Findings of Chronic Bioassays at Champion International Paper Mill, Frenchtown, Montana
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by

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DISCLAIMER

ABSTRACT

Thirty-day flow-through bioassays were conducted on the button-up stage of rainbow trout, *Salmo gairdneri*, using dilutions of waste water from the Champion International Paper Mill near Frenchtown, Montana. A seven-day daphnid, *Ceriodaphnia dubia*, life-cycle test was conducted on a similar series of dilutions as those used for the trout. In addition, a *Ceriodaphnia dubia* static-renewal life-cycle test was conducted on samples of Clark Fork River water from nine stations above and below Champion (ambient test).

Test dilutions used in the study and endpoints used as indicators of effects follow. Dilution waters used for each test were from two sources: (1) Clark Fork River water taken above Champion property and (2) unchlorinated well water. For the trout the percentages of waste for each dilution water were 2, 1.5, 1.12, 0.64, 0.36, 0.2 and 0 (control) percent. For the *C. dubia* test, the series was 4, 2, 1.5, 1.12, 0.64, 0.36, 0.2, and 0 (control) percent. For the ambient test using *C. dubia* and river water, samples were taken daily at each of nine locations, returned to the laboratory unpreserved and the test organisms transferred daily into the new sample. Endpoints of effects for the trout was mortality and growth measured two ways: weights and lengths. Any other indication of effect was noted. For the tests with *C. dubia*, mortality and reproduction were used as endpoints.

Mortality of fish in both series of dilution waters and waste was extremely low and no indications of reduced growth could be attributed to increased concentrations of Champion's waste water. No abnormal swimming or feeding behavior, incidences of disease, nor pathology were apparent during or after the test. No evidence was found to indicate that test dilutions were chronically toxic to trout.

Using reproduction as an endpoint of effect, the number of young daphnids produced by each female *C. dubia* was significantly less in the four percent waste dilution using Clark Fork River water. Control mortality in the dilutions of unchlorinated well water was 60 percent indicating incompatibility with this water.

Ceriodaphnia dubia survived and reproduced in ambient water from nine locations on the Clark Fork River and no indication of toxicity was found at any of the stations. Greatest reproduction was in water taken at Huson, the station immediately below Champion.

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CONTENTS

Page

Abstract ii
Acknowledgements iii

Introduction 1

- Background of the Study 1
- Request for Assistance 2
- Consideration of Test Procedure and Conditions 2
- Site Description 3

Methods and Materials 3

- Procedures 3
- Sampling Dates and Parameters 6

Results 9

- Clogged Drain System 9
- Mortality 9
- Growth of Fish 9
- Ceriodaphnia Growth and Reproduction in Waste Water 13
- Ceriodaphnia Growth and Reproduction and Below Outfall 13
- Analysis of Chemical Constituents 17

Discussion 18
Recommendations 19
Literature Cited 20
Appendices

A. Outline for Chronic Fish Bioassay: Champion International Paper Mill, Frenchtown, Montana.

B. Means (and Ranges) of Chemical Parameters Measured On-Site: Champion International Waste Water Diluted with Unchlorinated Well Water.

C. Means (and Ranges) of Chemical Parameters Measured in the Laboratory: Champion International Waste Water Diluted with Unchlorinated Well Water.

D. Means (and Ranges) of Chemical Parameters Measured in the Laboratory: Champion International Waste Water Diluted with Unchlorinated Well Water.

E. Means (and Ranges) of Chemical Parameters Measured On-Site: Champion International Waste Water Diluted with Clark Fork River Water.

F. Means (and Ranges) of Chemcial Parameters Measured in the Laboratory: Champion International Waste Water Diluted with Clark Fork River Water.

G. Means (and Ranges) of Chemical Parameters Measured in the Laboratory: Champion International Waste Water Diluted with Clark Fork River Water.

H. Organic Analysis Data Sheet - Champion Waste 5/17/85.

I. Organic Analysis Data Sheet - Champion Waste 5/31/85.

J. ICAP Analyses Data Sheets, Champion Waste Water, Well Water, and Clark Fork River Water, collected on 5/17/85 and 5/31/85.

INTRODUCTION

In a letter dated January 9, 1985, the Regional Administrator of EPA's Region VIII received a request for assistance from the Department of Health and Environmental Sciences, State of Montana, for use of a mobile bioassay facility to conduct a long term test using rainbow trout on treated waste water from Champion International Paper Mill.

For some time, there had been public concern about water quality in the lower Clark Fork, River, in particular the long-term impacts from the discharge of treated waste water from Champion International. The question was whether Champion waste water had deleterious effects on the early-life stages of trout inhabiting the Clark Fork River. Results of such a study would aid in conducting a modified discharge permit originally issued by the State of Montana in April 1984. Assistance was requested to conduct long-term chronic bioassays using trout eggs through post hatch.

Background of the Study

The Champion International Paper Mill, formerly Hoemer-Waldorf and recently purchased by the Stone Container Corporation, located at Frenchtown, Montana, began operation in 1957. At startup, mill production of unbleached kraft pulp totalled 250 tons/day (TPD). Since 1957, mill expansions have occured in 1960, 1966, 1970, and 1976; with the current production, a maximum of 2005 TPD unbleached kraft pulp and liner board. At present, Champion waste water receives the equivalent of secondary treatment (aeration) followed by a minimum of 10 days retention. An intricate and convoluted series of retention ponds is shown by diagram in Figure I. Three non-chloro-phenolic biocides are used to treat the paper machine stock systems and the minimum amount of dilution the waste water would receive in the Clark Fork River is 200 parts river water to 1 part waste water. A more detailed summary concerning issues in the Clark Fork follows.

According to the publication, Montana Water Quality 1984, the two largest dischargers to the lower Clark Fork are the City of Missoula and Champion International. Both have been asked to expand their self-monitoring programs to provide data needed by the state to assess water quality impacts. A modified permit, issued in April 1984, allowed Champion to increase its yearly load of suspended solids to the river and to discharge year-round, but only when flows in the river exceed 1,900 cubic feet per second (cfs). Nutrients, heavy metals and suspended solids, expecially organic solids had been issues raised. Concern has been expressed about Champion and the City of Missoula as point sources of nitrogen and phosphorus which may have stimulated undesirable algal growth in downstream reserviors and in Lake Pend Oreille, Idaho. Heavy metals which originate upstream in the Butte mining district, may have been mobilized by lowered dissolved oxygen and lower pH of bottom waters downstream, thereby making them more toxic to fish and aquatic life.

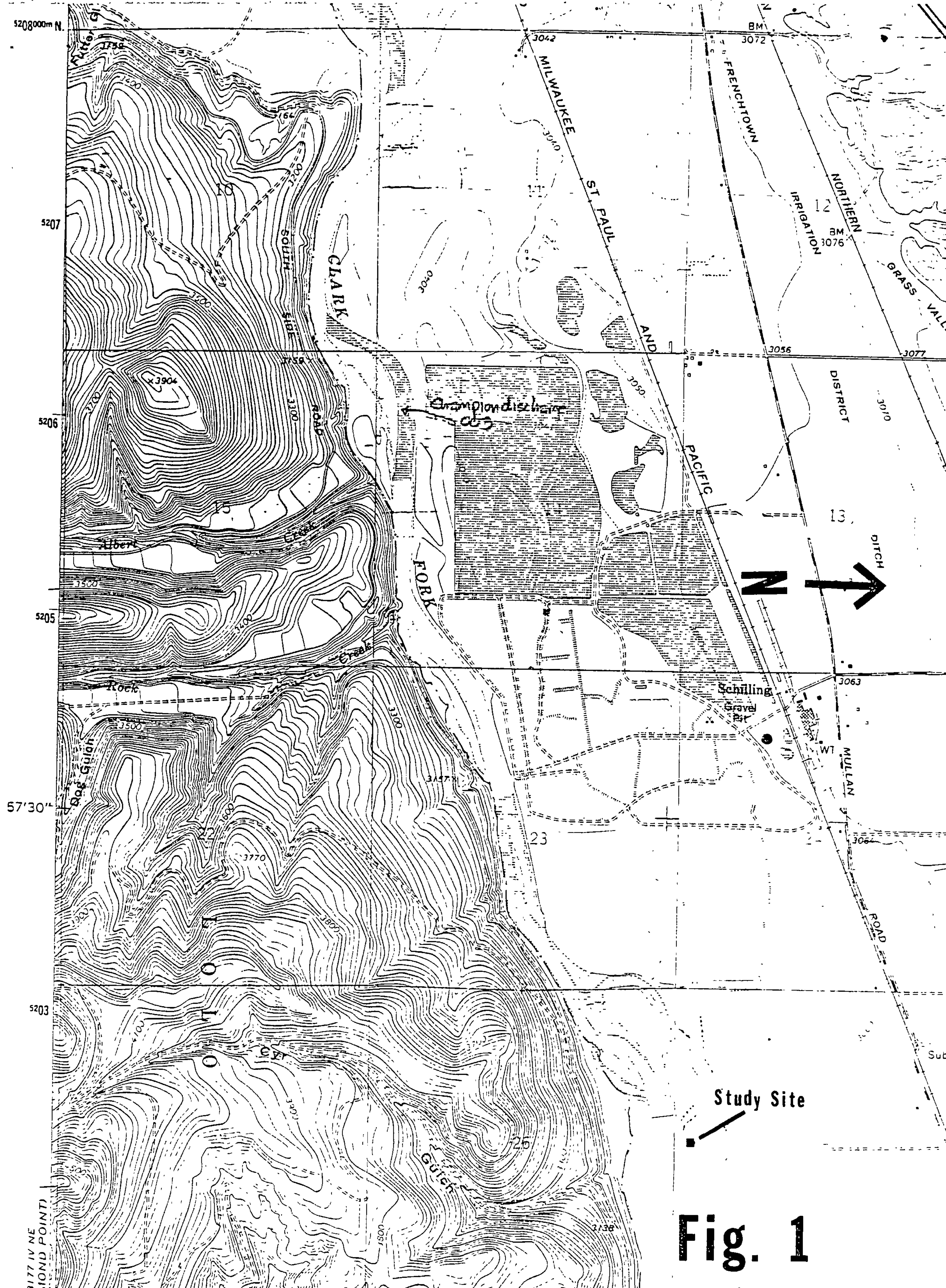
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Fig. 1

Request for Assistance

Therefore, the request from the State of Montana involved testing the long term effects of wastewater using two options:

1. a 30-day test from fertilized trout eggs to hatch, or
2. a 60-day test from the eyed-egg stage of a trout through 30 days of growth.

The first option has the advantage of testing at what was believed to be the most sensitive stage of embryological development, the period immediately after fertilization. The second option allowed for measurement of rate of growth and survival, two sensitive endpoints. Because the American Society for Testing and Materials procedure (ASTM, 1985) recommended the eggs should be incubated at 10°C and at extremely low light intensity, the development of eggs using either option was extremely lengthy due to the low temperature. EPA responded to the request for assistance with a workplan outlining an optional approach to address the concerns in the letter of request (Appendix A).

Considerations of Test Procedure and Conditions

The Montana Department of Health and Environmental Sciences requested that tests be conducted on the most sensitive stages of fish inhabiting the Clark Fork River. Specifically, tests were requested using the egg stage of the rainbow trout life cycle. Wastes from the pulp mill lagoon system were to be mixed with dilution water from the Clark Fork River and pumped through a "flow-through" dilution system to test chambers containing trout eggs.

However, information received from Dr. C.E. Warren at Oregan State University (Personal Communication 2-4-85) indicated that the most sensitive stage of a salmonid species exposed to stable unbleached kraft pulp mill waste, was the period from button-up stage to the juvenile stage in the life cycle. Therefore, EPA Region VIII personnel proposed the following tests: (1) rainbow trout exposed to dilutions of waste from the button-up stage through 30 days, and (2) a seven-day Ceriodaphnia dubia life cycle test, exposed to a series of waste dilutions similar to those used in the studies with trout.

In addition to the test above, a seven-day Ceriodaphnia life cycle test was used to determine ambient toxic conditions in the Clark Fork River at nine sites above and below Champion International. Each day from May 10 to 16, a grab sample of water from the CLark Fork was transported to the study site at Champion International to be used in the testing.

Site Discription

The Champion International Paper Mill is located about five miles northwest of Missoula, Montana near Frenchtown. The mill and waste ponds are located on the left side of the river (north bank) with some treatment ponds close enough to the river to seep wastes into the river. The mobile laboratory was located on Champion's property next to the River at a power source close to ponds 1A and 2 (Figure 1). Treated waste water was hauled (daily) to the mobile laboratory and mixed with Clark Fork River water for one series of dilutions. A separate set of dilutions was obtained by mixing the waste with unchlorinated well water from wells adjacent to the mobile laboratory.

METHODS AND MATERIALS

Procedures

The following procedures were used as guidance for conducting the test with rainbow trout: ASTM, 1985; Birge and Black, 1981; and Peltier and Weber, 1985. Larval rainbow trout, Salmo gairdneri, were obtained from the U.S. Fish and Wildlife hatchery, Creston, Montana on May 3, 1985 and transported to the mobile laboratory. They were acclimated to and held in unchlorinated well water until testing began on May 13, 1985. During this period of ten days the fish began to actively feed on trout chow and from this stage through the 30 days of testing they were fed a rate of 4% diet (dry weight/fish weight/day) as suggested in the ASTM, draft No. 8 document. Test temperature was 12 ± 1.5 C throughout the test period and test dates, May 13 - June 12, 1985. Forty fish were used in each aquarium, resulting in 80 fish per waste dilution.

We used the following methods to test Ceriodaphnia dubia: Mount and Norberg 1984; Horning and Weber 1985; and Hamilton 1984. To begin a test, twelve-hour-old daphnids, one per test container and ten replicates per dilution of Champion International waste water or ambient site water from the Clark Fork River, were used. Each day, for seven consecutive days, the daphnids were transferred into renewed test solutions. On day four, the females began to produced young and within three days and two additional broods, about 30 + daphnids/female daphnid in "control" water are produced. Their diet consisted of a mixture of dried cereal leaves, trout chow and bakers' yeast.

For the fish tests, dilutions of Champion's waste water were predetermined to provide the following series using Clark Fork River as dilution: 4/200; 3/200; 2.24/200; 1.28/200; 0.72/200; 0.4/200; and 0/200 (control). A second series of identical dilutions were also tested using unchlorinated well water. This latter series was tested because of the possibility of metals in Clark Fork River Water confounding the results using the Champion waste. The result was a median dilution between 1/200 and 0.72/200 diluter setting in both series of dilutions. In terms of percentages of waste to dilution water, the series were 2, 1.5, 1.12, 0.64, 0.36, 0.2, and 0 (control) percent.

For the *Ceriodaphnia* tests, the percentages of waste using either the Clark Fork River water or unchlorinated well water were 4, 2, 1.5, 1.12, 0.64, 0.36, 0.2 and 0 (control) percent.

To test ambient conditions in the Clark Fork River with *Ceriodaphnia*, each day from May 10 to 16, grab samples of water from nine sites on the Clark Fork River were transported to the study site at Champion's. These sites were above and below the plant and the locations are listed in Table 1. Each day test animals were transferred to new solutions (static renewal) and events such as mortality or reproduction were noted and recorded.

Table 1. Locations of Sampling Stations on the Clark Fork River, (CFR) May 10-16, 1985.

Station Number	Description
10	CFR Below Milltown Dam
11	CFR Above Missoula WWTP
12	CFR Harper Bridge
13	CFR At Huson (below Champion)
14	CFR At Superior
15	CFR Above Flathead confluence
16	CFR Thompson Falls
17	CFR Below Thompson Falls
18	CFR Below Noxon Dam

Sampling Dates and Parameters

Samples were collected from each of 14 aquaria according to the schedule in Table 2. In some instances, samples were taken from a single replicate. All sample collection, handling and preservation followed the guidelines established in the following: EPA, 1983; Peltier and Weber, 1985. Information regarding sample size, container, perservative and special handling for various parameters to be analyzed is summarized in Table 3.

Table 2. Sample Parameters and Frequency Champion International Paper Mill, Frenchtown, Montana

Analysis	Frequency	Lab Location
D.O.	Daily	Mobile Lab
Temp.	Continuous	Mobile Lab
Hardness	Daily	State
Alkalinity	Daily	Mobile Lab
pH	Daily	Mobile Lab
Conductivity or TDS	Weekly	State
		Mobile Bioassay
NH_3-N	Daily	State
Dissolvent Organic Carbon	Weekly	State
Total Organic Carbon	Weekly	State
BOD	Weekly	State
Color	Weekly	State
Chlorides	Daily & Weekly	State
Sulfide	Weekly	State
ICAP Metals	6 Samples	Denver-EPA
Organic Priority Pollutants	6 Samples	Denver-EPA

Table 3

Sample Requirements for Chemical Samples Sent to the State and EPA Laboratories

Chemical	Samples Size	Container	Preservative
NH_3-N, Total NO_3-N NO_2-N	1 liter	Cubitainer	2ml conc H_2SO_4
TDS, Conductivity and Hardness	1 liter	Cubitainer	Chilled
Priority Pollutant Organics	1 quart	Glass Jar	Chilled
ICAP-Metals	1 quart	Cubitainer	5ml conc. HNO_3

RESULTS

Clogged Drain System

One unfortunate event interrupted an otherwise problem-free study at Champion. On day 12, a drain system evacuating test water from each of the test aquaria, became clogged. As a result, the test dilutions delivered to aquaria, were not drained. The aquaria finally filled and overflowed into the temperature control bath. As this process was occurring, test fish escaped into the bath, and eventually mixed with fish from other aquaria. Consequently, certain data could not be used in the analyses because of increased numbers of fish in two aquaria while most had reduced numbers of fish. As a result, aquaria with the 0.2 percentage wastewater dilutions were not used in the analysis of data.

Mortality

Mortality during the tests was extremely low in both river and well water dilutions. Using a base of 80 fish per dilution, the percentage of deaths was 10% or less in the dilutions of river water; 8.75% or less in the well water dilutions. No fish died in the last nine days in the well water and only one died in the last ten days in the river water dilutions. Approximately half of the fish that died in the first 20 days of the test were recorded as "pinheads" or non-feeding larvae.

Growth of Fish

Means of condition coefficients, determined by dividing the wet weight by the $(\text{length})^3$, are shown in Table 4. Although significant differences in coefficients occurred among several test groups and controls (0.0), there was no relationship between coefficients and dilution of waste water. Based on condition coefficients, significant differences occurred between control and test fish in the 1.12 and 1.5 percent waste water diluted with river water. Also, in waste water diluted with well water, fish were smaller in the 0.64 and 1.5 percent. We note that some fish exposed to dilutions of river water appeared to be healthier (based on condition coefficients) than those in well water; however, the grand average of the two test regimes (all groups in river water vs. those in well water) were the same, i.e. 165.9 mg for river water and 165.8 mg for well water.

Means and 95 percent confidence limits of wet weights of fish are shown in Table 5. These data are provided to address the varying number of fish in a tank with regard to their growth due to overcrowding and competition for food, or effects of behavior because of in an uneven number of fish per tank. Inspection of wet weights again did not show a dose-response effect with increased concentration of Champion waste water, although fish in dilutions of riverwater of 0.36, 0.64, 1.12 and 1.5 weighed significantly less than controls. Interestingly the heaviest fish were the controls in river water, the next heaviest were fish in the 2.0 percent waste water/river dilution. We also noted that the lowest number (33) of fish in any test dilution (2.0 percent of wastewater/river; 1.12 percent dilution wastewater/well), were heavier than those in other dilutions, but these differences were not significant. The grand average of mean weights of all fish in the river water dilutions were 15 percent greater than those in dilutions of well water suggesting that some factor in the well water was not compatible with successful weight gain of the fish.

Table 4

Means ($\bar{x}$) and 95% Confidence Intervals of Condition Coefficients of Rainbow Trout, Tested in Various Dilutions of Champion International Waste Water.

Percentage Waste water Dilution	Means ($\bar{x}$) Condition Coefficient	95% Confidence Interval	Number of Fish Per Dilution
RIVER WATER			
0.0	173.7	166.9-180.5	56
0.2	182.7	176.8-188.7[2]	85
0.36	164.4	156.7-172.2	66
0.64	160.0	152.5-167.4	58
1.12	159.0	154.4-163.6[3]	76
1.5	148.3	142.6-154.1[3]	48
2.0	173.2	168.8-177.6	33
WELL WATER			
0.0	164.0	158.2-169.7	49
0.2	146.9	143.7-150.0[2]	111
0.36	172.2	166.9-177.6	70
0.64	175.9	171.9-179.9[3]	74
1.12	175.0	168.5-181.5	33
1.5	159.3	150.3-168.3[3]	39
2.0	167.6	162.8-172.3	49

[1] Condition coefficients were calculated by dividing the wet weights of each fish alive at the end of the study by the $(\text{length})^3$, multiplied times 10^4. This procedure provided a measure of the "health" or "plumpness" of the fish expressed as whole numbers.

[2] Excluded from analysis due to co-mingling of fish; data used in the analysis are from the replicates showing number of fish as > 40 each

[3] Significantly different from control fish based on 95% confidence limits.

Table 5

Means ($\bar{X}$) and 95% Confidence Intervals of Wet Weights of Rainbow Trout, Tested in Various Dilutions of Champion International Waste Water.

Percentage Waste Water Dilution	Means ($\bar{x}$) Wet Weights (mg)	95% Confidence Interval	Number of Fish Per Dilution
		RIVER WATER	
0.0	909.7	828.7-990.7	56
0.2	837.6	775.6-899.6[1]	85
0.36	742.0	678.9-805.5[2]	66
0.64	666.6	611.2-722.0[2]	58
1.12	732.6	678.7-787.0[2]	76
1.5	697.3	649.1-745.5[2]	48
2.0	900.2	815.3-985.1	33
		WELL WATER	
0.0	675.9	645.5-706.4	49
0.2	597.8	567.2-628.4[1]	111
0.36	708.0	651.6-764.4	70
0.64	673.6	618.1-729.1	74
1.12	724.0	645.2-802.8	33
1.5	697.1	634.0-760.2	39
2.0	612.7	555.5-669.9	49

1. Excluded from analysis due to co-mingling of fish; data shown are from the replicates showing total number of fish as > 40 each.

2. Significantly different from control fish based on 95% confidence limits.

Ceriodaphnia Growth and Reproduction in Waste Water

Tests with Ceriodaphnia (chronic seven-day static renewal) using waste water and dilutions of well water were not considered acceptable for analysis. Control mortality was 60% in this study, indicating something in the test dilution (well) water affected the survival of daphnids.

Test with the daphnids and wastewater diluted with Clark Fork River water were completed successfully and these data are shown in Table 6. Using the 95% confidence intervals to indicate differences, the number of neonates produced per female was significantly lower in the 4% (8/200) dilution than in controls. We also noted that reproductive success of the 4% dilution-group of daphnids was significantly less than in the 0.2, 0.36, 1.12, 1.5, dilutions as well.

Ceriodaphnia Growth and Reproduction, Above and Below Outfall

Using ambient water from the Clark Fork River sampling stations above and below Champion's outfall as test water, Ceriodaphnia survived and reproduced in water from all locations (Table 7). Survival was 90% and above, and reproduction in water from all stations equalled or exceeded the controls (Table 3). Stations 10, 11, and 12 were considered as "controls" because they were upstream of Champion's outfall. Stations 14 through 18 were considered as "test" stations because they are below Champion. Interestingly, there were no statistical differences among any stations with respect to survival (all greater than 90%), or reproduction (Table 7), except that station 13 (Huson below Champion), reproduction (measured as number of young per female) was significantly greater than all others (Table 7). This difference was significant using data from the 3rd, 4th, or 5th brood releases in the calculations. For example, almost 40 neonates per female were produced on day 7 in water from Huson; whereas between 30 to 34 were produced, on the average, at the other eight stations.

Table 6

Means ($\bar{x}$), Standard Deviations (S.D.) and Confidence Intervals of <u>Ceriodaphnia</u> Reproduction, Tested in Various Dilutions of Champion International Waste water Diluted with Clark Fork River Water

Percentage Waste water Dilution	Number of Survivors	Mean Number of Neonates Produced	95% Confidence Interval
0.0	8	10.6	6.5-14.7
0.2	9	9.9	7.2-12.6
0.36	9	10.9	5.8-16.0
0.64	9	6.6	4.2- 9.0
1.12	9	12.2	7.2-17.2
1.5	10	10.1	6.6-13.6
2.0	10	9.9	4.9-14.9
4.0	9	3.4[1]	1.0- 5.8

1. Significantly different from controls (0.0) at P 0.05.

Table 7

Average Number ($\bar{x}$) of Neonates Produced Per Female Ceriodaphnia in Seven Consecutive Daily Samples of Clark Fork River Water Taken From Nine Stations.

Station	Description	Number of Surviors	Mean Number of Neonates Produced	95% Confidence Interval
		- Data from Total of Five Broods -		
10	CFR Below Milltown Dam	10	30.6	26.2-35.0
11	CFR Above Missolua WWTP	10	30.0	28.4-31.6
12	CFR Harper Bridge	9	30.6	27.8-33.4
13	CFR At Huson (below Champion)	10	39.9	35.9-43.9[1]
14	CFR At Superior	9	32.1	30.3-33.9
15	CFR Above Flathead confl.	9	33.8	28.9-38.7
16	CFR Thompson Falls	9	30.2	27.5-32.9
17	CFR Below Thompson Falls	10	30.6	28.1-33.1
18	CFR Below Noxon Dam	10	31.3	28.7-33.9
		- Data from Total of Four Broods -		
10	CFR Below Milltown Dam	10	29.6	26.3-32.9
11	CFR Above Missoula WWTP	10	30.0	28.4-31.6

12	CFR Harper Bridge	9	29.3	27.3-31.3
13	CFR At Huson (Below Champion)	10	35.4	33.7-37.1[1]
14	CFR At Superior	9	32.1	30.3-33.9
15	CFR Above Flathead Confl.	9	30.0	28.0-32.0
16	CFR Above Thompson Falls	9	29.1	27.5-30.7
17	CFR Below Thompson Falls	10	29.1	27.6-30.6
18	CFR Below Noxon Dam	10	31.3	28.7-33.9

- Data from Total of Three Broods -

10	CFR Below Milltown Dam	10	21.0	19.4-22.6
11	CFR Above Missoula WWTP	10	20.0	18.9-21.1
12	CFR Harper Bridge	9	19.8	18.5-21.1
13	CFR At Huson (below Champion)	10	23.4	22.5-24.3[1]
14	CFR At Superior	9	21.3	20.3-22.3
15	CFR Above Flathead confl.	9	19.9	18.9-20.9
16	CFR Above Thompson Falls	9	19.9	18.9-20.9
17	CFR Below Thompson Falls	10	19.4	17.9-20.9
18	CFR Below Noxon Dam	10	21.3	19.3-23.3

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[1] Significantly different from other stations, i.e. greater number of neonates produced per female.

Analyses of Chemical Constituents

Summaries of chemical parameters measure during the testing are shown in Appendices B through G. Inspection of these data indicate that characteristics of the final test dilutions were similar among the aquaria with either well water or river water. Total ammonia and test temperatures were virtually identical. The pH was higher in well-water dilutions along with conductivity, calcium, magnesium, and alkalinity. Concentrations of dissolved sulfide was greater in dilutions of river water than well water as were concentrations of dissolved organic carbon and total organic carbon. Concentrations of dissolved oxygen throughout the test aquaria were essentially indentical and well above acceptable lower limits for trout. The decision to deliver compressed air to test aquaria was due to slightly lower dissolved oxygen in dilutions of unoxygenated well water and not the river water.

Analysis of 100 percent Champion waste water, Champion's well water, and the Clark Fork River above Champion's outfall on two different sampling dates did not reveal concentrations of known toxic materials (priority pollutants) (Appendices H and I). Of note were concentrations of natural acids, ketones and alcohols in Champion's wastewater with most of these substances higher in the sample collected on 5/17/85 that the sample collected on 5/31/85.

Analyses of metals by ICAP (Appendix J) on two sampling dates did not show any metals at concentrations believed to be toxic. Of interest was the concentration of aluminum in Champion's waste water of 4860 ug/l in the 5/17/85 sample and 3440 ug/l in the 5/31/85 sample. Freeman and Everhart (1971), found that aluminum salts were slightly soluble at pH of about 7.0 and had little effect in rainbow trout. As the pH was raised, greater amounts of aluminum became dissolved and therefore, more toxic. Likewise, studies of acid precipitation suggest that at lower pH, e.g. 5-6, aluminum is also mobilized and more toxic. Important to consider in the tests at Champion was that the maximum concentrations of aluminum in the test solutions were only two percent of those concentrations shown in the analyses because of the dilution factors.

DISCUSSION

We found no evidence that test dilutions of Champion's waste water were chronically toxic to trout. It was unfortunate that the drain system evacuating the test water caused the mingling of fish, but it should also be understood that after the upset, the fish in their respective test aquaria were continuously exposed to the dilutions of waste water for at least 20 days with no apparent effects in survival or growth. There were no noticeable behavioral changes and no incidences of disease nor pathology associated with the waste water.

The single criterion of effect which appeared to be significant was the reduced number of neonates (young) produced by *Ceriodaphnia* in the four (4) percent waste diluted with Clark Fork River water, a concentration which is 16 times the current allowable dilution. Also, there was no indication that the Clark Fork River was impaired at Huson (downstream of Champions' discharge) based on a *Ceriodaphnia* test. In fact, *Ceriodaphnia* produced more young (daphnid) at this station than at all others.

RECOMMENDATIONS

Recommendations for further testing include additional acute and chronic tests with fish and invertebrates. Acute tests are necessary because they provide data for a better-defined series of dilutions for subsequent chronic tests and provide data for calculating acute and chronic ratios. (Using the data in the present report, there were no LC50 limits of toxicity and no toxicological basis for choosing the two percent dilution as the upper limit.) Recommended dilutions of wastewater in the acute tests could be the series; 100, 75, 56, 32, 18, 10 percent waste and a Clark Fork River Water control. Suggested species could include post button-up rainbow trout; the midge *Tanytarsus tentans*, and *Hyalella azteca* both representing benthic forage species; and *Ceriodaphnia* as a reference species-comparison for earlier tests.

For the chronic test, we recommend an eight-day-growth study with post button-up stage rainbow trout tested in two diluter systems be considered. Because we do not have data from acute tests to aid in setting the range of test dilutions, two options are available. The first would provide two identical series of dilutions and about 160 fish per dilution to provide values of (n) great enough to determine subtle differences. The second option could provide a concurrent series using both diluters and a range of 50, 37.5, 28, 16, 9, 5, 2, 1.5, 1.12, 0.64, 0.36, 0.2 percent plus two Clark Fork water controls. These dilutions are feasible without alterations in the diluter design. By this method, if the acute tests showed that the LC50 was between 35 and 65% dilution for example, then the series should bracket the chronic range. In contrast, by using the present test methodology of a two percent upper dilution, a chronic value may never be determined regardless of the duration of the test. A distinct advantage of an eight-day-growth study with rainbow trout would be the ability to repeat the study within a three to four weeks testing period if an upset occurred.

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Appendix A. Outline for Chronic Fish Bioassay: Champion International Paper Mill, Frenchtown, Montana.

APPENDIX A

Outline for Chronic Fish Bioassay:
Champion International Paper Mill, Frenchtown, Montana

Introduction

In a letter dated January 9, 1985, the Regional Administrator (Region VIII) received a request for assistance from the Department of Health and Environmental Sciences, State of Montana for use of a mobile bioassay facility to conduct a long term test using eggs of rainbow trout, on treated wastewater from Champion International paper mill. Assistance was requested to conduct long-term chronic bioassays using trout eggs through post hatch.

For some time, there has been public concern about water quality in the lower Clark Fork River, in particular the long-term impacts from the discharge of treated wastewater from Champion International at Frenchtown. The question that needs resolution is whether the Champion wastewater has discernable effects on the early-life stages of trout inhabiting the Clark Fork River. Results of such a study would aid in the review of a modified discharge permit issued by the State of Montana in April 1984.

Background of the Study

The Champion International Paper Mill, formerly Hoerner-Waldorf, located at Frenchtown, Montana began operation in 1957. At startup, mill production of unbleached kraft pulp totalled 250 tons/day (TPD). Since 1957, mill expansions have occurred in 1960, 1966, 1970, and 1976; with the current production, a maximum of 2005 TPD unbleached kraft pulp and liner board. At present, Champion wastewater receives the equivalent of secondary treatment (aeration) followed by a minimum of 10 days retention. An intricate and convoluted series of retention ponds is shown by diagram in Figure I. Three non-chloro-phenolic biocides are used to treat the paper machine stock systems and the minimum amount of dilution the wastewater would receive in the Clark Fork River is 200 parts river water to 1 part wastewater. A more detailed explanation follows concerning issues in the Clark Fork.

According to the publication, Montana Water Quality 1984, the two largest dischargers to the lower Clark Fork are the City of Missoula and Champion International. Both have been asked to expand their self-monitoring programs to provide data needed by the state to assess water quality impacts. A modified permit, issued in April 1984, allows Champion to increase its yearly load of suspended solids to the river and to discharge year-round, but only when flows in the river exceed 1,900 cubic feet per second (cfs). Nutrients, heavy metals and suspended solids, especially organic solids also are of concern. Concern has been expressed about Champion and the City of Missoula as point sources of nitrogen and phosphorus which may stimulate undesirable algal growth in downstream reservoirs and in Lake Pend Oreille, Idaho. Heavy metals which originate upstream in the Butte mining district, may be mobilized by lowered dissolved oxygen and lower pH of bottom waters downstream thereby making them more toxic to fish and aquatic life.

Request for Assistance

The request from the State of Montana involved testing the long term effects of wastewater using two options:

1. a 30-day test from fertilized trout eggs to hatch, or

2. a 60-day test from the eyed-egg stage of a trout through 30 days of growth.

According to the letter of request, the first option has the advantage of testing at what is believed to be the most sensitive stage of embyological development, the period immediately after fertilization. The second option allows for measurement of rate of growth and survival, two sensitive endpoints. Because the American Society of Testing and Materials Procedure (ASTM) recommends the eggs should be incubated at $12^{\circ}C$ and at extremely low light intensity, the development of eggs using either option is extremely lengthy.

Test Procedure and Conditions

The Montana Department of Health and Environmental Sciences has requested that tests be conducted on the most sensitive stages of fish inhabiting the Clark Fork River. Specifically, tests were requested using the egg stage of the rainbow trout life cycle. Wastes from the pulp mill lagoon system are to be mixed with dilution water from the Clark Fork River and pumped through a "flow-through" dilution system to test chambers containing trout eggs. However, information received from Dr. C.E. Warren at Oregon State University (Personal Communication 2-4-85) indicates that the most sensitive stage of a salmonid exposed to stable unbleached kraft pulp mill waste, is the period from button-up stage to the juvenile stage in the life cycle.

Therefore, EPA Region VIII personnel propose the following tests. Rainbow trout, just after the button-up stage (on feed), will be exposed to dilutions of mill waste for approximately 30 days. Waste dilutions will range from 1:10 to 1:1000 with median dilution present at 1:200 dilution of wastewater to dilution water. Major endpoints of the study will be mortality and growth rates of the larvae. Larvae will be fed four times/day at a relatively high rate of food consumption (>4% diet dry weight/fish weight/day) as suggested in the proposed ASTM methods for chronic tests with salmonid fish. Test temperatures will be held at $12^{\circ}C \pm 1.5^{\circ}$ throughout the test period. The test species will be rainbow trout, *Salmo gairdneri*. Larval fish will be obtained from the U.S. Fish and Wildlife hatchery located at Creston, Montana. A seven-day *Ceriodaphnia* life cycle test will be conducted in parallel with the rainbow trout study using samples from the dilutions used in the trout study. In addition a 7-day *Ceriodaphnia* life cycle test will be used to test ambient stream conditions in the Clak Fork River at eight sites above and below Cham pion International. The locations selected are those in which algal assays are being conducted by EPA/Corvallis as part of the Water Quality Bureau's Lower Clark Fork River Study.

Station Number	Location
11	CFR above Missoula WWTP
12	CFR at Harper Bridge (above Champion)
13	CFR at Huson (below Champion)
14	CFR at Superior
15	CFR above Flathead River confluence
16	CFR above Thompson Falls Reservoir
17	CFR below Thompson Falls Dam
18	CFR below Noxon Dam

Note: An additional station (CFR below Milltown Dam) was added at the time of the study.

Project Description

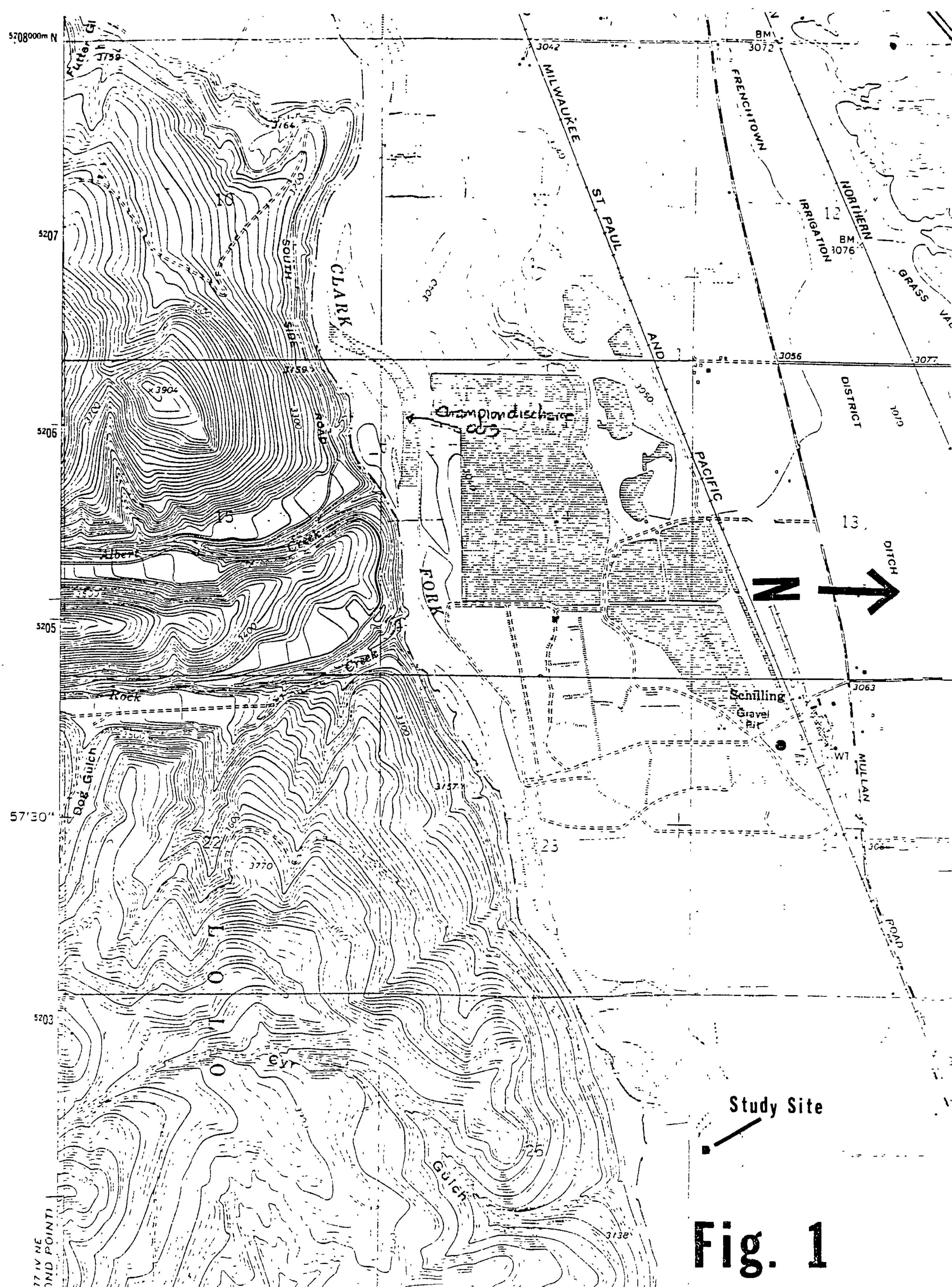
Study Location - The Champion Paper Mill is located about 20 miles northwest of Missoula, Montana near Frenchtown. The mill and waste ponds are located on the left side of the river (north bank) with some ponds close enough to the river to seep wastes into the river. The mobile laboratory will be located on mill property at a power source located upstream of ponds 1A and 2 (Figure 1). Treated wastewater will be hauled (daily) to the mobile laboratory and tested in two ways. Using one diluter system, wastewater will be mixed with Clark Fork River water obtained at the site (upstream of the mill).

In a second separate diluter system, wastewater will be diluted with unchlorinated well water (used for processing at the mill). The well water will be pumped daily to the mobile laboratory. Using two sources of dilution water should aid in the interpretation of results from the trout studies and the wastewater.

Dates of Testing - The test is scheduled from May 4th through June 3rd. Allowing for set-up and breakdown time, we estimate actual on-site time would be from May 1st through June 6th.

Reference Methodologies - All test procedures will follow the EPA "Methods of Measuring the Acute Toxicity of Effluents to Aquatic organisms", 2nd edition and 3rd edition (draft). However, because this is a chronic study, guidance for the the test will be ASTMs "Proposed New Standard Practice for Conducting Fish Early Life-Stage Toxicity Tests (draft No. 8). In addition, methods listed in Birge and Blacks "*In Situ* Acute/Chronic Toxicological Monitoring of Industrial Effluents for NPDES Biomonitoring Program Using Fish and Amphibian Embryo-Larval Stages as Test Organisms" (EPA Report No. DWEP-82-001), and Short-Term Embryo-Larval Test for Effluent Biomonitoring (Preliminary Draft; available from T.H. Morgan School of Biological Sciences, University of Kentucky, Lexington, KT 40506. Methods for the *Ceriodaphnia* testing will be those of Mount and Norberg (1984), with analysis of data following the procedures of Hamilton, M.A. 1984. Statistical Analysis of the Seven-day *Ceriodaphnia reticulata* Reproductivity Toxicity Test. Contract Order No. J3905 NASX-1, U.S. EPA Duluth, MN.

Sampling Dates and Parameters - Sets of "grab" samples will be collected from each of 14 aquaria according to the schedule in Table 1.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Study Site

Fig. 1

Table 1. Sample Parameters and Frequency Champion International Paper Mill, Frenchtown, Montana

Analysis	Frequency	Lab Location
Dissolved Sulfide	Weekly	State
D.O.	Daily	Mobile Lab
Temp.	Continuous	Mobile Lab
Hardness[1]	Twice Weekly	State
Alkalinity	Daily	Mobile Lab
pH	Daily	Mobile Lab
TDS[1]	Daily	Mobile Bioassay
Conductivity	Weekly	State
NH_3-N	Weekly	State
Dissolvent Organic Carbon	Weekly	State
Total Organic Carbon	Weekly	State
BOD	Weekly	State
Color	Weekly	State
Chlorides	Weekly	State
Sulfide	Weekly	State
ICAP Metals	8 Samples	Denver-EPA
Organic Priority Pollutants	8 Samples	Denver-EPA

[1] - Frequency may be increased due to unusual hydrologic conditions.

Sample Collection, Handling, Preservation

All sample collection, handling and preservation will follow the guidelines established in "a Guide for Field Samples", "Methods for Chemical Analysis of Water and Wastes, and "Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents". Information regarding sample size, container, preservative and special handling for parameters under consideration is summarized in Table 2.

Table 2

Sample Requirements for Chemical Samples Sent to the State and EPA Laboratories

Chemical	Sample Size	Container	Preservative
NH_3-N, Total NO_3-N NO_2-N	1 liter	Cubitainer	2ml conc H_2SO_4
TDS or Conductivity and Hardness	1 liter	Cubitainer	Chilled
Priority Pollutant Organics	1 quart	Glass Jar	Chilled
ICAP-Metals	1 quart	Cubitainer	5ml conc. HNO_3

Quality Assurance

All direct reading bioassay laboratory equipment will be checked for calibration before each series of samples are collected. In addition, each test concentration is run in duplicate and a control (0% waste) is run at the same time. Samples of various waste concentrations from select aquaria will be split with the State lab and the EPA mobile lab. When the mobile laboratory is set-up on site, each diluter will be checked and recalibrated to deliver the required amounts of effluent or dilution water to each aquarium. At the end of the test a representative number of fish from each test conc. will be weighed, measured and checked for abnormalities. Two duplicate priority pollutant and ICAP samples of wastewater and [illegible] water will be collected during the study.

Personnel Needs

Personnel from EPA (Bruce Binkley [NEIC], Jim Lazorchak, Denise Link and Del Nimmo [WMD]) will conduct the trout and Ceriodaphnia studies. In addition, Gary Ingman from the State Department of Health and Environmental Sciences will assist in the project and be the primary contact with Champion International.

Record Keeping

Sample tags shall be affixed to each sample container. Tags shall be legible and filled out using ball-point or other permanent marking pen. Information to be entered on each tag shall include:

1. Sample identification number
2. Date and time for collection
3. Name of source, type of sample
4. Appropriate field measurements (pH, temperature, etc.)
5. Analyses to be performed
6. Preservative(s) used
7. Size of sample
8. Name of person collecting sample
9. Witness to the collection, if appropriate

Lab request sheets will accompany all samples. A bound field notebook will be maintained by the survey leader to provide a daily record of events pertaining to the study. All members of the survey party will provide input to the survey leaders field notebook. Notes entered into the field notebook should be kept complete and permanent.

Information regarding calibration of field instrumentation shall be entered into the field notebook or logbook specifically provided for the purpose.

Report

A report of the findings will be prepared upon completion of field and laboratory work. Reports may be prepared as appropriate to call attention to significant findings. Data will be entered into STORET. Del Nimmo will be responsible for data reduction, analyses, and preparing the report. An initial draft report will be prepared within 60 days of completion of all tests.

Any question regarding this plan can be addressed to C. Runas, Del Nimmo (293-1579) or L. Parrish (236-5084)

Cost Estimate

Per diem for (for 6 weeks 2 staff persons)	$ 3,600
Overtime (40 hrs/person)	1,300
Misc. Supplies	300
Air Freight	150
Rental Car	500
Gas for the rental car	200
Total	$ 6,150

Equipment Needs

Table 3 summarizes the equipment and supplies required for the testing.

Table 3

Equipment List - Bioassay

Mobile Bioassay Lab
Another Support Vehicle
Pumps
Hose
Extension cords
pH meters - 2 plus standards
Dissolved Oxgen meters - 2
Thermometers - 2
Tygon Tubing - 1/4", 3/8", 1/2", 5/8"
Plastic Buret - Dissolved Oxygen
Ring Stand
D.O. powder pillows

Balance
Weighing boats
H_2SO_4
Disposable pipettes
Ice chests

Cubitainers
HNO_3
Specific Conductance Meter

Appendix B. Means (and Ranges) of Chemical Parameters Measure On-Site: Champion International Waste Water Diluted with Unchlorinated Well Water.

APPENDIX B

Means (and Ranges) of Chemical Parameters Measured On-Site: Champion International Waste water Diluted with Unchlorinated Well Water.

Percentage Waste Water	Temperature C		pH		Dissolved Oxygen mg/1		Conductivity umhos/cm		Alkalinity mg/1 as $CaCO_3$	
	RI	R2	RI	R2	R1	R2	R1	R2	R1	R2
0	12 (10.5-13.5)	12 (10-13.3)	7.5 (7.1-8.2)	7.5 (7.2-8.1)	7.6 (6.2-10.1)	7.5 (6.2-8.3)	284 (240-345)	279 (230-350)	115 (107-127)	124 (103-168)
0.2	12 (10-13.5)	11 (10-13)	7.3 (6.9-8.0)	7.4 (6.9-8.0)	7.5 (6.5-10)	7.2 (6.3-8.1)	278 (240-340)	285 (240-340)	116 (107-126)	124 (107-170)
0.36	12 (10.5-13.2)	11 (10-13)	7.4 (7.0-8.2)	7.4 (6.9-8.1)	7.7 (6.3-9.8)	7.3 (6.2-8.2)	285 (240-340)	289 (240-345)	116 (108-127)	123 (---)
0.64	12 (10-13)	11 (10-13)	7.4 (7.0-8.1)	7.4 (7.1-8.1)	7.4 (6.2-10)	7.3 (6.2-8.0)	293 (250-355)	293 (250-350)	118 (111-127)	126 (106-170)
1.12	12 (10-13)	11 (10-13)	7.4 (6.9-8.3)	7.5 (7.1-8.2)	7.6 (6.2-9.5)	7.6 (6.2-8.2)	303 (206-360)	304 (260-360)	119 (110-128)	127 (111-127)
1.5	12 (10.5-13)	11 (10-13)	7.4 (6.9-8.2)	7.5 (7.1-8.1)	7.6 (6.1-10)	7.5 (6.2-8.2)	312 (270-370)	312 (270-370)	119 (111-128)	125 (109-168)
2.0	12 (10-13)	11 (10-13)	7.4 (7.1-8.1)	7.5 (7.1-8.2)	7.5 (5.9-10)	7.2 (5.9-8.2)	323 (280-390)	327 (280-370)	122 (119-130)	129 (111-168)

R1. Replicate 1
R2. Replicate 2

Appendix C. Means (and Ranges) of Chemical Parameters Measured in the Laboratory: Champion International Waste Water Diluted with Unchlorinated Well Water.

APPENDIX C

Means (and Ranges) of Chemical Parameters Measured in the Laboratory[1,2]: Champion International Waste water Diluted with Unchlorinated Well Water.

Percentage Waste water	Calcium mg/l	Magnesium mg/l	Chloride mg/l	Conductivity umhos/em
0	39.1 (37.5-40.6)	10.5 10.3-10.8)	2.9 (2.0-3.4)	295 (288-308)
0.2	39.8 (37.7-41.5)	10.4 (10.0-10.9)	3.2 (2.7-3.6)	303 (292-321)
0.36	38.8 (37.2-40.5)	10.4 (10.0-10.7)	2.9 (2.0-3.6)	302 (296-312)
0.64	39.0 (37.6-40.7)	10.6 (10.4-10.8)	3.2 (2.1-3.9)	310 (304-322)
1.12	39.2 (38.4-40.9)	10.5 (10.2-10.7)	3.7 (2.4-4.6)	318 (314-327)
1.15	39.4 (38.6-40.7)	10.5 (10.3-10.6)	4.2 (3.1-5.0)	330 (325-337)
2.0	39.3 (37.9-41.1)	10.4 (10.1-10.7)	4.0 (3.3-5.0)	341 (336-346)

[1] One Replicate Only

[2] State Department of Health and Environmental Sciences

Appendix D. Means (and Ranges) of Chemical Parameters Measure in the Laboratory: Champion International Waste Water Diluted with Unchlorinated Well Water.

APPENDIX D

Means (and Ranges) of Chemical Parameters Measured in the Laboratory [1,2]: Champion International Waste water Diluted with Unchlorinated Well Water.

Percentage Waste water	Total Organic Carbon mg/l	Dissolved Organic Carbon mg/l	Dissolved[3] Sulfide mg/l	Total Ammonia mg/l
0	2.5 (1.9-3.7)	0.9 (0.8-1.0)	0.05	0.07 (0.05-0.15)
0.2	4.0 (1.5-8.4)	3.6 (1.6-5.6)	0.05	0.17 (0.13-0.17)
0.36	2.2 (1.2-3.0)	1.4 (1.3-1.6)	0.05	0.24 (0.18-0.30)
0.64	2.6 (1.7-3.3)	1.9 (1.9-2.0)	0.05	0.2 (0.11-0.35)
1.12	3.4 (2.4-4.2)	2.2 (2.0-2.5)	0.05	0.15 (0.11-0.22)
1.5	4.4 (2.6-5.7)	2.4 (2.3-2.5)	0.05	0.17 (0.12-0.25)
2.0	4.6 (1.3-8.0)	2.3 (2.2-2.4)	0.05	0.2 (0.016-0.24)

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1. One Replicate Only

2. State Department of Health and Environmental Sciences

Appendix E. Means (and Ranges) of Chemical Parameters Measured On-Site: Champion International Waste Water Diluted with Clark Fork River Water.

APPENDIX E

Means (and Ranges) of Chemical Parameters Measured On-Site: Champion International Waste water Diluted with Clark Fork River Water.

Percentage Waste water	Temperature C		pH		Dissolved Oxygen mg/l		Conductivity umhos/cm		Alkalinity mg/l as $CaCO_3$	
	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
0	12 (10-13.9)	12 (10.5-14)	7.2 (6.7-7.9)	7.1 (6.6-7.9)	7.9 (7.0-9.1)	7.8 (7.2-9.0)	135 (100-160)	131 (100-160)	51 (45-60)	56 (51-5
0.2	12 (10-13.5)	11 (10-12)	7.1 (6.6-7.7)	7.1 (6.6-7.8)	7.5 (6.8-9.0)	7.5 (6.8-8.5)	134 (100-160)	134 (100-160)	52 (46-61)	56 (51-6
0.36	12 (10-14)	12 (10-13)	7.1 (6.5-7.8)	7.1 (6.7-7.6)	7.8 (6.3-9.1)	7.7 (6.3-8.5)	140 (110-165)	140 (105-165)	53 (46-61)	57 (47-6
0.64	12 (10-13.5	12 (10-13)	7.1 (6.6-7.7)	7.1 (6.5-7.8)	7.4 (6.5-9.0)	7.7 (6.5-9.0)	147 (115-190)	147 (110-190)	57 (48-63)	58 (53-6
1.12	12 (10-13.5)	12 (10.5-14)	7.1 (6.5-7.8)	7.1 (6.5-7.8)	7.5 (6.6-9.0)	7.6 (6.6-9.0)	159 (120-200)	160 (120-202)	57 (50-63)	61 (55-6
1.5	12 (10.5-14)	12 (10.5-13)	7.1 (6.5-7.9)	7.1 (6.5-7.8)	7.7 (6.7-9.1)	7.4 (6.5-9.5)	170 (125-218)	171 (135-214)	60 (53-65)	63 (57-6
2.0	13 (11-14.8)	12 (11-14)	7.1 (6.5-8.0)	7.1 (6.5-7.9)	7.7 (6.6-9.5)	7.5 (6.8-7.2)	185 (140-227)	187 (130-230)	59 (49-68)	65 (61-7

R1. Replicate 1
R2. Replicate 2

Appendix F. Means (and Ranges) of Chemcial Parameters Measured in the Laboratory: Champion International Waste Water Diluted with Clark Fork River Water.

APPENDIX F

Means (and Ranges) of Chemical Parameters Measured in the Laboratory[1, 2]: Champion International Wastewater Diluted with Clark Fork River Water

Percentage Wastewater	Calcium mg/l	Magnesium mg/l	Chloride mg/l	Conductivity umhos/cm
0	17.7 (16.4-18.5)	4.0 (3.6-4.3)	1.2 (0.2-2.0)	134 (123-140)
0.2	17.7 (16.1-18.6)	4.0 (3.6-4.4)	1.1 (0.8-1.6)	141 (129-150)
0.36	17.2 (15.7-18.4)	4.0 (4.0-4.2)	1.6 (0.7-2.2)	144 (135-153)
0.64	17.9 (16.7-18.9	4.1 (3.7-4.5)	1.9 (1.2-2.6)	164 (---)
1.12	17.9 (16.6-19.0)	4.1 (3.7-4.4)	2.3 (1.5-2.9)	166 (153-180)
1.5	18.0 (16.7-18.9)	4.0 (3.7-4.4)	2.6 (1.5-3.3)	177 (163-199)
2.0	18.1 (16.4-19.3)	4.2 (4.0-4.5)	2.7 (1.8-3.4)	193 (177-210)

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1. One Replicate Only
2. State Department of Health and Environmental Sciences

Appendix G. Means (and Ranges) of Chemical Parameters Measured in the Laboratory: Champion International Waste Water Diluted with Clark Fork River Water.

APPENDIX G

Means (and Ranges) of Chemical Parameters Measured in the Laboratory [1, 2]: Champion International Waste water Diluted with Clark Fork River Water.

Percentage Waste water	Total Organic Carbon mg/l	Dissolved Organic Carbon mg/l	Dissolved[3] Sulfide mg/l	Total Ammonia mg/l
0	4.1 (3.2-5.4)	2.7 (2.6-2.8)	0.05 (0.05-0.1)	0.13 (0.07-0.11)
0.2	4.9 (3.3-7.1)	4.1[4] (---)	0.03 (0.05-0.08)	0.23 (0.14-0.40
0.36	5.1 (4.0-7.8)	2.9 (2.0-3.8)	0.04 (0.05-0.09)	0.18 (0.10-0.32)
0.64	5.0 (3.9-6.2)	4.4 (4.3-4.6)	0.05 (0.05-0.10)	0.19 (0.08-0.32)
1.12	6.0 (4.8-7.1)	5.0 (4.8-5.3)	0.05 (0.05-0.11)	0.25 (0.19-0.36)
1.5	6.5 (5.2-7.8)	4.6 (3.7-5.6)	0.06 (0.05-0.12)	0.17 (0.15-0.19)
2.0	6.3 (4.1-7.6)	5.2 (4.3-6.1)	0.06 (0.05-0.12)	0.13 (0.09-0.16)

---

1. One Replicate Only
2. State Department of Health and Environmental Sciences
3. Less than values (< 0.05) were used in the calculations as 1/2 (0.05) or 0.025
4. Single value

Appendix H. Organic Analysis Data Sheet - Champion Waste 5/17/85.

APPENDIX H

Note: Sample was Champion Waste and was logged in the laboratory as Silver Bow due to a concurrent study.

FRN 9371

Sample Number
CHAMPION WASTE
5-17-85

ORGANICS ANALYSIS DATA SHEET

Laboratory Name: USEPA REGION 8
Lab Sample ID No: SILVER ROW
Sample Matrix: AQUEOUS
Data Release Authorized By: A. CURTIS
Case No: —
QC Report No:
Contract No.:
Date Sample Received: 5-18-85

SEMIVOLATILE COMPOUNDS

CONCENTRATION: [✓ LOW] MEDIUM HIGH (circle one)
DATE EXTRACTED/PREPARED: 5-29-85
DATE ANALYZED: 6-10-85
PERCENT MOISTURE: —
[✓ CONC]/DILUTION FACTOR: 200

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(21A)	88-06-2	2,4,6- trichlorophenol	<10
(22A)	59-50-7	p-chloro-m-cresol	
(24A)	95-57-8	2- chlorophenol	
(31A)	120-83-2	2,4-dichlorophenol	
(34A)	105-67-9	2,4-dimethylphenol	
(57A)	88-75-5	2- nitrophenol	
(58A)	100-02-7	4-nitrophenol	
(59A)	51-28-5	2,4-dinitrophenol	
(60A)	534-52-1	4,6-dinitro-2-methylphenol	
(64A)	87-86-5	pentachlorophenol	
(65A)	108-95-2	phenol	
	65-85-0	benzoic acid	
	95-48-7	2-methylphenol	
	108-39-4	4-methylphenol	
	95-95-4	2,4,5-trichlorophenol	
(1B)	83-32-9	acenaphthene	
(5B)	92-87-5	benzidine	
(8B)	120-82-1	1,2,4-trichlorobenzene	
(9B)	118-74-1	hexachlorobenzene	
(12B)	67-72-1	hexachloroethane	
(18B)	111-44-4	bis(2-chloroethyl)ether	
(20B)	91-58-7	2-chloronaphthalene	
(25B)	95-50-1	1,2-dichlorobenzene	
(26B)	541-73-1	1,3-dichlorobenzene	
(27B)	106-46-7	1,4-dichlorobenzene	
(28B)	91-94-1	3,3'-dichlorobenzidine	
(35B)	121-14-2	2,4-dinitrotoluene	
(36B)	606-20-2	2,6-dinitrotoluene	
(37B)	122-66-7	1,2-diphenylhydrazine	
(39B)	206-44-0	fluoranthene	
(40B)	7005-72-3	4-chlorophenyl phenyl ether	
(41B)	101-55-3	4-bromophenyl phenyl ether	
(42B)	39638-32-9	bis (2-chloroisopropyl) ether	
(43B)	111-91-1	bis (2-chloroethoxy) methane	↓

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(52B)	87-68-3	hexachlorobutadiene	<10
(53B)	77-47-4	hexachlorocyclopentadiene	
(54B)	78-59-1	isophorone	
(55B)	91-20-3	naphthalene	
(56B)	98-95-3	nitrobenzene	
(61B)	62-75-9	N-nitrosodimethylamine	
(62B)	86-30-6	N-nitrosodiphenylamine	
(63B)	621-64-7	N-nitrosodipropylamine	
(66B)	117-81-7	bis (2-ethylhexyl) phthalate	
(67B)	85-68-7	benzyl butyl phthalate	
(68B)	84-74-2	di-n-butyl phthalate	
(69B)	117-84-0	di-n-octyl phthalate	
(70B)	84-66-2	diethyl phthalate	
(71B)	131-11-3	dimethyl phthalate	
(72B)	56-55-3	benzo(a)anthracene	
(73B)	50-32-8	benzo(a)pyrene	
(74B)	205-99-2	benzo(b)fluoranthene	
(75B)	207-08-9	benzo(k)fluoranthene	
(76B)	218-01-9	chrysene	
(77B)	208-96-8	acenaphthylene	
(78B)	120-12-7	anthracene	
(79B)	191-24-2	benzo(ghi)perylene	
(80B)	86-73-7	fluorene	
(81B)	85-01-8	phenanthrene	
(82B)	53-70-3	dibenzo(a,h)anthracene	
(83B)	193-39-5	indeno(1,2,3-cd)pyrene	
(84B)	129-00-0	pyrene	
	62-53-3	aniline	
	100-51-6	benzyl alcohol	
	106-47-8	4-chloroaniline	
	132-64-9	dibenzofuran	
	91-57-6	2-methylnaphthalene	
	88-74-4	2-nitroaniline	
	99-09-2	3-nitroaniline	
	100-01-6	4-nitroaniline	↓

FRN 9371

Environmental Protection Agency, CLP Sample Management Office,
P. O. Box 818, Alexandria, Virginia 22313 703/557-2490

Sample Number
CHAMPION WASTE
5-17-85

Organics Analysis Data Sheet
(Page 3)

Pesticide/PCBs

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared: 5-29-85

Date Analyzed: 6-10-85

[✓ Conc]/Dil Factor: 200

CAS Number		[✓ ug/L] or ug/Kg (Circle One)
319-84-6	Alpha-BHC	<10
319-85-7	Beta-BHC	↓
319-86-8	Delta-BHC	↓
58-89-9	Gamma-BHC (Lindane)	↓
76-44-8	Heptachlor	↓
309-00-2	Aldrin	↓
1024-57-3	Heptachlor Epoxide	↓
959-98-8	Endosulfan I	↓
60-57-1	Dieldrin	↓
72-55-9	4, 4'-DDE	↓
72-20-8	Endrin	↓
33213-65-9	Endosulfan II	↓
72-54-8	4, 4'-DDD	↓
7421-93-4	Endrin Aldehyde	↓
1031-07-8	Endosulfan Sulfate	↓
50-29-3	4, 4'-DDT	↓
72-43-5	Methoxychlor	↓
53494-70-5	Endrin Ketone	↓
57-74-9	Chlordane	↓
8001-35-2	Toxaphene	N/A
12674-11-2	Aroclor-1016	↓
11104-28-2	Aroclor-1221	↓
11141-16-5	Aroclor-1232	↓
53469-21-9	Aroclor-1242	↓
12672-29-6	Aroclor-1248	↓
11097-69-1	Aroclor-1254	↓
11096-82-5	Aroclor-1260	↓

V_i = Volume of extract injected (ul)

V_s = Volume of water extracted (ml)

W_s = Weight of sample extracted (g)

V_t = Volume of total extract (ul)

V_s ____________ or W_s ____________ V_t ____________ V_i ____________

Form 1 4 84

Form I. (continued).

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O Box 818, Alexandria, Virginia 22313 703/557-2490

FRN 9371

Sample Number
CHAMPION WASTE
5-17-85

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

CAS Number	Compound Name	Fraction	[✓ RT] or Scan Number	Estimated Concentration ([✓ ug/l] or ug/kg)
1.	1[2-(2-METHOXY-1-METHYLETHOXY)-1-	A/B/N	76.53	480
~~2.~~	METHYLETHOXY]-2-PROPANOL $C_{10}H_{22}O_4$			
~~3.~~ 2	ISOMER OF #1		16.90	145
~~4.~~ 3	METHYLPENTADECANOIC ACID		26.82	188
~~5.~~ 4	ANDROST-16-EN-3-ONE		26.98	99.5
~~6.~~ 5	1-EICOSENE $C_{20}H_{40}$ MW 280		30.73	164
~~7.~~ 6	ISOPIMARIC ACID MW 302		31.30	216
~~8.~~ 7	PIMARIC ACID MW 302		31.77	804
~~9.~~ 8	SIMILAR TO PIMARIC ACID MW 302		32.52	1050
~~10.~~ 9	DEHYDROABIETIC ACID MW 300		32.97	1120
~~11.~~ 10	15-HYDROXY-ANDROST-4-ENE-3,17-DIONE		33.42	538
~~12.~~ 11	UNKNOWN ACID MW 340		33.75	336
~~13.~~ 12	1-TETRACOSANOL $C_{24}H_{50}O$		34.95	171
~~14.~~ 13	ERGOST-5-EN-3-OL $C_{28}H_{48}O$ MW 400		41.72	243
~~15.~~ 14	STIGMAST-5-EN-3-OL $C_{29}H_{50}O$ MW 414	↓	43.65	847
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

NATURAL ACIDS, KETONES AND ALCOHOLS.

Note: Sample was Clark Fork River (River at Champion International) and logged in as Silver Bow due to a concurrent study.

FRN 9362

Sample Number
CHAMPION RIVER
5-17-85

ORGANICS ANALYSIS DATA SHEET

Laboratory Name: USEPA REGION 8
Case No: —
Lab Sample ID No: SILVER BOW
QC Report No:
Sample Matrix: AQUEOUS
Contract No.:
Data Release Authorized By: A. CURTIS
Date Sample Received: 5-17-85

SEMIVOLATILE COMPOUNDS

CONCENTRATION: [✓ LOW] MEDIUM HIGH (circle one)
DATE EXTRACTED/PREPARED: 5-29-85
DATE ANALYZED: 6-7-85
PERCENT MOISTURE: —
[✓ CONC]/DILUTION FACTOR: 1000

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(21A)	88-06-2	2,4,6- trichlorophenol	<2
(22A)	59-50-7	p-chloro-m-cresol	
(24A)	95-57-8	2- chlorophenol	
(31A)	120-83-2	2,4-dichlorophenol	
(34A)	105-67-9	2,4-dimethylphenol	
(57A)	88-75-5	2- nitrophenol	
(58A)	100-02-7	4-nitrophenol	
(59A)	51-28-5	2,4-dinitrophenol	
(60A)	534-52-1	4,6-dinitro-2-methylphenol	
(64A)	87-86-5	pentachlorophenol	
(65A)	108-95-2	phenol	
	65-85-0	benzoic acid	
	95-48-7	2-methylphenol	
	108-39-4	4-methylphenol	
	95-95-4	2,4,5-trichlorophenol	
(1B)	83-32-9	acenaphthene	
(5B)	92-87-5	benzidine	
(8B)	120-82-1	1,2,4-trichlorobenzene	
(9B)	118-74-1	hexachlorobenzene	
(12B)	67-72-1	hexachloroethane	
(18B)	111-44-4	bis(2-chloroethyl)ether	
(20B)	91-58-7	2-chloronaphthalene	
(25B)	95-50-1	1,2-dichlorobenzene	
(26B)	541-73-1	1,3-dichlorobenzene	
(27B)	106-46-7	1,4-dichlorobenzene	
(28B)	91-94-1	3,3'-dichlorobenzidine	
(35B)	121-14-2	2,4-dinitrotoluene	
(36B)	606-20-2	2,6-dinitrotoluene	
(37B)	122-66-7	1,2-diphenylhydrazine	
(39B)	206-44-0	fluoranthene	
(40B)	7005-72-3	4-chlorophenyl phenyl ether	
(41B)	101-55-3	4-bromophenyl phenyl ether	
(42B)	39638-32-9	bis (2-chloroisopropyl) ether	
(43B)	111-91-1	bis (2-chloroethoxy) methane	↓

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(52B)	87-68-3	hexachlorobutadiene	<2
(53B)	77-47-4	hexachlorocyclopentadiene	
(54B)	78-59-1	isophorone	
(55B)	91-20-3	naphthalene	
(56B)	98-95-3	nitrobenzene	
(61B)	62-75-9	N-nitrosodimethylamine	
(62B)	86-30-6	N-nitrosodiphenylamine	
(63B)	621-64-7	N-nitrosodipropylamine	
(66B)	117-81-7	bis (2-ethylhexyl) phthalate	
(67B)	85-68-7	benzyl butyl phthalate	
(68B)	84-74-2	di-n-butyl phthalate	
(69B)	117-84-0	di-n-octyl phthalate	
(70B)	84-66-2	diethyl phthalate	↓
(71B)	131-11-3	dimethyl phthalate	2.0
(72B)	56-55-3	benzo(a)anthracene	<2
(73B)	50-32-8	benzo(a)pyrene	
(74B)	205-99-2	benzo(b)fluoranthene	
(75B)	207-08-9	benzo(k)fluoranthene	
(76B)	218-01-9	chrysene	
(77B)	208-96-8	acenaphthylene	
(78B)	120-12-7	anthracene	
(79B)	191-24-2	benzo(ghi)perylene	
(80B)	86-73-7	fluorene	
(81B)	85-01-8	phenanthrene	
(82B)	53-70-3	dibenzo(a,h)anthracene	
(83B)	193-39-5	indeno(1,2,3-cd)pyrene	
(84B)	129-00-0	pyrene	
	62-53-3	aniline	
	100-51-6	benzyl alcohol	
	106-47-8	4-chloroaniline	
	132-64-9	dibenzofuran	
	91-57-6	2-methylnaphthalene	
	88-74-4	2-nitroaniline	
	99-09-2	3-nitroaniline	
	100-01-6	4-nitroaniline	↓

'983

Environmental Protection Agency, CLP Sample Management Office,
P. O. Box 818, Alexandria, Virginia 22313 703/557-2490

FRN 9362

Sample Number
CHAMPION RIVER
5-17-85

Organics Analysis Data Sheet
(Page 3)

Pesticide/PCBs

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared: 5-29-85

Date Analyzed: 6-7-85

[✓ Conc] / Dil Factor: 1000

CAS Number		[✓ ug/l] or ug/Kg (Circle One)
319-84-6	Alpha-BHC	<2
319-85-7	Beta-BHC	
319-86-8	Delta-BHC	
58-89-9	Gamma-BHC (Lindane)	
76-44-8	Heptachlor	
309-00-2	Aldrin	
1024-57-3	Heptachlor Epoxide	
959-98-8	Endosulfan I	
60-57-1	Dieldrin	
72-55-9	4 4'-DDE	
72-20-8	Endrin	
33213-65-9	Endosulfan II	
72-54-8	4 4'-DDD	
7421-93-4	Endrin Aldehyde	
1031-07-8	Endosulfan Sulfate	
50-29-3	4 4'-DDT	
72-43-5	Methoxychlor	
53494-70-5	Endrin Ketone	
57-74-9	Chlordane	↓
8001-35-2	Toxaphene	N/A
12674-11-2	Aroclor-1016	
11104-28-2	Aroclor-1221	
11141-16-5	Aroclor-1232	
53469-21-9	Aroclor-1242	
12672-29-6	Aroclor-1248	
11097-69-1	Aroclor-1254	
11096-82-5	Aroclor-1260	↓

V_i = Volume of extract injected (ul)

V_s = Volume of water extracted (ml)

W_s = Weight of sample extracted (g)

V_t = Volume of total extract (ul)

V_s ______ or W_s ______ V_t ______ V_i ______

Form I 4 84

Form I. (continued).

Note: Sample was well water at Champion International and was logged in at the laboratory as Silver Bow due to a concurrent study.

FRN 9363

Sample Number
CHAMPION WELL
5-17-85

ORGANICS ANALYSIS DATA SHEET

Laboratory Name: USEPA REGION 8
Lab Sample ID No: SILVER BOW
Sample Matrix: AQUEOUS
Data Release Authorized By: A. CURTIS

Case No: —
QC Report No:
Contract No.:
Date Sample Received: 5-17-85

SEMIVOLATILE COMPOUNDS

CONCENTRATION: [✓ LOW] MEDIUM HIGH (circle one)
DATE EXTRACTED/PREPARED: 5-29-85
DATE ANALYZED: 6-7-85
PERCENT MOISTURE: —
[✓ CONC]/DILUTION FACTOR: 1000

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(21A)	88-06-2	2,4,6- trichlorophenol	<2
(22A)	59-50-7	p-chloro-m-cresol	
(24A)	95-57-8	2- chlorophenol	
(31A)	120-83-2	2,4-dichlorophenol	
(34A)	105-67-9	2,4-dimethylphenol	
(57A)	88-75-5	2- nitrophenol	
(58A)	100-02-7	4-nitrophenol	
(59A)	51-28-5	2,4-dinitrophenol	
(60A)	534-52-1	4,6-dinitro-2-methylphenol	
(64A)	87-86-5	pentachlorophenol	
(65A)	108-95-2	phenol	
	65-85-0	benzoic acid	
	95-48-7	2-methylphenol	
	108-39-4	4-methylphenol	
	95-95-4	2,4,5-trichlorophenol	
(1B)	83-32-9	acenaphthene	
(5B)	92-87-5	benzidine	
(8B)	120-82-1	1,2,4-trichlorobenzene	
(9B)	118-74-1	hexachlorobenzene	
(12B)	67-72-1	hexachloroethane	
(18B)	111-44-4	bis(2-chloroethyl)ether	
(20B)	91-58-7	2-chloronaphthalene	
(25B)	95-50-1	1,2-dichlorobenzene	
(26B)	541-73-1	1,3-dichlorobenzene	
(27B)	106-46-7	1,4-dichlorobenzene	
(28B)	91-94-1	3,3'-dichlorobenzidine	
(35B)	121-14-2	2,4-dinitrotoluene	
(36B)	606-20-2	2,6-dinitrotoluene	
(37B)	122-66-7	1,2-diphenylhydrazine	
(39B)	206-44-0	fluoranthene	
(40B)	7005-72-3	4-chlorophenyl phenyl ether	
(41B)	101-55-3	4-bromophenyl phenyl ether	
(42B)	39638-32-9	bis (2-chloroisopropyl) ether	
(43B)	111-91-1	bis (2-chloroethoxy) methane	↓

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(52B)	87-68-3	hexachlorobutadiene	<2
(53B)	77-47-4	hexachlorocyclopentadiene	
(54B)	78-59-1	isophorone	
(55B)	91-20-3	naphthalene	
(56B)	98-95-3	nitrobenzene	
(61B)	62-75-9	N-nitrosodimethylamine	
(62B)	86-30-6	N-nitrosodiphenylamine	
(63B)	621-64-7	N-nitrosodipropylamine	
(66B)	117-81-7	bis (2-ethylhexyl) phthalate	
(67B)	85-68-7	benzyl butyl phthalate	
(68B)	84-74-2	di-n-butyl phthalate	
(69B)	117-84-0	di-n-octyl phthalate	
(70B)	84-66-2	diethyl phthalate	
(71B)	131-11-3	dimethyl phthalate	
(72B)	56-55-3	benzo(a)anthracene	
(73B)	50-32-8	benzo(a)pyrene	
(74B)	205-99-2	benzo(b)fluoranthene	
(75B)	207-08-9	benzo(k)fluoranthene	
(76B)	218-01-9	chrysene	
(77B)	208-96-8	acenaphthylene	
(78B)	120-12-7	anthracene	
(79B)	191-24-2	benzo(ghi)perylene	
(80B)	86-73-7	fluorene	
(81B)	85-01-8	phenanthrene	
(82B)	53-70-3	dibenzo(a,h)anthracene	
(83B)	193-39-5	indeno(1,2,3-cd)pyrene	
(84B)	129-00-0	pyrene	
	62-53-3	aniline	
	100-51-6	benzyl alcohol	
	106-47-8	4-chloroaniline	
	132-64-9	dibenzofuran	
	91-57-6	2-methylnaphthalene	
	88-74-4	2-nitroaniline	
	99-09-2	3-nitroaniline	
	100-01-6	4-nitroaniline	↓

Environmental Protection Agency. CLP Sample Management Office.
P. O. Box 818. Alexandria, Virginia 22313 703/557-2490

FRN 9363

Sample Number
CHAMPION WELL

5-17-85

Organics Analysis Data Sheet
(Page 3)

Pesticide/PCBs

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared: 5-29-85

Date Analyzed: 6-7-85

[✓ Conc]/Dil Factor: 1000

CAS Number		[✓ ug/L] or ug/Kg (Circle One)
319-84-6	Alpha-BHC	<2
319-85-7	Beta-BHC	
319-86-8	Delta-BHC	
58-89-9	Gamma-BHC (Lindane)	
76-44-8	Heptachlor	
309-00-2	Aldrin	
1024-57-3	Heptachlor Epoxide	
959-98-8	Endosulfan I	
60-57-1	Dieldrin	
72-55-9	4, 4'-DDE	
72-20-8	Endrin	
33213-65-9	Endosulfan II	
72-54-8	4, 4'-DDD	
7421-93-4	Endrin Aldehyde	
1031-07-8	Endosulfan Sulfate	
50-29-3	4, 4'-DDT	
72-43-5	Methoxychlor	
53494-70-5	Endrin Ketone	
57-74-9	Chlordane	↓
8001-35-2	Toxaphene	N/A
12674-11-2	Aroclor-1016	
11104-28-2	Aroclor-1221	
11141-16-5	Aroclor-1232	
53469-21-9	Aroclor-1242	
12672-29-6	Aroclor-1248	
11097-69-1	Aroclor-1254	
11096-82-5	Aroclor-1260	↓

V_i = Volume of extract injected (ul)

V_s = Volume of water extracted (ml)

W_s = Weight of sample extracted (g)

V_t = Volume of total extract (ul)

V_s __________ or W_s __________ V_t __________ V_i __________

Form I. (continued).

Appendix I. Organic Analysis Data Sheet - Champion Waste 5/31/85.

Note: Sample was Clark Fork River water at Champion International and was logged in at the laboratory as Silver Bow due to a concurrent study.

APPENDIX I

FRN 9366

Sample Number
CHAMPION
5-31-85

ORGANICS ANALYSIS DATA SHEET

Laboratory Name: USEPA REGION 8
Case No: —
Lab Sample ID No: SILVER BOW
QC Report No:
Sample Matrix: AQUEOUS
Contract No.:
Data Release Authorized By: A. CURTIS
Date Sample Received: 5-31-85

SEMIVOLATILE COMPOUNDS

CONCENTRATION: [✓ LOW] MEDIUM HIGH (circle one)
DATE EXTRACTED/PREPARED: 6-5-85
DATE ANALYZED: 6-7-85
PERCENT MOISTURE: —
[✓ CONC.]/DILUTION FACTOR: 1000

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(21A)	88-06-2	2,4,6- trichlorophenol	<2
(22A)	59-50-7	p-chloro-m-cresol	
(24A)	95-57-8	2- chlorophenol	
(31A)	120-83-2	2,4-dichlorophenol	
(34A)	105-67-9	2,4-dimethylphenol	
(57A)	88-75-5	2- nitrophenol	
(58A)	100-02-7	4-nitrophenol	
(59A)	51-28-5	2,4-dinitrophenol	
(60A)	534-52-1	4,6-dinitro-2-methylphenol	
(64A)	87-86-5	pentachlorophenol	
(65A)	108-95-2	phenol	
	65-85-0	benzoic acid	
	95-48-7	2-methylphenol	
	108-39-4	4-methylphenol	
	95-95-4	2,4,5-trichlorophenol	
(1B)	83-32-9	acenaphthene	
(5B)	92-87-5	benzidine	
(8B)	120-82-1	1,2,4-trichlorobenzene	
(9B)	118-74-1	hexachlorobenzene	
(12B)	67-72-1	hexachloroethane	
(18B)	111-44-4	bis(2-chloroethyl)ether	
(20B)	91-58-7	2-chloronaphthalene	
(25B)	95-50-1	1,2-dichlorobenzene	
(26B)	541-73-1	1,3-dichlorobenzene	
(27B)	106-46-7	1,4-dichlorobenzene	
(28B)	91-94-1	3,3'-dichlorobenzidine	
(35B)	121-14-2	2,4-dinitrotoluene	
(36B)	606-20-2	2,6-dinitrotoluene	
(37B)	122-66-7	1,2-diphenylhydrazine	
(39B)	206-44-0	fluoranthene	
(40B)	7005-72-3	4-chlorophenyl phenyl ether	
(41B)	101-55-3	4-bromophenyl phenyl ether	
(42B)	39638-32-9	bis (2-chloroisopropyl) ether	
(43B)	111-91-1	bis (2-chloroethoxy) methane	

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(52B)	87-68-3	hexachlorobutadiene	<2
(53B)	77-47-4	hexachlorocyclopentadiene	
(54B)	78-59-1	isophorone	
(55B)	91-20-3	naphthalene	
(56B)	98-95-3	nitrobenzene	
(61B)	62-75-9	N-nitrosodimethylamine	
(62B)	86-30-6	N-nitrosodiphenylamine	
(63B)	621-64-7	N-nitrosodipropylamine	
(66B)	117-81-7	bis (2-ethylhexyl) phthalate	
(67B)	85-68-7	benzyl butyl phthalate	
(68B)	84-74-2	di-n-butyl phthalate	
(69B)	117-84-0	di-n-octyl phthalate	
(70B)	84-66-2	diethyl phthalate	
(71B)	131-11-3	dimethyl phthalate	
(72B)	56-55-3	benzo(a)anthracene	
(73B)	50-32-8	benzo(a)pyrene	
(74B)	205-99-2	benzo(b)fluoranthene	
(75B)	207-08-9	benzo(k)fluoranthene	
(76B)	218-01-9	chrysene	
(77B)	208-96-8	acenaphthylene	
(78B)	120-12-7	anthracene	
(79B)	191-24-2	benzo(ghi)perylene	
(80B)	86-73-7	fluorene	
(81B)	85-01-8	phenanthrene	
(82B)	53-70-3	dibenzo(a,h)anthracene	
(83B)	193-39-5	indeno(1,2,3-cd)pyrene	
(84B)	129-00-0	pyrene	
	62-53-3	aniline	
	100-51-6	benzyl alcohol	
	106-47-8	4-chloroaniline	
	132-64-9	dibenzofuran	
	91-57-6	2-methylnaphthalene	
	88-74-4	2-nitroaniline	
	99-09-2	3-nitroaniline	
	100-01-6	4-nitroaniline	

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P. O. Box 818. Alexandria, Virginia 22313 703/557-2490

FRN 9366

Sample Number
CHAMPION

5-31-85

Organics Analysis Data Sheet
(Page 3)

Pesticide/PCBs

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared: 6-5-85

Date Analyzed: 6-7-85

[✓ Conc]/Dil Factor: 1000

CAS Number		[✓ ug/l] or ug/Kg (Circle One)
319-84-6	Alpha-BHC	<2
319-85-7	Beta-BHC	
319-86-8	Delta-BHC	
58-89-9	Gamma-BHC (Lindane)	
76-44-8	Heptachlor	
309-00-2	Aldrin	
1024-57-3	Heptachlor Epoxide	
959-98 8	Endosulfan I	
60-57 1	Dieldrin	
72-55 9	4 4'-DDE	
72-20-8	Endrin	
33213 65-9	Endosulfan II	
72-54-8	4 4'-DDD	
7421-93-4	Endrin Aldehyde	
1031-07 8	Endosulfan Sulfate	
50-29-3	4 4'-DDT	
72-43 5	Methoxychlor	
53494-70-5	Endrin Ketone	
57-74-9	Chlordane	↓
8001 35 2	Toxaphene	N/A
12574-11-2	Aroclor 1016	
11104-28-2	Aroclor 1221	
11141-16-5	Aroclor-1232	
53469 21-9	Aroclor-1242	
12672-29 6	Aroclor-1248	
11097 69-1	Aroclor-1254	
11096 82 5	Aroclor-1260	↓

V_i = Volume of extract injected (ul)

V_s = Volume of water extracted (ml)

W_s = Weight of sample extracted (g)

V_t = Volume of total extract (ul)

V_s ______ or W_s ______ V_t ______ V_i ______

Form 1 4 84

Form I. (continued).

Note: Sample Number should have been Champion well water and was identified as Silver Bow due to a concurrent study.

FRN 9369

Sample Number
CLARK FORK WELL
5-31-85

ORGANICS ANALYSIS DATA SHEET

Laboratory Name: USEPA REGION 8
Case No: —
Lab Sample ID No: SILVER BOW
QC Report No:
Sample Matrix: AQUEOUS
Contract No.:
Data Release Authorized By: A. CURTIS
Date Sample Received: 5-31-85

SEMIVOLATILE COMPOUNDS

CONCENTRATION: [✓ LOW] MEDIUM HIGH (circle one)
DATE EXTRACTED/PREPARED: 6-5-85
DATE ANALYZED: 6-10-85
PERCENT MOISTURE: —
[✓ CONC.]/DILUTION FACTOR: 1000

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(21A)	88-06-2	2,4,6- trichlorophenol	<2
(22A)	59-50-7	p-chloro-m-cresol	
(24A)	95-57-8	2- chlorophenol	
(31A)	120-83-2	2,4-dichlorophenol	
(34A)	105-67-9	2,4-dimethylphenol	
(57A)	88-75-5	2- nitrophenol	
(58A)	100-02-7	4-nitrophenol	
(59A)	51-28-5	2,4-dinitrophenol	
(60A)	534-52-1	4,6-dinitro-2-methylphenol	
(64A)	87-86-5	pentachlorophenol	
(65A)	108-95-2	phenol	
	65-85-0	benzoic acid	
	95-48-7	2-methylphenol	
	108-39-4	4-methylphenol	
	95-95-4	2,4,5-trichlorophenol	
(1B)	83-32-9	acenaphthene	
(5B)	92-87-5	benzidine	
(8B)	120-82-1	1,2,4-trichlorobenzene	
(9B)	118-74-1	hexachlorobenzene	
(12B)	67-72-1	hexachloroethane	
(18B)	111-44-4	bis(2-chloroethyl)ether	
(20B)	91-58-7	2-chloronaphthalene	
(25B)	95-50-1	1,2-dichlorobenzene	
(26B)	541-73-1	1,3-dichlorobenzene	
(27B)	106-46-7	1,4-dichlorobenzene	
(28B)	91-94-1	3,3'-dichlorobenzidine	
(35B)	121-14-2	2,4-dinitrotoluene	
(36B)	606-20-2	2,6-dinitrotoluene	
(37B)	122-66-7	1,2-diphenylhydrazine	
(39B)	206-44-0	fluoranthene	
(40B)	7005-72-3	4-chlorophenyl phenyl ether	
(41B)	101-55-3	4-bromophenyl phenyl ether	
(42B)	39638-32-9	bis (2-chloroisopropyl) ether	
(43B)	111-91-1	bis (2-chloroethoxy) methane	↓

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(52B)	87-68-3	hexachlorobutadiene	<2
(53B)	77-47-4	hexachlorocyclopentadiene	
(54B)	78-59-1	isophorone	
(55B)	91-20-3	naphthalene	
(56B)	98-95-3	nitrobenzene	
(61B)	62-75-9	N-nitrosodimethylamine	
(62B)	86-30-6	N-nitrosodiphenylamine	
(63B)	621-64-7	N-nitrosodipropylamine	↓
(66B)	117-81-7	bis (2-ethylhexyl) phthalate	36.1
(67B)	85-68-7	benzyl butyl phthalate	<2
(68B)	84-74-2	di-n-butyl phthalate	
(69B)	117-84-0	di-n-octyl phthalate	
(70B)	84-66-2	diethyl phthalate	
(71B)	131-11-3	dimethyl phthalate	
(72B)	56-55-3	benzo(a)anthracene	
(73B)	50-32-8	benzo(a)pyrene	
(74B)	205-99-2	benzo(b)fluoranthene	
(75B)	207-08-9	benzo(k)fluoranthene	
(76B)	218-01-9	chrysene	
(77B)	208-96-8	acenaphthylene	
(78B)	120-12-7	anthracene	
(79B)	191-24-2	benzo(ghi)perylene	
(80B)	86-73-7	fluorene	
(81B)	85-01-8	phenanthrene	
(82B)	53-70-3	dibenzo(a,h)anthracene	
(83B)	193-39-5	indeno(1,2,3-cd)pyrene	
(84B)	129-00-0	pyrene	
	62-53-3	aniline	
	100-51-6	benzyl alcohol	
	106-47-8	4-chloroaniline	
	132-64-9	dibenzofuran	
	91-57-6	2-methylnaphthalene	
	88-74-4	2-nitroaniline	
	99-09-2	3-nitroaniline	
	100-01-6	4-nitroaniline	↓

Environmental Protection Agency, CLP Sample Management Office,
P. O. Box 818, Alexandria, Virginia 22313 703/557-2490

FRN 9369

Sample Number
CLARK FORK WELL
5-31-85

Organics Analysis Data Sheet
(Page 3)

Pesticide/PCBs

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared: 6-5-85

Date Analyzed: 6-10-85

[✓ Conc]/Dil Factor: 1000

CAS Number		[✓ ug/l] or ug/Kg (Circle One)
319-84-6	Alpha-BHC	<2
319-85-7	Beta-BHC	
319-86-8	Delta-BHC	
58-89-9	Gamma-BHC (Lindane)	
76-44-8	Heptachlor	
309-00-2	Aldrin	
1024-57-3	Heptachlor Epoxide	
959-98-8	Endosulfan I	
60-57-1	Dieldrin	
72-55-9	4 4'-DDE	
72-20-8	Endrin	
33213-65-9	Endosulfan II	
72-54-8	4 4'-DDD	
7421-93-4	Endrin Aldehyde	
1031-07-8	Endosulfan Sulfate	
50-29-3	4 4'-DDT	
72-43-5	Methoxychlor	
53494-70-5	Endrin Ketone	
57-74-9	Chlordane	↓
8001-35-2	Toxaphene	N/A
12674-11-2	Aroclor-1016	
11104-28-2	Aroclor-1221	
11141-16-5	Aroclor-1232	
53469-21-9	Aroclor-1242	
12672-29-6	Aroclor-1248	
11097-69-1	Aroclor-1254	
11096-82-5	Aroclor-1260	↓

V_i = Volume of extract injected (ul)

V_s = Volume of water extracted (ml)

W_s = Weight of sample extracted (g)

V_t = Volume of total extract (ul)

V_s ______ or W_s ______ V_t ______ V_i ______

Form 1 4 84

Form I. (continued).

Note: Sample Identification should have read Champion wastewater and reference to Silver Bow was due to a concurrent study.

FRN 9372

Sample Number
CHAMPION WASTE
5-31-85

ORGANICS ANALYSIS DATA SHEET

Laboratory Name: USEPA REGION 8
Lab Sample ID No: SILVER BOW
Sample Matrix: AQUEOUS
Data Release Authorized By: A. CURTIS
Case No: —
QC Report No:
Contract No.:
Date Sample Received: 5-31-85

SEMIVOLATILE COMPOUNDS

CONCENTRATION: [✓ LOW] MEDIUM HIGH (circle one)
DATE EXTRACTED/PREPARED: 6-5-85
DATE ANALYZED: 6-10-85
PERCENT MOISTURE: —
[✓ CONC]/DILUTION FACTOR: 200

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(21A)	88-06-2	2,4,6- trichlorophenol	<2
(22A)	59-50-7	p-chloro-m-cresol	
(24A)	95-57-8	2- chlorophenol	
(31A)	120-83-2	2,4-dichlorophenol	
(34A)	105-67-9	2,4-dimethylphenol	
(57A)	88-75-5	2- nitrophenol	
(58A)	100-02-7	4-nitrophenol	
(59A)	51-28-5	2,4-dinitrophenol	
(60A)	534-52-1	4,6-dinitro-2-methylphenol	
(64A)	87-86-5	pentachlorophenol	
(65A)	108-95-2	phenol	
	65-85-0	benzoic acid	
	95-48-7	2-methylphenol	
	108-39-4	4-methylphenol	
	95-95-4	2,4,5-trichlorophenol	
(1B)	83-32-9	acenaphthene	
(5B)	92-87-5	benzidine	
(8B)	120-82-1	1,2,4-trichlorobenzene	
(9B)	118-74-1	hexachlorobenzene	
(12B)	67-72-1	hexachloroethane	
(18B)	111-44-4	bis(2-chloroethyl)ether	
(20B)	91-58-7	2-chloronaphthalene	
(25B)	95-50-1	1,2-dichlorobenzene	
(26B)	541-73-1	1,3-dichlorobenzene	
(27B)	106-46-7	1,4-dichlorobenzene	
(28B)	91-94-1	3,3'-dichlorobenzidine	
(35B)	121-14-2	2,4-dinitrotoluene	
(36B)	606-20-2	2,6-dinitrotoluene	
(37B)	122-66-7	1,2-diphenylhydrazine	
(39B)	206-44-0	fluoranthene	
(40B)	7005-72-3	4-chlorophenyl phenyl ether	
(41B)	101-55-3	4-bromophenyl phenyl ether	
(42B)	39638-32-9	bis (2-chloroisopropyl) ether	
(43B)	111-91-1	bis (2-chloroethoxy) methane	↓

PP #	CAS #		[✓ ug/l] or ug/kg (circle one)
(52B)	87-68-3	hexachlorobutadiene	<2
(53B)	77-47-4	hexachlorocyclopentadiene	
(54B)	78-59-1	isophorone	
(55B)	91-20-3	naphthalene	
(56B)	98-95-3	nitrobenzene	
(61B)	62-75-9	N-nitrosodimethylamine	
(62B)	86-30-6	N-nitrosodiphenylamine	
(63B)	621-64-7	N-nitrosodipropylamine	
(66B)	117-81-7	bis (2-ethylhexyl) phthalate	
(67B)	85-68-7	benzyl butyl phthalate	
(68B)	84-74-2	di-n-butyl phthalate	
(69B)	117-84-0	di-n-octyl phthalate	
(70B)	84-66-2	diethyl phthalate	
(71B)	131-11-3	dimethyl phthalate	
(72B)	56-55-3	benzo(a)anthracene	
(73B)	50-32-8	benzo(a)pyrene	
(74B)	205-99-2	benzo(b)fluoranthene	
(75B)	207-08-9	benzo(k)fluoranthene	
(76B)	218-01-9	chrysene	
(77B)	208-96-8	acenaphthylene	
(78B)	120-12-7	anthracene	
(79B)	191-24-2	benzo(ghi)perylene	
(80B)	86-73-7	fluorene	
(81B)	85-01-8	phenanthrene	
(82B)	53-70-3	dibenzo(a,h)anthracene	
(83B)	193-39-5	indeno(1,2,3-cd)pyrene	
(84B)	129-00-0	pyrene	
	62-53-3	aniline	
	100-51-6	benzyl alcohol	
	106-47-8	4-chloroaniline	
	132-64-9	dibenzofuran	
	91-57-6	2-methylnaphthalene	
	88-74-4	2-nitroaniline	
	99-09-2	3-nitroaniline	
	100-01-6	4-nitroaniline	↓

Environmental Protection Agency, CLP Sample Management Office,
P. O. Box 818, Alexandria, Virginia 22313 703/557-2490

FRN 9372

Sample Number
CHAMPION WASTE
5-31-85

Organics Analysis Data Sheet
(Page 3)

Pesticide/PCBs

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared: 6-5-85

Date Analyzed. 6-10-85

[✓ Conc]/Dil Factor: 200

CAS Number		[✓ ug/l] or ug/Kg (Circle One)
319-84-6	Alpha-BHC	< 2
319-85-7	Beta-BHC	
319-86-8	Delta-BHC	
58-89-9	Gamma-BHC (Lindane)	
76-44-8	Heptachlor	
309-00-2	Aldrin	
1024-57-3	Heptachlor Epoxide	
959-98-8	Endosulfan I	
60-57-1	Dieldrin	
72-55-9	4 4'-DDE	
72-20-8	Endrin	
33213-65-9	Endosulfan II	
72-54-8	4, 4'-DDD	
7421-93-4	Endrin Aldehyde	
1031-07-8	Endosulfan Sulfate	
50-29-3	4 4'-DDT	
72-43-5	Methoxychlor	
53494-70-5	Endrin Ketone	
57-74-9	Chlordane	↓
8001-35-2	Toxaphene	N/A
12674-11-2	Aroclor-1016	
11104-28-2	Aroclor-1221	
11141-16-5	Aroclor-1232	
53469-21-9	Aroclor-1242	
12672-29-6	Aroclor-1248	
11097-69-1	Aroclor-1254	
11096-82-5	Aroclor-1260	↓

V_i = Volume of extract injected (ul)

V_s = Volume of water extracted (ml)

W_s = Weight of sample extracted (g)

V_t = Volume of total extract (ul)

V_s ________ or W_s ________ V_t ________ V_i ________

Form 1 4 84

Form I. (continued).

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O. Box 818, - Alexandria, Virginia 22313 703/557-2490

FRN 9372

Sample Number
CHAMPION WASTE

5-31-85

Organics Analysis Data Sheet
(Page 4)

Tentatively Identified Compounds

CAS Number	Compound Name	Fraction	[✓ RT] or Scan Number	Estimated Concentration ([✓ ug/l] or ug/kg)
1.	1-[2-(2-METHOXY-1-METHYLETHOXY)-	A/B/N	76.58	547
2.	1-METHYLETHOXY]-2-PROPANOL $C_{10}H_{22}O_4$			
3.	ISOMER OF #1		16.93	190
4.	METHYLPENTADECANOIC ACID		26.78	116
5.	ANDROST-16-EN-3-ONE		26.98	62.6
6.	1-EICOSENE $C_{20}H_{40}$ MW 280		30.68	94.6
7.	ISOPIMARIC ACID MW 302		31.22	155
8.	PIMARIC ACID MW 302		31.65	375
9.	SIMILAR TO PIMARIC ACID MW302		32.37	570
10.	DEHYDROABIETIC ACID MW 300		32.83	905
11.	15-HYDROXY-ANDROST-4-ENE-3,17-DIONE		33.28	240
12.	UNKNOWN ACID MW 340		33.65	285
13.	1-TETRACOSANOL $C_{24}H_{50}O$		34.90	160
14.	ERGOST-5-EN-3-OL $C_{28}H_{48}O$ MW400		41.88	194
15.	STIGMAST-5-EN-3-OL $C_{29}H_{50}O$ MW 414	↓	43.57	695
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

NATURAL ACIDS, KETONES + ALCOHOLS.

Appendix J. ICAP Analyses Data Sheets, Champion Waste Water, Well Water, and Clark Fork River Water, collected on 5/17/85 and 5/31/85.

APPENDIX J

ENVIRONMENTAL PROTECTION AGENCY
REGION VIII, DEN), COLORADO

LABORATORY SERVICES REQUEST

PROJECT NAME Champion Bonner PROJECT CODE ______ SAMPLES COLL. BY ______ DATE ______

SAMPLES RECEIVED AT LABORATORY BY M. Saunders DATE 6/[illegible] DATA REVIEWED BY ______

ANALYST INITIALS	STATION CODE		Samples taken, 5/31/85											
	SAMPLE COLL. TIME								11/[illegible]		11/[illegible]		[illegible]	
	STATION DESCRIPTION AND REMARKS Priority Pollutants Chilled ICAP 5 mls HNO3 PAGE I		Champion waste Sta-11		Well water Sta-4		Clark Fork River at Missoula Sta- Mgt.		[illegible] well		[illegible] (Clark Fork)		[illegible]	
	CODE	PARAMETER												
	organics	Priority Pollutants	X		X		X		X					
	ICAP		X		X		X		X					
		Ag ug/l		<5		<5		<5		<5		<5		<5
		Al		3440		<30		194		<30		911		[illegible]
		As		6		<5		<5		<5		<5		[illegible]
		Ba		171		167		68		171		58		[illegible]
		Be		<10		<10		<10		<10		<10		<10
		Cd		<5		<5		<5		<5		<5		<5
		Co		<5		<5		<5		<5		<5		<5
		Cr		13		<5		<5		<5		<5		[illegible]
		Cu		<5		<5		5		<5		<5		[illegible]
		Fe		434		<10		230		<10		90		[illegible]
		Mn		619		<5		31		<5		11		470
		Mo		<10		<10		<10		<10		<10		[illegible]
		Ni		<30		<30		<30		<30		<30		[illegible]
		Pb		<30		<30		<30		<30		<30		[illegible]

All results in mg/l unless otherwise indicated, heavy metals in ug/l, pH in units, turbidity in JTU, specific conductance in µmhos/cm, as per STORET.

★ GPO: 1979-680-570

R8EPA-012
(Rev. 11-82)

REGION VIII, DENVER, COLORADO

LABORATORY SERVICES REQUEST

PROJECT NAME ____________ PROJECT CODE ____________ SAMPLES COLL. BY D Lark DATE 5/17/85

SAMPLES RECEIVED AT LABORATORY BY ____________ DATE ____________ DATA REVIEWED BY ____________

STATION CODE	Sample taken	Sample taken	Sample taken				
SAMPLE COLL. TIME	5/31/85	5/31/85	5/31/85	5/17/85	5/17/85	5/17/85	
STATION DESCRIPTION AND REMARKS	Champion Well STA 11	well WATER STA-4	Clark Fork at Missoula Mont STA-9	Champion Well STA-1	Champion River (Clark Fork STA-2	Champion WASTE STA-3	

TAG COLOR SYMBOL

CODE	PARAMETER														
				✓		✓		✓		✓		✓			
				✓		✓		✓		✓		✓			
			<5		<5		<5		<5		<5		<5		
			<5		<5		<5		<5		<5		<5		
			87		<10		<10		<10		<10		73		
			<6		<5		10		<5		10		59		
			<100		<100		<100		<100		<100		<100		
			50.0		30.5		17.4		36.8		18.5		47.4		
			10.3		11.0		5.2		11.1		5.5		12.7		
			4.5		4.3		3.0		7.2		3.6		531		

esults in mg/l unless otherwise indicated, pH in units, turbidity in JTU, specific conductance in μ mhos/cm, as per STORET.