Appendix C: Nonradiological Environmental Monitoring Program Supplemental Information

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

SRS collected monthly water quality samples at 5 Savannah River and 10 stream locations in 2020, totaling 180 samples per analyte or 3,717 records (see notes below regarding RM-129.1 & RM-141.5). Locations sampled are as follows: Savannah River locations (RM-118.8, RM-129.1, RM-141.5 and RM 150.4 [Vogtle discharge]), and SRS Stream locations (FM-2B, FM-6, FMC-2, L3R-2, PB-3, SC-4, TB-5 and U3R-4). The control location for the river samples is RM-161.0. The control locations for the stream samples are TC-1 and U3R-1A.

The table compares all results to South Carolina Freshwater Quality Standards (unless otherwise noted) and shows the average and maximum values of each analyte for the river and stream samples. Locations exceeding standards are shown in **red** text. Field duplicates are not included in the generation of these tables.

DL-Detection Limit
DO-Dissolved Oxygen
TOC-Total Organic Carbon
TSS-Total Suspended Solids

Notes:

1. The DO value in the maximum column is a minimum value because the South Carolina Freshwater Quality Standard is based on a minimum value.
2. The pH value in the average column is a minimum value because the South Carolina Freshwater Quality Standard includes minimum and maximum limits.
3. RM-118.8: March and April samples collected at HWY 301 boat ramp due to high river level.
4. RM-129.1: March and April samples not collected due to high river level.
5. RM 141.5: March sample collected at Johnson's Landing due to high river level. No April sample collected due to closure of Johnson's Landing.
6. RM-150.4: March and April samples collected at Vogtle Boat Ramp due to high river level.
7. RM-161.0: March and April samples collected at North Augusta boat ramp due to high river level.

Four River Locations Plus One Control

Analyte	SC Freshwater Quality Std. (µg/L)	Unit	No. of Results Outside Std.	No. of Results > DL	Control RM 161.0 Avg.[a]	Control RM 161.0 Max.[b]	Highest River Location	Avg.[a]	Highest River Location	Max.[b]	Comments
DO [c]	min. 4.0	mg/L	0 of 57		8.8	7.5	RM-129.1	7.8	RM-141.5	6.7	All samples met std.
pH [d]	6.0-8.5	SU	1 of 57		6.1	7.3	RM-118.8	**5.95**	RM-129.1	7.3	All maximums met std.
Temperature	< 5° F (2.8° C) above nat. cond. and not > 90° F (32.2° C)	° C	0 of 57		19	25	RM-129.1	21.3	RM-129.1	27.1	All samples met std.
Aluminum	87 [e]	µg/L	56 of 57	57 of 57	**381**	**1,130**	RM-118.8	**720**	RM-118.8	**3,560**	
Beryllium	4 [f]	µg/L	0 of 57	16 of 57	0.1	0.2	RM-118.8	0.3	RM-118.8	1.8	All samples met std.
Cadmium	0.25	µg/L	0 of 57	5 of 57	0.06	0.09	RM-150.4	0.06	RM-150.4	0.10	All samples met std.
Chromium	11	µg/L	0 of 57	2 of 57	< DL	< DL	RM-118.8	2	RM-118.8	3	All samples met std.
Copper	2.9	µg/L	3 of 57	14 of 57	1.8	2.0	RM-150.4	2.2	RM-150.4	**5.9**	All averages met std.
Hardness (total)	none	mg/L	no std.	57 of 57	15	20	RM-129.1	23	RM-129.1	42	
Iron	1,000 [g]	µg/L	8 of 57	57 of 57	558	945	RM-118.8	934	RM-118.8	**2,350**	All averages met std.
Lead	0.54	µg/L	12 of 57	52 of 57	0.53	**2.54**	RM-118.8	0.50	RM-150.4	**1.29**	All averages met std.
Manganese	none	µg/L	no std.	57 of 57	101	156	RM-129.1	101	RM-118.8	177	
Mercury	0.91	µg/L	0 of 57	4 of 57	0.03	0.03	RM-129.1	0.03	RM-150.4	0.03	All samples met std.
Nickel	16	µg/L	0 of 57	2 of 57	2	3	RM-118.8	3	RM-118.8	4	All samples met std.
Nitrate-Nitrogen	1 [h]	mg/L	0 of 57	57 of 57	0.3	0.4	RM-150.4	0.3	RM-150.4	0.5	All samples met std.
Nitrite-Nitrogen	1 [h]	mg/L	0 of 57	55 of 57	0.01	0.02	RM-141.5	0.01	RM-129.1	0.03	All samples met std.
Thallium	0.24 [f]	µg/L	5 of 57	0 of 57	< DL	< DL	< DL	< DL	< DL	< DL	January DL > std.
TOC	none	mg/L	no std.	57 of 57	3	3	RM-141.5	4	RM-118.8	7	
Phosphorus	0.06	mg/L	48 of 57	54 of 57	**0.11**	**0.24**	RM-141.5	**0.11**	RM-118.8	**0.20**	
TSS	none	mg/L	no std.	57 of 57	8	14	RM-118.8	12	RM-129.1	25	
Zinc	37	µg/L	0 of 57	34 of 57	6	12	RM-118.8	5	RM-150.4	20	All samples met std.

Eight Stream Locations Plus Two Controls

Analyte	SC Freshwater Quality Std. (µg/L)	Unit	No. of Results Outside Std.	Number of Results > DL	Control TC-1 Avg.[a]	Control TC-1 Max.[b]	Control U3R-1A Avg.[a]	Control U3R-1A Max.[b]	Highest Stream Location Avg.[i]			Highest Stream Location Max[b]	Comments
DO [c]	min. 4.0	mg/L	6 of 120		8.1	6.5	8.2	7.5	FMC-2	4.4	FMC-2	**0.6**	All averages met std.
pH [d]	6.0-8.5	SU	14 of 120		**5.5**	7.1	**5.0**	6.9	U3R-4	**5.5**	U3R-4	**8.6**	
Temperature	< 5° F (2.8° C) above nat. cond. and not > 90° F (32.2° C)	° C	2 of 120		19	**33**	19	24	SC-4	21	SC-4	**36**	All averages met std.
Aluminum	87 [e]	µg/L	66 of 120	105 of 120	82	**140**	**170**	**499**	U3R-4	**435**	U3R-4	**1,900**	
Beryllium	4 [f]	µg/L	0 of 120	28 of 120	0.2	0.8	0.2	1.0	FMC-2	0.4	FMC-2	1.8	All averages met std.
Cadmium	0.25	µg/L	0 of 120	14 of 120	< DL	< DL	0.1	0.1	SC-4	0.06	SC-4	0.19	All averages met std.
Chromium	11	µg/L	0 of 120	18 of 120	1.8	2.0	1.7	2.0	PB-3	2.6	PB-3	6.0	All averages met std.
Copper	2.9	µg/L	2 of 120	6 of 120	< DL	< DL	< DL	< DL	U3R-4	2.2	U3R-4	**8.0**	All averages met std.
Hardness (total)	none	mg/L	no std.	77 of 120	10	16	3	10	L3R-2	33	L3R-2	46	
Iron	1,000 [g]	µg/L	34 of 120	120 of 120	450	661	427	715	FMC-2	**3,320**	FM-2B	**10,900**	
Lead	0.54	µg/L	11 of 120	109 of 120	0.19	0.30	0.30	**0.59**	U3R-4	0.48	L3R-2	**3.29**	All averages met std.
Manganese	none	µg/L	no std.	119 of 120	18	29	10	20	FM-2B	377	FM-2B	1,900	
Mercury	0.91	µg/L	0 of 120	4 of 120	< DL	< DL	0.02	0.02	FMC-2	0.03	FMC-2	0.03	All averages met std.
Nickel	16	µg/L	0 of 120	19 of 120	2	3	< DL	< DL	TB-5	4	TB-5	7	All averages met std.
Nitrate-Nitrogen	1 [h]	mg/L	0 of 120	118 of 120	0.1	0.2	0.4	0.8	FM-6	0.5	SC-4	0.8	All averages met std.
Nitrite-Nitrogen	1 [h]	mg/L	0 of 120	56 of 120	0.005	0.015	0.004	0.016	TB-5	0.01	SC-4	0.02	All averages met std.
Thallium	0.24 [f]	µg/L	10 of 120	1 of 120	< DL	< DL	< DL	< DL	FMC-2	1.31	FMC-2	0.09	January DL > std.
TOC	none	mg/L	no std.	120 of 120	4	7	2	7	FMC-2	7	U3R-4	16	

Analyte	SC Freshwater Quality Std. (µg/L)	Unit	No. of Results Outside Std.	Number of Results > DL	Control TC-1 Avg.[a]	Control TC-1 Max.[b]	Control U3R-1A Avg.[a]	Control U3R-1A Max.[b]	Highest Stream Location Avg.		Highest Stream Location Max[b]		Comments
Phosphorus	0.06	mg/L	71 of 120	81 of 120	**0.10**	**0.18**	**0.06**	**0.14**	FM-6	**0.12**	FMC-2	**0.29**	
TSS	none	mg/L	no std.	115 of 120	6	9	4	6	FMC-2	11	FM-2B	44	
Zinc	37	µg/L	0 of 120	75 of 120	3	5	3	6	FMC-2	8	FMC-2	32	All averages met std.

Note:
The following pesticides, herbicides and PCBs were sampled semiannually in 2020: Aldrin, Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, alpha-BHC, beta-BHC, delta-BHC, gamma-BHC (Lindane), Chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide, Toxaphene, 2,4-D and 2,4,5-TP (Silvex). 810 analytical records were reviewed. All results were < DL.

[a] When results fell below the detection limit, the detection limit value was used to determine average
[b] Maximum detected value
[c] Min. (versus Max.) value reported
[d] Min. (versus Avg.) value reported
[e] EPA Region 4 Ecological Risk Assessment Supplemental Guidance, March 2018 Update
[f] Standard from Human Health vs Freshwater Aquatic Life (which has no standard)
[g] EPA National Recommended Water Quality Criteria - Aquatic Life
[h] Per SCDHEC Environmental Surveillance and Oversight Program 2019 Data Report (CR-004111 11/20)

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

SRS collected annual sediment samples at 24 locations in 2020: 9 Savannah River, 12 stream, and 3 stormwater basins, totaling 384 analytes. Locations sampled are as follows: Savannah River locations (BDC RM, RM 118.7, RM 129, RM 150.2, RM 150.4 [Vogtle discharge], RM 157.2, RM 170.5, and SC RM), SRS Stream locations (BDC, FMC @ Rd A, L3R-2, McQB at MO, McQB below Z-Basin, PB @ Rd A, SC-4, TB-5, U3R-3 and U3R-4), and SRS Stormwater Basin locations (E-001, E-002, and E-003). The control location for the river samples is RM 161.0. The control locations for the stream and stormwater basin sediment samples are TC-1 and U3R-1A.

The table compares all results to EPA Region 4 Refinement Screening Values (RSVs) for sediment and shows the maximum value of each analyte for the river, stream, and stormwater basin samples. Locations exceeding RSVs are shown in **red** text.

River Sediment Results

Eight River Locations Plus One Control

Analyte	No. of Detected Results	Control RM 161.0 (mg/kg)	Location of Maximum Result	Maximum Conc. (mg/kg)	EPA Region 4 RSV for Sediment (mg/kg)	No. of Results > RSV	Comments
Aluminum	9 of 9	20,000	RM 150.4	32,000	58,000	0	All samples met std.
Antimony	0 of 9	< DL	All < DL	All < DL	25	0	All samples met std.
Arsenic	9 of 9	2	BDC RM	3	33	0	All samples met std.
Barium	9 of 9	**130**	BDC RM & RM 150.4	**180**	60	9	
Cadmium	0 of 9	< DL	All < DL	All < DL	5	0	All samples met std.
Chromium	9 of 9	25	RM 150.4	40	111	0	All samples met std.
Copper	9 of 9	13	RM 150.4	18	149	0	All samples met std.
Iron	9 of 9	20,000	RM 150.4	26,000	40,000	0	All samples met std.
Lead	9 of 9	10	RM 118.7	11	128	0	All samples met std.
Manganese	9 of 9	**1,200**	BDC RM	**1,800**	1,100	3	
Mercury	0 of 9	< DL	All < DL	All < DL	1.1	0	All samples met std.
Nickel	9 of 9	9.6	RM 150.4	17.0	48.6	0	All samples met std.
Selenium	0 of 9	< DL	All < DL	All < DL	2.9	0	All samples met std.
Silver	0 of 9	< DL	All < DL	All < DL	2.2	0	All samples met std.
Uranium	0 of 9	< DL	All < DL	All < DL	1,000	0	All samples met std.
Zinc	9 of 9	47	RM 150.4	67	459	0	All samples met std.

Stream Sediment Results

10 Stream Locations Plus 2 Controls

Analyte	No. of Detected Results	Control TC-1 (mg/kg)	Control U3R-1A (mg/kg)	Location of Maximum Result	Maximum Conc (mg/kg)	EPA Region 4 RSV for Sediment (mg/kg)	No. of Results > RSV	Comments
Aluminum	12 of 12	2,300	11,000	U3R-3	7,000	58,000	0	All samples met std.
Antimony	1 of 12	< DL	< DL	L3R-2	1	25	0	All samples met std.
Arsenic	6 of 12	< DL	3	U3R-3	2	33	0	All samples met std.
Barium	12 of 12	31	**110**	U3R-3	**87**	60	2	
Cadmium	1 of 12	< DL	< DL	FMC @ Rd A	0.2	5	0	All samples met std.
Chromium	12 of 12	5	17	L3R-2	13	111	0	All samples met std.
Copper	12 of 12	3	8	FMC @ Rd A	4	149	0	All samples met std.
Iron	12 of 12	1,300	6,800	FMC @ Rd A	5,420	40,000	0	All samples met std.
Lead	12 of 12	4	16	U3R-3	7	128	0	All samples met std.
Manganese	12 of 12	40	29	L3R-2	283	1,100	0	All samples met std.
Mercury	5 of 12	< DL	< DL	L3R-2	0.1	1.1	0	All samples met std.
Nickel	9 of 12	< DL	6.8	U3R-3	7.1	48.6	0	All samples met std.
Selenium	4 of 12	< DL	< DL	L3R-2	1.9	2.9	0	All samples met std.
Silver	0 of 12	< DL	< DL	All < DL	All < DL	2.2	0	All samples met std.
Uranium	0 of 12	< DL	< DL	All < DL	All < DL	1,000	0	All samples met std.
Zinc	12 of 12	10	23	FMC @ Rd A	28	459	0	All samples met std.

Stormwater Basin Sediment Results

Three Basin Locations Plus Two Controls

Analyte	Number of Detected Results	Control TC-1 (mg/kg)	Control U3R-1A (mg/kg)	Location of Maximum Result	Maximum Conc. (mg/kg)	EPA Region 4 RSV for Sediment (mg/kg)	Number of Results > RSV	Comments
Aluminum	5 of 5	2,300	11,000	E-001	39,000	58,000	0	All samples met std.
Antimony	0 of 5	< DL	< DL	All < DL	All < DL	25	0	All samples met std.
Arsenic	4 of 5	< DL	3	E-003	9	33	0	All samples met std.
Barium	5 of 5	31	**110**	E-001	**94**	60	3	
Cadmium	0 of 5	< DL	< DL	All < DL	All < DL	5	0	All samples met std.
Chromium	5 of 5	5	17	E-001 & E-003	42	111	0	All samples met std.
Copper	5 of 5	3	8	E-003	17	149	0	All samples met std.
Iron	5 of 5	1,300	6,800	E-003	35,000	40,000	0	All samples met std.
Lead	5 of 5	4	16	E-003	18	128	0	All samples met std.
Manganese	5 of 5	40	29	E-003	230	1,100	0	All samples met std.
Mercury	0 of 5	< DL	< DL	All < DL	All < DL	1.1	0	All samples met std.
Nickel	4 of 5	< DL	6.8	E-001	12.0	48.6	0	All samples met std.
Selenium	0 of 5	< DL	< DL	All < DL	All < DL	2.9	0	All samples met std.
Silver	0 of 5	< DL	< DL	All < DL	All < DL	2.2	0	All samples met std.
Uranium	0 of 5	< DL	< DL	All < DL	All < DL	1,000	0	All samples met std.
Zinc	5 of 5	10	23	E-001	110	459	0	All samples met std.

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

All lead results were not detected and, thus, not reported in this table.

Analyte	Number of Detected Values (above the MDC)	Number of Estimated Values (above the MDC, below the SQL)	Maximum Detected Concentration (µg/g)	SQL (µg/g)	MDC (µg/g)	Fish Type with Maximum Concentration	Location of Maximum Concentration
Antimony	44	2	1.98	12.4	1.24	Catfish	Fourmile Creek Mouth
Arsenic	136	42	43.9	5.85	0.585	Catfish	Fourmile Creek Mouth
Cadmium	143	2	0.113	0.547	0.055	Panfish	Fourmile Creek Mouth
Chromium	115	87	0.555	0.771	0.077	Bass	Fourmile Creek Mouth
Copper	137	97	2.62	1.41	0.141	Bass	Fourmile Creek Mouth
Manganese	165	122	1.82	0.557	0.056	Catfish	Fourmile Creek Mouth
Mercury	165	48	1.07	0.2	0.02	Panfish	Augusta Lock and Dam
Nickel	146	2	0.227	1.09	0.109	Panfish	Fourmile Creek Mouth
Zinc	175	0	22.8	1.2	0.12	Catfish	Hwy 301 Bridge

Note:

175 freshwater tissue samples were collected and analyzed for metals and mercury.

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

All antimony, cadmium, lead, and nickel results were not detected and, thus, not reported in this table.

All results are for mullet.

Analyte	Number of Detected Values (above the MDC)	Number of Estimated Values (above the MDC, below the SQL)	Maximum Detected Concentration (µg/g)	SQL (µg/g)	MDC (µg/g)
Arsenic	4	4	2.52	5.39	0.539
Chromium	3	3	0.086	0.573	0.057
Copper	5	5	0.353	1.31	0.131
Manganese	8	7	1.16	0.571	0.057
Mercury	1	0	0.039	0.20	0.020
Zinc	8	0	4.02	1.41	0.141

Note:
Eight saltwater tissue samples were collected and analyzed for metals and mercury.