NMP-RMT--910319-Rev.1

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DOCUMENTATION OF TOXICITY TESTING RESULTS ON INCREASED SUPERNATE TREATMENT RATE OF 2700 GALLONS/BATCH(U)

by

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Aiken, South Carolina 29808

DISCLAIMER

This report was prepared in connection with work done under Contract No. DE-AC09-89SR18035 with the U.S. Department of Energy.

WESTINGHOUSE SAVANNAH RIVER COMPANY NMP-RMT-910319, Rev. 1

INTER-OFFICE MEMORANDUM

September 16, 1991
Revised July 6, 1992

TO: C. P. Thompson, 730-M
Reactor Materials Engineering and Technology

FROM: J. B. Pickett, 730-M (5-3838)
Reactor Materials Engineering and Technology

Documentation of Toxicity Testing Results on Increased Supernate Treatment Rate of 2700 Gallons/Batch (U)

Summary

In February 1991, Reactor Materials increased the rate of supernate treatment in the M-Area Dilute Effluent Treatment Facility (DETF) from 1800 gallons to ~2700 gallons of supernate per 36,000 gallon dilute wastewater batch. The first release of the treated effluent began March 3, 1991. A series of whole effluent toxicity tests was conducted on the DETF effluent to determine if the increased supernate concentration would result in any chronic toxicity affects in the receiving stream (Tims Branch). The toxicity tests were conducted at instream concentrations equivalent to DETF release rates of 5, 10, 15, 20, and 25 gallons/min.

The test results, based on 7-day Ceriodaphnia dubia chronic toxicity, indicated no toxicity effects at any concentration tested. Supernate treatment in the DETF continued at the higher concentration. The toxicity results are summarized below:

	Toxicity Results: Average No. Young				
Control (# of Young)	16.9	19.4	21.8	20.0	21.0
Test (# of Young)	18.6	20.0	20.2	15.0	22.2
Test Different From Control	No	No	No	No	No
Instream Concentration, %	0.44	0.89	1.33	1.78	2.22
Equivalent DETF Release Rate, gpm	5	10	15	20	25

RECORD AUTHENTICATED BY SIGNATURE Rosene B. Johnson 7/27/92

M-AREA EFFLUENT TOXICITY TESTING, TREATED SUPERNATE

SUPERNATE BATCH NO 37 (2734 GALS SUPERNATE/36,000 GALS WASTEWATER)

Date*	3/4/91	3/6/91	3/8/91
Time Sampled	0945	0900	0900
Flow rate, gpm	5	5	5
Collection location	M-004	M-004	M-004
Normandeau Log.No.	H00014	NA	H00028

*Sample collection dates for Chronic Toxicity Test Renewals
(These samples were diluted by the testing laboratory to the concentrations equivalent to various DETF release rates)

7 Day Chronic Toxicity Test Results **

20% Perrier/Milli Q water		Control	Control	Control	Control	Control
Ave. No. Repro.		**16.9**	**19.35**	**21.8**	**20**	**21**
"Instream" concentration#	%	0.44	0.89	1.33	1.78	2.22
Equivalent DETF release rate	gpm	5	10	15	20	25
Ave. No. Repro.		**18.55**	**19.95**	**20.18**	**14.95**	**22.2**
Pass/Fail		Pass	Pass	Pass	Pass	Pass

#Assuming 1125 gpm(1.6MGD) at A-014
**Toxicity testing by Normandeau Associates, New Ellenton, SC.

Normandeau Chemical Analyses

Sample Id		%	Control*	0.44*	0.89*	1.33*	1.78*	2.22*	100**
pH			7.70	7.61	7.78	7.79	7.83	7.84	7.27
Temp.		°C	24.9	24.5	24.4	24.5	24.6	24.7	-
Alkalinity	(ppm CaCO3)		61.1	-	-	-	-	-	46.7
Hardness	(ppm CaCO3)		78.9	-	-	-	-	-	4.33
Conductivity	(mS/cm)		0.167	0.221	0.273	0.323	0.372	0.419	9.83
Dissolved Oxygen		mg/L	7.70	7.65	7.68	7.58	7.6	7.54	-
Total Residual Cl		mg/L	-	-	-	-	-	-	<0.02

The chemical lab. results are the average of 7(*) analyses and 3(**) analyses, respctively on each of the "instream" concentration samples.

320-M Lab. Analyses on Equalization Tank and Effluent Samples#

		Equalization Tank	Effluent#
Date sampled		2/25/91	3/1/91
Time sampled		0255	0700
320 Lab. Id. No.		351	398
pH		8.3	7.58
Tot. Suspended solids	mg/L	1335	5.0
Al	mg/L	52.1	0.047
B	mg/L	0.29	2.01
Cd	mg/L	<0.002	<0.002
Cr	mg/L	0.04	<0.002
Cu	mg/L	0.004	<0.002
Fe	mg/L	0.81	0.014
Ni	mg/L	0.07	0.002
Pb	mg/L	0.02	<0.013
Sn	mg/L	0.03	0.009
Zn	mg/L	0.11	0.015
U	mg/L	<0.01	0.05
NITRATE (as N)	mg/L	1291.0	1002.0
PHOSPHATE (as P)	mg/L	21.0	12.8
CHLORIDE	mg/L	20.6	-
SULFATE(as S)	mg/L	2859	-

#A grab sample from the DETF storage tank.

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Normandeau Associates, Inc.
P.O. Box 1393
Aiken, SC 29802
(803) 652-2206
(803)652-7428 (Fax)

NORMANDEAU ASSOCIATES

6 April 1991

John Pickett
Westinghouse Savannah River Co.
Buiding 730 - M
PO Box 616
Aiken, SC 29802

Dear John:

Enclosed please find copies of tables summarizing the results of the 5 SC Pass/Fail chronic toxicity tests, a copy of a SC chronic toxicity test data form, and your chain-of-custody forms. This contract specifies that we perform only SC chronic toxicity tests and the price we quoted reflects the level of effort associated with performing and reporting these test results. The tables that I've submitted are adopted from those used by the state of South Carolina to summarize these tests. I've provided the chemistry data in more detail than would have appeared on the SC form; chemistry data is summarized in Tables 6 and 7. As you can see, no chronic effect was indicated at any of the concentrations tested.

Please contact me if I can answer any questions you might have regarding these data.

Yours,

Kathleen E. Trapp, Ph.D.
General Manager
Normandeau Associates

Table 1. Summary of observations made during a 7-day Ceriodaphnia dubia chronic toxicity test performed on an effluent collected from the M004 outfall located on the Savannah River Site. Laboratory water (20% Perrier/Milli-Q water) served as the control and diluent for this test. A 0.44% effluent solution was tested. 5 - 12 March 1991.

	Control		Effluent	
Replicate	Adult (L/D)	# of Young	Adult (L/D)	# of Young
1	L	19	L	20
2	L	21	L	21
3	L	25	L	24
4	L	24	L	23
5	L	22	L	20
6	D	0	L	12
7	L	15	L	19
8	L	21	L	21
9	L	17	L	13
10	D	0	L	26
11	L	12	L	15
12	L	22	L	20
13	L	17	L	20
14	L	11	L	21
15	L	18	L	13
16	L	18	L	12
17	L	19	L	25
18	L	20	L	23
19	L	18	L	13
20	L	18	L	10
mean number of young:		16.85		18.55
standard deviation:		6.72		4.90

Pass/Fail Results	%Mortality	Young Prod.
Control:	10	16.85
0.44% Effluent:	0	18.55
Statistical Test:	Fisher's	NA
Pass/Fail:	Pass	Pass

Table 3. Summary of observations made during a 7-day Ceriodaphnia dubia chronic toxicity test performed on an effluent collected from the M004 outfall located on the Savannah River Site. Laboratory water (20% Perrier/Milli-Q water) served as the control and diluent for this test. A 1.33% effluent solution was tested. 5 - 12 March 1991.

	Control		Effluent	
Replicate	Adult (L/D)	# of Young	Adult (L/D)	# of Young
1	L	18	L	MALE
2	L	15	L	12
3	L	23	L	13
4	L	25	L	11
5	L	25	L	MALE
6	L	23	L	MALE
7	L	26	L	19
8	L	26	L	26
9	L	20	L	23
10	L	16	L	23
11	L	24	L	22
12	L	15	L	18
13	L	23	L	22
14	L	19	L	23
15	L	26	L	15
16	L	26	L	22
17	L	25	L	21
18	L	15	L	24
19	L	22	L	25
20	L	23	L	24
mean number of young:		21.75		20.18
standard deviation:		4.04		4.72

Pass/Fail Results	%Mortality	Young Prod.
Control:	0	21.75
1.33% Effluent:	0	20.18
Statistical Test:	NA	t-test
Pass/Fail:	Pass	Pass

Table 5. Summary of observations made during a 7-day Ceriodaphnia dubia chronic toxicity test performed on an effluent collected from the M004 outfall located on the Savannah River Site. Laboratory water (20% Perrier/Milli-Q water) served as the control and diluent for this test. A 2.22% effluent solution was tested. 5 - 12 March 1991.

	Control		Effluent	
Replicate	Adult (L/D)	# of Young	Adult (L/D)	# of Young
1	L	37	L	23
2	L	21	L	24
3	L	22	L	20
4	L	22	L	19
5	L	20	L	21
6	L	24	L	25
7	L	20	L	24
8	L	12	L	21
9	L	21	L	21
10	L	13	L	23
11	L	21	L	21
12	L	21	L	23
13	L	23	L	24
14	L	23	L	20
15	L	23	L	24
16	L	14	L	23
17	L	22	L	19
18	L	21	L	23
19	L	21	L	23
20	L	23	L	23
mean number of young:		21.2		22.2
standard deviation:		5.02		1.79

Pass/Fail Results	**%Mortality**	**Young Prod.**
Control:	0	21.20
2.22% Effluent:	0	22.20
Statistical Test:	**Fisher's**	**NA**
Pass/Fail:	**Pass**	**Pass**

Table 7. Summary of basic water chemistry for a 7-d Ceriodaphnia dubia chronic static renewal toxicity test; 24-h readings, conducted on effluent discharged from NPDES Outfall M004 located on the Savannah River Site. Values are the mean, standard deviation, range and number of observations. Dilute mineral water served as the control and diluent. 5 - 12 March 1991.

Concentration (%)	Dissolved Oxygen (mg/L)	Temperature (°C)	pH
Control	7.49 ± 0.36 (7.79-7.90) n = 7	24.4 ± 0.38 (24.0-25.1) n = 7	7.91 ± 0.09 (7.80-8.00) n = 7
0.44	7.42 ± 0.46 (6.69-7.91) n = 7	24.5 ± 0.41 (24.1-25.1) n = 7	8.01 ± 0.08 (7.85-8.10) n = 7
0.89	7.53 ± 0.39 (6.86-8.01) n = 7	24.5 ± 0.43 (24.0-25.2) n = 7	8.04 ± 0.07 (7.90-8.10) n = 7
1.33	7.50 ± 0.43 (6.92-8.02) n = 7	24.5 ± 0.45 (24.0-25.3) n = 7	8.06 ± 0.08 (7.90-8.10) n = 7
1.78	7.46 ± 0.46 (6.78-8.02) n = 7	24.5 ± 0.42 (24.0-25.2) n = 7	8.06 ± 0.09 (7.90-8.15) n = 7
2.22	7.49 ± 0.49 (6.64-8.02) n = 7	24.5 ± 0.40 (24.1-25.2) n = 7	8.06 ± 0.09 (7.90-8.15) n = 7

OSR 4 451 (Rev 8 88)

NPDES SAMPLES
ENVIRONMENTAL COLLECTIONS
CHAIN OF CUSTODY RECORD

SRM NA1

DISTRIBUTION VENDOR
LAB RECEIVING SAMPLES
FILE 735 A

PROJECT NAME WSRC
~~E.I. du Pont (SRP)~~ - NPDES RE. REECE

SAMPLER (SIGNATURE) B. B. Harrell

STA NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NUMBER OF CONTAINERS	SAMPLES ANALYSIS (/) TOTAL AL. FE	VOLATILE ORGANICS	TOTAL MG. MN. ZN	FECAL COLIFORM (400-D)	BOD	TSS	O & G	TOTAL CR	SULFATE	LAB LOG NUMBER	REMARKS
	3-691	0900		✓	M-004	1											TOXICITY

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME
B B Harrell	3-691	1115	Becky Bowman			
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME
		AM				
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY LAB (SIGNATURE)	DATE	TIME	REMARKS

Rec'd 11 Mar 91

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NPDES TOXICITY TEST REPORTING FORM - SCI

Facility:_____ NPDES #:SC_____
Sampling Point:_____ Receiving Stream:_
Laboratory: NORMANDEAU-SE Cert. No.: 87075 Exp.

Test Organism: Ceriodaphnia dubia Temp.Range:_____
Test Type: [ ] hr acute; [ ] d chronic; ___ static __
Started (date/time):_____ h Ended (date/tir

Dilution Water Source	Alk (mg/L)	Hard (mg/L)
20% Mill Q; Perrier		
~~10% Diluto Mineral Water~~	_____	_____

Sample Type: [ ] grab [ ] hr comp.

Sample #	Date/Time Collected	Alk (mg/L)	Hard (mg/L)	Cond (µmhos/
1	_____/_____ h	_____	_____	_____
2	_____/_____ h	_____	_____	_____
3	_____/_____ h	_____	_____	_____

Control

Day		0	1	2	3	4	
Temp	Initial						
DO	Initial						
	Final	----					
pH	Initial						
	Final	----					

( ) % Effluent

Day		0	1	2	3	4	
Temp	Initial						
DO	Initial						
	Final	----					
pH	Initial						
	Final	----					

Comments: *TRC measured in laboratory

END

DATE
FILMED
12/22/92