

# Appendix C: Nonradiological Environmental Monitoring Program Supplemental Information

---

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

Five river and 10 stream locations were sampled monthly in 2019, totaling 306 samples per analyte (except TB-5, which had 285 samples due to “no flow” on 11/19) or 4,569 records. 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.

Appendix C: Nonradiological Environmental Monitoring Program Supplemental Information

Four River Locations Plus One Control

| Analyte          | SC Freshwater<br>Quality Std. (µg/L)                             | Unit | Number of<br>Results<br>Outside Std. | Number of<br>Results<br>> DL | Control           |                   |                        |      |                       |      |
|------------------|--|------|--------------------------------------|------------------------------|-------------------|-------------------|------------------------|------|-----------------------|------|
|                  |  |      |                                      |                              | RM 161.0          |                   | Highest River Location |      |                       |      |
|                  |  |      |                                      |                              | Avg. <sup>a</sup> | Max. <sup>b</sup> | Avg. <sup>a</sup>      |      | Max. <sup>b</sup>     |      |
| DO <sup>c</sup>  | min. 4.0   | mg/L | 0 of 60                              |                              | 8.9               | 7.1               | RM-129.1               | 8.3  | RM-129.1              | 6.3  |
| pH <sup>d</sup>  | 6.0-8.5  | SU   | 2 of 60                              |                              | 5.99              | 7.4               | RM-118.8               | 5.95 | RM-118.8              | 7.4  |
| Temperature      | < 5° F (2.8° C) above<br>nat. cond. and not<br>> 90° F (32.2° C) | ° C  | 1 of 60                              |                              | 19                | 26                | RM-118.8,<br>RM-141.5  | 20   | RM-141.5              | 34   |
| Aluminum         | 87 <sup>e</sup>  | µg/L | 41 of 60                             | 46 of 60                     | 214               | 821               | RM-141.5               | 292  | RM-129.1              | 762  |
| Beryllium        | none   | µg/L | no standard                          | 4 of 60                      | All < DL          |                   | RM-141.5               | 0.2  | RM-141.5              | 0.6  |
| Cadmium          | 0.1  | µg/L | 2 of 60                              | 16 of 60                     | 0.1               | 0.1               | RM-141.5               | 0.1  | RM-141.5              | 0.12 |
| Chromium         | 11   | µg/L | 0 of 60                              | 1 of 60                      | All < DL          |                   | RM-141.5               | 2    | RM-141.5              | 3    |
| Copper           | 2.9  | µg/L | 1 of 60                              | 5 of 60                      | All < DL          |                   | RM-141.5               | 2.2  | RM-141.5              | 3.9  |
| Hardness (total) | none   | mg/L | no standard                          | 58 of 60                     | 16                | 22                | RM-129.1               | 29   | RM-129.1              | 60   |
| Iron             | 1,000 <sup>f</sup>   | µg/L | 0 of 60                              | 60 of 60                     | 357               | 840               | RM-129.1               | 524  | RM-141.5              | 748  |
| Lead             | 0.54   | µg/L | 4 of 60                              | 60 of 60                     | 0.25              | 0.81              | RM-118.8               | 0.26 | RM-150.4              | 0.64 |
| Manganese        | none   | µg/L | no standard                          | 60 of 60                     | 71                | 145               | RM-150.4               | 68   | RM-150.4              | 104  |
| Mercury          | 0.91   | µg/L | 0 of 60                              | 0 of 60                      | All < DL          |                   | All < DL               |      | All < DL              |      |
| Nickel           | 16   | µg/L | 1 of 60                              | 7 of 60                      | 3                 | 5                 | RM-129.1               | 8    | RM-129.1              | 61   |
| Nitrate-Nitrogen | 1 <sup>g</sup>   | mg/L | 0 of 60                              | 60 of 60                     | 0.3               | 0.4               | RM-118.8               | 0.3  | RM-118.8              | 0.5  |
| Nitrite-Nitrogen | 1 <sup>g</sup>   | mg/L | 0 of 60                              | 60 of 60                     | 0.01              | 0.01              | RM-150.4               | 0.01 | RM-141.5              | 0.01 |
| Thallium         | none   | µg/L | no standard                          | 6 of 60                      | All < DL          |                   | RM-141.5               | 13   | RM-141.5              | 23   |
| TOC              | none   | mg/L | no standard                          | 60 of 60                     | 3                 | 4                 | RM-129.1               | 4    | RM-129.1              | 11   |
| Phosphorus       | 0.06   | mg/L | 47 of 60                             | 58 of 60                     | 0.16              | 0.33              | RM-118.8               | 0.13 | RM-118.8,<br>RM-129.1 | 0.25 |
| TSS              | none   | mg/L | no standard                          | 59 of 60                     | 5                 | 20                | RM-118.8               | 7    | RM-118.8              | 17   |
| Zinc             | 37   | µg/L | 0 of 60                              | 42 of 60                     | 5                 | 10                | RM-118.8               | 5    | RM-141.5              | 14   |

Eight Stream Locations Plus Two Controls

| Analyte          | SC Freshwater Quality Std. (µg/L)                          | Unit | Number of Results Outside Std. | Number of Results > DL | Control TC-1      |                   | Control U3R-0     |                   | Highest Stream Location |       |                   |        |
|------------------|--|------|--------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------|-------|-------------------|--------|
|                  |  |      |                                |                        | Avg. <sup>a</sup> | Max. <sup>b</sup> | Avg. <sup>a</sup> | Max. <sup>b</sup> | Avg. <sup>a</sup>       |       | Max. <sup>b</sup> |        |
| DO <sup>c</sup>  | min. 4.0   | mg/L | 5 of 119                       |                        | 8.5               | 6.4               | 8.6               | 7.5               | FMC-2                   | 4.5   | FMC-2             | 1.2    |
| pH <sup>d</sup>  | 6.0-8.5  | SU   | 18 of 119                      |                        | 5.8               | 8.3               | 5.6               | 8.1               | FMC-2                   | 5.2   | SC-4              | 8.0    |
| Temperature      | < 5° F (2.8° C) above nat. cond. and not > 90° F (32.2° C) | ° C  | 0 of 119                       |                        | 18                |                   | 18                | 23                | SC-4                    | 21    | SC-4              | 30     |
| Aluminum         | 87 <sup>5</sup>  | µg/L | 51 of 119                      | 69 of 119              | 103               | 306               | 155               | 451               | PB-3                    | 219   | TB-5              | 1,480  |
| Beryllium        | none   | µg/L | no standard                    | 10 of 119              | All < DL          |                   | 0.1               | 0.1               | U3R-4                   | 0.1   | U3R-4             | 0.2    |
| Cadmium          | 0.1  | µg/L | 5 of 119                       | 18 of 119              | 0.06              | 0.12              | All < DL          |                   | FMC-2                   | 0.07  | SC-4              | 0.3    |
| Chromium         | 11   | µg/L | 0 of 119                       | 2 of 119               | All < DL          |                   | All < DL          |                   | TB-5                    | 2     | TB-5              | 2      |
| Copper           | 2.9  | µg/L | 4 of 119                       | 5 of 119               | All < DL          |                   | All < DL          |                   | FMC-2                   | 3.1   | FMC-2             | 9.6    |
| Hardness (total) | none   | mg/L | no standard                    | 92 of 119              | 13                | 20                | 4                 | 12                | L3R-2                   | 41    | L3R-2             | 62     |
| Iron             | 1,000 <sup>6</sup>   | µg/L | 39 of 119                      | 119 of 119             | 475               | 966               | 423               | 839               | FM-2B                   | 4,354 | FM-2B             | 13,100 |
| Lead             | 0.54   | µg/L | 9 of 119                       | 117 of 119             | 0.21              | 0.38              | 0.36              | 0.85              | TB-5                    | 0.37  | TB-5              | 1.72   |
| Manganese        | none   | µg/L | no standard                    | 119 of 119             | 25                | 56                | 9                 | 18                | FM-2B                   | 283   | FM-2B             | 942    |
| Mercury          | 0.91   | µg/L | 0 of 119                       | 7 of 119               | All < DL          |                   | All < DL          |                   | FMC-2                   | 0.02  | FMC-2             | 0.04   |
| Nickel           | 16   | µg/L | 0 of 119                       | 17 of 119              | 3                 | 5                 | 3                 | 5                 | TB-5                    | 4     | FMC-2             | 9      |
| Nitrate-Nitrogen | 1 <sup>8</sup>   | mg/L | 0 of 119                       | 118 of 119             | 0.1               | 0.2               | 0.4               | 0.5               | FM-6                    | 0.6   | FMC-2             | 0.9    |
| Nitrite-Nitrogen | 1 <sup>8</sup>   | mg/L | 0 of 119                       | 46 of 119              | 0.004             | 0.012             | 0.004             | 0.016             | FMC-2                   | 0.01  | FMC-2             | 0.04   |
| Thallium         | none   | µg/L | no standard                    | 11 of 119              | 13                | 16                | 14                | 27                | FMC-2                   | 13    | FMC-2             | 22     |
| TOC              | none   | mg/L | no standard                    | 119 of 119             | 4                 | 9                 | 2                 | 10                | FMC-2                   | 8     | U3R-4             | 20     |
| Phosphorus       | 0.06   | mg/L | 85 of 119                      | 99 of 119              | 0.14              | 0.33              | 0.06              | 0.12              | TB-5                    | 0.16  | TB-5              | 0.44   |
| TSS              | none   | mg/L | no standard                    | 115 of 119             | 5                 | 14                | 6                 | 16                | FM-2B                   | 17    | TB-5              | 108    |

| Analyte | SC Freshwater Quality Std. (µg/L) | Unit | Number of Results Outside Std. | Number of Results > DL | Control TC-1      |                   | Control U3R-0     |                   | Highest Stream Location |    |                   |    |
|---------|-----------------------------------|------|--------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------|----|-------------------|----|
|         |                                   |      |                                |                        | Avg. <sup>a</sup> | Max. <sup>b</sup> | Avg. <sup>a</sup> | Max. <sup>b</sup> | Avg. <sup>a</sup>       |    | Max. <sup>b</sup> |    |
| Zinc    | 37                                | µg/L | 3 of 119                       | 98 of 119              | 4                 | 8                 | 6                 | 17                | L3R-2                   | 16 | FMC-2             | 53 |

Note:

The following pesticides, herbicides and PCBs were sampled semiannually in 2019: 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.

<sup>a</sup> When results fell below the detection limit, the detection limit value was used to determine average

<sup>b</sup> Maximum detected value

<sup>c</sup> Min. (versus Max.) value reported

<sup>d</sup> Min. (versus Avg.) value reported

<sup>e</sup> EPA Region 4 Ecological Risk Assessment Supplemental Guidance, March 2018 Update

<sup>f</sup> EPA National Recommended Water Quality Criteria - Aquatic Life

<sup>g</sup> Per SCDHEC Environmental Surveillance and Oversight Program 2017 Data Report (CR-004111 2/19)

**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 23 locations in 2019: 8 Savannah River, 12 stream, and 3 stormwater basins, totaling 367 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 161.0, and SC RM), SRS Stream locations (BDC, FMC @ Rd A, L3R-1A, L3R-2, McQB at MO, McQB below Z-Basin, PB @ Rd A, SC-4, TC-1, U3R-0, U3R-3 and U3R-4), and SRS Stormwater Basin locations (E-004, E-05, and E-06). The control location for the river samples is RM 161.0. The control locations for the stream and stormwater basin sediment samples is TC-1 and U3R-0.

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. One analyte, uranium, was not sampled at McQB below Z Basin due to an administrative error; results from previous years were well below its RSV.

**River Sediment Results**

Seven River Locations Plus One Control

| Analyte   | Number 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) | Number of Results > RSV |
|-----------|----------------------------|--------------------------|----------------------------|----------------------|---------------------------------------|-------------------------|
| Aluminum  | 8 of 8                     | 7,800                    | RM 157.2                   | 40,000               | 58,000                                | 0                       |
| Arsenic   | 6 of 8                     | 1                        | RM 157.2                   | 3                    | 33                                    | 0                       |
| Barium    | 8 of 8                     | 62                       | RM 157.2                   | 170                  | 60                                    | 7                       |
| Chromium  | 8 of 8                     | 11                       | RM 157.2                   | 38                   | 111                                   | 0                       |
| Copper    | 8 of 8                     | 5                        | RM 157.2                   | 26                   | 149                                   | 0                       |
| Iron      | 8 of 8                     | 9,800                    | RM 157.2                   | 28,000               | 40,000                                | 0                       |
| Lead      | 8 of 8                     | 5                        | RM 157.2                   | 26                   | 128                                   | 0                       |
| Manganese | 8 of 8                     | 570                      | BDC RM & RM 118.7          | 1,100                | 1,100                                 | 0                       |
| Nickel    | 8 of 8                     | 4.3                      | RM 157.2                   | 19                   | 48.6                                  | 0                       |
| Zinc      | 8 of 8                     | 20                       | RM 157.2                   | 78                   | 459                                   | 0                       |

Note:

Antimony, cadmium, mercury, selenium, silver, and uranium were nondetects.

**Stream Sediment Results**

10 Stream Locations Plus 2 Controls

| Analyte   | Number of Detected Results | Control TC-1 (mg/kg) | Control U3R-0 (mg/kg) | Location of Maximum Result | Maximum Conc (mg/kg) | EPA Region 4 RSV for Sediment (mg/kg) | Number of Results > RSV |
|-----------|----------------------------|----------------------|-----------------------|----------------------------|----------------------|---------------------------------------|-------------------------|
| Aluminum  | 12 of 12                   | 2,900                | 5,000                 | BDC                        | 42,000               | 58,000                                | 0                       |
| Arsenic   | 6 of 12                    | < DL                 | < DL                  | McQB at MO                 | 6                    | 33                                    | 0                       |
| Barium    | 12 of 12                   | 39                   | 58                    | McQB at MO                 | 170                  | 60                                    | 2                       |
| Cadmium   | 2 of 12                    | < DL                 | < DL                  | FMC @ Rd A                 | 0.4                  | 5                                     | 0                       |
| Chromium  | 12 of 12                   | 5                    | 8                     | McQB at MO                 | 37                   | 111                                   | 0                       |
| Copper    | 11 of 12                   | 2                    | 4                     | McQB at MO                 | 40                   | 149                                   | 0                       |
| Iron      | 12 of 12                   | 1,900                | 3,100                 | McQB at MO                 | 26,000               | 40,000                                | 0                       |
| Lead      | 12 of 12                   | 5                    | 12                    | McQB at MO                 | 21                   | 128                                   | 0                       |
| Manganese | 12 of 12                   | 63                   | 12                    | FMC @ Rd A                 | 403                  | 1,100                                 | 0                       |
| Mercury   | 7 of 12                    | < DL                 | < DL                  | L3R-1A                     | 0.2                  | 1.1                                   | 0                       |
| Nickel    | 11 of 12                   | 2.5                  | < DL                  | McQB at MO                 | 17.0                 | 48.6                                  | 0                       |
| Selenium  | 2 of 12                    | < DL                 | < DL                  | McQB below Z-Basin         | 3.3                  | 2.9                                   | 1                       |
| Zinc      | 12 of 12                   | 10                   | 8                     | McQB at MO                 | 99                   | 459                                   | 0                       |

Note:  
Antimony, silver, and uranium were nondetects.

**Stormwater Basin Sediment Results**

Three Basin Locations Plus Two Controls

| Analyte          | Number of Detected Results | Control TC-1 (mg/kg) | Control U3R-0 (mg/kg) | Location of Maximum Result | Maximum Conc (mg/kg) | EPA Region 4 RSV for Sediment (mg/kg) | Number of Results > RSV |
|------------------|----------------------------|----------------------|-----------------------|----------------------------|----------------------|---------------------------------------|-------------------------|
| <b>Aluminum</b>  | 5 of 5                     | 2,900                | 5,000                 | E-05                       | 44,000               | 58,000                                | 0                       |
| <b>Arsenic</b>   | 3 of 5                     | < DL                 | < DL                  | E-004                      | 11                   | 33                                    | 0                       |
| <b>Barium</b>    | 5 of 5                     | 39                   | 58                    | E-004                      | 53                   | 60                                    | 0                       |
| <b>Chromium</b>  | 5 of 5                     | 5                    | 8                     | E-004                      | 49                   | 111                                   | 0                       |
| <b>Copper</b>    | 5 of 5                     | 2                    | 4                     | E-004                      | 19                   | 149                                   | 0                       |
| <b>Iron</b>      | 5 of 5                     | 1,900                | 3,100                 | E-004                      | 37,000               | 40,000                                | 0                       |
| <b>Lead</b>      | 5 of 5                     | 5                    | 12                    | E-06                       | 25                   | 128                                   | 0                       |
| <b>Manganese</b> | 5 of 5                     | 63                   | 12                    | E-004                      | 190                  | 1,100                                 | 0                       |
| <b>Nickel</b>    | 4 of 5                     | 2.5                  | < DL                  | E-05                       | 14.0                 | 48.6                                  | 0                       |
| <b>Zinc</b>      | 5 of 5                     | 10                   | 8                     | E-004                      | 72                   | 459                                   | 0                       |

Note:

Antimony, cadmium, mercury, selenium, silver, and uranium were nondetects.

**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 |
|-----------|---|---|---------------------------------------|------------|------------|--------------------------------------|-----------------------------------|
| Mercury   | 127                                       | 58  | 1.31                                  | 0.2        | 0.02       | Bass                                 | Lower Three Runs Creek Mouth      |
| Antimony  | 6   | 6   | 1.24                                  | 12.4       | 1.24       | Bass                                 | Upper Three Runs Creek Mouth      |
| Arsenic   | 38  | 38  | 2.07                                  | 6.37       | 0.637      | Bass                                 | Fourmile Creek Mouth              |
|           |   |   | 2.07                                  | 5.85       | 0.585      | Panfish                              | Steel Creek Mouth                 |
| Cadmium   | 13  | 12  | 0.746                                 | 0.547      | 0.055      | Bass                                 | Steel Creek Mouth                 |
| Chromium  | 107                                       | 104   | 2.28                                  | 0.771      | 0.077      | Panfish                              | Steel Creek Mouth                 |
| Copper    | 79  | 79  | 0.58                                  | 1.41       | 0.141      | Panfish                              | Upper Three Runs Creek Mouth      |
| Manganese | 103                                       | 98  | 1.39                                  | 0.557      | 0.056      | Panfish                              | Steel Creek Mouth                 |
| Nickel    | 3   | 3   | 0.257                                 | 1.09       | 0.109      | Catfish                              | Hwy 301 Bridge                    |
| Zinc      | 126                                       | 0   | 14.5                                  | 1.2        | 0.12       | Catfish                              | Hwy 301 Bridge                    |

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 Tissue Collected from the Savannah River between River Miles 0–8, Near Savannah, Georgia**

All antimony, cadmium, lead, mercury, 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   | 2   | 2   | 0.671                                 | 5.39       | 0.539      |
| Chromium  | 7   | 7   | 0.184                                 | 0.573      | 0.057      |
| Copper    | 7   | 7   | 0.226                                 | 1.31       | 0.131      |
| Manganese | 6   | 6   | 0.103                                 | 0.571      | 0.057      |
| Zinc      | 7   | 0   | 4.28                                  | 1.41       | 0.141      |

Note:

Seven saltwater tissue samples were collected and analyzed for metals and mercury.