



Collecting a Sample at a Continuous-Stream Sample Station

Appendix C - 1

Summary of Water and Sediment Monitoring Data

Table C - 1.1
Total Radioactivity of Liquid Effluents
Released from Lagoon 3 in 1991 (curies)

| QTR | ALPHA | BETA | H-3 | C-14 | SR-90 | I-129 | CS-137 |
|-------------------------------------|----------------|---------------|---------------|---------------|---------------|-------------------|---------------|
| <i>1st Qtr</i> | 1.66±1.02E-04 | 1.93±0.06E-02 | 7.91±0.20E-01 | 2.12±0.50E-03 | 1.15±0.07E-03 | <1.38E-05 | 3.00±0.37E-03 |
| <i>2nd Qtr</i> | 7.76±5.73E-05 | 9.19±0.35E-03 | 1.59±0.10E-01 | <8.53E-05 | 1.09±0.06E-03 | 4.61±0.93E-04 | 3.04±0.32E-03 |
| <i>3rd Qtr</i> | 5.16±4.55E-05 | 5.89±0.23E-03 | 7.52±0.26E-02 | 1.50±0.39E-04 | 8.38±0.43E-04 | 4.21±0.60E-05 | 7.30±1.20E-04 |
| <i>4th Qtr</i> | 3.26±2.42E-05 | 4.01±0.16E-03 | 6.38±0.21E-02 | <3.11E-05 | 3.90±0.27E-04 | 2.68±0.01E-05 | 1.64±0.21E-03 |
| TOTAL | 3.27±1.28E-04 | 3.83±0.07E-02 | 1.09±0.02E-00 | 2.29±0.51E-03 | 3.47±0.10E-03 | 5.22±0.94E-04 | 8.42±0.55E-03 |
| AVG ($\mu\text{Ci/mL}$) | 9.78E-09 | 1.14E-06 | 3.25E-05 | 6.85E-08 | 1.03E-07 | 1.56E-08 | 2.51E-07 |
| | U-232 | U-234 | U-235 | U-238 | PU-238 | PU-239/240 | AM-241 |
| <i>1st Qtr</i> | *6.79±0.77E-05 | 4.87±0.66E-05 | 1.53±1.28E-06 | 1.71±0.34E-05 | <2.18E-06 | <8.58E-07 | 2.55±1.25E-06 |
| <i>2nd Qtr</i> | *3.9E±0.40E-05 | 5.84±3.32E-06 | <3.21E-06 | 7.13±6.05E-06 | <2.33E-06 | <7.86E-07 | 3.99±1.47E-06 |
| <i>3rd Qtr</i> | *3.31±0.56E-05 | 1.89±0.26E-05 | <2.36E-07 | 6.87±1.29E-06 | <9.71E-07 | <3.29E-07 | 1.63±0.73E-06 |
| <i>4th Qtr</i> | *3.21±2.29E-05 | 3.52±1.64E-06 | <2.94E-07 | 1.38±1.22E-06 | 2.64±1.95E-07 | <1.41E-07 | 3.59±2.68E-07 |
| TOTAL | 1.72±0.30E-04 | 7.70±0.80E-05 | <3.47E-06 | 3.24±0.72E-05 | <3.34E-06 | <1.22E-06 | 8.53±2.08E-06 |
| AVG ($\mu\text{Ci/mL}$) | 5.13E-09 | 2.30E-09 | <5.40E-11 | 9.69E-10 | <9.97E-11 | <3.64E-11 | 2.55E-10 |

* Calculated values for U-232 are provisional, pending resolution of analytical uncertainties.
 First quarter U-232 results are estimated.

Table C - 1.2
Comparison of 1991 Lagoon 3 Liquid Effluent Radioactivity Concentrations
with Department of Energy Guidelines

| ISOTOPE | TOTAL | AVG CONC.($\mu\text{Ci/mL}$) | DCG ($\mu\text{Ci/mL}$) | % OF DCG |
|-----------------------|----------|--------------------------------|---------------------------|---------------------|
| Alpha | 3.27E+02 | 9.78E-09 | N/A ^b | _____ |
| Beta | 3.83E+04 | 1.14E-06 | N/A ^b | _____ |
| H-3 | 1.09E+06 | 3.25E-05 | 2E-03 | 1.6 |
| C-14 | 2.29E+03 | 6.85E-08 | 7E-05 | .1 |
| Sr-90 | 3.47E+03 | 1.03E-07 | 1E-06 | 10.3 |
| I-129 | 5.22E+02 | 1.56E-08 | 5E-07 | 3.1 |
| Cs-137 | 8.42E+03 | 2.51E-07 | 3E-06 | 8.4 |
| U-234 ^c | 7.70E+01 | 2.30E-09 | 5E-07 | .5 |
| U-235 ^c | 3.47E+00 | < 5.40E-11 | 6E-07 | .0 |
| U-238 ^c | 3.24E+01 | 9.69E-10 | 6E-07 | .2 |
| Pu-238 | 3.34E+00 | < 9.97E-11 | 4E-08 | <.2 |
| Pu-239/240 | 1.22E+00 | < 3.64E-11 | 3E-08 | <.1 |
| Am-241 | 8.53E+00 | 2.55E-10 | 3E-08 | .9 |
| TOTAL % OF DCG | | | | 25.4 ^(d) |

Notes:

^a Total volume released: 3.35E+10 mL

^b Derived concentration guides (DCGs) are not applicable to gross alpha or beta activity.

^c Total U (μg) = 1.43E+08; Average U (mg/L) = 4.27E-03.

^d Total percent of DCGs for specific measured radionuclides does not include percent of DCG for U-232 because of analytical uncertainties. Total percent DCG including provisional reporting of U-232 would be 30.5 for 1991.

Table C - 1.3
1991 Radioactivity Concentrations ($\mu\text{Ci}/\text{mL}$) in Surface Water
Upstream of the WVDP at Fox Valley (WFBCBKG)

| MONTH | ALPHA | BETA | H-3 | SR-90 | CS-137 |
|----------------|---------------|---------------|---------------|---------------|-----------|
| January | <1.06E-09 | 3.36±1.91E-09 | <1.00E-07 | | |
| February | <1.22E-09 | 2.74±1.79E-09 | <1.00E-07 | | |
| March | <1.81E-09 | 7.47±2.63E-09 | <1.00E-07 | | |
| 1ST QTR | | | | <1.95E-09 | <1.06E-08 |
| April | <9.31E-10 | 5.25±2.12E-09 | 1.55±1.30E-07 | | |
| May | <1.32E-09 | 2.21±1.73E-09 | <1.00E-07 | | |
| June | 3.02±2.67E-09 | 3.30±1.94E-09 | <1.00E-07 | | |
| 2ND QTR | | | | 2.23±1.60E-09 | <1.18E-08 |
| July | 6.12±1.80E-10 | 5.30±2.14E-09 | <1.00E-07 | | |
| August | <2.52E-09 | 3.38±2.12E-09 | <1.00E-07 | | |
| September | <1.38E-09 | 4.29±2.07E-09 | <1.00E-07 | | |
| 3RD QTR | | | | 1.85±1.70E-09 | <3.40E-08 |
| October | <1.43E-09 | 2.65±1.63E-09 | <1.00E-07 | | |
| November | <1.80E-09 | 3.57±1.88E-09 | <1.00E-07 | | |
| December | <1.30E-09 | 2.83±1.62E-09 | <1.20E-07 | | |
| 4TH QTR | | | | 2.43±1.73E-09 | <3.40E-08 |

Table C - 1.4
1991 Radioactivity Concentrations ($\mu\text{Ci}/\text{mL}$) in Surface Water
Downstream of the WVDP at Thomas Corners (WFBCTCB)

| MONTH | ALPHA | BETA | H-3 | SR-90 | CS-137 |
|----------------|---------------|---------------|-----------|---------------|-----------|
| January | <2.05E-09 | 4.42±2.04E-09 | <1.00E-07 | | |
| February | <1.85E-09 | 5.07±2.05E-09 | <1.00E-07 | | |
| March | 4.57±3.69E-09 | 6.64±2.60E-09 | <1.00E-07 | | |
| 1ST QTR | | | | 1.32±1.30E-09 | <1.06E-08 |
| April | <1.57E-09 | 7.15±2.36E-09 | <1.00E-07 | | |
| May | <1.26E-09 | 4.20±2.03E-09 | <1.00E-07 | | |
| June | <1.84E-09 | 3.55±0.42E-08 | <1.00E-07 | | |
| 2ND QTR | | | | 2.77±1.60E-09 | <1.18E-08 |
| July | <2.64E-09 | 1.15±0.28E-08 | <1.00E-07 | | |
| August | <5.14E-09 | 1.16±0.28E-08 | <1.23E-07 | | |
| September | <2.32E-09 | 1.13±0.27E-08 | <1.00E-07 | | |
| 3RD QTR | | | | 6.20±1.80E-09 | <3.40E-08 |
| October | <2.42E-09 | 1.22±0.25E-08 | <1.00E-07 | | |
| November | <1.60E-09 | 7.00±2.11E-09 | <1.00E-07 | | |
| December | <1.73E-09 | 6.49±1.98E-09 | <1.00E-07 | | |
| 4TH QTR | | | | 3.83±0.60E-08 | <1.10E-08 |

Table C - 1.5
1991 Radioactivity Concentrations ($\mu\text{Ci}/\text{mL}$) in Surface Water
Downstream of the WVDP at Frank's Creek (WNSP006)

| MONTH | ALPHA | BETA | H-3 |
|-----------|-----------|---------------|---------------|
| January | <2.49E-09 | 1.71±0.09E-07 | 8.34±0.44E-06 |
| February | <1.95E-09 | 1.92±0.32E-08 | 1.59±1.04E-07 |
| March | <2.26E-09 | 6.06±0.52E-08 | 1.78±0.16E-06 |
| April | <1.70E-09 | 3.11±0.40E-08 | 3.26±1.26E-07 |
| May | <2.83E-09 | 9.23±0.66E-08 | 1.20±0.15E-06 |
| June | <4.52E-09 | 1.23±0.08E-07 | 1.55±0.16E-06 |
| July | <3.41E-09 | 5.45±0.54E-08 | 2.06±1.25E-07 |
| August | <5.43E-09 | 3.78±0.14E-07 | 4.56±0.26E-06 |
| September | <3.47E-09 | 5.06±0.51E-08 | 1.37±1.13E-07 |
| October | <3.96E-09 | 4.32±0.46E-08 | <1.13E-07 |
| November | <2.68E-09 | 3.24±0.38E-08 | <1.08E-07 |
| December | <1.74E-09 | 5.43±0.46E-08 | 5.38±1.33E-07 |

Table C - 1.6
1991 Radioactivity Concentrations ($\mu\text{Ci}/\text{mL}$) in Surface Water
Downstream of the WVDP at Frank's Creek (WNSP006)

| | C-14 | SR-90 | I-129 | CS-137 | U-234 |
|---------|---------------|---------------|---------------|------------|---------------|
| 1st Qtr | <8.38E-09 | 1.36±0.27E-08 | 1.30±1.19E-09 | <2.38E-08 | 4.10±1.50E-10 |
| 2nd Qtr | <6.60E-09 | 1.90±0.31E-08 | <1.18E-09 | <3.59E-08 | 4.30±2.70E-10 |
| 3rd Qtr | <8.00E-09 | 3.87±0.45E-08 | 4.00±2.10E-09 | <3.47E-08 | 2.70±1.40E-10 |
| 4th Qtr | 7.20±6.70E-09 | 2.17±0.37E-08 | 4.40±1.30E-09 | <2.35E-08 | 3.30±1.20E-10 |
| | U-235 | U-238 | PU-238 | PU-239/240 | AM-241 |
| 1st Qtr | <2.66E-11 | 1.80±1.10E-10 | 1.40±1.20E-10 | <6.70E-11 | 3.50±3.10E-10 |
| 2nd Qtr | <8.60E-11 | 2.70±2.20E-10 | <4.70E-10 | <2.20E-10 | <1.38E-10 |
| 3rd Qtr | <3.90E-11 | <1.40E-10 | <9.40E-11 | <4.70E-11 | <2.66E-10 |
| 4th Qtr | <2.44E-11 | 1.30±0.80E-10 | <1.82E-11 | <3.20E-11 | 2.80±0.70E-10 |

Table C - 1.7
1991 Radioactivity Concentrations ($\mu\text{Ci/mL}$) in Surface Water
Downstream of Buttermilk Creek at Felton Bridge (WFFELBR)

| MONTH | ALPHA | BETA | H-3 | SR-90 | CS-137 |
|-----------|---------------|---------------|-----------|---------------|---------------|
| January | <1.94E-09 | 4.56±2.11E-09 | <1.00E-07 | 5.31±2.60E-09 | <3.19E-09 |
| February | 4.93±2.90E-09 | 5.77±2.20E-09 | <1.00E-07 | 2.11±1.60E-09 | <1.06E-08 |
| March | <1.78E-09 | 1.94±1.77E-09 | <1.00E-07 | 2.00±1.70E-09 | <1.06E-08 |
| April | <1.77E-09 | 4.85±2.09E-09 | <1.00E-07 | 6.64±2.10E-09 | <3.59E-09 |
| May | <1.90E-09 | 7.21±2.31E-09 | <1.00E-07 | 1.71±1.30E-09 | <1.08E-08 |
| June | <3.00E-09 | 2.42±2.03E-09 | <1.00E-07 | 2.77±1.60E-09 | <1.08E-08 |
| July | <4.89E-09 | 4.53±2.25E-09 | <1.00E-07 | 6.87±2.30E-09 | <1.18E-08 |
| August | <3.27E-09 | 3.12±2.04E-09 | <1.00E-07 | 2.24±1.60E-09 | <1.18E-08 |
| September | <1.40E-09 | 3.31±1.95E-09 | <1.00E-07 | <1.40E-09 | <4.22E-09 |
| October | <1.73E-09 | 3.97±1.85E-09 | <1.00E-07 | 5.13±2.73E-09 | 5.44±5.34E-09 |
| November | <2.32E-09 | 3.89±1.87E-09 | <1.00E-07 | 3.49±2.08E-09 | <6.88E-09 |
| December | <1.76E-09 | 4.10±1.78E-09 | <1.00E-07 | 2.23±1.48E-09 | <7.60E-09 |

Table C - 1.8
1991 Results of Sampling of Potable Well Water
around the WVDP Site

| WELL | pH | CONDUCTIVITY ($\mu\text{mhos/cm@25}^{\circ}\text{C}$) | ALPHA ($\mu\text{Ci/mL}$) | BETA ($\mu\text{Ci/mL}$) | H-3 ($\mu\text{Ci/mL}$) | CS-137 ($\mu\text{Ci/mL}$) |
|---------|--------|--|--------------------------------|-------------------------------|------------------------------|---------------------------------|
| WFWEL01 | 7.46 | 386 | <1.38E-09 | 4.16±2.50E-09 | <1.00E-07 | <3.40E-08 |
| WFWEL02 | 6.72 | 360 | <1.29E-09 | 3.41±2.40E-09 | <1.00E-07 | <3.40E-08 |
| WFWEL03 | 6.74 | 846 | <2.40E-09 | 5.11±2.80E-09 | <7.37E-08 | <3.40E-08 |
| WFWEL04 | 8.00 | 1660 | <8.00E-09 | 3.33±2.80E-09 | <1.00E-07 | <3.40E-08 |
| WFWEL05 | 7.04 | 394 | <1.20E-09 | 4.50±2.50E-09 | <1.00E-07 | <3.40E-08 |
| WFWEL06 | 6.95 | 610 | <1.59E-09 | 2.92±2.40E-09 | <6.08E-08 | <2.31E-08 |
| WFWEL07 | 6.97 | 455 | <1.11E-09 | <2.17E-09 | <1.00E-07 | <2.31E-08 |
| WFWEL08 | 7.06 | 458 | <1.71E-09 | 5.32±2.70E-09 | <1.00E-07 | <2.31E-08 |
| WFWEL09 | 10.35* | 616 | <2.60E-09 | 2.76±2.40E-09 | <1.00E-07 | <2.31E-08 |
| WFWEL10 | 7.56 | 264 | <1.29E-09 | 2.37±2.20E-09 | <7.72E-08 | <2.31E-08 |

* High pH value attained confirmed for 1991 sample collected. However, a follow-up sample collected April 7, 1992 returned to a more normal value of 7.92.

Table C - 1.9
1991 Radioactivity Concentrations in Stream Sediments around the WVDP
($\mu\text{Ci/g}$ dry weight from upper 15 cm)

| LOCATION | DATE | ALPHA | BETA | K-40 | CS-137 | SR-90 | CO-60 |
|----------|-------|---------------------|--------------------|---------------------|---------------------|--------------------|---------------|
| SFBCSED | 6/91 | 1.4 \pm 0.60E-05 | 3.1 \pm 0.30E-05 | 1.26 \pm 0.13E-05 | 4.44 \pm 2.31E-08 | < 5.52E-08 | < 1.9E-08 |
| SFSDSED | 6/91 | 5.7 \pm 4.80E-06 | 2.9 \pm 0.30E-05 | 1.01 \pm 0.01E-05 | 1.98 \pm 0.32E-07 | < 5.2E-08 | < 1.8E-08 |
| SFTCSSED | 6/91 | 1.15 \pm 0.60E-05 | 3.2 \pm 0.30E-05 | 1.24 \pm 0.12E-05 | 2.08 \pm 0.21E-06 | < 1.35E-07 | < 1.85E-08 |
| SFCCSED | 6/91 | 6.1 \pm 4.90E-06 | 2.9 \pm 0.30E-05 | 1.06 \pm 0.11E-05 | 2.5 \pm 0.34E-07 | < 4.2E-08 | < 2.02E-08 |
| SFBISED | 6/91 | 1.3 \pm 0.60E-05 | 3.2 \pm 0.30E-05 | 1.19 \pm 0.12E-05 | 6.89 \pm 2.94E-08 | 8.8 \pm 5.70E-08 | < 1.82E-08 |
| SFBCSED | 11/91 | 1.2 \pm 0.50E-05 | 3.2 \pm 0.30E-05 | 1.44 \pm 0.14E-05 | 8.37 \pm 2.96E-08 | 2 \pm 0.80E-07 | < 1.69E-08 |
| SFSDSED | 11/91 | 1.5 \pm 0.81E-05 | 3.2 \pm 2.20E-05 | 1.27 \pm 0.13E-05 | 1.99 \pm 1.66E-07 | < 4.29E-08 | < 1.72E-08 |
| SFTCSSED | 11/91 | 1.2 \pm 0.50E-05 | 3.6 \pm 0.30E-05 | 1.59 \pm 0.16E-05 | 1.71 \pm 0.17E-06 | 1.3 \pm 0.50E-07 | < 2.04E-08 |
| SFCCSED | 11/91 | 1.0 \pm 0.50E-05 | 3.8 \pm 0.30E-05 | 1.52 \pm 0.15E-05 | 3.87 \pm 0.39E-07 | 3.6 \pm 0.90E-07 | < 1.56E-08 |
| SFBISED | 11/91 | 1.4 \pm 0.60E-05 | 3.3 \pm 0.30E-05 | 1.36 \pm 0.14E-05 | 5.0 \pm 2.50E-08 | 9.2 \pm 4.00E-08 | < 2.12E-08 |
| | | U-234 | U-235 | U-238 | PU-238 | PU-239/240 | AM-241 |
| SFBCSED | 6/91 | 4.8 \pm 0.90E-08 | < 2.1E-09 | 3.6 \pm 0.80E-08 | < 4.1E-09 | < 6.9E-09 | < 1.7E-08 |
| SFTCSSED | 6/91 | 6.65 \pm 1.46E-08 | < 2.4E-09 | 5.45 \pm 1.37E-08 | < 2.26E-08 | < 1.4E-08 | < 2.07E-08 |

Table C - 1.10
1991 Contributions by the New York State Low-level Waste Disposal Area to
Radioactivity in WVDP Liquid Effluents (curies)

| TOTALS | |
|---------------|--------------------|
| Gross Alpha | < 8.5E-07 |
| Gross Beta | 1.21 \pm 0.2E-03 |
| H-3 | 4.02 \pm 0.1E-02 |
| Sr-90 | 6.01 \pm 0.1E-04 |
| Cs-137 | < 1.6E-05 |

Table C - 1.11

1991 Radioactivity Concentrations in Surface Soil Sediments Collected at Air Sampling Stations around the WVDP ($\mu\text{Ci/g}$ dry weight from upper 15 cm)

| LOCATION | K-40 | CS-137 | SR-90 | AM-241 | PU-239/240 |
|----------|---------------|---------------|---------------|---------------|------------|
| SFFXVRD | 1.14±0.11E-05 | 9.31±0.93E-07 | 3.20±0.60E-07 | < 9.80E-09 | <1.90E-08 |
| SFRSPRD | 1.42±0.14E-05 | 2.08±0.21E-06 | 5.80±0.80E-07 | < 2.47E-08 | <1.10E-07 |
| SFRT240 | 1.21±0.12E-05 | 1.03±0.13E-06 | 2.90±0.60E-07 | < 1.60E-08 | <1.60E-08 |
| SFSPRVL | 1.71±0.17E-05 | 1.03±0.10E-06 | 2.40±0.50E-07 | < 1.14E-08 | <2.26E-08 |
| SFTCORD | 2.13±0.21E-05 | 4.89±0.55E-07 | 1.85±0.50E-07 | < 8.20E-09 | <1.22E-08 |
| SFWEVAL | 1.14±0.11E-05 | 4.91±0.49E-07 | 2.20±0.60E-07 | < 7.00E-09 | <3.06E-08 |
| SFGRVAL | 9.98±1.00E-06 | 4.38±0.44E-06 | 4.70±0.70E-07 | 2.10±1.50E-08 | <3.20E-08 |
| SFBOEHN | 1.25±0.13E-05 | 1.69±0.17E-06 | 2.00±0.60E-07 | <1.07E-08 | <3.50E-08 |
| SFDNKRK | 1.66±0.17E-05 | 3.78±0.43E-07 | 1.20±0.50E-07 | <1.84E-08 | <9.40E-08 |
| SFLTVAL | 1.55±0.16E-05 | 3.09±0.59E-07 | 8.90±4.20E-08 | <1.50E-08 | <2.10E-08 |
| | U -234 | U-235 | U-238 | | |
| SFRSPRD | 5.70±1.50E-08 | <3.30E-09 | 5.50±1.40E-08 | | |
| SFGRVAL | 1.50±0.50E-07 | <9.30E-09 | 1.10±0.40E-07 | | |
| SFBOEHN | 1.20±0.50E-07 | <1.11E-08 | 8.00±4.10E-08 | | |

Table C - 1.12

1991 Water Quality Concentrations (mg/L) in Surface Water at Locations WFBCBKG and WNSP006

| LOCATION | DATE | pH | *Conductivity | TOC | TOX | Chloride | Sulfate | Nitrate-N | Fluoride | Bicarbonate Alkalinity (as CaCO ₃) | Carbonate Alkalinity (as CaCO ₃) |
|----------|-------|---------|---------------|-----|--------|----------|---------|-----------|----------|--|--|
| WFBCBKG | 6/25 | **7.66 | N/A | 3.1 | 0.650 | 9 | 22 | 0.38 | <0.1 | 100 | 30 |
| WFBCBKG | 11/20 | 7.87 | N/A | 3.1 | <0.005 | 12 | 52 | 0.10 | N/A | 110 | <1.0 |
| WNSP006 | 6/25 | ***7.60 | ***462 | 3.9 | 0.120 | 60 | 19 | 9.7 | <0.1 | 230 | <1.0 |
| WNSP006 | 11/20 | 7.83 | 650 | 7.2 | 0.047 | 62 | 62 | 3.1 | N/A | 130 | <1.0 |

| LOCATION | DATE | CA | MG | NA | K | BA | MN | | FE | |
|----------|-------|-------|-------|-------|-------|--------|-------|---------|-------|---------|
| | | Total | Total | Total | Total | Total | Total | Soluble | Total | Soluble |
| WFBCBKG | 6/25 | 44 | 7.7 | 6.7 | 2.2 | 0.110 | 0.250 | <0.005 | 5.600 | 0.056 |
| WFBCBKG | 11/20 | 51 | 7.2 | 10 | 1.8 | 0.120 | 0.024 | 0.005 | 0.180 | <0.030 |
| WNSP006 | 6/25 | 36 | 5.9 | 34 | 4.6 | <0.050 | 0.350 | 0.320 | 2.400 | 0.260 |
| WNSP006 | 11/20 | 60 | 8.8 | 35 | 2.7 | 0.059 | 0.040 | 0.029 | 0.290 | 0.110 |

* Measured in $\mu\text{mhos/cm}$ at 25°C

** Average of biweekly measurements during semiannual period

*** Average of weekly measurements during semiannual period