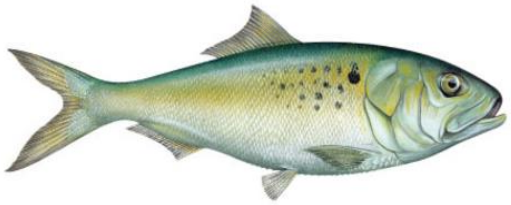
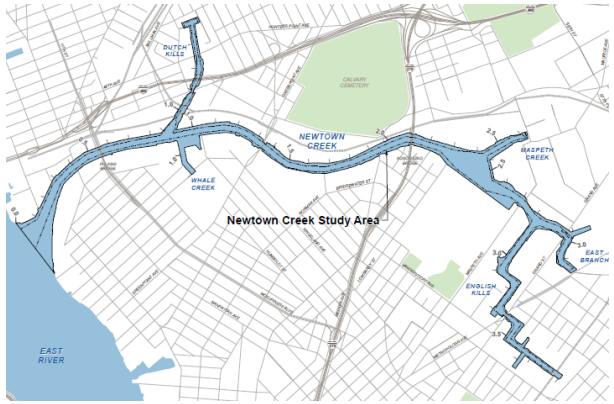


Atlantic Menhaden
Brevoortia tyrannus



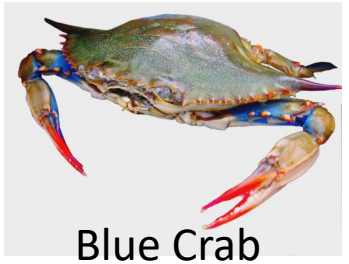
Striped Bass
Morone saxatilis

Newtown Creek Baseline Ecological Risk Assessment (BERA) Summary

Chuck Nace
Environmental Toxicologist
USEPA Region 2

Mummichog
Fundulus heteroclitus

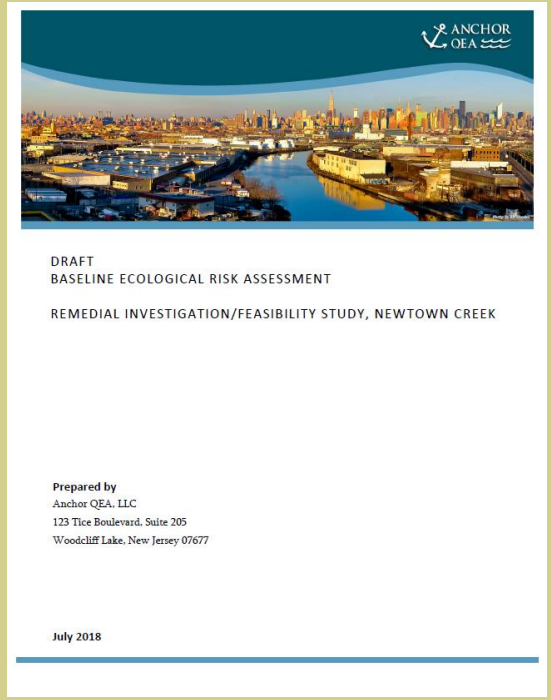
Ribbed Mussel
Geukensia demissa



Blue Crab
Callinectes sapidus

Baseline Ecological Risk Assessment (BERA)

- Revised BERA received July 2018, reviewed by EPA, EPA's contractor (CDM Smith), USFWS, NOAA, NYSDEC, CAG and also by the NYCDEP
- Term ecological risk assessment, as used specifically for the Superfund Program, refers to a qualitative and/or quantitative appraisal of the actual or potential impacts of contaminants from a hazardous waste site on plants and animals other than humans and domesticated species.
- Risk does not exist unless:
  - The stressor has the ability to cause one or more adverse effects, and
  - It co-occurs with or contacts an ecological component long enough and at a sufficient intensity to elicit the identified adverse effect

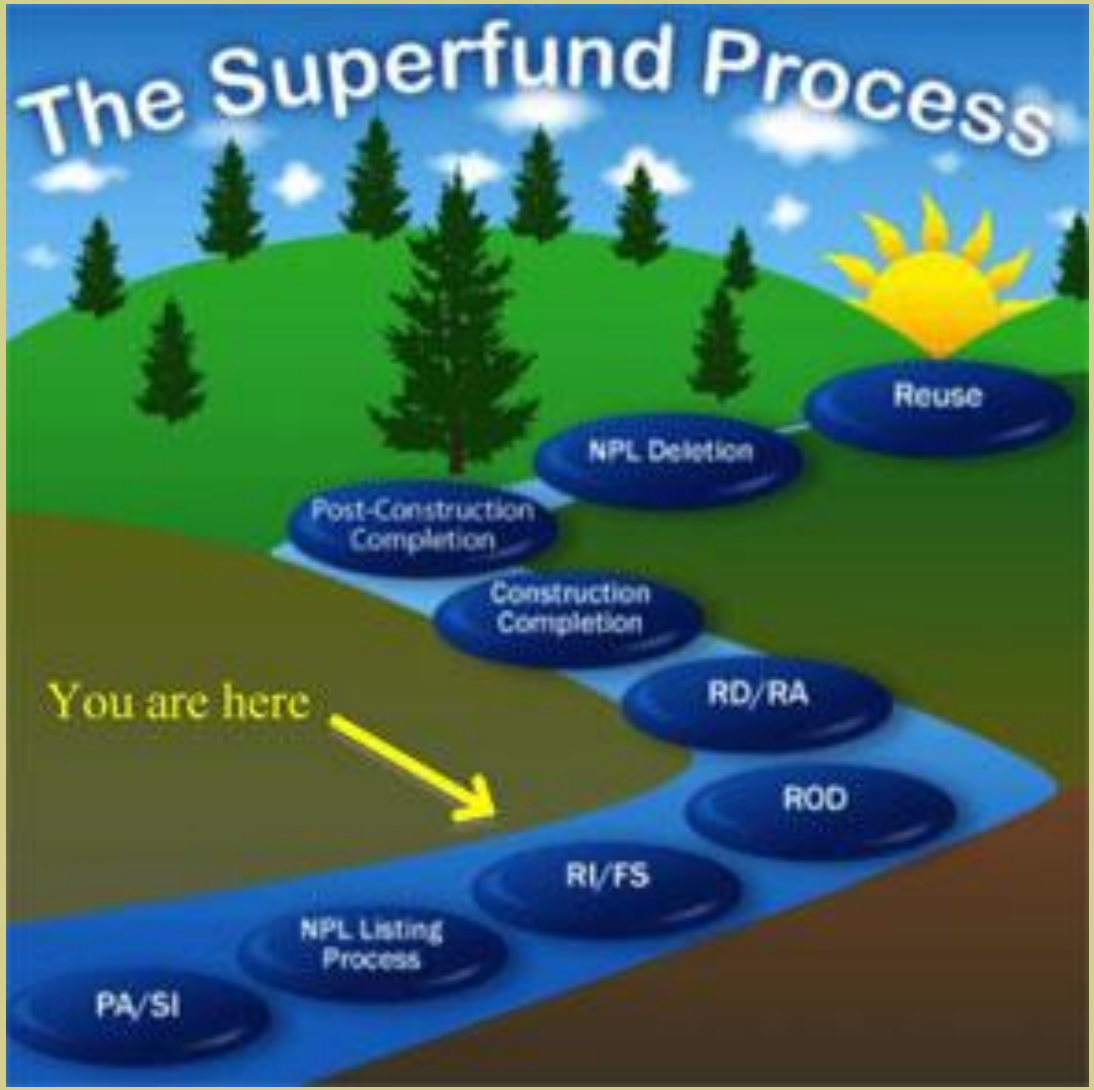


Goal of BERA

- CERCLA authorizes EPA to protect public health and welfare and the environment from the release or potential release of any hazardous substance, pollutant or contaminant.
- Under the NCP, EPA is responsible for the identification and mitigation of environmental impacts (such as toxicity, bioaccumulation, death, reproductive impairment, growth impairment and loss of critical habitat) at hazardous waste sites, and for the selection of remedial actions to protect the environment.
- NCP requires an Remedial Investigation/Feasibility Study (~ 4 documents)
  - The RI
    - Identifies the nature and extent of contamination
    - estimates risks to human health and
    - estimates risks to the environment
  - The FS develops and evaluates remedial options

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act; NCP – National Contingency Plan

EPA Superfund Process



The Remedial Investigation (RI) and Feasibility Study (FS), commonly called the RI/FS, is a process that can take several years or longer to complete

One of the processes that occur during the RI is conducting an ecological risk assessment

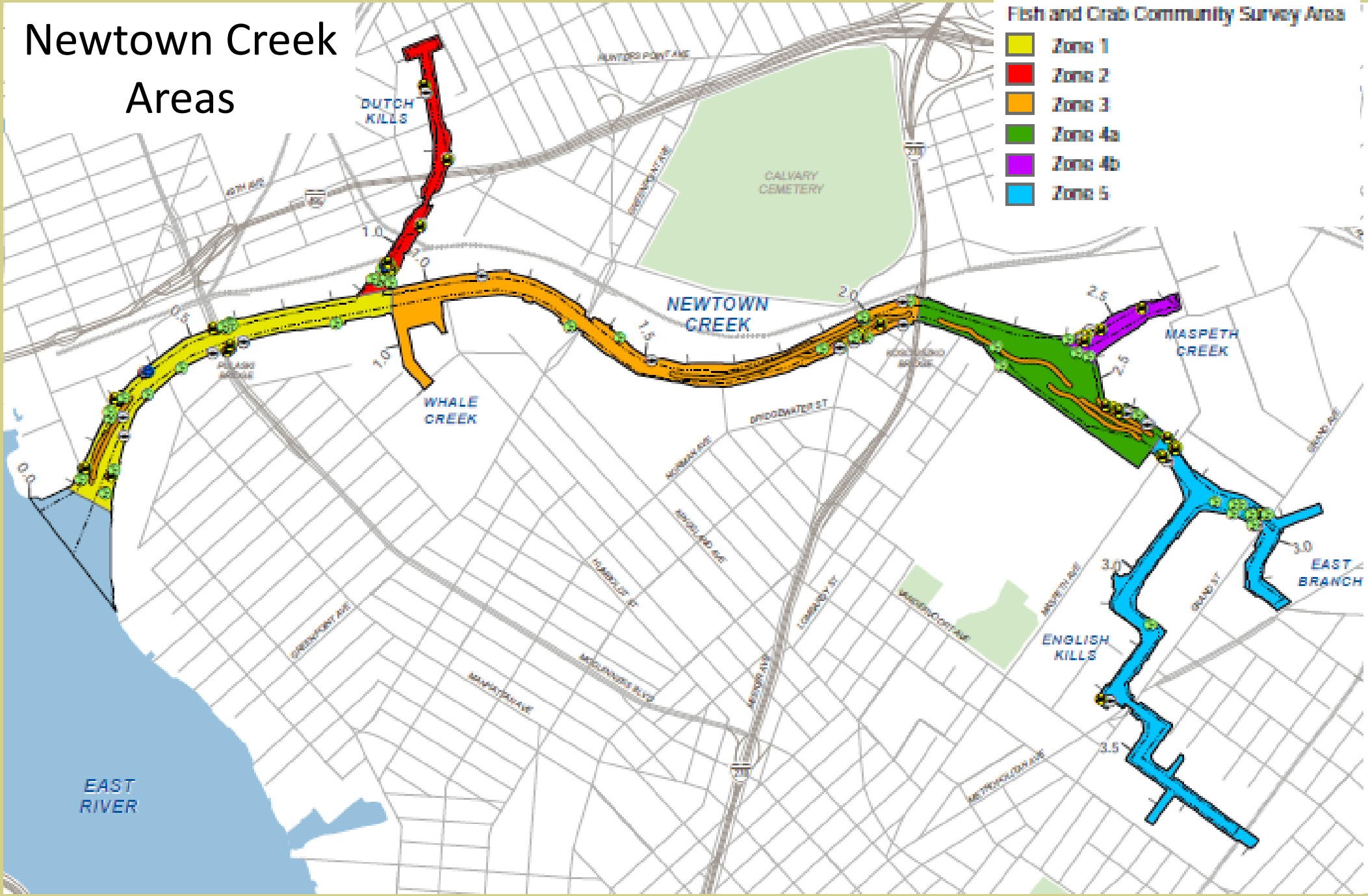
For Newtown Creek, the ecological risk assessment contains both a Screening Level Ecological Risk Assessment (SLERA) and a Baseline Ecological Risk Assessment (BERA)

The BERA has had multiple drafts submitted for review; the last version received was conditionally approved by EPA, pending several required changes

CAG comments received 08/22/18 – General comment that the executive summary did not clearly summarize the findings of the risk assessment nor directly identify the contaminants of potential ecological concern (COPECs).

- BERA does not outline sources of COPECs
- NAPL areas not identified on maps and description of physical contact with NAPL is necessary
- Ebullition is not identified in the BERA
- Confounding factors and unresolved complex mixture (UCM) not adequately evaluated
- Difference between NCG CBRs and LPRSA CBRs is not explained
- BERA indicates Westchester Creek is the most appropriate reference area

Newtown Creek Areas



Reference Areas

Westchester Creek – Industrial/CSO

Head of Bay – Industrial/Limited CSO

Spring Creek – Non-Industrial/CSO

Gerritsen Creek – Non-Industrial/Limited CSO

How Much Exposure Is Toxic?

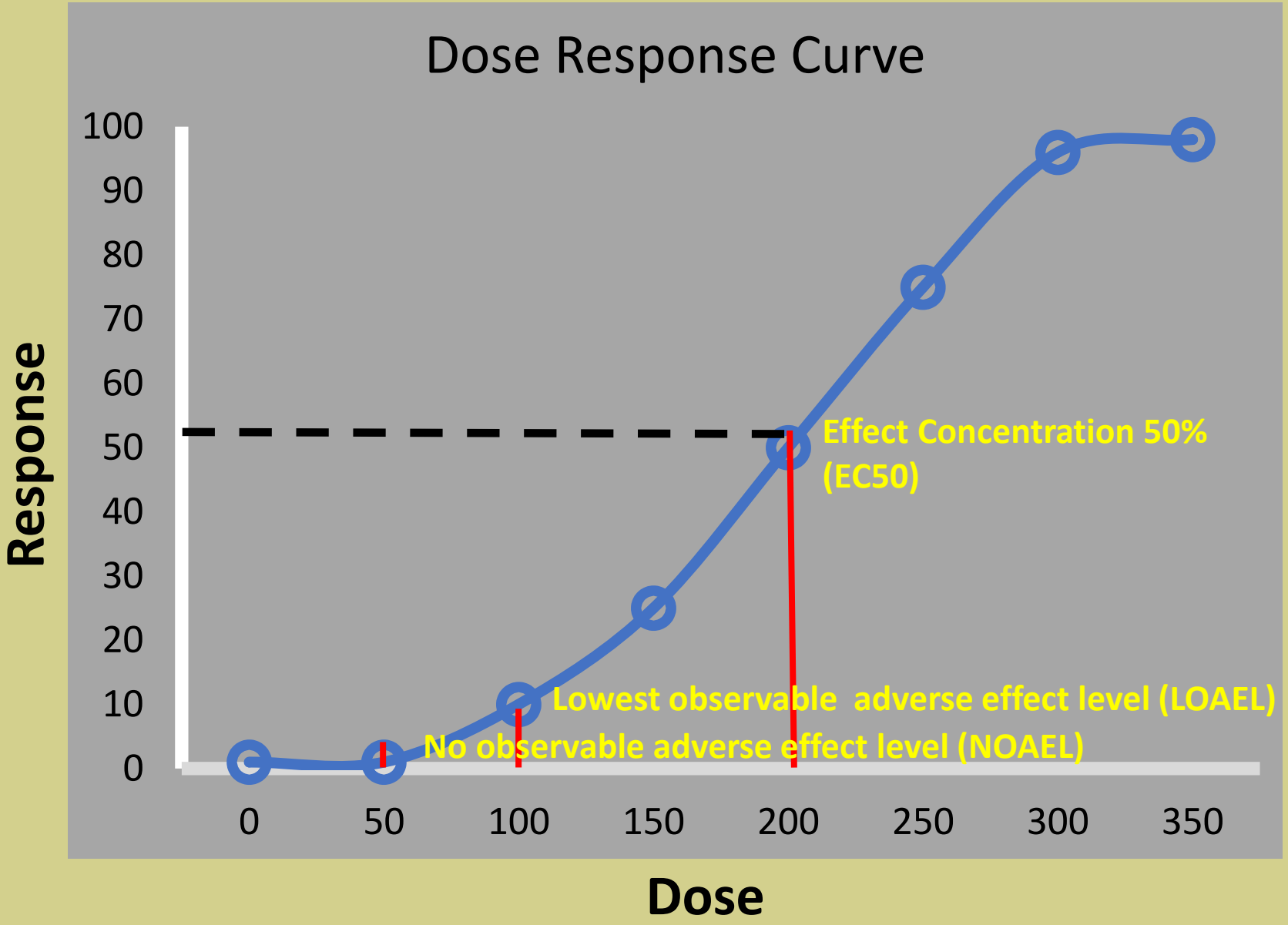
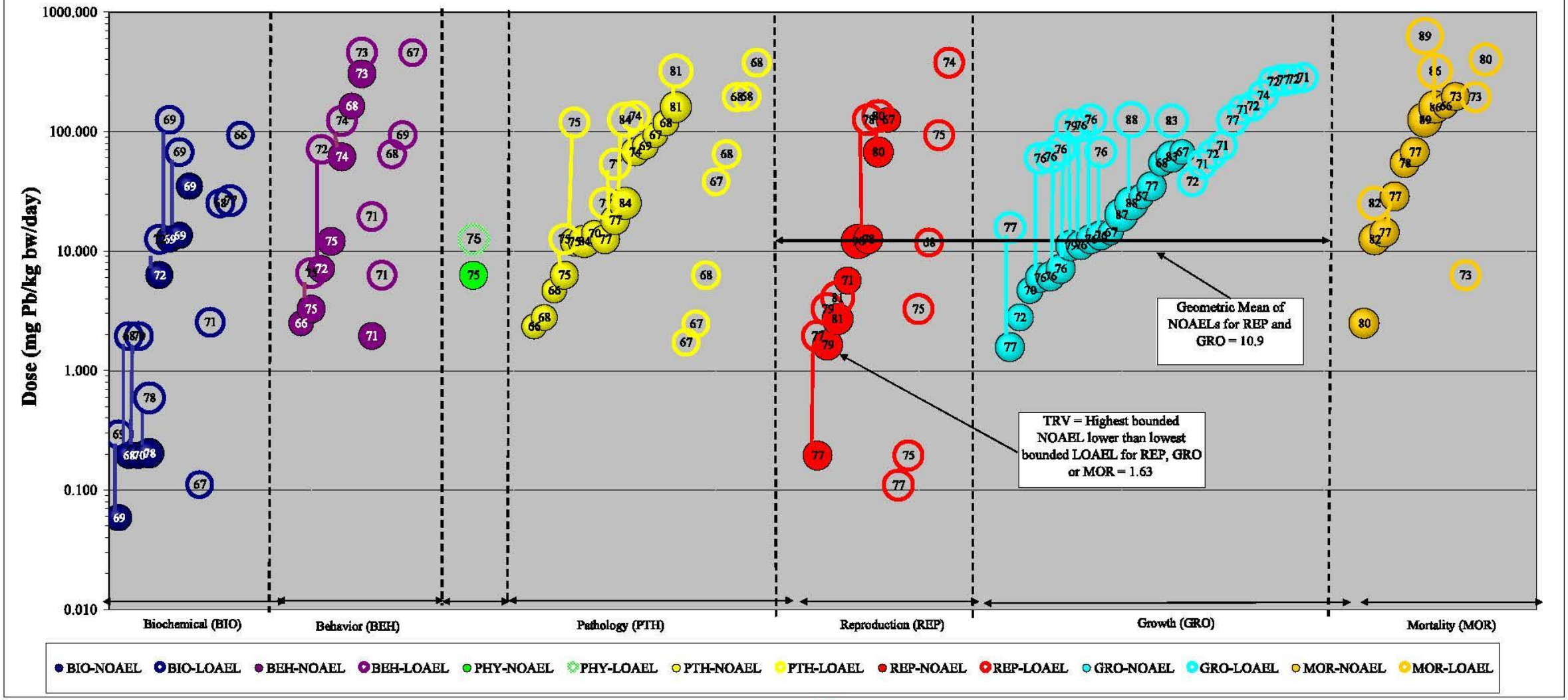
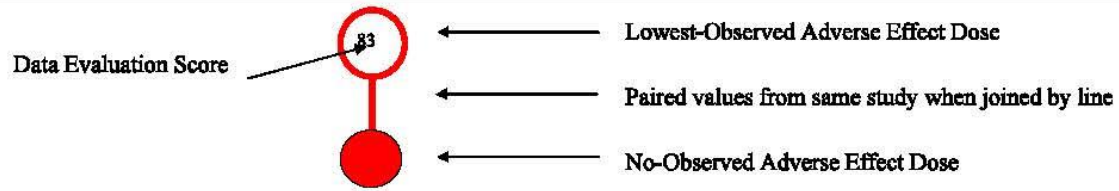


Figure 5.1 Avian TRV Derivation for Lead

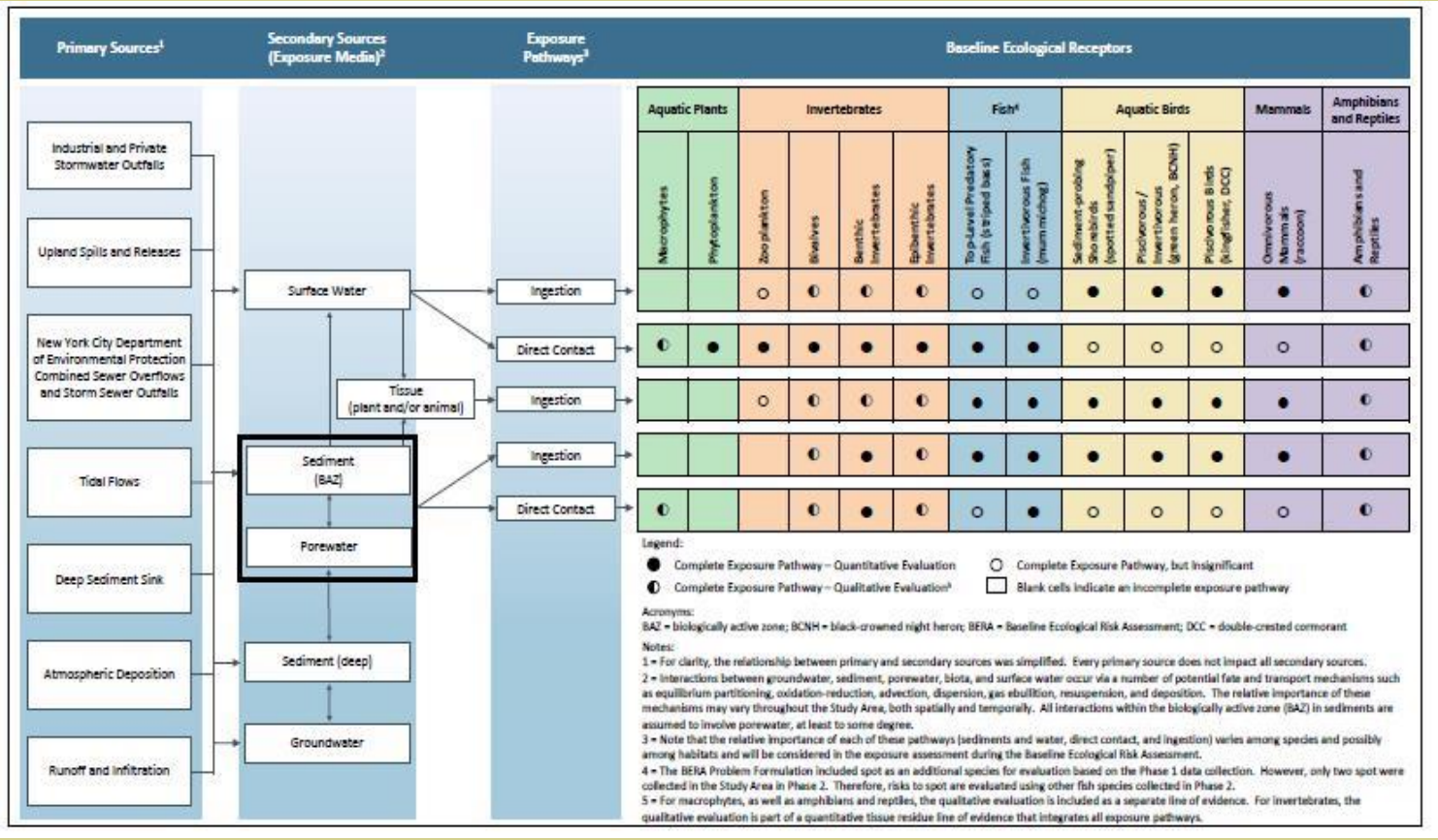


- Illustration of TRV selection process



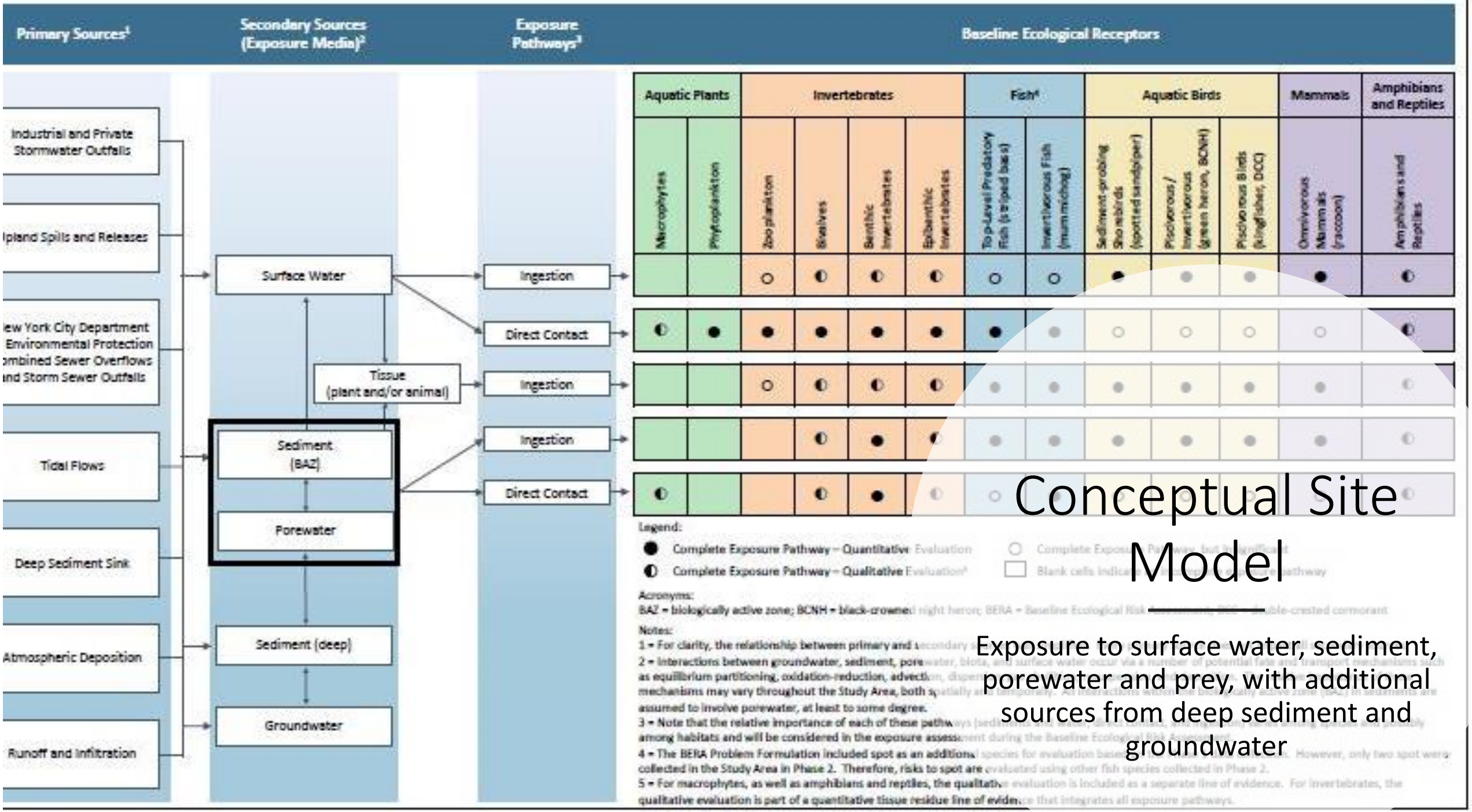
Executive Summary, Section 1 – Introduction, and Section 2 – Study Area and Reference Areas

- Executive Summary is organized to summarize each section of the document – it does not provide an overall summary or interpretation of how the results will be used in future documents or decisions
- Introduction presents the purpose, format and layout of the document
- Study Area and Reference Areas section provides a brief history of the study area, ecological characterization of the study area and reference areas based on previous investigations



Section 3 – Problem Formulation

- Problem Formulation section reiterates information that was provided in the BERA Problem Formulation document, which was a precursor to the BERA workplan
- The conceptual site model, ecological receptors, exposure pathways, assessment and measurement endpoints, and weight of evidence approach are also identified in this section.



Conceptual Site Model

Exposure to surface water, sediment, porewater and prey, with additional sources from deep sediment and groundwater

Receptors and Pathways

Aquatic Plants – phytoplankton, macrophytes

Zooplankton – general

Bivalves – ribbed mussel

Benthic invertebrates – general, *Leptocheirus plumulosus, Nereis virens*

Epibenthic decapods – blue crab

Amphibians and reptiles

Fish – general, mummichog, striped bass, Atlantic menhaden

Birds – general, belted kingfisher, double-crested cormorant, green heron, black-crowned night heron, spotted sandpiper

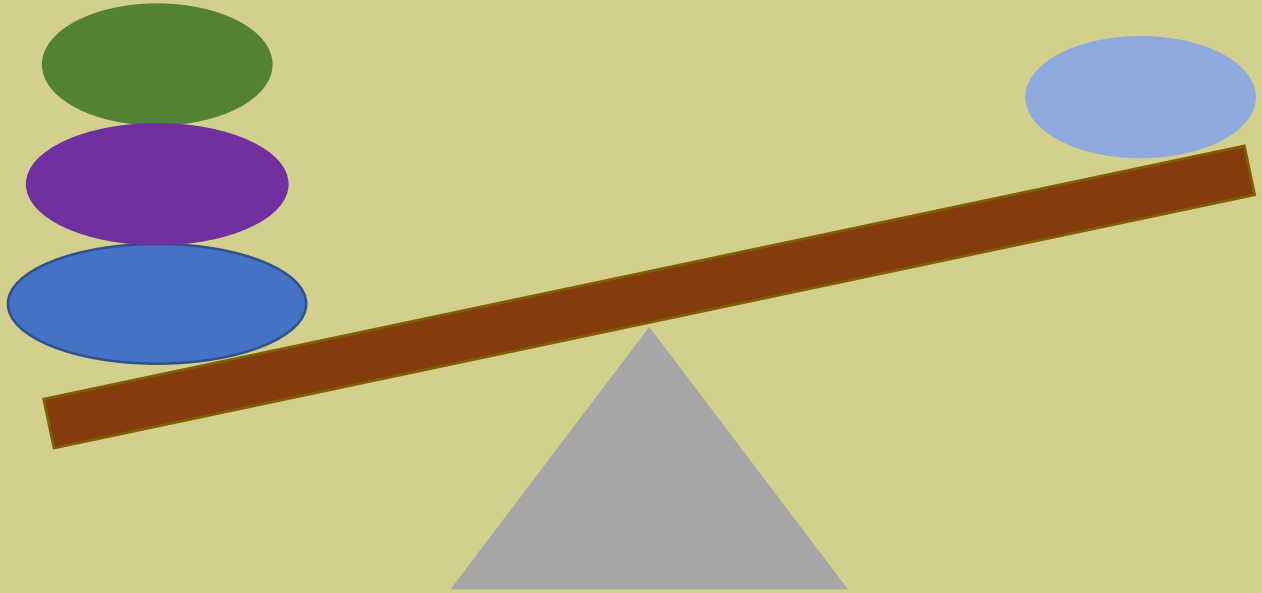
Mammal - raccoon

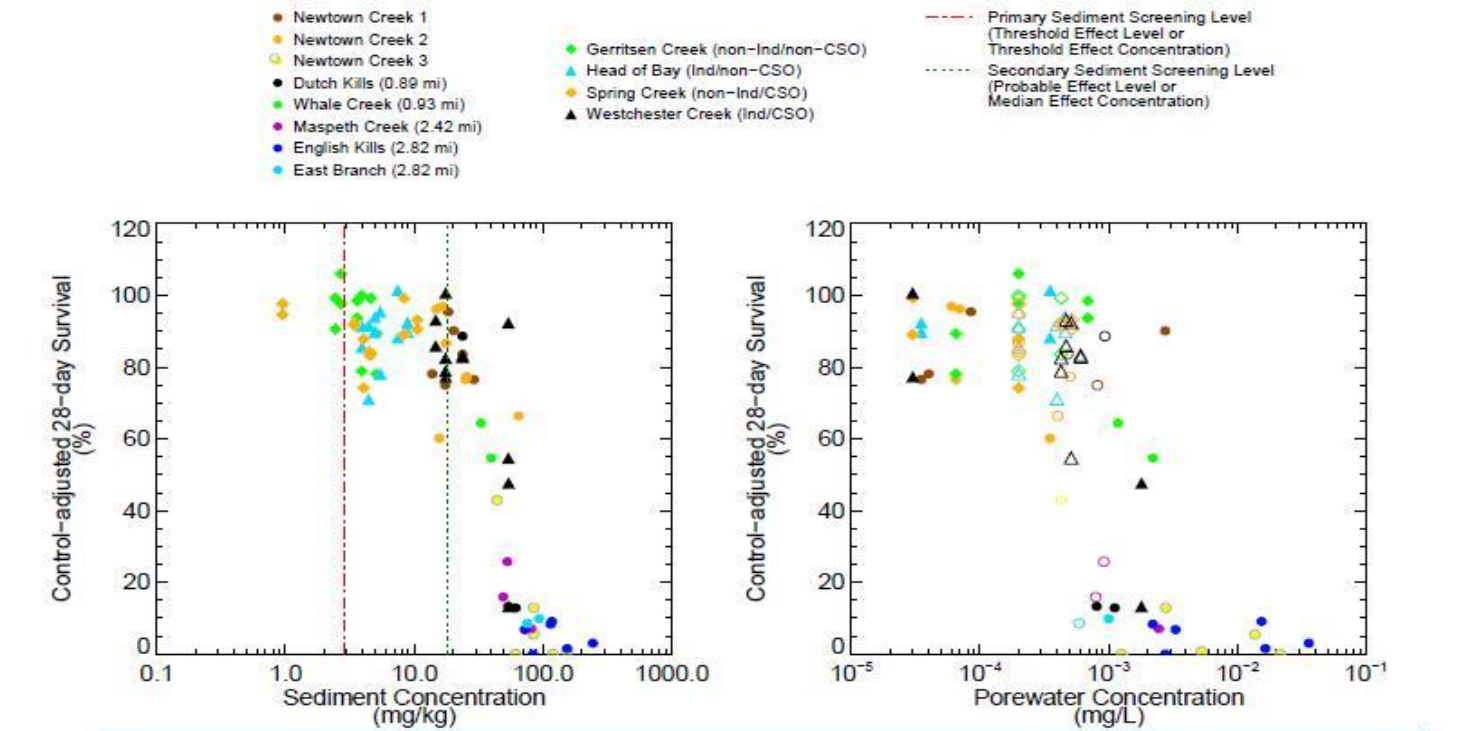
Weight of Evidence

Individual lines of evidence for multiple trophic levels, multiple species and multiple pathways – each has its own results associated with toxicity and specific chemical exposure

All lines of evidence are then examined together in an overall weight of evidence approach to understand trends in toxicity or impacts, localized areas of impact and chemical signature/associations

Includes more than comparing concentrations to toxicity benchmarks





Section 4 – Data Evaluation

- This section discusses the data usability, data sets that were used, and provides the specific metrics and measurements for each data type:
  - Surface water
  - Sediment
  - Toxicity testing
  - Bioaccumulation testing
  - Biota/tissue collection
  - Surveys
  - In addition, the analytes measured and the methodology for evaluating the data were identified
  - The majority of the information contained in this section was selected and discussed in the work plan

Table 5-7
Phase 2 SLERA Selection of Contaminants of Potential Ecological Concern – Surface Sediment

Exposure Point	Chemical	CAS RN	Units	Frequency of Detection (%)	Maximum Detected Concentration[1]	Maximum Non-detect Concentration[1]	Maximum Concentration[1,2]	Basis for Maximum (D/ND)	95% UCL[1,3]	UCL Type	Screening Level	Screening Level Note	Hazard Quotient (Maximum Concentration)[1]	Hazard Quotient (95% UCL)[1]	COPEC Selection	Rationale for COPEC Selection
Study Area	*Conventional Parameters*															
	Cyanide	57-12-5	mg/kg	31	9.7	9.7	9.7	D	1.5	95% KM (t) UCL	0.1	--	97	15	Yes	95% UCL > SL
	Metals															
	Aluminum	7429-90-5	mg/kg	100	24,000	N/A	24,000	D	12,000	95% Chebyshev (Mean, Sd) UCL	18,000	--	1.3	0.68	No	95% UCL < SL
	Antimony	7440-36-0	mg/kg	100	110	N/A	110	D	7.2	95% Chebyshev (Mean, Sd) UCL	2	--	55	3.6	Yes	95% UCL > SL
	Arsenic	7440-38-2	mg/kg	100	400	N/A	400	D	38	95% Chebyshev (Mean, Sd) UCL	7.24	--	56	5.2	Yes	95% UCL > SL
	Barium	7440-39-3	mg/kg	100	680	N/A	680	D	170	95% Chebyshev (Mean, Sd) UCL	20	--	34	8.5	Yes	95% UCL > SL
	Beryllium	7440-41-7	mg/kg	99	1.9	0.67	1.9	D	0.7	95% KM (BCA) UCL	N/A	--	N/A	N/A	Uncertain	FoD > 5%_No SL
	Cadmium	7440-43-9	mg/kg	100	250	N/A	250	D	27	95% Chebyshev (Mean, Sd) UCL	0.68	--	370	39	Yes	95% UCL > SL
	Chromium	7440-47-3	mg/kg	100	1,400	N/A	1,400	D	220	95% Chebyshev (Mean, Sd) UCL	52.3	--	27	4.3	Yes	95% UCL > SL
	Cobalt	7440-48-4	mg/kg	100	69	N/A	69	D	14	95% Chebyshev (Mean, Sd) UCL	50	--	1.4	0.29	No	95% UCL < SL
	Copper	7440-50-8	mg/kg	100	37,000	N/A	37,000	D	1,900	95% Chebyshev (Mean, Sd) UCL	18.7	--	2,000	100	Yes	95% UCL > SL
	Lead	7439-92-1	mg/kg	100	3,100	N/A	3,100	D	540	95% Chebyshev (Mean, Sd) UCL	30.2	--	100	18	Yes	95% UCL > SL
	Manganese	7439-96-5	mg/kg	100	830	N/A	830	D	310	95% Chebyshev (Mean, Sd) UCL	460	--	1.8	0.68	No	95% UCL < SL
	Mercury	7439-97-6	mg/kg	100	13	N/A	13	D	2.2	95% Chebyshev (Mean, Sd) UCL	0.13	--	100	17	Yes	95% UCL > SL
	Nickel	7440-02-0	mg/kg	100	4,200	N/A	4,200	D	270	95% Chebyshev (Mean, Sd) UCL	15.9	--	260	17	Yes	95% UCL > SL
	Selenium	7782-49-2	mg/kg	96	53	1.5	53	D	4.3	95% KM (BCA) UCL	2	--	26	2.1	Yes	95% UCL > SL
	Silver	7440-22-4	mg/kg	100	52	N/A	52	D	10	95% Chebyshev (Mean, Sd) UCL	0.73	--	72	14	Yes	95% UCL > SL
	Thallium	7440-28-0	mg/kg	99	2.5	0.44	2.5	D	0.37	95% KM (BCA) UCL	N/A	--	N/A	N/A	Uncertain	FoD > 5%_No SL
	Tin	7440-31-5	mg/kg	100	250	N/A	250	D	47	95% Chebyshev (Mean, Sd) UCL	3.4	--	72	14	Yes	95% UCL > SL
	Vanadium	7440-62-2	mg/kg	100	150	N/A	150	D	52	95% Modified-t UCL	57	--	2.7	0.91	No	95% UCL < SL
	Zinc	7440-66-6	mg/kg	100	14,000	N/A	14,000	D	1,800	95% Chebyshev(Mean, Sd) UCL (H-UCL recommended)	124	--	110	15	Yes	95% UCL > SL
	Organometallic Compounds															
	Methyl mercury	22967-92-6	µg/kg	88	26	2.2	26	D	2.7	95% KM (Chebyshev) UCL	100	--	0.26	0.027	No	Max Conc < SL
	Volatile Organic Compounds															
	1,1,1-Trichloroethane	71-55-6	mg/kg (at 1% TOC)	0	N/A	0.16	0.16	ND	N/A	N/A	0.856	EqP	0.091	N/A	No	Max Conc < SL
	1,1,2,2-Tetrachloroethane	79-34-5	mg/kg (at 1% TOC)	0	N/A	0.16	0.16	ND	N/A	N/A	0.202	EqP	0.39	N/A	No	Max Conc < SL
	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	µg/kg	0	N/A	14,000	14,000	ND	N/A	N/A	N/A	--	N/A	N/A	Uncertain	FoD < 5%_No SL
	1,1,2-Trichloroethane	79-00-5	mg/kg (at 1% TOC)	0	N/A	0.16	0.16	ND	N/A	N/A	0.57	EqP	0.14	N/A	No	Max Conc < SL
	1,1-Dichloroethane	75-34-3	mg/kg (at 1% TOC)	0.58	0.00044	0.16	0.00044	D	N/A	N/A	0.00057	EqP	0.76	N/A	No	Max Conc < SL
	1,1-Dichloroethene	75-35-4	mg/kg (at 1% TOC)	0	N/A	0.16	0.16	ND	N/A	N/A	2.78	EqP	0.028	N/A	No	Max Conc < SL
	1,2,3-Trichlorobenzene	87-61-6	µg/kg	0.59	19	3,600	19	D	N/A	N/A	858	--	0.022	N/A	No	Max Conc < SL
	1,2,4-Trichlorobenzene	120-82-1	mg/kg (at 1% TOC)	1.2	0.033	0.38	0.033	D	N/A	N/A	0.473	EqP	0.07	N/A	No	Max Conc < SL
	1,2-Dibromo-3-chloropropane	96-12-8	µg/kg	0	N/A	3,600	3,600	ND	N/A	N/A	N/A	--	N/A	N/A	Uncertain	FoD < 5%_No SL
	1,2-Dichlorobenzene	95-50-1	mg/kg (at 1% TOC)	5.2	0.0092	0.38	0.0092	D	0.00055	95% KM (Percentile Bootstrap) UCL	0.989	EqP	0.0093	0.00056	No	Max Conc < SL

Section 5 – Phase 2 SLERA

- Screening Level Ecological Risk Assessment (SLERA)
  - First step of ecological risk assessment
  - Maximum detected concentrations are compared to toxicity values associated with no observed effect concentrations (NOECs)
  - 95% upper-confidence limit also compared to NOECs
- Surface water, surface sediment, aquatic organism tissue and wildlife
- Compounds that exceed NOECs are carried forward for further evaluation

Surface Water

Six chemicals were identified as COPECs with HQs based on 95% UCL concentrations greater than 110. These COPECs are aluminum, barium, copper, cyanide, carbon disulfide, and total DDx.

Surface Sediment

The following chemicals were identified as sediment COPECs:

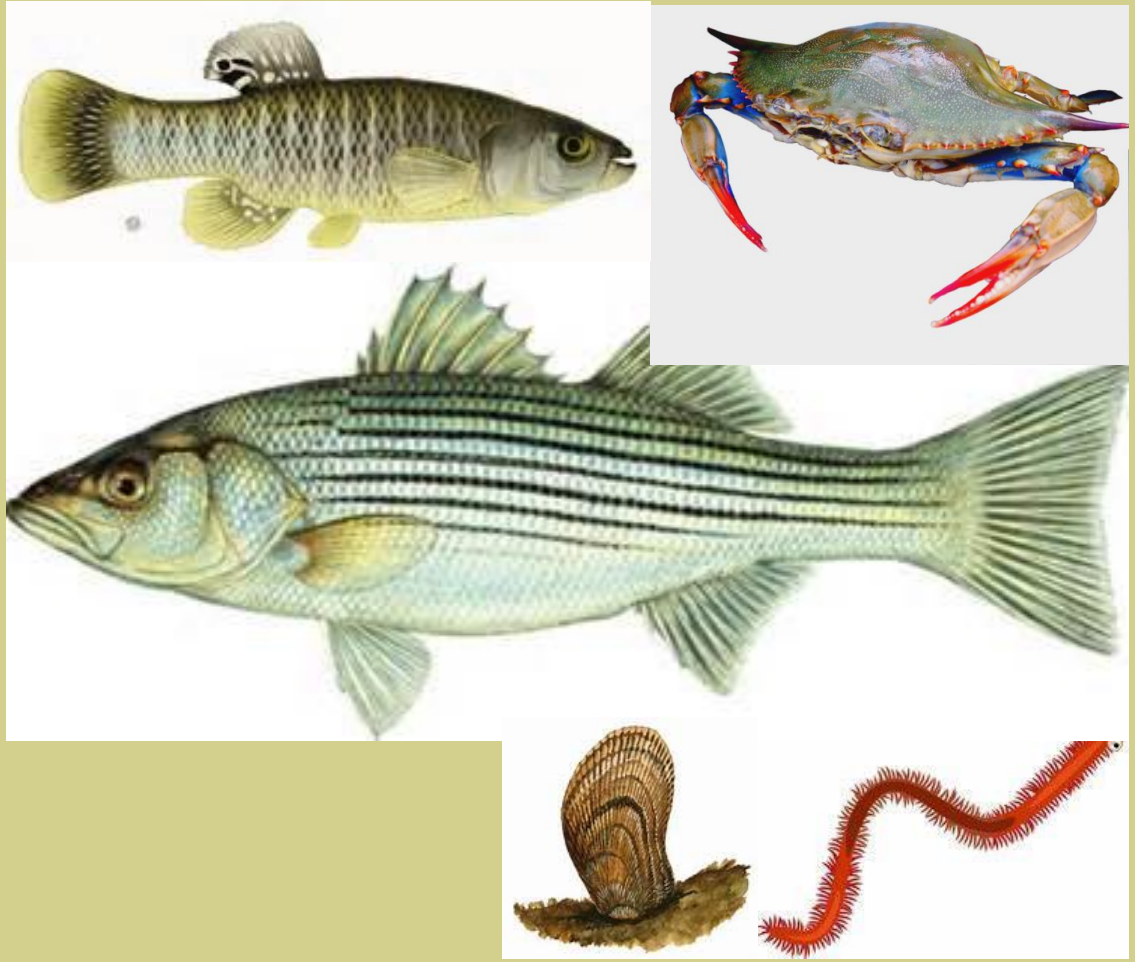
- Thirteen metals: antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, tin, and zinc
- One conventional: cyanide
- Two volatile organic compounds (VOCs): isopropylbenzene and carbon disulfide
- Four SVOCs: biphenyl (1,1-biphenyl), bis(2-ethylhexyl)phthalate (BEHP), di-n-octyl phthalate, and dimethylphthalate
- Low-molecular-weight PAHs (LPAHs), high-molecular-weight PAHs (HPAHs), and total PAHs (TPAH)
- Eight pesticides: aldrin, dieldrin, endrin, heptachlor epoxide, hexachlorocyclohexane (BHC), and isomers of dichlorodiphenyldichloroethane (DDD), dichlorodiphenyldichloroethylene (DDE), and dichlorodiphenyltrichloroethane (DDT)
- Total PCB congener

Several compounds were not carried through to the BERA for reasons detailed in the text

Aquatic Organism Tissue

The following COPECs were identified based on the USEPA Region 2 NOECs for each of these receptors:

- Striped bass: copper, mercury, methyl mercury, selenium, dieldrin, total DDx, 2,3,7,8-TCDD, total dioxin/furan TEQ (fish), and total PCB congeners
- Mummichog: copper, lead, zinc, dieldrin, total dioxin/furan TEQ (fish), and total PCB congeners
- Blue crab: copper, lead, dieldrin, HPAH, TPAH, 2,3,7,8-TCDD, and total PCB congeners
- Ribbed mussel: dieldrin (based on a maximum concentration), HPAH, TPAH, and total PCB congeners
- Polychaete: dieldrin, HPAH, TPAH, 2,3,7,8-TCDD, and total PCB congeners



Wildlife

The COPECs identified for the spotted sandpiper consisted of the following:

- Eight metals: arsenic, cadmium, chromium, copper, lead, nickel, selenium, and zinc
- Total PCB congeners
- Total PCB congener TEQs for avian receptors
- Dioxin/furan TEQs for avian receptors

For the green heron, black-crowned night heron, double-crested cormorant, and belted kingfisher, the COPECs were a subset of those identified for the spotted sandpiper. The only exception was the identification of methyl mercury as an additional COPEC for the belted kingfisher.

Again, for the raccoon, the COPECs were a subset of those identified for the spotted sandpiper. The only exception was the identification of pyrene, HPAHs, and TPAHs as additional COPECs for the raccoon.

Section 6 – Baseline Surface Water Risk Assessment

Assessment endpoint: Are the levels of contaminants in surface water from the Study Area greater than surface water toxicity-based values for the survival, growth, or reproduction of phytoplankton, zooplankton, bivalves, benthic macroinvertebrates, and fish?

- Site-wide surface water concentrations, based on 95% UCL, were compared to surface water quality criteria
- Four compounds exceed surface water quality criteria
  - Cyanide, copper, barium and total DDx

COPECs in Surface Water

The risk question applies to five receptor groups so there are five LOEs associated with the surface water risk assessment. The risk assessment results for these five LOEs are incorporated into the WOE evaluation completed in Section 14.

Aluminum was not carried through due to concentrations being similar to concentrations in the four reference areas, decreasing trend of concentrations from the mouth of Newtown Creek to the tributaries, and lack of aluminum in the sediment samples

Cyanide, copper, barium, carbon disulfide and total DDX were evaluated and only cyanide had an HQ greater than 1

Cyanide HQ of 1.1, was due to two samples with elevated concentrations

Section 7 – Baseline Epibenthic Bivalve Risk Assessment

Assessment Endpoints: Are the levels of contaminants in surface water from the Study Area greater than surface water toxicity-based values for the survival, growth, or reproduction of bivalves?

- Is the accumulation of bioaccumulative contaminants in ribbed mussels sufficient to cause adverse effects to Study Area bivalves?
- Caged bivalves (ribbed mussel) tissue concentrations were compared critical body residues (CBRs)
- Tissue concentrations highest in English Kills and Maspeth Creek

Surface Water

Cyanide, copper, barium, carbon disulfide and total DDX were evaluated and only cyanide had an HQ greater than 1

Cyanide HQ of 1.1, was due to two samples with elevated concentrations

Tissue

When using the NCG CBRs, HQs for bivalves for all COPECs are below 1.

When using the USEPA Region 2 CBRs:

– The LOEC-based HQs for HPAH and TPAH are similar, ranging from 1.7 to 1.9, respectively, and for the NOEC-based HQs, ranging from 17 to 19, respectively.

– For dieldrin, the HQs range from 0.62 to 3.1 based on the LOEC and NOEC, respectively.

– For total PCB congeners, the HQs range from 3.9 to 13 based on the LOEC and NOEC, respectively.

Section 8 – Baseline Benthic Macroinvertebrate Risk Assessment

Assessment Endpoints:

- Comparison of surface water concentrations to benchmarks
- Comparison of tissue concentrations to CBR benchmarks
- Comparison of sediment concentrations to benchmarks
- Comparison of ΣSEM – AVS concentrations to benchmarks
- Comparison of porewater concentrations to benchmarks
- Comparison of benthic macroinvertebrate community metrics in Study Area and reference area locations
- Comparison of benthic macroinvertebrate community metrics with bulk sediment concentrations
- Direct laboratory test measure of 28-day toxicity to test amphipods; exposure measured in bulk sediment and porewater
- Direct laboratory test measure of 10-day toxicity to test amphipods; exposure measured in bulk sediment and porewater

Comparison of surface water concentrations to benchmarks

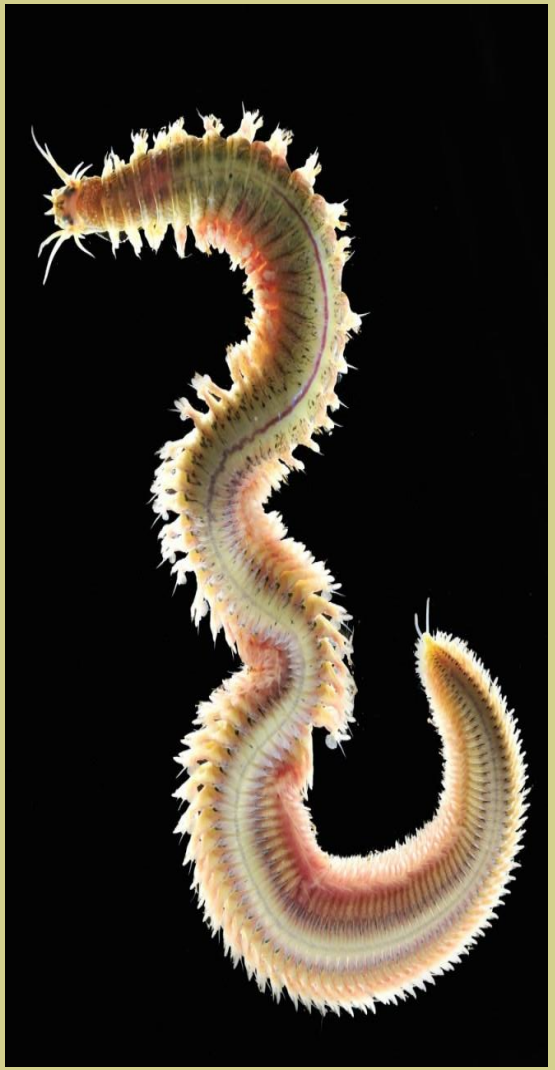
Cyanide, copper, barium, carbon disulfide and total DDX were evaluated and only cyanide had an HQ greater than 1

Cyanide HQ of 1.1, was due to two samples with elevated concentrations

Comparison of tissue concentrations to CBR benchmarks

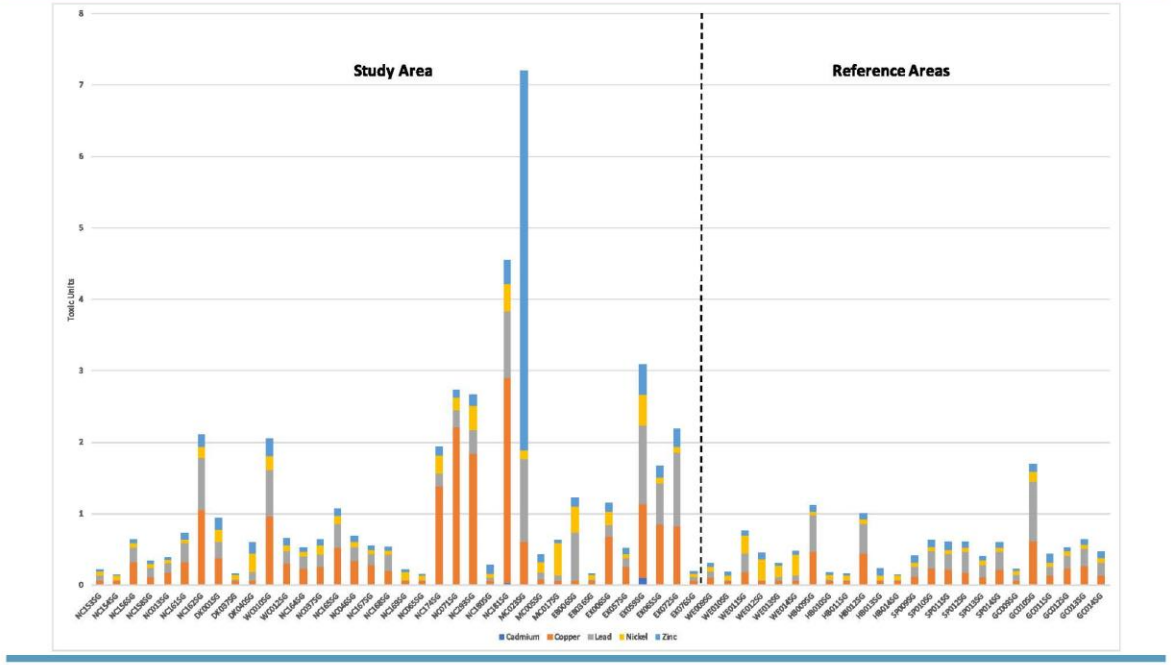
- When using the NCG NOECs, HQs for all COPECs are less than 1.
- When using the USEPA Region 2 CBRs, the LOEC-based HQs for HPAH and TPAH are 1.0 and 1.2, respectively, and the NOEC-based HQs are 10 and 11, respectively.
- For dieldrin and 2,3,7,8-TCDD, the USEPA Region 2 LOEC-based HQs are less than 1 (0.59 and 0.19, respectively); the USEPA Region 2 NOEC-based HQs are greater than 1 (2.9 and 1.7, respectively).
- For total PCB congeners, the HQs are 15 and 48 based on the USEPA Region 2 LOEC and NOEC, respectively.

The polychaete tissue concentrations were found to be highest in English Kills for total HPAH, total PAH (17), dieldrin, 2,3,7,8-TCDD, and total PCB congeners, with tissues from the Turning Basin showing equally high concentrations of total HPAH, total PAH (17), and 2,3,7,8-TCDD. Additionally, the tissue concentrations of these COPECs show a tendency to increase as they move upstream, with English Kills and the Turning Basin exhibiting tissue concentrations above the USEPA Region 2 CBR LOEC values for total HPAH, total PAH (17), and total PCB congeners. Concentrations of 2,3,7,8-TCDD exceed the USEPA Region 2 CBRs NOEC value in English Kills, the Turning Basin, and Whale Creek.



Comparison of ΣSEM – AVS concentrations to benchmarks

- The ΣSEM – AVS illustrates a lack of metals bioavailability with respect to bulk sediment exposures; the ΣSEM – AVS values for all samples were less than zero.
- Metals speciation evaluation also supports lack of metals bioavailability with respect to bulk sediment exposures. Very few metals, including the individual SEM metals, were found to be present in an exchangeable form in the sediment samples that were evaluated. Exchangeable metals would be assumed to be bioavailable. However, even when exchangeable metals were found in a sample, the percentages that were exchangeable were low relative to the metal that was insoluble in the same sample. Therefore, the concentrations of bioavailable forms of the metals are low in the Study Area sediment samples.



ANCHOR QEA

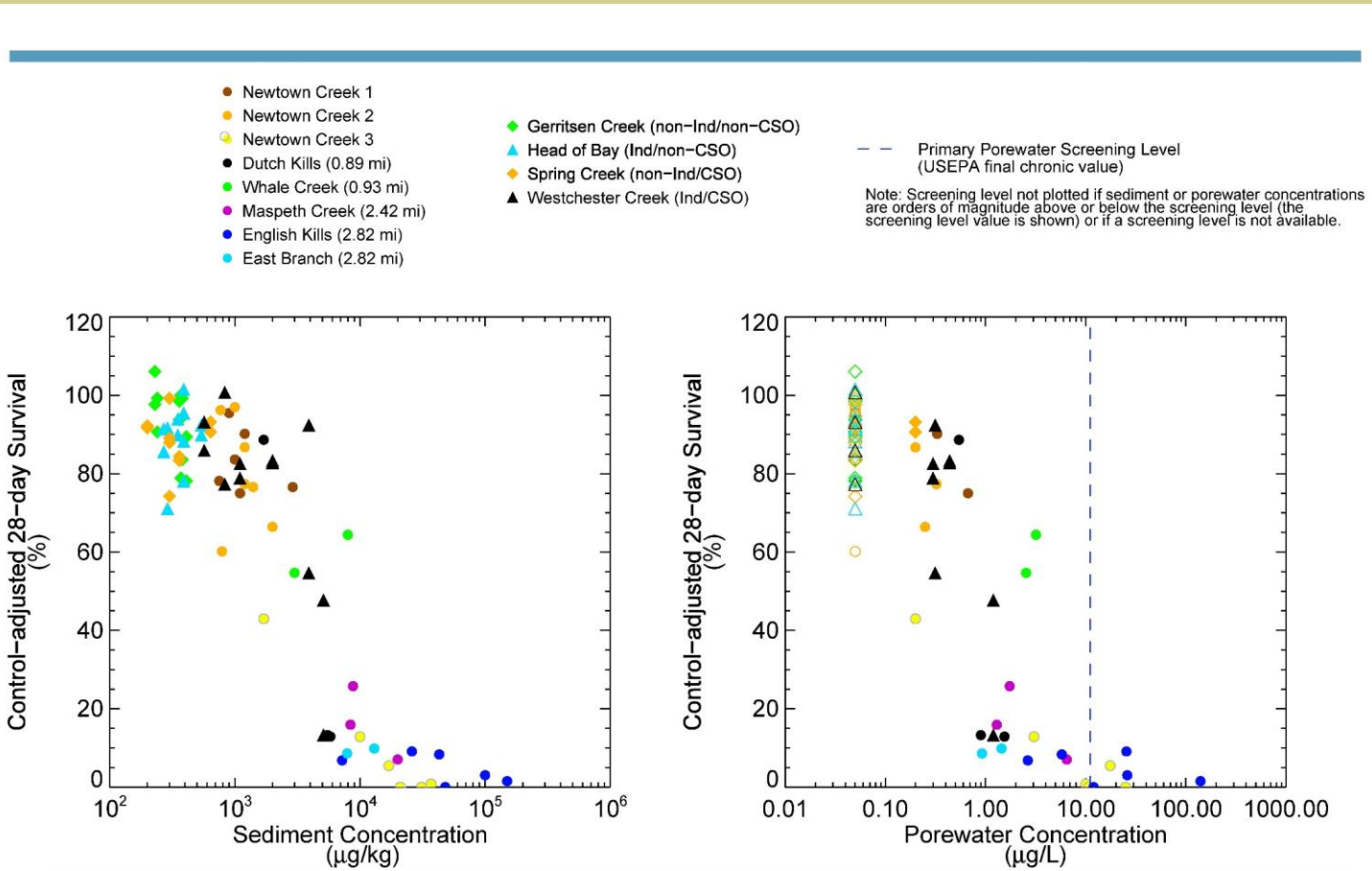
Figure 8-34
SEM Metals in Porewater – Toxicity Test (Ex Situ) Samples
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

SEM – simultaneously extracted metal; AVS – acid volatile sulfide

Comparison of porewater concentrations to benchmarks

Based on COPECs measured in porewater, the primary COPEC with HQs above 1 is TPAH (34).

SEM metals copper, lead, and zinc in porewater are elevated and may contribute to toxicity at several locations (e.g., MC023, NC181, and EK072).



Comparison of porewater concentrations to benchmarks

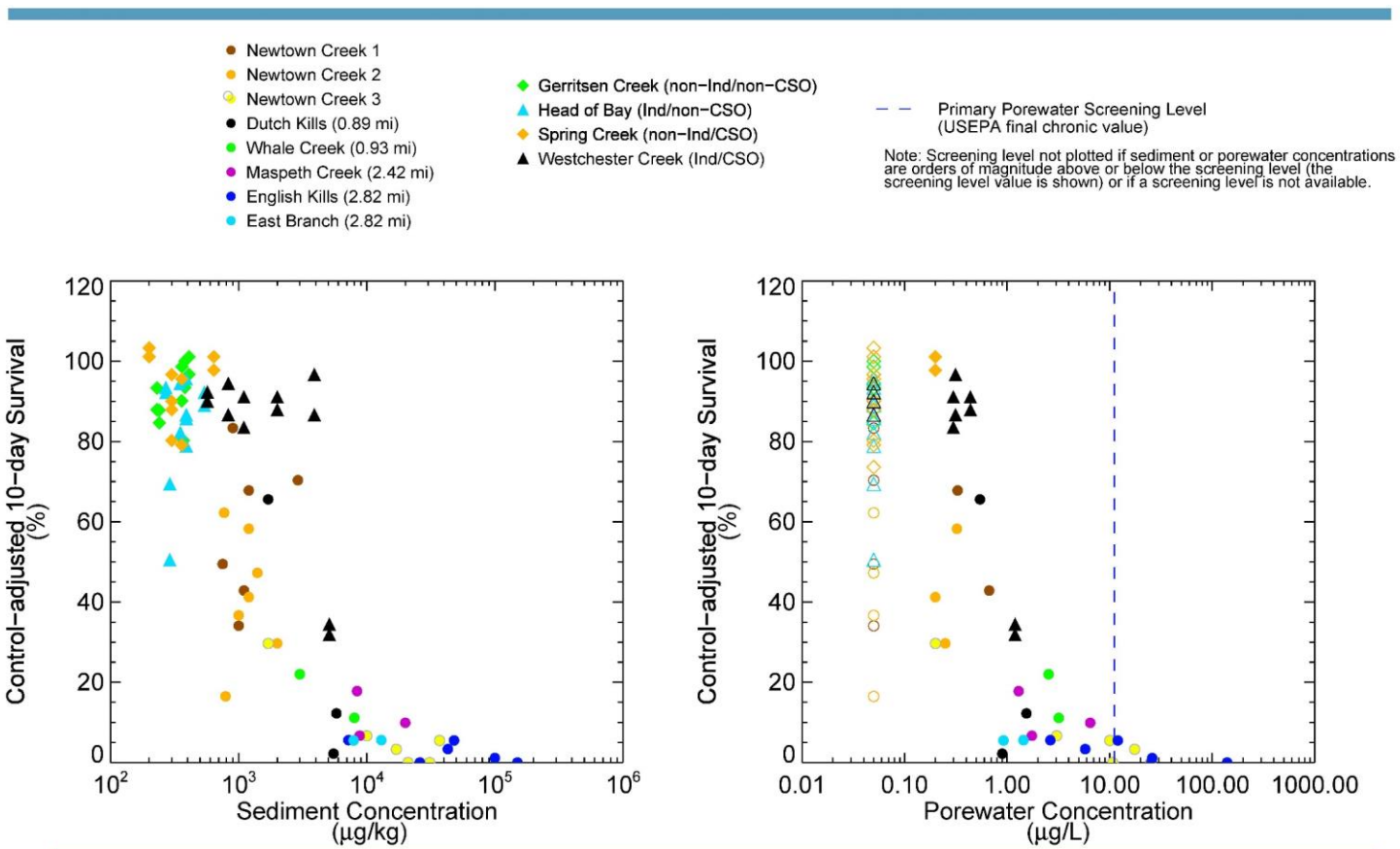


Figure 8−29k

Surface Sediment, Porewater, and 10−day Triad Survival for C3−Naphthalenes
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

Totals reported using Kaplan−Meier, if applicable. SE: Standard error in the arithmetic average. Nondetects plotted as hollow symbols.

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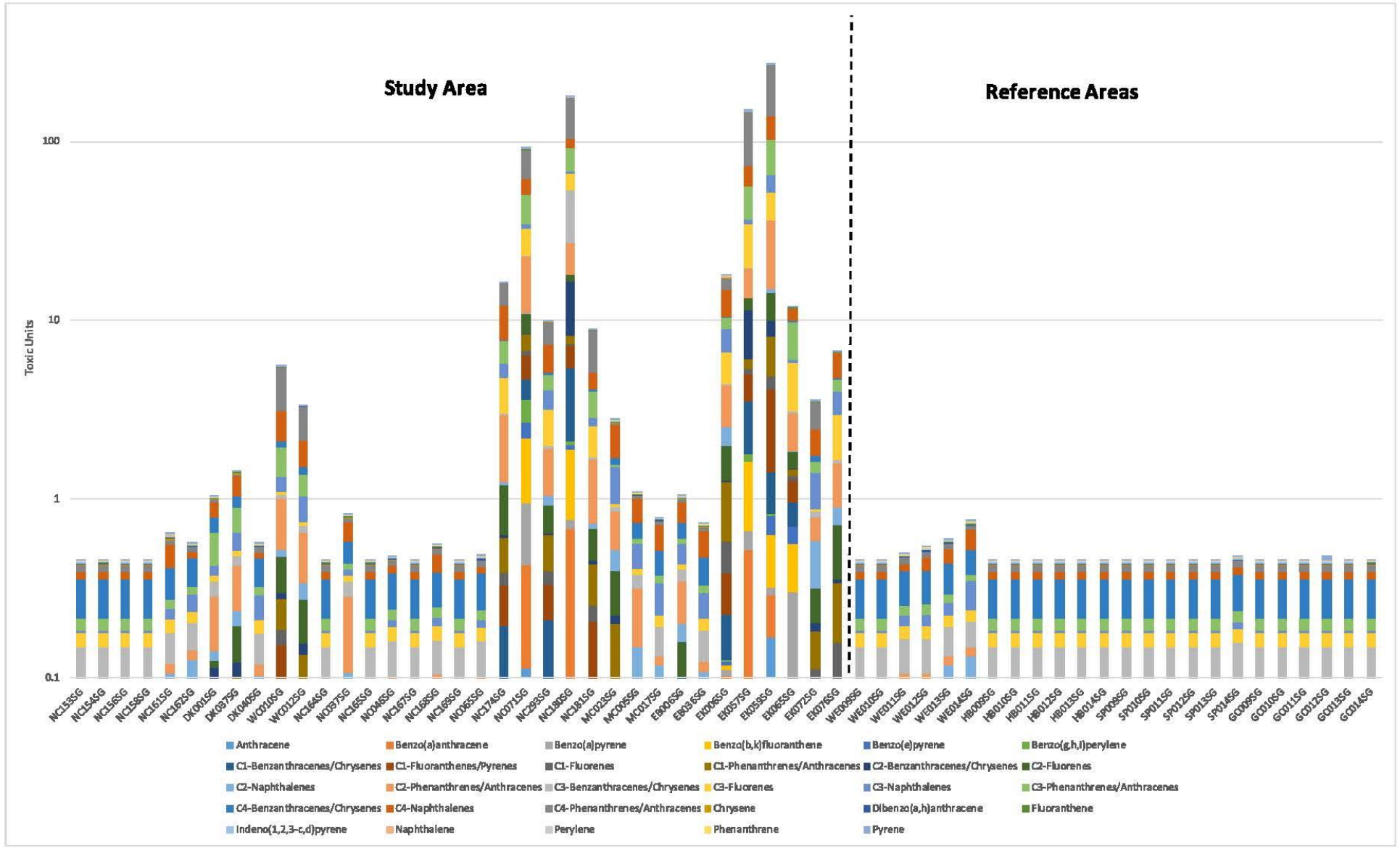

Figure 8-33
PAHs in Porewater – SPME Samples
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

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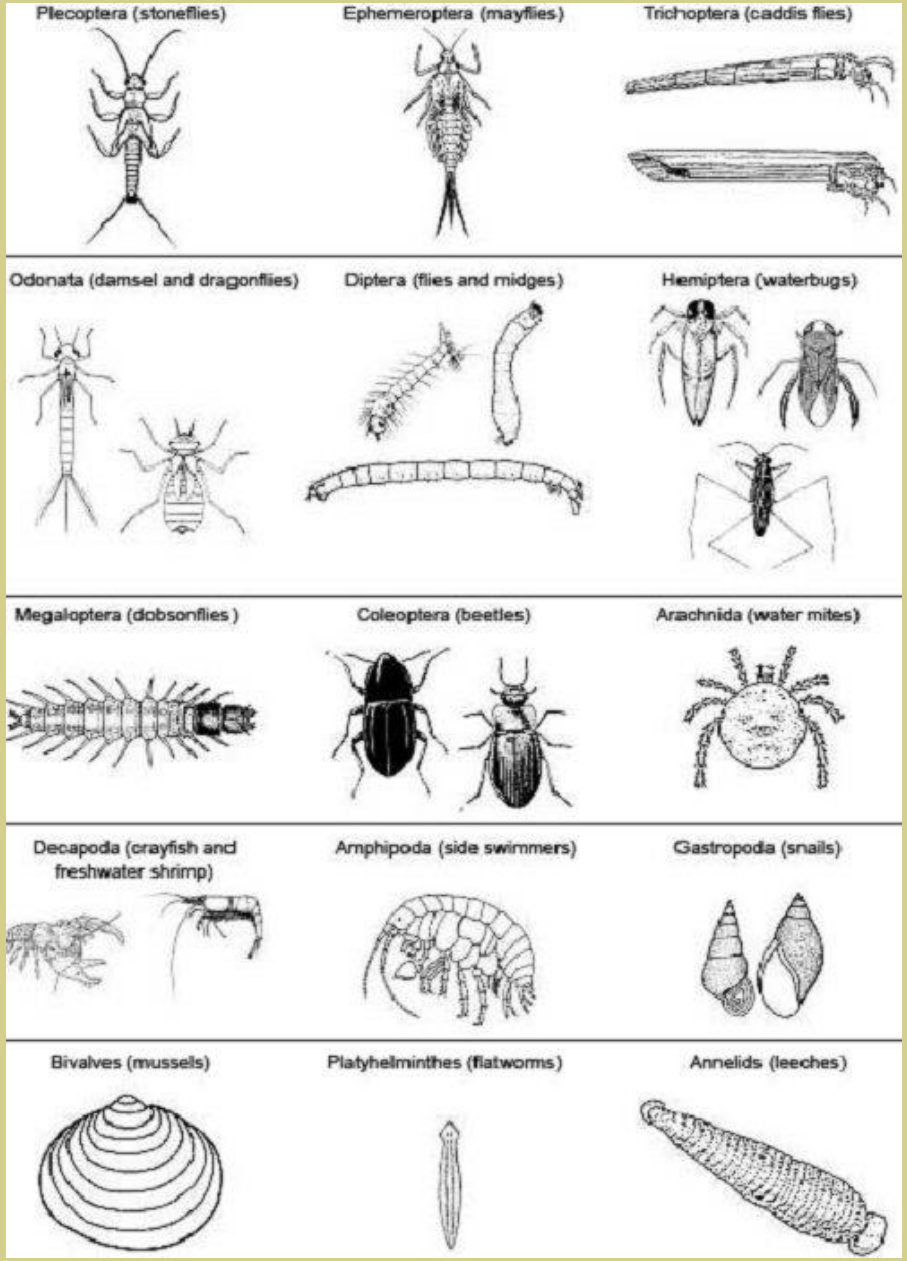
Comparison of benthic macroinvertebrate community metrics

The benthic community in the Study Area and the four Phase 2 reference areas showed signs of stress because no station had a WBI score greater than 3.0.

− None of the sediment COPECs demonstrate a clear relationship with the WBI scores in the Study Area and in the four Phase 2 reference areas.

− Dissolved oxygen (DO) does demonstrate a relationship with the WBI at some locations in the Study Area during certain seasons (e.g., upstream of CM 2 and in the tributaries in summer 2012). When measured DO levels are below 3 mg/L at specific benthic community sampling stations, WBI scores are lower at these stations. Some of the impacts at these stations may also be attributable to exposure to porewater COPECs.



Toxicity Testing

Sediment bioassays conducted with *Leptocheirus* show that:

- 28-day survival, growth, and reproduction for samples collected in CM 2+ and the tributaries were significantly lower than in laboratory controls, and were below the reference envelope thresholds based on a pooled reference area dataset (n = 48).

- The results of the 10-day sediment bioassays indicate that survival is significantly lower throughout most of the Study Area.

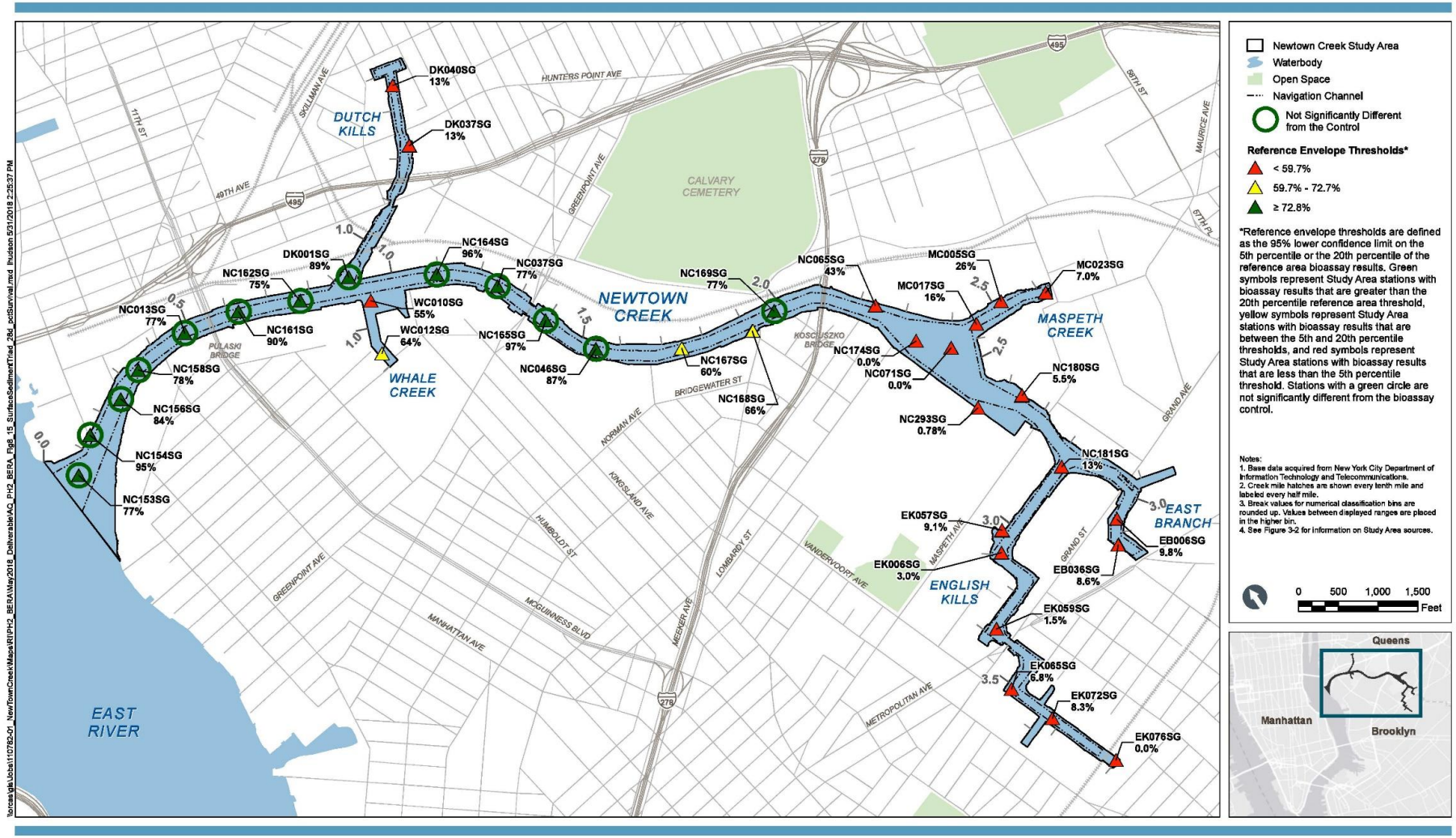


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Figure 8-15
28-day Survival Reference Envelope (n=48) Comparison by Study Area Creek Mile
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

Toxicity Testing

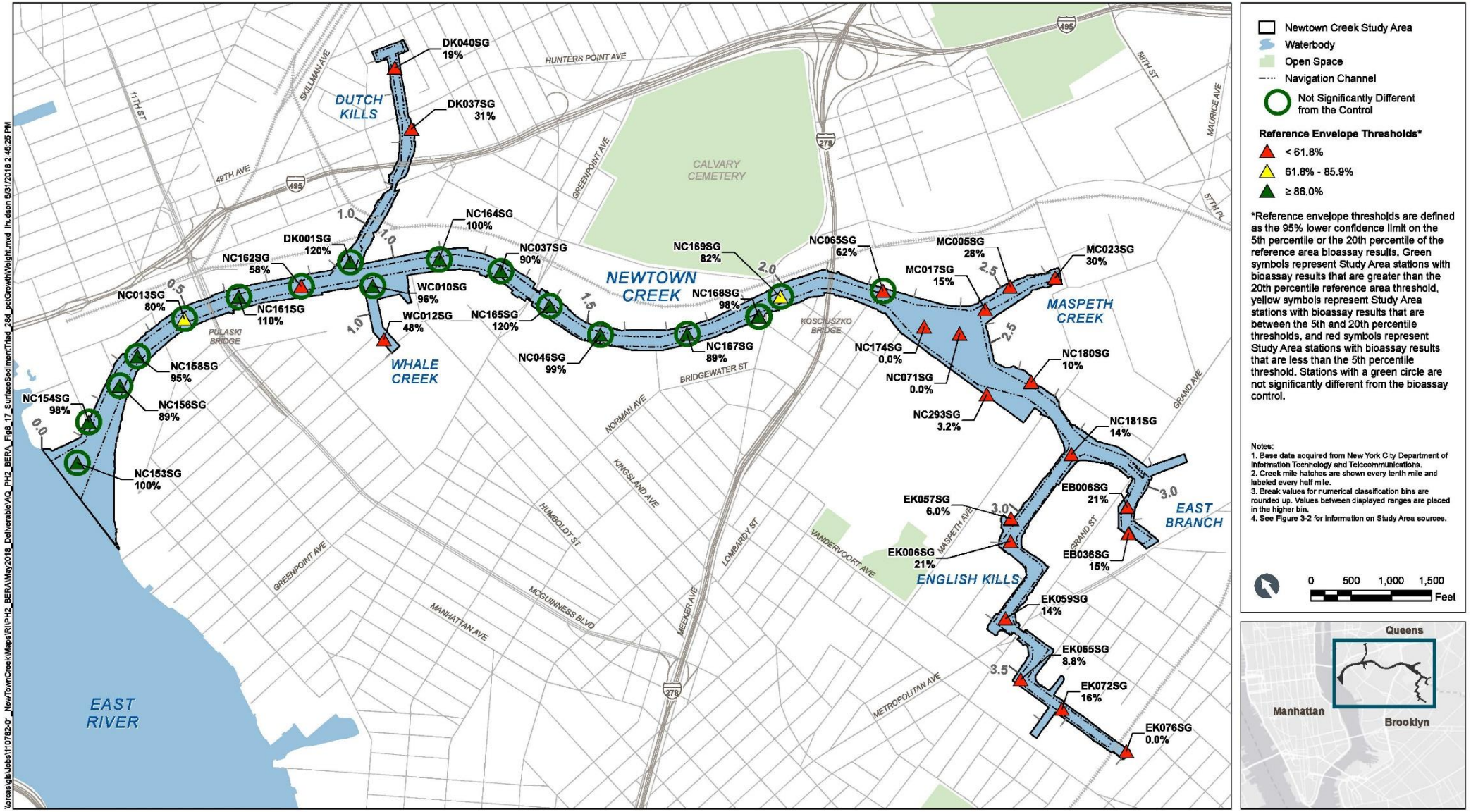

Figure 8-17
28-day Growth (Weight) Reference Envelope (n=48) Comparison by Study Area Creek Mile
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

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Toxicity Testing

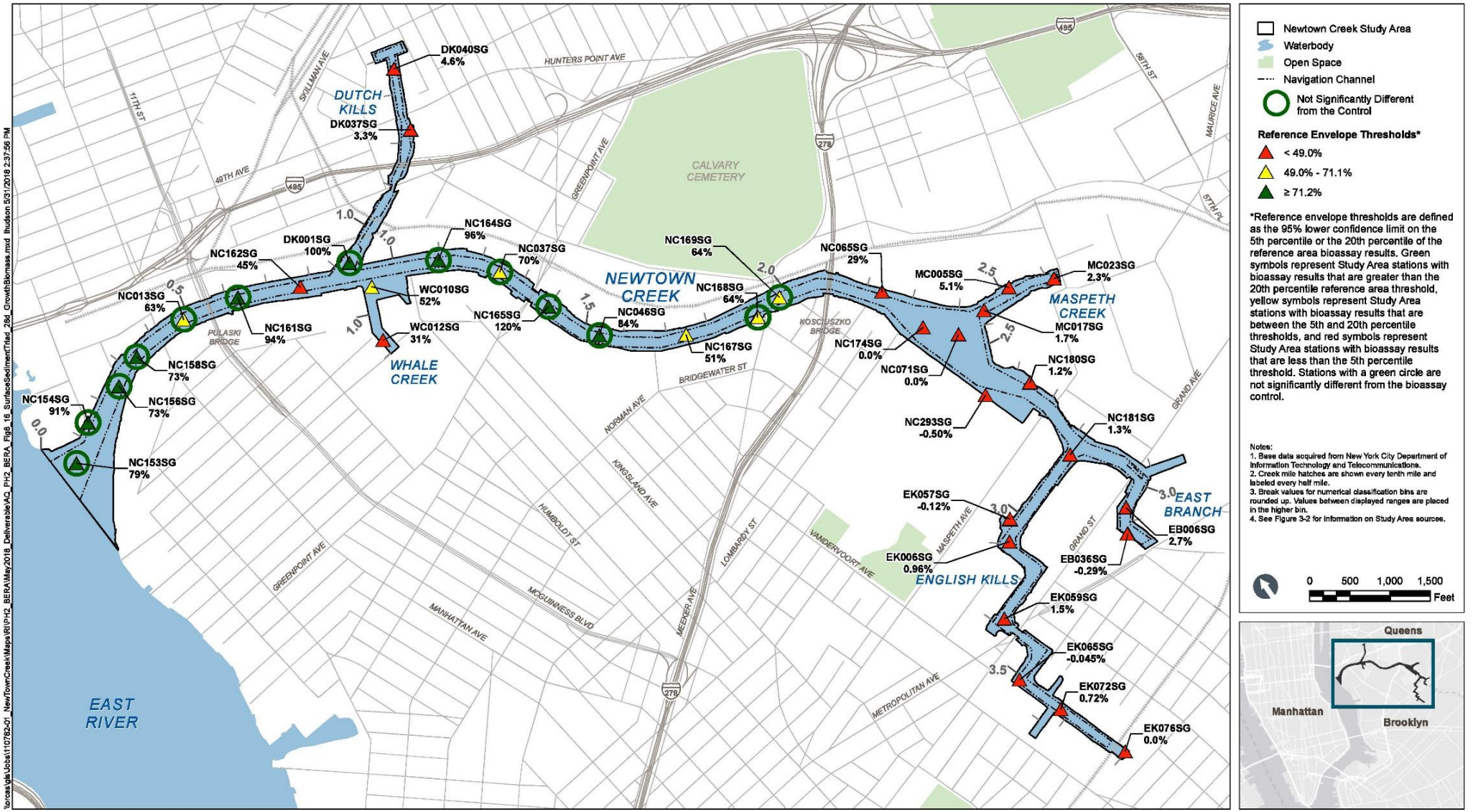


Figure 8-16
28-day Growth (Biomass) Reference Envelope (n=48) Comparison by Study Area Creek Mile
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

Toxicity Testing

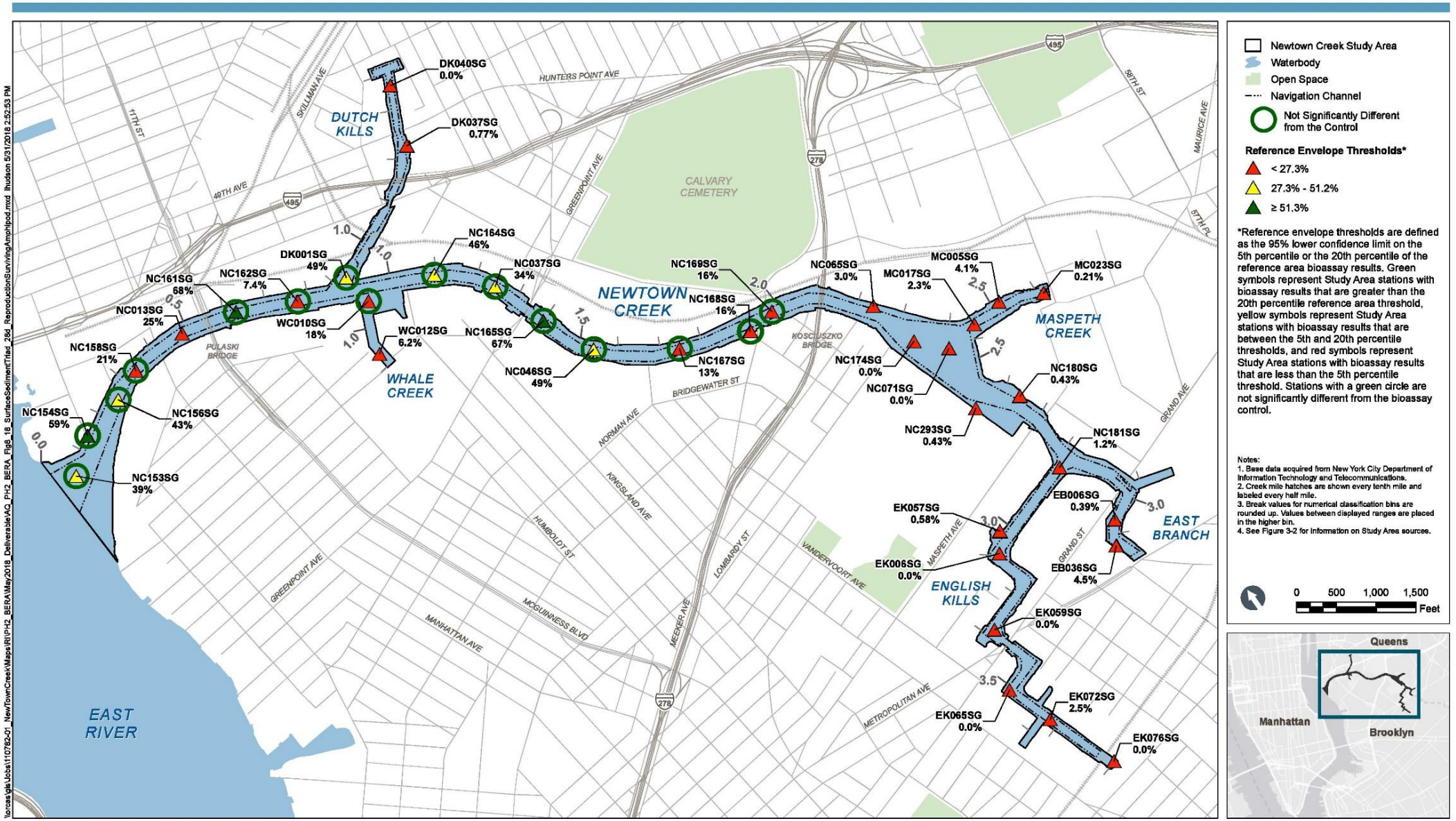


Figure 8-18
28-day Reproduction (Per Surviving Amphipod) Reference Envelope (n=48) Comparison by Study Area Creek Mile
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

ANCHOR QEA

Toxicity Testing

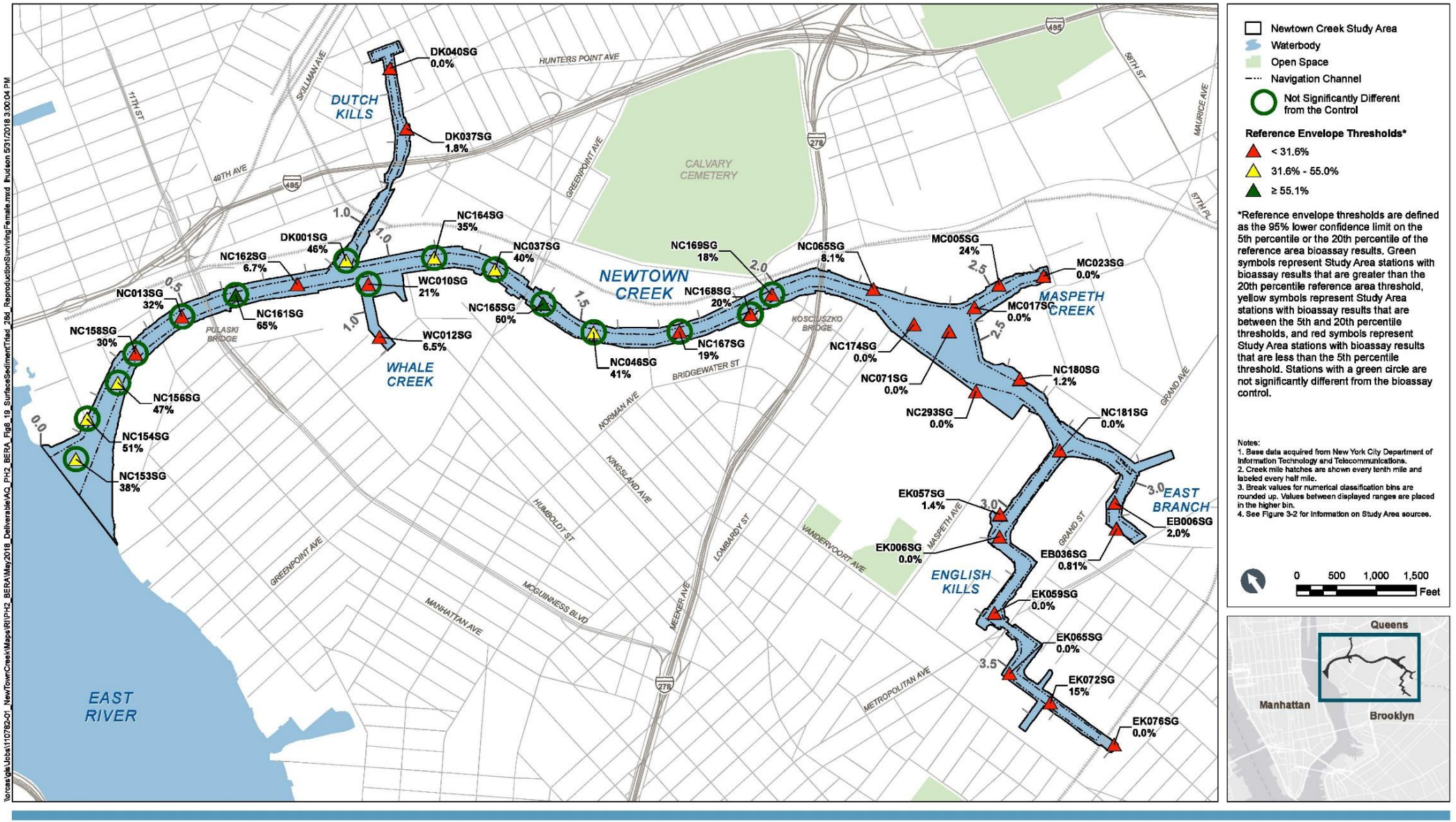


Figure 8-19
28-day Reproduction (Per Surviving Female) Reference Envelope (n=48) Comparison by Study Area Creek Mile
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

ANCHOR QEA

Toxicity Testing

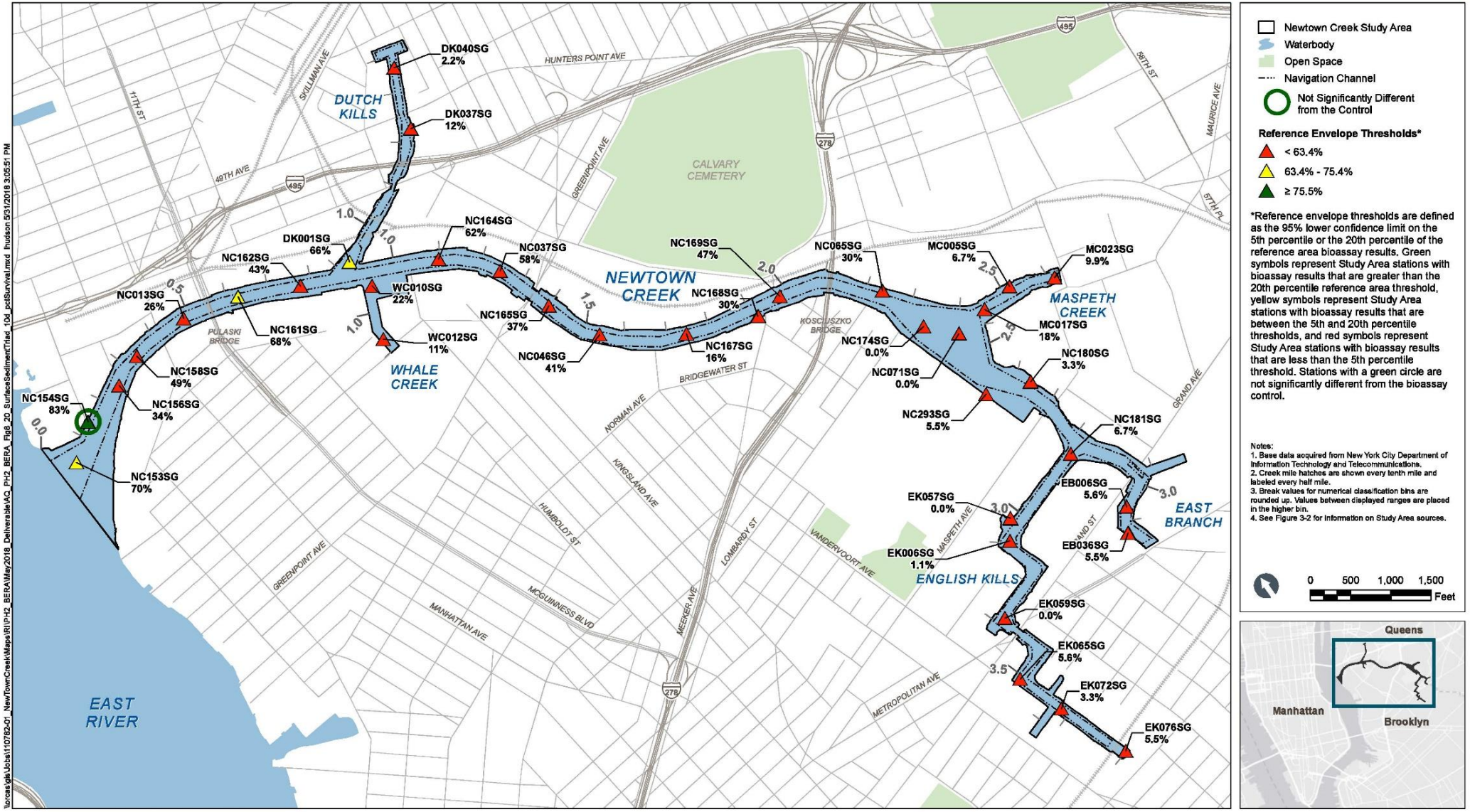


Figure 8-20
10-day Survival Reference Envelope (n=48) Comparison by Study Area Creek Mile
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

Section 9 – Baseline Epibenthic Risk Assessment

Assessment Endpoints:

- Are the levels of contaminants in surface water from the Study Area greater than surface water toxicity-based values for the survival, growth, or reproduction of epibenthic decapods?
- Is the accumulation of bioaccumulative contaminants in epibenthic decapods sufficient to cause adverse effects to Study Area epibenthic decapods as represented by blue crab?
- Copper, dieldrin, PAHs, PCBs and 2,3,7,8-TCDD
- Dutch Kills highest for PCBs

Comparison of surface water concentrations to benchmarks

Cyanide, copper, barium, carbon disulfide and total DDX were evaluated and only cyanide had an HQ greater than 1

Cyanide HQ of 1.1, was due to two samples with elevated concentrations

Tissue

When using the NCG CBRs, the HQs for copper range from 0.71 to 1.03, based on the LOEC and NOEC, respectively. When using the USEPA Region 2 CBRs for copper, the HQs range from 1.6 to 3.8, based on the LOEC and the NOEC, respectively.

- For lead, use of the NCG CBRs results in HQs of less than 1; when using the USEPA Region 2 CBRs, the HQs range from 0.24 to 1.2.
- The HQs for HPAH and TPAH are less than 1 when using the NCG CBRs; when using the USEPA Region 2 CBRs, the HQs range from 0.12 to 1.2 (HPAH), and 0.2 to 2.0 based on the LOEC and NOEC, respectively.
- The HQs for dieldrin are less than 1 using the NCG CBRs, and range from 0.27 to 1.4, based on the USEPA Region 2 LOEC and the NOEC, respectively.
- The HQs for 2,3,7,8-TCDD are less than 1 using the NCG CBRs, and range from 0.4 to 3.5, using the USEPA Region 2 LOEC and NOEC, respectively.
- For total PCB congeners, the HQs are also less than 1 using the NCG CBRs, and range from 8.8 to 29, based on the USEPA Region 2 LOEC and NOEC, respectively.

Section 10 – Baseline Fish Risk Assessment

Assessment Endpoints:

- Are the levels of contaminants in surface water and porewater from the Study Area greater than surface water toxicity-based values for the survival, growth, or reproduction of fish?
- Are the levels of contaminants in whole-body mummichog from the Study Area greater than CBRs for the survival, growth, and reproduction of fish, and to consumers of prey represented by mummichog?
- Are the levels of contaminants in whole-body striped bass from the Study Area greater than CBRs for the survival of migratory fish?
- Do the estimated average daily doses of selected bioaccumulative contaminants in the diets of the fish receptors exceed dose-based TRVs for the survival, growth, and reproduction of resident fish, and the survival of migratory fish?
- Can the information from the fish community survey be used to compare the abundance and diversity of the fish community in the Study Area with that in the four Phase 2 reference area locations?

Comparison of surface water concentrations to benchmarks

Cyanide, copper, barium, carbon disulfide and total DDX were evaluated and only cyanide had an HQ greater than 1

Cyanide HQ of 1.1, was due to two samples with elevated concentrations

Porewater

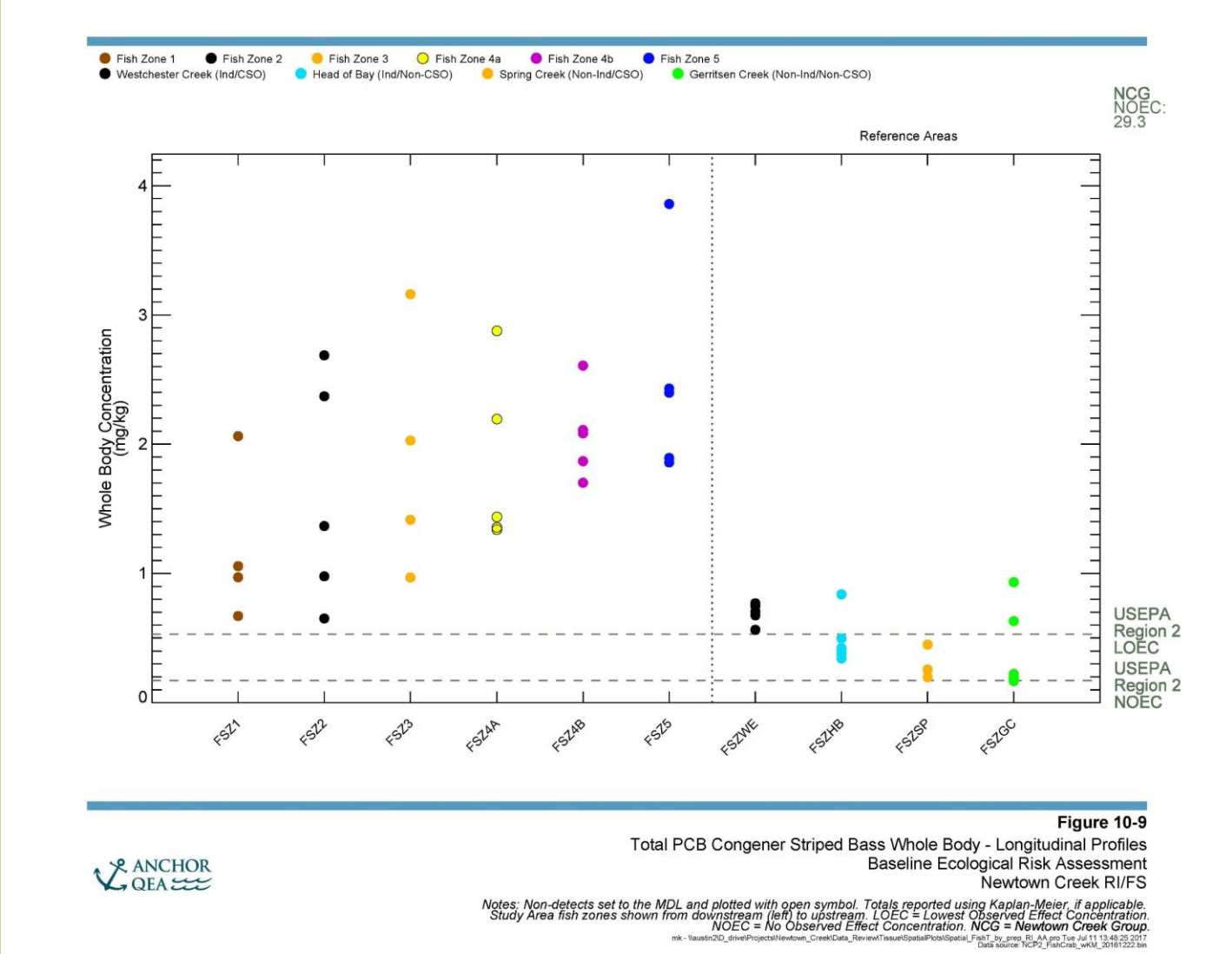
For benthic fish in the Study Area as represented by mummichog, porewater-based HQs are greater than 1 for SEM metals (copper, lead, and zinc), TPAH, and total PCB congeners at some locations upstream of CM 2 and in the tributaries.

Tissue Residue

Based on a tissue-residue approach for striped bass, and using NCG LOECs, Study Area HQs are all less than 1 for all COPECs. When using USEPA Region 2 LOECs, HQs for striped bass are less than 1 for copper, mercury, methyl mercury, dieldrin, and DDx, and greater than 1 for 2,3,7,8-TCDD, total dioxin/furan TEQ, and total PCB congeners.

HQs for mummichog are less than 1 for lead, zinc, dieldrin, and total dioxin/furan TEQ, and greater than 1 for copper and total PCB congeners.

Although for both striped bass and mummichog, HQs based on the USEPA Region 2 LOEC for PCBs are higher than other tissue-based COPECs, the HQ for mummichog is approximately twice that for striped bass (9.2 and 4.0, respectively). Examination of the spatial distribution in tissue concentrations demonstrates that for mummichog, Dutch Kills is a primary contributor to exceedances of the USEPA Region 2 CBRs and reflects the small home range for mummichog.



Tissue Residue

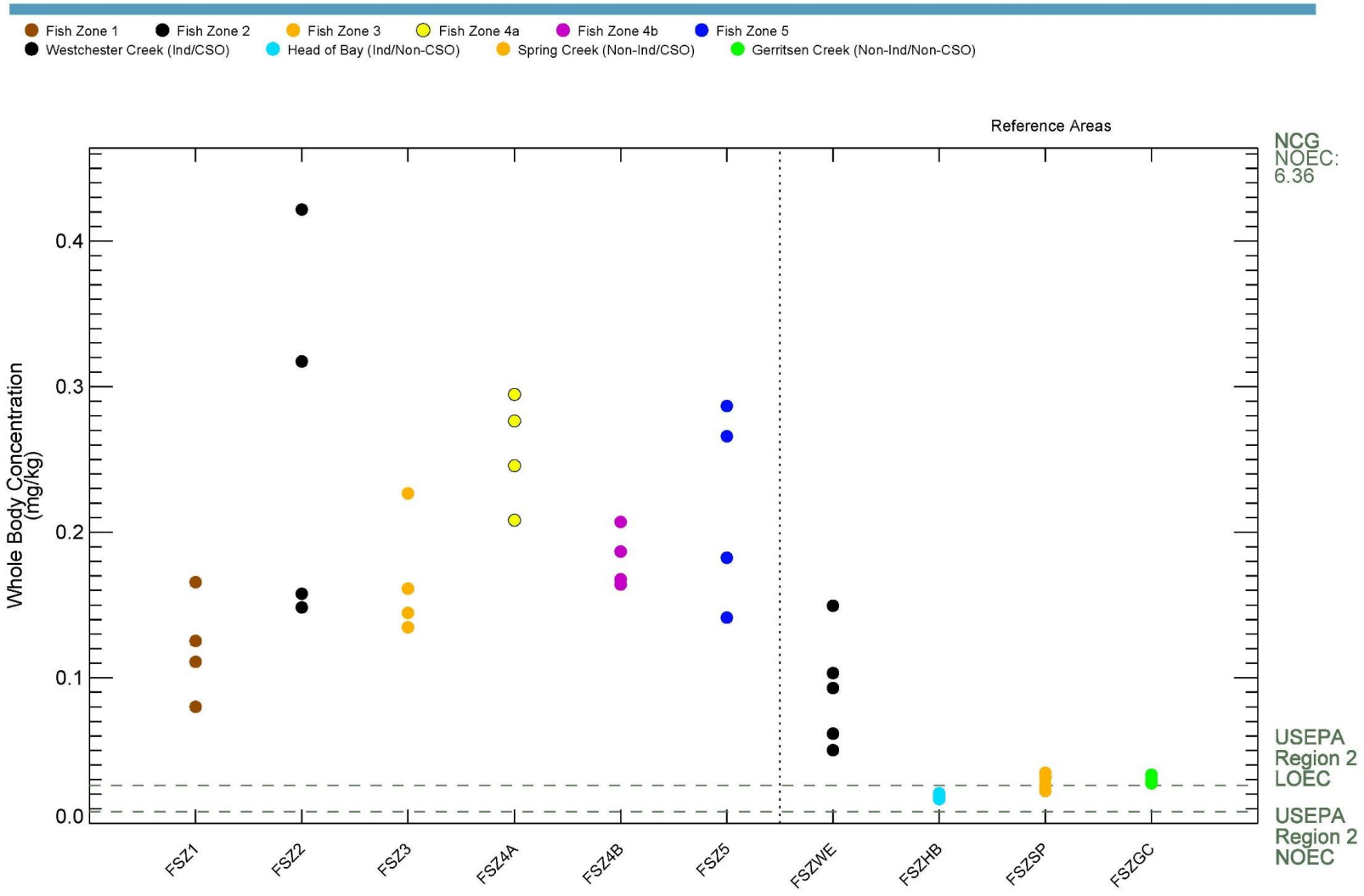


Figure 9-7

Total PCB Congener Blue Crab Whole Body - Longitudinal Profiles
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

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Notes: Non-detects set to the MDL and plotted with open symbol. Totals reported using Kaplan-Meier, if applicable. Study Area fish zones shown from downstream (left) to upstream. LOEC = Lowest Observed Effect Concentration. NOEC = No Observed Effect Concentration. ***NCG = Newtown Creek Group.***

mk - \\austin2\D_drive\Projects\Newtown_Creek\Data_Review\Tissue\SpatialPlots\Spatial_BCrabT_by_prep_RI_AA.pro Tue Jul 11 13:29:53 2017
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Tissue Residue

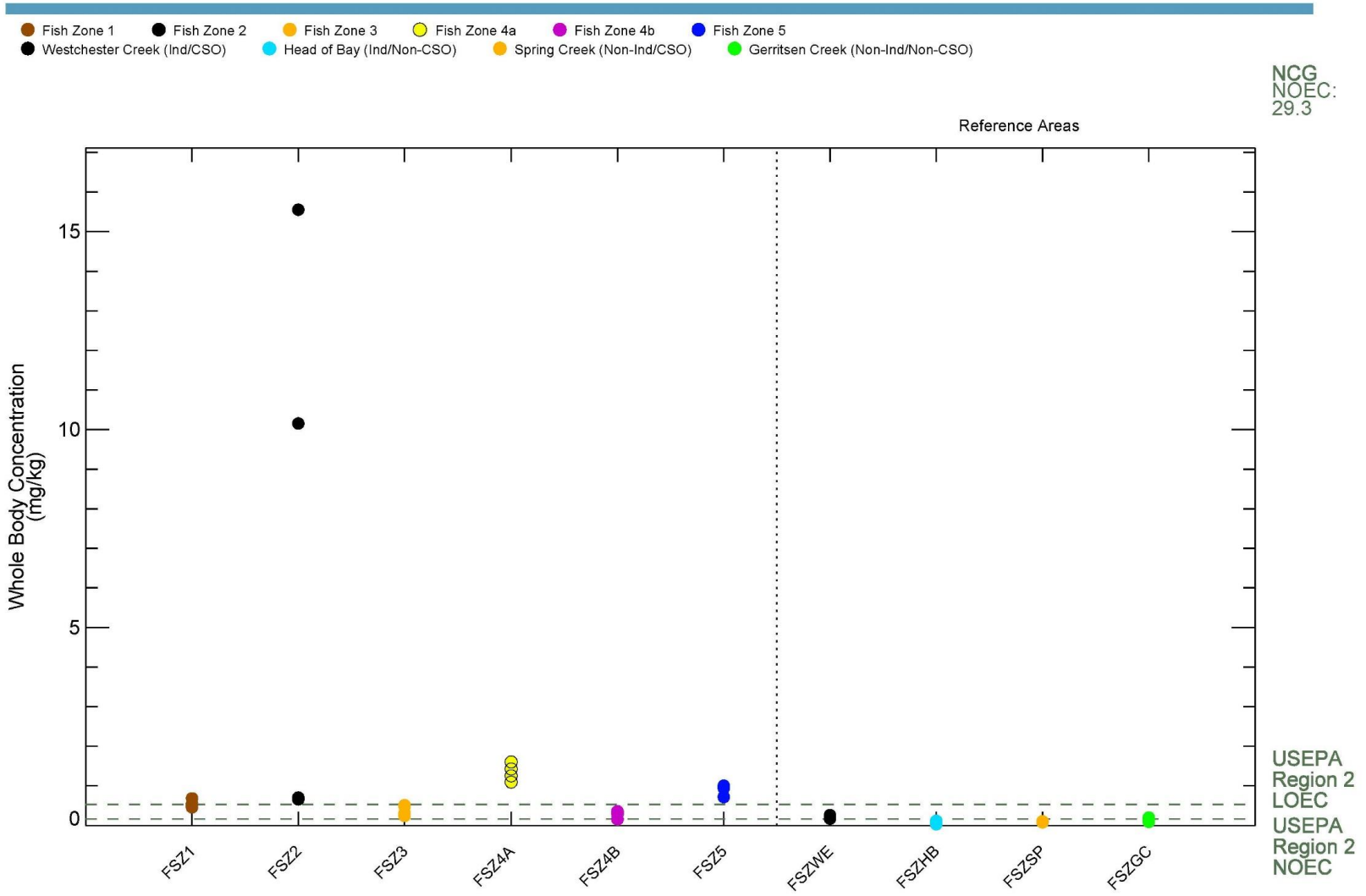

Figure 10-15

Total PCB Congener Mummichog Whole Body - Longitudinal Profiles
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

*Notes: Non-detects set to the MDL and plotted with open symbol. Totals reported using Kaplan-Meier, if applicable. Study Area fish zones shown from downstream (left) to upstream. LOEC = Lowest Observed Effect Concentration. NOEC = No Observed Effect Concentration. **NCG = Newtown Creek Group**.*

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Tissue Residue

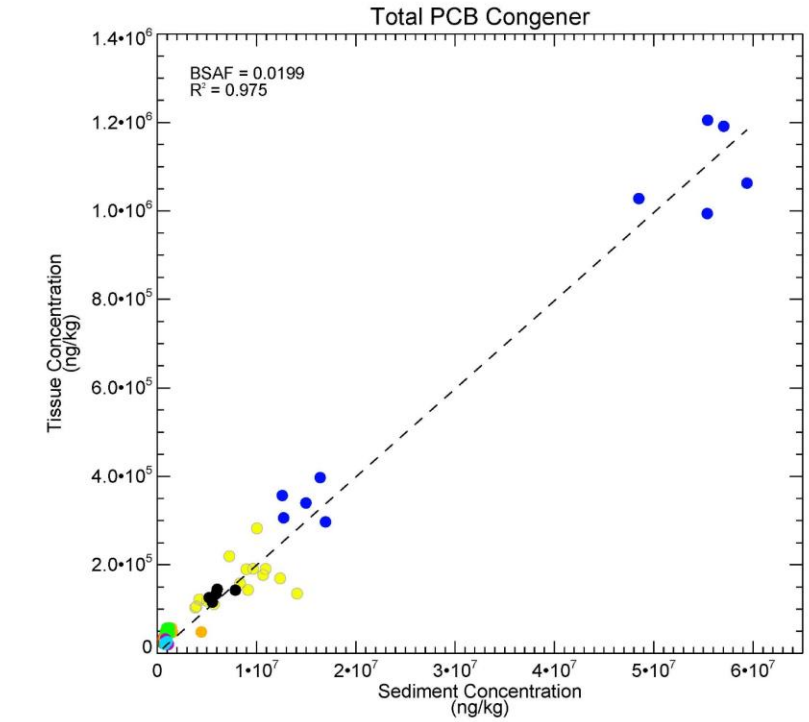


Figure 11-3a

Relationship Between Study Area Sediment and Polychaete Tissue Data - Total PCB Congener
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

ANCHOR QEA

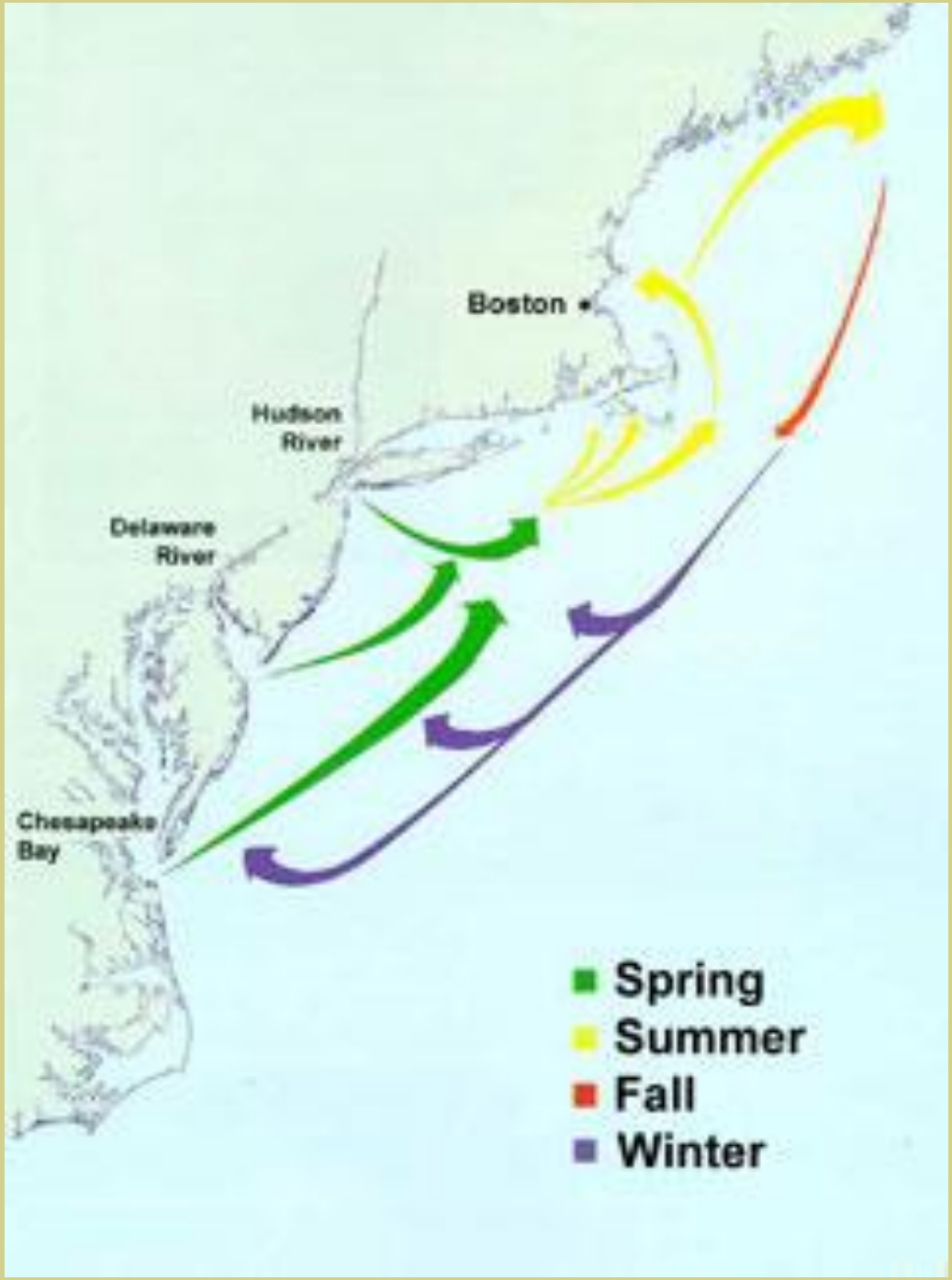
Notes: Non-detects included at method detection limit and plotted with an open symbol.
Sediment plotted on a dry-weight basis, tissue plotted on a wet-weight basis. BSAF calculated as regression with intercept forced through zero.

mk - \\helios\D_Drive\Projects\Newtown_Creek\RI-FS\Risk_assessment\Triads\Bioaccumulation\DL\p_surfsed_worm_crossplots_chems_wRegress.pro Tue May 30 15:14:08 2017

Fish Dietary

Using a dietary exposure model, HQs for striped bass are less than 1 for all COPECs throughout the Study Area.

For mummichog, HQs are less than 1 for all COPECs in CM 0 – 2 (FSZs 1, 2, 3) but are greater than 1 for copper for mummichog from CM 2+ and the tributaries (FSZs 4a, 4b and 5).



Fish Community Surveys

In general, the species richness and diversity is higher in the three Phase 2 Jamaica Bay reference areas than the Study Area. Furthermore, the species richness and diversity of Westchester Creek, an industrial and CSO influenced waterbody, is closer to that of the Study Area than the other three Phase 2 Jamaica Bay reference areas.

Section 11 – Baseline Wildlife Risk Assessment

Assessment Endpoints:

- Is the abundance and estimated diversity of the avian community in the Study Area similar to that of reference locations?

Are the levels of contaminants in the diets of the bird receptors from the Study Area (including invertebrates and whole-body fish) sufficiently elevated to adversely affect the survival, growth, or reproduction of avian receptors?

- Are the levels of contaminants in the diets of the receptor mammals from the Study Area (including invertebrates and whole-body fish) sufficiently elevated to adversely affect the survival, growth, or reproduction of omnivorous mammals?

Community Surveys

- Reference areas have more shoreline habitat than Newtown Creek
- Species richness and diversity is greater in the reference areas when compared to Newtown Creek

Avian Dietary Pathway

• For the spotted sandpiper, using the site-specific model and Study Area-wide BSAFs, LOAEL-based HQs are greater than 1 for copper, lead, and total PCB congeners. The areas contributing to these exceedances are as follows: for lead—Dutch Kills, Maspeth Creek, and English Kills; for copper—Maspeth Creek; for total PCB congeners—Dutch Kills. For exposure models with overall EMFs of 0.5, 0.75, and 1, the LOAEL based HQ for selenium is also greater than 1.

• For the green heron, black-crowned night heron, and belted kingfisher, using the site-specific model and Study Area-wide BSAFs, LOAEL-based HQs are greater than 1 for total PCB congeners and based on the exposure models with overall EMFs of 0.5, 0.75, and 1. The area contributing to these exceedances is Dutch Kills. LOAEL-based HQs are less than 1 when using the exposure model with an overall EMF of 0.25.

• For the spotted sandpiper, green heron, and black-crowned night heron, using the site-specific model and segment or tributary-specific BSAFs results in LOAEL-based HQs of less than 1 in all creek segments and tributaries for total PCB congeners and total PCB congener TEQs, with the exception of Dutch Kills, where HQs range from 6.6 for the black-crowned night heron to 15 for the spotted sandpiper.

• For the spotted sandpiper, using the site-specific model and segment or tributary specific BSAFs for dioxin/furan TEQs results in LOAEL-based HQs of less than 1 in all creek segments and tributaries.

• For the double-crested cormorant with the site-specific model, LOAEL-based HQs are less than 1 for all COPECs. When using the modified exposure models, LOAEL-based HQs are less than 1 except for the model with an overall EMF 1 for which the total PCB congener LOAEL-based HQ is 1.03.

Mammal Dietary Pathway

For the raccoon with the site-specific model, LOAEL-based HQs are less than 1 for all COPECs.

When using the exposure model with an overall EMF of 0.75, the LOAEL based HQ for selenium is greater than 1, and when using the exposure model with an overall EMF of 1, the LOAEL-based HQ for total PCB congeners is greater than 1.

Section 12 – Aquatic Macrophytes

Assessment Endpoint:

Do aquatic macrophytes occur in the Study Area to the extent that exposure to contaminants in surface water and surface sediments may impair survival and growth?

Qualitative Analysis

Much of Newtown Creek consists of bulk headed shoreline with deep bottom – these areas are not suitable for submerged macrophytes due to a combination of depth and poor light penetration

Some areas, especially the dead end creeks, contain shallow areas that could support submerged or emergent macrophytes, but are currently absent

Additional factors that may impact submerged or emergent plants include contaminants, sulfide concentrations, wave action, prop wash and suspended solids

Table 2-1
Secchi Depth and Sulfide Data Summary and Analysis

Station[1]	Water Column Depth (feet)	Average Secchi Depth Disappearance (feet)[2]	Water Surface Elevation (feet)[3]	Date	Time
DK037SG[4]	1.1	1.1	-1.543	5/20/2014	6:51
EK076SG	2.3	1.4	1.351	5/30/2014	10:15
MC023SG	3.4	2.6	1.57	5/29/2014	9:27
EB036SG	4.3	1.2	-0.454	6/2/2014	9:54
NC154SG	4.4	2.8	-1.243	6/4/2014	9:21
NC180SG	4.4	1.8	0.519	6/10/2014	9:33
MC005SG	4.9	2.7	2.5725	5/28/2014	9:45
MC017SG	5.4	4.1	1.235	5/27/2014	10:24
NC065SG	5.4	1.8	0.8525	6/3/2014	12:15
EK072SG	5.7	2.6	-1.966	5/22/2014	11:12
EK065SG	7.3	4.7	-1.1445	5/23/2014	10:03
EK057SG	7.4	2.7	1.191	6/13/2014	12:03
WC012SG	8.2	3.9	-2.194	5/22/2014	10:48
EB006SG	10	2.5	-2.394	5/21/2014	9:54
NC153SG	13.6	3.7	0.219	6/9/2014	9:27
NC071SG	14	2.7	-0.7185	6/2/2014	9:33
NC168SG	14.6	4.2	0.837	5/30/2014	9:42
DK040SG	15.7	1.9	-1.833	6/9/2014	12:51
NC293SG	16.1	1.5	-1.0285	6/5/2014	9:45
EK059SG	17.2	4.8	-0.443	5/20/2014	11:18
DK001SG	17.5	4.5	0.066	5/23/2014	8:30
EK006SG	18.2	4.8	-1.9	5/21/2014	10:24
NC169SG	20.1	2.2	-0.054	6/5/2014	11:33
NC013SG	21.1	4.0	-1.1945	6/17/2014	9:09
NC181SG	21.1	2.5	0.053	6/4/2014	11:15
NC164SG	22.3	3.1	-0.6885	6/6/2014	8:09
NC174SG	22.7	3.4	-1.1375	6/6/2014	11:45
NC161SG	23.2	5.1	2.583	5/28/2014	9:54
NC158SG	23.5	4.5	2.096	6/12/2014	8:21
NC156SG	23.7	4.0	1.751	6/11/2014	9:51
NC162SG	24	4.5	1.729	6/13/2014	8:33
NC167SG	24.1	2.5	-0.7715	6/10/2014	11:33
NC046SG	24.5	4.6	1.445	5/29/2014	9:18
NC037SG	25	2.3	0.2945	6/3/2014	11:15
NC165SG	25.6	4.2	0.8225	6/12/2014	11:33
WC010SG	27.5	3.0	0.2065	6/11/2014	11:33

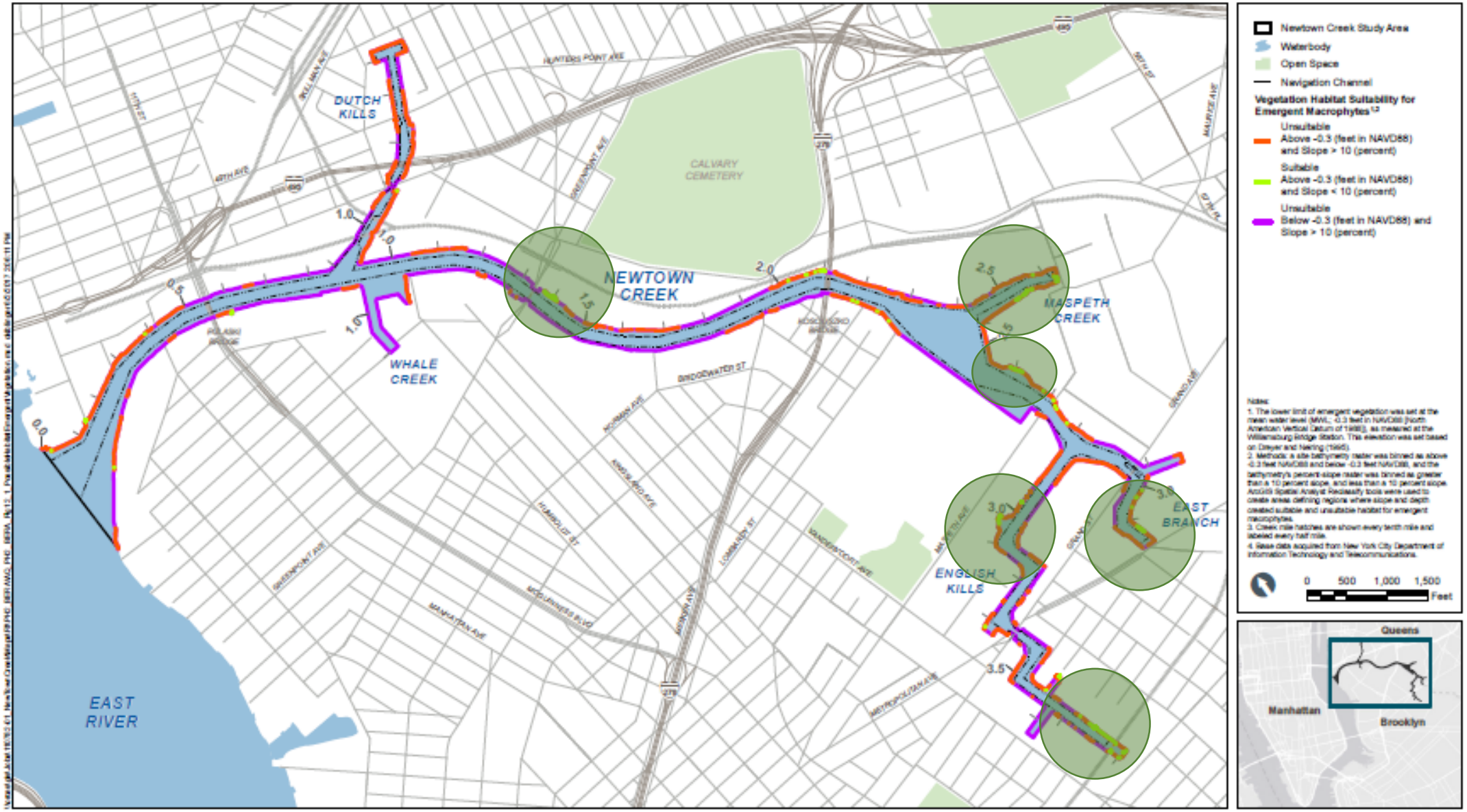


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Figure 12-1
Possible Habitat Suitable for Emergent Macrophytes
Baseline Ecological Risk Assessment
Newtown Creek RI/FS

Section 13 – Amphibians and Reptiles

Assessment Endpoint:

Do amphibians and reptiles occur in or use the Study Area to the extent that exposure to contaminants in surface water and surface sediments may impair survival, growth, or reproduction?

Qualitative Analysis

Amphibians are not likely to be present in the system due to salinity

Several reptile species could be present – diamond back terrapins and sea turtles (loggerhead, green, leatherback and Kemp's Ridely), however none are expected to spend significant time in the system due to lack of preferred habitat and/or limited visitation

Section 14 – Baseline Ecological Risk Assessment Weight-of-Evidence Evaluation and Risk Summary

- All lines of evidence were weighted
- Attribute scores were developed for each assessment endpoint based on relevance, strength and reliability
- Lots of stuff was done to summarize the risk for each line of evidence based on magnitude, location, and other factors
- Summarized in several tables – focusing on identifying risk driving contaminants and spatial areas with greatest risk – also identified evidence of harm and magnitude of effect for each receptor group and measurement endpoint

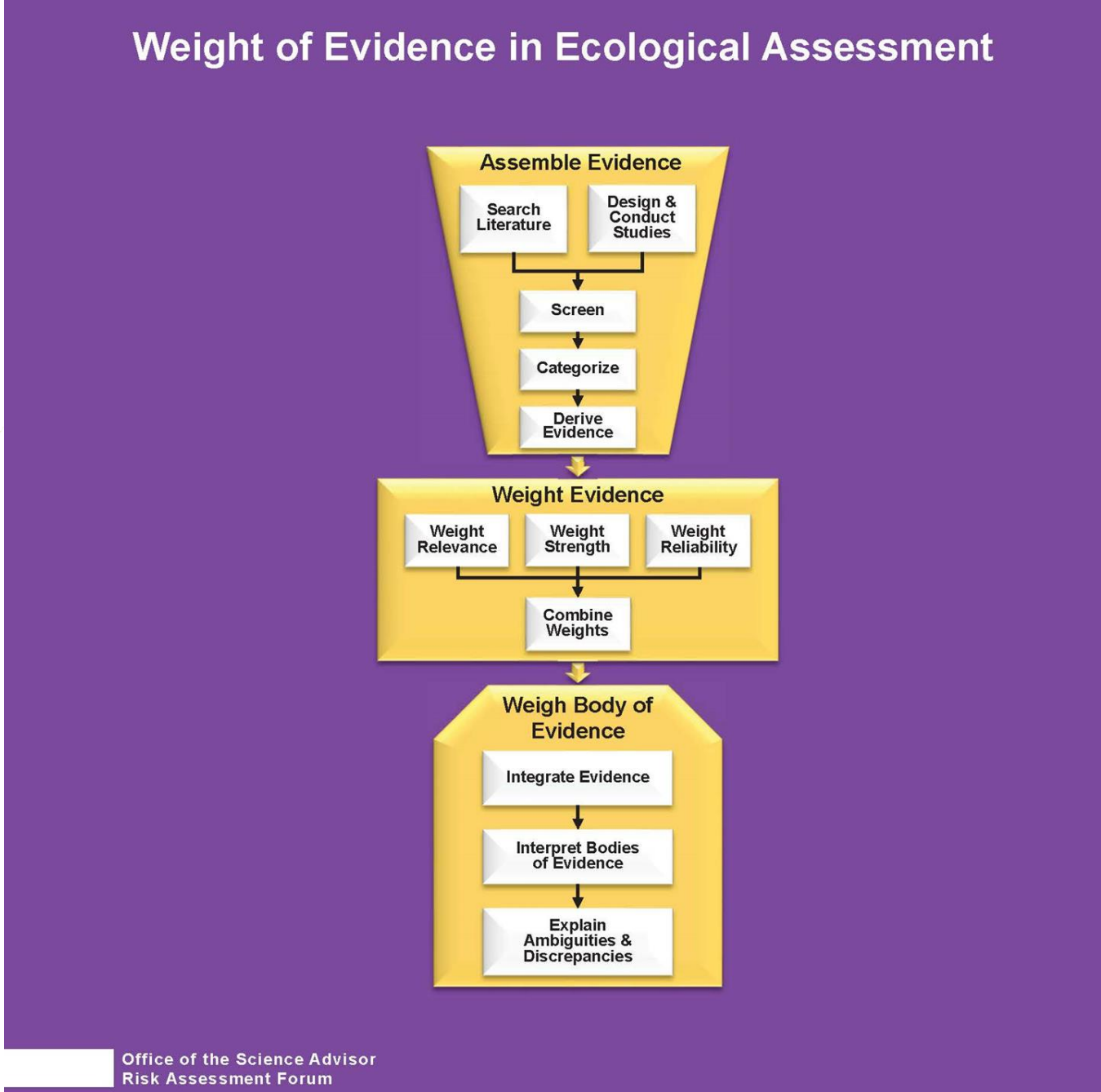

Figure 14-4

This table illustrates the COPECs and specific areas within Newtown Creek that are associated with a cumulative weight of evidence indicating unacceptable risk.

Receptor Group	Receptor	Line of Evidence	Contaminant	HQ or Tu••	Priority Locations Contributing to Exceedances
Aquatic Plants	Macrophytes	Qualitative Evaluation	Qualitative Evaluation	Qualitative Evaluation	Qualitative Evaluation
	Phytoplankton	Surface Water	Cyanide	HQ= 0.8, 1.1	Dutch Kills, English Kills (one data point in each location)
Invertebrates	Zooplankton	Surface Water	Cyanide	HQ= 0.8, 1.1	Dutch Kills, English Kills (one data point in each location)
	Epibenthic Invertebrates (Bivalves)	Surface Water	Cyanide	HQ= 0.8, 1.1	Dutch Kills, English Kills (one data point in each location)
		Tissue Residue	HPAH	HQ<I,1.7	Maspeth Creek, English Kills
		Tissue Residue	TPAH	HQ<1,1.9	Maspeth Creek, English Kills
		Tissue Residue	Total PCB Congener	HQ< 1, 3.9	Maspeth Creek, Turning Basin, English Kills
	Benthic Macroinvertebrates	Surface Water	Cyanide	HQ= 0.8, 1.1	Dutch Kills, English Kills (one data point in each location)
		Sediment Toxicity	See Porewater and Bulk Sediment	See Porewater and Bulk Sediment	Dutch Kills, Whale Creek, Maspeth Creek, East Branch, English Kills, Turning Basin
		Porewater	TPAH (34)'	TU = 0.46 to 270	Dutch Kills, Whale Creek, Maspeth Creek, East Branch, English Kills, Turning Basin
			Porewater Total SEM'	TU = 0.15 to 7.2	Whale Creek, Maspeth Creek, East Branch, English Kills, Turning Basin
		Bulk Sediment AVS, SEM	None	LSEM -AVS < 0	N/A
		Tissue Residue	HPAH	HQ< 1, 1.0	Turning Basin, English Kills
		Tissue Residue	TPAH	HQ< 1, 1.2	Turning Basin, English Kills
		Tissue Residue	Total PCB Congener	HQ< 1, 15	Turning Basin, English Kills
	Epibenthic Decapods (Blue Crab)	Surface Water	Cyanide	HQ= 0.8, 1.1	Dutch Kills, English Kills (one data point in each location)
		Tissue Residue	Copper	HQ< 1, 1.6	All Zones
		Tissue Residue	Total PCB Congener	HQ< 1, 8.8	All Zones (Dutch Kills, Turning Basin, English Kills)
Fish	Fish	Surface Water	Cyanide	HQ= 0.8, 1.1	Dutch Kills, English Kills (one data point in each location)
		Porewater	TPAH (34)'	TU = 0.46 to 270	Dutch Kills, Whale Creek, Maspeth Creek, East Branch, English Kills, Turning Basin
			Porewater Total SEM '	TU = 0.15 to 7.2	Whale Creek, Maspeth Creek, East Branch, English Kills, Turning Basin
			Total PCB Congener	TU = 0.05 to 9.4	English Kills, Turning Basin
		Tissue Residue	2,3,7,8-TCDD (Striped Bass)	HQ< 1, 1.7	Fish Sampling Zone 3, English Kills
		Tissue Residue	Total D/F TEQ (Striped Bass)	HQ< 1, 2.8	Dutch Kills, Fish Sampling Zone 3, English Kills
		Tissue Residue	Total PCB Congener (Striped Bass)	HQ< 1, 4.0	All Zones
		Tissue Residue	Copper (Mummichog)	HQ< 1, 2.1	All Zones
		Tissue Residue	Total PCB Congener (Mummichog)	HQ< 1, 9.2	Dutch Kills
		Dietary Intake	Copper (Mummichog)	HQ= 1.2	Maspeth Creek, East Branch, English Kills, Turning Basin
Wildlife (Aquatic Birds)	Spotted Sandpiper	Dietary Intake	Copper	HQ= 1.04	Maspeth Creek
			Lead	HQ= 1.6	Dutch Kills, Maspeth Creek, English Kills
			Total PCB Congener	HQ= 1.7	Dutch Kills
	Green Heron	Dietary Intake	Total PCB Congener	HQ= 2.3	Dutch Kills
	Black-crowned Night Heron	Dietary Intake	Total PCB Congener	HQ= 1.7	Dutch Kills
	Belted Kingfisher	Dietary Intake	Total PCB Congener	HQ= 1.8	Dutch Kills
	Double-crested Cormorant	Dietary Intake	None	HQ< 1	N/A
Wildlife (Mammals)	**Raccoon**	Dietary Intake	None	HQ< 1	N/A
Amphibians and Reptiles	Amphibians and Reptiles	Qualitative vie Evaluation	Qualitative Evaluation	Qualitative Evaluation	Qualitative Evaluation

Figure 14-6

The majority of the lines of evidence were weighted with an value of 4, which is not unusual since the most relevant lines of evidence were included in the BERA.

Assessment Endpoint[4]	Representative Receptor[1]	Measurement Endpoint[4]	Risk Question [4]	Lines of Evidence[4]	Scoring (from Table 14-3)[2]	Evidence of Harm	Magnitude of Response
Survival and growth of aquatic plants	Phytoplankton	Contaminant concentration in surface water	Are the levels of contaminants in surface water from the Study Area greater than surface water toxicity-based values for the survival or growth of phytoplankton?	Comparison of benchmarks to media	4	Yes	Low
	Aquatic macrophytes	None - qualitative only	Do aquatic macrophytes occur in the Study Area to the extent that exposure to contaminants in surface water and surface sediments may impair survival and growth?	Qualitative assessment	2		
Survival, growth, and reproduction of zooplankton	Zooplankton	Contaminant concentration in surface water	Are the levels of contaminants in surface water from the Study Area greater than surface water toxicity-based values for the survival or growth of zooplankton?	Comparison of benchmarks to media	4	Yes	Low
Survival, growth, and reproduction of bivalves	Mussels	Contaminant concentration in surface water	Are the levels of contaminants in surface water from the Study Area greater than surface water toxicity-based values for the survival, growth, or reproduction of bivalves?	Comparison of benchmarks to media	4	Yes	Low
		Selected bioaccumulative contaminant concentrations in tissue	Is the accumulation of bioaccumulative contaminants in mussels sufficient to cause adverse effects to Study Area bivalves?	Comparison of USEPA Region 2 CBR benchmarks to media	4	Yes	Low
				Comparison of NCG CBR benchmarks to media	4	No	
Survival, growth, and reproduction of BMI	BMI	Contaminant concentrations in surface water, surface sediment, and porewater	Are the levels of contaminants in surface water, surface sediment, and porewater from the Study Area greater than benchmarks for the survival, growth, or reproduction of BMI?	Comparison of benchmarks to surface water concentrations	3	Yes	Low
				Comparison of benchmarks to sediment concentrations	4	Yes	High
				Comparison of benchmarks to ISEM - AVS concentrations	4	No	
				Comparison of benchmarks to porewater concentrations	4	Yes	High
		BMI community metrics associated with abundance and diversity	Is the abundance and diversity of the BMI community in the Study Area similar to that of reference area locations?	Comparison of BMI community metrics in Study Area and reference area locations	4	Yes	Low
				Comparison of BMI community metrics with bulk sediment concentrations	4	Yes	Low
		Leptocheirus 10-day laboratory toxicity tests (survival)	Do Study Area surface sediments exhibit similar toxicity to *Leptocheirus* as reference area sediments?	Direct laboratory test measure of toxicity to test amphipods; exposure measured in bulk sediment	4	Yes	High
				Direct laboratory test measure of toxicity to test amphipods; exposure measured in porewater	5	Yes	High
		Leptocheirus 28-day laboratory toxicity tests on survival, growth, and reproduction	Do Study Area surface sediments exhibit similar toxicity to *Leptocheirus* as reference area sediments?	Direct laboratory test measure of toxicity to test amphipods; exposure measured in bulk sediment	5	Yes	High
				Direct laboratory test measure of toxicity to test amphipods; exposure measured in porewater	5	Yes	High
		Bioaccumulation in 28-day laboratory bioaccumulation tests with *Nleanthes* (formerly known as *Nereis*)	Is the accumulation of contaminants from Study Area surface sediments in *Neanthes* sufficient to cause adverse effects to receptors represented by test organisms, and to consumers of prey represented by test organisms?	Comparison of USEPA Region 2 CBR benchmarks to media	4	Yes	High
				Comparison of NCG CBR benchmarks to media	4	No	
Survival, growth, and reproduction of blue crab	Blue crab	Contaminant concentrations in surface water	Are the levels of contaminants in surface water from the Study Area greater than surface water toxicity-based values for the survival, growth, or reproduction of blue crab?	Comparison of benchmarks to media	4	Yes	Low
		Selected bioaccumulative contaminant concentrations in blue crab soft tissue	Is the accumulation of bioaccumulative contaminants in blue crab tissues sufficient to cause adverse effects to blue crab, and to consumers of prey represented by crab?	Comparison of USEPA Region 2 CBR benchmarks to media	4	Yes	High
				Comparison of NCG CBR benchmarks to media	4	No	
Survival, growth, and reproduction of amphibians and reptiles	Amphibians and reptiles	Qualitative general discussion regarding potential exposure of amphibians and reptiles and potential likelihood of effects to amphibians and reptiles from contaminants in the sediment and surface water in the Study Area	Do amphibians and reptiles occur in or use the Study Area to the extent that exposure to contaminants in surface water and surface sediments may impair survival, growth, or reproduction?	Qualitative assessment			
Survival, growth, and reproduction of resident fish and survival of migratory fish	Fish (general)	Contaminant concentrations in surface water and porewater	Are the levels of contaminants in surface water and porewater from the Study Area greater than surface water toxicity-based values for the survival, growth, or reproduction of fish?	Comparison of benchmarks to surface water concentrations	4	Yes	Low
				Comparison of benchmarks to porewater concentrations	4	Yes	High
		Fish community metrics associated with abundance and diversity	Is the abundance and diversity of the fish community in the Study Area similar to that of reference area locations?	Direct comparison of metrics in Study Area and reference area locations	4		
	Spot, mummichog, and striped bass	Contaminant concentrations in the diets of mummichog and striped bass	Do the estimated average daily doses of selected bioaccumulative contaminants in the diets of the fish receptors exceed dose-based TRVs for the survival, growth, and reproduction of resident fish, and the survival of migratory fish?	Comparison of total daily intake to dietary-based TRVs	4	Yes	Low
	Mummichog	Contaminant concentrations in whole-body mummichog	Are the levels of contaminants in whole-body mummichog from the Study Area greater than CBRs for the survival, growth, and reproduction of fish, and to consumers of prey represented by mummichog?	Comparison of USEPA Region 2 CBR benchmarks to media	4	Yes	Low
				Comparison of NCG CBR benchmarks to media	4	No	
	Striped bass	Contaminant concentrations in whole-body striped bass	Are the levels of contaminants in whole-body striped bass from the Study Area greater than CBRs for the survival of migratory fish?	Comparison of USEPA Region 2 CBR benchmarks to media	4	Yes	High
				Comparison of NCG CBR benchmarks to media	4	No	
Survival, growth, and reproduction of piscivorous and sediment-probing birds	Birds (general)	Avian community metrics associated with abundance and estimated diversity	Is the abundance and estimated diversity of the avian community in the Study Area similar to that of reference area locations?	Direct comparison of metrics in Study Area and reference area locations	4		
	Belted kingfisher, double-crested cormorant, green heron, black-crowned night heron, and spotted sandpiper	Contaminant concentrations in environmental media ingested by piscivorous, invertivorous, and sediment-probing birds	Are the levels of contaminants in the diets of the bird receptors from the Study Area (including invertebrates and whole-body fish) sufficiently elevated to adversely affect the survival, growth, or reproduction of avian receptors?	Comparison of total daily intake to dietary-based TRVs	4	Yes	Low
Survival, growth, and reproduction of omnivorous mammals	Raccoon	Contaminant concentrations in environmental media ingested by omnivorous mammals	Are the levels of contaminants in the diets of the receptor mammals from the Study Area (including invertebrates and whole-body fish) sufficiently elevated to adversely affect the survival, growth, or reproduction of omnivorous mammals?	Comparison of total daily intake to dietary-based TRVs	4	No	

Overall BERA Conclusions

Locations: Turning Basin, English Kills, Maspeth Creek, East Branch, Dutch Kills are primary areas of elevated risk, with less impact in Creek Miles 0-2

Compounds: Primarily PAHs and PCBs, with additional contributions of copper, lead and dioxin (2,3,7,8-TCDD)

Next Steps: Results of BERA, HHRA and RI will be used to develop the Feasibility Study, which will identify remedial alternatives to address risk associated with areas and compounds listed above.

Overall, the results of the BERA indicate that sediments are toxic to benthic macroinvertebrates in the Study Area in the Turning Basin and the tributaries, primarily from exposure to porewater PAHs. PCBs are bioavailable in the Study Area and accumulate in the tissues of receptors and also represent a dietary exposure pathway for birds (i.e., spotted sandpiper, green heron, black-crowned night heron, and belted kingfisher). PCB exposure is highest in Dutch Kills, English Kills, and the Turning Basin. Other COPECs include copper, lead, and dioxins/furans, but the magnitude of response resulting from exposure to these COPECs is lower than for PAHs and PCBs, and they are generally collocated in the same areas where PAH and PCB concentrations are highest (see Table 14-5). Based on the WOE evaluation completed in this section, there is evidence of harm to multiple receptors in the Study Area from exposure to multiple COPECs. However, the magnitude of response is highest in the tributaries and the Turning Basin, primarily due to exposure to PAHs and PCBs through direct contact or dietary exposure, respectively, with some contribution from copper, lead, and dioxins/furans through these exposure pathways. Although there is some evidence of harm in CM 0 – 2, based on some LOEs, the overall WOE evaluation indicates that the magnitude of response is lower in this segment of the Study Area.

CAG comments received 08/22/18 – General comment that the executive summary did not clearly summarize the findings of the risk assessment nor directly identify the contaminants of potential ecological concern (COPECs).

- The Executive Summary was organized to summarize each section of the BERA and it was not designed to present general findings of the BERA. EPA agrees that the executive summary does not serve as a good communication vehicle for public distribution. EPA will be preparing additional documents, likely in the form of fact sheets or project summaries, to summarize the technical aspects of the project. Regarding the identification of COPECs, the executive summary does include the COPECs within the text but does not include a table with the COPECs. There are two tables in Section 14, Tables 14-4 and 14-5, that contain this information.

CAG comments received 08/22/18

The BERA does not sufficiently outline sources of COPECs. While there is some emphasis placed on CSO, runoff and municipal discharges, the report does not properly address additional historic and ongoing sources, including eroding shorelines, groundwater seeps, and bulkheads leaking petroleum related products. Because an effective remedy will largely rely on identification of pollution sources, we believe a full list of potential COPECs and their locations must be added to the BERA.

- EPA agreed that the discussion of sources needed to be updated. EPA required additional text to be included in Section 3.1.1 to more clearly describe historic and ongoing sources. Although EPA agrees that identification of source areas is important for remedy selection and implementation, the BERA is not typically the document that contains this information. The RI report, which identifies the nature and extent of contamination, as well as the FS, which identifies the areas in which the remedial alternatives will be employed, will present the requested information.

CAG comments received 08/22/18

In Section 3.1.1, the draft BERA states that non-aqueous phase liquid (NAPL) can cause direct physical effects to benthic invertebrates from fouling but does not evaluate any physical effects from exposure to NAPL (gasoline, oils and tars). There are no maps showing coal tar or NAPL seeps, or any areas contaminated with NAPL in the study area. We would like locations of coal tar and NAPLs to be clearly shown in the BERA report. In addition, we would like to see if additional evaluation of physical contact with NAPLs is necessary to assess ecological risk.

- Additional discussion, albeit brief, of physical impacts is included in Section 8.5.3.4.2: USEPA (2017) also states that for filter-feeding benthic invertebrates, the mechanism of toxicity for the aliphatic hydrocarbons…can stem from a physical effect, such as fouling of respiratory surfaces by the oil phase. The toxicity tests that were performed were not designed to distinguish between chemical and physical effects, therefore, there is limited additional evaluation that can be included. The BERA is a component of the RI, which also contains a document that focuses on nature and extent of contamination. The requested maps showing coal tar and NAPL seeps will be included in the companion RI report.

CAG comments received 08/22/18

The draft BERA does not mention the ongoing ebullition sampling in the creek. The results of the ongoing ebullition sampling will likely impact the BERA and should be clearly outlined within the report. A 2009 paper regarding ebullition within Bangor Landing addresses this issue.

- Ebullition is a fate and transport factor that is important for understanding the movement of contaminants within Newtown Creek. The contamination associated with ebullition would have been identified within the samples collected for the BERA, thus the inclusion of recent surface water and sediment samples, as well as tissue sampling and toxicity results, would provide an assessment of risk from all contaminant sources, including ebullition. Ebullition is more important from a nature and extent and remedial design perspective, which is why the results will be in the RI.

CAG comments received 08/22/18

There is significant mention of confounding factors, but they are not examined with the same scrutiny as COPECs. We believe the same standards should be applied when examining all causes of ecological risk. Additionally, we have issue with the “Unresolved Complex Mixture” that is referenced in the BERA. If suggested as an important cause of ecological risk, then a proper identification, study and assessment of the sources needs to be included.

- BERAs often identify data gaps or uncertainties. NAPL and UCM are two related data gaps that will likely be explored in greater detail as part of the remedial design phase. The type of remedial action is important…for example, if a bank to bank dredging will be done, then UCM is less of an issue because all of the sediment will be taken out so identifying specific constituents is less important, but if there are surgical removals of sediment, then it may be much more important to make sure we are actually removing things that are associated with the toxicity. Likewise with NAPL, if the action is targeting NAPL sources, for example through sheet piles walls and extraction, NAPL nature and extent is important, but constituent identification is less of a factor. It is anticipated that UCM and NAPL will be evaluated in greater detail.

CAG comments received 08/22/18

Comparing tissue concentrations to LPRSA CBRs results in estimates of more risk than comparing to Newtown Creek CBRs. The difference between the Newtown Creek CBRs and LPRSA CBRs is not explained in the draft BERA report. The report should clearly explain the differences and what they mean in relationship to the Remedial Investigation.

- Section 8.2.2 explains that the two sets of CBRs were used to provide upper- and lower-bound estimates of potential risk. The section also indicates that Newtown Creek CBRs are less conservative that LPRSA CBRs, now called EPA Region 2 CRBs. Providing upper- and lower-bound risk estimates are useful for risk managers as it can highlight specific compounds or exposure pathways that have greater impact or help illustrate conclusions that contain uncertainty or data gaps.

CAG comments received 08/22/18

The draft BERA indicates that Westchester Creek is the most appropriate reference area for comparison to Newtown Creek. Section 10.7.5.1 of the draft BERA states that the species richness and diversity of Westchester Creek, an industrial and CSO influenced waterbody, is closer to that of the Study Area than the other Phase 2 Jamaica Bay reference areas. We have concerns that comparison to a similarly impaired water body will only serve to downplay ecological risks at Newtown Creek and that comparison to a healthier area is more appropriate.

- EPA understands your concerns. The BERA compared Newtown Creek to each of the individual reference areas, some which were healthier areas, and provided an analysis of these comparisons. Since Newtown Creek and Westchester Creek are in the same category, it is understandable that they are most alike in metrics. This does not downplay the ecological risks within Newtown Creek, as evidenced by the BERA conclusions.

Questions?