# MANGANESE PROTOCOL

1. <u>Eligibility.</u> With the goal of optimizing conditions for aquatic life at certain mine sites, the following protocol is suggested for determining eligibility for manganese limit modifications to an NPDES permit Be aware that existing guidelines addressing "Wine mine drainage and post <u>mining</u> am still in effect. Therefore, please consult with your regional NPDES permit writer as to which set of guidelines best serves your situation. Furthermore, regular meetings shall be held with the regional permit writer throughout this process (see attached flow chart).

- A. Status. These modifications will be granted only to post mining sites: surface mines, refuse areas, loadouts, prep plants. Post mining deep mine discharges are not eligible, as per 40 CFR Part 434.
- B. Intake water testing.
  - A raw water study of six (6) monthly samples must be completed prior to sampling for the treatability and toxic screening tests to determine the characteristics of a representative sample. Samples are to be taken monthly and consecutively until six (6) samples have been obtained. 'No Flows" are not to be counted as samples. The median shall be calculated for the manganese concentration. Ali future tests dealing with intake water, including the toxic screening, shall be done at a manganese concentration equal to or greater than the median. Parameters to be analyzed include:
    - a. Manganese
    - b. Conductivity
    - c. Hardness
    - d. Acidity
    - e. Alkalinity
    - f. Iron (Fe)
    - g. Aluminum (Al) Total
    - h. pH
    - i. Flow
    - j. Sulfates
    - k. TSS
  - 2. Intake water shall dm be collected and tested for eligibility by performing Treatability Tests and 49 hour toxic screening at 100% concentration on the influent at the adjusted pH levels: 6.0, 7.5, 9.0, mid the upper pH variance limit in the permit if it is greater than 9.0. (If the raw water demonstrates a pH of greater than 6.0, then that pH shall be the low pH-) This sample shall also be analyzed at each pH level for the Parameters listed in I.B.1. plus Un-ionized Ammonia (where anhydrous ammonia is used as a reagent). "Total" and "Dissolved" metals will be Performed on the raw water and pH adjusted water. The chemical reagent used for

pH adjustment must be the same reagent that is used on site. Also, if a back-up system utilizing an alternative chemical is planned, additional tests must be performed with the alternative chemical used as reagent.

- 3. If the toxic screening is positive, a preliminary Benthic; Study shall be conducted at this time to establish a base line for invertebrate aquatic life, All benthic studies Am to be conducted at, preferably, two (2) sites to provide, as much as possible, a control representing the unaffected portion of the stream Prior to the discharge point and all sites shall be sampled on the same day. At the time of benthic sampling, the following parameters shall be analyzed:
  - a. All parameters of I.B.l.
  - b. Chlorides
  - c. Sodium
  - d. Fecal Coliform
  - e. Dissolved Oxygen
  - f. Calcium
  - g. Magnesium
  - h. Temperature
- 4. If eligibility tests indicate that the effluent will remain toxic despite manganese relief, further testing is superfluous. Each site shall be evaluated with the reasonable goal of habitat and aquatic life improvement.

II. <u>Permit Modification</u>, If results of the Eligibility Tests and Toxic Screening so indicate, the next step is to submit an application for a permit modification. Each site is to be judged on a case-by-case basis. While unfavorable results from the Eligibility Tests and Toxic Screening would preclude modifying the permit for manganese, favorable results do not necessarily mandate such modification. All other factors are to be considered by the Agency, including Title 46, Series 1 Legislative Rules.

- A. Permit modification issued with a ninety (90) day Compliance Schedule.
  - 1. If a discharge point under study has a pH variance, the variance will be revoked and pH limits modified to 6.0 9.0.
  - 2. Manganese limits modified to "Report Only".
  - 3. Bioassay (toxicity testing) on the discharge.
    - a. All sampling and testing performed at this stage must be done during normal seasonal flow conditions.
    - b. Analysis will include the parameters fisted in I.B.2.
    - c. Bioassay tests shall be performed in accordance with EPA/600/4-90/027F.

- B. If the results of the bioassay indicate that the effluent is toxic to aquatic life, the permit shall be revised back to the pre-modification conditions. Otherwise, the permit will be modified again with a three (3) year Compliance Schedule requiring semi-annual benthic monitoring in the receiving streams.
  - 1. At a minimum, one benthic survey station will be established downstream of the discharge point (The same stations shall be used as a in I.B.3.)
  - Benthic surveys shall be conducted according to EPA No. 444/4-89-001 May 1989 and include the parameters listed in I.B.3.

<u>NOTE:</u>Further testing may be needed on a case-by-case basis. All tests must be performed by laboratories certified in the testing procedures involved.

All sampling locations must be mutually agreed upon by the permittee and WVDEP personnel.

### NPDES Manganese Protocol



ABC COAL CORPORATION-TOXICITY SUMMARY SHEET

# **COMPLIANCE PERIOD TOXICITY RESULTS VS. INITIAL BENCH RESULTS FOR OUT.-001**

# **FATHEAD MINNOWS**

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Ŋ		The second s	NIN	VIN	-		NA	NIA		NIA	NIA	NIN.	VNI	NIA	NIA	0.293	0.048		0.047
z	States and	Section 2	NIA	NIN	-	N.	VN	NIA		NA	NIA	N/N	2	N/N	NIA	0.459	0.206	-	0.082
VN	10.000	12.121	NIA	NIN	111	VA.	N/A	NIA		NN	NIA	NIN		<b>N</b> A	NIA	106.80	19.87		37.47
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HARD.			2,618	2,725	1,996	3,327	2,041		3,148	4,042	2,718	4,325	1,397		3,162	2,633	2,574
TK			8	100	3.00	0.00	48.0		2.00	9.00	200	S.00	13.0		8.00	0.00	8.00
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N <sup>D</sup>			ž	3.96	385	<b>V</b> N	2.16		MN	3.91	3.78	<b>N</b>	1.62		2.38	1.96	NN
LCS			ž	3952	572	¥N	¥.17		M	25.64	26.56	NN	61.56		42.04	50.78	YN
H			102	8	1.56	9.00	10.5		187	6.8	7.50	9.60	102		7.10	7.45	7.94
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SITE			110-LL	11-01 K	H 10-11	71-01 B	H 10-LL		7-01A 5	1-01A B	1 A10-7	1 A14 F	1 VI0-L		D-14-21	0-16-8	21-97-D
			-HL-S	ETT-S	E-s	111-8	ET-8		S-TT-S	S-TT-S	8-111-S	5-11-8	5-11-8		601/8-3	01/9-	001/10-

001/8-11-97-DISC. 7.10 90 DAY COMPLANCE PERIOD FIELD TOXICITY TEST RESULTS

S-777-77-01A RAW 2.87 INTIAL BENCH TESTING TOXICITY RESULTS

## TOTAL INFORMATION SUMMARY SHEET OUTLET 001

PH         3.74         7.65         7.10         3.20         9.95         7.45         3.47         9.30         7.94           ALKALINITY         -3.00         16.00         16.00         2.00         20.00         22.00         320.00         28.00           ALBALINITY         -360.00         16.00         10.00         22.00         16.00         42.00         28.00           CONDUCTIVITY         6.780         5.970         6.055         4.680         4.950         4.665         5.860         4.575         5.310           GOA         3.370         4.530         2.674         2.591         3.711         2.336         2.18         2.190         2.59         0.00         2.89         4.605         5.860         4.575         5.310           OTAL F         17.20         8.83         -0.04         13.271         1.38         0.04         12.41         5.39         -0.04         7.59         0.03         2.39         4.04         0.04         10.40         7.40         10.60         10.20         10.40         7.40         10.50         10.70         60.40         89.00         1.40         27.30         101.90         17.40         16.50         0.21         2.33<	PARAMETER	8/22-R	8/22-T	8/22-D	9/18-R	9/18-T	9/18-D	10/21-R	16/21.T	10/21 0
PH         3.74         7.65         7.10         3.20         9.95         7.45         3.34         9.38         7.94           ALKALINTY         -2.00         16.00         15.00         -2.00         20.00         -2.00         330.00         22.60           TURBIDITY         4.20         11.10         1.00         7.20         30.10         11.10         3.60         66.10         2.00         26.00           CONDUCTIVITY         4.20         11.10         1.00         7.20         30.10         1.10         3.60         66.10         2.00           SO4         3.373         3.211         3.222         2.674         2.501         3.00         2.30         2.30         2.59           OTAL FE         19.20         8.83         -0.04         12.40         -0.04         12.41         5.39         -0.04         -0.04         12.00         -0.04         -0.04         10.20         -0.04         -0.04         12.00         -0.04         -0.04         12.00         -0.04         -0.04         12.00         -0.04         -0.04         12.00         -0.04         12.00         -0.04         12.00         -0.05         -0.02         -0.023         0.39.20         -0.02<			Section Sector	S				IN 21-R	10/21-1	10/21-D
ALKALINITY         -2.00         16.00         16.00         20.00	PH	3.74	7.65	7.10	3.20	9.95	7.45	3.47	9 30	7.04
ACIDITY       360.00       180.00       180.00       14.00       300.00       -2.00       16.00       400.00       -2.00       26.00         CONDUCTIVITY       6.780       5.970       6.055       4.660       4.350       4.665       5.046       5.04       2.06       2.6.00         SO4       3.573       3.211       3.222       2.674       2.501       3.00       2.36       2.118       2.10         CL       3.10       3.70       4.55       2.60       2.50       3.00       2.36       2.39       2.50         TOTAL FE       19.20       8.83       -0.04       112.40       -0.04       4.04       12.00       -0.04       4.04       12.00       -0.04       4.04       12.00       -0.04       4.04       12.00       -0.04       -0.04       7.00       101.90       17.60       10.23       39.39       26.24       0.32         DISSOLVED N1       13.05       102.70       66.40       89.00       1.40       27.50       101.90       17.40       16.50         DISSOLVED NA       45.73       69.85       1.66.70       31.35       39.20       46.44       23.29       28.57       3.747       11.55       15.90	ALKALINITY	<2.00	16.00	18.00	<2.00	20.00	20.00	<2.00	320.00	28.00
TURBDITY         4.20         11.10         1.00         7.20         30.10         11.10         3.65         2000           CONDUCTVTY         6,780         5.970         6,055         4,680         4,390         4,665         5,080         4,575         5,310           CL         3.10         3.70         4.50         2.60         2.50         3.00         2.80         2.80         2.80         2.80         3.00         4.04           DISALVED FE         17.77         0.53         -0.04         12.40         -0.04         -0.04         12.00         +0.04         -0.02         -0.02         -0.02         -0.02         -0.02         -0.02         -0.02         -0.02         -0.02         -0.02         -0.02	ACIDITY	360.00	180.00	14.00	300.00	<2.00	16.00	400.00	<2.00	26.00
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	TURBIDITY	4.20	11.10	1.00	7.20	30.10	1.10	3.60	66 10	20.00
SO4         3,373         3,211         3,220         2,674         2,501         2,711         2,325         2,118         2,109         2,118         2,109         2,118         2,109         2,118         2,109         2,118         2,109         2,118         2,109         2,118         2,109         2,118         2,109         2,108         2,109         2,108         2,109         2,108         2,109         2,109         2,109         2,109         2,109         2,109         2,109         2,109         2,109         2,109         2,109         2,109         2,100         1,100         1,100         1	CONDUCTIVITY	6,780	5,970	6,055	4,680	4.390	4.605	5.080	4 575	5 310
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	SO4	3,373	3,211	3,220	2,674	2.501	2.711	2.336	2 118	2 109
TOTAL FE         19.20         8.83         -0.04         13.27         1.89         0.04         12.41         5.35           DISSOLVED FE         17.77         0.58         -0.04         12.40         -0.04         12.01         -0.04         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05         -0.05 <t< td=""><td>CL</td><td>3.10</td><td>3.70</td><td>4.50</td><td>2.60</td><td>2.50</td><td>3.00</td><td>2.80</td><td>2 30</td><td>2,109</td></t<>	CL	3.10	3.70	4.50	2.60	2.50	3.00	2.80	2 30	2,109
DISSOLVED PE         17.77         0.58         -0.04         12.40         -0.04         -12.10         -0.04         -0.04           TOTAL MN         134.50         110.90         60.60         90.70         55.00         77.60         102.40         74.30         117.00           DISSOLVED MN         130.50         102.70         60.40         85.00         1.40         27.30         101.700         17.40         16.50           DISSOLVED AL         37.55         29.38         0.22         29.70         0.48         0.23         29.92         0.42         0.83           DISSOLVED AL         35.74         1.69         0.21         29.76         0.48         0.23         29.96         0.42         0.76           TOTAL MA         45.73         69.85         106.60         31.75         41.11         48.50         24.32         29.33         7.01           TOTAL CA         227.80         334.30*         370.80         177.90         392.70*         362.80         179.79         323.40*         338.10           SUS SOLIDS         1.001         10.00         10.00         10.00         10.00         10.00         2.002         4.002         4.002         4.002	TOTAL FE	19.20	8.83	<0.04	13.27	1.89	0.04	12.41	5 30	<0.04
TOTAL MN         134.50         110.90         60.60         90.70         59.00         27.60         102.40         74.30           DISSOLVED MN         130.50         102.70         60.40         89.00         1.40         27.60         102.40         74.30         11.00           DTALA L         37.55         29.38         0.22         29.70         0.48         0.23         29.95         0.42         0.76           DTALA NA         45.73         69.85         106.80         31.75         11.11         48.50         24.32         29.33         37.47           DISSOLVED NA         42.45         68.22         106.70         31.35         39.20         46.44         23.50         24.82         29.33         37.47           DISSOLVED NA         42.45         68.22         106.70         31.35         39.20         46.44         23.50         12.85         12.57         34.42         24.20         13.53         14.00         486.7.00         33.81         37.07         412.50         13.57         2,573         2,573         2,573         2,573         2,571         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,595         3,998<	DISSOLVED FE	17.77	0.58	<0.04	12.40	<0.04	<0.04	12.00	<0.04	<0.04
DISSOLVED MN         130.50         102.70         60.40         89.00         1.40         27.30         101.50         17.40         16.50           TOTAL AL         37.95         29.38         0.22         29.70         27.51         0.32         30.39         26.24         0.83           DISSOLVED AL         36.74         1.69         0.21         29.67         0.48         0.32         29.96         0.42         0.76           TOTAL NA         45.73         69.85         106.50         31.35         39.20         46.44         23.50         28.35         37.01           TOTAL NG         654.50         592.60°         543.10         501.40         370.70°         419.50         51.00         42.02         170.70         322.70°         325.80         179.79         323.40°         338.10           HARDNESS         3.264         3.275         3.162         2.558         2.507         2.633         2.575         3.2,57         3.246         3.819         3.717           B         0.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         4	TOTAL MN	134.50	110.90	60.60	90.70	59.00	27.60	102.40	74.30	17.00
TOTAL AL       37.95       29.38       0.22       29.70       27.51       0.32       20.33       26.24       0.83         DISSOLVED AL       36.74       1.69       0.21       29.67       0.48       0.32       29.96       0.42       0.76         TOTAL NA       45.73       69.85       106.80       31.75       41.11       48.50       24.32       29.33       37.47         DISSOLVED NA       42.45       68.22       106.70       31.35       39.20       46.44       23.50       28.85       37.01         TOTAL AC       22.7.80       334.30°       37.08       177.90       392.70°       456.80       17.97       323.40°       388.10         HARDNESS       3.264       3.275       3.162       2.508       2.507       2.633       2.585       2.573       2.574         SUS. SOLIDS       10.00       210.00       10.00       5.00       810       5.00       44.04       466       7.00         SIS       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002       -0.002	DISSOLVED MN	130.50	102.70	60.40	89.00	1.40	27.30	101.90	17.40	16.50
DISSOLVED AL         36.74         1.69         0.21         29.67         0.48         0.23         29.96         0.42         0.76           TOTAL NA         45.73         69.85         106.60         31.75         41.11         44.850         24.32         29.33         37.47           DISSOLVED NA         42.45         68.21         106.70         31.35         39.20         46.44         23.50         28.85         37.01           TOTAL MG         654.50         592.60*         543.10         501.40         370.70*         419.50         519.00         428.70*         420.20           TOTAL CA         227.80         334.40*         33.162         7.508         2.677         2.633         7.585         3.258         7.573         32.46*         38.19         3.717           SUS SOLIDS         10.00         10.00         5.00         810         5.00         14.00         466         7.000           DISS.SOLIDS         0.002         40.002         40.002         40.002         -0.002         -0.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002         40.002	TOTAL AL	37.95	29.38	0.22	29.70	27.51	0.32	30.39	26.24	0.83
TOTAL NA         45.73         69.85         106.80         31.75         41.11         48.50         24.32         29.33         37.47           DISSOLVED NA         42.45         68.22         106.70         31.35         39.20         46.44         23.50         28.85         37.47           DTAL MG         654.50         592.60*         554.10         501.04         370.70*         419.50         519.00         428.70*         420.20           TOTAL CA         227.80         334.30*         370.80         177.90         392.70*         362.80         179.79         323.40*         338.10           HARDNESS         3.264         3.275         3.162         2,508         2,607         2,633         2,585         2,573         2,574           SUS SOLIDS         10.00         10.00         10.00         5.00         810         5.00         14.00         486         7.00           SB         -0.002	DISSOLVED AL	36.74	1.69	0.21	29.67	0.48	0.23	29.96	0.42	0.05
DISSOLVED NA         42.45         68.22         106.70         31.35         39.20         46.44         23.50         28.85         37.01           TOTAL MG         654.60         592.60*         543.10         501.40         370.70*         419.50         519.00         428.70*         420.20           TOTAL CA         227.80         334.30*         370.70         19.50         519.00         428.70*         420.20           HARDNESS         3.264         3.275         3.162         2.508         2.507         2.633         2.585         2.573         2.574           SUS.SOLIDS         10.00         10.00         5.00         810         5.00         14.00         466         7.00           DISS.SOLIDS         5.511         4.984         5.955         3.998         3.609         4.011         4.265         3.819         3.717           SB         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.002         -0.005         -0.005         -0.005         -0.005         -0.005 <td>TOTAL NA</td> <td>45.73</td> <td>69.85</td> <td>106.80</td> <td>31.75</td> <td>41.11</td> <td>48.50</td> <td>24.32</td> <td>29.33</td> <td>37.47</td>	TOTAL NA	45.73	69.85	106.80	31.75	41.11	48.50	24.32	29.33	37.47
TOTAL MG         654.50         592.60*         543.10         501.40         370.70*         419.50         519.00         428.70*         440.20           TOTAL CA         227.80         334.30*         370.80         177.90         392.70*         352.80         179.79         323.40*         3388.10           HARDNESS         3.264         3.275         3.162         2.588         2.9573         2.573         2.574           SUS.SOLIDS         10.00         210.00         10.00         5.00         810         5.00         14.00         486         7.00           DISS.SOLIDS         5.511         4.984         5.055         3.998         3.609         4.011         4.265         3.819         3.717           SB         <0.002	DISSOLVED NA	42.45	68.22	106.70	31.35	39.20	46.44	23.50	28.85	37.01
TOTAL CA         227.80         334.30*         370.80         177.90         392.70*         362.80         179.79         323.40*         338.10           HARDNESS         3,264         3,275         3,162         2,508         2,507         2,535         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,573         2,574         3,609         4,011         4,406         4,86         7,00           DISS. SOLIDS         5,511         4,984         5,055         3,998         3,609         4,011         4,265         3,819         3,717           SB         -0,002<	TOTAL MG	654.50	592.60*	543.10	501.40	370.70*	419.50	519.00	428.70*	420 20
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	TOTAL CA	227.80	334.30*	370.80	177.90	392.70*	362.80	179.79	323.40*	338 10
SUS. SOLIDS         10.00         210.00         10.00         5.00         810         5.00         14.00         486         7.00           DISS. SOLIDS         5,511         4,944         5,055         3,998         3,609         4,011         4,265         3,819         3,717           SB         <0.002	HARDNESS	3,264	3,275	3,162	2,508	2,507	2.633	2.585	2.573	2 574
DISS. SOLIDS         5,511         4,984         5,055         3,998         3,609         4,011         4,265         3,819         3,717           SB         -0.002         <0.002	SUS. SOLIDS	10.00	210.00	10.00	5.00	810	5.00	14.00	486	7.00
SB         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.002         <0.003         <0.005         <0.005         <0.005         <0.005         <0.005         <0.006         <0.005         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001	DISS. SOLIDS	5,511	4,984	5,055	3,998	3,609	4.011	4.265	3 819	3,717
AS         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001	SB	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
BE         0.026         0.020         <0.006         0.050         0.048         <0.006         0.032         0.027         <0.006           CD         0.006         <0.005	AS	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002
CD         0.006         <0.005         <0.005         0.022         0.021         <0.005         0.002         <0.005           CR         0.015         0.011         0.008         0.015         0.011         0.009         0.015         0.014         0.009           CU         0.044         0.034         0.008         0.038         0.030         0.004         0.051         0.014         0.009           CN         <0.02	BE	0.026	0.020	<0.006	0.050	0.048	<0.006	0.032	0.027	<0.005
CR         0.015         0.011         0.008         0.015         0.011         0.009         0.015         0.014         0.009           CU         0.044         0.034         0.008         0.038         0.030         0.004         0.061         0.050         0.018           CN         <0.02	CD	0.006	<0.005	<0.005	0.022	0.021	<0.005	0.008	0.005	<0.005
CU         0.044         0.034         0.008         0.038         0.030         0.004         0.051         0.050         0.001           CN         <0.02	CR	0.015	0.011	0.008	0.015	0.011	0.009	0.015	0.014	0.009
CN         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.02         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.004         <0.004	CU	0.044	0.034	0.008	0.038	0.030	0.004	0.061	0.050	0.018
PB         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004	CN	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.018
HG         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.001         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.004         <0.004	PB	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.02	<0.004
NI         2.064         1.849         0.459         1.790         1.591         0.206         2.323         2.047         0.082           PHENOLS         <0.005	HG	<0.001	<0.001	<0.001	<0.001	< 0.001	<0.001	<0.001	<0.001	<0.001
PHENOLS         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.005         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004	NI	2.064	1.849	0.459	1.790	1.591	0.206	2 323	2.047	0.082
SE         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.003         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004         <0.004	PHENOLS	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
AG         0.007         0.007         0.007         0.005         0.003          0.003         0.003         0.003         0.003         0.007         0.006           TI         <0.004	SE	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
TI       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004       <0.004	AG	0.007	0.007	0.007	0.005	0.003	<0.003	0.008	0.007	0.006
ZN         3.370         3.155         0.293         2.220         2.040         0.068         3.145         2.790         0.047           LC50         FH         38.88         64.15         N/A           TUA         FH         2.57         1.56         N/A           LIVE ORG. 50%-FH         20/05/01         20/08/03         20/20/20           DIS. O2 100 %         FH         5.50         5.80         5.90           PH-100% (48HR)-FH         7.17.21/7.1         7.457.327.16         7.547.367.21           LIVE ORG. 50%-FH         20/09/00         5.80         5.90           PH-100% (48HR)-FH         7.17.21/7.1         7.457.327.16         N/A           LIVE ORG. 50%D         22/09/00         20/09/01         20/20/20           DIS. O2 100 %         20/09/00         20/09/01         20/20/20           DIS. O2 100 %         20/09/00         20/09/01         20/20/20           DIS. O2 100 %         0         20/14/05         20/16/09         20/20/20           DIS. O2 100 %         0         5.60         5.70         6.00           PH-100% (48HR)D         7.1/7.186.91         7.457.34/7.43         7.34/7.32/7.15	TI	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
LC50         FH         38.88         64.15         N/A           TUA         FH         2.57         1.56         N/A           LIV. OR. 100%FH         20/05/01         20/08/03         20/20/20           LIVE ORG. 50%-FH         20/12/03         20/19/14         20/20/20           DIS. O2 100 %FH         20/12/03         20/19/14         20/20/20           DIS. O2 100 %FH         5.50         5.80         5.90           PH-100% (48HR)-FH         7.1/7.21/7.1         7.457/32/7.16         7.547.32/7.22           LC50         D         42.04         50.78         N/A           TUA         D         2.38         1.96         N/A           LIVE ORG. 50%D         20/14/05         20/16/09         20/20/20           DIS. O2 100 %D         20/14/05         20/16/09         20/20/20           DIS. O2 100 %D         20/14/05         20/16/09         20/20/20           DIS. O2 100 %D         5.60         5.70         6.00           PH-100% (48HR)D         7.1/7.186/51         7.457/26/7.43         7.547.32/7.15	ZN	3,370	3.155	0.293	2.220	2.040	0.068	3.145	2.790	0.047
TUA         FH         38.88         64.15         N/A           TUA         FH         2.57         1.56         N/A           LIV. OR. 100%FH         20/05/01         20/08/03         20/20/20           DIS. 02 100 %FH         20/12/03         20/19/14         20/20/20           DIS. 02 100 %FH         5.50         5.80         5.90           PH-100% (48HR)-FH         7.1/7.21/7.1         7.45/7.32/7.16         7.34/7.36/7.22           LC50         D         42.04         50.78         N/A           TUA         D         2.38         1.96         N/A           LIVE ORG. 50%D         20/14/05         20/16/09         20/20/18           LIVE ORG. 50%D         20/14/05         20/16/09         20/20/20           DIS. 02 100 %D         5.60         5.70         6.00           PH-100% (48HR)D         7.1/7.18/6.91         7.45/7.26/7.43         7.54/7.32/7.15	1.050	Section 18.		20.00	Constant in the second	INSURATION				
LIV. OR. 100%FH         20/05/01         1.56         N/A           LIVE ORG. 50%-FH         20/05/01         20/08/03         20/20/20           DIS. 02 100 %FH         20/12/03         20/19/14         20/20/20           DIS. 02 100 %FH         5.50         5.80         5.90           PH-100% (48HR)-FH         7.1/7.21/7.1         7.45/7.32/7.16         7.34/7.36/7.22           LCS0D         42.04         50.78         N/A           TUAD         2.38         1.96         N/A           LIVE ORG. 50%D         20/14/05         20/16/09         20/20/20           DIS. 02 100 %D         20/14/05         20/16/09         20/20/20           DIS. 02 100 %D         5.60         5.70         6.00           PH-100% (48HR)D         7.1/7.18/6.91         7.45/7.26/7.43         7.54/7.32/7.15	TUA			38.88			64.15			N/A
Litt ORC 100 //FH       20/05/01       20/08/03       20/20/20         LIVE ORG, 50%-FH       20/12/03       20/19/14       20/20/20         DIS. 02 100 %FH       5.50       5.80       5.90         PH-100% (48HR)-FH       7.1/7.21/7.1       7.45/7.32/7.16       7.94/7.36/7.22         LC50D       42.04       50.78       N/A         TUAD       2.38       1.96       N/A         LIVE ORG, 50%D       20/09/00       20/09/01       20/20/20         DIS. 02 100 %D       20/14/05       20/16/09       20/20/18         LIVE ORG, 50%D       20/14/05       20/16/09       20/20/20         DIS. 02 100 %D       5.60       5.70       6.00         PH-100% (48HR)D       7.1/7.18/691       7.45/7.26/7.43       7.54/7.32/7.15	LIV OR 100% PH			2.57			1.56			N/A
Little Orkol, 3074-FH       20/12/03       20/19/14       20/20/20         DIS. 02 100 %—FH       5.50       5.80       5.90         PH-100% (48HR)-FH       7.1/7.21/7.1       7.45/7.32/7.16       7.94/7.36/7.12         LC50       D       42.04       50.78       N/A         TUA       D       20/09/00       20/09/01       20/20/20         LIV. OR, 100%-D       20/09/00       20/09/01       20/20/18         LIVE ORG, 50%-D       20/14/05       20/16/09       20/20/20         DIS. 02 100 %-D       5.60       5.70       6.00         PH-100% (48HR)-D       7.1/7.18/6.91       7.45/7.26/7.43       7.54/7.32/7.15	LIVE ORC 50% PT			20/05/01			20/08/03			20/20/20
DIS. 02 100 %—PH         5.50         5.90           PH-100% (48HR)-FH         7.1/7.21/7.1         7.45/7.32/7.16         7.94/7.36/7.22           LC50         D         42.04         50.78         N/A           TUA         D         2.38         1.96         N/A           LIV. OR. 100%         D         20/09/00         20/09/01         20/20/18           LIVE ORG. 50%—D         20/14/05         20/16/09         20/20/20           DIS. O2 100 %         D         5.60         5.70         6.00           PH-100% (48HR)—D         7.1/7.18%<91	DIS 02 100 % FI			20/12/03			20/19/14			20/20/20
IL-100 % (40HK)-FH       7.07.107.1       7.457.327.16       7.547.367.12         LC50       D       42.04       50.78       N/A         TUA       D       2.38       1.96       N/A         LIV. OR. 100%D       20/09/00       20/09/01       20/20/18         LIVE ORG. 50%D       20/14/05       20/16/09       20/20/20         DIS. O2 100 %D       5.60       5.70       6.00         PH-100% (48HR)D       7.17.18/6.91       7.45/7.26/7.43       7.54/7.32/7.15	PH-100% (48HD) PH			5.50			5.80			5.90
TUA         50.78         N/A           TUA         D         2.38         1.96         N/A           LIV. OR. 100%         D         20/09/00         20/09/01         20/20/18           LIVE ORG. 50%         D         20/14/05         20/16/09         20/20/20           DIS. O2 100 %         D         5.60         5.70         6.00           PH-100% (48HR)         D         7.1/7.18/6.91         7.45/7.26/7.43         7.54/7.32/7.15	ICS0 D			1.01.201.1			7.45/7.32/7.16			1.547.367.12
LIV. OR, 100%D         20/09/00         20/09/01         20/20/18           LIVE ORG. 50%D         20/14/05         20/16/09         20/20/20           DIS. O2 100 %D         5,60         5,70         6.00           PH-100% (48HR)D         7.1/7.18/6.91         7.45/7.26/7.43         7.54/7.32/7.15	TUA			42.04			50.78			N/A
LIVE ORG. 50%D         20/09/00         20/20/18           DIS. 02 100 %D         20/14/05         20/16/09         20/20/20           PH-100% (48HR)D         7.1/7.18/6.91         7.45/7.26/7.43         7.54/7.32/7.15	LIV. OR. 100%-D			2.38			1.96			N/A
DIS. 02 100 %D         20/14/05         20/16/09         20/20/20           PH-100% (48HR)D         5.60         5.70         6.00           PH-100% (48HR)D         7.1/7.18/6.91         7.45/7.26/7.43         7.94/7.32/7.15	LIVE ORG 50%		CHERONAL STREAMS	20/09/00		and a strain of the	20/09/01			20/20/18
PH-100% (48HR)D 5.70 6.00 7.1/7.18/6.91 7.45/7.26/7.83 7.34/7.32/7.15	DIS. 02 100 %D		the second	20/14/05			20/16/09			20/20/20
D. D. A.W. 75 (7547.307.15	PH-100% (48HP)_D			7.1/7.18/6.91			5.70			6.00
	D D	ATL			THE REAL PROPERTY OF	10.00 M (20.00 M)	1461.041.45			1341.327.15

FH-FATHEAD

**D-DAPHNIA** 

SULVE