

ORISE

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

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February 21, 2006

Ms. Betsy Ullrich
U.S. Nuclear Regulatory Commission
Region 1
475 Allendale Road
King of Prussia, PA 19406

**SUBJECT: REPORT FOR ANALYSIS OF SAMPLES COLLECTED DURING
THE PERIOD JANUARY 10 THROUGH JANUARY 12, 2006 FROM
THE ROYERSFORD WASTEWATER TREATMENT FACILITY
ROYERSFORD, PENNSYLVANIA
(INSPECTION REPORT NO. 99990001/06-001)[RFTA 06-001]**

Dear Ms. Ullrich:

The Oak Ridge Institute for Science and Education (ORISE) received six sludge samples, two effluent water samples, two primary digester sludge samples, three reed samples, and two secondary digester sludge samples on January 17, 2006 from the Royersford Wastewater Treatment Facility. A portion of each sample was used to determine the moisture and solid content (Procedure SP3, Revision 4). Gamma spectroscopy (GS) (Procedure CP1, Revision 15) was performed on each sample as they were received. Total radiostrontium (Procedures AP4, Revision 13 and CP3, Revision 2) was also performed on the six sludge samples, two primary digester sludge samples, and the two secondary digester sludge samples. The results of the moisture content, GS, and total radiostrontium are presented in Tables 1 through 3, respectively. The results are presented in pCi/L for the liquid samples, whereas the results for the solid samples are presented as pCi/g wet weight for the GS and as pCi/g dry weight for the total radiostrontium.

The Quality Control (QC) requirements were met for these analyses. The QC files are available for your review upon request.

Ms. Betsy Ulrich

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February 21, 2006

My contact information is below or you may contact Wade Ivey at 865.576.9184 with any questions or comments.

Sincerely,

Wade P. Ivey
Dale Condra, Manager
Laboratory

RDC/WPI:ar

Enclosures

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TABLE 1

PERCENT MOISTURE AND SOLIDS
IN LIQUID AND SOLID SAMPLES
SP3, REVISION 4
ROYERSFORD WASTEWATER TREATMENT FACILITY
ROYERSFORD, PENNSYLVANIA

ORISE Sample ID	NRC Region I Sample ID	Percent Moisture	Percent Solids
1678M0001	Sludge 1	69	31
1678M0002	Sludge 2	71	29
1678M0003	Sludge 3	66	34
1678M0004	Sludge 4	71	29
1678M0005	Sludge 5	75	25
1678M0006	Sludge 6	80	20
1678M0007	Effluent 1	100	0
1678M0008	Effluent 2	100	0
1678M0009	Primary Digester 1	98	2
1678M0010	Primary Digester 2	98	2
1678M0014	Secondary A-1	98	2
1678M0016	Secondary B-1	98	2
1678V0001	Reeds 1	15	85
1678V0002	Reeds 2	13	87
1678V0003	Reeds 3	22	78

TABLE 2

SELECTED GAMMA EMITTING RADIONUCLIDE CONCENTRATIONS
IN LIQUID AND SOLID SAMPLES
BY GAMMA SPECTROSCOPY
CP1, REVISION 15
ROYERSFORD WASTEWATER TREATMENT FACILITY
ROYERSFORD, PENNSYLVANIA

ORISE SAMPLE ID	NRC Region I Sample ID	Radionuclide Concentrations (pCi/L or pCi/g) ^a			
		Mn-54	Co-58	Co-60	Zn-65
1678M0001	sludge 1	10.04 ± 0.99 ^b (0.95) ^c	0.37 ± 0.58 (0.97)	198.5 ± 6.2 (0.9)	1.3 ± 2.2 (2.4)
1678M0002	sludge 2	5.06 ± 0.59 (0.55)	-0.10 ± 0.34 (0.56)	188.3 ± 5.8 (0.5)	0.92 ± 0.84 (1.41)
1678M0003	sludge 3	12.34 ± 0.76 (0.58)	0.17 ± 0.36 (0.59)	184.2 ± 5.7 (0.5)	3.85 ± 0.96 (1.47)
1678M0004	sludge 4	2.19 ± 0.21 (0.16)	0.02 ± 0.10 (0.17)	39.2 ± 1.2 (0.2)	0.65 ± 0.33 (0.43)
1678M0005	sludge 5	3.98 ± 0.81 (0.74)	-0.18 ± 0.47 (0.75)	211.9 ± 6.6 (0.7)	0.2 ± 1.1 (1.8)
1678M0006	sludge 6	2.02 ± 0.61 (0.65)	-0.26 ± 0.40 (0.64)	147.4 ± 4.8 (0.6)	0.79 ± 0.94 (1.60)
1678M0007	effluent 1	0.5 ± 2.6 (4.4)	-1.2 ± 2.8 (4.6)	1.5 ± 2.9 (5.2)	-4.8 ± 6.9 (9.6)
1678M0008	effluent 2	0.3 ± 2.9 (4.9)	1.5 ± 3.4 (5.2)	2.6 ± 3.8 (5.5)	-0.4 ± 6.5 (11.3)
1678M0009	primary digester 1	6.2 ± 4.5 (4.9)	0.7 ± 3.4 (5.7)	51.4 ± 6.4 (6.0)	-1.0 ± 8.7 (12.3)
1678M0010	primary digester 2	3.7 ± 4.1 (4.2)	0.3 ± 2.5 (4.2)	50.5 ± 6.2 (4.5)	11.0 ± 8.4 (9.2)
1678M0014	secondary A-1	14.6 ± 4.6 (4.5)	-1.4 ± 2.6 (4.2)	175.9 ± 9.4 (4.6)	-3.5 ± 6.0 (9.9)
1678M0016	secondary B-1	11.2 ± 5.5 (4.3)	1.1 ± 2.7 (4.6)	149.5 ± 8.8 (4.5)	-3.0 ± 6.2 (10.4)
1678V0001	reeds 1	0.04 ± 0.02 (0.03)	0.01 ± 0.02 (0.03)	0.14 ± 0.03 (0.03)	0.00 ^d ± 0.04 (0.06)
1678V0002	reeds 2	0.03 ± 0.04 (0.04)	0.01 ± 0.03 (0.05)	0.06 ± 0.06 (0.05)	0.07 ± 0.07 (0.11)
1678V0003	reeds 3	0.02 ± 0.03 (0.05)	-0.02 ± 0.03 (0.04)	0.27 ± 0.08 (0.05)	0.05 ± 0.07 (0.11)

TABLE 2 (continued)

SELECTED GAMMA EMITTING RADIONUCLIDE CONCENTRATIONS
IN LIQUID AND SOLID SAMPLES
BY GAMMA SPECTROSCOPY
CP1, REVISION 15
ROYERSFORD WASTEWATER TREATMENT FACILITY
ROYERSFORD, PENNSYLVANIA

ORISE SAMPLE ID	NRC Region I Sample ID	Radionuclide Concentrations (pCi/L or pCi/g) ^a		
		I-131	Sb-125	Cs-137
1678M0001	Sludge 1	-0.05 ± 0.58 (0.95)	1.92 ± 0.85 (1.47)	15.23 ± 0.96 (0.76)
1678M0002	Sludge 2	0.01 ± 0.37 (0.60)	1.57 ± 0.73 (0.92)	19.18 ± 0.87 (0.45)
1678M0003	Sludge 3	0.54 ± 0.46 (0.64)	1.76 ± 0.66 (1.01)	12.21 ± 0.61 (0.47)
1678M0004	Sludge 4	1.04 ± 0.19 (0.19)	0.37 ± 0.22 (0.30)	4.03 ± 0.20 (0.14)
1678M0005	Sludge 5	0.66 ± 0.71 (0.86)	1.18 ± 0.96 (1.30)	22.0 ± 1.1 (0.6)
1678M0006	Sludge 6	0.73 ± 0.51 (0.70)	1.51 ± 0.82 (1.06)	14.08 ± 0.82 (0.53)
1678M0007	Effluent 1	13 ± 10 (13)	3.7 ± 6.7 (10.9)	-3.3 ± 5.0 (5.4)
1678M0008	Effluent 2	20 ± 12 (13)	0.4 ± 6.3 (11.0)	4.3 ± 4.4 (3.3)
1678M0009	Primary Digester 1	2300 ± 100 (10)	-5.2 ± 7.7 (12.9)	13.0 ± 4.1 (5.4)
1678M0010	Primary Digester 2	3690 ± 150 (10)	3.9 ± 6.2 (10.0)	10.9 ± 3.5 (4.3)
1678M0014	Secondary A-1	659 ± 30 (7)	2.3 ± 5.7 (10.4)	13.8 ± 5.2 (4.2)
1678M0016	Secondary B-1	627 ± 28 (7)	-3.7 ± 5.6 (9.5)	18.9 ± 5.2 (4.4)
1678V0001	Reeds 1	0.02 ± 0.05 (0.08)	-0.01 ± 0.04 (0.06)	1.00 ± 0.05 (0.03)
1678V0002	Reeds 2	0.09 ± 0.10 (0.12)	0.02 ± 0.06 (0.11)	0.61 ± 0.06 (0.05)
1678V0003	Reeds 3	-0.01 ± 0.08 (0.13)	0.04 ± 0.06 (0.11)	0.58 ± 0.07 (0.04)

^aSamples 1678M0007-M0010, 1678M014, and 1678M016 are pCi/L and all other samples are pCi/g wet material.

^bUncertainties represent the 95% confidence level, based on total propagated uncertainties.

^cMDC values are in parenthesis.

^dZero value due to rounding.

TABLE 3

TOTAL RADIOSTRONTIUM CONCENTRATIONS
IN SOLID SAMPLES
BY LOW BACKGROUND BETA COUNTING
AP4, REVISION 13; CP3, REVISION 2
ROYERSFORD WASTEWATER TREATMENT FACILITY
ROYERSFORD, PENNSYLVANIA

ORISE SAMPLE ID	NRC REGION I SAMPLE ID	Total Sr Concentrations (pCi/g dry weight)	MDC (pCi/g dry weight)
1678M0001	Sludge 1	0.48 ± 0.26^a	0.39
1678M0002	Sludge 2	1.77 ± 0.37	0.44
1678M0003	Sludge 3	0.64 ± 0.29	0.44
1678M0004	Sludge 4	0.85 ± 0.36	0.53
1678M0005	Sludge 5	21.7 ± 1.1	0.4
1678M0006	Sludge 6	1.03 ± 0.24	0.30
1678M0009	Primary Digester 1	5.1 ± 2.5	3.8
1678M0010	Primary Digester 2	1.2 ± 2.4	4.2
1678M0014	Secondary A-1	4.2 ± 2.6	4.1
1678M0016	Secondary B-1	3.9 ± 2.7	4.2

^aUncertainties represent the 95% confidence level, based on total propagated uncertainties.