

EDEN NORTH CAROLINA COAL ASH SPILL SEDIMENT RESULTS

NOTE: The data below represents sediment samples that were collected on June 3, 2014 by EPA START Team 1. Sediment sample measurements are in milligrams per kilogram (mg/kg). The data is being compared to ecological risk screening levels (ERSLs) to protect aquatic life in the sediments of the Dan River. Specific qualifiers and footnotes are listed below the summary table. These samples were collected at various locations along the river (refer to map for generalized locations). The detected concentrations in sediment are all below the ERSLs with the exception of aluminum, barium, chromium, iron, manganese, selenium, and vandium. There were no exceedances of human health screening criteria for sediment. When chemical concentrations exceed the screening values it doesn't mean there will be adverse health or ecological effects, but recommends further investigation may be needed.

Analyte	Ecological Screening Standards for Sediment ²	SFDA-7A	SFDA-7B	SFDA-7C				
Sample Information								
Sample ID	-	EDEN-SFDA-7A-0006-SD-20140603	EDEN-SFDA-7B-0006-SD-20140603	EDEN-SFDA-7C-0006-SD-20140603				
Date	-	6/3/2014	6/3/2014	6/3/2014				
Time	-	1320	1337	1347				
Status	-	Validation Complete	Validation Complete	Validation Complete				
Type	-	Sediment	Sediment	Sediment				
Total Metals								
Aluminum	3,200 (bkg)	mg/kg	29000	mg/Kg	26000	mg/Kg	25000	mg/Kg
Antimony	2 ^a	mg/kg	2.2UJ	mg/Kg	2.3UJ	mg/Kg	2.3UJ	mg/Kg
Arsenic	9.8	mg/kg	4.7	mg/Kg	4.3J	mg/Kg	3.4J	mg/Kg
Barium	60 ^b	mg/kg	210	mg/Kg	190	mg/Kg	190	mg/Kg
Beryllium	-	-	1.5	mg/Kg	1.3	mg/Kg	1.3	mg/Kg
Boron	-	-	24U	mg/Kg	23U	mg/Kg	23U	mg/Kg
Cadmium	0.99	mg/kg	0.18	mg/Kg	0.13	mg/Kg	0.13	mg/Kg
Calcium	-	-	2600	mg/Kg	2400	mg/Kg	2000	mg/Kg
Chromium	43.4	mg/kg	47	mg/Kg	47	mg/Kg	42	mg/Kg
Cobalt	50	mg/kg	17	mg/Kg	16	mg/Kg	15	mg/Kg
Copper	31.6	mg/kg	30	mg/Kg	30	mg/Kg	25	mg/Kg
Iron	6,800 (bkg)	mg/kg	41000	mg/Kg	38000	mg/Kg	35000	mg/Kg
Lead	35.8	mg/kg	21J+	mg/Kg	17J+	mg/Kg	17J+	mg/Kg
Magnesium	-	-	4600	mg/Kg	4600	mg/Kg	4400	mg/Kg
Manganese	460 ^c	mg/kg	980	mg/Kg	920	mg/Kg	720	mg/Kg
Mercury	0.18	mg/kg	0.066	mg/Kg	0.056	mg/Kg	0.071	mg/Kg
Molybdenum	-	-	0.75J	mg/Kg	2.3U	mg/Kg	2.3U	mg/Kg
Nickel	22.7	mg/kg	19	mg/Kg	19	mg/Kg	17	mg/Kg
Potassium	-	-	3300	mg/Kg	3400	mg/Kg	3200	mg/Kg
Selenium	2 ^d	mg/kg	4.9	mg/Kg	3.9	mg/Kg	4.3	mg/Kg
Silver	0.733	mg/kg	0.22U	mg/Kg	0.11J	mg/Kg	0.23U	mg/Kg
Sodium	-	-	470U	mg/Kg	200J	mg/Kg	470U	mg/Kg
Thallium	-	mg/kg	0.4	mg/Kg	0.33	mg/Kg	0.36	mg/Kg
Vanadium	57 ^c	mg/kg	75J+	mg/Kg	75J+	mg/Kg	69J+	mg/Kg
Zinc	121	mg/kg	87J+	mg/Kg	82J+	mg/Kg	76J+	mg/Kg

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Analyte	Ecological Screening Standards for Sediment ²	SFDA-7A	SFDA-7B	SFDA-7C			
Sample Information							
Sample ID	-	EDEN-SFDA-7A-0006-SD-20140603	EDEN-SFDA-7B-0006-SD-20140603	EDEN-SFDA-7C-0006-SD-20140603			
Date	-	6/3/2014	6/3/2014	6/3/2014			
Time	-	1320	1337	1347			
Status	-	Validation Complete	Validation Complete	Validation Complete			
Type	-	Sediment	Sediment	Sediment			
Physical Properties							
Percent Ash	-	1	%	ND	%	1	%

Notes

² MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters.

^a The screening value for antimony is from Long, Edward R., and Lee G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52.

^b The screening value for barium was the probable effect level (PEL) instead of the threshold effect level (TEL) because the TEL was below background

^c Sediment screening values for manganese and vanadium come from the NOAA SQuIRT. <http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf>

^d The screening value for selenium is from Region 3 after Lemley, A.D. 2002. Selenium assessment in aquatic ecosystems. US Forest Service, Blacksburg, VA.

^e Cadmium from diet

^f Chromium (VI)

^g Methyl Mercury

^h Thallium Chloride

%	Percent
EPA	U.S. Environmental Protection Agency
J	Value is estimated
J+	Value is estimated with a possible high bias
mg/kg	milligrams per kilogram
ND	No fly ash detected at a PLM reporting limit of 1 percent
PLM	Polarized light microscopy
U	Analyte was not detected at the listed reporting limit.
UJ	Analyte was not detected at the listed reporting limit, which is an estimated quantitation.

**EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS**

Analyte	Ecological Screening Standards for Sediment ²		EPA04-LD		EPA05-LD		EPA05-LD	
Sample Information								
Sample ID	-		EDEN-EPA04-L-SD-20140603		EDEN-EPA05-L-SD-20140603		EDEN-EPA05-L-SD-20140603-DUP	
Date	-		6/3/2014		6/3/2014		6/3/2014	
Time	-		1540		1625		1620	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Total Metals								
Aluminum	3,200 (bkg)	mg/kg	3400	mg/Kg	7000	mg/Kg	6300	mg/Kg
Antimony	2 ^a	mg/kg	1.1UJ	mg/Kg	1.5UJ	mg/Kg	1.3UJ	mg/Kg
Arsenic	9.8	mg/kg	0.75J	mg/Kg	1.8J	mg/Kg	1.5J	mg/Kg
Barium	60 ^b	mg/kg	32	mg/Kg	66	mg/Kg	61	mg/Kg
Beryllium	-	-	0.19J	mg/Kg	0.45J	mg/Kg	0.4J	mg/Kg
Boron	-	-	12U	mg/Kg	15U	mg/Kg	14U	mg/Kg
Cadmium	0.99	mg/kg	0.057U	mg/Kg	0.05J	mg/Kg	0.049J	mg/Kg
Calcium	-	-	360	mg/Kg	790	mg/Kg	670	mg/Kg
Chromium	43.4	mg/kg	10	mg/Kg	14	mg/Kg	13	mg/Kg
Cobalt	50	mg/kg	3.1	mg/Kg	5.4	mg/Kg	5	mg/Kg
Copper	31.6	mg/kg	3.6	mg/Kg	7.8	mg/Kg	7.2	mg/Kg
Iron	6,800 (bkg)	mg/kg	6800	mg/Kg	11000	mg/Kg	11000	mg/Kg
Lead	35.8	mg/kg	3.1J+	mg/Kg	7.1J+	mg/Kg	6J+	mg/Kg
Magnesium	-	-	1100	mg/Kg	1900	mg/Kg	1800	mg/Kg
Manganese	460 ^c	mg/kg	77	mg/Kg	300	mg/Kg	250	mg/Kg
Mercury	0.18	mg/kg	0.024U	mg/Kg	0.016J	mg/Kg	0.014J	mg/Kg
Molybdenum	-	-	1.2U	mg/Kg	1.5U	mg/Kg	1.4U	mg/Kg
Nickel	22.7	mg/kg	3.5J	mg/Kg	6.1	mg/Kg	5.7	mg/Kg
Potassium	-	-	830	mg/Kg	1400	mg/Kg	1400	mg/Kg
Selenium	2 ^d	mg/kg	0.43J	mg/Kg	1.4	mg/Kg	1.6	mg/Kg
Silver	0.733	mg/kg	0.11U	mg/Kg	0.15U	mg/Kg	0.13U	mg/Kg
Sodium	-	-	230U	mg/Kg	300U	mg/Kg	270U	mg/Kg
Thallium	-	mg/kg	0.055J	mg/Kg	0.13J	mg/Kg	0.15	mg/Kg
Vanadium	57 ^c	mg/kg	13J+	mg/Kg	22J+	mg/Kg	20J+	mg/Kg
Zinc	121	mg/kg	15J+	mg/Kg	29J+	mg/Kg	27J+	mg/Kg

EDEN NORTH CAROLINA COAL ASH SPILL SEDIMENT RESULTS

Analyte	Ecological Screening Standards for Sediment ²	EPA04-LD	EPA05-LD	EPA05-LD			
Sample Information							
Sample ID	-	EDEN-EPA04-L-SD-20140603	EDEN-EPA05-L-SD-20140603	EDEN-EPA05-L-SD-20140603-DUP			
Date	-	6/3/2014	6/3/2014	6/3/2014			
Time	-	1540	1625	1620			
Status	-	Validation Complete	Validation Complete	Validation Complete			
Type	-	Sediment	Sediment	Sediment			
Physical Properties							
Percent Ash	-	1	%	1	%	1	%

Notes

² MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters.

^a The screening value for antimony is from Long, Edward R., and Lee G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52.

^b The screening value for barium was the probable effect level (PEL) instead of the threshold effect level (TEL) because the TEL was below background

^c Sediment screening values for manganese and vanadium come from the NOAA SQuIRT. <http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf>

^d The screening value for selenium is from Region 3 after Lemley, A.D. 2002. Selenium assessment in aquatic ecosystems. US Forest Service, Blacksburg, VA.

^e Cadmium from diet

^f Chromium (VI)

^g Methyl Mercury

^h Thallium Chloride

% Percent

EPA U.S. Environmental Protection Agency

J Value is estimated

J+ Value is estimated with a possible high bias

mg/kg milligrams per kilogram

ND No fly ash detected at a PLM reporting limit of 1 percent

PLM Polarized light microscopy

U Analyte was not detected at the listed reporting limit.

UJ Analyte was not detected at the listed reporting limit, which is an estimated quantitation.

**EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS**

Analyte	Ecological Screening Standards for Sediment ²		DUKE-DRB-LD		DUKE-DRE-LD		EPA12-RD	
Sample Information								
Sample ID	-		EDEN-DUKEDRB-L-SD-20140603		EDEN-DUKEDRE-L-SD-20140603		EDEN-EPA12-R-SD-20140603	
Date	-		6/3/2014		6/3/2014		6/3/2014	
Time	-		1040		1150		1220	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Total Metals								
Aluminum	3,200 (bkg)	mg/kg	3500	mg/Kg	5600	mg/Kg	11000	mg/Kg
Antimony	2 ^a	mg/kg	1.5UJ	mg/Kg	1.2UJ	mg/Kg	1.4UJ	mg/Kg
Arsenic	9.8	mg/kg	2.7U	mg/Kg	0.76J	mg/Kg	0.94J	mg/Kg
Barium	60 ^b	mg/kg	31	mg/Kg	59	mg/Kg	95	mg/Kg
Beryllium	-	-	0.21J	mg/Kg	0.3J	mg/Kg	0.57J	mg/Kg
Boron	-	-	13U	mg/Kg	12U	mg/Kg	15U	mg/Kg
Cadmium	0.99	mg/kg	0.077U	mg/Kg	0.015J	mg/Kg	0.04J	mg/Kg
Calcium	-	-	410	mg/Kg	870	mg/Kg	1200	mg/Kg
Chromium	43.4	mg/kg	8.3	mg/Kg	16	mg/Kg	24	mg/Kg
Cobalt	50	mg/kg	3	mg/Kg	5	mg/Kg	8.4	mg/Kg
Copper	31.6	mg/kg	4.1	mg/Kg	5.6	mg/Kg	12	mg/Kg
Iron	6,800 (bkg)	mg/kg	5900	mg/Kg	9900	mg/Kg	17000	mg/Kg
Lead	35.8	mg/kg	3.7J+	mg/Kg	4.5J+	mg/Kg	8.1J+	mg/Kg
Magnesium	-	-	970	mg/Kg	2100	mg/Kg	2900	mg/Kg
Manganese	460 ^c	mg/kg	130	mg/Kg	260	mg/Kg	440	mg/Kg
Mercury	0.18	mg/kg	0.027U	mg/Kg	0.024U	mg/Kg	0.021J	mg/Kg
Molybdenum	-	-	1.3U	mg/Kg	1.2U	mg/Kg	1.5U	mg/Kg
Nickel	22.7	mg/kg	3.1J	mg/Kg	6.7	mg/Kg	9.9	mg/Kg
Potassium	-	-	720	mg/Kg	1600	mg/Kg	2000	mg/Kg
Selenium	2 ^d	mg/kg	0.68J	mg/Kg	0.84	mg/Kg	2	mg/Kg
Silver	0.733	mg/kg	0.15U	mg/Kg	0.12U	mg/Kg	0.14U	mg/Kg
Sodium	-	-	270U	mg/Kg	250U	mg/Kg	120J	mg/Kg
Thallium	-	mg/kg	0.053J	mg/Kg	0.091J	mg/Kg	0.18	mg/Kg
Vanadium	57 ^c	mg/kg	12J+	mg/Kg	21J+	mg/Kg	34J+	mg/Kg
Zinc	121	mg/kg	15J+	mg/Kg	23J+	mg/Kg	39J+	mg/Kg

EDEN NORTH CAROLINA COAL ASH SPILL SEDIMENT RESULTS

Analyte	Ecological Screening Standards for Sediment ²	DUKE-DRB-LD	DUKE-DRE-LD	EPA12-RD
Sample Information				
Sample ID	-	EDEN-DUKEDRB-L-SD-20140603	EDEN-DUKEDRE-L-SD-20140603	EDEN-EPA12-R-SD-20140603
Date	-	6/3/2014	6/3/2014	6/3/2014
Time	-	1040	1150	1220
Status	-	Validation Complete	Validation Complete	Validation Complete
Type	-	Sediment	Sediment	Sediment
Physical Properties				
Percent Ash	-	-	ND	%
			1	%
			ND	%

Notes

² MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters.

^a The screening value for antimony is from Long, Edward R., and Lee G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52.

^b The screening value for barium was the probable effect level (PEL) instead of the threshold effect level (TEL) because the TEL was below background

^c Sediment screening values for manganese and vanadium come from the NOAA SQuIRT. <http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf>

^d The screening value for selenium is from Region 3 after Lemley, A.D. 2002. Selenium assessment in aquatic ecosystems. US Forest Service, Blacksburg, VA.

^e Cadmium from diet

^f Chromium (VI)

^g Methyl Mercury

^h Thallium Chloride

% Percent

EPA U.S. Environmental Protection Agency

J Value is estimated

J+ Value is estimated with a possible high bias

mg/kg milligrams per kilogram

ND No fly ash detected at a PLM reporting limit of 1 percent

PLM Polarized light microscopy

U Analyte was not detected at the listed reporting limit.

UJ Analyte was not detected at the listed reporting limit, which is an estimated quantitation.

**EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS**

Analyte	Ecological Screening Standards for Sediment ²		EPA13-LD	EPA14-RD-UP	EPA15-LD			
Sample Information								
Sample ID	-	EDEN-EPA13-L-SD-20140603	EDEN-EPA14-R-UP-SD-20140603	EDEN-EPA15-L-SD-20140603				
Date	-	6/3/2014	6/3/2014	6/3/2014				
Time	-	1125	1015	905				
Status	-	Validation Complete	Validation Complete	Validation Complete				
Type	-	Sediment	Sediment	Sediment				
Total Metals								
Aluminum	3,200 (bkg)	mg/kg	17000	mg/Kg	1700	mg/Kg	9300	mg/Kg
Antimony	2 ^a	mg/kg	1.8UJ	mg/Kg	1.3UJ	mg/Kg	1.3UJ	mg/Kg
Arsenic	9.8	mg/kg	3.1J	mg/Kg	2.4U	mg/Kg	2.4U	mg/Kg
Barium	60 ^b	mg/kg	130	mg/Kg	19	mg/Kg	110	mg/Kg
Beryllium	-	-	0.92	mg/Kg	0.098J	mg/Kg	0.3J	mg/Kg
Boron	-	-	19U	mg/Kg	12U	mg/Kg	12U	mg/Kg
Cadmium	0.99	mg/kg	0.1	mg/Kg	0.067U	mg/Kg	0.065U	mg/Kg
Calcium	-	-	1200	mg/Kg	330	mg/Kg	1700	mg/Kg
Chromium	43.4	mg/kg	34	mg/Kg	3.4	mg/Kg	15	mg/Kg
Cobalt	50	mg/kg	12	mg/Kg	1.1J	mg/Kg	7.5	mg/Kg
Copper	31.6	mg/kg	20	mg/Kg	2.5J	mg/Kg	16	mg/Kg
Iron	6,800 (bkg)	mg/kg	25000	mg/Kg	3600	mg/Kg	19000	mg/Kg
Lead	35.8	mg/kg	14J+	mg/Kg	1.4J+	mg/Kg	2.9J+	mg/Kg
Magnesium	-	-	3400	mg/Kg	790	mg/Kg	4300	mg/Kg
Manganese	460 ^c	mg/kg	460	mg/Kg	46	mg/Kg	240	mg/Kg
Mercury	0.18	mg/kg	0.041	mg/Kg	0.023U	mg/Kg	0.025U	mg/Kg
Molybdenum	-	-	1.9U	mg/Kg	1.2U	mg/Kg	1.2U	mg/Kg
Nickel	22.7	mg/kg	14	mg/Kg	2J	mg/Kg	8.3	mg/Kg
Potassium	-	-	2400	mg/Kg	720	mg/Kg	4000	mg/Kg
Selenium	2 ^d	mg/kg	2.6	mg/Kg	0.38J	mg/Kg	0.58J	mg/Kg
Silver	0.733	mg/kg	0.093J	mg/Kg	0.13U	mg/Kg	0.13U	mg/Kg
Sodium	-	-	150J	mg/Kg	240U	mg/Kg	150J	mg/Kg
Thallium	-	mg/kg	0.26	mg/Kg	0.13U	mg/Kg	0.076J	mg/Kg
Vanadium	57 ^c	mg/kg	50J+	mg/Kg	11J+	mg/Kg	47J+	mg/Kg
Zinc	121	mg/kg	58J+	mg/Kg	6.7J+	mg/Kg	34J+	mg/Kg

EDEN NORTH CAROLINA COAL ASH SPILL SEDIMENT RESULTS

Analyte	Ecological Screening Standards for Sediment ²	EPA13-LD	EPA14-RD-UP	EPA15-LD
Sample Information				
Sample ID	-	EDEN-EPA13-L-SD-20140603	EDEN-EPA14-R-UP-SD-20140603	EDEN-EPA15-L-SD-20140603
Date	-	6/3/2014	6/3/2014	6/3/2014
Time	-	1125	1015	905
Status	-	Validation Complete	Validation Complete	Validation Complete
Type	-	Sediment	Sediment	Sediment
Physical Properties				
Percent Ash	-	-	1 %	ND %

Notes

² MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters.

^a The screening value for antimony is from Long, Edward R., and Lee G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52.

^b The screening value for barium was the probable effect level (PEL) instead of the threshold effect level (TEL) because the TEL was below background

^c Sediment screening values for manganese and vanadium come from the NOAA SQuIRT. <http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf>

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^f Chromium (VI)

^g Methyl Mercury

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% Percent

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mg/kg milligrams per kilogram

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PLM Polarized light microscopy

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