

US EPA ARCHIVE DOCUMENT

A total of eight SVOCs and one pesticide (dieldrin) were detected in various soil samples above the respective RI DEC values. Dioxin results exceeded the EPA Region I Residential Action Level for dioxin (1 ppb) at four sample locations and ranged from 3.0 J ppb to 6.3 J ppb. In regards to soil samples collected, the greatest number of SVOCs and the highest concentrations of SVOCs and dioxin were detected in soil sample SS-04 (Figure 3A) [4; 7].

Table 1

**Sample Summary: Centredale Manor Site
Samples Collected by START on 9 September 1998**

Sample Location No.	Traffic Report No.	Time (hours)	Remarks	Sample Depth (Inches)	Sample Coordinates
MATRIX: Soil					
SS-01	APA72 DAFZ73 AAL24-001	0920	Grab	3 to 12	41° 51' 23.5" north 71° 29' 12.5" west
SS-02	APA73 DAFZ74 AAL24-002	0950	Grab	0 to 16	41° 51' 18.7" north 71° 29' 9.9" west
SS-03	APA74 DAFZ75 AAL24-003	1005	Grab	30 to 42	41° 51' 18.7" north 71° 29' 9.9" west
SS-04	APA75 DAFZ76 AAL24-004	1050	Grab	0 to 18	41° 51' 17.9" north 71° 29' 9.5" west
SS-05	APA76 DAFZ77 AAL24-005	1130	Grab	0 to 18	41° 51' 17.7" north 71° 29' 8.2" west
SS-06	APA77 DAFZ78 AAL24-006	1110	Grab	0 to 24	42° 51' 18.2" north 71° 29' 7.7" west
MATRIX: Sediment					
SD-01 (MS/MSD)	APA78 DAFZ79 AAL24-007	0819	Grab	0 to 6	41° 49' 37.7" north 71° 24' 50.6" west
SD-02	APA79 DAFZ80 AAL24-008	0835	Grab	0 to 3	41° 49' 21.4" north 71° 26' 25.0" west
SD-03	APA80 DAFZ81 AAL24-009	0850	Grab	0 to 3	41° 49' 21.2" north 71° 26' 30.0" west

Table 1

Sample Summary: Centredale Manor Site
Samples Collected by START on 9 September 1998
(Continued)

Sample Location No.	Traffic Report No.	Time (hours)	Remarks	Sample Depth (Inches)	Sample Coordinates
MATRIX: Sediment (Continued)					
SD-04	APA81 DAFZ82 AAL24-010	0900	Grab	0 to 6	41° 49' 6.3" north 71° 26' 56.5" west
SD-05	APA82 DAFZ83 AAL24-011	0938	Grab	0 to 6	41° 49' 15.3" north 71° 27' 18.0" west
SD-06	APA83 DAFZ84 AAL24-012	0950	Grab	0 to 6	41° 49' 13.9" north 71° 27' 19.4" west
SD-07	APA84 DAFZ85 AAL24-013	0955	Grab	0 to 6	41° 49' 40.4" north 71° 27' 47.4" west
SD-08	APA85 DAFZ86 AAL24-014	1022	Grab	0 to 3	41° 49' 47.5" north 71° 27' 52.3" west
SD-09	APA86 DAFZ87 AAL24-015	1036	Grab	0 to 6	41° 50' 6.5" north 71° 28' 21.2" west
SD-10	APA87 DAFZ88 AAL24-016	1115	Grab	0 to 6	41° 50' 22.4" north 71° 28' 35.9" west
SD-11	APA88 DAFZ89 AAL24-017	1135	Grab	0 to 12	41° 50' 33.3" north 71° 28' 43.4" west
SD-12	APA89 DAFZ90 AAL24-018	1238	Grab	0 to 12	41° 50' 41.3" north 71° 28' 50.9" west
SD-13	APA90 DAFZ91 AAL24-019	1215	Grab	0 to 12	41° 50' 41.4" north 71° 28' 43.1" west
SD-14	APA91 DAFZ92 AAL24-020	1230	Grab	0 to 6	41° 50' 41.8" north 71° 28' 44.7" west

Table 1

Sample Summary: Centredale Manor Site
Samples Collected by START on 9 September 1998
(Continued)

Sample Location No.	Traffic Report No.	Time (hours)	Remarks	Sample Depth (Inches)	Sample Coordinates
MATRIX: Sediment (Continued)					
SD-15	APA92 DAFZ93 AAL24-021	1250	Grab	0 to 6	41° 50' 42.3" north 71° 28' 46.0" west
SD-16	APA93 DAFZ94 AAL24-022	1315	Grab	0 to 6	41° 50' 42.8" north 71° 28' 48.3" west
SD-17	APA94 DAFZ95 AAL24-023	1315	Grab, Duplicate of SD-16	0 to 6	41° 50' 42.8" north 71° 28' 48.3" west
SD-18 (MS/MSD)	APA95 DAFZ96 AAL24-024	1155	Grab	0 to 3	41° 50' 57.0" north 71° 28' 49.7" west
SD-19	APA96 DAFZ97 AAL24-025	1110	Grab	0 to 3	41° 50' 53.7" north 71° 28' 49.8" west
SD-20	APA97 DAFZ98 AAL24-026	1406	Grab	0 to 3	41° 51' 3.9" north 71° 28' 54.8" west
SD-21	APA98 DAFZ99 AAL24-027	1415	Grab	6 to 25	41° 51' 3.9" north 71° 28' 59.8" west
SD-22	APA99 DAF01A AAL24-028	1411	Grab	0 to 3	41° 51' 4.2" north 71° 28' 53.2" west
SD-23	APB00 DAF02A AAL24-029	1355	Grab	0 to 3	41° 50' 4.4" north 71° 28' 56.2" west
SD-24	APB01 DAF03A AAL24-030	1356	Grab	0 to 3	41° 51' 6.8" north 71° 28' 53.9" west
SD-25	APB02 DAF04A AAL24-031	1356	Grab, Duplicate of SD-24	0 to 3	41° 51' 6.8" north 71° 28' 53.9" west

Table 1

Sample Summary: Centredale Manor Site
Samples Collected by START on 9 September 1998
(Continued)

Sample Location No.	Traffic Report No.	Time (hours)	Remarks	Sample Depth (Inches)	Sample Coordinates
MATRIX: Sediment (Continued)					
SD-26	APB03 DAF05A AAL24-032	1320	Grab	0 to 6	41° 51' 17.7" north 71° 29' 10.1" west
SD-27	APB04 DAF06A AAL24-033	1420	Grab	0 to 6	41° 51' 23.8" north 71° 29' 13.4" west
SD-28	APB05 DAF07A AAL24-034	1450	Grab	0 to 6	41° 51' 28.7" north 71° 29' 13.5" west
SD-29	APB06 DAF08A AAL24-035	1350	Grab	0 to 6	41° 51' 18.0" north 71° 29' 7.6" west
SD-30	APB07 DAF09A AAL24-036	1415	Grab	0 to 6	41° 51' 21.2" north 71° 29' 8.4" west
SD-31	APB08 DAF10A AAL24-037	1435	Grab	0 to 6	41° 51' 28.1" north 71° 29' 11.0" west
SD-32	APB09 DAF11A AAL24-038	1435	Grab, Duplicate of SD-31	0 to 6	41° 51' 28.1" north 71° 29' 11.0" west
SD-33	APB10 DAF12A AAL24-039	1515	Grab	0 to 3	41° 51' 47.4" north 71° 29' 21.5" west
SD-34	APB11 DAF13A AAL24-040	1520	Grab	0 to 3	41° 51' 48.6" north 71° 29' 25.1" west
SD-35 (MS/MSD)	APB12 DAF14A AAL24-041	1526	Grab	0 to 3	41° 51' 58.9" north 71° 29' 35.8" west
SD-36	APB13 DAF15A AAL24-042	1546	Grab	0 to 3	41° 52' 23.2" north 71° 29' 48.7" west

Table 1

Sample Summary: Centredale Manor Site
Samples Collected by START on 9 September 1998
(Concluded)

Sample Location No.	Traffic Report No.	Time (hours)	Remarks	Sample Depth (Inches)	Sample Coordinates
MATRIX: Sediment (Concluded)					
SD-37	APB17 DAF16A AAL24-043	1547	Grab	0 to 6	41° 52' 36.7" north 71° 29' 59.9" west
SD-38	APB18 DAF17A AAL24-044	1600	Grab	0 to 6	41° 52' 44.0" north 71° 30' 6.2" west
SD-39	APB19 DAF18A AAL24-045	1602	Grab	0 to 3	41° 52' 44.1" north 71° 30' 7.0" west
MATRIX: Aqueous					
RB-01	APB20 DAF19A	1250	Grab	NA	NA
Matrix: Performance Evaluation Samples					
PE-503338	APB24	0500	SVOC	NA	NA
PE-501151	APB25	0500	SVOC	NA	NA
PE-501688	APB26	0500	SVOC	NA	NA
PE-0023053	APB27	0500	Pest/PCB	NA	NA
PE-0021565	APB28	0500	Pest/PCB	NA	NA
PE-0000466	APB29	0500	Pest/PCB	NA	NA
PE-TT03728	APB30	0500	Aroclor 1260	NA	NA
PE-TT01048	APB31	0500	Aroclor 1260	NA	NA
PE-TT00153	APB32	0500	Aroclor 1260	NA	NA

MS/MSD = Matrix Spike/Matrix Spike Duplicate
 NA = Not Applicable
 SVOC = Semivolatile Organic Compound
 Pest/PCB = Pesticide/Polychlorinated Biphenyl

[3]

Table 2

**Soil Sample Results from Centredale Manor Site
Above Residential Direct Exposure Criteria**

Sample Location	Compound	Sample Concentration	Direct Exposure Criteria* (Residential)
SS-01 (APA72) (DAFZ73) (AAL24-001)	SVOCs		
	Chrysene	0.420 J mg/kg	0.4 mg/kg
	Benzo(a)pyrene	0.460 mg/kg	0.4 mg/kg
	DIOXINS		
	Dioxins [†]	R ppb	1.0 ppb
	Hexachloroxanthene	R ppb	NA
SS-02 (APA73) (DAFZ74) (AAL24-002)	SVOCs		
	Chrysene	0.450 J mg/kg	0.4 mg/kg
	PESTICIDES/PCBs		
	Dieldrin	0.14 J,EB mg/kg	0.04 mg/kg
	DIOXINS		
	Dioxins [†]	4.7 J ppb	1.0 ppb
	Hexachloroxanthene	263 J ppb	NA
SS-03 (APA74) (DAFZ75) (AAL24-003)	DIOXINS		
	Hexachloroxanthene	9.9 ppb	NA
SS-04 (APA75) (DAFZ76) (AAL24-004)	SVOCs		
	Benzo(a)anthracene	2.4 mg/kg	0.9 mg/kg
	Chrysene	2.2 mg/kg	0.4 mg/kg
	Benzo(b)fluoranthene	3.2 mg/kg	0.9 mg/kg
	Benzo(k)fluoranthene	0.960 mg/kg	0.9 mg/kg
	Benzo(a)pvrene	2.6 mg/kg	0.4 mg/kg
	Indeno(1,2,3-cd)pyrene	1.5 mg/kg	0.9 mg/kg
	Dibenz(a,h)anthracene	0.460 mg/kg	0.4 mg/kg
	Benzo(g,h,i)perylene	1.3 mg/kg	0.8 mg/kg

Table 2

**Soil Sample Results from Centredale Manor Site
Above Residential Direct Exposure Criteria (Concluded)**

Sample Location	Compound	Sample Concentration		Direct Exposure Criteria* (Residential)
SS-04 (concluded)	DIOXINS			
	Dioxins†	6.3	J ppb	1.0 ppb
	Hexachloroxanthene	168.2	J ppb	NA
SS-05 (APA76) (DAFZ77) (AAL24-005)	SVOCs			
	Chrysene	0.470	J mg/kg	0.4 mg/kg
	Benzo(a)pyrene	0.500	mg/kg	0.4 mg/kg
	DIOXINS			
	Dioxins†	3.4	J ppb	1.0 ppb
	Hexachloroxanthene	63.2	ppb	NA
SS-06 (APA77) (DAFZ78) (AAL24-006)	SVOCs			
	Chrysene	0.710	J mg/kg	0.4 mg/kg
	Benzo(a)pyrene	0.690	J mg/kg	0.4 mg/kg
	DIOXINS			
	Dioxins†	3.0	J ppb	1.0 ppb
	Hexachloroxanthene	48.3	J ppb	NA

J = The associated numerical value is an estimated quantity.

EB = The compound was identified in an aqueous equipment blank (EB) that was used to assess field contamination associated with soil/sediment samples.

R = Value was rejected due to insufficient of non-compliant quality control.

mg/kg = Milligrams per kilogram.

ppb = Parts per billion.

NA = Not Applicable.

PCBs = Polychlorinated Biphenyls.

SVOCs = Semivolatile Organic Compounds.

* For SVOCs, the RI DEM Residential Direct Exposure Criteria (1993, amended 1996) is presented for comparison purposes. For dioxins, the EPA Region I Residential Action Level is presented for comparison purposes. No benchmark concentration is available for hexachloroxanthene.

† Values presented for dioxins are the 2,3,7,8-tetrachlorodibenzo dioxin toxicity equivalence on a dry-weight basis.

[4; 7;10]

Complete analytical results of START sediment samples including quantitation and detection limits are presented in Attachment A (for SVOCs and pesticides/PCBs), Attachment B (for dioxin and hexachloroxanthene), and Attachment C (for TOCs). Sample results quantified with a "J" on analytical tables are considered approximate because of limitations identified during CLP and DAS data validation. In addition, organic sample results reported at concentrations below quantitation limits and confirmed by mass spectrometry are also qualified by a "J" and considered approximate.

Table 3 summarizes SVOCs, pesticides/PCBs, dioxins, and HCX detected through analyses of START sediment samples (SD-01 through SD-32) that were collected adjacent to or downstream of the Centredale Manor property. Sediment samples collected upstream of the Centredale Manor property (SD-33 through SD-39) are discussed later in this report.

For each sample location, a compound is listed if it is detected at three times or greater than the appropriate reference sample concentration. Based on its relative upstream location, sediment sample SD-28 is the reference sample for samples SD-01 through SD-27. Based on their relative upstream locations, sediment samples SD-31 and SD-32 (duplicates) are the references for SD-29 and SD-30. If the compound is not detected in the appropriate reference sample, the reference sample quantitation limit (SQL) is used as the reference value. These compounds are listed if they occurred at a value equal to or greater than the reference SQL and are designated by their approximate relative concentration above these values. Dioxin values are presented as the 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD) toxicity equivalence on a dry-weight basis. The estimated detection limit for 2,3,7,8-TCDD is used to calculate the total toxicity equivalence value for the reference sample [11].

Twelve SVOCs, 12 pesticides, one PCB (Aroclor-1254), dioxins, and HCX were detected at concentrations exceeding reference values in various sediment samples collected along Woonasquatucket River downstream of the Centredale Manor property (SD-01 through SD-27). In addition, five pesticides, one PCB (Aroclor-1254), dioxins, and HCX were detected at concentrations exceeding reference values in the drainage channel downstream sediment samples (SD-29 and SD-30) [4; 5].

Generally, dioxin concentrations were highest near the Centredale Manor property and attenuate to less than 1 ppb at downstream locations. The highest concentration of dioxins was detected in a sediment sample collected along the drainage channel (SD-30) adjacent to the Centredale Manor property, which flows into the Woonasquatucket River approximately 0.3 miles downstream of the property. Analytical results of the Woonasquatucket River sediment samples indicate that the highest dioxin concentration detected was 10.8 ppb in sample SD-23 collected at the Allendale Dam Area [7]. It should be noted that this is the first downstream dam from the Centredale Manor property. The dam acts as a barrier and slows the flow of water, providing the sediments and possibly contaminants time to settle out of the water column.

Various SVOCs and pesticides/PCBs were detected at several locations along the Woonasquatucket River and the drainage channel. However, the greatest number of SVOCs and the highest concentrations of SVOCs were detected in the sample collected farthest downstream along Woonasquatucket River (SD-01) [4; 5]. Sediment samples with elevated levels of PCBs were detected only in samples upstream of the Allendale Dam.

Table 3

Summary of Analytical Results
Sediment Sample Analysis for Woonasquatucket River Samples SD-01 through SD-32

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration*	Comments
SD-01 (APA78) (DAFZ79) AAL24-007	SVOCs			
	Acenaphthene	170 J ppb	56 J ppb	3.0 × Ref
	Phenanthrene	3,400 ppb	1,100 ppb	3.1 × Ref
	Fluoranthene	9,100 ppb	1,400 ppb	6.5 × Ref
	Pyrene	11,000 J ppb	1,100 ppb	10 × Ref
	Benzo(a)anthracene	4,500 ppb	560 ppb	8.0 × Ref
	Chrysene	2,600 J ppb	580 ppb	4.5 × Ref
	Bis(2-ethylhexyl)phthalate	3,700 J ppb	87 J ppb	42 × Ref
	Benzo(b)fluoranthene	4,700 ppb	830 J ppb	5.7 × Ref
	Benzo(a)pyrene	3,700 ppb	530 ppb	7.0 × Ref
	Indeno(1,2,3-cd)pyrene	3,500 ppb	340 J ppb	10 × Ref
	Dibenz(a,h)anthracene	680 ppb	140 J ppb	4.9 × Ref
	Benzo(g,h,i)perylene	2,700 ppb	280 J ppb	9.6 × Ref
	PESTICIDES/PCBs			
	Heptachlor Epoxide	2.7 J ppb	2.1 U ppb	1.3 × SQL
	4,4'-DDD	35 J ppb	4.1 U ppb	8.5 × SQL
	4,4'-DDT	22 J ppb	4.1 U ppb	5.4 × SQL
	DIOXINS			
	Dioxins [†]	0.12 ppb	0.002 UJ ppb	60 × SQL
	Hexachloroxanthene	49.4 J ppb	0.261 UJ ppb	190 × SQL
SD-02 (APA79) (DAFZ80) AAL24-008	SVOCs			
	Bis(2-ethylhexyl)phthalate	840 ppb	87 J ppb	9.7 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	3.6 J ppb	0.38 J ppb	9.5 × Ref
	4,4'-DDD	6.1 J ppb	4.1 U ppb	1.5 × SQL
	alpha-Chlordane	3.4 J ppb	2.1 U ppb	1.6 × SQL
	DIOXINS			
	Dioxins [†]	0.088 J ppb	0.002 UJ ppb	44 × SQL
	Hexachloroxanthene	21.9 J ppb	0.261 UJ ppb	84 × SQL

Table 3

Summary of Analytical Results
Sediment Sample Analysis for Woonasquatucket River Samples SD-01 through SD-32
(Continued)

Sample Location	Compound/Element	Sample Concentration	Reference Concentration*	Comments
SD-03 (APA80) (DAFZ81) AAL24-009	SVOCs			
	Acenaphthene	250 J ppb	56 J ppb	4.5 × Ref
	Bis(2-ethylhexyl)phthalate	440 ppb	87 J ppb	5.1 × Ref
	Benzo(b)fluoranthene	2,500 ppb	830 J ppb	3.0 × Ref
	Benzo(a)pyrene	1,600 ppb	530 ppb	3.0 × Ref
	DIOXINS			
	Dioxins [†]	0.034 J ppb	0.002 UJ ppb	17 × SQL
SD-04 (APA81) (DAFZ82) AAL24-010	SVOCs			
	Bis(2-ethylhexyl)phthalate	870 ppb	87 J ppb	10 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	3.7 J ppb	0.38 J ppb	9.7 × Ref
	4,4'-DDD	5.1 J ppb	4.1 U ppb	1.2 × SQL
	alpha-Chlordane	4.2 J ppb	2.1 U ppb	2.0 × SQL
	DIOXINS			
	Dioxins [†]	0.42 J ppb	0.002 UJ ppb	210 × SQL
	Hexachloroxanthene	6.8 J ppb	0.261 UJ ppb	26 × SQL
SD-05 (APA82) (DAFZ83) AAL24-011	PESTICIDES/PCBs			
	4,4'-DDE	4.9 ppb	0.38 J ppb	13 × Ref
	DIOXINS			
	Dioxins [†]	0.018 J ppb	0.002 UJ ppb	9.0 × SQL
SD-06 (APA83) (DAFZ84) AAL24-012	DIOXINS			
	Dioxins [†]	0.018 J ppb	0.002 UJ ppb	9.0 × SQL
SD-07 (APA84) (DAFZ85) AAL24-013	DIOXINS			
	Dioxins [†]	0.055 J ppb	0.002 UJ ppb	28 × SQL
SD-08 (APA85) (DAFZ86) AAL24-01	SVOCs			
	Bis(2-ethylhexyl)phthalate	390 J ppb	87 J ppb	4.5 × Ref
	DIOXINS			
	Dioxins [†]	0.21 J ppb	0.002 UJ ppb	105 × SQL

Table 3

Summary of Analytical Results
Sediment Sample Analysis for Woonasquatucket River Samples SD-01 through SD-32
(Continued)

Sample Location	Compound/Element	Sample Concentration	Reference Concentration*	Comments
SD-09 (APA86) (DAFZ87) AAL24-015	DIOXINS			
	Dioxins [†]	0.030 J ppb	0.002 UJ ppb	15 × SQL
SD-10 (APA87) (DAFZ88) AAL24-016	SVOCs			
	Bis(2-ethylhexyl)phthalate	700 ppb	87 J ppb	8.1 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	1.7 J ppb	0.38 J ppb	4.5 × Ref
	alpha-Chlordane	2.4 J ppb	2.1 U ppb	1.1 × SQL
	DIOXINS			
	Dioxins [†]	0.16 J ppb	0.002 UJ ppb	80 × SQL
SD-11 (APA88) (DAFZ89) AAL24-017	PESTICIDES/PCBs			
	4,4'-DDE	6.1 ppb	0.38 J ppb	16 × Ref
	alpha-Chlordane	14 J ppb	2.1 U ppb	6.7 × SQL
	gamma-Chlordane	16 J ppb	2.1 U ppb	7.6 × SQL
	DIOXINS			
	Dioxins [†]	0.27 J ppb	0.002 UJ ppb	135 × SQL
SD-12 (APA89) (DAFZ90) AAL24-018	DIOXINS			
	Dioxins [†]	0.020 J ppb	0.002 UJ ppb	10 × SQL
SD-13 (APA90) (DAFZ91) AAL24-019	PESTICIDES/PCBs			
	4,4'-DDE	3.5 J ppb	0.38 J ppb	9.2 × Ref
	alpha-Chlordane	5.7 ppb	2.1 U ppb	2.7 × SQL
	gamma-Chlordane	3.5 ppb	2.1 U ppb	1.7 × SQL
	DIOXINS			
	Dioxins [†]	0.12 J ppb	0.002 UJ ppb	60 × SQL
SD-14 (APA91) (DAFZ92) AAL24-020	PESTICIDES/PCBs			
	4,4'-DDE	3.6 J ppb	0.38 J ppb	9.5 × Ref
	4,4'-DDD	4.1 ppb	4.1 U ppb	1.0 × SQL

Table 3

Summary of Analytical Results
Sediment Sample Analysis for Woonasquatucket River Samples SD-01 through SD-32
(Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration*	Comments
SD-14 (concluded)	alpha-Chlordane	25 J ppb	2.1 U ppb	12 × SQL
	gamma-Chlordane	21 ppb	2.1 U ppb	10 × SQL
	DIOXINS			
	Dioxins†	0.030 J ppb	0.002 UJ ppb	15 × SQL
SD-16 (APA93) (DAFZ94) AAL24-022	PESTICIDES/PCBs			
	4,4'-DDE	2.5 J ppb	0.38 J ppb	6.6 × Ref
	alpha-Chlordane	3.5 J ppb	2.1 U ppb	1.7 × SQL
	DIOXINS			
	Dioxins†	0.47 J ppb	0.002 UJ ppb	240 × SQL
	Hexachloroxanthene	15 J ppb	0.261 UJ ppb	57 × SQL
SD-17 (APA94) (DAFZ95) AAL24-023	PESTICIDES/PCBs			
	4,4'-DDE	6.8 J ppb	0.38 J ppb	18 × Ref
	alpha-Chlordane	12 J ppb	2.1 U ppb	5.7 × SQL
	gamma-Chlordane	7.9 J ppb	2.1 U ppb	3.8 × SQL
	DIOXINS			
	Dioxins†	0.62 J ppb	0.002 UJ ppb	310 × SQL
	Hexachloroxanthene	15 J ppb	0.261 UJ ppb	57 × SQL
SD-18 (APA95) (DAFZ96) AAL24-024	SVOCs			
	Bis(2-ethylhexyl)phthalate	470 ppb	87 J ppb	5.4 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	2.8 J ppb	0.38 J ppb	7.4 × Ref
	alpha-Chlordane	5.6 J ppb	2.1 U ppb	2.7 × SQL
	gamma-Chlordane	4.7 J ppb	2.1 U ppb	2.2 × SQL
	DIOXINS			
	Dioxins†	8.0 J ppb	0.002 UJ ppb	4,000 × SQL
	Hexachloroxanthene	167 J ppb	0.261 UJ ppb	640 × SQL

Table 3

Summary of Analytical Results
Sediment Sample Analysis for Woonasquatucket River Samples SD-01 through SD-32
(Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration*	Comments
SD-19 (APA96) (DAFZ97) AAL24-025	SVOCs			
	Bis(2-ethylhexyl)phthalate	920 ppb	87 J ppb	10 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	1.3 J ppb	0.38 J ppb	3.4 × Ref
	alpha-Chlordane	9.1 ppb	2.1 U ppb	4.3 × SQL
	gamma-Chlordane	4.0 J ppb	2.1 U ppb	1.9 × SQL
	DIOXINS			
	Dioxins [†]	0.018 J ppb	0.002 UJ ppb	9.0 × SQL
SD-20 (APA97) (DAFZ98) AAL24-026	SVOCs			
	Bis(2-ethylhexyl)phthalate	590 J ppb	87 J ppb	6.8 × Ref
	Indeno(1,2,3-cd)pyrene	1,200 J ppb	340 J ppb	3.5 × Ref
	PESTICIDES/PCBs			
	delta-BHC	2.4 J ppb	2.1 U ppb	1.1 × SQL
	4,4'-DDE	4.2 J ppb	0.38 J ppb	11 × Ref
	Endrin Aldehyde	5.2 J ppb	0.77 J ppb	6.8 × Ref
	Aroclor-1254	200 J ppb	48 J ppb	4.2 × Ref
	DIOXINS			
	Dioxins [†]	3.6 J ppb	0.002 UJ ppb	1,800 × SQL
	Hexachloroxanthene	76 J ppb	0.261 UJ ppb	290 × SQL
SD-21 (APA98) (DAFZ99) AAL24-027	SVOCs			
	Bis(2-ethylhexyl)phthalate	330 J ppb	87 J ppb	3.8 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	2.8 J ppb	0.38 J ppb	7.4 × Ref
	Endrin aldehyde	2.6 J ppb	0.77 J ppb	3.4 × Ref

Table 3

Summary of Analytical Results
Sediment Sample Analysis for Woonasquatucket River Samples SD-01 through SD-32
(Continued)

Sample Location	Compound/Element	Sample Concentration	Reference Concentration*	Comments
SD-21 (concluded)	DIOXINS			
	Dioxins [†]	4.1 J ppb	0.002 UJ ppb	2,050 × SQL
	Hexachloroxanthene	99 J ppb	0.261 UJ ppb	380 × SQL
SD-22 (APA99) (DAF01A) AAL24-028	SVOCs			
	Bis(2-ethylhexyl)phthalate	930 J ppb	87 J ppb	11 × Ref
	Indeno(1,2,3-cd)pyrene	1,800 ppb	340 J ppb	5.3 × Ref
	Dibenz(a,h)anthracene	440 J ppb	140 J ppb	3.1 × Ref
	Benzo(g,h,i)perylene	1,100 ppb	280 J ppb	3.9 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	9.5 J ppb	0.38 J ppb	25 × Ref
	Methoxychlor	16 J ppb	3.5 J ppb	4.6 × Ref
	alpha-Chlordane	9.1 ppb	2.1 U ppb	4.3 × SQL
	gamma-Chlordane	9.3 J ppb	2.1 U ppb	4.4 × SQL
	Aroclor-1254	440 ppb	48 J ppb	9.2 × Ref
	DIOXINS			
	Dioxins [†]	7.5 J ppb	0.002 J ppb	3,750 × SQL
	Hexachloroxanthene	163 J ppb	0.261 UJ ppb	624 × SQL
SD-23 (APB00) (DAF02A) AAL24-029	SVOCs			
	Bis(2-ethylhexyl)phthalate	1,600 J ppb	87 J ppb	18 × Ref
	Indeno(1,2,3-cd)pyrene	1,100 J ppb	340 J ppb	3.2 × Ref
	Benzo(g,h,i)perylene	990 J ppb	280 J ppb	3.5 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	9.3 J ppb	0.38 J ppb	24 × Ref
	gamma-Chlordane	5.0 J ppb	2.1 U ppb	2.4 × SQL
	Aroclor-1254	320 J ppb	48 J ppb	6.7 × Ref

Table 3

Summary of Analytical Results
Sediment Sample Analysis for Woonasquatucket River Samples SD-01 through SD-32
(Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration*	Comments
SD-23 (concluded)	DIOXINS			
	Dioxins†	10.1 J ppb	0.002 UJ ppb	5,050 × SQL
	Hexachloroxanthene	365 J ppb	0.261 UJ ppb	1,400 × SQL
SD-24 (APB01) (DAF03A) AAL24-030	SVOCs			
	Bis(2-ethylhexyl)phthalate	650 J ppb	87 J ppb	7.5 × Ref
	Indeno(1,2,3-cd)pyrene	1,200 J ppb	340 J ppb	3.5 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	5.1 J ppb	0.38 J ppb	13 × Ref
	Methoxychlor	12 J ppb	3.5 J ppb	3.4 × Ref
	gamma-Chlordane	3.2 J ppb	2.1 U ppb	1.5 × SQL
	Aroclor-1254	260 J ppb	48 J ppb	5.4 × Ref
	DIOXINS			
	Dioxins†	5.8 J ppb	0.002 UJ ppb	2,900 × SQL
	Hexachloroxanthene	135 J ppb	0.261 UJ ppb	517 × SQL
SD-25 (APB02) (DAF04A) AAL24-031	SVOCs			
	Bis(2-ethylhexyl)phthalate	510 J ppb	87 J ppb	5.9 × Ref
	PESTICIDES/PCBs			
	4,4'-DDE	3.7 J ppb	0.38 J ppb	9.7 × Ref
	gamma-Chlordane	2.4 J ppb	2.1 U ppb	1.1 × SQL
	Aroclor-1254	170 J ppb	48 J ppb	3.5 × Ref
	DIOXINS			
	Dioxins†	5.2 J ppb	0.002 UJ ppb	2,600 × SQL
	Hexachloroxanthene	89 J ppb	0.261 UJ ppb	340 × SQL

Table 3

Summary of Analytical Results
Sediment Sample Analysis for Woonasquatucket River Samples SD-01 through SD-32
(Continued)

Sample Location	Compound/Element	Sample Concentration	Reference Concentration*	Comments
SD-26 (APB03) (DAF05A) AAL24-032	DIOXINS			
	Dioxins [†]	0.093 ppb	0.002 UJ ppb	47 × SQL
SD-27 (APB04) (DAF06A) AAL24-033	PESTICIDES/PCBs			
	Dieldrin	12 ppb	4.1 U ppb	2.9 × SQL
	4,4'-DDE	5.2 ppb	0.38 J ppb	14 × Ref
	Endrin aldehyde	2.6 J ppb	0.77 J ppb	3.4 × Ref
	DIOXINS			
	Dioxins [†]	1.3 J ppb	0.002 UJ ppb	650 × SQL
	Hexachloroxanthene	50 J ppb	0.261 UJ ppb	190 × SQL
SD-29 (APB06) (DAF08A) AAL24-035	PESTICIDES/PCBs			
	gamma-Chlordane	5.5 J ppb	1.4 J ppb	3.9 × Ref
	Aroclor-1254	65 J ppb	41 U ppb	1.6 × SQL
	DIOXINS			
	Dioxins [†]	0.057 J ppb	0.002 UJ ppb	28 × SQL
SD-30 (APB07) (DAF09A) AAL24-036	PESTICIDES/PCBs			
	beta-BHC	6.5 J ppb	1.7 U ppb	3.8 × CRQL
	Dieldrin	27 J,EB ppb	4.1 U ppb	6.6 × SQL
	4,4'-DDE	23 J ppb	4.1 U ppb	5.6 × SQL
	Endosulfan Sulfate	23 ppb	3.3 U ppb	7.0 × CRQL
	Aroclor-1254	1,400 ppb	41 U ppb	34 × Ref

Table 3

Summary of Analytical Results
Sediment Sample Analysis for Woonasquatucket River Samples SD-01 through SD-32
(Concluded)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration*	Comments
SD-30 (concluded)	DIOXINS			
	Dioxins [†]	15.8 J ppb	0.002 UJ ppb	7,900 × SQL
	Hexachloroxanthene	94 J ppb	1.9 UJ ppb	49 × SQL

J = The associated numerical value is an estimated quantity.

U = The compound was analyzed for, but not detected. The associated numerical value is the sample quantitation limit or the adjusted sample quantitation limit.

UJ = The compound was analyzed for, but not detected. The associated numerical value is the estimated sample quantitation limit.

EB = The compound was identified in an aqueous equipment blank (EB) that was used to assess field contamination associated with soil/sediment samples.

mg/kg = Milligrams per kilogram.

ppb = Parts per billion.

PCBs = Polychlorinated Biphenyls.

SVOCs = Semivolatile Organic Compounds.

Ref = Reference value.

SQL = Sample Quantitation Limit.

CRQL = Contract Required Quantitation Limit

* For SVOCs, the reference concentration or the reference SQL is presented. For dioxins, the estimated detection limit for 2,3,7,8-TCDD that is used to calculate the total toxicity equivalence value for the reference sample is presented.

† Values presented for dioxins are the 2,3,7,8-tetrachlorodibenzo dioxin toxicity equivalence on a dry-weight basis.

Note: Analytical results for numerous pesticides and PCBs in sediment samples were rejected due to deficiencies in quality control identified during the data validation process. Refer to Attachment B for complete analytical results.

[4; 5; 7]

Table 4 summarizes SVOCs, pesticides/PCBs, dioxins, and HCX detected through analyses of START sediment samples (SD-33 through SD-39) collected upstream of the Centredale Manor property. For each sample location, a compound is listed if it is detected at three times or greater than the reference sample concentration (SD-39). If the compound is not detected in the reference sample, the reference SQL is used as the reference value. These compounds are listed if they occurred at a value equal to or greater than the reference SQL and are designated by their approximate relative concentration above these values. Dioxin values are presented as the 2,3,7,8-TCDD toxicity equivalence on a dry-weight basis. The estimated detection limit for 2,3,7,8-TCDD is used to calculate the total toxicity equivalence value for the reference sample [11].