Nuclear Fuel Services, Inc.
1205 Banner Hill Road
Erwin, TN 37650

(423) 743-9141

www.atnfs.com

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

21G-02-0063
GOV-01-55
ACF-02-0047

February 26, 2002

Mr. Luis A. Reyes, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II, Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, GA 30303

References: 1) Docket No. 70-143; SNM License 124

Subject: **Bi-Annual Effluent Monitoring Report July - December 2001**

Dear Mr. Reyes:

In accordance with the requirements set forth in 10 CFR, Part 70.59, Nuclear Fuel Services, Inc. (NFS) submits the attached reports. Attachment A reports the Radioactivity in Effluent Liquid for the period July - December 2001. Attachment B reports the Radioactivity in Effluent Air for the period July - December 2001. Attachment C summarizes an evaluation of the dose and air activity concentration for the maximally exposed offsite individual, due to effluents during the period July - December 2001.

If you or your staff have any questions, require additional information, or wish to discuss this, please contact me or Ms. Janice Greene, Environmental Safety Manager, at (423) 743-1730. Please reference our unique document identification number (21G-02-0063) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

B Marie Moore

B. Marie Moore
Vice President
Safety and Regulatory

BPG/mfh

Attachments

xc: Mr. William Gloersen, Project Inspector
U. S. Nuclear Regulatory Commission
Region II, Atlanta Federal Center
61 Forsyth Street, SW
Suite 23T85
Atlanta, GA 30303

Director
Office of Nuclear Material Safety & Safeguards
U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Mr. Melvyn Leach, Chief
Fuel Cycle Licensing Branch
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Mr. Dan Rich
Senior Resident Inspector
U. S. Nuclear Regulatory Commission

Attachment A
To Letter Dated February 26, 2002
B. M. Moore to Mr. Luis A. Reyes (NRC)

Report of Radioactivity in Effluent Liquid for the Period July - December 2001

(One Page to Follow)

Radioactivity in Effluent Liquid
July 1, 2001 to December 31, 2001

Location	Total Volume (l)	Activity Concentration (µCi/ml)	Error Estimate (µCi/ml)	LLD (µCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV[1]
Banner Spring Down							
Pu-238	329,710,340	-1.76E-11	2.28E-10	1.47E-10	-5.81E-06	-3.40E-07	-8.82E-04
Pu-239/240	329,710,340	6.02E-11	8.98E-11	1.84E-10	1.99E-05	3.19E-04	3.01E-03
Tc-99	329,710,340	1.23E-08	9.40E-09	2.04E-08	4.07E-03	2.41E-01	2.06E-04
Th-228	329,710,340	1.08E-10	1.37E-10	2.57E-10	3.56E-05	4.35E-08	5.40E-04
Th-230	329,710,340	1.32E-10	9.92E-11	1.38E-10	4.36E-05	2.16E-03	1.32E-03
Th-232	329,710,340	1.95E-11	5.21E-11	1.15E-10	6.42E-06	5.89E+01	6.49E-04
U-234	329,710,340	1.37E-08	1.64E-09	1.06E-10	4.53E-03	7.26E-01	4.58E-02
U-235/236	329,710,340	6.34E-10	1.80E-10	6.48E-11	2.09E-04	9.68E+01	2.11E-03
U-238	329,710,340	2.19E-09	3.71E-10	6.79E-11	7.21E-04	2.15E+03	7.28E-03
						Total:	**6.00E-02**
Sewer							
Pu-238	48,876,475	3.08E-11	6.24E-11	1.44E-10	1.51E-06	8.81E-08	1.54E-04
Pu-239/240	48,876,475	4.37E-11	7.70E-11	1.52E-10	2.14E-06	3.44E-05	2.19E-04
Tc-99	48,876,475	-6.38E-09	9.80E-09	2.49E-08	-3.12E-04	-1.85E-02	-1.06E-05
Th-228	48,876,475	7.81E-11	1.23E-10	2.28E-10	3.82E-06	4.66E-09	3.91E-05
Th-230	48,876,475	1.19E-10	9.39E-11	1.05E-10	5.81E-06	2.88E-04	1.19E-04
Th-232	48,876,475	6.79E-12	4.04E-10	1.04E-10	3.32E-07	3.04E+00	2.26E-05
U-234	48,876,475	1.51E-08	1.75E-09	1.07E-10	7.38E-04	1.18E-01	5.03E-03
U-235/236	48,876,475	7.02E-10	1.85E-10	9.90E-11	3.43E-05	1.59E+01	2.34E-04
U-238	48,876,475	1.89E-09	3.38E-10	9.07E-11	9.23E-05	2.76E+02	6.30E-04
						Total:	**6.44E-03**
WWTF							
Cs-137	3,526,983	4.63E-10	1.76E-09	2.82E-09	1.63E-06	1.88E-08	4.63E-04
Na-22	3,526,983	1.19E-10	1.72E-09	2.89E-09	4.19E-07	6.71E-11	1.98E-05
Pu-238	3,526,983	3.40E-11	9.04E-11	2.20E-10	1.20E-07	7.01E-09	1.70E-03
Pu-239/240	3,526,983	1.56E-11	4.87E-11	1.50E-10	5.49E-08	8.82E-07	7.78E-04
Ra-224	3,526,983	3.62E-08	4.93E-09	9.12E-09	1.28E-04	8.03E-10	1.81E-01
Tc-99	3,526,983	8.67E-08	1.45E-08	2.06E-08	3.06E-04	1.81E-02	1.45E-03
Th-228	3,526,983	1.05E-10	1.14E-10	1.93E-10	3.70E-07	4.52E-10	5.25E-04
Th-230	3,526,983	1.55E-10	1.04E-10	1.40E-10	5.46E-07	2.70E-05	1.55E-03
Th-232	3,526,983	1.97E-11	5.19E-10	9.82E-11	6.94E-08	6.37E-01	6.56E-04
U-234	3,526,983	8.36E-08	8.93E-09	1.17E-10	2.95E-04	4.72E-02	2.79E-01
U-235/236	3,526,983	2.35E-09	4.42E-10	1.43E-10	8.30E-06	3.84E+00	7.85E-03
U-238	3,526,983	5.16E-10	1.72E-10	1.39E-10	1.82E-06	5.44E+00	1.72E-03
						Total:	**4.76E-01**

[1] ECV: Effluent Concentration Value from 10 CFR 20, Appendix B.

Attachment B
To Letter Dated February 26, 2002
B. M. Moore to Mr. Luis A. Reyes (NRC)

Report of Radioactivity in Effluent Air for the Period
July - December 2001

(Four Pages to Follow)

Radioactivity in Effluent Air
July 1, 2001 to December 31, 2001

Location	Total Volume (m^3)	Activity Concentration (µCi/ml)	Error Estimate (µCi/ml)	LLD (µCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV[1]
Main Stack 416		**1177.61 m^3/min**		**19.63 m^3/sec**			
Tc-99	296,758,436	3.91E-13	3.58E-14	3.86E-14	1.16E-04	6.87E-03	4.35E-04
Th-230	296,758,436	9.94E-18	1.25E-18	1.25E-18	2.95E-09	1.46E-07	4.97E-04
Thorium-231	296,758,436	5.01E-15	4.59E-16	4.94E-16	1.49E-06	2.79E-12	5.57E-07
U-234	296,758,436	2.22E-13	2.80E-14	2.79E-14	6.59E-05	1.06E-02	4.44E+00
U-235	296,758,436	3.74E-15	4.71E-16	4.70E-16	1.11E-06	5.13E-01	6.23E-02
U-238	296,758,436	4.29E-18	5.41E-19	5.39E-19	1.27E-09	3.80E-03	7.15E-05
						Total:	**4.50E+00**
Stack 185 Bldg. 131		**69.21 m^3/min**		**1.15 m^3/sec**			
Tc-99	15,945,150	1.43E-13	3.51E-14	4.29E-14	2.29E-06	1.35E-04	1.59E-04
Th-230	15,945,150	8.76E-19	8.37E-19	1.46E-18	1.40E-11	6.91E-10	4.38E-05
Thorium-231	15,945,150	1.84E-15	4.49E-16	5.50E-16	2.93E-08	5.51E-14	2.04E-07
U-234	15,945,150	1.96E-14	1.87E-14	3.25E-14	3.12E-07	5.00E-05	3.91E-01
U-235	15,945,150	3.29E-16	3.15E-16	5.47E-16	5.25E-09	2.43E-03	5.49E-03
U-238	15,945,150	3.78E-19	3.61E-19	6.28E-19	6.03E-12	1.80E-05	6.30E-06
						Total:	**3.97E-01**
Stack 234 Bldg. 234		**257.99 m^3/min**		**4.30 m^3/sec**			
Am-241	65,014,695	6.58E-17	4.05E-16	7.97E-16	4.28E-09	1.25E-09	3.29E-03
Pu-238	65,014,695	1.33E-17	8.20E-17	1.61E-16	8.66E-10	5.06E-11	6.66E-04
Pu-239	65,014,695	1.11E-16	6.85E-16	1.35E-15	7.24E-09	1.16E-07	5.57E-03
Pu-240	65,014,695	3.92E-17	2.41E-16	4.74E-16	2.55E-09	1.12E-08	1.96E-03
Pu-241	65,014,695	1.07E-15	2.80E-15	4.83E-15	6.93E-08	6.73E-10	1.33E-03
						Total:	**1.28E-02**
Stack 27 Bldg. 234		**93.62 m^3/min**		**1.56 m^3/sec**			
Am-241	23,592,535	2.16E-16	4.43E-16	7.97E-16	5.10E-09	1.49E-09	1.08E-02
Pu-238	23,592,535	4.38E-17	8.97E-17	1.61E-16	1.03E-09	6.04E-11	2.19E-03
Pu-239	23,592,535	3.66E-16	7.50E-16	1.35E-15	8.63E-09	1.39E-07	1.83E-02
Pu-240	23,592,535	1.29E-16	2.64E-16	4.74E-16	3.04E-09	1.33E-08	6.44E-03
Pu-241	23,592,535	3.52E-15	2.98E-15	4.83E-15	8.30E-08	8.06E-10	4.40E-03
						Total:	**4.21E-02**
Stack 28 Bldg. 234		**89.41 m^3/min**		**1.49 m^3/sec**			
Am-241	22,530,721	1.04E-16	4.21E-16	7.97E-16	2.34E-09	6.82E-10	5.19E-03
Pu-238	22,530,721	2.10E-17	8.52E-17	1.61E-16	4.73E-10	2.77E-11	1.05E-03
Pu-239	22,530,721	1.76E-16	7.12E-16	1.35E-15	3.95E-09	6.36E-08	8.78E-03
Pu-240	22,530,721	6.18E-17	2.51E-16	4.74E-16	1.39E-09	6.10E-09	3.09E-03
Pu-241	22,530,721	1.64E-15	2.85E-15	4.86E-15	3.69E-08	3.58E-10	2.05E-03
						Total:	**2.01E-02**
Stack 332 Bldg. 120		**62.07 m^3/min**		**1.03 m^3/sec**			
Tc-99	14,301,051	4.61E-14	3.01E-14	4.29E-14	6.60E-07	3.90E-05	5.13E-05
Th-230	14,301,051	5.34E-19	8.06E-19	1.45E-18	7.63E-12	3.78E-10	2.67E-05

[1] ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Radioactivity in Effluent Air
July 1, 2001 to December 31, 2001

Location	Total Volume (m^3)	Activity Concentration (µCi/ml)	Error Estimate (µCi/ml)	LLD (µCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV[1]
Stack 332 Bldg. 120		**62.07 m^3/min**		**1.03 m^3/sec**			
Thorium-231	14,301,051	5.91E-16	3.85E-16	5.49E-16	8.45E-09	1.59E-14	6.56E-08
U-234	14,301,051	1.19E-14	1.80E-14	3.25E-14	1.71E-07	2.73E-05	2.38E-01
U-235	14,301,051	2.01E-16	3.03E-16	5.46E-16	2.87E-09	1.33E-03	3.34E-03
U-238	14,301,051	2.30E-19	3.48E-19	6.27E-19	3.29E-12	9.84E-06	3.84E-06
						Total:	**2.42E-01**
Stack 376 Bldg. 301		**177.89 m^3/min**		**2.96 m^3/sec**			
Tc-99	44,315,073	1.56E-14	1.63E-14	2.94E-14	6.89E-07	4.08E-05	1.73E-05
Th-230	44,315,073	2.98E-19	4.73E-19	9.80E-19	1.32E-11	6.53E-10	1.49E-05
Thorium-231	44,315,073	1.99E-16	2.09E-16	3.77E-16	8.83E-09	1.66E-14	2.21E-08
U-234	44,315,073	6.65E-15	1.06E-14	2.19E-14	2.95E-07	4.72E-05	1.33E-01
U-235	44,315,073	1.12E-16	1.78E-16	3.69E-16	4.96E-09	2.30E-03	1.87E-03
U-238	44,315,073	1.29E-19	2.04E-19	4.23E-19	5.70E-12	1.70E-05	2.14E-06
						Total:	**1.35E-01**
Stack 421 Bldg. 100		**22.96 m^3/min**		**0.38 m^3/sec**			
Tc-99	5,721,032	2.03E-13	2.88E-14	2.96E-14	1.16E-06	6.87E-05	2.25E-04
Th-230	5,721,032	1.85E-17	1.78E-18	9.88E-19	1.06E-10	5.25E-09	9.27E-04
Thorium-231	5,721,032	2.60E-15	3.69E-16	3.80E-16	1.49E-08	2.79E-14	2.89E-07
U-234	5,721,032	4.14E-13	3.98E-14	2.21E-14	2.37E-06	3.80E-04	8.29E+00
U-235	5,721,032	6.97E-15	6.69E-16	3.72E-16	3.99E-08	1.85E-02	1.16E-01
U-238	5,721,032	8.00E-18	7.68E-19	4.27E-19	4.58E-11	1.37E-04	1.33E-04
						Total:	**8.40E+00**
Stack 547 Bldg. 100		**51.65 m^3/min**		**0.86 m^3/sec**			
Tc-99	12,867,032	3.77E-14	2.73E-14	4.02E-14	4.86E-07	2.87E-05	4.19E-05
Th-230	12,867,032	4.03E-19	7.23E-19	1.37E-18	5.18E-12	2.56E-10	2.01E-05
Thorium-231	12,867,032	4.83E-16	3.50E-16	5.15E-16	6.22E-09	1.17E-14	5.37E-08
U-234	12,867,032	9.00E-15	1.62E-14	3.07E-14	1.16E-07	1.86E-05	1.80E-01
U-235	12,867,032	1.51E-16	2.72E-16	5.17E-16	1.95E-09	9.02E-04	2.52E-03
U-238	12,867,032	1.74E-19	3.12E-19	5.93E-19	2.24E-12	6.68E-06	2.90E-06
						Total:	**1.83E-01**
Stack 573 Bldg 306-W		**92.11 m^3/min**		**1.54 m^3/sec**			
Tc-99	23,212,908	2.55E-14	2.21E-14	3.88E-14	5.93E-07	3.51E-05	2.84E-05
Th-230	23,212,908	4.65E-19	6.26E-19	1.27E-18	1.08E-11	5.35E-10	2.33E-05
Thorium-231	23,212,908	3.27E-16	2.83E-16	4.97E-16	7.60E-09	1.43E-14	3.64E-08
U-234	23,212,908	1.04E-14	1.40E-14	2.84E-14	2.41E-07	3.87E-05	2.08E-01
U-235	23,212,908	1.75E-16	2.35E-16	4.79E-16	4.06E-09	1.88E-03	2.92E-03
U-238	23,212,908	2.01E-19	2.70E-19	5.49E-19	4.66E-12	1.39E-05	3.35E-06
						Total:	**2.11E-01**
Stack 600 Bldg. 110		**289.60 m^3/min**		**4.83 m^3/sec**			
Tc-99	72,978,299	2.13E-13	2.66E-14	3.91E-14	1.56E-05	9.22E-04	2.37E-04

[1] ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Radioactivity in Effluent Air
July 1, 2001 to December 31, 2001

Location	Total Volume (m^3)	Activity Concentration (µCi/ml)	Error Estimate (µCi/ml)	LLD (µCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV[1]
Stack 600 Bldg. 110		**289.60 m^3/min**		**4.83 m^3/sec**			
Th-230	72,978,299	3.53E-18	7.93E-19	1.28E-18	2.58E-10	1.28E-08	1.77E-04
Thorium-231	72,978,299	2.73E-15	3.41E-16	5.01E-16	2.00E-07	3.75E-13	3.04E-07
U-234	72,978,299	7.90E-14	1.77E-14	2.87E-14	5.76E-06	9.24E-04	1.58E+00
U-235	72,978,299	1.33E-15	2.98E-16	4.82E-16	9.70E-08	4.49E-02	2.22E-02
U-238	72,978,299	1.53E-18	3.42E-19	5.54E-19	1.11E-10	3.32E-04	2.54E-05
						Total:	**1.60E+00**
Stack 615 Bldg. 306-W		**25.23 m^3/min**		**0.42 m^3/sec**			
Tc-99	6,358,039	2.50E-14	2.21E-14	3.88E-14	1.59E-07	9.42E-06	2.78E-05
Th-230	6,358,039	4.27E-19	6.18E-19	1.27E-18	2.71E-12	1.34E-10	2.13E-05
Thorium-231	6,358,039	3.21E-16	2.83E-16	4.97E-16	2.04E-09	3.83E-15	3.56E-08
U-234	6,358,039	9.53E-15	1.38E-14	2.84E-14	6.06E-08	9.71E-06	1.91E-01
U-235	6,358,039	1.60E-16	2.32E-16	4.79E-16	1.02E-09	4.72E-04	2.67E-03
U-238	6,358,039	1.84E-19	2.67E-19	5.49E-19	1.17E-12	3.50E-06	3.07E-06
						Total:	**1.93E-01**
Stack 646 Bldg. 110		**63.29 m^3/min**		**1.05 m^3/sec**			
Tc-99	14,581,592	6.00E-15	2.03E-14	3.92E-14	8.75E-08	5.18E-06	6.66E-06
Th-230	14,581,592	4.08E-19	6.16E-19	1.28E-18	5.95E-12	2.95E-10	2.04E-05
Thorium-231	14,581,592	7.68E-17	2.60E-16	5.02E-16	1.12E-09	2.11E-15	8.54E-09
U-234	14,581,592	9.13E-15	1.38E-14	2.86E-14	1.33E-07	2.13E-05	1.83E-01
U-235	14,581,592	1.54E-16	2.32E-16	4.82E-16	2.24E-09	1.04E-03	2.56E-03
U-238	14,581,592	1.76E-19	2.66E-19	5.53E-19	2.57E-12	7.68E-06	2.94E-06
						Total:	**1.85E-01**
Stack 649 Bldg. 330		**10.82 m^3/min**		**0.18 m^3/sec**			
Tc-99	2,694,740	1.94E-14	1.67E-14	2.94E-14	5.22E-08	3.09E-06	2.15E-05
Th-230	2,694,740	2.12E-19	4.53E-19	9.81E-19	5.72E-13	2.83E-11	1.06E-05
Thorium-231	2,694,740	2.48E-16	2.14E-16	3.77E-16	6.69E-10	1.26E-15	2.76E-08
U-234	2,694,740	4.75E-15	1.01E-14	2.19E-14	1.28E-08	2.05E-06	9.49E-02
U-235	2,694,740	7.99E-17	1.70E-16	3.69E-16	2.15E-10	9.97E-05	1.33E-03
U-238	2,694,740	9.17E-20	1.96E-19	4.24E-19	2.47E-13	7.38E-07	1.53E-06
						Total:	**9.63E-02**
Stack 667 Bldg. 410		**1512.66 m^3/min**		**25.21 m^3/sec**			
Actinium-228	372,476,859	2.98E-15	3.77E-16	4.75E-16	1.11E-06	4.96E-13	1.49E-04
Am-241	372,476,859	6.30E-16	1.04E-16	1.21E-16	2.35E-07	6.84E-08	3.15E-02
Protactinium-234m	372,476,859	5.16E-14	6.52E-15	8.23E-15	1.92E-05	2.80E-14	
Pu-238	372,476,859	1.15E-16	1.90E-17	2.20E-17	4.29E-08	2.51E-09	5.76E-03
Pu-239	372,476,859	1.29E-15	2.14E-16	2.48E-16	4.82E-07	7.74E-06	6.47E-02
Pu-240	372,476,859	4.33E-16	7.16E-17	8.30E-17	1.61E-07	7.08E-07	2.17E-02
Pu-241	372,476,859	5.20E-15	6.56E-16	8.28E-16	1.94E-06	1.88E-08	6.49E-03
Ra-224	372,476,859	1.63E-15	2.68E-16	3.11E-16	6.05E-07	3.81E-12	8.13E-04

[1] ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Radioactivity in Effluent Air
July 1, 2001 to December 31, 2001

Location	Total Volume (m^3)	Activity Concentration (µCi/ml)	Error Estimate (µCi/ml)	LLD (µCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV[1]
Stack 667 Bldg. 410		**1512.66 m^3/min**		**25.21 m^3/sec**			
Radium-228	372,476,859	2.98E-15	3.77E-16	4.75E-16	1.11E-06	4.07E-09	1.49E-03
Th-228	372,476,859	1.63E-15	2.68E-16	3.11E-16	6.05E-07	7.39E-10	8.13E-02
Th-230	372,476,859	8.53E-16	1.41E-16	1.63E-16	3.18E-07	1.57E-05	4.27E-02
Th-232	372,476,859	1.63E-15	2.68E-16	3.11E-16	6.05E-07	5.55E+00	4.06E-01
Th-234	372,476,859	5.16E-14	6.52E-15	8.23E-15	1.92E-05	8.32E-10	2.58E-04
Thorium-231	372,476,859	1.60E-15	2.02E-16	2.55E-16	5.96E-07	1.12E-12	1.78E-07
U-234	372,476,859	3.04E-14	5.03E-15	5.83E-15	1.13E-05	1.82E-03	6.09E-01
U-235	372,476,859	8.73E-16	1.44E-16	1.67E-16	3.25E-07	1.51E-01	1.46E-02
U-238	372,476,859	2.82E-14	4.66E-15	5.40E-15	1.05E-05	3.13E+01	4.70E-01
						Total:	**1.76E+00**

[1] ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Attachment C
To Letter Dated February 26, 2002
B. M. Moore to Mr. Luis A. Reyes (NRC)

Report of Dose and Activity Concentration for the Maximally Exposed Off-Site Individual for the Release Period July - December 2001

(Three Pages to Follow)

B. M. Moore to Mr. Luis Reyes (NRC)
February 26, 2002

21G-02-0063
GOV-01-55
ACF-02-0047

Report on Potential Dose to the Maximally Exposed Offsite Individual and on the Maximum Radionuclide Concentrations for the Period: July through December 2001

Introduction

The average radionuclide concentrations in gaseous effluents routinely exceed the concentration values listed in 10 CFR Part 20, Appendix B, Table 2, Column 1 (i.e., the sum of fractions exceeds 1.0 for several gaseous effluent point sources). SNM-124, Part I, Section 5.1.1.3 requires NFS to estimate the potential total effective dose equivalent (TEDE) to the maximally exposed offsite receptor, and the maximum radioactive air concentrations at the site boundary, when the sum of fractions exceeds 1.0. These estimates have been completed and the details of the estimates are provided in the subsequent sections.

Average radionuclide concentrations in liquid effluents did not exceed the concentration values listed in 10 CFR Part 20, Appendix B, Table 2, Column 1 (i.e., the sum of fractions did not exceed 1.0 for the liquid effluent streams). No dose assessment was performed for the liquid effluent streams, because SNM-124, Part I, Section 5.1.2.3 does not require a dose assessment unless the sum of fractions exceeds 1.0.

Summary of Methods

In accordance with SNM-124, Section 5.1.1.4 and internal procedure NFS-HS-A-27, the U.S. Department of Energy's CAP88-PC computer program was used to estimate off-site doses and activity concentrations for gaseous effluents. CAP88-PC accommodates up to six stacks and considers stacks to be co-located (i.e., at the same physical location on the site). NFS operated fifteen (15) radiological stacks during the 2nd half of 2001. Based on effluent types and stack physical characteristics, releases from these stacks were grouped into four effective stacks for modeling purposes. To accommodate the co-location limitation of the model, the four effective stacks were taken to be at the approximate center of the plant site. The distance to the site boundary (nearest model receptor distance) was taken to be 100 meters for all sectors and is conservative. Meteorological data were based on five-year average wind speed and direction frequencies as presented in NFS' 1996 Environmental Report. Atmospheric stability class D (neutral atmosphere) was used for all releases (default value recommended by the U.S. Environmental Protection Agency in "User's Guide for COMPLY"). The most conservative inhalation class was assumed for each radionuclide released. A particle size (activity median aerodynamic diameter or AMAD) of 1.0 microns was assumed for modeling purposes since no information on actual particle sizes exists; this size is consistent with assumptions used in EPA Federal Guidance Report 11.

Because CAP88-PC models releases over an entire year, the six-month source term (i.e., total curies of each radionuclide released over the period, given in Attachment B) was annualized (i.e., transformed into a 12-month release) so that airborne activity concentrations would not be under-estimated during the release period.

Summary of Results

Doses are reported in a table below and are derived from the CAP88-PC "Synopsis Report". These doses are at the location of the maximally exposed (off-site) individual (MEI). The results include an adjustment (using the normalization factor mentioned above) to convert the "annualized" doses back to

those doses that were actually received in the six-month release period. Activity concentrations reported below come directly from the CAP88-PC "Concentration Tables" report; no adjustments are needed for these concentrations. The CAP88PC output reports are available for review at NFS.

Table 1 summarizes the six-month dose to a hypothetical individual at the MEI location, which was determined to be approximately 250 meters North Northeast from the center of the plant site. The effective dose equivalent (EDE) to the MEI was estimated to be 0.0162 mrem for gaseous effluents released during the 2nd half of 2001. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 0.104 mrem to the lungs. These MEI doses are well below SNM-124 license action levels and applicable regulatory limits/ALARA constraints.

Table 2 summarizes the maximum radioactive air concentrations at or beyond the site boundary, as determined by CAP88-PC, for radionuclides released. The total sum of fractions based on maximum values indicates that exposures to offsite public from gaseous effluents were much less than 1% of the 10 CFR 20, Appendix B, Table 2, Col. 1 values for all offsite receptors including the site boundary on out. It is noted that the location of the maximum airborne concentration for a given radionuclide does not necessarily correspond to the MEI location. This is due primarily to the fact that the maximum concentrations for individual nuclides can vary due to large differences in values input into the dispersion model for each of the effective stacks—such inputs include stack height, stack diameter, flow rate, and total radionuclide activities released per stack. Another reason for the disparity is the fact that the MEI dose includes both inhalation and ingestion pathways.

Table 1. Organ Dose Equivalents and Effective Dose Equivalent at the MEI Location

Organ	**Committed Dose Equivalent (mrem per 2nd Half of 2001)**
Gonads	4.40E-04
Breast	1.27E-04
Red Bone Marrow	5.04E-03
Lungs	1.04E-01
Thyroid	5.09E-04
Endosteal Tissue (Bone Surfaces)	6.55E-02
Remainder Organs	3.07E-03
Effective Dose Equivalent	**1.62E-02 mrem**
Location of MEI:	250 meters North Northeast

Notes: Dose results are from the CAP88-PC "Synopsis Report". CAP88-PC uses organ dose weighting factors equal to those in 10 CFR Part 20.1003 to compute the effective dose equivalent.

Table 2. Maximum Predicted Air Concentrations for Receptors at or Beyond the Site Boundary

Nuclide	Maximum Concentration (uCi/mL)	Concentration Location		10 CFR 20, App. B, Table 2, Col. 1 Value (uCi/mL)	Ratio of Maximum Concentration to 10 CFR 20 Value
		Sector	Dist. (m)		
Tc-99	2.1E-17	NNE	500	9.E-10	2.3E-08
Ra-224	4.2E-19	NNE	250	2.E-12	2.1E-07
Ra-228	7.6E-19	NNE	250	2.E-12	3.8E-07
Ac-228	7.6E-19	NNE	250	2.E-11	3.8E-08
Th-228	4.2E-19	NNE	250	2.E-14	2.1E-05
Th-230	2.2E-19	NNE	250	2.E-14	1.1E-05
Th-231	6.4E-19	NNE	250	9.E-09	7.1E-11
Th-232	4.2E-19	NNE	250	4.E-15	1.1E-04
Th-234	1.3E-17	NNE	250	2.E-10	6.5E-08
Pa-234m	6.4E-18	NNE	200	not available	
U-234	1.6E-17	NNE	250	5.E-14	3.2E-04
U-235	3.6E-19	NNE	250	6.E-14	6.0E-06
U-238	7.2E-18	NNE	250	6.E-14	1.2E-04
Pu-238	3.2E-20	NNE	250	2.E-14	1.6E-06
Pu-239	3.5E-19	NNE	250	2.E-14	1.8E-05
Pu-240	1.2E-19	NNE	250	2.E-14	6.0E-06
Pu-241	1.5E-18	NNE	250	8.E-13	1.9E-06
Am-241	1.7E-19	NNE	250	2.E-14	8.5E-06
				Sum of Fractions:	**6.2E-04**

Notes: The maximum concentration values were extracted from the CAP88-PC computer code's "Concentration" output report generated for this semiannual period. Appendix B of 10 CFR 20 does not provide any values for Pa-234m.