Dzus OU5 Ecological Evaluation Summary

Ecological Sampling Summary

- Surficial sediment samples (0-6 inches) were collected in September 2019 from 45 locations within the tidal area of Willetts Creek (OU5; **Figure 1**), and from four reference locations (**Figure 2**).
    - Per the NYSDEC-approved Work Plan Addendum[1], sample locations were chosen based on previous observations of cadmium concentrations in the top 6-inches of sediment that were in the Class B saltwater SGV range (1.2 - 9.6 mg/kg).
    - The goal of the supplemental sampling and analysis was to eliminate samples that fall within the Class B range and reclassify them as either acceptable (Class A) or toxic (Class C).
    - Samples were analyzed for cadmium, total chromium, acid volatile sulfide/simultaneously extracted metals (AVS/SEM), total organic carbon (TOC), moisture content, and grain size.
    - Toxicity Testing was performed on each sample using the estuarine amphipod *Leptocheirus plumulosus.*
- Seven hard shell clam (*Mercenaria mercenaria*) tissue samples were collected from OU5 with two additional samples collected from a reference location. To the extent practicable, clam sample locations were co-located with sediment sampling locations (**Figure 2**). Tissue was analyzed for cadmium, chromium, and percent moisture.

Sediment Analytical Results

- Cadmium: One sample (location WT-52) exceeded the Class C saltwater SGV (9.6 mg/kg) with a reported concentration of 15 mg/kg. Twenty-four samples were in the Class B saltwater SGV range of 1.2 - 9.6 mg/kg (**Table 1**).
- Chromium: One sample (location WT-62) was in the Class B saltwater SGV (81 - 370 mg/kg) with a reported concentration of 100 mg/kg. No samples exceeded the Class C SGV (370 mg/kg).
- All reference sediments had concentrations of cadmium and chromium below Class A SGVs.
- TOC content was similar in OU5 and reference locations, falling generally between 1 and 8%.
- Grain size in both OU5 and reference locations is dominated by fines (silt + clay) and sand.
- AVS/SEM results suggests limited bioavailability of metals (all SEM:AVS results < 1 and $\sum$SEM-AVS/f_{oc} <130 µmol/g).

Toxicity Results

- Survival endpoints in 89% of the samples from Willetts Creek were not statistically different than the lowest reference survival.
- Survival endpoints in all reference samples (55% - 72% survival) were statically lower than the laboratory control (93% survival).
- Toxicity results did not correlate with cadmium or chromium concentrations in sediment. The sample with the highest cadmium concentration (15 mg/kg) did not show impacts to amphipod

[1] EA. 2019. *Operable Unit 5 Remedial Investigation Work Plan Addendum*. September.

survival or reproduction. The next two highest concentrations (7.1 and 5.6 mg/kg) did not show any impacts to any amphipod endpoints. The sample with the highest chromium concentration (100 mg/kg) also did not show impacts to any amphipod endpoints.

- There were no impacts to reproduction on any of the samples.
- Toxicity impacts may be due to other physical and/or chemical factors associated with the sediments off southern Long Island.

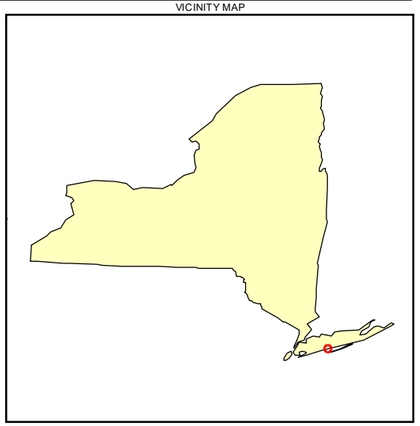
Clam Tissue Results

- Clam tissue sample cadmium concentrations in Willetts Creek are consistent with samples from the reference location and do not correlate to metals results from associated sediments.
- Tissue sample chromium concentrations are lower than reference area locations.

Conclusion

- Concentrations of cadmium and chromium observed in sediments from the tidal portion of Willetts Creek present a low risk to aquatic life.

VICINITY MAP



Legend

Approximate Operable Unit Boundary

Operable Unit 5

Cadmium Surface Sediment Results (0-6")

- Class A Sediments (< 1.2 mg/kg)
- Class B Sediments (1.2 - 9.6 mg/kg)
- Class C Sediments (> 9.6 mg/kg)
- Tissue Sampling Location (Clam)
- Toxicological Impacts Identified

Map Date: 1/28/2020
Projection: NAD83 State Plane New York Long Island

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Figure 2
Reference Sediment Locations
Dzus Fastener Company, Inc.
OU5 Remedial Investigation/Feasibility Study
West Islip, NY

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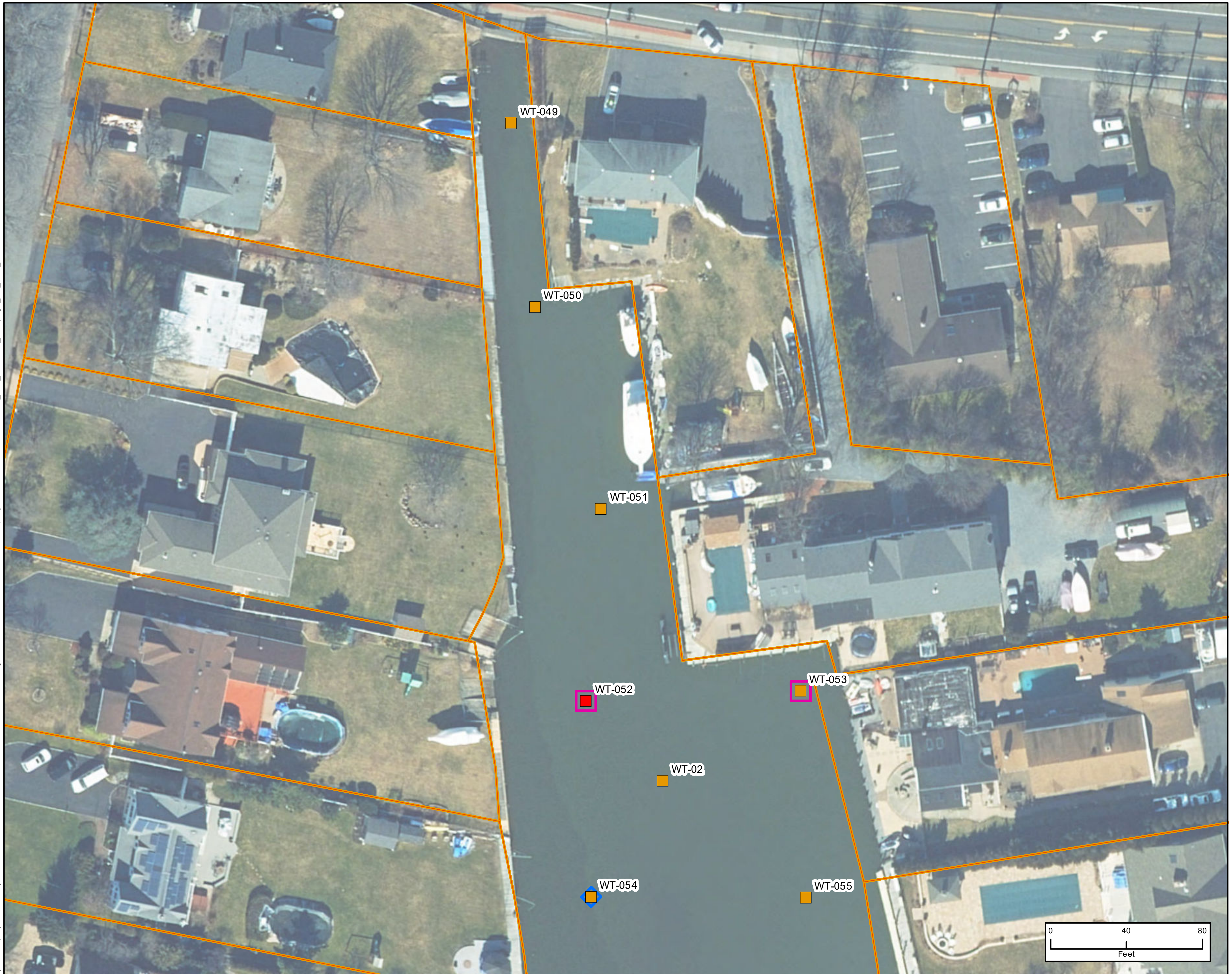

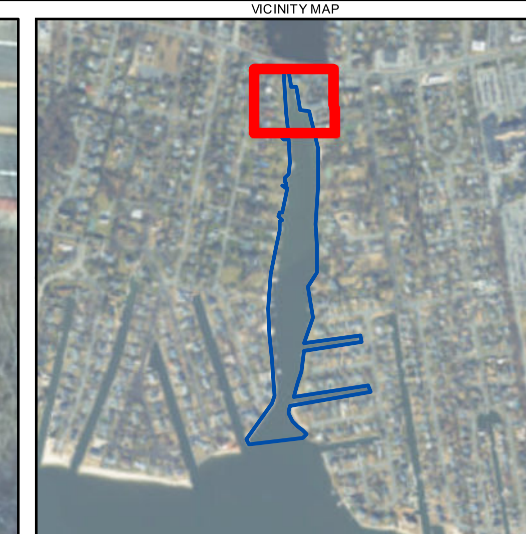

Legend

- Approximate Limits of Operable Unit 5
- Approximate Tax Parcel Boundary

Cadmium Surface Sediment Results (0-6")

- Class A Sediments (< 1.2 mg/kg)
- Class B Sediments (1.2 - 9.6 mg/kg)
- Class C Sediments (> 9.6 mg/kg)
- Tissue Sampling Location (Clam)
- Toxicological Impacts Identified

Notes:
1 Surficial sediment data collected in September, 2019.

Map Date: 1/28/2020
Projection: NAD83 State Plane New York Long Island

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Figure 1a
Ecological Risk Assessment
Dzus Fastener Company, Inc.
OU5 Remedial Investigation/Feasibility Study
West Islip, NY

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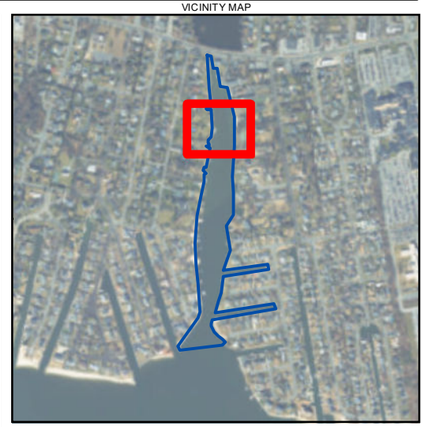
VICINITY MAP



Legend

- Approximate Limits of Operable Unit 5
- Approximate Tax Parcel Boundary

Cadmium Surface Sediment Results (0-6")

- Class A Sediments (< 1.2 mg/kg)
- Class B Sediments (1.2 - 9.6 mg/kg)
- Class C Sediments (> 9.6 mg/kg)
- Tissue Sampling Location (Clam)
- Toxicological Impacts Identified

Notes:
1 Surficial sediment data collected in September, 2019.

Map Date: 1/28/2020
Projection: NAD83 State Plane New York Long Island

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Figure 1b
Ecological Risk Assessment
Dzus Fastener Company, Inc.
OU5 Remedial Investigation/Feasibility Study
West Islip, NY

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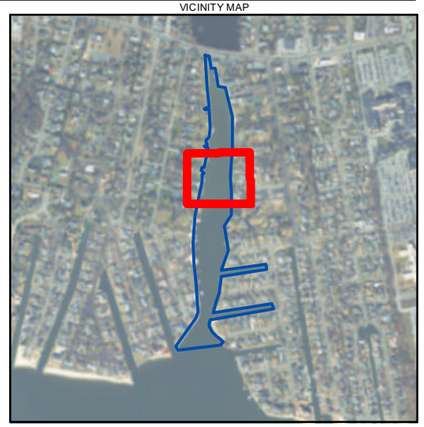
VICINITY MAP



Legend

- Approximate Limits of Operable Unit 5
- Approximate Tax Parcel Boundary

Cadmium Surface Sediment Results (0-6")

- Class A Sediments (< 1.2 mg/kg)
- Class B Sediments (1.2 - 9.6 mg/kg)
- Class C Sediments (> 9.6 mg/kg)
- Tissue Sampling Location (Clam)
- Toxicological Impacts Identified

Notes:
1 Surficial sediment data collected in September, 2019.

Map Date: 1/28/2020
Projection: NAD83 State Plane New York Long Island

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Figure 1c
Ecological Risk Assessment
Dzus Fastener Company, Inc.
OU5 Remedial Investigation/Feasibility Study
West Islip, NY

WT-06
WT-090
WT-092
WT-094
WT-093
WT-097
WT-098
WT-100
WT-101
WT-104
0
40
80
Feet

VICINITY MAP

Legend

- Approximate Limits of Operable Unit 5
- Approximate Tax Parcel Boundary

Cadmium Surface Sediment Results (0-6")

- Class A Sediments (< 1.2 mg/kg)
- Class B Sediments (1.2 - 9.6 mg/kg)
- Class C Sediments (> 9.6 mg/kg)
- Tissue Sampling Location (Clam)
- Toxicological Impacts Identified

Notes:
1 Surficial sediment data collected in September, 2019.

Map Date: 1/28/2020
Projection: NAD83 State Plane New York Long Island

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Figure 1d
Ecological Risk Assessment
Dzus Fastener Company, Inc.
OU5 Remedial Investigation/Feasibility Study
West Islip, NY

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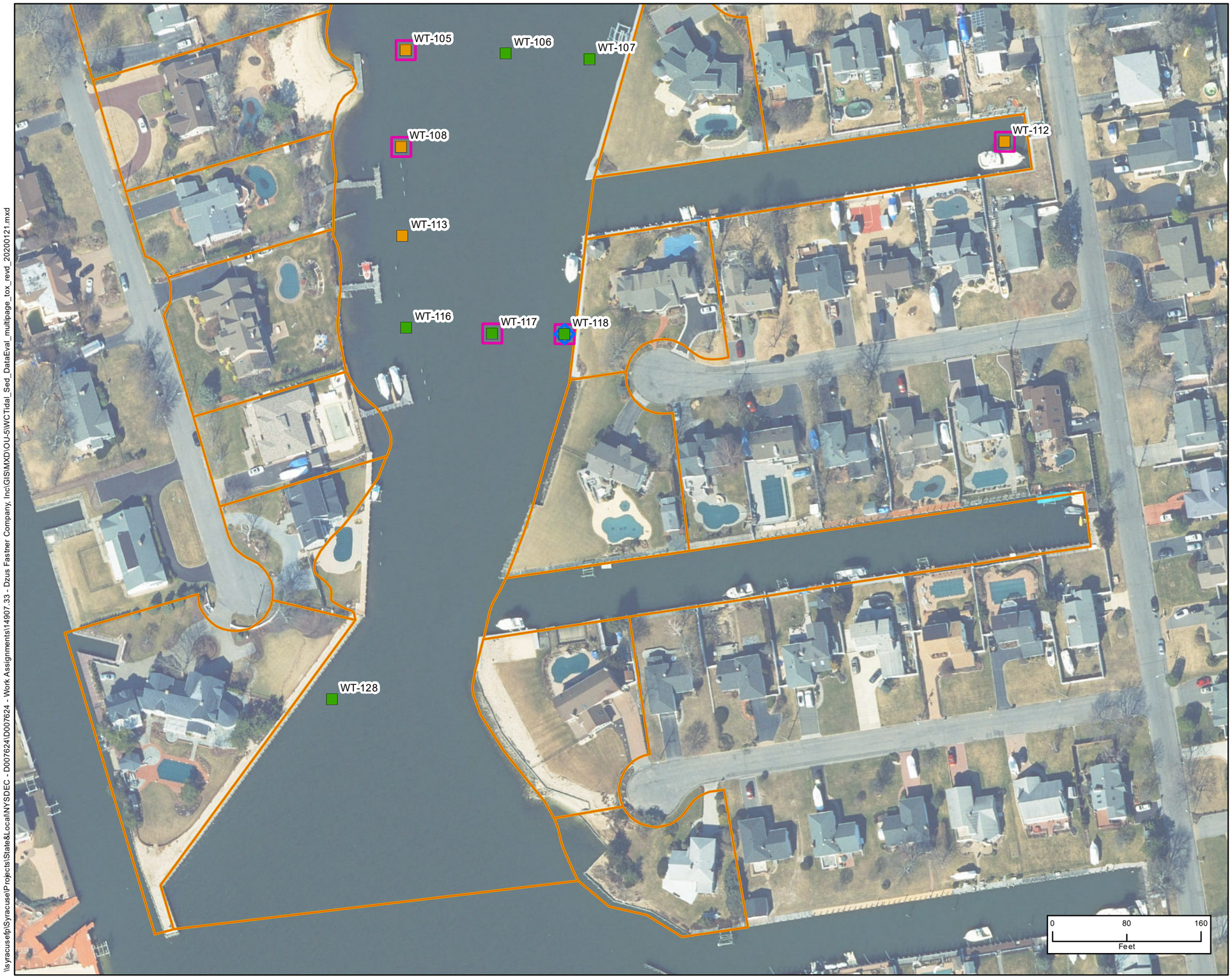
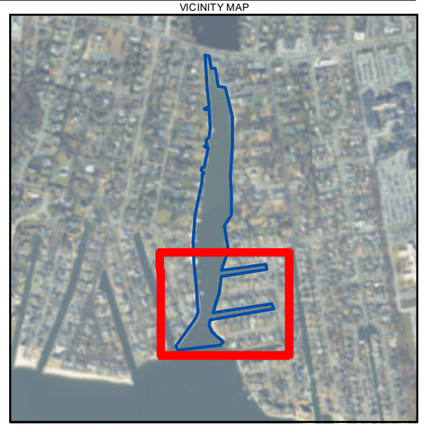


VICINITY MAP



Legend

- Approximate Limits of Operable Unit 5
- Approximate Tax Parcel Boundary

Cadmium Surface Sediment Results (0-6")

- Class A Sediments (< 1.2 mg/kg)
- Class B Sediments (1.2 - 9.6 mg/kg)
- Class C Sediments (> 9.6 mg/kg)
- Tissue Sampling Location (Clam)
- Toxicological Impacts Identified

Notes:
1 Surficial sediment data collected in September, 2019.

Map Date: 1/28/2020
Projection: NAD83 State Plane New York Long Island

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Figure 1e
Ecological Risk Assessment
Dzus Fastener Company, Inc.
OU5 Remedial Investigation/Feasibility Study
West Islip, NY

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Table 1 Cadmium and Chromium Ecological Evaluation

				Analyte	Cadmium		Chromium				Grain Size (%)					Toxicity			In Situ Tissue (*Mercenaria mercenaria*)		
				NYSDEC Class A Saltwater Sediment Guidance Value	< 1.2		< 81														
				NYSDEC Class B Saltwater Sediment Guidance Value	1.2 - 9.6		81 - 370														
				NYSDEC Class C Saltwater Sediment Guidance Value	> 9.6		> 370														
Location	Sample ID	Sample Date	Sample Depth (in)		Result (mg/kg)	Qualifier	Result (mg/kg)	Qualifier	$(\sum SEM-AVS)/f_{OC}$	SEM:AVS	Cobble	Gravel	Sand	Fines (Silt + Clay)	TOC (%)	Survival (%)	Growth (mg dry weight)	Reproduction (#neonates per adult)	Cadmium (mg/kg)	Chromium (mg/kg)	Qualifier
Willetts Creek Tidal Samples (sediment and tissue)																					
WT-02	152033-OU5-SD-WT-02-0006	9/18/2019	0-6		3.5	J	72	J	-5744	0.014	0	0	1.8	98.2	6.3	-	-	-			
WT-03	152033-OU5-SD-WT-03-0006	9/18/2019	0-6		2.6	J	51	J	-4302	0.028	0	0	23.1	76.9	4.0	-	-	-			
WT-04	152033-OU5-SD-WT-04-0006	9/18/2019	0-6		2	J	63	J	-2058	0.030	0	0	2.4	97.6	5.7	-	-	-			
WT-04	152033-OU5-HSC-REP8	9/20/2019	--		--		--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.144	0.263	J
WT-05	1520333-OU5-SD-WT-05-006	9/17/2019	0-6		1	J	25	J	-3306	0.032	0	0	35	65	2.9	-	+	-			
WT-06	152033-OU5-SD-WT-06-0006	9/18/2019	0-6		0.14	J	6.4		-2299	0.042	0	16.6	45.6	37.8	0.7	-	-	-			
WT-100	1520333-OU5-SD-WT-100-006	9/17/2019	0-6		0.72	J	54	J	-5345	0.025	0	0	0.7	99.3	4.8	-	-	-			
WT-101	1520333-OU5-SD-WT-101-006	9/17/2019	0-6		1	J	63	J	-3975	0.029	0	0.2	1.7	98.1	5.3	-	-	-			
WT-104	1520333-OU5-SD-WT-104-006	9/17/2019	0-6		0.77	J	60	J	-5747	0.022	0	0	0.8	99.2	4.1	-	-	-			
WT-105	152033-OU5-SD-WT-105-0006	9/18/2019	0-6		1.6	J	64	J	-1784	0.051	0	0	3.8	96.2	5.0	+	-	-			
WT-106	1520333-OU5-SD-WT-106-006	9/17/2019	0-6		0.78	J	59	J	-3955	0.026	0	0	0.5	99.5	4.9	-	-	-			
WT-107	1520333-OU5-SD-WT-107-006	9/17/2019	0-6		0.85	J	64	J	-4344	0.051	0	0	0.8	99.2	5.0	-	-	-			
WT-107	1520333-OU5-SD-WT-FD-091719-02	9/17/2019	0-6		0.81	J	61	J	-5243	0.025	NA	NA	NA	NA	4.5	NA	NA	NA			
WT-108	152033-OU5-SD-WT-108-0006	9/18/2019	0-6		1.3	J	51	J	-3824	0.025	0	0	4.3	95.7	5.2	+	-	-			
WT-112	152033-OU5-SD-WT-112-0006	9/18/2019	0-6		1.6	J	64	J	-1152	0.064	0	0.1	9.0	90.9	7.8	+	+	-			
WT-113	152033-OU5-SD-WT-113-0006	9/18/2019	0-6		1.3	J	62	J	-5324	0.024	0	0	4.9	95.1	5.3	-	-	-			
WT-116	152033-OU5-SD-WT-116-0006	9/18/2019	0-6		1.1	J	65	J	-2512	0.038	0	0	3.1	96.9	4.9	-	-	-			
WT-117	1520333-OU5-SD-WT-117-006	9/18/2019	0-6		0.73	J	58	J	-2839	0.032	0	0	0.9	99.1	5.9	+	+	-			
WT-117	1520333-OU5-SD-WT-FD-091819	9/18/2019	0-6		0.72	J	60	J	-3233	0.028	NA	NA	NA	NA	5.5	NA	NA	NA			
WT-118	1520333-OU5-SD-WT-118-006	9/18/2019	0-6		0.42	J	28		-2283	0.049	0	33	38.3	28.7	3.5	-	+	-			
WT-118	152033-OU5-HSC-REP2	9/18/2019	--		--		--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.115	0.126	J
WT-128	1520333-OU5-SD-WT-128-006	9/18/2019	0-6		0.031	J	3.1	J	-1029	0.136	0	14.5	81.1	4.4	0.2	-	-	-			
WT-23	1520333-OU5-SD-WT-023-006	9/17/2019	0-6		0.19	J	3.1	J	-13076	0.025	0	21.1	77.5	1.4	0.4	-	-	-			
WT-37	1520333-OU5-SD-WT-037-006	9/16/2019	0-6		1.8	J	24	J	-2360	0.050	0	25.6	41.0	33.4	3.5	-	-	-			
WT-42	152033-OU5-HSC-REP6	9/20/2019	--		--		--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.208	0.392	J
WT-42	1520333-OU5-SD-WT-042-006	9/16/2019	0-6		0.39	J	10		-2324	0.088	0	1.6	78.4	20	0.4	-	-	-			
WT-49	152033-OU5-SD-WT-049-0006	9/18/2019	0-6		2.8	J	46	J	-5423	0.020	0	0.7	67.8	31.5	3.0	-	-	-			
WT-49	152033-OU5-SD-WT-FD091919	9/18/2019	0-6		2.4	J	51	J	-4989	0.020	NA	NA	NA	NA	3.3	NA	NA	NA			
WT-50	152033-OU5-SD-WT-050-0006	9/18/2019	0-6		4	J	60	J	-1550	0.042	0	0	34.1	65.9	3.4	-	-	-			
WT-51	1520333-OU5-SD-WT-051-006	9/17/2019	0-6		3.5	J	66	J	-5866	0.017	0	0.1	11.6	88.3	5.8	-	-	-			
WT-52	152033-OU5-SD-WT-052-0006	9/18/2019	0-6		15	J	46	J	-1302	0.060	0	0	8.2	91.8	7.0	-	+	-			
WT-53	1520333-OU5-SD-WT-053-006	9/17/2019	0-6		3.2	J	68	J	-1742	0.031	0	0	13.2	86.8	7.9	-	+	-			
WT-54	152033-OU5-SD-WT-054-0006	9/18/2019	0-6		3.9	J	63	J	-2495	0.028	0	0	17	83	5.3	-	-	-			
WT-54	152033-OU5-HSC-REP7	9/20/2019	--		--		--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.085	0.226	J
WT-55	1520333-OU5-SD-WT-055-006	9/17/2019	0-6		4.2	J	59	J	-3403	0.023	0	0.1	11.6	88.3	6.4	-	-	-			
WT-56	1520333-OU5-SD-WT-056-006	9/17/2019	0-6		0.15	J	3.8	J	-5850	0.032	0	37.1	62.6	0.3	0.5	-	-	-			
WT-58	1520333-OU5-SD-WT-058-006	9/17/2019	0-6		7.1	J	55	J	-3541	0.027	0	0.2	30.9	68.9	4.7	-	-	-			
WT-61	152033-OU5-SD-WT-061-0006	9/18/2019	0-6		0.28	J	8		-1138	0.116	0	1.3	72	26.7	0.6	-	-	-			
WT-62	152033-OU5-HSC-REP9	9/20/2019	--		--		--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.105	0.136	J
WT-62	152033-OU5-SD-WT-062-0006	9/18/2019	0-6		5.6	J	100	J	-2326	0.037	0	1.4	23.9	74.7	5.3	-	-	-			
WT-64	1520333-OU5-SD-WT-064-006	9/17/2019	0-6		2	J	68	J	-2078	0.037	0	0	4.3	95.7	5.7	-	-	-			
WT-65	1520333-OU5-SD-WT-065-006	9/16/2019	0-6		0.9	J	22	J	-3554	0.046	0	15	38.6	46.4	2.9	-	-	-			
WT-67	152033-OU5-SD-WT-067-0006	9/18/2019	0-6		1.5	J	61	J	-4189	0.025	0	0	3.3	96.7	5.1	-	-	-			
WT-70	152033-OU5-SD-WT-070-0006	9/18/2019	0-6		1.6	J	58	J	-3750	0.031	0	0	4.9	95.1	4.6	+	-	-			
WT-76	152033-OU5-SD-WT-076-0006	9/18/2019	0-6		0.091	J	6.1		-212	0.368	0	27.2	62.9	9.9	0.3	-	-	-			
WT-83	1520333-OU5-SD-WT-083-006	9/17/2019	0-6		1.3	J	50	J	-4798	0.024	0	0	1.5	98.5	4.7	-	-	-			

Table 1 Cadmium and Chromium Ecological Evaluation

				Analyte	Cadmium		Chromium				Grain Size (%)					Toxicity			In Situ Tissue (*Mercenaria mercenaria*)		
				NYSDEC Class A Saltwater Sediment Guidance Value	< 1.2		< 81														
				NYSDEC Class B Saltwater Sediment Guidance Value	1.2 - 9.6		81 - 370														
				NYSDEC Class C Saltwater Sediment Guidance Value	> 9.6		> 370														
Location	Sample ID	Sample Date	Sample Depth (in)		Result (mg/kg)	Qualifier	Result (mg/kg)	Qualifier	(∑SEM-AVS)/f_{OC}	SEM:AVS	Cobble	Gravel	Sand	Fines (Silt + Clay)	TOC (%)	Survival (%)	Growth (mg dry weight)	Reproduction (#neonates per adult)	Cadmium (mg/kg)	Chromium (mg/kg)	Qualifier
WT-86	1520333-OU5-SD-WT-086-006	9/17/2019	0-6		0.43	J	13		-3041	0.037	0	15.3	35.6	49.1	1.9	-	+	-			
WT-86	1520333-OU5-SD-WT-FD-091719	9/17/2019	0-6		0.44	J	13		-2948	0.036	NA	NA	NA	NA	1.7	NA	NA	NA			
WT-86	152033-OU5-HSC-REP1	9/17/2019	--		--		--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.176	0.259	J
WT-90	1520333-OU5-SD-WT-090-006	9/17/2019	0-6		2.2	J	57	J	-4110	0.025	0	0	2.1	97.9	4.6	-	-	-			
WT-90	152033-OU5-HSC-REP3	9/20/2019	--		--		--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.164	0.2	J
WT-92	1520333-OU5-SD-WT-092-006	9/17/2019	0-6		1.5	J	79	J	-3400	0.029	0	0.3	2.4	97.3	5.8	-	-	-			
WT-93	1520333-OU5-SD-WT-093-006	9/17/2019	0-6		1.3	J	21	J	-4470	0.045	0	2.1	58.1	39.8	2.5	-	-	-			
WT-94	1520333-OU5-SD-WT-094-006	9/17/2019	0-6		1	J	58	J	-4032	0.024	0	0	0.7	99.3	5.4	-	-	-			
WT-97	1520333-OU5-SD-WT-097-006	9/17/2019	0-6		1.1	J	65	J	-4345	0.037	0	0	0.8	99.2	4.9	-	+	-			
WT-98	1520333-OU5-SD-WT-098-006	9/17/2019	0-6		1.1	J	57	J	-2495	0.039	0	0.1	6.3	93.6	6.2	-	-	-			
WT-98	1520333-OU5-SD-WT-FD-091719-01	9/17/2019	0-6		1.3	J	67	J	-2662	0.042	NA	NA	NA	NA	5.4	NA	NA	NA			
Reference Samples (sediment and tissue)																					
BG-01	1520333-OU5-SD-WT-BG-01-006	9/18/2019	0-6		0.48	J	31	J	-2546	0.030	0	0.1	3.2	96.7	6.4	70	0.025	0.45			
BG-02	1520333-OU5-SD-WT-BG-02-006	9/18/2019	0-6		0.28	J	24	J	-3859	0.035	0	0	44.1	55.9	2.2	55	0.018	0.15			
BG-03	1520333-OU5-SD-WT-BG-03-006	9/18/2019	0-6		0.61	J	43	J	-3703	0.027	0	0	4.9	95.1	5.1	72	0.018	0.13			
BG-04	1520333-OU5-SD-WT-BG-04-006	9/18/2019	0-6		0.56	J	40	J	-2552	0.039	0	0	8.3	91.7	5.8	64	0.02	0.15			
BG-04	152033-OU5-HSC-REP4	9/20/2019	--		--		--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.083	0.302	J
BG-04	152033-OU5-HSC-REP5	9/20/2019	--		--		--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.127	0.319	J

Notes

in. = inch(es)

mg/kg = milligram(s) per kilogram

NA = not analyzed

NYSDEC = New York State Department of Environmental Conservation

U = Indicates the analyte was analyzed for but not detected.

J = The result is an estimated quantity. The associated numerical value is theapproximate concentration of the analyte in the sample.

Result that exceeds the NYSDEC Class C sediment guidance value for saltwater bold red.

Results that meet the NYSDEC Class B sediment guidance values for saltwater are shaded gray.

Toxicity Results

+ = unacceptable risk; statistically different from lowest reference

- = no unacceptable risk; not statistically different from lowest reference

Pink station IDs correspond to locations with one or more toxicological impacts as noted on Figures 1 and 2.