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THE OUTLOOK FOR BARITE PRODUCTION IN BRITISH COLUMBIA

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THE OUTLOOK FOR BARITE PRODUCTION IN BRITISH COLUMBIA

1. INTRODUCTION

THE PURPOSE OF THIS REPORT IS TO EXAMINE THE OPPORTUNITIES FOR EXPANDING BARITE PRODUCTION IN BRITISH COLUMBIA. OF PRIMARY INTEREST WILL BE THE RELATIONSHIP BETWEEN THE PROJECTED FUTURE LEVELS OF PRODUCTION AND CONSUMPTION OF BARITE IN WESTERN CANADA AND THE EXTENT TO WHICH INCREASED DOMESTIC PRODUCTION COULD REPLACE THE NEED FOR IMPORTS IN FILLING ANY EXPECTED SUPPLY SHORTAGES.

AFTER A BRIEF OVERVIEW OF THE NATURE AND USES OF THE BARITE AND SOME OF THE RELEVANT FEATURES OF THE BARITE SUPPLY INDUSTRY, THE DISCUSSION WILL TURN TO THE SUPPLY GAP IN THE CANADIAN MARKET AND THE POSSIBILITIES FOR IMPORT SUBSTITUTION.

2. OVERVIEW

BARITE IS AN INDUSTRIAL MINERAL WHICH IS USED IN LARGE QUANTITIES BY THE OIL AND GAS WELL-DRILLING INDUSTRY. IT IS THE BASIC COMPONENT OF DRILLING MUD, A FLUID CIRCULATED IN THE WELL CONTINUOUSLY DURING THE DRILLING PROCESS TO LUBRICATE AND COOL THE DRILLING APPARATUS AND TO CONTAIN THE HIGH OIL AND GAS PRESSURES FOUND AT DEPTH. BARITE IS PARTICULARLY WELL-SUITED FOR DRILLING MUD BECAUSE IT IS A HEAVY, INERT SUBSTANCE WHICH IS INEXPENSIVE IN RELATION TO OTHER HEAVY MATERIALS. IN THE PRODUCTION OF DRILLING MUD, CRUSHED OR GROUND BARITE IS COMBINED WITH THE OTHER SOLID INGREDIENTS AND THEN SUSPENDED IN WATER. IN GROUND FORM, BARITE HAS THE ADVANTAGES OF BEING CLEAN, EASY TO HANDLE AND NON ABRASIVE.

THE USES OF BARITE IN OTHER INDUSTRIES TAKEN TOGETHER ACCOUNT FOR ONLY A SMALL PROPORTION OF TOTAL CONSUMPTION, LESS THAN 10%, BOTH IN CANADA AND THE UNITED STATES. HOWEVER, THESE APPLICATIONS ARE FAIRLY NUMEROUS AND DIVERSE IN NATURE. BARITE IS USED AS A FILLER IN PAINTS AND RUBBER, AND IN THE MANUFACTURE OF CERAMIC PRODUCTS, CHEMICALS, PLASTICS AND BRAKE LININGS. IN RUBBER PRODUCTS THE WHITENESS AND PARTICLE SIZE RANGE OF NATURAL BARITE ARE IMPORTANT CHARACTERISTICS.

ANNUAL DATA ON THE QUANTITIES OF BARITE USED BY THESE VARIOUS INDUSTRIES FROM 1950 TO 1980 ARE PRESENTED IN TABLES 1 AND 2 FOR CANADA AND THE UNITED STATES RESPECTIVELY.

TABLE I

BARITE - HISTORICAL MARKET DATA BY MAJOR INDUSTRY USE
(In Canada - tonnes)

USE YEAR	WELL DRILLING	PAINTS	RUBBER GOODS	GLASS	MISCELLANEOUS CHEMICALS	MISCELLANEOUS OTHER	TOTAL
1950	NA	1 322	534	240		1 652	3 479
1951	1 793	1 106	340	192		332	3 763
1952	1 814	954	465	190		230	3 653
1953	1 814	954	465	190		230	3 653
1954	1 814	1 089	396	216		253	3 768
1955	10 886	874	487	260	87	35	12 630
1956	10 886 E	788 E	446	300	87	58	12 564
1957	10 886 E	873 E	476	273		544 E	13 052
1958	16 722 E	730	351	195	11	571 E	18 580
1959	19 051	633	156	323	59	102	20 324
1960	21 599	865	198	330	21	105	23 013
1961	15 432	826	273	374	73	8	16 985
1962	8 049	1 218	292	570	66	9	10 205
1963	7 638	1 527	161	697	134	133	10 290
1964	9 271	1 835	167	618	143	246	12 281
1965	8 560	1 806	56	780	132	118	11 453
1966	11 089	1 481	143	813		249	13 775
1967	14 515	1 304	203	848		479	17 349
1968	14 515	1 900	260	2 461		277	19 416
1969	16 329	2 086	279	2 888		328	21 909
1970	43 785	1 856	230	4 084		122	50 077
1971	45 078	2 175	226	4 646		674	52 798
1972	61 482	2 389	201	6 510		995	71 577
1973	67 036	1 337	239	6 619		200	75 431
1974	51 522	2 154	120	4 179		464	58 439
1975	36 044	2 175	48	867		1 095	40 229
1976	54 767	2 140	86	169		904	58 066
1977	48 758	2 474	810	156		1 310	53 508
1978	53 068	1 071	2 977	13		1 062	58 191
1979	75 000	NA	NA	NA		NA	79 595
1980	130 000	NA	NA	NA		NA	136 000

E Estimates

Note: For years 1950-54, 1957, 1966-80, Chemicals included in 'Other'.

Source: Canadian Minerals Yearbook, and Drilling Industry and Barite

BARITE - HISTORICAL MARKET DATA BY
MAJOR INDUSTRY USE
(United States - Tonnes)

USE YEAR	WELL DRILLING	PAINTS	GLASS	RUBBER	MISCELLANEOUS		TOTAL
					CHEMICALS	OTHER	
1950	438 641	25 401	22 351	17 237	NA(1)	16 513	520 143
1951	539 474	25 401	23 386	13 608	NA(1)	35 895	637 764
1952	687 864	22 680	22 320	16 329	NA(1)	12 323	761 516
1953	747 566	21 772	22 546	19 051	NA(1)	23 751	834 686
1954	878 544	19 958	21 054	18 144	NA(1)	3 586	941 286
1955	1 036 285	23 254	26 070	22 774	NA(1)	9 428	1 117 811
1956	1 289 139	18 690	29 630	20 050	NA(1)	5 999	1 363 508
1957	1 263 159	14 677	25 034	19 760	NA(1)	8 316	1 330 946
1958	886 551	13 282	8 972	16 680	NA(1)	6 071	931 556
1959	1 046 492	15 464	11 035	17 968	NA(1)	6 650	1 097 609
1960	834 685	16 577	13 619	15 497	NA(1)	5 606	886 165
1961	854 150	14 631	27 862	21 779	NA(1)	21 224	939 646
1962	847 317	17 950	35 396	23 800	NA(1)	3 670	928 132
1963	822 938	31 399	51 131	25 836	NA(1)	2 831	934 134
1964	844 557	52 976	51 588	14 199	NA(1)	3 436	976 756
1965	895 291	62 439	63 646	27 208	NA(1)	11 538	1 060 122
1966	927 239	63 408	66 823	34 699	NA(1)	4 178	1 096 346
1967	875 417	54 157	69 146	28 158	154 308	11 761	1 192 947
1968	913 007	55 242	65 109	37 774	159 510	18 967	1 249 609
1969	1 120 581	47 451	65 958	12 861	161 089	47 858	1 455 797
1970	1 015 115	39 843	45 034	23 123	132 483	22 285	1 277 884
1971	947 434	39 407	W(2)	W(2)	127 771	114 984	1 229 595
1972	1 073 508	42 041	W(2)	W(2)	95 788	128 986	1 340 324
1973	1 203 336	47 540	W(2)	W(2)	98 605	95 002	1 444 483
1974	1 306 388	43 744	W(2)	W(2)	90 948	63 732	1 504 811
1975	1 486 304	31 585	W(2)	W(2)	65 125	77 311	1 660 326
1976	1 801 638	45 115	W(2)	W(2)	71 082	68 863	1 999 723
1977	2 151 842	45 359	W(3)	W(3)	73 482	81 647	2 352 330
1978	2 244 375	55 338	32 659	W(3)	78 018	39 916	2 451 213
1979	2 579 126	33 566	W(3)	W(3)	67 132	58 060	2 738 791
1980	NA	NA	NA	NA	NA	NA	3 175 000

NA(1): Not available
W(2): Withheld to avoid disclosure of confidential company data, included in total.
W(3): Withheld to avoid disclosing company proprietary data, included with 'Other'.

Source: Haines, Barite - A Statistical Summary, 1978

2.1 THE BARITE SUPPLY INDUSTRY INTERNATIONALLY

STRICTLY SPEAKING, IT SHOULD BE RECOGNIZED THAT THE BARITE SUPPLY INDUSTRY IS LINKED BOTH TO DRILLING MUD PRODUCTION AND TO THE PRODUCTION OF THE OTHER VARIOUS COMMODITIES SUCH AS PAINTS, CHEMICALS AND RUBBER PRODUCTS. HOWEVER, SINCE THE VOLUME OF BARITE USED BY THESE OTHER INDUSTRIES FROM YEAR TO YEAR TENDS TO BE RELATIVELY STABLE AND AS MENTIONED EARLIER, FAIRLY SMALL IN SCALE, THE ORGANIZATION OF THE BARITE SUPPLY INDUSTRY WILL SIMPLY BE ADDRESSED WITHIN THE CONTEXT OF THE VERTICAL LINKAGES WITH DRILLING MUD PRODUCTION AND WITH THE WELL DRILLING SERVICE INDUSTRY.

A VERY IMPORTANT RAMIFICATION OF THESE LINKAGES HAS BEEN THE TENDENCY FOR A FEW LARGE VERTICALLY INTEGRATED FIRMS TO DOMINATE THE BARITE MARKET INTERNATIONALLY. THE FOUR LARGEST COMPANIES ARE ALL BASED IN THE UNITED STATES AND ARE CONSEQUENTLY REFERRED TO AT TIMES AS THE AMERICAN "CARTEL". THEY INCLUDE: MILCHEM INCORPORATED (A SUBSIDIARY OF BAKER INTERNATIONAL), BAROID DIVISION (NL INDUSTRIES), DRESSER MINERALS (DRESSER-MAGCOBAR) AND IMCO SERVICES (HALLIBURTON COMPANY). ALL OF THESE COMPANIES OWN AND OPERATE BARITE MINES ALL OVER THE WORLD, DIRECTLY OR THROUGH CORPORATE TIES, IN ORDER TO PRODUCE THE RAW MATERIALS THEY NEED FOR SERVICING THE WELL-DRILLING INDUSTRY.

THE SIGNIFICANT MARKET POWER OF THESE FIRMS IS APPARENT IN TERMS OF THEIR EXTENSIVE CONTROL OVER THE WORLD'S BARITE RESOURCES, THEIR SHARE OF DRILLING MUD PRODUCTION, AS WELL AS IN TERMS OF THEIR SHARE OF OIL WELL-SERVICING CONTRACTS. WHILE NUMEROUS SMALL DRILLING MUD SUPPLIERS SERVING LOCAL MARKETS AFFORD THE MULTINATIONALS SOME COMPETITION FOR WELL-SERVICING CONTRACTS, THE EXTENT OF THIS COMPETITION IS LIMITED BY THE FACT THAT MANY OF THESE COMPANIES MUST RELY ON THE MAJORS FOR THEIR BARITE SUPPLIES.

A GENERAL INDICATION OF THE MARKET SHARE BREAKDOWN FOR DRILLING MUD IS PROVIDED IN TABLE 3. SINCE THE FIGURES FLUCTUATE FROM YEAR TO YEAR, THE TABLE SHOULD NOT BE CONSTRUED AS ANYTHING MORE THAN A ROUGH INDICATION OF THE DISTRIBUTION OF THE MARKET BETWEEN THE MAJORS AND THE INDEPENDENTS. ACCORDINGLY, IT IS FAIR TO SAY THAT WHILE THE MARKET POWER OF THE BIG 4 VARIES FROM YEAR TO YEAR AND FROM REGION TO REGION, THE DEGREE OF MARKET CONCENTRATION DOES APPEAR TO BE SIGNIFICANT BY MOST INDUSTRIAL STANDARDS.

EVIDENTLY THE ESTABLISHMENT OF SECURE, WELL LOCATED SUPPLIES OF BARITE HAS SOME BEARING ON THE DEGREE OF MARKET POWER A COMPANY CAN WIELD IN THE WELL-DRILLING SERVICE INDUSTRY. AN INTERESTING STATEMENT TO THIS EFFECT IS CONTAINED IN AN ANNUAL REPORT OF ONE OF THE MAJORS:

> "SO ESSENTIAL IS THIS MINERAL TO THE DRILLING PROCESS THAT THE LEVEL OF RESERVES OF HIGH GRADE BARITE CAN CONTROL THE AMOUNT OF DRILLING IN THE FUTURE. FOR A COMPANY WHOSE PARTICIPATION IN THE DRILLING INDUSTRY REQUIRES ACCESS TO BARITE RESERVES, THE LOCATIONAND ACQUISITION OF THIS DEPOSIT ARE OF PARAMOUNT IMPORTANCE".*

* BAKER INTERNATIONAL CORPORATION 1979 ANNUAL REPORT P.18 MILCHEM INC. IS THE OPERATING UNIT IN THE DRILLING FLUID BUSINESS OF THE BAKER DRILLING EQUIPMENT COMPANY.

TABLE 3

ESTIMATED MARKET DIVISION FOR

DRILLING MUD SUPPLIERS

	GULF COAST (1978)	NORTH SEA (1976)
MAGCOBAR	27 - 30 %	20 %
BAROID	20 - 25 %	26 %
MILCHEM	12 - 20 %	11 %
IMCO	12 - 20 %	4 %
'INDEPENDENTS'	20 - 25 %	39 %

SOURCE: INDUSTRIAL MINERALS, (1978), "RAW MATERIALS FOR OILWELL DRILLING".

IN ADDITION TO HAVING TIED SUPPLIES OF BARITE, THE OTHER IMPORTANT STRENGTH OF THE MAJORS IS THEIR HIGH LEVEL OF TECHNICAL EXPERTISE. GIVEN THE DAY TO DAY FLUCTUATIONS IN THE CONDITIONS ENCOUNTERED BY THE DRILLING COMPANIES AND THE RANGE OF MUD FORMULATIONS REQUIRED, THE QUALITY OF THE TECHNICAL SERVICE WHICH CAN BE PROVIDED BY THE MUD SUPPLIER IS AN IMPORTANT CONSIDERATION IN KEEPING WITH THE LARGE SCALE AND RANGE OF THEIR OPERATIONS IT FOLLOWS THAT THE MAJORS OFTEN HAVE BETTER, MORE EXTENSIVE TECHNICAL RESOURCES AND GREATER PRACTICAL EXPERIENCE THAN THE INDEPENDENTS.

2.2 The Canadian Barite Supply Industry

Interestingly enough the Canadian barite supply market has not been penetrated by the multinationals to the same extent found in other countries. Although one of the three firms which produce barite in this country is in fact a subsidiary of Baroid, this is a small operation recovering about 5 000 tonnes of barite annually from the tailings of an old mine in south eastern B.C. This operation does not mine barite per se. Of the other two companies only the larger one, Mountain Minerals, supplies barite for well drilling. The other, Extender Minerals located in Ontario, mines and processes chemical and filler grade material destined for industrial use in Eastern Canada. Mountain Minerals, a privately owned Canadian firm, has a virtual monopoly over the domestic barite supply since Baroid's tailings operation represents its only competition other than from imports.

As a private company, the confidentiality of Mountain Minerals annual reports must be respected. However a rough idea of the Canadian market share breakdown can be inferred from the estimated consumption and import figures for last year.

Accordingly, domestic consumption by the well-drilling industry less imports* for 1980 was in the order of 90 000 tonnes, of which 5 000 tonnes would represent Baroid's contribution. This information therefore suggests that Mountain Minerals produced in the order of 85 000 tonnes in 1980, or over 90% of the domestic market.

* As noted at the bottom of Table 3, the import data was constructed by adding proxies for the barite component in the reported volumes of drilling mud imports to the reported volumes of natural barite imported.

TABLE 3

INDEPENDENT DRILLING MUD AND BARITE SUPPLIERS IN CANADA

MAJOR INDEPENDENTS

International Drilling Fluids
Protec Mud Services
Diversified Drilling Muds Ltd.
Dynamic Drilling Fluids Co. Ltd.
Wilson Mud Service Ltd.
Reef Mud

SMALLER INDEPENDENTS

Ace Mud Service	Mission Mud Control
Alpha Mud Service	Mudco Services
Alpine	National Mud Control
Apex Mud Service	North Star Mud Service
Brinadd Co. Ltd.	Nomad Drilling Fluids Ltd.
Diamond L. Mud and Chemicals	Northern Mud Specialists
Devonian Mud	Superiod Mud Sales
Hollimex Products Co.	Western Mud Services
Independent Mud Services	Westwood Mud Service

WHOLESALERS

Wyo-Ben
United Mud Supply

Sources: Canadian Association of Oilwell Drilling Contractors;
Oilweek, December 3, 1979;
Personal Correspondance with Mud Supply Companies.

TABLE 4

BARITE IMPORTS BRITISH COLUMBIA AND ALBERTA

1973 - 1980

YEAR	NATURAL BARITE QUANTITY t	NATURAL BARITE VALUE $	$ PER TONNE	DRILLING MUD QUANTITY t	DRILLING MUD VALUE $	$ PER TONNE	ESTIMATED QUANTITY BARITE * t	ESTIMATED TOTAL BARITE IMPORTED t
1973	11 501	353 569	30.74	11 874	2 712 324	228.43	2 969	14 470
1974	1 776	143 143	80.60	18 270	3 385 360	185.30	4 568	6 344
1975	74	9 324	126.00	14 746	4 613 259	312.85	3 687	3 763
1976	13 414	771 798	57.54	26 117	5 930 409	227.02	6 529	19 943
1977	1 848	99 571	53.88	40 689	7 701 638	189.28	10 172	12 020
1978	12 099	1 374 114	113.57	75 559	13 028 378	172.43	18 890	30 989
1979	4 611	344 289	74.67	38 682	10 723 259	277.22	9 671	14 282
1980	31 906	2 378 378	74.54	30 387	6 760 407	222.48	7 597	37 984

Source: Imports by Province of Clearance Commodity by Country (Catalogue 12-525 Occasional) Statistics Canada

* The estimated quantity of barite in drilling mud was obtained by assuming that in general, mud contains 25% barite by volume.

PRODUCTION OF BARITE IN BRITISH COLUMBIA DATES BACK TO 1940, THE YEAR OF THE FIRST RECORDED COMMERCIAL SHIRMENTS. ANNUAL PRODUCTION VOLUMES HAVE FLUCTUATED CONSIDERABLY SINCE THEN, CLIMBING TO ABOUT 90 000 TONNES IN 1980. THERE ARE TWO MAJOR AREAS OF BARITE DEPOSITS IN B.C.: THE SOUTHEASTERN PART OF THE PROVINCE ALONG THE ROCKY MOUNTAIN TRENCH, WHICH HAS BEEN THE SOURCE OF ALL PRODUCTIDN UP TO DATE, AND THE UNDEVELOPED STRATABOUND OCCURRENCES IN NORTHEASTERN B.C., SPECIFICALLY IN THE GATAGA-KETCHIKA RIVER AND MUNCHO LAKE AREAS. OF ABOUT 100 REPORTED BARITE OCCURRENCES IN B.C., ONLY 10 HAVE REPORTED COMMERCIAL SHIPMENTS, AND SOME OF THESE HAVE BEEN INSIGNIFICAHT. SO FAR, FOUR DEPOSITS HAVE PROVEN TO BE ECONOMICALLY IMPORTANT PRODUCERS: SILVER GIANT, BRISCO, PARSON AND MINERAL KING. THE FIRST OF THESE, SILVER GIANT IS OPERATED BY BAROID AND THE OTHER THREE ARE OPERATED BY MOUNTAIN MINERALS.

THE MINERAL KING PROPERTY IS LOCATED NEAR THE CONFLUENCE OF TOBY AND JUMBO CREEKS, 35 KM SOUTHWEST OF INVERMERE. FROM 1954 TO 1967 THIS MINE PRODUCED 2 300 000 TONNES OF BARITIO ORE PROCESSED FOR BASE METAL CONCENTRATES AND 25 000 TONNES OF BARITE. SINCE 1970, SOME 200 000 TONNES OF BARITE HAVE BEEN RECOVERED FROM THE OLD TAILINGS POND. THE DEPOSIT IS NOW CONSIDERED DEPLETED.

3. The Supply Gap

Since the Canadian oil and gas well-drilling industry is concentrated in Alberta and, to a lesser extent, British Columbia, it follows that the derived demand for drilling mud is also largely confined to the two western provinces. Although some drilling takes place in Manitoba, the scale is quite small and the wells are relatively shallow so that overall demand from this province for drilling mud is not significant.

3.1 The Current Gap

This information is useful in interpreting the Canadian statistics on annual barite and drilling mud consumption because the figures are not broken down into provincial or regional sub-totals. For the sake of convenience in the discussion that follows, it will simply be assumed that Alberta and British Columbia account for virtually all of the barite consumed by the well-drilling industry.

Because much of the data on Canadian barite production is confidential, the relative magnitude of gap between domestic consumption and production of barite must be inferred from the relationship between total consumption and imports. Estimates on the amounts of barite imported into Alberta and British Columbia over the period 1973 - 1980 are provided in Table 3. Although the year to year fluctuations in the amounts of barite imported into Canada have been quite large, the overall trend appears to have been upward.

THE SILVER GIANT MINE, LOCATED 10 KM NORTHWEST OF SPILLIMACHEEN, PRODUCED OVER 900 000 TONNES OF BARITIC ORE PROCESSED FOR LEAD AND ZINC CONCENTRATE BETWEEN 1951 AND 1957. THE PRODUCTION OF BARITE BEGAN IN 1959, FIRST FROM OPEN PIT AND LATER BY PROCESSING OLD TAILINGS. THE TOTAL PRODUCTION OF BARITE TO 1979 HAS TOTALLED APPROXIMATELY 200 000 TONNES.

THE DEPOSITS IN THE NORTH EASTERN PART OF THE PROVINCE ARE OF THE LARGE, BEDDED VARIETY AND WOULD BE MINED BY OPEN PIT METHODS. THE MUNCHO LAKE DEPOSIT LOCATED ABOUT 40 KILOMETERS EAST OF MILE 430 ON THE ALASKA HIHGWAY IS VERY LARGE: ESTIMATED RESERVES EXCEED 100 MILLION TONNES. SIX OTHER DEPOSITS (DRIFTPILE CREEK, MOUNT ALCOCK, CIRQUE, PIE, FLUKE AND ELF) ARE BARITE-LEAD-ZINC OCCURRENCES. THESE DEPOSITS ARE ALSO QUITE IMPRESSIVE IN SIZE - THE BARITE HORIZON AT MOUNT ALCOCK IS REPORTED TO BE 25 TO 30 METERS THICK AND THE DRILLING RESULTS FROM THE CIRQUE DEPOSIT INDICATE RESERVES OF 33 MILLION TONNES OF BARITE LEAD-ZINC-SILVER ORE.

THE PARSON OPERATION INVOLVES TWO MINERAL CLAIMS IN THE KOOTENAY REGION. ABOUT 150 TONNES OF BARITE HAVE BEEN MINED FROM THESE CLAIMS SINCE 1941.

UNTIL 1957, MINING WAS BY OPEN PIT METHODS, THE ORE WAS HAND-COBBED AND THE PRODUCT SHIPPED IN LUMP FORM. SINCE 1957 BARITE ORE HAS BEEN RECOVERED FROM ADITS AS WELL AND PRESENTLY, ALL RECOVERY IS BY UNDERGROUND MINING. OVER THE PAST TWO YEARS MOUNTAIN MINERALS HAVE CONDUCTED EXTENSIVE UNDERGROUND DEVELOPMENT WORK TO EXPAND THE PARSON MINE FROM A SMALL TO MEDIUM-SIZED OPERATION. UPON COMPLETION OF THIS WORK THE CAPACITY OF THE PARSON MINE WILL BE IN THE ORDER OF 80 000 TONNES PER YEAR.

THE BRISCO OPERATION IS IN FIVE MINERAL CLAIMS LOCATED 4 KM WEST OF BRISCO IN SOUTHEAST B.C. BARITE HAS BEEN MINED HERE SINCE 1945, AND TOTAL PRODUCTION TO 1980 HAS TOTALLED ABOUT 210 000 TONNES. UNTIL 1957, NEARLY ALL PRODUCTION CAME FROM OPEN PIT MINING, ALTHOUGH NOW MINING IS DONE UNDERGROUND. PRODUCTION FROM BRISCO HAS BEEN DECLINING IN RECENT YEARS AND THE MINE SOON WILL BE SHUT DOWN.

3. THE SUPPLY GAP

SINCE THE CANADIAN OIL AND GAS WELL-DRILLING INDUSTRY IS CONCENTRATED IN ALBERTA AND, TO A LESSER EXTENT, BRITISH COLUMBIA, IT FOLLOWS THAT THE DERIVED DEMAND FOR DRILLING MUD IS ALSO LARGELY CONFINED TO THE TWO WESTERN PROVINCES. ALTHOUGH SOME DRILLING TAKES PLACE IN MANITOBA, THE SCALE IS QUITE SMALL AND THE WELLS ARE RELATIVELY SHALLOW SO THAT OVERALL DEMAND FROM THIS PROVINCE FOR DRILLING MUD IS NOT SIGNIFICANT.

3.1 THE CURRENT GAP

THIS INFORMATION IS USEFUL IN INTERPRETING THE CANADIAN STATISTICS ON ANNUAL BARITE AND DRILLING MUD CONSUMPTION BECAUSE THE FIGURES ARE NOT BROKEN DOWN INTO PROVINCIAL OR REGIONAL SUB-TOTALS. FOR THE SAKE OF CONVENIENCE IN THE DISCUSSION THAT FOLLOWS, IT WILL SIMPLY BE ASSUMED THAT ALBERTA AND BRITISH COLUMBIA ACCOUNT FOR VIRTUALLY ALL OF THE BARITE CONSUMED BY THE WELL-DRILLING INDUSTRY.

BECAUSE MUCH OF THE DATA ON CANADIAN BARITE PRODUCTION IS CONFIDENTIAL, THE RELATIVE MAGNITUDE OF GAP BETWEEN DOMESTIC CONSUMPTION AND PRODUCTION OF BARITE MUST BE INFERRED FROM THE RELATIONSHIP BETWEEN TOTAL CONSUMPTION AND IMPORTS. ESTIMATES ON THE AMOUNTS OF BARITE IMPORTED INTO ALBERTA AND BRITISH COLUMBIA OVER THE PERIOD 1973 - 1980 ARE PROVIDED IN TABLE 3. ALTHOUGH THE YEAR TO YEAR FLUCTUATIONS IN THE AMOUNTS OF BARITE IMPORTED INTO CANADA HAVE BEEN QUITE LARGE, THE OVERALL TREND APPEARS TO HAVE BEEN UPWARD.

TABLE 5

BARITE IMPORTS AS A PER CENT OF TOTAL CONSUMPTION*

	BARITE CONSUMPTION IN WELL DRILLING TONNES	ESTIMATED TOTAL BARITE IMPORTS FOR ALTA & BC TONNES	IMPORTS AS A PERCENT OF TOTAL CONSUMPTION %
1973	67 036	14 470	22
1974	51 522	6 344	12
1975	36 044	3 763	10
1976	54 767	19 943	36
1977	48 758	12 020	25
1978	53 068	30 989	58
1979	75 000	14 282	19
1980	130 000	37 984	29

* EXPORTS TO THE USA. OWING TO THE VERY SMALL SCALE OF THESE SHIPMENTS, THEY HAVE NOT ENTERED INTO THE DISCUSSION OF THE SUPPLY "GAP".

TABLE 6*

NUMBER OF WELLS DRILLED
IN WESTERN CANADA

1973	4 400
1974	4 000
1975	4 000
1976	5 500
1977	6 000
1978	7 000
1979	7 700
1980	9 200

* ROUNDED TO THE NEAREST HUNDRED.

As shown in Table 4, the contribution of imports to the Annual volumes of barite that have been consumed by the well-drilling industry on balance has been quite significant, ranging from a low of 10% in 1975 to a high of 58% in 1978. In 1980 which was a peak drilling year, Canadian demand exceeded domestic supply by an estimated 38 000 tonnes. That year a total of 9 200 wells were drilled compared to 7 700 for the year preceeding. The comparable supply "gap" for barite in 1979 was only 14 000 tonnes or 19% of total consumption.

3.2 Outlook

At present the political situation in this country is such that projections about future oil and gas well-drilling in Western Canada are fraught with severe uncertainty. However sufficient information is available to make a few statements about the kind of market prospect which British Columbia barite producers likely will face over the next 10 to 20 years.

There are essentially three relevant market areas to consider:

1) Western Canadian Sedimentary Basin
2) The Beaufort Sea
3) British Columbia Offshore

Owing to the high pressures encountered in offshore drilling the last two represent interesting possibilities.

The Beaufort Sea area in particular can be expected to absorb large quantities of barite in the future; however there is reason to believe that the Yukon could be the chief domestic source of baritefor this area. Like British Columbia, the Yukon also has large undeveloped deposits but these appear to be of higher grade than those found in the northern part of this province. The closer physical proximity of the Yukon to the Beaufort Sea and the federal government's interest in the development of the Yukon through the mandate of its Indian and Northern Affairs Department also mitigate against B.C.'s chances of securing the Beaufort market.

OFFSHORE DRILLING ALONG THE B.C. COAST IS EXPECTED TO COMMENCE IN THE NEXT FEW YEARS, PROVIDING A SMALL MARKET FOR LOCAL BARITE PRODUCERS. IT IS UNLIKELY THAT THIS WILL EVENTUALLY BECOME A SIGNIFICANT MARKET, FOR ALTHOUGH OFFSHORE WELLS INDIVIDUALLY CONSUME LARGE QUANTITIES OF BARITE, IN RELATIVE TERMS THE NUMBER OF WELLS INVOLVED WILL ONLY REPRESENT A SMALL FRACTION OF WESTERN CANADIAN DRILLING ACTIVITY.

ON BALANCE IT APPEARS THAT THE SEDIMENTARY BASIN WILL CONTINUE TO BE THE MAJOR MARKET FOR B.C. PRODUCERS. IN 1980 OVER 7 000, OF THE 9 000 WELLS DRILLED IN CANADA WERE LOCATED IN THE SEDIMENTARY BASIN AND BY EXTENSION THIS AREA'S REQUIREMENTS WOULD REPRESENT A ROUGHLY SIMILAR PROPORTION OF THE BARITE MARKET.

GIVEN THE LARGE SWINGS THAT HAVE OCCURRED OVER TIME IN WESTERN CANADA BOTH IN THE SIZE OF THE BARITE MARKET AND IN THE LEVEL OF PRODUCTION, THE NOTION THAT THE SUPPLY SHORTFALL CAN BE PROJECTED INTO THE FUTURE OBVIOUSLY HAS DRAWBACKS. ALTHOUGH THE 1981 FIGURES ARE NOT YET COMPLETE THERE IS EVIDENCE TO SUGGEST THAT AT THE PRESENT TIME THERE MAY BE A SURPLUS OF BARITE, RATHER THAN A SHORTFALL. SINCE IT WOULD BE WORTHWHILE NEVERTHELESS TO GAIN SOME FEELING FOR THE POSSIBLE MAGNITUDES INVOLVED, SEVERAL HYPOTHETICAL SCENARIOS HAVE BEEN WORKED OUT AS GUIDELINES. IT HAS BEEN ASSUMED THAT THE FUTURE PATTERN OF DRILLING ACTIVITY IN THE SEDIMENTARY BASIN AND HENCE THE MARKET FOR B.C. BARITE CAN BE EXPRESSED IN TERMS OF SIMPLE GROWTH RATES. ASSUMING FURTHER THAT THE DOMESTIC SUPPLY INDUSTRY REMAINS AT ITS CURRENT LEVEL OF ACTIVITY THE PROJECTED MARKET GROWTH WOULD BE ROUGHLY EQUIVALENT TO THE GROWTH OF THE SUPPLY SHORTFALL. SINCE THE ACTUAL SIZE OF THE

CURRENT SUPPLY GAP IS NOT KNOWN, TWO ALTERNATIVE VALUES FOR THE GAP HAVE BEEN CONSIDERED; 10 000 TONNES AND 30 000 TONNES.

	Initial Gap 1981	Market Growth	Projected Gap 2000
Case 1	10 000 tonnes	5% annually	25 000 tonnes
Case 2	30 000 tonnes	5% annually	76 000 tonnes
Case 3	10 000 tonnes	10% annually	61 000 tonnes
Case 4	30 000 tonnes	10% annually	183 000 tonnes

4. Meeting the Supply Gap

As western Canada's barite requirements continue to grow over time the additional supplies will come from some combination of the following sources:

I. existing B.C. producers

II. the development of new deposits in B.C.

III. the development of new deposits in the Yukon

IV. increased imports

The reserves of Baroid's Silver King mine are reported to be nearly depleted and this operation is therefore not a candidate for expansion. Mountain Minerals have recently completed an expansion of the Parson Mine and probably is in a position to further increase production at relatively low capital costs. This operation must therefore be regarded as a primary supply source to meet any moderate increases in demand over the short term.

Assuming however that the supply gap does grow quite rapidly over the next 10 to 20 years, reaching for example 200 000 tonnes by the turn of the century, then new deposits will have to be brought into production. As reasoned earlier if the growth occurs mostly in the Beaufort Sea area, the Yukon deposits will probably be in a preferential position for development. If on the other hand the growth takes place primarily in the western sedimentary basin and offshore B.C., then development of one or more B.C. deposits can be expected to take place.

UNQUESTIONABLY THE DEVELOPMENT OF AN OPEN PIT MINE IN NORTHERN B.C. WOULD BE VERY EXPENSIVE. CAPITAL COSTS TO SET UP MINING AND MILLING OPERATIONS CAPABLE OF PRODUCING 50 000 TONNES ANNUALLY FROM LOW GRADE ORE WOULD BE AT LEAST $15 MILLION. FOR A CAPACITY OF 100 000 TONNES ANNUALLY THESE COSTS WOULD RISE TO AT LEAST $22 MILLION. THE FIGURES ARE EXCLUSIVE OF INFRASTRUCTURE COSTS WHICH WOULD BE PRIMARILY FOR ROADS TO ACCESS THE DEPOSITS; SUCH COSTS COULD ADD SIGNIFICANTLY TO THE ABOVE CAPITAL REQUIREMENTS.

ESTIMATES OF THE TOTAL COSTS OF OPERATING AN OPEN PIT BARITE MINE AT 50 000 AND 100 000 TONNES/ANNUM CAPACITY RESPECTIVELY ARE PRESENTED BELOW. THE COSTS ARE EXPRESSED IN "PER TONNE" UNITS IN ORDER TO DETERMINE WHETHER BREAK-EVEN CAN BE ACHIEVED AT PREVAILING PRICE LEVELS. TRANSPORTATION COSTS TO THE ALBERTA MARKET HAVE BEEN INCLUDED SO THAT THE TOTAL MAY BE COMPARED WITH F.O.B. PRICES.

	50 000 TONNES/YEAR		100 000 TONNES/YEAR	
	$ MILL	$/TONNE	$ MILL	$/TONNE
CAPITAL COST	25	100*	32	64*
MINE	(10)	(40)	(16)	(32)
MILL	(5)	(20)	(6)	(12)
INFRASTRUCTURE	(10)	(40)	(10)	(20)
OPERATING COST		50		30
TAXES		5		5
TRANSPORTATION		70**		70**
TOTAL COSTS		225.00		170.00

* CAPITAL COSTS WERE AMORTIZED OVER A 10 YEAR MINE LIFE AT A 15% INTEREST RATE.

** TO OBTAIN THE TRANSPORTATION COST FIGURE IT WAS ASSUMED THAT THE PRODUCT WOULD HAVE TO BE SHIPPED ABOUT 700 KM AT 10¢ PER KILOMETER PER TONNE.