Rainier ENVIRONMENTAL

Dangerous Waste Characterization

Sample ID: SS-6

Report date: May 22, 2023

Submitted to:

Stratum Group
2102 Young Street
Bellingham, WA 98225

Rainier Environmental
5013 Pacific Hwy East
Suite 20
Tacoma, WA 98424

1.0 INTRODUCTION

A dangerous waste characterization using the test organism *Oncorhynchus mykiss* (rainbow trout) was conducted on one sample submitted by Stratum Group to Rainier Environmental. Testing was conducted following the Washington State Department of Ecology Publication 80-12.

2.0 METHODS

The sample, identified as SS-6 was received in the laboratory on May 16, 2023. Upon arrival at the laboratory the sample was inspected and contents verified against information provided on the chain-of-custody form. The sample was stored at 4°C in the dark until use. The test procedure is outlined in Table 1.

Table 1. Summary of Dangerous Waste Characterization Test Conditions

Parameter	Standard Fish Toxicity Test
Test number	2305-026
Sample ID	SS-6
Test initiation date; time	5/17/2023; 1030h
Test termination date; time	5/21/2023; 1030h
Endpoint	Mortality at 96-hours
Test chamber	7.5 L plastic tank
Test temperature	12 ± 1°C
Dilution water	Moderately hard synthetic water
Test solution volume	6 L
Test concentrations (mg/L)	100, 10, 0
Number of organisms/chamber	10
Number of replicates	3
Test organism	*Oncorhynchus mykiss* (rainbow trout)
Feeding	No feeding during test
Photoperiod	16 hours light/ 8 hours dark
Extraction	Rotary agitation (30 +/- 2 rpm) for 18 hours
Reference Toxicant	Copper sulfate
Deviations	None

The test organisms used in the test are outlined in Table 2. The samples were tested using fish received on May 2, 2023.

Table 2. Test organisms (*Oncorhynchus mykiss*)

Test organism age	44 days post swim-up (hatch date 3/13/2023)
Mean weight	0.38 g
Mean length	37 mm
Ratio of longest to shortest	1.2
Loading	0.63 g/L
Test organism source	Trout Lodge; Sumner, WA

3.0 RESULTS

A summary of results for the dangerous waste characterization conducted on sample SS-6 is contained in Table 3. There was no mortality during the test. Based on these results, the sample does not designate as either a dangerous or extremely hazardous waste. Copies of the laboratory bench sheets, statistical summaries of reference toxicant tests, and chain-of-custody form are provided in Appendices A through C.

Table 3. Summary of Results

Sample ID	Concentration (mg/L)	Survival (# fish, N=30)	Percent Mortality	Dangerous Waste Designation
Control	0	30	0	NA
SS-6	10	30	0	None
	100	30	0	

4.0 QUALITY ASSURANCE

The most recently completed reference toxicant test was initiated May 15, 2023. The LC_{50} of 115 g/L copper fell within the acceptable range of mean ± two standard deviations of historical test results indicating that the test organisms were of an appropriate degree of sensitivity. The coefficient of variation (CV) for the last 20 tests was 31.3 percent, which is considered excellent by the Biomonitoring Science Advisory Board.

5.0 REFERENCES

WDOE. 2016. Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. Washington State Department of Ecology. Water Quality Program. Publication number: WQ-R-95-80, Revised June 2016.

WDOE. 2020. Biological Testing Methods 80-12 for the Designation of Dangerous Waste. Washington State Department of Ecology. Hazardous Waste and Toxics Reduction Program. Publication number: 80-12, Revised September 2020.

Appendix A

Oncorhynchus mykiss Dangerous Waste Toxicity Test

Raw Bench Sheets

Dangerous Waste Toxicity Test

Client: Stratum Group
Sample ID: SS-6
Test #: 2305-026
Log In #: T23-146

Start Date & Time: 5/17/2023 1030
End Date & Time: 5/21/2023 1030
Test Organism: *Oncorhynchus mykiss*
Test Protocol: **Washington State Department of Ecology Publ. 80-12**

Rep	Conc.	Cont #	Number of Live Organisms					Dissolved Oxygen (mg/L)					pH (units)					Conductivity (umhos/cm)					Temperature (°C)					Percent Survival
			0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
1	CON	16	10	10	10	10	10	8.5	8.1	7.8	7.5	7.2	8.00	7.84	7.57	7.41	7.27	297				303	11.9	12.1	11.7	12.3	11.8	
2		1	10	10	10	10	10	8.9	8.6	8.1	7.9	7.8	8.06	7.86	7.59	7.39	7.31	299				304						
3		27	10	10	10	10	10	8.8	8.4	8.2	8.1	7.9	8.01	7.89	7.56	7.43	7.24	294				298						
1	10 PPM	26	10	10	10	10	10	8.6	8.3	8.0	7.9	7.7	8.04	7.84	7.61	7.37	7.24	291				295	11.8	12.2	11.9	12.3	12.0	
2		18	10	10	10	10	10	9.0	8.7	8.4	8.4	8.1	8.03	7.81	7.59	7.41	7.27	297				303						
3		7	10	10	10	10	10	9.1	8.6	8.3	8.1	8.0	8.07	7.85	7.62	7.39	7.28	293				299						
1	100 PPM	24	10	10	10	10	10	8.8	8.5	8.1	8.0	7.8	8.06	7.87	7.63	7.40	7.31	294				299	11.9	12.3	12.0	12.1	11.9	
2		5	10	10	10	10	10	9.0	8.7	8.5	8.3	8.1	8.00	7.84	7.66	7.36	7.27	290				294						
3		11	10	10	10	10	10	8.7	8.4	8.3	8.2	8.1	8.03	7.85	7.58	7.42	7.31	296				301						
1																												
2																												
3																												
1																												
2																												
3																												
1																												
2																												
3																												
1																												
2																												
3																												
Technician Initials			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]																

Sample	Alk. (init.)	Hard. (init.)	Alk. (fin.)	Hard. (fin.)	Chlorine
	(mg/L as CaCO3)				(mg/L Cl2)
Control	68	92	68	92	<0.03
100PPM	68	92	68	92	

Animal Source: Troutlodge
Date Received: 5/2/2023
Test Volume: 6.0L
Date of Hatch: 3/13/2023
Date of Swim up: 4/3/2023

Weights (g): .37 .34 .38 .33 .41 .39 .38 .40 .35 .38 μ = .38
Lengths(mm): 36 35 36 33 40 39 39 41 37 38 μ = 37
Length max/min: 41/33 1.2 Loading: 0.63 g/L

Rainier Environmental
Washington Laboratory
5013 Pacific HWY E Suite 20
Tacoma, WA 98424

Dilution Water Source: MHSW 045
QA Check [illegible]

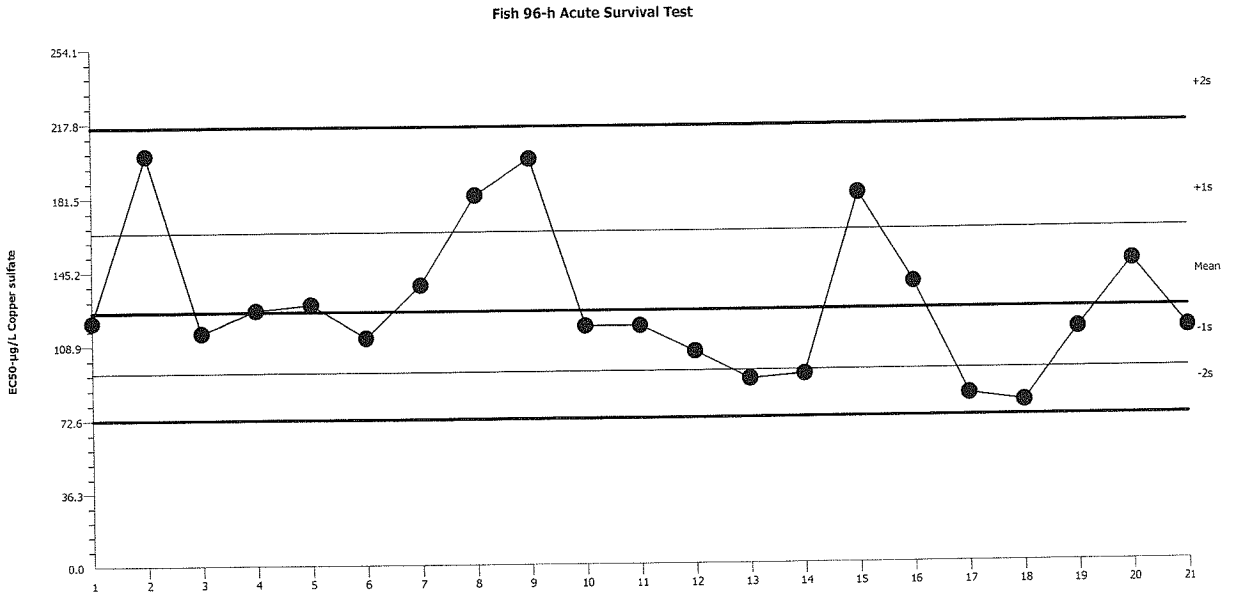
Appendix B
Reference Toxicant Test
Control Chart and Statistical Summary

CETIS QC Plot

Report Date: 22 May-23 10:11 (1 of 1)

Fish 96-h Acute Survival Test — **Rainier Environmental Laboratory**

Test Type:	Survival (96h)	**Organism:**	Oncorhynchus mykiss (Rainbow Tro	**Material:**	Copper sulfate
Protocol:	Not Applicable	**Endpoint:**	96h Survival Rate	**Source:**	Reference Toxicant-REF



Mean:	125.2	**Count:**	20	**-1s Warning Limit:**	95.34	**-2s Action Limit:**	72.6
Sigma:	NA	**CV:**	31.30%	**+1s Warning Limit:**	164.4	**+2s Action Limit:**	215.9

Quality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2021	Sep	6	120.3	-4.908	-0.1468			05-9967-6128	07-2600-9766
2		Oct	4	202.2	76.97	1.758	(+)		19-8922-3248	13-1559-3159
3		Nov	5	114.9	-10.34	-0.3163			04-8669-6249	15-6834-1433
4		Dec	6	126	0.7811	0.02282			13-8732-0751	08-1557-4326
5	2022	Jan	5	128.9	3.726	0.1076			08-2261-8669	03-7761-6146
6		Feb	5	112.2	-12.96	-0.4011			01-7899-0440	09-8784-8920
7		Mar	7	138.2	12.98	0.362			15-8880-5349	18-5703-0746
8		Apr	11	182.3	57.13	1.379	(+)		19-4475-1025	00-2732-4149
9		May	11	200	74.79	1.719	(+)		04-3686-1214	17-7144-4708
10		Jun	13	117.6	-7.656	-0.2315			02-1194-6933	14-6655-2671
11		Jul	11	117.6	-7.656	-0.2315			18-9490-6426	20-8229-8763
12		Aug	12	104.7	-20.48	-0.6555			16-1269-6384	20-8498-8487
13		Sep	14	91.17	-34.04	-1.164	(-)		21-3997-4244	00-3631-7496
14		Oct	10	93.3	-31.91	-1.079	(-)		01-3925-6404	03-9134-1193
15		Nov	14	182.3	57.13	1.379	(+)		09-0829-7750	07-1545-0995
16		Dec	12	138.2	12.98	0.362			02-0643-2090	02-3247-9401
17	2023	Jan	12	83.12	-42.09	-1.503	(-)		10-5717-9012	06-2162-7195
18		Feb	13	79.37	-45.84	-1.673	(-)		19-2977-9552	20-0081-1333
19		Mar	13	114.9	-10.34	-0.3163			14-1992-9075	20-3196-8530
20		Apr	14	148.1	22.9	0.6163			00-0643-4903	11-5830-8594
21		May	15	114.9	-10.34	-0.3163			06-5181-9947	15-0207-5859

CETIS Summary Report

Fish 96-h Acute Survival Test — **Rainier Environmental Laboratory**

Batch ID:	03-1324-2453	**Test Type:**	Survival (96h)	**Analyst:**	Eric Tollefson
Start Date:	15 May-23 10:15	**Protocol:**	Not Applicable	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	19 May-23 10:15	**Species:**	Oncorhynchus mykiss	**Brine:**	
Duration:	96h	**Source:**	Trout Lodge Fish Farm	**Age:**	42d
Sample ID:	08-8734-5798	**Code:**	RA051523OM	**Client:**	Internal Lab
Sample Date:	15 May-23	**Material:**	Copper sulfate	**Project:**	
Receive Date:	15 May-23	**Source:**	Reference Toxicant		
Sample Age:	10h	**Station:**	In House		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
18-8251-7403	96h Survival Rate	50	100	70.71	11.9%		Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	µg/L	95% LCL	95% UCL	TU	Method
15-0207-5859	96h Survival Rate	LC50	114.9	98.8	133.6		Spearman-Kärber

96h Survival Rate Summary

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	1	1	1	1	1	0	0	0.0%	0.0%
25		3	1	1	1	1	1	0	0	0.0%	0.0%
50		3	0.9667	0.9451	0.9882	0.9	1	0.03333	0.05774	5.97%	3.33%
100		3	0.6333	0.5902	0.6765	0.5	0.7	0.06667	0.1155	18.23%	36.67%
200		3	0.1	0.06266	0.1373	0	0.2	0.05774	0.1	100.0%	90.0%
400		3	0	0	0	0	0	0	0		100.0%

96h Survival Rate Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
25		1	1	1
50		1	0.9	1
100		0.7	0.5	0.7
200		0.1	0	0.2
400		0	0	0

96h Survival Rate Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
25		10/10	10/10	10/10
50		10/10	9/10	10/10
100		7/10	5/10	7/10
200		1/10	0/10	2/10
400		0/10	0/10	0/10

Appendix C
Chain-of-Custody Form

Chain of Custody

Rainier ENVIRONMENTAL

Washington
5013 Pacific Highway East, Suite 20 Fife,
WA 98424
Phone253.922.8898

Date 5/15/23 Page 1 of 1

Sample Collection By:

Report to:		Invoice To:	
Company	Stratum Group	Company	Same
Address	2102 Young St.	Address	
City/State/Zip	Bellingham, WA 98225	City/State/Zip	
Contact	Ben Carlson	Contact	
Phone	360-714-9409	Phone	
Email	ben@stratumgroup.net	Email	

ANALYSES REQUIRED

Arsenic @ 21-08

	SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NO. OF CONTAINERS	COMMENTS	Receipt Temperature (°C)
1	SS-6	5/15/23	0730	Soil	Jar	1		
2								
3								
4								
5								
6								
7								
8								
9								
10								

PROJECT INFORMATION		SAMPLE RECEIPT	
Client:	Stebbert	Total No. of Containers	1
PO No.:	Stebbert	Received Good Condition?	Y
Shipped Via:	Fedex	Matches Test Schedule?	Y

SPECIAL INSTRUCTIONS/COMMENTS:
RUSH

RELINQUISHED BY (CLIENT)
(Signature) (Time) 0920
(Printed Name) Ben Carlson (Date) 5/15/23
(Company) Stratum Group

RELINQUISHED BY (COURIER)
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (COURIER)
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY)
(Signature) Eric Tollefson (Time) 0950
(Printed Name) ERIC TOLLESON (Date) 5/16/23
(Log in #) T23-146