

~~CONFIDENTIAL~~

AN EVALUATION
OF THE
CLINTON CREEK PROJECT
CASSIAR ASBESTOS CORPORATION

by

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INTRODUCTION

Cassiar Asbestos Corporation, a Canadian company which operates an asbestos mine in northern British Columbia, announced that it intends to put its Clinton Creek, Yukon, asbestos property into production by 1968. The Company has written to the Minister of Northern Affairs and National Resources asking the Federal and/or Yukon Territorial Governments to construct and maintain the following roads and bridges in the Yukon Territory. (See MAP I and MAP 2).

	<u>ESTIMATED COST</u>
1. A 26 mile road from the mine to Mile 37 on the Sixty Mile Road \$	650,000
2. A bridge across the Forty Mile River	450,000
3. Re-locate and improve the Sixty Mile Road from Mile 37 to Dawson	1,850,000
4. A bridge over the Yukon River at or near Dawson .	3,000,000
TOTAL COST \$	<u>5,950,000</u>

It is the purpose of this report to evaluate the proposed Clinton Creek mining operation, to consider alternative solutions to the transportation problem, and to analyse the economics of the project so that the desirability of government financial assistance may be assessed.

Information used in this evaluation was received from the following sources:

1. A report prepared by Cassiar Asbestos Corporation on the Clinton Creek mine.
2. Discussions between Company officials and representatives of the Department of Northern Affairs and National Resources.

3. Discussions with officers of the Department of Mines and Technical Surveys.

SUMMARY

An evaluation of the Clinton Creek project has revealed that at the minimum rate of production contemplated by the Company, the rate of return to the Company will be below an acceptable level if financial assistance to the extent of approximately 2 1/2 million dollars is not provided for the construction of roads and bridges.

There is a fairly good possibility however, that additional ore reserves will be proven. If this happens the Company will be able to increase its rate of production and thus its profits. At a doubled rate of production profits will be such that the operation might assume the cost of building the required roads and bridges. This is based on the assumption that the Company would not consider building a bridge across the Yukon River but would rely on ferries and ice bridges.

An analysis of the net return to the Company if a bridge were built across the Yukon compared to the return if ferries and ice bridges were used for the crossing, thus requiring the Company to provide additional warehousing, indicates that the difference is not sufficient to seek justification for the construction of a \$3,000,000 bridge.

COMPANY, PROPERTY AND LOCATION (see MAP I)

Cassiar Asbestos Corporation has been operating a highly successful open pit asbestos mine in northern British Columbia for the past ten years. In addition, the Company has a 50% interest in the Territorial Supply Company which provides a supply and service agency for the Company and for United Keno Hill Mines Ltd. at Whitehorse, Yukon Territory. Major shareholders

in Cassiar Asbestos Corporation are Comwest Exploration Limited (16%) Raybestos-Manhattan, Incorporated, (10%), Bell Asbestos Mines (5%) shares, and Newmont Mining Corporation (16%). The Company produces high quality long and medium-fibred asbestos which is used mainly for spinning purposes. Production at the British Columbia property began in 1954 and since July, 1958, \$14,620,000 has been paid in dividends.

Cassiar's Clinton Creek property consists of 153 mineral claims which are located about five miles upstream from the mouth of Clinton Creek, about 60 miles northeast of Dawson, and about seven miles from the Alaska boundary. Latitude and longitude are 64°27'N and 140°45'W.

ACCESSIBILITY

Access to the property is by light aircraft to an airstrip within one half mile of the campsite and by a low standard road which leaves the Sixty Mile Road at Mile 37. This road is impassable to all vehicles except tractors and possibly four-wheel drive vehicles.

HISTORY

The original 32 claims were staked by an Indian who was grubstaked by Fred Caley of Dawson. Comwest Exploration Company Limited optioned these claims and Cassiar Asbestos Corporation acquired the claims from Comwest and added additional ones until the Company now holds 153 claims. In 1957 a sampling and trenching program was carried out and two adits started. Bulk samples were sent to Cassiar, B.C. for testing.

In 1958, three adits were completed for a total footage of 5,247 feet. Approximately 5,000,000 tons of ore were outlined at that time. Because of unfavourable market conditions, no further work was done until 1963.

In 1963 work was resumed which consisted of geological and magnetometer surveys. Some improvements were made to the 26 mile access road from the Sixty Mile Road to the Clinton Creek camp. Some trenching and a limited amount of diamond drilling were done.

The 1964 program consisted of trenching and diamond drilling. Up until the end of that year the Company had spent approximately \$865,000 on the Clinton Creek project.

GEOLOGY AND MINERALOGY

The asbestos fibre, which is chrysotile, occurs in peridotite. The country rock, according to Dr. R. Skinner of the Geological Survey of Canada, is mainly slate with some quartzite. The fibre is much harsher than that found in the Eastern townships of Quebec and, although in some places fibre length is more than one inch, the greater bulk is less than 1/2 inch in length.

ORE RESERVES

The 1963 and 1964 exploration programs increased the ore reserves substantially. The reserves calculated to a depth of 100 feet below the adit level are 12,300,000 tons grading 6.84% fibre and valued at \$12.32 per ton. This calculation is based on producing two or three grades of fibre in the Group 4 and Group 5 ranges. These grades are suitable for the manufacture of asbestos cement products. The ore body is suitable for open pit mining, and reserves are sufficient to support an annual output of 40,000 tons of fibre for 19 years.

One diamond drill hole located about 1,000 feet west of the ore body, (see MAP 3), diamond drill hole CW-1, indicated the possibility of increased ore reserves. If the intervening area is underlain with

asbestos ore, reserves could be in the order of 30,000,000 tons. This possibility, which will be investigated in the course of the 1965 drilling program, is considered in this evaluation. Should the increased reserves be confirmed, the Company will attempt to find markets for an annual output of 80,000 of fibre for 24 years. (See MAP 3).

FINANCING

The Company is proposing to increase its capitalization from 4,000,000 to 5,000,000 shares and to issue 775,000 of these new shares at \$12.00 per share. This will provide \$9,300,000 of the \$14,200,000 required for developing the Clinton Creek Mine. The balance of \$4,900,000 will be obtained from financing within the Company. The proposed issue of shares will be taken up by the following companies, who are major purchasers of Cassiar's asbestos production:

Bell Asbestos Mines Ltd.

James Hardie Asbestos Limited.

Raybestos-Manhattan Inc.

MARKET ANALYSIS

Clinton Creek will produce a fibre which will be used mainly for the manufacture of asbestos cement products. The demand for this type of fibre has increased greatly in the past few years. World production of all types of asbestos fibre has increased from 1,970,000 tons in 1956 to nearly 3 million tons in 1963. Canada's proportion of these totals has decreased from 51% in 1956 to 42% in 1963 which reflects the increasing importance of the Soviet Union as an asbestos producer. Increased use of asbestos cement products accounts for a good proportion of the increased production mentioned above.

The three companies which are providing most of the financing for the Clinton Creek project have undertaken to purchase 30,000 tons per year of asbestos produced at the new mine. Although initial production at the mine is planned to be at the rate of 40,000 tons of fibre per year, the plant will be capable of producing 55,000 to 60,000 tons of fibre annually without any additional appreciable capital expenditures. If an annual production of 80,000 tons is desired, approximately \$4,000,000 will have to be spent on plant enlargement.

Company officials feel certain conditions are such that there will be no difficulty in selling from 55,000 to 60,000 tons of fibre from Clinton Creek within 2 or 3 years after production is commenced. They are also optimistic about the possibility of being able to market 80,000 tons of fibre per year within 5 to 6 years after production starts.

It is difficult to predict accurately what share of the world's asbestos markets Canada will be able to obtain. Soviet Union production is now as high as Canada's and it is not known how much of this will enter Western markets. It is believed, however, that the per capita use of asbestos in the Soviet Union is higher than that in Canada, which indicates that a good proportion of Soviet production will be for domestic use. The following factors would indicate that the Company has reasonable justification for optimism regarding increased future sales of asbestos.

1. The market for asbestos cement products is likely to continue to grow rapidly, mainly because of the world-wide need for housing construction. Asbestos cement products are used in housing construction for sewer and water lines, roofing and siding. A United Nations study has predicted that in the next 35 years, the world will require as many new housing units as there are in

existence today. In Canada, studies have indicated that the present number of housing starts must double by 1970. Provided that asbestos cement products can hold their own with competitive building materials, it is logical that the demand for these products will increase rapidly.

2. Cassiar Asbestos Corporation has a reputation for producing products of high quality. Manufacturers of asbestos cement products prefer this higher quality, and if Cassiar applies the same philosophy to its Clinton Creek operation, it should be able to obtain a fair share of the expanding market.

On the negative side, competition from the U.S.S.R will continue to be severe and new production from Asbestos Hill in Ungava will be on the market within a few years. In summary, the demand for asbestos cement products will undoubtedly increase rapidly over the next few years. Cassiar Asbestos Corporation should be able to increase its sales of fibre substantially, but it is difficult to predict whether or not the Company will be able to attain a production of 80,000 tons per year of fibre from its Clinton Creek operation within 5 or 6 years time. It is important, however, that the Company does not delay in putting its Clinton Creek property into production because delays may result in the loss of market to competitors.

At present prices the market value of the minimum proposed production of 40,000 tons of fibre per year from Clinton Creek will be approximately \$7,200,000 per year. Practically all of this will be foreign exchange since Cassiar will export its production to Pacific markets (mainly Japan, Australia, Western United States and New Zealand), with smaller amounts going to Europe.

EVALUATION

Background

Cassiar Asbestos Corporation, as mentioned previously, operates an asbestos mine at Cassiar, British Columbia. In conjunction with United Keno Hill Mines Ltd., the Company operates a trucking service from Cassiar, British Columbia, to Whitehorse, Yukon Territory, as well as from Elsa, Yukon Territory, to Whitehorse. From Whitehorse, asbestos fibre and lead-zinc concentrates are shipped via White Pass and Yukon rail and ocean services to Vancouver, British Columbia. When the Clinton Creek project comes into production, this trucking service will be used to haul asbestos fibre from Clinton Creek to Whitehorse and to back-haul supplies (including oil) to the mine.

To provide uninterrupted year-around trucking service between the mine and Whitehorse, it will be necessary to build all roads and bridges as outlined in the Company's request for assistance. The largest single item of expenditure is a bridge across the Yukon River at Dawson. If this bridge is not built the Company will be forced to use the ferry at Dawson in the summer and an ice bridge during the winter. There will be two periods yearly, during breakup and freezeup, when no trucking can take place between the mine and Whitehorse.

Alternatives

Several alternatives were considered in evaluating the Clinton Creek project and the Company's application for assistance.

CASE I - Taking the less optimistic view of the Company's prospects, assume that the ore reserves at Clinton Creek are 12,300,000 tons and that production will continue for 19 years at the rate of 655,000 tons of ore and 40,000 tons of fibre per year.

Financial assistance on road and bridge construction to the full amount requested by the Company, will be provided by the government.

- CASE II- The same assumptions as in (1), except that the government will not provide financial assistance for the construction of a bridge across the Yukon River. It is assumed that the Company will not undertake such a project thus making the use of ferries and ice bridges a necessity. The Company would have to provide additional warehousing at the mine and at Dawson and would have to increase its truck fleet.
- CASE III- Adopting the more optimistic view, assume that the Company's ore reserves are 30,000,000 tons and that production will begin at the rate of 40,000 tons of fibre annually and will increase to a maximum of 80,000 tons annually at the end of 5 years. Ore production will then be 1,310,000 tons per year and the life of the mine will be approximately 24 years. Full financial assistance as requested by the Company will be provided.
- CASE IV- The same assumptions as in (3) except that no assistance for construction of a bridge across the Yukon River will be given. Other alternatives were considered but rejected for the reasons given as follows:

- (a) Shipping asbestos fibre during breakup and freezeup via the Sixty Mile Road into Alaska and thence via the Taylor Highway and Alaska Highway to Whitehorse. This alternative was rejected because it was not known to what extent the Alaska Government would repair or rebuild the Taylor Highway to bring it up to the standards required.

Another reason is that the load limits on the paved portion of the Alaska Highway in Alaska are such that the Company would be forced to reduce its payload from 24 to 20 tons per vehicle.

- (b) Shipping fibre via Alaska to the Alaska ports of Valdez or Anchorage for shipment by boats to Vancouver. This was rejected because, as in (a), it was not known to what extent the Alaska Government would repair the Taylor Highway. Another reason is the fact that to make effective use of the backhaul, supplies would have to come in through Anchorage or Valdez. This would have an unfavourable effect on the benefits which the Company can obtain by combining the transportation of both the production of and the supplies for three mining operations, (Cassiar, British Columbia, United Keno Hill and Clinton Creek), in one operation.
- (c) Cease shipments of fibre from Clinton Creek to Whitehorse during breakup and freezeup and provide for market requirements by building up inventories in Whitehorse or Vancouver. This alternative was not considered because it would involve laying off of truck drivers during breakup and freezeup. With present labour shortages, this would create serious personnel problems. Another reason is that the shipping services from Skagway to Vancouver are geared for a steady flow of cargo and will not take the periodic surges which would occur if shipments from Clinton Creek were interrupted.
- (d) Construct an aerial tramway over the Yukon River at Dawson to carry asbestos fibre across the Yukon River. This alternative was rejected for several reasons:

- (i) because of the long unsupported span, an aerial tramway suitable for carrying one ton loads would be a sizeable and expensive structure, and would only be used over freezeup and breakup;
- (ii) use of a tramway would require handling and storage facilities on both sides of the river at Dawson as well as crews to operate the tramway.

For purposes of this evaluation, only the first four alternatives are considered. CASE I and CASE II represent the more pessimistic outlook for the operation. No consideration is given to the possibility of increasing ore reserves or the rate of production throughout the life of the mine. CASE III and CASE IV take the more optimistic view. Ore reserves are assumed to be much higher, as indicated as a possibility from the results of one diamond drill hole. The rate of production starts off at the same rate as in CASE I but doubles after 5 years of production.

CASE I

Assumptions

1. The Government will pay the cost of building a bridge across the Yukon River, improvements to the Sixty Mile Road and 2/3 of the cost of building a mine access road to the property (including a bridge across the Forty Mile River).
2. Trucking will be carried out on a year-around basis between Clinton Creek and Whitehorse.
3. Ore Reserves = 12,300,000 tons with a recoverable value of \$11.00 per ton.
4. Yearly production = 40,000 tons of fibre from 655,000 tons of ore.

5. Mine operating costs are as follows:

Mining\$ 1.65	per ton of ore.
Mill Feed Preparation60	" " " "
Milling	1.48	" " " "
Plant Burden	1.15	" " " "
Transportation and Marketing	3.04	" " " "
Road and Bridge Maintenance06	" " " "
<hr/>		
T O T A L\$ <u>7.98</u>	per ton of ore.

6. Pre-production expenditures \$2,515,813

7. Capital expenditures \$11,141,000 . . . with no provision for additional capital expenditures during the life of the mine.

Evaluation

In Figure 1 the present value at different discount rates of the anticipated cash flow which will be realized by the Company, is plotted. (See CASE I). The rate of return on the Company's initial investment will be approximately 12%. If the Company has to pay the total cost of all road construction and the bridge across the Forty Mile River (an additional \$2,583,000), then the rate of return will be reduced to 9%.

CASE II

Assumptions

1. The Government will pay the cost of improvements to the Sixty Mile Road and 2/3 of the cost of a mine access road to the property (including a bridge across the Forty Mile River).
2. Trucking from Clinton Creek will continue year-around except during breakup and freezeup. Crossing of the Yukon River will be accomplished by ferry and ice bridge. Inventories of asbestos fibre will be built

up in Dawson to enable year-around trucking to be carried out between Dawson and Whitehorse.

3. Ore Reserves = 12,300,000 tons with a recoverable value of \$11.00 per ton.
4. Yearly production = 40,000 tons of fibre from 655,000 tons of ore.
5. Mine operating costs = 8.05 per ton (an additional 7¢ per ton for transportation.)
6. Pre-production expenditures = \$ 2,515,813
7. Capital expenditures = \$ 12,061,000 with no provision for additional capital expenditures during the life of the mine.

Evaluation

The graph in Figure 2, (see CASE II), reveals that the rate of return on the Company's investment will be approximately 11 1/2%. If the Company has to pay the total cost of all road construction and the bridge across the Forty Mile River, an additional \$2,583,000, then the rate of return will be reduced to 8 1/2%.

CASE III

Assumptions

1. The Government will pay the cost of building a bridge across the Yukon River, improvements to the Sixty Mile Road and 2/3 of the cost of building a mine access road to the property, including a bridge across the Forty Mile River.
2. Trucking will be carried out on a year-around basis between Clinton Creek and Whitehorse.
3. Ore Reserves = 30,000,000 tons with a recoverable value of \$11.00 per ton.
4. Yearly production starts at 40,000 tons of fibre and increases to 60,000 tons in the first 5 years and then increases to 80,000 tons for years 6 to 24 inclusive.

5. Mine operating costs = \$ 7.98 per ton. Any decrease in costs due to increased rate of production will be offset by increases in costs due to increased waste to ore stripping ratio which will be encountered in mining reserves in excess of 12,300,000 tons.
6. Pre-production expenditures = \$ 2,515,813
7. Capital expenditures = \$ 11,001,000 initially with an additional expenditure of \$ 4,000,000 at the beginning of the sixth year.

Evaluations

The graph in Figure 1, (See CASE III), indicates that the rate of return on the Company's investment will be approximately 24%. If the Company has to pay the total cost of all road construction and the bridge across the Forty Mile River (an additional \$2,583,000), then the rate of return will be reduced to 18 1/2%.

CASE IV

Assumptions

1. The Government will pay the cost of improvements to the Sixty Mile Road and 2/3 of the cost of a mine access road to the property (including a bridge across the Forty Mile River).
2. Trucking from Clinton Creek will continue year around, except during breakup and freezeup. Crossing of the Yukon River will be accomplished by ferry and ice bridge. Inventories of asbestos fibre will be built up in Dawson to enable year-around trucking to be carried out between Dawson and Whitehorse.
3. Ore Reserves = 30,000,000 tons with a recoverable value of \$11.00 per ton.
4. Yearly production starts at 40,000 tons of fibre and increases to 60,000 tons in the first 5 years and then increases to 80,000 tons for years 6 to 24 inclusive.

5. Mine operating costs = \$ 8.03 per ton.
6. Pre-production expenditures = \$ 2,515,813.
7. Capital expenditures = \$ 12,001,000 with an additional expenditure of \$4,000,000 at the beginning of the sixth year.

Evaluation

The graph in Figure 2, (see CASE IV), indicates that the rate of return on the Company's investment will be approximately 22%. If the Company has to pay the total cost of all road construction and the bridge across the Forty Mile River (an additional \$2,583,000), then the rate of return will be reduced to 17%.

Summary of Evaluation

There is no hard and fast rule as to what rate of profitability should be expected from a mining operation. It is generally accepted, however, that a return of capital with interest at 10% is a minimum. In certain situations a return of 15% or 20% is necessary to offset risks and exploration losses sustained elsewhere. Risks in mining are numerous and include the following:

1. Unexpected and unforeseen changes in the size and character of ore bodies.
2. Decline of market prices (e.g. tungsten in the early 1960's).
3. Unexpected changes in the competency of ground conditions resulting in higher mining costs.
4. Other unforeseen events such as intrushes of water, avalanches, rock bursts, etc.
5. Unsuccessful exploration expenses.

In the case of the Clinton Creek project, a return of capital with interest at 10% should be considered to be an absolute minimum and 15-20% would be desirable. If the first two alternatives, CASE I and CASE II

are considered, it is apparent that the venture cannot sustain any significant increase in capital requirements. In the case of the latter two alternatives, CASE III and CASE IV, a good profit can be obtained even with fairly substantial increases in capital requirements. It must be pointed out, however, that CASE III and CASE IV are based on ore reserve information which is inferred but by no means proven. These alternatives represent a more optimistic view of the Clinton Creek project, and only additional work will prove whether or not this view is justified.

BENEFITS TO THE CROWN

The following table lists the estimated revenue over the life of the mine which will accrue to the Crown from the Clinton Creek operations for each of the four previously mentioned alternatives. Also shown is the estimated present value (discounted at 6%), of this revenue as of the year the mine goes into production (i.e.), 1968.

	<u>CASE I</u>	<u>CASE II</u>	<u>CASE III</u>	<u>CASE IV</u>
Income Tax on Payroll	\$ 4,978,000	\$ 4,985,000	\$ 7,800,000	\$ 7,920,000
Fed.Sales Tax on Annual Purchases	2,071,000	2,071,000	3,840,000	4,200,000
Yukon Taxes and Licenses	1,102,000	1,102,000	2,040,000	2,280,000
Corporate Income Taxes	5,615,905	5,212,643	19,963,874	20,237,265
Yukon Quartz Royalty	625,000	625,000	2,293,247	2,216,971
Fed.Sales Tax on Capital Exp.	800,000	900,000	1,200,000	1,300,000
T O T A L	<u>\$15,191,905</u>	<u>\$14,895,643</u>	<u>\$37,137,121</u>	<u>\$38,154,236</u>
Present Value as of 1968	<u>\$ 8,434,000</u>	<u>\$ 8,322,000</u>	<u>\$18,381,000</u>	<u>\$18,398,000</u>

In addition to this revenue, there will be indirect revenue in the form of taxes paid by suppliers, transportation companies, etc., who are involved in the Cassiar operation and also the benefits derived from the effect of a \$2-\$3,000,000 annual payroll on the economy of the Yukon Territory.

CONCLUSIONS

This analysis and evaluation of the Clinton Creek project brings out the following points:

1. If the mine goes into production at the minimum rate of 40,000 tons of fibre per year and if full government assistance for road and bridge construction is provided, the return to the company is very little above the minimum which is considered acceptable in a high risk industry such as mining.
2. If the company has to pay the cost of roads and a bridge across the Forty Mile River, its rate of return at the minimum rate of production is below the acceptable level.
3. If additional ore reserves are proven and the rate of production doubled, the operation then yields a good rate of return to the company regardless of whether or not the government provides assistance in the construction of roads and bridges.
4. The construction of a bridge over the Yukon River by the government does not affect the economics of the project to an extent where it would mean the difference between whether or not the mine could be put into production.

5. No consideration has been given in this report to other factors such as tourist traffic, local benefits, etc., which may affect the desirability of constructing bridges and roads in the Dawson area.

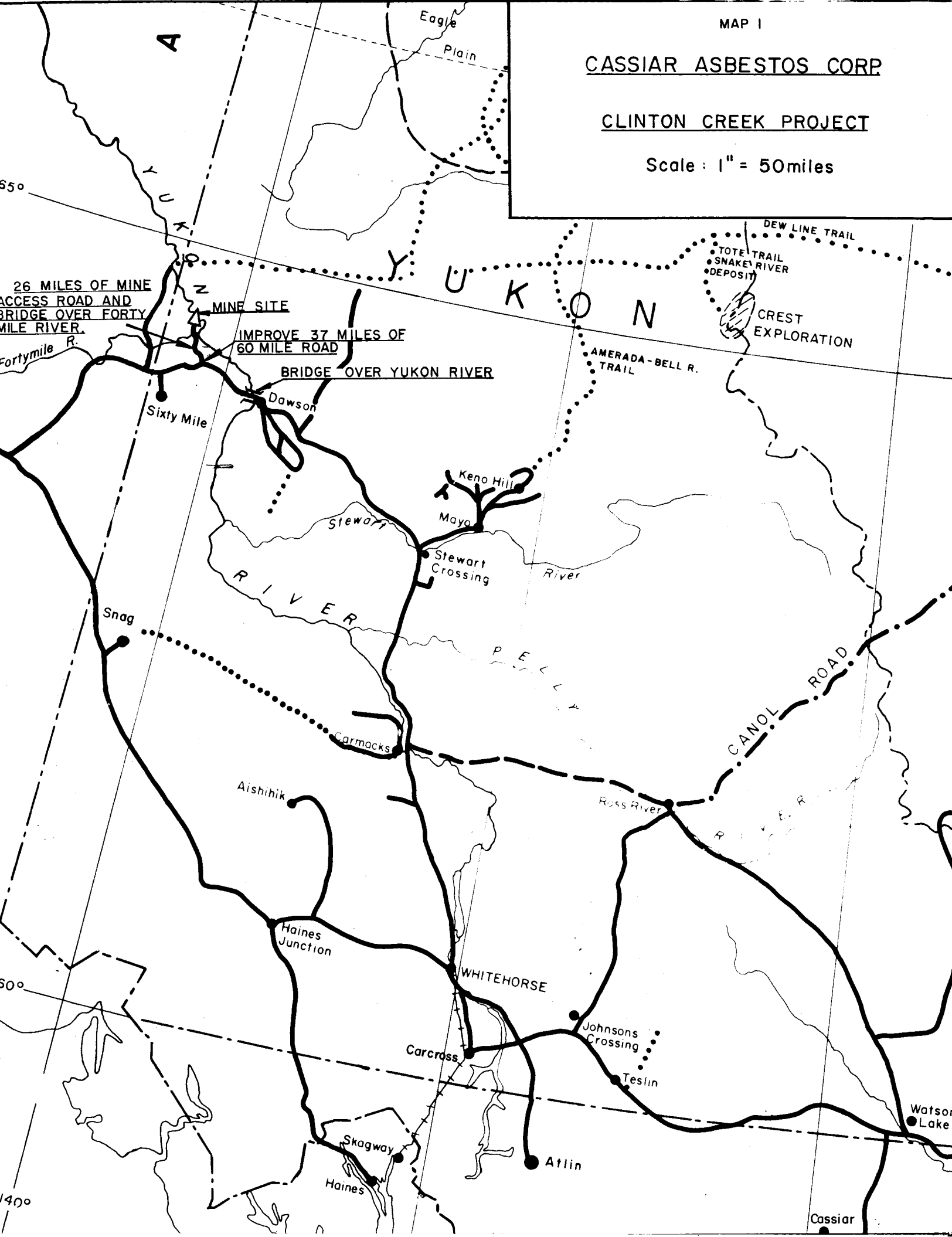
A handwritten signature in cursive script that reads "A.T. Jordan". The signature is written in dark ink and is centered on the page.

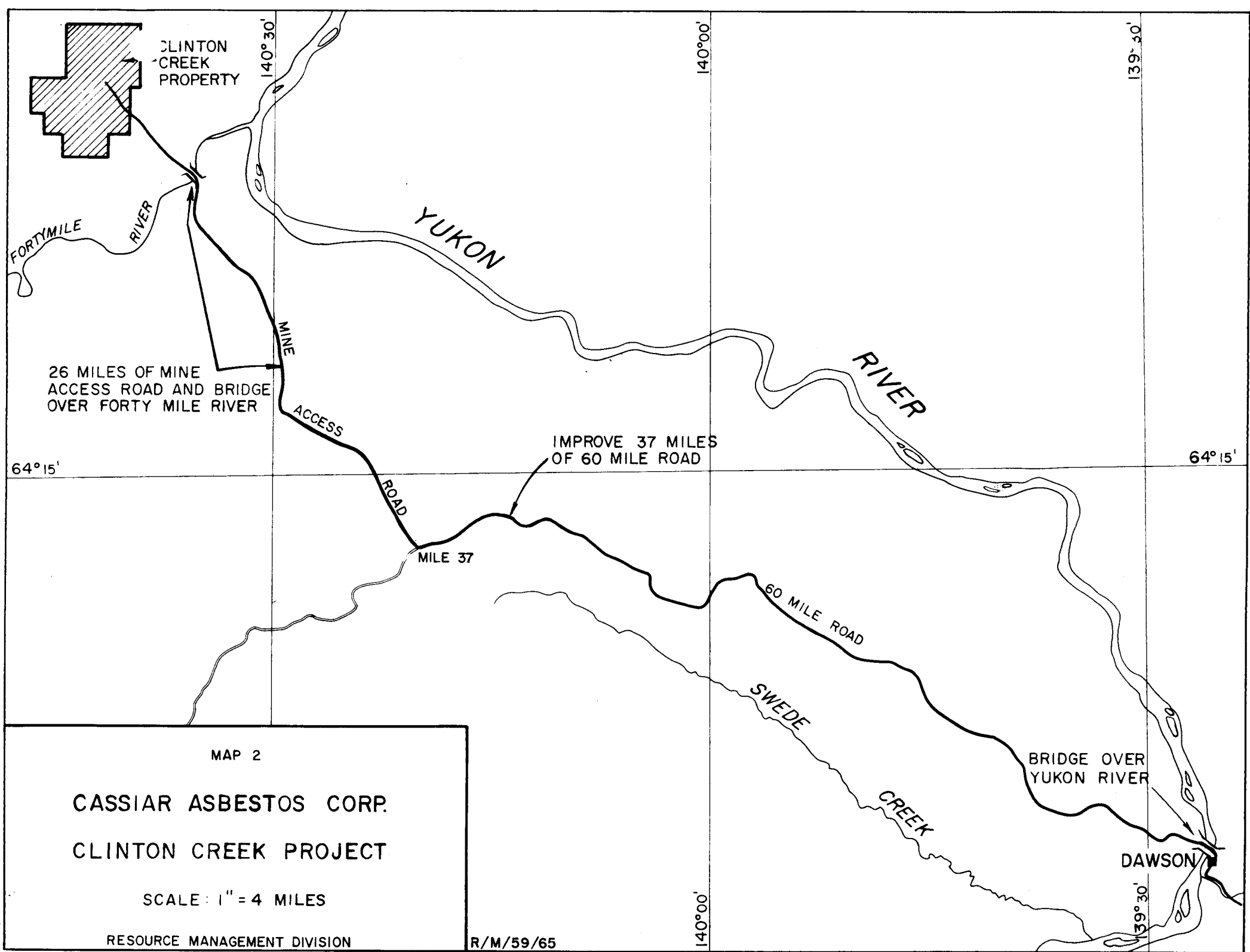
A.T. JORDAN, B. Sc., P. Eng.

CASSIAR ASBESTOS CORP

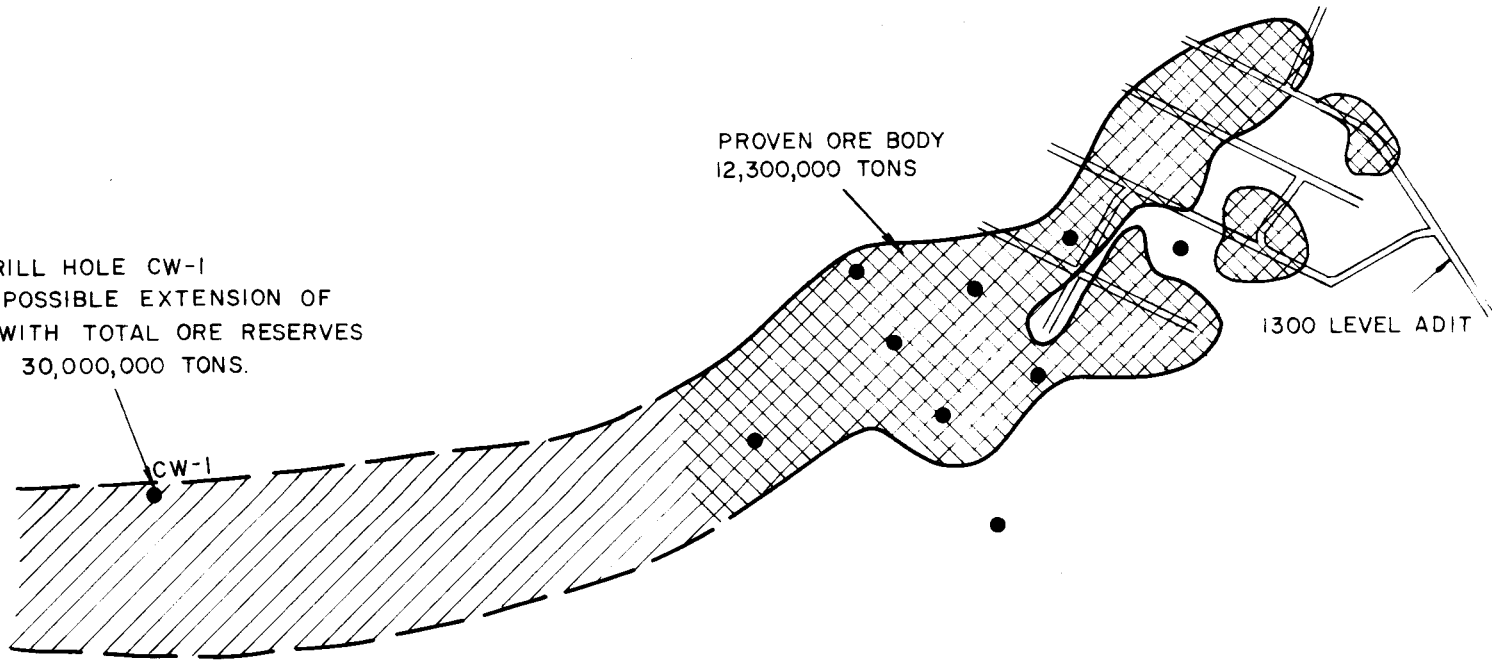
CLINTON CREEK PROJECT

Scale: 1" = 50miles





DIAMOND DRILL HOLE CW-1
INDICATES POSSIBLE EXTENSION OF
ORE BODY WITH TOTAL ORE RESERVES
OF APPROX. 30,000,000 TONS.



LEGEND

- DIAMOND DRILL HOLES
- ==== UNDERGROUND WORKINGS
- ▣ PROVEN ORE BODY
- ▨ POSSIBLE EXTENSION TO ORE BODY

MAP 3

CASSIAR ASBESTOS CORPORATION
CLINTON CREEK PROJECT
DIAGRAM OF ORE BODY

SCALE : 1" = 400'

CASSIAR ASBESTOS CORPORATION

GLINTON CREEK PROJECT

PRESENT VALUE PROFILE, CASE I AND CASE III

ASSUMING UNINTERRUPTED YEAR-ROUND TRUCKING FROM CLINTON CREEK TO WHITE HORSE BY PROVISION OF BRIDGE OVER YUKON RIVER AT DAWSON

CASE I - ASSUMES ORE RESERVES OF 12,300,000 TONS AND MINE LIFE OF 19 YEARS

CASE III ASSUMES ORE RESERVES OF 30,000,000 TONS AND MINE LIFE OF 24 YEARS

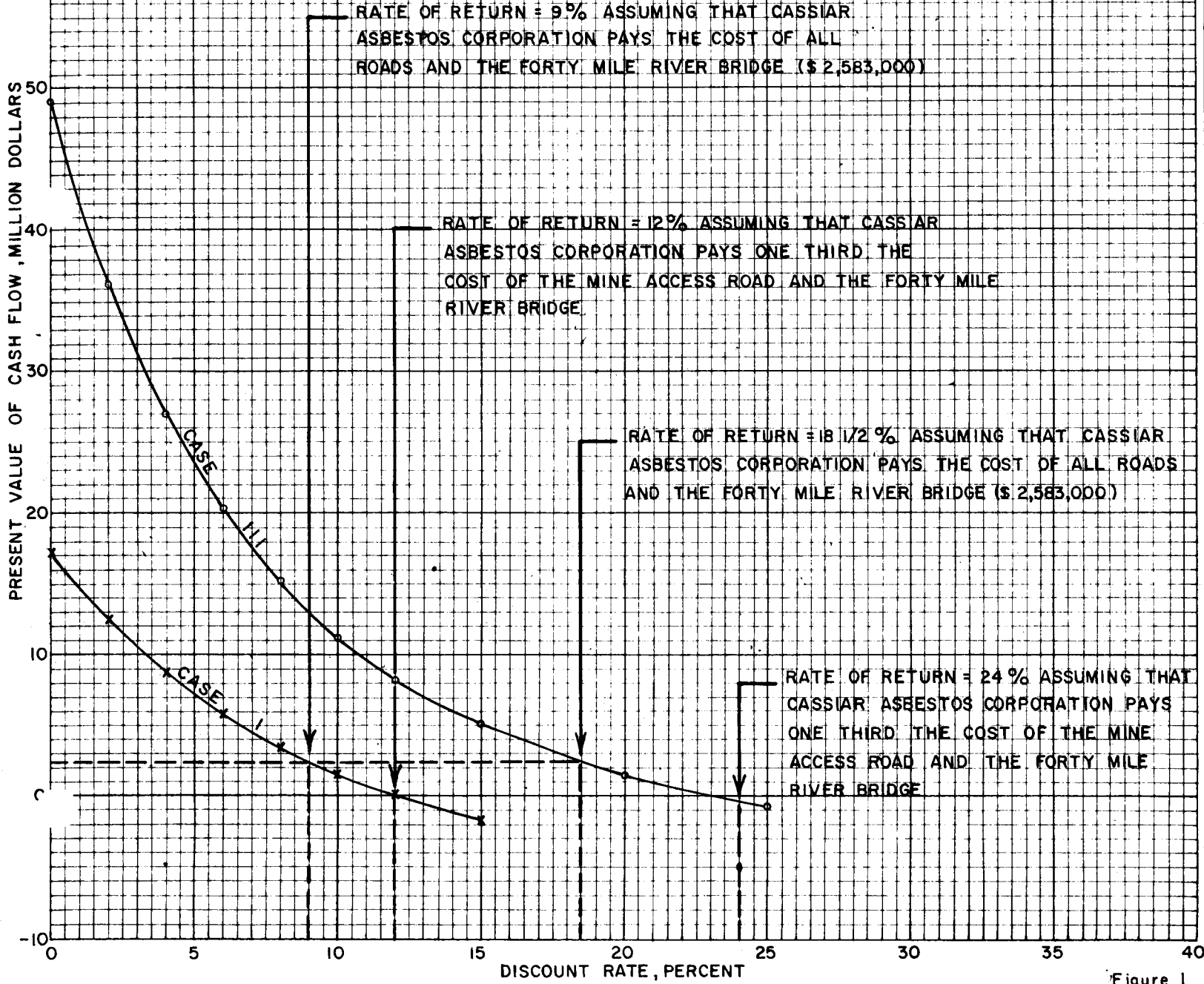


Figure 1

CASSIAR ASBESTOS CORPORATION

CLINTON CREEK PROJECT

PRESENT VALUE PROFILE, CASE II AND CASE IV

ASSUMING YEAR-ROUND TRUCKING FROM CLINTON CREEK TO WHITEHORSE EXCEPT DURING BREAK-UP AND FREEZE-UP. ASBESTOS INVENTORIES TO BE MAINTAINED IN DAWSON TO ENSURE UNINTERRUPTED DELIVERY OF FIBRE TO WHITEHORSE.

CASE II - ASSUMES ORE RESERVES OF 12,300,000 TONS AND MINE LIFE OF 19 YEARS.

CASE IV ASSUMES ORE RESERVES OF 30,000,000 TONS AND MINE LIFE OF 24 YEARS.

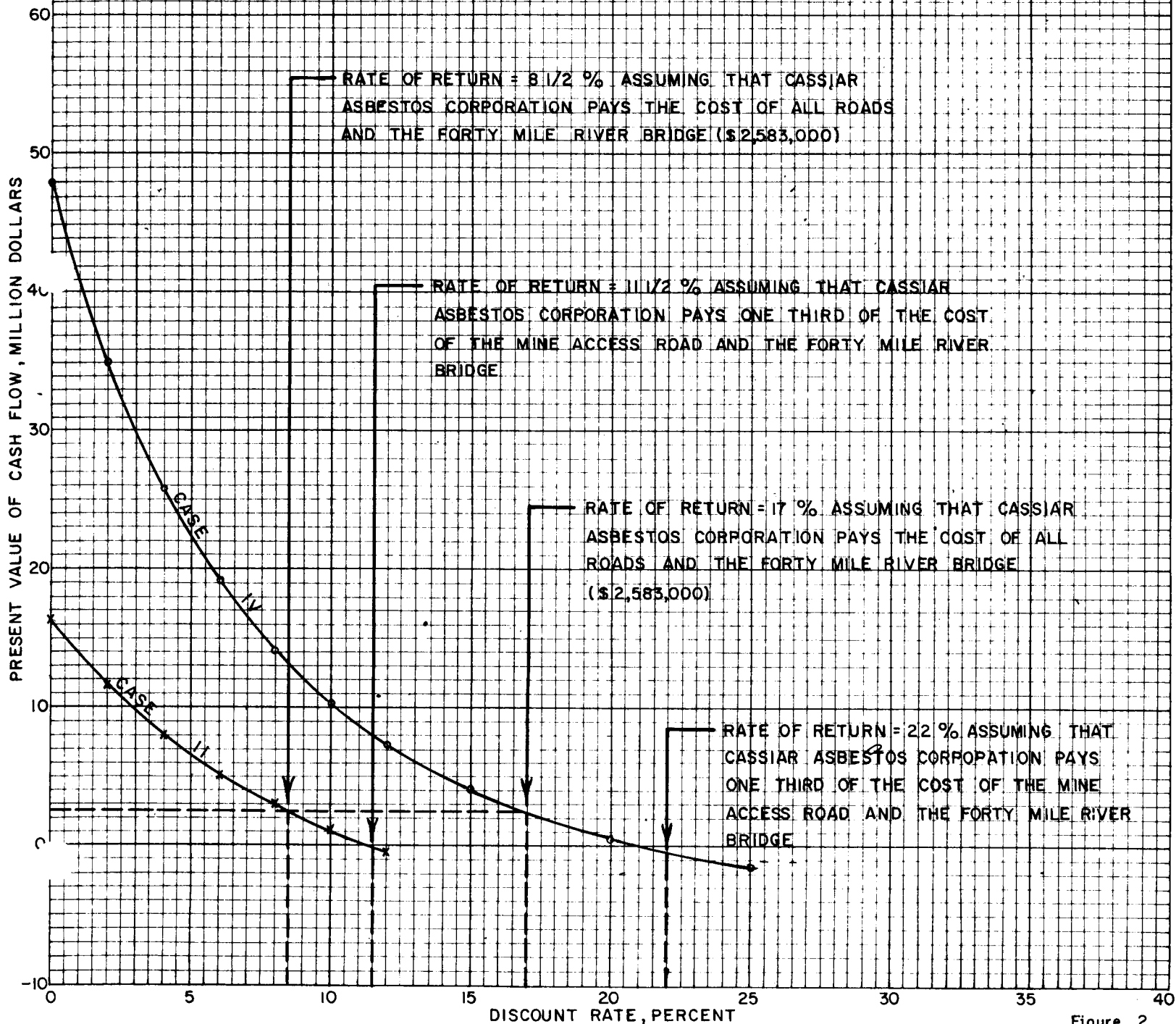


Figure 2