Appendix C Nonradiological Environmental Monitoring Program Supplemental Information

Appendix Table C-1 River and Stream Water Quality Summary Results

Analytes that were not detected during 2016 are not included in the table. Bolded concentration results were reported as detected. Concentrations not bolded indicate the result was less than the sample quantitation limit.

Location	Detected Analytes	# of Detected Results	Units	Mean	Min Value	Max Value
FMC-2	Aluminum	12	µg/L	189.6	**46.8**	**753.0**
	Beryllium	3	µg/L	0.229	< 0.100	**1.570**
	Cadmium	2	µg/L	0.886	< 0.500	**5.120**
	Chromium	1	µg/L	2.12	< 2.00	**3.47**
	Copper	4	µg/L	3.16	< 2.00	**10.20**
	Iron	12	µg/L	2,907	**578**	**6,970**
	Manganese	12	µg/L	186.67	**25.00**	**460.0**
	Mercury	4	µg/L	0.0231	< 0.0200	**0.0365**
	Nickel	2	µg/L	3.20	< 3.00	**4.78**
	Nitrate-Nitrogen	12	mg/L	0.1638	**0.200**	**0.6540**
	Nitrite-Nitrogen	4	mg/L	0.0061	< 0.0034	**0.0300**
	Total Organic Carbon	12	mg/L	7.3	**4.1**	**12.0**
	Phosphorus	12	mg/L	0.077	**0.012**	**0.170**
	Total Suspended Solids	12	mg/L	9	**1**	**32**
	Zinc	11	µg/L	16.28	< 2.00	**32.90**
FM-2B	Aluminum	7	µg/L	96.2	< 40.0	**245.0**
	Beryllium	3	µg/L	0.218	< 0.100	**1.020**
	Cadmium	4	µg/L	0.919	< 0.500	**3.140**
	Chromium	1	µg/L	2.06	< 2.00	**2.68**
	Copper	2	µg/L	2.17	< 2.00	**3.26**
	Iron	12	µg/L	2,274	**530**	**8,990**
	Lead	1	µg/L	10.2	< 10.0	**11.8**
	Manganese	12	µg/L	198.05	**15.50**	**790.00**
	Nickel	1	µg/L	3.14	< 3.00	**4.64**
	Nitrate-Nitrogen	12	mg/L	0.1241	**0.0567**	**0.2400**
	Nitrite-Nitrogen	1	mg/L	0.0034	< 0.0027	**0.0044**
	Total Organic Carbon	12	mg/L	6.2	**3.6**	**8.3**
	Phosphorus	12	mg/L	0.067	**0.032**	**0.130**
	Total Suspended Solids	9	mg/L	6	< 1	**28**
	Zinc	11	µg/L	12.74	< 2.00	**29.10**
	2,4,5-TP (Silvex)	1	µg/L	0.17	< 0.01	**0.66**

Location	Detected Analytes	# of Detected Results	Units	Mean	Min Value	Max Value
FM-6	Aluminum	10	µg/L	113.0	< 40.0	**366.0**
	Beryllium	1	µg/L	0.101	< 0.100	**0.108**
	Copper	2	µg/L	2.17	< 2.00	**3.13**
	Iron	12	µg/L	925	**628**	**1,140**
	Manganese	12	µg/L	49.55	**28.50**	**87.90**
	Nickel	1	µg/L	3.22	< 3.00	**5.60**
	Nitrate-Nitrogen	12	mg/L	0.4229	**0.1400**	**0.9300**
	Nitrite-Nitrogen	1	mg/L	0.0033	< 0.0027	**0.0038**
	Total Organic Carbon	12	mg/L	4.6	**3.3**	**7.2**
	Phosphorus	12	mg/L	0.103	**0.053**	**0.210**
	Total Suspended Solids	11	mg/L	4	< 1	**8**
	Zinc	11	µg/L	9.28	< 2.00	**22.30**
L3R-2	Aluminum	9	µg/L	149.6	< 40.0	**562.0**
	Iron	12	µg/L	531	**367**	**705**
	Manganese	12	µg/L	64.88	**27.80**	**110.00**
	Nitrate-Nitrogen	11	mg/L	0.0560	< 0.0013	**0.1100**
	Total Organic Carbon	12	mg/L	4.9	**2.9**	**9.2**
	Phosphorus	12	mg/L	0.054	**0.020**	**0.140**
	Total Suspended Solids	10	mg/L	4	< 1	**11**
	Zinc	11	µg/L	8.83	< 2.00	**18.40**
PB-3	Aluminum	12	µg/L	285.1	**64.1**	**1,280.0**
	Copper	1	µg/L	2.07	< 2.00	**2.80**
	Iron	12	µg/L	819	**564**	**1,020**
	Manganese	12	µg/L	52.37	**20.70**	**68.90**
	Nitrate-Nitrogen	12	mg/L	0.1401	**0.0570**	**0.2520**
	Nitrite-Nitrogen	1	mg/L	0.0034	< 0.0027	**0.0045**
	Total Organic Carbon	12	mg/L	6.0	**3.4**	**9.3**
	Phosphorus	12	mg/L	0.064	**0.023**	**0.180**
	Total Suspended Solids	12	mg/L	6	**3**	**10**
	Zinc	11	µg/L	12.17	< 2.00	**45.60**
RM-118.8	Aluminum	12	µg/L	363.8	**97.2**	**1,140.0**
	Beryllium	4	µg/L	0.406	< 0.100	**1.150**
	Cadmium	6	µg/L	1.769	< 0.500	**4.130**
	Chromium	5	µg/L	2.21	< 2.00	**2.87**
	Copper	5	µg/L	2.27	< 2.00	**3.56**
	Iron	12	µg/L	726	**420**	**1,210**
	Manganese	12	µg/L	73.41	**20.70**	**110.00**
	Nickel	3	µg/L	3.28	< 3.00	**4.89**
	Nitrate-Nitrogen	12	mg/L	0.3179	**0.1980**	**1.1000**
	Nitrite-Nitrogen	2	mg/L	0.0038	< 0.0027	**0.0083**

Location	Detected Analytes	# of Detected Results	Units	Mean	Min Value	Max Value
	Total Organic Carbon	12	mg/L	4.4	**3.1**	**7.3**
	Phosphorus	12	mg/L	0.150	**0.041**	**0.420**
	Total Suspended Solids	12	mg/L	8	**3**	**14**
	Zinc	11	µg/L	7.34	< 2.00	**12.50**
RM-129.1	Aluminum	10	µg/L	325.8	< 40.0	**1,570.0**
	Beryllium	2	µg/L	0.271	< 0.100	**1.930**
	Cadmium	3	µg/L	1.089	< 0.500	**6.970**
	Chromium	1	µg/L	2.22	< 2.00	**4.65**
	Copper	3	µg/L	2.13	< 2.00	**2.92**
	Iron	12	µg/L	874	432	**1,580**
	Manganese	12	µg/L	83.58	29.70	**233.00**
	Nickel	2	µg/L	3.24	< 3.00	**5.55**
	Nitrate-Nitrogen	12	mg/L	0.2556	**0.0619**	**0.9300**
	Nitrite-Nitrogen	1	mg/L	0.0038	< 0.0027	**0.0093**
	Total Organic Carbon	12	mg/L	5.2	**3.4**	**7.5**
	Phosphorus	12	mg/L	0.116	**0.045**	**0.220**
	Total Suspended Solids	12	mg/L	6	**1**	**13**
	Zinc	11	µg/L	7.53	< 2.00	**16.10**
RM-141.5	Aluminum	10	µg/L	240.1	< 40.0	**897.0**
	Beryllium	4	µg/L	0.345	< 0.100	**1.390**
	Cadmium	4	µg/L	1.388	< 0.500	**5.790**
	Chromium	2	µg/L	2.17	< 2.00	**3.04**
	Copper	3	µg/L	2.43	< 2.00	**4.54**
	Iron	12	µg/L	625	**294**	**1,080**
	Manganese	12	µg/L	68.73	**14.70**	**96.00**
	Nickel	3	µg/L	3.56	< 3.00	**6.47**
	Nitrate-Nitrogen	12	mg/L	0.2498	**0.1200**	**0.5200**
	Nitrite-Nitrogen	2	mg/L	0.0040	< 0.0027	**0.0107**
	Thallium	1	µg/L	15.1	< 15.0	**16.0**
	Total Organic Carbon	12	mg/L	4.4	**2.8**	**7.0**
	Phosphorus	12	mg/L	0.134	**0.027**	**0.210**
	Total Suspended Solids	11	mg/L	6	< 1	**11**
	Zinc	11	µg/L	9.40	< 2.00	**24.10**
RM-150.4	Aluminum	10	µg/L	308.0	< 40.0	**1,580.0**
	Cadmium	1	µg/L	0.529	< 0.500	**0.853**
	Copper	3	µg/L	2.33	< 2.00	**4.56**
	Iron	12	µg/L	532	**260**	**1,180**
	Manganese	12	µg/L	65.78	**44.90**	**88.40**
	Nickel	1	µg/L	3.08	< 3.00	**3.93**
	Nitrate-Nitrogen	12	mg/L	0.2415	**0.1100**	**0.3800**
	Nitrite-Nitrogen	4	mg/L	0.0054	< 0.0028	**0.0200**

Location	Detected Analytes	# of Detected Results	Units	Mean	Min Value	Max Value
	Total Organic Carbon	12	mg/L	4.1	**3.0**	**6.3**
	Phosphorus	12	mg/L	0.138	**0.064**	**0.210**
	Total Suspended Solids	10	mg/L	5	< 1	**10**
	Zinc	11	µg/L	7.16	< 2.00	**14.90**
RM-160	Aluminum	9	µg/L	309.2	< 40.0	**1,690.0**
	Beryllium	2	µg/L	0.211	< 0.100	**1.420**
	Cadmium	1	µg/L	0.859	< 0.500	**4.810**
	Chromium	1	µg/L	2.09	< 2.00	**3.07**
	Copper	6	µg/L	2.39	< 2.00	**3.32**
	Iron	12	µg/L	542	**202**	**1,910**
	Manganese	12	µg/L	79.71	**52.20**	**218.00**
	Nickel	2	µg/L	3.14	< 3.00	**4.45**
	Nitrate-Nitrogen	12	mg/L	0.2359	**0.1530**	**0.5600**
	Nitrite-Nitrogen	5	mg/L	0.0071	< 0.0032	**0.0210**
	Total Organic Carbon	12	mg/L	4.5	**3.3**	**9.0**
	Phosphorus	12	mg/L	0.187	**0.082**	**0.280**
	Total Suspended Solids	11	mg/L	5	< 1	**9**
	Zinc	11	µg/L	8.43	< 2.00	**17.00**
SC-4	Aluminum	9	µg/L	135.1	< 40.0	**467.0**
	Iron	12	µg/L	494	**244**	**1,300**
	Manganese	12	µg/L	47.43	**19.70**	**169.00**
	Mercury	1	µg/L	0.0200	< 0.0200	**0.0201**
	Nitrate-Nitrogen	12	mg/L	0.0831	**0.0380**	**0.1200**
	Thallium	1	µg/L	15.1	< 15.0	**15.7**
	Total Organic Carbon	12	mg/L	4.6	**3.3**	**6.1**
	Phosphorus	12	mg/L	0.060	**0.014**	**0.170**
	Total Suspended Solids	11	mg/L	7	< 1	**37**
	Zinc	11	µg/L	6.87	< 2.00	**15.00**
TB-5	Aluminum	9	µg/L	103.2	< 40.0	**234.0**
	Cadmium	1	µg/L	0.525	< 0.500	**0.795**
	Copper	1	µg/L	2.09	< 2.00	**3.06**
	Iron	12	µg/L	3,376	**1,410**	**7,090**
	Manganese	12	µg/L	183.98	**57.30**	**659.00**
	Mercury	1	µg/L	0.0210	< 0.0200	**0.0314**
	Nickel	9	µg/L	5.69	< 3.00	**11.60**
	Nitrate-Nitrogen	9	mg/L	0.0377	< 0.0013	**0.0918**
	Total Organic Carbon	12	mg/L	5.2	**2.9**	**6.8**
	Phosphorus	12	mg/L	0.069	**0.024**	**0.170**
	Total Suspended Solids	11	mg/L	11	< 1	**31**
	Zinc	11	µg/L	5.91	< 2.00	**11.70**
TC-1	Aluminum	7	µg/L	81.8	< 40.0	**182.0**

Location	Detected Analytes	# of Detected Results	Units	Mean	Min Value	Max Value
	Iron	12	µg/L	494	**260**	**842**
	Manganese	12	µg/L	21.56	**8.77**	**55.90**
	Nitrate-Nitrogen	12	mg/L	0.0804	**0.0200**	**0.3400**
	Total Organic Carbon	12	mg/L	4.7	**3.3**	**6.4**
	Phosphorus	12	mg/L	0.099	**0.038**	**0.200**
	Total Suspended Solids	11	mg/L	6	< 1	**14**
	Zinc	10	µg/L	8.82	< 2.00	**25.80**
U3R-1A	Aluminum	5	µg/L	62.0	< 40.0	**159.0**
	Beryllium	1	µg/L	0.102	< 0.100	**0.121**
	Chromium	1	µg/L	2.55	< 2.00	**8.63**
	Iron	12	µg/L	340	**228**	**429**
	Manganese	12	µg/L	8.81	**7.53**	**13.30**
	Nitrate-Nitrogen	9	mg/L	0.1222	< 0.0013	**0.3740**
	Nitrite-Nitrogen	1	mg/L	0.0033	< 0.0027	< 0.0034
	Total Organic Carbon	12	mg/L	2.2	**1.5**	**3.8**
	Phosphorus	12	mg/L	0.035	**0.013**	**0.110**
	Total Suspended Solids	11	mg/L	3	< 1	**5**
	Zinc	11	µg/L	5.54	< 2.00	**11.60**
U3R-4	Aluminum	12	µg/L	152.8	**41.9**	**267.0**
	Beryllium	1	µg/L	0.102	< 0.100	**0.128**
	Cadmium	1	µg/L	0.506	< 0.500	**0.567**
	Iron	12	µg/L	621	**401**	**965**
	Manganese	12	µg/L	28.29	**14.10**	**87.20**
	Nickel	1	µg/L	3.15	< 3.00	**4.75**
	Nitrate-Nitrogen	12	mg/L	0.0953	**0.0430**	**0.1780**
	Nitrite-Nitrogen	2	mg/L	0.0034	< 0.0027	**0.0046**
	Thallium	1	µg/L	15.1	< 15.0	**16.6**
	Total Organic Carbon	12	mg/L	5.2	**2.2**	**17.0**
	Phosphorus	11	mg/L	0.0627	< 0.0016	**0.1500**
	Total Suspended Solids	11	mg/L	6	< 1	**16**
	Zinc	11	µg/L	11.06	< 2.00	**39.40**

Appendix Table C-2 Summary of Detected Metal Results for Sediments Collected from the Savannah River, SRS Streams, and Stormwater Basins

Bolded concentration results were reported as detected. Concentrations not bolded indicate the result was less than the sample quantitation limit. The control location for the river sediment samples is River Mile 160 (RM-160.0_SED).

River Sediment Results			
Analyte	**Control Conc. (mg/kg)**	**Location of Maximum Result**	**Maximum Conc. (mg/kg)**
Aluminum	**3.70E+03**	RM-157.2_SED	**2.20E+04**
Arsenic	1.90E+00	RM-157.2_SED	**3.70E+00**
Barium	**7.30E+01**	RM-157.2_SED	**1.40E+02**
Chromium	**1.30E+01**	RM-157.2_SED	**2.60E+01**
Copper	**2.50E+00**	RM-157.2_SED	**1.50E+01**
Cyanide	**1.50E+00**	RM-160.0_SED	**1.50E+00**
Iron	**5.70E+03**	RM-157.2_SED	**2.60E+04**
Lead	**3.50E+00**	RM-157.2_SED	**1.50E+01**
Magnesium	**4.60E+02**	SC LANDING (RM-141)	**2.20E+03**
Manganese	**1.80E+03**	RM-160.0_SED	**1.80E+03**
Nickel	**2.80E+00**	RM-157.2_SED	**1.10E+01**
Uranium	3.10E+01	RM-150.4(Vogtle Discharge)	**4.20E+01**
Zinc	**1.20E+01**	RM-157.2_SED	**5.90E+01**

Note: Cadmium, mercury, selenium, and silver were non-detects.

The control location for the stream and stormwater basin sediment samples is Upper Three Runs U3R-1A (U3R-1A_SED).

Stream and Stormwater Basin Sediment Results			
Analyte	**Control Conc. (mg/kg)**	**Location of Maximum Result**	**Maximum Conc. (mg/kg)**
Aluminum	**9.30E+03**	E-003_SED	**2.70E+04**
Arsenic	3.60E+00	E-002_SED	**4.80E+00**
Barium	**8.90E+01**	U3R-ROAD-C	**9.10E+01**
Chromium	**1.40E+01**	E-001_SED	**3.30E+01**
Copper	**8.40E+00**	E-001_SED and E-003_SED	**1.30E+01**
Cyanide	2.60E+00	FMC-ROAD-A	**1.29E+02**
Iron	**7.60E+03**	E-003_SED	**2.70E+04**
Lead	**1.70E+01**	U3R-1A_SED	**1.70E+01**
Magnesium	1.20E+03	E-003_SED	**1.40E+03**
Manganese	**2.80E+01**	PB-ROAD-A	**2.90E+02**
Mercury	4.10E-01	L3R-1A_SED	**6.32E+01**
Nickel	9.50E+00	E-003_SED	**8.30E+00**
Selenium	4.70E+00	L3R-2_SED	**1.16E+00**
Silver	2.40E+00	L3R-1A_SED	**1.60E-01**
Zinc	**1.70E+01**	E-001_SED	1.30E+02

Note: Cadmium and uranium were non-detects.

Appendix Table C-3 Summary of Detected Metal Results for Freshwater Fish[1] Tissue Collected from the Savannah River

Analyte	Number of Detected Values (above the MDC)	Number of Estimated Values (above the MDC, below the SQL)	Maximum Concentration (ug/g)	SQL (ug/g)	MDC (ug/g)	Fish Type with Maximum Concentration	Location of Maximum Concentration
Mercury	126	58	1.44	0.2	0.02	Bass	Augusta Lock and Dam
Cadmium	8	8	0.163	0.808	0.081	Panfish	Steel Creek Mouth
Chromium	97	97	0.272	0.753	0.075	Bass	Augusta Lock and Dam
Copper	117	117	0.798	1.70	0.170	Bass	Steel Creek Mouth
Manganese	108	105	3.05	0.644	0.064	Panfish	Fourmile Creek Mouth
Nickel	11	11	0.655	1.62	0.162	Panfish	Steel Creek Mouth
Zinc	126	0	12.6	1.62	0.162	Catfish	Augusta Lock and Dam

Note: 126 freshwater tissue samples were collected and analyzed for metals and mercury.

Appendix Table C-4 Summary of Detected Metal Results for Saltwater Fish[1] Tissue Collected from the Savannah River between River Miles 0–8, Near Savannah, GA

Analyte	Number of Detected Values (above the MDC)	Number of Estimated Values (above the MDC, below the SQL)	Maximum Concentration (ug/g)	SQL (ug/g)	MDC (ug/g)	Fish Type with Maximum Concentration
Mercury	15	15	0.148	0.20	0.02	Sea Trout/Flounder
Arsenic	4	4	1.49	10.8	1.08	Red Drum
Cadmium[a]	1	1	0.189	1.02	0.102	Red Drum
Chromium[a]	8	8	0.207	1.02	0.102	Red Drum
Copper[a]	20	20	0.453	2.04	0.204	Red Drum
Manganese[a]	11	11	0.257	1.02	0.102	Red Drum
Nickel[a]	9	9	0.562	2.04	0.204	Red Drum
Zinc	20	0	5.13	2.16 and 1.86	0.216 and 0.186	Red Drum and Sea Trout/Flounder

Notes:
21 saltwater tissue samples were collected and analyzed for metals and mercury.
[a] Maximum values were from a single sample

Appendix Table C-5 Precipitation Results of SRS National Trends Network Station for Calendar Year 2015

Analyte	Precipitation Weighted Concentration	Deposition
Calcium (Ca^{2+})	0.055 mg/L	0.75 kg/ha
Magnesium (Mg^{2+})	0.021 mg/L	0.287 kg/ha
Potassium (K^{+})	0.019 mg/L	0.260 kg/ha
Sodium (Na^{+})	0.144 mg/L	1.971 kg/ha
Ammonium (NH_4^{+})	0.147 mg/L	2.01 kg/ha
Nitrate (NO_3^{-})	0.492 mg/L	6.73 kg/ha
Chloride (Cl^{-})	0.253 mg/L	3.46 kg/ha
Sulfate (SO_4^{2-})	0.441 mg/L	6.04 kg/ha

Note: ha = hectare—a metric unit of area defined as 10,000 square meters.