~~82-G-15~~ J

K-Shell- Line Creek - Horseshoe Ridge 70(1)A

CROWS NEST INDUSTRIES LIMITED

EXPLORATION PROGRAM

LINE CREEK PROJECT

February 28, 1971

Fernie, British Columbia
Telephone: (604) 423-4464

CROWS NEST INDUSTRIES LIMITED

March 16, 1971.

J. J. Crabb
exploration manager

Mr. K. B. Blakey,
Deputy Minister of Mines,
Department of Mines & Petroleum Resources,
Parliament Buildings,
Victoria, B.C.

Dear Mr. Blakey:

We are pleased to submit the enclosed report concerning coal licences 264 - 313 inclusive, 365 - 373 inclusive, and 408, in support of our application for rental rebate pursuant to Sec 24(2) Coal Act RS 1948 C209 S1. This report discusses the work performed and the results obtained during the period March 1, 1970, to February 28, 1971, and is the third report submitted in connection with the above licences.

You will note that coal reserves have been greatly expanded over the previous reporting period. Some of this increase is attributable to the discovery of open pit reserves in a new area which we have referred to as Ewin Pass. Please note also that there has been a considerable amount of effort directed toward coal testing, particularly carbonization and the evaluation of different methods of cleaning coal. Results of these are included under the heading of "Testing".

A preliminary feasibility study was also completed during the reporting period, the results of which are highly encouraging. The company is presently engaged in detailed mine design and plant flow sheet refinement. We expect to continue exploring new portions of our licence areas.

GENERAL OFFICES
FERNIE, B. C.

MINERALS DIVISION
FERNIE, B. C.

FOREST PRODUCTS DIVISION
MAIN OFFICE
FERNIE, B. C.

ELKO OPERATIONS
ELKO, B. C.

/ 2

Our affidavit and summary of exploration costs are included in the Introduction. We draw your attention to the fact that the money spent on our investigation exceeds considerably the requirements of $7.50 per acre to qualify for rebate. Would you kindly advise us if the excess may be applied to the succeeding term.

We hope you will treat this application favourably.

Yours very truly,

J. J. CRABB P.Eng.

JJC/sb

enc.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J. J. CRABB

3544

MAR 22 '71 AM

DEPT. OF MINES AND PETROLEUM RESOURCES

REFERRED TO	✓	DATE	INITIAL
D. M.	✓		
C.G.C.	✓		
C.C.			
D.C.G.C.			
D.C.C.			
ACCTS.			
C.M.B.			
C.I.			
C.A.			
R. T.			
C.P.E.			
AKC	✓		
FILING CLERK			

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

DEPARTMENT OF MINES
AND PETROLEUM RESOURCES

MINERAL ACT

FORM B

Affidavit on Application for Certificate of Work

PURSUANT TO SEC. 24(2) COAL ACT R.S. 1948C209 S1

I, J.J. Crabb (Name.) Agent for Crows Nest Industries Limited (Name.)

Box 718 (Address.) Box 250 (Address.)

Fernie, B.C. Fernie, B.C.

Free Miner's Certificate No. NA Free Miner's Certificate No. NA

Date issued NA Date issued NA

make oath and say:—

I have done, or caused to be done, work on the Coal Licences 264 to 313 incl., 365 to 373 incl., and 408. Mineral Claim(s)

Record No.(s)

situate at Line Creek - Tributary of Fording River D.L. 4588 K.D.

in the Ft. Steele Mining Division, to the value of at least $732,399.61 ~~one hundred dollars~~, since the 1st day of March, 19 70

The following is a detailed statement of such work:—
(Set out full particulars of the work done in the twelve months in which such work is required to be done.)

See Attached Statement as Exhibit "A" to this my affidavit.

That I have not and will not use the work declared herein in any way for the purposes of obtaining tax exemption on a Crown-granted mineral claim under the terms of the *Taxation Act*.

SWORN and subscribed to at Fernie B.C.

this 16th day of March

19 71, before me

* [illegible] Commissioner for taking affidavits [illegible] Columbia.

* This affidavit may be taken by a person empowered to take affidavits by the *Evidence Act* of British Columbia.

CROWS NEST INDUSTRIES LIMITED

EXPLORATION EXPENSE DETAIL

MARCH 1, 1970 TO FEBRUARY 28, 1971

	COAL LICENCES 264 to 313 INCL. 365 to 373 INCL. AND 408
BULLDOZING	$ 41,903.64
ADIT WORK	$ 81,821.71
CONTRACT DRILLING	$351,903.34
SAMPLING & TESTING	$ 22,691.55
AIR PHOTOGRAPHY	$ 4,497.44
SUPERVISION & ENGINEERING	$ 67,323.23
CONSULTANTS	$ 32,846.57
SNOW REMOVAL	$ 8,632.64
MISCELLANEOUS	$ 9,706.28
ROAD CONSTRUCTION	$ 55,777.78
TEST PIT EXCAVATION	$ 15,033.75
PLASTIC MODEL	$ 1,572.77
FISHING OPERATION	$ 6,064.00
POWDER MAGAZINE	$ 759.67
ASSAY LAB	$ 31,192.84
	$732,399.61

This is exhibit "A" referred to in the affidavit of J.J. Crabb sworn before me this 16th day of March 1971.

A Commissioner for taking affidavits within British Columbia

CROWS NEST INDUSTRIES LIMITED

EXPLORATION REPORT

March 1971

PERIOD COVERED

The time interval represented by this report dates from March 1, 1970 to February 28, 1971. There was no interruption of exploration work which began March 15, 1968 and temporarily ceased January 11, 1971.

The exploration area is covered by 64 coal licences, 50 of which fall due for renewal on March 13, 1971. The following list shows coal licences, due dates, acreages and fees:

March 13	#264 - 313 incl.	
	27,770 acres @ $.50	$13,885.00
	50 Licences @ $25	$ 1,250.00
July 11	#365 - 373 incl.	
	3,649 acres @ $.50	$ 1,824.50
	9 Licences @ $25	$ 225.00
August 17	#408	
	108 acres @ $.50	$ 54.00
	1 Licence @ $25	$ 25.00
October 16	#1299 - 1302 incl.	
	1280 acres @ $.50	$ 640.00
	4 Licences @ $25	$ 100.00
TOTAL	32,807 Acres	$16,403.50
	64 Licences	$ 1,600.00

AREAS OF INVESTIGATION

Detailed field work was conducted in three areas: (See Plate 1)

1. Line Creek Ridge
2. Horseshoe Ridge
3. Ewin Pass Area

Examination began in areas 1 and 2 on March 15, 1968 and were continued through the present reporting period. Exploration in area 3, four miles north of Line Creek Ridge commenced with the start of the access road February 16, 1970.

WORK PERFORMED

Adits

During the reporting period Crows Nest Industries employed two adit crews which were directed on site by a field supervisor. A crew consisted of a fire boss and two miners.

Each crew was supplied with a one-half ton truck, a 375 CFM compressor, a pneumatic ventilating fan, pneumatic shaker conveyor, pneumatic drill, pneumatic pick and blasting materials.

All entries were driven parallel to the floor of the seam and entirely in coal. Coal was excavated by means of a series of auger holes drilled to outline the entry. These holes were loaded with permissible powder and detonated electrically by milisecond delay caps.

To date all adits driven by C.N.I. have been strike (horizontal) entries except adits 8, 9, 10 and 11 on the west side of Line Creek Ridge. Pneumatic pan shaker conveyors were employed to carry coal to the surface in all strike entry adits. On the west face of Line Creek Ridge, the strike parallels the seam outcrop, therefore it was necessary to drive the adits down a partial pitch (25°) using electrically driven chain conveyors. Rate of advance and working conditions were superior in all strike entries compared to partial pitch entries.

The locations of all adits are shown on Plate 2. Adits and seams for the reporting period are listed in Summary 1. A complete tabulation of all adits providing further details is shown in Table I.

SUMMARY

ADIT WORK MARCH 1, 1970 - FEBRUARY 28, 1971

1. Adits Started Before 1 March 1970 And Completed Before 28 February 1971

	Adit	Seam	Location
Completed Apr. 22/70	11	10A	L.C.R. *
Completed May 27/70	6	10A	L.C.R.

2. Adits Started After 1 March 1970 And Completed Before 28 February 1971

Adit	Seam	Location
12	10A	L.C.R.
13	7	H.S.R. **
14	8	H.S.R.
15	6	L.C.R.
16	7	L.C.R.
2	7	H.S.R.

3. Adits Incomplete on 28 February 1971

Adit	Seam	Location
17	2	L.C.R.

4. Work Performed 1 March 1970 - 28 February 1971

Location	Entry Distance	Crosscut Length
L.C.R.	1325'	95'
H.S.R.	470'	112'

* Line Creek Ridge

** Horseshoe Ridge

TABLE I

ADIT NO.	SEAM NO.	STARTING DATE	FINISHING DATE	ENTRY DISTANCE	CROSS CUTS	COMPLETED	MAN DAYS
10	10B	Sept. 25/69	Jan. 27/70	305'	305'	Yes - Sample To Ottawa	139
11	10A	Oct. 27/69	Apr. 22/70	394'	394'	Yes - Oxidized	266.5
12	10A	May 28/70	July 3/70	339'	339'	Yes - Sample To Ottawa	149
13	7 HSR	May 4/70	May 26/70	104'	48' 100'	Yes - Sample To Ottawa	45
14	8 HSR	May 24/70	Sept. 24/70	148'	84'	Yes - Sample To Ottawa	102
15	6 LCR	Aug. 12/70	Sept. 8/70	121'	71' 121'	Yes - Sample To Ottawa	55
16	7 LCR	Sept. 11/70	Dec. 2/70	295'	186' 272'	Yes - Sample To Ottawa	127
17	2 LCR	Nov. 11/70	Jan. 7/71	150'		No	65

TABLE I

ADIT WORK SUMMARY

ADIT NO.	SEAM NO.	STARTING DATE	FINISHING DATE	ENTRY DISTANCE	CROSS CUTS		COMPLETED	MAN DAYS
1	8 HSR	May 2, 1968	June 4, 1968	110'	None		No ✓	28
2	7 HSR	June 5/68 Sept. 30/70	June 7, 1968 Nov. 9, 1970	25' 218'		218'	No Yes - Sample to Ottawa	6 68
3	8 LCR	July 16/68 Sept. 9/68	Aug. 16/68 Oct. 21/68	110' 305'	178'	305'	No Yes - Oxidized	61 65
4	9	Aug. 19/68 Mar. 10/69	Aug. 27/68 May 14/69	45' 360'	100'	345'	No Yes - Sample to Ottawa	21 131
5	10B	Aug. 28/68 Jan. 29/70	Sept. 5/68 Feb. 24/70 ✓	40' 156'		156'	No Yes - Sample to Ottawa	9 51
6	10A	Sept. 6/68 Feb. 25/70	Sept. 6/68 May 27/70	Collared 443'		443'	No Yes - Oxidized	3 175
7	8	Oct. 28/68 Jan. 1/69	Dec. 31/68 Mar. 7/69	380'	300'	375'	Yes - Partially Oxidized Sample To Ottawa	82 103
8	8	May 20/69	Sept. 11/69	340'	200'	335'	Yes - Oxidized	220
9	9	June 20/69	Oct. 20/69	375'		356'	Yes - Oxidized	214

ROTARY DRILLING

To date, Crows Nest Industries has drilled 87 holes, 37 of which were done during the reporting period. All holes have been completed with a reverse circulation rotary drill. This machine uses 4-5/8" diameter pipe and a 4-7/8" diameter tricone bit. Reverse circulation of the medium (air) is down the annulus and up the centre core. Due to the close fit of the pipe (one-eighth inch clearance between the pipe and hole wall) the drill bit (sample area) is isolated from the remainder of the hole. The method resembles drilling a complete hole inside casing, resulting in holes with relatively straight and smooth walls as shown by the caliper logs of D.H.'s 39 and 43. Refer to Plate 6.

The tricone bit chips all material to minus 3/16" size. These small particles should have equal chance of reaching the sample bag whereas in core drilling there is a tendency for soft friable material to be lost. Not only is coal softer than rock but within a seam, coal friability and hardness can vary greatly. The sample recoveries by both methods are similar but the type of coal recovered is different. Coal core favors the harder materials whereas rotary chips yield a complete cross section regardless of coal friability.

All completed drill holes have been logged with a gamma ray-neutron tool. Certain holes were experimentally logged with caliper and sonic tools which did not prove too helpful. However, experiments with a density log showed a great deal of information on the top and bottom of coal seams and on the relative cleanliness of the seams. The logs of the drill holes have been reproduced as correlation charts (Plates 4 to 12 inclusive).

The locations of all Line Creek Ridge and Horseshoe Ridge drill holes are shown on Plate 2 and Ewin Pass drill holes are shown on Plate 3. Summary II shows the drilling record for the reporting period and Table II compiles all drill holes since inception showing location, depth, log type and plate reference for each drill hole.

ROTARY DRILLING

MARCH 1, 1970 - SEPTEMBER 27, 1970

1.	Line Creek Ridge			
	16 holes	13,424 feet	839 ft./hole	Average
2.	Horseshoe Ridge			
	12 holes	10,102 feet	842 ft./hole	"
3.	Ewin Pass Area			
	9 holes	7,882 feet	878 ft./hole	"
4.	Total Drilling June 21, 1969 To September 27, 1970			
	87 Holes	61,556 Feet	707 Ft./Hole	"

BORE HOLE

DRILLING AND LOGGING SUMMARY

D.H. No.	LOCATION + DEPTH DRILLED				LOGGING				PLATE REFERENCE								
	LCR	HSR	CR.MT.	E.P.	G.R.-N	DENSITY	SONIC	CALIPER	4	5	6	7	8	9	10	11	12
	HOLES DRILLED BETWEEN JUNE 21, 1969 AND FEBRUARY 28, 1970																
1	773				G				4	5							
2	690				G				4								
3	720				G				4								
4	940				G				4								
5	992				G				4	5							
6	605				G				4								
7	721				G				4								
8	945				G				4								
9	948				G					5							
10	460				G					5							
11	603				G				4								
12	634				G				4								
13	167				G											11	
14	718				G				4	5							
15	1000				G					5							
16	1002				G					5							
17	334				G					5							
18	983				G					5							
19	892				G				4							11	
20	381				G					5							
21	887				G												12

BORE HOLE

DRILLING AND LOGGING SUMMARY

D.H. No.	LOCATION + DEPTH DRILLED				LOGGING				PLATE REFERENCE								
	LCR	HSR	CR.MT.	E.P.	G.R.-N	DENSITY	SONIC	CALIPER	4	5	6	7	8	9	10	11	12
22	723				G				4	5							12
23	1010				G					5						11	
24	996				G					5							
25			501		G							7					
26			481		G							7					
27			464		G							7					
28			416		G							7					
29			399		G							7					
30			439		G							7					
31			460		G							7					
32			622		G							7					
33			622		G							7					
34			538		G							7					
35			529		G							7					
36	610				G						6						
37	611				G						6						
38	399				G						6						
39	570				G			C			6						
40	545				G		S				6						
41	555				G		S				6						
42	555				G		S				6						
43	264				G		S	C									

BORE HOLE

DRILLING AND LOGGING SUMMARY

D.H. No.	LOCATION + DEPTH DRILLED				LOGGING				PLATE REFERENCE								
	LCR	HSR	CR.MT.	E.P.	G.R.-N	DENSITY	SONIC	CALIPER	4	5	6	7	8	9	10	11	12
44-1	109																
44-2	623				G									9			12
45	170				G									9			
46	162																
47	155																
48	560				G	D								9			12
49	665				G									9			
SUB.	24,677		5,471														
	HOLES DRILLED BETWEEN MARCH 1, 1970 AND SEPTEMBER 27, 1970																
50	597				G	D								9			
51		944			G								8				
52		760			G								8				
53		968			G								8				
54		895			G								8				
55		427			G								8				
56		1001			G								8				
57		841			G								8				
58		949			G								8				
59		1004			G								8				
60	923				G									9			
61	200				G									9			

BORE HOLE

DRILLING AND LOGGING SUMMARY

D. H. No.	LOCATION + DEPTH DRILLED				LOGGING				PLATE REFERENCE								
	LCR	HSR	CR.MT.	E.P.	G.R.-N	DENSITY	SONIC	CALIPER	4	5	6	7	8	9	10	11	12
62	650				G									9			
63	172				G									9			12
64	765				G	D										11	
65		354			G								8				
66		853			G	D							8				
67		1106			G								8				
68	431																
69	1001				G	D				5							12
70	1441				G	D										11	
71	651				G	D								9			12
72	686				G	D				5							12
73	1747				G											11	
74				1000	G	D									10		
75				804	G	D									10		
76				731	G	D									10		
77				875	G	D									10		
78	1987				G	D										11	
79				870	G.	D									10		
80				998	G										10		
81				815	G	D									10		
82	1677				G	D											
83				906	G	D									10		

BORE HOLE

DRILLING AND LOGGING SUMMARY

D. H. No.	LOCATION + DEPTH DRILLED				LOGGING				PLATE REFERENCE								
	LCR	HSR	CR.MT.	E.P.	G.R.-N	DENSITY	SONIC	CALIPER	4	5	6	7	8	9	10	11	12
84				883	G	D									10		
85	265				G	D										11	
86	231				G	D										11	
SUB	13,424	10,102		7,882													
TOTAL	38,101	10,102	5,471	7,882													

GRAND TOTAL 61,556 Ft.

LEGEND

LCR - LINE CREEK RIDGE

HSR - HORSESHOE RIDGE

CR.MT.- CROWN MOUNTAIN

G.R.-N- GAMMA RAY NEUTRON

BULLDOZING

Bulldozers were used in all facets of surface exploration. These machines built access roads, adit sites and drill sites, traced coal seam outcrops and excavated test pits. An average of two D-8H cats equipped with dozer blades and rippers were employed with the addition of a D-9G for test pit work. Summary III shows work completed during the reporting period.

BULLDOZERS

	LINE CREEK RIDGE	HORSESHOE RIDGE	EWIN PASS
MILES ACCESS ROADS	3.7	3.6	9.2
MILES SEAM TRACING & TRENCHING	1.5	1.5	5.2
TEST PITS +	1		
CUBIC YARDS WASTE	40,000		

TOPOGRAPHIC MAPPING, GEOLOGICAL MAPPING AND AERIAL PHOTOGRAPHY

The topographic map compiled in 1969 was used as base plan for Line Creek Ridge and Horseshoe Ridge. All new adits, drill holes, outcrops and trenches were tied in by means of chain and transit to the map base control. Ref. Plate 2.

In May 1970 McElhanney Surveying and Engineering Ltd., photogrametrically compiled a base plan for the Ewin Pass area. B.C. Government air photos were used to produce a map on a scale of 1" = 400' with 25 ft. contour intervals. All drill holes, trenches, outcrops and roads were tied in to this plan by C.N.I. employees. Ref. Plate 3.

Geological mapping done on air photo enlargements was transferred to base plans in each area. Ref. Plates 2 and 3.

Aerial photography of Crown Mountain, Line Creek Ridge, Horseshoe Ridge and Ewin Pass areas was flown in July 1970. These photos were black and white on a scale of 1" = 2000'. The same area except for Crown Mountain was photographed with color positive film on a scale of 1" = 1000'. These color photos have proven superior to black and white photos for geologic interpretation and for general reconnaissance.

RESULTS

Reserves

The continued exploration program during the period March 1, 1970, to February 28, 1971, added considerable coal tonnage to the 1969 reserve picture. Tonnage figures are expressed as short tons recoverable raw coal. The derivation of the term "short tons recoverable raw coal" is shown in Figure 1. The reserves of open pit coal are compiled in Summary IV. The coal reserves were examined by John T. Boyd Company and reported upon in October 1970.

RESERVES OF OPEN PIT COAL

AREA	RAW RECOVERABLE SHORT TONS *			
Line Creek Ridge	Metallurgical (ooo's)	Oxidized (ooo's)	Total (ooo's)	Ratio **
Proven	58,000	11,100	69,100	7.2
Partially Proven	4,000	-	4,000	
	62,000	11,100	73,100	
Horseshoe Ridge				
Proven	-	-	-	
Partially Proven	18,800	3,300	22,100	10.3
Ewin Pass				
Proven	17,200	3,000	20,200	
Partially Proven	11,200	2,000	13,200	9.1
	28,400	5,000	33,400	
GRAND TOTALS				
Proven & Partially Proven	109,200	19,400	128,600	8.2

* Based upon 81% mining recovery

** Total waste in cubic yards mining losses per short ton raw recovered coal.

MINING

The main objective of the exploration program to date was to determine open pit coal reserves. In June 1970, mine design and equipment selection studies for open pit mining were started when Mr. J. Kervin, Mining Engineer, joined the staff of C.N.I. Various preliminary plans are being studied but no final decision has been reached. In December 1970, Wright Engineers Limited submitted a preliminary feasibility study of open pit mining, coal handling and preparation.

SAMPLING

Coal, to be tested for its metallurgical quality must be obtained beyond the outcrop zone of oxidation. The width of this oxidized zone varies greatly depending on: * Lithological nature of the overlying strata, proximity of faults and folds, relationship of seam to the surface, geologic history, drainage and certain inherent characteristics of the coal.

The two methods of determining the width of this zone are adit entries and drill holes. Adits face channel samples are taken after each ten feet of entry. These samples are checked for F.S.I. (free swelling index) and raw ash content. Face samples in thicker seams are augmented with one inch diameter auger samples of roof coal. F.S.I. usually increases with distance from the surface. Unoxidized coal has been reached when the F.S.I. at a given ash content reaches a constant level greater than 3-1/2.

The width of the oxidized zone is also checked by drilling holes progressively closer to the outcrop. These samples are similarly tested for F.S.I.

Oxidized zone widths on Line Creek Ridge and Horseshoe Ridge varied from a low of 60 feet on H.S.R. up to a maximum of 350 feet in some areas of L.C.R.

All samples obtained from adits, except for auger cuttings, were channel type for preliminary evaluation or for bulk testing. These samples varied in size, depending on the proposed test. Channel samples used in testing for oxidized coal totalled about five pounds and excluded all visible rock and bone. Samples of about one pound per foot excluding rock and bone,

* C.N.I. Report 1970

for proximate analysis, were taken over the entire seam width from cross-cuts. Sampling for washability studies included all material within the seam boundaries except major partings three or more feet thick. About 200 pounds were required for a washability analysis but samples sent varied from 2000 to 5000 pounds. The surplus coal was cleaned to less than 10% ash and eight hundred pounds were then forwarded to the Metals Reduction and Energy Centre, Ottawa, for carbonization studies.

Bore hole samples contain all material within a seam plus, possibly, some roof, floor and, parting materials. The chips size consist is 3/16" x 0. Dry samples trapped in a cyclone were placed in large flour sacks for transport to the C.N.I. lab. Wet samples caught in 45 gallon drums were also placed in sacks after the clean water had been decanted. Flocculents were used with some success to increase the settling rate of the sample from the water.

Test Pit 9 (Seam 8) was completed in October 1970. In this area, unoxidized metallurgical coal was obtained very close to the surface. Ref. Plate 2. Large channel samples of No. 8 seam were sent to Ottawa for carbonization tests.

Samples of oxidized (thermal) coal were taken from surface seam exposures. A bulldozer developed a clean vertical cross section for each of six coal seams. Coal was then gouged from the seam with the corner bit of the dozer blade. This rough method was used in an attempt to simulate the product resulting from surface mining. The sample was then bagged and shipped to the C.N.I. lab for various tests.

TESTING

Methods

Standard A.S.T.M. procedures were used for all proximate, F.S.I. and sulfur analysis. Washing procedures were adopted from methods evolved in the Department of Energy, Mines and Resources, Western Region, Edmonton.

Drill Holes

Two hundred and twenty-three proximate analysis and F.S.I. determinations were conducted for drill holes 50 to 87 inclusive. Included were 14 sulfur determinations. Drill hole cuttings intersecting seams five feet or greater in thickness were subjected to washing at S.G. 1.45 and proximate, F.S.I., sulfurs, etc., were assessed on the float fractions. Refer to Plates 4 to 12 inclusive. Twenty-two small scale oven tests (30 lb) were conducted by M.R.E.C. Ottawa while a bulk sample of 8-seam was also obtained from drill holes for a twelve inch (500 lb.) oven test.

Adits

Two hundred and twenty ash and F.S.I. determinations were done on channel samples from adits 2, 6 and 11 to 17 inclusive. With the exception of adits 12 and 13, which were processed by Cyclone Engineering of Edmonton, the remaining samples (each about 1400 lbs. raw) were washed in the C.N.I. lab and shipped to Ottawa for carbonization studies.

In addition the following bulk samples were processed in the C.N.I. lab:

a.) Eight hundred pounds from each of seams 8, 9, 10B and 10A for Japan

b.) A three-ton blend from 8, 9, 10B and 10A shipped to Ottawa for carbonization at the request of Stelco of Canada

c.) A one-ton blend of seams 8, 9, 10B and 10A was airlifted to Great Britain at the request of British Steel Corporation.

Test Pits

Laboratory work for Test Pit 9 consisted mainly of ash and F.S.I. analysis in attempting to pinpoint the zone of oxidation.

Thermal

Outcrop coal from six seams and a sample from test pit 9 was evaluated for B.T.U. content. One-ton samples were screened at 1½" x 1/4" and 1/4" x 0. These samples were in turn rescreened at +1½", 1½" x 7/8", 7/8" x 1/4" and 1/4" x 0. Moisture, ash and volatile values were ascertained for each size fraction. Some calorific and ash fusion values were obtained from commercial labs and Department of Energy and Mines sources, while a few calorific values were ascertained in the C.N.I. labs.

Special Tests

A six hundred ton blend of seams 8, 9, 10B and 10A in the proportion which they are expected to be mined, was shipped to the preparation plant at Coleman, Alberta. The purpose was to ascertain the performance of this type of plant on Line Creek coals.

Ten tons of a similar blend of 8, 9, 10B and 10A was crushed to 1/4" x 0 and shipped to the Deister Concentrating Company, Fort Wayne, Indiana. Observers from C.N.I. were present at the time of testing, the objective being to evaluate the performance of Deister Tables on cleaning the fines fraction of C.N.I. coals.

Summary of Test Results

All tables and charts pertinent to the above tests are enclosed and encompass the latest available results.

INDEX OF TESTING RESULTS

SAMPLE ANALYSIS

DRILL HOLE NO. 1

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
616	45	50	6	1.7	17.1	42.7		1
617	50	55	"	1.1	23.0	16.4		5½
618	55	60	"	0.9	23.3	38.8		3
619	60	65	"	1.0	21.9	18.9		3½
620	65	70	"	1.9	25.6	10.3		2½
621	70	75	"	1.1	13.5	66.3		0
622	125	130	7	0.9	21.0	34.2		3½
623	360	365	"	0.8		69.9		1
624	445	450	8	0.8		88.9		0
625	450	455	"	0.5	20.3	32.0		2
626	455	460	"	0.6	22.2	26.5		5
627	460	465	"	0.8	21.5	12.9		2
628	465	470	"	0.7		60.6		1
629	470	475	"	0.7	20.1	23.8		2
630	475	480	"	0.6		30.0		2½
631	480	485	"	0.7	21.0	13.9		2½
632	485	490	"	0.7		24.0		2½
633	490	495	"	0.5		51.0		1

DRILL HOLE NO. 1

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
635	615	620	9	0.7	17.1	50.9		2
636	620	625	"	0.7	21.7	21.6		3½
637	633	635	"	0.8		34.9		1
638	635	640	"	0.8		62.5		1
645	720	725	10B	0.6		44.6		1
646	725	730	"	0.5	22.9	19.1		4½
647	730	735	"	0.8	21.0	27.7		3½
648	735	740	"	0.4	21.4	19.0		7
649	745	750	10A	0.7	19.4	27.5		1½
650	750	755	"					0
701	755	758	"	0.5	20.6	27.8		6½

SAMPLE ANALYSIS

DRILL HOLE NO. 2

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
651	20	24	7	3.1	21.3	17.6		1½
652	24	30	7	2.0		53.5		1
653	30	35	7	2.4		42.7		1
654	35	40	7	3.4		38.1		1
655	40	45	"	0.9	18.5	24.5		1½
659	352	355	8	0.6		21.9		1½
660	355	360	"	0.5	22.2	19.6		6
661	360	365	"	0.4	21.1	19.4		2
662	365	370	"	0.7		71.1		0
663	370	375	"	0.6	20.8	21.8		3½
664	375	380	"	0.5		14.9		1½
665	380	385	"	0.6	21.4	15.4		4
666	385	390	"	0.7	22.6	11.8		3
667	385	390	"	0.5		20.8		1½
670	530	535	9			39.0		2
671	530	535	"	0.6	23.3	11.4		7½
672	535	540	"	0.4		23.5		2
673	535	540	"	0.8	22.9	9.5		6½

DRILL HOLE NO. 2

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
674	540	545	9	0.3	23.4	9.5		5
675	540	545	"	0.9		22.6		1½
676	545	550	"	0.4	21.2	21.7		7
677	605	610	10B			47.8		1
680	610	615	"	0.6 *	20.2	25.7		3
681	615	620	"	0.6 *	17.6	32.7		2½
682	620	624	"	0.6 *	16.9	47.6		2
683	651	655	10A			46.1		1
684	655	660	"			28.0		1½
685	660	664	"	0.6 *	24.7	10.4		8
686	660	664	"	0.6 *	20.6	33.6		4

* Est. Moisture

SAMPLE ANALYSIS

DRILL HOLE NO. 3

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
687	70	80	7	0.9	22.2	16.3		4½
688	80	85	"	0.8		56.0		1½
689	85	90	"	0.6		60.6		1
690	90	95	"	0.8	23.3	38.6		4
691	95	100	"	0.8	22.2	37.2		3
693	343	345		0.7	20.0	60.6		4½
694	392	395	8	0.6		45.2		1
695	395	400	"	0.7	21.9	23.2		3½
696	400	405	"	0.7	23.0	16.6		4½
697	400	405	"	0.6	24.0	8.8		7
698	405	410	"	0.5		26.7		1½
699	410	415	"	0.9		43.5		1
700	415	420	"			20.0		1½
702	420	425	"			16.6		1
703	420	425	"	0.6	22.0	8.8		2½
704	425	430	"			28.2		1
705	425	430	"	0.6	22.8	10.8		6
707	435	438	"	0.6	21.0	19.0		2

DRILL HOLE NO. 3

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM No.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
708	570	575	8	0.7		44.9		1
709	575	580	9	0.6	20.0	33.2		2½
710	580	585	"	0.6		43.5		1
712	585	590	"	0.6		50.5		1
713 & 714	634	640	10B	0.7	20.4	23.1		2½
715 & 716	640	645	"	0.6	22.4	18.0		7
717	645	646	"	0.4	16.0	52.0		2
718 & 719	673	678	10A	0.4		33.6		1½
720	678	680	"	0.5		35.7		1
721 & 722	680	685	"	0.5	21.1	37.4		3

SAMPLE ANALYSIS

DRILL HOLE NO. 4

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
561 & 562	28	35	4	0.5		53.9		1
725	35	40	"					0
726	40	45	"	1.1		59.0		0
727	45	50	"	0.5		39.5		0
729	79	80	5	1.1		25.4		0
730	80	85	"	4.7		47.4		0
736	183	185	6	0.9		39.9		1
737	185	190	"	0.5		45.0		1½
742	285	290	7	0.7		69.8		1
743	290	295	"	0.7	21.0	42.4		2
744 & 745	295	301	"	0.7	18.4	45.3		2
560	611	615	8	0.7		53.9		1
558	615	620	"	0.8	22.2	29.2		2½
568	620	625	"	0.7	19.2	33.5		3
566	630	635	"	0.6	21.8	21.4		1½
563	625	630						
564	635	640	"	0.7	20.0	33.3		2
559	640	645	"	0.7	21.8			2
567	645	650	"	0.7		23.3		1
565	650	654	"	0.8		52.2		1

DRILL HOLE NO. 4

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
746	802	807	9	1.4	18.6	36.4		3
747	807	812	"	1.0	22.3	15.6		4½
748	812	814	"	0.7		42.4		2½
749	816	821	"	0.7	20.5	25.7		4
750	821	825	"	0.6	18.2	45.4		3
753	867	870	10B	0.6		45.2		1
754	870	875	"	1.1	20.0	20.3		4½
755	875	880	"	0.9	21.1	21.3		5
756	880	883	10B	0.7	21.5	25.8		6
757	911	916	10A	1.0		29.9		1½
758	916	921	"	0.8	22.2	16.2		5

S A M P L E A N A L Y S I S

DRILL HOLE NO. 5

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
759	91	95	4					
760	95	100	4	2.4		13.5		3
761	100	105	4	0.9	23.7	23.6		5½
762	105	110	"	0.9	17.8	54.2		3
764	151	155	5	1.1	24.2	18.0		4
768	216	220		1.0		69.3		1
769	261	265	6	0.9	18.8	17.2		2
770	265	270	"	0.8		61.5		1½
774	285	290	"	0.9		55.7		1½
775	290	295	"	0.8	24.7	28.8		5½
776	390	392	7	0.8		76.3		0
777	400	405	"	0.8	21.1	30.9		3
778	405	410	"	0.8		57.8		1
779	410	415	"	0.5	20.2	37.1		2½
780 & 781	415	421	"	0.5		58.2		1
782	718	725	8	0.6	21.0	34.7		2½
783	725	730	"	0.8	21.4	20.8		3

DRILL HOLE NO. 5

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
784	730	735	8	0.7	22.0	19.3		2
785	735	740	"	0.6		38.2		1
786	740	745	"	0.8	22.9	15.1		5½
787	745	750	"	0.8		16.1		2
788	750	755	"	0.5	22.5	15.1		4½
789 & 790	755	761	"	0.5		41.3		1
791	908	915	9	0.6	21.2	34.4		4
792 & 793	915	920	"	0.7	22.1	31.2		3½
794	920	927	"	0.5	20.8	34.0		4½
795	927	930	"	0.6		67.7		1
796	986	990	10B	0.6		36.5		2
797	990	992	"	0.6	21.3	21.1		4½

S A M P L E A N A L Y S I S

DRILL HOLE NO. 6

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
798	140	145	MB	4.1		41.9		0
800	237	240	8	2.3		31.4		0
901	240	245	"	1.8		10.0		1
902	245	250	"	1.5		18.4		1
903	250	255	"	1.0		18.1		1
904	260	265	"	0.4	21.3	17.3		2
905	265	270	"	0.7	22.0	23.1		4
906	270	275	"	0.5	22.2	10.3		5
907	275	280	"	0.7	21.4	14.8		3½
908	280	285	"	0.5	23.5	21.5		4½
910 & 911	448	455	9	1.4		21.4		1
913	455	460	"	1.0	20.9	11.7		4½
914	460	465	"	0.5	21.3	12.0		4
912	465	470	"	0.6	19.8	28.2		6
916	518	525	10B	0.5	20.5	34.6		1
917	525	530	"	0.6	21.0	17.8		7
918	530	535	"	0.6	23.1	23.7		5
919	535	540	"	0.8	20.1	27.2		8

DRILL HOLE NO. 6

SAMPLE NO.	DRILLER'S LOG FROM	TO	SEAM NO.	PERCENT MOISTURE	PERCENT VOL.	PERCENT ASH	D.A.F. % F.C.	F.S.I.
	Feet							
920	568	570	10A	1.3		47.0		1
921	570	575	"	1.3		29.6		1
922	575	579	"	1.3		17.0		1

REPORT ON

CLEANING COKING COAL

from the

HORSESHOE RIDGE

for

CROWS NEST INDUSTRIES LIMITED

ADIT NO. 13

Submitted by

CYCLONE ENGINEERING SALES LTD.
EDMONTON - ALBERTA - CANADA

Report No.: RI-70.10

Job No.: S1 - 83

Dated: July 15, 1970

REPORT ON

CLEANING COKING COAL

from the

HORSESHOE RIDGE

for

CROWS NEST INDUSTRIES LIMITED

ADIT NO. 13.

SUMMARY.

The data presented in this report refers to coal from the Horseshoe Ridge prospect, Adit No. 13.

The analysis and the washability indicates that this coal is of low volatile bituminous rank with a relatively high ash content (20.49%) and average sulphur content (0.46%).

The ash distribution over the various specific gravity fractions indicate that cleaning by heavy medium circuit may be required if an ash content of 0.5% in the clean coal is specified and crushing to 2" x 0 is indicated.

CONTENTS

INTRODUCTION.

This report is the first one of a series providing

a. Washability data of size fractions.

b. Performance evaluation data for cleaning coking coal from the Horseshoe Ridge prospect at various levels of efficiency.

c. Residual moisture contents on size fractions.

d. Free swelling indexes on size and specific gravity fractions.

The objective of this and following reports is to provide analytical data for the design of facilities for preparing this coal to market specifications.

This report is of a preliminary character in that it deals with one adit sample only. Subsequent adit samples will most likely have different composition and cleaning characteristics.

After all samples have been analysed a final study can be made as to mining, blending (if required) and cleaning. Allowance should be made with regard to the contamination with some foreign material from roof and floor strata that is unavoidably produced along with the coal. It should also be kept in mind that the size consist of the run of mine derived from this sample may not be representative for the amount of fines under plant operating conditions. Attrition of the coal as a result of mining and transportation can greatly increase the fines fraction.

The cleaning characteristics of the coal are based on the error curve, a parameter for cleaning efficiency that is largely independent of the gravimetric composition of the coal (ash distribution) and can be used for comparing coal cleaning systems whose probable error values are known.

In the last section of this report examples of this method for predicting coal cleaning results are presented for the coarse coal fraction (2" x 28 mesh) and the fines fraction (28 m. x 100 mesh) when using equipment operating with a probable error of 0.10 for this coal.

Methods of coal cleaning can be directly compared for a range of cut points and the yield losses of each cleaning system can be properly balanced against the cost of cleaning.

WASHABILITY CHARACTERISTICS.

The overall weight and ash distribution of the raw coal, crushed to minus 2", is shown on Table 3. Ash contents were done for each individual size - gravity fraction and these values are shown in brackets. Sulphur analyses were done on size fractions only in view of the low sulphur level. (See table 2.).

The minus 100 mesh fraction constitutes a minor part of the coal (3.30% by weight). The weights and ash contents of this size fraction were found not by direct analyses, but by calculation from the other size - gravity fractions.

From the master Table, washability data have been derived for the 2" x 28 mesh and 28 x 100 mesh fractions. This information is presented on Tables 5 and 6, respectively. Washability curves for these two main size fractions are presented on Figures 1 and 3.

Table 4 shows the volatile matter in weight percent against size and specific gravity fractions.

Table 7 shows the free swelling indexes for all size and specific gravity fractions.

PERFORMANCE EVALUATION.

Thewashability curves of both size fractions of the raw coal indicates that the cleaning of this coal is encumbered by intergrown ash. Yield of recovery at an ash content of 8.75% is therefore depressed.

The 2" x 28 mesh fraction constitutes the major part of the mine run (87.5% of the total, see Table 3). Figure 2 illustrates that with 21.62% ash on raw, the actual yield at 8.75% ash in the clean coal can be expected to range from 61% to 70%, depending on the efficiency of the coal cleaning equipment. Performance Evaluation (P.E.) curves, relating yield and ash contents of coal and reject, are shown for separation efficiencies corresponding with probable error values ranging from 0.06 to 0.12.

The 28 x 100 mesh fraction constitutes 9.20% by weight of the mine run. Figure 4 shows the P.E. curves for probable error values ranging from 0.08 to 0.14. An example illustrates the actual yield that can be expected at these efficiencies when cleaning the coal to 8.75% ash.

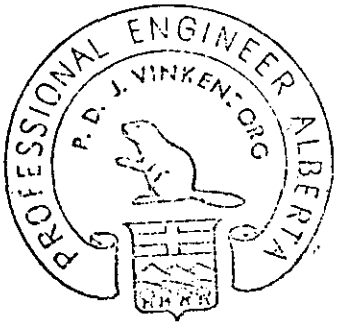
It is noted that the yield errors are very small when cleaning this fraction. Although the weight percentage of this fraction is not very large, the information is important in that it shows that crushing of the coarse fractions, 2" x 28 mesh, to smaller sizes will liberate the ash and increase the recovery of clean coal.

It is noted that the "yield error" can be found in each case by subtracting the expected actual yield from the corresponding theoretical yield read on the "theoretical curve" at the point vertically above it.

Similarly, the "ash error" can be read directly from the P.E. graph along a horizontal line corresponding with the actual yield that is being considered. The ash error is the difference between the theoretical ash (intersect with "theoretical" curve) and the actual ash (intersect with the selected P.E. curve).

Respectfully submitted,

CYCLONE ENGINEERING SALES LTD.



Per: _____
P.D.J. Vinkenborg, P. Eng.
General Manager

Manufacturers and Suppliers of Compound Water Cyclones

●

Engineering and Testing Services

●

Cyclone Engineering Sales Ltd.

Gravity Separation of Bulk Materials

Telephone 429 - 5708

Credit Foncier Building
10275 Jasper Avenue
Edmonton, Alberta

CABLE ADDRESS :
Cyclone, Edmonton

June 12, 1970

Crowsnest Industries Ltd.
Fernie, B.C.

Attention: Mr. J. J. Crabb
Exploration Manager

Dear Mr. Crabb:

Re: Performance Evaluations,
Adits #8, #9 and #10.

The P.E. curves for the above noted coal have been prepared for the 2" x 28 mesh calculated composites. Since there was no washability available for the 28 m. x 0 fractions, only the flotation results, we were not able to prepare these for you. Fernie #8 and #10 samples appear to contain a fair amount of this size fraction, which under industrial conditions could easily be increased noticeably, and it would have been worthwhile to study its cleaning characteristics. The more so since this fraction in general is easy to clean because of the liberated impurities.

The 2" x 28 m. fraction for all three appears rather difficult to clean. Substantial yield losses have to be expected.

We expect therefore that a heavy medium circuit will have its place in the plant design. As discussed with you on June 9th, economies can be obtained by application of a scalping C.W.C. circuit which will reduce the capacity required for the H.M. cyclones and operational costs, while still maintaining the same overall efficiency.

A probable error of 0.06 for the heavy medium cyclones and of 0.10 for a two-stage 24 in. C.W.C. circuit was arbitrarily selected, but it is very well possible that both figures are somewhat on the conservative side. For instance the single-stage 24 in. C.W.C.s in Canmore are operating at a probable error of 0.09. Pilot plant tests will be required to establish these parameters.

/2

We trust that this information will throw some more light on the coal characteristics. Further information will be presented after the analyses of the bulk samples, sent to us, have been completed.

We were very pleased to have had the opportunity to meet you in person and to explain the various facets of our operations. If you may have additional questions please do not hesitate to call upon us.

Very truly yours,

CYCLONE ENGINEERING SALES LTD.

Per: Pieter Vinkenborg

P.D.J. Vinkenborg, P. Eng.
General Manager

PDJV:sw

Encl.

REPORT ON

CLEANING COKING COAL

from the

LINE CREED RIDGE

for

CROWS NEST INDUSTRIES LIMITED

ADIT NO. 12

Submitted by

CYCLONE ENGINEERING SALES LTD.
EDMONTON - ALBERTA - CANADA

Report No.: RI-70.13

Job No.: S1 - 83

Dated: August 21, 1970

Manufacturers and Suppliers of Compound Water Cyclones

●

Engineering and Testing Services

●

Cyclone Engineering Sales Ltd.

Gravity Separation of Bulk Materials

Telephone 429 - 5708

Credit Foncier Building
10275 Jasper Avenue
Edmonton, Alberta

CABLE ADDRESS:
Cyclone, Edmonton

August 21, 1970

Mr. R. Crisafio
Assayer
Crows Nest Industries Limited
Fernie, B. C.

Dear Bob:

Re Adit #12 Seam 10-A
Line Creek Ridge.

The analysis of the above noted adit has become available, and we enclose two copies for your consideration.

We found the free-swelling indexes and the ash distribution of such a nature that we thought to do good by providing you with the P.E. curves for the F.S.I.'s also. This will prevent you the trouble of doing a great number of calculations.

You are familiar with the P.E. curves for ash and this is just an extension. For guidance, we superimpose an example.

We will wash this coal also for you as per our discussion, but would suggest that in first instance the required ash content for the clean coal be established. Recovery of the 1/2" x 0 clean coal will be low and therefore, further crushing to 1/4" seems advisable. I am certain that this will bring the recovery up, noticeable. As mentioned before the wash plant is presently in operation 12 hours per day and 7 days per week, but we hope to be able to wash your coal around the middle of next month.

I am sorry that this could not be done any quicker, but since Shelpac has paid for the plant, their coal has to go first.

With my regards,

Very truly yours,

CYCLONE ENGINEERING SALES LTD.

Per: _____
P.D.J. Vinkenborg, P. Eng.
General Manager

PDJV:nh

Enclosures

CONTENTS

SUMMARY.

This report is the second of a series, investigating the properties of coal from seam 10-A Line Greed Ridge.

The ash content of the raw coal is rather high (18.25%), sulphur content is low (0.22%), and the F.S.I.'s as an expression of the coking properties are excellent.

The 1" x 28 m. fraction appears to be difficult to clean. The float-sink analysis shows that in order to obtain an 8.75% ash, the theoretical yield is suppressed to 42%. However, the washabilities for the 28 m. x 200 m. fraction have improved, float-sinking of this fraction to an ash content of 8.75% shows a yield of 77%.

It is therefore to be expected that crushing to 1/2 in., 1/4 in. or 1/8 in. sizes will liberate impurities and increase the yield to economical requirements.

Drying this coal to a much higher ash content and blending the clean coal with a second coal of low ash should also be a consideration.

Report On

CLEANING COKING COAL

from

FERNIE #8 (Adit #7)

FERNIE #9 (Adit #4)

FERNIE #10-B (Adit #5)

for

CROWS NEST INDUSTRIES LIMITED

Submitted by

CYCLONE ENGINEERING SALES LTD.
EDMONTON - ALBERTA - CANADA

Report No.: RI-70.12
Job No.: S1 - 83
Dated: August 6, 1970

CONTENTS

Report On

CLEANING COKING COAL

from

Fernie #8 (Adit #7)
Fernie #9 (Adit #4)
Fernie #10-B (Adit #5)

for

CROWS NEST INDUSTRIES LIMITED

WASHABILITY CHARACTERISTICS.

The data presented in this report refers to coal for Fernie #8, Fernie #9 and Fernie #10-B seams.

In Tables 1, 3 and 5 the ash contents of size fractions are presented for seams #8, #9 and #10-B, respectively.

In Tables 2, 4 and 6 the washability data are presented for the 28 m. x 200 m. fractions in the same order of seams.

Seams #8 and #10-B showed relatively high ash contents of 19.82% and 19.03%, Seam #9 a rather average ash content of 14.68%.

The performance evaluations for the 2" x 28 mesh fractions are based on washabilities done by others. The performance evaluation for the 28 m. x 200 mesh fractions are based on washabilities prepared by C.E.S. laboratory.

FERNIE #8.

The 2" x 28 mesh fraction appears rather difficult to clean to an ash content of 8.5% because of the intergrown ash. Heavy medium cleaning should therefore be considered. However the 28 m. x 200 m. fraction is relatively easy to clean and it may therefore be expected that further crushing of the 2" x 28 m. would liberate impurities and reduce the yield-error. Further study of middlings crushing is suggested.

FERNIE #9.

Compared to Fernie #8 this coal is much easier to wash and yield-errors for cleaning the 2" x 28 m. fraction are sharply reduced. Cleaning of the 28 m. x 200 m. fraction is also reduced to a black-white separation. Yield-errors are negligible. Also for this seam a study of crushing the middlings would be of value.

FERNIE #10-B.

The 2" x 28 m. fraction as well as the 28 m. x 200 m. fraction are very difficult to clean. Further crushing of the coal will not result in substantial reduction of yield-error. Heavy medium cyclone washing for the coarse fraction and hydrocyclone washing with small cyclones or froth flotation for the fines will be required.

Respectfully submitted,

CYCLONE ENGINEERING SALES LTD.

Per: _____

P.D.J. Vinkenborg, P. Eng.
General Manager

CHEMICAL & GEOLOGICAL LABORATORIES LTD.

EDMONTON - CALGARY - FORT ST. JOHN

Sample No.

Company CROWS NEST INDUSTRIES LIMITED
Location Line Creek
Interval 4 Seam - 1/4" x 0"
Fuel Classification

Lab. No. E/0-3341-4 A
Date sampled
Date Received Dec. 11, 1970
Date reported Dec. 17, 1970

1. PROXIMATE ANALYSIS:	As Analyzed	Dry Basis	Remarks
Moisture ..... %	8.3	---	
Ash ..... %	12.2	13.3	
Volatile Matter ..... %	26.3	28.7	
Fixed Carbon ..... %	53.2	58.0	
2. Heating Value:			
B.T.U./lb.	9746	10628	
Cal/ Gm	5414	5904	
3. Sulfur ..... %	0.40	0.44	
4. Phosphorous ..... %			
5. Sodium (as % of ash)			
6. Free Swelling Index			

FUSIBILITY OF ASH: Atmosphere °F.	Oxidizing	Reducing
Initial Deformation Temperature:	2800+	2785
Softening Temperature (Spherical)	2800+	2800+
Softening Temperature (Hemispherical)	2800+	2800+
Fluid Temperature	2800+	2800+

8. ASH ANALYSES

	%		%
a) Silicon Dioxide		h) Molybdenum Trioxide	
b) Aluminum Oxide		i) Chromium Oxide	
c) Iron Oxide		j) Nickel Oxide	
d) Calcium Oxide		k) Vanadium Pentoxide	
e) Magnesium Oxide		l) Sodium Oxide	
f) Titanium Dioxide		m) Potassium Oxide	
g) Manganese Oxide		n) Phosphorous Pentoxide	
		o) Sulphur Trioxide	

9. Special Tests:

Note: 1. The "Usual Method of Volatile Matter of ASTM D-271-68 was followed.

2. All analyses were run in duplicate.

Analysed by: [signature]

C.G.L. 3

CHEMICAL & GEOLOGICAL LABORATORIES LTD.

EDMONTON - CALGARY - FORT ST. JOHN

Sample No.

Company	CROWS NEST INDUSTRIES LIMITED	Lab. No.	E70-3341-3A
Location	Line Creek	Date sampled	
Interval	4 Seam - 7/8" x 1/4"	Date Received	Dec. 11, 1970
Fuel Classification		Date reported	Dec. 17, 1970

1. PROXIMATE ANALYSIS:	As Analyzed	Dry Basis	Remarks
Moisture ....%	7.6	---	
Ash ....%	13.5	14.6	
Volatile Matter ....%	26.5	28.7	
Fixed Carbon ....%	52.4	56.7	
2. Heating Value:			
B.T.U./lb.	9736	10537	
Cal/ Gm	5409	5854	
3. Sulfur ....%	0.40	0.43	
4. Phosphorous ....%			
5. Sodium (as % of ash)			
6. Free Swelling Index			

7. FUSIBILITY OF ASH: Atmosphere °F.	Oxidizing	Reducing
Initial Deformation Temperature:	2800+	2635
Softening Temperature (Spherical)	2800+	2745
Softening Temperature (Hemispherical)	2800+	2800+
Fluid Temperature	2800+	2800+

8. ASH ANALYSES	%		%
a) Silicon Dioxide		h) Molybdenum Trioxide	
b) Aluminum Oxide		i) Chromium Oxide	
c) Iron Oxide		j) Nickel Oxide	
d) Calcium Oxide		k) Vanadium Pentoxide	
e) Magnesium Oxide		l) Sodium Oxide	
f) Titanium Dioxide		m) Potassium Oxide	
g) Manganese Oxide		n) Phosphorous Pentoxide	
		o) Sulphur Trioxide	

9. Special Tests:

Note: 1. The "Usual Method of Volatile Matter of ASTM D-271-68 was followed.
2. All analyses were run in duplicate.

Analysed by:

C.G.L. 3

CHEMICAL & GEOLOGICAL LABORATORIES LTD.

EDMONTON - CALGARY - FORT ST. JOHN

Sample No.

Company CROWS NEST INDUSTRIES LIMITED
Location Line Creek
Interval B Seam - 1/4" x 0"
Fuel Classification

Lab. No. E70-3341-2 A
Date sampled
Date Received Dec. 11, 1970
Date reported Dec. 17, 1970

1. PROXIMATE ANALYSIS:	As Analyzed	Dry Basis	Remarks
Moisture ..... %	6.4	---	
Ash ..... %	6.3	6.7	
Volatile Matter ..... %	29.0	31.0	
Fixed Carbon ..... %	58.3	62.3	
2. Heating Value:			
B.T.U./lb.	11512	12299	
Cal/ Gm	6396	6833	
3. Sulfur ..... %	0.4	0.43	
4. Phosphorous ..... %			
5. Sodium (as % of ash)			
6. Free Swelling Index			

FUSIBILITY OF ASH: Atmosphere °F.	Oxidizing	Reducing
Initial Deformation Temperature:	2315	2295
Softening Temperature (Spherical)	2385	2325
Softening Temperature (Hemispherical)	2440	2385
Fluid Temperature	2615	2490

8. ASH ANALYSES %

a) Silicon Dioxide
b) Aluminum Oxide
c) Iron Oxide
d) Calcium Oxide
e) Magnesium Oxide
f) Titanium Dioxide
g) Manganese Oxide

%

h) Molybdenum Trioxide
i) Chromium Oxide
j) Nickel Oxide
k) Vanadium Pentoxide
l) Sodium Oxide
m) Potassium Oxide
n) Phosphorous Pentoxide
o) Sulphur Trioxide

Note: 1. The "Usual Method of Volatile Matter of ASTM D-271-68 was followed.

9. Special Tests:

Note: 2. All analyses were run in duplicate.

Analysed by:

C.G.L. 3

CHEMICAL & GEOLOGICAL LABORATORIES LTD.

EDMONTON - CALGARY - FORT ST. JOHN

Sample No.

Company CROWS NEST INDUSTRIES LIMITED
Location Line Creek
Interval B Seam - 7/8" x 1/4"
Fuel Classification

Lab. No. E70-3341-1A
Date sampled
Date Received Dec. 11, 1970
Date reported Dec. 17, 1970

1. PROXIMATE ANALYSIS:	As Analyzed	Dry Basis	Remarks
Moisture ....%	5.8	---	
Ash ....%	8.6	9.1	
Volatile Matter ....%	29.3	31.1	
Fixed Carbon ....%	56.3	59.8	
2. Heating Value:			
B.T.U./lb.	11268	11962	
Cal/ Gm	6260	6646	
3. Sulfur ....%	0.42	0.45	
4. Phosphorous ....%			
5. Sodium (as % of ash)			
6. Free Swelling Index			

FUSIBILITY OF ASH: Atmosphere °F.	Oxidizing	Reducing
Initial Deformation Temperature:	2365	2320
Softening Temperature (Spherical)	2435	2365
Softening Temperature (Hemispherical)	2565	2420
Fluid Temperature	2735	2545

8. ASH ANALYSES	%		%
a) Silicon Dioxide		h) Molybdenum Trioxide	
b) Aluminum Oxide		i) Chromium Oxide	
c) Iron Oxide		j) Nickel Oxide	
d) Calcium Oxide		k) Vanadium Pentoxide	
e) Magnesium Oxide		l) Sodium Oxide	
f) Titanium Dioxide		m) Potassium Oxide	
g) Manganese Oxide		n) Phosphorous Pentoxide	
		o) Sulphur Trioxide	

NOTE: 1. The "Usual Method of Volatile Matter of ASTM D-271-68 was followed.

9. Special Tests:

Note: 2. All analyses were run in duplicate.
Please note that due to the failure of our Muffle the Ash Fusibilities were delayed this long. We hope to give you a reasonably faster service in future.

Analysed by:

C.G.L. 3

CROWS NEST INDUSTRIES

REPORT BY: R. CRISAFIO

ON: Results from Washing 600 tons of 8, 9, 10B and 10A Seams From Adits 7, 4, 5 and 12 - Line Creek

1.. Coal was shipped by I. Morgan on August 8 and August 15, 1970.

Tonnage was as follows:

8 Seam	-	250 tons
9 Seam	-	140 tons
10B Seam	-	120 tons
10A Seam	-	84 tons
TOTAL	-	594 tons

2.. Coal was run through the plant on August 17th, 1970. Present were:

P. Levine and A. Reid of Allen and Garcia.

C.N.I. personnel were:

J. Crabb, J. Kervin, R. Crisafio, L. Sclippa, J. Kubinec, E. Hornquist, B. Bjornson, T. Prentice, D. Hutchinson, D. Pidgeon, H. Ashmore, J. Musil, J. Latak, B. Morris. Coleman Collieries also provided four additional helpers.

3.. Sixteen points were sampled as outlined in analysis sheet. Plant was started about 8:45 A.M. and run until the jig bed was stabilized. The coal was then run through to about 11:15 A.M. There was an interruption when the drier fan was damaged due to overheating in the drier and the controls failed to function.

4.. The blending did not go according to plan with Bin 2 (Seam 10B) being depleted by 9:40 A.M. followed by 10A Seam in Bin 3 at 10:00 A.M. Some 20 tons of 8 Seam remained in the bin after shutdown.

5.. Some surging occurred in feed to the plant. Hang up was also observed in the bins.

6.. Notwithstanding the drawbacks mentioned the ease with which the plant was started and set in operation after a two week closure was noteworthy.

7.. The co-operation of Roy Whitehouse and his staff, P. Levin and A. Reid was much appreciated.

8.. Recovery can be estimated from weightometer readings which showed 72.8% recovery. However, this is not a true recovery picture because:

a.) Raw coal weightometer is ahead of breaker thus weight of rock rejected by breaker should not possibly be classed as plant feed. This could be a matter of opinion.

b.) The clean coal which remained in the thickner was not weighed.

c.) The breakdown of the drier fan caused clean coal to be weighed at 12.1% moisture instead of the delivery moisture of 6.0%.

9.. A more true recovery picture can be ascertained by truck weights of clean coal, middlings and refuse. The weights are as follows:

a.) Clean coal - 422.1 tons or 78.4%

Middlings - 11.5 tons or 2.2%

Refuse - 104.7 tons or 19.4%

TOTAL - 538.3 tons

b.) The 78.4% clean coal does not include the coal which would have remained in the thickner.

c.) It is difficult to assess the effect of excess Moisture on final weight of clean coal.

d.) A final recovery of 75.0% would appear to be realistic for 2" x 0 size range.

LINE CREEK PROJECT

EVALUATION OF DEISTER TABLES AND H.M. CYCLONES IN THE FINE COAL CIRCUIT (1/4" x 0)

R. Crisafio

5 March 1971

LINE CREEK PROJECT

EVALUATION OF DEISTER TABLES AND H.M. CYCLONES IN THE FINE COAL CIRCUIT (1/4" x 0).

R. Crisafio 5 March 1971

INTRODUCTION

1. In late October 1970 a decision was made to test samples on a Deister Table, of 1/4" x 0 coal composited from Seams 8, 9, 10B and 10A consisting 40.0%, 24.0%, 21.0% and 15.0% respective ratio.

2. The samples were to be taken to simulate, as much as possible, open pit mining conditions and were to include some of the "rations" etc., found near the roof of 10B and to some extent in 10A seam.

3. Ten tons of sample were collected and blended by mixing and turning over with a front end loader.

4. The ten ton sample was split into halves, which were in turn disposed of as follows:

   a.) Five tons ROM was run through a roll crusher with a setting of 2.0". The resultant product was screened at 2" x 1/4" and 1/4" x 0 and showed a size distribution of 28.0% for the former and 72.0% for the latter. The 1/4" x 0 thus obtained was labeled 1/4" x 0 "Natural".

   b.) For the other five tons the rolls were reset at 1/4" and the ROM was put through and crushed. This was labeled 1/4" x 0"Total Crush".

5. The entire lot was then shipped to Fort Wayne, Indiana, by means of a truck rented from F. Sowchuk and arrived in Fort Wayne 31 October 1970 on the sixth day after starting.

6. The tests were commenced on 2 November 1970 in the presence of R. Crisafio of C.N.I. and joined by W. Prentice and J. Crabb for one of the later tests.

7. It was found there was a considerable amount of tramp oversize (+1/4") in the 1/4" x 0"Natural" and this was screened out. The same operation was conducted on the 1/4" x 0"Total Crush," and since this was near size it was recrushed and entered into the sample.

8. The test table was one-quarter size. The feed rate was adjusted to a rate equivalent to 12 T.P.H. for a commercial size deck.

9. The table operation was balanced and checked by float sink tests at 1.60 S.G. for clean coal and refuse.

10. Two types of testing were done on each sample and tagged as follows:
Run I - A zone test in which the clean coal side was divided into four zones and the refuse end into three zones. Each zone was collected separately. This run was conducted on the 1/4" x 0"Natural".
Run II - A three product test in which the 1/4" x 0"Natural" washed coal was collected as clean coal, middlings and refuse.

11. Runs III and IV - Similar to Runs I and II but conducted on the 1/4" x 0 "Total Crush".

Run V was a repeat of Run III because visual inspection showed that fluctuation in feed rate had occurred in Run III.

12. All test products were collected in doubled sugar bags and filtered until only clean water resulted. Every ounce of coal was thus accounted for.

13. The samples were then crated and shipped to Fernie for testing.

14. Duplicates of the head samples and Run II and IV were shipped to Ottawa for washabilities, screen analysis and ash analysis on each size fraction.

15. The results obtained by the C.N.I. lab are attached.

DEISTER TABLE TEST EVALUATIONS

METHOD

1. This evaluation will primarily centre around the 1/4" x 200M fractions of the 1/4" x 0 "Natural" clean coal. The data is derived mainly from Run II, Page 2.

2. The -200M fraction yield of 5.3% will be subtracted from the total yield (87.1 - 5.3) which results in 81.8% of the total 1/4" x 0 clean. The ash reduction achieved by elimination of the -200M is 0.4%

3. A comparison of the zone test Run I, Page 3 and the three product test Run II, Page 2, on the 1/4" x 0 "Natural" shows nearly identical results ie. 87.8% yield at 10.6% ash for the former and 87.1% yield at 10.5% ash for the latter. Consequently where necessary the information can be pooled. Data from the other tests will be used as support evidence when required.

4. An attempt will be made to evaluate the performance of a D.M. Cyclone as back up cleaning for the 1/4" x 16M clean coal table product.

5. Yields, clean coal ash, middling or reject ash from the cyclone will be ascertained on the basis of a 9.5% clean coal ash and further assumptions of 75.0%, 85.0% and 95.0% recovery from the cyclone.

6. The cyclone yields will be added to the 16M x 200M clean coal table yield to give a total recovery picture for the 1/4" x 200M. Ash values for the 1/4" x 200M will be compiled from the given data.

7. The 1/4" x 0 fraction of the total feed can be regarded as constituting 70.0% of the total.

CALCULATIONS

1. Ash for 1/4" x 16M clean coal

$$\frac{(15.9 \times 11.8) + (34.9 \times 10.9)}{50.8} = 11.2\%$$

2. Ash for 16M x 200M clean coal

$$\frac{(17.2 \times 9.2) + (11.4 \times 8.3) + (10.1 \times 8.4) + (5.2 \times 11.9)}{43.9} = 9.1\%$$

3. Yield of 1/4" x 16M clean coal = 15.9% + 34.9% = 50.8% of 1/4" x 0

   This is equivalent to $\frac{100}{100 - 5.3} \times 50.8 = 53.6\%$ of 1/4" x 200M

4. Yield of 16M x 200 clean coal = 17.2 + 11.4 + 10.1 + 5.2 = 43.9% of 1/4" x 0

   This is equivalent to $\frac{100}{100 - 5.3} \times 43.9 = 46.4\%$ of 1/4" x 200M

5. Assuming 75.0% overflow and 25.0% underflow on 1/4" x 16M and using 9.5% clean coal ash:

   a.) Yield 1/4" x 16M clean coal = $\frac{75}{100} \times 53.6 = 40.2\%$

   b.) Yield of 16M x 200M = $\frac{100}{100} \times 46.4 = 46.4\%$

   Total recovery 1/4" x 200M = 86.6%

   c.) Total yield of 1/4" x 200M = $\frac{86.6}{100} \times 81.8 = 70.8\%$ of 1/4" x 0 feed

   d.) Underflow ash on 1/4" x 16M = (75 x 9.5) x (25x) = 100 x 11.2 = 16.3%

   e.) Clean coal ash on 1/4" x 200M = $\frac{(40.2 \times 9.5) + (46.4 \times 9.1)}{86.6} = 9.3\%$

6. Assuming 85.0% overflow and 15.0% underflow on 1/4" x 16M and using 9.5% clean coal ash:

6. a.) Yield 1/4" x 16M clean coal = $\frac{85}{100}$ x 53.6 = 45.6%

b.) Yield of 16M x 200M = $\frac{100}{100}$ x 46.4 = 46.4%

Total recovery of 1/4" x 200M = 92.0%

c.) Total yield of 1/4" x 200M = $\frac{92}{100}$ x 81.8 = 75.2% of 1/4" x 0 feed

d.) Underflow ash on 1/4" x 16M = (85.0 x 9.5) + (15x) = 100 x 11.2 = 20.8

e.) Clean coal ash on 1/4" x 200M = $\frac{(45.6 \times 9.5) + (46.4 \times 9.1)}{92.0}$ = 9.3%

7. Assuming 95.0% overflow and 5.0% underflow on 1/4" x 16M using 9.5% clean coal ash:

a.) Yield of 1/4" x 16M clean coal = $\frac{95}{100}$ x 53.6 = 50.9%

b.) Yield of 1/4" x 16M = $\frac{100}{100}$ x 46.4 = 46.4%

Total recovery 1/4" x 200M = 97.3%

c.) Total yield of 1/4" x 200M = $\frac{97.3}{100}$ x 81.8 = 79.6% of 1/4" x 0 feed

d.) Underflow ash = (95 x 9.5) + (5x) = 100 x 11.2 = 43.5%

e.) Clean coal ash on 1/4" x 200 = $\frac{(50.9 \times 9.5) + (46.4 \times 9.1)}{97.3}$ = 9.3%

COMMENTS

1. The Deister Table results indicate that the 1/4" x 16M table product is relatively high in ash (11.2% for 1/4" x 0 "Natural" - Run II). This fraction (1/4" x 16M) consisted of 50.8% of the 1/4" x 0 clean and is 53.2% of the 1/4" x 0 Head Sample. Using the 70.0% figure for 1/4" x 0 and 30.0% for 2" x 1/4" plant feed we arrive at 37.2% of the raw feed is 1/4" x 16M.

2. If a D.M. vessel is used on the 2" x 1/4" then ash levels can be readily controlled with attendant changes in yield. However, because of the amount of near gravity material the tables can not be adjusted much below the 1.60 S.G.

3. Subtracting the 5.3% yield and the 0.4% ash from the totals in Run II, Page 2, the result is 81.8% yield at 10.1% ash. No doubt a figure of 9.8% ash could be achieved at some sacrifice in yield.

4. The ash on the total 2" x 200M could also be easily kept below 10.0% by adjusting the ash level of the vessel product.

5. The ash level of the 16M x 200M from the tables at 9.1% is satisfactory and the 81.1% yield for the 1/4" x 200M reflects good yield for the 1/4" x 16M.

6. At a 10.0% ash the yield for the D.M. vessel is 68.3% for 2" x 1/4".

7. Lacking washability data for the 1/4" x 16M fraction, it is not possible to give an accurate figure for cyclone recovery. However, two factors would indicate that a 90.0% recovery at least would be conservative. This would give a yield of 77.4% and an underflow ash of 26.5%.

7. (Con't)

1.) D.M. cleaning in cyclones is at least 98.0% efficient even with greater than 10.0% near gravity material.

2.) The sink ash from the 1.60 float sink tests on the 1/4" x 0 clean in the Coleman tests ran 40.9% in test 3776 (see Coleman results) 41.9% in test 3779 and 36.8% on a single 1.60 S.G. test conducted on the Run II product. All three ash figures are higher than the 90.0% recovery underflow ash which was 26.5% and are close to the 95.0% recovery underflow ash which was 43.5%.

8. However, assuming the conservative 90.0% cyclone (1/4" x 16M) recovery yield and combining it with the 16M x 200M table product a 1/4" x 200M yield of 77.4% at 9.5% ash in ash levels. Then using a computed 68.3% at 10.0% ash (from washability tables) for the 2" x 1/4" the final yield and ash for 2" x 200M clean would be:

$(68.3 \times 30) + (77.4 \times 70) = \underline{74.7}\%$ Yield

$(30 \times 10.0) + (70 \times 9.5) = \underline{9.7}\%$ Ash

9. The use of cyclones to back up the table would appear justified. At 90.0% recovery the yield of 77.4% for table and cyclone as opposed to 81.8% for tables only, indicates there would be 81.8 - 77.4 or 4.4% loss.

However, comparing the ash value of 9.7% for tables and cyclones in combination against 10.1% for tables alone indicates the yield differences would be small at the same ash levels. The near gravity high ash reject from the cyclone would be offset by addition of -16M from Zones IV and V, Page 5, which ash levels can be absorbed.

10. A table only operation would render achieving 9.7% ash as the optimum and ash levels in the order of 9.25% would be virtually impossible for the 1/4" x 200M. Addition of cyclones would greatly increase flexibility.

11. Since only 1/4" x 16M would be processed by cyclones, magnetite losses should be minimal. Also a middling circuit which would be necessary to a table operation (8.3% of the 1/4" x 0 clean at 16.1% ash - Zones IV and V) could be eliminated since cyclone underflow could be retained as a middling at 26.5% ash or refuse at 40.0% ash.

12. Not resolved is the fate of the -200M material. Three possibilities exist for its utilization, they are:

    a.) Beneficiation by spherical agglomeration

    b.) Beneficiation by froth floatation

    c.) Use as a middlings

    There are drawbacks to all three especially the first two since clear-cut answers are not available to these procedures.

13. When occasion arises to process thermal coal, a cyclone by-pass should be available in the plant layout.

PLATE INDEX

PLATE	DESCRIPTION
1.	ELK VALLEY PHOTO MOSAIC ✓
2.	MAP - TOPOGRAPHY AND GEOLOGY LINE CREEK RIDGE AND ~~HORSESHOE RIDGE~~ LCR only
3.	MAP - TOPOGRAPHY AND GEOLOGY EWIN PASS AREA No
4 - 12 incl.	BORE HOLE LOG CORRELATION SHEETS No

Fernie, British Columbia
Telephone: (604) 423-4464

CROWS NEST INDUSTRIES LIMITED

February 3, 1971.

J. J. Crabb
exploration manager

Mr. J. W. Peck,
Chief Inspector of Mines,
Department of Mines & Petroleum Resources,
Parliament Buildings,
Victoria, B.C.

Dear Sir:

Enclosed herewith are the plans which I promised you last Tuesday, January 26th.

Best regards.

Yours very truly,

JJC/sb

Encl.

GENERAL OFFICES
FERNIE, B. C.

MINERALS DIVISION
FERNIE, B. C.

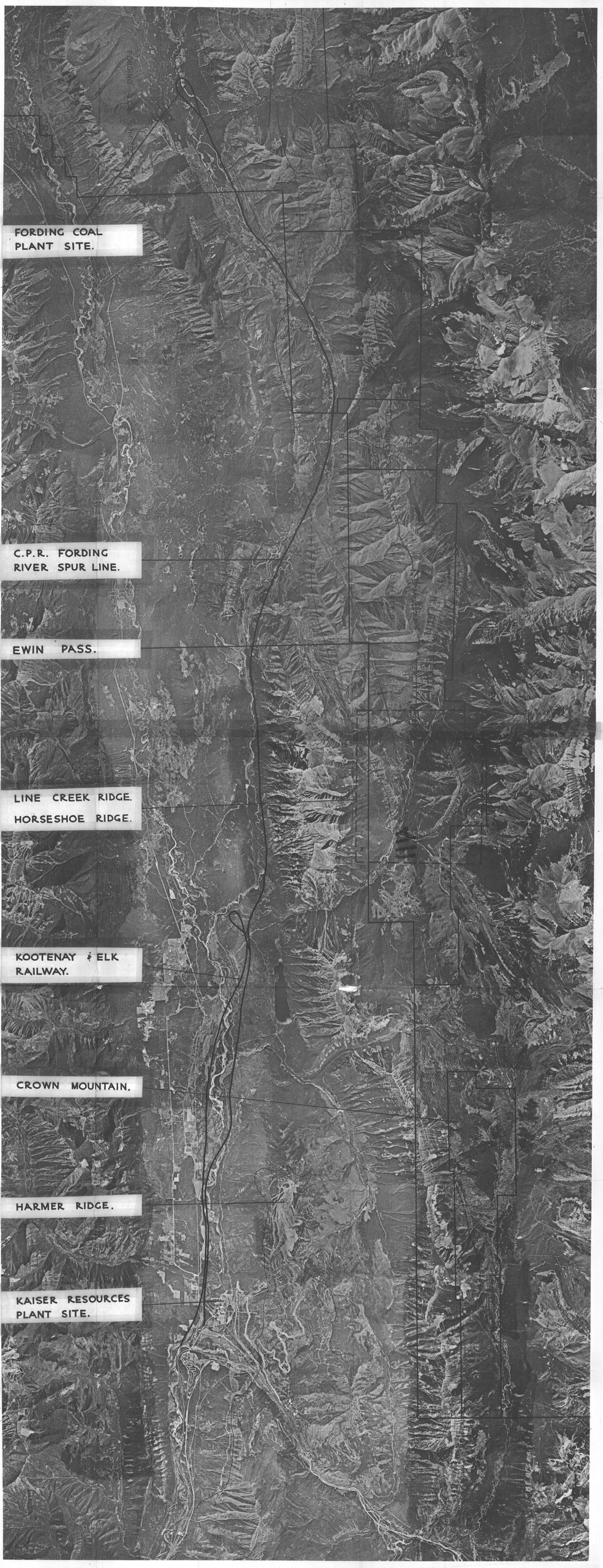
FOREST PRODUCTS DIVISION
MAIN OFFICE
FERNIE, B. C.

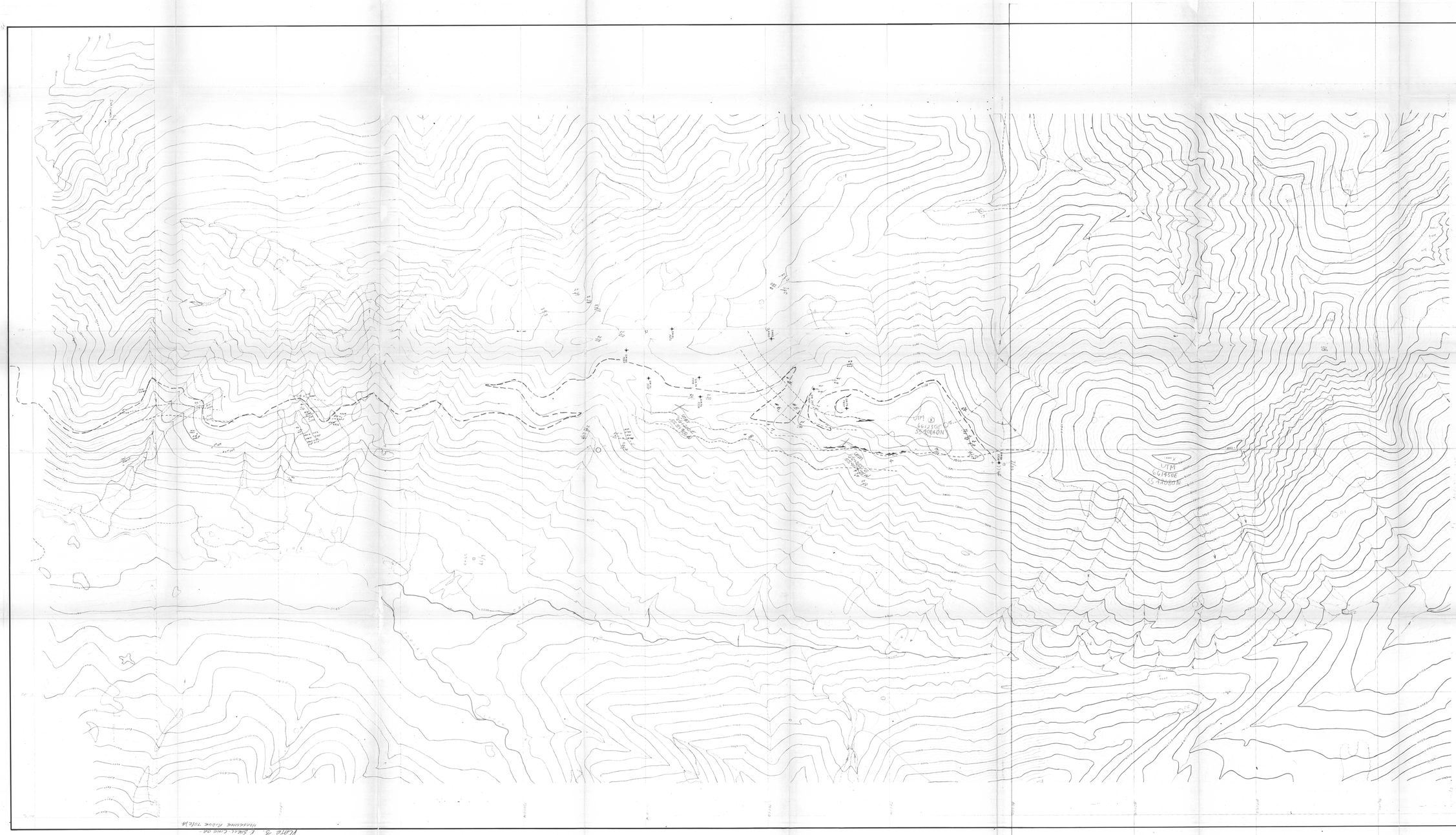
ELKO OPERATIONS
ELKO, B. C.

A.R.C.J.

The coal to be mined at Line Creek is from outcrops to outcrop but open at one end. Thus all the coal from the area to be mined will be recovered for say 15 years. I have asked Mr Prentice to give reasons in not considering future extraction or how it will be done

J. W. P.


FORDING COAL PLANT SITE.
C.P.R. FORDING RIVER SPUR LINE.
EWIN PASS.
LINE CREEK RIDGE.
HORSESHOE RIDGE.
KOOTENAY & ELK RAILWAY.
CROWN MOUNTAIN.
HARMER RIDGE.
KAISER RESOURCES PLANT SITE.
CROWSNEST INDUSTRIES LIMITED
Scale 1" = 3000'
CROWSNEST INDUSTRIES LIMITED
Scale 1" = 3000'
N
N



411

PLATE 3

CROWSNEST INDUSTRIES LTD.

LINE CREEK

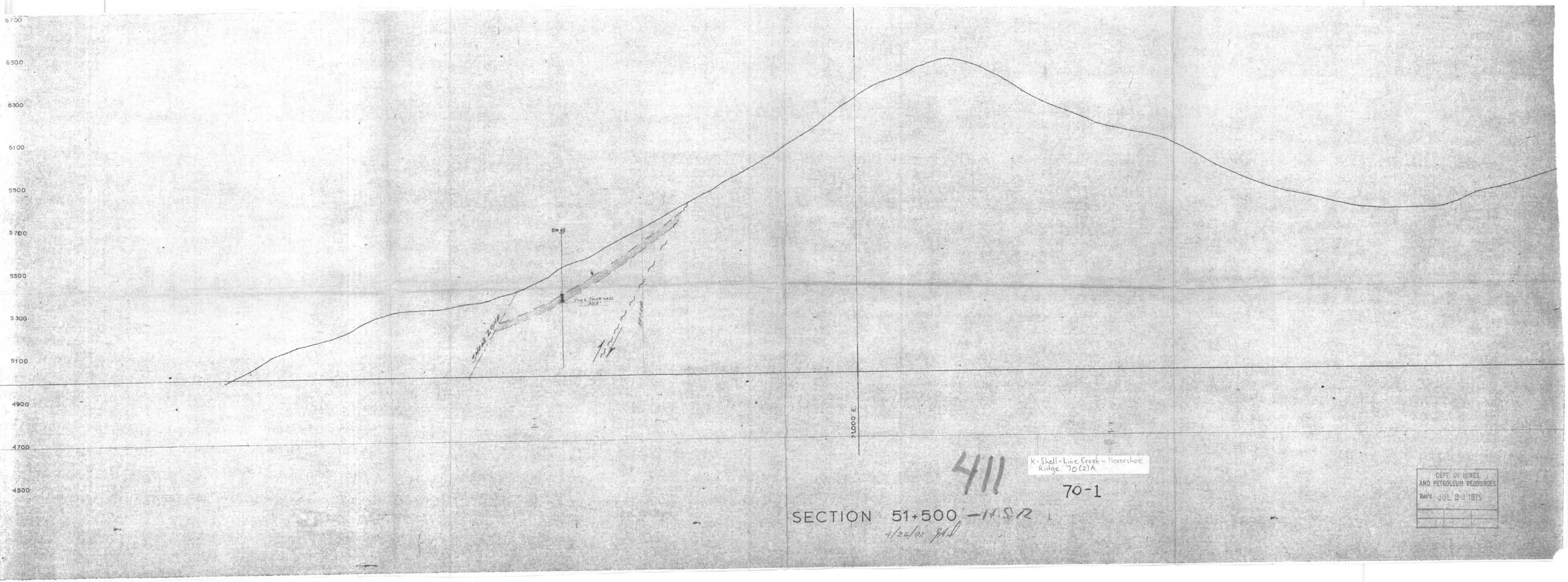
PRELIMINARY RECONNAISSANCE TYPE MAPPING

Compiled by
McELHANNEY SURVEYING & ENGINEERING LTD.
1200 West Pender St. Vancouver, B.C.

SCALE	CONTOUR INTERVAL	DATE	JOB NO.	SHEET NO.
1:500	10'	JUNE, 1976	0075-5	1 of 1

SCALE AND ELEVATION DATUM BASED ON LIMITED GROUND CONTROL, RESULTING IN GOOD RELATIVE, BUT UNCERTAIN ABSOLUTE MAP ACCURACY

COMPILED FROM AERIAL PHOTOGRAPHY AT 1in APPROXIMATE SCALE
OF 1 INCH EQUALS 2000 FEET PLUS OR MINUS 200'



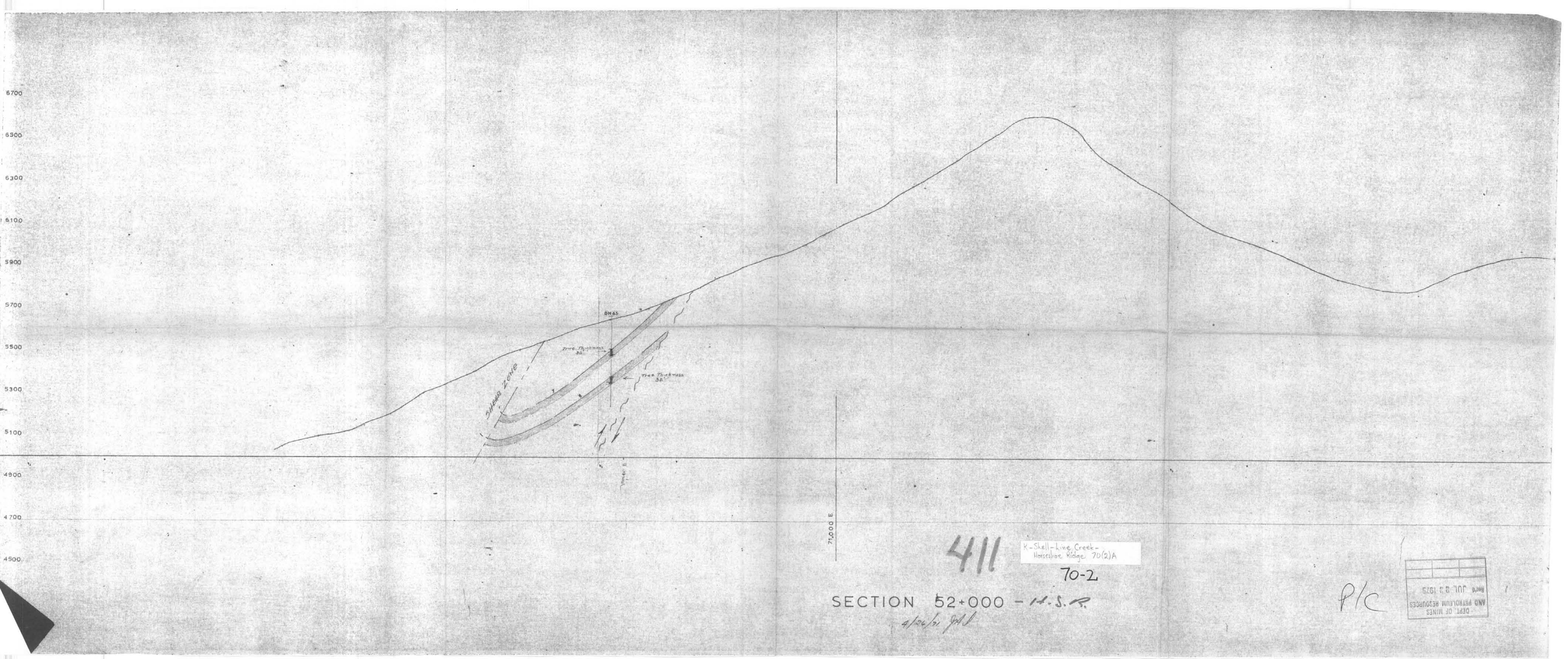
411

K-Shell-Lime Creek-Horseshoe Ridge 70(2)A

70-1

SECTION 51+500 — N.S.R.

4/20/71 JHL



411

K-Shell-Lime Creek-
Horseshoe Ridge 70(2)A

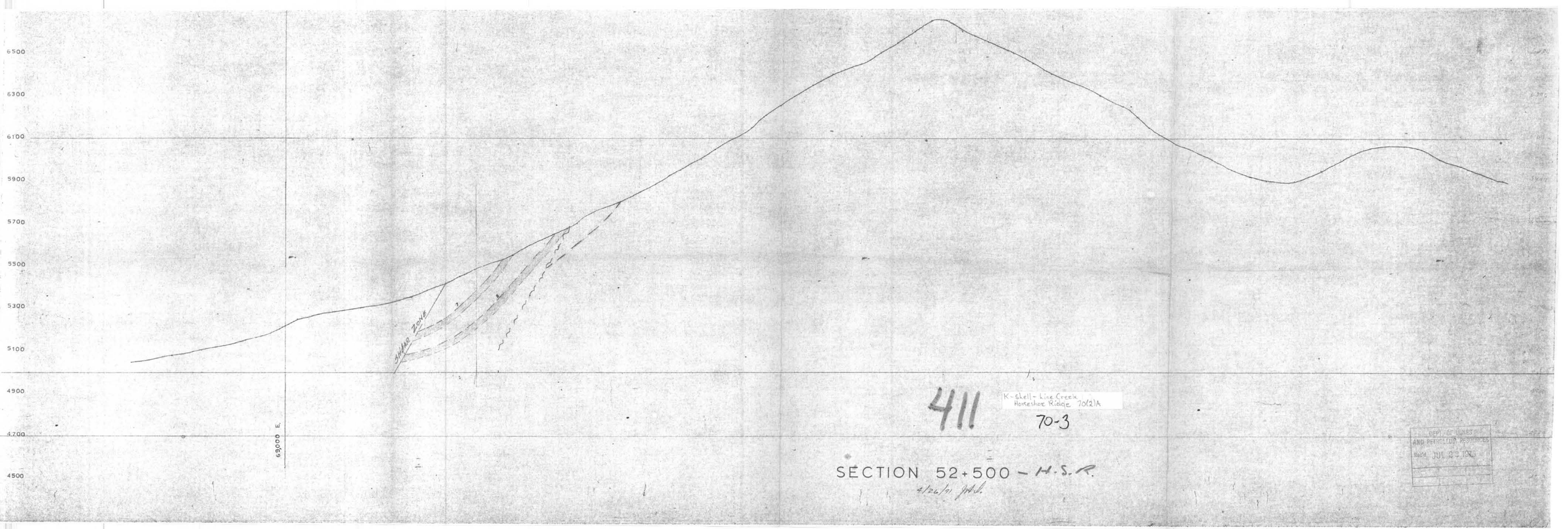
70-2

SECTION 52+000 - N.S.R.

4/26/71 JHJ

P/C

DEPT. OF MINES AND PETROLEUM RESOURCES
Rec'd JUL 23 1973



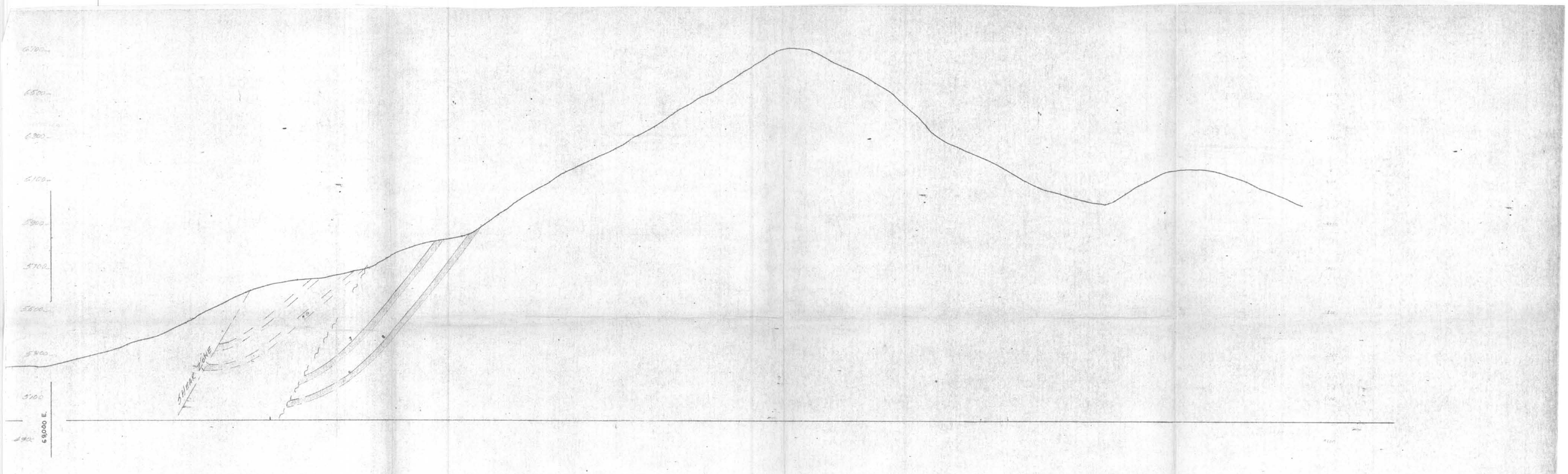
411

K-Skell - Line Creek
Horseshoe Ridge 70(21)A

70-3

SECTION 52+500 – H.S.R.

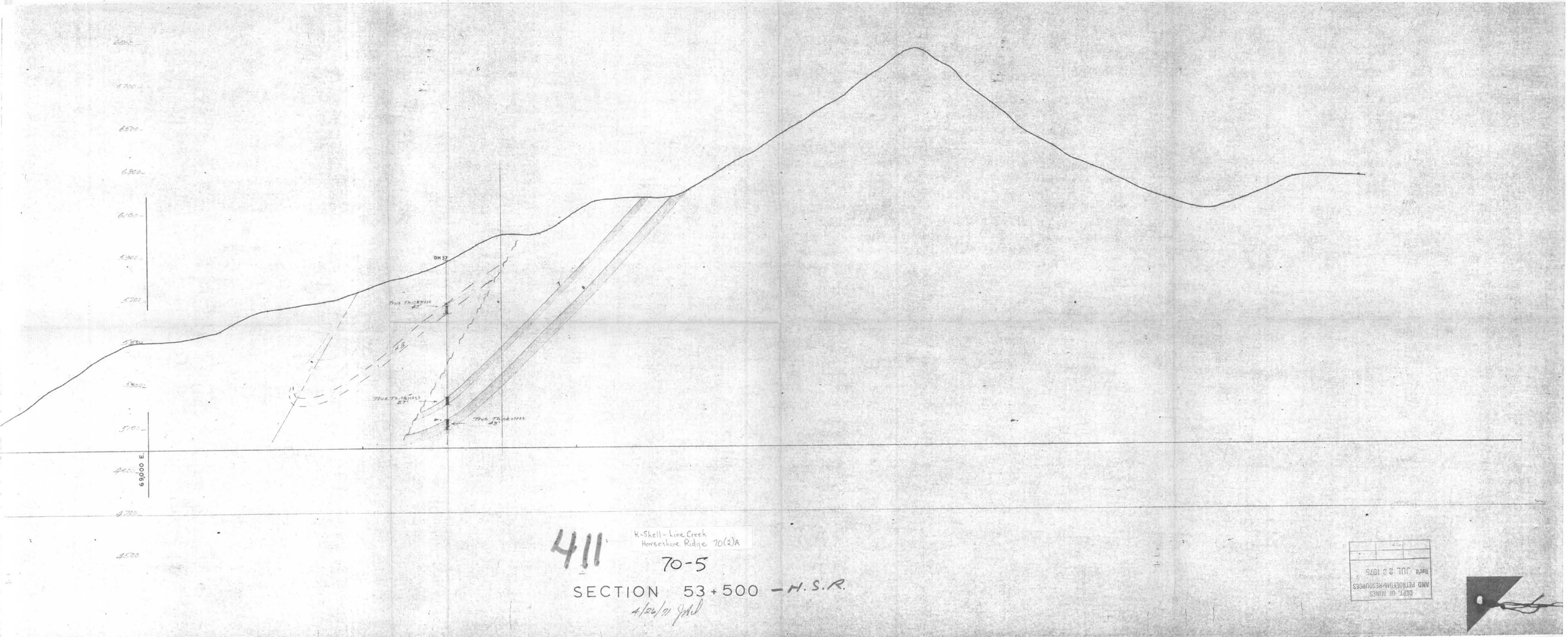
4/24/71 jmd.



411 K-Shell-Line Creek, Horseshoe Ridge 70(2)A
70-4

SECTION 53+000 — H.S.R.
4/26/71 JAL

P/C



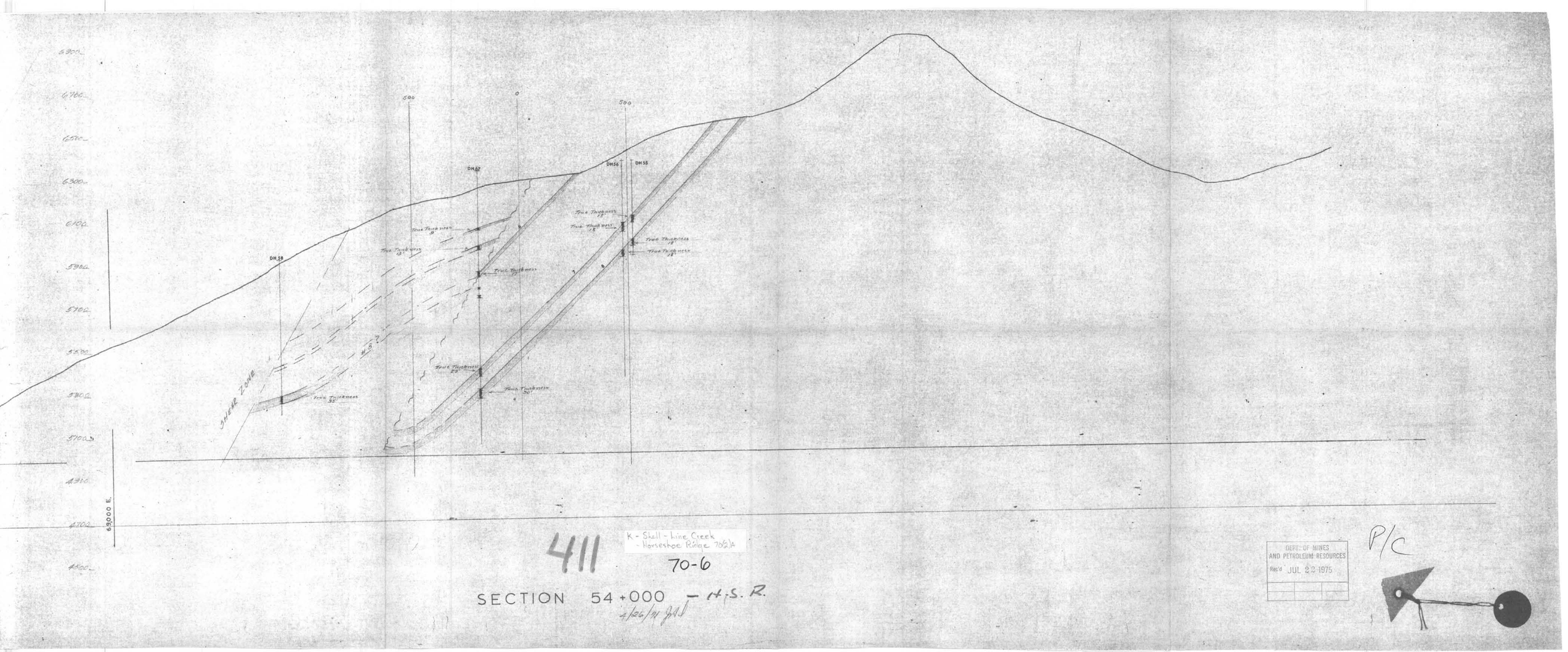
411

K-Shell - Line Creek
Horseshoe Ridge 70(2)A

70-5

SECTION 53+500 — H.S.R.

4/24/11 JAH



411

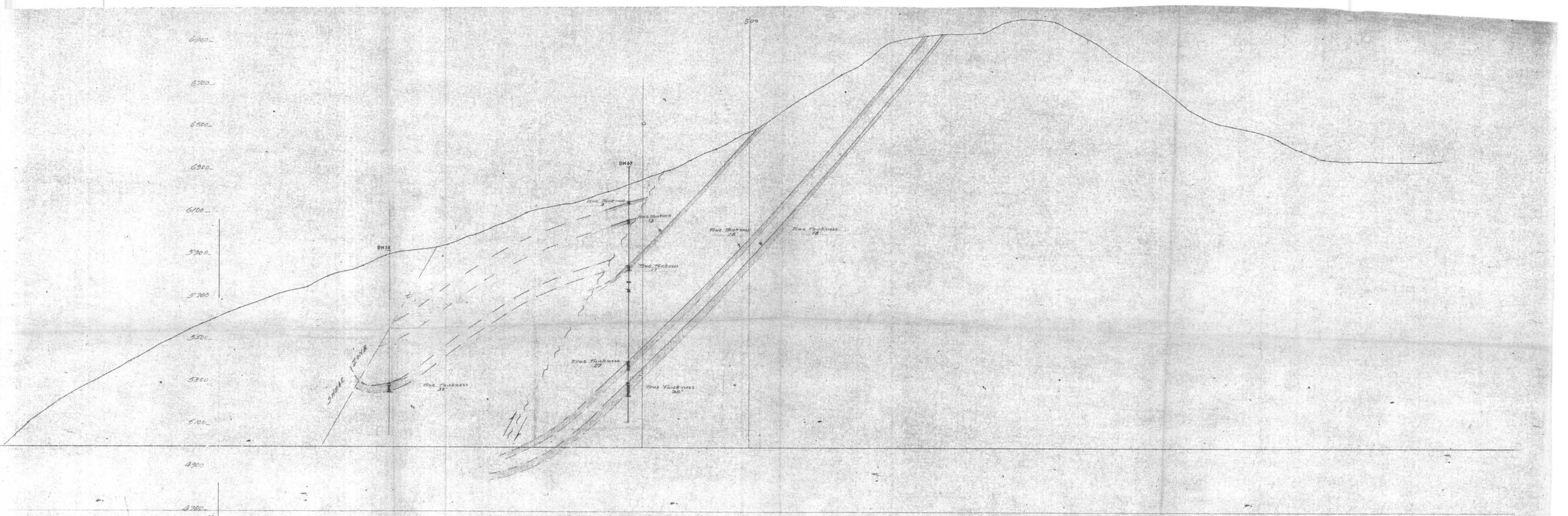
K - Shell - Kine Creek - Horseshoe Ridge 7062A

70-6

SECTION 54+000 — H.S.R.

4/26/71 JJS

P/C



411

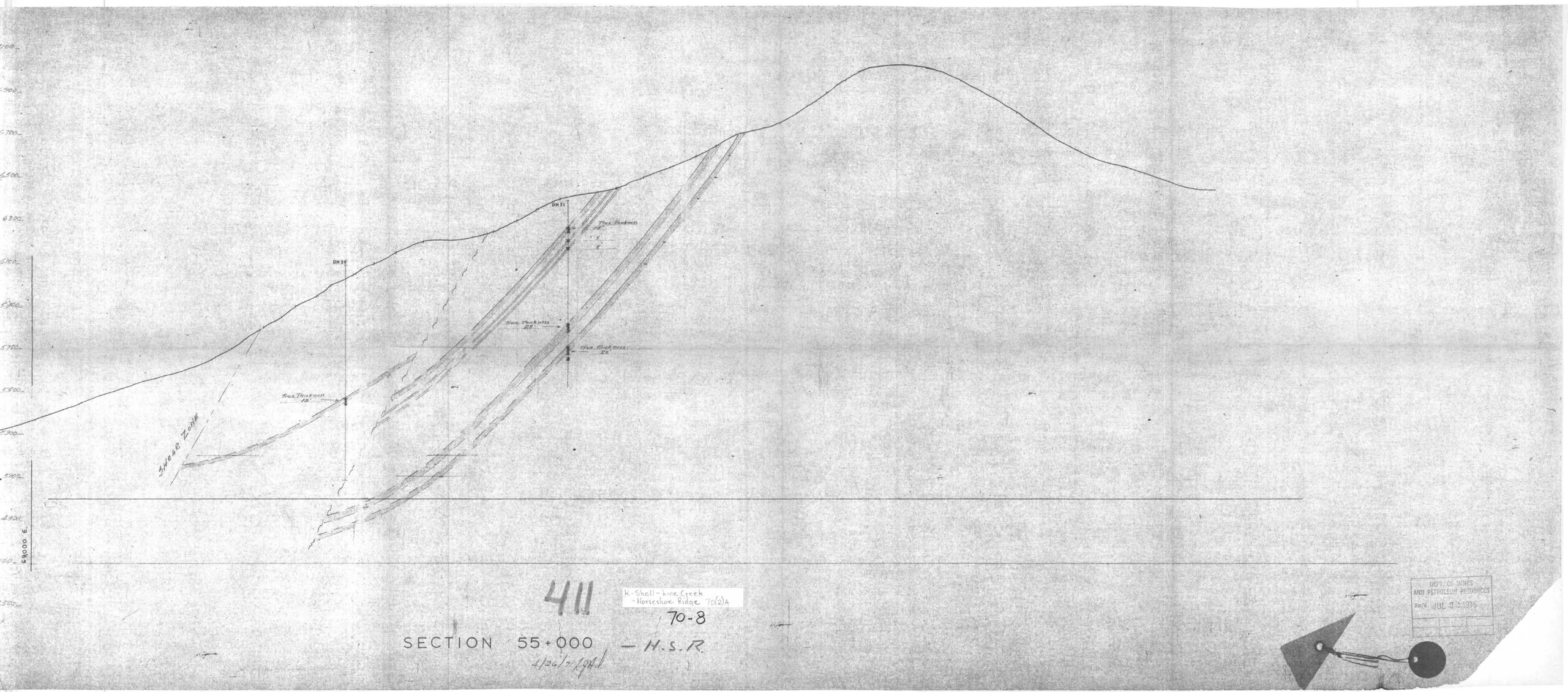
K-Shell-hine Creek
-Horseshoe Ridge 70(2)A

70-7

SECTION 54+500 — H.S.R

4/26/71 PMC

P/C



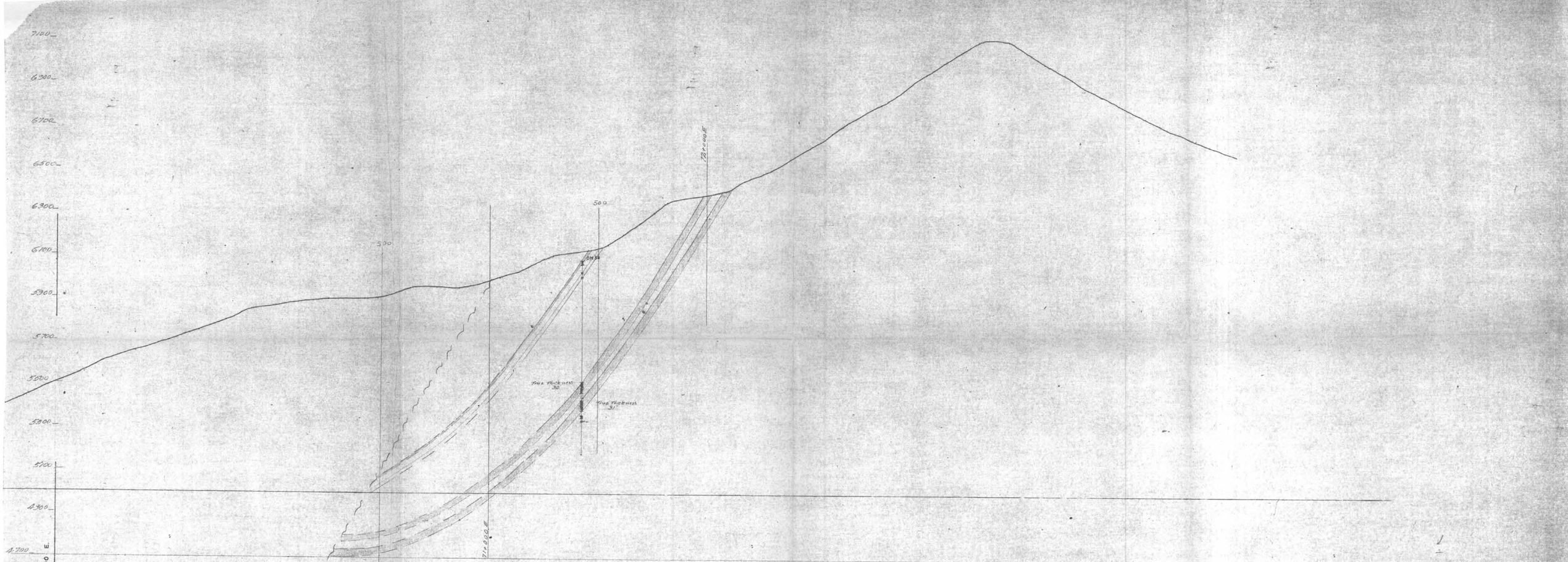
411

K-Shell-kine Creek
-Horseshoe Ridge 70(2)A

70-8

SECTION 55+000 — H.S.R.

4/26/71 (Opt.)



411

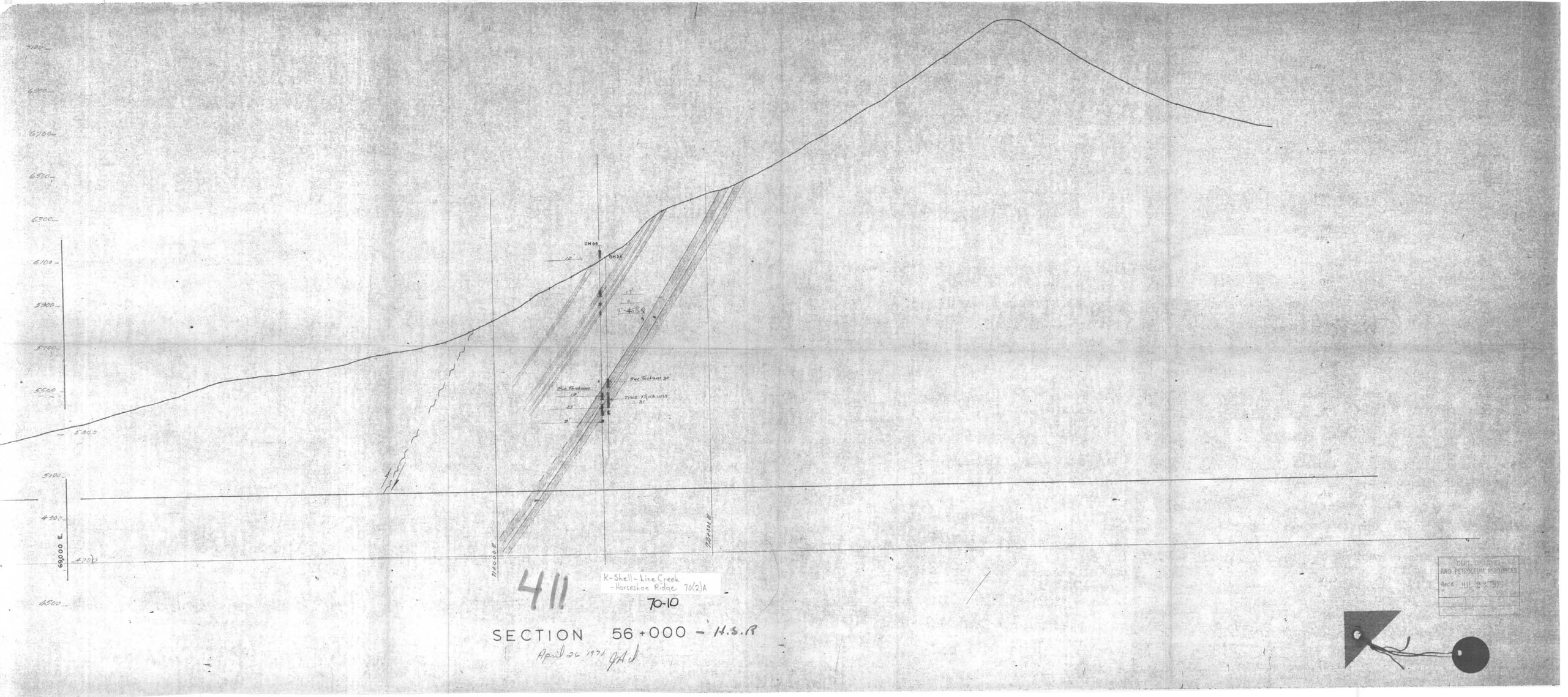
K-Shell - Line Creek - Horseshoe Ridge 70(2)A

70-9

SECTION 55+500 — H.S.R

4/26/71 JHH

P/C



411

K-Shell-Kine Creek
-Horseshoe Ridge 70(2)A

70-10

SECTION 56+000 - H.S.B

April 26 1971 GAJ

114

CROWS NEST INDUSTRIES

DRILL HOLE LOGS

LINE CREEK RIDGE

SCALE 1" = 50'

N° 6

N° 7

N° 8

N° 9

N° 10 B

N° 10 A

P/C

CROWS NEST INDUSTRIES

DRILL HOLE LOGS

LINE CREEK RIDGE

SCALE 1" = 50'

112