

ENVIRONMENT CANADA  
CONSERVATION AND PROTECTION  
ENVIRONMENTAL PROTECTION  
PACIFIC AND YUKON REGION

SITE INVESTIGATION AT  
BIG MISSOURI/PREMIER SILBAK PROPERTIES  
NEAR STEWART, B.C.

Regional Data Report DR 86-07

By

M. Ross  
B. Godin

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## MATERIAL AND METHOD

Receiving water samplers were comprised of three grab samples collected on June 13, 1983. The samples were analysed for pH, sulphate, total residue, filterable residue, non-filterable residue, turbidity, conductivity, total cyanide, thiocyanate, cyanate and total and dissolved metals.

The conductivity, turbidity, residue, sulphates, alkalinity and acidity samples were kept cool with wet ice until analysed. Total metal samples of 250 ml each were preserved on site with 1 ml of nitric acid. Dissolved metal samples of 100 ml each were filtered on site through a 0.45 micron cellulose nitrate filter and then preserved with 0.5 ml nitric acid. All samples were delivered to the Environmental Protection Service Laboratory in West Vancouver.

The Inductively Coupled Argon Plasma or ICAP scan, an automatic atomic emissions spectrophotometer, was used for the total and dissolved metal analysis and gave a reading of twenty-six metals. If the copper, lead, or cadmium readings were below the ICAP detection limit, the samples were rerun on the graphite furnace of the atomic absorption spectrophotometer to obtain lower detection limit.

Total cyanide samples were collected in 500 ml bottles, preserved with sodium hydroxide pellets, and stored in the dark at 4°C. The samples were analysed at EPS, West Vancouver lab with the tetracyanonickelate colorimetric method. The detection limit of the analysis is 0.01 mg/l. Thiocyanide samples were complexed with iron and analysed by colorimetric method. The detection limit is 1.0 mg/l.

TABLE 1      SAMPLE SITE LOCATION

STATION	LOCATION
1	Long Lake outlet.
2	Felter Lake outlet.
3	Silver Creek upstream of the road crossing.
4	Hog lake outlet.
5	Silver Lake outlet.
6	Lesser Silver Lake outlet.
7	Upstream crossing of Hovland Creek (Cobalt Creek) on the upstream side of the Big Missouri Road.
8	Downstream crossing of Hovland Creek (Cobalt Creek) on the upstream side of the Big Missouri Road.
9	Upstream of the Lesley Creek (Cooper) Big Missouri Road bridge.
10	Upstream of the Lesley Creek (Cooper) Granduc Road bridge.
11	Fletcher Creek upstream of the Granduc Road.
12	Drainage upstream of tailings pond.
13	Drainage downstream of tailings pond.
14	Mile 20.

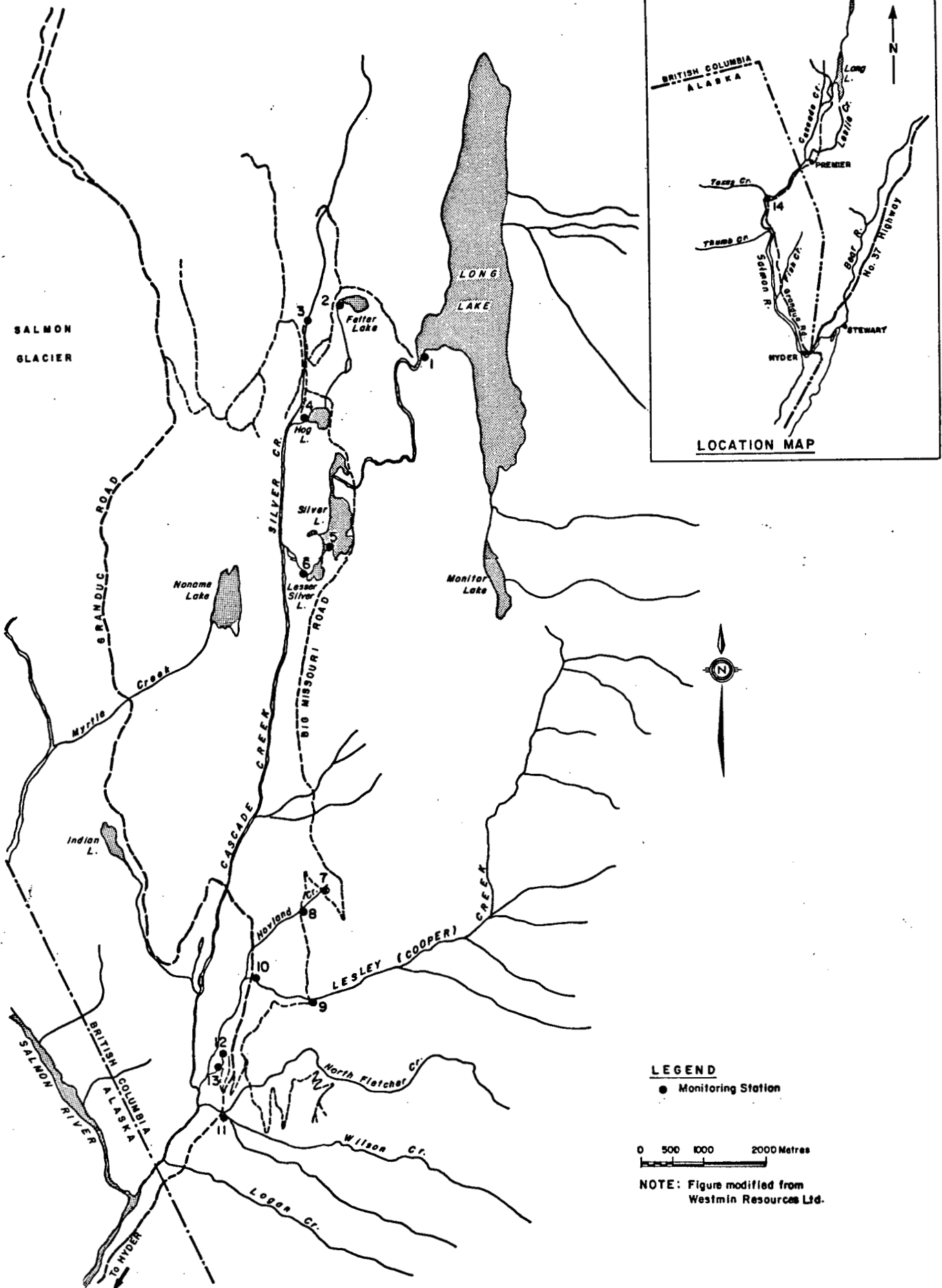


FIGURE 1 RECEIVING WATER SAMPLING STATIONS

TABLE 2(a) RECEIVING WATER DATA FROM THE BIG MISSOURI/PREMIER SILBAK PROPERTY - JULY 13, 1983

PARAMETER <sup>1</sup>	STATION 1			STATION 2			STATION 3			
	$\bar{x}$	S		$\bar{x}$	S		$\bar{x}$	S		
	Total	Diss.2	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.
pH (relative units)	7.2	0	6.8	0	7.4	0	7.4	0	0	0
turbidity (FTU)	0.7	0.4	< .1	0	2.3	0	2.3	0	0	0
conductivity (umhos/cm)	29.4	0.06	15.4	0	46.8	0	46.8	0.06	0	0
filterable residue	31.3	8.1	33.0	8.7	43.7	10.0	43.7	10.0	0	0
non-filterable residue	< 5	0	< 5	0	< 5	0	< 5	0	0	0
total residue	31.3	8.1	33.0	8.7	45.3	8.4	45.3	8.4	0	0
sulphate	5.0	0.23	2.9	0.17	6.9	0.25	6.9	0.25	0	0
total CN	< .01	0	< .01	0	< .01	0	< .01	0	0	0
thiocyanate	< 1.0	0	< 1.0	0	< 1.0	0	< 1.0	0	0	0
cyanate	-	-	-	-	-	-	-	-	-	-
As	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	0	0
B	0.012	< .001	0.015	0.012	0.015	0.010	0.015	0.008	0.008	0.001
Ba	0.011	0.009	0.002	0.002	0.001	0	0.029	0.001	0	0
Be	< .001	< .001	< .001	< .001	0	0	< .001	0	0	0
Cd	< .0005	< .0005	< .0005	< .0005	0	0	< .0005	0	0	0
Co	< .005	< .005	< .005	< .005	0	0	< .005	0	0	0
Cr	< .005	< .005	< .005	< .005	0	0	< .005	0	0	0
Cu	< .001	< .001	< .001	< .001	0	0	< .001	0	0	0
Mn	0.005	0.001	0.002	0.003	0.001	0.001	0.009	0.001	0.001	0
Mo	< .005	< .005	< .005	< .005	0	0	< .005	0	0	0
Ni	< .02	< .02	< .02	< .02	0	0	0.01	0.006	0	0
P	< .05	< .05	< .05	< .05	0	0	< .05	0	0	0
Pb	< .001	< .001	< .001	< .001	0	0	< .001	0	0	0

1 All units in mg/l unless otherwise stated  
 2 Diss. = Dissolved

CONTINUED...

TABLE 2(a) (Continued)

PARAMETER <sup>1</sup>	STATION 1				STATION 2				STATION 3			
	$\bar{x}$		s		$\bar{x}$		s		$\bar{x}$		s	
	Total	Diss.	Total	Diss.	Total	Diss.2	Total	Diss.	Total	Diss.	Total	Diss.
Sb	< .05	< .05	0	0	< .05	< .05	0	0	< .05	< .05	0	0
Se	< .05	< .05	0	0	< .05	< .05	0	0	< .05	< .05	0	0
Sn	0.007	< .01	0.003	0	< .01	< .01	0	0	< .01	< .01	0	0
Sr	0.042	0.042	0	0.001	0.022	0.022	0.001	0.001	0.074	0.075	0.001	0.001
Ti	0.002	< .002	0	0	< .002	< .002	0	0	0.003	< .002	0.002	0
V	< .01	< .01	0	0	< .01	< .01	0	0	< .01	< .01	0	0
Zn	0.003	0.003	0.001	0	< .002	0.005	0	0.004	0.007	0.004	0.001	0.002
Al	0.107	< .05	0	0.02	0.04	< .05	0.03	0	0.34	< .05	0.02	0
Fe	0.115	0.015	0.009	0.008	0.016	0.008	0.009	0.003	0.345	0.016	0.013	0.002
Si	0.7	0.5	0.1	0	0.4	0.4	0.1	0	1.0	0.6	0	0
Ca	4.6	4.3	0.2	0	2.2	2.	0.1	0	6.5	6.5	0.1	0
Mg	0.6	0.5	0	0.1	0.4	0.4	0.1	0	1.4	1.3	0	0
Na	0.4	0.3	0.1	0	0.4	0.3	0	0	0.5	0.3	0.06	0.06
Hardness, Ca, Mg	13.0		0		6.72		0.06		21.5		0.12	
Hardness, Total	13.2		0.06		6.83		0.06		21.7		0.12	
Hg	-	-	-	-	-	-	-	-	-	-	-	-

<sup>1</sup> All units in mg/l unless otherwise stated

<sup>2</sup> Diss. = Dissolved

TABLE 2(b) RECEIVING WATER DATA FROM THE BIG MISSOURI/PREMIER SILBAK PROPERTY - JULY 13, 1983

PARAMETER <sup>1</sup>	STATION 4			STATION 5			STATION 6			
	$\bar{x}$	S		$\bar{x}$	S		$\bar{x}$	S		
	Total	Diss. <sup>2</sup>	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.
pH (relative units)	7.2	0	7.1	0.06	7.2	0	7.2	0	7.2	0
turbidity (FTU)	< 0.1	0.02	0.8	0	1.03	0	1.03	0	1.03	0.5
conductivity (umhos/cm)	52.6	0.5	29.5	0	29.9	0	29.9	0	29.9	0.7
filterable residue	47.3	7.5	31.0	9.6	18.7	6.4	18.7	6.4	18.7	6.4
non-filterable residue	< 5	0	< 5	0	< 5	0	< 5	0	< 5	0
total residue	47.3	7.5	310	9.6	18.7	6.4	18.7	6.4	18.7	6.4
sulphate	8.4	0.8	5.0	2	5.0	0.2	5.0	0.2	5.0	0.2
total CN	< .01	0	< .01	0	< .01	0	< .01	0	< .01	0
thiocyanate	< 1.0	0	< 1.0	0	< 1.0	0	< 1.0	0	< 1.0	0
cyanate	-	-	-	-	-	-	-	-	-	-
As	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	0
B	0.009	0.02	< .001	< .001	< .001	0	0.002	< .001	0.003	0
Ba	0.048	0.045	0.01	0.011	0	0	0.011	0.01	0	0.001
Be	< .001	< .001	< .001	< .01	0	0	< .001	< .001	0	0
Cd	< .0005	< .0005	< .0005	< .0005	0	0	< .0005	< .0005	0	0
Co	< .005	< .005	< .005	< .005	0	0	< .005	< .005	0	0
Cr	< .005	< .005	< .005	< .005	0	0	< .005	< .005	0	0
Cu	< .001	< .001	< .001	< .001	0	0	< .001	< .001	0	0
Mn	0.027	0.005	0.005	0.001	0.001	0	0.005	0.001	0.001	0.001
Mo	< .005	< .005	< .005	< .005	0	0	< .005	< .005	0	0
Ni	< .01	< .02	< .02	< .02	0	0	< .01	< .02	0.006	0
P	< .05	< .05	< .05	< .05	0	0	< .02	< .05	0.009	0
Pb	0.001	< .001	< .001	< .001	0	0	< .001	< .001	0	0

<sup>1</sup> All units in mg/l unless otherwise stated  
<sup>2</sup> Diss. = Dissolved

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TABLE 2(b) (Continued)

PARAMETER <sup>1</sup>	STATION 4			STATION 5			STATION 6				
	$\bar{x}$		S	$\bar{x}$		S	$\bar{x}$		S		
	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	
Sb	< .05	< .05	0	0	< .05	< .05	0	< .05	< .05	0	0
Se	< .05	< .05	0	0	< .05	< .05	0	< .05	< .05	0	0
Sn	< .01	< .01	0	0	< .01	< .01	0	< .01	< .01	0	0
Sr	0.082	0.084	0.003	0.001	0.042	0.043	0.001	0.042	0.043	0.001	0
Ti	0.002	< .002	0.001	0	< .002	< .002	0	< .002	< .002	0	0
V	< .01	< .01	0	0	< .01	< .01	0	< .01	< .01	0	0
Zn	0.004	0.002	0.004	0.001	0.001	< .002	0.001	0.001	< .002	0.001	0
Al	0.14	< .05	0.16	0	0.08	< .05	0.02	0.07	< .05	0.01	0
Fe	0.238	0.009	0.341	0.001	0.082	0.017	0.003	0.08	0.01	0.003	0.006
Si	0.7	0.6	0.2	0	0.6	0.6	0	0.6	0.5	0	0
Ca	8.2	8.1	0.25	0	4.5	4.3	0.3	4.5	4.3	0.1	0
Mg	1.0	0.6	0	0.5	0.6	0.5	0	0.6	0.6	0.1	0.1
Na	0.7	0.5	0.1	0.06	0.5	0.3	0.1	0.5	0.3	0.06	0
Hardness, Ca, Mg		24.2		0.1	12.9		0.1	12.9		0.1	0.1
Hardness, Total		24.4		0.1	13.2		0.1	13.2		0.1	0.1
Hg	-	-	-	-	-	-	-	-	-	-	-

1. All units in mg/l unless otherwise stated

2. Diss. = Dissolved



TABLE 2(c) RECEIVING WATER DATA FROM THE BIG MISSOURI/PREMIER SILBAK PROPERTY - JULY 13, 1983

PARAMETER <sup>1</sup>	STATION 7			STATION 8			STATION 9		
	$\bar{x}$	S		$\bar{x}$	S		$\bar{x}$	S	
	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total
pH (relative units)	7.9	0.06	7.8	0	7.6	0	7.6	0	0
turbidity (FTU)	< 0.1	0	< 0.1	0	0.2	0	0.2	0	0
conductivity (umhos/cm)	126.2	0.6	99.8	0	66.2	0	66.2	0	0
filterable residue	36.3	51.7	78.0	6.1	51.0	1.0	51.0	1.0	1.0
non-filterable residue	< 5	0	< 5	0	< 5	0	< 5	0	0
total residue	36.3	51.7	78.0	6.1	51.0	1.0	51.0	1.0	1.0
sulphate	6.3	0.6	6.1	0.2	7.4	0.3	7.4	0.3	0.3
total CN	< .01	0	< .01	0	< .01	0	< .01	0	0
thiocyanate	< 1.0	0	< 1.0	0	< 1.0	0	< 1.0	0	0
cyanate	-	-	-	-	-	-	-	-	-
As	< .05	0	< .05	0	< .05	0	< .05	0	0
B	< .001	0	0.005	0.007	< .001	0	< .001	0	0
Ba	0.112	0.002	0.087	0.001	0.056	0.002	0.057	0.002	0
Be	< .001	0	< .001	0	< .001	0	< .001	0	0
Cd	< .0005	0	< .0005	0	< .0005	0	< .0005	0	0
Co	< .005	0	< .005	0	< .005	0	< .005	0	0
Cr	< .005	0	< .005	0	< .005	0	< .005	0	0
Cu	< .001	0	< .001	0	< .001	0	< .001	0	0
Mn	0.003	0.001	0.004	0.002	0.003	0.001	< .001	0.001	0
Mo	< .005	0	< .005	0	< .005	0	< .005	0	0
Ni	0.02	0.01	< .02	0	0.01	0	< .02	0.006	0
P	< .05	0	< .05	0	< .05	0	< .05	0	0
Pb	< .001	0	< .001	0	< .001	0	< .001	0	0

1 All units in mg/l unless otherwise stated  
 2 Diss. = Dissolved

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TABLE 2(c) (Continued)

PARAMETER <sup>1</sup>	STATION 7				STATION 8				STATION 9			
	$\bar{x}$		s		$\bar{x}$		s		$\bar{x}$		s	
	Total	Diss.	Total	Diss.	Total	Diss.2	Total	Diss.	Total	Diss.	Total	Diss.
Sb	< .05	< .05	0	0	< .05	< .05	0	0	< .05	< .05	0	0
Se	< .05	< .05	0	0	< .05	< .05	0	0	< .05	< .05	0	0
Sn	< .01	< .01	0	0	< .01	< .01	0	0	< .01	< .01	0	0
Sr	0.249	0.26	0	0.004	0.20	0.206	0	0.002	0.09	0.094	0.003	0.001
Ti	< .002	< .002	0	0	< .002	< .002	0	0	< .002	< .002	0	0
V	< .01	< .01	0	0	< .01	< .01	0	0	< .01	< .01	0	0
Zn	< .002	< .002	0	0	< .002	< .002	0	0	0.001	< .002	0.001	0
Al	< .05	< .05	0	0	0.07	0.04	0.02	0.01	0.04	< .05	0.03	0
Fe	0.015	0.011	0.004	0.001	0.034	0.014	0.010	0.002	0.052	0.010	0.006	0.004
Si	1.7	1.7	0	0	1.5	1.6	0	0.1	0.8	0.7	0	0
Ca	23.4	24.1	0.3	0.1	1.5	18.4	0	0.2	10.3	10.5	0.1	0.1
Mg	1.2	1.2	0.1	0	0.9	0.9	0	0	1.4	1.4	0	0.1
Na	1.0	0.9	0	0	0.9	0.8	0.1	0	0.5	0.4	0.1	0.1
Hardness, Ca, Mg		65.0		0.3		50.7		0.2		31.8		0.4
Hardness, Total		65.5		0.3		51.3		0.2		32.0		0.4
Hg	-	-	-	-	-	-	-	-	-	-	-	-

<sup>1</sup> All units in mg/l unless otherwise stated

<sup>2</sup> Diss. = Dissolved

TABLE 2(d) (Continued)

PARAMETER <sup>1</sup>	STATION 10			STATION 11			STATION 12				
	$\bar{x}$		S	$\bar{x}$		S	$\bar{x}$		S		
	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.	
Sb	< .05	< .05	0	0	< .05	0	< .05	< .05	0	< .05	0
Se	< .05	< .05	0	0	< .05	0	< .05	< .05	0	< .05	0
Sn	< .01	< .01	0	0	0.007	0	0.003	< .01	0	< .01	0
Sr	0.089	0.091	0.003	0.002	0.136	0.141	0.002	1.65	0.001	1.65	0.02
Ti	0.002	< .002	0.001	0	0.004	< .002	0.001	< .002	0	< .002	0
V	< .01	< .01	0	0	< .01	< .01	0	< .01	0	< .01	0
Zn	0.009	0.007	0.005	0.004	0.153	0.134	0.003	4.4	0.001	3.5	0.16
Al	0.15	< .05	0.18	0	0.20	< .05	0.09	0.43	0	< .05	0.04
Fe	0.10	0.004	0.09	0.002	0.196	0.011	0.01	2.0	0.003	0.008	0.002
Si	0.9	0.7	0.2	0	1.6	1.4	0.12	2.6	0	2.4	0
Ca	10.3	10.1	0.3	0.1	15.6	15.5	0.1	65.6	0.1	66.0	0.7
Mg	1.3	1.3	0	0	0.9	0.9	0.1	5.7	0	5.4	0.1
Na	0.5	0.4	0.1	0	0.8	0.7	0	8.5	0	8.3	0.1
Hardness, Ca, Mg		30.5		0.3	42.5		0.2	187.5		187.5	1.5
Hardness, Total		30.5		0.2	43.0		0.2	195.7		195.7	2.1
Hg	-	-	-	-	-	-	-	-	-	-	-

<sup>1</sup> All units in mg/l unless otherwise stated

<sup>2</sup> Diss. = Dissolved

TABLE 2(d) RECEIVING WATER DATA FROM THE BIG MISSOURI/PREMIER SILBAK PROPERTY - JULY 13, 1983

PARAMETER <sup>1</sup>	STATION 10			STATION 11			STATION 12			
	$\bar{x}$	S		$\bar{x}$	S		$\bar{x}$	S		
	Total	Diss. <sup>2</sup>	Total	Diss.	Total	Diss.	Total	Diss.	Total	Diss.
pH (relative units)	8.0	0	7.4	0.06	7.6	0	0.06	0	7.6	0
turbidity (FTU)	0.1	0	0.8	0.2	4.7	0	0.2	0	4.7	0.29
conductivity (umhos/cm)	65.1	0	90.1	0	411.3	0	0	0	411.3	1.15
filterable residue	59.0	13.2	65.3	8.02	285.0	0	8.02	0	285.0	11.0
non-filterable residue	< 5	0	< 5	0	9.7	0	0	0	9.7	0.58
total residue	59.0	13.2	65.3	8.02	294.7	0	8.02	0	294.7	10.5
sulphate	6.9	0.25	12.3	0.1	120	0	0.1	0	120	1.0
total CN	< .01	0	< .01	0	< .01	0	0	0	< .01	0
thiocyanate	< 1.0	0	< 1.0	0	< 1.0	0	0	0	< 1.0	0
cyanate	-	-	-	-	-	-	-	-	-	-
As	< .05	0	< .05	0	< .05	0	< .05	0	< .05	0
B	0.017	0.009	< .001	0	< .001	0	< .001	0	< .006	0.02
Ba	0.054	0.001	0.101	0.002	0.101	0	0.101	0	0.04	0.001
Be	< .001	0	< .001	0	< .001	0	< .001	0	< .001	0
Cd	< .0005	0	0.0015	0.0001	0.0013	0	0.0013	0	0.048	0.001
Co	< .005	0	< .005	0	< .005	0	< .005	0	< .005	0
Cr	< .005	0	< .005	0	< .005	0	< .005	0	< .005	0
Cu	0.003	0.002	0.0013	0.001	< .001	0	0.0013	0	0.008	0.001
Mn	0.004	0.001	0.087	0.001	0.02	0	0.02	0	0.362	0.003
Mo	< .005	0	< .005	0	< .005	0	< .005	0	< .005	0.003
Ni	< .02	0	0.02	0.01	< .02	0	< .02	0	< .02	0
P	< .05	0	< .05	0	< .05	0	< .05	0	< .05	0
Pb	< .001	0	0.012	0.02	< .001	0	0.012	0	0.013	0.007

<sup>1</sup> All units in mg/l unless otherwise stated

<sup>2</sup> Diss. = Dissolved

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TABLE 2(e) RECEIVING WATER DATA FROM THE BIG MISSOURI/PREMIER SILBAK PROPERTY - JULY 13, 1983

PARAMETER <sup>1</sup>	STATION 13		STATION 14	
	Total	Diss. <sup>2</sup>	Total	Diss.
pH (relative units)	7.5	7.5	7.5	0.06
turbidity (FTU)	4.2	4.2	33.3	1.2
conductivity (umhos/cm)	424	424	49.4	0
filterable residue	280	280	45.0	3.6
non-filterable residue	< 5	< 5	85.0	2.0
total residue	280	280	130.0	3.6
sulphate	-	-	7.0	0.3
total CN	< 1.0	< 1.0	< .01	0
thiocyanate	< 0.01	< 0.01	< 1.0	0
cyanate	-	-	-	-
As	< .05	< .05	< .05	< .05
B	0.003	< .001	< .001	< .001
Ba	0.034	0.034	0.091	0.012
Be	< .001	< .001	< .001	< .001
Cd	0.041	0.037	< .0005	< .0005
Co	< .005	< .005	0.009	< .005
Cr	< .005	< .005	< .005	< .005
Cu	0.057	0.005	0.007	< .001
Mn	0.351	0.359	0.140	0.012
Mo	< .005	< .005	< .005	< .005
Ni	< .02	< .02	< .02	< .02
P	< .05	< .05	0.21	< .05
Pb	0.03	< .0005	0.004	< .001
			Total	Diss.
			0	0
			0	0
			0.003	0
			0	0
			0	0
			0.001	0
			0	0
			0	0
			0.003	0.001
			0	0
			0	0
			0.006	0
			0	0

<sup>1</sup> All units in mg/l unless otherwise stated  
<sup>2</sup> Diss. = Dissolved

CONTINUED...

TABLE 2(e) (Continued)

PARAMETER <sup>1</sup>	STATION 13		STATION 14			
			$\bar{x}$		S	
	Total	Diss. <sup>2</sup>	Total	Diss.	Total	Diss.
Sb	< .05	< .05	< .05	< .05	0	0
Se	< .05	< .05	< .05	< .05	0	0
Sn	< .01	< .01	< .01	0.007	0	0.003
Sr	1.59	1.62	0.064	0.046	0.001	0.001
Ti	< .002	< .002	0.226	< .002	0.010	0
V	< .01	< .01	0.008	< .01	0.003	0
Zn	3.72	3.13	0.038	0.001	0.001	0.001
Al	0.26	< .05	4.3	< .05	0.14	0
Fe	1.36	0.019	4.44	0.033	0.12	0.006
Si	2.4	2.4	7.7	0.5	0.3	0.1
Ca	64.5	66.7	9.7	8.0	0.1	0.1
Mg	5.7	5.7	1.9	0.4	0.1	0
Na	8.1	8.3	1.0	0.3	0.1	0
Hardness, Ca, Mg		190		21.9		0.2
Hardness, Total		198		22.3		0.2
Hg	-	-	-	-	-	-

<sup>1</sup> All units in mg/l unless otherwise stated

<sup>2</sup> Diss. = Dissolved