Crows Nest Resources LIMITED
P.O. Box 2003, Sparwood, British Columbia V0B 2G0
(604) 425-2555 Fax (604) 425-2779

February 26, 1991

Coal Administrator
Ministry of Energy, Mines and
Petroleum Resources
525 Superior Street, Room 17
Victoria, B.C.
V8V 1X4

ATTENTION: MS. KIM STONE/PAUL HAGEN

Please find attached two copies of the documentation required from Crows Nest Resources Ltd. for our application to convert five coal licenses to a lease. Also attached are cheques covering the application fee and the prescribed rent as per Sections 24 (2) (a) and 24 (2) (b) of the Coal Act.

Development activities for the pit area contained within the lease applied for are scheduled for start up May 1, 1991. Permitting and licensing of the plans has been initiated with the Mines Department and the appropriate Environmental agencies. Due to the tight time constraints your speedy attention to this lease application would be appreciated. To facilitate your circulation of this document, two (2) copies have been enclosed.

Any questions regarding this application should be directed to the undersigned.

Yours truly,

CROWS NEST RESOURCES LTD.

R. Williams

R. Williams, P. Eng.
Manager of Engineering
Line Creek Mine

attachments: Binder of Technical Data (2)
Application Fee (cheque)
Prescribed Rent (cheque)

DV4 DE1.1
910226(RW/jb)

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MINE SERVICES AREA NORTH
SOUTHEASTERN BRITISH COLUMBIA
APPLICATION TO CONVERT
COAL LICENSES TO A LEASE

BRITISH COLUMBIA COAL LICENCES
291, 288, 289, 287 AND 1300

COAL LICENSES HELD BY:

SHELL CANADA RESOURCES LIMITED

OPERATED BY:

CROWS NEST RESOURCES LIMITED

KOOTENAY LAND DISTRICT

NTS 82G/15 AND 82J/2

LATITUDE: 49° 58' NORTH TO 50° 00° NORTH

LONGITUDE: 114° 43'45" WEST TO 114° 46'30" WEST

FEBRUARY 1991

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1.0 BACKGROUND INFORMATION

1.1 Corporate Structure

Crows Nest Resources Limited (C.N.R.L.) was incorporated in 1978 to manage the development of the consolidated coal holdings of Shell Canada Resources Ltd. (SCRL) and Crows Nest Industries Limited (CNI) following the acquisition of CNI by SCRL. The Line Creek property was part of the CNI acquisition. CNRL is structured as a wholly-owned subsidiary of SCRL but operates as an independent business unit of Shell Canada. It carries out its function with four main departments: Mining, Exploration, Marketing and Planning and Administration.

1.2 Land Tenure

Enclosure 1: Index Map (1:50,000)

The Group #330 coal licenses have been held in good standing since 1975; initially by Crows Nest Industries Ltd. and subsequently by Shell Canada Ltd. Exploration work has been done on various portions of Group #330. Listed below are the monies spent in each year on each project.

PROJECT	1978	1979	1980	1981	1989	1990	TOTAL TO DATE
MT. MICHAEL			$39,887	$243,429			$283,316
EWIN PASS	$90,653	$250,921	$503,514	$494,214			$1,339,302
M.S.A.N.					$51,644	$198,000	$249,644
							$1,872,262

1.3 Site Description

Enclosure 1: Index Map (1:50,000)

The Mine Services Area North (M.S.A.N.) coal licences are located 14 kilometres southeast of Elkford, British Columbia, in the front ranges of the Rocky Mountains in southeastern British Columbia. These licences consist of CL 291, 288, 289, 287 and 1300 are centred at approximately:

Latitude 49° 59' North

Longitude 114° 45' West

The proposed pit and dump areas lie partially within Coal Lease #4. The balance lies immediately adjacent to the north, within portions of the above named coal licenses, which belong to Group 330 in the Central Block area. The pit, dumps and roads associated with this proposal are on Crown land, and logging for development is covered under License To Cut YN571, which encompasses all of the Line Creek mine development activities.

The M.S.A.N. area upon which the exploration has been focused, extends from the Line Creek valley bottom up onto the east-facing slope of Mount Michael. The elevation varies from 1580 metres - 2475 metres (ASL). Natural outcroppings of resistant sandstone units are fairly abundant and the Mist Mountain Formation/Morrissey Formation contact can be traced over most of the property. Coal seam exposures are restricted to road cuts and hand trenches.

The proposed mining area is a steep (15° - 50°) hillside, mostly timbered, that toes out onto a flat valley bottom. The Line Creek headwaters in this area experience seasonal intermittent flows, and there is no development other than evidence of past logging activity upstream of the proposed mine site. Mining activity is within a trap line area owned by a local trapper, and within an area easily accessible to recreational users seasonally.

Because of the proximity, the proposed lease area experiences essentially the same weather and climate regime as the adjacent developments within Coal Lease #4. Steepness of the terrain precludes agricultural capability within the area. Generally, terrain steepness and timber quality make logging and management of the site for timber production uneconomical.

At the present time, vehicular access is via; mine service roads in the valley-bottom north of the Mine Services Building, the 1989 exploration road into the M.S.A.N. area and the Ewin Pass Road.

1.4 Coal Preparation Facilities

The Line Creek operation features independent coal processing facilities for thermal coal and metallurgical coal. This process separation increases operating flexibility,

maximizes product recovery and minimizes conflicts in shipping schedules.

Raw coal blending and storage is accomplished in the preparation process by the use of five 5,000 tonne capacity enclosed concrete silos. Each silo is a predetermined, dedicated storage for one particular seam or combination of seams. In addition, three of the five silos are reserved for metallurgical coal, one is for thermal coal only, and the fifth may be used for either coal type.

Thermal and metallurgical coals are usually processed in separate plant facilities. With appropriate feeds, the plants are capable of producing up to 2.0 million tonnes per year of clean thermal coal and 2.25 million tonnes per year of clean metallurgical coal. The metallurgical coal preparation process design is typical of the type required to process Western Canadian coal. It therefore emphasizes fine coal cleaning.

The metallurgical plant features a combination of heavy medium cyclones, water cyclones and flotation, followed by thermal drying to achieve specified moisture content.

In the thermal plant, raw coal is screened, then cleaned in a heavy medium bath. Drying is not required.

Current run-of-mine coal production has a reduced proportion of thermal coal, a portion of which is treated in the metallurgical plant, resulting in an effective metallurgical plant capacity of 2.0 million clean tonnes per year over the ten year plan. Under these conditions, the thermal plant capacity is significantly underutilized.

Unit train loading utilizes computer control with cars loaded at a rate of 3,000 tonnes per hour. A nominal unit train consists of 110 cars, each holding 94 tonnes of clean coal.

1.5 Manpower

Currently, CNRL has about 470 employees, of whom 457 are at Line Creek while the remainder are based in Calgary. Under the current proposal for the M.S.A.N. Pit and the mining activity scheduled on the Lease 4 Pits, no change in manpower is required.

1.6 Union Representation

The hourly employees of Line Creek Mine (mine and plant operators, maintenance and warehouse personnel) have been represented by the International Union of Operating Engineers, Local 115C since the company began operating in 1981.

Currently there is a three year collective agreement in effect which expires May 31, 1992.

1.7 Sales Contracts

The following data summarizes the current sales contracts for all coal presently being produced from the Line Creek Mine. The proposed M.S.A.N. Pit would release coal that would be slotted into these contracts where appropriate.

METALLURGICAL COAL

CUSTOMER	VOLUME (1,000 metric t/y)	CONTRACT DURATION
1. Grouping of 10 Japanese Steel Mills	1,016 +/- 10%	15 yrs. April, 1983 to March 31, 1998
2. Ssangyong Corp. for resale to Pohang Iron and Steel Co. (Korea)	200 +/- 10%	5 yrs., April 1, 1988 to March 31, 1993
3. British Steel	165 + 55 option +/1 10%	3 yrs., April 1, 1990 to March 31, 1993 extendable
4. Massey Coal for resale to Inland Steel	336 +/- 15%	3 yrs., April 1, 1990 to March 31, 1993 extendable
5. Massey Coal for resale to USX	220 +/- 10%	I yr., Jan. 1, 1991 to Dec. 31, 1991 Purchase Order Term agreement under negotiations

THERMAL COAL

	Korea Electric		
1.	Samchonpo Power Plant	350 +/- 10%	Evergreen, reviewable every 5 years. Started fiscal 1982.
2.	Poryong Power Plant	400 +/- 10%	Evergreen, reviewable every 10 years. Started CY 1983.
3.	Honam Power Plant	400 +/- 10%	Evergreen, reviewable every 9 years.. Started CY 1985

2.0 GEOLOGY

2.1 Summary of Work Done

Between 1975 and 1976 Crows Nest Industries Ltd. built the Ewin Pass access road, mapped the Mt. Michael and Ewin Pass areas at a scale of 1:12,000 and drilled nine reverse-circulation rotary holes in the Ewin Pass area.

In 1978 Shell Canada again mapped the area at scales of 1:24,000 and 1:12,000. Some coal seams were hand-trenched.

In 1979 additional detailed scale (1:2,000) mapping was done and 150 metres of trenching and three adits were driven for bulk samples in the Ewin Pass area to the north.

Additional drilling, trenching and sampling was done in Ewin Pass during 1980 and 1981. Six diamond holes and five rotary holes were drilled, sampled and geophysically logged. Some of this data will be extrapolated into the M.S.A.N. area as the geological interpretation develops.

The 1981 Mount Michael Geological Report by A. White covered the north central area of Mount Michael and some of his findings were extrapolated into the Mine Services Area North Project area. Physical work included extensive mapping and hand trenching.

The 1989 program on M.S.A.N., as reported on by Sharma, consisted of geological mapping (1:2000), four rotary drill holes, backhoe trenching and road upgrading in a small portion of the M.S.A.N. area 1.4 km north of the Mine Services Building.

Work done in 1990 on M.S.A.N. included 370 metres of road construction, geological mapping (1:2000 scale), 190 metres of backhoe trenching, 4279 metres of CSR rotary drilling in 23 holes and one bulk sample site (Test Pit).

2.2 *Regional Stratigraphy and Structure*

Enclosure 2: Table of Formations

Enclosure 3: Regional Geological Map (1:20,000)

The Kootenay Group has been subdivided into three formations; the lower Morrissey Formation, consisting of Moose Mountain and Weary Ridge Members; the Mist Mountain Formation, and the uppermost Elk Formation.

The Mist Mountain Formation of the Kootenay Group of Upper Jurassic-Lower Cretaceous age is the main coal-bearing sequence in southeastern British Columbia. It is a thick sequence of clastic sediments representing delta progradation over marine shales, siltstones and sandstones of the Jurassic Fernie Formation.

The ***Moose Mountain Member*** is a resistant, generally cliff forming unit comprised of massive, medium to coarse grained, medium gray weathering sandstone. There are commonly two coal horizons within this sandstone, but their small thickness (rarely over one metre) and the overlying massive sandstone make them unattractive for economic consideration. The distinctive nature and prominence of this unit makes it an easily traceable marker horizon throughout the Crows Nest Coal Field of southeastern British Columbia.

The ***Mist Mountain Formation*** is the main coal bearing unit of the Kootenay Group. It overlies conformably but abruptly the Moose Mountain Member.

It is comprised of a generally recessive, interbedded sequence of brownish tinted sandstones, gray to brown siltstones, gray and black shales, gray mudstones and coal seams. In the Elk Coal Field this formation ranges in thickness between 400 metres and 660 metres. The coal seams attain a thickness of up to 10 metres and a lateral extent of several kilometres.

The ***Elk Formation*** lies conformably but abruptly over the Mist Mountain Formation. It consists of an interbedded sequence of cliff forming sandstones, shales and siltstones and thin (less than one metre), sporadic coal seams.

Coal bearing Mist Mountain Formation occurrences in the front ranges of southeast British Columbia are preserved in north/south trending synclines referred to as the Crowsnest Coal Field. The structure within the synclines is complicated to varying degrees by thrust faults, and to a lesser extent, normal faults.

The Crowsnest Coal Field can be subdivided into three coal bearing areas. From south to north they are the Flathead Coal Field, the Fernie Coal Field and the Upper Elk Coal Field (where this project area is located).

Upper Elk Coal Field

The Upper Elk Coal Field is an elongate basin composed of two major synclines (Greenhills and Alexander Creek) separated by an anticline and the northern extension of the Erickson Normal Fault. Line Creek is located at the southern end of the northerly plunging Alexander Creek syncline. The Ewin Thrust Fault causes a repeat of the east limb of this syncline. The Mine Services Area North Project is located in the footwall of this thrust fault.

2.3 Mine Services Area North Stratigraphy and Structure

Enclosure 4: Typical Stratigraphic Sections

Enclosure 5: Geology + Access Map (1:10,000)

Enclosure 6: Geological Cross-Sections (1:2,000) - 7

The Mine Services Area North (M.S.A.N.) project covers an area under the Line Creek valley bottom and up onto the east-facing slope of Mt. Michael. The west-dipping Moose Mountain Member outcrops along almost the entire length of the project, with bedding attitudes ranging from 45° to 60° west. Up section, the bulk of the interesting coal occurs in the lower 100 metres to 250 metres of the Mist Mountain Formation. There are six zones containing mineable seams, with individual seams ranging in thickness from 1.0 metres to 11.0 metres. The coal seam nomenclature has been extrapolated from the Line Creek Pit and Ewin Pass areas into this project. Stratigraphic changes are evident along the strike from south to north. As well as seam changes within zones, complete zones move up and down in the stratigraphic section or appear to be replaced completely by major sandstone units. The geophysical log signature of the seams are consistent enough to allow relatively easy correlation throughout the project and into the adjacent Ewin Pass data to the north.

Correlation of the drill hole geophysical logs also shows ample evidence of a number of west-dipping, low angle thrust faults which affect both the Mist Mountain Formation and the Moose Mountain Member. Seam repeats are common. Attempts have been made to correlate these faults from one cross-section to the next, but more mapping and drilling is needed to properly interpret these structures. Displacement

on these faults ranges up to 20 metres vertically and 100 metres horizontally.

2.4 *Coal Quality*

Enclosure 7: Increment Quality Data

Enclosure 8: Composite Quality Data

Enclosure 9: Loring Quality Data

Enclosure 10: Petrographic Data

Enclosure 11: Test Pit Quality Data

In 1990 coal samples for analyses were obtained from reverse-circulation rotary drill holes, the backhoe trench and the test pit. A variety of tests were done on these samples by the Crows Nest Resources Ltd.'s lab, Loring Laboratories Ltd., and David E. Pearson and Associates Ltd. All of the data is included in the above enclosures, but as of yet no summary of the data on a seam-by-seam basis is available. The following comments are preliminary but serve to give some idea of the basic quality:

- Based on CSR drill hole data
  - raw ash varies from 15% - 35%
  - volatiles (at 1.6 S.G.) are in the 21 - 22% range
  - sulphur (at 1.6 s.g.) is low (0.3 - 0.5%)
  - RoMax (at 1.6 S.G.) ranges from 1.21 - 1.29
  - Calorific values range from 6200 - 7800 Kcal/kg
- There is evidence of "layering" within seams of "Met." and "Thermal" coal (based on raw FSI values). The reason for this layering has not yet been tied to either

oxidation or petrography. Some of these seams may be potential candidates for selective mining in order to optimize the reserves.

3.0 MINING PROGRAM

Enclosure 12: Mine Plans (1:2,000) - 3

Enclosure 13: Mine Cross Sections (1:2,000) - 3

3.1 Description of Mine and Access

The Mine Services Area North (M.S.A.N.) Pit is located approximately 600 metres northeast of Line Creek Mine Services Building. The pit will be developed to maintain the current coal feed to the existing plant.

The M.S.A.N. Pit will be developed as a conventional truck shovel operation. The pit has been designed with a 47.5° overall wall angle (Piteau Report PA-019). Total material removed is 5.0 million tonnes of coal and 15.1 million BCM's of waste material.

Road access to the M.S.A.N. Pit area is from behind the Mine Services Building. Initial upgrading of the road is to 13 metres at 12% for the first 450 metres. The second portion of the road is built at nine metres in width and grades varying between 7 and 11%. The 13 metre road width conforms to the Mines Act for a two way road when running a P-12 equivalent (4.5 metre width), and the nine metre road with pull outs conforms to the Mines Act for single lane traffic.

3.2 Surface Development

To date surface development has been in upgrading the existing road and removing a bulk sample.

Projected development over the next five years is to upgrade the existing road for two lane traffic, and progress with the road up to the apex of the pit. Development in the first year is a small pit that will be utilized to determine an optimum overall wall angle (Enclosure 12: Mine Plans - Proposed Test Pit). Development of the road will continue in the following year along with waste removal from the north end of the pit.

By year five the M.S.A.N. Pit will be half finished, with the 1950, 1900, 1850 and 1800 dumps completed, and the 1770 dump half completed (Enclosure 12: Mine Plans - Mid-Life Pit Plan).

The final five years of mining will concentrate on developing the south end of the pit. The 1770, 1740, 1720 and 1690 dumps are built into the Line Creek Valley and a dump at 1810 backfills the north end of the pit (Enclosure 12: Mine Plans - Ultimate Pit).

3.3 Pit Slope Design for M.S.A.N. Pit

The conditions of steep topography and bedding dipping 35° - 60° into the hillside have shaped a pit that daylights to the east and has a single highwall on its west side running parallel to topography and the strike of the bedding. The endwalls have been created naturally by steep gullies cut into the hillside.

The configuration of the highwall is very similar to the east hanging wall of the original North Line Creek pit. A slope stability analysis of this latter wall was completed by Piteau Assoc. in January 1986. Their recommendations have been followed for the preliminary design of the M.S.A.N. pit. Using 12 metre benches, a 10 metre berm is left every other bench, for an overall slope angle of 47.5°. The failure modes considered to control bench stability are stepping wedge and stepped plane failures. Backbreak is anticipated to be high and controlled blasting should be utilized.

Trial slopes or slope documentation will be used to evaluate and update the slope design on an ongoing basis.

3.4 Coal Reserves

In the proposed M.S.A.N. Pit, the calculated waste and coal volumes are as follows:

Waste:	15,132,000 BCM
Coal:	4,859,700 ROM tonnes
Strip Ratio:	3.11:1

Factored into these numbers are a 3% rehandle, 20% coal loss and a coal specific gravity of 1.5. For planning purposes, 75% of these reserves are considered to be metallurgical coal and 25% are thermal coal. The thermal coal is composed of near-

surface oxidized metallurgical coal and the "thermal" portion of the layered seams as referred to in section 2.4.

3.5 Waste Disposal

Waste disposal from the pit will comprise eight dumps that wrap around to the north and one dump that backfills the north end of the proposed pit. The wrap around dumps have been analyzed by Piteau and Associates. Disposal of soils and overburden would be placed in the dumps, these would not constitute large volumes because of the nature of the topography.

3.6 Water Management

A surface water management plan has been prepared to achieve the following objectives:

(1) Maintain water quality in Line Creek to comply with Waste Management Branch permit objectives during mine development.

(2) Separate all potentially sedimented tributaries and surface water for abatement prior to discharge into Line Creek during mine development.

(3) Design all hydraulic control, conveyance and treatment structures to handle expected flows (minimum one in 10 year flow).

Considerations for water management and drainage control related to the M.S.A.N. development deal with the following areas:

1. Mine Aocess Road Runoff

2. Tributaries of Line Creek

3. Line Creek

4. Settling Pond/Sediment Traps

3.6.1 Mine Access Road Runoff

Runoff from the mine access road will be directed into a ditch on the inside of the road, and thus carried downhill to the Mine Services Area and ultimately into Ponds 5 and 6. The ditch will be approximately 1.5 metres wide and 0.5 metres deep.

3.6.2 Tributaries of Line Creek

Three small creeks flow in steep gullies located across the south, middle and north portions of the site. Whereas, the north gully flows year round into Line

Creek, the flow in the middle and south gullies disappears into the alluvium and coarse colluvium of the Line Creek flood plain, indicating the minor nature of the flows in these creeks.

The south and middle gullies will be intercepted by the pit. The north gully serves as the site for the initial waste dump. The expected flow rates in all the gullies is low, but in order to ensure that the waste dump will convey the surface flows, the dump will be constructed within the gullies using select, competent, coarse-grained waste rock.

Sediment control will be maintained by directing the flow from these creeks into a ditch leading to a settling pond, which will be constructed immediately downstream from the mining area. It is anticipated that much of the flow will infiltrate to ground prior to reaching the pond.

3.6.3 Line Creek

Sedimented runoff from the mining area will be kept away from Line Creek by construction of a protective berm (as outlined in the report from Piteau Engineering addressing the stability evaluation of the proposed waste dump), and an associated ditch on the inside of the berm.

A short section of Line Creek will have to be diverted but the stream gradient will not change.

3.6.4 Settling Ponds and Sediment Traps

Baffle dykes may be placed at regular intervals across the ditch in the valley floor, in order to create small sediment traps, and minimize the sediment entering the settling pond. This will allow the maximum area for infiltration within the pond and thus likely eliminate any direct discharge into Line Creek.

Should the need arise, there is an opportunity for further treatment of runoff from the mining area. A longer section of Line Creek could be relocated to the east side of the valley, thus creating space for additional settling ponds.

3.6.5 Groundwater

This has also been addressed in the report noted above from Piteau Engineering.

4.0 IMPACTS AND MANAGEMENT

Enclosure 12: Mine Plans - Ultimate Pit

Enclosure 13: Mine Cross Sections

Enclosure 14: Wildlife Habitat Units

4.1 Wildlife

Approximately 80% of the nearly 100 ha. constituting the proposed pit/waste dump area is Class 4 summer range for bighorn sheep, and Class 3 summer range for elk, moose and mule deer. Habitat capability is restricted by steep slopes and high snowfall. The area contains several avalanche tracks, which contribute to high habitat diversity. Approximately 15% of the area of potential disturbance is Class 3 summer range for bighorn sheep, elk, moose and mule deer, limited by steep slopes, avalanche tracks, and high snowfall. The remaining 5% of the area is Class 4 summer range for moose, bighorn sheep and elk, and Class 3 summer range for mule deer. This area is sub-alpine meadow with upland forest soils and receives high snowfall. (Enclosure 14)

According to Demarchi, et al 1983 "Wildlife Capability Classification for British Columbia: An Ecological (Biophysical) Approach For Ungulates", winter range availability is usually the limiting factor for ungulate populations. There is an area of Class 3 moose winter range in the valley bottom adjacent to the proposed development, but mining activity will not encroach on it. Class 3 moose winter range has moderate capability, and can support 1.6-3.0 animals per square

kilometre per year under optimum conditions, therefore every effort will be made to minimize encroachment.

Class 3 and 4 summer range have moderate to low capabilities respectively and can support 0.4 to 3.0 animals of any one species listed per square kilometre per year. The proposed pit and dump development encompasses approximately one square kilometre, all of which is summer range, not generally considered limiting. It is anticipated that bighorn sheep utilizing the area irregularly throughout the spring, summer and fall will continue to do so as mining progresses, as has been the experience with Line Ridge mining development to date. Research indicates that moose are highly tolerant to loud noises and mining machinery activity as long as they are able to withdraw from it at will, and are expected to continue to use the adjacent Class 3 winter range when not limited by ecological factors like high snowfall. Elk and deer are expected to avoid the active mining area during development, but will benefit from reclamation efforts. Mining will displace approximately 100 ha. of summer range in the short term, which will be replaced by reclamation over the life of the mine.

Rehabilitation of the site will involve establishment of vegetation on resloped waste dumps to replace wildlife habitat capabilities temporarily displaced by mine development. The pit and associated waste dumps cover

approximately 100 ha., of which approximately 58 ha. will be re-vegetated to grasses, shrubs and conifers at abandonment. Planting highly productive agronomic grasses and legumes has been demonstrated in the Elk Valley to significantly increase the carrying capacity of some habitat types. Where summer range is being replaced, successful reclamation is expected to replace enough range to support the number of animals as were previously supported.

Site restoration will be ongoing, commencing with reclamation of early construction disturbances and continuing until all waste dump areas have been successfully re-vegetated. Detailed annual reclamation plans will be forecast in the appropriate Reclamation Permit reports submitted annually to the Head of Reclamation, Ministry of Energy, Mines and Petroleum Resources. The company will regularly monitor reclamation success to ensure that end land-use objectives (re-establishment of wildlife habitat) are being met.

4.2 Fisheries

Line Creek in the lower vicinity of the proposed development is described by B.C. Research (Stage II Environmental Study of the Line Creek Project, 1977) as "narrow, shallow and straight with few pools". Average gradient is 1.7%, and pool value is rated as Class 2 (depth approximately 2 feet and length greater than average channel width). Swift, straight, thickly

vegetated riffle areas are common. The presence of cutthroat trout and bull trout are probable but unconfirmed. In the upper stream reaches adjacent to the planned pit, Line Creek flows are intermittent, flowing underground in places. No fish populations are expected to persist in this area.

A toe berm and collector ditch between the mine development and Line Creek will be constructed to maintain water quality and channel integrity in the stream, and protect the riparian habitat which constitutes a portion of the Class 3 winter range for moose. A fisheries mitigation program to offset the loss of fish populations displaced by the rock drain in Line Creek upstream of the confluence with South Line Creek has already been implemented. Additional work to finalize the project will be undertaken in 1991, and will involve riprap placement on Line Creek and planting of willow clumps within the South Line Creek diversion channel. A monitoring program is ongoing to ascertain that the fisheries mitigation work is effective, and maintenance-free.

4.3 Recreation/Trapping

Vehicle access to the upper Line Creek valley is available to hunters and other recreationists via summer road from the Grave Lake area. Winter access is also available to snowmobiles over this same route, which skirts active mining areas to ensure public and worker safety. Development associated with the proposed mine will encroach on a

portion of the access road to the upper valley, and the company will ensure that access is maintained to those areas, possibly through construction of a short bypass road. A portion of the waste dump development may impinge on a trapline and cabin owned by a local trapper. To eliminate possible safety hazards associated with waste dump construction, the company will undertake to develop an action plan that will re-establish the trapper's facilities in an area not subject to future mining disturbance.

4.4 Archaeological/Historic Resources

Prior to development of the Line Creek Mine, a Heritage Resource Assessment was completed in 1976, which investigated the Line Creek/Ewin Pass area for evidence of historic heritage sites. A four man survey team conducted archaeological reconnaissance for a six week period, and identified sites in the lower Line Creek canyon area, as well as evidence of prehistoric cultural deposits at the summit of the west passage of Ewin Pass. The report does not document the existence of cultural sites in the area enclosed by this proposal. (Choquette, 1976)

4.5 Nitrogen Export

Ferguson and Leask (1988) developed a procedure for forecasting nitrogen export from Coal Mines as a function of type and quantity of explosives used.

For mines using ANFO, annual nitrogen export was 0.2% of the nitrogen contained in the ANFO, 98% of which showed up as an increase in nitrate values in receiving waters. ANFO is considered to be 33% N by weight. At a powder factor of 0.47 (kg ANFO per BCM of waste rock), it takes 705,000 kg of ANFO to produce the 1,500,000 BCM of waste rock annually for this pit development, which equates to a nitrogen content of 232,650 kg. The annual nitrogen release forecast by the Ferguson and Leask (1988) method would be 465 kg.

Nanuk (1988) used measured concentrations of nitrate, nitrite and total ammonia from Jan. 1983 to Dec. 1988 on Line Creek to calculate the distribution of loading on a monthly basis as a percentage of annual load. Flows in Line Creek downstream of the proposed development are related to measured flows at the mouth using a ratio of drainage areas of the two sites. The drainage areas are:

(a)	Line Creek at mouth	138 km^2
(b)	Line Creek U/S proposed pit	30.5 km^2

Using this ratio, flows in Line Creek upstream of the location of the proposed development are 22% of flows measured at the mouth.

The total potential annual nitrogen export from the development is apportioned over the year according to the

monthly percentages developed in Nanuk Engineering 1989, producing the following total monthly increases:

MONTH	PERCENT OF YEARLY TOTAL OF NITROGEN ADDITION	NITROGEN EXPORT FROM PROPOSED DEVELOPMENT (KG)
January	5.4	25.1
February	3.8	17.7
March	3.1	14.4
April	12.5	58.1
May	17.8	82.8
June	19.1	88.8
July	8.3	38.6
August	7.4	34.4
September	6.4	29.8
October	8.0	37.2
November	4.2	19.5
December	4.0	18.6
TOTAL	**100%**	**465.0**

Loading is calculated by apply the monthly nitrogen available for export to the average minimum daily flow on Line Creek at the proposed development site. Flows from the drainage area upstream of the site are calculated, and potential increases in nitrogen loading are as follows:

MONTH	AVERAGE MINIMUM DAILY FLOW (M^3/SEC)	TOTAL DAILY NITROGEN INCREASE (KG)	CHANGE IN CONCENTRATION OF NITROGEN COMPOUNDS (MG/L)
January	.0869	.8097	0.108
February	.0867	.632	0.084
March	.0899	.4645	0.059
April	.1096	1.937	0.205
May	.4129	2.671	0.075
June	.964	2.96	0.036
July	.4066	1.245	0.035
August	.2673	1.11	0.048
September	.2112	.993	0.054
October	.1797	1.2	0.077
November	.1223	.65	0.061
December	.0968	.6	0.072

Of these nitrogen compound increases due to export from blasting, Nanuk (1989) suggests that the inorganic nitrogen load is 87% nitrate-N, 11% ammonia-N and 2% nitrite-N.

Adding these values to average nitrogen concentrations just downstream of the proposed development at water sampling station 0200335 represents an estimate of expected water quality as a result of ANFO use during mining. The recorded values for nitrogen at station 0200335 represent nitrate ***plus*** nitrite ***plus*** ammonia averaged by month over a

five year sampling program, 1983 - 1988 and presented in Nanuk (1989).

MONTH	AVERAGE RECORDED N CONCENTRATION AT STN. 0200335 (MG/L)	EXPECTED N CONCENTRATION AT STN. 0200335 AFTER DEVELOPMENT (MG/L)
January	0.188	0.296
February	0.153	0.237
March	0.305	0.364
April	0.171	0.376
May	0.043	0.118
June	0.097	0.133
July	0.047	0.082
August	0.058	0.106
September	0.064	0.118
October	0.115	0.192
November	0.107	0.168
December	0.099	0.171

Nanuk (1989) states that leaching of explosive residue from the waste rock will result from surface runoff and vertical percolation of precipitation, and that these mechanisms are assumed to export nitrogen over a longer time frame than within the same year the waste is placed in the dump.

4.6 Reclamation

The objective of project reclamation will be to re-establish wildlife habitat values similar to those that existed prior to mining. Reclamation at Line Creek involves the rehabilitation of mining disturbances such that a diverse, effective and self-sustaining mosaic of native and agronomic vegetation species and other abiotic topography features such as rock piles, snags, cracks, ledges, holes and surface undulations are provided in a combination suitable as wildlife habitat. The aim is to provide habitat which is compatible with the needs of elk and Rocky Mountain Bighorn Sheep during spring, summer, and early fall, the period of potential use by these species on Line Ridge. These two species are common to the area both prior to and during the mining operation, and are therefore the target species for C.N.R.L. reclamation efforts (B.C. Research 1977, TAESCO 1982, TAESCO 1983). By improving the habitat for a key wildlife species, it is expected that other wildlife species will benefit as well, since the complex of wildlife species within a given plant community generally have similar habitat requirements (Green & Yonge, 1984). Waste dump slope angles will be reduced as required to ensure stability for vegetation re-establishment. Operational mine planning will incorporate measures to salvage till/topsoil where feasible. The material will be stockpiled on waste dump platforms, then spread after resloping to accelerate vegetation re-establishment. Ongoing research at the Line Creek mine has identified an

effective mix of grasses and legumes that readily provide vegetative cover on reclaimed waste dump slopes, as well as forage for ungulates using the area. Reclamation techniques will be incorporated to develop topography features capable of providing habitat diversity, and will follow the guidelines established in the Reclamation Plan for Reclamation Permit C-129. It is the company's intention to keep reclamation following closely behind mining to minimize the amount of area that is under disturbance at any one time. The final mine configuration after reclamation is illustrated in Enclosure 12: Mine Plan - Ultimate Pit and associated cross sections.

Backfilling will cover in a portion of the pit area, and these dumps within the pit will also be subject to reclamation similar to the out-of-pit dumps. Where backfilling is not feasible, a depression will remain that will eventually partially fill with water to as yet unknown recovery levels. In-pit pond development will be monitored to determine the potential for establishment of willow or other shoreline vegetation as forage for moose in the area. As well, the potential for a pond fishery will be investigated.

4.7 Logging

Merchantable timber will be removed from the site prior to development.

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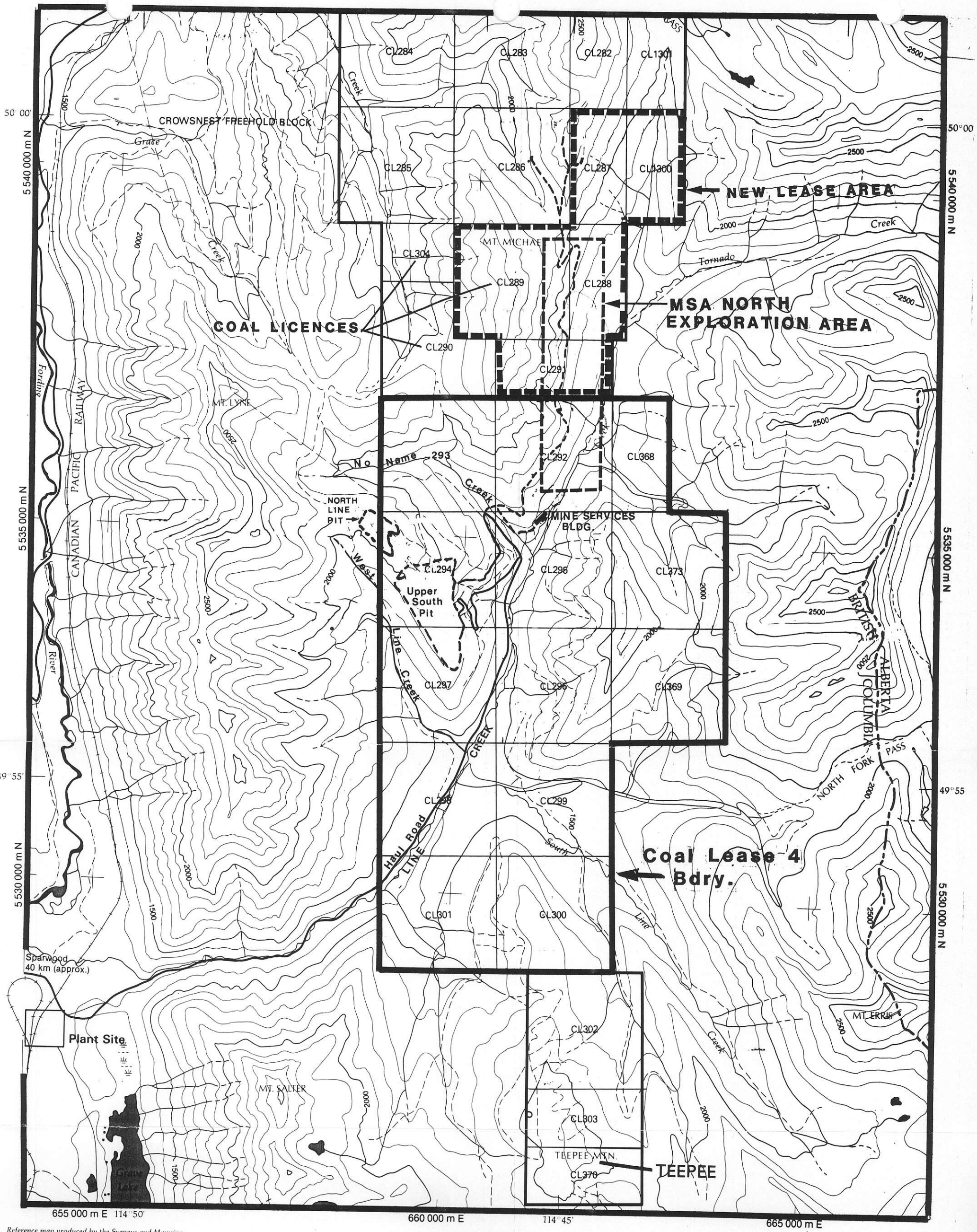


Reference map produced by the Surveys and Mapping Branch, Department of Energy, Mines and Resources in 1975 and updated from 1979 Province of British Columbia 1:100.000 mapping. Metric contours were manually interpolated.

Scale 1:50 000

Kilometres 0.5 0 0.5 1.0 1.5 2.0 2.5 3.0 Kilometres

Miles 0.5 0 0.5 1.0 1.5 2.0 Miles

Contour Interval 100m

Transverse Mercator Projection

Universal Transverse Mercator Grid Zone II

Legend

- Road; Highway, Main road
- Road; Loose surface, Dry weather
- Track or trail
- Railway
- River
- Stream
- Contours (2000, 1500)
- Licence boundary
- Licence group boundary

T.N. 1°43' Grid North

Crows Nest Resources Limited

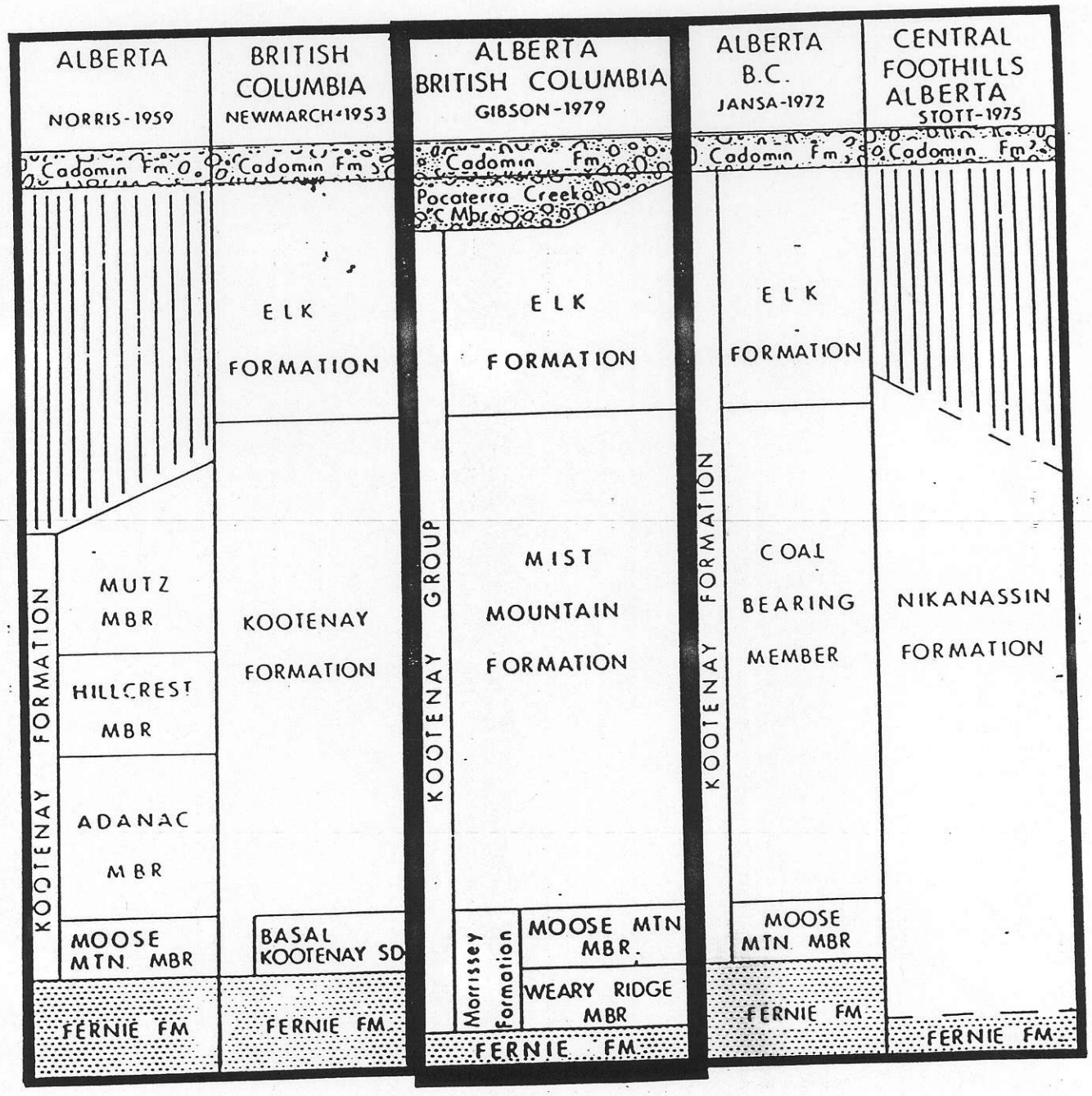
INDEX MAP
MSA NORTH

AUTHOR: JWK	SCALE: 1:50 000	ENCLOSURE No.:
DATE: FEB 91	REVISED:	FA – 131
To Accompany		

ENCLOSURE # 1

TABLE OF FORMATIONS

Nomenclature of the Kootenay Group (after Gibson, 1979)



ENCLOSURE 2

CL285

CL286

CL287

CL1300

CL304

CL289

CL288

CL290

CL291

COAL LEASE #4

NORTH LINE PIT

UPPER PIT

UTM 5535000N

UTM 660000E

COAL LEASE No. 4

Crows Nest Resources Limited
EXPLORATION
S.E. BRITISH COLUMBIA

REGIONAL GEOLOGY MAP

UTM ZONE 11

DRAWING No. RM2U03

MAP INDEX

SCALE 1:20000

LEGEND

- THRUST FAULT (indicates upthrown side)
- ANTICLINE
- SYNCLINE
- COAL SEAM (definite, assumed)
- GEOLOGIC CONTACT (definite, assumed)
- BEDDING ATTITUDE
- ADIT
- TRENCH
- ROTARY DRILL HOLE
- DIAMOND DRILL HOLE
- SANDSTONE
- SHALE
- SILTSTONE
- COAL OUTCROP
- CONGLOMERATE

CRETACEOUS
- Kbl BLAIRMORE GROUP

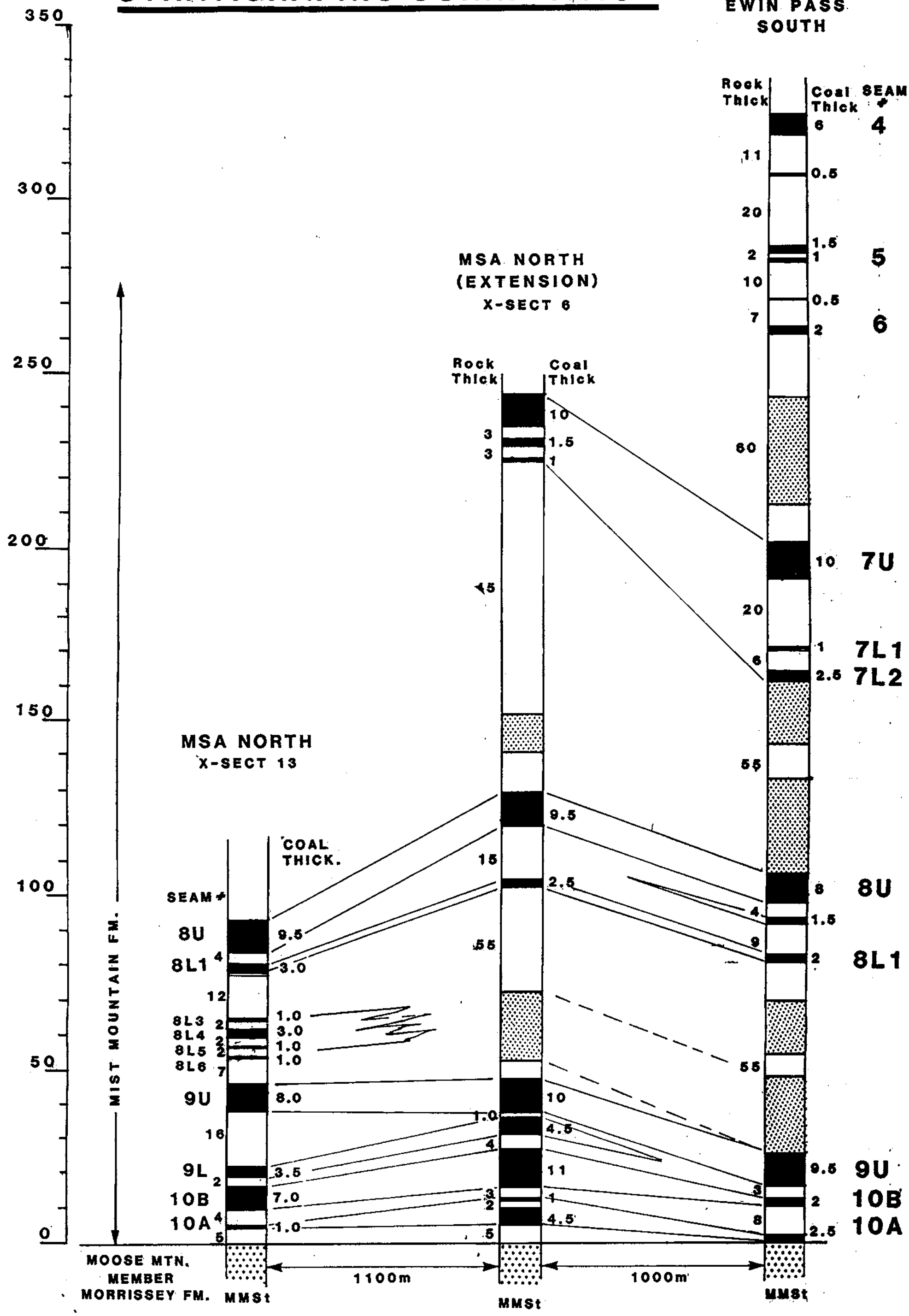
JURASSIC – CRETACEOUS
- JKk KOOTENAY GROUP
  - JKe ELK FORMATION
  - JKmm MIST MOUNTAIN FORMATION
  - JKm MORRISSEY FORMATION

JURASSIC
- Jf FERNIE FORMATION

GEOLOGY–McKINSTRY 1984

ENCLOSURE #3

STRATIGRAPHIC CORRELATION



ENCLOSURE # 4

CL284
CL283
CL282
CL1301
CL285
CL286
CL287
CL1300
CL304
CL289
CL288
CL290
CL291
MSA NORTH
CROSS SECTIONS (ENCL#6)
AREA ENCOMPASSED BY 1:2000 PLANS (ENCL#12)
Coal Lease #4
Main Office
NORTH LINE PIT
LOWER PIT
UPPER PIT
HORSESHOE RIDGE
COAL LEASE No. 4
DRY CREEK
ALEXANDER CREEK SYNCLINE
MOUNT MICHAEL THRUST
ERWIN THRUST
TWIN ANTICLINE THRUST
LEWIN PASS ACCESS
MSA NORTH RD
MINE SERVICES RD
ADIT 1
ADIT 2
ADIT 4
2
4
6
8
10
12
14

Crows Nest Resources Limited
EXPLORATION
S.E. BRITISH COLUMBIA

ELK VALLEY COALFIELD
-CNRL PROPERTIES-
SHEET 3 of 3

NTS-82G/15 & 82J/2 | UTM ZONE 11
AUTHOR: B. MACKENZIE | SCALE: 1:10000 | DRAWN BY: TCH, RGF
DATE: 84 • 04 | REVISED: | DRAWING No. RM2U03

MAP INDEX

SCALE 1:10000

LEGEND

- THRUST FAULT (indicates upthrown side)
- ANTICLINE
- SYNCLINE
- COAL SEAM (definite, assumed)
- GEOLOGIC CONTACT (definite, assumed)
- BEDDING ATTITUDE
- ADIT
- TRENCH
- ROTARY DRILL HOLE
- DIAMOND DRILL HOLE
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- SILTSTONE
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CRETACEOUS
- Kbl BLAIRMORE GROUP

JURASSIC – CRETACEOUS
- JKk KOOTENAY GROUP
  - JKe ELK FORMATION
  - JKmm MIST MOUNTAIN FORMATION
  - JKm MORRISSEY FORMATION

JURASSIC
- Jf FERNIE FORMATION

LEGEND:
- COAL LEASE #4
- NEW COAL LEASE AREA
- ACCESS ROAD
- CL287 COAL LICENCE

GEOLOGY & ACCESS MAP

SCALE 1:10,000

ENCLOSURE #5

00758

661000

1900. ELEV

660897

5538600

R28

CO

8U

8L1

9U

9L

10B

10A

MMST

28

LEGEND:

R28 / CO — DRILL HOLE

10B — COAL SEAM

MOOSE MTN. HANGING WALL

FAULT

661400

5538827

MAP SCALE

0 10 20 30 40 50 60 70

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 2

758

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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661100

7

8U

8L1

9U

9L

10B

10A

1900. ELEV

660920
5538600

LEGEND:

R28
CO
DRILL HOLE

10B
COAL SEAM

MOOSE MTN.
HANGING WALL

FAULT

661400
5538827

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 3

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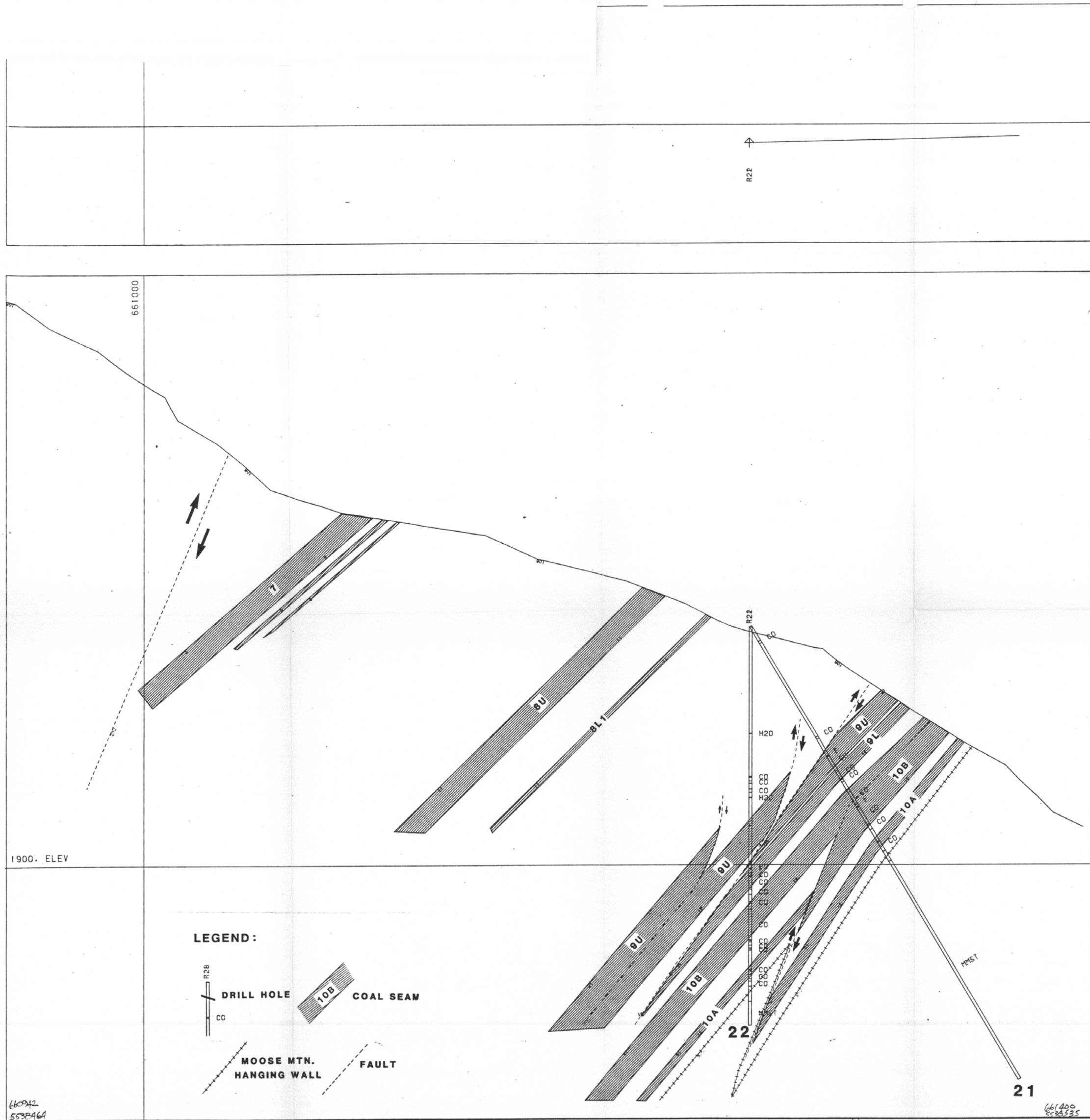

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 4

758

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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661100

7

8U

8L1

9U

9L

10B

10A

1900. ELEV

LEGEND:

R28 DRILL HOLE

CO

10B COAL SEAM

MOOSE MTN. HANGING WALL

FAULT

660950
5538356

661400
5538425

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 5

758

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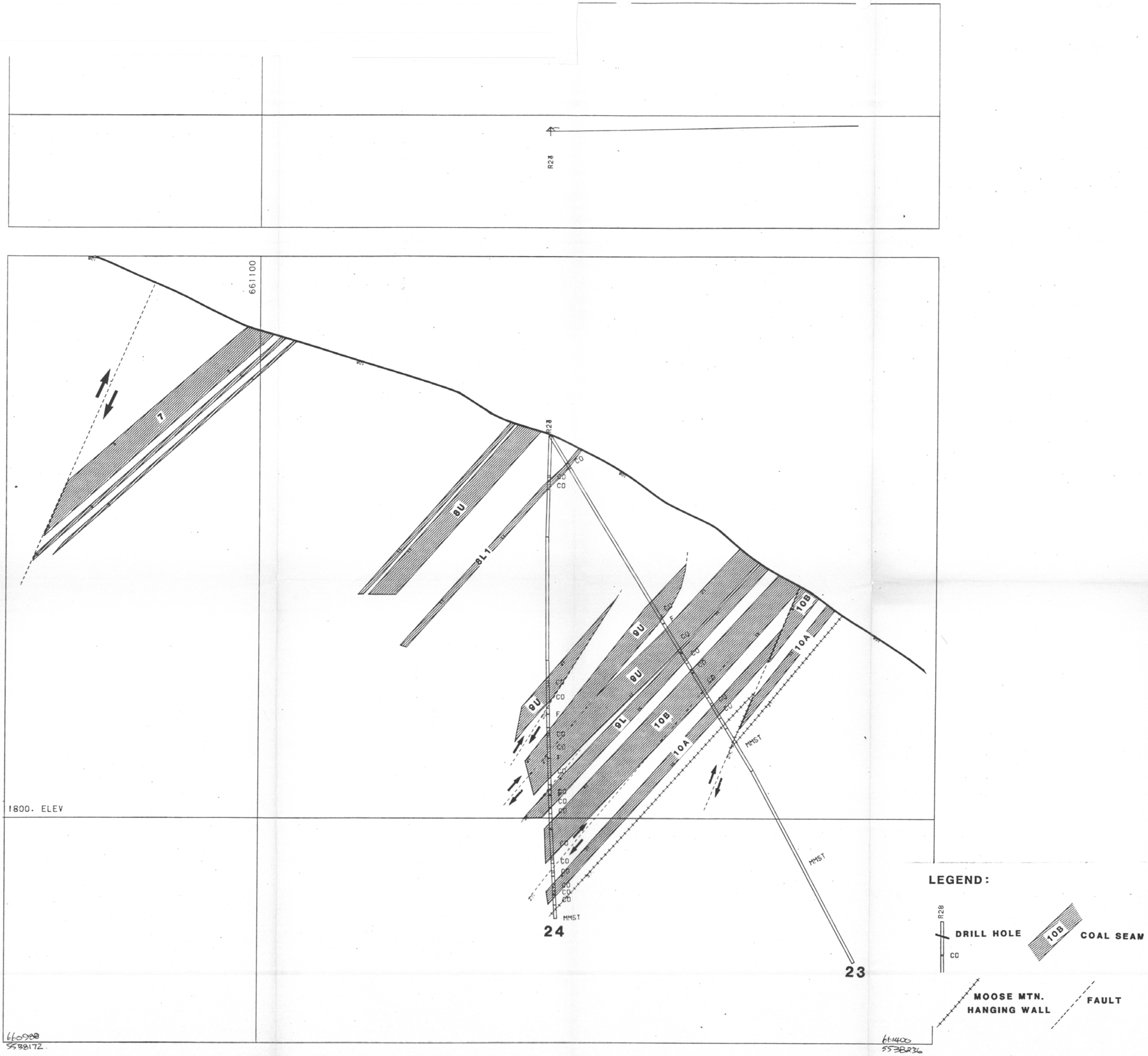

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 6

758

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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661100

7

8U

8L1

8L2

9U

9U

9L

9U

9L

10B

10B

10A

1800. ELEV

LEGEND:

R26 — CO — **DRILL HOLE**

10B — **COAL SEAM**

MOOSE MTN. HANGING WALL

FAULT

661019
5537968

661500
5538040

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 7

758

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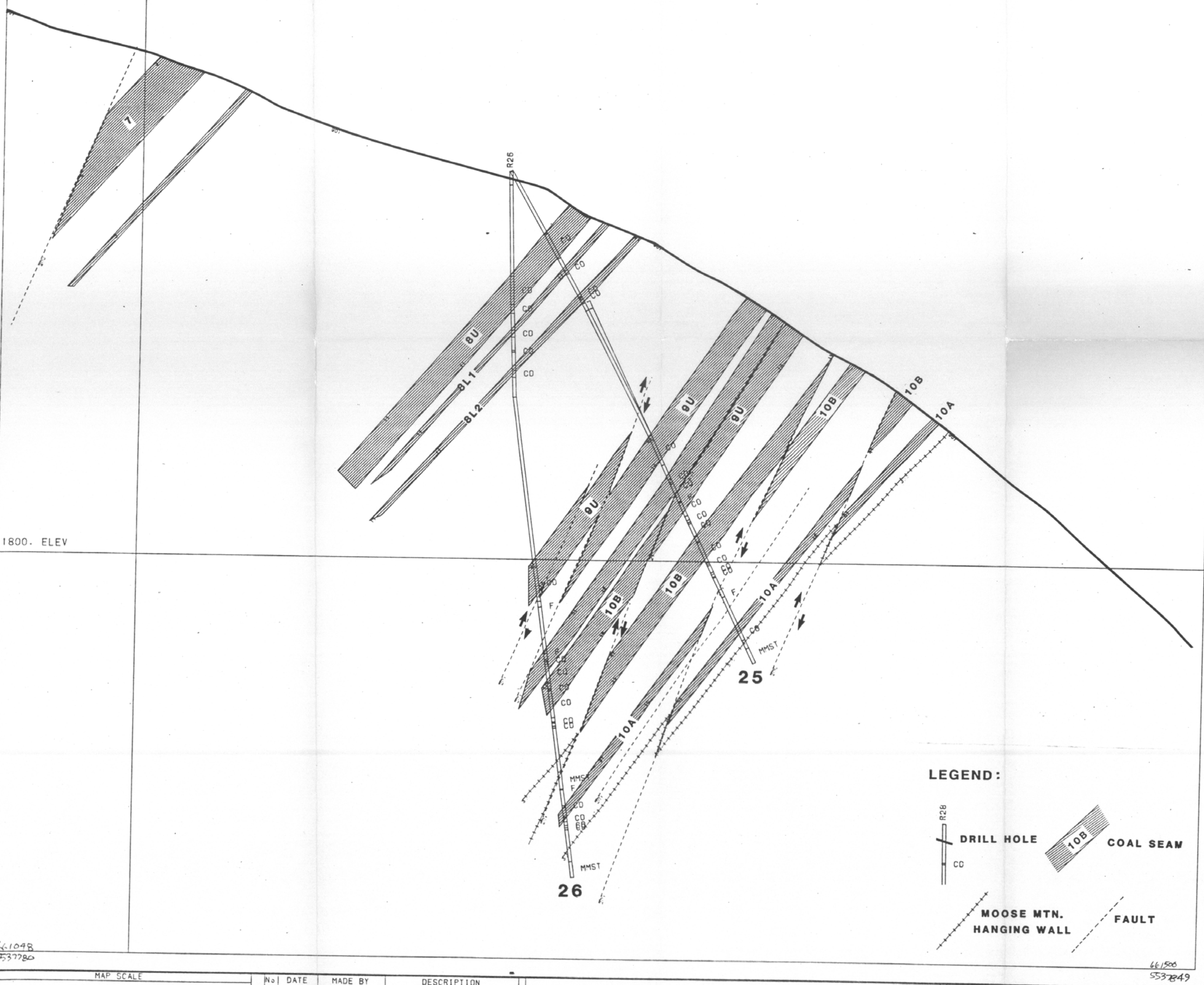
R26

661100



LEGEND:

R28 — DRILL HOLE (CO)

10B — COAL SEAM

MOOSE MTN. HANGING WALL

FAULT

661500

553849

661048

553780

MAP SCALE	REVISIONS				
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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 8

758

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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661200

8U

8L1

8L2

9U

9L

10B

10A

1800. ELEV

LEGEND:

R28 — DRILL HOLE — CD

10B — COAL SEAM

MOOSE MTN. HANGING WALL

FAULT

661500
5537680

661074
5537614

MAP SCALE

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 9

758

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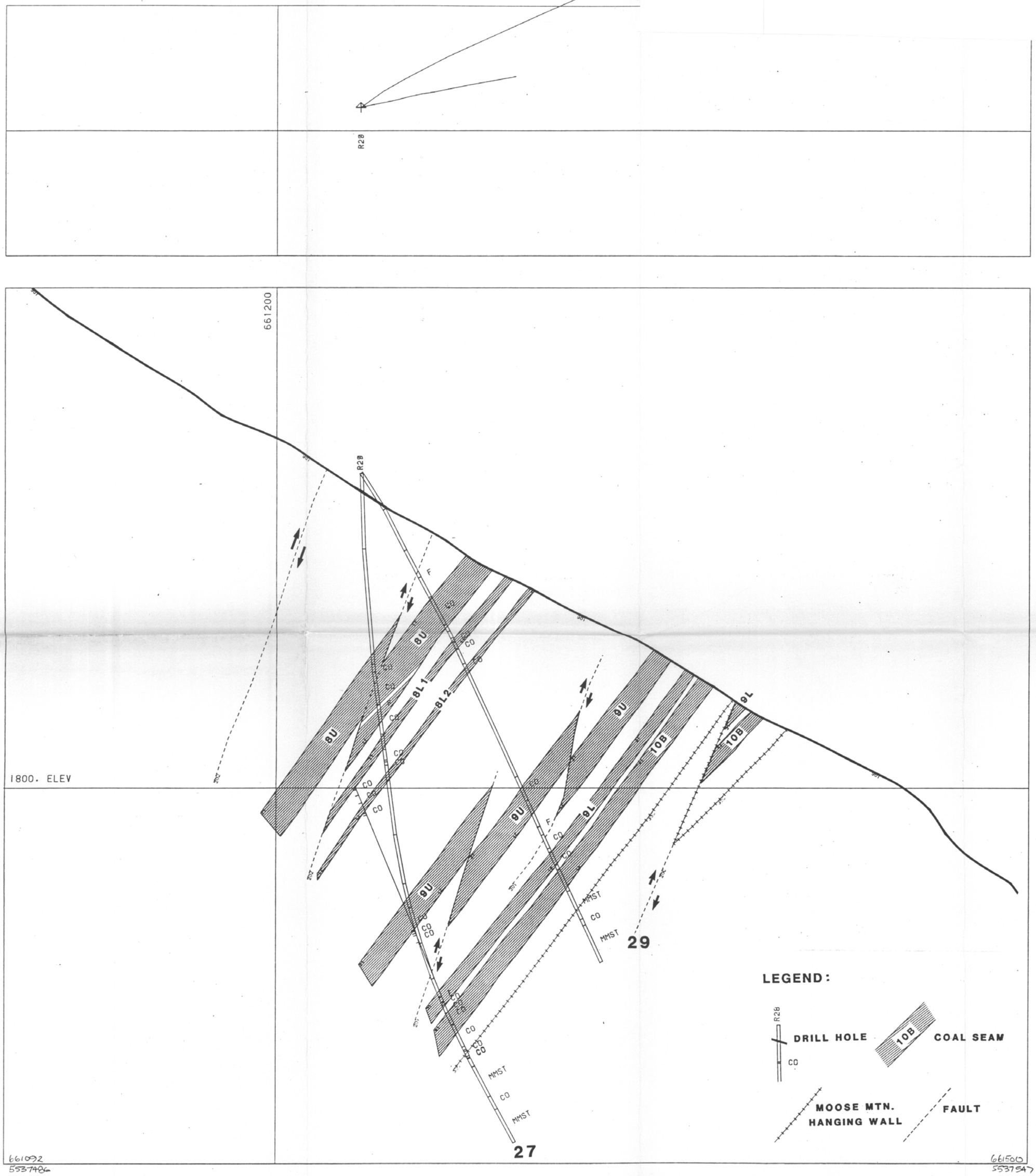

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 10

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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661200

1800. ELEV

8U

8L1

8L2

9U

9L

10B

LEGEND:

R28

CD

DRILL HOLE

10B

COAL SEAM

MOOSE MTN.
HANGING WALL

FAULT

661113
5537355

661500
5537412

MAP SCALE:

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 11

758

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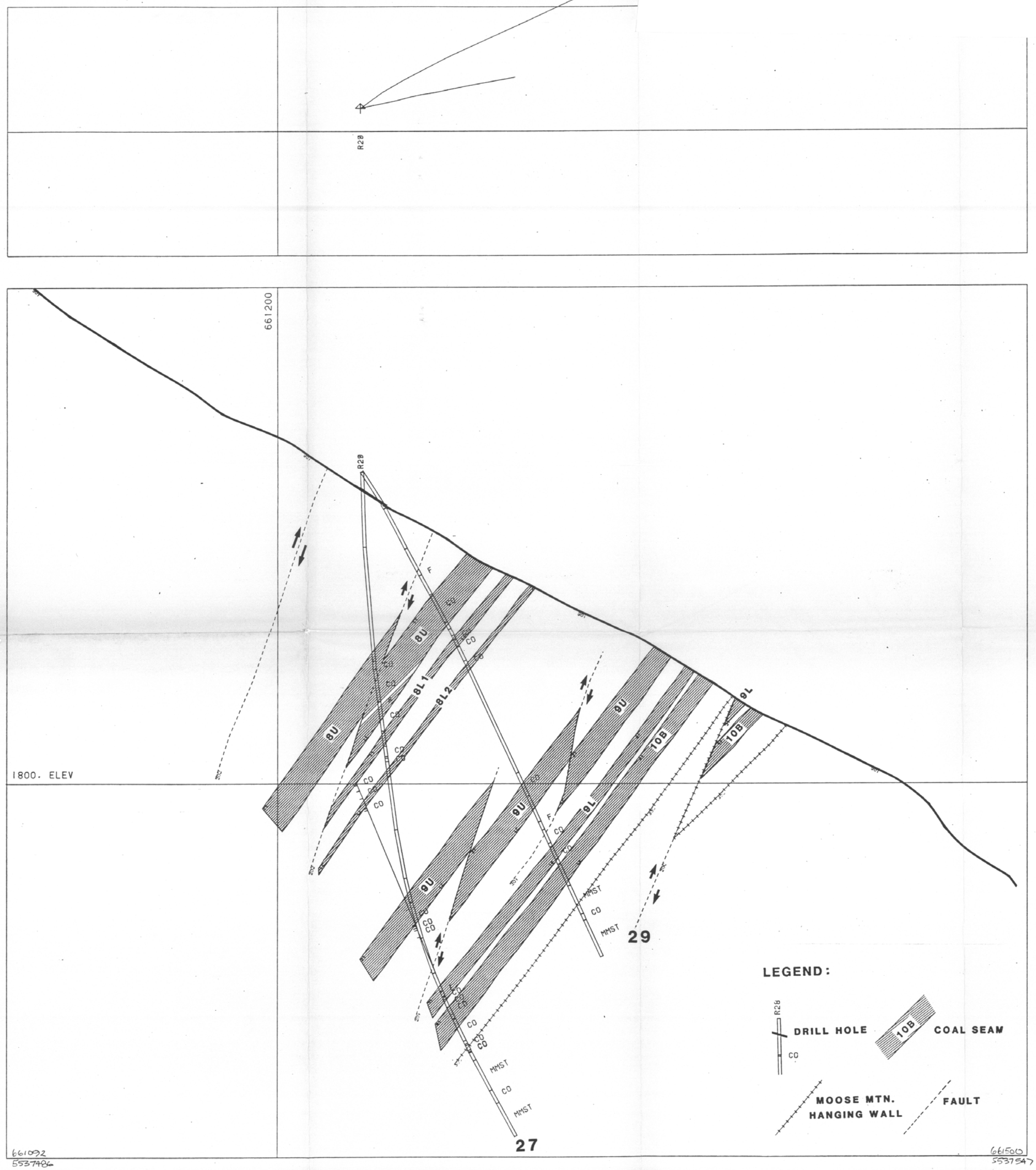

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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 10

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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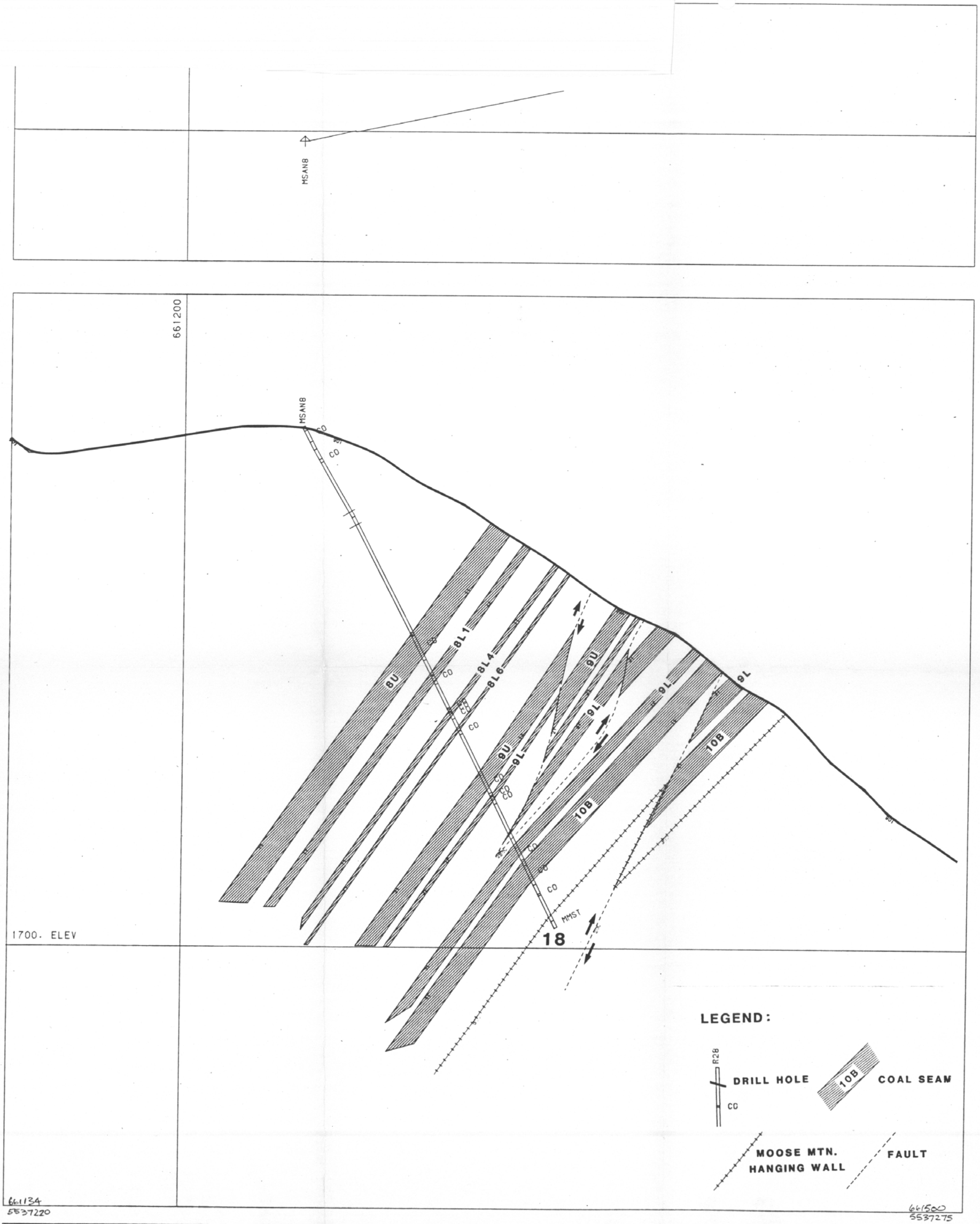

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02-18-91			

CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 12

758

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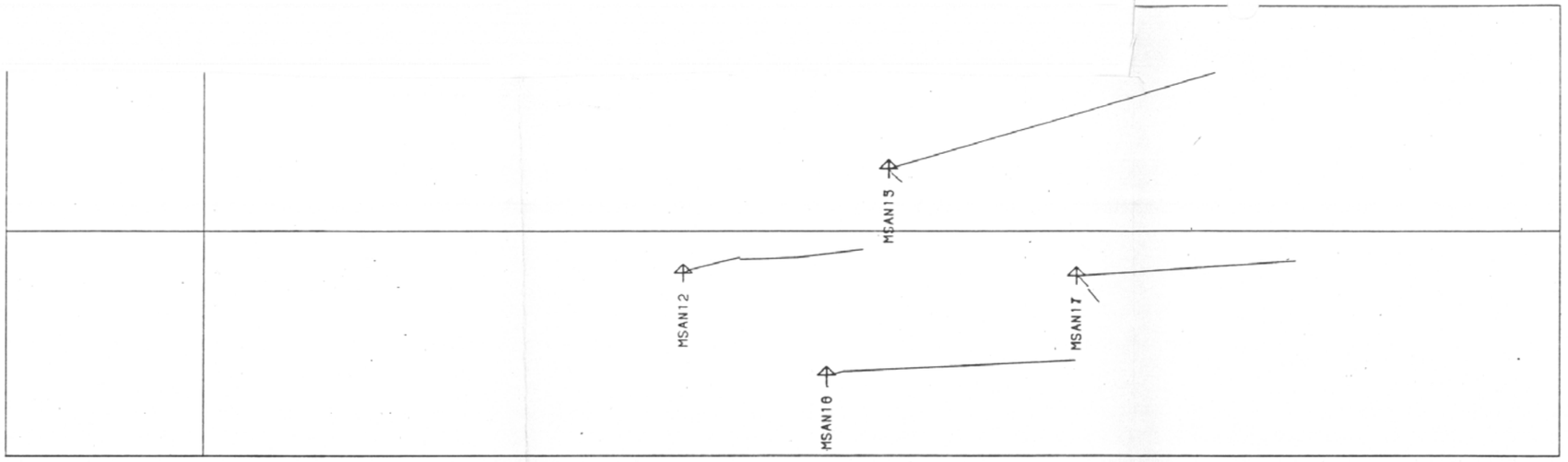

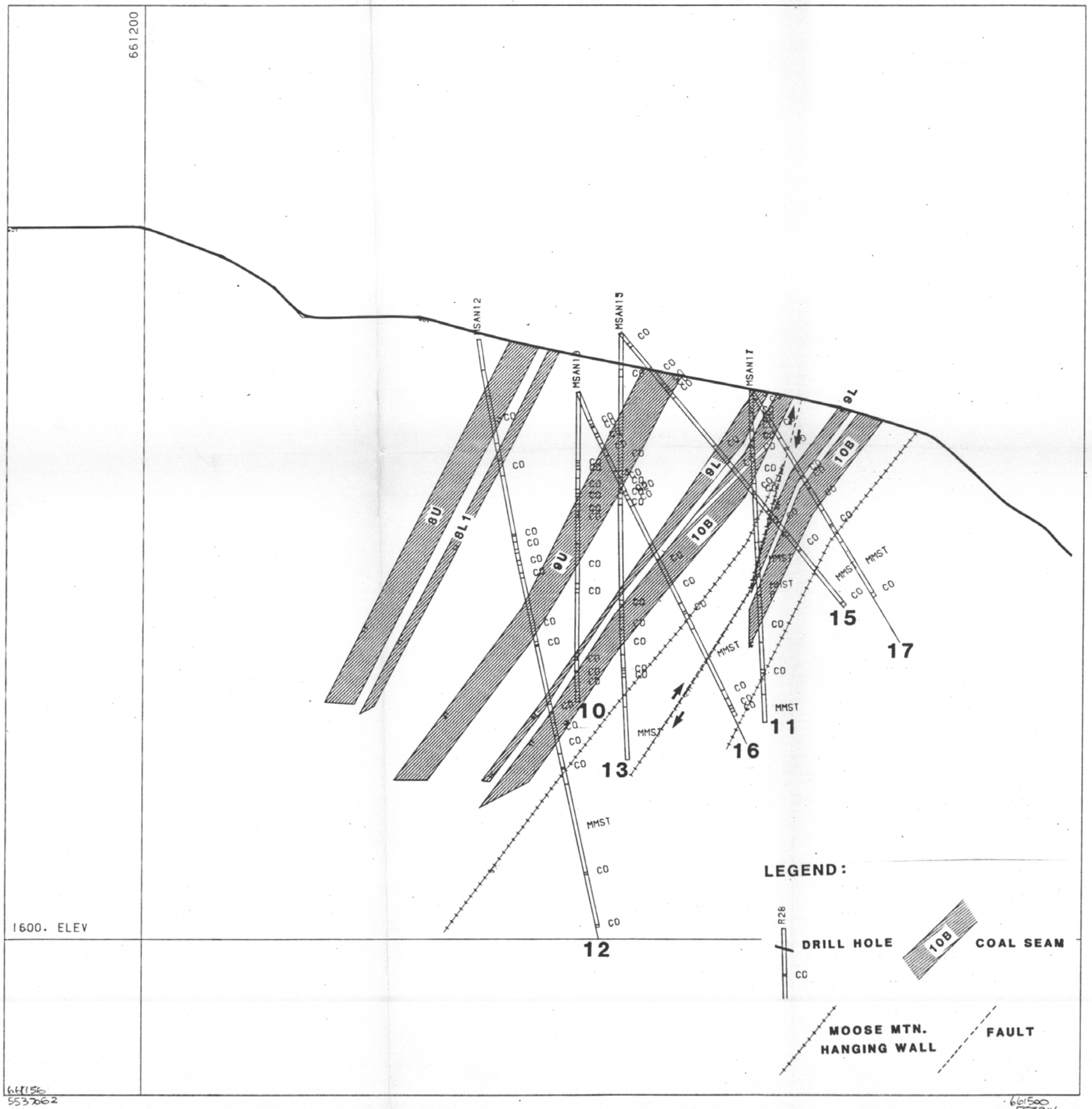

661156
5537062

661500
5537116

MAP SCALE	REVISIONS	No	DATE	MADE BY	DESCRIPTION
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DATE	DRAWN BY	CHECKED	APPROVED
02-16-91			

CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 13

758

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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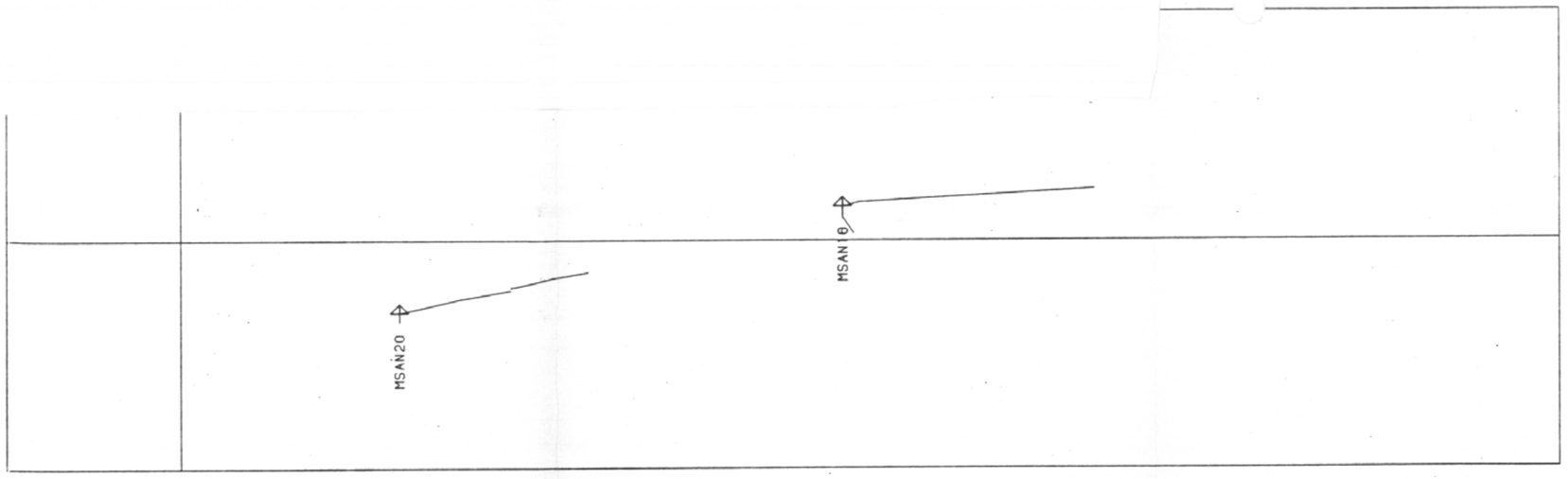

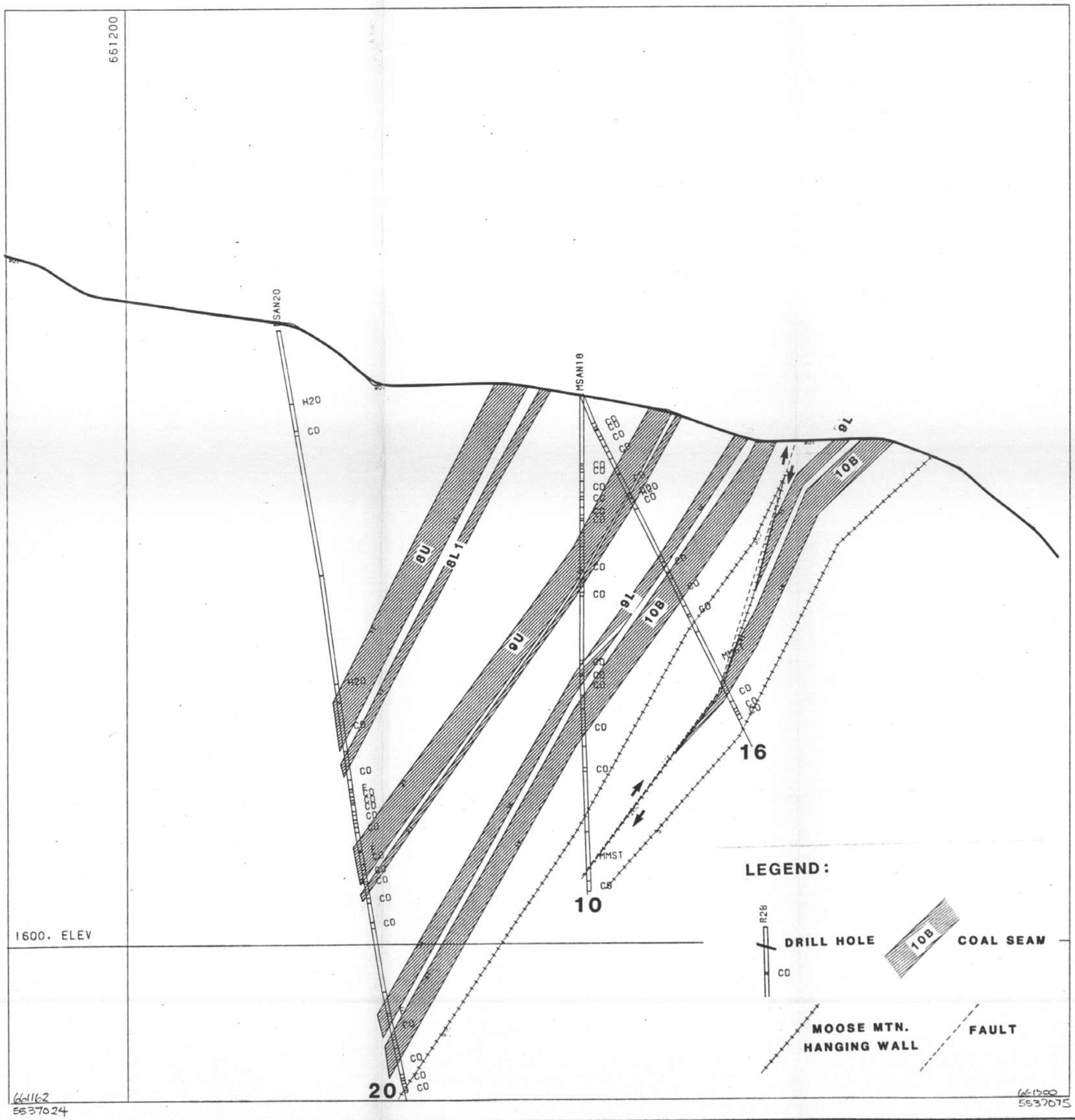

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DATE	DRAWN BY	CHECKED	APPROVED
02-18-91			

CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 14

758

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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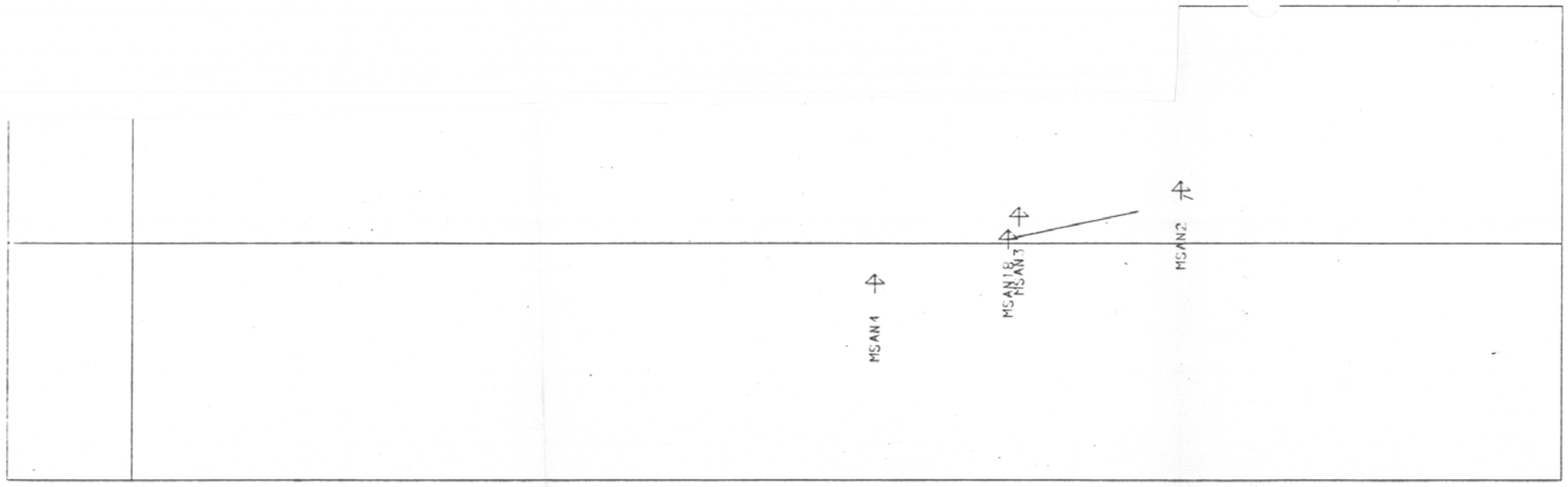

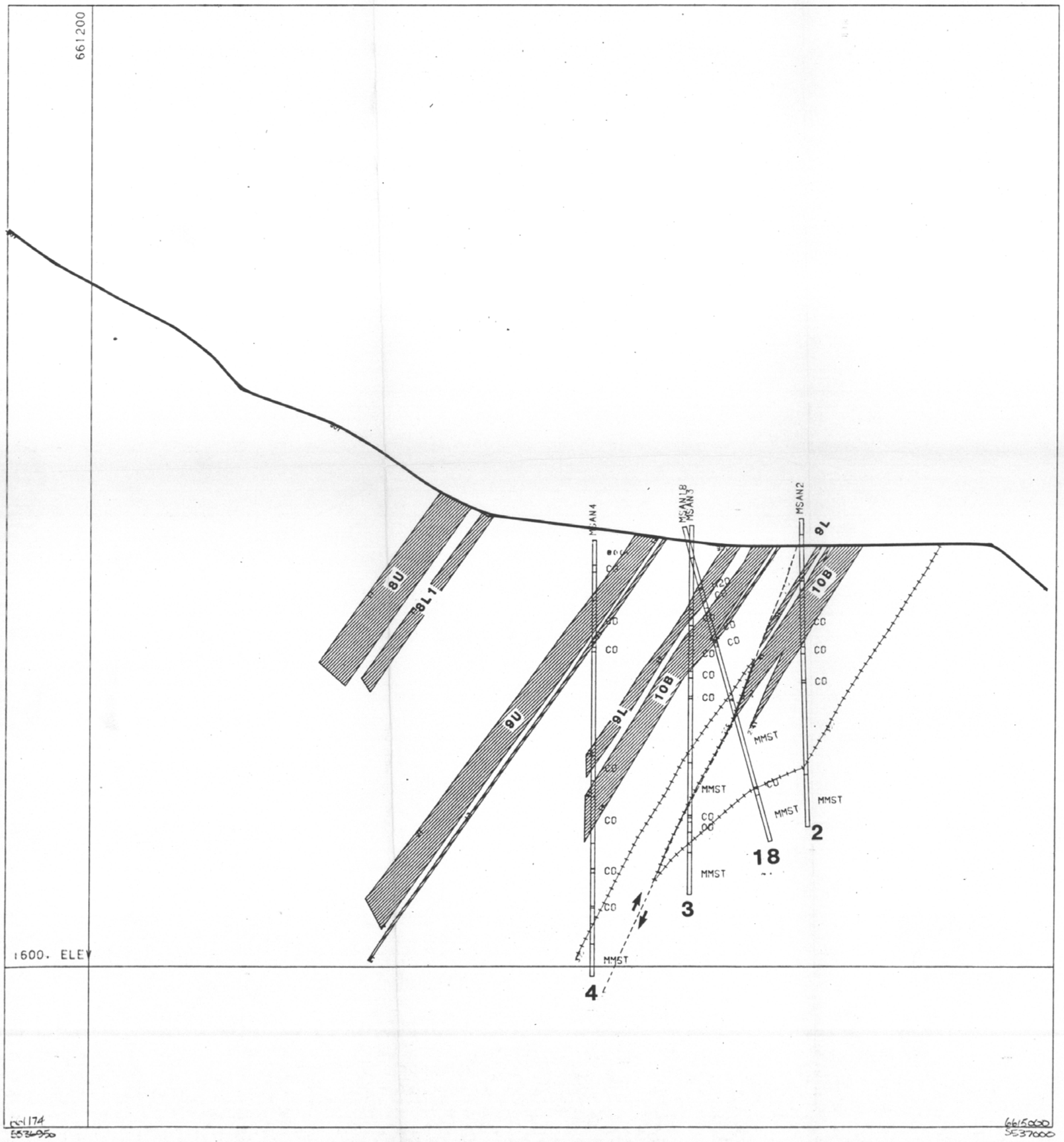

LEGEND:

R28 — DRILL HOLE — CO

10B — COAL SEAM

MOOSE MTN. HANGING WALL

FAULT

MAP SCALE	REVISIONS	No	DATE	MADE BY	DESCRIPTION
0 10 20 30 40 50 60 70		1			
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		3			
		4			
		5			

DATE	DRAWN BY	CHECKED	APPROVED
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CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 15

758

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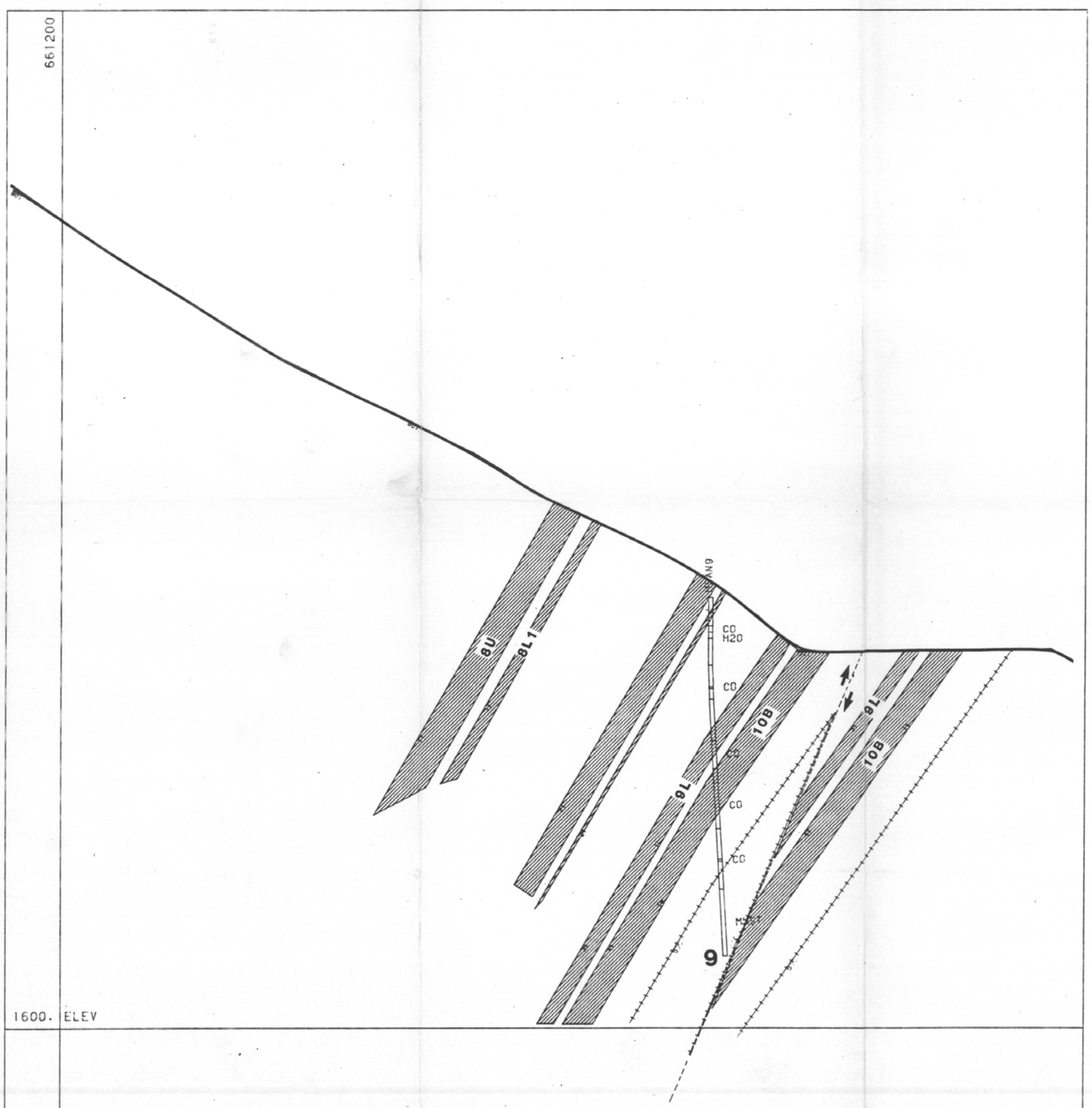
MSA NO

661200



1600. ELEV

661184
5536895

661500
5536943

LEGEND:

R28 — CO — **DRILL HOLE**

10B — **COAL SEAM**

MOOSE MTN. HANGING WALL

FAULT

MAP SCALE

0 10 20 30 40 50 60 70

REVISIONS	No.	DATE	MADE BY	DESCRIPTION
	1			
	2			
	3			
	4			
	5			

DATE	DRAWN BY	CHECKED	APPROVED
02-18-91			

CROWS NEST RESOURCES
LINE CREEK MINE

OFFICE	DEPARTMENT

MSA NORTH EXTENSION
SECTION 16

758

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
	1:1,000. M	ENCL#5

ENCLOSURE 7

LEGEND FOR MEDS COMPUTER DATABASE LISTING OF MSA NORTH DRILL HOLE DATA

HOLE NO.			UTM EASTING		UTM NORTHING		ELEVATION (m)		AZIMUTH		PLUNGE	TOTAL DEPTH (m)
R16			661342.60		5537058.30		1775.60		67.00		-67.00	126.0
R16	DEVIATION	FROM	0.00	TO	10.00	INTERVAL	10.00	AZIMUTH	67.00	PLUNGE	-67.00	
R16	DATA)	(m)	10.00	(m)	126.00		116.00	*	78.00	**	69.40	

R16	GEOPHYSICAL DEPTH (m)			HORIZON/	MEDS	RAW	RAW
R16	TOP	BASE	INTERVAL	SEAM	CODE	ASH	FSI
R16	11.40	12.20	0.80	8L3	-1.	31.4	0.5
R16	12.60	14.80	2.20	8L4	-1.	31.4	0.5
R16	16.00	18.40	2.40	8L5	-1.	24.5	0.5
R16	20.40	22.80	2.40	8L6	-1.	42.1	4.0
R16	28.40	35.50	7.10	9U	-1.	29.3	2.5
R16	36.00	37.00	1.00	9U	-1.	29.3	2.5
R16	37.00	37.10	0.10	H20	-1.	-1.0	-1.0
R16	38.60	40.90	2.30	9U	-1.	29.3	2.5
R16	60.00	63.60	3.60	9L	-1.	32.1	1.0
R16	66.00	75.80	9.80	10B	-1.***	32.1	1.0

*	IN DEGREES FROM TRUE NORTH
**	0 DEGREES = HORIZONTAL
	-90 DEGREES = VERTICAL
***	-1 INDICATES "NO DATA"

0.40 LA36.WK1

910423(TH/jb)

R1	661405.09	5537031.79	1753.84	141.00	-81.00	95.5		
R1	0.00	5.00	5.00	141.00	-81.00			
R1	5.00	20.00	15.00	132.00	-83.30			
R1	20.00	95.50	75.50	110.00	-85.90			
R1								
R1	7.00	18.30	11.30	10B	-1.	15.3	1.0	
R1	18.80	20.20	1.40	10B	-1.	7.7	1.0	
R1	22.00	23.10	1.10	10B	-1.	46.0	0.5	
R1	29.60	30.20	0.60	10A	-1.	67.0	1.0	
R1	47.00	52.60	12.00	10B	-1.	21.0	3.5	
R1	53.30	59.00	0.10	10B	-1.	-1.0	-1.0	
R1	64.50	65.50	1.00	10A	-1.	28.0	5.0	
R1	76.00	95.50	19.50	MMST	-1.	-1.0	-1.0	
R2	661418.40	5537000.10	1739.70	140.00	-82.00	96.2		
R2	0.00	5.00	5.00	140.00	-88.50			
R2	5.00	40.00	35.00	140.00	-88.00			
R2	40.00	96.00	56.00	140.00	-83.50			
R2	40.00	96.20	56.20	108.00	-87.90			
R2								
R2	19.50	22.20	2.70	9L	-1.	-1.0	-1.0	
R2	24.60	42.20	17.60	10B	-1.	14.3	2.5	
R2	50.50	51.20	0.70	10A	-1.	-1.0	-1.0	
R2	79.80	96.20	16.40	MMST	-1.	-1.0	-1.0	
R3	661385.00	5536989.80	1737.60	0.00	-90.00	115.0		
R3	0.00	115.00	115.00	0.00	-90.00			
R3								
R3	26.20	31.30	5.10	9L	-1.	29.1	1.0	
R3	34.40	45.50	11.10	10B	-1.	15.8	3.0	
R3	45.50	47.60	2.10	10B	-1.	64.4	0.0	
R3	53.30	54.00	0.70	10A	-1.	-1.0	-1.0	
R3	74.00	90.40	16.40	MMST	-1.	-1.0	-1.0	
R3	90.40	91.10	0.70	10A	-1.	33.9	3.5	
R3	92.40	95.70	3.30	10A	-1.	33.9	1.0	
R3	102.00	115.00	13.00	MMST	-1.	-1.0	-1.0	
R4	661356.70	5536972.10	1733.00	0.00	-90.00	136.0		
R4								
R4	0.00	7.80	7.80	-1.	-1.0	-1.0	-1.	
R4	7.80	10.00	2.20	8L6	-1.	35.0	4.5	
R4	18.80	31.70	12.90	9U	-1.	25.3	3.0	
R4	33.40	34.80	1.40	9U	-1.	34.0	4.0	
R4	67.20	75.00	7.80	9L	-1.	17.1	1.5	
R4	80.00	94.50	14.50	10B	-1.	17.2	3.5	
R4	102.40	103.60	1.20	10A	-1.	-1.0	-1.0	
R4	114.00	114.60	0.60	10A	-1.	-1.0	-1.0	
R4	126.00	136.00	10.00	MMST	-1.	-1.0	-1.0	
R5	661529.30	5536211.70	1587.00	0.00	-90.00	181.0		
R5	0.00	40.00	40.00	55.00	-90.00			
R5	40.00	50.00	10.00	145.00	-88.60			
R5	50.00	70.00	20.00	257.00	-86.80			
R5	70.00	181.00	111.00	81.00	-84.60			
R5								
R5	0.00	33.50	33.50	GRVL	-1.	-1.0	-1.0	
R5	76.80	86.00	9.20	9L	-1.	-1.0	-1.0	
R5	86.80	88.40	1.60	9L	-1.	-1.0	-1.0	
R5	89.80	98.50	8.70	10B	-1.	-1.0	-1.0	
R5	99.70	100.90	1.20	10B	-1.	-1.0	-1.0	

R5	108.30	110.40	2.10	10A	-1.	-1.0	-1.0	
R5	118.00	120.20	2.20	10A	-1.	-1.0	-1.0	
R5	141.00	181.00	40.00	MMST	-1.	-1.0	-1.0	
R7	661510.60		5536685.40	1696.70	0.00	-90.00	138.5	
R7								
R7	1.60	4.50	2.90	9L	-1.	27.4	0.0	
R7	5.50	7.40	1.90	9L	-1.	27.4	0.0	
R7	10.20	14.90	4.70	10B	-1.	27.9	1.5	
R7	15.90	17.40	1.50	10B	-1.	27.9	1.5	
R7	24.40	25.30	0.90	10A	-1.	22.2	1.0	
R7	32.50	138.50	106.00	MMST	-1.	-1.0	-1.0	
R8	661244.90		5537232.30	1899.20	70.00	-61.80	217.0	
R8	0.00		10.00	10.00	70.00	-61.80		
R8	10.00		40.00	30.00	70.00	-59.30		
R8	40.00		90.00	50.00	70.00	-61.90		
R8	90.00		217.00	127.00	70.00	-62.80		
R8								
R8	1.80	6.60	4.80	CO	-1.	27.3	0.0	
R8	14.20	15.60	1.40	CO	-1.	-1.0	-1.0	
R8	91.30	101.80	10.50	8U	-1.	14.9	3.0	
R8	108.50	112.20	3.70	8L1	-1.	28.9	4.5	
R8	122.50	123.00	0.50	8L3	-1.	-1.0	-1.0	
R8	124.00	124.40	0.40	8L3	-1.	-1.0	-1.0	
R8	125.10	127.20	2.10	8L4	-1.	-1.0	-1.0	
R8	132.40	133.80	1.40	8L6	-1.	44.4	1.0	
R8	151.50	159.20	7.70	9U	-1.	32.7	3.0	
R	160.20	160.70	0.50	9U	-1.	-1.0	-1.0	
R	162.10	163.80	1.70	9U	-1.	26.3	2.0	
R8	182.60	187.70	5.10	9L	-1.	21.2	2.0	
R8	190.20	198.40	8.20	10B	-1.	22.7	2.5	
R8	202.30	203.00	0.70	10A	-1.	-1.0	-1.0	
R8	214.00	217.00	3.00	MMST	-1.	-1.0	-1.0	
R9	661389.80		5536921.50	1726.70	0.00	-90.00	105.6	
R9	0.00		20.00	20.00	0.00	-90.00		
R9	20.00		30.00	10.00	80.00	-87.40		
R9	30.00		105.60	75.60	80.00	-86.60		
R9								
R9	8.40	10.30	1.90	9U	-1.	19.8	-1.0	
R9	12.00	12.10	0.10	H2O	-1.	-1.0	-1.0	
R9	26.30	26.80	0.50	CO	-1.	-1.0	-1.0	
R9	42.20	50.50	8.30	9L	-1.	22.6	2.5	
R9	54.60	68.20	13.60	10B	-1.	21.2	2.5	
R9	77.10	77.70	0.60	10A	-1.	-1.0	-1.0	
R9	86.00	105.60	19.40	MMST	-1.	-1.0	-1.0	
R10	661342.60		5537058.30	1775.60	0.00	-90.00	168.0	
R10	0.00		90.00	90.00	172.00	-88.40		
R10	90.00		160.00	70.00	136.00	-86.60		
R10								
R10	22.00	22.60	0.60	8L3	-1.	68.0	1.0	
R10	23.60	24.70	1.10	8L3	-1.	68.0	1.0	
R	27.60	31.20	3.60	8L4	-1.	36.4	2.5	
R10	32.50	33.50	1.00	CO	-1.	-1.0	-1.0	
R10	36.00	38.40	2.40	8L6	-1.	40.8	3.5	
R10	39.50	40.20	0.70	CO	-1.	-1.0	-1.0	
R10	48.60	61.50	12.90	9U	-1.	28.0	1.5	
R10	63.20	64.40	1.20	9U	-1.	27.7	4.0	

R10	85.00	86.00	1.00	CO	-1.	-1.0	-1.0	
R10	89.50	96.10	6.60	9L	-1.	13.2	1.0	
R10	100.60	112.60	12.00	10B	-1.	17.0	2.5	
R	119.40	120.60	1.20	10A	-1.	-1.0	-1.0	
R10	140.00	155.70	15.70	MMST	-1.	-1.0	-1.0	
R10	155.70	159.00	3.30	CO	-1.	23.0	2.5	
R11	661394.40		5537088.80	1776.20	0.00	-90.00	107.0	
R11	0.00		10.00	10.00	166.00	-90.00		
R11	10.00		30.00	20.00	120.00	-86.30		
R11	30.00		60.00	30.00	133.00	-85.00		
R11	60.00		107.00	47.00	132.00	-85.10		
R11								
R11	5.60	6.60	1.00	CO	-1.	21.2	1.0	
R11	7.30	12.50	5.20	9L	-1.	21.9	1.0	
R11	13.00	16.40	3.40	9L	-1.	21.9	1.0	
R11	17.90	18.50	0.60	CO	-1.	-1.0	-1.0	
R11	20.40	33.50	13.10	10B	-1.	17.4	2.0	
R11	41.60	42.50	0.90	10A	-1.	-1.0	-1.0	
R11	49.00	66.00	17.00	MMST	-1.	-1.0	-1.0	
R11	66.00	66.10	0.10	F	-1.	-1.0	-1.0	
R11	70.00	81.20	11.20	10B	-1.	17.6	3.5	
R11	90.00	91.20	1.20	10A	-1.	40.2	2.5	
R11	98.00	107.00	9.00	MMST	-1.	-1.0	-1.0	
R12	661307.40		5537076.10	1792.60	65.00	-80.00	197.0	
R12	0.00		10.00	10.00	48.00	-80.00		
R12	10.00		70.00	60.00	69.00	-79.00		
R	70.00		130.00	60.00	79.00	-77.50		
R..	130.00		197.00	67.00	74.00	-77.30		
R12								
R12	18.60	34.00	15.40	8U	-1.	17.2	3.0	
R12	39.60	44.70	5.10	8L1	-1.	28.1	3.5	
R12	63.80	64.40	0.60	8L3	-1.	48.6	2.0	
R12	66.40	68.80	2.40	8L4	-1.	39.7	2.0	
R12	72.50	74.00	1.50	8L5	-1.	11.6	6.0	
R12	76.60	78.30	1.70	8L6	-1.	37.2	1.5	
R12	88.60	99.20	10.60	9U	-1.	26.6	4.0	
R12	100.20	100.60	0.40	9U	-1.	50.0	2.5	
R12	119.80	122.60	2.80	9L	-1.	21.3	2.0	
R12	126.00	136.00	10.00	10B	-1.	16.0	4.0	
R12	140.50	141.00	0.50	10A	-1.	38.9	0.5	
R12	146.00	174.90	28.90	MMST	-1.	-1.0	-1.0	
R12	174.90	175.60	0.70	10A	-1.	38.6	3.5	
R12	192.40	193.20	0.80	CO	-1.	-1.0	-1.0	
R13	661349.10		5537105.80	1794.40	0.00	-90.00	137.0	
R13	0.00		55.00	10.00	65.00	-90.00		
R13	55.00		95.00	60.00	140.00	-87.90		
R13	95.00		137.00	67.00	116.00	-86.40		
R13								
R13	11.40	13.80	2.40	CO	-1.	18.7	1.0	
R13	32.60	44.00	11.40	9U	-1.	29.2	4.0	
R..	46.00	48.00	2.00	9U	-1.	29.2	4.0	
R.	50.00	51.20	1.20	9U	-1.	29.2	4.0	
R13	52.90	55.00	2.10	9U	-1.	29.2	4.0	
R13	85.60	87.00	1.40	9L	-1.	33.6	1.0	
R13	91.10	103.20	12.10	10B	-1.	20.4	2.5	
R13	107.50	108.20	0.70	10B	-1.	47.2	2.0	
R13	109.20	110.40	1.20	10A	-1.	-1.0	-1.0	

R13	120.00	137.00	17.00	MMST	-1.	-1.0	-1.0	
R15	661349.00		5537106.00	1794.40		60.00	-50.00	166.0
F	0.00		125.00	125.00		65.00	-49.00	
R15	125.00		166.00	41.00		72.00	-52.00	
R15								
R15	4.50	6.00	1.50	CO	-1.	25.9	0.0	
R15	15.10	21.40	6.30	9U	-1.	28.7	0.5	
R15	22.00	23.20	1.20	9U	-1.	28.7	0.5	
R15	24.30	25.10	0.80	9U	-1.	28.7	0.5	
R15	26.20	27.70	1.50	9U	-1.	28.7	0.5	
R15	48.20	53.70	5.50	9L	-1.	20.8	2.0	
R15	55.50	63.00	7.50	10B	-1.	23.1	2.0	
R15	68.30	69.10	0.80	10B	-1.	49.2	1.0	
R15	76.00	76.10	0.10	F	-1.	-1.0	-1.0	
R15	77.10	86.70	9.60	10B	-1.	20.7	3.0	
R15	92.60	93.10	0.50	10A	-1.	44.5	2.5	
R15	101.00	115.00	14.00	MMST	-1.	-1.0	-1.0	
R15	115.00	116.50	1.50	CO	-1.	-1.0	-1.0	
R16	661342.60		5537058.30	1775.60		67.00	-67.00	126.0
R16	0.00		10.00	10.00		67.00	-67.00	
R16	10.00		126.00	116.00		78.00	-63.40	
R16								
R16	11.40	12.20	0.80	8L3	-1.	31.4	0.5	
R16	12.60	14.80	2.20	8L4	-1.	31.4	0.5	
R16	16.00	18.40	2.40	8L5	-1.	24.5	0.5	
R16	20.40	22.80	2.40	8L6	-1.	42.1	4.0	
F	28.40	35.50	7.10	9U	-1.	29.3	2.5	
R16	36.00	37.00	1.00	9U	-1.	20.3	2.5	
R16	37.00	37.10	0.10	H2O	-1.	-1.0	-1.0	
R16	38.60	40.90	2.30	9U	-1.	29.3	2.5	
R16	60.00	63.60	3.60	9L	-1.	32.1	1.0	
R16	66.00	75.80	9.80	10B	-1.	32.1	1.0	
R16	78.80	79.60	0.80	10A	-1.	-1.0	-1.0	
R16	85.00	107.00	22.00	MMST	-1.	-1.0	-1.0	
R16	107.00	110.00	3.00	10B	-1.	-1.0	-1.0	
R16	112.60	113.60	1.00	10A	-1.	-1.0	-1.0	
R16	114.70	116.30	1.60	10A	-1.	47.2	1.5	
R17	661394.40		5537088.80	1776.20		77.00	-58.50	95.0
R17								
R17	3.70	8.90	5.20	9L	-1.	14.7	0.0	
R17	11.60	18.40	6.80	10B	-1.	18.3	1.0	
R17	22.00	22.60	0.60	10A	-1.	-1.0	-1.0	
R17	30.80	32.90	2.10	9L	-1.	12.1	2.5	
R17	33.40	35.00	1.60	9L	-1.	12.1	2.5	
R17	37.30	45.60	8.30	10B	-1.	19.7	2.5	
R17	50.90	51.60	0.70	10A	-1.	-1.0	-1.0	
R17	57.50	76.60	19.10	MMST	-1.	-1.0	-1.0	
R17	76.60	78.20	1.60	CO	-1.	26.0	2.0	
R18	661383.30		5536984.80	1737.00		70.00	-73.00	102.0
F	0.00		10.00	10.00		70.00	-75.00	
R18	10.00		90.00	80.00		70.00	-73.80	
R18								
R18	20.00	20.10	0.10	H2O	-1.	-1.0	-1.0	
R18	20.40	26.40	6.00	9L	-1.	23.7	2.0	
R18	29.30	37.70	8.40	10B	-1.	21.0	2.5	
R18	38.40	38.90	0.50	10B	-1.	21.0	2.5	

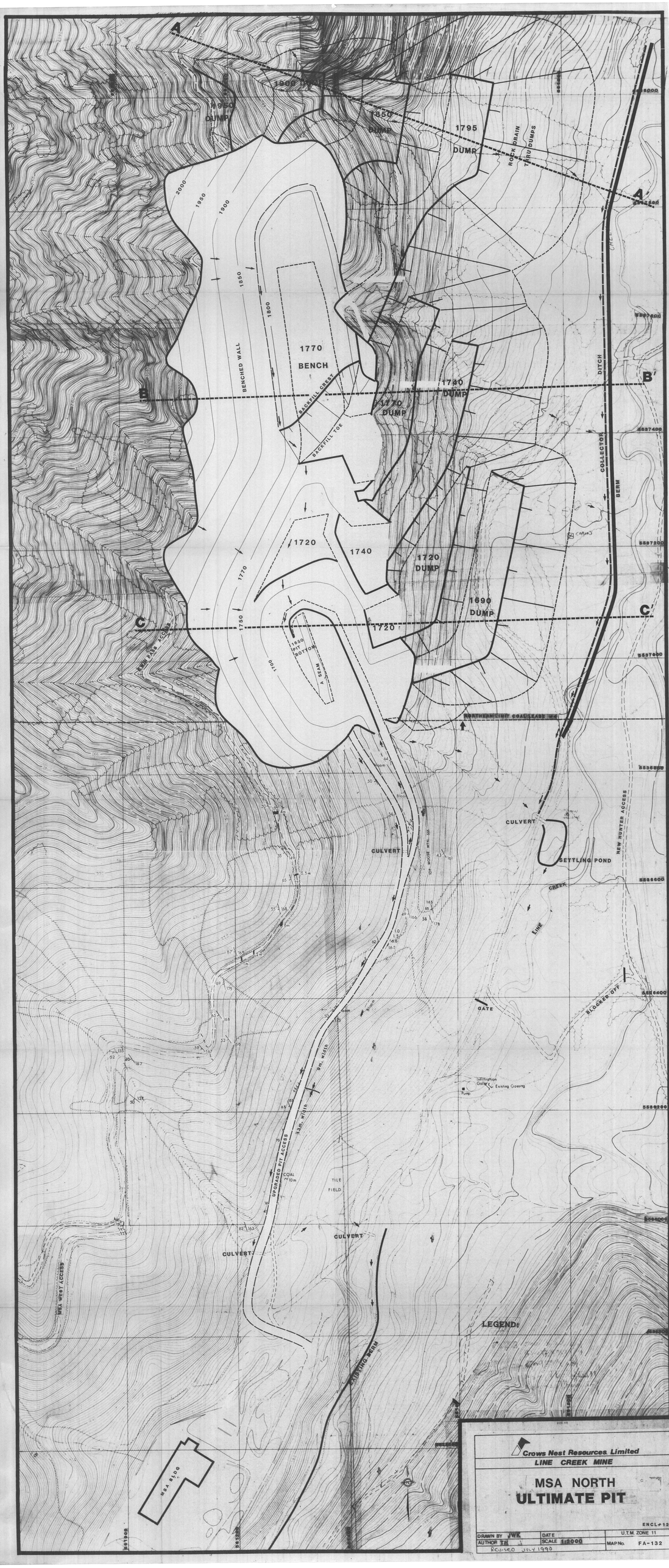
R18	56.00	56.10	0.10	F?	-1.	-1.0	-1.0	
R18	56.50	84.50	28.00	MMST	-1.	-1.0	-1.0	
R1°	84.50	85.00	0.50	CO	-1.	-1.0	-1.0	
R.	87.00	102.00	15.00	MMST	-1.	-1.0	-1.0	
R20	661249.40		5537021.00		1796.80	70.00	-80.00	268.0
R20	0.00		80.00		80.00	70.00	-80.00	
R20	80.00		160.00		80.00	70.00	-82.00	
R20	160.00		215.00		55.00	70.00	-80.00	
R20	215.00		245.00		30.00	70.00	-77.50	
R20	245.00		268.00		28.00	70.00	-74.50	
R20								
R20	24.00	24.10	0.10	H2O	-1.	-1.0	-1.0	
R20	32.80	34.40	1.60	CO	-1.	37.8	6.5	
R20	115.0	115.10	0.10	H2O	-1.	-1.0	-1.0	
R20	121.00	136.80	15.80	8U	-1.	20.1	3.5	
R20	141.50	146.00	4.50	8L1	-1.	20.1	3.5	
R20	149.00	149.10	0.10	F	-1.	-1.0	-1.0	
R20	150.00	151.50	1.50	8L3	-1.	-1.0	-1.0	
R20	152.60	153.40	0.80	CO	-1.	35.7	4.0	
R20	154.00	156.20	2.20	8L4	-1.	36.5	2.0	
R20	157.40	158.90	1.50	8L5	-1.	36.5	2.0	
R20	161.30	163.00	1.70	8L6	-1.	-1.0	-1.0	
R20	169.00	169.10	0.10	F	-1.	-1.0	-1.0	
R20	169.40	173.50	4.10	9U	-1.	32.4	3.0	
R20	175.20	176.60	1.40	9U	-1.	32.4	3.0	
R20	179.00	179.80	0.80	9U	-1.	32.4	3.0	
R20	184.50	186.10	1.60	9U	-1.	32.4	3.0	
R'	192.40	194.40	2.00	CO	-1.	-1.0	-1.0	
R2.	222.00	222.10	0.10	F	-1.	-1.0	-1.0	
R20	222.90	230.60	7.70	9L	-1.	16.6	2.0	
R20	233.40	242.00	8.60	10B	-1.	15.2	2.5	
R20	243.20	244.00	0.80	10B	-1.	-1.0	-1.0	
R20	247.30	248.00	0.70	10A	-1.	-1.0	-1.0	
R20	254.50	268.00	13.50	MMST	-1.	-1.0	-1.0	
R21	661255.70		5538505.20		2000.30	80.00	-59.00	223.0
R21								
R21	7.40	8.40	1.00	CO	-1.	0.0	0.0	
R21	54.60	55.60	1.00	CO	-1.	0.0	0.0	
R21	64.00	64.10	0.10	F	-1.	0.0	0.0	
R21	64.20	71.20	7.00	9U	-1.	0.0	0.0	
R21	71.80	75.20	3.40	9L	-1.	0.0	0.0	
R21	75.60	76.70	1.10	9L	-1.	0.0	0.0	
R21	81.60	87.60	6.00	10B	-1.	0.0	0.0	
R21	87.70	87.80	0.10	F	-1.	0.0	0.0	
R21	89.00	97.60	8.60	10B	-1.	0.0	0.0	
R21	98.00	100.00	2.00	10B	-1.	0.0	0.0	
R21	106.00	110.60	4.60	10A	-1.	0.0	0.0	
R21	115.50	223.00	107.50	MMST	-1.	0.0	0.0	
R22	661255.70		5538505.20		2000.30	0.00	-90.00	168.0
R22								
R^^	45.00	45.10	0.10	H2O	-1.	0.0	0.0	
R_	63.10	63.50	0.40	CO	-1.	0.0	0.0	
R22	65.00	66.00	1.00	CO	-1.	0.0	0.0	
R22	68.40	69.80	1.40	CO	-1.	0.0	0.0	
R22	72.00	72.10	0.10	H2O	-1.	0.0	0.0	
R22	83.80	98.90	15.10	9U	-1.	0.0	0.0	
R22	100.50	101.90	1.40	9L	-1.	0.0	0.0	

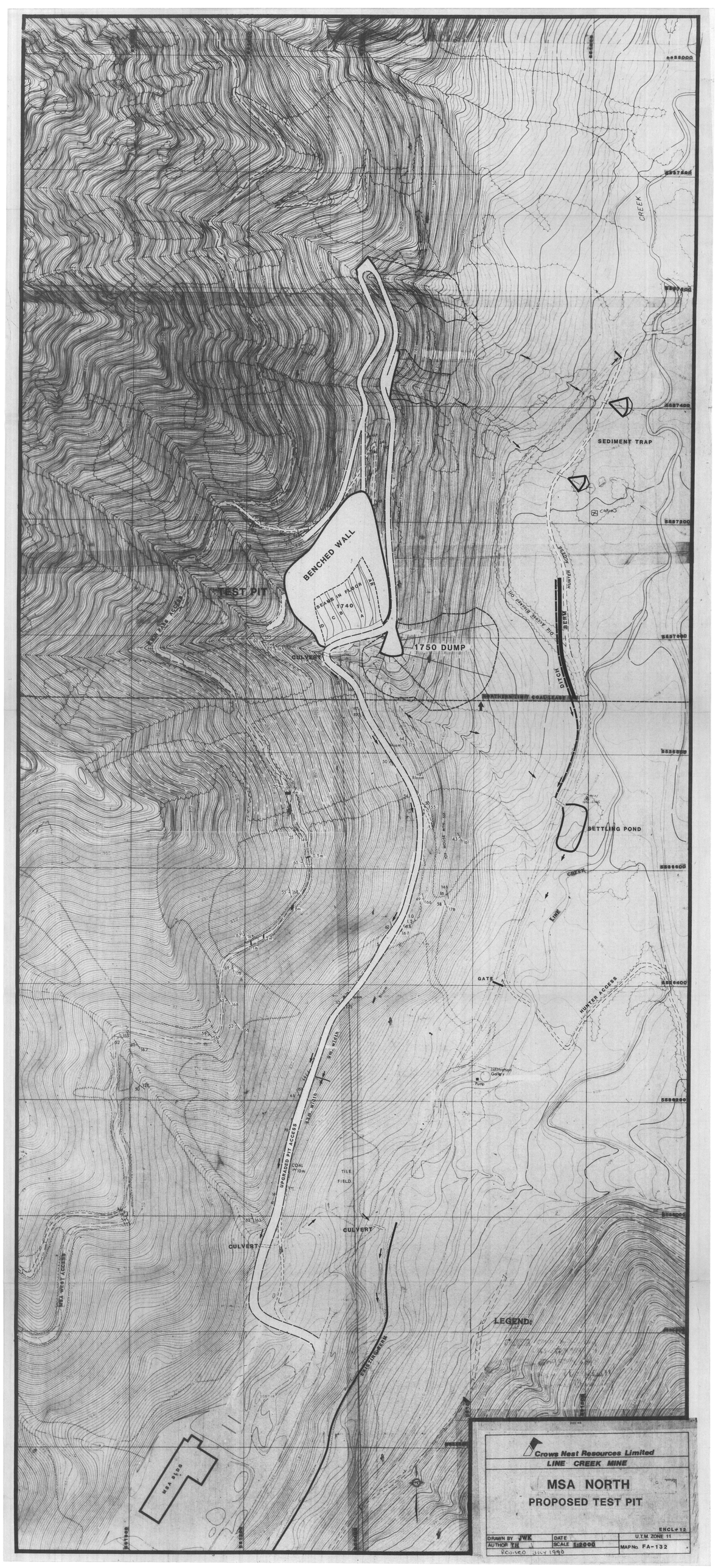
R22	102.00	102.10	0.10	F	-1.	0.0	0.0	
R22	103.90	105.10	1.20	9L	-1.	0.0	0.0	
R22	105.20	105.30	0.10	F	-1.	0.0	0.0	
R22	105.30	110.10	4.80	9L	-1.	0.0	0.0	
R22	110.70	112.90	2.20	9L	-1.	0.0	0.0	
R22	115.90	116.60	0.70	CO	-1.	0.0	0.0	
R22	119.20	131.90	12.70	10B	-1.	0.0	0.0	
R22	132.20	132.80	0.60	10B	-1.	0.0	0.0	
R22	134.20	135.30	1.10	10B	-1.	0.0	0.0	
R22	135.80	136.30	0.50	10B	-1.	0.0	0.0	
R22	144.40	144.80	0.40	10A	-1.	0.0	0.0	
R22	146.50	148.50	2.00	10A	-1.	0.0	0.0	
R22	149.40	151.60	2.20	10A	-1.	0.0	0.0	
R22	158.00	168.00	10.00	MMST	-1.	0.0	0.0	
R23	661228.70		5538202.00	1970.10	80.00	-60.00	272.0	
R23	0.00		175.00	175.00	80.00	-58.50		
R23	175.00		272.00	97.00	80.00	-61.50		
R23								
R23	15.00	17.40	2.40	CO	-1.	0.0	0.0	
R23	88.00	98.20	10.20	9U	-1.	0.0	0.0	
R23	98.40	98.50	0.10	F	-1.	0.0	0.0	
R23	102.20	113.40	11.20	9U	-1.	0.0	0.0	
R23	114.00	119.00	5.00	9L	-1.	0.0	0.0	
R23	122.20	122.90	0.70	CO	-1.	0.0	0.0	
R23	124.00	137.00	13.00	10B	-1.	0.0	0.0	
R23	140.00	140.90	0.90	10A	-1.	0.0	0.0	
R23	142.60	147.70	5.10	10A	-1.	0.0	0.0	
F	153.00	272.00	119.00	MMST	-1.	0.0	0.0	
R24	661228.70		5538202.00	1970.10	287.00	-88.10	215.0	
R24	0.00		45.00	45.00	287.00	-88.50		
R24	45.00		100.00	55.00	50.00	-89.50		
R24	100.00		130.00	30.00	65.00	-88.80		
R24	130.00		175.00	45.00	80.00	-88.00		
R24	175.00		215.00	40.00	80.00	-86.60		
R24								
R24	17.60	18.40	0.80	CO	-1.	-1.0	-1.0	
R24	20.00	23.90	3.90	CO	-1.	-1.0	-1.0	
R24	109.40	110.20	0.80	9U	-1.	-1.0	-1.0	
R24	111.40	121.40	10.00	9U	-1.	-1.0	-1.0	
R24	124.00	124.10	0.10	F	-1.	-1.0	-1.0	
R24	132.70	133.40	0.70	9U	-1.	-1.0	-1.0	
R24	134.10	143.50	9.40	9U	-1.	-1.0	-1.0	
R24	143.50	143.60	0.10	F	-1.	-1.0	-1.0	
R24	143.60	155.40	11.80	9U	-1.	-1.0	-1.0	
R24	157.60	159.60	2.00	9L	-1.	-1.0	-1.0	
R24	160.00	160.10	0.10	F	-1.	-1.0	-1.0	
R24	160.30	165.40	5.10	9L	-1.	-1.0	-1.0	
R24	165.90	168.30	2.40	9L	-1.	-1.0	-1.0	
R24	175.40	188.00	12.60	10B	-1.	-1.0	-1.0	
R24	188.80	190.40	1.60	10B	-1.	-1.0	-1.0	
R24	193.70	194.50	0.80	10A	-1.	-1.0	-1.0	
R24	196.00	196.10	0.10	F	-1.	-1.0	-1.0	
R24	199.60	201.00	1.40	10A	-1.	-1.0	-1.0	
R24	202.70	204.00	1.30	10A	-1.	-1.0	-1.0	
R24	204.50	208.90	4.40	10A	-1.	-1.0	-1.0	
R24	214.99	215.00	0.01	MMST	-1.	-1.0	-1.0	
R25	661237.00		5537809.50	1945.80	80.00	-60.00	207.6	

R25		0.00	60.00	60.00	80.00	-60.30		
R25		60.00	115.00	55.00	80.00	-62.10		
R25		115.00	200.00	15.00	80.00	-64.00		
R								
R25	27.10	37.60	10.50	8U	-1.	-1.0	-1.0	
R25	42.80	44.40	1.60	8L1	-1.	-1.0	-1.0	
R25	54.00	54.40	0.40	8L2	-1.	-1.0	-1.0	
R25	55.20	57.00	1.80	8L2	-1.	-1.0	-1.0	
R25	115.00	125.20	10.20	9U	-1.	-1.0	-1.0	
R25	131.20	132.40	1.20	9L	-1.	-1.0	-1.0	
R25	133.00	138.50	5.50	9L	-1.	-1.0	-1.0	
R25	140.50	140.60	0.10	F	-1.	-1.0	-1.0	
R25	140.60	146.40	5.80	9U	-1.	-1.0	-1.0	
R25	148.00	149.00	1.00	9L	-1.	-1.0	-1.0	
R25	149.60	154.60	5.00	9L	-1.	-1.0	-1.0	
R25	157.20	165.80	8.60	10B	-1.	-1.0	-1.0	
R25	166.40	167.00	0.60	10B	-1.	-1.0	-1.0	
R25	169.80	170.60	0.80	10B	-1.	-1.0	-1.0	
R25	171.60	172.00	0.40	10B	-1.	-1.0	-1.0	
R25	180.00	180.10	0.10	F	-1.	-1.0	-1.0	
R25	194.00	197.90	3.90	10A	-1.	-1.0	-1.0	
R25	201.40	207.60	6.20	MMST	-1.	-1.0	-1.0	
R26		661237.00	5537809.50	1945.80	80.00	-90.00	267.0	
R26		0.00	5.00	5.00	80.00	-89.00		
R26		5.00	50.00	45.00	80.00	-88.50		
R26		50.00	85.00	35.00	80.00	-87.50		
R26		85.00	267.00	182.00	80.00	-82.00		
R								
R..	39.30	53.40	14.10	8U	-1.	-1.0	-1.0	
R26	59.70	62.40	2.70	8L1	-1.	-1.0	-1.0	
R26	67.40	68.00	0.60	CO	-1.	-1.0	-1.0	
R26	74.80	77.60	2.80	8L2	-1.	-1.0	-1.0	
R26	149.40	162.40	13.00	9U	-1.	-1.0	-1.0	
R26	164.50	164.60	0.10	F	-1.	-1.0	-1.0	
R26	182.00	182.10	0.10	F	-1.	-1.0	-1.0	
R26	184.70	185.40	0.70	9L	-1.	-1.0	-1.0	
R26	186.20	193.30	7.10	9L	-1.	-1.0	-1.0	
R26	195.40	195.90	0.50	10B	-1.	-1.0	-1.0	
R26	196.30	206.40	10.10	10B	-1.	-1.0	-1.0	
R26	208.00	208.40	0.40	10B	-1.	-1.0	-1.0	
R26	209.60	210.40	0.80	10B	-1.	-1.0	-1.0	
R26	227.00	233.50	6.50	MMST	-1.	-1.0	-1.0	
R26	233.60	233.70	0.10	F	-1.	-1.0	-1.0	
R26	239.80	240.60	0.80	10A	-1.	-1.0	-1.0	
R26	244.20	246.00	1.80	10A	-1.	-1.0	-1.0	
R26	247.40	248.20	0.80	10A	-1.	-1.0	-1.0	
R26	248.20	249.00	0.80	CO	-1.	-1.0	-1.0	
R26	261.00	267.00	6.00	MMST	-1.	-1.0	-1.0	
R27		661231.70	5537516.10	1925.70	00.00	-90.00	278.8	
R27		0.00	30.00	30.00	50.00	-88.00		
R27		30.00	80.00	50.00	50.00	-85.10		
R27		80.00	145.00	65.00	50.00	-82.20		
R		145.00	165.00	20.00	50.00	-79.00		
R27		165.00	175.00	10.00	50.00	-75.90		
R27		175.00	190.00	15.00	50.00	-73.00		
R27		190.00	205.00	10.00	50.00	-70.40		
R27		205.00	220.00	15.00	50.00	-66.80		
R27		220.00	240.00	20.00	50.00	-63.30		

R27		240.00	266.00	26.00	50.00	-61.00		
R27								
R27	76.70	93.00	16.30	8U	-1.	-1.0	-1.0	
R27	93.00	93.10	0.10	F	-1.	-1.0	-1.0	
R27	93.10	105.00	11.90	8U	-1.	-1.0	-1.0	
R27	111.20	115.30	4.10	8L1	-1.	-1.0	-1.0	
R27	116.00	117.40	1.40	8L1	-1.	-1.0	-1.0	
R27	122.60	123.10	0.50	CO	-1.	-1.0	-1.0	
R27	125.50	128.80	3.30	8L2	-1.	-1.0	-1.0	
R27	133.20	134.00	0.80	CO	-1.	-1.0	-1.0	
R27	177.40	184.00	6.60	9U	-1.	-1.0	-1.0	
R27	184.60	185.60	1.00	9U	-1.	-1.0	-1.0	
R27	186.40	189.40	3.00	9U	-1.	-1.0	-1.0	
R27	215.10	215.40	0.30	9L	-1.	-1.0	-1.0	
R27	216.50	223.30	6.80	9L	-1.	-1.0	-1.0	
R27	225.40	235.20	9.80	10B	-1.	-1.0	-1.0	
R27	236.50	237.10	0.60	10B	-1.	-1.0	-1.0	
R27	239.30	240.40	1.10	10B	-1.	-1.0	-1.0	
R27	244.00	244.00	0.00	MMST	-1.	-1.0	-1.0	
R27	257.70	263.50	5.80	CO	-1.	-1.0	-1.0	
R28		661236.90	5538805.80	2029.70	80.00	-90.00	195.0	
R28		0.00	45.00	45.00	80.00	-89.50		
R28		45.00	80.00	35.00	80.00	-88.50		
R28		80.00	110.00	30.00	80.00	-87.50		
R28		110.00	125.00	15.00	80.00	-86.50		
R28		125.00	145.00	20.00	80.00	-85.00		
R28		145.00	170.00	25.00	80.00	-82.50		
R28		170.00	195.00	25.00	80.00	-80.00		
R28	14.70	15.20	0.50	CO	-1.	-1.0	-1.0	
R28	67.00	81.50	14.50	9U	-1.	-1.0	-1.0	
R28	84.80	89.70	4.90	9L	-1.	-1.0	-1.0	
R28	91.50	92.40	0.90	9L	-1.	-1.0	-1.0	
R28	103.00	113.70	10.70	10B	-1.	-1.0	-1.0	
R28	114.50	115.50	1.00	10B	-1.	-1.0	-1.0	
R28	123.10	125.20	2.10	10A	-1.	-1.0	-1.0	
R28	127.90	131.20	3.30	10A	-1.	-1.0	-1.0	
R28	141.00	146.50	5.50	MMST	-1.	-1.0	-1.0	
R28	146.50	146.60	0.10	F	-1.	-1.0	-1.0	
R28	147.70	150.20	2.50	10B	-1.	-1.0	-1.0	
R28	156.60	157.00	0.40	10A	-1.	-1.0	-1.0	
R28	157.40	157.50	0.10	F	-1.	-1.0	-1.0	
R28	161.50	161.60	0.10	F	-1.	-1.0	-1.0	
R28	161.60	163.40	1.80	10B	-1.	-1.0	-1.0	
R28	169.30	171.40	2.10	10A	-1.	-1.0	-1.0	
R28	176.00	179.50	3.50	10A	-1.	-1.0	-1.0	
R28	189.50	195.00	5.50	MMST	-1.	-1.0	-1.0	
R29		661231.00	5537516.00	1925.70	50.00	-60.00	224.0	
R29		0.00	40.00	40.00	46.20	-51.90		
R29		40.00	80.00	40.00	51.00	-59.00		
R29		80.00	150.00	70.00	54.80	-58.70		
R29		110.00	224.00	74.00	57.00	-62.80		
R29	59.20	72.30	13.1	8U	-1.	-1.0	-1.0	
R29	78.70	80.60	1.90	8L1	-1.	-1.0	-1.0	
R29	83.40	83.90	0.50	CO	-1.	-1.0	-1.0	
R29	90.30	92.50	2.20	8L2	-1.	-1.0	-1.0	
R29	141.00	151.50	10.50	9U	-1.	-1.0	-1.0	

R29	166.70	172.80	6.10	9L	-1.	-1.0	-1.0
R29	174.30	182.10	7.80	10B	-1.	-1.0	-1.0
R29	192.00	192.00	0.00	MMST	-1.	-1.0	-1.0
29	204.70	207.60	2.90	CO	-1.	-1.0	-1.0


A
A'
B
B'
C
C'
1950 DUMP
1850 DUMP
1795 DUMP
ROCK DRAIN
TRIM DUMPS
1770 BENCH
BENCHED WALL
BACKFILL CREST
BACKFILL TOE
1770 DUMP
1740 DUMP
DITCH
COLLECTOR
BERM
1720
1740
1720 DUMP
1690 DUMP
1850 PIT BOTTOM
A SEAM
NORTHERN LIMIT COAL LEASE
CULVERT
SETTLING POND
NEW HUNTER ACCESS
CREEK
LINE
GATE
BLOCKED OFF
Infiltration Gallery
Existing Crossing
Pump
9m width
UPGRADED PIT ACCESS
COAL
TILE FIELD
CULVERT
CULVERT
WEST ACCESS
EXISTING BERM
MSA BLOCK
LEGEND:
Crows Nest Resources Limited
LINE CREEK MINE
MSA NORTH
ULTIMATE PIT
ENCL. 12
DRAWN BY JWK
DATE
U.T.M. ZONE 11
AUTHOR TH
SCALE 1:2000
MAP No. FA-132
REVISED JULY 1990



Crows Nest Resources Limited

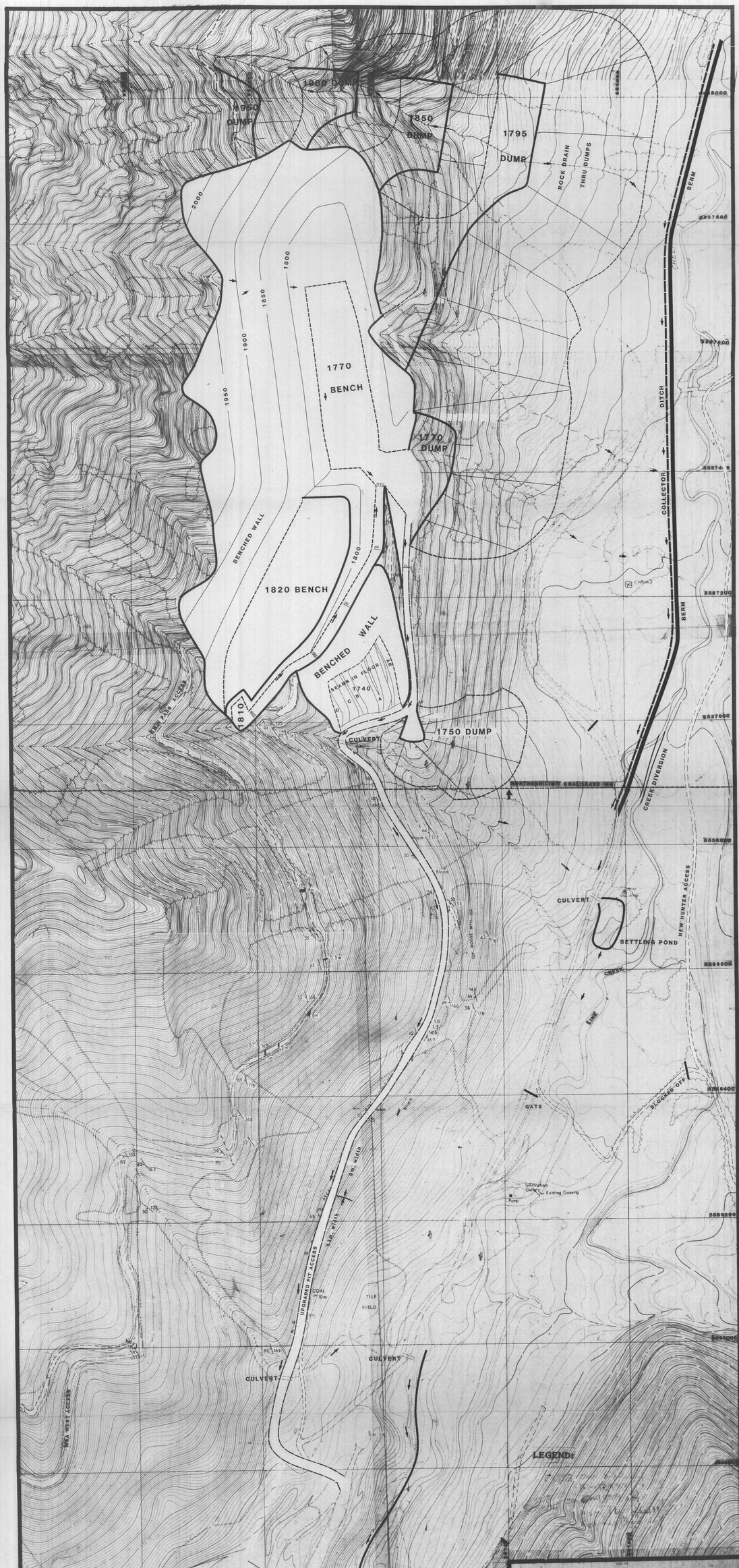
LINE CREEK MINE

MSA NORTH

PROPOSED TEST PIT

ENCL # 12

DRAWN BY JWK	DATE	U.T.M. ZONE 11
AUTHOR TH	SCALE 1:2000	MAP No. FA-132
REVISED JULY 1990		



Crows Nest Resources Limited

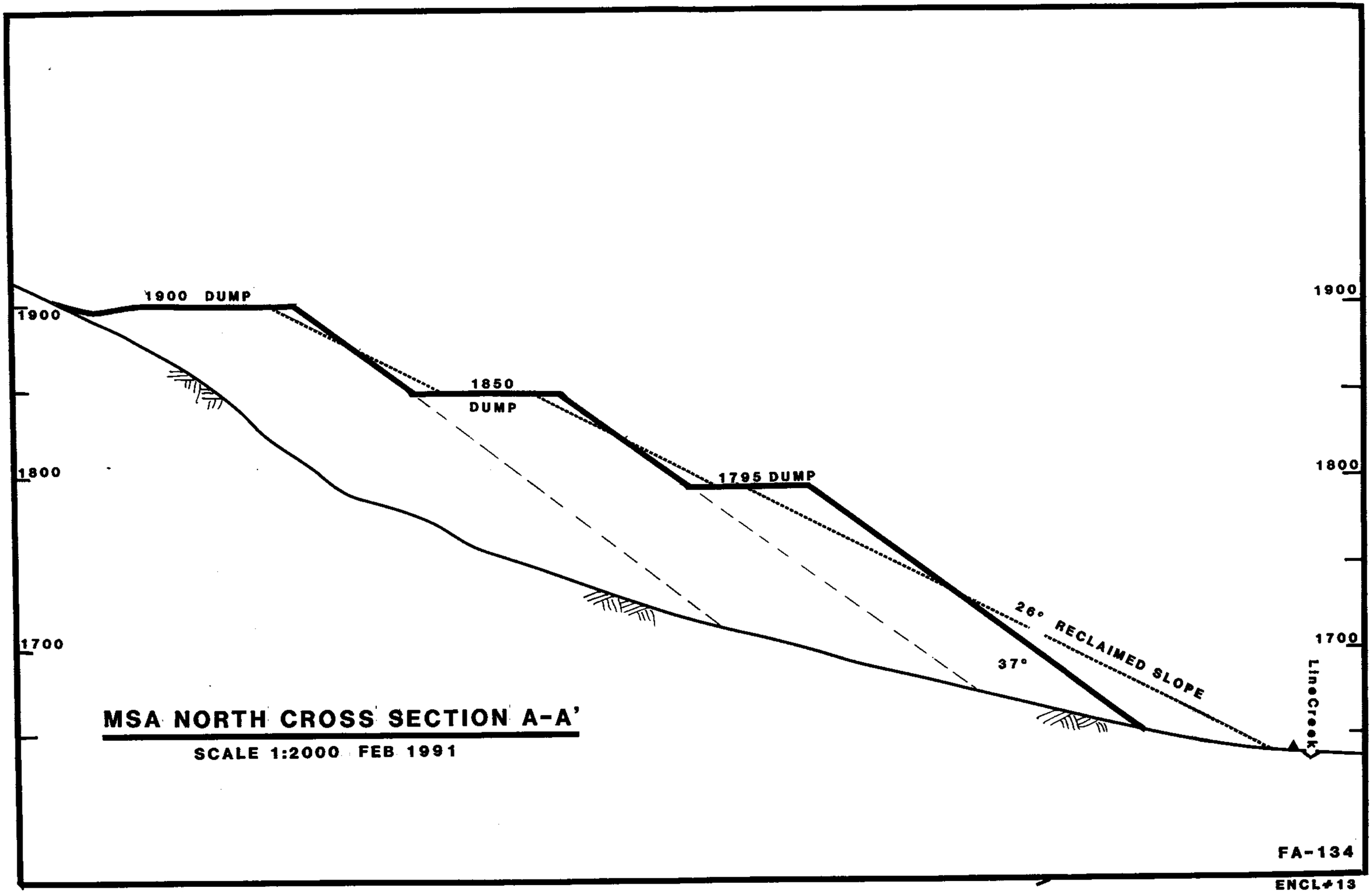
LINE CREEK MINE

MSA NORTH

MID-LIFE PIT PLAN

ENCL # 12

DRAWN BY JWK	DATE	U.T.M. ZONE 11	
AUTHOR TH	SCALE 1:2000	MAP No. FA-132	
REVISED JULY 1990			



MSA NORTH CROSS SECTION A-A'

SCALE 1:2000 FEB 1991

FA-134

ENCL#13

2000

1900

1800

1700

1810
BACKFILL
DUMP

PIT FLOOR
1770

1770
DUMP

1740
DUMP

26° RECLAIMED SLOPE

37°

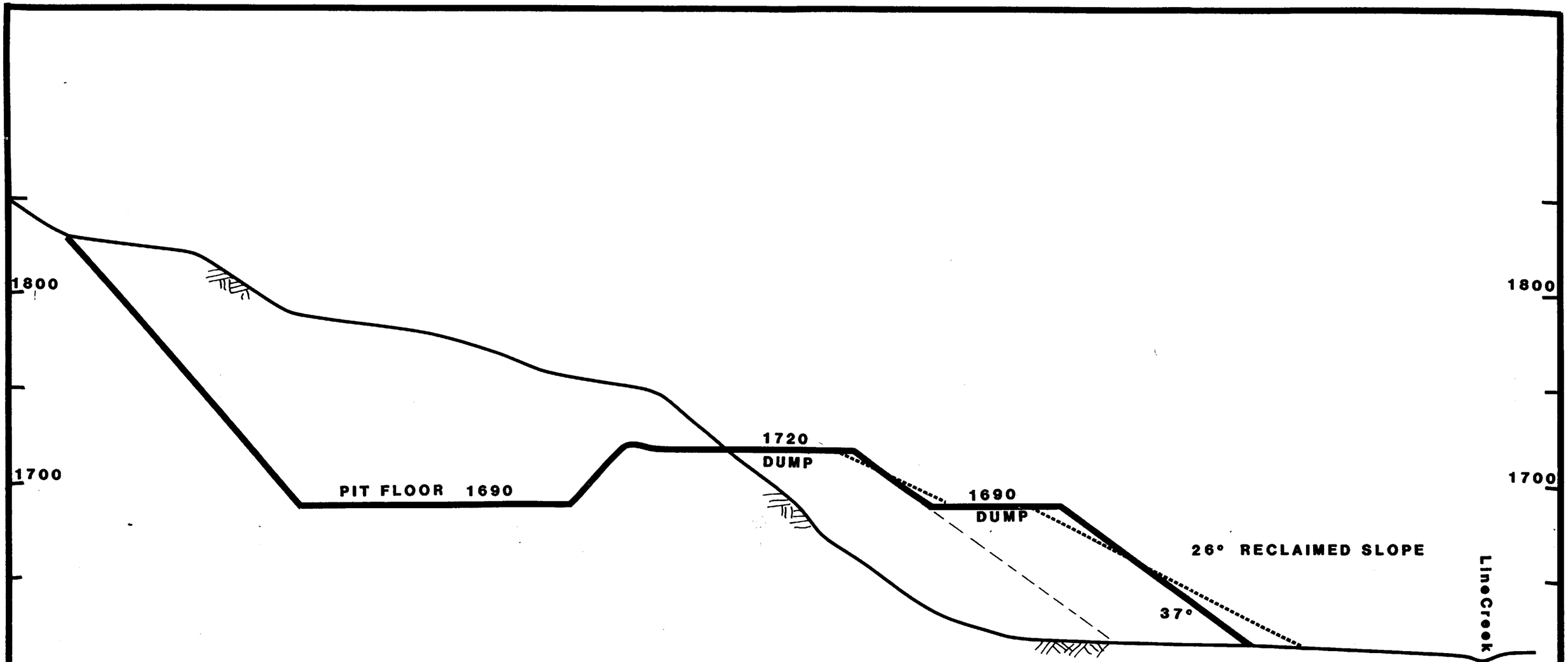
LineCreek

MSA NORTH CROSS SECTION B-B'

SCALE 1:2000 FEB 1991

FA-134

ENCL#13



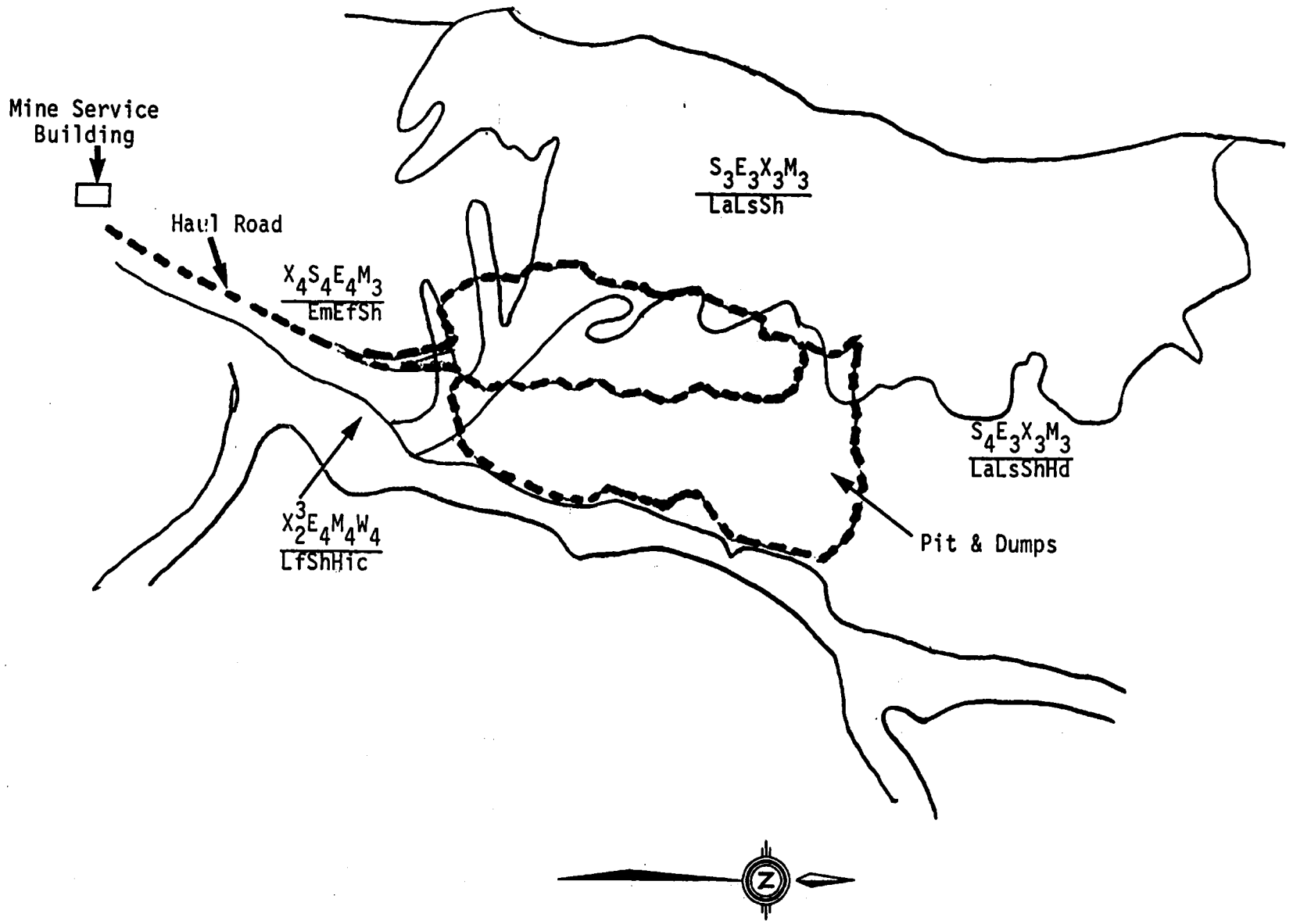
MSA NORTH CROSS SECTION C-C'

SCALE 1:2000 FEB 1991

FA-134

ENCL#13

WILDLIFE HABITAT UNITS ON PROPOSED MINE AREA
(APPROXIMATE SCALE 1 cm = 170 m)



ENCLOSURE 14

5.0 COAL QUALITY

Enclosure 9:	Increment Quality Data
Enclosure 10:	Composite Quality Data
Enclosure 11:	Loring Quality Data
Enclosure 12:	Petrographic Data
Enclosure 13:	Test Pit Quality Data

In 1990 coal samples for analyses were obtained from reverse-circulation rotary drill holes, the backhoe trench and the test pit. A variety of tests were done on these samples by the Crows Nest Resources Ltd.'s lab, Loring Laboratories Ltd., and David E. Pearson and Associates Ltd. All of the data is included in the above enclosures, but as yet no summary of the data on a seam-by-seam basis is available. The following comments are preliminary in nature to give some idea of the basic quality:

- Based on CSR drill hole data
  - raw ash varies from 15% - 35%
  - volatiles (at 1.6 S.G.) are in the 21 - 22% range
  - sulphur (at 1.6 s.g.) is low (0.3 - 0.5%)
  - RoMax (at 1.6 S.G.) ranges from 1.21 - 1.29
  - Calorific values range from 7400 - 7800 Kcal/kg

- There is evidence of "layering" within seams of "Met." and "Thermal" coal (based on raw FSI values), and therefore some of these seams may have potential for selective mining to optimize the reserves.

AT TRENCH SAMPLES 10/18/90

SEAM 10A

		Fs'	R/m	V/m	cal/V/m
A3-1	RAW ASH 18.92	0.0	2.49	26.72	24.23

SIEVE ANALYSIS

	%	wt	
1	3.8	361.0	
1x½	15.9	1496.4	45.3
½x¼	13.4	1260.5	
¼x4.75	12.2	1145.1	
-4.75	54.7	5149.0	

-4.75 ASH = 19.24

FLOAT SINK ON +4.75 AT 1.60

	%	wt	ASH	R/m	V/m	cal/m.	cal/gm.
FLOAT	77.7	3214.3	9.75	.38	24.34	2396	6554
SINK	22.3	924.6	60.41	-	-	-	-

AT TRENCH SAMPLES 10/18/90

SEAM 10B

		Fsi	R/m	U/m	CALC U/m
A2-3	RAW ASH 11.19	0.0	2.92	26.58	2366

SIEVE ANALYSIS

	%	wt	
1	3.6	489.5	
1x1/2	16.0	2151.3	
1/2x1/4	12.7	1703.9	42.8
1/4x4.75	10.5	1403.7	
-4.75	57.2	7665.2	

-4.75 ASH = 11.09

FLOAT SINK ON +4.75 AT 1.60

	%	wt	ASH	R/m	U/m	calc U/m	cal/gm.
FLOAT	82.9	4674.4	10.74	1.00	23.23	22.23	6579
SINK	17.1	967.5	43.55	—	—	—	—

SEAM 10B

			R/m	U/m	calc U/m.
A2-4	RAW ASH 14.29	1-Si.00	3.14	29.81	26.67

SIEVE ANALYSIS

	%	wt	
~~1~~	2.4	88.1	
1x1/2	7.5	270.5	15.8
1/2x1/4	6.5	236.2	
1/4x4.75	9.4	341.6	
-4.75	74.2	26903	

-4.75 ASH = 13.31

FLOAT SINK ON +4.75 AT 1.60

	%	WT	ASH	R/m	U/m	cal/U/m	cal/gm
FLOAT	70.2	6608	8.95	.40	2553	25.13	6455
SINK	29.8	280.2	79.41	—	—	—	—

PIT TRENCH SAMPLES 10/18/90

SEAM 10B			R/m	V/m	CAL/LM
A2-1	RAW ASH 16.37	FSI 0.0	4.01	24.60	20.59

SIEVE ANALYSIS.

	%		wt
1"	14.5		1262.0
1x½	26.4	62.0	2290.5
½x¼	13.0		1129.5
¼x4.75	8.1		706.7
-4.75	38.0		3302.3

-4.75 ASH = 14.61

FLOAT SINK ON +4.75

	%	wt	ASH	R/m	V/m	CAL/m	CAL/gm.
FLOAT	81.0	4375.0	10.13	.61	23.13	22.52	6555.53 6720
SINK	19.0	1025.8	60.96	—	—	—	

SEAM 10B		FSI	R/m	V/m	CAL/m.
A2-2	RAW ASH 29.55	00	1.63	22.70	21.07

SIEVE ANALYSIS.

	%		wt
1	5.6		275.4
1x½	12.7	84.9	627.8
½x¼	10.4		514.0
¼x28	56.2		2773.4
28x48	7.2		357.4
48x100	3.6		177.8
100x200	2.3		112.5
-200	2.0		94.3

FLOAT SINK ON +28

	%	wt	ASH	R/m	V/m	CAL/m	CAL/gm.
FLOAT	55.3	2241.6	13.26	.19	22.91	22.72	6600
SINK	44.7	1813.3	59.93	—	—	—	

[redacted] TABOCH SAMPLES 10/18/90

				R/M	U/M	cal/U/M	FSI
SEAM 9U							
B2-3	RAW	ASH	24.69	2.21	22.02	19.84	0.0

SIEVE ANALYSIS

	%	wt	
1"	7.8	668.1	
1 x 1/2"	15.9	1362.0	84.6
1/2 x 1/4"	11.0	939.4	
1/4 x 28"	49.9	4258.5	
28 x 48	7.6	649.0	
48 x 100	3.6	308.3	
100 x 200	3.9	333.0	
-200	.3	21.9	

FLOAT SINK ON +28 MESH AT 1.60

	%	wt	ASH	R/M	U/M	U/M calc	cal/gm.
FLOAT	71.5	4692.0	12.65	.77	21.83	21.06	6859.62
SINK	28.5	1869.1	51.36				

PIT TRENCH SAMPLES 10/18/90

SEAM 9u

B-1	RAW	ASH	23.01	3.40	24.04	20.64	0.0

SIEVE ANALYSIS

	%		wt
1"	10.9		422.5
1x½	23.7	85.6	916.5
½x¼	12.5		482.6
¼x28	38.3		1480.3
28x48	5.8		224.4
48x100	3.7		143.6
100x200	2.4		92.2
-200	2.7		104.6

FLOAT SINK ON +28 MESH AT 1.60

	%	wt	ASH	R/M	U/M	cal U/M	cal/gm
FLOAT	78.4	2545.7	10.23	.64	22.51	21.87	6716.86
SINK	21.6	707.4	57.63				

B2-1	ASH	29.98	FS: 0.0	SEAM 9u
B2-2	ASH	49.12	FS: 0.0	SEAM 9u

MSAN: SEAM 8L6

	Fsi	E/m	V/m	Calc V/m
C-1 Raw Ash 29.31	0.0	1.35	20.49	19.14

Sieve Analysis

	%	wt
1"	14.5	1499.5
1x1/2	16.0	1649.9
1/2x1/4	11.0	1130.9
1/4x28	45.9	4737.3
28x48	5.2	540.6
48x100	3.2	335.0
100x200	2.5	258.2
-200	1.7	160.6

Float Sink on +28 At 1.60

	%	wt	Ash	E/m	V/m	Calc V/m.	Btu/lb
Float	60.00	5314.0	13.81	.48	22.33	21.85	7199
Sink	40.00	3546.7	58.51				

SEAM 8L5

	Fsi	E/m	V/m	Calc V/m.
C-2 Raw Ash 14.89	0.0	1.19	21.98	20.79

Sieve Analysis

	%	wt
1"	20.3	1038.5
1x1/2	25.3	1291.5
1/2x1/4	10.3	525.1
1/4x4.75	7.5	383.4
-4.75	36.0	1869.9

Ash on -4.75 = 12.01

Float Sink on +4.75 at 1.60

	%	wt	Ash	E/m	V/m	Calc V/m	Btu/lb
Float	89.8	2950.2	9.84	.58	21.72	21.14	738
Sink	10.2	334.2	61.55				

AT SAMPLES 10/18/90

TRENCH

SEAM & LI		ASH	FSI	(calc) Vol	RIM	Vol	T.M.
D-1	RAW	18.46	0.0	33.28	~~11.53~~ 2.62	44.61	17.6
	%	wt					
1"	9.4	1110.2					
1" x 1/2"	19.5 (50.5)	2288.7					
1/2 x 1/4	12.3	1444.0					
1/4 x 4.75	9.3	1096.8					
-4.75	49.5	5813.8					

ON -4.75 6315.35

(C/U ON Float +4.75 7019.86 CAL/gm)

RAW	ASH
+4.75	31.08
-4.75	13.84

Float Sink At 1.60

	wt	%	ASH	RIM	VOL.
Float	2938.3	57.9	9.00	1.15	22.69
SINK	2132.6	42.1	62.32	-	-

SEAM & LI		ASH	FSI	(calc) Vol	RIM	Vol	T.M.
D-2 FW	RAW	12.89	0.0	27.39	~~10.64~~ 6.53	38.03	16.9
	%	wt					
1"	.6	39.7					
1" x 1/2"	5.4 (24.5)	365.4					
1/2 x 1/4	9.1	619.6					
1/4 x 4.75	14.4	978.4					
-4.75	70.5	4790.1					

ON -4.75 5120.11

(C/U ON Float +4.75 5939.05 CAL/gm)

RAW	ASH
+4.75	14.66
-4.75	(13.73)

Float Sink At 1.60

	wt	%	ASH	RIM	VOL
Float	1247.1	75.6	(10.37)	2.25	27.94
SINK	401.5	24.4	41.40		

Pit Samples 10/18/90
Trench.

	Ash	Fsi	(calc) Vol	Rlm	Vol
Seam 8u D2-2 Raw	16.14	0.0	30.92	7.44	38.36

	%		wt.
1"	2.9	23.8	377.6
1" x ½"	5.3		697.5
½" x ¼"	6.0		778.9
¼" x 4.75"	9.6		1258.0
-4.75"	76.2		9937.1

OD -4.75 4411.71
(C/U on Float 5684.87 Cal/gm)
+4.75

Float sink at 1.60

Raw	Ash
+4.75"	19.02
-4.75"	13.97

	wt	%	Ash	Rlm	Vol
Float	1752.4	76.1	10.99	2.70	27.90
Sink	551.0	23.9	69.54	-	

	Ash	Fsi	(calc) Vol	Rlm	Vol
Seam 8u D2-3 Raw.	15.85	0.0	21.25	3.13	24.38

	%	wt
1" x ½" x ¼" x 4.75"	4.4	242.3
-4.75"	95.6	5250.3

OD -4.75 4101.69
(C/U on Float 5178.90 Cal/gm)
+4.75

Float sink at 1.60

Raw	Ash
+4.75"	29.90
-4.75"	15.09

	wt	%	Ash	Rlm	Vol
Float	123.0	58.4	14.27	3.91	27.50
Sink	87.7	41.6	57.11		

DRILL HOLE COMPOSITES BY CONE LABS. — ALL ANALYSIS @ AIR DRY BASIS

HOLE #	INTERVAL	LAB#	Coal Type	%RM. (ADM)	%ASH	%VOL. (AM)	%FC.	FSI.
5	78-86	-7277	RAW	.71	29.3	17.9	52.1	1.0
9L		7284	1.6 FLT	.71	9.1	20.0	70.2	1.5

%YLD= 68.4 : Kcal/Kg 7657

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
13	34.5-56	7332-7335	RAW	.39	29.2	20.0	50.4	4.0
9U		7338-7341	1.6 FLT	.85	11.3	22.0	65.8	7.0

%YLD= 60.6 : Kcal/Kg 7506

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
12	64-78.5	7520, 7505, 7505	RAW	.48	36.2	20.7	42.6	1.0
8L		7507-7509	1.6 FLT	.76	11.6	20.8	66.8	3.5

%YLD= 53.2 : Kcal/Kg 7438

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
12	18.5-34.5	7491-7500	RAW	.50	21.4	19.5	58.6	2.0
8U		7471-7477	1.6 FLT	.95	7.2	21.9	70.0	4.0
		7464-7467						

%YLD= 70.7 : Kcal/Kg 7763

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
18	21-27	7592-	RAW	.44	23.7	18.5	57.4	2.0
9L		7597	1.6 FLT	.82	8.4	20.9	70.0	3.0

%YLD= 68.1 : Kcal/Kg 7712

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
18	29.5-38	7599-	RAW	.52	21.0	18.0	60.5	2.5
10B		7606	1.6 FLT	.76	9.0	19.1	71.9	3.5

%YLD= 75.7 : Kcal/Kg 7671

1/61.

A.D.B.

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
8	92-101	7680-	RAW	.68	14.9	18.8	65.6	3.0
8U		7688	1.6 FLT.	.74	7.2	20.2	71.9	4.0

%YLD= 78.0 : Kcal/Kg 7801

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
8	108-112	7690-	RAW	.40	28.9	18.5	52.2	4.5
8L1		7693	1.6 FLT.	.92	6.8	23.8	68.5	7.0

%YLD= 62.6 : Kcal/Kg 7892

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
8	151.5-157	7696-	RAW	.38	32.7	21.4	45.5	3.0
9U		7701	1.6 FLT	.57	10.8	22.8	65.8	7.0

%YLD= 62.0 : Kcal/Kg 7548

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
8	162-164	7702-	RAW	.60	26.3	21.0	52.1	2.0
9U		7703	1.6 FLT	.74	8.0	21.8	69.5	4.0

%YLD= 66.0 : Kcal/Kg 7772

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
8	182.5-188	7704-	RAW	.54	21.2	19.3	59.0	2.0
9L		7709	1.6 FLT.	.96	8.5	21.2	69.3	3.0

%YLD= 72.6 : Kcal/Kg 7715

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
8	190.5-199	7710-	RAW	.69	22.7	19.8	56.8	2.5
10B		7718	1.6 FLT.	.98	8.5	21.4	69.1	5.0

%YLD= 730 : Kcal/Kg 7707.

2/6/1

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
20	122-137.5	7721-7736	RAW	.62	20.1	20.4	58.9	3.5
8L	142-147	7737-7741	1.6 FLT	1.02	7.6	22.6	68.8	6.0
+8L1			%YLD= 75.3	KCAL/KG	7806			

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
20	153.5-164	7743-	RAW	.42	36.5	19.4	56.3	2.0
8L		7749.	1.6 FLT	.81	12.1	21.8	65.3	7.0
			%YLD= 54.4	KCAL/KG	7447			

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
20	170-187	7750-	RAW	.42	32.41	18.6	48.6	3.0
9L		7759.	1.6 FLT	.86	10.8	21.7	66.6	7.0
			%YLD= 63.7	KCAL/KG	7553			

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
20	223-231	7762-	RAW	.57	16.6	19.3	63.5	2.0
9L		7769.	1.6 FLT	.82	8.4	20.1	70.7	2.5
			%YLD= 82.1	KCAL/KG	7748			

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
20	234.5-243	7771-	RAW	.48	15.2	19.5	64.8	2.5
10B		7779	1.6 FLT	.88	8.7	20.8	69.6	3.5
			%YLD= 77.5	KCAL/KG	7724			

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
9	43-51	7614-	RAW	.69	22.6	18.6	58.1	2.5
9L		7621.	1.6 FLT	.68	8.9	21.0	69.4	3.0
			%YLD= 76.3	KCAL/KG	7673			

8/6
JN=91

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
9	55-69	7623-	RAW	.44	21.2	21.1	57.3	2.5
10B		7686	1.6 FLT	.46	8.3	22.1	69.1	3.5

%YLD= 78.3 : Kcal/Kg = 7746

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
16	29.5-41	7646-	RAW	.32	29.3	20.5	49.9	2.5
9L		7655	1.6 FLT	.93	11.2	21.7	65.7	5.0

%YLD= 60.2 : Kcal/Kg = 7430

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
16	61-76	7657-	RAW	.51	32.1	18.0	49.4	1.0
9L		7670	1.6 FLT	.87	11.4	20.8	66.9	2.0
+10B								

%YLD= 59.3 : Kcal/Kg = 7444

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
10	48.5-61.5	7370-	RAW	.54	27.9	20.0	51.6	1.5
9L		7383	1.6 FLT	.82	13.3	21.0	64.9	3.0

%YLD= 62.5 : Kcal/Kg 7267

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
10	90-96	7386-	RAW	.50	13.2	19.7	66.6	1.0
9L		7391	1.6 FLT	.92	10.5	20.3	68.3	1.0

%YLD= 84.6 : Kcal/Kg 7484

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
10	101-113	7394-	RAW	.60	17.0	20.9	61.5	2.5
10B		7405	1.6 FLT	.91	9.4	21.2	68.5	3.0

%YLD= 78.9 : Kcal/Kg 7613

4/6
D.C.L.

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
7	155.5-159	7406-		.40	23.0	19.9	56.7	2.5
10A		7409		.54	14.5	21.4	63.6	4.0

%YLD= 73.6 : Kcal/K6 = 7248

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
11	8.5-17	7410-		.29	21.9	19.6	57.7	1.0
9L		7418		1.10	8.5	20.8	69.6	1.0

%YLD= 71.1 : Kcal/K6 = 7676

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
11	21.5-34	7420-		.51	17.4	19.7	62.4	2.0
10B		7432		.82	8.5	21.6	69.1	2.5

%YLD= 77.4 : Kcal/K6 = 7688

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
11	70.5-82	7436-		.53	17.6	21.4	60.5	3.5
10B		7447		.67	8.9	22.0	68.4	4.5

%YLD= 80.6 : Kcal/K6 = 7695

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
15	17-28	7523-		.56	28.7	20.2	50.5	0.5
9U		7532		1.03	10.9	21.2	66.9	1.0

%YLD= 64.1 : Kcal/K6 = 7332

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
15	49-54	7534-		.52	20.8	19.5	59.2	2.0
9L		7538		.75	8.4	21.2	69.7	3.0

%YLD= 76.5 : Kcal/K6 = 7729

5/6-1

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
5	56.5-63	7556-		.65	23.1	21.5	54.7	2.0
10B		7562		.76	8.5	21.7	69.0	4.0

%YLD= 74.4 ; Kcal/K6 [7207]

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
15	77.5-87	7540-		.58	20.7	20.2	58.5	3.0
10B		7549		.62	8.2	22.1	69.1	4.0

%YLD= 77.9 ; Kcal/K6 [7265]

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
17	32-34	7576-		.60	12.1	21.8	65.5	2.5
9L		7577		.76	6.4	22.3	70.5	3.0

%YLD= 80.7 ; Kcal/K6 [7824]

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
17	38-47	7580-		.48	19.7	20.9	58.9	2.5
10B		7588		.52	8.9	22.0	68.6	3.5

%YLD= 71.0 ; Kcal/K6 [7210]

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.

%YLD= ; Kcal/K6 [ ]

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.

%YLD= ; Kcal/K6 [ ]

26/6; 1.

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 1	9-18		RAW	.21	15.28	21.21	63.30	1.0
10B			1.6 FLT	.11	7.71	21.89	70.29	1.0

%YLD= 70.00

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 1	55-60		RAW	.16	21.03	19.29	59.02	3.5
10B			1.6 FLT	.15	10.09	21.65	68.11	6.5

%YLD= 72.76

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 2	27-33		RAW	.19	13.56	20.52	65.73	1.0
10B			1.6 FLT	.15	7.24	21.60	71.01	1.0

%YLD= 70.15

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 2	33-42		RAW	.22	14.43	21.12	64.23	5.5
10B			1.6 FLT	.42	7.18	22.20	70.20	6.0

%YLD= 66.18

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 2	27-42		RAW	.17	14.26	20.39	65.18	2.5
10B			1.6 FLT	.20	7.52	21.50	70.78	3.0

%YLD= 64.88

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 3	27-32		RAW	.43	29.10	18.41	52.06	1.0
9L			1.6 FLT	.97	9.00	20.43	69.60	2.5

%YLD= 56.05

DN21

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 1	9-18		RAW	.21	15.28	21.21	63.30	1.0
10B			1.6 FLT	.11	7.71	21.89	70.29	1.0
			%YLD= 70.00					

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 1	55-60		RAW	.16	21.03	19.79	59.02	3.5
10B			1.6 FLT	.15	10.09	21.65	68.11	6.5
			%YLD= 72.76					

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 2	27-33		RAW	.19	13.56	20.52	65.73	1.0
10B			1.6 FLT	.15	7.24	21.60	71.01	1.0
			%YLD= 70.15					

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 2	33-42		RAW	.22	14.43	21.12	64.23	5.5
10B			1.6 FLT	.42	7.18	22.20	70.20	6.0
			%YLD= 66.18					

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 2	27-42		RAW	.17	14.26	20.39	65.18	2.5
10B			1.6 FLT	.20	7.52	21.50	70.78	3.0
			%YLD= 64.88					

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS# 3	27-32		RAW	.43	29.10	18.41	52.06	1.0
1L			1.6 FLT	.97	9.00	20.43	69.60	2.5
			%YLD= 56.05					

DN.21

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS#3	35-45		RAW	.12	15.82	21.40	62.66	3.0
10B			1.6 FLT	.41	8.82	81.18	69.59	3.0

%YLD= 65.08

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS#3	90.5-95.5		RAW	.35	33.92	16.30	49.43	1.0
10A			1.6 FLT	.50	14.20	19.60	65.20	3.0

%YLD= 47.99

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS#4	26.5-31.		RAW	.47	25.31	20.27	53.95	3.0
9U			1.6 FLT.	.54	13.54	81.53	64.39	5.5

%YLD= 61.25

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS#4	67-75		RAW	.40	17.13	19.32	63.15	1.5
9L			1.6 FLT	.57	8.87	20.58	69.98	3.5

%YLD= 66.25

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS#4	79-83		RAW	.28	24.03	20.29	55.40	1.5
10B			1.6 FLT.	.13	11.76	21.06	67.05	2.0

%YLD= 59.00

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.
EPS#4	83-93		RAW	.12	11.50	21.90	66.48	3.5
10B			1.6 FLT	.18	7.82	21.88	70.12	4.5

%YLD= 72.26

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI
FPS#4.	79-94		RAW	.48	17.20	20.08	62.24	3.5
10B			1.6FLT	.51	8.71	21.21	69.57	4.5

%YLD= 64.40

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.

%YLD=

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.

%YLD=

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.

%YLD=

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.

%YLD=

HOLE#	INTERVAL	LAB#	Coal Type	%RM.	%ASH	%VOL.	%FC.	FSI.

%YLD=

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TO : CROWSNEST RESOURCES LTD.
ATTN : TED HANNAH
PROJECT : MSAN - RIDGE AREA

FILE # : 33573
DATE : AUGUST 16, 1990
REPORT BY : ARNO HOOGVELD

SAMPLE TYPE: Trench (BACKHOE TRENCH NORTH OF TEST PIT)

P.O.# R0635

PAGE : 2 RAW SCREEN ANALYSIS

SAMPLE ID	SIZE	% RECOVERY	
ZONE	+ 1"	10.09	
~~AA~~	1"x 1/4"	40.95	86.74
	1/4"x28mesh	35.70	
10B	28x100mesh	10.64	
	100x325mesh	2.04	13.26
FAULT	- 325mesh	0.58	
REPEAT			

SAMPLE ID	SIZE	% RECOVERY	
ZONE	+ 1"	3.70	
~~A~~	1"x 1/4"	29.33	85.54
	1/4"x28mesh	52.51	
10B	28x100mesh	10.57	
	100x325mesh	2.87	14.46
	- 325mesh	1.03	

SAMPLE ID	SIZE	% RECOVERY	
ZONE	+ 1"	2.23	
~~B~~	1"x 1/4"	22.48	80.03
	1/4"x28mesh	55.32	
9A	28x100mesh	15.68	
	100x325mesh	2.59	19.97
	- 325mesh	1.71	

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SAMPLE TYPE: Trench (BACKHOE TRENCH NORTH OF TEST PIT)

P.O.# R0635

PAGE: 3 SCREEN ANALYSIS

SAMPLE ID	SIZE	% RECOVERY	
ZONE	+ 1"	3.33	
~~B~~	1"x 1/4"	27.26	82.97
8L	1/4"x28mesh	52.38	
	28x100mesh	13.49	
	100x325mesh	2.94	17.03
	- 325mesh	0.60	

SAMPLE ID	SIZE	% RECOVERY	
ZONE	+ 1"	0.46	
~~B~~	1"x 1/4"	13.20	76.15
8U	1/4"x28mesh	62.49	
	28x100mesh	19.59	
	100x325mesh	3.75	23.85
	- 325mesh	0.51	

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PROJECT : MSAN - RIDGE AREA

FILE #: 33573
DATE: AUGUST 22, 1990
REPORT BY: ARNO HOOGVELD

SAMPLE TYPE: Trench (BACKHOE TRENCH NORTH OF TEST PIT)

P.O.# R0635

PAGE : 4

SCREENED 1.60 FLT

SAMPLE ID	BASIS	%H2O	%V.M.	%ASH	%F.C.	%S	CAL/GM	F.S.I.
AR +1/4"	A.D.	3.43	22.46	8.23	65.88	0.25	6871	0
10B	D.B.	----	23.26	8.52	68.22	0.26	7115	
AR +28mesh	A.D.	3.45	23.23	8.13	65.19	0.27	6804	0
FAULT REPEAT	D.B.	----	24.06	8.42	67.52	0.28	7047	
+1/4"	A.D.	3.58	23.04	9.71	63.67	0.26	6496	0
10B	D.B.	----	23.90	10.07	66.03	0.27	6737	
+28mesh	A.D.	3.80	24.40	7.74	64.06	0.31	6561	0
	D.B.	----	25.36	8.05	66.59	0.32	6820	
+1/4"	A.D.	3.79	23.42	13.61	59.18	0.32	6107	0
9U	D.B.	----	24.34	14.15	61.51	0.33	6348	
+28mesh	A.D.	3.99	24.67	11.29	60.05	0.30	6144	0
	D.B.	----	25.70	11.76	62.55	0.31	6399	
+1/4"	A.D.	2.08	21.90	17.25	58.77	0.65	6399	0.5
8L	D.B.	----	22.37	17.62	60.02	0.66	6535	
+28mesh	A.D.	2.58	23.66	12.59	61.17	0.73	6692	0.5
	D.B.	----	24.29	12.92	62.79	0.75	6869	
+1/4"	A.D.	5.14	26.32	10.41	58.13	0.21	6058	0
	D.B.	----	27.75	10.97	61.28	0.22	6386	
+28mesh	A.D.	4.77	28.85	8.75	57.63	0.27	6046	0
	D.B.	----	30.30	9.19	60.52	0.28	6349	

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PROJECT : MSAN - RIDGE AREA

FILE #: 33573-1
DATE: SEPTEMBER 7, 1990
REPORT BY: ARNO HOOGVELD

SAMPLE TYPE: Trench (BACKHOE TRENCH NORTH OF TEST PIT) P.O.# R0635

PAGE : 1

SCREENED PROC.

SAMPLE ID	BASIS	%H2O	%V.M.	%ASH	%F.C.	%S	CAL/GM	F.S.I.
AA -28 mesh	A.D.	5.80	25.28	9.77	59.15	0.43	6245	0
10B FAULT REPEAT	D.B.	----	26.84	10.37	62.79	0.46	6629	
10B -28 mesh	A.D.	4.05	24.51	14.22	57.22	0.31	5885	0
	D.B.	----	25.54	14.82	59.64	0.32	6133	
9U -28 mesh	A.D.	7.74	25.24	15.81	51.21	0.31	5179	0
	D.B.	----	27.36	17.14	55.51	0.34	5613	
8L -28 mesh	A.D.	5.19	24.31	18.65	51.85	0.64	5746	0
	D.B.	----	25.64	19.67	54.69	0.68	6061	
8U -28 mesh	A.D.	8.23	26.96	13.32	51.49	0.30	5456	0
	D.B.	----	29.38	14.51	56.11	0.33	5945	

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ATTN : TED HANNAH
PROJECT : MSAN - RIDGE AREA
(Trench samples) (BACKHOE TRENCH NORTH OF TEST PIT)
SINK/FLOAT

FILE #: 33573
DATE : AUGUST 21, 1990
P.O. # R0635

SAMPLE ID : ZONE ~~AA~~ /DB FAULT REPEAT PAGE : 5

HEAD	H2O%	ASH%	V.M.%	F.C.%
(AIR DRIED)	3.66	12.98	23.50	59.86

SIZE FRACTION : + 1/4"

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	1.11	4.01	1.11	4.01	1.93	22.76	71.38	2.5
1.30x1.40	32.51	4.74	33.62	4.72	2.99	22.31	70.10	0
1.40x1.50	47.72	9.48	81.34	7.51	3.89	22.06	64.94	0
1x1.60	7.70	21.37	89.04	8.71	3.35	21.03	54.97	0
.60x1.70	2.58	34.82	91.62	9.44	2.66	18.34	45.11	0
1.70x1.80	0.18	38.81	91.80	9.50	3.45	16.48	42.60	0
1.80x1.90	0.92	48.71	92.72	9.89	3.02	16.24	33.50	0
1.90x2.00	0.14	56.03	92.86	9.96	3.00	16.11	26.54	0
2.00 SNK	7.14	80.88	100.00	15.03	1.65	10.43	8.37	0

1.5

SIZE FRACTION : + 28 mesh

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	3.52	2.37	3.52	2.37	1.68	22.75	73.24	2.5
1.30x1.40	30.92	3.75	34.43	3.61	2.93	22.44	70.99	0
1.40x1.50	44.03	9.09	78.47	6.68	4.04	22.20	65.04	0
1.50x1.60	9.28	18.12	87.74	7.89	4.40	22.08	56.20	0
1.60x1.70	2.90	33.04	90.64	8.70	3.28	19.59	45.17	0
1.70x1.80	1.78	41.16	92.42	9.32	2.75	16.91	40.31	0
1.80x1.90	2.01	49.25	94.43	10.17	3.14	16.42	32.74	0
1.90x2.00	0.23	56.10	94.66	10.28	3.63	16.25	26.06	0
2.00 SNK	5.34	80.87	100.00	14.05	1.66	10.61	8.20	0

9.5

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PROJECT : MSAN - RIDGE AREA
(Trench samples) (BACKHOE TRENCH NORTH OF TEST PIT)

FILE #: 33573
DATE : AUGUST 22, 1990
P.O. # R0635

SAMPLE ID : ZONE X 10B

HEAD	H2O%	ASH%	V.M.%	F.C.%
(AIR DRIED)	2.62	26.53	21.17	49.68

SIZE FRACTION : + 1/4"

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	0.37	3.24	0.37	3.24	2.64	24.89	69.32	1.5
1.30x1.40	14.15	3.71	14.52	3.70	2.96	24.57	68.87	0
1.40x1.50	36.86	8.52	51.39	7.16	3.45	23.48	64.84	0
9.5 50x1.60	10.61	20.22	62.00	9.40	2.91	21.95	55.51	0
..60x1.70	5.18	33.04	67.18	11.22	2.41	18.93	46.42	0
1.70x1.80	1.92	41.38	69.09	12.05	2.31	17.01	40.26	0
1.80x1.90	3.73	50.59	72.83	14.03	2.00	17.49	30.93	0
1.90x2.00	2.75	61.86	75.58	15.77	1.38	13.06	24.55	0
2.00 SNK	24.42	82.26	100.00	32.01	1.52	9.60	7.87	0

SIZE FRACTION : + 28 mesh

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	0.03	1.65	0.03	1.65	3.27	24.93	70.20	1.5
1.30x1.40	18.01	2.55	18.04	2.55	3.05	24.81	69.67	0
1.40x1.50	40.02	7.84	58.05	6.20	4.36	23.66	64.48	0
9.5 1.50x1.60	12.20	16.51	70.25	7.99	3.86	23.05	57.22	0
1.60x1.70	5.30	30.50	75.55	9.57	2.90	20.27	47.21	0
1.70x1.80	1.02	38.66	76.57	9.95	3.37	18.89	40.38	0
1.80x1.90	3.39	49.91	79.96	11.65	2.65	15.16	33.60	0
1.90x2.00	1.03	58.68	80.98	12.24	2.39	13.97	26.36	0
2.00 SNK	19.02	81.18	100.00	25.35	1.68	10.20	8.30	0

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(Trench samples) (BACKHOE TRENCH NORTH OF TEST PIT)

FILE #: 33573
DATE : AUGUST 21, 1990
P.O. # R0635

SAMPLE ID : 8 94

HEAD	H2O%	ASH%	V.M.%	F.C.%
(AIR DRIED)	6.98	22.86	23.40	46.76

SIZE FRACTION : + 1/4"

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	0.14	2.17	0.14	2.17	1.90	24.46	71.51	2
1.30x1.40	2.73	7.49	2.87	7.22	2.48	24.22	66.00	0
[illegible]x1.50	30.40	9.67	33.27	9.46	3.96	23.51	63.24	0
[illegible]x1.60	24.44	19.26	57.71	13.61	3.69	23.33	54.43	0
1.60x1.70	6.99	32.26	64.70	15.63	3.03	21.10	44.59	0
1.70x1.80	5.29	42.61	69.99	17.67	2.30	20.49	35.58	0
1.80x1.90	6.54	48.80	76.53	20.33	2.10	19.83	30.29	0
1.90x2.00	2.50	56.55	79.03	21.47	1.75	17.52	25.17	0
2.00 SNK	20.97	80.02	100.00	33.75	1.25	10.97	8.76	0

SIZE FRACTION : + 28 mesh

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	0.70	2.09	0.70	2.09	2.42	25.32	70.22	0
1.30x1.40	7.31	3.87	8.00	3.71	2.80	25.25	68.19	0
1.40x1.50	25.71	8.78	33.71	7.58	3.62	25.05	62.87	0
1.50x1.60	31.81	15.91	65.52	11.62	3.98	24.69	56.05	0
1.60x1.70	9.46	29.27	74.97	13.85	3.15	22.15	46.35	0
1.70x1.80	5.09	38.69	80.06	15.43	2.31	21.31	38.58	0
1.80x1.90	4.63	47.08	84.69	17.16	2.47	18.73	32.88	0
1.90x2.00	1.56	57.39	86.25	17.89	2.71	17.45	24.01	0
[illegible]0 SNK	13.75	78.05	100.00	26.16	1.46	12.29	9.34	0

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(Trench samples) (BACKHOE TRENCH NORTH OF TEST PIT)

FILE #: 33573
DATE : AUGUST 27, 1990
P.O. # R0635

SAMPLE ID : 8L

HEAD	H2O%	ASH%	V.M.%	F.C.%
(AIR DRIED)	3.03	31.2	21.07	44.70

SIZE FRACTION : + 1/4"

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	0.29	1.30	0.29	1.30	1.61	25.17	71.94	3
.30x1.40	6.22	7.72	6.51	7.43	2.02	23.49	66.93	1.5
.40x1.50	25.28	14.73	31.79	13.24	2.25	21.76	61.59	0.5
1.50x1.60	13.58	26.30	45.37	17.15	2.24	20.89	51.16	0.5
1.60x1.70	8.57	35.17	53.94	20.01	2.11	20.27	43.19	0
1.70x1.80	7.00	44.79	60.94	22.86	1.94	17.86	36.28	0
1.80x1.90	3.94	52.47	64.89	24.66	2.26	16.27	30.19	0
1.90x2.00	3.95	60.88	68.84	26.74	1.75	13.13	25.31	0
2.00 SNK	31.16	81.93	100.00	43.93	1.23	8.30	9.55	0

SIZE FRACTION : + 28 mesh

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	3.24	1.25	3.24	1.25	2.25	24.73	71.80	2.5
1.30x1.40	12.64	4.73	15.88	4.02	2.39	24.60	68.39	1
1.40x1.50	22.22	11.70	38.11	8.50	3.34	23.39	61.96	0
1.50x1.60	13.84	23.42	51.95	12.47	3.11	22.16	52.04	0
1.60x1.70	8.41	33.85	60.36	15.45	2.84	20.68	43.59	0
1.70x1.80	2.97	42.03	63.33	16.70	3.35	19.24	36.79	0
1.80x1.90	7.69	51.17	71.02	20.43	3.17	17.01	30.27	0
.90x2.00	3.51	61.12	74.53	22.35	2.47	14.28	23.64	0
.00 SNK	25.47	79.79	100.00	36.98	1.81	9.44	10.40	0

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ATTN : TED HANNAH
PROJECT : MSAN - RIDGE AREA
(Trench samples) (BACKHOE TRENCH NORTH OF TEST PIT)

FILE #: 33573
DATE : AUGUST 29, 1990
P.O. # R0635

SAMPLE ID : # 84

HEAD	H2O%	ASH%	V.M.%	F.C.%
(AIR DRIED)	6.9	22.07	25.33	45.70

SIZE FRACTION : + 1/4"

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	0.00	1.43	0.00	1.43	2.30	24.43	71.87	0
1.30x1.40	9.65	4.90	9.65	4.89	3.80	23.68	67.81	0
1.40x1.50	25.07	8.22	34.72	7.29	6.17	26.93	59.19	0
1.50x1.60	13.64	16.89	48.36	10.00	5.74	26.11	52.23	0
1.60x1.70	3.85	31.37	52.21	11.58	4.40	22.94	42.67	0
1.70x1.80	1.35	40.84	53.56	12.32	4.90	20.04	36.22	0
1.80x1.90	9.66	51.01	63.22	18.23	3.03	16.84	30.67	0
1.90x2.00	1.99	60.20	65.21	19.51	2.93	14.97	23.66	0
2.00 SNK	34.79	82.16	100.00	41.30	1.40	9.98	7.61	0

SIZE FRACTION : + 28 mesh

SPECIFIC GRAVITY	DRY BASIS FRACTIONAL WT%	DRY BASIS FRACTIONAL ASH%	DRY BASIS CUMULATIVE WT%	DRY BASIS CUMULATIVE ASH%	AIR DRIED H2O%	AIR DRIED V.M.%	AIR DRIED F.C.%	F.S.I.
1.30 FLT	0.07	1.55	0.07	1.55	2.55	26.22	69.72	0
1.30x1.40	8.48	3.22	8.55	3.21	2.85	25.51	68.51	0
1.40x1.50	31.29	6.86	39.83	6.08	5.40	28.22	59.89	0
1.50x1.60	25.72	13.58	65.56	9.02	5.80	28.20	53.21	0
1.60x1.70	7.44	26.45	73.00	10.80	4.53	25.50	44.72	0
1.70x1.80	2.22	36.97	75.21	11.57	4.71	22.43	37.63	0
1.80x1.90	6.19	47.30	81.40	14.28	3.76	19.65	31.07	0
1.90x2.00	1.80	56.41	83.20	15.19	3.51	17.84	24.22	0
2.00 SNK	16.80	79.47	100.00	25.99	1.39	11.79	8.45	0

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PROJECT : MSA NORTH

FILE # : 33150
DATE : MARCH 5, 1990
SAMPLE TYPE : COAL
CSR DRILL HOLE SAMPLES

* PEDULL NOS. FROM CNRL LAB
AIR DRY.

PAGE : 2 A

1.6 S.G. PROX.

HOLE	SEAM	SAMPLE DEPTH	BASIS	% H20	% ASH	% VOL.	% F.C.	% S	KCAL/KG	F.S.I.	
1	~~AZ~~ 10B	9 - 18	A.D.	1.25	7.56	22.05	69.14	0.30	7696	1.5	
			D.B.	----	7.66	22.33	70.02	0.30	7793		
				0.11	7.71	21.89	70.29			1.0	*
2	~~AAA~~ 10B	27 - 33 [redacted] FAULT REPEAT	A.D.	0.92	7.18	20.96	71.02	0.42	7913	3.0	
			D.B.	----	7.17	21.15	71.68	0.42	7986		
				0.15	7.24	21.60	71.01			1.0	*
2	~~AZC~~ 10B	33 - 42 [redacted]	A.D.	0.65	7.02	22.01	70.32	0.30	7964	5.0	
			D.B.	----	7.07	22.15	70.78	0.30	8016		
				0.42	7.18	22.20	70.20			6.0	*
3	~~AB~~ 9L	27 - 32	A.D.	0.96	8.84	20.94	69.26	0.33	7711	2.5	
			D.B.	----	8.93	21.14	69.93	0.33	7786		
				0.97	9.00	20.43	69.60			2.5	*
3	~~AZ~~ 10B	35 - 45	A.D.	0.80	8.68	21.25	69.27	0.32	7769	4.0	
			D.B.	----	8.75	21.42	69.83	0.32	7832		
				0.41	8.82	21.18	69.59			3.0	*
4	~~BZ~~ 9U	19.5 - 31.	A.D.	0.92	13.41	21.91	63.76	0.35	7343	5.0	
			D.B.	----	13.53	22.11	64.35	0.35	7411		
				0.54	13.54	21.53	64.39			5.5	*

[redacted]

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ATTN : TED HANNAH
PROJECT : MSAN - RIDGE AREA

FILE # 33629
DATE : SEPT. 4, 1990
SAMPLE TYPE : CLEAN COAL, 1.6 FLOAT
CSR DRILL HOLE SAMPLES

PAGE : 3

GIESELER FLUIDITY TEST

HOLE :	SEAM	STARTING TEMP. DDPM	STARTING TEMP. (DEG.C)	MAXIMUM TEMP. DDPM	MAXIMUM TEMP. (DEG.C)	FINAL TEMP. DDPM	FINAL TEMP. (DEG.C)	RANGE
5	9L	1	418	2	451	0	493	75
12	8L	1	407	6	444	0	492	85
12	8U+L	1	426	2	447	0	494	68
13	9U	1	424	5	460	0	490	66
20	8L	1	411	11	460	0	494	83
20	8U+L	1	427	2	460	0	494	67

DILATATION TEST

		ST (DEG.C)	MDT (DEG.C)	MC %	MD %	G
5	9L	404	--	18%@488 Deg C	--	--
12	8L	----------		NO ACTIVITY	----------	
12	8U+L	416	--	20%@485 Deg C	--	--
13	9U	392	465	22	-12	0.7754
20	8L	395	467	19	-11	0.7615
20	8U+L	410	--	21%@482 Deg C	--	--

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PROJECT : MSA NORTH

FILE # : 33150
DATE : MARCH 8, 1990
SAMPLE TYPE : COAL
CSR DRILL HOLE SAMPLES

PAGE 3A

HOLE	SEAM	SAMPLE DPTH	FLUIDITY TEST START. TEMP. DDPM	(DEG.C)	MAXIM. TEMP. DDPM	(DEG.C)	FINAL TEMP. DDPM	(DEG.C)	RANGE
53	B	10.5 - 48	1	385	7	444	0	482	97
58	B	14 - 52	1	427	7	450	0	479	52
58	C1	67.5 - 70	1	371	431	450	0	487	116
58	C2	72 - 77.5	1	379	110	450	0	486	107
59	C2	66.5 - 72	1	411	36	452	0	480	69
61	B4	23 - 38	1	423	5	453	0	480	57
61	C2	61 - 71	1	376	33	450	0	478	102
46	B	92.5 - 123	1	411	65	449	0	487	76
1	10B	9 - 10	1	442	--	--	--	--	--
2	10B FAULT REPEAT	27 - 33	1	449	--	--	--	--	--
2	10B	33 - 42	1	432	9	456	0	487	55
3	9L	27 - 32	1	408	4	429	0	483	75
3	10B	35 - 45	1	410	11	459	0	488	78
4	9U	19.5 - 31	1	414	8	456	0	491	77

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FILE # : 33150
DATE : MARCH 8, 1990
SAMPLE TYPE : COAL
CSR DRILL HOLE SAMPLES

DILATATION TEST

HOLE	SEAM	SAMPLE DPTH	ST (DEG.C)	MDT (DEG.C)	MC%	MD%	G
53	B	10.5 - 48	398	--	18 % @ 449 DEG.C		
58	B	14 - 52	410	--	20 % @ 455 DEG.C		
58	C1	67.5 - 70	380	452	21	100	1.059
58	C2	72 - 77.5	386	456	20	31	1.018
59	C2	66.5 - 72	407	467	11	-4	0.872
61	B4	23 - 38	387	--	15 % @ 455 DEG.C		
61	C2	61 - 71	389	467	23	17	1.176
46	B	92.5 - 123	395	470	25	25	1.000
1	10B	9 - 10	NO ACTIVITY				
2	10B	27 - 33	422	--	17 % @ 491 DEG.C		
2	10B	FAULT REPEAT 33 - 42	404	467	21	-12	0.769
3	9L	27 - 32	413	--	26 % @ 497 DEG.C		
3	10B	35 - 45	398	464	22	-16	0.673
4	9U	19.5 - 31	412	479	19	-17	0.425

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PROJECT : MSAN - RIDGE AREA
TRENCH SAMPLES (BACKHOE TRENCH NORTH OF TEST PIT)
PAGE : II

FILE # 33573
DATE : AUG 29, 1990
REPORTED BY : ARNO HOOGVELD

1.6 FLT

SAMPLE	SIZE	MINERAL ANALYSIS OF ASH %SiO2	%Al2O3	%TiO2	%Fe2O3	%CaO	%MgO	%Na2O	%K2O	%P2O5	%SO3	%Undet.
10B	+1/4 "	54.91	33.58	1.25	2.76	3.72	0.68	0.14	0.45	1.30	0.54	0.67
FAULT REPEAT	+28 mesh	56.23	31.78	1.57	2.35	3.98	0.75	0.15	0.61	0.90	0.80	0.88
10B	+1/4 "	57.51	29.96	1.15	7.27	1.83	0.62	0.11	0.48	0.25	0.47	0.35
	+28 mesh	55.14	31.08	1.56	5.21	3.03	1.13	0.20	0.54	0.42	0.92	0.77
9u	+1/4 "	52.02	30.44	1.09	8.02	3.74	1.51	0.11	0.59	1.20	0.66	0.62
	+28 mesh	54.39	30.47	1.52	4.17	4.63	1.89	0.07	0.40	0.62	1.16	0.68
8L	+1/4 "	54.25	28.06	0.96	7.09	3.96	0.67	0.15	0.94	2.70	0.53	0.69
	+28 mesh	56.12	26.52	1.44	5.66	4.41	1.43	0.13	1.15	1.06	1.73	0.35
8u	+1/4 "	51.13	24.56	1.24	1.07	12.10	4.98	0.17	0.99	1.26	2.06	0.44
	+28 mesh	44.30	21.55	1.52	1.03	20.01	6.31	0.19	0.79	1.02	2.94	0.34

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TN : TED HANNAH
ROJECT : MSAN - RIDGE AREA
AGE : 2

FILE # 33573-1
DATE : SEPTEMBER 21, 1990
REPORTED BY : ARNO HOOGVELD

TRENCH SAMPLES (BACKHOE TRENCH NORTH OF TEST PIT)

AMPLE	SIZE	%SiO2	%Al2O3	%TiO2	%Fe2O3	%CaO	%MgO	%Na2O	%K2O	%P2O5	%SO3	%Undet.
		---------- MINERAL ANALYSIS OF ASH ----------										
10B	-28 mesh	50.50	26.82	1.80	7.36	6.83	1.68	0.15	0.69	0.45	3.29	0.43
FAULT REPEAT												
10B	-28 mesh	55.85	27.97	1.57	6.46	2.44	1.00	0.11	1.13	0.27	2.26	0.94
9U	-28 mesh	52.89	26.29	1.63	7.70	4.52	1.83	0.21	0.93	0.59	2.63	0.78
8L	-28 mesh	55.56	20.85	1.46	6.99	5.99	1.72	0.11	1.34	0.87	4.33	0.78
8U	-28 mesh	48.09	25.45	1.73	2.23	12.41	4.01	0.12	0.73	0.56	4.19	0.48

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PROJECT : NSAN - RIDGE AREA

FILE # 33629
DATE : SEPTEMBER 7, 1990
REPORTED BY : ARNO HOOGVELD

CSR DRILL HOLE SAMPLES

1.6 FLT

			MINERAL ANALYSIS OF ASH										
HOLE	DEPTH	SEAM	%SiO2	%Al2O3	%TiO2	%Fe2O3	%CaO	%MgO	%Na2O	%K2O	%P2O5	%SO3	%Undet.
5	78 - 86	9L	57.54	32.32	2.15	2.04	2.30	0.31	0.07	0.39	1.34	0.35	1.19
12	64.5 - 78.5	8L	62.67	28.37	1.96	1.57	1.55	0.23	0.08	0.51	1.45	0.22	1.39
13	18.5 - 34.5	8U+L	60.95	29.94	2.03	0.81	1.57	0.23	0.05	0.46	1.71	0.38	1.87
13	34.5 - 56	9L	62.21	28.93	1.61	1.84	2.00	0.30	0.06	0.64	1.63	0.29	0.49
20	153.5 - 164	8L	62.34	28.51	2.02	1.11	1.93	0.39	0.06	0.67	1.39	0.62	0.96
20	122 - 137.5 142 - 147	8U+L	59.37	28.46	2.10	1.58	2.78	0.68	0.10	0.38	1.81	1.90	0.84

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PROJECT : MSAN - RIDGE AREA

FILE # 33573
DATE : AUG 29, 1990
REPORTED BY : ARNO HOOGVELD

TRENCH SAMPLES (BACKHOE TRENCH NORTH OF TEST PIT)

1.6 FLT

SAMPLE	SIZE	ULTIMATE ANALYSIS %H2O	%C	%H	%N	%ASH	%S	%O
10B	+1/4 "	3.43	73.34	3.64	0.82	8.23	0.25	10.29
FAULT REPEAT	+28 mesh	3.45	72.14	3.39	0.88	8.43	0.27	11.44
10B	+1/4 "	3.58	70.19	3.31	0.62	9.71	0.26	12.33
"	+28 mesh	3.80	71.07	3.72	0.76	7.74	0.31	12.60
9U	+1/4 "	3.79	65.51	3.10	0.60	13.61	0.32	13.07
"	+28 mesh	3.99	67.29	3.24	0.65	11.29	0.30	13.24
8L	+1/4 "	2.08	67.94	4.13	0.74	17.25	0.65	7.21
"	+28 mesh	2.58	70.46	3.93	0.83	12.59	0.73	8.88
8U	+1/4 "	5.14	65.68	2.89	0.71	10.41	0.21	14.96
"	+28 mesh	4.77	66.93	3.19	0.69	9.19	0.27	14.96

NOTE: Hydrogen and oxygen do not include H and O from sample moisture.
Value of oxygen by difference.

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PROJECT : MSAN - RIDGE AREA
PAGE : 2

FILE # 33573-1
DATE : SEPT. 10, 1990
REPORTED BY : ARNO HOOGVELD

TRENCH SAMPLES (BACKHOE TRENCH NORTH OF TEST PIT)

		ULTIMATE ANALYSIS						
SAMPLE	SIZE	%H2O	%C	%H	%N	%ASH	%S	%O
10B FAULT REPEAT	-28 mesh	5.80	68.29	4.02	0.94	9.77	0.43	10.75
10B	-28 mesh	4.05	64.67	3.23	0.93	14.22	0.31	12.59
9U	-28 mesh	7.74	59.54	3.32	0.58	15.81	0.31	12.70
8L	-28 mesh	5.19	62.36	3.37	0.69	18.65	0.64	9.10
8U	-28 mesh	8.23	60.83	2.97	0.77	13.32	0.30	13.58

NOTE: Hydrogen and oxygen do not include H and O from sample moisture.

Value of oxygen by difference.

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PROJECT : MSAN - RIDGE AREA

FILE # 33629
DATE : SEPTEMBER 7, 1990
REPORTED BY : ARNO HOOGVELD

 CSR DRILL HOLE SAMPLES

1.6 FLT

			ULTIMATE ANALYSIS						
HOLE	DEPTH	SEAM	%H2O	%C	%H	%N	%ASH	%S	%O
5	78 - 86	9L	0.92	78.07	4.00	0.71	9.48	0.35	6.47
12	64.5 - 78.5	8L	0.99	77.09	4.84	0.82	11.66	0.61	3.99
12	18.5 - 34.5	8u+L	1.06	78.57	4.31	0.89	7.39	0.30	7.48
13	34.5 - 56	9L	0.96	76.03	4.95	0.80	11.27	0.43	5.56
20	153.5 - 164	8L	0.97	72.85	4.47	0.84	11.24	0.56	9.07
20	122 - 137.5 142 - 147	8u+L	0.98	79.32	4.46	0.88	7.23	0.32	6.81

NOTE: Hydrogen and oxygen do not include H and O from sample moisture.

Value of oxygen by difference.

ENCLOSURE 12

Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM 10B FAULT REPEAT TRENCH SAMPLE (BACKHOE TRENCH NORTH OF TEST PIT)

Laboratory number M10119
Sample AR +28 mesh
Ash 9.50% Sulphur 0.40%

PETROGRAPHIC INDICES

Mean Maximum Reflectance....%	1.27
Composition Balance Index....	2.73
Calculated Strength Index....	4.70
Calculated Stability Index....	44
Estimated Coke Strength DI 30/15....	91.6
Predicted Free Swelling Index....	5

DISTRIBUTION OF VITRINITE TYPES

V - 11....%	14
V - 12....%	49
V - 13....%	36
V - 14....%	1

REACTIVE COMPONENTS

Vitrinite....%	32.9
Exinite....%	0.1
Reactive Semifusinite....%	22.2
Total Reactives....%	55.2

INERT COMPONENTS

Macrinite....%	1.5
Inert Semifusinite....%	27.6
Fusinite....%	6.8
Inertodetrinite....%	3.7
Mineral Matter....%	5.2
Total Inerts....%	44.8

Analysis Completed : September 13, 1990 11:00 AM

David E. Pearson & Associates Ltd.
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6076

Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM 10B

Laboratory number M10123

Sample A +28 mesh TRENCH SAMPLE

Ash 9.50% Sulphur 0.40% (BACKHOE TRENCH NORTH OF TEST PIT)

PETROGRAPHIC INDICES

Mean Maximum Reflectance	%	1.27
Composition Balance Index		2.50
Calculated Strength Index		4.73
Calculated Stability Index		46
Estimated Coke Strength DI 30/15		92.2
Predicted Free Swelling Index		5

DISTRIBUTION OF VITRINITE TYPES

V - 11	%	10
V - 12	%	57
V - 13	%	33

DIFFERENT DISTRIBUTION

REACTIVE COMPONENTS

Vitrinite	%	36.5
Exinite	%	0.0
Reactive Semifusinite	%	20.8
Total Reactives	%	57.3

INERT COMPONENTS

Macrinite	%	2.4
Inert Semifusinite	%	27.4
Fusinite	%	5.9
Inertodetrinite	%	1.8
Mineral Matter	%	5.2
Total Inerts	%	42.7

Analysis Completed : September 13, 1990 7:59 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION

Laboratory number M9579
MSA North Hole 2 [redacted]
Ash 9.00% Sulphur 0.40%

SEAM 10B
FAULT REPEAT
CSR DRILL HOLE SAMPLE

PETROGRAPHIC INDICES

Mean Maximum Reflectance	%	1.29
Composition Balance Index		3.56
Calculated Strength Index		4.71
Calculated Stability Index		35
Estimated Coke Strength DI 30/15		88.2
Predicted Free Swelling Index		<4

DISTRIBUTION OF VITRINITE TYPES

V - 11	%	10
V - 12	%	39
V - 13	%	47
V - 14	%	4

REACTIVE COMPONENTS

Vitrinite	%	28.1
Exinite	%	0.0
Reactive Semifusinite	%	21.6
Total Reactives	%	49.7

INERT COMPONENTS

Macrinite	%	0.8
Inert Semifusinite	%	42.8
Fusinite	%	1.7
Inertodetrinite	%	0.0
Mineral Matter	%	5.0
Total Inerts	%	50.3

Analysis Completed : March 14, 1990 12:30 PM

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4277 Houlihan Place, Victoria, British Columbia, Canada. V8N 3T2
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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM. 10B

Laboratory number M9580

MSA North Hole 2 [redacted] CS/R DRILL HOLE SAMPLE

Ash 9.00% Sulphur 0.40%

PETROGRAPHIC INDICES

Mean Maximum Reflectance..... %	1.29
Composition Balance Index.....	2.25
Calculated Strength Index.....	5.02
Calculated Stability Index.....	52
Estimated Coke Strength DI 30/15.....	93.4
Predicted Free Swelling Index.....	6

DISTRIBUTION OF VITRINITE TYPES

V - 11..... %	7
V - 12..... %	46
V - 13..... %	45
V - 14..... %	2

REACTIVE COMPONENTS

Vitrinite..... %	39.1
Exinite..... %	0.0
Reactive Semifusinite..... %	21.7
Total Reactives..... %	60.8

INERT COMPONENTS

Macrinite..... %	0.3
Inert Semifusinite..... %	30.4
Fusinite..... %	2.8
Inertodetrinite..... %	0.7
Mineral Matter..... %	5.0
Total Inerts..... %	39.2

Analysis Completed : March 14, 1990 2:27 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM 10B

Laboratory number M9578

MSA North Hole 1 ~~9-18m~~ CSR DRILL HOLE SAMPLE

Ash 9.00% Sulphur 0.40%

PETROGRAPHIC INDICES

Mean Maximum Reflectance..... %	1.29
Composition Balance Index.....	2.57
Calculated Strength Index.....	4.88
Calculated Stability Index.....	47
Estimated Coke Strength DI 30/15.....	92.4
Predicted Free Swelling Index.....	5.5 - 6

DISTRIBUTION OF VITRINITE TYPES

V - 11..... %	8
V - 12..... %	47
V - 13..... %	44
V - 14..... %	1

REACTIVE COMPONENTS

Vitrinite..... %	37.6
Exinite..... %	0.1
Reactive Semifusinite..... %	19.7
Total Reactives..... %	57.4

INERT COMPONENTS

Macrinite..... %	1.0
Inert Semifusinite..... %	32.7
Fusinite..... %	3.2
Inertodetrinite..... %	0.7
Mineral Matter..... %	5.0
Total Inerts..... %	42.6

Analysis Completed : March 13, 1990 7:06 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM 10B

Laboratory number M9582

MSA North Hole 3 35-45m CSR DRILL HOLE SAMPLE

Ash 9.00% Sulphur 0.40%

PETROGRAPHIC INDICES

Mean Maximum Reflectance..... %	1.28
Composition Balance Index.....	2.87
Calculated Strength Index.....	4.77
Calculated Stability Index.....	43
Estimated Coke Strength DI 30/15.....	91.3
Predicted Free Swelling Index.....	5

DISTRIBUTION OF VITRINITE TYPES

V - 11..... %	8
V - 12..... %	49
V - 13..... %	42
V - 14..... %	1

REACTIVE COMPONENTS

Vitrinite..... %	33.8
Exinite..... %	0.1
Reactive Semifusinite..... %	20.7
Total Reactives..... %	54.6

INERT COMPONENTS

Macrinite..... %	2.1
Inert Semifusinite..... %	35.3
Fusinite..... %	2.7
Inertodetrinite..... %	0.3
Mineral Matter..... %	5.0
Total Inerts..... %	45.4

Analysis Completed : March 14, 1990 5:20 PM

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Organic Petrographers & Geologists
4277 Houlihan Place, Victoria, British Columbia, Canada. V8N 3T2
Telephones (604) 477-2548 & 380-8324 Fax (604) 477-4775

Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION

Laboratory number M10131 SEAM 9L.
Hole #5 7277-7284 CSR DRILL HOLE SAMPLE
Ash 9.00% Sulphur 0.40%

PETROGRAPHIC INDICES

Mean Maximum Reflectance.....%	1.28
Composition Balance Index.....	4.93
Calculated Strength Index.....	4.64
Calculated Stability Index.....	19
Estimated Coke Strength DI 30/15.....	78.3
Predicted Free Swelling Index.....	<<4

DISTRIBUTION OF VITRINITE TYPES

V - 11.....%	7
V - 12.....%	47
V - 13.....%	45
V - 14.....%	1

REACTIVE COMPONENTS

Vitrinite.....%	20.5
Exinite.....%	0.4
Reactive Semifusinite.....%	20.5
Total Reactives.....%	41.4

INERT COMPONENTS

Macrinite.....%	4.7
Inert Semifusinite.....%	42.8
Fusinite.....%	3.7
Inertodetrinite.....%	2.4
Mineral Matter.....%	5.0
Total Inerts.....%	58.6

Analysis Completed : September 4, 1990 10:28 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION

Laboratory number M9581 — SEAM 9L

MSA North Hole 3 27-32m — CSR DRILL HOLE SAMPLE

Ash 9.00% Sulphur 0.40%

PETROGRAPHIC INDICES

Mean Maximum Reflectance..... %	1.26
Composition Balance Index.....	2.80
Calculated Strength Index.....	4.56
Calculated Stability Index.....	41
Estimated Coke Strength DI 30/15.....	90.6
Predicted Free Swelling Index.....	4.5

DISTRIBUTION OF VITRINITE TYPES

V - 11..... %	5
V - 12..... %	70
V - 13..... %	25

REACTIVE COMPONENTS

Vitrinite..... %	31.6
Exinite..... %	0.2
Reactive Semifusinite..... %	22.6
Total Reactives..... %	54.4

INERT COMPONENTS

Macrinite..... %	2.3
Inert Semifusinite..... %	35.1
Fusinite..... %	2.4
Inertodetrinite..... %	0.8
Mineral Matter..... %	5.0
Total Inerts..... %	45.6

Analysis Completed : March 14, 1990 3:58 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM 9u

Laboratory number M10121

Sample B +28 mesh TRENCH SAMPLE

Ash 9.50% Sulphur 0.40% (BACKHOE TRENCH NORTH OF TEST PIT)

PETROGRAPHIC INDICES

Mean Maximum Reflectance	%	1.19
Composition Balance Index		2.84
Calculated Strength Index		4.09
Calculated Stability Index		33
Estimated Coke Strength DI 30/15		87.2
Predicted Free Swelling Index		<4

LOWER THAN DRILL HOLES.

DISTRIBUTION OF VITRINITE TYPES

V - 10	%	4
V - 11	%	43
V - 12	%	47
V - 13	%	6

DIFFERENT DISTRIBUTION THAN DRILLHOLE

REACTIVE COMPONENTS

Vitrinite	%	31.5
Exinite	%	0.1
Reactive Semifusinite	%	19.4
Total Reactives	%	51.0

LOWER THAN DRILLHOLES.

INERT COMPONENTS

Macrinite	%	3.2
Inert Semifusinite	%	26.7
Fusinite	%	11.4
Inertodetrinite	%	2.5
Mineral Matter	%	5.2
Total Inerts	%	49.0

HIGHER

Analysis Completed : September 13, 1990 2:08 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION

Laboratory number M9583
MSA North Hole 4 [redacted]
Ash 9.00% Sulphur 0.40%

SEAM 9L.
CSR DRILL HOLE SAMPLE

PETROGRAPHIC INDICES

Mean Maximum Reflectance....%	1.23
Composition Balance Index....	1.63
Calculated Strength Index....	4.70
Calculated Stability Index....	55
Estimated Coke Strength DI 30/15....	93.7
Predicted Free Swelling Index....	7

DISTRIBUTION OF VITRINITE TYPES

V - 10....%	1
V - 11....%	21
V - 12....%	66
V - 13....%	12

REACTIVE COMPONENTS

Vitrinite....%	47.6
Exinite....%	0.3
Reactive Semifusinite....%	17.9
Total Reactives....%	65.8

INERT COMPONENTS

Macrinite....%	3.9
Inert Semifusinite....%	22.6
Fusinite....%	2.0
Inertodetrinite....%	0.7
Mineral Matter....%	5.0
Total Inerts....%	34.2

Analysis Completed : March 14, 1990 7:39 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM 9u
Laboratory number M10132
Hole #13 7322-7341 CSR DRILL HOLE
Ash 9.00% Sulphur 0.40% SAMPLE

PETROGRAPHIC INDICES

Mean Maximum Reflectance.....%	1.21
Composition Balance Index.....	1.56
Calculated Strength Index.....	4.62
Calculated Stability Index.....	55
Estimated Coke Strength DI 30/15.....	93.7
Predicted Free Swelling Index.....	7

DISTRIBUTION OF VITRINITE TYPES

V - 11.....%	36
V - 12.....%	57
V - 13.....%	7

REACTIVE COMPONENTS

Vitrinite.....%	49.5
Exinite.....%	1.3
Reactive Semifusinite.....%	15.3
Total Reactives.....%	66.1

INERT COMPONENTS

Macrinite.....%	1.9
Inert Semifusinite.....%	21.6
Fusinite.....%	4.6
Inertodetrinite.....%	0.8
Mineral Matter.....%	5.0
Total Inerts.....%	33.9

Analysis Completed : September 4, 1990 10:42 PM

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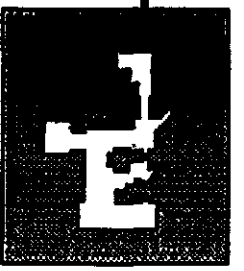

Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM 8L

Laboratory number M10125
Sample C +28 mesh TRENCH SAMPLE
Ash 9.50% Sulphur 0.40% (BACKHOE TRENCH NORTH OF TEST PIT)

PETROGRAPHIC INDICES

Mean Maximum Reflectance	%	1.22
Composition Balance Index		1.37
Calculated Strength Index		4.62
Calculated Stability Index		58
Estimated Coke Strength DI 30/15		93.9
Predicted Free Swelling Index		8

← LOWER THAN DRILL HOLES.

DISTRIBUTION OF VITRINITE TYPES

V - 10	%	1
V - 11	%	28
V - 12	%	69
V - 13	%	2

REACTIVE COMPONENTS

Vitrinite	%	56.0
Exinite	%	0.0
Reactive Semifusinite	%	13.0
Total Reactives	%	69.0

← HIGHER THAN DRILL HOLES

INERT COMPONENTS

Macrinite	%	1.5
Inert Semifusinite	%	19.0
Fusinite	%	4.6
Inertodetrinite	%	0.7
Mineral Matter	%	5.2
Total Inerts	%	31.0

Analysis Completed : September 14, 1990 9:24 AM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION

Laboratory number M10130
Hole #12 7505-7520
Ash 9.00% Sulphur 0.40%

SEAMS 8L TOTAL
CSR DRILL HOLE SAMPLE

PETROGRAPHIC INDICES

Mean Maximum Reflectance....%	1.26
Composition Balance Index....	2.49
Calculated Strength Index....	4.61
Calculated Stability Index....	45
Estimated Coke Strength DI 30/15....	91.9
Predicted Free Swelling Index....	5

DISTRIBUTION OF VITRINITE TYPES

V - 11....%	8
V - 12....%	70
V - 13....%	21
V - 14....%	1

REACTIVE COMPONENTS

Vitrinite....%	39.0
Exinite....%	0.4
Reactive Semifusinite....%	17.6
Total Reactives....%	57.0

INERT COMPONENTS

Macrinite....%	2.0
Inert Semifusinite....%	30.4
Fusinite....%	3.6
Inertodetrinite....%	2.0
Mineral Matter....%	5.0
Total Inerts....%	43.0

Analysis Completed : September 4, 1990 6:13 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION

Laboratory number M10129
Hole #20 7743-7749
Ash 9.00% Sulphur 0.40%

SEAM 8L
TOTAL
CSR DRILL HOLE SAMPLE

PETROGRAPHIC INDICES

Mean Maximum Reflectance	%	1.23
Composition Balance Index		1.98
Calculated Strength Index		4.50
Calculated Stability Index		49
Estimated Coke Strength DI 30/15		92.9
Predicted Free Swelling Index		6

DISTRIBUTION OF VITRINITE TYPES

V - 10	%	1
V - 11	%	24
V - 12	%	69
V - 13	%	6

REACTIVE COMPONENTS

Vitrinite	%	43.3
Exinite	%	0.1
Reactive Semifusinite	%	17.5
Total Reactives	%	60.9

INERT COMPONENTS

Macrinite	%	2.2
Inert Semifusinite	%	27.0
Fusinite	%	3.8
Inertodetrinite	%	1.1
Mineral Matter	%	5.0
Total Inerts	%	39.1

Analysis Completed : September 4, 1990 5:59 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM 8U

Laboratory number M10127

Sample D +28 mesh TRENCH SAMPLE

Ash 9.50% Sulphur 0.40% (BACKHOE TRENCH NORTH OF TEST PIT)

PETROGRAPHIC INDICES

Mean Maximum Reflectance	%	1.19
Composition Balance Index		1.87
Calculated Strength Index		4.38
Calculated Stability Index		49
Estimated Coke Strength DI 30/15		92.9
Predicted Free Swelling Index		5.5 - 6

LOWER THAN DRILL HOLES

DISTRIBUTION OF VITRINITE TYPES

V - 10	%	10
V - 11	%	39
V - 12	%	45
V - 13	%	6

LOWER THAN DRILL HOLES.

REACTIVE COMPONENTS

Vitrinite	%	43.2
Exinite	%	0.0
Reactive Semifusinite	%	17.8
Total Reactives	%	61.0

INERT COMPONENTS

Macrinite	%	1.0
Inert Semifusinite	%	23.9
Fusinite	%	8.3
Inertodetrinite	%	0.6
Mineral Matter	%	5.2
Total Inerts	%	39.0

Analysis Completed : September 14, 1990 11:38 AM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION

Laboratory number M10133
Hole #12 7464-7500
Ash 9.00% Sulphur 0.40%

SEAM Bu
CSR DRILL HOLE SAMPLE

PETROGRAPHIC INDICES

Mean Maximum Reflectance..... %	1.21
Composition Balance Index.....	1.67
Calculated Strength Index.....	4.49
Calculated Stability Index.....	53
Estimated Coke Strength DI 30/15.....	93.5
Predicted Free Swelling Index.....	6.5

DISTRIBUTION OF VITRINITE TYPES

V - 10..... %	3
V - 11..... %	35
V - 12..... %	60
V - 13..... %	2

REACTIVE COMPONENTS

Vitrinite..... %	46.9
Exinite..... %	1.1
Reactive Semifusinite..... %	16.2
Total Reactives..... %	64.2

INERT COMPONENTS

Macrinite..... %	1.5
Inert Semifusinite..... %	25.7
Fusinite..... %	2.6
Inertodetrinite..... %	1.0
Mineral Matter..... %	5.0
Total Inerts..... %	35.8

Analysis Completed : September 4, 1990 10:57 PM

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Petrographic Analysis

for

Crows Nest Resources Ltd.

SAMPLE IDENTIFICATION SEAM 8 U

Laboratory number M10128

Hole #20 7721-7741 CSR DRILL HOLE SAMPLE

Ash 9.00% Sulphur 0.40%

PETROGRAPHIC INDICES

Mean Maximum Reflectance	%	1.22
Composition Balance Index		2.44
Calculated Strength Index		4.34
Calculated Stability Index		42
Estimated Coke Strength DI 30/15		91.0
Predicted Free Swelling Index		4.5 - 5

DISTRIBUTION OF VITRINITE TYPES

V - 11	%	29
V - 12	%	65
V - 13	%	6

REACTIVE COMPONENTS

Vitrinite	%	40.7
Exinite	%	0.9
Reactive Semifusinite	%	14.1
Total Reactives	%	55.7

INERT COMPONENTS

Macrinite	%	3.2
Inert Semifusinite	%	30.6
Fusinite	%	4.2
Inertodetrinite	%	1.3
Mineral Matter	%	5.0
Total Inerts	%	44.3

Analysis Completed : September 4, 1990 3:34 PM

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4277 Houlihan Place, Victoria, British Columbia, Canada. V8N 3T2
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ENCLOSURE 13: TEST PIT QUALITY DATA

The M.S.A.N. test pit was intended to be an attempt to obtain bulk samples of individual seams that would be large enough to run through either the thermal or the metallurgical plant to obtain some idea of their individual cleaning characteristics. It was hoped that this data would then be used to determine how these coals could be blended with other Line Creek seams and still match the sales contract quality specifications.

Samples were collected from the following seams:

8U, 8L1, 9U, 9L and 10B.

Unfortunately, due to inadequate coordination at the Plant, the 8U and 8L1 sample was mixed with other coals and not processed by itself. Therefore there is no data available for these seams.

Samples were processed for seams 9U, 9L and 10B with data being obtained for 9U through the metallurgical plant, 9L through the metallurgical and thermal plants and 10B through the thermal plant.

All available data is attached:

9U SEAM - Bulk sample processed through Line Creek Metallurgical Plant

Feed Ash - 35.6%
Raw FSI - 1.0

Size Distribution

+1"	8.5%
1"x 1/2"	12.4%
1/2" x 1/4"	10.4%
1/4" x 28	45.5%
28 x 48	13.4%
48 x 100	3.4%
100 x 200	3.7%
-200	2.7%

	RAW ASH	WEIGHT	CLEAN ASH	YIELD	REJECT ASH
+ 28 mesh	39.9%	76.8%	14.6%	58.7%	75.8%
- 28 mesh	18.4%	23.2%	13.8%	60.9%	28.2%

Coarse clean coal - 14.6% ash
Bird product - 13.8% ash
Coarse reject - 75.8% ash
Belt press - 28.2% ash

Total clean coal - 13.6% ash
- 0.57% Res. Moist.
- 21.16% volatiles
- 6467.07 cal/gm

Coarse circuit recovery - 58.7%
Fine circuit recovery - 68.1%
Overall - 60.9%

9L SEAM - Bulk sample processed through Line Creek Metallurgical Plant

Feed Ash - 26.2%
Raw FSI - 0.5

Size Distribution

+1"	2.7%
1"x 1/2"	3.4%
1/2" x 1/4"	2.5%
1/4" x 28	87.0%
28 x 48	2.0%
48 x 100	0.8%
100 x 200	0.9%
-200	0.7%

	RAW ASH	WEIGHT	CLEAN ASH	YIELD	REJECT ASH
+ 28 mesh	38.8%	95.6%	14.0%	61.7%	78.3%
- 28 mesh	16.8%	4.4%	12.2%	69.5%	27.3%

Coarse clean coal - 14.0% ash
Bird product - 12.2% ash
Coarse reject - 78.3% ash
Belt press - 27.3% ash

Total clean coal
- 13.92% ash
- 0.71% Res. Moist.
- 21.77% volatiles
- 7301.19 cal/gm

Coarse circuit recovery - 61.7%
Fine circuit recovery - 69.5%
Overall - 62.0%

9L SEAM - Bulk sample processed through Line Creek Thermal Plant

Feed ash - 22.2%
Raw FSI - 0.0
Raw Moist. - 11.92%

+ 4.75	508.5 tonnes	(59.82%)
- 4.75	341.5 tonnes	(40.18%)
	850.0 tonnes	

Prewet screen	-	18.9% ash	0.5 FSI
Coarse clean coal	-	10.9% ash	0.5 FSI
Coarse reject	-	74.1% ash	0.0 FSI
Raw coal undersize	-	17.2% ash	0.0 FSI

Clean coal - 1.15% Resid. Moist.
- 21.03% volatiles
- 15.1% Ash
- 0.5 FSI
- 6718.26 cal/gm
- 11.5% Moist.

10B SEAM - Bulk samples processed through Line Creek Thermal Plant - Samples numbered (1), (2) and (3)

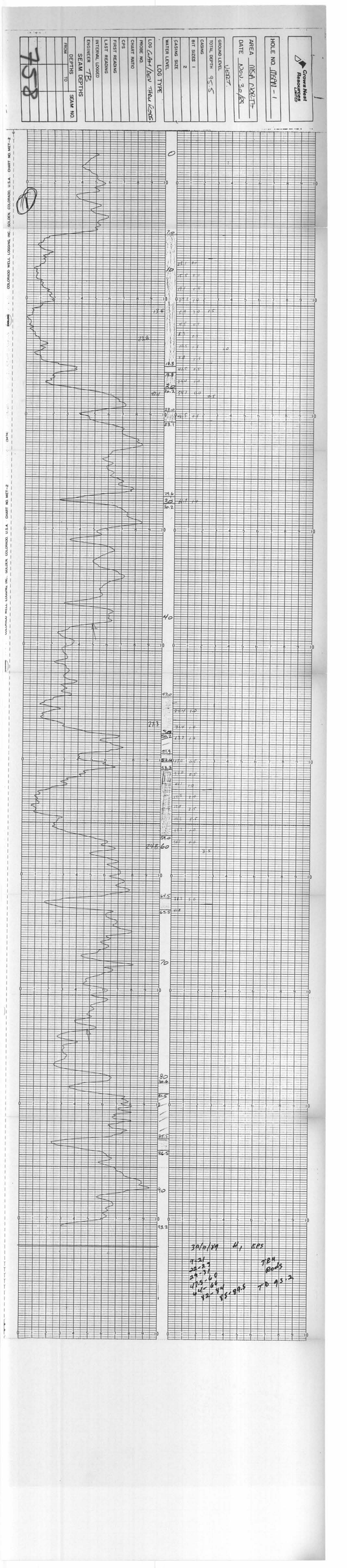
SAMPLE NO.	1	2	3
Feed Ash %	21.2	22.3	21.0
Raw FSI	0.5	0.5	-
Raw Moist. %	11.59	9.57	-

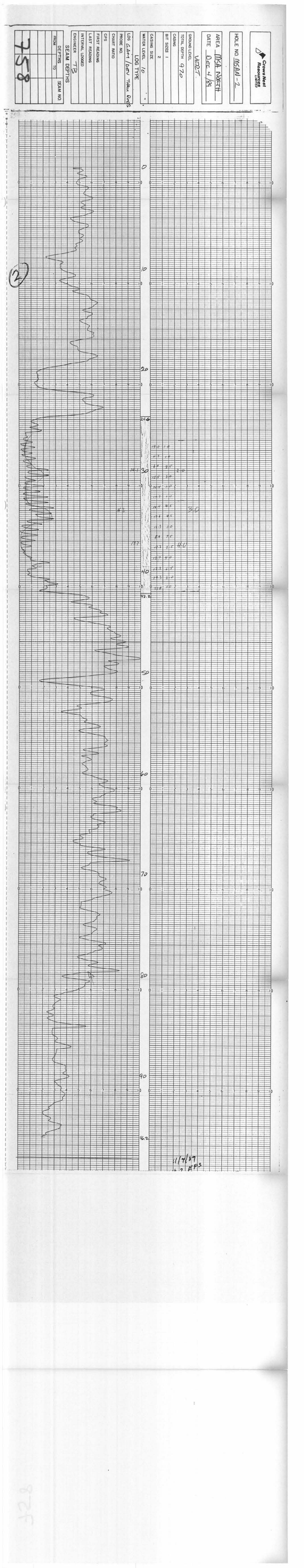
SAMPLE NO.	1	2	3
+ 4.75	482.5 t. (48.25%)	1392.4 t. (63.29%)	487.5 t. (32.5%)
- 4.75	517.5 t. (51.75%)	807.6 t. (36.71%)	1012.5 t. (67.5%)
	1000.0 t.	2200.0 t.	1500.0 t.

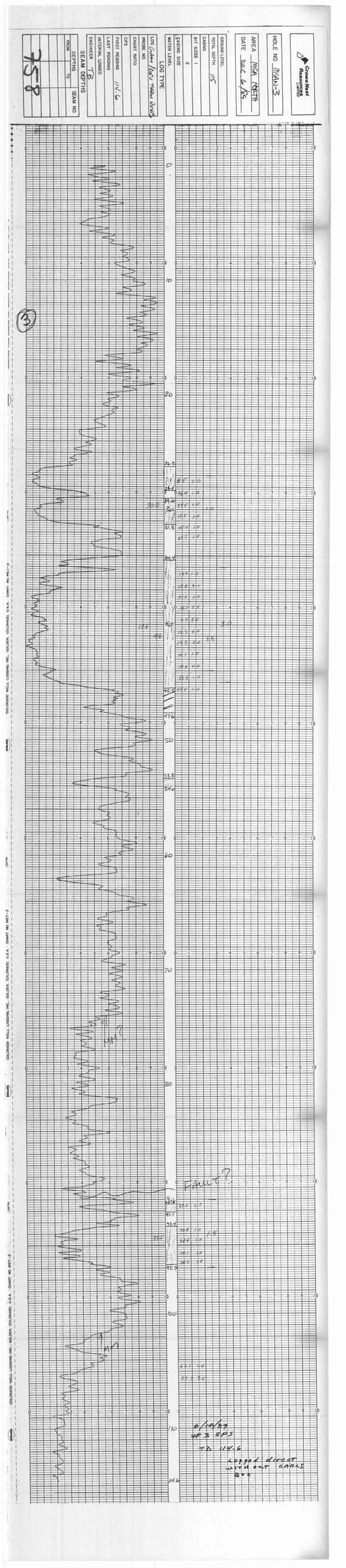
SAMPLE NO.	1	2	3
Prewet Screen	25.1% ash	20.5% ash	21.7% ash
Coarse Clean Coal	14.1% ash	12.7% ash	9.8% ash
Coarse Reject	71.6% ash	75.1% ash	74.8% ash
Raw Coal Undersize	16.5% ash	16.0% ash	14.9% ash

CLEAN COAL

SAMPLE NO.	1	2	3
Resid. Moist.	0.38	0.69	-
Volatiles	20.62	21.70	-
Ash	15.1	15.9	15.1
FSI	0.5	0.5	-
cal/gm	6549.79	6922.84	-
Moisture	11.5	15.1	-


Crown Nest Resources Limited
HOLE NO. MSW-1
AREA MSA PROJECT
DATE NOV. 30/85
GROUND LEVEL VERT.
TOTAL DEPTH 95.5
CASING
BIT SIZES 1
2
CASING SIZE
WATER LEVEL
LOG TYPE
LOG RAN UP THRU RODS
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER TB
SEAM DEPTHS
DEPTHS
FROM
TO
SEAM NO.
157
COLORADO WELL LOGGING INC. GOLDEN, COLORADO, U.S.A. CHART NO. MET-2
30/11/84 R1 EOS
TBH
RODS
TD 97.2


Crown West Resources
HOLE NO. DSDD-2
AREA DSA NORTH
DATE Dec 4 '85
VERT
STRONG LEVEL
TOTAL DEPTH 970
CASING
BIT SIZE 1
2
CASING SIZE
WATER LEVEL 0
LOG GAMMA / DEV THRU RODS
PROBE NO
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER TB
SEAM DEPTHS
FROM (METRES) TO
SEAM NO.
458
(2)
0
10
20
30
40
50
60
70
80
90
11/4/85
#3


Consol Mont Resources Limited
HOLE NO. MSAU-3
AREA MSA NORTH
DATE DEC 6/89
GROUND LEVEL
TOTAL DEPTH 115
CASING 1
BIT SIZES 1
2
CASING SIZE
WATER LEVEL
LOG TYPE
LOG (short/long) 16in 64ss
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING 114.6
INTERVAL LOGGED
ENGINEER TB
SEAM DEPTHS
FROM
TO
SEAM NO.
U/S
6/12/89
#3 BPS
TD 114.6
Logged direct with ext cable box
COLORADO WELL LOGGING INC. GOLDEN, COLORADO, U.S.A. CHART NO. MET-2

Crows Nest Resources LIMITED

HOLE NO. MSAN-4

AREA MSA NORTH

DATE DEC. 7/89

VERT.

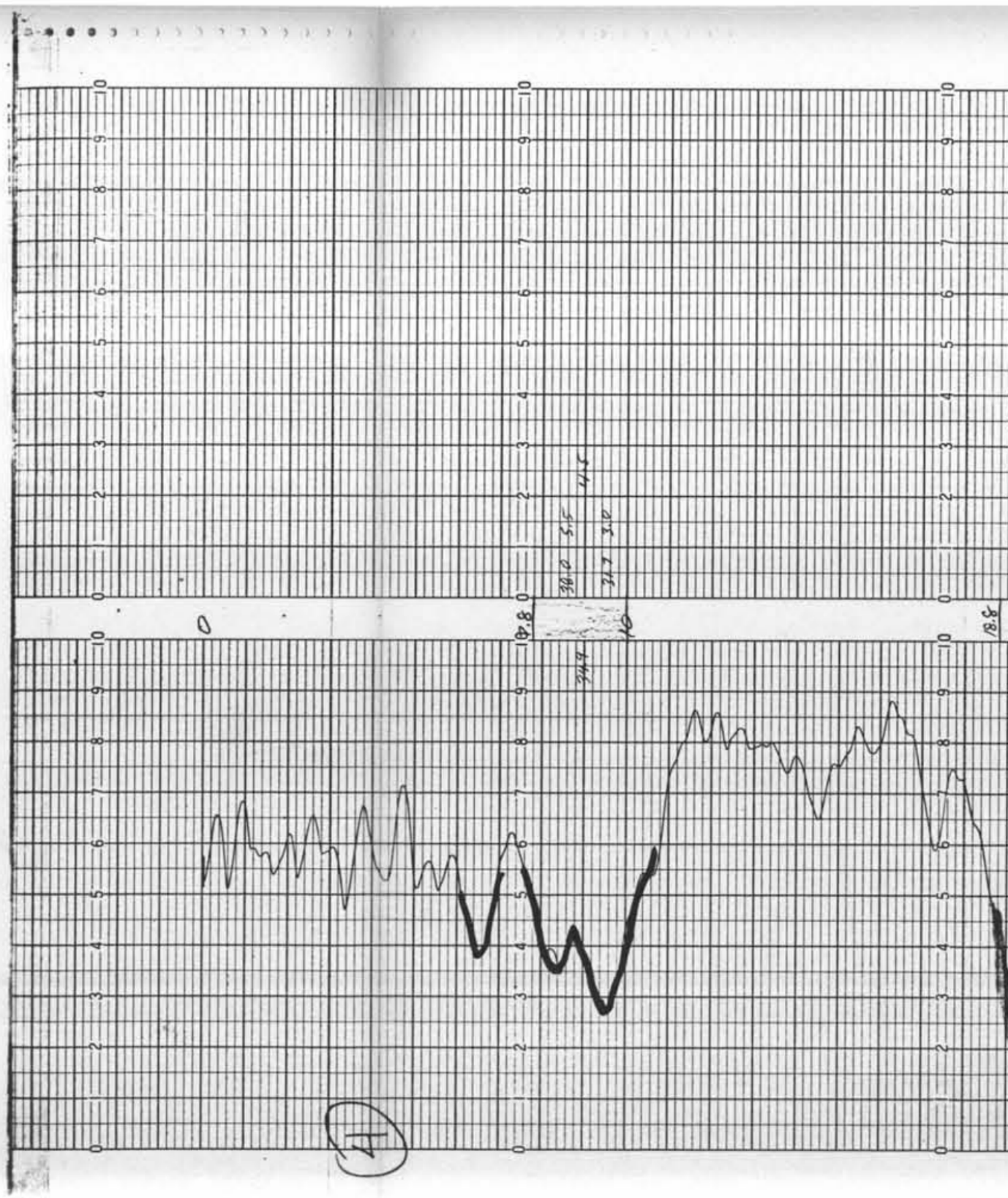
GROUND LEVEL	
TOTAL DEPTH	136
CASING	
BIT SIZES 1	
2	
CASING SIZE	
WATER LEVEL	

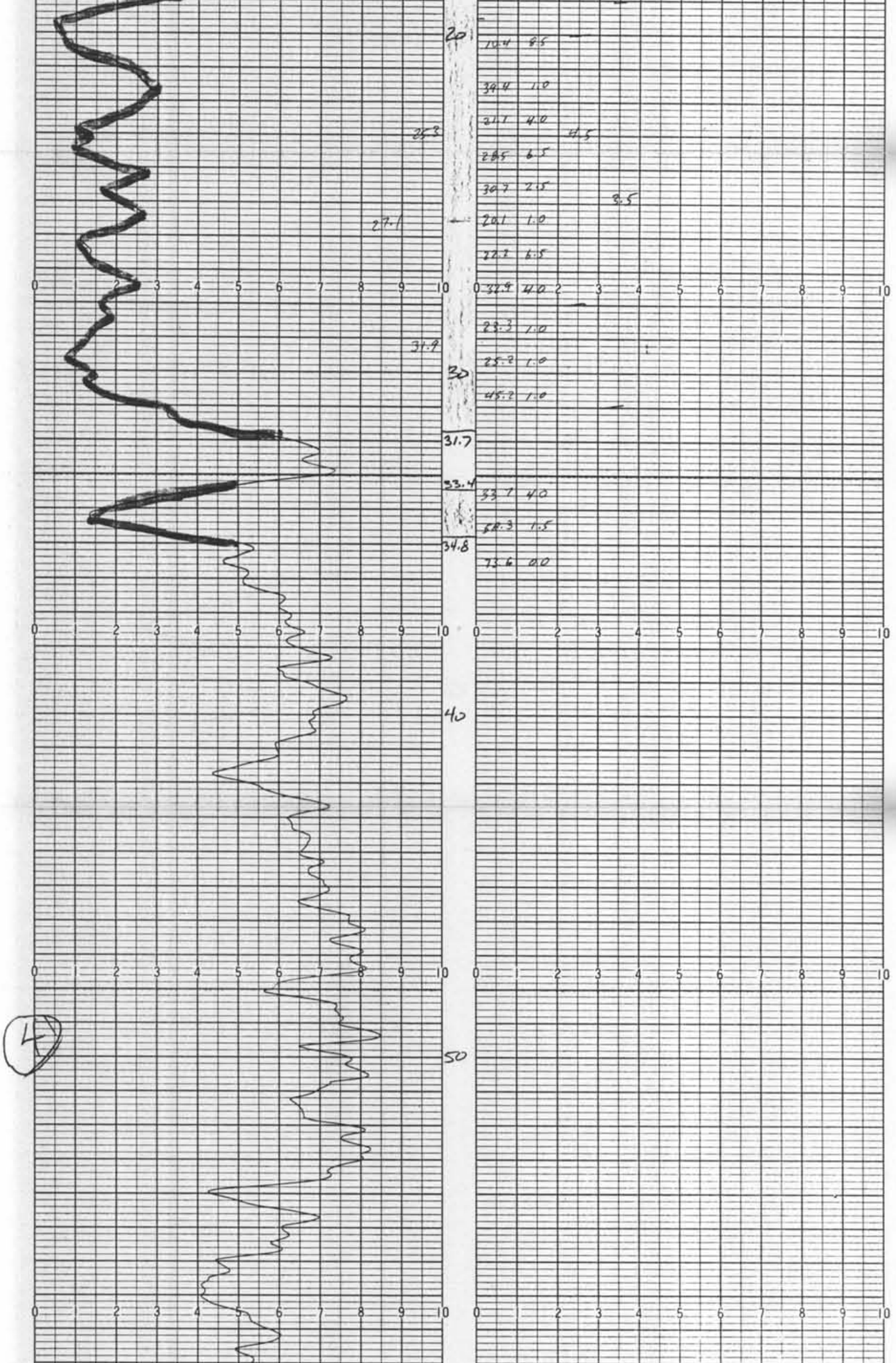
LOG TYPE

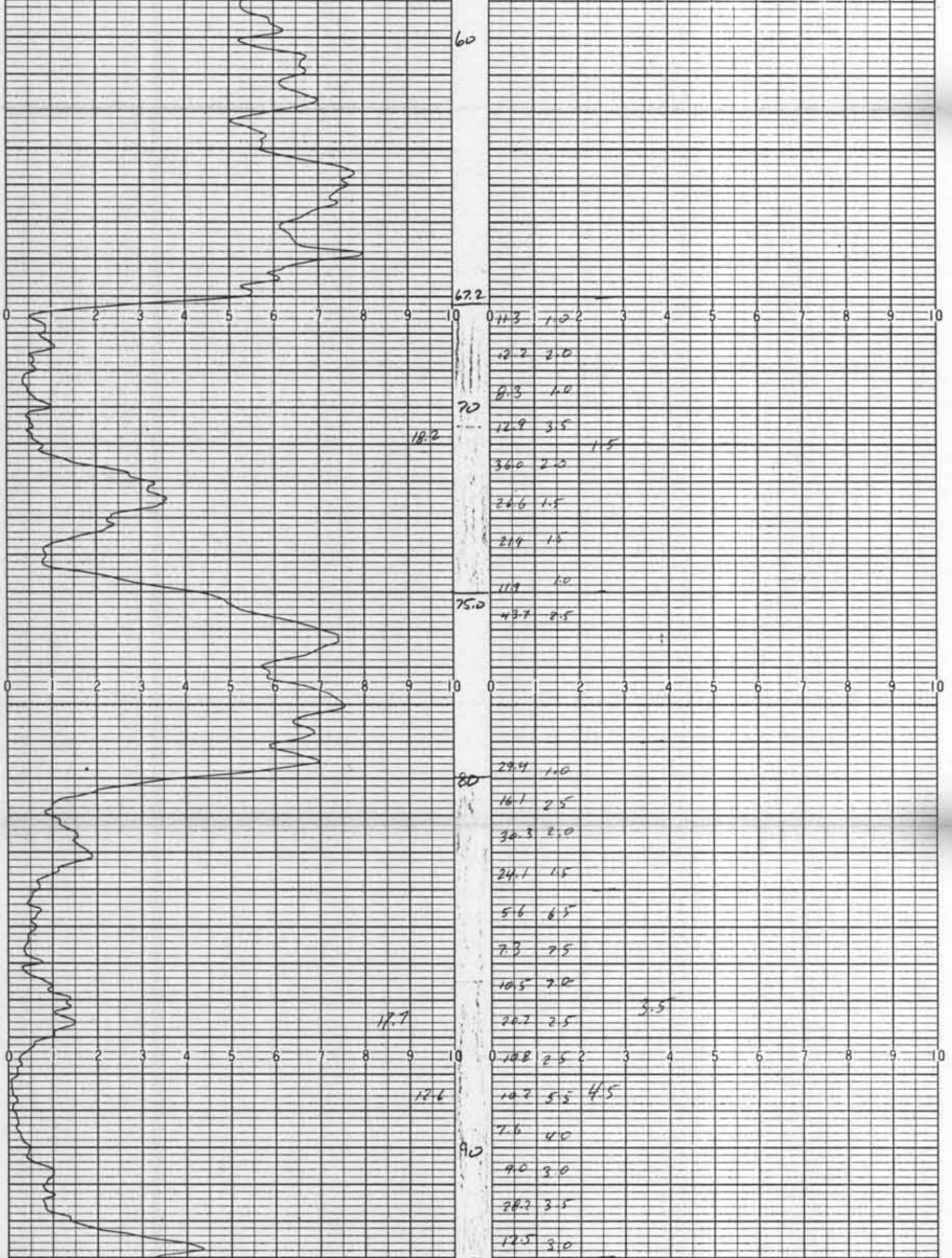
LOG	GAM/DEV THRU RODS.
PROBE NO.	
CHART RATIO	
CPS	
FIRST READING	
LAST READING	
INTERVAL LOGGED	
ENGINEER	TB

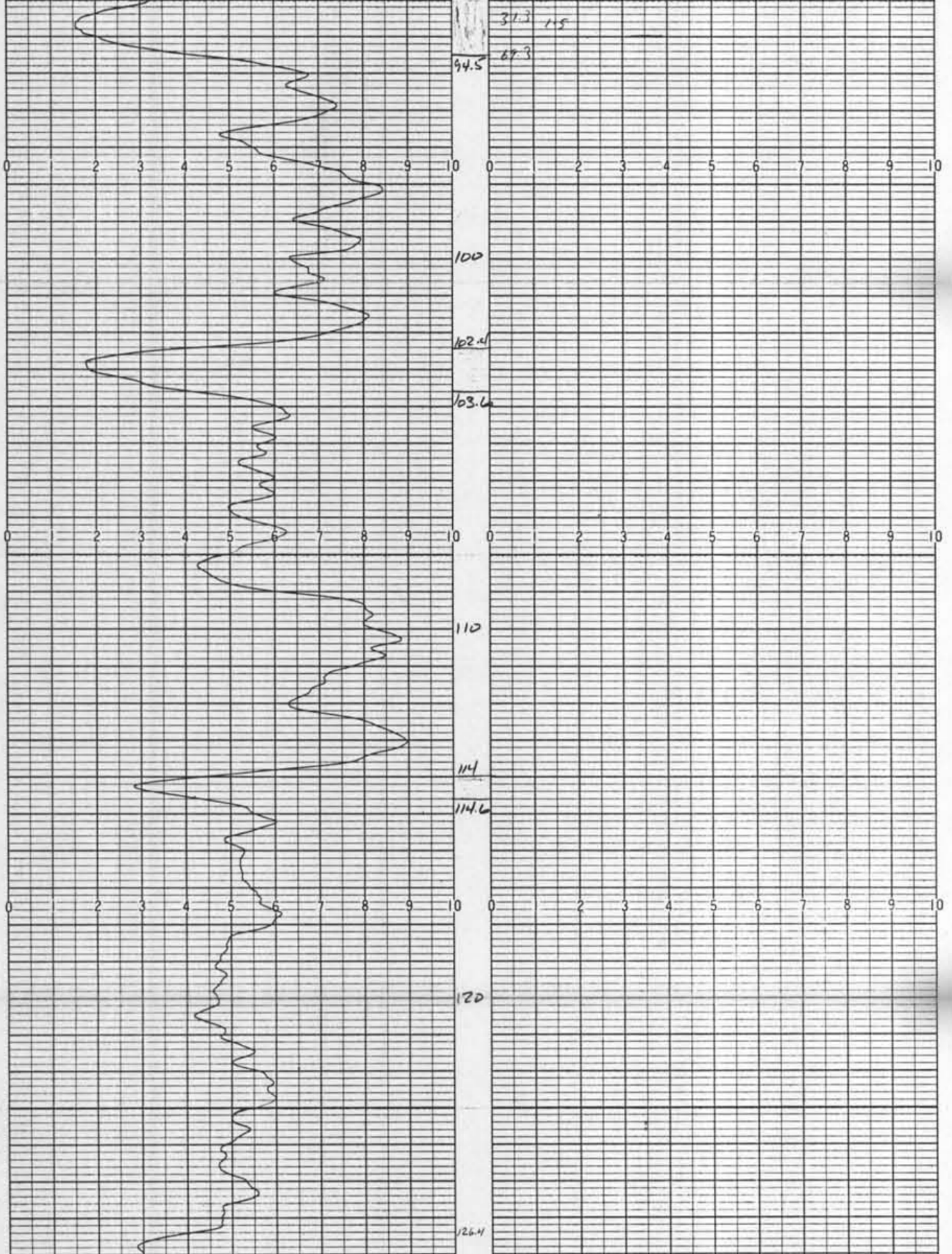
SEAM DEPTHS

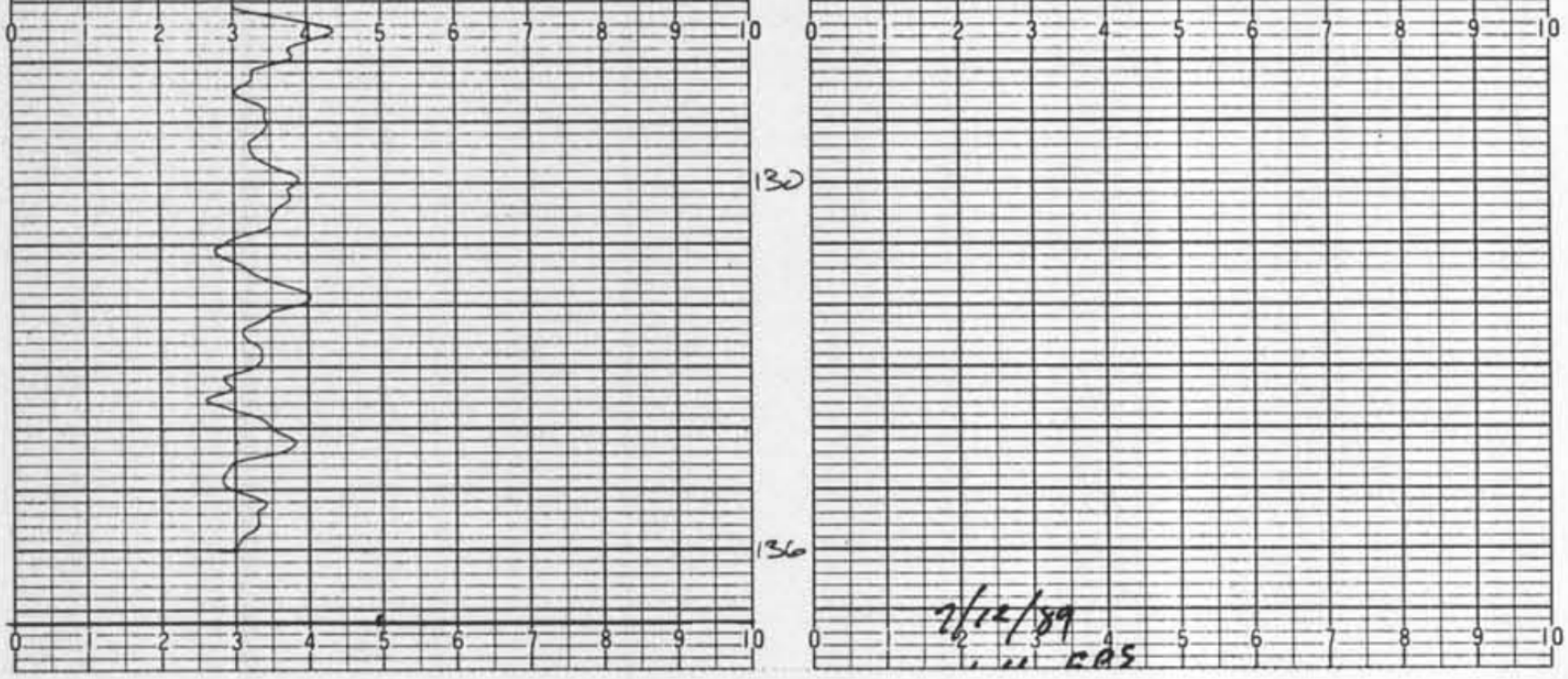
DEPTHS FROM	DEPTHS TO	SEAM NO.
758		




20
10.4 8.5
34.4 1.0
21.1 4.0
25.3
4.5
28.5 6.5
30.7 2.5
8.5
27.1
20.1 1.0
22.2 6.5
32.9 4.0
23.3 1.0
31.9
25.2 1.0
30
45.2 1.0
31.7
33.4
33.7 4.0
58.3 1.5
34.8
73.6 0.0
40
50
4


60
67.2
70
75.0
80
90
0 1 2 3 4 5 6 7 8 9 10
18.2
17.7
12.6
11.3 1.0
12.2 2.0
8.3 1.0
12.9 3.5
1.5
36.0 2.0
26.6 1.5
21.9 1.5
11.9 1.0
43.7 2.5
29.4 1.0
16.1 2.5
30.3 2.0
24.1 1.5
5.6 6.5
7.3 2.5
10.5 2.0
3.5
20.2 2.5
10.8 2.5
10.7 5.5
4.5
7.6 4.0
9.0 3.0
28.2 3.5
12.5 3.0


31.3
1.5
67.3
94.5
0 1 2 3 4 5 6 7 8 9 10
100
102.4
103.6
110
114
114.6
120
126.4


0 1 2 3 4 5 6 7 8 9 10
130
136
0 1 2 3 4 5 6 7 8 9 10
0 1 2 3 4 5 6 7 8 9 10
7/12/89

Crows Nest Resources LIMITED

HOLE NO. M...-5

AREA MSA NORTH

DATE 6/14/90

GROUND LEVEL

TOTAL DEPTH 181.0

CASING

BIT SIZES 1 2

CASING SIZE

WATER LEVEL

LOG TYPE

LOG Gam/Den Thick Beds

PROBE NO.

CHART RATIO 100

CPS 10

FIRST READING 181

LAST READING 0

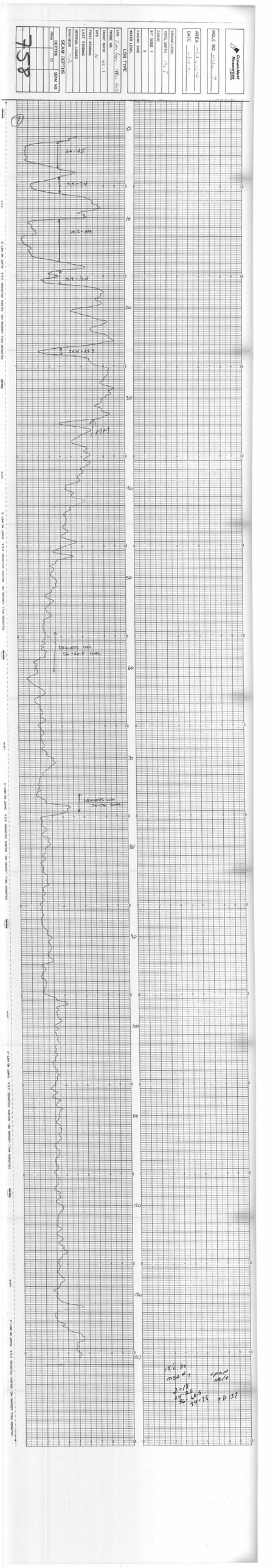
INTERVAL LOGGED

ENGINEER T.B.

SEAM DEPTHS

FROM	TO	SEAM NO.

758


Grand Mesa Resources
HOLE NO. #1884-7
AREA Paonia-McClure
DATE 10/15/94
GROUND LEVEL
TOTAL DEPTH 171.5'
CASING
BIT SIZES 7 7/8
CASING SIZE
WATER LEVEL
LOG TYPE
RUN 1 Gamma Neutron
DEPTH DRILLER 171.5
DEPTH LOGGER 171.5
BTM. LOG INTERVAL 171.5
SCALE 1" = 20'
CHART MOVE 20'
CPS 60
FIRST READING
LAST READING
RECORDED BY
WITNESSED BY
ENGINEER
SEAM DEPTHS
SEAM NO.
FROM
TO
16-16.5
15-15.4
14-14.2
13-13.4
12-12.4
11
DRILLERS SEAM 58-60.5 COAL
DRILLERS SEAM 74-76 COAL
18.6-19
1954 #1
8-18-95
24-26-95
96-99-94
open hole
+D 97
COLORADO WELL LOGGING INC. GOLDEN, COLORADO U.S.A. CHART NO. MET-2
0
10
20
30
40
50
60
70
80
90
100
110
120
130
137

Crows Nest Resources Limited

HOLE NO. MSAD-8

AREA MSAD
DATE 7/24/90

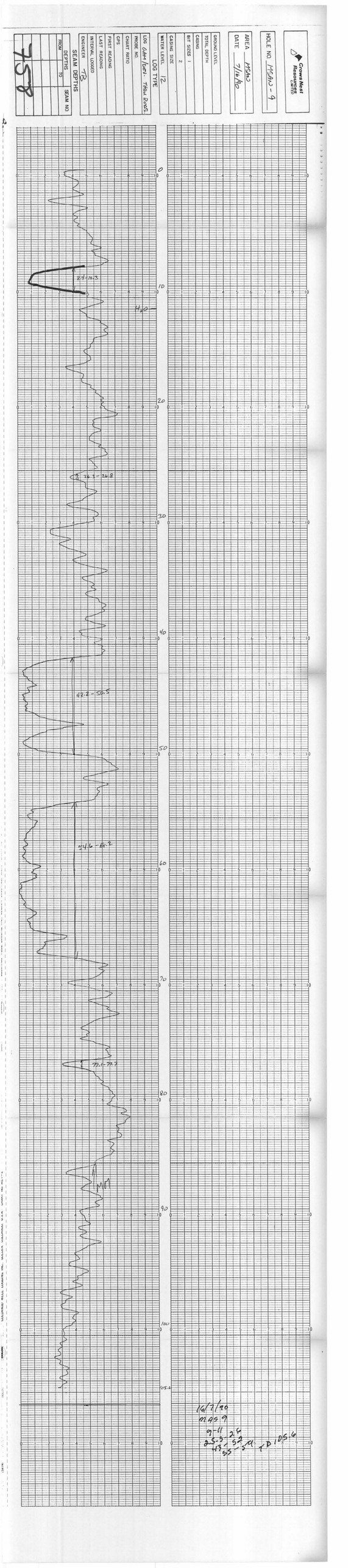
GROUND LEVEL
TOTAL DEPTH
CASING
BIT SIZES 1
2
CASING SIZE
WATER LEVEL

LOG TYPE
LOG GAM/DEV THRU RODS
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER JK.

SEAM DEPTHS

DEPTHS FROM	TO	SEAM NO.

758


Crowsnest Resources Ltd.
HOLE NO. MSA3-9
AREA MSA3
DATE 7/16/80
GROUND LEVEL
TOTAL DEPTH
CASING
BIT SIZES 1
2
CASING SIZE
WATER LEVEL 12
LOG TYPE GAM/DEN/7"HOLE 2POS.
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER TB
SEAM DEPTHS
FROM
TO
SEAM NO
7SB
8.1-10.3
H2O
26.1-28.8
42.2-50.5
54.6-66.2
71.1-72.7
105.6
16/7/80
MSA9
9-11
25-3-52
49-55-101
105.6

Crows Nest Resources LIMITED

HOLE NO. MSAN -10

AREA MSAN

DATE 7/3/90

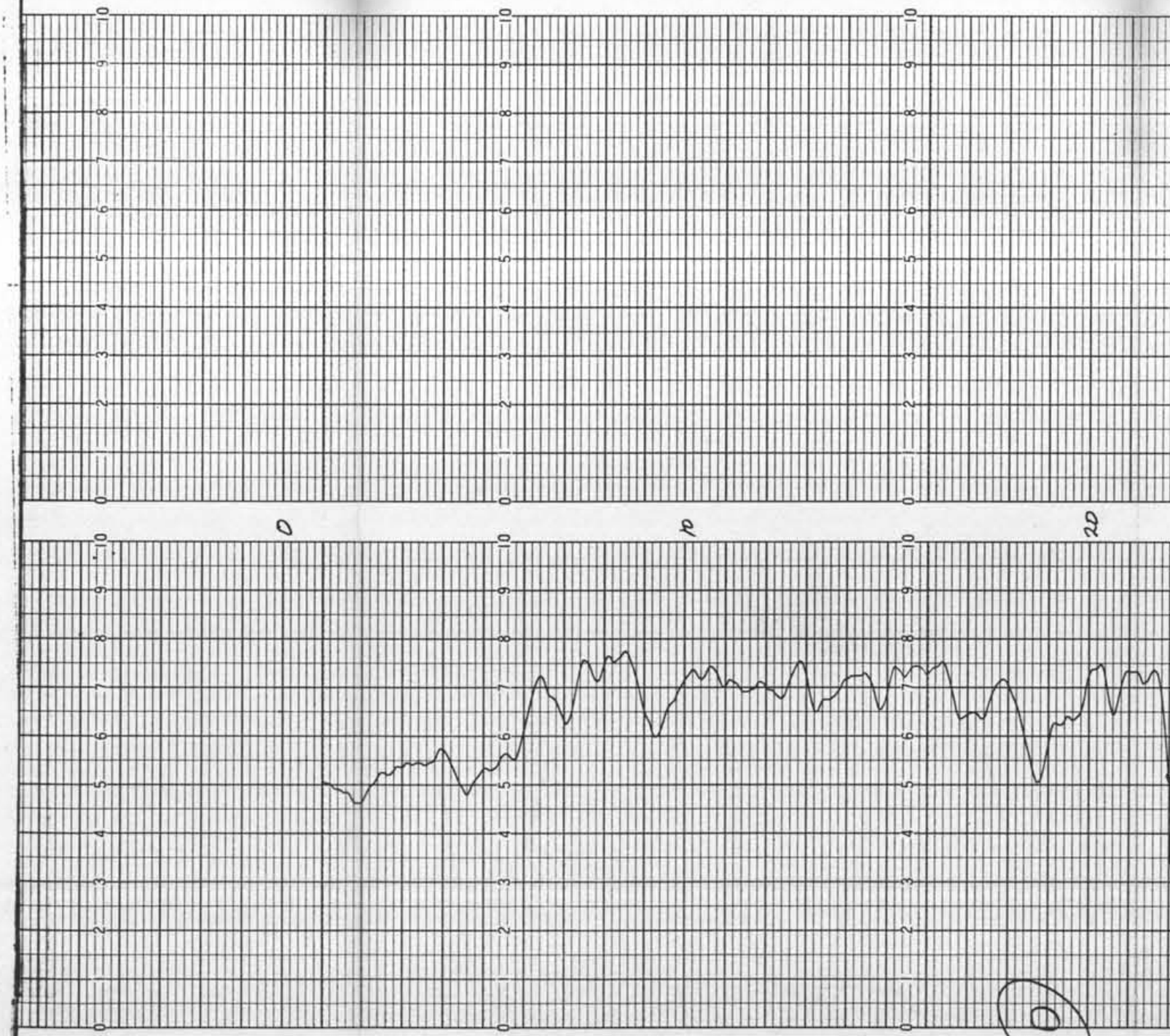
GROUND LEVEL	
TOTAL DEPTH	168
CASING	
BIT SIZES 1	
2	
CASING SIZE	
WATER LEVEL	

LOG TYPE

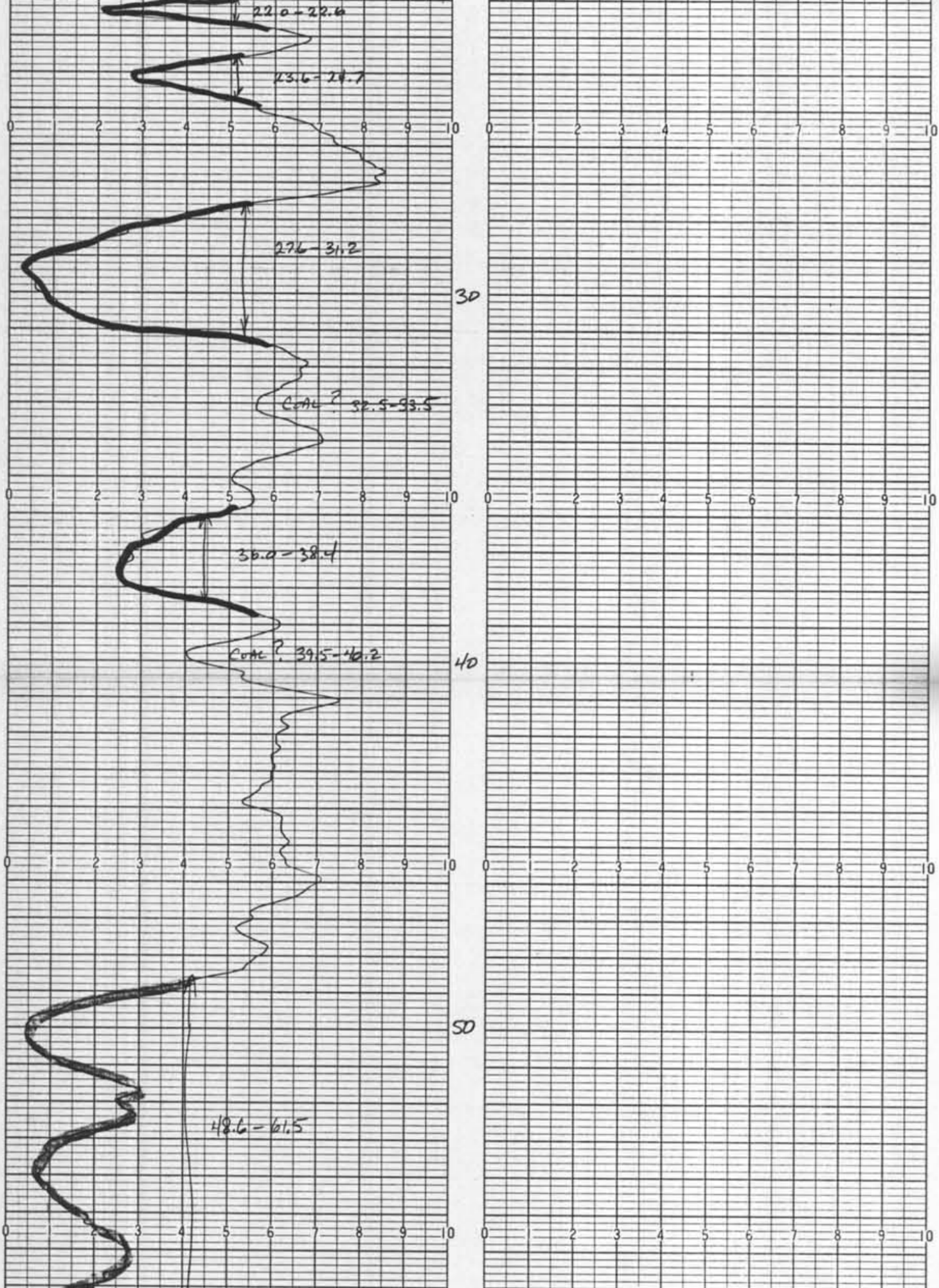
LOG	GAM / DEV.
PROBE NO.	
CHART RATIO	
CPS	
FIRST READING	
LAST READING	
INTERVAL LOGGED	
ENGINEER	TB

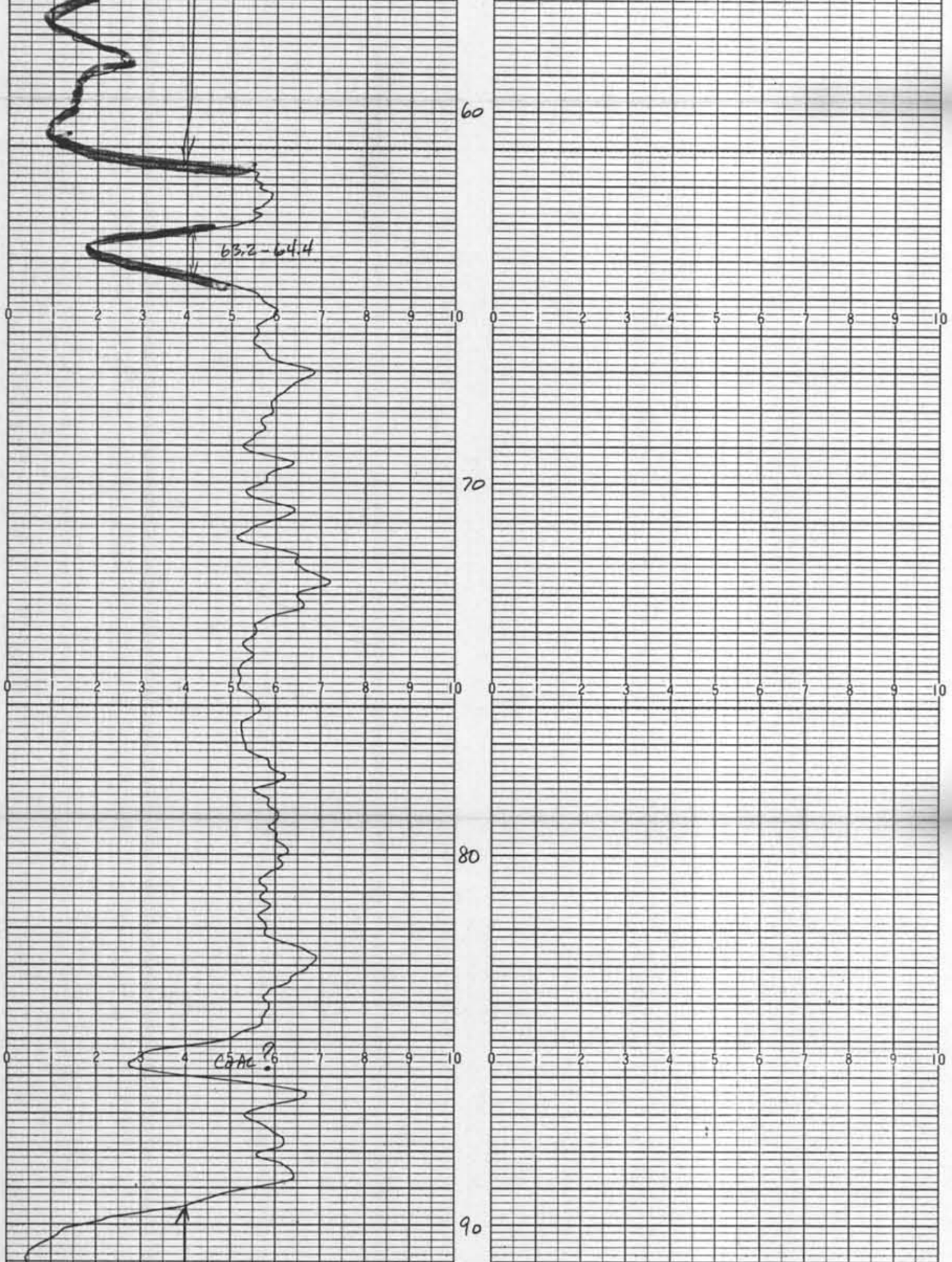
SEAM DEPTHS

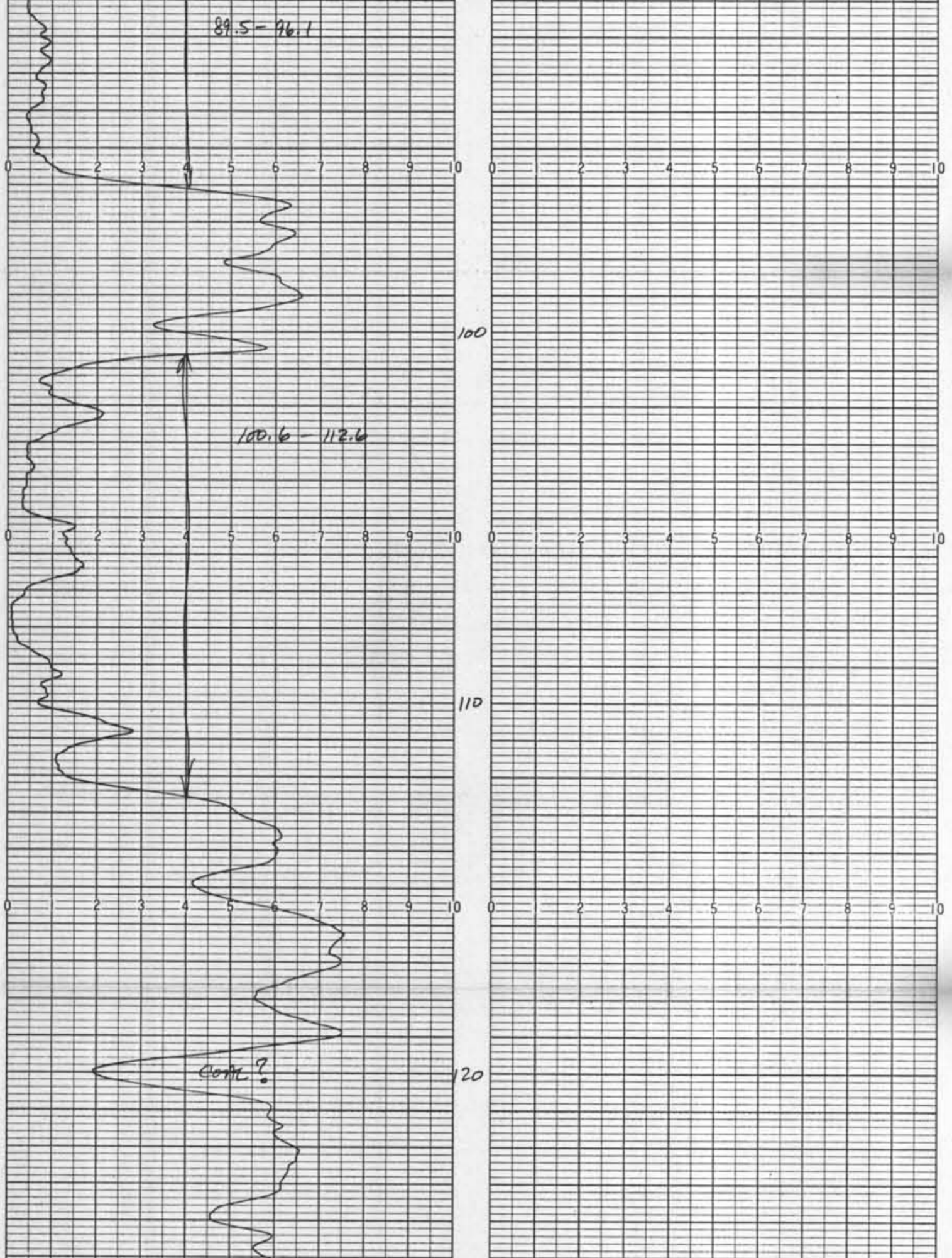
DEPTHS		SEAM NO.
FROM	TO	
758		

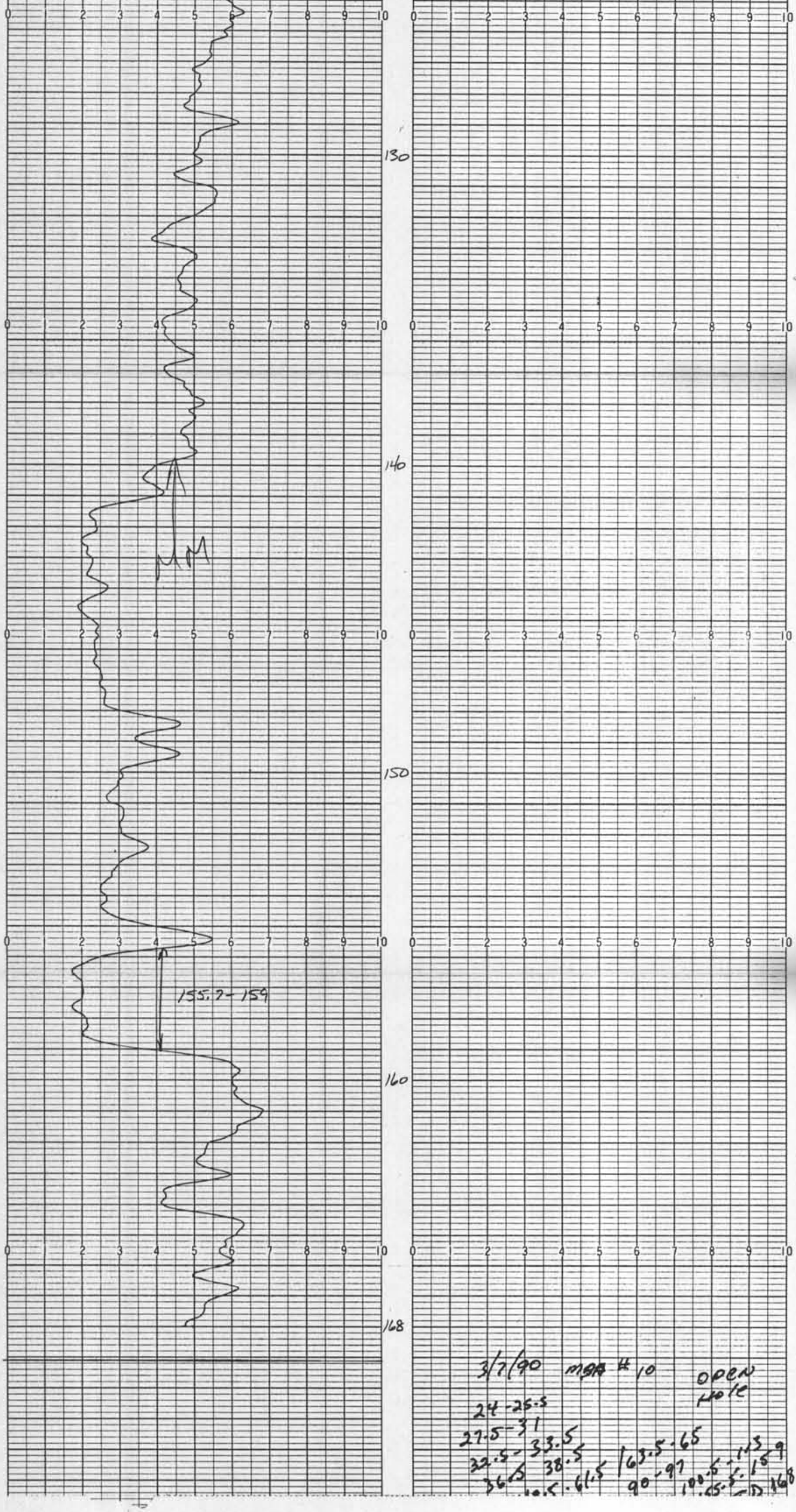


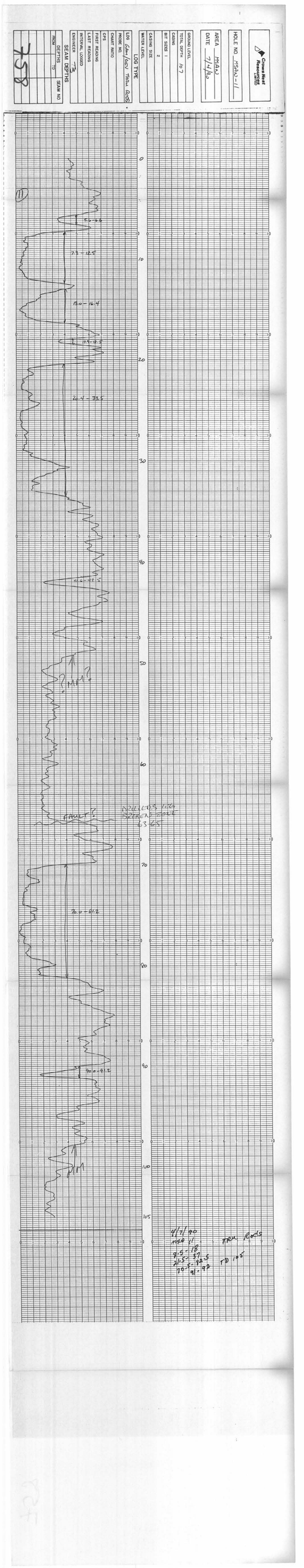
1


22.0 - 22.6
23.6 - 24.7
27.6 - 31.2
30
COAL ? 32.5 - 33.5
35.0 - 38.4
40
COAL ? 39.5 - 40.2
50
48.6 - 61.5
0 1 2 3 4 5 6 7 8 9 10


60
63.2-64.4
70
80
COAL?
90
0 1 2 3 4 5 6 7 8 9 10


89.5 - 96.1
100.6 - 112.6
CONT.?
0 1 2 3 4 5 6 7 8 9 10
100
110
120


0 1 2 3 4 5 6 7 8 9 10
130
140
150
160
168
155.2-159
3/7/90 MGA #10
OPEN HOLE
24-25.5
27.5-31
32.5-33.5
36.5-38.5
61.5
63.5-65
90-97
100.5-105
159
168


CompuMost Resources Corp.
HOLE NO. MSA1-11
AREA MSA1
DATE 7/4/90
GROUND LEVEL
TOTAL DEPTH 107
CASING
BIT SIZE 1
2
CASING SIZE
WATER LEVEL
LOG TYPE
LOG GAM/SEC TRAN RDS
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER
SEAM DEPTHS
DEPTHS
FROM
TO
SEAM NO
TSR
0
10
20
30
40
50
60
70
80
90
100
105
7.5 - 12.5
15.0 - 16.4
17.9 - 18.5
26.4 - 33.5
41.2 - 42.4
FAULT?
NOTE LOSS TIME INCREASE
70.0 - 81.2
90.0 - 91.2
4/7/90
MSA #1
9.5 - 18
21.5 - 37
70.5 - 72.5
90.5 - 92
TRX RODS
TD 105

Crows Nest Resources Limited

HOLE NO MSAJ-12
AREA MSAJ
DATE 6/29/82

GROUND LEVEL	
TOTAL DEPTH	197
CASING	
BIT SIZES 1	
2	
CASING SIZE 1	
2	
WATER LEVEL	

LOG TYPE

LOG	GAM/DEV.
PROBE NO.	
CHART RATIO	
CPS	
FIRST READING	
LAST READING	
INTERVAL LOGGED	
ENGINEER	J.K.

SEAM DEPTHS

DEPTHS FROM	TO	SEAM NO

758

Crows Nest Resources LIMITED

HOLE NO. MSAN 13

AREA MSAN

DATE 6/26/90

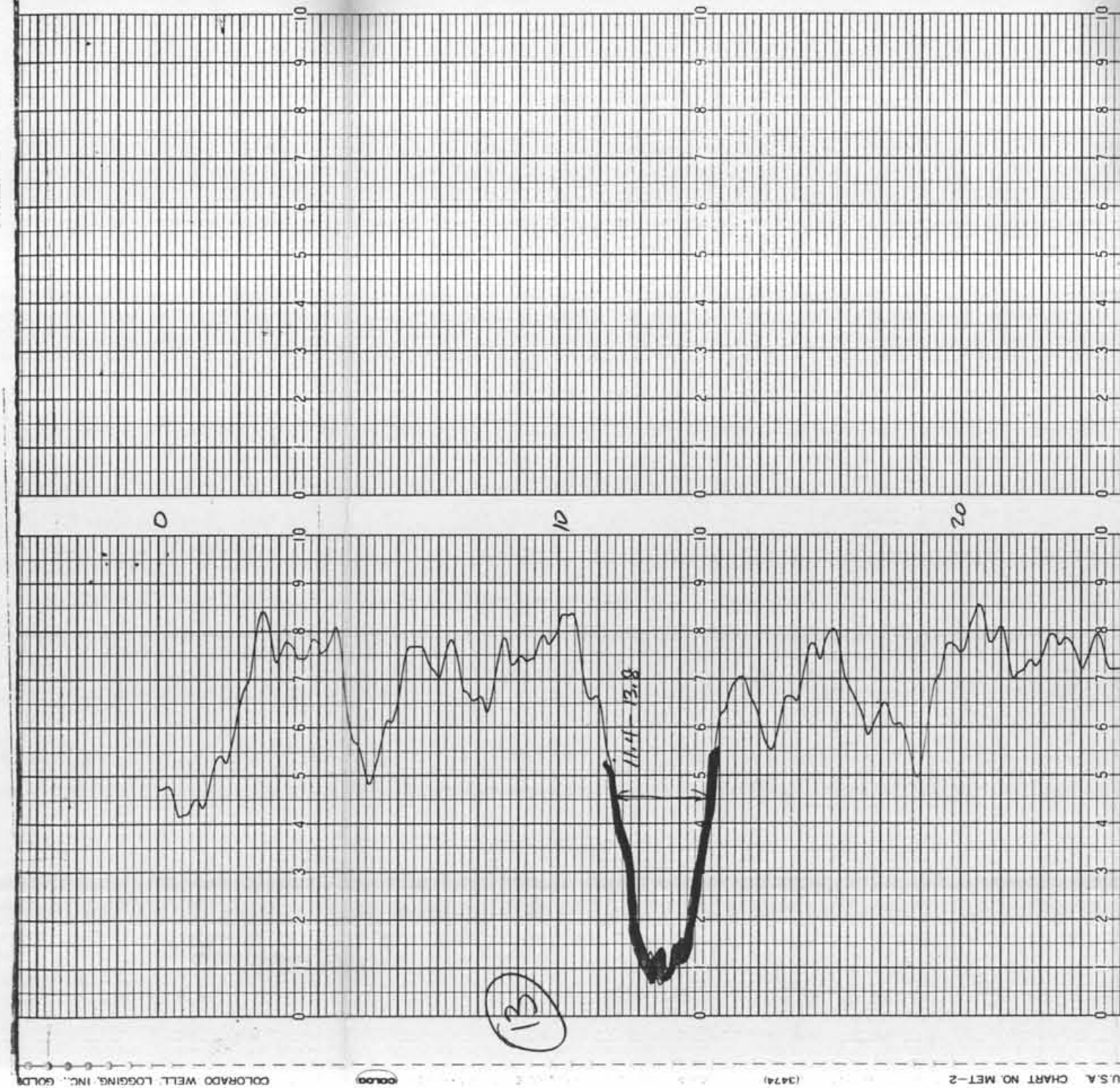
GROUND LEVEL	
TOTAL DEPTH	137
CASING	
BIT SIZES 1	
2	
CASING SIZE	
WATER LEVEL	

LOG TYPE

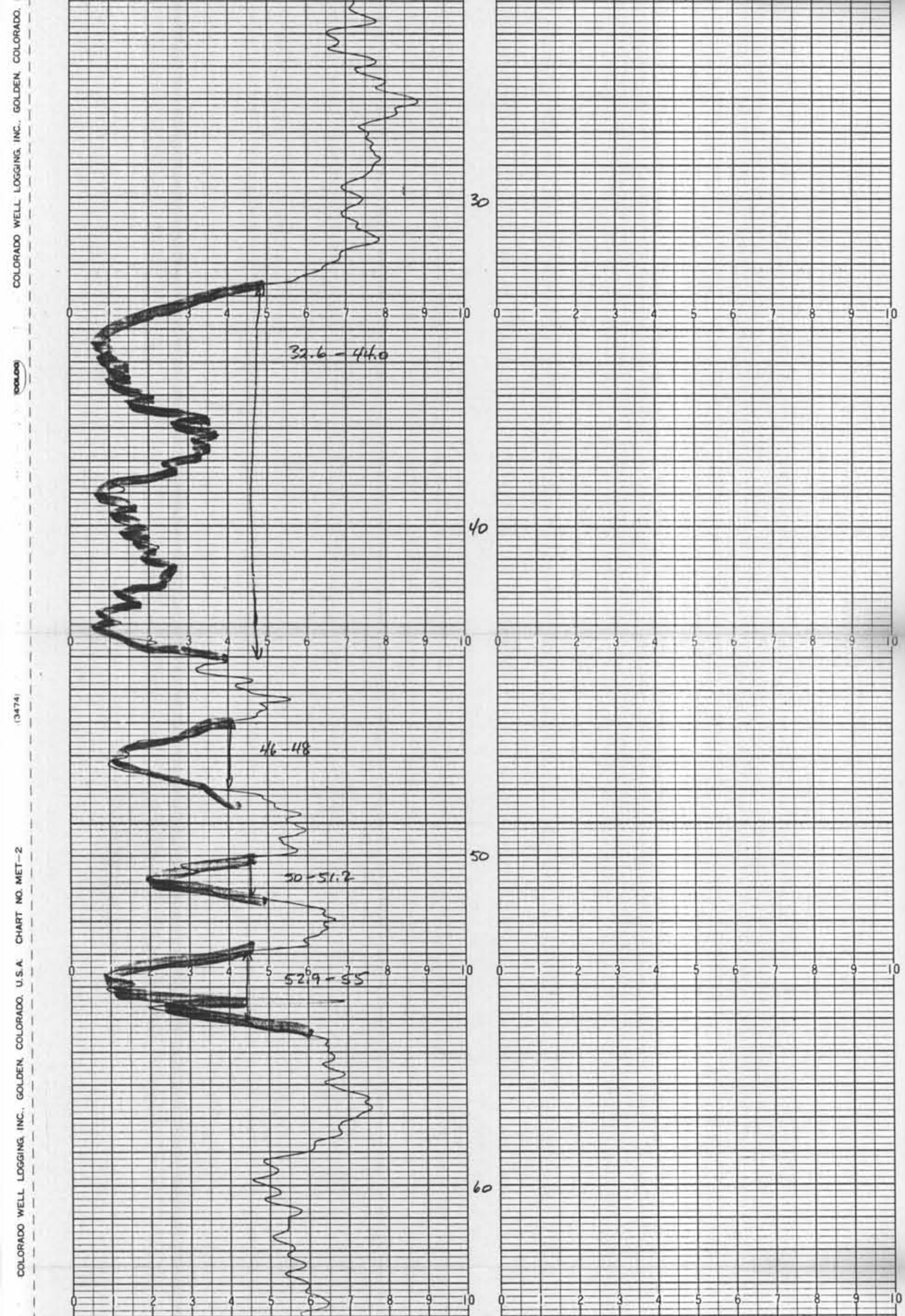
LOG	GAM / DEV.
PROBE NO.	
CHART RATIO	
CPS	
FIRST READING	
LAST READING	
INTERVAL LOGGED	
ENGINEER	B

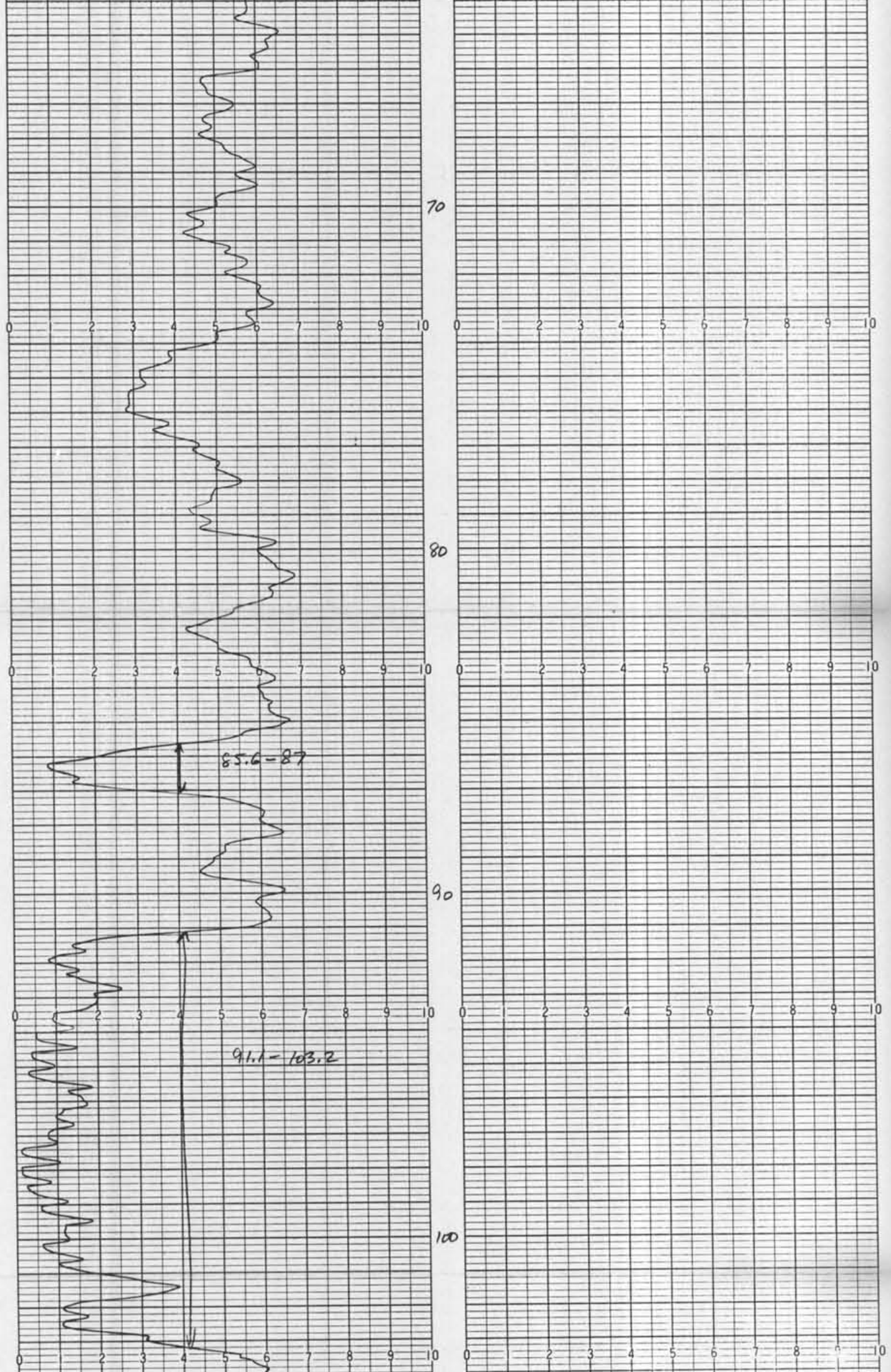
SEAM DEPTHS

DEPTHS FROM	TO	SEAM NO.
758		

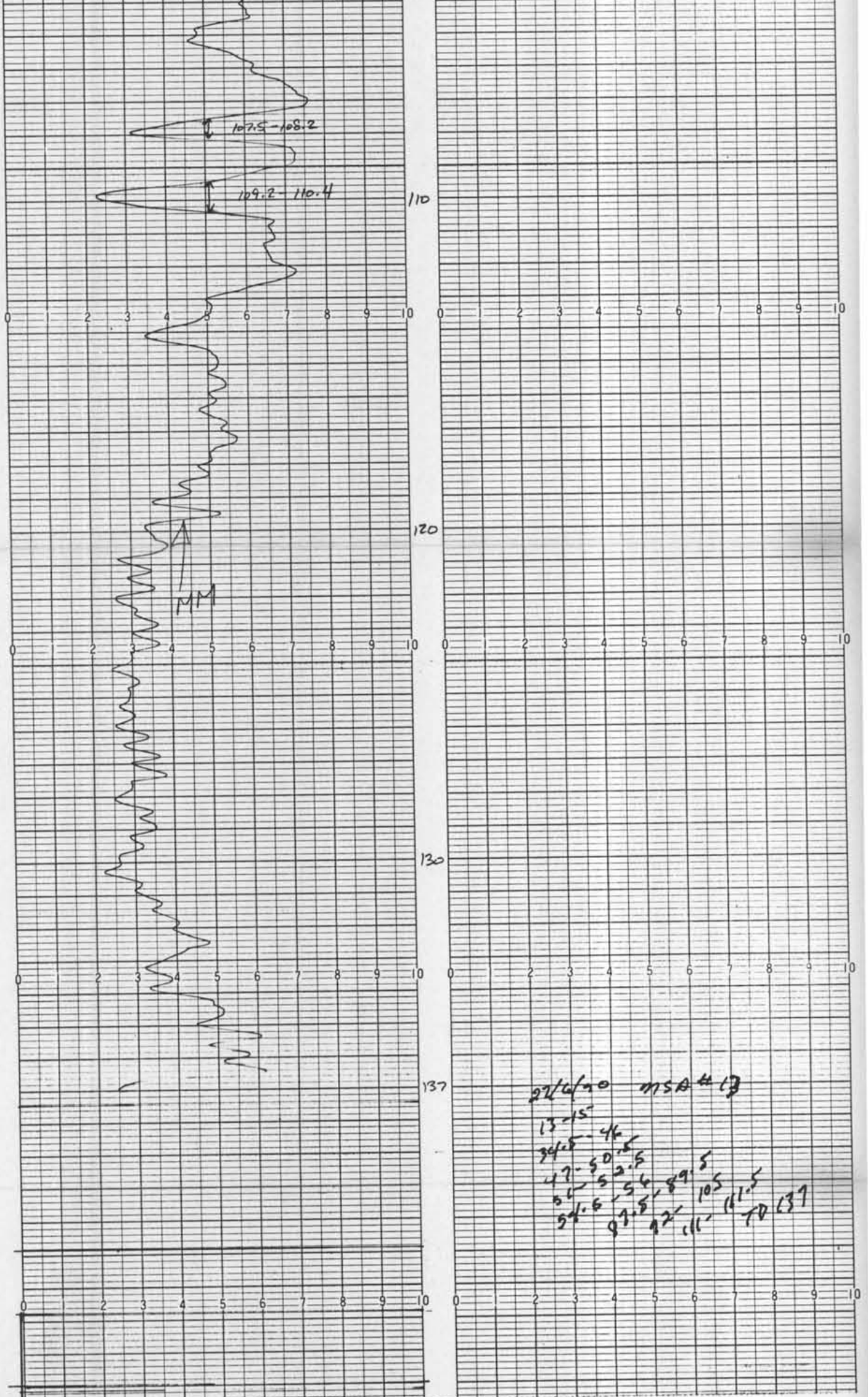


COLORADO WELL LOGGING INC., GOLDE (3474) U.S.A. CHART NO. MET-2


COLORADO WELL LOGGING, INC., GOLDEN, COLORADO, U.S.A. CHART NO. MET-2 (3474)
COLORADO WELL LOGGING, INC., GOLDEN, COLORADO
30
40
50
60
32.6 - 44.0
46 - 48
50 - 51.2
52.9 - 55

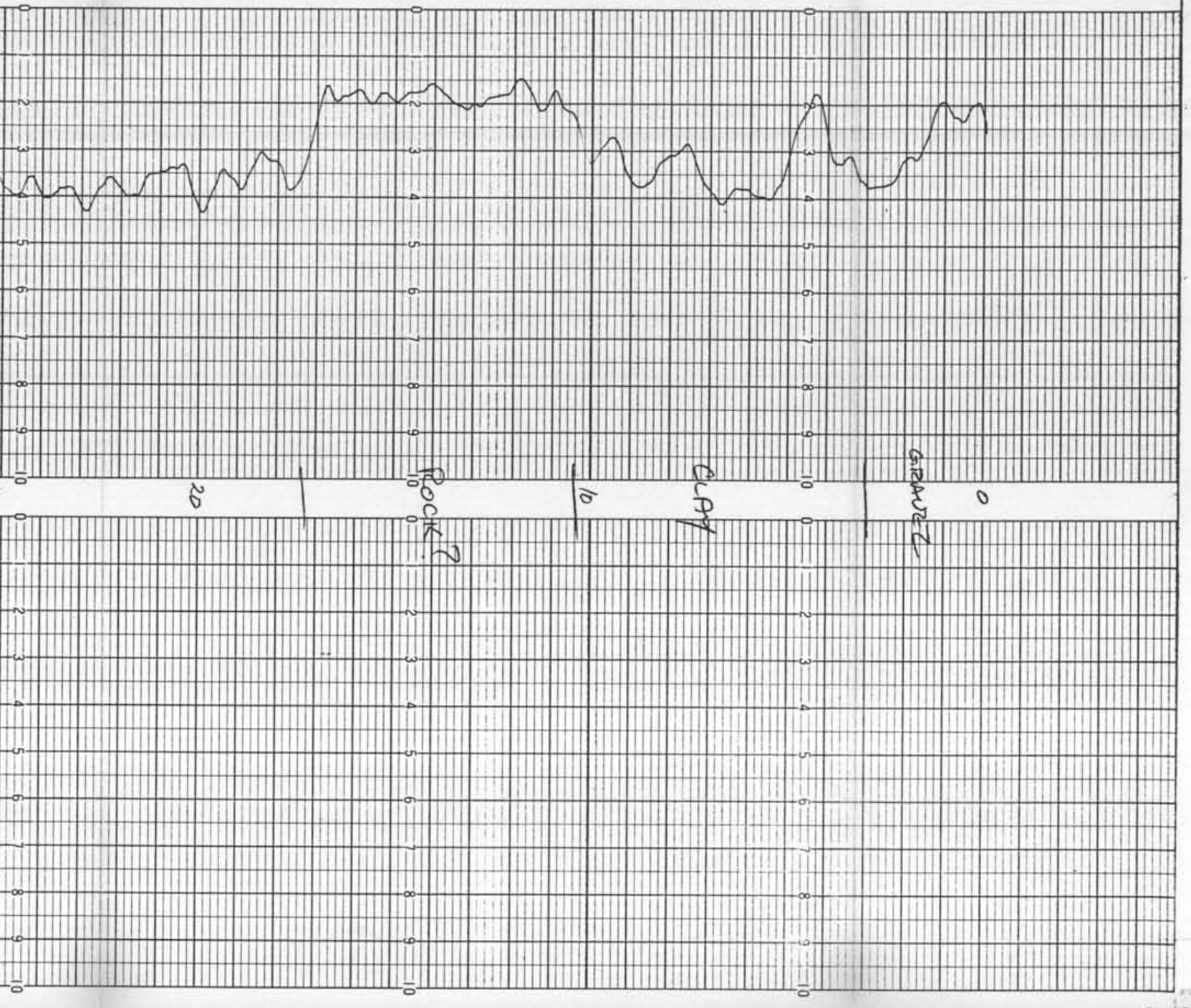


COLOGO
COLORADO WELL LOGGING, INC., GOLDEN, COLORADO, U.S.A. CHART NO. MET-2 (3474)
COLOGO



COLORADO WELL LOGGING INC., GOLDEN, COLORADO, U.S.A. CHART NO. MET-2 (3474)

COLORADO WELL LOGGING, INC., GOLDEN, COLORADO, U.S.A. CHART NO. MET-2 (3474) COLOG



Crows Nest Resources LIMITED

HOLE NO. MSAN-14

AREA MSAN-HSR

DATE 5-27-90

085 / 55° AT COLLAR / 38° AT TD

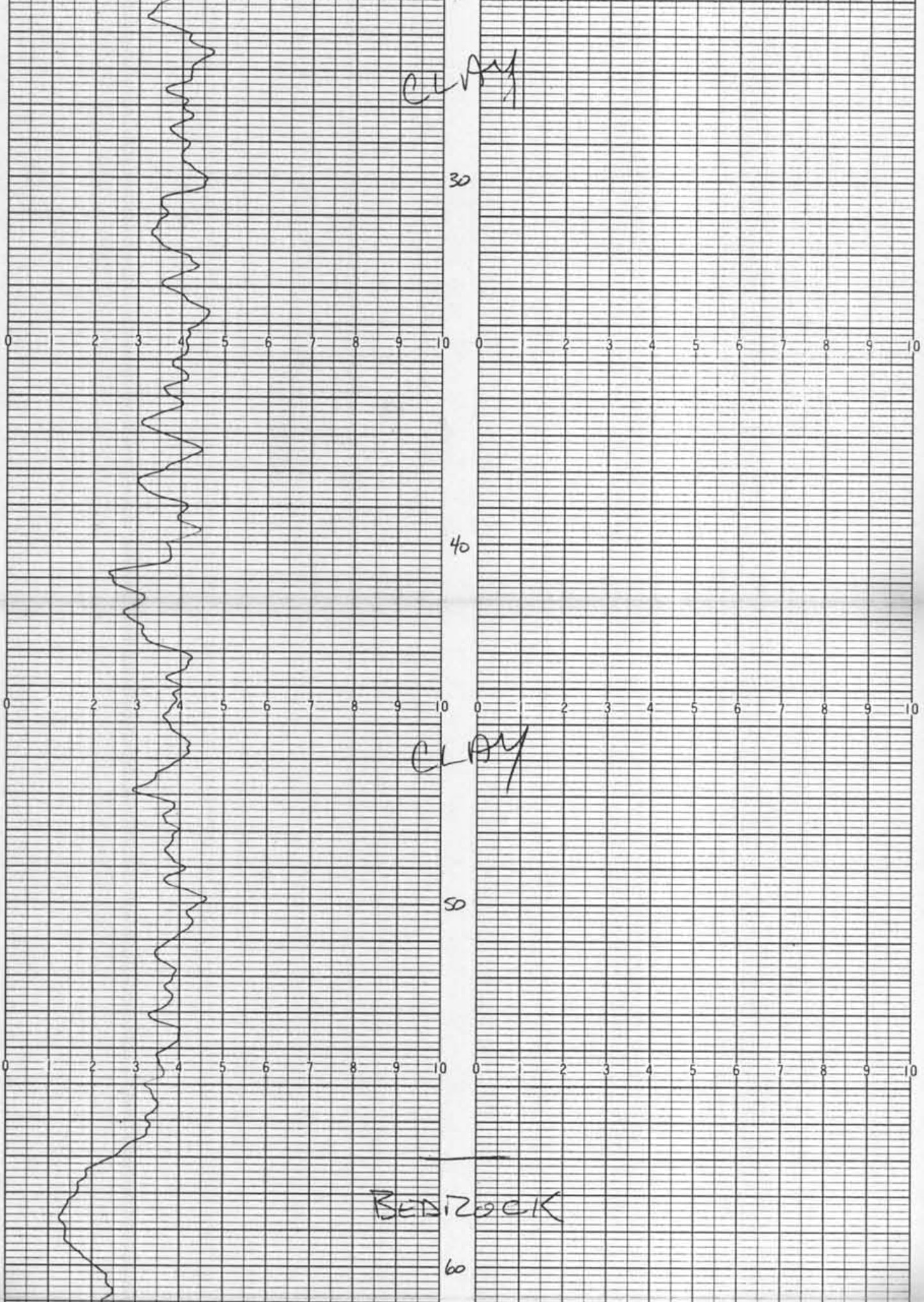
GROUND LEVEL	
TOTAL DEPTH	
CASING	
BIT SIZES 1	
2	
CASING SIZE	
WATER LEVEL	

LOG TYPE

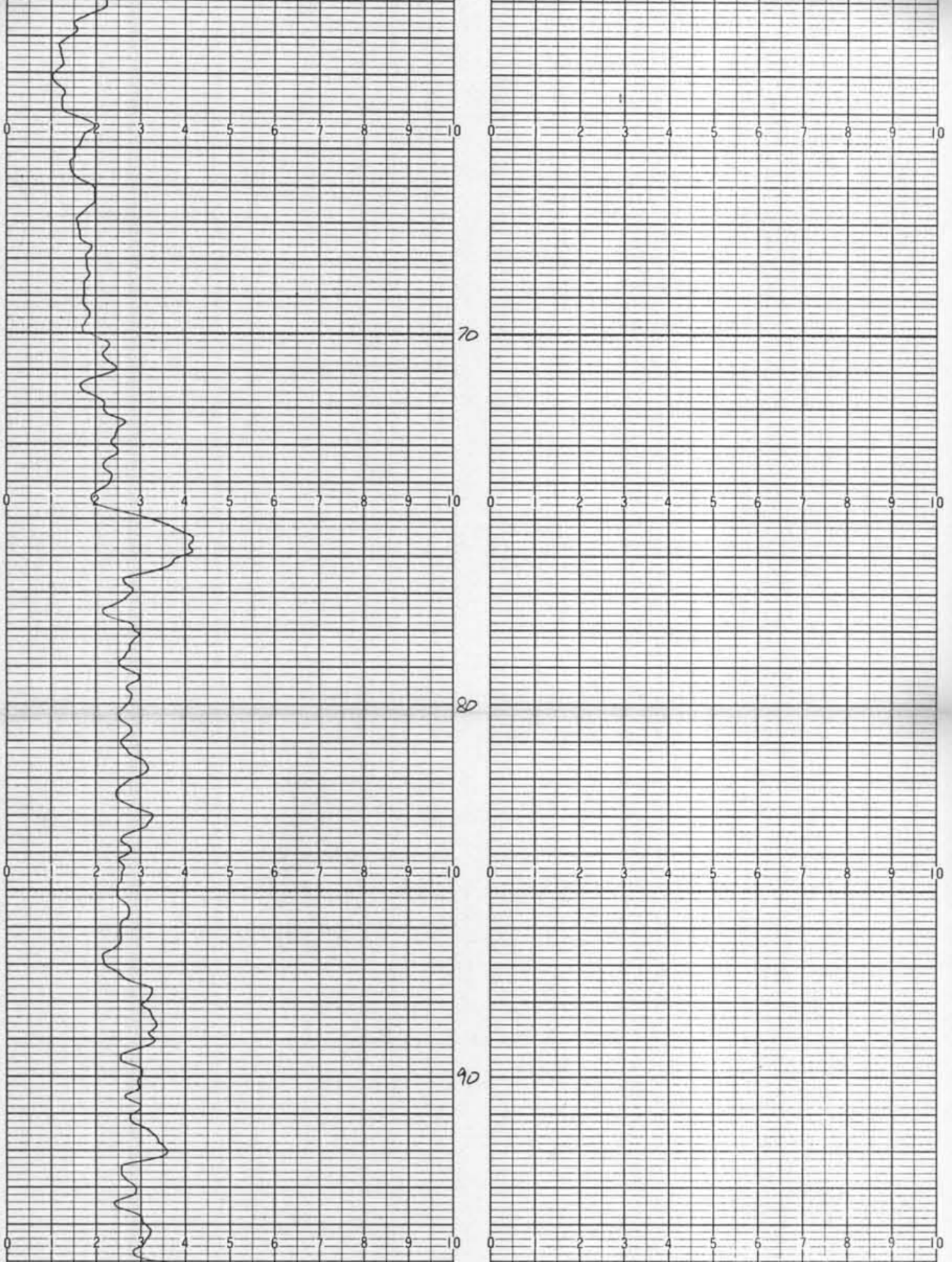
LOG	GAM / DEV THRU RODS
PROBE NO.	
CHART RATIO	
CPS	
FIRST READING	
LAST READING	
INTERVAL LOGGED	
ENGINEER	TB

SEAM DEPTHS

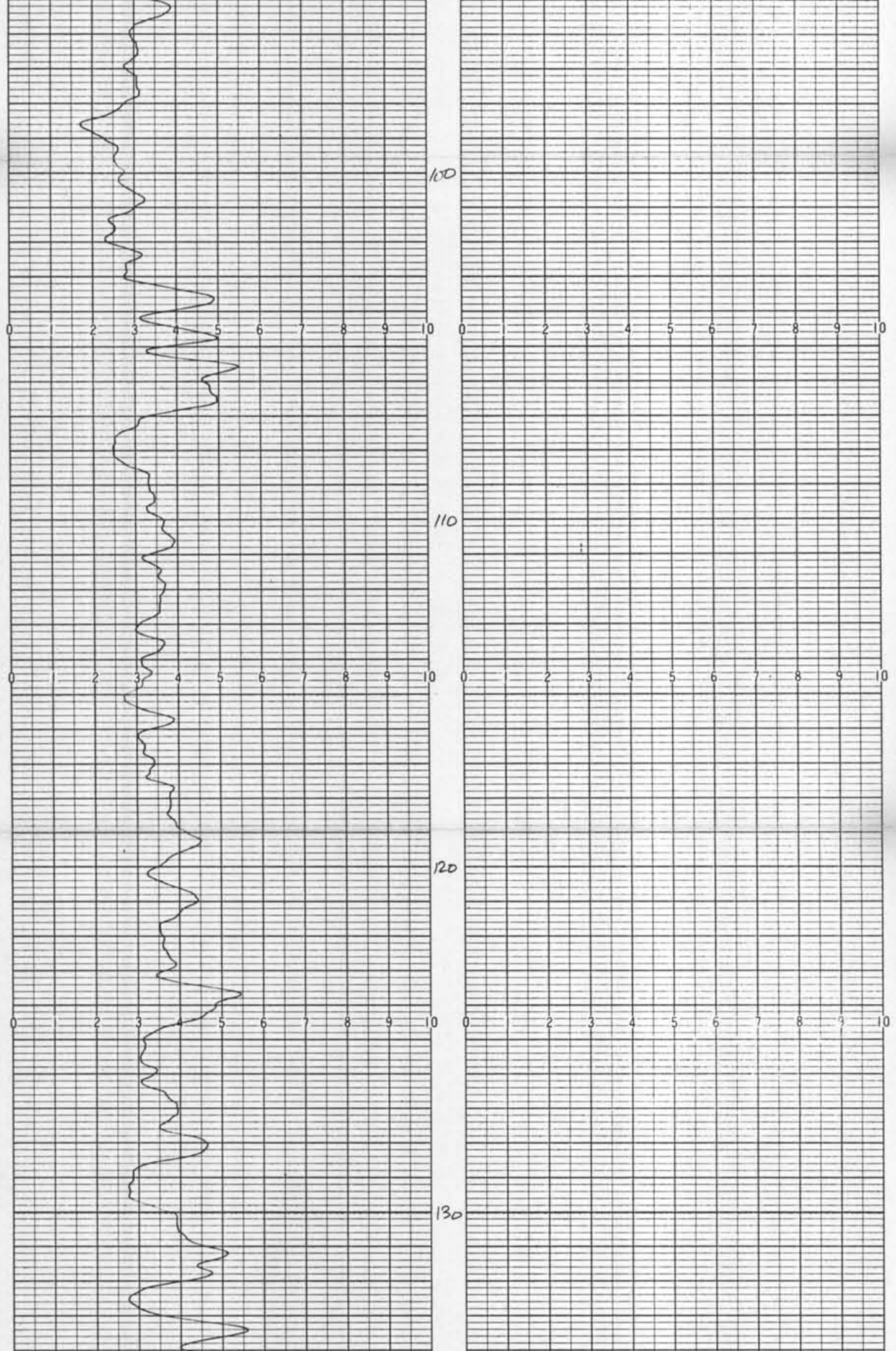
DEPTHS FROM	DEPTHS TO	SEAM NO.
		NO COAL
7	5	8

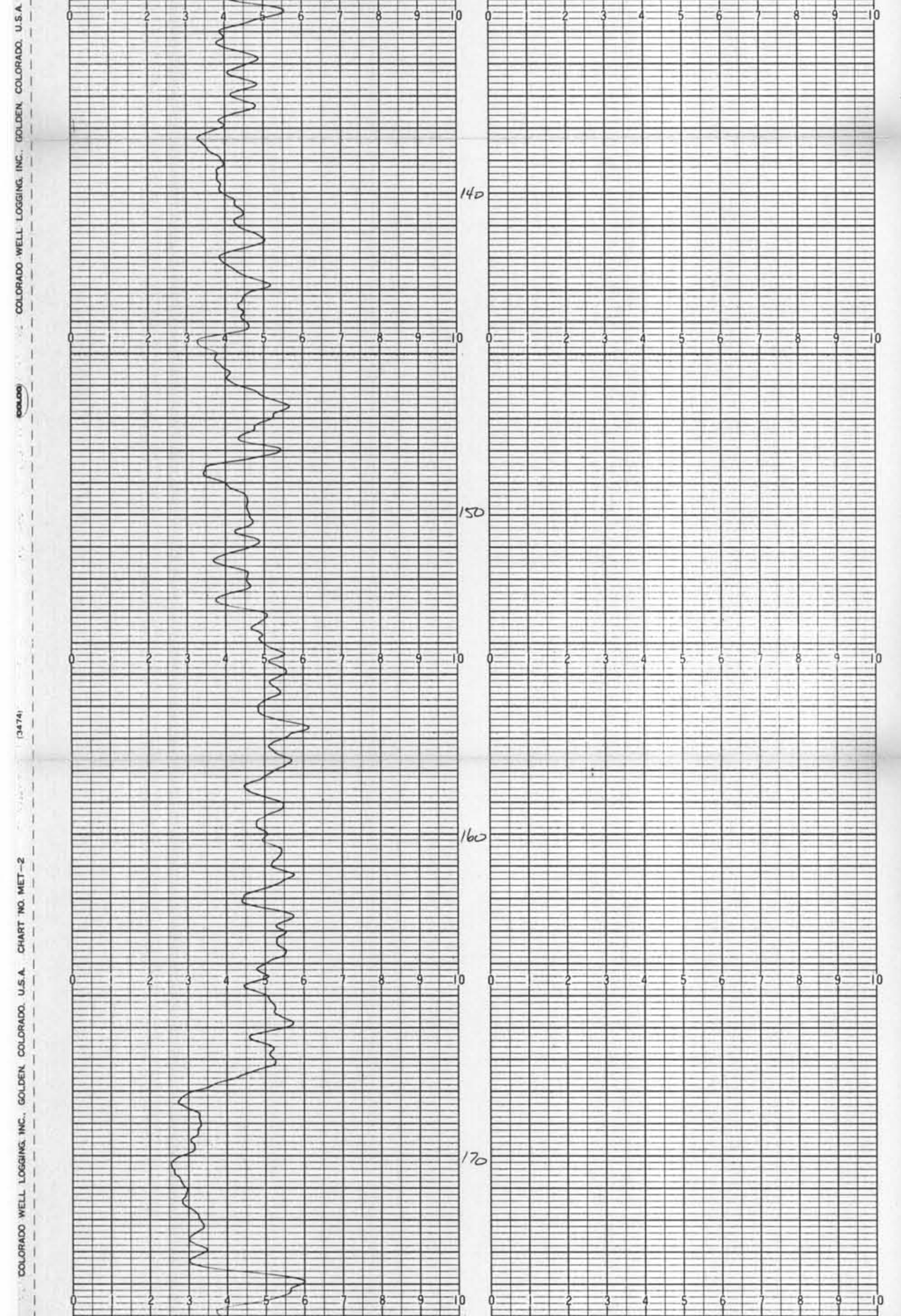


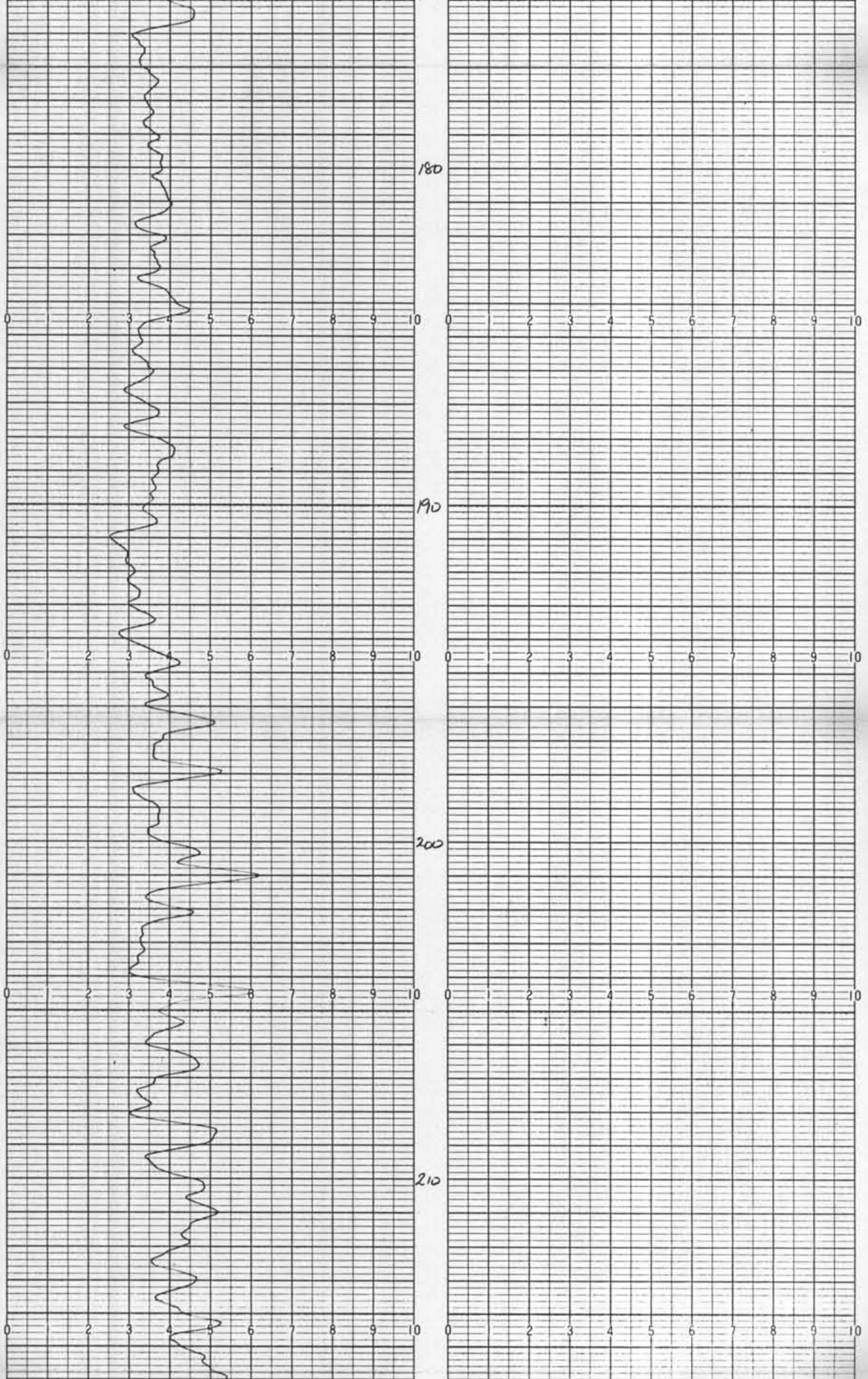
COLOGO
COLORADO WELL LOGGING, INC., GOLDEN, COLORADO, U.S.A. CHART NO. MET-2 (3474)
COLOGO



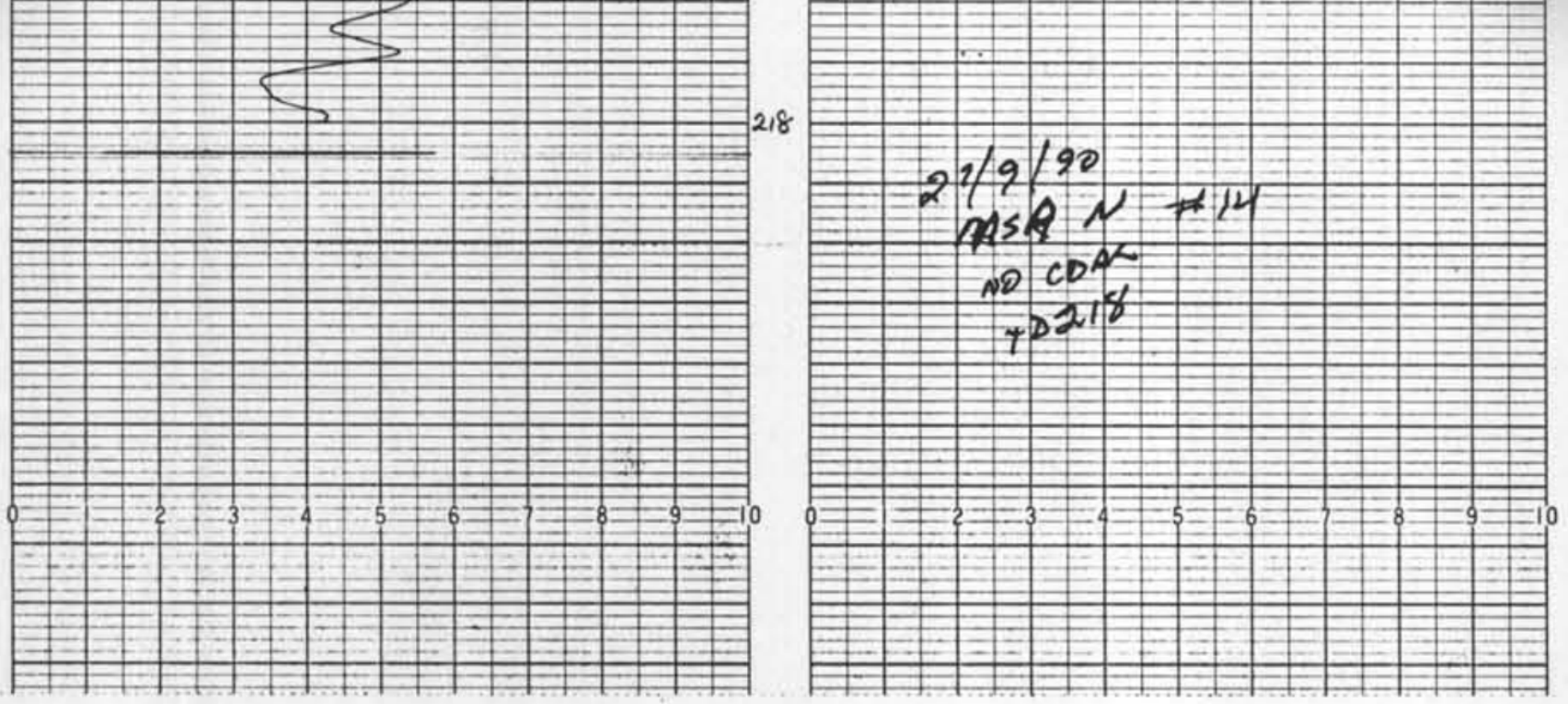
COLORADO WELL LOGGING, INC., GOLDEN, COLORADO, U.S.A. CHART NO. MET-2 (3474)


COLORADO WELL LOGGING, INC., GOLDEN, COLORADO, U.S.A. CHART NO. MET-2 (3474)
COLOG
100
110
120
130
0 1 2 3 4 5 6 7 8 9 10


COLORADO WELL LOGGING, INC., GOLDEN, COLORADO, U.S.A.
COLOG
(3474)
CHART NO. MET-2
COLORADO WELL LOGGING, INC., GOLDEN, COLORADO, U.S.A.
0 1 2 3 4 5 6 7 8 9 10
140
150
160
170



COLORADO WELL LOGGING, INC., GOLDEN, COLORADO, U.S.A. CHART NO. MET-2 (3474)



(3474) IN. COLORADO, U.S.A. CHART NO. MET-2

758

Crows Nest Resources Limited

HOLE NO. MSAN-15

AREA MSAN

DATE 7/9/90

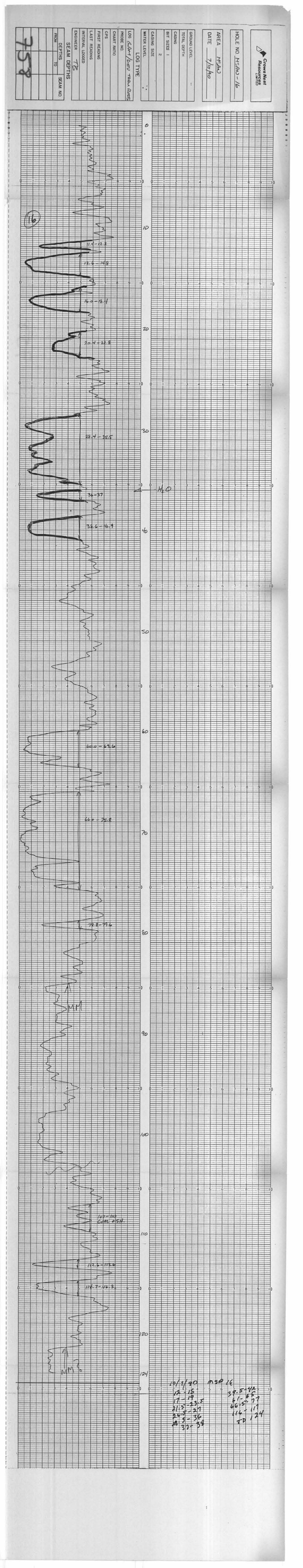
GROUND LEVEL	
TOTAL DEPTH	166
CASING	
BIT SIZES 1	
2	
CASING SIZE	
WATER LEVEL	

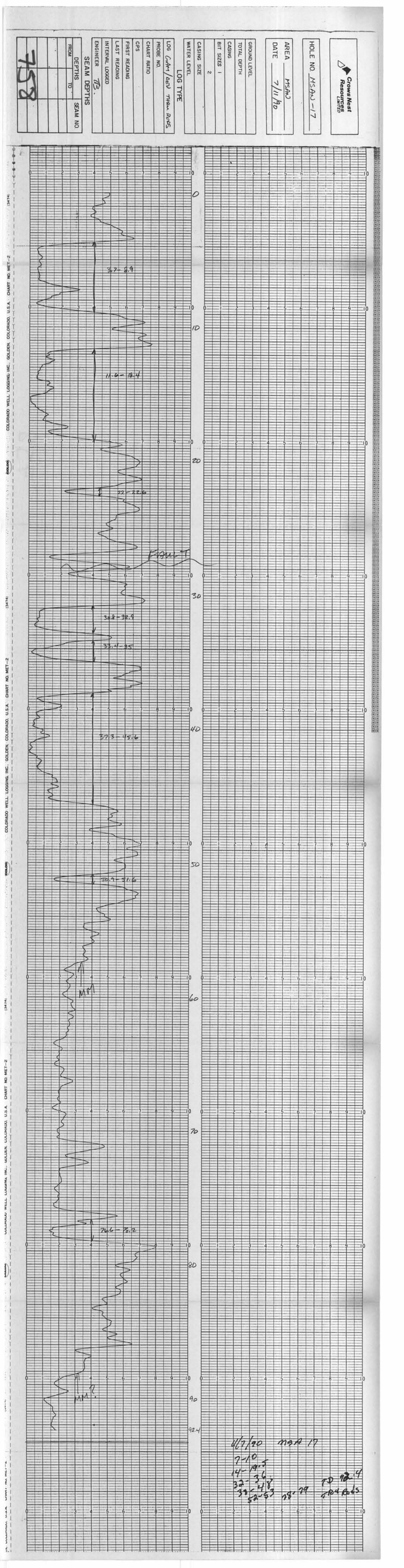
LOG TYPE

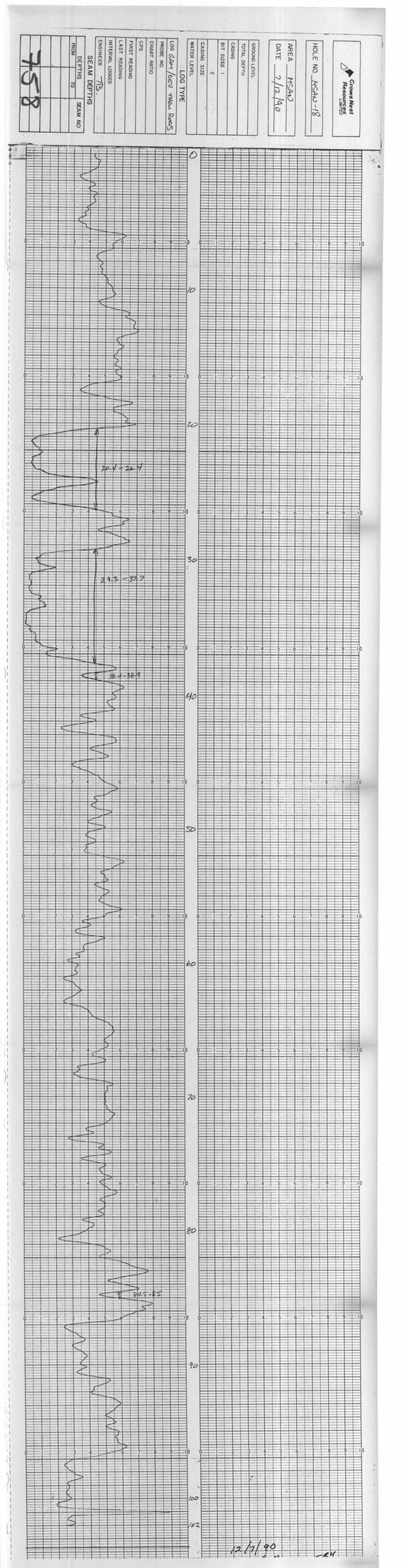
LOG	GAMMA/DEV THRU RODS
PROBE NO.	
CHART RATIO	
CPS	
FIRST READING	
LAST READING	
INTERVAL LOGGED	
ENGINEER	TB

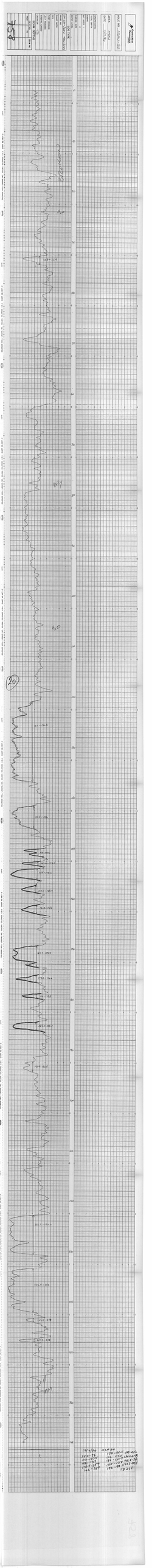
SEAM DEPTHS

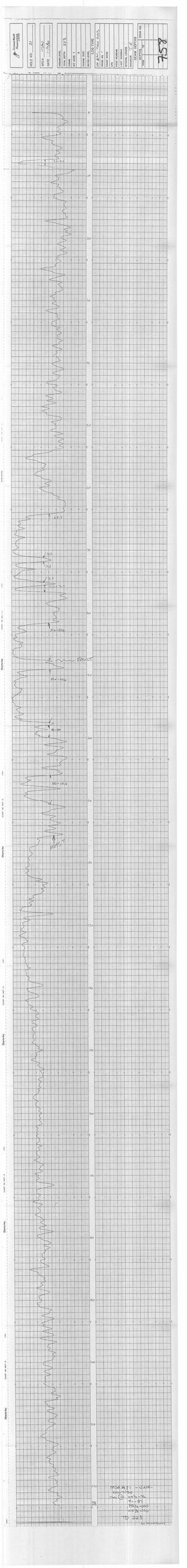
DEPTHS FROM	TO	SEAM NO


Grant Mast Resources
HOLE NO. MSAD-16
AREA MSAD
DATE 7/16/90
GROUND LEVEL
TOTAL DEPTH
CASING
BIT SIZES 1
2
CASING SIZE
WATER LEVEL
LOG TYPE
LOG GAMMA/GAMMA TRAM/CALIPER
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER
SEAM DEPTHS
FROM TO SEAM NO
16
11.4 - 12.2
13.6 - 14.9
16.0 - 16.1
20.4 - 22.8
28.4 - 35.5
36 - 37
38.6 - 40.9
60.0 - 63.6
66 - 75.8
78.8 - 79.6
107 - 110
CUM: 45H.
112.5 - 113.6
116.7 - 116.3
MM
H2O
10/7/90 MSD 16
12 - 15
17 - 19
21.5 - 23.5
24.5 - 27
29.5 - 36
37.5 - 38
39.5 - 42
61 - 63
66.5 - 77
116 - 119
TD 124


Crown Nest Resources Limited
HOLE NO. MSPAJ-17
AREA MSPAJ
DATE 7/11/80
GROUND LEVEL
TOTAL DEPTH
CASING
BIT SIZES 1
2
CASING SIZE
WATER LEVEL
LOG TYPE
LOG Conn/Dens Therm Res
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER TB.
SEAM DEPTHS
FROM
TO
SEAM NO.
8SE
COLORADO WELL LOGGING INC. GOLDEN, COLORADO, U.S.A. CHART NO. MET-2
3.7- 8.9
11.6- 18.4
22-22.6
FLOAT
30.8- 32.9
33.4- 35
37.3- 45.6
50.9- 51.6
MAP
74.6- 75.2
MAP
4/7/80 MSA 17
7-10
14- 19.5
32- 34
38- 41.8
52-53
78-79
TD 92.4
4 1/2 Rods


Crows Nest Resources Limited
HOLE NO MSAD-18
AREA McArthur
DATE 7/12/90
GROUND LEVEL
TOTAL DEPTH
CASING
BIT SIZES 1
2
CASING SIZE
WATER LEVEL
LOG TYPE
LOG Gamma Ray Neutron Density
PROBE NO.
CHART RATIO
C/PS
FIRST READING
LAST READING
INTERNAL LOGGED
ENGINEER TS
SEAM DEPTHS
DEPTHS FROM
TO
SEAM NO
FS8
20.4 - 26.4
29.2 - 37.7
38.4 - 38.9
64.5 - 85
12/7/90
EH




Dynamic Metal Mouldings
HOLE NO. 21
AREA Surface
DATE 1.5.86
DIMENSIONS
Drilling Depths 22.5
Core Length 1
Core Dia. 36
Drilled To 22
WATER LEVEL
CORE RECOVERY
Core Recovered
Core Not Recovered
Fissured
Broken Rocks
Soft Patches
Lost Flushings
Lost Percentage
Fissures at 5°
Fissures at 45°
Fissures at 90°
Fissures at 135°
Fissures at 180°
REMARKS
SEAM NO.
758

Crows Nest Resources Limited

HOLE NO. 22
VERT.
AREA MSAN
DATE 11/8/90

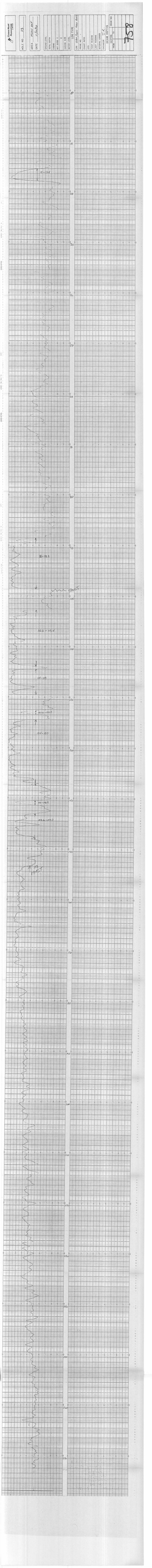
GROUND LEVEL
TOTAL DEPTH 168
CASING
BIT SIZES 1
2
CASING SIZE
WATER LEVEL

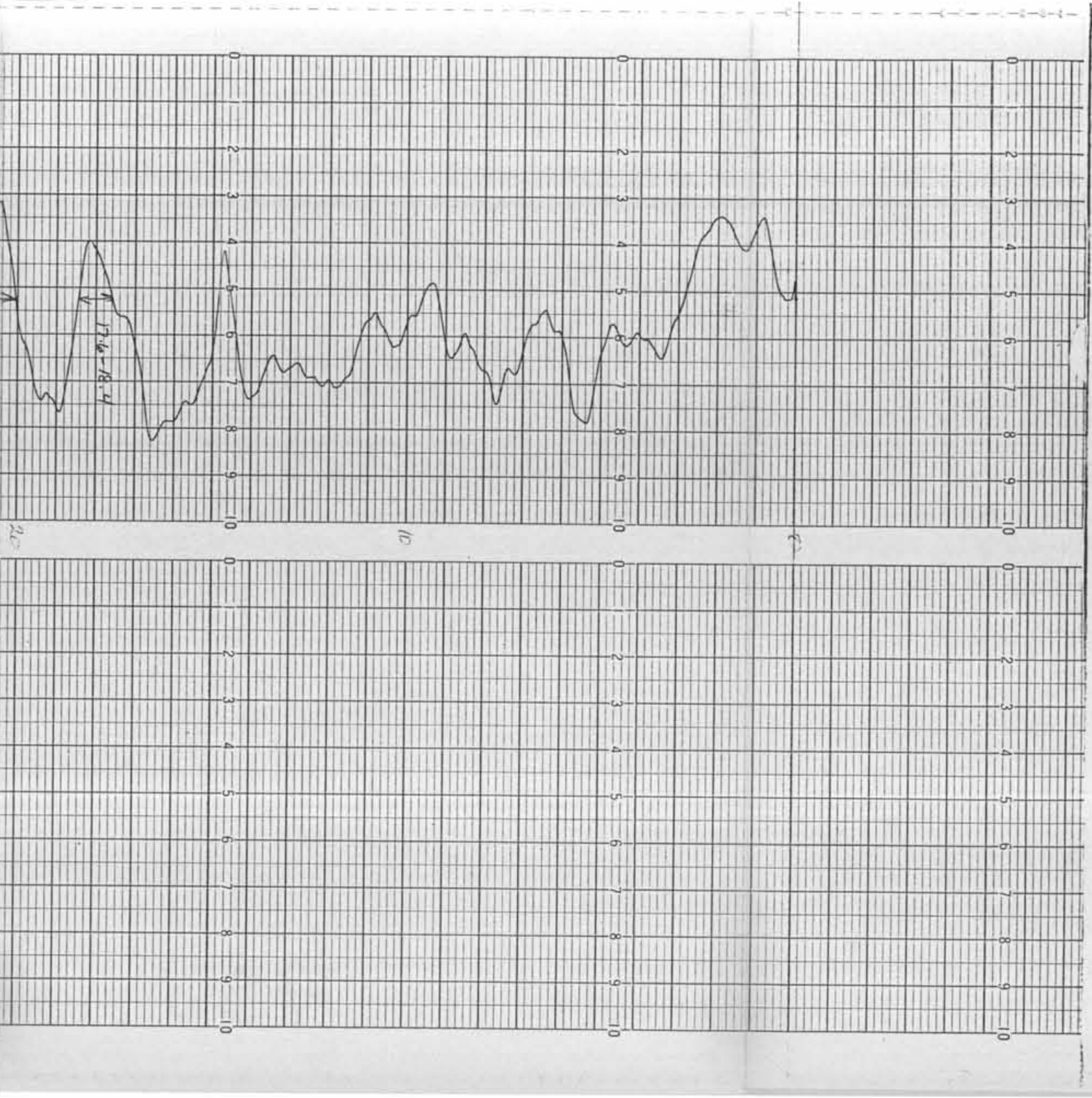
LOG TYPE
LOG GAM - THRU RODS
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER J.K.

SEAM DEPTHS

DEPTHS FROM	TO	SEAM NO.

758





Crows Nest Resources LIMITED

HOLE NO. 24

AREA MSAW

DATE 12/10/90

GROUND LEVEL	
TOTAL DEPTH	214
CASING	
BIT SIZES 1	
2	
CASING SIZE	
WATER LEVEL	

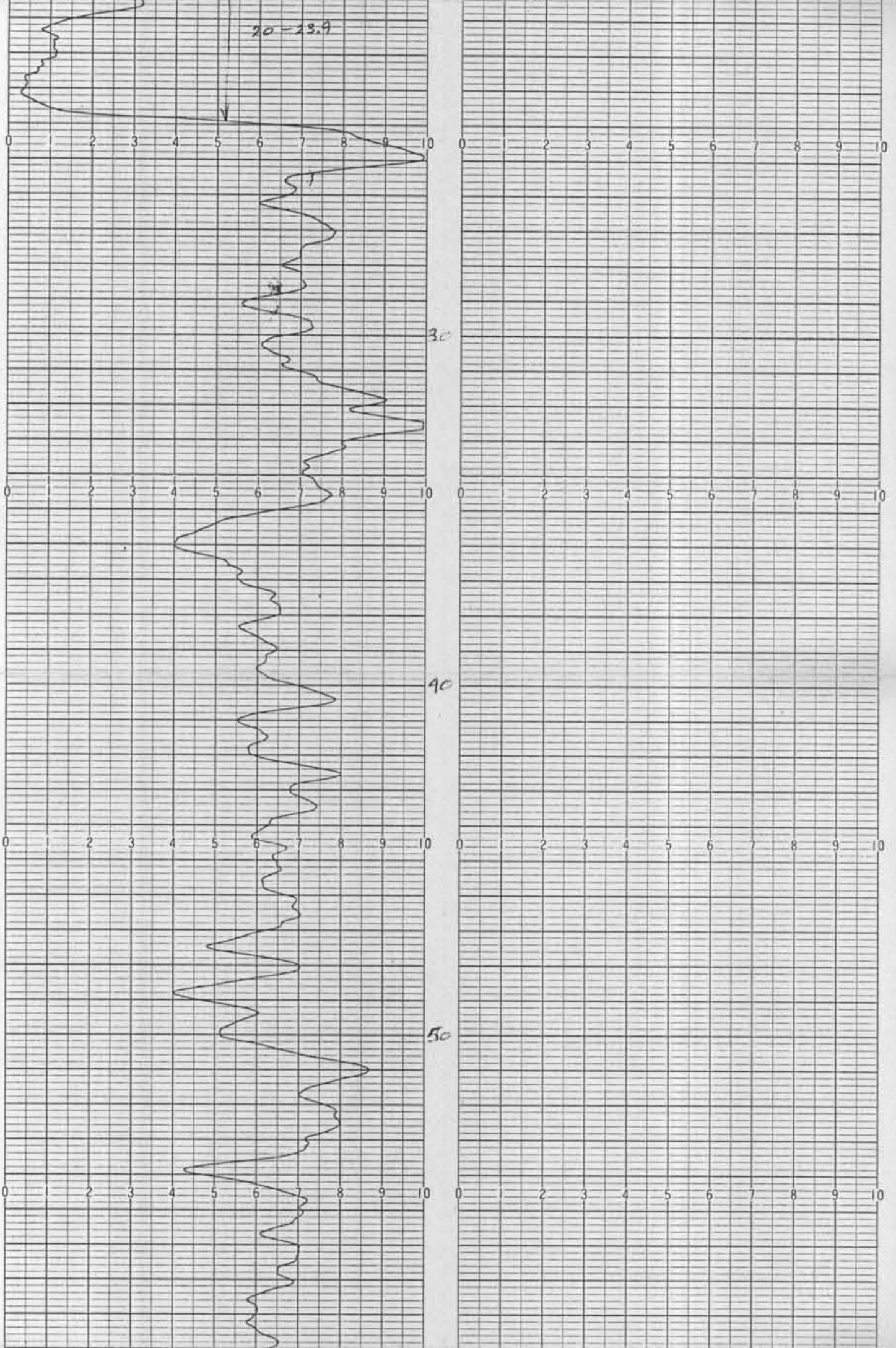
LOG TYPE

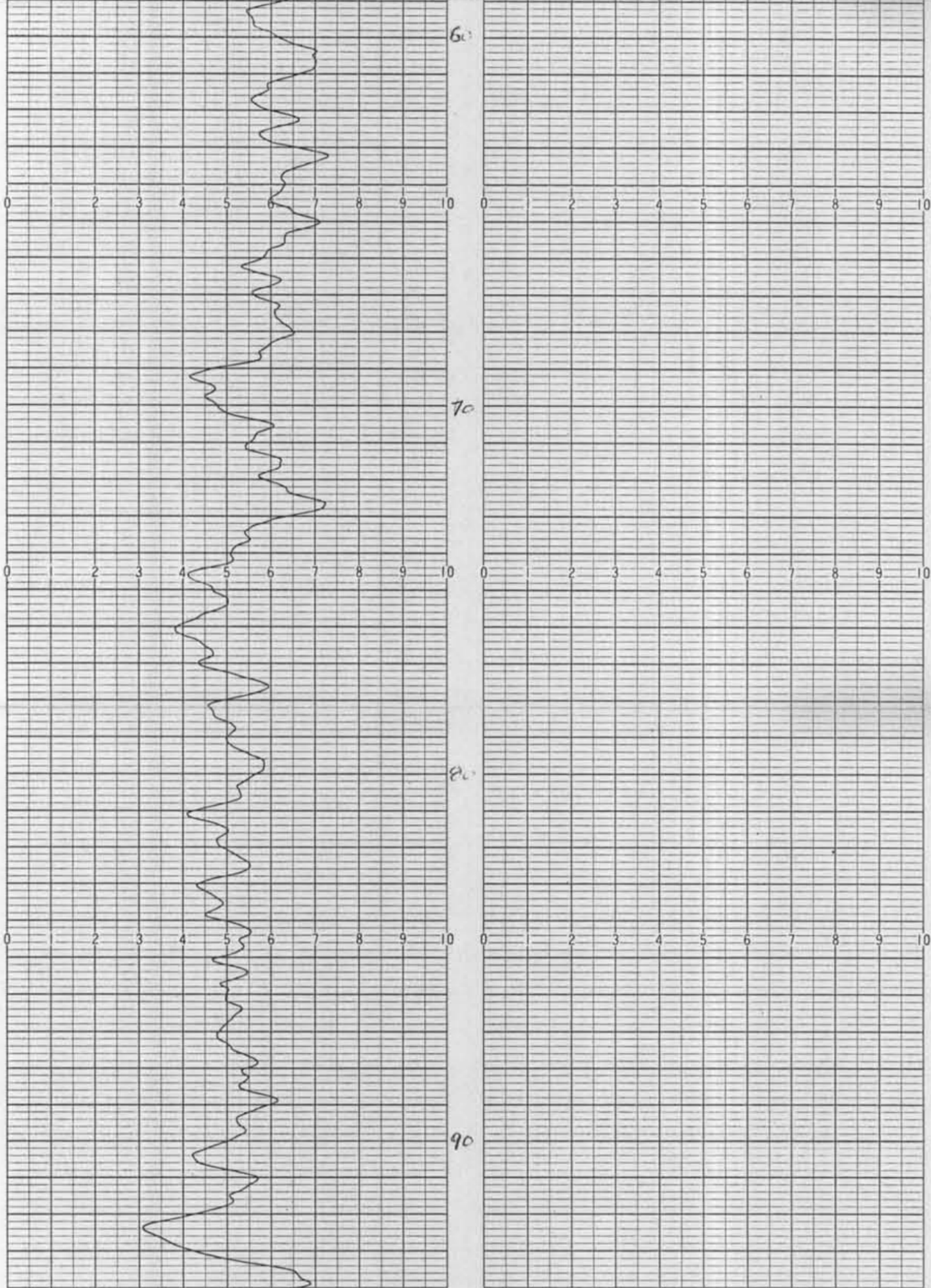
LOG	GAM / DEV THRU RODS
PROBE NO.	
CHART RATIO	
CPS	
FIRST READING	
LAST READING	
INTERVAL LOGGED	
ENGINEER	JK

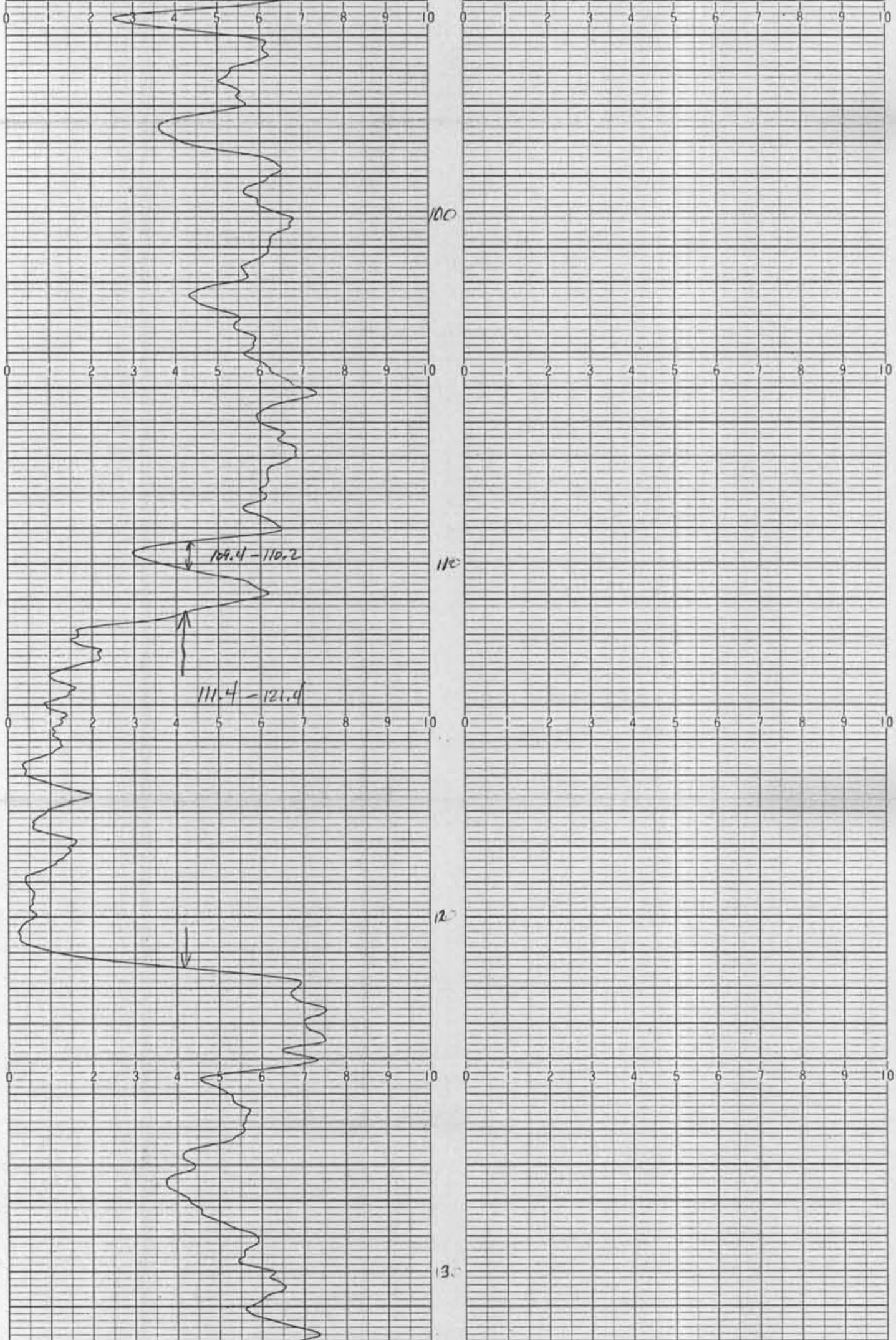
SEAM DEPTHS

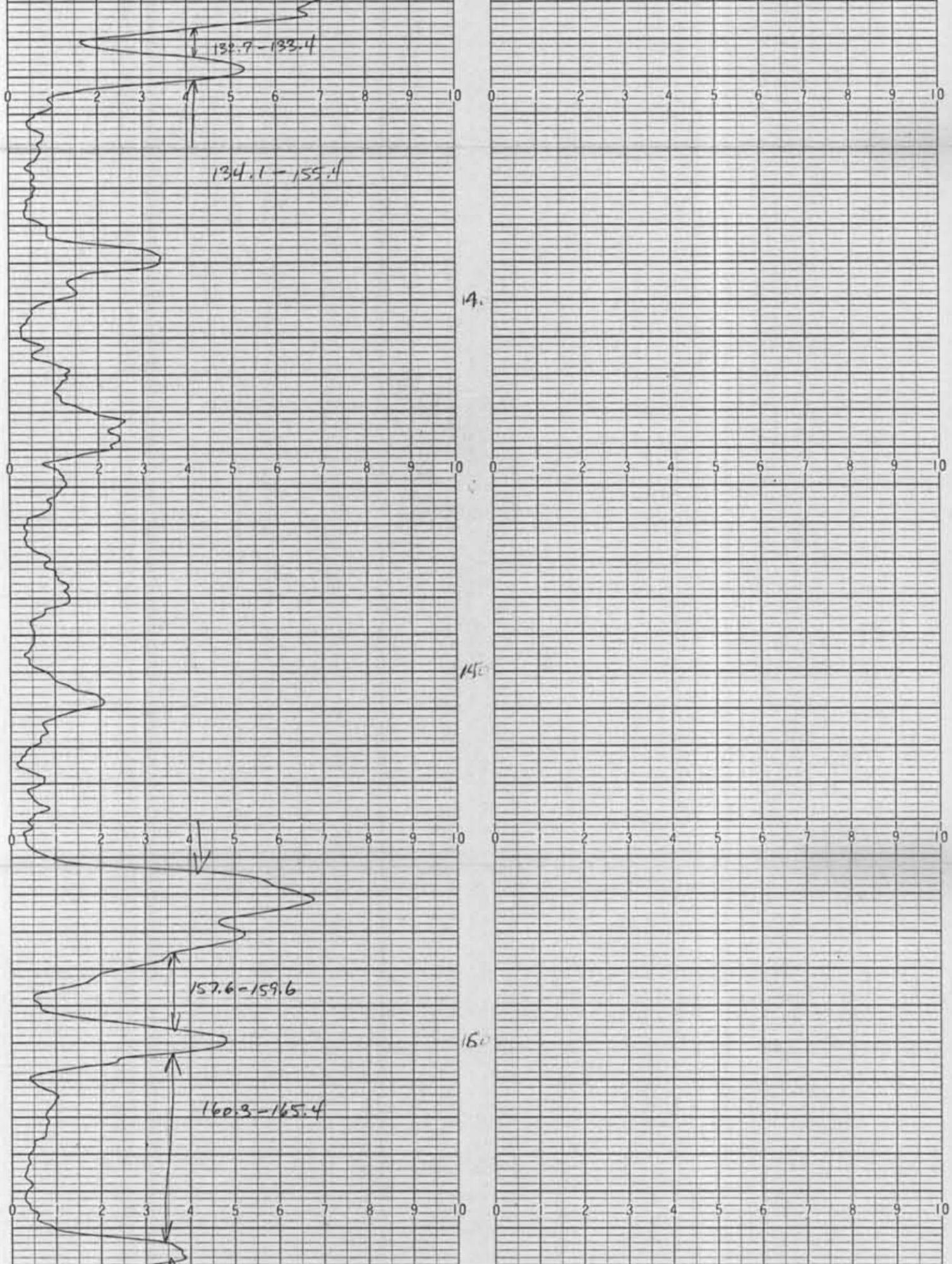
DEPTHS		SEAM NO.
FROM	TO	

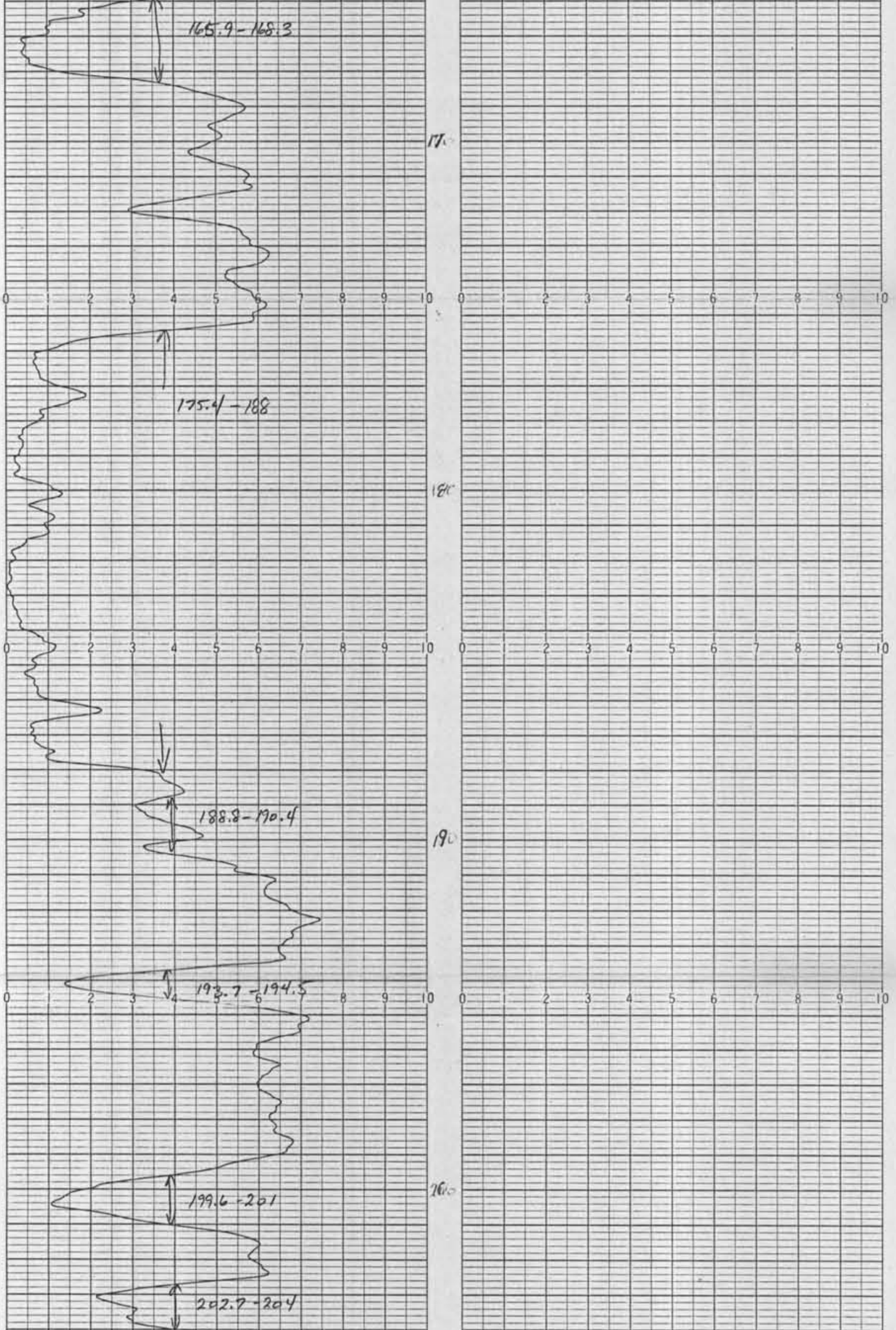
758

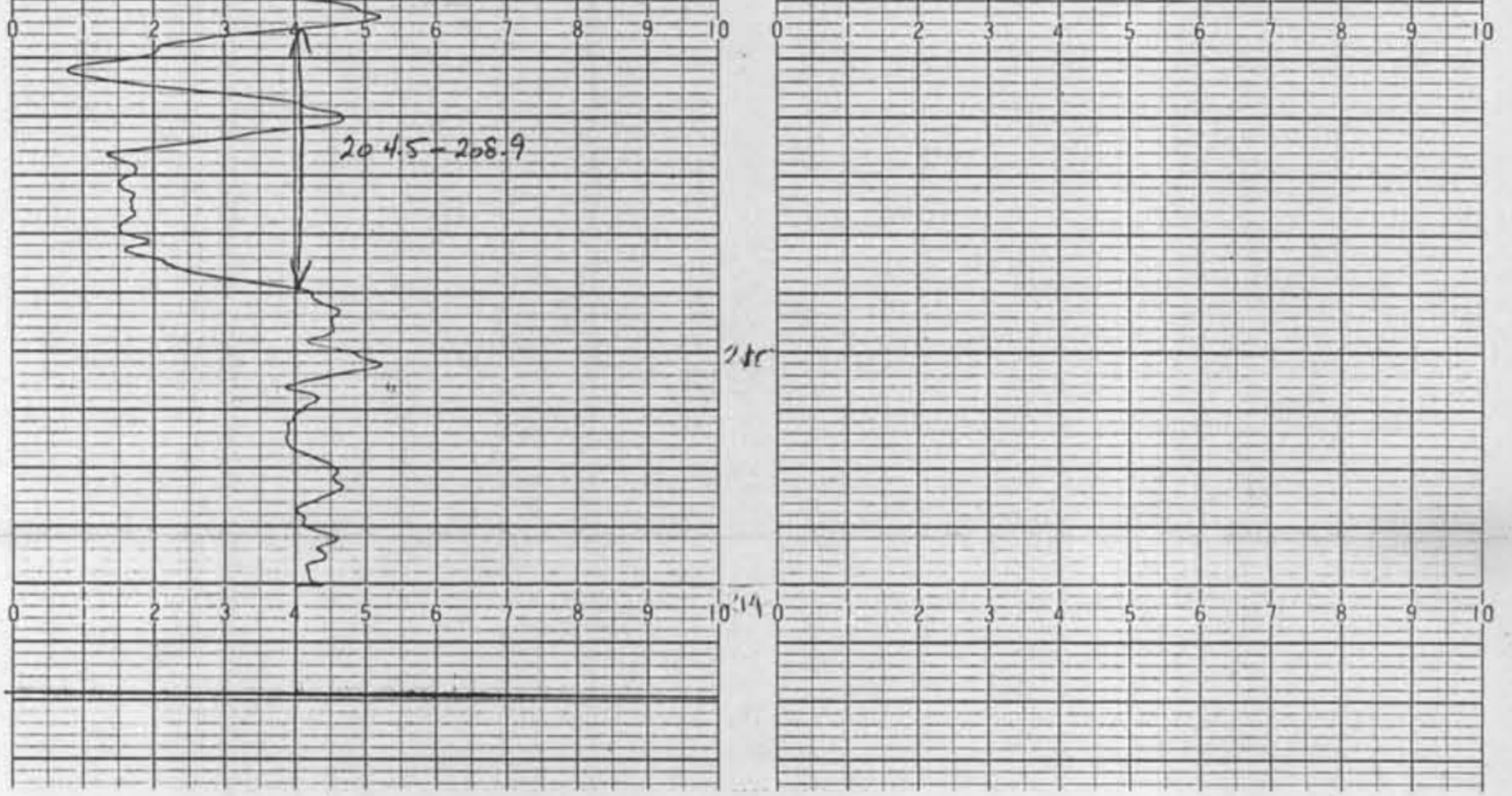

20 = 23.9
0 1 2 3 4 5 6 7 8 9 10
30
40
50


60
70
80
90
0 1 2 3 4 5 6 7 8 9 10


0 1 2 3 4 5 6 7 8 9 10
100
109.4 - 110.2
110
111.4 - 121.4
120
130


132.7-133.4
134.1-155.1
157.6-159.6
160.3-165.4
0 1 2 3 4 5 6 7 8 9 10
14.
145
16.


165.9 - 168.3
175.4 - 188
188.8 - 190.4
193.7 - 194.5
199.6 - 201
202.7 - 204
0 1 2 3 4 5 6 7 8 9 10


0 1 2 3 4 5 6 7 8 9 10
204.5 - 208.9
0 1 2 3 4 5 6 7 8 9 10
0 1 2 3 4 5 6 7 8 9 10
0 1 2 3 4 5 6 7 8 9 10

Crows Nest Resources LIMITED

HOLE NO. 25

AREA MSAD
DATE 12/13/90

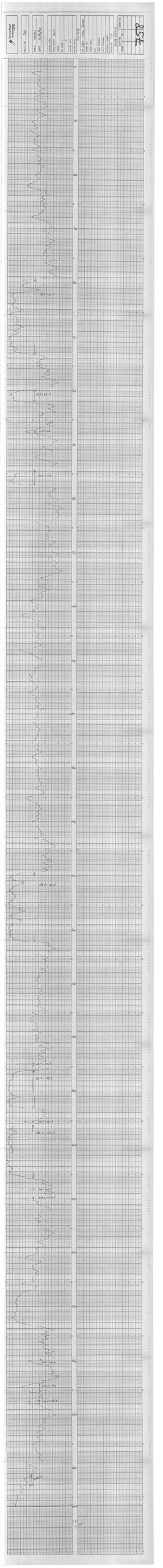
GROUND LEVEL
TOTAL DEPTH 207.6
CASING
BIT SIZES 1
2
CASING SIZE
WATER LEVEL

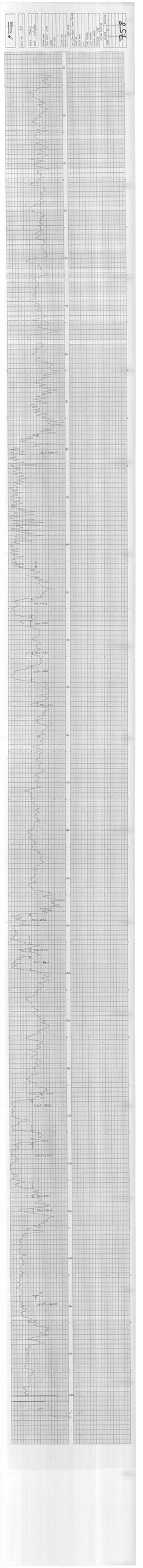
LOG TYPE
LOG GAM/DEV THRU RODS.
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER JK.

SEAM DEPTHS

DEPTHS FROM	TO	SEAM NO.

758





Crows Nest Resources LIMITED

HOLE NO. 28

AREA MSAN
DATE 12/2/90

GROUND LEVEL
TOTAL DEPTH 195
CASING
BIT SIZES 1
2
CASING SIZE
WATER LEVEL

LOG TYPE
LOG GAM (E=) THRU RODS
PROBE NO.
CHART RATIO
CPS
FIRST READING
LAST READING
INTERVAL LOGGED
ENGINEER JK.

SEAM DEPTHS

DEPTHS FROM	TO	SEAM NO

758

758

Century Geophysical Corp.

DEVAITION

COMPANY	: CROWSNEST RESOURCES			OTHER SERVICES:	
WELL	: MSAN-29				
LOCATION/FIELD	: MSAN				
COUNTY	:				
STATE	:				
SECTION	:	TOWNSHIP	:	RANGE	:
DATE	: 12/21/90	PERMANENT DATUM	:	ELEVATIONS	
DEPTH DRILLER	: 227	ELEV. PERM. DATUM	:	KB	:
LOG BOTTOM	: 225.35	LOG MEASURED FROM	: GL	DF	:
LOG TOP	: 2.21	DRL MEASURED FROM	: GL	GL	:
CASING DRILLER	:	LOGGING UNIT	: 8909		
CASING TYPE	: STEEL	FIELD OFFICE	: CALGARY		
CASING THICKNESS	: .025	RECORDED BY	: D.ZANKL		
BIT SIZE	: 13	BOREHOLE FLUID	: WATER	FILE	: PROCESSED
MAGNETIC DECL.	: 1.700	RM	:	TYPE	: 9055A
MATRIX DENSITY	: 2.68	RM TEMPERATURE	:	LOG	: 9
FLUID DENSITY	: 1.10	MATRIX DELTA T	:	PLOT	: 9055-DEV
NEUTRON MATRIX	: SANDSTONE	FLUID DELTA T	:	THRESH	: 10000
REMARKS	:				

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

* * * * * * * COMPU-LOG - VERTICAL DEVIATION * * * * * * *

CLIENT : CROWSNEST RESOURCES HOLE ID. : MSAN-29
FIELD OFFICE : CALGARY DATE OF LOG : 12/21/90
DATA FROM : PROBE : 9055A . 245
MAG. DECL. : 1.700 DEPTH UNITS : METERS LOG 9

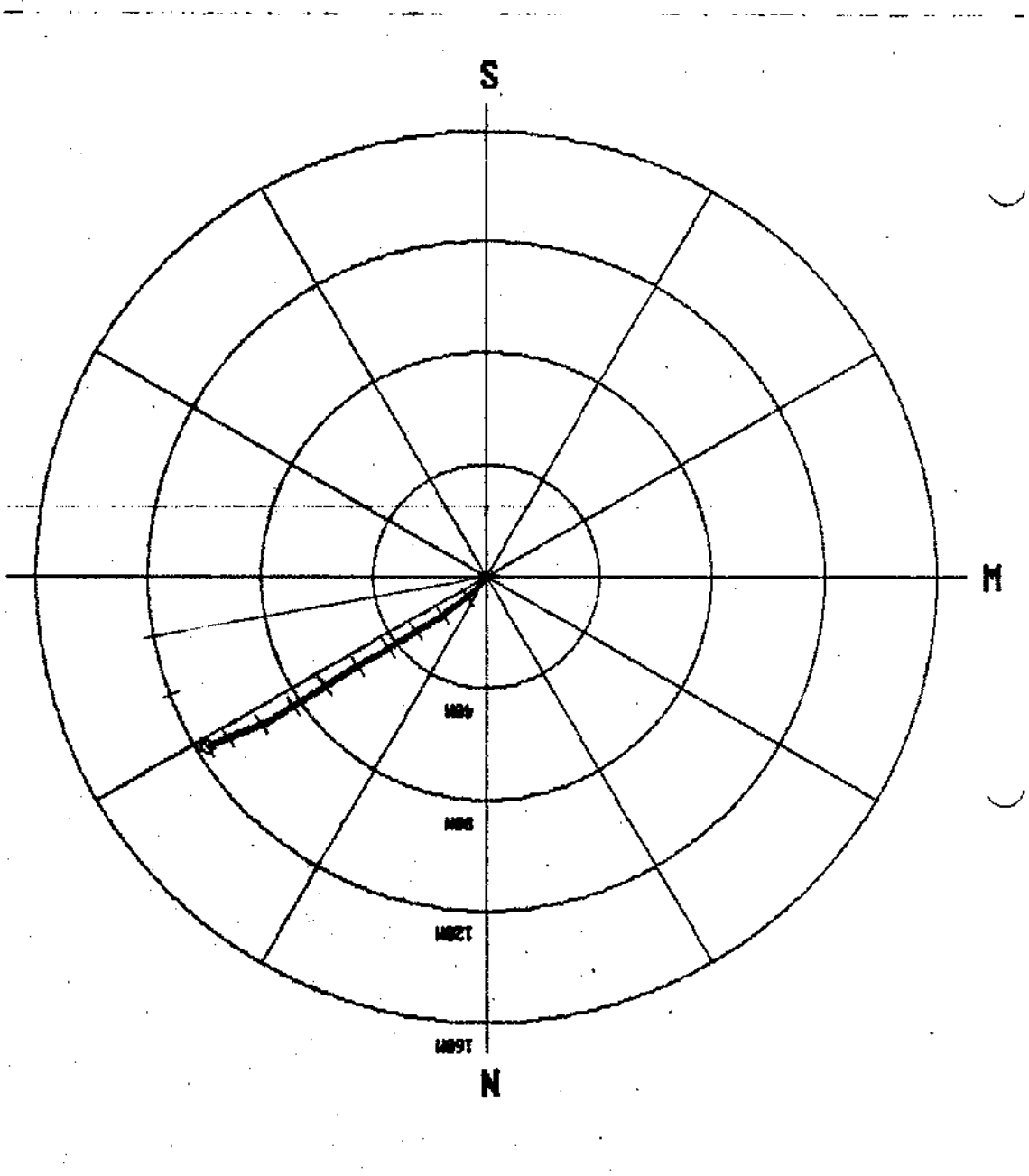
CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0
10.0	9.01	2.82	2.30	3.6	39.2	30.0	47.6
20.0	17.65	6.21	6.03	8.7	44.1	30.1	47.9
30.0	26.34	9.40	9.80	13.6	46.2	28.5	56.2
40.0	35.05	12.28	13.79	18.5	48.3	29.2	55.9
50.0	43.77	15.08	17.47	23.1	49.2	28.8	58.3
60.0	52.51	17.62	21.60	27.9	50.8	28.8	58.5
70.0	61.27	20.13	25.73	32.7	52.0	28.8	59.6
80.0	69.99	22.68	29.90	37.5	52.8	29.1	59.7
90.0	78.64	25.24	34.21	42.5	53.6	31.0	59.8
100.0	87.18	27.83	38.72	47.7	54.3	32.4	59.1
110.0	95.56	30.57	43.42	53.1	54.9	33.2	63.4
120.0	103.85	33.45	48.23	58.7	55.3	34.3	59.7
1[illegible].0	112.11	36.40	53.02	64.3	55.5	35.0	55.2
140.0	120.40	39.38	57.76	69.9	55.7	33.8	58.0
150.0	128.71	42.31	62.48	75.5	55.9	34.2	56.9
160.0	137.06	45.22	67.16	81.0	56.0	33.4	57.7
170.0	145.43	48.09	71.80	86.4	56.2	33.1	56.2
180.0	153.83	50.89	76.45	91.8	56.4	32.6	60.8
190.0	162.19	53.28	81.36	97.2	56.8	33.4	68.3
200.0	170.56	55.40	86.41	102.6	57.3	32.8	67.5
210.0	178.96	57.49	91.41	108.0	57.8	33.5	65.3
220.0	187.30	59.59	96.50	113.4	58.3	34.5	63.8
225.4	191.74	60.78	99.15	116.3	58.5	0.0	0.0

PLAN VIEW
COMPU-LOG DEVIATION

CLIENT: CROWSNEST RESOURCES
LOCATION: MSAN
HOLE ID: MSAN-29
DATE OF LOG: 12/21/90
PROBE: 9055A 245

SCALE: 20 M/CM
TRUE DEPTH: 191.72 M
AZIMUTH: 58.5
DISTANCE: 116.3 M
+ = 20 M INCR
O = BOTTOM OF HOLE

MAG DECL: 1.7



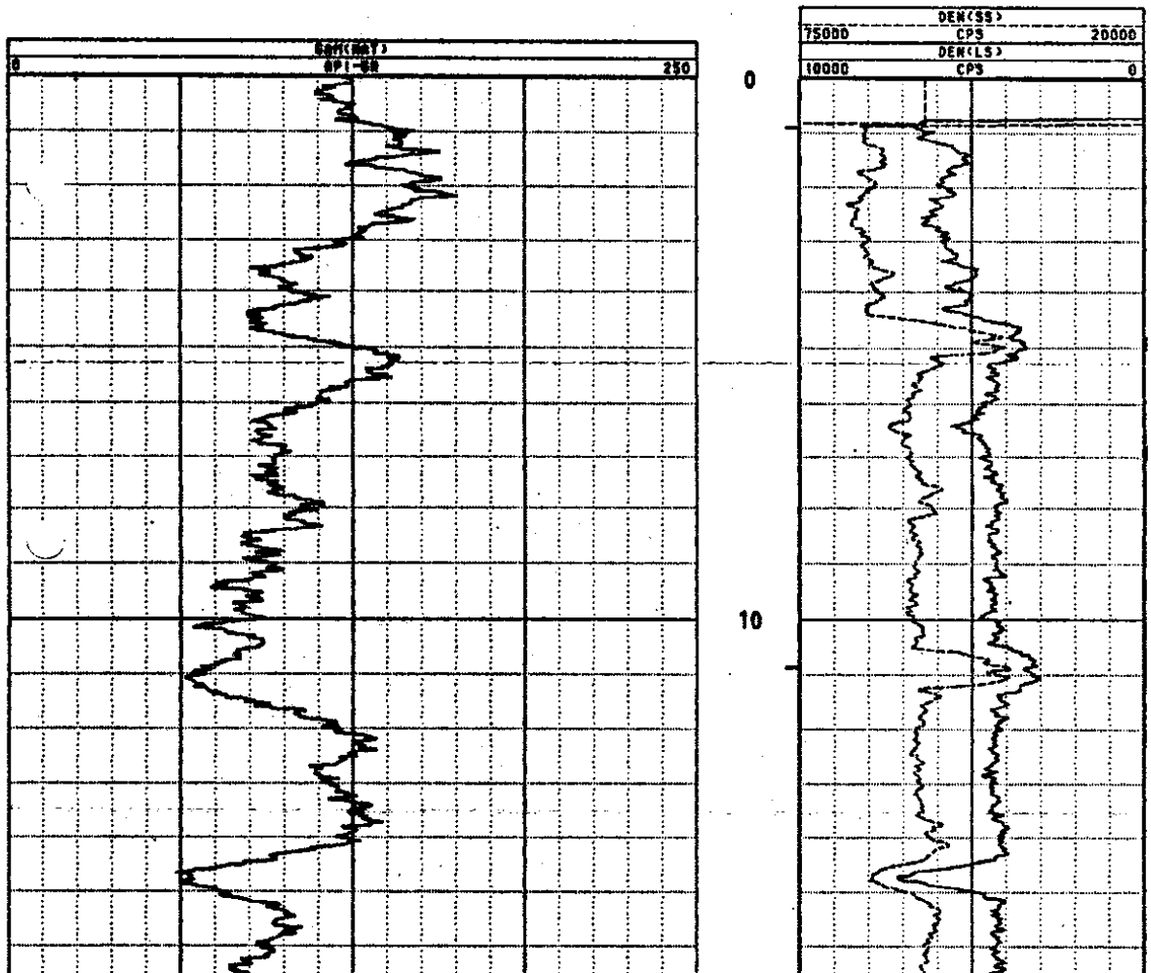
758

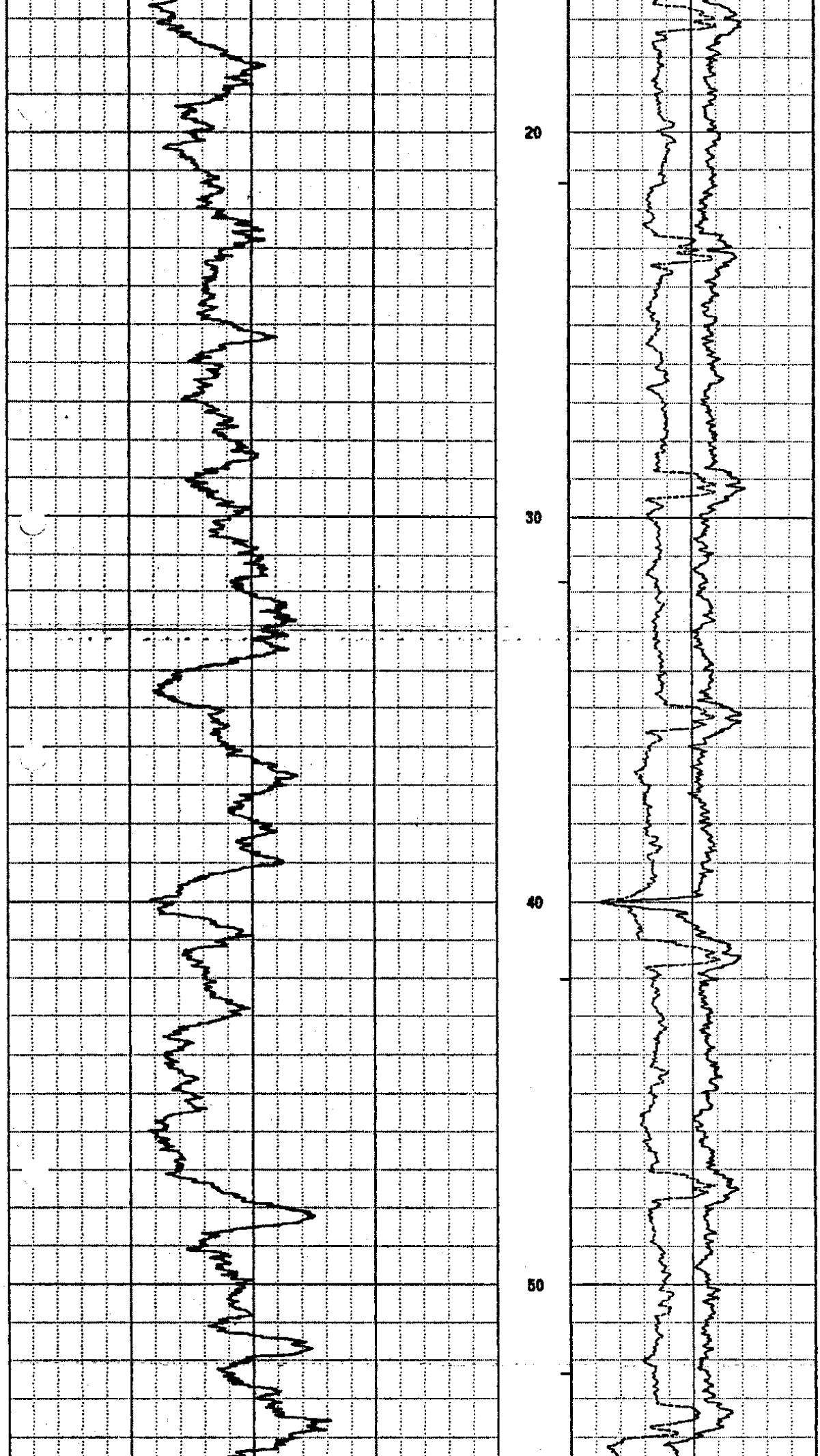
Century GEOPHYSICAL CORP.

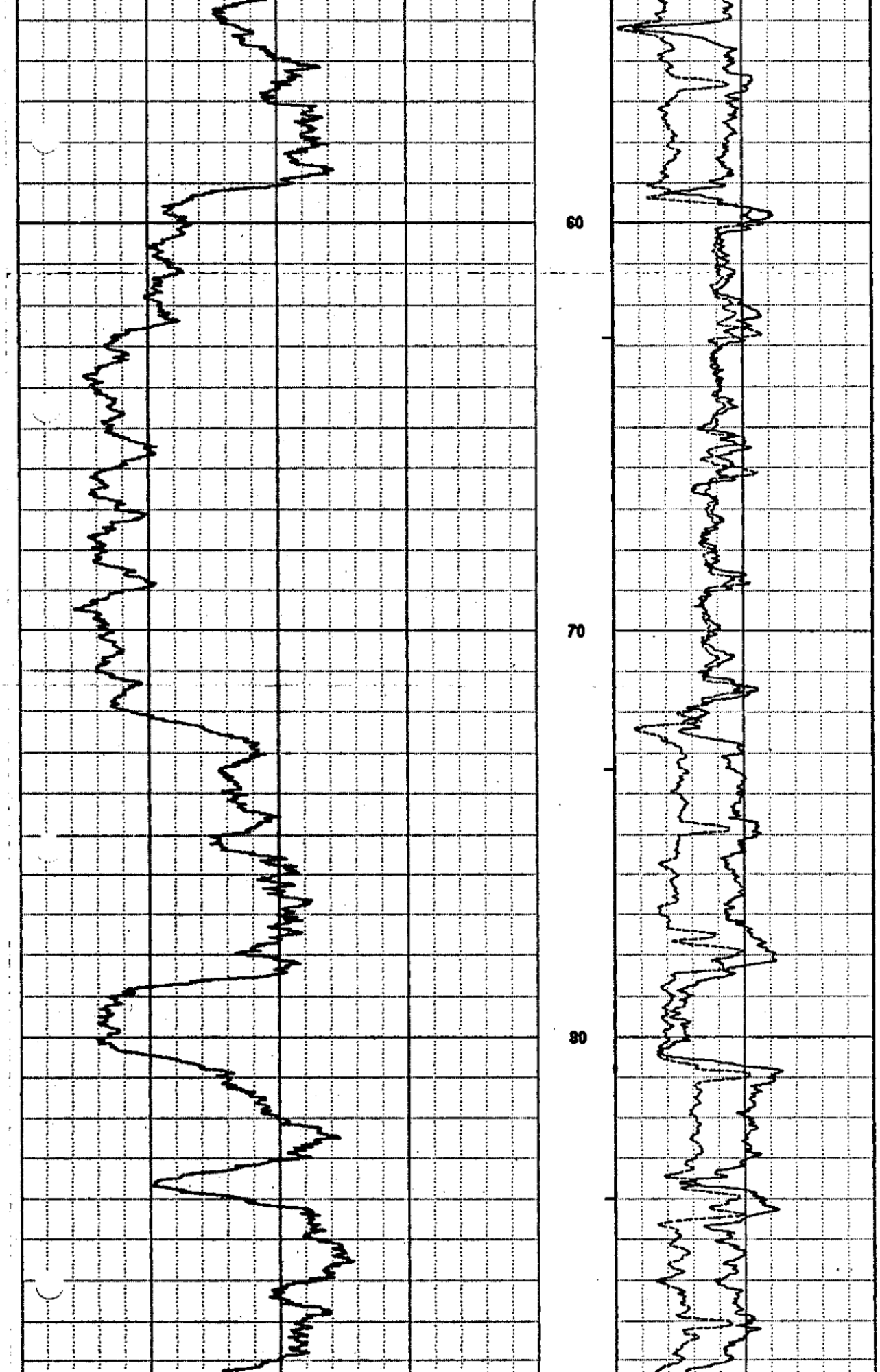
GAMMA-GAMMA UNCALIBRATED

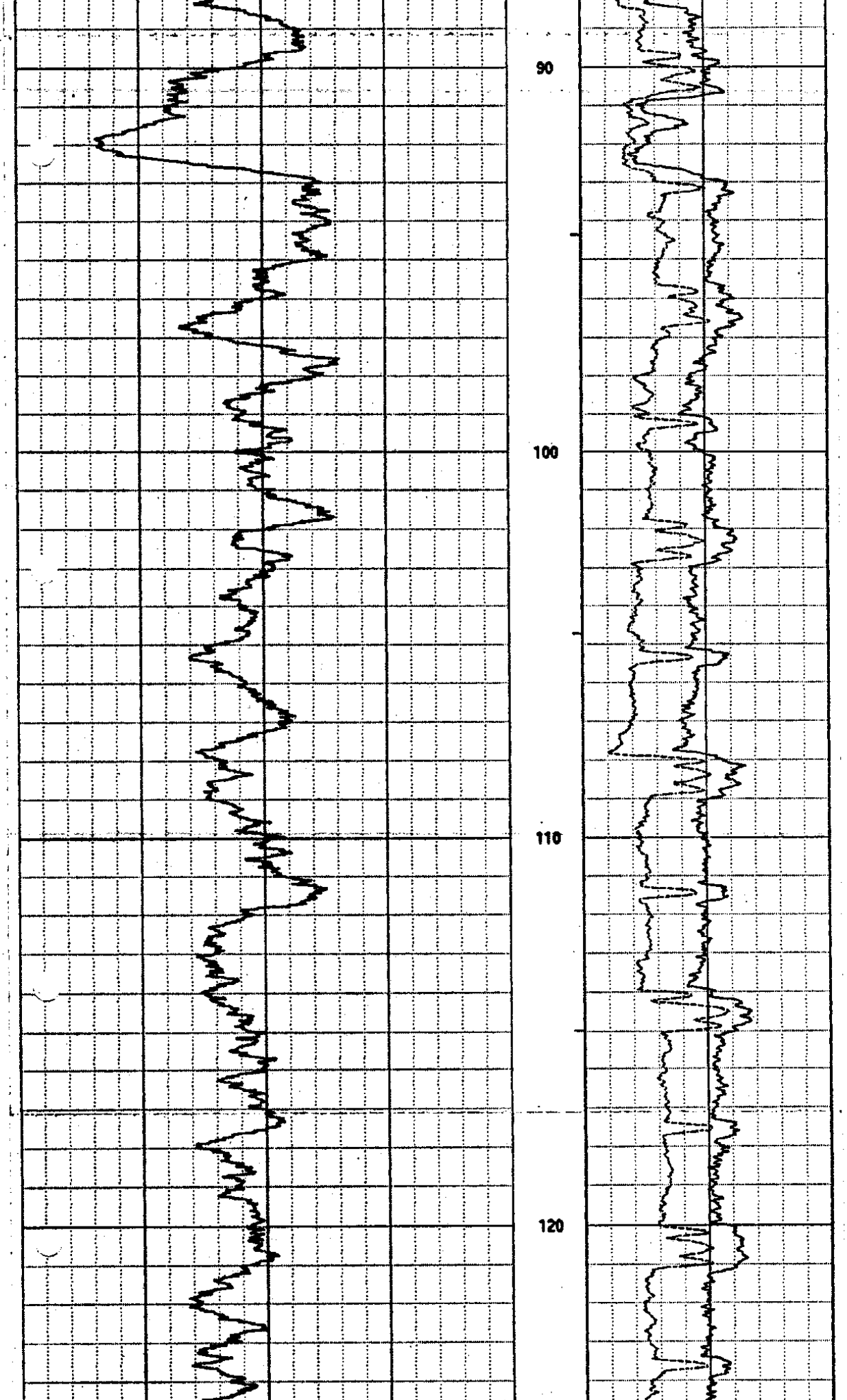
COMPANY	: CROWSNEST RESOURCES			OTHER SERVICES:	
WELL	: MSAN-29				
LOCATION/FIELD	: MSAN				
COUNTY	:				
STATE	:				
SECTION	:	TOWNSHIP	:	RANGE	:
DATE	: 12/21/90	PERMANENT DATUM	:	ELEVATIONS	
DEPTH DRILLER	: 227	ELEV. PERM. DATUM	:	KB	:
LOG BOTTOM	: 224.43	LOG MEASURED FROM	: GL	DF	:
LOG TOP	: 8.04	DRL MEASURED FROM	: GL	GL	:
CASING DRILLER	:	LOGGING UNIT	: 8909		
CASING TYPE	: STEEL	FIELD OFFICE	: CALGARY		
CASING THICKNESS	: .625	RECORDED BY	: D.ZANKL		
BIT SIZE	: 13	BOREHOLE FLUID	: WATER	FILE	: ORIGINAL
MAGNETIC DECL.	: 00	RM	:	TYPE	: 9869A
MATRIX DENSITY	: 2.68	RM TEMPERATURE	:	LOG	: 1
FLUID DENSITY	: 1.10	MATRIX DELTA T	:	PLOT	: 9869A 3
NEUTRON MATRIX	: SANDSTONE	FLUID DELTA T	:	THRESH	: 10000
REMARKS	:				

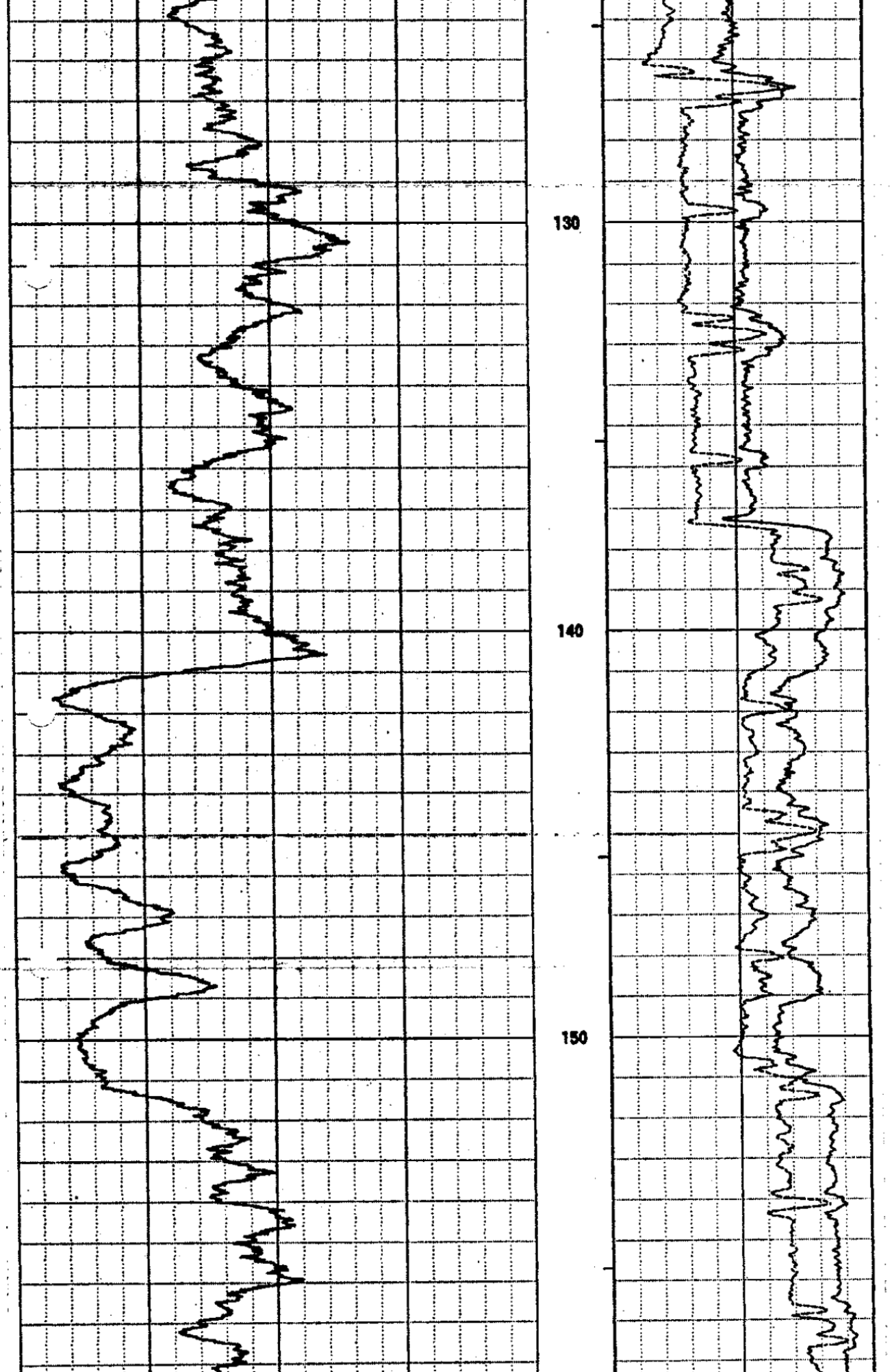
ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

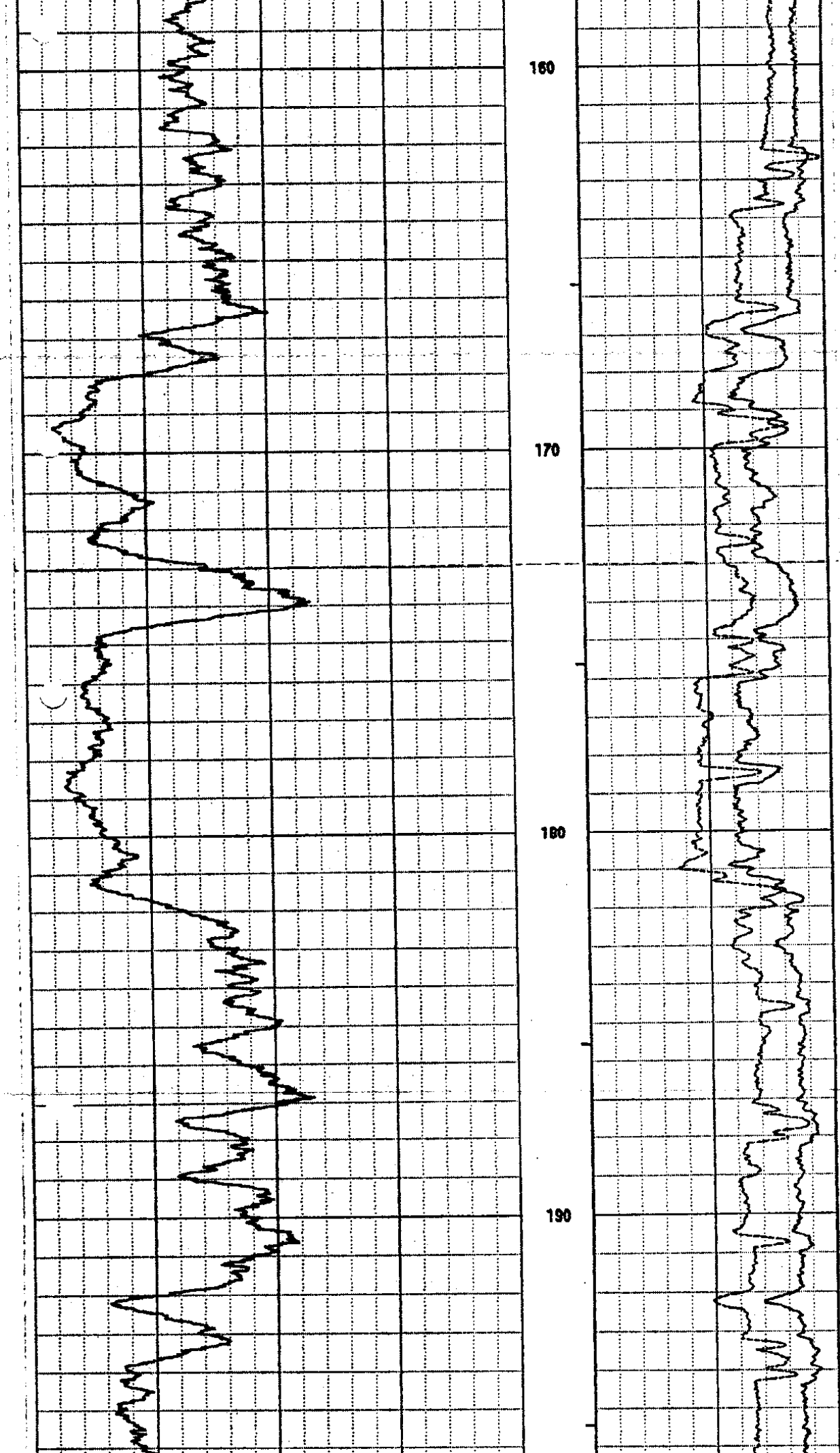


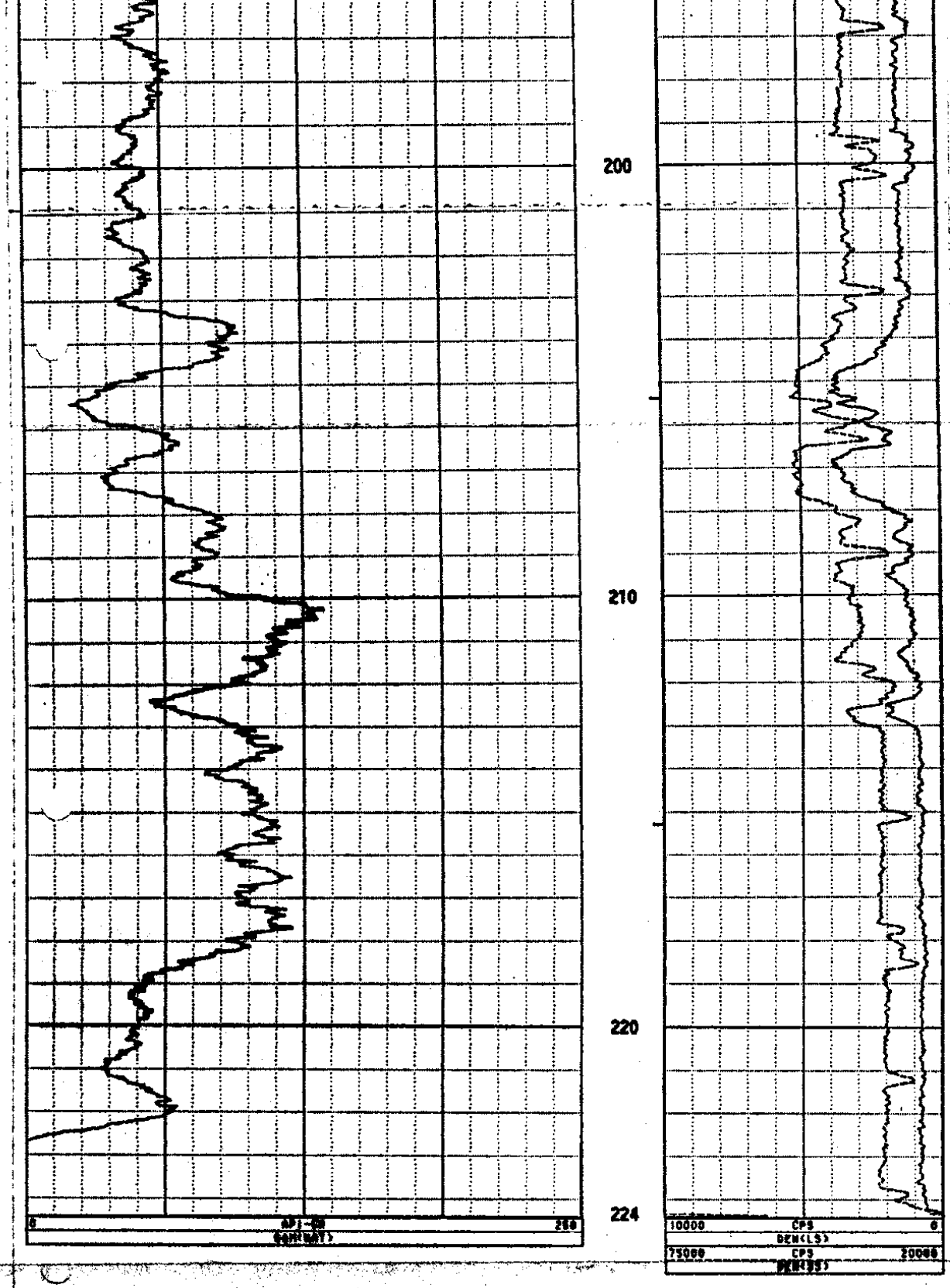

20
30
40
50


60
70
80


90
100
110
120


130
140
150


160
170
180
190


200
210
220
224
0
API-GR
200
GAMMA(T)
10000
CPS
0
DEN(LS)
75000
CPS
20000
DEN(SS)