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Comparative Asbestos Mining and Processing Costs— Alaska Versus Yukon Territory

UNITED STATES DEPARTMENT OF THE INTERIOR

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TABLES--Continued

COMPARATIVE ASBESTOS MINING AND PROCESSING COSTS- ALASKA VERSUS YUKON TERRITORY

by

Robert G. Bottge[1]

ABSTRACT

Hard rock mining has grown in importance in the Yukon Territory during the last 10 years while Alaskan hard rock mining has declined. One asbestos deposit in Alaska is dormant, but an asbestos deposit 55 miles to the east in the Yukon Territory is being mined by the Clinton Mine Div., Cassiar Asbestos Corp., Ltd. In this Bureau of Mines report, the economics of mining in the two locations were derived using the Clinton mine as a model. Both deposits were assumed to be of equal size and mined by similar methods. Conventional open pit mining and processing methods were assumed, and capital and operating costs were derived using flowsheets and standard costing methods.

The estimated cost for the mine, mill, and support facilities in Alaska was about 30 percent more expensive than that in the Yukon Territory. The higher labor rates in Alaska were the primary contributor to the higher construction costs; freight rates added only slightly to the total costs. Approximately two-thirds of the additional annual costs of operating in Alaska were for wages and fringe benefits. The price required for the Alaskan asbestos fiber was $356.65 per ton compared with $287.44 for Yukon fiber, plus or minus 20 percent. A 12 percent discounted cash flow rate of return, 100 percent equity financing, and a rapid writeoff of assets were assumed.

INTRODUCTION

This report is the third in a series of publications by the Bureau of Mines that estimates the cost of mining and processing various types of minerals in Alaska. These reports are written to provide the State and Federal Governments with information to help in appraising the potential for development of Alaska's mineral deposits. The detailed cost tables will advise industry and government of the factors that raise mining and processing costs in Alaska over those in the 48 contiguous States and the Yukon Territory of Canada.

During the past 10 years, revenues in the Yukon Territory from hard rock mining increased nearly tenfold to $150 million while revenues from hard rock

[1]Mining engineer.

mining in Alaska doubled to approximately $4 million (5, 13).[2] Because the geology of the two areas is very similar and the accessibility of the two areas is about equally developed, one may then ask if the difference in development rates is not due to a difference in cost.

Several asbestos deposits are known to exist near the Alaska-Yukon Territory boundary. One deposit is being mined at Clinton Creek, Yukon Territory, about 25 miles southeast of Eagle, Alaska. Another deposit 45 miles southwest of Eagle in Alaska is not under development (fig. 1). Reports by the U.S. Geological Survey indicate the Alaskan deposit may have good potential for development (8).

This report compares the estimated cost of mining asbestos in Alaska with the estimated cost of mining a similarly sized asbestos mine at Clinton Creek in the Yukon Territory 55 miles to the east. This report will attempt to point out the factors that contribute to the cost of mining in each locality and any differences that exist. Capital and operating costs are determined using the Clinton Creek operation of Cassiar Asbestos Corp., Ltd., as a model. The cost estimates are prepared from a modified flowsheet of that operation. These estimates, listing only the major equipment, are expected to be within 20 percent of actual costs.

SETTING

Clinton Creek is located about 25 miles southeast of Eagle, Alaska, 65 road miles northwest of Dawson and 400 miles north of Whitehorse, Yukon Territory. Ground access to Clinton Creek is by gravel road. A ferry is used to cross the Yukon River during the summer, and an ice bridge is constructed across the river during the winter. The Alaskan deposit is located about 45 air miles southwest of Eagle. No access presently exists to the area, so 43 miles of gravel road would have to be constructed from the present gravel highway connecting Eagle with Tok. The Alaskan deposit is about 500 road miles northeast of Anchorage via existing and proposed roads (fig. 1).

The location for both mines is approximately 65°30" north latitude or about 140 air miles south of the Arctic Circle. The climate is arctic with summer temperatures in the high 80's and winter lows to -70° F. Precipitation is about 10 inches annually with snow on the ground from early November until May. The probable number of heating degree days is 15,000 (10).[3]

ACKNOWLEDGMENTS

Acknowledgment is made to the Clinton Mine Div., Cassiar Asbestos Corp., Ltd., and its general superintendent Marcel De Rouin, to William Lyall, mill superintendent, and to Donald Hudgeon, mine superintendent. Their patience

[2] Underlined numbers in parentheses refer to items in the list of references preceding the appendixes.

[3] The total annual degree days is the sum of the departures of daily average temperatures below 65° F. Degree days are useful when determining fuel requirements for heating buildings.

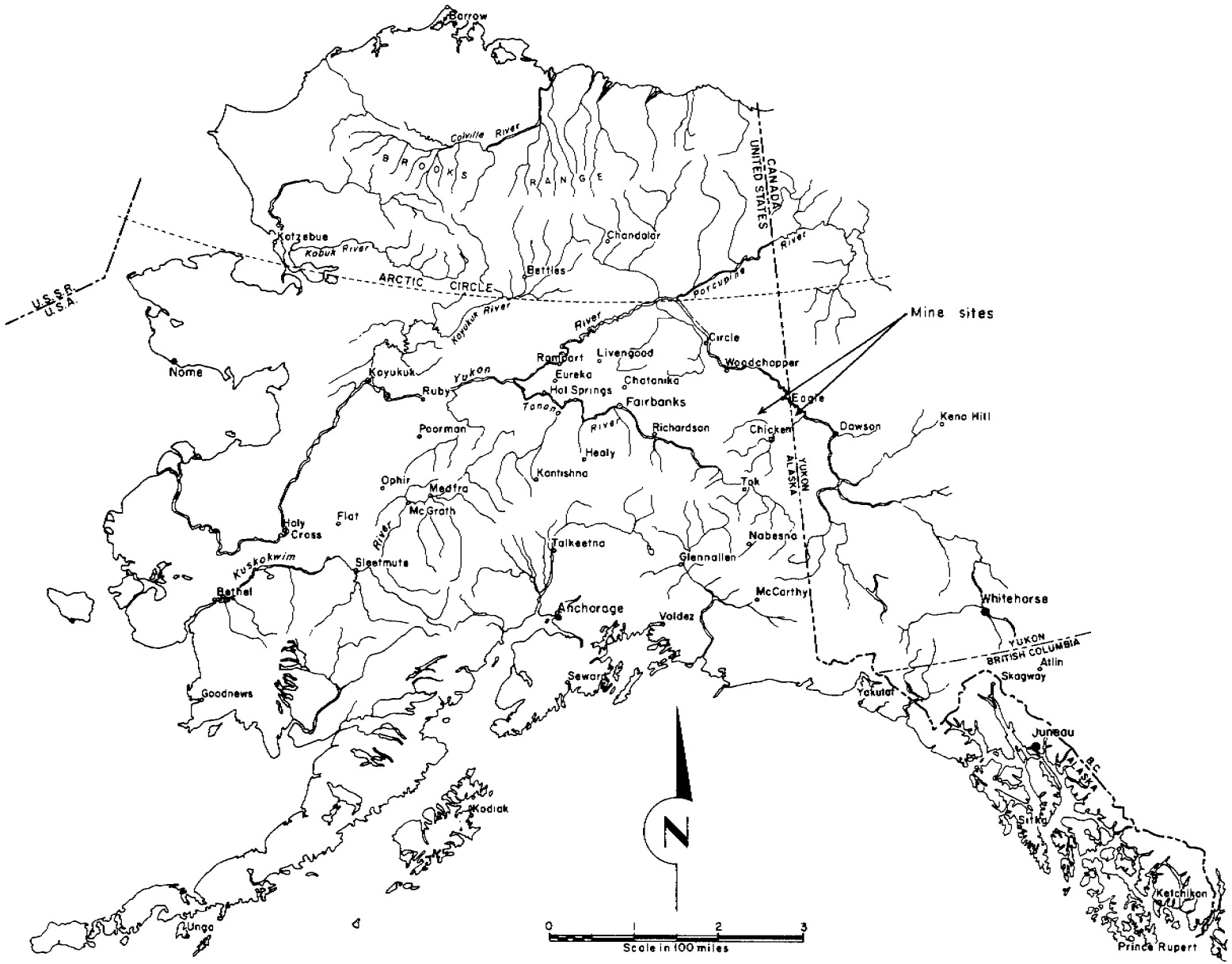


FIGURE 1. - Index map of Alaska.

in answering the many questions of the author about the unique flowsheet for asbestos milling and the specialized mill equipment is most appreciated. Acknowledgment is made to Brian Trevor, Regional Director of Resources, Department of Indian Affairs and Northern Development, and to R. Raghunathan, Statistical and Planning Advisor, Government of the Yukon Territory, for helping the author understand the mineral industry in the Yukon Territory and the wage structure there.

ECONOMIC ENVIRONMENT

Construction costs in Alaska were estimated to be greater than in the Yukon Territory during July of 1973, the base date for all calculations in this report. Buildings and other items constructed at the asbestos deposit in Alaska were estimated to cost 1.94 times their cost in Seattle; the cost for the same item constructed in the Yukon Territory, just 55 miles away, were estimated to cost 1.30 times their cost in Seattle. Therefore, Alaskan construction costs were 49 percent greater than those in the Yukon Territory. These cost factors were derived by the author after talking to mine officials in the Yukon Territory and by consulting published sources relating Alaskan costs to those in Seattle.

The derivation of the construction factor of 1.94 for the Eagle area of Alaska was as follows: Construction of buildings and similar items in Anchorage was 1.70 times the cost in the 48 contiguous States in 1970 according to the Military Pricing Guide (4). The difference in 1973 was 1.38 according to Building Construction Cost Data (9). The 1.38 factor was chosen to be representative of the difference in costs between Anchorage and the 48 contiguous States because it is more recent and it probably reflects a lowering of costs in Alaska relative to the 48 contiguous States. The 1.38 factor is 81 percent of the 1.70 factor. The factor for the location closest to the construction site in Alaska was 2.40 at Tok (4). Taking 81 percent of 2.40 yields 1.94.

Construction costs at Clinton Creek were estimated to be 1.30 times the cost in the 48 contiguous States. This cost factor was suggested to the author by a mine official in the Yukon Territory who was responsible for ongoing construction projects at his company's site. The individual based his suggestion on his experience using Building Construction Cost Data (9), saying his company's costs were slightly greater than the factor given for New York City, 1.16.

The major difference in construction cost is the higher labor rates paid in Alaska. A journeyman construction carpenter in Alaska was paid $10.11 per hour in 1973 versus $6.94 in the Yukon Territory, a 46 percent difference. A journeyman carpenter employed by the government or industry was paid about $7.65 per hour in Alaska versus $5.90 in the Yukon Territory, a 30 percent difference. A comparison of wages in other occupations in the Yukon Territory and Alaska provided similar differences. In general, construction wages are higher than nonconstruction wages owing to the seasonal nature of the industry and the need to procure the services of specialized personnel for short-term periods.

Transportation rates were higher from Seattle to the Alaskan site than from Vancouver to the Yukon site. For example, the freight rate from Seattle to the Alaskan site via Anchorage was $5.72 per hundredweight for heavy machinery (1). The freight rate from Vancouver, British Columbia, to Clinton Creek, Yukon Territory, via Skagway, Alaska, and Whitehorse, Yukon Territory, was $3.80 per hundredweight (2). The transportation cost for heavy machinery was 51 percent higher delivered to the Alaskan site from a west coast port, excluding handling charges. Transportation charges do not add appreciably to capital costs; for example, freight charges would add only 3.5 percent to the cost of a $65,000 crawler tractor weighing 40,000 pounds delivered to Alaska and 2.3 percent to the crawler tractor cost delivered to the Yukon Territory.

OPERATION DESCRIPTION

Geology and Ore Body

The Cassiar Asbestos Corp., Ltd., described the geology of the Clinton Creek ore body as follows (3):

> "The ore body occurs within an intrusive serpentinised peridotite dyke striking northeast and dipping 45 degrees to northwest. The dyke intrudes sedimentary and volcanic rocks of paleozoic age and has been traced by diamond drilling to 800 feet wide and 4,500 feet in length.
>
> "The porcupine ore body is confined to the crest and hanging wall side of the dyke and consists of chrysotile filled joints in a conjugate pattern. The ore zone is 400 feet wide and has been drilled to 900 feet in depth; it is bounded on the footwall by a wide zone of sheared serpentine and on the hanging wall by a quartz carbonate zone--an alteration of the dyke. Overlying the alteration are black sedimentary rocks, mainly schistose argillites and carbonaceous limestone."

The deposit in Alaska was described by H. L. Foster on the basis of 1 day's fieldwork (8):

> "The asbestos occurrence consists of large joint blocks of dark gray, black, and dark-greenish and brownish-black serpentine (antigorite).... The well-exposed part of the outcrop, all of which is believed to contain asbestos, is about 500 feet long and 200 feet wide and rises 30 feet or more above the main level of the ridge. The rock is cut by closely spaced (mostly from one to a few inches apart) subparallel veins of cross-fiber chrysotile asbestos that range in width from 1/8 inch to about 3/4 inch. Most of the veins are about 1/4 inch wide and many are compound. In the limited exposure examined, the asbestos veins cutting the massive serpentine would, if the occurrence were large enough, be sufficiently abundant and of good enough quality to have commercial value."

Mining

In order to compare relatively equal entities in this study, the Clinton Creek ore body was assumed to exist in both Alaska and the Yukon. At each hypothetical open pit mine, 4,600 tons of ore and 13,800 tons of waste were mined during two shifts each day, 300 operating days each year. The ore and waste were drilled by track-mounted 7-inch drills working two 8-hour shifts each day, 300 days each year. A 15-foot by 15-foot pattern was drilled on 40-foot benches. Blasting was done using AN-FO at a rate of one-half pound per ton of rock. Broken ore was hauled 6,200 feet to the primary crusher near the mill, and waste was hauled 5,500 feet to a dump. Twelve 75-ton trucks hauled the ore and waste. Loading was done by 2-1/2 and 5-yard shovels and a 10-yard front-end loader.

The estimated cost to install the mine in Alaska was $12.2 million versus $10.3 million in the Yukon Territory (table 1). Mobile equipment costs were 5 percent greater in Alaska than in the Yukon Territory, reflecting the higher priced labor required for onsite assembly of the larger sized equipment and the slightly higher transportation rates. Details of capital costs for each mine site are given in appendixes A and B.

TABLE 1. - Estimated capital requirements for an 18,400-ton-per-day open pit mine, dollars

	Alaska	Yukon Territory
Mobile equipment	3,375,000	3,207,100
Plant and buildings	3,165,600	2,542,600
Property acquisition cost	250,000	200,000
Exploration, development, and feasibility study	2,000,000	1,800,000
Environmental studies and hearings	1,500,000	1,350,000
Preproduction stripping, 3,000,000 tons	2,550,000	2,040,000
Subtotal	12,840,600	11,139,700
Contingencies and fees	1,804,700	1,550,300
Subtotal	14,645,300	12,690,000
Less credit for asbestos mined during development	2,400,000	2,400,000
Total	12,245,300	10,290,000

Plant and building costs in Alaska were an estimated 24 percent greater than those in the Yukon Territory. The difference was not as great as those encountered with other constructed items due to items not requiring onsite construction such as distribution wire, poles, shop equipment and tools, parts inventory, and office furniture. The cost of property acquisition and the cost of feasibility and environmental studies were arbitrarily chosen. Actual costs could vary considerably above or below the costs chosen. Preproduction stripping costs were based on the estimated annual operating costs for each operation.

Milling

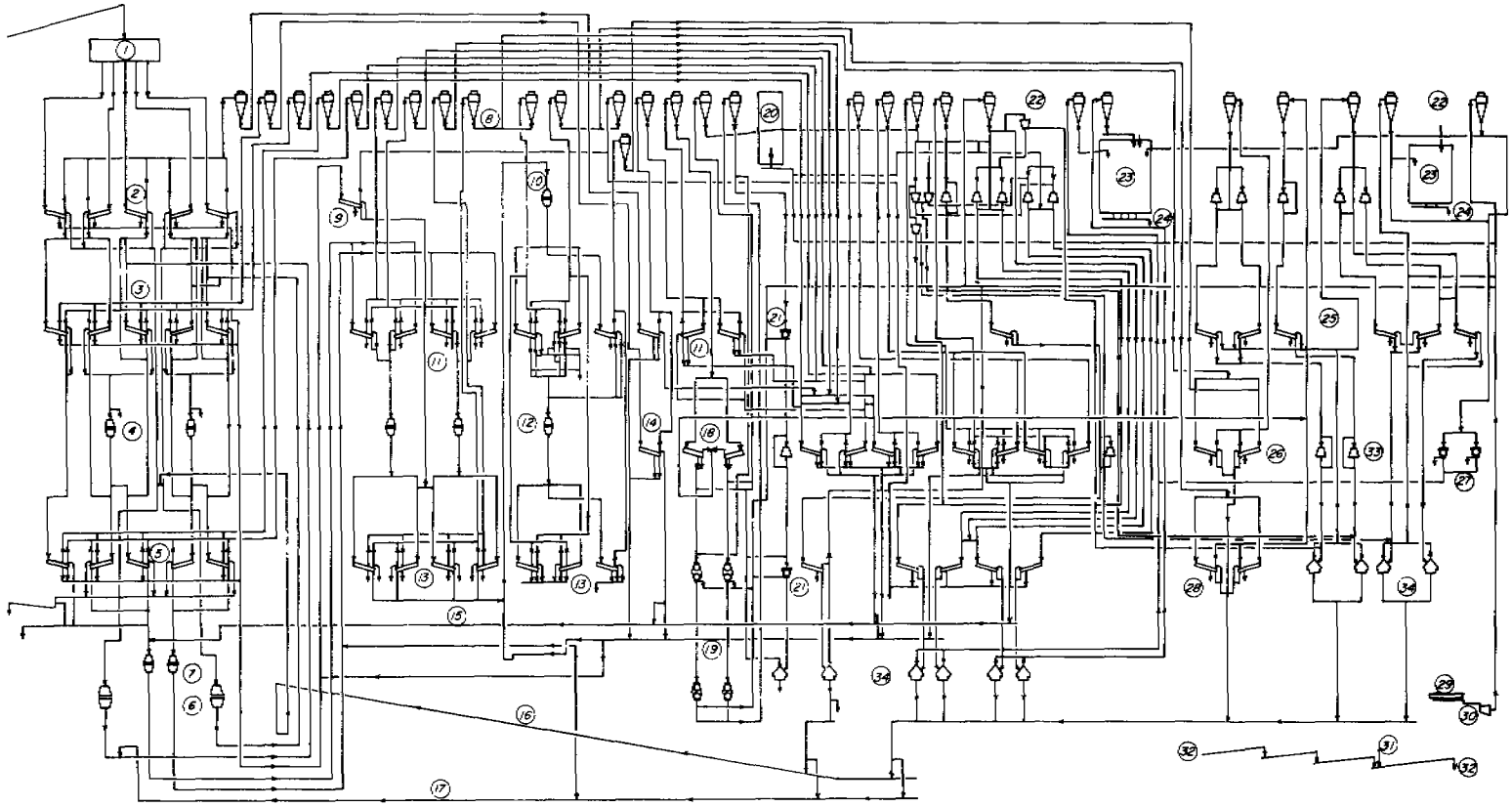
Ore arriving from the mine was dumped into a hopper and conveyed to a 3,000-ton surge bin, which led to a 48-inch by 60-inch jaw crusher. Minus 5-inch ore that bypassed the jaw crusher and crushed ore from the jaw crusher was conveyed to a 5-1/2-foot standard head cone crusher. Ore from the cone crusher was conveyed to a 3,000-ton surge bin and then into a dryer building where it underwent screening and drying. First, the ore was screened on 3/4-inch by 4-inch screen with the undersized conveyed to an 80-inch by 60-foot dryer and then to dry rock storage. Plus 3/4-inch by 4-inch ore was then screened on a 3/8-inch by 4-inch screen with the undersized going to dry rock storage and the oversized to a 48-inch by 50-inch impact crusher. The crushed product was routed to a 1/4-inch by 4-inch screen with the underflow going to dry rock storage and the oversized conveyed to the tailings pile.

Dry rock storage was a 150-foot by 300-foot unheated building where 40,000 tons of ore were stored for blending and for surge. Ore in dry rock storage was loaded onto a sub-floor conveyor by a 5-1/2-yard rubber-tired front-end loader and conveyed into the adjacent mill. The crushing and screening sections operated two shifts per day, whereas the mill operated three shifts each day.

The milling process was designed to release the fibrous asbestos from the waste rock. The product was designated, from longest to shortest fiber, CP, CT, CY, and CZ. Ninety percent of the produce was CT and CY grades, which were used for such products as cement asbestos shingles, flat sheets, brake linings, putties, and plastics. F. H. Stephens described the milling process as follows (11):

> "The treatment is a dry process consisting of five stages of fiberizing and screening for recovery of the desired quality and grade of fiber for packaging. Three 125,000 cfm fans provide suction lift for fiber released from the rock, and for the dust sent to the cyclone collectors."
>
> "The mill consists of a rock line and three fiber lines. The rock line has successive stages of screening, fiber-lifting, crushing, and fiberizing. Longer fiber is lifted during early stages and shorter fiber progressively thereafter. Longer elements are collected and discharged into the CP cleaning circuit of screens and cyclones; intermediate fiber is lifted from the 2nd, 3rd, 4th, and 5th stages of screening and collected for grading and cleaning in the CT fiber circuit of collectors, screens, specific-gravity separators, and opener fans; and short fiber from the 5th, 6th, and 7th stages of screening is collected in the CY circuit and directed through a further series of screens, collectors, specific-gravity separators, and opener fans to bin storage. Final fiber product is fed to pressure packers, bagged under 2,000 lb. pressure into 100 lb capacity jute bags, conveyed to the palletizing machine, and strapped in one ton units for temporary storage and truck transportation."

The flowsheet for the mill is given in figure 2.



KEY

1 - Distributor
2 - Screens
3 - Screens
4 - Fiberizers
5 - Screens
6 - 3-stage fiberizers
7 - Fiberizers
8 - Cyclone collectors
9 - Screen
10 - Fiberizer
11 - Screens
12 - Fiberizers
13 - Screens
14 - Screen
15 - Screw
16 - Conveyor
17 - Conveyor
18 - Screens
19 - Double dedusters
20 - Bin
21 - Single dedusters
22 - Cyclone collectors
23 - Bins
24 - To bagging machines
25 - Screens
26 - Screens
27 - Single dedusters
28 - Screens
29 - Reclaim belt
30 - Fiber fluffer
31 - Discharge
32 - Conveyor to tailings pile
33 - Opener fan
34 - Separators

FIGURE 2. - Mill flowsheet.

The estimated cost of the mill and associated production facilities was $26.5 million in Alaska and $19.3 million in the Yukon Territory (table 2). The 37-percent increase in costs in Alaska over those in the Yukon Territory was less than the estimated 49-percent increase for such constructed items as buildings owing to the large amount of equipment used in the mill. Equipment constituted about 17 percent of the Alaskan mill cost and 22 percent of the Yukon Territory mill cost. As equipment costs were increased only by the freight charges, they tended to lower the total cost of the mill below the disparity of 49 percent.

TABLE 2. - Estimated capital requirements for a 4,600-ton-per-day asbestos mill, dollars

	Alaska	Yukon Territory
Crushing and drying section.....	6,447,800	4,684,200
Screening and fiberizing section	10,052,200	7,425,900
Miscellaneous production items..	6,428,200	4,577,400
Subtotal.....	22,928,200	16,687,500
Contingencies and fees.....	3,553,900	2,586,500
Total.....	26,482,100	19,274,000

Support Facilities

Unlike the mine and mill, which were held to be identical for this study, the support facilities reflected the local differences in access. There was no cost for a cableway across the Yukon River or a steel girder bridge across the Forty Mile River in Alaska as is required for access to the Yukon Territory site; however, two small bridges were presumed to cross creeks in Alaska to gain access to the mine. The length of the access roads were about the same to both sites.

The total cost for the support facilities in Alaska was $24.7 million versus $18.6 million in the Yukon Territory (table 3). The cost of access to the Yukon Territory site was about $1 million greater than that to the Alaskan site, but the Canadian Federal Government would have contributed $1.2 million toward supplying access to the site under the Northern Roads Program (5). The townsite was the major cost item of the support facilities. The cost included housing and dormitories for 300 employees, a commercial center, clinic, recreational center, communications system, road system, sewer system, electrical distribution lines, and a water system. The costs were estimated to be $39,000 per employee for the Alaska site and $26,000 per employee for the Yukon Territory site.

TABLE 3. - Estimated capital requirements for support facilities, dollars

	Alaska	Yukon Territory
Road	1,938,000	1,248,000
Bridge	1,200,000	2,400,000
Cableway	-	464,100
Runway	715,500	482,300
Power generator	5,220,000	4,280,000
Powerlines	447,000	338,000
Fuel tank	172,400	115,600
Vehicles	18,000	17,600
Townsite	11,700,000	7,800,000
Subtotal	21,410,900	17,144,600
Less transportation access assistance	-	1,200,000
Subtotal	21,410,900	15,944,600
Contingencies and fees	3,318,700	2,657,500
Total	24,729,600	18,602,100

Operating Costs

Operating costs per ton of ore were $16.8 in Alaska and $13.1 in the Yukon Territory, excluding depreciation and amortization (tables 4 and 5). Of the additional $3.7 million in annual expenses paid by the Alaskan operation, 67 percent was paid for wages and fringe benefits, 16 percent for fixed expenses, and 17 percent for materials and supplies. Depreciation and amortization costs were handled in a different manner for each operation owing to different Federal laws; hence, the two categories were not directly comparable. In both cases, the most rapid writeoff of capital allowed was utilized.

Labor rates for production employees in Alaska were estimated to average $6.28 per hour for the mill and $7.08 per hour for the mine and support facilities. Fifteen cents was added for swing shifts in the mine, mill, and powerhouse and 30 cents for graveyard shifts in the mill and powerhouse. Time and one-half was paid for all time in excess of 40 hours each week. Supervisory personnel were paid $22,000 per year. Maintenance personnel were paid average base hourly salaries of $7.30 in the mill and support facilities and $7.45 in the mine. Supervisory maintenance personnel were paid an annual salary of $23,400. Payroll overhead was estimated to be 25 percent of gross pay, and taxable subsidies were estimated to be 12.5 percent of gross pay. These subsidies included partial payment of board and room for single employees and partial payment of rent and utilities for families in houses. Travel allowance was made for one trip for all employees and their immediate families to Seattle, Wash., each year.

TABLE 4. - Estimated annual operating cost for the Alaskan asbestos operation,[1] dollars

	Mine		Mill		Support facilities		Total	
	Annual cost	Cost per ton	Annual cost	Cost per ton	Annual cost	Cost per ton	Annual cost	Cost per ton
Direct cost:								
Production:								
Labor	818,400	0.59	987,000	0.72	186,500	0.14	1,991,900	1.45
Supervision	132,000	.10	132,000	.10	44,000	.03	308,000	.23
Subtotal	950,400	.69	1,119,000	.82	230,500	.17	2,299,900	1.68
Maintenance:								
Labor	663,400	.48	597,400	.43	170,900	.12	1,431,700	1.03
Supervision	140,400	.10	140,400	.10	46,800	.03	327,600	.23
Maintenance supplies and parts	810,900	.59	742,700	.54	[2]187,300	.14	1,740,900	1.27
Subtotal	1,614,700	1.17	1,480,500	1.07	405,000	.29	3,500,200	2.53
Operating supplies	1,324,900	.96	1,587,100	1.15	[2]206,000	.15	3,118,000	2.26
Power	102,200	.07	1,187,300	.86	18,600	.01	1,308,100	.94
Water	2,200	Nil	6,500	Nil	6,500	Nil	15,200	Nil
Fuel oil	40,100	.03	4,700	Nil	-	-	44,800	.03
Payroll overhead--25% of payroll	438,600	.32	464,200	.34	112,000	.08	1,014,800	.74
Taxable subsidies--12.5% of payroll	219,300	.16	232,100	.17	56,000	.04	507,400	.37
Total direct cost	4,692,400	3.40	6,081,400	4.41	1,034,600	.74	11,808,400	8.55
Indirect cost:								
Administration, technical, and clerical labor	423,400	.31	598,600	.43	270,100	.20	1,292,100	.94
Payroll overhead--25% of payroll	105,800	.08	149,600	.11	67,500	.05	322,900	.24
Taxable subsidies--12.5% of payroll	52,900	.04	74,800	.05	33,800	.02	161,500	.11
Facilities maintenance and supplies--10% of administration, technical and clerical	42,300	.03	59,900	.04	27,000	.02	129,200	.09
General overhead including head office charges, exploration, and research--5% of direct cost	234,600	.17	304,100	.22	51,700	.04	590,400	.43
Total indirect cost	859,000	.63	1,187,000	.85	450,100	.33	2,496,100	1.81
Fixed cost:								
Taxes and insurance--2% of plant cost	244,900	.18	521,900	.38	494,600	.36	1,261,400	.92
Property taxes--2% of plant cost	244,900	.18	521,900	.38	494,600	.36	1,261,400	.92
Total fixed cost	489,800	.36	1,043,800	.76	989,200	.72	2,522,800	1.84
Total cost	6,041,200	4.39	8,312,200	6.02	2,473,900	1.79	16,827,300	12.20

[1]Excluding depreciation and amortization.

[2]Maintenance supplies, parts, and fuel costs are included in the cost for power.

TABLE 5. - Estimated annual operating cost for the Yukon Territory asbestos operation,[1] dollars

	Mine		Mill		Support facilities		Total	
	Annual cost	Cost per ton	Annual cost	Cost per ton	Annual cost	Cost per ton	Annual cost	Cost per ton
Direct cost:								
Production:								
Labor	563,900	0.41	682,500	0.49	130,100	0.09	1,376,500	0.99
Supervision	90,000	.07	90,000	.07	30,000	.02	210,000	.16
Subtotal	653,900	.48	772,500	.56	160,100	.11	1,586,500	1.15
Maintenance:								
Labor	455,300	.33	410,700	.30	117,100	.08	983,100	.71
Supervision	96,000	.07	96,000	.07	32,000	.02	224,000	.16
Maintenance supplies and parts	810,900	.59	639,600	.46	[2]170,300	.12	1,620,800	1.17
Subtotal	1,362,200	.99	1,146,300	.83	319,400	.22	2,827,900	2.04
Operating supplies	1,172,400	.85	1,580,600	1.15	[2]187,300	.14	2,940,300	2.14
Power	90,700	.07	1,053,900	.76	16,500	.01	1,161,100	.84
Water	2,200	Nil	6,500	Nil	6,500	Nil	15,200	Nil
Fuel oil	40,600	.03	4,800	Nil	-	-	45,400	.03
Payroll overhead--20% of payroll	241,000	.17	255,800	.19	61,800	.04	558,600	.40
Taxable subsidies--12.5% of payroll	150,600	.11	159,900	.12	38,600	.03	349,100	.26
Total direct cost	3,713,600	2.70	4,980,300	3.61	790,200	.55	9,484,100	6.86
Indirect cost:								
Administration, technical and clerical labor	289,500	.21	410,000	.30	185,000	.13	884,500	.64
Payroll overhead--20% of payroll	57,900	.04	82,000	.06	37,000	.03	176,900	.13
Taxable subsidies--12.5% of payroll	36,200	.03	51,200	.04	23,100	.02	110,500	.09
Facilities maintenance and supplies--10% of administration, technical and clerical	29,000	.02	41,000	.03	18,500	.01	88,500	.06
General overhead including head office charges, exploration and research--5% of direct cost	185,700	.13	249,000	.18	39,500	.03	474,200	.34
Total indirect cost	598,300	.43	833,200	.61	303,100	.22	1,734,600	1.26
Fixed cost:								
Taxes and insurance--2% of plant cost	205,800	.15	385,500	.28	372,000	.27	963,300	.70
Property taxes--2% of plant cost	205,800	.15	385,500	.28	372,000	.27	963,300	.70
Total fixed cost	411,600	.30	771,000	.56	744,000	.54	1,926,600	1.40
Total cost	4,723,500	3.43	6,584,500	4.78	1,837,300	1.31	13,145,300	9.52

[1]Excluding depreciation and amortization.

[2]Maintenance supplies, parts, and fuel costs are included in the cost for power.

In the Yukon Territory, production employees had average hourly wages of $4.30 in the mill and $4.85 in the mine and support facilities. Supervisory personnel were paid an annual salary of $15,000. Maintenance personnel were paid average base hourly salaries of $5.00 in the mill and support facilities and $5.10 in the mine. Supervisory maintenance personnel were paid annual salaries of $16,000. Payroll overhead was 20 percent of gross salary, and taxable subsidies were 12.5 percent of gross salary.

Although the cost for most operating supplies such as tires, explosives, drill bits, and drill steel were estimated to be higher in Alaska, total operating costs were reduced substantially in Alaska relative to those in the Yukon Territory by the cost of fuel for mobile equipment in the Yukon Territory. In mid-1973, diesel fuel at the Alaskan site was estimated to cost 26.7 cents per U.S. gallon while that in the Yukon Territory cost 24.8 cents per U.S. gallon plus 11.2 cents per U.S. gallon Federal road tax. This tax was paid for all diesel fuel consumed in mobile equipment including pit trucks and front-end loaders. No tax was paid on fuel consumed by stationary equipment such as dryers or furnaces. With approximately 1.5 million U.S. gallons of diesel fuel consumed by mobile equipment each year, 11.2 cents tax per U.S. gallon amounted to $168,000 per year, or about 6 percent of the total cost for operating supplies.

FINANCIAL ANALYSIS

The calculation of the required gross income in Alaska is shown in table 6. Gross revenues of $35,436,800 were found necessary to provide the 12 percent discounted cash flow (DCF) rate of return. The average price required for each ton of fiber, delivered in Seattle, was $356.65, plus or minus 20 percent. A double declining balance method of depreciating the assets was used for 10 years and was switched to straight-line depreciation in the eleventh year for the duration of the project. This accounting method allowed for a writeoff of approximately 41 percent of the assets in the first 5 years and 65 percent in the first 10 years.

TABLE 6. - Financial analysis of Alaskan asbestos operation, dollars

Years	1	2	3	4	5	6	7	8	9	10
Gross income[1]	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800
Production costs[2]	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700
Depreciation[3] [4]	6,663,000	5,996,700	5,397,000	4,857,300	4,371,600	3,934,400	3,541,000	3,186,900	2,868,200	2,581,400
Gross profit	4,089,100	4,755,400	5,355,100	5,894,800	6,380,500	6,817,700	7,211,100	7,565,200	7,883,900	8,170,700
Depletion allowance[4] [5]	2,044,550	2,377,700	2,677,550	2,947,400	3,190,250	3,408,850	3,605,550	3,782,600	3,941,950	4,085,350
Taxable income	2,044,550	2,377,700	2,677,550	2,947,400	3,190,250	3,408,850	3,605,550	3,782,600	3,941,950	4,085,350
Federal income tax[4] [6]	1,022,275	1,188,850	1,338,775	1,473,700	1,595,125	1,704,425	1,802,775	1,891,300	1,970,975	2,042,675
Net profit	1,022,275	1,188,850	1,338,775	1,473,700	1,595,125	1,704,425	1,802,775	1,891,300	1,970,975	2,042,675
Cash flow:										
Depreciation	6,663,000	5,996,700	5,397,000	4,857,300	4,371,600	3,934,400	3,541,000	3,186,900	2,868,200	2,581,400
Depletion allowance	2,044,550	2,377,700	2,677,550	2,947,400	3,190,250	3,408,850	3,605,550	3,782,600	3,941,950	4,085,350
Net profit	1,022,275	1,188,850	1,338,775	1,473,700	1,595,125	1,704,425	1,802,775	1,891,300	1,970,975	2,042,675
Capital expenditures	-	-	-	-	-51,200	-	-	-	-	-4,173,700
Total	9,729,825	9,563,250	9,413,325	9,278,400	9,105,775	9,047,675	8,949,325	8,860,800	8,781,125	8,709,425
Present worth factor at 12%	0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039	0.3606	0.3220
Present worth value at 12%	8,687,800	7,623,800	6,700,400	5,896,400	5,166,600	4,583,600	4,047,800	3,578,900	3,166,500	1,460,500
Years	11	12	13	14	15	16	17	18	19	20
Gross income[1]	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800	35,436,800
Production costs[2]	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700	24,684,700
Depreciation[3] [4]	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200
Gross profit	8,428,900	8,428,900	8,428,900	8,428,900	8,428,900	8,428,900	8,428,900	8,428,900	8,428,900	8,428,900
Depletion allowance[4] [5]	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450
Taxable income	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450
Federal income tax[4] [6]	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225
Net profit	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225
Cash flow:										
Depreciation	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200	2,323,200
Depletion allowance	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450	4,214,450
Net profit	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225	2,107,225
Capital expenditures	-	-	-	-	-51,200	-	-	-	-	-
Total	8,644,875	8,644,875	8,644,875	8,644,875	8,593,675	8,644,875	8,644,875	8,644,875	8,644,875	8,644,875
Present worth factor at 12%	0.2875	0.2567	0.2292	0.2046	0.1827	0.1631	0.1456	0.1300	0.1161	0.1037
Present worth value at 12%	2,485,400	2,219,100	1,981,400	1,768,700	1,570,100	1,410,000	1,258,700	1,123,800	1,003,700	896,500

[1]Sale price per ton of ore = $35,436,800 ÷ 1,380,000 tons = $25.68.
Sale price per ton of fiber = $35,436,800 ÷ 99,360 tons = $356.65.
[2]Includes transportation costs to Seattle of $7,857,400 annually.
[3]Double declining balance method used.
[4]Rounded to nearest 100.
[5]50% of gross profit.
[6]50% of taxable income.

A financial analysis of the Yukon Territory operation was more complicated because of the changes in the Canadian taxation laws that will occur during the next several years. For this study, the situation in effect after 1976 was chosen for the life of the operation. Newly enacted Canadian Federal law allows the writeoff of assets in yearly amounts equal to the greater of the income from a mine or 30 percent of the undepreciated capital cost. The depletion allowance allows for the depletion of all assets except the townsite and transportation facilities as "eligible expenditures" earning allowable depletion at the rate of 33-1/3 percent of the lesser of production profits or the earned depletion base (12). The depletion allowance is used up to the maximum earned depletion base. Federal taxes were assumed to be 46 percent of net taxable income, a rate that will be in effect after 1976. Territorial taxes were omitted due to existing uncertainty. It was assumed the proposed federal abatement will offset territorial taxes.

Gross revenues of $28,560,000 annually were required in the Yukon Territory to provide a 12 percent DCF rate of return over the life of the operation (table 7). The average required sale price of the fiber was $287.44 per ton, plus or minus 20 percent, delivered to Vancouver, British Columbia. This compared with prices of $261 per ton for CP grade, $235 per ton for CT grade, and $155 per ton for CY grade in July, 1973 (7). The average price received by the Clinton Creek mine for its product in 1973 was $212.49 assuming transportation costs of $62.50 per ton (3, 14).

To produce asbestos fiber from similar deposits in Alaska and the Yukon Territory required a price of $356.65 per ton in Alaska and $287.44 in the Yukon Territory. The financial analysis assumed a 12 percent equity financing. The required price could be reduced by accepting a lower return on equity or by partial debt financing through a bank loan or the issuance of bonds or common stock. No attempt to minimize price or maximize profits through financial leverage was made in this study.

By way of comparison, had the Canadian system of recovering depreciable assets been utilized by the Alaskan operation, gross revenues of $35,697,800 would have been required as against $35,436,800, or $359.28 per ton of fiber versus $356.65, plus or minus 20 percent. The accounting systems allowed by the two Federal governments resulted in a slight advantage to the Alaskan producer. Before recent changes in Canadian Federal laws, Canadian mines had a decisive tax advantage over U.S. producers over the life of the mine (6). The more rapid writeoff of assets allowed in Canada is still advantageous to any company because of the time value of money. Under Canadian tax laws taking full effect after 1976, 84 percent of the Canadian assets can be recovered during the first 5 years versus 41 percent in the same period in the United States.

TABLE 7. - Financial analysis of Yukon Territory asbestos operation, dollars

Years	1	2	3	4	5	6	7	8	9	10
Gross income[1]	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000
Production costs[2]	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300
Net income	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700
Capital cost allowance[3]	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	71,000	-	-	-
Income before depletion	-	-	-	-	-	-	9,133,700	9,204,700	9,204,700	9,204,700
Depletion allowance[4 5]	-	-	-	-	-	-	3,044,500	3,068,200	3,068,200	2,502,500
Taxable income	-	-	-	-	-	-	6,089,200	6,136,500	6,136,500	6,702,200
Federal income tax[5 6]	-	-	-	-	-	-	2,801,000	2,822,800	2,822,800	3,083,000
Net profit	-	-	-	-	-	-	3,288,200	3,313,700	3,313,700	3,619,200
Cash flow:										
Capital, cost allowance	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	71,000	-	-	-
Depletion allowance	-	-	-	-	-	-	3,044,500	3,068,200	3,068,200	2,502,500
Net profit	-	-	-	-	-	-	3,288,200	3,313,700	3,313,700	3,619,200
Capital expenditures	-	-	-	-	-45,600	-	-	-	-	-4,037,100
Total	9,204,700	9,204,700	9,204,700	9,204,700	9,159,100	9,204,700	6,403,700	6,381,900	6,381,900	2,084,600
Present worth factor at 12%	0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039	0.3606	0.3220
Present worth value at 12%	8,218,900	7,338,000	6,551,900	5,849,600	5,196,900	4,663,100	2,896,400	2,577,600	2,301,300	671,200
Years	11	12	13	14	15	16	17	18	19	20
Gross income[1]	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000	28,560,000
Production costs[5]	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300	19,355,300
Net income	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700
Capital cost allowance[3]	-	-	-	-	-	-	-	-	-	-
Income before depletion	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700
Depletion allowance[4 5]	-	-	-	-	-	-	-	-	-	-
Taxable income	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700	9,204,700
Federal income[5 6]	4,234,200	4,234,200	4,234,200	4,234,200	4,234,200	4,234,200	4,234,200	4,234,200	4,234,200	4,234,200
Net profit	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500
Cash flow:										
Capital cost allowance	-	-	-	-	-	-	-	-	-	-
Depletion allowance	-	-	-	-	-	-	-	-	-	-
Net profit	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500
Capital expenditures	-	-	-	-	-45,600	-	-	-	-	-
Total	4,970,500	4,970,500	4,970,500	4,970,500	4,924,900	4,970,500	4,970,500	4,970,500	4,970,500	4,970,500
Present worth factor at 12%	0.2875	0.2567	0.2292	0.2046	0.1827	0.1631	0.1456	0.1300	0.1161	0.1037
Present worth value at 12%	1,429,000	1,275,900	1,139,200	1,017,000	899,800	810,700	723,700	646,200	577,100	515,400

[1]Sale price per ton of ore = $28,560,000 ÷ 1,380,000 tons = $20.70.
Sale price per ton of fiber = 28,560,000 ÷ 96,360 tons = $287.44.
[2]Includes transportation costs to Vancouver of $6,210,000 annually.
[3]Capital allowance allowed up to $55,299,200.
[4]Depletion allowance allowed up to 33-1/3% of earned depletion base of $35,050,500 or $11,683,400.
[5]Rounded to nearest 100.
[6]46% of taxable income.

CONCLUSION

Two known asbestos deposits exist, one 25 miles southeast of Eagle, Alaska, at Clinton Creek, Yukon Territory, and one 45 miles southwest of Eagle in Alaska. The Clinton Mine Div., Cassiar Asbestos Corp., Ltd., is currently developing the deposit in the Yukon Territory. The Alaskan deposit appears to be favorable for development. In this report, asbestos operations mining 13,800 tons of waste and 4,600 tons of ore each day were assumed for each location. The purpose of the report was to explore the possible differences in the cost of constructing and operating similarly sized mining and processing operations in close proximity but in different countries.

The total estimated plant costs were $63.5 million in Alaska and $48.2 million in the Yukon Territory in mid-1973. Buildings and similar items constructed in Alaska were estimated to cost 49 percent more than those in the Yukon Territory. The difference in total plant costs was reduced to 32 percent by the large expenditures for equipment, which had to bear only the cost of transportation and onsite assembly costs. Total capital costs were reduced in the Yukon Territory by $1.2 million because access costs were borne in part by the Canadian Federal Government's Northern Roads Program. The major difference in costs between Alaska and the Yukon Territory appeared to be labor; journeymen in the trades earned 30 to 46 percent more in Alaska than in the Yukon Territory.

Operating costs were $16.8 million annually in Alaska versus $13.1 million in the Yukon Territory, excluding depreciation and amortization costs. Wages and fringe benefits accounted for 67 percent of the increase in Alaska; fixed expenses, 16 percent; and materials and supplies, 17 percent. The Federal tax on fuel used in off-the-road equipment added 11.2 cents per U.S. gallon to the cost of operating in the Yukon Territory, or $168,000 per year.

The production of asbestos fiber from the Alaskan and Yukon Territory sites required sales prices of $356.65 and $287.44 per ton, respectively, plus or minus 20 percent. These prices assumed a 12 percent DCF rate of return, 100 percent equity, and the most rapid writeoff of capital allowed by the respective governments. Utilizing the Canadian taxation system for the Alaskan property would have resulted in a price of $359.28 per ton of fiber. The new Canadian taxation system is no longer as attractive an inducement for companies to develop Canadian properties as they once were.

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APPENDIX A.--COST TABLES FOR ALASKAN ASBESTOS OPERATION

TABLE A-1. - Total capital requirement, Alaskan asbestos operation

	Investment, dollars
Mine	12,245,300
Mill	26,482,100
Support facilities	24,729,600
Total plant cost (insurance, tax base)	63,457,000
Interest during construction	3,172,800
Subtotal for depreciation	66,629,800
Working capital	4,306,500
Original capital expenditures	70,936,300
5-year equipment cost at present worth value	29,100
10-year equipment cost at present worth value	1,343,900
15-year equipment cost at present worth value	9,400
Total investment	72,318,700

TABLE A-2. - Working capital, Alaskan asbestos operation

		Cost, dollars
Direct labor	3 months	1,014,800
Payroll overhead and utilities	do	722,600
Operating supplies	do	779,500
Indirect cost	4 months	832,000
Fixed cost	0.5% of insurance base	317,300
Spare parts		435,200
Miscellaneous expense		205,100
Total		4,306,500

TABLE A-3. - Alaska mine pit equipment cost summary, 18,400-ton-per-day open pit mining operation

	Quantity	Size	Unit hp	Total hp	Cost, dollars		Total cost, dollars
					Material	Labor	
Drill.....	2	Track-mounted, 7-in, electric....	300	600	222,200	19,600	241,800
Shovel.....	1	Track-mounted, 2-3/4 yd, electric	200	200	161,900	23,700	185,600
Do.....	1	Track-mounted, 5-1/2 yd, electric	300	300	336,000	65,400	401,400
Front-end loader.	1	10-yd, rock tires, diesel.....	550	550	161,900	8,200	170,100
Truck.....	12	75-ton, rock tires, diesel.....	700	8,400	1,829,500	129,400	1,958,900
Crawler tractor..	2	Power shift, hydraulic bulldozer, diesel.	270	540	179,300	5,300	184,600
Grader.....	1	Power shift, 14-ft blade, diesel.	125	125	43,000	1,300	44,300
Stopehammer drill	1	3-in bore.....	-	-	1,300	100	1,400
Compressor.....	1	125 cfm, 100 psi, diesel.....	45	45	6,900	400	7,300
Lubrication truck	1	Lube tanks, pumps, gasoline.....	180	180	-	-	18,200
Service truck....	1	Welding equipment, hoists, gasoline.	180	180	-	-	13,800
Mobile crane.....	1	30-ton capacity, diesel.....	325	325	108,400	6,000	114,400
Powder truck.....	1	10,000-lb capacity, auger, gasoline.	180	180	-	-	11,200
Pickup truck.....	5	1/2-ton capacity, gasoline.....	80	400	-	-	15,000
Sedan.....	2	4-door sedan, gasoline.....	150	300	-	-	7,000
Subtotal....	-	-	-	12,325			3,375,000
Contingency.....	-	-	-	-	-	-	337,500
Total.....	-	-	-	-	-	-	3,712,500

TABLE A-4. - Alaska plant and buildings cost summary, 18,400-ton-per-day open pit mining operation

	Quantity	Size	Total cost, dollars
Transformer station.....	1	1,000 kV-a, 33,000-V to 4,160-V transformer with semipermanent building.	20,000
Switch.....	1	Main disconnect 4,160 V.....	11,500
Distribution wire.....ft..	26,400	Main distribution overhead line, 4 single size 1-0 wires.....	29,700
Circuit breaker.....	5	Weatherproof, portable oil circuit breakers.....	33,200
Portable cable.....ft..	2,700	3 conductor extra heavy-duty insulation size 1-0 wire.....	11,200
Coupler.....	5	Heavy-duty electric couplers for portable cable.....	2,200
Pole.....	60	Poles for overhead distribution system including installation....	32,400
Accessories for line.....	1	Cross arms, insulators and accessories.....	18,100
Primer and cap house.....	2	1 each, 10 ft by 10 ft filled concrete block building at $48 per sq ft.	9,600
Ammonium nitrate bin.....	1	400,000-lb capacity, 10-ft-high by 23-ft-diam steel tank.....	37,800
Blasting equipment.....	1	Galvanometer and generator in a shack on skids.....	900
Repair and service shop.....	1	110 ft by 220 ft with 36-ft eaves, including utilities at $50 per sq ft.	1,210,000
Shop equipment and tools.....	1	Includes hoists, welders, and general shop tools at $23 per sq ft	556,600
Warehouse.....	1	60 ft by 100 ft with 20-ft eaves, including utilities at $31 per sq ft, 1/2 charged to mine.	93,000
Parts inventory.....	-	Parts inventory and maintenance supplies, 1/2 charged to mine....	717,500
Administration building.....	1	40 ft by 60 ft with 20-ft eaves, 2 stories, including utilities at $72 per sq ft, 1/2 charged to mine.	172,800
Office furniture and equipment	1	40 ft by 60 ft, 2 stories at $10 per sq ft, 1/2 charged to mine..	24,000
Fuel tank.....	1	25,000-gal steel tank for fuel oil.....	33,200
Do.....	1	3,000-gal steel tank for fuel oil.....	6,800
Do.....	1	7,000-gal steel tank for gasoline.....	15,200
Do.....	1	6,000-bbl steel tank for diesel fuel.....	116,200
Lube tank.....	2	3,000-gal steel tank for hydraulic and crankcase oil.....	13,700
Property acquisition.....	-	-	250,000
Exploration, development, and feasibility study.	-	-	2,000,000
Environmental studies and hearings.	-	-	1,500,000
Preproduction stripping.....	-	3,000,000 tons at $0.85 per ton.....	2,550,000
Subtotal.....	-	-	9,465,600
Contingency.....	-	-	946,600
Subtotal.....	-	-	10,412,200
Fee.....	-	-	520,600
Subtotal.....	-	-	10,932,800
Less credit for asbestos mined during development.	-	-	2,400,000
Total.....	-	-	8,532,800

TABLE A-5. - Alaska cost summary, crushing and drying section, 4,600-ton-per-day asbestos fiber mill

	Quantity	Size	Unit hp	Total hp	Cost, dollars		Total cost, dollars
					Material	Labor	
Unloading chute	1	26 ft by 20 ft steel chute.	-	-	17,000	6,600	23,600
Belt conveyor	1	36 in by 400 ft covered	100	100	76,300	38,000	114,300
Ore bin	1	3,000-ton capacity	-	-	92,600	186,700	279,300
Ore feeder	1	48 in by 35 ft	10	10	30,100	7,000	37,100
Grizzly	1	5 ft by 10 ft, 5-in spacing	-	-	2,400	2,300	4,700
Chute	1	5 ft by 10 ft below grizzly	-	-	4,700	1,600	6,300
Jaw crusher	1	48 in by 60 in	-	-	169,300	30,200	199,500
Crusher motor	1	-	250	250	12,100	21,300	33,400
Belt conveyor	1	36 in by 160 ft	50	50	26,900	8,500	35,400
Head magnet	1	36-in magnetic head pulley.	-	-	10,000	2,300	12,300
Screen	1	6 ft by 14 ft, 5-in by 5-in mesh.	15	15	12,600	1,300	13,900
Chute	1	6 ft by 14 ft, below screen	-	-	6,200	2,200	8,400
Cone crusher	1	5-1/2-ft std head	-	-	90,900	16,900	107,800
Crusher motor	1	-	200	200	8,000	14,700	22,700
Belt conveyor	1	36 in by 350 ft covered	100	100	68,800	31,500	100,300
Ore bin	1	3,000-ton capacity	-	-	92,600	186,700	279,300
Ore feeder	1	48 in by 35 ft	10	10	30,100	7,000	37,100
Screen	1	6 ft by 14 ft, 3/4-in by 4-in mesh.	15	15	12,600	1,300	13,900
Chute	1	6 ft by 14 ft, below screen	-	-	6,200	2,200	8,400
Belt conveyor	4	24 in by 20 ft	10	40	21,100	6,600	27,700
Do	1	24 in by 30 ft	10	10	6,100	2,300	8,400
Screen	1	6 ft by 14 ft, 3/8-in by 4-in mesh.	15	15	12,600	1,300	13,900
Chute	1	6 ft by 14 ft, below screen	-	-	6,200	2,200	8,400
Pan conveyor	1	36 in by 15 ft	20	20	15,200	3,600	18,800
Belt conveyor	1	24 in by 100 ft	15	15	16,100	5,500	21,600
Impact crusher	1	48 in by 50 in	-	-	42,000	10,200	52,200
Crusher motor	1	-	250	250	12,100	21,300	33,400
Belt conveyor	1	24 in by 75 ft	20	20	10,800	4,400	15,200
Screen	1	6 ft by 14 ft, 1/4-in by 4-in mesh.	20	20	12,600	1,300	13,900
Belt conveyor	1	24 in by 20 ft	10	10	5,300	1,600	6,900
Do	1	24 in by 40 ft	15	15	6,800	2,500	9,300
Do	1	24 in by 200 ft	50	50	24,600	8,600	33,200
Do	1	30 in by 300 ft	75	75	43,600	14,900	58,500
Dryer	2	80 in by 60 ft	50	100	176,000	41,600	217,600
Dust collector	7	10,000 cfm, cloth filters	20	140	83,800	48,000	131,800
Subtotal	-	-	-	1,530	1,264,300	744,200	2,008,500
Excavation	-	-	-	-	37,500	419,100	456,600
Concrete	-	-	-	-	228,200	486,900	715,100
Buildings	-	-	-	-	528,500	293,500	822,000
Air ducts	-	-	-	-	75,100	60,400	135,500
Electrical	-	-	-	-	177,600	274,800	452,400
Mechanical	-	-	-	-	-	-	-
Painting	-	-	-	-	10,600	38,800	49,400
Instrumentation	-	-	-	-	17,600	11,500	29,100
Insulation	-	-	-	-	5,300	15,400	20,700
Subtotal	-	-	-	-	1,080,400	1,600,400	2,680,800
Total direct costs	-	-	-	-	2,344,700	2,344,600	4,689,300
Field indirect	-	-	-	-	-	-	1,172,300
Total construction	-	-	-	-	-	-	5,861,600
Engineering	-	-	-	-	--	-	293,100
Administration and overhead.	-	-	-	-	-	-	293,100
Subtotal	-	-	-	-	-	-	6,447,800
Contingency	-	-	-	-	-	-	644,800
Subtotal	-	-	-	-	-	-	7,092,600
Fee	-	-	-	-	-	-	354,600
Total	-	-	-	-	-	-	7,447,200

TABLE A-6. - Alaska cost summary, screening and fiberizing section, 4,600-ton-per-day asbestos fiber mill

	Quantity	Size	Unit hp	Total hp	Cost, dollars		Total cost, dollars
					Material	Labor	
Screen	60	5 ft by 10 ft, Hall type	5	300	408,500	38,100	446,600
Fiberizer	8	3 stages	75	600	81,100	17,800	98,900
Do	2	do	100	200	19,900	4,700	24,600
Cyclone	29	9 ft	-	-	128,100	28,200	156,300
Fan	4	125,000 cfm	400	1,600	333,600	67,500	401,100
Separator	10	Bauer type	1	10	39,100	8,600	47,700
Opener fan	17	High speed	30	510	58,600	13,000	71,600
Deduster	4	Single	15	60	29,800	6,600	36,400
Do	4	Double	30	120	46,200	10,700	56,900
Fiber bin	1	250-ton capacity	-	-	14,900	29,500	44,400
Do	1	500-ton capacity	-	-	24,300	48,200	72,500
Do	1	350-ton capacity	-	-	20,300	40,200	60,500
Pressure packer	4	Automatic	60	240	276,000	65,700	341,700
Palletizer	1	do	12	12	36,700	8,200	44,900
Strapping machine	1	do	15	15	30,000	6,600	36,600
Forklift truck	4	3,000-lb capacity	55	220	41,800	-	41,800
Dust collector	4	125,000 cfm	300	1,200	299,500	66,600	366,100
Subtotal	-	-	-	5,087	1,888,400	460,200	2,348,600
Excavation	-	-	-	-	36,600	409,400	446,000
Concrete	-	-	-	-	222,700	475,200	697,900
Buildings	-	-	-	-	1,030,600	572,300	1,602,900
Air ducts	-	-	-	-	245,600	197,500	443,100
Electrical	-	-	-	-	519,700	804,200	1,323,900
Mechanical	-	-	-	-	386,700	112,900	499,600
Painting	-	-	-	-	21,700	79,000	100,700
Instrumentation	-	-	-	-	34,800	22,800	57,600
Insulation	-	-	-	-	9,500	27,900	37,400
Subtotal	-	-	-	-	2,507,900	2,701,200	5,209,100
Total direct costs	-	-	-	-	4,396,300	3,161,400	7,557,700
Field indirect	-	-	-	-	-	-	1,580,700
Total construction	-	-	-	-	-	-	9,138,400
Engineering	-	-	-	-	-	-	456,900
Administration and overhead	-	-	-	-	-	-	456,900
Subtotal	-	-	-	-	-	-	10,052,200
Contingency	-	-	-	-	-	-	1,005,200
Subtotal	-	-	-	-	-	-	11,057,400
Fee	-	-	-	-	-	-	552,900
Total	-	-	-	-	-	-	11,610,300

TABLE A-7. - Alaska cost summary, miscellaneous production items, 4,600-ton-per-day asbestos fiber mill

	Quantity	Size	Total cost, dollars
Dry rock storage.....	1	150 ft by 300 ft with 60-ft eaves no utilities at $66 per sq ft.	2,970,000
Belt conveyor.....	1	30 in by 600 ft under storage covered to top of mill, 100 hp at $815 per ft, installed.	489,000
Front-end loader.....	1	5-1/2-yd capacity, power shift, 300-hp diesel.....	98,800
Water tank.....	1	10,000-bbl steel tank for fire protection.....	172,400
Reservoir dam.....	1	1,000 ft by 50 ft earthen dam.....	989,400
Pipe.....ft..	3,000	6-in and 4-in-diam steel pipe, installed.....	394,200
Pump.....	1	500 gpm, 600 ft head, 250 hp, installed.....	108,100
Do.....	1	1,500 gpm, 70 ft head, 250 hp, installed.....	116,400
Crawler tractor.....	1	50,000-lb drawbar pull, power shift, 270 hp, diesel...	82,600
Warehouse.....	1	60 ft by 100 ft with 20-ft eaves, including utilities at $31 per sq ft, 1/2 charged to mill.	93,000
Parts inventory.....	1	Parts inventory and maintenance supplies, 1/2 charged to mill.	717,500
Administration building.....	1	40 ft by 60 ft with 20-ft eaves, 2 stories, including utilities at $72 per sq ft, 1/2 charged to mill.	172,800
Office furniture and equipment	1	40 ft by 60 ft, 2 stories at $10 per sq ft, 1/2 charged to mill.	24,000
Subtotal.....	-	-	6,428,200
Contingency.....	-	-	642,800
Subtotal.....	-	-	7,071,000
Fee.....	-	-	353,600
Total.....	-	-	7,424,600

TABLE A-8. - Alaska cost summary, support facilities

	Quantity	Size	Total cost, dollars
Road	1	Gravel road, 24 ft wide, 34 miles at $57,000 per mile.	1,938,000
Bridge	2	Steel girder, two lanes wide	1,200,000
Runway	1	Gravel runway, 5,300 ft at $135 per linear ft.	715,500
Power generator	4	2,500-kW diesel generators, installed, including building at $522 per kW.	5,220,000
Powerlines..miles	10	Electrical transmission lines, 10 miles at $44,700 per mile.	447,000
Fuel tank	1	10,000-bbl steel tank for diesel fuel.	172,400
Pickup	2	1/2-ton capacity	6,000
Truck	1	5-ton flatbed	12,000
Townsite	1	Includes living quarters for 300 single and married employees, commercial center, clinic, recreational center, communications system, road system, sewer system, electrical distribution lines, and water system at $39,000 per employee.	11,700,000
Subtotal	-	-	21,410,900
Contingency	-	-	2,141,100
Subtotal	-	-	23,552,000
Fee	-	-	1,177,600
Total	-	-	24,729,600

TABLE A-9. - Alaska utility summary

	Power, kW-hr per day	Water requirement, gpd
Mine	13,200	48,000
Mill	153,400	144,000
Support facilities	2,400	144,000
Total	169,000	336,000

Power: At $0.0258/kW-hr[1]
Mine--$0.0258 X 13,200 X 300 = $102,200/year[2] = $0.07/ton
Mill--$0.0258 X 153,400 X 300 = $1,187,300/year[2] = $0.86/ton
Support facilities--$0.0258 X 2,400 X 300[2] = 18,600/year[2] = $0.01/ton

Water: At $0.15/1,000 gallons
Mine--$0.00015 X 48,000 X 300 = $2,200/year[2] = nil
Mill--$0.00015 X 144,000 X 300 = $6,500/year[2] = nil
Support facilities--$0.00015 X 144,000 X 300 = $6,500/year[2] = nil

[1]Includes fuel, lubrication, and repair parts.
[2]rounded to nearest 100.

APPENDIX B.--COST TABLES FOR YUKON TERRITORY ASBESTOS OPERATION

TABLE B-1. - Total capital requirement, Yukon Territory asbestos operation

	Investment, dollars
Mine	10,290,000
Mill	19,274,000
Support facilities	18,602,100
Total plant cost (insurance, tax base)	48,166,100
Interest during construction	2,408,300
Subtotal for depreciation	50,574,400
Working capital	3,350,100
Original capital expenditures	53,924,500
5-year equipment cost at present worth value	25,900
10-year equipment cost at present worth value	1,340,300
15-year equipment cost at present worth value	8,500
Total investment	55,299,200

TABLE B-2. - Working capital, Yukon Territory asbestos operation

		Cost, dollars
Direct labor	3 months	698,400
Payroll overhead and utilities	do	532,400
Operating supplies	do	735,100
Indirect cost	4 months	578,200
Fixed cost	0.5% of insurance base	240,800
Spare parts		405,700
Miscellaneous expense		159,500
Total		3,350,100

TABLE B-3. - Yukon Territory mine pit equipment cost summary, 18,400-ton-per-day open pit mining operation

	Quantity	Size	Unit hp	Total hp	Cost, dollars		Total cost, dollars
					Material	Labor	
Drill.....	2	Track-mounted, 7-in electric.....	300	600	218,000	13,400	231,400
Shovel.....	1	Track-mounted, 2-3/4 yd electric.....	200	200	156,200	16,200	172,400
Do.....	1	Track-mounted, 5-1/2 yd electric.....	300	300	324,200	44,800	369,000
Front-end loader.	1	10-yd, rock tires, diesel.....	550	550	157,700	5,600	163,300
Rear dump truck..	12	75-ton, rock tires, diesel.....	700	8,400	1,784,800	88,600	1,873,400
Crawler tractor..	2	Power shift hydraulic bulldozer, diesel.	270	540	173,900	3,600	177,500
Grader.....	1	Power shift, 14-ft blade, diesel.....	125	125	42,000	900	42,900
Stopehammer drill	1	3-in bore.....	-	-	1,300	100	1,400
Compressor.....	1	125 cfm, 100 psi, diesel.....	45	45	6,800	300	7,100
Lubrication truck	1	Lube tanks, pumps, gasoline.....	180	180	-	-	17,000
Service truck....	1	Welding equipment, hoists, gasoline...	180	180	-	-	12,800
Mobile crane.....	1	30-ton capacity, diesel.....	325	325	105,800	4,100	109,900
Powder truck.....	1	10,000-lb capacity, auger, gasoline...	180	180	-	-	10,200
Pickup truck.....	5	1/2-ton capacity, gasoline.....	80	400	-	-	12,800
Sedan.....	2	4-door sedan, gasoline.....	150	300	-	-	6,000
Subtotal....	-	-	-	12,325	-	-	3,207,100
Contingency.....	-	-	-	-	-	-	320,700
Total.....	-	-	-	-	-	-	3,527,800

TABLE B-4. - Yukon Territory plant and buildings cost summary, 18,400-ton-per-day open pit mining operation

	Quantity	Size	Total cost, dollars
Transformer station.....	1	1,000 kV-A, 33,000-V to 4,160-V transformer with semipermanent building....	14,300
Switch.....	1	Main disconnect, 4,160 V.....	8,000
Distribution wire....ft..	26,400	Main distribution overhead line, 4 single size 1-0 wires.....	29,000
Circuit breaker.....	5	Weatherproof portable oil circuit breakers.....	30,700
Portable cable.....ft..	2,700	3 conductor extra heavy-duty insulation, size 1-0 wire.....	10,900
Coupler.....	5	Heavy-duty electric couplers for portable cable.....	2,100
Pole.....	60	Poles for overhead distribution system, including installation.....	23,200
Accessories for line.....	1	Cross arms, insulators and accessories.....	13,000
Primer and cap house.....	2	1 each, 10 ft by 10 ft filled concrete block building at $32.50 per sq ft..	6,500
Ammonium nitrate bin.....	1	400,000-lb capacity, 10-ft high by 23-ft-diam, steel tank.....	25,300
Blasting equipment.....	1	Galvanometer and generator in a shack on skids.....	800
Repair and service shop..	1	110 ft by 220 ft with 36-ft eaves, including utilities at $34 per sq ft....	822,800
Shop equipment and tools.	1	Includes hoists, welders, and general shop tools at $22 per sq ft.....	532,400
Warehouse.....	1	60 ft by 100 ft with 20-ft eaves including utilities at $21 per sq ft, 1/2 charged to mine.	63,000
Parts inventory.....	-	Parts inventory and maintenance supplies, 1/2 charged to mine.....	700,000
Administration building..	1	40 ft by 60 ft with 20-ft eaves, 2 stories, including utilities at $48 per sq ft, 1/2 charged to mine.	115,200
Office furniture and equipment.	1	40 ft by 60 ft, 2 stories, at $9 per sq ft, 1/2 charged to mine.....	21,600
Fuel tank.....	1	25,000-gal steel tank for fuel oil.....	22,200
Do.....	1	3,000-gal steel tank for fuel oil.....	4,600
Do.....	1	7,000-gal steel tank for gasoline.....	10,100
Do.....	1	6,000-bbl steel tank for diesel fuel.....	77,800
Lube tank.....	2	3,000-gal steel tank for hydraulic and crankcase oil.....	9,100
Property acquisition.....	-	-	200,000
Exploration, development, and feasibility study.	-	-	1,800,000
Environmental studies and hearings.	-	-	1,350,000
Preproduction stripping..	-	3,000 tons at $0.68 per ton.....	2,040,000
Subtotal.....	-	-	7,932,600
Contingency.....	-	-	793,300
Subtotal.....	-	-	8,725,900
Fee.....	-	-	436,300
Subtotal.....	-	-	9,162,200
Less credit for asbestos mined during development	-	-	2,400,000
Total.....	-	-	6,762,200

TABLE B-5. - Yukon Territory cost summary, crushing and drying section, 4,600-ton-per-day asbestos fiber mill

	Quantity	Size	Unit hp	Total hp	Cost, dollars		Total cost, dollars
					Material	Labor	
Unloading chute	1	26-ft by 20-ft steel chute	-	-	16,000	4,500	20,500
Belt conveyor	1	36 in by 400 ft, covered	100	100	60,700	26,000	86,700
Ore bin	1	3,000-ton capacity	-	-	87,200	127,900	215,100
Ore feeder	1	48 in by 25 ft	10	10	28,700	4,800	33,500
Grizzly	1	5 ft by 10 ft, 5-in spacing	-	-	2,200	1,600	3,800
Chute	1	5 ft by 10 ft, below grizzly	-	-	4,400	1,100	5,500
Jaw crusher	1	48 in by 60 in	-	-	155,600	20,700	176,300
Crusher motor	1	-	250	250	11,200	14,600	25,800
Belt conveyor	1	36 in by 160 ft	50	50	26,200	5,800	32,000
Head magnet	1	36-in magnetic head pulley	-	-	9,700	1,700	11,400
Screen	1	6 ft by 14 ft, 5-in by 5-in mesh	15	15	12,200	900	13,100
Chute	1	6 ft by 14 ft, below screen	-	-	5,800	1,500	7,300
Cone crusher	1	5-1/2-ft std head	-	-	86,900	11,500	98,400
Crusher motor	1	-	200	200	7,700	9,700	17,400
Belt conveyor	1	36 in by 350 ft, covered	100	100	53,100	21,600	74,700
Ore bin	1	3,000-ton capacity	-	-	87,200	127,900	215,100
Ore feeder	1	48 in by 35 ft	10	10	28,700	4,800	33,500
Screen	1	6 ft by 14 ft, 3/4-in by 4-in mesh	15	15	12,200	900	13,100
Chute	1	6 ft by 14 ft, below screen	-	-	5,800	1,500	7,300
Belt conveyor	4	24 in by 20 ft	10	40	20,700	4,500	25,200
Do	1	24 in by 30 ft	10	10	6,000	1,600	7,600
Screen	1	6 ft by 14 ft, 3/8-in by 4-inch mesh	15	15	12,200	900	13,100
Chute	1	6 ft by 14 ft, below screen	-	-	5,800	1,500	7,300
Pan conveyor	1	36 in by 15 ft	20	20	14,700	2,500	17,200
Belt conveyor	1	24 in by 100 ft	15	15	15,600	3,800	19,400
Impact crusher	1	48 in by 50 in	-	-	39,900	7,000	46,900
Crusher motor	1	-	250	250	11,200	14,600	25,800
Belt conveyor	1	24 in by 75 ft	20	20	10,300	3,000	13,300
Screen	1	6 ft by 14 ft, 1/4-in by 4-in mesh	20	20	12,200	900	13,100
Belt conveyor	1	24 in by 20 ft	10	10	5,200	1,100	6,300
Do	1	24 in by 40 ft	15	15	6,700	1,700	8,400
Do	1	24 in by 200 ft	50	50	23,900	5,900	29,800
Do	1	30 in by 300 ft	75	75	42,400	10,200	52,600
Dryer	2	80 in by 60 ft	50	100	169,400	28,500	197,900
Dust collector	7	10,000 cfm, cloth filters	20	140	80,000	32,900	112,900
Subtotal	-	-	-	1,530	1,177,700	509,600	1,687,300
Excavation	-	-	-	-	31,800	243,900	275,700
Concrete	-	-	-	-	194,100	283,700	477,800
Buildings	-	-	-	-	449,200	170,900	620,100
Air ducts	-	-	-	-	63,800	35,200	99,000
Electrical	-	-	-	-	150,900	160,000	310,900
Mechanical	-	-	-	-	-	-	-
Painting	-	-	-	-	9,000	22,500	31,500
Instrumentation	-	-	-	-	15,000	6,800	21,800
Insulation	-	-	-	-	4,500	9,000	13,500
Subtotal	-	-	-	-	918,300	932,000	1,850,300
Total direct costs	-	-	-	-	2,096,000	1,441,600	3,537,600
Field indirect	-	-	-	-	-	-	720,800
Total construction	-	-	-	-	-	-	4,258,400
Engineering	-	-	-	-	-	-	212,900
Administration and overhead	-	-	-	-	-	-	212,900
Subtotal	-	-	-	-	-	-	4,684,200
Contingency	-	-	-	-	-	-	468,400
Subtotal	-	-	-	-	-	-	5,152,600
Fee	-	-	-	-	-	-	257,600
Total	-	-	-	-	-	-	5,410,200

TABLE B-6. - Yukon Territory cost summary, screening and fiberizing section, 4,600-ton-per-day asbestos fiber mill

	Quantity	Size	Unit hp	Total hp	Cost, dollars		Total cost, dollars
					Material	Labor	
Screen	60	5 ft by 10 ft, Hall type	5	300	384,100	26,100	410,200
Fiberizer	8	3 stages	75	600	73,500	12,200	85,700
Do	2	.....do	100	200	19,100	3,200	22,300
Cyclone	29	9 ft	-	-	121,500	19,300	140,800
Fan	4	125,000 cfm	400	1,600	320,100	46,200	366,300
Separator	10	Bauer type	1	10	37,100	5,900	43,000
Opener fan	17	High speed	30	510	55,500	8,900	64,400
Deduster	4	Single	15	60	28,200	4,500	32,700
Do	4	Double	30	120	44,500	7,300	51,800
Fiber bin	1	250-ton capacity	-	-	14,200	20,200	34,400
Do	1	500-ton capacity	-	-	22,900	33,000	55,900
Do	1	350-ton capacity	-	-	19,200	27,500	46,700
Pressure packer	4	Automatic	60	240	263,500	45,000	308,500
Palletizer	1	.....do	12	12	35,100	5,600	40,700
Strapping machine	1	.....do	15	15	28,700	4,500	33,200
Forklift truck	4	3,000-lb capacity	55	220	40,400	-	40,400
Dust collector	4	125,000 cfm	300	1,200	287,400	45,600	333,000
Subtotal	-	-	-	5,087	1,795,000	315,000	2,110,000
Excavation	-	-	-	-	31,100	237,900	269,000
Concrete	-	-	-	-	189,000	276,200	465,200
Buildings	-	-	-	-	874,900	332,700	1,207,600
Air ducts	-	-	-	-	208,500	114,800	323,300
Electrical	-	-	-	-	441,000	467,300	908,300
Mechanical	-	-	-	-	328,100	65,600	393,700
Painting	-	-	-	-	18,400	45,900	64,300
Instrumentation	-	-	-	-	29,500	13,300	42,800
Insulation	-	-	-	-	8,100	16,200	24,300
Subtotal	-	-	-	-	2,128,600	1,569,900	3,698,500
Total direct costs	-	-	-	-	3,923,600	1,884,900	5,808,500
Field indirect costs	-	-	-	-	-	-	942,400
Total construction	-	-	-	-	-	-	6,750,900
Engineering	-	-	-	-	-	-	337,500
Administration and overhead	-	-	-	-	-	-	337,500
Subtotal	-	-	-	-	-	-	7,425,900
Contingency	-	-	-	-	-	-	742,600
Subtotal	-	-	-	-	-	-	8,168,500
Fee	-	-	-	-	-	-	408,400
Total	-	-	-	-	-	-	8,576,900

TABLE B-7. - Yukon Territory cost summary, miscellaneous production items, 4,600-ton-per-day asbestos fiber mill

	Quantity	Size	Total cost, dollars
Dry rock storage.....	1	150 ft by 300 ft with 60-ft eaves, no utilities $44 per square ft.	1,980,000
Belt conveyor.....	1	30 in by 600 ft, under storage covered to top of mill, 100 hp, $546 per ft, installed.	327,600
Front-end loader.....	1	5-1/2-yd capacity, power shift, 300-hp diesel.	96,200
Water tank.....	1	10,000-bbl steel tank for fire protection.	115,600
Reservoir dam.....	1	1,000 ft by 50 ft earthen dam.	663,000
Pipe.....ft..	3,000	6-in and 4-in-diam steel pipe, installed.	264,200
Pump.....	1	500 gpm, 600 ft head, 250 hp, installed.	72,400
Do.....	1	1,500 gpm, 70 ft head, 250 hp, installed.	78,000
Crawler tractor.....	1	50,000-lb drawbar pull, power-shift, 270-hp diesel.	80,600
Warehouse.....	1	60 ft by 100 ft with 20 ft eaves, including utilities at $21 per sq ft, 1/2 charged to mill.	63,000
Parts inventory.....	-	Parts inventory and maintenance supplies, 1/2 charged to mill.	700,000
Administrative building	1	40 ft by 60 ft with 20-ft eaves, 2 stories, including utilities at $48 per sq ft, 1/2 charged to mill.	115,200
Office furniture equipment.	1	40 ft by 60 ft, 2 stories, at $9 per sq ft, 1/2 charged to mill.	21,600
Subtotal.....	-	-	4,577,400
Contingency.....	-	-	457,700
Subtotal.....	-	-	5,035,100
Fee.....	-	-	251,800
Total.....	-	-	5,286,900

TABLE B-8. - Yukon Territory cost summary, support facilities

	Quantity	Size	Total cost, dollars
Road.....	1	Gravel road, 24 ft wide, 30 miles at $41,600 per mile.	1,248,000
Bridge.....	1	Steel girder, one lane wide, 500 ft at $4,800 per ft.	2,400,000
Cableway.....	1	1,460-ft span between two steel derricks.	464,100
Runway.....	1	Gravel runway, 5,300 ft at $91 per linear ft.	482,300
Power generator.....	1	10,000-kW, four-diesel generators, installed, including building at $428/kW.	4,280,000
Powerlines.....	1	Electrical transmission lines, 10 miles at $33,800 per mile.	338,000
Fuel tank.....	1	10,000-bbl steel tank for diesel fuel.	115,600
Pickup.....	2	1/2-ton capacity.....	5,100
Truck.....	1	5-ton flatbed.....	11,500
Townsite.....	1	Includes living quarters for 300 single and married employees, commercial center, clinic, recreational center, communications system, road system, sewer system, electrical distribution lines and water system at $26,000 per employee.	7,800,000
Subtotal.....	-	-	17,144,600
Contingency.....	-	-	1,714,500
Subtotal.....	-	-	18,859,100
Fee.....	-	-	943,000
Subtotal.....	-	-	19,802,100
Less federal assistance on road, cable way and bridge construction.	-	-	-1,200,000
Total.....	-	-	18,602,100

TABLE B-9. - Yukon Territory utility summary

	Power, kW-hr per day	Water requirement gpd
Mine	13,200	48,000
Mill	153,400	144,000
Support facilities	2,400	144,000
Total	169,000	336,000

Power: At $0.0229/kW-hr[1]
Mine--$0.0229 X 13,200 X 300 = $90,700/year[2] = $0.07/ton
Mill--$0.0229 X 153,400 X 300 = $1,053,900/year[2] = $0.76/ton
Support facilities $0.0229 X 2,400 X 300 = $16,500/year[2] = $0.01/ton

Water: At $0.15/1,000 gallons
Mine--$0.00015 X 48,000 X 300 = $2,200/year = nil
Mill--$0.00015 X 144,000 X 300 = $6,500/year = nil
Support facilities--$0.00015 X 144,000 X 300 = $6,500/year = nil

[1]Includes fuel, lubrication, and repair parts.
[2]Rounded to the nearest 100.

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