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VOLUME II

HOSMER-WHEELER COAL PROJECT

STAGE II ENVIRONMENTAL ASSESSMENT

TABLES AND FIGURES

B.C. RESEARCH

GEOLOGICAL
ASSESSMENT REPORT

00338

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HOSMER-WHEELER COAL PROJECT

STAGE II ENVIRONMENTAL ASSESSMENT

October 1976

Prepared for:

Kaiser Coal of Canada Ltd.
2600 Board of Trade Tower
1177 West Hastings Street
Vancouver, B.C.

GEOLOGICAL BRANCH
ASSESSMENT REPORT

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YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL MEAN
1965	27	25	24	43	48	56	64	62	44	47	32	23	41
1966	19	25	32	40	50	55	62	59	57	42	30	28	42
1967	26	29	27	37	49	58	64	65	60	44	32	21	43
1968	21	31	38	38	48	55	62	58	52	41	32	14	41
1969	5	22	32	44	52	58	59	61	55	40	34	24	41
1970	16	28	30	37	51	60	63	62	48	39	28	20	40
1971	18	26	17	39	50	54	60	65	48	39	31	14	39
1972	12	25	36	37	49	56	58	63	46	38	32	16	39
1973	18	24	36	40	49	55	62	61	53	43	26	27	41
1974	18	30	32	41	45	58	60	58	52	46	32	29	42
Avg.	18	27	31	40	49	57	61	61	52	42	31	22	41

TABLE 2

MONTHLY MAXIMUM TEMPERATURES AT FERNIE, B.C. (^{o}F)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1965	42	48	51	76	76	85	87	91	70	69	60	49
1966	46	43	61	61	85	79	85	89	80	68	52	44
1967	42	48	45	56	76	81	88	94	89	66	47	42
1968	50	53	58	72	69	81	89	85	80	64	47	38
1969	44	38	56	74	80	87	87	95	89	66	53	45
1970	41	44	47	56	79	89	89	91	75	74	50	43
1971	49	48	45	63	78	84	90	95	77	74	49	37
1972	42	50	60	66	84	84	85	90	80	71	48	46
1973	51	50	56	65	83	90	91	92	88	67	48	46
1974	47	44	53	70	70	87	87	88	79	72	50	43
AVG.	45	47	49	66	78	85	88	91	81	69	50	43

TABLE 3

MONTHLY MINIMUM TEMPERATURES AT FERNIE, B.C. (^{o}F)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1965	3	-14	-10	19	27	30	40	35	28	24	1	-13
1966	-24	-16	- 7	15	29	36	40	34	28	24	7	- 1
1967	-13	1	- 5	11	26	35	39	36	30	26	5	-10
1968	-18	3	22	7	28	34	38	35	34	24	8	-43
1969	-33	- 6	4	27	29	30	35	30	27	16	10	- 5
1970	-23	2	- 7	18	25	34	38	33	20	17	-19	-14
1971	-24	-10	- 7	11	28	32	33	37	20	0	- 2	-26
1972	-32	-25	2	12	22	35	33	38	21	9	4	-31
1973	-25	-17	17	14	24	28	33	32	20	19	4	-13
1974	-25	5	1	23	27	31	35	36	24	22	7	3
AVG.	-21	- 8	1	16	27	33	36	35	25	18	3	-15

TABLE 4

PRECIPITATION AT FERNIE, B.C. (INCHES)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	YEARLY TOTAL	YEARLY SNOW
1965	5.22	8.21	0.53	2.89	4.25	2.69	0.69	2.78	2.56	1.71	7.74	7.70	47.24	193.8
1966	8.35	2.45	3.84	1.59	2.91	3.44	2.72	2.59	0.10	3.83	8.03	7.34	47.19	193.4
1967	10.41	3.98	4.63	1.08	1.45	2.67	0.91	0.36	0.36	6.48	3.25	5.91	41.49	169.0
1968	5.54	3.15	4.53	2.45	4.05	4.09	1.96	2.17	3.22	5.38	5.14	9.52	51.20	114.1
1969	9.01	1.62	1.99	3.56	3.28	5.54	0.74	0.33	4.79	1.32	1.06	1.98	35.22	189.8
1970	6.03	1.57	1.67	4.00	1.89	3.28	2.62	0.51	4.49	3.20	3.24	6.80	39.30	88.0
1971	7.65	2.24	4.22	2.63	1.87	3.04	2.60	1.60	2.30	4.50	5.27	9.85	47.77	166.5
1972	8.82	9.01	4.21	3.72	1.73	4.29	4.09	0.79	5.49	2.66	1.74	7.88	54.43	282.4
1973	4.53	3.11	2.37	1.66	1.93	5.82	0.29	1.49	2.61	4.28	10.95	7.24	46.28	110.3
'74	10.24	4.47	5.34	4.00	4.66	3.70	5.58	1.50	2.79	0.44	9.05	5.70	57.47	190.1
AVG.	7.58	3.98	3.33	2.76	2.80	3.86	2.22	1.41	2.87	3.38	5.55	6.99	46.76	169.7

TABLE 5

REACH CHARACTERISTICS OF NO-NAME CREEK
(REACH BOUNDARIES SHOWN IN FIGURE 5)

Physical Characteristics		Reach						
		NA	NB	NC	ND	NE	NF	NG
Total Pool %		25	15	20	75	50	70	
Width (m)	wetted	2	2.25	1.7	2.45	1.6	3.4	3.5
	rooted	3	3.5	1.9	2.3	1.6	3.6	3.7
Length (m)		-	835	835	2366	1392	3828	-
Gradient %		15	11	2	1	-	1	1
Pool Control %	gravel	10	40	50			5	10
	rock	80	40					
	debris	10	20		20		15	30
	beaver				5	20	40	20
	low gradient			50	75	80	40	40
Flow Character	placid				+		+	+
	swirling			+		+	+	
	rolling		+					+
	broken	+						
	tumbling							
Channel (Thread)	single	+	+		+	+	+	+
	multiple			+				
Cross Section	c	+				+		
	b		+		+		+	+
	u			+				
Entrench-ment	low			+	+	+	+	
	medium		+					+
	high	+						
Substrate Stability	braided							
	bars			+				+
	islands							
Form	straight					+		
	irregular	+	+	+	+		+	+
	meandering							
Flood Side	nil	+	+.			+	+	+
	low				+		+	
	medium							
	high			+				
Bed Composition %	fines	20	10	10	100	70	31	10
	gravel	50	60	50		30	61	85
	rock	30	30	0			2	<5
Bank	texture*	g$	g$	$	$	$	$g	$g
	% unstable	<5	<5	10	<5	10	10	
Debris	low			+		+	+	
	medium		+		+		+	+
	high	+						
Debris Stability	stable				+	+	+	+
	unstable	+	+	+				
% Bank Vegetation	conifer	50	70		10	0	<1	
	deciduous	20	10	<1	45	10	16	20
	shrub	90	60	20	70	50	56	70
	grass	10	15	95	55	50	52	45
	bare	0	5					<5
Closure	% crown	25	15	0	50	0	10	25
	% overhang	30	30	30	75	10	15	30
Species Captured	Cutthroat	+	+	+	+			+
	Brook		+	+	+	+	+	+
	Dolly Varden		+					
	Sucker					+	+	
	Longnose Dace						+	

* $ = silty g = gravelly

TABLE 6

DISCHARGE VALUES FOR STATIONS IN THE HOSMER-WHEELER AREA (SITE LOCATIONS SHOWN IN FIGURE 5)

Drainage	Site	Date	Discharge (cfs)	Sampled By
No-Name Creek	A	May 27	31.9	Kaiser Environmental Services
		28	31.6	
		31	22.0	
		June 1	19.6	
		2	16.9 (morning)	
		2	16.1 (afternoon)	
		3	13.1	
		4	12.7	
		8	12.6	
		9	23.4	
		29	16.0	
		July 20	3.9	
		22	2.7	
		28	2.3	
		Aug. 4	2.0	
		5	8.0	
		9	15.6	
		11	10.0	
		13	8.7	
		20	5.7	
		27	3.7	
		30	3.0	
		Sept. 2	2.6	
		9	2.1	B.C. Research
		10	3.2	
	B	Sept. 9	2.7	B.C. Research
	C*	June 4	14.5	
		8	14.5	
		12	5.0	
		22	2.1	
		28	2.8	
		Aug. 4	3.9	
		9	21.6	
		13	12.8	
		27	6.7	
		Sept. 9	3.7	B.C. Research
		10	7.0	
	D	Sept. 9	5.5	B.C. Research
	E	Sept. 9	2.2	B.C. Research
	F	Sept. 9	3.2	B.C. Research
	K4	July 14	0.6	Kaiser Environmental Services
		19	0.4	
		20	0.4	
		22	0.3	
		29	0.2	

* Flow difficult to measure because of dense aquatic vegetation

TABLE 7

RANGE OF VALUES FOR ANALYTICAL VARIABLES AT EACH SITE*

Site	TLA	KA (HW3)	K3A (HW2)	KF
Temperature (°C)	0 - 12.0(6) (8/1/76) (11/7/76)	0 - 7.0(3) (28/10/75) (21/8/76) (8/1/76)	0 - 6.0(3) (8/1/76) (21/8/76)	2.0 - 10.0(4) (21/4/76) (11/7/76)
Dissolved oxygen (mg/l)	9.0 - 9.9(2) (11/7/76) (20/8/76)	9.6(1) (21/8/76)	10.0(1) (21/8/76)	9.6 - 10.8(2) (20/8/76) (11/7/76)
Dissolved oxygen (%)	85(2)	80(1) (21/8/76)	80(1) (21/8/76)	85 - 95(2) (20/8/76) (11/7/76)
pH (field)	7.9 - 8.4(5) (11/7/76) (1/6/76)	7.7 - 9.1(3) (21/8/76) (28/10/75)	8.1 - 8.8(3) (21/8/76) (28/10/76)	7.8 - 8.2(4) (20/8/76) (31/5/76)
pH (laboratory)	8.1 - 8.3(6) (28/10/75) (8/1/76) (1/6/76)	7.8 - 8.1(3) (28/10/75) (8/1/76)	8.0 - 8.3(3) (28/10/76) (8/1/76)	7.9 - 8.2(4) (31/5/76) (21/4/76) (11/7/76)
Dissolved solids (mg/l)	126 - 205(6) (29/6/76) (28/10/75)	80 - 118(3) (21/8/76) (8/1/76)	155 - 204(3) (21/8/76) (28/10/76)	81 - 129(4) (11/7/76) (20/8/76)
Suspended solids (mg/l)	<1 - 23(6) (28/10/75) (29/6/76) (8/1/76)	<1(3)	<1 - 3(3) (28/10/76) (8/1/76)	5 - 20(4) (11/7/76) (20/8/76)
Turbidity (mg SiO_2/l)	0.5 - 6.7(6) (28/10/75) (29/6/76)	0.5 - 2.0(3) (8/1/76) (21/8/76)	0.5 - 2.0(3) (28/10/76) (21/8/76)	3.1 - 10(4) (11/7/76) (20/8/76)
Alkalinity (mg $CaCO_3$/l)	99 - 164(6) (1/6/76) (8/1/76)	57 - 91(3) (21/8/76) (8/1/76)	112 - 158(3) (21/8/76) (28/10/75)	71 - 98(4) (11/7/76) (20/8/76)
EDTA Hardness (mg $CaCO_3$/l)	104 - 169(6) (1/6/76) (8/1/76)	60 - 96(3) (21/8/76) (8/1/76)	118 - 163(3) (21/8/76) (28/10/75)	73 - 104(4) (11/7/76) (20/8/76)
Specific Conductance (μmho/cm)	176 - 278(6) (29/6/76) (28/10/75)	120 - 165(3) (21/8/76) (8/1/76)	196 - 276(3) (21/8/76) (28/10/75)	132 - 180(4) (11/7/76) (20/8/76)
TOC (mg/l)	3 - 8(6) (28/10/76) (20/8/76)	3 - 6(3) (28/10/76 (21/8/76) (8/1/76)	4 - 10(3) (28/10/75 (8/1/76)	2 - 9(4) (21/4/76) (20/8/76)
Sulphate (mg/l)	6 - 11(6) (1/6/76) (28/10/75) (29/6/76)	2 - 7(3) (21/8/76) (28/10/76) (8/1/76)	7 - 13(3) (21/8/76) (28/10/75)	5 - 8(4) (11/7/76) (20/8/76)
Dissolved Zinc (μg/l)	1 - 2(2)	3 - 8(2)	1(2)	<1(1)
Dissolved Lead (μg/l)	<5(2)	<5(2)	<5(2)	<5(1)
Dissolved Copper (μg/l)	<1(2)	<1(2)	<1(2)	<1(1)
Dissolved Iron (μg/l)	1 - 70(6) (11/7/76) (20/8/76)	2 - 35(3) (8/1/76) (21/8/76)	<1 - 15(3) (8/1/76) (21/8/76)	11 - 150(4) (11/7/76) (20/8/76)

*No. of measurements in brackets after minimum and maximum values. Date (day/month/year) sample collected given under minimum and maximum values.

Site	K7A	KC (HW12)	KB (HW8)	KD (HW9)
Temperature (°C)	0 - 13.0(5) (8/1/76) (11/7/76)	0 - 11.0(6) (8/1/76) (11/7/76)	0 - 11.0(7) (8/1/76) (10/7/76)	0 - 12.0(7) (8/1/76) (11/7/76)
Dissolved oxygen (mg/l)	9.5 - 10.0(2) (20/8/76) (11/7/76)	9.7 - 10.7(2) (20/8/76) (11/7/76)	9.8 - 10.4(2) (20/8/76) (10/7/76)	8.6 - 9.6(2) (20/8/76) (11/7/76)
Dissolved oxygen (%)	80 - 95(2) (20/8/76) (11/7/76)	85 - 95(2) (20/8/76) (11/7/76)	85 - 95(2) (20/8/76) (10/7/76)	70 - 90(2) (20/8/76) (11/7/76)
pH (field)	7.9 - 8.3(5) (20/8/76) (11/7/76)	7.8 - 8.4(6) (11/7/76) (28/10/75) (20/8/76)	7.6 - 8.5(6) (21/4/76) (10/7/76)	7.3 - 8.3(6) (20/8/76) (28/10/75)
pH (Laboratory)	8.2 - 8.3(5)	7.8 - 8.2(6) (28/10/75) (8/1/76) (21/4/76)	7.9 - 8.2(7) (3 dates) (3 dates)	7.8 - 8.1(7) (28/10/75) (5 dates)
Dissolved solids (mg/l)	159 - 211(5) (8/1/76) (11/7/76)	76 - 165(6) (11/7/76) (28/10/76)	82 - 177(7) (10/7/76) (28/10/75)	125 - 230(7) (11/7/76) (28/10/75)
Suspended solids (mg/l)	<1 - 5(5) (8/1/76) (21/4/76)	1 - 21(6) (28/10/75) (20/8/76) (8/1/76)	<1 - 48(7) (28/10/75) (29/6/76) (8/1/76)	<1 - 44(7) (28/10/75) (20/8/76) (8/1/76)
Turbidity (mg SiO_2/l)	0.8 - 2.8(5) (11/7/76) (31/5/76)	1.3 - 10(6) (28/10/75) (20/8/76)	0.8 - 12.0(7) (28/10/75) (29/6/76)	0.4 - 42(7) (28/10/76) (20/8/76)
Alkalinity (mg $CaCO_3$/l)	122 - 179(5) (8/1/76) (11/7/76)	74 - 120(6) (11/7/76) (8/1/76)	70 - 128(7) (29/6/76) (28/10/76)	114 - 180(7) (29/6/76) (28/10/75)
EDTA Hardness (mg $CaCO_3$/l)	127 - 191(5) (8/1/76) (11/7/76)	76 - 124(6) (11/7/76) (8/1/76)	73 - 136(7) (29/6/76) (28/10/76)	115 - 188(7) (29/6/76) (28/10/75)
Specific Conductance (μmho/cm)	222 - 332(5) (8/1/76) (11/7/76)	134 - 216(6) (31/5/76) (8/1/76)	127 - 233(7) (29/6/76) (28/10/76)	196 - 325(7) (29/6/76) (28/10/75)
TOC (mg/l)	2 - 11(5) (31/5/76) (11/7/76)	1 - 10(6) (21/4/76) (20/8/76)	1 - 11(7) (31/5/76) (20/8/76)	<1 - 9(7) (20/4/76) (20/8/76)
Sulphate (mg/l)	6 - 21(5) (21/4/76) (11/7/76)	5 - 10(6) (11/7/76) (8/1/76)	5 - 11(7) (10/7/76) (28/10/75)	6 - 14(7) (29/6/76) (28/10/75) (11/7/76) (21/4/76)
Dissolved Zinc (μg/l)	<1 - 1(2)	<1 - 3(4) (21/4/76) (28/10/75) (8/1/76)	<1 - 5(5) (28/10/75) (10/7/76) (21/4/76)	1 - 3(4) (8/1/76) (28/10/76)
Dissolved Lead (μg/l)	<5(2)	<5(4)	<5(5)	<5(4)
Dissolved Copper (μg/l)	<1(2)	<2(4)	<1(5)	<1(4)
Dissolved Iron (μg/l)	1 - 35(5) (11/7/76) (20/8/76)	<5 - 250(6) (28/10/76) (20/8/76)	3 - 250(7) (8/1/76) (20/8/76)	5 - 550 (7) (8/1/76) (20/8/76)

*No. of measurements in brackets after minimum and maximum values. Date (day/month/year) sample collected given under minimum and maximum values.

Site	K2A (HW6)	K4A	HW13	HW15
Temperature (°C)	0 - 13.0(7) (8/1/76) (11/7/76)	0 - 12.0(7) (8/1/76) (11/7/76)	7.5 - 12.0(4) (31/5/76) (29/6/76) (10/7/76)	8.0 - 13.0(4) (31/5/76) (10/7/76) (19/8/76)
Dissolved oxygen (mg/l)	9.6 - 9.8(2) (20/8/76) (11/7/76)	8.4 - 8.6(2) (11/7/76) (29/8/76)	9.6 - 10.3(2) (19/8/76) (10/7/76)	9.7 - 10.4(2) (19/8/76) (10/7/76)
Dissolved oxygen (%)	85 - 90(2) (20/8/76) (11/7/76)	70 - 80(2) (20/8/76) (11/7/76)	85 - 95(2) (19/8/76) (10/7/76)	80 - 100(2) (19/8/76) (10/7/76)
pH (field)	7.9 - 8.5(6) (8/1/76) (29/10/75) (21/4/76)	7.2 - 8.3(6) (20/8/76) (29/10/75)	7.5 - 8.4(3) (10/7/76) (31/5/76)	7.9 - 8.6(3) (19/8/76) (10/7/76)
pH (laboratory)	7.8 - 8.2(7) (29/10/75) (3 dates)	7.6 - 8.2(7) (29/10/75) (11/7/76)	8.1 - 8.2(4) (3 dates) (19/8/76)	8.2(4) (4 dates)
Dissolved solids (mg/l)	120 - 175(7) (31/5/75) (29/10/75)	141 - 233(7) (31/5/76) (29/10/75)	121 - 196(4) (10/7/76) (19/8/76)	149 - 169(4) (10/7/76) (19/8/76)
Suspended solids (mg/l)	<1 - 48(7) (20/8/76) (21/4/76)	<1 - 10(7) (8/1/76) (31/5/76)	2 - 15(4) (29/6/76) (19/8/76) (10/7/76)	4 - 52(4) (29/6/76) (19/8/76)
Turbidity (mg SiO_2/l)	1.0 - 57(7) (29/10/75) (21/4/76)	0.6 - 11(7) (29/10/75) (20/8/76)	1.8 - 6.0(4) (10/7/76) (19/8/76)	1.6 - 6.0(4) (10/7/76) (19/8/76)
Alkalinity (mg $CaCO_3$/l)	82 - 141(7) (21/4/76) (29/6/76)	100 - 190(7) (31/5/76) (29/10/75)	112 - 133(4) (29/6/76) (19/8/76)	115 - 128(4) (29/6/76) (19/8/76)
EDTA Hardness (mg $CaCO_3$/l)	82 - 122(7) (21/4/76) (11/7/76)	104 - 193(7) (31/5/76) (29/10/75)	114 - 147(4) (31/5/76) (19/8/76)	129 - 151(4) (10/7/76) (19/8/76)
Specific Conductance (umho/cm)	140 - 213(7) (31/5/76) (11/7/76)	174 - 330(7) (31/5/76) (29/10/75)	185 - 250(4) (29/6/76) (19/8/76)	213 - 242(4) (31/5/76) (19/8/76)
TOC (mg/l)	3 - 12(7) (21/4/76) (20/8/76)	1 - 11(7) (21/4/76) (20/8/76)	4 - 9(4) (31/5/76) (19/8/76) (29/6/76)	<1 - 7(4) (31/5/76) (19/8/76)
Sulphate (mg/l)	5 - 8(7) (24/4/76) (29/10/75) (20/8/76) (8/1/76)	5 - 7(7) (31/5/76) (29/10/75) (29/6/76) (8/1/76)	5 - 7(4) (10/7/76) (19/8/76)	13 - 16(4) (31/5/76) (19/8/76) (10/7/76)
Dissolved Zinc (µg/l)	2 - 8(3) (29/10/75) (21/4/76) (8/1/76)	<1 - 2(3)	2 - 5(3) (19/8/76) (10/7/76)	<1 - 3(3)
Dissolved Lead (µg/l)	<5(3)	<5(3)	<5(3)	<5(3)
Dissolved Copper (µg/l)	<1 - 2(3)	<1(3)	<1(3)	<1(3)
Dissolved Iron (µg/l)	5 - 200(7) (29/10/75) (20/8/76)	24 - 220(7) (29/10/75) (20/8/76)	24 - 50(4) (10/7/76) (19/8/76)	<1 - 27(4) (10/7/76) (29/6/76)

*No. of measurements in brackets after minimum and maximum values. Date (day/month/year) sample collected given under minimum and maximum values.

Site	HW10	HW14	HW11	Wells
Temperature (°C)	0 - 13.0(5) (8/1/76) (10/7/76)	8.0 - 11.0(4) (31/5/76) (29/6/76) (19/8/76) (10/7/76)	0 - 12.0(5) (8/1/76) (29/6/76)	-
Dissolved oxygen (mg/l)	9.9 - 11.1(2) (19/8/76) (10/7/76)	9.4 - 10.4(2) (19/8/76) (10/7/76)	9.6 - 10.4(2) (19/8/76) (10/7/76)	-
Dissolved oxygen (%)	85 - 105(2) (19/8/76) (10/7/76)	80 - 95(2) (19/8/76) (10/7/76)	80 - 95(2) (19/8/76) (10/7/76)	-
pH (field)	7.9 - 8.2(5) (19/8/76) (3 dates)	7.7 - 8.3(3) (19/8/76) (31/5/76)	7.5 - 8.1(5) (10/7/76) (3 dates)	6.8 - 7.6(12) G1(20/8/76) G2(21/4/76) G2(19/8/76)
pH (laboratory)	8.2 - 8.5(6) (3 dates) (29/6/76)	8.2 - 8.4(4) (31/5/76) (29/6/76) (19/8/76)	8.1 - 8.4(5) (1/6/76) (21/4/76) (19/8/76) (29/6/76)	7.5 - 8.3(12) G1(21/4/76) G1(11/7/76)
Dissolved solids (mg/l)	132 - 226(6) (10/7/76) (8/1/76)	139 - 168(4) (10/7/76) (19/8/76)	128 - 205(5) (10/7/76) (21/4/76)	203 - 278(12) HTW4(22/8/76) G2(19/8/76)
Suspended solids (mg/l)	<1 - 28(6) (8/1/76) (19/8/76)	2 - 22(4) (29/6/76) (19/8/76)	2 - 16(5) (19/8/76) (1/6/76)	<1 - 233(12) CG(19/8/76) (G2(21/4/76)
Turbidity (mg SiO_2/l)	0.9 - 6.0(6) (8/1/76) (19/8/76)	2.0 - 6.0(4) (29/6/76) (19/8/76)	1.8 - 5.2(5) (10/7/76) (1/6/76)	1.0 - 130(12) GC(19/8/76) G2(21/4/76)
Alkalinity (mg $CaCO_3$/l)	117 - 160(6) (1/6/76) (8/1/76)	120 - 129(4) (31/5/76) (19/8/76)	118 - 147(5) (1/6/76) (19/8/76) (29/6/76)	140 - 225(12) G2(21/4/76) G1(21/4/76) G2(19/8/76)
EDTA Hardness (mg $CaCO_3$/l)	129 - 187(6) (10/7/76) (8/1/76)	131 - 150(4) (31/5/76) (19/8/76)	127 - 169(5) (29/6/76) (21/4/76)	139 - 242(12) G2(21/4/76) G1(20/8/76)
Specific Conductance (μmho/cm)	215 - 320(6) (29/6/76) (8/1/76)	223 - 240(4) (31/5/76) (19/8/76)	212 - 285(5) (29/6/76) (21/4/76)	250 - 385(12) G2(21/4/76) (19/8/76)
TOC (mg/l)	<1 - 7(6) (21/4/76) (19/8/76)	2 - 8(4) (31/5/76) (19/8/76)	<1 - 9(5) (21/4/76) (19/8/76)	<1 - 8(12) G1(21/4/76) (11/7/76)
Sulphate (mg/l)	13 - 30(6) (10/7/76) (8/1/76)	3 - 17(4) (31/5/76) (19/8/76)	7 - 26(5) (19/8/76) (21/4/76)	1 - 15(12) G1(21/4/76) HTW1(22/8/76) HTW3(22/8/76) HTW2(22/8/76)
Dissolved Zinc (μg/l)	<1 - 2(5)	<1 - 4(3) (10/7/76) (31/5/76)	<1 - 2(4)	1 - 170(12) HTW2(22/8/76) CG(19/8/76)
Dissolved Lead (μg/l)	<5(5)	<5(3)	<5(4)	<5(12)
Dissolved Copper (μg/l)	<1(5)	<1 - 1(3)	<1(4)	<1 - 7(12) (4 wells) (G2(11/7/76)
Dissolved Iron (μg/l)	<1 - 20(6) (3 dates) (19/8/76)	<1 - 30(4) (10/7/76) (19/8/76)	<1 - 30(6) (8/1/76) (19/8/76) (21/4/76)	4 - 590(12) G1(11/7/76) HTW1(22/8/76)

*No. of measurements in brackets after minimum and maximum values. Date (day/month/year) sample collected given under minimum and maximum values.

TABLE 8

WATER RESOURCES SERVICE DATA SUMMARY, ELK RIVER

Site	0200102 (HW15)				0200024 (HW14)				1190004 (approx. 4 miles downstream of HW11)			
Period covered (day/month/year)	10/1/73 - 4/5/76				28/7/69 - 17/5/76				13/5/75 - 25/3/76			
	Minimum	Maximum	Mean ± SD	No. of Readings	Minimum	Maximum	Mean ± SD	No. of Readings	Minimum	Maximum	Mean ± SD	No. of Readings
Temperature (°C)	0 (6 dates)	13.5 (23/7/75)	4.8 ± 4.37	25	-0.1 (1/3/71)	16.0 (23/7/75)	5.2 ± 4.66	59	0 (13/1/76)	11.0 (22/7/75)	6.6 ± 3.71	5
Dissolved oxygen (mg/l)	7.0 (10/9/74)	15.4 (8/3/73)	10.8 ± 2.20	16	7.4 (30/7/74)	15.6 (11/10/72)	11.7 ± 1.57	35	-	-	-	-
Dissolved oxygen (% sat)	88.5 (4/5/76)	110 (23/7/75)	98 ± 7.4	9	109 (17/11/75)	83 (28/1/75)	101 ± 7.3	10	-	-	-	-
pH (field and lab)	8.0 (10/1/73)	9.0 (10/9/74) (26/11/74)	-	49	7.6 (3 dates)	8.7 (5 dates)	-	120	8.1 (4 dates)	8.9 (7/10/75)	-	12
Total solids (mg/l)	158 (30/6/75)	336 (4/5/76)	206 ± 37.7	25	144 (23/6/71)	782 (15/5/72)	214 ± 85.5	61	140 (22/7/75)	278 (2/6/75)	196 ± 46.7	5
Dissolved solids (mg/l)	134 (2/6/75)	222 (2/3/76)	188 ± 25.5	25	122 (15/5/72)	236 (28/1/75)	182 ± 30.5	58	138 (2/6/75) (22/7/75	152 (13/5/75)	144 ± 6.5	4
Suspended solids (mg/l)	2 (15 dates)	186 (4/5/76)	-	25	2 (14 dates)	660 (15/5/72)	-	58	2 (22/7/75)	140 (2/6/75)	-	4
Turbidity	0.4 (26/11/74)	52 (4/5/76)	5.6 ± 11.74	26	0.2 (15/10/69)	84 (15/5/72)	8.4 ± 18.65	51	0.5 (22/7/75)	44 (2/6/75)	13.1 ± 15.96	6
Alkalinity (mg $CaCO_3$/l)	111 (2/6/75)	168 (2/3/76)	143 ± 16.1	26	85 (15/5/72)	177 (6/12/72)	140 ± 18.5	77	111 (22/7/75)	154 (13/1/76)	128 ± 14.6	6
EDTA Hardness (mg $CaCO_3$/l)	127 (4/5/76)	210 (10/1/73)	169 ± 20.2	21	105 (26/5/71)	214 (28/1/75)	165 ± 26.5	58	-	-	-	-
Specific Conductance (μmho/cm)	227 (21/5/75)	390 2/3/76)	-	27	198 (9/5/74)	430 (6/12/72)	315 ± 53.4	74	228 (2/6/75)	352 (13/1/76)	-	6
TOC (mg/l)	<1 (4 dates)	16 (21/5/74)	3.8 ± 3.6	18	<1 (4 dates)	10 (2/6/75)	4.4 ± 7.1	20	<1 (13/5/75)	6 (2/6/75)	2.7 ± 2.1	4
Sulphate (mg/l)	13 (30/6/75)	33 (2/3/76)	24 ± 6.8	21	6 (9/5/74)	63 (28/10/71)	24 ± 10.2	50	-	-	-	-
Dissolved Zinc (μg/l)	-	-	-	-	<5 (9 dates)	50 (19/1/72)	12 ± 11	18	-	-	-	-
Dissolved Lead (μg/l)	-	-	-	-	<3 (12 dates)	10 (13/6/72)	4 ± 2	18	-	-	-	-
Dissolved iron (mg/l)	-	-	-	-	<0.02 (5 dates)	3.6 (5/5/70)	0.24 ± 0.65	36	-	-	-	-
Dissolved cadmium (μg/l)	-	-	-	-	<0.1 (23/11/72)	-	-	-	-	-	-	-

B.C. Research

Site	0200102 (HW15)				0200024 (HW14)				1190004 (approx. 4 miles downstream of HW11)			
Period Covered (Day/Month/Year)	10/1/73 - 4/5/76				28/7/69 - 17/5/76				13/5/75 - 25/3/76			
	Minimum	Maximum	Mean ± SD	No. of Readings	Minimum	Maximum	Mean ± SD	No. of Readings	Minimum	Maximum	Mean ± SD	No. of Readings
Chloride (mg/l)	0.6 (10/7/73)	2.3 (26/3/74)	1.5 ± 0.48	12	0.3 (2/6/70) (23/6/71)	3.3 (17/1/73)	1.4 ± 0.70	56	-	-	-	-
Fluoride (mg/l)	0.17 (16/7/74)			1	0.15 (26/5/71) (23/6/71)	0.36 (11/11/69)	0.24 ± 0.06	25	-	-	-	-
Ammonia (mg/l)	<0.005 (3 dates)	0.05 (4/12/73)	0.01 ± 0.01	23	<0.005 (3 dates)	0.25 (28/1/70)	0.04 ± 0.05	51	-	-	-	-
Nitrate (mg/l)	0.02 (8/3/73)	0.18 (10/1/73)	0.09 ± 0.05	21	<0.02 (11/7/72)	0.56 (8/2/72)	0.14 ± 0.26	61	0.05 (22/7/75)	0.14 (13/5/75)	0.09 ± 0.04	4
Kjeldahl Nitrogen (mg/l)	0.01 (23/7/75)	0.36 (4/5/76)	0.13 ± 0.10	12	0.05 (11/3/75) (25/3/76)	0.21 (17/11/75)	0.11 ± 0.05	13	-	-	-	-
Phenols (µg/l)	<2	2	-	3	<2 (20 dates)	11 (1/12/70)	~2	34	-	-	-	-
Dissolved phosphorus (µg/l)	<3 (8 dates)	12 (21/5/75) (4/5/76)	5 ± 2	21	<3 (14 dates)	32 (7/3/74)	-	53	-	-	-	-
Total phosphorus (µg/l)	<3 (12/8/75)	222 (4/5/76)	28 ± 52	29	<3 (2/11/70)	428 (15/5/72)	33 ± 61	62	3 (22/7/75)	180 (2/6/75)	50 ± 60	7
Silica (mg/l)	3.6 (30/6/74)	5.0 (10/1/73)	4.3 ± 0.36	22	3.2 (11/8/70)	12.5 (5/5/70)	4.8 ± 1.37	57	-	-	-	-
Dissolved calcium (mg/l)	35.7 (4/5/76)	53.5 (10/1/73)	46.3 ± 5.16	22	30.0 (9/5/74)	61.2 (28/1/75)	46.3 ± 7.02	57	-	-	-	-
Dissolved magnesium (mg/l)	9.1 (30/6/75)	14.5 (10/1/73)	12.5 ± 1.64	21	7.0 (23/6/71)	17.5 (6/12/72)	11.8 ± 2.37	57	-	-	-	-
Dissolved potassium (mg/l)	0.4	0.6	0.48 ± 0.06	22	0.3 (23/11/72)	1.5 (12/7/70)	0.6 ± 0.21	58	-	-	-	-
Dissolved sodium (mg/l)	0.9 (16/7/74) (30/6/75)	2.5 (2/3/76) (26/3/74)	1.78 ± 0.52	22	1.1 (3 dates)	3.3 (28/1/75)	1.98 ± 0.73	21	-	-	-	-
Total coliforms (MPN/100 ml)	<20	110	-	5	-	-	-	-	4 (22/7/75)	1600 (29/1/76)	-	9
Faecal coliforms (MPN/100 ml)	<2 (3 dates)	920 (25/9/73)	-	25	<2 (3 dates)	540 (28/1/75)	-	37	<2 (30/6/75)	540 (29/1/76)	-	12

TABLE 9

APPROXIMATE SUSPENDED SOLIDS LOADINGS IN NO-NAME CREEK AT SITE KB

Date	Suspended solids loadings (Kg/h)
May 31/76	25
June 29/76	78
Aug. 4/76	0.6*
Aug. 9/76	362*
Aug. 20/76	12

* Suspended solids measured by Kaiser Resources.

TABLE 10

ANALYSIS RESULTS FOR SPARWOOD PLANT EFFLUENT AND THICKENER OVERFLOW SAMPLES

Received August 27, 1976

Analysis	Sparwood Plant Effluent	Thickener Overflow
pH (laboratory)	7.9	7.8
Dissolved solids (mg/l)	220	153
Specific conductance (μmho/cm)	294	281
Alkalinity (mg $CaCO_3$/l)	122	108
EDTA Hardness (mg $CaCO_3$/l)	164	152
TOC (mg/l)	8	5
Sulphate (mg/l)	42	46
Dissolved Mercury (μg/l)	<0.05	0.1
Dissolved Arsenic (μg/l)	<1	<1
Dissolved Zinc (μg/l)	80	22
Dissolved Lead (μg/l)	<5	<5
Dissolved Copper (μg/l)	2	5
Dissolved Iron (μg/l)	20	58

TABLE 11

LEACHATE TESTS ON COAL SAMPLES
PULP DENSITY (100 g/250 ml)

METALS (mg/1) LEACHED AFTER 24 HRS AT pH 4

Coal Sample*	Cu	Pb	Zn	Fe	Hg
1	0.004	0.006	0.012	0.009	0.00030
2	0.024	0.004	0.057	0.009	0.00019
3	0.006	0.008	0.028	0.021	0.00016
4	0.005	0.008	0.030	0.013	0.00011
5	0.007	0.003	0.027	0.017	0.00018

METALS (mg/1) LEACHED AFTER 48 HRS AT pH4

Coal Sample	Cu	Pb	Zn	Fe	Hg
1	0.010	0.003	0.030	0.013	0.00039
2	0.011	0.009	0.038	0.017	0.00014
3	0.030	0.007	0.066	0.018	0.00020
4	0.005	0.001	0.018	0.005	0.00009
5	0.006	0.002	0.024	0.006	0.00013
PCB	0.05	0.05	0.50	0.30	0.001

*Origin of coal samples

#1 = Adit #28 Seam #4
#2 = Adit #32 Seam #8
#3 = Adit #33 Seam #11
#4 = Adit #34 Seam #10
#5 = Adit #35 Seam #9

TABLE 12

SUMMARY OF FISHING EFFORT IN NO-NAME CREEK AND OTHER DRAINAGES IN THE HOSMER WHEELER AREA (LOCATIONS SHOWN IN FIGURE 5)

Site	Date Sept.	Time	Drainage	Location	Type of Effort	Length of Time
FS 1	6	09:00	No-name	Behind abandoned farm	Trap	74 h
FS 2	6	10:00	No-name	Beaver pond near park	Trap	73 h
FS 3	6	11:00	No-name	Beaver pond at road crossing	Trap	72 h
FS 4	6	13:00	Highway drainage	0.1 miles along drainage	Electro-shocker	781 sec
FS 5	6	14:00	Highway drainage	0.1 miles along drainage	Electro-shocker	695 sec
FS 6	6	15:00	No-name Creek	Below logging bridge	Electro-shocker	1505 sec
FS 7	6	17:00	No-name Creek	Above logging bridge	Electro-shocker	596 sec
FS 8	7	08:30	No-name Creek	Above culvert at Hosmer to Creek	Electro-shocker	869 sec
FS 9	7	09:00	No-name Creek	Above the settlement at Hosmer (near highway)	Electro-shocker	808 sec
FS 10	7	10:00	No-name Creek	Below trap FS-1	Electro-shocker	850 sec
FS 11	7	13:00	No-name Creek	Below road crossing	Trap	46 h
FS-12	7	14:30	No-name Creek	Below transmission line crossing	Electro-shocker	75 sec
FS 13	7	15:00	No-name Creek	Upstream portion of reach ND	Electro-shocker	297 sec
FS 14	7	17:00	No-name Creek	Upper reach of "No-Name"	Electro-shocker	307 sec
FS 15	7	11:00	Beaver Ponds	Between highway and Elk River	2" gill set	24 h

TABLE 13

RELATIVE ABUNDANCE AND SIZE OF FISH CAPTURED BY ELECTROSHOCKING IN NO-NAME CREEK
(REACH LOCATIONS SHOWN IN FIGURE 5)

Reach	Fish Captured Per Minute Shocking					Length/Range (cm)				
	Brook Trout	Cutthroat Trout	Dolly Varden	Sucker	Longnose Dace	Brook Trout	Cutthroat Trout	Dolly Varden	Sucker	Longnose Dace
NA	-	2.16	0	0	0	-	12.5/9.8-17.0	0	0	0
NB	0.40	0.40	0.03*	0	0	13.3/10.7-21.1	13.4/7.9-19.6	24.1*	0	0
NC	7.20	1.60	0	0	0	10.7/6.2-13.5	14.5/13.1-15.9	0	0	0
ND	0.81	0.60	0	0	0	14.9/13.3-18.2	16.8/13.7-21.0	0	0	0
Highway Drainage NE	5.49	0	0	0	0	10.3/5.1-25.5	0	0	0	0
NF	0.50	0	0	0.36	0.72	16.1/5.9-24.0	0	0	6.2/4.3-8.4	6.48/4.3-8.4
NG	0.35	0	0	0	0	17.3/14.9-19.7	0	0	0	0

*One fish captured

TABLE 14

SELECTED PHYSICAL PROPERTIES OF THE SOILS

Site	Horizon	Depth	% Sand	% Silt	% Clay	% >2mm	Texture
2	Ae	0-5	14.1	56.2	29.7	28.3	gsicl
	Bm	5-12	37.2	25.6	37.2	26.6	gcl
	BC	12-26	18.4	43.8	37.7	39.1	gsicl
3	Ae	0-7	20.1	52.0	27.9	32.2	gsicl
	Bm	7-11	48.6	33.5	17.9	37.8	gl
	IIBC	19-44	23.5	45.7	30.8	71.9	vgcl
	IIC	44-100+	31.3	37.3	31.4	68.7	vgcl
5	Ae	0-12	48.6	41.2	10.2	43.6	gl
	Bm	12-50	44.3	45.0	10.7	41.0	gl
6	Ae	0-7	16.3	58.5	25.2	40.7	gsil
	Bm	7-24	45.6	37.4	17.0	36.3	gl
	BC	24-40	37.8	40.9	21.3	63.2	gl
	C	40-100+	36.7	37.0	26.3	72.1	gl
8	Ae	0-5	30.8	49.5	19.7	54.1	vgl
	Bm	5-30	46.2	35.6	18.2	51.5	vgl
	BC	30-75	60.2	35.7	4.1	55.0	vgsl
	C	75-100+	26.4	35.2	38.4	59.0	vgcl
9	Ae	0-7	30.8	53.6	15.6	34.9	gsil
	Bf	7-16	39.1	45.7	15.2	36.6	gl
	Bt	16-43	32.8	42.5	19.6	47.0	gl
	BC	43-75	42.3	40.4	17.4	51.8	vgl
	C	75-125	57.2	38.4	4.4	72.7	vgsl
11	Ae	0-5	37.8	36.1	26.1	32.4	gl
	Bm	5-38	46.1	34.9	20.0	42.5	gl
	BC	38-69	42.6	36.2	21.2	53.9	vgl
	C	69-100+	47.7	32.6	20.7	54.7	vgl
12	Ae	0-7	27.0	53.5	19.5	45.4	gsil
	Bm	7-19	27.6	58.3	14.1	39.8	gsil
	Bt	19-35	42.6	36.2	21.2	64.7	vgl
	C	35-100+	47.7	35.6	16.7	53.8	vgl
13	Ae	0-5	24.9	51.5	23.6	60.0	vgsil
	Bm	5-25	63.1	23.5	13.4	49.4	gsl
	C	25-50	69.6	15.7	14.7	67.6	vgsl

Continued ...

Site	Horizon	Depth	% Sand	% Silt	% Clay	% >2mm	Texture
14	Bm	0-45	26.7	46.4	26.9	76.0	vgsil
	Bc	45-55	37.9	43.0	19.1	56.3	vgl
	C	55-70	50.8	26.8	22.8	67.9	vgl
	Rx coal	70-125+	47.5	38.0	14.5	0	l
15	Ah	0-5	24.1	47.3	28.6	37.4	gl to gcl
	Bm	5-20	41.7	34.8	23.5	39.4	gl
	BC	20-45	31.4	45.3	23.3	44.1	gl
	IIBC	45-65	55.7	26.9	17.4	71.0	vgsl
	Rx coal	65+	49.8	35.3	14.9	0	l
16	Bm_1	0-15	22.0	54.8	23.2	43.1	gsil
	Bm_2	15-43	73.0	17.6	9.3	59.5	vgsl
	Btj	43-70	63.7	28.8	7.5	50.6	vgsl
	IIC	70-100+	69.9	21.4	8.7	69.6	vgsl
17	Ahe	0-8	24.8	52.8	22.1	51.4	vgsil
	Bm	8-25	38.2	44.7	17.1	56.4	vgl
	Btj	25-54	42.8	46.6	10.7	33.7	gl
	C	54-75	16.5	58.5	38.7	24.1	gsicl
19	Ae	0-8	35.9	52.3	11.8	36.2	gsil
	Bm	8-30	40.2	45.1	14.7	43.9	gl
	C	30-50	42.6	40.3	17.2	46.0	gl
20	Ap	0-20	31.1	50.3	18.5	11.4	sil to l
	II Bm	20-45	48.7	28.2	23.1	68.7	vgl
	II C	45-100+	49.3	34.2	16.6	66.8	vgl
21	Ae	0-5	14.1	60.3	25.6	47.0	gsil
	Bm	5-25	43.0	42.4	14.6	35.7	gl
	Btj	25-45	60.3	31.3	8.4	31.1	gsl
	C	45-65	24.0	53.8	22.2	63.3	vgsil
22	Ae	0-8	49.2	41.4	9.4	51.7	vgl
	Bm	8-25	40.8	48.0	11.2	45.8	gl
	BC	25-50	32.1	47.7	20.1	61.8	vgl
	IIC	50-100+	61.4	25.7	12.9	52.0	vgsl
23	Ae	0-4	31.2	57.7	11.1	25.6	gsil
	Bm	4-15	35.5	50.6	13.8	28.7	gsil
	IIBCca	15-45	69.1	19.4	11.5	70.0	vgsl

Continued ...

Site	Horizon	Depth	%				Texture
			Sand	Silt	Clay	>2mm	
24	Ap	0-10	10.6	60.8	28.6	35.8	gsil to gsicl
	Bm	10-23	11.5	69.1	19.4	0.5	sil
	Cca	23-48	16.3	65.4	18.3	1.3	sil
25	Ap	0-13	5.2	56.8	38.0	6.7	sicl
	Bmk	13-40	25.3	55.1	19.6	2.9	sil
	Cca	40-95	60.3	29.3	10.4	0.4	sl
26	Bm	2-12	43.4	37.7	18.9	46.0	gl
	BCck	12-57	60.4	29.3	10.4	45.6	gsl
	Ck	57-100+	59.0	27.1	13.9	56.1	vgsl
27	Ae	0-5	35.2	55.5	9.3	14.2	sil
	Bm	5-23	35.4	52.6	12.0	18.6	sil
	BC	23-43	35.5	51.0	13.5	14.6	sil
	C	43-64	30.7	51.8	17.5	13.7	sil
	IICca	64-100+	47.1	20.1	32.8	71.3	vgscl
29	Ap	0-10	44.7	43.1	12.2	1.3	l
	Bm	10-29	51.7	38.5	9.8	0	l to sl
	Ck	29-121	66.5	25.6	7.9	0	sl
	IICca	121+	ND	ND	ND	86.7	

ND - Not Determined

TABLE J5

SELECTED CHEMICAL PROPERTIES OF THE SOILS

Site	Horizon	Depth (cm)	pH H_2O	pH 0.01M $CaCl_2$	CEC me/100g	Ca me/100g	Mg me/100g	Na me/100g	K me/100g	BS %	EC mmhos/cm
2	Ae	0-5	4.2	4.1	20.84	4.58	1.01	0.01	0.58	29.6	0.130
	Bm	5-12	5.0	4.3	19.34	5.63	1.50	0.01	0.53	39.6	0.097
	BC	12-26	5.2	4.3	15.63	5.68	1.77	0.02	0.38	50.2	0.094
3	Ae	0-7	5.3	5.0	26.20	11.53	1.42	0.01	0.70	52.2	0.143
	Bm	7-19	5.6	5.2	29.92	10.23	1.69	0.02	0.78	42.5	0.097
	IIBC	19-44	5.4	4.9	17.27	10.65	2.39	0.01	0.38	77.8	0.020
	IIC	44-100+	6.3	5.8	19.06	12.03	2.90	0.02	0.20	79.5	0.017
5	Ae	0-12	4.7	4.1	18.61	7.88	1.69	0.01	0.95	56.6	0.181
	Bm	12-50	5.5	4.4	19.95	5.63	1.03	0.02	0.68	36.9	0.086
6	Ae	0-7	5.5	4.4	27.99	9.05	1.19	0.04	0.55	38.7	0.130
	Bm	7-24	4.8	4.2	20.86	2.93	0.45	0.02	0.28	27.1	0.241
	BC	24-40	5.0	4.2	12.89	3.68	1.52	0.03	0.10	41.3	0.079
	C	40-100+	5.1	4.0	11.91	6.35	2.00	0.04	0.08	71.1	0.068
8	Ae	0-5	6.0	5.5	16.86	9.55	1.94	0.01	1.33	76.1	0.245
	Bm	5-30	5.8	5.3	14.59	7.48	0.93	0.01	0.78	63.1	0.181
	BC	30-75	6.0	5.8	10.22	7.60	1.01	0.02	0.20	86.4	0.177
	C	75-100+	6.1	5.7	19.05	12.85	1.87	0.03	0.23	78.6	0.115
9	Ae	0-7	4.9	4.2	23.82	3.90	0.86	0.02	1.60	26.7	0.082
	Bf	7-16	5.0	3.8	30.36	1.70	0.39	0.04	0.48	8.6	0.071
	Bt	16-43	5.0	4.0	16.07	0.85	0.25	0.02	0.23	8.4	0.071
	BC	43-75	4.8	3.5	10.41	0.95	0.25	0.02	0.05	12.2	0.095
	C	75-125	5.2	4.5	15.04	5.90	0.99	0.02	0.18	47.1	0.122
10	Ah	0-10	6.0	5.5	49.40	32.06	4.54	0.02	1.43	77.0	0.227
	Bm	10-35	5.9	4.3	29.17	12.53	1.87	0.01	0.80	52.1	0.077
	C	35-50	5.6	4.7	34.97	13.70	2.35	0.01	0.55	47.5	0.074

Continued ...

Site	Horizon	Depth (cm)	pH H_2O	pH 0.01M $CaCl_2$	CEC me/100g	Ca me/100g	Mg me/100g	Na me/100g	K me/100g	BS %	EC mmhos/cm
11	Ae	0-5	6.1	4.5	17.27	7.53	1.09	0.01	1.90	61.0	0.210
	Bm	5-38	5.0	4.2	18.45	3.63	0.66	0.02	1.08	29.2	0.103
	BC	38-69	5.0	4.0	19.95	2.40	0.31	0.01	1.33	20.3	0.121
	C	69-100+	5.1	4.1	18.16	3.18	0.37	0.01	0.20	20.7	0.061
12	Ae	0-7	4.4	4.0	29.47	5.80	1.07	0.03	1.45	28.3	0.131
	Bm	7-19	5.2	4.0	57.01	0.70	0.14	0.03	0.20	1.8	0.030
	Bt	19-35	5.0	3.6	35.58	1.70	0.23	0.02	0.13	5.9	0.039
	C	35-100+	5.1	4.1	37.51	6.60	0.89	0.03	0.05	20.1	0.045
13	Ae	0-5	4.9	3.9	24.11	1.80	0.23	0.01	1.03	12.7	0.057
	Bm	5-25	4.7	4.3	16.97	0.73	0.08	0.01	0.10	5.4	0.031
	C	25-50	4.9	3.5	13.09	2.20	0.56	0.01	0.18	22.5	0.038
14	Bm	0-45	4.8	4.4	27.68	7.33	1.81	0.02	0.15	33.6	0.091
	BC	45-55	5.1	4.3	38.54	4.48	0.82	0.04	0.03	13.9	0.049
	C	55-70	5.3	4.4	36.31	7.55	1.26	0.03	0.05	24.5	0.063
	Rx	70-125+	5.1	4.1	59.83	19.65	3.52	0.07	<.03	38.9	0.076
15	Ae	0-5	4.9	4.1	45.85	5.95	1.34	0.01	2.63	21.6	0.109
	Bm	5-20	4.9	3.5	25.90	1.53	0.21	0.01	0.60	9.1	0.069
	BC	20-45	4.7	4.0	19.06	1.00	0.10	0.01	0.25	7.1	0.038
	IIBC	45-65	5.0	3.6	19.20	3.38	0.47	0.02	0.80	24.3	0.045
	Rx	65+	5.0	3.8	58.63	13.83	1.48	0.03	0.18	26.5	0.091
16	Bm_1	0-15	4.8	4.1	14.88	2.95	0.54	0.01	0.38	26.1	0.084
	Bm_2	15-43	5.0	4.1	37.51	1.90	0.43	0.02	0.28	7.0	0.079
	Btj	43-70	5.1	4.0	19.34	1.28	0.25	0.03	0.18	9.0	0.044
	IIC	70-100+	5.4	4.5	10.86	4.03	0.58	0.02	0.20	44.5	0.054
17	Ae	0-8	5.0	4.1	22.91	3.48	0.27	0.03	0.55	18.9	0.118
	Bm	8-25	5.3	4.2	24.70	3.18	0.25	0.02	0.43	16.9	0.084
	Btj	25-54	5.4	5.0	24.11	1.95	0.10	0.03	0.30	9.9	0.034
	C	54-75	5.2	4.8	18.75	7.80	1.07	0.02	0.28	48.9	0.051

Continued ...

Site	Horizon	Depth (cm)	pH H_2O	pH 0.01M $CaCl_2$	CEC me/100g	Ca me/100g	Mg me/100g	Na me/100g	K me/100g	BS %	EC mmhos/cm
19	Ae	0-8	5.1	4.5	13.09	4.33	0.74	0.01	0.48	42.5	0.138
	Bm	8-30	5.3	4.7	12.20	5.20	0.78	0.02	0.28	51.4	0.063
	C	30-50	5.5	4.7	10.86	5.50	1.26	0.02	0.20	64.2	0.057
20	Ap	0-20	6.0	4.9	23.81	12.65	1.87	0.01	0.80	64.4	0.215
	II Bm	20-45	6.0	5.3	23.81	15.28	2.16	0.02	0.25	74.4	0.371
	II C	45-100+	6.1	5.6	12.50	8.23	1.79	0.03	0.15	81.6	0.394
21	Ae	0-5	5.7	4.3	19.95	7.38	1.57	0.01	0.90	49.4	0.132
	Bm	5-25	5.8	4.3	17.27	5.18	0.78	0.01	0.70	38.6	0.109
	Btj	25-45	6.7	4.8	19.95	4.08	0.60	0.01	0.55	26.3	0.059
	C	45-65	5.2	4.8	16.38	6.45	1.57	0.02	0.25	50.6	0.049
22	Ae	0-8	5.7	4.6	26.18	7.20	0.70	0.03	0.70	33.0	0.155
	Bm	8-25	5.8	4.4	23.50	5.48	0.45	0.02	0.50	27.4	0.087
	BC	25-50	5.7	4.2	13.40	5.65	0.82	0.02	0.35	51.0	0.069
	IIC	50-100+	5.9	4.1	15.18	7.08	0.89	0.03	0.25	54.3	0.052
23	Ae	0-4	5.5	4.3	23.52	6.23	0.87	0.02	0.28	31.4	0.176
	Bm	4-15	6.5	5.9	11.91	6.55	0.62	0.02	0.08	61.0	0.086
	IIBCca	15-45	6.4	5.6	11.61	18.20	1.38	0.01	0.05	100.0	0.520
24	Ap	0-10	7.4	5.9	46.13	32.25	4.92	0.02	2.05	85.1	0.720
	Bm	10-23	7.2	5.8	31.84	32.25	4.18	0.03	0.15	100.0	0.401
	Cca	23-48	7.4	6.2	22.47	34.25	3.32	0.03	0.08	100.0	0.411
25	Ap	0-13	6.4	5.4	61.02	32.75	6.57	0.03	0.48	65.3	0.370
	Bmk	13-40	6.5	5.9	26.20	16.80	4.02	0.02	0.15	80.1	0.211
	Cca	40-95	7.2	6.5	12.50	22.08	1.98	0.02	0.20	100.0	0.307
26	Bm	2-12	7.2	6.6	27.09	19.00	3.28	0.02	0.68	84.8	0.460
	Bck	12-57	7.8	6.0	10.41	25.73	1.38	0.01	0.28	100.0	0.351
	Ck	57-100+	7.7	6.1	10.86	34.95	1.40	0.02	0.23	100.0	0.424

Continued ...

Site	Horizon	Depth (cm)	pH H_2O	pH 0.01M $CaCl_2$	CEC me/100g	Ca me/100g	Mg me/100g	Na me/100g	K me/100g	BS %	EC mmhos/cm
27	Ae	0-5	5.5	5.2	9.68	3.68	0.45	0.01	0.23	45.1	0.128
	Bm	5-23	5.6	4.3	14.43	1.05	0.12	0.01	0.18	9.4	0.037
	BC	23-43	5.4	3.8	11.31	2.18	0.27	0.01	0.18	23.3	0.031
	C	43-64	5.3	3.7	12.81	3.55	0.54	0.02	0.18	33.5	0.034
	IICk	64-100+	6.5	5.6	23.52	11.25	2.86	0.02	0.33	61.4	0.171
28	Bm	8-40	5.4	4.8	13.25	3.73	0.62	0.01	0.33	35.4	0.075
29	Ap	0-10	6.9	5.6	21.13	27.95	1.65	0.01	0.28	100.0	0.570
	Bm	10-29	7.3	6.1	11.02	24.18	1.28	0.01	0.08	100.0	0.272
	Ck	29-121+	7.5	6.3	9.52	24.20	1.13	0.01	0.08	100.0	0.292

TABLE 16

AVAILABLE NUTRIENT STATUS

Site	Horizon	Depth (cm)	MORGAN'S EXTRACTION			N %	OM %	Available P ppm	AVAILABLE HEAVY METALS (0.1N HCl)						
			Ca ppm	Mg ppm	K ppm				B ppm	Cu ppm	Zn ppm	Fe ppm	Mn ppm	Pb ppm	Cd ppm
2	Ae	0-5	563	92.5	97.5	0.077	3.41	30.7	0.08	0.85	4.70	314.5	94.50	*	Δ
	Bm	5-12	675	142.5	92.5	0.056	2.32	33.3	0.06	0.85	1.40	294.5	6.65	*	Δ
	BC	12-26	575	130.0	50.0	0.049	2.69	36.8	0.04	1.00	0.85	199.5	4.30	*	Δ
3	Ae	0-7	2675	217.5	187.5	0.131	7.74	164.4	ND	1.10	4.40	184.5	100.00	*	Δ
	Bm	7-19	1350	182.5	140.0	0.121	6.07	79.6	ND	2.35	5.05	224.5	63.00	*	Δ
	IIBC	19-44	1815	390.0	85.0	0.102	4.53	40.8	ND	2.85	3.70	98.5	55.50	*	Δ
	IIC	44-100+	2025	472.5	52.5	0.108	4.36	16.4	ND	2.80	4.40	119.5	37.00	*	
5	Ae	0-12	908	147.5	150.0	0.098	3.94	36.8	ND	0.75	9.50	244.5	196.00	*	Δ
	Bm	12-50	763	115.0	135.0	0.064	2.49	164.0	0.09	0.65	0.95	154.5	53.50	*	Δ
6	Ae	0-7	1070	97.5	82.5	0.073	3.84	32.2	0.13	0.95	3.25	289.5	34.50	*	Δ
	Bm	7-24	545	62.5	87.5	0.071	2.89	36.7	0.06	0.95	2.75	374.5	6.65	*	Δ
	BC	24-40	775	230.0	50.0	0.046	2.36	58.6	0.15	1.45	1.00	144.5	10.45	*	Δ
	C	40-100+	1265	310.0	50.0	0.039	2.39	18.4	0.15	2.45	1.70	119.5	13.75	*	Δ
8	Ae	0-5	1825	320.0	407.5	0.088	3.54	72.0	0.15	0.75	3.40	219.5	94.00	*	0.10
	Bm	5-30	1150	115.0	212.5	0.043	1.25	38.6	0.08	0.90	0.95	179.5	18.15	*	Δ
	BC	30-75	1285	135.0	62.5	0.032	0.69	12.3	0.09	1.15	0.90	134.5	16.50	*	Δ
	C	75-100+	2450	307.5	92.5	0.056	1.28	5.4	0.13	3.50	4.55	114.5	71.50	*	Δ
9	Ae	0-7	755	145.0	260.0	0.165	6.00	123.6	0.10	1.30	7.30	409.0	33.40	*	Δ
	Bf	7-16	183	37.5	122.5	0.115	5.41	131.6	0.05	0.80	2.60	474.5	19.30	*	Δ
	Bt	16-43	85	22.5	85.0	0.056	2.13	77.6	0.05	0.65	2.80	259.5	37.00	3.0	Δ
	BC	43-75	115	27.5	50.0	0.043	1.97	129.2	0.03	0.90	0.70	194.5	40.00	3.0	Δ
	C	75-125	1200	167.5	57.5	0.081	6.23	43.0	0.07	3.15	3.35	51.5	21.80	*	0.55
10	Ah	0-10	2470	317.5	255.0	0.580	22.80	35.5	ND	0.30	45.80	11.0	83.00	*	0.80
	Bm	10-35	4540	615.0	375.0	0.306	21.58	31.5	ND	0.80	17.80	18.0	29.40	*	0.60
	C	35-50	2263	377.5	120.0	0.288	19.68	14.4	ND	1.10	16.80	8.0	14.95	*	0.45

Site	Horizon	Depth (cm)	MORGAN'S EXTRACTION Ca ppm	Mg ppm	K ppm	N %	OM %	Available P ppm	AVAILABLE HEAVY METALS (0.1N HCl) B ppm	Cu ppm	Zn ppm	Fe ppm	Mn ppm	Pb ppm	Cd ppm
11	Ae	0-5	1233	165.0	335.0	0.132	6.92	212.8	ND	0.70	4.35	264.5	112.00	*	0.30
	Bm	5-38	533	110.0	210.0	0.099	7.12	120.0	ND	1.00	3.00	219.5	23.25	*	
	BC	38-69	888	40.0	133.0	0.100	8.17	244.8	ND	1.65	3.45	124.5	23.70	*	0.45
	C	69-100+	605	57.5	63.0	0.214	8.52	106.0	ND	2.00	4.65	78.0	15.60	*	0.55
12	Ae	0-7	983	185.0	165.0	0.191	10.59	35.6	0.07	0.90	5.90	138.0	14.80	*	0.90
	Bm	7-19	20	22.5	95.0	0.203	10.73	32.4	0.01	0.70	3.20	144.5	4.10	*	
	Bt	19-35	158	27.5	65.0	0.088	19.25	132.0	0.06	1.10	3.35	41.0	4.50	*	
	C	35-100+	1015	140.0	45.0	0.141	21.52	60.4	ND	2.95	11.15	58.5	16.45	*	1.50
13	Ae	0-5	150	30.0	117.5	0.103	8.36	277.6	0.07	0.75	6.45	139.5	84.50	*	0.35
	Bm	5-25	93	10.0	40.0	0.070	5.07	149.6	0.02	1.20	4.50	92.0	53.50	*	0.55
	C	25-50	365	67.5	60.0	0.053	4.72	35.0	0.03	4.35	4.55	124.5	6.35	*	0.65
14	Bm	0-45	1278	267.5	62.5	0.348	11.34	271.2	0.07	1.00	5.75	101.5	20.50	*	0.85
	BC	45-55	553	92.5	30.0	0.213	13.55	270.4	0.04	0.80	5.25	204.5	17.10	*	0.80
	C	55-70	873	122.5	25.0	0.294	27.42	320.0	ND	1.05	3.10	54.5	8.20	*	1.95
	Rx	70-125+	1213	150.0	25.0	1.025	68.39	18.6	ND	0.30	6.55	33.0	1.45	*	1.00
15	Ae	0-5	1080	207.5	490.0	0.713	26.50	145.2	ND	0.70	21.60	143.0	78.00	*	2.70
	Bm	5-20	150	17.5	107.5	0.713	16.84	222.4	ND	0.55	6.05	269.5	6.30	*	0.35
	BC	20-45	83	7.5	52.5	0.419	12.33		ND	0.70	2.65	144.5	5.00	*	0.30
	IIBC	45-65	508	65.0	70.0	0.138	12.24	58.2	ND	1.25	2.50	61.5	3.45	*	0.45
	Rx	65+	2038	200.0	62.5	0.016	61.50	5.4	ND	0.60	29.90	76.5	0.65	*	1.35
16	Bm_1	0-15	625	82.5	112.5	0.090	4.84	155.6	ND	0.85	11.70	174.5	81.00	*	0.90
	Bm_2	15-43	270	47.5	62.5	0.070	4.15	279.2	ND	0.85	3.25	234.5	9.95	*	0.40
	Btj	43-70	123	25.0	67.5	0.063	4.87	60.4	ND	1.05	1.55	134.5	4.85	*	0.65
	IIC	70-100+	818	95.0	77.5	0.046	3.42	51.2	ND	2.00	5.65	37.5	12.70	*	1.40
17	Ae	0-8	610	40.0	145.0	0.079	4.28	269.6	0.04	0.55	11.65	284.5	114.00	3.0	2.50
	Bm	8-25	538	35.0	115.0	0.081	3.62	305.6	0.05	0.75	3.10	209.5	66.00	*	1.05
	Btj	25-54	323	10.0	105.0	0.070	3.62	32.0	0.01	0.85	1.55	159.5	26.05	*	0.50
	C	54-75	1403	167.5	107.5	0.101	9.54	40.0	0.05	4.35	9.60	31.0	13.00	*	1.80

Site	Horizon	Depth (cm)	MORGAN'S EXTRACTION Ca ppm	Mg ppm	K ppm	N %	OM %	Available P ppm	AVAILABLE HEAVY METALS (0.1N HCl) B ppm	Cu ppm	Zn ppm	Fe ppm	Mn ppm	Pb ppm	Cd ppm
19	Ae	0-8	1040	140.0	190.0	0.053	2.04	77.6	0.09	0.55	1.20	244.5	59.50	*	Δ
	Bm	8-30	1100	142.5	102.5	0.041	1.02	58.6	0.09	0.60	0.40	124.5	18.00	*	Δ
	C	30-50	1220	227.5	100.0	0.031	0.43	16.4	0.07	0.95	0.90	88.0	17.20	*	Δ
20	Ap	0-20	5225	602.5	435.0	0.180	6.71	41.8	ND	2.00	6.00	94.0	88.00	*	0.40
	IIBm	20-45	3650	362.5	97.5	0.150	4.74	30.0	ND	1.50	6.30	74.5	74.50	*	0.40
	IIC	45-100+	1700	295.0	72.5	0.031	3.61	17.2	ND	1.15	4.65	75.0	31.50	*	0.20
21	Ae	0-5	1693	297.5	67.5	0.073	4.08	90.6	ND	0.95	1.75	100.0	37.50	*	Δ
	Bm	5-25	1130	135.0	235.0	0.053	1.88	82.2	0.09	0.55	0.80	224.5	29.50	*	Δ
	Btj	25-45	600	75.0	117.5	0.053	2.11	90.6	0.09	0.45	0.70	139.5	8.45	*	Δ
	C	45-65	1228	242.5	95.0	0.369	2.50	37.0	0.08	1.45	0.70	78.0	4.40	*	Δ
22	Ae	0-8	1315	100.0	240.0	0.091	5.00	112.0	ND	0.55	5.90	299.5	135.00	*	1.65
	Bm	8-25	888	65.0	142.5	0.063	4.22	85.6	ND	0.65	2.45	189.5	70.00	*	1.00
		25-50	1138	137.5	125.0	0.048	5.52	40.4	ND	1.50	1.95	69.5	5.95	*	0.50
	IIC	50-100+	1313	140.0	90.0	0.058	6.32	21.4	ND	0.90	1.00	30.0	2.00	*	0.30
23	Ae	0-4	1133	137.5	92.5	0.104	5.14	56.6	ND	0.75	8.10	159.5	164.50	*	0.45
	Bm	4-15	1318	100.0	32.5	0.040	1.91	70.4	ND	0.75	0.90	124.5	22.00	*	Δ
	IIBCca	15-45	15825	377.5	30.5	0.073	4.87	37.8	ND	0.15	0.40	1.0	31.00	*	Δ
24	Ap	0-10	6450	772.5	110.0	0.300	15.33	13.0	0.10	0.15	5.80	3.0	83.00	*	0.60
	Bm	10-23	6900	647.5	52.5	0.259	13.19	7.0	0.07	0.15	1.45	1.0	36.50	*	0.40
	Cca	23-48	21925	722.5	32.5	0.180	8.45	3.8	0.07	0.15	0.35	<0.5	10.50	*	Δ
25	Ap	0-13	5700	870.0	122.5	0.300	23.23	34.0	ND	0.35	32.40	22.5	82.50	*	1.15
	BmK	13-40	2500	612.5	56.0	0.175	12.17	24.6	ND	1.60	14.55	68.0	56.50	*	0.75
	Cca	40-95	15625	505.0	40.0	0.067	4.61	12.0	ND	0.10	0.85	0.5	20.85	*	Δ
26	Bm	2-12	4450	477.5	157.5	0.171	6.42	77.0	0.23	0.35	8.50	44.0	170.50	*	0.60
	BcK	12-57	22700	447.5	62.5	0.082	7.53	1.0	0.18	0.10	0.40	1.0	19.60	*	Δ
	Ck	57-100+	27550	495.0	70.0	0.081	8.55	1.0	0.17	0.15	0.25	1.5	19.75	*	Δ

Site	Horizon	Depth (cm)	MORGAN'S EXTRACTION			N %	OM %	Available P ppm	AVAILABLE HEAVY METALS (0.1N HCl)						
			Ca ppm	Mg ppm	K ppm				B ppm	Cu ppm	Zn ppm	Fe ppm	Mn ppm	Pb ppm	Cd ppm
27	Ae	0-5	795	72.5	80.0	0.044	1.70	63.0	ND	0.65	4.75	149.5	91.50	*	Δ
	Bm	5-23	68	25.0	37.5	0.056	1.70	81.0	ND	2.75	3.45	209.5	23.70	*	Δ
	BC	23-43	335	50.0	37.5	0.057	1.70	83.6	ND	2.95	1.50	139.5	18.00	*	0.25
	C	43-64	583	92.5	42.5	0.054	1.54	67.6	ND	2.65	1.15	98.5	14.95	*	0.30
	IICk	64-100+	1797	410.0	65.0	0.064	1.41	31.4	ND	3.50	4.00	68.0	72.00	*	0.65
28	Bm	8-40	330	50.0	67.5	0.053	1.51	87.6		0.95	1.10		25.00	*	Δ
29	Ap	0-10	17125	455.0	57.5	0.204	8.79	8.4	0.11	0.15	37.90	1.5	36.50	*	Δ
	Ck	10-29	24025	475.0	37.5	0.099	6.56	2.2	0.14	0.10	0.25	<0.5	17.00	*	Δ
	IICk	29-121+	25200	430.0	35.0	0.066	6.26	2.6	0.15	0.25	0.50	0.5	23.15	*	Δ

* = <0.5 ppm
Δ = <0.05 ppm
ND = Not Determined

TABLE 17

THE RELATIONSHIP BETWEEN MAJOR CATEGORIES, VEGETATION MAP UNITS AND BIOGEOCLIMATIC ZONES

Major Category	Map Unit	Biogeoclimatic Zone
Lowland Areas	Meadow	IDF
	Tree Meadow	IDF
	Tree Shrub	IDF
	Coniferous Forest	IDF
	Deciduous Forest	IDF
	Mixed Forest	IDF
	Disturbed Lands	IDF
	Agricultural Land	IDF
	Developed Land	IDF
	River Bars	IDF
Upland Areas	Hillside Meadow	IDF
	Upland Tree Shrub	IDF
	Upland Mixed Forest	IDF
	Slide Vegetation	IDF, Transition, ESSF
	Low Elevation Young Forest	IDF
	Low Elevation Older Forest	IDF
	Mid Elevation Older Forest	IDF, Transition
	High Elevation Older Forest	ESSF

IDF - Interior Douglas Fir Biogeoclimatic Zone

ESSF - Engelmann Spruce - Subalpine Fir Biogeoclimatic Zone

TABLE 18

RESULTS OF PELLET PLOT TRANSECT SURVEY IN THE PROPOSED HOSMER DEVELOPMENT AREA, 1976

Map Unit	MEADOW																																			
Vegetation Type	Dry Meadow												Grass Meadow												Hillside Meadow											
Transect Number*	1						2						3						4						10						11					
Number of Plots	50						50						25						25						25						25					
Category / Species	Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets		
	Total Pellet Groups (T)	Mean Pellet Groups (M)	Range (R)	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R
Elk	3	0.06	0-2	21	0.42	0-2	2	0.04	0-1	13	0.26	0-2	25	1.00	0-3	35	1.40	0-4	8	0.32	0-1	14	0.64	0-3	15	0.60	0-3	90	3.60	0-14	4	0.16	0-1	19	0.76	0-7
Moose	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	1	0.04	0-1	0	-	-	0	-	-	0	-	-	1	0.04	0-1	0	-	-	0	-	-
Deer	0	-	-	0	-	-	0	-	-	2	0.04	0-1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Domestic Cattle	0	-	-	48	0.96	0-4	0	-	-	47	0.94	0-5	0	-	-	19	0.76	0-3	0	-	-	3	0.12	0-1	0	-	0-1	0	-	-	0	-	-	1	0.4	0-1
All Species	3	0.06	0-2	69	1.38	0-5	2	0.04	0-1	62	1.24	0-5	25	1.00	0-3	55	2.20	0-6	8	0.32	0-1	17	0.76	0-3	15	0.60	0-3	91	3.64	0-14	4	0.16	0-1	20	0.80	0-3

*See Figure 8 for locations.

Continued...

Map Unit	MEADOW						TREE-MEADOW												CONIFEROUS FOREST																	
Vegetation Type	Shrub Meadow						Coniferous Tree-Meadow						Deciduous and Mixed Tree-Meadow						Lodgepole Pine												Coniferous Tree Mix					
Transect Number*	13						6						9						5						12						14					
Number of Plots	15						25						25						25						25						25					
Category / Species	Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets		
	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R
Elk	0	-	-	0	-	-	7	0.28	0-2	13	0.52	0-3	1	0.04	0-1	3	0.12	0-1	12	0.48	0-3	18	0.72	0-6	3	0.12	0-1	3	0.12	0-1	2	0.08	0-1	20	0.80	0-3
Moose	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Deer	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Domestic Cattle	0	-	-	0	-	-	0	-	-	1	0.04	0-1	0	-	-	5	0.20	0-2	0	-	-	0	-	-	0	-	-	1	0.04	0-1	0	-	-	1	0.04	0-1
All Species	0	-	-	0	-	-	7	0.28	0-2	14	0.56	0-3	1	0.04	0-1	8	0.32	0-2	12	0.48	0-3	18	0.72	0-6	3	0.12	0-1	4	0.16	0-1	2	0.08	0-1	21	0.84	0-3

*See Figure 8 for locations.

Continued...

Map Unit	DECIDUOUS FOREST						MIXED FOREST																	
Vegetation Type	Closed Poplar						Open Mixed Forest						Closed Mixed Forest											
Transect Number*	8						16						7						15					
Number of Plots	20						25						25						25					
Category	Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets			Past Winter			Total all Pellets		
Species	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R	T	M	R
Elk	1	0.05	0-1	1	0.05	0-1	2	0.08	0-1	5	0.20	0-2	13	0.52	0-3	20	0.80	0-4	1	0.04	0-1	2	0.08	0-1
Moose	0	-	-	0	-	-	1	0.04	0-1	1	0.04	0-1	0	-	-	0	-	-	0	-	-	0	-	-
Deer	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Domestic Cattle	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	3	0.12	0-1
All Species	1	0.05	0-1	1	0.05	0-1	3	0.12	0-1	6	0.24	0-2	13	0.52	0-3	20	0.80	0-4	1	0.04	0-1	5	0.20	0-1

*See Figure 5 for locations.

TABLE 19

BROWSE SPECIES UTILIZED IN THE PROPOSED HOSMER DEVELOPMENT AREA*

Species	Number of Transects where Present	Number of Plots where Present	Number of Plots in which Browsed	Percentage of Plots in which Browsed	Mean Degree of Browsing	Relative Rating
Acer glabrum	4	6	1	16	0.33	5
Amelanchier alnifolia	9	30	16	53	0.70	4
Cornus stolonifera	6	15	12	80	1.86	1
Lonicera utahensis	10	27	2	7	0.07	7
Populus tremuloides	1	1	1	100	1.00	3
Ribes lacustre	5	7	1	14	0.14	6
Rosa sp.	7	18	1	5	0.05	8
Salix sp.	10	22	13	59	1.32	2
Shepherdia canadensis	11	25	1	4	0.04	9
Thuja plicata	1	1	1	100	1.00	3

* For original data refer to Appendix N.

TABLE 20

RESULTS OF SMALL MAMMAL TRAPPING IN THE PROPOSED HOSMER DEVELOPMENT AREA, 1976

	Trapline 1*		Trapline 2		Trapline 3		Trapline 4		Total capture per 100 trap nights	
Map Unit	Mixed forest		Mixed forest		Tree-meadow		Coniferous forest			
Vegetation Type	Open mixed forest		Closed mixed forest		Deciduous and mixed		Lodgepole pine			
Trapping Period	May 28-31		May 28-31		May 29-June 1		May 29-June 1			
Total Trap Nights	40		40		40		40			
Total Sprung	2		3		0		1			
Actual Trap Nights (A.T.N.)**	39		38.5		40		39.5			
Species Captured:	Number†	% of A.T.N.	Number	% of A.T.N.	Number	% of A.T.N.	Number	% of A.T.N.	No. of individuals††	Per 100 T.N.
Peromyscus maniculatus artemisiae	13 (6)	33.3%	3 (2)	7.8%	3 (1)	7.5%	7 (3)	17.7%	14	8.75
Clethrionomys gapperi galei	-	-	1	2.6%	-	-	-	-	1	0.62
Eutamias amoenus luteiventris	-	-	1	2.6%	-	-	2 (1)	5.1%	2	1.25
Total	13 (6)	33.3%	5 (2)	13.0%	3 (1)	7.5%	9 (3)	22.8%		

* For location of traplines refer to Figure 8
** Actual trap nights (A.T.N.) = total trap nights minus 50% of total sprung
† Number of each species caught on trapline with the number of recaptures in brackets ( )
†† Number of individuals excludes recaptures

TABLE 21

MINIMUM SOIL AREAS TO BE DISTURBED BY MINE DEVELOPMENT

Development ha(ac)	Soil Mapping Unit	Minimum Area of Unit to be Disturbed ha(ac)
Tailings dam and pond 121.4(300)	2a	22.7(56)
	3a	70.8(175)
	4b	2.3(6)
	5a	25.6(63)
Railway loop 76.9(190)	2a	11.6(29)
	3a	65.3(161)
Plant site 46.5(115)	2a	5.2(13)
	3a	28.0(69)
	4a	11.6(29)
	5a	1.7(4)
Portals 52 and 202, fan sites, water head tank and pumping station 8.9(22)	8a	1.0(2)
	9a	6.8(17)
	9b	1.1(3)
Total Development Area		256.0(633)

TABLE 22

MININUM AREAS OF VEGETATION TO BE DISTURBED BY MINE DEVELOPMENT

Vegetation Map Unit	Tailings Dam and Pond ha(ac)	Railway Loop ha(ac)	Plant Site & Portals 1 & 2 ha(ac)	Portal No.52, 202 Water Head Tank, for Sites & Pumping Stn ha(ac)	Total Developed Area ha(ac)	Agricultural Land Reserve Buffer Areas ha(ac)	Total Area Utilized ha(ac)
LOWLAND AREAS Sub-total	86.3(213)	76.9(190)	46.5(115)		209.7(518)	92.8(229)	302.5(747)
Meadow Map Unit	25.8(64)	4.1(10)	9.3(23)		39.2(97)	15.7(39)	54.9(136)
Tree-Meadow Map Unit	21.4(53)	1.2(3)	6.4(16)		29.0(72)	15.1(37)	44.1(109)
Tree-Shrub Map Unit	1.2(3)	4.1(10)	1.0(2)		6.3(16)		6.3(16)
Coniferous Forest Map Unit	16.6(41)	6.4(16)	20.5(51)		43.5(107)	5.2(13)	48.7(120)
Deciduous Forest Map Unit	1.8(4)	33.8(84)			35.6(88)		35.6(88)
Mixed Forest Map Unit	18.3(45)	27.3(67)	9.3(23)		54.9(136)	55.1(136)	110.0(272)
Disturbed Lands	1.2(3)				1.2(3)	1.7(4)	2.9(7)
UPLAND AREAS Sub-total	35.1(87)			8.9(22)	44.0(109)		
Upland Mixed Forest Map Unit	13.7(34)				13.7(34)		13.7(34)
Low Elevation Young Forest Map Unit	21.4(53)				21.4(53)	6.9(17)	28.3(70)
Mid-elevation Older Forest Map Unit				8.9(22)	8.9(22)		8.9(22)
Total	121.4(300)	76.9(190)	46.5(115)	8.9(22)	256.0(633)	99.7(246)	353.4(873)

TABLE 23

MINIMUM FORESTED AREAS TO BE DISTURBED BY MINE DEVELOPMENT

Forest Classification			Tailings Dam and Pond ha(ac)	Railway Loop ha(ac)	Plant Site ha(ac)	Portals 52, 202 Water Head Tank and Pumping Station ha(ac)	Agricultural Reserve Buffer Area ha(ac)	Total ha(ac)
Mature Timber			121.3(300)	77.3(190)	46.5(115)	8.9(22)	100(247)	354(874)
Date of Establishment	Species	Vol./ Acre						
1889	P1(F1)	22				8.9(22)		
Immature Timber								
Date of Establishment	Species	Site						
1889	P1(LF)	6	9.3(23)					9.3(23)
1891	P1(F)	6	21.0(52)					21.0(52)
1891	PA(S)	6		19.0(46)				19.0(46)
1891	P1(L)	6		7.7(19)	15.0(37)			22.7(56)
1891	P1A(S)	6			8.1(20)			8.1(56)
1881	P1(L)	6					24.3(60)	24.3(60)
1890	Cot A (P1)	M	19.4(48)					19.4(48)
1891	A Cot (S)	M	21.0(52)	33.6(83)			12.5(31)	67.1(166)
1890	PA (S)	M		13.0(32)				13.0(32)
1890	P1(LA)	M			2.4(6)		8.5(21)	10.9(27)
1892	P1(C)	M					5.7(14)	5.7(14)
1891	AP1	P	7.3(18)				5.7(14)	13.0(32)
Open Range			43.3(107)	4.0(10)	21.0(52)		25.1(62)	93.4(231)
Cleared Land							5.3(13)	5.3(13)

TABLE 24

RECLAMATION CAPABILITY OF SURFACE SOILS

Mapping Unit	Landform	Slope	Soil Depth Suitable for Reclamation	Texture	Water Holding Capacity	Calcareousness	Salinity	Fertility	Reclamation Potential	Limitations	Remarks
1a	S$ Fv / g fl	level	0-100 cm	loam to sandy loam	moderate to low	weak to moderate	low	moderate to good	moderate to low	depth, texture, fertility	Fertilizer application required for initial growth response. Not preferred for stock-piling. Material above the stony gravel layer can be utilized for reclamation. On-site use preferred.
1b	S$ Fv E^A(S) / g Fl	level to depressional	20-100 cm	loam to sandy loam	moderate to low	weak to moderate	low	moderate	moderate to high	depth, texture, poor drainage	Same as above.
2a	$S Fu / g Ft	level to very gently undul-ating	40-100+ cm	silt loam	moderate to high	weak to moderate	low	moderate to high	high	depth	Preferred unit for stockpiling. Material above stony gravel lay can be stockpiled for future reclamation needs Fertilizer application required for initial growth response. On-site evaluation and direction required for material removal.
3a	S$ Fu / g Ft	level to very gently undul-ating	15-100 cm	silt loam to loam	moderate to high	none to moderate	low	moderate to high	high	depth	Same as above.
4a	gaFf	gently sloping	0-20 cm	silt loam to loam	moderate to high	weak to moderate	low	moderate to high	moderate to low	depth, stoniness	Not preferred for stockpiling. Shallow depth limits quantity that can be utilized for reclamation. On-site use preferred. Fertilizer application required for initial growth response.
4b	gaFf	gently sloping	0-20 cm	silt loam to loam	moderate to high	weak to moderate	low	moderate to high	moderate to low	depth, stoniness	Same as above.

Continued...

Mapping	Landform	Slope	Soil Depth Suitable for Reclamation	Texture	Water Holding Capacity	Calcareousness	Salinity	Fertility	Reclamation Potential	Limitations	Remarks
5a	gsFt	level to gently sloping	0	gravelly loam to sandy loam	low	moderate to strong	low	low	low	stoniness, texture, fertility	Not preferred as reclamation medium. Extensive fertilization would be necessary. Draughtiness can be expected.
Colluvium	Cbov / Rsh	strongly rolling to extremely steeply sloping	50 cm to 6 meters	gravelly silt loam to clay loam	moderate to high	non-calcareous to weakly calcareous	low	moderate to high	moderate to high	stoniness, slope	Not preferred for stockpiling. On-site use preferred. Fertilizer application required for initial growth response. On-site evaluation of slope and material depth required.
till	Mbv / Rhm	moderately rolling to very steeply sloping	75 cm to 4 meters	very gravelly loam to silt loam & clay loam	moderate to high	weak to non-calcareous	low	moderate to high	moderate to high	stoniness, slope	Not preferred for stockpiling. On-site use preferred. Fertilization will be required for initial growth response. On-site evaluation of slope and material depth required.

TABLE 25

SUMMARY OF THE RECLAMATION OBJECTIVES FOR MINE DEVELOPMENT

Proposed Mine Development	Date of disturbance	Landform mapping unit	Land Use Capabilities* Forestry	Land Use Capabilities* Agriculture	Land Use Capabilities* Wildlife	Total area HA	Date of cosmetic revegetation	Date of complete reclamation	RECLAMATION Objectives for Land Use Capabilities Forestry	RECLAMATION Objectives for Land Use Capabilities Agriculture	RECLAMATION Objectives for Land Use Capabilities Wildlife	RECLAMATION Surface Material	RECLAMATION Configuration Slope (degrees)	RECLAMATION Configuration Aspect	RECLAMATION Configuration Elevation (ft)
Tailings dam	(1978?)	2a	$^{7}4^{M}_{1P} - 3^{3}M_{1P}$	$3^{5}_{M} - 4^{3}_{M} - 5^{2}_{M}$	$3W^{Q}_{E}R$	10.0	during mine construction and operation	after mine completion	4^{M}_{P} 1P	6^{P}_{T}	$3W^{M}_{E}$				
		4b	$^{7}4^{M}_{1P} - 3^{3}M_{1P}$	5^{P}_{M}	$3W^{Q}_{E}R$	2.3			4^{M}_{P} 1P	6^{P}_{T}	$3W^{M}_{E}$	Coarse mine waste	26°	W to S	3523
		5a	4^{M}_{1P}	$6^{6}_{R}T - 7^{4}_{C}T$	$3W^{Q}_{E}R$	2.0			4^{M}_{P} 1P	6^{P}_{T}	$3W^{M}_{E}$				
Tailings pond	(1978?)	2a	4^{M}_{1P}	$3^{5}_{M} - 4^{3}_{M} - 5^{2}_{M}$	$3W^{Q}_{E}R$	12.7	during mine construction and operation	after mine completion	3^{S}_{1P}	3X	$3W^{Q}_{E}$	Coal tailings	0	-	
		3a	$^{7}4^{M}_{1P} - 3^{3}M_{1P}$	$3^{5}_{M} - 4^{3}_{M} - 5^{2}_{P}M$	$3W^{Q}_{E}R$	70.8			3^{S}_{1P}	3X	$3W^{Q}_{E}$	Coal tailings	0	-	3523
		5a	$^{7}4^{M}_{1P} - 3^{3}M_{1P}$	$6^{6}_{R}T - 7^{4}_{C}T$	$3W^{Q}_{E}R$	23.6			3^{S}_{1P}	3X	$3W^{Q}_{E}$	Coal tailings	0	-	
Railway loop	(1978?)	2a	$^{7}4^{M}_{1P} - 3^{3}M_{1P}$	$4_{M} - 5^{4}_{P}M$	3^{Q}_{DE}	11.6	during mine construction and operation	after mine completion	4^{M}_{1P}	5P	3^{Q}_{DE}	Gravel			
		3a	$^{7}4^{M}_{1P} - 3^{3}_{1P}$	$4^{5}_{M} - 5^{5}_{P}M$	3^{Q}_{DE}	65.3			4^{M}_{1P}	5P	3^{Q}_{DE}		0	-	3500
Float site	(1978?)	2a	$^{7}4^{M}_{1P} - 3^{3}M_{1P}$	4^{M}	3^{Q}_{DE}	5.2	during mine construction operation	after mine completion	$4^{M}_{1P}P$	5^{M}_{P}	$^{Q}3^{R}_{DE}$	Portal waste rock and existing gravel subsoils	< 5°	W	3500
		3a	$^{7}4^{M}_{1P} - 3^{3}M_{1P}$	4^{M}	3^{Q}_{DE}	28.0			$4^{M}_{1P}P$	5^{M}_{P}	$^{Q}3^{R}_{DE}$				
		4a	$^{7}3^{M}_{1P} - 4^{3}M_{1P}$	4^{M}	3^{Q}_{DE}	11.6			$4^{M}_{1P}P$	$5^{M}_{1P}P$	$^{Q}3^{R}_{DE}$				
		5a	$^{7}3^{M}_{1P} - 4^{3}M_{1P}$	$6^{6}_{R}T - 7^{4}_{C}T$	$3W^{Q}_{E}R$	1.7			$4^{M}_{1P}P$	$5^{M}_{1P}P$	$^{Q}3^{R}_{DE}$				
Portal #52, #202, Fan sites	(1978?)	9a	$^{5}5^{H}_{es} - 3^{3}M_{1P} - 2^{2}S_{es}$	7^{T}_{R}	$^{7}4^{Q}_{C} - 3^{3}Q_{EMD}$ EMD	6.8	during mine construction and operation	after mine completion	$5^{H}_{es}P$	7^{T}_{P}	4^{Q}_{P} EMD	Waste rock and salvaged surficial material	25°	W	3700 to 4900
		8a	$^{5}5^{H}_{es} - 3^{3}M_{1P} - 2^{2}S_{es}$	7^{T}_{R}	$^{7}4^{Q}_{C} - 3^{3}Q_{EMD}$ EMD	1.0			$5^{H}_{es}P$	7^{T}_{P}	4^{Q}_{P} EMD		25°	W	
		9b	$^{5}5^{H}_{es} - 3^{3}M_{1P} - 2^{2}S_{es}$	7^{T}_{R}	$^{7}4^{Q}_{C} - 3^{3}Q_{EMD}$ EMD	1.1			$5^{H}_{es}P$	7^{T}_{P}	4^{Q}_{P} EMD		25°	W	

*Land use capabilities are calculated using the Landform mapping unit as a basis. For descriptions of legends see Forestry (Figure 60), Agriculture (Figure 67) and Wildlife (Figure 65) maps.

B.C. Research

FIGURES

Figure 1

LOCATION OF THE PROPOSED HOSMER-WHEELER MINE DEVELOPMENT

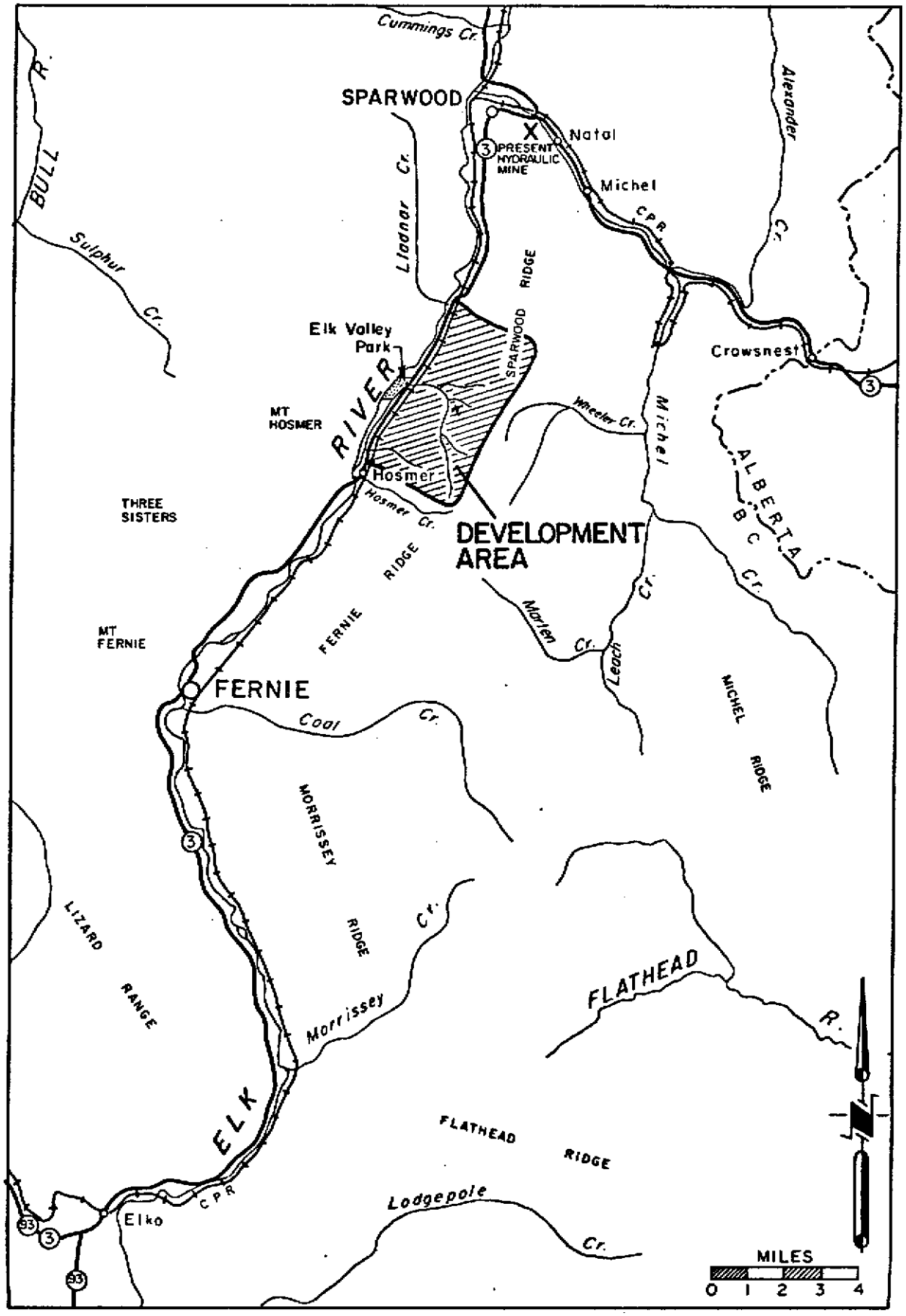
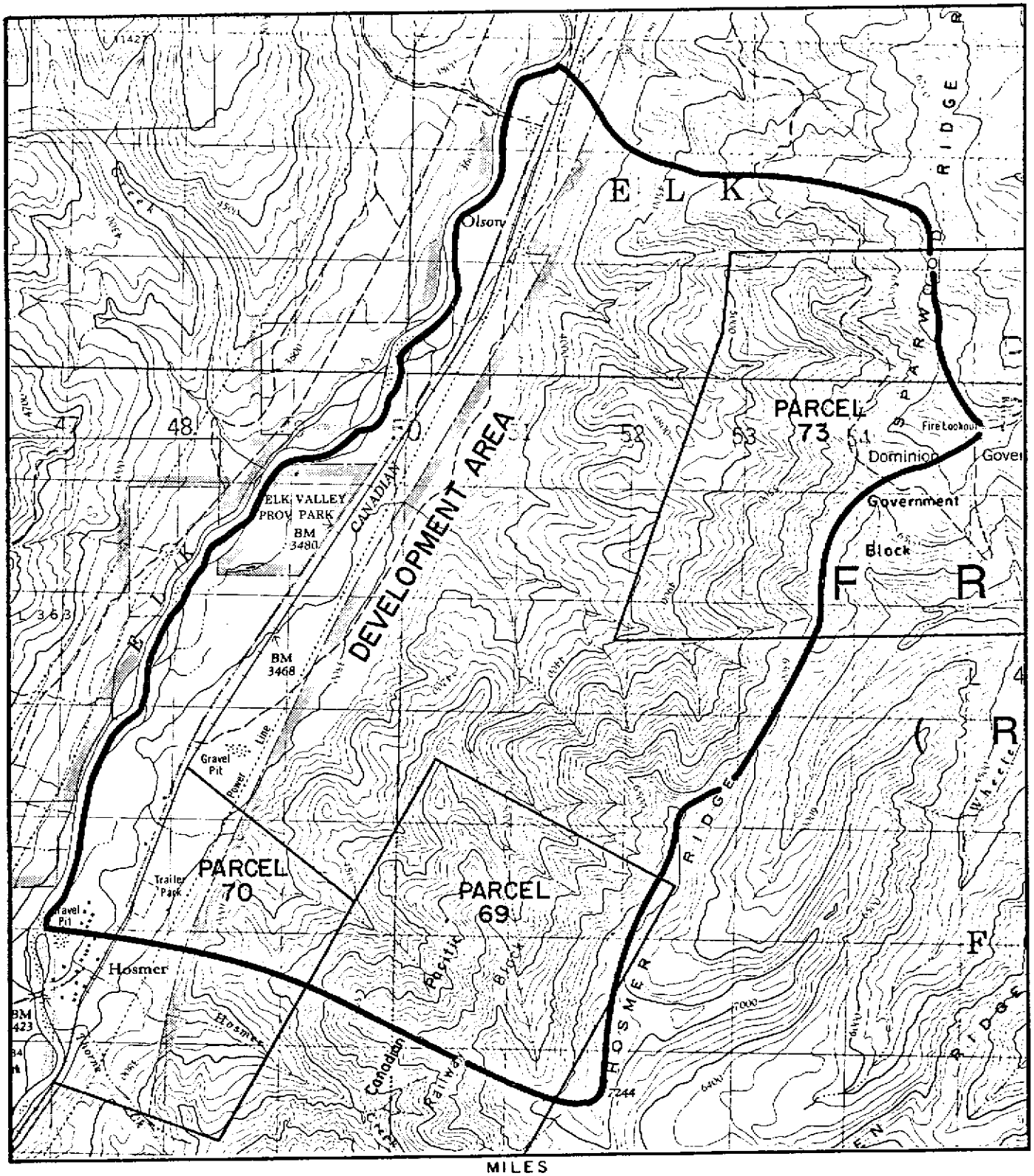
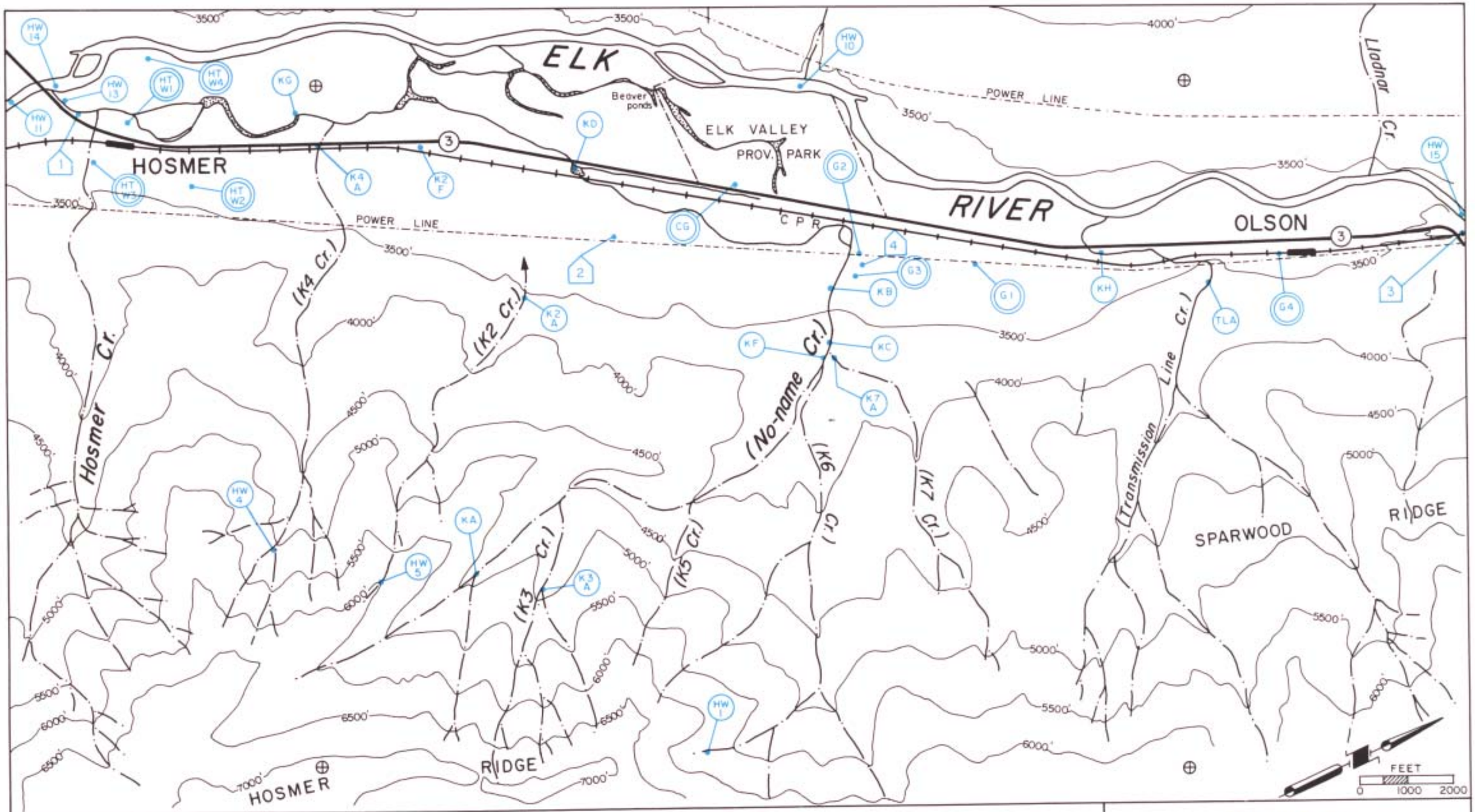


Figure 2
STUDY AREA



MILES
0 1/2 1
1: 50,000
(TAKEN FROM MAP 82G/10)



Surface water sample sites

Ground water sites

Air sampling sites

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Figure 3
IDENTIFICATION OF DRAINAGES AND SAMPLING SITES

Overlay (Scale 1: 24,000) of proposed developments in back pocket

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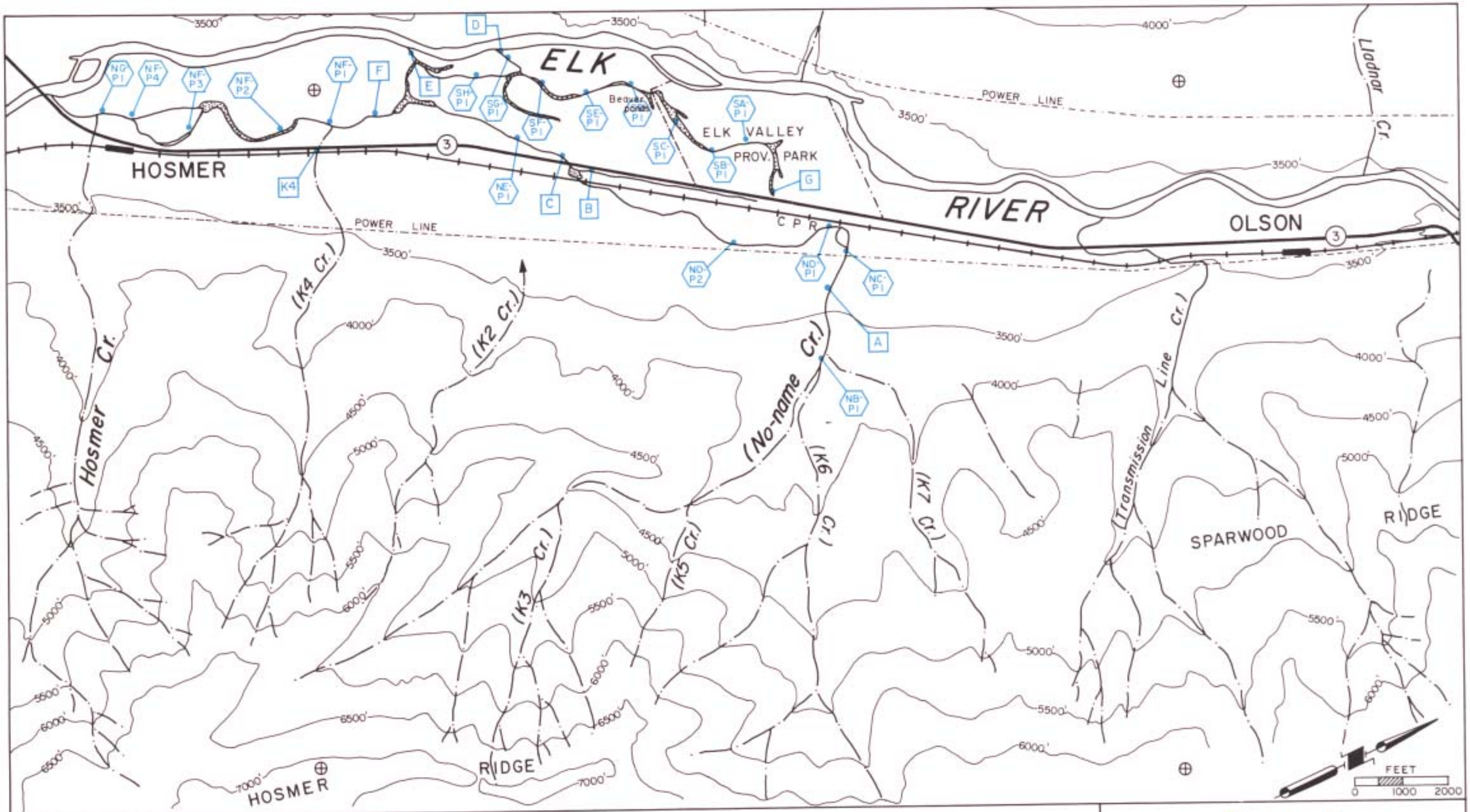

Point sample site

Flow measurement site

Figure 4
STREAM SURVEY SITES AND STREAM FLOW MEASUREMENT SITES

Overlay (Scale 1: 24,000) of proposed developments in back pocket

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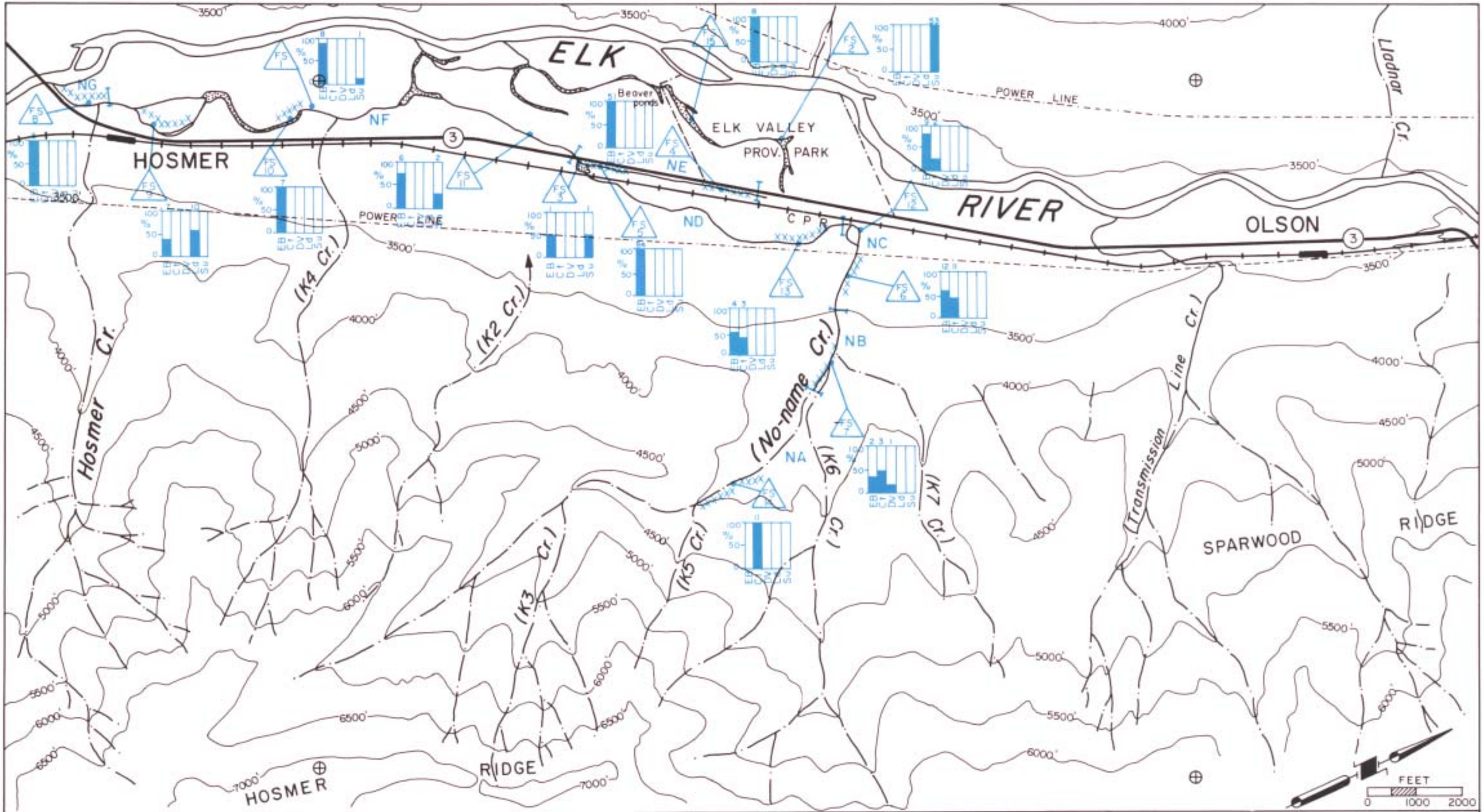

Fishing effort

EB Eastern brook trout
Ct Cutthroat trout
DV Dolly Varden
Ld Longnose dace
Su Sucker

Reach boundary
NA Reach code
xxxx Electroshocking limits

Figure 5
REACH BOUNDARIES AND FISH CAPTURED IN NO-NAME CREEK AND BEAVER PONDS SEPTEMBER 1976

Overlay (Scale 1: 24,000) of proposed developments in back pocket

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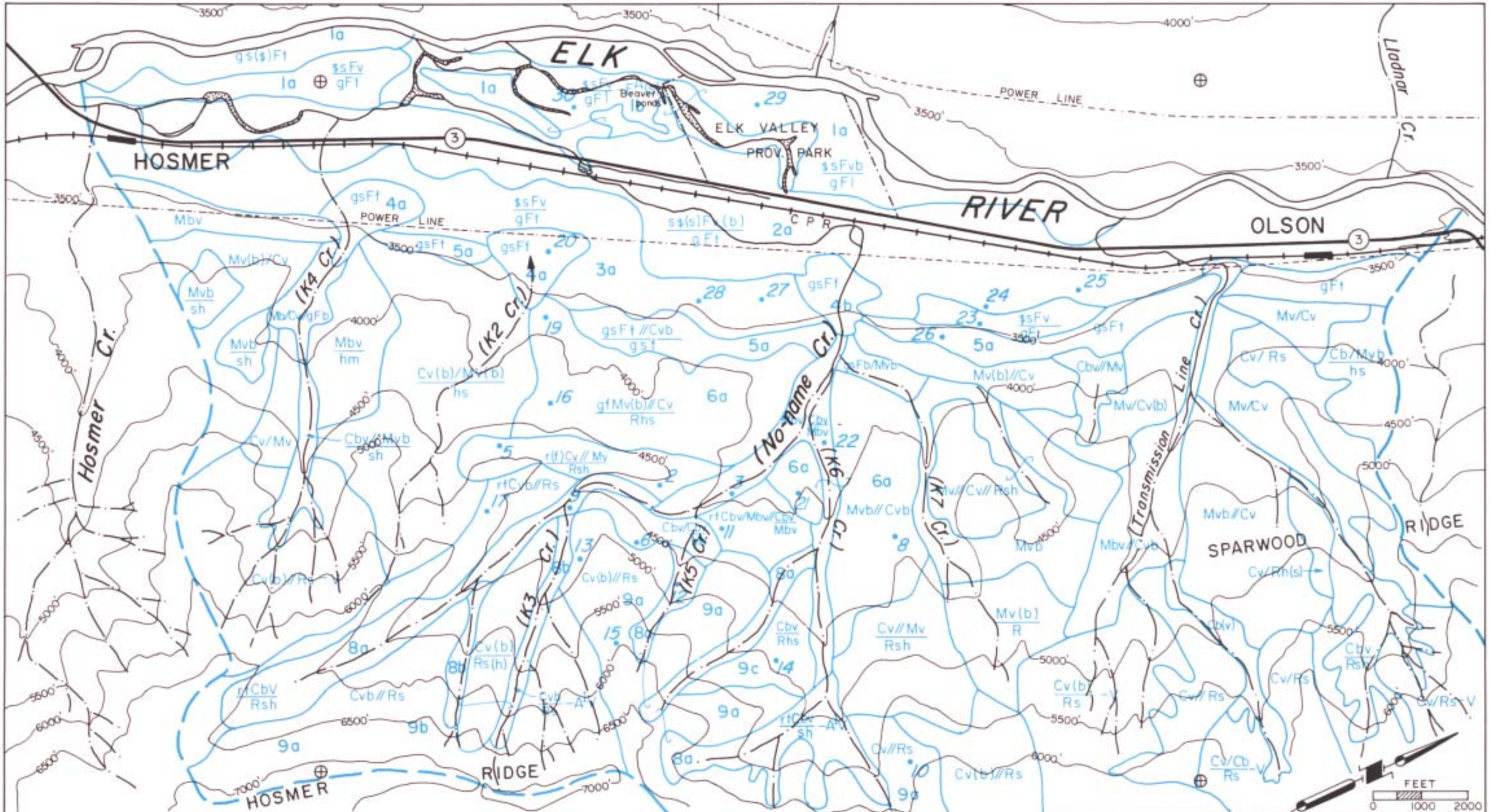

GENETIC MATERIALS

- C Colluvial
- F Fluvial
- M Morainal
- R Bedrock

TEXTURE

- m Rubbly
- g Gravelly
- f Fines
- s Sandy
- $ Silty

SURFACE EXPRESSION

- b Blanket
- f Fan
- h Hummocky
- l Level
- s Steep
- t Terraced
- v Veneer

MODIFYING PROCESSES

- A Avalanched
- E Channelled
- V Gullied

QUALIFYING DESCRIPTOR

- I Inactive
- A Active

SOIL MAPPING UNITS 6a

SOIL SAMPLING SITES •28

PROJECT BOUNDARY — — —

Qualifying Descriptor
Genetic Material
Surface Expression
Texture
Modifying Process
Stratigraphic Indicator
s $ F A b - V
g Fl

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Figure 6

*TERRAIN CLASSIFICATION AND SOIL UNITS

*(Terrain units adapted from Terrain Classification System, E.L.U.C. Secretariat, May, 1976)

Overlay (Scale 1: 24,000) of proposed developments in back pocket

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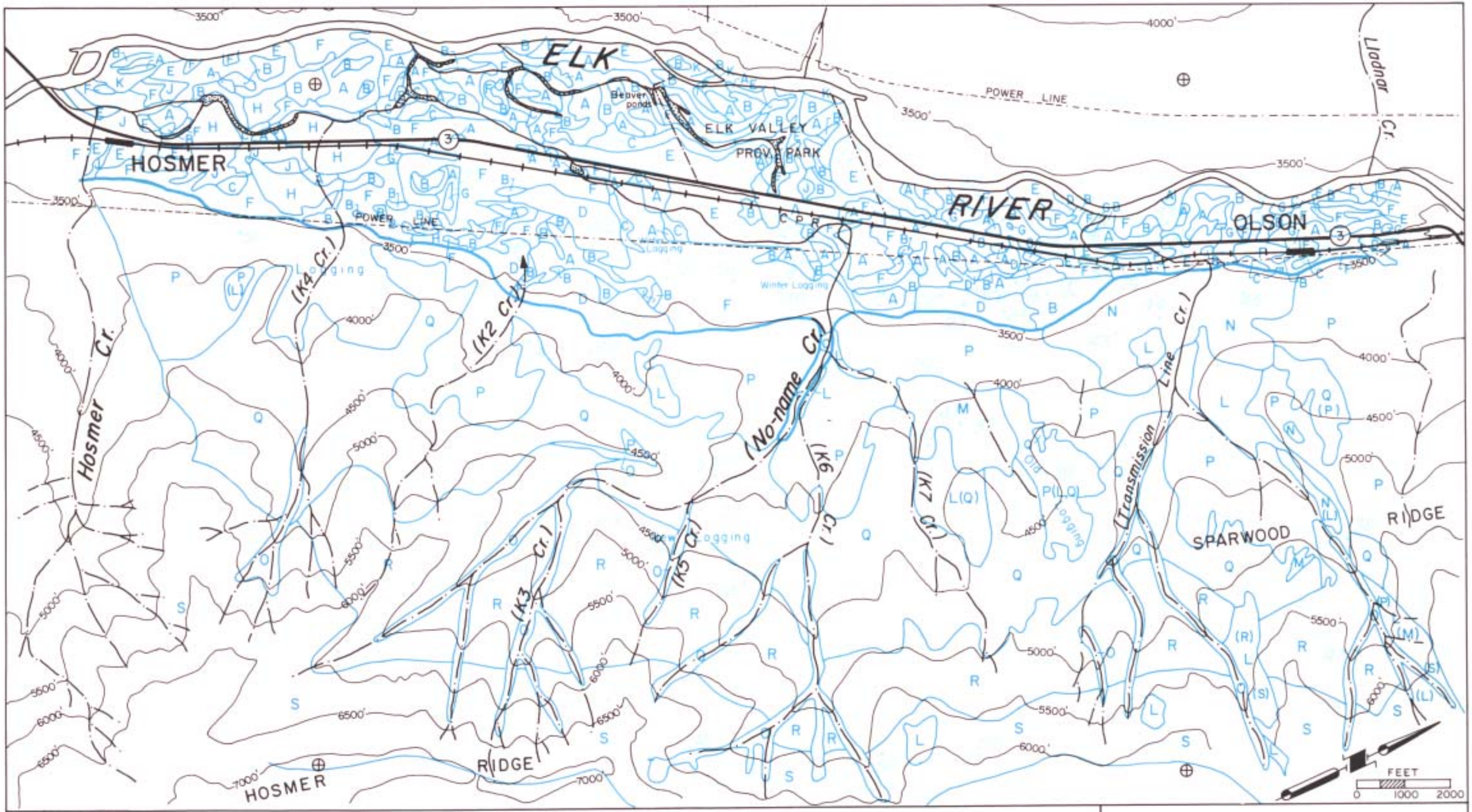

LOWLAND MAP UNITS

- A Meadow
- B Tree-Meadow
- C Tree-Shrub
- D Coniferous Forest
- E Deciduous Forest
- F Mixed Forest
- G Disturbed Land
- H Agricultural Land
- J Developed Land
- K River Bars

UPLAND MAP UNITS

- L Hillside Meadow
- M Upland Tree-Shrub
- N Upland Mixed Forest
- O Slide Vegetation
- P Low Elevation Young Forest
- Q Low Elevation Older Forest
- R Mid-Elevation Older Forest
- S High Elevation Older Forest

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Figure 7
VEGETATION MAP

Overlay (Scale 1: 24,000) of proposed developments in back pocket

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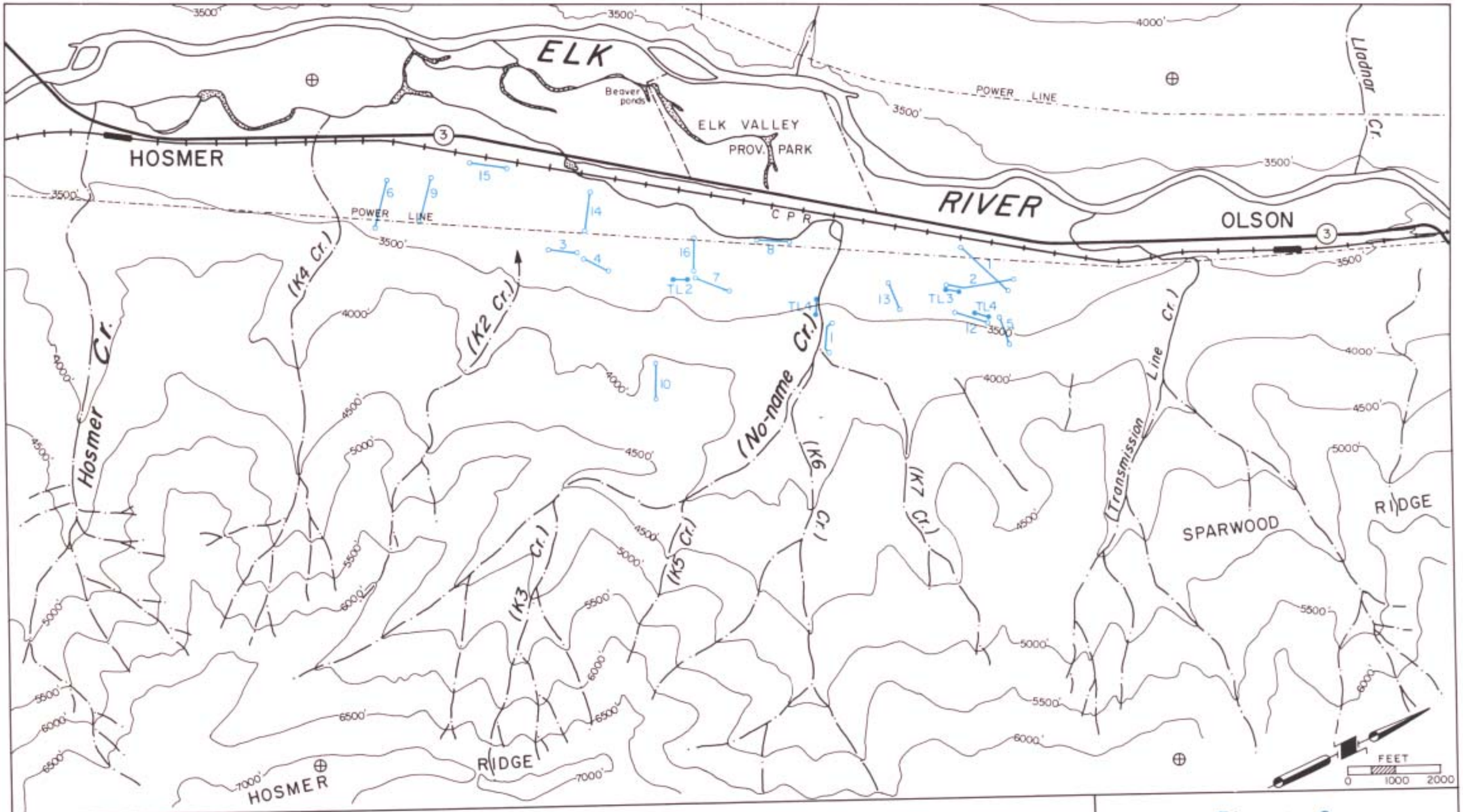

Pellet Plot Transect

Small Mammal Trapline

Figure 8

LOCATION OF PELLET PLOT TRANSECTS AND SMALL MAMMAL TRAPLINES

Overlay (Scale 1: 24,000) of proposed developments in back pocket

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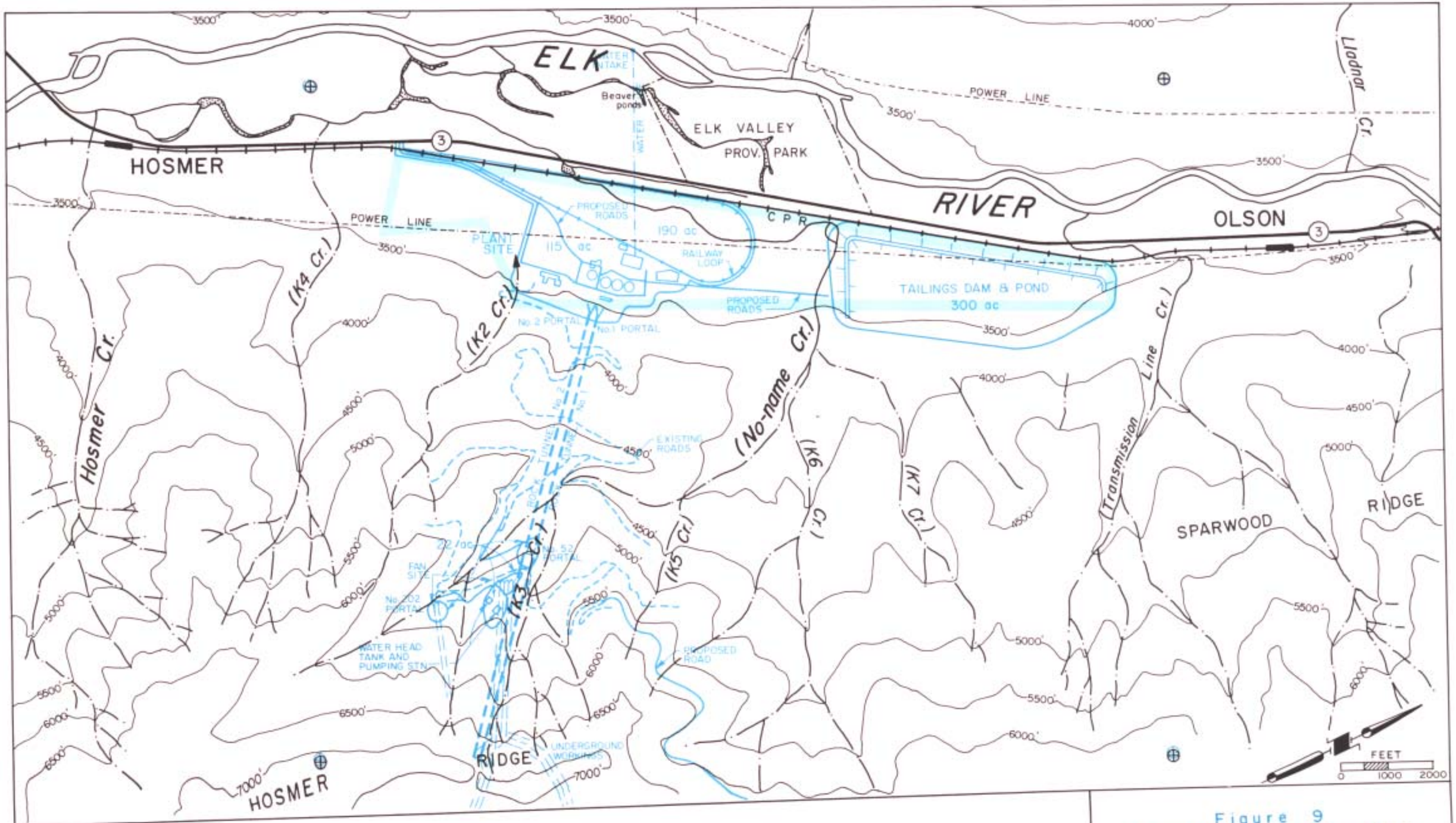

Boundary of Agricultural Reserve Buffer Area

Figure 9
PROPOSED MINE DEVELOPMENTS

Overlay (Scale 1: 24,000) of proposed developments in back pocket

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FIGURE 10

SURFACE FACILITIES - GENERAL ARRANGEMENT

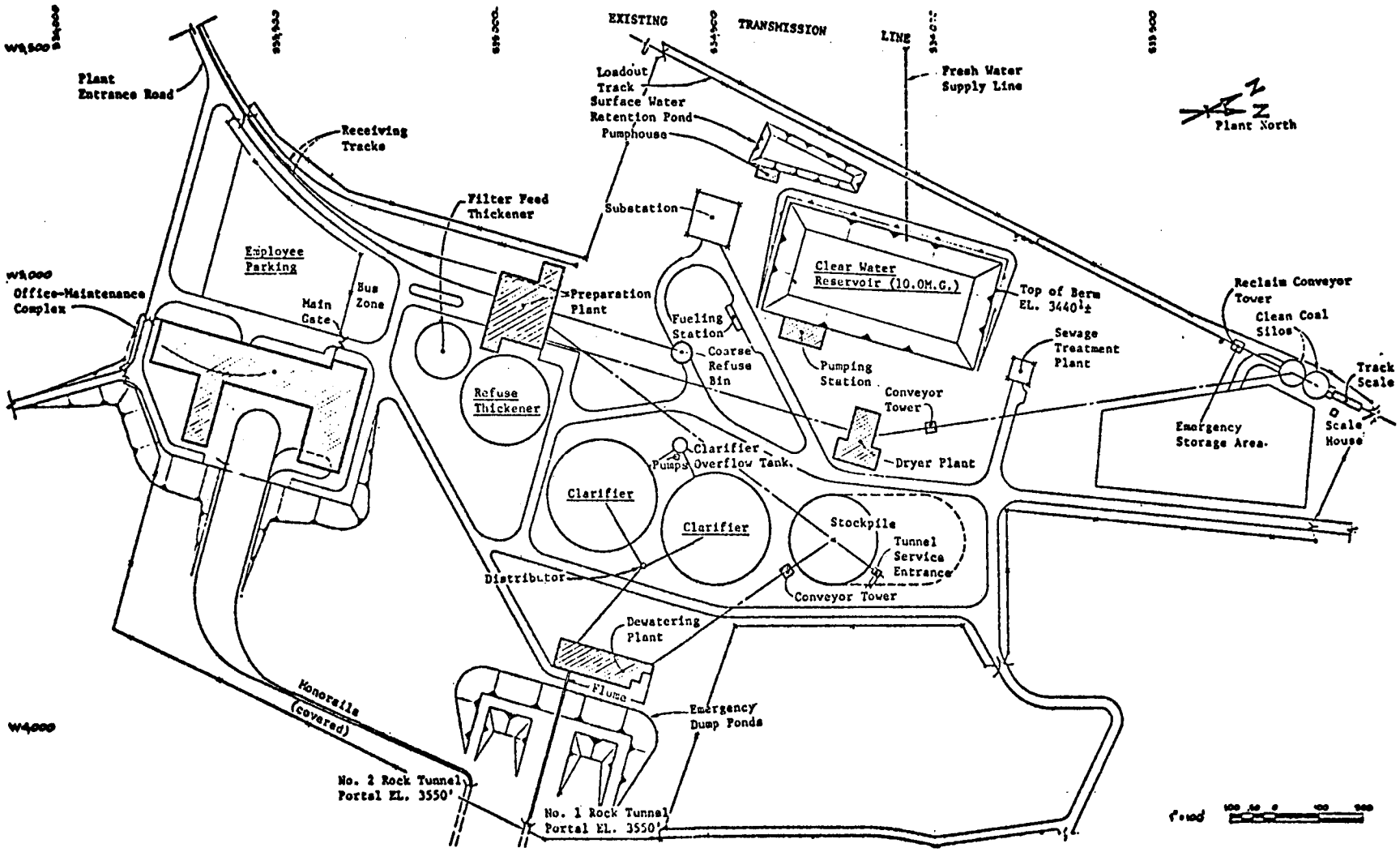


Figure 11
RAW COAL HANDLING

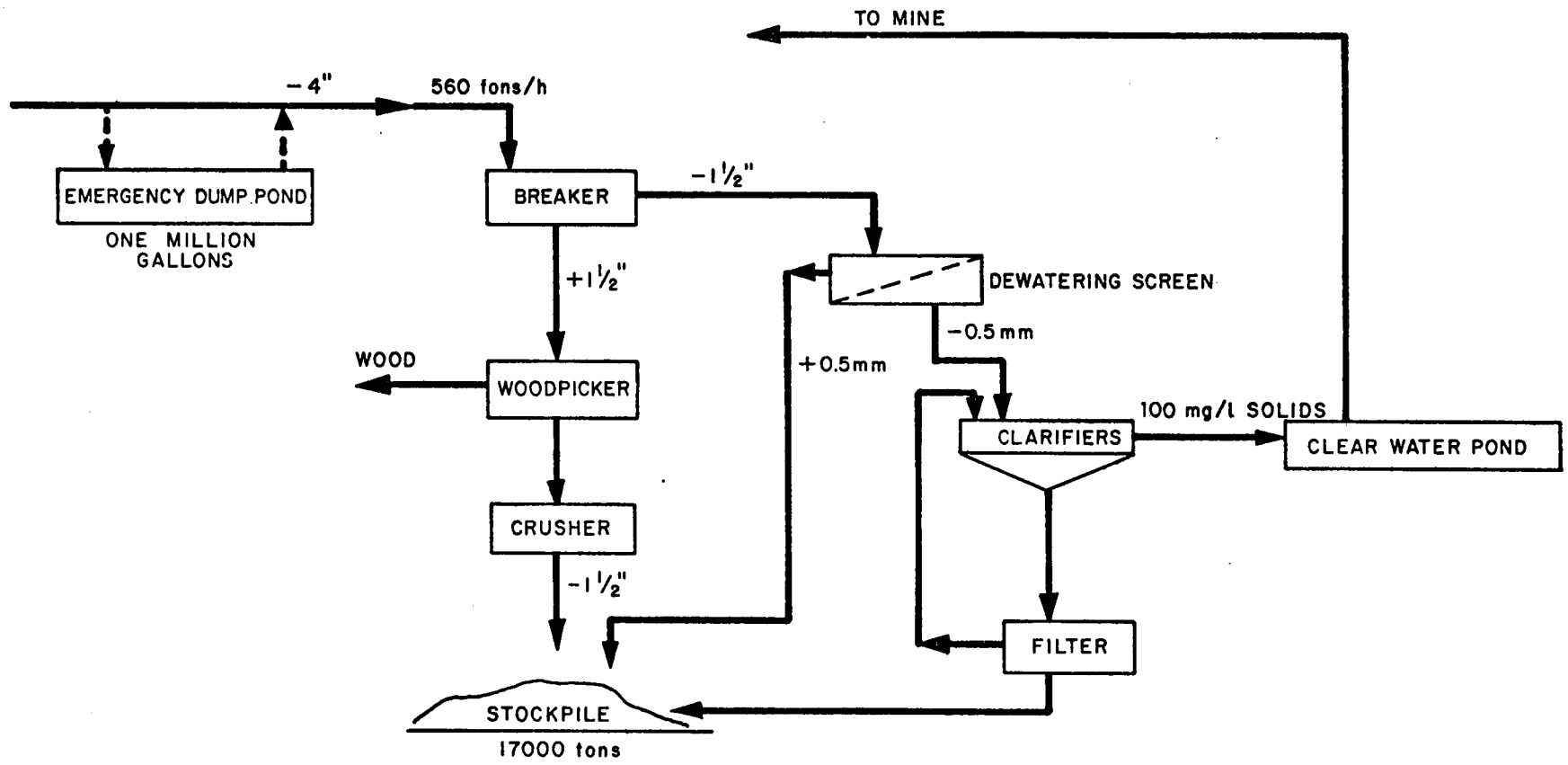


Figure 12

PREPARATION PLANT FLOW SHEET

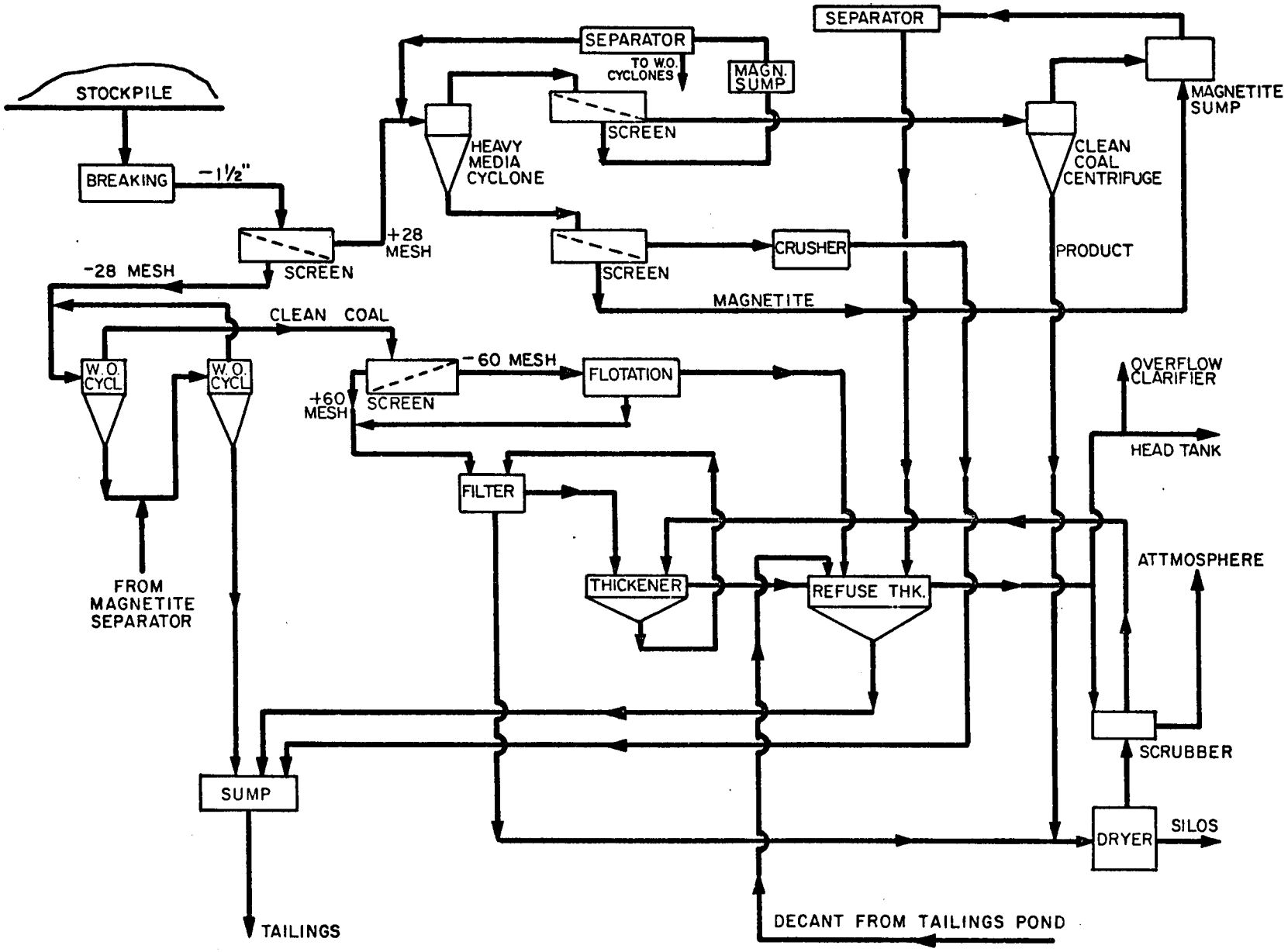
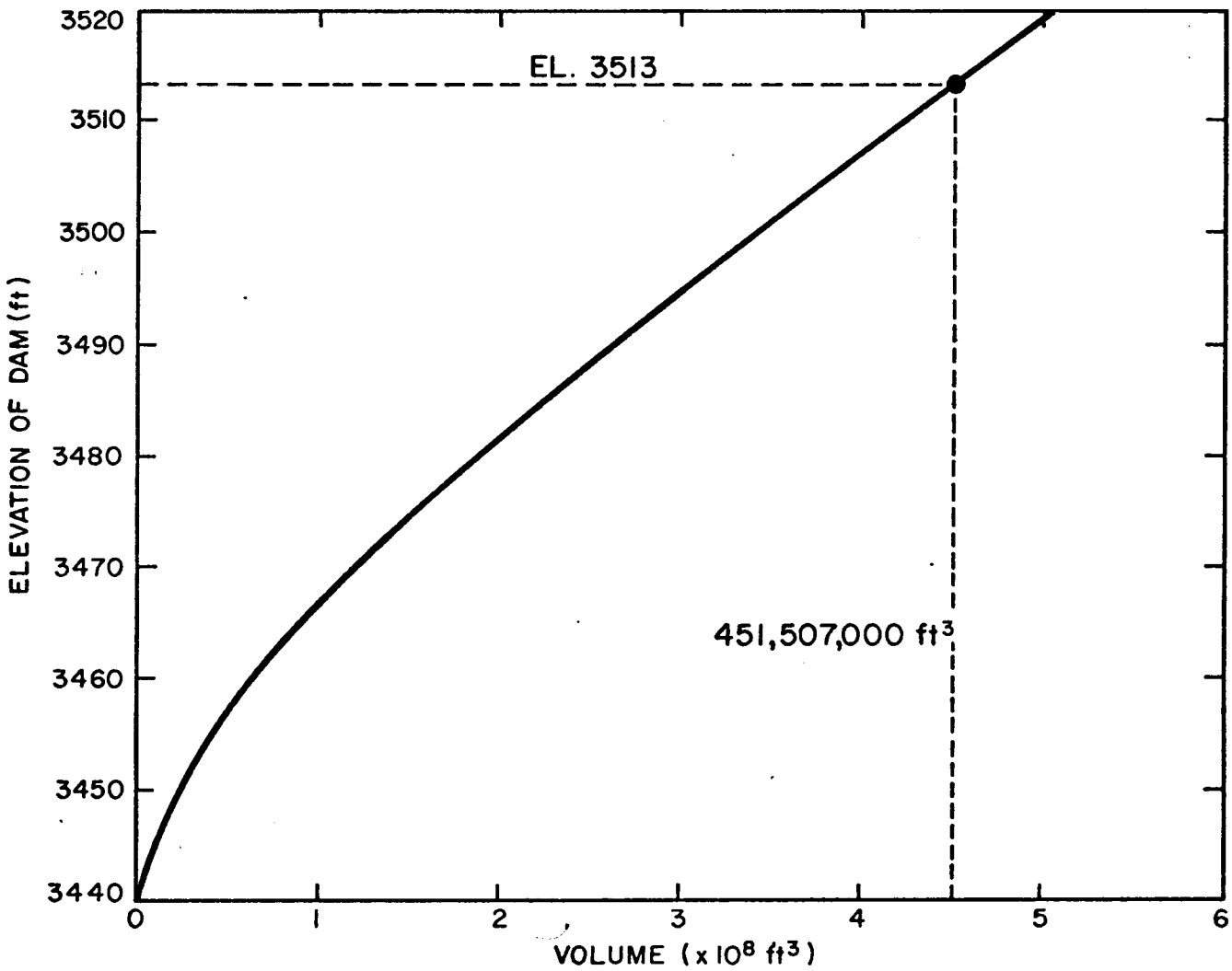


Figure 13

VOLUME OF TAILINGS POND AS A FUNCTION OF DAM HEIGHT



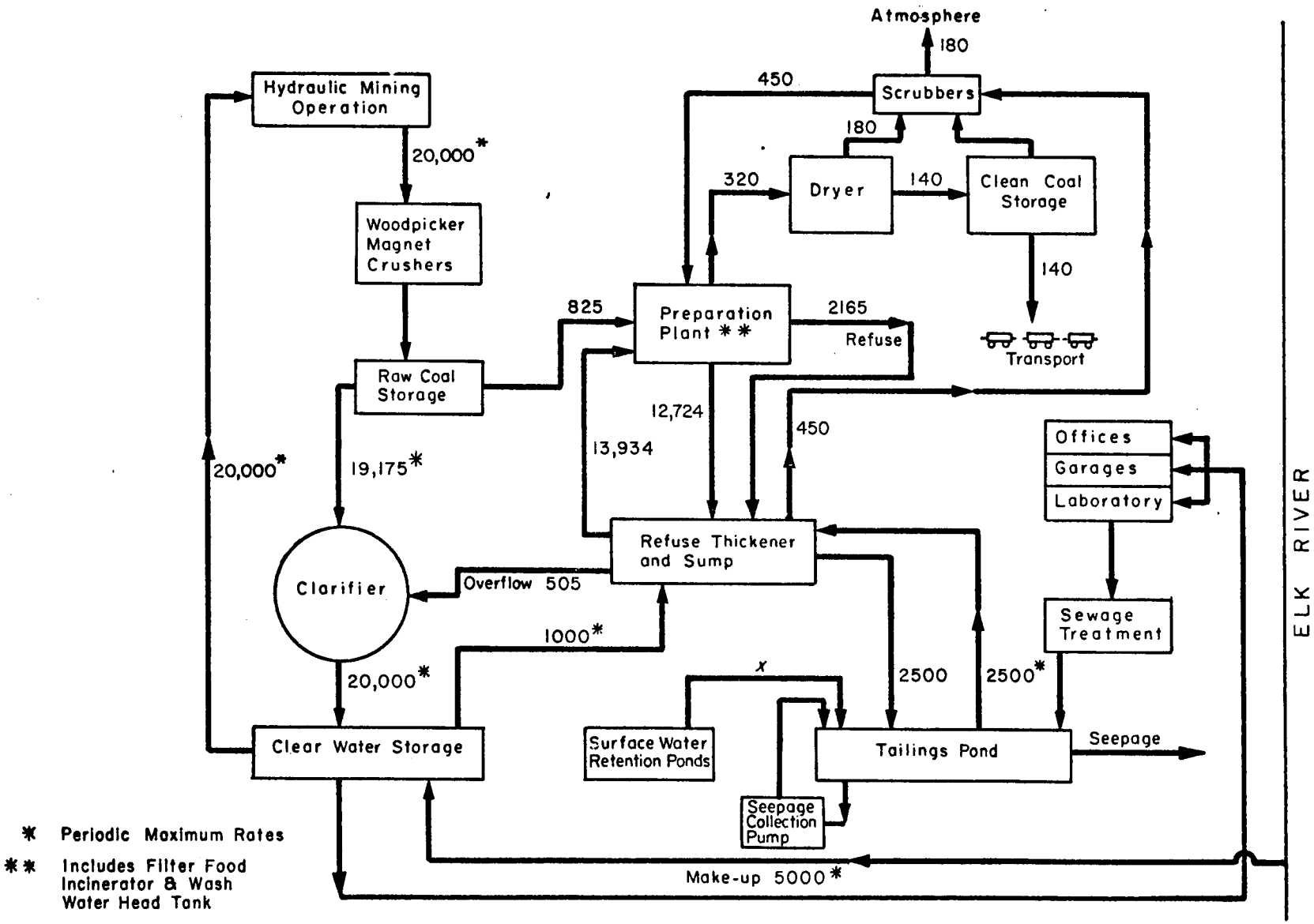


Figure 14
PROCESS WATER FLOW SHEET
(Average flows in U.S. gallons/min)

Figure 15
PROFILE OF NO-NAME CREEK

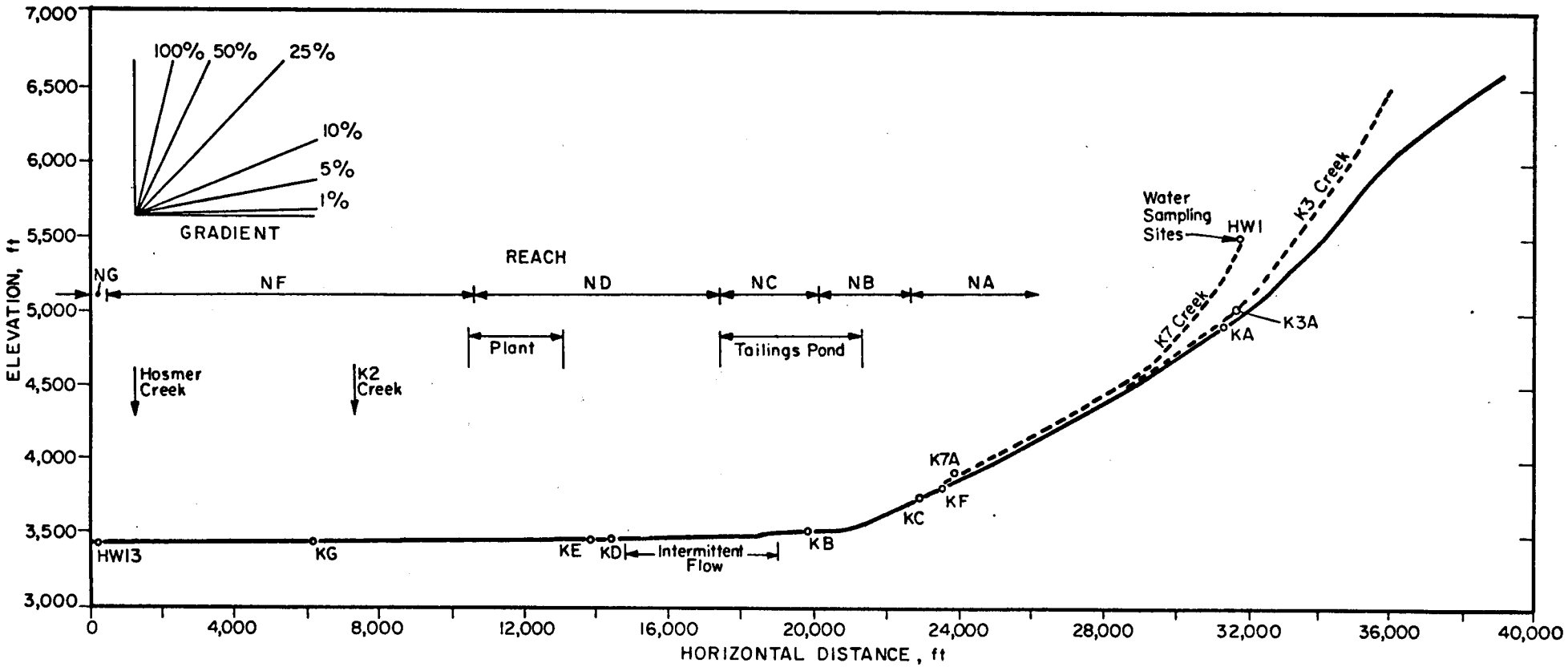


FIGURE 16

Reach NA of No-name Creek (22990.11).

FIGURE 17

Sediment in No-name Creek (centre) at junction with reach NE (22989.1A).

FIGURE 18

Electroshocking in lower portion of reach NB looking upstream (22990.5).

FIGURE 19

No-name Creek looking downstream. Proposed tailings pond location is to the right (22987.6A).

FIGURE 20

Lower portion of reach ND of No-name Creek above beaver dam (in foreground) (22989.14A).

FIGURE 21

Highway drainage; reach NE of No-name Creek (22990.2).

FIGURE 22

Old beaver dam on reach NF of No-name Creek (22987.24A).

FIGURE 23

Reach NF near Hosmer (22989.33A).

FIGURE 24

Beaver ponds below Highway 3 near Provincial Park (22987.25A).

Figure 25

STREAM FLOW IN NO-NAME CREEK - TEMPERATURE AND RAINFALL DATA FROM FERNIE

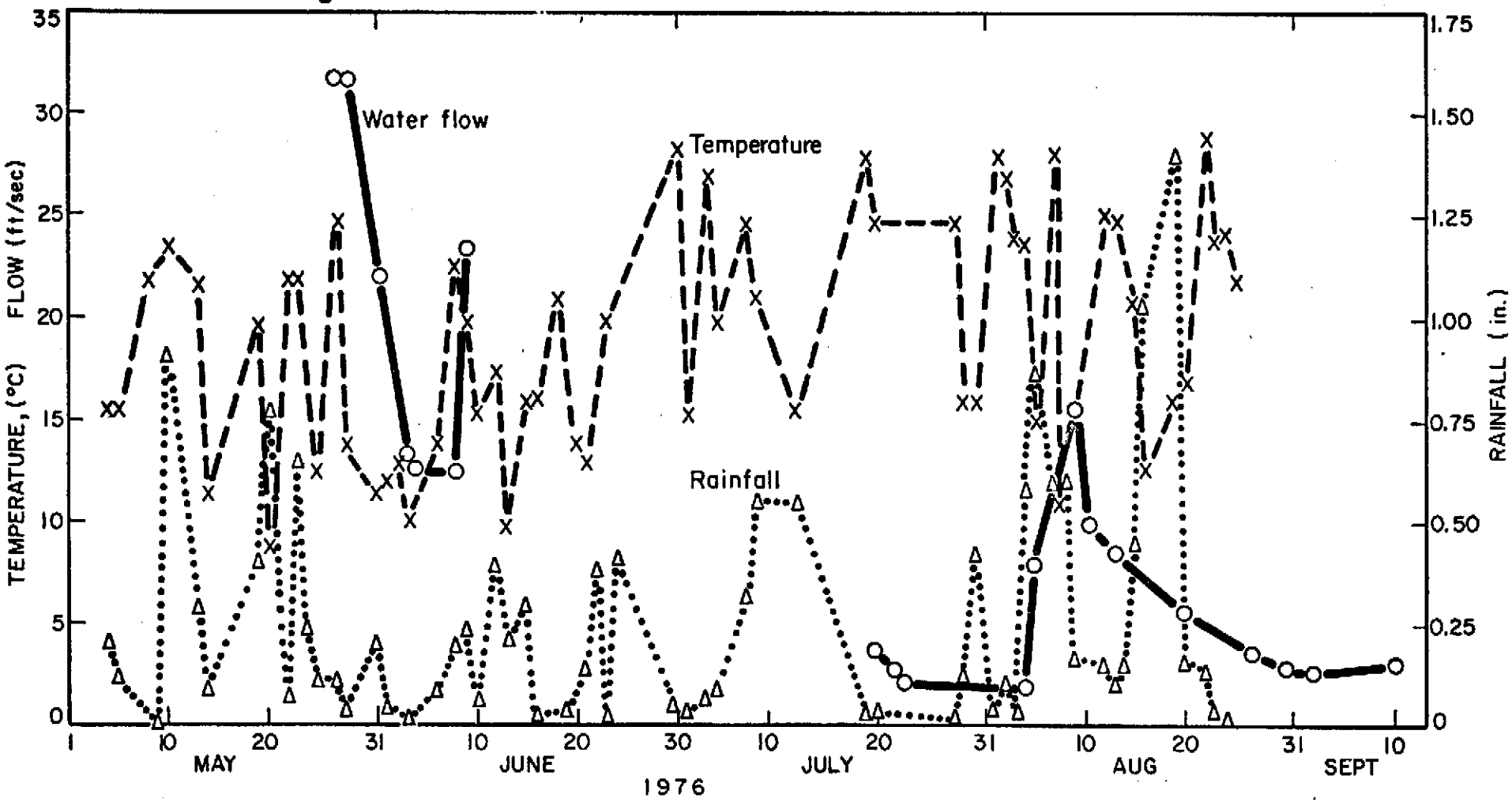


Figure 26

MEAN MONTHLY DISCHARGE FOR THE ELK RIVER NEAR NATAL 1965-1974

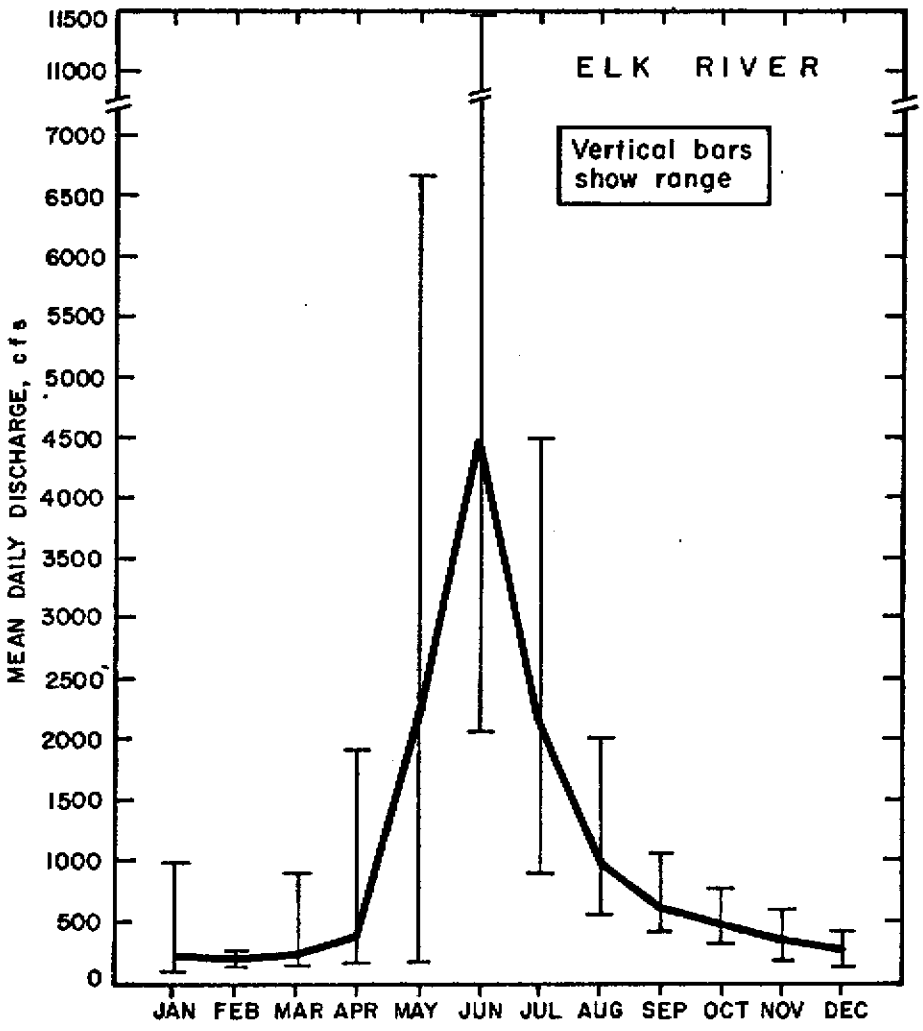


Figure 27
SIMULTANEOUS SURFACE FLOWS (cfs) IN THE HOSMER AREA

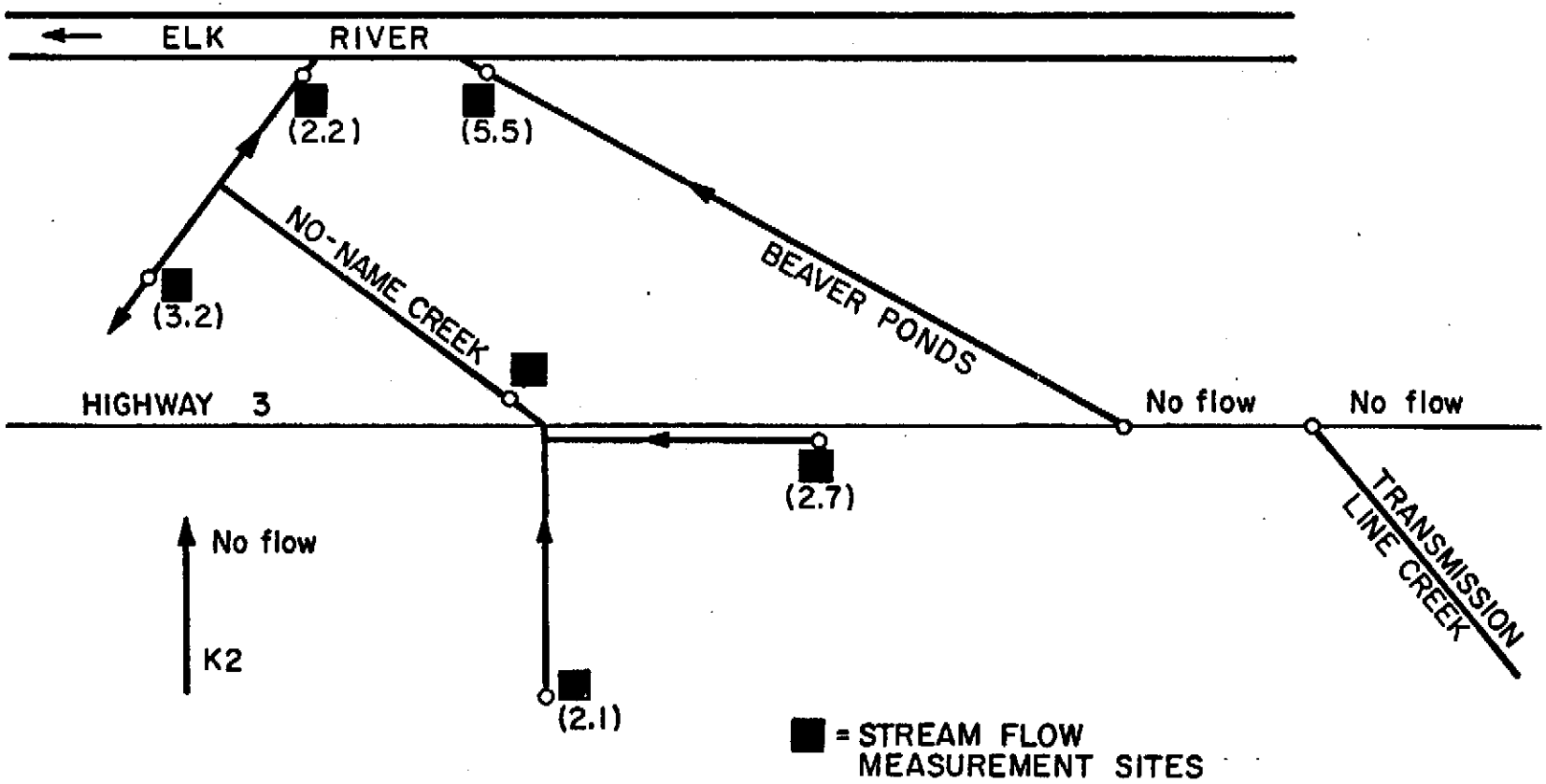


Figure 28
SEASONAL VARIATION IN WATER QUALITY

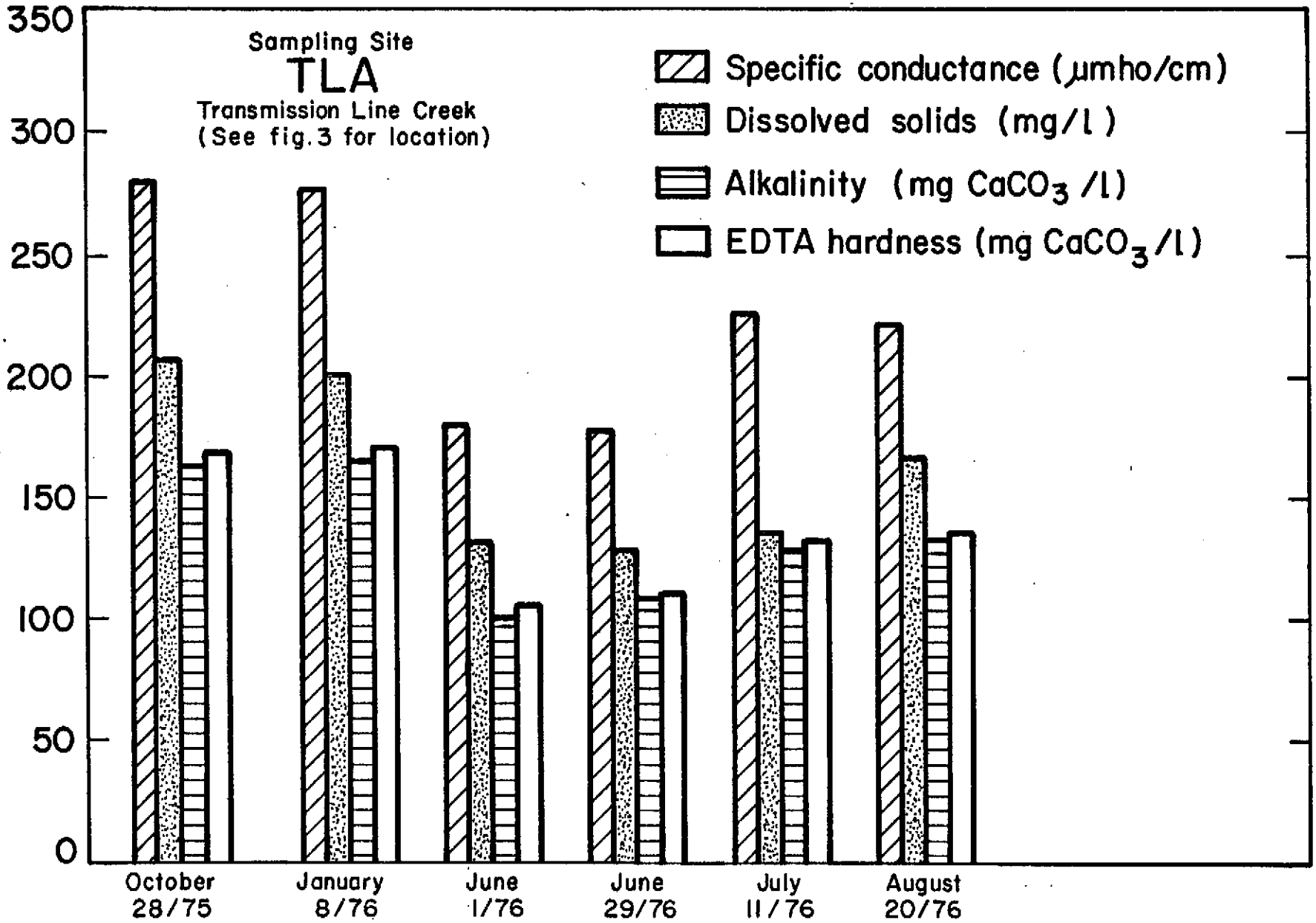


Figure 29
SEASONAL VARIATION IN WATER QUALITY

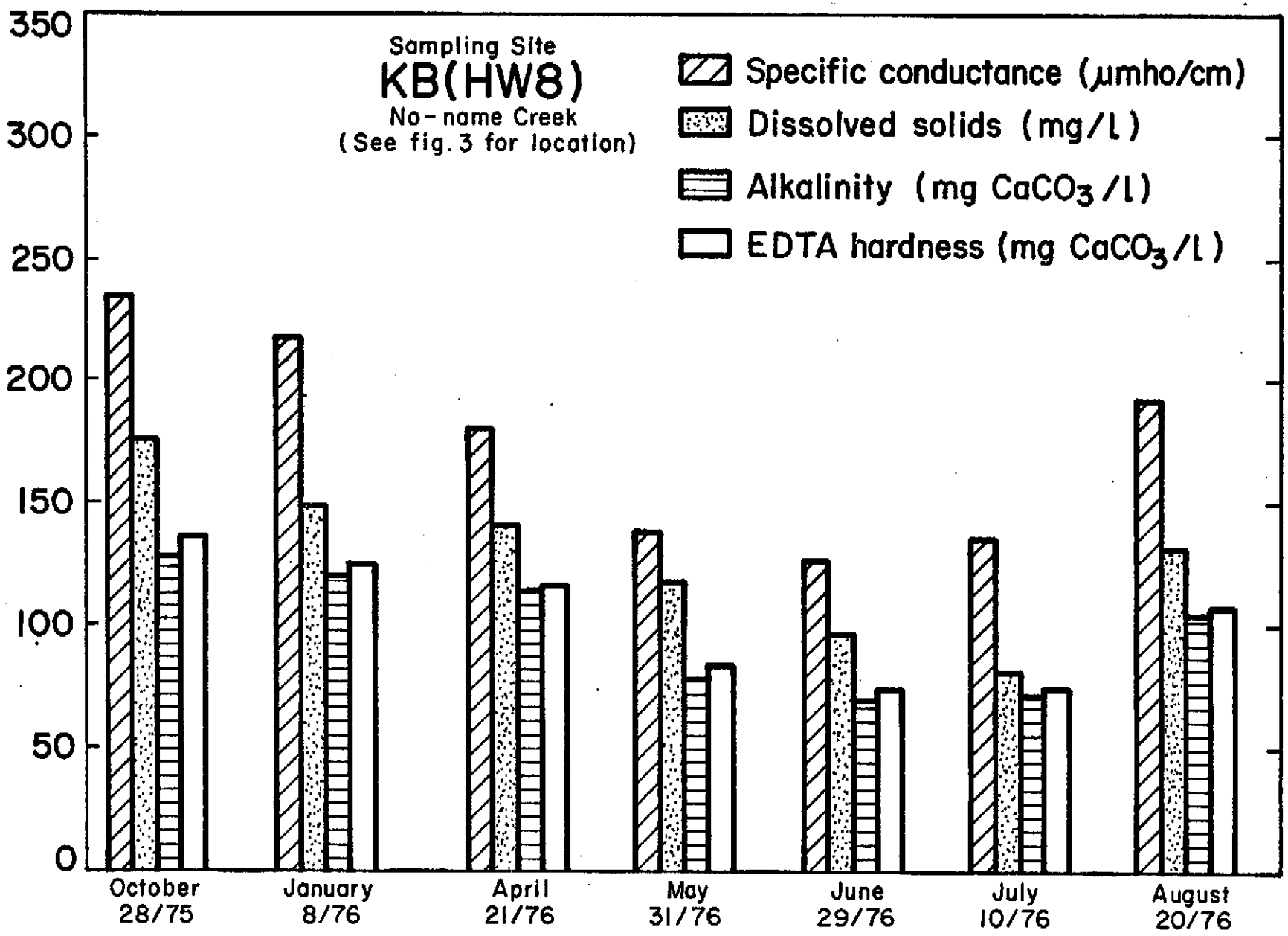


Figure 30
SEASONAL VARIATION IN WATER QUALITY

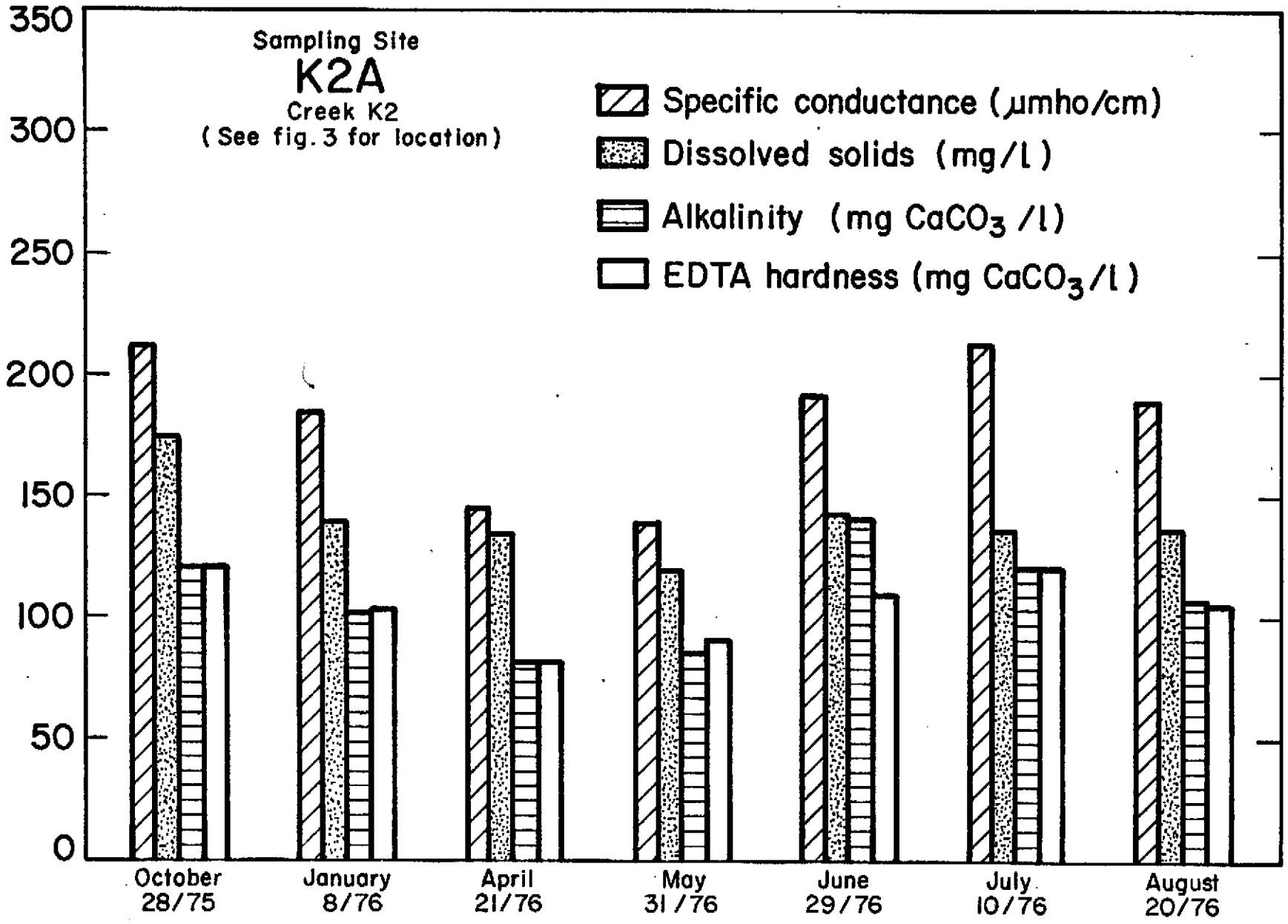


Figure 31
SEASONAL VARIATION IN WATER QUALITY

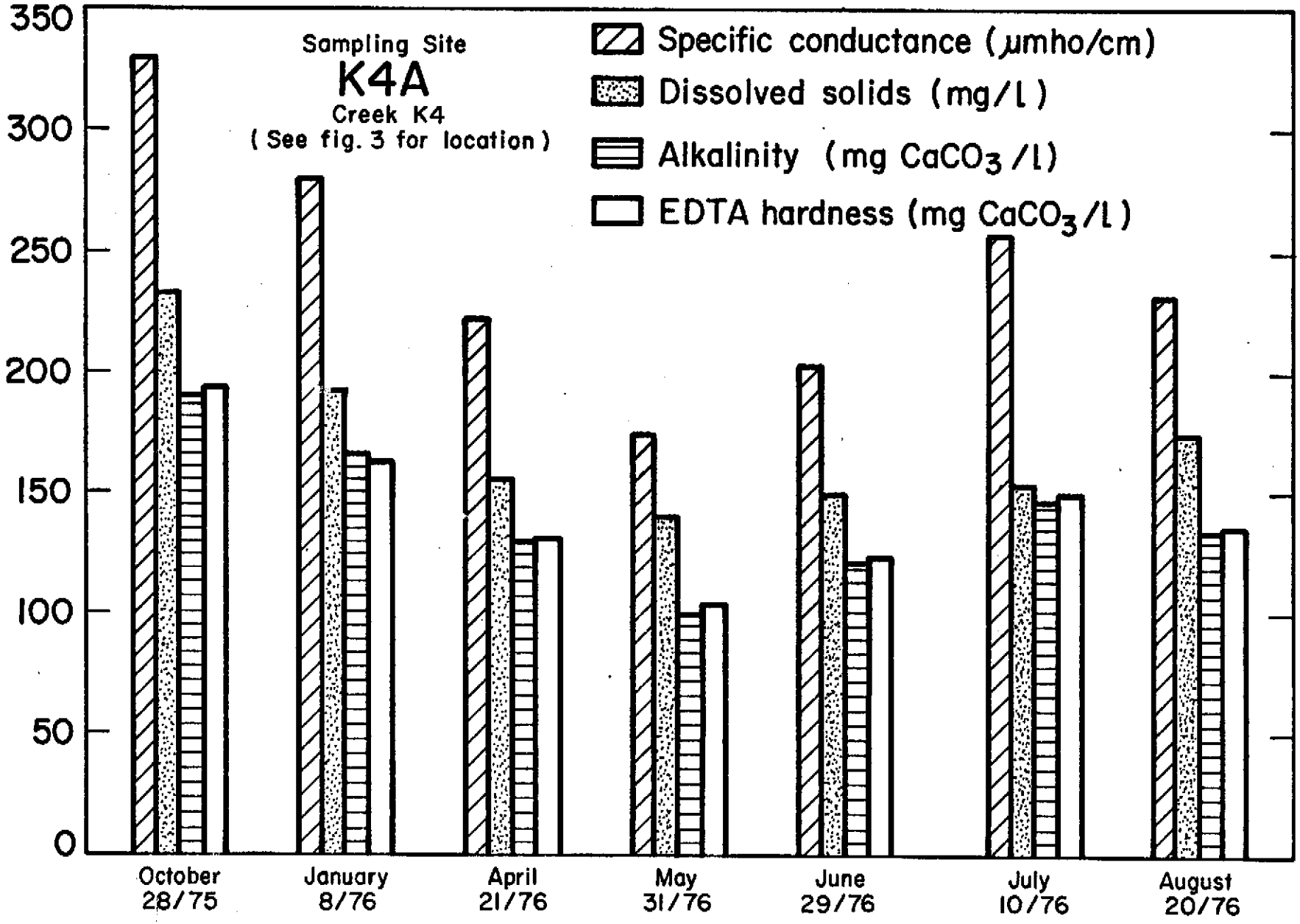


Figure 32
SEASONAL VARIATION IN WATER QUALITY

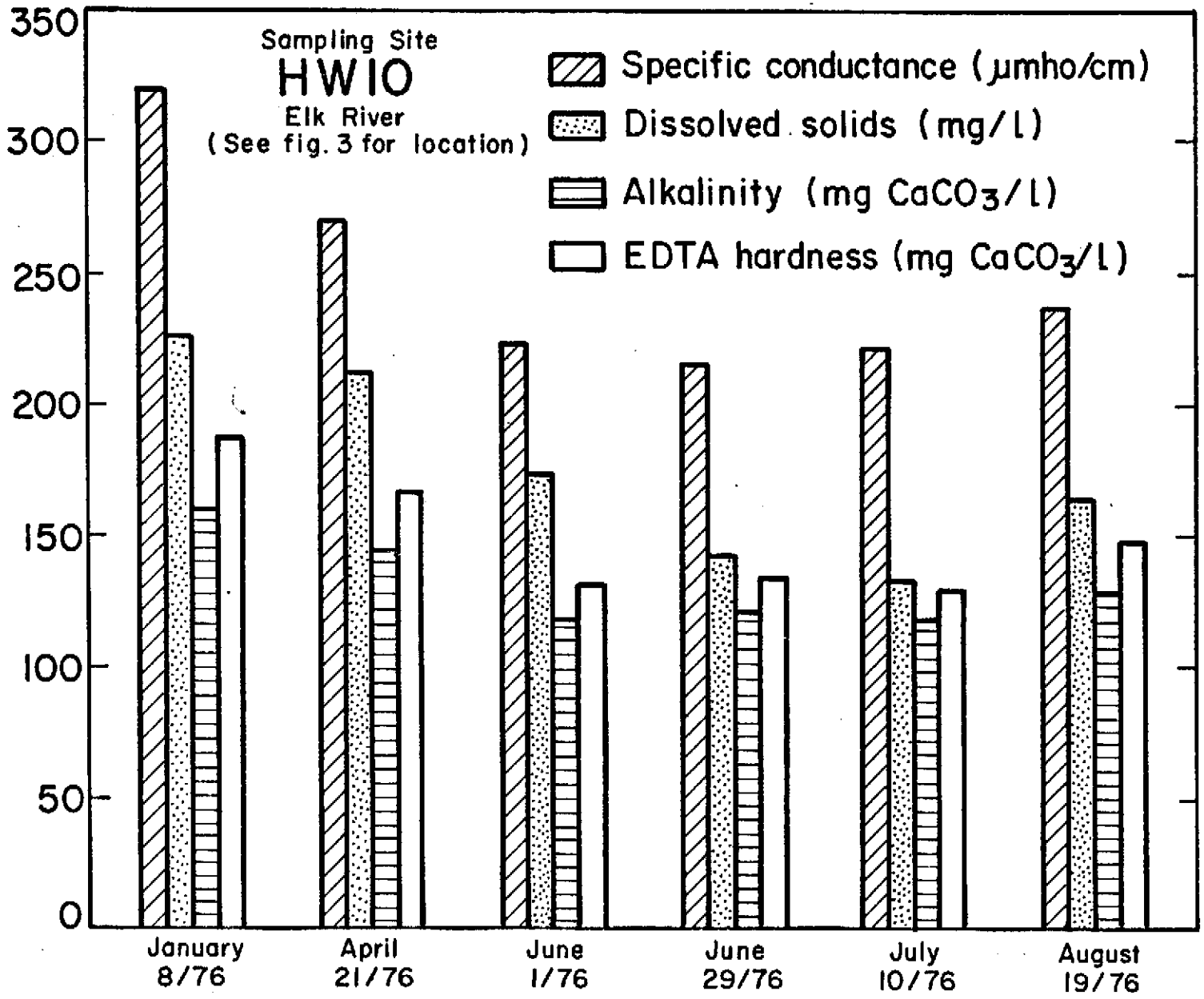


Figure 33

PROFILE OF NO-NAME CREEK

Fall (October 28, 1975)

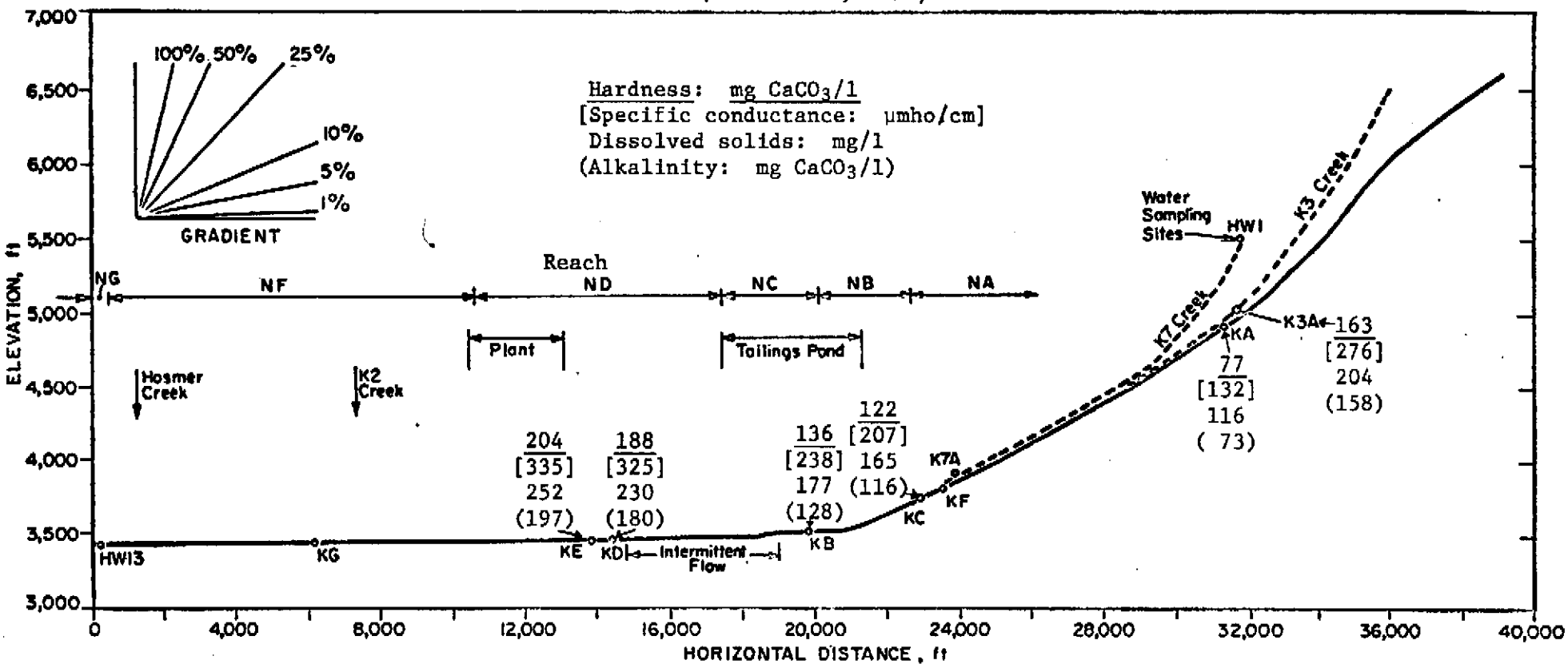


Figure 34

PROFILE OF NO-NAME CREEK

Winter (January 8, 1976)

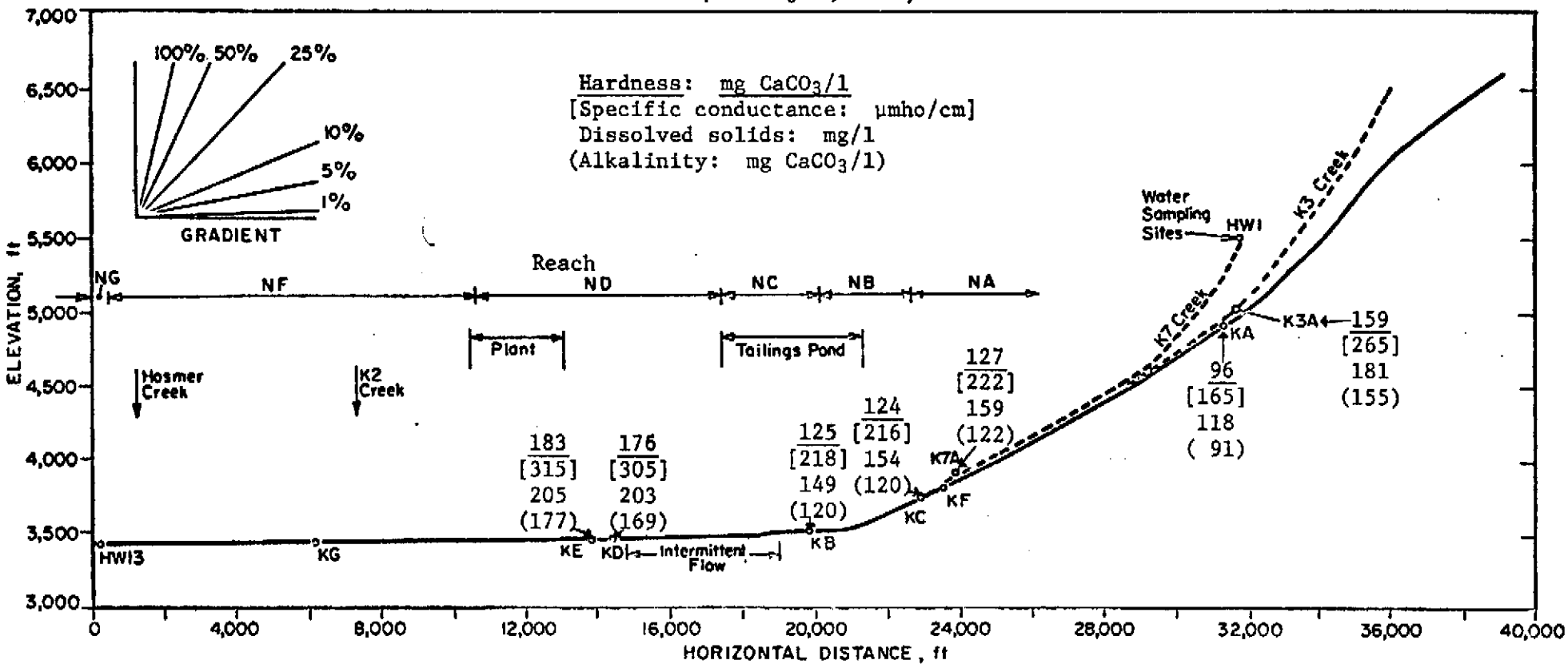


Figure 35

PROFILE OF NO-NAME CREEK

Spring (May 31, 1976)

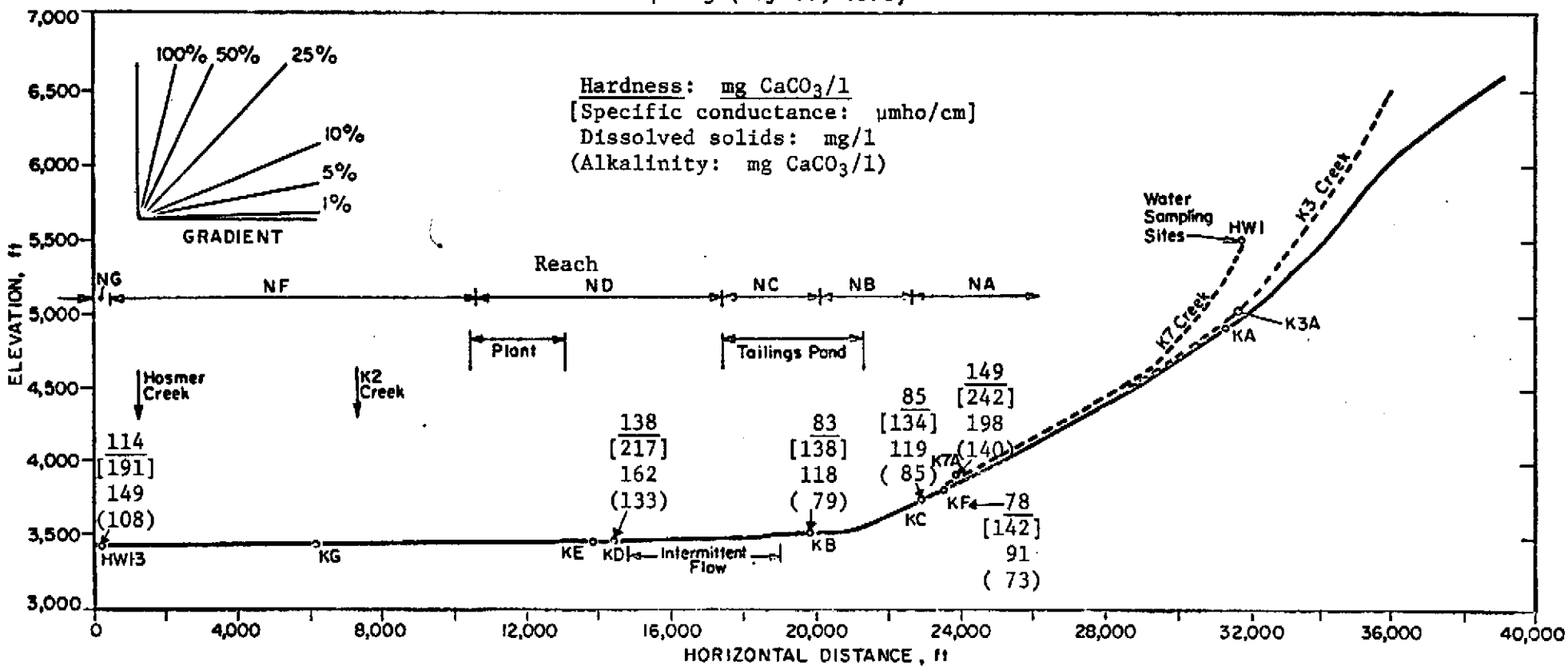


Figure 36

PROFILE OF NO-NAME CREEK

Summer (August 19-21, 1976)

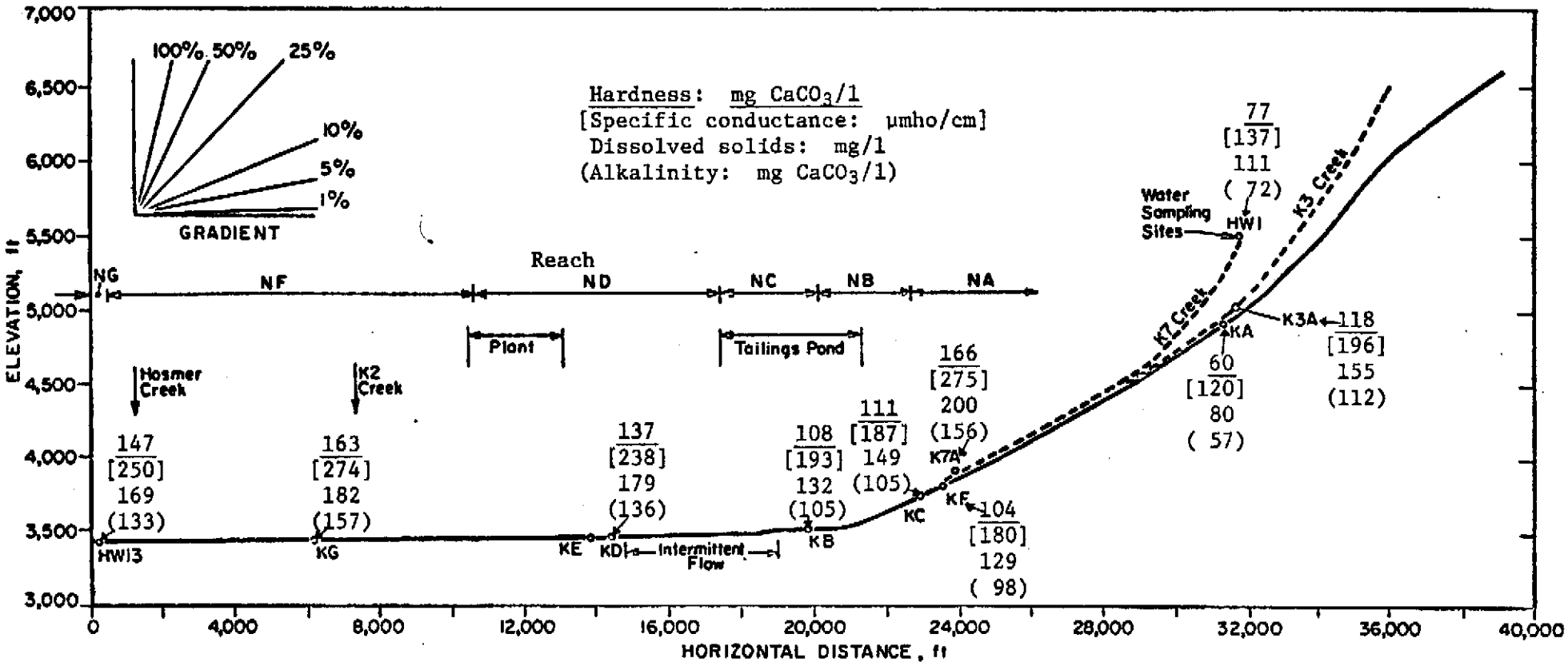


Figure 37

SEASONAL VARIATIONS IN SUSPENDED SOLIDS CONCENTRATIONS AT VARIOUS SITES

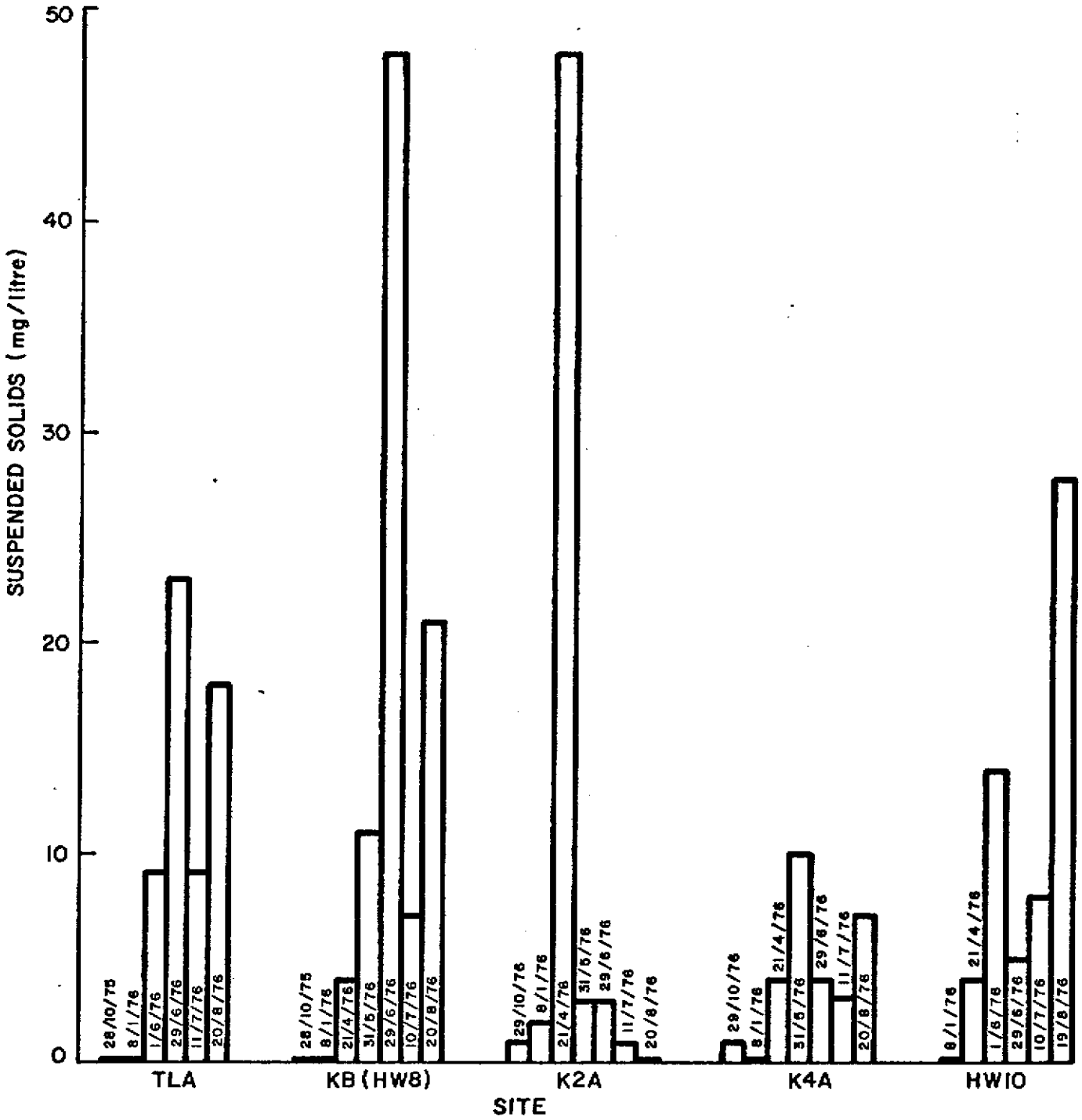


Figure 38

PROFILE OF NO-NAME CREEK

Fall (October 28, 1975)

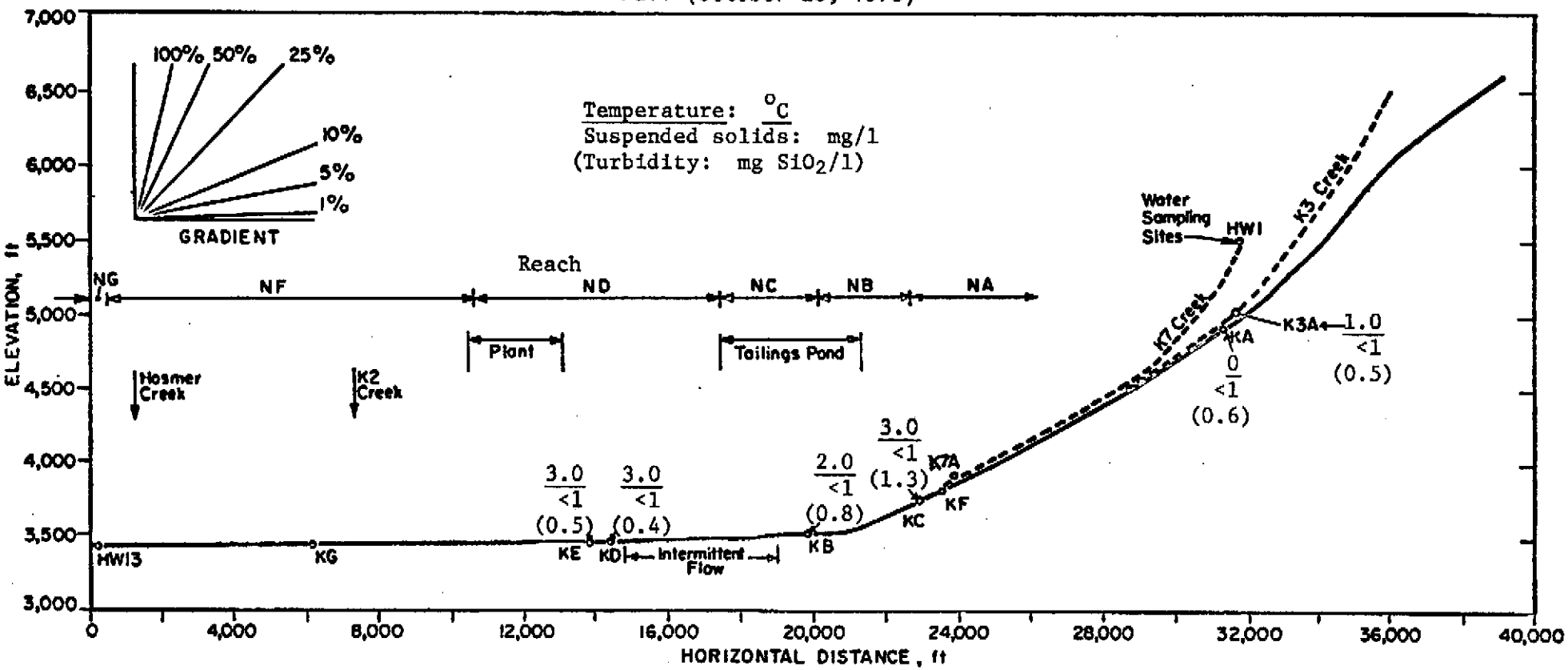


Figure 39

PROFILE OF NO-NAME CREEK

Winter (January 8, 1976)

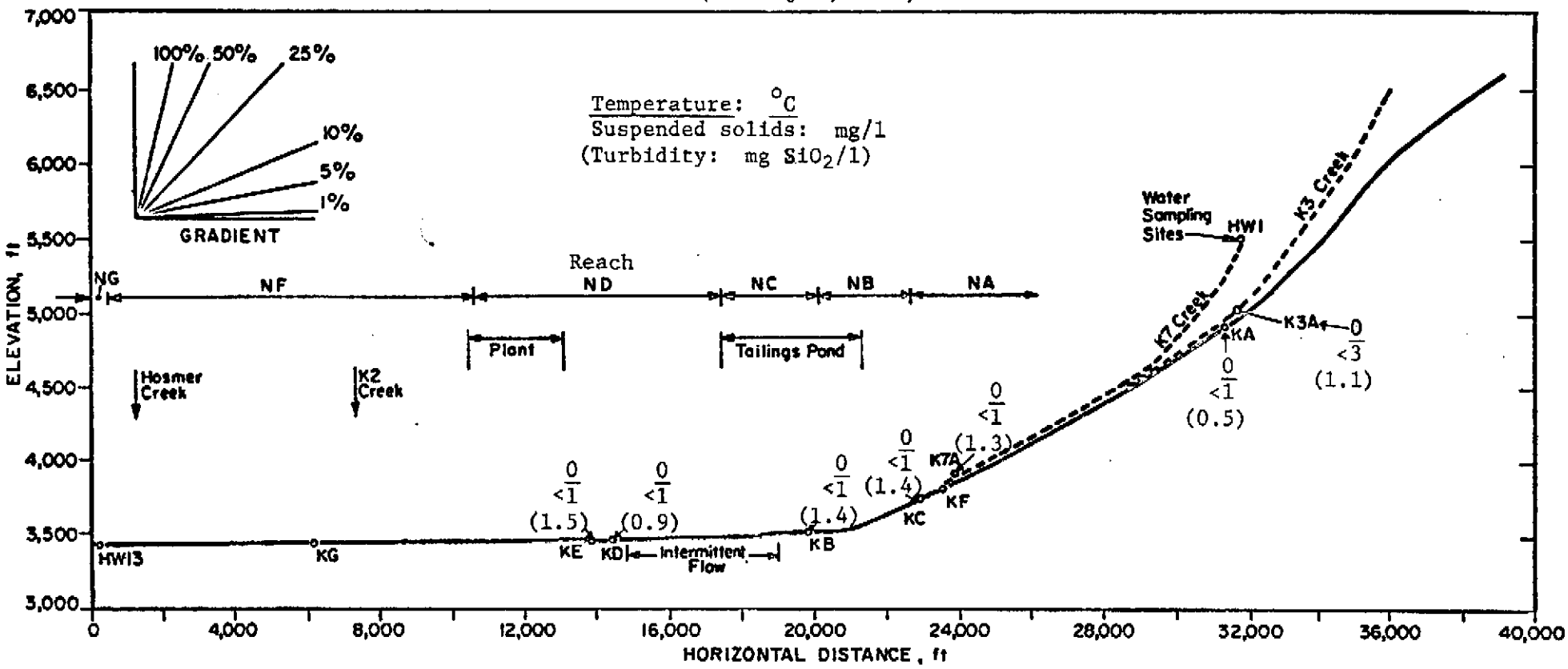


Figure 40

PROFILE OF NO-NAME CREEK

Spring (May 31, 1976)

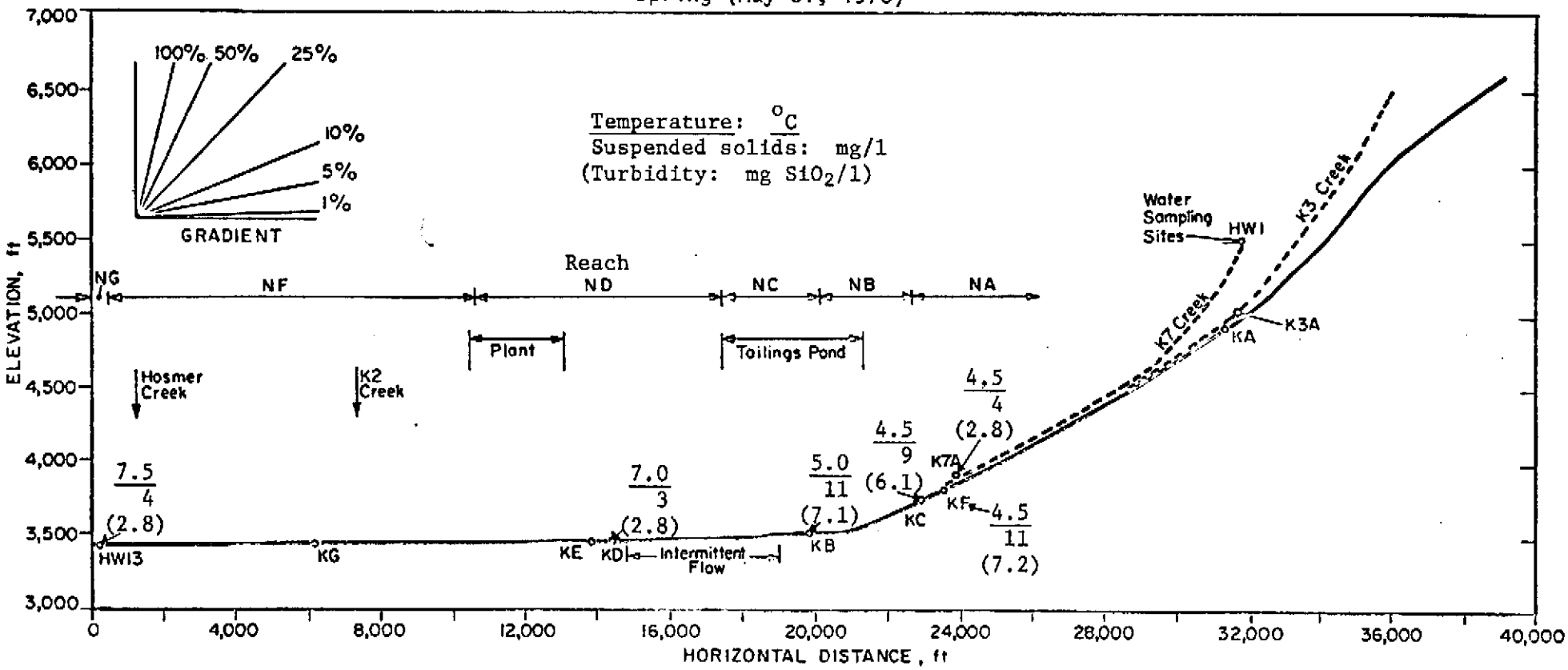


Figure 41

PROFILE OF NO-NAME CREEK

Summer (August 19-21, 1976)

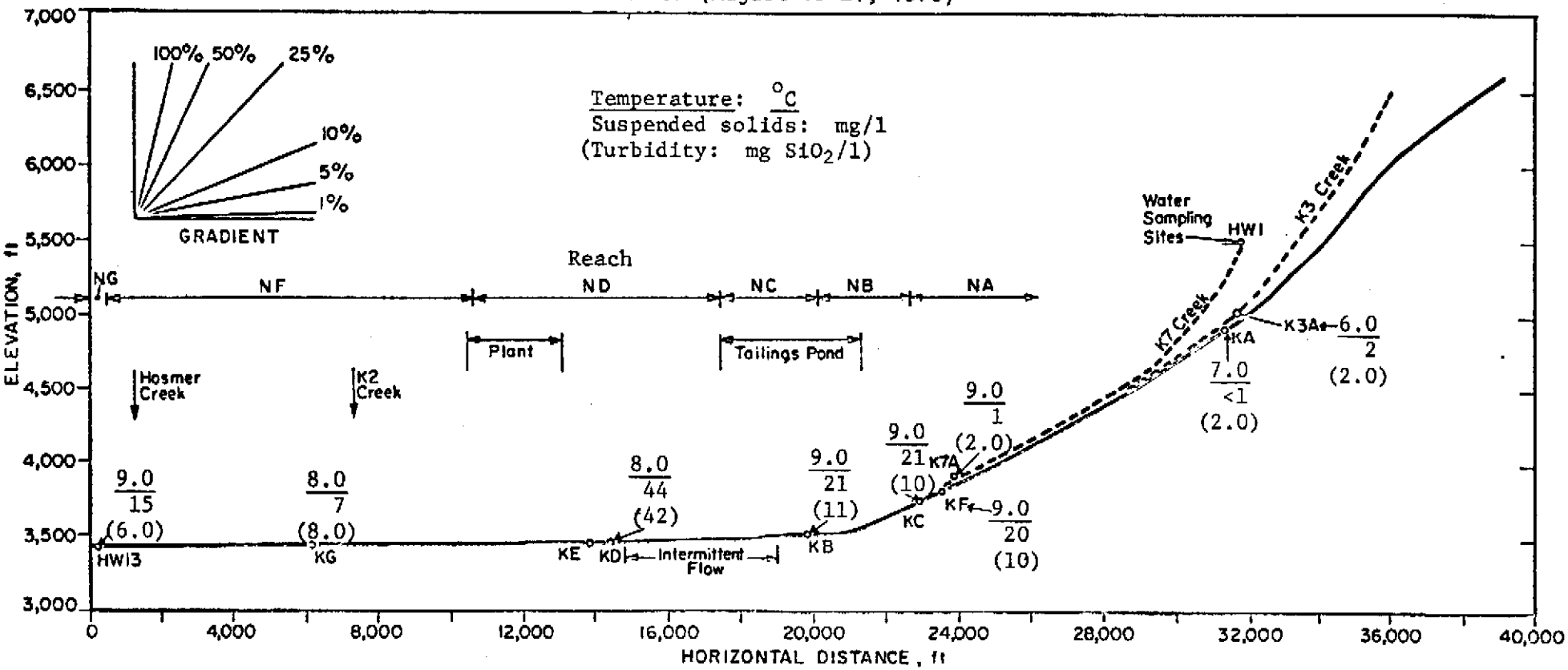


Figure 42

WATER QUALITY ALONG THE ELK RIVER

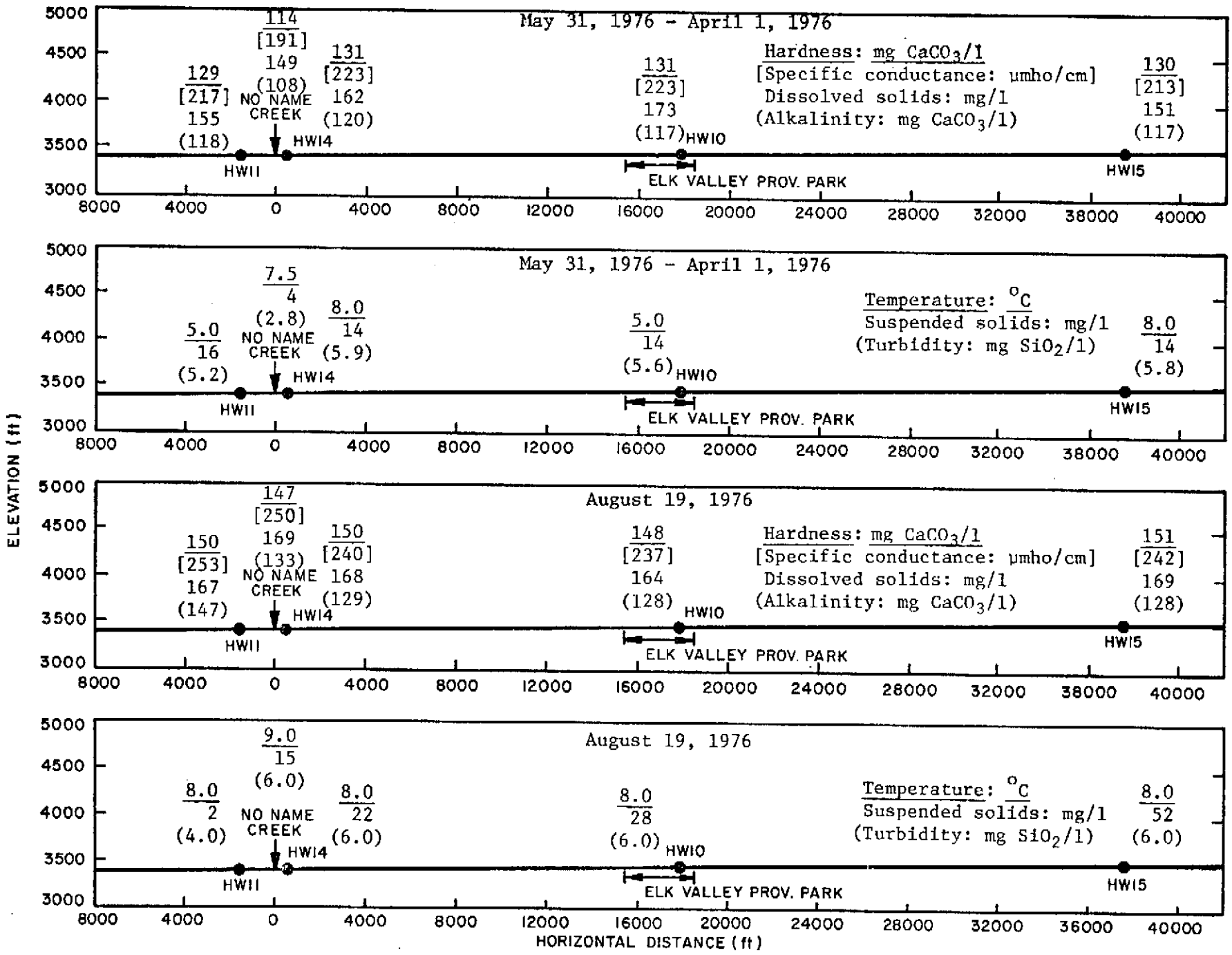


Figure 43
SIZE RANGE OF CUTTHROAT TROUT CAPTURED
IN NO-NAME CREEK IN SEPTEMBER

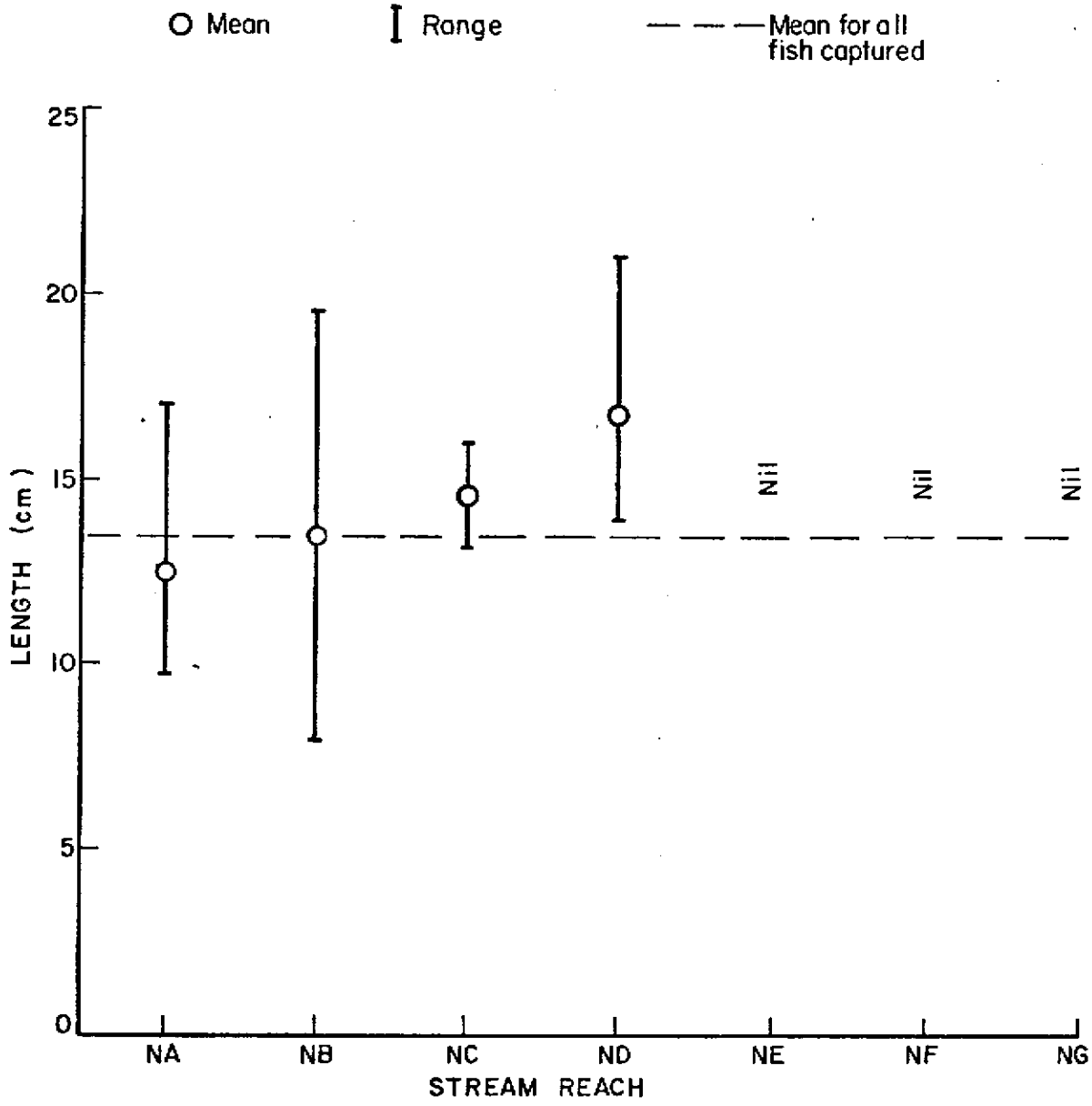


Figure 44
SIZE RANGE OF EASTERN BROOK TROUT CAPTURED
IN NO-NAME CREEK IN SEPTEMBER

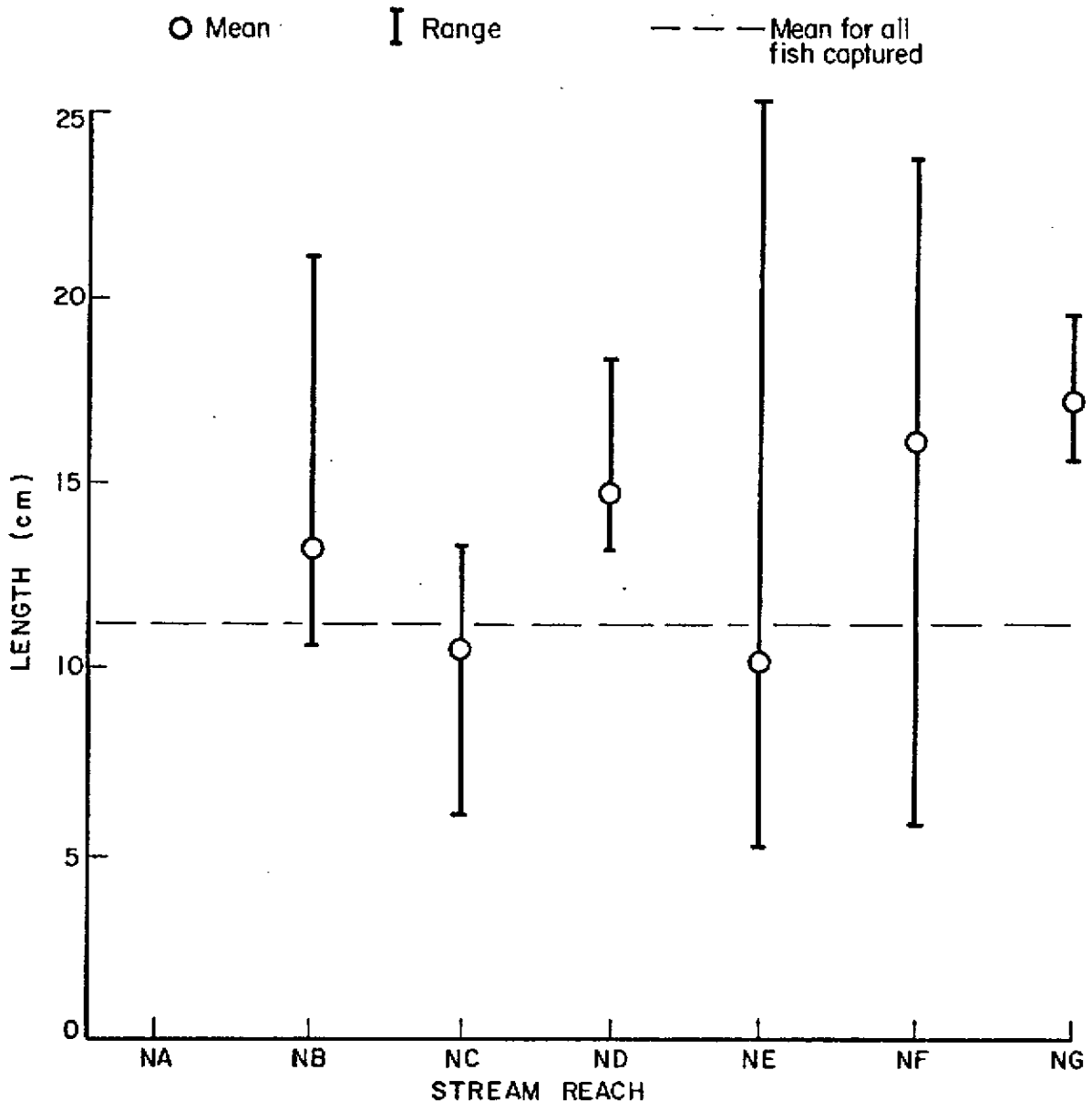


FIGURE 45

Degraded Eutric Brunisol
Soil site 23, mapping unit
3a (22909.15).

FIGURE 46

Degraded Eutric Brunisol
Soil site 27, mapping unit
3a (22909.24).

FIGURE 47

Orthic Eutric Brunisol Soil site 20, mapping unit 4a (22909.9).

FIGURE 48

Soil and material, mapping unit 4b (23001.8).

FIGURE 49

Orthic Eutric Brunisol
Soil site 26, mapping unit
5a (22909.22).

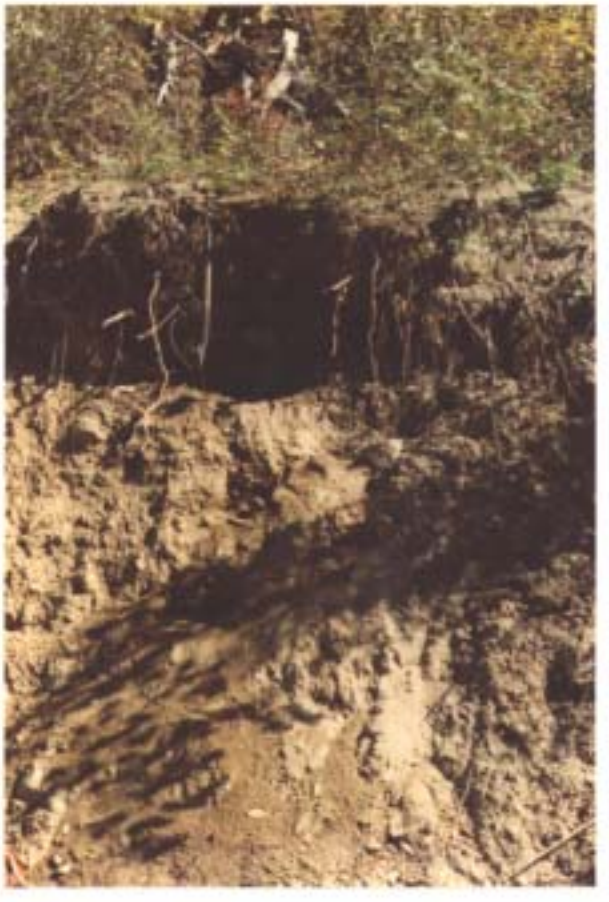


FIGURE 50

Degraded Eutric Brunisol
Soil site 8, mapping unit
6a (23001.28).

FIGURE 51

Surficial material, mapping unit 8a (23000.22A).

FIGURE 52

Orthic Dystric Brunisol Soil site 16, mapping unit 9a (22908.34).

FIGURE 53

Brunisolic Gray Luvisol
Soil site 12, mapping unit
9c (22908.28).

FIGURE 54

Degraded Dystric Brunisol
Soil site 11, mapping unit
10a (22908.15).

FIGURE 55

Lowland area: Meadow map unit; grass meadow vegetation type (22814.3).

FIGURE 56

Lowland area: Tree-meadow map unit; coniferous tree-meadow vegetation type (22879.22).

FIGURE 57

Lowland area: Coniferous forest map unit; lodgepole pine vegetation type (22880.33).

FIGURE 58

Lowland area: Deciduous forest map unit; closed poplar vegetation type (22868.3A).

FIGURE 59

Lowland area: Mixed forest map unit; open mixed forest vegetation type (22880.29).

FIGURE 60

Upland area: Hillside meadow map unit (22991.33).

FIGURE 61

Upland area: Slide vegetation map unit (22997.8).

FIGURE 62

Upland area: Low elevation young forest map unit (22992.36A).

FIGURE 63

Upland area: Mid-elevation older forest map unit (22997.36A).

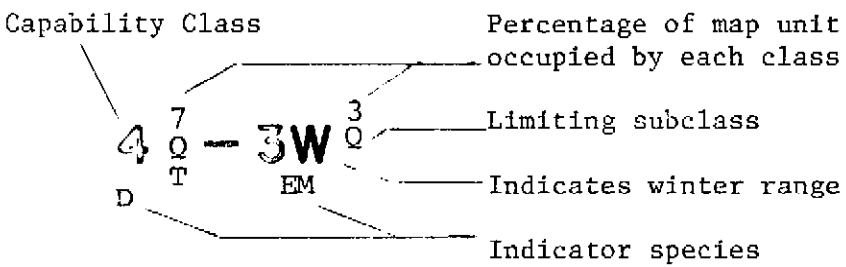
FIGURE 64

Crow's Nest Industries summer logging in low and mid-elevation older forest vegetation map units above No-name Creek (22997.27).

KEY FOR INTERPRETATION OF UNGULATE CAPABILITY MANUSCRIPT MAPS (B.C.)

There are 7 capability classes based on the ability of the land to support or produce wild ungulates. The capability class level is determined by the degree of limitation which affects the quality and/or quantity of habitat for the animals.

Example Classification



a) Capability Classes

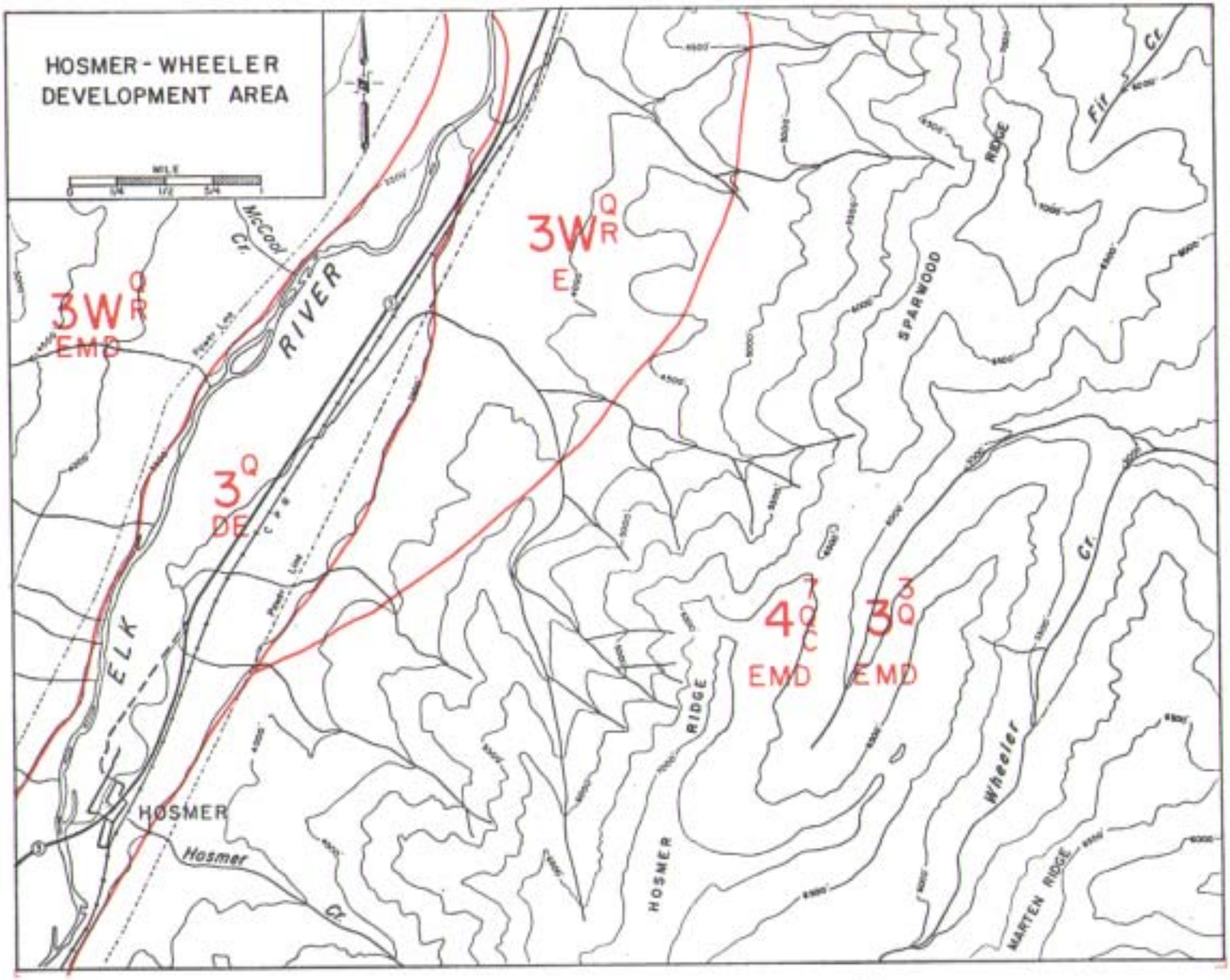
Class 1 - No limitations to the production of ungulates.
Class 1W - Extremely important winter range for ungulates.
Class 2 - Very slight limitations to the production of ungulates.
Class 2W - Very important winter range for ungulates.
Class 3 - Slight limitations to the production of ungulates.
Class 3W - Important winter range for ungulates.
Class 4 - Moderate limitations to the production of ungulates.
Class 5 - Moderately severe limitations to the production of ungulates.
Class 6 - Severe limitations to the production of ungulates.
Class 7 - Such severe limitations that almost no ungulates are produced.

b) Limiting Subclasses

A - Aridity (climate restricts growth of suitable food.
C - Climate (combination of Climate factors such as excessive cold or moisture, short growing season, high rainfall, etc., restricting growth of suitable food and cover plants).
F - Fertility (lack of nutrients in soil for optimum growth of cover plants).
G - Landform (poor distribution or interspersion of landforms necessary for optimum ungulate habitat).
I - Inundation (excessive water fluctuation that adversely affects the habitat or survival of ungulates).
M - Soil Moisture (poor soil moisture limitations affecting development and growth of vegetation or limiting the mobility of ungulates).
N - Adverse Soil Characteristics (excessive salinity or alkalinity, abundance of toxic elements in the soil).
Q - Snow Depth (prolonged periods of snow conditions reducing mobility of ungulates and/or availability of food plants).
R - Soil Depth (restriction of rooting zones by bedrock).
T - Adverse Topography (excessive steepness or flatness of the land.
U - Exposure or Aspect (special climatic factors such as exposure to prevailing winter winds or hot dry summer winds).

c) Species

A - Antelope
C - Caribou
D - Deer
E - Elk
G - Goat
M - Moose
S - Mountain Sheep



Key – see opposite page

Figure 65
UNGULATE CAPABILITY

Overlay (Scale 1=50,000) of proposed developments in back pocket

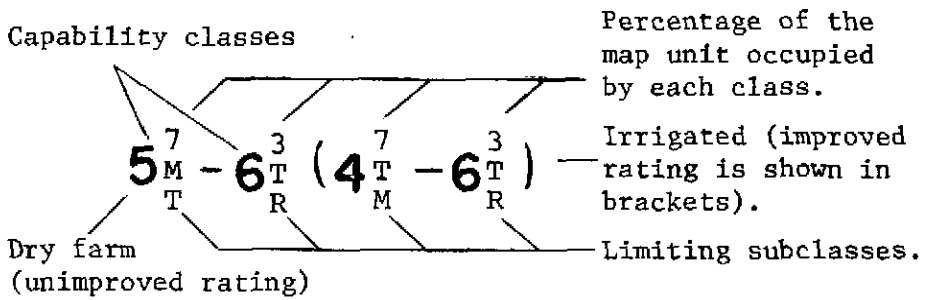
FIGURE 66

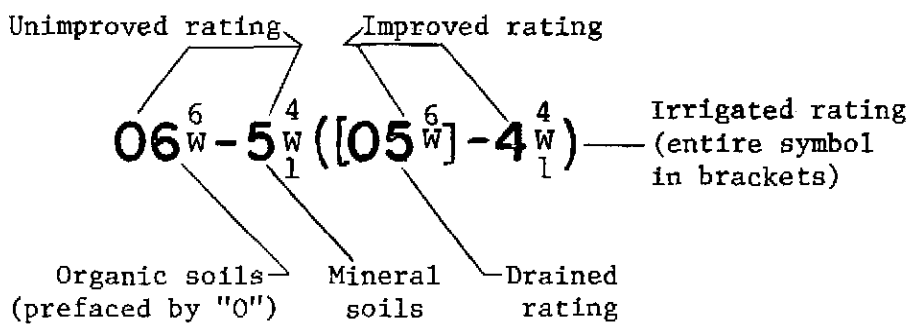
Lodgepole pine with bark stripped by black bear in late May, 1976 (22829.11).

KEY FOR INTERPRETATION OF AGRICULTURE CAPABILITY MANUSCRIPT MAPS (B.C.)

There are 7 capability classes for agriculture with 1 representing the highest class and 7 representing the lowest. In some areas of the province, two ratings are shown: one for dry farming and a second for irrigated or drained (improved) conditions. The irrigated ratings are shown enclosed in round brackets while the drained ratings appear in square brackets. In all cases improved ratings have precedence over dry farm ratings.

Example Classifications





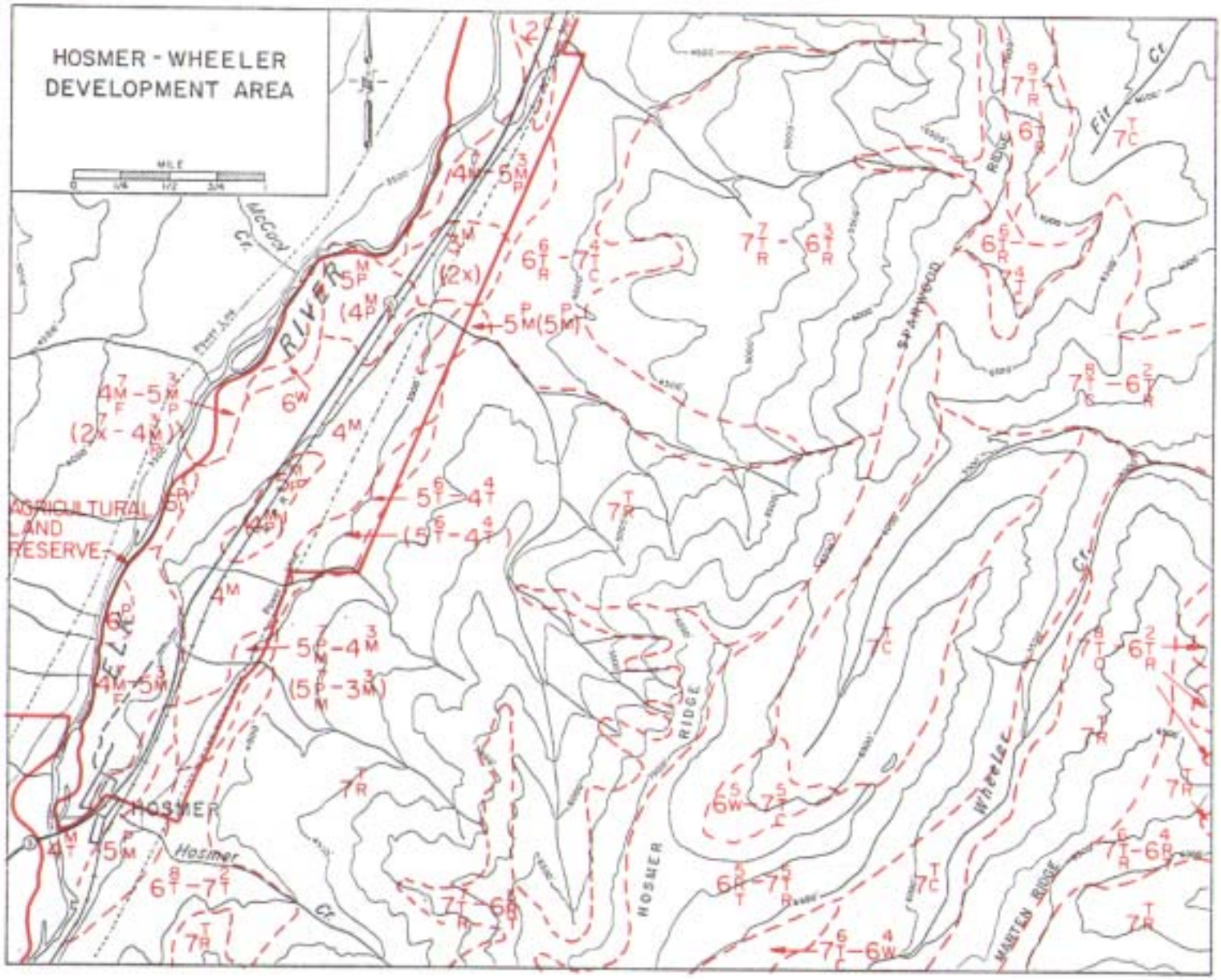
The agriculture capability classes are determined on the relative range of crops the land can produce.

a) Capability Classes

Class 1 - widest range of crops
Class 2
Class 3 } reduced range of crops caused by a number of limiting factors (subclasses)
Class 4
Class 5 - only permanent pasture or forage
Class 6 - natural grazing
Class 7 - no productivity

b) Limiting Subclasses

C - adverse climate
D - undesirable soil structure
E - erosion
F - low fertility
I - inundation (flooding)
M - moisture deficiency (droughtiness)
N - salts
P - stoniness
R - bedrock near the surface
T - topography (slope)
W - excess water
X - combination of soil factors



Key – see opposite page

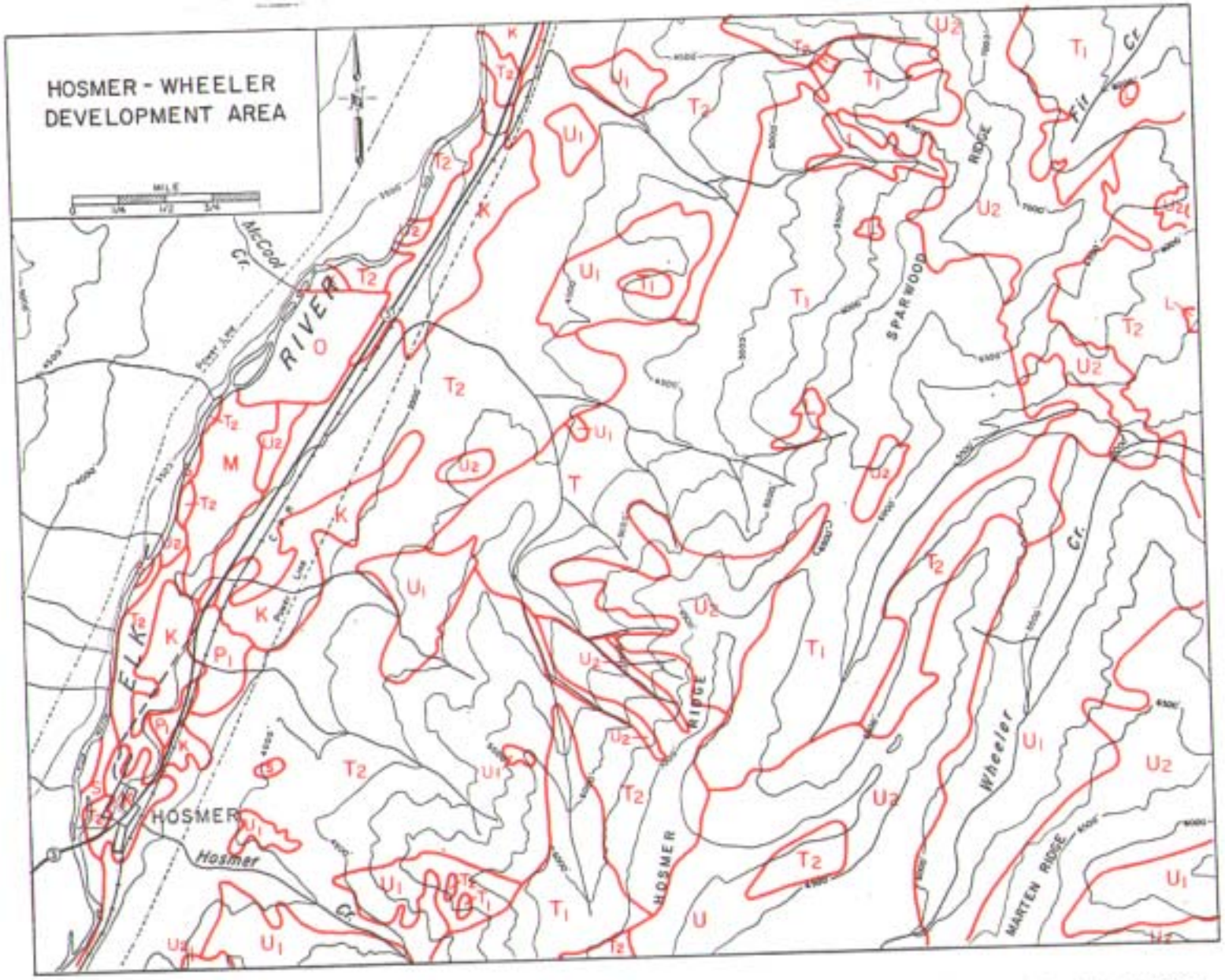
Figure 67
AGRICULTURAL CAPABILITY

Overlay (Scale 1=50,000) of proposed developments in back pocket

BRITISH COLUMBIA PRESENT LAND USE CLASSIFICATION

Mapping Symbol	
O	1. Outdoor Recreation. Land used for private or public outdoor recreational purposes. Summer cottages and associated beach areas, parks and golf courses are included.
A	2. Cropland. Land used primarily for cash crops, usually in rotation but including both cash and feed grains. Oilseeds, sugar beets, potatoes, field vegetables, associated fallow and land in the process of being cleared for cultivation are included.
P	3. Improved Pasture and Forage Crops. Land used primarily for the production of improved pasture, hay and other forage crops. Cultivation and planting have occurred in a recent year.
	2,3. Cropland-Pasture Complex. Where large blocks of Categories 2 and 3 cannot be distinguished, the following complexes are shown on the land-use maps:
A	95.0 - 100% Cropland
A_1	75.0 - 94.9% Cropland
A_2	50.0 - 74.9% Cropland
P_2	50.1 - 74.9% Improved Pasture & Forage Crops
P_1	75.0 - 94.9% Improved Pasture & Forage Crops
P	95.0 - 100% Improved Pasture & Forage Crops
	The subscript is determined by use of a "Cropland/ Improved Pasture and Hay" ratio derived from the 1961 or 1966 Census of Agriculture and applied on a census subdivision basis. Census subdivisions are subdivided into two or more parts with different symbols only where it is known from other sources or from the photos that significant differences do exist within the subdivision.
	4. Unimproved Pasture and Range Land
K	a. Open Grassland. Based on cover rather than use as not necessarily used for grazing (eg., remote meadows). Open grassland includes grasses, sedges, herbaceous plants and scattered shrubs to four ft in height. Abandoned farms and intermittently wet hay land (sloughs) are included.

Mapping Symbol	
	5. Woodland. Land covered with tree or scrub growth.
T_1	a. Mature Productive Woodland. Land bearing a productive forest type with at least one tree per acre greater than 11.1" d.b.h.
T_2	b. Immature Productive Woodland. Productive forest land with immature cover.
U_1	c. Non-productive Woodland on a Productive Site. Forest land which has been logged, burnt or diseased and has either not been satisfactorily restocked or has been restocked by a non-commercial type.
U_2	d. Non-productive Woodland on a Non-productive Site. Land bearing a non-productive type on a non-productive site.
M	6. Swamp, Marsh and Bog. Open wetlands except for those with evidence or knowledge or haying or grazing in the drier years.
	7. Unproductive Land. Land that is biologically unproductive in its present state.
S	a. Sandflats, Dunes and Beaches. Depositional features with exposed sand surfaces predominating.
L	b. Rock and Other Unvegetated Surfaces. Badlands, eroded river banks, rock barrens, etc.



Key – see opposite page

Figure 68
PRESENT LAND USE

Overlay (Scale 1=50,000) of proposed developments in back pocket

KEY FOR INTERPRETATION OF FORESTRY CAPABILITY MANUSCRIPT MAPS (B.C.)

There are seven capability classes based on their inherent ability to grow commercial timber. The classes are based or a productivity range representing total tree volumes (no merchantability factors have been included).

Example Classification

	Percentage of map unit occupied by each class
Capability class	Limiting subclasses
	Indicator tree species

a) Capability Classes

Class 1 - 111-130 cubic feet per acre per year growth,
- as required can be further subdivided as class 1a (131-150), class 1b (151-170), class 1c (171-190), etc., increasing by 20 cubic feet for classes thereafter.

Class 2 - 91-110 cubic feet per acre per year
Class 3 - 71-90 cubic feet per acre per year
Class 4 - 51-70 cubic feet per acre per year
Class 5 - 31-50 cubic feet per acre per year
Class 6 - 11-30 cubic feet per acre per year
Class 7 - 0-10 cubic feet per acre per year

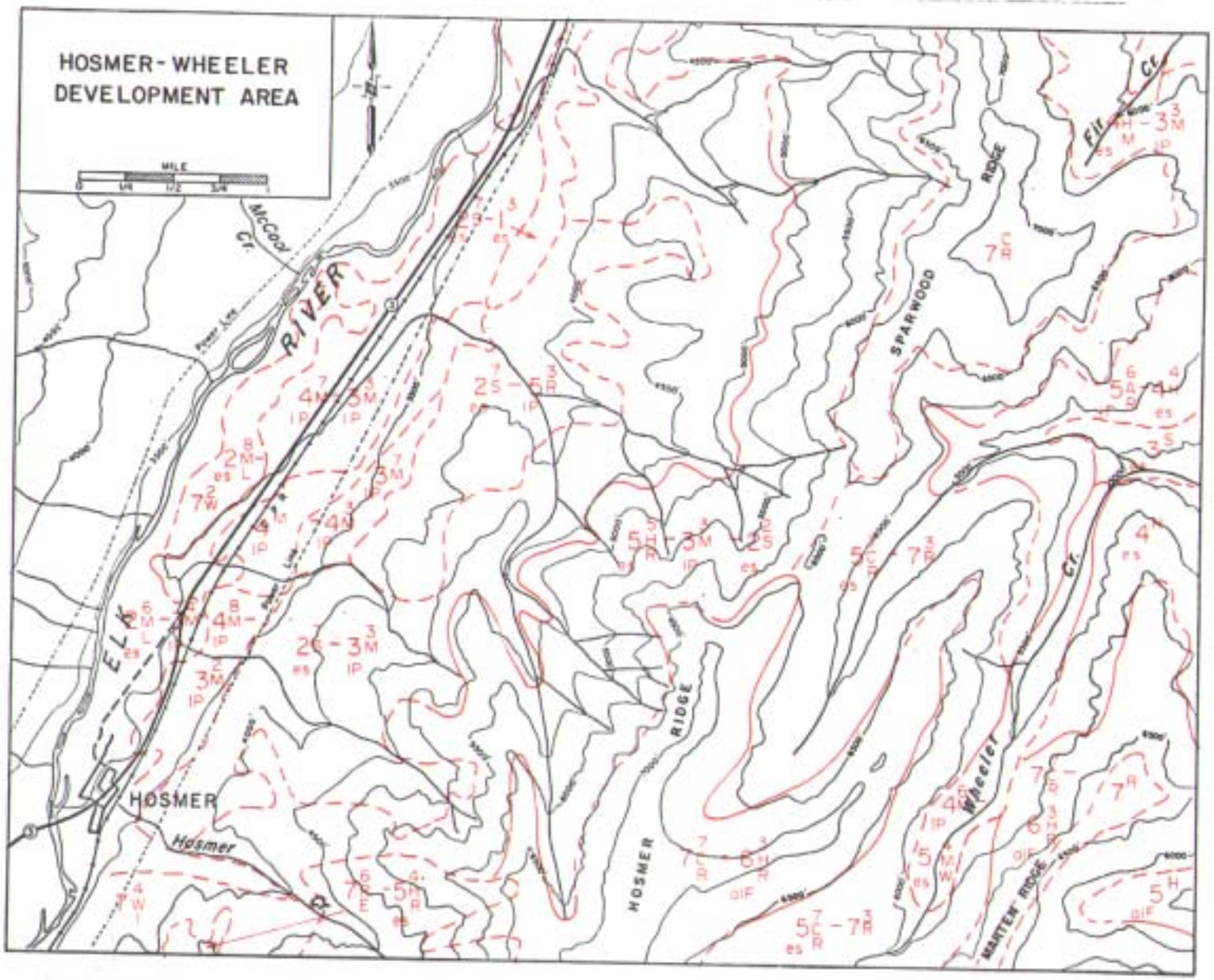
b) Limiting Subclasses

A - drought or aridity
C - adverse climate - usually high alpine areas
D - rooting depth restricted by a dense or compacted soil layer
E - actively eroding soils
F - low fertility
H - low air and soil temperatures, short growing season
I - inundation (flooding)
L - excessive lime levels
M - soil moisture deficiency
N - excessive levels of toxic elements
P - stoniness
R - rooting depth restricted by bedrock
S - combination of soil factors
U - exposure
W - soil moisture excess

c) Species

rAl - red alder
Ar - arbutus
wB - white birch
D - Douglas fir
aF - amabilis fir
alF - alpine fir
gF - grand fir
mH - mountain hemlock
wH - western hemlock
aL - alpine larch
tL - tamarack
wL - western larch
bM - broadleaf maple
gO - Garry oak

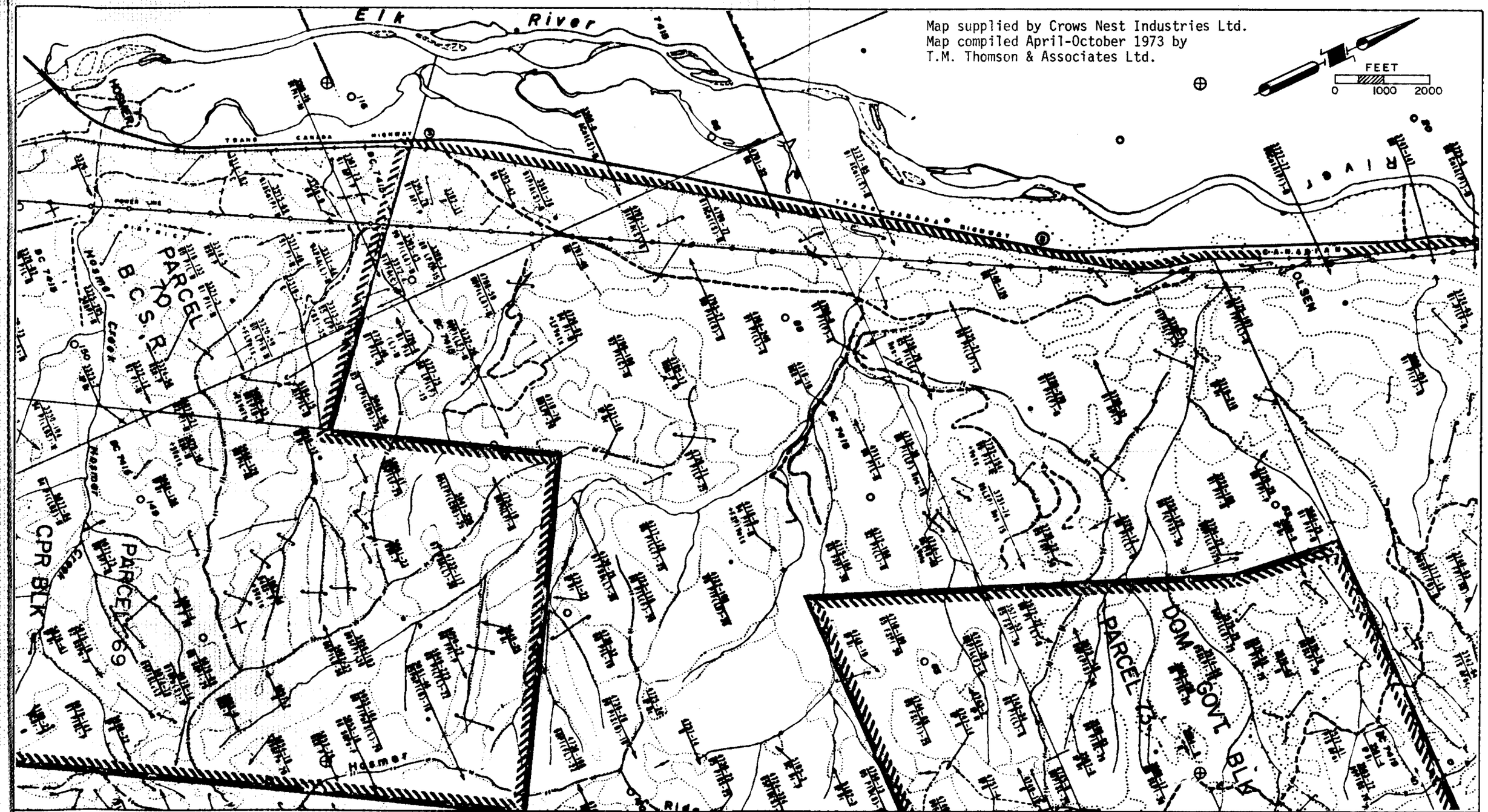
lP - lodgepole pine
liP - limber pine
pP - ponderosa pine
sP - shore pine
wP - western white pine
whP - whitebark pine
tA - trembling aspen
bCo - black cottonwood
bPo - balsam poplar
bS - black spruce
eS - Engelmann spruce
sS - Sitka spruce
wS - white spruce



Key — see opposite page

Figure 69
FOREST CAPABILITY

Overlay (Scale 1=50,000) of proposed developments in back pocket



Symbols

Main haul road
Main branch road
Minor branch road
Cat road
Pipeline
Powerline
Railway
Bridge
Dam
Height of land
Timber types lines

Symbols

Swamp
Mining
Sand banks
Photo centers 62
Alpine
Rock R
Cleared land

Boundaries

Surveyed Tree Farm Bdy.
Unsurveyed Tree Farm Bdy.

Surveyed Lot Bdy.
Unsurveyed Lot Bdy.

Mature — Stand No. Acres
Date of establishment - Species - Vol/Acre

Immature — Stand No. Acres
Date of establishment - Species - Site

Date of Establishment - 1910 (example)

Range Land	OR
Not Satisfactorily Restocked	N.S.R.
Non-productive Decid. Brush	NP BR

Tree Species	Symbol
Douglas Fir	F
Western Red Cedar	C
Western Hemlock	H
Engelmann Spruce	S
White Spruce	S
Balsam (fir)	B
Lodgepole Pine	Pl
Western Larch	L
Black Cottonwood	Cot
Trembling Aspen	A

Figure 70
FOREST INVENTORY MAP

Overlay (Scale 1:24,000) of proposed developments in back pocket

B. C. RESEARCH
Vancouver B.C.

FIGURE 71

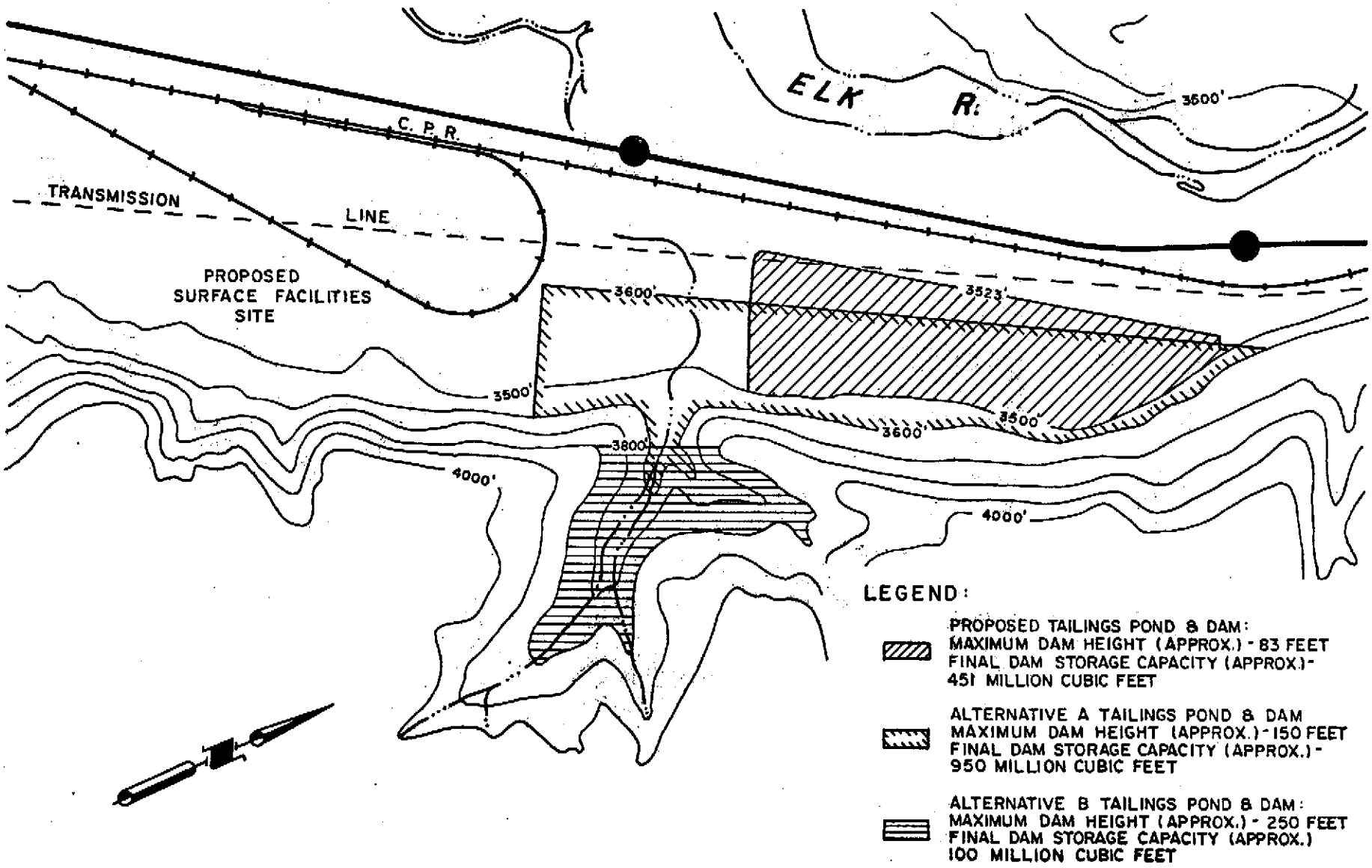
UPPER - View of Hosmer Ridge looking east-south-east across Highway 3 at the turn-off to the Elk Valley Provincial Park picnic ground. The "T" shows the estimated height of the top of the tailings pond dam (23060.1).

LOWER - View of Elk Valley Provincial Park picnic ground at the turn-off from Highway 3. Mt. Hosmer is in the background across the Elk River (23060.2).

FIGURE 72

Water intake on the Elk River will be located on the forested bank to the left (22990.17).

Figure 73
ALTERNATIVE TAILINGS POND LOCATIONS



LEGEND

C.L.I. RECREATION CAPABILITY

Capability Class 2 — 2S — Shoreland unit (fronts on lake, ocean or large river)

K, B, A — Feature symbols indicate opportunity for organized camping (K), bathing beach (B), and sport fishing (A)

Capability Class 4 — 4U — Upland Unit

E, M, O — Feature symbols indicate attractive or unique vegetation (E), frequent small water bodies (M) and upland wildlife (O)

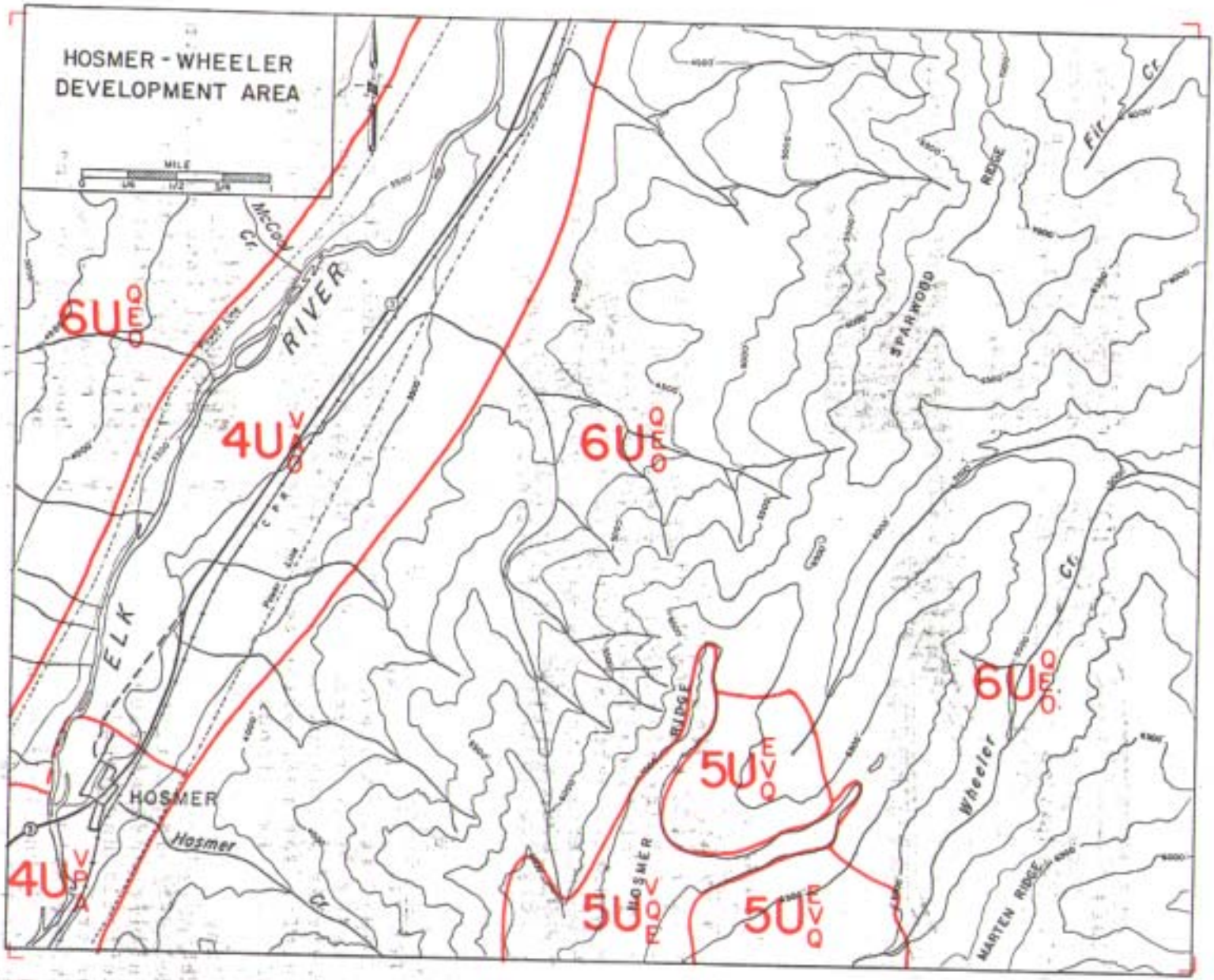
a) Capability Classes

Class 1 - very high capability for outdoor recreation
Class 2 - high capability for outdoor recreation
Class 3 - moderately high capability for outdoor recreation
Class 4 - moderate capability for outdoor recreation
Class 5 - moderately low capability for outdoor recreation
Class 6 - low capability for outdoor recreation
Class 7 - very low capability for outdoor recreation

b) Capability sub-classes or features

Up to three features are used for each unit of land. The first feature is the most important while the second and third features are relatively less important. The recreation features indicate opportunities for recreation and are used as positive aspects of the land, not limitations.

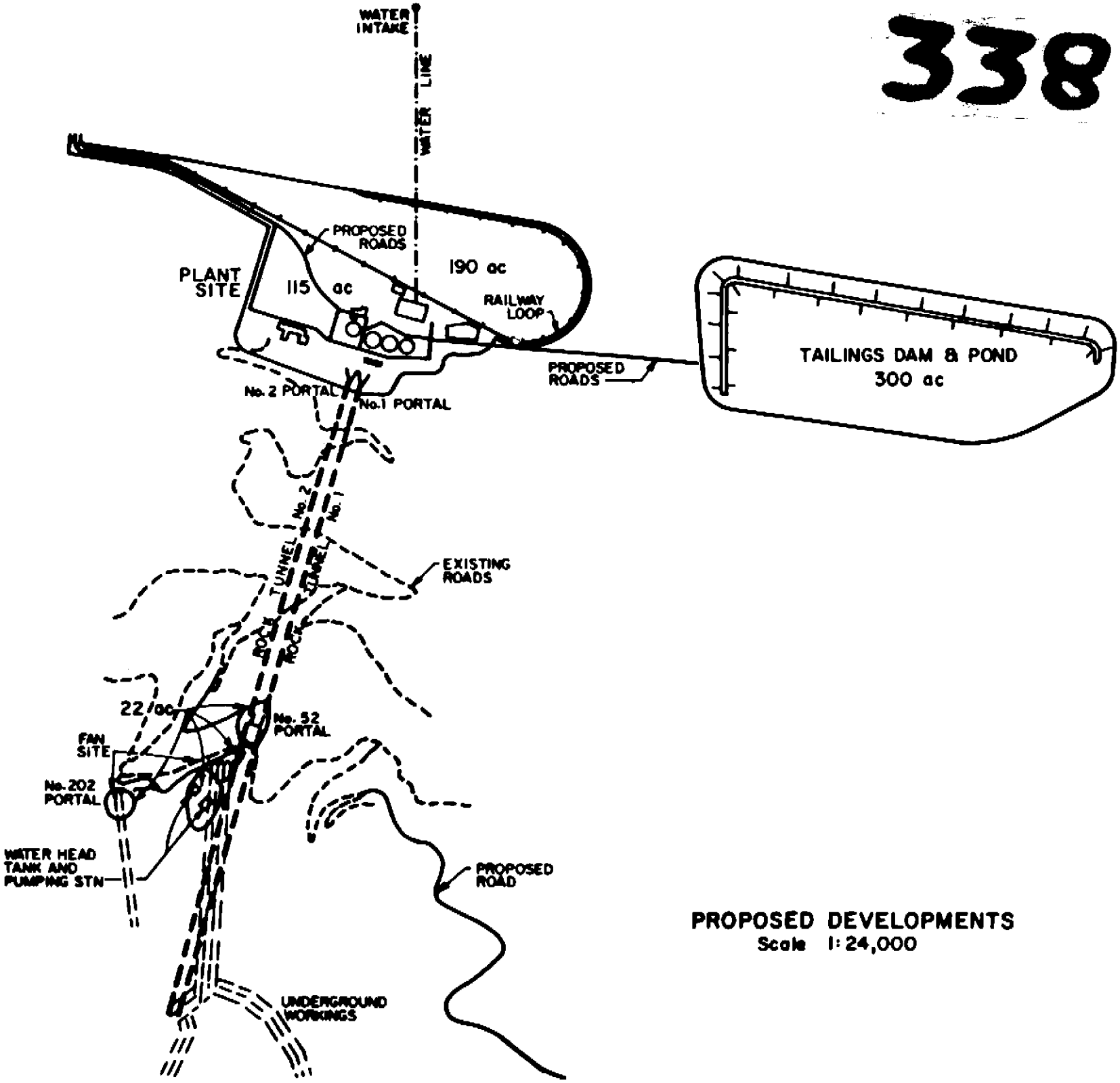
A - Angling
B - Beach
C - Canoe Tripping
E - Significant Vegetation
F - Waterfalls and Rapids
G - Glacier
H - Historic Site
J - Gathering and Collecting
K - Organized Camping
L - Landforms
M - Significant Small Surface Waters
N - Lodging and Cottaging
O - Upland Wildlife
P - Cultural Landscape Pattern
Q - Topographic Patterns
R - Rock Formations
S - Skiing
T - Thermal Springs
U - Deep-water Boating Area and Harbour
V - Viewing
W - Wetland Wildlife
Y - Family Boating
Z - Man-made Features



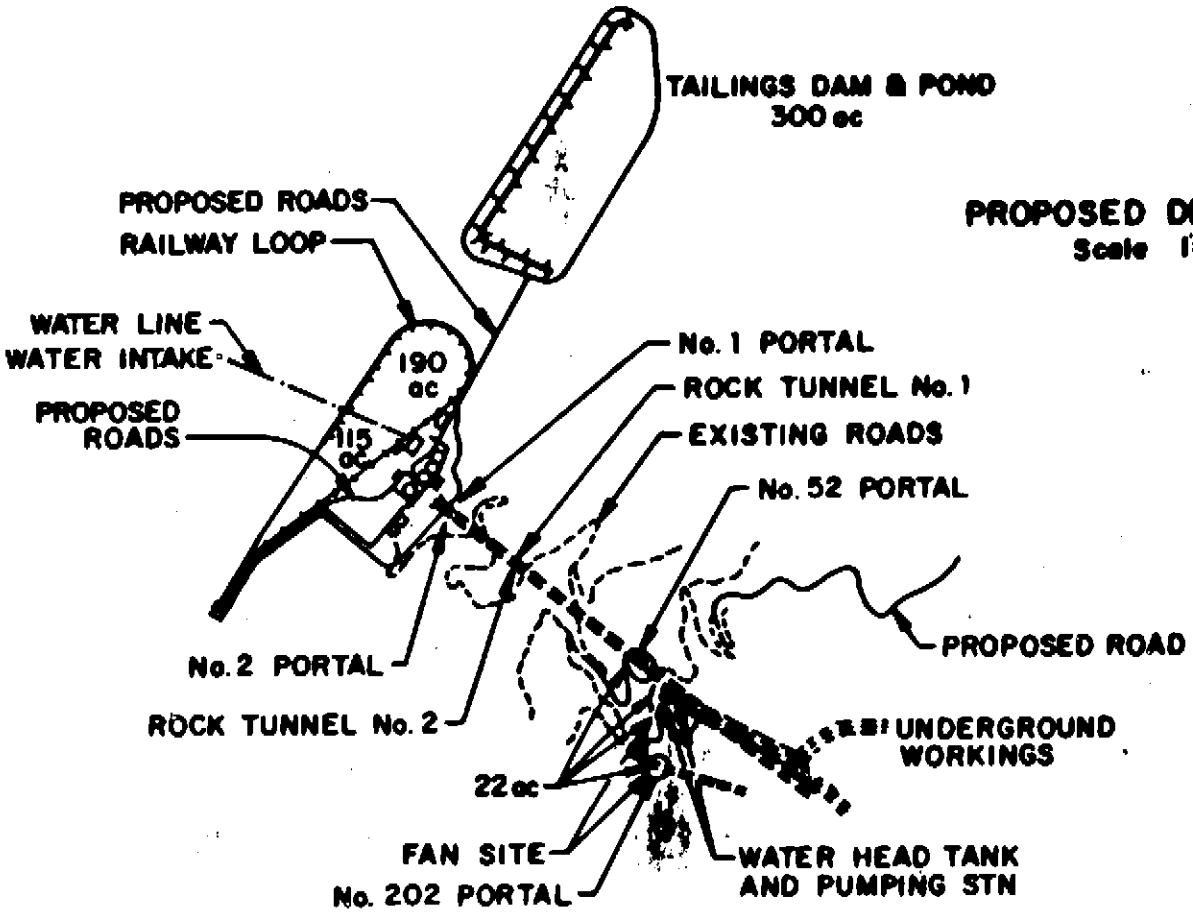
Key—see opposite page

Figure 74
RECREATION

Overlay (Scale 1=50,000) of proposed developments in back pocket



PROPOSED DEVELOPMENTS
Scale 1:24,000



PROPOSED DEVELOPMENTS
Scale 1: 50,000

230-3

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VOLUME III

HOSMER-WHEELER COAL PROJECT

STAGE II ENVIRONMENTAL ASSESSMENT

APPENDICES

B.C. RESEARCH

GEOLOGICAL
ASSESSMENT REPORT

00 338

K-Hosmer-Wheeler (Parcel 69) 76(9)A

B.C. Research

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HOSMER-WHEELER COAL PROJECT

STAGE II ENVIRONMENTAL ASSESSMENT

October 1976

Prepared for:

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GEOLOGICAL BRANCH
ASSESSMENT REPORT

VOLUME III - APPENDICES

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R.M.HARDY & ASSOCIATES LTD.

HYDROGEOLOGICAL INVESTIGATIONS:
HOSMER-WHEELER PROJECT,
BRITISH COLUMBIA

Prepared for

KAISER RESOURCES CANADA LIMITED

VANCOUVER BRITISH COLUMBIA

By

R. M. HARDY & ASSOCIATES LTD.

CALGARY ALBERTA

CS3567 September 20, 1976

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1.0 BACKGROUND

Kaiser Coal Company of Canada Limited and Kaiser Resources Canada Limited have proposed the development of a coal mine in the Hosmer-Wheeler area in southeastern British Columbia. The mine area is situated in the Elk River Valley, northeast of the small settlement of Hosmer, and is accessible from Highway #3.

The coal is to be hydraulically mined and processed on site. The resultant mining and processing wastes are to be disposed of in a tailings pond to be located northeast of the plant site. R. M. Hardy & Associates Ltd. were retained to undertake the prerequisite geotechnical studies for the design of the proposed tailings dam. As part of the geotechnical investigations, the requirement for a detailed assessment of the hydrogeological conditions in the area of the tailings pond became apparent. These requirements relate largely to the complexity of the subsurface stratigraphy in the area of the proposed tailings dam and to the environmental concerns which have been expressed relative to the possibility of leakage from the tailings pond.

2.0 TERMS OF REFERENCE

The terms of reference for this study provide for the collection of sufficient information on existing groundwater conditions and the hydraulic properties of the strata at depth in the Hosmer-Wheeler mine area in order to assess the implications of the proposed tailings dam on the local groundwater regime and associated environmental implications. The study has provided for a limited drilling and testing program and for the analysis of available information on subsurface and groundwater conditions in the area of the proposed tailings pond and dam. While the scope of the study was not expressly limited to the area of the tailings pond, the principal environmental implications of the proposed mine and ancillary facilities are related to this area. Based on our understanding of the groundwater conditions the mine and the processing plant are regarded as having little overall impact on the groundwater regime in the Elk River Valley.

3.0 GEOLOGICAL SETTING

The proposed tailings dam and associated pond are located on an alluvial terrace within the Elk River Valley.

The elevation of the terrace is on the order of 20 feet above the present level of the Elk River. The surficial materials in the area of the proposed tailings pond consist primarily of coarse alluvial gravels with interbedded colluvium and alluvial fan material.

The results of the geotechnical investigations have shown the alluvial or river gravels beneath the southern half of the proposed tailings pond to be underlain by clay, probably of glacial-lacustrine origin. The clay layer which varies from a few feet up to about 50 feet in thickness is in turn underlain by water-bearing sands and gravels of high permeability and preglacial gravels. The preglacial gravels are highly consolidated and of moderate permeability.

The clay layer pinches out at approximately the middle of the tailings pond area and is absent beneath the northern half. In this area the alluvial gravels directly overlie the dense preglacial gravels and the highly permeable sands and gravels. Bedrock beneath most of the tailings dam is at a depth in excess of 70 feet. The depth to bedrock decreases to a few feet along the eastern or uphill edge of the tailings pond. Only one test hole (i.e., No. B-6) in the tailing pond area was of sufficient depth to penetrate

to bedrock. The bedrock in this hole was encountered at a depth of 43.5 feet below ground surface.

The bedrock in the proposed mine area consists mainly of sandstones, siltstones, and shales with interbedded coal. Where it was encountered in test hole B-6, the bedrock consisted of a very hard, massive, grey, siltstone. From a hydrogeological point-of-view, the permeability of the bedrock strata is, in general, several orders of magnitude less than that of the unconsolidated valley-fill materials.

4.0 HYDROGEOLOGY

To obtain specific information on the groundwater regime in the area of the proposed tailings dam and aquifer properties, a limited drilling and testing program was undertaken. This program included the drilling of a number of test holes to supplement those drilled as part of the geotechnical program and the installation of six piezometers. In addition, in situ permeability tests were carried out in the river gravels, in the water-bearing sands and gravels directly underlying the clay and in the preglacial gravels.

The test holes drilled as part of both the geotechnical and hydrogeological field programs are summarized in Table 1. Observations on groundwater levels in these test holes are also given in Table 1 where available. The test hole logs are included as Appendix A to this report. The construction details of those test holes instrumented as piezometers are summarized in Table 2. The test hole locations are shown on the map included in the pocket at the end of this report.

A geological cross-section A-A' parallel to the tailings dam is shown in Figure 1. The location of the cross-section is indicated on the enclosed map. Where the drill holes did not fall directly on the section, they have been projected onto the vertical plane defined by A-A' for the purpose of arriving at a composite cross-section of the subsurface stratigraphy.

From Figure 1, the subsurface stratigraphy can be seen to be complex and highly variable. Marked changes in the stratigraphy occur over short distances. As was previously noted, the southern portion of the tailings dam is underlain by clay whereas the clay is absent in the northern half of the area. In the southern part of the pond area,

TABLE 1 SUMMARY OF TEST HOLES AND PIEZOMETRIC OBSERVATIONS

No.	Approx. Surface Elev. (ft)	Total Depth (ft)	Elev. of Bottom of Hole (ft)	Piezometric Elev. (ft)		
				1/9/76	3/9/76	8/9/76
B-1	3460	41.0	3419	----	Caved	----
B-2	3441	75.0	3366	3431	3431	3431
B-3	3447	77.0	3370	3436	3436	3436
B-4	3450	59.0	3391	3438	3438	3437
B-5	3457	30.0	3427	-	-	3431
B-6	3470	45.5	3425	-	-	-
P-6	3455	34	3421	Dry	Dry	Dry
P-7A*	3455	24	3431	3437	3437	3436
P-7B	3455	15	3416	Dry	Dry	Dry
P-9*	3448	74.5	3372	3432	3432	3432
P-10*	3446	74.7	3371	3434	3434	3434
P-11*	3444	14	3430	Dry	Dry	Dry
P-12	3442	70	3372	-	-	-
P-12A*	3442	20.5	3422	Dry	Dry	Dry

* Instrumented as peizometers.

TABLE 2 SUMMARY OF PIEZOMETER INSTALLATIONS AND CONSTRUCTION DETAILS

No.	Depth of Screen (ft)	Screen Interval (ft)	Grout* (Bentonite) (ft)
P-7A	24	20-24	15-19
P-7B	15	10-15	6-10
P-9	65	61-65	58-59[1]
P-10	39	35-39	28-32
P-11	13	8-13	4-8
P-12A	15	10-15	5-10

[1] Plugged @ 10 feet

* All piezometers sealed/grouted at surface.

the clay layer varies in thickness from a few feet to more than 50 feet. The clay which as noted previously is probably of glacial-lacustrine origin, was deposited over an irregular erosional surface. The surface of this erosion surface is mantled by a thin layer of highly permeable sands and gravels.

From a hydrogeological point-of-view the clay layer, being of relatively low permeability, behaves as a confining layer.

The saturated sands and gravels underlying the clay layer exist under artesian pressure. As indicated on Figure 1 the peizometeic levels as measured in this zone were close to the top of the clay layer and similar to the water levels in the Elk River in the vicinity of the proposed tailings dam. The permeability of the sands and gravels directly underlying the clay is 2 to 3 orders of magnitude greater than that of the underlying preglacial, highly-consolidated gravels and of the same order as that of the river gravels overlying the clay. The in situ permeabilities for the main stratigraphic units within the valley fill materials are summarized in Table 3. The permeabilities were determined during the drilling program by slug

TABLE 3 SUMMARY OF PERMEABILITY DATA

Strata	Permeability cm/sec
River Gravel	0.01 to 0.18
River Gravel/Clay Contact	>1.00*
Clay Layer	$< 1. \times 10^{-4}$*
Sand/Gravel Layer at Base of Clay	0.2 to 1.0
Silt/Base of Clay	4.2×10^{-3}
Pre-Glacial Gravels	1.2×10^{-3}

* Estimated

injection tests (Hvorslev, 1951). As indicated in Table 3, the clay is directly overlain by a thin gravel layer of very high permeability. This high permeability layer undoubtedly behaves much like a subsurface drain.

With regard to the existing groundwater flow regime within the valley fill materials, the direction of flow is controlled mainly by the slope of the valley floor and is principally down valley and to the Elk River. Groundwater recharge occurs both as a result of rainfall and snowmelt directly within the alluvial plain and due to downslope seepage from both sides of the valley. Both surface and subsurface runoff from the hillsides, for example, infiltrate into the alluvial gravels and act to recharge the local groundwater flow within the Elk River Valley. Although information on groundwater levels is limited to the immediate area of the proposed tailings pond, it is suggested that groundwater levels in the Elk River Valley are, because of the high permeability of the valley-fill materials, at or close to that in the river throughout much of the year.

In the area of the tailings dam, the groundwater flow regime within the valley-fill deposits would be modi-

fied by the presence of the clay layer. The results of the drilling programs and piezometer installations confirm that the primary source of recharge to the artesian aquifer directly underlying the clay is through the alluvial gravels. The high permeability zone underlying the clay subcrops beneath the northern half of the tailings ponds and therefore, would be recharged directly by seepage from the tailings pond. Under existing conditions the artesian aquifer is recharged from infiltration of rainfall and snowmelt as well as from the groundwater flow within the valley-fill materials.

5.0 DISCUSSION AND CONCLUSIONS

The proposed tailings dam and associated tailings pond are situated on alluvial gravel of high permeability. *In situ* tests indicate that the permeability of these gravels is in the range of 1×10^{-2} to 1×10^{-1} cm/sec. Beneath the southern half of the tailings pond, the alluvial gravels are underlain by clay. The clays, in turn, are underlain by sands and gravels which exist under artesian pressures and by very dense, preglacial gravels. Beneath the northern half of the proposed tailings pond, the clay strata was not

encountered in any of the test holes, but the artesian sand and gravel aquifer which occurred under the clay was found to subcrop beneath the alluvial gravels and to be recharged directly through the alluvial gravels.

With regard specifically to the hydrogeological implications, if direct seepage control measures are not provided, the initial seepage losses from the tailings pond through both the surficial alluvial gravels and through the artesian aquifer zone beneath the clay will be very high. Furthermore, the time between when seepage loss occurs and when the seepage reaches the Elk River will be on the order of several days rather than weeks or months. It can be anticipated, however, that the rate of seepage looses from the tailings pond will decrease with time due to the reduction in permeability of the gravels due to infilling of the pores and sealing of the bottom of the tailings pond. The length of time required to seal the bottom of the tailings pond by placement of tailings alone depends on a number of factors and cannot be estimated from the information available to us at this time.

From the point-of-view of the design and construction of the tailings dam, the fact that the site is underlain by high permeability materials is advantageous. It is a decided disadvantage, however, from the point-of-view of limiting or preventing seepage loss from the tailings pond. If, for environmental or other reasons, it is not permissible to allow seepage from the tailing pond to the Elk River, then it becomes necessary to either seal the bottom of the pond and interior wall of the tailings dam or to collect and recycle the seepage. To collect and recycle the seepage losses would, because of the subsurface conditions existing at the site, be difficult and undoubtedly very expensive. It would not only be necessary to intercept seepage through the alluvial gravels, but it would also be necessary to intercept any seepage which occurred beneath the clay. As has been noted, the high permeability zone underlying the clay would be recharged through the alluvial gravels beneath the northern half of the tailings pond.

A number of potential problems are implicit in any attempt to intercept and collect seepage in the sands and gravels underlying the clay by means of wells or well points. For example, if the piezometric levels within the sands and gravels are reduced below the water level in Elk River, flow

from the River into the aquifer could be induced. This is a potential problem which must be evaluated if it becomes necessary to intercept seepage losses from the tailings pond.

To summarize, the primary concern relative to the proposed tailings dam is whether seepage from the tailing pond to the Elk River is acceptable from an environmental point-of-view. There is no evidence on the basis of our investigation to indicate that the proposed tailings dam will adversely affect groundwater conditions except for the question of possible contamination of the Elk River and the groundwaters in the immediate vicinity of the tailings pond.

Respectfully submitted,

R. M. HARDY & ASSOCIATES LTD.,

Per:

R. L. Harlan, Ph.D., P.Geol.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ALBERTA
PERMIT NUMBER
P 2 2 6
R. M. HARDY & ASSOCIATES LTD.

REFERENCES

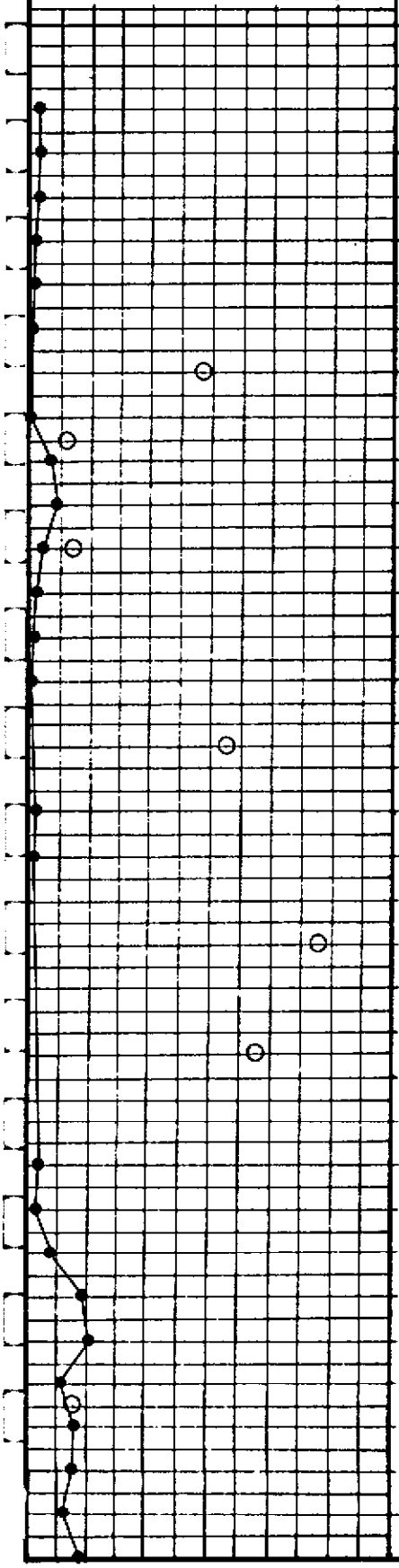
Hvorslev, M. J., 1951. Time lag and soil parameters in ground-water observations. U.S. Army-Corps of Engineers, Waterways Expt. Sta., Vicksburg, Mississippi, Bulletin 36, 50 pp.

R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 18, 1976 | FOR NO: CS 3553 | HOLE: B-1



DEPTH	SOIL PROFILE — SOIL DESCRIPTION (DATUM: SURFACE ELEVATION 3463.9')	SOIL SAMPLES — CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	TOPSOIL black, peaty, some sand and silt				
2, 4	SAND silty, some gravel sizes to 1"Ø, medium dense, damp, black to brown				
6, 8	SILT sandy, fine grained, some gravel pockets, loose to medium dense, dark brown, very moist		U_1		γ_w = 93.4 pcf; γ_d = 77.3 pcf
10, 12, 14	GRAVEL trace sand, medium dense, dark brown, moist; -- silty; -- wet		D_1	N=23	
			D_2	N=22	
16, 18	SILT clayey, some gravel pockets, slight plastic, soft to firm, wet, dark grey; -- gravelly; -- clayey, low plastic; ---- silty clay, dark brown to black		U_2		q_u = 802 psf; γ_w = 113.3 pcf; γ_d = 85.2 pcf
20, 22, 24	CLAY silty, low plastic, soft to firm, dark brown, wet, occasional gravel sizes; ---- soft		U_3		q_u = 1239 psf (upper); q_u = 1175 psf (lower); γ_w = 106.0 pcf; γ_d = 74.1 pcf
			D_3	N=2	
26, 28, 30, 32, 34	GRAVEL silty, some cobbles to 3"Ø, dense, light brown, dry; ---- free water, brown; GWL		D_4	N=42	

PLATE A-1

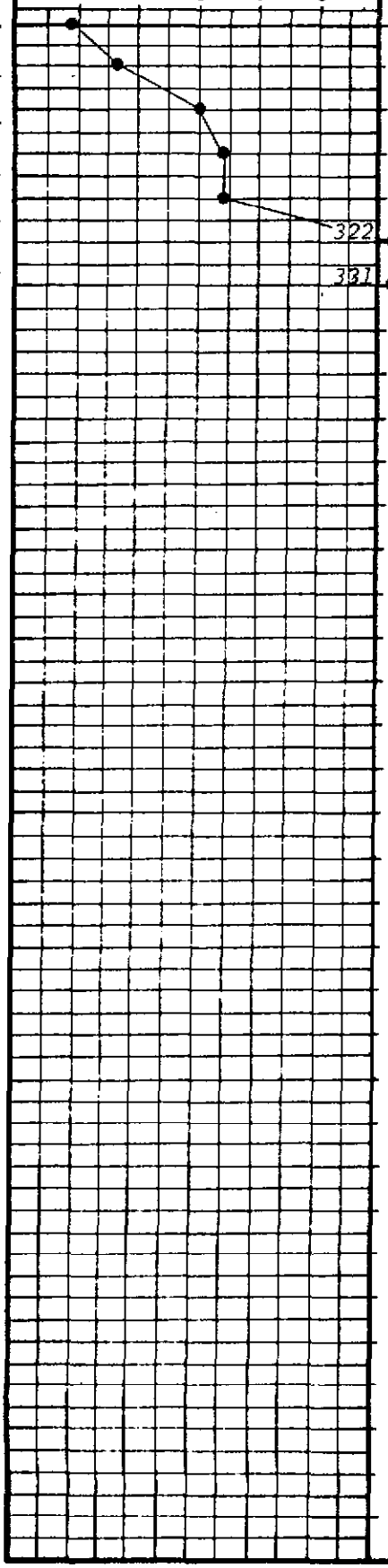
R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 18, 1976 | JOB NO: CS 3553 | HOLE: B-1 (con't)

WATER CONTENT
● PENETRATION RESISTENCE - blows/foot
50 100 150 200 250
⊙ WATER CONTENT - %
10 20 30 40 50



DEPTH	SOIL SYMBOL	SOIL PROFILE — SOIL DESCRIPTION (DATUM; SURFACE ELEVATION 3463.9')	CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
36		GRAVEL silty, some cobbles to 3"ø, dense, light brown, dry (con't)				
		dry, very dense (pre-glacial)				
38		boulder				
		sandy				
42		Bottom of Hole at 41.0'. Hole dry at completion. Standpipe installed. W.L. in Standpipe at 31'9" on Sept. 8, 1976.				

PLATE A-1(con't)

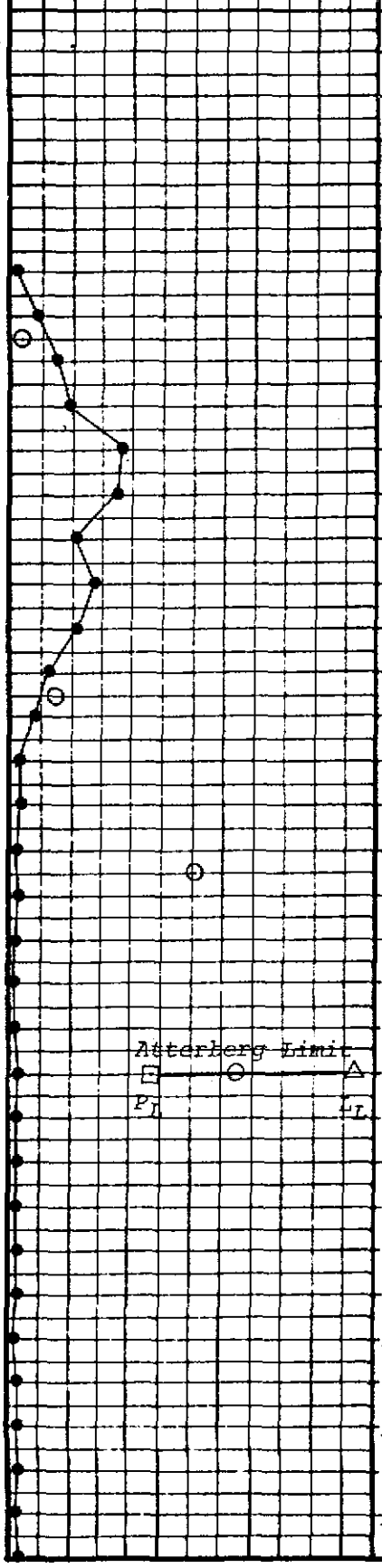
R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 18, 1976 | JOB NO: CS 3553 | HOLE: B-2

WATER CONTENT
● PENETRATION RESISTENCE - blows/foot: 50, 100, 150, 200, 250
○ WATER CONTENT - %: 10, 20, 30, 40, 50



DEPTH	SOIL PROFILE (SOIL DESCRIPTION)	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	DATUM / SURFACE ELEVATION 3441.0'				
	TOPSOIL silt, trace clay, slight plastic, rooty, organic, black				
2	SAND silty, loose to medium dense, moist, dark brown				
4					
6	GRAVEL sandy, dense, some cobbles, brown, moist				
		X	D_1	N=34	
8	cobbley, very dense, light brown, dry				
10					
		X	D_2	N=39	
12	free water				
14					
		X	D_3	N=27	
16	medium dense, free water, trace clay				
18	CLAY silty, low to medium plastic, occasional gravel sizes, soft, dark grey				(upper) q_u = 758 psf; q_u = 666 psf; (lower) γ_w = 120.1 pcf; γ_d = 88.2 pcf
			U_1		
20	medium plastic clay				
22	high plastic clay				
	grey, firm,				
24			U_2		q_u = 1218 psf; pp = 1000 psf; γ_w = 126.6 pcf; γ_d = 91.9 pcf
26					
28					
30					γ_w = 122.7 pcf; γ_d = 91.9 pcf; q_u = 1558 psf; pp = 1500 psf; Consolidation Test on Plate A-21
			U_3		
32	fine to medium sand lens				
34					

PLATE A-2

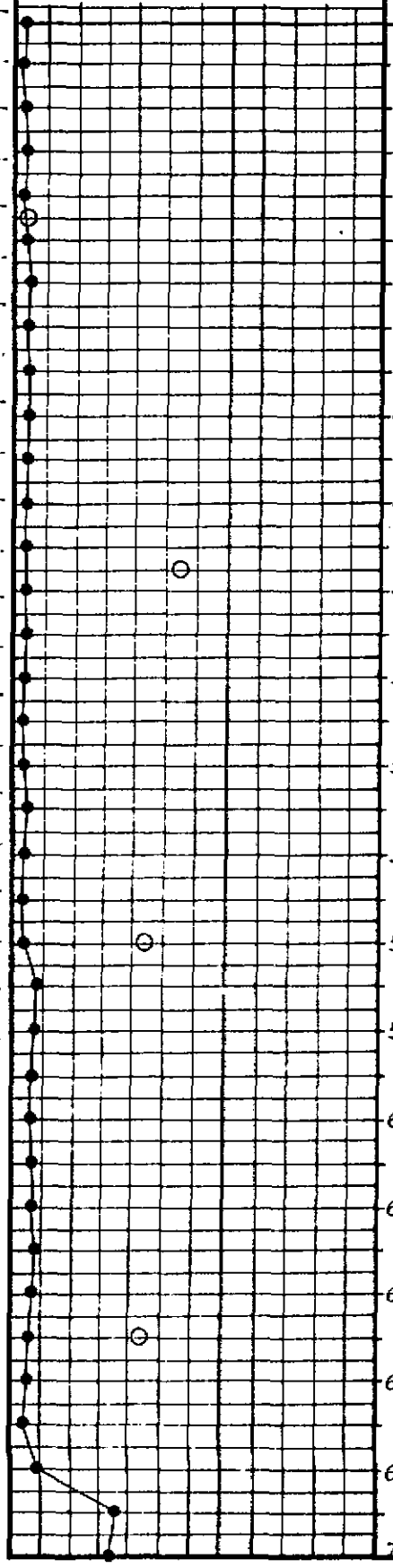
R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 18, 1976 | JOB NO: CS 3553 | HOLE: B-2(con't)

WATER CONTENT
● PENETRATION RESISTENCE - blows/foot: 50, 100, 150, 200, 250
⊙ WATER CONTENT - %: 10, 20, 30, 40, 50



DEPTH	SOIL PROFILE (SOIL DESCRIPTION)	SOIL SAMPLES: CONDITION / TYPE	PENETRATION RESISTANCE	OTHER TESTS
	DATUM; SURFACE ELEVATION 3441.0'			
36	CLAY silty, low to medium plastic, occasional gravel sizes, firm, dark grey (con't)			
38	----soft to firm clay			q_u = 450 psf (upper)
40		U_4		q_u = 442 psf (lower); γ_w = 121.6 pcf; γ_d = 95.0 pcf; pp = 600 psf
42				
44				
46	----firm, very silty			
48		U_5		pp = 1500 psf; Consolidation Test on Plate A-22
50				
52				
54				
56	---- silty, saturated	U_6		
	SILT sandy, trace clay			
58	----free water			
60				
62				
64		U_7		
66	SAND fine grained, silty, medium dense, water-bearing, dark grey			
68	GRAVEL very dense, water-bearing, brown			
70				

PLATE A-2(con't)

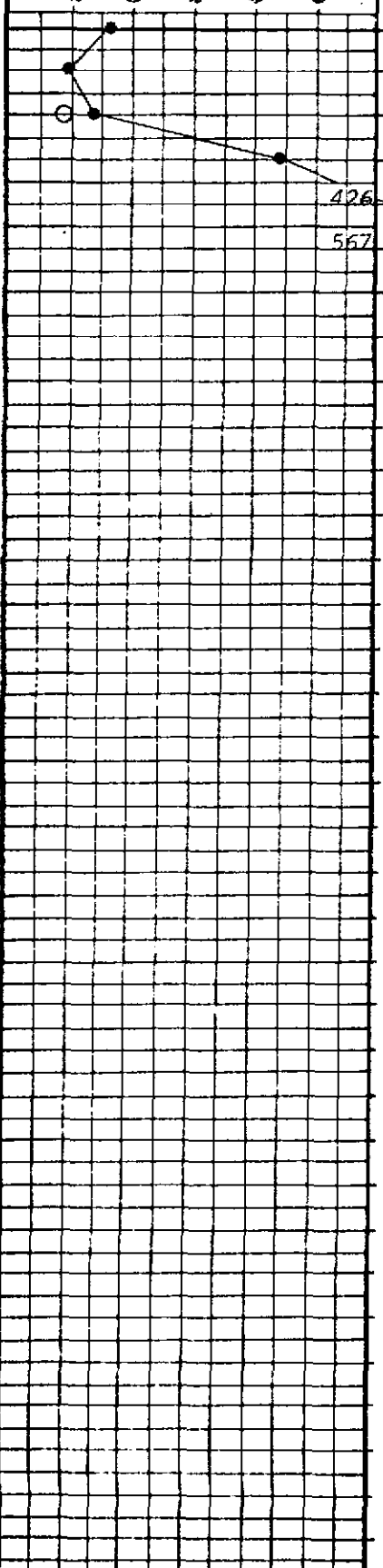
R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 18, 1976 | JOB NO: CS 3553 | HOLE: B-2 (con't)

WATER CONTENT
● PENETRATION RESISTENCE - blows/foot: 50, 100, 150, 200, 250
⊙ WATER CONTENT - %: 10, 20, 30, 40, 50



DEPTH	SOIL SYMBOL	SOIL PROFILE — SOIL DESCRIPTION (DATUM; SURFACE ELEVATION 3441.0')	CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
		GRAVEL very dense, water-bearing, brown (con't) (pre-glacial gravel)	☒	D_4	11"= 52	
		---- cobbles				
		---- dry				
		Bottom of Hole at 75.0'. Hole dry at completion. Hole subsequently caved at 12' depth.				

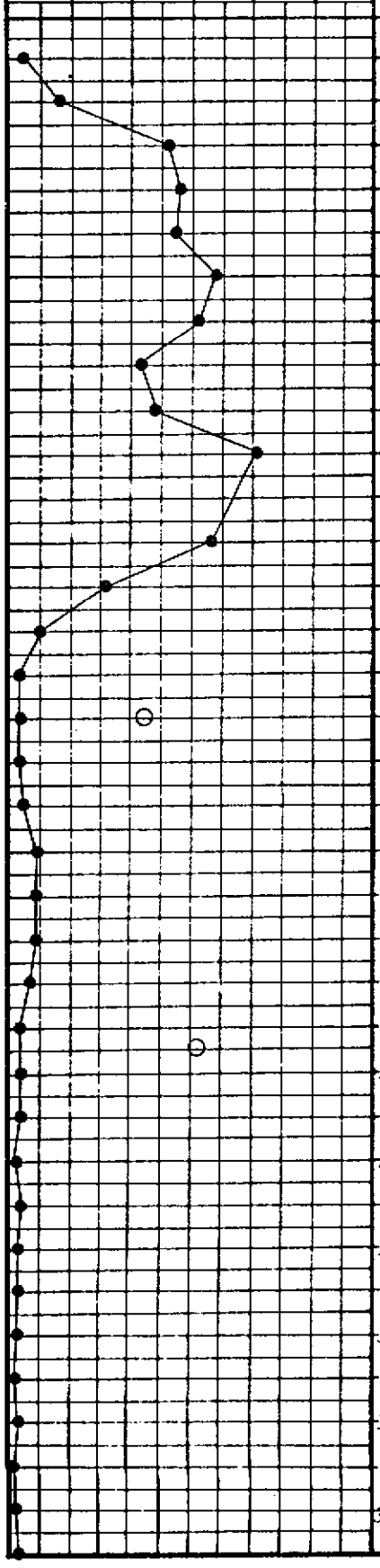
PLATE A-2 (con't)

R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DRWN | CKD | DATE OF INVESTIGATION: August 19, 1976 | JOB NO: CS 3553 | HOLE: B-3



DEPTH	SOIL PROFILE (SOIL DESCRIPTION)	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	DATUM; SURFACE ELEVATION 3448.7'				
0–14	GRAVEL dense, cobbly, some boulders, dry, light grey				
	---- very dense, light brown				
6		X	D_1	6"= 64	
10	---- boulder				
14–34	CLAY silty, low plastic, firm, wet, brown, occasional gravel sizes				
16		◢	U_1		pp = 3000 psf
	---- grey, medium plastic clay				
23		◢	U_2		pp > 500 psf
31	---- medium to high plastic clay	◢	U_3		q_u = 1323 psf; pp = 1000 psf; γ_w = 118.5 pcf; γ_d = 89.6 pcf

PLATE A-3

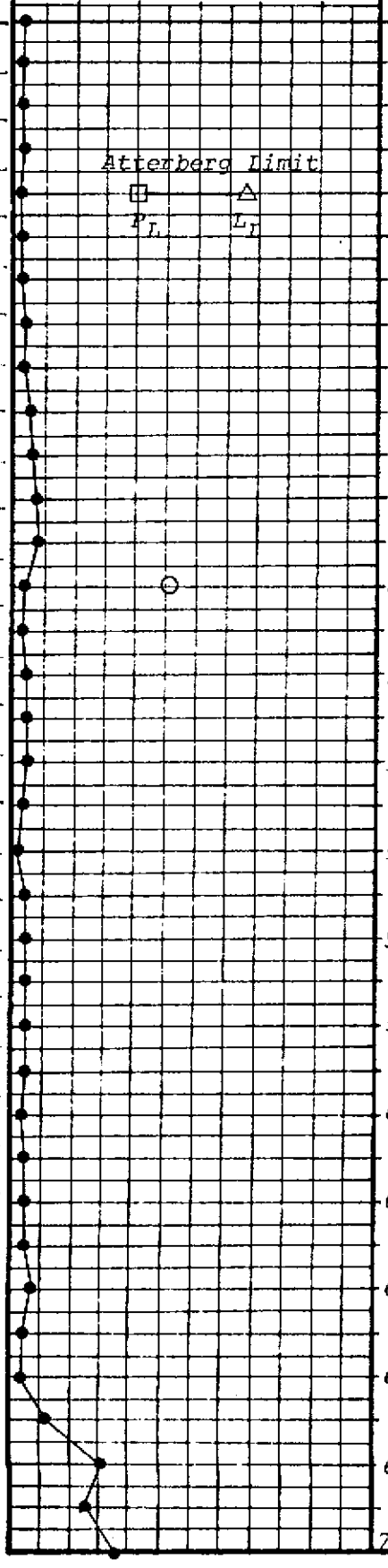
R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: Augsut 19, 1976 | JOB NO: CS 3553 | HOLE: B-3 (con't)

WATER CONTENT
● PENETRATION RESISTENCE - blows/foot
50 100 150 200 250
⊙ WATER CONTENT - %
10 20 30 40 50



DEPTH	SOIL SYMBOL	SOIL PROFILE — SOIL DESCRIPTION (DATUM: SURFACE ELEVATION 3448.7')	CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
36		CLAY silty, medium plastic, firm, wet, brown (con't)				
38		low plastic clay		U_4		q_u = 1645 psf pp = 1500 psf γ_w = 119.5 pcf γ_d = 91.7 pcf
40						
42						
44						
46						
48		SILT trace sand, low plastic, brown, occasional gravel, occasional lenses of clay free water		U_5		pp = 500 psf
50						
52						
54		non plastic lenses of medium sand				
56				U_6		pp = 1000 psf
58						
60						
62						
64		SAND gravelly, water-bearing, medium dense		D_2	N=15	
66		GRAVEL sandy, cobbles, some boulders, dense, water-bearing, brown				
68		very dense (pre-glacial gravel)				
70						

PLATE A-3(con't)

R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

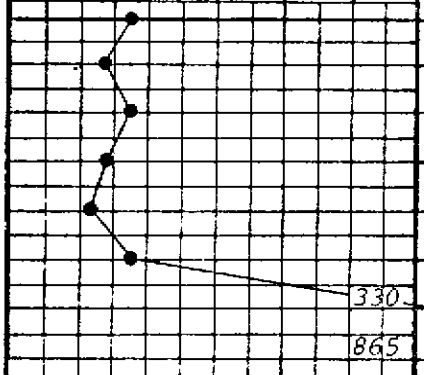
PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 19, 1976 | JOB NO: CS 3553 | HOLE: B-3 (con't)

WATER CONTENT

● PENETRATION RESISTENCE - blows/foot: 50, 100, 150, 200, 250

⊖ WATER CONTENT - %: 10, 20, 30, 40, 50



DEPTH	SOIL PROFILE (SOIL DESCRIPTION; DATUM; SURFACE ELEVATION 3448.7')	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	GRAVEL sandy, cobbles, some boulders, water-bearing, brown (con't)				
72		☒	D_3	N=54	
74					
	boulder				
	dry				
78	Bottom of Hole at 77.0'. W.L. in standpipe at 15'9" on Sept. 8, 1976.				

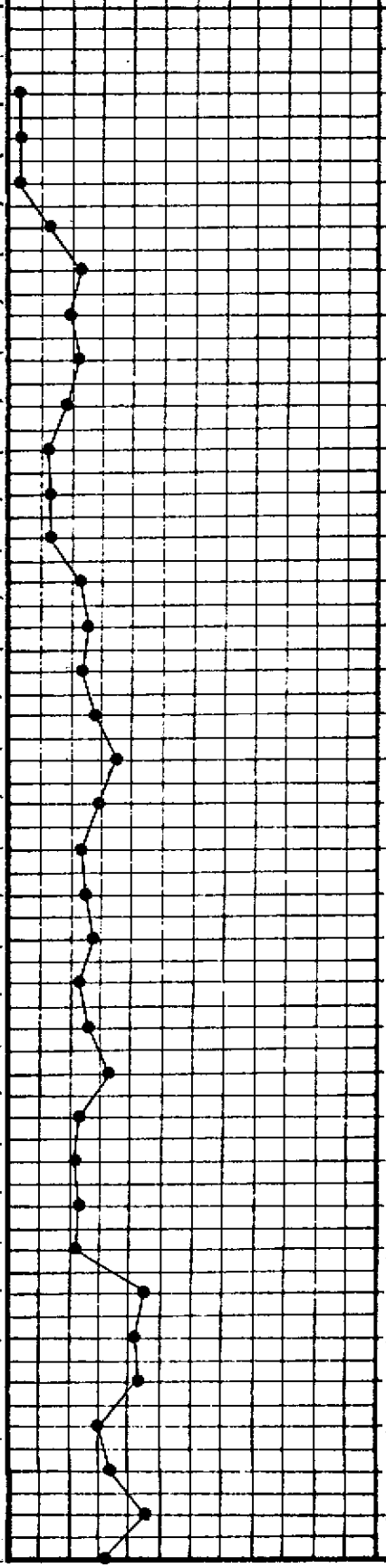
PLATE A-3(con't)

R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 20, 1976 | JOB NO: CS 3553 | HOLE: B-4



DEPTH	SOIL PROFILE (SOIL DESCRIPTION)	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	DATUM; SURFACE ELEVATION 3452.1'				
	TOPSOIL silt, trace clay, soft, wet, brown				
2	GRAVEL sandy, medium dense, moist, brown				
4	dense to very dense				Grain Size on Plate A-15
6	very dense				
	cobbly, dry, light brown	X	D_1	N=68	Grain Size on Plate A-16
8					
10					
12					
14					
	GWL	X	D_2	N=95	
16					
18					
20					SO_4 = 0.01%
22					
24	free water	X	D_3	N=82	
26					
28	boulder				
30					
32					
34					

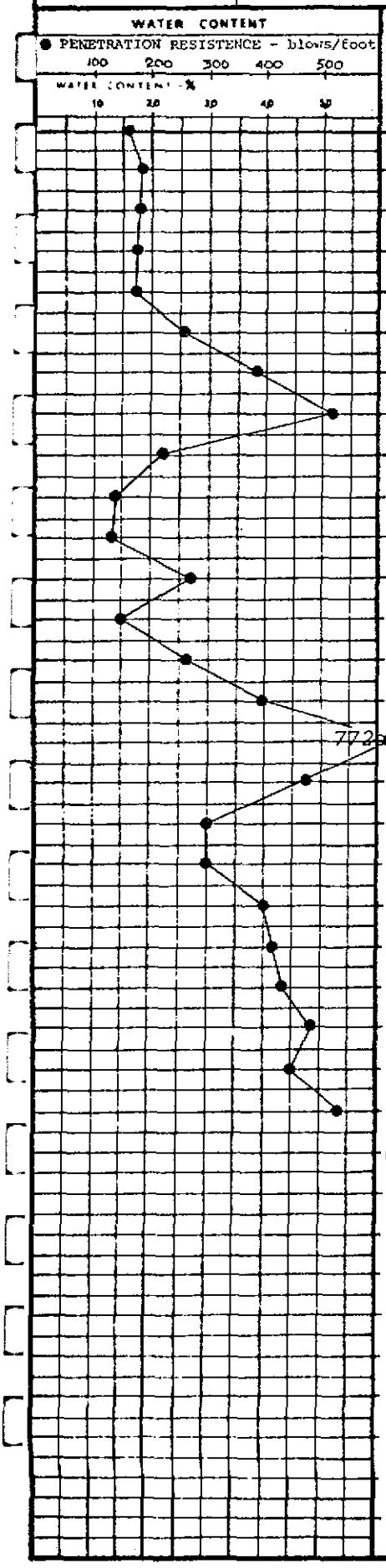
PLATE A-4

R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 20, 1976 | JOB NO: CS 3553 | HOLE: B-4 (con't)



SOIL PROFILE	SOIL SAMPLES			
SOIL DESCRIPTION (DATUM; SURFACE ELEVATION 3452.1')	CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
GRAVEL sandy, medium dense, moist, brown (con't)				
very sandy, saturated, grey				
SAND gravelly, very dense, water-bearing	X	D4	6"= 77	
GRAVEL sandy, dry, very dense, (pre-glacial gravel)				
boulder				
Bottom of Hole at 59.0'. Hole dry at completion. W.L. in open hole at 17'8" on Sept. 8, 1976.				

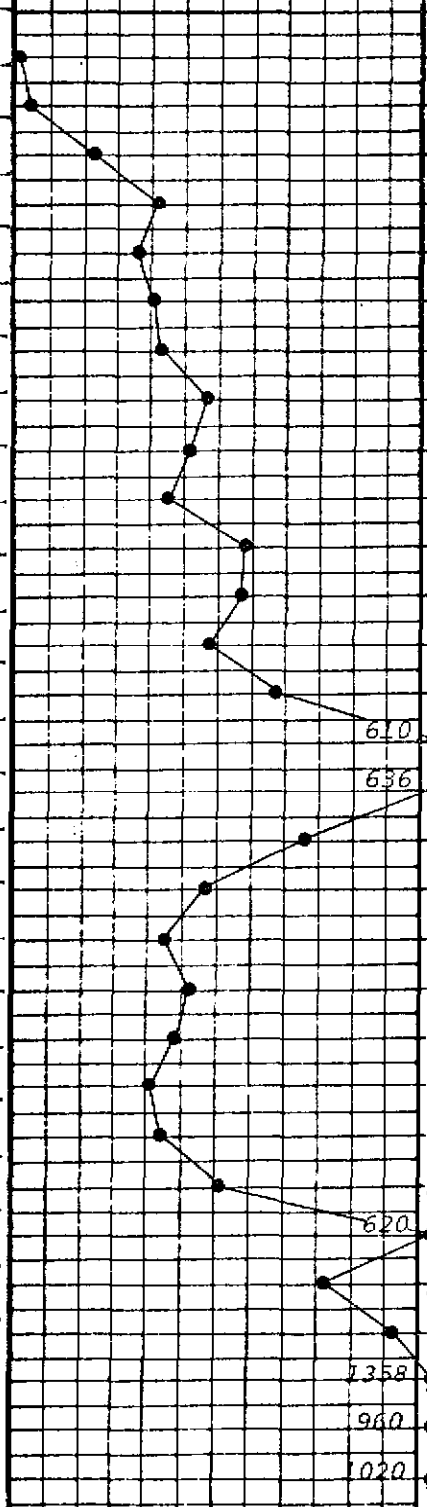
PLATE A-4(con't)

R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 20, 1976 | JOB NO: CS 3553 | HOLE: B-5



DEPTH	SOIL PROFILE (SOIL DESCRIPTION)	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	DATUM; SURFACE ELEVATION 3456.6'				
	TOPSOIL silt, gravel, brown, rooty				
2	GRAVEL sandy, medium dense, dry, occasional cobbles, light brown				
	-- very dense (pre-glacial gravel)				
4	-- boulder				SO_4 < 0.10%
6		☒	D_1	6"= 100 Refusal	Grain Size on Plate A-17
8					
10					
12					
14	GWL				
16					
18					
20					
22					Grain Size on Plate A-18
24					
26	boulder, cobbly gravel				
28					
30					SO_4 < 0.10%

Bottom of Hole at 30.0'.

Hole dry at bottom.

W.L. in open hole at 14'9" on Sept.8, 1976.

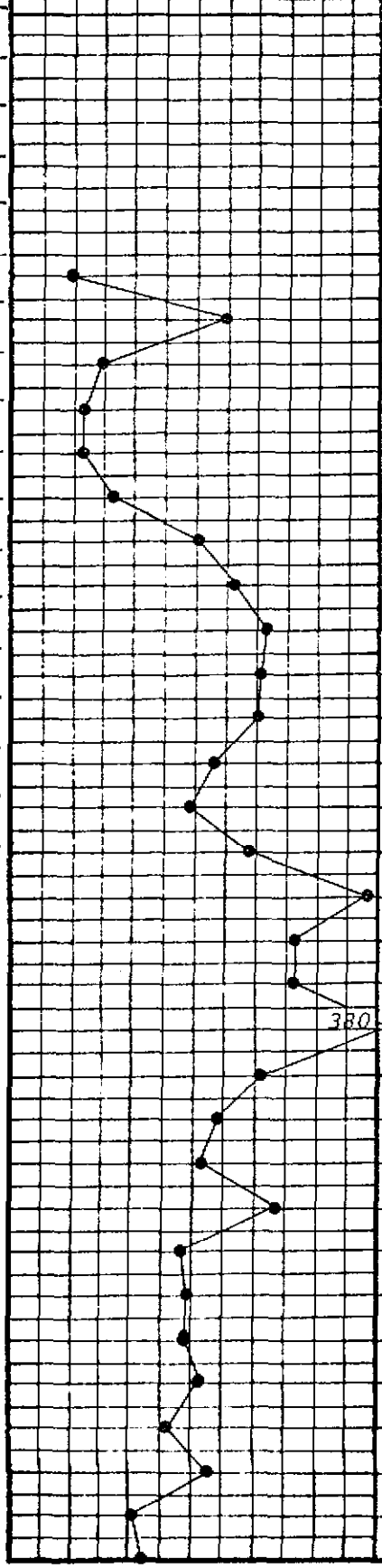
PLATE A-5

R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 21, 1976 | JOB NO: CS 3553 | HOLE: B-6



DEPTH	SOIL PROFILE (SOIL DESCRIPTION)	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	DATUM; SURFACE ELEVATION 3460.2'				
	TOPSOIL clay, silt, low plastic, black, organic, roots				
2, 4	SILT clayey, woody, low plastic, loose to soft, moist to wet, dark brown, occasional gravel sizes				
	GRAVEL sandy, dense, brown, moist				
6	very dense, dry, light brown, some cobbles (pre-glacial gravel)				SO_4 = 0.01% Grain Size on Plate A-19
8	dense	X	D_1	N=73	
10					Grain Size on Plate A-20
12	very dense				
14		X	D_2	6"= 188	
16, 18, 20, 22, 24, 26, 28, 30					
32	free water, brown, sandy gravel saturated	X	D_3	6"= 105	
34					

PLATE A-6

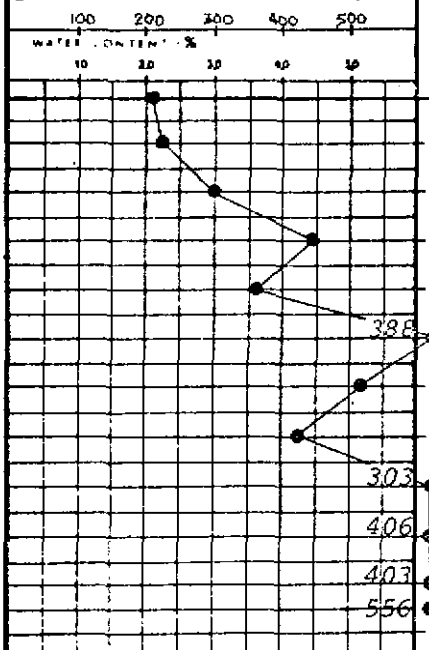
R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER – WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 21, 1976 | JOB NO: CS 3553 | HOLE: B-6 (con't)

WATER CONTENT — ● PENETRATION RESISTENCE – blows/foot



DEPTH	SOIL SYMBOL	SOIL PROFILE — SOIL DESCRIPTION (DATUM: SURFACE ELEVATION 3460.2')	CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
36		GRAVEL sandy, dense, brown, moist (con't)				
38						
42		---- silty, dry				
44		BEDROCK siltstone, very hard, sound, grey, massive				
46						

Bottom of Hole at 45.5'.

Hole dry at completion.
W.L. in standpipe at 14'10" on Sept.8, 1976.

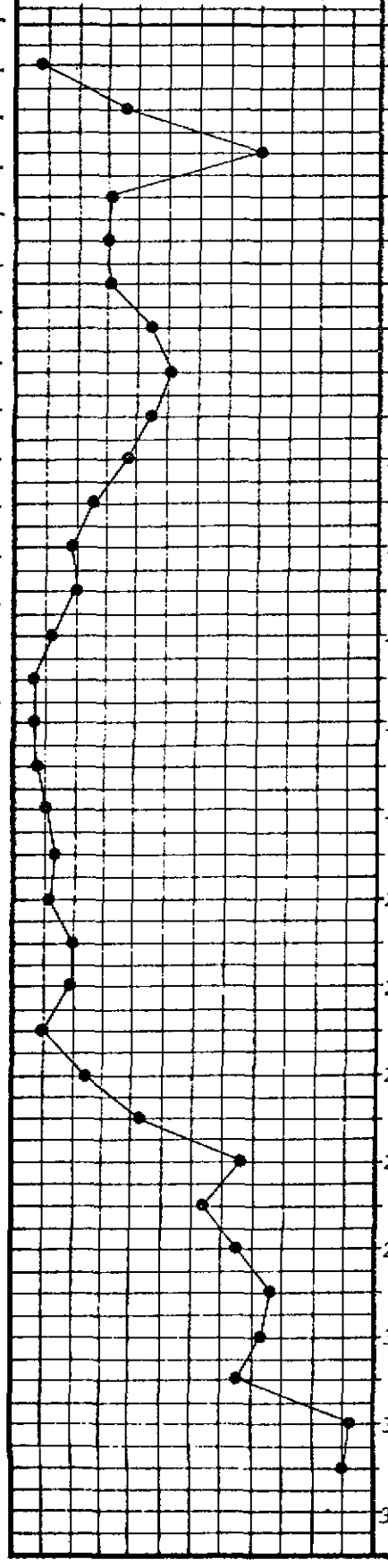
PLATE A-6 (con't)

R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: Sept. 1, 1976 | JOB NO: CS 3553 | HOLE: P-6



SOIL PROFILE — SOIL DESCRIPTION

DATUM

SURFACE ELEVATION: 3455.4'

TOPSOIL mosses, rootlets

GRAVEL sandy, dense, moist, brown

--- very dense.

--- dry, cobbly

--- light brown

--- very sandy, moist, brown, dense

--- medium dense, moist, brown

GWL

SAND medium grained, gravelly, medium dense to dense, damp, brown

GRAVEL sandy, silty, very dense, damp, brown (pre-glacial gravel)

--- dry, light brown

Bottom of Hole at 34.0'.

Dry at completion.

SOIL SAMPLES

CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
			Permeability Test @ 34'

Time: 2:00

ΔT	GWL
0 sec.	0
15 sec.	0'1 1/4"
30 sec.	0'2 1/2"
1 min.	0'4 3/4"
2 min.	0'11"
3 min.	1'5"
5 min.	2'3"
7 min.	3'0"
10 min.	4'1"
15 min.	5'7"
20 min.	6'9"
30 min.	8'8"
45 min.	10'7"
1hr2min	11'8"
1hr18min	12'3"
1hr30min	12'6"

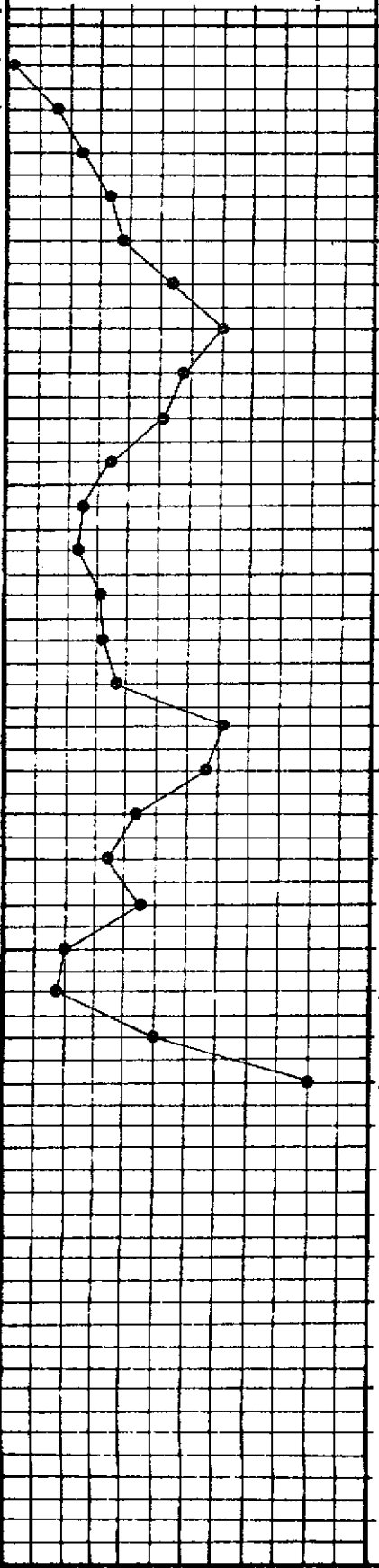
PLATE A-7

R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: Sept. 1, 1976 | JOB NO: CS 3553 | HOLE: P-7



SOIL PROFILE	SOIL SAMPLES			
SOIL DESCRIPTION (DATUM; SURFACE ELEVATION 3455.8')	CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
TOPSOIL				
GRAVEL sandy, dry, medium dense				
--- very dense				Permeability Test @ 14'
SAND gravelly, medium dense, wet				
--- damp, light brown				
GRAVEL (pre-glacial) dry				
Bottom of Hole at 24.0'.				

Permeability Test @ 14'

Time: 5:00 PM

ΔT	GWL
0 sec	0
5 sec	4"
18 sec	1'0"
33 sec	2'0"
55 sec	3'0"
1'55sec	5'0"
2'23sec	6'0"
3 min	7'0"
4min 55sec	9'0"
6min 25sec	10'0"
8 min	10'11"
10 min	11'8"
12 min	12'4"
15 min	12'10"
20 min	13'6"

PLATE A-8

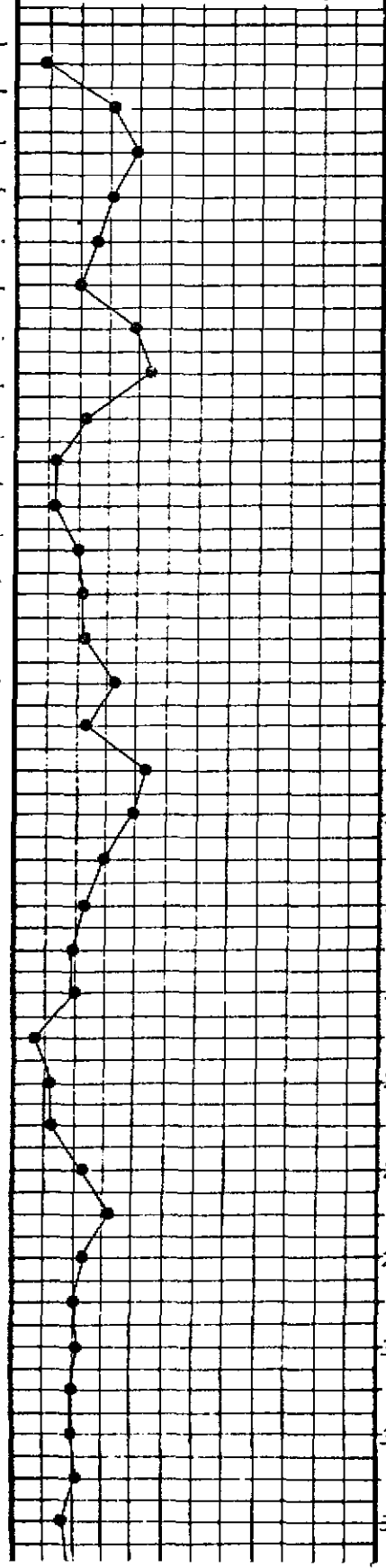
R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: Sept. 2, 1976 | JOB NO: CS 3553 | HOLE: P-8

WATER CONTENT — ● PENETRATION RESISTENCE - blows/foot (30, 60, 90, 120, 150); WATER CONTENT - % (10, 20, 30, 40, 50)



DEPTH	SOIL PROFILE — SOIL DESCRIPTION (DATUM; SURFACE ELEVATION 3452.1')	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	TOPSOIL mosses, grass, silt, sand				
	GRAVEL sandy, dense, damp, brown				
2	silty, sandy				
4	medium dense				
6					
8					
10					
12					
14					
16					
18	sandy				
20					
22	CLAY silty, low to medium plastic, firm, moist, dark grey				
24					
26					
28					
30					
32					
34					

PLATE A-9

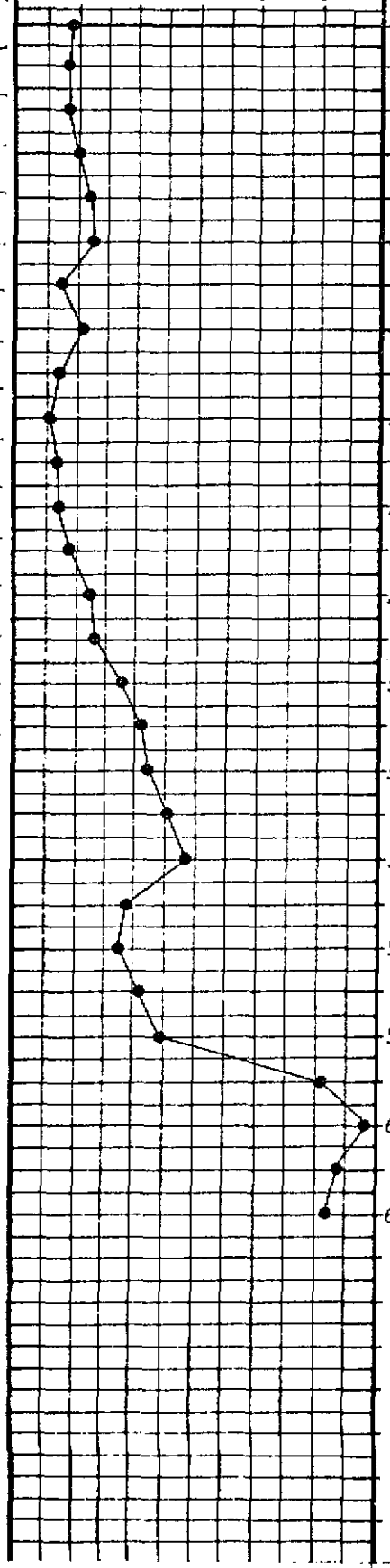
R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: Sept. 2, 1976 | JOB NO: CS 3553 | HOLE: P-8 (con't)

WATER CONTENT — ● PENETRATION RESISTENCE - blows/foot (30, 60, 90, 120, 150); WATER CONTENT - % (10, 20, 30, 40, 50)



DEPTH	SOIL PROFILE — SOIL DESCRIPTION (DATUM; SURFACE ELEVATION 3452.8')	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
36	CLAY silty, low to medium plastic, firm to stiff, moist, dark grey (con't)				
38	occasional gravel sizes to 1/2"ϕ				
40					
42					
44					
46	silty, moist to wet				
48					
50	GRAVEL sandy, dense, wet, dark grey				
52					
54	trace silt				
56					
	free water, very sandy				
58	GRAVEL (pre-glacial) very dense, sandy, wet				
60					
	moist, brown				
62					
	Bottom of Hole at 62.0'.				

PLATE A-9(con't)

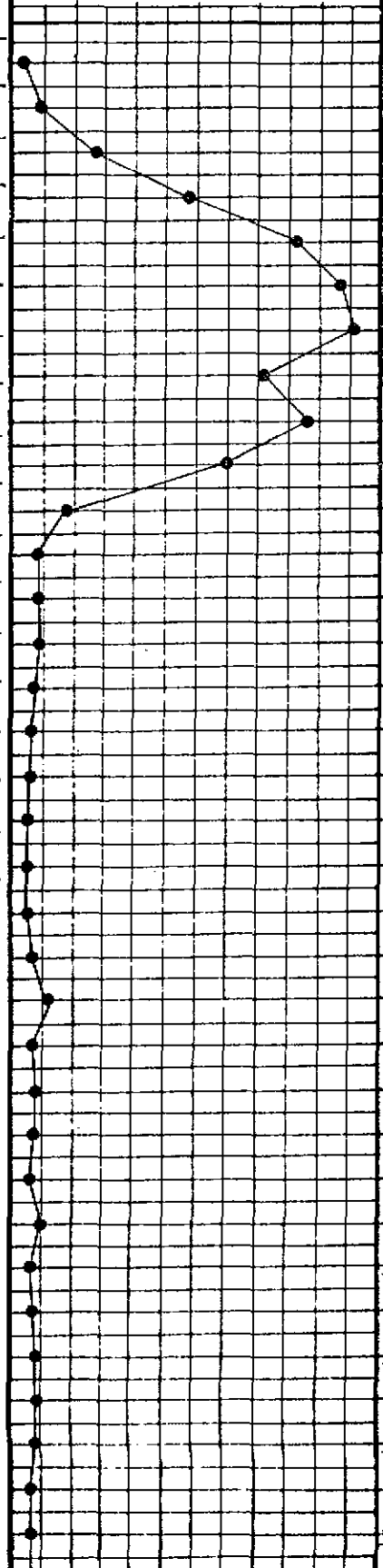
R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 31, 1976 | JOB NO: CS 3567 | HOLE: P-9

WATER CONTENT
● PENETRATION RESISTENCE - blows/foot
30 60 90 120 150
WATER CONTENT %
10 20 30 40 50



DEPTH	SOIL PROFILE (SOIL DESCRIPTION)	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	DATUM; SURFACE ELEVATION 3447.8'				
0	TOPSOIL silt, sand, dark brown				
	GRAVEL sandy, medium dense, moist, brown				
4	very dense, damp				
	light brown, dry				
10	CLAY silty, low to medium plastic, firm, dark grey, moist				
22	very silty, low plastic, some gravel				

PLATE A-10

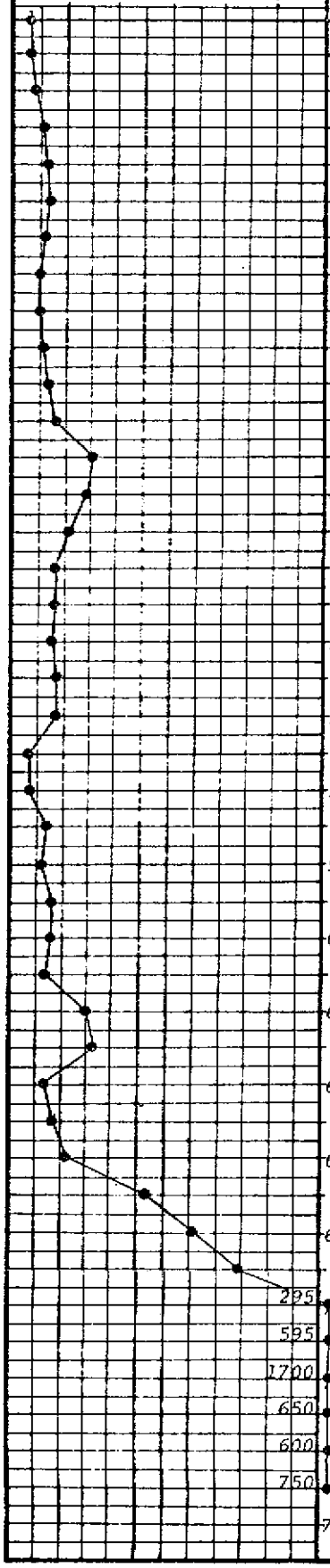
R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 31, 1976 | JOB NO: CS 3567 | HOLE: P-9 (con't)

WATER CONTENT — PENETRATION RESISTENCE - blows/foot (50, 60, 90, 120, 150); WATER CONTENT - % (10, 20, 30, 40, 50)



DEPTH	SOIL PROFILE — SOIL DESCRIPTION (DATUM; SURFACE ELEVATION 3447.8')	SOIL SAMPLES: CONDITION / TYPE / PENETRATION RESISTANCE	OTHER TESTS
36	CLAY silty, low to medium plastic, firm, dark grey, moist (con't)		
38			
40			
42			
44			
46	--- stiff		
48	--- some gravel, stiff		
50			
52			
54			
56			
58			Permeability Test @ 64'
60			Time 6:06
62	SAND medium grained, dark grey, water-bearing, medium dense		ΔT GWL 0 sec 3" 15 sec 7'0" 30 sec 11'5" 45 sec 14'5" 1 min 15'0" 2 min 15'1" 3 min 15'1.5" 4 min 15' 1.5"
64	--- some gravel		
66	--- saturated, gravelly		
68	GRAVEL sandy, very dense, wet, dark grey (pre-glacial gravel)		
0			
2	--- dry		
4	--- free water		
76	Bottom of Hole at 75.0'.		

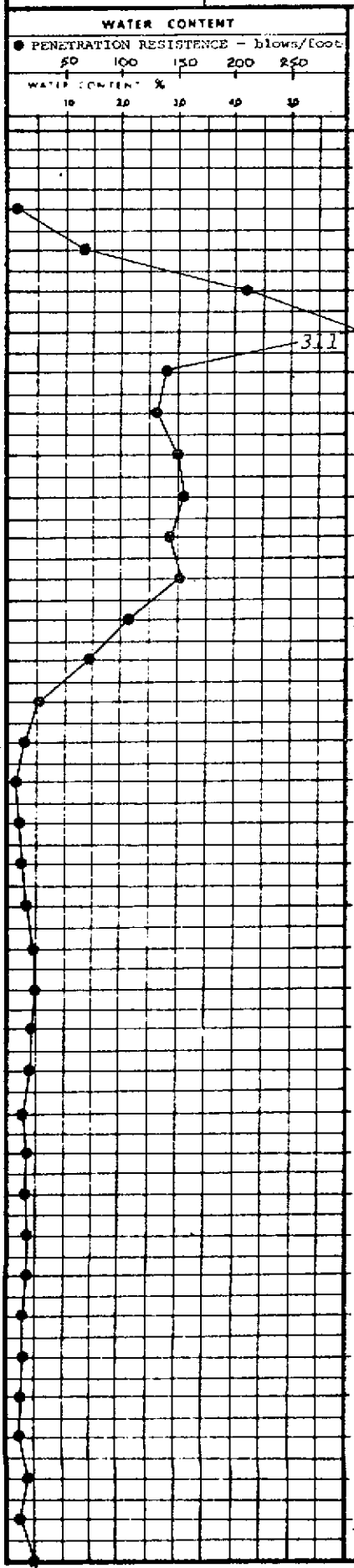
PLATE A-10 (con't)

R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 31, 1976 | JOB NO: CS 3567 | HOLE: P-10



DEPTH	SOIL PROFILE (SOIL DESCRIPTION)	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	DATUM; SURFACE ELEVATION 3444.2'				
	TOPSOIL sandy, silty, loam, moist, dark brown, rootlets				
	SAND medium dense				
2	GRAVEL. sandy, dense, dry, light brown				
4	-- very silty, very dense				
6					
8					
10					
12	GWL				
14	CLAY silty, low plastic, firm, miost to wet, dark grey				
16					
18					
20	--- stiff, low to medium plastic				
22					
24					
26					
28					
30					
32	--- sandy, occasional gravel				
34	SAND gravelly, water-bearing				

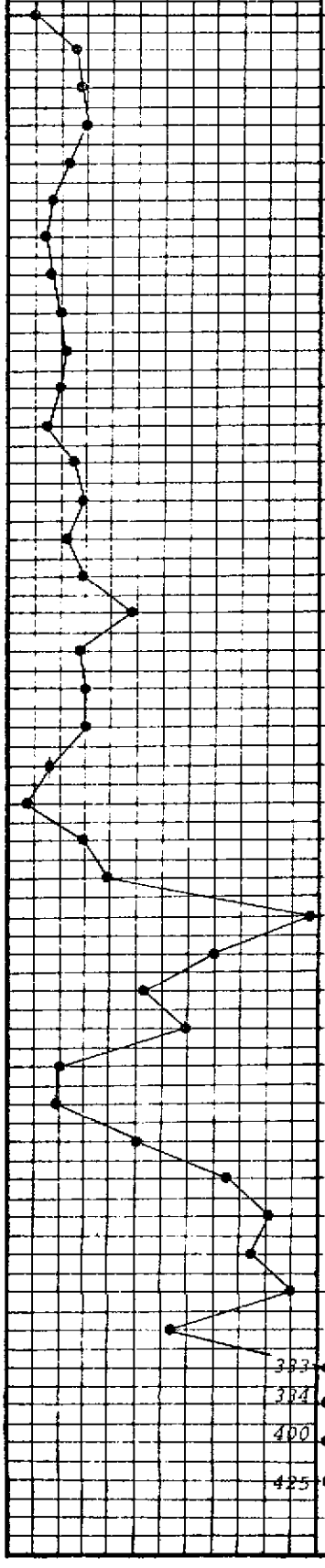
PLATE A-11

R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER – WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: August 31, 1976 | JOB NO: CS 3567 | HOLE: P-10 (con't)



DEPTH	SOIL PROFILE – SOIL DESCRIPTION (DATUM: SURFACE ELEVATION 3444.2')	SOIL SAMPLES – CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
36	GRAVEL sandy, occasional cobbles, water-bearing				
38					
40	SAND gravelly, water-bearing				
42	GRAVEL sandy, water-bearing				
44	SAND gravelly, water-bearing, fine to medium grained, brown				
46					
	coarse sand				
48					
50	very gravelly				
	GRAVEL sandy, saturated				
52	very little sand				
54					
	1' lens of sand, water-bearing, loose				
56					
58	saturated gravel, very dense				
	wet, little sand				
60	moist				
	water-bearing				
62					
64	saturated				
66	GRAVEL (pre-glacial), wet, very dense				
68	moist, sandy, brown				
	brown, dry				
70					
72					
74	Bottom of Hole at 74.0'.				

Permeability Test @ 74'
Time: 29:00

ΔT	GWL
0 min	0
.5 min	0'1"
1 min	1'1.5"
2 min	0'2.25"
3 min	0'3.5"
4 min	0'5"
5 min	0'7"
7 min	0'10"
10 min	1'3"
15 min	1'10"
20 min	2'7"
30 min	3'8"
40 min	4'8"
50 min	5'6"
1 hr	6'1"

PLATE A-11 (con't)

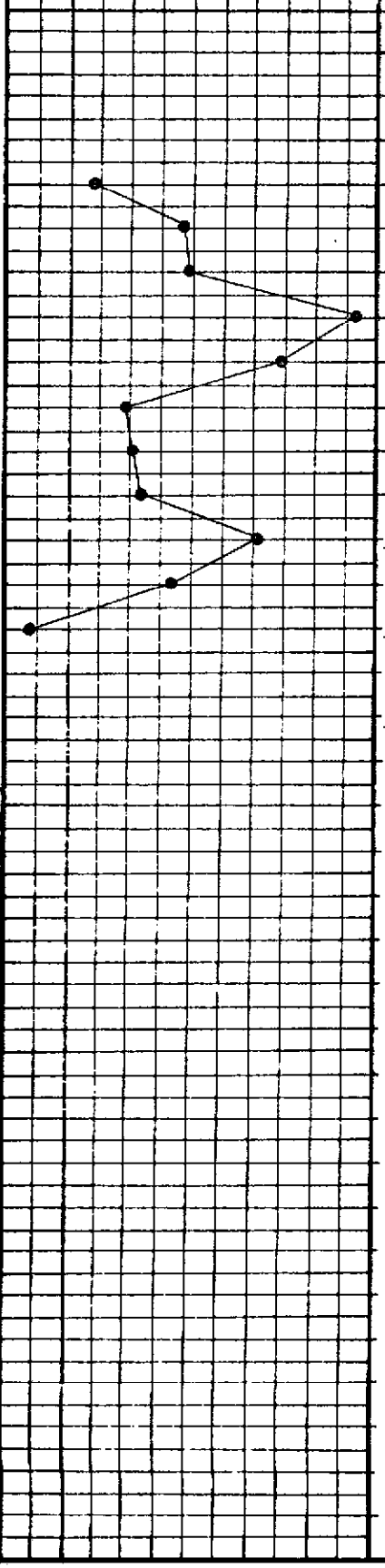
R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: Sept. 2, 1976 | JOB NO: CS 3567 | HOLE: P-11

WATER CONTENT — ● PENETRATION RESISTENCE - blows/foot (20, 40, 60, 80, 100); WATER CONTENT - % (10, 20, 30, 40, 50)



DEPTH	SOIL PROFILE — SOIL DESCRIPTION (DATUM: SURFACE ELEVATION 3443.8')	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
	TOPSOIL silt, organic, dark brown to black				
2	SILT rootlets, very loose				
4	GRAVEL sandy, moist, medium dense, dark brown				
	- dense, brown				
6	very dense, dry, light brown				
8	medium dense to dense				
10	cobbles				
12	moist				
14	CLAY silty, low to medium plastic, soft				
16	Bottom of Hole at 14.0'. Dry at completion.				

PLATE A-12

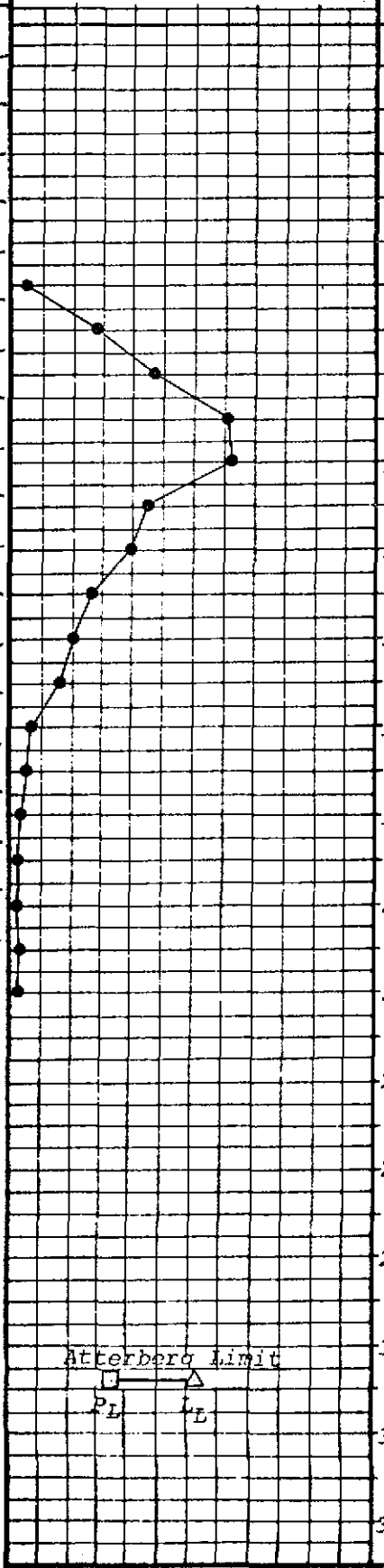
R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: Sept. 2, 1976 | JOB NO: CS 3567 | HOLE: P-12

WATER CONTENT
● PENETRATION RESISTENCE - blows/foot
50 100 150 200 250
WATER CONTENT - %
10 20 30 40 50



DEPTH	SOIL SYMBOL	SOIL PROFILE — SOIL DESCRIPTION (DATUM: SURFACE ELEVATION 3444.2')	CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
2, 4		SAND silty, occasional gravel, loose, moist, dark brown				
6, 8, 10, 12, 14		GRAVEL sandy, medium dense, moist, brown -- very dense -- dry, light brown --- 2" moist lens of sand --- damp				
16, 18, 20, 22, 24, 26, 28, 30, 32, 34		CLAY silty, low to medium plastic, firm, wet, dark grey --- medium plastic	U_1 U_2			Triaxial Test on Plate A-21

PLATE A-13

R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: Sept. 2, 1976 | JOB NO: CS 3567 | HOLE: P-12 (con't)

WATER CONTENT — ● PENETRATION RESISTENCE - blows/foot (50, 100, 150, 200, 250); WATER CONTENT - % (10, 20, 30, 40, 50)

SURFACE ELEVATION: 3444.2'

DEPTH	SOIL PROFILE / SOIL DESCRIPTION	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
36, 38	CLAY silty, medium plastic, firm, wet, dark grey (con't)				
40	SAND very silty, trace clay, very loose, saturated		U 3		
42, 44					
44			U 4		
46, 48, 50, 52	occasional gravel, free water				
54	SILT sandy, occasional gravel, water-bearing				Permeability Test @ 54' Time: 2:35 PM
56	GRAVEL sandy, saturated, brown				
58, 60, 62	free water				
64	very dense, wet, brown				
66	light brown, dry				
68, 70	Bottom of Hole at 70.0'.				

ΔT	GWL
30 sec	8"
1 min	7"
1min 30sec	11"
2 min	1'4"
3 min	2'0"
4 min	2'10"
5 min	3'4"
7 min	4'7"
10 min	6'3"
16 min	9'1"
20 min	10'6"
25 min	11' 6"
30 min	12'2"

PLATE A-13(con't)

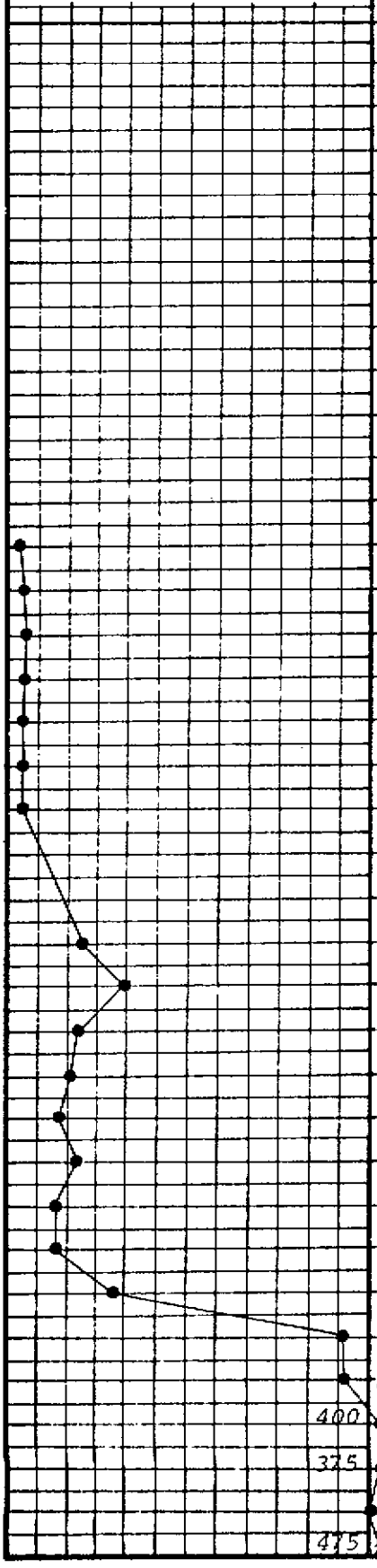
R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

DWN | CKD | DATE OF INVESTIGATION: Sept. 2, 1976 | JOB NO: CS 3567 | HOLE: P-12 (con't)

WATER CONTENT — ● PENETRATION RESISTENCE - blows/foot (50, 100, 150, 200, 250); WATER CONTENT - % (10, 20, 30, 40, 50)



DEPTH	SOIL PROFILE — SOIL DESCRIPTION (DATUM: SURFACE ELEVATION 3444.2')	SOIL SAMPLES — CONDITION / TYPE	PENETRATION RESISTANCE	OTHER TESTS
36, 38	CLAY silty, medium plastic, firm, wet, dark grey (con't)			
40	SAND very silty, trace clay, very loose, saturated	U 3		
42, 44				
46		U 4		
48, 50, 52	occasional gravel, free water			
54	SILT sandy, occasional gravel, water-bearing			Permeability Test @ 54' Time: 2:35 PM
56	GRAVEL sandy, saturated, brown — free water			
58, 60, 62				
64	very dense, wet, brown			
66	light brown, dry			
68, 70	Bottom of Hole at 70.0'.			

ΔT	GWL
30 sec	8"
1 min	7"
1min 30sec	11"
2 min	1'4"
3 min	2'0"
4 min	2'10"
5 min	3'4"
7 min	4'7"
10 min	6'3"
16 min	9'1"
20 min	10'6"
25 min	11' 6"
30 min	12'2"

PLATE A-13 (con't)

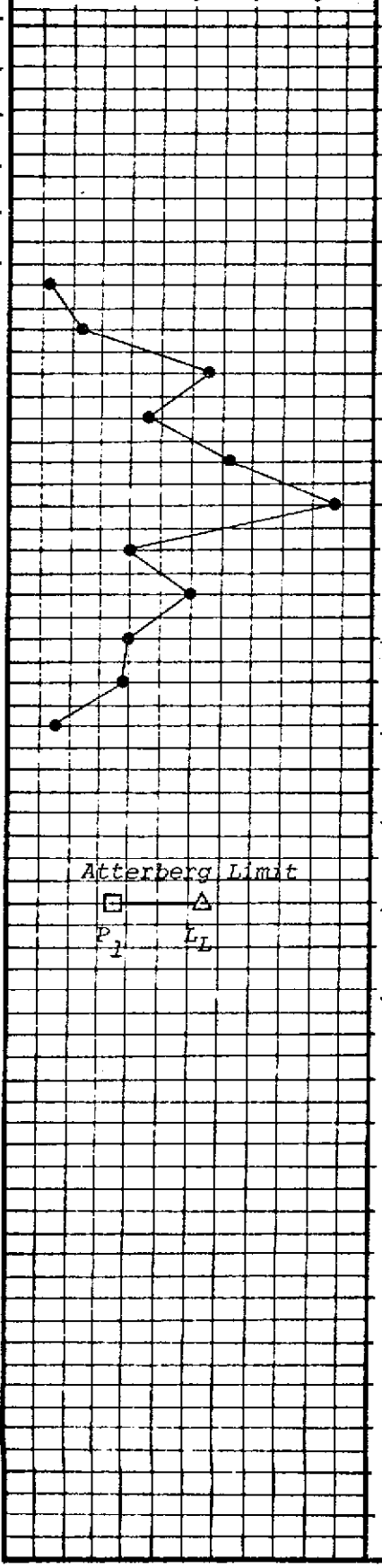
R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: HOSMER - WHEELER PROJECT

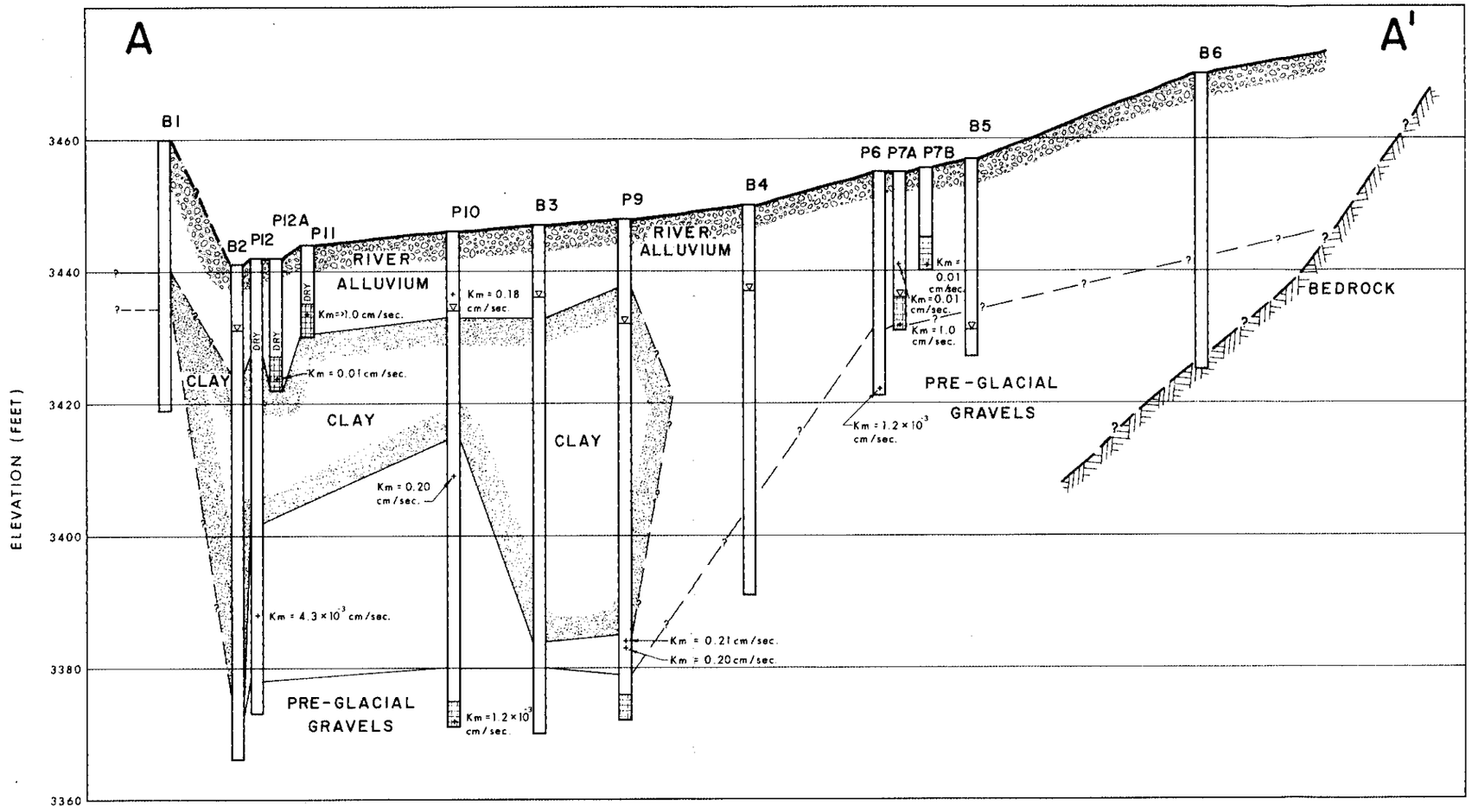
DWN | CKD | DATE OF INVESTIGATION: Sept. 4, 1976 | JOB NO: CS 3553 | HOLE: P-12A

WATER CONTENT — ● PENETRATION RESISTENCE - blows/foot (30, 60, 90, 120, 150); WATER CONTENT - % (10, 20, 30, 40, 50)



DEPTH	SOIL PROFILE (DATUM / SURFACE ELEVATION) — SOIL DESCRIPTION	SOIL SAMPLES: CONDITION	TYPE	PENETRATION RESISTANCE	OTHER TESTS
2, 4	SAND silty, very loose				Permeability Test @ 12'
6, 8, 10, 12, 14	GRAVEL sandy, medium dense --- very dense, dry --- damp				Time:10:00 AM ΔT — GWL 0 sec — 0 7 sec — 1' 23 sec — 2'8" 1 min — 5'+8" 2 min — 9'0" 2min 20sec — 10' 2min 50sec — 11" 4 min — 12'10" 5 min — 13'11" 7 min — 14'9" 10 min — 15'4" 15 min — 15'11"
16, 18, 20	CLAY silty, soft	■	U_1		
		■	U_2		Triaxial Test on Plate A-22
22	Bottom of Hole at 20.5'.				

PLATE A-14



HORIZONTAL SCALE: 1" = 800'
VERTICAL SCALE: 1" = 20'

R.M.HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

Figure 1
HOSMER-WHEELER PROJECT
GEOLOGIC CROSS-SECTION A-A'
LB/SEPT., 1976 —— CS 3567

338 3/3

(1)

K- HOMMER-WHEELER (PARCEL 69) 76(2)A.

TOPOGRAPHICAL MAP

OF THE

MICHEL MINING AREA

SOUTHEASTERN BRITISH COLUMBIA

— Prepared by —

McELHANNEY SURVEYING & ENGINEERING LTD.

VANCOUVER B.C.

400 200 100 0 400 800

Scale 1 inch to 400 feet

CONTOUR INTERVAL 20 FEET

This mapping was compiled photogrammetrically from aerial photography flown in July 1969

— Prepared for —

KAISER RESOURCES LTD.

NOVEMBER 1974

LEGEND

- Roads a) Major Highway
  - b) Main Gravel
  - c) Secondary Gravel
  - d) Trails
- Railway
- Railway abandoned
- Buildings
- Bridges
- Power Lines
- Telephone
- Trenches
- Adits
- Dams
- Strip Mine
- Gravel Pit
- Rivers
- Streams
- Lakes
- Rectangular Grid Lines
- 5468 Spot Heights
- Contour
- 3800 Index Contour
- Escarpment
- Test Hole Locations
- Piezometer Locations
- A – A' Geological Cross Section

		1C	1B	1A		
	Z7	Z6	Z5	Z4	Z3	
Y8		Y6	Y5	Y4	Y3	
X8	X7	X6	X5	X4	X3	
W8	W7	W6	W5	W4	W3	
V8	V7	V6	V5	V4	V3	V2
U8	U7	U6	U5	U4	U3	U2

INDEX TO MAP SHEETS

M.S.E.L. REF. NO. 06077

APPENDIX B

PLEASE QUOTE

FILE.....

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

THE ARCHAEOLOGICAL SITES ADVISORY BOARD
OF
BRITISH COLUMBIA

PARLIAMENT BUILDINGS
VICTORIA, BRITISH COLUMBIA
CANADA

October 8th, 1976

RECEIVED
OCT 15 1976
RETURN TO FILE

Mr. A. Brunstein
B.C. Research
3650 Westbrook Crescent
Vancouver 8, B. C.

Dear Mr. Brunstein:

Further to our telephone conversation of this morning, please find enclosed a copy of the report entitled Heritage Resource Assessment of the Proposed Hosmer-Wheeler Coal Development.

Yours sincerely,

Ray A. Kenny

Ray A. Kenny
for: A.S. Charlton
Research Archaeologist
Thompson/Okanagan Region

RAK/am

Encl.

HERITAGE RESOURCE ASSESSMENT OF THE PROPOSED HOSMER-WHEELER COAL DEVELOPMENT

SUBMITTED TO THE ARCHAEOLOGICAL SITES ADVISORY BOARD OF BRITISH COLUMBIA

BY WAYNE T. CHOQUETTE

OCTOBER 1, 1976

INTRODUCTION

Archaeological reconnaissance was conducted during June and July 1976 in the area of a proposed coal development in the East Kootenay area of B.C. (Figure 1). A four man survey team directed by the writer with James Pike, John Foster, and Russell Brulotte serving as assistants devoted four weeks to inventory of the Heritage Resource. During this time, a total of 2 Heritage sites, both historic, were recorded in the general vicinity of the coal development.

DESCRIPTION OF AREA

The locality of the proposed coal development is situated on the west slope of the Continental Divide of the Rocky Mountains. The topography is dominated by folded and faulted limestone strata which are segmented by faults enlarged into several major valleys. The locality is in the middle Elk River drainage with Raspberry Creek being the tributary of specific concern to this study.

The valleys and mountain sides have been modified by several glaciations which left behind a variety of glacial features and deposits. The valley bottoms contain low alluvial terraces and flood plains flanked by glacial fluvial terraces and moraine. The alluvial bottomlands are generally wet and are covered by dense communities of cottonwood and willows, while the better drained glacial and glacial fluvial landforms support relatively open forests of pine, fir, larch, and aspen, with interspersed grassland. The mountain slopes above, mantled at lower elevations by glacial till, support a thick cover of spruce, fir, and jackpine. At increased elevation these give way to alpine meadows and bare rock.

The biota of the area today evince the large scale forest fires of the last 100 years. Most of the vegetation is com-

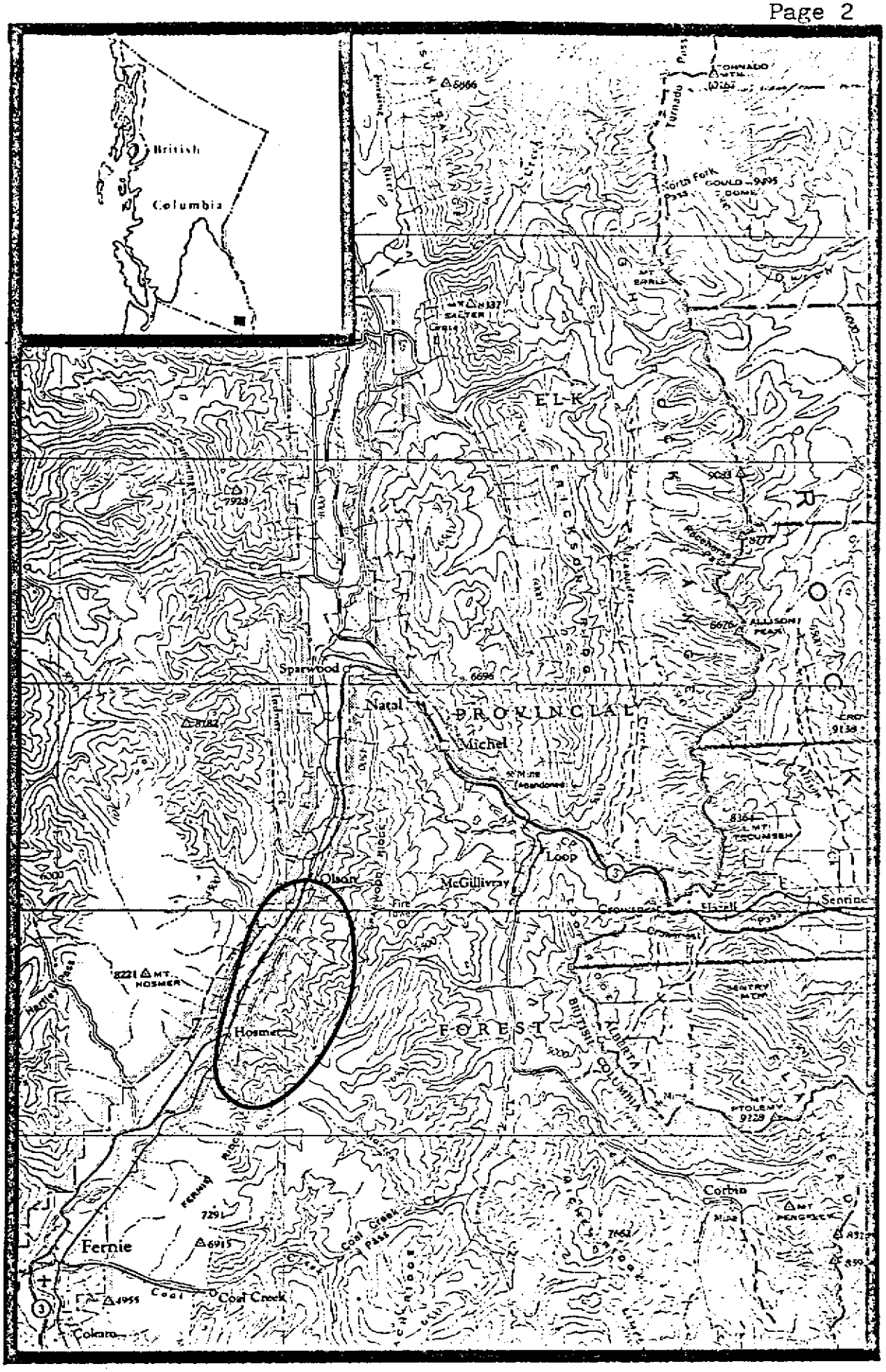


Figure 1: Hosmer-Wheeler Study Area

prised of seral communities of grasses, aspen, jackpine, or mixed forest in which wildflowers and berry bushes are common. These early fire succession communities provide excellent habitat for wildlife, particularly ungulates. Throughout the course of the survey, we observed very abundant evidence of a substantial wild ungulate population in the form of scats, deeply incised trails, and fragments of wool and hair clinging to rocks and bushes. Mineral licks were found in every study area; these displayed obvious signs of heavy wild ungulate use. In addition, the area is populated by a great diversity of birds, insects, amphibians, small mammals, and larger mammalian scavengers and carnivores. Not a single day passed without the sighting of several different members of the wildlife population.

HISTORY OF THE AREA

The known history of the Kootenay Region commences in the early 1800's with the explorations of the fur trade era, particularly those of David Thompson in 1807-11. However, the area under discussion, in the middle Elk River drainage, did not receive attention from Euroamericans until the late 19th century when Michael Phillips, a Hudson Bay trader, crossed Crowsnest Pass from the west in 1873. He followed a known trail via Coal Creek, Leach Creek, and Michel Creek, then crossed the Divide through Phillips Pass. Considerable exploration of the study vicinity was undertaken by George M. Dawson first as a member of the International Boundary Commission of 1874 and later as palaeontologist for the Geological Survey of Canada (Dawson 1886).

The first wagon road through the area was built in 1887 by William Fernie and his brother to gain access to coal fields they had staked earlier. This ushered in the mining era which received impetus from the construction of the Crowsnest Branch Line of the C.P.R. in 1898 to become the primary industry of

the area. The towns of Natal, Michel and Fernie grew in response to these developments; Fernie thriving in spite of several disasters and Natal and Michel eventually declining in favor of growth at Sparwood.

The rich wildlife resources have also been a major attraction to the area. In his 1905 expedition to the Elk Valley, Dr. William T. Hornaday, director of the New York zoological park collected both live and taxidermic wild game specimens. This expedition obtained several peerless wildlife photographs and produced considerable descriptive information on the area and its unrivalled wild game resources (Hornaday 1906). Since that time, the face of the area has been made over by large scale land alteration in the course of continued development and settlement which continues up to the present time.

PREHISTORY OF AREA

PREVIOUS RESEARCH

The first systematic archaeological investigations in the middle Elk River drainage were funded by a grant from the Archaeological Survey of Canada to Dr. B. Reeves of the University of Calgary. The grant supported a brief reconnaissance which was conducted by the writer and Ross Anderson from September 6 to October 15, 1973. This survey located and recorded 16 historic and 70 prehistoric Heritage sites. It utilized a judgemental sampling design due to the constraints of limited time and funding and the large scale of imminent development faced by the area. That is, only those localities in the general area which displayed high potential for containing sites were examined in order for a basic inventory of positive data to be established.

In 1974 the writer examined the site of a proposed golf course at Elkford and found one site, while a 1975 survey of the

Alberta Natural Gas pipeline recorded 3 historic sites and 1 possible prehistoric site in Michel Creek Valley (Lifeways 1976).

RECONSTRUCTED PREHISTORY

The prehistoric site inventory from the surveys previously described display definite patterning in site distribution. The only sites containing definite evidence of antiquity greater than about 2000 years B.P. (before present) occurred as: (1) a short westward extension of the intensive prehistoric occupational focus in the Crowsnest Valley in Alberta and (2) as a small string of small campsites along the north side of the Fording River about 5 kilometers upriver from its confluence with the Elk. Definite patterning was also displayed by several site clusters between Sparwood and the mouth of the Fording River which contained evidence of occupation within the last 2000 years. These consist primarily of hunting camps oriented towards exploitation of large ungulates including bison, and workshops relating to the processing of local silicious mudstone into tools.

From the above data, an hypothetical reconstruction of the prehistory of the middle Elk River drainage was developed (Choquette 1974a, 1974b): The first prehistoric human utilization of the Elk Valley vicinity was focussed east of the Continental Divide with the presence of people west of the Divide having been due primarily to their utilization of the Fording Trail as a trans-mountain travel route. Sometime after 2000 B.P. however, a local aboriginal population began occupying the Elk Valley itself, at least on a seasonal basis, and systematically exploiting the local subsistence and lithic resources. Around this same 2000 B.P. time period, evidence of human inhabitation in the Crowsnest Valley declines (Reeves 1973). Possibly the decline of inhabitation there is linked with increase in evidence of human presence west of the

Divide. This parallels the pattern of the westward movement of the Kootenay in response to the pressures of the Blackfoot during historic times, and may reflect considerably greater time depth to this relationship than has heretofore been commonly considered.

ASSESSMENT STRATEGY AND RESULTS

PROBLEM ORIENTATION

While the 1973 survey did cover most of the optional localities for human use in the middle Elk River drainage with very positive results, the sampling contained a bias towards those optional localities which were most readily recognizable, either by reason of ease of access, preservation of landform, or obvious ecological indication (such as existing natural grassland). While the presence of humans in the area within the last 2000 years could be accepted, there was some reason to suspect the premise that man had not inhabited the area prior to that time. That is, the scarcity of pre-2000 B.P. sites may have been the product of sampling bias in that time may have made them less recognizable. The lack of a geologic chronology for landforms in the area did not immediately allow for accurate assessment of the coverage of all ages of landform. The bias towards lake sites in the data base may have been a product of a bias towards examination of relatively late landforms during the judgemental sample.

A closer investigation of the area was required, one which would allow for the construction of at least a rough geologic chronology and which would focus on objectively chosen segments of the study area. Heritage impact assessment of the proposed Hosmer-Wheeler coal developments was a means of commencing this close examination.

The development locality forms a first level of objective arbitrarily chosen sampling units. The locality of the

development was utilized as foci for the detailed examination required to test the hypothetical culture history construct already outlined. Detailed examination of landforms, soils, and sediment types would allow for recognition of early land surfaces of optimal potential; if examination of these resulted in discovery of sites, then the hypothesis would not hold, whereas if sites were not found on pre-2000 B.P. land surfaces, it could be assumed with much more certainty that man had not been present in the area to occupy them.

FIELD METHODOLOGY

Investigation of the proposed development locality followed a similar tripartite strategy. Detailed examination of aerial photographs was synthesized with known site and resource distribution patterns to predict localities of site potential. Localities of high potential were then examined on the ground by foot traverse. Where possible local residents and contractors were consulted as to locations of potential sites. Then followed a second stage of examination wherein all subsurface exposures are delineated from air photos and from previous on-the-ground inspection were examined, also by foot traverse. These latter consist predominantly of road and railroad cutline transects, bulldozed roadways, and exposed terrace margins and may be considered as arbitrarily (but not randomly) chosen vectors. The third stage of examination was the detailed on-the-ground inspection of rectangular transects which had been chosen via a systematic simple random sample technique. The transects were 2.5 km. by 0.5 km. in size and were oriented either perpendicular to the strike of the Elk Valley or on the axes of the Universal Transverse Mercator Grid. The transects surveyed during this study are part of a 20% random transect survey sample of the Elk Valley which is necessary for total coverage and maximal confidence in site inventory.

All sites were recorded on B.C. Archaeological Site survey

forms and photographed. Salient prehistoric features and significant structural details of historic sites were photographed, noted and sketch mapped. Test excavation was done by trowel in arbitrary 10 cm. levels screened through 1/4 inch wire mesh. Significant soil, sediment, and lithologic exposures were studied, photographed, plotted on aerial photos, and a few of them sampled. Other environmental data including vegetational, climatological, and faunal observations were also recorded.

DESCRIPTIONS OF DEVELOPMENT LOCALITY

Hosmer-Wheeler

The proposed Hosmer-Wheeler coal development involves construction of an hydraulic coal mine utilizing underground shafts in Hosmer and Wheeler Ridges on the east side of the Elk River Valley about midway between Fernie and Sparwood. Facilities for processing and transporting the coal will be constructed on the west slope of Hosmer Ridge and on the alluvial second bottoms at the base of the ridge east of the Elk River where Raspberry Creek enters the Elk Valley bottom.

This locality at present supports a considerable expanse of grassland on the second bottoms with interspersed mixed forest. The slopes of the ridge above are forested principally with Engelmann Spruce although larch and stands of lodgepole pine also occur and a shrub and grass community is present on several exposed slopes.

The present vegetal configuration, especially at lower elevations, is the result of logging and fire within the past 100 years. Prior to this time, the valley bottom more visibly displayed the moistness of much of the ground due to subsurface flow and the high precipitation which it receives in that it supported a cedar forest containing trees of con-

siderable size.

Deposits here are primarily fluvial and glacial in which single sequence podsolic and minorly brunisolic and regosolic soils are present.

SURVEY RESULTS

A total of 2 historic Heritage sites were recorded within the proposed development locality during the 1976 survey. The sites are plotted in Figure 2, summarized in Table I and described below.

HOSMER-WHEELER

DjPr H 1: This site is a three building complex located on a terrace above a northerly tributary of Raspberry Creek. All buildings are of logs but have been constructed by completely different techniques and appear to have served different functions. The largest building was a stable, the next largest a work shed, and the smallest a dwelling cabin. Round nails were used in construction. Information supplied by Paul Brulotte and Don Jacubec of Fernie suggests the complex was utilized in the 1914-16 logging operation of Higgins Logging Company. The buildings are in quite good condition, still standing except for the collapsed roof of the stable. The site is of high value and should not be destroyed. It is recommended that the history of the complex be thoroughly researched and the structural details be recorded by an historian competent in log architecture.

DjPr H 2: This site is a large log loading ramp consisting of two log platforms. The platforms are adjacent but separated by approximately two meters vertical distance. The structures are oriented roughly north-south and are 59 m. long by 36 m. wide in maximum dimensions. Some decay has set in but the platforms are basically intact. The site is of medium value

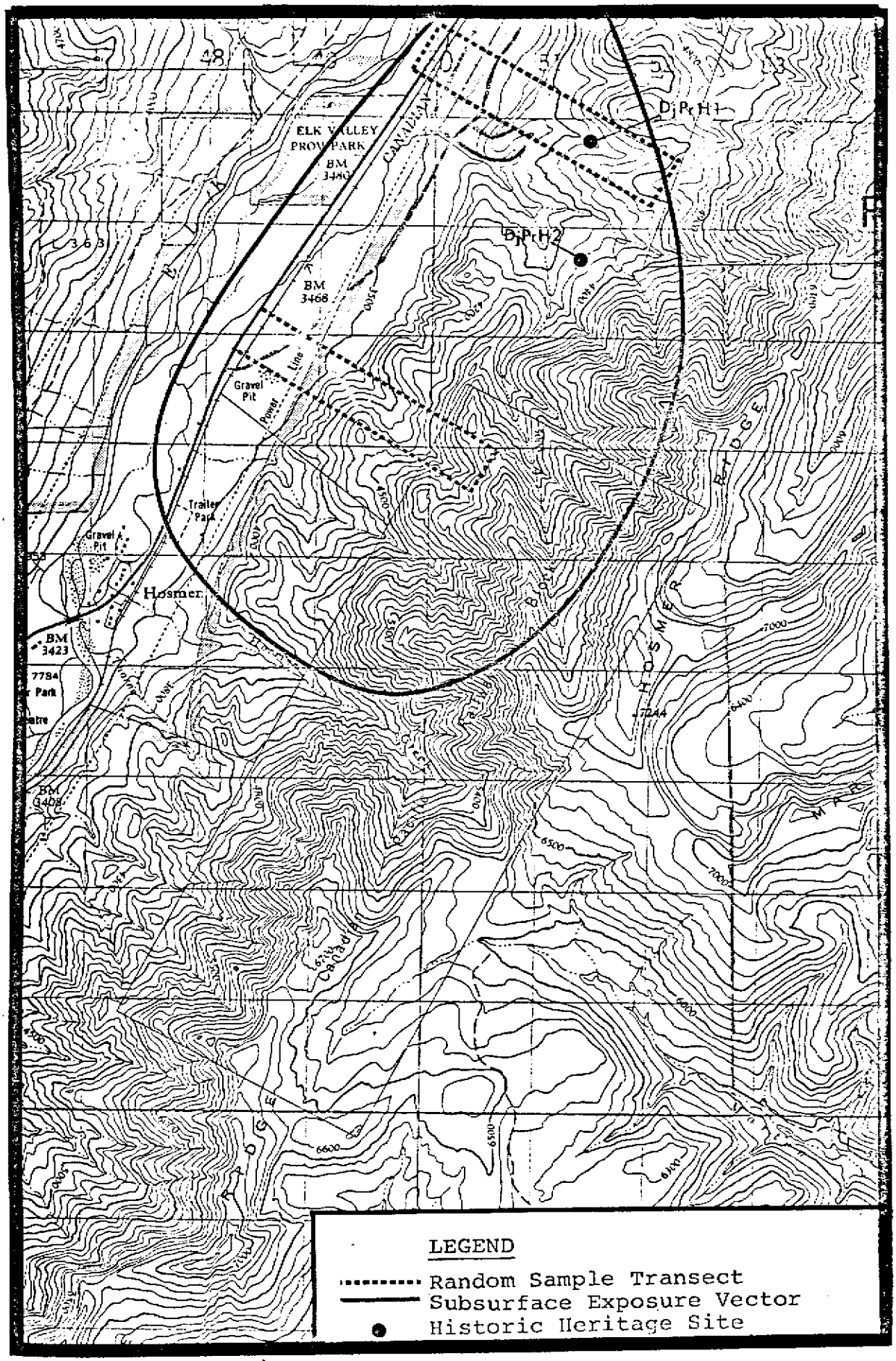


Figure 2: Hosmer-Wheeler Study Area
with localities surveyed and Heritage Sites plotted

and should not be needlessly destroyed. It is recommended that a competent architectural Historian record the log construction techniques.

DISCUSSION OF SURVEY RESULTS

EVALUATION OF RESULTS

The tripartite sampling scheme employed in this survey provided for examination of almost every major exposure of subsurface deposits of the development locality; in addition, the combination of judgemental reconnaissance and random sample transects gave a greater than 20% coverage of undifferentiated terrain. Within the confines of the arbitrary but not totally objective sampling frames of the development locality, a high degree of reliance can be placed upon the results of the surveys and upon the interpretations regarding human land use derived therefrom.

Certain limitations must be pointed out. First, the representativeness of the locality relative to the middle Elk River drainage area is not quantifiable. It must be accepted as sufficient that a range of variability in site potential similar to that of the middle Elk River drainage is contained within the sample locality. Second, there is a certain degree of bias involved in the judgemental sampling of some spot localities of specific potential development. While the coal development locality is a response to the occurrance of coal, a factor which can be assumed to be independent of factors determining locations of prehistoric sites, locations of proposed transportation facilities and the existing transportation facility cutlines for example are subject to similar optimizing determinant influences as were early historic and prehistoric travel corridors. The transects alone are free from this type of bias of survey focusing. Unfortunately, a traverse of an undisturbed surface does not provide a sample of subsurface deposits and an important component of the

survey, the auger sample, was not possible due to logistic limitations.

Interpretation of environmental data led to the formulation of hypothetical resource capabilities for the locality. These resource capabilities served both to delineate foci for judgemental sampling and to provide a contextual framework for the data obtained from the objective samples. In effect, a set of mini-hypotheses pertaining to human utilization was developed which were tested and modified as a result of the field surveys.

The Hosmer-Wheeler locality is a moist environment, at climax heavily vegetated. Capability for support of humans at periods of climax would depend mostly upon the degree of their orientation to vegetal resources. Soil development in storm tracks in the Rocky Mountain Trench shows that the influence of the Pacific Maritime air mass has been a dominant climatic element for many thousands of years. The location of the Hosmer-Wheeler locality in a major funnel of moist eastward moving air suggests that its moistness has been a long-standing and consistant factor in habitat vegetation, and it was probably not frequented by pedestrian hunter-gatherer aboriginal populations. It is thus within expectations that the two Heritage sites recorded here relate to historic exploitation of the forest.

IMPACT AND MITIGATION SUMMARY

LOCALITY OF PROPOSED DEVELOPMENT

It is important to note that in most cases the major recommendations are two-fold: do not needlessly destroy, and document history and architecture. The first recommendation should be self-evident, and stems from a rather subjective appreciation of the total settings of old structures which today includes the aspect of their decay. In future, study

of decay processes operating on extant Historic structures may provide valuable knowledge facilitating the preservation of other more valuable structures. The second recommendation is based on the writer's experience in recording historic log structures: the particular techniques and arrangements of components are important features of all log structures which can be diagnostic of a range of site attributes from ethnicity of builder (e.g. Scandinavians seem to have preferred the dove tail technique) to intrasite structural history (e.g. number of builders, sequence of construction, etc.) It is therefore considered important that attention be focussed on recording the architectural details of historic log structures not just here but elsewhere before this aspect of the Heritage resource is lost.

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1973 — Archaeological Resource Inventory and Evaluation, Crowsnest Pass, Alberta and British Columbia. in W.J. Byrne, comp. Archaeological Salvage Projects 1973. National Museum of Man, Mercury Series. Archaeological Survey of Canada, paper No. 26.

TABLE I HERITAGE SITE SUMMARY, HOSMER-WHEELER PROJECT

DEVELOPMENT LOCALITY	SITE NO.	SITE TYPE	VALUE	RECOMMENDATIONS
Hosmer-Wheeler	DjPr H 1	log building complex	high	do not destroy; document history and architecture
Hosmer-Wheeler	DjPr H 2	log loading ramp	medium	do not needlessly destroy; document architecture

APPENDIX C

APPENDIX C

STREAM SURVEY FORM

Stream No. _____ Station _____ Date _____

Photo No. _____ Air temp. _____ Time _____

Water Sample No. _____

Location and surrounding vegetation: _____

Temp.	pH	Dissolved Oxygen	Bedload		Total Width	Riffle	Pool	WIDTH										Vegetation Bank Cover			Bank Stability	
			Yes	No				Pool Quality					Bottom									
								#1	#2	#3	#4	#5	B	C	G	S-S	O	F	B	O	S	U

Remarks

SURBER SAMPLES			
No.	Distance from bank	Bottom	Remarks

DISCHARGE				
Distance from bank	Depth	Velocity		Discharge
		cks/min	ft/sec	
TOTAL				

B.C. Research

APPENDIX D

VEGETATION DATA FORM

(Second Draft – January, 1976)

NUMBERS 1-17 MUST BE RECORDED FOR EVERY PLOT. FOR DESCRIPTION OF DATA TERMS SEE V.D.F. EXPLANATION SHEET.

1a. Project Identification _____ 1b. Sampling technique _____

2. Name of surveyor(s) and agency _____

3. Plot number _____ 4. Date _____

5. Latitude ____° ____' ____" 6. Longitude ____° ____' ____"

7. Topographical map _____ 8. Plot size _____

9. Location description _____

10. Slope _____ (°/%) 11. Elevation _____ (meters/feet)

12. Aspect _____ 13. Length upslope _____ (meters/feet)

14. Moisture regime:

a. hydric
  i. hydric
  ii. subhydric
b. hygric
  i. hygric
  ii. subhygric
c. mesic
  i. mesic
  ii. submesic
d. xeric
  i. subxeric
  ii. xeric
  iii. very xeric

15. Slope position macro:

a. apex
b. face
c. upper slope
d. middle slope
e. lower slope
f. valley floor
g. plain

16. Surface shape:

a. smooth convex
b. irregular convex
c. smooth straight
d. irregular straight
e. smooth concave
f. irregular concave
g. smooth flat
h. irregular flat

17. Slope position moisture:

a. shedding
b. normal
c. receiving
d. collecting
e. seepage

18. Exposure type:

a. wind
b. insolation
c. frost pocket
d. cold air drainage
e. (other) _____
f. not applicable

19. Site type _____

20. Climatic climax zone/subzone _____

21. Successional trend _____

22. Relative rate of succession _____

23. Cause of stand establishment _____

24. Present land use _____

25. Plot representing _____

26. Miscellaneous comments: (including sample identification of associated determinations)

Veg 1/76

27. Floristic List	STRATUM															
	Cover,												Quantity			
	VETERAN	A1	A2	A3	Total trees	B1	B2	Total shrubs	C	D	Seedlings	All strata	Epiphytes	Epiliths	Epixyles	
Height of top of strata (m/ft.)																
Number of dead snags																
Total vegetation																

	VETERAN
	A1
	A2
	A3
	Total trees
	B1
	B2
	Total shrubs
	C
	D
	Seedlings
	All strata
	Epiphytes
	Epiliths
	Epixyles

28. Substrate	% Grd. Cover	Thickness (cm/in.)	Type
Humus (L-F-H)			
Decaying Wood			
Bedrock			
Rocks			
Mineral Soil			

29. Parent material texture:
finer soil fragments (<2 mm)

A. coarse
- a. coarse
  - i. s
  - ii. ls
- b. moderately coarse
  - i. sl

B. medium
- a. medium
  - i. l
  - ii. sil
  - iii. si

C. fine
- a. moderately fine
  - i. scl
  - ii. cl
  - iii. sicl
- b. fine
  - i. sc
  - ii. c
  - iii. sic
- c. very fine
  - i. hc

D. organic
- a. organic
  - i. fibric
  - ii. mesic
  - iii. humic

30. Parent material texture:
coarser soil fragments (>2 mm)

a. shape
- i. rounded
- ii. angular
- iii. thin, flat

b. size
- i. 2-74 mm
- ii. 75-149 mm
- iii. 150-250 mm
- iv. >250 mm

c. volume
- i. <20%
- ii. 20-49%
- iii. 50-90%
- iv. >90%

d. type
- i. mixed
- ii. (other)_____

31. Parent material salinity:

a. saline
- i. weakly
- ii. moderately
- iii. strongly

b. not saline

32. Parent material calcareousness:

a. calcareous
- i. weakly
- ii. moderately
- iii. strongly

b. not calcareous

33. Parent material acidity:
pH_____

34. Soil drainage:

a. rapidly drained
b. well drained
c. moderately well drained
d. imperfectly drained
e. poorly drained
f. very poorly drained

35. Landform_____

36. Bedrock type_____

37. Depth to lithological discontinuity_____cm.

38. Depth to root restricting layer_____cm.

39. Soil development_____

40. Soil association/member_____

41. Soil profile description:

Horizon	Depth (cm/in.)		Texture	Volume of Coarse Fragments	Colour	Comments (structure, pH, pan, etc.)
	Upper	Lower				

42. Tree mensuration data:

Species				
Horiz. distance (m/ft.)				
Top reading				
Bottom reading				
Height (m/ft.)				
Total height				
Boring height				
Age				
Total age				
DBH				

Prism number				
No. of trees				
BASAL AREA				
S.I. 100				
S.I.				

APPENDIX E

WATER QUALITY ANALYSIS
RESULTS B.C. RESEARCH

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE TLA

Date of Collection	28/10/75	8/1/76	1/6/76	29/6/76	11/7/76	20/8/76		
Time of Collection	14.30	13.00	09.30	12.10	13.30	13.00		
Temperature (°C)	1.0	0	3.0	10.0	12.0	9.0		
Dissolved oxygen (mg/l)	-	-	-	-	9.0	9.9		
-(±2.5% air saturation)	-	-	-	-	85	85		
pH - field	8.3	8.3	8.4	-	7.9	8.0		
- laboratory	8.1	8.3	8.1	8.2	8.2	8.2		
Total solids (mg/l)	205	199	139	149	143	183		
Dissolved solids (mg/l)	205	199	130	126	134	165		
Suspended solids (mg/l)	<1	<1	9	23	9	18		
Volatile suspended solids (mg/l)	-	-	4	15	6	9		
Turbidity (mg SiO_2/l)	0.5	0.8	3.4	6.7	1.8	5.0		
Alkalinity (mg $CaCO_3$/l)	161	164	99	107	127	131		
EDTA Hardness (mg $CaCO_3$/l)	167	169	104	109	131	133		
Specific Conductance (μmhos/cm)	278	276	178	176	224	220		
TOC (mg/l)	3	5	5	5	7	8		
Sulphate (mg/l)	11	10	6	6	8	7		
Dissolved Zinc (μg/l)	2	1	-	-	-	-		
Dissolved Lead (μg/l)	<5	<5	-	-	-	-		
Dissolved Copper (μg/l)	<1	<1	-	-	-	-		
Dissolved Iron (μg/l)	<5	3	7	18	1	70		

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE KA(HW3)

Date of Collection	28/10/75	8/1/76	31/5/76	29/6/76	11/7/76	21/8/76		
Time of Collection	12.45	10.30				13.30		
Temperature (°C)	0	0	I	I	I	7.0		
Dissolved oxygen (mg/1)	-	-	N	N	N	9.6		
-(±2.5% air saturation)	-	-	A	A	A	80		
pH - field	9.1	8.0				7.7		
- laboratory	7.8	8.1	C	C	C	7.9		
Total solids (mg/1)	116	118	C	C	C	80		
Dissolved solids (mg/1)	116	118	E	E	E	80		
Suspended solids (mg/1)	<1	<1	S	S	S	<1		
Volatile suspended solids (mg/1)	-	-	S	S	S	<1		
Turbidity (mg SiO_2/1)	0.6	0.5	I	I	I	2.0		
Alkalinity (mg $CaCO_3$/1)	73	91	B	B	B	57		
EDTA Hardness (mg $CaCO_3$/1)	77	96	L	L	L	60		
Specific Conductance (μmhos/cm)	132	165	E	E	E	120		
TOC (mg/1)	3	3				6		
Sulphate (mg/1)	7	7				2		
Dissolved Zinc (μg/1)	3	8				-		
Dissolved Lead (μg/1)	<5	<5				-		
Dissolved Copper (μg/1)	<1	<1				-		
Dissolved Iron (μg/1)	<5	2				35		

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE K3A(HW2)

Date of Collection	28/10/75	8/1/76	31/5/76	29/6/76	11/7/76	21/8/76		
Time of Collection	-	10.30				12.00		
Temperature (°C)	1.0	0	I	I	I	6.0		
Dissolved oxygen (mg/l)	-	-	N	N	N	10.0		
-(±2.5% air saturation)	-	-				80		
pH - field	8.8	8.2	A	A	A	8.1		
- laboratory	8.0	8.3	C	C	C	8.2		
Total solids (mg/l)	204	184	C	C	C	157		
Dissolved solids (mg/l)	204	181	E	E	E	155		
Suspended solids (mg/l)	<1	3	S	S	S	2		
Volatile suspended solids (mg/l)	-	-	S	S	S	1		
Turbidity (mg SiO_2/l)	0.5	1.1	I	I	I	2.0		
Alkalinity (mg $CaCO_3$/l)	158	155	B	B	B	112		
EDTA Hardness (mg $CaCO_3$/l)	163	159	L	L	L	118		
Specific Conductance (μmhos/cm)	276	265	E	E	E	196		
TOC (mg/l)	4	10				9		
Sulphate (mg/l)	13	11				7		
Dissolved Zinc (μg/l)	1	1				-		
Dissolved Lead (μg/l)	<5	<5				-		
Dissolved Copper (μg/l)	<1	<1				-		
Dissolved Iron (μg/l)	<5	<1				15		

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE KF

Date of Collection	21/4/76	31/5/76	29/6/76	11/7/76	20/8/76			
Time of Collection	11.00	16.15		16.10	17.30			
Temperature (^{o}C)	2.0	4.5	C	10.0	9.0			
Dissolved oxygen (mg/l)	-	-	N	10.8	9.6			
-(±2.5% air saturation)	-	-	I	95	85			
pH - field	8.1	8.2		8.1	7.8			
- laboratory	8.2	7.9		7.9	8.0			
Total solids (mg/l)	121	102		86	149			
Dissolved solids (mg/l)	118	91	W	81	129			
Suspended solids (mg/l)	3	11	O	5	20			
Volatile suspended solids (mg/l)	-	3	R	2	6			
Turbidity (mg SiO_2/l)	4.2	7.2	K	3.1	10			
Alkalinity (mg $CaCO_3$/l)	95	73	I	71	98			
EDTA Hardness (mg $CaCO_3$/l)	96	78	N	73	104			
Specific Conductance (μmhos/cm)	175	142	G	132	180			
TOC (mg/l)	2	5		4	9			
Sulphate (mg/l)	6	6		5	8			
Dissolved Zinc (μg/l)	<1	-		-	-			
Dissolved Lead (μg/l)	<5	-		-	-			
Dissolved Copper (μg/l)	<1	-		-	-			
Dissolved Iron (μg/l)	17	46		11	150			

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE 7A

Date of Collection	8/1/76	21/4/76	31/5/76	29/6/76	11/7/76	20/8/76		
Time of Collection	13.00	10.45	16.00		16.00	17.15		
Temperature (°C)	0	2.0	4.5		13.0	9.0		
Dissolved oxygen (mg/l)	-	-	-	C	10.0	9.5		
-(±2.5% air saturation)	-	-	-	N	95	80		
pH - field	8.1	8.0	8.1	I	8.3	7.9		
- laboratory	8.2	8.3	8.2		8.3	8.2		
Total solids (mg/l)	159	184	202		213	201		
Dissolved solids (mg/l)	159	179	198	W	211	200		
Suspended solids (mg/l)	<1	5	4	O	2	1		
Volatile suspended solids (mg/l)	-	-	2	R	1	<1		
Turbidity (mg SiO_2/l)	1.3	2.6	2.8	K	0.8	2.0		
Alkalinity (mg $CaCO_3$/l)	122	151	140	I	179	156		
EDTA Hardness (mg $CaCO_3$/l)	127	147	149	N	191	166		
Specific Conductance (μmhos/cm)	222	230	242	G	332	275		
TOC (mg/l)	5	3	2		11	10		
Sulphate (mg/l)	13	6	14		21	15		
Dissolved Zinc (μg/l)	1	<1	-		-	-		
Dissolved Lead (μg/l)	<5	<5	-		-	-		
Dissolved Copper (μg/l)	<1	<1	-		-	-		
Dissolved Iron (μg/l)	2	5	5		1	35		

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE KC(HW12)

Date of Collection	28/10/75	8/1/76	21/4/76	31/5/76	29/6/76	11/7/76	20/8/76	
Time of Collection	15.00	12.30	11.00	15.45		16.30	17.00	
Temperature (°C)	3.0	0	2.0	4.5		11.0	9.0	
Dissolved oxygen (mg/l)	-	-	-	-		10.7	9.7	
-(±2.5% air saturation)	-	-	-	-	C	95	85	
pH - field	8.4	8.0	8.0	8.1	N	7.8	7.8	
- laboratory	7.8	8.2	8.2	7.9	I	8.0	8.1	
Total solids (mg/l)	166	154	157	128		81	170	
Dissolved solids (mg/l)	165	154	153	119		76	149	
Suspended solids (mg/l)	1	1	4	9	W	5	21	
Volatile suspended solids (mg/l)	-	-	-	3	O	<1	6	
Turbidity (mg SiO_2/l)	1.3	1.4	3.4	6.1	R	3.0	10	
Alkalinity (mg $CaCO_3$/l)	116	120	119	82	K	74	105	
EDTA Hardness (mg $CaCO_3$/l)	122	124	122	85	I	76	111	
Specific Conductance (μmhos/cm)	207	216	209	134	N	141	187	
TOC (mg/l)	3	3	1	4	G	4	10	
Sulphate (mg/l)	9	10	8	7		5	8	
Dissolved Zinc (μg/l)	3	3	<1	2		-	-	
Dissolved Lead (μg/l)	<5	<5	<5	<5		-	-	
Dissolved Copper (μg/l)	<1	<2	<1	<1		-	-	
Dissolved Iron (μg/l)	<5	5	8	60		18	250	
Dissolved Mercury (μg/l)	-	-	-	<0.05		-	-	
Dissolved Arsenic (μg/l)	-	-	-	<1		-	-	
Phenols (μg/l)	-	-	-	4		-	-	
Ammonia (μg N/l)	-	-	-	17		-	-	

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE KB(HW8)

Date of Collection	28/10/75	8/1/76	21/4/76	31/5/76	29/6/76	10/7/76	20/8/76
Time of Collection	11.30	13.00	12.00	15.15	12.50	17.40	16.00
Temperature (°C)	2.0	0	4.0	5.0	9.5	11.0	9.0
Dissolved oxygen (mg/l)	-	-	-	-	-	10.4	9.8
-(±2.5% air saturation)	-	-	-	-	-	95	85
pH - field	8.7	7.8	7.6	8.2	-	8.5	7.9
- laboratory	7.9	8.2	8.2	7.9	8.0	7.9	8.2
Total solids (mg/l)	177	149	145	129	145	89	153
Dissolved solids (mg/l)	177	149	141	118	97	82	132
Suspended solids (mg/l)	<1	<1	4	11	48	7	21
Volatile suspended solids (mg/l)	-	-	-	4	10	3	8
Turbidity (mg SiO_2/l)	0.8	1.4	3.8	7.1	12.0	3.4	11
Alkalinity (mg $CaCO_3$/l)	128	120	115	79	70	72	105
EDTA Hardness (mg $CaCO_3$/l)	136	125	116	83	73	74	108
Specific Conductance (μmhos/cm)	233	218	181	138	127	136	193
TOC (mg/l)	2	3	2	1	2	4	11
Sulphate (mg/l)	11	10	7	6	6	5	8
Dissolved Zinc (μg/l)	<1	1	<1	-	-	5	3
Dissolved Lead (μg/l)	<5	<5	<5	-	-	<5	<5
Dissolved Copper (μg/l)	<1	<1	<1	-	-	<1	<1
Dissolved Iron (μg/l)	<5	3	10	26	210	31	250
Dissolved Mercury (μg/l)	-	-	-	-	-	<0.05	<0.05
Dissolved Arsenic (μg/l)	-	-	-	-	-	<1	<1
Dissolved Manganese (μg/l)	-	-	-	-	-	10	3
Phenols (μg/l)	-	-	-	-	-	7	4
Ammonia (μg N/l)	-	-	-	-	-	3	63

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH
SITE KD(HW9)

Date of Collection	28/10/75	8/1/76	21/4/76	31/5/76	29/6/76	11/7/76	20/8/76	
Time of Collection	-	13.00	16.00	17.50	15.50	16.00	11.30	
Temperature (°C)	3.0	0	2.0	7.0	11.5	12.0	8.0	
Dissolved oxygen (mg/l)	-	-	-	-	-	9.6	8.6	
-(±2.5% air saturation)	-	-	-	-	-	90	70	
pH - field	8.3	7.9	7.5	8.1	-	8.1	7.3	
- laboratory	7.8	8.1	8.1	8.1	8.1	8.1	8.0	
Total solids (mg/l)	230	203	212	165	141	127	223	
Dissolved solids (mg/l)	230	203	208	162	134	125	179	
Suspended solids (mg/l)	<1	<1	4	3	7	2	44	
Volatile suspended solids (mg/l)	-	-	-	2	2	<1	8	
Turbidity (mg SiO_2/l)	0.4	0.9	1.2	2.8	8.4	1.6	42	
Alkalinity (mg $CaCO_3$/l)	180	169	174	133	114	119	136	
EDTA Hardness (mg $CaCO_3$/l)	188	176	180	138	115	121	137	
Specific Conductance (μmhos/cm)	325	305	320	217	196	208	238	
TOC (mg/l)	1	2	<1	2	4	5	9	
Sulphate (mg/l)	14	12	14	7	6	6	10	
Dissolved Zinc (μg/l)	3	1	2	2	-	-	-	
Dissolved Lead (μg/l)	<5	<5	<5	<5	-	-	-	
Dissolved Copper (μg/l)	<1	<1	<1	<1	-	-	-	
Dissolved Iron (μg/l)	7	5	7	26	65	13	550	
Dissolved Mercury (μg/l)	-	-	-	<0.05	-	-	-	
Dissolved Arsenic (μg/l)	-	-	-	<1	-	-	-	
Phenols (μg/l)	-	-	-	6	-	-	-	
Ammonia (μg N/l)	-	-	-	18	-	-	-	

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE K2A(HW6)

Date of Collection	29/10/75	8/1/76	21/4/76	31/5/76	29/6/76	11/7/76	20/8/76
Time of Collection	16.50	12.00	16.00	16.45	13.45	17.00	15.30
Temperature (^{o}C)	1.0	0	3.0	5.0	10.0	13.0	9.0
Dissolved oxygen (mg/l)	-	-	-	-	-	9.8	9.6
-(±2.5% air saturation)	-	-	-	-	-	90	85
pH - field	8.5	7.9	7.9	8.3	-	8.1	8.0
- laboratory	7.8	8.1	8.1	8.0	8.2	8.2	8.2
Total solids (mg/l)	176	142	183	123	147	138	138
Dissolved solids (mg/l)	175	140	135	120	144	137	138
Suspended solids (mg/l)	1	2	48	3	3	1	<1
Volatile suspended solids (mg/l)	-	-	-	2	2	<1	<1
Turbidity (mg SiO_2/l)	1.0	4.8	57	4.0	2.6	1.7	5.0
Alkalinity (mg $CaCO_3$/l)	121	102	82	86	141	122	108
EDTA Hardness (mg $CaCO_3$/l)	121	104	82	91	113	122	106
Specific Conductance (μmhos/cm)	212	185	146	140	193	213	190
TOC (mg/l)	5	5	3	4	5	7	12
Sulphate (mg/l)	8	8	5	6	7	6	5
Dissolved Zinc (μg/l)	2	2	8	-	-	-	-
Dissolved Lead (μg/l)	<5	<5	<5	-	-	-	-
Dissolved Copper (μg/l)	<1	2	<1	-	-	-	-
Dissolved Iron (μg/l)	5	36	160	26	25	11	200

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE K4A

Date of Collection	29/10/75	8/1/76	21/4/76	31/5/76	29/6/76	11/7/76	20/8/76
Time of Collection	10.00	14.00	09.00	17.10	15.20	18.00	11.0
Temperature (^{o}C)	4.0	0	3.0	6.0	10.0	12.0	8.0
Dissolved oxygen (mg/l)	-	-	-	-	-	8.4	8.6
-(±2.5% air saturation)	-	-	-	-	-	80	70
pH - field	8.3	7.7	7.7	8.1	-	7.6	7.2
- laboratory	7.6	8.0	7.8	7.9	8.1	8.2	8.1
Total solids (mg/l)	234	192	160	151	154	157	182
Dissolved solids (mg/l)	233	192	156	141	150	154	175
Suspended solids (mg/l)	1	<1	4	10	4	3	7
Volatile suspended solids (mg/l)	-	-	-	3	2	2	2
Turbidity (mg SiO_2/l)	0.6	1.6	4.2	4.9	2.1	1.2	11
Alkalinity (mg $CaCO_3$/l)	190	163	130	100	122	147	134
EDTA Hardness (mg $CaCO_3$/l)	193	166	131	104	124	150	135
Specific Conductance (μmhos/cm)	330	280	222	174	204	258	232
TOC (mg/l)	2	4	1	5	4	10	11
Sulphate (mg/l)	7	7	6	5	5	6	6
Dissolved Zinc (μg/l)	1	2	<1	-	-	-	-
Dissolved Lead (μg/l)	<5	<5	<5	-	-	-	-
Dissolved Copper (μg/l)	<1	<1	<1	-	-	-	-
Dissolved Iron (μg/l)	24	27	32	26	26	38	220

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE HW13

Date of Collection	31/5/76	29/6/76	10/7/76	19/8/76				
Time of Collection	19.15	14.05	12.45	12.00				
Temperature (°C)	7.5	12.0	12.0	9.0				
Dissolved oxygen (mg/l)	-	-	10.3	9.6				
-(±2.5% air saturation)	-	-	95	85				
pH - field	8.4	-	7.5	7.6				
- laboratory	8.1	8.1	8.1	8.2				
Total solids (mg/l)	153	131	123	184				
Dissolved solids (mg/l)	149	129	121	169				
Suspended solids (mg/l)	4	2	2	15				
Volatile suspended solids (mg/l)	2	1	<1	3				
Turbidity (mg SiO_2/l)	2.8	2.1	1.8	6.0				
Alkalinity (mg $CaCO_3$/l)	108	112	122	133				
EDTA Hardness (mg $CaCO_3$/l)	114	116	123	147				
Specific Conductance (μmhos/cm)	191	185	214	250				
TOC (mg/l)	4	4	6	9				
Sulphate (mg/l)	6	6	5	7				
Dissolved Zinc (μg/l)	4	-	5	2				
Dissolved Lead (μg/l)	<5	-	<5	<5				
Dissolved Copper (μg/l)	<1	-	<1	<1				
Dissolved Iron (μg/l)	33	30	24	50				
Dissolved Mercury (μg/l)	<0.05	-	<0.05	<0.05				
Dissolved Arsenic (μg/l)	<1	-	<1	<1				
Dissolved Manganese (μg/l)	-	-	33	12				
Phenols (μg/l)	5	-	6	<2				
Ammonia (μg N/l)	17	-	3	22				

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE HW15

Date of Collection	31/5/76	29/6/76	10/7/76	19/8/76				
Time of Collection	18.30	10.25	16.30	15.00				
Temperature (°C)	8.0	9.0	13.0	8.0				
Dissolved oxygen (mg/1)	-	-	10.4	9.7				
-(±2.5% air saturation)	-	-	100	80				
pH - field	8.3	-	8.6	7.9				
- laboratory	8.2	8.2	8.2	8.2				
Total solids (mg/1)	165	171	157	221				
Dissolved solids (mg/1)	151	167	149	169				
Suspended solids (mg/1)	14	4	8	52				
Volatile suspended solids (mg/1)	4	3	1	12				
Turbidity (mg SiO_2/1)	5.8	2.0	1.6	6.0				
Alkalinity (mg $CaCO_3$/1)	117	115	119	128				
EDTA Hardness (mg $CaCO_3$/1)	130	130	129	151				
Specific Conductance (μmhos/cm)	213	216	225	242				
TOC (mg/1)	<1	2	4	7				
Sulphate (mg/1)	13	14	13	16				
Dissolved Zinc (μg/1)	3	-	<1	3				
Dissolved Lead (μg/1)	<5	-	<5	<5				
Dissolved Copper (μg/1)	<1	-	<1	<1				
Dissolved Iron (μg/1)	6	27	<1	20				
Dissolved Mercury (μg/1)	<0.05	-	<0.05	<0.05				
Dissolved Arsenic (μg/1)	<1	-	<1	<1				
Dissolved Manganese (μg/1)	-	-	3	2				
Phenols (μg/1)	7	-	4	<2				
Ammonia (μg N/1)	27	-	10	45				

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH
SITE HW10

Date of Collection	8/1/76	21/4/76	1/6/76	29/6/76	10/7/76	19/8/76		
Time of Collection	14.30	17.30	10.50	16.15	15.40	14.00		
Temperature (°C)	0	-	5.0	12.0	13.0	8.0		
Dissolved oxygen (mg/l)	-	-	-	-	11.1	9.9		
-(±2.5% air saturation)	-	-	-	-	105	85		
pH - field	8.2	8.1	8.2	-	8.2	7.9		
- laboratory	8.3	8.4	8.2	8.5	8.2	8.2		
Total solids (mg/l)	226	215	187	148	140	192		
Dissolved solids (mg/l)	226	211	173	143	132	164		
Suspended solids (mg/l)	<1	4	14	5	8	28		
Volatile suspended solids (mg/l)	-	-	2	2	4	8		
Turbidity (mg SiO_2/l)	0.9	3.7	5.6	2.3	1.6	6.0		
Alkalinity (mg $CaCO_3$/l)	160	144	117	120	118	128		
EDTA Hardness (mg $CaCO_3$/l)	187	166	131	133	129	148		
Specific Conductance (μmhos/cm)	320	270	223	215	222	237		
TOC (mg/l)	1	<1	3	3	4	7		
Sulphate (mg/l)	30	25	14	15	13	16		
Dissolved Zinc (μg/l)	2	<1	1	-	<1	1		
Dissolved Lead (μg/l)	<5	<5	<5	-	<5	<5		
Dissolved Copper (μg/l)	<1	<1	<1	-	<1	<1		
Dissolved Iron (μg/l)	<1	<1	<1	1	1	20		
Dissolved Mercury (μg/l)	-	-	<0.05	-	<0.05	<0.05		
Dissolved Arsenic (μg/l)	-	-	<1	-	<1	<1		
Dissolved Manganese (μg/l)	-	-	-	-	2	2		
Phenols (μg/l)	-	-	7	-	5	<2		
Ammonia (μg N/l)	-	-	26	-	5	33		

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE HW11

Date of Collection	8/1/76	21/4/76	1/6/76	29/6/76	10/7/76	19/8/76		
Time of Collection	14.00	18.30	08.50	14.50	10.15	10.00		
Temperature (°C)	0	-	5.0	12.0	11.0	8.0		
Dissolved oxygen (mg/l)	-	-	-	-	10.4	9.6		
-(±2.5% air saturation)	-	-	-	-	95	80		
pH - field	8.1	8.1	8.1	-	7.5	7.8		
- laboratory	-	8.4	8.1	8.4	8.2	8.1		
Total solids (mg/l)	-	209	171	145	132	169		
Dissolved solids (mg/l)	-	205	155	142	128	167		
Suspended solids (mg/l)	-	4	16	3	4	2		
Volatile suspended solids (mg/l)	-	-	4	<1	1	1		
Turbidity (mg SiO_2/l)	-	3.2	5.2	2.0	1.8	4.0		
Alkalinity (mg $CaCO_3$/l)	-	145	118	118	120	147		
EDTA Hardness (mg $CaCO_3$/l)	-	169	129	127	129	150		
Specific Conductance (μmhos/cm)	-	285	217	212	226	253		
TOC (mg/l)	-	<1	3	3	4	9		
Sulphate (mg/l)	-	26	12	12	12	7		
Dissolved Zinc (μg/l)	1	<1	-	-	1	2		
Dissolved Lead (μg/l)	<5	<5	-	-	<5	<5		
Dissolved Copper (μg/l)	<1	<1	-	-	<1	<1		
Dissolved Iron (μg/l)	<1	<1	8	7	1	30		
Dissolved Mercury (μg/l)	-	-	-	-	<0.05	<0.05		
Dissolved Arsenic (μg/l)	-	-	-	-	<1	<1		
Dissolved Manganese (μg/l)	-	-	-	-	7	5		
Phenols (μg/l)	-	-	-	-	6	2		
Ammonia (μg N/l)	-	-	-	-	5	19		

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE HW14

Date of Collection	31/5/76	29/6/76	10/7/76	19/8/76				
Time of Collection	19.30	14.30	13.40	11.00				
Temperature (°C)	8.0	11.0	11.0	8.0				
Dissolved oxygen (mg/l)	-	-	10.4	9.4				
-(±2.5% air saturation)	-	-	95	80				
pH - field	8.3	-	8.2	7.7				
- laboratory	8.2	8.4	8.3	8.2				
Total solids (mg/l)	176	155	144	190				
Dissolved solids (mg/l)	162	153	139	168				
Suspended solids (mg/l)	14	2	5	22				
Volatile suspended solids (mg/l)	4	<1	<1	5				
Turbidity (mg SiO_2/l)	5.9	2.0	2.4	6.0				
Alkalinity (mg $CaCO_3$/l)	120	125	123	129				
EDTA Hardness (mg $CaCO_3$/l)	131	136	132	150				
Specific Conductance (µmhos/cm)	223	227	232	240				
TOC (mg/l)	2	3	5	8				
Sulphate (mg/l)	3	15	13	17				
Dissolved Zinc (µg/l)	4	-	<1	2				
Dissolved Lead (µg/l)	<5	-	<5	<5				
Dissolved Copper (µg/l)	<1	-	<1	1				
Dissolved Iron (µg/l)	2	12	<1	30				
Dissolved Mercury (µg/l)	<0.05	-	<0.05	<0.05				
Dissolved Arsenic (µg/l)	<1	-	<1	<1				
Dissolved Manganese (µg/l)	-	-	2	3				
Phenols (µg/l)	6	-	8	6				
Ammonia (µg N/l)	26	-	1	7				

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE K2F

Date of Collection	29/6/76	11/7/76	20/8/76					
Time of Collection								
Temperature (°C)	D	D	D					
Dissolved oxygen (mg/l) -(±2.5% air saturation)	R Y	R Y	R Y					
pH - field - laboratory								
Total solids (mg/l)								
Dissolved solids (mg/l)								
Suspended solids (mg/l)								
Volatile suspended solids (mg/l)								
Turbidity (mg SiO_2/l)								
Alkalinity (mg $CaCO_3$/l)								
EDTA Hardness (mg $CaCO_3$/l)								
Specific Conductance (µmhos/cm)								
TOC (mg/l)								
Sulphate (mg/l)								
Dissolved Zinc (µg/l)								
Dissolved Lead (µg/l)								
Dissolved Copper (µg/l)								
Dissolved Iron (µg/l)								

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE KE

Date of Collection	28/10/75	8/1/76						
Time of Collection	-	14.00						
Temperature (^{o}C)	3.0	0						
Dissolved oxygen (mg/l)	-	-						
-(±2.5% air saturation)	-	-						
pH - field	8.6	7.8						
- laboratory	7.9	8.1						
Total solids (mg/l)	252	206						
Dissolved solids (mg/l)	252	205						
Suspended solids (mg/l)	<1	<1						
Volatile suspended solids (mg/l)	-	-						
Turbidity (mg SiO_2/l)	0.5	1.5						
Alkalinity (mg $CaCO_3$/l)	197	177						
EDTA Hardness (mg $CaCO_3$/l)	204	183						
Specific Conductance (μmhos/cm)	335	315						
TOC (mg/l)	2	3						
Sulphate (mg/l)	8	11						
Dissolved Zinc (μg/l)	2	1						
Dissolved Lead (μg/l)	<5	<5						
Dissolved Copper (μg/l)	<1	<1						
Dissolved Iron (μg/l)	<5	6						

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE KG

Date of Collection	10/7/76	20/8/76						
Time of Collection	14.40	10.00						
Temperature (°C)	14.0	8.0						
Dissolved oxygen (mg/l)	9.9	8.7						
-(±2.5% air saturation)	95	75						
pH - field	7.8	7.4						
- laboratory	8.2	8.0						
Total solids (mg/l)	146	189						
Dissolved solids (mg/l)	143	182						
Suspended solids (mg/l)	3	7						
Volatile suspended solids (mg/l)	1	2						
Turbidity (mg SiO_2/l)	1.4	8.0						
Alkalinity (mg $CaCO_3$/l)	136	157						
EDTA Hardness (mg $CaCO_3$/l)	140	163						
Specific Conductance (μmhos/cm)	234	274						
TOC (mg/l)	6	6						
Sulphate (mg/l)	6	7						
Dissolved Zinc (μg/l)	2	2						
Dissolved Lead (μg/l)	<5	<5						
Dissolved Copper (μg/l)	<1	<1						
Dissolved Iron (μg/l)	22	130						
Dissolved Mercury (μg/l)	<0.05	<0.05						
Dissolved Arsenic (μg/l)	<1	<1						
Dissolved Manganese (μg/l)	48	37						
Phenols (μg/l)	5	<2						
Ammonia (μg N/l)	9	22						

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE KH

Date of Collection	29/6/76	11/7/76	20/8/76*					
Time of Collection			12.00					
Temperature (°C)	N	N	9.0					
Dissolved oxygen (mg/l)	O	O	9.8					
-(±2.5% air saturation)			85					
pH - field	F	F	8.0					
- laboratory			8.2					
Total solids (mg/l)	L	L	188					
Dissolved solids (mg/l)	O	O	173					
Suspended solids (mg/l)	W	W	15					
Volatile suspended solids (mg/l)			8					
Turbidity (mg SiO_2/l)			5.0					
Alkalinity (mg $CaCO_3$/l)			126					
EDTA Hardness (mg $CaCO_3$/l)			132					
Specific Conductance (μmhos/cm)			218					
TOC (mg/l)			8					
Sulphate (mg/l)			7					
Dissolved Zinc (μg/l)			-					
Dissolved Lead (μg/l)			-					
Dissolved Copper (μg/l)			-					
Dissolved Iron (μg/l)			65					

*Taken above RR tracks

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE HW1

Date of Collection	11/7/76	21/8/76						
Time of Collection		12.30						
Temperature (°C)	I	4.0						
Dissolved oxygen (mg/l)	N	10.2						
-(±2.5% air saturation)	A	75						
pH - field	C	8.1						
- laboratory		7.9						
Total solids (mg/l)	C	112						
Dissolved solids (mg/l)	E	111						
Suspended solids (mg/l)	S	1						
Volatile suspended solids (mg/l)	S	1						
Turbidity (mg SiO_2/l)	I	3						
Alkalinity (mg $CaCO_3$/l)	B	72						
EDTA Hardness (mg $CaCO_3$/l)	L	77						
Specific Conductance (μmhos/cm)	E	137						
TOC (mg/l)		6						
Sulphate (mg/l)		5						
Dissolved Zinc (μg/l)		-						
Dissolved Lead (μg/l)		-						
Dissolved Copper (μg/l)		-						
Dissolved Iron (μg/l)		70						

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE HW4

Date of Collection	11/7/76	22/8/76						
Time of Collection		10.15						
Temperature (°C)	D	7.0						
Dissolved oxygen (mg/1)	R	10.0						
-(±2.5% air saturation)	Y	80						
pH - field		8.1						
- laboratory		8.2						
Total solids (mg/1)		139						
Dissolved solids (mg/1)		135						
Suspended solids (mg/1)		4						
Volatile suspended solids (mg/1)		1						
Turbidity (mg SiO_2/1)		1.0						
Alkalinity (mg $CaCO_3$/1)		114						
EDTA Hardness (mg $CaCO_3$/1)		118						
Specific Conductance (μmhos/cm)		202						
TOC (mg/1)		8						
Sulphate (mg/1)		6						
Dissolved Zinc (μg/1)		-						
Dissolved Lead (μg/1)		-						
Dissolved Copper (μg/1)		-						
Dissolved Iron (μg/1)		10						

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

SITE HW5

Date of Collection	11/7/76	21/8/76						
Time of Collection		14.30						
Temperature (^{o}C)		5.0						
Dissolved oxygen (mg/l)	I	9.8						
-(±2.5% air saturation)	N	75						
pH - field	A	8.1						
- laboratory	C	8.1						
Total solids (mg/l)	C	168						
Dissolved solids (mg/l)	E	168						
Suspended solids (mg/l)	S	<1						
Volatile suspended solids (mg/l)	S	<1						
Turbidity (mg SiO_2/l)	I	1.0						
Alkalinity (mg $CaCO_3$/l)	B	129						
EDTA Hardness (mg $CaCO_3$/l)	L	134						
Specific Conductance (μmhos/cm)	E	225						
TOC (mg/l)		11						
Sulphate (mg/l)		7						
Dissolved Zinc (μg/l)		-						
Dissolved Lead (μg/l)		-						
Dissolved Copper (μg/l)		-						
Dissolved Iron (μg/l)		10						

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

WELL G1

Date of Collection	21/4/76	31/5/76	11/7/76	20/8/76				
Time of Collection	15.00		11.45	18.30				
Temperature (°C)	-	D	-	9.0				
Dissolved oxygen (mg/1)	-	R	-	-				
-(±2.5% air saturation)	-	Y	-	-				
pH - field	7.4		7.5	6.8				
- laboratory	7.5		8.3	7.9				
Total solids (mg/1)	471		465	305				
Dissolved solids (mg/1)	258		244	265				
Suspended solids (mg/1)	213		221	40				
Volatile suspended solids (mg/1)	-		22	8				
Turbidity (mg SiO_2/1)	55		120	10				
Alkalinity (mg $CaCO_3$/1)	225		204	224				
EDTA Hardness (mg $CaCO_3$/1)	225		207	242				
Specific Conductance (μmhos/cm)	360		352	380				
TOC (mg/1)	<1		7	4				
Sulphate (mg/1)	1		7	7				
Dissolved Zinc (μg/1)	8		21	5				
Dissolved Lead (μg/1)	<5		<5	<5				
Dissolved Copper (μg/1)	2		6	<1				
Dissolved Iron (μg/1)	6		4	<5				
Dissolved Mercury (μg/1)	-		0.84	<0.05				
Dissolved Arsenic (μg/1)	-		<1	<1				
Dissolved Manganese (μg/1)	-		4	5				
Phenols (μg/1)	-		4	<2				
Ammonia (μg N/1)	-		29	96				
Nitrate (μg N/1)	-		12	15				
Nitrite (μg N/1)	-		<1	<1				

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

WELL G2

Date of Collection	21/4/76	31/5/76	11/7/76	19/8/76				
Time of Collection	13.00		10.00	17.00				
Temperature (°C)	-	D	-	7.0				
Dissolved oxygen (mg/l)	-	R	-	-				
-(±2.5% air saturation)	-	Y	-	-				
pH - field	7.6		7.2	6.8				
- laboratory	7.6		8.1	7.9				
Total solids (mg/l)	444		3395	425				
Dissolved solids (mg/l)	211		955	278				
Suspended solids (mg/l)	233		2440	147				
Volatile suspended solids (mg/l)	-		149	14				
Turbidity (mg SiO_2/l)	130		150	59				
Alkalinity (mg $CaCO_3$/l)	140		200	225				
EDTA Hardness (mg $CaCO_3$/l)	139		202	237				
Specific Conductance (μmhos/cm)	250		354	385				
TOC (mg/l)	3		8	4				
Sulphate (mg/l)	10		5	8				
Dissolved Zinc (μg/l)	29		24	6				
Dissolved Lead (μg/l)	<5		<5	<5				
Dissolved Copper (μg/l)	4		7	1				
Dissolved Iron (μg/l)	130		36	10				
Dissolved Mercury (μg/l)	-		0.16	<0.05				
Dissolved Arsenic (μg/l)	-		<1	<1				
Dissolved Manganese (μg/l)	-		9	5				
Phenols (μg/l)	-		4	<2				
Ammonia (μg N/l)	-		10	31				
Nitrate (μg N/l)	-		330	5				
Nitrite (μg N/l)	-		<1	<1				

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH

WELL G3, G4

Date of Collection	11/7/76	19/8/76	19/8/76					
Time of Collection			16.00					
Temperature (°C)	D	D	9.5					
Dissolved oxygen (mg/l)	R	R	-					
-(±2.5% air saturation)	Y	Y	-					
pH - field			7.3					
- laboratory			7.9					
Total solids (mg/l)			227					
Dissolved solids (mg/l)			225					
Suspended solids (mg/l)			2					
Volatile suspended solids (mg/l)			1					
Turbidity (mg SiO_2/l)			3.0					
Alkalinity (mg $CaCO_3$/l)			203					
EDTA Hardness (mg $CaCO_3$/l)			204					
Specific Conductance (μmhos/cm)			358					
TOC (mg/l)			5					
Sulphate (mg/l)			6					
Dissolved Zinc (μg/l)			9					
Dissolved Lead (μg/l)			<5					
Dissolved Copper (μg/l)			1					
Dissolved Iron (μg/l)			30					
Dissolved Mercury (μg/l)			<0.05					
Dissolved Arsenic (μg/l)			<1					
Dissolved Manganese (μg/l)			110					
Phenols (μg/l)			<2					
Ammonia (μg N/l)			31					
Nitrate (μg N/l)			5					
Nitrite (μg N/l)			<1					

WATER QUALITY ANALYSIS RESULTS, B.C. RESEARCH
MISCELLANEOUS WELLS

Well Code	CG Well	HTW1	HTW2	HTW3	HTW4
Date of collection	19/8/76	22/8/76	22/8/76	22/8/76	22/8/76
Time of collection	13.00	12.15	13.30	14.00	15.00
Temperature (°C)	8.0	7.0	7.0	6.0	11.0
Dissolved oxygen (mg/l)	-	-	-	-	-
-(±2.5% air saturation)	-	-	-	-	-
pH - field	6.9	7.2	7.5	7.5	7.4
- laboratory	7.8	7.9	7.8	8.0	7.8
Total solids (mg/l)	213	266	248	214	206
Dissolved solids (mg/l)	213	245	243	208	203
Suspended solids (mg/l)	<1	21	5	6	3
Turbidity (mg SiO_2/l)	1.0	13	6.0	3.0	2.0
Alkalinity (mg $CaCO_3$/l)	188	213	207	170	177
EDTA Hardness (mg $CaCO_3$/l)	193	209	189	184	185
Specific Conductance (μmhos/cm)	332	370	372	318	310
TOC (mg/l)	4	4	4	6	5
Sulphate (mg/l)	10	15	15	1	7
Dissolved Zinc (μg/l)	170	9	1	17	90
Dissolved Lead (μg/l)	<5	<5	<5	<5	<5
Dissolved Copper (μg/l)	<1	<1	2	<1	2
Dissolved Iron (μg/l)	35	590	400	30	5
Dissolved Mercury (μg/l)	<0.05	<0.05	<0.05	<0.05	<0.05
Dissolved Arsenic (μg/l)	<1	<1	<1	<1	<1
Dissolved Manganese (μg/l)	2	88	38	4	2
Phenols (μg/l)	4	4	3	2	<2
Ammonia (μg N/l)	14	136	155	9	49
Nitrate (μg N/l)	23	4	5	8	<1
Nitrite (μg N/l)	<1	<1	2	4	<1

APPENDIX F

WATER QUALITY ANALYSIS RESULTS, KAISER

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE TLA

Date of Collection	19/7/76	4/8/76	9/8/76					
Time of Collection	11.10	10.50	11.50					
Temperature (°C)	12.0	11.0	9.0					
Dissolved Oxygen (mg/l)	10.6	9.6	9.0					
-(±2.5% air saturation)	100	85	80					
pH	8.4	8.3	8.1					
Total solids (mg/l)	226	264	2848					
Dissolved solids (mg/l)	218	259	177					
Suspended solids (mg/l)	8	5	2671					
Turbidity (mg SiO_2/l)	4	3	320					
Alkalinity (mg $CaCO_3$/l)	147	168	136					
EDTA Hardness (mg $CaCO_3$/l)	179	200	125					
Specific Conductance (µmhos/cm)	-	-	140					
Sulphate (mg/l)	12	5	4					
Dissolved Iron (µg/l)	40	220	20					
Phenols (µg/l)	-	-	-					
Ammonia (µg N/l)	-	-	-					

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE KA(HW3)

Date of Collection	19/11/75	2/12/75	8/1/76	4/8/76	9/8/76			
Time of Collection	-	-	10.30	13.25	13.00			
Temperature (°C)	-	-	-	10.0	9.0			
Dissolved Oxygen (mg/l)	-	10.3	-	9.0	9.5			
-(±2.5% air saturation)	-	-	-	80	80			
pH	7.9	8.1	8.0	8.1	8.0			
Total solids (mg/l)	270	271	201	-	21			
Dissolved solids (mg/l)	264	269	200	-	17			
Suspended solids (mg/l)	6	2	1	<1	4			
Turbidity (mg SiO_2/l)	2	3	1	1	7			
Alkalinity (mg $CaCO_3$/l)	202	96	138	66	52			
EDTA Hardness (mg $CaCO_3$/l)	-	-	-	94	80			
Specific Conductance (µmhos/cm)	-	-	-	-	74			
Sulphate (mg/l)	18	31	32	2	5			
Dissolved Iron (µg/l)	200	80	<10	<10	20			
Phenols (µg/l)	<100	<100	<10	-	-			
Ammonia (µg N/l)	<10	<10	<10	-	-			

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE K3A(HW2)

Date of Collection	19/11/75	2/12/75	8/1/76	4/8/76	9/8/76			
Time of Collection	-	-	10.30	13.15	10.10			
Temperature (^{o}C)	-	-	-	10.0	9.0			
Dissolved Oxygen (mg/l)	-	10.6	-	9.5	9.6			
-(±2.5% air saturation)	-	-	-	85	85			
pH	7.8	8.0	8.0	8.3	8.3			
Total solids (mg/l)	278	300	228	139	109			
Dissolved solids (mg/l)	274	298	222	137	43			
Suspended solids (mg/l)	4	2	6	2	66			
Turbidity (mg SiO_2/l)	3	2	2	1	35			
Alkalinity (mg $CaCO_3$/l)	168	152	198	142	96			
EDTA Hardness (mg $CaCO_3$/l)	-	-	-	176	114			
Specific Conductance (μmhos/cm)	-	-	-	-	124			
Sulphate (mg/l)	14	31	30	5	5			
Dissolved Iron (μg/l)	120	110	<10	<10	40			
Phenols (μg/l)	<100	<100	<10	-	-			
Ammonia (μg N/l)	<10	<10	<10	-	-			

WATER QUALITY ANALYSIS RESULTS, KAISER

SITE KF

Date of Collection	19/7/76	4/8/76	9/8/76					
Time of Collection	10.50	11.10	11.15					
Temperature (^{o}C)	11.0	11.0	9.0					
Dissolved Oxygen (mg/l)	10.6	9.6	9.3					
-(±2.5% air saturation)	95	85	80					
pH	8.0	8.2	8.1					
Total solids (mg/l)	261	196	524					
Dissolved solids (mg/l)	248	194	185					
Suspended solids (mg/l)	13	2	339					
Turbidity (mg SiO_2/l)	10	4	114					
Alkalinity (mg $CaCO_3$/l)	122	102	90					
EDTA Hardness (mg $CaCO_3$/l)	104	133	112					
Specific Conductance (μmhos/cm)	-	-	115					
Sulphate (mg/l)	6	5	3					
Dissolved Iron (μg/l)	10	80	<10					
Phenols (μg/l)	-	-	-					
Ammonia (μg N/l)	-	-	-					

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE K7A

Date of Collection	4/8/76	9/8/76						
Time of Collection	11.10	11.10						
Temperature (°C)	11.0	9.0						
Dissolved Oxygen (mg/l)	9.3	10.4						
-(±2.5% air saturation)	85	90						
pH	8.0	8.3						
Total solids (mg/l)	228	358						
Dissolved solids (mg/l)	226	147						
Suspended solids (mg/l)	2	211						
Turbidity (mg SiO_2/l)	3	13						
Alkalinity (mg $CaCO_3$/l)	140	136						
EDTA Hardness (mg $CaCO_3$/l)	180	150						
Specific Conductance (μmhos/cm)	-	182						
Sulphate (mg/l)	6	4						
Dissolved Iron (μg/l)	250	<10						
Phenols (μg/l)	-	-						
Ammonia (μg N/l)	-	-						

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE KC(HW12)

Date of Collection	8/1/76	19/7/76	4/8/76	9/8/76				
Time of Collection	12.00	10.55	11.10	11.20				
Temperature (°C)	-	11.0	11.0	9.0				
Dissolved Oxygen (mg/l)	-	10.6	9.7	9.5				
-(±2.5% air saturation)	-	95	85	80				
pH	8.1	8.3	8.1	8.2				
Total solids (mg/l)	232	306	143	427				
Dissolved solids (mg/l)	229	223	139	146				
Suspended solids (mg/l)	3	83	4	281				
Turbidity (mg SiO_2/l)	1	10	3	102				
Alkalinity (mg $CaCO_3$/l)	198	112	122	98				
EDTA Hardness (mg $CaCO_3$/l)	-	140	152	168				
Specific Conductance (μmhos/cm)	-	-	-	129				
Sulphate (mg/l)	31	14	9	8				
Dissolved Iron (μg/l)	<10	40	<10	30				
Phenols (μg/l)	<10	-	-	-				
Ammonia (μg N/l)	<10	-	-	-				

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE KB(HW8)

Date of Collection	20/11/75	2/12/75	8/1/76	26/5/76	31/5/76	19/7/76	4/8/76	9/8/76
Time of Collection	-	-	13.00	10.10	13.30	10.50	10.35	10.50
Temperature (^{o}C)	-	-	-	4.0	6.0	10.0	11.0	10.0
Dissolved Oxygen (mg/1)	-	10.2	-	10.5	11.0	11.0	9.6	9.5
-(±2.5% air saturation)	-	-	-	-	-	100	85	85
pH	8.0	8.0	8.1	8.0	8.2	8.3	8.3	8.2
Total solids (mg/1)	248	314	231	-	-	240	118	326
Dissolved solids (mg/1)	244	309	228	-	-	219	115	98
Suspended solids (mg/1)	4	5	3	2	6	21	3	228
Turbidity (mg SiO_2/1)	2	3	2	13	4	18	2	75
Alkalinity (mg $CaCO_3$/1)	138	110	174	152	138	100	124	100
EDTA Hardness (mg $CaCO_3$/1)	-	-	-	86	103	131	157	124
Specific Conductance (μmhos/cm)	-	-	-	-	-	-	-	137
Sulphate (mg/1)	12	38	29	13	18	12	4	4
Dissolved Iron (μg/1)	100	20	<10	-	-	50	<10	30
Phenols (μg/1)	<100	<100	<10	-	-	-	-	-
Ammonia (μg N/1)	<10	<10	<10	-	-	-	-	-

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE KD(HW9)

Date of Collection	20/11/75	2/12/75	8/1/76	26/5/76	31/5/76	19/7/76	4/8/76	9/8/76
Time of Collection	-	-	13.00	11.25	14.25	10.00	09.45	09.55
Temperature (^{o}C)	-	-	-	4.0	6.0	9.0	7.0	10.0
Dissolved Oxygen (mg/l)	-	10.2	-	8.5	11.0	9.2	9.9	9.8
-(±2.5% air saturation)	-	-	-	65	90	80	80	85
pH	8.0	8.0	8.1	8.2	8.1	8.0	7.6	7.9
Total solids (mg/l)	280	287	228	-	-	237	153	169
Dissolved solids (mg/l)	274	281	226	-	-	233	150	106
Suspended solids (mg/l)	6	6	2	3	2	4	3	63
Turbidity (mg SiO_2/l)	2	3	2	10	5	3	2	77
Alkalinity (mg $CaCO_3$/l)	148	174	220	136	162	150	170	136
EDTA Hardness (mg $CaCO_3$/l)	-	-	-	154	145	180	204	158
Specific Conductance (μmhos/cm)	-	-	-	-	-	-	-	190
Sulphate (mg/l)	14	41	33	14	18	14	3	5
Dissolved Iron (μg/l)	10	<10	<10	-	-	50	40	<10
Phenols (μg/l)	<100	<100	<10	-	-	-	-	-
Ammonia (μg N/l)	<10	<10	<10	-	-	-	-	-

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE K2A(HW6)

Date of Collection	20/11/75	2/12/75	8/1/76	26/5/76	31/5/76	19/7/76	4/8/76	9/8/76
Time of Collection	-	-	12.00	09.55	13.55	10.40	14.20	11.55
Temperature (°C)	-	-	-	4.0	5.0	11.0	8.0	10.0
Dissolved Oxygen (mg/l)	-	10.6	-	11.0	11.0	10.8	9.2	10.2
-(±2.5% air saturation)	-	-	-	85	85	95	75	90
pH	8.0	7.9	8.0	8.0	8.2	8.2	8.3	8.1
Total solids (mg/l)	261	308	228	-	-	210	130	135
Dissolved solids (mg/l)	258	305	225	-	-	205	100	89
Suspended solids (mg/l)	3	3	3	3	3	5	30	46
Turbidity (mg SiO_2/l)	6	3	2	5	4	3	3	6
Alkalinity (mg $CaCO_3$/l)	200	114	156	138	142	129	137	130
EDTA Hardness (mg $CaCO_3$/l)	-	-	-	111	128	162	165	159
Specific Conductance (µmhos/cm)	-	-	-	-	-	-	-	192
Sulphate (mg/l)	15	38	30	14	16	12	3	5
Dissolved Iron (µg/l)	390	20	<10	-	-	20	20	30
Phenols (µg/l)	<100	<100	<10	-	-	-	-	-
Ammonia (µg N/l)	<10	<10	<10	-	-	-	-	-

WATER QUALITY ANALYSIS RESULTS, KAISER

SITE K4A

Date of Collection	19/7/76	4/8/76	9/8/76					
Time of Collection	10.30	10.25	10.35					
Temperature (^{o}C)	9.0	9.0	10.0					
Dissolved Oxygen (mg/l)	10.8	7.9	8.1					
-(±2.5% air saturation)	95	70	70					
pH	7.7	7.5	7.9					
Total solids (mg/l)	212	267	281					
Dissolved solids (mg/l)	208	266	180					
Suspended solids (mg/l)	4	1	101					
Turbidity (mg SiO_2/l)	9	3	95					
Alkalinity (mg $CaCO_3$/l)	160	182	122					
EDTA Hardness (mg $CaCO_3$/l)	197	212	139					
Specific Conductance (μmhos/cm)	-	-	153					
Sulphate (mg/l)	6	3	40					
Dissolved Iron (μg/l)	10	80	40					
Phenols (μg/l)	-	-	-					
Ammonia (μg N/l)	-	-	-					

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE HW13

Date of Collection	31/5/76	19/7/76	4/8/76	9/8/76				
Time of Collection	14.25	10.20	10.05	10.20				
Temperature (^{o}C)	5.0	14.0	14.0	10.0				
Dissolved Oxygen (mg/1)	11.5	10.4	8.7	9.5				
-(±2.5%)air saturation)		100	85	85				
pH	8.1	8.2	8.0	7.9				
Total solids (mg/1)	-	240	258	322				
Dissolved solids (mg/1)	-	237	257	190				
Suspended solids (mg/1)	3	3	1	132				
Turbidity (mg SiO_2/1)	8	3	3	187				
Alkalinity (mg $CaCO_3$/1)	156	152	168	128				
EDTA Hardness (mg $CaCO_3$/1)	154	177	202	121				
Specific Conductance (μmhos/cm)	-	-	-	181				
Sulphate (mg/1)	16	8	4	5				
Dissolved Iron (μg/1)	-	30	20	30				
Phenols (μg/1)	-	-	-	-				
Ammonia (μg N/1)	-	-	-	-				

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE HW 15

Date of Collection	31/5/76	19/7/76	4/8/76	9/8/76				
Time of Collection	14.55	09.30	09.15	09.15				
Temperature (°C)	6.0	14.0	10.0	9.0				
Dissolved Oxygen (mg/l)	11.0	10.8	9.8	9.6				
-(±2.5% air saturation)	90	105	85	85				
pH	8.1	8.4	8.1	8.5				
Total solids (mg/l)	-	232	265	425				
Dissolved solids (mg/l)	-	223	260	144				
Suspended solids (mg/l)	2	9	5	281				
Turbidity (mg SiO_2/l)	6	3	2	97				
Alkalinity (mg $CaCO_3$/l)	180	128	134	140				
EDTA Hardness (mg $CaCO_3$/l)	171	177	175	156				
Specific Conductance (μmhos/cm)	-	-	-	185				
Sulphate (mg/l)	13	19	9	7				
Dissolved Iron (μg/l)	-	10	<10	20				
Phenols (μg/l)	-	-	-	-				
Ammonia (μg N/l)	-	-	-	-				

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE HW11

Date of Collection	20/11/75	2/12/75	8/1/76	26/5/76	31/5/76	19/7/76	4/8/76	9/8/76
Time of Collection	-	-	14.00	11.10	14.35	10.25	10.15	10.30
Temperature (°C)	-	-	-	4.0	6.0	14.0	10.0	9.0
Dissolved Oxygen (mg/l)	-	10.8	-	11.0	11.0	10.8	9.6	9.6
-(±2.5% air saturation)	-	-	-	85	90	105	85	85
pH	8.1	8.0	8.1	8.0	8.1	8.3	8.0	8.2
Total solids (mg/l)	247	301	259	-	-	260	167	485
Dissolved solids (mg/l)	245	297	257	-	-	254	164	215
Suspended solids (mg/l)	2	4	2	12	2	6	3	260
Turbidity (mg SiO_2/l)	1	1	1	10	6	2	3	118
Alkalinity (mg $CaCO_3$/l)	146	172	192	198	146	138	144	132
EDTA Hardness (mg $CaCO_3$/l)	-	-	-	154	154	172	184	232
Specific Conductance (μmhos/cm)	-	-	-	-	-	-	-	178
Sulphate (mg/l)	16	37	30	14	14	16	9	6
Dissolved Iron (μg/l)	<10	<10	<10	-	-	30	10	20
Phenols (μg/l)	<100	<100	<10	-	-	-	-	-
Ammonia (μg N/l)	<10	<10	<10	-	-	-	-	-

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE HW14

Date of Collection	31/5/76	19/7/76	4/8/76	9/8/76				
Time of Collection	14.20	10.25	10.10	10.25				
Temperature (°C)	6.0	14.0	10.0	9.0				
Dissolved Oxygen (mg/l)	11.0	10.8	9.6	9.0				
-(±2.5% air saturation)	90	105	85	80				
pH	8.1	8.3	8.0	8.2				
Total solids (mg/l)	-	238	245	290				
Dissolved solids (mg/l)	-	231	241	60				
Suspended solids (mg/l)	2	7	4	230				
Turbidity (mg SiO_2/l)	6	2	3	102				
Alkalinity (mg $CaCO_3$/l)	144	132	144	136				
EDTA Hardness (mg $CaCO_3$/l)	171	178	189	150				
Specific Conductance (μmhos/cm)	-	-	-	-				
Sulphate (mg/l)	15	19	8	4				
Dissolved Iron (μg/l)	-	30	10	10				
Phenols (μg/l)	-	-	-	-				
Ammonia (μg N/l)	-	-	-	-				

WATER QUALITY ANALYSIS RESULTS, KAISER

SITE K2F

Date of Collection	4/8/76	9/8/76						
Time of Collection								
Temperature (°C)								
Dissolved Oxygen (mg/l) -(±2.5% air saturation)	D R Y	D R Y						
pH								
Total solids (mg/l)								
Dissolved solids (mg/l)								
Suspended solids (mg/l)								
Turbidity (mg SiO_2/l)								
Alkalinity (mg $CaCO_3$/l)								
EDTA Hardness (mg $CaCO_3$/l)								
Specific Conductance (μmhos/cm)								
Sulphate (mg/l)								
Dissolved Iron (μg/l)								
Phenols (μg/l)								
Ammonia (μg N/l)								

WATER QUALITY ANALYSIS RESULTS, KAISER

SITE KG

Date of Collection	19/7/76	4/8/76	9/8/76					
Time of Collection	10.10	09.55	10.55					
Temperature (°C)	15.0	14.0	12.0					
Dissolved Oxygen (mg/l)	10.6	6.9	8.1					
-(±2.5% air saturation)	105	65	75					
pH	8.0	7.7	7.8					
Total solids (mg/l)	249	287	342					
Dissolved solids (mg/l)	240	283	131					
Suspended solids (mg/l)	9	4	211					
Turbidity (mg SiO_2/l)	4	4	260					
Alkalinity (mg $CaCO_3$/l)	166	184	192					
EDTA Hardness (mg $CaCO_3$/l)	192	210	186					
Specific Conductance (μmhos/cm)	-	-	221					
Sulphate (mg/l)	10	3	4					
Dissolved Iron (μg/l)	40	120	40					
Phenols (μg/l)	-	-	-					
Ammonia (μg N/l)	-	-	-					

WATER QUALITY ANALYSIS RESULTS, KAISER

SITE KH

Date of Collection	4/8/76	9/8/76						
Time of Collection		09.30						
Temperature (°C)	N	10.0						
Dissolved Oxygen (mg/l)	O	9.0						
~(±2.5% air saturation)		80						
pH	F	8.4						
Total solids (mg/l)	L	-						
Dissolved solids (mg/l)	O	-						
Suspended solids (mg/l)	W	1250						
Turbidity (mg SiO_2/l)		1025						
Alkalinity (mg $CaCO_3$/l)		192						
EDTA Hardness (mg $CaCO_3$/l)		120						
Specific Conductance (µmhos/cm)		126						
Sulphate (mg/l)		6						
Dissolved Iron (µg/l)		<10						
Phenols (µg/l)		-						
Ammonia (µg N/l)		-						

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE HW1

Date of Collection	19/11/75	2/12/75	4/8/76	9/8/76				
Time of Collection	-	-	13.00	10.20				
Temperature (°C)	-	-	5.0	9.0				
Dissolved Oxygen (mg/l)	-	10.0	10.2	9.9				
-(±2.5% air saturation)	-	-	80	85				
pH	8.0	8.0	8.1	8.3				
Total solids (mg/l)	298	286	77	52				
Dissolved solids (mg/l)	294	284	77	41				
Suspended solids (mg/l)	4	2	<1	11				
Turbidity (mg SiO_2/l)	4	2	<1	5				
Alkalinity (mg $CaCO_3$/l)	142	104	82	98				
EDTA Hardness (mg $CaCO_3$/l)	-	-	112	99				
Specific Conductance (μmhos/cm)	-	-	-	105				
Sulphate (mg/l)	17	29	4	6				
Dissolved Iron (μg/l)	110	10	<10	20				
Phenols (μg/l)	<100	<100	-	-				
Ammonia (μg N/l)	<10	<10	-	-				

WATER QUALITY ANALYSIS RESULTS, KAISER

SITE HW4

Date of Collection	20/11/75	4/8/76	9/8/76					
Time of Collection	-	13.45	11.20					
Temperature (^{o}C)	-	9.0	10.0					
Dissolved Oxygen (mg/l)	-	8.4	9.3					
-(±2.5% air saturation)	-	70	80					
pH	7.8	8.1	8.3					
Total solids (mg/l)	281	125	-					
Dissolved solids (mg/l)	276	125	-					
Suspended solids (mg/l)	5	<1	174					
Turbidity (mg SiO_2/l)	2	1	5					
Alkalinity (mg $CaCO_3$/l)	196	150	140					
EDTA Hardness (mg $CaCO_3$/l)	-	182	174					
Specific Conductance (μmhos/cm)	-	-	210					
Sulphate (mg/l)	22	4	5					
Dissolved Iron (μg/l)	320	<10	50					
Phenols (μg/l)	<100	-	-					
Ammonia (μg N/l)	<10	-	-					

WATER QUALITY ANALYSIS RESULTS, KAISER

SITE HW10

Date of Collection	20/11/75	2/12/75	8/1/76	26/5/76	31/5/76	19/7/76	4/8/76	9/8/76
Time of Collection	-	-	14.30	09.40	14.40	09.40	09.30	09.40
Temperature (°C)	-	-	-	4.0	5.0	11.0	10.0	9.0
Dissolved Oxygen (mg/l)	-	10.6	-	11.0	10.8	10.8	8.3	8.3
-(±2.5% air saturation)	-	-	-	85	85	95	75	70
pH	8.1	8.0	7.9	8.0	8.0	8.2	8.1	8.2
Total solids (mg/l)	238	291	259	-	-	268	146	501
Dissolved solids (mg/l)	236	285	258	-	-	264	128	112
Suspended solids (mg/l)	2	6	1	7	4	4	18	389
Turbidity (mg SiO_2/l)	1	1	1	10	5	2	3	113
Alkalinity (mg $CaCO_3$/l)	140	136	210	180	148	162	134	128
EDTA Hardness (mg $CaCO_3$/l)	-	-	-	162	154	180	178	156
Specific Conductance (μmhos/cm)	-	-	-	-	-	-	-	180
Sulphate (mg/l)	16	34	33	18	19	18	9	7
Dissolved Iron (μg/l)	<10	<10	<10	-	-	40	20	20
Phenols (μg/l)	<100	<100	<10	-	-	-	-	-
Ammonia (μg N/l)	<10	<10	<10	-	-	-	-	-

WATER QUALITY ANALYSIS RESULTS, KAISER
SITE HW5

Date of Collection	20/11/75	2/12/75	9/8/76					
Time of Collection	-	-	11.00					
Temperature (°C)	-	-	10.0					
Dissolved Oxygen (mg/l)	-	10.8	9.8					
-(±2.5% air saturation)	-	-	85					
pH	7.9	8.0	8.2					
Total solids (mg/l)	259	299	72					
Dissolved solids (mg/l)	255	298	59					
Suspended solids (mg/l)	4	1	13					
Turbidity (mg SiO_2/l)	10	2	15					
Alkalinity (mg $CaCO_3$/l)	214	146	112					
EDTA Hardness (mg $CaCO_3$/l)	-	-	165					
Specific Conductance (μmhos/cm)	-	-	152					
Sulphate (mg/l)	20	36	4					
Dissolved Iron (μg/l)	310	20	20					
Phenols (μg/l)	<100	<100	-					
Ammonia (μg N/l)	<10	10	-					

WATER QUALITY ANALYSIS RESULTS, KAISER

SITE G1

Date of Collection	31/5/76	4/8/76	9/8/76					
Time of Collection	13.00	12.15	12.15					
Temperature (°C)	-	-	-					
Dissolved Oxygen (mg/l)	<1	<1	-					
-(±2.5% air saturation)	-	-	-					
pH	8.0	7.0	7.3					
Total solids (mg/l)	-	306	-					
Dissolved solids (mg/l)	-	-	334					
Suspended solids (mg/l)	366	-	-					
Turbidity (mg SiO_2/l)	1050	890	260					
Alkalinity (mg $CaCO_3$/l)	210	262	254					
EDTA Hardness (mg $CaCO_3$/l)	137	274	269					
Specific Conductance (μmhos/cm)	-	-	346					
Sulphate (mg/l)	22	5	3					
Dissolved Iron (μg/l)	-	-	-					
Phenols (μg/l)	-	-	-					
Ammonia (μg N/l)	-	-	-					

APPENDIX G

WATER QUALITY ANALYSIS RESULTS, WATER RESOURCES SERVICE

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SHEET 1 OF 4 PAGE 1

TEST RESULTS FOR SITE 0200102 ELK R:SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	002 COLOR TR REL UNIT	004 PH REL UNIT	005 RES 105C MG/L	006 RES 550C MG/L	007 RESF 105 MG/L	008 RESNF105 MG/L	011 SPF COND UMHO/CM	012 TEM ARRV DEG.C	013 T SAMPLG DEG.C	014 OXY DISS MG/L
721127	1445		1	L 5.	8.3			202.			6.	1.	
730110	1230		1		8.2 7.95	218.		216.	2	370. 340.	2.	0.	
730308	1435		1	L 5.	8.6	212.		210.	2	365.	6.	3.	* 15.4
730502	1315		1	5.	8.4	200.		198.	2	350.	11.	5.	11.6
730710	1240		1	L 5.	8.2 8.3	168.		164.	2	320.	16.	9.5	10.2
730925	0305		1	5.	8.4	198.		196.	2		12.		
730925	1305		1		8.7					348.		6.5	11.6
731204	1430		1	L 5.	8.6 8.2	212.		210.	2	370.	7.	0.	
740123	1300		1	5.	8.3 8.2	204.		202.	2	350. 345.	13.	1.5	11.9
740326	1330		1	5.	8.7 8.4	216.		214.	2	256. 355.	10.	1.	
740521	1340		1	5.	8.3 8.2	194.		180.	14	320. 312.	18.	7.	10.4
740716	1345		1		8.1					180.		11.	8.1
740716	1348		1	5.	8.2	166.		144.	22	241.	16.		
740910	1415		1	L 5.	9. 8.3	186.		184.	2	175. ? 314.	16.	9.5	7.
741126	1300		1	5.	9.	208.		202.	6	122. ? 340.	13.	1.	11.4
750121	1345		1	L 5.	8.2 8.7	214.		212.	2	369. 330.	9.	0.	11.9
750313	1310		1	L 5.	8.3 8.9	220.		218.	2	365. 362.	13.	3.	14.9
750521	1120		1	10.	8.1	194.		164.	30	277.	18.	8.	7.9

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200102 CONTINUED

18 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 2

SHEET 1 OF 4 PAGE 2

TEST RESULTS FOR SITE 0200102 ELK R:SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	002 COLOR REL	TR UNIT	004 PH REL	PH UNIT	005 RES 105C MG/L	006 RES 550C MG/L	007 RESF 105 MG/L	008 RESNF105 MG/L	011 SPF COND UMHO/CM	012 TEM ARRV DEG.C	013 T SAMPLG DEG.C	014 OXY DISS MG/L
750521	1120		1				8.4								
750602	1300		1				8.1 8.3	298.		134.	164	227.		7.	
750630	1400		1		5.		8.2 8.5	158.		148.	10	247.	21.		
750723	1445		1		5.		8.2 8.1	165.		162.	4	276.		13.5	10.2
750812	1400		1				8.2 8.4	180.		174.	6	305.		13.	8.9
750904	1425		1		5.		8.3 8.5	184.		182.	2	300. 195.	?	10.	11.2
751007	1800		1				8.3 8.7	188.				316. 190.	?	6.2	
751120	1300		1		L 5.		8.2	202.		200.	2	346.			
760113	1430		1				8.1 8.4					340. 180.	?	0.	
760121	1405		1		L 5.		8.1 8.7	206.		204.	2	353.		0.	
760302	1330		0		5.		8.4 8.6	224.		222.	2	376. 390.		0.	
760504	1030		1		20.		8.1 8.2	336.		150.	186	243. 270.		4.5	10.

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES SITE 0200102 CONTINUED

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SHEET 1 OF 4 PAGE. 3

TEST RESULTS FOR SITE 0200102 ELK R:SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

	002 COLOR TR	004 PH	005 RES 105C	006 RES 550C	007 RESF 105	008 RESNF105	011 SPF COND	012 TEM ARRV	013 T SAMPLG	014 OXY DISS
	REL UNIT	REL UNIT	MG/L	MG/L	MG/L	MG/L	UMHO/CM	DEG.C	DEG.C	MG/L
NUMBER OF VALUES	22	49	25	0	25	1	40	17	25	16
MAXIMUM	20.	9.	336.		222.	2.	390.	21.	13.5	* 15.4
MINIMUM	L 5.	7.95	158.		134.	2.	122.	2.	0.	7.
AVERAGE	5.9091	8.3622	206.08		187.68	2.	300.97	12.176	4.848	10.787
STANDARD DEVIATION	3.2461	0.24295	37.687		25.492		67.812	4.9377	4.3651	2.2002
GEOMETRIC MEAN	5.4957	8.3588	203.19		185.83	2.	291.62	10.794	4.7876	10.565
PERCENTILES:										
PCT10	5.	8.1	166.		146.4		181.	5.2	0.	7.63
PCT25	5.	8.2	185.		164.		249.25	8.	0.5	9.175
PCT50	5.	8.3	202.		198.		320.	13.	4.5	10.8
PCT75	5.	8.5	215.		210.		352.25	16.	8.75	11.825
PCT90	8.5	8.7	253.6		216.8		369.9	18.6	11.8	15.05
	***	@@@					@@@			@@@

EXPLANATORY NOTES:
STATISTICS FLAGGED WITH '****' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 0200102 CONTINUED

18 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 4

SHEET 2 OF 4 PAGE 1

TEST RESULTS FOR SITE 0200102 ELK R:SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	014 OXY DISS %	015 TURBIDTY J.T.UNIT	016 CL.RESID MG/L	017 BAR.PRES IN HG	020 AIR TEMP DEG.C	038 DIL.COND UMHO/CM	101 ALKALI P MG/L	102 ALKALI T MG/L	103 CARBN DP MG/L	104 CHLORIDE MG/L
730110 1230		1		0.95								
				2.2						164.	2.	1.7
730308 1435		1		1.		29.37	6.			144.	4.	2.1
730502 1315		1	102.	2.5		26.299#	16.			135.	6.	1.8
730710 1240		1	102.	1.9		26.181#	23.			135.	4.	0.6
730925 0305		1										
											6.	1.2
730925 1305		1		0.53		26.579#	10.			149.		
731204 1430		1		0.53			0.			157.	2.	1.8
740123 1300		1	92.1	1.2		26.72	3.	99.		152.	1.	1.6
740326 1330		1		4.			7.5	102.		167.	1.	2.3
740521 1340		1	94.5	5.5		27.21	16.	100.		140.	16.	1.6
740716 1345		1		8.			14.			121.		
740716 1348		1									1.	0.8
740910 1415		1		1.1			18.	103.		160.	5.	1.1
741126 1300		1		0.4			2.	105.		146.		1.4
750121 1345		1	92.5	0.47		26.5	-2.			161.	L 1.	
750313 1310		1		1.7		26.18	4.			161.	L 1.	
750521 1120		1		16.			11.			128.	4.	
750602 1300		1		36.						111.	8.	
750630 1400		1		4.2						127.	5.	
750723 1445		1	110.	1.5		26.4	28.			131.	L 1.	
										126.		
750812 1400		1	95.	0.8		26.5	20.			140.	L 1.	
750904 1425		1	110.				17.					

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200102 CONTINUED

18 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 5

SHEET 2 OF 4 PAGE 2

TEST RESULTS FOR SITE 0200102 ELK R:SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	014 OXY DISS %	015 TURBIDTY J.T.UNIT	016 CL.RESID MG/L	017 BAR.PRES IN HG	020 AIR TEMP DEG.C	038 DIL.COND UMHO/CM	101 ALKALI P MG/L	102 ALKALI T MG/L	103 CARBN OR MG/L	104 CHLORIDE MG/L
751007 1800		1		2.2						141.		
751120 1300		1		0.6					L 0.5	154.		
760113 1430		1		0.6						152.		
760121 1405		1		0.57		26.57	-4.			158.		
760302 1330		0		0.61			-12.			168.		
760504 1030		1	88.5	52.		26.11	14.			114.		
NUMBER OF VALUES			9	26	0	12	20	5	1	26	18	12
MAXIMUM			110.	52.		29.37	28.	105.	L 0.5	168.	16.	2.3
MINIMUM			88.5	0.4		26.11	-12.	99.	L 0.5	111.	L 1.	0.6
AVERAGE			98.511	5.6562		26.718	9.575	101.8	0.5	143.92	3.8333	1.5
STANDARD DEVIATION			7.4103	11.741		0.84822	9.7536	2.1354		16.077	3.6553	0.48305
GEOMETRIC MEAN			98.237	1.8481		26.705	10.548	101.78	0.5	142.99	2.6001	1.4074
PERCENTILES:												
PCT10				0.512		26.131	-3.8			118.9	1.	0.66
PCT25			92.3	0.6		26.211	2.25	99.5		130.25	1.	1.125
PCT50			95.	1.35		26.5	10.5	102.		145.	3.	1.6
PCT75			106.	4.05		26.685	16.75	104.		158.5	5.25	1.8
PCT90				22.		28.722	22.7			164.9	8.7999	2.24
			@@@	@@@		@@@			***	@@@	*** @@@	

EXPLANATORY NOTES:
RESULTS FLAGGED WITH '#' HAVE REQUIRED CONVERSION
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 0200102 CONTINUED

18 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 6

SHEET 3 OF 4 PAGE 1

TEST RESULTS FOR SITE 0200102 ELK R:SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	105 CYANIDE MG/L	106 FLUORIDE MG/L	107 HARDNESS MG/L	108 AMMONIA MG/L	109 NO2/NO3 MG/L	110 NO3 DIS MG/L	111 NO2 DIS MG/L	112 NIT ORGN MG/L	113 NIT KJEL MG/L	117 PHENOL MG/L
730110	1230	1				210.	0.01		0.18	L 0.005	0.05		
730306	1435	1				178.	L 0.01		0.02	L 0.005	0.07		
730502	1315	1				173.	L 0.01		0.1	L 0.005	0.07		
730710	1240	1				149.	0.01		0.05	L 0.005	0.05		
730925	0305	1				170.	0.01		0.04	L 0.005	0.06		
731204	1430	1				186.	0.05		0.09	L 0.005	0.02		
740123	1300	1				178.	L 0.01		0.13	L 0.005	L 0.01		
740326	1330	1				187.	0.011		0.05	L 0.005	0.02		
740521	1340	1				168.	L 0.01		0.13	L 0.005	0.09		
740716	1348	1			0.17		L 0.005		0.04	L 0.005	0.16	0.16	
740910	1415	1				157.	0.006		0.04	L 0.005	0.02	0.03	
741126	1300	1				177.							
750121	1345	1				188.	0.019		0.13	L 0.005	0.021	0.04	
750313	1310	1				188.	0.013		0.13	L 0.005	0.06	0.07	
750521	1120	1		L 0.01		144.	0.013	0.15	0.15	L 0.005	0.14	0.15	
750602	1300	1		L 0.01			0.008	0.1					0.002
750630	1400	1		L 0.01		131.	0.008	0.06	0.06	L 0.005	0.18	0.19	
750723	1445	1		L 0.01		148.	L 0.005	0.04	0.04	L 0.005	0.01	0.01	0.002
750812	1400	1		L 0.01			0.005	0.04					L 0.002
750904	1425	1				159.	L 0.005		0.06	L 0.005	0.1	0.1	
751120	1300	1				181.	0.022		0.15	L 0.005	0.13	0.15	
760121	1405	1				183.	0.022		0.15	L 0.005	0.01	0.03	
760302	1330	0				165.	0.009		0.09	L 0.005	0.24	0.25	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200102

CONTINUED

18 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 7

SHEET 3 OF 4 PAGE 2

TEST RESULTS FOR SITE 0200102 ELK R:SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	105 CYANIDE MG/L	106 FLUORIDE MG/L	107 HARDNESS MG/L	108 AMMONIA MG/L	109 NO2/NO3 MG/L	110 NO3 DIS MG/L	111 NO2 DIS MG/L	112 NIT ORGN MG/L	113 NIT KJEL MG/L	117 PHENOL MG/L
760504 1030		1			127.	0.014		0.15	L 0.005	0.35	0.36	
NUMBER OF VALUES			5	1	21	23	5	21	21	21	12	3
MAXIMUM			L 0.01	0.17	210.	0.05	0.15	0.18	L 0.005	0.35	0.36	0.002
MINIMUM			L 0.01	0.17	127.	L 0.005	0.04	0.02	L 0.005	L 0.01	0.01	L 0.002
AVERAGE			0.01	0.17	168.9	.012391	0.078	.094286	0.005	.089619	0.12833	0.002
STANDARD DEVIATION			0.0		20.159	.0093192	.042143	.048065	0.0	.084999	.099819	0.0
GEOMETRIC MEAN			0.01	0.17	167.65	.010422	.067869	.080198	0.005	0.05452	.085617	0.002
PERCENTILES:												
PCT10					133.6	0.005		0.04	0.005	0.01	0.016	
PCT25			0.01		153.	0.008	0.04	0.045	0.005	0.02	0.0325	
PCT50			0.01		173.	0.01	0.06	0.09	0.005	0.06	0.125	0.002
PCT75			0.01		184.5	0.013	0.125	0.14	0.005	0.135	0.1925	
PCT90			***		189.	0.022		0.15	0.005	0.228	0.327	
						***			***	***		***
						@@@		@@@		@@@		@@@

EXPLANATORY NOTES:
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 0200102 CONTINUED

18 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 8

SHEET 4 OF 4 PAGE 1

TEST RESULTS FOR SITE 0200102 ELK R:SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	118 PHOS DIS MG/L	119 PHOS TOT MG/L	120 SILICA MG/L	121 SULPHATE MG/L	254 C CALCIUM DISSOLVED MG/L	259 D MGNESIUM DISSOLVED MG/L	264 D POTASIUM DISSOLVED MG/L	265 D SODIUM DISSOLVED MG/L	450 COL.FECL M.P.N.	451 COL.TOTL M.P.N.
730110 1230	1		0.008	0.013	5.	21.5	53.5	14.5	0.6	2.4	130.	
730308 1430	1										350.	
730308 1435	1		0.005	0.01	4.6	31.	50.	13.	0.5	2.3		
730502 1315	1		0.005	0.012	4.2		47.	13.5	0.6	2.	170.	
730710 1240	1		L 0.003	0.014	3.9	15.5	42.	10.7	0.4	1.		
730925 0305	1		L 0.003	0.009	4.	24.4	47.	12.8	0.5	1.7		
730925 1305	1										920.	
731204 1430	1		0.004	0.008	4.2	29.	50.8	14.4	0.5	2.	2.	
740123 1300	1		0.004	0.017	4.5	26.4	48.4	14.	0.5	2.2	7.	
740326 1330	1		L 0.003	0.011	4.3	31.6	51.5	14.1	0.6	2.5	L 2.	
740521 1340	1		0.006	0.021	4.8	19.7	45.7	13.	0.5	1.5	2.	
740716 1345	1										23.	
740716 1348	1		0.005	0.035	3.7	14.	38.		0.4	0.9		
740910 1415	1		L 0.003	0.009	4.	19.3	43.	12.	0.5	1.4	4.	
741126 1300	1			0.006	4.3	27.5	49.1	13.2	0.5	2.		
750121 1345	1		L 0.003	0.007	4.5	21.	52.6	13.7	0.5	2.3	5.	
750313 1115	1										L 2.	
750313 1310	1		0.003	0.009	4.5	31.8	53.	13.5	0.5	2.4		
750521 1120	1		0.012	0.05 0.045	4.4	17.5	40.9	10.2	0.4	1.6	8.	
750602 1300	1			0.21 0.012							80.	
750630 1400	1		0.005	0.025 0.007	3.6	13.	37.4	9.1	0.4	0.9		

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES SITE 0200102 CONTINUED

18 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 9

SHEET 4 OF 4 PAGE 2

TEST RESULTS FOR SITE 0200102 ELK R:SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	CODE TYPE	118 PHOS DIS MG/L	119 PHOS TOT MG/L	120 SILICA MG/L	121 SULPHATE MG/L	254 D CALCIUM DISSOLVED MG/L	259 D MGNESIUM DISSOLVED MG/L	264 D POTASIUM DISSOLVED MG/L	265 D SODIUM DISSOLVED MG/L	450 COL.FECL M.P.N.	451 COL.TOTL M.P.N.
750630 1400	1										L 20.	
750723 1445	1		L 0.003	0.011 0.004	3.8	16.8	42.5	10.2	0.4	1.	L 20.	L 20.
750812 1400	1			0.007 L 0.003								
750904 1425	1		L 0.003	0.008	4.1	20.5	45.1	11.3	0.4	1.4	L 2.	
751007 1800	1										20.	80.
751009 1000	1										L 20.	110.
751009 1430	1										L 20.	L 20.
751120 1300	1		0.005	0.006	4.6	27.6	50.4	13.3	0.5	1.8	4.	
760121 1100	1										40.	40.
760121 1405	1		0.005	0.008	4.5	29.	50.8	13.6	0.5	2.1	20.	
760302 1330	0		L 0.003	0.005	4.8	33.	44.1	13.4	0.5	2.5		
760302 1330	1										2.	
760504 1030	1		0.012	0.222	4.1	14.5	35.7	9.3	0.4	1.4	20.	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200102

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30 AUGUST 1976 PAGE 10

SHEET 4 OF 4 PAGE 3

TEST RESULTS FOR SITE 0200102 ELK R;SOUTH OF SPARWOOD FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

	118 PHOS DIS MG/L	119 PHOS TOT MG/L	120 SILICA MG/L	121 SULPHATE MG/L	254 D CALCIUM DISSOLVED MG/L	259 D MGNESIUM DISSOLVED MG/L	264 D POTASIUM DISSOLVED MG/L	265 D SODIUM DISSOLVED MG/L	450 COL.FECL M.P.N.	451 COL.TOTL M.P.N.
NUMBER OF VALUES	21	29	22	21	22	21	22	22	25	5
MAXIMUM	0.012	0.222	5.	33.	53.5	14.5	0.6	2.5	920.	110.
MINIMUM	L 0.003	L 0.003	3.6	13.	35.7	9.1	0.4	0.9	L 2.	L 20.
AVERAGE	.0049048	.027724	4.2909	24.029	46.295	12.514	0.48182	1.7864	75.72	54.
STANDARD DEVIATION	0.002635	.052489	0.36169	6.7802	5.1688	1.6461	.064922	0.52596	187.92	35.553
GEOMETRIC MEAN	.0044092	0.01316	4.2755	22.978	45.994	12.396	0.47745	1.6983	14.837	42.63
PERCENTILES:										
PCT10	0.003	0.005	3.73	14.1	37.58	9.48	0.4	0.93	2.	
PCT25	0.003	0.007	4.	17.15	42.375	11.	0.4	1.4	3.	20.
PCT50	0.004	0.01	4.3	26.4	47.	13.2	0.5	1.9	20.	40.
PCT75	0.005	0.019	4.525	31.	50.8	13.55	0.5	2.3	31.5	95.
PCT90	0.0112	0.05	4.8	31.76	52.88	14.34	0.6	2.47	242.	
	***	***							***	***
	@@@	@@@								

EXPLANATORY NOTES:
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 0200102

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 1

SHEET 1 OF 5 PAGE 1

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

RES-NF (mg/l)

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	002 COLOR TR REL UNIT	004 PH REL UNIT	005 RES 105C MG/L	006 RES 550C MG/L	007 RESF 105 MG/L		011 SPF COND UMHO/CM	012 TEM APRV DEG.C	013 T SAMPLG DEG.C	014 OXY DISS MG/L	014 OXY DISS %
690728	1100	1		5.	8.5 7.8	194.	114.			300.		11.		
690729	1100	1		10.	8.4 8.	172.	112.			290.		12.		
690730	1030	1			8.5 7.8	180.	107.	163.	17					
690721	0630	1		5.	8.3 7.8	180.	111.	166.	14					
691015	1030	1			8.2 7.9	206.	150.	202.	4	320.		3.8		
691111	1100	1		5.	8.1 8.	205.	136.	197.	8	380.		2.4		
691209	1130	1			2.4 7.8							0.1		
700128	1130	1			8. 7.9	210.	148.			330.		0.		
700224	1000	1		5.	8.1	229.	154.	215.	14	345.				
700408	1030	1		5.	8.3 8.5	230.	161.	220.	10	340.		3.5		
700505	1100	1		10.	8.1 7.5	448.	254.	157.	291	262.	15.	6.7		
700602	1030	1		5.	7.9 8.3	117.	144.	146.	?	233.		7.5		
700712	1000	1		5.	8.2 8.5	187.	106.	162.	25	270.	22.	11.5		
700811	1000	1		5.	8.3 8.4	203.	130.	195.	8	315.		11.7		
700930	1000	1		5.	8.3 8.4	197.	124.	186.	11	335.		7.2		
701102	1100	1	L	5.	8.2	216.	153.	214.	2	354.	8.	1.4		

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024 CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 2

SHEET 1 OF 5 PAGE 2

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

RES NF (mg/l)

** START ** Y M D H M	DEPTH FEET	COMP TYPE	002 CCLOR REL UNIT	TR	004 PH REL UNIT	005 RES 105C MG/L	006 RES 550C MG/L	007 RESF 105 MG/L	011 SPF COND UMHO/CM	012 TEM ARRV DEG.C	013 T SAMPLG DEG.C	014 OXY DISS MG/L	014 OXY DISS %
701102 1100		1			8.5								
701201 1030		1		L 5.	8.2 8.3	217.	141.	209.	8 379.	4.	1.		
710107 1030		1		L 5.	8.	222.	167.	215.	7 376.		0.		
710201 1130		1		L 5.	8. 8.	243.	207.	221.	22 367.	12.	0.		
710301 1200		1		L 5.	8.2 8.1	225.	157.	213.	12 300. 373.	12.	-0.1		
710426 1300		1		5.	8. 7.9	283.	212.	177.	106 300. 292.		4.7		
710526 1210		1		10.	7.9 8.2	255.	178.	131.	124 240.		7.5		
710623 1200		1		L 5.	8.3 8.3	144.	118.	127.	17 250.	18.	8.5	9.9	
710721 1230		1		L 5.	8.3 8.45	154.		142.	12 275.	24.	13.5	10.8	
710825 1115		1			8.3 8.45	180.	112.		320.	20.	11.5	10.25	
711028 0835		1		L 5.	8.3 8.4	192.	134.	180.	12 315.	8.	0.		
711124 0915		1		L 5.	8.2 8.3	204.	150.	178.	26 360.	6.	1.	12.85	
711215 1000		1		L 5.	8.2 8.1	218.	140.	208.	10 318.	7.	2.	12.9	
720115 0920		1		L 5.	8. 8.	220.	150.	184.	36 347.	8.	0.	11.	
720208 0900		1		L 5.	8. 8.3	220.	144.	202.	18 359.	7.	1.	12.3	
720306 0915		1		5.	8.	204.	174.	198.	6 319.	5.	2.	12.1	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024

CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 3

SHEET 1 OF 5 PAGE 3

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

RES NF (mg/l)

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	002 COLOR REL	TR UNIT	004 PH REL	UNIT	005 RES 105C MG/L	006 RES 550C MG/L	007 RESF 105 MG/L	011 SPF COND UMHO/CM	012 TEM ARRV DEG.C	013 T SAMPLG DEG.C	014 OXY DISS MG/L	014 OXY DISS %
720306	0915		1			7.9									
720411	0825		1	L	5.	8. 8.1		228.	192.	206.	22 335.	6.	2.5	10.8	
720515	0800		1		25.	8. 8.1		782.	620.	122.	660 250.	12.	4.	10.2	
720613	1005		1		10.	8.1 7.9		312.	164.	138.	174 245.	13.	6.	11.4	
720711	1315		1		5.	8.2 7.95		166.	104.	158.	8 290.	16.	10.	11.6	
720803	1235		1	L	5.	8.1 8.1		160.	114.	158.	8 300.	16.	12.	11.8	
720920	1005		1	L	5.	8.4 8.7		190.	168.	184.	6 320.	16.			
721011	1010		1		5.	8.5		194.	182.	188.	6 320.	8.	0.	* 15.6	
721123	1030		1	L	5.	8.3		212.	160.	204.	8 380.	10.	1.	11.4	
721206	1250		1	L	5.	8.2 8.3		230.	204.	228.	2 430.	2.	0.	13.9	
730117	1030		1	L	5.	7.9 7.6		194.		188.	6 340.	7.	1.5	12.8	
730313	1345		1	L	5.	8.4		224.		220.	4 370.	6.	3.	13.8	
730613	1150		1		5.	8.2 7.6		160.		146.	14 280.	13.	7.	10.	93.5
730709	0930		1		5.	8.2 8.2		174.		172.	2 322.	19.	8.	11.	105.
730905	1220		1		5.	8.7 8.3		206.		190.	16 355. 335.	18.	10.	11.	108.
731206	1350		1		5.	8.65 8.3		218.		208.	10 370.	10.	0.5	13.2	100.
740218	1035		1	L	5.	8.2		214.		210.	4 370.	7.	1.	12.8	101.5

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024

CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 4

SHEET 1 OF 5 PAGE 4

TEST RESULTS FOR SITE C200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

RES NF (mg/T)

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	C02 COLOR TR REL UNIT	004 PH REL UNIT	005 RES 105C MG/L	006 RES 550C MG/L	007 RESF 105 MG/L	011 SPF COND UMHC/CM	012 TEM ARRV DEG.C	013 T SAMPLG DEG.C	014 OXY DISS MG/L	014 OXY DISS %
740216	1035	1			8.3				360.				
740307	1130	1		L 5.	8.7 8.2	222.		220.	2	370. 370.	13.	1.	13.3	105.5
740505	1200	1		20.	7.95 8.	160.		126.	34	205. 199.	14.	4.	10.4	
740730	1130	1		5.	8.5 8.4	168.		166.	2	290. 278.	22.	13.5	7.4	
740917	1340	1		L 5.	8.65 8.3	190.		188.	2	210. 332.	19.	13.	10.4	
750128	1400	0		L 5.	7.9	238.		236.	2	415. 405.	6.	0.	12.	83.
750311	1115	0		5.	8.1 8.25	226.		224.	2	380. 207.	13.	0.5		
750521	1145	1		15.	8.1 8.3	168.		154.	14	252.	17.	9.	12.1	
750602	1400	1			8. 8.4	240.		124.	116	205.		8.		
750630	1430	1		10.	8.1 8.6	152.		138.	14	246.	20.	9.		
750716	1140	0		5.	8.1 8.4	158.		156.	2	269.	23.	12.	10.2	
750723	1520	1			8.2 7.8	164.		162.	2	285.		16.		
750902	1230	1		5.	8.1 8.4	182.		180.	2	300. 315.		10.	10.4	103.1
751117	1040	1		5.	8.2 8.7	190.		188.	2	324. 340.		1.	13.8	108.9
760120	1350	1		L 5.	8.1 8.4	208.		206.	2	356. 355.		2.	13.	103.
760325	1330	1		5.	8.3	212.		208.	4	361.		5.	12.4	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024 CONTINUED

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SHEET 1 OF 5 PAGE 5

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

RES NF (mg/T)

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	002 COLOR TR REL	UNIT	004 PH REL	UNIT	005 RES 105C MG/L	006 RES 550C MG/L	007 RESF 105 MG/L	011 SPF COND UMHO/CM	012 TEM ARRV DEG.C	013 T SAMPLG DEG.C	014 OXY DISS MG/L	014 OXY DISS %
760325	1330		1				8.7								
760517	1030		1	5.		8. 8.2		198.		144.	247. 265.		6.	9.4	
NUMBER OF VALUES				56		120		62	38	58	74	40	59	35	10
MAXIMUM				25.		8.7		782.	620.	236.	430.	24.	16.	* 15.5	108.9
MINIMUM				L 5.		2.4		117.	104.	122.	198.	2.	-0.1	7.4	83.
AVERAGE				6.25		8.1462		214.44	163.05	181.86	315.08	12.55	5.2186	11.663	101.15
STANDARD DEVIATION				3.69		0.57829		85.464	82.113	30.502	53.396	5.8521	4.6579	1.5733	7.3304
GEOMETRIC MEAN				5.7227		8.1077		205.49	152.88	179.15	310.24	11.004	4.0002	11.553	100.86
PERCENTILES:															
PCT10				5.		7.9		160.	110.6	137.3	242.5	6.	0.	9.96	84.05
PCT25				5.		8.		180.	122.5	157.75	277.25	7.	1.	10.4	98.375
PCT50				5.		8.2		204.5	150.	187.	320.	12.5	4.	11.6	103.05
PCT75				5.		8.3		222.5	169.5	208.	359.25	17.75	9.	12.85	106.12
PCT90				10.		8.5		242.1	207.5	220.	377.5	21.8	12.	13.8	108.81
				***											
				@@@		@@@			@@@		@@@			@@@	@@@

EXPLANATORY NOTES:
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 0200024 CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 6

SHEET 2 OF 5 PAGE 1

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	015 TURBIDTY J.T.UNIT	017 BAR.PRES IN HG	020 AIR TEMP DEG.C	030 C.D.C. UMHO/CM	038 DIL.COND UMHO/CM	101 ALKALI P MG/L	102 ALKALI T MG/L	103 CARBN OR MG/L	104 CHLORIDE MG/L	106 FLUORIDE MG/L
690728 1100		1	1.3					1.5	135.		0.7	0.22
690729 1100		1	0.9					1.5	137.		0.4	
690730 1030		1	1.									
690731 0630		1	4.									
691015 1030		1	0.2						159.		0.8	0.35
691111 1100		1	0.4						150.		0.8	0.36
691209 1130		1							155.			
700128 1130		1	0.4						148. 148.		0.8	0.33
700224 1000		1	1.9						156.		2.	0.34
700408 1030		1	2.2						156.		1.3	
700505 1100		1	83.						120. 118.		2.	0.24
700602 1030		1	13.						107.		0.3	0.16
700712 1000		1	2.3						127.			0.23
700811 1000		1	0.9						140. 142.			0.22
700930 1000		1	0.8						148. 148.		0.8	
701102 1100		1	0.7						150. 156.		1.	0.21
701201 1030		1	1.1						153.		0.8	0.27
710107 1030		1	0.6						158.		1.3	0.27
710201 1130		1	2.9						142. 153.		1.5	0.24
710301 1200		1	0.5						154.		1.3	0.27

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024 CONTINUED

19 WATER RESOURCES SERVICE

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TEST RESULTS FOR SITE 0200024 ELK R:HOSMER

SHEET 2 OF 5 PAGE 2

FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	015 TURBIDTY J.T.UNIT	017 BAR.PRES IN HG	020 AIR TEMP DEG.C	030 C.D.C. UMHO/CM	036 DIL.COND UMHO/CM	101 ALKALI P MG/L	102 ALKALI T MG/L	103 CARBN OR MG/L	104 CHLORIDE MG/L	106 FLUORIDE MG/L
710301 1200		1							154.			
710426 1300		1	28.						126.		2.	0.19
710526 1210		1							130.			
710623 1200		1							108.		0.4	0.15
710721 1230		1							103.			
710825 1115		1							105.		0.3	0.15
711028 0835		1							119.		0.5	0.18
711124 0915		1							136.5		0.5	0.22
711215 1000		1									1.	0.23
720119 0920		1							145.		1.5	0.27
720208 0900		1							135.		1.3	0.21
720306 0915		1							142.		1.8	0.26
720411 0825		1	3.6						155.		1.5	0.23
720515 0800		1	84.						140.		2.	0.22
720613 1005		1	69.						145.		1.8	
720711 1315		1	5.1						85.		0.8	
720803 1235		1	5.						130.		0.6	
720920 1005		1	3.6						124.		0.7	
721011 1010		1	4.8						147.		1.5	
721123 1030		1	0.9						143.		1.1	
721206 1250		1	1.2						137.		1.	
730117 1030		1	1.8						145.		1.5	
									177.		2.4	
									156.	4.	3.3	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024

CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 8

SHEET 2 OF 5 PAGE 3

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	015 TURBIDTY J.T.UNIT	017 BAR.PRES IN HG	020 AIR TEMP DEG.C	030 C.D.C. UMHO/CM	038 DIL.COND UMHO/CM	101 ALKALI P MG/L	102 ALKALI T MG/L	103 CARBN OR MG/L	104 CHLORIDE MG/L	106 FLUORIDE MG/L
730313 1345	1		0.8	29.38	5.				151.	4.	2.2	
730613 1150	1		5.3	26.378#	16.				125.	5.	1.1	
730709 0930	1		1.6	26.575#	15.				146.	4.	1.1	
730905 1220	1		0.6	26.929#	19.				149.	4.	1.3	
731206 1350	1		0.7	26.85	0.5			4.	159.	3.	2.	
740218 1035	1		4.3	26.52	0.		95.		169.	2.	2.	
740307 1130	1		0.55	26.47			100.		167.	1.	2.1	
740509 1200	1		17.	* 26.06	7.		102.		96.	? 74.	0.8	
740730 1130	1		3.1	26.53	19.		109.		140.	1.	1.	
740917 1340	1		0.75		21.		101.		161.	2.	1.2	
750128 1400	0		0.7	29.7	6.5	451.			175.	3.	2.8	
750311 1115	0		1.		1.	424.			169. 166.	L 1.	2.8	
750521 1145	1		12.		11.	275.			122.	4.	1.3	
750602 1400	1		26.						103.	10.		
750630 1430	1		2.6			276.			120. 125.	3.	1.	
750716 1140	0		3.5	26.26	20.	293.			132. 132.		0.8	
750723 1520	1		0.9						137. 129.	L 1.		
750902 1230	1		1.9	26.53	16.	326.			140. 139.	1.	1.4	
751117 1040	1		1.2	26.53	3.	354.			145. 146.	L 1.	1.7	
760120 1350	1			26.86	0.	388.			154.		2.3	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024

CONTINUED

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	015 TURBIDTY J.T.UNIT	017 BAR.PRES IN HG	020 AIR TEMP DEG.C	030 C.D.C. UMHO/CM	038 DIL.COND UMHO/CM	101 ALKALI P MG/L	102 ALKALI T MG/L	103 CARBN OR MG/L	104 CHLORIDE MG/L	106 FLUORIDE MG/L
760120 1350		1							153.			
760325 1330		1	1.7			406.			158.	L 1.	3.1	
760517 1030		1	19.	26.36	12.	265.			120. 120.		1.1	
NUMBER OF VALUES			51	15	17	10	5	3	77	20	56	25
MAXIMUM			84.	29.7	21.	451.	109.	4.	177.	34.	3.3	0.36
MINIMUM			0.2	* 26.06	0.	265.	95.	1.5	85.	L 1.	0.3	0.15
AVERAGE			8.4569	26.929	10.118	345.8	101.4	2.3333	140.19	4.45	1.3643	0.2408
STANDARD DEVIATION			18.647	1.049	7.4804	64.998	4.4989	1.1785	18.544	7.0956	0.70742	.056915
GEOMETRIC MEAN			2.3792	26.909	7.8448	339.74	101.3	2.0801	138.96	2.5924	1.1818	0.23423
PERCENTILES:												
PCT10			0.56	26.18	0.	266.			116.	1.	0.5	0.156
PCT25			0.8	26.378	2.	275.75	97.5		127.5	1.	0.8	0.21
PCT50			1.8	26.53	11.	340.	101.	1.5	143.	3.	1.3	0.23
PCT75			4.8	26.86	17.5	410.5	105.5		154.	4.	1.95	0.27
PCT90			24.6	29.508	20.2	448.3			159.4	9.5	2.33	0.344
			@@@	@@@				@@@	@@@	*** @@@	@@@	

EXPLANATORY NOTES:
RESULTS FLAGGED WITH 'A' HAVE REQUIRED CONVERSION
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 0200024 CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 10

SHEET 3 OF 5 PAGE 1

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	107 HARDNESS MG/L	108 AMMONIA MG/L	109 NO2/NO3 MG/L	110 NO3 DIS MG/L	111 NO2 DIS MG/L	112 NIT ORGN MG/L	113 NIT KJEL MG/L	114 NIT TOTL MG/L	117 PHENOL MG/L	118 PHOS DIS MG/L
690728	1100		1	160.			0.02	L 0.005					
690729	1100		1	161.	0.06		0.07	L 0.005	0.02			? 0.12	L 0.0195
690730	1030		1		0.11		0.05	0.005	0.02				
690731	0630		1				0.06	L 0.005				? 0.015	
691015	1030		1	180.	0.05		0.06	L 0.005	0.04				
691111	1100		1	171.	0.1		0.03	0.006	0.01				
691209	1130		1		0.08		0.07		0.04				
700128	1130		1	176.	0.25		0.17	L 0.005	0.02				L 0.0195
700224	1000		1	180.	0.04		0.09	0.005	0.02				0.0117
700408	1030		1	193.	0.05		0.09	0.006	0.05				L 0.0039
700505	1100		1	129.	0.07		0.18	0.009	0.13				0.0117
700602	1030		1	121.	0.01		0.09	0.006	0.06				0.0078
700712	1000		1	147.			0.05	L 0.005	0.08				L 0.0039
700811	1000		1	166.			0.1	L 0.005					L 0.0039
700930	1000		1	176.			0.03	L 0.005			0.13		L 0.0039
701102	1100		1	183.	0.04		0.06	L 0.005	0.05			0.008	L 0.003
701201	1030		1	188.			0.1	L 0.005	0.05			0.011	0.007
710107	1030		1	196.	0.07		0.13	L 0.005	0.08			0.006	0.005
710201	1130		1	191.	0.04		0.14	0.005	0.16			0.003	0.006
710301	1200		1	190.	0.07		0.14	L 0.005	0.14				0.005
710426	1300		1	155.	0.17		0.39	0.011	0.4			0.002	0.005
710526	1210		1	105.			0.05	L 0.005	0.28			0.002	0.015
710623	1200		1	119.	0.01		0.05	0.005	0.15			0.001	? 0.55

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024 CONTINUED

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	107 HARDNESS MG/L	108 AMMONIA MG/L	109 NO2/NO3 MG/L	110 NO3 DIS MG/L	111 NO2 DIS MG/L	112 NIT ORGN MG/L	113 NIT KJEL MG/L	114 NIT TOTL MG/L	117 PHENOL MG/L	118 PHOS DIS MG/L
710721 1230		1	138.	0.16		0.02	L 0.005	0.08			0.001	L 0.003
710825 1115		1	164.			0.12	L 0.005	0.08				
711028 0835		1	184.	0.04		0.05	L 0.005	0.07				L 0.003
711124 0915		1	184.			0.07	L 0.005	0.03				0.005
711215 1000		1	193.	0.012		0.1	L 0.005	0.11				0.008
720119 0920		1	190.	0.04		0.17	L 0.005	0.07				0.009
720208 0900		1	184.	0.06		0.56	0.005	0.03			L 0.002	0.012
720306 0915		1	174.	L 0.01		0.12	L 0.005	0.25			L 0.002	0.011
720411 0825		1	184.	0.1		0.16	L 0.005	0.17			0.003	0.012
720515 0800		1	111.	L 0.01		0.24	L 0.005	1.6			0.003	0.028
720613 1005		1	120.	0.05		0.06	L 0.005	0.37			L 0.002	0.021
720711 1315		1	139.	0.01		L 0.02	L 0.005	0.02			L 0.002	0.013
720803 1235		1	147.	0.04		0.04	L 0.005	0.05			L 0.002	0.004
720920 1005		1	161.	0.02		? 1.44	L 0.005	0.07			L 0.002	0.007
721011 1010		1	167.	L 0.01		0.04	L 0.005	0.7			L 0.002	0.003
						? 1.43	L 0.005					
721123 1030		1	176.			0.11	L 0.005		0.1		L 0.002	L 0.003
721206 1250		1	210.	L 0.01		0.13	L 0.005	0.02			L 0.002	0.005
730117 1030		1	170.	0.02		0.12	L 0.005	0.1			L 0.002	0.015
730313 1345		1	188.	L 0.01		0.02	L 0.005	0.05			L 0.002	L 0.003
730613 1150		1	132.	L 0.01		0.06	L 0.005	0.04			0.004	0.011
730705 0930		1	166.	0.01		0.03	L 0.005	0.05			L 0.002	0.004
730905 1220		1	173.	0.01		0.02	L 0.005	0.04			L 0.002	L 0.003

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

TEST RESULTS FOR SITE 0200024 ELK RIHOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	107 HARDNESS MG/L	108 AMMONIA MG/L	109 NO2/NO3 MG/L	110 NO3 DIS MG/L	111 NO2 DIS MG/L	112 NIT ORGN MG/L	113 NIT KJEL MG/L	114 NIT TOTL MG/L	117 PHENOL MG/L	118 PHOS DIS MG/L
731206	1350		1	186.	0.04		0.09	L 0.005	0.06			L 0.002	0.003
740218	1035		1	181.	0.01		0.06	L 0.005	0.1			L 0.002	L 0.003
740307	1130		1	197.	L 0.01		0.05	L 0.005	0.11			0.002	L 0.003
740509	1200		1	107.	0.01		0.04	L 0.005	0.18			0.002	0.032
740730	1130		1	156.	0.011		0.03	L 0.005	0.05	0.06		L 0.002	0.004
740917	1340		1	174.	L 0.005		0.02	L 0.005	0.07	0.07		L 0.002	L 0.003
750128	1400		0	214.	0.034		0.14	L 0.005	0.07	0.1			0.01
750311	1115		0	196.	0.011		0.11	L 0.005	0.04	0.05		L 0.002	0.005
750521	1145		1	132.	0.012	0.07	0.07	L 0.005	0.09	0.1			0.021
750602	1400		1			0.07							
750630	1430		1	133.	0.005	0.04	0.04	L 0.005	0.19	0.2			0.008
750716	1140		0	140.	L 0.005		0.03	L 0.005	0.09	0.09		0.003	0.006
750723	1520		1			0.02							
750902	1230		1	158.	L 0.005		0.04	L 0.005	0.09	0.09		L 0.002	L 0.003
751117	1040		1	169.	0.007		0.11	L 0.005	0.2	0.21		L 0.002	L 0.003
760120	1350		1	184.	0.014		0.14	L 0.005	0.11	0.12			0.003
760325	1330		1	183.	0.008		0.08	L 0.005	0.04	0.05			L 0.003
760517	1030		1	132.	0.014		0.14	L 0.005	0.16	0.17			0.009

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024 CONTINUED

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TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

	107 HARDNESS MG/L	108 AMMONIA MG/L	109 NO2/NO3 MG/L	110 NO3 DIS MG/L	111 NO2 DIS MG/L	112 NIT ORGN MG/L	113 NIT KJEL MG/L	114 NIT TOTL MG/L	117 PHENOL MG/L	118 PHOS DIS MG/L
NUMBER OF VALUES	58	51	4	62	61	56	13	1	36	54
MAXIMUM	214.	0.25	0.07	1.63	0.011	1.6	0.21	0.13	0.12	0.55
MINIMUM	105.	L 0.005	0.02	L 0.02	L 0.005	0.01	0.05	0.13	0.001	L 0.003
AVERAGE	165.24	.040255	0.05	0.14097	.0052131	0.13304	0.10846	0.13	.0062778	.018219
STANDARD DEVIATION	26.491	.048091	.021213	0.26907	.0009253	0.2281	.051268		0.01942	.073341
GEOMETRIC MEAN	162.92	.022941	.044496	.078541	.0051601	.076929	.097595	0.13	0.002732	.0068523
PERCENTILES:										
PCT10	120.9	0.0072		0.023	0.005	0.02	0.05		0.002	0.003
PCT25	145.25	0.01	0.025	0.04	0.005	0.04	0.065		0.002	0.003
PCT50	172.	0.014	0.055	0.07	0.005	0.07	0.1		0.002	0.005
PCT75	184.	0.05	0.07	0.13	0.005	0.1375	0.145		0.003	0.0117
PCT90	193.3	0.1		0.177	0.005	0.259	0.206		0.0089	0.02025
		***		***	***				***	***
	@@@	@@@		@@@	@@@	@@@			@@@	@@@

EXPLANATORY NOTES:
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 0200024 CONTINUED

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SHEET 4 OF 5 PAGE 1

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	119 PHOS TOT MG/L	120 SILICA MG/L	121 SULPHATE MG/L	125 SULPHIDE MG/L	253 D CADMIUM DISSOLVED MG/L	254 D CALCIUM DISSOLVED MG/L	257 D IRON DISSOLVED MG/L	258 D LEAD DISSOLVED MG/L	259 D MGNESIUM DISSOLVED MG/L	260 D MANGNESE DISSOLVED MG/L
690728	1100	1			6.5	26.8			44.8	0.2		11.7	
690725	1100	1		L 0.0195	5.7	32.5			45.2	0.2		11.6	
691015	1030	1		0.0312	3.7	23.6			49.4			13.9	
691111	1100	1			4.	29.2			54.3	0.06		8.6	0.02
691209	1130	1		0.0413						0.04			0.02
700128	1130	1			4.				47.8			13.7	0.03
700224	1000	1		0.0136	7.				49.	0.12		14.	0.02
700408	1030	1		0.0117	3.3				53.3	0.08		14.5	L 0.01
700505	1100	1		0.0312	12.5				38.4	3.6 ?		8.1	0.09
700602	1030	1		0.0404	4.				34.3	0.96		8.6	0.02
700712	1000	1		0.0195	4.8				41.4	0.16		10.4	0.03
700811	1000	1		0.0039	3.2				46.8	0.02		12.	0.03
700930	1000	1		L 0.0039	5.5					0.06			0.02
701102	1100	1		L 0.003	4.5	29.6			52.	0.04		12.8	0.01
701201	1030	1		0.007	3.7	32.8			52.6	0.04		13.6	L 0.01
710107	1030	1		0.008	6.2	34.2			54.8	0.04		14.3	0.44
710201	1130	1		0.019	4.2	33.6			52.2	0.22		14.7	L 0.01
710301	1200	1		0.014	4.8	35.2			52.8	0.04		14.1	L 0.01
710426	1300	1		0.122	8.8	24.6			44.5	1.8		10.6	0.01
710526	1210	1		0.214	5.5	13.			32.8	0.06		7.4	L 0.01
710623	1200	1		0.088	3.5	12.2			33.4	L 0.02	0.005	7.	L 0.01
710721	1230	1		0.021	3.8	16.5			40.2	0.04	L 0.003	9.3	L 0.01
710825	1115	1		0.014		22.			46.6	L 0.02	0.003	10.9	L 0.01

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024

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SHEET 4 OF 5 PAGE 2

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	119 PHOS TOT MG/L	120 SILICA MG/L	121 SULPHATE MG/L	125 SULPHIDE MG/L	253 D CADMIUM DISSOLVED MG/L	254 D CALCIUM DISSOLVED MG/L	257 D IRON DISSOLVED MG/L	258 D LEAD DISSOLVED MG/L	259 D MGNESIUM DISSOLVED MG/L	260 D MANGNESE DISSOLVED MG/L
711028 0835		1	0.006	4.43	62.9			51.6	0.04	L 0.003	13.5	L 0.01
711124 0915		1	0.017	4.3	32.2			52.2	0.04	0.006	14.2	L 0.01
711215 1000		1	0.01	4.6	32.5			52.4	L 0.02	L 0.003	13.5	L 0.01
720119 0920		1	0.019	5.1	33.1			52.4	0.02	L 0.003	13.1	0.01
720208 0900		1	0.06	4.7	32.1			51.6	0.02	L 0.003	12.5	L 0.01
720306 0915		1	0.013	5.1	29.6			48.2	0.14	L 0.003	11.6	L 0.01
720411 0825		1	0.028	4.8	24.5			50.8	0.06	L 0.003	11.5	0.01
720515 0800		1	0.428	4.7	10.2			31.	0.06	L 0.003	7.2	L 0.01
720613 1005		1	0.021	4.4	9.2			33.8	0.38	0.01	8.2	0.03
720711 1315		1	0.036	4.3	9.2			38.6	L 0.02	0.003	9.8	0.01
720803 1235		1	0.018	4.3	12.			42.	L 0.02	0.01	9.8	L 0.01
720920 1005		1	0.009	4.9	23.5			45.5	L 0.04	L 0.003	11.5	L 0.01
721011 1010		1	0.032	4.3	24.8			46.	L 0.04	L 0.003	12.6	L 0.01
721123 1030		1	0.006	4.7	31.2		L 0.0001	48.5	L 0.04	L 0.003	13.3	L 0.01
721206 1250		1	0.013	5.5	32.			55.	L 0.04	L 0.003	17.5	L 0.01
730117 1030		1	0.02	5.3	16.7			48.5			11.9	
730313 1345		1	0.007	4.2	32.			52.			14.	
730613 1150		1	0.033	4.4	10.9			38.			9.	
730709 0930		1	0.017	4.4	14.1			46.			12.5	
730905 1220		1	0.006	4.	22.9			47.			13.5	
731206 1350		1	0.007	4.4	29.5			51.6			13.8	
740218 1035		1	0.007	4.5	29.1			49.4			14.	
740307 1130		1	0.007	5.1	32.2			54.6			14.7	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES SITE 0200024 CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 16

SHEET 4 OF 5 PAGE 3

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	119 PHOS TOT MG/L	120 SILICA MG/L	121 SULPHATE MG/L	125 SULPHIDE MG/L	253 D CADMIUM DISSOLVED MG/L	254 D CALCIUM DISSOLVED MG/L	257 D IRON DISSOLVED MG/L	258 D LEAD DISSOLVED MG/L	259 D MGNESIUM DISSOLVED MG/L	260 D MANGNESE DISSOLVED MG/L
740509 1200		1	0.082	6.	6.5			30.			7.8	
740730 1130		1	0.013	4.	16.			45.3			10.4	
740917 1340		1	0.009	4.6	19.5			48.9			12.5	
750128 1400		0	0.016	4.8	32.			61.2			14.8	
750311 1115		0	0.01	5.	28.			55.6			14.	
750521 1145		1	0.042 0.336	4.9	10.9			37.6			9.2	
750602 1400		1	0.135 0.023			L 0.5						
750630 1430		1	0.02 0.01	4.	10.8			37.5			9.5	
750716 1140		0	0.017	4.	12.9			39.7			10.	
750723 1520		1	0.011 0.004									
750902 1230		1	0.008	4.1	20.4			44.9			11.2	
751117 1040		1	0.008	4.5	24.7			47.			12.5	
760126 1350		1	0.008	4.5	27.6			51.2			13.6	
760325 1330		1	0.009	4.4	32.			51.			13.4	
760517 1030		1	0.072	4.1	13.2			38.5			8.7	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024

CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 17

SHEET 4 OF 5 PAGE 4

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

	119 PHOS TOT MG/L	120 SILICA MG/L	121 SULPHATE MG/L	125 SULPHIDE MG/L	253 D CADMIUM DISSOLVED MG/L	254 D CALCIUM DISSOLVED MG/L	257 C IRON DISSOLVED MG/L	258 D LEAD DISSOLVED MG/L	259 D MGNESIUM DISSOLVED MG/L	260 D MANGNESE DISSOLVED MG/L
NUMBER OF VALUES	62	57	50	1	1	57	35	18	57	35
MAXIMUM	0.428	12.5	62.9	L 0.5	L 0.0001	61.2	3.6	0.01	17.5	0.44
MINIMUM	L 0.003	3.2	6.5	L 0.5	L 0.0001	30.	L 0.02	L 0.003	7.	L 0.01
AVERAGE	.033568	4.8163	24.136	0.5	0.0001	46.346	0.24444	.0040556	11.8	.028286
STANDARD DEVIATION	.061666	1.375	10.234			7.0299	0.65298	.0022478	2.3696	.072051
GEOMETRIC MEAN	.017598	4.6832	21.814	0.5	0.0001	45.767	.058893	.0036666	11.543	.014851
PERCENTILES:										
PCT10	0.006	3.78	10.81			34.2	0.02	0.003	8.18	0.01
PCT25	0.008	4.1	13.875			40.8	0.04	0.003	9.8	0.01
PCT50	0.0165	4.5	24.75			47.8	0.04	0.003	12.5	0.01
PCT75	0.0314	5.05	32.			52.	0.135	0.0035	13.75	0.02
PCT90	0.079	6.04	33.07			54.36	0.55399	0.01	14.34	0.03
	***			***	***		***	***		***
	@@@	@@@	@@@			@@@	@@@	@@@	@@@	@@@

EXPLANATORY NOTES:
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 0200024 CONTINUED

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WATER RESOURCES SERVICE

30 AUGUST 1976 PAGE 18

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER

SHEET 5 OF 5 PAGE 1

FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	264 D POTASIUM DISSOLVED MG/L	265 D SODIUM DISSOLVED MG/L	265 T SODIUM TOTAL MG/L	266 D ZINC DISSOLVED MG/L	450 COL.FECL M.P.N.	451 COL.TOTL M.P.N.
690728 1100	1		1.		1.8		L 2.	
690729 1100	1		1.1		7.		L 2.	
690730 1030	1						L 2.	
690731 0630	1						8.	
691015 1030	1		0.5		2.		13.	
691111 1100	1		0.9		2.2		17.	
691209 1130	1						70.	
700128 1130	1		0.6		2.3		109.	
700224 1000	1		0.7		2.6		27.	
700408 1030	1		0.7		3.5		46.	
700505 1100	1		0.9		2.7		278.	
700602 1030	1		0.7		1.4		33.	
700712 1000	1		1.5		1.6			
700811 1000	1		0.9		2.			
700930 1000	1		0.5		2.		109.	
701102 1100	1		0.5		1.8			
701201 1030	1		0.5		2.6		27.	
710107 1030	1		0.7		2.4			
710201 1130	1		0.7		2.2			
710301 1200	1		0.6		2.9			
710426 1300	1		0.6		1.5			
710526 1210	1		0.5		0.9			
710623 1200	1		0.4		0.8	L 0.02		

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024 CONTINUED

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SHEET 5 OF 5 PAGE 2

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	264 D POTASSIUM DISSOLVED MG/L	265 D SODIUM DISSOLVED MG/L	265 T SODIUM TOTAL MG/L	266 D ZINC DISSOLVED MG/L	450 COL.FECL M.P.N.	451 COL.TOTL M.P.N.
710721 1230	1		0.4		3.1	L 0.005		
710825 1115	1		0.6		1.6	0.02		
711028 0835	1		0.6		2.1	0.013		
711124 0915	1		0.7		2.4	L 0.005		
711215 1000	1		0.5		2.4	0.016		
720115 0920	1		0.5		2.4	0.05		
720208 0900	1		0.7		2.7	0.005		
720306 0915	1		0.6		2.6	0.02		
720411 0825	1		0.6			0.009		
720515 0800	1		0.6			L 0.005		
720613 1005	1		0.4			L 0.005		
720711 1315	1		0.6			L 0.005		
720803 1235	1		0.5			0.03		
720920 1005	1		0.5			L 0.005		
721011 1010	1		0.5			L 0.005		
721123 1030	1		0.3			L 0.005		
721206 1250	1		0.5			L 0.005		
730117	1						49.	
730117 1030	1		0.7	2.8			49.	
730313 1345	1		0.5	2.7			220.	
730613 1150	1		0.5	1.1				
730709 0930	1		0.5	1.3			170.	
730905 1220	1		0.6	1.8			79.	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024 CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 20

SHEET 5 OF 5 PAGE 3

TEST RESULTS FOR SITE 0200024 ELK R:HOSMER FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	264 D POTASIUM DISSOLVED MG/L	265 D SODIUM DISSOLVED MG/L	265 T SODIUM TOTAL MG/L	266 D ZINC DISSOLVED MG/L	450 COL.FECL M.P.N.	451 COL.TOTL M.P.N.
731206 1350	1		1.4	2.4			L 2.	
740218 1035	1		0.5	2.7			L 200.	
740307	1						L 2.	
740307 1130	1		0.5	2.8				
740509 1200	1		0.6	1.1			33.	
740730 1130	1		0.5	1.2			22.	
740917 1340	1		0.6	1.8			L 2.	
750128 1400	0		0.6	3.3				
750128 1400	1						540.	
750311 1115	0		0.8	2.8				
750311 1115	1						.5.	
750521 1145	1		0.5	1.7				
750521 1145	1						4.	
750602 1400	1						210.	
750630 1430	1						L 2.	
750630 1430	1		0.5	1.1				
750716 1140	0		0.4	1.2				
750716 1140	1						49.	
750723 0000	1						8.	8.
750902 1230	1		0.5	1.4			5.	
751117 1040	1		0.5	1.9			33.	
760120 1350	1		0.5	2.4			L 2.	
760325 1330	1		0.5	3.			5.	

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES

SITE 0200024 CONTINUED

19 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 21

SHEET 5 OF 5 PAGE 4

TEST RESULTS FOR SITE 0200024 ELK RIVER

FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	264 D POTASIUM DISSOLVED MG/L	265 D SODIUM DISSOLVED MG/L	265 T SODIUM TOTAL MG/L	266 D ZINC DISSOLVED MG/L	450 COL.FECL M.P.N.	451 COL.TOTL M.P.N.
760517	1030		1	0.4	1.2			4.	
NUMBER OF VALUES				58	21	28	18	37	1
MAXIMUM				1.5	3.3	7.	0.05	540.	8.
MINIMUM				0.3	1.1	0.8	L 0.005	L 2.	8.
AVERAGE				0.61552	1.9857	2.3393	.012667	65.892	8.
STANDARD DEVIATION				0.21799	0.73309	1.0788	.011709	106.52	
GEOMETRIC MEAN				0.56674	1.8482	2.1559	.0091918	19.274	8.
PERCENTILES:									
PCT10				0.4	1.1	1.35	0.005	2.	
PCT25				0.5	1.2	1.8	0.005	4.	
PCT50				0.55	1.8	2.25	0.005	27.	
PCT75				0.7	2.75	2.6	0.02	74.5	
PCT90				0.9	2.96	3.14	0.032	212.	
				@@@			*** @@@	***	

EXPLANATORY NOTES:
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 0200024

20 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 1

SHEET 1 OF 2 PAGE 1

TEST RESULTS FOR SITE 1190004 ELK RIVER U/S FERNIE FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D H M	DEPTH FEET	COMP TYPE	004 PH FEL UNIT	005 RES 105C MG/L	007 RESF 105 MG/L	008 RESNF105 MG/L	011 SPE COND UMHO/CM	013 T SAMPLG DEG.C	015 TURBIDTY J.T.UNIT	102 ALKALI T MG/L	103 CARBN OR MG/L	109 NO2/NO3 MG/L
750513 1425		1	8.2 8.5	208.	152.	56	262.		24.	134.	L 1.	0.14
750602 1430		1	8.1 8.3	278.	138.	140	228.	7.	44.	113.	6.	0.12
750630 1455		1	8.1 8.5	186.	150.	36	256.	9.	7.1	126.	3.	0.06
750722 1415		1	8.1 8.4	140.	139.	2	238.	11.	0.5	111.	1.	0.05
751007 1415		1	8.2 8.9	168.			282. 170. ?	6.2	3.	135.		
760113 1500		1	8.1 8.4			1.	352. 100. ?	0.	0.5	154.		
NUMBER OF VALUES			12	5	4	1	8	5	6	6	4	4
MAXIMUM			8.9	278.	152.	1.	352.	11.	44.	154.	6.	0.14
MINIMUM			8.1	140.	138.	1.	170.	0.	0.5	111.	L 1.	0.05
AVERAGE			8.3167	196.	144.5	1.	246.12	6.64	13.183	128.83	2.75	0.0925
STANDARD DEVIATION			0.23033	46.665	6.5383		54.177	3.7146	15.964	14.576	2.0463	.038324
GEOMETRIC MEAN			8.3135	190.81	144.35	1.	240.24	8.0962	4.2169	128.02	2.0598	.084257
PERCENTILES:												
PCT10			8.1				192.	3.1	0.5	112.5	1.	0.0525
PCT25			8.1	154.	138.		247.	7.	5.05	130.	2.	0.09
PCT50			8.25	186.	144.		277.75	10.	29.	139.75	5.25	0.135
PCT75			8.475	243.	151.5						***	
PCT90			8.78									
			@@@				@@@			@@@		

EXPLANATORY NOTES:
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 1190004 CONTINUED

TEST RESULTS FOR SITE 1190004 ELK RIVER U/S FERNIE FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

** START ** Y M D	H M	DEPTH FEET	COMP TYPE	119 PHOS TOT MG/L	450 COL.FECL M.P.N.	451 COL.TOTL M.P.N.
750513	1425		1	0.091	L 20.	
750602	1430		1	0.18 0.01	170.	
750630	1455		1	0.054 0.008	L 2.	
750722	1415		1	0.007 0.003	4.	4.
751007	1415		1		34.	34.
751009	1000		1		2.	13.
760121	1045		1		5.	13.
760129	1045		1		540.	1600.
760205	1300		1		130.	280.
760212	1120		1		70.	350.
760318	1230		1		8.	33.
760325	1325		1		7.	27.

NOTE: CHECK THE LAST PAGE OF EACH SHEET OF THIS REPORT FOR EXPLANATORY NOTES SITE 1190004 CONTINUED

20 WATER RESOURCES SERVICE 30 AUGUST 1976 PAGE 3

SHEET 2 OF 2 PAGE 2

TEST RESULTS FOR SITE 1190004 ELK RIVER U/S FERNIE FOR 01 JANUARY 1965 TO 30 AUGUST 1976

SUBMITTING AGENCY: ALL
DEPTH: ALL
SAMPLING LOCATION: ALL

	119 PHOS TOT MG/L	450 COL.FECL M.P.N.	451 COL.TOTL M.P.N.
NUMBER OF VALUES	7	12	9
MAXIMUM	0.18	540.	1600.
MINIMUM	0.003	L 2.	4.
AVERAGE	.050429	82.667	261.56
STANDARD DEVIATION	.060966	147.76	488.59
GEOMETRIC MEAN	.020431	19.222	52.84
PERCENTILES:			
PCT10		2.	
PCT25	0.007	4.25	13.
PCT50	0.01	14.	33.
PCT75	0.091	115.	315.
PCT90		429.	
	@@@	***	

EXPLANATORY NOTES:
STATISTICS FLAGGED WITH '***' INCLUDE ONE OR MORE VALUES MARKED L (LESS THAN), G (GREATER THAN) OR M (MEAN OF RESULTS)
COLUMNS FLAGGED WITH '@@@' INCLUDE MORE THAN ONE TEST METHOD

SITE 1190004

APPENDIX H

FISH CAPTURED

FISH CAPTURED IN REACH NA, NB AND NC OF NO-NAME CREEK

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight (g)	Sex	Maturity+	Comments
REACH NA									
Sept. 7	17:00	Cutthroat Trout*	FS14	ES	11.4	20	M	III-IV	Parr marks
" "	"	" "	"	"	14.9	30	M	III-IV	Parr marks
" "	"	" "	"	"	17.0	60	M	IV	Parr marks
" "	"	" "	"	"	11.6	20		NSP	Parr marks
" "	"	" "	"	"	11.7	20			Parr marks
" "	"	" "	"	"	11.6	15			Parr marks
" "	"	" "	"	"	10.3	15			Parr marks
" "	"	" "	"	"	11.2	15			
" "	"	" "	"	"	16.3	55			
" "	"	" "	"	"	12.2	25			
" "	"	" "	"	"	9.8	10			
REACH NB									
Sept. 7	17:00	Brook Trout**	FS7	ES	10.7	10			
" "	"	" "	"	"	12.5	15			
" "	"	Cutthroat Trout	"	"	17.8	70			
" "	"	" "	"	"	11.4	15			
Sept. 6	"	" "	"	"	10.9	15			
" "	"	Dolly Varden***	"	"	24.1	145	M	II	
REACH NC									
Sept. 6	16:00	Brook Trout	FS6	ES	18.5	90			Scales taken
" "	"	" "	"	"	14.0	40			Parr marks
" "	"	" "	"	"	21.1	120			Scales taken
" "	"	" "	"	"	12.6	35			
" "	"	" "	"	"	13.3	40			
" "	"	" "	"	"	11.8	30			
" "	"	" "	"	"	14.0	45			
" "	"	" "	"	"	11.9	35			
" "	"	" "	"	"	12.1	30			
" "	"	" "	"	"	11.5	25			
" "	"	" "	"	"	10.9	25			
" "	"	" "	"	"	11.3	25			

Continued ...

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight (g)	Sex	Maturity†	Comments
REACH NC continued									
Sept. 7	15:00	Brook Trout	FS6	ES	13.1	30			Parr marks
" "	"	" "	"	"	13.5	35		NSP	Red belly, parr marks
" "	"	" "	"	"	12.2	30		NSP	Parr marks
" "	"	" "	"	"	12.2	25		NSP	Parr marks
" "	"	" "	"	"	11.4	20	M	IV-V	Preserved
" "	"	" "	"	"	11.6	20		NSP	Parr marks
" "	"	" "	"	"	10.0	10		NSP	Parr marks
" "	"	" "	"	"	6.3				
" "	"	" "	"	"	6.2				
Sept. 6	16:00	Cutthroat Trout	"	"	15.1	50			Fin tattered
" "	"	" "	"	"	14.4	50			
" "	"	" "	"	"	19.6	50			
" "	"	" "	"	"	13.0	35			
" "	"	" "	"	"	12.4	30			Parr marks
" "	"	" "	"	"	13.0	35			
" "	"	" "	"	"	12.4	30			Parr marks
" "	"	" "	"	"	13.0	35			Parr marks
" "	"	" "	"	"	19.5	105			Scales taken
" "	"	" "	"	"	10.0	20			
" "	"	" "	"	"	7.9				Preserved
" "	"	" "	"	"	12.5	35			
" "	"	" "	"	"	10.1	20			
Sept. 7	15:00	" "	FS12	"	15.9	55	M	IV	Parr marks
" "	"	" "	"	"	13.1	35	M	IV	Parr marks

* *Salmo clarki*
** *Salvelinus fontinalis*
*** *Salvelinus malma*

ES Electroshocking

FISH CAPTURED IN REACH ND OF "NO-NAME" CREEK

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight (g)	Sex	Maturity+	Comments
Sept. 7	13:00	Brook Trout	FS3	Trap	25.9	200	M	IV	
" "	15:00	" "	FS13	ES	14.5	45		NSP	Parr Marks
" "	"	" "	"	"	13.5	35		NSP	Parr Marks
" "	"	" "	"	"	18.2	80		NSP	Parr Marks
" "	"	" "	"	"	13.3	30		NSP	Parr Marks
" "	12:00	" "	FS10	"	21.3	115		NSP	No Parr Marks, Spawning Colours
" "	"	" "	"	"	20.5			NSP	Faint Marks
" "	"	" "	"	"	21.5	125		NSP	No Parr Marks
" "	"	" "	"	"	16.4	60		NSP	Parr Marks
" "	"	" "	"	"	5.9				
" "	"	" "	"	"	6.9				
" "	"	" "	"	"	7.3				
Sept. 9	07:30	" "	FS1	"	16.7	60		NSP	Parr Marks
" "	"	" "	"	"	20.5	80		"	" "
" "	"	" "	"	"	9.6	15		"	" "
" "	"	" "	"	"	14.3	25		"	" "
" "	"	" "	"	"	17.1	50		"	" "
" "	"	" "	"	"	11.7	15		"	" "
" "	"	" "	"	"	12.9	20		"	" "
" "	"	" "	"	"	10.1	10		"	" "
Sept. 9	08:00	" "	FS11	"	24.6	170		NSP	Red Belly
" "	"	" "	"	"	23.9	150	M	Milt	Red Belly
" "	"	" "	"	"	18.2	60		NSP	Parr Marks
" "	"	" "	"	"	17.1	50	F	IV-V	" "
" "	"	" "	"	"	11.9	20		NSP	" "
" "	"	" "	"	"	12.3	20		NSP	" "
Sept. 7	15:00	Cutthroat Trout	FS13	"	21.0	140			
" "	"	" "	"	"	13.7	35		NSP	Parr Marks
" "	"	" "	"	"	15.7	55		NSP	Parr Marks

Continued ...

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight (g)	Sex	Maturity+	Comments
REACH ND continued									
Sept. 7	10:00	Longnose Dace	FS9	ES	4.4				
" "	"	" "	"	"	7.6				
" "	"	" "	"	"	7.4				
" "	"	" "	"	"	7.3				
" "	"	" "	"	"	7.7				
" "	"	" "	"	"	4.4				
" "	"	" "	"	"	5.1				
" "	"	" "	"	"	5.8				
" "	"	" "	"	"	8.4				
" "	"	" "	"	"	4.3				
Sept. 7	11:00	" "	"	"	8.3		F	III	
Sept. 9	07:30	Sucker	FS1	"	15.4	40		IV-V	
" "	08:00	"	"	"	15.8	50		"	
" "	"	"	"	"	15.7	50		"	
" "	"	"	"	"	15.8	55	M	V-VI	

FISH CAPTURED IN REACH NE OF NO-NAME CREEK

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight (g)	Sex	Maturity	Comments
Sept. 6	12:30	Brook Trout	FS4	ES	19.8	80	M	Milt	
" "	"	" "	"	"	5.4				
" "	"	" "	"	"	6.5				
" "	"	" "	"	"	6.2				
" "	"	" "	"	"	11.9	25			
" "	"	" "	"	"	14.9	40			
" "	"	" "	"	"	14.8	35			
" "	"	" "	"	"	6.8				
" "	"	" "	"	"	6.1				
" "	"	" "	"	"	6.1				
" "	"	" "	"	"	5.4				
" "	"	" "	"	"	4.8				
" "	"	" "	"	"	12.7	20			
" "	"	" "	"	"	5.5				
" "	"	" "	"	"	5.0				
" "	"	" "	"	"	11.5	15			Parr Marks
" "	"	" "	"	"	5.5				
" "	"	" "	"	"	7.4				
" "	"	" "	FS5	"	5.5				
" "	"	" "	"	"	5.0				
" "	"	" "	"	"	6.0				
" "	"	" "	"	"	5.5				
" "	"	" "	"	"	5.5				
" "	"	" "	"	"	6.1				
" "	"	" "	"	"	7.2				
" "	"	" "	"	"	6.0				
" "	"	" "	"	"	4.7				
" "	"	" "	"	"	5.4				
" "	"	" "	"	"	5.8				
" "	"	" "	"	"	6.4				
" "	"	" "	"	"	5.7				
" "	"	" "	"	"	5.1				

Continued ...

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight (g)	Sex	Maturity	Comments
REACH NE continued									
Sept. 6	12:30	Brook Trout	FS4	ES	17.7	70		NSP	Scales Taken
" "	"	" "	"	"	20.2	95	M	IV	
" "	"	" "	"	"	17.0	50		NSP	
" "	"	" "	"	"	12.5	30			
" "	"	" "	"	"	11.5	25			Scales Taken
" "	"	" "	"	"	18.6	60		NSP	Scales Taken
" "	"	" "	"	"	15.8	55	M	III-IV	
" "	"	" "	"	"	18.3	75	F	IV	
" "	"	" "	"	"	18.8	70			Scales Taken
" "	"	" "	"	"	14.0	35			Scales Taken
" "	"	" "	"	"	12.0	20			Parr Marks
" "	"	" "	"	"	11.4	15			
" "	"	" "	"	"	12.6	25			
" "	"	" "	"	"	12.0	15			
" "	"	" "	"	"	5.6				
" "	"	" "	"	"	5.3				
" "	"	" "	"	"	7.0				
" "	"	" "	"	"	5.1				
" "	"	" "	"	"	5.1				
Sept. 6	14:00	" "	"	"	18.0	55		NSP	
" "	"	" "	"	"	18.7	75			
" "	"	" "	"	"	6.5				
" "	"	" "	"	"	5.8				
" "	"	" "	"	"	6.6				
" "	"	" "	"	"	5.9				
" "	"	" "	"	"	5.5				
" "	"	" "	"	"	7.4				
" "	"	" "	"	"	25.5	225			Scales Taken
" "	"	" "	"	"	21.5	125		NSP	Scales Taken
" "	"	" "	"	"	20.0	100			Scales Taken
" "	"	" "	"	"	11.7	10			
" "	"	" "	"	"	11.0				
" "	"	" "	"	"	6.0				
" "	"	" "	"	"	7.4				
" "	"	" "	"	"	11.5				

Continued ...

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight (g)	Sex	Maturity	Comments
REACH NE continued									
Sept. 6	14:00	Brook Trout	FS5	ES	6:1				
" "	"	" "	"	"	16.6	35			
" "	"	" "	"	"	5.9				
" "	"	" "	"	"	17.4	60			
" "	"	" "	"	"	12.0	15			
" "	"	" "	"	"	10.0	5			
" "	"	" "	"	"	10.0				
" "	"	" "	"	"	11.0	5			
" "	"	" "	"	"	12.0				
" "	"	" "	"	"	5.5				
" "	"	" "	"	"	6.2				
" "	"	" "	"	"	6.5				
" "	"	" "	"	"	6.1				
" "	"	" "	"	"	6.3			NSP	
" "	"	" "	"	"	11.4				
" "	"	" "	"	"	6.1				
" "	"	" "	"	"	5.6				
" "	"	" "	"	"	5.9				
" "	"	" "	"	"	6.6				
" "	"	" "	"	"	5.5				
" "	"	" "	"	"	6.4				
" "	"	" "	"	"	6.9				
" "	"	" "	"	"	6.6				
" "	"	" "	"	"	6.3				
" "	"	" "	"	"	6.4				
" "	"	" "	"	"	≈12				Escaped
" "	"	" "	"	"	6.5				
" "	"	" "	"	"	12.5	15			
" "	"	" "	"	"	12.5	15			
" "	"	" "	"	"	17.5	60			
" "	"	" "	"	"	18.5	70			
" "	"	" "	"	"	18.0	60			
" "	"	" "	"	"	15.2	45			
" "	"	" "	"	"	18.0	55		NSP	

Continued ...

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight (g)	Sex	Maturity	Comments
REACH NE continued									
Sept. 6	14:00	Brook Trout	FS5	ES	11.6	10			
" "	"	" "	"	"	11.7	15			
" "	"	" "	"	"	13.9	30			
" "	"	" "	"	"	6.5				
" "	"	" "	"	"	15.0	40			
" "	"	" "	"	"	13.7	25			
" "	"	" "	"	"	6.0				
" "	"	" "	"	"	14.1	30			
" "	"	" "	"	"	5.9				
" "	"	" "	"	"	6.0				
" "	"	" "	"	"	14.1	30			
" "	"	" "	"	"	12.2	20			
" "	"	" "	"	"	16.5	50			
" "	"	" "	"	"	21.3	110			
" "	"	" "	"	"	16.8	50			
" "	"	" "	"	"	7.5				
" "	"	" "	"	"	5.4				
" "	"	" "	"	"	12.0	20			
" "	"	" "	"	"	6.5				
" "	"	" "	"	"	6.5			NSP	
" "	"	" "	"	"	10.9	15			
" "	"	" "	"	"	16.1	45			
" "	"	" "	"	"	15.2	45			
" "	"	" "	"	"	19.3	95			
" "	"	" "	"	"	≈12				Escaped
" "	"	" "	"	"	10.8				
" "	"	" "	"	"	11.4	20			
" "	"	" "	"	"	15.6	40			
" "	"	" "	"	"	11.5				
" "	"	" "	"	"	11.6	15			
" "	"	" "	"	"	13.3	25			
" "	"	" "	"	"	12.3	25			
" "	"	" "	"	"	6.5				
" "	"	" "	"	"	7.0				

FISH CAPTURED IN REACH NF AND NG OF "NO-NAME" CREEK

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight (g)	Sex	Maturity	Comments
REACH NF									
Sept. 7	10:30	Brook Trout	FS9	ES	18.8	80		NSP	No parr marks
" "	"	" "	"	"	19.7	85	M	IV	
" "	"	" "	"	"	24.0	135		NSP	No parr marks
" "	"	" "	"	"	17.5	50		NSP	Parr marks
" "	"	" "	"	"	12.2	20	F	II-III	Parr marks
Sept. 7	11:00	Brook Trout	FS1	Trap	14.5	30	F	ILI	Parr marks
" "	"	" "	"	"	23.5	135	F	V	Faint marks
" "	"	" "	"	"	19.0	85	M	MILT	Faint marks
" "	"	" "	"	"	16.2	55		NSP	Faint marks
" "	"	" "	"	"	19.9	90	M	MILT	Faint marks
" "	"	" "	"	"	16.8	50		NSP	Faint marks
" "	"	" "	"	"	18.5	70		NSP	First year marks
" "	"	" "	"	"	15.5	40	M	IV	Parr marks
" "	"	" "	"	"	12.2	20	F	II-III	Parr marks
REACH NG									
Sept. 7	09:00	Brook Trout	FS8	ES	18.7	85		NSP	Parr marks
" "	"	" "	"	"	19.7	100	M	MILT	No parr marks
" "	"	" "	"	"	15.8	45		NSP	Parr marks
" "	"	" "	"	"	14.9	35		NSP	Parr marks
" "	"	" "	"	"	≈ 6				Parr marks, escaped

FISH CAPTURED AT BEAVER PONDS BELOW PROVINCIAL PARK

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight	Sex	Maturity	Comments
Sept. 9	09:30	Brook Trout	FS15	2" GN	25.2	180	F	IV-V	No parr marks
" "	10:00	" "	"	1½" GN	15.1	35	M	III-IV	Parr marks
" "	"	" "	"	"	15.0	35	M	III-IV	Parr marks
" "	"	" "	"	"	16.1	45	F	V	Preserved
" "	09:30	" "	"	2" GN	25.4	225	M	MILT	No parr marks
" "	"	" "	"	"	20.2	95		NSP	Parr marks
" "	"	" "	"	"	23.5	130	M	IV	Parr marks
" "	"	" "	"	"	24.1	165	F	V	Faint marks
" "	10:30	Sucker*	FS2	Trap	13.7	25		NSP	
" "	"	"	"	"	11.2	15		"	
" "	"	"	"	"	18.6	85		"	
" "	"	"	"	"	20.2	90		"	
" "	"	"	"	"	15.1	45		"	
" "	"	"	"	"	19.0	80		"	
" "	"	"	"	"	14.9	35		"	
" "	"	"	"	"	17.0	65		"	
" "	"	"	"	"	13.4	30		"	
" "	"	"	"	"	16.4	50		"	Scales taken
" "	"	"	"	"	18.9	85		"	" "
" "	"	"	"	"	14.8	40		"	" "
" "	"	"	"	"	9.6	10		"	" "
" "	"	"	"	"	16.5	50		"	" "
" "	"	"	"	"	11.9	20		"	" "
" "	"	"	"	"	10.0	15		"	" "
" "	"	"	"	"	16.8	60		"	" "
" "	"	"	"	"	18.7	90		"	" "
" "	"	"	"	"	16.3	60		"	
" "	"	"	"	"	15.5	50		"	
" "	"	"	"	"	14.0	40		"	
" "	"	"	"	"	11.5	20		"	
" "	"	"	"	"	16.2	50		"	
" "	"	"	"	"	14.8	40		"	

*Longnose sucker

Continued ...

Date	Time	Species	Location	Fishing Method	Fork Length (cm)	Weight	Sex	Maturity	Comments
Beaver Ponds continued									
Sept. 9	10:30	Sucker	FS2	Trap	10.0	15		NSP	
" "	"	"	"	"	15.0	40		"	
" "	"	"	"	"	11.4	20		"	
" "	"	"	"	"	17.4	65		"	
" "	"	"	"	"	13.4	30		"	
" "	"	"	"	"	15.2	40		"	
" "	"	"	"	"	8.1	10		"	
" "	"	"	"	"	11.2	20		"	
" "	"	"	"	"	17.1	60		"	
" "	"	"	"	"	15.0	40		"	
" "	"	"	"	"	17.5	70		"	
" "	"	"	"	"	16.1	50		"	
" "	"	"	"	"	14.4	35		"	
" "	"	"	"	"	14.3	35		"	
" "	"	"	"	"	17.4	60		"	
" "	"	"	"	"	13.0	30		"	
" "	"	"	"	"	9.2	15		"	
" "	"	"	"	"	17.6	65		"	
" "	"	"	"	"	14.9	45		"	
" "	"	"	"	"	16.1	50		"	
" "	"	"	"	"	12.9	35		"	
" "	"	"	"	"	10.1	15		"	
" "	"	"	"	"	15.0	45		"	
" "	"	"	"	"	9.2	15		"	
" "	"	"	"	"	12.2	30		"	
" "	"	"	"	"	13.6	35		"	

GN - Gill Net

APPENDIX I

SOIL PROFILE DESCRIPTIONS

SOIL PROFILE DESCRIPTION SITE 29

Elevation:	3360'
Slope and Aspect:	Level
Parent Material:	Fluvial
Landform:	$\frac{\$sFv(b)}{gF1}$
Drainage Class:	Rapidly drained
Seepage:	Seasonal; area subjected to high water table during freshet
Depth to Bedrock:	Unknown
Classification:	Orthic Eutric Brunisol

LF 2-0 cm. Fresh grasses and leaves.

Ap 0-10 cm. Dark grayish brown (10YR 4/2d) sandy loam; very weak fine granular; loose abundant fine roots; very weakly effervescent; smooth boundary; pH 5.6.

BCk 10-29 cm. Dark grayish brown (10YR 4/2d) sandy loam; very weak medium subangular blocky breaking to granular; loose; strongly effervescent; abundant fine roots; smooth boundary; pH 6.1.

Ck 29-121 cm. Grayish brown (2.5Y 5/2d) sandy; very weak medium subangular blocky breaking to granular and single grain; extremely effervescent; few fine roots; abrupt boundary; pH 6.3.

IICca 121+ cm. Gravelly sand; single grain; loose; occasional large rounded stones; extremely effervescent; pH 6.5.

SOIL PROFILE DESCRIPTION SITE 30

Elevation:	3360'
Slope and Aspect:	Level to depressional
Parent Material:	Fluvial
Landform:	$\frac{ssFv}{gFl} - E^{A}$
Drainage Class:	Imperfectly and poorly drained
Seepage:	Subjected to high water table and partial flooding during freshet; consist of numerous streams which drain the upland slopes
Depth to Bedrock:	Unknown
Classification:	Rego Gleysol

OF	20-0 cm. Partially decomposed grasses, sedges and other organic materials; fibrous; abundant grass and sedge roots.
Aha	0-8 cm. Black (5YR 2.5/1m) silt loam; massive when wet; plastic, slightly sticky; abundant fine and medium roots; pH 5.0.
Cg	8-33 cm. Dark olive gray (5YR 3/2m) silt loam; massive when wet; plastic, slightly sticky; abundant fine and medium roots; pH 5.5.
IICg	33+ cm. Coarse stony gravels; loose; cleanly washed; pH 6.5.

SOIL PROFILE DESCRIPTION SITE 23

Elevation:	3380'
Slope and Aspect:	Level
Parent Material:	Fluvial
Landform:	$\frac{\$s(s)Fv}{gsFt}$
Drainage Class:	Rapidly drained
Seepage:	None
Depth to Bedrock:	Unknown
Classification:	Degraded Eutric Brunisol

LF 2-0 cm. Partially decomposed needles, twigs and other forest litter; abundant fine and medium roots.

Ae 0-4 cm. Pale brown (10YR 6/3m, 10YR 6/2d); gravelly silt loam; weakly platy breaking to fine granular; very friable when moist; firm when dry; abundant fine, few medium roots; wavy boundary; 2-6 cm thick; pH 4.3.

Bm 4-15 cm. Yellowish brown (10YR 5/4m, 10YR 6/3d); gravelly blocky breaking to granular; very friable; occasional pebbles; plentiful fine, few medium roots; smooth boundary; pH 4.2.

IICca 15-45 cm. Dark brown (10YR 3/3m, 10YR 4/3d); gravelly sand; fine granular breaking to single grain; loose; moderately effervescent; plentiful fine, few medium roots; smooth boundary; pH 5.6.

IICca 45-100+ cm. Very dark grayish brown (10YR 3/2m, 10YR 5/2d); gravelly sand; single grain; loose; few fine roots; pH 5.9.

SOIL PROFILE DESCRIPTION SITE 27

Elevation:	3380'
Slope and Aspect:	Level
Parent Material:	Fluvial
Landform:	$\frac{\$sFv}{g(s)Ft}$
Drainage Class:	Well drained
Seepage:	None
Depth to Bedrock:	Unknown
Classification:	Degraded Eutric Brunisol

LFH 4-0 cm. Partially decomposed needles, leaves, twigs and grasses; abundant fine and medium roots.

Ae 0-5 cm. Light gray (10YR 7/2m, 10YR 7/1d) sandy loam; weakly platy breaking to granular; very friable; slightly plastic; abundant fine and medium roots; wavy boundary; 2-6 cm thick; pH 5.2.

Bm 5-23 cm. Yellowish brown (10YR 5/4m, 10YR 6/4d) sandy loam; weak medium to coarse subangular blocky breaking to granular; very friable; slightly plastic; slightly hard when dry; plentiful fine and medium roots; smooth boundary; pH 4.3.

BC 23-43 cm. Dark yellowish brown (10YR 4/4m, 10YR 6/3d) sandy loam; moderate coarse breaking to fine subangular blocky; very friable when moist, slightly hard when dry; few medium roots; smooth boundary; pH 3.8.

C 43-64 cm. Dark brown (10YR 3/3m, 10YR 5/3d) sandy loam; moderate coarse and medium breaking to fine subangular blocky; very friable, firm when dry; few medium roots; abrupt boundary; pH 3.7.

IICca 64-100+ cm. Very dark grayish brown (10YR 3/2m, 10YR 5/4d) gravelly sandy loam to gravelly sand; strong coarse subangular blocky in upper 5 cm, single grain below; upper 5 cm plastic and sticky; clay matrix not pedogenic; no roots; pH 5.6.

SOIL PROFILE DESCRIPTION SITE 24

Elevation:	3375'
Slope and Aspect:	Level
Parent Material:	Fluvial
Landform:	$\frac{s\$(s)Fv}{gFt}$
Drainage Class:	Rapidly drained
Seepage:	None
Depth to Bedrock:	Unknown
Classification:	Orthic Eutric Brunisol

LF 2-0 cm. Partially decomposed grasses, needles and leaves.

Ap 0-10 cm. Very dark grayish brown (10YR 3/2m, 10YR 3/1d); gravelly silt loam; weak fine and medium blocky breaking to fine granular; friable, firm when dry; slightly plastic; abundant fine, few medium roots; smooth boundary; pH 5.9.

Bm 10-23 cm. Dark brown (10YR 3/3m, 10YR 3/2d) silt loam; weak medium and coarse subangular blocky breaking to granular; friable; occasional stones; plastic; smooth boundary; pH 5.8.

Cca 23-48 cm. Dark grayish brown (10YR 4/2m, 10YR 5/2d) silt loam; weak medium and coarse subangular blocky breaking to fine subangular blocky and granular; strongly effervescent; slightly plastic; abrupt boundary; pH 6.2.

IICca 48-100+ cm. Very dark brown (10YR 2/2m); very gravelly sand; single grain to weak fine granular; loose; strongly effervescent; pH 6.5.

SOIL PROFILE DESCRIPTION SITE 25

Elevation:	3365'
Slope and Aspect:	Level
Parent Material:	Fluvial
Landform:	s$(s)Fv(b) / gsFt
Drainage Class:	Well to moderately well drained
Seepage:	Seasonal
Depth to Bedrock:	Unknown
Classification:	Orthic Eutric Brunisol

LF 2-0 cm. Fresh leaves and grass litter.

Ap 0-13 cm. Very dark grayish brown (10YR 3/2d) silt loam; weak fine blocky; slightly firm; slightly plastic; abundant fine, few medium and large roots; smooth boundary; pH 5.4.

Bm 13-40 cm. Dark grayish brown (10YR 4/2d); loamy sand; very weak fine and medium subangular blocky breaking to granular; very friable to loose; nonsticky, nonplastic; plentiful fine, few medium and large roots; smooth boundary; pH 5.9.

Cca 40-95 cm. Dark grayish brown (10YR 4/2d) sandy loam; very weak medium subangular blocky breaking to granular; very friable, loose; strongly effervescent; abrupt boundary; pH 6.5.

IICca 95+ cm. Very dark brown (10YR 2/2m) gravelly sand; single grain; loose; strongly effervescent; no roots; pH 6.5.

SOIL PROFILE DESCRIPTION SITE 28

Elevation:	3380'
Slope and Aspect:	Level
Parent Material:	Fluvial
Landform:	$\frac{\$s(s)Fv}{g(s)Ft}$
Drainage Class:	Well drained
Seepage:	None
Depth to Bedrock:	Unknown
Classification:	Degraded Eutric Brunisol

LF 4-0 cm. Partially decomposed needles, twigs and other forest litter; abundant fine and medium, occasional large roots.

Ae 0-8 cm. Light grayish brown (10YR 6/2m, 10YR 7/1d) gravelly sandy loam; weakly platy breaking to granular; very friable; abundant fine, few medium roots; few pebbles; smooth boundary; pH 4.5.

Bm 8-40 cm. Dark yellowish brown (10YR 4/4m, 10YR 5/4d) gravelly loamy sand; very weak medium subangular blocky breaking to granular; very friable; nonsticky, nonplastic; plentiful fine, few medium roots, occasional large roots; abrupt boundary; pH 4.8.

IICca 40-100+ cm. Very dark grayish brown (10YR 3/2m, 10YR 5/3d) very gravelly sand; few large rounded stones; pH 6.5.

SOIL PROFILE DESCRIPTION SITE 20

Elevation:	3410'
Slope and Aspect:	5°, 268°
Parent Material:	Fluvial
Landform:	$\frac{\$sFv}{gsFf}$
Drainage Class:	Rapidly drained
Seepage:	None
Depth to Bedrock:	Unknown
Classification:	Orthic Eutric Brunisol

LF 2-0 cm. Fresh needles, twigs and grasses.

Ap 0-20 cm. Very dark grayish brown (10YR 3/2m, 10YR 5/2d); gravelly sand; very weak platy breaking to fine granular; very friable; abundant fine, few medium roots; smooth boundary; 15-22 cm thick; pH 4.9.

IIBm 20-45 cm. Dark grayish brown (10YR 4/2m, 10YR 4/1d); gravelly loamy sand; fine granular breaking to single grain; loose; nonsticky, nonplastic; occasional large stones; abundant fine roots; abrupt boundary; pH 5.3.

IIC 45-100+ cm. Black (10YR 2/1m, 10YR 4/1d); gravelly sand; single grain; loose; occasional large stones; very weakly effervescent; plentiful fine roots in upper part; pH 5.6.

SOIL PROFILE DESCRIPTION SITE 26

Elevation:	3480'
Slope and Aspect:	35°, 264°
Parent Material:	Fluvial
Landform:	gsFt / Rh(s)
Drainage Class:	Rapidly drained
Seepage:	None
Depth to Bedrock:	Unknown but more than 6 meters
Classification:	Orthic Eutric Brunisol

LF 2-0 cm. Partially decomposed needles, twigs, leaves and grasses.

Ae 0-2 cm. Discontinuous; 0-2 cm thick.

Bm 2-12 cm. Dark grayish brown (10YR 4/2d); gravelly sand; single grain; loose; few large stones; nonsticky, nonplastic; plentiful fine and medium occasional large roots; smooth boundary; pH 6.1.

BCca 12-57 cm. Very dark grayish brown (10YR 3/2d); gravelly loamy sand; single grain; loose; plentiful fine, few medium and large roots; strongly effervescent; pH 6.0.

Cca 57-100+ cm. Grayish brown (10YR 5/2d); gravelly loamy sand; very weak medium granular breaking to single grain; very friable; strongly effervescent; pH 6.6.

SOIL PROFILE DESCRIPTION SITE 8

Elevation:	3480'
Slope and Aspect:	25°, 272°
Parent Material:	Till
Landform:	gf$\frac{Mb}{Rh}$
Drainage Class:	Well drained
Seepage:	Seasonal
Depth to Bedrock:	2 meters
Classification:	Degraded Eutric Brunisol

LF 4-0 cm. Partially decomposed forest litter and grasses; abundant fine and medium roots.

Ae 0-5 cm. Light brownish gray (10YR 6/2m, 10YR 7/2d) gravelly sandy loam; weakly platy to very weak fine subangular blocky; very friable; abundant fine and medium roots; wavy boundary; 4-7 cm thick; pH 5.5.

Bm 5-30 cm. Brown (10YR 5/3m, 10YR 6/3d) gravelly sandy loam; very weak medium subangular blocky; friable; slightly sticky, slightly plastic; occasional large stones; abundant fine, few medium roots; smooth boundary; pH 5.3.

BC 30-75 cm. Dark grayish brown (10YR 4/2m, 10YR 6/2d) gravelly loam; moderate, medium subangular blocky; firm; slightly plastic, slightly sticky; occasional large stones; few medium roots; pH 5.8.

C 75-100+ cm. Very dark grayish brown (2.5YR 3/2m, 2.5YR 5/2d) gravelly loam; strong, medium, subangular blocky; hard when dry; slightly plastic, slightly sticky; occasional large stones; occasional medium and large roots; pH 5.7.

SOIL PROFILE DESCRIPTION SITE 19

Elevation:	3480'
Slope and Aspect:	30°, 226°
Parent Material:	Till derived from claystone
Landform:	$\frac{gfMb}{Rh(s)}$
Drainage Class:	Moderately well drained
Seepage:	Seasonal
Depth to Bedrock:	106 cm
Classification:	Degraded Dystric Brunisol

LFH 8-0 cm. Partially decomposed forest litter; abundant fine and medium roots.

Ae 0-8 cm. Pale brown (10YR 6/3m, 10YR 7/2d); gravelly clay loam; weak coarse breaking to fine subangular blocky; friable; firm when dry; sticky and plastic; abundant fine and medium roots; smooth boundary; pH 4.5.

Bm 8-30 cm. Pale brown (10YR 6/3m, 10YR 7/3d); gravelly clay loam; weak medium breaking to fine subangular blocky; friable; sticky and plastic; few fine and medium roots; smooth boundary; pH 4.7.

C 30-106 cm. Light brownish gray (2.5YR 6/2m, 10YR 7/2d); gravelly clay loam; strong medium subangular blocky; firm when moist, hard when dry; no roots; abrupt boundary; pH 4.7.

Rx 106+ cm. Claystone bedrock.

SOIL PROFILE DESCRIPTION SITE 5

Elevation:	4070'
Slope and Aspect:	30°, 320°
Parent Material:	Colluvium
Landform:	rfCv / Rh
Drainage Class:	Well drained
Seepage:	None
Depth to Bedrock:	50 cm
Classification:	Degraded Dystric Brunisol

L-F 2-0 cm. Undecomposed forest litter and grasses; abundant fine and medium roots.

Ae 0-12 cm. Light brownish gray (10YR 6/2m, 10YR 7/2d) gravelly silt loam; weakly platy breaking to fine granular; very friable; slightly plastic, nonsticky; plentiful fine, few medium, occasional large roots; clear wavy boundary; 11-13 cm thick; pH 4.1.

Bm 12-50 cm. Yellowish brown (10YR 5/4m, 10YR 6/4d) gravelly silt loam; very weak medium subangular blocky breaking to granular; plentiful fine , few medium roots; nonsticky, slightly plastic; occasional angular stones; pH 4.5.

Rx 50+ cm. Shattered siltstone bedrock.

SOIL PROFILE DESCRIPTION SITE 2

Elevation:	4180'
Slope and Aspect:	20°, 220°
Parent Material:	Colluvium
Landform:	rf $\frac{Cv}{Rh}$
Drainage Class:	Well drained
Seepage:	None
Depth to Bedrock:	26 cm
Classification:	Lithic Dystric Brunisol

L-F 20 cm. Undecomposed, needles, twigs and grass; abundant fine and medium roots.

Ae 0-5 cm. Pale brown, (10YR 6/3m, 10YR 6/2d); gravelly sandy loam; weakly platy to fine granular; very friable; nonsticky, nonplastic; plentiful fine medium roots; smooth boundary; 4-7 cm thick; pH 4.2.

Bm 5-12 cm. Brown (7.5YR 5/4m, 10YR 6/3d) rubbly sandy loam; very weak medium subangular blocky; very friable; nonsticky, nonplastic; few fine and medium roots; smooth boundary; occasional large angular stones; 6 to 8 cm thick; pH 5.0.

BC 12-26 cm. Yellowish brown (10YR 5/4m, 10YR 6/3d); rubbly sandy loam; very weak medium subangular blocky breaking to fine granular; noncalcareous; few large angular stones; smooth boundary; 12-16 cm thick; pH 5.2.

Rx 26+ cm. Siltstone; highly fractured and slightly weathered in upper 10 cm.

SOIL PROFILE DESCRIPTION SITE 3

Elevation:	4140'
Slope and Aspect:	22°, 230°
Parent Material:	Rubbly loam colluvium over gravelly fine till
Landform:	rfCv / gfMb
Drainage Class:	Well to moderately well drained
Seepage:	Seasonal seepage at lithologic contact
Depth to Bedrock:	1.5 meters
Classification:	Degraded Eutric Brunisol

L-F 2-0 cm. Partially and undecomposed forest litter; abundant fine and medium roots.

Ae 0-7 cm. Dark grayish brown (10YR 4/2m, 10YR 5/2d) gravelly loam weakly platy to single grain; abundant fine roots; occasional angular stones; 5-10 cm thick; wavy boundary; pH 5.0.

Bm 7-19 cm. Dark brown (10YR 3.5/3m, 10YR 6/2d) gravelly sandy loam; very weak subangular blocky breaking to granular; very friable; abundant fine and medium roots; occasional angular stones; smooth boundary; slightly plastic; 10-14 cm thick; pH 5.2.

IIBC 19-44 cm. Very dark gray (10YR 3/1m, 10YR 5/2d) gravelly sandy loam; moderate coarse to medium subangular blocky firm when moist; slightly sticky, slightly plastic few fine and medium roots; clear, wavy boundary; 20-24 cm thick; pH 4.9.

IIC 44-100+ cm. Very dark gray (10YR 3/1m, 10YR 4/2d) gravelly sandy loam; strong, coarse subangular blocky; firm when moist; slightly sticky, plastic; occasional stones; no roots; pH 5.8.

SOIL PROFILE DESCRIPTION SITE 21

Elevation:	3790'
Slope and Aspect:	15°, 200°
Parent Material:	Till
Landform:	gfMv / Rhm
Drainage Class:	Well drained
Seepage:	Seasonal seepage at bedrock contact
Depth to Bedrock:	65 cm
Classification:	Degraded Dystric Brunisol

LFH 2-0 cm. Partially decomposed forest litter and other organic materials.

Ae 0-5 cm. Light brownish gray (10YR 6/2m, 10YR 7/3d); gravelly sandy loam; weak platy breaking to granular; very friable; nonsticky, nonplastic; abundant fine and medium roots; smooth boundary; 3-6 cm thick; pH 4.3.

Bm 5-25 cm. Brown (10YR 5/3m, 10YR 6/3d); gravelly sandy loam; very weak medium subangular blocky breaking to granular; very friable; abundant fine and medium roots; occasional angular and rounded stones; smooth boundary; pH 4.3.

Btj 25-45 cm. Yellowish brown (10YR 5/4m, 10YR 6/4d); gravelly loam; weak coarse and medium subangular blocky breaking to granular; very friable; slightly sticky; plentiful fine, few medium roots; smooth boundary; pH 4.8.

C 45-65 cm. Brown (10YR 5/3m, 10YR 6/3d); gravelly sandy loam; weak coarse breaking to fine subangular blocky; friable when moist; slightly hard when dry; few fine roots; abrupt boundary; pH 4.8.

SOIL PROFILE DESCRIPTION SITE 22

Elevation:	3680'
Slope and Aspect:	10°, 179°
Parent Material:	Till
Landform:	gsCv / gfMb
Drainage Class:	Rapidly to well drained
Seepage:	Seasonal seepage a lithologic contact
Depth to Bedrock:	4 meters
Classification:	Brunisolic Gray Luvisol

LFH 4-0 cm. Partially decomposed needles, twigs and other forest litter; abundant fine and medium roots.

Ae 0-8 cm. Grayish brown (10YR 5/2m, 10YR 6/3d); gravelly loamy sand; weakly platy breaking to granular; very friable; abundant fine and medium roots; smooth boundary; pH 4.1.

Bm 8-25 cm. Yellowish brown (10YR 5/4m, 10YR 6/4d); gravelly loamy sand; very weak medium subangular blocky breaking to granular; very friable; smooth boundary; pH 4.2.

Bt 25-50 cm. Dark grayish brown (10YR 4/2m, 10YR 6/2d); gravelly loamy sand; weak medium subangular blocky breaking to granular; very friable; few fine and medium roots; smooth boundary; pH 4.4.

IIC 50-100+ cm. Dark grayish brown (2.5YR 4/2m, 10YR 6/1d); gravelly sandy clay loam; moderate medium subangular blocky; very friable; slightly sticky; few fine roots; pH 4.6.

SOIL PROFILE DESCRIPTION SITE 12

Elevation:	6205'
Slope and Aspect:	30°, 340°
Parent Materials:	Colluvium
Landform:	$\frac{rfCbv}{Rsh} - A^{I}v$
Drainage Class:	Moderately well drained
Seepage:	Seepage for most of the year especially during spring snow melt
Depth to Bedrock:	6 meters
Classification:	Brunisolic Gray Luvisol

LFH 4-0 cm. Partially decomposed forest litter and other organic debris; abundant fine and medium, few large roots.

Ae 0-7 cm. Dark grayish brown (10YR 4/2m, 10YR 6/2d) gravelly sandy loam to loamy sand; weakly platy to very weak fine and medium subangular blocky; very friable when moist; nonsticky, nonplastic; wavy boundary; 4-10 cm thick; pH 4.0.

Bm 7-19 cm. Brown to dark brown (7.5YR 4/4m, 10YR 4/6d) gravelly sandy loam; very weak medium subangular blocky breaking to granular; very friable; nonsticky, nonplastic; plentiful fine and medium, occasional large roots; wavy boundary; 10-18 cm thick; pH 4.0.

Bt 19-35 cm. Very dark grayish brown (2.5YR 3/2m, 2.5YR 4/2d) gravelly sandy loam; very weak medium breaking to fine subangular blocky; very friable; few fine and medium roots; smooth boundary; pH 3.8.

C 35-100+ cm. Very dark gray to black (2.5YR 2.5/0m, 10YR 3/1d) gravelly sandy loam; very weak medium breaking to fine subangular blocky; friable when moist; firm when dry; few fine roots; pH 4.1.

SOIL PROFILE DESCRIPTION SITE 14

Elevation:	6610'
Slope and Aspect:	40°, 340°
Parent Materials:	Colluvium
Landform:	rfCv / Rs
Drainage Class:	Moderately well drained
Seepage:	Prolonged seepage due to aspect
Depth to Bedrock:	70 cm
Classification:	Orthic Dystric Brunisol

LFH	10-0 cm. Partially decomposed needles, twigs, leaves and other forest litter; abundant fine and medium, few large roots.
Bm	0-45 cm. Dark brown (10YR 3/3m, 10YR 5/2d) gravelly sandy loam; very weak fine and medium subangular blocky breaking to granular; very friable; nonsticky, nonplastic; abundant fine, few medium and large roots; smooth boundary; pH 4.4.
BC	45-55 cm. Dark yellowish brown (10YR 3/6m, 10YR 5/4d) gravelly loam; very weak medium subangular blocky breaking to granular; very friable; occasional clay skins on underside of pebbles and stones; slightly sticky, nonplastic, plentiful fine, few medium roots, smooth boundary; pH 4.3.
C	55-70 cm. Very dark gray (2.5YR 3/0m, 10YR 3/1d) gravelly sandy loam; very weak, fine and medium subangular blocky; very friable; nonsticky, nonplastic; occasional angular stones; few fine and medium roots; abrupt boundary; pH 4.3.
Rx	55-125 cm. Carbonaceous shale and coal; pH 4.1.
Rx	125+ cm. Sandstone bedrock.

SOIL PROFILE DESCRIPTION SITE 13

Elevation:	6480'
Slope and Aspect:	28°, 178°
Parent Materials:	Colluvium
Landform:	rfCv / Rsh
Drainage Class:	Rapidly drained
Seepage:	None
Depth to Bedrock:	50 cm
Classification:	Degraded Dystric Brunisol

LFH 4-0 cm. Partially decomposed needles, twigs and some grasses; abundant fine and medium roots.

Ae 0-5 cm. Dark grayish brown (10YR 4/2m, 10YR 4/2d) gravelly loam sand; very weak fine subangular blocky breaking to granular; very friable when moist, slightly firm when dry; nonsticky, nonplastic; abundant fine and medium, large roots; smooth boundary; pH 3.9.

Bm 5-25 cm. Yellowish brown (10YR 5/4m, 10YR 6/4d) gravelly loamy sand; very weak fine and medium subangular blocky breaking to granular; very friable; plentiful medium roots; smooth boundary; pH 4.3.

C 25-50 cm. Very dark grayish brown (2.5YR 3/2m, 10YR 5/2d) gravelly sandy loam; very weak fine to medium subangular blocky and granular; very friable when moist; slightly firm when dry; few medium roots; abrupt boundary pH 4.5.

Rx 50+ cm. Slightly shattered carbonaceous shale.

SOIL PROFILE DESCRIPTION SITE 17

Elevation:	4775'
Slope and Aspect:	32°, 172°
Parent Materials:	Colluvium derived from sandstone
Landform:	rsCv / Rh(s)
Drainage Class:	Rapidly drained
Seepage:	None
Depth to Bedrock:	75 cm
Classification:	Degraded Dystric Brunisol

LF 5-0 cm. Partially decomposed needles, twigs, leaves, grasses and other forest litter; abundant fine and medium roots.

Ae 0-8 cm. Very dark grayish brown (10YR 3/2m, 10YR 5/2d); gravelly loamy sand; very weak medium subangular blocky and granular; very friable; nonsticky, nonplastic; abundant fine and medium roots, occasional large root; wavy boundary; 5-10 cm thick; pH 4.1.

Bm 8-25 cm. Dark brown (10YR 3/3m, 10YR 5/3d); gravelly loamy sand; very weak fine and medium subangular blocky; very friable; abundant fine, few medium roots; occasional large angular stones; smooth boundary; pH 4.0.

Btj 25-54 cm. Dark yellowish brown (10YR 6/6m, 10YR 6/4d); gravelly sandy loam; weak medium subangular blocky; friable; slightly sticky, slightly plastic; some clay skins on pebbles; smooth boundary; pH 5.0.

C 54-75 cm. Very dark gray (10YR 3/1m, 10YR 5/1d); gravelly loamy sand; very weak medium subangular blocky breaking to granular; very friable; occasional large angular stones; few medium roots; abrupt boundary; pH 4.8.

Rx 75+ cm. Sandstone bedrock.

SOIL PROFILE DESCRIPTION SITE 15

Elevation:	6680'
Slope and Aspect:	40°, 260°
Parent Materials:	Colluvium
Landform:	rfCv / Rs(h)
Drainage Class:	Moderately well drained
Seepage:	
Depth to Bedrock:	45 cm
Classification:	Orthic Dystric Brunisol

LFH 2-0 cm. Partially decomposed forest litter; abundant fine and medium roots.

Ah 0-5 cm. Dark brown (7.5YR 3/2m, 5YR 3/1d) gravelly loamy sand; granular; very friable; occasional small angular stones; abundant fine and medium roots; smooth boundary; 3-5 cm thick; pH 4.1.

Bm 5-20 cm. Dark yellowish brown (10YR 4/4m, 10YR 5/4d) gravelly loamy sand; granular breaking to single grain; very friable; plentiful fine and medium roots; smooth boundary; 13-17 cm thick; pH 3.5.

BC 20-45 cm. Dark yellowish brown (10YR 3/4m, 10YR 5/4d) gravelly loamy sand; granular to very weak fine subangular blocky; very friable; plentiful fine and medium roots; abrupt boundary; pH 4.0.

IIBC 45-65 cm. Weathered carbonaceous siltstone; pH 3.6.

Rx 65+ cm. Coal; black (7.5YR 2/0d); pH 3.8.

SOIL PROFILE DESCRIPTION SITE 16

Elevation:	5080'
Slope and Aspect:	32°, 93°
Parent Materials:	Colluvium derived from shale
Landform:	$\frac{gsCv}{Rs}$ (h)
Drainage Class:	Rapidly drained
Seepage:	Seasonal seepage above bedrock contact
Depth to Bedrock:	70 cm
Classification:	Orthic Dystric Brunisol

LFH 1-0 cm. Fresh needles, twigs and grasses.

Bm_1 0-15 cm. Dark brown (7.5YR 3/3m, 10YR 5/2d); gravelly sandy loam; very weak fine and medium subangular blocky breaking to granular; very friable; abundant fine and medium roots; smooth boundary; pH 4.1.

Bm_2 15-43 cm. Brown to dark brown (10YR 4/3m, 10YR 6/3d); gravelly sandy loam; very weak fine subangular blocky breaking to granular; very friable; plentiful medium roots; pH 4.1.

Btj 43-70 cm. Dark yellowish brown (10YR 4/4m, 10YR 6/4d); gravelly loam; weak to very weak medium subangular blocky breaking to granular; friable; slightly sticky, slight plastic; few medium roots; abrupt boundary; pH 4.0.

IIC 70-100+ cm. Slightly weathered shale bedrock; very dark grayish brown (2.5YR 3/2m, 10YR 5/2d); gravelly loamy sand; granular and single grain; few medium roots; pH 4.5.

SOIL PROFILE DESCRIPTION SITE 10

Elevation:	5560'
Slope and Aspect:	38°, 180°
Parent Materials:	Colluvium
Landform:	rfCv / Rs
Drainage Class:	Rapidly drained
Seepage:	seasonal
Depth to Bedrock:	50 cm.
Classification:	Orthic Dystric Brunisol

LF 6-0 cm. Partially decomposed grasses, needles and other forest litter; abundant fine and medium roots.

Ah 0-10 cm. Black (10YR 2/1m, 10YR 2/2d) gravelly sandy loam; granular; friable to loose; nonsticky, nonplastic; abundant fine and medium roots; gradual boundary; pH 5.4.

Bm 10-35 cm. Black to very dark brown (10YR 2/1.5m, 10YR 2/2d) gravelly loamy sand; granular to single grain; loose; abundant fine and medium roots; pH 4.3.

C 35-50 cm. Black to very dark brown (10YR 2/1.5m, 10YR 2/2d) gravelly loamy sand; very weak fine, subangular blocky to granular and single grain; friable and loose; plentiful fine roots; pH 4.7.

Rx 50+ cm. Sandstone bedrock.

SOIL PROFILE DESCRIPTION SITE 11

Elevation:	5580'
Slope and Aspect:	39°, 190°
Parent Material:	Till
Landform:	$\frac{gsMb}{Rs}$
Drainage Class:	Well drained
Seepage:	Some seepage at soil bedrock interface. Excessive seepage is expected during snow melt.
Depth to Bedrock:	4 meters
Classification:	Degraded Dystric Brunisol

LFH 3-0 cm. Partially decomposed needles, leaves, twigs and other organic materials; abundant fine and medium roots.

Ae 0-5 cm. Grayish brown (10YR 5/2m, 10YR 6/1d) gravelly loamy sand; very weak medium subangular blocky breaking to granular and single grain; friable when moist, firm when dry; plentiful fine and medium roots; 4-8 cm thick; pH 4.5.

Bm 5-38 cm. Brown (10YR 5/3m, 10YR 5/3d) gravelly loamy sand; granular to very weak fine subangular blocky; very friable; nonsticky, nonplastic, plentiful fine and medium roots, occasional large root; smooth boundary; pH 4.2.

BC 38-69 cm. Dark grayish brown (2.5YR 4/2m, 2.5YR 5/2d) gravelly loamy sand; very weak, fine to medium subangular blocky; very friable; nonsticky, nonplastic; few fine and medium roots; smooth boundary; pH 4.0.

C 69-100+ cm. Dark grayish brown (2.5YR 4/2m, 2.5YR 5/2d) gravelly loamy sand; very weak, medium to fine subangular blocky breaking to granular and single grain when dry; very friable; nonsticky, nonplastic; few medium roots; pH 4.1.

SOIL PROFILE DESCRIPTION SITE 9

Elevation:	5410'
Slope and Aspect:	30°, 320°
Parent Material:	Till
Landform:	gfMbv / Rhs
Drainage Class:	Well drained
Seepage:	Some seepage at lithologic contact at approximately one meter
Depth to Bedrock:	75 to 150 cm
Classification:	Podzolic Gray Luvisol

LFH 5-0 cm. Partially decomposed needles, twigs, leaves and other forest litter; abundant fine and medium roots.

Ae 0-7 cm. Dark grayish brown (10YR 4/2m, 10YR 5/2d) gravelly sandy loam; very weak medium subangular blocky breaking to fine granular and single grain; very friable; slightly sticky when wet, nonplastic; abundant fine and medium roots; wavy boundary; 4-8 cm thick; pH 4.2.

Bf 7-16 cm. Brown to dark brown (7.5YR 4/4m, 10YR 5/4d) gravelly sandy loam; very weak medium to fine subangular blocky; very friable; slightly sticky; occasional stones; wavy boundary; 5-15 cm thick; pH 3.8.

Bt 16-43 cm. Yellowish brown (10YR 5/6m, 10YR 6/4d) gravelly sandy loam; very weak medium to fine subangular blocky, very friable; slightly sticky; abundant fine and medium roots; smooth boundary; pH 4.0.

BC 43-75 cm. Grayish brown (2.5YR 5/2m, 2.5YR 6/3d) gravelly sandy loam; weak medium and fine subangular blocky; friable; slightly sticky; plentiful medium roots; smooth boundary; pH 4.3.

II C 75-125 cm. Very dark gray (2.5YR 3/1m, 2.5YR 5/1d); gravelly sandy loam; moderate, coarse to medium subangular blocky, hard when dry, friable when moist; few medium roots; abrupt boundary; pH 4.5.

Rx 125+ cm. Carbonaceous siltstone with coal lenses.

SOIL PROFILE DESCRIPTION SITE 6

Elevation:	4010'
Slope and Aspect:	Level to 20°, 220°
Parent Material:	Fluvial gravels both rounded and angular
Landform:	$\frac{(r)g(s)Fb}{Rh}$
Drainage Class:	Rapidly drained
Seepage:	Some seepage from coarse gravels at 4 meters
Depth to Bedrock:	6 meters plus
Classification:	Degraded Dystric Brunisol

LFH 6-0 cm. Partially decomposed forest litter; abundant fine and medium roots.

Ae 0-7 cm. Pale brown (10YR 6/3m, 10YR 6/2d) gravelly loamy sand; weakly platy to single grain; very friable; loose; abundant fine and medium roots; wavy boundary; 5-9 cm thick; pH 4.4.

Bm 7-24 cm. Yellowish brown (10YR 5/4m, 10YR 6/3d) gravelly sand; single grain; loose; abundant fine and medium roots; smooth boundary; 15-21 cm thick; pH 4.2.

BC 24-40 cm. Dark grayish brown (2.5YR 4/2m, 2.4YR 6/2d) gravelly sand; single grain; very friable; few fine and medium roots; smooth boundary; 14-18 cm thick; pH 4.2.

C 40-100+ cm. Olive gray (5YR 5/2m, 5YR 6/2d) gravelly coarse sand; single grain, very friable and loose; occasional large stones; gravelly cleanly washed appearance; few fine and medium roots; pH 4.0.

APPENDIX J

VEGETATION DATA

KEY TO THE INTERPRETATION OF THE VEGETATION APPENDICES

Vegetation is measured in five vegetation layers: tree, shrub, forb, grass and bryophyte and lichen vegetation layers. Cover (Daubenmire, 1959) is given as a simple percent for each species and as a total for each vegetation layer.

Two vegetation sub-layers are recognized in each of the tree and shrub vegetation layers.

Tree layer:

50(18)[68]

- 50 — Dominant Main Tree Canopy cover
- (18) — Secondary Tree Canopy Cover (distinct from main canopy and greater than 10 m high)
- [68] — Total Tree Layer cover

Shrub layer:

(10)35[45]

- (10) — Tall Shrub and Young Tree Layer (shrubs and trees with heights greater than 2 m and less than 10 m)
- 35 — Dominant Shrub and Small Tree Layer (shrubs and small trees less than 2 m 2 m high)
- [45] — Total Shrub Layer cover

The forb, grass and bryophyte and lichen layers do not have sub-layers.

MEADOW MAP UNIT
DRY MEADOW VEGETATION TYPE

PLOT DATA

	Plot Number 1	2	3
Date	July 8/76	July 14/76	July 6/76
Elevation ft(m)	3500(1067)	3500(1067)	3500(1067)
Slope	--	--	--
Aspect	--	--	--
Moisture regime	Submesic	Mesic	Mesic
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Irregular Straight	Irregular Straight	Irregular Flat

VEGETATION COVER DATA†

		Plot Number 1	2	3
SHRUBS				
Total		16	+	11
Amelanchier alnifolia Nutt.	Saskatoon-berry	2		1
Berberis repens Lindl.	Creeping Mahonia	2		4
Crategus douglasii Lindl.	Hawthorn	+		
Juniperus communis L.	Ground Juniper	1		
Populus balsamifera L.	Balsam Poplar			1
Populus tremuloides Michx.	Aspen		+	
Prunus virginiana L.	Choke Cherry	1		
Rosa woodsii Lindl.	Common Wild Rose	5	+	
Salix sp.	Willow		+	
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	2		
Spiraea lucida Dougl.	White Meadow Sweet			1
Symphoricarpos occidentalis Hook.	Buckbrush	3		4
FORBS				
Total		32	40	43
Antennaria microphylla Rydb.	Rosy Pussy-toes	8		2
Antennaria umbrinella Rydb.	Umber Pussy-toes	8		2
Achillea millefolium L.	Common Yarrow	1	2	5
Anemone multifida Poir.	Cut-leaved Anemone			+
Calochortus apiculatus Baker	Mariposa Lily	+		
Campanula rotundifolia L.	Harebell	3		1
Chrysanthemum leucanthemum L.	Ox-eye Daisy	1	23	20
Cirsium arvense (L.) Scop.	Canada Thistle		2	
Erigeron compositus Pursh	Fleabane	3		
Erigeron grandiflorus Hook.	Fleabane	+		
Fragaria virginiana Duchesne	Wild Strawberry	3	4	2
Gaillardia aristata Pursh	Gaillardia	+		
Galium boreale L.	Northern Bedstraw	1		2

		Plot Number 1	2	3
FORBS cont'd				
Oenothera biennis L.	Yellow Evening Primrose	+		
Oxytropis sericea Nutt. var. *spicata* (Hook.) Barneby	Early Yellow Locoweed	+		1
Penstemon albidus Nutt.	White Beard-tongue	1		1
Sedum stenopetalum Pursh	Common Stonecrop	1		+
Solidago decumbens Greene	Goldenrod	1		
Stellaria longipes Goldie	Long-stalked Chickweed	1		1
Taraxacum officinale Weber	Common Dandelion	+	+	+
Tragopogon dubius Scop.	Goat's-beard	+		2
Trifolium agrarium L.	Yellow Clover	+	2	1
Trifolium pratense L.	Red Clover	+	1	
Trifolium repens L.	White Clover	+	4	
Verbascum thapsus L.	Common Mullein	+	2	
Vicia americana Muhl.	Wild Vetch		+	3
GRASSES, SEDGES AND RUSHES				
Total		25	7	29
Agropyron subsecundum (Link) Hitchc.	Bearded Wheatgrass		1	
Deschampsia elongata (Hook.) Munro ex Benth.	Slender Hairgrass		+	
Koeleria cristata (L.) Pers.	Jane Grass	6		1
Phleum pratense L.	Timothy	9	2	+
Poa compressa L.	Canada Bluegrass	1	1	13
Poa pratensis L.	Kentucky Bluegrass	9	3	13
Stipa columbiana Macoun.	Columbia Needle Grass			2
LICHENS, MOSSES AND LIVERWORTS				
Total		35	5	10
Brachythecium plumosum (Hedw.) B.S.G.			5	
Cladonia squamosa (Scop) Hoffm.		15		5
Peltigera canina (L.) Willd.		10		+
Polytrichum piliferum (Hedw.)		10		5

†cover given in percent - See Appendix J-1 for explanation

MEADOW MAP UNIT
GRASS MEADOW VEGETATION TYPE

PLOT DATA

	Plot Number 4	5	6
Date	July 6/76	July 8/76	July 8/76
Elevation ft(m)	3400(1036)	3500(1067)	3500(1067)
Slope	--	--	--
Aspect	--	--	--
Moisture regime	Mesic	Subhygric	Mesic
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Irregular Straight	Irregular Straight	Irregular Straight

VEGETATION COVER DATA†

		Plot Number 4	5	6
SHRUBS				
Total		18	14	6
Crategus douglasii Lindl.	Hawthorn			1
Elaeagnus commutata Bernh.	Wolf Willow	1		
Juniperus communis L.	Ground Juniper			1
Rhamnus alnifolia L'Her.	Buckthorn			1
Ribes oxycanthoides L.	Wild Gooseberry	5		
Rosa acicularis Lindl.	Prickly Rose		6	
Rosa woodsii Lindl.	Common Wild Rose	+		
Salix sp.	Willow	+	1	
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	2	2	
Symphoricarpos occidentalis Hook.	Buckbrush	10	5	3
Viburnum edule (Michx.) Raf.	Low-bush Cranberry	+		
FORBS				
Total		49	49	39
Achillea millefolium L.	Common Yarrow	2	3	2
Anemone multifida Poir.	Cut-leaved Anemone	6	1	
Antennaria microphylla Rydb.	Rosy pussy-toes	3	2	+
Antennaria umbrinella Rydb.	Umber Pussy-toes	3		
Chrysanthemum leucanthemum L.	Ox-eye Daisy		4	
Cirsium arvense (L.) Scop.	Canada Thistle	2	8	1
Cirsium foliosum (Hook.) DC.	Thistle		+	1
Erigeron philadelphicus L.	Philadelphicus Daisy		1	
Equisetum arvense L.	Common Horsetail		3	
Equisetum hyemale L.	Scouring Rush	2	+	
Equisetum scirpoides Michx.	Horsetail		2	

FORBS cont'd		Plot Number 4	5	6
Fragaria virginiana Duchesne	Wild Strawberry	12	12	13
Galium boreale L.	Northern Bedstraw			3
Hieracium gracile Hook.	Slender Hawkweed	2		
Lathyrus ochroleucus Hook.	Pea Vine		2	
Lomatogonium rotatum (L.) Fries	Marsh Felwort		+	
Mertensia paniculata (Ait.) G. Don	Tall Mertensia		1	
Ranunculus acris L.	Tall Buttercup	1	6	2
Penstemon albidus Nutt.	White Beard-tongue	+		1
Potentilla glandulosa Lindl. ssp. pseudorupestris (Rydb.) Keck	Stiky Cinquefoil			2
Senecio integerrimus Nutt. var. exaltatus (Nutt.) Cronq.	Ragwort	2	1	2
Sisyrinchium montanum Greene	Blue-eyed Grass	4		
Smilacina stellata (L.) Desf.	Star-flowered Solomon's-seal	10		+
Stellaria longipes Goldie	Long-stalked Chickweed			+
Taraxacum officinale Weber	Common Dandelion			+
Tragopogon dubius Scop.	Goat's-beard		+	
Trifolium agrarium L.	Yellow Clover			2
Trifolium repens L.	White Clover		+	8
Verbascum thapsus L.	Common Mullein		+	+
Vicia americana Muhl.	Wild Vetch		3	2
GRASSES, SEDGES AND RUSHES				
Total		76	51	68
Carex bebbii Olney	Bebb's Sedge	1	+	
Deschampsia elongata (Hook.) Munro ex Benth.	Slender Hairgrass		1	
Juncus balticus Willd.	Baltic Rush		+	
Phleum pratense L.	Timothy	15	10	8
Poa pratensis L.	Kentucky Bluegrass	60	40	60
LICHENS, MOSSES AND LIVERWORTS				
Total		75	10	0
Brachythecium plumosum (Hedw.) B.S.G.		75		
Pohlia sp.			10	

†cover given in percent - See Appendix J-1 for explanation

MEADOW MAP UNIT
SHRUB-MEADOW VEGETATION TYPE

PLOT DATA

	Plot Number 7	8	9
Date	July 9/76	July 7/76	July 9/76
Elevation ft(m)	3500(1067)	3500(1067)	3500(1067)
Slope	--	--	--
Aspect	--	--	--
Moisture regime	Mesic	Mesic	Mesic
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Smooth Straight	Smooth Straight	Irregular Concave

VEGETATION COVER DATA †

		Plot Number 7	8	9
SHRUBS				
Total		48	60	40
Cornus stolonifera Michx.	Dogwood	12		
Crategus douglasii Lindl.	Hawthorn		1	
Larix occidentalis Nutt.	Western Larch	3		
Lonicera involucrata (Richards.) Banks	Bracted Honeysuckle		4	
Picea glauca (Moench) Voss	White Spruce	1		
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	4		
Populus tremuloides Michx.	Aspen	3		
Rhamnus alnifolia L'Her	Buckthorn			2
Ribes oxycanthoides L.	Wild Gooseberry		3	30
Rosa woodsii Lindl.	Common Wild Rose	5	5	
Sambucus melanocarpa A. Gray	Black Elder		2	
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	8		
Symphoricarpos occidentalis Hook.	Buckbrush	12	45	8
FORBS				
Total		63	25	16
Achillea millefolium L.	Common Yarrow	1	1	
Antennaria microphylla Rydb.	Rosy Pussy-toes	3		
Antennaria umbrinella Rydb.	Umber Pussy-toes		2	
Chrysanthemum leucanthemum L.	Ox-eye Daisy		2	
Cirsium arvense (L.) Scop.	Canada Thistle	5	3	6
Cirsium hookerianum Nutt.	White Thistle	+		
Epilobium angustifolium L.	Fireweed	5		

FORBS cont'd		Plot Number 7	8	9
Fragaria virginiana Duchesne	Wild Strawberry	20	8	3
Gentianella amarella (L.) Börner ssp. acuta (Michx.) J.M. Gillett	Felwort	+		
Geum macrophyllum Willd.	Yellow Avens		2	1
Hackelia floribunda (Lehm.) I.M. Johnston	Stick-seed			1
Hieracium gracile Hook.	Slender Hawkweed	5		
Lathyrus ochroleucus Hook.	Pea Vine	10		
Penstemon albidus Nutt.	White Beard-tongue		1	+
Ranunculus acris L.	Tall Buttercup		3	4
Senecio integerrimus Nutt. var. exaltatus (Nutt.) Cronq.	Ragwort	1	1	
Smilacina stellata (L.) Desf.	Star-flowered Solomon's-seal	+	+	
Stellaria longipes Goldie	Long-stalked Chickweed		+	
Trifolium repens L.	White Clover	3		
Urtica lyallii S. Wats.	Nettle			1
Verbascum thapsus L.	Common Mullein		2	
Vicia americana Muhl.	Wild Vetch	10		
GRASSES, SEDGES AND RUSHES				
Total		50	25	41
Agropyron subsecundum (Link) Hitchc.	Bearded Wheatgrass		2	
Calamagrostis scribneri Beal.	Scribner Reedgrass	2		
Carex bebbii Olney	Bebb's Sedge			+
Carex praticola Rydb.	Meadow Sedge	+	1	
Deschampsia elongata (Hook.) Munro ex Benth.	Slender Hairgrass		2	1
Phleum pratense L.	Timothy	25	4	5
Poa compressa L.	Canada Bluegrass			5
Poa pratensis L.	Kentucky Bluegrass	25	16	30

† cover given in percent - See Appendix J-1 for explanation

MEADOW MAP UNIT
WET MEADOW VEGETATION TYPE

PLOT DATA

	Plot Number 10	11	12
Date	July 14/76	July 14/76	July 14/76
Elevation ft(m)	3400(1036)	3400(1036)	3400(1036)
Slope	--	--	--
Aspect	--	--	--
Moisture regime	Hygric	Hygric	Hygric
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Smooth Concave	Smooth Concave	Smooth Concave

VEGETATION COVER DATA†

		Plot Number 10	11	12
SHRUBS				
Total		8	5	(4)20[24]
Alnus crispa (Ait.) Pursh	Green Alder	+		(1)5
Rhamnus alnifolia L'Her	Buckthorn	+		
Salix bebbiana Sarg.	Bebb Willow	8		(3)15
Salix sp.	Willow		5	
FORBS				
Total		9	12	9
Cerastium dubium L.	Doubtful Chickweed	3		+
Cicuta douglasii (DC.) Coult. & Rose	Water Hemlock	1	1	1
Cirsium foliosum (Hook.) DC.	Thistle		1	
Epilobium glandulosum Lehm.	Common Willow-herb		2	
Erigeron philadelphicus L.	Philadelphicus Daisy	+	+	
Equisetum arvense L.	Common Horsetail	2		+
Galium trifidum L.	Small Bedstraw		+	
Geum macrophyllum Willd.	Yellow Avens	+	2	
Habenaria hyperborea (L.) R.Br.	Northern Green Orchid	+		
Hieracium gracile Hook.	Slender Hawkweed	+		1
Lomatogonium rotatum (L.) Fries	Marsh Felwort			2
Mentha arvensis L. var vellosa (Benth.) S.R. Stewart	Wild Mint		4	5
Mimulus guttatus DC.	Yellow Monkey-flower	+		
Parnassia parviflora DC.	Grass-of-Parnassus	1		
Potentilla norvegica L.	Norwegian Cinquefoil		2	
Stellaria nitens Nutt.	Shining Chickweed	2		
Veronica americana (Raf.) Schw.	American Brookline	+		
Vicia americana Muhl.	Wild Vetch		+	

		Plot Number 10	11	12
GRASSES, SEDGES AND RUSHES				
Total		86	87	84
Agrostis stolonifera L.	Bentgrass	1		
Bromus ciliatus L.	Fringed Brome			+
Calamagrostis inexpansa .A. Gray	Northern Reedgrass		1	+
Carex aquatilis Wahl.	Water Sedge	4	6	
Carex bebbii Olney	Bebb's Sedge	24	2	
Carex deweyana Schwein	Dewey's Sedge	+	2	
Carex interior Baily	Inland Sedge	6		
Carex rostrata Stokes	Beaked Sedge	20	70	60
Carex simulata Mack.	Short-beaked Sedge			12
Carex stipata Muhl.	Sawbeak Sedge	16	3	4
Juncus balticus Willd.	Baltic Rush	7		
Juncus ensifolius Wikst.	Dagger-leaf Rush	+	1	
Poa palustris L.	Fowl Bluegrass	+		2
Poa pratensis L.	Kentucky Bluegrass	+	1	
Scirpus acutus Michx. & Bigel.	Hardstem Bulrush	+		
Scirpus microcarpus Presl.	Small-fruit Bulrush	4	1	
Typha latifolia L.	Common Cat-tail	4		6
LICHENS, MOSSES AND LIVERWORTS				
Total		4	+	6
Brachythecium plumosum (Hedw.) B.S.G.		2	+	3
Plagiomnium ellipticum		2		3

†cover given in percent - See Appendix J-1 for explanation

TREE-MEADOW MAP UNIT

CONIFEROUS TREE-MEADOW VEGETATION TYPE

PLOT DATA

	Plot Number 13	14	15
Date	July 9/76	July 7/76	July 10/76
Elevation ft(m)	3500(1067)	3500(1067)	3500(1067)
Slope	--	--	--
Aspect	--	--	--
Moisture regime	Mesic	Submesic	Mesic
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Irregular Straight	Smooth Straight	Smooth Straight

VEGETATION COVER DATA†

		Plot Number 13	14	15
TREES				
Total		25(6)[31]	23	25
Picea glauca (Moench) Voss	White Spruce	(4)	2	
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	25(2)	20	25
Populus balsamifera L.	Balsam Poplar		1	
SHRUBS				
Total		(2)32[34]	35	20
Acer glabrum Torr.	Mountain Maple	2		
Amelanchier alnifolia Nutt.	Saskatoon-berry		3	
Berberis repens Lindl.	Creeping Mahonia	2	2	2
Chimaphila umbellata (L.) Bart var. occidentalis (Rydb.) Blake	Prince's Pine	1		
Juniperus communis L.	Ground Juniper			+
Lonicera utahensis S.Wats.	Red Twin-berry	5		
Picea glauca (Moench) Voss	White Spruce	(2)		
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	2		
Rosa woodsii Lindl.	Common Wild Rose	8		8
Salix sp.	Willow			2
Shepherdia canadensis(L.) Nutt.	Canadian Buffalo-berry	4	6	1
Spiraea lucida Dougl.	White Meadowsweet	3	12	3
Symphoricarpos occidentalis Hook.	Buckbrush		12	4
Vaccinium caespitosum Michx.	Dwarf Bilberry	5		
FORBS				
Total		37	26	35
Achillea millefolium L.	Common Yarrow		2	4
Antennaria microphylla Rydb.	Pussy-toes	3		
Antennaria neglecta Greene	Pussy-toes		1	2
Antennaria parvifolia Nutt.	Nuttall's Pussy-toes	3	3	2
Antennaria umbrinella Rydb.	Umber Pussy-toes		2	3
Arnica cordifolia Hook.	Heart-shaped Arnica	5		
Aster conspicuus Lindl.	Showy Aster		1	
Calochortus apiculatus Baker	Mariposa Lily		1	
Castilleja sp.	Indian Paint-brush		+	
Chrysanthemum leucanthemum L.	Ox-eye Daisy	2		8

FORBS cont'd		Plot Number 13	14	15
Fragaria virginiana Duchesne	Wild Strawberry	16	9	8
Galium boreale L.	Northern Bedstraw		1	2
Heuchera cylindrica Dougl.	Alum-root			4
Penstemon albidus Nutt.	White Beard-tongue	1	+	1
Pyrola elliptica Nutt.	White Wintergreen	+		
Pyrola secunda L.	One-sided Wintergreen	+		
Ranunculus acris L.	Tall Buttercup	+	+	
Stellaria longipes Goldie	Long-stalked Chickweed		+	
Taraxacum officinale Weber	Common Dandelion	1		
Trifolium agrarium L.	Yellow clover	2	1	1
Trifolium repens L.	White clover	3	2	
Vicia americana Muhl.	Wild Vetch	1	3	
GRASSES, SEDGES AND RUSHES				
Total		17	30	11
Calamagrostis rubescens Buckl.	Pine Grass	11	11	
Deschampsia elongata (Hook.) Munro ex Benth.	Slender Hairgrass	2	2	
Koeleria cristata (L.) Pers.	June Grass		3	2
Oryzopsis asperifolia Michx.	Rice Grass	2		
Phleum pratense L.	Timothy	1	5	1
Poa compressa L.	Canada Bluegrass			3
Poa pratensis L.	Kentucky Bluegrass	1	9	5
LICHENS, MOSSES AND LIVERWORTS				
Total		65	29	65
Brachythecium plumosum (Hedw.) B.S.G.			10	
Cladonia sp.		1	6	
Cladonia squamosa (Scop) Hoffm.			3	15
Peltigera canina (L.) Willd.		1	8	+
Pleurozium schreiberi (Brid) Mitt.		60		3
Polytrichum juniperinum Hedw.		3		40
Polytrichum piliferum (Hedw.)			2	5
Stereocaulon sp.				2

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 13*	14	15**
Pinus contorta	24m;30cm;48yr bh;	13m;28cm;35yr bh; 4.6 m^2/ha	10.8m;26cm;34yr bh;
Total Basal Area		4.6 m^2/ha	

*No basal area taken

**No trees on basal area plot

TREE-MEADOW MAP UNIT

DECIDUOUS AND MIXED TREE-MEADOW VEGETATION TYPE

PLOT DATA

	Plot Number 16	17	18
Date	July 13/76	July 6/76	July 12/76
Elevation ft(m)	3500(1067)	3400(1036)	3500(1067)
Slope	--	--	--
Aspect	--	--	--
Moisture regime	Submesic	Subhygric	Submesic
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Irregular Straight	Smooth Straight	Irregular Straight

VEGETATION COVER DATA†

		Plot Number 16	17	18
TREES				
Total		26	30(10)[40]	22
Picea glauca (Moench) Voss	White Spruce	2	(5)	
Pinus contorta Louden var. latifolia Engelm.	Lodgepole pine	6	(5)	9
Populus balsamifera L.	Balsam Poplar	18	20	11
Populus tremuloides Michx.	Aspen		10	
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir			2
SHRUBS				
Total		(3)32[35]	(3)49[52]	(9)22[31]
Acer glabrum Torr.	Mountain Maple	(1)		1
Alnus crispa (Ait.) Pursh	Green Alder		(3)5	
Amelanchier alnifolia Nutt.	Saskatoon-berry	4		
Berberis repens Lindl.	Creeping Mahonia	6		+
Cornus stolonifera Michx.	Dogwood		8	4
Crategus douglasii Lindl.	Hawthorn			+
Juniperus communis L.	Ground Juniper			1
Juniperius scopulorum Sarg.	Rocky Mountain Juniper	1		
Populus balsamifera L.	Balsam Poplar	1		(4)
Pinus contorta Louden var. latifolia Engelm.	Lodgepole pine	(2)		(5)+
Prunus virginiana L.	Choke Cherry			4
Ribes oxycanthoides L.	Wild Gooseberry			+
Rosa sp.	Rose		7	
Rubus strigosus Michx.	Wild Red Raspberry		1	
Salix bebbiana Sarg.	Bebb Willow		5	
Salix sp.	Willow	1		
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	16	8	9
Symphoricarpos occidentalis Hook	Buckbrush	3	15	3
FORBS				
Total		30	66	24
Achillea millefolium L.	Common Yarrow	+		+
Anemone multifida Poir.	Cut-leaved Anemone			+
Antennaria microphylla Rydb.	Rosy Pussy-toes	3		1
Antennaria parvifolia Nutt.	Nuttal's Pussy-toes	2		1
Apocynum androsaemifolium L.	Spreading Dogbane			5
Aster conspicuus Lindl.	Showy Aster	+	9	1
Cirsium arvense (L.) Scop.	Canada Thistle		2	
Epilobium sp.	Willow-herb			1

FORBS cont'd		Plot Number 16	17	18
Equisetum arvense L.	Common Horsetail		30	
Equisetum hyemale L.	Scouring Rush	+		
Fragaria virginiana Duchesne	Wild Strawberry	3	5	3
Galium Boreale L.	Northern Bedstraw	1		
Gentianella amarella (L.) Börner ssp. acuta (Michx.) J.M. Gillett	Felwort			+
Habenaria hyperborea(L.)R.Br.	Northern Green Orchid		1	
Habenaria unalascensis (Spreng.) S. Wats.	Alaska Bog Orchid		1	+
Hieracium gracile Hook.	Slender Hawkweed	2		
Linnaea borealis L. var. americana(Forbes) Rehd.	Twin-flower		1	
Penstemon albidus Nutt.	White Beard-tongue			+
Senecio integerrimus Nutt. var. exaltatus (Nutt.)Cronq.	Ragwort	2		+
Smilacina stellata(L.)Desf.	Star-flowered Solomon's-seal	+	5	2
Solidago multiradiata	Northern Goldenrod	14	6	10
Stellaria longipes Goldie	Long-stalked Chickweed		+	
Tragopogon dubius Scop.	Goat's-beard	+		
Vicia americana Muhl.	Wild vetch	3	6	
GRASSES, SEDGES AND RUSHES				
Total		28	20	11
Agropyron subsecundum(Link) Hitchc.	Bearded Wheatgrass			1
Bromus pumpellianus Scribn.	Bromegrass		10	
Calamagrostis rubescens Buckl.	Pinegrass			2
Elymus innovatus Beal.	Wild-rye	2		
Juncus balticus Willd.	Baltic Rush		10	
Phleum pratense L.	Timothy	14		3
Poa compressa L.	Canada Bluegrass			+
Poa pratensis L.	Kentucky Bluegrass	12	+	5
Stipa columbiana Macoun.	Columbia Needlegrass			1
LICHENS, MOSSES AND LIVERWORTS				
Total		7	+	3
Brachythecium plumosum (Hedw.) B.S.G.		1	+	+
Cladonia sp.		6		
Cladonia squamosa (Scop) Hoffm.				2
Peltigera canina (L.) Willd.				+
Polytrichum piliferum (Hedw.)				+

†Cover given in percent - See Appendix J-1 for explanation

TREE DATA *

	Plot Number 16	17	18
Pinus contorta	15.7m;41cm;41yr bh;		
Populus balsamifera	20.4m;25cm;27yr bh;		20.4m;40cm;39yr bh;
Populus tremuloides		24m;36cm;44yr bh;	

*No basal area taken

TREE-SHRUB MAP UNIT

DECIDUOUS AND MIXED TREE-SHRUB VEGETATION TYPE

PLOT DATA

	Plot Number 19	20	21
Date	July 12/76	July 11/76	July 9/76
Elevation ft(m)	3500(1067)	3500(1067)	3400(1036)
Slope	—	—	—
Aspect	—	—	—
Moisture regime	Subhygric	Subhygric	Subhygric
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Irregular Concave	Smooth Concave	Smooth Concave

VEGETATION COVER DATA†

		Plot Number 19	20	21
TREES				
Total		17	26	18
Betula papyrifera Marsh.	White Birch		5	
Larix occidentalis Nutt.	Western Larch		1	
Picea glauca (Moench) Voss	White Spruce			3
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine		6	
Populus balsamifera L.	Balsam Poplar	10	14	10
Populus tremuloides Michx.	Aspen	7		5
SHRUBS				
Total		(5)105[110]	(34)69[103]	(30)71[101]
Acer glabrum Torr.	Mountain Maple		(7)3	
Alnus crispa(Ait.) Pursh	Green Alder	(5)	(15)8	(9)
Amelanchier alnifolia Nutt.	Saskatoon-berry			(1)6
Betula p pyrifera Marsh.	White Birch		(6)	
Cornus stolonifera Michx.	Dogwood	80	18	
Crategus douglasii Lindl.	Hawthorn			2
Hieracium gracile Hook.	Slender Hawkweed		2	1
Lonicera utahensis S.Wats.	Red Twin-berry		6	
Rhamnus alnifolia L'Her.	Buckthorn		3	40
Ribes oxycanthoides L.	Wild Gooseberry	10	1	+
Rosa acicularis Lindl.	Prickly Rose			2
Rosa woodsii Lindl.	Wood's Rose	15		
Rubus strigosus Michx.	Wild Red Raspberry		5	+
Salix bebbiana Sarg.	Bebb Willow		(6)6	(20)8
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry		2	
Symphoricarpos occidentalis Hook.	Buckbrush		15	12
FORBS				
Total		9	37	26
Cornus canadensis L.	Bunchberry		1	
Equisetum arvense L.	Common Horsetail	5	2	10
Fragaria virginiana Duchesne	Wild Strawberry		3	
Galium triflorum Michx.	Sweet-scented Bedstraw	+	5	2
Gentianella amarella (L.) Börner ssp. acuta (Michx.) J.M. Gillett	Felwort		1	

		Plot Number 19	20	21
FORBS cont'd				
Geum aleppicum Jacq. var strictum (Ait.) Fern	Yellow Avens			+
Geum macrophyllum Willd.	Yellow Avens			+
Habenaria hyperborea (L.) R.Br.	Northern Green Orchid			+
Heracleum lanatum Michx.	Cow Parsnip		8	
Mentha arvensis L. var villosa (Benth.) S.R. Stewart	Wild Mint			3
Petasites sagittatus (Pursh) A. Gray	Arrow-leaved Colts-foot			4
Prunella vulgaris L.	Heal-all			2
Ranunculus acris L.	Tall Buttercup			+
Rubus pubescens Raf.	Dewberry		3	
Smilacina stellata (L.) Desf.	Star-flowered Solomon's-seal		2	+
Taraxacum officinale Weber	Common Dandelion			1
Thalictrum occidentale A. Gray	Western Meadow Rue		2	1
Urtica lyallii S. Wats.	Nettle	4	5	2
Vicia americana Muhl.	Wild Vetch			1
Viola rugulosa Greene	Western Canada Violet		5	
GRASSES, SEDGES AND RUSHES				
Total		2	3	7
Agropyron subsecundum (Link) Hitchc.	Bearded Wheatgrass		2	1
Bromus pumpellianus Scribn.	Bromegrass	2		3
Carex bebbii Olney	Bebb's Sedge			+
Oryzopsis asperifolia Michx.	Rice Grass		+	
Phleum pratense L.	Timothy		1	+
Poa palustris L.	Fowl Bluegrass		+	3
LICHENS, MOSSES AND LIVERWORTS				
Total		4	4	65
Brachythecium plumosum (Hedw.) B.S.G.		4	4	5
Brachythecium salebrosum (Web. & Mohr.) B.S.G.			+	
Marchantia polymorpha L.			+	
Plagiomnium ellipticum			+	60

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 19	20	21
Betula papyrifera		13.5m;17cm;26yr bh; *	
Pinus contorta		18m;32cm;35yr bh; *	
Populus balsamifera	14.4m;23cm;38yr bh; 4.6 m^2/ha	29.8m;55cm;54yr bh; *	21m;50cm;41yr bh; *
Total Basal Area	4.6 m^2/ha	*	*

*Not present on basal area plot

CONIFEROUS FOREST MAP UNIT
LODGEPOLE PINE VEGETATION TYPE

PLOT DATA

	Plot Number 22	23	24
Date	July 6/76	July 7/76	July 9/76
Elevation ft(m)	3500(1067)	3500(1067)	3500(1067)
Aspect	--	--	--
Moisture regime	--	--	--
Slope position	Mesic	Mesic	Mesic
Surface slope	Valley floor	Valley floor	Valley floor
	Irregular Straight	Smooth Straight	Smooth Straight

VEGETATION COVER DATA+

		Plot Number 22	23	24
TREES				
Total		75	75	81(5)[86]
Pinus contorta Louden var. latifolia Engelm.	Lodgepole pine	75	75	75
Larix occidentalis Nutt.	Western Larch			4
Picea glauca (Moench) Voss	White Spruce			(5)
Populus balsamifera L.	Balsam Poplar			2
SHRUBS				
Total		(10)30[40]	53	(1)34[35]
Acer glabrum Torr.	Mountain Maple			+
Amelanchier alnifolia Nutt.	Saskatoon-berry	1		
Berberis repens Lindl.	Creeping Mahonia	1	1	
Chimaphila umbellata (L.) Bart var. occidentalis (Rydb.) Blake	Prince's Pine	1	2	
Juniperus communis L.	Ground Juniper			1
Lonicera utahensis S. Wats.	Red Twin-berry	4	6	6
Pachystima myrsnites (Pursh) Raf.	Mountain Lover	1	2	
Picea glauca (Moench) Voss	White Spruce			(1)
Rosa woodsii Lindl.	Common Wild Rose	2		
Rubus parviflorus Nutt.	Thimbleberry		12	2
Salix bebbiana Sarg.	Bebb Willow	(10)		2
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	2	8	16
Spiraea lucida Dougl.	White Meadow Sweet	15	20	5
Thuja plicata D. Don	Western Red Cedar			
Vaccinium caespitosum Michx.	Dwarf Bilberry		2	
Vaccinium uliginosum L.	Bog Bilberry	3		
FORBS				
Total		7	36	23
Antennaria racemosa Hook.	Raceme Pussy-toes		1	+
Aralia nudicaulis L.	Wild Sarsaparilla		2	4
Arnica cordifolia Hook.	Heart-shaped Arnica	4	1	+
Aster conspicuus Lindl.	Showy Aster			+
Clintonia uniflora (Schult.) Kunth	One-flowered Clintonia		5	2
Corallorhiza striata Lindl.	Striped Coral-root		1	
Cornus canadensis L.	Bunchberry	+	11	4
Equisetum scirpoides Michx.	Horsetail		+	
Fragaria virginiana Duchesne	Wild Strawberry		2	5
Galium boreale L.	Northern Bedstraw	+		
Galium triflorum Michx.	Sweet-scented Bedstraw	+	+	

FORBS cont'd		Plot Number 22	23	24
Goodyera repens (L.)R.Br.	Rattlesnake Plantain	+	2	
Hieracium gracile Hook.	Slender Hawkweed	+		
Lathyrus ochroleucus Hook.	Pea Vine	3	7	2
Osmorhiza chilensis Hook. and Arn.	Sweet Cicely			1
Pyrola chlorantha Sw.	Wintergreen	+		
Pyrola elliptica Nutt.	White Wintergreen			1
Pyrola secunda L.	One-sided Wintergreen	+	1	
Pyrola sp.	Wintergreen		2	
Rubus pubescens Raf.	Dewberry			+
Smilacina racemosa (L.) Desf. var. amplexicaulis (Nutt.) S.Wats.	False Solomon's-seal		+	
Smilacina stellata (L.) Desf.	Star-flowered Solomon's-seal	+	+	1
Thalictrum occidentale A. Gray	Western Meadow Rue	+	1	+
Viola orbiculata Geyer	Evergreen Violet			3
GRASSES, SEDGES AND RUSHES				
Total		30	8	6
Calamagrostis rubescens Buckl.	Pine Grass	30	5	6
Oryzopsis asperifolia Michx.	Rice Grass		3	
LICHENS, MOSSES AND LIVERWORTS				
Total		1	7	1
Atrichum selwynii Aust.		+		+
Brachythecium plumosum (Hedw.) B.S.G.		+		+
Bracnythecium salebrosum (Web. & Mohr.) B.S.G.		+		
Cladonia sp.			1	
Peltigera canina (L.) Willd.			1	
Plagiomnium ellipticum				+
Pleurozium schreiberi (Brid) Mitt.		+	1	
Pohlia sp.		+		+
Polytrichum juniperinum Hedw.		1	4	+
Polytrichum piliferum (Hedw.)		+		+

+cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 22	23	24
Pinus contorta	16.2m;17cm;61yr bh; 41.2 m^2/ha	23m;24cm;59yr bh; 73.4 m^2/ha	26.2m;30cm;58yr bh; 45.8 m^2/ha
Total Basal Area	41.2 m^2/ha	73.4 m^2/ha	45.8 m^2/ha

CONIFEROUS FOREST MAP UNIT
CONIFEROUS TREE MIX VEGETATION TYPE

PLOT DATA

	Plot Number 25	26	27
Date	July 8/76	July 12/76	July 6/76
Elevation ft(m)	3500(1067)	3500(1067)	3550(1082)
Slope	--	7°	11°
Aspect	—	W	W
Moisture regime	Mesic	Mesic	Mesic
Slope position	Valley floor	Lower slope	Lower slope
Surface slope	Smooth Straight	Smooth Straight	Smooth Straight

VEGETATION COVER DATA†

		Plot Number 25	26	27
TREES				
Total		85(10)[95]	83(7)[90]	70(15)[85]
Betula papyrifera Marsh.	White Birch			5
Larix occidentalis Nutt.	Western Larch	15	35	25
Picea glauca (Moench) Voss	White Spruce	(10)		
Pinus contorta Louden var. latifolia Englem.	Lodgepole Pine	70	21	35
Populus balsamifera L.	Balsam Poplar		5	
Populus tremuloides Michx.	Aspen			5
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir		22(5)	(15)
Thuja plicata D. Don	Western Red Cedar		(2)	
SHRUBS				
Total		(4)68[72]	(1)41[42]	82
Acer glabrum Torr.	Mountain Maple		2	1
Amelanchier alnifolia Nutt.	Saskatoon-berry	(4)8	(+)1	16
Berberis repens Lindl.	Creeping Mahonia	+	+	
Chimaphila umbellata (L.) Bart var. occidentalis (Rydb.) Blake	Prince's Pine	1		
Cornus stolonifera Michx.	Dogwood			6
Lonicera involucrata (Richards.) Banks	Bracted Honeysuckle	1	+	
Lonicera utahensis S.Wats.	Red Twin-berry		1	
Pachystima myrsnites (Pursh) Raf.	Mountain Lover	1	1	+
Rubus parviflorus Nutt.	Thimbleberry		10	45
Rubus strigosus Michx.	Wild Red Raspberry			1
Salix bebbiana Sarg.	Bebb Willow		(1)	
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	5	20	8
Spiraea lucida Dougl.	White Meadow Sweet	18	6	5
Thuja plicata D. Don	Western Red Cedar	4		
Vaccinium caespitosum Michx.	Swarf Bilberry	30		
FORBS				
Total		34	37	68
Achillea millefolium L.	Common Yarrow			+
Antennaria racemosa Hook.	Raceme Pussy-toes	+	+	2
Aralia nudicaulis L.	Wild Sarsaparilla			6
Aster conspicuus Lindl.	Showy Aster		1	
Clematis verticellaris DC. var. columbiana (Nutt.) A. Gray	Purple Clematis		+	
Clintonia uniflora (Schult.) Kunth	One-flowered Clintonia		2	5

FORBS cont'd		Plot Number 25	26	27
Cornus canadensis L.	Bunchberry	6	2	11
Epilobium angustifolium L.	Fireweed			+
Epilobium sp.				
Fragaria virginiana Duchesne	Wild Strawberry		5	15
Galium triflorum Michx.	Sweet-scented Bedstraw		1	2
Hieracium gracile Hook.	Slender Hawkweed	+		
Lathyrus ochroleucus Hook.	Pea Vine	2	1	3
Linnaea borealis L. var. americana (Forbes) Rehd.	Twin-flower	20	19	
Osmorhiza chilensis Hook. and Arn.	Sweet Cicely		2	2
Pyrola secunda L.	One-sided Wintergreen	+	+	
Pyrola sp.	Wintergreen	+		
Trifolium repens L.	White Clover			16
Viola orbiculata Geyer	Evergreen Violet	6	3	6
Viola rugulosa Greene	Western Canada Violet		1	
GRASSES, SEDGES AND RUSHES				
Total		7	2	3
Calamagrostis rubescens Buckl.	Pine Grass	7	2	1
Oryzopsis asperifolia Michx.	Rice Grass			2
LICHEN, MOSSES AND LIVERWORTS				
Total		8	+	6
Atrichum selwynii Aust.				6
Brachythecium plumosum (Hedw.) B.S.G.		+	+	+
Cladonia sp.		+	+	+
Hypogymnia imshuagi			+	+
Pohlia sp.				+
Polytrichum juniperinum Hedw.		8	+	+
Tetraphis pellucida Hedw.				+

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 25	26	27
Larix occidentalis	21.8m;31cm;51yr bh; 4.6 m^2/ha	23.8m;32cm;51yr bh; 18.4 m^2/ha	4.6 m^2/ha
Pinus contorta	21m;29cm;47yr bh; 32 m^2/ha	22.8m;29cm;47yr bh; 13.8 m^2/ha	24m;36cm;51yr bh; 41.2 m^2/ha
Pseudotsuga menziesii		20m;25cm;45yr bh; 2.4 m^2/ha	
Total Basal Area	36.6 m^2/ha	34.6 m^2/ha	45.8 m^2/ha

DECIDUOUS FOREST MAP UNIT
CLOSED POPLAR VEGETATION TYPE

PLOT DATA

	Plot Number 28	29	30
Date	July 10/76	July 7/76	July 7/76
Elevation ft(m)	3400(1036)	3500(1067)	3500(1067)
Slope	--	--	--
Aspect	--	--	--
Moisture regime	Subhygric	Subhygric	Subhygric
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Smooth Straight	Irregular Straight	Irregular Straight

VEGETATION COVER DATA†

		Plot Number 28	29	30
TREES				
Total		90	60(10)[70]	75
Picea glauca (Moench) Voss	White Spruce		(10)	
Populus balsamifera L.	Balsam Poplar	65	30	75
Populus tremuloides Michx.	Aspen		30	
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir	25		
SHRUBS				
Total		(24)31[55]	(13)46[59]	(16)28[44]
Acer glabrum Torr.	Mountain Maple			(12)10
Alnus crispa (Ait.) Pursh	Green Alder	(20)10	(9)	(4)
Cornus stolonifera Michx.	Dogwood	10	10	12
Lonicera utahensis S. Wats.	Red Twin-berry	4	6	6
Rhamnus alnifolia L'Her.	Buckthorn		5	
Ribes oxycanthoides L.	Wild Gooseberry		2	
Rosa acicularis Lindl.	Prickly Rose	5		
Rubus parviflorus Nutt.	Thimbleberry		10	
Rubus strigosus Michx.	Wild Red Raspberry		2	
Salix bebbiana Sarg.	Bebb Willow	(4)2	(4)3	
Symphoricarpos occidentalis Hook.	Buckbrush		8	
FORBS				
Total		22	57	60
Actaea rubra (Ait.) Willd.	Red and White Baneberry			6
Aquilegia flavescens S. Wats.	Yellow Columbine			2
Aralia nudicaulis L.	Wild Sarsaparilla		6	
Aster sp.	Aster	3		
Disporum trachycarpum (S.Wats.) B. and H.	Fairy-bells			1
Equisetum arvense L.	Common Horsetail	5	20	
Equisetum hyemale L.	Scouring Rush	1		
Galium bifolium Wats.	Bedstraw		1	
Galium triflorum Michx.	Sweet-scented Bedstraw	+	12	10
Geum macrophyllum Willd.	Yellow Avens			1
Habenaria hyperborea (L.) R.Br.	Northern Green Orchid	+		
Heracleum lanatum Michx.	Cow Parsnip		1	4
FORBS cont'd				
Mentha arvensis L. var *villosa* (Benth.) S.R. Stewart	Wild Mint	4		
Osmorhiza chilensis Hook. and Arn.	Sweet Cicely		+	10
Pyrola asarifolia Michx.	Common Pink Wintergreen	2		
Pyrola sp.	Wintergreen	+		
Ranunculus acris L.	Tall Buttercup	1		
Rubus pubescens Raf.	Dewberry		3	
Smilacina racemosa (L.) Desf. var. *amplexicaulis* (Nutt.) S. Wats	False Solomon's-seal			2
Smilacina stellata (L.) Desf.	Star-flowered Solomon's-seal	3	2	1
Taraxacum officinale Weber	Common Dandelion	+		
Tellima grandiflorum (Pursh) Dougl.	Fringecup			2
Thalictrum occidentale A. Gray	Western Meadow		2	
Unidentified species	Rue			5
Urtica lyallii S. Wats	Nettle		10	12
Veronica americana (Raf.) Schw.	American Brookline	1		
Vicia americana Muhl.	Wild Vetch	2		
Viola rugulosa Greene	Western Canada Violet			4
GRASSES, SEDGES AND RUSHES				
Total		60	12	1
Bromus ciliatus L.	Fringed Brome	60	12	1
Carex bebbii Olney	Bebb's Sedge	+		
LICHENS, MOSSES AND LIVERWORTS				
Total		+	1	1
Brachythecium plumosum (Hedw.) B.S.G.		+	1	1

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 28	29	30
Picea glauca		*	
Populus balsamifera	32m;45cm;71yr bh; 18.4 m^2/ha	33m;54cm;57yr bh; 32 m^2/ha	35m;59cm;60yr bh; 55 m^2/ha
Populus tremuloides		4.6 m^2/ha	
Total Basal Area	18.4 m^2/ha	41.2 m^2/ha	55 m^2/ha

*Not present on cover plot

MIXED FOREST MAP UNIT
OPEN MIXED FOREST VEGETATION TYPE

PLOT DATA

	Plot Number 31	32	33
Date	July 12/76	July 9/76	July 13/76
Elevation ft(m)	3500(1067)	3500(1067)	3500(1067)
Slope	--	--	--
Aspect	--	--	--
Moisture regime	Mesic	Mesic	Mesic
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Irregular Straight	Irregular Straight	Irregular Straight

VEGETATION COVER DATA†

		Plot Number 31	32	33
TREES				
Total		22	52(7)[59]	44
Larix occidentalis Nutt.	Western Larch	1	12	12
Picea glauca (Moench) Voss	White Spruce	+	6(2)	
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	4	14(5)	22
Populus balsamifera L.	Balsam Poplar	14	8	8
Populus tremuloides Michx.	Aspen	3	12	
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir			2
SHRUBS				
Total		(12)62[74]	(7)41[48]	(10)30[40]
Acer glabrum Torr.	Mountain Maple	(1)4		(1)2
Amelanchier alnifolia Nutt.	Saskatoon-berry	15	5	(1)1
Chimaphila umbellata (L.) Bert var. occidentalis (Rydb.) Blake	Prince's Pine		+	
Cornus stolonifera Michx.	Dogwood		+	
Berberis repens Lindl.	Creeping Mahonia		+	+
Betula papyrifera Marsh.	White Birch	(+)		
Larix occidentalis Nutt.	Western Larch	(+)+		
Lonicera utahensis S.Wats.	Red Twin-berry		7	
Picea glauca (Moench) Voss	White Spruce		(2)+	
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	(8)	(1)	(6)
Populus balsamifera L.	Balsam Poplar	(2)		(2)
Populus tremuloides Michx.	Aspen	(1)	(1)	
Ribes oxycanthoides L.	Wild Gooseberry		2	
Rosa woodsii Lindl.	Common Wild Rose	6		2
Rubus parviflorus Nutt.	Thimbleberry		4	
Rubus strigosus Michx.	Wild Red Raspberry		+	
Salix sp.	Willow sp.	6		
Salix bebbiana Sarg.	Bebb's Willow		(3)+	
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	25	4	18
Spiraea lucida Dougl.	White Meadow Sweet		9	3
Symphoricarpos occidentalis Hook.	Buckbrush	6	10	4
FORBS				
Total		11	55	22
Achillea millefolium L.	Common Yarrow		2	1
Anaphalis margaritacea (L.) Benth. and Hook.	Pearly Everlasting		+	
Anemone multifida Poir.	Cut-leaved Anemone	+		
Antennaria microphylla	Rosy Pussy-toes	+		1
Aralia nudicaulis L.	Wild Sarsaparilla	2		
Arctostaphylos uva-ursi (L.) Spreng.	Common Bearberry	+		
Arnica sp.				+

FORBS cont'd		Plot Number 31	32	33
Aster conspicuus Lindl.	Showy Aster	+	2	5
Cornus canadensis L.	Bunchberry		3	
Epilobium angustifolium L.	Fireweed	+		
Equisetum arvense L.	Common Horsetail		2	
Equisetum hyemale L.	Scouring Rush	+		
Fragaria virginiana Duchesne	Wild Strawberry	8	14	6
Galium boreale L.	Northern Bedstraw	1	2	
Gentianella amarella (L.) Börner ssp. acuta (Michx.) J.M. Gillett	Felwort		+	
Hieracium gracile Hook.	Slender Hawkweed		3	+
Lathyrus ochroleucus Hook.	Pea Vine		1	
Penstemon albidus Nutt.	White Beard-tongue			2
Pyrola secunda L.	One-sided Wintergreen		1	
Ranunculus acris L.	Tall Buttercup		1	
Senecio integerrimus Nutt. var. exaltatus (Nutt.) Cronq.	Ragwort		1	
Solidago multiradiata Ait.	Northern Goldenrod			3
Thalictrum occidentale A. Gray	Western Meadow Rue			+
Trifolium agrarium L.	Yellow Clover			2
Trifolium pratense L.	Red Clover		1	
Trifolium repens L.	White Clover		20	
Vicia americana Muhl.	Wild Vetch		2	2
GRASSES, SEDGES AND RUSHES				
Total		+	15	38
Agropyron subsecundum (Link) Hitchc.	Bearded Wheatgrass	+	6	+
Calamagrostis rubescens Buckl.	Pine Grass	+	3	35
Phleum pratense L.	Timothy	+	2	3
Poa palustris L.	Fowl Bluegrass	+		
Poa pratensis L.	Kentucky Bluegrass	+		+
Stipa columbiana Macoun.	Columbia Needlegrass		4	+
LICHENS, MOSSES AND LIVERWORTS				
Total		1	4	8
Brachythecium plumosum (Hedw.) B.S.G.		1	3	6
Cladonia squamosa (Scop) Hoffm.				1
Polytrichum juniperinum (Hedw.)			1	1
Tetraphis pellucida Hedw.				+

†cover given in percent - See Appendix J-1 for explanation.

TREE DATA

	Plot Number 31	32	33
Larix occidentalis		17.4m;31cm;47yr bh; 9.2 m^2/ha	18.6m;38cm;55yr bh; *
Picea glauca		15.2m;29cm;47yr bh; *	
Pinus contorta	15.9m;43cm;41yr bh; 4.6 m^2/ha	23m;43cm;43yr bh; 4.6 m^2/ha	16m;35cm;47yr bh; 9.2 m^2/ha
Populus balsamifera	24.6m;49cm;45yr bh; 4.6 m^2/ha		17.7m;38cm;48yr bh; 4.6 m^2/ha
Populus tremuloides		16.8m;27cm;44yr bh; *	
Total Basal Area	9.2 m^2/ha	13.8 m^2/ha	

*Not present on basal area plot

MIXED FOREST MAP UNIT
CLOSED MIXED FOREST VEGETATION TYPE

PLOT DATA

	Plot Number 34	35	36
Date	July 13/76	July 14/76	July 13/76
Elevation ft(m)	3500(1067)	3500(1067)	3500(1067)
Slope	--	--	--
Aspect	--	--	--
Moisture regime	Mesic	Mesic	Mesic
Slope position	Valley floor	Valley floor	Valley floor
Surface slope	Smooth Straight	Irregular Straight	Smooth Straight

VEGETATION COVER DATA†

		Plot Number 34	35	36
TREES				
Total		88	65	80
Larix occidentalis Nutt.	Western Larch	18		23
Picea glauca (Moench) Voss	White Spruce		20	
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	30		35
Populus balsamifera L.	Balsam Poplar	25	20	14
Populus tremuloides Michx.	Aspen	15		8
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir		25	
SHRUBS				
Total		(5)31[36]	(20)18[38]	(5)20[25]
Acer glabrum Torr.	Mountain Maple	1		1
Amelanchier alnifolia Nutt.	Saskatoon-berry	3		(2)2
Berberis repens Lindl.	Creeping Mahonia	+		
Chimaphila umbellata (L.) Bart var. occidentalis (Rydb.) Blake	Prince's Pine	+		+
Cornus stolonifera Michx.	Dogwood	2	4	
Elaeagnus commutata Bernh	Wolf Willow		2	
Juniperus communis L.	Ground Juniper		+	
Lonicera utahensis S.Wats.	Red Twin-berry	2	2	4
Picea glauca (Moench) Voss	White Spruce	(2)	(12)+[12]	(2)
Populus tremuloides Michx.	Aspen			(1)
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir	(3)	(8)+	(+)
Rosa woodsii Lindl.	Common Wild Rose	3	1	3
Rubus parviflorus Nutt.	Thimbleberry	10		2
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	5	9	5
Spiraea lucida Dougl.	White Meadow Sweet	3		3
Thuja phcata D. Don	Western Red Cedar	2		
FORBS				
Total		30	10	18
Achillea millefolium L.	Common Yarrow			+
Allium cernuum Roth	Nodding Onion		5	
Antennaria parvifolia Nutt.	Nuttall's Pussy-toes			+
Aralia nudicaulis L.	Wild Sarsaparilla	2		1
Arnica cordifolia Hook.	Heart-shaped Arnica	3		2
Aster conspicuus Lindl.	Showy Aster		2	
Castilleja miniata var. miniata Dougl.	Indian Paint-brush	+		+

FORBS cont'd		Plot Number 34	35	36
Clintonia uniflora (Schult.) Kunth	One-flowered Clintonia	2		
Corallorhiza trifida Chatêlain	Pale Coral Root	+		
Cornus canadensis L.	Bunchberry	12		2
Epilobium angustifolium L.	Fireweed		+	
Fragaria virginiana Duchesne	Wild Strawberry	1	1	2
Galium boreale L.	Northern Bedstraw		+	
Galium trifidum L.	Small Bedstraw	3		
Gentianella amarella (L.) Börner ssp. acuta (Michx.) J.M. Gillett	Felwort		+	
Hieracium gracile Hook.	Slender Hawkweed	2		3
Lathyrus ochroleucus Hook.	Pea Vine	1		2
Osmorhiza chilensis Hook. and Arn.	Sweet Cicely			+
Pyrola secunda L.	One-sided Wintergreen	1		+
Ranunculus acris L.	Tall Buttercup			+
Senecio integerrimus Nutt. var. exaltatus (Nutt.) Cronq.	Ragwort			+
Smilacina stellata (L.) Desf.	Star-flowered Solomon's-seal		1	
Taraxacum officinale Weber	Common Dandelion		+	+
Trifolium repens L.	White Clover			3
Vicia americana Muhl.	Wild Vetch		1	1
Viola orbiculata Geyer	Evergreen Violet	3		2
GRASSES, SEDGES AND RUSHES				
Total		+	3	4
Agropyron subsecundum (Link) Hitchc.	Bearded Wheatgrass	+		+
Calamagrostis rubescens Buckl.	Pine Grass	+	3	2
Carex sp.	Sedge		+	
Oryzopsis asperifolia Michx.	Rice Grass	+		1
Phleum pratense L.	Timothy			1
Stipa columbiana Macoun.	Columbia Needlegrass	+		+
LICHENS, MOSSES AND LIVERWORTS				
Total		16	20	3
Brachythecium plumosum (Hedw.) B.S.G.		16	12	3
Cladonia sp.			2	
Peltigera canina (L.) Willd.			+	
Tetraphis pellucida Hedw.			6	

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 34	35	36
Larix occidentalis	18.9m;34cm;56yr bh; 4.6 m^2/ha		25.2;46cm;53yr bh; 4.6 m^2/ha
Picea glauca		13.4m;21cm;55yr bh; *	
Pinus contorta	24.6m;31cm;46yr bh; 18.4 m^2/ha		19.5m;32cm;49yr bh; 27.6 m^2/ha
Populus balsamifera	21.7m;36cm;46yr bh; 13.8 m^2/ha	17.2m;24cm;49yr bh; 4.6 m^2/ha	4.6 m^2/ha
Pseudotsuga menziesii		15.6m;24cm;55yr bh; 13.8 m^2/ha	
Total Basal Area	36.8 m^2/ha	18.4 m^2/ha	36.8 m^2/ha

*Not present on basal area plot

HILLSIDE MEADOW UNIT

PLOT DATA

	Plot Number 37	38	39
Date	August 31/76	September 2/76	September 1/76
Elevation ft(m)	4100(1250)	4900(1494)	4450(1356)
Slope	37°	32°	22°
Aspect	250°	240°	220°
Moisture regime	Submesic	Submesic	Mesic
Slope position	Lower slope	Upper slope	Middle slope
Surface slope	Irregular Straight	Irregular Convex	Smooth Concave

VEGETATION COVER DATA†

		Plot Number 37	38	39
TREES				
Total				
SHRUBS				
Total		(3)36[39]	58	(5)29[34]
Acer glabrum Torr.	Mountain Maple	3	1	2
Amelanchier alnifolia Nutt.	Saskatoon-berry	15	40	3
Berberis repens Lindl.	Creeping Mahonia	1		+
Juniperus communis L.	Ground Juniper	1	4	
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	(1)	1	(2)1
Populus balsamifera L.	Balsam Poplar			(2)
Populus tremuloides Michx.	Aspen		2	
Prunus virginiana L.	Choke Cherry	4		
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir	(2)		(1)1
Rosa woodsii Lindl.	Common Wild Rose	3	4	1
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry		5	5
Spiraea lucida Dougl.	White Meadowsweet	2	1	
Symphoricarpos occidentalis Hook.	Buckbrush	7		16
FORBS				
Total		13	26	65
Achillea millefolium L.	Common Yarrow	1	1	2
Actaea rubra (Ait.) Willd.	Red and White Baneberry			1
Allium cernuum Roth	Nodding Onion	3	2	
Artemisia frigida Willd.	Artemisia		1	
Aster modestus Lindl.	Few-flowered Aster			1
Balsamorhiza sagittata (Pursh) Nutt.	Balsam-root		2	
Campanula rotundifolia L.	Harebell	+	2	

FORBS cont'd		Plot Number 37	38	39
Cirsium arvense (L.) Scop.	Canada Thistle			2
Epilobium angustifolium L.	Fireweed			4
Eriogonum umbellatum Torr.	Wild Buckwheat		1	
Fragaria virginiana Duchesne	Wild Strawberry	6		45
Heuchera cylindrica Dougl.	Alum-root	2	1	
Lupinus sericeus Pursh	Perennial Lupine		6	
Polemonium pulcherrimum Hook.	Jacob's-ladder		6	
Potentilla glandulosa Lindl. ssp. pseudorupestris (Rydb.) Keck	Sticky Cinquefoil		2	
Smilacina stellata (L.) Desf.	Star-flowered Solomon's-seal			8
Solidago rigida L.	Golden rod		1	
Stellaria longipes Goldie	Long-stalked Chickweed	+		
Tragopogon dubius Scop.	Goat's-beard	1	1	
Verbascum thapsus L.	Common Mullein			+
Vicia americana Muhl.	Wild Vetch			2
GRASSES, SEDGES AND RUSHES				
Total		7	14	23
Agropyron smithii Rydb.	Western Wheatgrass		6	
Agropyron spicatum (Pursh) Scribn. & Smith	Bluebunch Wheatgrass			7
Calamagrostis sp.	Reedgrass	+		
Phleum pratense L.	Timothy	3		2
Poa gracillima Vasey	Pacific Bluegrass			2
Poa interior Rydb.	Inland Bluegrass		8	
Poa pratensis L.	Kentucky Bluegrass	4		12
LICHENS, MOSSES AND LIVERWORTS				
Total		1		9
Brachythecium frigidum (C. Muell.) Besch.				+
Brachythecium velutinum (Hedw.) B.S.G.		+		2
Cladonia sp.				+
Mnium spinulosum B.S.G.				6
Pohlia nutans (Hedw.) Lindb.		1		+
Polytrichum juniperinum Hedw.				1

†cover given in percent - See Appendix J-1 for explanation

UPLAND TREE-SHRUB MAP UNIT

PLOT DATA

	Plot Number 40	41	42
Date	September 1/76	September 1/76	September 1/76
Elevation ft(m)	4100(1250)	4150(1265)	4200(1280)
Slope	18°	16°	20°
Aspect	320°	270°	220°
Moisture regime	Mesic	Mesic	Mesic
Slope position	Middle slope	Middle slope	Middle slope
Surface slope	Irregular Straight	Irregular Straight	Smooth Straight

VEGETATION COVER DATA†

		Plot Number 40	41	42
TREES				
Total				15
Larix occidentalis Nutt.	Western Larch			15
SHRUBS				
Total		(30)40[70]	(35)36[71]	(27)40[67]
Acer glabrum Torr.	Mountain Maple	7	4	(5)6
Alnus crispa (Ait.) Pursh	Green Alder	8		3
Amelanchier alnifolia Nutt.	Saskatoon-berry	2	8	6
Berberis repens Lindl.	Creeping Mahonia			2
Juniperus communis L.	Ground Juniper	+		
Larix occidentalis Nutt.	Western Larch	(5)1		(4)
Lonicera utahensis S.Wats.	Red Twin-berry	4		
Pachystima myrsnites (Pursh) Raf.	Mountain Lover	4	2	
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	(10)2	(20)3	(7)2
Populus balsamifera L.	Balsam Poplar	(2)		(1)
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir	(8)2	(15)5	(10)3
Rubus parviflorus Nutt.	Thimbleberry	3		
Salix bebbiana Sarg.	Bebb Willow		1	
Shepherdia canadensis(L.) Nutt.	Canadian Buffalo-berry		10	10
Spiraea lucida Dougl.	White Meadowsweet	1		
Symphoricarpos occidentalis Hook.	Buckbrush		3	8
Thuja plicata D.Don	Western Red Cedar	(5)2		
Vaccinium membranaceum Dougl.	Tall Billberry	4		
FORBS				
Total		11	6	22
Antennaria neglecta Greene	Everlasting		+	
Antennaria parviflora Nutt.	Pussytoes		+	
Aster conspicuus Lindl.	Showy Aster		+	
Aster modestus Lindl.	Few-flowered Aster			1
Aster sp.	Aster		2	

FORBS cont'd		Plot Number 40	41	42
Chrysanthemum leucanthemum L.	Ox-eye Daisy			3
Clintonia uniflora (Schult.) Kunth	One-flowered Clintonia	4		
Epilobium angustifolium L.	Fireweed	1		1
Fragaria virginiana Duchesne	Wild Strawberry			4
Habenarid unalascensis (Spreng.) S. Wats.	Alaska Bog Orchid	+		
Lathyrus ochroleucus Hook.	Pea Vine		2	1
Linnaea borealis L. var. americana (Forbes) Rehd.	Twin-flower	6		
Solidago sp.	Golden-rod			2
Streptopus amplexifolius (L.) DC.	Twisted-stalk			1
Taraxacum officinale Weber	Common Dandelion		+	
Trifolium agrarium L.	Yellow Clover		1	6
Trifolium repens L.	White Clover			3
Verbascum thapsus L.	Common Mullein			+
Vicia americana Muhl.	Wild Vetch		1	
Viola sp.	Violet		+	
GRASSES, SEDGES AND RUSHES				
Total		15	18	9
Agropyron spicatum (Pursh) Scribn. & Smith	Bluebunch Wheatgrass			1
Calamagrostis rubescens Buckl.	Pine Grass	15	18	6
Carex interior Baily	Inland Sedge			+
Phleum pratense L.	Timothy			2
LICHENS, MOSSES AND LIVERWORTS				
Total		9	5	4
Brachythecium velutinum (Hedw.) B.S.G.		1	2	
Cladonia sp.		1	+	+
Pohlia nutans (Hedw.) Lindb.		4		2
Polytrichum juniperinum Hedw.		3	3	1
Polytrichum piliferum (Hedw.)				1

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 40	41	42
Larix occidentalis	10.6m;19cm;21yr bh;		No data taken
Pinus contorta		10m;14cm;21yr bh; 2.4 m^2/ha	
Pseudotsuga menziesii		9.8m;15cm;16yr bh; 2.4 m^2/ha	
Total Basal Area	No Data Taken	4.8 m^2/ha	

UPLAND MIXED FOREST MAP UNIT

PLOT DATA

	Plot Number 43	44	45
Date	September 2/76	September 2/76	September 2/76
Elevation ft(m)	3750(1143)	3700(1198)	3650(1113)
Slope	22°	13°	7°
Aspect	240°	240°	270°
Moisture regime	Mesic	Mesic	Mesic
Slope position	Lower slope	Middle slope	Middle slope
Surface slope	Smooth Straight	Smooth Straight	Irregular Straight

VEGETATION COVER DATA†

		Plot Number 43	44	45
TREES				
Total		30	45	60
Pinus contorta Louden var. *latifolia* Engelm.	Lodgepole Pine	30	25	40
Populus tremuloides Michx.	Aspen		20	20
SHRUBS				
Total		(18)20[38]	(6)30[36]	(5)20[25]
Acer glabrum Torr.	Mountain Maple	(8)3	(4)	(1)2
Amelanchier alnifolia Nutt.	Saskatoon-berry			2
Berberis repens Lindl.	Creeping Mahonia	1	2	+
Juniperus communis L.	Ground Juniper			+
Pachystima myrsnites (Pursh) Raf.	Mountain Lover		+	
Pinus contorta Louden var. *latifolia* Engelm.	Lodgepole Pine			1
Populus tremuloides Michx.	Aspen	(10)	(2)	
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir		+	
Rosa woodsii Lindl.	Common Wild Rose	3	6	5
Salix bebbiana Sarg.	Bebb Willow			(4)
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	6	12	8
Spiraea lucida Dougl.	White Meadowsweet	2	4	2
Symphoricarpos occidentalis Hook.	Buckbrush	5	6	
FORBS				
Total		14	14	24
Achillea millefolium L.	Common Yarrow	1		2
Antennaria neglecta Greene	Everlasting			1
Antennaria parviflora Nutt.	Pussytoes	1	1	2
Aster conspicuus Lindl.	Showy Aster	4	2	2
Aster modestus Lindl.	Few-flowered Aster	2	2	2
Fragaria virginiana Duchesne	Wild Strawberry		6	

FORBS con't		Plot Number 43	44	45
Lathyrus ochroleucus Hook.	Pea Vine	2	1	2
Senecio integerrimus Nutt. var. *exaltatus*	Ragwort	+		
Senecio sp.	Groundsel	+		1
Solidago sp.	Goldenrod			1
Streptopus amplexifolius (L.) DC.	Twisted-stalk		1	
Taraxacum officinale Weber	Common Dandelion			+
Trifolium agrarium L.	Yellow Clover	2		4
Trifolium repens L.	White Clover	1		6
Unidentified composite				1
Vicia americana Muhl.	Wild Vetch	1		
Viola sp.	Violet		1	
GRASSES, SEDGES AND RUSHES				
Total		25	10	16
Agropyron canium (L.) Beauv.	Bearded Wheatgrass			1
Calamagrostis rubescens Buckl.	Pine Grass	20	10	12
Phleum pratense L.	Timothy	5		3
LICHENS, MOSSES AND LIVERWORTS				
Total		5	6	32
Brachythecium velutinum (Hedw.)	B.S.G.	5	6	30
Cladonia sp.		+		
Cladonia squamosa (Scop) Hoffm.				+
Drepanocladus uncinatus (Hedw.)	Warnst.		+	
Peltigera canina (L.) Willd.		+		2

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Data 43	44	45
Pinus contorta	16.2m;30cm;36yr bh; 18.4 m²/ha	13.4m;28cm;41yr bh; 20.6 m²/ha	18.4m;31cm;48yr bh; 22.8 m²/ha
Populus tremuloides		12m;19cm;43yr bh;	18m;21cm;45yr bh;
Pseudotsuga menziesii		Data not taken 4.6 m²/ha	
Total Basal Area	18.4 m²/ha	25.2 m²/ha	22.8 m²/ha

SLIDE VEGETATION MAP UNIT

PLOT DATA

	Plot Number 46	47	48
Date	August 31/76	September 3/76	September 3/76
Elevation ft(m)	4450(1356)	5450(1661)	5850(1783)
Slope	27°	34°	21°
Aspect	320°	250°	25°
Moisture regime	Hygric	Subhygric	Subhygric
Slope position	Middle slope	Middle slope	Upper slope
Surface slope	Smooth Straight	Irregular Straight	Irregular Straight

VEGETATION COVER DATA†

		Plot Number 46	47	48
TREES				
Total				
SHRUBS				
Total		(16)39[55]	(14)30[44]	(6)12[18]
Abies lasiocarpa (Hook.) Nutt.	Alpine fir		(4)	(6)5
Acer glabrum Torr.	Mountain Maple	(4)		
Alnus crispa (Ait.) Pursh	Green Alder	(12)16	(10)6	2
Oplopanax horridum (Sm.) Miq.	Devil's-club	15		
Rhododendron albiflorum Hook.	White-flowered Rhododendron			3
Ribes lacustre (Pers.) Poir	Bristly Black Current		8	1
Rubus parviflorus Nutt.	Thimbleberry	8	8	
Sambucus melanocarpa A. Gray	Black Elder		8	1
FORBS				
Total		35	48	59
Actaea rubra (Ait.) Willd.	Red and White Baneberry	+	4	2
Arnica latifolia Bong.	Mountain Arnica		1	
Aster modestus Lindl.	Few-flowered Aster		2	1
Aster sp.	Aster			+
Athyrium distentifolium Tausch.	Lady-fern	6		
Epilobium angustifolium L.	Fireweed		2	
Epilobium glandulosum Lehm.	Willow-herb	2		
Epilobium sp.	Fireweed			2
Heracleum lanatum Michx.	Cow Parsnip	12	6	5
Lomatium sp.	Prairie Parsley		1	3
Mimulus lewisii Pursh.	Red Monkey-flower			6
Mycsotis discolor Pers.	Forget-me-not			2
Osmorhiza chilensis Hook. and Arn.	Sweet Cicely		3	
Osmorhiza occidentalis (Nutt.) Torr.	Western Sweet-root			8
Parnassia fimbriata Konig.	Grass-of-Parnassus			2

FORBS cont'd		Plot Number 46	47	48
Pedicularis bracteosa Benth.	Lousewort		1	
Polystichium lonchitis (L.) Roth.	Mountain Holly-fern		1	
Senecio triangularis Hook.	Arrowleaf Groundsel		5	20
Smilacina racemosa (L.) Desf. var. *amplexicaulis* (Nutt.) S. Wats.	False Solomon's-seal	2		
Stellaria sp.	Chickweed		2	
Streptopus amplexifolius (L.)DC.	Twisted-stalk	1	1	2
Thalictrum occidentale A. Gray	Western Meadow Rue		4	6
Tiarella trifoliata L.	Foamflower	2	2	
Unidentified fern			+	
Urtica lyallii S. Wats.	Nettle	8	6	
Valeriana septentrionalis Rydb.	Valeriana			+
Veratrum eschscholtzii A. Gray	False Hellebore	+	4	
Viola sp.	Violet	2	3	
GRASSES, SEDGES AND RUSHES				
Total		2	+	1
Cinna latifolia (Trevir.) Griseb.	Drooping Woodreed	2		1
Elymus glaucus Buckl.	Blue Wild-rye		+	
Stipa columbiana Macoun.	Columbia Needle Grass		+	
LICHENS, MOSSES AND LIVERWORTS				
Total		7	5	11
Brachythecium albicans (Hedw.) B.S.G.				1
Brachythecium sp.		2	5	7
Ceratodon purpureus (Hedw.) Brid.				2
Cyrtomnium hymenophylloides (Hueb. Koponen		2		+
Lophocolea sp.			+	
Marchantia polymorpha L.		3		1
Mnium sp.			+	

†cover given in percent - See Appendix J-1 for explanation

LOW ELEVATION YOUNG FOREST MAP UNIT

PLOT DATA

	Plot Number 49	50	51
Date	August 31/76	September 1/76	September 4/76
Elevation ft(m)	3900(1189)	3700(1128)	3600(1097)
Slope	26°	34°	33°
Aspect	270°	320°	290°
Moisture regime	Mesic	Mesic	Mesic
Slope position	Middle slope	Middle slope	Lower slope
Surface slope	Irregular Straight	Smooth Straight	Irregular Straight

VEGETATION COVER DATA+

		Plot Number 49	50	51
TREES				
Total		75	75	75
Betula papyrifera Marsh.	White Birch		15	
Larix occidentalis Nutt.	Western Larch			30
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	75	60	
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir			25
Thuja plicata D.Don	Western Red Cedar			20
SHRUBS				
Total		(3)36[39]	(6)40[46]	(28)12[40]
Acer glabrum Torr.	Mountain Maple	(1)	(6)3	(3)2
Alnus crispa (Ait.) Pursh	Green Alder		3	
Amelanchier alnifolia Nutt.	Saskatoon-berry	(2)	5	
Berberis repens Lindl.	Creeping Mahonia	+		
Lonicera involucrata (Richards.) Banks	Bracted Honeysuckle			2
Pachystima myrsnites (Pursh) Raf.	Mountain Lover	1	+	+
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir			(15)
Rosa woodsii Lindl.	Common Wild Rose	1		
Rubus parviflorus Nutt.	Thimbleberry	3	15	7
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry	30	10	
Spiraea lucida Dougl.	White Meadowsweet	1	3	1
Thuja plicata D.Don	Western Red Cedar		1	(10)
FORBS				
Total		5	17	2
Apocynum androsaemifolium L.	Spreading dogbane	+		
Aralia nudicaulis L.	Wild Sarsaparilla		6	
Arnica cordifolia Hook.	Heart-shaped Arnica	1		
Arnica sp.	Arnica		3	
Aster conspicuus Lindl.	Showy Aster	+		

FORBS cont'd		Plot Number 49	50	51
Clematis verticellaris DC. var. columbiana (Nutt.) A. Gray	Purple Clematis		2	
Cornus canadensis L.	Bunchberry		2	1
Fragaria virginiana Duchesne	Wild Strawberry	4		
Galium triflorum Michx.	Sweet-scented Bedstraw			+
Goodyera repens (L.) R.Br.	Rattlesnake Plantain			1
Lathyrus ochroleucus Hook.	Pea Vine		2	+
Pyrola secunda L.	One-sided Wintergreen		1	
Streptopus amplexifolius (L.) DC.	Twisted-stalk		1	
GRASSES, SEDGES AND RUSHES				
Total				
LICHENS, MOSSES AND LIVERWORTS				
Total		15	20	1
Brachythecium frigidum (C. Muell.) Besch.		13		
Brachythecium sp.				1
Brachythecium velutinum (Hedw.) B.S.G.			20	
Peltigera canina (L.) Willd.		1	+	
Polytrichum piliferum (Hedw.)		1		

+cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 49	50	51
Betula papyrifera		- 7.0 m^2/ha	
Larix occidentalis			16.6m;29cm;53yr bh; 13.8 m^2/ha
Pinus contorta	10m;14cm;42yr bh; 11.6 m^2/ha	14.4m;17cm;49yr bh; 27.6 m^2/ha	
Pseudotsuga menziesii			19.2m;27cm;54yr bh; 18.2 m^2/ha
Thuja plicata			12.5m;19cm;41yr bh; 4.6 m^2/ha
Total Basal Area	11.6 m^2/ha	34.6 m^2/ha	36.6 m^2/ha

LOW ELEVATION OLDER FOREST MAP UNIT

PLOT DATA

	Plot Number 52	53	54
Date	September 5/76	September 5/76	September 4/76
Elevation ft(m)	4350(1326)	4450(1365)	4450(1356)
Slope	17°	26°	37°
Aspect	70°	320°	40°
Moisture	Mesic	Mesic	Mesic
Slope position	Lower slope	Middle slope	Middle slope
Surface slope	Irregular Straight	Irregular Straight	Irregular Straight

VEGETATION COVER DATA†

TREES		Plot Number 52	53	54
Total		85	80	80
Larix occidentalis Nutt.	Western Larch	40	30	35
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	30	20	20
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir		15	25
Thuja plicata D.Don	Western Red Cedar	15	15	
SHRUBS				
Total		(7)3[10]	(20)13[33]	(25)25[50]
Acer glabrum Torr.	Mountain Maple	(2)1		
Alnus crispa (Ait.) Pursh	Green Alder			10
Chimaphila umbellata (L.) Bart var. occidentalis (Rydb.) Blake	Prince's Pine		1	
Lonicera involucrata (Richards.) Banks	Bracted Honeysuckle			+
Lonicera utahensis S.Wats.	Red Twin-berry		1	4
Pachystima myrsnites (Pursh) Raf.	Mountain Lover		6	1
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir		(5)	(20)
Ribes oxycanthoides L.	Wild Gooseberry			1
Rubus parviflorus Nutt.	Thimbleberry	2	4	+
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry			4
Spiraea lucida Dougl.	White Meadowsweet		1	3
Thuja plicata D.Don	Western Red Cedar	(5)	(15)	(5)
Vaccinium membranaceum Dougl.	Tall Billberry			2

FORBS		Plot Number 52	53	54
Total		10	5	12
Actacea rubra (Ait.) Willd.	Red and White Baneberry	1		
Arnica latifolia Bong.	Mountain Arnica		1	6
Aster modestus Lindl.	Few-flowered Aster			1
Aster sp.	Aster			+
Clintonia uniflora (Schult.) Kunth	One-flowered Clintonia	5		
Fragaria virginiana Duchesne	Wild Strawberry			+
Galium triflorum Michx.	Sweet-scented Bedstraw	1		
Goodyera repens (L.) R.Br.	Rattlesnake Plantain		1	2
Gymnocarpium sp.	Fern		+	
Pyrola secunda L.	One-sided Wintergreen	2	1	2
Tiarella trifoliata L.	Foamflower	1	2	
Viola orbiculata Geyer	Evergreen Violet		+	1
GRASSES, SEDGES AND RUSHES				
Total				2
Calamagrostis rubescens Buckl.	Pine Grass			2
LICHENS, MOSSES AND LIVERWORTS				
Total		2	4	10
Brachythecium frigidum (C. Muell.) Besch.		2		1
Brachythecium sp.				2
Cladonia sp.			+	2
Mnium spinulosum B.S.G.		+	2	
Peltigera canina (L.) Willd.			+	1
Pleurozium schreiberi (Brid) Mitt.			2	
Pohlia nutans (Hedw.) Lindb.				2
Polytrichum juniperinum Hedw.				2

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 52	53	54
Larix occidentalis	37.8m;42cm;117yr bh; 41.2 m²/ha	37.9m;47cm;115yr bh; 27.6 m²/ha	29m;47cm;143yr bh; 14 m²/ha
Pinus contorta	28.2m;35cm;110yr bh; 13.8 m²/ha	27.8m;27cm;102yr bh; 3.4 m²/ha	24.4m;23cm;88yr bh; 14 m²/ha
Pseudotsuga menziesii		33m;37cm;110yr bh; 20.6 m²/ha	29.5m;70cm;98yr bh; 7.0 m²/ha
Thuja plicata	24m;36cm;88yr bh; 36.6 m²/ha	14.2m;23cm;90yr bh; 7.0 m²/ha	
Total Basal Area	91.6 m²/ha	58.6 m²/ha	35 m²/ha

MID-ELEVATION OLDER FOREST MAP UNIT

PLOT DATA

	Plot Number 55	56	57
Date	August 31/76	September 1/76	September 4/76
Elevation ft(m)	4650(1417)	4750(1448)	5100(1554)
Slope	35°	20°	29°
Aspect	360°	320°	40°
Moisture regime	Mesic	Mesic	Mesic
Slope position	Middle slope	Middle slope	Middle slope
Surface slope	Irregular Straight	Irregular Straight	Irregular Straight

VEGETATION COVER DATA

		Plot Number 55	56	57
TREES				
Total		70(5)[75]	80	80
Abies lasiocarpa (Hook.) Nutt.	Alpine Fir	5	20	20
Larix occidentalis Nutt.	Western Larch	15	10	5
Picea engelmannii Parry	Engelmann Spruce	25	20	30
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir	20(5)	25	25
Thuja plicata D.Don	Western Red Cedar	5	5	
SHRUBS				
Total		(2)8[10]	(3)10[13]	53
Abies lasiocarpa (Hook.) Nutt.	Alpine Fir			2
Acer glabrum Torr.	Mountain Maple	(1)	(3)	1
Amelanchier alnifolia Nutt.	Saskatoon-berry	(1)		
Lonicera utahensis S. Wats.	Red Twin-berry	2		5
Menziesia ferruginea Smith			2	
Oplopanax horridum (Sm.) Miq.	Devil's-club	2	5	15
Pachystima myrsnites (Pursh) Raf.	Mountain Lover	+	+	+
Ribes oxycanthoides L.	Wild Gooseberry	1		
Rubus parviflorus Nutt.	Thimbleberry	3	3	25
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry			3
Spiraea lucida Dougl.	White Meadowsweet	+		
Vaccinium membranaceum Dougl.	Tall Billberry			2
FORBS				
Total		10	15	61
Actaea rubra (Ait.) Willd.	Red and White Baneberry			1
Arnica latifolia Bong.	Mountain Arnica			35
Arnica sp.	Arnica		6	
Athyrium distentifolium Tausch.	Ladyfern			

FORBS cont'd		Plot Number 55	56	57
Clintonia uniflora (Schult.) Kunth	One-flowered Clintonia	1		2
Dryopteris sp.	Fern			4
Galium triflorum Michx.	Sweet-scented Bedstraw	2		+
Goodyera repens (L.) R.Br.	Rattlesnake Plantain	2	2	6
Gymnocarpium sp.	Fern		2	3
Pyrola secunda L.	One-sided Wintergreen		1	2
Smilacina racemosa (L.) Desf. var. amplexicaulis (Nutt.) S. Wats.	False Solomon's-seal	1	1	1
Streptopus amplexifolius (L.) DC.	Twisted-stalk	+	1	
Thalictrum occidentale A. Gray	Western Meadow Rue	1	1	5
Tiarella trifoliata L.	Foamflower		1	2
Unidentified Fern			+	
Viola orbiculata Geyer	Evergreen Violet	1	+	
GRASSES, SEDGES AND RUSHES				
Total				+
Calamagrostis rubescens Buckl.	Pine Grass			+
Luzula parviflora (Ehrh.) Desv.	Woodrush			+
LICHENS, MOSSES AND LIVERWORTS				
Total		12	6	8
Atrichum selwynii Aust.				+
Brachythecium frigidum (C. Muell.) Besch.		+	3	
Brachythecium velutinum (Hedw.) B.S.G.		6		+
Cladonia sp.		+	+	
Mnium spinulosum B.S.G.		+		5
Pohlia nutans (Hedw.) Lindb.		6		
Polytrichum juniperinum Hedw.		+		3
Polytrichum piliferum (Hedw.)			3	

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 55	56	57
Abies lasiocarpa		21.6m;38cm;79yr bh; -	33m;41cm;111yr bh; 7.0 m²/ha
Larix occidentalis	30.9m;38cm;107yr bh;	46.5m;52cm;97yr bh; 7.0 m²/ha	31.5m;33cm;104yr bh;
Picea engelmannii	37.5m;54cm;82yr bh; 9.2 m²/ha	32.7m;38cm;95yr bh; 27.6 m²/ha	37.5m;39cm;107yr bh; 14.0 m²/ha
Pinus contorta	- 9.2 m²/ha		
Pseudotsuga menziesii	34.5m;58cm;107yr bh; 20.6 m²/ha	28.6m;62cm;104yr bh; 27.6 m²/ha	28.8m;37cm;114yr bh; 29.8 m²/ha
Thuja plicata		25.8m;31cm;rotton -	
Total Basal Area	39 m²/ha	62.2 m²/ha	50.8 m²/ha

HIGH ELEVATION OLDER FOREST MAP UNIT

PLOT DATA

	Plot Number 58	59	60
Date	August 31/76	September 3/76	September 4/76
Elevation ft(m)	5650(1722)	5950(1814)	6400(1951)
Slope	22°	32°	34°
Aspect	270°	330°	240°
Moisture regime	Submesic	Subhygric	Mesic
Slope position	Upper slope	Upper slope	Upper slope
Surface slope	Irregular Straight	Irregular Straight	Irregular Straight

VEGETATION COVER DATA†

		Plot Number 58	59	60
TREES				
Total		55(10)[65]	40	45
Abies lasiocarpa (Hook.) Nutt.	Alpine Fir	15(5)	25	10
Pinus albicaulis Engelm.	White-bark Pine		15	10
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	40(5)		15
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir			10
SHRUBS				
Total		(4)62[66]	68	(3)41[44]
Abies lasiocarpa (Hook.) Nutt.	Alpine Fir	(2)	5	
Amelanchier alnifolia Nutt.	Saskatoon-berry			3
Juniperus communis L.	Ground Juniper			2
Pachystima myrsnites (Pursh) Raf.	Mountain Lover			2
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine	(2)		
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir			(2)
Rhododendron albiflorum Hook.	White-flowered Rhododendron	5	15	
Ribes oxycanthoides L.	Wild Gooseberry			2
Rosa woodsii Lindl.	Common Wild Rose			6
Rubus parviflorus Nutt.	Thimbleberry			2
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry			5
Spiraea lucida Dougl.	White Meadowsweet			4
Thuja plicata D. Don	Western Red Cedar			(1)
Vaccinium membranaceum Dougl.	Tall Billberry		8	3
Vaccinium scoparium Leiberg	Grouse-berry	45	40	12
Vaccinium uliginosum L.	Bog Bilberry	12		
FORBS				
Total		28	9	27
Allium cernuum Roth	Nodding Onion			2
Arnica latifolia Bong.	Mountain Arnica	20	4	
Aster conspicuus Lindl.	Showy Aster			15
Aster sp.	Aster		1	
Campanula rotundifolia L.	Harebell			1

		Plot Number 58	59	60
FORBS cont'd				
Castilleja sp.	Paintbrush		+	
Clematis verticellaris DC. var. columbiana (Nutt.) A. Gray	Purple Clematis			3
Epilobium angustifolium L.	Fireweed			4
Hieracium albiflorum Hook.	White-flowered Hawkweed	2		
Hieracium gracile Hook.	Slender Hawkweed	2	1	
Pedicularis bracteosa Benth.	Lousewort		2	
Pyrola secunda L.	One-sided Wintergreen	4		
Solidago multiradiata Ait.	Goldenrod			2
Stenanthium occidentale (Gray) Kunth	Bronze Bells		+	
Valeriana sitchensis Bong.	Valeriana		1	
GRASSES, SEDGES AND RUSHES				
Total		1	+	6
Calamagrostis rubescens Buckl.	Pine Grass			6
Carex aurea Nutt.		1		
Unidentified grass			+	
LICHENS, MOSSES AND LIVERWORTS				
Total		2	85	4
Brachythecium sp.				4
Brachythecium velutinum (Hedw.) B.S.G.		1		
Cratoneuron filicinum (Hedw.) Spruce				+
Cladonia sp.			5	
Letharia vulpina (L.) Hue				+
Lophozia lycopodioides			40	
Peltigera canina (L.) Willd.			5	
Pohlia nutans (Hedw.) Lindb.			35	
Polytrichum juniperinum Hedw.		1		

†cover given in percent - See Appendix J-1 for explanation

TREE DATA

	Plot Number 58	59	60
Abies lasiocarpa	14.6m;25cm;118yr bh; 4.6 m²/ha	12.8m;21cm;85yr bh; 12.6 m²/ha	8.9m;24cm;86yr bh; 4.6 m²/ha
Pinus albicaulis		13m;25cm;91yr bh; 4.6 m²/ha	8.7m;15cm;64yr bh; 8.0 m²/ha
Pinus contorta	13.4m;27cm;112yr bh; 29.8 m²/ha		14.9m;31cm;86yr bh; 7.9 m²/ha
Pseudotsuga menziesii			11.9m;33cm;98yr bh; 2.4 m²/ha
Total Basal Area	34.4 m²/ha	17.2 m²/ha	22.0 m²/ha

APPENDIX K

LIST OF PLANT SPECIES IN THE PROPOSED HOSMER-WHEELER MINE AREA, 1976

Scientific Name	Common Name
TREES	
Abies lasiocarpa (Hook.) Nutt.	Alpine Fir
Betula papyrifera Marsh	White Birch
Larix occidentalis Nutt.	Western Larch
Picea engelmannii Parry	Engelmann Spruce
Picea glauca (Moench) Voss	White Spruce
Pinus albicaulis Engelm.	White-bark Pine
Pinus contorta Louden var. latifolia Engelm.	Lodgepole Pine
Pinus monticola Dougl.	Western White Pine
Populus balsamifera L.	Balsam Poplar
Populus tremuloides Michx.	Aspen
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir
Thuja plicata D.Don	Western Red Cedar
SHRUBS	
Alnus crispa (Ait.) Pursh	Green Alder
Amelanchier alnifolia Nutt.	Saskatoon-berry
Acer glabrum Torr.	Mountain Maple
Berberis repens Lindl.	Creeping Mahonia
Betula papyrifera Marsh.	White Birch
Chimaphila umbellata (L.) Bart var. occidentalis (Rydb.) Blake	Prince's Pine
Cornus stolonifera Michx.	Dogwood
Crategus douglasii Lindl.	Hawthorn
Elaeagnus commutata Bernh.	Wolf Willow
Juniperus communis L.	Ground Juniper
Juniperus scopulorum Sarg.	Rocky Mountain Juniper
Lonicera involucrata (Richards.) Banks	Bracted Honeysuckle
Lonicera utahensis S.Wats.	Red Twin-berry
Menziesia ferruginea Smith	False Azalea
Menziesia glabella A. Gray	False Huckleberry
Oplopanax horridum (Sm.) Miq.	Devil's-club
Pachystima myrsnites (Pursh) Raf.	Mountain Lover
Prunus virginiana L.	Choke Cherry
Rhamnus alnifolia L'Her	Buckthorn
Rhododendron albiflorum Hook.	White-flowered Rhododendron
Ribes lacustre (Pers.) Poir	Bristly Black Current
Ribes oxycanthoides L.	Wild Gooseberry
Ribes viscosissimum Pursh	Sticky Current
Rosa acicularis Lindl.	Prickly Rose

Continued...

Scientific Name	Common Name
SHRUBS cont'd	
Rosa sp.	Rose
Rosa woodsii Lindl.	Common Wild Rose
Rubus parviflorus Nutt.	Thimbleberry
Rubus strigosus Michx.	Wild Red Raspberry
Salix bebbiana Sarg.	Bebb Willow
Salix exigua Nutt.	Willow
Salix sp.	Willow sp.
Sambucus melanocarpa A. Gray	Black Elder
Shepherdia canadensis (L.) Nutt.	Canadian Buffalo-berry
Sorbus sitchensis Roemer	Mountain Ash
Spiraea lucida Dougl.	White Meadowsweet
Symphoricarpos occidentalis Hook.	Buckbrush
Vaccinium caespitosum Michx.	Dwarf Bilberry
Vaccinium membranaceum Dougl.	Tall Billberry
Vaccinium myrtilloides Michx.	Blueberry
Vaccinium scoparium Leiberg	Grouse-berry
Vaccinium uliginosum L.	Bog Bilberry
Viburnum edule (Michx.) Raf.	Low-bush Cranberry
FORBS	
Achillea millefolium L.	Common Yarrow
Actaea rubra (Ait.) Willd.	Red and White Baneberry
Agoseris glauca (Pursh) Raf.	False Dandelion
Allium cernuum Roth	Nodding Onion
Anaphalis margaritacea (L.) Benth. and Hook.	Pearly Everlasting
Anemone multifida Poir.	Cut-leaved Anemone
Antennaria microphylla Rydb.	Rosy Pussytoes
Antennaria neglecta Greene	Everlasting
Antennaria parviflora Nutt.	Pussytoes
Antennaria racemosa Hook.	Raceme Pussytoes
Antennaria umbrinella Rydb.	Everlasting
Apocynum androsaemifolium L.	Spreading Dogbane
Aquilegia flavescens S.Wats.	Yellow Columbine
Arabis holboellii Hornem.	Rock Cress
Aralia nudicaulis L.	Wild Sarsaparilla
Arctostaphylos uva-ursi (L.) Spreng.	Common Bearberry
Arnica cordifolia Hook.	Heart-shaped Arnica
Arnica latifolia Bong.	Mountain Arnica
Arnica sp.	Arnica
Artemisia frigida Willd.	Artemisia
Aster conspicuus Lindl.	Showy Aster

Continued...

Scientific Name	Common Name
FORBS cont'd	
Aster modestus Lindl.	Few-flowered Aster
Aster sp.	Aster
Athyrium distentifolium Tausch.	Lady-fern
Balsamorhiza sagittata (Pursh) Nutt.	Balsam-root
Calochortus apiculatus Baker	Mariposa Lily
Calypso bulbosa (L.) Oakes	Venus'-slipper
Campanula rotundifolia L.	Harebell
Castilleja miniata var. miniata Dougl.	Scarlet Paintbrush
Castilleja sp.	Paintbrush
Cerastium dubium L.	Doubtful Chickweed
Chrysanthemum leucanthemum L.	Ox-eye Daisy
Cicuta douglasii (DC.) Coult. & Rose	Water Hemlock
Cirsium arvense (L.) Scop.	Canada Thistle
Cirsium foliosum (Hook.) DC.	Thistle
Cirsium hookerianum Nutt.	White Thistle
Clematis verticellaris DC. var. columbiana (Nutt.) A. Gray	Purple Clematis
Clintonia uniflora (Schult.) Kunth	One-flowered Clintonia
Corallorhiza striata Lindl.	Striped Coral-root
Corallorhiza trifida Chatelain	Pale Coral-root
Cornus canadensis L.	Bunchberry
Crepis elegans Hook.	Hawksbeard
Disporum trachycarpum (S.Wats.) B. & H.	Fairy-bells
Draba aurea Vahl	Draba
Dryas drummondii Richards.	Yellow Dryad
Dryopteris sp.	Fern
Epilobium angustifolium L.	Fireweed
Epilobium glandulosum Lehm.	Willow-herb
Epilobium hornemannii Reichenb.	Fireweed
Epilobium latifolium L.	Mountain Fireweed
Epilobium sp.	Fireweed
Equisetum arvense L.	Common Horsetail
Equisetum hyemale L.	Scouring Rush
Equisetum scirpoides Michx.	Horsetail
Erigeron compositus Pursh	Fleabane
Erigeron grandiflorus Hook.	Fleabane
Erigeron philadelphicus L.	Philadelphicus Daisy
Eriogonum umbellatum Torr.	Wild Buckwheat
Fragaria virginiana Duchesne	Wild Strawberry
Fritillaria pudica (Pursh) Spreng.	Yellow-bell
Gaillardia aristata Pursh	Gaillardia
Galium bifolium Wats.	Bedstraw
Galium boreale L.	Northern Bedstraw
Galium trifidum L.	Small Bedstraw
Galium triflorum Michx.	Sweet-scented Bedstraw
Gentiana tenella Rottb.	Gentian
Gentianella amarella (L.) Borner ssp. acuta (Michx.) J.M. Gillett	Felwort

Continued...

Scientific Name	Common Name
FORBS cont'd	
Geranium viscosissimum Fisch. and Mey	Sticky Purple Geranium
Geum allepicum Jacq. var strictum (Ait.) Fern	Yellow Avens
Geum macrophyllum Willd.	Yellow Avens
Goodyera repens (L.) R.Br.	Rattlesnake Plantain
Gymnorarpium sp.	Fern
Habenaria hyperborea (L.) R.Br.	Northern Green Orchid
Habenaria unalascensis (Spreng.) S.Wats.	Alaska Bog Orchid
Hackelia floribunda (Lehm.) I.M Johnston	Stick-seed
Hedysarum boreale Nutt.	Hedysarum
Heracleum lanatum Michx.	Cow Parsnip
Heuchera cylindrica Dougl.	Alum-root
Hieracium albiflorum Hook.	White-flowered Hawkweed
Hieracium gracile Hook.	Slender Hawkweed
Iliamna rivularis (Dougl.) Greene	Mountain Hollyhock
Lathyrus ochroleucus Hook.	Pea Vine
Linnaea borealis L. var. americana (Forbes) Rehd.	Twin-flower
Lomatogonium rotatum (L.) Fries	Marsh Felwort
Lomatium sp.	Prairie Parsley
Lomatium triterratum (Pursh) Coult. and Rose	Prairie Parsley
Lupinus sericeus Pursh	Perennial Lupine
Lycopodium complanatum L.	Ground Cedar
Melilotus alba Desr.	White Sweet Clover
Melilotus officinalis (L.) Lam.	Yellow Sweet Clover
Mentha arvensis L. var. villosa (Benth.) S.R. Stewart	Wild Mint
Mertensia paniculata (Ait.) G.Don	Tall Mertensia
Microsteris gracilis (Hook.) Greene	Microsteris
Mimulus guttatus DC.	Yellow Monkey-flower
Mimulus lewisii Pursh	Red Monkey-flower
Myosotis discolor Pers.	Forget-me-not
Oenothera biennis L.	Yellow Evening Primrose
Osmorhiza chilensis Hook. and Arn.	Sweet Cicely
Osmorhiza occidentalis (Nutt.) Torr.	Western Sweet-root
Oxytropis sericea Nutt. var. spicata (Hook.) Barneby	Early Yellow Locoweed
Parnassia fimbriata Konig.	Grass-of-Parnassus
Parnassia parviflora DC.	Grass-of-Parnassus
Pedicularis bracteosa Benth.	Lousewort
Penstemon albidus Nutt.	White Beard-tongue
Penstemon fruticosus (Pursh) Greene subs. scouleri (Lindl.) Penn. and Keck	Beard-tongue
Penstemon nitidus Dougl.	Smooth Blue Beard-tongue

Continued...

Scientific Name	Common Name
FORBS cont'd	
Petasites palmatus (Ait.) A. Gray	Palmate-leaved Coltsfoot
Petasites sagittatus (Pursh) A. Gray	Arrow-leaved Coltsfoot
Phacelia heterophylla Pursh.	Scorpion Weed
Polemonium pulcherrimum Hook.	Jacob's-ladder
Polystichium lonchitis (L.) Roth.	Mountain Holly-fern
Potentilla glandulosa Lindl. ssp. pseudorupestris (Rydb.) Keck	Sticky Cinquefoil
Potentilla gracilis Dougl.	Graceful Cinquefoil
Potentilla norvegica L.	Norwegian Cinquefoil
Prunella vulgaris L.	Heal-all
Pyrola asarifolia Michx.	Common Pink Wintergreen
Pyrola chlorantha Sw.	Wintergreen
Pyrola elliptica Nutt.	White Wintergreen
Pyrola secunda L.	One-sided Wintergreen
Pyrola sp.	Wintergreen
Ranunculus acris L.	Tall Buttercup
Rubus pubescens Raf.	Dewberry
Rumex acetosella L.	Sheep Sorrel
Sedum stenopetalum Pursh	Common Stonecrop
Senecio integerrimus Nutt. var. exaltatus (Nutt.) Cronq.	Ragwort
Senecio sp.	Groundsel
Senecio triangularis Hook.	Arrowleaf Groundsel
Silene parryi (S.Wats.) C.L. Hitchc. & Maguire	Campion
Sisyrinchium montanum Greene	Blue-eyed Grass
Smilacina racemosa (L.) Desf. var. amplexicaulis (Nutt.) S.Wats.	False Solomon's-seal
Smilacina stellata (L.) Desf.	Star-flowered Solomon's-seal
Solidago decumbens Greene	Goldenrod
Solidago multiradiata Ait.	Goldenrod
Solidago rigida L.	Goldenrod
Solidago sp.	Goldenrod
Stellaria longipes Goldie	Long-stalked Chickweed
Stellaria nitens Nutt.	Shining Chickweed
Stellaria sp.	Chickweed
Stenanthium occidentale (Gray) Kunth	Bronze Bells
Streptopus amplexifolius (L.) DC.	Twisted-stalk
Taraxacum officinale Weber	Common Dandelion
Tellima grandiflorum (Pursh) Dougl.	Fringecup
Thalictrum occidentale A. Gray	Western Meadow Rue
Thalictrum sparsiflorum Turcz.	Flat-fruited Meadow Rue
Tiarella trifoliata L.	Foamflower
Tragopogon dubius Scop.	Goat's-beard
Trifolium agrarium L.	Yellow Clover
Trifolium pratense L.	Red Clover

Continued...

Scientific Name	Common Name
FORBS cont'd	
Trifolium repens L.	White Clover
Unidentified composite	
Unidentified fern	
Urtica lyallii S.Wats.	Nettle
Valeriana septentrionalis Rydb.	Valeriana
Valeriana sitchensis Bong.	Valeriana
Veratrum eschscholtzii A. Gray	False Hellebore
Verbascum thapsus L.	Common Mullein
Veronica americana (Raf.) Schw.	American Brookline
Veronica wormskjoldii Roem. and Schult.	Speedwell
Vicia americana Muhl.	Wild Vetch
Viola adunca J.E. Smith	Early Blue Violet
Viola orbiculata Geyer	Evergreen Violet
Viola rugulosa Greene	Western Canada Violet
Viola sp	Violet
GRASSES, SEDGES AND RUSHES	
Agropyron canium (L.) Beauv.	Bearded Wheatgrass
Agropyron smithii Rydb.	Western Wheatgrass
Agropyron spicatum (Pursh) Scribn. & Smith	Bluebunch Wheatgrass
Agropyron subsecundum (Link) Hitchc.	Bearded Wheatgrass
Agrostis scabra Willd.	Bentgrass
Agrostis stolonifera L.	Bentgrass
Alopecurus aequalis Sobol.	Short-awn Foxtail
Beckmania syzigachne (Steud.) Fernald	American Sloughgrass
Bromus brizaeformis Fisch. & Mey	Rattlesnake Chess
Bromus ciliatus L.	Fringed Brome
Bromus pumpellianus Scribn.	Bromegrass
Bromus sp.	Bromegrass
Calamagrostis canadensis (Michx.) Beauv.	Bluejoint
Calamagrostis inexpansa A. Gray	Northern Reedgrass
Calamagrostis neglecta (Ehrh.) Gaertn. Mey and Schreb.	Reedgrass
Calamagrostis rubescens Buckl.	Pinegrass
Calamagrostis scribneri Beal.	Scribner Reedgrass
Calamagrostis sp.	Reedgrass
Carex aquatilis Wahl.	Water Sedge
Carex aurea Nutt.	
Carex bebbii Olney	Bebb's Sedge
Carex interior Baily	Inland Sedge
Carex deweyana Schwein.	Dewey's Sedge
Carex praticola Rydb.	Meadow Sedge
Carex rossii Boot	Ross Sedge
Carex rostrata Stokes	Beaked Sedge

Continued...

Scientific Name	Common Name
GRASSES, SEDGES AND RUSHES cont'd	
Carex scirpoidea Michx.	Single-spike Sedge
Carex simulata Mack.	Short-beaked Sedge
Carex sp.	Sedge
Carex stipata Muhl.	Sawbeak Sedge
Cinna latifolia (Trevir.) Griseb.	Drooping Woodreed
Danthonia spicata (L.) Beauv. ex Roem. and Schult.	Poverty Oatgrass
Deschampsia elongata (Hook.) Munro ex Benth.	Slender Hairgrass
Elymus glaucus Buckl.	Blue Wild-rye
Elymus innovatus Beal.	Wild-rye
Hierochloe adorata (L.) Beauv.	Sweetgrass
Juncus balticus Willd.	Baltic Rush
Juncus ensifolius Wikst.	Dagger-leaf Rush
Juncus sp.	Rush
Koeleria cristata (L.) Pers.	Junegrass
Luzula glabrata (Hoppe) Desv.	Woodrush
Luzula parviflora (Ehrh.) Desv.	Woodrush
Luzula wahlenbergii Rupr.	Woodrush
Oryzopsis asperifolia Michx.	Rice Grass
Phleum pratense L.	Timothy
Poa compressa L.	Canada Bluegrass
Poa gracillima Vasey	Pacific Bluegrass
Poa interior Rydb.	Inland Bluegrass
Poa palustris L.	Fowl Bluegrass
Poa pratensis L.	Kentucky Bluegrass
Scirpus acutus Michx. & Bigel.	Hardstem Bulrush
Scirpus microcarpus Presl.	Small-fruit Bulrush
Sparganium angustifolium Michx.	Narrowleaf Bur-reed
Stipa columbiana Macoun.	Columbia Needle Grass
Trisetum spicatum (L.) Richt.	Spike Trisetum
Typha latifolia L.	Common Cat-tail

LICHENS, MOSSES AND LIVERWORTS

Atrichum selwynii Aust.
Brachythecium albicans (Hedw.) B.S.G.
Brachythecium frigidum (C. Muell.) Besch.
Brachythecium plumosum (Hedw.) B.S.G.
Brachythecium salebrosum (Web. & Mohr.) B.S.G.
Brachythecium sp.
Brachythecium velutinum (Hedw.) B.S.G.
Cladonia sp.
Cratoneuron filicinum (Hedw.) Spruce
Ceratodon purpureus (Hedw.) Brid.
Cladonia squamosa (Scop.) Hoffm.
Cyrtomnium hymenophylloides (Hueb.) Koponen

Continued...

LICHENS, MOSSES AND LIVERWORTS cont'd

Drepanocladus uncinatus (Hedw.) Warnst.
Hypogymnia inshuagi
Letharia vulpina (L.) Hue
Lophocolea sp.
Lophozia lycopodioides
Marchantia polymorpha L.
Mnium sp.
Mnium spinulosum B.S.G.
Peltigera canina (L.) Willd.
Plagiomnium ellipticum
Pleurozium schreiberi (Brid) Mitt.
Pohlia nutans (Hedw.) Lindb.
Pohlia sp.
Polytrichum juniperinum Hedw.
Polytrichum piliferum (Hedw.)
Ptilidium pulcherrimum
Stereocaulon sp.
Tetraphis pellucida Hedw.

APPENDIX L

LIST OF MAMMALS POSSIBLY OCCURRING (BANFIELD, 1974; COWAN AND GUIGET, 1973) IN THE HOSMER AREA

Common Name	Latin Name
ORDER INSECTIVORA (Insectivores)	
Masked shrew	Sorex cinereus cinereus
Vagrant shrew	Sorex vagrans obscurus
American water shrew	Sorex palustris navigator
Pigmy shrew	Microsorex hoyi washingtoni
ORDER CHIROPTERA (Bats)	
Little brown bat	Myotis lucifugus alascensis
Long-eared bat	Myotis evotis evotis
Long-legged bat	Myotis volans longicrus
Silver-haired bat	Lasionycteris noctivagans
Big brown bat	Eptesicus fuscus pallidus
Hoary bat	Lasiurus cinereus
ORDER LAGOMORPHA (Pikas, Hares and Rabbits)	
American pika	Ochotona princeps princeps
Snowshoe hare	Lepus americanus columbiensis
ORDER RODENTIA (Rodents)	
Least chipmunk	Eutamias minimus oreocetes
Yellow pine chipmunk	Eutamias amoenus luteiventris
Hoary marmot	Marmota caligata okanagana
Columbian ground squirrel	Spermophilus columbianus columbianus
Golden-mantled ground squirrel	Spermophilus lateralis tescorum
American red squirrel	Tamiasciurus hudsonicus richardsoni
Northern flying squirrel	Glaucomys sabrinus latipes
American beaver	Castor canadensis leucodontus
Deer mouse	Peromyscus maniculatus artemisiae
Bushy-tailed wood rat	Neotoma cinerea cinerea
Gapper's red-backed vole	Clethrionomys gapperi galei
Northern bog lemming	Synaptomys borealis chapmani

Continued...

Common Name	Latin Name
Heather vole	Phenacomys intermedius levis
Muskrat	Ondatra zibethicas osoyoosensis
Richardson's water vole	Arvicola richardsoni richardsoni
Meadow vole	Microtus pennsylvanicus drummondii
Long-tailed vole	Microtus longicaudus vellerosus
Western jumping mouse	Zapus princeps idahoensis
American porcupine	Erethizon dorsatum nigrescens

ORDER CARNIVORA (Carnivores)

Coyote	Canis latrans lestis
Wolf	Canis lupus columbianus
Red fox	Vulpes vulpes macroura
American black bear	Ursus americanus cinnamomum
Grizzly bear	Ursus arctos
American marten	Martes americana abietinoides
Ermine	Mustela erminea invicta
Long-tailed weasel	Mustela frenata oribasus
American mink	Mustela vison energumenos
Wolverine	Gulo gulo luscus
American badger	Taxidea taxus jeffersonii
Striped skunk	Mephitis mephitis hudsonica
River otter	Lutra canadensis evexa
Mountain lion	Felis concolor missoulensis
Lynx	Lynx lynx canadensis
Bobcat	Lynx rufus pallescens

ORDER ARTIODACTYLA (Cloven-hoofed Mammals)

Mule deer	Odocoileus hemionus hemionus
White-tailed deer	Odocoileus virginianus ochrourus
Moose	Alces alces andersoni
American elk	Cervus elaphus nelsoni
Mountain goat	Oreamnos americanus
Bighorn sheep	Ovis canadensis canadensis

Total 53 species

APPENDIX M

APPENDIX M

SUMMARY OF SIGHTINGS OF BIG GAME AND SIGN IN THE PROPOSED HOSMER DEVELOPMENT AREA, 1976

Species	Date	Number, Age & Sex	Location*	Remarks
Mule deer (Odocoileus hemionus hemionus)	May 27	1 yearling F	Along access road near Transect 12.	In mixed forest.
	June 1	2	Edge of cut-over area along K7 Creek	At 4700 ft level in upland tree-shrub map unit.
	July 26	1F	Near transect 12	Seen feeding at base of slope in lodgepole pine forest (coniferous forest).
	July 7	1M	Foot of hill below Upland Mixed Forest.	In coniferous tree-meadow vegetation.
	July 11	1M	Meadow area near Well No. 3.	Coniferous tree-meadow.
	Aug. 21	1M	No Name Creek near bridge.	Open mixed forest.
White-tailed deer (Odocoileus virginianus ochrourus)	May 30	1F	On access road at Mile 2.5, near trapline 4.	Came from meadow and ran into lodgepole pine forest.
	May 31	1 yearling M	Near meadow at mile 2.5 on access road.	Spike buck, edge of coniferous forest.
	June 1	1 yearling M	Cut-over area northeast of K7A	About 4000 ft level in low elevation young forest.
	July 12	1M	No-name Creek at the bridge	
	July 8	1M	Transmission Line Creek near the railway crossing	
Moose (Alces alces andersoni)	May 31	1 adult F	Along access road by trapline 4	Crossing road in mixed forest.
	June 2	-	Transect 8	Frequent fresh and old tracks in wet poplar forest (deciduous forest).
	June 4	1 adult F with calf	By access road just north of No-name Creek crossing	Cow and very young calf seen in morning by Kaiser personnel
Elk (Cervus elaphus nelsoni)	May 27	-	Logging road up No-name Creek	Fresh tracks and droppings on road. Numerous elk trails crossing road
	May 28	-	Logging road up No Creek, 4000 ft level	Salt lick below road. Many fresh tracks at lick and on road
	May 29	-	Trapline 2	Fresh summer droppings; mixed forest.
	May 31	1 adult	Access road by trapline 2	Crossing road in mixed forest; came from recently logged area
	June 1	-	Cut-over area northeast of K7A	Tracks and droppings numerous in cut-over forest (upland tree-shrub); few in the older forest above
	June 1	1 adult	Along railroad tracks by No-name Creek	Seen in morning from a long distance
	June 2	1 adult M 1 adult F	Access road at mile 2.4	Both on road in lodgepole pine forest. Male in velvet, other could be immature cow
	June 3	2 immature M	Bottom of steep slope below transect 10	At edge of trees at bottom of hillside meadow, feeding in area
	June 4	1 yearling F	On access road just north of transect 12	Ran into lodgepole pine forest near edge of dry meadow

Continued ...

Species	Date	Number, Age & Sex	Location*	Remarks
Black bear (*Ursus americanus cinnamomum*)	May 31	-	Grass meadow at transect 4	Fresh droppings
	June 1	1 adult	Cut-over area northeast of K7A	In wet bottom in an old burn area (upland tree-shrub)
	June 3	1 adult	Below exploration road just above valley bottom	Below road in dense lodgepole pine. Foraging in area
	May 29-June 1	-	Gravel pit area and throughout tree-meadow and mixed forest	Bark stripped from lodgepole pine trees; frequently observed in lowland area
	July 5	2	½ mile west of No-name Creek bridge	On road
	July 7	1	½ mile west of No-name Creek bridge	On road
	July 26	1 yearling	Base of hill above transect 12	Seen digging up rodent hole in lodgepole pine forest

*For location of Transects and Traplines refer to Figure 8

APPENDIX N

APPENDIX N

RESULTS OF BROWSE SURVEY ALONG PELLET PLOT TRANSECTS IN THE PROPOSED HOSMER DEVELOPMENT AREA, 1976

Map Unit	Meadow																				
Vegetation Type	Dry Meadow						Grass Meadow						Hillside Meadow						Shrub Meadow		
Transect Number*	1			2			3			4			10			11			13		
Number of Plots	10			10			5			5			5			5			3		
Species \ Category	Frequency of Occurrence (F) %	Mean Cover (C) %	Intensity of Browsing (B) 0-3	F %	C %	B 0-3	F %	C %	B 0-3	F %	C %	B 0-3	F %	C %	B 0-3	F %	C %	B 0-3	F %	C %	B 0-3
Acer glabrum																20	5	2			
Amelanchier alnifolia										40	1	0.5	100	25	1.2	100	16	0.6			
Lonicera utahensis																			33	5	0
Populus tremuloides																20	1	1			
Prunus virginiana	10	tr.	0																		
Ribes lacustre										20	1	0							67	25	0
Rosa sp.													80	4	0.25	40	1	0			
Salix sp.	10	tr.	3							20	3	3	40	5	1	100	4	0.6			
Shepherdia canadensis				10	tr	0				60	3	0	20	1	0	20	4	0			
Symphoricarpos occidentalis	70	15	0	70	6	0	20	4	0	40	2	0				100	24	0	33	7	0
No browse available	20	-	-	30	-	-	80	-	-	0	-	-	0	-	-	0	-	-	0	-	-

* For location of transects see Figure 8

continued...

Map Unit	Tree-Meadow																										
Vegetation Type	Coniferous Tree-Meadow			Decid. & Mixed Tree -Meadow			Coniferous Forest									Deciduous Forest			Mixed Forest								
							Lodgepole Pine						Coniferous Tree Mix			Closed Poplar			Open Mixed Forest			Closed Mixed Forest					
Transect Number*	6			9			5			12			14			8			16			7			15		
Number of Plots	5			5			5			5			5			4			5			5			5		
Category / Species	Frequency of Occurrence (F) %	Mean Cover (C) %	Intensity of Browsing (B) 0-3	F %	C %	B 0-3	F %	C %	B 0-3	F %	C %	B 0-3	F %	C %	B 0-3	F %	C %	B 0-3	F %	C %	D 0-3	F %	C %	B 0-3	F %	C %	B 0-3
Acer glabrum	20	1	0	20	tr	0	60	2	0																		
Alnus crispa																50	4	0									
Amelanchier alnifolia	100	10	0.8	60	3	0										25	3	0	60	5	1.3	80	10	0.5	40	5	0.5
Cornus stolonifera	60	4	1.7	20	1	3	20	1	3				100	19	1	50	5	3	60	10	2						
Lonicera involucrata							60	11	0	40	2	0				25	1	0				20	tr	0			
Lonicera utahensis	20	1	0	20	1	0	80	11	0	60	5	0	40	1	0.5	100	40	0	80	25	0	60	4	0	80	12	0.2
Pachistima myrsinites													20	tr	0												
Pseudotsuga menziesii				20	3	0																					
Ribes lacustre	20	1	0													25	3	1	40	tr	0						
Ribes viscosissium				40	2	0							40	2	0							20	1	0			
Rosa sp.							60	5	0	40	2	0							60	1	0	20	1	0	60	3	0
Rubus parviflorus																			20	tr	0	20	1	0			
Salix sp.	40	3	2				40	2	2.5				40	1	1.5	75	15	1	20	6	1	60	2	0.7			
Shepherdia canadensis	80	6	0				80	9	0	20	1	0	40	6	0				60	7	0	80	5	0.2	20	3	0
Spirea lucida										100	16	0	80	9	0				40	1	0	60	3	0	80	4	0
Symphoricarpos occidentalis	20	1	0				20	4	0																		
Thuja plicata																						40	5	1			
No browse available	0	-	-	40	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

* For location of transects see Figure 8

APPENDIX O

APPENDIX O

CHECK LIST OF BIRDS WHOSE BREEDING RANGES (GODFREY, 1966) COINCIDE WITH THE HOSMER AREA

Common Name	Latin Name
ORDER GAVIIFORMES(Loons)	
Common loon	Gavia immer
ORDER PODICIPEDIFORMES(Grebes)	
Horned grebe	Podiceps auritus
Eared grebe	Podiceps caspicus
ORDER CICONIIFORMES(Herons)	
American bittern	Botaurus lentiginosus
ORDER ANSERIFORMES(Geese, Ducks)	
*Canada goose	Branta canadensis
*Mallard	Anas platyrhynchos
Pintail	Anas acuta
Green-winged teal	Anas crecca
Blue-winged teal	Anas discors
American widgeon	Anas americana
Northern shoveler	Anas clypeata
Lesser scaup	Aythya affinis
Barrow's goldeneye	Bucephala islandica
Bufflehead	Bucephala albeola
Harlequin duck	Histrionicus histrionicus
Hooded merganser	Lophodytes cucullatus
*Common merganser	Mergus merganser
ORDER FALCONIFORMES(Vultures, Eagles, Hawks, Falcons)	
Turkey vulture	Cathartes aura
*Goshawk	Accipiter gentilis
Sharp-shinned hawk	Accipiter striatus
Cooper's hawk	Accipiter cooperii
*Red-tailed hawk	Buteo jamaicensis
Golden eagle	Aquila chrysaëtos
*Bald eagle	Haliaeetus leucocephalus
Marsh hawk	Circus cyaneus
*Osprey	Pandion haliaetus
Prairie falcon	Falco mexicanus
Peregrine falcon	Falco peregrinus
Merlin	Falco columbarius
*American kestrel	Falco sparverius

Continued...

Common Name	Latin Name
ORDER GALLIFORMES(Grouse)	
*Blue grouse	Dendragapus obscurus
Spruce grouse	Canachites canadensis
*Ruffed grouse	Bonasa umbellus
White-tailed ptarmigan	Lagopus leucurus
Sharp-tailed grouse	Pedioecetes phasianellus
ORDER GRUIFORMES(Rails)	
Sora	Porzana carolina
American coot	Fulica americana
ORDER CHARADRIIFORMES(Shorebirds)	
*Killdeer	Charadrius vociferus
*Common snipe	Capella gallinago
*Spotted sandpiper	Actitis macularia
Wilson's phalarope	Steganopus tricolor
ORDER COLUMBIFORMES(Doves)	
*Mourning dove	Zenaida macroura
ORDER STRIGIFORMES(Owls)	
Great horned owl	Bubo virginianus
Pygmy owl	Glaucidium gnoma
*Barred owl	Strix varia
Great gray owl	Strix nebulosa
Long-eared owl	Asio otus
Short-eared owl	Asio flammeus
Saw-whet owl	Aegolius acadicus
ORDER CAPRIMULGIFORMES(Goatsuckers)	
*Common nighthawk	Chordeiles minor
ORDER APODIFORMES(Swifts, Hummingbirds)	
Black swift	Cypseloides niger
Vaux's swift	Chaetura vauxi
*Rufous hummingbird	Selasphorus rufus
*Calliope hummingbird	Stellula calliope
ORDER CORACIIFORMES(Kingfisher)	
*Belted kingfisher	Megaceryle alcyon

Continued...

Common Name	Latin Name
ORDER PICIFORMES(Woodpeckers)	
*Common flicker	Colaptes auratus
*Pileated woodpecker	Dryocopus pileatus
*Lewis's woodpecker	Asyndesmus lewis
Yellow-bellied sapsucker	Sphyrapicus varius
Williamson's sapsucker	Sphyrapicus thyroideus
*Hairy woodpecker	Dendrocopos villosus
Downy woodpecker	Dendrocopos pubescens
Black-backed three-toed woodpecker	Picoïdes arcticus
Northern three-toed woodpecker	Picoïdes tridactylus
ORDER PASSERIFORMES(Perching Birds)	
*Eastern kingbird	Tyrannus tyrannus
Western kingbird	Tyrannus verticalis
*Say's phoebe	Sayornis saya
Willow flycatcher	Empidonax traillii
Least flycatcher	Empidonax minimus
Hammond's flycatcher	Empidonax hammondii
Dusky flycatcher	Empidonax oberholseri
Western flycatcher	Empidonax difficilis
Western wood pewee	Contopus sordidulus
Olive-sided flycatcher	Nuttallornis borealis
Horned lark	Eremophila alpestris
Violet-green swallow	Tachycineta thalassina
*Tree swallow	Iridoprocne bicolor
*Bank swallow	Riparia riparia
Rough-winged swallow	Stelgidopteryx ruficollis
*Barn swallow	Hirundo rustica
Cliff swallow	Petrochelidon pyrrhonota
*Gray jay	Perisoreus canadensis
*Steller's jay	Cyanocitta stelleri
Black-billed magpie	Pica pica
*Common raven	Corvus corax
Common crow	Corvus brachyrhynchos
*Clark's nutcracker	Nucifraga columbiana
*Black-capped chickadee	Parus atricapillus
*Mountain chickadee	Parus gambeli
Boreal chickadee	Parus hudsonicus
White-breasted nuthatch	Sitta carolinensis
*Red-breasted nuthatch	Sitta canadensis
Brown creeper	Certhia familiarus
American dipper	Cinclus mexicanus
House wren	Troglodytes aedon
*Winter wren	Troglodytes troglodytes
Rock wren	Salpinctes obsoletus
*Gray catbird	Dumetella carolinensis
*American robin	Turdus migratorius

Continued...

Common Name	Latin Name
ORDER PASSERIFORMES(cont'd)	
*Varied thrush	Ixoreus naevius
*Hermit thrush	Catharus guttatus
*Swainson's thrush	Catharus ustulata
Veery	Hylocichla fuscescens
Western bluebird	Sialia mexicana
*Mountain bluebird	Sialia currucoides
*Townsend's solitaire	Myadestes townsendi
Golden-crowned kinglet	Regulus satrapa
*Ruby-crowned kinglet	Regulus calendula
*Water pipit	Anthus spinoletta
Bohemian waxwing	Bombycilla garrulus
Cedar waxwing	Bombycilla cedrorum
Common starling	Sturnus vulgarus
Solitary vireo	Vireo solitarius
*Red-eyed vireo	Vireo olivaceus
*Warbling vireo	Vireo gilvus
*Tennessee warbler	Vermivora peregrina
Orange-crowned warbler	Vermivora celata
*Nashville warbler	Vermivora ruficapilla
*Yellow warbler	Dendroica petechia
*Yellow-rumped warbler	Dendroica coronata
*Townsend's warbler	Dendroica townsendi
*Northern waterthrush	Seiurus noveboracensis
*MacGillivray's warbler	Oporornis tolmiei
*Common yellowthroat	Geothlypis trichas
*Wilson's warbler	Wilsonia pusilla
*American redstart	Setophaga ruticilla
House sparrow	Passer domesticus
Western meadowlark	Sturnella neglecta
*Yellow-headed blackbird	Xanthocephalus xanthocephalus
*Red-winged blackbird	Agelaius phoeniceus
*Brewer's blackbird	Euphagus cyanocephalus
*Brown-headed cowbird	Molothrus ater
*Western tanager	Piranga ludoviciana
Luzuli bunting	Passerina amoena
*Evening grosbeak	Hesperiphona vespertina
Purple finch	Carpodacus purpureus
Cassin's finch	Carpodacus cassinii
Pine grosbeak	Pinicola enucleator
Gray-crowned rosy finch	Leucosticte tephrocotis
*Pine siskin	Spinus pinus
*American goldfinch	Spinus tristis
Red crossbill	Loxia curvirostra
White-winged crossbill	Loxia leucoptera
Rufous-sided towhee	Pipilo erythropthalmus
Savannah sparrow	Passerculus sandwichensis
Vesper sparrow	Pooecetes gramineus
*Dark-eyed junco	Junco hyemalis

Continued...

Common Name	Latin Name
ORDER PASSERIFORMES(cont'd)	
*Chipping sparrow	Spizella passerina
Brewer's sparrow	Spizella breweri
*White-crowned sparrow	Zonotrichia leucophrys
Fox sparrow	Passerella iliaca
Lincoln's sparrow	Melospiza lincolnii
*Song sparrow	Melospiza melodia

*Recorded in area during summer of 1976.

APPENDIX P

APPENDIX P

SUMMARY OF SIGHTINGS OF BIRDS (OTHER THAN SONG BIRDS) IN THE PROPOSED HOSMER DEVELOPMENT AREA, 1976

Species	Date	Number, Age & Sex	Location*	Remarks
Anseriformes				
Canada Goose	May 28	several	Elk River	Heard calling from river
Mallard	May 30	1 pair	Along highway	In ditch at road side
	May 31	3M	On beaver ponds	-
	June 1	1F	Gravel pit	Flying overhead
	June 1	9 young	On beaver pond	Near Elk River, female nearby
	June 10, 14 & 15	3-5	Over beaver ponds	Flight of 3-5 birds overhead
	June 12	F & brood	Transmission Line	In pond receiving Transmission Line Creek
Common Merganser	June 1	1	Elk River	Along shore
	July 7	1F & brood	Elk River	At proposed water intake
	Aug. 26	4	Elk River	Upstream from Hosmer Bridge
	Sept. 5	1M	No Name Creek	During storm in ditch by highway crossing
	Sept. 9	2M, 2F	Beaver ponds	-
Falconiformes				
Goshawk	May 27	1F adult	Access road	Along road in Mixed Forest
	June 2	1F adult	Access road	Near Transect 12, lodgepole pine forest
	July 7	F	Kaiser road	Over Upland Young Low Elevation Forest
	Sept. 2	F	Kaiser road	Over Mid-Elevation Older Forest
Red-tailed Hawk	June 3	1 adult	Upland above Transect 10	Edge of young and old forest, also over Hillside Meadow
	July 6	1	Above Elk River	Soaring
	July 8	1	Near Transect 8	Edge of powerline in Deciduous Forest
	Aug. 21 & 24	1	Above No Name Creek	Soaring
	Sept. 2 & 3	1	Above Elk River	Soaring
Bald Eagle	July 25 & 26	1 immature	Ridge top	Seen over ridge both days
Osprey	May 28	1 adult	Over fields north of Hosmer	Flying towards river
	May 31	1	Elk River	Flying up river
	June 4	1 adult	Elk River	Flying from river over flats
	July 13	1	Elk River	Over water sample site HW15
	Aug. 22	1	Elk River	West of Elk Valley Park
American Kestrel	June 1	1F adult	Near Transect 8	Edge of powerline in Deciduous Forest, co-acting with red-tailed hawk

Continued ...

Species	Date	Number, Age & Sex	Location*	Remarks
Galliformes				
Blue grouse	July 26	1F adult	Ridge top	Open hillside near ridge top
Ruffed grouse	May 29	1M adult	Mile 1 by access road	Drumming from wet area below road, Deciduous Forest
	May 30	1M adult	Trapline 2	Drumming, in Mixed Forest
	June 1	1M	Creek drainage of No Name Creek	At 4000 ft. level in Tree-Shrub area by creek
	June 1	1	Above No Name Creek	Upland Tree-Shrub
	June 2	1M	By Transect 7	Heard drumming in Mixed Forest
	June 4	1M adult	No Name Creek at Trapline 1	Along creek in Mixed Forest
	July 5	1F & brood	West of Elk Valley Park	Tree-Shrub
	Sept. 2	1	No Name Creek	Tree-Shrub
Spruce grouse	Sept. 1	1F	No Name Creek	Older Low Elevation Forest
Charadriiformes				
Killdeer	May 24	2	Elk River	Hear calls from gravel bank
	May 27	1	Elk Valley Park	Heard in area
	May 29	2 adults	Gravel pit	At edge of pond
	June 1	1 adult	Gravel pit	Edge of pond
Common snipe	May 31	1	Beaver pond	At beaver pond near Park
	June 2	1	By Transect 8	Heard from wet area in Deciduous Forest
	July 9 & 11		Across highway from Elk Valley Park	Lowland
Spotted sandpiper	May 29	3	Gravel pit	In pond
	May 31	2 pairs	Beaver ponds	-
Columbiformes				
Mourning dove	June 1	1	Along highway north of Park	On wires
	Aug. 22	2	Along highway north of Park	On wires
Strigiformes				
Barred owl	Sept. 4	1	K-4 Creek	Mid-Elevation Older Forest
Caprimulgiformes				
Common nighthawk	July 11	1	Elk Valley Park	Over Elk River
Apodiformes				
Rufous hummingbird	June 1	1 adult M	Drainage basin of No Name Creek	In Tree-Shrub area
Calliope hummingbird	June 1	2 adults (1M)	Transect 6	Edge of Tree-Meadow, male territorial
	June 3	1 adult M	Transect 10	On open Hillside Meadow
	June 3	1 adult M	Transect 11	On open Hillside Meadow

Continued ...

Species	Date	Number, Age & Sex	Location*	Remarks
Coraciiformes				
Belted kingfisher	May 31	1 adult F	Beaver ponds	-
	June 4	1 adult	Beaver pond	Near Elk Valley Park
	June 4	1 adult	Elk River	Edge of River by Park
	Aug. 21	1	No Name Creek	Pool at highway crossing
Piciformes				
Common flicker	May 27	1 adult	Near Transect 12	Edge of conifers and meadow
	May 29	1 adult	Gravel pit area	At edge of aspen stand in Tree-Meadow area
	May 31	1	Transect 4	Edge of Tree-Meadow
	June 1	1	Gravel pit	Tree-Meadow area
	July 6	1	No Name Creek	Deciduous Forest
	Aug. 21	1	No Name Creek	Mixed Forest
Pileated woodpecker	June 3	1	Slope above Transect 10	On snag at edge of Young and Older Forests
	Sept. 7	1	Old beaver pond east of highway	Near Elk Valley Park, in poplars
Lewis's woodpecker	June 4	1 adult	Meadow by River	In stump-meadow, to west of Elk Valley Park
Yellow-bellied sapsucker	June 4	1 adult	Beaver pond area	In poplar stand at edge of beaver pond
Hairy woodpecker	May 28	1 adult F	Road up No Name Creek	In Larch in Mixed Conifers

*For location of Transects and Traplines refer to Figure CS-5

APPENDIX Q

APPENDIX Q

SONG BIRDS (ORDER PASSERIFORMES) RECORDED IN THE PROPOSED HOSMER DEVELOPMENT AREA, 1976

Species	Lowland Map Units						Upland Map Units
	Meadow	Tree-Meadow	Tree-Shrub	Coniferous Forest	Deciduous Forest	Mixed Forest	
Eastern kingbird	+						
Empidonax sp.		+		+	+	+	+
Tree swallow	+	+	+				
Bank swallow	+	+	+				
Barn swallow	+	+					
Gray jay				+		+	+
Steller's jay							+
Common raven							+
Clark's nutcracker							+
Black-capped chickadee			+	+	+	+	+
Chickadee sp.							+
Red-breasted nuthatch		+					+
American dipper			+				
Winter wren							+
Gray catbird			+				
American robin	+	+	+	+	+	+	+
Varied thrush							+
Hermit thrush							+
Swaison's thrush		+	+	+	+	+	
Mountain bluebird		+	+			+	+
Townsend's solitaire	+	+		+			+
Ruby-crowned kinglet		+	+	+	+	+	
Red-eyed vireo		+	+		+		
Warbling vireo		+	+		+		
Tennessee warbler		+					
Nashville warbler					+		
Yellow warbler			+				
Yellow-rumped warbler	+		+	+	+	+	+
Townsend's warbler							+
MacGillivray's warbler			+				
Common yellowthroat			+				
Wilson's warbler					+	+	+
American redstart			+				
Red-winged blackbird	+		+				
Brewer's blackbird	+	+					
Brown-headed cowbird	+	+					
Western tanager	+		+		+	+	
Evening grosbeak						+	
Pine siskin	+			+			
American goldfinch		+		+		+	
Dark-eyed junco	+	+	+	+	+	+	+
Chipping sparrow	+	+	+	+			+
Song sparrow	+	+	+				+

APPENDIX R

ENVIRONMENTAL IMPACT MATRIX

ENVIRONMENTAL IMPACT MATRIX

IMPACT	RESTORATION FEASIBILITY
Positive	Good
None	Poor
Negative	None Required
Unknown	Unknown

ENVIRONMENTAL FACTORS	PROPOSED MINE ACTIVITIES: Exploration		Construction and Development											Operation					
	Existing Roads	Existing Adits	Portals 1 and 2	Fan Sites	Portals 52 and 202	Water Head Tank and Pumping Station	Road Network	Plant Site	Tailings Dam and Pond	Railway Loop	Water Intake	Water Line	Agricultural Land Reserve Buffer Area	Mine	Plant Site	Water Supply	Tailings Pond	Coal Transport	Cumulative Activities
AIR QUALITY																			
Air Quality	−/+						−/+	−/+	−/+	−/+	−/+	−/+			−/+			−/+	−/+

ENVIRONMENTAL IMPACT MATRIX

IMPACT	RESTORATION FEASIBILITY
Positive	Good
None	Poor
Negative	None Required
Unknown	Unknown

AQUATIC FACTORS	PROPOSED MINE ACTIVITIES: Exploration		Construction and Development											Operation					Cumulative Activities
	Existing Roads	Existing Adits	Portals 1 and 2	Fan Sites	Portals 52 and 202	Water Head Tank and Pumping Station	Road Network	Plant Site	Tailings Dam and Pond	Railway Loop	Water Intake	Water Line	Agricultural Land Reserve Buffer Area	Mine	Plant Site	Water Supply	Tailings Pond	Coal Transport	
ENVIRONMENTAL FACTORS																			
Water Quality																			
No-name Creek	−/+			?	?	?	−/+	−/+	−/+	−/+		−/+							−/+
Elk River								?	?		−/+								?
Other Drainages	−/+			?	?	?	−/+	−/+				−/+							−/+
Groundwater								?	?					?	?		?		?
Stream Discharge																			
No-name Creek															?		?		?
Elk River																			
Other Drainages																			
Stream Alignment																			
No-name Creek									−/+	−/+							−/+		−/+
Elk River																			
Other Drainages																			
Invertebrates																			
No-name Creek									?	?							?	?	?
Elk River																			
Other Drainages																			
Fish Habitat																			
No-name Creek									/+	/+		/+					/+	/+	/+
Elk River																			
Other Drainages																			

ENVIRONMENTAL IMPACT MATRIX

IMPACT	RESTORATION FEASIBILITY
Positive	Good
None	Poor
Negative	None Required
Unknown	Unknown

TERRESTRIAL FACTORS Soils	PROPOSED MINE ACTIVITIES: Exploration		Construction and Development											Operation					
	Existing Roads	Existing Adits	Portals 1 and 2	Fan Sites	Portals 52 and 202	Water Head Tank and Pumping Station	Road Network	Plant Site	Tailings Dam and Pond	Railway Loop	Water Intake	Water Line	Agricultural Land Reserve Buffer Area	Mine	Plant Site	Water Supply	Tailings Pond	Coal Transport	Cumulative Activities
ENVIRONMENTAL FACTORS																			
Lowland Mapping Unit																			
1a Fluvial terrace												−							
1b Fluvial terrace												−							
2a Fluvial terrace							−	−	−	−		−					−		
3a Fluvial terrace							−	−	−	−							−		
4a Fluvial fan	−						−	−									−		
4b Fluvial fan							−		−								−		
5a Fluvial terrace			−					−	−										
Upland Mapping Unit																			
6a Till and colluvium slopes	−																		
6b Colluvium upland slopes	−																		
7a Drainage channel and gully																			
8a Colluvium upland gullies	−				−														
8b Colluvium upland gullies	−																		
9a Colluvium upland slopes	−	−		−	−	−	−												
9b Colluvium upland slopes	−			−	−														
10a Colluvium and till lower slopes																			
10b Colluvium and till lower slopes	−																		

ENVIRONMENTAL IMPACT MATRIX

IMPACT	RESTORATION FEASIBILITY
Positive	Good
None	Poor
Negative	None Required
Unknown	Unknown

	PROPOSED MINE ACTIVITIES																			
	Exploration		Construction and Development											Operation						
TERRESTRIAL FACTORS Vegetation	Existing Roads	Existing Adits	Portals 1 and 2	Fan Sites	Portals 52 and 202	Water Head Tank and Pumping Station	Road Network	Plant Site	Tailings Dam and Pond	Railway Loop	Water Intake	Water Line	Agricultural Land Reserve Buffer Area	Mine	Plant Site	Water Supply	Tailings Pond	Coal Transport	Cumulative Activities
ENVIRONMENTAL FACTORS																			
Lowland Vegetation Map Units																			
Meadow	−/+						−/+	−/+	−/−	−/+		−/+	?			−/+	−/−		
Tree-meadow	−/−						−/−	−/−	−/−	−/−		−/−	?			−/−	−/−		
Tree-Shrub								−/−	−/−	−/−		−/−	?			−/−	−/−		
Coniferous forest	−/−						−/−	−/−	−/−	−/−						−/−	−/−		
Deciduous forest									−/−	−/−		−/−	?			−/−	−/−		
Mixed forest	−/−						−/−	−/−	−/−	−/−		−/−	?			−/−	−/−		
Disturbed lands	−/+						−/+		−/+										
Agricultural land																			
Developed land																			
River bars											−/+								
Upland Vegetation Map Units																			
Hillside Meadow	−/+																		
Upland tree-shrub																			
Upland mixed forest									−/−								−/−		
Slide vegetation	−/−						−/−												
Low elevation young forest	−/−		−/−				−/−	−/−	−/−					−/−			−/−		
Mid-elevation older forest	−/−	−/−		−/−	−/−	−/−	−/−												
High elevation older forest	−/−	−/−					−/−												

ENVIRONMENTAL IMPACT MATRIX

IMPACT	RESTORATION FEASIBILITY
Positive	Good
None	Poor
Negative	None Required
Unknown	Unknown

TERRESTRIAL FACTORS
Mammals and Birds

	PROPOSED MINE ACTIVITIES																			
	Exploration		Construction and Development											Operation						
	Existing Roads	Existing Adits	Portals 1 and 2	Fan Sites	Portals 52 and 202	Water Head Tank and Pumping Station	Road Network	Plant Site	Tailings Dam and Pond	Railway Loop	Water Intake	Water Line	Agricultural Land Reserve Buffer Area	Mine	Plant Site	Water Supply	Tailings Pond	Coal Transport	Cumulative Activities
ENVIRONMENTAL FACTORS																			
Mammals																			
Deer-summer range	−/+	−/+	−/+	−/+	−/+	−/+	−/+	−/+	−/+	−/+		−/+	?		−/+		−/+		−/+
-winter range							−/+	−/+	−/+	−/+		−/+	?		−/+		−/+	−/+	−/+
Moose-summer range							−/+	−/+	−/+	−/+			?		−/+		−/+		−/+
Elk-summer range	−/+	−/+	−/+	−/+	−/+	−/+	−/+	−/+	−/+	−/+		−/+	?		−/+		−/+		−/+
-winter range							−/+	−/+	−/+	−/+		−/+	?		−/+		−/+	−/+	−/+
Bears	?						?	−/+	−/+	−/+					−/+		−/+	?	−/+
Dog family	?						?	?	?	?					?		?	?	−/+
Cat family	?						?	?	?	?					?		?	?	?
Weasel family	?						?	?	?	?					?		?	?	?
Aquatic rodents												−/+							−/+
Small mammals								−/+	−/+	−/+									−/+
Birds																			
Waterfowl												−/+							−/+
Raptorial birds																			?
Upland bame birds							−/+	−/+	−/+	−/+					−/+		−/+		−/+
Song birds and other small birds							−/+	−/+	−/+	−/+					−/+				−/+
Rare and Endangered Species																			?

ENVIRONMENTAL IMPACT MATRIX

IMPACT	RESTORATION FEASIBILITY
Positive	Good
None	Poor
Negative	None Required
Unknown	Unknown

HUMAN USE	PROPOSED MINE ACTIVITIES: Exploration		Construction and Development										Operation					Cumulative Activities
	Existing Roads	Existing Adits	Portals 1 and 2	Fan Sites	Portals 52 and 202	Water Head Tank and Pumping Station	Road Network	Plant Site	Tailings Dam and Pond	Railway Loop	Water Intake	Water Line	Agricultural Land Reserve Buffer Area	Mine	Plant Site	Water Supply	Tailings Pond	Coal Transport	
ENVIRONMENTAL FACTORS																			
Present and Potential Resource Use																			
Agriculture																			
- high capability									−/+										−/+
- moderate capability			−/+				−/+	−/+	−/+	−/+		−/+	?						−/+
- poor capability	−/+	−/+		−/+	−/+	−/+	−/+												
Forestry																			
- good site	−/+		−/+		−/+		−/+		−/+	−/+									−/+
- moderate site	−/+			−/+		−/+	−/+			−/+									−/+
- poor site							−/+	−/+	−/+										−/+
Recreation	+/	−/+					+/	−/+	−/+	−/+		−/+	?	−/+	−/+	−/+	−/+	−/+	−/+
Elk Valley Provincial Park			−/+					−/+	−/+						−/+		−/+	−/+	−/+
Hunting	+/						+/	−/+	−/+	−/+			−/+		−/+		−/+		−/+
Angling											?	?							?/+
Guiding																			
Trapping																			−/+
Historic and Archaelogical Sites																			−/−