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ELK RIVER COKING COAL PROJECT

GEOLOGY REPORT

J. LONG - CONSULTING ENG.

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by J. Long, Consult. Eng.

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EXHIBITS IN APPENDIX

GEOLOGY REPORT

ELK RIVER COKING COAL PROJECT

J. Long - Consulting Engineer International Engineering Company

A. REGIONAL GEOLOGY

The Elk River coal project is located within the Front Range geomorphic subprovince of the Rocky Mountains. The dominant tectonic feature of this region is the classic Lewis Thrustfault which crops out several miles east of the project area. The well known Rocky Mountain Trench is located approximately 20 miles west of the project area.

Rocks which both underlie and form the eastern flank of the Elk River Valley are folded into tight northwest trending anticlines and synclines that are thought, by most geologists, to comprise the upper plate, or hanging wall of the Lewis Thrust. Regional geologic mapping and nearby oil well information suggest the Lewis Thrust may be in the order of 8,000 to 10,000 feet below the Elk River in the area under investigation (Dahlstrom et. al., 1962).

Anticlinal and synclinal structures, mentioned above, appear to be overridden and truncated along the west flank of the Elk River Valley by a fault which has been designated as the Elk River Thrust by some authorities.

This fault is projected at least 30 miles south of the study area and extends an unknown distance to the north. Dip of the Elk River fault plane is unknown but stratigraphic and structural relationships suggest it dips to the west and is well outside areas likely to be initially mined within the Elk River Project.

A general description of formations which are known to exist in the Front Range Province is shown in Table 1. Rocks exposed within the project area and general vicinity include the Permo-Pennsylvanian, Rocky Mountain formation, the Triassic Spray River

TABLE 1

TABLE OF FORMATIONS

SOUTHEASTERN BRITISH COLUMBIA

AGE	FORMATION	PRINCIPAL LITHOLOGY	THICKNESS
Upper Cretaceous	Belly River	Non-Marine Sandstone & Shale	3000 - 4200
	Wapiabi	Marine Grey Shale	1000 - 1600
	Cardium	Marine Sandstone	30 - 300
	Blackstone	Marine Grey Shale & Siltstone	450 - 1000
Upper Cretaceous	Crownsnest	Volcanic Agglomerate & Tuff	0 - 1000
Lower Cretaceous	Blairmore	Non-Marine Sandstone, Shale & Conglomerate	1000 - 2200
		DISCONFORMITY	
Lower Cretaceous Jurassic	* Kootenay	Non-Marine Sandstone, Shale & Coal	600 - 3500
Jurassic	Fernie	Marine Black Shale	480 - 1500
		DISCONFORMITY	
Triassic	Spray River	Marine Laminated Siltstone	0 - 1800
Permo-Penn	Rocky Mountain	Orthoquartzite & Arenaceous Dolomite	100 - 1000
Mississippian	Rundle Group		
	Etherington	Silty Dolomite	
	Mount Head	Thin Bedded Limestone	
	Livingstone	Massive Crinoidal Limestone	
	Banff	Dark, Argillaceous Cherty Limestone	800
Mississippian?	Exshaw	Black, Fissile Shale	20 - 250
		DISCONFORMITY	
Devonian	Palliser	Cliff-Forming Mottled Limestone	900 - 1000
	Fairholme	Dark, Grey Limestone, Reefield Dolomite	1600
		DISCONFORMITY	
Cambrian	Dolomite Unit	Light Grey Dolomite	280 - 350
	Shale Unit	Green Shale & Limestone	215
	Quartzite Unit	Light Yellowish Grey Quartzite	140
		DISCONFORMITY	
Precambrian	Kintla	Red & Green Argillite & Quartzite	600 - 1600
	Sheppard	Dolomite, Quartzite, Siltstone	150
	Purcella Lava	Amygdaloidal Andesite	320
	Siyeh	Grey Dolomite	1150
	Grinnell	Red Argillite	350
	Appekunny	Green Argillite	1700
	Altyn	Grey Argillaceous Limestone	1500
	Waterton	Banded Limestone & Dolomite	300

Formation, the Jurassic Fernie Formation and the Jurassic-Cretaceous Kootenay Formation. Coal bearing measures to be mined on the Elk River Project are contained, within the Kootenay Formation.

B. GEOLOGY OF THE PROJECT AREA

STRUCTURAL GEOLOGY - In the Elk River Valley coal fields, beds of the Kootenay Formation have been folded into a northwest trending syncline. This syncline is probably the northern extension of the Alexander syncline which can be traced into the Fording River coal mining area and beyond for a distance of 30 miles to the south. As shown on Exhibit 4, the syncline is assymetric with beds on the west side folded to near vertical at the surface while beds along the eastern side of the valley dip westward at 35-45 degrees.

Coal bearing strata of the Kootenay Formation are exposed at the surface on both the eastern and western synclincal limbs on either side of the valley. Stratigraphic relationships and field observations indicate that the western limb of the syncline has been overridden by a westward dipping, high angle reverse or thrust fault. As indicated earlier, this fault is designated as the Elk River Thrust. It will have no effect on minability of coal in the initial area.

Geologic relationships under the Elk River Valley floor are not completely known due to glacial till accumulations which mask rock outcrops over most of the area. Surface geologic evidence and subsurface information from exploratory drilling in the initial study area indicates it is unlikely that a major thrust fault exists under the central part of the valley. As shown on the geologic cross section included on Exhibit 4, enough space is available between valley walls to project beds, which crop out on both sides of the valley, into a normal synclincal fold without major fault offset. Also drill holes along Station 340 + 00, which extend well into the central part of the Elk River Valley, penetrated 20 coal seams all of which appear to be in their normal stratigraphic positions further indicating no major thrust faulting has occurred under the valley floor.

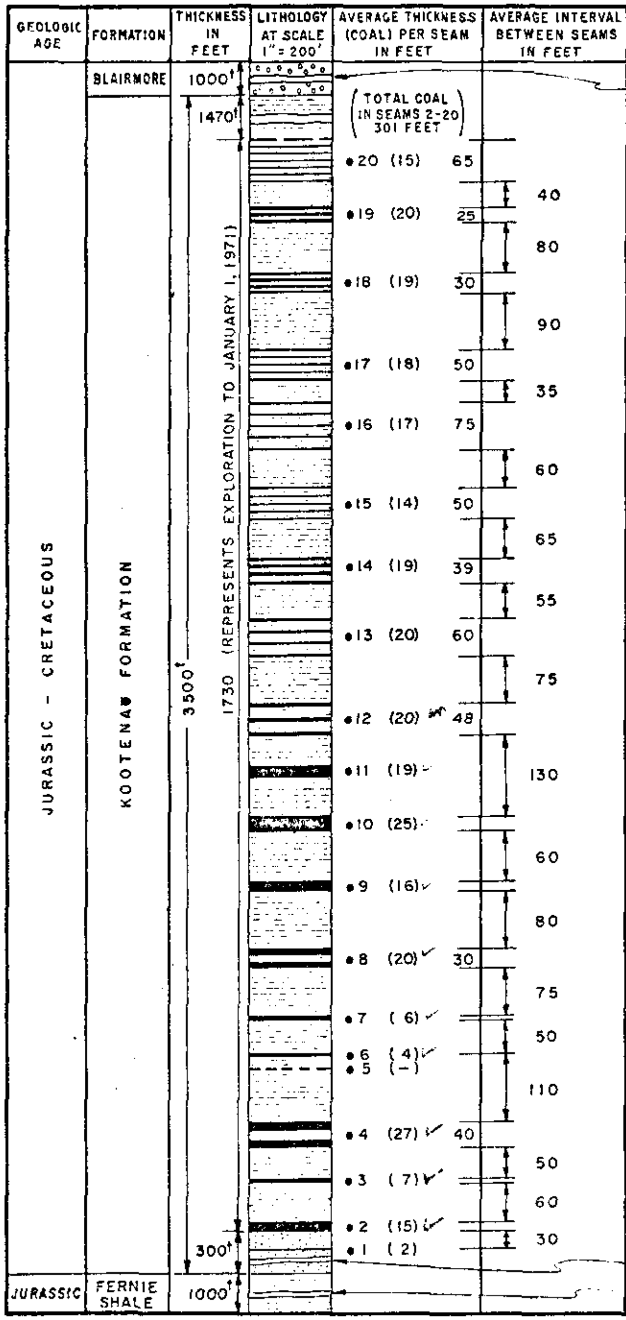
Some authorities believe, however, that Kootenay Formation beds exposed on the west side of the valley were displaced along a major thrust fault from a distance of approximately five miles to the west. Considering the regional tectonics of the area and the amount of movement believed to exist on the Lewis Thrustfault the above is possible. Final answer to this question, however, will be dependent on additional exploration outside the area being covered in this report.

Mountain building occurred in the Elk River Valley area during the Tertiary Period of geologic time. It was during this period that the syncline into which the Elk River Valley has been eroded was formed. Movement along the Elk River Thrustfault was also probably initiated at this time. Some evidence indicates normal faulting in the project area also took place during the Tertiary Period.

STRATIGRAPHY - As indicated earlier, coal bearing strata in the Elk River Coal Field are contained within the Kootenay Formation (See Figure 1). Coal bearing strata appear to be at least 1700-1800 feet thick and have been reported by earlier investigators to contain between 20 and 25 mineable coal seams. Field observations and published information indicate sediments within the coal bearing portion of the Kootenay formation were deposited in a coastal swampy environment with frequent incursions of turbid sea water (Price, 1963, and Walton, 1969). The predominate rock type interval between coal seams is dark, gray siltstone. Siltstone grades laterally and vertically into sandstone layers and dark carbonaceous shale. Prominent coal seams are persistent, laterally, although the detailed lithology of intervals between seams is irregular, as would be expected in a coastal environment such as existed in the Elk River Valley area during Jurassic-Cretaceous time.

Coal bearing strata are underlain by a massive basal sandstone bed which probably correlates with what is known as the Moose Mountain Member of the Kootenay Formation in other parts of British Columbia and Alberta. The basal sandstone may be in the order of 300 feet thick in this area. Total thickness of the Kootenay Formation is estimated to be about 3,500 feet.

FIGURE I



REMARKS

Pebble conglomerate where observed in the field.

Kootenay Formation above Seam 20 not explored--may contain additional coal.

20 COAL SEAM Possibly 6 seams from 1-6 feet thick over a stratigraphic interval of 65 feet.

19 COAL SEAM From 2-5 seams ranging from 1-6 feet thick over a stratigraphic interval estimated to average 25 feet thick.

18 COAL SEAM About four (4) seams 1-11 feet thick over a stratigraphic interval estimated to average 30 feet thick.

17 COAL SEAM One (1) to seven (7) seams ranging from 1-9 feet thick over a stratigraphic interval estimated to be 50 feet thick.

16 COAL SEAM About 5 seams from 1-5 feet thick over a stratigraphic interval estimated to be 75 feet thick.

15 COAL SEAM About 5 coal seams 1-5 feet thick over a stratigraphic interval of about 50 feet.

14 COAL SEAM Six coal seams ranging from about 1-7 feet thick over a stratigraphic interval up to 65 feet thick.

13 COAL SEAM In south part of field four or more seams from 1-12 feet thick with shale splits over a stratigraphic interval of approximately 65 feet, merges into thick single seam to north.

12 COAL SEAM Appears to range from about 12-28 feet thick with shale splits ranging from 5-15 feet thick.

11 COAL SEAM Seam appears to merge with seam 12 near Station 255 + 00.

10-10A COAL SEAM Varies from about 14 feet thick in south part of field to 35 feet thick north of Weary Creek.

9 COAL SEAM Lateral continuity and thickness of seam persistent. Thickness varies from about 14-19 feet. May split into two (2) seams between Stations 240 + 00 and 270 + 00.

8-8A COAL SEAM Varies from 17-26 feet thick, contains shale split which varies from 4-25 feet.

7 COAL SEAM Varies from 4-9 feet thick, splits into two seams north of Station 295 + 00.

6 COAL SEAM Average thickness 4 feet ranges up to 12 feet and splits into 2-3 seams in the area of Weary Creek.

5 COAL SEAM Usually only a trace but does reach 3 feet thickness in several places.

4-4A COAL SEAM Varies in thickness from about 20-37 feet; average thickness 27 feet.

3 COAL SEAM Varies in thickness from about 4-15 feet; average about 7 feet.

2 COAL SEAM Varies in thickness from about 8-29 feet; average thickness 15 feet.

1 COAL SEAM A 1-2 foot shaly coal seam within basal sandstone member.

Basal sandstone member, estimated 500 feet thick.

Marine shale, estimated 500-1000 feet thick.

NOTES

* Data compiled for Fig. 1 was based on information available as of Jan. 1, 1971. Interpretations could differ slightly from those based on later data and more detailed study.

† Thickness estimated from published information and geologic relationships in Elk River Valley.

GENERALIZED COMPOSITE STRATIGRAPHIC SECTION

INITIAL STUDY AREA*
ELK RIVER COAL FIELD

A thick marine shale sequence, known as the Fernie Formation, underlies the basal sandstone member of the Kootenay Formation. The Fernie Formation ranges from 500-1500 feet thick. Thickness in the project area is estimated to be 1,000 feet.

The Kootenay Formation is overlain by the Blairmore Formation which, where observed in the project area, consists of a hard pebble conglomerate. Thickness of the Blairmore Conglomerate is estimated to be 200 feet in the study area. The complete formation is reported to range from 1,000 - 2,200 feet thick in other areas (See Table 1).

Progressive vertical change in lithology from the older marine shale of the Fernie Formation up through the relatively younger stream laid conglomerate of the Blairmore Formation represents a normal gradual change of depositional environment in geologic time from marine to non-marine. Shales of the Fernie Formation were deposited in a deep sea environment. Gradual recession of the sea, possibly due to gentle uplift, is represented by the basal sandstone member of the Kootenay Formation which was deposited in a nearshore environment. Uplift continued and deposition of the overlying coal bearing strata in the Elk River Project Area occurred at a time when the sea had nearly completely receded and a coastal swampy environment existed in the area. As time progressed, uplift accelerated, coastal swamps disappeared, and the geologic cycle was culminated with continental deposition represented by the Blairmore conglomerate. The Blairmore conglomerate was probably deposited by torrential mountain streams.

No major disconformities are believed to exist within the Fernie or Kootenay Formations due to relatively constant and slow rate of uplift and deposition during this period of geological time. An erosional discontinuity is believed to have been developed after Kootenay time and prior to deposition of the Blairmore Conglomerate.

GLACIATION - The last important geologic event to take place in the project area was alpine glaciation. In geologically recent time, large mountain glaciers moved down the Elk River Valley from the north filling scoured areas under the glacier, and along glacier margins, with accumulations of glacial till. During periods of glacial retreat "outwash" gravels were deposited in the valley by streams developed from melting glaciers.

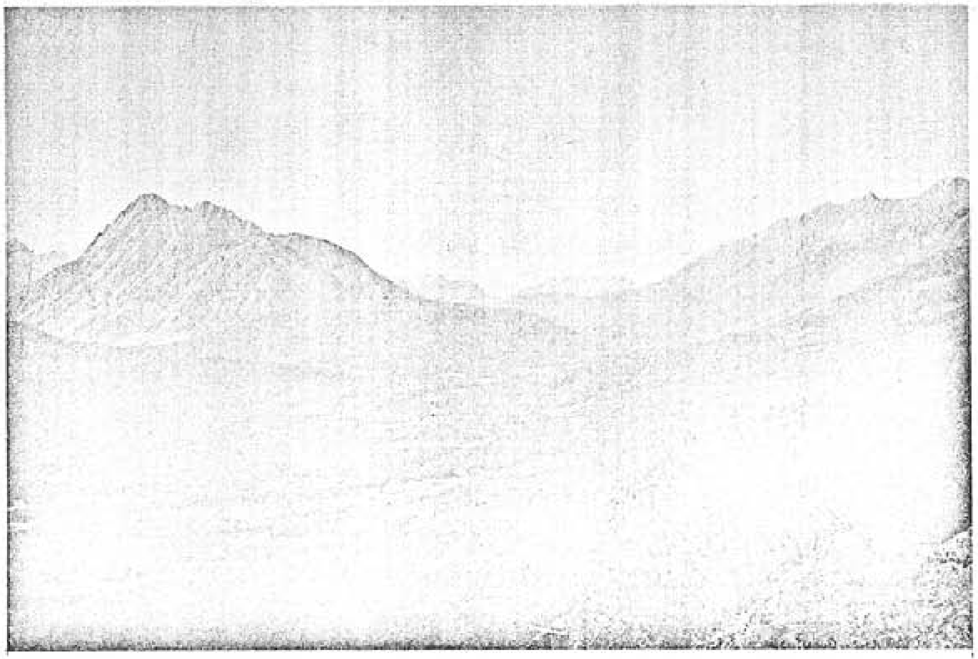


Figure 2. View of Elk River Valley looking north. Note "U" shaped glaciated character of valley. Photograph taken in September, 1970

Glaciation appears to have scoured considerable amounts of coal and rock from both Little Weary and Big Weary Ridges, which was replaced by glacial till. Bulldozer trenches excavated in 1970 revealed remnants of glacial till on the above slopes which were up to 34 feet deep locally. Coal seam 2 was found beneath a 27-foot thick cover of glacial till in bulldozer trench T-70-3 (See Exhibit 8, Sheet 3). It appears that Coal Seam 2 was stripped of the basal Kootenay sandstone down to approximately elevation 5,700 in the vicinity of trench T-70-3 (See Exhibit 5).

Glacial till ranges up to a maximum depth of 140 feet in the river valley. Elevation of the till-bedrock contact is variable, indicating glacial erosion and scour may have dug channels into the ancient bedrock surface of the valley. There is also evidence that glacial till was deposited in pre-existing river channels eroded by the ancestral Elk River. Some drill holes in the river valley encountered water bearing gravels lying on the bedrock surface under glacial till accumulations. Water bearing gravels were probably of alluvial origin.

Till is composed of a hetergeneous assortment of angular rock fragments in a dense silty clay matrix which has provided some protection of coal seam against deep weathering and oxidation. Glacial till in the Elk River Valley is essentially impervious. Impervious till, however, appears to be locally interbedded with pervious water bearing glacial outwash gravel. As mentioned earlier, till accumulations also appear to be locally underlain by water bearing gravels of alluvial origin.

Matterhorn-type mountain peaks and high level glaciated benches indicate ice masses may have been up to 3,000 feet thick in the Elk River Valley, at one time. Remnants of glaciers persist today in the high mountains flanking the project area.

C. GEOLOGY OF INITIAL STUDY AREA

GENERAL - The initial section of the Elk River Project being studied is shown on Exhibits 3 and 5. It comprises the area between approximately Station 180 + 00 and 365 + 00. Photographs showing various views of the area are presented on Figures 3 and 4.

The southern limit of the initial area of study was located at Station 180 + 00 to provide sufficient clearance from portion of Big Weary south of that station which has been disturbed by glaciation, landsliding and possible minor faulting. This area is a complicated zone which will require extensive and time consuming exploration and testing. Geologic information north of Station 180 + 00 is adequate for confident calculation of coal volume.

At the time of this report, exploratory work is still in progress in the vicinity of the northern limits of the Elk River Valley property. For the purposes of this report, the

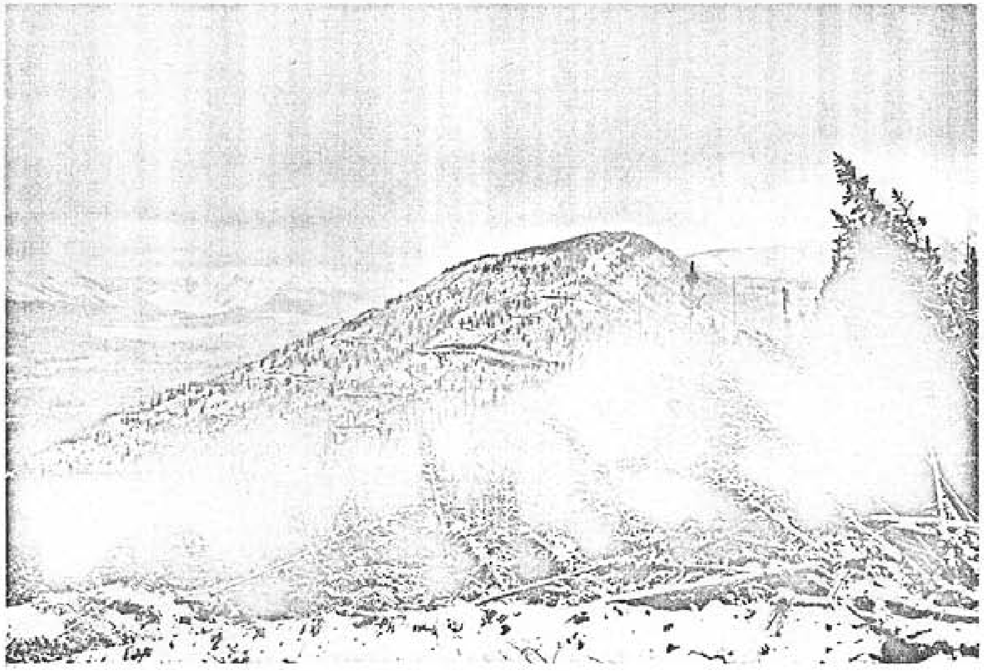


Figure 3. View of Little Weary looking North. Note west slope which is a dip slope. A number of exploratory dozer trench cuts can be seen on the hillside.

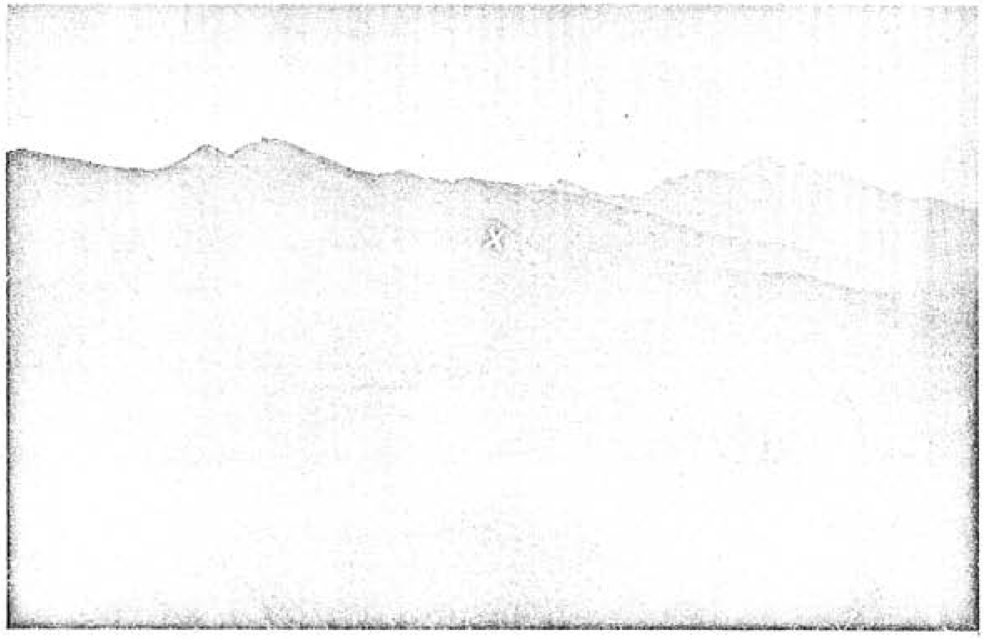


Figure 4. View looking south at area directly south of Weary Creek. Spot marked (x) is location of large outcrop of Kootenay sandstone which appears to have slumped downhill possibly due to undercutting by glacial action. Photograph taken September, 1970.

northern limit of the study area is established along the Station 365 + 00 section. Exact northern mining limits will be dependent on results of exploration presently in progress north of Station 365 + 00.

At least 20 coal seams have been identified in the study area by exploration initiated in 1970. A composite stratigraphic section showing pertinent generalized information such as average thickness of coal within individual seams and intervals between seams is presented in Figure 1.

Coal seams are identified from bottom to top, in a stratigraphic sense. The lowest mineable coal seam, Seam 2, directly overlies the basal sandstone member of the Kootenay Formation. Average thickness of coal bearing strata in the Kootenay Formation, as indicated by exploration to date, is about 1,700 feet. Average total thickness of coal within the Kootenay Formation in the initial study area is about 300 feet.

Geologic structure of the Kootenay Formation in the initial study area is relatively simple. Beds generally strike North 20 degrees West and dip 35-45 degrees Southwest. Minor changes in strike and dip indicate beds "roll" gently due to minor local folding.

The relative simplicity of the subsurface geologic structure within the initial study area is illustrated by a structural contour map of Seam 2 footwall shown on Exhibit 9. The lateral subsurface continuity of coal seams stratigraphically above Seam 2 is illustrated on Exhibit 10 which shows the traces of major coal seams in the initial study area taken at the 5,000 elevation.

The simplicity of geologic structure area is also well illustrated by the geologic maps presented as Exhibits 3 and 5. As shown, surface expression of coal seams on Little and Big Weary Ridges north of Station 180 + 00 is very regular. Nearly 8,000 feet of dozer trenching, in which outcrops of numerous coal seams were exposed, failed to uncover any major faulting. Minor faulting was observed in one dozer trench (T-70-4) near Station 190 + 00 (See Exhibit 8, Sheet 5). Geologic logs of dozer trenches are presented in Exhibit 8.

The overall persistence of beds, between Stations 180 + 00 and 340 + 00, a distance of more than three (3) miles indicates no major faulting should be expected which might critically effect mineability or coal reserves for the area studied. Minor faults will, no doubt, be found during detailed mining development exploration and as the excavation progresses.

COAL SEAM CORRELATION - Coal seams were preliminarily identified by field personnel according to their stratigraphic position relative to the basal sandstone member of the Kootenay Formation, the interval between coal seams, and thickness of individual seams. Density logs and natural gamma logs were made both in rotary holes drilled with rock bits and in holes cored with diamond bits. Comparison of drill core logs and geophysical logs provided adequate information for field identification of seams from geophysical logs alone, in rotary holes which were not cored.

Correlation of coal seams was subsequently checked and refined by utilization of slightly modified standard geologic techniques. All drill hole data and seam intercepts were projected to a longitudinal section along the baseline of the study area. Intercepts and traces of coal seams were also projected in section and plan from drill hole to drill hole. Coal seam intercepts were then plotted at their points of intersection with geologic sections which were constructed at right angles to the baseline every 1,000 feet between Stations 180 + 00 and 360 + 00.

Location and identification of coal seams at the surface on Little and Big Weary Ridges was verified by exposing coal seams in bulldozer trenches (See Exhibits 7 and 8).

Strike and dip of beds measured from outcrops and bedding plane dips observed in drill core were also checked against bedding orientations derived from plotting and projecting of coal seam intercepts. There was no important disagreement between field observations and information derived from plotting and projecting between drill holes.

As mentioned earlier, the excellent lateral persistence of coal seams is illustrated in the Exhibits 9 and 10. Evidence of thickening and thinning of intervals between coal seams, however, can be seen on a seam correlation chart presented as Exhibit 11.

DISCUSSION OF COAL SEAMS - The following is a discussion of thickness and continuity of the coal beds. The generalized conclusions were presented earlier in the report on Figure 1, Composite Stratigraphic Section. References for the analysis are Exhibit 11, Coal Seam Correlation Chart, Exhibit 12, Isopach Drawings of Coal Seams and Exhibit 7, General Exploration Drawing.

Also included is discussion of the columnar logs of coal seams prepared according to Japanese standards, Exhibit 13. Columnar logs of the coal seams were constructed by Dr. A. Aihara of Mitsui Mining Co., in October, 1970, during a visit to the Elk River Project. Dr. Aihara's classification consisted of qualitative visual classification of coal seams according to the estimated ash content and petrographic class that can be corresponded roughly with the Stopes-Heerlen classification which is widely used in North America and Europe.

TABLE 2

VISUAL COAL CLASSIFICATION (*AIHARA)

1. CLASSIFICATION BY RAW ASH CONTENT

Coal Type	Ash Content %
C-A	0 - 10
C-B	10 - 20
C-C	20 - 30
C-D	30 - 40

* Dr. A. Aihara, Mitsui Mining Company

2. PETROGRAPHIC CLASSIFICATION

Class	Appearance
Bright	Uniform, shiny black
Bright Banded	Laminated, composed of shiny and dull bands with bright bands predominate
Banded	Laminated, composed of equal amounts of bright and dull bands
Dull Banded	Laminated, composed of predominantly dull bands
Dull	Dull, little or no lamination

COAL SEAM 1 ranges from 1 to 3 feet thick. It is located approximately 30 feet below from the top of the basal sandstone member and will not be mined.

COAL SEAM 2 varies from 8 - 29 feet in coal thickness. Average coal thickness is about 15 feet. Seam 2 develops a 2 - 3 foot thick shale parting between Station 185 + 00 and 215 + 00 and appears to split into three seams at Station 360 + 00.

Columnar logs on Seam 2 were developed from observations taken in Adits 2 and 2N both in the vicinity of Weary Creek. At this location the coal is predominantly in the "B" - "C" ash classification. That is shaley and petrographically in the banded to dull banded class.

SEAM 3 varies from 4 - 15 feet thick. Average thickness is about 7 feet. Seam 3 splits into two seams between station 270 + 00 and 340 + 00. The seam appears to split into three seams at Station 360 + 00.

Visual classification of the seam in No. 3 test adit at Weary Creek indicates approximately 70% of coal in the seam is classified in the B - C range and about 30% is within "A" category. Most coal is dull to banded.

SEAM 4 varies in coal thickness from 20 - 37 feet. The seam contains a distinctive

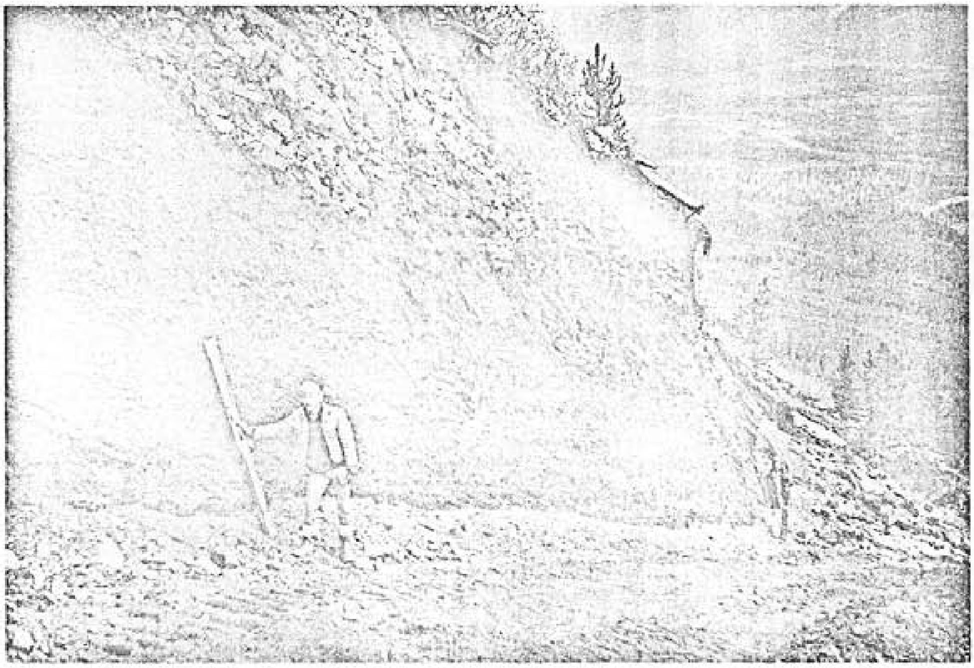


Figure 5. View looking southwest at outcrop of coal seam no. 4 exposed in trench T-70-7. Note thin rock cover on dip slope. Photograph taken October, 1970.

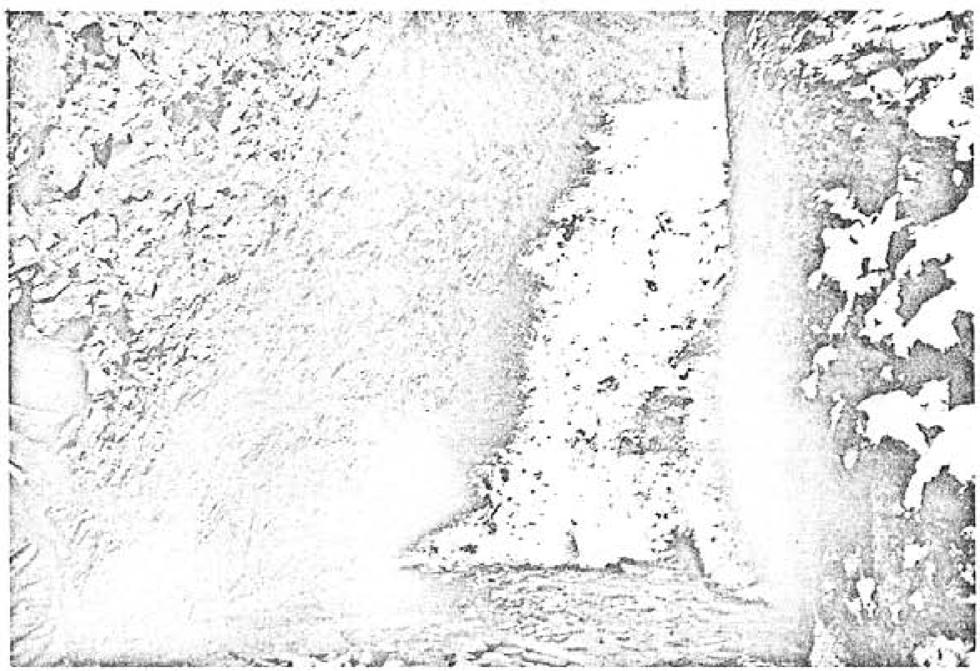


Figure 6. View looking east at seam no. 4 exposed in trench T-70-3. Seam is 29.75 feet thick at this point. Photograph taken October, 1970.

split into two seams from near Station 230 + 00 to Station 360 + 00. The lower seam is designated Seam 4A. Maximum interval between Seam 4 and 4A is about 40 feet near Station 290 + 00.

Visual classification of Seam 4 was made in Adit 4 on the south side of Weary Creek, in bulldozer trenches T-70-3 and T-70-10 on Little Weary Ridge and in bulldozer trench T-70-4 on Big Weary Ridge. The seam classified predominantly in the "A" - "B" category and was generally banded to dull banded in appearance.

SEAM 5 is not a continuous seam. It is usually found in drill holes and on the surface as a thin trace up to a maximum of 3 feet thick. This seam has been identified in the subsurface and on the surface between Stations 190 + 00 to 250 + 00.

SEAM 6 contains up to 12 feet of coal. Average coal thickness is about 4 feet. The seam is very persistent as one or two seams between Stations 230 + 00 and 340 + 00 but splits into three seams between Stations 185 + 00 and 230 + 00. The seam apparently pinches out near Station 340 + 00.

Visual classifications were made of Seam 6 coal inside Adit No. 6. Coal seams outside Adit No. 6, where splits of Seam 6 are exposed near the portal, were also classified. In addition, visual classifications were made in bulldozer trench T-70 6. Seam 6 coal was visually classified in the "B" - "A" category and appeared to be generally dull banded with several noticeable bright bands.

SEAM 7 varies from 4 - 9 feet coal thickness with an average thickness of about 6 feet. The seam is very persistent between Station 180 + 00 and 340 + 00, but splits into two seams between Stations 295 + 00 and 325 + 00. Correlation of Seam 7 north of Station 340 + 00 is doubtful.

Seam 7 was visually classified in Adit No. 7 and dozer trench T-70-6. Visually, the seam in Adit No. 7 appeared to contain a relatively high amount of "A" category coal which ranged from bright to bright banded.

Figure 7. View looking north at seam no. 7, exposed in T-SR-10. True thickness of seam is 10 feet at this point. Photograph taken in September, 1970.

SEAM 8 is one of the thicker and more persistent coal seams in the Elk River Coal Field. The seam usually consists of two seams (8 and 8A) and contains coal ranging from 17 - 26 feet thick. Average coal thickness is 20 feet. A shale parting between Seams 8 and 8A ranges up to about 40 feet thick near Station 265 + 00. Seam 8 appears to split into four seams in the northern part of the field near Stations 340 + 00. Correlation of Seam 8 north of Station 340 + 00 is doubtful at the present time.

Visual classifications of Seam 8 were made in Adit No. 8 near Weary Creek and dozer trench SR-4 on Little Weary Ridge. In No. 8 Adit Seam 8 is divided into two seams by a two foot thick shale parking. Visual classification indicates that the coal below the shale, which correlates with Seam 8A, is comprised of approximately 65% coal that falls within the "A" category and 35% coal in the "B" category of classification according to ash content. The coal appears to be bright to banded.

Figure 8. View of seam no. 8 exposed in trench T-SR-4 which was excavated by Scurry-Rainbow Oil Co., Ltd. in 1969 and deepened in 1970. Photo taken in September, 1970.

The upper part of Seam 8 contains approximately 14.5 feet of coal which is comprised of 42% "B" coal, 38% "A" coal and about 10% coal falling in the "B" to "C" category. Petrographically, most coal in the upper part of Seam 8 in Adit No. 8 appears to be bright banded.

SEAM 9 varies in coal thickness from 14 to 19 feet. Average coal thickness is about 16 feet.

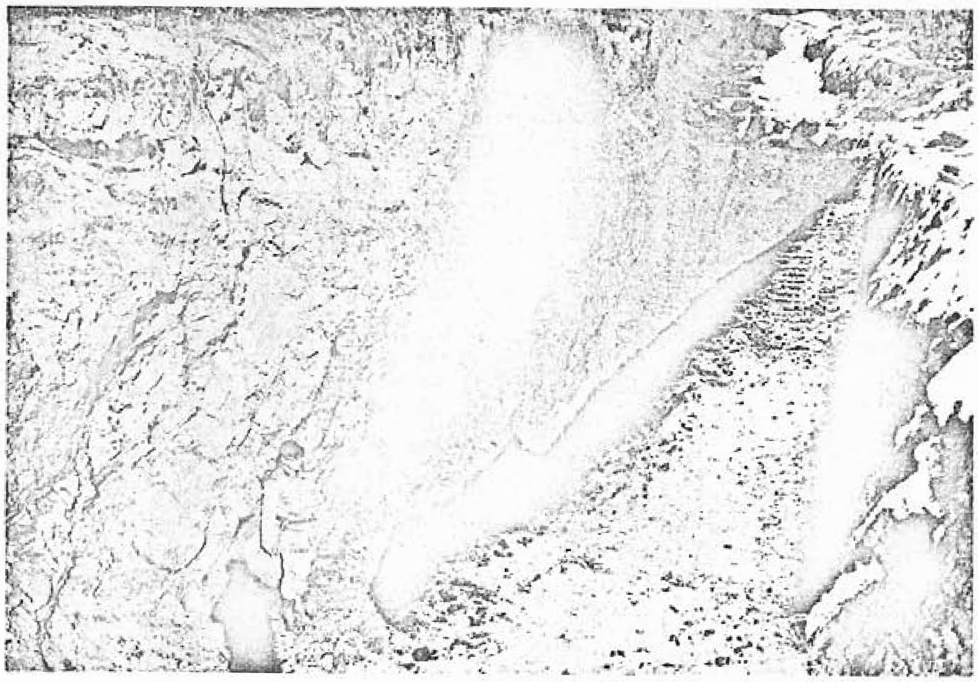


Figure 9. View of seam no. 9 exposed in trench T-70-9. Seam 19.4 feet thick at this point. Photograph taken in October, 1970.

Seam 9 can be correlated in the subsurface as a single seam from Station 180 + 00 to 310 + 00. It appears to split into two seams on the surface between Stations 240 + 00 and 270 + 00. North of Station 310 + 00 the seam appears to split into three seams merging back into one near station 340 + 00. Correlation of Seam 9 north of Station 340 + 00 is tentative pending additional drilling.

Columnar logs were made from exposures of Seam 9 in bulldozer trenches T-70-11, T-SR-12, T-SR-5 and Adit 9. According to visual classification, Seam 9 is comprised predominantly of dull banded coal "B" with minor dark shale partings.

SEAM 10 is very persistent through the study area. The seam ranges in coal thickness from 14 to 35 feet. Average coal thickness is about 25 feet.

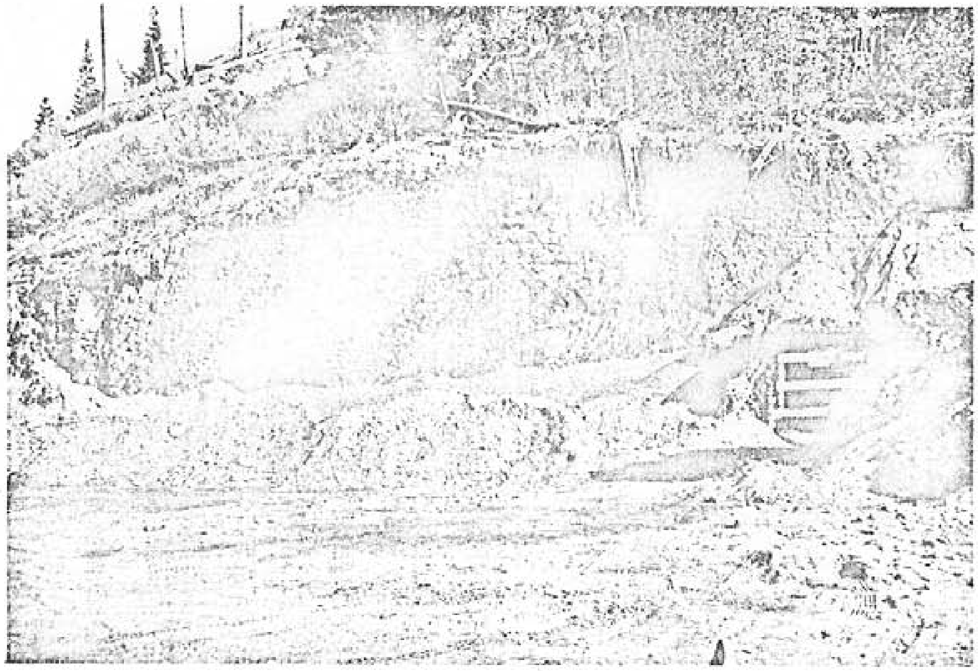


Figure 10. View of seam no. 10 near Adit 10 north of Weary Creek. Note 4′ x 5′ adit entrance for scale. Coal seam is 43′ thick at this point. Photograph taken in September, 1970.

Seam 10 is comprised of two or three splits from Station 180 + 00 to 220 + 00. Between Station 220 + 00 and 340 + 00 the seam is predominated by a 25 - 30 foot thick single seam. North of Station 340 + 00 Seam 10 appears to split into five seams over a stratigraphic interval of about 45 feet.

Columnar logs of coal seams were made in dozer trenches T-SR-6, T-70-13, T-SR-13, and Adit No. 10. Visual classification indicates Seam 10 contains approximately 60% category "A" coal. The remainder of the seam is comprised of mostly Coal "B" with a small amount of "C" and "D" coal. Petrographically, coal of Seam 10 appeared to be predominantly banded to dull banded.

SEAM 11 is a persistent seam between Stations 260 + 00 and 360 + 00. The seam contains an average coal thickness of 19 feet. Seam 11 appears to merge with Seam 12 at Station 250 + 00. Identification of Seam 11 in the area of Station 250 + 00 is somewhat doubtful and will require additional attention during mine development exploration.

No visual classification was made on Seam 11.

SEAM 12 contains an average coal thickness of 20 feet over an average stratigraphic interval of 48 feet. The seam is comprised of three seams between Stations 180 + 00 and 210 + 00. North of Station 210 + 00 to approximately Station 265 + 00, Seam 12 is comprised of one seam approximately 20 feet thick. From Station 265 + 00 to the northern boundary of the study area, the seam is comprised of up to seven splits.

One columnar log was constructed of Seam 12 in bulldozer trench T-70-1. In T-70 1, Seam 12 contains a coal thickness of 19 feet, 2 inches Approximately 60 percent of the seam at this location is composed of coal in the "A" category. Petrographically, the seam appears to be predominantly bright to bright banded.

SEAM 13 is comprised of as many as four coal seams ranging up to 12 feet thick over an average stratigraphic interval of 65 feet, between Station 180 + 00 and 290 + 00. From Station 290 + 00 to approximately 320 + 00, Seam 13 appears to merge into one seam with a 2-4 foot shale parting. The seam appears to again split into about four seams in the vicinity of Station 340 + 00.

No visual classification made on Seam 13.

GENERAL COMMENTS SEAMS 14 THRU 18: The exploration work on Seams 14 thru 18 is presently incomplete. The Seam Correlation Chart, Exhibit 11, outlines the limited areas in which definitive information has been secured. Tentative seam identification has been assigned at Station 340 + 00. Seams 14 and 15 are well defined between Stations 340 + 00 and 300 + 00. Drilling data has been obtained at Stations 190 + 00 and 180 + 00 but the seam groupings were not constant enough to permit seam identification.

Exploratory drilling and bulk sampling of these seams is presently being pursued and additional data will be available in about 3 months.

The drilling at Station 340 + 00 does, however, establish a gross coal thickness of approximately 125 feet in these 7 seam groupings. The following comments are presented with the understanding that they are based on very limited information.

SEAM 14 is composed of up to seven seams over an average stratigraphic interval of about 65 feet. Average coal thickness of Seam 14 is about 19 feet.

SEAM 15 is composed of up to five coal seams ranging from 1.5 - 7 feet thick over an average stratigraphic interval of 50 feet. Average coal thickness of Seam 15 is about 14 feet.

SEAM 16 data indicated the seam consists of four or five seams ranging from 1 to about 6 feet thick. Stratigraphic thickness of the interval containing Seam 16 coal ranges from 50 - 150 feet. Average stratigraphic interval is estimated to be 75 feet thick. Average thickness of coal in Seam 16 is about 17 feet.

SEAM 17 Average stratigraphic interval containing Seam 17 coal is estimated to be 50 feet. Average coal thickness is estimated to be 18 feet.

SEAM 18 Drilling information indicated the seam consists of an average of 19 feet coal thickness within about four seams over an average stratigraphic interval of 30 feet.

SEAM 19 is comprised of from 2 - 5 coal seams ranging from about 1 - 6 feet thick over an average stratigraphic interval of 30 feet. Average coal thickness is estimated at 20 feet.

SEAM 20 At this location Seam 20 consists of six coal seams ranging from 1 - 6 feet thick within a stratigraphic interval of 65 feet. Seam 20 is, stratigraphically, the highest mineable coal seam penetrated in the initial study area at this stage of the exploration.

D. GEOTECHNICAL CONSIDERATION

TAILINGS DAM - A sixty foot high earthfill dam will be constructed to provide retention for tailings from the coal preparation plant. The dam will be located west of the Elk River between base line stations 180 + 00 and 200 + 00 on a topographic bench at about elevation 5,150.

Test pits dug with a backhoe reveal the bench to be covered with 3 to 5 feet of weak organic material. Weak organic materials are underlain by dense impervious, bouldery, glacial till. Till deposits are contained in a matrix of silty clay. Glacial till in the area of the tailings dam, is estimated to range up to 60 feet deep or deeper.

Additional exploration and soils testing will be required prior to detailed design of the tailings dam. Preliminary exploration, however, indicates organic materials will require stripping but underlying dense glacial till will provide an adequate foundation for a dam of the height being considered. Glacial till, available in the immediate area, should provide adequate quantities of suitable quality materials for construction of a dam with a homogenous section. Till materials might require scalping to remove oversize rock.

It is believed slope protection will not be required for the tailings dam due to the small size of the reservoir. If later study indicates protection is necessary, coarse granular materials contained in locally available outwash gravels or waste rock from the mining operation could be utilized for face protection.

PLANT SITE - Processing facilities for the project will be located directly north of the tailings dam on the west side of the Elk River between stations 205 + 00 and 230 + 00. Backhoe test pits and rotary drilling indicate the plant site area is underlain by 25-60 feet of dense glacial till, generally composed of a heterogenous assortment of gravels and boulders in a silty clay matrix. Minor amounts of clay were reported from rotary holes drilled at the plant site.

Till deposits are locally underlain by approximately 10 feet of water bearing gravels which are, in turn, underlain generally by bedrock. Gravels were found to contain water under artesian pressures in several holes.

Dense glacial till materials will provide adequate foundation for processing plant structures. Heavy storage silos may require foundation treatment such as piling if foundations are not placed into rock. Additional exploration and some sampling will be required for final foundation design.

RIVER RELOCATION Present mining plans contemplate relocation of the Elk River by canal around the mining and coal processing area. A drawing of the relocation will be included in Volume II of this report. Basically the Elk River is diverted by a small dam located approximately 4,000 feet north of Cordona Creek. A canal will carry the water south along the east side of the valley. It swings west at Cordona Creek, joins the flow from Cordona and then proceeds south along the west side of the valley.

No exploratory work or detailed topography has been made along the proposed alignment. Preliminary field observations have, however, indicated the following:

(a) The bulk of the canal excavation north of Cordona Creek will be in rock.

(b) The canal excavation one-half to one and one-half miles south of Cordona Creek, where the largest cuts are required, will also encounter substantial amounts of rock.

(c) The balance of the canal work will generally be in glacial till. However, accumulations of pervious talus and glacial outwash gravels are to be expected in the till and precautions must be taken against seepage.

Investigations to be made prior to design of the river relocation will require careful study of potential canal seepage problem. Information available at the present time, however, indicates that clayey soils which can be processed from glacial till in the area will provide suitable lining materials to insure against excessive seepage from the river relocation canal.

EXCAVATION - Due to the relative homogeniety of rock in intervals between coal seams, blasting pattern, loading, and delays, which will permit maximum blasting efficiency for excavation of rock, can be developed with a small amount of experimentation. The rock is relatively massive with a minimal amount of open bedding planes, or other natural fractures which might lower blasting effectiveness. Although the rock is massive at depth, beds near surface that have been weathered are platy or blocky in many places indicating microscopic planes of weakness occur in the rock along bedding planes and joints. These planes should help the rock to break out in sizes which can be handled easily.

Soil overburden consists of glacial till and weathered rock to variable depths. Both can be considered common excavation.

Figure 11. Exposure of glacial till in trench T-70-6. Note size of angular till fragments which are in the order of 3-6 inches. Matrix is dense silty clay. Material is firm but not cemented. Photo taken in October, 1970.

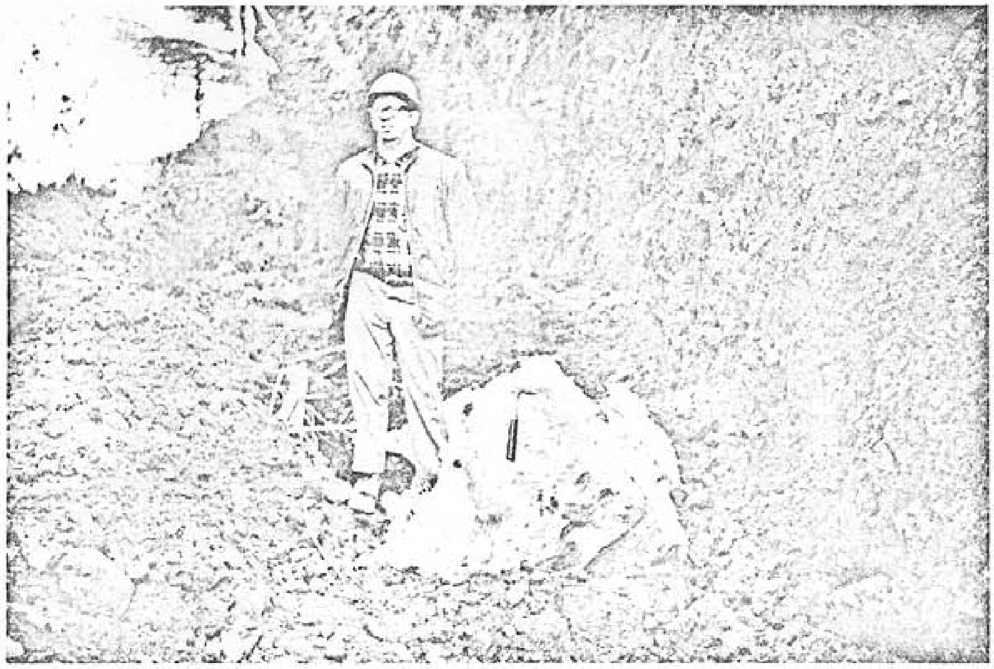


Figure 12. Taken in trench T-70-6 illustrating large diameter of materials which will be occasionally encountered in till. Photograph taken in October, 1970.

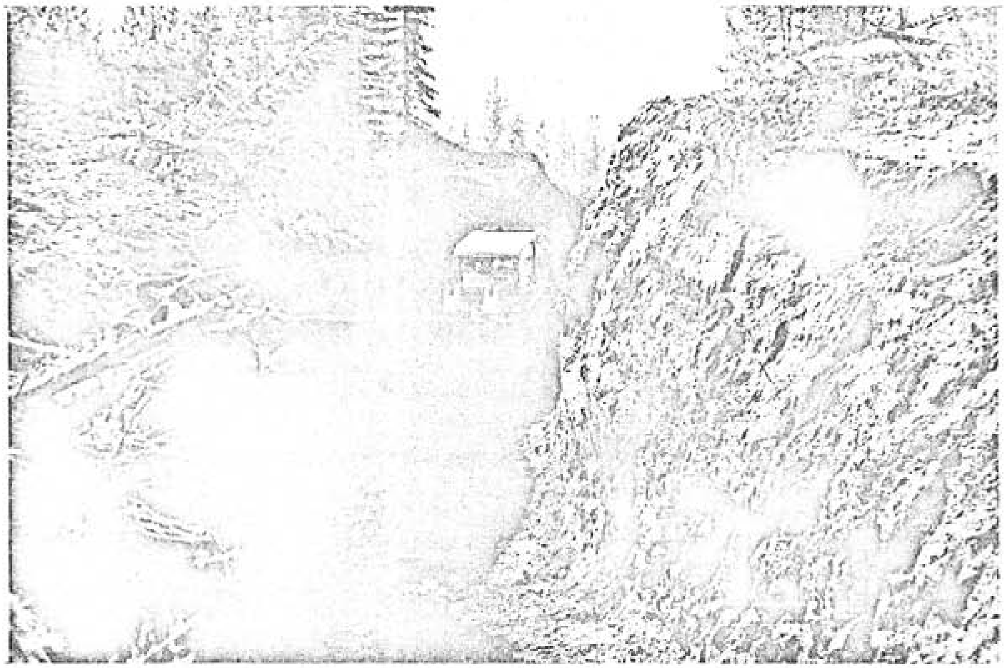


Figure 13. View illustrating depth of glacial till in some areas. Note D8 tractor for scale. Photo taken in October, 1970 in trench T-70-6.

Groundwater flows from water bearing gravels, that will be found beneath and possibly interbedded with glacial till, will require attention during excavation to insure tnat flows into the pit will not hamper mining operations. It is believed that the gravels should drain relatively quickly after heavy initial flows due to the limited recharge area available in the drainage basin and the relatively small amount of storage capacity of the gravel itself. Some minor recharge of gravels which lay directly on bedrock will continue indefinitely, however, due to water under hydrostatic pressure that is ejected from bedrock fractures and bedding planes into overlying gravels. Lining of the river relocation canal, as planned, will insure against recharge of gravels by infiltration of Elk River water to the water table.

Artesian flows from deep drill holes in the mining area indicate some flows should be expected from rock deep in the excavation. Water in rock to be mined is probably stored primarily in joints and bedding planes. Storage capacity of the rock, relative to the volumes to be excavated, will be small and it should be possible to handle inflows from this source by sump pumps.

SLOPE STABILITY - Slope stability studies are being made by Golden Brawner Associates of Vancouver, British Columbia. Results of their studies will be contained in a separate report.

Geological information for the stability studies was provided for Golden Brawner and Associates by geologists of International Engineering Co. Geological information consisted of rock joint orientation logs prepared from some sixteen drill holes. Joints were oriented relative to bedding planes of known strike and dip as observed in core samples. The chosen drill holes were located to reflect changes in geologic structure which might influence joint patterns in the rock. Approximately 9,500 feet of drill core was logged in this manner from the following core holes: SR 1, SR-2, SR-3, SR-4, SR 16, 1C, 4C, 8C, 12C, 13C, 14C, 19C, 23C, 24C, 29C, 30C.

CONCRETE AGGREGATE - Good quality gravels which may be used for concrete aggregate are available approximately 10 miles south of the project area on the west side of the valley along the main access road. Exploration may also reveal gravel near tne mouth of Cardona Creek to be of adequate quality and gradation for use as concrete aggregate.

TABLE 3

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Work Report for Year Ending

December 31, 1970

for

EMKAY CANADA NATURAL RESOURCES LTD.

and

SCURRY-RAINBOW OIL LTD.

Elk River Coal Project
Upper Elk River Coal Fields
Kootenay Land District
British Columbia

By:

F. Wilmot, P. Eng.

May, 1971

EXPLORATION

GENERAL - The previously described licenses have had three separate exploratory programs in recent years. In 1968 North American Coal Co., pursuant to an option agreement with Scurry-Rainbow, conducted a limited program that centered on the Big Weary Ridge reserves. During the following year Scurry-Rainbow continued the program alone extending the investigations and concentrating on Little Weary Ridge and the west side of the valley. In 1970 Emkay Canada Natural Resources and Scurry Rainbow Oil jointly undertook a comprehensive exploration program.

The purpose of the 1970 program was to confirm previous data, extend the area of investigation, and to gather all the information necessary for commercial development.

A program was developed which would fulfill that aim and complete in late fall. However, the scope of the additional coal seams discovered and their lateral persistence was such that operating through the winter to present still has not fully defined them. The current program has been extended into the spring of 1971 in an effort to gather additional data. The scope of the future exploration is discussed herein.

Exploratory activity covering the three years is presented in summary on Exhibit 3, General Geologic Map. An expanded drawing of exploratory work in the initial mining area is shown on Exhibit 7, Site Plan of Exploration in Initial Mining Area. Other details are presented in Exhibit 8, Geologic Trenches, Exhibit 14, Test Adits and Exhibit 16, Interpretation of Drill Hole Logs, Seam Identification and Thickness. Data has been gathered on coal seam oxidation, but the Exhibits and discussion are presented in a later section of this report. Exhibit 15 is a sample Lithologic and Geophysical Log used to present the results of drilling and classification. Such logs exist for all core drilling done during the 1970 season, but only a sample is included in this report. The results of all this data have, of course, been incorporated in the Exhibits to the previous section on Geology.

The exploratory activity to date and the samples taken have been summarized on a coal seam basis and included in tabular form in Exhibit 19. This listing is complete for all drilling and adit work. It contains all 1970 trenching and any 1970 work done in earlier trenches. However, data on a few of the older 1968 and 1969 trenches not reworked has been excluded.

Sampling procedure is not covered in this section but is included in SAMPLING AND TESTING later in this report.

A. - 1968 EXPLORATION - The first major exploration program on the Elk River property, other than 1920 development of Aldridge Tunnel, was completed by the North American Coal Corporation in the late fall of 1968. Primary emphasis during this period was on evaluation of Big Weary Ridge. The following work was done:

TOPOGRAPHIC MAPPING - Aerial photography was completed by Spartan Air Services and a 1,000 foot to the inch base map of the property with 20 foot contours was prepared.

DRILLING - Thirteen vertical rotary drill holes and five vertical core holes were completed and sampled. Holes were logged with gamma ray-neutron equipment by ROKE Oil Enterprises. A 1,000 foot horizontal core hole, drilled from the end of the 650 foot Aldridge Tunnel, was completed and sampled by Shepherd Enterprises.

EXPLORATORY TRENCHES - Dozers exposed all coal seams in exploration trenches along the crest of Big Weary Ridge to a depth of 30 feet where possible. Coal Seams 2 through 9 were also exposed along Weary Creek. Numerous random cuts were made to open coal seams along the flank of Big Weary Ridge and a network of access roads was completed.

TEST ADITS - Adits were driven by Shepherd Enterprises into Seams 2, 3, 4, 7, 8, and 9 immediately south of Weary Creek. Test adits were also driven into Seam

9 and 10 north of Weary Creek on the south flank of Little Weary Ridge. Bulk samples taken from the above adits were analyzed by Commercial Testing and Engineering, Warnock-Hershey International and North American Coal Company.

B. - 1969 EXPLORATION - A second major field exploration program was completed by Scurry-Rainbow Oil Co. during the 1969 season. Exploration during this period extended work done by North American Coal Company northward to include most of Little Weary Ridge. Specific items of work completed during 1969 are summarized below:

TOPOGRAPHIC MAPPING - An updated and enlarged base map of the entire license area was completed by McElhanney Surveying and Engineering, Limited, Vancouver B.C. at a scale of one (1) inch to 1,000 feet with 20 foot contour interval. A portion of the initial mining area, was also mapped by McElhanney at a scale of 1 inch to 200 feet with a 5-foot contour interval. All drill holes, adits and trenches completed at that time were located on these maps. New topography was used for reserve calculations.

DRILLING - Sixteen additional core holes were completed by Canadian Longyear for Scurry-Rainbow to enlarge upon the potential areas explored by North American Coal Co. in 1968. Emphasis was placed on evaluation of Little Weary Ridge. Holes were logged with gamma ray-neutron equipment by ROKE Oil Enterprises. Samples were analyzed by Cyclone Engineering Sales Ltd., Edmonton, Alberta.

TEST ADITS - Additional bulk samples were taken from test adits 4, 7, 8 and 9 by Scurry-Rainbow Oil Company after the adits were deepened to insure samples free from surface oxidation. Three (3) adits were also driven on the west side of the valley in the Bleasdell Creek and Coal Creek areas. The adits were not excavated deep enough to escape surface oxidation.

EXPLORATORY TRENCHES - Several new trenches were excavated on Little Weary Ridge for coal seam correlation purposes. An extensive trenching program was also started on the west flank of the valley in the Bleasdell area. This program was terminated during the fall of 1969. Prior to termination of the program several trenches were completed on the west side of the valley on approximately 4,000 foot spacing from 2,500 feet south of Bleasdell Creek to about 2,000 feet north of Gardner Creek.

C. - 1970 EXPLORATION - Exploration during the 1970 season was resumed in July. The camp was relocated at the 1969 location on Aldrich Creek just south of the Big Weary Ridge.

A comprehensive trailer complex consisting of living quarters, kitchen and mess hall, recreation facilities and office working quarters was established. Power was supplied by a 50KW generator and facilities for equipment maintenance were set up.

By late July drilling and restoration of adits prior to bulk sampling was in progress. The exploration program was conducted by Elk River Exploration Ltd., a subsidiary of Emkay Canada Natural Resources Ltd.

TOPOGRAPHIC MAPPING - The mapping prepared by McElhanney and Associates at the end of the 1969 exploratory program was used in 1970. Additional aerial photography and ground survey was ordered for strip maps on the railroad spur location from Sparwood up the valley.

DRILLING - Coal seam exploratory drilling amounted to a total of twenty-seven core holes and fifteen rotary holes in the 1970 season. Of that total twenty-six core and eight rotary holes were located in the initial mining area. The total footage represented by the above drilling was 22,284 feet, of which 17,226 feet was cored and 5,058 was rotary drilled. Average hole depth was 700 feet.

Core drilling was performed with one skid mounted Longyear (T-44) drill and two skid mounted Chicago Pneumatic No. 8 drills. Coring was done with NQ wire line equipment and 3 inch drill bit. A water truck supported the operation for the preparation of the bentonite drilling "mud". Core recovery, in coal, averaged about 80%, with most of the core losses occurring in the beginning of the program.

Statistics on the core drilling performance are as follows:

Chicago - Pneumatic No. 8 - (CP - No. 8) Core Drill

Activated	:	August 13, 1970
Hours Worked	:	1,387 hrs.
Hours Down/Idle	:	134/458 hrs.
Hours Available	:	1,979 hrs.
Productive Effort	:	70%
Number of Holes Drilled	:	10 holes
Total Drilling Footage	:	6,363 feet
Footage per Available Hour	:	3.2 ft./hr.
Footage per Worked Hour	:	4.6 ft./hr.

Longyear (T-44) Core Drill

Activated	:	August 24, 1970
Hours Worked	:	1,802 hrs.
Hours Down/Idle	:	53/473 hrs.
Hours Available	:	2,328 hrs.
Productive Effort	:	77.5%
Number of Holes Drilled	:	17 holes
Total Drilling Footage	:	10,863 feet

Footage per Available Hour	:	4.6 ft./hr.
Footage per Working Hour	:	5.9 ft./hr.

Cores on coal were sampled as described in SAMPLING AND TESTING. All remaining recoverable overburden and rock interval core was boxed and stored for future reference.

Rotary drilling was done with a self-contained, truck mounted Reich rotary drill. A 4.5 inch drilling bit was used. The primary function of the rotary drill was to drill "fill in" holes which could be logged for seam correlation between core holes. The rotary drill was also occasionally used to drill through bouldery glacial till for setting of surface casing prior to coring with skid mounted core drills.

Statistics on rotary drilling performance are as follows:

Reich - Rotary Drill

Activated	:	August 5, 1970
Hours Worked	:	1,125 hours
Hours Down/Idle	:	148/418 hours
Hours Available	:	1,691 hours
Productive Effort	:	66.5%
Number of Holes Drilled	:	15 holes (Coal Exploration)
Total Drilling Footage	:	5,058 ft.
Footage per Available Hour	:	4.5 ft./hr.
Footage per Working Hour	:	6.8 ft./hr.

All core and rotary holes were logged with gamma ray and high resolution density probes by BPB Borehole Ltd. Some holes were also logged with a resistivity probe. Coal intercepts were determined from the probe logs. A columnar log of all core holes was made by combining the geologic evaluation of the cored material and placing it directly on the probe recording, see Exhibit 15, Lithologic and Geophysical Log of Drill Holes.

BULK SAMPLING - The program of bulk sampling was given first priority in the 1970 program. Previously established adits in the Weary Creek area were opened and rehabilitated. The existing adits were deepened with FSI checks until a fresh unoxidized face was obtained. A fifty barrel bulk sample, including all partings, was taken from a crosscut which exposed the full face of the coal seam (see Exhibit 14). Details of the sampling procedure will be presented in a later section, SAMPLING AND TESTING.

Bulk samples of coal seams 2, 3, 4, 6, 7, 8 and 9 were obtained from adits of the respective numbers on the south side of Weary Creek. An additional bulk sample of coal seam 2 was taken at adit no. 2N located north of Weary Creek at Station 220 + 00. Coal seam 10 was also sampled in an adit near Station 220 + 00. Seam 12 could not be conveniently reached by an adit and was bulk sampled in trench T-70-1 located near Station 228 + 00.

All of the above bulk samples were taken under the direction of Mr. Rozenhart, Field Engineer from the Canadian Department of Energy, Mines and Resources, Edmonton, Alberta. Part of the bulk samples went to Cyclone Engineering Sales, Ltd. for cleaning and then to the Canadian Department of Energy, Mines and Resources for coking testing. A part of the cleaned bulk samples were sent to the Japanese Steel Mills for testing. The remainder raw bulk samples were stored in 50-gallon drums under water for further possible use.

EXPLORATORY TRENCHING - A series of sixteen dozer trenches were excavated during the 1970 season. This amounted to 8,900 lineal feet of trenching almost exclusively located in the initial mining area. Coal seams 2 through 13 inclusive were intersected by the trenching.

This work yielded information on the depth of glacial till in many areas and accurately established the cropline location of the seams. Rock exposures in the trenches gave a good insight into the degree of uniformity of seam attitudes and demonstrated the lack of any major faulting in the study areas.

A bulk sample of seam 12 was taken in trench T-70-1. Smaller channel samples were taken in the trenches as part of the oxidation studies and in two trenches, T-70-2 and T-SR-4, a line of drill holes was established to secure "stepped" samples for the oxidation study.

ACCESS ROAD IMPROVEMENT - The total footage of road building and major improvement during the coal exploration program and adit work, is as follows:

Main Roads	64,000 lin. ft.
Aux. Roads (eg. to Drillsites)	46,500 lin. ft.
Total Roadwork	110,500 lin. ft.

The total footage of road building with respect to the plant site location determination is as follows:

East Side of River	20,000 lin. ft.
West Side of River	45,000 lin. ft.
Total Plant Site Roadwork	65,000 lin. ft.

The overall footage of roadwork to December 31, 1970 was 175,500 lin. ft. equivalent to 33.2 miles.

Major road improvement north from the upper limits of the coal leases to the Upper Kananaskis Lakes Dam has been conducted along 17 miles of the Kan-Elk Transmission Line Access Road. This improved access towards Calgary provides this major center at a distance of 105 miles from Aldridge Creek camp over 50 miles of gravel roads and 55 miles of Trans-Canada highway.

PLANT SITE SUBSURFACE INVESTIGATIONS - Rotary drilling and dozer trenches were used to evaluate the quality of subsurface material as a foundation for the plant structures. Some work had been started in the area of Station 170 + 00 which was the initial plant location. However, exploratory coal seam drilling revealed that the higher numbered seams then being discovered would be beneath the plant site.

As soon as the extent of the new seams was ascertained, the remaining areas were studied and a new plant location established at Station 220 + 00 on the west side of the Elk River. After a tentative plant layout was established the drilling and trenching resumed in the new area. Drill hole locations for both areas are indicated on Exhibit 7. The extensive trenching has been omitted from this Exhibit. Results of this work are reported in the Geotechnical section of GEOLOGY.

WEATHER OBSERVATIONS - The keeping of daily weather records was established as part of the exploratory program since none had been accurately observed for this area. The decision to extend work through the winter afforded an excellent opportunity to judge the severity of local conditions. These records are not included as part of this report, but the general conclusions were presented in PHYSIOGRAPHY AND CLIMATE.

SLOPE STABILITY STUDIES - Slope stability studies were made by Golder Brawner and Associates of Vancouver, B.C., to determine safe slope angle and height criteria for design of operating benches, footwall slopes, highway slopes, and north and south terminal ends of the mine as is presently being considered. Data utilized for this study included institu testing of the Kootenay Sandstone and Coal Seam No. 1 in Adit 2 and M-K tunnel No. 1, laboratory strength tests on core samples and geologic data consisting of natural rock fracture orientations from core holes and surface outcrops exposed in dozer trenches in the mining area.

D. - 1971 EXPLORATION - Work during this current season has been directed exclusively to determining the location, quality and quantity of coal seams 13 through 20. Four core holes M-71-31C to 34C drilled during the season are included in this report. Effort is currently centered on drilling at Stations 260 + 00 and 380 + 00 in order to tie down the position of these seams. Trenches T-70-16 and T-71-17 are now being deepened in order to get unoxidized bulk samples of coal seams 13 through 20.

E. - FUTURE EXPLORATION - Exhibit 7 outlines the future drilling necessary to fully ascertain the position, amount and characteristics of seams 14 through 20. Also indicated are proposed drill holes which would continue to trace all seams to the northern limits of the property. When the sampling is completed in trenches T-70-16 and T-71-17, bulk samples will have been obtained on all mineable seams on the east side of the valley.

At present there are no plans to extend exploration of the Big Weary Ridge area or the coal reserves on the west side of the valley.

F. - SUMMARY OF EXPLORATION:

Program	Drill Core	Holes Rotary	Drill Footage	Bulk Samples	Trenching Footage	Access Road Miles
1968	6	13	10,800	8	6,900	NA
1969	16	--	9,621	4	5,125	NA
1970	27	15	22,284	10	8,900	33.3 mi.
1971	4	--	3,029	--	1,600	--
Total	53	28	45,734	22	22,525	50.0 approx.

(Figures through February, 1971 only)

COAL RESERVES

1. - GENERAL - This section discusses the total coal reserves that lie within the property lease limits. The data used to determine these reserves is all the exploration and pertinent information collected over the past three working periods, North American in 1968, Scurry-Rainbow in 1969 and Emkay-Scurry in 1970. This data from drill holes, dozer outcrop trenches and adits, along with the historical geology of the area has been discussed in previous sections of the report.

There are, however, several general exhibits that are particularly relevant to this Section.

Exhibit	3	General Geologic Map
	4	Geologic Cross Section
	11	Seam Correlation Chart
	12	Isopach Drawings
	16	Interpretation of Drill Hole Logs, Seam Identification & Thickness
	17	Geologic Reserve Map

The last referenced Exhibit 17 was prepared specifically for this section and demonstrates all the reserve areas on the property and their classification.

Reserves have been categorized into the following classifications:

PROVEN - Reserves which have been drilled and trenched to an extent that accurate engineering calculations on a station to station basis are used in the computation of coal volume.

PARTIALLY PROVEN - Reserves which have been partially drilled and trenched permitting engineering calculation of gross coal at particular sections and having established geology permitting the gross coal amounts to be projected into areas not sufficiently explored to be considered proven.

INFERRED - Reserves not drilled in which computations are based on projections of gross coal from proven areas, partially proven areas or surface trenching on the basis of established geology.

UNCERTAIN - Reserves not drilled in which computations are based on projections of gross coal from proven areas, partially proven areas or surface trenching but do not have sufficiently established geology to justify being classified as inferred.

2. - AREA A - PROVEN OPEN PIT RESERVE - This area is the indicated initial mining area of the report. It extends from Station 180 + 00 to 365 + 00 and from Seam 2 on the east to basically Seam 13 on the west. However, it also includes short sections of Seams 14 and 15, totaling about 2,000 feet. In the initial mining plan analysis, excavation is carried to a 400 feet depth. However, it is judged that surface mining may be extended to 600 feet depth and reserves are therefore calculated for both conditions.

Area A, as the indicated initial mining area, has received the bulk of the attention during the exploration program. The extensive drilling, adit samples and trenching have all been correlated and plotted on detail cross sections. All this detail work will be presented in the Section on MINING in Volume II and is not stated here. The original ground surface on the cross sections was taken from a detailed topographic map that was prepared by McElhanney Associates to a scale of 1 inch equals 200 feet, with a 5 foot contour interval. The drilling pattern is such that the holes are within 2,000 feet or less along the strike of the coal beds and close enough in the direction of the dip to overlap all the coal seams. This drilling pattern established consistency in the strike and dip of the bedding planes, therefore the coal seams were plotted on even 1,000 foot cross sections with a scale of 1 inch equals 50 feet.

The quantities of coal and overburden were determined, using the double end area method applied to detailed 1,000 foot cross sections.

There are several reductions which must be applied to the in place coal to reflect the final mined open pit reserve of usable metallurgical coal.

MANTLE OR WASTE COAL - An average thickness of 15 feet normal to the surface is assumed to be waste coal in those areas not covered by at least 15 feet of glacial till.

OXIDIZED COAL - A layer of coal 15 feet thick below the 15 feet of waste zone or till layer is considered to be oxidized coal. At higher elevations, above 5,600 feet elevation, an oxidizing depth of 35 feet was used because of greater exposure. This oxidized coal has thermal value but is not included in the proven metallurgical coal reserve.

PIT LOSSES - Because of the dip of the coal beds, the variations in seam thickness, and the mining operation planned, a pit mining loss in proportion to the seam thickness of each seam was determined. A factor varying from 5 to 35 percent was used depending on the nature and thickness of the seam. The pit losses were deducted from the in situ coal volume and added to the overburden volume to calculate the ratios. The weighted average of all seams was calculated to be 10 percent pit loss.

The following is a statement of the in place coal without considering reductions for the above factors. These reductions will be considered in the summary section.

AREA A	In Situ Coal ST	Ratio CY/ST
Surface to 400 feet	109,172,000	4.88:1
400 feet to 600 feet	39,270,000	5.88:1
Total	148,442,000	5.15:1

3. - AREA B - PARTIALLY PROVEN OPEN PIT RESERVES - This area parallels Area A along the strike of the coal and includes the seams from the west edge of Area A out to Seam 20. Based on the present drilling, the identified Seam 20 appears to be the last commercially mineable seam. These higher numbered seams have been drilled at Stations 180 + 00 and 340 + 00. However, the interval between these stations is sparsely drilled at this time (see Exhibits 3 and 11). The geology is established and the available drilling information is fully consistent with geological projections from one station to the other. The average of the gross coal at Stations 180 + 00 and 340 + 00 was projected over the interval yielding:

AREA B	In Situ Coal ST	Ratio CY/ST
Surface to 400 feet	27,000,000	4.7:1
400 feet to 600 feet	27,000,000	7.2:1
Total	54,000,000	5.9:1

4 - AREAS C AND D - PARTIALLY PROVEN OPEN PIT RESERVES - Some drilling has been done in this area north to Station 380 + 00. Also, coal outcrops have been observed by the geologists north to the property limits. Therefore, it appears to be a safe assumption to calculate partially proven reserves in these areas.

Area C is defined as a zone of coal measures equal to the extreme north section at 365 + 00 extended north to the property lease limits. (Includes Seams 2 through 12.) Area D is the extension of Area B at Station 340 + 00 and extended north to the property line (includes Seams 13 through 20).

AREA C	In Situ Coal ST	Ratio CY/ST
Surface to 400 feet	21,000,000	6.2:1
400 feet to 600 feet	13,000,000	7.5:1
Total	34,000,000	6.7:1

AREA D	In Situ Coal ST	Ratio CY/ST
Surface to 400 feet	15,000,000	4.3:1
400 feet to 600 feet	13,000,000	6.5:1
Total	28,000,000	5.4:1

5. - AREA E - PARTIALLY PROVEN OPEN PIT RESERVES - This area is commonly referred to as Big Weary. It extends from Station 180 + 00 to the south property line. It is bounded on the east by the property line of the Cominco licenses in this area. Coal reserves are present in both Area E and the contiguous Cominco licenses.

This area was more thoroughly studied by North American Coal Co. and Scurry-Rainbow in 1968 and 1969 than by Emkay-Scurry in 1970. (See Exhibit 3.) The area has been generally drilled and well trenched along the Big Weary ridge. Since the drilling was not complete and the geology indicates possible faulting and slides in the Station 140 + 00 to 170 + 00 zone, the reserves are assigned a partially proven classification. The reserves were calculated on the basis of cross sections carried down to elevation 4,850, which is typical of Area A.

AREA E	In Situ Coal ST	Ratio CY/ST
Surface to 400 feet	54,000,000	9.4:1
400 feet to 600 feet	14,000,000	6.4:1
Total	68,000,000	8.8:1

AREA F AND G - INFERRED OPEN PIT RESERVES - In 1969 Scurry-Rainbow exposed coal seams on the west side of the valley in a series of dozer trenches. (See Exhibit 3.) They also drilled one core hole, SR-11, at an angle to intersect the coal measures which are nearly vertical in this area.

Areas F and G are contiguous along the strike of the coal, and the reserve has been broken into two areas, mainly to reflect that the strength of the geologic study is higher and there are a greater number of trenches in Area F than G. The reserves were calculated on the basis of apparent gross coal at trench sections projected over the interval. The pit was established at a 1:1 side slope down to 5,200 feet elevation.

AREA F	In Situ Coal ST	Ratio CY/ST
To Elevation 5,200 feet	123,000,000	7.4:1
AREA G		
To Elevation 5,200 feet	39,000,000	7.6:1

7. - AREA H - UNCERTAIN OPEN PIT RESERVES - This area is an apparent extension of the coal beds in Areas F and G. However, there are no direct coal observations by drilling or trenching and no firm geologic work has been performed. In addition, the topography in a substantial portion of the area indicates surface open pit mining would be difficult or economically prohibitive.

The area has been assigned an uncertain reserve classification. Reserves are calculated by projecting the gross coal indications of Area G on the same pit slope and depth assumption.

AREA H	In Situ Coal ST	Ratio CY/ST
To Elevation 5,200	25,000,000	7.6:1

8. - AREA J - INFERRED UNDERGROUND RESERVES - The structural geology of the coal measures as shown on Exhibit No. 4 and the consistency of the dips

infer that the coal beds on the east side of the valley continue to dip at a uniform rate at least 2,000 feet below the valley floor.

Considered in an underground mining operation are seams 5 feet thick and greater to a bottom elevation of 3,200 feet. An estimated recovery factor of 30 percent is considered. In situ coal for Area J is 1,200,000,000 ST.

9. - AREA K - UNCERTAIN UNDERGROUND RESERVES - The geology of the underground portion of the west side of the valley is unsettled. These reserves are therefore placed in the uncertain category.

Consider again seams greater than 5 feet thick and a bottom elevation of 3,200 feet. Using these criteria under areas F, G, and H, there would be 660,000,000 tons of in situ coal. A 30 percent recovery would be considered in this area also.

10. - SUMMARY OF RESERVES - The following chart summarizes the reserves outlined in this section. The in situ amounts of coal indicated at the end of each area analysis will be corrected for waste coal loss, oxidized loss and pit loss. These items were discussed in the section on Area A. For the other areas, an approximate loss of 15% will be used for the surface to 400 foot depth volume and 10% for the 400 to 600 foot depth where only the pit loss is applicable. An assumed processing plant loss of 25% is applied to coal in all areas to yield the final available clean coal volume.

COAL RESERVE SUMMARY

REFERENCE EXHIBIT 17

SURFACE MINE RESERVES

CLASSIFICATION OF RESERVE	LOCATION	DEPTH *	SHORT TONS IN PLACE	RATIO CY/ST	WASTE COAL OXIDATION COAL & PIT LOSS **	PLANT LOSS 25%	NET CLEAN COAL PRODUCT ST	NET CLEAN COAL PRODUCT LT
PROVEN		To 400	109,172,000	4.88:1	17,457,000	22,929,000	68,786,000	61,416,000
	AREA A	400-600	39,270,000	5.88:1	3,927,000	8,836,000	26,507,000	23,667,000
		Total	148,442,000	5.15:1	21,384,000	31,765,000	95,293,000	85,083,000
		To 400	27,000,000	4.72:1	4,300,000	5,700,000	17,000,000	15,200,000
	AREA B	400-600	27,000,000	7.16:1	2,700,000	6,100,000	18,200,000	16,300,000
		Total	54,000,000	5.94:1	7,000,000	11,800,000	35,200,000	31,500,000
		To 400	21,000,000	6.22:1	3,400,000	4,400,000	13,200,000	11,800,000
	AREA C	400-600	13,000,000	7.45:1	1,300,000	2,900,000	8,800,000	7,900,000
PARTLY		Total	34,000,000	6.69:1	4,700,000	7,300,000	22,000,000	19,700,000
PROVEN		To 400	15,000,000	4.33:1	2,400,000	3,200,000	9,400,000	8,400,000
	AREA D	400-600	13,000,000	6.53:1	1,300,000	2,900,000	8,800,000	7,900,000
		Total	28,000,000	5.36:1	3,700,000	6,100,000	18,200,000	16,300,000
		To 400	54,000,000	9.39:1	8,600,000	11,400,000	34,000,000	30,400,000
	AREA E	400-600	14,000,000	6.37:1	1,400,000	3,200,000	9,400,000	8,400,000
		Total	68,000,000	8.77:1	10,000,000	14,600,000	43,400,000	38,800,000
	TOTAL		184,000,000	7.04:1	25,400,000	39,800,000	118,800,000	106,300,000

* The 400 ft. depth is measured from the dragline bench and not the existing ground.

** Calculated for Area A as indicated and assumed 16% for other areas except for the 400 to 600 foot cut where 10% was used.

COAL RESERVE SUMMARY

REFERENCE EXHIBIT 17

CLASSIFICATION OF RESERVE	LOCATION	DEPTH *	SHORT TONS IN PLACE	RATIO CY/ST	WASTE COAL OXIDATION COAL & PIT LOSS **	PLANT LOSS 25%	NET CLEAN COAL PRODUCT ST	NET CLEAN COAL PRODUCT LT
SURFACE MINE RESERVES								
	AREA F	To 5200	123,000,000	7.41:1	19,700,000	25,800,000	77,500,000	69,200,000
INFERRED	AREA G	To 5200	39,000,000	7.62:1	6,200,000	8,200,000	24,600,000	22,000,000
	TOTAL		162,000,000	7.46:1	25,900,000	34,000,000	102,100,000	91,200,000
UNCERTAIN	AREA H	To 5200	25,000,000	7.62:1	4,000,000	5,300,000	15,700,000	14,000,000
TOTAL SURFACE MINE RESERVES			519,442,000	6.66:1	76,684,000	110,865,000	331,893,000	296,583,000
UNDERGROUND MINE RESERVES								
INFERRED	AREA J	To 3200	1,205,000,000		843,500,000	90,400,000	271,100,000	242,100,000
UNCERTAIN	AREA K	To 3200	660,000,000		462,000,000	49,500,000	148,500,000	132,600,000
TOTAL UNDERGROUND MINE RESERVES			1,865,000,000		1,305,500,000	139,900,000	419,600,000	374,700,000
TOTAL OR ALL RESERVES			2,384,442,000		1,382,184,000	250,765,000	751,493,000	671,283,000

SAMPLING AND TESTING

A. - SAMPLING PROGRAMS

The sampling and testing work carried out by North American Coal Co. in 1968 and Scurry-Rainbow Oil Ltd. in 1969 had as its primary objective the evaluation of reserves and the determination of the quality of the coal in the various seams to the extent possible by borehole samples and analysis. The extent of the exploratory work done at the site is covered in detail in the section of this report entitled 'EXPLORATION'.

The objectives of the Emkay-Scurry 1970 program were broader and intended to obtain data on the quality of coal in the various seams of the original and extended development area, to define the extent of surface oxidation, to obtain washability data from all seams that could be bulk sampled, and most important, to gather bulk samples for technical scale coke oven tests.

NORTH AMERICAN COAL CO. - 1968 PROGRAM - In addition to borehole samples, bulk samples were also taken by North American from Adits near Weary Creek, driven along the strike into Seams Nos. 2, 3, 4, 7, 8, 9, and 10. The location of these Adits is shown on Exhibit 14-1. Details of the location where the bulk sample was taken in each adit are shown on a series of drawings of the adits of the respective seam number. (See Exhibit 14.)

SCURRY-RAINBOW - 1969 PROGRAM - The 1969 program of Scurry-Rainbow included further samples from bore holes and additional bulk samples taken from previously excavated Adits into Seams 4, 7, 8, and 9. Separate samples were taken from each side of the major parting of Seam No. 8 at two different locations, making a total of 4 separate bulk samples from this seam. Seam No. 9 was sampled at two different locations, making two separate samples. Seams 4 and 7 were only sampled at one location each. This makes a total of 8 separate bulk samples from these 4 seams. The location where these samples were taken is detailed on the above mentioned Exhibit 14 identified by the respective seam number.

EMKAY-SCURRY 1970 PROGRAM - The item of most urgency in the 1970 program was to obtain representative bulk samples from as many seams as possible for use in preparation of bulk clean coal samples for technical scale coke oven tests to be performed by the Japanese steel mills in Japan, and the Canadian Department of Energy, Mines and Resources (EMAR) at Ottawa, Ontario. In addition to taking samples from previously excavated Adits Nos. 2, 3, 4, 7, 8, 9 and 10, new adits were excavated to sample Seam No. 6 and Seam No. 2 near Station 220 + 00, North of Weary Creek. A bulk sample was also obtained from Seam No. 12 in an open trench (T-70-1) near Station 228 + 00. Seam No. 11 was not bulk sampled. The seam correlation work determined that Seam No. 11 joined Seam No. 12 north of the T-70-1 trench where the bulk sample was taken.

Samples needed for determination of depth of surface oxidation were obtained in connection with the excavation of 18 surface trenches for locating coal seam outcrops. Where possible, without drilling and blasting, the floor of these trenches was successively lowered, after obtaining sample test results, to a point where unoxidized coal was found. To supplement the surface trench work, at two locations, T-SR-4 and T-70-2, core hole samples were taken from holes drilled vertically down from the bottom of the trench to obtain information on depth of surface oxidation. The details of the surface trenches and location where all samples were taken is shown on a series of drawings in the Appendix, designated as Exhibit No. 8. The test results of samples taken in connection with the oxidation study is recorded on the drawing showing the location of the sample. See oxidation drawing series Exhibit 18.

Toward the end of the 1970 season, when the extent of the deposit toward the west became known, it became evident that a bulk sampling program was necessary to obtain washability data and clean coal for tenchical scale coke oven tests on the higher numbered seams, 13 through 20, that had not been tested previously. Based on results from oxidation studies in surface trenches it was decided to obtain these bulk samples from the extension of trench T-70-16 and the excavation of a new one, T-71-17. These trenches are located one on each side of Weary Creek as it emerges from the notch in

Weary Ridge. At the time of this writing bulk samples have been obtained from three of the eight seams to be sampled, and two more have been located, uncovered, and are ready for sampling. In connection with the excavation of the trenches and sampling, to assure unoxidized coal, much valuable information was obtained on depth of surface oxidation in this area from these two trenches.

In addition to the special sampling programs outlined above, core hole samples were taken from all the holes drilled in connection with the program to determine the extent and quality of the coal in the deposit on the east side and bottom of the Valley from Station 180 + 00 north to the property line near Station 420 + 00. This sampling work is continuing at the date of this report.

To assist in the correlation of the various seams, and the determination of the reserves in the initial study area, a tabulation of all the available sampling and test data was prepared. All data was included from the beginning of the 1968 program of North American to the date of this report. A separate tabulation was made for each major coal seam No. 2 through 20. Data was organized from south to north, following the general direction of the investigation. This data is contained in the Appendix as Exhibit No. 19.

B. - SAMPLING PROCEDURES

DRILL HOLE SAMPLING - Two types of drilling were utilized on the Elk River Project, coring and rotary. No effort was made to log or save the cuttings from the rotary drilling largely because the water based drilling medium produced an unpredictable sample recovery.

Core drilling was conducted with two skid mounted drill rigs, one a Chicago Pneumatic Model 8, and one a Longyear Model 44 - both diesel powered Longyear size NQ wire line core barrels and rods were used with relatively good core recovery - averaging about 75% in coal, to date. As the core was removed from the barrel, it was placed in wooden core boxes five feet in length with wooden footage markers at appropriate intervals. Coal found in lengths of two feet or greater was immediately encased in a tight cylinderical plastic sack which was immediately filled with nitrogen and sealed. As each core box was filled, a wooden cover was nailed on and the box removed to a storage area. Coal occurrences, which had been encased in plastic at the drill site, were opened and inspected, and if the total seam penetration, as identicated by the density log, was four feet or greater, the coal would be repackaged for analysis. The only exception to this practice was the odd occasion where core recovery was so poor that the "boxed" coal did not appear to be of sufficient quantity to be representative of the entire seam.

Since the repackaged coal sample was to be analyzed as soon as it reached Calgary, it was placed loose in a regular 12 inch by 18 inch or 18 inch by 24 inch plastic sample bag, along with a sample tag, and the bag sealed with a wire - no nitrogen was added. The resulting samples were taken by car to Loring Laboratories, Ltd. of Calgary, Alberta where proximate analyses were completed on the raw coal and on a cleaned sample which was washed at 1.50 specific gravity.

ADIT BULK SAMPLES - A number of bulk samples were required of the various coal seams for washability and coking tests. The existing adits (Exhibit No 14) previously dug by North American or Scurry-Rainbow, were rehabilitated and two 25 barrel bulk samples were taken from each adit. To insure freedom from surface oxidation, each adit was advanced until grab samples, analyzed at Scurry-Rainbow's Blairmore laboratory, indicated that the F.S.I. determinations were consistent in values for at least 25 feet. At this point, a cross cut was driven to the full width of the coal seam exposing both the hanging wall and footwall. After the necessary barrels, equipment and personnel (including an observer from the Department of Mines, Edmonton) was assembled, an additional six inches of coal was hand spaded from the rib of the cross-cut to eliminate any blasting effects from the forthcoming sample. Then the entire face of coal, across the full seam, was sampled utilizing air-powered spaders and digging to a depth sufficient to yield 25 barrels of coal at an average weight of 400 pounds of sample. Two separate 25 barrel samples were taken of each coal seam, ie., Seams 2, 3, 4, 6, 7, 8, 9, and 10. As the coal was removed from the sample face via wheelbarrow, it was loaded into plastic sack lined, 40 gallon (Imperial Measure) barrels to which two pounds of dry ice had been added. After standing to allow purging of the air from the sample by the carbon dioxide gas from the dry ice, a gasketed lid was installed and bolted in place and the barrels were loaded on a job operated truck and hauled to Cyclone Engineering Sales Ltd.'s laboratory in Edmonton, Alberta. Here the sample was washed, dried, and repackaged with dry ice for shipment via commercial truck lines to Ottawa for coking tests.

During the adit program, some difficulty was experienced in obtaining a consistent ash analysis for Seam No. 2 in the extended original 2 South adit. Therefore, a second adit (2 North) was driven in Seam No. 2 at a location some 400 feet higher in elevation and 1,500 feet to the north on the south end of Little Weary Ridge. Here again samples were analyzed from every second round at Scurry's Blairmore laboratory until the F.S.I. values stabilized and then the bulk sample was taken from a full seam cross-cut.

TRENCH CHANNEL SAMPLES - To better define area seam continuity and sequence and develop depth of oxidation data, additional dozer trenches (Exhibit No. 8) were excavated at appropriate locations, where glacial till and/or alluvium was known to be reasonably thin. In conjunction with the oxidation study, a field laboratory was set up to make F.S.I. determinations. Channel samples were taken in the dozer trenches, coned and quartered and then air dried. A mortar and pestle was utilized to grind the sample so that it all passed a 60 mesh screen. Then the standard ASTM F.S.I. analysis was made to allow an evaluation of the depth of oxidation in that particular trench when compared to the raw F.S.I. analysis of the same seam in the closest drill hole.

In the pursuit of this oxidation study, it was determined that the glacial till cover, predominate in the valley floor, would allow additional bulk sampling of non-oxidized coal at reasonably shallow depths.

TRENCH BULK SAMPLES - Several seams were not capable of being sampled by adit and the bulk sample had to be taken in an open trench. Seam 12 was bulk sampled in trench T-70-1. This trench was cut through till on the west flank of Little Weary Ridge at about 2,500 feet north of the sample adits along Little Weary Creek. Channel samples were taken as the cut was deepened to insure the quality.

The recent drilling program developed additional seams, identified as Seam 13 through 20, which did not outcrop along Weary Creek, and must also be trench sampled. The original trench T 70-16 was extended to a total length of 1,900 feet (Exhibit 8-16) and bulk samples of Seams 13, 14 and 15 are now being taken. Trench T-70-17 (Exhibit 8-17) is being used to bulk sample Seams 16, 17 and 18. Seams 19 and 20 will be bulk sampled in trench T-70-18, located near Station 167 + 00.

The following trench sampling procedure is being followed. Trench bulk sampling is conducted after extensive and careful oxidation sampling in which the ash and F.S.I. are both observed. The dozer excavation work is stopped at intervals to allow this sampling and analysis to progress simultaneously. After good consistent F.S.I. values are reported, the individual seam area is cleaned up with a D-4 dozer, then a backhoe and then blown off with compressed air. Depending on the number of splits to each seam, and utilizing the factor of "one barrel of coal equals 5 cubic feet - in place", the proper sized excavation is determined for each split. The coal is spaded loose with air spaders and hand loaded into clean new barrels on top of three pounds of dry ice. Plastic sacks are not used since the barrels are emptied for crushing and sampling at the Coal Science and Minerals Testing's laboratory in Calgary within the week. The filled barrels are then covered with a "bolt on" lid with a cotton seal. A 50 barrel sample is taken for each seam, and these barrels are hauled to the Calgary laboratory the day of sampling to prevent freezing.

C.S. & M.T. crushes and samples each seam within 7 to 10 days of its delivery to Calgary. The crushed coal is restored in its barrels with a plastic sack liner and under a carbon dioxide atmosphere until the sample analysis is complete and washing conditions determined. During April of 1971, each seam will be washed in the C.S. & M.T. pilot plant and 2,000 pounds dried, packaged in plastic lined barrels under carbon dioxide atmosphere and shipped to the Department of Energy, Mines and Resources facilities in Ottawa for coke tests.

C. - TESTING PROGRAMS

NORTH AMERICAN 1968 PROGRAMS - The eight bulk samples taken from the adits near Weary Creek were tested by Commercial Testing and Engineering Company in their laboratory in West Virginia, U S A. The coal from these bulk samples was crushed down to 2 inches maximum size in preparation for complete washability tests at 7 specific gravity levels and 10 size fractions. The test work was very detailed and gave complete data for each seam. A typical report by Commerical Testing is that for Seam No. 2 dated December 1968, presented in this report as Exhibit 20. The complete data for these 8 seams tested is too voluminous for inclusion in this report, but is available for review.

Proximate analysis of bore hole samples taken by North American are included in their report of the 1968 operations. This data, to the extent available, is included in the tabulation of sampling and test results in Exhibit No. 19

SCURRY RAINBOW 1969 TESTING PROGRAM In order to check out the work done by North American in 1968 Scurry Rainbow had complete washability tests run on each of the 8 bulk samples taken from Seams 4, 7, 8, and 9. Cyclone Engineering Sales, Ltd. of Edmonton, Alberta, Canada were engaged to do this work. The samples were crushed down to 2 inches maximum size and tested at 6 specific gravities and 7 size fractions. A typical report of the test results is that for Seam No. 7 included as Exhibit 21.

Samples of core borings were also tested by Cyclone Engineering. Samples were crushed to ¼ inch minus and floated at 1.50 Specific Gravity. Proximate analysis tests were run on both the raw and clean coal basis. A typical test report by Cyclone Engineering on a bore hole sample is Test No. 5177 for Seam No. 7, included in the Appendix as Exhibit No. 22. A total of 72 tests of this type were made for Scurry-Rainbow by Cyclone Engineering of bore hole samples taken from the study area in 1969. All of these samples and the proximate analysis raw and floated at 1.50 S.G. are included in the Sample Summary and Proximate Analysis tabulation as Exhibit 19.

After analyzing the data available from the above mentioned tests, it became evident that data on the resultant F.S.I. value and yield in a coal blending program would be necessary. To assist in determining whether or not such an operation might be feasible, Cyclone Engineering was authorized to make tests on coal from the bulk samples taken from Seams Nos. 4, 7, 8 and 9. The results of these tests are detailed in a report from Cyclone Engineering dated February 12, 1970, indicating that this procedure would be entirely feasible and that the results would approximate an arithmetic average for blends of the four coals studied. A copy of this report is included as Exhibit 23.

EMKAY-SCURRY 1970 TESTING PROGRAM The 1970 test program was agreed upon shortly after the technical presentation to the Japanese steel interests in early June 1970. At the completion of this presentation the major remaining areas of interest were outlined. The main remaining undertakings in regard to sampling and testing were:

1. What are the coking characteristics of the coals?
2. Can the washed product from the property be economically produced at an ash content in the range of 7.5 to 8.0%?
3. What are the specifications of the blended product to be produced from the property?

In order to provide answers to these questions it became necessary to run tests on bulk samples obtained from all the major seams in the proposed mining area. Samples were obtained from Seam Nos. 2, 3, 4, 6, 7, 8, 9, 10 and 12, as outlined in an earlier portion of the report.

From these tests sufficient clean coal was to be provided to the Steel Mills for coke tests and to the Canadian Department of Energy, Mines and Resources at Ottawa to run the technical scale oven tests on individual seams and blends with a blended coal to be provided by NKK to Ottawa EMAR for this purpose. A survey of available washing facilities capable of handling the volume of coal required for these tests resulted in the finding that the water only cyclone plant at Edmonton, Alberta, was the only such facility available for this work. An arrangement was made with Cyclone Engineering Sales Ltd. of Edmonton, Alberta, to do this work.

Since answers to questions Nos. 2 and 3 above, were to be obtained, a testing program was agreed upon to provide the following information:

a. Develop washability data on each seam to determine whether it would be economically feasible to produce a clean coal product with an ash content in the range of 7.5 to 8.0%.

b. Develop for each seam the relationship between specific gravity, F.S.I., ash content and percentage yield for various values of specific gravity in a practical range of operation for a coal preparation plant.

D. - TESTING PROCEDURES

TESTING OPERATIONS AT CYCLONE ENGINEERING SALES The services of Dr. G. Norton, a consultant to Birtley Engineering Ltd. of Chesterfield, Derbyshire, England, was arranged to set up and oversee the testing program to insure that the necessary information was obtained. He was familiar with the problems to be encountered in the development of the property, since he had worked with Birtley Engineering on an analysis of the bulk sample washability data obtained in the 1968 and 1969 testing programs of North American and Scurry-Rainbow. We had retained Birtley to study this data and give us a recommended flow sheet for the preparation plant needed on this project.

Dr. Norton was resident at the Cyclone Engineering Laboratory in Edmonton while most of the work was done, but had to return to the U.K. in the latter part of September 1970, to resume his duties at the University of Nottingham.

The compound water cyclone plant used for washing the clean coal could not handle material larger than ½ inch maximum size. All of the raw coal was crushed down to this size and tests were performed on samples taken from the crushed raw coal product.

WASHABILITY TESTING - Particular attention was given to obtaining an accurate relationship of F.S.I. to ash and separating specific gravity. In order to duplicate as nearly as possible a commercial operation, it was decided to develop the washability data by screening the raw coal at 28 mesh. The plus 28 mesh coal would be separated by the use of heavy organic liquids and the minus 28 mesh by use of a laboratory model froth flotation cell. The clean coal products from these two operations at a particular separating gravity were then combined in their proper proportions to represent the clean coal product that might be produced by a commercial plant. This clean coal product was then tested for F.S.I. From a series of these tests run at different separating gravities a curve was produced providing the relationship of separating gravity to F.S.I. to ash to yield, thus providing the data needed for a blending analysis.

The results obtained from the series of tests are the subject of a report No. RI 70.16-1 prepared by Cyclone Engineering dated November 16, 1970, contained in Exhibit 24.

Complete proximate analysis was not run on the coal at Cyclone Engineering Sales since a very complete analysis was scheduled to be made on the clean coal at Ottawa as a part of their coke test procedure and a report of results

BULK SAMPLE WASHING FOR COKE TESTING - The testing work was started on the basis of producing a clean coal with an ash content approximately 7.5 to 8.0 percent. Earlier washability test data indicated that this might be a possibility. As the 1970 testing program progressed it soon became apparent that this was not economically feasible and higher ash contents were requested.

Details of quantities of clean coal, ash content, F.S.I. and date of shipment to Ottawa EMAR and Japan for each seam is contained in Table 2, page 5, of the report No. RI-70.16-I from Cyclone Engineering, Exhibit 24.

Clean coal shipped to Japan was sent in two shipments, the first one left Edmonton on October 9, 1970. This coal was stored under water and was shipped by boat. The second and last shipment left Edmonton on November 5, 1970, was shipped without water and went by air freight, so that all of the coal would arrive in Japan at approximately the same date.

As of the date of this report, test results of the clean coal sent to Japan are not available.

WASHABILITY TESTING - NOTTINGHAM UNIVERSITY - U.K. BY DR. NORTON - As results became available from the analysis being made in Ottawa, a major difference in F.S.I. values for the clean coal became apparent. Comparative results of the determinations made by the two different organizations are presented in tabular form below:

SEAM	CYCLONE ENGINEERING SALES		MINES BRANCH, OTTAWA (EMR)	
NO.	ASH %	F.S.I.	ASH %	F.S.I.
2N	10.6	6½	10.4	8
3	8.1	6½	8.2	7
4	8.6	4	8.5	5
6A	9.1	1½	9.0	2½
7	9.0	5	8.5	5½
8	7.3	4	6.8	5½
9	7.6	2	7.2	4
10	6.8	4	6.3	7
12	8.4	9+	9.0	9
Average		4.72		5.95

This difference of nearly 1¼ points in coking index was too great to go unchecked.

In the interest of obtaining an independent check as soon as possible Dr. Norton agreed to have the work done in the U.K. at Nottingham where excellent laboratory facilities and technicians were available for this work. Samples of the same raw coal, used in the test work at Cyclone Engineering, except for Seam No. 3, were air freighted to the U.K. and Dr. Norton supervised the test work required to develop a new set of washability curves comparable to the ones developed from the data produced in tests by Cyclone Engineering. The relationships of ash and yield vs. separating gravity were very close for all seams except for the last two seams tested by Cyclone where erroneous determinations were made on the froth flotation products for the minus 28 mesh fraction of the raw coal. There was a major difference of results in the Specific Gravity - Ash - F.S.I. relationship, the work by Dr. Norton showing higher indices and generally confirming the Ottawa results.

Details of the procedures followed and the results obtained are contained in a report by Dr. Norton entitled "Report on the Laboratory Test Work on the Elk River

Coals Carried Out in the U.K.", dated January 8, 1971, which report is reproduced as Exhibit 25.

The curves prepared from the test results obtained from the work outlined in the above mentioned report as referred to in Section 7 were later adjusted on a theoretical basis to take into account yield losses caused by inefficiencies in separation of coarse sizes by heavy medium processes. These adjusted curves were later extrapolated into gravity ranges up to 1.90 and down to 1.30 S.G. for later use in blending analyses to be performed by computer. These adjusted curves showing the theoretical relationship between plant operating gravity and ash, F.S.I. and yield are contained as Exhibit 26.

It was decided to use this data as the basis for future analyses of the quality of the coal from the property because of the care exercised in the test work and the qualifications of the personnel performing the tests

TESTING BY CANADIAN DEPARTMENT OF ENERGY, MINES AND RESOURCES - OTTAWA - As mentioned earlier, arrangements were made with the Mines Branch of the Canadian Department of Energy, Mines and Resources in Ottawa to run a complete series of tests on the washed coal samples, as customary in connection with their coke testing program. For this reason no tests beyond washability and F.S.I. determinations were requested of Cyclone Engineering in Edmonton.

Tests performed on samples of the washed coal from each seam are contained in a report dated December, 1970 prepared by Messrs Botham, Montgomery and Gardiner of the Department of Energy, Mines and Resources in Ottawa which is available as part of this report. Analyses made on each of the coals and reported in Table I of the Department of Energy, Mines and Resources report are as follows:

Proximate Analysis

Gross Calorific Value

Ultimate Analysis

Grindability

Free Swelling Index

ASH ANALYSIS IN THE UNITED KINGDOM BY DR. NORTON - As the tests and analyses in Ottawa progressed, it appeared that due to the heavy work load of some of the Government Departments, the ash analysis might not be available in time for inclusion in the coke testing report. Arrangements were made with Dr. Norton to have these tests made in the United Kingdom from splits of the same samples used in Ottawa for this purpose. The results of the tests made in the United Kingdom are presented in tabular form on Page 11 of the report by Dr. Norton dated January 8, 1971 presented as Exhibit 25.

PROXIMATE ANALYSIS OF BORE HOLE SAMPLES As the drilling program progressed numerous bore hole samples were obtained. The laboratory of Cyclone Engineering Sales in Edmonton was so overloaded with the washing and testing of the bulk samples, as outlined above in this section, that other arrangements had to be made to obtain proximate analyses on raw coal samples and floats of 1.50 S.G. Arrangements were made with Loring Laboratories, Calgary, Alberta to do this work. The samples tested by them and the test results of raw coal and floats at 1.50 S.G. are included in the tabulation with all other results in Exhibit 19

TESTING BY COAL SCIENCE AND MINERALS TESTING LTD. - A new organization called Coal Science and Minerals Testing Ltd. (CS & MT) operating as a subsidiary of Great West Steel Industries, Ltd. of Calgary, Alberta has set up operations in Calgary to provide testing services and consulting advice on sampling, testing and washing plant problems to the coal industry and to the metal mining industries of Canada. This organization is under the active management of Dr. G. Norton, who assisted us in the sampling and testing work in 1970.

This organization started operation in January, 1970 at which time all bore hole and other samples were sent to them for analysis. Results of tests made on samples delivered to them are included in the tabulation of test results in Exhibit 19.

Part of the facilities to be provided by C.S. & M.T is a pilot size heavy medium separation plant equipped with froth flotation equipment for handling the fine coal. This plant is presently under construction and scheduled for commissioning on March 20, 1971. Arrangements have been made with C.S. & M.T. to do the laboratory work and washing of the bulk samples now being obtained in the field from Seam Nos. 13 through 20. Progress to date in this program includes delivery to the C.S. & M.T. plant in Calgary bulk samples taken from three seams and their splits.

Testing work to be performed by them will include proximate analysis on raw and clean coal, washability studies similar to those above-mentioned which were prepared under Dr. Norton's direction, and washing of bulk samples to a predetermined ash content for use in technical scale oven tests by the Department of Energy, Mines and Resources in Ottawa.

1971 COKE TESTING PROGRAM - An agreement has been reached with the Canadian Department of Energy, Mines and Resources to perform technical scale oven tests on clean coal bulk samples to be obtained from Seams Nos. 13 through 20 which were not included in the 1970 program. A similar series of tests and analyses as made in the 1970 program, as reported in the December 1970 report of the Department of Energy, Mines and Resources will be made.

Technical scale oven tests are scheduled to begin in Ottawa on May 15, 1971 and be completed by July 15, 1971. At the present time the program is on schedule.

K- ELK RIVER 70(2)B

ELK RIVER COKING COAL PROJECT

EXHIBITS 1 - 10

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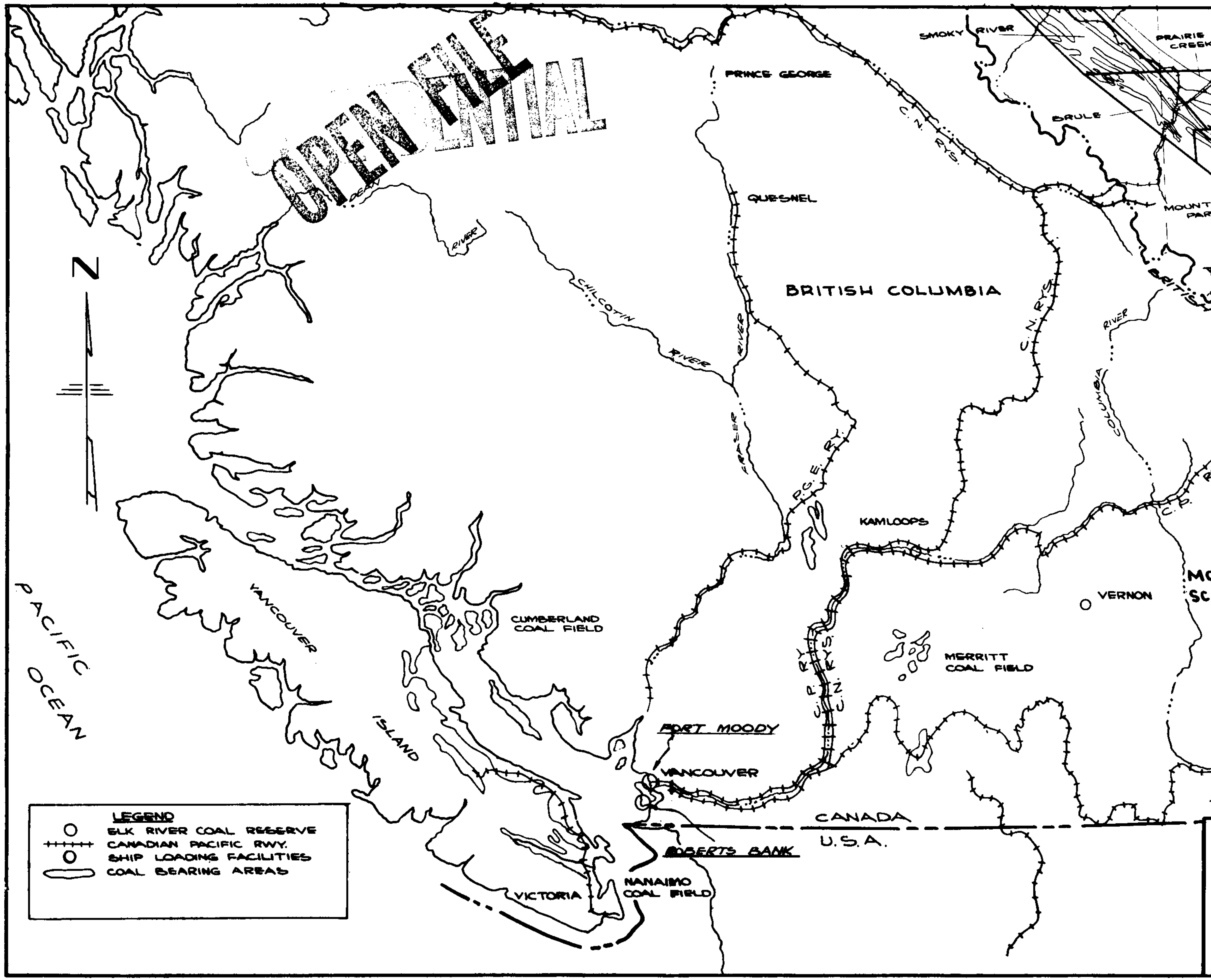
K-ELK RIVER 70(2)B

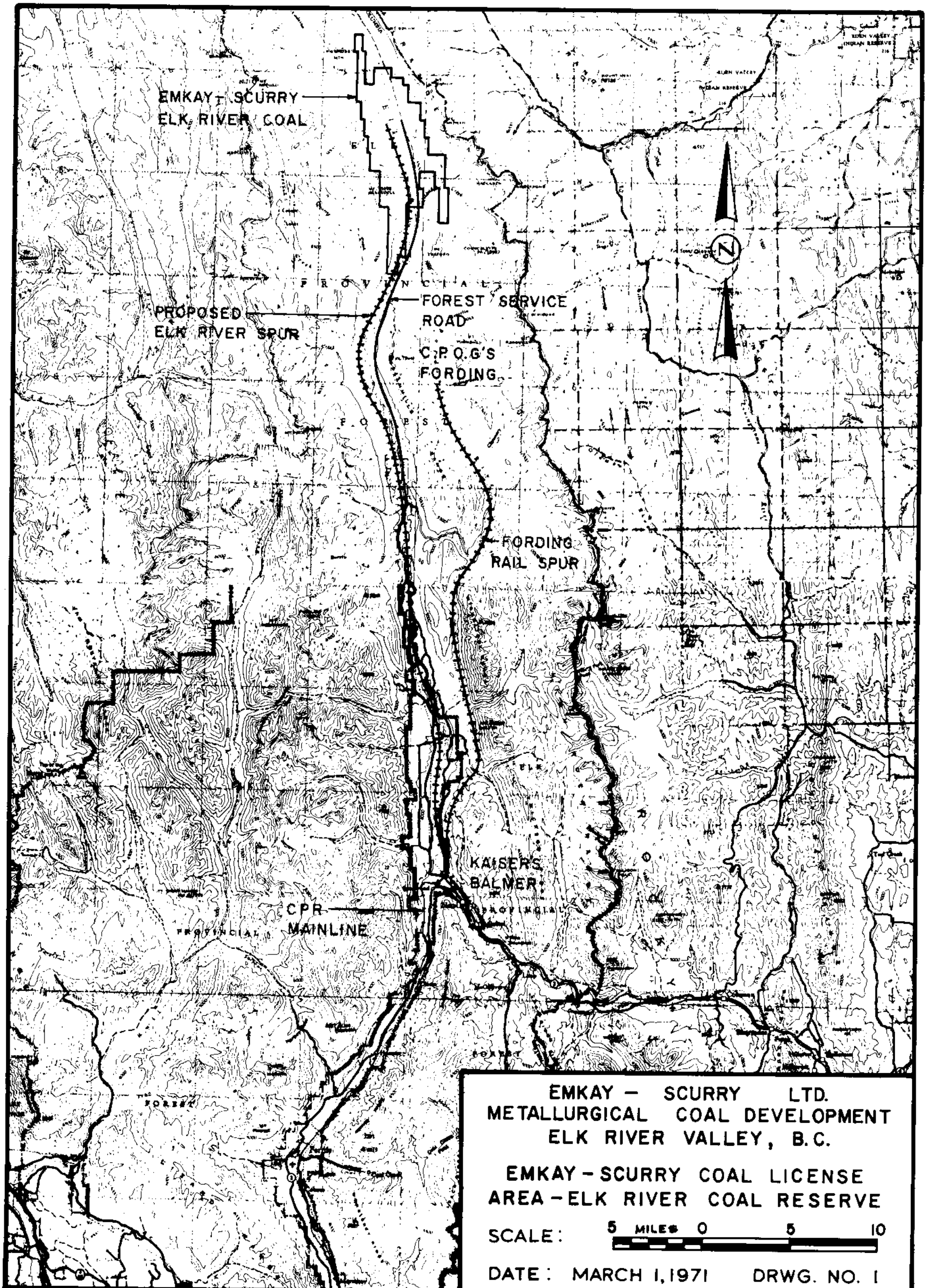


EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
BRITISH COLUMBIA AND ALBERTA
VICINITY MAP

MARCH 1970 EXHIBIT NO. 1

MAP SHOWING
PRINCIPAL COAL FIELDS
OF WESTERN CANADA
WITH
LOCATION OF ELK RIVER COAL RESERVE
SCURRY-RAINBOW OIL LTD.
SCALE 1" = 40 MILES

JUNE 1969
JOHN T. BOYD COMPANY
MINING ENGINEERS
EXHIBIT No. 1



EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

EMKAY - SCURRY COAL LICENSE
AREA - ELK RIVER COAL RESERVE

SCALE: 5 MILES 0 5 10

DATE: MARCH 1, 1971 DRWG. NO. 1

269

K-ELK RIVER 70(2)B. EXHIBIT NO. 2

DIAGRAMMATIC GEOLOGIC SECTION A-A
PALEOZOIC BEDS
ELK RIVER THRUST
COAL MEASURES
BLAIRMORE CONGLOMERATE
ELK RIVER
TILL
KOOTENAY FORMATION
FERNIE SHALE
PALEOZOIC BEDS
PROPERTY LEASE LIMIT
FERNIE SHALE
KOOTENAY SANDSTONE
BIG WEARY RIDGE
POSSIBLE ROCK SLIDE OF KOOTENAY SANDSTONE
AREA MOSTLY COVERED BY OVERBURDEN OF VARIABLE DEPTH
GLACIAL TILL
LITTLE WEARY RIDGE
KOOTENAY SANDSTONE
ALDRIDGE TUNNEL AND X-CUT DRILL HOLE
BASE LINE
NORTHERN LIMIT OF INITIAL STUDY AREA
ELK
RIVER
SOUTHERN LIMIT OF INITIAL STUDY AREA
AREA MASKED BY GLACIAL TILL, MAY BE UNDERLAIN BY SYNCLINE AXIS
POSSIBLE OUTCROPS OF BLAIRMORE CONGLOMERATE
BLAIRMORE CONGLOMERATE
ADDITIONAL COAL LOCATED IN UPPER PART OF THE KOOTENAY - EXTENT AND QUALITY NOT INVESTIGATED TO DATE
THRUST FAULT TRACE
OVER THRUST BLOCK OF PRE-KOOTENAY ROCKS
BASAL KOOTENAY SANDSTONE
FERNIE SHALES
PROPERTY LEASE LIMIT
NOTE:
REFER TO EXHIBITS 7 AND 8 FOR LOCATION AND IDENTIFICATION OF PRE 1970 DOZER TRENCHES EXCAVATED IN THE INITIAL STUDY AREA.
LEGEND
GLACIAL TILL, CONTAINS GLACIAL OUTWASH GRAVELS AND ALLUVIAL GRAVELS IN RIVER VALLEY.
AREA OF GEOLOGIC DISTURBANCE, BEDS BADLY DISTORTED
COAL SEAM OF INITIAL AREA SHOWING AVERAGE THICKNESS. HEAVY LINE INDICATES PRINCIPAL SEAM, THIN LINE INDICATES MINOR SEAM. DASHED WHERE APPROXIMATE
COAL SEAM ON BIG WEARY RIDGE OUTSIDE INITIAL AREA
COAL SEAM ON WEST SIDE OF ELK RIVER VALLEY
KOOTENAY SANDSTONE
STRIKE AND DIP OF BEDDING PLANE
STRIKE AND DIP OF VERTICAL BED
STRIKE AND DIP OF OVERTURNED BED
POSSIBLE THRUST FAULT
SYNCLINE
EXPLORATORY HOLE DRILLED BY EMKAY-SCURRY LTD. IN 1970. C DESIGNATES CORE HOLE, R DESIGNATES ROTARY HOLE
EXPLORATORY HOLE DRILLED BY SCURRY RAINBOW CO. LTD. IN 1969
EXPLORATORY HOLES DRILLED BY NORTH AMERICAN COAL CORP. IN 1968.
TEST ADIT
BULL DOZER TRENCH EXCAVATED BY EMKAY-SCURRY LTD. IN 1970.
DOZER TRENCHES EXCAVATED BY NORTH AMERICAN COAL CO. IN 1968 ALONG CREST OF BIG WEARY RIDGE.
ADDITIONAL TRENCHES EXCAVATED BY SCURRY RAINBOW OIL CO. IN 1969.
Scale 1000 0 1000 2000 3000 Feet
K-ELK RIVER 70(2) B
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
GENERAL GEOLOGIC MAP
ELK RIVER COAL PROJECT
DATE: MARCH 1,1971
DRWG. No. 1
EXHIBIT No. 3

SECTION 250+00

K-ELK RIVER 70(2)13.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

CROSS — SECTION
250+00

SCALE: 0 100 300 / 50 200 400

DATE: MARCH 1, 1971 DRWG. NO. 1

EXHIBIT NO. 4

LEGEND

ALLUVIUM	GRAVEL OF WEARY CREEK
GLACIAL TILL	PEBBLES AND COBBLES IN DENSE CLAY MATRIX, CONTAINS A SMALL NUMBER OF BOULDERS UP TO 3-4' IN DIAMETER
COAL SEAM	DASHED WHERE LOCATION APPROXIMATE
KOOTENAY SANDSTONE	
40° STRIKE AND DIP OF BEDS	
TEST ADIT	
DRILL HOLE (M-70-1C, M-70-1R)	EXPLORATORY HOLE DRILLED BY EMKAY-SCURRY LTD. IN 1970, C DESIGNATES CORE HOLE, R DESIGNATES ROTARY DRILL HOLE
DRILL HOLE (SR-1)	EXPLORATORY HOLE DRILLED BY SCURRY-RAINBOW LTD DURING 1969
DRILL HOLE (N-1 or A)	EXPLORATORY HOLE DRILLED BY NORTH AMERICAN COAL CORP. IN 1968
DOZER TRENCH (T-70-1, T-SR-15)	(T 70-1) DESIGNATES TRENCH EXCAVATED IN 1970 BY EMKAY-SCURRY LTD. T-SR-15 DESIGNATES TRENCH EXCAVATED IN 1969 BY SCURRY-RAINBOW OIL CO.

GEOLOGY BY J. S. LONG, INTERNATIONAL ENGINEERING CO.

Scale 200 0 200 400 600 Feet

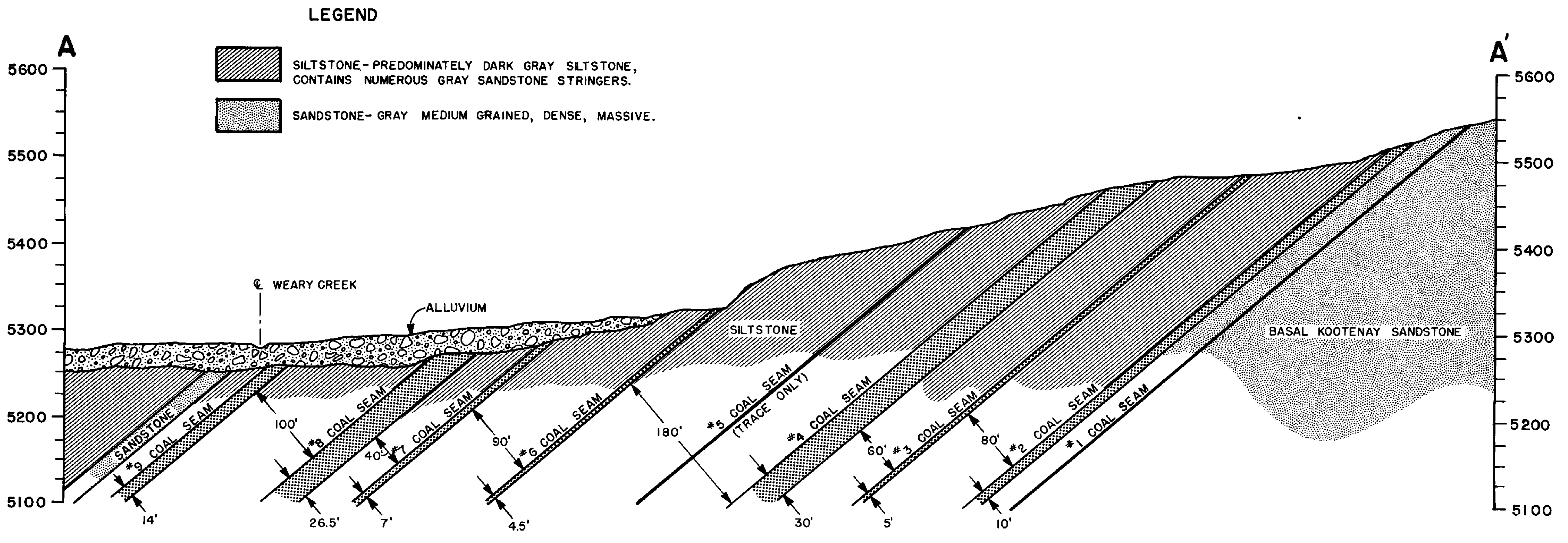
K-ELK RIVER 70(2)B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY B.C.

GEOLOGIC MAP
PORTION OF INITIAL STUDY AREA
ELK RIVER COAL PROJECT

DATE: MARCH 1, 1971 DRWG. No. 1

EXHIBIT No. 5



SECTION A-A'

NOTE:
STRIKE MEASUREMENTS OF N 20° W WERE PROJECTED ON TO LINE OF SECTION DRAWN PERPENDICULAR TO STRIKE OF BEDS.

K-ELK RIVER 70(2)B.

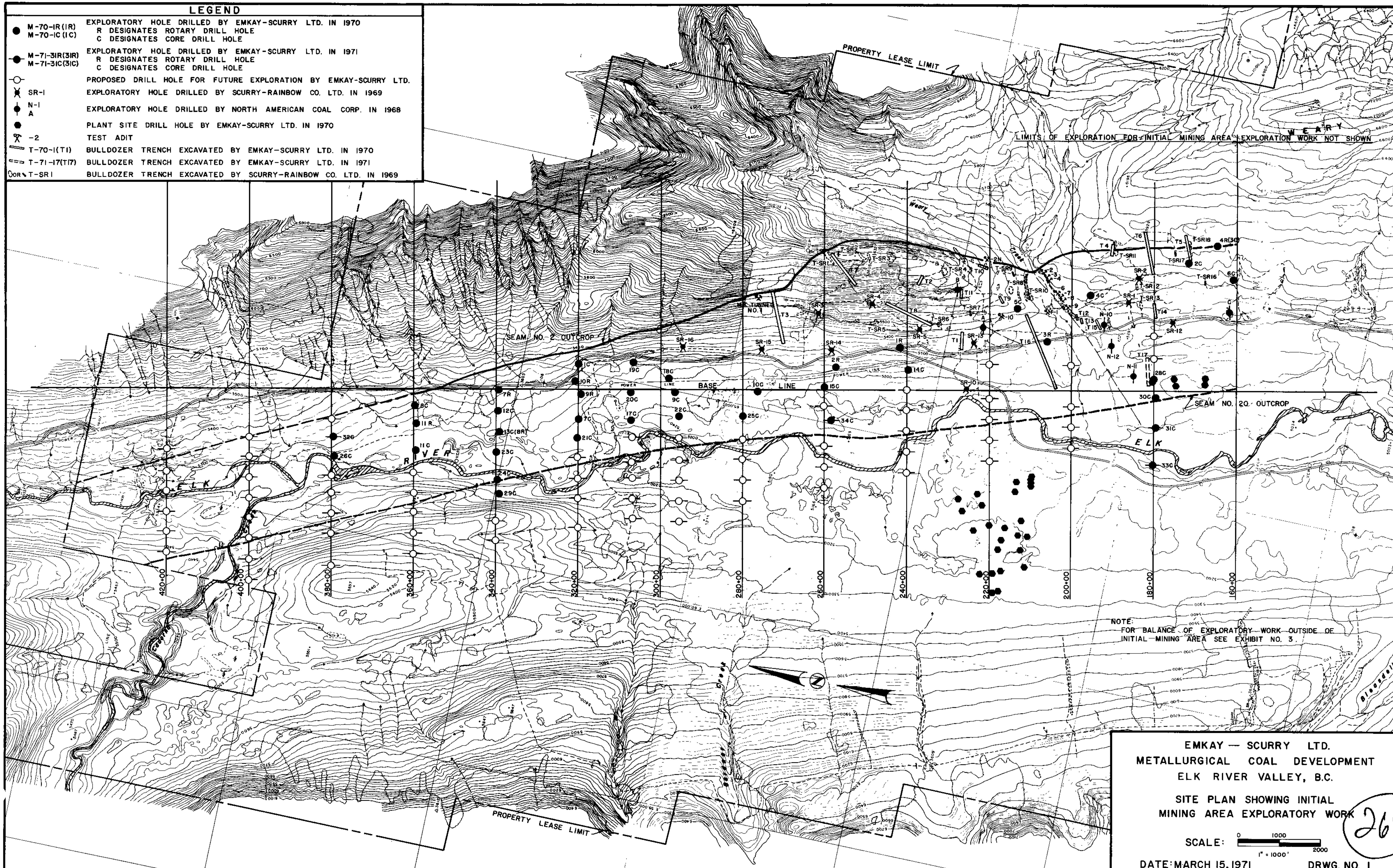
EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.

MEASURED STRATIGRAPHIC SECTION
SOUTH SIDE OF WEARY CREEK *

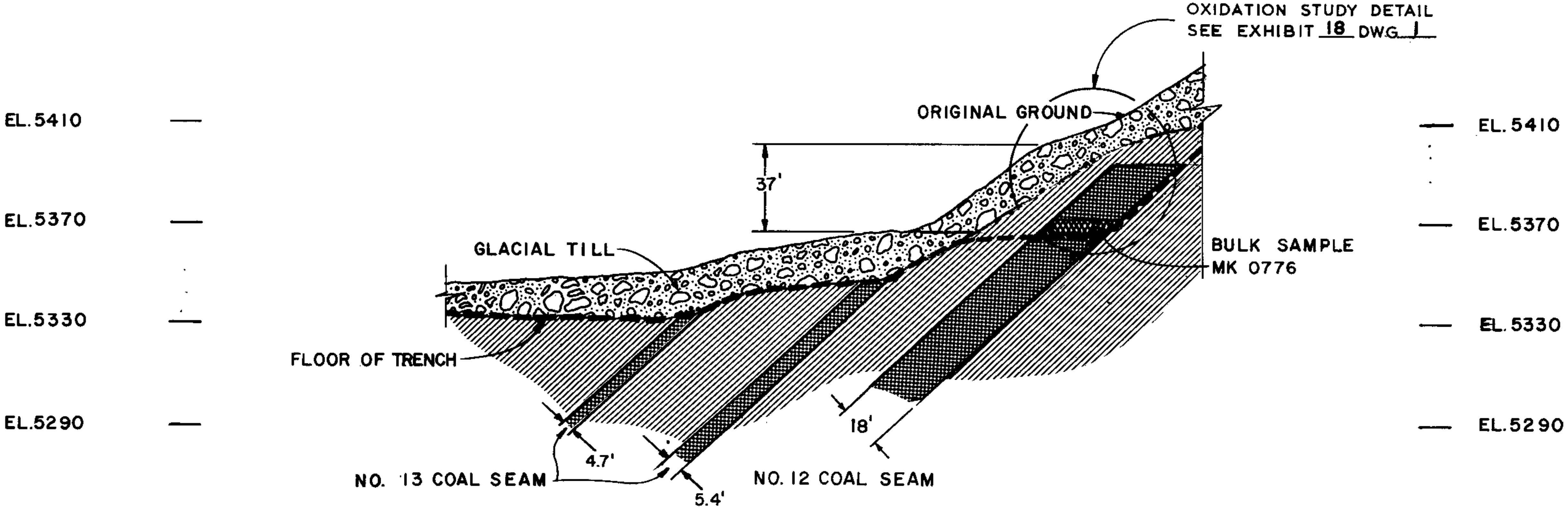
SCALE: 0 50 100 200 FEET

DATE: MARCH 1, 1971 DRWG. NO. 1

EXHIBIT NO. 6



K-ELK RIVER 70(2)B EXHIBIT NO. 7

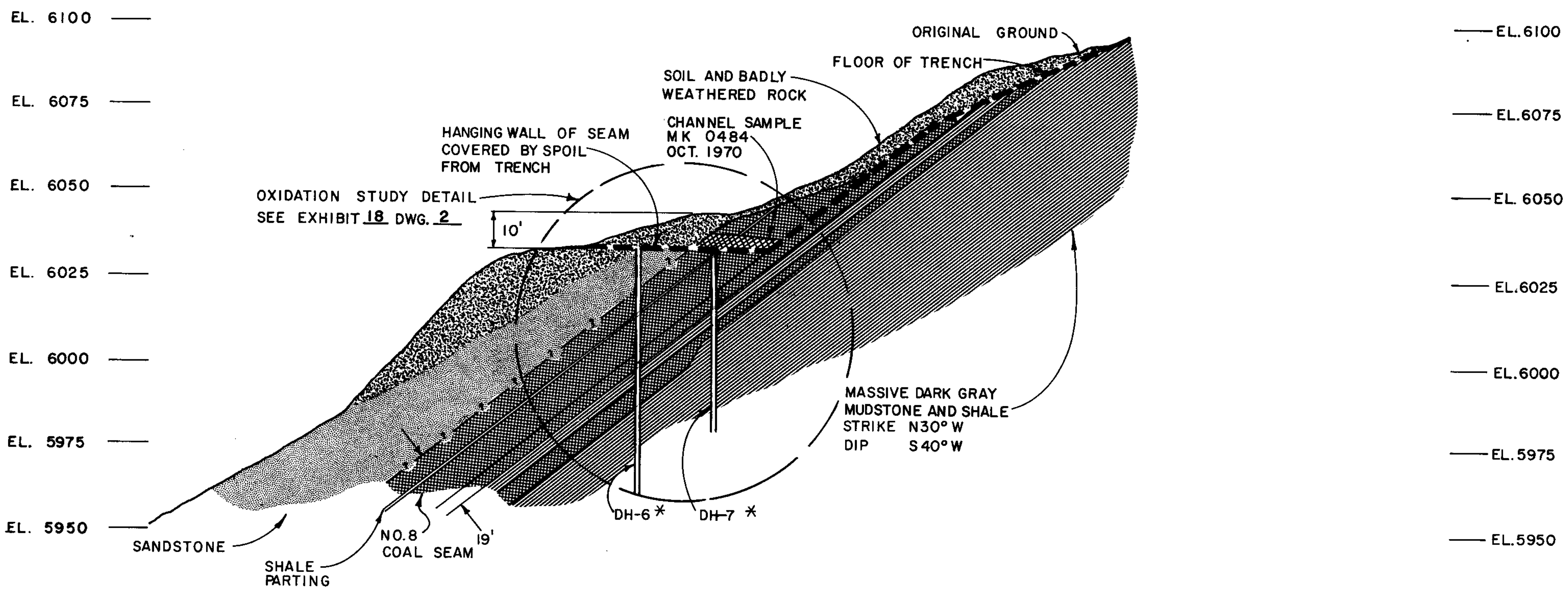


NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NOS. 12 AND 13
K-ELK RIVER 70(2)B.

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T – 70 – 1
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 1

EXHIBIT NO. 8

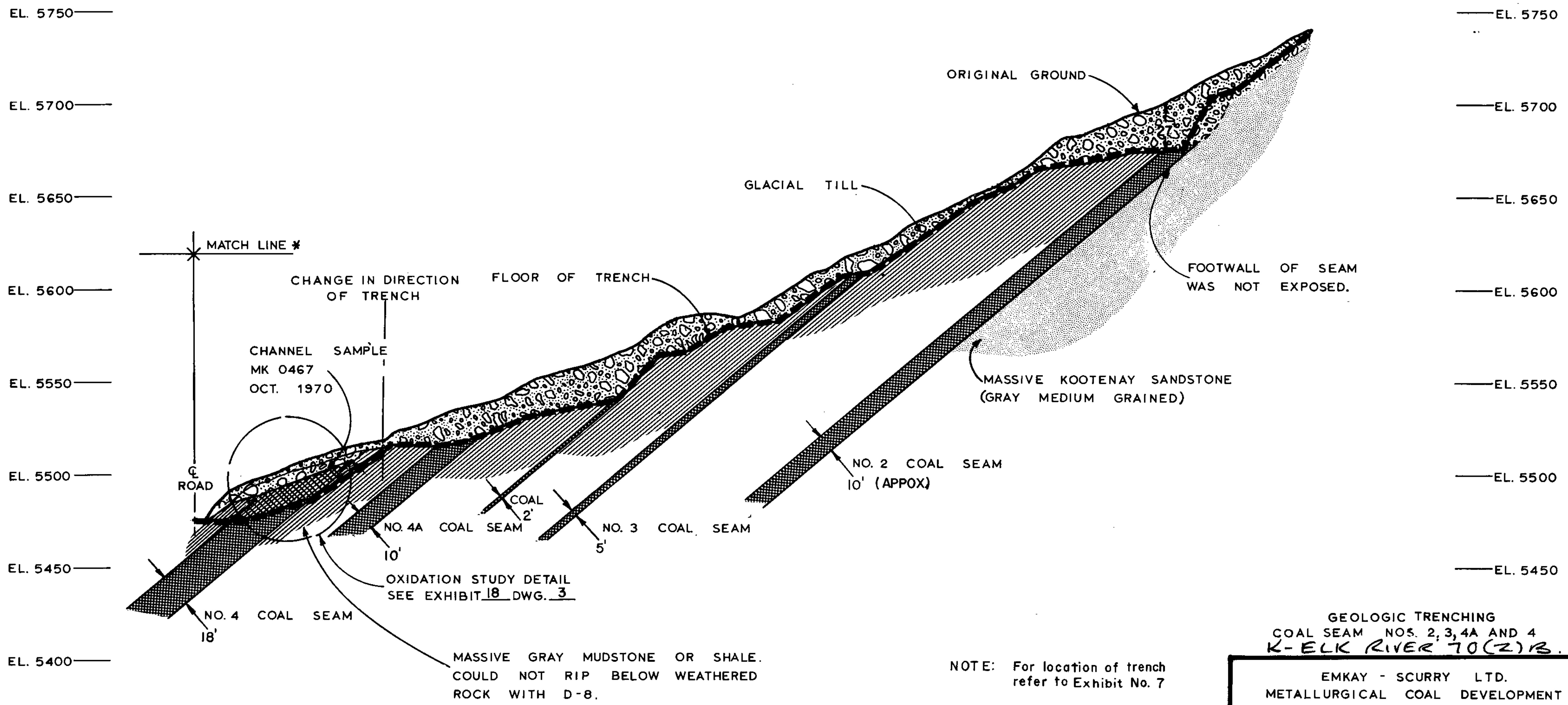


NOTE: For location of trench refer to Exhibit No. 7
* DH-6 & 7 were drilled to obtain oxidation data.

GEOLOGIC TRENCHING
COAL SEAM NO. 8
K- ELK RIVER 70 (2) B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 2
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 2

EXHIBIT NO. 8



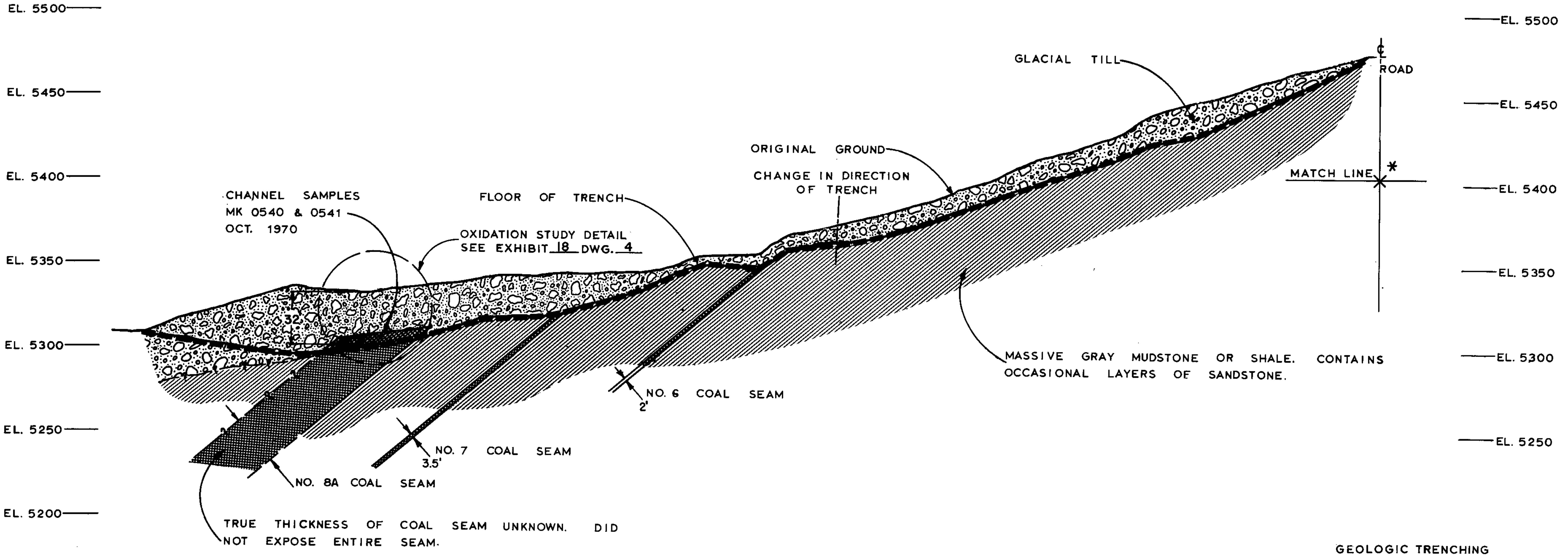
NOTE: For location of trench refer to Exhibit No. 7

* Lower portion of T-70-3 shown in Exhibit. 8 Dwg. 4

GEOLOGIC TRENCHING
COAL SEAM NOS. 2, 3, 4A AND 4
K-ELK RIVER 70(2)B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
UPPER PORTION T-70-3
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DPWG. NO. 3

EXHIBIT NO. 8



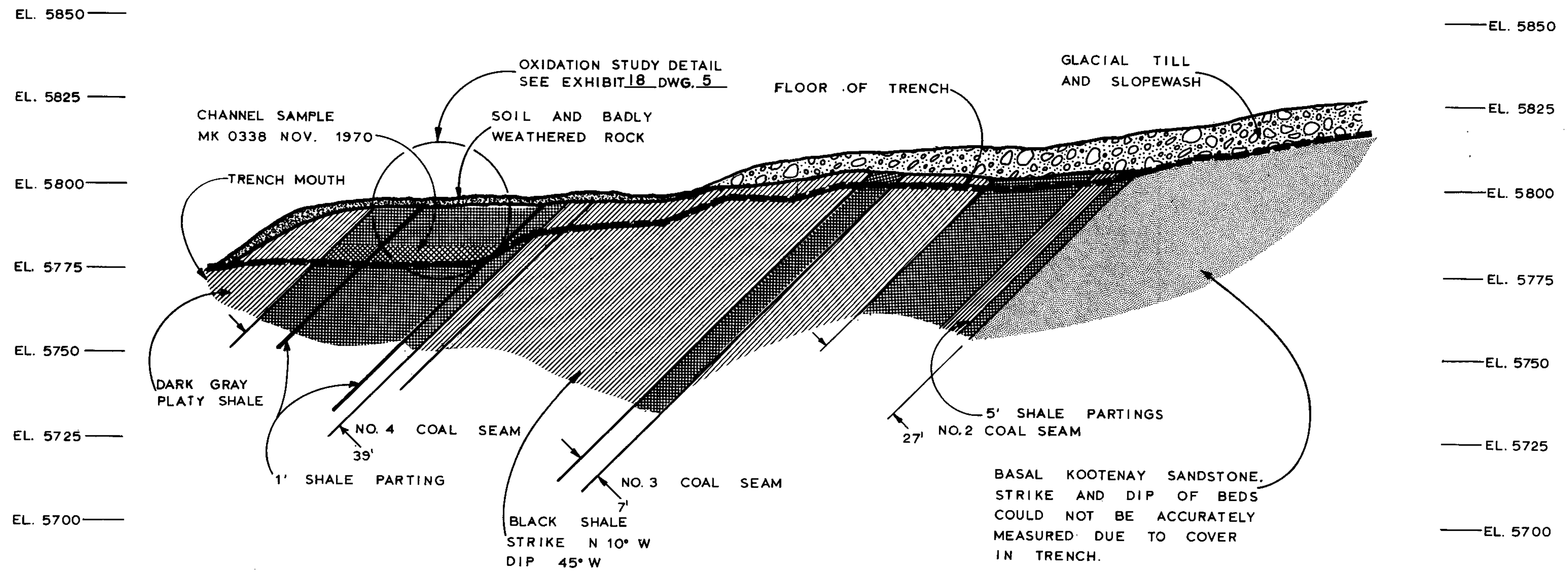
NOTE: For location of trench refer to Exhibit No. 7

*Upper portion of T-70-3 shown in Exhibit 8 Dwg. 3

GEOLOGIC TRENCHING
COAL SEAM NOS. 6, 7 AND 8A
K-ELK RIVER 70(2)B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
EXPLORATORY TRENCH
LOWER PORTION T - 70 - 3
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 4

EXHIBIT NO. 8

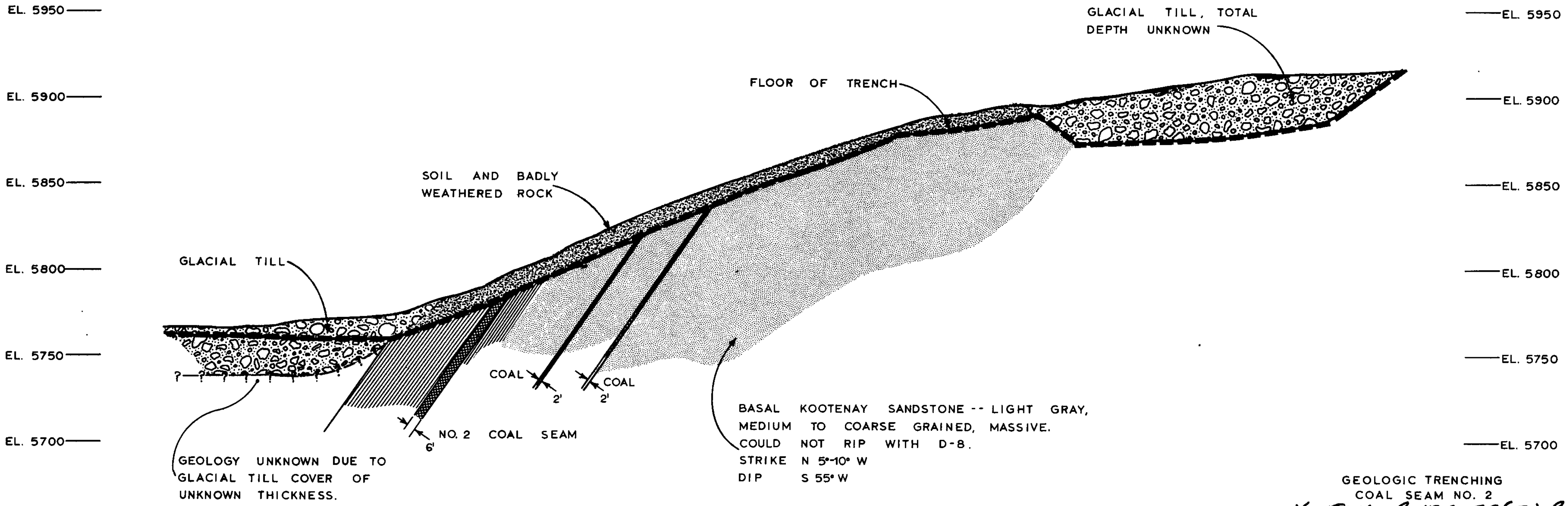


GEOLOGIC TRENCHING
COAL SEAM NOS. 2, 3 AND 4
K-ELK RIVER 70(2)B.

NOTE: For location of trench refer to Exhibit No 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 4
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 5

EXHIBIT NO. 8



GEOLOGIC TRENCHING
COAL SEAM NO. 2
K-ELK RIVER 70(2)B.

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 6
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 6

EXHIBIT NO. 8

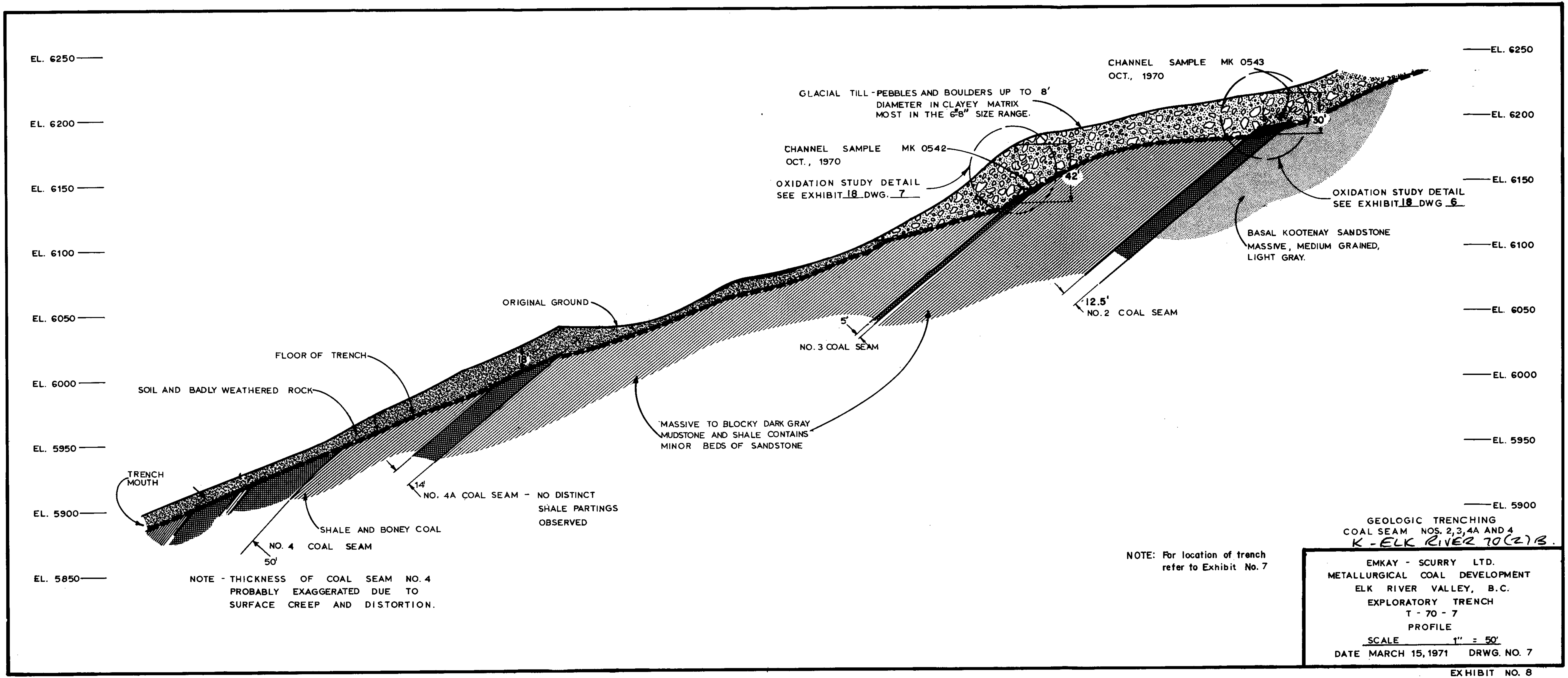
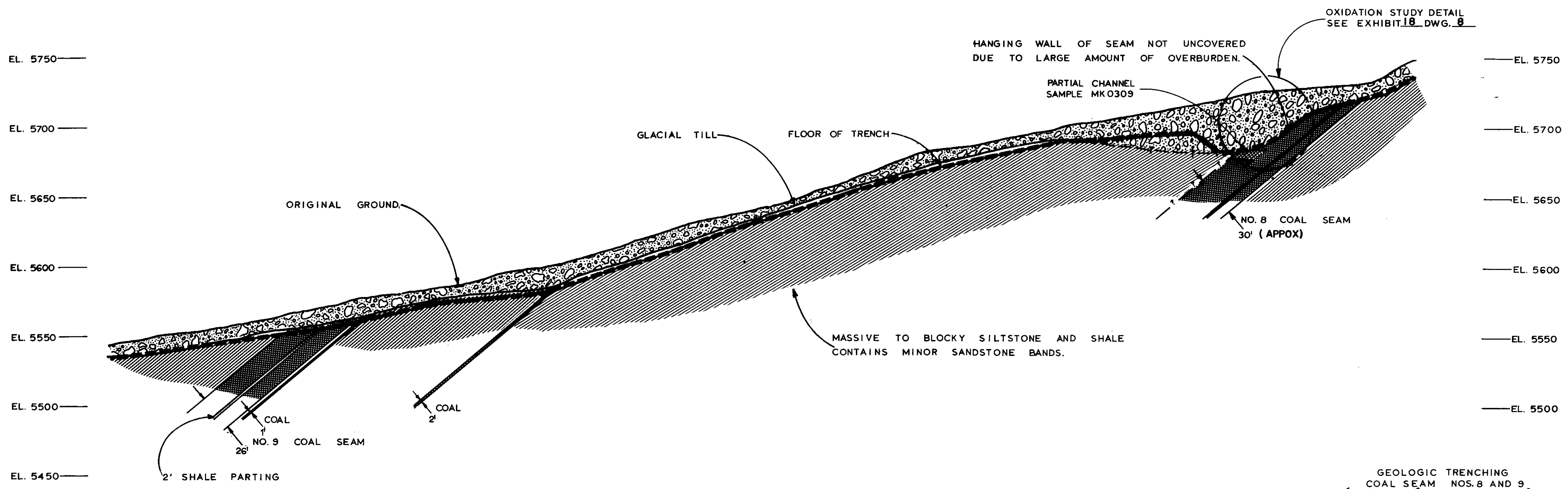

EL. 6250
EL. 6200
EL. 6150
EL. 6100
EL. 6050
EL. 6000
EL. 5950
EL. 5900
EL. 5850
CHANNEL SAMPLE MK 0543
OCT., 1970
GLACIAL TILL - PEBBLES AND BOULDERS UP TO 8' DIAMETER IN CLAYEY MATRIX MOST IN THE 6-8" SIZE RANGE.
CHANNEL SAMPLE MK 0542
OCT., 1970
OXIDATION STUDY DETAIL SEE EXHIBIT 18 DWG. 7
30'
42'
OXIDATION STUDY DETAIL SEE EXHIBIT 18 DWG 6
BASAL KOOTENAY SANDSTONE MASSIVE, MEDIUM GRAINED, LIGHT GRAY.
12.5'
NO. 2 COAL SEAM
ORIGINAL GROUND
5'
NO. 3 COAL SEAM
FLOOR OF TRENCH
18'
SOIL AND BADLY WEATHERED ROCK
MASSIVE TO BLOCKY DARK GRAY MUDSTONE AND SHALE CONTAINS MINOR BEDS OF SANDSTONE
TRENCH MOUTH
14'
NO. 4A COAL SEAM - NO DISTINCT SHALE PARTINGS OBSERVED
SHALE AND BONEY COAL
NO. 4 COAL SEAM
50'
NOTE - THICKNESS OF COAL SEAM NO. 4 PROBABLY EXAGGERATED DUE TO SURFACE CREEP AND DISTORTION.
GEOLOGIC TRENCHING
COAL SEAM NOS. 2, 3, 4A AND 4
K - ELK RIVER 70(2)B.
NOTE: For location of trench refer to Exhibit No. 7
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 7
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 7

EXHIBIT NO. 8

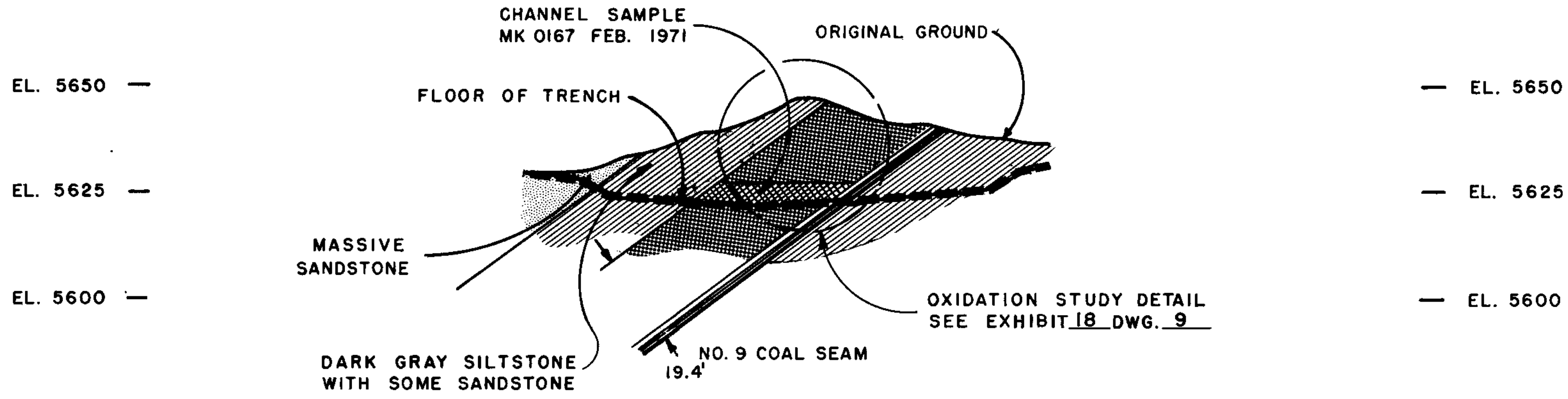


GEOLOGIC TRENCHING
COAL SEAM NOS. 8 AND 9
K-ELK RIVER 70(2)B.

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-70-8
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 8

EXHIBIT NO. 8

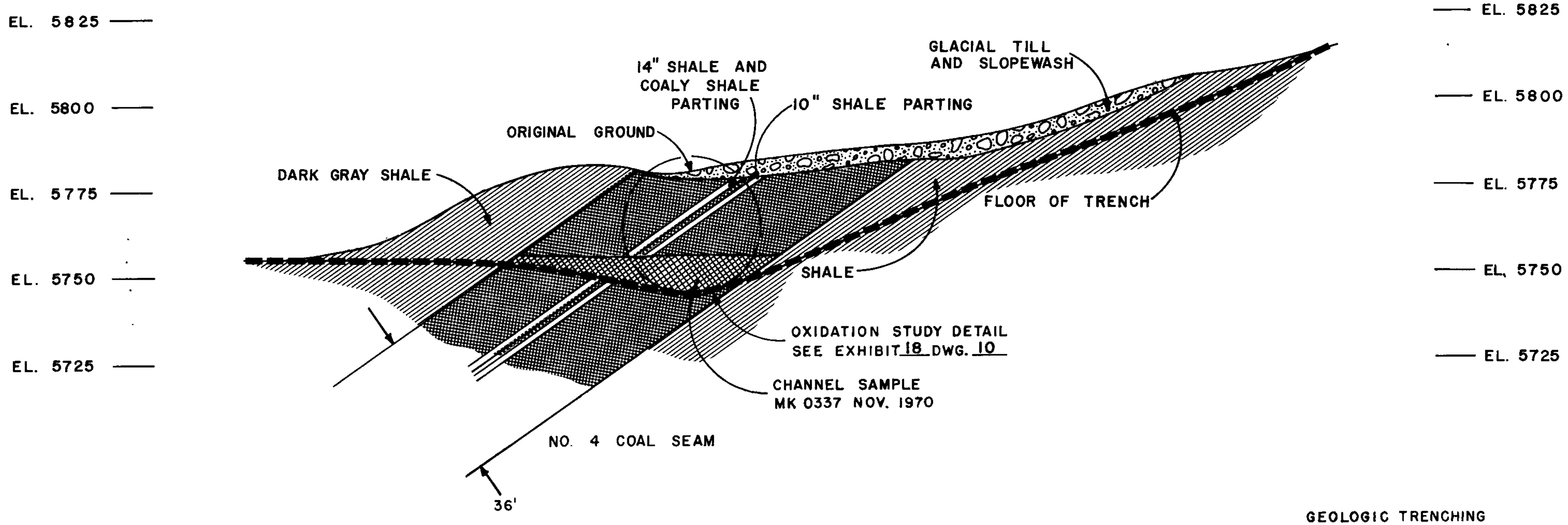


NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NO. 9
K-ELK RIVER 70(2)B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 9
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 9

EXHIBIT NO. 8



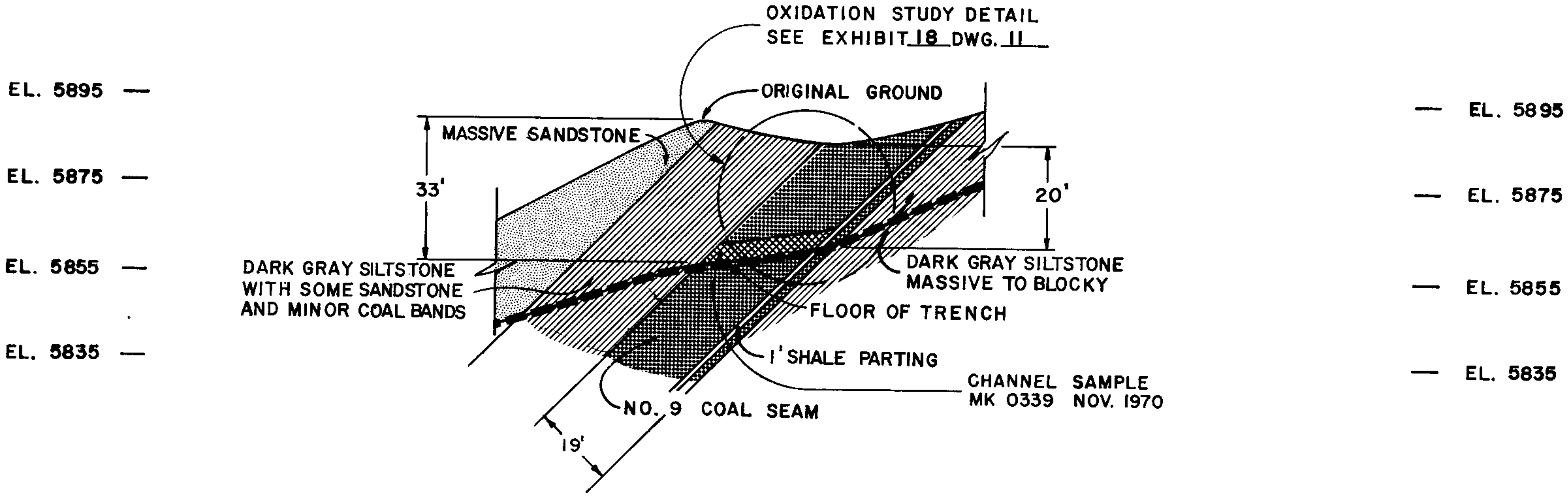
GEOLOGIC TRENCHING
COAL SEAM NO. 4

K - ELK RIVER 70(2)B.

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 10
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 10

EXHIBIT NO. 8

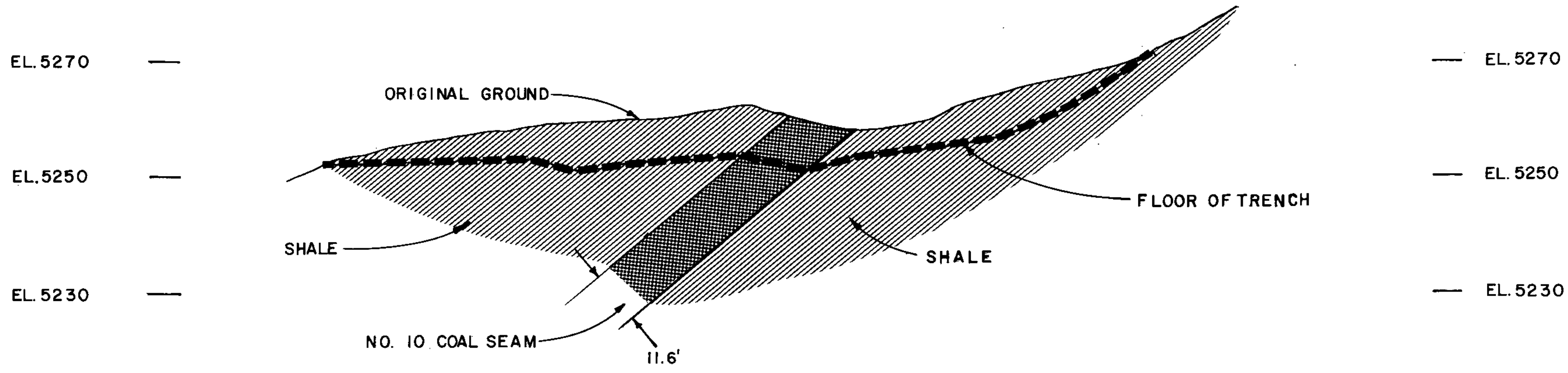


NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NO. 9
K-ELK RIVER 70(2)B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 11
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 11

EXHIBIT NO. 8

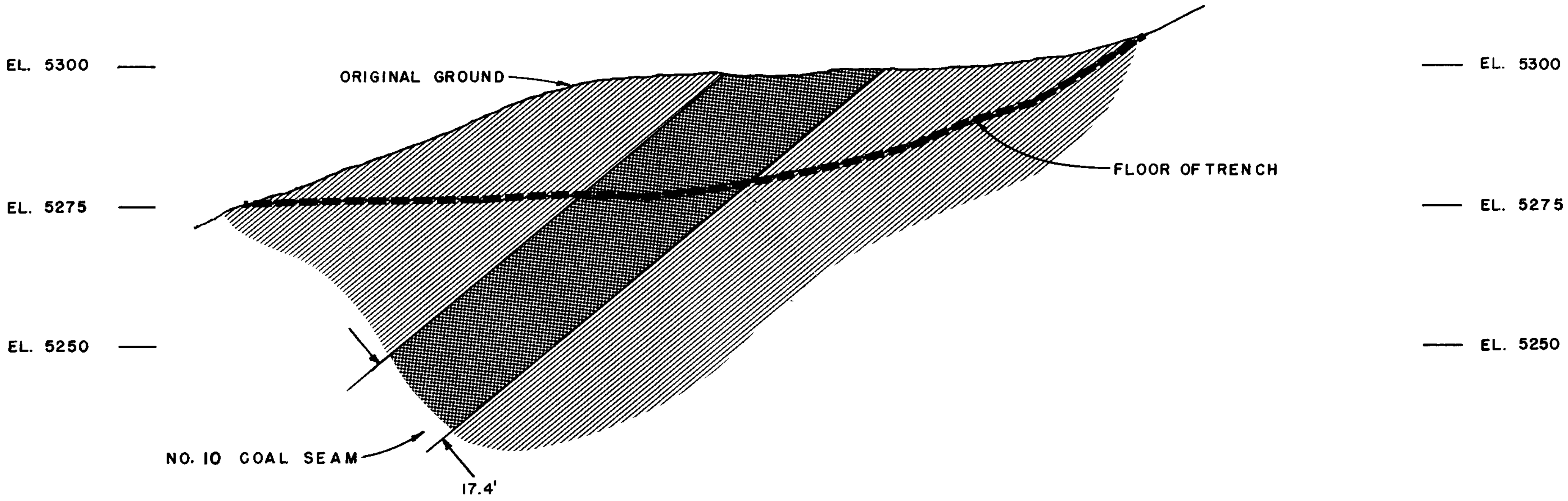


NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NO. 10
K- ELK RIVER 70 (2) B.

EMKAY - SCURRY LTD
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
EXPLORATORY TRENCH
T - 70 - 12
PROFILE
SCALE 1" = 20'
DATE MARCH 15, 1971 DRWG. NO. 12

EXHIBIT NO. 8

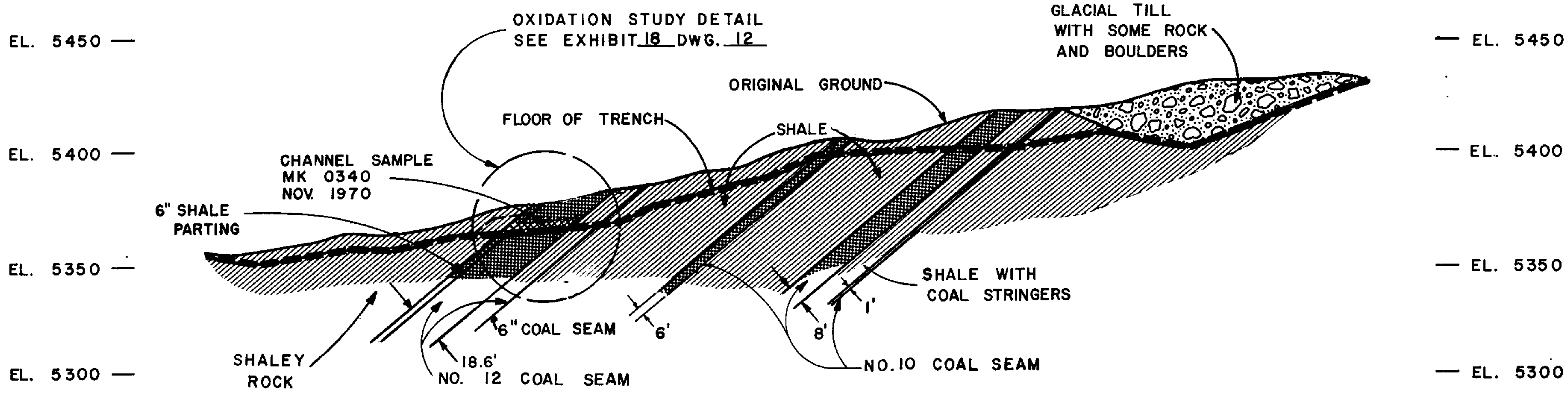


NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NO. 10
K-ELK RIVER 70(2) B.

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T – 70 – 13
PROFILE
SCALE 1" = 20'
DATE MARCH 15, 1971 DRWG. NO. 13

EXHIBIT NO. 8



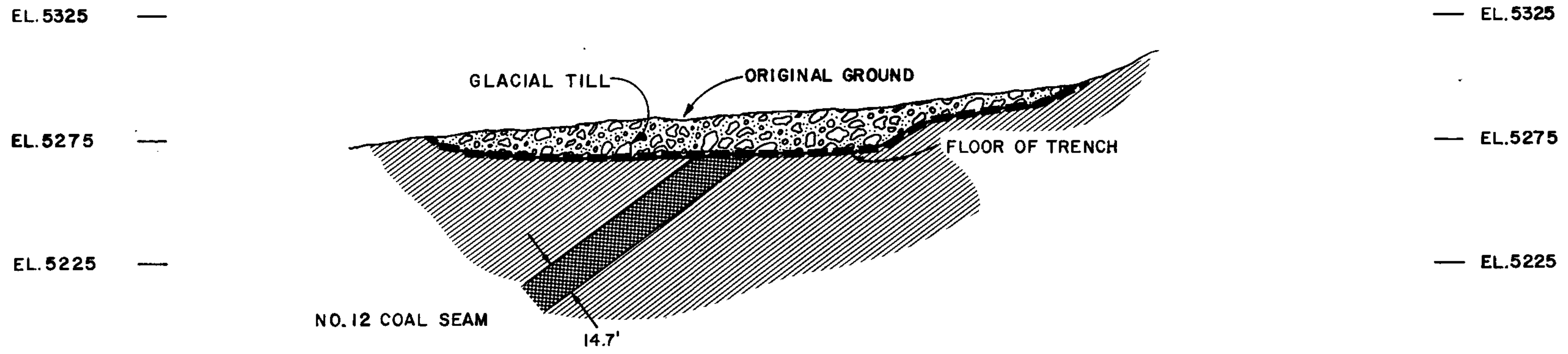
GEOLOGIC TRENCHING
COAL SEAM NOS. 10 AND 12

K-ELK RIVER 70(2)B.

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 14
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 14

EXHIBIT NO. 8

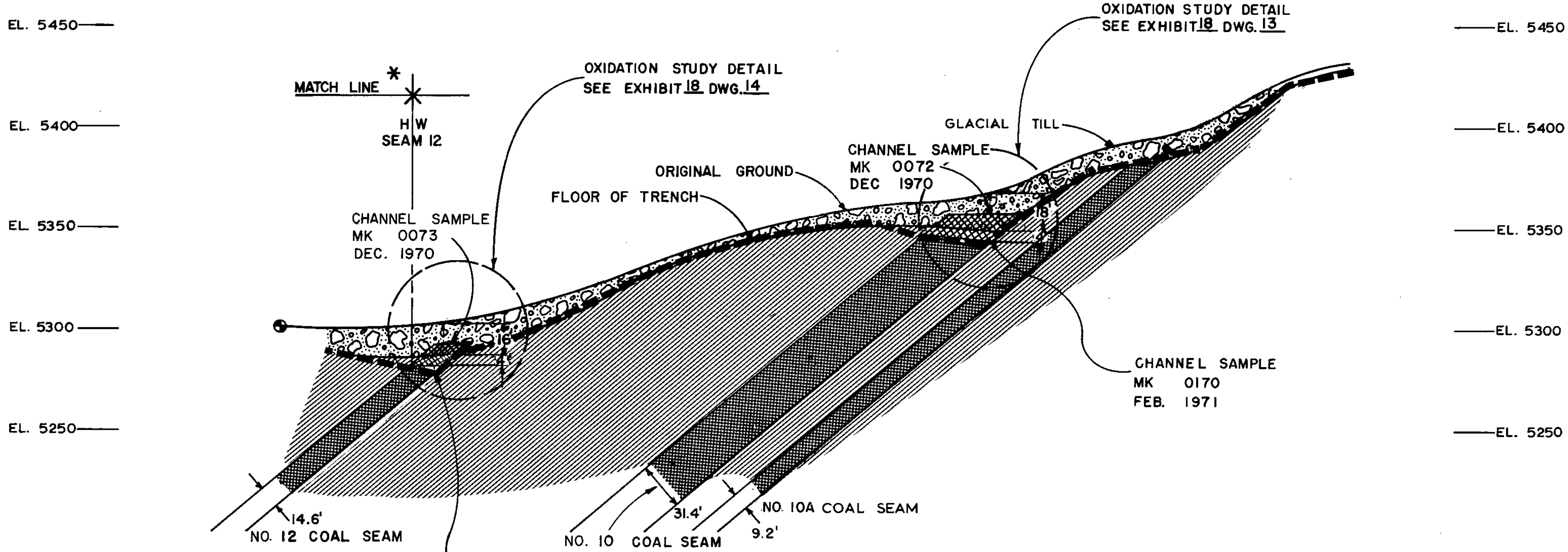


GEOLOGIC TRENCHING
COAL SEAM NO. 12
K-ELK RIVER 70(2)B.

NOTE: For location of trench refer to Exhibit No. 7

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK - RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 15
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 15

EXHIBIT NO. 8



NOTE: For location of trench refer to Exhibit No. 7

* Lower portion of T-70-16 shown in Exhibit 8 Dwg. 17

GEOLOGIC TRENCHING
COAL SEAM NOS. 10A, 10 AND 12
K- ELK RIVER 70(2)B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
UPPER PORTION T-70-16
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 16

EXHIBIT NO. 8

K-ELK RIVER 70(2)B. EXHIBIT NO. 8

GEOLOGIC TRENCHING
COAL SEAM NOS. 16,17, & 18

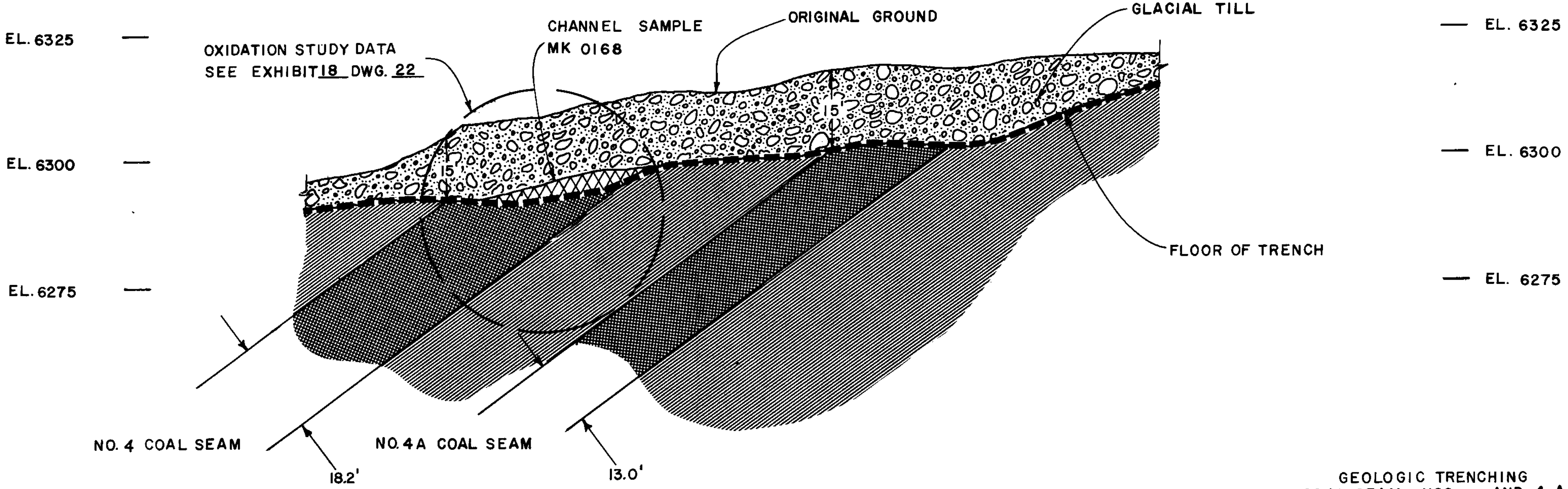
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

EXPLORATORY TRENCH
T - 71 - 17
PROFILE

SCALE 1" = 50'

DATE: MARCH 15, 1971 DRWG. NO. 18

K-ELK RIVER 70(2)B EXHIBIT NO. 8

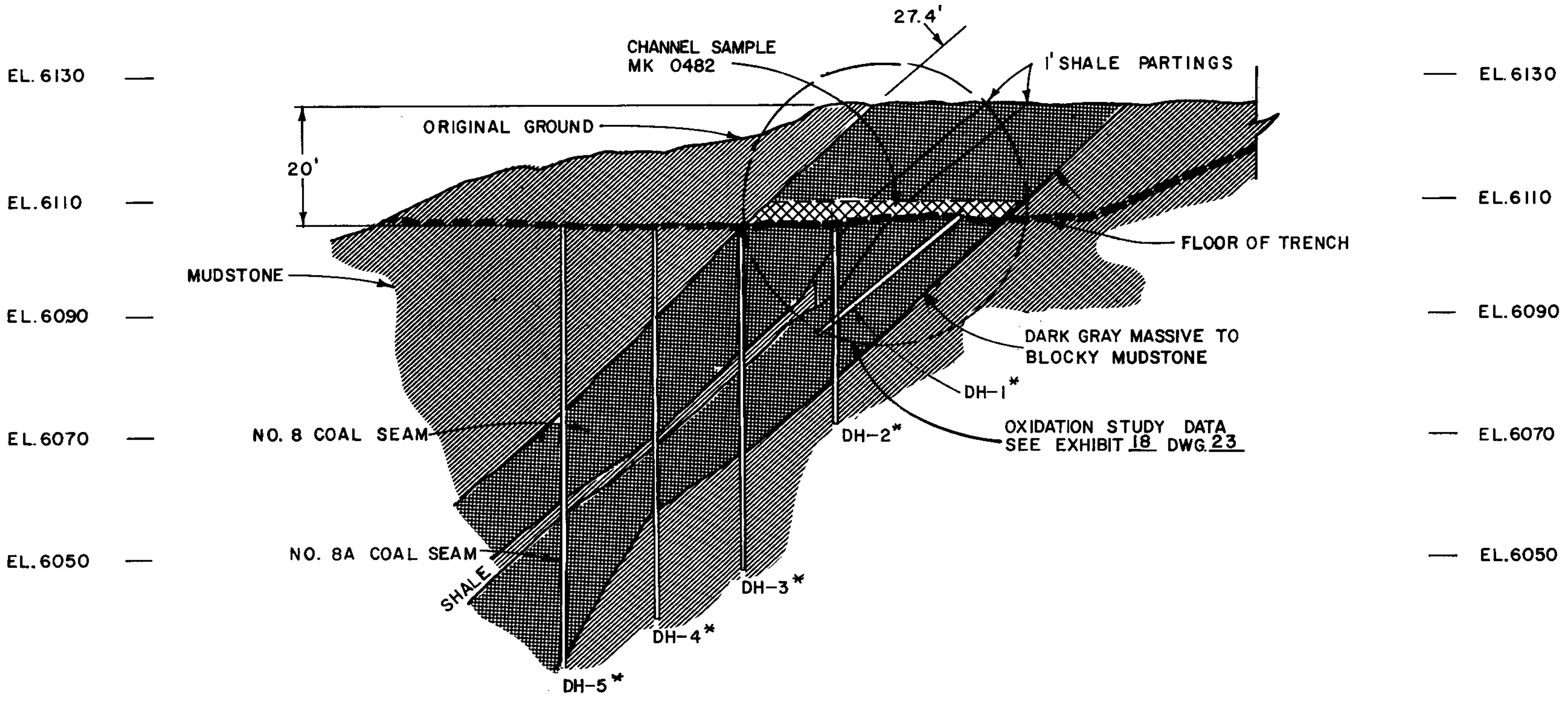


NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NOS. 4 AND 4 A
K-ELK RIVER 70(2)B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - SR - 3
PROFILE
SCALE 1" = 20'
DATE MARCH 15, 1971 DRWG. NO. 19

EXHIBIT NO. 8



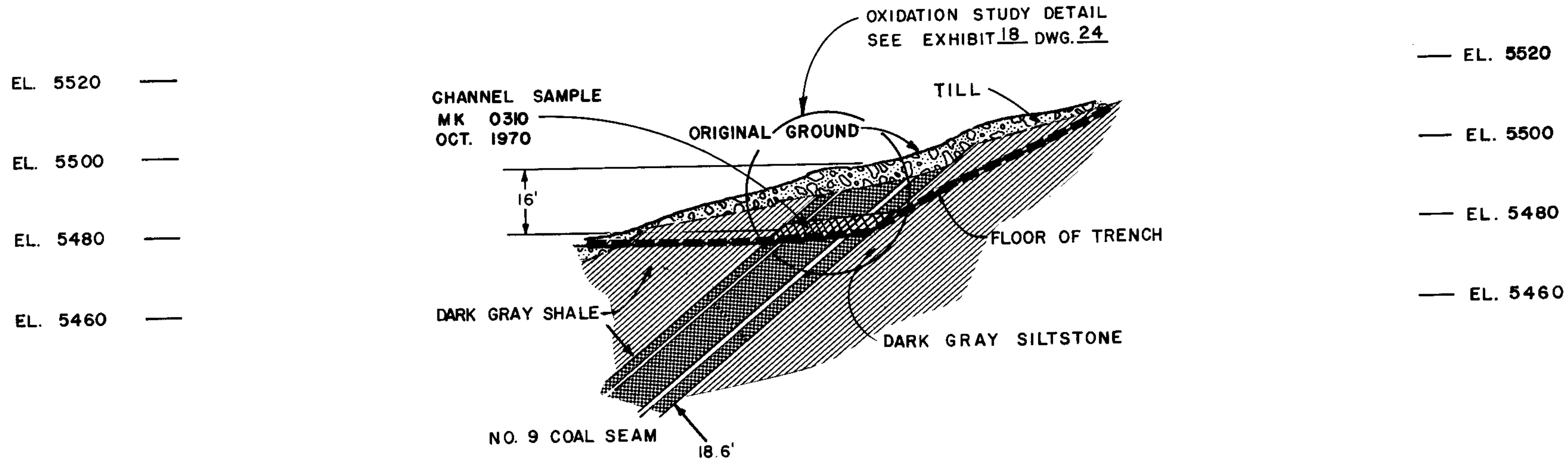
NOTE: For location of trench refer to Exhibit No. 7

* DH1 – DH5 were drilled to obtain oxidation data.

GEOLOGIC TRENCHING
COAL SEAM NOS. 8 AND 8A
K-ELK RIVER 70(2)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T – SR – 4
PROFILE
SCALE 1" = 20'
DATE MARCH 15, 1971 DRWG. NO. 20

EXHIBIT NO. 8



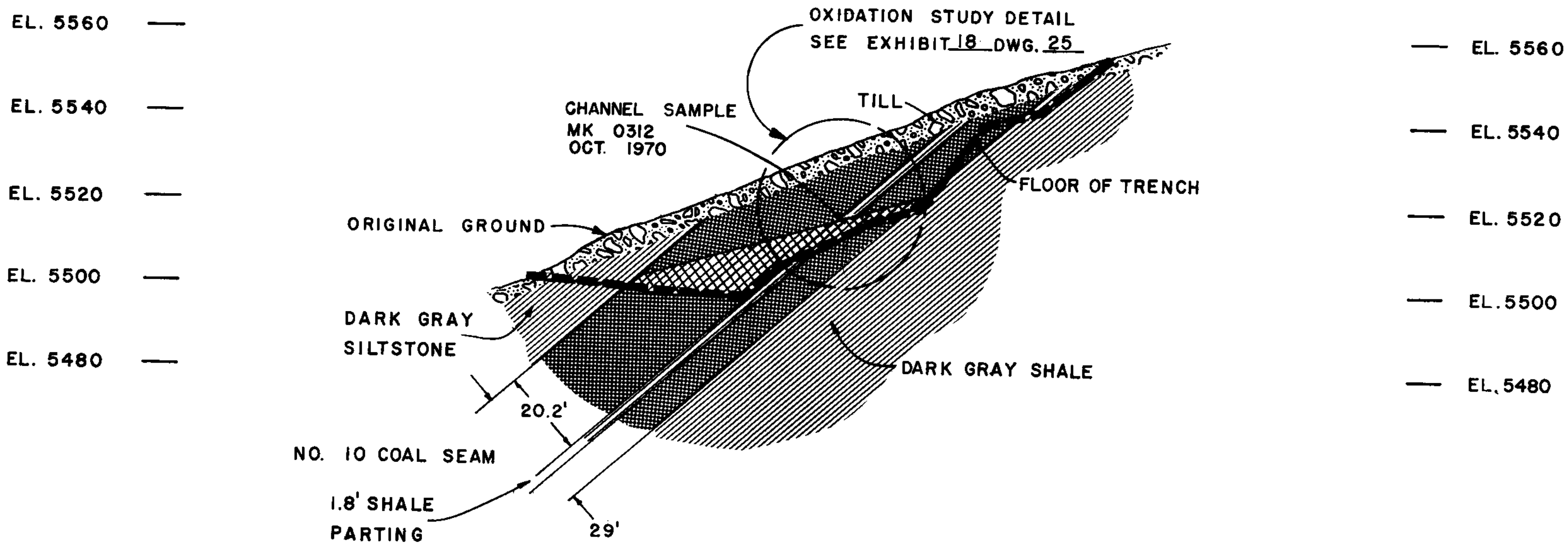
NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NO. 9

K-ELK RIVER 70(2)B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-SR-5
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 21

EXHIBIT NO. 8

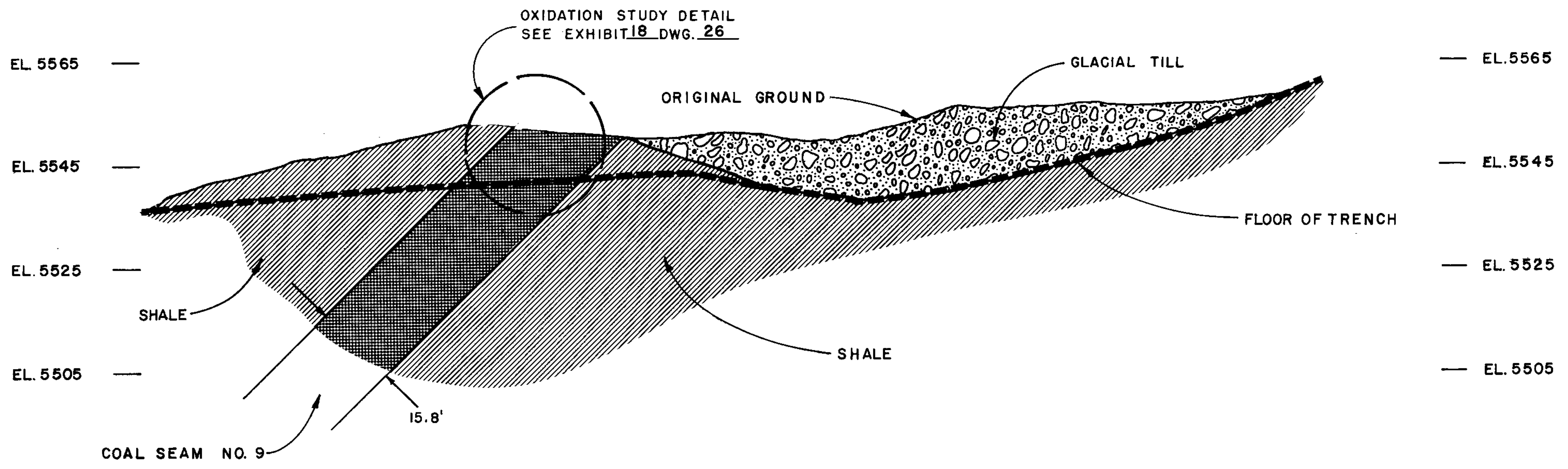


NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NO.10
K-ELK RIVER 70(2)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - SR - 6
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 22

EXHIBIT NO. 8



NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NO. 9

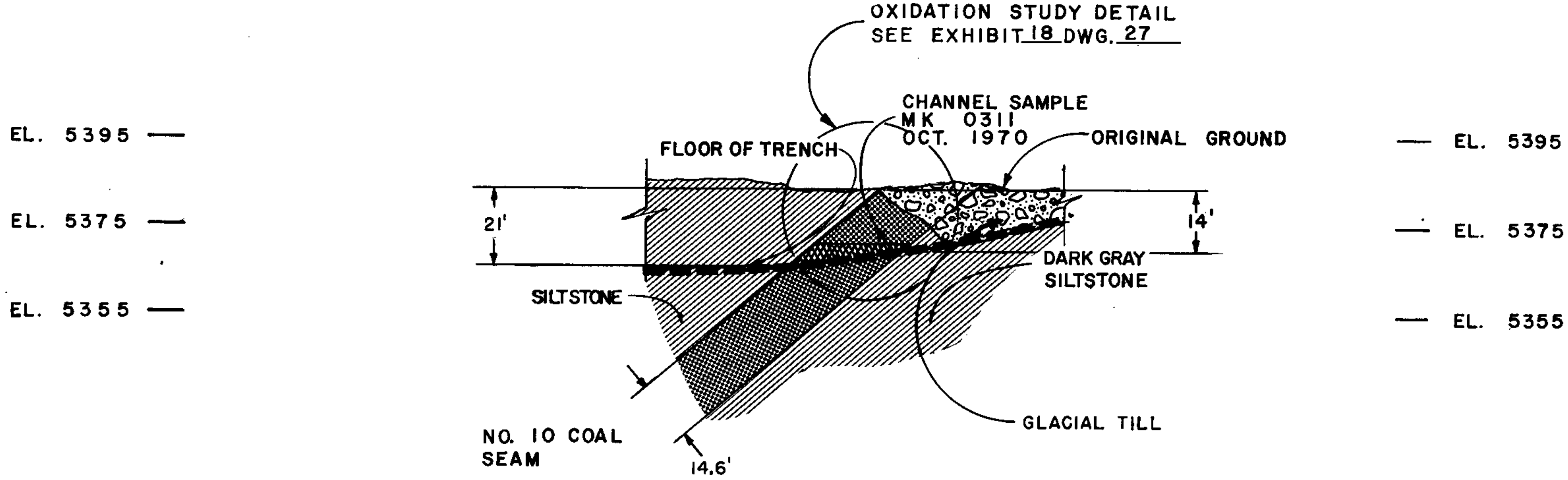
K-ELK RIVER 70 (2) B.

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T – SR – 12
PROFILE

SCALE 1" = 20'

DATE MARCH 15, 1971 DRWG. NO. 23

EXHIBIT NO. 8

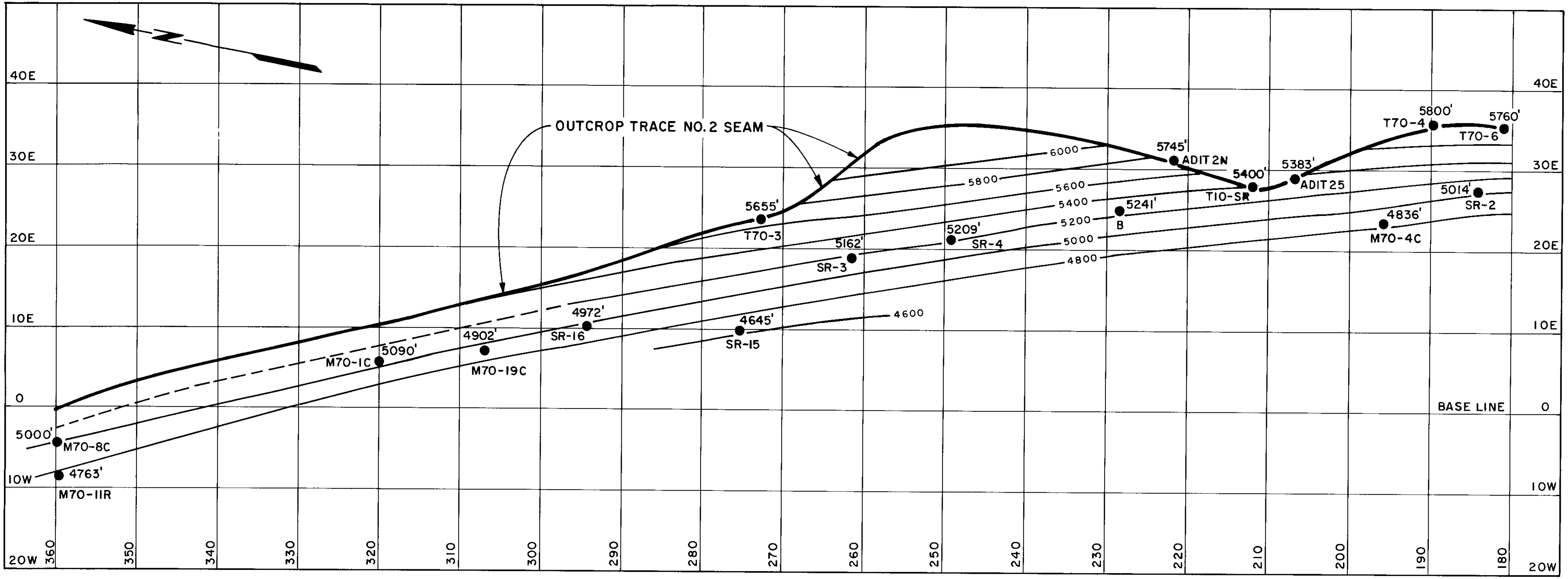


NOTE: For location of trench refer to Exhibit No. 7

GEOLOGIC TRENCHING
COAL SEAM NO. 10
K-ELK RIVER 70(2)B.

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-SR-13
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 24

EXHIBIT NO. 8



K-ELK RIVER 70(2)B.

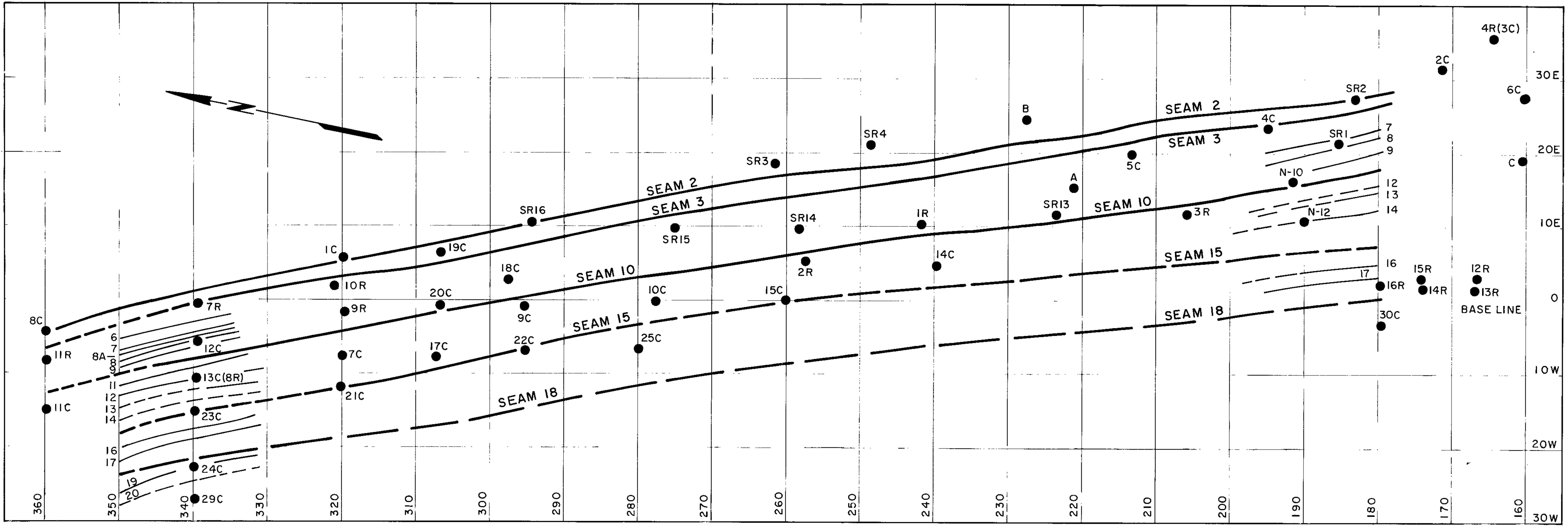
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.

STRUCTURAL CONTOUR MAP
NO. 2 COAL SEAM FOOTWALL

SCALE: 0 500 1000 2000 FEET

DATE: MARCH 1, 1971 DRWG. NO. 1

EXHIBIT NO. 9



K-ELK RIVER 70(3)A

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.

COAL SEAM TRACE MAP AT 5000 FOOT ELEVATION*

SCALE: 0 500 1000 2000 FEET

DATE: MARCH 1, 1971 DRWG. NO. 1

EXHIBIT NO. 10

*Plan shows footwall trace of predominant seams and relative position of intermediate seams.

RETURN TO

RTMENT OF MINES AND PETROLEUM RESOURCES

VICTORIA, BRITISH COLUMBIA

V8V 4S2

GEOLOGICAL BRANCH
ASSESSMENT REPORT

00 270

K- ELK RIVER 71(3)A-1

ELK RIVER

INTERPRETATION OF DRILL HOLE LOGS

CONFIDENTIAL

OPEN FILE

DEPT. OF MINES AND PETROLEUM RESOURCES
Rec'd JUL 2 1973

NOTE:
SEAM NUMBERS IN HOLES OUTSIDE OF INITIAL STUDY AREA (SOUTH OF STATION 180+00) WERE IDENTIFIED BY NORTH AMERICAN COAL CORP. & SCURRY-RAINBOW CO. LTD.

COAL THICKNESSES ARE VERTICAL COAL PENETRATIONS.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

INTERPRETATION OF DRILL HOLE LOGS
SEAM IDENTIFICATION AND THICKNESSES

SCALE: 0 25 75 / 10 50 100 71(3)A-1

DATE: MARCH 1, 1971 DRWG. NO. 1

EXHIBIT NO. 16

ELK RIVER COAL PROJECT
LOGS OF CORE DRILL HOLES M70-1C TO 34C

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

INTERPRETATION OF DRILL HOLE LOGS
SEAM IDENTIFICATION AND THICKNESSES

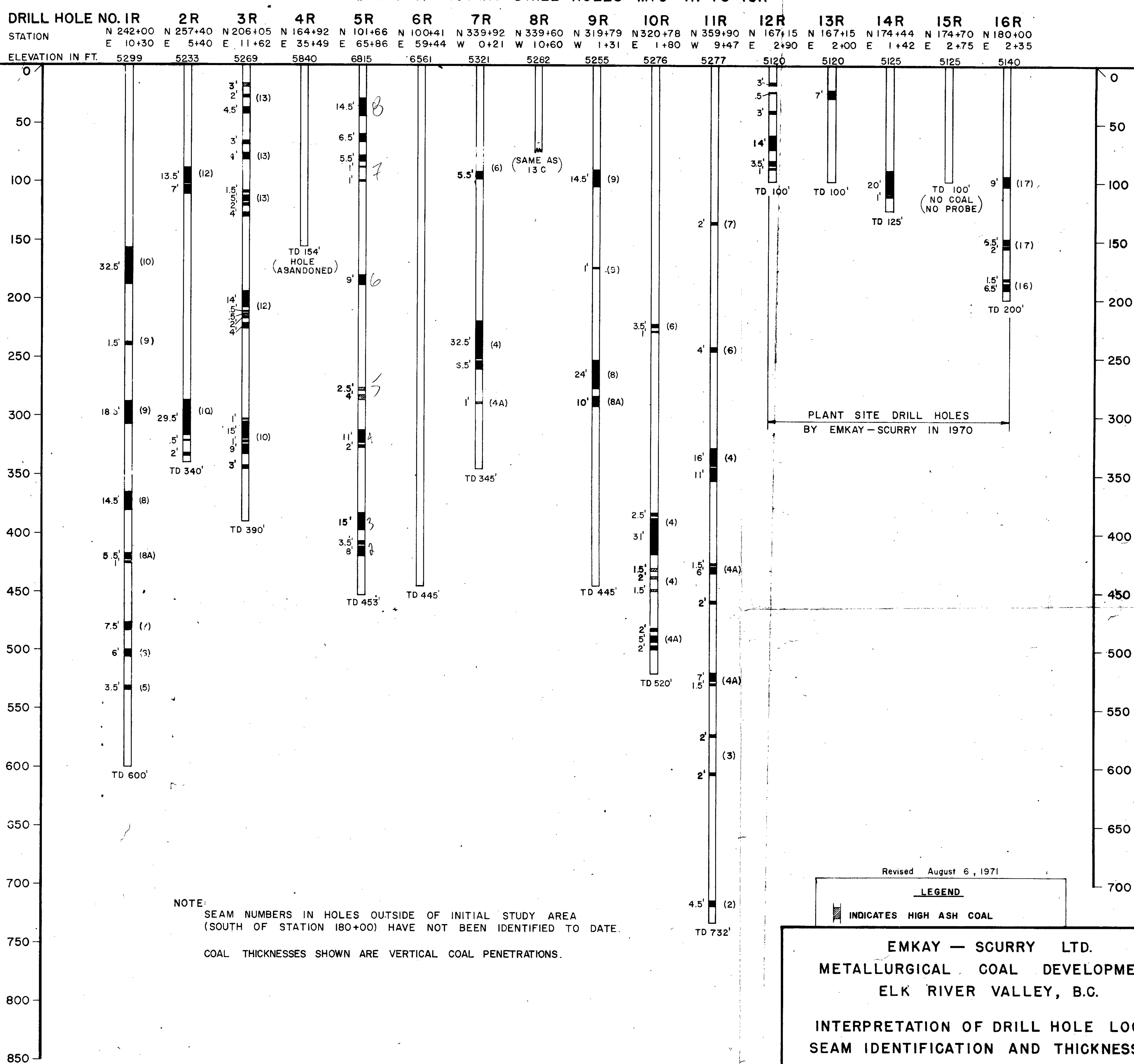
SCALE: 0 10 25 50 75 100

DATE: MARCH 1, 1971 DRWG. NO. 2

270

EXHIBIT NO. 16
71(3)4-1

ELK RIVER PROJECT
LOG OF ROTARY DRILL HOLES M70-1R TO 16R



NOTE:
SEAM NUMBERS IN HOLES OUTSIDE OF INITIAL STUDY AREA (SOUTH OF STATION 180+00) HAVE NOT BEEN IDENTIFIED TO DATE.

COAL THICKNESSES SHOWN ARE VERTICAL COAL PENETRATIONS.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

INTERPRETATION OF DRILL HOLE LOGS
SEAM IDENTIFICATION AND THICKNESSES

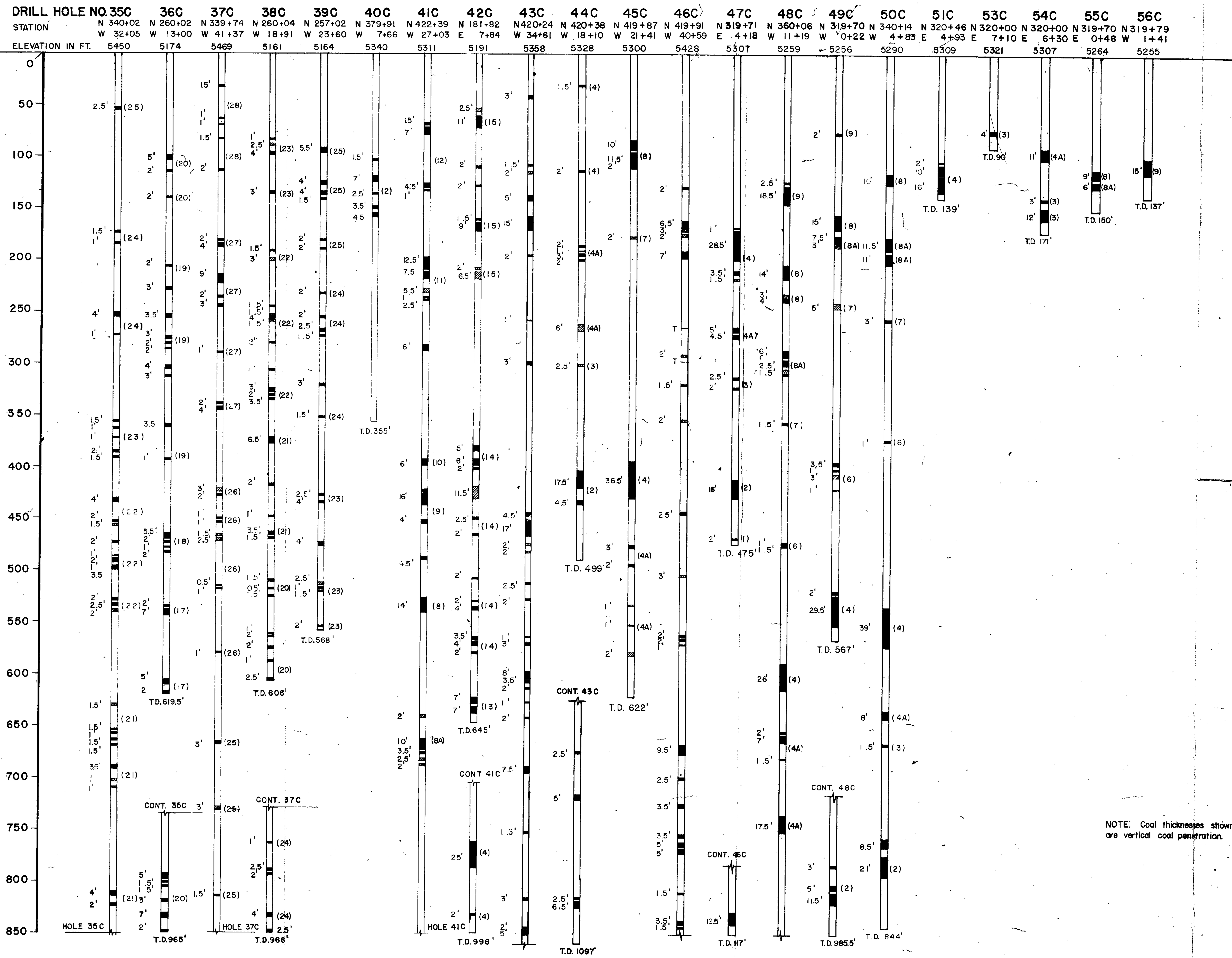
SCALE: 0 25 75 / 10 50 100

DATE: MARCH 1, 1971 DRWG. NO. 3

EXHIBIT NO. 16
71(3)A-1.

270

ELK RIVER COAL PROJECT
LOGS OF CORE DRILL HOLES M71-35C TO M71-56C



NOTE: Coal thicknesses shown are vertical coal penetration.

LEGEND
INDICATES HIGH ASH COAL

270

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

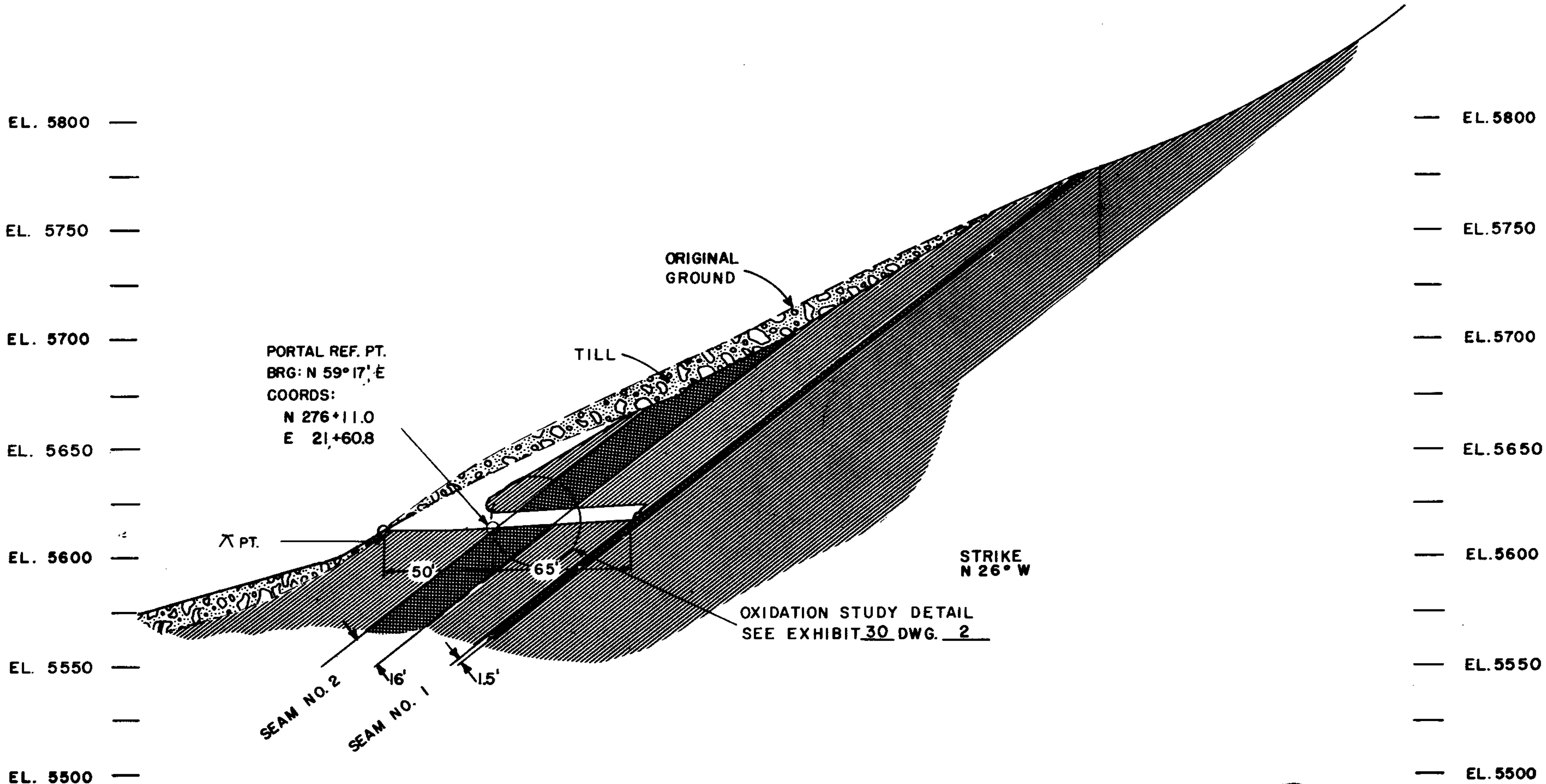
INTERPRETATION OF DRILL HOLE LOGS
SEAM IDENTIFICATION AND THICKNESSES

SCALE: 0 25 75 10 50 100

71(3)4-1

DATE: MARCH 1, 1971 DRWG. NO. 4

EXHIBIT NO. 16



PROFILE

SCALE: 1" = 50'

NOTE: For location of Rock Tunnel refer to Exhibit 7

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K-ELK RIVER 71(2)A-2

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
MORRISSON-KNUDSON TUNNEL
ROCK TUNNEL NO. 1
PROFILE

SCALE 1" = 50'

DATE: MARCH 15, 1971 DRWG. NO. 1

EXHIBIT NO. 30

RETURN TO

RTMENT OF MINES AND PETROLEUM RESOURCES

VICTORIA, BRITISH COLUMBIA

V8V 4S2

GEOLOGICAL BRANCH
ASSESSMENT REPORT

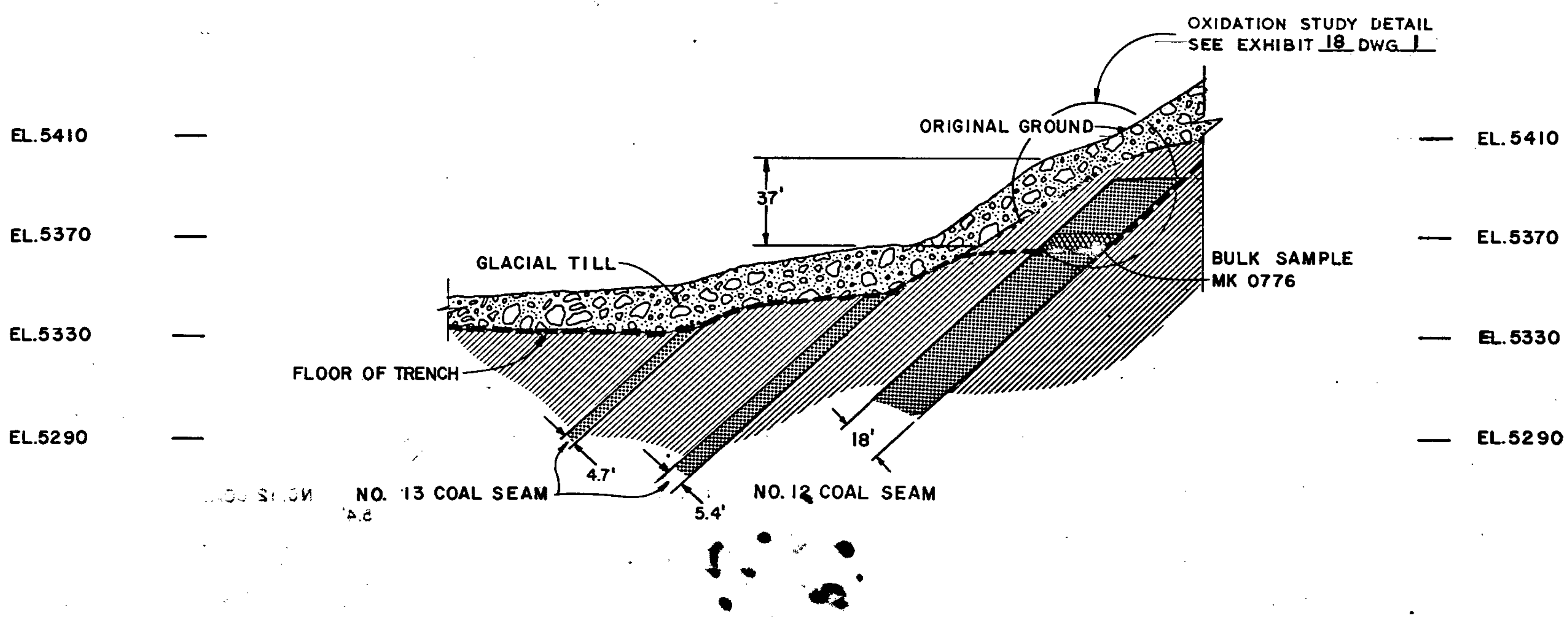
00 269

K- ELK RIVER 71 (3) A-2

ELK RIVER
TRENCHS

CONFIDENTIAL
OPEN FILE

Duplicate Trench
Information



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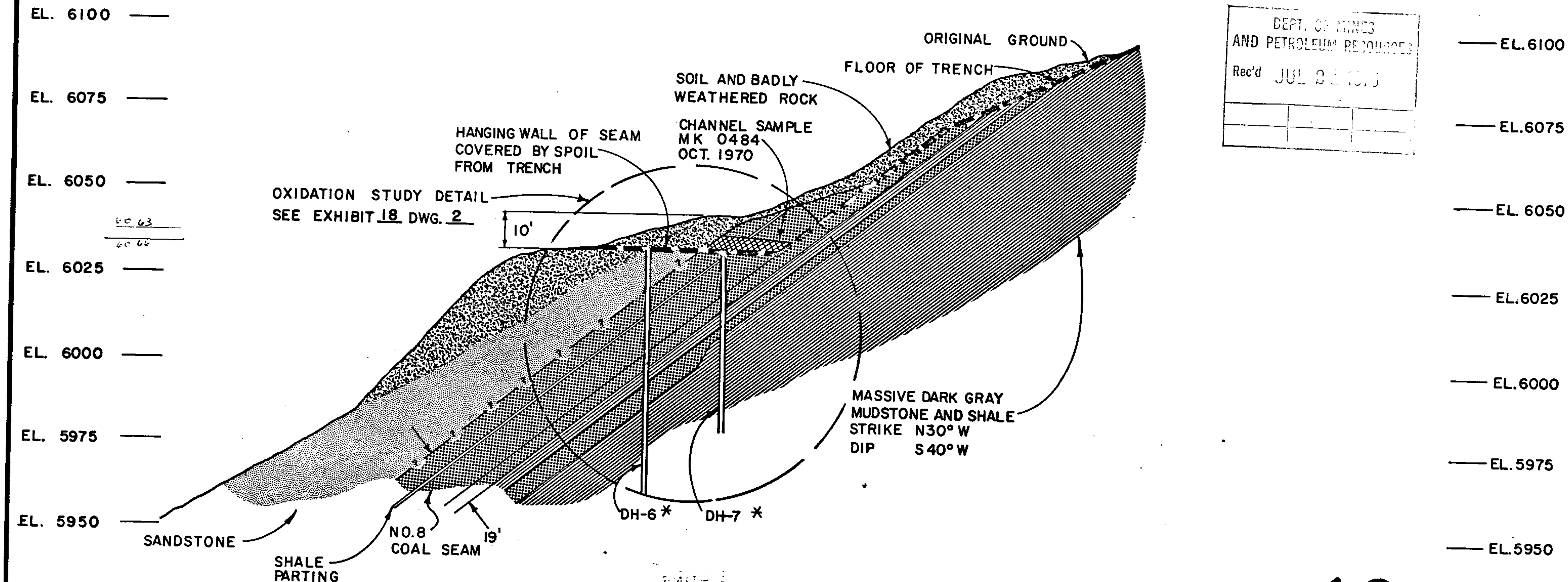
[redacted]

GEOLOGIC TRENCHING
COAL SEAM NOS. 12 AND 13

NOTE: For location of trench refer to Exhibit No. 7

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 1 71(3) A-2
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 1

EXHIBIT NO. 8



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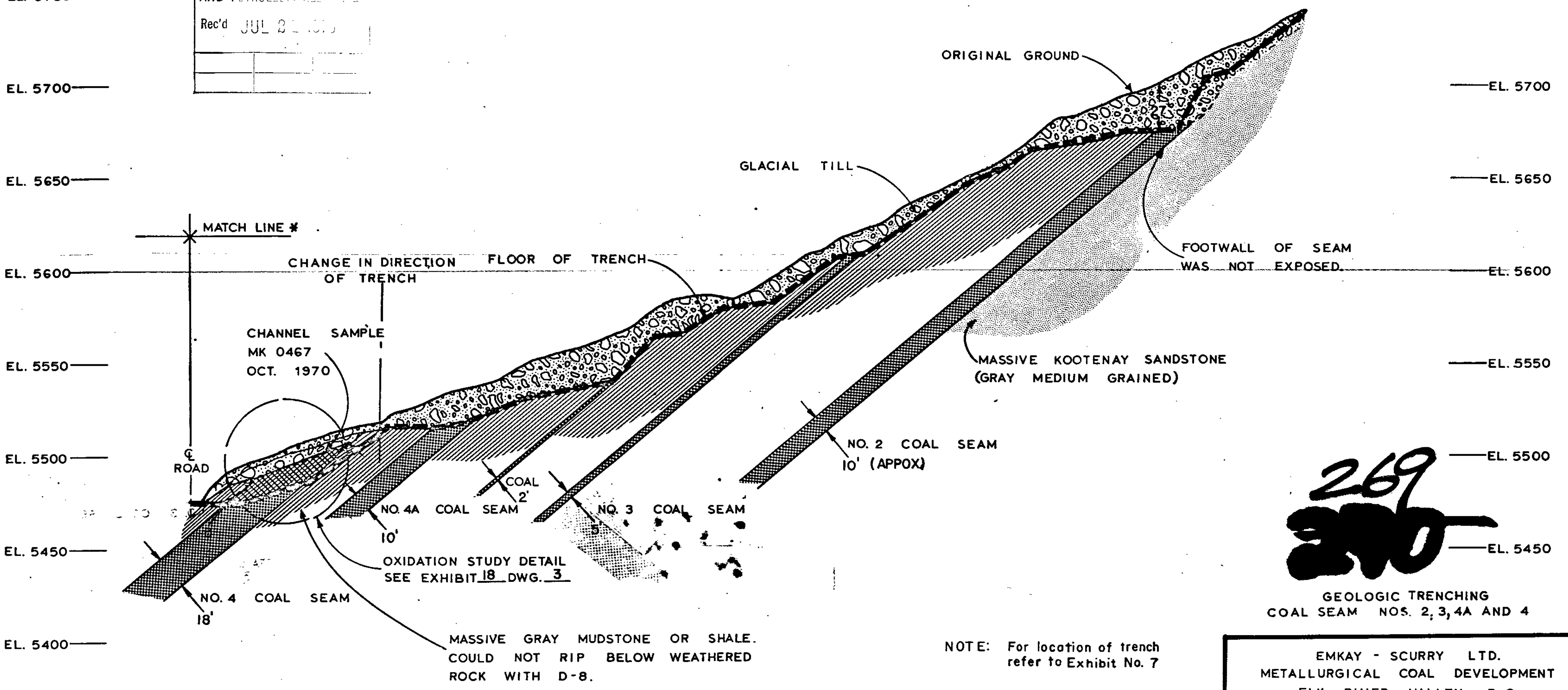
GEOLOGIC TRENCHING
COAL SEAM NO. 8

NOTE: For location of trench refer to Exhibit No. 7
* DH-6 & 7 were drilled to obtain oxidation data.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-70-2 71(3)A-2
PROFILE

SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 2

EXHIBIT NO. 8



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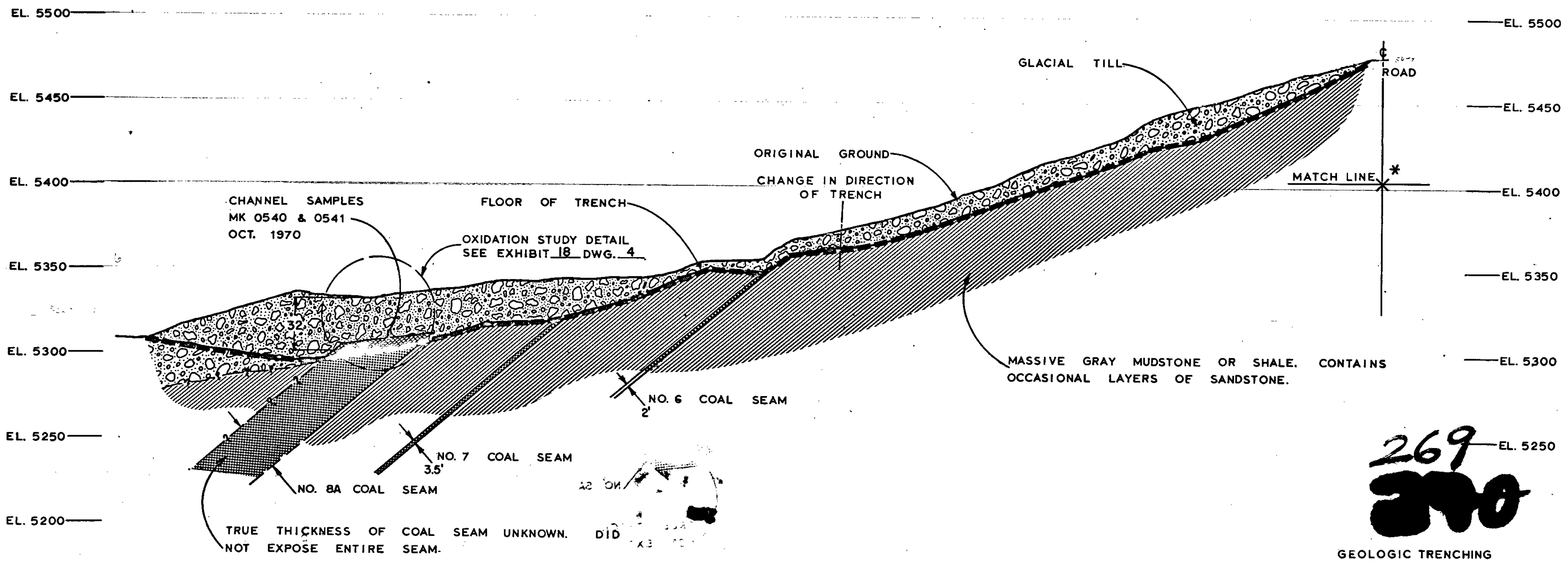
GEOLOGIC TRENCHING
COAL SEAM NOS. 2, 3, 4A AND 4

NOTE: For location of trench refer to Exhibit No. 7

* Lower portion of T-70-3 shown in Exhibit. 8 Dwg. 4

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
UPPER PORTION T-70-3
PROFILE 71(3) A-2
SCALE 1" = 50'
DATE MARCH 15, 1971 DPWG. NO. 3

EXHIBIT NO. 8



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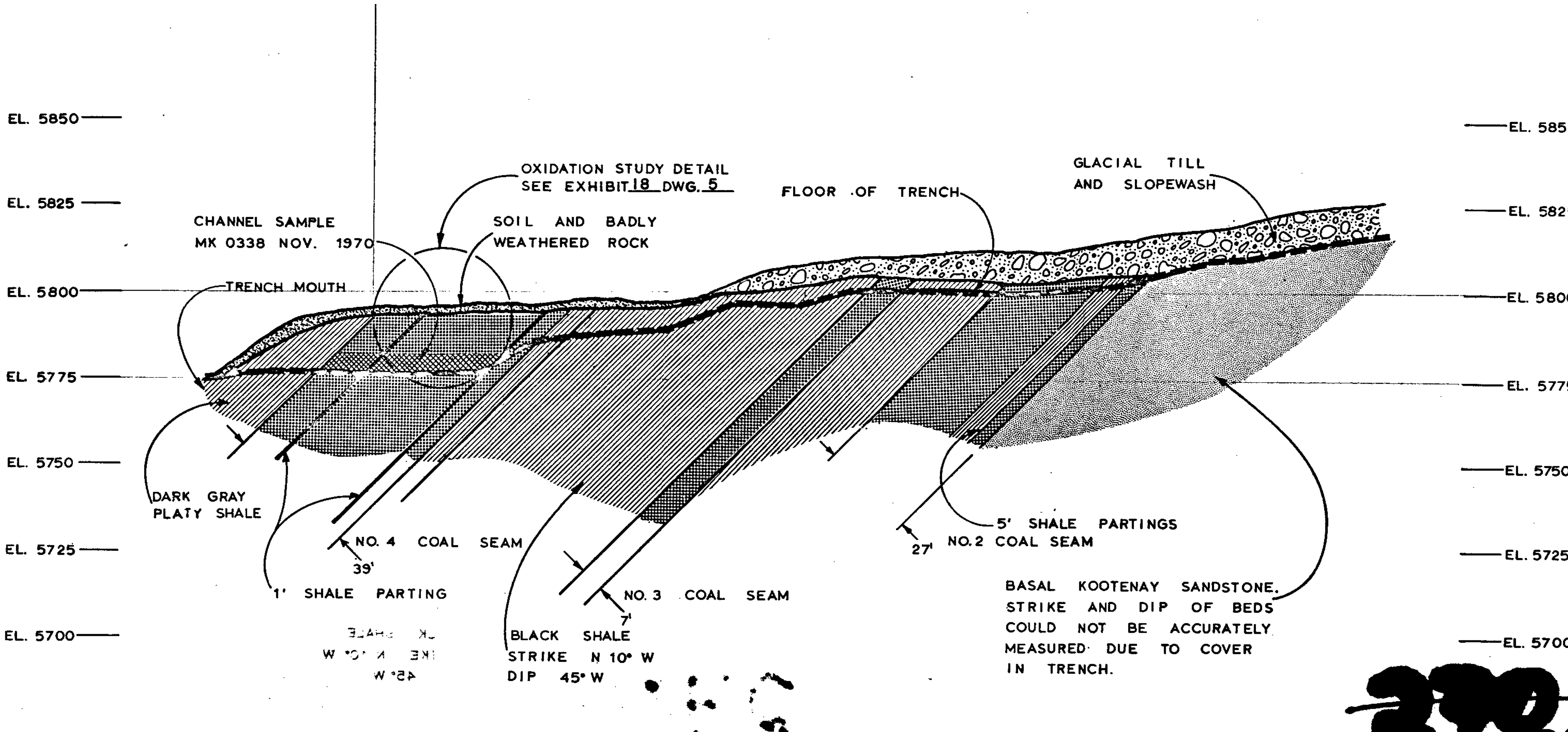
GEOLOGIC TRENCHING
COAL SEAM NOS. 6,7 AND 8A

NOTE: For location of trench refer to Exhibit No. 7

*Upper portion of T-70-3 shown in Exhibit 8 Dwg. 3

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY. B.C.
EXPLORATORY TRENCH
LOWER PORTION T-70-3
PROFILE 71(3)A-2
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 4

EXHIBIT NO. 8



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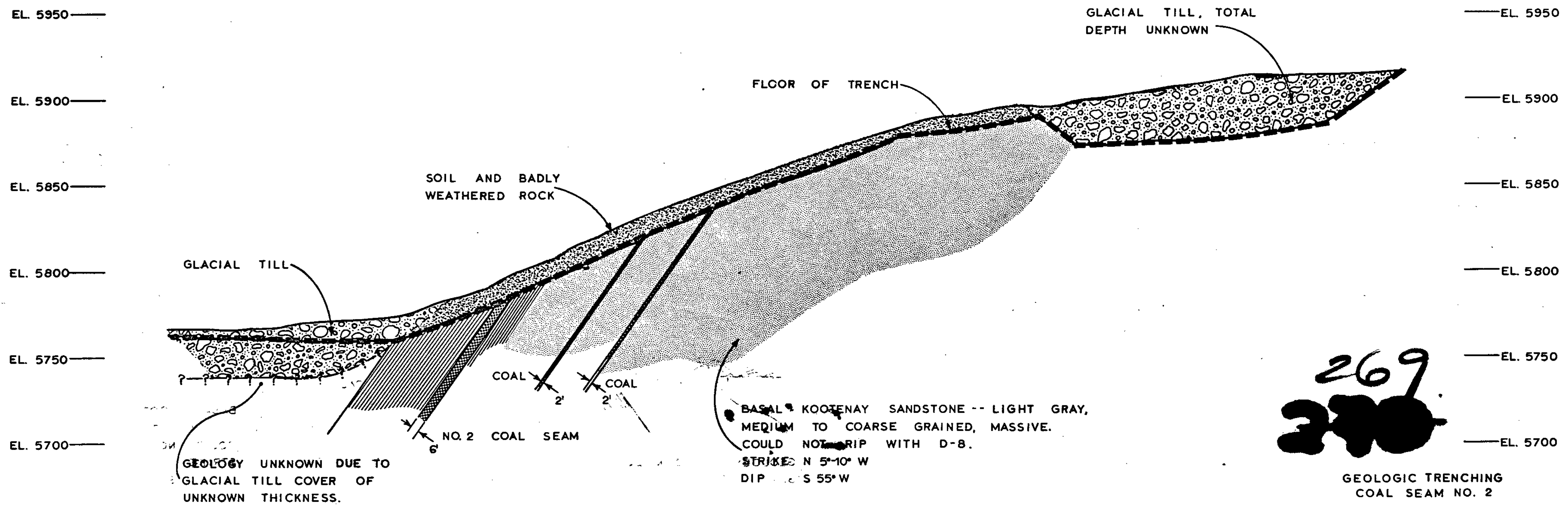
GEOLOGIC TRENCHING
COAL SEAM NOS. 2, 3 AND 4

NOTE: For location of trench refer to Exhibit No 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
EXPLORATORY TRENCH
T - 70 - 4 71(3)A-2
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 5

EXHIBIT NO. 8



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[redacted]

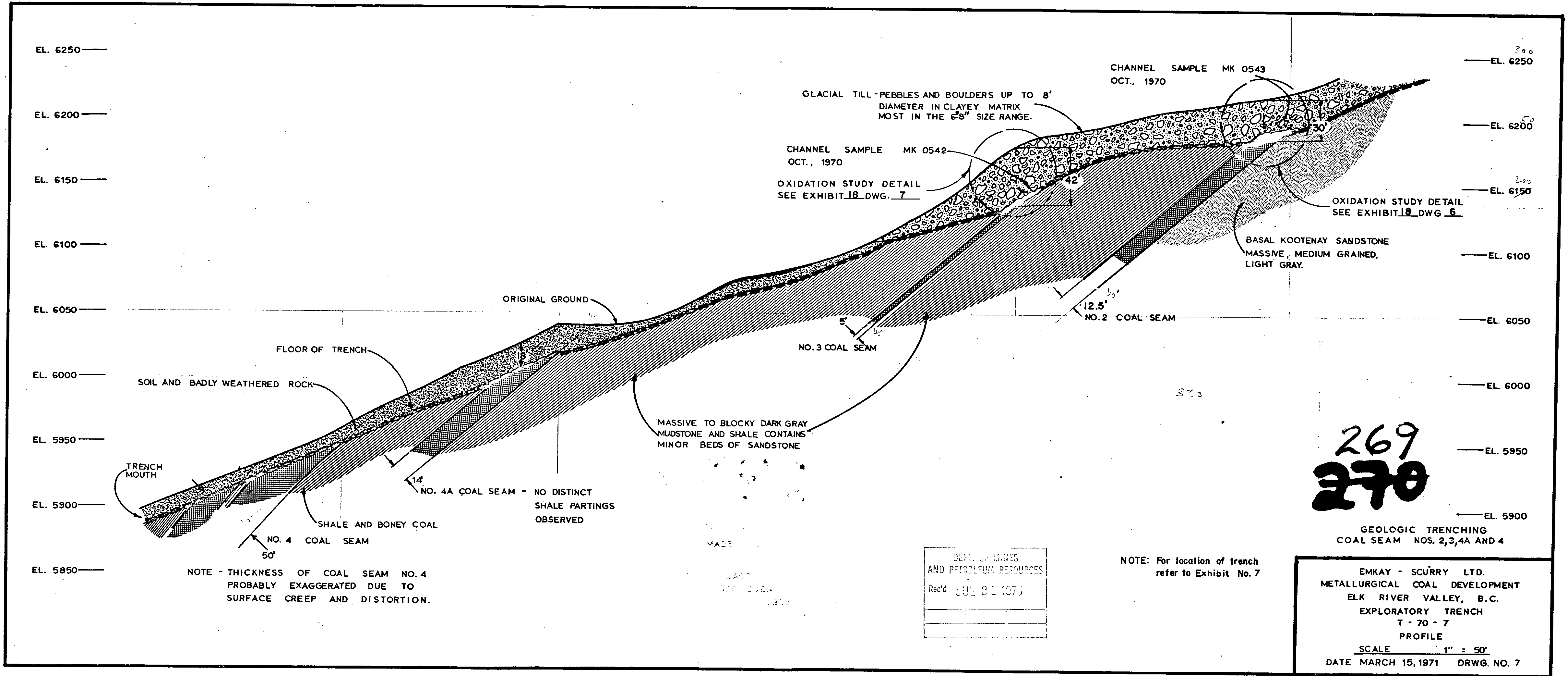
GEOLOGIC TRENCHING
COAL SEAM NO. 2

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
EXPLORATORY TRENCH
T - 70 - 6
PROFILE 71(3)A-2

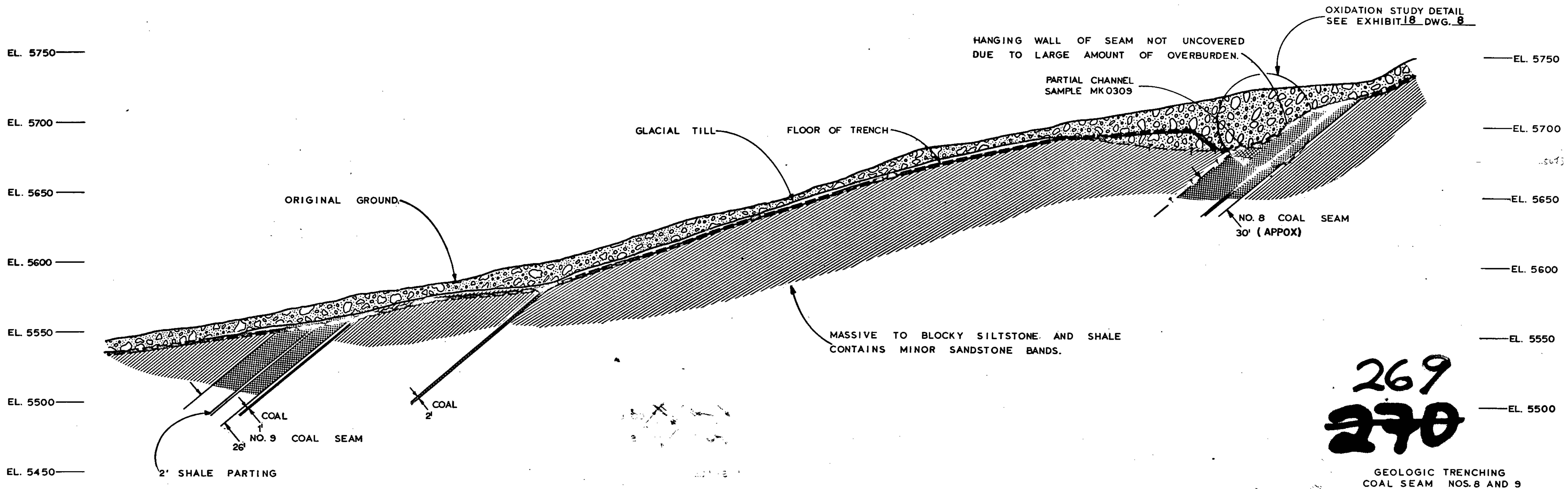
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 6

EXHIBIT NO. 8



EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 7
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 7

71(3)A-2 EXHIBIT NO. 8



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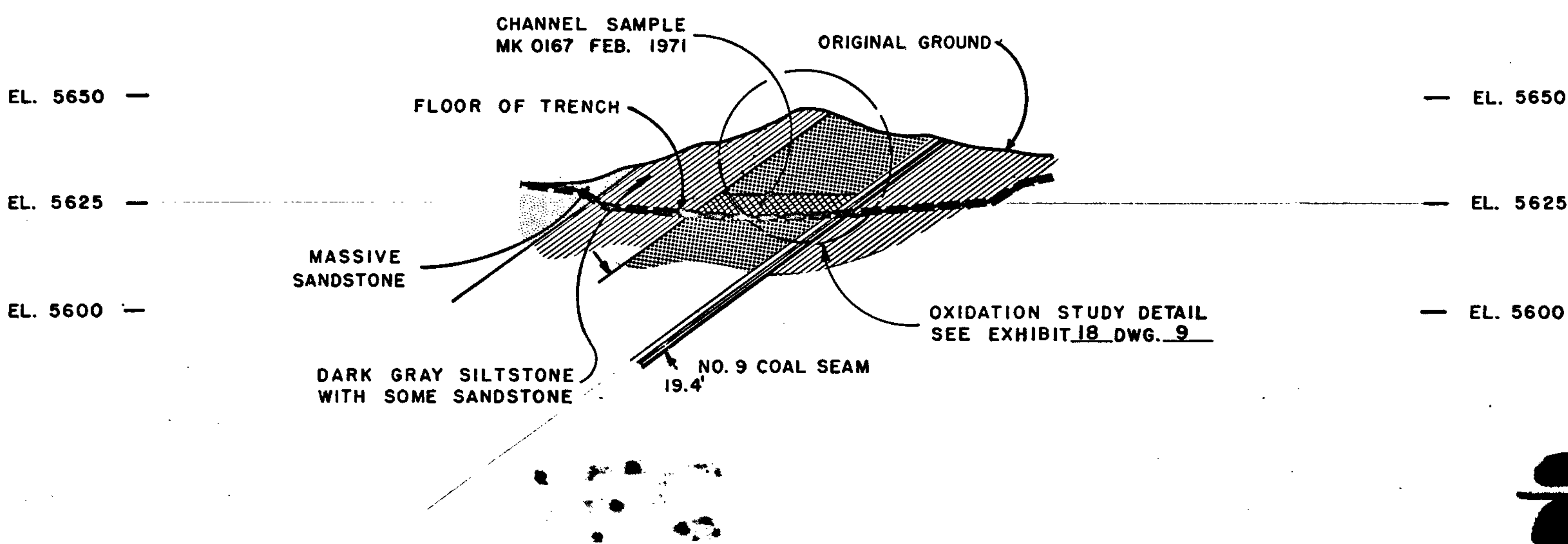
GEOLOGIC TRENCHING
COAL SEAM NOS. 8 AND 9

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 8
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 8

71(3)A-2 EXHIBIT NO. 8



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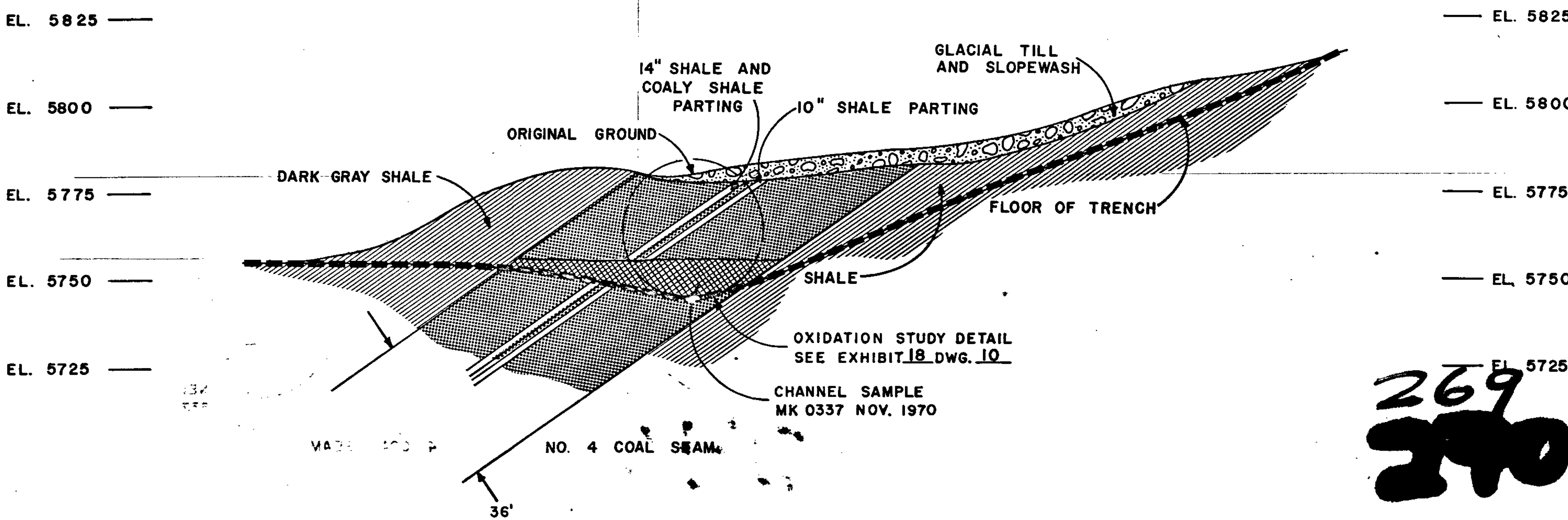
[redacted]

GEOLOGIC TRENCHING
COAL SEAM NO. 9

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 9
PROFILE 71(3)A-2
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 9

EXHIBIT NO. 8



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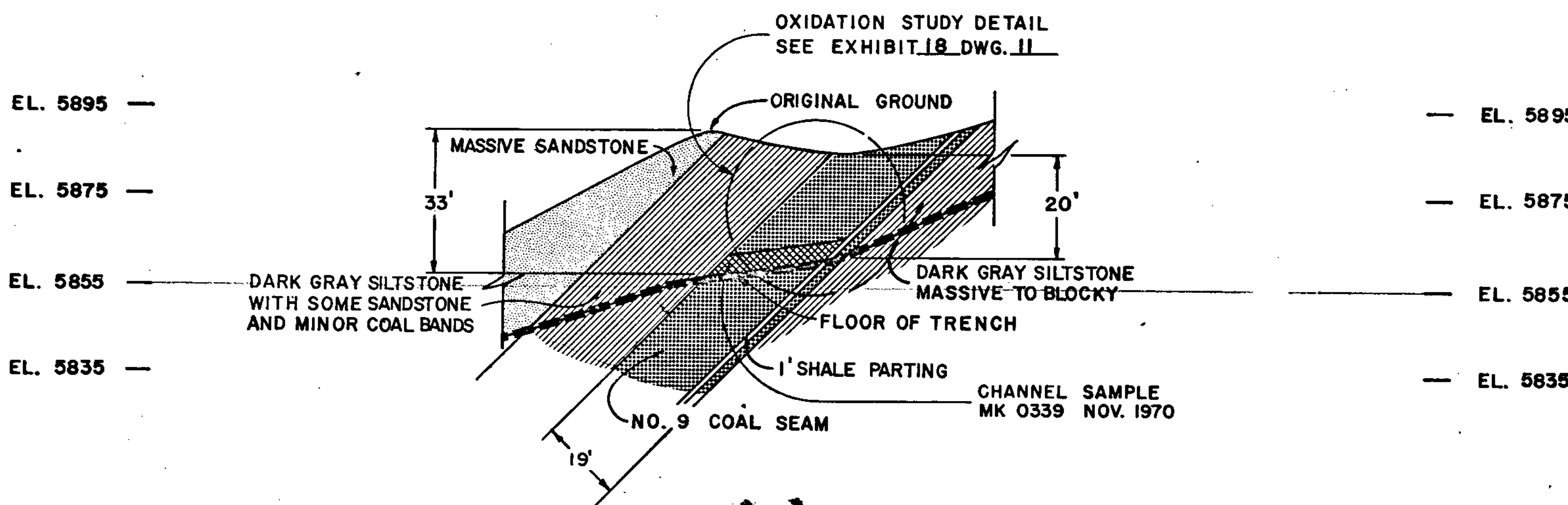
GEOLOGIC TRENCHING
COAL SEAM NO. 4

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 10 71(3)A-2
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 10

EXHIBIT NO. 8



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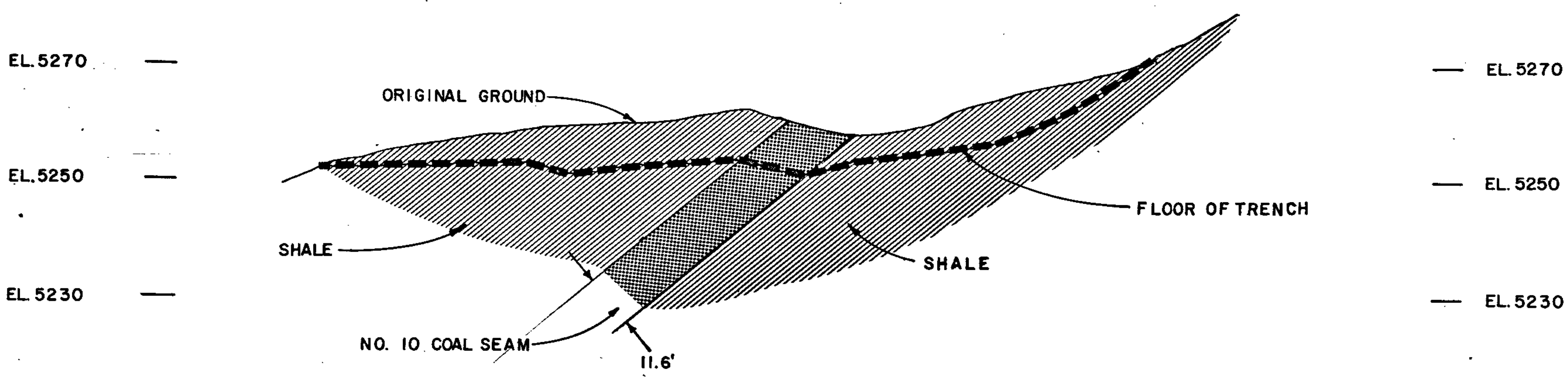
GEOLOGIC TRENCHING
COAL SEAM NO. 9

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 11
PROFILE
71(3)A-2
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 11

EXHIBIT NO. 8



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GEOLOGIC TRENCHING
COAL SEAM NO. 10

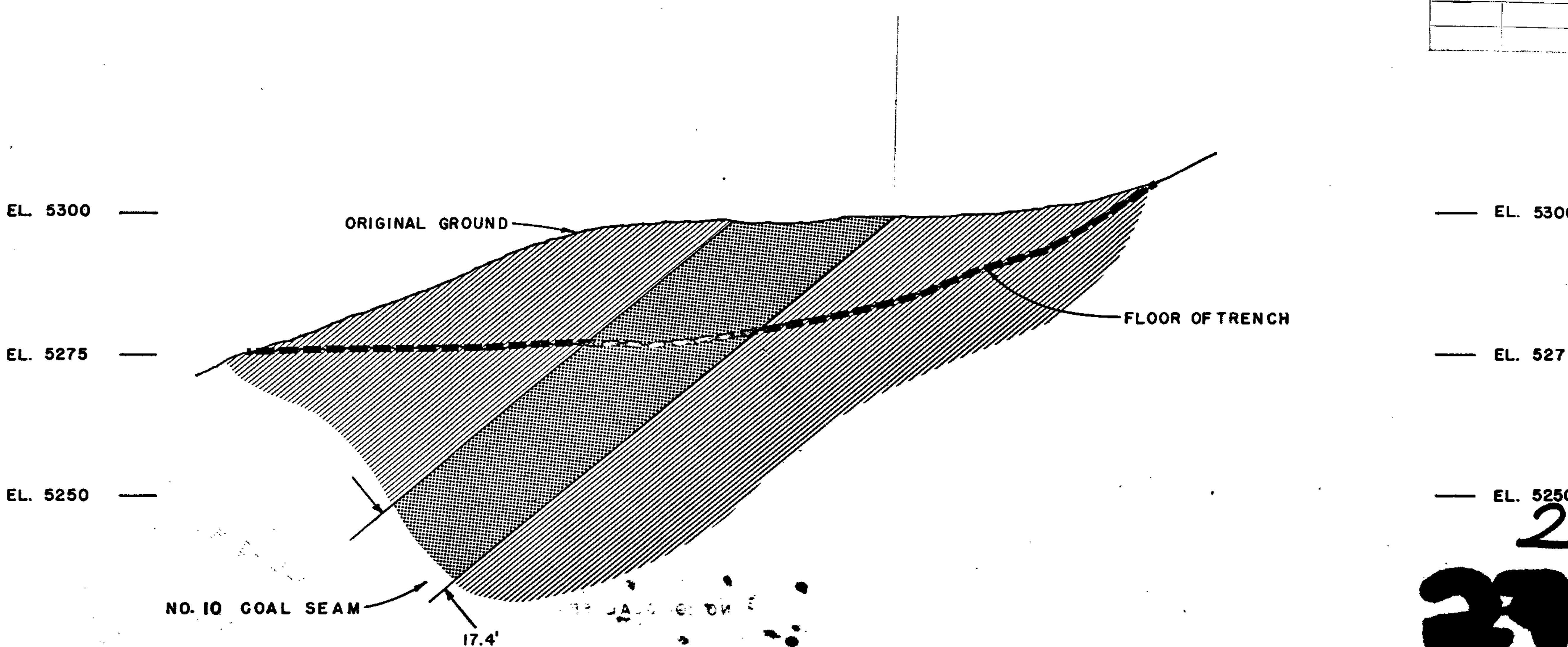
NOTE: For location of trench refer to Exhibit No. 7

EMKAY – SCURRY LTD
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
EXPLORATORY TRENCH
T – 70 – 12
PROFILE 71(3)A-2

SCALE 1" = 20'

DATE MARCH 15, 1971 DRWG. NO. 12

EXHIBIT NO. 8



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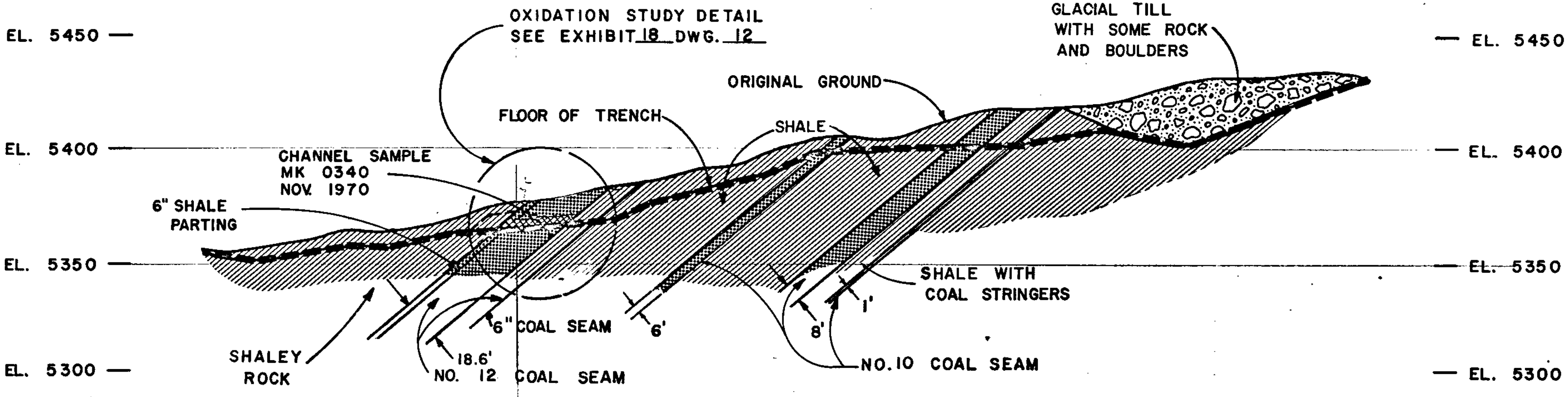
[redacted]

GEOLOGIC TRENCHING
COAL SEAM NO. 10

NOTE: For location of trench refer to Exhibit No. 7

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T – 70 – 13
PROFILE 71(3)A-2
SCALE 1" = 20'
DATE MARCH 15, 1971 DRWG. NO. 13

EXHIBIT NO. 8



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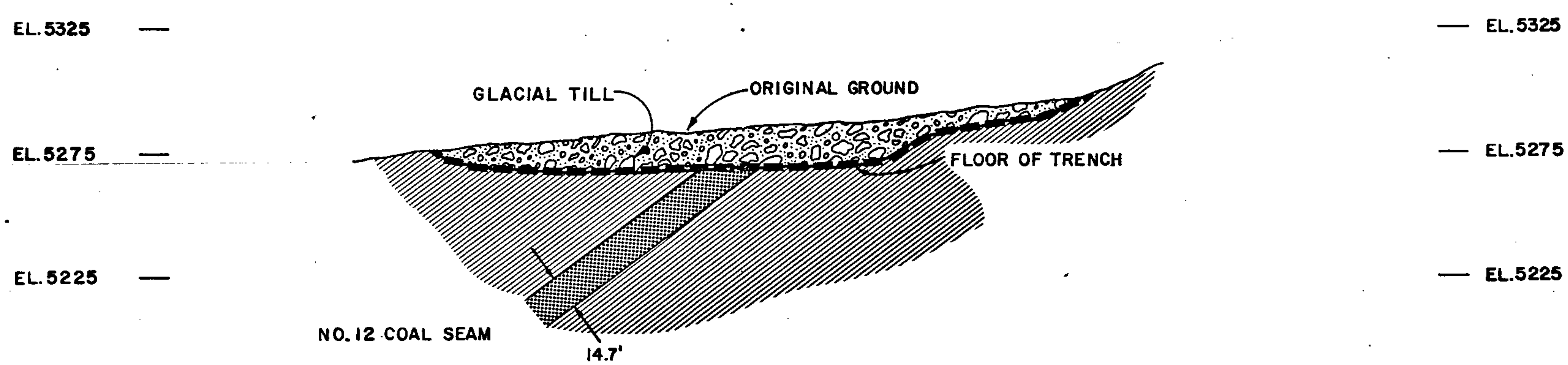
GEOLOGIC TRENCHING
COAL SEAM NOS. 10 AND 12

NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-70-14
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 14

71(3)A-2

EXHIBIT NO. 8



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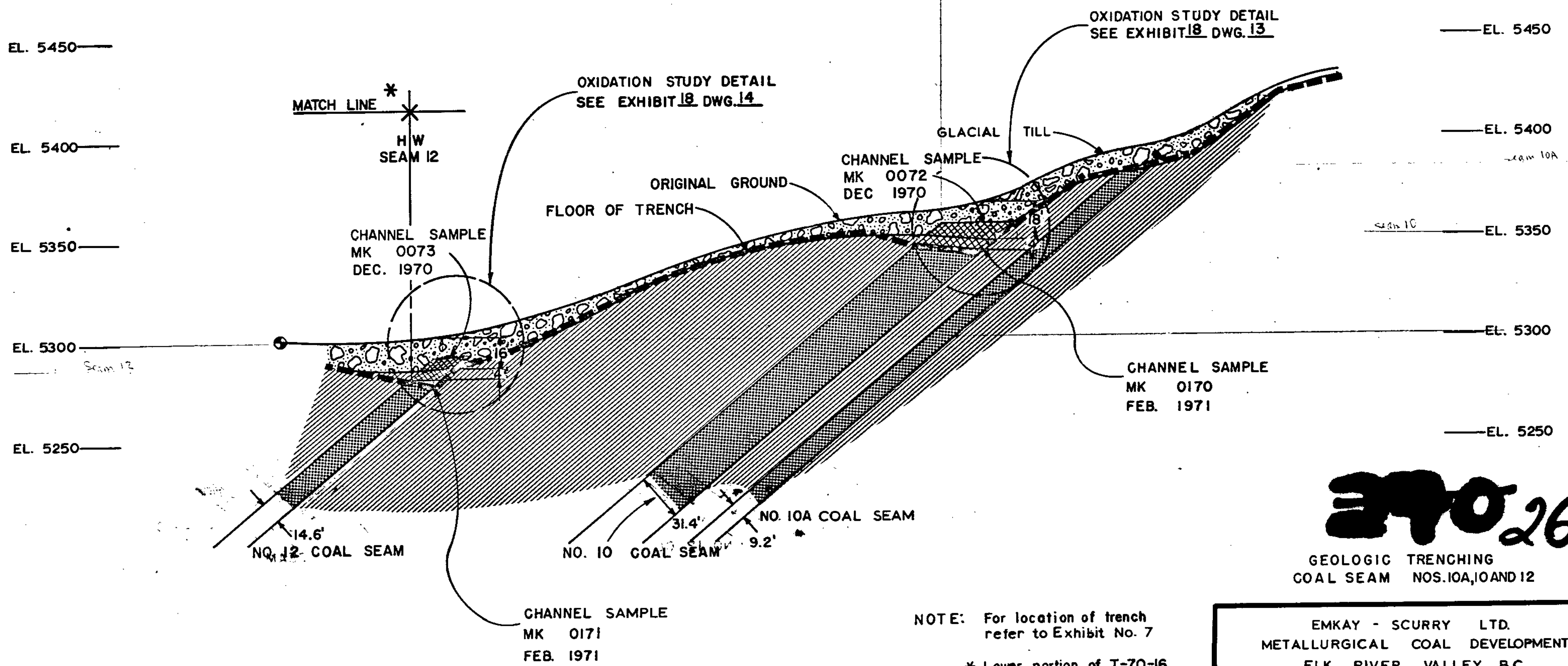
GEOLOGIC TRENCHING
COAL SEAM NO. 12

NOTE: For location of trench refer to Exhibit No. 7

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK - RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 15
PROFILE 78(3)-A-2
SCALE 1" = 50'
DATE MARCH 15,1971 DRWG. NO. 15

EXHIBIT NO. 8



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GEOLOGIC TRENCHING
COAL SEAM NOS. 10A, 10 AND 12

NOTE: For location of trench refer to Exhibit No. 7

* Lower portion of T-70-16 shown in Exhibit 8 Dwg. 17

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
UPPER PORTION T-70-16 71(3)A-2
PROFILE
SCALE 1" = 50'
DATE MARCH 15, 1971 DRWG. NO. 16

EXHIBIT NO. 8

71(3)A-2 EXHIBIT NO. 8

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GEOLOGIC TRENCHING
COAL SEAM NOS. 16, 17, & 18

NOTE: For location of trench refer to Exhibit No. 7.

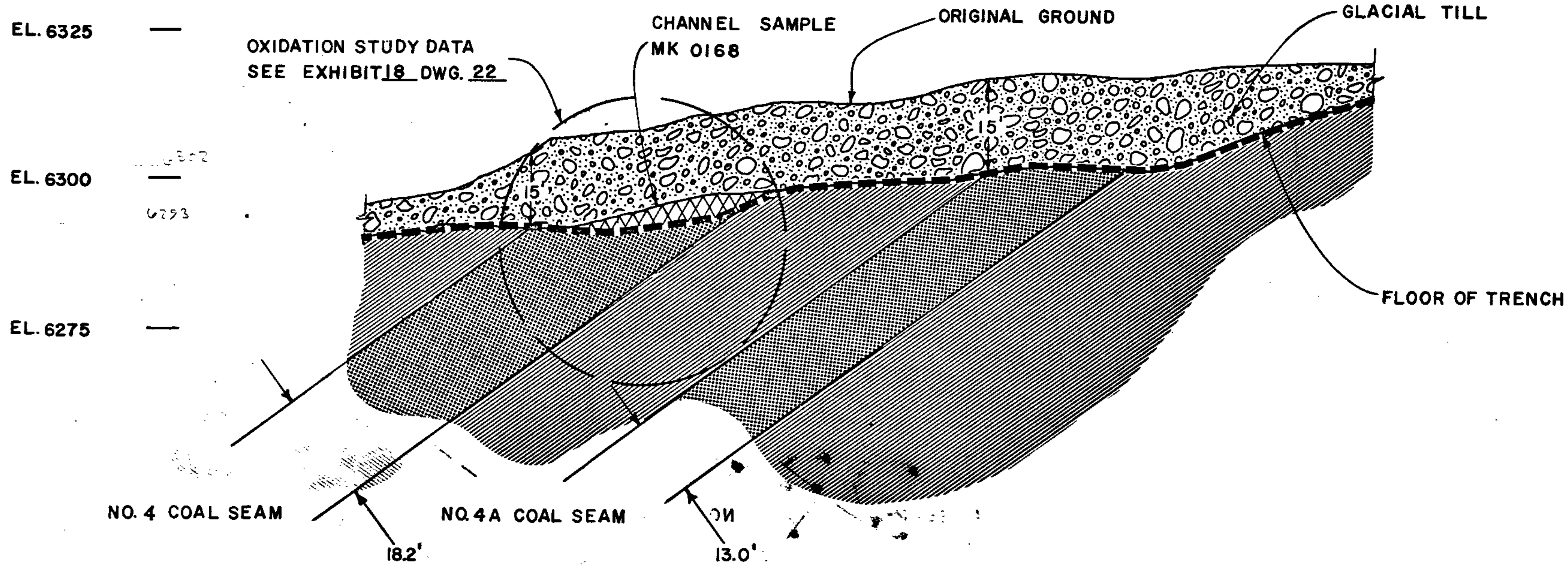
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

EXPLORATORY TRENCH
T - 71 - 17
PROFILE 71(3)4-2

SCALE 1" = 50'

DATE: MARCH 15, 1971 DRWG. NO. 18

EXHIBIT NO. 8



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GEOLOGIC TRENCHING
COAL SEAM NOS. 4 AND 4 A

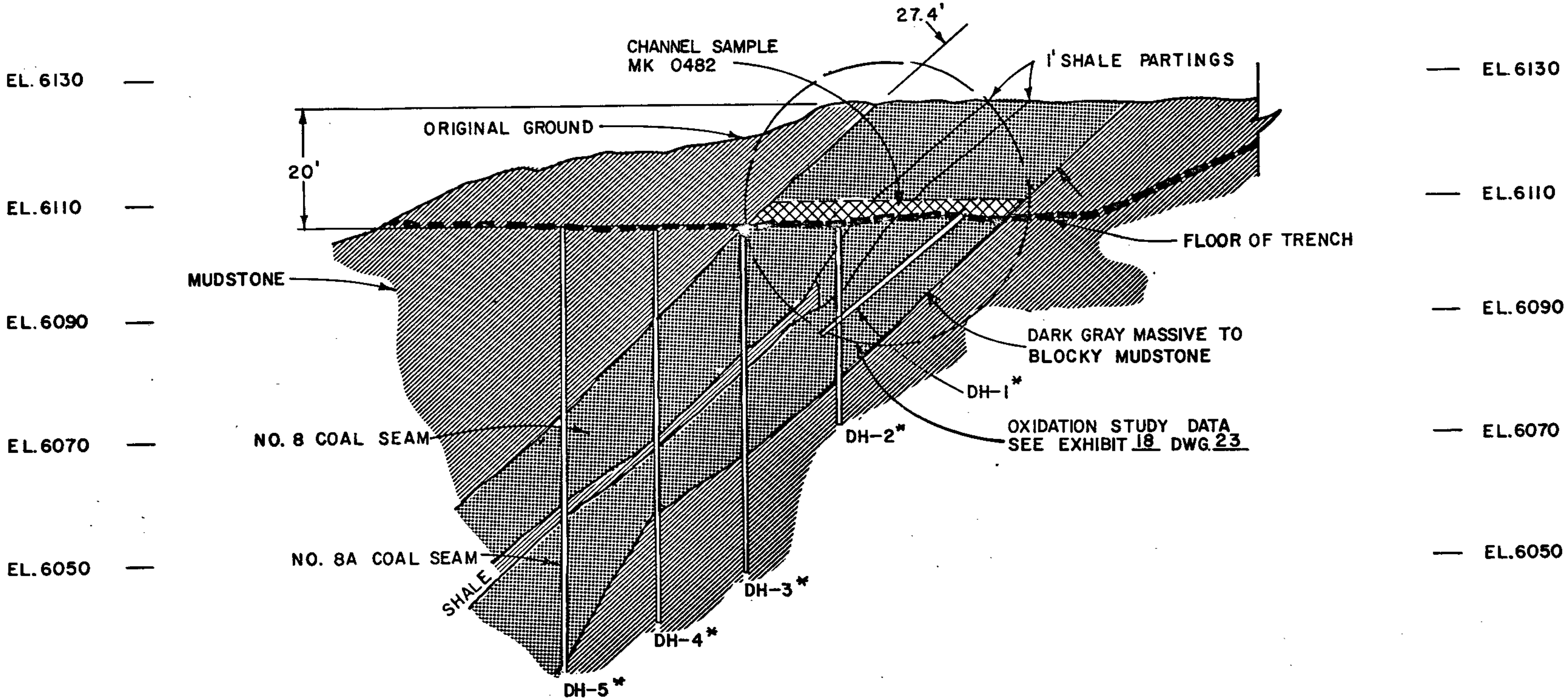
NOTE: For location of trench refer to Exhibit No. 7

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

EXPLORATORY TRENCH
T - SR - 3 71(3)A-2
PROFILE

SCALE 1" = 20'
DATE MARCH 15, 1971 DRWG. NO. 19

EXHIBIT NO. 8



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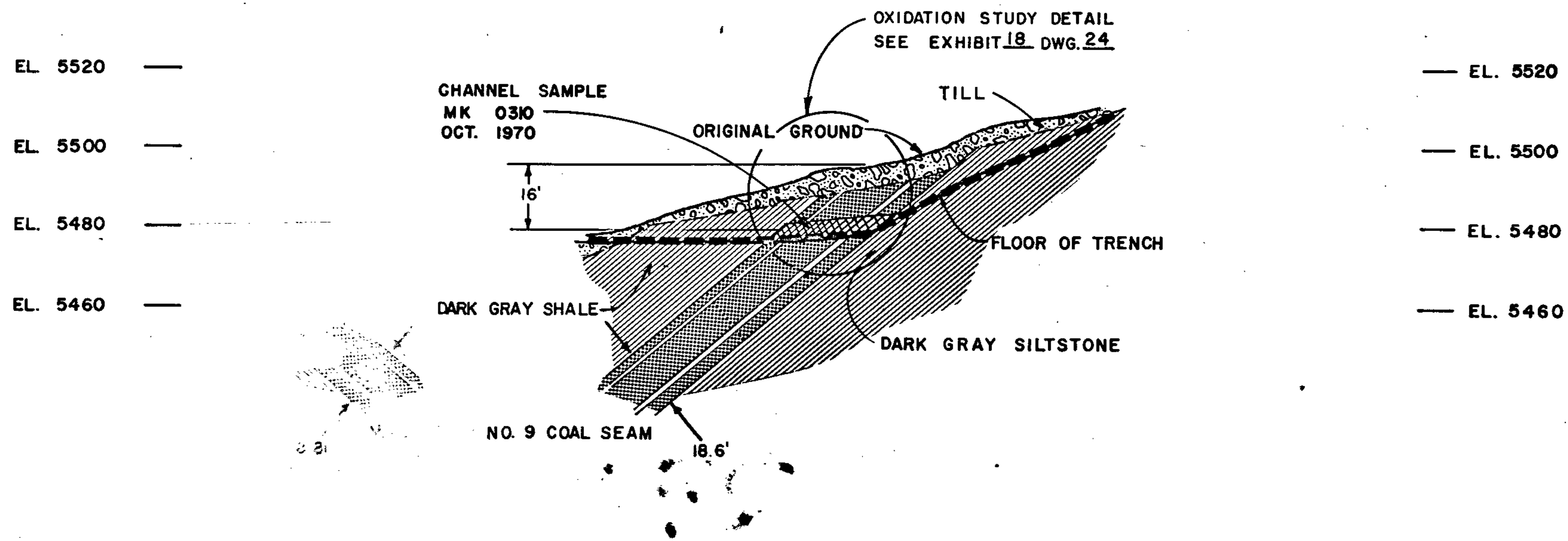
GEOLOGIC TRENCHING
COAL SEAM NOS. 8 AND 8A

NOTE: For location of trench refer to Exhibit No. 7

* DH1 – DH5 were drilled to obtain oxidation data.

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T – SR – 4 71(3)A-2
PROFILE
SCALE 1" = 20'
DATE MARCH 15, 1971 DRWG. NO. 20

EXHIBIT NO. 8



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[redacted]

GEOLOGIC TRENCHING
COAL SEAM NO. 9

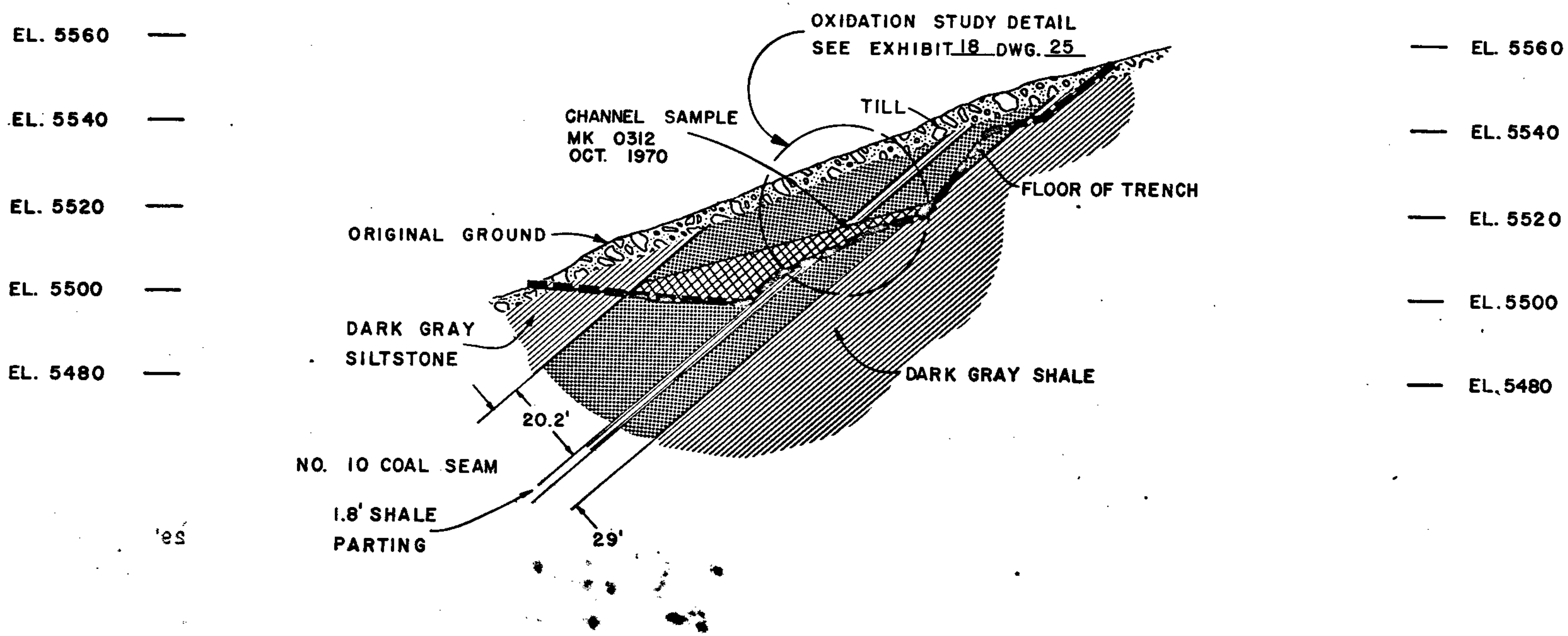
NOTE: For location of trench refer to Exhibit No. 7

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - SR - 5
PROFILE
71(3)4-2

SCALE 1" = 30'

DATE MARCH 15, 1971 DRWG. NO. 21

EXHIBIT NO. 8



269

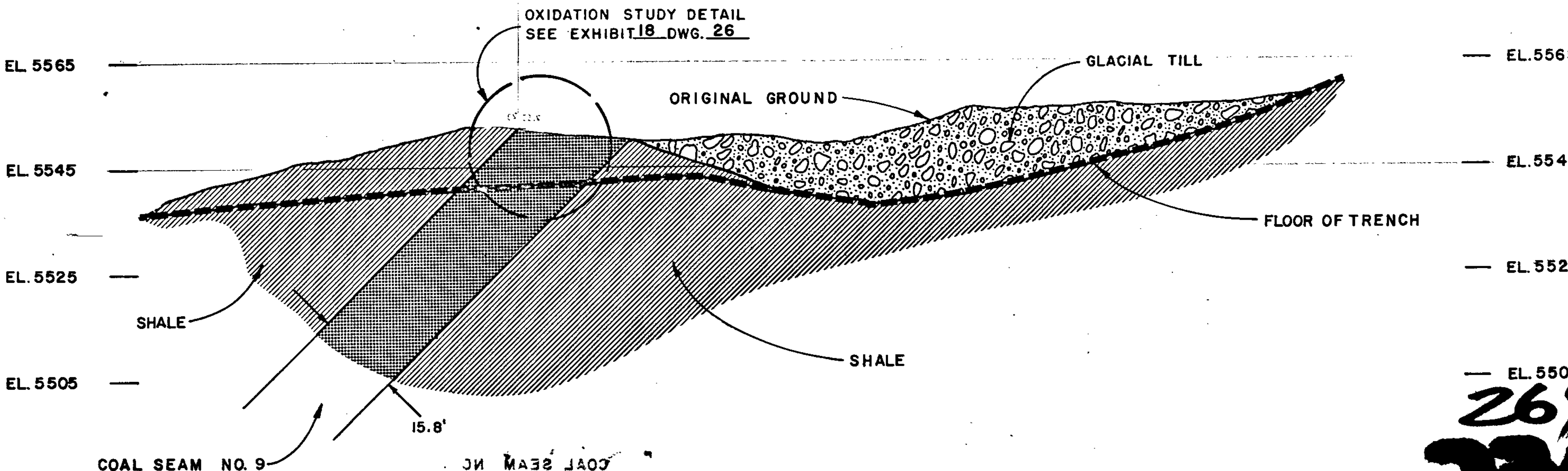
[redacted]

GEOLOGIC TRENCHING
COAL SEAM NO.10

NOTE: For location of trench refer to Exhibit No. 7

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-SR-6
PROFILE 71(3)A-2
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 22

EXHIBIT NO. 8



269

GEOLOGIC TRENCHING
COAL SEAM NO. 9

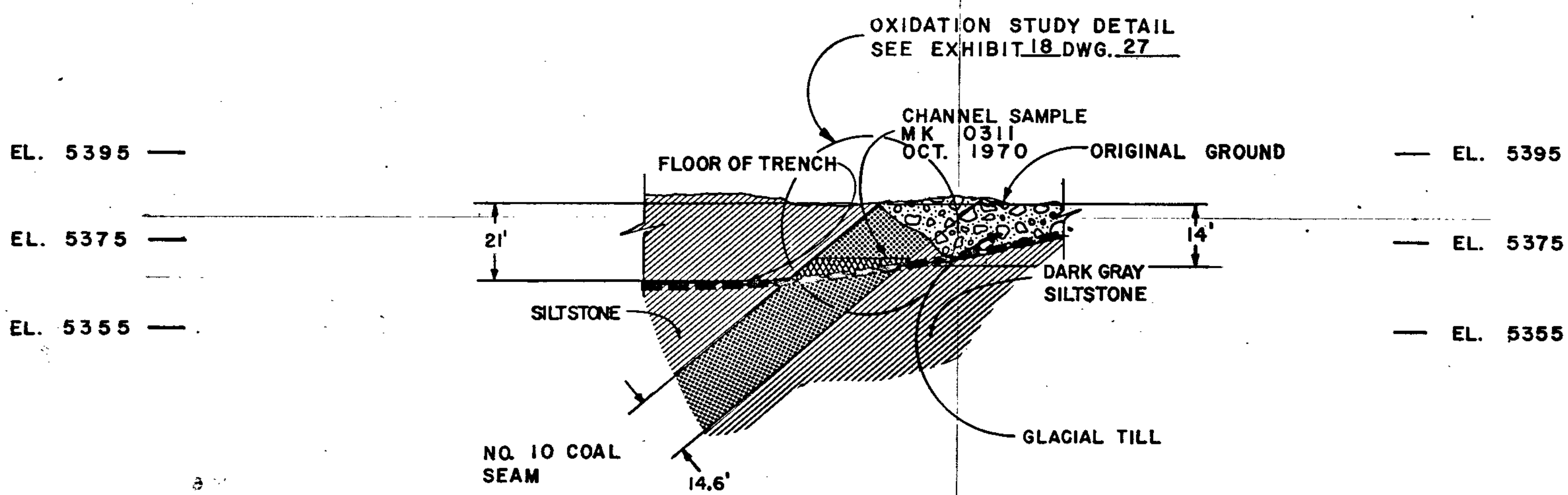
NOTE: For location of trench refer to Exhibit No. 7

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T – SR – 12 71(3)A-2
PROFILE
SCALE 1" = 20'
DATE MARCH 15, 1971 DRWG. NO. 23

EXHIBIT NO. 8

183 : 63

E20 + 79



269

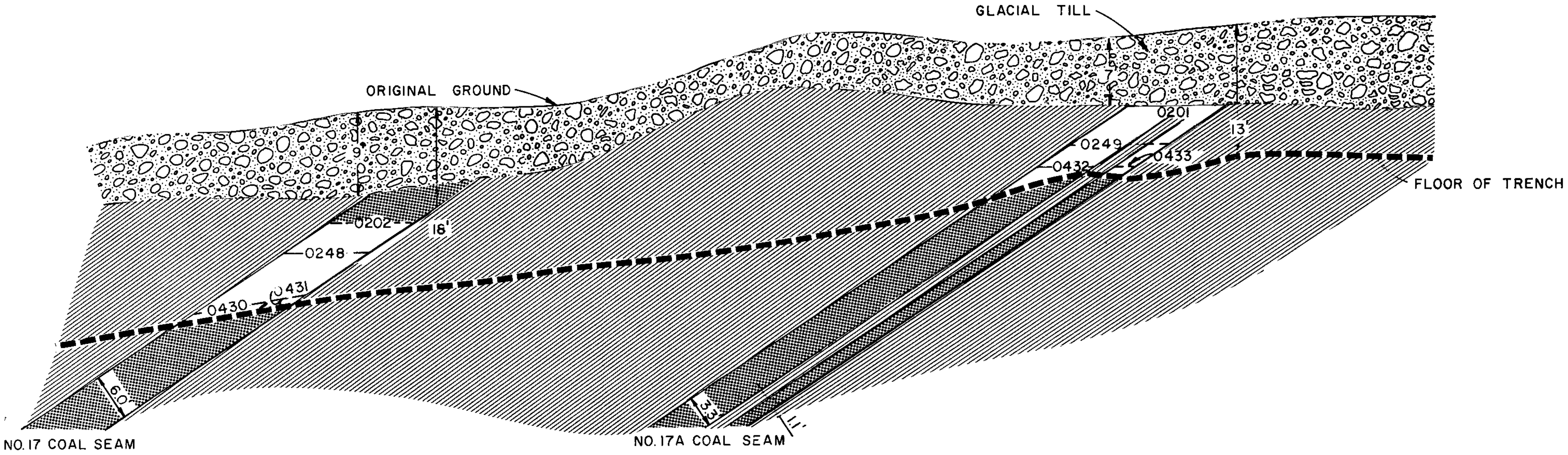
[redacted]

GEOLOGIC TRENCHING
COAL SEAM NO. 10

NOTE: For location of trench refer to Exhibit No. 7

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-SR-13 71(3)A-2
PROFILE
SCALE 1" = 30'
DATE MARCH 15, 1971 DRWG. NO. 24

EXHIBIT NO. 8



OXIDATION STUDY

Description		Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel	Sample	Floor + 7'	0202	1½	—	—	—
"	"	Floor + 4'	0248	½	—	5.28	—
"	"	Floor	0430	* —	—	—	—
"	"	Floor	0431	* —	—	—	—
"	"	Floor + 7'	0201	½	—	—	—
"	"	Floor + 3'	0249	3	—	11.30	—
"	"	Floor	0432	* —	—	—	—
"	"	Floor	0433	* —	—	—	—

NOTE: For location refer to Exhibit No. 8, Drwg. No. 18.

All Samples taken March 1971.

* Test Results not yet available.

K-ELK RIVER 70(5)B

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-71-17
OXIDATION STUDY — SEAM NOS. 17 & 17A
SCALE: 1" = 10'
DATE: MARCH 15, 1971 DRWG. NO. 20

EXHIBIT NO. 18

K. ELK RIVER 70(4) B.

ELK RIVER COKING COAL PROJECT

— ANALYTICAL DATA —

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BRANCH REPORT

K ELK RIVER 70(4)B

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[redacted]

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

SEAM NO. 2

February, 1971

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis: H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr.: Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
5235	SR-2	569.0 580.0 603.0	579.0 590.0 605.0	10.0 10.0 2.0 22.0/36.0	569.0	590.0	20.5/21.0	0.59	17.05	30.95	51.41	0.52	10,220	5	66.04	--	19.65	8.58	--	0.48	--	9
0507	M70-4C	598.5	600.0	1.5	599.5	606.0	2.0/6.5	0.20	12.02	48.34	39.40	0.44	7,700	2	37.3	0.39	15.91	10.90	72.80	0.56	13,620	7½
0508, 0509, 0510	(Composite)	601.0 612.0	611.0 621.0	10.0 9.0 20.5/22.5	606.0	622.5	14.0/16.5	0.13	16.56	17.54	65.57	0.47	12,770	4	72.5	1.15	16.20	8.87	73.78	0.51	14,330	5½
337315	Adit 2S	NA Bulk Sample - 46 ft. from Portal - Hor. @ 38° Dip					10.5 ft.	0.72	18.85	16.36	64.77	0.60	14,540	7	65.2	--	20.35	7.01	--	0.59	--	8½
0778	Adit 2N	MK Bulk Sample - 72 ft. from Portal - Hor. @ 35° Dip					13.4 ft.	--	--	26.07	--	--	--	--	--	0.55	18.61	11.77	69.07	0.45	--	7
--	NA - B	--	--	--	643.0	656.0	13.0	--	18.73	17.53	--	0.41	--	3½	79.3	--	20.20	8.98	--	0.51	--	4½
5220	SR-4)	465.0	481.0	16.0	466.8	476.0	9.2	0.43	17.02	25.54	57.01	0.35	11,310	4	13.64	--	19.46	10.05	--	0.38	--	6
5221	)				476.0	486.0	10.0	0.35	20.42	11.45	67.78	0.39	13,490	9	91.32	--	20.2	8.50	--	0.38	--	9
0543	T70-7 Emkay-Scurry Dozer Trench - (Sampled for Oxidation Study)				Horizontal Thickness 20 ft @ 40°			0.38	16.40	18.03	65.19	0.44	12,350	½	79.8	0.68	16.79	12.56	69.97	0.40	13,360	1
5226	SR-3	378.0	397.0	19.0	377.0	396.0	19.0/19.0	0.58	19.34	12.06	68.02	0.39	13,600	7½	89.03	--	20.20	7.73	--	0.39	--	8½
5184	SR-15	640.0	658.0	18.0	643.0	660.0	17.0	0.93	17.85	19.32	61.90	0.41	12,230	7½	80.02	--	19.7	9.80	--	0.42	--	9
5183	SR-16	342.0	361.0	19.0	344.5	363.5	19.0	0.74	20.16	12.31	66.79	0.38	13,430	8½	89.7	--	21.2	8.27	--	0.41	--	9
0336	M70-19C	350.0	368.5	18.5	357.0	369.5	8.0/12.5	0.29	16.28	18.36	65.07	0.36	12,890	5½	71.1	0.45	17.38	8.65	73.52	0.41	14,350	6
	M70-1C	281.5	297.0	15.5	No Core Recovered			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	M70-11R	713.0	717.5	4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0488	M70-8C	303.0 313.0 326.0	305.0 318.0 330.5	2.0 5.0 4.5	315.0	320.5	5.5	0.34	13.40	36.89	49.37	0.42	9,890	4	60.2	0.77	17.86	9.74	71.64	0.56	14,120	5½
0486 - 0487	(Composite)	333.5	342.5	9.0 20.5/39.5	335.5	346.0	9.5	0.16	20.25	13.31	66.28	0.56	13,530	8	91.6	1.66	18.50	8.90	70.94	0.55	14,160	8

Exhibit No. 19-1

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 3

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
5234	SR-2	506.9	515.5	8.6	507.0	516.8	8.6/9.8	0.58	18.59	14.64	66.19	0.45	13,326	7	88.7	--	19.97	8.00	--	0.41	--	8
0505	M70-4C	497.0	499.0	2.0	526.5	530.5	4.0/4.0	0.45	6.71	87.50	5.34	0.36	8	NA	--	--	--	--	--	--	--	--
		501.0	504.0	3.0																		
0506		537.5	544.0	6.5	541.0	546.0	4.5/5.0	0.13	12.97	37.59	49.31	0.37	8,627	NA	51.0	1.41	16.10	6.34	76.15	0.53	14,817	7½
				11.5/47.0																		
337612	Adit 3	NA Bulk Sample - 37.5 ft. from Portal - Hor. @ 38°					8.0 ft.	0.66	20.14	8.49	71.37	0.50	14,240	8	92.8	--	19.79	6.36	--	0.50	--	7½
0905-29		MK Bulk Sample - 73.8 ft. from Portal - Hor. @ 35°					10.0 ft.	--	--	9.72	--	--	--	6½	--	0.56	19.58	7.62	72.24	0.53	--	7
--	NA-B	557.0	589.0	32.0/32.0	582.0	592.5	10.5	--	19.91	12.29	--	0.48	--	5½	90.8	--	22.92	6.64	--	0.51	--	6
5219	SR-4	390.0	397.0	7.0/7.0	393.3	398.0	4.7/4.7	0.49	19.36	8.00	72.15	0.52	14,100	9	93.5	--	20.65	6.33	--	0.54	--	9
0542	T70-7 Emkay Scurry Dozer Trench - Horizontal Thickness 5' @ 40° (Sampled for Oxidation Study)							0.07	16.46	12.28	71.19	0.51	13,650	6½	90.0	1.40	17.28	8.89	72.43	0.53	14,280	6½
5225	SR-3	299.0	306.0	7.0	300.0	306.5	6.5/6.5	0.71	19.74	6.87	72.68	0.52	14,340	8	95.5	--	21.15	4.75	--	0.49	--	8½
		548.0	551.0	3.0																		
5181	SR-15	553.0	556.0	3.0	551.0	558.5	7.5/7.5	0.82	18.00	17.51	63.67	0.48	12,450	8	84.46	--	20.12	6.57	--	0.52	--	9
				6.0/8.0																		
5186	SR-16	229.0	237.0	8.0	231.0	240.0	9.0/9.0	0.87	18.27	11.97	68.89	0.52	13,550	6½	90.0	--	20.28	7.27	--	0.54	--	7
5187		240.0	251.0	11.0	244.0	254.0	10.0/10.0	0.68	18.82	16.48	64.02	0.51	13,020	8½	87.15	--	18.25	8.07	--	0.53	--	9
				19.0/22.0																		
	M70-10R	481.0	481.5	0.5																		
		488.0	493.0	5.0																		
		496.0	498.0	2.0																		
				7.5/17.0																		
	M70-19C	240.0	241.5	1.5)																		
		254.0	256.5	2.5)	No Core Recovery																	
		261.0	264.0	3.0)																		
				7.0/10.0																		

Exhibit No. 19-2

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 3 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	M70-1C	173.0	179.0	6.0	No Core Recovery																	
	M70-11R	519.0	526.0	7.0																		
		528.0	529.5	1.5																		
				8.5/10.5																		
0489	M70-8C	200.0	203.0	3.0	201.5	209.0	5.0/7.5	0.51	8.33	68.34	22.82	0.34	4,165	½	8.0	0.38	15.97	14.13	69.52	0.82	13,380	7½
		207.0	209.0	2.0																		
		220.0	222.0	2.0																		
				7.0/22.0																		

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 4

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
5232	SR-2)				407.5	425.0	17.5	0.65	17.45	15.10	66.80	0.43	12,790	3½	79.89	--	20.32	6.34	--	0.41	--	4½
	)	407.6	434.0	26.4																		
5233	SR-2)				425.0	432.0	7.0	0.56	18.06	12.38	69.00	0.36	13,130	3½	90.37	--	18.67	6.87	--	0.32	--	5
0338	T70-4 (Sampled for Oxidation Study)	Emkay Scurry Dozer Trench - Horizontal Thickness 6' @ 45°						0.36	14.64	22.98	62.02	0.35	11,480	3	60.2	0.42	16.26	7.22	76.10	0.45	14,580	4½
	M70-4C (4A)	415.5 429.0	427.0 447.0	11.5 18.0 29.5/31.5			Poor Core Recovery - No Samples Taken.															
337314	Adit 4	NA Bulk Sample--35' from Portal - 50' Hor.@ 30°						--	17.92	14.31	--	0.36	--	3½	79.2	--	18.21	7.54	--	0.35	--	3
RI-6907		SR Bulk Sample--160' from Portal - 50' Hor.@ 30°						0.67	15.47	25.14	58.72	0.33	11,680	1½	--	--	17.15	9.00	--	--	--	--
0653-0700		MK Bulk Sample--201' from Portal - 42' Hor.@ 30°						--	--	27.60	--	--	--	2½	--	.61	17.44	10.0	71.95	0.39	--	5
0337	T70-10 (Sampled for Oxidation Study)	Emkay Scurry Dozer Trench - Horizontal 67' @ 35°						0.31	14.81	25.25	59.63	0.45	11,160	3	61.5	0.41	15.36	7.95	76.28	0.58	14,370	5
B5	(NA) B	446.0	448.0	2.0	459.0	478.0	19.0	--	18.17	19.75	--	0.34	--	1	77.2	--	19.66	8.55	--	0.34	--	1
B6		454.0	471.0	17.0 19.0/25.0	478.0	493.0	15.0	--	16.99	32.72	--	0.32	--	2	66.6	--	19.41	8.32	--	0.44	--	3½
5217	SR-4	228.0 251.0	247.0 255.0	19.0 4.0 23.0/27.0	231.0	257.0	26.0	0.61	16.35	28.33	54.72	0.24	11,000	1½	70.32	--	19.06	7.97	--	0.32	--	3
5218	SR-4 (4A)	275.0	284.0	9.0	259.5	266.7	7.2	0.71	9.32	67.01	22.96	0.14	4,460	NA	29.21	--	17.29	14.32	--	0.35	--	3½
5222	SR-3)				123.5	136.0	12.5	0.41	17.97	9.33	72.29	0.35	13,690	2	91.14	--	19.31	6.81	--	0.39	--	3
5223	)	123.0	151.0	28.0	136.0	149.0	13.0	0.61	18.99	13.58	66.82	0.27	13,040	2½	85.79	--	19.24	7.17	--	0.33	--	3½
5224	)				149.0	152.0	3.0	0.87	14.26	36.04	48.83	0.27	9,390	2½	65.33	--	18.92	14.35	--	0.31	--	3½
5237	SR-3 (4A)	181.0	190.0	9.0	183.0	190.0	2.5/7.0	0.77	25.68	29.12	44.43	0.52	11,380	4	61.72	--	28.34	7.62	--	0.53	--	5½
0467	T70-3 (Sampled for Oxidation Study)	Emkay Scurry Dozer Trench - Horizontal 29' @ 40°						0.32	14.38	16.05	69.25	0.34	12,830	1	68.3	0.94	15.89	6.51	76.66	0.36	14,480	1

Exhibit No. 19-4

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 4 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
5178	SR-15	394.0	412.0	18.0	398.0	410.0	12.0	0.69	17.85	11.57	69.89	0.37	13,340	2	89.65	--	18.45	7.76	--	0.32	--	3
				3.0																		
5179		414.0	417.0	21.0/23.0	410.0	421.0	11.0	0.77	15.23	36.05	47.95	0.26	9,280	2	59.09	--	18.50	8.90	--	0.32	--	5
		451.0	457.0	6.0																		
5180	SR-15(4A)	469.0	471.0	2.0	455.0	459.5	4.5	0.92	17.72	11.94	69.42	0.49	13,310	5½	90.11	--	19.64	5.20	--	0.50	--	6
				8.0/20.0																		
5172	SR-16	53.0	54.0	1.0																		
		62.0	82.0	20.0	64.5	76.0	11.5	0.65	18.09	11.47	67.79	0.34	13,480	1½	90.31	--	18.32	7.62	--	0.32	--	1½
5173		84.0	87.0	3.0	76.0	88.5	11.5	0.71	17.49	15.52	66.28	0.32	12,830	2	83.17	--	18.58	8.41	--	0.31	--	3
				24.0/34.0																		
5182	SR-16(4A)	150.0	156.0	6.0	152.0	159.0	7.0	0.65	13.53	44.76	41.06	0.39	7,910	1½	43.11	--	18.49	13.46	--	0.55	--	4½
0334	M70-18C	518.5	546.0	27.5	520.0	548.0	28.0/28.0	0.36	16.45	12.73	70.46	0.39	13,390	1	77.30	0.58	16.74	7.51	75.17	0.53	14,340	1½
	(4A)	557.0	558.0	1.0																		
		560.5	565+	4.5																		
				33.0+/46.5+																		
0335	M70-19C	79.5	83.5	4.0																		
		88.0	109.0	21.0	90.5	118.0	17.5/27.5	0.38	16.34	17.12	66.16	0.35	12,450	1	75.00	0.40	16.34	6.72	76.54	0.51	14,560	1½
		110.0	116.0	6.0																		
				31.0/37.0																		
	(4A)	188.0	189.0	1.0																		
		190.0	196.5	6.5	No Core Recovery																	
		204.0	208.0	4.0																		
				11.5/20.0																		
0058	M70-20C	724.0	751.0	27.0	726.5	754.0	15.0/27.5	0.25	15.33	18.52	65.90	0.29	12,490	1	73.7	1.29	16.27	8.68	73.76	0.33	14,720	1
0301	M70-12C	654.0	656.5	2.5																		
		657.5	672.5	15.0	656.0	687.0	18.5/31.0	0.53	17.33	16.60	65.54	0.13	12,820	1	85.0	0.83	16.38	8.51	72.28	0.26	14,[illegible]70	1½
		674.0	687.0	13.0																		
				30.5/33.0																		
	M70-10R	382.0	384.5	2.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		387.0	418.5	31.5																		
				34.0/36.0																		

Exhibit No. 19-5

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 4 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	M70-10R																					
	(4A)	436.5	437.0	0.5																		
		447.5	449.0	1.5																		
				2.0/12.5																		
	M70-1C																					
	(4A)	114.0	124.0	10.0	No Core Recovery																	
	M70-7R	219.5	252.0	32.5																		
		253.5	260.0	6.5																		
				39.0/40.5																		
	(4A)	288.5	289.5	1.0																		
		296.5	297.0	0.5																		
				1.5/8.5																		
	M70-11R	327.0	343.0	16.0																		
		344.0	355.0	11.0																		
				27.0/28.0																		
	(4A)	426.0	427.5	1.5																		
		428.0	434.0	6.0																		
				7.5/8.0																		
	M70-8C	108.0	111.5	2.5																		
	(4A)	170.5	181.0	10.5	No Core Recovery																	
		183.0	184.0	1.0																		
				11.5/13.5																		

Exhibit No. 19-6

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 6

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0471	M70-6C	580.5	587.0	6.5	584.0	588.0	4.0/4.0	0.20	14.22	22.56	63.02	0.57	11,950	4	55.8	0.25	16.65	11.50	71.60	0.75	13,830	5
0472		597.0	602.0	5.0	600.0	605.0	4.5/5.0	0.20	14.86	16.79	68.17	0.62	12,902	2½	67.4	0.37	16.67	6.62	76.34	0.75	14,430	2½
				11.5/21.5																		
5230	SR-2	187.0	191.0	4.0	187.0	191.4	4.4	0.62	17.69	15.12	66.57	0.65	12,700	3	80.04	--	18.17	9.58	--	0.67	--	4
		198.0	201.0	3.0																		
		207.0	212.5	5.5																		
				12.5/25.5																		
5207	SR-1	463.0	468.0	5.0	463.3	468.3	5.0/5.0	0.59	18.35	14.27	66.78	0.56	13,030	5½	86.31	--	18.86	9.60	--	0.60	--	6½
		469.0	472.0	2.5	469.5	472.5	3.0/3.0	--	--	--	--	--	--	--	60.46	--	19.22	12.60	--	0.58	--	8½
		480.0	484.0	4.0																		
		508.0	512.0	4.0																		
				15.5/49.0																		
0502	M70-4C	198.0	204.0	6.0	200.0	204.0	4.0	0.10	17.31	28.30	54.29	0.52	10,600	3	46.80	0.37	14.94	7.44	77.25	0.69	14,430	3½
		206.0	210.0	4.0																		
				10.0/12.0																		
0551-0575	Adit 6	MK Bulk Sample - 64' from Portal - 6.9' Hor.@ 36°						--	--	18.65	--	--	--	--	--	0.38	17.41	9.04	73.17	0.72	--	3½
	NA-B	244.0	250.0	6.0	247.0	255.0	8.0	--	18.45	9.74	--	0.76	--	2	94.10	--	19.42	7.59	--	0.80	--	1½
	SR-4	48.0	52.0	4.0																		
	M70-1R	500.0	506.0	6.0																		
	SR-14	372.0	376.0	4.0																		
0530	M70-10C	823.5	827.0	3.5	826.0	830.5	4.5	0.21	13.59	31.68	54.52	0.57	9,959	2½	55.90	0.41	16.52	7.07	76.00	0.80	14,610	7
	M70-18C	379.0	381.0	2.0	No Core Recovery																	
		387.5	389.5	2.0																		
				4.0/10.0																		

Exhibit No. 19-7

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 6 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	M70-20C	588.0	591.0	3.0	Not Sampled																	
		592.0	597.0	5.0	Not Sampled																	
		599.5	602.5	3.0	Not Sampled																	
		604.5	605.5	1.0																		
		607.5	608.5	1.0																		
		609.5	610.5	1.0																		
				14.0/22.5																		
	M70-10R	220.5	224.0	3.5																		
		227.5	228.5	1.0																		
				4.5/8.0																		
	M70-12C	491.0	493.5	2.5	Not Sampled																	
	M70-7R	84.0	86.5	2.5																		
		91.0	101.0	10.0																		
				12.5/17.0																		

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 7

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0470	M70-6C	479.0	490.5	11.5	481.0	495.0	7.5/14.0	0.29	11.93	44.82	42.96	0.40	8,280	1	33.9	0.43	16.77	8.53	74.27	0.66	14,150	1½
5229	SR-2	115.0	124.0	9.0	115.0	124.0	9.0	0.63	18.10	17.84	63.43	0.54	12,250	3	78.09	—	19.26	9.02	—	0.52	—	4½
5206	SR-1	398.0	406.0	8.0	398.0	406.0	8.0	0.69	17.78	16.13	65.40	0.58	12,300	2½	75.51	—	19.00	8.40	—	0.63	—	3½
	M70-4C	143.0	147.5	4.5	Not Sampled		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
337720	Adit 7	NA Bulk Sample - 35 ft. from Portal - 13 ft. Hor. @ 33°						—	18.44	19.83	—	0.51	—	3	73.00	—	—	8.08	—	—	—	—
6907		SR Bulk Sample - 154 ft. from Portal - 11 ft. Hor. @ 33°						0.44	17.85	14.46	67.25	0.59	12,860	1	—	—	18.22	9.19	—	—	—	—
0704 — 0759		MK Bulk Sample - 189 ft. from Portal - 11 ft. Hor. @ 33°						—	—	21.97	—	—	—	2	—	.54	18.44	10.8	70.22	.61	—	4
B 3	NA - B	200.0	206.0	6.0	206.0	211.0	5.0	—	22.21	6.81	—	0.63	—	4	96.4	—	21.53	5.71	—	0.64	—	3½
	M70-1R	477.0	484.5	7.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5171	SR-14	326.0	337.0	11.0	330.0	338.5	6.0/8.5	0.59	19.59	25.18	54.64	0.46	11,100	3	69.71	—	20.51	6.33	—	0.54	—	5
5177	SR-15	161.0	168.0	7.0	165.0	172.0	7.0	0.57	18.81	20.72	59.90	0.49	11,750	3	71.41	—	19.08	11.34	—	0.54	—	4
0529	M70-10C	767.5 775.0	773.5 776.0	6.0 1.0 7.0/8.5	770.0	779.0	9.0/9.0	0.16	19.82	32.58	47.44	0.49	10,140	1	52.0	1.11	17.20	8.86	72.83	0.73	14,240	3½
0333	M70-18C	266.5	272.0	5.5	268.5	274.0	5.0/5.5	0.31	16.26	23.01	60.42	0.60	11,430	4½	61.1	0.80	17.50	9.17	72.53	0.78	14,090	5½
	M70-20C	461.0	465.0	4.0	Not Sampled																	
	M70-12C	373.5	376.0	2.5	Not Sampled																	

Exhibit No. 19-9

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 8

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0468	M70-6C	380.0	404.0	24.0	382.0	406.0	18.0/24.0	0.29	15.98	10.96	72.77	0.42	13,840	3½	72.5	0.47	17.15	6.26	76.12	0.50	14,570	2½
0469	(8A)	407.0	426.0	19.0	410.0	427.0	14.0/17.0	0.24	15.03	29.70	55.03	0.26	10,570	1	53.8	0.34	17.60	6.91	75.15	0.48	14,500	3
				43.0/46.0																		
5227	SR-2	22.3	34.8	12.5	22.3	32.7	10.4	0.65	18.68	9.83	70.84	0.44	13,570	3½	91.98	--	19.07	6.51	--	0.39	--	4
5228	(8A)	36.4	49.8	13.4	38.0	49.5	11.5	0.68	18.79	12.69	67.84	0.45	13,460	3½	86.94	--	19.22	7.24	--	0.43	--	4½
5203	SR-1	--	--	--	324.0	338.2	14.2	0.71	19.09	11.12	69.08	0.41	13,350	5½	87.99	--	20.47	6.49	--	0.42	--	6
5204		--	--	--	338.4	343.4	5.0	0.84	7.16	85.06	6.92	0.06	1,710	NA	10.60	--	16.63	33.80	--	0.44	--	10
5205	(8A)	--	--	--	343.4	352.5	9.1	0.65	19.85	13.89	65.61	0.41	12,870	3½	86.87	--	19.44	7.80	--	0.49	--	4
	(NA) N-10	517.0	529.0	12.0)	Probe Log by North American - No Data Available on Samples Taken.																	
	(NA)	534.0	543.0	9.0)																		
				21.0/26.0																		
	(MK)	518.0	531.0	13.0	Check Probe by MK - 1970.																	
	(8A)	535.0	542.0	7.0																		
				20.0/26.0																		
0501	M70-4C	62.0	76.0	14.0	69.0	102.0	33.0	0.19	14.83	31.75	53.22	0.36	10,120	2	54.3	0.38	15.44	8.19	75.99	0.50	14,200	2½
	(8A)	82.0	95.0	13.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
				27.0/33.0																		
337433	Adit 8	NA Bulk Sample - 55 ft. from Portal - FW - 20 ft. Horizontal @ 40°						0.66	18.89	11.95	69.16	0.46	13,530	4)	85.2	--	18.88	7.11	74.01	0.45	14,398	3½
														)	(Composite Sample of 8 and 8A)							
337434		NA Bulk Sample - 55 ft. from Portal - HW - 22 ft. Horizontal @ 40°						0.93	19.31	9.08	71.61	0.50	14,400	3½)								
6907E		SR Bulk Sample - 107 ft. from Portal - FW - 20 ft. Horizontal @ 42°						0.60	18.89	15.75	64.76	0.36	12,820	4	--	--	19.65	8.28	--	--	--	--
6907F		SR Bulk Sample - 107 ft. from Portal - HW - 16 ft. Horizontal @ 40°						0.68	18.94	11.91	68.47	0.37	13,240	4	--	--	19.56	6.96	--	--	--	--
6907B		SR Bulk Sample - 148 ft. from Portal - FW - 20 ft. Horizontal @ 42°						0.42	17.86	16.90	64.82	0.43	12,430	4	--	--	18.92	7.90	--	--	--	--

Exhibit No. 19-10

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 8 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
6907C	Adit 8	SR Bulk Sample - 148 ft. from Portal - HW - 16 ft. Hor. @ 40°						0.51	19.34	11.34	68.81	0.41	13,530	5	--	--	19.89	6.87	--	--	--	--
0805—0830		MK Bulk Sample - 205 ft. from Portal - 39.6 ft. Hor. @ 42°						--	--	20.94	--	--	--	3	--	.45	19.0	6.68	73.87	0.45	--	6
0513)	M70-5C	253.0	267.0	14.0	262.0	270.0	7.0/8.0	0.04	16.59	17.91	65.48	0.41	11,730	3	74.44	0.60	17.02	6.99	75.38	0.44	14,410	3
0514)	Composite	274.0	286.0	12.0	277.0	292.5	10.0/15.5															
		(8A)		26.0/33.0			17.0/23.5															
5165	SR-13	590.0	602.0	12.0	593.5	606.0	12.0/12.5	0.56	19.76	8.52	71.16	0.54	14,020	4½	92.59	--	20.73	5.72	--	0.57	--	5½
B 1	(NA) B	132.0	145.0	13.0	138.0	152.0	16.0	--	19.41	24.78	--	0.44	--	2	72.2	--	21.96	6.29	--	0.58	--	3
B 2		149.0	161.0	12.0	152.0	165.3	13.3	--	19.99	32.34	--	0.37	--	1	63.1	--	23.07	8.19	--	0.47	--	3½
				25.0/29.0																		
0461)	TSR-4	Scurry Trench - MK Hor. 25 ft. 43.5°					41.0	0.30	14.95	26.72	58.03	0.44	10,990	1½	58.0	0.51	16.98	7.34	75.17	0.53	14,430	3½
0463)	Composite	(Oxidation Drilling - Sampled for Oxidation Study)																				
0309	T70-8	MK Dozer Trench Horiz. 45 ft. @ 41° (Sampled for Oxidation Study)						0.30	14.19	31.47	54.03	0.47	--	1	58.0	0.61	16.91	8.36	74.12	0.62	14,130	3
	M70-1R	365.5	380.0	14.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	(8A)	417.5	423.0	5.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	(8A)	424.5	425.5	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
				21.0/60.0																		
5215	SR-5	324.0	336.0	12.0	321.0	335.0	14.0	0.59	18.83	8.07	72.51	0.52	14,210	3	94.67	--	20.14	5.67	--	0.56	--	3½
5216	(8A)	342.0	354.8	12.8	344.0	354.7	10.7	0.55	18.39	17.00	64.06	0.38	13,360	2½	83.13	--	19.44	8.46	--	0.43	--	4
				24.8/30.8																		
5169	SR-14	211.0	224.0	13.0	213.5	226.0	12.0/12.5	0.58	19.56	11.47	68.39	0.48	13,450	5½	89.60	--	20.37	6.76	--	0.52	--	6
5170	(8A)	252.0	261.0	9.0	254.5	262.5	7.5/8.0	0.60	17.52	22.09	59.79	0.45	11,600	2½	72.37	--	19.36	9.56	--	0.54	--	4
0540 - 0541	T70-3 MK	Dozer Trench Hor. 46' Dip (Sampled for Oxidation Study)						0.30	17.52	13.77	68.41	0.48	13,260	2½	80.4	0.76	18.13	6.53	74.58	0.50	14,560	4
5174	SR-15	76.0	86.0	10.0	79.5	90.0	10.5	0.71	18.71	16.28	64.30	0.48	12,750	3½	85.23	--	20.9	7.09	--	0.49	--	4
5175					90.0	97.0	7.0	0.99	11.25	75.01	12.75	0.19	2,710	NA	14.62	--	18.42	26.98	--	0.38	--	6
5176	(8A)	93.0	104.0	11.0	97.0	107.5	10.5	0.82	18.84	17.62	62.72	0.39	12,340	4	80.11	--	19.6	9.60	--	0.40	--	5

Exhibit No. 19-11

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 8 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0527	M70-10C	639.0	650.0	11.0	642.0	652.5	10.5/10.5	0.20	16.90	8.44	74.46	0.53	14,280	6	94.7	1.57	18.08	6.28	74.07	0.58	14,760	5
0528	(8A)	711.5	720.0	8.5	713.0	724.0	11.0/11.0	0.18	14.42	32.26	53.14	0.50	10,500	1	65.1	0.68	17.94	7.75	73.63	0.65	14,320	3
				19.5/81.0																		
0499	M70-9C	526.0	534.5	8.5	528.0	541.0	13.0/13.0	0.25	11.05	53.94	34.76	0.20	6,680	1	34.4	1.07	17.38	11.19	70.36	0.59	13,700	5
		537.0	538.0	1.0																		
0500	(8A)	552.5	559.5	7.0	557.0	564.0	4.0/7.0	0.18	16.60	17.46	65.76	0.48	12,710	2	88.3	0.77	17.14	10.40	71.69	0.58	13,810	2½
		562.0	565.0	3.0																		
				19.5/39.0																		
0331	M70-18C	182.5	195.0	12.5	184.0	197.5	9.5/13.5	0.38	16.66	15.95	67.01	0.49	12,790	2	83.6	1.19	17.51	8.25	73.05	0.56	14,400	2½
0332	(8A)	204.0	208.0	4.0	205.5	211.0	5.5/5.5	0.44	14.02	36.08	49.46	0.30	8,040	1	41.7	0.98	18.57	7.96	72.49	0.52	14,400	4
				16.5/25.5																		
0348	M70-20C	359.0	373.5	14.5	361.5	378.0	13.0/16.5	0.23	15.91	24.35	59.51	0.39	11,470	3	69.0	1.29	19.27	6.78	72.66	0.42	14,550	4
0349		385.0	396.5	11.5	388.0	400.0	8.5/12.0	0.21	14.40	30.95	59.44	0.38	10,540	1	59.4	0.73	16.99	9.59	72.69	0.51	14,090	2½
		400.0	402.0	2.0																		
				28.0/37.5																		
	M70-9R	252.0	276.0	24.0																		
	(8A)	283.5	292.5	9.0																		
				33.0/40.5																		
0548	M70-12C	237.0	247.5	10.5	240.0	250.5	9.5/10.5	0.02	11.99	58.56	29.43	0.42	--	1	24.1	0.41	20.18	11.87	67.54	0.75	13,650	8
0549	(8A)	302.0	308.0	6.0	305.0	312.0	7.0/7.0	0.03	21.25	32.08	46.64	0.29	--	½	63.4	2.07	17.92	5.90	74.11	0.50	14,480	1
	(8A)	314.0	324.0	10.0	316.5	326.0	9.0/9.5	0.14	16.29	26.74	56.83	0.43	--	1	69.3	0.57	17.56	8.72	73.15	0.53	14,050	1½
0550	(8A)	327.0	329.0	2.0																		
				18.0/27.0																		
0544	M70-11C	604.0	620.0	16.0	606.0	618.0	12.0/12.0	0.17	18.61	21.26	63.96	0.41	--	1½	78.1	0.56	18.56	6.89	73.97	0.53	14,460	3
		646.0	656.0	10.0	Not Sampled																	
0545	(8A)	710.5	723.0	12.5	712.5	727.0	11.0/14.5	0.08	18.08	8.13	73.71	0.48	--	2½	96.1	1.66	18.34	6.08	73.92	0.50	14,570	2½
	(8A)	724.0	726.0	2.0																		
0546	(8A)	729.5	739.5	10.0	734.0	741.0	7.0/7.0	0.16	16.73	14.99	68.12	0.40	--	1	79.9	0.46	17.46	8.13	73.95	0.47	14,200	1½
				24.5/29.0																		

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 9

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0474	M70-6C	0.0	39.0	39.0	19.0	21.0	2.0	0.20	17.09	11.78	70.93	0.55	13,536	2	89.2	0.37	16.64	6.19	76.80	0.57	14,468	2
C-12	NA-C	--	--	3.0	609.0	613.0	3.0	--	17.31	30.95	--	0.51	--	1½	64.9	--	21.19	6.76	--	0.74	--	6
C-13		--	--	5.0	637.0	642.0	5.0	--	15.77	43.99	--	0.41	--	1	42.17	--	21.31	8.24	--	0.68	--	5½
C-14		--	--	17.0	656.0	673.0	17.0	--	21.52	22.41	--	0.40	--	2	70.13	--	20.83	7.83	--	0.51	--	3
				25.0/64.0																		
5157	SR-12	572.0	594.0	22.0	576.0	595.5	19.5	0.72	19.30	16.65	63.33	0.37	12,390	2	79.36	--	19.37	7.37	--	0.43	--	2½
5201	SR-1	131.0	132.5	1.5	163.5	175.0	11.5	0.75	18.13	23.70	57.42	0.32	11,090	1½	72.07	--	19.4	7.6	--	0.43	--	3
5202		163.4	185.0	21.6	175.0	185.4	10.4	0.80	18.82	13.19	67.19	0.37	13,090	2½	86.6	--	19.4	7.3	--	0.38	--	3½
				23.1/54.0																		
	N-10	400.0	406.0	6.0				(No records available as to whether samples were taken by North American)														
		407.0	418.0	11.0																		
				17.0/18.0																		
6907d	Adit 9	SR Bulk Sample 108' from Portal 25' Hor.@ 36° Dip						--	19.27	13.66	66.39	0.42	12,940	--	--	--	19.86	6.8	--	--	--	--
0853-0877	Adit 9	MK Bulk Sample 139' from Portal 25' Hor.@ 38° Dip						--	--	15.48	--	--	--	3	--	0.43	19.33	6.9	73.3	0.42	--	4½
337073	Adit P-1 (9N)	NA Bulk Sample 148' from Portal 23' Hor.@ 38° Dip						--	19.44	13.66	--	0.37	--	4	84.4	--	20.85	7.02	--	0.46	--	3½
0512	M70-5C	86.0	109.0	23.0	90.0	112.0	18.0/22.0	0.03	20.05	19.55	45.37	0.31	12,260	3	71.4	0.38	16.91	6.86	75.85	0.46	14,130	7½
A-4	(NA) A)	318.0	338.0	20.0	318.0	328.0	10.0	--	20.22	18.66	--	0.45	--	1½	76.7	--	20.96	6.78	--	0.49	--	4½
A-5	A)				328.0	337.0	9.0	--	20.24	20.24	--	0.38	--	1	88.0	--	20.12	7.83	--	0.39	--	2½
5163	SR-13)	496.0	516.0	20.0	500.0	515.5	15.5	0.59	19.91	14.51	64.99	0.34	12,940	3	83.25	--	20.92	7.65	--	0.39	--	4
5164	)				515.5	519.5	4.0	0.56	22.04	18.90	58.50	0.37	12,390	8½	75.79	--	23.60	6.27	--	0.43	--	9
0339	T70-11 (Sampled for Oxidation Study)	Emkay Scurry Trench - Horizontal Thickness 28' @ 45° Dip						0.47	18.10	11.36	70.24	0.46	13,470	1	81.2	0.30	17.96	7.26	74.31	0.50	14,190	1½
5213	SR-5)	203.0	225.4	22.4	203.5	216.0	12.5	0.60	18.82	17.63	62.95	0.35	12,260	2½	77.79	--	19.5	7.16	--	0.43	--	3½
5214	)				216.0	225.6	9.6	0.55	20.01	12.41	67.03	0.35	13,240	5	87.19	--	20.3	6.22	--	0.41	--	5½

Exhibit No. 19-13

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 9 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0310	TSR-5 (Sampled	Scurry Trench - Deepened for Oxidation Study)			1970 - Horizontal 29' @ 40° Dip			0.45	18.19	12.45	68.91	0.28	--	2½	85.0	0.48	18.42	5.84	75.26	0.36	14,580	4½
	M70-1R	289.5	308.0	18.5																		
5167	SR-14)	128.0	146.0	18.0	129.5	141.0	11.5	0.58	18.72	14.83	65.87	0.37	12,860	1	79.7	--	20.04	6.71	--	0.42	--	3
5168	)				141.0	148.0	7.0	0.55	19.81	15.63	64.01	0.39	12,700	4	79.3	--	21.20	6.66	--	0.46	--	5½
0526	M70-10C	498.0	517.0	19.0	498.0	520.0	22.0	0.22	15.75	32.59	51.44	0.37	10,670	2	60.0	0.40	18.12	7.47	74.01	0.42	14,380	3
0498	M70-9C	345.5	359.0	13.5	345.5	365.0	18.0/19.5	0.20	14.40	38.42	46.98	0.45	8,930	1	48.4	0.46	17.54	8.52	73.48	0.67	14,090	2
		360.5	361.5	1.0																		
				14.5/16.0																		
0347	M70-20C	162.0	175.0	13.0	165.5	179.5	14.0/14.0	0.25	16.31	22.35	61.09	0.51	11,810	1	68.4	0.35	18.01	8.27	73.37	0.59	14,170	3½
		176.0	178.0	2.0																		
				15.0/16.0																		
0330	M70-17C	721.0	730+	9+	722.5	737.0	14.5/14.5	0.28	17.78	23.88	58.66	0.51	11,620	1	68.5	0.28	18.40	9.01	72.31	0.64	14,090	3½
	M70-9R	89.5	104.0	14.5																		
0519	M70-7C	608.0	622.0	14.0	613.0	628.0	15.0/15.0	0.23	15.55	31.81	52.41	0.51	--	1	55.9	0.44	18.32	8.93	72.31	0.59	14,000	2
		623.0	625.0	2.0																		
		669.5	680.0	10.5																		
				26.5/72.0																		
0547	M70-12C	184.0	185.0	1.0																		
		187.5	191.5	4.0																		
		192.0	204.0	12.0	197.0	210.0	13.0/13.0	0.07	17.60	25.20	57.13	0.43	--	2½	65.9	0.41	18.84	7.64	73.11	0.5[illegible]	14,340	3½
		205.0	206.5	1.5																		
				18.5/22.5																		
0320	M70-13C	637.0	652.0	15.0	639.0	655.0	16.0/16.0	0.44	17.38	24.41	57.77	0.49	12,000	2½	71.8	0.63	18.61	8.40	72.36	0.5[illegible]	14,150	4½
		653.0	654.5	1.5																		
0321		658.0	666.0	8.0	662.0	670.0	7.5/8.0	0.46	12.10	52.07	35.28	0.29	6,850	3½	32.5	0.62	21.32	8.03	70.03	0.7[illegible]	14,410	8½
				24.5/29.0																		

Exhibit No. 19-14

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 9 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0539	M70-11C	548.0	557.0	9.0	553.0	560.0	7.0	0.13	19.85	8.36	71.66	0.32	--	1½	94.9	1.70	19.87	5.13	73.30	0.36	14,600	1½
0091	M70-26C	800.0 805.5	802.5 809.0	2.5 3.5 6.0/9.0	803.0	812.5	8.5/9.5	0.14	14.02	46.63	39.21	0.46	7,950	2½	37.8	0.49	19.79	9.46	70.32	0.66	14,130	8

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 10

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
C-8	(NA) C	--	--	--	463.0	465.0	2.0	--	25.09	10.17	--	0.93	--	8	91.6	--	23.67	5.54	--	0.99	--	7½
C-9		--	--	--	467.0	471.0	4.0	--	23.16	14.03	--	0.73	--	8	88.7	--	23.05	7.39	--	0.82	--	5½
C-10		--	--	--	495.0	501.0	6.0	--	22.72	9.04	--	0.76	--	5	92.8	--	22.82	5.14	--	0.77	--	5
C-11		--	--	--	561.0	570.0	9.0	--	18.45	28.69	--	0.99	--	7	67.9	--	22.82	6.39	--	0.86	--	8½
5155	SR-12	361.0	374.0	13.0	365.2	375.0	9.8	0.68	20.88	10.11	68.33	0.61	13,600	4½	91.30	--	21.70	5.39	--	0.61	--	6½
		384.0	388.0	4.0																		
5156		422.0	429.0	7.0	425.0	431.0	6.0	0.61	19.89	17.76	61.74	0.62	12,460	7	81.88	--	20.62	8.50	--	0.68	--	8½
				24.0/68.0																		
0311	TSR-13 (Sampled for Oxidation Study)	Scurry Dozer Trench - Hor. 22' @ 40°						0.2	19.12	7.67	73.00	0.54	--	6½	89.6	0.41	17.97	4.07	77.55	0.58	15,180	7½
	(NA) N-10	178.0	187.0	9.0																		
		190.0	193.0	3.0																		
		209.5	214.0	4.5																		
		215.0	216.0	1.0																		
				17.5/38.0																		
337533	Adit 10	NA Bulk Sample - 77' from Portal - 43					Hor.@ 35° Dip	--	21.44	16.06	--	0.40	--	2½	--	--	--	7.02	--	--	--	--
	Adit 10	MK Bulk Sample - 98' from Portal - 36					Hor. @ 40° Dip	--	--	17.24	--	--	--	3½	--	0.47	20.25	6.8	72.48	0.43	--	5½
	M70-3R	303.0	304.0	1.0																		
		305.0	320.0	15.0																		
		321.5	322.5	1.0																		
		324.0	333.0	9.0																		
		342.0	342.5	0.5																		
				26.5/39.5																		
0072	T70-16 (Sampled for Oxidation Study)	Emkay Scurry Dozer Trench, Horizontal					24', 10' @ 40.5°	0.82	17.90	13.80	67.48	0.36	12,760	NA	70.8	0.81	18.62	6.10	74.47	0.39	14,080	½

Exhibit No. 19-16

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 10 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	(NA) A	113.0	138.0	25.0	112.0	136.0	24.0	--	21.83	13.55	--	0.43	--	4	85.4	--	22.60	6.83	--	0.45	--	5
		145.0	154.0	9.0	145.0	153.0	8.0	--	24.45	16.45	--	0.40	--	6½	82.0	--	23.83	6.56	--	0.42	--	7½
				34.0/41.0																		
5161	SR-13)	314.0	338.0	24.0	316.0	325.5	9.5	0.66	20.48	12.12	66.74	0.39	13,360	4½	91.24	--	21.60	6.06	--	0.40	--	4½
5162	)				325.5	340.5	15.0	0.71	20.87	13.58	64.84	0.30	13,070	7	26.78	--	23.03	6.06	--	0.32	--	8½
5210	SR-5)				29.5	45.0	15.5	0.72	18.71	13.97	67.32	0.34	12,930	3	87.66	--	20.1	7.16	--	0.39	--	4
5211	)	28.5	67.5	39.0	45.0	56.0	11.0	0.60	19.86	12.34	67.20	0.31	13,130	5	88.71	--	20.7	6.60	--	0.33	--	6
5212	)				56.0	66.4	10.4	0.57	16.93	31.46	57.04	0.49	10,650	2½	63.18	--	20.5	8.06	--	0.56	--	5½
0308	M70-14C	464.0	489.0	25.0	464.0	502.0	27.5/38.5	0.37	15.85	25.88	57.90	0.18	--	2½	68.1	0.38	18.31	7.04	74.45	0.25	14,540	5½
		491.5	496.0	4.5																		
		497.5	499.0	1.5																		
				31.0/35.0																		
	M70-1R	156.0	188.5	32.5																		
	M70-2R	287.5	317.0	29.5																		
0312	TSR-6 (Sampled	Scurry Trench - Deepened for Oxidation Study)			Horiz	42' @	41.5°	0.29	19.58	11.16	68.97	0.22	--	3	88.6	0.33	19.53	6.19	73.95	0.31	14,470	4½
	M70-10C	416.5	448.0	31.5	419.5	457.0	32.5/37.5	0.23	16.70	21.45	61.62	0.28	11,870	2	71.5	0.53	18.59	6.57	74.13	0.34	14,460	3½
		451.0	454.5	3.5																		
				35.0/38.0																		
0497	M70-9C	257.0	262.0	5.0																		
		265.0	309.0	44.0	266.0	312.0	45.0/46.0	0.21	17.98	14.53	67.28	0.33	13,120	1	81.8	1.12	18.95	5.71	74.22	0.39	14,610	2
				49.0/52.0																		
0346	M70-20C	59.5	95.5	36.0	59.5	97.5	27.5/38.0	0.27	18.35	11.66	69.72	0.26	13,580	2	87.6	0.56	19.01	7.10	73.33	0.27	14,350	3
0329	M70-17C	642.0	674.0	32.0	642.5	675.0	27.0/32.5	0.27	18.90	13.15	67.68	0.24	13,250	2½	--	0.35	19.30	5.97	74.38	0.26	14,580	4
0516,7	M70-7C	500.0	510.0																			
& 8		511.0	544.0	43.0/44.0	503.0	545.5	40.5/41.5	0.34	19.09	10.76	69.81	0.37	--	3	88.4	1.15	20.13	5.75	72.98	0.42	14,690	4

Exhibit No. 19-17

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 10 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0319	M70-13C	510.0	550.0	40.0	516.0	551.5	27.0/35.5	0.51	17.79	19.94	61.76	0.27	12,270	2	80.8	0.86	21.84	6.22	71.08	0.27	14,390	8
0534,	M70-11C	400.0	402.0	2.0																		
35, 36		403.5	409.0	5.5	406.0	412.0	5.5/610	0.35	17.58	26.86	55.21	0.61	11,520	5	66.7	1.20	21.72	5.73	71.35	0.70	14,520	7½
		412.0	419.0	7.0	414.5	422.0	7.5/7.5															
		422.0	423.5	1.5	424.0	427.5	3.5/3.5															
0537,		425.0	428.0	3.0	438.0	448.0	10.0/10.0	0.33	15.18	40.44	44.05	0.42	9,140	2	48.0	0.51	20.51	6.54	72.44	0.58	14,560	7
38		435.5	442.5	7.0	449.0	453.0	4.0/4.0															
		446.0	449.0	3.0																		
		452.0	453.5	1.5																		
				30.5/53.5																		
0090	M70-26C	594.0	595.5	1.5																		
		596.0	598.0	2.0																		
		598.5	621.5	23.0	597.0	612.0	4.5/15.0	0.22	14.16	48.25	37.37	0.04	7,310	1	27.1	0.28	18.37	9.65	71.71	0.32	14,120	1½
				26.5/27.5																		

Exhibit No. 19-18

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 11

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	M70-2R	89.0	102.5	13.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		103.5	110.0	6.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
				20.0/21.0																		
0078	M70-25C	660.0	669.5	9.5	662.0	677.0	8.0/15.0	0.16	11.53	58.23	30.08	0.34	5,900	1	25.9	0.41	19.91	9.54	70.14	0.48	13,990	6½
		670.5	692.0	21.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
				31.0/32.0																		
0524	M70-10C	282.0	290.0	8.0	284.5	304.0	19.0/19.5	0.25	17.24	29.68	52.83	0.47	11,000	5½	65.8	0.73	20.09	9.65	69.53	0.62	13,970	6
		291.0	306.0	15.0																		
				23.0/24.0																		
0495	M70-9C	60.0	67.0	7.0	61.5	69.5	8.0/8.0	0.35	17.22	34.89	47.54	0.50	9,630	4½	54.3	0.55	20.20	10.33	68.92	0.83	13,830	6½
		69.0	71.0	2.0																		
0496		73.5	90.5	17.0	77.0	94.0	7.0/17.0	0.33	17.54	15.59	66.54	0.56	13,040	7½	61.5	0.86	19.40	7.37	72.37	0.82	14,350	7½
		99.0	101.0	2.0																		
				28.0/41.0																		
0056	M70-22C	No Probe -	Log Taken -		574.5	580.5	4.0/6.0	0.25	18.93	21.01	59.81	0.61	11,970	7½	69.7	0.59	19.89	8.93	70.59	0.76	14,220	8
		Hole	Caved																			
0057					587.0	603.0	8.0/16.0	0.29	20.46	13.72	65.53	0.70	13,190	6½	87.6	0.99	21.63	8.27	69.11	0.78	14,350	8
				22.0/28.5			/22.0															
0328	M70-17C	483.0	499.0	16.0	484.0	502.0	14.5/18.0	0.30	19.04	21.45	59.21	0.69	12,070	7	--	0.30	21.56	7.91	70.23	0.69	14,330	8½
0492	M70-7C	291.0	294.5	3.5																		
		296.0	312.0	16.0	295.0	313.5	11.5/18.5	0.41	17.47	17.58	64.54	0.58	12,800	6½	79.7	1.20	20.44	10.09	68.27	0.79	14,060	6½
		314.0	315.0	1.0																		
				20.5/24.0																		
0344	M70-21C	587.0	589.5	2.5	588.5	597.5	10.0/12.0	0.32	14.20	46.91	38.57	0.41	7,910	3½	39.2	0.32	22.22	7.08	70.36	0.54	14,530	7½
		591.0	598.5	7.5																		
0345		599.0	607.0	8.0	600.0	607.0	7.0/7.0	0.27	15.76	42.96	41.01	0.40	8,460	2	49.4	0.45	20.09	6.23	73.23	0.69	14,610	7
		608.0	609.0	1.0																		
		622.5	624.5	2.0																		
				21.0/37.5																		

Exhibit No. 19-19

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 11 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0318	M70-13C	379.0	396.0	17.0	385.5	398.0	11.0/12.5	0.50	20.67	9.52	69.31	0.70	14,000	8	91.8	0.86	21.84	6.22	71.08	0.70	14,640	8
		404.0	407.0	3.0																		
		410.0	413.0	3.0																		
				23.0/34.0																		
0079	M70-23C	706.0	708.0	2.0																		
		709.0	722.0	13.0	712.5	726.0	7.0/13.5	0.11	17.00	30.11	52.78	0.56	10,750	3½	57.9	0.50	20.89	6.91	71.70	0.57	14,290	6
		723.5	724.5	1.0																		
		725.0	726.0	1.0																		
		730.0	733.0	3.0																		
		735.5	738.0	2.5																		
				22.5/32.0																		
0532,33	M70-11C	197.0	200.5	3.5	199.0	208.0	7.0/9.0	0.38	18.80	27.22	53.60	0.54	11,260	4½	68.3	1.18	22.23	8.25	68.34	0.50	14,330	7
		201.5	205.5	4.0	209.5	226.0	14.5/15.5															
		207.0	220.5	13.5																		
		222.0	223.0	1.0																		
				22.0/26.0																		
0086	M70-26C	346.0	353.0	7.0	347.0	350.0	1.0/3.0	0.16	19.44	13.79	66.61	0.44	13,380	5	86.7	1.43	21.00	6.38	71.19	0.38	14,600	6
0085		355.5	365.5	10.0	351.0	363.0	4.0/12.0	0.12	17.86	14.08	67.94	0.37	13,170	1	73.2	0.40	18.50	8.61	72.49	0.42	14,150	1½
				17.0/19.5																		

Exhibit No. 19-20

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 12

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
C 6	(NA) C	--	--	--	370.0	384.0	14.0	--	19.56	28.28	--	0.62	--	8	64.9	--	24.05	7.29	--	0.77	--	5½
C 7	C	--	--	--	393.0	395.0	2.0	--	18.91	36.15	--	0.84	--	6	53.2	--	25.08	8.27	--	1.12	--	6½
	T70-14	Emkay	Scurry	Dozer Trench	30' Hor. @		40° Dip	0.33	16.46	28.92	54.29	0.69	11,220	6	63.6	0.60	20.11	5.82	73.47	0.82	14,650	7
	(Sampled	for Oxidation Study)																				
5154	SR-12	219.0	228.0	9.0																		
		316.0	321.0	5.0	219.0	228.0	5.5/9.0	0.59	21.63	18.37	59.41	0.58	12,430	7½	80.32	--	22.59	7.73	--	0.64	--	9
				14.0/102.0																		
	N-12	373.0	387.0	14.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-10	67.0	81.0	14.0	Probe Log By M-K Co. - 1970 - No Record Available of Any Samples Taken.																	
		100.5	102.0	1.5																		
		117.0	121.5	4.5																		
				20.0/54.5																		
	M70-3R	194.0	208.0	14.0																		
		211.0	211.5	0.5																		
		213.5	214.0	0.5																		
		215.0	217.0	2.0																		
		221.5	225.5	4.0																		
				21.0/29.5																		
5159	SR-13	195.0	216.0	21.0	199.0	215.0	13.5/16.0	0.76	22.14	14.79	62.31	0.53	13,080	9	85.74	--	24.63	7.63	--	0.55	--	9
5160		221.0	222.0	1.0	215.0	221.0	5.0/6.0	0.78	19.08	31.07	49.07	0.63	10,110	8	57.26	--	24.74	7.43	--	0.77	--	10
				22.0/27.0																		
0073	T70-16	Emkay	Scurry	Dozer Trench	17' Hor. @		40° Dip	0.26	18.47	14.41	66.86	0.51	12,950	4	71.5	0.69	20.66	5.47	73.18	0.58	--	5
0171		Emkay	Scurry	Dozer Trench	(Same Location		Deepened 4.0')	--	--	--	--	--	--	9	--	--	--	--	--	--	--	--
	(Sampled	for Oxidation Study)																				
0776	T70-1	MK Bulk Sample - Dozer Trench 34' Hor. @ 40° Dip						--	--	26.02	--	--	--	--	--	0.44	20.6	9.19	69.76	0.67	--	8½
0307	M70-14C	296.0	318.0	22.0	298.0	321.5	21.0/23.5	0.45	15.25	39.45	44.85	0.57	--	4½	44.70	0.72	20.83	7.54	70.91	0.68	14,450	7
		323.5	324.0																			

Exhibit No. 19-21

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 12 (Continued)

Sample Number	Location	Probe Interval		Total Coal in Vertical Penetration	Core Interval		Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis							Washed Coal Analysis at 1.50 Sp. Gr.							
		From	To		From	To		H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	M70-2R	89.0	102.5	13.5																		
		103.5	110.5	7.0																		
				20.5/22.5																		
0317	M70-15C	319.5	328.0	8.5																		
		329.0	335.0	6.0	323.0	349.5	18.0/26.5	0.21	16.08	33.77	49.94	0.50	--	4	56.7	0.30	17.90	8.49	73.31	0.62	14,200	7
		336.0	342.5	6.5																		
		344.5	345.5	1.0																		
		346.5	348.0	1.5																		
				23.5/28.5																		
0522	M70-10C	186.0	190.0	4.0																		
		194.5	198.0	3.5																		
		208.0	230.0	22.0	211.5	233.5	19.5/22.0	0.33	18.02	17.64	64.01	0.64	12,690	6½	84.3	1.08	20.18	4.85	73.89	0.65	14,720	6½
		246.5	253.5	7.0	249.5	257.0	6.0/7.5	0.26	18.30	24.92	56.52	1.05	11,950	6½	64.6	0.38	20.68	6.55	72.39	1.10	14,590	7
				36.5/67.5																		
0076	M70-25C	618.0	619.0	1.0																		
		621.5	624.5	3.0																		
		628.0	643.5	15.5	625.5	645.0	14.0/19.5	0.14	17.17	28.37	34.32	0.55	10,740	4½	67.6	1.26	20.45	3.97	74.32	0.58	15,030	5½
		646.0	650.5	4.5	647.0	652.0	5.0/5.0	0.15	12.25	51.79	35.81	0.47	5,020	1½	36.6	0.46	21.40	8.22	69.97	0.68	14,230	7
				24.0/32.5																		
0055	M70-22C	470.0	471.5	1.5																		
		477.5	481.0	3.5																		
		487.0	502.0+	15.0+	488.0	513.5	15.5/25.5	0.32	20.88	6.70	72.10	0.67	14,420	6	89.2	2.26	20.50	4.20	73.04	0.71	14,980	7
				20.0/32.0+																		
0326	M70-17C	340.0	341.5	1.5																		
		346.0	349.0	3.0																		
		352.5	353.5	1.0																		
		356.5	376.0	19.5	358.5	381.5	13.0/23.0	0.36	16.39	31.33	51.92	0.61	10,490	6	64.8	0.94	21.12	7.45	70.49	0.77	14,360	8½
		377.0	378.5	1.5																		
		411.0	414.0	3.0																		
		415.5	420.0	4.5	411.0	423.0	12.0/12.0	0.32	12.91	57.02	29.75	0.60	6,150	1½	25.9	0.29	19.92	8.42	71.37	0.95	14,220	8
				34.0/80.0																		

Exhibit No. 19-22

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 12 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	M70-21C	467.5	470.5	3.0																		
0343		476.5	478.5	2.0																		
		481.0	484.5	3.5																		
		490.5	510.5	20.0	477.5	507.0	11.0/29.5	0.36	10.95	66.68	22.01	0.22	4,240	1	20.5	0.60	23.63	5.00	70.77	0.87	14,870	7
		512.0	514.5	2.5																		
		531.5	534.5	3.0																		
		537.5	538.5	1.0																		
		541.0	543.0	2.0																		
		545.0	546.0	1.0																		
				38.0/78.5																		
0491	M70-7C	133.0	136.0	3.0																		
		141.0	144.5	3.5																		
0493		150.0	151.0	1.0																		
		152.0	154.5	2.5																		
		160.0	176.0	16.0	164.0	178.0	5.0/14.0	0.43	19.16	11.56	68.86	0.61	13,680	6	91.6	1.01	19.98	8.86	70.15	0.72	14,190	6½
		179.0	182.0	3.0																		
		200.0	208.5	8.5	206.0	210.0	4.0/4.0	0.42	12.93	53.58	33.07	0.53	6,840	1	32.0	0.53	20.18	11.92	67.37	0.97	13,730	6½
		210.0	212.0	2.0																		
		215.0	217.0	2.0																		
				41.5/84.0																		
0302	M70-13C	203.0	218.0	15.0	208.0	223.0	11.0/15.0	0.50	21.15	8.27	70.08	0.63	13,920	6	87.8	1.47	21.53	5.74	71.26	0.65	14,620	6½
		219.0	224.0	5.0																		
0303		235.0	241.5	6.5	238.5	243.5	5.0/5.0	0.52	19.76	20.17	59.55	0.67	12,330	5½	75.7	1.22	21.10	11.83	65.85	0.75	13,700	7
		254.5	257.0	2.5																		
		267.0	270.0	3.0																		
		274.0	276.0	2.0																		
		285.0	286.5	1.5																		
				35.5/83.5																		
0074	M70-23C	535.0	543.0	8.0	538.0	548.0	9.0/10.0	0.23	20.51	14.01	65.25	0.60	13,620	6	75.9	0.81	21.51	6.07	71.61	0.59	14,650	7½
		544.0	546.0	2.0																		
0075		550.0	558.0	8.0	553.0	558.0	4.0/5.0	0.19	18.31	29.92	51.58	0.65	10,510	4	58.1	0.38	21.48	9.71	68.43	0.71	14,000	6½
				18.0/23.0																		
0084	M70-26C	178.5	182.5	4.0																		
		183.5	199.0	15.5	184.0	201.0	12.0/17.0	0.21	18.41	20.16	61.22	0.42	12,150	2	71.7	0.40	19.51	8.55	71.54	0.52	14,120	4½
		200.5	201.5	1.0																		
				20.5/23.0																		

Exhibit No. 19-23

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 13

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
C 4	(NA) C	--	--	5.0	314.0	319.0	5.0	--	21.88	23.34	--	2.02	--	8	72.0	--	25.19	6.46	--	0.99	--	6½
C 5		--	--	3.0	323.0	326.0	3.0	--	19.65	31.74	--	1.15	--	5	55.4	--	25.70	9.80	--	1.12	--	6½
				8.0/12.0																		
5155	SR-12	102.0	105.0	3.0																		
		110.0	114.0	4.0																		
		138.0	144.0	6.0	140.0	144.0	4.0	0.73	23.41	9.42	66.44	0.78	13,720	9	91.82	--	24.50	4.72	--	0.83	--	9
5152		166.0	171.0	5.0	166.0	173.0	7.0	0.70	22.54	14.41	62.35	1.10	12,950	8½	87.82	--	24.75	7.98	--	1.12	--	9½
5153		178.0	186.0	8.0	180.0	186.0	6.0	0.73	22.43	11.39	65.45	0.74	13,500	7½	91.75	--	23.01	7.42	--	0.80	--	8
				26.0/84.0																		
	N-12	253.0	261.0	8.0				No Record Available of Any Samples Taken.														
		291.0	296.0	5.0																		
		306.0	313.0	7.0																		
				20.0/60.0																		
	M70-3R	15.5	22.5	7.0																		
		26.0	28.0	2.0																		
		37.5	42.0	4.5																		
		56.0	57.5	1.5																		
		65.0	68.0	3.0																		
		70.0	73.0	3.0																		
		75.5	81.0	5.5																		
		85.0	88.0	3.0																		
		108.5	110.0	1.5																		
		112.0	117.0	5.0																		
		119.0	121.0	2.0																		
		126.0	130.0	4.0																		
				42.0/114.5																		
5158	SR-13	142.0	147.0	5.0	146.0	150.0	3.5/4.0	0.74	18.88	35.13	45.25	0.91	12,120	6½	49.52	--	24.77	11.10	--	1.16	--	10
0305	M70-14C	177.0	179.5	2.5																		
		188.0	199.0	11.0	178.0	200.0	18.5/22.0	0.40	15.10	37.50	47.00	0.50	--	5	52.8	1.20	20.30	7.01	71.49	0.87	14,430	7½
0306		226.0	233.0	7.0	227.0	233.0	6.0/6.0	0.35	20.05	7.01	72.59	0.82	--	6	93.8	0.95	20.56	5.05	73.44	0.83	14,760	7
				20.5/56.0																		

Exhibit No. 19-24

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 13 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0316	M70-15C	211.0	213.0	2.0																		
		221.0	224.0	3.0																		
		229.0	245.0	16.0	230.5	247.0	14.5/16.5	0.30	19.05	15.91	64.74	0.56	--	5½	85.6	1.15	20.02	5.58	73.25	0.69	14,650	7
		250.0	251.0	1.0																		
		252.0	253.5	1.5																		
				23.5/42.5																		
0075	M70-25C	464.0	475.0	11.0	467.0	482.0	12.0/15.0	0.23	17.78	12.26	69.73	0.62	10,190	6	53.5	0.50	23.08	6.06	70.36	0.63	14,690	7½
		476.5	480.0	3.5																		
		491.0	493.0	2.0																		
		506.5	509.0	2.5																		
				19.0/45.0																		
0521	M70-10C	43.0	57.0	14.0	47.0	60.5	13.0/13.5	0.34	20.16	21.82	57.68	0.68	12,100	6½	66.5	0.38	23.08	5.94	70.60	0.74	14,640	7
		74.0	75.0	1.0																		
		80.0	82.0	2.0																		
				17.0/39.0																		
0054	M70-22C	337.0	346.0	9.0	339.0	354.0	6.5/15.0	0.38	17.65	24.53	57.44	0.60	11,160	5½	60.9	0.85	21.54	6.79	70.82	0.70	14,480	7½
		347.0	353.0	6.0																		
		368.5	371.5	3.0																		
				18.0/34.5																		
0325	M70-17C	247.5	255.5	8.0	251.0	266.0	15.0/15.0	0.38	18.22	25.67	55.73	0.59	10,940	5½	68.4	0.56	22.94	4.80	71.70	0.65	14,800	8½
		257.0	262.5	5.5																		
				13.5/15.0																		
0342	M70-21C	420.0	432.5	12.5	417.0	427.0	7.5/10.0	0.36	22.44	7.39	69.81	0.54	14,310	6½	90.9	1.01	23.46	4.16	71.37	0.65	14,910	7½
0067	M70-23C	393.0	403.0	10.0	398.0	406.5	7.0/8.5	0.31	21.82	17.07	60.76	0.71	12,700	6	75.6	1.39	22.37	7.40	68.84	0.71	14,380	7
		419.0	423.0	4.0	423.0	427.0	4.0/4.0	0.35	19.58	35.34	44.77	1.01	9,790	4½	46.3	0.58	25.80	8.52	65.10	0.91	14,250	7
0066		426.5	428.0	1.5																		
				15.5/35.0																		
	M70-13C	62.0	66.0	4.0																		
		68.0	72.5	4.5	Not Sampled																	
		74.0	81.5	7.5																		
				16.0/19.5																		
0083	M70-26C	102.0	122.0	20.0	106.0	122.0	7.0/16.0	0.22	19.37	17.81	62.60	0.70	12,490	2	67.0	0.93	20.36	8.88	69.83	0.46	14,140	2

Exhibit No. 19-25

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 14

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
C 2	(NA) C				235.0	244.0	9.0	--	22.44	13.05	--	0.71	--	6½	87.6	--	23.76	6.00	--	0.67	--	5½
C 3					277.0	283.0	6.0	--	25.22	9.70	--	0.67	--	8	93.9	--	23.16	5.59	--	1.00	--	6½
	N-12	70.0	77.0	7.0																		
		83.0	93.0	10.0			No Record Available of Any Samples Taken.															
		106.0	113.0	7.0																		
		125.0	132.0	7.0																		
				31.0/62.0																		
0304	M70-14C	87.0	88.5	1.5																		
		91.0	95.0	4.0																		
		110.0	118.0	8.0	110.0	119.0	5.0/9.0	0.53	17.45	33.81	48.21	0.80	--	5½	52.1	0.74	22.04	9.85	67.37	0.90	13,930	8
				13.5/31.0																		
0315	M70-15C	97.0	100.0	3.0																		
		112.0	120.0	8.0	110.0	119.0	5.0/9.0	0.53	17.45	33.81	48.21	0.80	--	5½	52.1	0.74	22.04	9.85	67.37	0.90	13,930	8
		122.0	126.0	4.0																		
		141.0	147.5	6.5																		
				21.5/50.5																		
0069	M70-25C	388.0	397.5	9.5	391.0	399.0	5.5/8.0	0.25	26.12	6.97	66.66	0.71	14,620	6	92.8	0.69	26.01	4.42	68.88	0.70	14,970	7½
		403.0	408.0	5.0																		
				14.5/20.0																		
0052	M70-22C	215.0	225.5	10.5	216.0	226.0	6.0/10.0	0.21	20.79	26.38	52.62	0.43	11,130	5½	71.0	0.84	23.50	5.25	70.41	0.57	14,220	8
		244.0	247.0	3.0																		
0053		248.0	253.0	5.0	243.5	254.0	6.0/10.5	0.35	19.71	20.50	59.44	0.72	12,120	6	67.6	0.55	22.91	8.46	68.08	0.80	14,330	8
		260.0	262.0	2.0																		
		265.0	266.5	1.5																		
				22.0/51.5																		
0323	M70-17C	103.0	111.5	8.5	104.0	112.5	6.5/8.5	0.46	19.59	25.84	54.11	0.58	11,260	6½	63.4	0.56	22.82	8.60	68.02	0.73	14,120	7½
		118.5	123.0	4.5	120.5	126.0	5.5/5.5	0.51	14.09	53.62	31.78	0.42	6,680	3	43.8	0.41	23.28	6.21	70.10	0.67	14,570	8½
0324		124.5	127.0	2.5																		
		133.5	135.5	2.0																		
		142.5	144.0	1.5																		
				19.0/41.0																		

Exhibit No. 19-26

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 14 (Continued)

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	M70-21C	292.0	298.0	6.0																		
		308.5	318.0	9.5																		
		325.5	327.0	1.5	Not	Sampled																
		347.0	350.0	3.0																		
		361.0	362.0	1.0																		
				21.0/50.0																		
0065	M70-23C	291.0	310.0	19.0	295.0	313.0	13.5/18.0	0.36	20.80	25.54	53.50	0.56	11,270	5	67.5	0.71	24.02	7.71	67.56	0.67	14,330	9
		318.5	319.5	1.0																		
		321.0	323.0	2.0																		
		328.5	331.0	2.5																		
		332.5	334.0	1.5																		
		343.0	344.0	1.0																		
				27.0/53.0																		
0096	M70-24C	Hole	Caved		791.0	795 +	+4'	0.11	25.02	10.84	64.03	0.79	13,760	7½	86.2	1.08	25.14	5.51	68.27	0.76	14,540	8

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 15

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0313	M70-15C	42.0	49.5	7.5	45.5	53.0	4.0/7.5	0.36	15.04	45.37	39.23	0.47	--	4	61.0	1.48	23.86	5.40	69.26	0.67	14,750	7½
0314		58.0	62.0	4.0	61.0	65.0	4.0/4.0	0.20	18.06	34.44	47.30	0.65	--	6½	54.1	0.53	22.55	6.46	70.46	0.91	14,330	7½
				11.5/20.0																		
0063	M70-25C	260.0	261.0	1.0																		
		270.5	278.0	7.5	273.0	281.0	8.0/8.0	0.16	22.08	25.81	51.95	0.34	11,250	6½	68.6	1.08	27.04	4.85	67.03	0.49	14,780	7½
0064		281.5	293.5	12.0	287.0	296.0	7.0/9.5	0.18	21.28	20.76	57.78	0.41	12,160	6½	73.4	1.33	25.13	3.57	69.97	0.50	15,070	8½
0068		313.5	323.5	10.0	317.0	325.0	6.5/8.0	0.32	21.66	14.49	63.53	0.67	13,270	7	82.8	0.70	23.96	5.04	70.30	0.66	14,870	8
				30.5/63.5																		
0051	M70-22C	175.0	184.0	9.0	175.5	200.0	16.5/24.5	0.12	20.81	30.51	48.56	0.29	10,430	5½	60.6	0.81	25.18	5.89	68.12	0.47	14,580	7
		184.5	186.0	1.5																		
		188.0	201.5	13.5																		
				24.0/26.5																		
0322	M70-17C	52.5	61.0	8.5	57.0	75.0	16.5/18.0	0.47	19.85	40.89	38.79	0.34	8,370	5	51.1	0.56	23.86	6.11	69.47	0.49	14,510	8½
		64.5	71.0	6.5																		
		72.0	74.0	2.0																		
		77.5	81.5	4.0																		
				21.0/29.0																		
0341	M70-21C	174.0	180.0	6.0	167.0	181.0	9.0/14.0	0.39	23.98	15.36	60.27	0.53	12,820	8	77.5	1.11	23.96	6.94	67.99	0.54	14,340	9
		182.0	188.0	6.0																		
		224.0	226.0	2.0																		
		246.0	249.0	3.0																		
				17.0/75.0																		
0059	M70-23C	133.5	146.5	13.0	137.0	150.5	12.0/13.5	0.28	23.03	19.02	57.67	0.55	12,420	7	73.2	0.80	25.28	4.48	69.44	0.68	14,850	8
		156.0	162.0	6.0	159.0	170.0	11.0/11.0	0.26	20.51	28.82	50.41	1.60	9,000	4½	42.1	0.33	25.32	8.79	65.56	1.05	14,070	7½
0060		163.5	170.0	6.5																		
				25.5/36.5																		
0088	M70-24C	684.5	690.5	6.0	689.0	695.5	6.5/6.5	0.17	21.94	22.41	50.48	0.53	11,090	7½	62.8	0.80	25.69	6.22	67.29	0.76	14,560	8½
		694.0	699.0	5.0	698.0	703.0	4.5/5.0	0.33	21.21	32.06	46.40	0.91	10,190	5	51.8	0.37	25.81	7.71	66.41	0.85	14,320	8½
0089		701.1	702.5	1.5																		
				12.5/18.0																		

Exhibit No. 19-28

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971

SEAM NO. 16

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	M70-30C	524.0	529.0	5.0					Not Sampled and Tested.													
		530.0	530.5	0.5																		
		538.0	540.0	2.0																		
				7.5/16.0																		
0156		570.0	577.0	7.0	573.0	579.0	6.0	0.45	23.54	9.40	66.61	0.73	14,010	8	83.5	1.24	26.24	5.16	67.36	0.73	14,740	8
	T-71-17	(See Exhibit No. 27-21)																				
	T-70-16	(See Exhibit No. 27-21)																				
0062	M70-25C	143.5	154.0	10.5	147.0	156.5	5.0/9.5	0.27	20.47	36.85	42.41	0.60	9,220	5	52.2	1.48	24.92	7.23	66.37	0.72	14,390	8½
		178.5	180.0	1.5																		
0093	M70-24C	556.0	561.0	5.0	560.5	568.0	2.5/7.5	0.21	20.62	29.61	49.56	0.68	10,370	7½	62.4	0.41	26.18	5.80	67.61	0.73	14,500	9
		561.5	562.5	1.0																		
		575.0	580.5	5.5	582.0	590.5	0.5/8.5	Sample not representative - not analyzed.														
		583.0	586.0	3.0																		
		590.0	591.5	1.5																		
				16.0/35.5																		

Exhibit No. 19-29

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 17

Sample Number	Location	Probe Interval		Total Coal in Vertical Penetration	Core Interval		Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis							Washed Coal Analysis at 1.50 Sp. Gr.							
		From	To		From	To		H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0154	M70-30C	356.0	358.0	2.0																		
		368.5	369.0	0.5																		
0157		388.0	394.5	6.5	390.5	397.0	6.5/6.5	0.40	27.30	6.07	66.23	0.70	14,450	8	87.0	0.72	27.77	2.66	68.85	0.70	15,110	8½
		447.5	452.0	4.5	416.0	423.0	5.5/7.0	0.23	25.73	16.74	57.30	0.73	12,810	7½	73.8	0.55	27.99	6.14	65.32	0.78	14,240	8½
0155		414.0	420.5	6.5	450.0	454.5	4.0/4.5	0.40	24.92	17.93	56.75	0.70	12,600	8	74.1	0.90	27.19	5.28	66.63	0.73	14,720	8½
				20.0/64.5																		
	T-71-17	(See Exhibit No. 27-22)																				
	T-70-16	(See Exhibit No. 27-22)																				
0061	M70-25C	66.0	76.0	10.0	69.5	77.5	4.0/8.0	0.28	23.28	17.20	59.24	0.86	12,610	7	78.5	0.50	26.02	5.05	68.43	0.97	14,730	7½
0087	M70-24C	450.0	474.0	24.0	454.0	478.0	17.0/24.0	0.18	26.67	9.56	63.59	0.61	13,860	7	85.9	1.07	26.89	4.24	67.80	0.64	14,770	9

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971

SEAM NO. 18

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0153	M70-30C	238.0	252.0	14.0	241.0	256.5	9.5/15.5	0.41	24.71	24.72	50.16	0.51	11,360	8	65.5	1.21	28.74	5.78	64.27	0.65	14,450	8½
		253.5	254.5	1.0																		
		256.6	260.0	3.5																		
		271.5	272.5	1.0																		
		275.5	276.0	0.5																		
				20.0/38.0																		
	T-71-17	(See Exhibit No. 27-23)																				
	T-71-18	(See Exhibit No. 27-23)																				
0081	M70-24C	260.5	264.0	3.5																		
		265.0	278.0	13.0	265.0	289.0	18.0/24.0	0.33	24.30	25.87	49.50	0.40	11,110	6½	61.1	0.90	28.20	5.58	65.32	0.42	14,580	8½
0082		279.0	284.0	5.0																		
		288.0	293.5	5.5	291.5	298.0	6.5/6.5	0.31	22.46	31.55	45.68	0.72	10,240	6½	55.3	0.49	27.93	6.11	65.47	0.75	14,560	8½
				27.0/33.5																		
0159	M70-29C	574.0	576.5	2.5																		
		579.5	600.0	20.5	578.5	603.0	13.0/24.5	0.47	22.12	30.70	46.71	0.33	10,300	7	59.1	1.40	26.75	4.21	67.64	0.40	15,100	8
0160		605.0	608.0	3.0	605.0	608.0	3.0/3.0	0.26	26.81	11.62	61.31	0.85	13,550	8	82.5	0.56	29.14	4.21	66.09	0.86	14,810	8½
				26.0/34.0																		

Exhibit No. 19-31

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 19

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
	M70-30C	107.0	110.0	3.0																		
		116.0	118.0	2.0	Not Sampled																	
				5.0/11.5																		
0158	M70-29C	378.0	380.0	2.0																		
		430.0	434.0	4.0																		
		453.0	459.0	6.0	453.0	458.0	5.0/5.0	0.35	26.37	6.44	66.84	0.56	14,180	7	81.4	0.74	26.01	2.68	70.57	0.61	14,840	7
				12.0/81.0																		
0080	M70-24C	98.0	101.5	3.5																		
		113.0	114.0	1.0																		
		122.5	130.0	7.5	128.0	135.0	7.0/7.0	0.41	23.19	17.68	58.72	0.60	12,490	6	68.5	0.44	27.71	3.59	68.26	0.74	14,770	8
		148.0	151.0	3.0																		
				15.0/53.0																		

Exhibit No. 19-32

ELK RIVER COAL PROJECT

SAMPLE SUMMARY - LOCATION AND PROXIMATE ANALYSIS

February, 1971 SEAM NO. 20

Sample Number	Location	Probe Interval From	Probe Interval To	Total Coal in Vertical Penetration	Core Interval From	Core Interval To	Recovered and Sampled Length	Raw Coal Analysis - Air Dried Basis H_2O	V.M.	Ash	F.C.	S.	BTU	FSI	Washed Coal Analysis at 1.50 Sp. Gr. Float	H_2O	V.M.	Ash	F.C.	S.	BTU	FSI
0151	M70-29C	274.0	278.0	4.0	275.0	280.5	5.5/5.5	0.53	29.45	12.93	57.09	0.65	13,380	7	81.6	0.45	31.82	4.57	63.16	0.79	14,810	8
		281.5	282.5	1.0																		
0152		307.0	309.5	2.5																		
		330.0	337.5	7.5	330.5	338.0	5.5/7.5	0.44	30.41	8.44	60.71	0.80	14,030	7½	81.0	0.44	32.78	4.85	61.93	0.80	14,490	7½
				15.0/63.5																		

Exhibit No. 19-33

COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434

SINCE 1908

MAIL ADDRESS
P.O. BOX 508
CHARLESTON, WEST VIRGINIA 25322
LOCATION
626 BROAD STREET
PHONE 304 342-2156

North American Coal Corp.
12800 Shaker Blvd.
Cleveland, Ohio

December 18, 1968

Raw Coal Sample No. 2

SAMPLED & IDENTIFIED BY:
No. Am. Coal Corp.

Composite 2" Rd x 200 Mesh Total
1.40 Float, 200 Mesh x 0 Raw

Lab No. C-337315

Assay No. 5329

PROXIMATE ANALYSIS

	DRY
% Ash	7.01
% Volatile	20.35
% Fixed Carbon	72.64
	100.00
Btu	14543
% Sulfur	0.59

FUSION TEMPERATURE OF ASH

	Reducing
Initial Deformation	2820+°F
Softening (H=W)	2820+°F
Softening (H=1/2W)	2820+°F
Fluid	2820+°F

H is cone Height
W is cone Width

Hardgrove Grindability Index = 121.0

Free Swelling Index = #8-1/2

* EXPANSION / CONTRACTION = -1.5

(@ 52 lbs./cu. ft. Bulk Density and 2.00% H_2O)

This test was run under the following conditions:

Face Temperature, °F	1950
Moisture, %	1.6
Bulk Density, lbs./cu. ft.	55.39
Particle Size, % minus 1/8"	93.3

* Intermediate Expansion

+ 0.1

COAL PLASTICITY (Gieseler Plastometer)

Maximum Fluidity, D.D.P.M. **	53
Temp. at Maximum Fluidity, °C	465
Temp. at Initial Fluidity, °C	427
Temp. at Final Fluidity, °C	489
Temp. Range of Fluidity, °C	62

** Dial Divisions Per Minute

This replaces report dated
11/12/68 correcting the
identification. (1.40 Float)

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

I. H. Wilson

I. H. WILSON, Manager Appalachian Division

Charter Member

MOISTURE 3.16 BTU, AS RECD 12,569 DRY BTU 12979

Exhibit No. 20-1

COMMERCIAL TESTING & ENGINEERING CO.

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315 | SCREEN ANALYSIS | October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
							CUMULATIVE RESULTS									
SIZE			DRY BASIS				Retained on Screen in Column 2					Passing Screen in Column 1				
Passing	Ret. On	% Wt.	% Ash	% Sul.	% Vol.	% FC	% Wt.	% Ash	% Sul.	% Vol.	% FC	% Wt.	% Ash	% Sul.	% Vol.	% F
2" Rd	1" Rd	12.5	19.86	0.52	18.12	62.02	12.5	19.86	0.52	18.12	62.02	100.0	16.36	0.60	18.73	64
1" Rd	3/4" Rd	7.1	20.00	0.52	17.83	62.17	19.6	19.91	0.52	18.01	62.08	87.5	15.86	0.61	18.82	65
3/4" Rd	1/2" Rd	10.7	19.15	0.52	18.09	62.76	30.3	19.64	0.52	18.04	62.32	80.4	15.50	0.62	18.90	65
1/2" Rd	3/8" Rd	7.3	18.62	0.51	17.87	63.51	37.6	19.44	0.52	18.01	62.55	69.7	14.94	0.63	19.03	66
3/8" Rd	1/4" Rd	9.6	16.33	0.52	17.86	63.81	47.2	19.22	0.52	17.98	62.80	62.4	14.51	0.65	19.16	66
1/4" Rd	1/8" Rd	15.9	16.56	0.53	18.47	64.97	63.1	18.55	0.52	18.10	63.35	52.8	13.81	0.67	19.40	66
1/8" Rd	28 M	19.2	14.48	0.64	19.17	66.35	82.3	17.60	0.55	18.35	64.05	36.9	12.63	0.73	19.79	67
28 M	60 M	9.3	11.09	0.68	20.21	68.70	91.6	16.94	0.56	18.54	64.52	17.7	10.62	0.83	20.47	68
60 M	100 M	3.8	9.59	0.73	20.54	69.87	95.4	16.65	0.57	18.62	64.73	8.4	10.11	1.00	20.76	69
100 M	200 M	2.6	9.56	0.98	21.44	69.00	98.0	16.45	0.58	18.69	64.86	4.6	10.53	1.22	20.94	68
200 M		2.0	11.80	1.53	20.30	67.90	100.0	16.36	0.60	18.73	64.91	2.0	11.80	1.53	20.30	67

Exhibit No. 20-2

Commercial Testing & Engineering Co.

CONSULTING FUEL ENGINEERS
AND CHEMISTS

CHICAGO, ILL.

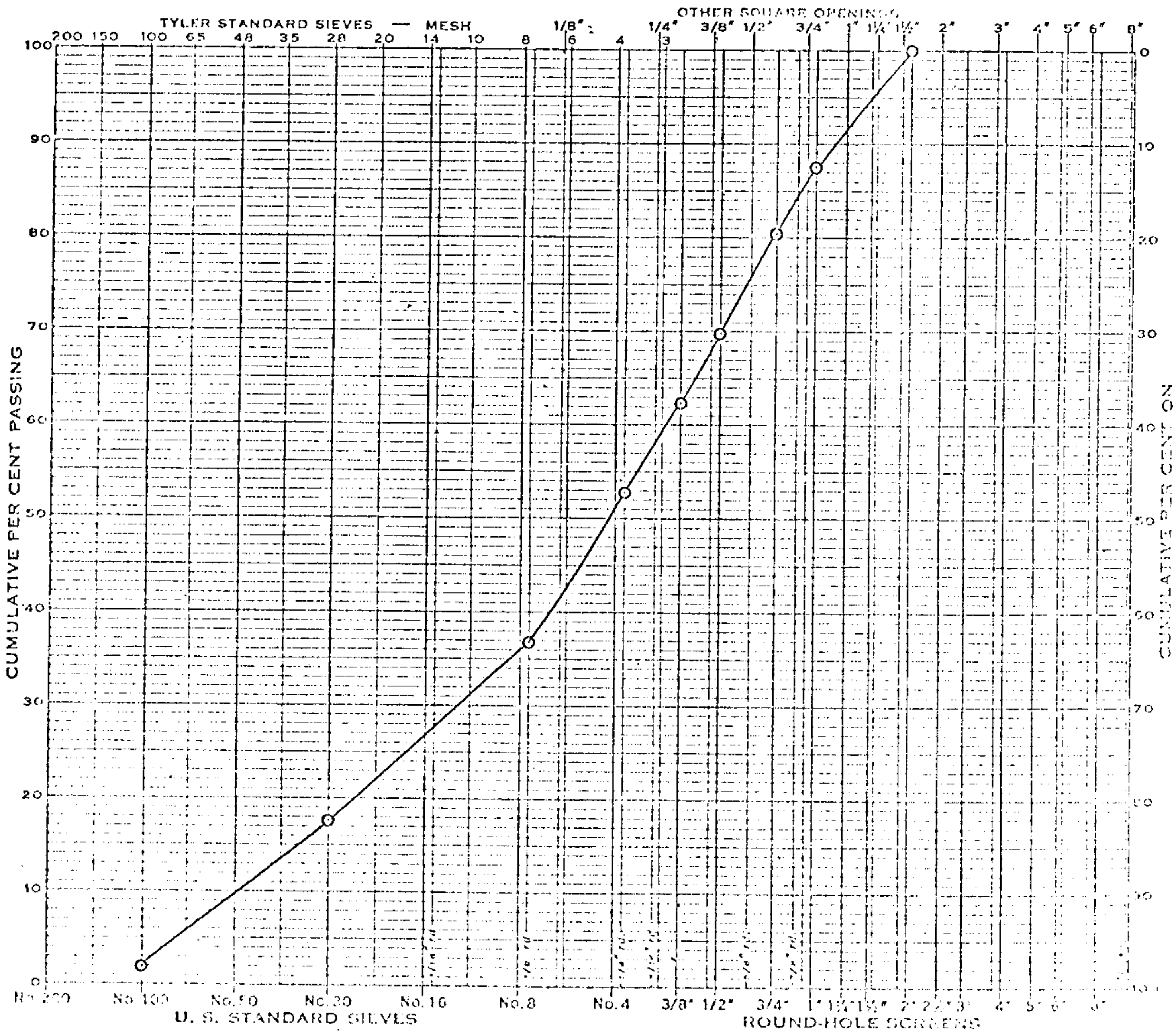
Charleston, W. Va. · Terre Haute, Ind.

Description THE NORTH AMERICAN COAL CORPORATION - Cleveland, Ohio

Raw Coal Sample No. 2 Lab No. C-337315

Total Weight of Sample ____________ Date ____________

SCREEN ANALYSIS CURVE



NOTE: Screen Openings on Logarithmic Scale with $\frac{\text{in. rd}}{\text{in. sq}} = 1.25$

Form SC 3M 9-49

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Exhibit No. 20-3

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-4

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315

SCREEN ANALYSIS

October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SIZE			DRY BASIS % SULFUR				CUMULATIVE RESULTS									
							Retained On Screen in Column 2					Passing Screen in Column 1				
Passing	Ret. On	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.
2" Rd	1" Rd	12.5	0.52	0.05	0.00	0.47	12.5	0.52	0.05	0.00	0.47	100.0	0.60	0.08	0.00	0.52
1" Rd	3/4" Rd	7.1	0.52	0.05	0.00	0.47	19.6	0.52	0.05	0.00	0.47	87.5	0.61	0.09	0.00	0.52
3/4" Rd	1/2" Rd	10.7	0.52	0.05	0.00	0.47	30.3	0.52	0.05	0.00	0.47	80.4	0.62	0.09	0.00	0.53
1/2" Rd	3/8" Rd	7.3	0.51	0.05	0.00	0.46	37.6	0.52	0.05	0.00	0.47	69.7	0.63	0.10	0.00	0.53
3/8" Rd	1/4" Rd	9.6	0.52	0.05	0.00	0.47	47.2	0.52	0.05	0.00	0.47	62.4	0.65	0.10	0.00	0.55
1/4" Rd	1/8" Rd	15.9	0.53	0.05	0.00	0.48	63.1	0.52	0.05	0.00	0.47	52.8	0.67	0.11	0.00	0.56
1/8" Rd	28 M	19.2	0.64	0.07	0.00	0.57	82.3	0.55	0.05	0.00	0.50	36.9	0.73	0.14	0.00	0.59
28 M	60 M	9.3	0.68	0.10	0.00	0.58	91.6	0.56	0.06	0.00	0.50	17.7	0.83	0.21	0.01	0.61
60 M	100 M	3.8	0.73	0.18	0.01	0.54	95.4	0.57	0.06	0.00	0.51	8.4	1.00	0.34	0.01	0.65
100 M	200 M	2.6	0.93	0.35	0.01	0.62	98.0	0.58	0.07	0.00	0.51	4.6	1.22	0.48	0.02	0.72
200 M		2.0	1.53	0.64	0.03	0.86	100.0	0.60	0.08	0.00	0.52	2.0	1.53	0.64	0.03	0.36

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-5

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315 | FLOAT & SINK ANALYSIS | October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SPECIFIC	GRAVITY		DRY BASIS					CUMULATIVE RECOVERY (FLOAT)					CUMULATIVE REJECT (SINK)				
Sink	Float	% Wt.	% Ash	% Sul.	% Vol.	% FC	FSI	% Wt.	% Ash	% Sul.	% Vol.	% FC	% Wt.	% Ash	% Sul.	% Vol.	% FC
			Composite 2" Rd x 200 Mesh = 98.0% of Raw Coal Sample Crushed to 2" Rd														
	1.30	16.0	1.99	0.69	22.20	75.81		16.0	1.99	0.69	22.20	75.81	100.0	16.45	0.58	18.69	64.9
1.30	1.35	27.1	6.41	0.61	20.30	73.29		43.1	4.77	0.64	21.01	74.22	84.0	19.24	0.56	18.03	62.7
1.35	1.40	22.1	10.81	0.55	18.96	70.23		65.2	6.82	0.61	20.31	72.87	56.9	25.35	0.54	16.95	57.7
1.40	1.45	13.9	15.75	0.53	18.05	66.20		79.1	8.39	0.60	19.91	71.70	34.8	34.59	0.53	15.67	49.7
1.45	1.50	6.6	20.75	0.50	17.66	61.59		85.7	9.34	0.59	19.74	70.92	20.9	47.12	0.53	14.09	38.[illegible]
1.50	1.55	2.6	24.92	0.50	17.51	57.57		88.3	9.80	0.59	19.68	70.52	14.3	59.28	0.54	12.44	28.2
1.55	1.60	1.5	29.32	0.53	16.79	53.89		89.8	10.13	0.58	19.63	70.24	11.7	66.92	0.55	11.32	21.7
1.60		10.2	72.45	0.55	10.51	17.04		100.0	16.45	0.58	18.69	64.86	10.2	72.45	0.55	10.51	17.0
			Composite 2" Rd x 1/4" Rd = 47.2% of Raw Coal Sample Crushed to 2" Rd														
	1.30	7.8	3.21	0.65	21.91	74.88		7.8	3.21	0.65	21.91	74.88	100.0	19.22	0.52	17.98	62.8
1.30	1.35	31.5	6.69	0.60	20.27	73.04		39.3	6.00	0.61	20.60	73.40	92.2	20.58	0.51	17.66	61.7
1.35	1.40	25.9	11.13	0.54	18.66	70.21		65.2	8.04	0.58	19.83	72.13	60.7	27.79	0.46	16.30	55.9
1.40	1.45	14.5	16.43	0.50	17.65	65.92		79.7	9.56	0.57	19.43	71.01	34.8	40.20	0.41	14.54	45.2
1.45	1.50	5.2	21.61	0.48	17.17	61.22		84.9	10.30	0.56	19.29	70.41	20.3	57.17	0.34	12.32	30.5
1.50	1.55	1.6	26.41	0.47	16.61	56.98		86.5	10.60	0.56	19.24	70.16	15.1	69.42	0.29	10.65	19.9
1.55	1.60	0.9	30.95	0.47	16.06	52.99		87.6	10.78	0.56	19.17	70.05	13.5	74.52	0.27	9.95	15.5
1.60		12.6	77.63	0.26	9.51	12.86		100.0	19.22	0.52	17.98	62.80	12.6	77.63	0.26	9.51	12.8

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size Composite 2" Rd x 200 Mesh
Raw Coal Ash 16.45%
Raw Coal Sul.

Raw Coal Sample No. 2

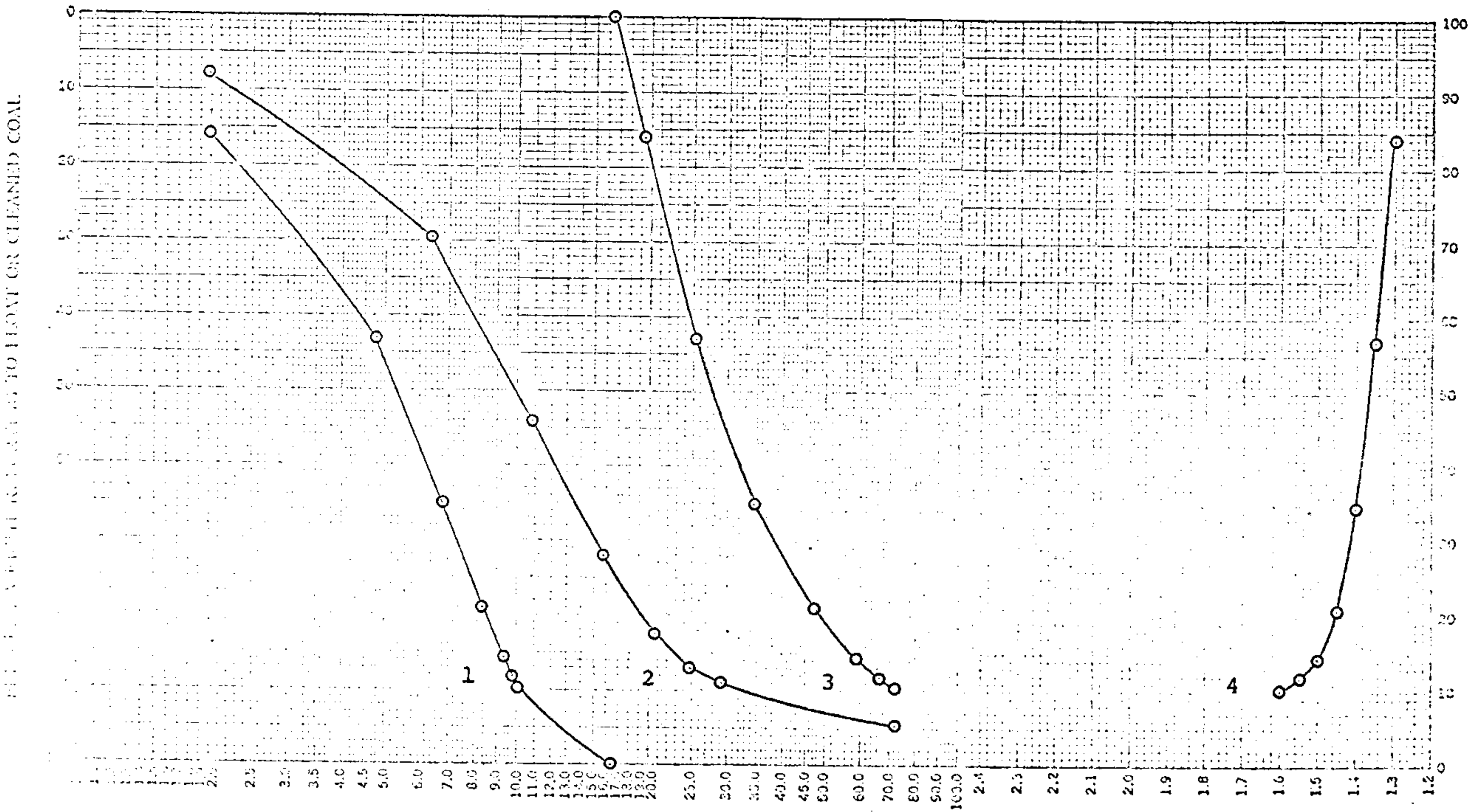
Commercial Testing & Engineering Co.

CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.

Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND
1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



ASH CONTENT IN PER CENT OF SAMPLE 4A SPECIFIC GRAVITY

Form WCR 3M 9-49

Exhibit No. 20-6

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size Composite 2" Rd x 1/4" Rd
Raw Coal Ash 19.22%
Raw Coal Sul.

Raw Coal Sample No. 2

Commercial Testing & Engineering Co.

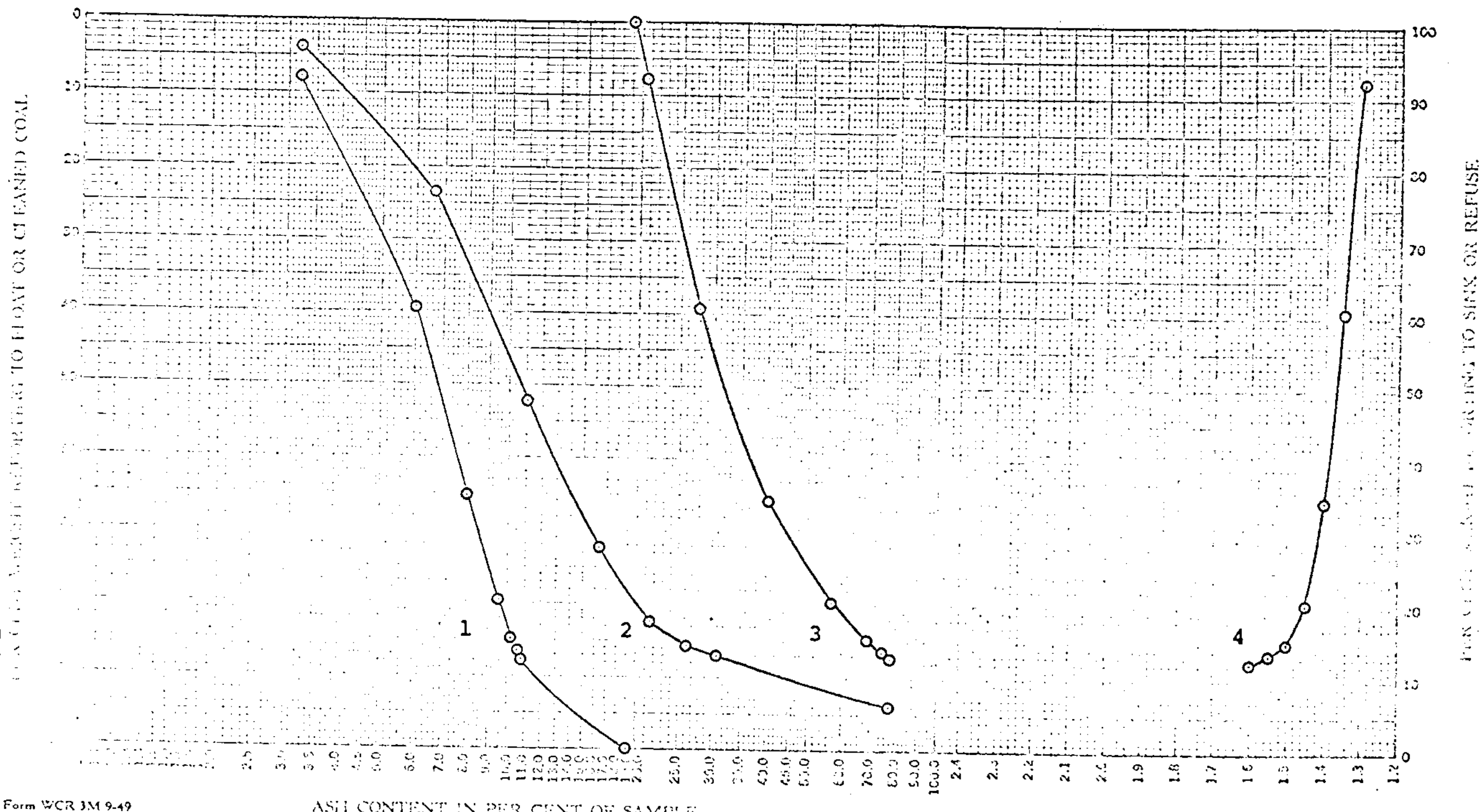
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.

Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



4B

Exhibit No. 20-7

Form WCR 3M 9-49

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-8

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315

FLOAT & SINK ANALYSIS

October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SPECIFIC	GRAVITY		DRY BASIS % SULFUR				CUMULATIVE RECOVERY (FLOAT) % SULFUR					CUMULATIVE REJECT (SINK) % SULFUR				
Sink	Float	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.
		Composite 2" Rd x 200 Mesh = 98.0% of Raw Coal Sample Crushed to 2" Rd														
	1.30	16.0	0.69	0.02	0.00	0.67	16.0	0.69	0.02	0.00	0.67	100.0	0.58	0.07	0.00	0.51
1.30	1.35	27.1	0.61	0.03	0.00	0.58	43.1	0.64	0.03	0.00	0.61	84.0	0.56	0.08	0.00	0.48
1.35	1.40	22.1	0.55	0.04	0.00	0.51	65.2	0.61	0.03	0.00	0.58	56.9	0.54	0.11	0.00	0.43
1.40	1.45	13.9	0.53	0.05	0.00	0.48	79.1	0.60	0.03	0.00	0.57	34.8	0.53	0.15	0.00	0.38
1.45	1.50	6.6	0.50	0.06	0.00	0.44	85.7	0.59	0.04	0.00	0.55	20.9	0.53	0.22	0.00	0.31
1.50	1.55	2.6	0.50	0.09	0.00	0.41	88.3	0.59	0.04	0.00	0.55	14.3	0.54	0.29	0.00	0.25
1.55	1.60	1.5	0.53	0.13	0.00	0.40	89.8	0.58	0.04	0.00	0.54	11.7	0.55	0.34	0.00	0.21
1.60		10.2	0.55	0.37	0.00	0.18	100.0	0.58	0.07	0.00	0.51	10.2	0.55	0.37	0.00	0.18
		Composite 2" Rd x 1/4" Rd = 47.2% of Raw Coal Sample Crushed to 2" Rd														
	1.30	7.8	0.65	0.03	0.00	0.62	7.8	0.65	0.03	0.00	0.62	100.0	0.52	0.05	0.00	0.47
1.30	1.35	31.5	0.60	0.03	0.00	0.57	39.3	0.61	0.03	0.00	0.58	92.2	0.51	0.05	0.00	0.46
1.35	1.40	25.9	0.54	0.04	0.00	0.50	65.2	0.58	0.03	0.00	0.55	60.7	0.46	0.06	0.00	0.40
1.40	1.45	14.5	0.50	0.04	0.00	0.46	79.7	0.57	0.04	0.00	0.53	34.8	0.41	0.08	0.00	0.33
1.45	1.50	5.2	0.48	0.05	0.00	0.43	84.9	0.56	0.04	0.00	0.52	20.3	0.34	0.10	0.00	0.24
1.50	1.55	1.6	0.47	0.06	0.00	0.41	86.5	0.56	0.04	0.00	0.52	15.1	0.29	0.12	0.00	0.17
1.55	1.60	0.9	0.47	0.09	0.00	0.38	87.6	0.56	0.04	0.00	0.52	13.5	0.27	0.13	0.00	0.14
1.60		12.6	0.26	0.13	0.00	0.13	100.0	0.52	0.05	0.00	0.47	12.6	0.26	0.13	0.00	0.13

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315

FLOAT & SINK ANALYSIS

October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SPECIFIC	GRAVITY		DRY BASIS					CUMULATIVE RECOVERY (FLOAT)					CUMULATIVE REJECT (SINK)				
Sink	Float	% Wt.	% Ash	% Sul.	% Vol.	% FC	FSI	% Wt.	% Ash	% Sul.	% Vol.	% FC	% Wt.	% Ash	% Sul.	% Vol.	% FC
Composite 1/4" Rd x 200 Mesh = 50.8% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	23.7	1.62	0.70	22.28	76.10		23.7	1.62	0.70	22.28	76.10	100.0	13.87	0.64	19.37	66.7
1.30	1.35	23.1	6.07	0.63	20.35	73.58		46.8	3.82	0.67	21.33	74.85	76.3	17.68	0.62	18.46	63.8
1.35	1.40	18.6	10.39	0.57	19.35	70.26		65.4	5.69	0.64	20.77	73.54	53.2	22.72	0.61	17.64	59.6
1.40	1.45	13.3	15.05	0.55	18.46	66.49		78.7	7.27	0.62	20.38	72.35	34.6	29.34	0.64	16.72	53.9
1.45	1.50	7.8	20.21	0.51	17.97	61.82		86.5	8.44	0.61	20.16	71.40	21.3	38.27	0.69	15.64	46.0
1.50	1.55	3.5	24.31	0.51	17.88	57.81		90.0	9.05	0.61	20.07	70.88	13.5	48.70	0.79	14.30	37.0
1.55	1.60	2.1	28.69	0.55	17.07	52.24		92.1	9.50	0.61	20.00	70.50	10.0	57.23	0.89	13.04	29.7
1.60		7.9	64.82	0.98	11.97	23.21		100.0	13.87	0.64	19.37	66.76	7.9	64.82	0.98	11.97	23.2

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-9

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size Composite 1/4" Rd x 200 Mesh
Raw Coal Ash 13.87%
Raw Coal Sul.

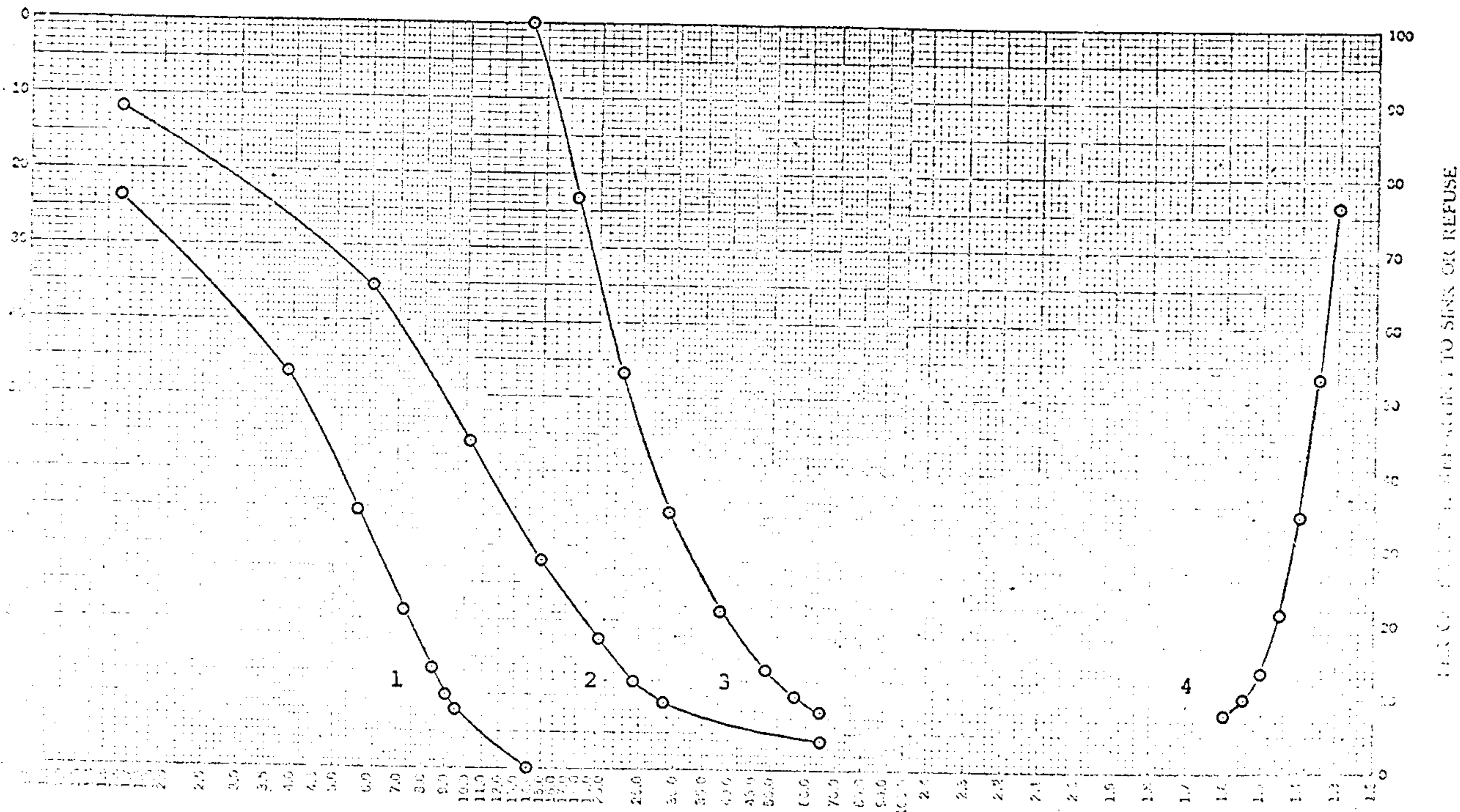
Raw Coal Sample No. 2

Commercial Testing & Engineering Co.
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



ASH CONTENT IN PER CENT OF SAMPLE 5A SPECIFIC GRAVITY

Form WCR 3M 9-49

Exhibit No. 20-10

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315 FLOAT & SINK ANALYSIS October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SPECIFIC GRAVITY			DRY BASIS % SULFUR				CUMULATIVE RECOVERY (FLOAT) % SULFUR					CUMULATIVE REJECT (SINK) % SULFUR				
Sink	Float	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.
Composite 1/4" Rd x 200 Mesh = 50.8% of Raw Coal Sample Crushed to 2" Rd																
	1.30	23.7	0.70	0.02	0.00	0.68	23.7	0.70	0.02	0.00	0.68	100.0	0.64	0.09	0.00	0.55
1.30	1.35	23.1	0.63	0.03	0.00	0.60	46.8	0.67	0.02	0.00	0.65	76.3	0.62	0.12	0.00	0.50
1.35	1.40	18.6	0.57	0.04	0.00	0.53	65.4	0.64	0.03	0.00	0.61	53.2	0.61	0.15	0.00	0.46
1.40	1.45	13.3	0.55	0.05	0.00	0.50	78.7	0.62	0.03	0.00	0.59	34.6	0.64	0.22	0.00	0.42
1.45	1.50	7.8	0.51	0.07	0.00	0.44	86.5	0.61	0.04	0.00	0.57	21.3	0.69	0.32	0.00	0.37
1.50	1.55	3.5	0.51	0.10	0.00	0.41	90.0	0.61	0.04	0.00	0.57	13.5	0.79	0.46	0.01	0.32
1.55	1.60	2.1	0.55	0.15	0.00	0.40	92.1	0.61	0.04	0.00	0.57	10.0	0.89	0.59	0.01	0.29
1.60		7.9	0.98	0.71	0.01	0.26	100.0	0.64	0.09	0.00	0.55	7.9	0.98	0.71	0.01	0.26

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-11

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315

FLOAT & SINK ANALYSIS

October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SPECIFIC	GRAVITY		DRY BASIS					CUMULATIVE RECOVERY (FLOAT)					CUMULATIVE REJECT (SINK)				
Sink	Float	% Wt.	% Ash	% Sul.	% Vol.	% FC	FSI	% Wt.	% Ash	% Sul.	% Vol.	% FC	% Wt.	% Ash	% Sul.	% Vol.	% FC
2" Rd x 1" Rd = 12.5% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	6.5	3.22	0.66	21.58	75.20	9	6.5	3.22	0.66	21.58	75.20	100.0	19.86	0.52	18.12	62.0
1.30	1.35	41.8	7.07	0.60	20.21	72.72	8-1/2	48.3	6.55	0.61	20.39	73.06	93.5	21.01	0.51	17.88	61.1
1.35	1.40	22.3	11.77	0.53	19.07	69.16	6	70.6	8.20	0.58	19.98	71.82	51.7	32.29	0.44	16.00	51.7
1.40	1.45	11.8	16.70	0.50	17.58	65.72	2	82.4	9.42	0.57	19.63	70.95	29.4	47.85	0.38	13.66	38.4
1.45	1.50	2.4	22.00	0.54	17.00	61.00	2	84.8	9.77	0.57	19.56	70.67	17.6	68.73	0.30	11.04	20.2
1.50	1.55	0.8	27.02	0.45	15.96	57.02	2	85.6	9.93	0.57	19.52	70.55	15.2	76.11	0.26	10.10	13.7
1.55	1.60	0.4	31.49	0.45	16.11	52.40	2	86.0	10.03	0.57	19.51	70.46	14.4	78.84	0.25	9.26	11.9
1.60		14.0	80.19	0.24	9.59	10.22	*	100.0	19.86	0.52	18.12	62.02	14.0	80.19	0.24	9.59	10.2
1" Rd x 3/4" Rd = 7.1% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	7.2	3.68	0.66	21.90	74.42	9	7.2	3.68	0.66	21.90	74.42	100.0	20.00	0.52	17.83	62.1
1.30	1.35	35.7	6.95	0.59	19.65	73.40	8-1/2	42.9	6.40	0.60	20.03	73.57	92.8	21.26	0.51	17.52	61.2
1.35	1.40	24.2	11.60	0.53	18.89	69.51	5-1/2	67.1	8.28	0.58	19.62	72.10	57.1	30.21	0.45	16.19	53.6
1.40	1.45	14.2	16.97	0.50	17.73	65.40	2	81.3	9.78	0.56	19.29	70.93	32.9	43.91	0.40	14.20	41.3
1.45	1.50	3.2	22.07	0.48	17.12	60.81	2	84.5	10.24	0.56	19.21	70.55	18.7	64.44	0.32	11.52	24.0
1.50	1.55	1.1	26.59	0.48	16.60	56.81	2	85.6	10.45	0.56	19.17	70.38	15.5	73.18	0.28	10.36	16.4
1.55	1.60	0.6	31.67	0.48	15.54	52.79	2	86.2	10.60	0.56	19.15	70.25	14.4	76.74	0.27	9.89	13.3
1.60		13.8	78.70	0.26	9.64	11.66	*	100.0	20.00	0.52	17.83	62.17	13.8	78.70	0.26	9.64	11.6

*Non-Agglomerating

Exhibit No. 20-12

23

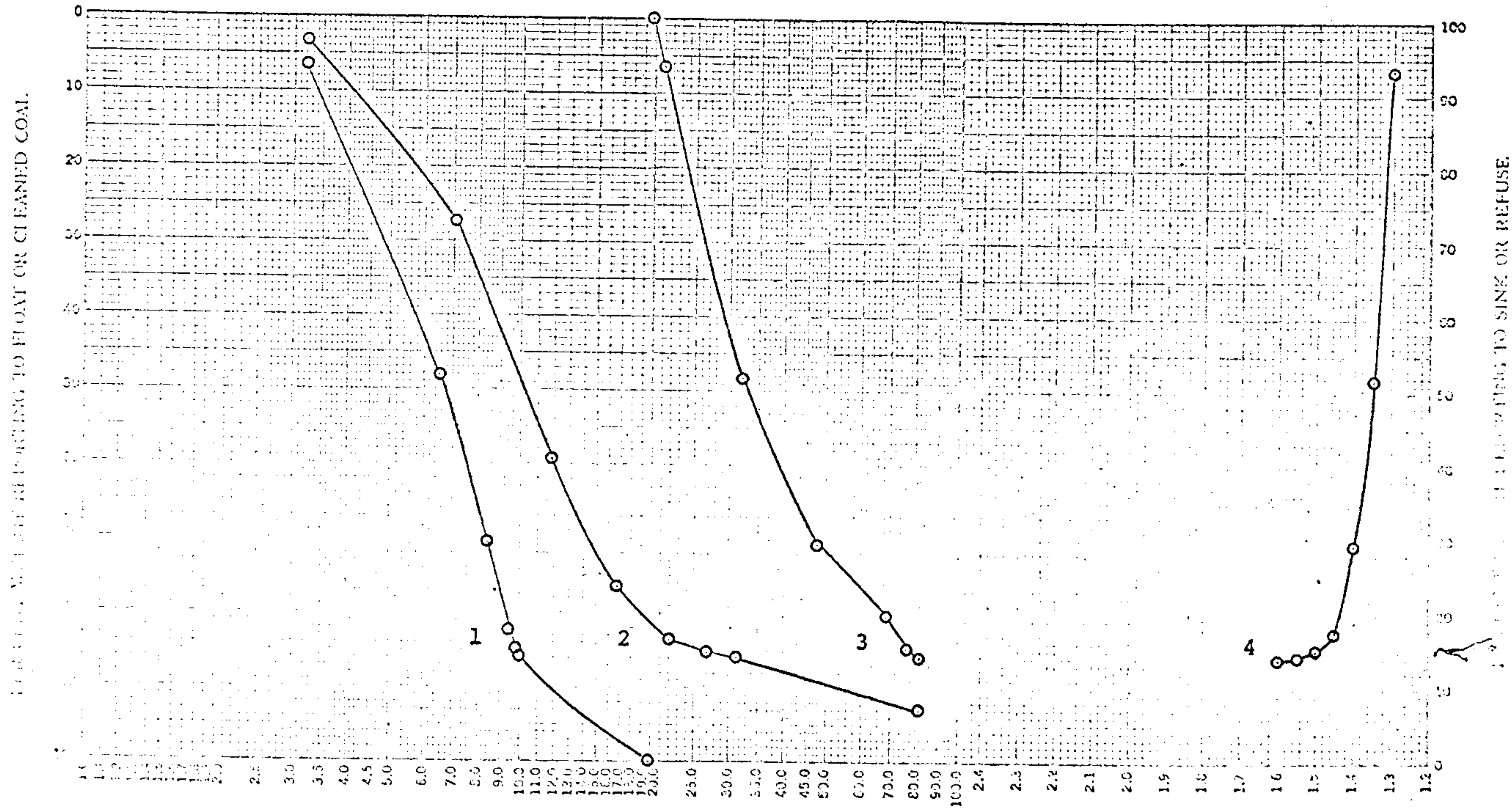
Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 2" Rd x 1" Rd
Raw Coal Ash 19.86%
Raw Coal Sul.

Commercial Testing & Engineering Co.
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND
1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

Raw Coal Sample No. 2

WASHABILITY CURVES



ASH CONTENT IN PER CENT OF SAMPLE 6A

SPECIFIC GRAVITY

Form WCR 3M 9-49

Exhibit No. 20-13

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 1" Rd x 3/4" Rd
Raw Coal Ash 20.00%
Raw Coal Sul.

Commercial Testing & Engineering Co.

CONSULTING FUEL ENGINEERS
AND CHEMISTS

CHICAGO, ILL.

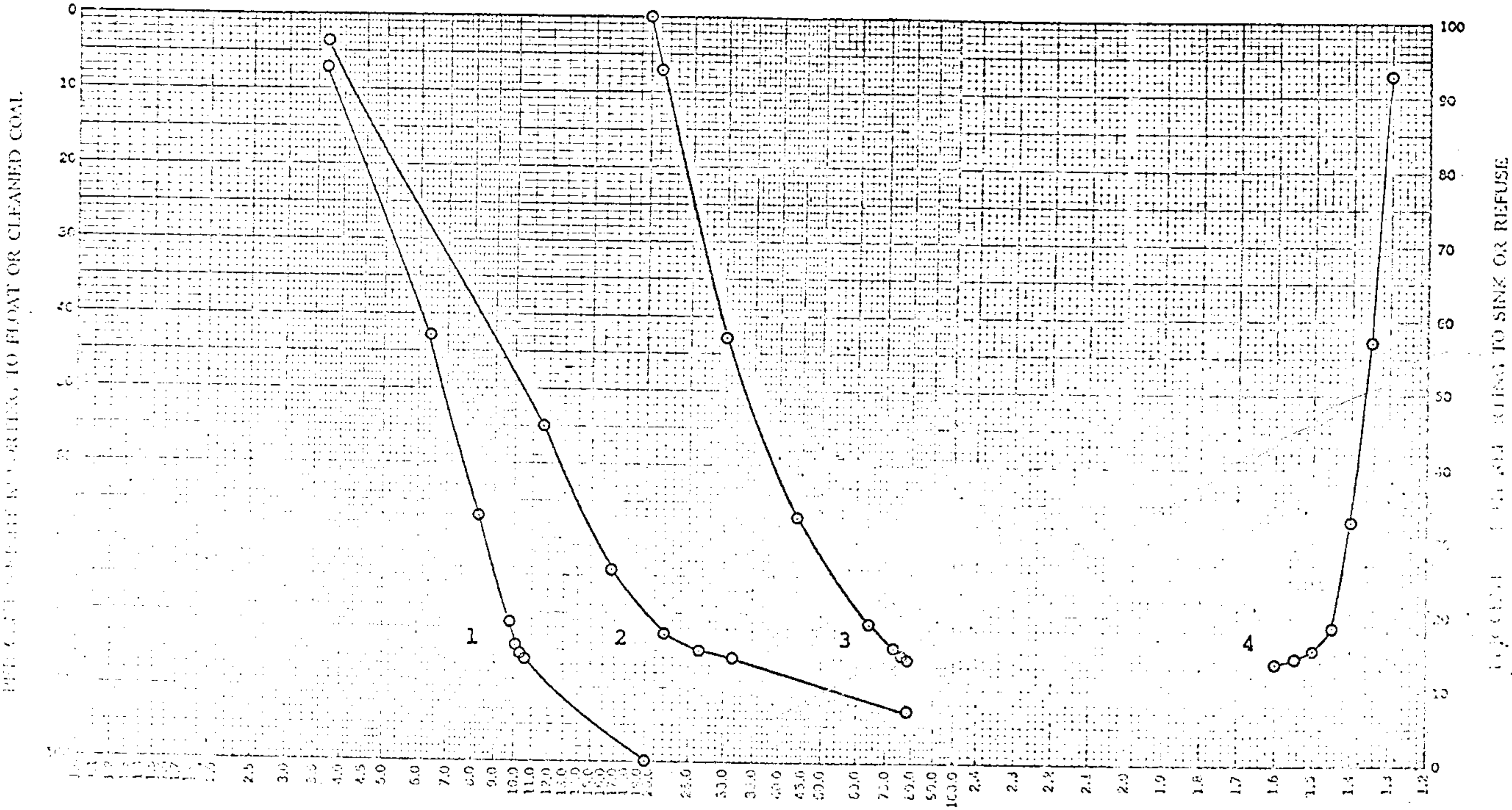
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

Raw Coal Sample No. 2

WASHABILITY CURVES



6B

Form WCR 3M 9-49

Exhibit No. 20-14

COMMERCIAL TESTING & ENGINEERING CO.

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315

FLOAT & SINK ANALYSIS

October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SPECIFIC	GRAVITY		DRY BASIS % SULFUR				CUMULATIVE RECOVERY (FLOAT) % SULFUR					CUMULATIVE REJECT (SINK) % SULFUR				
Sink	Float	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.
2" Rd x 1" Rd = 12.5% of Raw Coal Sample Crushed to 2" Rd																
	1.30	6.5	0.66	0.02	0.00	0.64	6.5	0.66	0.02	0.00	0.64	100.0	0.52	0.05	0.00	0.47
1.30	1.35	41.8	0.60	0.03	0.00	0.57	48.3	0.61	0.03	0.00	0.58	93.5	0.51	0.05	0.00	0.46
1.35	1.40	22.3	0.53	0.04	0.00	0.49	70.6	0.58	0.03	0.00	0.55	51.7	0.44	0.07	0.00	0.37
1.40	1.45	11.8	0.50	0.03	0.00	0.47	82.4	0.57	0.03	0.00	0.54	29.4	0.38	0.09	0.00	0.29
1.45	1.50	2.4	0.54	0.09	0.00	0.45	84.8	0.57	0.04	0.00	0.53	17.6	0.30	0.13	0.00	0.17
1.50	1.55	0.8	0.45	0.07	0.00	0.38	85.6	0.57	0.04	0.00	0.53	15.2	0.26	0.13	0.00	0.13
1.55	1.60	0.4	0.45	0.08	0.00	0.37	86.0	0.57	0.04	0.00	0.53	14.4	0.25	0.14	0.00	0.11
1.60		14.0	0.24	0.14	0.00	0.10	100.0	0.52	0.05	0.00	0.47	14.0	0.24	0.14	0.00	0.10
1" Rd x 3/4" Rd = 7.1% of Raw Coal Sample Crushed to 2" Rd																
	1.30	7.2	0.66	0.04	0.00	0.62	7.2	0.66	0.04	0.00	0.62	100.0	0.52	0.05	0.00	0.47
1.30	1.35	35.7	0.59	0.04	0.00	0.55	42.9	0.60	0.04	0.00	0.56	92.8	0.51	0.05	0.00	0.56
1.35	1.40	24.2	0.53	0.04	0.00	0.49	67.1	0.58	0.04	0.00	0.54	57.1	0.45	0.06	0.00	0.39
1.40	1.45	14.2	0.50	0.03	0.00	0.47	81.3	0.56	0.04	0.00	0.52	32.9	0.40	0.08	0.00	0.32
1.45	1.50	3.2	0.48	0.05	0.00	0.43	84.5	0.56	0.04	0.00	0.52	18.7	0.32	0.12	0.00	0.20
1.50	1.55	1.1	0.48	0.09	0.00	0.39	85.6	0.56	0.04	0.00	0.52	15.5	0.28	0.13	0.00	0.15
1.55	1.60	0.6	0.48	0.10	0.00	0.38	86.2	0.56	0.04	0.00	0.52	14.4	0.27	0.14	0.00	0.13
1.60		13.8	0.26	0.14	0.00	0.12	100.0	0.52	0.05	0.00	0.47	13.8	0.26	0.14	0.00	0.12

Exhibit No. 20-15

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-16

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315

FLOAT & SINK ANALYSIS

October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SPECIFIC	GRAVITY		DRY BASIS					CUMULATIVE RECOVERY (FLOAT)					CUMULATIVE REJECT (SINK)				
Sink	Float	% Wt.	% Ash	% Sul.	% Vol.	% FC	FSI	% Wt.	% Ash	% Sul.	% Vol.	% FC	% Wt.	% Ash	% Sul.	% Vol.	% FC
3/4" Rd x 1/2" Rd = 10.7% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	7.9	3.47	0.66	22.41	74.12	9	7.9	3.47	0.66	22.41	74.12	100.0	19.15	0.52	18.09	62.7
1.30	1.35	32.3	6.80	0.60	20.25	72.95	8	40.2	6.15	0.61	20.67	73.18	92.1	20.50	0.51	17.72	61.7
1.35	1.40	26.0	11.52	0.54	18.71	69.77	4-1/2	66.2	8.26	0.58	19.90	71.84	59.8	27.89	0.46	16.35	55.[illegible]
1.40	1.45	13.8	16.77	0.49	17.44	65.79	2	80.0	9.72	0.57	19.48	70.80	33.8	40.49	0.40	14.53	44.9
1.45	1.50	5.6	21.80	0.47	17.25	60.95	2	85.6	10.51	0.56	19.33	70.16	20.0	56.85	0.34	12.53	30.6
1.50	1.55	1.5	26.76	0.47	17.00	56.24	2	87.1	10.79	0.56	19.29	69.92	14.4	70.48	0.29	10.69	18.2
1.55	1.60	0.7	31.23	0.45	16.02	52.75	2	87.8	10.96	0.56	19.27	69.77	12.9	75.57	0.27	9.96	14.4
1.60		12.2	78.11	0.26	9.61	12.28	*	100.0	19.15	0.52	18.09	62.76	12.2	78.11	0.26	9.61	12.2
1/2" Rd x 3/8" Rd = 7.3% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	9.7	2.72	0.62	21.88	75.40	9	9.7	2.72	0.62	21.88	75.40	100.0	18.62	0.51	17.87	63.5
1.30	1.35	23.0	5.97	0.58	20.77	73.26	8-1/2	32.7	5.01	0.59	21.10	73.89	90.3	20.33	0.50	17.44	62.2
1.35	1.40	29.5	10.68	0.55	18.18	71.14	4	62.2	7.70	0.57	19.71	72.59	67.3	25.23	0.48	16.30	58.4
1.40	1.45	15.8	16.31	0.51	17.64	66.05	1-1/2	78.0	9.44	0.56	19.29	71.27	37.8	36.59	0.42	14.83	48.5
1.45	1.50	7.1	21.51	0.48	17.47	61.02	1-1/2	85.1	10.45	0.55	19.14	70.41	22.0	51.15	0.35	12.81	36.0
1.50	1.55	2.2	26.30	0.47	16.39	57.31	1-1/2	87.3	10.85	0.55	19.07	70.08	14.9	62.27	0.29	10.59	27.1
1.55	1.60	1.1	30.74	0.48	15.78	53.48	1-1/2	88.4	11.10	0.55	19.03	69.87	12.7	72.03	0.26	9.59	18.3
1.60		11.6	75.94	0.24	9.00	15.06	*	100.0	18.62	0.51	17.87	63.51	11.6	75.94	0.24	9.00	15.0

* Non-Agglomerating

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 3/4" Rd x 1/2" Rd
Raw Coal Ash 19.15%
Raw Coal Sul.

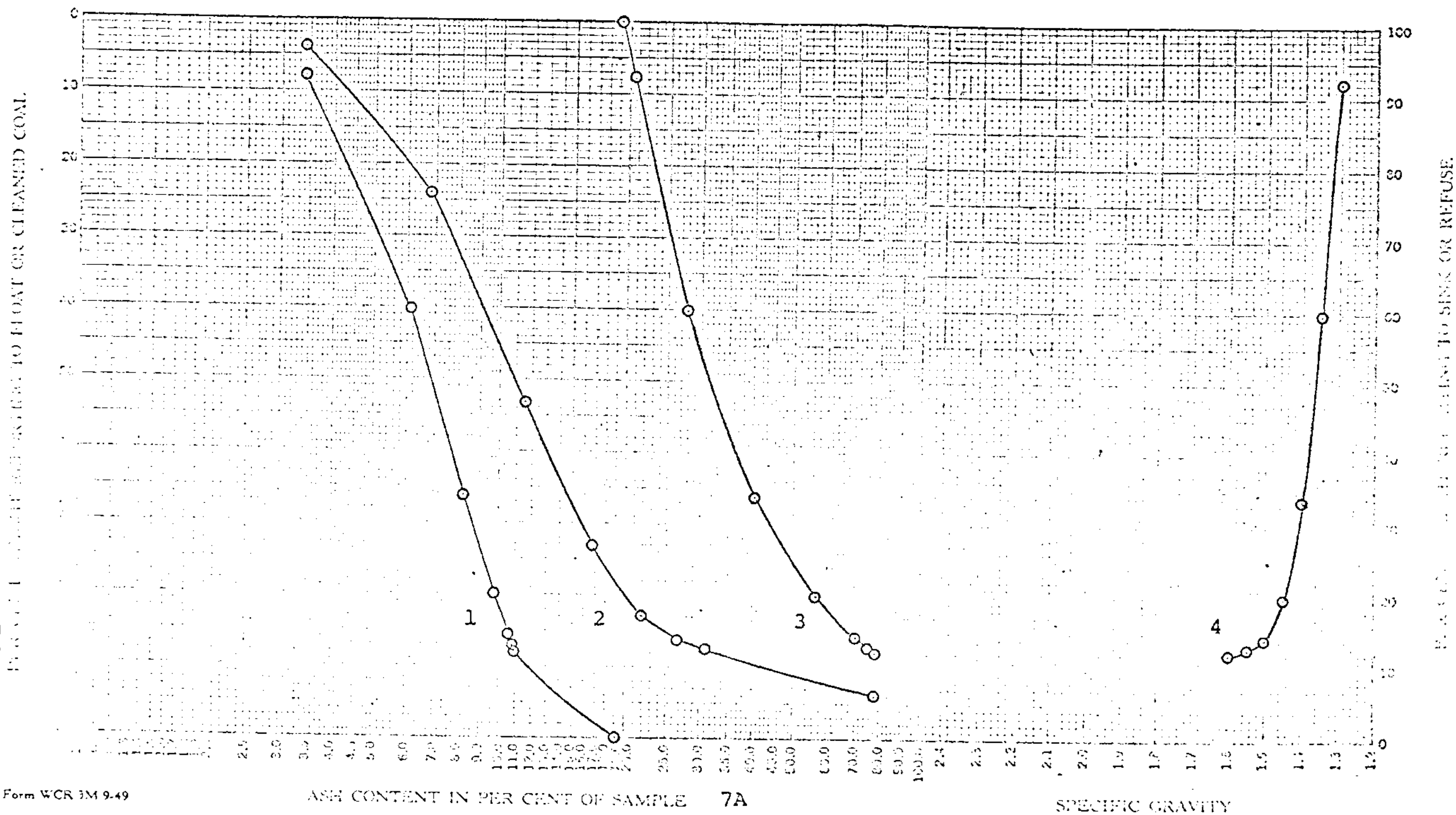
Commercial Testing & Engineering Co.
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

Raw Coal Sample No. 2

WASHABILITY CURVES



7A

Exhibit No. 20-17

Form WCR 3M 9-49

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 1/2" Rd x 3/8" Rd
Raw Coal Ash 18.62%
Raw Coal Sul.

Commercial Testing & Engineering Co.

CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.

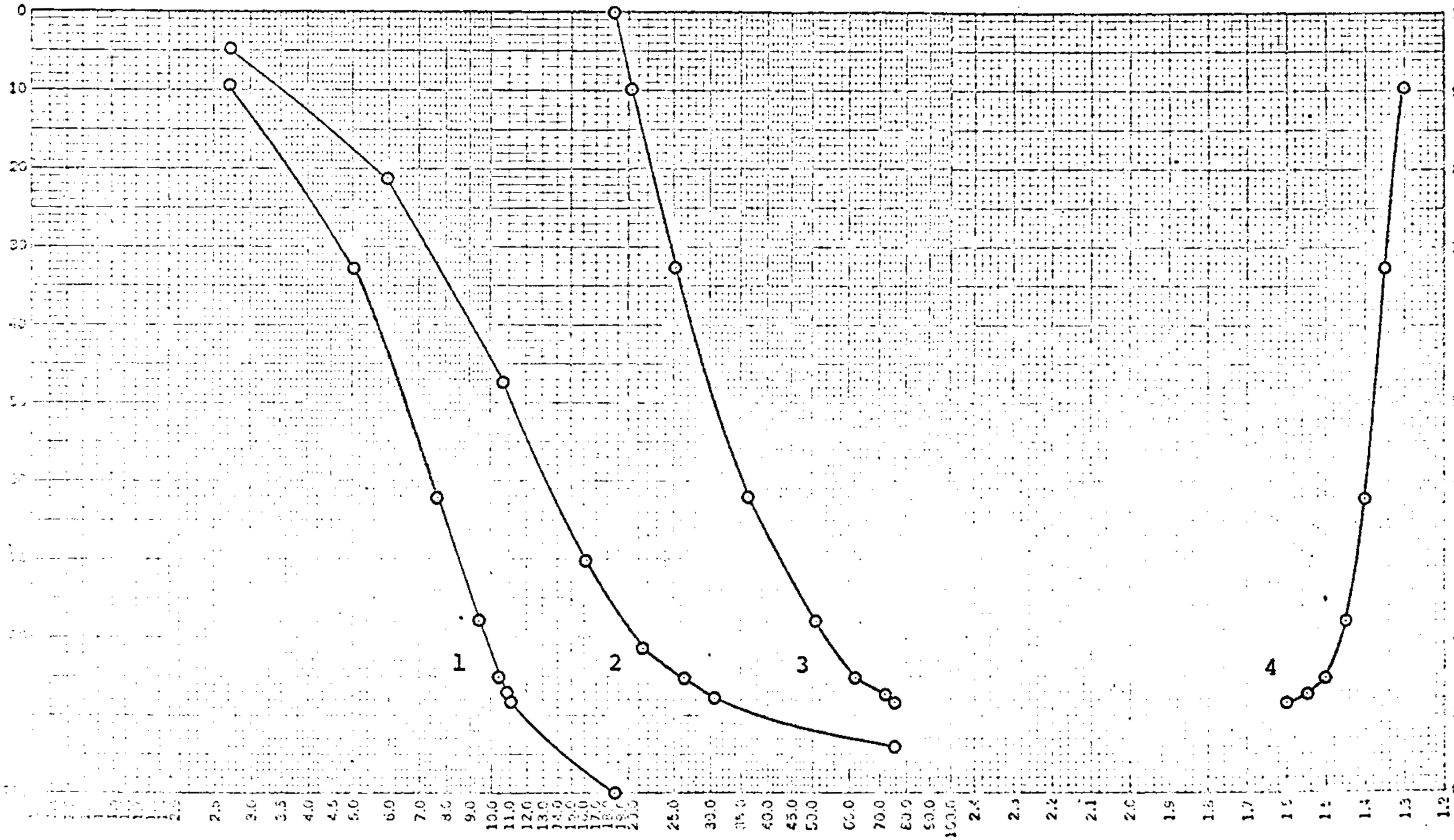
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

Raw Coal Sample No. 2

WASHABILITY CURVES



7B

Exhibit No. 20-18

Form WCR 3M 9-49

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-19

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315 FLOAT & SINK ANALYSIS October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SPECIFIC	GRAVITY		DRY BASIS % SULFUR				CUMULATIVE RECOVERY (FLOAT) % SULFUR					CUMULATIVE REJECT (SINK) % SULFUR				
Sink	Float	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.
3/4" Rd x 1/2" Rd = 10.7% of Raw Coal Sample Crushed to 2" Rd																
	1.30	7.9	0.66	0.02	0.00	0.64	7.9	0.66	0.02	0.00	0.64	100.0	0.52	0.05	0.00	0.47
1.30	1.35	32.3	0.60	0.03	0.00	0.57	40.2	0.61	0.03	0.00	0.58	92.1	0.51	0.05	0.00	0.46
1.35	1.40	26.0	0.54	0.04	0.00	0.50	66.2	0.58	0.03	0.00	0.55	59.8	0.46	0.06	0.00	0.40
1.40	1.45	13.8	0.49	0.04	0.00	0.45	80.0	0.57	0.03	0.00	0.54	33.8	0.40	0.08	0.00	0.32
1.45	1.50	5.6	0.47	0.05	0.00	0.42	85.6	0.56	0.04	0.00	0.52	20.0	0.34	0.10	0.00	0.24
1.50	1.55	1.5	0.47	0.07	0.00	0.40	87.1	0.56	0.04	0.00	0.52	14.4	0.29	0.12	0.00	0.17
1.55	1.60	0.7	0.45	0.09	0.00	0.36	87.8	0.56	0.04	0.00	0.52	12.9	0.27	0.13	0.00	0.14
1.60		12.2	0.26	0.13	0.00	0.13	100.0	0.52	0.05	0.00	0.47	12.2	0.26	0.13	0.00	0.13
1/2" Rd x 3/8" Rd = 7.3% of Raw Coal Sample Crushed to 2" Rd																
	1.30	9.7	0.62	0.04	0.00	0.58	9.7	0.62	0.04	0.00	0.58	100.0	0.51	0.05	0.00	0.46
1.30	1.35	23.0	0.58	0.03	0.00	0.55	32.7	0.59	0.03	0.00	0.56	90.3	0.50	0.05	0.00	0.45
1.35	1.40	29.5	0.55	0.04	0.00	0.51	62.2	0.57	0.04	0.00	0.53	67.3	0.48	0.05	0.00	0.43
1.40	1.45	15.8	0.51	0.03	0.00	0.48	78.0	0.56	0.04	0.00	0.52	37.8	0.42	0.06	0.00	0.36
1.45	1.50	7.1	0.48	0.05	0.00	0.43	85.1	0.55	0.04	0.00	0.51	22.0	0.35	0.09	0.00	0.36
1.50	1.55	2.2	0.47	0.06	0.00	0.41	87.3	0.55	0.04	0.00	0.51	14.9	0.29	0.11	0.00	0.18
1.55	1.60	1.1	0.48	0.09	0.00	0.39	88.4	0.55	0.04	0.00	0.51	12.7	0.26	0.12	0.00	0.14
1.60		11.6	0.24	0.12	0.00	0.12	100.0	0.51	0.05	0.00	0.46	11.6	0.24	0.12	0.00	0.12

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315

FLOAT & SINK ANALYSIS

October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SPECIFIC	GRAVITY		DRY BASIS					CUMULATIVE RECOVERY (FLOAT)					CUMULATIVE REJECT (SINK)				
Sink	Float	% Wt.	% Ash	% Sul.	% Vol.	% FC	FSI	% Wt.	% Ash	% Sul.	% Vol.	% FC	% Wt.	% Ash	% Sul.	% Vol.	% FC
3/8" Rd x 1/4" Rd = 9.6% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	8.3	3.05	0.64	21.77	75.18	9	8.3	3.05	0.64	21.77	75.18	100.0	18.33	0.52	17.86	63.8
1.30	1.35	20.5	5.78	0.61	20.81	73.41	9	28.8	4.99	0.62	21.09	73.92	91.7	19.71	0.51	17.51	62.[illegible]
1.35	1.40	29.2	10.18	0.53	18.44	71.38	5	58.0	7.60	0.57	19.75	72.65	71.2	23.72	0.48	16.56	59.7
1.40	1.45	18.1	15.75	0.51	17.58	66.67	2	76.1	9.54	0.56	19.24	71.22	42.0	33.13	0.44	15.25	51.6
1.45	1.50	8.7	21.26	0.48	17.00	61.74	1-1/2	84.8	10.74	0.55	19.01	70.25	23.9	46.30	0.39	13.49	40.2
1.50	1.55	2.5	25.95	0.47	16.76	57.29	1-1/2	87.3	11.18	0.55	18.94	69.88	15.2	60.63	0.34	11.49	27.8
1.55	1.60	1.7	30.57	0.48	16.33	53.10	1-1/2	89.1	11.54	0.55	18.87	69.59	12.7	67.46	0.32	10.45	22.0
1.60		11.0	73.16	0.29	9.54	17.30	*	100.0	18.33	0.52	17.86	63.81	11.0	73.16	0.29	9.54	17.3
1/4" Rd x 1/8" Rd = 15.9% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	13.5	2.75	0.63	22.38	74.87	9	13.5	2.75	0.63	22.38	74.87	100.0	16.56	0.53	18.47	64.9
1.30	1.35	23.3	6.18	0.58	19.79	74.03	8-1/2	36.8	4.92	0.60	20.74	74.34	86.5	18.71	0.51	17.86	63.4
1.35	1.40	25.8	10.68	0.54	18.91	70.41	5	62.6	7.29	0.57	19.99	72.72	63.2	23.33	0.49	17.15	59.5
1.40	1.45	15.3	16.26	0.51	18.08	65.66	2	77.9	9.06	0.56	19.61	71.33	37.4	32.06	0.45	15.94	52.0
1.45	1.50	8.2	21.37	0.47	17.20	61.43	1-1/2	86.1	10.23	0.55	19.38	70.39	22.1	43.00	0.41	14.45	42.5
1.50	1.55	3.0	25.96	0.47	17.35	56.69	1-1/2	89.1	10.76	0.55	19.31	69.93	13.9	55.77	0.38	12.83	31.4
1.55	1.60	1.6	30.55	0.46	16.24	53.21	1	90.7	11.11	0.55	19.26	69.63	10.9	63.97	0.35	11.59	24.4
1.60		9.3	69.72	0.33	10.79	19.49	*	100.0	16.56	0.53	18.47	64.97	9.3	69.72	0.33	10.79	19.4

* Non-Agglomerating

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-20

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 3/8" Rd x 1/4" Rd
Raw Coal Ash 18.33%
Raw Coal Sul.

Commercial Testing & Engineering Co.

CONSULTING FUEL ENGINEERS
AND CHEMISTS

CHICAGO, ILL.

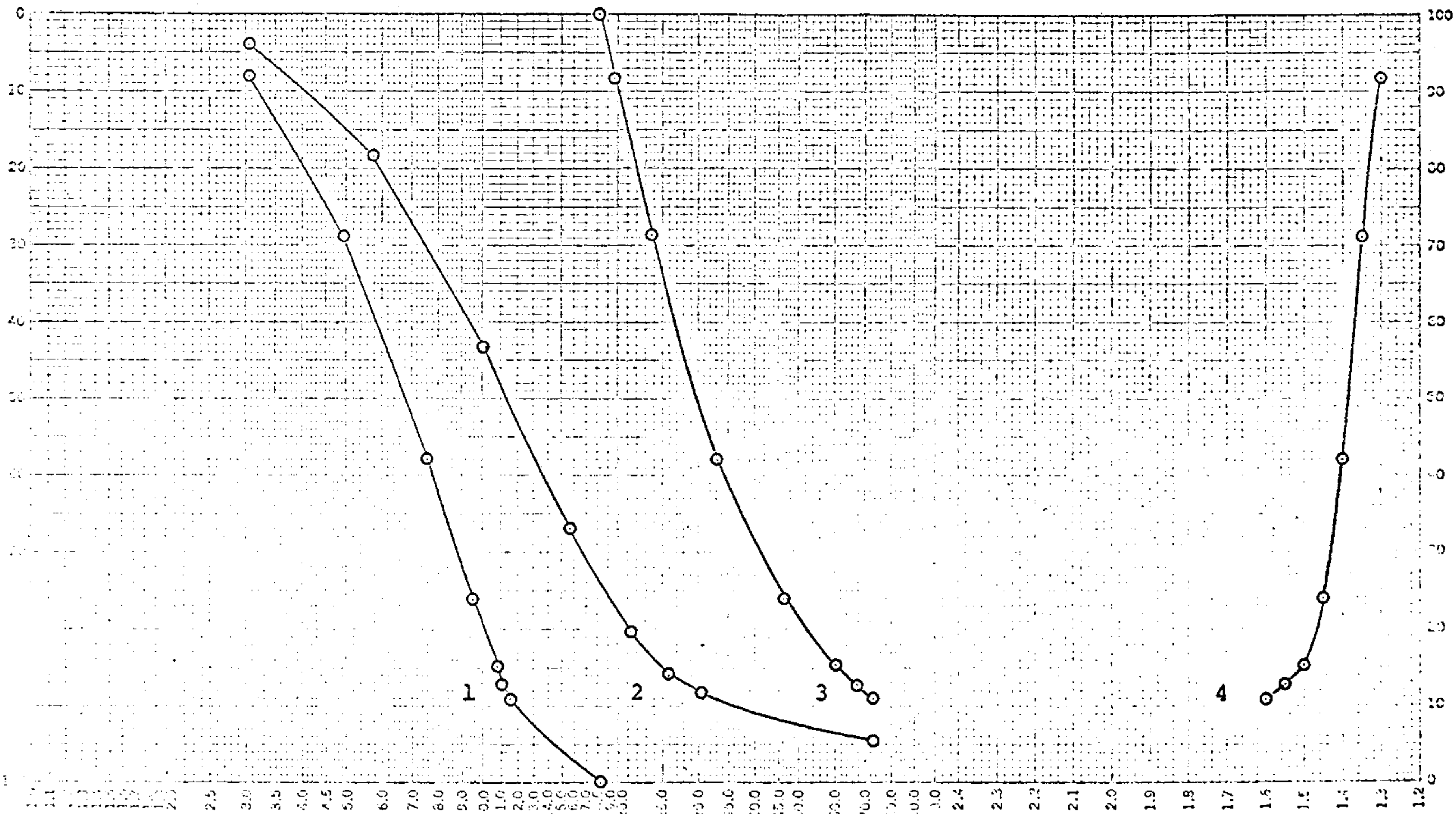
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

Raw Coal Sample No. 2

WASHABILITY CURVES



8A

Exhibit No. 20-21

Form WCR 3M 9-49

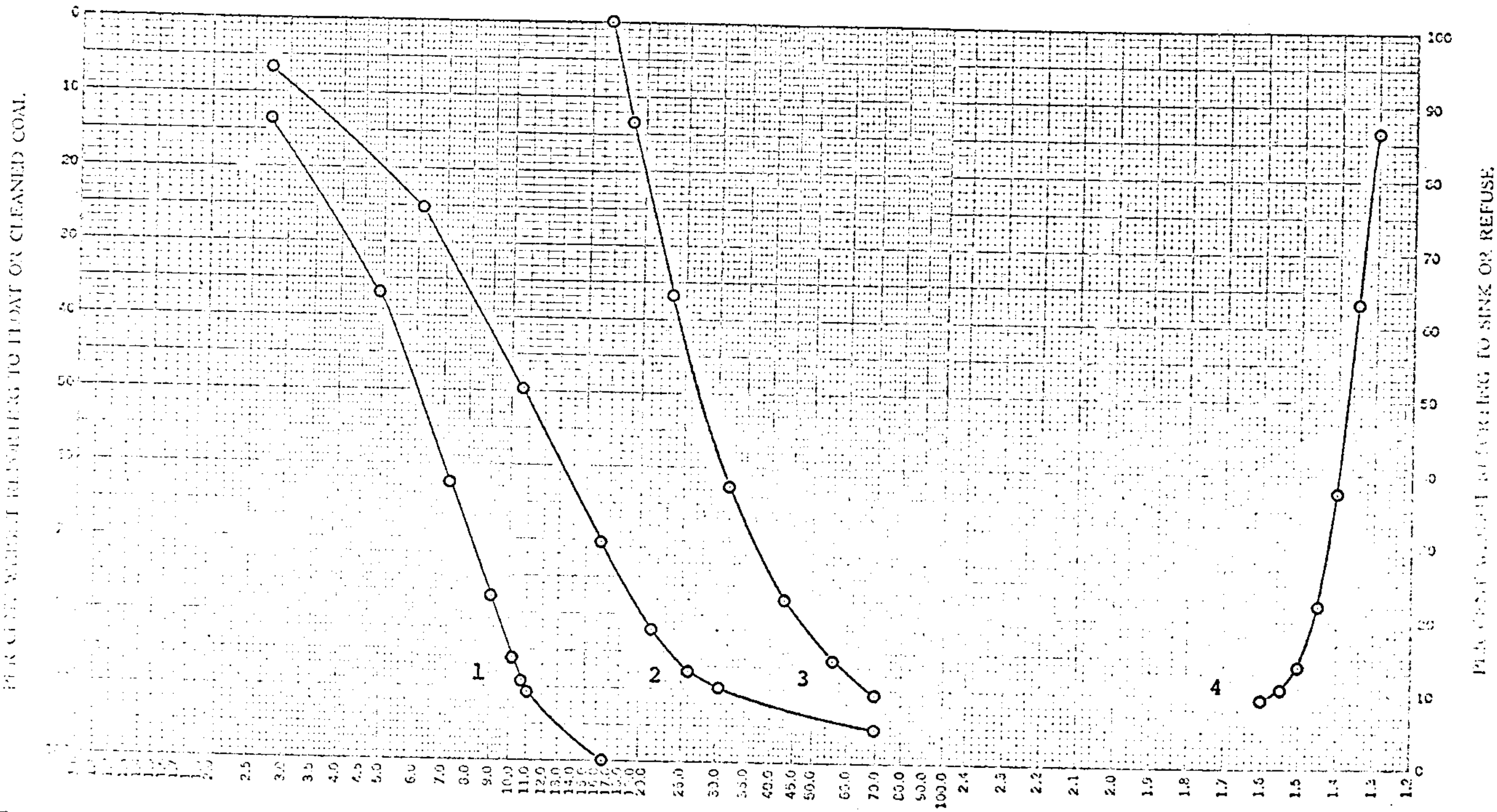
Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 1/4" Rd x 1/8" Rd
Raw Coal Ash 16.56%
Raw Coal Sul.

Raw Coal Sample No. 2

Commercial Testing & Engineering Co.
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND
1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



8B

Exhibit No. 20-22

Form WCR 3M 9-49

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315 FLOAT & SINK ANALYSIS October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SPECIFIC	GRAVITY		DRY BASIS % SULFUR				CUMULATIVE RECOVERY (FLOAT) % SULFUR					CUMULATIVE REJECT (SINK) % SULFUR				
Sink	Float	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.
3/8" Rd x 1/4" Rd = 9.6% of Raw Coal Sample Crushed to 2" Rd																
	1.30	8.3	0.64	0.02	0.00	0.62	8.3	0.64	0.02	0.00	0.62	100.0	0.52	0.05	0.00	0.47
1.30	1.35	20.5	0.61	0.02	0.00	0.59	28.8	0.62	0.02	0.00	0.60	91.7	0.51	0.05	0.00	0.46
1.35	1.40	29.2	0.53	0.03	0.00	0.50	58.0	0.57	0.03	0.00	0.54	71.2	0.48	0.06	0.00	0.42
1.40	1.45	18.1	0.51	0.06	0.00	0.45	76.1	0.56	0.03	0.00	0.53	42.0	0.44	0.08	0.00	0.36
1.45	1.50	8.7	0.48	0.04	0.00	0.44	84.8	0.55	0.03	0.00	0.52	23.9	0.39	0.09	0.00	0.30
1.50	1.55	2.5	0.47	0.05	0.00	0.42	87.3	0.55	0.03	0.00	0.52	15.2	0.34	0.12	0.00	0.22
1.55	1.60	1.7	0.48	0.10	0.00	0.38	89.1	0.55	0.04	0.00	0.51	12.7	0.32	0.13	0.00	0.19
1.60		11.0	0.29	0.14	0.00	0.15	100.0	0.52	0.05	0.00	0.47	11.0	0.29	0.14	0.00	0.15
1/4" Rd x 1/8" Rd = 15.9% of Raw Coal Sample Crushed to 2" Rd																
	1.30	13.5	0.63	0.01	0.00	0.62	13.5	0.63	0.01	0.00	0.62	100.0	0.53	0.05	0.00	0.48
1.30	1.35	23.3	0.58	0.03	0.00	0.55	36.8	0.60	0.02	0.00	0.58	86.5	0.51	0.06	0.00	0.45
1.35	1.40	25.8	0.54	0.04	0.00	0.49	62.6	0.57	0.03	0.00	0.54	63.2	0.49	0.07	0.00	0.42
1.40	1.45	15.3	0.51	0.04	0.00	0.47	77.9	0.56	0.03	0.00	0.53	37.4	0.45	0.09	0.00	0.36
1.45	1.50	8.2	0.47	0.06	0.00	0.41	86.1	0.55	0.03	0.00	0.52	22.1	0.41	0.12	0.00	0.29
1.50	1.55	3.0	0.47	0.09	0.00	0.38	89.1	0.55	0.04	0.00	0.51	13.9	0.38	0.16	0.00	0.22
1.55	1.60	1.6	0.46	0.11	0.00	0.35	90.7	0.55	0.04	0.00	0.51	10.9	0.35	0.18	0.00	0.17
1.60		9.3	0.33	0.19	0.00	0.14	100.0	0.53	0.05	0.00	0.48	9.3	0.33	0.19	0.00	0.14

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-23

Exhibit No. 20-24

COMMERCIAL TESTING & ENGINEERING CO.

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315

FLOAT & SINK ANALYSIS

October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SPECIFIC	GRAVITY		DRY BASIS					CUMULATIVE RECOVERY (FLOAT)					CUMULATIVE REJECT (SINK)				
Sink	Float	% Wt.	% Ash	% Sul.	% Vol.	% FC	FSI	% Wt.	% Ash	% Sul.	% Vol.	% FC	% Wt.	% Ash	% Sul.	% Vol.	% FC
1/8" Rd x 28 Mesh = 19.2% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	20.6	1.62	0.75	22.12	76.26	9	20.6	1.62	0.75	22.12	76.26	100.0	14.48	0.64	19.17	66.[illegible]
1.30	1.35	24.5	6.26	0.68	20.15	73.59	6	45.1	4.14	0.71	21.05	74.81	79.4	17.82	0.61	18.41	63.[illegible]
1.35	1.40	17.8	10.37	0.60	19.54	70.09	2-1/2	62.9	5.90	0.68	20.62	73.48	54.9	22.97	0.58	17.63	59.4
1.40	1.45	13.7	14.72	0.58	18.12	67.16	1-1/2	76.6	7.48	0.66	20.17	72.35	37.1	29.02	0.58	16.72	54.[illegible]
1.45	1.50	8.9	20.12	0.53	18.20	61.68	1-1/2	85.5	8.80	0.65	19.97	71.23	23.4	37.39	0.57	15.90	46.[illegible]
1.50	1.55	4.1	24.29	0.50	17.64	58.07	1-1/2	89.6	9.51	0.64	19.86	70.63	14.5	48.00	0.60	14.48	37.5
1.55	1.60	2.1	28.73	0.55	17.38	53.89	1-1/2	91.7	9.95	0.64	19.81	70.24	10.4	57.34	0.64	13.24	29.4
1.60		8.3	64.58	0.66	12.19	23.23	*	100.0	14.48	0.64	19.17	66.35	8.3	64.58	0.66	12.19	23.2
28 Mesh x 60 Mesh = 9.3% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	35.1	1.30	0.73	21.87	76.83	9	35.1	1.30	0.73	21.87	76.83	100.0	11.09	0.68	20.20	68.7
1.30	1.35	21.5	5.97	0.60	21.17	72.86	8-1/2	56.6	3.07	0.68	21.60	75.33	64.9	16.39	0.65	19.32	64.2
1.35	1.40	13.3	9.99	0.57	19.92	70.09	7	69.9	4.36	0.66	21.28	74.36	43.4	21.55	0.68	18.40	60.0
1.40	1.45	11.1	14.16	0.55	19.28	66.56	3	81.0	5.70	0.64	21.01	73.29	30.1	26.66	0.73	17.73	55.6
1.45	1.50	6.7	19.07	0.53	18.87	62.06	1-1/2	87.7	6.73	0.64	20.85	72.42	19.0	33.97	0.83	16.82	49.2
1.50	1.55	3.6	23.12	0.53	18.42	58.46	1-1/2	91.3	7.37	0.63	20.75	71.88	12.3	42.09	1.00	15.70	42.2
1.55	1.60	2.5	27.80	0.59	17.75	54.45	1-1/2	93.8	7.92	0.63	20.68	71.40	8.7	49.93	1.20	14.58	35.4
1.60		6.2	58.86	1.44	13.30	27.84	*	100.0	11.09	0.68	20.20	68.71	6.2	58.86	1.44	13.30	27.8

* Non-Agglomerating

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 1/8" Rd x 28 Mesh
Raw Coal Ash 14.48%
Raw Coal Sul.

Commercial Testing & Engineering Co.
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND
1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

Raw Coal Sample No. 2

WASHABILITY CURVES

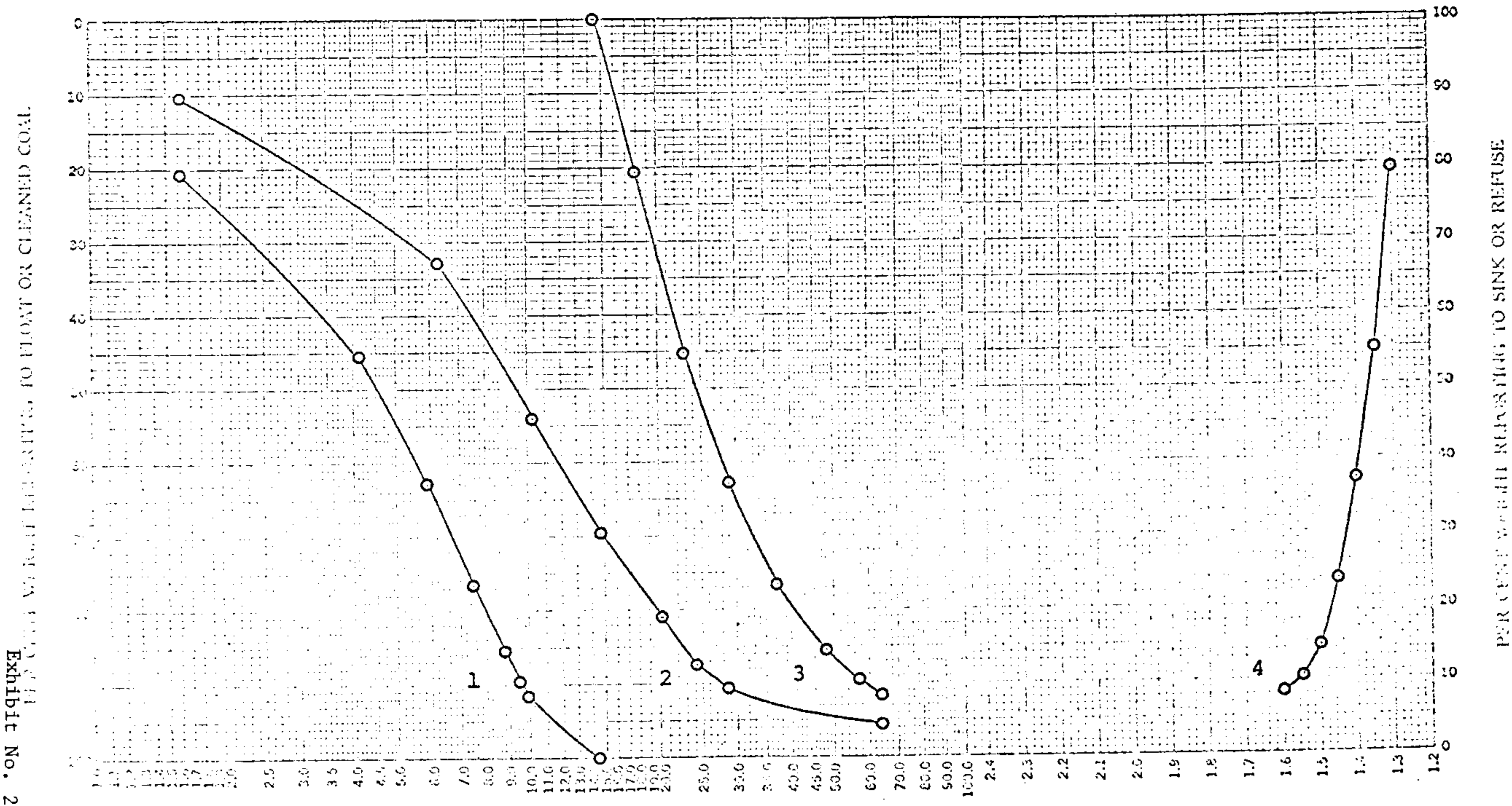


Exhibit No. 20-25

Form WCR 3M 9-49

26

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 28 Mesh x 60 Mesh
Raw Coal Ash 11.09%
Raw Coal Sul.

Commercial Testing & Engineering Co.

CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.

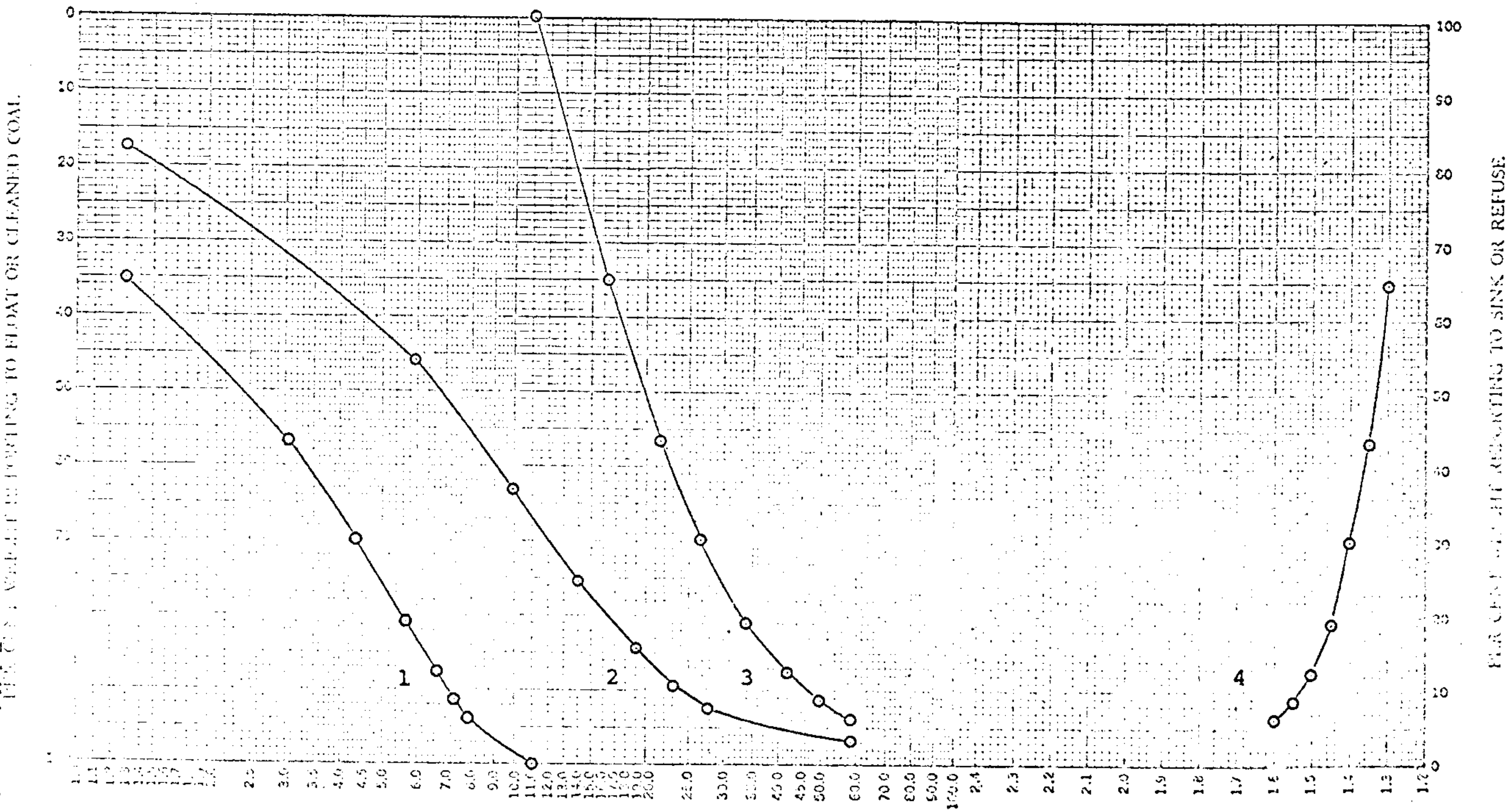
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

Raw Coal Sample No. 2

WASHABILITY CURVES



9B

Exhibit No. 20-26

Form WCR 3M 9-49

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315 FLOAT & SINK ANALYSIS October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SPECIFIC	GRAVITY		DRY BASIS % SULFUR				CUMULATIVE RECOVERY (FLOAT) % SULFUR					CUMULATIVE REJECT (SINK) % SULFUR				
Sink	Float	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.
							1/8" Rd x 28 Mesh = 19.2% of Raw Coal Sample Crushed to 2" Rd									
	1.30	20.6	0.75	0.02	0.00	0.73	20.6	0.75	0.02	0.00	0.73	100.0	0.64	0.07	0.00	0.57
1.30	1.35	24.5	0.68	0.02	0.00	0.66	45.1	0.71	0.02	0.00	0.69	79.4	0.61	0.08	0.00	0.53
1.35	1.40	17.8	0.60	0.03	0.00	0.57	62.9	0.68	0.02	0.00	0.66	54.9	0.58	0.11	0.00	0.47
1.40	1.45	13.7	0.58	0.06	0.00	0.52	76.6	0.66	0.03	0.00	0.63	37.1	0.58	0.15	0.00	0.43
1.45	1.50	8.9	0.53	0.07	0.00	0.46	85.5	0.65	0.03	0.00	0.62	23.4	0.57	0.21	0.01	0.45
1.50	1.55	4.1	0.50	0.09	0.01	0.40	89.6	0.64	0.04	0.00	0.60	14.5	0.60	0.29	0.01	0.31
1.55	1.60	2.1	0.55	0.13	0.00	0.42	91.7	0.64	0.04	0.00	0.60	10.4	0.64	0.37	0.01	0.26
1.60		8.3	0.66	0.43	0.01	0.22	100.0	0.64	0.07	0.00	0.57	8.3	0.66	0.43	0.01	0.22
							28 Mesh x 60 Mesh = 9.3% of Raw Coal Sample Crushed to 2" Rd									
	1.30	35.1	0.73	0.01	0.01	0.71	35.1	0.73	0.01	0.01	0.71	100.0	0.68	0.10	0.00	0.58
1.30	1.35	21.5	0.60	0.03	0.00	0.57	56.6	0.68	0.02	0.01	0.65	64.9	0.65	0.15	0.00	0.50
1.35	1.40	13.3	0.57	0.04	0.00	0.53	69.9	0.66	0.02	0.01	0.63	43.4	0.68	0.21	0.00	0.47
1.40	1.45	11.1	0.55	0.06	0.00	0.49	81.0	0.64	0.03	0.00	0.61	30.1	0.73	0.28	0.00	0.45
1.45	1.50	6.7	0.53	0.08	0.01	0.44	87.7	0.64	0.03	0.00	0.61	19.0	0.83	0.41	0.01	0.42
1.50	1.55	3.6	0.53	0.11	0.01	0.41	91.3	0.63	0.03	0.00	0.60	12.3	1.00	0.60	0.00	0.40
1.55	1.60	2.5	0.59	0.17	0.01	0.41	93.8	0.63	0.04	0.01	0.58	8.7	1.20	0.80	0.00	0.40
1.60		6.2	1.44	1.05	0.00	0.39	100.0	0.68	0.10	0.00	0.58	6.2	1.44	1.05	0.00	0.39

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-27

COMMERCIAL TESTING & ENGINEERING CO.

Exhibit No. 20-28

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315

FLOAT & SINK ANALYSIS

October 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SPECIFIC	GRAVITY		DRY BASIS					CUMULATIVE RECOVERY (FLOAT)					CUMULATIVE REJECT (SINK)				
Sink	Float	% Wt.	% Ash	% Sul.	% Vol.	% FC	FSI	% Wt.	% Ash	% Sul.	% Vol.	% FC	% Wt.	% Ash	% Sul.	% Vol.	% FC
60 Mesh x 100 Mesh = 3.8% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	41.8	1.08	0.65	22.13	76.79	9	41.8	1.08	0.65	22.13	76.79	100.0	9.59	0.73	20.54	69.
1.30	1.35	20.6	5.52	0.63	21.59	72.89	8-1/2	62.4	2.55	0.64	21.95	75.50	58.2	15.70	0.79	19.40	64.
1.35	1.40	10.8	9.70	0.56	19.67	70.63	6-1/2	73.2	3.60	0.63	21.62	74.78	37.6	21.28	0.88	18.21	60.
1.40	1.45	10.2	13.49	0.57	20.01	66.50	5	83.4	4.81	0.62	21.42	73.77	26.8	25.95	1.01	17.62	56.
1.45	1.50	5.3	18.56	0.55	17.05	64.39	3	88.7	5.63	0.62	21.16	73.21	16.6	33.60	1.28	16.14	50.
1.50	1.55	3.1	22.58	0.56	18.73	58.69	2	91.8	6.20	0.62	21.08	72.72	11.3	40.65	1.63	15.72	43.
1.55	1.60	2.5	27.10	0.61	15.70	57.20	1	94.3	6.76	0.62	20.93	72.31	8.2	47.49	2.03	14.58	37.
1.60		5.7	56.43	2.65	14.09	29.48	*	100.0	9.59	0.73	20.54	69.87	5.7	56.43	2.65	14.09	29.
100 Mesh x 200 Mesh = 2.6% of Raw Coal Sample Crushed to 2" Rd																	
	1.30	41.8	1.19	0.65	24.13	74.68	9	41.8	1.19	0.65	24.13	74.68	100.0	9.56	0.98	21.44	69.
1.30	1.35	20.7	4.92	0.60	21.13	73.95	8-1/2	62.5	2.43	0.63	23.14	74.43	58.2	15.57	1.22	19.51	64.
1.35	1.40	11.1	9.14	0.58	20.44	70.42	7	73.6	3.44	0.63	22.73	73.83	37.5	21.44	1.56	18.61	59.
1.40	1.45	9.4	12.86	0.59	19.85	67.29	5-1/2	83.0	4.51	0.62	22.40	73.09	26.4	26.61	1.97	17.84	55.
1.45	1.50	4.9	17.61	0.62	19.03	63.36	4	87.9	5.24	0.62	22.22	72.54	17.0	34.22	2.73	16.73	49.
1.50	1.55	3.0	22.04	0.76	19.98	57.98	2	90.9	5.79	0.63	22.14	72.07	12.1	40.95	3.58	15.80	43.
1.55	1.60	2.6	26.68	0.68	17.96	55.36	1-1/2	93.5	6.37	0.63	22.03	71.60	9.1	47.18	4.52	14.42	38.
1.60		6.5	55.38	6.05	13.01	31.61	*	100.0	9.56	0.98	21.44	69.00	6.5	55.38	6.05	13.01	31.

* Non-Agglomerating

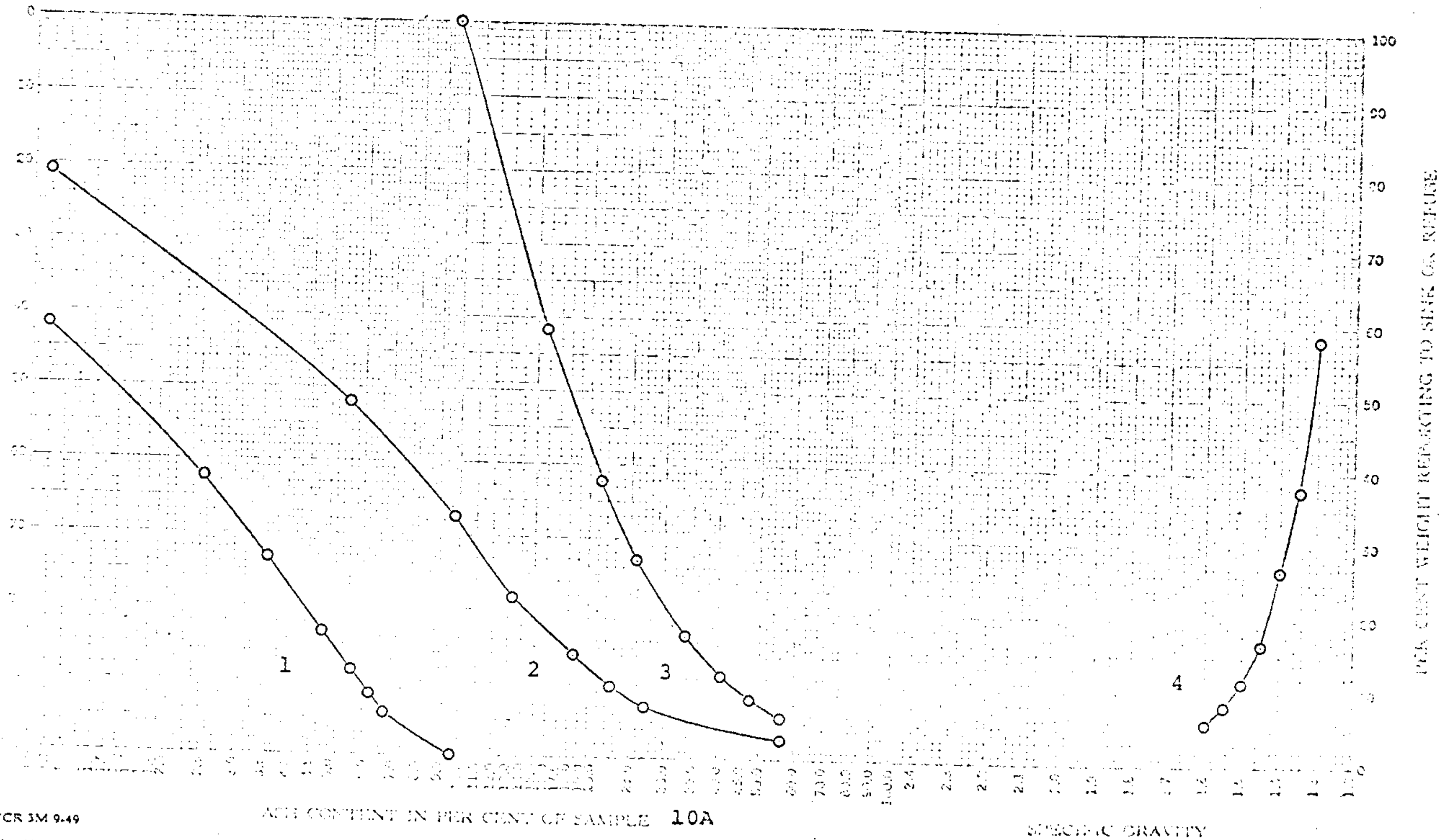
Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 60 Mesh x 100 Mesh
Raw Coal Ash 9.59%
Raw Coal Sul.

Raw Coal Sample No. 2

Commercial Testing & Engineering Co.
CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND
1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

WASHABILITY CURVES



10A

Exhibit No. 20-29

Form WCR 3M 9-49

Job THE NO. AM. COAL CORP.
Lab. No. C-337315
Mine
Size 100 Mesh x 200 Mesh
Raw Coal Ash 9.56%
Raw Coal Sul.

Commercial Testing & Engineering Co.

CONSULTING FUEL ENGINEERS
AND CHEMISTS
CHICAGO, ILL.

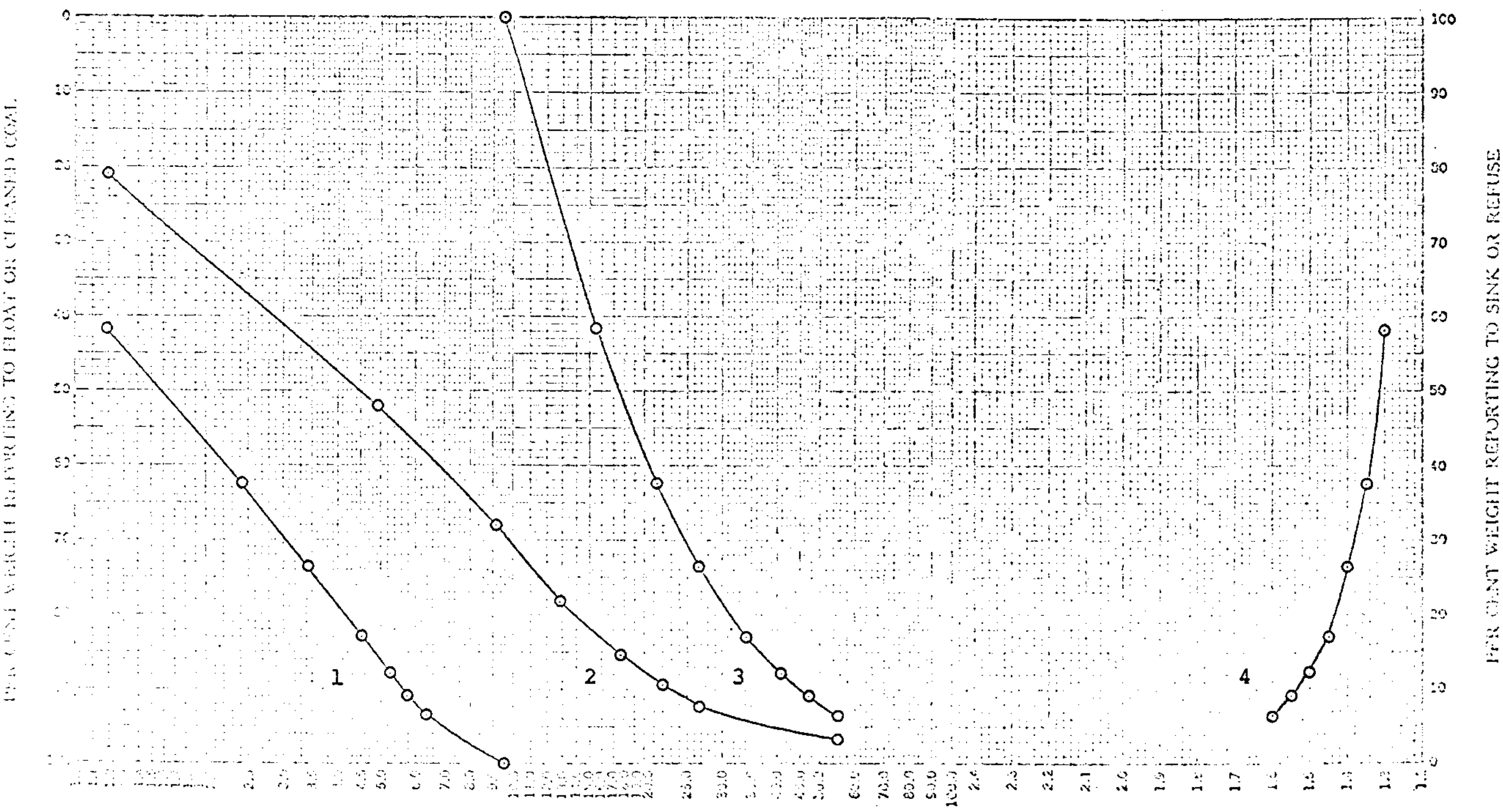
Charleston, W. Va. Terre Haute, Ind.

CURVE LEGEND

1 Cumulative Coal-Ash
2 Coal Characteristic
3 Cumulative Refuse-Ash
4 Yield-Specific Gravity
5 Separation Effected

Raw Coal Sample No. 2

WASHABILITY CURVES



10B

Exhibit No. 20-30

Form WCR 3M 9-49

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315 FLOAT & SINK ANALYSIS **October 1968**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SPECIFIC	GRAVITY		DRY BASIS % SULFUR				CUMULATIVE RECOVERY (FLOAT) % SULFUR					CUMULATIVE REJECT (SINK) % SULFUR				
Sink	Float	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.	% Wt.	Total	Pyritic	Sulf.	Org.
60 Mesh x 100 Mesh = 3.8% of Raw Coal Sample Crushed to 2" Rd																
	1.30	41.8	0.65	0.02	0.02	0.61	41.8	0.65	0.02	0.02	0.61	100.0	0.73	0.18	0.01	0.54
1.30	1.35	20.6	0.63	0.03	0.00	0.60	62.4	0.64	0.02	0.01	0.61	58.2	0.79	0.29	0.01	0.49
1.35	1.40	10.8	0.56	0.05	0.00	0.51	73.2	0.63	0.03	0.01	0.59	37.6	0.88	0.43	0.01	0.44
1.40	1.45	10.2	0.57	0.07	0.01	0.49	83.4	0.62	0.03	0.01	0.58	26.8	1.01	0.59	0.01	0.41
1.45	1.50	5.3	0.55	0.10	0.01	0.44	88.7	0.62	0.04	0.01	0.57	16.6	1.28	0.91	0.01	0.36
1.50	1.55	3.1	0.56	0.13	0.01	0.42	91.8	0.62	0.04	0.01	0.57	11.3	1.63	1.28	0.02	0.33
1.55	1.60	2.5	0.61	0.21	0.01	0.39	94.3	0.62	0.04	0.01	0.57	8.2	2.03	1.72	0.02	0.29
1.60		5.7	2.65	2.38	0.02	0.25	100.0	0.73	0.18	0.01	0.54	5.7	2.65	2.38	0.02	0.25
100 Mesh x 200 Mesh = 2.6% of Raw Coal Sample Crushed to 2" Rd																
	1.30	41.8	0.65	0.02	0.00	0.63	41.8	0.65	0.02	0.00	0.63	100.0	0.98	0.35	0.01	0.62
1.30	1.35	20.7	0.60	0.04	0.00	0.56	62.5	0.63	0.03	0.00	0.60	58.2	1.22	0.59	0.01	0.62
1.35	1.40	11.1	0.58	0.05	0.01	0.52	73.6	0.63	0.03	0.00	0.60	37.5	1.56	0.89	0.02	0.65
1.40	1.45	9.4	0.59	0.07	0.01	0.51	83.0	0.62	0.03	0.00	0.59	26.4	1.97	1.24	0.03	0.70
1.45	1.50	4.9	0.62	0.10	0.01	0.61	87.9	0.62	0.04	0.00	0.58	17.0	2.73	1.89	0.03	0.81
1.50	1.55	3.0	0.76	0.15	0.01	0.60	90.9	0.63	0.04	0.00	0.59	12.1	3.58	2.61	0.04	0.93
1.55	1.60	2.6	0.68	0.24	0.02	0.42	93.5	0.63	0.05	0.00	0.58	9.1	4.52	3.42	0.06	1.04
1.60		6.5	6.05	4.69	0.07	1.29	100.0	0.98	0.35	0.01	0.62	6.5	6.05	4.69	0.07	1.29

COMMERCIAL TESTING & ENGINEERING CO.

THE NORTH AMERICAN COAL CORPORATION
Cleveland, Ohio

Raw Coal Sample No. 2

Lab No. C-337315 October 1968

HEAD SAMPLE

% Air Dry Moisture	2.44
% Total Moisture	3.16

PROXIMATE ANALYSIS

	AS REC'D.	DRY
% Moisture	3.16	xxxxx
% Ash	15.86	16.38
% Volatile	18.25	18.85
% Fixed Carbon	62.73	64.77
% Sulfur	0.58	0.60

FREE SWELLING INDEX = 7

T A B L E 1. SEAM #7.

SCURRY RAINBOW OIL LTD.

Classification by Rank.

Ash:	14.46%
Volatile Matter:	17.85%
Residual Moisture:	0.44%
Fixed Carbon:	67.25%
Sulphur:	0.59%
B.T.U./lb.	12,860
Rank:	Low volatile bituminous

T A B LE 2. SEAM #7.

Size Analysis - Sulphur, B.T.U. and Residual Moisture.

Size	Weight %	Sulphur %	B.T.U./lb.	R.M. %
2" x 1"	16.41	0.64	13,030	0.44
1" x 1/2"	22.74	0.58	12,820	0.43
1/2" x 1/4"	19.44	0.57	12,400	0.44
1/4" x 8 m.	17.75	0.57	12,750	0.41
8 x 20 m.	9.76	0.60	12,930	0.47
20 x 100 m.	11.24	0.62	13,360	0.48
- 100 m.	2.66	0.65	13,740	0.45
Total	100.00	0.59	12,860	0.44

T A B L E 3. SEAM #7.

SCURRY RAINBOW OIL LTD.

Weight and Ash Distribution vs. Size and Specific Gravity.
(Figures in Brackets show the Ash content of individual fractions)

Sp.Gr. / Size	1.30	1.35	1.40	1.50	1.60	1.80		Total
2" x 1"	7.24 (4.76)	3.52 (8.24)	1.31 (12.90)	2.32 (21.35)	1.37 (30.84)	0.36 (38.69)	0.29 (72.51)	16.41 (12.62)
1 x 1/2"	9.28 (5.05)	4.09 (8.47)	2.36 (12.42)	3.61 (21.41)	1.89 (32.95)	0.70 (39.90)	0.81 (76.36)	22.74 (14.95)
1/2 x 1/4"	6.51 (4.23)	3.66 (9.10)	2.44 (12.46)	3.66 (20.38)	1.54 (32.10)	0.94 (41.75)	0.69 (74.88)	19.44 (15.75)
1/4" x 8 m.	7.66 (4.38)	1.77 (8.66)	2.93 (13.17)	2.27 (22.13)	1.43 (31.08)	0.85 (42.29)	0.84 (71.83)	17.75 (15.68)
8 x 20 m.	5.09 (4.40)	0.74 (8.60)	1.33 (14.21)	0.91 (21.52)	0.66 (30.67)	0.54 (40.54)	0.49 (68.68)	9.76 (14.65)
20 x 100 m.	6.35 (3.30)	1.24 (9.63)	0.83 (13.85)	0.91 (19.97)	0.90 (30.56)	0.59 (38.35)	0.42 (75.98)	11.24 (12.86)
Total	42.14 (4.40)	15.02 (8.69)	11.20 (13.00)	13.68 (21.15)	7.79 (31.59)	3.98 (40.59)	3.54 (73.57)	97.34 (14.57)
- 100 m.	This fractions forms 2.66% of the total sample and has an ash content of 10.46%, thus giving a total sample ash value of 14.46%.							

Exhibit No. 21-2

TABLE 4. SEAM #7.

SCURRY RAINBOW OIL LTD.

Weight % and Volatile Matter % vs. Size and Specific Gravity.

(Figures in brackets give Volatile Matter)

Size \ Sp.Gr.	1.30	1.35	1.40	1.50	1.60	1.80		Total
2" x 1"	7.24 (18.01)	3.52 (16.71)	1.31 (16.91)	2.32 (16.69)	1.37 (16.59)	0.36 (15.47)	0.29 (14.71)	16.41 (17.22)
1" x 1/2"	9.28 (18.20)	4.09 (16.70)	2.36 (17.30)	3.61 (17.00)	1.89 (16.42)	0.70 (15.66)	0.81 (14.46)	22.74 (17.28)
1/2" x 1/4"	6.51 (18.92)	3.66 (16.70)	2.44 (17.22)	3.66 (16.70)	1.54 (16.04)	0.94 (15.38)	0.69 (14.01)	19.44 (17.29)
1/4" x 8 M.	7.66 (19.45)	1.77 (18.55)	2.93 (17.46)	2.27 (17.02)	1.43 (16.64)	0.85 (16.20)	0.84 (13.34)	17.75 (18.05)
8 x 20 m.	5.09 (20.50)	0.74 (19.44)	1.33 (17.93)	0.91 (17.44)	0.66 (17.38)	0.54 (16.84)	0.49 (13.28)	9.76 (19.00)
20 x 100 m.	6.35 (20.88)	1.24 (19.08)	0.83 (18.16)	0.91 (18.04)	0.90 (17.36)	0.59 (17.42)	0.42 (14.80)	11.24 (19.56)
Total	42.14 (19.18)	1.502 (17.25)	11.20 (17.41)	13.68 (16.96)	7.79 (16.60)	3.98 (16.11)	3.54 (14.00)	97.34 (17.84)
- 100 m.	This fraction forms 2.66% of the total sample and has a volatile matter content of 18.39%, thus giving a total sample volatile matter content of 17.85%.							

Exhibit No. 21-3

TABLE 5. SEAM #7.

SCURRY RAINBOW OIL LTD.

Washability Data - 2" x 20 mesh.

Specific Gravity Fraction	Fractional		Cumulative				
			Floats		Sinks		
	Wt.%	Ash %	Wt.%	Ash %	Wt. %	Ash %	F.S.I.
- 1.30	41.56	4.61	41.56	4.61	100.00	14.81	5.6
1.30 - 1.35	16.01	8.61	57.57	5.72	58.44	22.06	1.5
1.35-1.40	12.04	12.93	69.61	6.97	42.43	27.13	1.7
1.40 - 1.50	14.83	21.24	84.44	9.48	30.39	32.76	1.3
1.50 - 1.60	8.00	31.73	92.44	11.90	15.56	43.73	1.1
1.60 - 1.80	3.94	40.99	96.38	12.61	7.56	56.44	1.1
+ 1.80	3.62	73.25	100.00	14.81	3.62	73.25	0.1
Total	100.00	14.81					

TABLE 6. SEAM #7.

Washability Data - 20 x 100 mesh.

Specific Gravity Fraction	Fractional		Cumulative				
			Floats		Sinks		
	Wt. %	Ash %	Wt. %	Ash %	Wt. %	Ash %	F.S.I.
- 1.30	56.49	3.30	56.49	3.30	100,00	12.87	9.4
1.30 - 1.35	11.03	9.63	67.52	4.33	43.51	25.29	4.9
1.35 - 1.40	7.38	13.85	74.90	5.27	32.48	30.61	2.2
1.40 - 1.50	8.10	19.97	83.00	6.71	25.10	35.54	1.5
1.50 - 1.60	8.01	30.56	91.01	8.81	17.00	42.96	1
1.60 - 1.80	5.25	38.35	96.26	10.42	8.99	54.00	1
+ 1.80	3.74	75.98	100,00	12.87	3.74	75.98	1.5
Total	100.00	12.87					

T A B L E 7. SEAM #7.

SCURRY RAINBOW OIL LTD.

FREE SWELLING INDEX

Size / Sp.Gr.	2" x 1"	1" x 1/2"	1/2" x 1/4"	1/4" x 8 m.	8 x 20 m.	20 x 100 m.
- 1.30	3, 3, 3½	3½, 3½, 4	5½, 6, 6	7½, 8, 8	8½, 9, 9	9, 9½, 9½
1.30 - 1.35	1, 1, 1	1, 1, 1	½, ½, ½	4, 4, 4	5, 5, 5½	4½, 5, 5,
1.35 - 1.40	1, 1½, 1½	1½, 1½, 1½	1½, 1½, 1½	2, 2, 2	2, 2, 2½	2, 2, 2½
1.40 - 1.50	1½, 1½, 1½	1, 1½, 1½	1, 1, 1½	1, 1½, 1½	1, 1, 1½	1½, 1½, 1½
1.50 - 1.60	1, 1, 1	1, 1, 1½	1, 1, 1½	1, 1, 1½	1, 1, 1	1, 1, 1
1.60 - 1.80	1, 1, 1	1, 1, 1	1, 1, 1½	1, 1, 1½	1, 1, 1	1, 1, 1
+ 1.80	N.A.	N.A.	N.A.	N.A.	½, ½, ½	½, ½, ½

NOTE: F.S.I. on - 100 mesh fraction is 8, 8, 8.

BOREHOLE SAMPLES: REPORT OF ANALYSES ON FLOAT-SINK SAMPLES

Client: Scurry Rainbow Oil Limited
Date Received:

Project:
C.E.S. Project No.: S1-58

Client Sample No.: 5177
C.E.S. Sample No.: 87

SR-15 No. 7 Seam 165.0 - 172.0 Rec. 7.0'

SCREEN ANALYSES OF 1/4" x 0 CRUSHED SAMPLE.

Fraction	Weight %
1/4" x 20 mesh	74.14
20 x 100 mesh	20.59
- 100 mesh	5.27
Total	100 .00

FLOAT-SINK ANALYSES.

	Weight %
Floats @ 1.5 in 1/4" x 20 mesh -	49.67
Sinks @ 1.5 in 1/4" x 20 mesh -	24.47
Floats @ 1.5 in 20 x 100 mesh -	16.47
Sinks @ 1.5 in 20 x 100 mesh -	4.12

ANALYSES.

Property / Fraction	Weight %	Ash %	V.M. %	F.S.I.	Sulphur %
Combined floats @ 1.5	66.14	11.22	19.07	4, 4, 4	0.53
Combined sinks @ 1.5	28.59	46.95			0.33
- 100 mesh	5.27	12.81	19.19	5, 4½, 5	0.72
Total	100	21.12	*		0.48

* Total of Floats only.

C.E.S. Form 15

Date: October 30, 1969

CYCLONE ENGINEERING SALES LTD.

Per: [signature]

R. Sehgal, Head of Laboratory

Exhibit No. 22-1

BOREHOLE SAMPLES: REPORT OF ANALYSES ON RAW MATERIAL

Client: Scurry Rainbow Oil Limited	Date Received:
Project:	C.E.S. Project No.: S1-58
Client Sample No.: 5177	C.E.S. Sample No.: 87
SR-15 No 7 Seam	Interval 165.0 - 172.0

MOISTURE CONTENT:

Weight loss on air drying in weight percent: (on as received basis)	1.12
Residual moisture in weight percent: (on air dry basis)	0.57

CHEMICAL ANALYSIS: (On air dry basis)

Ash:	20.72
V.M.:	18.81
F.S.I.:	3, 3, 3
B.T.U./lb.:	11,750
Sulphur:	0.49
F.C.:	59.90
Rank:	mvb

REMARKS:

C.E.S. Form 14

CYCLONE ENGINEERING SALES LTD.

Date: October 30, 1969

Per: [signature]
R. S. Sehgal/
Head of Laboratory

1.5

Exhibit No. 22-2

Cyclone Engineering Sales Ltd.

Gravity Separation of Bulk Materials

Manufacturers and Suppliers of Compound Water Cyclones

Engineering and Testing Services

Telephone 429 - 5708

Credit Foncier Building
10275 Jasper Avenue
Edmonton, Alberta

CABLE ADDRESS:
Cyclone, Edmonton

February 23, 1970

Scurry Rainbow Oil Ltd
539 - 8th Avenue, S.W.
Calgary 2, Alberta

Attention: Mr. N. C. Croome
Vice-President

Dear Mr. Croome:

Re: Blending of High and Low F.S.I. Coals,
Report No. RI-70.03.

Please find enclosed two copies of the above noted report on the results of the blending tests which became available. For all practical purposed it appears that in blending the F.S.I.'s of the coal can be pro rated according the weight percentages of the components.

The engineering report which was promised during the meeting is also about ready and I expect that this can be forwarded in about three days.

We trust this will be satisfactory.

Very truly yours,

CYCLONE ENGINEERING SALES LTD.

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

PDJV:sw

Encl.

FEB 24 1970

Exhibit No. 23-1

SCURRY RAINBOW OIL LTD.

REPORT ON

BLENDING OF HIGH AND LOW F.S.I. COALS

Submitted by

CYCLONE ENGINEERING SALES LTD.

EDMONTON - ALBERTA - CANADA

Report No.: RI-70.03

Job No.: S1 - 58

Dated: February 23, 1970

Exhibit No. 23-2

SCURRY RAINBOW OIL LTD.

REPORT ON

BLENDING OF HIGH AND LOW F.S.I. COALS

The influence of blending coals with different free swelling indexes on the resulting F.S.I. was studied from two aspects described as follows:

1. Blending of a High F.S.I. Coal with a Highly Oxidized Coal.
2. Blending of a High F.S.I. Coal with a Low F.S.I. Coal.

1. Blending of a High F.S.I. Coal with a Highly Oxidized Coal:

It was found that even low percentages of highly oxidized coal, i.e. 10 - 20%, have an inordinately high depressive effect when blending with high F.S.I. coals. In the actual experiments carried out one of the Scurry Rainbow coals with high F.S.I. of 9 was blended with a low F.S.I. coal (1/2) from another property. Even a low content of 10 - 20% of this oxidized coal depressed the F.S.I. of the mixture to a value of 4.

2. Blending of a High F.S.I. Coal with a Low F.S.I. Coal:

In mixtures of this nature the resulting F.S.I. seemed to move towards the predominant fraction by a slight amount. This type of blending was discussed at some length at the meeting between Cyclone Engineering Sales Ltd. and Scurry Rainbow Oil Ltd. in Edmonton.

An extensive testing program was undertaken to verify this information. Even though a small degree of beneficial effect was apparent there are two governing factors:

i) F.S.I.'s of two components must be widely separated.

ii) The component with high F.S.I. must be present in a large proportion, i.e. 70%.

Blending tests on the floats at 1.5 specific gravity of Seams #4 - 7 - 8 - 9 were done and it was found that resulting F.S.I.s in practically all cases stayed very close to a mathematical average. A fairly detailed analysis was undertaken and the results are shown in Table 1.

Respectfully submitted,

CYCLONE ENGINEERING SALES LTD.

Per: Vinkenborg

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

TABLE 1. Blending Test on Floats at 1.50 Specific Gravity and - 100 mesh Fractions of Seams #4, #7, #8 and #9.

Seam #	% Composition	F.S.I.
4	100	6, 6, 6
7	100	5, 5, 5
8	100	4½, 4½, 4
9	100	4, 4, 4
4 - 7	80 - 20	5½, 6, 6
4 - 7	50 - 50	5, 5, 5½
4 - 7	20 - 80	5, 5, 5
8 - 9	20 - 80	4, 4, 4½
8 - 9	50 - 50	4, 4, 4½
8 - 9	80 - 20	4½, 4½, 4
7 - 8	20 - 80	4½, 4½, 5
7 - 8	50 - 50	4½, 5, 5
7 - 8	80 - 20	4½, 5, 4½
7 - 8 - 9	30 - 30 - 40	4½, 4½, 4½
7 - 8 - 9	20 - 20 - 60	4, 4, 4½
7 - 8 - 9	10 - 10 - 80	4, 4½, 4
4 - 7 - 8 - 9	10-10-10-70	4, 4, 4
4 - 7 - 8 - 9	10-10-70-10	4½, 4½, 5
4 - 7 - 8 - 9	10-70-10-10	4½, 5, 5
4 - 7 - 8 - 9	70-10-10-10	4½, 5, 5½
4 - 7 - 8 - 9	25-25-25-25	4½, 5, 5
9 - 4	80 - 20	4, 4½, 4½
9 - 4	50 - 50	4½, 5, 5½
9 - 4	20 - 80	5, 5, 5½
4 - 7 - 8	40 - 30 - 30	5, 5, 5½
4 - 7 - 8	60 - 20 - 20	5, 5, 5½
4 - 7 - 8	80 - 10 - 10	5½, 5½, 5½
4 - 7 - 9	30 - 40 - 30	4½, 4½, 4½
4 - 7 - 9	20 - 60 - 20	4½, 4½, 5
4 - 7 - 9	10 - 80 - 10	4½, 5, 5
4 - 8 - 9	30 - 40 -30	4½, 4½, 5
4 - 8 - 9	20 - 60 - 20	4½, 4½, 5
4 - 8 - 9	10 - 80 - 10	4½, 4, 4½

NOTE: The % of Composition is given in the same order as the Seam numbers.

Exhibit No. 23-5

REPORT ON

CLEANING COKING COAL

for the

MORRISON-KNUDSEN COMPANY, INC.

EMKAY - SCURRY - ELK RIVER, B.C.

Submitted by

CYCLONE ENGINEERING SALES LTD.

EDMONTON - ALBERTA - CANADA

Report No.:	RI-70:16 - I
Job No.:	S1 - 87
Date:	November 16, 1970

Exhibit No. 24-1

REPORT ON

CLEANING COKING COAL

for the

MORRISON-KNUDSEN COMPANY, INC.

EMKAY - SCURRY - ELK RIVER, B.C.

SUMMARY

A comprehensive study sponsored by the Morrison-Knudsen Company, Inc. was carried out by Cyclone Engineering Sales Ltd. in close cooperation with the Department of Energy, Mines & Resources in Edmonton, during the summer and fall of 1970.

A program of investigation was organized for the analysis and beneficiation of coking coal from the Elk River Prospect of Emkay Inc., with a view to assessing its coking properties and to collect information regarding the processing of the raw product on a commercial scale.

Representative coal samples were collected by Emkay personnel from 9 seams under Federal Government supervision, shipped to Edmonton for cleaning and dispatched to Japan and Ottawa for coking tests.

In this report the information obtained from float-sink and ash analyses is presented. F.S.I. determinations were done on float fractions of individual seams. Results of flotation tests by Dr. G. Norton are included.

In order to duplicate as nearly as possible a commercial operation, the raw coal samples were cleaned in water, using newly erected pilot plant facilities of the Western Regional Laboratory of the Department of Energy, Mines & Resources. The coarse coal was air-

dried and the fines were dewatered using the facilities of Shelpac Research and Development Ltd. being developed for use in dewatering pipelined coal. A small amount of oil is used in this dewatering process.

CONTENTS

I. INTRODUCTION

The investigation reported here refers to the analysis and testing of a series of adit samples collected in 1970. This study follows an earlier survey that was carried out during 1969, the results having been submitted by Cyclone Engineering Sales Ltd. in a series of reports. Some of this information about the Elk River Prospect provided guidance that contributed to the final plan for the present investigation.

WASHABILITY AND F.S.I. DETERMINATIONS.

It was recognized that the F.S.I. value of two or more combined coal fractions does not necessarily equal the average F.S.I. value of the individual fractions. It was decided, therefore, to determine the F.S.I. values of the + 28 mesh portion of the sample for float fractions obtained from a specific gravity separation at 1.30 on one split sample; a second separation at 1.35 on a second split sample; one at 1.40 on a third split, etc., using perlux and varsol up to 1.60 specific gravity and ethylene bromide for the cut at 1.80. The minus 28 mesh portion of these tests was cleaned by use of a laboratory size froth flotation unit under the direct supervision of Dr. G. Norton, consultant for Morrison-Knudsen Company, Inc.

RAW COAL CLEANING FOR COKING TESTS.

The compound water cyclone pilot plant facilities of the Department of Energy, Mines & Resources was used for washing the coal. The raw coal was crushed to 1/2" maximum size as feed to this plant.

The Shelpac dewatering pilot plant was used to dewater the fine coal by the use of approximately 2% of oil based on the 28 m. x 0 dry solids.

II. SAMPLING AT EMKAY - SCURRY PROSPECT.

Adit sampling was supervised at the above prospect in the Elk River area, B.C. from July 24, 1970 until September 10, 1970, by a representative of the Department of Energy, Mines and Resources of Edmonton, Alberta.

The samples were taken at the face of a cross-cut over the full width from hanging wall to footwall to a height of 6 ft. The coal mined was sufficient to fill 25 drums with an average weight of 350 - 400 lb. each. The drums were lined with large plastic bags, a piece of dry ice put in and shipped to the Clover Bar laboratory of Cyclone Engineering Sales Ltd. in Edmonton.

Table 1 gives the dates of sampling of the different adits and the drums shipped.

T A B L E 1. Sampling Data.

Date	Adit	Lot	Drums	Remarks	
July 24/70	2S	1	25	by F.J. Horvath	
Aug. 3/70	3	1	25	by C. Rozenhart	
Aug. 6/70	9	1	25	by C. Rozenhart	
Aug. 10/70	8	1	25	by C. Rozenhart	
Aug. 13/70	7	1	25	by C. Rozenhart	
Aug. 17/70	4	1	25	by C. Rozenhart	
Aug. 20/70	10	1	25	by C. Rozenhart	
Aug. 29/70	6A	1	25		
Sept. 1/70	7	2	25	by C. Rozenhart	
Sept. 3/70	4	2	25	by C. Rozenhart	
Sept. 8/70	12	1	50	by C. Rozenhart	About 25 drums with dry ice
Sept. 9/70	2N	3	50	by C. Rozenhart	First 25 drums without dry ice

Sketches of the adits showing details of the cross-sections, seam thickness, dip of footwall and hanging wall, etc. are shown on Figures 1, 2 and 3.

III. SAMPLE PREPARATION, PROCESSING AND SHIPMENT.

In preparing the coal for processing the following procedure was applied for each sample lot.

1. Each lot was dried as-received on a clean section of the pilot plant floor (approx. 500 sq. ft) at room temperature for a period of 3 to 4 days, in order to remove surface moisture.

2. The air-dried coal was crushed in a Sturtevant coal crusher to pass a 1/2 in. sq. screen. A head sample was collected for analysis.

3. The crushed coal was cleaned in bulk in a water-only cyclone wash plant of 5 tph capacity. The clean coal was passed over a dewatering screen (8 sq. mesh) and the 1/2" x 8 m. coal fraction was then dried on the floor. A general flow diagram of the compound water cyclone wash plant is shown on Figure 4.

4. The 8 m. x 0 fraction was conditioned with a small amount of oil (in the order of 2% by weight of dry coal (28 m. x 0) dewatered in a centrifuge and added to the 1/2" x 8 m. fraction. All the fine material circulating in the washing circuit was treated in this manner. A general flow diagram of the dewatering plant is presented on Figure 5.

All the 28 m. x 0 coal was blended with the 1/2" x 8 m. fraction on the floor. A sub-sample of the clean coal was collected for ash contents and F.S.I. determinations. Dry ice was added to expel air and reduce oxidation in transit to Ottawa. Samples for Japan were shipped under water.

The data on coal samples shipped to the Department of Energy, Mines and Resources, Ottawa and to Japan are shown on Table 2.

TABLE 2. SHIPPING DATA.

Sample No.	No. of bbl. to EMR, OTTAWA	Date of Shipment	No. of bbl. to Japan	Date of Shipment	F.S.I.	Ash Contents, %	Remarks
2S	1	Aug. 31/70			9	15.3	to EMR only
2N	5	Oct. 5/70	2	Oct. 9/70	6-1/2	10.6	
	4	Nov. 5/70	2	Nov. 5/70	5	14.8	
3	9	Aug. 9/70	3	Oct. 9/70	6-1/2	8.1	
	3	Aug. 31/70			6-1/2	8.1	
4	8	Sept. 4/70			4	8.6	to EMR
			3	Nov. 5/70	4	8.9	to Japan
6A	8	Oct. 13/70	2	Oct. 9/70	1-1/2	9.1	
7	7	Sept. 9/70			5	9.0	to EMR
			3	Nov. 5/70	5	8.8	to Japan
8	9	Aug. 31/70	3	Oct. 9/70	4	7.3	
9	9	Aug. 20/70	3	Oct. 9/70	2	7.6	
	1	Sept.15/70			1	11.5	
10	9	Sept.15/70	3	Oct. 9/70	4	6.8	
12	9	Oct. 9/70	2	Oct. 9/70	9 +	8.4	
			1	Nov. 5/70	9 +	8.4	

Exhibit No. 24-9

IV. ANALYSIS OF RAW COAL - FLOTATION TESTS.

Float-sink analyses were conducted on the 1/2" x 28 m. fraction of each head sample (see Section III, par. 2) in the following manner.

From each head sample fraction (1/2" x 28 m.) eight split samples were collected; and these were floated individually, each at one specific gravity only, in order to obtain cumulative F.S.I. values that can be directly compared with those from a commercial separation.

For the first split sample the cut was made at 1.30 specific gravity and ash content and F.S.I. value of the floats determined. For the second split sample the cut was made at 1.35 specific gravity and the same analysis done as for the floats at 1.30 specific gravity. And so on for all the split samples. The results are presented on Tables 3 to 11 for the nine seams.

F L O T A T I O N T E S T S.

On the same tables the size distributions are shown, with ash and F.S.I. values that resulted from the flotation tests performed under the supervision of Dr. G. Norton. These flotation tests were conducted in a model D2-Denver Sub A flotation cell. Ash contents and F.S.I. values were determined for the three individual, "timed" samples of clean coal, as well as for the cumulative ash contents and F.S.I. values, after the three fractions had been combined.

In addition, the clean coal of the froth flotation tests (three fractions combined) were blended with individual float fractions of the 1/2" x 28 m. raw coal at 1.30, 1.35, etc. in proportion to their relative abundance in a commercial plant. No allowance was made in these calculations for the yield loss of the 1/2" x 28 m. coal in a commercial plant, as these are presently not known. As a result of this the influence of the coarse fraction on the overall F.S.I. value is slightly biased and presents a conservative estimate of the expected actual operation of a washery using flotation for the 28 m. x 0 fraction. Test results are presented on Tables 12, 13 and 14.

Respectfully Submitted,

CYCLONE ENGINEERING SALES LTD.

Per: Vinkenborg

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

TABLE 3. SEAM No. 2N

1. Ash Content and F.S.I. for Size Fractions.

Size Fraction	Wt. %	Ash %	F.S.I.
½" x 28 mesh	77.50	28.21	2
28 mesh x 0	22.50	17.64	7½
Total	100.00	25.83	

2. Cumulative Float-Sink Data - ½" x 28 mesh.

Specific Gravity	Wt. %, Floats	Ash % in Floats	Wt. %, Sinks	Ash % in Sinks	Ash % of Fl. + Sk.	F.S.I. of Floats
- 1.30	9.20	1.92	90.80	30.53	27.89	10
- 1.35	27.44	4.80	72.56	37.86	28.78	8
- 1.40	48.11	7.76	51.89	48.50	28.89	6½
- 1.45	57.46	9.37	42.54	55.03	28.79	5½
- 1.50	64.22	10.85	35.78	61.78	29.07	4½
- 1.55	68.91	11.61	31.09	67.43	28.96	4
- 1.60	71.46	12.42	28.54	68.58	28.45	4
- 1.65	73.22	12.82	26.78	70.43	28.25	3½

3. Flotation Results of 28 mesh x 0 Fraction.

Stage No.	Flot.time in min.	Wt. %, Floats	Ash % in Floats	Cum. Wt. %	Cum. Ash %	F. S. I.	
						Frac.	Cum.
1	1	56.34	8.18	56.34	8.18	9	9
2	1	36.38	22.71	92.72	13.88	4	
3	1.5	5.39	69.71	98.11	16.91	½	7½
Tailings		1.89	83.07	100.00	18.16	N.A.	

TABLE 4. SEAM No. 3

1. Ash Content and F.S.I. for Size Fractions.

Size Fraction	Wt. %	Ash %	F.S.I.
½" x 28 mesh	75.00	9.42	5½
28 mesh x 0	25.00	10.61	7
Total	100.00	9.72	

2. Cumulative Float-Sink Data - ½" x 28 mesh.

Specific Gravity	Wt. %, Floats	Ash % in Floats	Wt. %, Sinks	Ash % in Sinks	Ash % of Fl. + Sk.	F.S.I. of Floats
- 1.30	32.57	2.00	67.43	13.27	9.60	12
- 1.35	58.17	3.94	41.83	17.18	9.48	9
- 1.40	80.08	5.11	19.92	29.05	9.88	8½
- 1.45	87.68	6.36	12.32	30.38	9.32	8
- 1.50	91.19	6.70	8.81	38.70	9.52	7½
- 1.55	93.60	6.98	6.40	46.20	9.49	7
- 1.60	93.97	7.36	6.03	47.52	9.78	6½
- 1.65	95.30	7.67	4.70	48.21	9.58	6½

3. Flotation Results of 28 mesh x 0 Fraction.

Stage No.	Flot.time in min.	Wt. %, Floats	Ash % in Floats	Cum. Wt. %	Cum. Ash %	F.S.I.	
						Frac.	Cum.
1	1	39.40	7.30	39.40	7.30	8½	8½
2	1	40.60	11.80	80.00	9.58	5½	
3	2	19.20	12.70	99.20	10.19	5	7½
Tailings		0.80	76.43	100.00	10.72	N.A.	

TABLE 5. SEAM No. 4

1. Ash Content and F.S.I. for Size Fractions.

Size Fraction	Wt. %	Ash %	F.S.I.
½" x 28 mesh	83.17	30.13	1½
28 mesh x 0	16.83	18.34	7
Total	100.00	28.14	

2. Cumulative Float-Sink Data - ½" x 28 mesh.

Specific Gravity	Wt. %, Floats	Ash % in Floats	Wt. %, Sinks	Ash % in Sinks	Ash % of Fl. + Sk.	F.S.I. of Floats
- 1.30	13.74	1.35	86.26	34.08	29.58	9+
- 1.35	36.18	3.71	63.82	44.12	29.50	7½
- 1.40	52.10	5.60	47.90	55.11	29.32	4½
- 1.45	60.92	6.07	39.08	66.48	29.67	4
- 1.50	64.77	7.75	35.23	70.58	29.88	4
- 1.55	67.55	8.80	32.45	73.80	29.89	3
- 1.60	68.73	9.10	31.27	75.66	29.91	2½
- 1.65	72.50	10.25	27.50	78.76	29.10	2½

3. Flotation Results of 28 mesh x 0 Fraction.

Stage No.	Flot.time in min.	Wt. %, Floats	Ash % in Floats	Cum. Wt. %	Cum. Ash %	F. S. I.	
						Frac.	Cum.
1	1	46.15	8.33	46.15	8.33	8½	8½
2	1	37.89	16.67	84.04	12.09	6	
3	2	12.78	40.78	96.82	15.88	3	7
Tailings		3.18	86.85	100.00	18.13	N.A.	

TABLE 6. SEAM No. 6A

1. Ash Content and F.S.I. for Size Fractions.

Size Fraction	Wt. %	Ash %	F.S.I.
½" x 28 mesh	87.10	19.65	1½
28 mesh x 0	12.90	12.12	5
Total	100.00	18.68	

2. Cumulative Float-Sink Data - ½" x 28 mesh.

Specific Gravity	Wt. %, Floats	Ash % in Floats	Wt. %, Sinks	Ash % in Sinks	Ash % of Fl. + Sk.	F.S.I. of Floats
- 1.30	10.21	1.63	89.79	21.66	19.61	9
- 1.35	37.93	4.82	62.07	28.11	19.27	5
- 1.40	61.85	6.84	38.15	40.05	19.51	2½
- 1.45	73.07	7.94	26.93	50.52	19.41	2
- 1.50	76.31	8.83	23.69	52.77	19.24	2
- 1.55	80.82	9.73	19.18	59.96	19.36	1½
- 1.60	82.24	10.32	17.76	61.62	19.43	1½
- 1.65	84.13	11.11	15.87	64.30	19.55	1½

3. Flotation Results of 28 mesh x 0 Fractions.

Stage No.	Flot.time in min.	Wt. %, Floats	Ash % in Floats	Cum. Wt. %	Cum. Ash %	F. S. I.	
						Frac.	Cum.
1	1	87.30	9.63	87.30	9.63	6½	6½
2	1	10.03	14.95	97.33	10.17	4	
3	2	1.31	63.55	98.64	10.87	N.A.	6
Tailings		1.36	84.97	100.00	11.88	N.A.	

TABLE 7. SEAM No. 7

1. Ash Content and F.S.I. for Size Fractions.

Size Fraction	Wt. %	Ash %	F.S.I.
½" x 28 mesh	84.09	23.61	1
28 mesh x 0	15.91	13.49	7½
Total	100.00	22.00	

2. Cumulative Float-Sink Data - ½" x 28 mesh.

Specific Gravity	Wt. %, Floats	Ash % In Floats	Wt. %, Sinks	Ash % in Sinks	Ash % of Fl. + Sk.	F.S.I. of Floats
- 1.30	15.00	2.39	85.00	27.25	23.52	9+
- 1.35	35.60	4.42	64.40	32.89	22.75	7½
-1.40	54.00	6.49	46.00	41.66	22.66	4
- 1.45	61.75	7.39	38.25	46.08	22.19	3½
- 1.50	68.95	8.82	31.05	51.03	21.92	2
- 1.55	71.05	10.67	28.95	55.19	23.55	1
- 1.60	80.25	11.75	19.75	63.54	21.98	1
- 1.65	83.20	12.99	16.80	68.58	22.33	1

3. Flotation Results of 28 mesh x 0 Fraction.

Stage No.	Flot. time in min.	Wt. %, Floats	Ash % in Floats	Cum. Wt. %	Cum. Ash %	F.S.I.	
						Frac.	Cum.
1	1	59.11	8.59	59.11	8.59	7	7
2	1	33.65	13.19	92.76	10.25	6	
3	2	6.36	40.36	99.12	12.18	1½	6½
Tailings		0.88	84.95	100.00	12.83	N.A.	

Exhibit No. 24-16

TABLE 8. SEAM No. 8

1. Ash Content and F.S.I. for Size Fractions.

Size Fraction	Wt. %	Ash %	F.S.I.
½" x 28 mesh	79.49	26.54	2
28 mesh x 0	20.51	13.23	7½
Total	100.00	23.81	

2. Cumulative Float-Sink Data - ½" x 28 mesh.

Specific Gravity	Wt. %, Floats	Ash % in Floats	Wt. %, Sinks	Ash % in Sinks	Ash % of Fl. + Sk.	F.S.I. of Floats
- 1.30	22.53	1.76	77.47	30.84	24.29	8½
- 1.35	42.02	3.48	57.98	41.03	25.25	5½
- 1.40	59.45	5.39	40.55	53.81	25.02	4½
- 1.45	66.12	5.91	33.88	60.13	24.28	4½
- 1.50	68.82	7.04	31.18	63.77	24.73	4
- 1.55	72.12	7.49	27.88	70.86	25.15	3½
- 1.60	75.35	8.67	24.65	73.68	24.69	3½
- 1.65	76.19	8.74	23.81	75.71	24.68	3½

3. Flotation Results of 28 mesh x 0 Fraction.

Stage No.	Flot.time in min.	Wt. %, Floats	Ash % in Floats	Cum. Wt. %	Cum. Ash %	F. S. I.	
						Frac.	Cum.
1	1	51.72	6.12	51.72	6.12	8½	8½
2	1	26.92	7.26	78.64	6.51	7½	
3	1	15.85	21.77	94.49	9.06	4½	7
Tailings		5.51	76.27	100.00	12.77	N.A.	

Exhibit No. 24-17

TABLE 9. SEAM No. 9

1. Ash Content and F.S.I. for Size Fractions.

Size Fraction	Wt. %	Ash %	F.S.I.
½" x 28 mesh	78.00	16.90	2
28 mesh x 0	22.00	9.50	6½
Total	100.00	15.27	

2. Cumulative Float-Sink Data - ½" x 28 mesh.

Specific Gravity	Wt. %, Floats	Ash % in Floats	Wt. %, Sinks	Ash % in Sinks	Ash % of Fl. + Sk.	F.S.I. of Floats
- 1.30	35.52	1.89	64.48	25.74	17.27	8½
- 1.35	70.34	4.72	29.66	42.90	16.04	4½
- 1.40	72.31	6.05	27.69	46.26	17.18	4
- 1.45	74.64	6.26	25.36	50.09	17.37	4
- 1.50	82.19	8.11	17.81	58.39	17.06	3
- 1.55	82.99	8.20	17.01	61.74	17.30	2½
- 1.60	84.64	9.46	15.36	63.15	16.86	2½
- 1.65	86.16	10.40	13.84	64.77	17.92	2½

3. Flotation Results of 28 mesh x 0 Fraction.

Stage No.	Flot.time in min.	Wt. %, Floats	Ash % in Floats	Cum. Wt. %	Cum. Ash %	F. S. I.	
						Frac.	Cum.
1	1	36.13	3.53	36.16	3.53	8½	8½
2	1	38.14	6.73	74.27	5.17	6½	
3	1	20.35	13.02	94.62	6.88	2½	8
Tailings		5.38	57.19	100.00	9.56	N.A.	

TABLE 10. SEAM No. 10

1. Ash Content and F.S.I. for Size Fractions.

Size Fraction	Wt. %	Ash %	F.S.I.
½" x 28 mesh	83.34	19.43	3
28 mesh x 0	16.66	11.61	7
Total	100.00	18.12	

2. Cumulative Float-Sink Data - ½" x 28 mesh.

Specific Gravity	Wt. %, Floats	Ash % in Floats	Wt. %, Sinks	Ash % in Sinks	Ash % of Fl. + Sk.	F.S.I. of Floats
- 1.30	29.32	1.59	70.68	25.09	18.19	9
- 1.35	54.40	3.38	45.60	37.24	18.82	6½
- 1.40	71.85	4.92	28.15	50.27	17.68	4½
- 1.45	76.10	5.56	23.90	59.80	18.52	4½
- 1.50	78.12	6.08	21.88	60.41	17.97	4
- 1.55	79.42	6.43	20.58	64.38	18.35	4
- 1.60	82.02	7.15	17.98	68.89	18.25	4
- 1.65	83.44	7.45	16.56	73.17	18.34	4

3. Flotation Results of 28 mesh x 0 Fraction.

Stage No.	Flot.time in min.	Wt. %, Floats	Ash % in Floats	Cum. Wt. %	Cum. Ash %	F. S. I.	
						Frac.	Cum.
1	1	63.06	5.83	63.06	5.83	8	8
2	1	17.75	7.33	80.81	6.15	5½	
3	1	15.51	23.88	96.32	9.01	1½	7
Tailings		3.67	67.06	100.00	11.14	N.A.	

TABLE 11. SEAM No. 12

1. Ash Content and F.S.I. for Size Fractions.

Size Fraction	Wt. %	Ash %	F.S.I.
½" x 28 mesh	74.04	29.45	7½
28 mesh x 0	25.96	16.48	9
Total	100.00	26.08	

2. Cumulative Float-Sink Data - ½" x 28 mesh.

Specific Gravity	Wt. %, Floats	Ash % in Floats	Wt. %, Sinks	Ash % in Sinks	Ash % of Fl. + Sk.	F.S.I. of Floats
- 1.30	38.80	2.37	61.20	47.54	30.01	9
- 1.35	48.64	3.87	51.36	54.85	30.04	9
- 1.40	57.53	4.70	42.47	63.71	29.76	8½
- 1.45	61.80	5.71	38.20	68.15	29.56	8½
- 1.50	62.39	6.05	37.61	70.55	30.30	8½
- 1.55	65.12	6.64	34.88	73.07	29.81	8½
- 1.60	68.79	8.26	31.21	75.50	29.24	8
- 1.65	69.87	8.32	30.13	79.01	29.62	8

3. Flotation Results of 28 mesh x 0 Fraction.

Stage No.	Flot.time in min.	Wt. %, Floats	Ash % in Floats	Cum. Wt. %	Cum. Ash %	F. S. I.	
						Frac.	Cum.
1	1	42.60	5.08	42.60	5.08	9+	9+
2	1	48.54	18.58	91.14	12.26	7	
3	1	6.96	63.20	98.10	15.87	1½	9+
Tailings		1.90	86.78	100.00	17.22	N.A.	

TABLE 12. F.S.I. Determinations on Blends of Flotation Product of Fines with Floats of ½" x 28 mesh Coal at Different Specific Gravities

Specific Gravity	½" x 28m, Wt. %	28 m x 0 Floats, Wt. %	F.S.I. of Blend	½" x 28m, Wt. %	28m x 0 Floats, Wt. %	F.S.I. of Blends
	SEAM No. 2N			SEAM No. 3		
- 1.30	24.40	75.60	8½	49.40	50.60	9½
- 1.35	49.10	50.90	7½	63.70	36.30	8
- 1.40	62.80	37.20	6	70.80	29.20	8
- 1.45	66.80	33.20	6	72.60	27.40	7½
- 1.50	69.30	30.70	5½	73.30	26.70	7
- 1.55	70.80	29.20	5	73.80	26.20	7
- 1.60	71.50	28.50	5	73.90	26.10	7
- 1.65	72.00	28.00	4	74.30	25.70	6½
	SEAM No. 4			SEAM No. 6A		
- 1.30	40.80	59.20	9	41.10	58.90	8
- 1.35	64.50	35.50	8	72.20	27.80	4½
- 1.40	72.30	27.70	6	80.90	19.10	3
- 1.45	75.40	24.60	4½	83.30	16.70	3
- 1.50	76.50	23.50	4	83.90	16.10	2½
- 1.55	77.30	22.70	4	84.70	15.30	2½
- 1.60	77.70	22.30	3½	84.90	15.10	2
- 1.65	78.90	21.10	3	85.20	14.80	1½

TABLE 13. F.S.I. Determinations on Blends of Flotation Product of Fines with Floats of ½" x 28 mesh Coal at Different Specific Gravities

Specific Gravity	½" x 28m, Wt. %	28 m x 0 Floats, Wt. %	F.S.I. of Blend	½" x 28m, Wt. %	28 m x 0 Floats, Wt. %	F.S.I. of Blend
	SEAM No. 7			SEAM No. 8		
- 1.30	44.20	55.80	7	49.20	50.80	8½
- 1.35	63.50	36.50	5½	64.30	35.70	7
- 1.40	74.00	26.00	3½	70.10	29.90	5
- 1.45	76.70	23.30	3½	71.80	28.20	5
- 1.50	78.40	21.60	3½	74.40	25.60	4½
- 1.55	79.00	21.00	3	75.20	24.80	4
- 1.60	80.60	19.40	2½	75.90	24.10	4
- 1.65	81.30	18.70	2	76.20	23.80	3½
	SEAM No. 9			SEAM No. 10		
- 1.30	57.11	42.89	8	58.50	41.50	8
- 1.35	72.40	27.60	7	64.10	35.90	6
- 1.40	73.10	26.90	4½	78.60	21.40	5
- 1.45	73.70	26.30	4½	79.60	20.40	5
- 1.50	75.50	24.50	4	29.90	20.10	5
- 1.55	75.80	24.20	3½	80.00	20.00	5
- 1.60	76.20	23.80	3½	80.70	19.30	4½
- 1.65	76.40	23.60	3½	80.90	19.10	4

TABLE 14. F.S.I. Determinations on Blends of Flotation Product of Fines with Floats of ½" x 28 mesh Coal at Different Specific Gravities

Specific Gravity	½" x 28m, Wt. %	28m x 0 Floats, Wt. %	F.S.I. of Blend
	SEAM No. 12		
- 1.30	53.90	46.10	11
- 1.35	59.40	40.60	10
- 1.40	63.40	36.60	9
- 1.45	65.10	34.90	9
- 1.50	65.30	34.70	9
- 1.55	66.20	33.80	8½
- 1.60	67.40	32.60	8½
- 1.65	67.80	32.20	8½

FIG. 1 MORRISON-KNUDSEN COMPANY, INC.

SEAMS NO. 2S, 3, 4 AND 6A

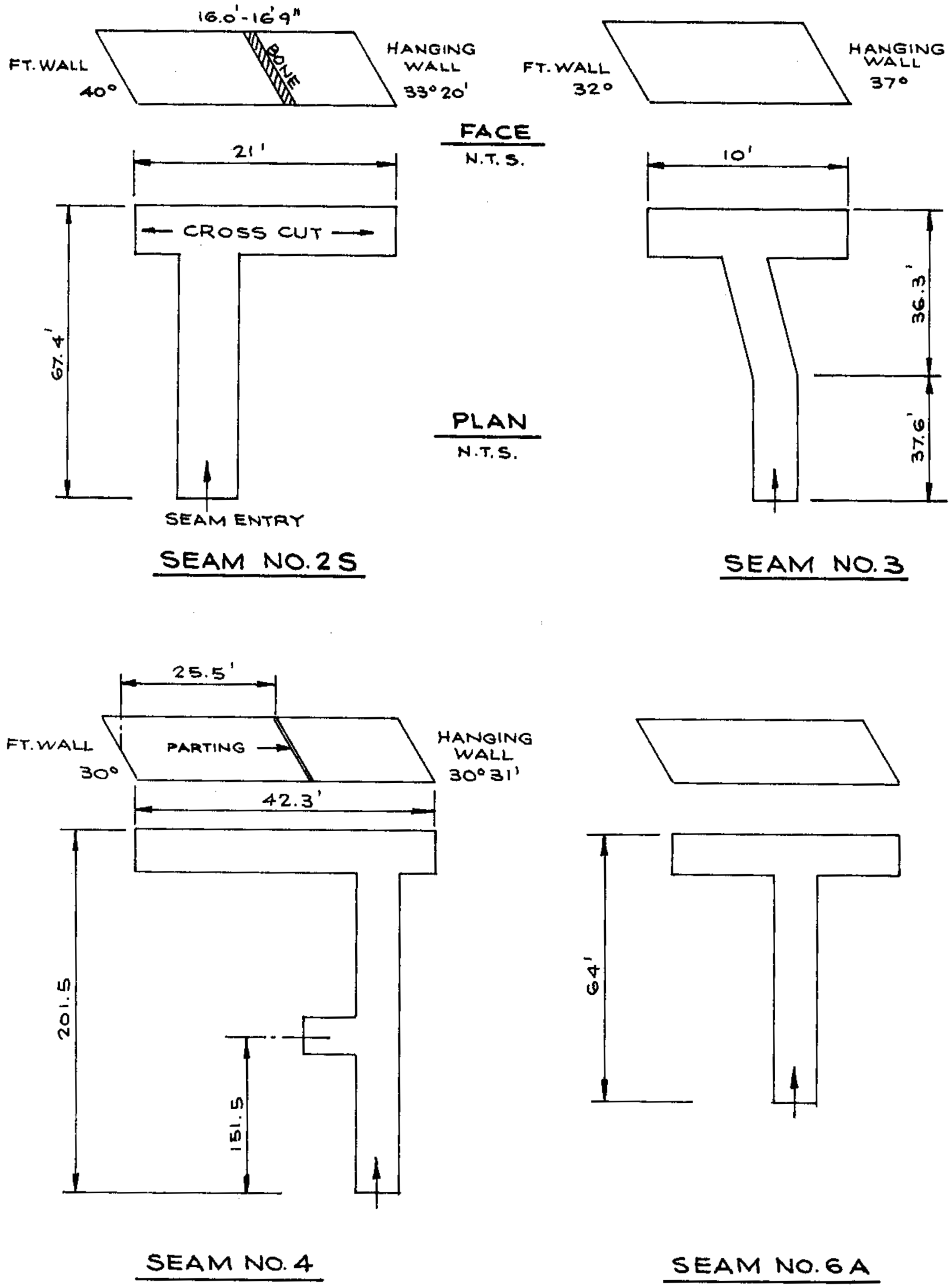


Exhibit No. 24-24

FIG. 2 MORRISON-KNUDSEN COMPANY, INC.

SEAMS NO. 7, 8, 9 AND 10

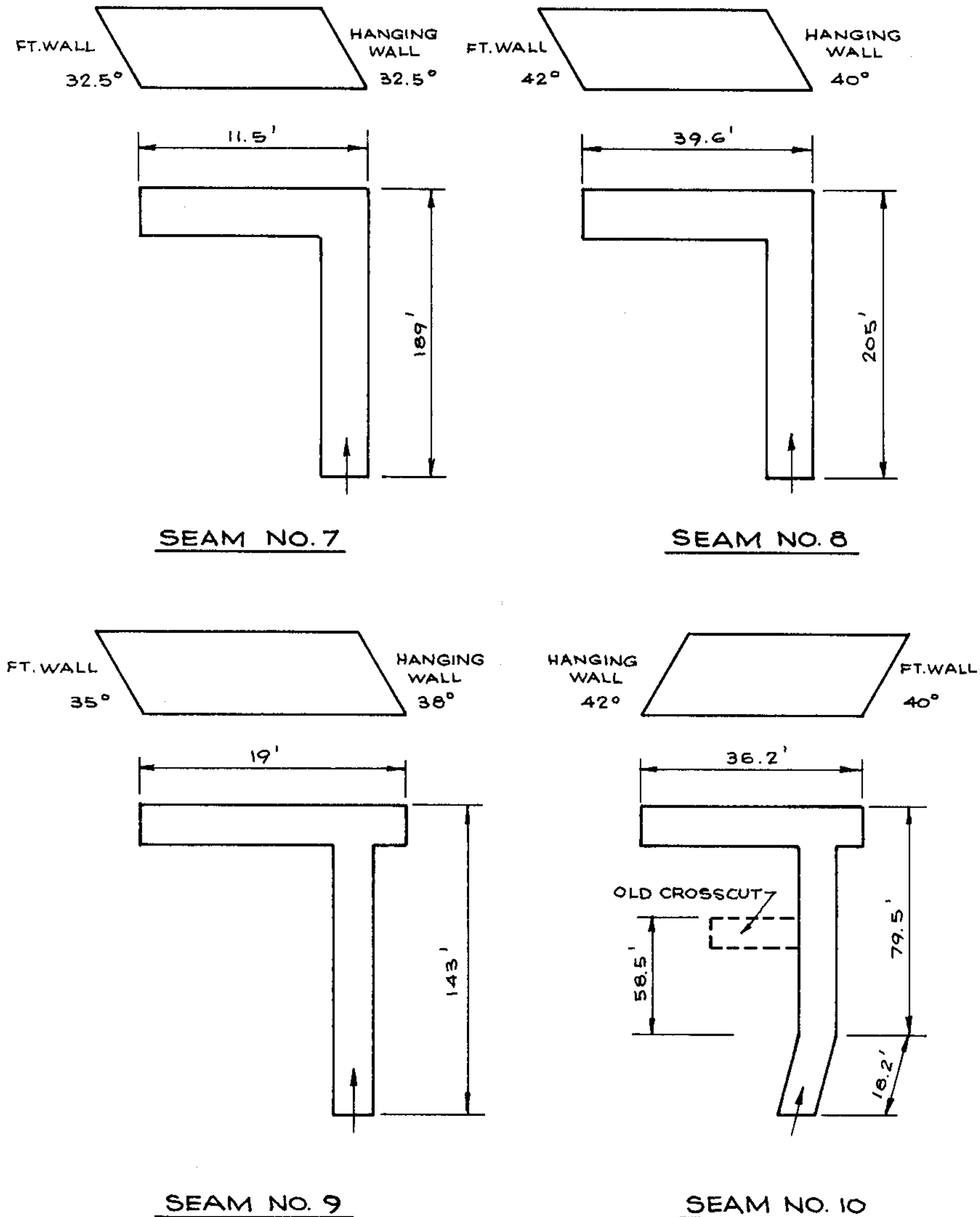
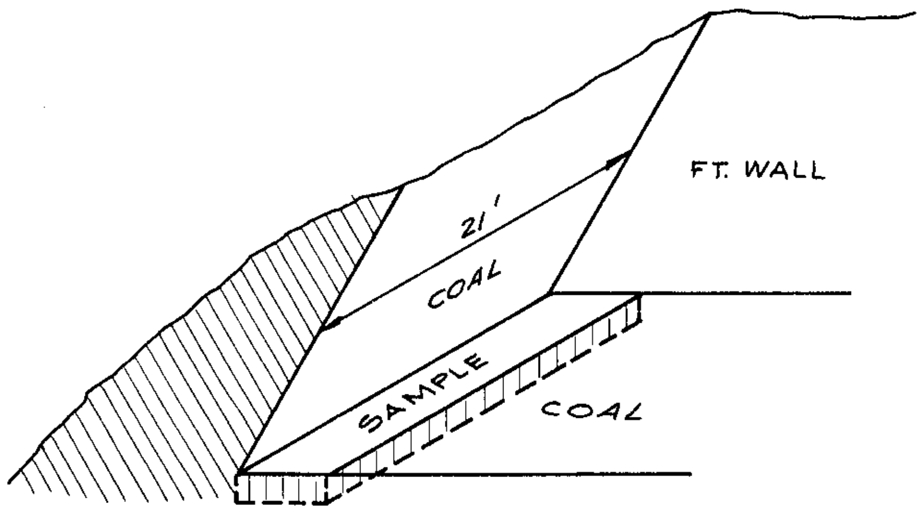


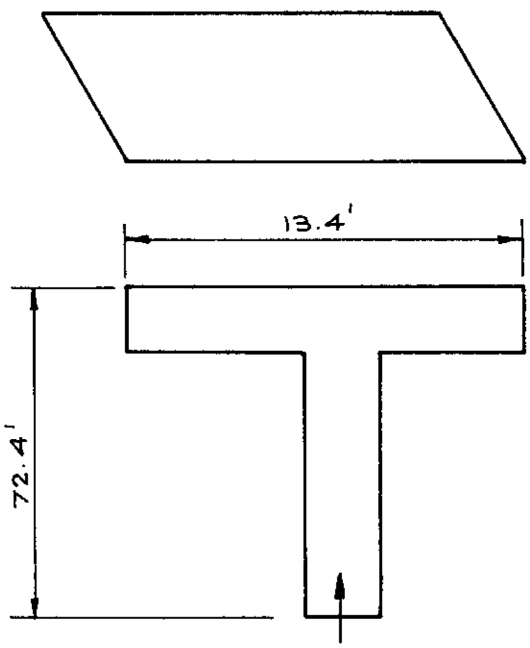
Exhibit No. 24-25

FIG. 3 MORRISON-KNUDSEN COMPANY, INC.

SEAMS NO. 12 AND NO. 2N



SEAM NO. 12

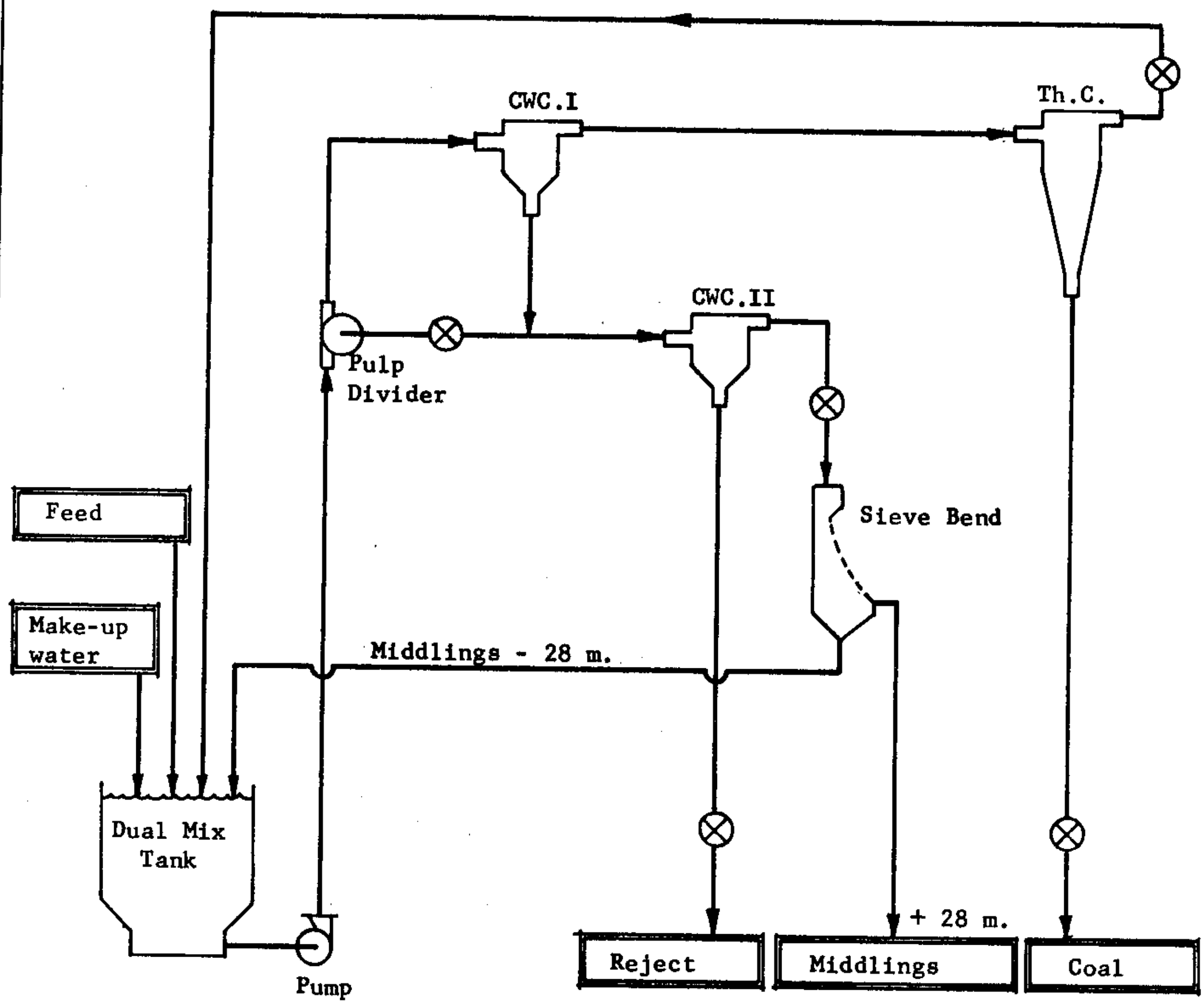


SEAM NO. 2N

FIG. 4 MORRISON-KNUDSEN COMPANY, INC.

FLOWSHEET OF AUTOMATIC 2-STAGE COMPOUND WATER CYCLONE PLANT.

(Capacity 5 tph)

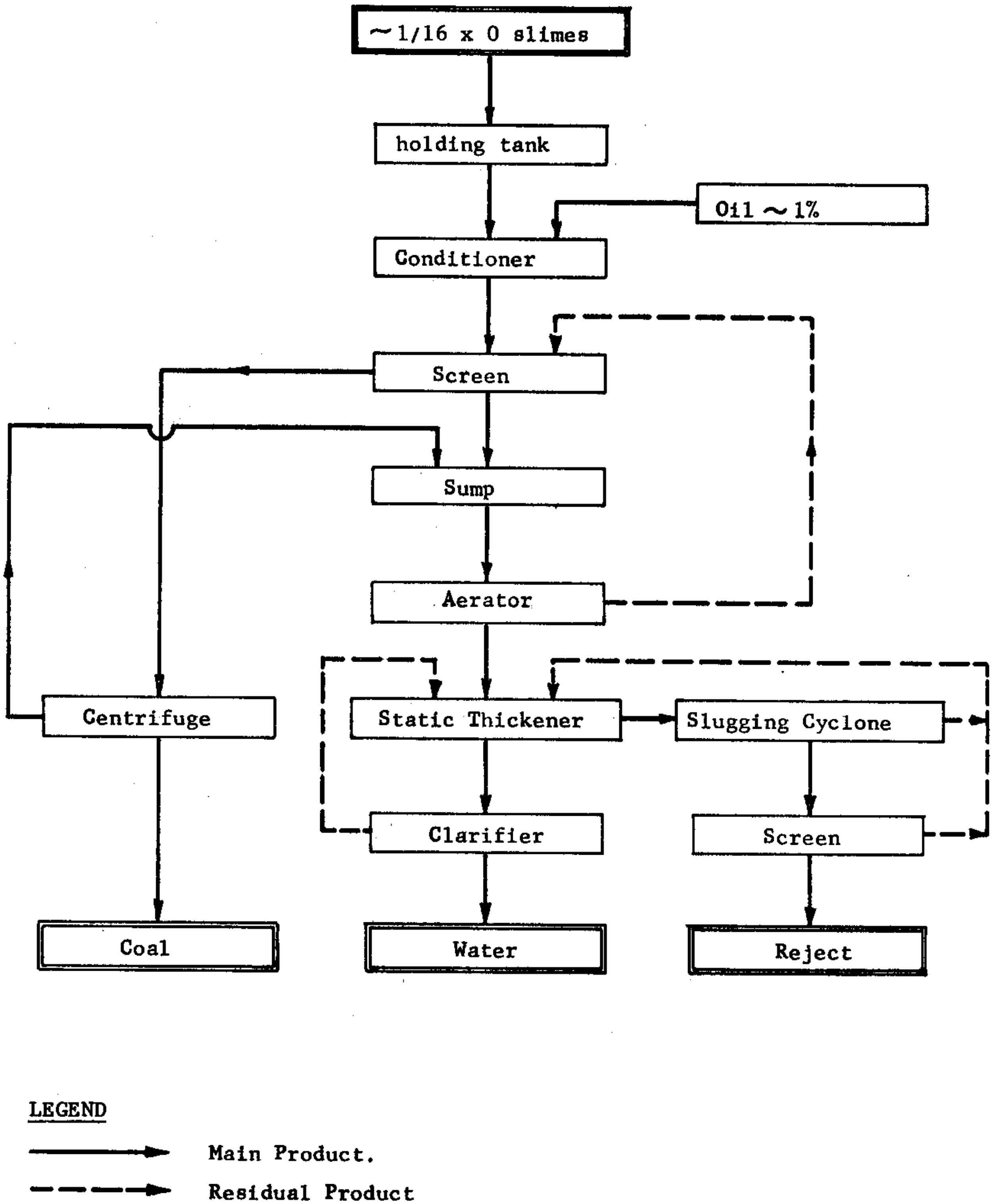


⊗ - Sampling Station

CYCLONE ENGINEERING SALES LTD.
EDMONTON-ALBERTA-CANADA

FIG. 5 MORRISON-KNUDSEN COMPANY, INC.

GENERAL FLOWSHEET - COAL DEWATERING PLANT SECTION.



CYCLONE ENGINEERING SALES LTD.
EDMONTON - ALBERTA - CANADA

January 8, 1971

REPORT ON THE LABORATORY TEST WORK ON THE ELK RIVER COALS CARRIED OUT IN THE U.K.

By: Dr. G. Norton, B.Sc., Ph.D., M.I.M.M., C.Eng.

Introduction

The clean coal samples sent to Ottawa for coking tests were checked for ash content and swelling index, and it was found that the results in most cases did not agree with those of Cyclone Engineering Sales Ltd. In general, the results obtained by the Mines Branch in Ottawa were higher in F.S.I. and appeared more in line with the actual carbonization performance of the coals. The sink-float analyses of the raw coal samples were carried out in Edmonton using Perlux and Varsol followed by Ethylene Bromide and it was claimed by Cyclone Engineering Sales Ltd. that organic liquids affected the swelling characteristics of some coals. Should this be the case, then the F.S.I. results on which many planning and design parameters were based would be in error. Clearly, these tests had to be repeated especially in the light of unrealistic F.S.I. values.

It was decided to carry out this work in the United Kingdon by arrangement with Birtley Engineering and the U.K. branch of the Coal Science and Mineral Testing Division of Great West Steel Industries Ltd., Edmonton, Alberta. Seam samples totalling 145 lbs. in weight were transported by air to England in order that analysis could proceed as soon as possible at the University of Nottingham. These samples were obtained from Cyclone Engineering Sales Ltd. as identical to the coals used in their analysis. The Mines Branch at Ottawa claimed to be so far behind in their assay and analytical work that it was decided to carry out the ash analysis by the same arrangement in the U.K.

Because of the importance of the exercise, the greatest possible care was taken to ensure that prescribed standard conditions were adhered to. Furthermore, the personnel involved in carrying out this work were experienced in coal science work and more highly qualified than would have been normally required.

1. Summary and Conclusions

1.1 The Effect of Organic Liquids on F.S.I.

Although in our experience there has been no indication that organic liquids affect the swelling properties of coals, it was considered that perhaps the Western Canadian coals were different in this respect. Based on reports by Cyclone Engineering Sales Ltd. that such effects had been experienced, it was decided to carry out sink-float separations in barytes suspensions. Since the above workers had quoted zinc chloride as also having an occasional deleterious effect on swelling property, there was little option but to use barytes. Unfortunately, the barytes suspension could not be maintained stable enough for accurate sink-float separation without excessively viscous conditions and after checking the floated increments in organic liquids, it was necessary to abandon the technique.

The sink-float separations were then carried out using benzene-carbon tetrachloride mixtures in the sp. gr. range up to 1.55 and tetra-bromo-ethane/carbon tetrachloride for gravities in excess of 1.55. There were many reasons for proceeding in this manner but primarily because accuracy of separation was important and there was no clear evidence of organic liquids affecting swelling property. This was checked by subjecting randomly chosen coals to contact with benzene, carbon tetrachloride and tetra-bromo-ethane and comparing their swelling indices with similar untreated coal samples. With reference to Cyclone Engineering Sales Report No. RI-70, 16-I which constitutes Appendix 2 in the Mines Branch Report, the following observations are relevant:

(1) For Seam 7, the first stage froth flotation product has a F.S.I. of 7 while the raw fines has a F.S.I. of 7½. Three flotation increments reduce this to 6½. Similarly, Seam 8, the total flotation product is lower in F.S.I. than the raw fines. Since this is not conceivable, some errors in determination must exist. NONE OF THESE FRACTIONS WERE TREATED WITH ORGANIC LIQUIDS. This indicates that anomalies occur whether organic liquids are used or not. There is no clear evidence, therefore, that organic liquids or zinc chloride solutions have the reported effects.

(2) The washed coal products sent to Ottawa for coking tests were not subjected at any time to contact with liquids other than water yet the ash and F.S.I. values reported by Edmonton and Ottawa are significantly different in most cases as indicated below:

TAKEN FROM EMR (OTTAWA) COKING TEST REPORT
SUMMARY OF TABLE 2 (PAGE 21) AND TABLE 2 (APPENDIX 2)

SEAM NO.	CYCLONE ENGINEERING SALES		MINES BRANCH, OTTAWA (EMR)	
	ASH %	F.S.I.	ASH %	F.S.I.
2N	10.6	6½	10.4	8
3	8.1	6½	8.2	7
4	8.6	4	8.5	5
6A	9.1	1½	9.0	2½
7	9.0	5	8.5	5½
8	7.3	4	6.8	5½
9	7.6	2	7.2	4
10	6.8	4	6.3	7
12	8.4	9+	9.0	9

1.2 Comparison of Results

In comparing the results contained in this report with those made available in Appendix 2 of the EMR Coke Test Report, the major areas of disagreement relate to F.S.I. values. There is in general agreement with respect to yield/specific gravity and yield/ash relationships except in the case of Seam 6A where the yields in this report by U.K. analysis are significantly lower and in the case of Seam 8 appreciably higher. This could be attributed to the sampling errors involved in the method adopted by Cyclone Engineering Sales to produce cumulative float fractions. Eight samples were subjected to sink-float separation, each at a different specific gravity so that simulated fractions could be produced directly. Cyclone Engineering Sales did not have any coal remaining from Seam No. 3, so no washability testing was done on this seam. The technique employed by us was to float one large sample of each coal into incremented fractions at specific gravities from 1.35 to 1.65 at 0.05 intervals. The cumulative fractions were then obtained by integrated blending. The values of F.S.I. are consistantly higher than those of Cyclone Engineering Sales and tend not to change so severely with increase in ash content. This results in much smoother ash-F.S.I. curves.

1.3 Analytical Technique

Although both the B.S. and A.S.T.M. standards are specific and straight forward, there are difficulties experienced by new analysts in carrying out determinations of F.S.I. A necessary precaution is to ensure that the specification is rigidly adhered to. The size distribution of the coal sample is very important not simply to the extent of grinding all the material below 65 mesh but ensuring that approximately 35% lies between 65 and 115 mesh, 30% between 115 and 250 mesh and 35% through 250 mesh. The standard crucible dimensions should be employed (height 26 mm, diam. at top 41 mm, at base 11 mm) covered with a lid. Coal samples should be tapped level in some standardized way since compaction affects the results. The temperature of the burner should ensure a temperature of 800°C <u>inside the crucible</u>. In the determination of F.S.I., three buttons are usually required for each test but at least 12 buttons were obtained in each case for the results in this report.

1.4 Conclusions

(1) Both the results of the Mines Branch, Ottawa and those accounted for in this report are consistently higher than the F.S.I. values reported by Cyclone Engineering Sales, Edmonton. The Mines Branch carried out F.S.I. determinations on samples of clean coal products out of contact with all liquids except water. Cyclone Engineering Sales conducted swelling tests on samples of clean coal products and also sink-float fractions using organic liquids. Perhaps the apparent depression in their results is due to the drying of samples saturated with varsol and perlux at +100°C and it could be that under such conditions the swelling properties of coals are affected.

(2) The higher ash increments of those froth flotation tests carried out by Cyclone Engineering Sales after I had left and not under my supervision, should not have been included in the final products. The proportions of these higher ash increments were relatively small but could in some cases have affected the value of F.S.I.

(3) The strict adherence to standard conditions and the large number of tests carried out in the U.K. leaves little doubt that the results contained in this report are most typical of the Elk River Coals and form the best basis for planning and design of plant and the negotiation of contracts.

(4) The flotation results for Seam No. 10 give a low tailing ash content which interpreted in the knowledge of this seams petrography indicated a fair amount of oxidation having taken place. It is expected that this seam will perform better in commercial practice although the present coke is still good.

2. Sample Preparation

The only readily available material for repeat test work was that already crushed to -½ inch by Cyclone Engineering Sales in Edmonton. Approximately 15 lbs. of each seam sample was air-freighted to Ottawa with the exception of Seam 3 for which no sample could be obtained. These samples of Seams 2N, 4, 6A, 7, 8, 9, 10 and 12 totalling 145 lbs. were air transported to England in order that analysis could proceed as soon as possible. No further crushing of the samples was carried out, but they were air-dried in the first instance prior to screening. Each sample was screened at ½mm (28 mesh Tyler) the ½ inch to ½ mm fraction, weighed and retained for sink-float analysis and the minus ½ mm for froth flotation tests.

3. Sink-Float Analysis

The ½ inch to ½ mm portion of each seam sample was subjected to sink-float separation in suspensions of barytes which at the higher specific gravities became very viscous. A check on the accuracy of separation with benzene-carbon tetrachloride mixtures revealed that the use of barytes suspensions was not satisfactory. The gravity fractions were, therefore, produced in organic liquids to ensure accurate separation. Separate tests were carried out on randomly chosen coal samples treated with organic liquids and compared with the swelling characteristics of untreated fractions; there was no indication that F.S.I. values were affected.

Because of the limited amount of each sample available for sink-float analysis and in order to ensure accurate separation, the floats were removed incrementally which, after drying and weighing were blended together to produce cumulative fractions. These cumulative fractions were retained.

4. Froth Flotation

The minus 28 mesh fractions were treated in a Wemco-Fagagren laboratory, froth flotation cell. In each case, a coal slurry was produced with water at 10% solids by weight and processed with a cresylic acid frother equivalent to 0.2 lbs. per ton and a fuel oil collector at 1½ lbs. per ton. The total flotation time varied between 4 and 6 minutes depending on the individual coals tested. All the coals responded to flotation very well except Seam 10 which appeared to be oxidized to some extent. This is evidenced by the relatively low tailings ash and the low values of F.S.I. for this seam in general.

It should be noted that by excess mechanical agitation in the laboratory cell, carbonaceous reject material of very high ash can be made to float but this is not commensurate with commercial practice and should be avoided. Such high ash flotation products should be counted as tailings materials.

5. Blending the Clean Coals Size Fractions

Since a commercial clean coal product would be made up of coarse coal (+28 mesh) obtained by dense medium processing and fine coal (-28 mesh) produced by froth flotation, the two fractions should be blended together in fixed proportions relative to the specific gravity of separation. The froth flotation product is independent of separating gravity and, therefore, constitutes a fixed addition to the blend varying in actual proportion by weight. This proportion by weight is affected by separating gravity only in as much as a low value of specific gravity results in the coarse fraction being low in proportion and conversely with a high value of separating gravity.

The final blends of the coarse floats fractions together with the fine froth flotation fractions were made up for each separating gravity from 1.35 to 1.65 at 0.05 intervals.

6. Ash and F.S.I. Determinations

The blended cumulative fractions numbering seven for each seam sample were ground to pass 72 B.S. mesh and retained for ash and F.S.I. determinations. The size distribution was reasonably controlled between the following specified size limits by use of a Sieb-Technik laboratory mill with means for retaining the finely elutriated particles.

Cum. % Passing	Tyler Mesh Size
100	65
65	115
35	250

6.1 Ash Determinations

One gram of coal sample was used, spread uniformly in a marked silica dish and placed in a muffle furnace. Gentle heat was applied at first, gradually pushing the crucible from the front of the furnace to the hottest part of the back. The dish and contents were raised to a temperature of 780°C - 800°C until constant weight residue was obtained.

6.2 F.S.I. Determination

One gram of coal was placed in a special crucible of standard dimensions (height 26 mm, maximum diam. at top 41 mm, base diameter 11 mm) and covered with a lid. The covered crucible was tapped gently to level the coal and heated out of draughts, over a Teclu burner (the blue core of the flame below the crucible giving a temperature of 800^{o}C inside the crucible. This was allowed to proceed for two minutes or longer if volatile matter is still being evolved. After cooling, the button formed was compared with standard profiles. At least 12 buttons were obtained for each individual determination.

7. Results (U.K. Test Work)

The results are expressed in a form which is meaningful in terms of a commercial operation, except for the fact that no allowance is made for yield losses which would occur in practice. The froth flotation product has been blended into the clean coal product in proportion to its yield and the raw coal percentage of fines. From these tabulated results, curves of yield against ash and specific gravity of separation are plotted as well as the F.S.I.-Ash relationships.

SEAM NO. 2N

Raw Coal Analysis

Size Fraction	Weight %	Ash %
+28 mesh	76.2	28.8
-28 mesh	23.8	17.0

Washability Data

Sink-Float Analysis (+28 mesh) Froth Flotation (-28 mesh)

Fraction	Yield %	Ash %	F.S.I.
Floats @ 1.35 + froth flotation product	43.5	10.1	8
" " 1.40 " " "	57.2	10.2	7½
" " 1.45 " " "	66.4	10.5	7
" " 1.50 " " "	70.7	11.6	7
" " 1.55 " " "	73.8	12.3	6½
" " 1.60 " " "	74.9	12.4	6½
" " 1.65 " " "	76.2	12.6	6

Froth Flotation	Yield %	Ash %	F.S.I.
Clean coal product	91.4	12.7	8
Tailings (rejects)	8.6	62.2	---

SEAM NO. 4

Raw Coal Analysis

Size Fraction	Weight %	Ash %
+28 mesh	82.6	29.5
-28 mesh	17.4	18.6

Washability Data

Sink-Float Analysis (+28 mesh) Froth Flotation (-28 mesh)

Fraction	Yield %	Ash %	F.S.I.
Floats @ 1.35 + froth flotation product	45.9	8.3	7½
" " 1.40 " " "	59.4	8.7	6½
" " 1.45 " " "	67.4	9.2	6
" " 1.50 " " "	70.2	9.5	5
" " 1.55 " " "	72.9	10.4	5
" " 1.60 " " "	73.9	10.7	4½
" " 1.65 " " "	75.2	11.1	4½

Froth Flotation	Yield %	Ash %	F.S.I.
Clean coal product	94.8	14.9	7½
Tailings (rejects)	5.2	85.3	---

SEAM NO. 6A

Raw Coal Analysis

Size Fraction	Weight %	Ash %
+28 mesh	85.2	19.8
-28 mesh	14.8	12.0

Washability Data

Sink-Float Analysis (+28 mesh) Froth Flotation (-28 mesh)

Fraction	Yield %	Ash %	F.S.I.
Floats @ 1.35 + froth flotation product	34.9	5.6	6½
" " 1.40 " " "	54.1	6.9	4½
" " 1.45 " " "	61.3	8.1	4
" " 1.50 " " "	66.5	9.2	3
" " 1.55 " " "	70.2	9.7	3
" " 1.60 " " "	71.0	9.9	3
" " 1.65 " " "	73.9	11.1	2½

Froth Flotation	Yield %	Ash %	F.S.I.
Clean coal product	97.4	10.3	6½
Tailings (rejects)	2.6	75.4	---

SEAM NO. 7

Raw Coal Analysis

Size Fraction	Weight %	Ash %
+28 mesh	82.4	22.5
-28 mesh	17.6	12.5

Washability Data

Sink-Float Analysis (+28 mesh) Froth Flotation (-28 mesh)

Fraction	Yield %	Ash %	F.S.I.
Floats @ 1.35 + froth flotation product	45.4	6.1	7
" " 1.40 " " "	56.7	7.2	6
" " 1.45 " " "	65.2	8.4	4½
" " 1.50 " " "	71.1	10.0	4
" " 1.55 " " "	75.8	10.5	4
" " 1.60 " " "	79.5	11.4	3½
" " 1.65 " " "	83.4	12.4	3

Froth Flotation	Yield %	Ash %	F.S.I.
Clean coal product	95.2	9.4	7
Tailings (rejects)	4.8	74.4	---

SEAM NO. 8

Raw Coal Analysis

Size Fraction	Weight %	Ash %
+28 mesh	78.3	24.0
-28 mesh	21.7	9.9

Washability Data

Sink-Float Analysis (+28 mesh) Froth Flotation (-28 mesh)

Fraction	Yield %	Ash %	F.S.I.
Floats @ 1.35 + froth flotation product	62.9	5.2	7
" " 1.40 " " "	69.6	5.3	6½
" " 1.45 " " "	73.3	5.9	6½
" " 1.50 " " "	76.5	6.9	6
" " 1.55 " " "	78.7	7.4	6
" " 1.60 " " "	80.2	7.7	6
" " 1.65 " " "	81.5	8.2	5½

Froth Flotation	Yield %	Ash %	F.S.I.
Clean coal product	96.1	7.2	8
Tailings (rejects)	3.9	75.5	---

SEAM NO. 9

Raw Coal Analysis

Size Fraction	Weight %	Ash %
+28 mesh	77.2	17.3
-28 mesh	22.8	9.0

Washability Data

Sink-Float Analysis (+28 mesh) Froth Flotation (-28 mesh)

Fraction	Yield %	Ash %	F.S.I.
Floats @ 1.35 + froth flotation product	60.9	4.9	6½
" " 1.40 " " "	70.9	5.5	6
" " 1.45 " " "	77.3	5.8	5
" " 1.50 " " "	82.5	6.7	4½
" " 1.55 " " "	84.6	7.9	4
" " 1.60 " " "	85.8	8.2	4
" " 1.65 " " "	97.0	8.5	4

Froth Flotation	Yield %	Ash %	F.S.I.
Clean coal product	98.0	7.8	6½
Tailings (rejects)	2.0	68.7	---

SEAM NO. 10

Raw Coal Analysis

Size Fraction	Weight %	Ash %
+28 mesh	82.4	18.4
-28 mesh	17.6	11.8

Washability Data

Sink-Float Analysis (+28 mesh) Froth Flotation (-28 mesh)

Fraction	Yield %	Ash %	F.S.I.
Floats @ 1.35 + froth flotation product	64.9	5.2	6½
" " 1.40 " " "	73.6	5.8	6
" " 1.45 " " "	78.3	6.3	6
" " 1.50 " " "	80.0	6.9	5½
" " 1.55 " " "	81.4	7.2	5½
" " 1.60 " " "	81.9	7.3	5½
" " 1.65 " " "	82.7	7.9	5

Froth Flotation	Yield %	Ash %	F.S.I.
Clean coal product	87.5	7.5	7
Tailings (rejects)	12.5	41.9	---

SEAM NO. 12

Raw Coal Analysis

Size Fraction	Weight %	Ash %
+28 mesh	75.0	29.7
-28 mesh	25.0	15.0

Washability Data

Sink-Float Analysis (+28 mesh) Froth Flotation (-28 mesh)

Fraction	Yield %	Ash %	F.S.I.
Floats @ 1.35 + froth flotation product	64.5	7.1	9
" " 1.40 " " "	68.5	7.5	9
" " 1.45 " " "	71.0	7.9	9
" " 1.50 " " "	73.2	9.1	9
" " 1.55 " " "	74.2	9.2	8½
" " 1.60 " " "	75.3	9.7	8½
" " 1.65 " " "	76.5	9.9	8

Froth Flotation	Yield %	Ash %	F.S.I.
Clean coal product	95.1	12.4	9
Tailings (rejects)	4.9	64.4	---

8. Ash Analysis

A comparison of the ash analysis results determined by EMR (Ottawa) with those obtained from the U.K. agree reasonably well in some cases, but are significantly at variance in others. The table below shows a maximum possible error of 7% in SiO_2 determination, 11% in Al_2O_3 determination but as high as 50% in the case of Seam 3 iron and the agreement is poor in respect to MgO determination.

	SEAM NO.																	
	2		3		4		6		7		8		9		10		12	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
SiO_2........%	66.5	65.8	59.7	57.6	63.8	61.2	54.6	54.4	59.7	58.9	60.3	56.3	58.7	56.1	62.0	58.1	62.0	60.3
Al_2O_3.......%	27.3	27.6	28.0	25.7	26.6	27.9	34.5	32.7	29.8	33.1	28.8	31.7	31.4	31.6	30.1	30.2	26.2	28.4
Fe_2O_3.......%	1.3	1.6	3.4	6.7	3.5	4.1	1.5	2.3	2.1	3.0	2.0	3.2	2.4	5.2	2.3	3.7	2.4	2.7
TiO_2........%	1.2	1.4	1.4	1.3	1.3	1.7	1.0	1.1	1.4	1.4	1.5	1.7	1.6	1.8	1.8	1.9	1.5	1.5
P_2O_5........%	0.3	0.3	2.8	2.6	1.1	1.1	4.1	4.0	1.2	1.1	2.2	1.8	1.2	1.0	0.8	0.8	1.5	1.6
CaO.........%	0.8	1.1	3.9	3.4	1.3	1.5	3.5	3.9	1.2	1.0	2.2	2.2	1.0	1.4	1.5	1.4	1.1	1.3
MgO.........%	0.4	0.3	0.1	0.5	0.6	0.4	2.4	<0.2	0.4	<0.2	0.6	0.4	-	<0.2	0.5	0.4	0.8	0.6
SO_3.........%	0.4	0.6	2.4	1.1	1.2	0.8	0.2	0.8	1.7	0.7	0.1	0.7	0.8	1.0	0.3	0.9	2.7	0.9
$(Na-K)_2O$....%	0.7	1.1	0.7	0.7	0.7	0.9	0.3	0.5	0.8	0.7	1.6	0.7	0.7	0.8	1.0	1.0	1.3	1.6

(a) EMR (Ottawa)

(b) Dr. G. Norton

G. Norton

Dr. G. Norton, B.Sc., Ph.D., M.I.M.M., C.Eng.

January 8, 1971

APPENDIX

QUALIFICATIONS OF PERSONNEL

The work was carried out under the supervision of Dr. G. Norton, Professor in Coal Science, Mineral Processing and Fuel Science at the University of Nottingham. Dr. Norton, who obtained his Bachelor of Science and Doctor of Philosophy degrees at the University of Durham, was a Coal Scientist and Coal Preparation Engineer with the National Coal Board before taking up the position of Senior Process Engineer with Head Wrightson Iron and Steel Co. Ltd. He took up his post at the University of Nottingham in September, 1967 and promptly became Coal Preparation Consultant to Birtley Engineering Ltd. and Mineral Processing Consultant to International Combustion Ltd. He supervised an important hamatite pilot beneficiation operation on behalf of Ashmore Benson Pease & Co. and the Bechtel Corporation. Dr. Norton is a member of the Institution of Mining and Metallurgy and figures prominently in the Coal Preparation Society.

Coal Scientists:

Donovan S. Symonds

Mr. Symonds is a part-time member of the University Staff and is submitting his thesis for a Ph.D. in Fuel Science. He graduated in 1966 from the University of Durham with a First Class-Honours Bachelor of Science degree and proceeded to the Research Department of the University of Nottingham. His previous association with the Scientific Department of the National Coal Board is a measure of his suitability to carry out coal science work.

Chan. Joashi

Mr. Joashi is also a part-time member of the University Staff and a graduate of Nottingham University currently in charge of the coal handleability project sponsored by the National Coal Board. His entire working life has been devoted to coal science and his understanding of the subject and experience in the Coal Science departments makes him eminently suitable for this work.

Technicians:

The following technicians were involved in sample preparation screening and grinding etc. and hold the highest laboratory qualifications (technicians grade):

1. Janek Palewicz - Chief Technician
2. Paul Rosik - Technician
3. John Mills - Technician

Coal Science and Minerals Testing
Division of Great West Steel Industries Ltd.
505-50th AVE. S.E., CALGARY, ALBERTA • TELEPHONE 403-253-8273

March 12, 1971

RECEIVED
MAR 18 1971

Mr. O'Dean Anderson,
Vice President,
Morrison-Knudsen Company, Inc.,
319 Broadway,
P.O. Box 7808,
Boise, Idaho 83707

Dear Mr. Anderson,

Re: <u>Washability Curves - Elk River Project</u>

I have approved the curves plotted in the several drawings you sent me and congratulate your staff on the excellent presentation of the data. With respect to the extrapolations below 1.35 and 1.65 specific gravity points the direction of the curves was determined by the standard method of ascribing a suitable specific gravity value to the heavy fraction of the coal.

For the coals of the Elk River area, a suitable limiting value of specific gravity was found to be 2.20. The quantities of inert material existing above this value of specific gravity are not significant in affecting the shape or direction of the extrapolated curves. Extrapolations of the yield-specific gravity curves were made on this basis and resulted in typical forms. The ash-specific gravity relationships were also based on the raw coal ash being coincident with a cumulative float at 2.20 specific gravity.

In the U.K. we usually sink-float up to gravities of 2.00 but the Canadian and American practice is to terminate at 1.60. Extrapolation of these curves by the method outlined has proved reliable in the past by later checking with higher gravity liquid mixtures.

You should therefore, find the extrapolated data reliable and most important in your presentation of results.

Yours very truly,

COAL SCIENCE & MINERALS TESTING DIV. OF GREAT WEST STEEL INDUSTRIES LTD.

G Norton

G. Norton,
Division Manager.

Encl.

GN/ms

Exhibit No. 26

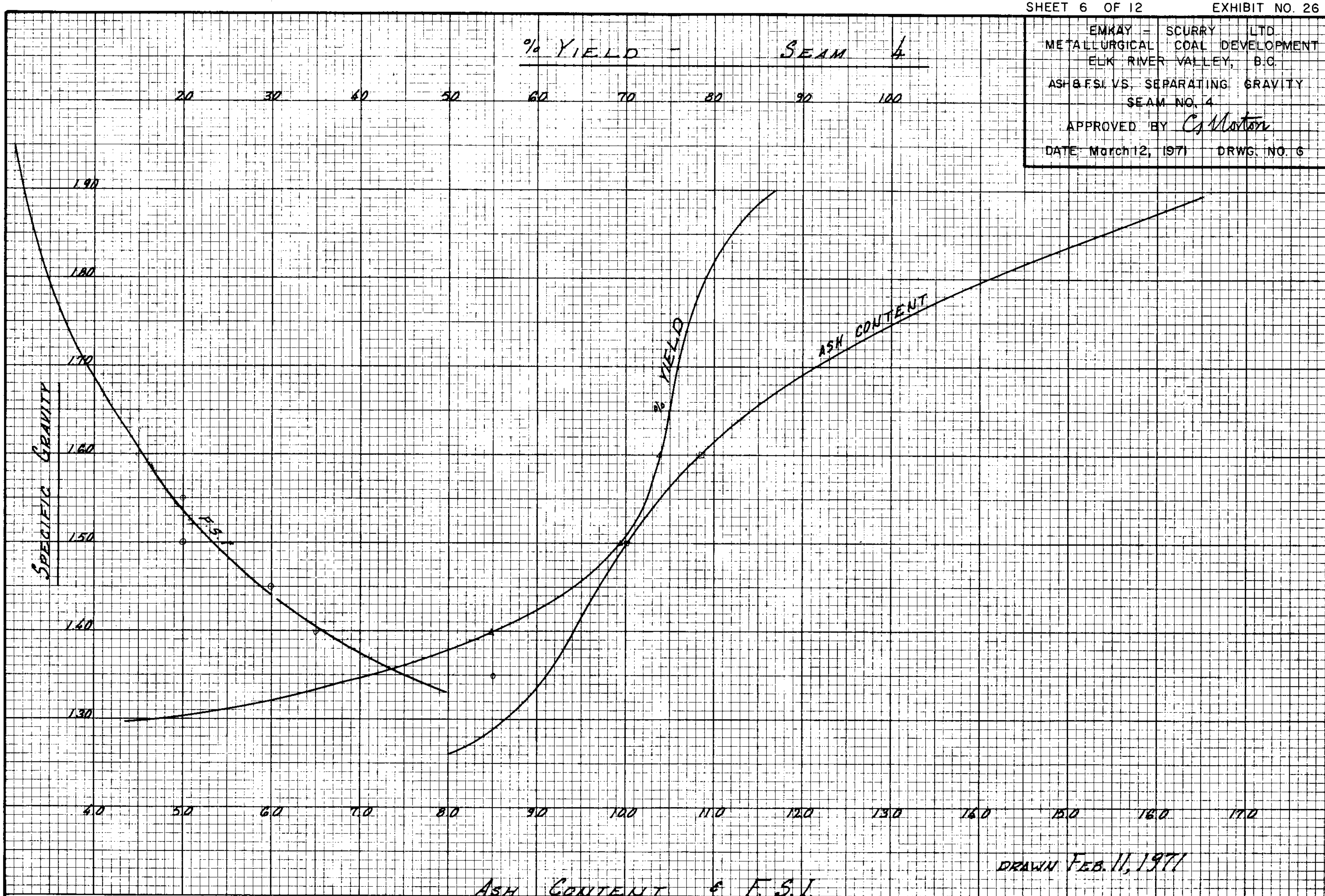
SHEET 6 OF 12 EXHIBIT NO. 26

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

ASH & F.S.I. VS. SEPARATING GRAVITY
SEAM NO. 4

APPROVED BY C. J. Morton

DATE March 12, 1971 DRWG. NO. 6



EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

YIELD VS. SEPARATING GRAVITY
ALL SEAMS

APPROVED BY G. Morton

DATE March 12, 1971 DRWG. NO. 1

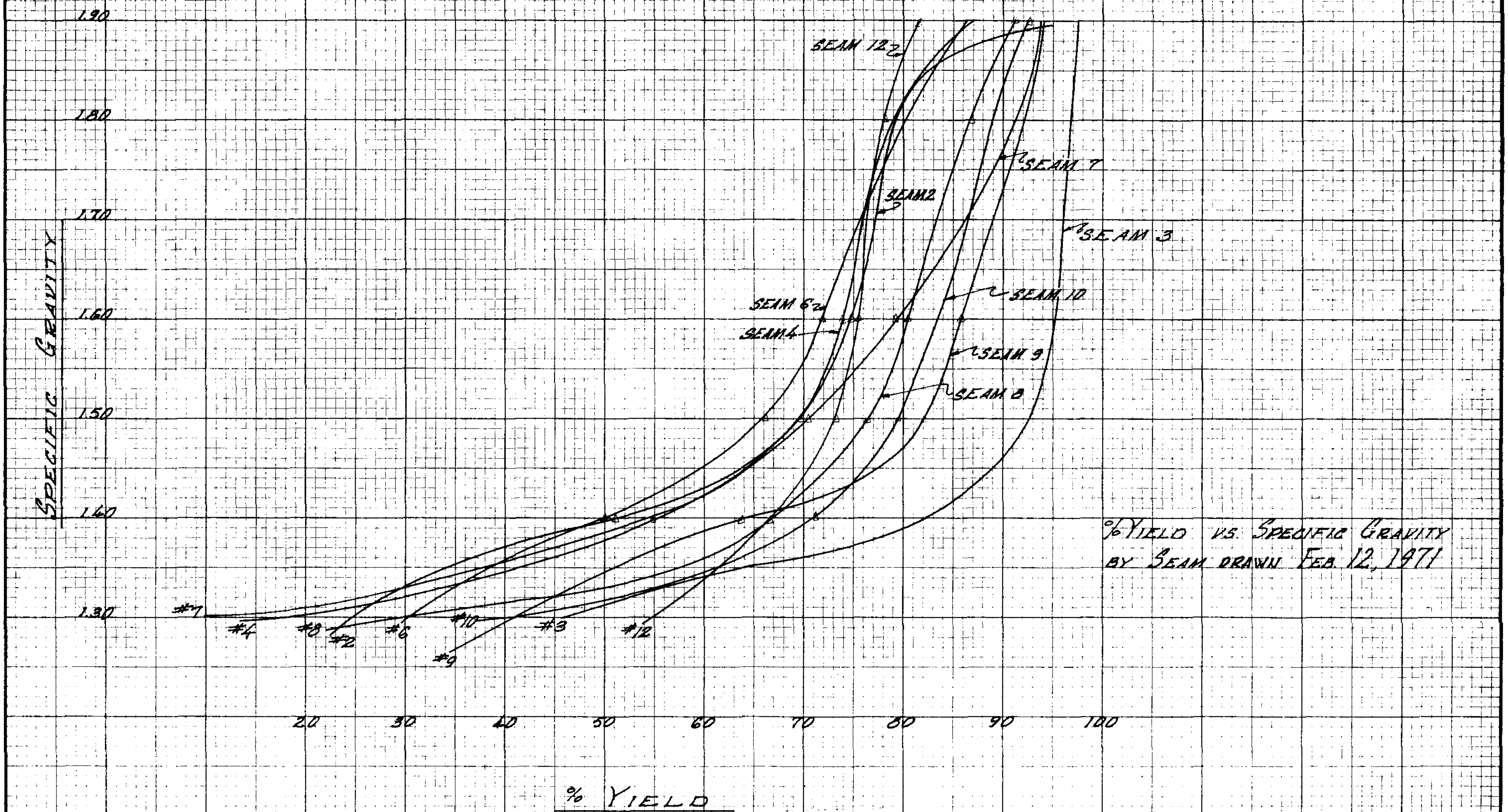
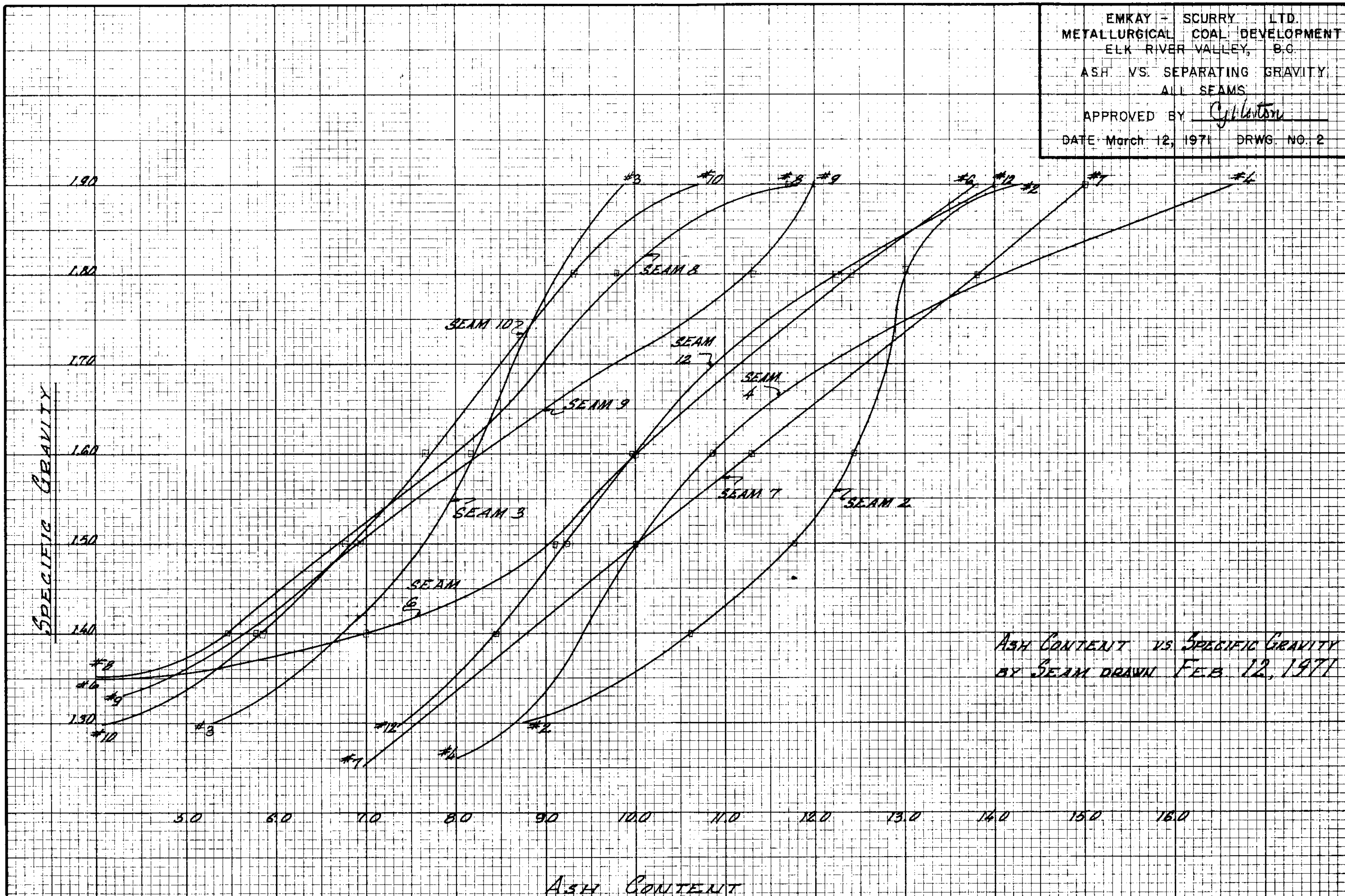


EXHIBIT NO. 26

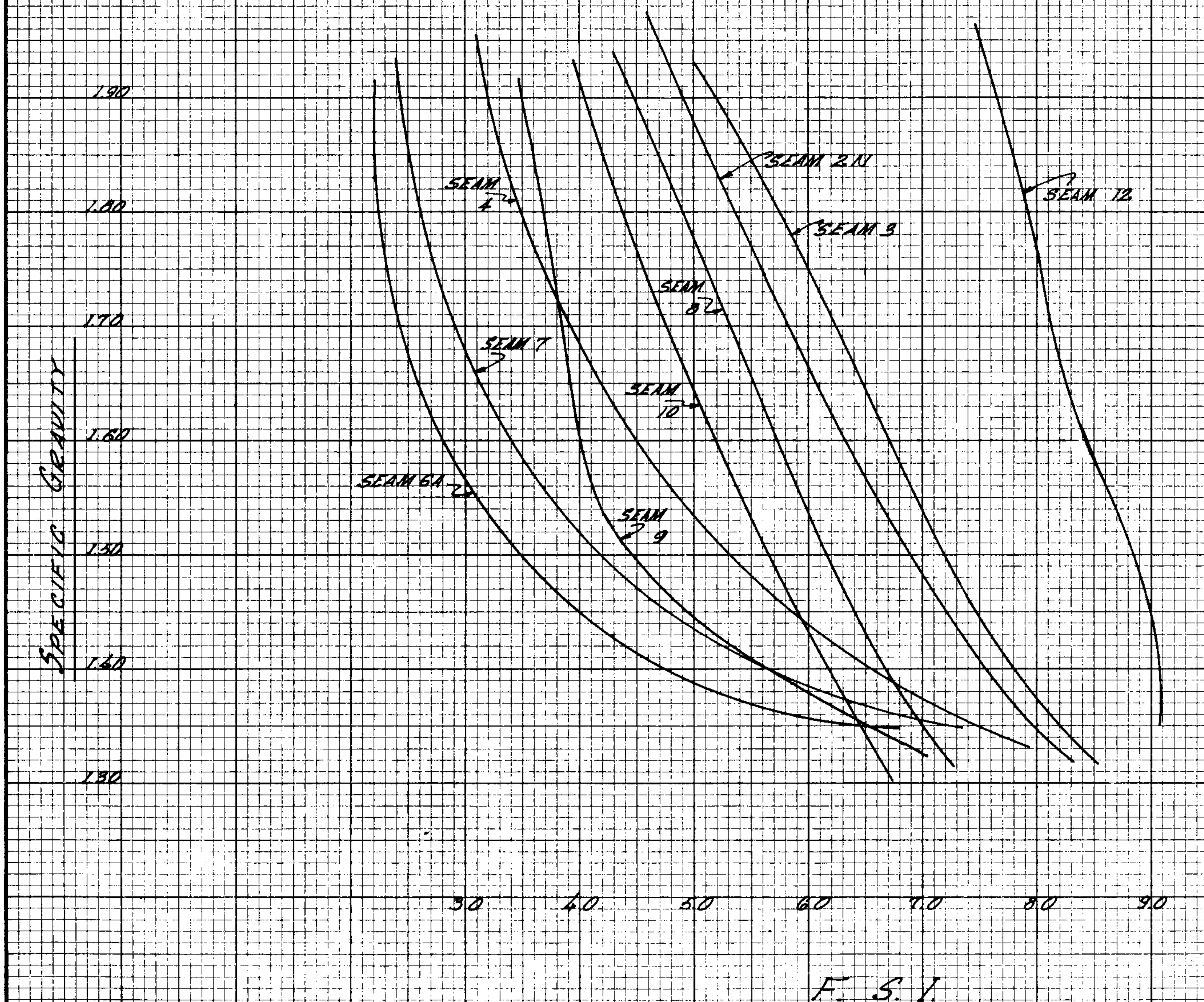


EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

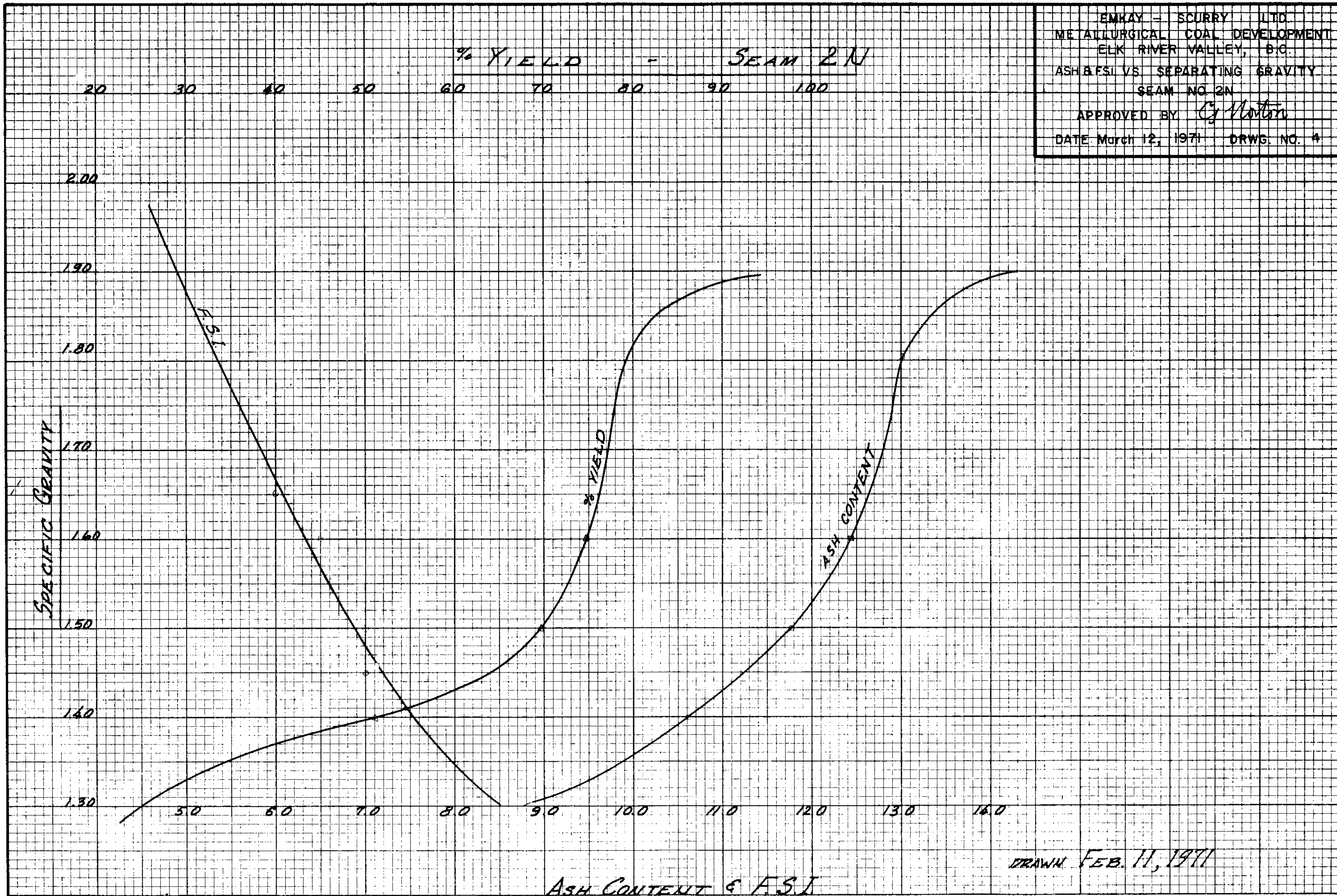
F.S.I. VS. SEPARATING GRAVITY
ALL SEAMS

APPROVED BY G. Naton

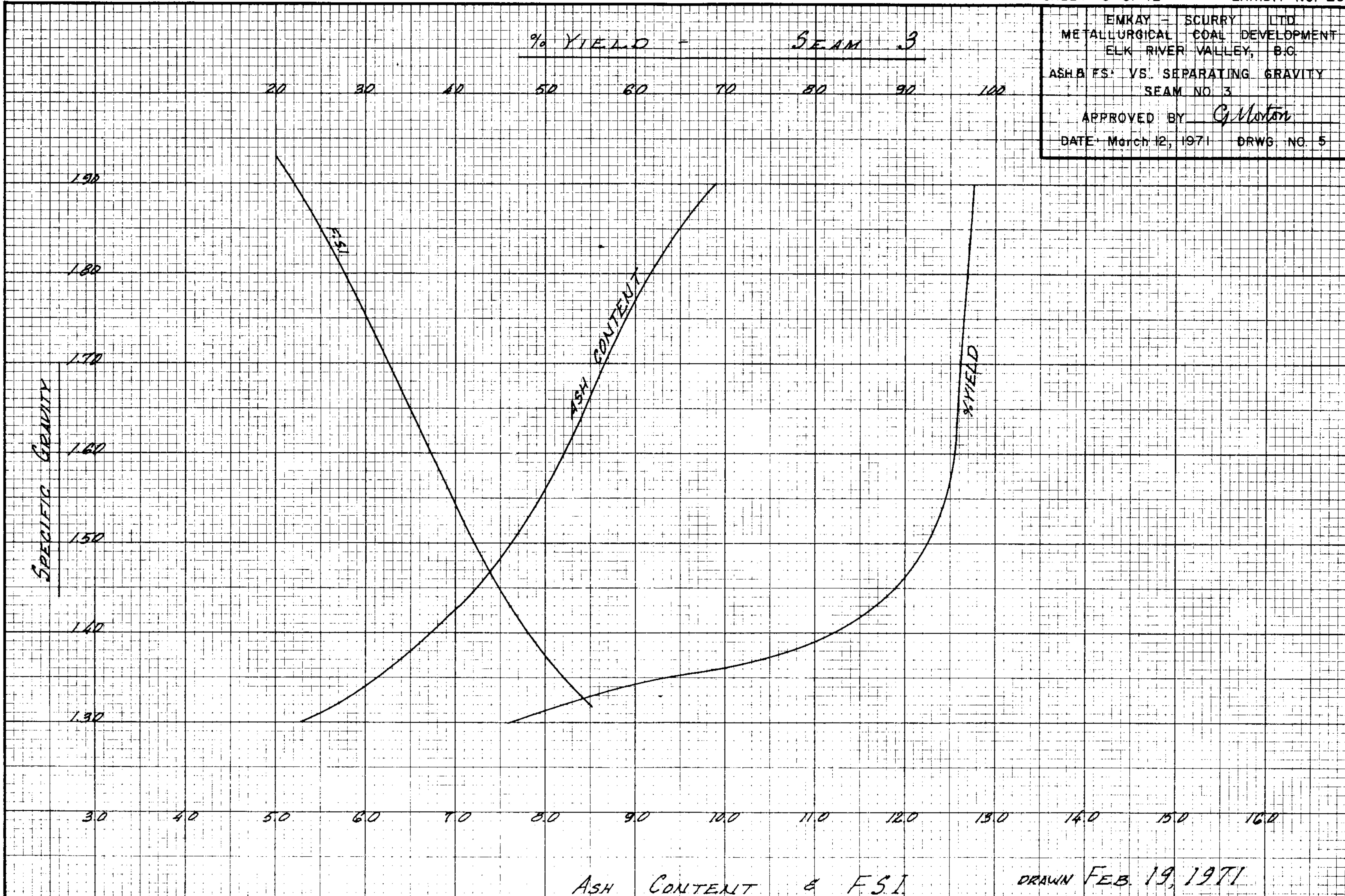
DATE: March 12, 1971 DRWG. NO. 3



F.S.I. vs SPECIFIC GRAVITY BY SEAM DRAWN FEB 17, 1971


EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
ASH & FSI VS. SEPARATING GRAVITY
SEAM NO. 2N
APPROVED BY G Norton
DATE March 12, 1971 DRWG. NO. 4
% YIELD - SEAM 2N
20 30 40 50 60 70 80 90 100
SPECIFIC GRAVITY
2.00
1.90
1.80
1.70
1.60
1.50
1.40
1.30
F.S.I.
% YIELD
ASH CONTENT
5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0
DRAWN FEB. 11, 1971
ASH CONTENT & F.S.I.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
ASH & FSI VS. SEPARATING GRAVITY
SEAM NO. 3
APPROVED BY G Morton
DATE March 12, 1971 DRWG. NO. 5

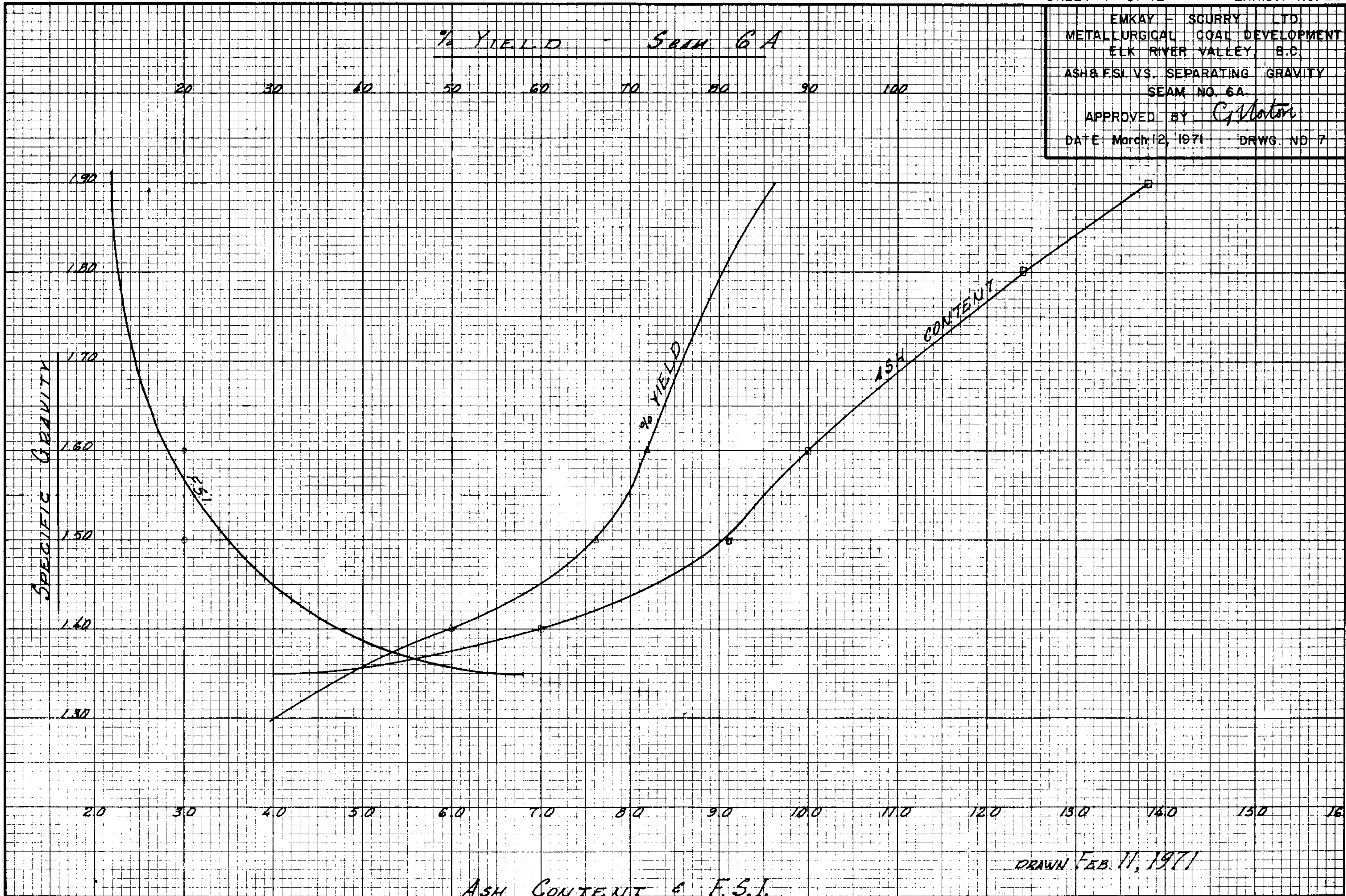


EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

ASH & F.S.I. VS. SEPARATING GRAVITY
SEAM NO. 6A

APPROVED BY G. Motor

DATE: March 12, 1971 DRWG. NO. 7

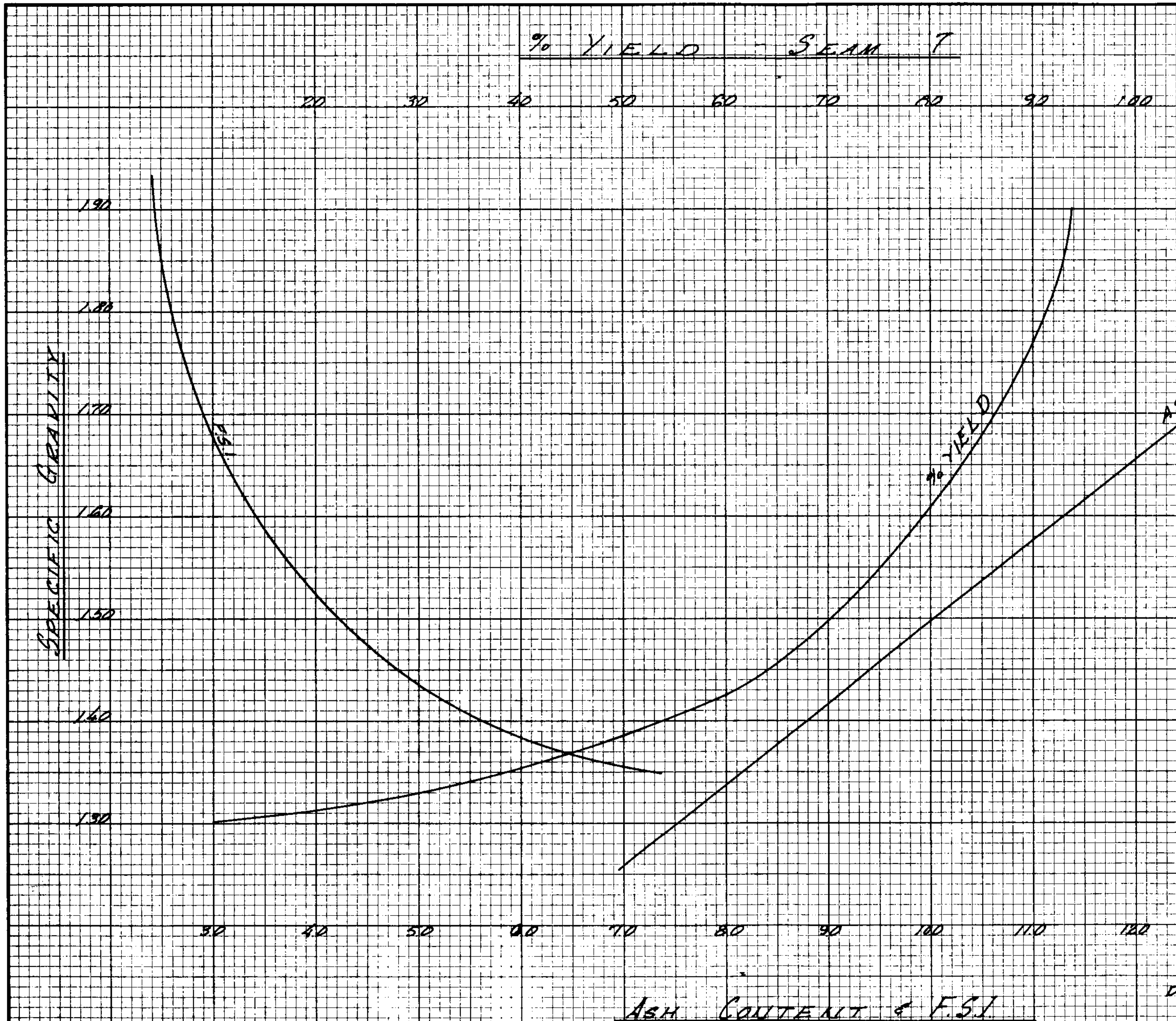


EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

ASH & F.S.I. VS. SEPARATING GRAVITY
SEAM NO. 7

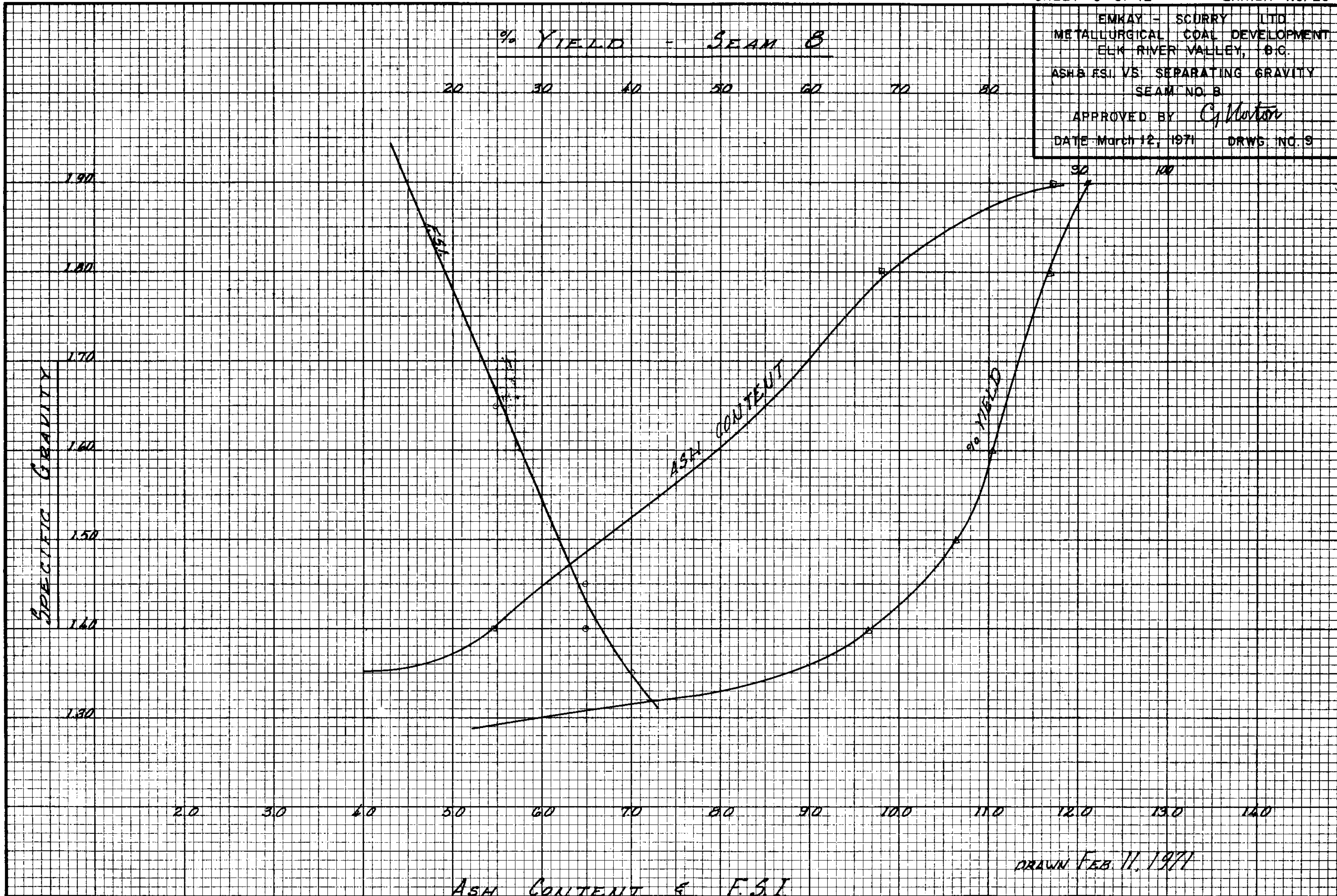
APPROVED BY G. Moton

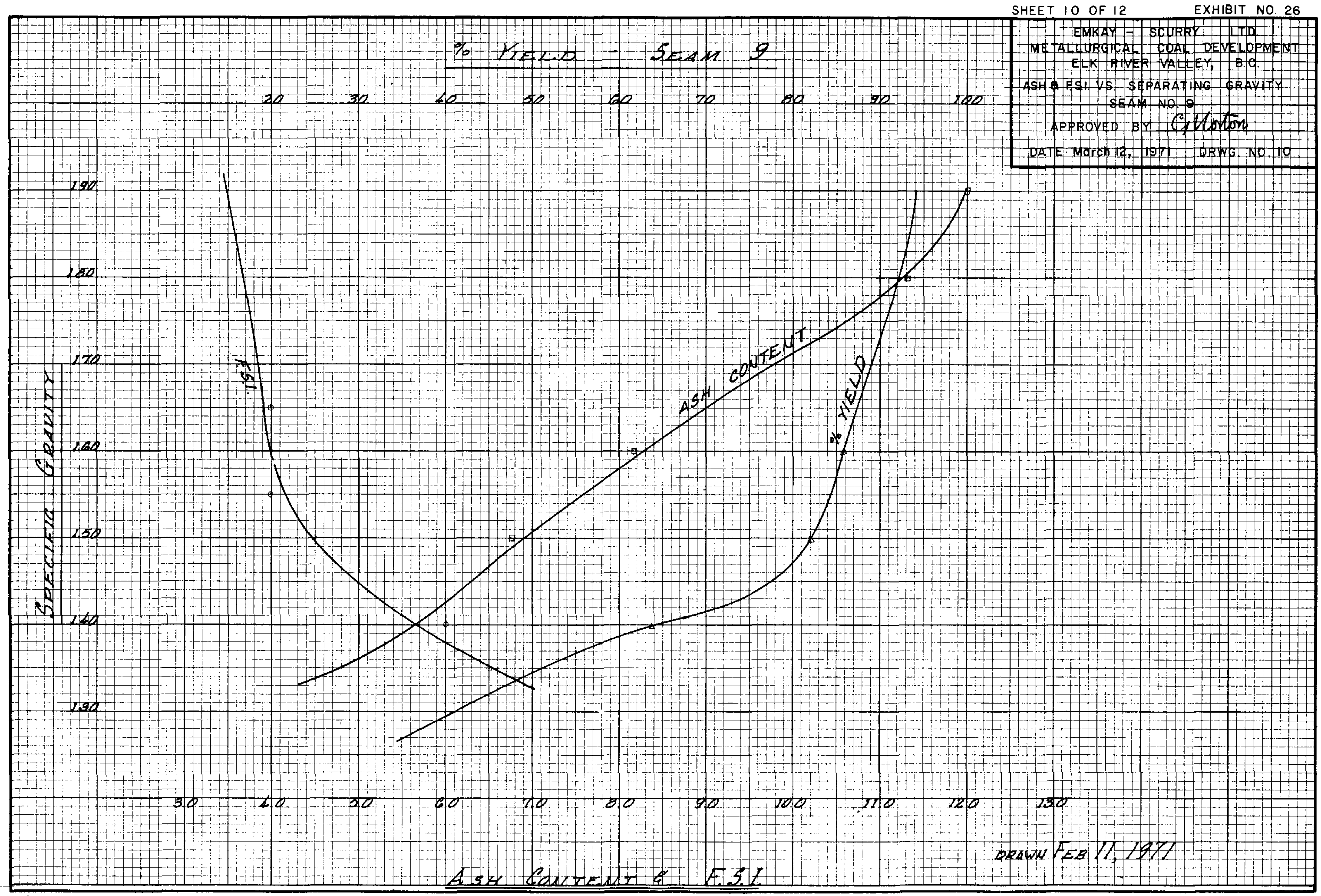
DATE: March 12, 1971 DRWG. NO. 8



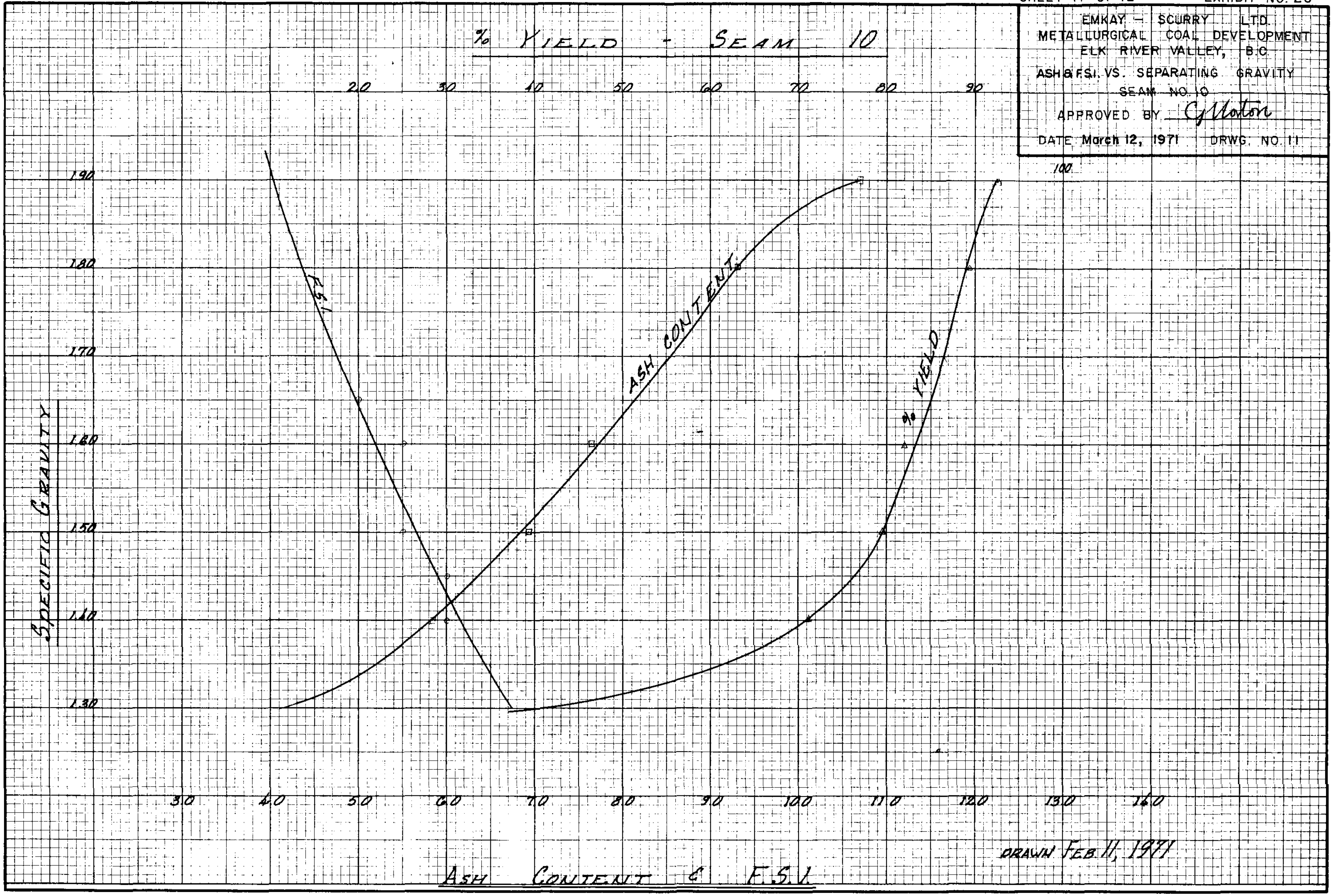
SHEET 9 OF 12 EXHIBIT NO. 26

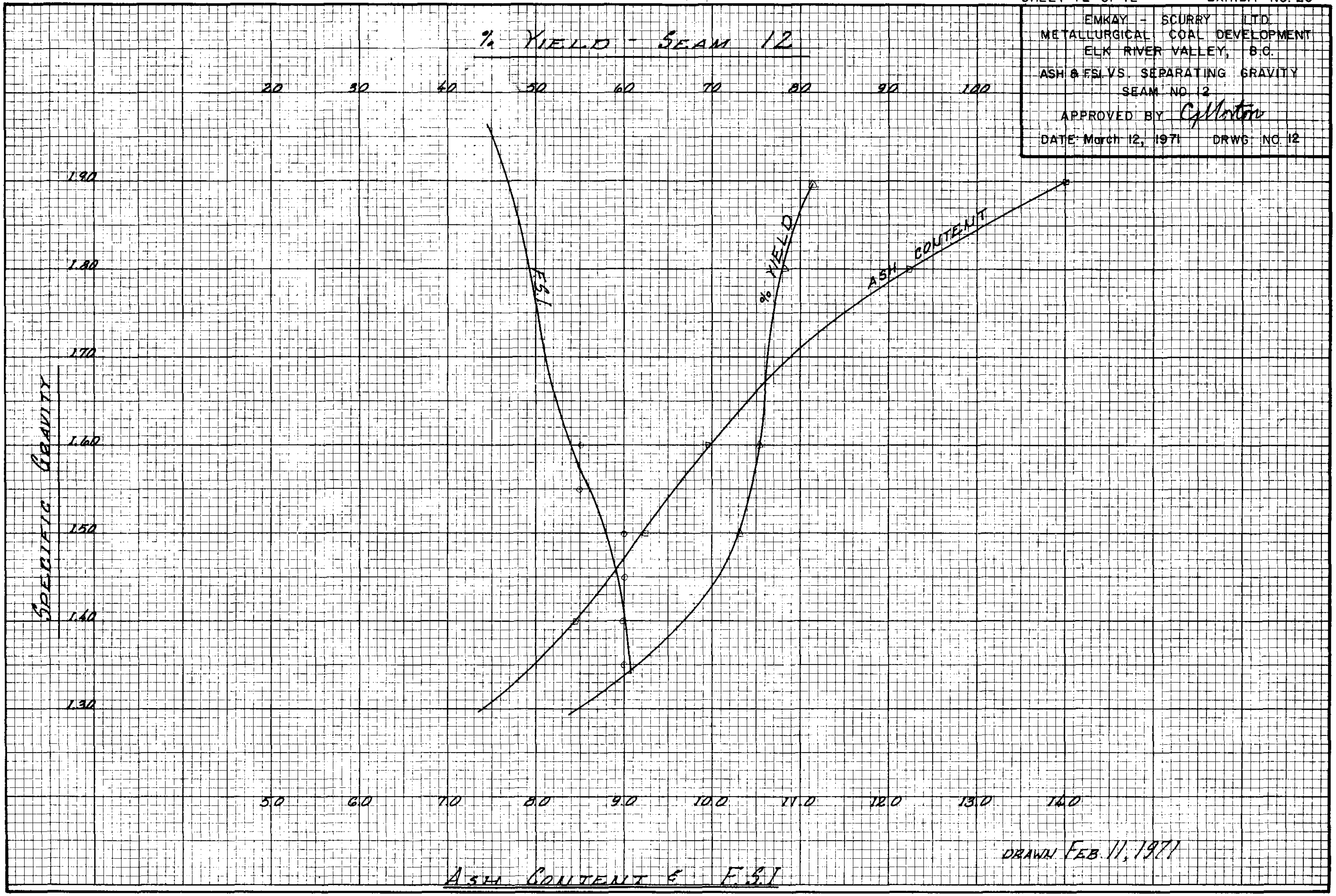
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
ASH & FSI VS. SEPARATING GRAVITY
SEAM NO. 8
APPROVED BY G. Motor
DATE March 12, 1971 DRWG. NO. 9




SHEET 10 OF 12
EXHIBIT NO. 26
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
ASH & F.S.I. VS. SEPARATING GRAVITY
SEAM NO. 9
APPROVED BY G. Morton
DATE March 12, 1971
DRWG. NO. 10
% YIELD - SEAM 9
20
30
40
50
60
70
80
90
100
1.90
1.80
1.70
1.60
1.50
1.40
1.30
SPECIFIC GRAVITY
F.S.I.
ASH CONTENT
% YIELD
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
DRAWN FEB 11, 1971
ASH CONTENT & F.S.I.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
ASH & F.S.I. VS. SEPARATING GRAVITY
SEAM NO. 10
APPROVED BY G Motion
DATE March 12, 1971 DRWG. NO. 11




EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
ASH & F.S.I. VS. SEPARATING GRAVITY
SEAM NO. 12
APPROVED BY C.J. Morton
DATE: March 12, 1971 DRWG. NO. 12
% YIELD - SEAM 12
20
30
40
50
60
70
80
90
100
1.90
1.80
1.70
1.60
1.50
1.40
1.30
SPECIFIC GRAVITY
F.S.I.
% YIELD
ASH CONTENT
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
DRAWN FEB 11, 1971
ASH CONTENT & F.S.I.

K - ELK RIVER 70(5) B.

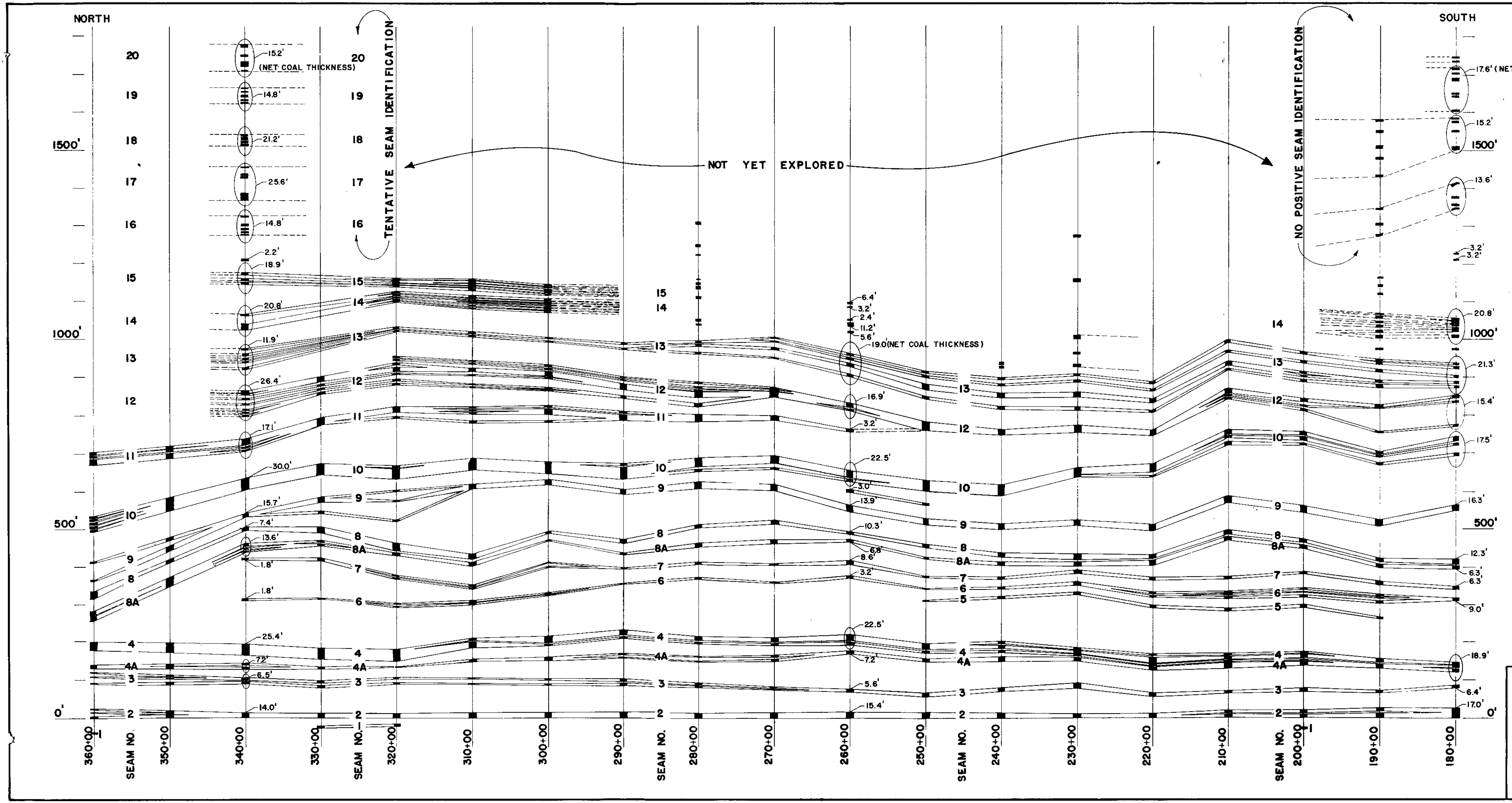
ELK RIVER COKING COAL PROJECT.

EXHIBITS 11 - 18

(COAL SEAM DATA)

269

K- ELK RIVER 70(5)B



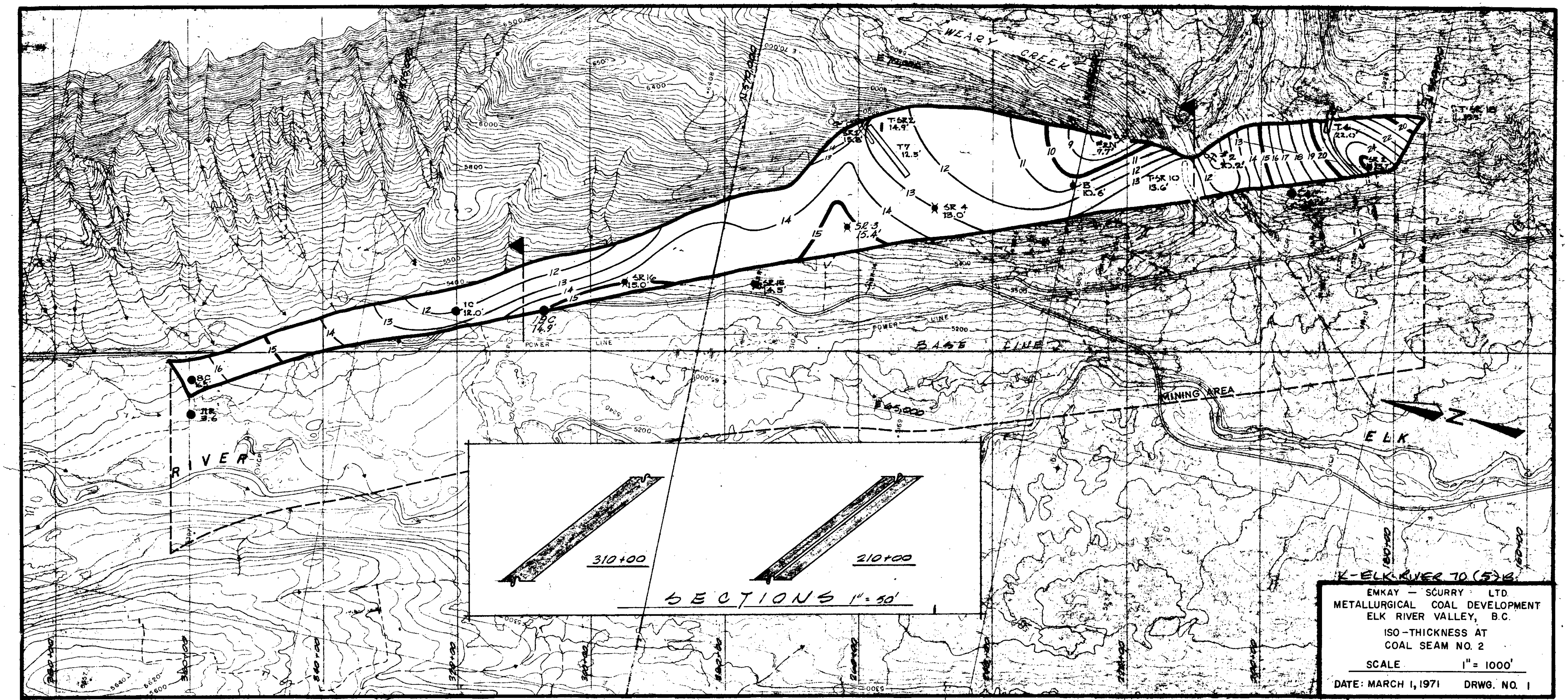
NOTE:
DRAWING SHOWS INTERCEPTS OF COAL SEAMS FROM GEOLOGIC SECTIONS, CONSTRUCTED EVERY 1,000 FEET ALONG BASELINE. INFORMATION WAS TAKEN ALONG STRIKE OF N 20°W WITH NO. 2 COAL SEAM USED AS REFERENCE. INTERVALS AND THICKNESSES SHOWN ARE STRATIGRAPHIC.
SHOWS SEAMS AND PARTINGS WITH MINIMUM TRUE THICKNESS OF 1.5' FEET. INCLUDES DATA OBTAINED FROM INVESTIGATION THROUGH CALENDAR YEAR 1970.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
SEAM CORRELATION CHART

SCALES: VERT. 0 100 200; HORIZ. 0 1000 2000

DATE: MARCH 1, 1971 DRWG. NO. 1

EXHIBIT NO. 11



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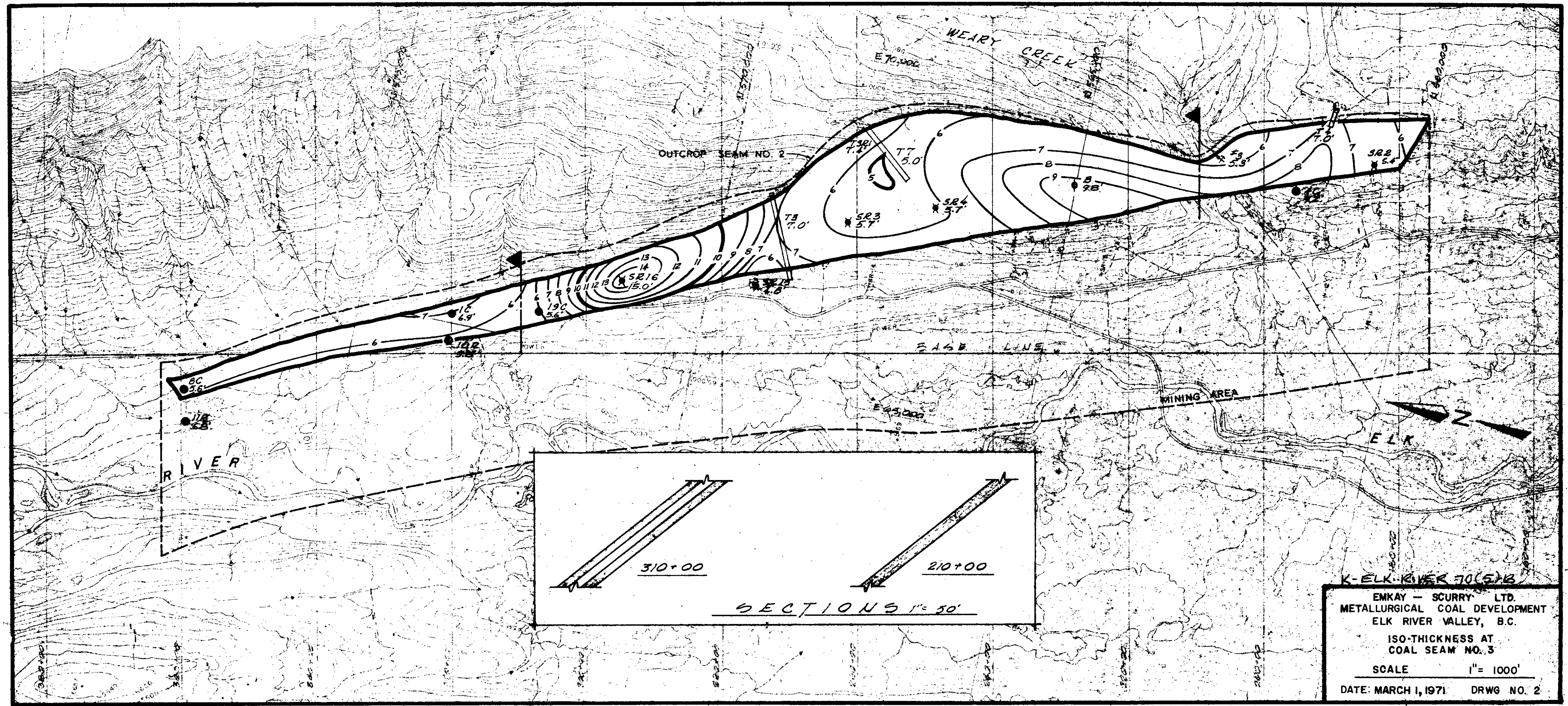

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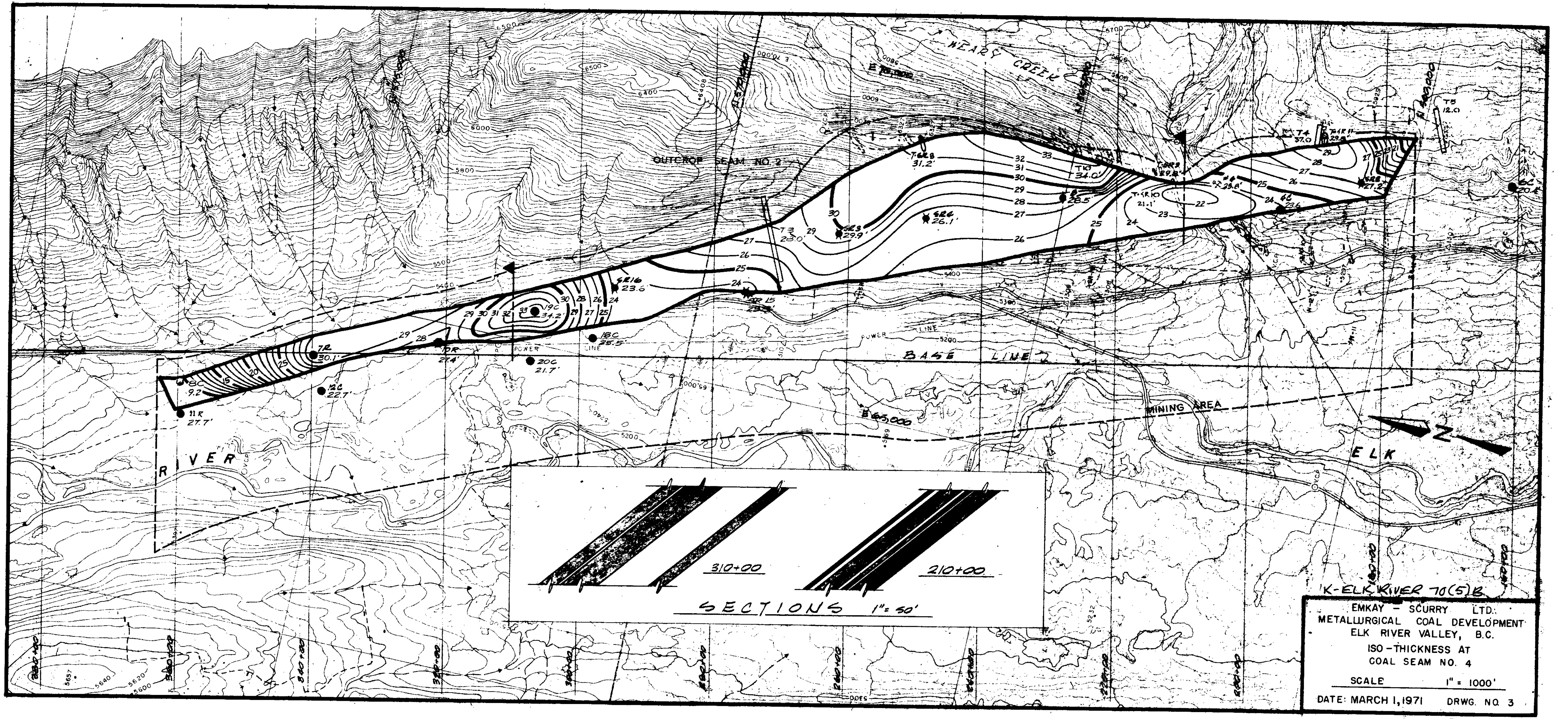

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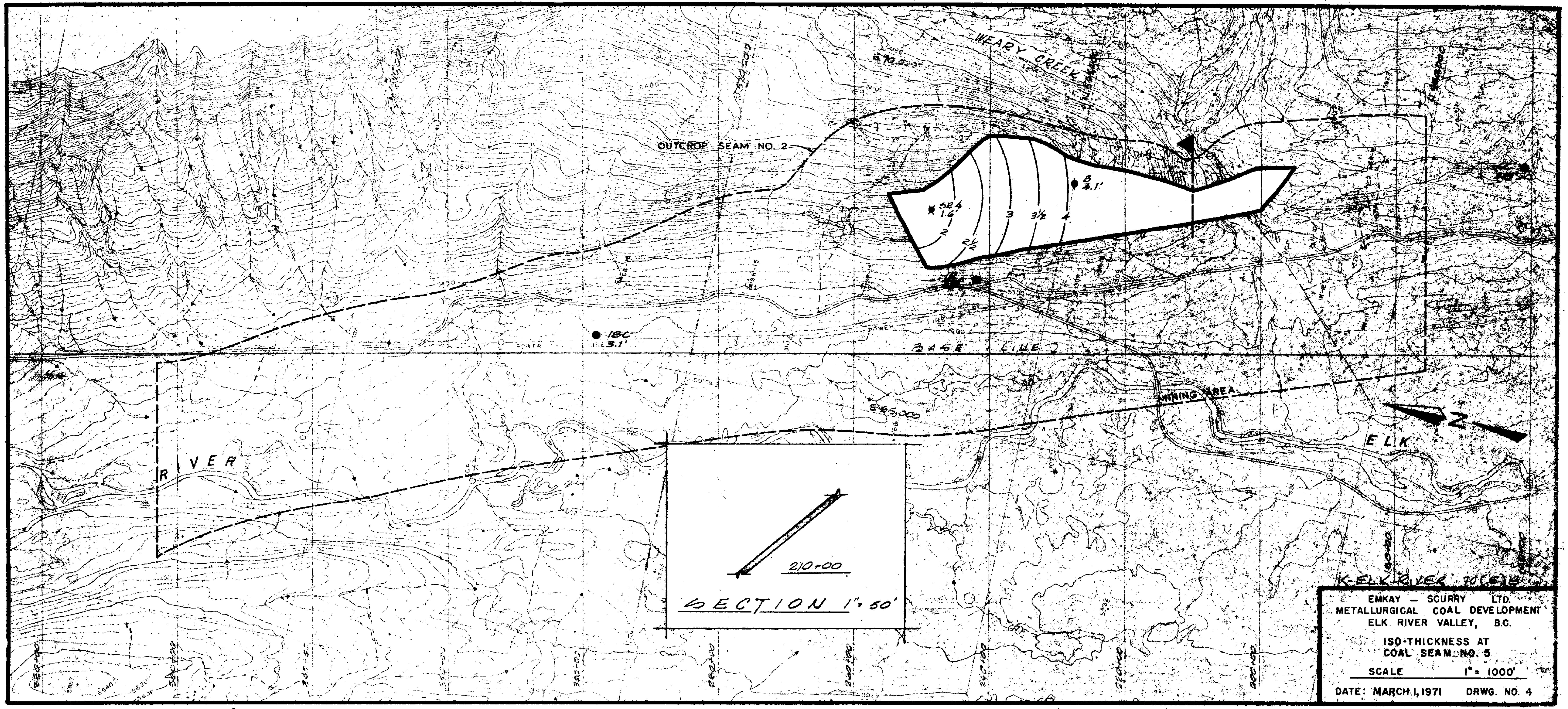

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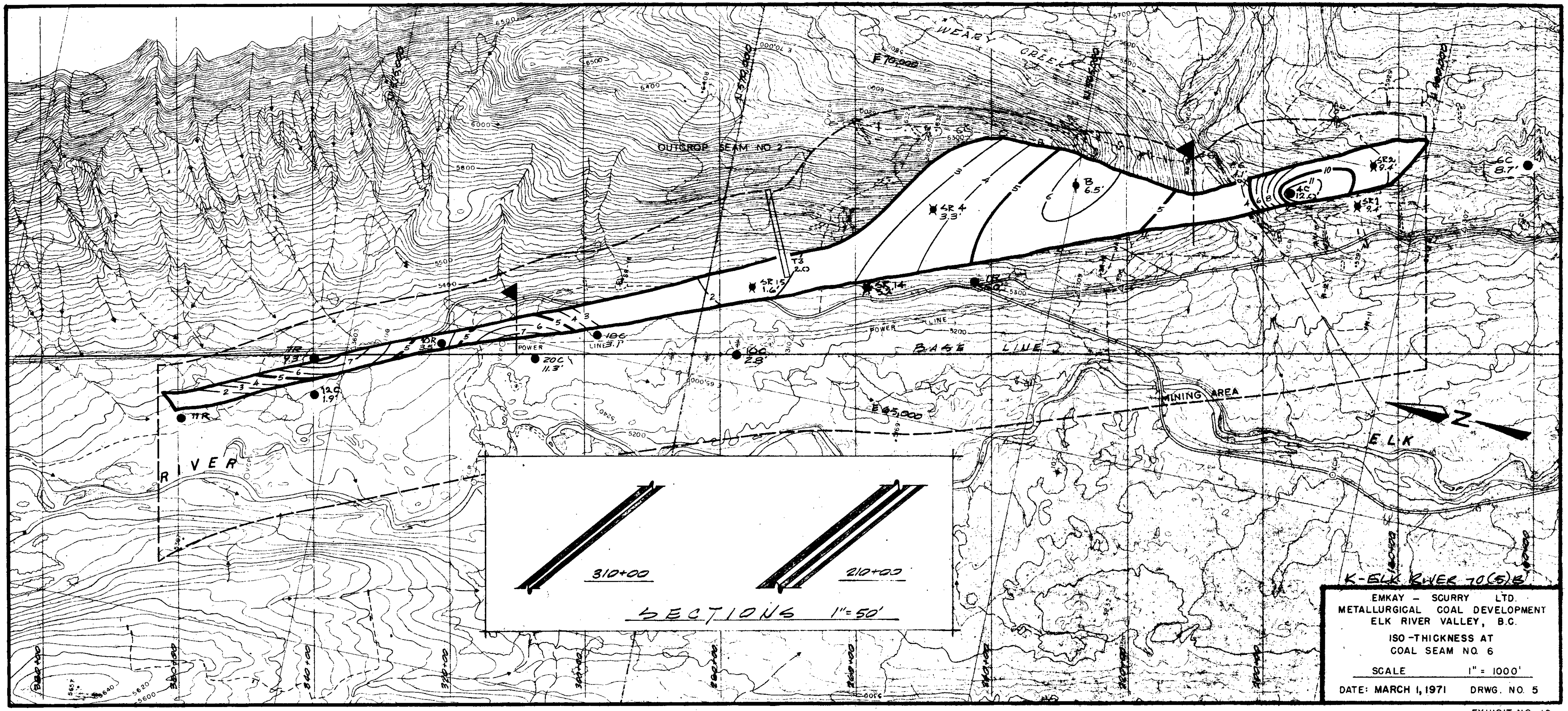

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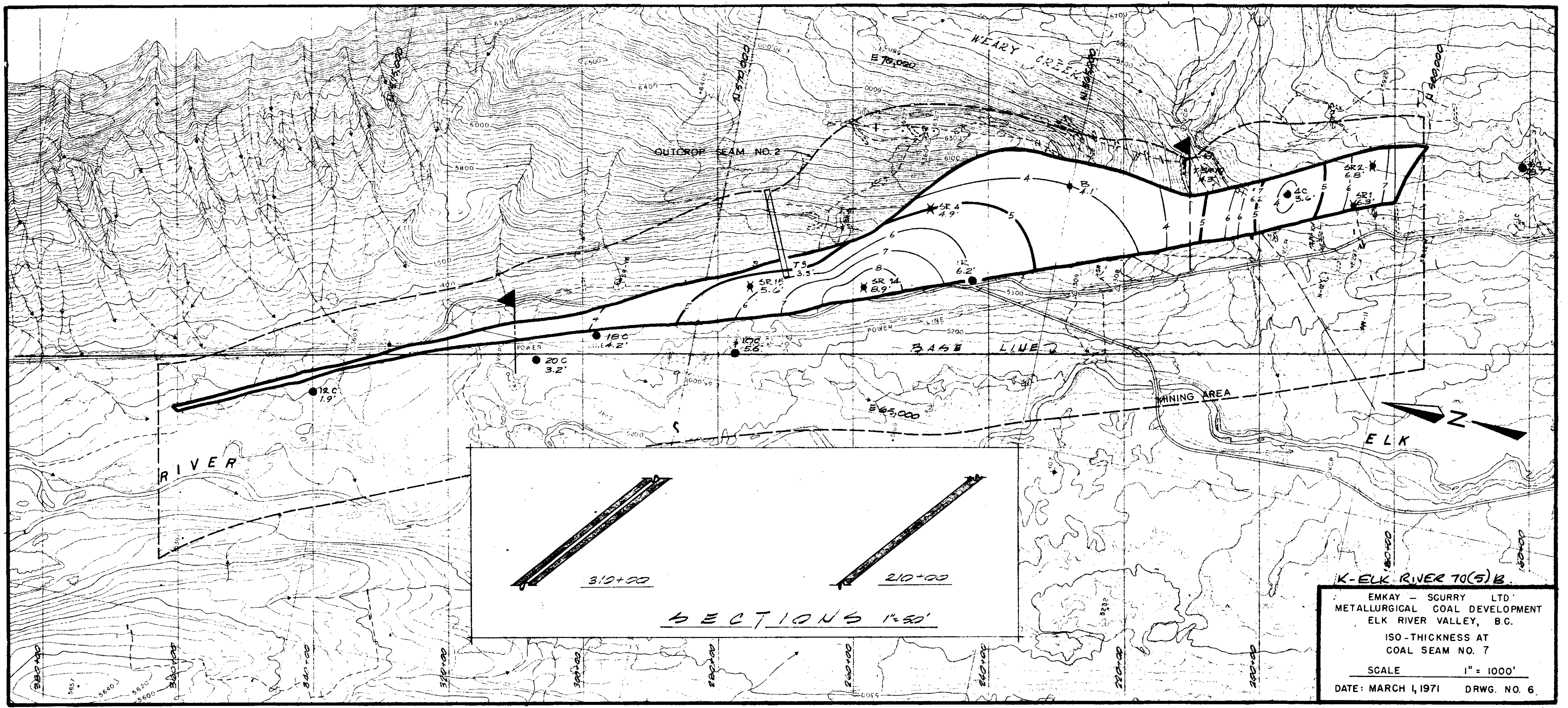

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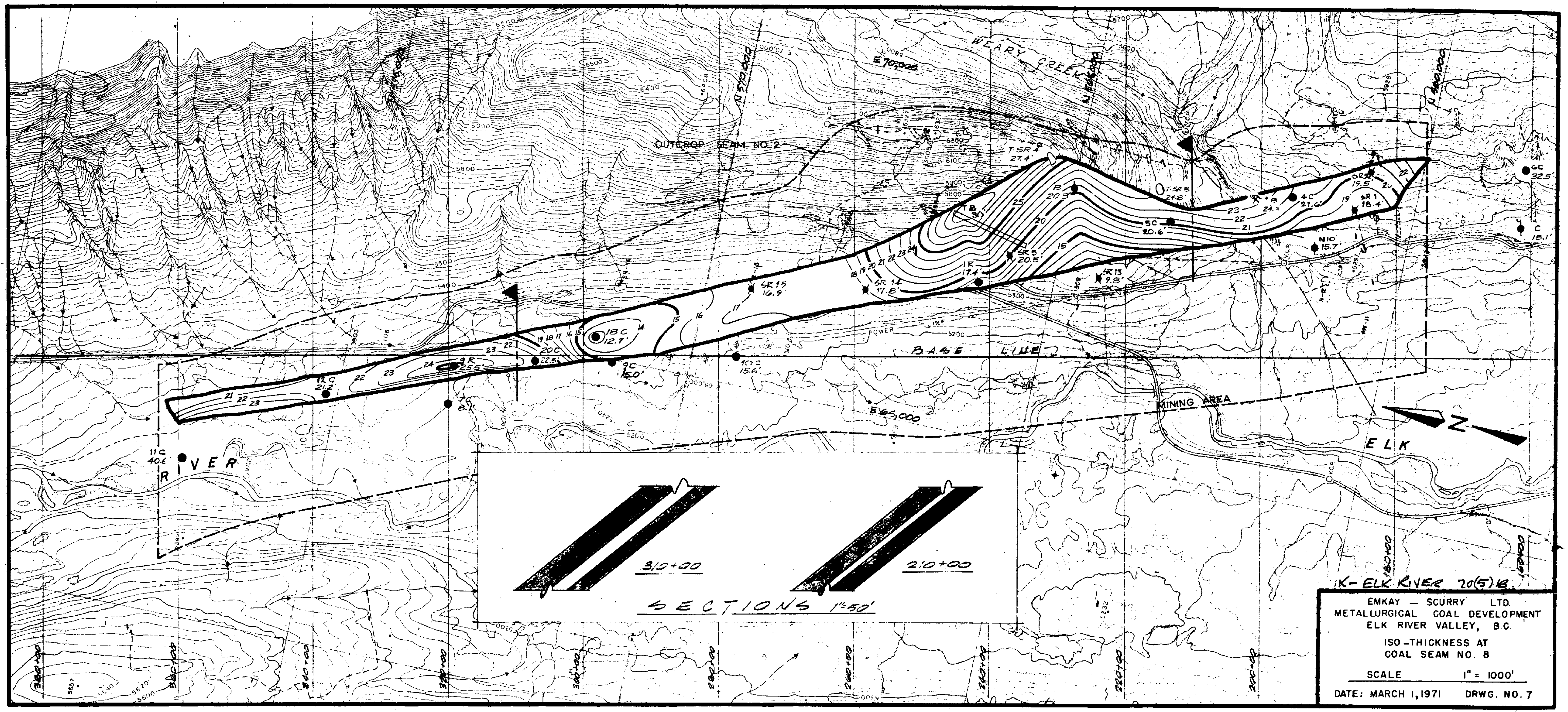

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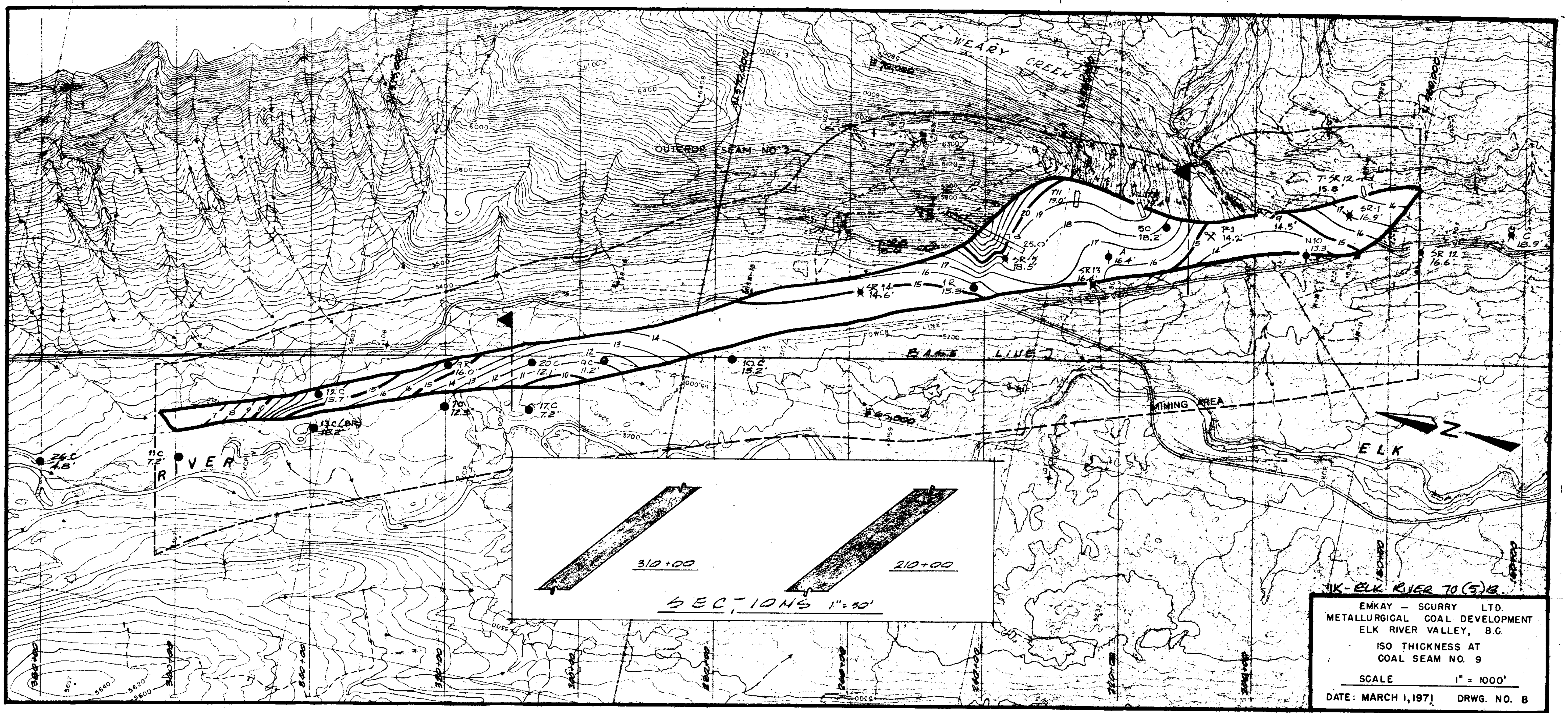

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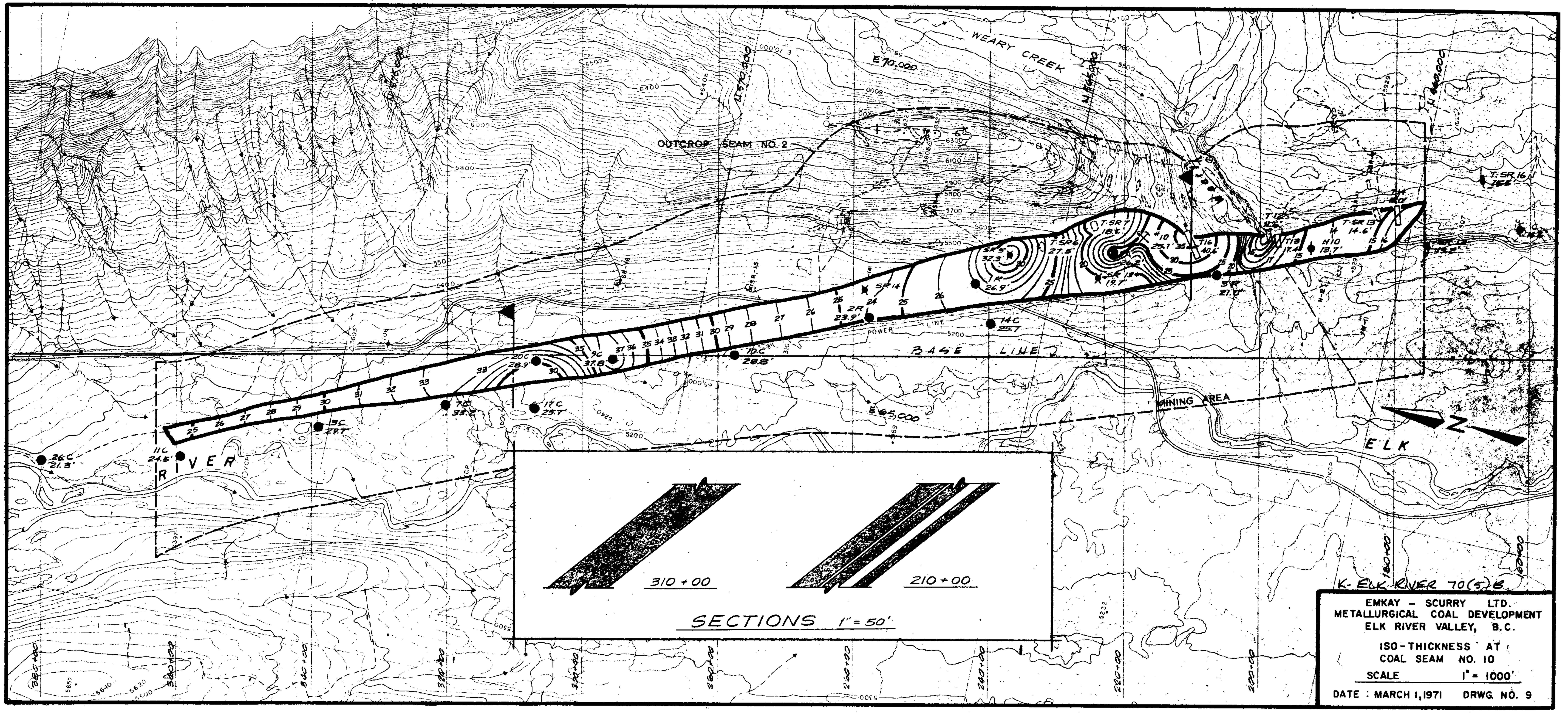


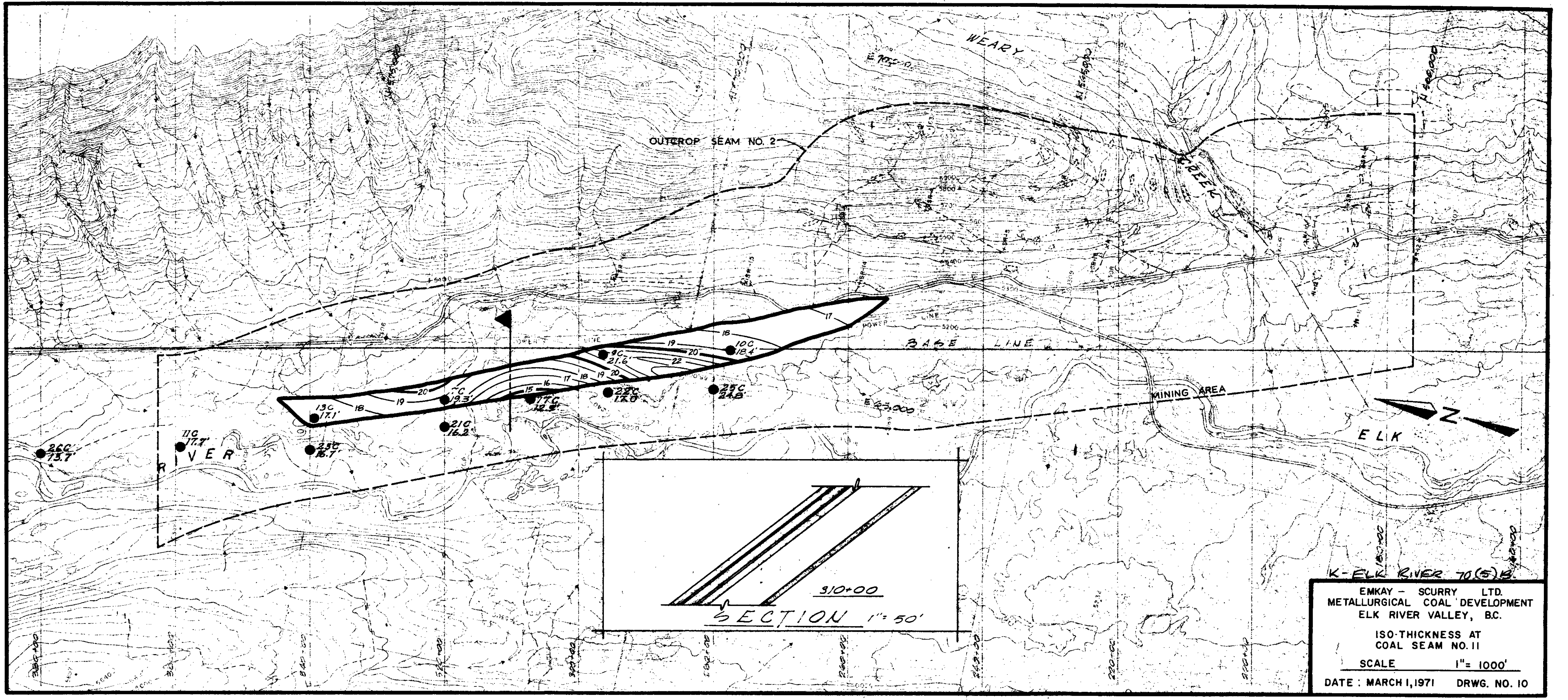
EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

ISO-THICKNESS AT
COAL SEAM NO. 10

SCALE 1" = 1000'

DATE : MARCH 1, 1971 DRWG. NO. 9

EXHIBIT NO. 12



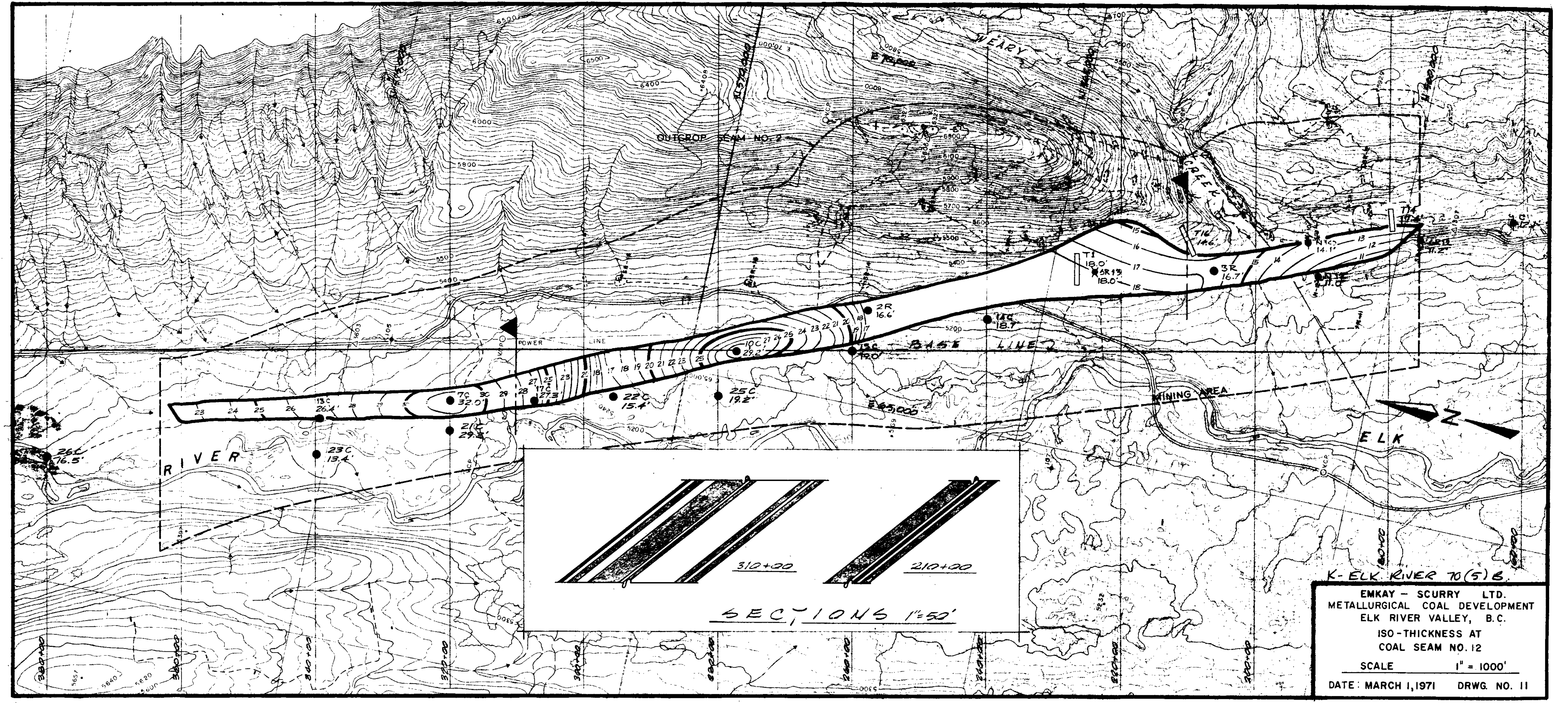
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

ISO-THICKNESS AT
COAL SEAM NO. 11

SCALE 1" = 1000'

DATE : MARCH 1, 1971 DRWG. NO. 10

EXHIBIT NO. 12



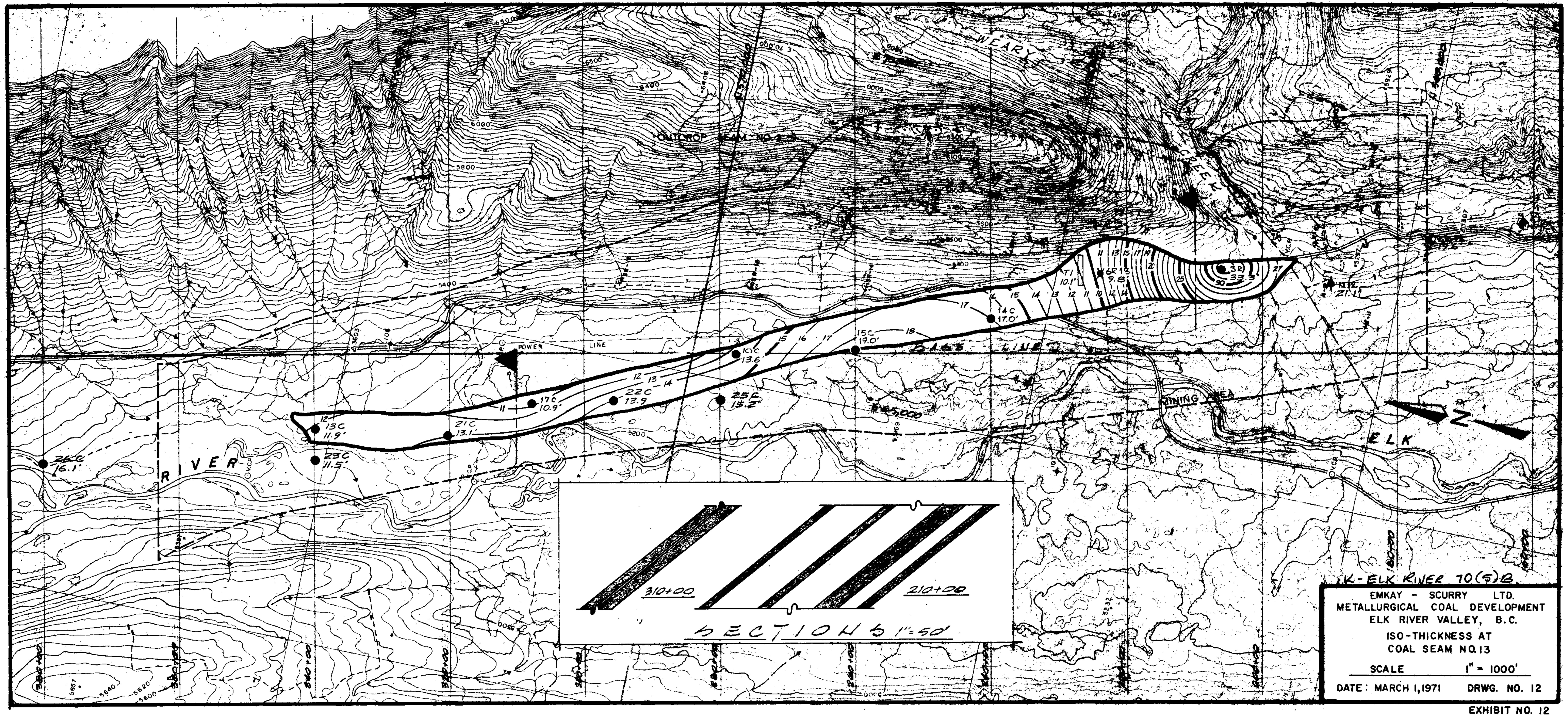
EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

ISO-THICKNESS AT
COAL SEAM NO. 12

SCALE 1" = 1000'

DATE: MARCH 1, 1971 DRWG. NO. 11

EXHIBIT NO. 12



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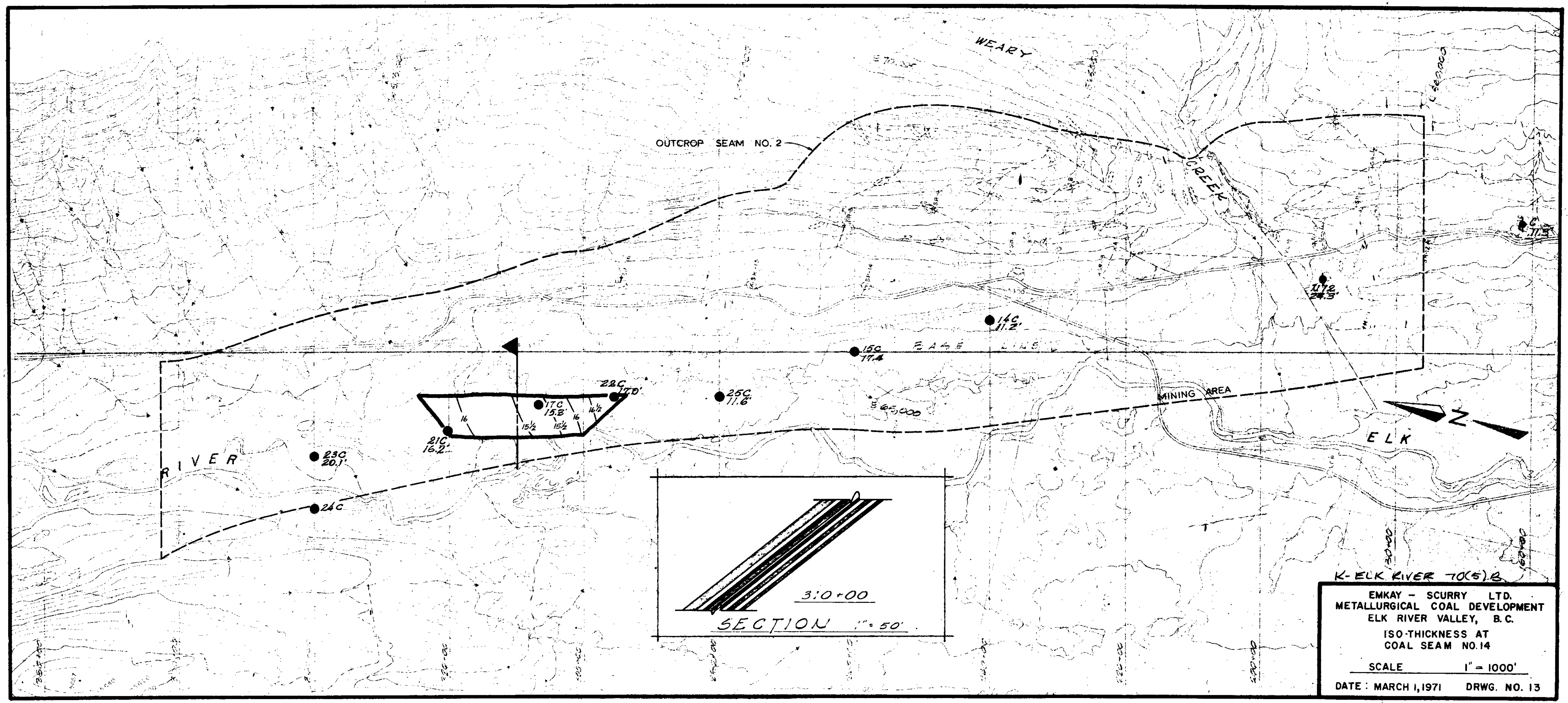

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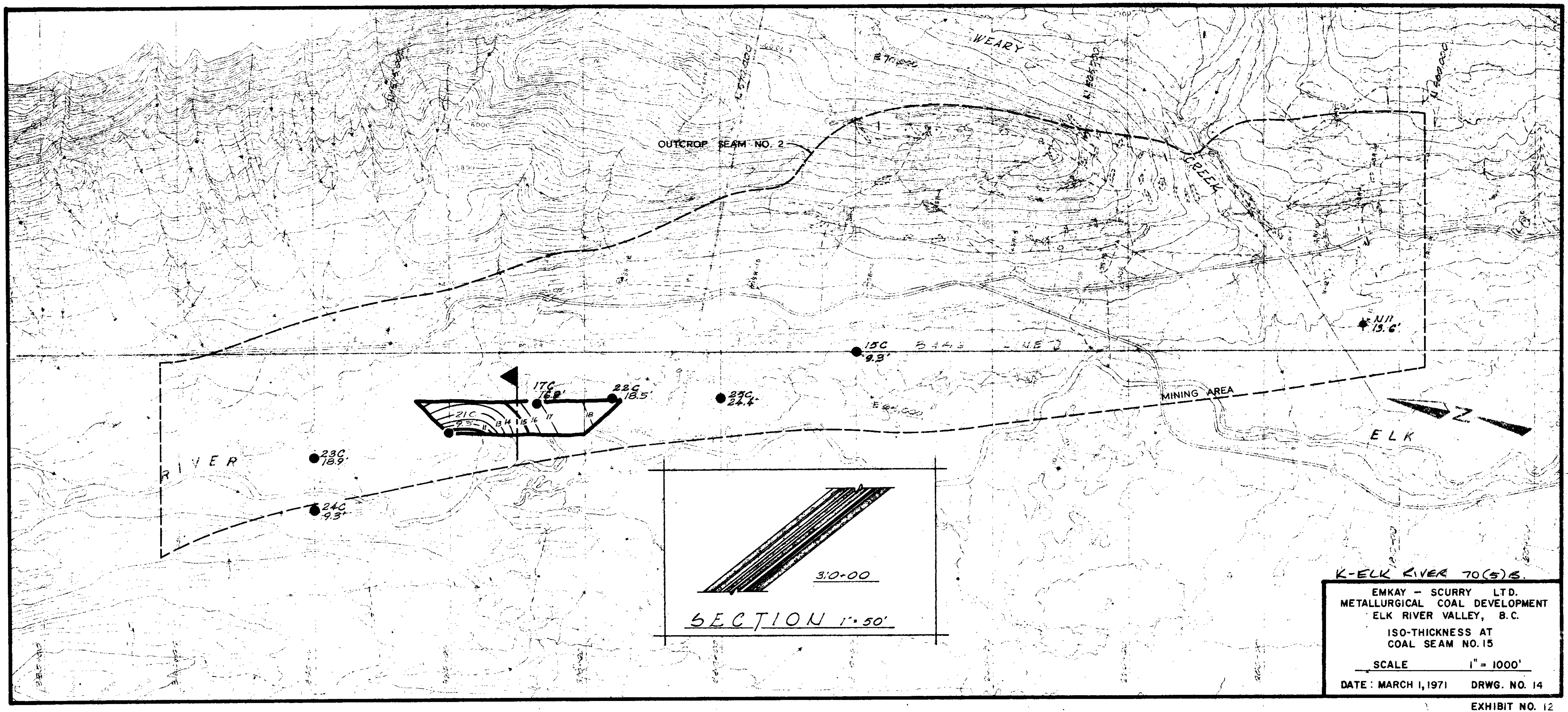

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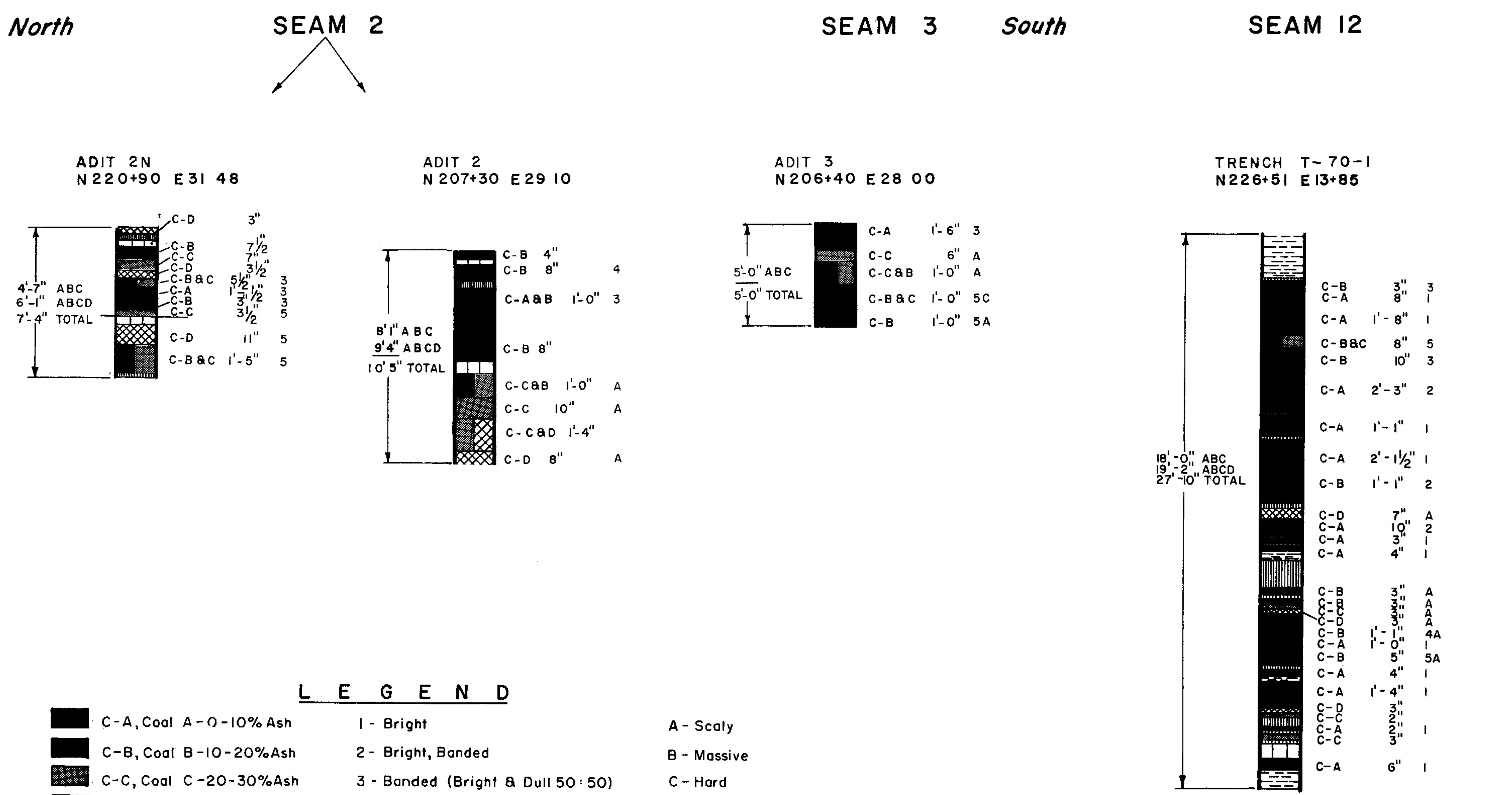


K-ELK RIVER 70(5)B.

LEGEND

C-A, Coal A-0-10% Ash	1 - Bright	A - Scaly
C-B, Coal B-10-20% Ash	2 - Bright, Banded	B - Massive
C-C, Coal C-20-30% Ash	3 - Banded (Bright & Dull 50:50)	C - Hard
C-D, Coal D-30-40% Ash	4 - Dull Banded	
Coaly Shale	5 - Dull	
Dark Shale		
Coal Bands		
Gray Shale		
Siltstone		

EXAMPLE:

C-A, 1'-0", 1, B
COAL TYPE — THICKNESS — BRIGHT — MASSIVE

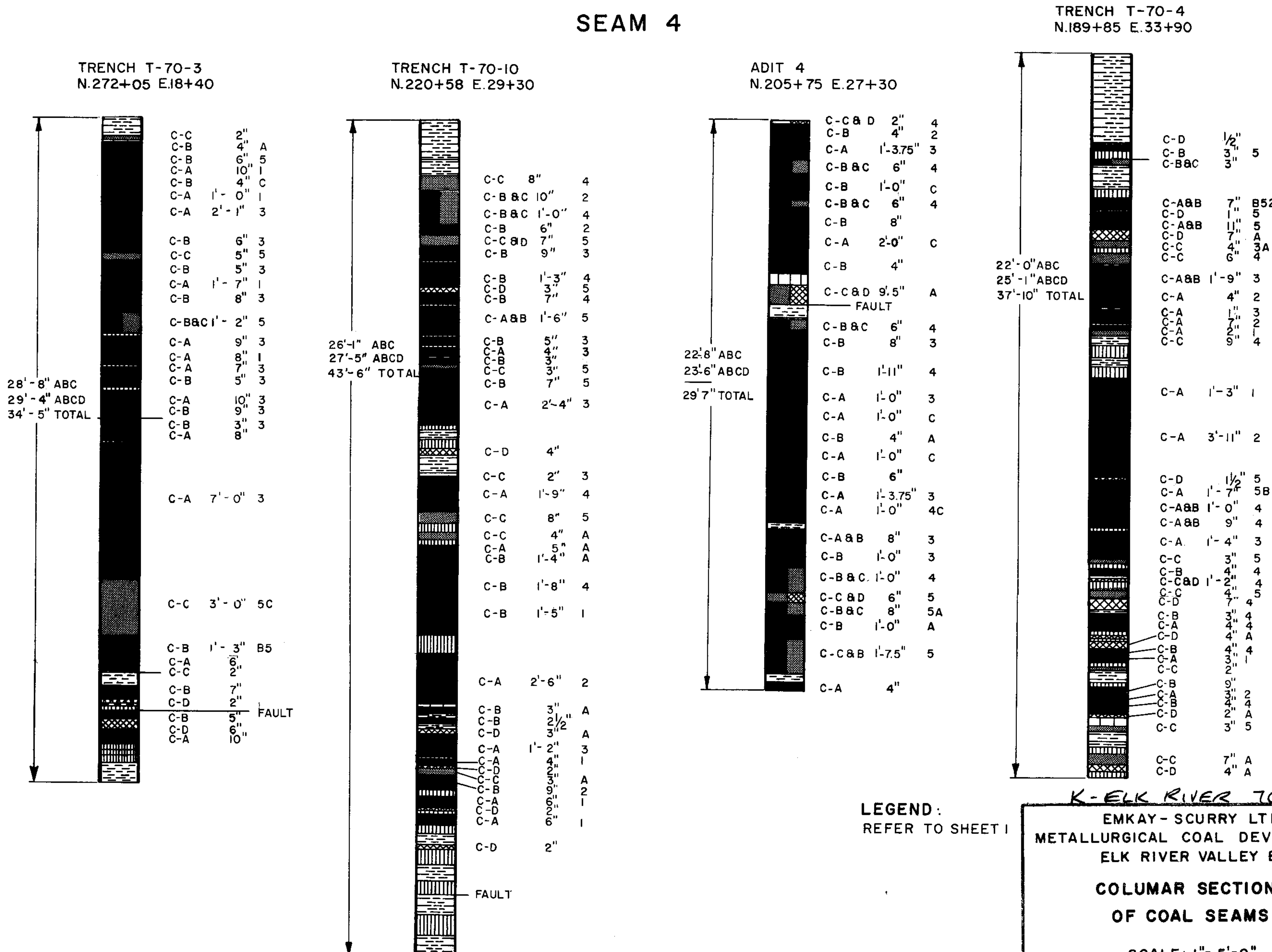
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY B.C.

COLUMAR SECTIONS OF COAL SEAMS

SCALE: 1"= 5'-0"
SHEET 1 OF 6

EXHIBIT No. 13

North SEAM 4 South



K-ELK RIVER 70(5)B.

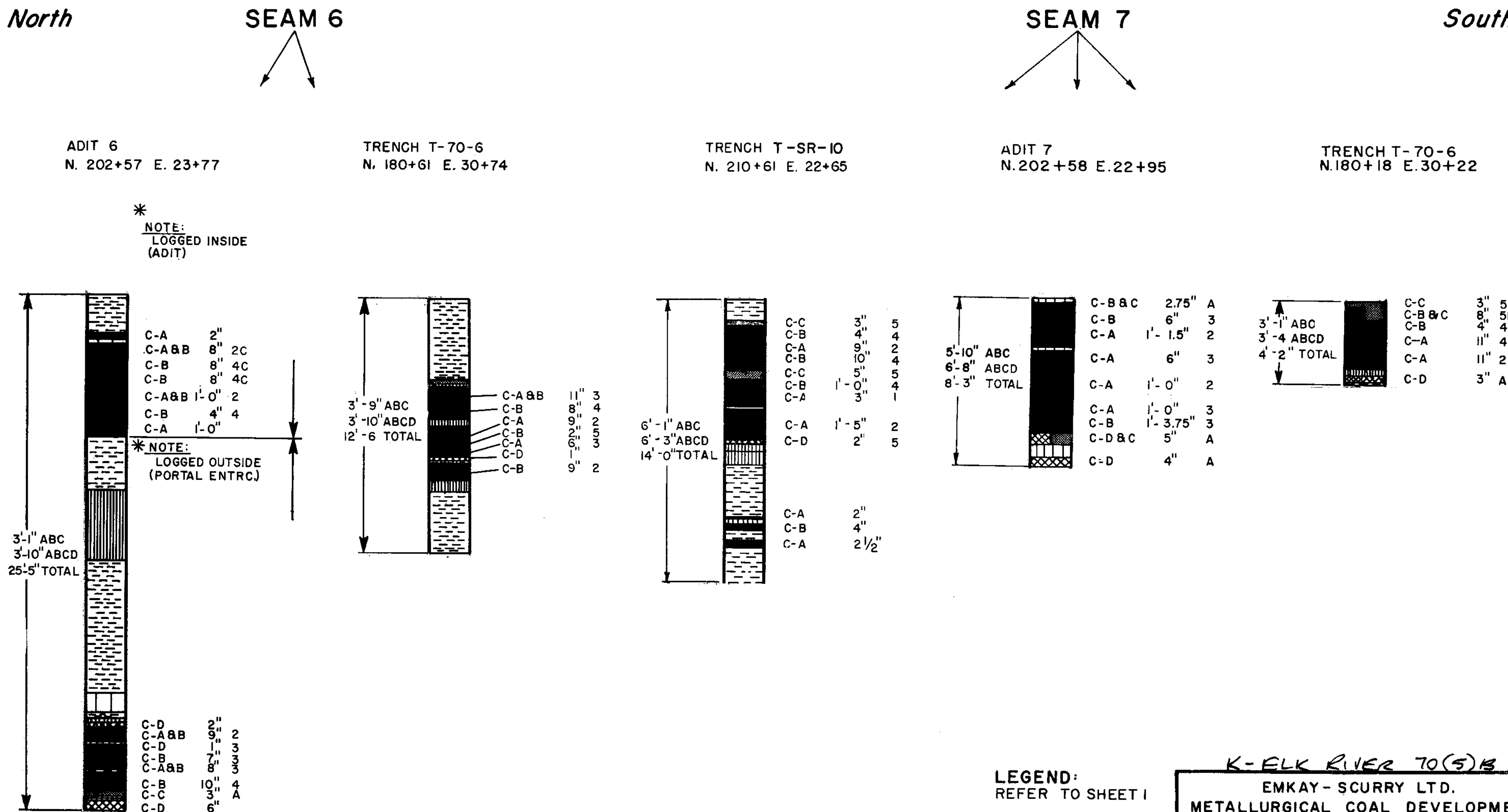
LEGEND:
REFER TO SHEET I

EMKAY- SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY B.C.

COLUMAR SECTIONS OF COAL SEAMS

SCALE: 1"= 5'-0"
SHEET 2 OF 6

EXHIBIT No.13



K-ELK RIVER 70(5)B

LEGEND:
REFER TO SHEET I

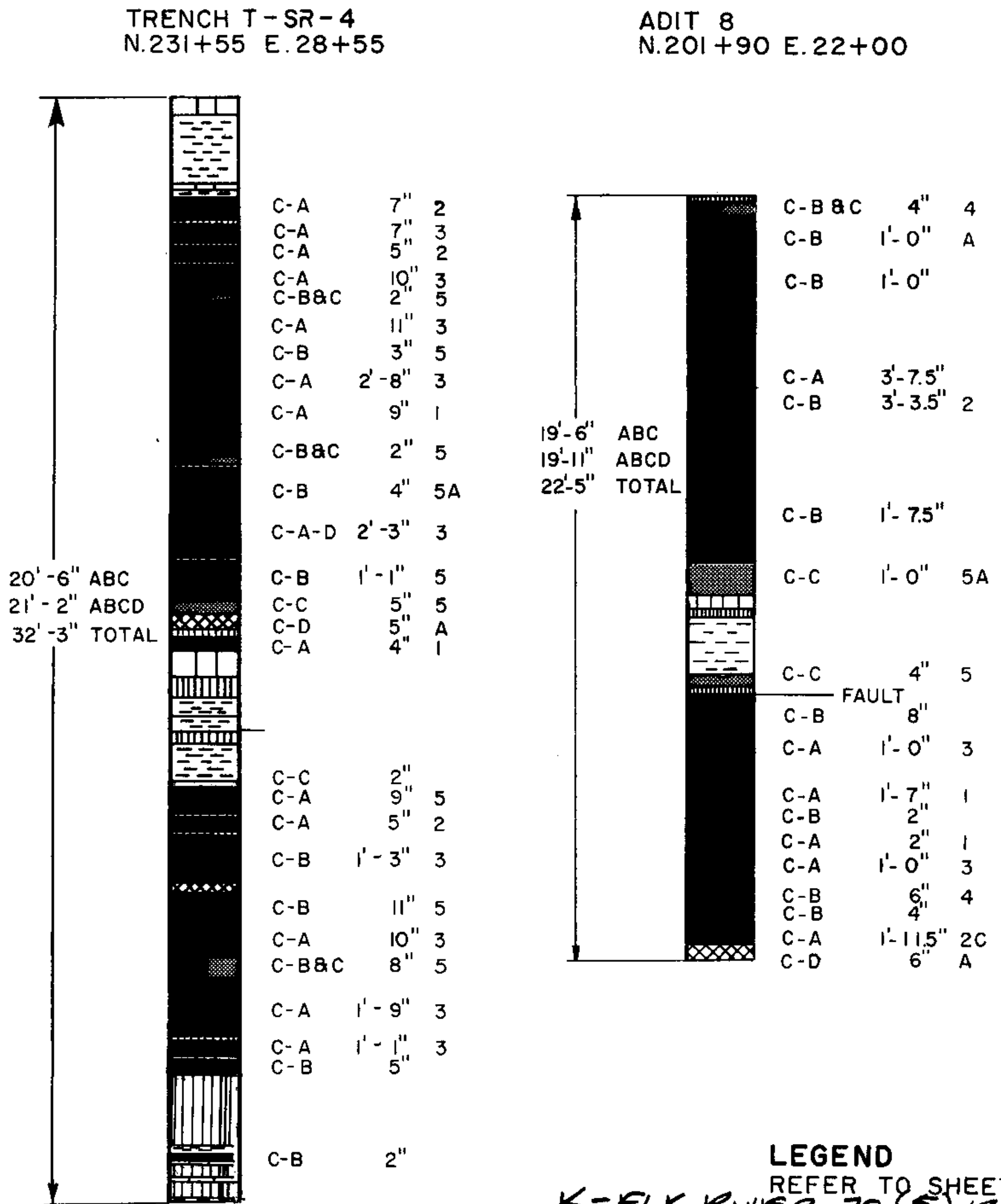
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY B.C.

COLUMAR SECTIONS OF COAL SEAMS

SCALE: 1" = 5'-0"
SHEET 3 OF 6

EXHIBIT No. 13

North **SEAM 8** *South*



LEGEND
REFER TO SHEET 1

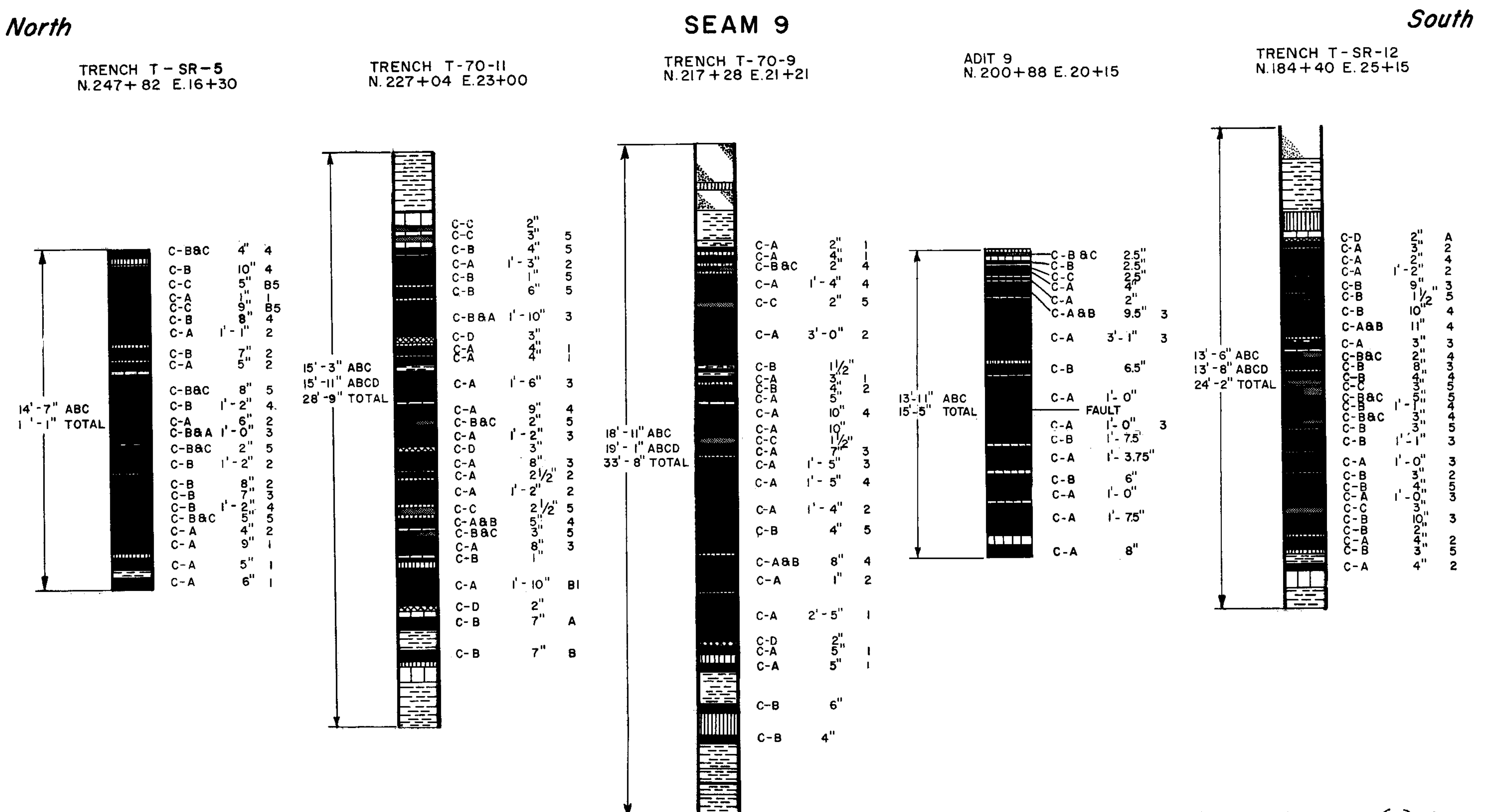
K-ELK RIVER 70(5) 13.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY B.C.

COLUMAR SECTIONS
OF COAL SEAMS

SCALE: 1" = 5'-0"
SHEET 4 OF 6

EXHIBIT No. 13



LEGEND:
REFER TO SHEET 1

K-ELK RIVER 70(5)B.

EMKAY-SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY B.C.

COLUMAR SECTIONS OF COAL SEAMS

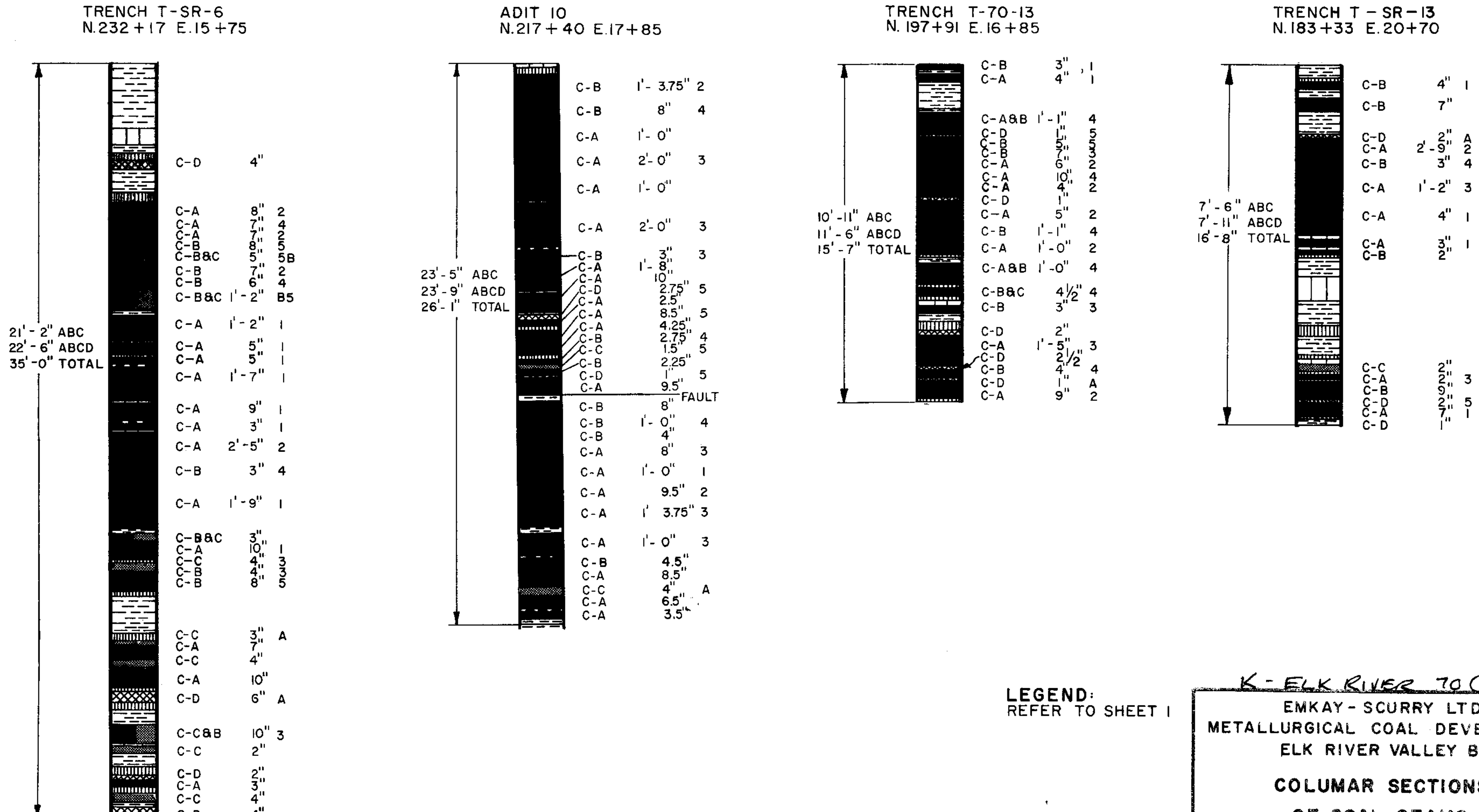
SCALE: 1" = 5'-0"
SHEET 5 OF 6

EXHIBIT No. 13

North

SEAM 10

South



LEGEND:
REFER TO SHEET 1

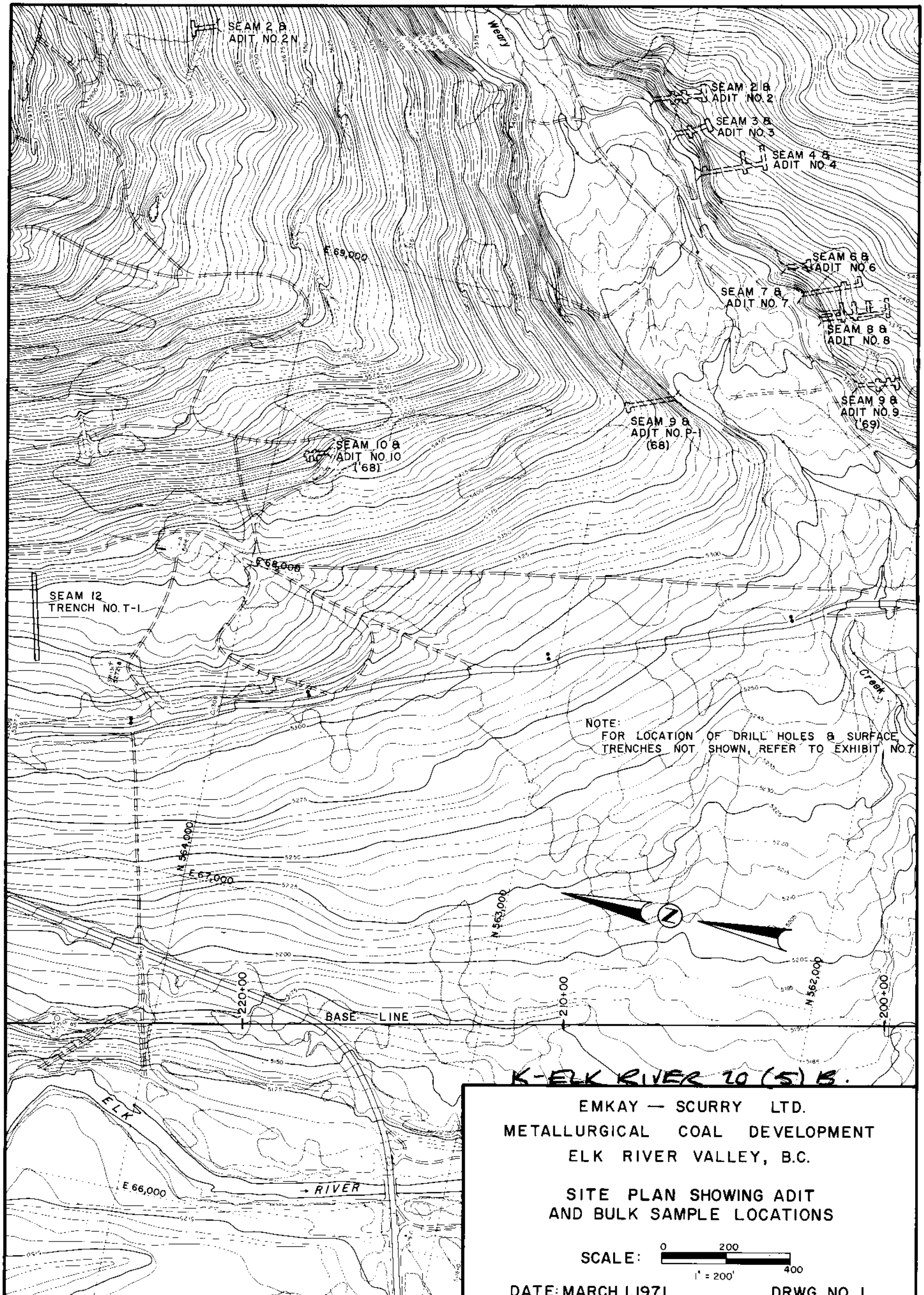
K - ELK RIVER 70 (5) B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY B.C.

COLUMAR SECTIONS OF COAL SEAMS

SCALE: 1" = 5'-0"
SHEET 6 OF 6

EXHIBIT No.13



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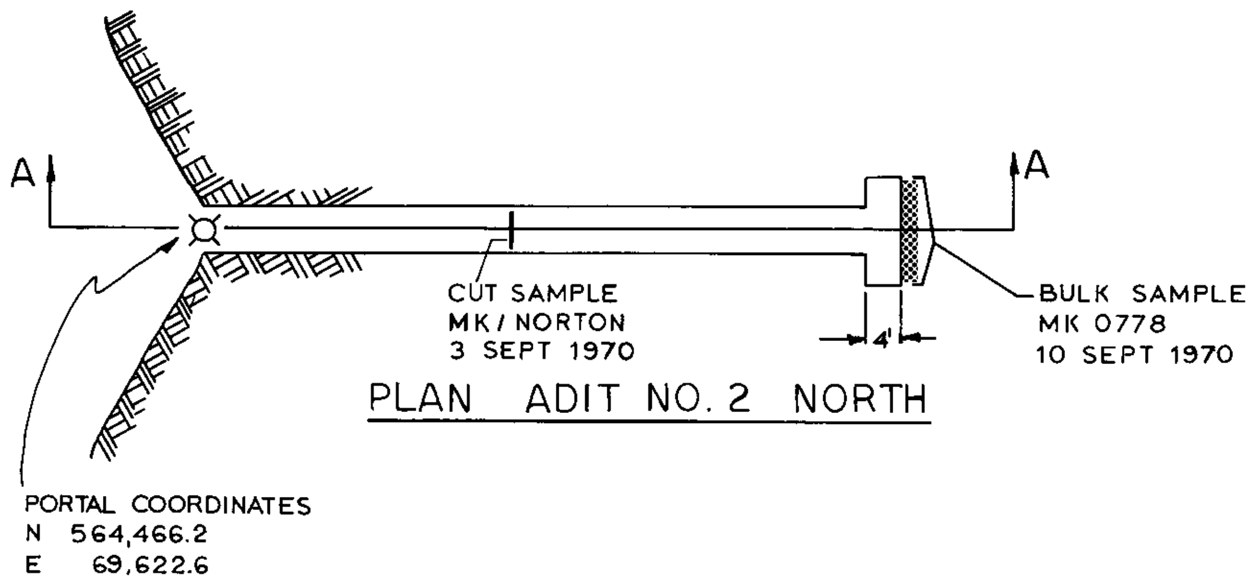
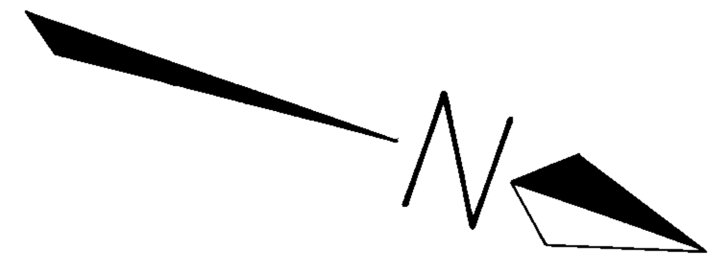
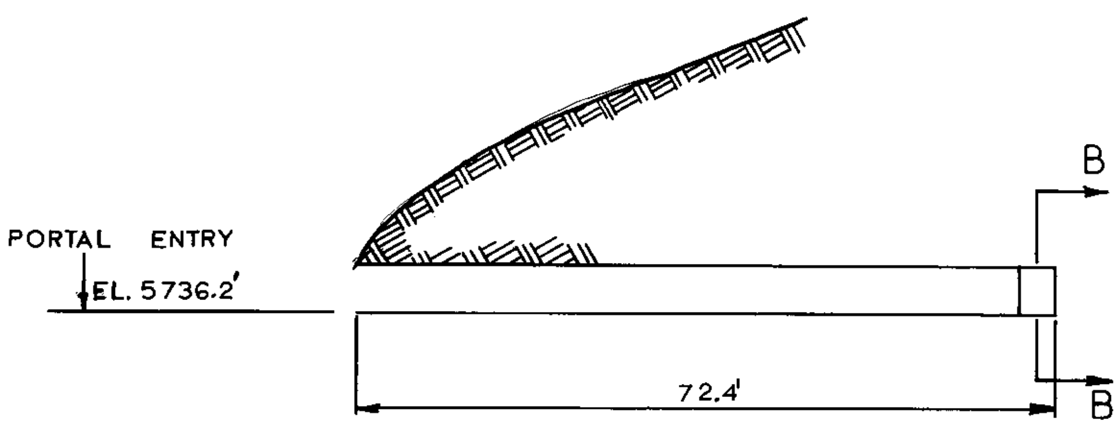
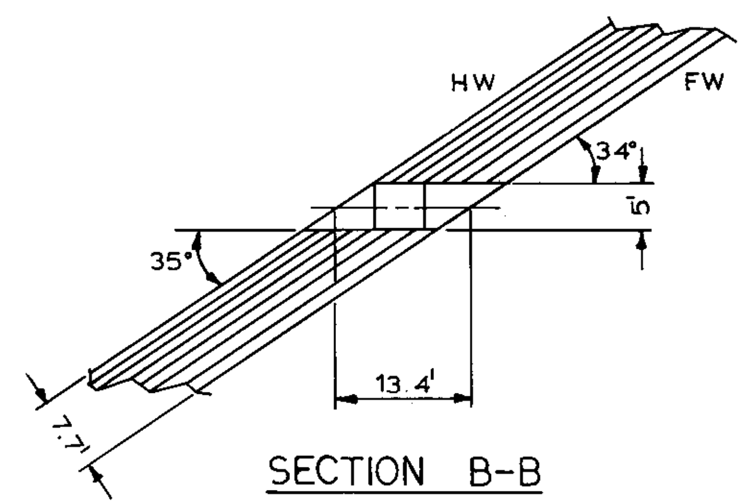


PLAN ADIT NO. 2 NORTH





SECTION A—A



SECTION B-B
(MK)

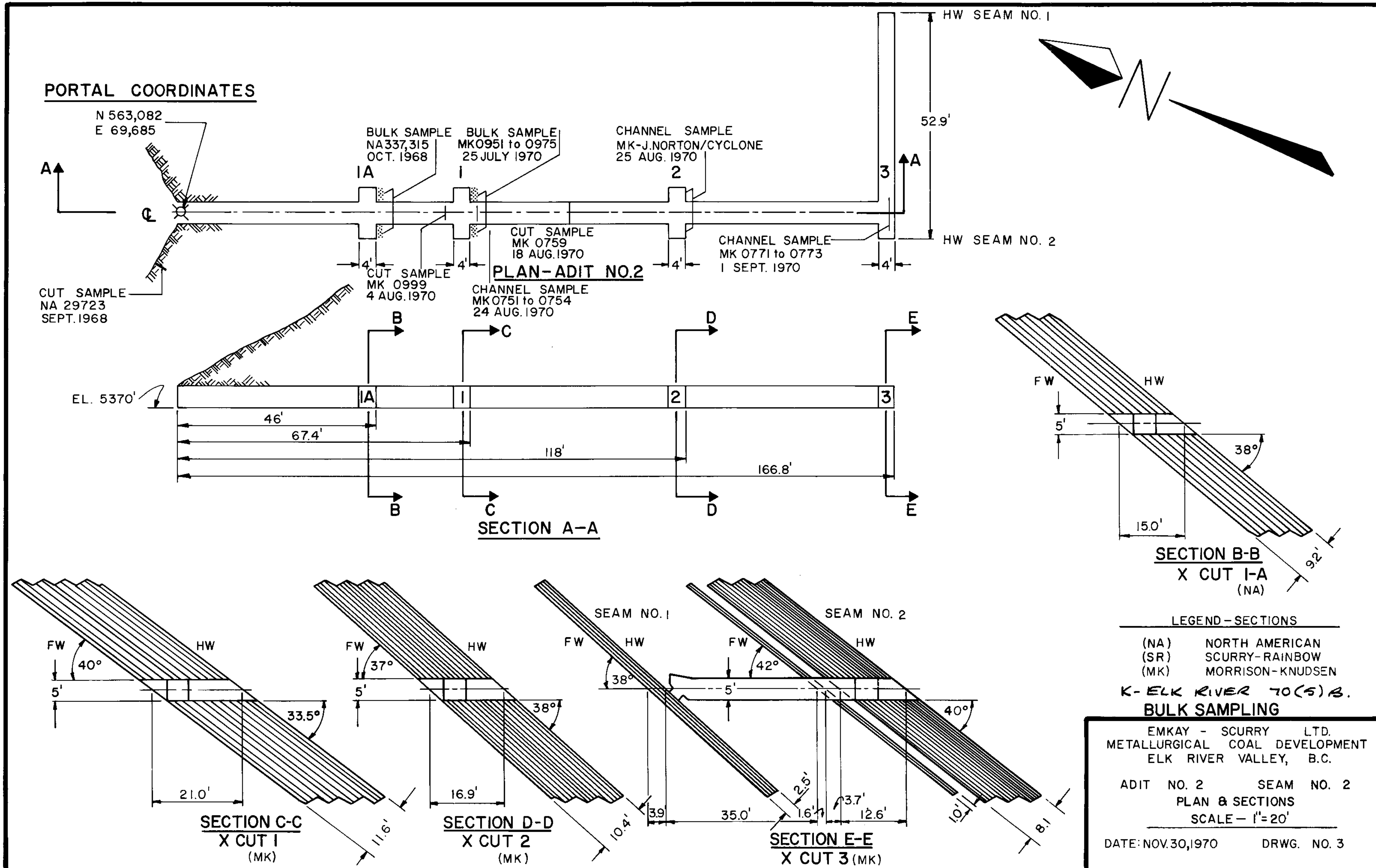
K- ELK RIVER 70(5)B.

BULK SAMPLING

EMKAY—SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. 2 NORTH SEAM NO. 2
PLAN & SECTIONS
SCALE — 1" = 20'

DATE : NOV. 30, 1970 DRWG. NO. 2

EXHIBIT NO. 14



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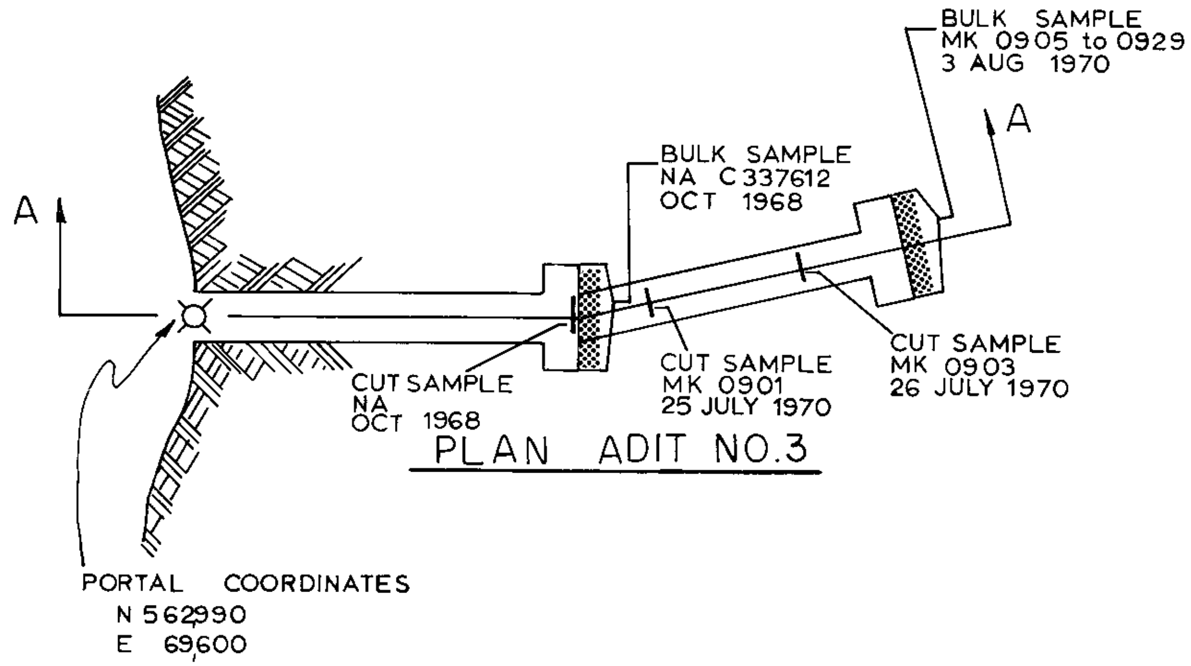
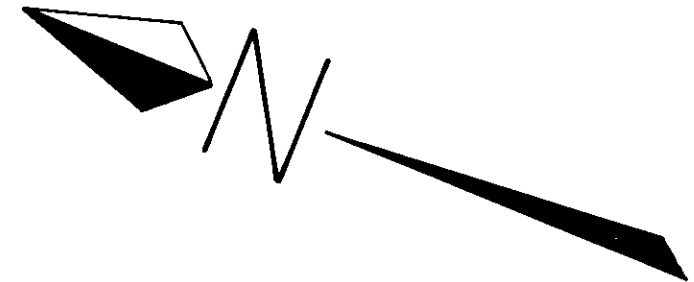
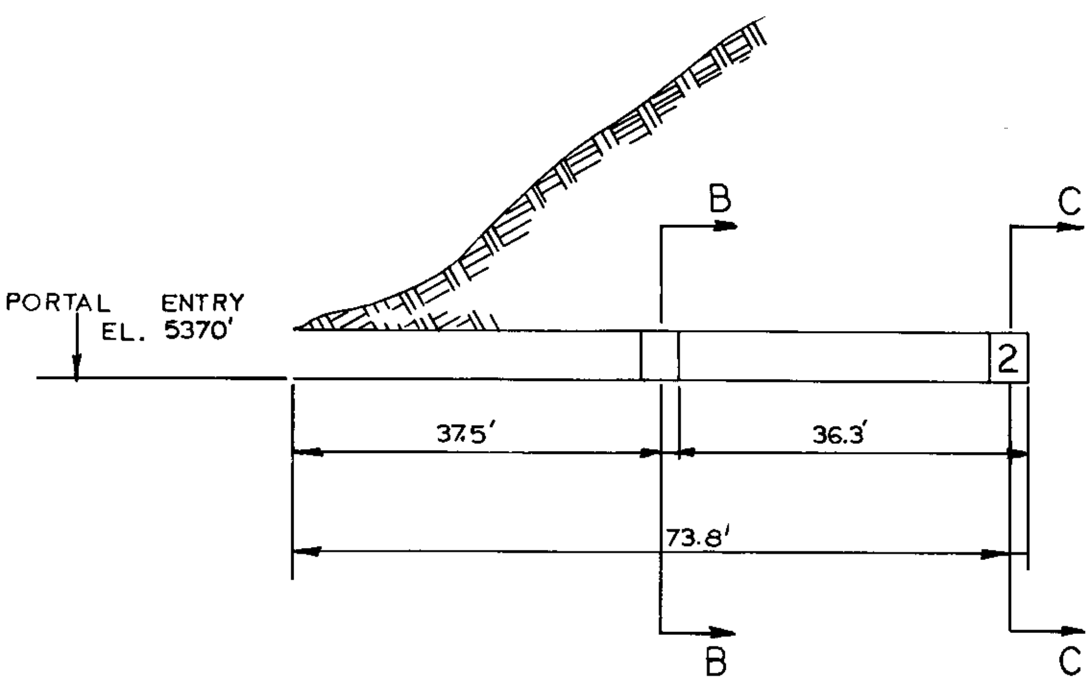
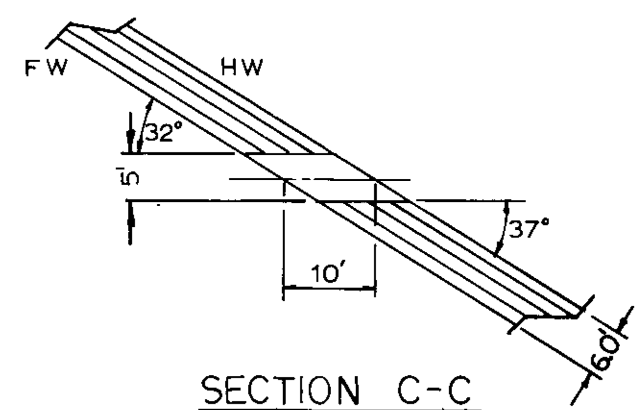


PLAN ADIT NO.3





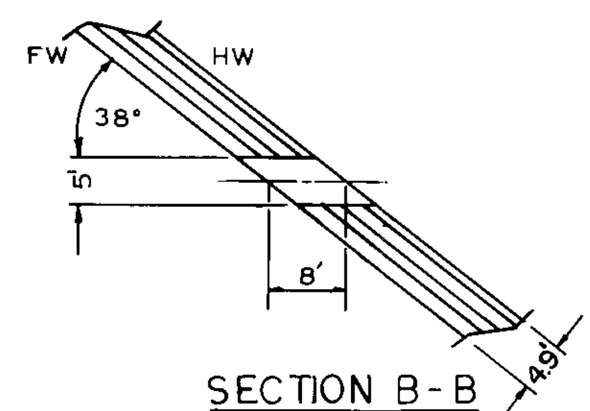
SECTION A-A



SECTION C-C

XCUT NO. 2

(MK)



SECTION B-B

(NA)

K-ELK RIVER 70(5)B.

BULK SAMPLING

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT

ELK RIVER VALLEY, B. C.

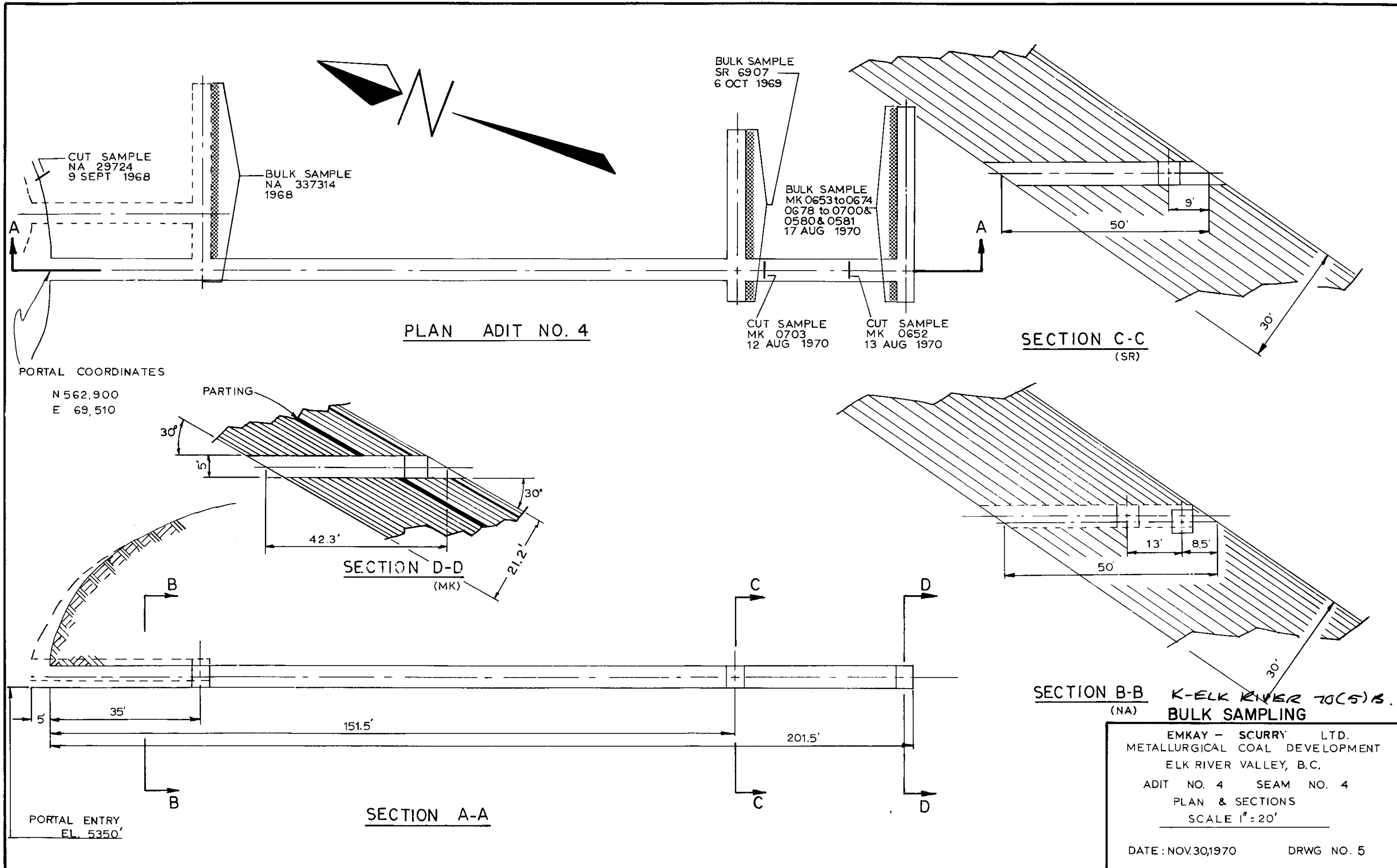
ADIT NO. 3 SEAM NO. 3

PLAN & SECTIONS

SCALE 1"= 20'

DATE: NOV.30,1970 DRWG. NO. 4

EXHIBIT NO. 14



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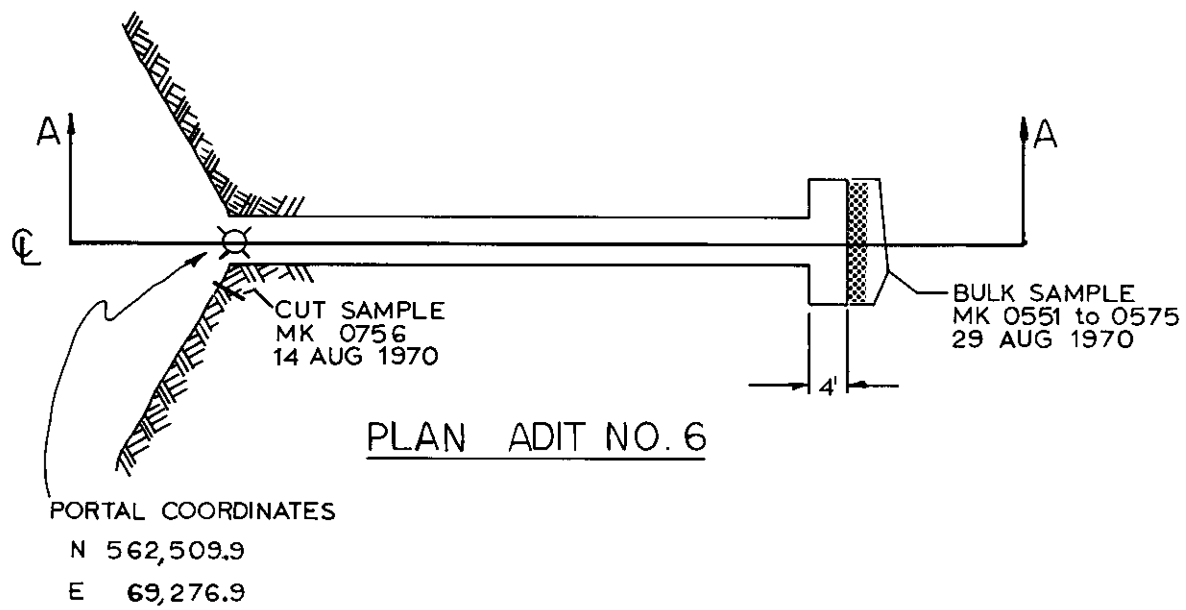
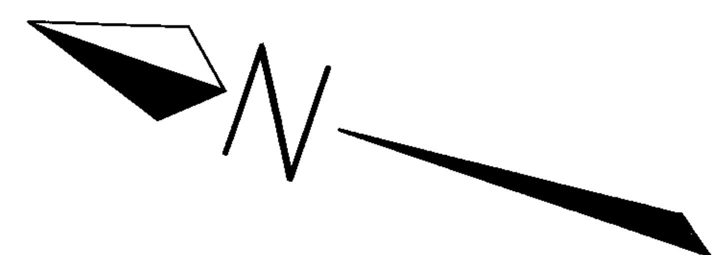
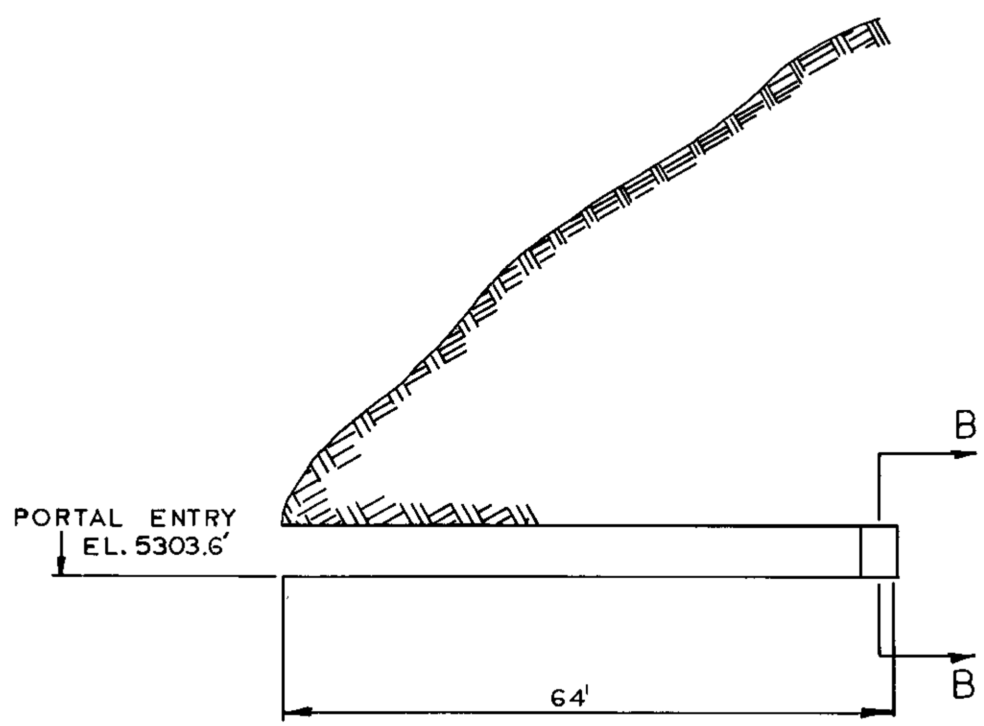
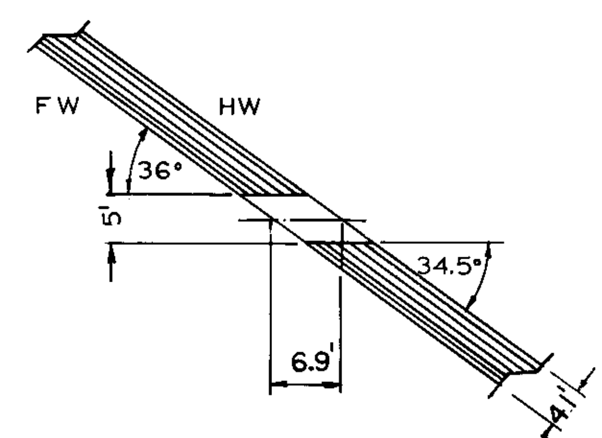


PLAN ADIT NO. 6





SECTION A-A



SECTION B-B
(MK)

K- ELK RIVER 70(5)B.

BULK SAMPLING

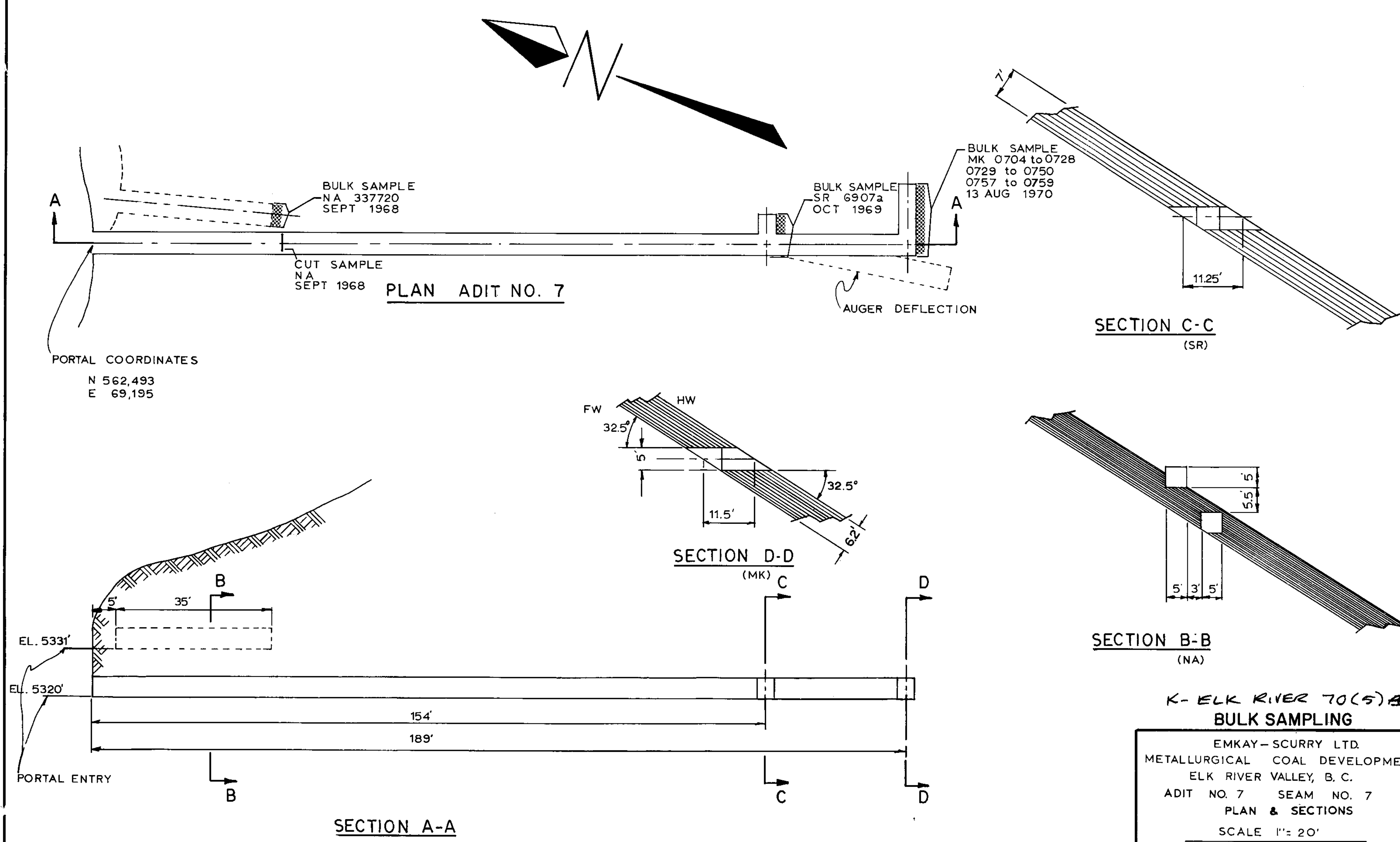
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

ADIT NO. 6 SEAM NO. 6
PLAN & SECTIONS

SCALE 1" = 20'

DATE : NOV.30,1970 DRWG NO. 6

EXHIBIT NO. 14



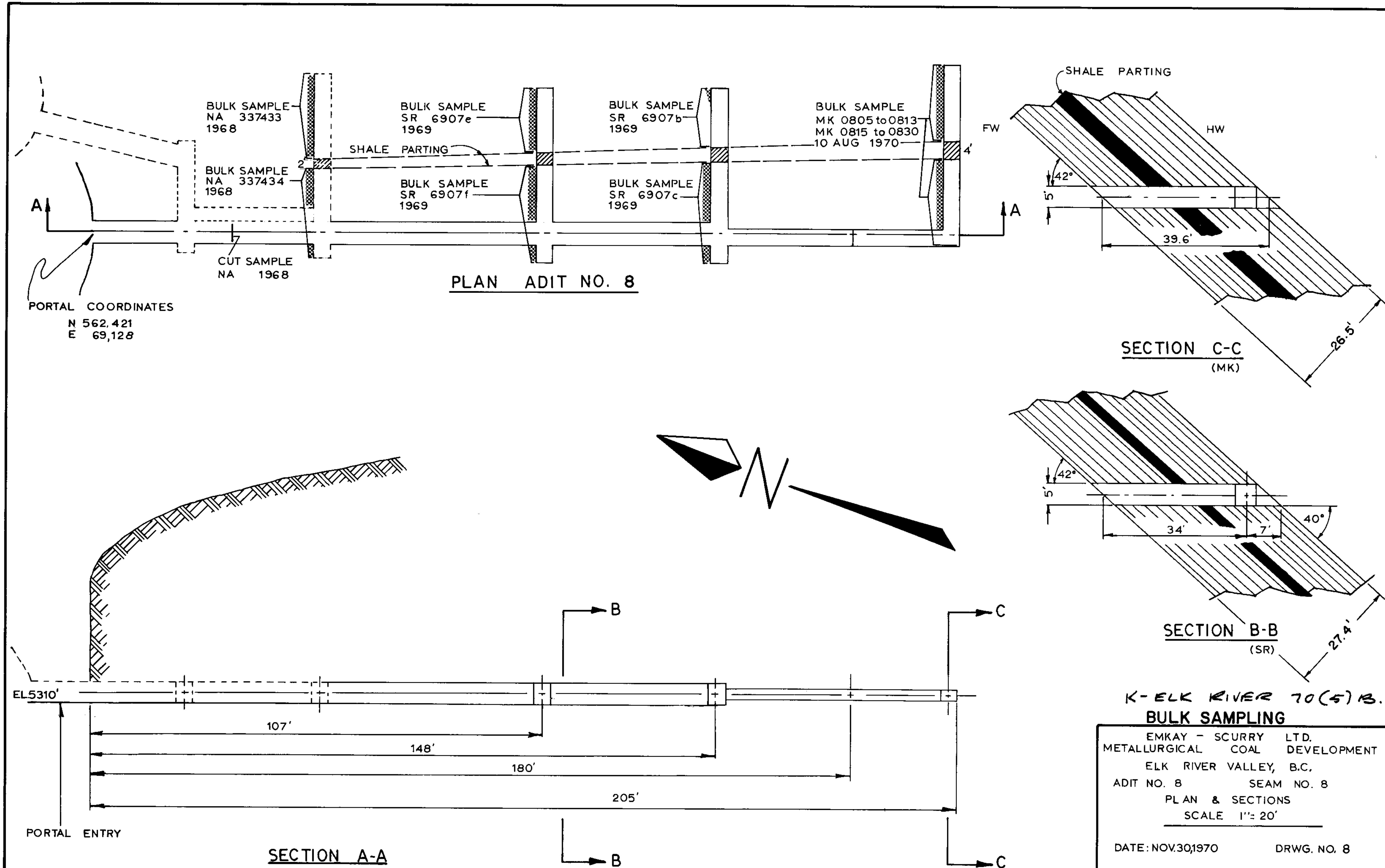
K- ELK RIVER 70(5)B

BULK SAMPLING

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. 7 SEAM NO. 7
PLAN & SECTIONS
SCALE 1"= 20'

DATE: NOV. 30, 1970 DRWG. NO. 7

EXHIBIT NO. 14



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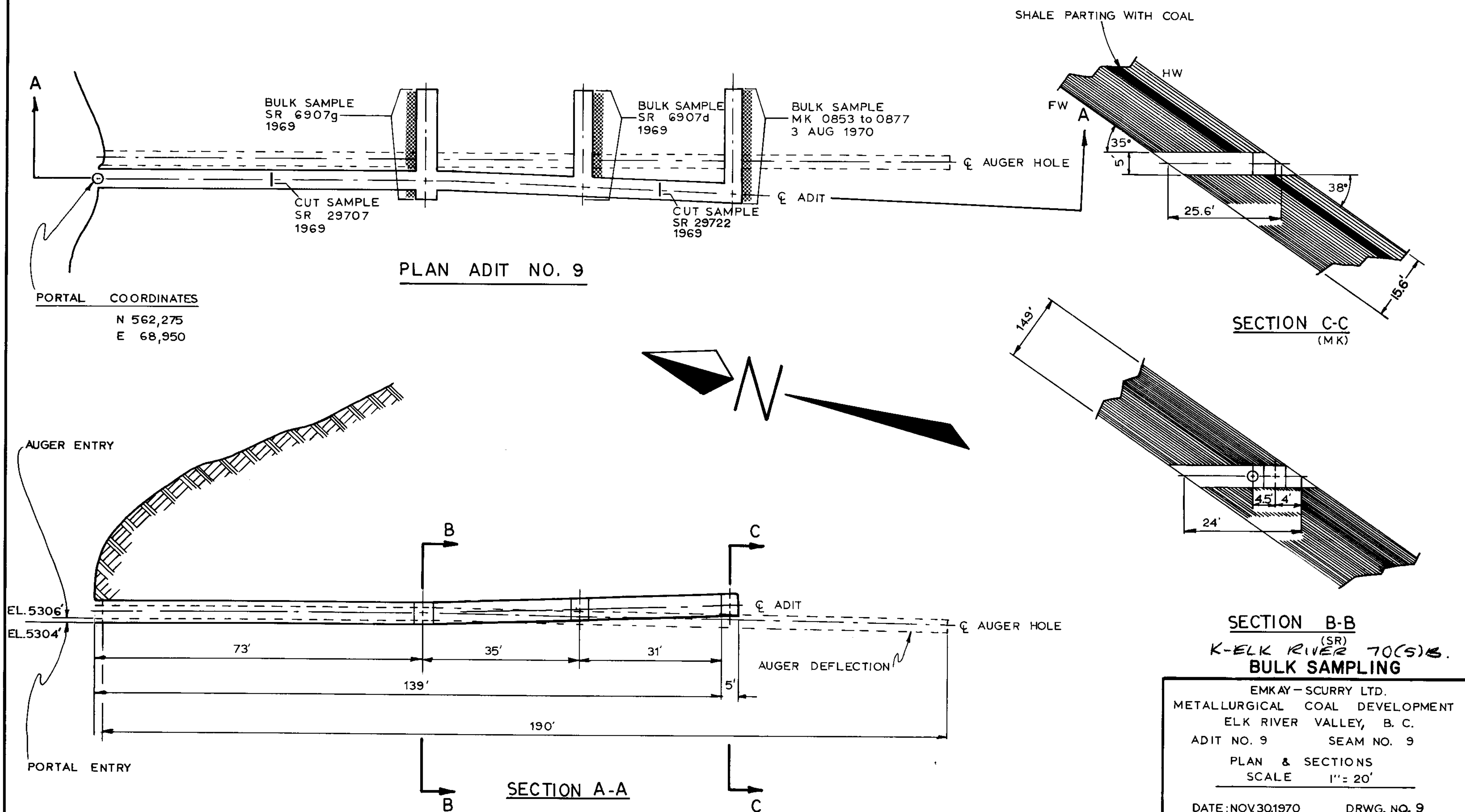


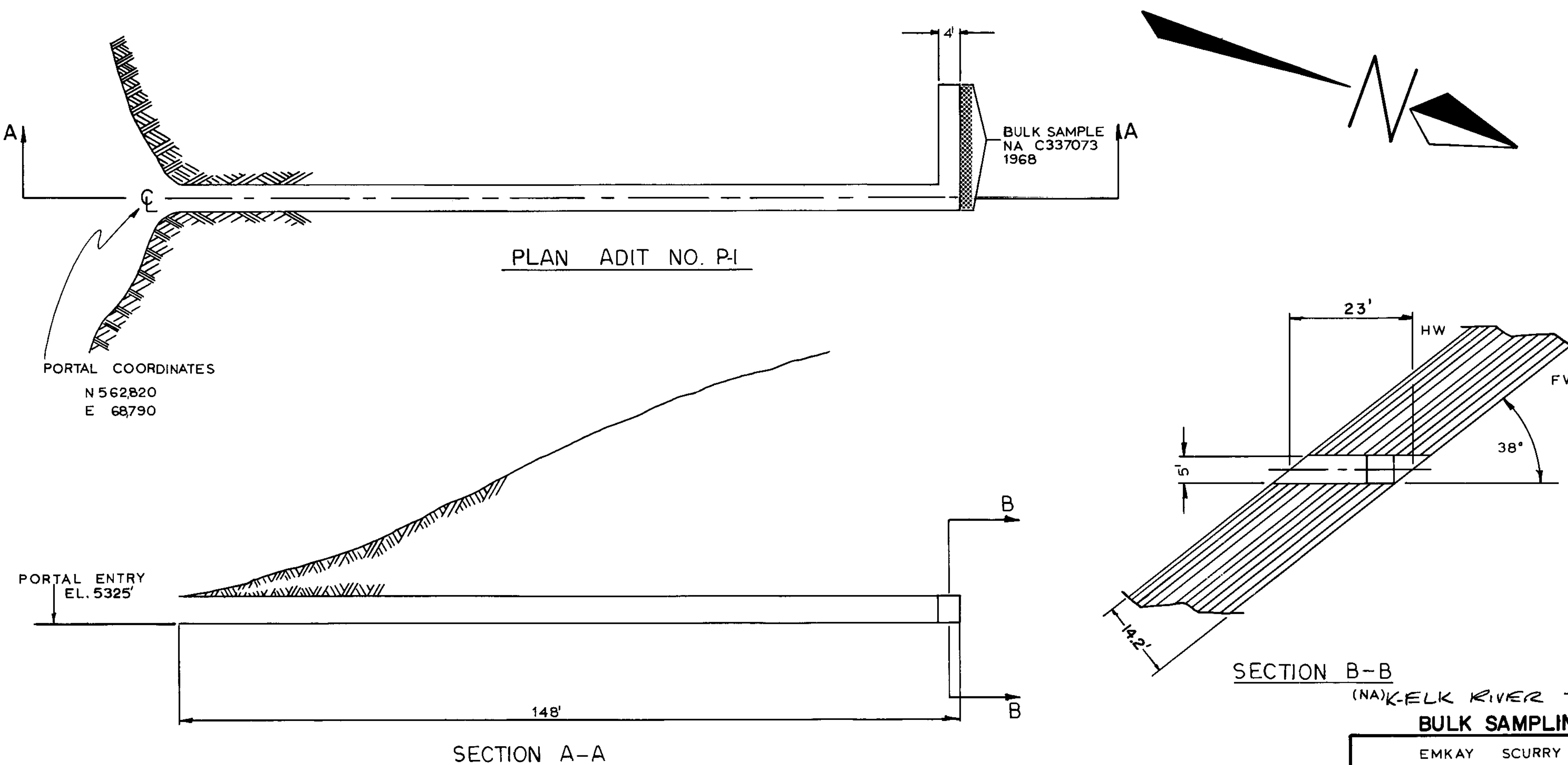
K-ELK RIVER 70(5)B.

BULK SAMPLING

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. 9 SEAM NO. 9
PLAN & SECTIONS
SCALE 1" = 20'

DATE: NOV. 30, 1970 DRWG. NO. 9

EXHIBIT NO. 14



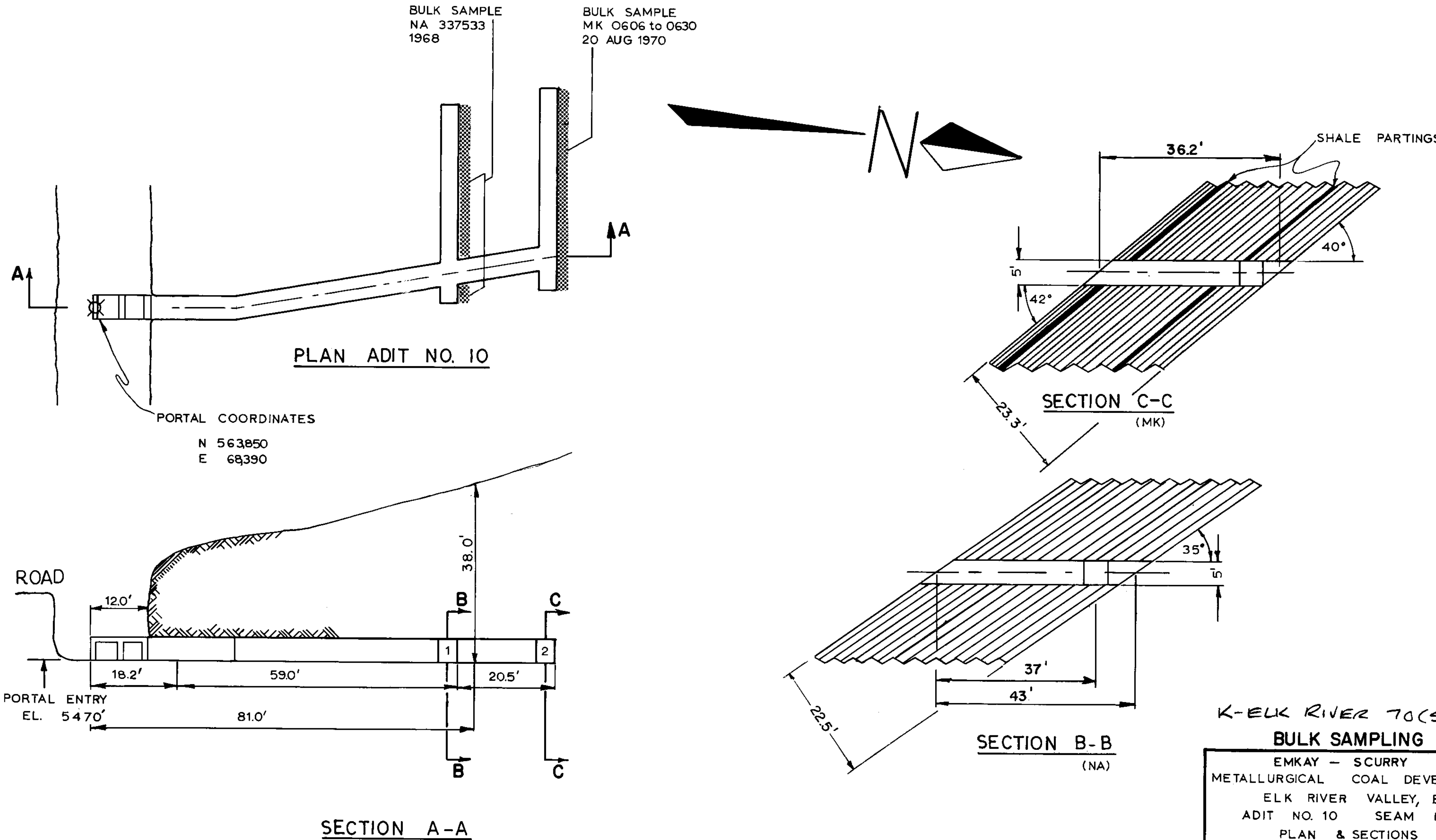
(NA) K-ELK RIVER 70(5)R.

BULK SAMPLING

EMKAY SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. P-1 SEAM NO. 9
PLAN & SECTIONS
SCALE 1"=20'

DATE: NOV. 30,1970 DRWG NO. 10

EXHIBIT NO. 14



K-ELK RIVER 70(5)B.

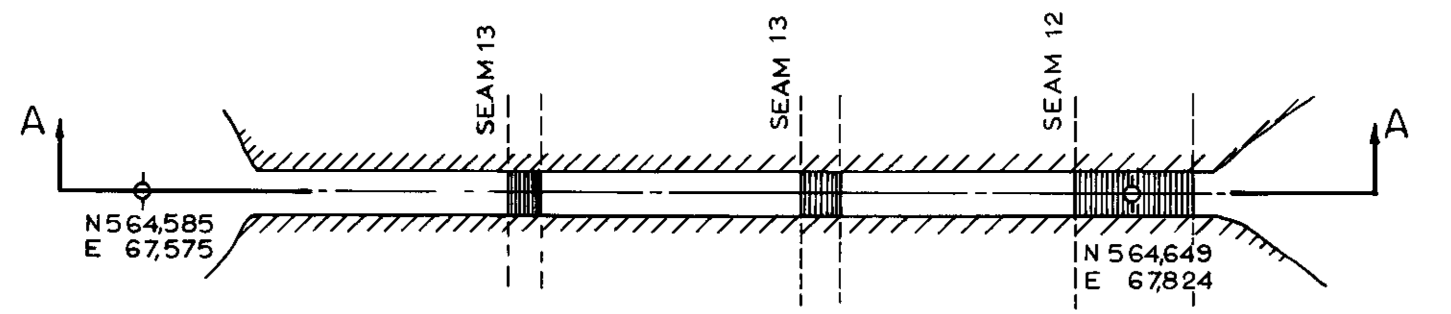
BULK SAMPLING

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. 10 SEAM NO. 10
PLAN & SECTIONS

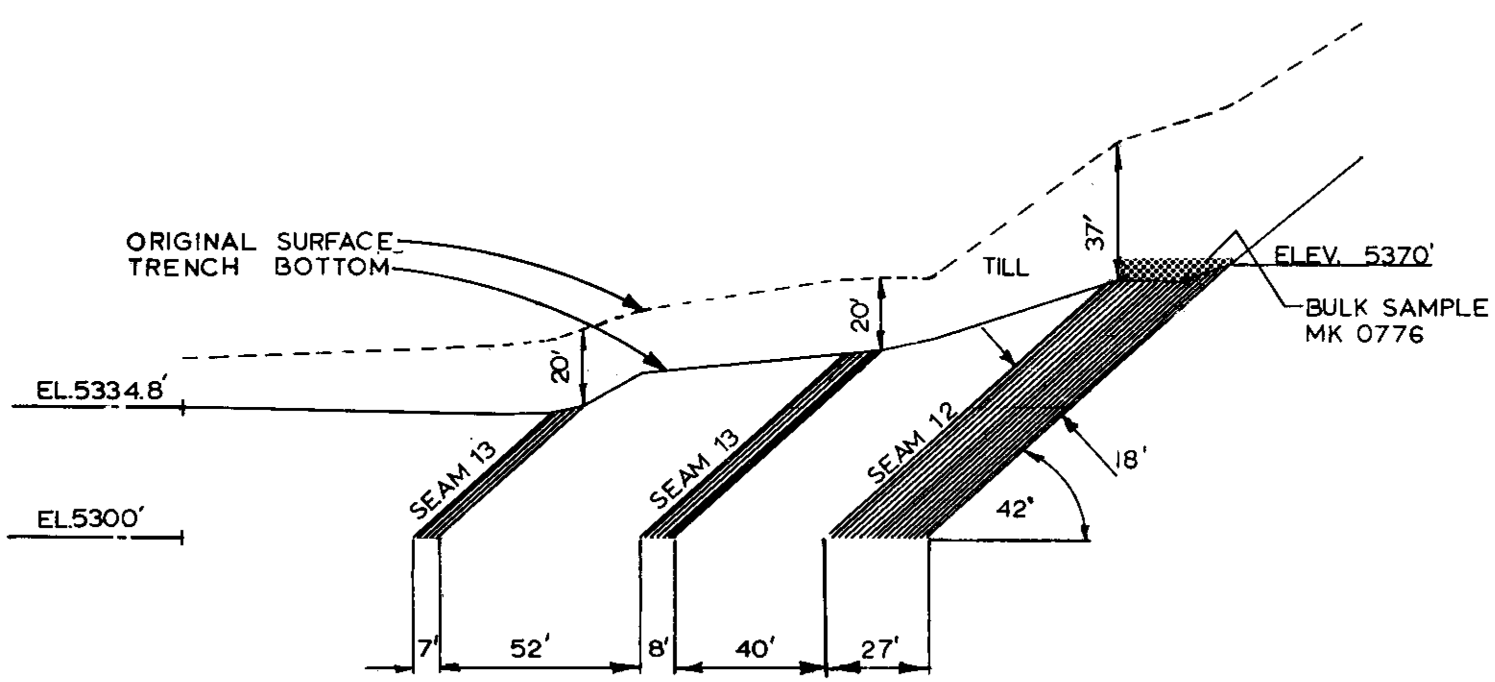
SCALE 1"=20'

DATE: NOV. 30,1970 DRWG NO. 11

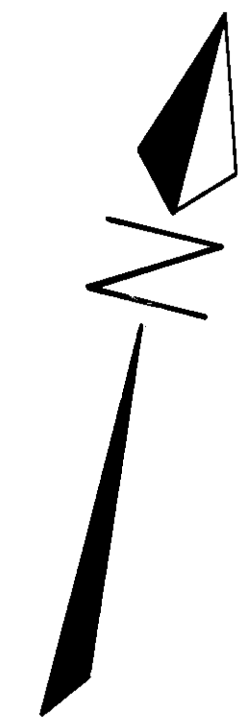
EXHIBIT NO. 14



PLAN T-70-1



SECTION A-A



BULK SAMPLING
SEAM NO. 12

K-ELK RIVER 70(5)B

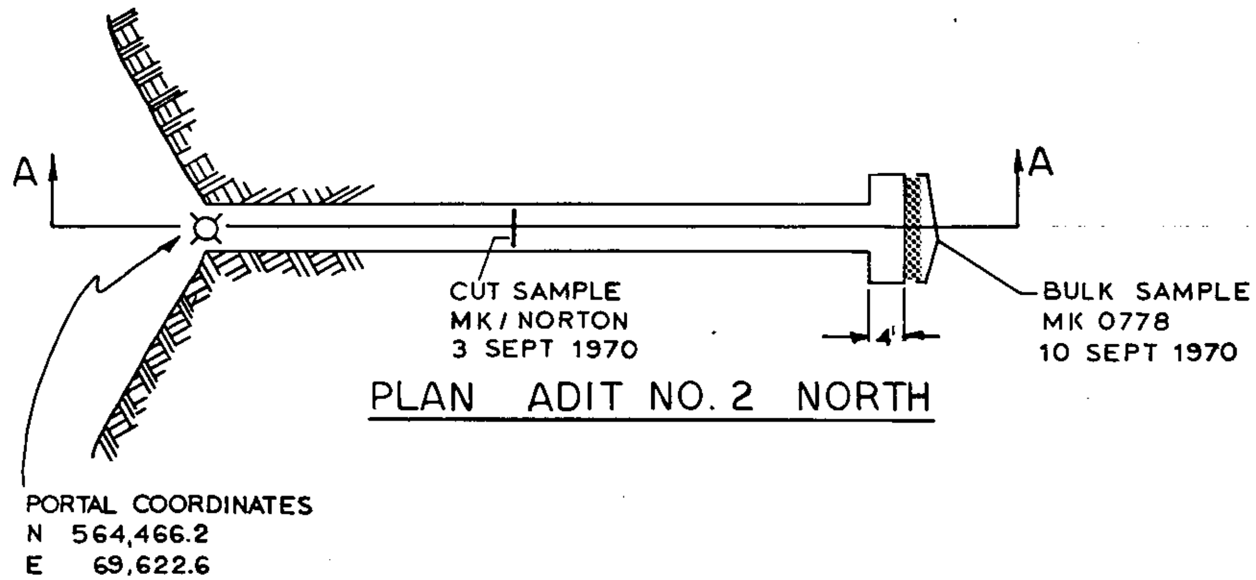
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

T-70-1
PLAN & PROFILE

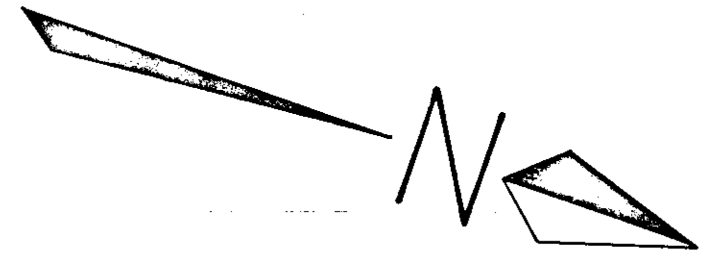
SCALE 1" = 50'

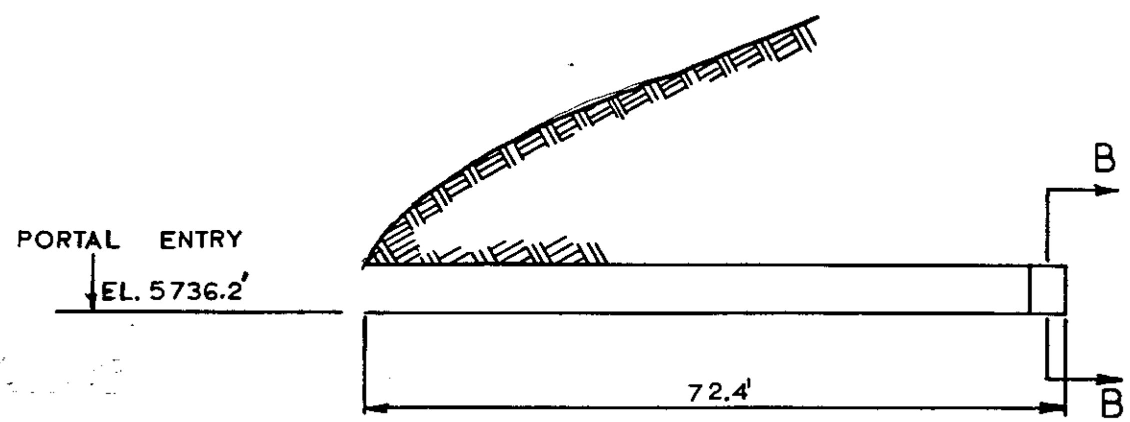
DATE: NOV. 30, 1970 DRWG NO. 12

EXHIBIT NO. 14

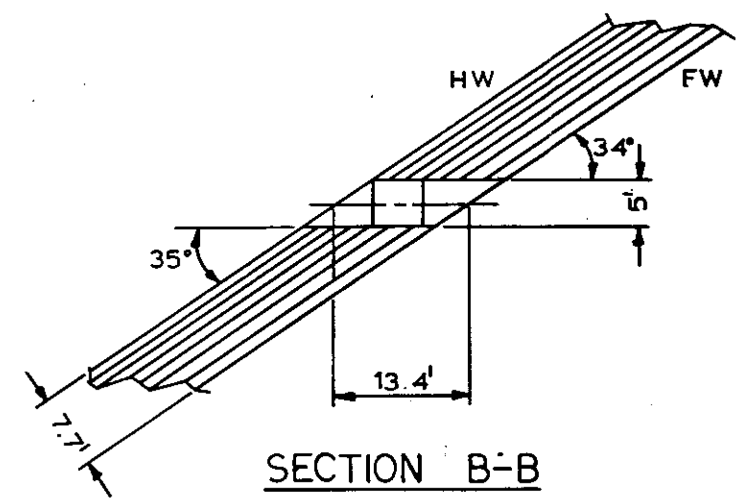


PLAN ADIT NO. 2 NORTH





SECTION A—A



SECTION B-B
(MK)

269

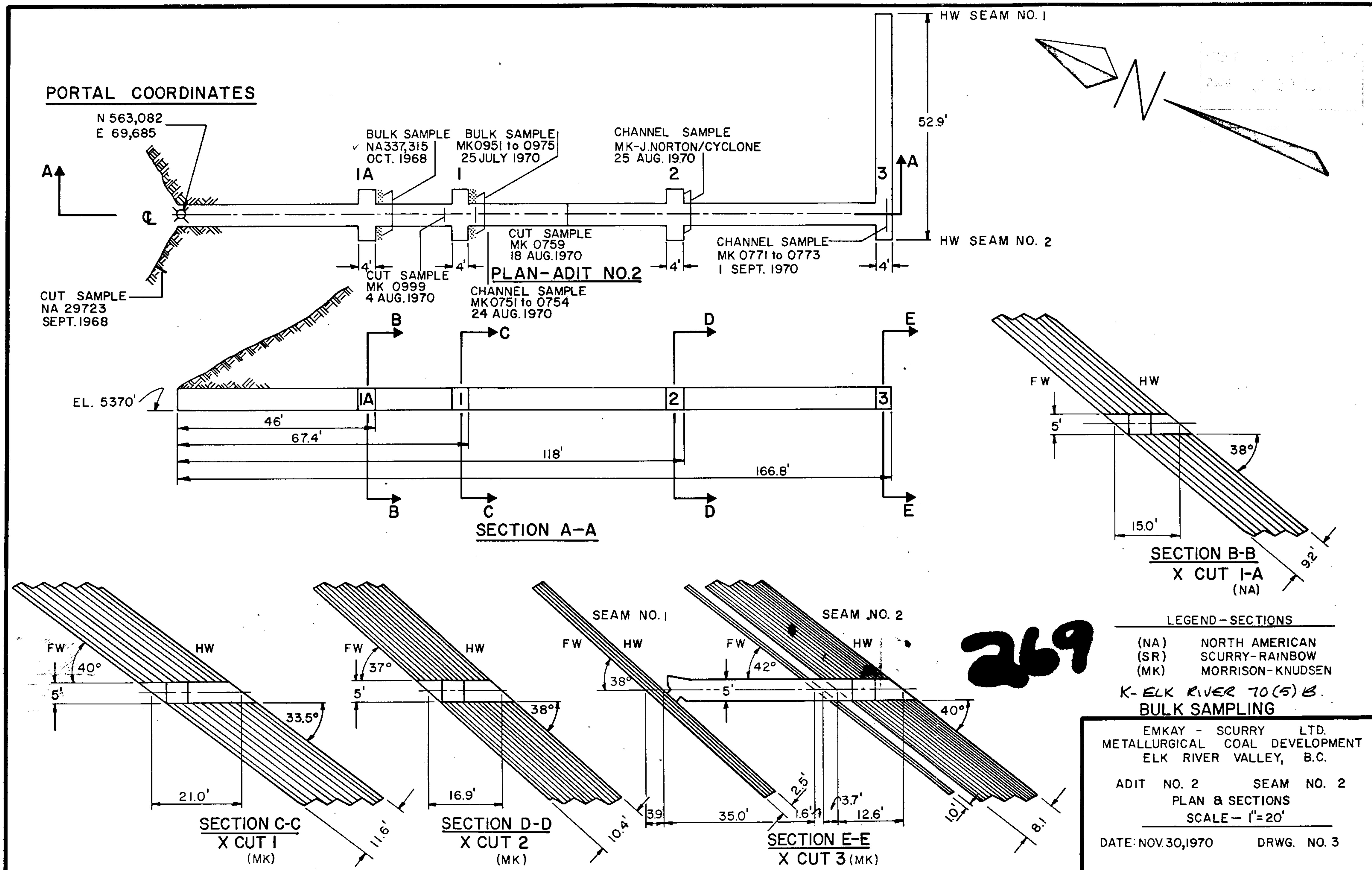
K-ELK RIVER 70

BULK SAMPLING

EMKAY—SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. 2 NORTH SEAM NO. 2
PLAN & SECTIONS
SCALE — 1"= 20'

DATE : NOV. 30,1970 DRWG. NO. 2

EXHIBIT NO. 14



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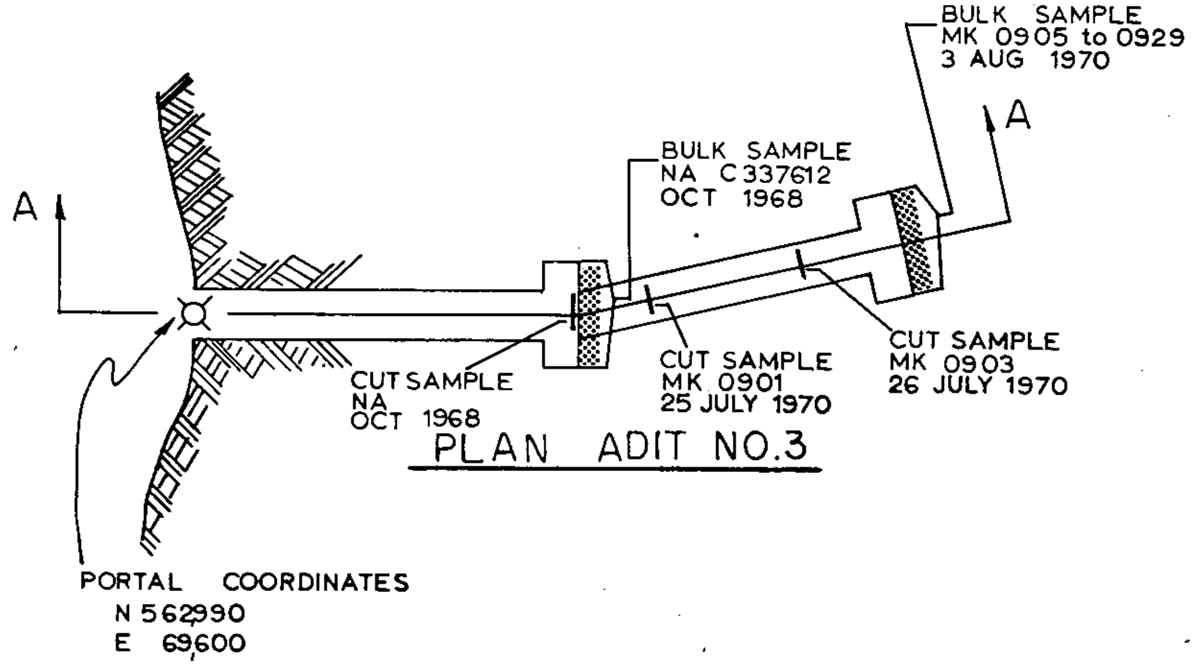

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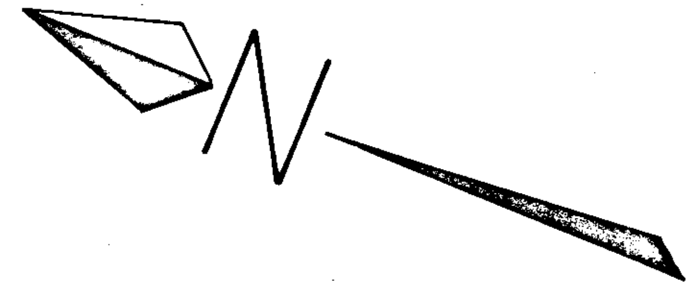
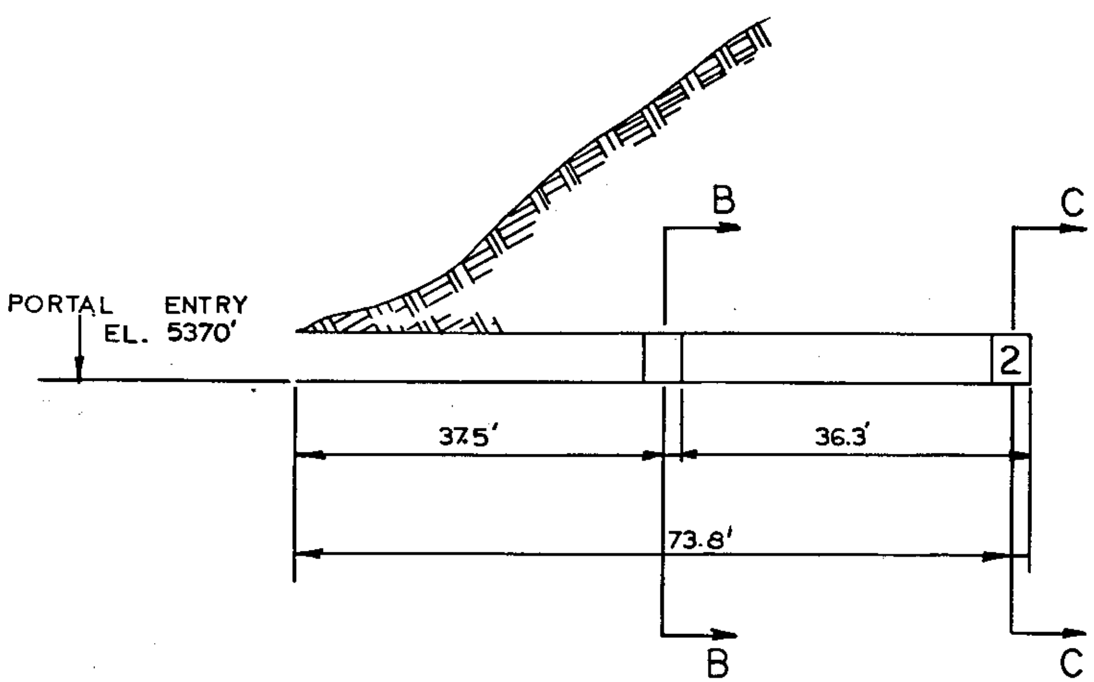
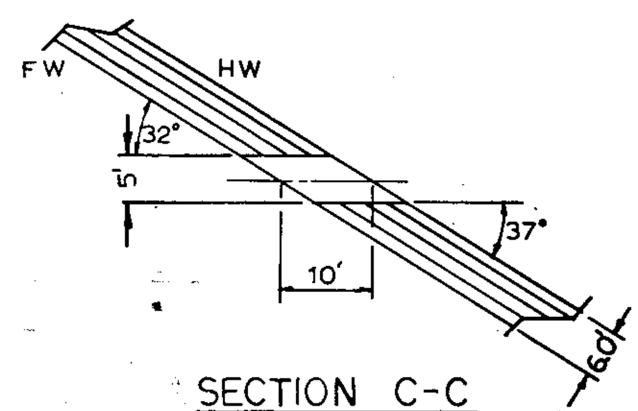


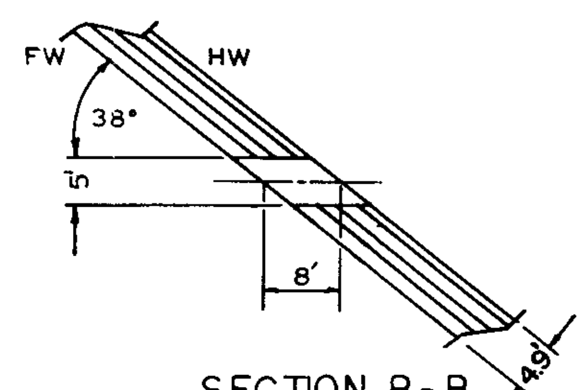


SECTION A-A



SECTION C-C

XCUT NO. 2
(MK)



SECTION B-B
(NA)

269

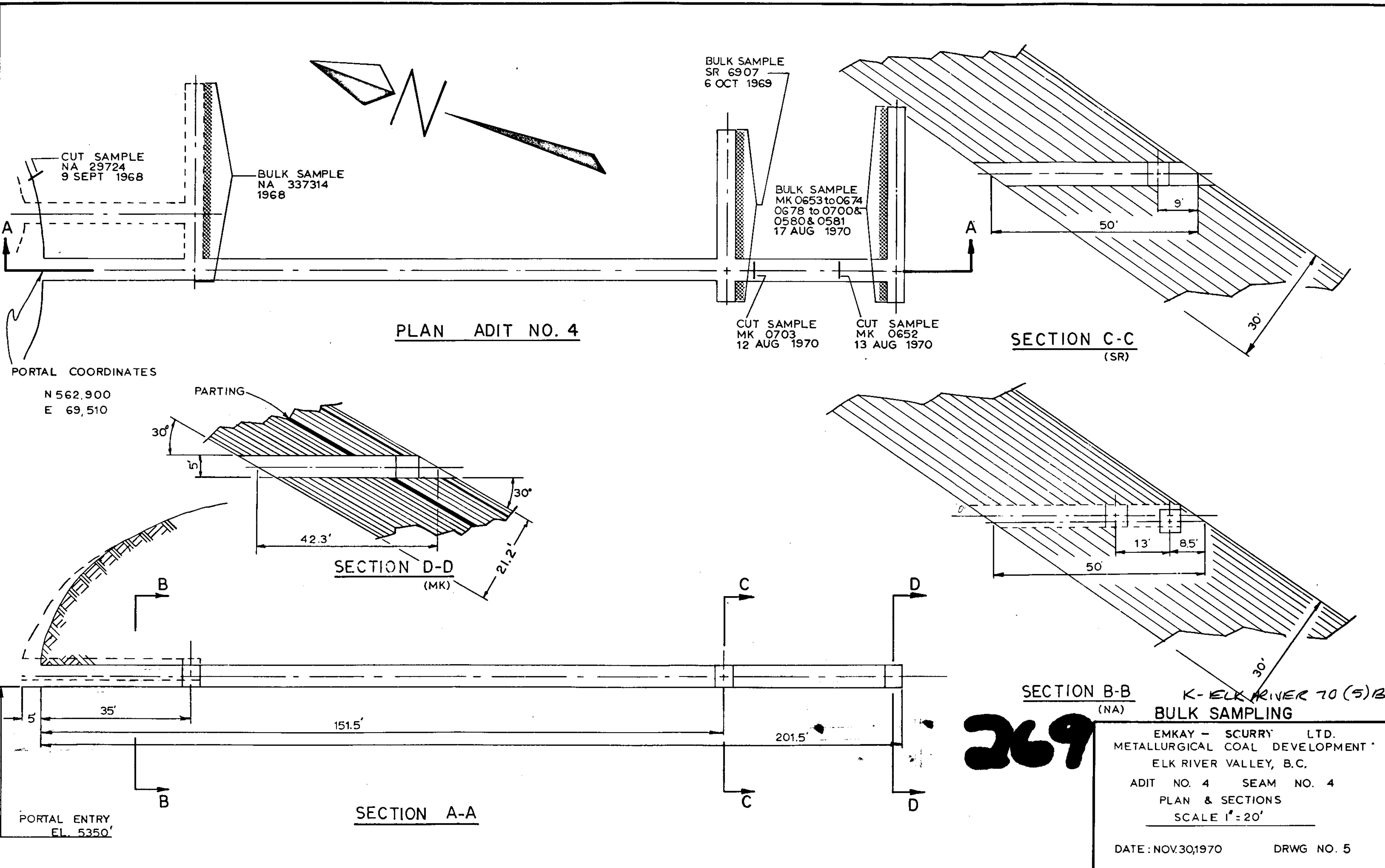
K-ELK RIVER 70(5)B.

BULK SAMPLING

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. 3 SEAM NO. 3
PLAN & SECTIONS
SCALE 1"= 20'

DATE: NOV.30,1970 DRWG. NO. 4

EXHIBIT NO. 14



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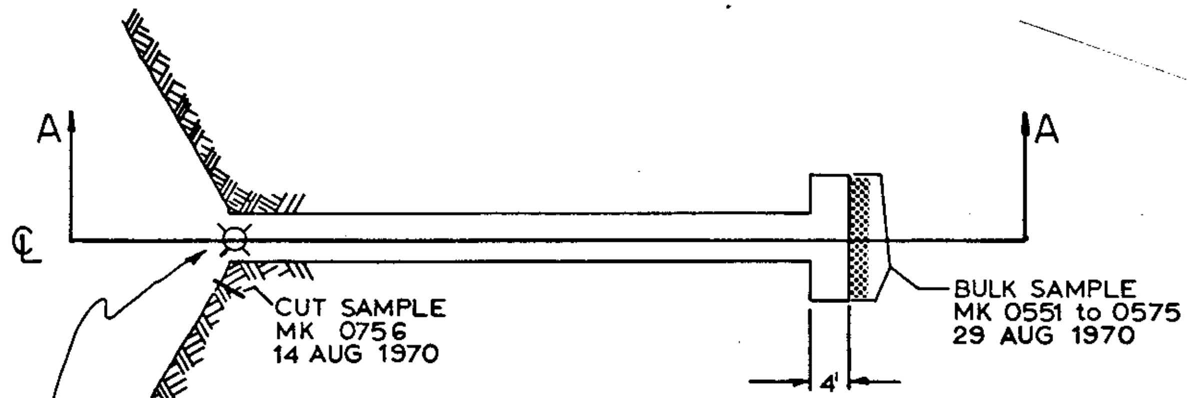
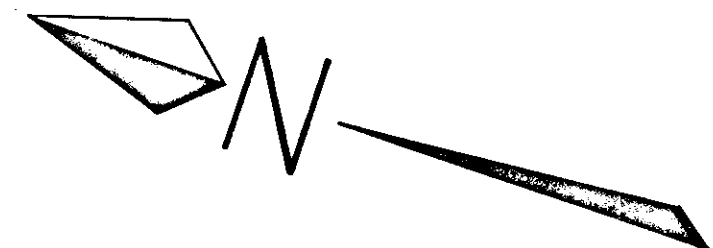
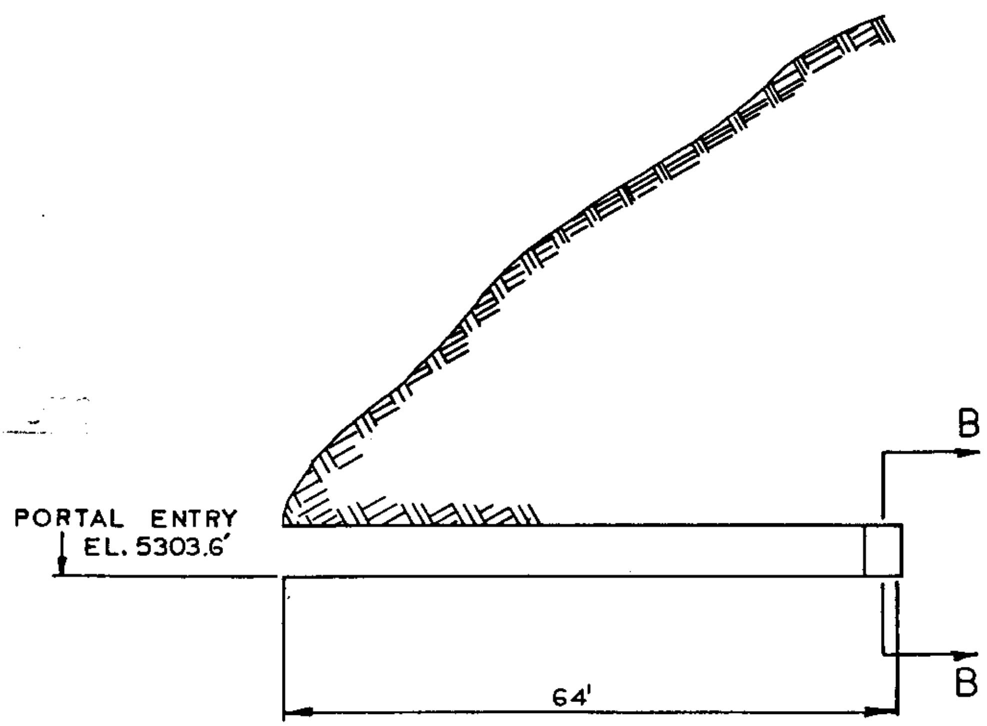


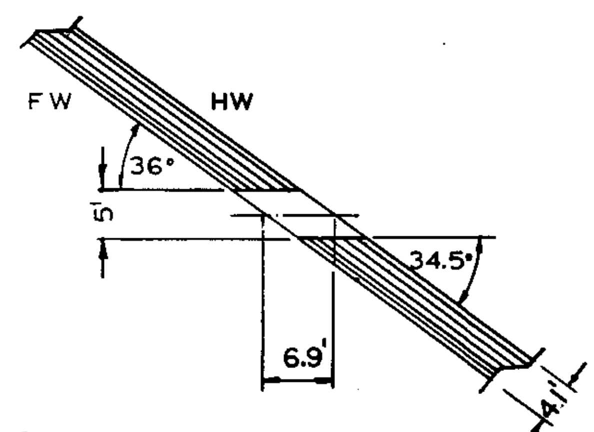
PLAN ADIT NO. 6

PORTAL COORDINATES
N 562,509.9
E 69,276.9





SECTION A-A



SECTION B-B
(MK)

269

K-ELK RIVER 70(5)B.

BULK SAMPLING

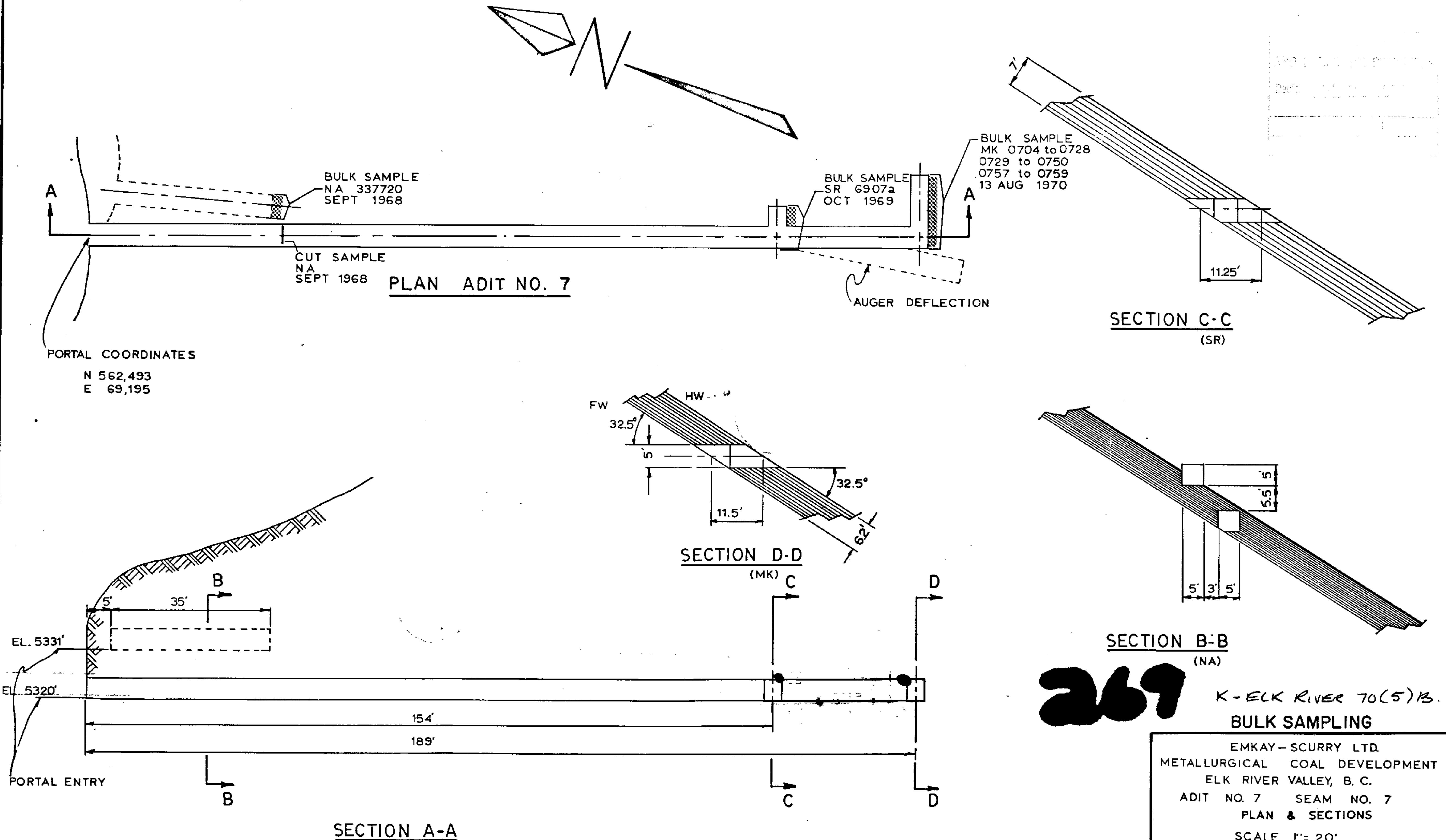
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

ADIT NO. 6 SEAM NO. 6
PLAN & SECTIONS

SCALE 1" = 20'

DATE : NOV.30,1970 DRWG NO. 6

EXHIBIT NO. 14



269

K-ELK RIVER 70(5)B.

BULK SAMPLING

EMKAY-SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. 7 SEAM NO. 7
PLAN & SECTIONS
SCALE 1"= 20'

DATE: NOV. 30, 1970 DRWG. NO. 7

EXHIBIT NO. 14

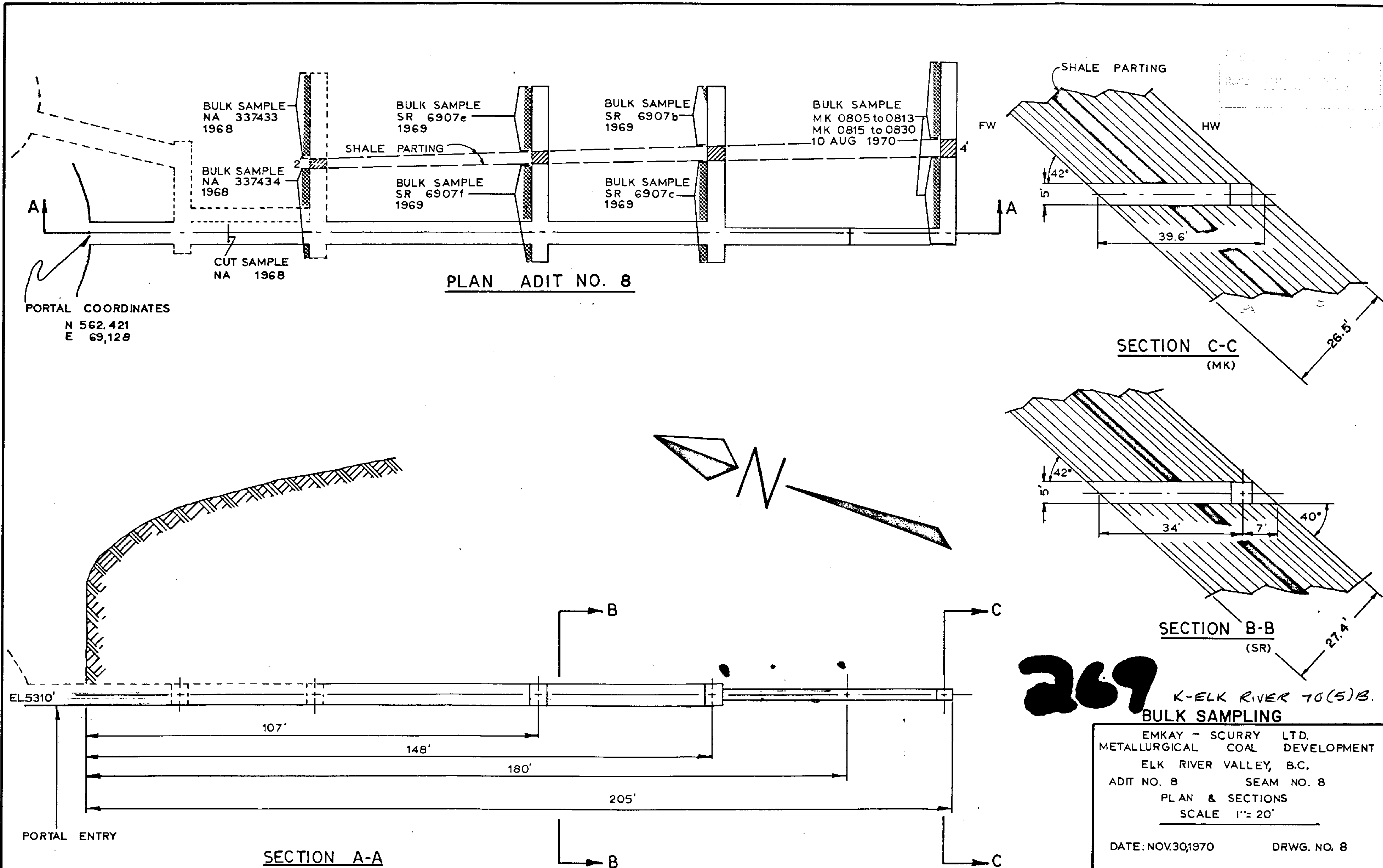
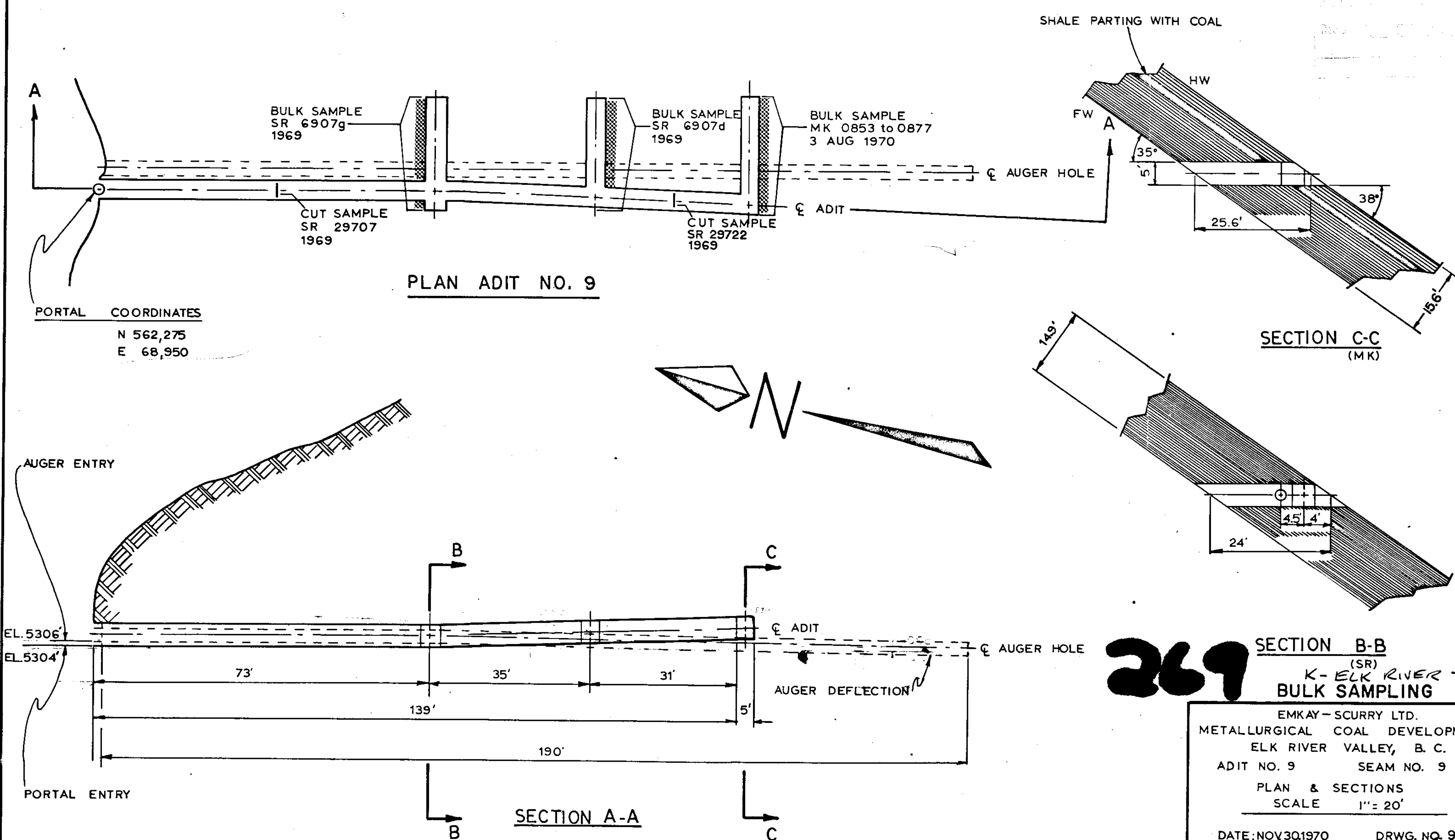


EXHIBIT NO. 14



269

K- ELK RIVER 70(5)B

BULK SAMPLING

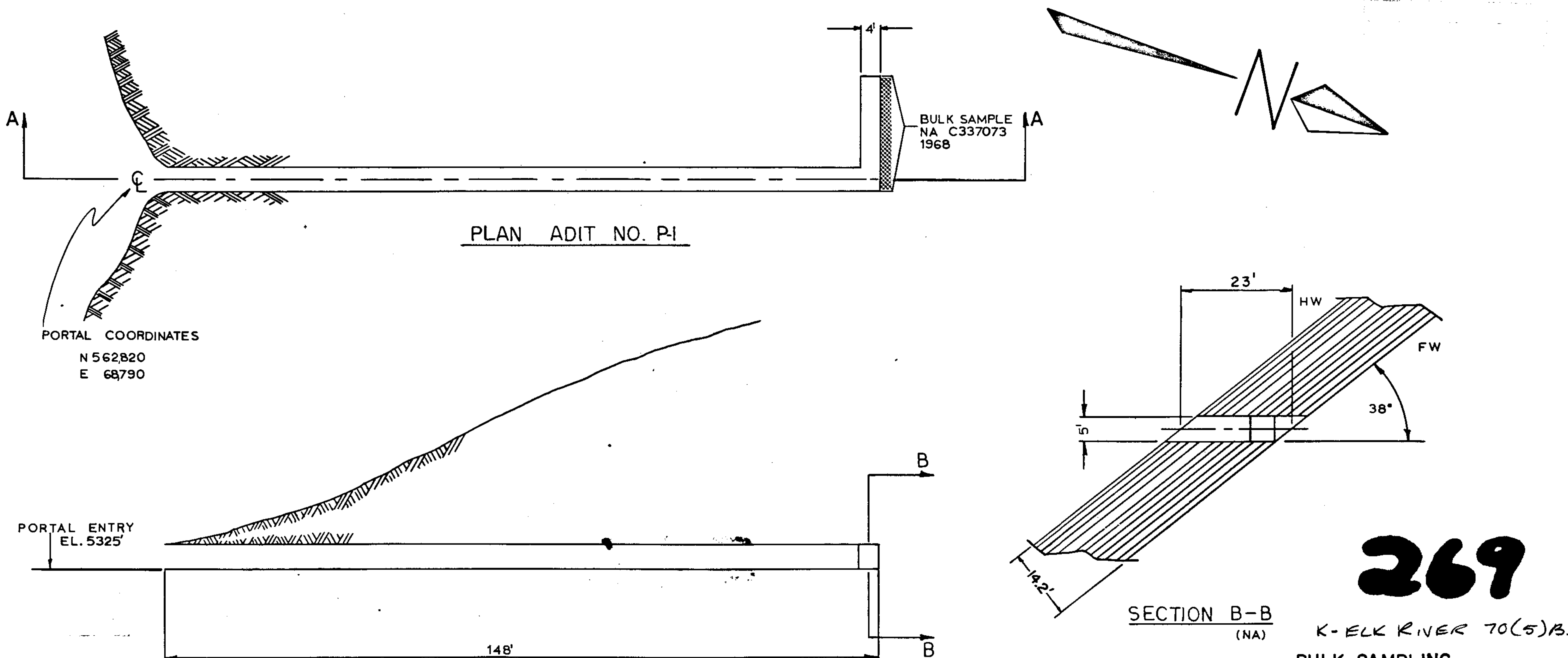
EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.

ADIT NO. 9 SEAM NO. 9

PLAN & SECTIONS
SCALE 1" = 20'

DATE: NOV 30, 1970 DRWG. NO. 9

EXHIBIT NO. 14

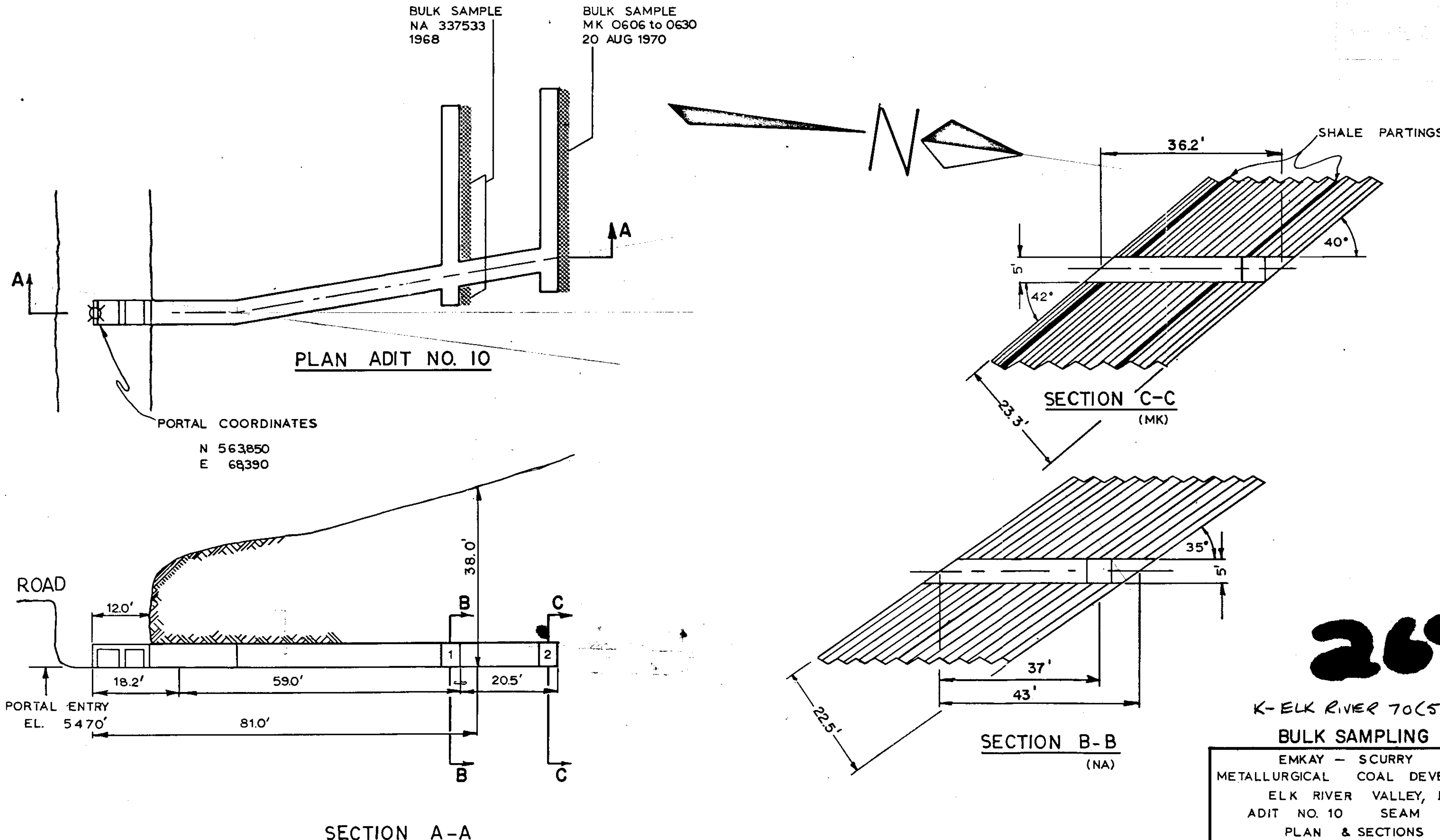


BULK SAMPLING

EMKAY SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. P-1 SEAM NO. 9
PLAN & SECTIONS
SCALE 1"=20'

DATE: NOV. 30, 1970 DRWG NO. 10

EXHIBIT NO. 14



269

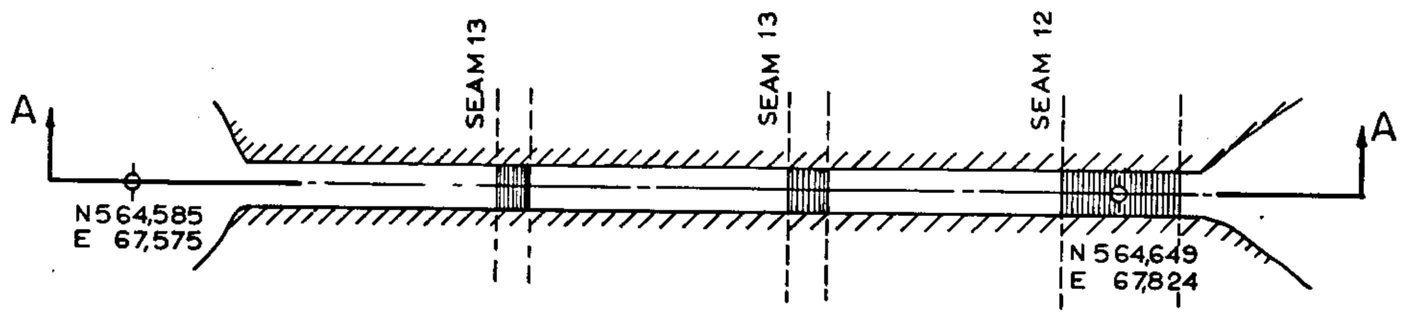
K-ELK RIVER 70(5) B.

BULK SAMPLING

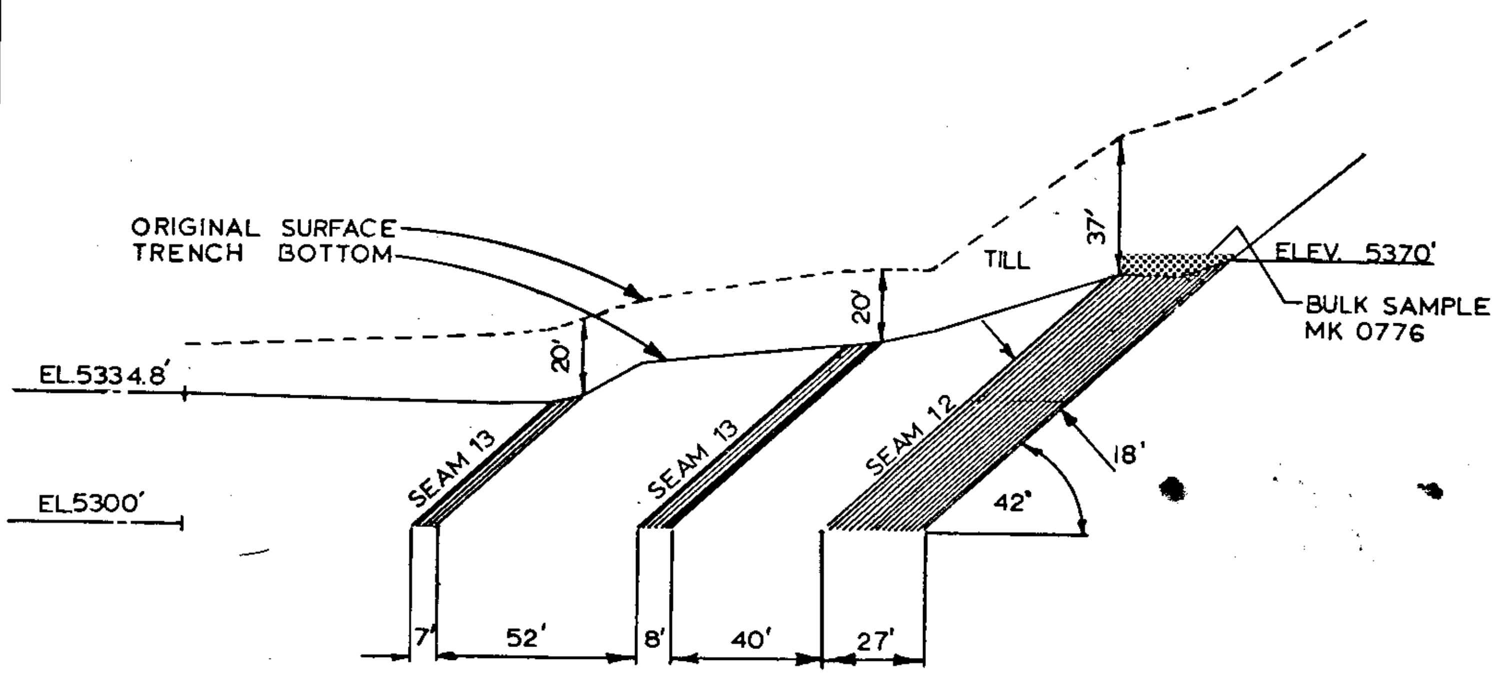
EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
ADIT NO. 10 SEAM NO. 10
PLAN & SECTIONS
SCALE 1"=20'

DATE: NOV. 30,1970 DRWG NO. 11

EXHIBIT NO. 14



PLAN T-70-1



SECTION A-A

269

BULK SAMPLING
SEAM NO. 12

K-ELK RIVER 70(5)B.

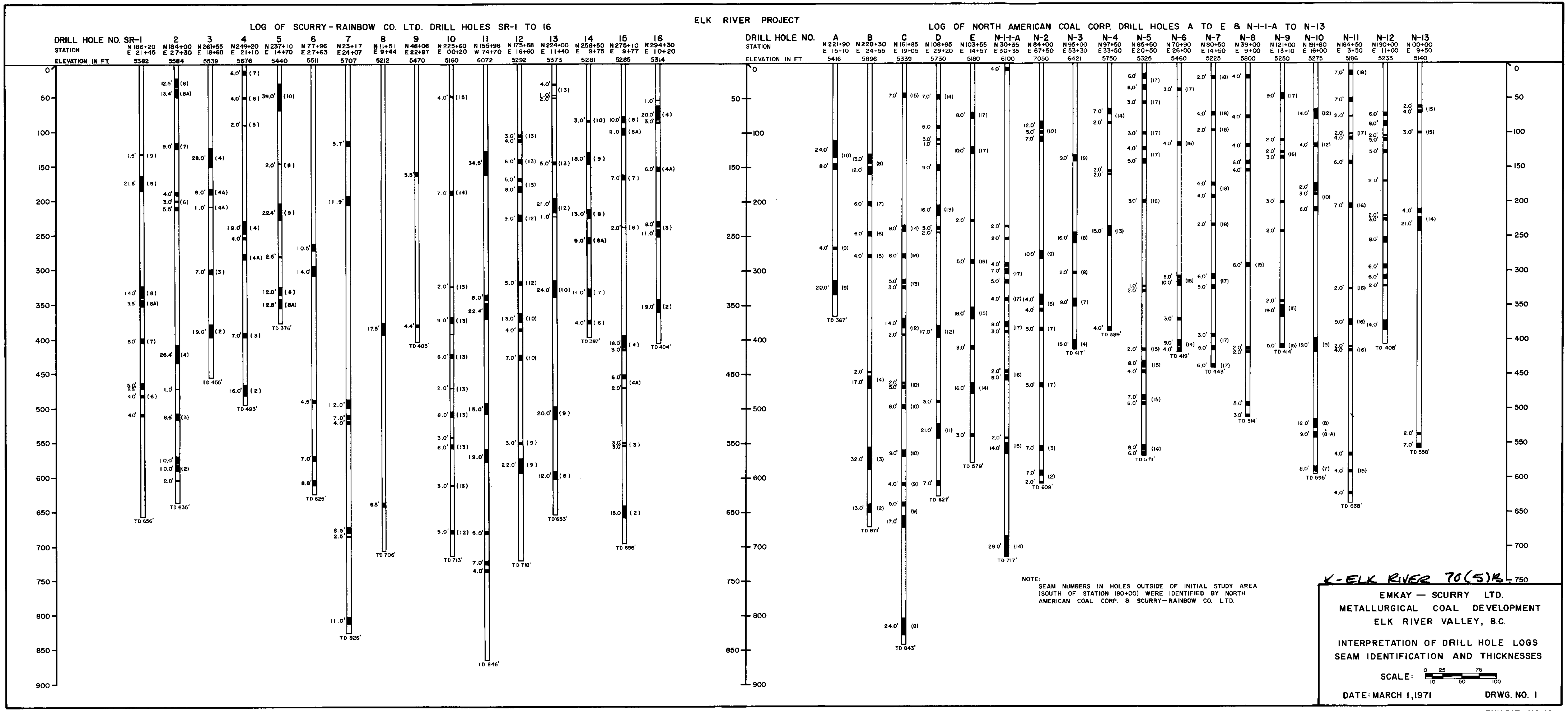
EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

T-70-1
PLAN & PROFILE

SCALE 1" = 50'

DATE: NOV. 30,1970 DRWG NO. 12

EXHIBIT NO. 14



EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

INTERPRETATION OF DRILL HOLE LOGS
SEAM IDENTIFICATION AND THICKNESSES

SCALE:

DATE: MARCH 1, 1971 DRWG. NO. 1

EXHIBIT NO. 16

269

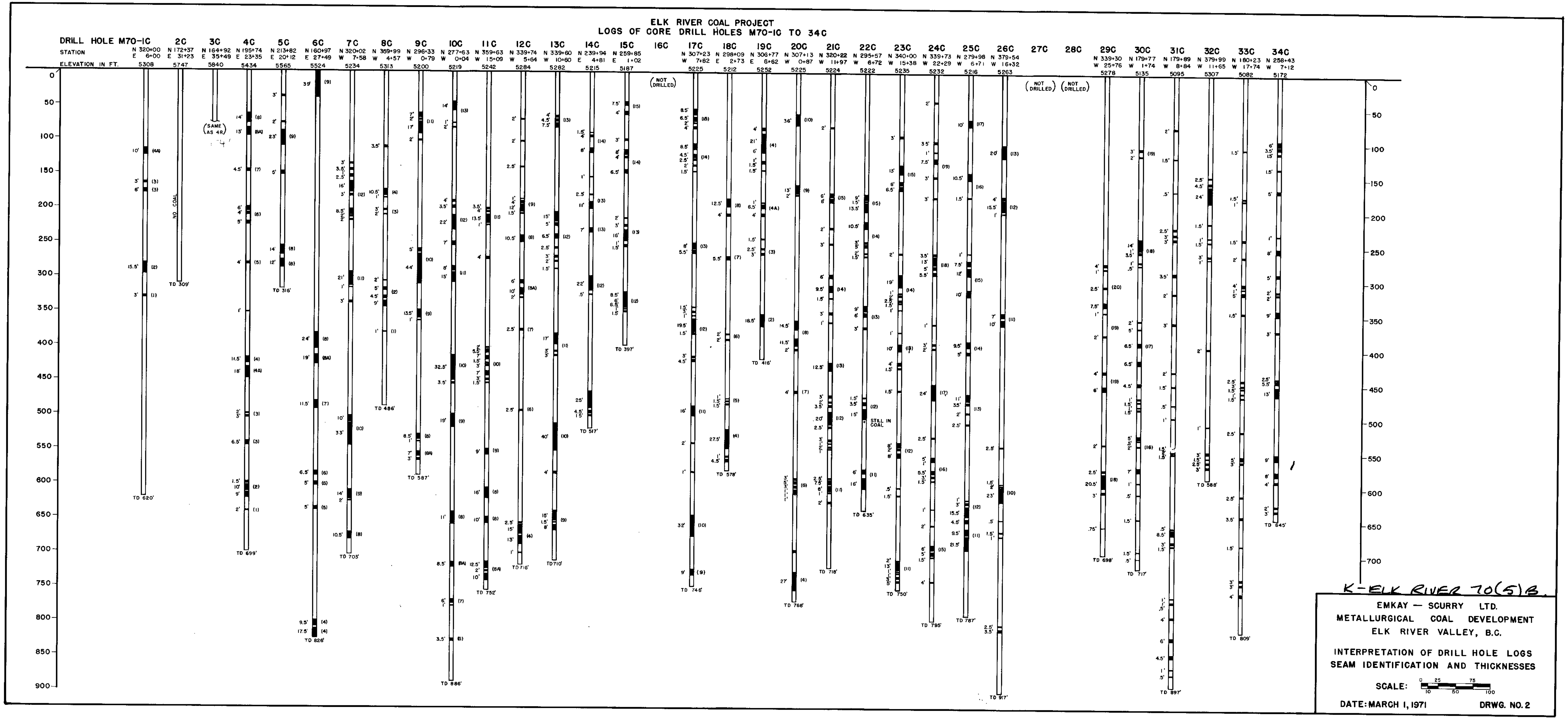
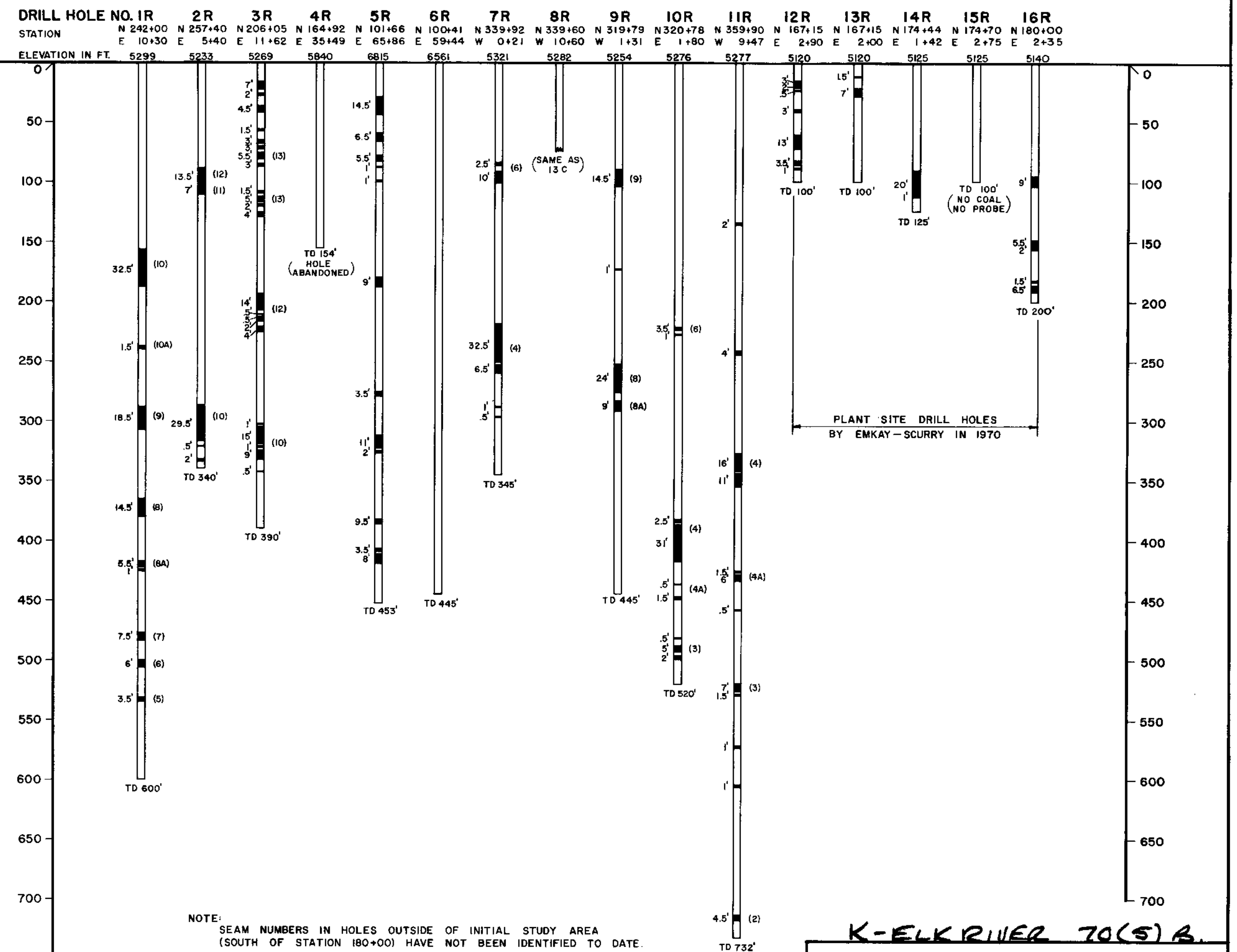


EXHIBIT NO. 16

269

ELK RIVER PROJECT
LOG OF ROTARY DRILL HOLES M70-1R TO 16R



K-ELK RIVER 70(5) B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

INTERPRETATION OF DRILL HOLE LOGS
SEAM IDENTIFICATION AND THICKNESSES

SCALE: 0 25 75 / 10 50 100

DATE: MARCH 1,1971 DRWG. NO. 3

EXHIBIT NO. 16

269

BPB INDUSTRIES LTD

M70 10C BOREHOLE

GAMMA & H.R. DENSITY LOG

EXHIBIT NO. 15

BOREHOLE DATA

Customer	EmKay.	Drillers Depth	886.0'	Hole Diameters	Casing Details
Contractor		Logging Depth	880'		30'
Date Logged	17:10:70	Cement			
Date Drilled	10/7/70-10/13/70	Mud Weight	WATER		
Log Datum	GROUND				

COMMENTS

Provincial Coordinates	N 569,360.0 E 65,395.0	% Recovery of Coal	91%
Collar Elevation	5,219.3		
Drill Type	Longyear 44		

CALIBRATION AND SCALES

Track 1	Depth	Track 2	Track 3
gamma		h.r. density	
0 — 125		2500 —	6500

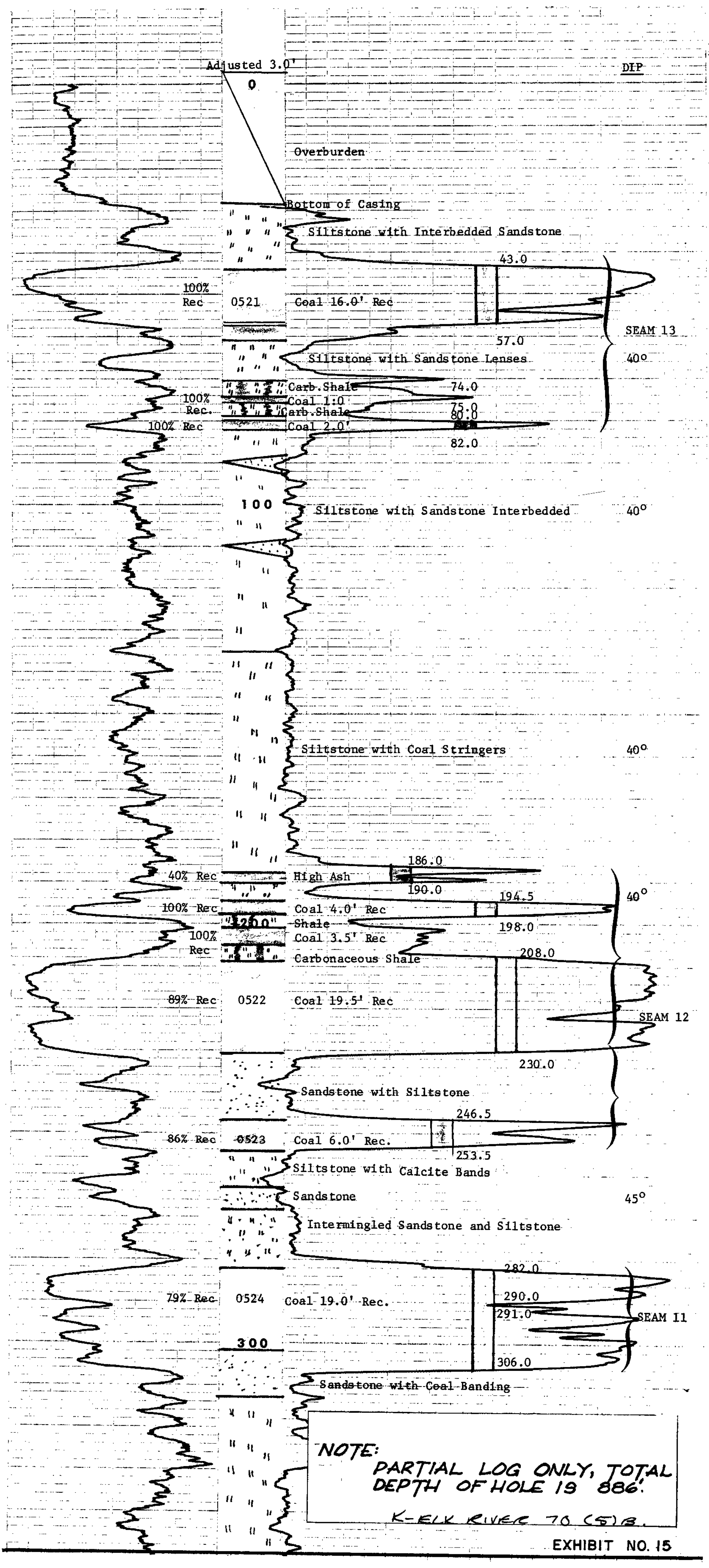


EXHIBIT NO. 15

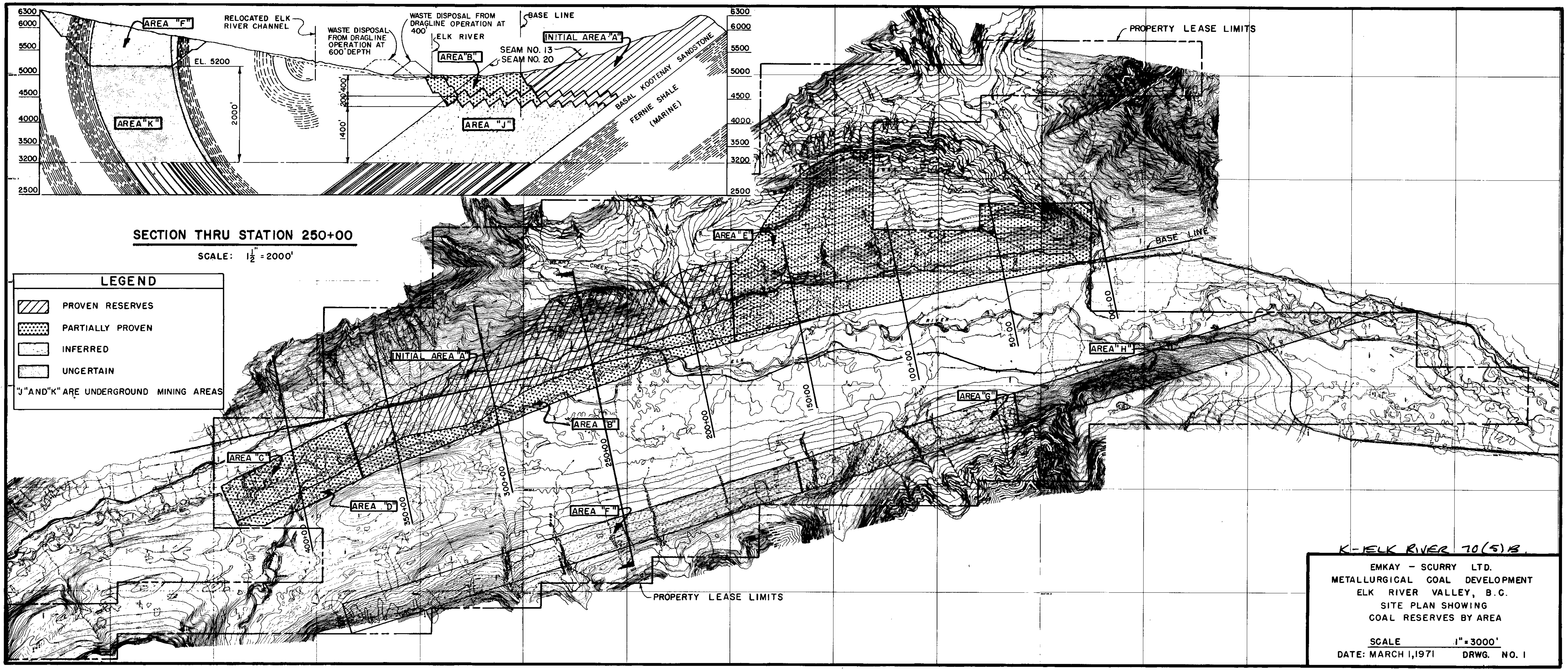
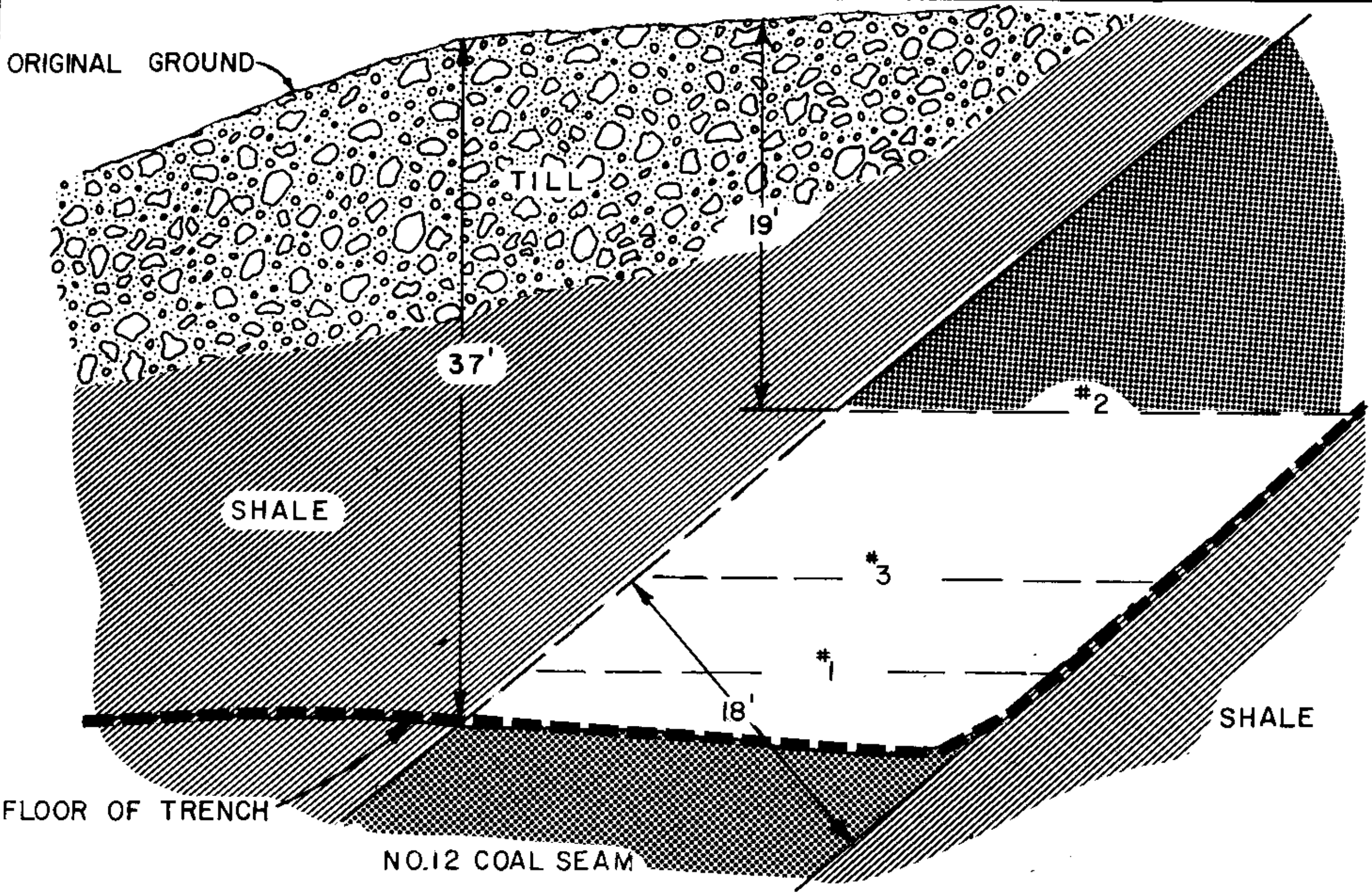


EXHIBIT NO. 17



OXIDATION STUDY

Description		Location	Sample No.	F.S.I.		ASH	
				Raw	Washed	Raw	Washed
Channel	Sample	Floor + 18'	2	9	—	—	—
"	"	Floor + 8'	3	$6\frac{1}{2}$	—	—	—
"	"	Floor + 3'	1	$8\frac{1}{2}$	—	—	—

NOTE: For location refer to Exhibit 8 Drwg. 1

Channel Sample No.'s 1, 2, & 3 tested in field Laboratory only. No Ash determinations made.

KELK RIVER 70(5) B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

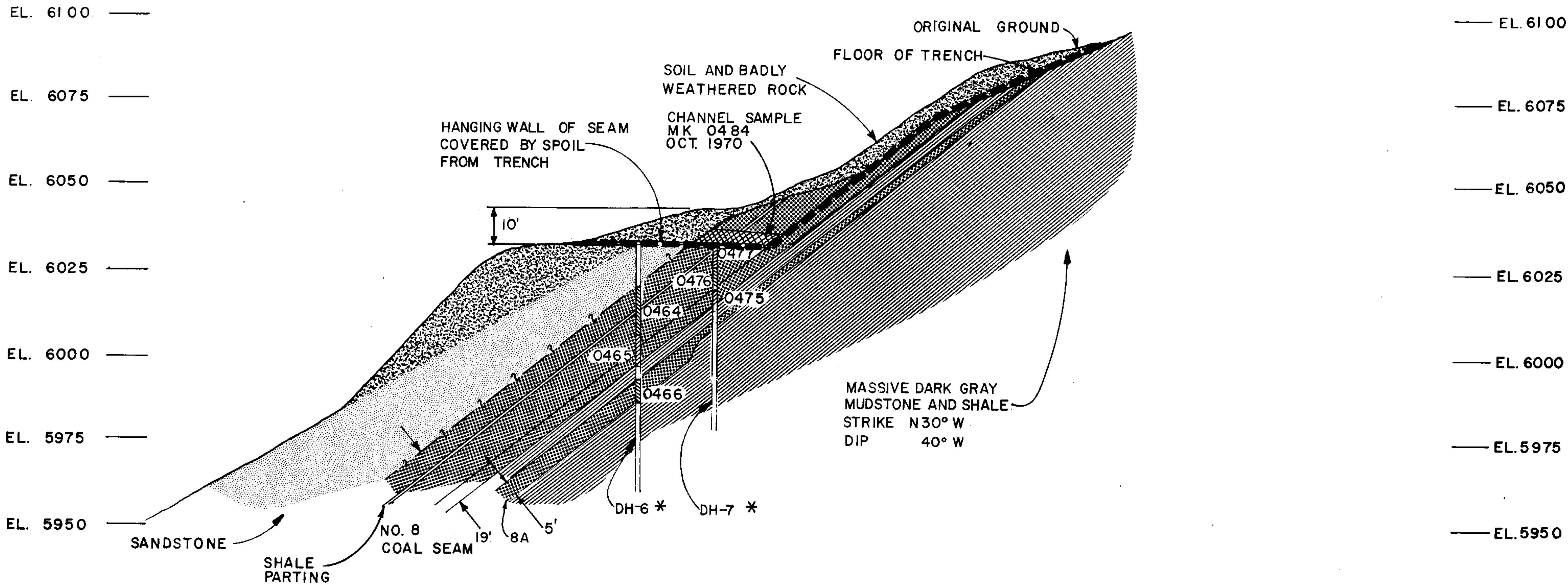
EXPLORATORY TRENCH
T-70-1

OXIDATION STUDY — SEAM NO. 12

SCALE: 1" = 10'

DATE: MARCH 15, 1971 DRWG. 1

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor (10' Cover)	0484	NA	—	—	—
DH-7	0.0'- 7.5'	0477	NA	—	—	—
	7.5'-14.5'	0476	NA	—	—	—
	14.5'-21.5'	0475	NA	—	—	—
DH-6	16.0'-30.0'	0464	1	—	—	—
	30.0'-38.0'	0465	1½	—	—	—
	41.0'-49.0'	0466	NA	—	—	—

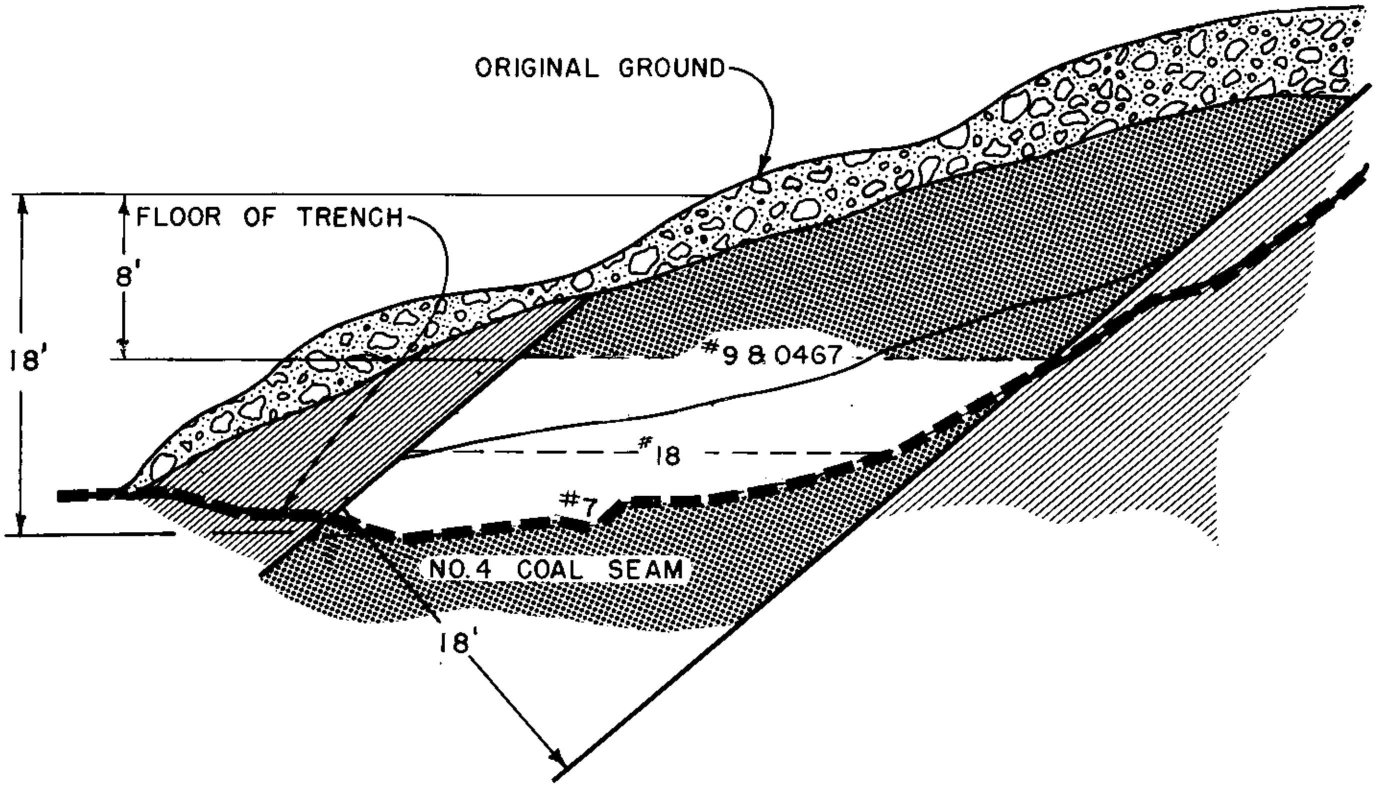
NOTE: For location refer to Exhibit 8 Drwg. 2

*DH-6 & 7 were drilled to obtain oxidation data.
These core samples not analyzed for Ash.

K-ELK RIVER 70 (5) B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 2
OXIDATION STUDY—SEAM NO. 8
SCALE 1" = 30'
DATE: MARCH 15, 1971 DRWG. NO. 2

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor+ 10'	0467	1	1	16.05	6.51
" "	Floor+ 10'	9	1½	—	—	—
" "	Floor+ 5'	18	2½	—	—	—
" "	Floor	7	2	—	—	—

K-ELK RIVER 70 (5) B.

NOTE: For location refer to Exhibit 8 Drwg. 3

Channel Sample No.'s 7, 9 & 18 tested in field Laboratory only. No Ash determinations made.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

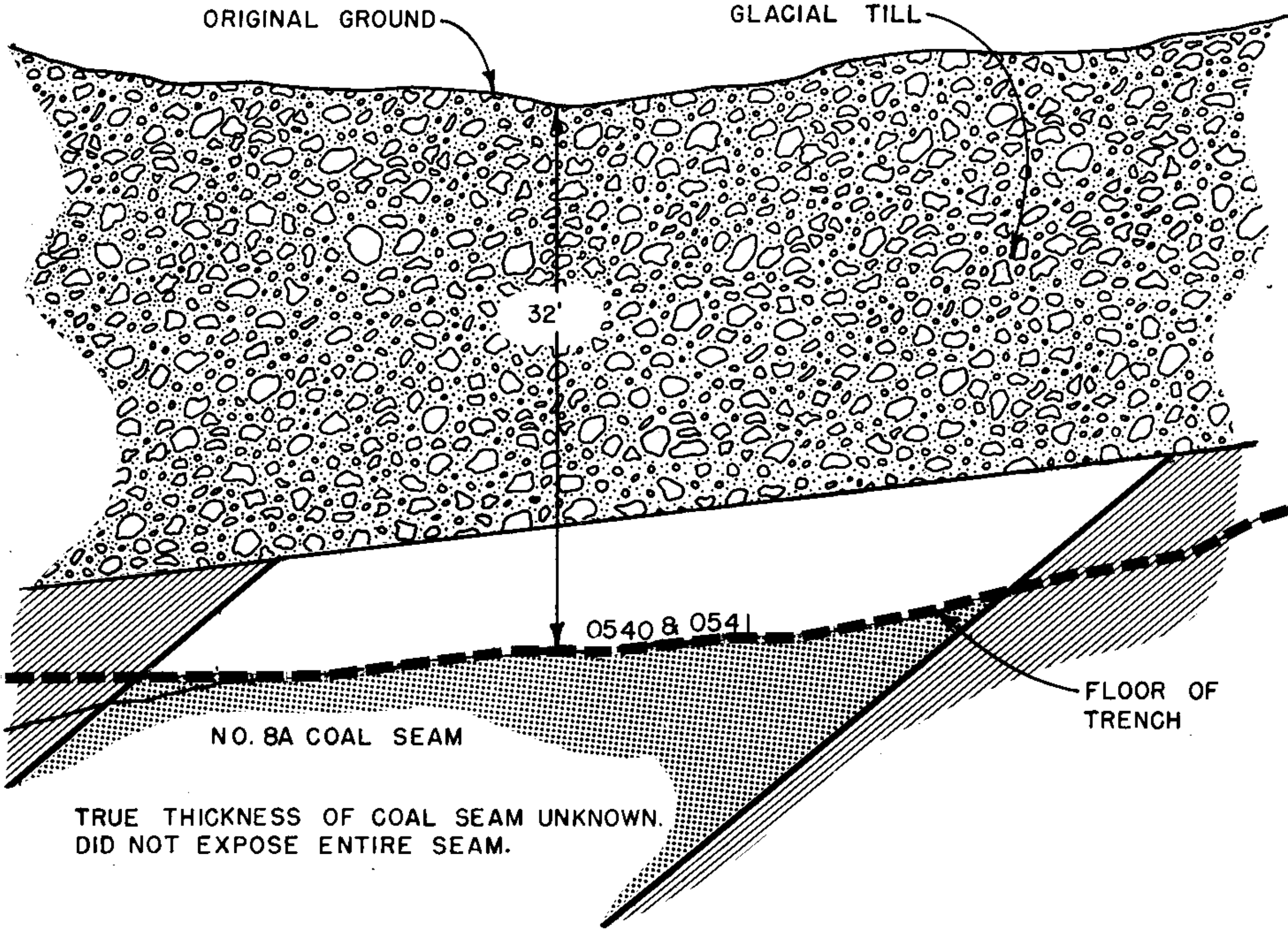
EXPLORATORY TRENCH
UPPER T-70-3

OXIDATION STUDY — SEAM NO. 4

SCALE: 1" = 10'

DATE: MARCH 15, 1971 DRWG. 3

EXHIBIT NO. 18



OXIDATION STUDY

			F.S.I.		ASH	
Description	Location	Sample No.	Raw	Washed	Raw	Washed
Channel Sample	Floor	0540, 0541	2 1/2	4	13.77	6.53

NOTE: For location refer to Exhibit 8 Drwg. 4

K-ELK RIVER 70(5) B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

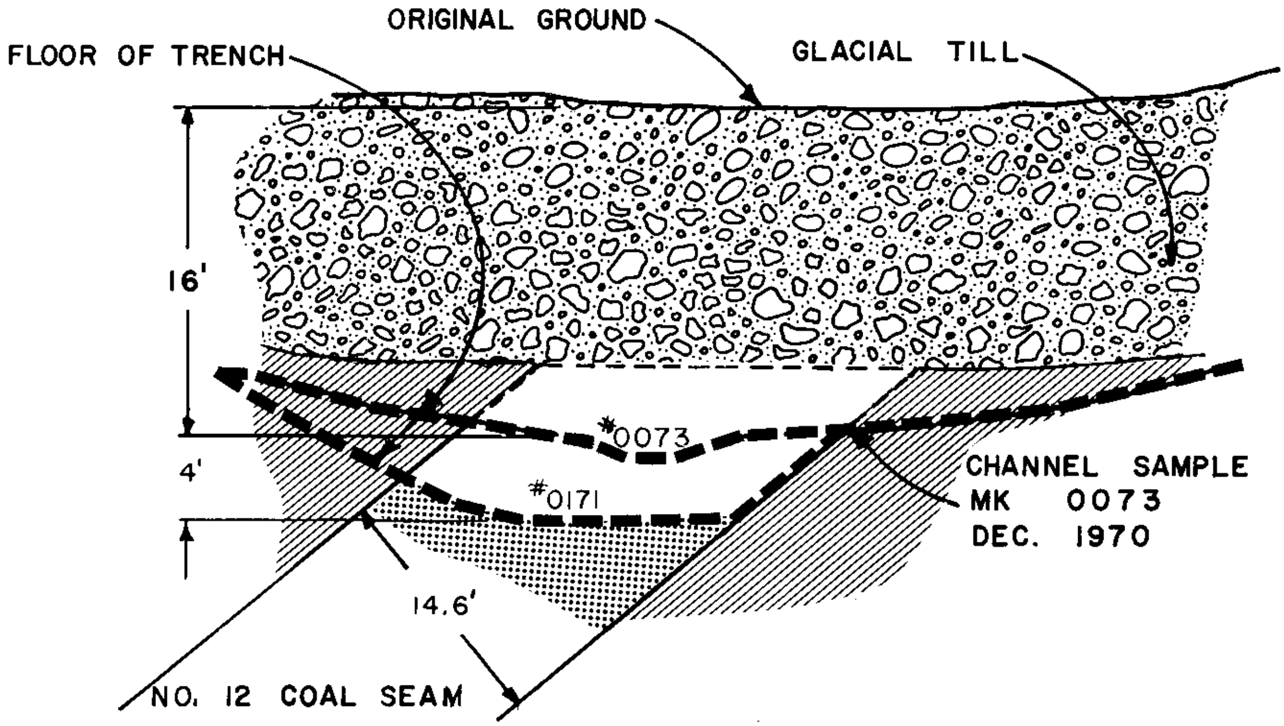
EXPLORATORY TRENCH
LOWER T-70-3

OXIDATION STUDY—SEAM NO. 8A

SCALE: 1" = 10'

DATE: MARCH 15, 1971 DRWG. 4

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor (Dec. 1970)	0073	4	5	14.41	5.47
" "	Floor (Feb. 1971)	0171	9	—	19.29	—

NOTE: For location refer to Exhibit 8 Drwg. 16

K-ELK RIVER 70(5)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

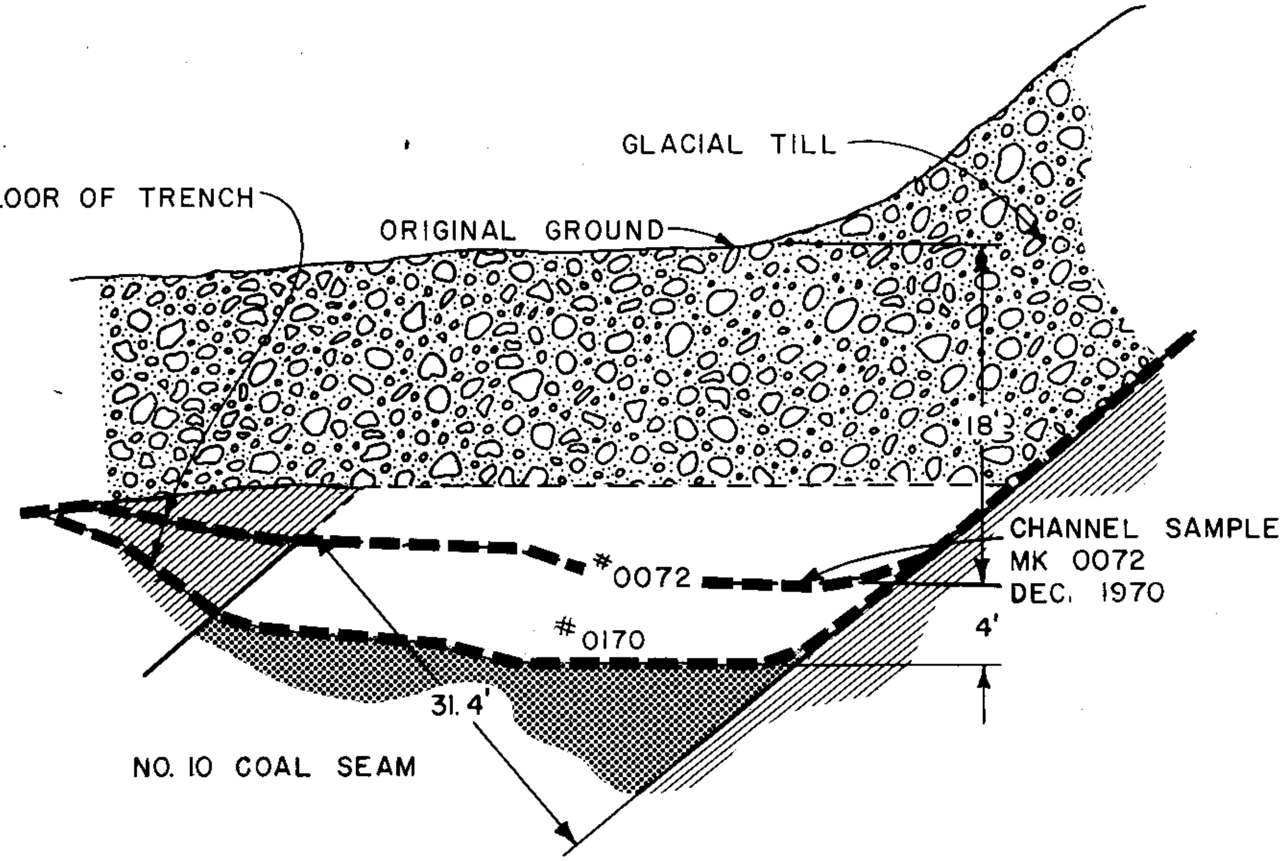
EXPLORATORY TRENCH
T-70-16

OXIDATION STUDY - SEAM NO. 12

SCALE: 1" = 10'

DATE: MARCH 15, 1971 DRWG. 14

EXHIBIT NO. 18



OXIDATION STUDY

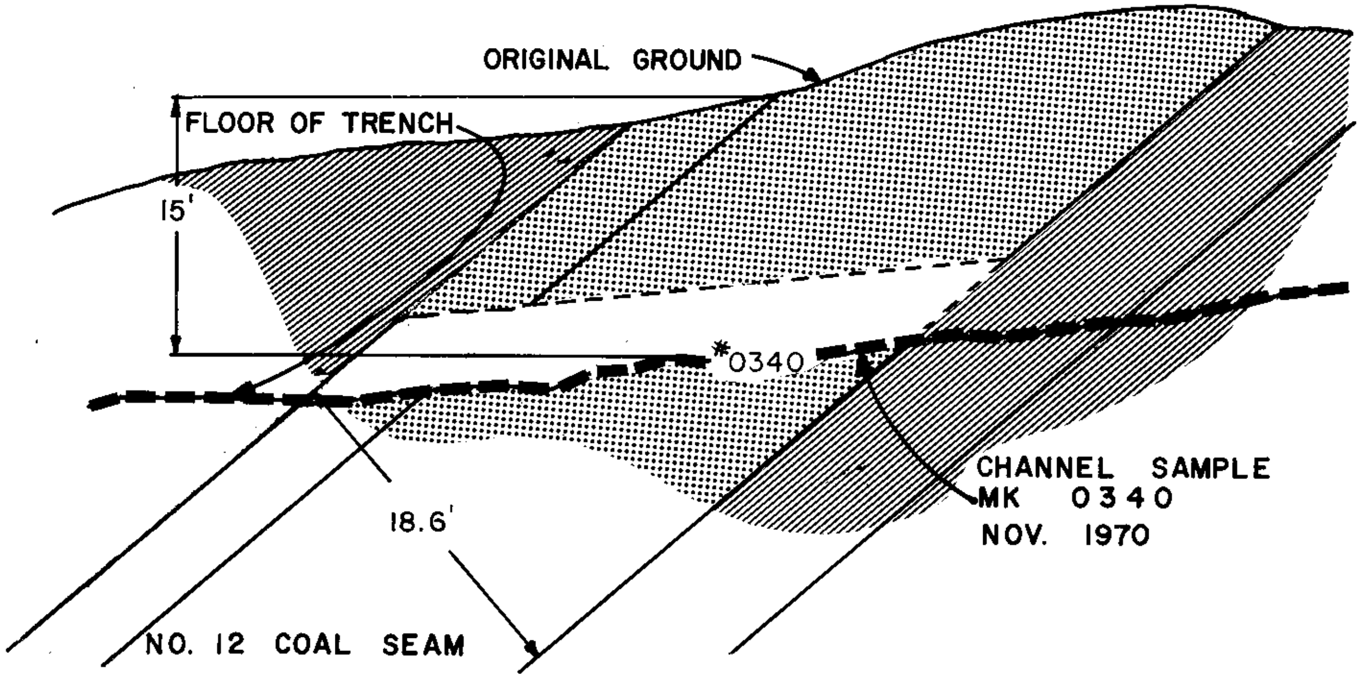
Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor (Dec.1970)	0072	NA	1/2	13.80	6.10
" "	Floor (Feb.1971)	0170	1	—	11.15	—

K-ELK RIVER 70 (5) B.

NOTE: For location refer to Exhibit 8 Drwg. 16

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-70-16
OXIDATION STUDY—SEAM NO. 10
SCALE: 1" = 10'
DATE: MARCH 15, 1971 DRWG: 13

EXHIBIT NO. 18



OXIDATION STUDY

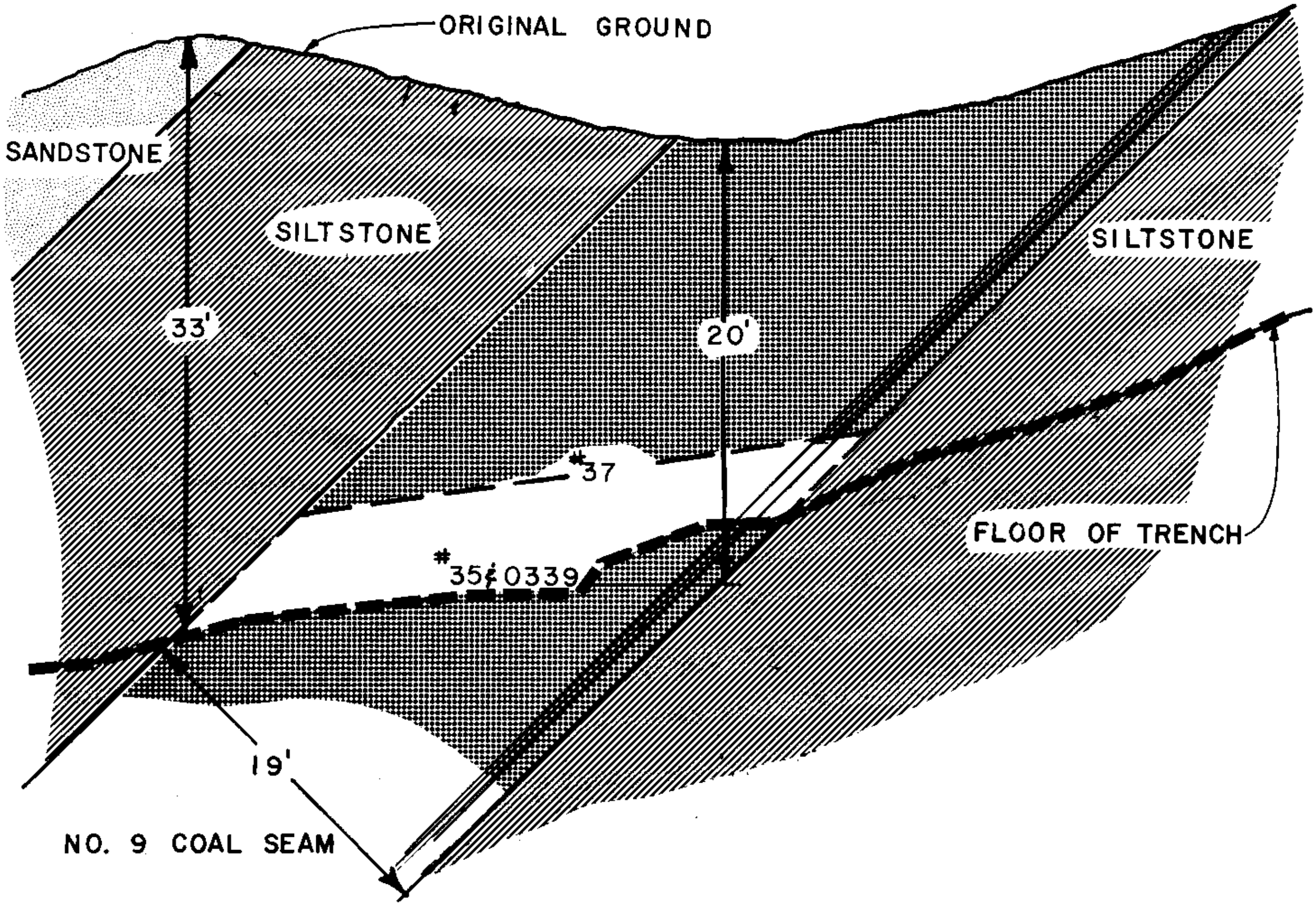
Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor (NOV.1970)	0340	6	7	28.92	5.82

NOTE For location refer to Exhibit 8 Drwg. 14

K-ELK RIVER 70(5)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B. C.
EXPLORATORY TRENCH
T-70-14
OXIDATION STUDY—SEAM NO. 12
SCALE 1" = 10'
DATE: MARCH 15, 1971 DRWG. 12

EXHIBIT NO. 18



OXIDATION STUDY

Description		Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel	Sample	Floor + 5'	37	1	—	—	—
"	"	Floor (Oct. 1970)	35	1	—	—	—
"	"	* Floor (Nov. 1970)	0339	1	1½	11.36	7.26

NOTE For location refer to Exhibit 8 Drwg. 11

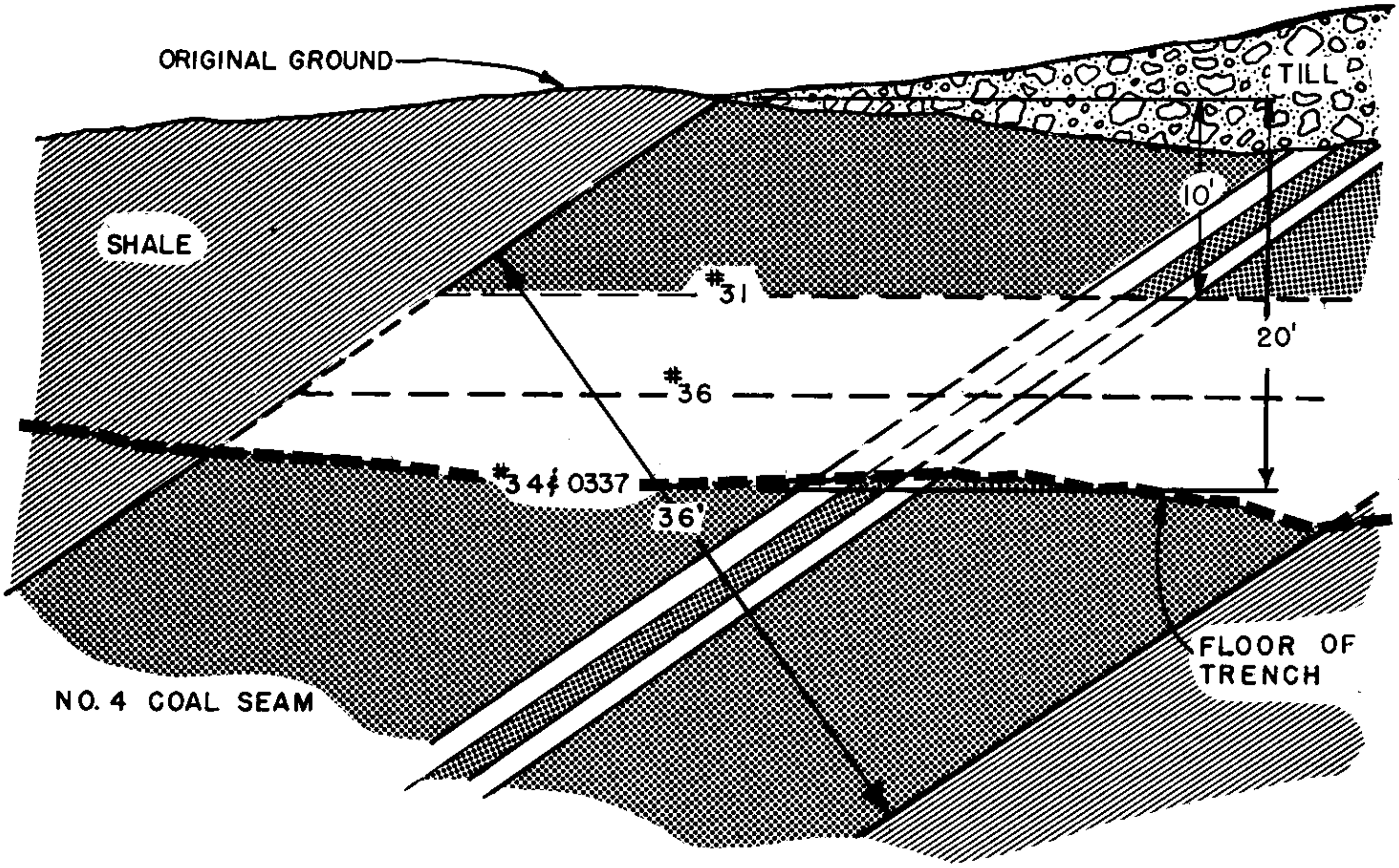
Channel Sample No.'s 35 & 37 tested in field laboratory only. No Ash determinations made.

* Very hard, D-8 could not rip.

K-ELK RIVER 70 (5) B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-70-11
OXIDATION STUDY — SEAM NO. 9
SCALE 1" = 10'
DATE: MARCH 15, 1971 DRWG. 11

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor + 10' (Oct. 1970)	31	1½	—	—	—
" "	Floor + 5' (Oct. 1970)	36	3	—	—	—
" "	Floor (Oct. 1970)	34	2	—	—	—
" "	Floor (Nov. 1970)	0337	3	5	25.25	7.95

NOTE For location refer to Exhibit 8 Drwg. 10

Channel Sample No.'s 31, 34, & 36 tested in field laboratory only. No Ash determinations made.

K-ELK RIVER 70(5)B.

EMKAY SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

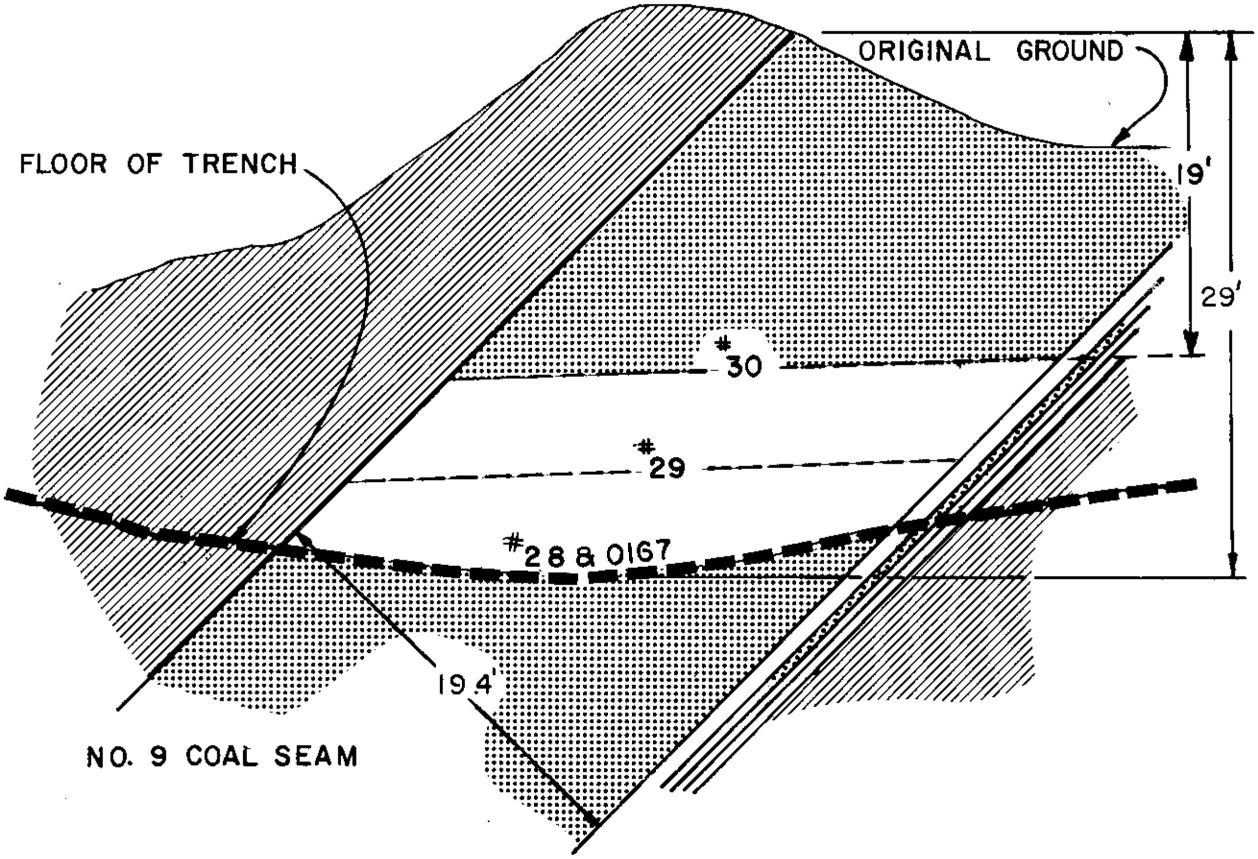
EXPLORATORY TRENCH
T-70-10

OXIDATION STUDY – SEAM NO. 4

SCALE 1" = 10'

DATE: MARCH 15, 1971 DRWG. 10

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor + 10'	30	NA	—	—	—
" "	Floor + 5'	29	NA	—	—	—
" "	Floor (Oct. 1970)	28	1½	—	—	—
" "	Floor (Feb. 1971)	0167	1½	—	11.04	—

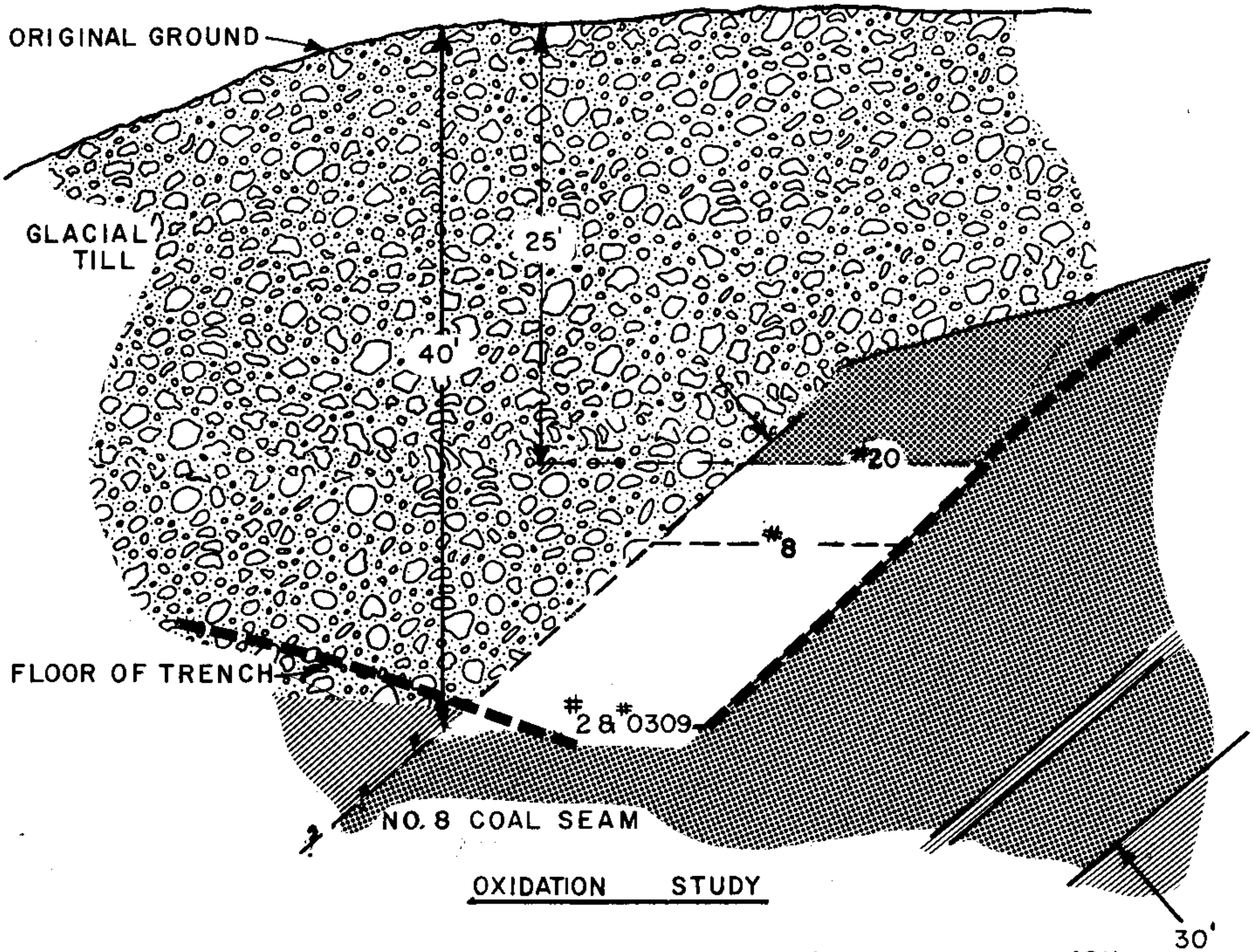
NOTE: For location refer to Exhibit 8 Drwg. 9

Channel Sample No.'s 28, 29 & 30 tested in field laboratory only. No Ash determinations made.

K-ELK RIVER 70(5)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-70-9
OXIDATION STUDY SEAM NO. 9
SCALE: 1" = 10'
DATE: MARCH 15, 1971 DRWG. 9

EXHIBIT NO. 18



OXIDATION STUDY

Description		Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel	Sample	Floor + 15'	20	3	—	—	—
"	"	Floor + 11'	8	5	—	—	—
"	"	Floor (Oct. 1970)	2	3	—	—	—
"	"	Floor (Oct. 1970)	0309	1	3	31.47	8.36

K-ELK RIVER 70(5) B.

NOTE For location refer to Exhibit 8 Drwg. 8

Channel Sample No.'s 2, 8, & 20 tested in field laboratory only. No Ash determinations made.

EMKAY — SCURRY LTD.

METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

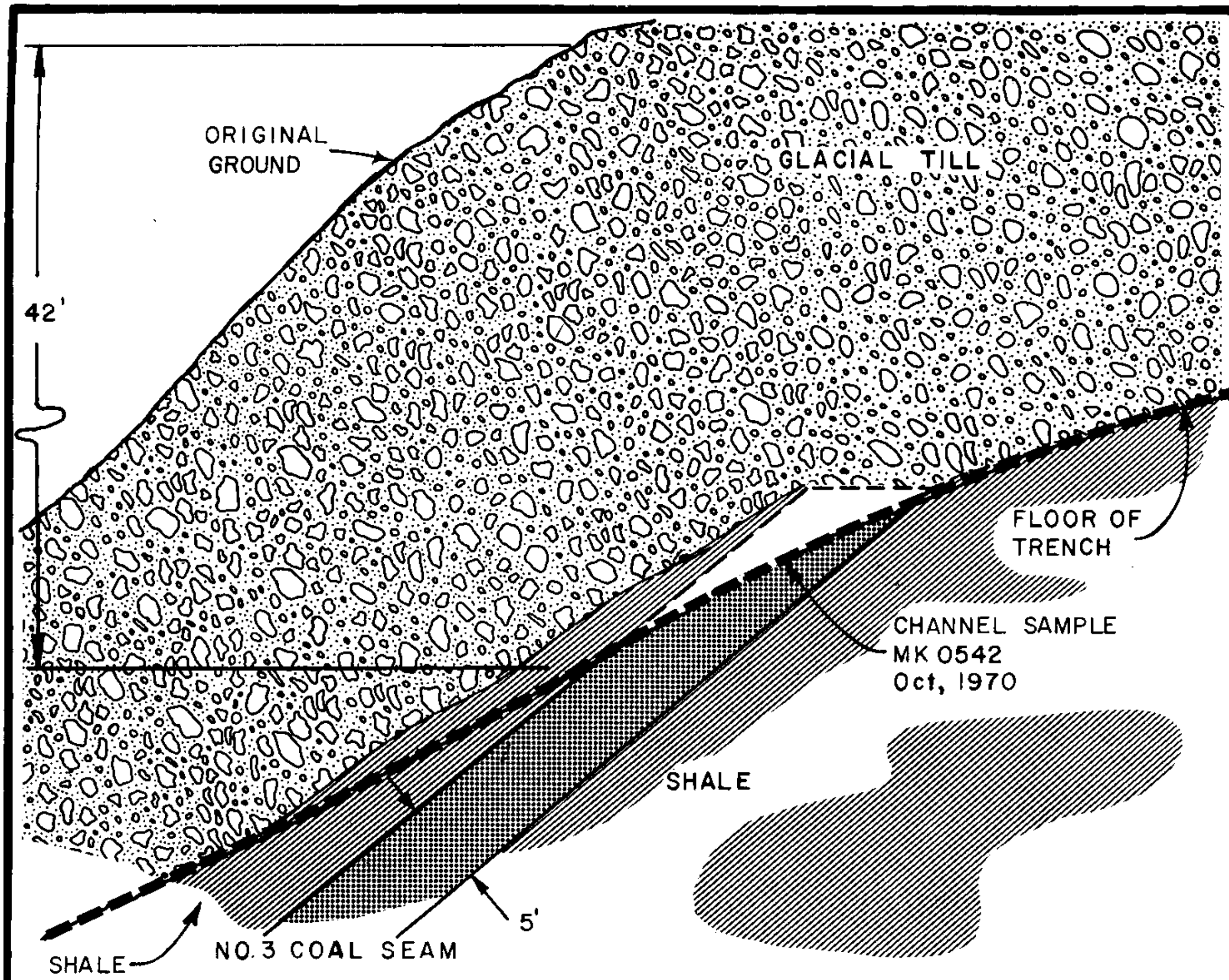
EXPLORATORY TRENCH
T-70-8

OXIDATION STUDY — SEAM NO. 8

SCALE 1" = 10'

DATE: MARCH 15, 1971 DRWG. 8

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor	0542	6½	6½	12.28	8.89

NOTE For location refer to Exhibit 8 Drwg. 7

K-ELK RIVER 70(5)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

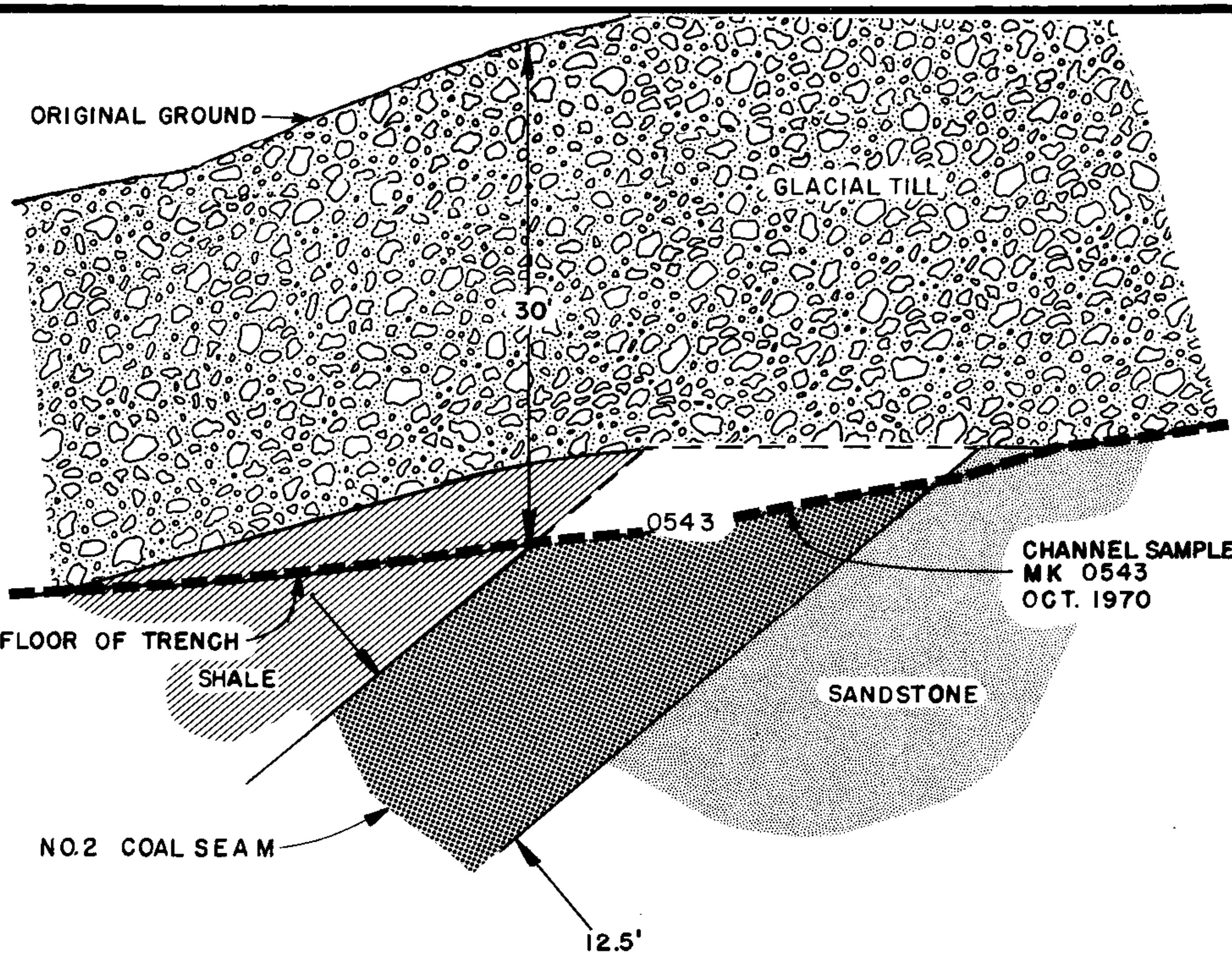
EXPLORATORY TRENCH
T-70-7

OXIDATION STUDY—SEAM NO. 3

SCALE 1" = 10'

DATE: MARCH 15, 1971 DRWG. 7

EXHIBIT NO. 18



OXIDATION STUDY

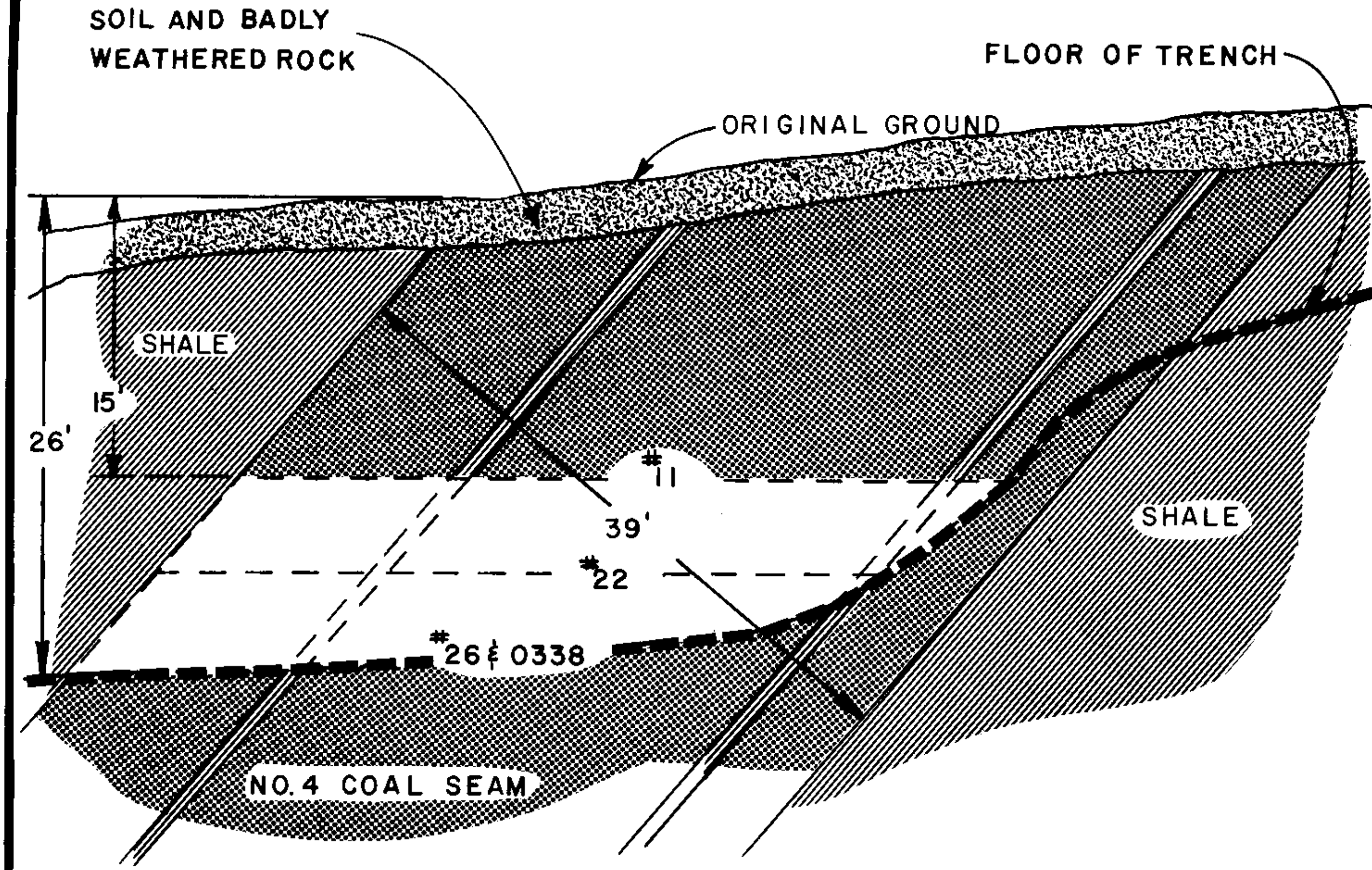
			F.S.I.		ASH	
Description	Location	Sample No.	Raw	Washed	Raw	Washed
Channel Sample	Floor	0543	½	1	18.03	12.56

NOTE For location refer to Exhibit 8 Drwg. 7

K-ELK RIVER 70 (5) B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-70-7
OXIDATION STUDY - SEAM NO. 2
SCALE 1" = 10'
DATE: MARCH 15, 1971 DRWG. 6

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor + 10'	11	NA	—	—	—
" "	Floor + 5'	22	1½	—	—	—
" "	Floor (Oct. 1970)	26	1½	—	—	—
" "	Floor (Nov. 1970)	0338	3	4½	22.98	7.22

NOTE For location refer to Exhibit 8 Drwg. 5

Channel Sample No.'s 11, 22, & 26 tested in field laboratory only. No Ash determinations made.

K-ELK RIVER 70(5)B.

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-70-4
OXIDATION STUDY – SEAM NO. 4
SCALE 1" = 10'
DATE: MARCH 15, 1971 DRWG. 5

EXHIBIT NO. 18

OXIDATION STUDY

Description		Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH. Raw	ASH. Washed
Channel	Sample	Floor +12'	0179	1	—	50.71	—
"	"	" +12'	0221	1	—	33.69	—
"	"	" +3'	0243	7	—	22.10	—
Bulk	"	"	(0358)	* —	—	—	—
Channel	"	" +14'	0178	4	—	13.97	—
"	"	" +14'	0222	1/2	—	11.11	—
"	"	" +4'	0244	9	—	5.44	—
Bulk	"	"	(0359)	* —	—	—	—
Channel	"	" +10'	0228	1 1/2	—	52.74	—
"	"	" +7'	0245	7 1/2	—	38.61	—
Bulk	"	" +5'	(0360)	* —	—	—	—
Channel	"	" +8'	0230	5 1/2	—	26.77	—
"	"	" +4'	0247	4 1/2	—	55.27	—
"	"	" +7'	0229	7 1/2	—	34.62	—
"	"	" +9'	0223	8 1/2	—	12.13	—
Bulk	"	" +7'	(0361)	* —	—	—	—
Channel	"	" +8'	0227	7 1/2	—	22.09	—
"	"	" +6'	0425	7	—	8.10	—
Bulk	"	" +4'	(0362)	* —	—	—	—

NOTE For location refer to Exhibit 8, Drwg. 17

* Test Results not yet available.

All Samples taken March 1971

K-ELK RIVER 70(5)13.

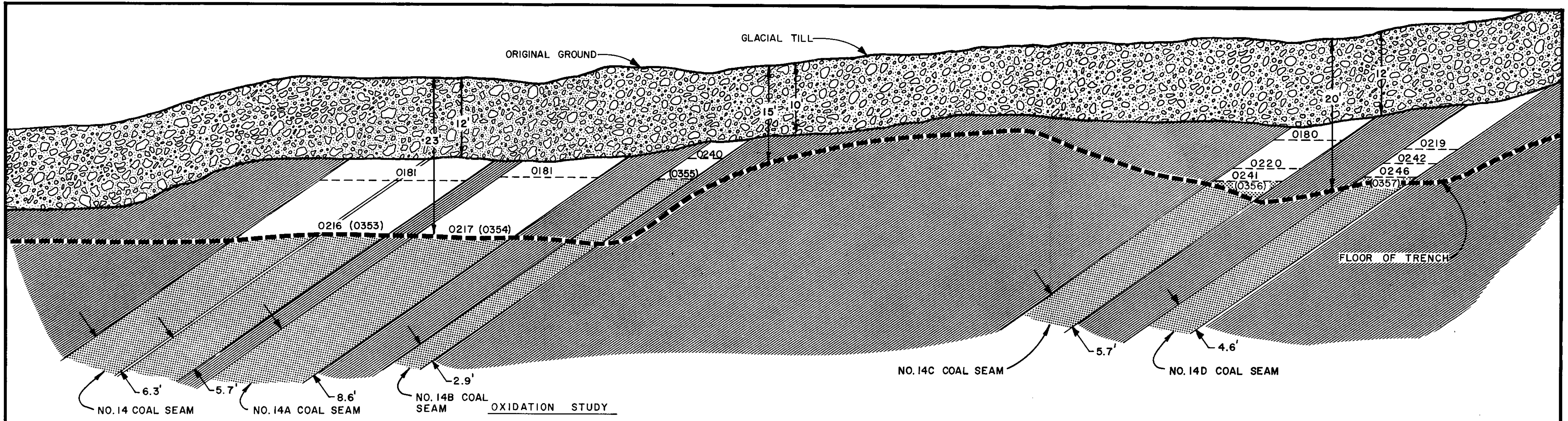
EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

EXPLORATORY TRENCH
T-70-16
OXIDATION STUDY SEAM NO. 13

SCALE: 1" = 10'

DATE MARCH 15, 1971 DRWG. NO. 15

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F. S. I. Raw	F. S. I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor + 8'	0181	4	—	13.78	—
" "	Floor	0216	8½	—	15.27	—
Bulk Sample	Floor	(0353)	* —	—	—	—
Channel Sample	Floor + 8'	0181	4	—	13.78	—
" "	Floor	0217	7	—	8.58	—
Bulk Sample	Floor	(0354)	* —	—	—	—
Channel Sample	Floor + 5'	0240	9	—	7.70	—
Bulk Sample	Floor	(0355)	* —	—	—	—
Channel Sample	Floor + 9'	0180	3	—	9.77	—
" "	Floor + 5'	0220	3	—	11.30	—
" "	Floor + 2'	0241	8	—	8.50	—
Bulk Sample	Floor	(0356)	* —	—	—	—
Channel Sample	Floor + 5'	0219	2	—	9.12	—
" "	Floor + 3'	0242	3½	—	13.28	—
" "	Floor + 1'	0246	8½	—	7.41	—
Bulk Sample	**Floor**	**(0357)**	* —	—	—	—

NOTE: For location refer to Exhibit 8, Drwg. 17

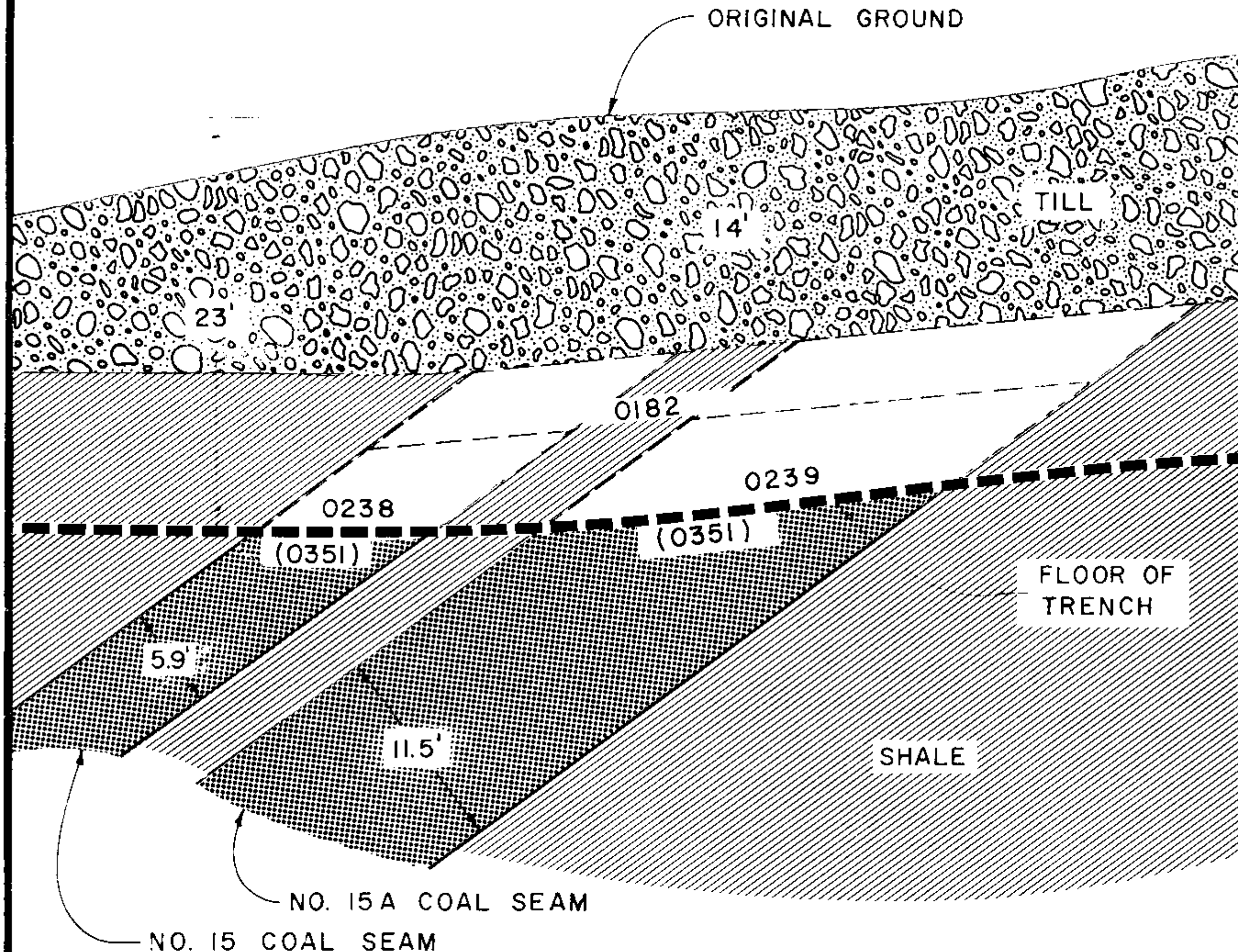
* Test Results not yet available.

All Samples taken March 1971

K-ELK RIVER 70(5)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T – 70 – 16
OXIDATION STUDY – SEAM NOS. 14, 14A, 14B, 14C, 14D
SCALE: 1" = 10'
DATE MARCH 15, 1971 DRWG. NO. 16

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor (March 1971)	0238	7 1/2	—	16.73	—
" "	Floor " "	0239	6	—	38.56	—
" "	Floor + 5' " "	0182	7	—	17.64	—
Bulk Sample	Floor " "	(0351) *	—	—	—	—

K-ELK RIVER 70(5)B.

NOTE For location refer to Exhibit 8, Drwg. 17

* Test Results not yet available.

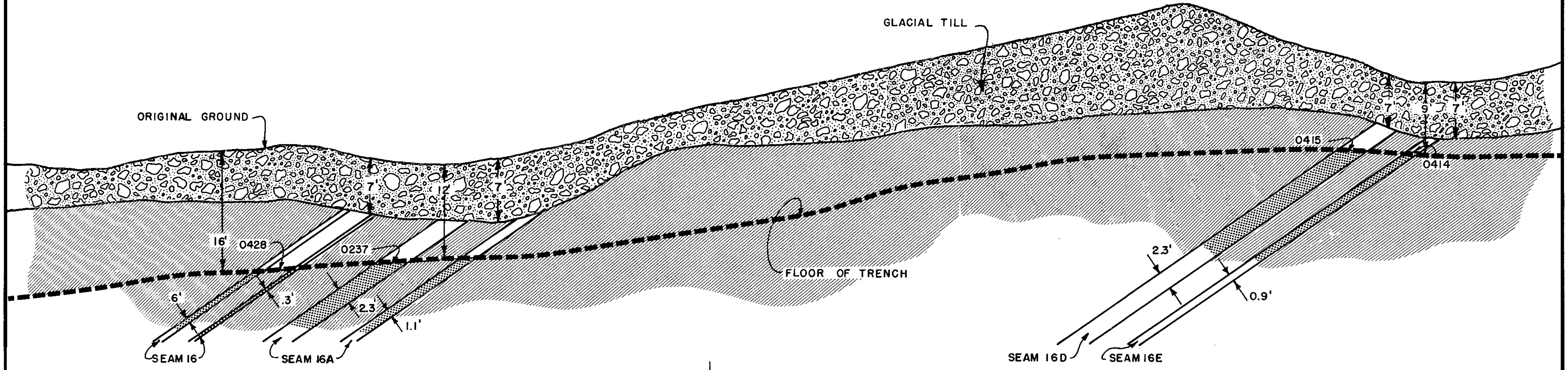
EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

EXPLORATORY TRENCH
T-70-16
OXIDATION STUDY - SEAM NOS. 15 & 15A

SCALE: 1" = 10'

DATE MARCH 15, 1971 DRWG. NO. 17

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor	0428	* -	-	-	-
" "	"	0237	5	-	11.87	-
" "	"	0415	7	-	12.23	-
Channel Sample	Floor	0414	7	-	9.97	-

NOTE:
For location refer to Exhibit 8, Drwg. 17

All Samples taken March 1971.

* Test Results not yet available.

K-ELK RIVER 70 (5) B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

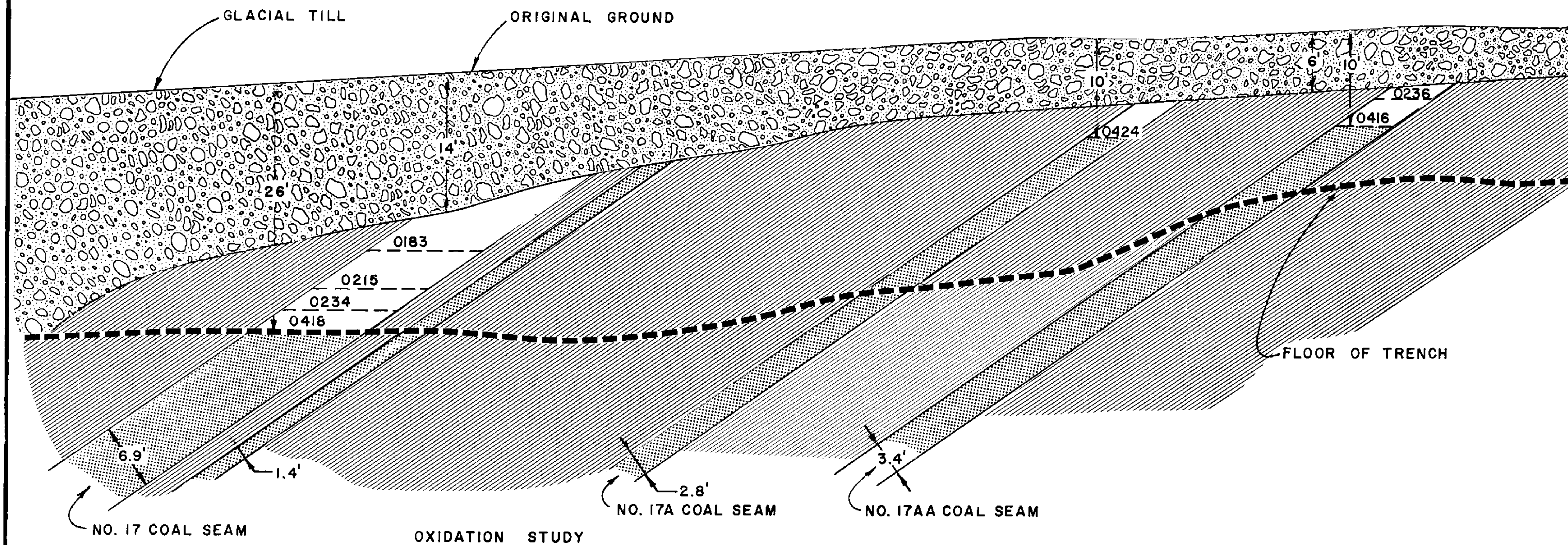
EXPLORATORY TRENCH
T-70-16

OXIDATION STUDY — SEAM NOS. 16, 16A, 16D & 16E

SCALE: 1" = 10'

DATE: MARCH 15, 1971 DRWG. NO. 18

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor + 8'	0183	3½	—	6.89	—
" "	Floor + 4'	0215	7	—	13.21	—
" "	Floor + 2'	0234	6	—	7.58	—
" "	Floor	0418	8	—	10.47	—
" "	Floor + 12'	0424	7½	—	10.05	—
" "	Floor + 10'	0236	NA	—	20.58	—
" "	Floor + 7'	0416	7	—	13.98	—

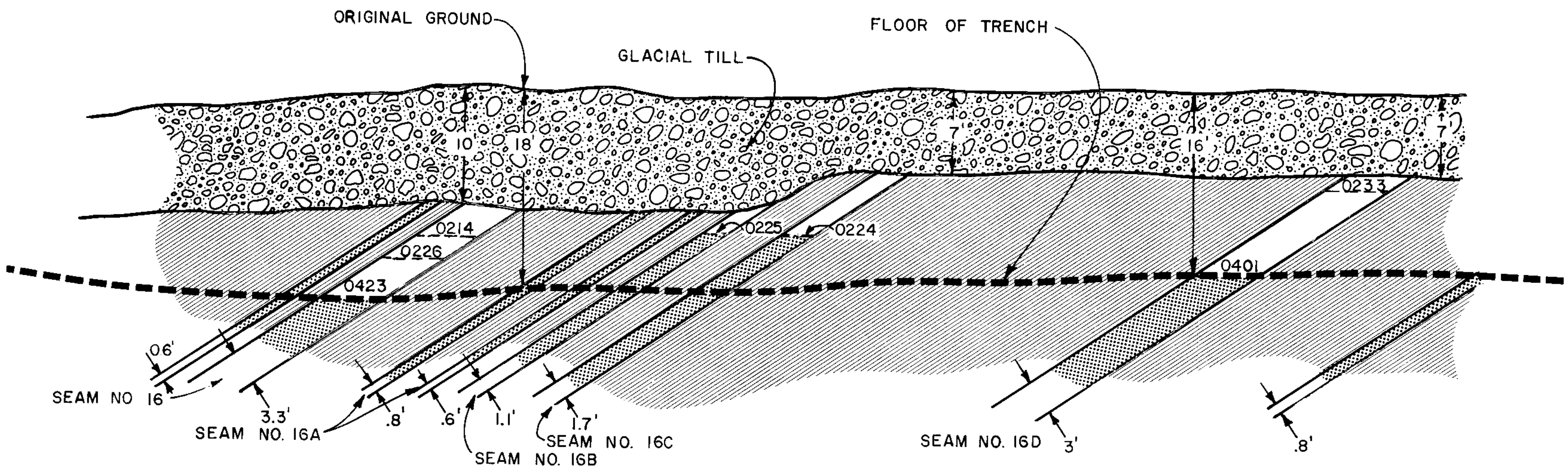
NOTE: For location refer to Exhibit 8, Drwg. 17

All Samples taken March 1971.

K - ELK RIVER 70(5)B.

EMKAY – SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 70 - 16
OXIDATION STUDY - SEAM NO. 17 - 17AA
SCALE: 1" = 10'
DATE MARCH 15, 1971 DRWG. NO. 18A

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH. Raw	ASH. Washed
Channel Sample	Floor+5'	0214	2½	—	15.77	—
" "	Floor+3'	0226	7	—	11.29	—
" "	Floor	0423	7½	—	11.61	—
" "	Floor+5'	0225	6½	—	15.65	—
" "	Floor+5'	0224	7½	—	8.78	—
" "	Floor+8'	0233	1½	—	10.84	—
" "	Floor	0401	7	—	12.17	—

NOTE: For location refer to Exhibit 8, Drwg. 18.

All Samples taken March 1971.

K-ELK RIVER 70(5)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

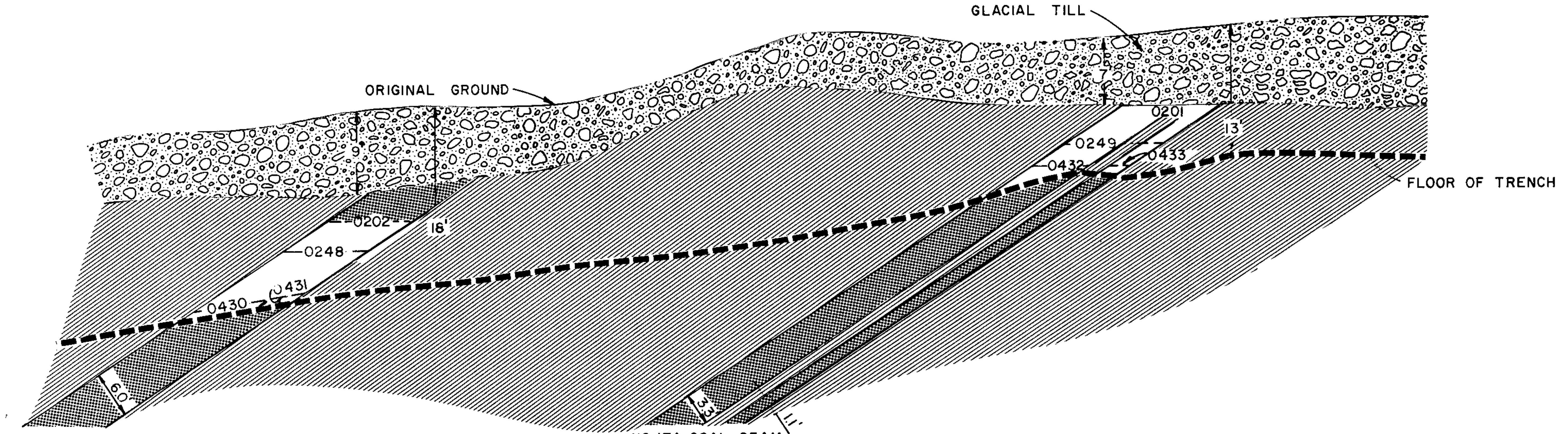
EXPLORATORY TRENCH
T-71-17

OXIDATION STUDY — SEAM NO. 16-16D

SCALE: 1" = 10'

DATE: March 15, 1971 DRWG. NO. 19

EXHIBIT NO. 18



OXIDATION STUDY

Description		Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel	Sample	Floor + 7'	0202	1 1/2	—	—	—
"	"	Floor + 4'	0248	1/2	—	5.28	—
"	"	Floor	0430	* —	—	—	—
"	"	Floor	0431	* —	—	—	—
"	"	Floor + 7'	0201	1/2	—	—	—
"	"	Floor + 3'	0249	3	—	11.30	—
"	"	Floor	0432	* —	—	—	—
"	"	Floor	0433	* —	—	—	—

NOTE: For location refer to Exhibit No. 8, Drwg. No. 18.

All Samples taken March 1971.

* Test Results not yet available.

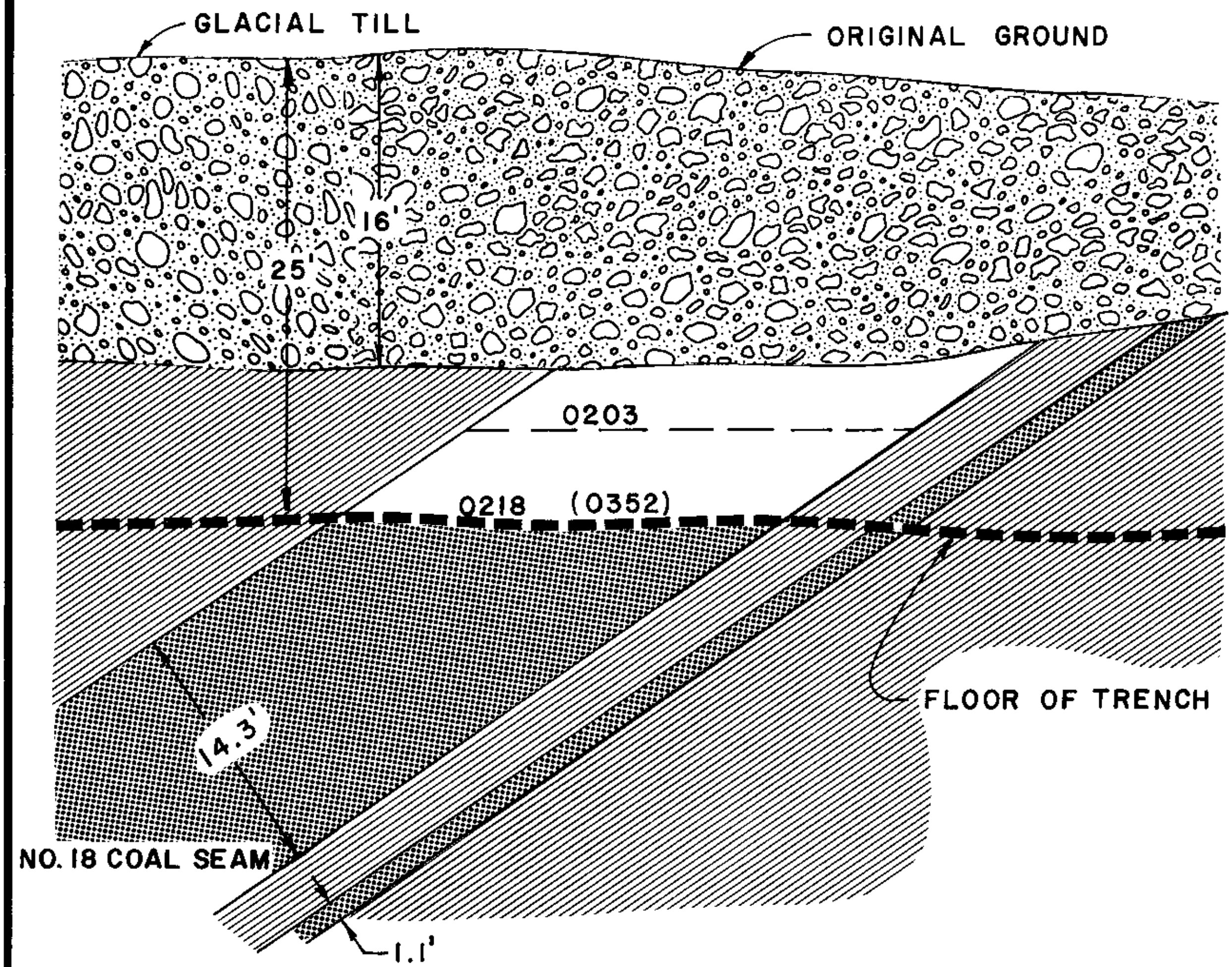
K-ELK RIVER 70(5)B

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.

EXPLORATORY TRENCH
T-71-17
OXIDATION STUDY — SEAM NOS. 17 & 17A

SCALE: 1" = 10'
DATE: MARCH 15, 1971 DRWG. NO. 20

EXHIBIT NO. 18



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor + 5'(Mar. 1971)	0203	7	—	—	—
" "	Floor (Mar. 1971)	0218	7½	—	11.98	—
Bulk Sample	Floor (Mar. 1971)	(0352)	* —	—	—	—

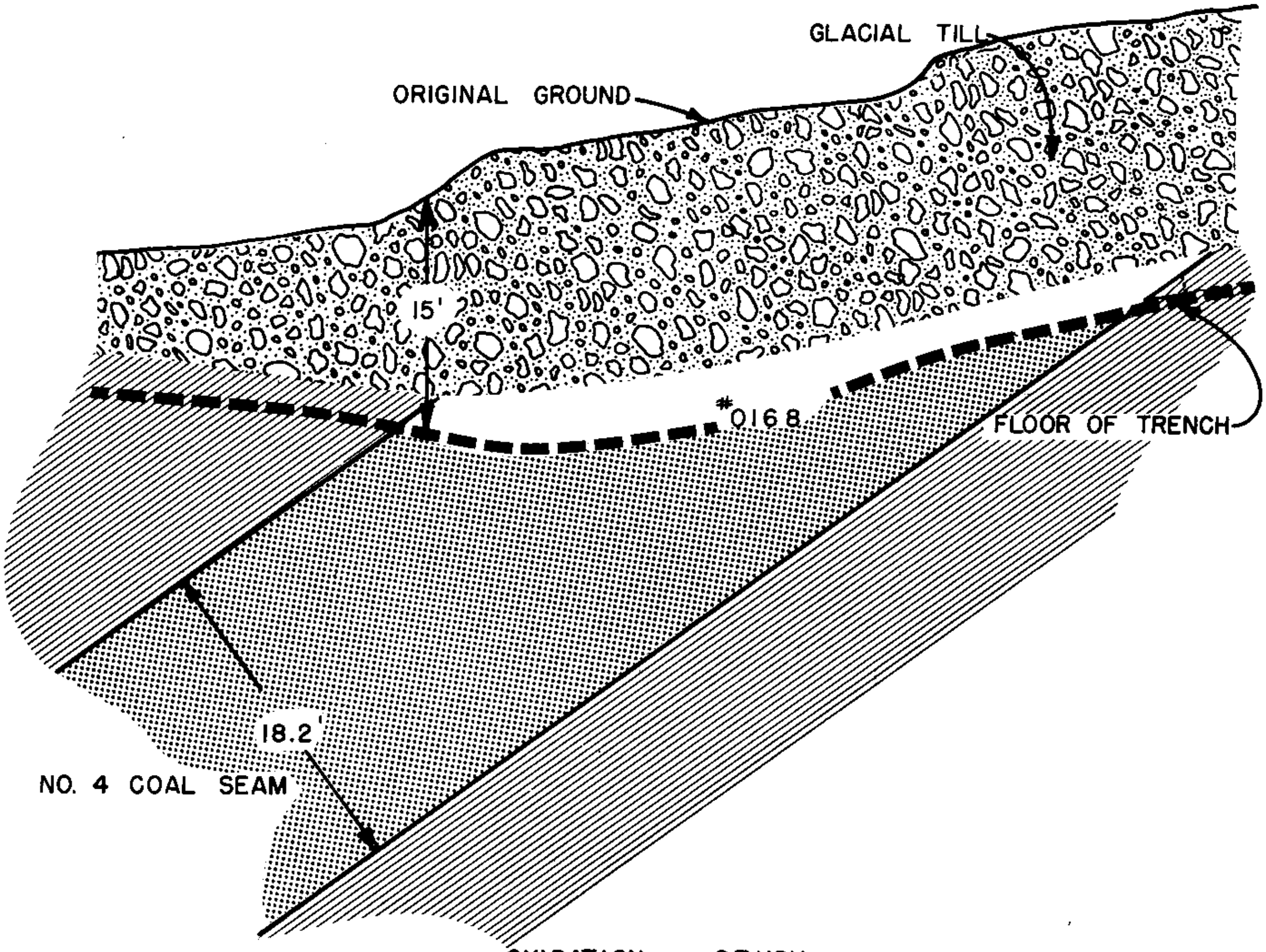
NOTE: For location refer to Exhibit 8, Drwg. 18

* Test Results not yet available.

K-ELK RIVER 70(5)13.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T - 71 - 17
OXIDATION STUDY — SEAM NO. 18
SCALE: 1" = 10'
DATE: MARCH 15, 1971 DRWG. NO. 21

EXHIBIT NO. 18



OXIDATION STUDY

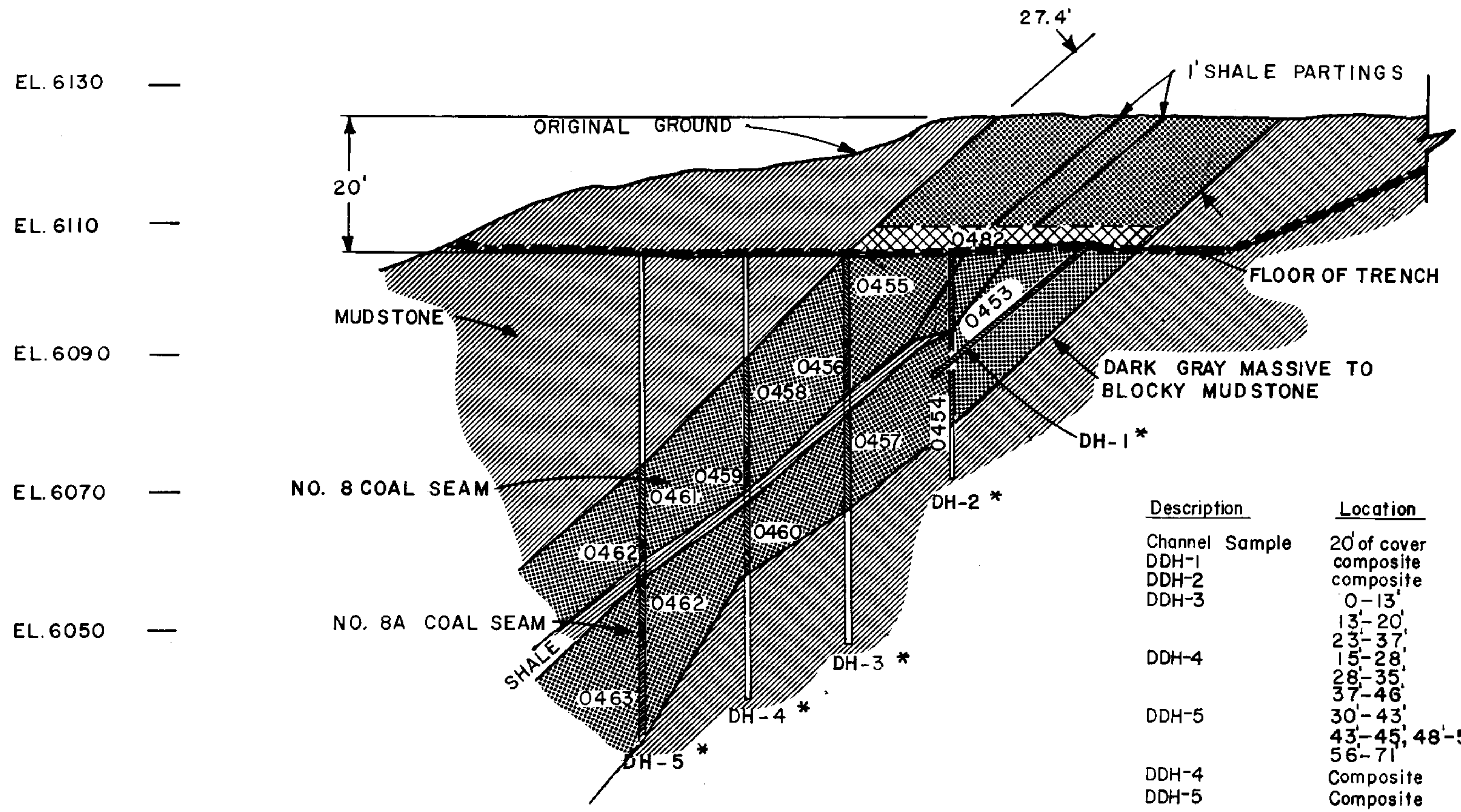
Description	Location	Sample No.	FSI Raw	FSI Washed	ASH Raw	ASH Washed
Channel Sample	Floor	0168	N.A.	—	16.83	—

NOTE: For location refer to Exhibit 8 Drwg. 19

K-ELK RIVER 70 (5) B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-SR-3
OXIDATION STUDY-SEAM NO. 4
SCALE 1" = 10'
DATE: MARCH 15, 1971 DRWG. 22

EXHIBIT NO: 18



EL. 6130

EL. 6110

EL. 6090

OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	20' of cover	0482	NA	-	-	-
DDH-1	composite	0453	NA	-	-	-
DDH-2	composite	0454	1½	-	-	-
DDH-3	0-13'	0455	NA	-	-	-
	13'-20'	0456	3½	-	-	-
	23'-37'	0457	1	-	-	-
DDH-4	15'-28'	0458	2	-	-	-
	28'-35'	0459	2½	-	-	-
	37'-46'	0460	1	-	-	-
DDH-5	30'-43'	0461	2½	-	-	-
	43'-45', 48'-56'	0462	1½	-	-	-
	56'-71'	0463	2	-	-	-
DDH-4	Composite	—	1½	3	21.83	6.88
DDH-5	Composite	—	1½	3½	26.72	7.34

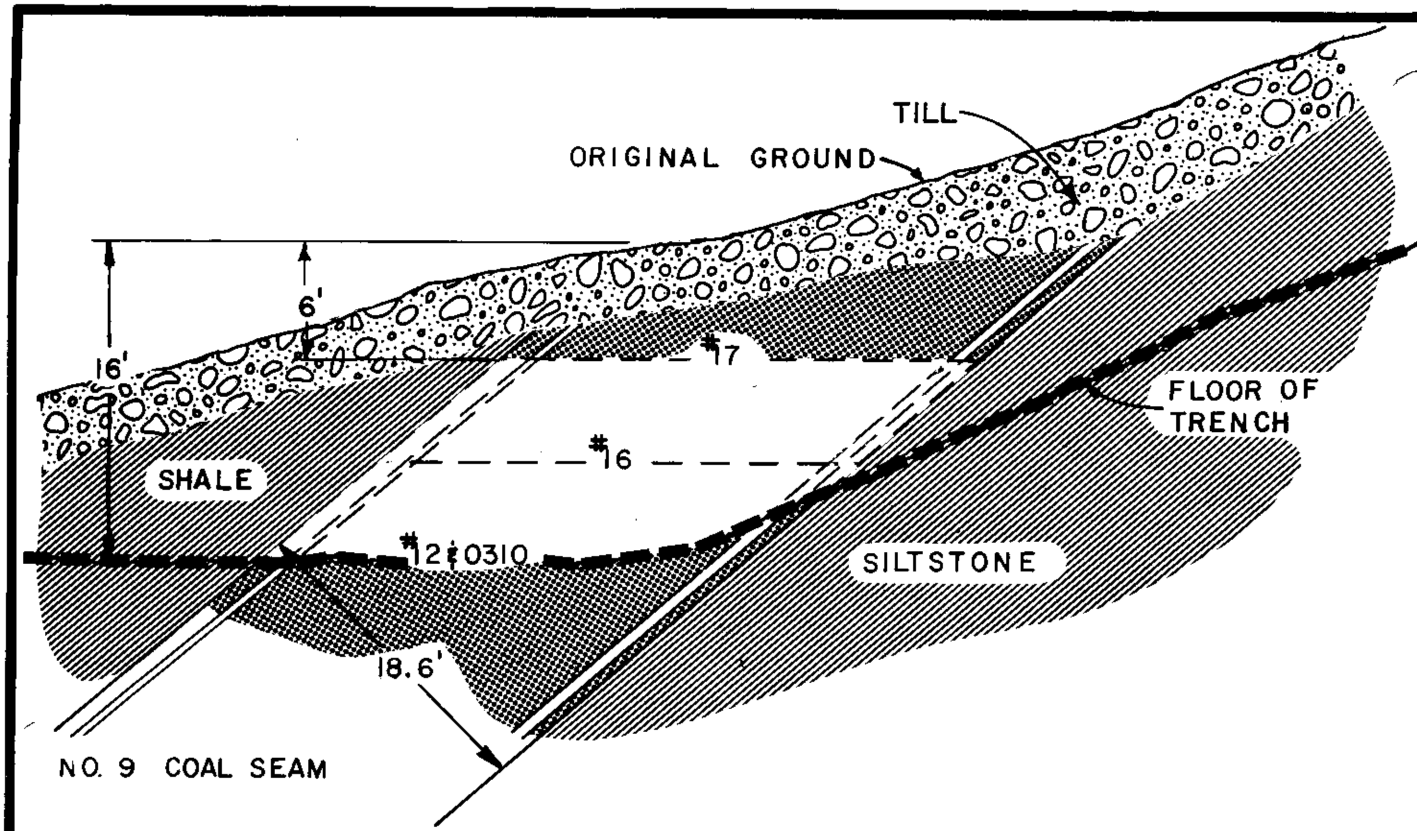
NOTE: For location refer to Exhibit 8 Drwg. 20

* DH1-DH5 were drilled to obtain oxidation data. These core samples not analyzed for Ash.

K-ELK RIVER 70 (5) B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-SR-4
OXIDATION STUDY - SEAM NOS. 8 & 8A
SCALE 1" = 20'
DATE: MARCH 15, 1971 DRWG. 23

EXHIBIT NO. 18



OXIDATION STUDY

Description		Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel	Sample	Floor + 10'	17	N.A.	—	—	—
"	"	Floor + 5'	16	1½	—	—	—
"	"	Floor	12	5½	—	—	—
"	"	Floor (Oct 1970)	0310	2½	4½	12.45	5.84

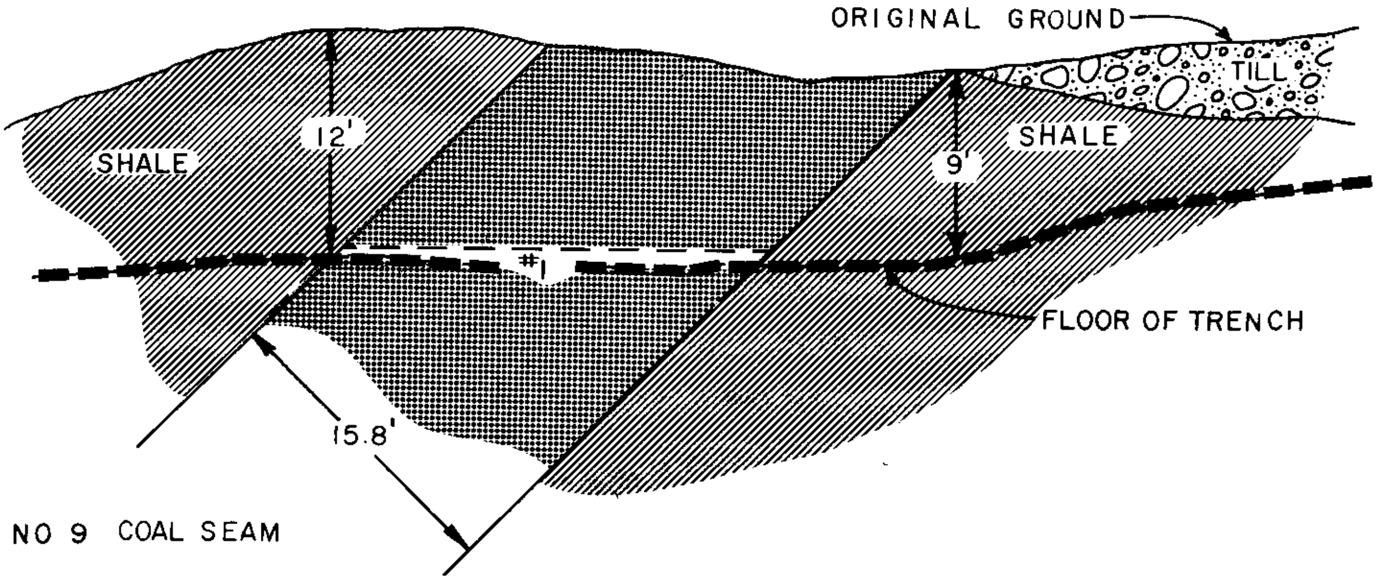
NOTE For location refer to Exhibit 8 Drwg. 21

Channel Sample No.'s 12, 16, & 17 tested in field laboratory only. No Ash determinations made.

K-ELK RIVER 70(5)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B C
EXPLORATORY TRENCH
T-SR-5
OXIDATION STUDY-SEAM NO. 9
SCALE 1" = 10'
DATE: MARCH 15, 1971 DRWG. 24

EXHIBIT NO. 18



OXIDATION STUDY

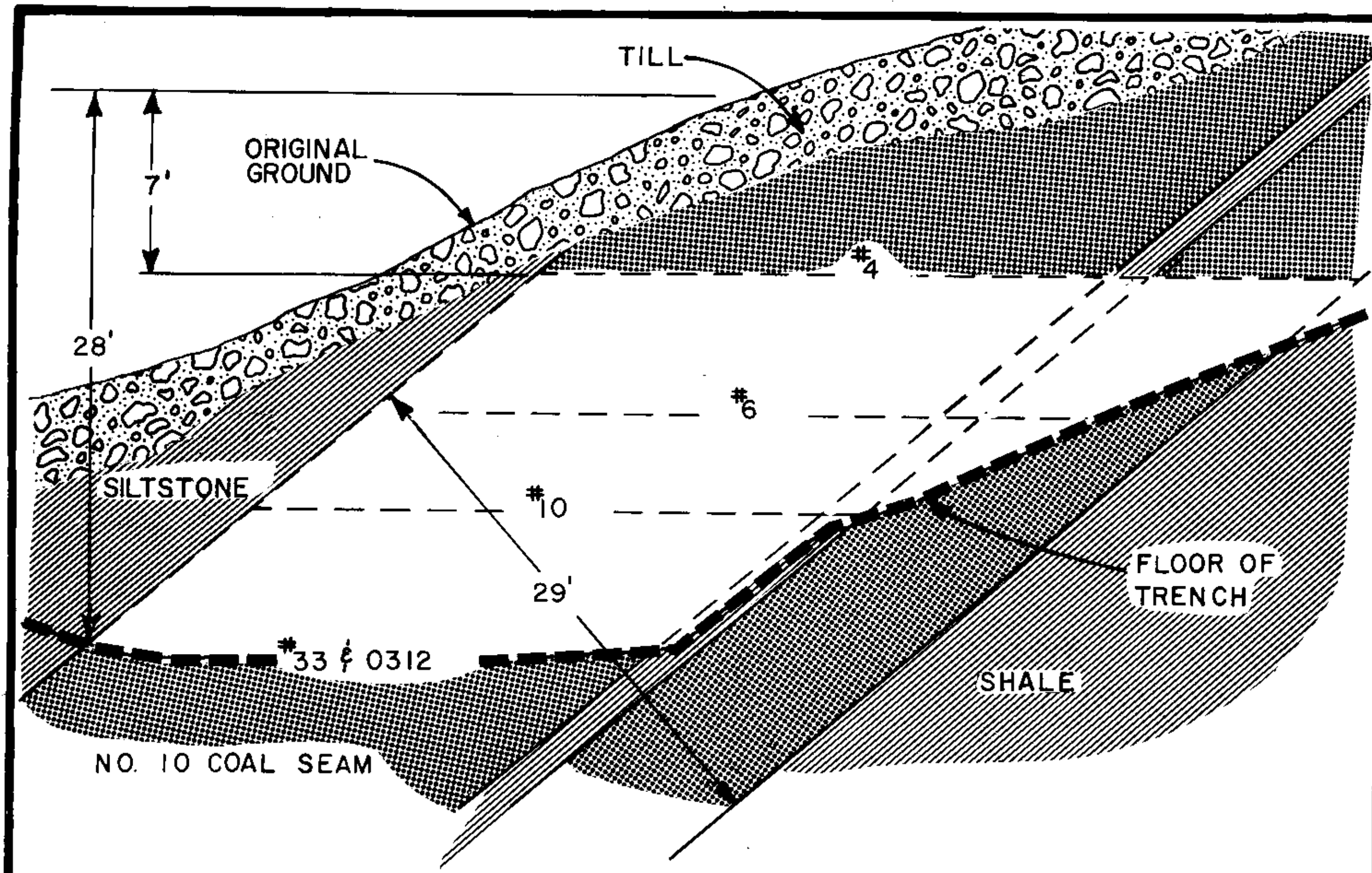
Description	Location	Sample No.	FSI Raw	FSI Washed	ASH Raw	ASH Washed
Channel Sample	Floor	1	N.A.	—	—	—

NOTE: For location refer to Exhibit 8 Drwg. 23

Channel Sample No. 1 tested in field laboratory only. No Ash determinations made.

K-ELK RIVER 70(5)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-SR-12
OXIDATION STUDY-SEAM NO. 9
SCALE 1" = 10'
DATE: MARCH 15, 1971 DRWG. 26



OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor + 21'	4	NA	—	—	—
" "	Floor + 13'	6	1	—	—	—
" "	Floor + 8'	10	2½	—	—	—
" "	Floor	33	7½	—	—	—
" "	Floor (Oct 1970)	0312	3	4½	11.16	6.19

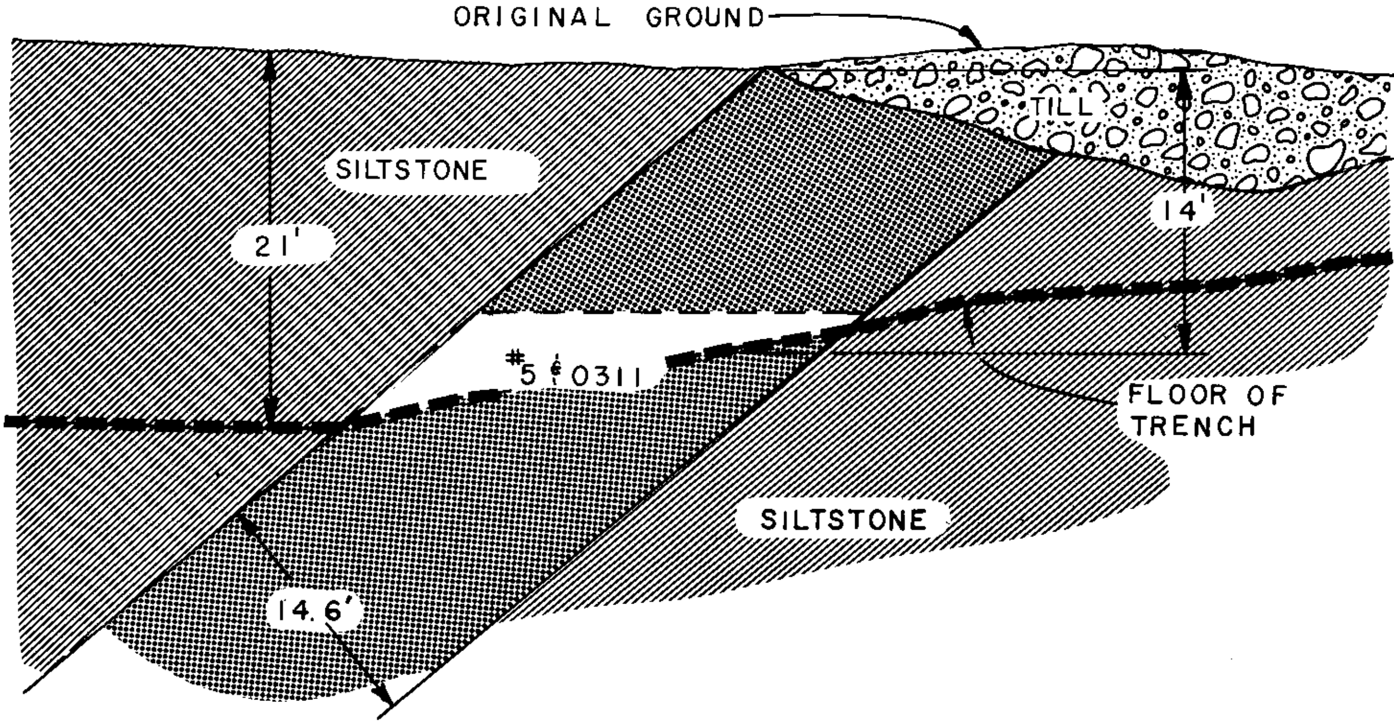
NOTE For location refer to Exhibit 8 Drwg. 22

Channel Sample No's 4, 6, 10, & 33 tested in field laboratory only. No Ash determinations made.

K-ELK RIVER 70(5)B.

EMKAY - SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-SR-6
OXIDATION STUDY - SEAM NO. 10
SCALE 1" = 10'
DATE: MARCH 15, 1971 DRWG. 25

EXHIBIT NO. 18



NO. 10 COAL SEAM

OXIDATION STUDY

Description	Location	Sample No.	F.S.I. Raw	F.S.I. Washed	ASH Raw	ASH Washed
Channel Sample	Floor	5	5½	—	—	—
" "	Floor (Oct 1970)	0311	6½	7½	7.67	4.07

NOTE For location refer to Exhibit 8 Drwg. 24

Channel Sample No. 5 tested in field laboratory only. No Ash determinations made.

K-ELK RIVER 70(5)B.

EMKAY — SCURRY LTD.
METALLURGICAL COAL DEVELOPMENT
ELK RIVER VALLEY, B.C.
EXPLORATORY TRENCH
T-SR-13
OXIDATION STUDY - SEAM NO. 10
SCALE 1" = 10'
DATE: MARCH 15, 1971 DRWG. 27

EXHIBIT NO. 18