ALCAN PIPELINE PROJECT 48 INCH
ALTERNATIVE PROPOSAL

ALCAN PIPELINE PROJECT

48 INCH ALTERNATIVE

PROPOSAL

SUBMITTAL OF

ALCAN PIPELINE COMPANY
AT DOCKET NO. RM77-6

BEFORE THE
UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

PROPOSAL FOR AN ALTERNATIVE
ALASKA NATURAL GAS TRANSPORTATION SYSTEM

March 1977

ALCAN PIPELINE PROJECT

48 INCH ALTERNATIVE PROPOSAL

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UNITED STATES OF AMERICA
BEFORE THE
FEDERAL POWER COMMISSION

In the Matters of	)	
	)	
Order Providing for Suspension of Proceedings and Prescribing Procedures Pursuant to the Provisions of the Alaska Natural Gas Transportation Act of 1976	)	Docket No. RM77-6
	)	
Alcan Pipeline Company	)	

PROPOSAL OF ALCAN PIPELINE COMPANY FOR A 48-INCH EXPRESS LINE ALTERNATIVE FOR AN ALASKA NATURAL GAS TRANSPORTATION SYSTEM

Alcan Pipeline Company ("Alcan"), pursuant to Section 5(b)(1) of the Alaska Natural Gas Transportation Act of 1976 (Public Law 94-586) submits this proposal as an alternative transportation system which Alcan believes that the FPC must consider prior to and as part of the recommendation it will submit to the President by May 1, 1977. If this alternative is found to be in the best interests of the U. S. and acceptable to Canada, the Alcan Pipeline Project participants would accept a certificate to construct and operate this system.

I.
IDENTIFICATION OF PROJECT PARTICIPANTS

Alcan, along with certain Canadian companies, the same participants who proposed the original 42-inch pipeline project, is presenting this 48-inch express line alternative for deliveries of Alaska gas to the U. S.-Canadian border. Alcan is a corporation organized and existing under the laws of the State of Delaware with authorization to conduct business in the states of Alaska and Utah and with its principal place of business located in Salt Lake City, Utah. Alcan is a wholly-owned subsidiary of Northwest Pipeline Corporation ("Northwest Pipeline"),

a Delaware corporation which owns and operates a 4,300-mile system for the transportation of natural gas to the states of Washington, Oregon, Idaho, Nevada, Utah, Wyoming and Colorado. Northwest Pipeline is a wholly-owned subsidiary of Northwest Energy Company, also a Delaware corporation which is a holding company whose principal asset is all of the outstanding common stock of Northwest Pipeline. Alcan is proposed to be the company which would own and operate[1/] the facilities for the transportation of natural gas within the State of Alaska to connect the Prudhoe Bay area of the North Slope of Alaska with an overland pipeline system through Canada for ultimate delivery to western, mid-west and eastern markets in the lower 48 states.

The Canadian sponsors of the Alcan Project are The Alberta Gas Trunk Line Company Limited ("AGTL")[2/], Westcoast Transmission Company Limited ("Westcoast") and Foothills Pipe Lines (Yukon) Ltd. ("Foothills-Yukon").[3/] AGTL and Westcoast are two of the three major natural gas transmission companies in Canada. Together, these companies own and operate approximately 7,500 miles of gathering lines and main transmission pipelines which extend throughout the Provinces of Alberta and British Columbia. Moreover, these companies gather and transport over 90% of the natural gas which is consumed in Canada or exported to the U. S. Foothills-Yukon is jointly owned by AGTL and Westcoast.

AGTL and Westcoast are the only companies in the North American continent who have experience in constructing and operating large diameter natural gas transmission pipeline facilities in Arctic regions with extreme climate and terrain features, including permafrost and muskeg. Further,

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1/ Northwest Pipeline has constructed and operated large diameter transmission lines, gathering systems, process plants, compressor stations and metering facilities in hostile environments in Wyoming, similar in many respects to those in Alaska. For example, winter temperatures to -50°F. every year, high winds and frost penetrating to depths of 8 feet in silty soils.

2/ A subsidiary, The Alberta Gas Trunk Line (Canada) Limited ("AGTL-Canada"), would own those certain facilities in the Province of Alberta.

3/ Foothills-Yukon is the subsidiary of Foothills Pipe Lines Ltd. that would be involved in the Alcan Project to transport Alaskan gas.

AGTL, as an early member of the Arctic Gas consortium, was the operator of test facilities at Prudhoe Bay and Norman Wells and supervised extensive permafrost and frost heave studies. In addition, AGTL as an early member in the consortium, has a proprietary interest in all data and studies developed prior to late 1974 when it withdrew from the consortium.

II.
PURPOSE OF THE 48-INCH EXPRESS LINE ALTERNATIVE

The Alcan project participants[4/] initially proposed a 42-inch pipeline system from Prudhoe Bay to Ft. Nelson in northern British Columbia and a smaller diameter line easterly to Zama Lake, Alberta. The Alaska gas would be transported from such points through the expanded existing systems of Westcoast and AGTL for utilimate delivery at the U. S.-Canadian border near Sumas, Washington to Northwest Pipeline; Kingsgate, British Columbia to Pacific Gas Transmission Company ("PGT"); and Monchy, Saskatchewan to Northern Border Pipeline Company ("Northern Border"). This system provided an optimum system for the initial and ultimate volumes of natural gas which Alcan expects to be received from northern Alaska. Alcan continues to believe that no more than 2.0 Bcf per day will be permitted to be produced from the Prudhoe Bay field by the State of Alaska, and with a maximum average day capacity by the addition of compression facilities of 2.9 Bcf per day that ample expansibility was provided. Further, the incremental addition of facilities to the existing systems of Westcoast and AGTL would most efficiently utilize any spare capacity available in those systems.

Notwithstanding the current uncertainties regarding the deliverability and the value of utilizing existing systems, the NEB, the FPC Staff and others have suggested that a 48-inch express line might be a preferable design for the transportation of Alaskan gas to the lower 48 states. Accordingly, Alcan has prepared an alternative filing for such a design. As described more fully hereafter, the 48-inch express line, while resulting in increased capital costs, provides identifiable advantages in terms of fuel savings, expansibility and lower transportation cost of service. Equally important, these

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4/ Hereinafter collectively referred to as Alcan.

advantages are achieved without loss of the substantial benefits which inhere in the use of the Fairbanks Corridor.

Since there are still uncertainties that need to be resolved before a final system can be designed, the most critical evaluation to be made at this time is the route by which Alaskan gas will be delivered to the lower 48 states. It is the route which will determine the environmental impact of a project. It is the route which in large part will determine the economics of transporting gas to American consumers. It is also the route which will determine the vulnerability of a project to schedule delays, cost overruns and interruptions of service. The pipeline system facilities to be installed on the selected route are of secondary concern since the facilities which are considered appropriate by the U. S. and Canada can be constructed along any overland pipeline route. Alcan submits that the analysis of overland pipeline routes is the primary concern since the LNG system advanced by El Paso should be selected only if Canada would not permit an overland pipeline system through its territories -- an occurrence Alcan does not expect.5/ An overland pipeline system is substantially better than an LNG system on all counts, but most importantly, it is not expected that the President or Congress will want this substantial supply of energy all delivered to the West Coast when much of the gas is needed in the mid-west and east.

III.
DESCRIPTION OF THE 48-INCH EXPRESS LINE ALTERNATIVE

A. General Description

The alternative is to provide a 48-inch high-pressure pipeline through Alaska and Canada to a point of bifurcation near James River, Alberta at which point gas destined for mid-west and eastern markets would be transported through a separate high-pressure 42-inch pipeline to Monchy, Saskatchewan for delivery to Northern Border. The gas destined for western markets would be transported from James River, Alberta through a separate high-pressure 36-inch pipeline for delivery at Kingsgate, British

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5/ The Prime Minister of Canada recently announced that it is in Canada's best interest to provide an overland route for the transportation of Alaska gas to the U. S.

Columbia to PGT. While in transit to the U. S. border the Alaska gas would be kept separate and not commingled with any Canadian gas. The deliveries at Monchy, Saskatchewan and Kingsgate, British Columbia are compatible with the previously proposed systems of Northern Border and PGT. The proposed alternative system would also be compatible with other possible delivery systems, such as the expansion of the Trans-Canada Pipelines system for delivery of mid-west and eastern gas to a location near Emerson, Manitoba on the U. S.-Canadian border or the continuation of a high-pressure pipeline along the PGT system which has previously been studied.

Since no Prudhoe Bay producer contracts have been executed and therefore the volumes to be delivered to each market region are unknown, the assumed volume split has been based upon delivering the same volumes to western region markets as shown in the PGT application[6/] of 659 MMcf per day at Kingsgate, British Columbia. The remaining volume delivered at Monchy, Saskatchewan for mid-west and eastern market regions is 1,569 MMcf per day, resulting in a split of approximately 29% to the west and 71% to the east. The assumption of deliveries of 15% of the Alaskan royalty gas (45 MMcf per day) to the Fairbanks area has been retained. These volumes are based upon an input from Prudhoe Bay of an average daily volume of 2,400 MMcf. The pipelines from James River, Alberta to Monchy, Saskatchewan and Kingsgate, British Columbia are sized to handle any reasonable variation in the delivered volumes, but should be reviewed and any appropriate adjustments made at the time producer contracts are available.

The alternative proposal provides greater expansibility, reduced fuel consumption and eliminates cost allocation problems in Canada, but does result in increased capital costs. The unit transportation cost of service per million Btu however, is less than the initial proposal.

Alcan is including in this submittal Sections showing the location and design of facilities, a gas volume balance, environmental assessment, capital costs, cost of service, financing, a tariff summary and compilation of the agreement among the Alcan Project participants as of March 1, 1977. In addition, Section 11 has been included which shows comparative costs for the initial proposal and the alternative proposal as well as cost comparisons with the Arctic Gas and El Paso systems.

6/ Docket No. CP74-241.

B. Route

1. Alaska

The route of the 48-inch pipeline will be the same in Alaska as the initial proposal whereby it parallels the Alyeska oil pipeline system for approximately 539 miles from Prudhoe Bay to Delta Junction, south of Fairbanks, Alaska. At Delta Junction the proposed alternative pipeline would diverge from the Alyeska oil pipeline system and would then follow the Alaska highway and the Haines products pipeline rights-of-way[7/] for approximately 192 miles in a southeasterly direction to the Alaska-Yukon border. The facilities in Alaska would be owned and operated by Alcan Pipeline Company.

2. Canada

At the Alaska-Yukon border, natural gas would be delivered by Alcan to Foothills which then continues the transportation of the gas in a southeasterly direction for approximately 513 miles along the Alaska Highway to a point on the Yukon-British Columbia border near Watson Lake, Yukon. This portion of the system, to be owned and operated by Foothills, is the same route as initially proposed, but with minor realignments which had previously been agreed upon for environmental reasons.

At the Yukon-British Columbia border the gas would be delivered by Foothills to Westcoast which would transport the gas through the Province of British Columbia southeasterly generally along the Alaska highway to the Alberta border near Boundary Lake for a distance of 438 miles. This location, a more direct route through British Columbia than the original proposal, is quite similar to the route proposed by the FPC Staff for its Fairbanks alternative. This portion of the system would be owned and operated by Westcoast.

At the Alberta-British Columbia border gas would be delivered by Westcoast to AGTL-Canada which then commences paralleling the AGTL system near Gold Creek and utilize AGTL's right-of-way to James River, Alberta, a

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7/ This right-of-way is presently cleared to a width of approximately 50 feet and is closely parallel to the highway. Reference is made to the 8 x 10 photos included in Exhibit Z-2 to Alcan's initial filing in Docket No. CP76-433.

distance of approximately 395 miles. At James River, the system would split with one leg following the AGTL existing system to Empress, Alberta on the Alberta-Saskatchewan border, a distance of approximately 235 miles. The route for the western leg would parallel the AGTL existing system from James River to Coleman, Alberta on the Alberta-British Columbia border, a distance of approximately 176 miles. The facilities in Alberta would be owned and operated by AGTL-Canada.

The route for the delivery of the gas to the mid-west and east would continue southeasterly from Empress, Alberta for 160 miles through Saskatchewan to the Canadian-U. S. border at Monchy, Saskatchewan, where the gas would be delivered to Northern Border. This portion of the system would be owned and operated by Foothills-Yukon. The route for the delivery of gas for the western region would parallel the existing system of Alberta Natural Gas Company from Coleman, Alberta to the Canadian-U. S. border at Kingsgate, British Columbia, a distance of 106 miles, where the gas would be delivered to PGT. The system in southern British Columbia would be owned and operated by Westcoast.

C. Contractual Arrangements

The Definitive Agreement dated July 5, 1976 has been amended three times in order to clarify the intent of the participants and to add flexibility to permit construction of a transportation system for Alaska gas which is in the best interests of the U. S. and is acceptable to Canada. A compilation of Agreement as of March 1, 1977 is included in Section 10.

D. Gas Supply and Assumed Volumes

For the purpose of analyzing the 48-inch alternative, volumes of 1.6 Bcf per day commencing October 1, 1981, increasing to 2.4 Bcf per day on January 1, 1983 and thereafter, have been assumed. The participants have projected an in-service date of October 1, 1981, or 21 months sooner than the projected in-service date of Arctic Gas of July 1, 1983 and two years sooner than El Paso.

Alcan continues to believe that the Prudhoe Bay gas deliveries will build up over a period of time rather than commencing immediately at full volume. The assumed build-up period for the alternative has been reduced to 15 months so that full volume delivery would commence on January 1, 1983, the same date previously assumed in the initial proposal.

Alcan also continues to believe that the State of Alaska will authorize no more than 2.0 Bcf per day for delivery from the present proven reserves at Prudhoe Bay. However, Alcan has developed its system data based upon a volume of 2.4 Bcf per day so that it can conveniently be compared with the initial proposal as well as with Arctic Gas and El Paso.

E. Facilities and System Design

The alternative facilities proposed in Alaska would consist of approximately 731 miles of 48-inch diameter pipeline and eight compressor stations with total installed compression horsepower of 212,000 and installed refrigeration horsepower of 84,470. Three metering stations and related facilities would be required. Peak day capacity of the pipeline, with this initial design is 2,567 MMcf per day, with annual average daily volumes of 2,400 MMcf per day. The optimum peak day capacity of the system, which would be achieved by the installation of intermediate compressor stations, is 3,400 MMcf per day, with annual average daily volumes of 3,200 MMcf per day. A further increase in capacity could be obtained by increasing the horsepower at each station.

Construction of the pipeline system required for initial gas flow will require three years from the date of receipt of final governmental approvals.

The system has been designed for a maximum operation of 1260 psig. Alcan continues to believe that this pressure is a reasonable advance of the present state of the art of pipeline technology and is sufficient to assure availability of materials of proper quality without sacrificing substantial efficiency. The Project participants, however, have previously stated and continue to state that they are prepared to construct and operate the system that appropriate governmental authorities of the U. S. and Canada ultimately agree is appropriate under the circumstances, provided it meets applicable safety codes.

The estimated total capital cost of the proposed facilities to U. S. markets, including facilities required in the lower 48 states, is $6.7 billion in 1975 dollars. As escalated through the year of construction, the total capital cost is $9.6 billion. Further detail is provided in Section 6.

F. Environmental Assessment

Since the proposed route of the alternative is the same as the initial proposal in Alaska, there is no basic change in the environmental impact for the pipeline. There is, however, a reduction in total impact due to the installation of eight compressor stations instead of fifteen. The overall environmental assessment is described in Section 5.

G. Comparison

A brief tabular comparison of the 48-inch alternative with the 42-inch line appears on the chart attached to this Section as Appendix "A".

IV.
ADVANTAGES OF THE 48-INCH ALTERNATIVE

The 48-inch alternative retains the route advantages of the original proposal. In addition, the alternative has the following further advantages:

A. Expansibility

While Alcan continues to believe that the expansibility provided in its initial proposal from the expected initial volume of 2.0 Bcf per day to a maximum of 2.9 Bcf per average day with the addition of compression is adequate, the 48-inch alternative will provide additional expansibility, without looping. An average daily volume of 3.2 Bcf per day can be achieved with reduced unit costs and greater volumes could be provided by additional compression at some sacrifice in unit costs.

B. Fuel Consumption

The percentage of the gas transported which is consumed as fuel for the 48-inch alternative is approximately 6.4% for deliveries to U. S. markets, as compared with the initial proposal of 13.2%. This reduced level of fuel consumption is somewhat less than that for the Arctic Gas project and substantially less than El Paso.

C. Cost of Service

The transportation cost of service per million Btu (including a fuel cost at $1.00 per million Btu) is 17 to 19 cents lower on an unescalated basis and 13 to 17 cents lower on an escalated basis than that shown in the initial 42-inch proposal. This results since the additional unit cost of service due to increased capital costs for the 48-inch alternative, $405 million unescalated and $918 million escalated, is more than offset by the decrease in unit cost of service due to lower fuel consumption.

Cost comparisons have been made with Arctic Gas and El Paso. These comparisons show that the 48-inch alternative can deliver gas to markets in the lower 48 states at a lower unit transportation cost than either Arctic Gas or El Paso. For example, comparing 1984 through 1987, the first four years of full operation for all three projects, the escalated transportation cost for the 48-inch alternative is 19 cents per million Btu less than Arctic Gas and $1.02 per million Btu less than El Paso. Even if the build-up periods are included, which Alcan does not believe presents a fair comparison since it is delivering gas sooner, the average cost for the period 1981 through 1987 on an escalated basis would be approximately the same as Arctic Gas and 83 cents per million Btu less than El Paso. In this instance, the Arctic Gas comparison is based upon the so-called "base case" which assumes volumes from Prudhoe Bay of 2.25 Bcf per day and ultimate volumes from the Mackenzie Delta of 2.25 Bcf per day. If the volumes from Mackenzie Delta only reach approximately 1 Bcf per day as presently anticipated, the Arctic Gas delivered costs would increase approximately 6%. Further, this comparison does not take into account the substantial risk of cost overruns and schedule delays inherent in the Arctic Gas project which are not nearly as severe for the Alcan Project. Previous comparisons show that Arctic Gas transportation costs are subject to a probable additional increase of 35% for this cause alone.

D. Additional Advantages

As with the 42-inch proposal, the 48-inch alternative has the following additional advantages over the Arctic Gas and El Paso proposals:

1. Alcan can begin deliveries at least two years earlier than either of the other two applicants.

2. Arctic Gas' plan for construction in the winter across the North Slope with snow roads and snow pads (with dubious sources for its collection or manufacture)8/ and El Paso's construction of a complex LNG system are more susceptible to cost overruns and delays than the Alcan Project with its capability for virtually year-round construction.

3. The Alcan route with year-round surface access on all weather roads is less subject to operation and maintenance risks.

4. The Alcan route is the most desirable environmentally, avoiding unique wilderness areas like the Arctic National Wildlife Range and the Chugach National Forest, while utilizing existing utility and transportation corridors to the maximum extent feasible.

In addition, this alternative provides the following significant benefits:

1. It produces significant economic benefits to Alaska, including direct deliveries of gas to Fairbanks, Alaska.

2. It does not require financial guarantees by the Canadian government.

3. It avoids the thorny native claims problems in the Mackenzie Valley of Canada.

4. It provides the Canadian government with the flexibility to optimize the timing of development of Mackenzie gas reserves.

V.
CANADIAN REGULATORY STATUS

Westcoast, AGTL and Foothills-Yukon each filed applications with the Canadian National Energy Board as an alternative for the 48-inch express line project on February 28, 1977. These applications will be processed

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8/ A good example of this problem is the winter of 1976-77 when lack of snow would have caused substantial delays.

through the normal hearing procedures before the National Energy Board and subjected to cross-examination by all parties.

VI.
SERVICE

Since there are no specific service obligations under the Alaska Natural Gas Transportation Act of 1976, Alcan proposes to serve this submittal on all of the parties who participated in the FPC proceedings under the Natural Gas Act as well as the FPC and the FPC's delegates who were appointed pursuant to Order No. 558-A dated December 16, 1976. This submittal will also be served on the Council of Environmental Quality because of their specific responsibilities under the new Act.

VII.
CONCLUSION

Alcan submits that the 48-inch express line alternative presented herein is an important alternative which the FPC (and other appropriate governmental agencies) should consider in carrying out its responsibilities under the Alaska Natural Gas Transportation Act of 1976. The 48-inch alternative continues to retain the substantial benefits of the Fairbanks Corridor route which Alcan believes best serves the interests of the U. S. in a manner that is acceptable to Canada. This alternative provides necessary design flexibility that will permit satisfaction of the goals which the U. S. determines are in its best interest once the substantial uncertainties are resolved and the actual facts are available.

Respectfully submitted,

ALCAN PIPELINE COMPANY

By /s/ A. N. Porter
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COMPARISON OF 42-INCH AND 48-INCH PROPOSALS

	42" Proposal	48" Proposal	Increase/ (Decrease) Over 42"
Capital Costs to Lower 48 Markets (Million Dollars)			
1975 Dollar Costs	$6,276.1	$6,681.7	$ 405.6
Escalated Costs	8,712.3	9,630.6	918.3
Average Unit Cost of Service to Lower 48 Markets 1983 - 1987 (Dollars/MMBTU)			
1975 Dollar Costs	$ 1.61	$ 1.43	($0.18)
Escalated Costs	2.20	2.05	(0.15)
Annual Volumes to Lower 48 Markets (Trillion Btu)			
Delivery to West	328.3	274.2	(54.1)
Delivery to East	507.1	640.6	133.5
Total Delivery to Lower 48	835.4	914.8	79.4
Annual Fuel to Lower 48 Markets			
Fuel Volume (Trillion Btu)	129.4	63.4	(66.0)
As a Percent of Receipt Volumes	13.2%	6.4%	(6.8%)
Miles of Pipeline to Lower 48 Markets			
New Lines	3,001	3,871	870
Looping of Existing Systems	1,958	911	(1,047)
Total	4,959	4,782	(177)
Compressor Stations - Alaska			
Number of Compressor Stations	15	8	(7)
Total Horsepower	397,500	212,000	(185,500)
Financing to Lower 48 Markets (Million Dollars)			
Debt	$6,948	$7,173	$225
Equity	1,668	1,997	329
Total	$8,616	$9,170	$554
Canadian Guarantee	No	No	-
Environmental Impact	No significant difference		
Commencement of Delivery	1/1/81	10/1/81	9 Months
Construction Period (Years)	3	3	-
System Capacity (Bcf/d)			
Design	2.576	2.576	-
Expanded	3.1	3.4	0.3

STATE OF UTAH)
: SS.
COUNTY OF SALT LAKE)

A. N. PORTER, being first duly sworn, on oath says:

That he is Vice President for Alcan Pipeline Company; that he has read the foregoing proposal of Alcan Pipeline Company for a 48-inch express line alternative for an Alaska natural gas transportation system and that he is familiar with the contents thereof; that, as such Vice President, he has executed the same for and on behalf of said Corporation with full power and authority to do so; and that the matters set forth therein are true to the best of his information, knowledge and belief.

/S/A. N. PORTER
A. N. PORTER
Vice President

SUBSCRIBED AND SWORN TO before me, the undersigned, this 7th day of March, 1977.

/S/ CHARLENE BALDWIN
CHARLENE BALDWIN
Residing at Salt Lake City, Utah

My Commission Expires:

May 5, 1977

CERTIFICATE OF SERVICE

I, Normal J. Provost, hereby certify that I have this day served the foregoing document upon each party designated on the official service list compiled by the Secretary in the proceeding captioned El Paso Alaska Company, et. al., Docket Nos. CP75-96, et. al., in accordance with the requirements of Section 1.17 or the Commission's Rules of Practice and Procedure. In addition to the service required by Section 1.17 or the Commission's Rules of Practice and Procedure, I have also served the parties listed below:

Federal Power Commission

Delegates appointed to the FPC at this proceeding

Council on Environmental Quality

Dated at Salt Lake City, Utah this 8th day of March, 1977.

/S/ Norman J. Provost
Norman J. Provost

Of Counsel for
Alcan Pipeline Company

SECTION 2

DESCRIPTION OF FACILITIES

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SECTION 2

DESCRIPTION OF FACILITIES

General

The Alcan Pipeline Project - 48" Alternative is a proposal whereby Alaska gas from Prudhoe Bay would be transported via an independent large diameter, high pressure pipeline to the lower United States eastern and western markets.

The pipeline system will receive natural gas from Prudhoe Bay and deliver it to U.S. shippers at two points on the Canada/U.S. border; at Kingsgate and at Monchy. The system was designed on the basis of a 2567 MMCFD peak day volume at Prudhoe Bay, with capacity for expansion to a 3400 MMCFD peak day volume.

Service is expected to commence October 1, 1981, with an average day volume of 1600 MMCFD being received at Prudhoe Bay. After fifteen months of operation, commencing January 1, 1983, this volume will increase to 2400 MMCFD average day receipt. Delivery split of the gas at James River will be 29% west to Kingsgate and 71% east to Monchy. Delivery pressure into the Pacific Gas Transmission system at Kingsgate will be approximately 845 psig. At Monchy, delivery pressure to the proposed Northern Border Pipeline system will be 1440 psig.

Location

The route of the proposed 48 inch Alternative system in Alaska will be identical to that of the proposed 42 inch system as filed with the Federal Power Commission and the National Energy Board. The route generally follows the existing Alyeska Pipeline corridor to Fairbanks and Delta Junction, then veers eastward following the Alaska Highway to the Yukon border. For reference, see the maps in Section 12 of this proposal.

In the Yukon the route remains identical to that of the 42 inch system presently filed before the Federal Power Commission. The pipeline continues to follow the Alaska Highway corridor to the B.C./Yukon border near Watson Lake.

The pipeline first deviates from the 42 inch system routing in British Columbia at approximately mile post 1420 from Prudhoe Bay. At mile post 1420, the pipeline swings southeast in a direct line towards Gold Creek Junction on the Alberta Gas Trunk Line system, crossing the existing Westcoast

system near compressor station N2 south of Fort Nelson, and the Alberta/British Columbia border near Boundary Lake.

From Boundary Lake, the pipeline continues in a southeasterly direction to Gold Creek Junction, then follows the existing Alberta Gas Trunk Line right-of-way to the bifurcation point at James River. From this point, two smaller diameter legs follow existing AGTL rights-of-way; a 36 inch line south to Coleman on the Alberta/B.C. border, and a 42 inch line east to Empress on the Alberta/Saskatchewan border.

In British Columbia, the 36 inch western delivery leg follows the existing Alberta Natural Gas Company Ltd. right-of-way from Coleman to Kingsgate. At Kingsgate, the pipeline interconnects with proposed expanded Pacific Gas Transmission Company facilities for transmission of the gas to western markets. In Saskatchewan, the 42 inch eastern leg continues from Empress to the delivery point near Monchy. Where the system interconnects with the proposed Northern Border Pipeline Company facilities for transmission to mid-western and eastern U.S. markets.

Pipeline

Pipeline facilities to the U.S.-Canadian border consist of a total of 2753.7 miles of pipe, the main trunk from Prudhoe Bay to the bifurcation point at James River being 48 inch O.D., and the two delivery legs to Monchy and Kingsgate being 42 inch O.D. and 36 inch O.D. respectively. The system is comprised of 2077.6 miles of 48 inch pipe, 394.5 miles of 42 inch pipe, and 281.6 miles of 36 inch pipe. The total distance from Prudhoe Bay to Kingsgate is 2360 miles, and from Prudhoe Bay to Monchy 2472 miles.

The total miles of pipeline by geographical area are as follows:

Alaska	731.4
Yukon	512.6
British Columbia	543.9
Alberta	806.9
Saskatchewan	159.8
TOTAL	2753.7 miles

The breakdown of the pipeline system by operating companies is as follows:

Alcan Pipeline Company	731.4
Foothills Pipe Lines (Yukon) Ltd.	672.4
Westcoast Transmission Company Ltd.	543.9
Alberta Gas Trunk Line (Canada) Ltd.	806.0
TOTAL	2753.7 miles

A complete summary of system pipeline requirements is provided in the following Exhibit 2-1.

Exhibit 2-1

ALCAN PIPELINE PROJECT - 48" ALTERNATIVE

PIPELINE REQUIREMENTS

Line No.	Section	Diameter (Inches)	Thickness (Inches)	Specified Minimum Yield Strength (psi)	Maximum Allowable Operating Pressure (psig)	Pipeline Length (Miles)
	(a)	(b)	(c)	(d)	(e)	(f)
1	PRUDHOE BAY TO JAMES RIVER (48")					
2	Alaska:	48	0.600	70,000	1260	731.4
3	Sub Total					731.4
4	Yukon:					
5	Chilled	48	0.600	65,000	1300	40.8
6	Non-Chilled	48	0.540	70,000	1260	471.8
7	Sub Total					512.6
8	B.C.:					
9	Good Terrain	48	0.540	70,000	1260	379.6
10	Muskeg	48	0.600	70,000	1260	34.0
11	Other	48	0.720	70,000	1260	25.1
12	Sub Total					438.7
13	Alberta:	48	0.540	70,000	1260	394.9
14	Sub Total					394.9
15	TOTAL					2077.6
16	JAMES RIVER TO KINGSGATE (36")					
17	Alberta:	36	0.405	70,000	1260	176.4
18	Sub Total					176.4
19	B.C.:	36	0.405	70,000	1260	105.2
20	Sub Total					105.2
21	TOTAL					281.6
22	JAMES RIVER TO MONCHY (42")					
23	Alberta:	42	0.473	70,000	1260	234.7
24	Sub Total					234.7
25	Saskatchewan:	42	0.473	70,000	1260	159.8
26	Sub Total					159.8
27	TOTAL					394.5
28	GRAND TOTAL					2753.7

The northern section of the pipeline which lies in the continuous and dis-continuous permafrost regions will be operated in a chilled state (i.e., below 32°F) to prevent degradation of the ice-rich soil. This section consists of the entire system in Alaska as well as the initial 41 miles of pipeline in the Yukon. Gas chilling will be accomplished by propane refrigeration systems located at all compressor stations in Alaska.

The remainder of the pipeline system will be non-chilled, with gas temperatures allowed to rise through both the Yukon and British Columbia segments. Cooling to prevent temperatures from cascading to unacceptably high levels becomes necessary in Alberta and Saskatchewan, and is accomplished by aerial coolers located at compressor stations in those two provinces.

The entire pipeline system is designed to operate at a maximum allowable pressure of 1260 psig.

Compressor Stations

The overall pipeline system configuration requires thirty (30) compressor stations in the final build-up year, with twenty-five (25) of these being located along the 48 inch main trunk line, and five (5) on the two delivery legs. A total of 975,000 HP(ISO) of mainline gas compression, and 85,000 HP(ISO) of propane chilling compression are to be installed. Of the thirty stations, eight are to be located in Alaska, seven in the Yukon, five in British Columbia, eight in Alberta, and two in Saskatchewan.

All compressor stations in Alaska are single unit 26,500 HP(ISO) stations, each equipped with propane chilling facilities. In the Yukon, the stations are comprised of single 29,000 HP(ISO) units, while in British Columbia, twin 24,000 HP(ISO) unit stations are proposed. In Alberta, all stations with the exception of one on the western delivery leg are single unit 32,700 HP(ISO), aerial-cooled stations. The exception is a single unit 4000 HP(ISO) station located at the James River junction. In Saskatchewan, the first station is a single unit 29,000 HP(ISO) station, and the second is a twin 29,000 HP(ISO) unit station. Both require aerial cooling.

A complete summary of the system compressor station requirements on a per segment basis is provided in the following Exhibit 2-2.

ALCAN PIPELINE PROJECT - 48" ALTERNATIVE

COMPRESSION SUMMARY

Line No.	Area & Company (a)	Phased Compression Additions (ISO H.P.) 1,600 MMCFD October, 1981 Gas Compression (b)	Refrig. (c)	2,400 MMCFD January, 1983 Gas Compression (d)	Refrig. (e)
1	Alaska	132,500	84,470	79,500	-0-
2	(Alcan Pipeline Co.)				
3	Yukon	87,000	-0-	116,000	-0-
4	(Foothills Pipelines)				
5	Northern British				
6	Columbia	144,000	-0-	96,000	-0-
7	(Westcoast Trans-				
8	mission Co.)				
9	Alberta	130,800	-0-	102,100	-0-
10	(AGTL-Canada)				
11	Saskatchewan	58,000	-0-	29,000	-0-
12	(Foothills Pipelines)				
	TOTAL ADDITIONS	552,300	84,470	422,600	-0-
13		Cumulative Compression (ISO H.P.)			
14	TOTAL ALASKA & CANADA	552,300	84,470	974,900	84,470

Exhibit 2-2

Meter Stations

Metering facilities for the measurement of flow and gas quality are required at the Prudhoe Bay receipt point, at the Fairbanks, Monchy, and Kingsgate delivery points, and at all interconnecting system transfer points. Thus a total of nine (9) metering stations will be installed on the overall system.

Metering facilities at Prudhoe Bay, Fairbanks, and the Alaska/Yukon border will be owned and operated by Alcan Pipeline Company. The meter station at the Yukon/British Columbia border will be owned and operated by Westcoast Transmission Company Limited, as will the metering station at the Kingsgate delivery point. In Alberta, Alberta Gas Trunk Line (Canada) Limited will own and operate metering facilities at the British Columbia transfer points at Boundary Lake and Coleman, as well as those facilities at the Saskatchewan border transfer point at Empress. Foothills Pipe Lines (Yukon) Ltd. will own and operate the Monchy delivery metering station.

System Expansibility

One of the advantages of this 48 inch system as compared to the previously filed 42 inch system is its inherent capacity for expansion. The 48 inch system is optimum at a volume in excess of 3000 MMCFD, and when designed for a volume of 2400 MMCFD can easily be expanded by the addition of mainline gas compression.

The 48 inch Alternative system proposed by the participating companies is based on an average day receipt volume of 2400 MMCFD from Prudhoe Bay. Considering the 48 inch main trunk line from Prudhoe Bay to the James River bifurcation point, a total of twenty-five (25) compressor stations are proposed for an average spacing of 81 miles. Similarly, the average spacing on the 42 inch delivery leg to Monchy is 99 miles. The system could be readily expanded to deliver additional volumes should they develop by simply adding intermediate compressor stations. The participating companies have performed such a study for illustrative purposes to determine the additional capacity which could be achieved. Although, it is realized that virtually any volume could be transported by the addition of adequate facilities, it was determined that a volume step-up to 3400 MMCFD peak day receipt from Prudhoe Bay was a logical increase since it could be accommodated by the addition of intermediate stations at a relatively modest capital cost increase.

The following Exhibit 2-3 provides a summary of the gas compression requirements at the increased system peak day capability of 3400 MMCFD. Considering the 48 inch main trunk only, the total number of stations required increases from 25 to 50, and total compression horsepower from 818,500 (ISO) to 1,797,900 (ISO). On the Monchy delivery leg, the number of stations increases from 4 to 8, and the installed compression horsepower from 152,400 (ISO) to 288,500 (ISO). The detail of this expanded system is fully illustrated in Section 3, Flow Diagrams.

ALCAN PIPELINE PROJECT - 48" ALTERNATIVE

COMPRESSION REQUIREMENTS FOR EXPANSION

TO PEAK DAY CAPACITY OF 3400 MMCFD

Line No.	DESCRIPTION (a)	3400 MMCFD (b)
1	48" Main Trunk	
2	Total Length (Miles)	2,077.6
3	No. of Stations	50
4	Total Gas Compression HP(ISO)	1,797,900
5	Total Refrigeration HP[1/]	210,430
6	42" Monchy Leg	
7	Total Length	394.5
8	No. of Stations	8
9	Total Gas Compression HP(ISO)	288,500
10	36" Kingsgate Leg	
11	Total Length	281.6
12	No. of Stations	2
13	Total Gas Compression HP(ISO)	18,000
14	Total System	
15	Total Length	2,753.7
16	No. of Stations	60
17	Total Gas Compression HP(ISO)	2,104,400
18	Total Refrigeration HP[1/]	210,430

1/ Refrigeration facilities requirements are all in the Alaska Section.

SECTION 3

FLOW DIAGRAMS

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Pipe Description - Alaska	4

SECTION 3

FLOW DIAGRAMS

General

Four (4) sets of flow diagrams illustrate the design and operation of the total gas transmission system from Prudhoe Bay, Alaska to points of interconnection with the Pacific Gas Transmission and Northern Border pipeline systems at the U.S.-Canadian border. These diagrams are organized as follows:

SET	DESCRIPTION	SECTION	FIGURE
1	Average Daily Capacity Summer 1983 & thereafter 2,400 MMCF/D Prudhoe Bay Supply	Alaska & Yukon	1A
		B.C., Alberta & Saskatchewan	1B
2	Average Daily Capacity Winter 1983 & thereafter 2,400 MMCF/D Prudhoe Bay Supply	Alaska & Yukon	2A
		B.C., Alberta & Saskatchewan	2B
3	Peak Daily Capacity Summer 1983 & thereafter 2,567 MMCF/D Prudhoe Bay Supply	Alaska & Yukon	3A
		B.C., Alberta & Saskatchewan	3B
4	Peak Daily Capacity Summer Conditions- Expansion Case 3,400 MMCF/D Prudhoe Bay Supply	Alaska	4A
		Yukon	4B
		B.C., Alberta to James River	4C
		James River to U.S.Border	4D

System Planning Summary

The principal design point for this alternative 48-inch Alcan pipeline system is the anticipated receipt of 2,400 MMCF average daily Prudhoe Bay gas supply on January 1, 1983 and thereafter. This anticipated receipt is identical both in quantity and timing to Alcan's original 42-inch system proposal. The transmission facilities proposed for this design point will accommodate up to 2,567 MMCF/D peak Prudhoe Bay gas production (93.5% supply load factor). All facilities are designed to operate at 1260 psig maximum allowable operating pressure (MAOP). Summer, winter, and peak day system plans are given in flow diagram sections 1, 2, and 3, respectively.

Set 4 of the flow diagrams illustrates the flexibility of the 48-inch system to transport 3,400 MMCF/D Prudhoe Bay supply at 1260 psig MAOP by additional gas compression. This expansion plan makes full use of all facilities proposed for the 2,400 MMCF/D design point, and employs additional compressor facilities of similar power and type throughout the system.

The 48-inch system is also planned to accommodate an initial 1,600 MMCF average day Prudhoe Bay supply during the period October 1, 1981 to December 31, 1982, in conformance with Alcan's original 42-inch system supply schedule and current construction plans for the 48-inch alternative. The compressor stations planned for this initial supply are selected to be compatible with the 2,400 MMCF/D design point stations, thereby providing a two-phase station construction program.

In addition to the flexibility planned for the 48-inch Alcan Pipeline system to accept a wide range of Prudhoe Bay supply, the delivery capabilities of this system are designed to be compatible with the proposals of Pacific Gas Transmission Company and Northern Border Pipeline Company for transporting Alaska gas.

Basic Design Formulas, Conditions and Assumptions

The descriptions provided in the 42-inch Alcan Application to the Federal Power Commission are directly applicable to this alternative, with the following adjustment to the Prudhoe Bay gas composition.

Component	Mol Percent
Nitrogen	0.597
Carbon Dioxide	1.002
Methane	85.342
Ethane	8.087
Propane	4.353
i-Butane	0.213
n-Butane	0.331
i-Pentane	0.034
n-Pentane	0.031
Hexane	0.008
Heptane +	0.002
	100.000

Higher Heating Value (14.73 psia, 60°F, Dry Ideal) = 1137.8 BTU/cu. ft.

Lower Heating Value (14.73 psia, 60°F, Dry Ideal) = 1029.0 BTU/cu. ft.

Hydrocarbon Dew Point @1000 psig = -10°F

This revised composition was introduced into the FPC Hearing record on November 11, 1976, and is based on the assumption that the raw gas would be chilled to -15°F at a pressure in the range of 500-600 psia, and the separated (condensed) methane, ethane, and propane would be returned to the main pipeline gas stream.

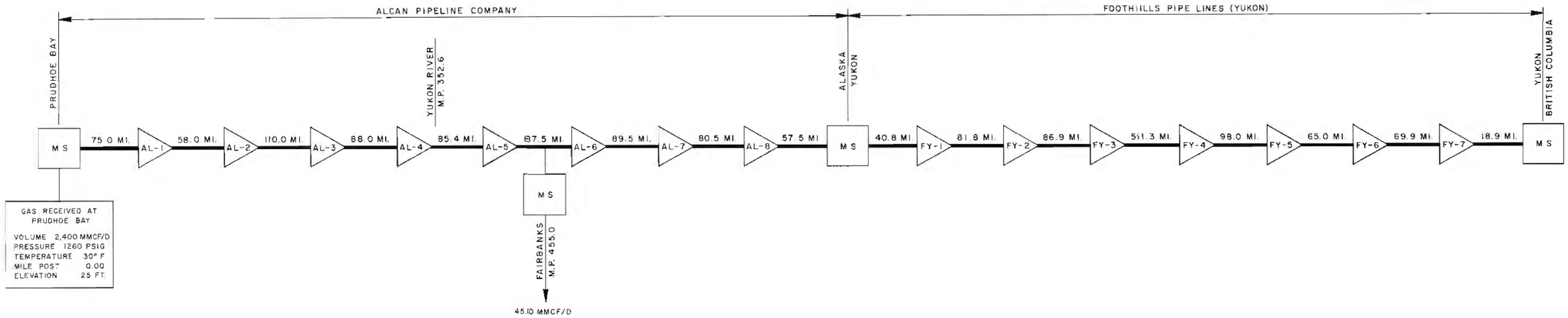
Pipe Description - Alaska

The Alaska pipeline will generally consist of 731.4 miles of 48-inch outside diameter, 0.600 inch wall thickness pipe. Maximum allowable operating pressure will be 1260 psig, at 72% of 70,000 psi specified minimum yield strength.

All of the pipe will be manufactured by the submerged arc method (or equivalent), factory inspected and tested for compliance with the latest API Std 5LX specification for High-Test Line Pipe. The proposed facilities have been designed and will be installed, inspected, tested, operated, maintained and when necessary replaced in accordance with the Department of Transportation Safety Standards.

SYSTEM FLOW DIAGRAMS

SET	DESCRIPTION	SECTION	FIGURE
1	Average Daily Capacity Summer 1983 & thereafter 2,400 MMCF/D Prudhoe Bay Supply	Alaska & Yukon B.C., Alberta & Saskatchewan	1A 1B
2	Average Daily Capacity Winter 1983 & thereafter 2,400 MMCF/D Prudhoe Bay Supply	Alaska & Yukon B.C., Alberta & Saskatchewan	2A 2B
3	Peak Daily Capacity Summer 1983 & thereafter 2,567 MMCF/D Prudhoe Bay Supply	Alaska & Yukon B. C., Alberta & Saskatchewan	3A 3B
4	Peak Daily Capacity Summer Conditions- Expansion Case 3,400 MMCF/D Prudhoe Bay Supply	Alaska Yukon B.C., Alberta to James River James River to U.S. Border	4A 4B 4C 4D



ALCAN PIPELINE COMPANY								
STATION DESIGNATION	AL-1	AL-2	AL-3	AL-4	AL-5	AL-6	AL-7	AL-8
MILEPOST (MILES)	75.0	133.0	243.0	331.0	416.4	503.9	593.9	673.9
ELEVATION (FEET)	800	2,824	1,031	580	560	1,075	1,380	1,900
STATION INLET VOLUME (MMCF/D)	2,400.0	2,395.3	2,390.4	2,384.1	2,378.2	2,326.7	2,320.3	2,314.2
TOTAL FUEL (MMCF/D)	1.39	4.85	6.34	5.93	6.52	6.04	6.15	5.53
NET VOLUME TO PIPELINE (MMCF/D)	2,398.3	2,390.4	2,384.1	2,378.2	2,371.7	2,320.3	2,314.2	2,308.7
STATION SUCTION PRESSURE (PSIG)	1,044	1,034	1,055	1,056	1,043	1,026	1,038	1,052
STATION SUCTION TEMPERATURE (°F)	13	13	27	24	25	21	23	22
STATION DISCHARGE PRESSURE (PSIG)	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259
STATION DISCHARGE TEMPERATURE (°F)	25	25	25	25	25	23	25	25
COMPRESSION RATIO	1.21	1.22	1.20	1.20	1.21	1.23	1.22	1.20
HORSEPOWER REQUIRED	17,500	18,242	17,338	17,171	18,496	19,345	18,311	16,825
HORSEPOWER SPARE	7,513	4,986	7,268	8,072	6,738	5,421	6,181	7,205
TOTAL HORSEPOWER-SITE RATED	25,013	23,229	24,805	25,243	25,234	24,766	24,492	24,031
NO. OF UNITS/ISO HORSEPOWER	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500
HP INSTALLED/HP PROPOSED (ISO)	26500/0	26500/0	0/26500	26500/0	0/26500	26500/0	0/26500	26500/0
COMPRESSOR SUCTION PRESSURE (PSIG)	1,039	1,029	1,050	1,051	1,038	1,021	1,033	1,047
COMPRESSOR SUCTION TEMPERATURE (°F)	13	13	27	24	25	21	23	22
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,265	1,265	1,265	1,265	1,265	1,265	1,265	1,265
COMPRESSOR DISCHARGE TEMPERATURE (°F)	40	39	52	49	52	49	50	47
COOLING LOAD (TONS)	5,397	5,137	9,457	8,409	9,343	8,429	8,446	7,466
REFRIGERATION HORSEPOWER REQUIRED	5,006	5,189	11,031	9,809	11,055	9,631	9,882	8,586
HP INSTALLED/HP PROPOSED (ISO)	7660/0	7660/0	13830/0	13830/0	13830/0	13830/0	13830/0	13830/0

FOOTHILLS PIPE LINES (YUKON)						
FY-1	FY-2	FY-3	FY-4	FY-5	FY-6	FY-7
772.2	854.0	940.9	992.2	1,090.2	1,155.2	1,225.1
2,300	2,800	2,300	4,500	2,400	2,900	2,700
2,308.7	2,304.6	2,300.6	2,296.7	2,292.7	2,289.1	2,285.2
4.13	4.01	3.91	3.99	3.58	3.84	3.72
2,304.6	2,300.6	2,297.6	2,292.7	2,289.1	2,285.2	2,281.5
1,013	1,032	1,046	1,046	1,070	1,060	1,067
21	35	46	51	59	61	65
1,260	1,260	1,260	1,260	1,260	1,260	1,260
49	61	71	77	82	86	89
1.25	1.22	1.21	1.21	1.18	1.19	1.18
19,769	19,173	18,689	19,086	17,140	18,382	17,818
6,631	7,327	8,111	5,314	9,260	7,618	7,982
26,400	26,500	26,800	24,400	26,400	26,000	25,800
1/29000	1/29000	1/29000	1/29000	1/29000	1/29000	1/29000
0/29000	29000/0	0/29000	29000/0	0/29000	29000/0	0/29000
1,013	1,032	1,046	1,046	1,070	1,060	1,067
21	35	46	51	59	61	65
1,265	1,265	1,265	1,265	1,265	1,265	1,265
49	61	71	77	82	86	89
-0-	-0-	-0-	-0-	-0-	-0-	-0-
-0-	-0-	-0-	-0-	-0-	-0-	-0-
N/A	N/A	N/A	N/A	N/A	N/A	N/A

LEGEND

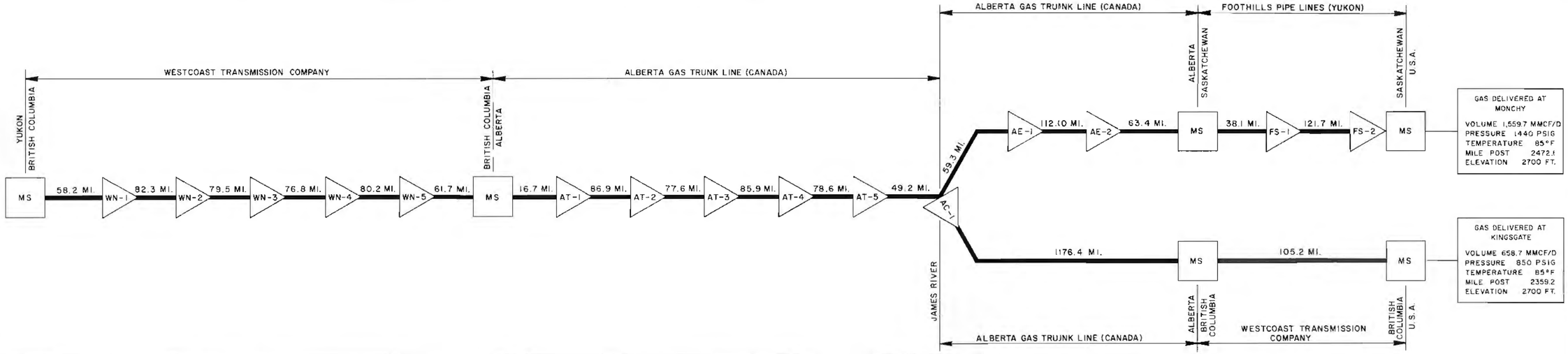
- PIPELINE
- COMPRESSOR STATION
- METER STATION

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT (48"ALTERNATIVE)

FLOW DIAGRAMS
ALASKA & YUKON SECTIONS
AVERAGE DAILY CAPACITY
SUMMER 1983 AND THEREAFTER
2400 MMCF/D SUPPLY AT PRUDHOE BAY

DATE PREPARED MARCH 1977 | FIGURE 1A



WESTCOAST TRANSMISSION COMPANY					
STATION DESIGNATION	WN-1	WN-2	WN-3	WN-4	WN-5
MILEPOST (MILES)	1,302.2	1,384.5	1,464.0	1,540.8	1,621.0
ELEVATION (FEET)	2,250	1,587	2,400	2,600	2,450
STATION INLET VOLUME (MMCF/D)	2,281.5	2,276.7	2,271.5	2,265.9	2,260.6
TOTAL FUEL (MMCF/D)	4.85	5.12	5.62	5.27	5.18
NET VOLUME TO PIPELINE (MMCF/D)	2,276.7	2,271.5	2,265.9	2,260.6	2,255.4
STATION SUCTION PRESSURE (PSIG)	1,039	1,025	1,001	1,018	1,021
STATION SUCTION TEMPERATURE (°F)	65	64	64	66	65
STATION DISCHARGE PRESSURE (PSIG)	1,260	1,260	1,260	1,260	1,260
STATION DISCHARGE TEMPERATURE (°F)	92	92	96	96	94
COMPRESSION RATIO	1.22	1.23	1.26	1.24	1.24
HORSEPOWER REQUIRED	21,773	23,271	25,968	24,095	23,608
HORSEPOWER SPARE	26,165	25,329	21,696	23,203	23,964
TOTAL HORSEPOWER-SITE RATED	47,938	48,600	47,664	47,298	47,572
NO. OF UNITS/ISO HORSEPOWER	2/24000	2/24000	2/24000	2/24000	2/24000
HP INSTALLED/HP PROPOSED (ISO)	48000/0	0/48000	48000/0	0/48000	48000/0
COMPRESSOR SUCTION PRESSURE (PSIG)	1,033	1,020	997	1,014	1,017
COMPRESSOR SUCTION TEMPERATURE (°F)	65	64	64	66	65
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,262	1,262	1,262	1,262	1,262
COMPRESSOR DISCHARGE TEMPERATURE (°F)	92	92	96	96	94
COOLING LOAD (TONS)	N/A	N/A	N/A	N/A	N/A
REFRIGERATION HORSEPOWER REQUIRED	-0-	-0-	-0-	-0-	-0-
HP INSTALLED/HP PROPOSED (ISO)	N/A	N/A	N/A	N/A	N/A

ALBERTA GAS TRUNK LINE (CANADA)							
AT-1	AT-2	AT-3	AT-4	AT-5	AC-1	AE-1	AE-2
1,699.4	1,786.3	1,863.9	1,949.8	2,028.4	2,077.6	2,136.9	2,248.9
2,089	2,000	2,833	2,989	3,532	3,852	3,109	2,474
2,255.4	2,251.5	2,247.7	2,243.9	2,240.1	659.0	1,577.2	1,573.6
3.90	3.80	3.81	3.85	3.85	0.32	3.63	3.57
2,251.6	2,247.7	2,243.9	2,240.0	2,236.2	658.7	1,573.6	1,570.0
1,036	1,025	1,024	1,022	1,033	1,123	980	983
65	61	59	60	60	68	59	59
1,259	1,259	1,259	1,259	1,259	1,154	1,259	1,259
80	80	80	80	80	73	80	80
1.23	1.24	1.24	1.24	1.23	1.03	1.30	1.29
21,667	22,380	22,409	22,645	21,375	1,019	19,123	18,794
7,777	7,161	6,203	5,839	6,498	2,331	8,803	8,780
29,444	29,541	28,612	28,474	27,873	3,350	26,926	27,574
1/32700	1/32700	1/32700	1/32700	1/32700	1/4000	1/32700	1/32700
32700/0	0/32700	32700/0	0/32700	32700/0	0/4000	32700/0	0/32700
1,032	1,021	1,020	1,018	1,029	1,119	976	979
65	61	59	60	60	68	59	59
1,268	1,268	1,268	1,268	1,268	1,158	1,268	1,268
N/A	N/A	N/A	N/A	N/A	73	N/A	N/A
3,999	3,113	2,777	3,109	2,633	-0-	3,107	2,906
-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

FOOTHILLS PIPE LINES (YUKON)	
FS-1	FS-2
2,350.4	2,472.1
2,400	2,700
1,570.0	1,566.7
3.36	7.01
1,566.7	1,599.7
995	900
62	63
1,260	1,440
85	85
1.27	1.23/1.33
17,659	37,472
7,541	12,528
25,200	50,000
1/29000	2/29000
0/29000	58000/0
995	900/1092
62	63
1,269	1106/1454
96	92/126
2,067	9,308
-0-	-0-
N/A	N/A

LEGEND

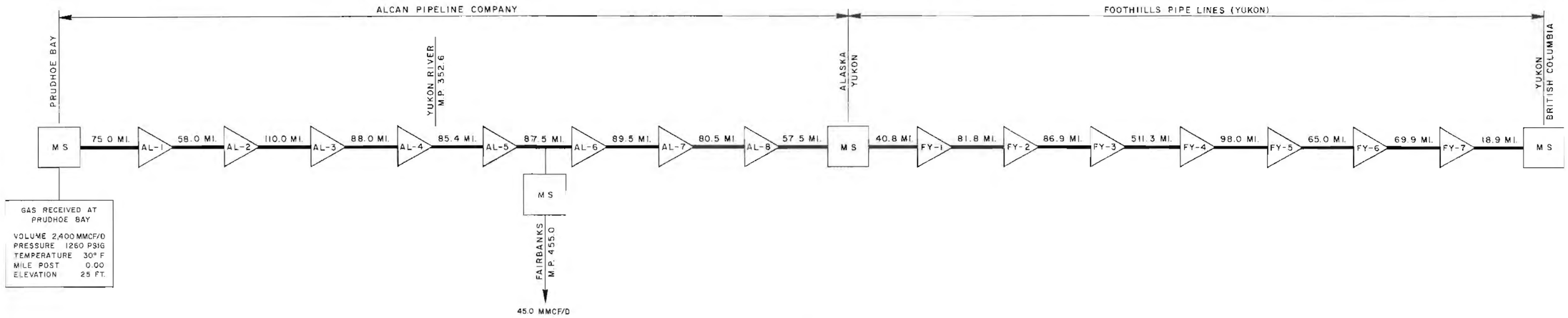
- PIPELINE
- COMPRESSOR STATION
- METER STATION

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT (48"ALTERNATIVE)

FLOW DIAGRAMS
B.C., ALBERTA, & SASKATCHEWAN SECTIONS
AVERAGE DAILY CAPACITY
SUMMER 1983 AND THEREAFTER
2400 MMCF/D SUPPLY AT PRUDHOE BAY

DATE PREPARED MARCH 1977 | FIGURE 1B



	ALCAN PIPELINE COMPANY							
STATION DESIGNATION	AL-1	AL-2	AL-3	AL-4	AL-5	AL-6	AL-7	AL-8
MILEPOST (MILES)	75.0	133.0	243.0	331.0	416.4	503.9	593.9	673.9
ELEVATION (FEET)	800	2,824	1,031	550	560	1,075	1,380	1,900
STATION INLET VOLUME (MMCF/D)	2,400.0	2,396.8	2,393.5	2,389.9	2,386.0	2,336.7	2,332.2	2,327.9
TOTAL FUEL (MMCF/D)	3.11	3.32	3.58	3.95	4.29	4.49	4.34	4.04
NET VOLUME TO PIPELINE (MMCF/D)	2,396.8	2,393.5	2,389.9	2,386.0	2,381.7	2,332.2	2,327.9	2,323.9
STATION SUCTION PRESSURE (PSIG)	1,046	1,034	1,062	1,057	1,043	1,025	1,035	1,049
STATION SUCTION TEMPERATURE (°F)	7	7	16	19	19	17	19	19
STATION DISCHARGE PRESSURE (PSIG)	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259
STATION DISCHARGE TEMPERATURE (°F)	31	33	30	30	30	30	30	30
COMPRESSION RATIO	1.213	1.227	1.195	1.201	1.216	1.238	1.225	1.209
HORSEPOWER REQUIRED	16,610	17,752	16,008	16,713	17,947	19,137	18,261	16,997
HORSEPOWER SPARE	8,405	5,477	8,797	8,530	7,287	5,429	6,321	7,034
TOTAL HORSEPOWER-SITE RATED	25,015	23,229	24,805	25,243	25,234	24,566	24,492	24,031
NO. OF UNITS ISO HORSEPOWER	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500
HP INSTALLED/HP PROPOSED (ISO)	26500/0	26500/0	0/26500	26500/0	0/26500	26500/0	0/26500	26500/0
COMPRESSOR SUCTION PRESSURE (PSIG)	1,041	1,029	1,057	1,052	1,038	1,020	1,030	1,044
COMPRESSOR SUCTION TEMPERATURE (°F)	7	7	16	19	19	17	19	19
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,265	1,265	1,265	1,265	1,265	1,265	1,265	1,265
COMPRESSOR DISCHARGE TEMPERATURE (°F)	33	33	40	43	45	43	46	44
COOLING LOAD (TONS)	-0-	-0-	3,403	4,713	5,313	5,231	5,307	4,956
REFRIGERATION HORSEPOWER REQUIRED	-0-	-0-	2,143	2,968	3,346	3,294	3,342	3,121
HP INSTALLED/HP PROPOSED (ISO)	7660/0	7660/0	13830/0	13830/0	13830/0	13830/0	13830/0	13830/0

	FOOTHILLS PIPE LINES (YUKON)						
STATION DESIGNATION	FY-1	FY-2	FY-3	FY-4	FY-5	FY-6	FY-7
MILEPOST (MILES)	772.2	854.0	940.9	992.2	1,090.2	1,155.2	1,225.1
ELEVATION (FEET)	2,300	2,900	2,350	4,500	2,400	2,900	2,700
STATION INLET VOLUME (MMCF/D)	2,323.9	2,318.0	2,313.7	2,309.8	2,305.8	2,302.5	2,298.9
TOTAL FUEL (MMCF/D)	5.95	4.25	3.91	3.97	3.29	3.60	3.36
NET VOLUME TO PIPELINE (MMCF/D)	2,318.0	2,313.7	2,309.8	2,305.8	2,302.5	2,298.9	2,295.6
STATION SUCTION PRESSURE (PSIG)	1,010	1,025	1,046	1,046	1,081	1,066	1,077
STATION SUCTION TEMPERATURE (°F)	15	34	41	44	48	48	49
STATION DISCHARGE PRESSURE (PSIG)	1,260	1,260	1,260	1,260	1,260	1,260	1,260
STATION DISCHARGE TEMPERATURE (°F)	60	62	66	69	70	71	71
COMPRESSION RATIO	1.25	1.23	1.21	1.21	1.17	1.18	1.17
HORSEPOWER REQUIRED	19,663	19,974	18,379	18,615	15,445	16,881	15,869
HORSEPOWER SPARE	12,037	11,126	13,621	10,685	16,155	14,139	15,531
TOTAL HORSEPOWER-SITE RATED	31,700	31,100	32,000	29,300	31,600	31,200	31,400
NO. OF UNITS ISO HORSEPOWER	1/29000	1/29000	1/29000	1/29000	1/29000	1/29000	1/29000
HP INSTALLED/HP PROPOSED (ISO)	0/29000	29000/0	0/29000	29000/0	0/29000	29000/0	0/29000
COMPRESSOR SUCTION PRESSURE (PSIG)	1,010	1,025	1,046	1,046	1,081	1,066	1,077
COMPRESSOR SUCTION TEMPERATURE (°F)	15	34	41	44	48	48	49
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,265	1,265	1,265	1,265	1,265	1,265	1,265
COMPRESSOR DISCHARGE TEMPERATURE (°F)	60	62	66	69	70	71	71
COOLING LOAD (TONS)	-0-	-0-	-0-	-0-	-0-	-0-	-0-
REFRIGERATION HORSEPOWER REQUIRED	-0-	-0-	-0-	-0-	-0-	-0-	-0-
HP INSTALLED/HP PROPOSED (ISO)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LEGEND

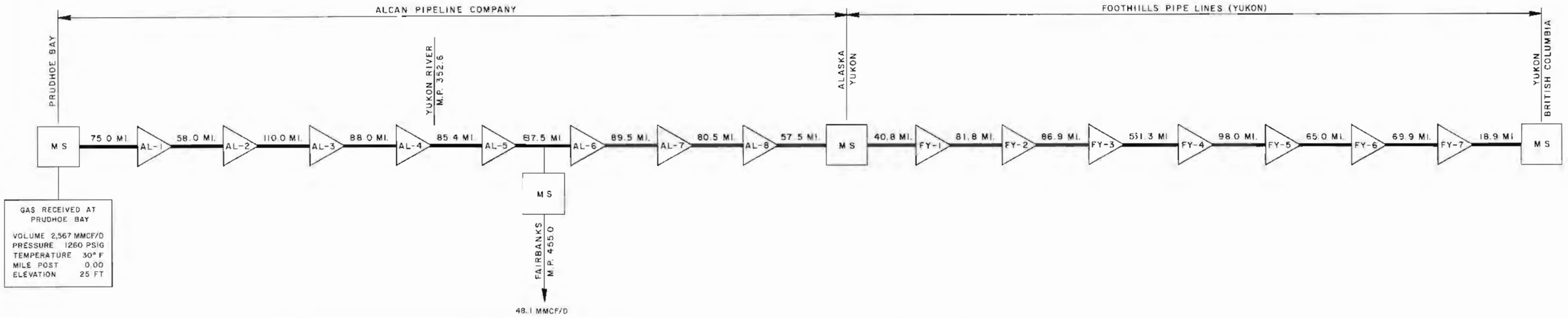
PIPELINE
COMPRESSOR STATION
METER STATION

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT (48"ALTERNATIVE)

FLOW DIAGRAMS
ALASKA & YUKON SECTIONS
AVERAGE DAILY CAPACITY
WINTER 1983 AND THEREAFTER
2400 MMCF/D SUPPLY AT PRUDHOE BAY

DATE PREPARED MARCH 1977 | FIGURE 2A



	ALCAN PIPELINE COMPANY							
STATION DESIGNATION	AL-1	AL-2	AL-3	AL-4	AL-5	AL-6	AL-7	AL-8
MILEPOST (MILES)	75.0	133.0	243.0	331.01	416.4	503.9	593.9	673.9
ELEVATION (FEET)	800	2824	1031	550	560	1,075	1,380	1,900
STATION INLET VOLUME (MMCF/D)	2,567.0	2,560.8	2,555.1	2,547.12	2,539.92	2,484.0	2,476.4	2,469.1
TOTAL FUEL (MMCF/D)	6.20	5.66	8.02	7.20	7.79	7.55	7.35	6.55
NET VOLUME TO PIPELINE (MMCF/D)	2,560.8	2,555.1	2,547.1	2,539.92	2,532.13	2,476.4	2,469.1	2,462.6
STATION SUCTION PRESSURE (PSIG)	1011	1014	1009	1,021	1,009	992	1,006	1,024
STATION SUCTION TEMPERATURE (°F)	16	11	24	22	23	19	21	20
STATION DISCHARGE PRESSURE (PSIG)	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259
STATION DISCHARGE TEMPERATURE (°F)	25	25	25	25	25	25	25	25
COMPRESSION RATIO	1.254	1.251	1.257	1.242	1.256	1.276	1.261	1.238
HORSEPOWER REQUIRED	22,290	21,448	23,429	21,751	23,051	23,791	22,617	20,540
HORSEPOWER SPARE	2,724	1,781	1,377	3,492	2,182	974	1,875	2,491
TOTAL HORSEPOWER-SITE RATED	25,015	23,229	24,805	25,243	25,234	24,766	24,492	24,031
NO. OF UNITS/ISO HORSEPOWER	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500
HP INSTALLED/HP PROPOSED (ISO)	26500/0	26500/0	0/26500	26500/0	0/26500	26500/0	0/26500	26500/0
COMPRESSOR SUCTION PRESSURE (PSIG)	1,006	1,009	1,004	1,016	1,004	988	1,001	1,019
COMPRESSOR SUCTION TEMPERATURE (°F)	16.3	11.7	24.8	22.2	23.3	19.2	21.0	20.3
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,265	1,265	1,265	1,265	1,265	1,265	1,265	1,265
COMPRESSOR DISCHARGE TEMPERATURE (°F)	46	40	55	51	53	51	51	48
COOLING LOAD (TONS)	7,908	5,907	11,273	9,679	10,624	9,599	9,650	8,505
REFRIGERATION HORSEPOWER REQUIRED	7,335	5,943	13,149	11,290	12,571	11,196	11,256	9,781
HP INSTALLED/HP PROPOSED (ISO)	7660/0	7660/0	13830/0	13830/0	13830/0	13830/0	13830/0	13830/0

	FOOTHILLS PIPE LINES (YUKON)						
FY-1	FY-2	FY-3	FY-4	FY-5	FY-6	FY-7
772.2	854.0	940.9	992.2	1,090.2	1,155.2	1,225.1
2,300	2,800	2,300	4,500	2,400	2,900	2,700
2,462.6	2,457.8	2,453.2	2,448.4	2,443.9	2,439.2	2,434.5
4.78	4.67	4.76	4.48	4.76	4.65	4.65
2,457.8	2,453.2	2,448.4	2,443.9	2,439.2	2,434.5	2,429.9
977	999	1,006	1,026	1,018	1,026	1,028
18	34	47	56	63	68	72
1,260	1,260	1,260	1,260	1,260	1,260	1,260
52	66	78	85	93	98	101
1.29	1.26	1.25	1.23	1.24	1.23	1.23
24,658	24,050	24,551	23,095	24,513	23,988	23,961
1,742	2,450	2,249	1,305	1,887	2,012	1,839
26,400	26,500	26,800	24,400	26,400	26,000	25,800
1/29000	1/29000	1/29000	1/29000	1/29000	1/29000	1/29000
0/29000	29000/0	0/29000	29000/0	0/29000	29000/0	0/29000
977	999	1,006	1,026	1,018	1,026	1,028
18	34	47	56	63	68	72
1,265	1,265	1,265	1,265	1,265	1,265	1,265
52	66	78	85	93	98	101
-0-	-0-	-0-	-0-	-0-	-0-	-0-
-0-	-0-	-0-	-0-	-0-	-0-	-0-
N/A	N/A	N/A	N/A	N/A	N/A	N/A

LEGEND

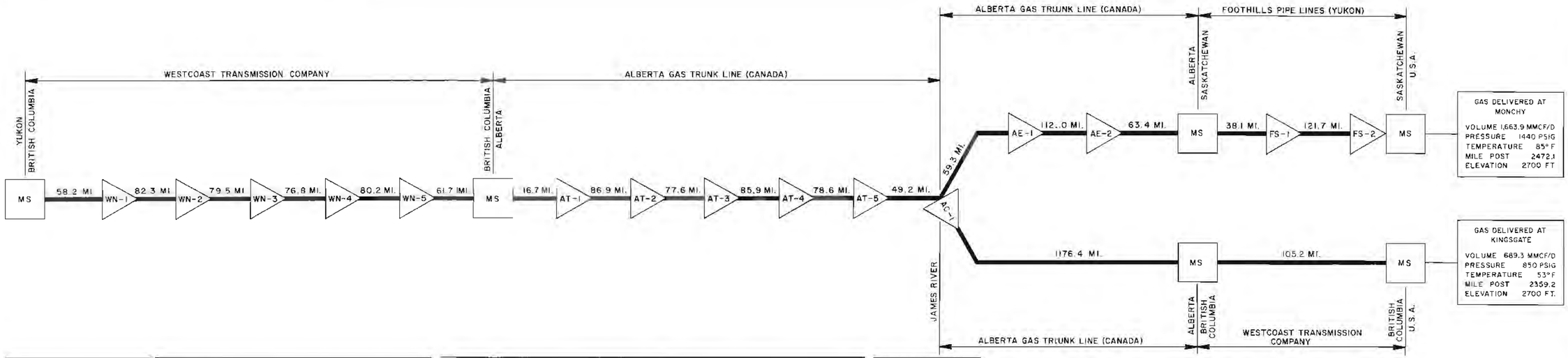
- PIPELINE
- COMPRESSOR STATION
- METER STATION

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT (48"ALTERNATIVE)

FLOW DIAGRAMS
ALASKA & YUKON SECTIONS
PEAK DAILY CAPACITY
SUMMER 1983 AND THEREAFTER
2567 MMCF/D SUPPLY AT PRUDHOE BAY

DATE PREPARED MARCH 1977 | FIGURE 3A



WESTCOAST TRANSMISSION COMPANY					
STATION DESIGNATION	WN-1	WN-2	WN-3	WN-4	WN-5
MILEPOST (MILES)	1,302.2	1,384.5	1,464.0	1,540.8	1,621.0
ELEVATION (FEET)	2,250	2,887	2,400	2,600	2,450
STATION INLET VOLUME (MMCF/D)	2,429.9	2,423.6	2,417.1	2,410.0	2,403.4
TOTAL FUEL (MMCF/D)	6.24	6.53	7.03	6.60	6.51
NET VOLUME TO PIPELINE (MMCF/D)	2,423.6	2,417.1	2,410.1	2,403.4	2,396.9
STATION SUCTION PRESSURE (PSIG)	995	971	960	978	980
STATION SUCTION TEMPERATURE (°F)	71	68	69	70	69
STATION DISCHARGE PRESSURE (PSIG)	1,260	1,260	1,260	1,260	1,260
STATION DISCHARGE TEMPERATURE (°F)	103	103	107	106	104
COMPRESSION RATIO	1.27	1.29	1.32	1.29	1.29
HORSEPOWER REQUIRED	29,007	30,629	33,346	30,999	30,566
HORSEPOWER SPARE	18,931	17,971	14,318	16,299	17,006
TOTAL HORSEPOWER-SITE RATED	47,938	48,600	47,664	47,298	47,572
NO. OF UNITS/ISO HORSEPOWER	2/24000	2/24000	2/24000	2/24000	2/24000
HP INSTALLED/HP PROPOSED (ISO)	48000/0	0/48000	48000/0	0/48000	48000/0
COMPRESSOR SUCTION PRESSURE (PSIG)	991	977	955	974	976
COMPRESSOR SUCTION TEMPERATURE (°F)	71	68	69	70	69
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,262	1,262	1,262	1,262	1,262
COMPRESSOR DISCHARGE TEMPERATURE (°F)	103	103	103	106	104
COOLING LOAD (TONS)	N/A	N/A	N/A	N/A	N/A
REFRIGERATION HORSEPOWER REQUIRED	-0-	-0-	-0-	-0-	-0-
HP INSTALLED/HP PROPOSED (ISO)	N/A	N/A	N/A	N/A	N/A

ALBERTA GAS TRUNK LINE (CANADA)							
AT-1	AT-2	AT-3	AT-4	AT-5	AC-1	AE-1	AE-2
11,699.6	11,786.3	11,863.9	11,949.8	12,208.4	12,077.6	12,136.9	12,248.9
2,089	2,000	2,853	2,980	3,332	3,852	3,100	2,474
2,396.9	2,392.5	2,388.0	2,383.7	2,379.2	690.0	1,685.0	1,680.7
4.48	4.42	4.34	4.44	4.24	0.71	4.17	4.15
2,392.3	2,388.0	2,383.7	2,379.3	2,375.0	689.3	1,680.8	1,676.7
995	990	994	988	1,004	1,107	932	933
69	59	58	59	59	67	57	57
1,259	1,259	1,259	1,259	1,259	1,183	1,259	1,259
90	80	80	80	80	77	80	80
1.28	1.28	1.28	1.28	1.26	1.08	1.36	1.36
28,195	27,776	27,155	27,944	26,005	2,296	24,335	24,390
1,249	1,765	1,457	525	1,868	1,054	2,391	3,184
29,444	29,541	28,612	28,474	27,873	3,350	26,926	27,574
1/32700	1/32700	1/32700	1/32700	1/32700	1/4000	1/32700	1/32700
32700/0	0/32700	32700/0	0/32700	32700/0	0/4000	32700/0	0/32700
991	986	990	984	1,000	1103	928	929
69	59	58	59	59	67	57	57
1,268	1,268	1,268	1,268	1,268	1182	1268	1268
N/A	N/A	N/A	N/A	N/A	77	N/A	N/A
27,195	4,355	3,816	4,302	3,659	-0-	4268	4217
-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

FOOTHILLS PIPE LINES (YUKON)	
FS-1	FS-2
2,350.4	2,472.1
2,400	2,700
1,676.7	1,672.4
4.27	8.53
1,672.4	1,663.9
952	840
60	60
1,260	1,440
85	85
1.31	1.31/1.33
22,464	45,615
2,736	4,385
25,200	50,000
1/29000	2/29000
0/29000	58000/0
952	840/1092
60	60/85
1,269	1106/1 454
100	99/126
3,108	11,300
-0-	-0-
N/A	N/A

LEGEND

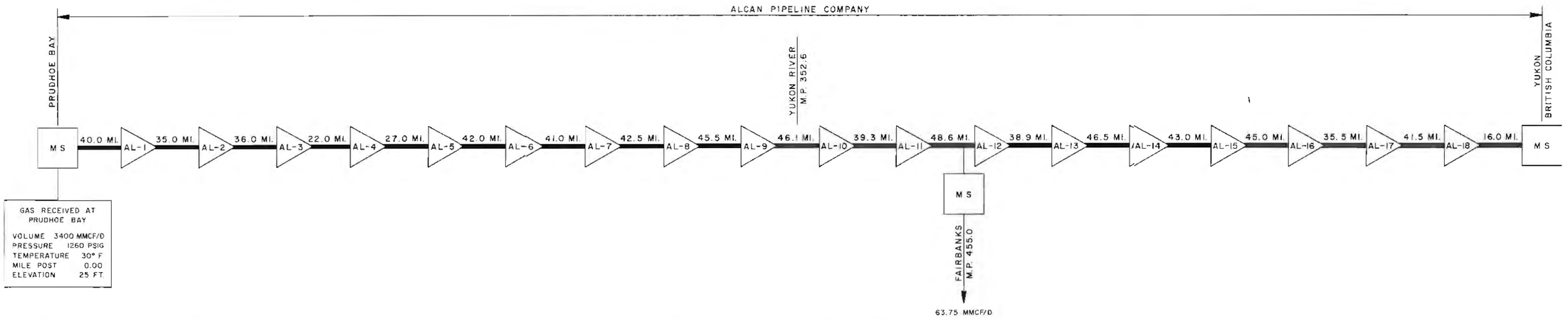
PIPELINE
COMPRESSOR STATION
METER STATION

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT (48"ALTERNATIVE)

FLOW DIAGRAMS
B.C., ALBERTA, & SASKATCHEWAN SECTIONS
PEAK DAILY CAPACITY
SUMMER 1983 AND THEREAFTER
2567 MMCF/D SUPPLY AT PRUDHOE BAY

DATE PREPARED MARCH 1977 | FIGURE 38



	ALCAN PIPELINE COMPANY																	
STATION DESIGNATION	AL-1	AL-2	AL-3	AL-4	AL-5	AL-6	AL-7	AL-8	AL-9	AL-10	AL-11	AL-12	AL-13	AL-14	AL-15	AL-16	AL-17	AL-18
MILEPOST (MILES)	40.0	75.0	111.0	133.0	160.0	202.0	243.0	285.5	331.0	377.1	416.4	465.0	503.9	550.4	593.4	638.4	673.9	715.4
ELEVATION (FEET)	375	800	1,600	2,824	3,128	1,450	1,031	900	550	500	560	485	1,075	1,190	1,380	1,600	1,900	1,960
STATION INLET VOLUME (MMCF/D)	3,400.0	3,393.1	3,387.8	3,381.8	3,377.4	3,373.1	3,368.1	3,362.0	3,355.3	3,348.9	3,341.3	3,270.5	3,263.0	3,256.2	3,249.2	3,242.6	3,235.8	3,230.5
TOTAL FUEL (MMCF/D)	6.90	5.29	6.02	4.43	4.30	5.00	6.02	6.73	6.41	7.64	6.99	7.50	6.83	7.04	6.57	6.84	5.30	5.92
NET VOLUME TO PIPELINE (MMCF/D)	3,393.1	3,387.8	3,381.8	3,377.4	3,373.1	3,368.1	3,362.10	3,355.3	3,348.9	3,341.3	3,334.3	3,263.0	3,256.2	3,249.2	3,242.6	3,235.8	3,230.5	3,224.5
STATION SUCTION PRESSURE (PSIG)	1,046	1,073	1,052	1,101	1,122	1,130	1,085	1,060	1,047	1,035	1,059	1,024	1,044	1,045	1,059	1,049	1,092	1,076
STATION SUCTION TEMPERATURE (°F)	17	14	12	15	17	23	18	17	17	17	18	16	15	16	17	16	17	17
STATION DISCHARGE PRESSURE (PSIG)	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,253	1,259	1,246	1,259	1,259	1,259	1,259	1,259	1,259
STATION DISCHARGE TEMPERATURE (°F)	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
COMPRESSION RATIO	1.213	1.182	1.205	1.152	1.131	1.123	1.169	1.197	1.212	1.219	1.198	1.225	1.214	1.213	1.198	1.209	1.162	1.179
HORSEPOWER REQUIRED	24,906	20,882	23,359	17,520	15,340	14,787	19,835	22,763	24,414	25,289	22,852	25,302	23,778	23,782	22,093	23,276	18,154	19,993
HORSEPOWER SPARE	497	4,133	937	5,709	7,630	9,642	4,971	2,161	829	-0-	2,981	-0-	988	980	2,299	1,019	5,876	3,985
TOTAL HORSEPOWER-SITE RATED	25,403	25,015	24,296	23,229	22,970	24,429	24,805	24,924	25,243	25,289	25,234	25,302	24,766	24,662	24,492	24,296	24,031	23,978
NO. OF UNITS/ISO HORSEPOWER	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500	1/26500
HP INSTALLED/HP PROPOSED (ISO)	0/26500	26500/0	0/26500	26500/0	0/26500	0/26500	26500/0	0/26500	26500/0	0/26500	26500/0	0/26500	26500/0	0/26500	26500/0	0/26500	26500/0	0/26500
COMPRESSOR SUCTION PRESSURE (PSIG)	1,041	1,066	1,047	1,096	1,117	1,125	1,080	1,055	1,042	1,030	1,054	1,019	1,039	1,040	1,054	1,044	1,087	1,071
COMPRESSOR SUCTION TEMPERATURE (°F)	17.2	14.3	12.8	15.1	17.9	23.6	18.9	17.0	17.2	17.1	18.2	16.3	15.0	16.4	17.2	16.3	17.9	17.8
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,265	1,265	1,265	1,265	1,265	1,265	1,265	1,265	1,265	1,259	1,265	1,259	1,265	1,265	1,265	1,265	1,265	1,265
COMPRESSOR DISCHARGE TEMPERATURE (°F)	42	35	36	33	33	38	39	40	42	42	41	42	40	41	40	41	37	39
COOLING LOAD (TONS)	8,732	5,414	5,926	4,133	4,417	6,911	7,144	7,649	5,686	8,891	8,289	8,560	7,373	8,000	7,555	7,817	5,990	6,852
REFRIGERATION HORSEPOWER REQUIRED	8,100	5,022	5,962	4,139	5,152	8,061	8,333	8,922	6,633	10,520	9,809	9,985	8,600	9,332	8,812	8,990	6,889	7,880
HP INSTALLED/HP PROPOSED (ISO)	0/13830	7660/0	0/7660	7660/0	0/7660	0/13830	13,830/0	0/13830	13830/0	0/13830	13830/0	0/13830	13830/0	0/13830	13830/0	0/13830	13830/0	0/13830

LEGEND

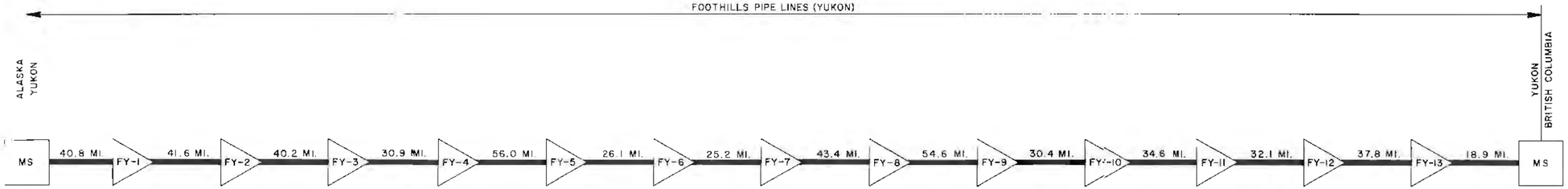
PIPELINE
COMPRESSOR STATION
METER STATION

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT (48"ALTERNATIVE)

FLOW DIAGRAMS
ALASKA SECTION
PEAK DAILY CAPACITY
SUMMER 1983 AND THEREAFTER
3400 MMCF/D SUPPLY AT PRUDHOE BAY

DATE PREPARED MARCH 1977 | FIGURE 4A



	FOOTHILLS PIPE LINES (YUKON)												
STATION DESIGNATION	FY-1	FY-2	FY-3	FY-4	FY-5	FY-6	FY-7	FY-8	FY-9	FY-10	FY-11	FY-12	FY-13
MILEPOST (MILES)	772.2	813.8	854.0	884.9	940.9	967.0	992.2	1,035.6	1,090.2	1,120.6	1,155.2	1,187.3	1,225.1
ELEVATION (FEET)	2,300	3,650	2,800	3,000	3,300	3,400	4,500	3,200	2,400	2,900	2,900	3,125	2,700
STATION INLET VOLUME (MMCF/D)	3,224.5	3,218.7	3,213.9	3,209.0	3,204.9	3,196.3	3,191.2	3,186.5	3,181.3	3,173.1	3,168.0	3,162.8	3,157.6
TOTAL FUEL (MMCF/D)	5.80	4.80	4.90	4.06	8.61	5.08	4.76	5.18	8.19	5.09	5.26	5.12	5.31
NET VOLUME TO PIPELINE (MMCF/D)	3,219.7	3,213.9	3,209.0	3,204.9	3,196.3	3,191.2	3,186.5	3,181.3	3,173.1	3,168.0	3,162.8	3,157.6	3,152.3
STATION SUCTION PRESSURE (PSIG)	992	1,049	1,035	1,076	973	1,086	1,096	1,084	987	1,085	1,079	1,083	1,077
STATION SUCTION TEMPERATURE (°F)	13	31	43	56	57	66	67	68	61	66	66	66	67
STATION DISCHARGE PRESSURE (PSIG)	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260
STATION DISCHARGE TEMPERATURE (°F)	44	56	68	77	80	80	80	80	80	80	80	80	80
COMPRESSION RATIO	1.277	1.208	1.201	1.157	1.302	1.172	1.161	1.175	1.289	1.174	1.180	1.175	1.182
HORSEPOWER REQUIRED	29,906	24,760	25,234	20,938	40,069	23,628	22,155	24,088	36,086	23,689	24,470	23,817	24,698
HORSEPOWER SPARE	22,594	3,540	1,266	5,162	13,531	1,872	2,245	1,412	14,714	2,311	1,530	1,683	1,102
TOTAL HORSEPOWER-SITE RATED	52,800	28,300	26,500	26,100	53,600	25,500	24,400	25,500	52,800	26,000	25,000	25,500	25,800
NO. OF UNITS ISO HORSEPOWER	2/29000	1/29000	1/29000	1/29000	2/29000	1/29000	1/29000	1/29000	2/29000	1/29000	1/29000	1/29000	1/29000
HP INSTALLED HP PROPOSED ISO)	29000/29000	0/29000	29000/0	0/29000	29000/29000	0/29000	29000/0	0/29000	29000/29000	0/29000	29000/0	0/29000	29000/0
COMPRESSOR SUCTION PRESSURE (PSIG)	987	1,044	1,030	1,091	968	1,081	1,091	1,079	982	1,080	1,074	1,078	1,072
COMPRESSOR SUCTION TEMPERATURE (°F)	13	31	43	56	57	66	67	68	61	66	66	66	67
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,265	1,265	1,265	1,265	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1,270
COMPRESSOR DISCHARGE TEMPERATURE (°F)	44	56	68	77	95	89	88	91	97	89	90	89	90
COOLING LOAD (TONS)	-0-	-0-	-0-	-0-	6,015	3,315	3,107	4,532	6,890	3,680	3,927	3,694	4,166
REFRIGERATION HORSEPOWER REQUIRED	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
HP INSTALLED/HP PROPOSED (ISO)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LEGEND

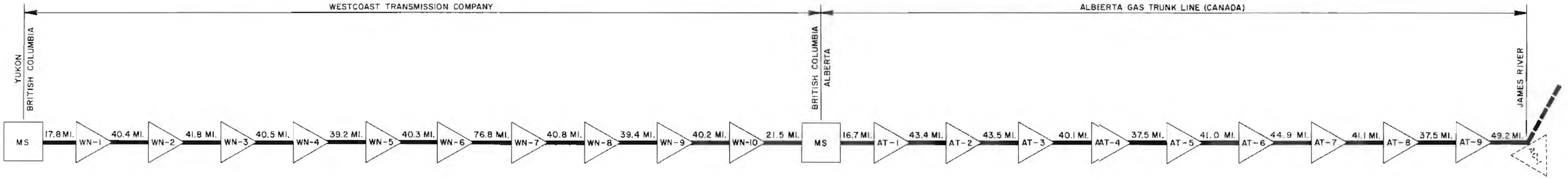
- PIPELINE
- COMPRESSOR STATION
- METER STATION

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT (48"ALTERNATIVE)

FLOW DIAGRAMS
YUKON SECTION
PEAK DAILY CAPACITY
SUMMER 1983 AND THEREAFTER
3400 MMCF/D SUPPLY AT PRUDHOE BAY

DATE PREPARED MARCH 1977 | FIGURE 48



WESTCOAST TRANSMISSION COMPANY										
STATION DESIGNATION	WN-1	WN-2	WN-3	WN-4	WN-5	WN-6	WN-7	WN-8	WN-9	WN-10
MILEPOST (MILES)	1,761.8	1,302.2	1,344.0	1,384.5	1,423.7	1,464.0	11,540.3	1,581.6	1,621.0	1,661.2
ELEVATION (FEET)	2,000	2,250	1,725	1,887	2,100	2,400	2,600	3,200	2,450	2,250
STATION INLET VOLUME (MMCF/D)	3,152.3	3,146.7	3,138.9	3,131.5	3,123.3	3,115.0	3,108.2	3,093.0	3,084.4	3,077.4
TOTAL FUEL (MMCF/D)	5.64	7.74	7.46	8.20	8.23	6.82	15.23	8.56	7.07	6.08
NET VOLUME TO PIPELINE (MMCF/D)	3,146.7	3,138.9	3,131.5	3,123.3	3,115.0	3,108.2	3,093.0	3,084.4	3,077.4	3,071.3
STATION SUCTION PRESSURE (PSIG)	1,076	1,007	1,022	1,001	1,003	1,027	776	990	1,042	1,051
STATION SUCTION TEMPERATURE (°F)	69	77	87	94	100	64	61	99	104	64
STATION DISCHARGE PRESSURE (PSIG)	1,262	1,262	1,262	1,262	1,262	1,262	1,262	1,262	1,262	1,262
STATION DISCHARGE TEMPERATURE (°F)	90	108	117	126	69	69	127	134	69	89
COMPRESSION RATIO	1.170	1.250	1.230	1.260	1.250	1.220	1.610	1.270	1.210	1.200
HORSEPOWER REQUIRED	24,300	28,731	34,207	38,269	38,468	30,775	76,305	40,432	31,924	26,881
HORSEPOWER SPARE	24,094	12,297	14,689	10,331	9,744	16,889	118,091	28,868	15,648	21,037
TOTAL HORSEPOWER-SITE RATED	48,394	47,938	48,896	48,600	48,212	47,664	94,396	69,300	47,572	47,938
NO. OF UNITS ISO HORSEPOWER	2/24000	2/24000	2/24000	2/24000	2/24000	2/24000	4/24000	3/24000	2/24000	2/24000
HP INSTALLED HP PROPOSED (ISO)	0/48000	48000/0	0/48000	48000/0	0/48000	48000/0	4800C/48000	0/72000	48000/0	0/48000
COMPRESSOR SUCTION PRESSURE (PSIG)	1,072	1,003	1,018	997	999	1,023	772	986	1,038	1,047
COMPRESSOR SUCTION TEMPERATURE (°F)	69	77	87	94	100	64	61	99	104	64
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,264	1,264	1,264	1,264	1,264	1,264	1,264	1,264	1,264	1,264
COMPRESSOR DISCHARGE TEMPERATURE (°F)	93	108	117	126	132	91	127	134	132	89
COOLING LOAD (TONS)	N/A	N/A	N/A	N/A	23,300	8,340	BN/A	N/A	22,966	N/A
REFRIGERATION HORSEPOWER REQUIRED	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
HP INSTALLED/HP PROPOSED (ISO)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

ALBERTA GAS TRUNK LINE (CANADA)									
AT-1	AT-2	AT-3	AT-4	AT-5	AT-6	AT-7	AT-8	AT-9
1,699.4	1,742.8	1,786.3	1,826.4	1,863.9	1,904.9	1,949.8	1,,990.9	2,038.4
2,089	2,400	2,000	2,201	2,853	3,717	2,980	33,058	3,532
3,071.3	3,066.8	3,060.1	3,055.8	3,051.4	3,047.1	3,040,4	3,,036.3	3,032.0
4.48	6.70	4.34	4.34	4.36	6.66	4.11	4.29	4.12
3,066.8	3,060.1	3,055.8	3,051.4	3,047.1	3,040.4	3,036.3	3,,032.0	3,027.9
1,055	1,031	1,055	1,054	1,052	,1030	1,064	11,035	1,063
75	64	67	66	65	63	68	66	66
1,259	1,259	1,259	1,259	1,259	1,259	1,259	11,259	1,259
80	80	80	80	80	80	80	80	80
1,207	1,235	1,207	1,208	1,210	1,236	1,197	11,207	1,195
27,995	30,457	27,110	27,118	27,260	30,261	25,176	265,798	25,743
1,449	3,455	2,431	2,204	1,352	1,980	2,758	11,591	2,130
29,444	33,912	29,541	29,322	28,612	32,241	29,474	288,389	27,873
1/32700	1/38000	1/32700	1/32700	1/32700	1/38000	1/32700	1/332700	1/32700
32700/0	0/38000	32700/0	0/32700	32700/0	0/38000	32700/0	0/332700	32700/0
1,050	1,026	1,050	1,049	1,047	1,025	1,059	11,050	1,038
75	64	67	66	65	63	68	66	66
1,270	1,270	1,270	1,270	1,270	1,270	1,270	11,270	1,270
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8,337	5,459	5,203	4,872	4,684	5,073	5,043	41,864	4,443
-0-	-0-	-0-	-0-	-0-	-0-	-0-	--0-	-0-
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LEGEND

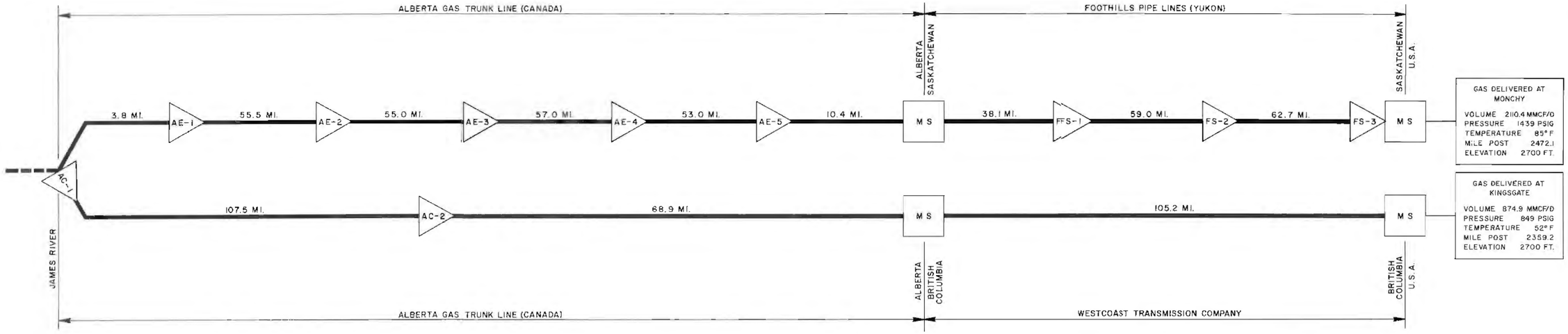
- PIPELINE
- COMPRESSOR STATION
- METER STATION

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT (48"ALTERNATIVE)

FLOW DIAGRAMS
B.C., ALBERTA TO JAMES RIVER SECTIONS
PEAK DAILY CAPACITY
SUMMER 1983 AND THEREAFTER
3400 MMCF/D SUPPLY AT PRUDHOE BAY

DATE PREPARED MARCH 1977 | FIGURE 4C



	ALBERTA GAS TRUNK LINE (CANADA)							FOOTHILLS PIPE LINES (YUKON)		
STATION DESIGNATION	AC-1	AC-2	AE-1	AE-2	AE-3	AE-4	AE-5	FS-1	FS-2	FS-3
MILEPOST (MILES)	2,077.6	2,185.1	2,081.4	2,136.9	2 191.9	2,248.9	2,301.9	3,350.4	2,409.4	2,472.1
ELEVATION (FEET)	3,852	4,200	3,635	3,100	2,905	2,474	2 020	2,400	3,004	2,700
STATION INLET VOLUME (MMCF/D)	878.1	876.5	2,149.8	2,145.8	2,141.9	2,137.9	2,133.9	2,130.2	2,125.9	2,119.0
TOTAL FUEL (MMCF/D)	1.62	1.63	4.02	3.91	4.01	3.98	3.68	4.30	6.90	8.62
NET VOLUME TO PIPELINE (MMCF/D)	876.5	874.9	2,145.8	2,141.9	2,137.9	2,133.9	2,130.2	2,125.9	2,119.0	2,110.4
STATION SUCTION PRESSURE (PSIG)	1,018	971	993	1,001	994	995	1,013	1,017	938	951/1174
STATION SUCTION TEMPERATURE (°F)	63	55	62	64	63	63	64	65	65	67/85
STATION DISCHARGE PRESSURE (PSIG)	1,187	1,171	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1174/1439
STATION DISCHARGE TEMPERATURE (°F)	85	82	80	80	80	80	80	85	85	85
COMPRESSION RATIO	1.172	1.213	1.282	1.272	1.281	1.279	1.256	1.232	1.356	1.249/1.242
HORSEPOWER REQUIRED	6,480	7,745	25,142	24,456	25,045	24,877	23,022	22,633	31,385	45,361
HORSEPOWER SPARE	-0-	595	1,231	2,470	2,083	2,697	5,021	2,567	1,761	4,639
TOTAL HORSEPOWER-SITE RATED	6,480	8,340	26,373	26,926	27,128	27,574	28,043	25,200	33,146	50,000
NO. OF UNITS/ISO HORSEPOWER	2/4000	1/10000	1/32700	1/32700	1/32700	1/33700	1/32700	1/29000	1/38000	2/29000
HP INSTALLED/HP PROPOSED (ISO)	4000/4000	0/10000	0/32700	32700/0	0/32700	32700/0	0/32700	29000/0	0/38000	58000/0
COMPRESSOR SUCTION PRESSURE (PSIG)	1,014	967	988	996	989	990	1,008	1,012	933	946/1169
COMPRESSOR SUCTION TEMPERATURE (°F)	63	55	62	64	63	63	64	65	65	67/85
COMPRESSOR DISCHARGE PRESSURE (PSIG)	1,191	1,175	1,270	1,270	1,270	1,270	1,270	1,270	1,270	1185/1455
COMPRESSOR DISCHARGE TEMPERATURE (°F)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
COOLING LOAD (TONS)	-0-	-0-	4,603	4,782	4,756	4,756	4,485	3,242	6,139	3576/8398
REFRIGERATION HORSEPOWER REQUIRED	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
HP INSTALLED/HP PROPOSED (ISO)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LEGEND

- PIPELINE
- COMPRESSOR STATION
- METER STATION

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT (48" ALTERNATIVE)

FLOW DIAGRAMS
JAMES RIVER TO U.S. BORDER SECTION
PEAK DAILY CAPACITY
SUMMER 1983 AND THEREAFTER
3400 MMCF/D SUPPLY AT PRUDHOE BAY

DATE PREPARED MARCH 1977 | FIGURE 40

SECTION 4

GAS BALANCE

SECTION 4

GAS BALANCE

The following exhibits have been prepared to illustrate the disposition of Alaska gas from Prudhoe Bay to markets in the lower 48 United States. The volumes shown are annual average day volumes based on average day volumes flowing at summer conditions for 183 days and winter conditions for 182 days.

The gas balance has been shown on both a volumetric basis and an energy (Btu) basis by canendar year beginning with first deliveries on October 1, 1981, at a Prudhoe Bay input volume of 1600 MMCFD. The Prudhoe Bay input volume is assumed to increase to 2400 MMCFD on January 1, 1983 and remain at that level thereafter.

The assumed deliveries at Fairbanks are at the same level, for the given Prudhoe Bay input, as shown in the original 42 inch design filed before the FPC. The assumed deliveries made to the western markets at Kingsgate are consistant with the "1580 Design" case filed by Pacific Gas Transmission Company ("PGT") at FPC Docket No. CP74-241. This assumption results in an east/west split of 71%/29%. The remaining volumes delivered to the east at Monchy are assumed to be delivered via the proposed Northern Border Pipeline system.

The expanded PGT system results in an incremental fuel savings on that system. These savings have been incorporated into the gas balance and are reflected in the deliveries to the western U.S. markets.

The deliveries to eastern markets are well within the capacity of the proposed Northern Border Pipeline system and thus require no change in the design as filed at FPC Docket No. CP74-290.

ALCAN PIPELINE PROJECT - 48" ALTERNATIVE

GAS BALANCE SUMMARY FROM PRUDHOE BAY TO U.S. MARKETS

(Annual Average Day Volumes in MMCF @ 1138 Btu/Cu.Ft.)

Line No.	SEGMENT (a)	1981[1/] (b)	1982 (c)	1983 (d)
1	Prudhoe Bay Supply	1600.0	1600.0	2400.0
2	Total System Fuel[2/]	39.9	52.8	152.6
3	Delivery to U.S. Markets	1560.1	1547.2	2247.4
4	Fairbanks	30.0	30.0	45.0
5	Western U.S.	467.7	467.7	660.2
6	Eastern U.S.	1062.4	1049.5	1542.2
7	Percent Fuel Consumption	2.5	3.3	6.4

1/ Beginning Service 10/1/81
2/ Includes incremental fuel savings resulting from expanded Pacific Gas Transmission Line

ALCAN PIPELINE PROJECT - 48" ALTERNATIVE

GAS BALANCE FROM PRUDHOE BAY TO CANADA/U.S. BORDER

(Annual Average Day Volumes in MMCF @ 1138 Btu/Cu.Ft.)

Line No.	SEGMENT (a)	1981[1/] (b)	1982 (c)	1983 (d)
1	Alcan Receipt at Prudhoe Bay	1600.0	1600.0	2400.0
2	Fairbanks Delivery	30.0	30.0	45.0
3	Fuel to Alaska/Yukon Border	15.3	25.1	38.7
4	Foothills (Yukon) Receipt	1554.7	1544.9	2316.3
5	Fuel to Yukon/B.C. Border	13.0	13.1	27.8
6	Westcoast Receipt	1541.7	1531.8	2288.5
7	Fuel to B.C./Alberta Border	11.5	12.1	24.5
8	AGTL (Canada) Receipt	1530.2	1519.7	2264.0
9	Fuel to James River	7.4	8.4	18.8
10	Volume at James River	1522.8	1511.3	2245.2
11	Delivery to Western Leg	442.0	442.0	659.0
12	Delivery to Eastern Leg	1080.8	1069.3	1586.2
13	Western Leg Receipt at James River	442.0	442.0	659.0
14	Fuel to Kingsgate	0.0	0.0	0.3
15	Delivery at Kingsgate	442.0	442.0	658.7
16	Fuel to Western U.S. Markets	(25.7)	(25.7)	(1.5)
17	Delivery to Western U.S. Markets	467.7	467.7	660.2
18	Eastern Leg Receipt at James River	1080.8	1069.3	1586.2
19	Fuel to Alberta/Saskatchewan Border	3.3	3.2	7.1
20	Foothills (Saskatchewan) Receipt	1077.5	1066.1	1579.1
21	Fuel to Saskatchewan/U.S. Border	3.4	4.9	10.2
22	Delivery at Monchy	1074.1	1061.2	1568.9
23	Fuel to Eastern U.S. Markets	11.7	11.7	26.7
24	Delivery to Eastern U.S. Markets	1062.4	1049.5	1542.2

[1/] Beginning Service 10/1/81

Exhibit 4-3

ALCAN PIPELINE PROJECT - 48" ALTERNATIVE

GAS BALANCE SUMMARY FROM PRUDHOE BAY TO U.S. MARKETS

(Annual Average Day Volumes in Billion Btu)

Line No.	SEGMENT	1981[1/]	1982	1983
1	Prudhoe Bay Supply	1820.8	1820.8	2731.2
2	Total System Fuel[2/]	45.4	60.1	173.7
3	Delivery to U.S. Markets	1775.4	1760.7	2557.5
4	Fairbanks	34.1	34.1	51.2
5	Western U.S.	532.3	532.3	751.3
6	Eastern U.S.	1209.0	1194.3	1755.0
7	Percent Fuel Consumption	2.5	3.3	6.4

1/ Beginning Service 10/1/81
2/ Includes incremental fuel savings resulting from expanded Pacific Gas Transmission Line

ALCAN PIPELINE PROJECT - 48" ALTERNATIVE

GAS BALANCE FROM PRUDHOE BAY TO CANADA/U.S. BORDER

(Annual Average Day Volumes in Billion Btu)

Line No.	SEGMENT (a)	1981[1/] (b)	1982 (c)	1983 (d)
1	Alcan Receipt at Prudhoe Bay	1820.8	1820.8	2731.2
2	Fairbanks Delivery	34.1	34.1	51.2
3	Fuel to Alaska/Yukon Border	17.4	28.6	44.0
4	Foothills (Yukon) Receipt	1769.3	1758.1	2636.0
5	Fuel to Yukon/B.C. Border	14.8	14.9	31.6
6	Westcoast Receipt	1754.5	1743.2	2604.4
7	Fuel to B.C./Alberta Border	13.1	13.7	27.9
8	AGTL (Canada) Receipt	1741.4	1729.5	2576.5
9	Fuel to James River	8.4	9.6	21.4
10	Volume at James River	1733.0	1719.9	2555.1
11	Delivery to Western Leg	503.0	503.0	749.9
12	Delivery to Eastern Leg	1230.0	1216.9	1805.2
13	Western Leg Receipt at James River	503.0	503.0	749.9
14	Fuel to Kingsgate	0.0	0.0	.3
15	Delivery at Kingsgate	503.0	503.0	749.6
16	Fuel to Western U.S. Markets	(29.3)	(29.3)	(1.7)
17	Delivery to Western U.S. Markets	532.3	532.3	751.3
18	Eastern Leg Receipt at James River	1230.0	1216.9	1805.2
19	Fuel to Alberta/Saskatchewan Border	3.8	3.7	8.1
20	Foothills (Saskatchewan) Receipt	1226.2	1213.2	1797.1
21	Fuel to Saskatchewan/U.S. Border	3.9	5.6	11.6
22	Delivery at Monchy	1222.3	1207.6	1785.5
23	Fuel to Eastern U.S. Markets	13.3	13.3	30.3
24	Delivery to Eastern U.S. Markets	1209.0	1194.3	1755.2

1/ Beginning Service 10/1/81

SECTION 5

ENVIRONMENTAL ASSESSMENT

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SECTION 5

ENVIRONMENTAL ASSESSMENT

Environmental Summary

Alaska. Alcan's 48-inch alternative proposal combines the benefits of using existing rights-of-way and transportation corridors with the availability of existing detailed environmental data which has been supplemented by extensive construction experience and studies conducted by experienced and knowledgeable experts in various disciplines. The proposal further benefits from a flexible construction schedule. The schedule provides the ability to construct Alcan's system within the constraints of time windows dictated by the presence of sensitive species in certain areas. The ability to utilize rational extensions of conventional engineering and construction techniques provides additional benefit.

This proposal minimizes potential adverse impacts on the environment, and has incorporated the identification of areas requiring special consideration. These include birds and their habitat, the range and migration routes of mammals, the aquatic environment, and vegetation.

The need for further and continuing studies to acquire additional site-specific information before final design and construction, as well as monitoring during and following construction has been incorporated in the proposal. In addition to assessing the impact of the project on the environment, the impact of the environment on the project has been considered. Northwest has extensive experience in constructing and operating pipeline facilities in an environment similar to Alaska; i.e., rivers, forests, and fish and wildlife, all under strict governmental controls.

Canada. Canadian companies participating in the Alcan project have a broad knowledge of environmental aspects of the construction and operation of natural gas facilities in northern regions, based on experience gained in practice. The same concepts of utilization of existing rights-of-way and transportation corridors and available environmental data based on experience have been used in Canada as were in Alaska.

Field studies have been conducted to provide a basis for environmental assessments. Further studies to obtain additional data required to address revisions in the proposed project are under way. Site specific data obtained from continuing studies will be used in detailed project planning.

Potential adverse impacts will be identified and proper mitigation included in all design and construction procedures by Alcan's Canadian affiliates. Consequently, the remainder of this section describes only Alcan's proposal in Alaska.

Lower 48 States. The proposed Alcan project can provide deliveries to markets in the lower 48 states through transmission systems proposed by others.

Deliveries to eastern markets can be through the systems proposed by Northern Border Pipeline Company. Environmental aspects of this proposal have been reviewed by the Federal Power Commission (FPC) and the Department of Interior. These agencies concluded that the Northern Border system can be constructed and operated, with proper mitigation, without adverse environmental impacts.

Deliveries to western markets can be through the system proposed by Pacific Gas Transmission Company, Pacific Gas and Electric Company and the existing Northwest Pipeline Corporation system. This system has also been subject to review and Environmental Impact Statements by the Federal Power Commission and the Department of Interior, with findings similar to those for the Northern Border System.

While the delivery systems in the lower 48 states have not been proposed by the Alcan project sponsors, they are compatible with Alcan's proposal. Alcan, therefore, now intends to utilize these systems but is not committed to doing so. Alternate proposals could be sponsored and subsequently receive the necessary regulatory approvals. Should they be equally compatible with Alcan's design, they would be similarly acceptable to Alcan's sponsors.

This brief assessment will summarize prior complete environmental analysis applicable to the route in Alaska which is the same as Alcan's initial proposal. The primary change for the 48-inch alternate is to reduce the number of compressor stations from 15 to 8 thereby reducing the total impact.

Description of the Route

The Alaska segment of the proposed Alcan route was selected to minimize environmental impacts by utilizing existing rights-of-way and transportation corridors. From Prudhoe Bay to Delta Junction, the route will follow the Alyeska oil pipeline right-of-way and haul road for 539 miles.

This portion of the route will initially traverse the tundra of the Arctic Coastal Plain and the valley of the Sagavanirktok River to a crossing of the Brooks Range through Atigun Pass, and follow the valleys of the Dietrich and Middle Fork of the Koyokuk Rivers to the vicinity of Coldfoot. The route then traverses the highlands north of the Yukon River and crosses the Yukon-Tanana upland to the vicinity of Fairbanks and then follows the Tanana River and Richardson Highway to Delta Junction, which is approximately 85 miles southeast of Fairbanks.

At Delta Junction, the route will proceed southeast along the Alaska Highway and the existing Haines products pipeline right-of-way for a distance of 192 miles to the Alaska-Yukon border, where it will connect with the proposed Canadian segment.

This portion of the route will follow the Tanana River valley, which borders the North Slope of the Alaska Range, to the junction of the Nabsena and Chisana Rivers, which join to form the Tanana. The route then follows the Chisana River valley to the Alaska-Yukon border.

Minor route deviations to avoid sensitive wildlife and bird habitat, sensitive river crossing areas, and flood plains of major rivers are presently being investigated, as are minor deviations in route to avoid ice-rich soils and potential permafrost problem areas.

Description of Compressor Stations

Centrifugal compressors, driven by natural gas fueled turbines will be used in the gas transmission system. To minimize degradation to permafrost soils, discharge gas at each station will be chilled by a propane refrigeration plant and appurtenant facilities. Engineering data on compressor stations as determined by flow studies may be found in Section 3, Flow Diagrams.

Compressor stations will be automated for remote control of all functions, including discharge gas temperature. The controls for all compressor station operations will be at the Fairbanks operating center.

Each compressor station will occupy a site of approximately 15 acres. All utilities and storage facilities necessary for complete operation and maintenance will be included on the site.

Access to these above ground facilities will be from existing adjacent roads and highways, with short lateral roads constructed as needed.

A review of current environmental information on compressor stations conducted following the flow studies previously referenced has shown the preferred locations of compressor stations to be as subsequently described. Note that the milepost designation of the locations determined by the initial engineering analysis and those described in the following sections differ slightly. Additional flow studies have shown that the environmentally preferred locations are also feasible from an engineering standpoint. Further studies on compressor station sites are presently being conducted to fine-tune and finalize these locations.

Description of Other Facilities

Alcan Pipeline Company proposes to utilize staging areas established for the Alyeska project at Prudhoe Bay, Fairbanks and Valdez. Material storage sites will also be located at Anchorage, Seward and Whittier, and at selected locations on the pipeline route.

Alcan also proposes to utilize existing Alyeska Camp facilities at existing locations where feasible. Alcan will also relocate existing Alyeska camps from sites not required to two locations in the Delta Junction to Yukon border segment. The proposed locations of these relocated camps are Tok (M.P. 643), and Northway (M.P. 692).

Two mainline meter stations are proposed. These will be orifice-type meter stations, located at Prudhoe Bay and the Alaska-Yukon border. A sales meter station for deliveries of gas in the Fairbanks area will also be installed.

Construction Plan

The construction plan proposed by Alcan Pipeline Company is based on conventional civil and pipeline construction, modified to reflect environmental concerns, techniques and experience gained from construction of the Alyeska and other northern projects, and the extensions of technology required for a project of this size and magnitude.

Maximum use of existing facilities, such as those of Alyeska, and existing transportation systems has been made.

A gravel work pad concept, proven in the construction of the Alyeska system, is included in Alcan's plan to allow pipeline construction from March through November. Such a construction season facilitates operating within the "time windows" established to protect sensitive species and locations; it also includes periods when streams and rivers are frozen. Productivity is enhanced by avoiding construction during the winter period of low efficiency caused by the harsh climate and darkness.

Special crews for construction in sensitive areas, such as river crossings, are provided in the plan.

Civil construction operations will begin prior to other construction to provide the necessary development of camps, access roads, material storage, aggregate sources, and to accomplish the site preparation work.

Construction of compressor stations and other facilities will be coincidental with pipeline construction, but separate construction forces will be used.

Control of the project will be provided by a project management organization, which will utilize established procedures to coordinate design and schedule of all project operations including construction. Cost control, inspection, and quality control will also be included in the project management function.

The construction plan contemplates the utilization of aggregate from previously identified material sites in the segment from Prudhoe Bay to Delta Junction. In the segment east of Delta Junction to the Yukon border, in most cases, existing material sites will be utilized by Alcan. All aggregate acquisition will be in accordance with the environmental stipulations and requirements of jurisdictional agencies.

The construction plan provides for hydrostatic testing of the system to insure its structural integrity prior to placing it in service. Acquisition and disposal of test water will be conducted in accordance with regulatory agency requirements and to avoid adverse effects on water resources and the aquatic environment. In addition, test water will be reused from section to section to minimize the effect of acquisition and disposal.

Operation and Maintenance

The proposed operations and maintenance plan is structured around an organization of multi-skilled personnel to provide for routine operations and maintenance, minor repairs, all scheduled major overhaul, as well as for contingencies and emergencies. The proposed plan will utilize existing transportation and communication facilities.

Support services will be provided by local organizations specializing in such services.

Permanent bases for operating districts will be selected and located within operating districts defining areas in which common problems are anticipated due to similarities of terrain and climate. Accessibility to all areas in the district and transportation facilities to points outside the district will also be considered in the location of operating bases. Bases will be located at or near compressor stations to avoid duplication of permanent, above-ground facilities.

Normal compressor station operation will be controlled remotely from an operating center at Fairbanks.

Periodic operation and equipment checks for preventive maintenance will be performed by crews dispatched from the operating center. All equipment will receive major maintenance and overhaul as recommended by equipment manufacturers and determined by operating procedures. Communication and control facilities will be monitored continuously.

The pipeline right-of-way will receive regularly scheduled surveillance for environmental monitoring and reporting, cathodic protection of facilities, encroachments, access and right-of-way maintenance.

Contingency planning for stations includes provision for spare components of major equipment and crews available to complete major repairs to maintain continuity of service.

Pipeline repair equipment and material will be located to allow emergency repairs to be made, limiting loss of service.

Operation and maintenance procedure manuals will be established. A training program to develop a flexible, efficient operation and maintenance staff will be included in these procedures. The program will include periodic meetings to allow the incorporation of new techniques and procedures and to maintain staff efficiency.

Description of the Existing Environment - Pipeline Alignment

Geology. The Alcan route originates at Prudhoe Bay on the Arctic Coastal Plain. The Arctic Coastal Plain, a smooth plain rising almost imperceptibly from the Arctic Ocean to a maximum southern elevation of about 600 feet, consists of 10 to 150 or more feet of unconsolidated deposits of Quarternary age generally overlying gently south-dipping sandstones, conglomerates, and siltstones.

Forming a transition between the Coastal Plain and the Brooks Range are the foothills, a series of rolling plateaus, asymetrical ridges and low mountains which trend in a generally east to west orientation and rise to elevations of approximately 2000 to 3000 feet. The east trending orientation of the foothills is maintained in the Central and Eastern Brooks Range, although the mountains tend to be higher (elevations to about 5000 feet), are more rugged, and are well drained by a series of major waterways.

South of the Brooks Range, the route traverses the Kokrine-Hodzana Highlands, the Yukon-Tanana Upland, and the Tanana-Kuskokwim Lowland and Yukon Plateau provinces. The two former provinces consist primarily of low, rounded mountains and hills. Slopes vary from steep to gently rolling. The Yukon River is the major drainage system of the area. Sand dunes and peat bogs are occasionally encountered.

East of Delta Junction, the route traverses the latter two above mentioned provinces, areas of comparatively little relief through terrain composed generally of low rolling hills. From an elevation of slightly under 1200 feet at Delta Junction, portions of the route east of Delta rise to approximately 2000 feet, with the proposed right-of-way generally within 200 feet of this elevation for its entire distance. Slopes in the area seldom exceed 500 feet per mile, including those both parallel and transverse to the proposed alignment.

Although some generally poorly drained areas are encountered, numerous tributaries to the Tanana and White Rivers are crossed. Bedrock outcrops occur throughout the area; other bedrock is usually overlain by sands, gravels, silts, and volcanic ash.

Soils. The surficial soil cover along the route varies widely. Predominantly, however, the soils consist of glacial till and glacial outwash sands and gravels. Other common soil types include lacustrine silty sediments, alluvial silts, sands, gravels, colluvium and loess.

As noted earlier, bedrock outcrops are common south and east of the Brooks Range and the highland areas immediately south of the range. Where bedrock is uncommon, fine grained soils tend to be ice-rich, often contain ice wedges, and may overlie discontinuous permafrost. North of the Brooks range, permafrost is continuous and excess ice and thermokarst features are widespread. The ice content of soils usually decreases rapidly southward.

By definition, permafrost consists of soil, rock, or any other earth material, the temperature of which remains at or below 32°F (0°C) continuously for two or more years. Hence, its distribution is not uniform and is dependent upon many variables. Included are the mean annual air temperature which is basic to its overall distribution and mean annual ground temperature which determines its local presence or absence. In addition, the glacial and climatic history of the area, thermal properties of the earth material, insulating properties of overburden such as vegetation, snow, and waterbodies, topographic orientation with respect to the sun, and other shade causing factors also influence its distribution.

Additionally, a thin unfrozen layer above the permafrost usually develops seasonally in even the coldest portions of Alaska. The thickness of this "active layer" is dependent upon the ability of the surface material to insulate the underlying permafrost from summer heat and can vary locally from less than one foot to 5 feet or more.

Engineering problems may arise when permafrost occurs in areas of poorly drained, fine grained, ice-rich soils. Thawing of permafrost in association with the instability induced in associated fine grained soils due to excessive plasticity and wetting may lead to subsidence of the ground surface or the downslope movement of thawed soil masses. Such degradation may occur either (1) as a result of changes in the thermal properties of the ground surface causing deepening of the active layer or (2) as a result of subterranean sources of heat and or cold which may alter the thermal equilibrium of the permafrost.

As noted above, permafrost is continuous along the proposed Alcan route from Prudhoe Bay to approximately the South Fork of the Koyokuk River at milepost 240. From this location to the Canadian border, a distance of approximately 490 miles, the permafrost is discontinuous. Of this distance, however, the fine grained silts of eolian nature in which high ice or moisture content are expected to be present cover only about 80-100 miles. Hence, the geotechnical problems which may be associated with these thaw

unstable soils are of limited geographical extent. The measures identified by Alcan to deal with the problem are discussed in a later section.

Seismicity. It is generally believed that the possible maximum expected earthquake in the area from Prudhoe Bay to approximately 67°N latitude (about the first 250 miles of Alcan's proposed alignment) is below the potentially destructive level. Hence, the design earthquake for the northernmost segment of the Alyeska oil pipeline was established to be one of Richter 5.5 magnitude.

South of the Brooks Range, seismic events of magnitude 5.5 - 7.5 have been recorded within 30 miles of the proposed route in the Rampart Trough. A magnitude 7.3 earthquake occurred southeast of Fairbanks, although surface faulting was not associated with this seismic event. Consequently, the risk of earthquake induced damage to the proposed system in this area is also not considered to be significant.

Similarly, the portion of the route east of Delta Junction exhibits low historic seismicity. No earthquakes of magnitude 5 or greater have been recorded from this region. In addition, the route crosses no active geological faults in this or the northern-most segments. The only fault of concern is the Denali fault. The Alcan route runs in a south, southeasterly direction from Delta Junction to the Border, whereas the Denali Fault crosses Alaska in an east-west direction; the only segment of the fault even approaching Alcan's Alaska route is that near the Border. At this point the Fault is about 30 miles from Alcan's alignment.

Biota. The proposed pipeline route traverses numerous and varied biotic associations or communities. Characteristic species of vegetation and animal life associated with each is summarized in Tables 1 and 2, respectively. Also shown in Table 2 are unique species or those species of special interest due to their limited distribution or important commercial and/or recreational utilization.

Climate. The Alaskan Arctic Zone extends from the Arctic Ocean on the north to the central portion of the Brooks Range to the south. Within this area, temperatures range between 40°F and 75°F during the summer and between -20°F

TABLE 5-1

FLORA CHARACTERISTICS OF VARIOUS BIOTIC COMMUNITIES TRAVERSED BY THE PROPOSED ALCAN PIPELINE ALIGNMENT, ALASKA

Community [1]	Common Feature	Dominant Vegetation
Wet Tundra	Small lakes, ponds	Moss, cottongrass, heather, saxifrage
Moist Tundra	Rivers, foothills	Cottongrass, lichens, dwarf birch, willow
High Brush	Floodplains	Horsetail, bluegrass, willow, alder
Alpine Tundra	Mountains, steep ridges	Heather, reindeer moss, lichens
Spruce-Poplar Forest	Bottomlands	White spruce, balsam poplar, alder willow, dogwood
Spruce-Hardwood Forest	Uplands	White spruce, paper birch, aspen, willow, alder, ferns
Spruce-Hardwood Forest	Lowlands	Black spruce, tamarack; blueberry, moss
Muskeg	Bog	Sedge, moss, rose, dwarf birch

[1] Generally corresponds to communities encountered from north to south along the route.

TABLE 5-2

FAUNA CHARACTERISTICS OF VARIOUS BIOTIC COMMUNITIES TRAVERSED BY THE PROPOSED ALCAN PIPELINE ALIGNMENT, ALASKA

Community [1]	Common Mammals	Common Birds	Common Fish	Unique Fauna	Other Special Components
Wet Tundra	Lemmings, shrews, Arctic fox, caribou	Shorebirds, waterfowl, Whistling swan	Whitefish, Stickleback	Polar bear, swans	Caribou calving areas; nesting waterfowl; flies and mosquitoes
Moist Tundra	Red fox, wolf, voles	Shorebirds, waterfowl, marsh hawks, Snowy Owl	Burbot, Lake Trout (in mountain lakes); Char, Whitefish, Grayling, salmon (in rivers and streams)	Muskox	Caribou calving areas; nesting waterfowl, flies and mosquitoes
High Brush	Moose, Grizzly bear, otter	Warblers, sparrows, ptarmigan Raven	Stream fisheries vary locally		
Alpine Tundra	Ground squirrel	Shorebirds, owls, Golden Eagle, hawks, Gyrfalcon, passerines		Peregrine falcon, Dall sheep	Wolf, bear and fox dens
Spruce-Poplar Forest	Black bear, Muskrat, Mink	Bald Eagle, waterfowl	Stream or lake fisheries vary locally	Pine marten	

[1] Generally corresponds to communities encountered from north to south along the route.

TABLE 5-2, (Cont.)

FAUNA CHARACTERISTICS OF VARIOUS BIOTIC COMMUNITIES TRAVERSED BY THE PROPOSED ALCAN PIPELINE ALIGNMENT, ALASKA

Community [1]	Common Mammals	Common Birds	Common Fish	Unique Fauna	Other Special Components
Spruce-Hardwood Forest	Caribou, beaver, Red Squirrel, Porcupine	Osprey, Goshawk, Gyrfalcon, passerines, Ruffed grouse	Stream or lake fisheries vary locally		Caribou overwintering areas
Spruce-Hardwood Forest	Red squirrel	Owls, passerines	Stream or lake fisheries vary locally	Pine marten	
Muskeg	Hare, voles, lemmings	passerines, loons, waterfowl		Trumpeter swan	Nesting swans

[1] Generally corresponds to communities encountered from north to south along the route.

and -60°F in winter. Precipitation ranges from about 4 inches northerly, to in excess of 40 inches in the Brooks Range. Consequently, snowfall also varies from 20 inches near the northern end of the proposed route to almost 60 inches near the continental divide at Atigun Pass in the Brooks Range.

Surface winds along the Arctic coast are generally stronger and more persistent than are those inland. Hence, snow accumulation on the coastal plain is limited. However, wind speeds in mountain valleys and passes may exceed 50 knots during winter. Stable atmospheric conditions tend to produce thermal inversions under extremely low temperature during winter in places like Fairbanks where mountains shield large areas against prevailing winds. Ice fog may result from such forces.

The Continental Zone occurs south of the Brooks Range and easterly from Fairbanks to the Yukon Border. In this area, temperatures range between -24°F in winter and 70°F in summer. Precipitation averages 10 to 14 inches annually, with snowfall accumulating to 60 inches as a result of a 33 to 54 inch annual snowfall. Snow is generally present on the ground from October to April in normal years.

Hydrology. The proposed alignment crosses the Arctic and Yukon hydrologic regions of Alaska. In the Arctic region, the route traverses the Sagavanirktok River drainage basin. South of the Brooks Range, it crosses the Koyokuk, Upper Yukon and Tanana subregions. In addition, the Arctic Coastal Plain contains many shallow lakes and ponds, and numerous small and intermediate size streams. Here and elsewhere permafrost generally blocks the vertical movement of water and forces it to move horizontally within the active layer.

Most runoff in the area is from snowmelt. Thus, flooding generally occurs in late May or early June. Subsequently, streamflow diminishes during the summer and may cease completely during fall and winter months. Storm runoff and glacial outwash augment snowmelt in many rivers and streams during summer.

Nutrients are generally low in Arctic lakes, ponds, and streams. Dissolved oxygen levels tend to remain high throughout due to low water temperature and insignificant biological activity. In addition, spring runoff, storm flooding, and glacial meltwater inflow during summer may cause very high turbidity levels which gradually clear at low flow stage during fall.

Groundwater conditions along the proposed route are generally determined by the presence of permafrost. Brackish or saline groundwater may be located under deep continuous permafrost, depending upon the availability of recharge areas, flow rates, and other factors. Perched water tables at or near the ground surface also exist in discontinuous permafrost areas. Boggy or swampy topography such as that found on the Arctic Coastal Plain usually results. Shallow groundwater may also be located under rivers where the development of permafrost is retarded due to the insulating properties of the river flow. Such sources probably contain groundwater of the highest quality since dissolved solids and other constituents become more concentrated with increasing depth.

Springs also occur in the vicinity of the proposed alignment; however, these and other sources of groundwater have not been completely surveyed. It is generally known, however, that alluvial deposits in the Tanana subregion east of Delta Junction may yield flows greater than 1000 gallons per minute of water suitable for public supply.

Surface waters in the vicinity of the route are also generally suitable for potable use. Iron, for example, is the only constituent found to be of excessive concentration in water samples.

Air and Noise Quality. Ambient air quality in the vicinity of the proposed route is generally considered to be typical of rural or remote areas, although activities at Prudhoe Bay and Fairbanks have probably caused some deterioration. In addition, emission sources associated with villages and highways may occasionally degrade air quality on a local basis. Natural sources of emissions such as dust generated by summer wind and forest fires may also be important contributions to local increases in air pollution.

Similarly, since most of the land adjacent to the pipeline route is undeveloped and very sparcely populated, existing ambient noise levels are low. Background noise is chiefly associated with vehicles utilizing the Alaska Highway, oil field activities at Prudhoe Bay, operation of the oil pipeline and ancillary facilities, and periodic aerial overflights of planes and helicopters.

As noted earlier, the area's climatology and topography create the potential for localized episodes of air stagnation in the vicinity of Fairbanks. Due to concurrent low temperature, thermal inversions often create conditions conductive to ice fog formation. Considered a form of air pollution, ice fog can also concentrate the effects of other emissions such as sulfur compounds and serve as a hazard to public safety.

Land Use. Historically, the Arctic Coastal Plain has been used primarily by nomadic native peoples. Consequently, until the discovery of the Prudhoe Bay Oil Pool in 1968, land use in the northern sector of Alcan's proposed route was one of subsistence hunting and fishing on the part of these natives. Exceptions included the development of military defense facilities such as DEW-line sites and nineteenth century whaling activities.

Land ownership has been almost exclusively Federal until the last few years. Substantial portions of land on the North Slope and elsewhere were subsequently transferred to the State of Alaska under provisions of the Alaska Statehood Act and to Alaska Native Regional and Village Corporations under provisions of the Alaska Native Claims Settlement Act.

Other portions of the proposed route are located exclusively within established transportation corridors on State, Federal, and privately held lands. The Alyeska system occupies this corridor from Prudhoe Bay to Delta Junction. East of Delta, Alcan parallels the Alaska Highway and the Haines products pipeline right-of-way. In fact, most of this land is not officially used for any other purpose. Although periodic settlements occur, the route is primarily uninhabited. Additional miscellaneous land uses include recreation, limited agriculture, mineral extraction, and forestry.

Recreation and Aesthetics. There are no established recreational facilities north of the Yukon River where access to the gravel haul road is restricted. Hence, the area presently exists as "de facto" wilderness with the exception of the activities and facilities associated with the Alyeska pipeline.

South of this point, there is increasing evidence of human activity. Two small public campgrounds, for example, exist at Tolovana River and Tatalina River. The community of Fairbanks also maintains numerous parks for day-use activities.

Other recreational activities occur east of Delta Junction adjacent to the Alaska Highway. For example, 10 public recreational areas exist southeasterly of Fairbanks along the Alaska/Richardson Highways. Topography along the Alaska Highway, however, generally restricts most recreational activity to the Tanana River or to the narrow corridor centered on the developed highway.

Archaeological Features. Archaeologic surveys of the Alyeska corridor were started in the early planning stages of that system. These surveys have continued to document

the paleoenvironmental setting of the corridor, including utilization of those areas spanning the range of human occupation from Paleoarctic sites to sites of recent abandonment. This work will continue as the oil pipeline is completed and the Alcan final alignment adjacent to the oil pipeline right-of-way is selected.

That portion of the route from Delta Junction to the Yukon Border has not benefited from a similarly intensive and systematic archaeological inventory. Limited surveys have been conducted during and subsequent to construction of the Alaska Highway. This work will be continued and intensified by Alcan prior to initiating construction activities in the area.

Native Culture. Native communities unimpacted by pipeline construction activities are located along the Alaska Highway portion of Alcan's proposed route east of Delta Junction. These communities are Dot Lake, Tanacross, Tetlin, and Northway; all are within the confines of the Doyon (Native) Corporation and Tanana Chiefs Conference political and social responsibility.

Virtually all of the inhabitants are interior Athabascans, but diversity within this general cultural group is evident. A recent study conducted for Alcan by University of Alaska social scientists has revealed the following information concerning the status of traditional native cultural activities and values in these communities:

1. The villages are now in a demographically transitional stage due to improved medical care causing a decrease in mortality rates and education and family planning causing a decrease in birth rates. The underdeveloped condition normally associated with "traditional" native culture is being abandoned and increasing participation in the work force of the Alaskan cash economy is evident;

2. Younger members of these communities are becoming increasingly oriented to the Euro-American life-style and economic activity and less oriented to the traditional subsistence life-style of the native Alaskan. Should these villages not develop a broader economic base, young persons will move away in increasing numbers in order to utilize the skills they have developed through education and training;

3. The maintenance of traditional life-styles is more pronounced in Tetlin than in any of the other three villages. The phenomenon is presumably associated with the inaccessibility of Tetlin by automobile. It has resulted in greater reliance on traditional subsistence life-styles and associated cultural values.

4. Tanacross is equally distinctive. However, its social and economic parameters are similar to those reflecting a modern, industrial society. Greater emphasis is placed on the wage economy and three-fourths of the work force indicates work skill or work experience.

Socioeconomics. Alaska's economic development began with the fur trade, and expanded with fisheries and timber and the discovery of gold, copper, and now petroleum resources. In the 1950's and the 1960's the area became primarily an exporter of military defense with construction of DEW-line stations and other military installations. More than 40 percent of the total work force of the state remains in government employment.

With the decline of defense spending, the value of natural resource production began to increase. Fisheries, forest products, and petroleum were contributing factors. Tourism is also a major industry within the state.

The civilian work force of the state grew with initiation of construction of the Alyeska pipeline system and now numbers approximately 160,000 persons. Due primarily to immigration of workers attracted to relatively high paying construction jobs, however, unemployment continues to be a state problem.

Historical patterns indicate that each job in pipeline construction generates a total of one to one and one-half secondary and indirect jobs within the Alaska economy.

Description of Existing Environment - Compressor Station Sites

Discussions developed in the preceeding subsections describe the existing environment along the entire Alcan alignment. As such, they also apply to the eight compressor station sites located at approximately equal intervals, along the route. The general nature of the descriptions, however, precludes a meaningful presentation of characteristics relating more specifically to the proposed station locations. Consequently, a detailed evaluation of the sites has been initiated in order to assess the environmental suitability of each and to assist in optimizing their final locations with respect to environmental and engineering feasibility issues.

As noted earlier, the sites were preliminarily selected on the basis of engineering gas flow studies to optimize system efficiency. These locations were examined for environmental compatability. As a result of this analysis, "preferred locations" were identified; further flow studies proved their engineering feasibility. Additional field work is now underway to confirm the preliminary observations. Descriptions contained herein will be supplemented at a later date as a result of these efforts.

The sites are designated numerically as AL-1 through AL-8 in consecutive order of occurrence by milepost from Prudhoe Bay to the Alaska-Yukon Border. Pertinent current environmental information, current geomorphic information, and information on other physical characteristics of each site is summarized in Tables 3, 4, and 5, respectively.

TABLE 5-3

SUMMARY OF CURRENT ENVIRONMENTAL INFORMATION
ON PREFERRED COMPRESSOR STATION SITES

COMPRESSOR STATIONS	VEGETATION TYPE	SENSITIVE HABITAT MAMMALS, BIRDS	WATERWAYS AND WATER BODIES PROXIMITY
AL-1 MP 75.0	Arctic tundra.	MAMMALS: Limited year-round moose habitat. Designated moose wintering area 2-3 mi. south. Possible grizzly bear usage area spring through fall. BIRDS: Sagwon Bluffs raptor nesting area approximately 2 miles south.	Sag River approximately 2000 feet east of site.
AL-2 MP 133.0	Arctic tundra, vegetation generally sparce.	MAMMALS: Located within southern limits of caribou wintering area, within southern limits of North Slope moose distribution. Big game movement area indicated north of site. BIRDS: No significant bird areas noted.	No major waterway within southern limits of caribou wintering area, within southern limits of North Slope moose distribution. Big game movement area indicated north of site.
AL-3 MP 242.0	Boreal, spruce and larger shrubs.	MAMMALS: Recognized caribou crossing 5-7 miles south. Dall sheep area to south associated with the Cathedral Mountains.	Middle Fork of Koyukuk River approximately ¼ to ½ mile from site.
AL-4 MP 331.0	Shrubs, heavily vegetated, some conifers locally.	MAMMALS: In or near southern limits of the historic winter range of Arctic caribou herd. Near high density black bear use area.	Ray River approximately 1 mile away. Nearest water bodies approximately ½ mile.

TABLE 5-3, CONTINUED

SUMMARY OF CURRENT ENVIRONMENTAL INFORMATION
ON PREFERRED COMPRESSORS STATION SITES

COMPRESSOR STATIONS	VEGETATION TYPE	SENSITIVE HABITAT MAMMALS, BIRDS	WATERWAYS AND WATER BODIES PROXIMITY
AL-5 MP 418.0	Mixed interior forest of spruce, birch, and balsam.	MAMMALS: Approximately 1 3/4 miles south of high density moose wintering area. Approximately 3/4 mile south of black bear area. BIRDS: 1 mile south of recognized golden eagle nesting area at Globe Creek.	Globe Creek approximately 1 mile north. No waterbodies within several miles.
AL-6 MP 504.5	Mixed interior forest of spruce and birch.	MAMMALS: Approximately 2 mi. northwest of high density moose wintering area. Historical caribou use are.	Less than ¼ mile from Gold Run Creek.
AL-7 MP 588.9	Mixed interior forest, moderate to heavy mixed birch, spruce, and balsam.	MAMMALS: Moose wintering and calving area in Tanana River flood plain and associated marsh lands. Moose move north and south after calving in May and June and return in the fall. BIRDS: Raptor nesting approximately 2 miles away.	The Tanana River is approximately ½ mile away. Marsh area within ¼ mile.
AL-8 MP 672.5	Mixed interior forest, birch and spruce vegetation.	MAMMALS: Several hundred caribou move south in Nov. and return north in March in the area between MP 665-675. Site is on eastern edge. BIRDS: Possible waterfowl nesting March 1 to July 30, molting in July.	The Tanana River is approximately 3/4 mile away.

TABLE 5-4

SUMMARY OF CURRENT GEOMORPHIC INFORMATION
ON PREFERRED COMPRESSOR STATION SITES

COMPRESSOR STATIONS	SEISMIC DATA GEO. FAULTING	TOPOGRAPHY/SLOPE OCCURRENCE OF PERMAFROST	SURFICIAL SOILS SUB-SURFACE SOILS
AL-1 MP 75.0	Maximum probable earthquake magniture of 6.0.-- No fault movement during Holocene time.	The terrain is of flat-topped terraces and separated by small scarps.--Generally present within 2 feet of surface. Generally absent in proximity to main river channels, may be present in depth Ice coats particles and fills voids with gravel. Ice wedges and masses present locally.	Alluvial terrace and floodplain Coarse sandy gravel and sand with minor amounts of silt. Gravel clasts sub-rounded. Generally poorly stratified with local beds and lenses of sand.--Bedrock locally close to surface, consists of cretaceous sediments.
AL-2 MP 133.0	Maximum probable earthquake magnitude of 6.0-- No fault movement during Holocene time.	Moderate to moderately steep mountainous slopes.-- Generally present within 2 feet of surface and locally ice-rich. Conspicuous ice wedges present locally in depressions.	Glacial fill, organics to silt with some sand; sandy gravel with some silt inter-bedded with gravel, sand, silt, cobbles and boulders.--Bedrock locally consists of cretaceous and jurassic sandstones, shales and conglomerates.
AL-3 MP 242.0	Maximum probable earthquake magnitude of 5.5 - 7.5.-- Isolated normal and thrust faults in the area. Generally trend east and west.	Gentle slopes, small hills.-- Generally within 2 feet of surface except under active stream channels.	Modern alluvium and older alluvium.--Silt, sand, and sub-angular to sub-rounded gravel with cobbles.

TABLE 5-4, CONTINUED

SUMMARY OF CURRENT GEOMORPHIC INFORMATION
ON PREFERRED COMPRESSOR STATION SITES

COMPRESSOR STATIONS	SEISMIC DATA GEO. FAULTING	TOPOGRAPHY/SLOPE OCCURRENCE OF PERMAFROST	SURFICIAL SOILS SUB SURFACE SOILS
AL-4 MP 331.0	Maximum probable earthquake magnitude at 7.5.--Possible faulting in bedrock units. No evidence of recent movement.	Moderate to gentle slopes. Steep slopes in the Fort Hamlin Hills area.--Generally present within 2 to 3 feet of the surface.	Colluvium wind blown silts.--Local outcrops of metamorphic and igneous bedrock. Colluvium is a heterogenous mixture of silt, sand, and rock fragments.
AL-5	Maximum probable earthquake magnitude of 7.5.--Local faulting including thrust faulting in bedrock units. Faults generally trend southwesterly and are concealed by recent sediments.	Topography consists of rounded fills with gentle to steep slopes.-- Permafrost generally present within 1 to 2 feet of surface. Depth may be 6 feet or more on south-facing slopes.	Colluvium, wind-deposited silts and silts of undifferential origins. Heterogenous mixing of silt, sand, and rock fragments.-- Rock types include chert, shale, siltstone, dolomite, limestone, graywacke and conglomerate.
AL-6 MP 504.5	Maximum probable earthwuake magnitude of 7.5.--No faulting activity at the site. Shaw Creek fault approximately 15 miles southeast.	Gentle slopes.--Permafrost varies throughout the area from 2 to 4 feet. Absent under rivers.	Alluvial silts near Gold Run Creek.--Alluvial fines with possible small gravels. Some perenially frozen silts.

TABLE 5-4, CONTINUED

SUMMARY OF CURRENT GEOMORPHIC INFORMATION
ON PREFERRED COMPRESSOR STATION SITES

COMPRESSOR STATIONS	SEISMIC DATA GEO. FAULTING	TOPOGRAPHY/SLOPE OCCURRENCE OF PERMAFROST	SURFICIAL SOILS SUB-SURFACE SOILS
AL-7 MP 588.9	Maximum probable earthquake magnitude of 7.5.--No recent faulting activity at the site. Southwest trending fault some distance north.	Gently sloping terrain.--Discontinuous permafrost, active layer of 8 feet to 10 feet.	Mainly glaciofluvial and alluvial in origin. Localized peat deposits.--Gravels and sands.
AL-8 MP 672.5	Maximum probable earthquake magnitude 7.5. Nothing recorded greater than 6.0 Smaller shocks have occurred.--Three parallel southeasterly trending faults reported to the north of Midway Lake	Gently sloping terrain.--Discontinuous permafrost zone. Low ice content soils and stable thaw.	Medium to fine sands.--The bedrock consists of granodiorite, schist, and quartzite, igneous and metamorphic.

TABLE 5-5

SUMMARY OF OTHER PHYSICAL LOCATION INFORMATION
ON PREFERRED COMPRESSOR STATION SITES

COMPRESSOR STATIONS	LAND OWNERSHIP OTHER	ACCESSIBILITY PROXIMITY TO ALYESKA	POTENTIAL MATERIAL SOURCES (Within 5 Miles)
AL-1 MP 75.0	U.S.A.	Compressor will be located west of haul road, short access road will be required (less than 1000 feet).--Close proximity to Alyeska, below ground mode. Location will be west of haul road.	Identified material source locations within 5 miles, material sites will not be located within 100 yards of the vegetated bank of a stream or lake.
AL-2 MP 133.0	U.S.A.	Access from haul road to ROW is close by.--Close proximity to Alyeska, above ground mode. Location west of haul road.	Seven identified material source locations within 5 miles, material sites will not be located within 100 yards of the vegetated bank of a stream or lake.
AL-3 MP 242.0	U.S.A.--This location was relocated to avoid the Koyukuk River floodplain.	Access readily available.--Close proximity to Alyeska above ground mode. Location west of haul road.	Seven identified material source locations within 5 miles. Material sites will not be located within 100 yards of the vegetated bank of a stream or lake.
AL-4 MP 331.0	U.S.A.	Access readily available to haul road.--Close proximity to Alyeska above ground mode. Location east of haul road.	Eight identified material source locations within 5 miles. Material sites will not be located within 100 yards of the vegetated bank of a stream or lake.

TABLE 5-5, CONTINUED

SUMMARY OF OTHER PHYSICAL LOCATION INFORMATION
ON PREFERRED COMPRESSOR STATION SITES

COMPRESSOR STATIONS	LAND OWNERSHIP OTHER	ACCESSIBILITY PROXIMITY TO ALYESKA	POTENTIAL MATERIAL SOURCES (Within 5 Miles)
AL-5 MP 418.0	U.S.A.--Compressor site relocated to avoid sensitive wildlife areas in the Globe Creek area.	Elliot Highway approximately 1½ mile away. Access possible to ROW at that point.--Close proximity to Alyeska below ground mode. Location east of the haul road.	Four identified material source locations within 5 miles. Material sites will not be located within 100 yards of the vegetated bank of a stream or lake.
AL-6 MP 504.5	State.	Access by ROW only. Possibly some unimproved roads for closer access.--Close proximity to Alyeska above ground mode. Location 9-10 miles north of Richardson Highway.	Four identified material source locations within 5 miles. Material sites will not be located within 100 yards of the vegetated bank of a stream or lake.
AL-7 MP 588.9	State.--Station relocated 1.4 miles northwest to edge of FEIS designated moose calving area.	Access available. Alaska Highway adjacent to ROW.--On Haines pipeline ROW. Not proximal to Alyeska. Location south of highway.	Material sources in this area will have to be identified or material purchased from private or state sources.
AL-8 MP 672.5	Northway Village Section.	Access available along Alaska Highway.--On Haines pipeline ROW. Not proximal to Alyeska. Location north of highway.	Material sources will have to be identified or material purchased from private or state sources.

Description of Potential Environmental Impacts And Mitigating Measures

Geology. Impact on the geologic environment will be caused primarily by the mining, transportation, and redistribution of borrow materials required to construct the work pad, haul road extensions, compressor station foundations, and to provide select aggregate materials for backfilling the pipeline trench. The most important impacts, however, will be primarily aesthetic and will be mitigated by revegetating borrow sources. Drainage disruption will be minor and mitigatible by installing proper control devices. Loss of game and other habitat is insignificant.

The most important impact will be the expenditure of a finite natural resource, aggregate. However, experts on gravel availability of the U.S. Department of Interior, Bureau of Land Management, have stated that "there is an unlimited quantity of materials available for pipeline construction along the proposed Alcan Pipeline Route" although "an exploration program will have to be mounted to locate new material sites" in certain areas where the Alyeska pipeline system has caused local shortages or where other agencies such as the Alaska Highway Department have exercised prior claim to available supplies.

The overall impact of the proposed project on topography will be similarly minor. The low, linear berm or mound of earth overlying the backfilled trench may persist as a temporary topographic feature for several years following completion of construction. Appropriate structural controls will minimize the possibility of adverse erosion along the berm and drainage structures will provide for normal flow of surface water across the trench. Settlement and thaw consolidation over the installed pipe will cause the berm to be gradually reduced to near grade level. Blasting and other excavation techniques will have no long term impact on topography or geology.

Soils. Soils excavated from the pipeline ditch will be placed adjacent to the open trench until the pipe has been laid in place. The spoil will then be used to backfill the trench. This process will result in a generally minor impact.

Select backfill materials may be utilized to mitigate frost heave and for other purposes. Excess spoil will be deposited in pre-selected and approved disposal sites or in borrow sites where the aggregate was originally extracted. These and other exposed soils along the refilled trench will be fertilized as needed and replanted with appropriate

vegetation. Revegetation will mitigate the long term effects of soil alterations.

Construction and operation of a buried, chilled natural gas pipeline may also present impacts due to changes in the local thermal regime of the soil and/or permafrost.

During construction, opening the trench and other activities will alter the thermal balance at the air-ground interface. In certain types of permafrost soils, notably those that are ice-rich and of fine grain, thawing of the permafrost may occur. Operation of the chilled gas line will also result in temperature discontinuities. Where the temperature of the gas is below the temperature of the soil, the depth of the active layer may be decreased. Where the chilled pipeline crosses sporadic permafrost in the discontinuous zone, freezing of unfrozen soils may occur. Formation of such a "frost bulb" around the pipeline may encourage "frost heave" depending upon the soil moisture conditions and the growth rate of the frost bulb.

Impacts related to surficial thaw will be mitigated by design criteria imposed to preclude thaw settlement, slope instability, and thaw-induced soil liquifaction. In addition, scheduling construction in fine-grain, ice-rich soils for periods of the year when the ambient temperatures are at or near freezing will minimize the occurrence of surficial thawing.

Frost heave is an occurrence which is well known and has been intensively investigated. It is known, for example, that heave is caused by volumetric expansion resulting from the freezing of the soil pore moisture which exists in-situ as well as that which "migrates" to the "freeze front" in the vicinity of the frost bulb surrounding the chilled pipeline. The magnitude of the heave depends, in turn, on a number of factors including depth of burial, temperature of the chilled gas, insulation afforded the buried pipeline, micro-climate of the site, and the thermal and physical characteristics of the earth material. Alcan intends to utilize bore-hole information collected during the design phase of the Alyeska pipeline system. Alcan has also planned a comprehensive soil boring program to collect additional pertinent data in addition to the over 200 holes that have already been drilled between Delta Junction and the Yukon border.

Along with plans to collect the necessary pre-design field information, Alcan has also incorporated measures into its conceptual design which are intended to mitigate the frost heave potential of soils along its alignment. These may include:

1. Insulation of the pipeline to decrease the rate of loss of heat from the soil to the pipe;

2. Backfilling with select materials to decrease moisture migration and soil water availability;

3. Controlled operation of the gas chillers to maintain the optimum gas temperature in relation to local soil conditions;

4. Deep burial or elevated berm height to increase the surcharge on the buried pipeline in limited, select locations; and

5. Elevation of the pipeline in limited, select locations.

Finally, Alcan is also participating in the development of a computer model for long term frost heave prediction which will be available to its design team prior to finalizing the pipeline design.

Seismicity. The proposed Alcan system will not induce or increase earthquake activity.

Earthquakes, in addition, are not expected to have a serious impact on the integrity of the Alcan system. As noted earlier, that portion of its system from Prudhoe Bay to 67^{o} N latitude has a maximum probable earthquake of magnitude 5.5 on the Richter Scale. Other areas are of similarly low seismicity. Seismic events associated with possible activity along the Denali fault, the only fault of concern to the system, have also been considered. Adequate design features are well known and have been incorporated into Alcan's conceptual design and cost estimates for a maximum magnitude of 8.5 on the Richter Scale. Consequently, selection of appropriate magnitude events for final system design such as the Design Maximum Earthquake will allow Alcan to continue to function should an event of the selected magnitude occur. Therefore, seismic activity presents no hazard to and will not impact the system.

Birds. Because the Alcan pipeline will be built along the Alyeska line and the Alaska Highway in a corridor in which birds have already been impacted, Alcan's alignment will produce minimal additional pressures on such species.

Peregrine falcon nesting sites occur in the Franklin Bluffs, Sagwon Bluffs and Robertson River areas. June, 1976, surveys at Franklin Bluffs and Sagwon Bluffs indicate that one nest is active at each location. These sites, located one to two and one-half miles from Alcan's alignment, will continue to be impacted by Alyeska-related activities along the haul road, with or without the construction of the Alcan pipeline. It is clear that minor site-specific realignments at either Franklin or Sagwon Bluffs can be accomplished to further mitigate impacts if necessary. Also, some construction activities, such as blasting, may be restricted near the nesting sites during the sensitive period of April and May. The Robertson river site is apparently not permanently active; the 6-8 nests in the area were not utilized in 1975. The pipeline will be far enough away from these inactive sites so that any potential adverse impacts will be avoided.

Two significant waterfowl habitats are found along the Alcan route. One is located about five miles north of the Alaska Highway, between the Gerstle and Robertson Rivers. This area is too far away from the Alcan alignment to be directly affected by pipeline construction and ongoing highway disturbances. The other waterfowl area is located between the Tanana River bridge and the Deadman Lake area (approximately MP 665-705). The Alaska Highway and the Alcan route are about three-quarters of a mile from this area at the closest point, and the habitat nearest the Alcan route is already impacted by activities along the Alaska Highway. In addition, Alcan realigned the routing to the north side of the highway in the Eliza-Yarger Lakes area in order to minimize impacts.

Mammals. The degree of development and use along the Alcan route means that significant additional impacts on mammals will also be avoided. Of course, interactions with mammals during pipeline construction can occur, such as during migration across or near the route. However, necessary restrictions on construction activities can be implemented to avoid or minimize impacts. Moreover, although some roads will be necessary for material site access, the Alaska Highway is already heavily utilized by hunters. Numerous sideroads enable hunters to get off the highway. Hence, new access to areas along the Alcan route which could serve to increase hunting pressure on mammals will not be provided.

Of primary concern are barren ground caribou, Dall sheep and moose. Although other mammals, such as bison and grizzly bear may be affected, interactions resulting in impact will be infrequent and minimal in effect. For example, while bison do occur along the pipeline route, no construction will occur near calving areas. Moreover, the migration of some 30-50 bison along the Haines pipeline corridor or across the Alaska Highway is of minor concern

and can be easily accommodated. Indeed, in the case of bison, habitat conditions from Delta Junction to the Gerstle River may be improved as a result of the Alcan project.

With respect to caribou herds, Alcan's impacts would not be significant. While Alcan will cross the ranges of the Arctic, Central Arctic, Porcupine and Forty-Mile herds, Alcan will avoid those herds' calving grounds. Thus, Alcan will avoid impacting those animals at the most sensitive time in their life cycle. Because of its emphasis on summer construction, Alcan will also minimize any impacts to caribou herds while they are on their wintering grounds.

Dall sheep occur primarily in the mountains along the Atigun and Dietrich River valleys. Although not extensive, Dall sheep habitat which could be affected by Alcan construction and operation are found in the Chandalar region. These sensitive areas have been identified and studied by biologists of the Alaska Department of Fish and Game (ADF&G) and by Joint State/Federal Fisheries and Wildlife Advisory Team (JFWAT) monitors both prior to and during the construction of the Alyeska pipeline. Another pipeline paralleling Alyeska will have no long-term harmful impacts on sheep. Implementation of appropriate mitigating measures, such as restrictions on construction activities, aerial overflights and human intrusion within one to three miles of lambing areas during mid-May to mid-June would reduce or eliminate potential adverse impacts of a short-term nature.

Construction and operation of the Alcan pipeline is unlikely to have a serious impact on moose. In fact, the effects of Alyeska construction on moose have been negligible. For the Alcan project, the only critical time for moose is the calving period, approximately mid-May to mid-June. Several known moose calving areas, such as the Shaw Creek Flats and certain areas along the lowlands of the Tanana River, are found near the Alcan route. However, moose are not restricted to particular calving grounds and can move to favorable calving habitats away from construction activity. If needed, construction can be scheduled to further reduce conflicts.

Fish. North of Delta Junction, JFWAT has identified fish sensitive streams and sensitive periods and has developed invaluable experience relating to both timing and design from Alyeska's construction of river crossings. Environmental impacts on fish will be minimized because of this detailed information and extensive on site experience.

Although similar data and experience has not been accumulated by JFWAT for Alcan's route east of Delta Junction, basic information is available from ADF&G surveys for the 30

streams that support fish. In addition, a stream catalogue of fish species which may be encountered has been completed by Alcan. The currently available information indicates that the mid-summer period is generally the least sensitive time, with many of the streams in this segment of the route either having very low flows or becoming dry in mid-summer. Alcan's flexibility to construct in or across particular streams utilizing a specialized "river crossing crew" in "winter" (i.e., frozen) or "summer" (i.e., flowing or dry) will maximize the ability to schedule around sensitive periods. In addition, aerial crossings of certain streams are planned.

Vegetation. The primary emphasis in revegetation will be on the approximately 180 miles of tundra vegetation encountered along the Alcan route because reseeding of tiaga vegetation is not now a technical problem. In developing its tundra revegetation plan, Alcan will benefit from experimentation which has been underway since 1969-70 in support of the Alyeska project and from Alyeska's current field experience. Alcan has also initiated inquires on the acquisition of the native seed necessary for tundra revegetation; it has been determined that the required seed could be obtained in a timely manner. For that portion of the route along the Haines pipeline-Alaska Highway corridor, Alcan will also be guided by the natural revegetation which has occurred as well as the success of the Highway Department in developing a revegetation plan. Detailed vegetation mapping and soil analysis are proposed to provide baseline information for the establishment of revegetation criteria for this segment of the route.

Climate. The Alcan system will have no short- or long-term impacts on the climate of Alaska.

The construction schedule of the Alcan system has been selected to avoid those months of the year when low ambient temperatures, high winds, and shortened periods of daylight hamper safe and efficient construction operations. Consequently, the harsh climate of Alaska will similarly have little impact on Alcan's ability to build the system according to the overall schedule and within the budget proposed.

Hydrology. Erosion resulting from diversion of streamflow or excavation in stream channels would be accelerated during pipeline construction. In addition, both vertical and lateral changes in channel shape and location may occur. However, Alcan has initiated the studies necessary to identify potential problem areas.

Drainage areas and sub-areas have been identified and specific hydrologic features of concern such as lakes, glaciers, streams, springs, and others have been isolated. Aggradation and scour, outburst flooding, and groundwater sources will also be delineated. Similar information has already been collected by Alyeska and the Alaska Highway Department for the common portion of the corridor shared by Alcan and the Alyeska pipeline right-of-way and by Alcan and the Alaska Highway, respectively. Site specific final designs will be based on this information in addition to discharge computations for all basins crossed by the proposed alignment and will preclude long term hydrologic impact on surface water channels and bodies.

The construction and operation of the pipeline is anticipated to have little effect on groundwater quantity or quality. The greatest impact would occur should the active layer overlaying permafrost be disrupted due to thermal imbalance. Design features and construction scheduleing will mitigate this possible impact, as noted earlier.

Finally, water will be withdrawn for the purpose of hydrostatically testing the completed pipeline and for use at work camps. Pre-use stream surveys conducted during final hydrologic design will allow adequate controls to be placed on water withdrawal and disposal, thereby mitigating possible impacts on aquatic biota, channel erosion patterns, flow patterns of streams, or surface and groundwater quality.

Air and Noise Quality. The impact of pipeline and compressor station construction on air and noise quality will occur only at widely scattered locations along the route and will be of short duration at each of these points of occurrence. At times the impact might be locally severe, but would be limited to the immediate vicinity of the construction spread or compressor station site.

Emissions associated with the construction program would be generated primarily due to the operation of internal combustion engines and propagation of construction generated dust. Vehicle emissions are considered to be a short term phenomenon which will cause no air or noise quality standard to be exceeded due to the application of appropriate mufflers and other control devices.

Compressor station operation will exert a long-term continuous impact on noise and emission levels near their respective sites. Federal emissions standards for gas-fired turbines have not been formulated; however, the emission of carbon monoxide, sulfur oxides, hydrocarbons, and particulates from these engines are low and will conform to state and local standards. Additionally, compressor stations will be equipped

with appropriate noise attenuation devices in order to preclude the long term promulgation of nuisance noise.

The potential for ice fog formation is present during winter months along the portion of the Alcan route from Prudhoe Bay to Delta Junction. However, Alcan proposes only limited winter construction. Consequently, this potential presents insignificant source of probable impact.

Operation of construction equipment and vehicles in the vicinity of Fairbanks also presents this potential. However, the selection of the previously mentioned construction season effectively excludes the extreme winter conditions under which ice fog formation is likely to occur. However, the emission of water vapor from the compressor stations will occur throughout the year. Such emission is covered by the Alaska Air Pollution Control Regulations. These rules and regulations will be observed during operation in order to minimize the possibility of generating ice fog at compressor station locations where such fog may interfere with the safety of workers or other persons using the common transportation corridor.

Land Use. Alcan will infringe upon no protected wilderness, scenic or wildlife areas in Alaska such as the Arctic National Wildlife Range and the Chugach National Forest. Further, Alcan will almost totally avoid undisturbed areas between Prudhoe Bay and Delta Junction, where Alcan will be immediately adjacent to the Alyeska workpad or haul road. For roughly 95 percent of the distance between Delta Junction and the Alaska-Canada border, Alcan will be on the existing Haines pipeline right-of-way, and will be near the Alaska Highway for that entire section. Hence, its impacts on alternate uses of these lands will be insignificant. In particular, no impacts on forestry, agriculture, or mineral extraction will occur.

Construction of the Alcan system may present serious short-term impacts on the highway system, especially during periods such as the recreational season when seasonally heavy use of highways normally occurs. These impacts, however, will not persist following completion of the project.

Recreation and Aesthetics. As noted earlier, the proposed Alcan route directly conflicts with no established recreational areas. Even after successful revegetation, however, the general aesthetic impact of the right-of-way may be significant to recreationers in the area. The existence of the Alyeska and Haines right-of-way tend to lessen the incremental impact of adding the Alcan system to the areas previously disturbed by these existing facilities.

Finally, local impact on the ground will vary considerably as a function of local vegetation cover, screening, and topography.

Archaeological Features. Impacts associated with construction of the Alcan system would be both direct and indirect. Direct impact would result from destruction of sites due to actual construction operations such as digging, blading, and borrow excavation. Indirect impacts would occur if construction workers collected artifacts uncovered during construction activities.

Alcan intends to mitigate these impacts by conducting detailed and intensive archaeological reconaissance surveys of the final pipeline alignment. All sites so noted will be surveyed by qualified professional archaeologists and excavated prior to construction so that the artifacts which may occur there are properly catalogued and preserved. In addition, restrictions to be formulated by Alcan will preclude worker activities which would otherwise threaten historical or archaeological finds inadvertently discovered along the route.

The program planned by Alcan is similar to the program implemented during design and construction of the Alyeska system which has successfully mitigated potential impacts on these valuable cultural resources.

Native Culture. Alcan has initiated studies which are necessary to assess the impact of its construction program on the native communities adjacent to the Alaska Highway portion of its proposed route. Although these studies are not yet completed, a number of preliminary conclusions relating to the severity of Alcan's possible impacts have been drawn. Among them are the following:

1. Impacts to Dot Lake and Tanacross will likely be less severe than might otherwise be postulated due to the degree of change already experienced by these communities as a result of their closeness to the highway and their current involvement in the cash economy. Alcan's plans will not materially alter the changes that have already occurred;

2. Impacts to Tetlin will be both quantitatively and qualitatively different from those occurring within the other communities. They require additional study prior to construction;

3. Both native and non-native residents of these communities may look favorably upon development of the Alcan system. Alcan's proposal represents a valid opportunity for training and jobs that may augment already existing economic development;

4. The project will probably move the natives in these communities further from their traditional, native lifestyle. This process, however, has already begun.

Socioeconomics. In economic terms, the net revenue contribution of Alcan construction and operation to the State of Alaska will be minor in comparison to the private capital costs of the project, the value of extracting the resource and transporting it to consumers, and the revenue derived by the state from this process. In any case, however, the Alcan proposal will result in a positive net economic benefit to both the State of Alaska and the nation as a whole.

Specifically, Alcan offers the potential for high employment and income and thus contributes to the total personal income of the residents of the state. As noted earlier, secondary sources of employment within the state and elsewhere are also made available due to the primary economic activity generated by the Alcan project.

Alcan may cause short-run inflationary pressures. However, initiation of the Alcan program will also alleviate recessionary trends in the state economy caused by demobilization of the construction work force assembled for the oil pipeline project. These impacts are difficult to quantify.

The Alcan proposal also offers a potential for social disruption and cost relating to housing, school, and medical needs and the provision of other essential social services to workers and their families. However, it should be noted that Alcan will not result in impacts in this sector comparable to those of the Alyeska program. Valuable lessons have been learned by the cognizant state agencies. In addition, Alcan will be constructed in areas of the state which have already geared up to handle the construction boom of the past several years. Hence, Alcan's impacts will likely be a continuation of existing conditions, moderated by the valuable lessons of the past few years, rather than imposition of new social costs on previously unstressed localities. Finally, the severity of all impacts on social and economic systems is dependent upon the comprehensive nature of the planning done by Alcan and state and local planning authorities. Alcan has committed to participating meaningfully in these efforts during the ample time available prior to the initiation of construction

Alternates to the Proposed Alcan 48" System

Original Proposal. Alcan filed with the FPC on July 9, 1976 for a certificate of public convenience and necessity to construct an Alaska natural gas transportation system. This application (herein referred to as the original Alcan proposal) was successfully supported by an extensive environmental exhibit and expert environmental witnesses.

A brief comparison of the original Alcan proposal and the 48" alternative follows. For a complete description of the original proposal, the reader should consult the Alcan application as amended and supported during the hearings.

The original proposal and the route of the 48" alternative are identical through Alaska. However, because of the greater efficiency of the 48" design, the number of compressor stations required to transport Prudhoe Bay gas through the Alaska portion of the transcontinental system has been reduced from 15 to 8 in the principal case. These new locations are described elsewhere.

In addition, a minor route modification in the British Columbia portion of Alcan's system (to be constructed and operated by Alcan's Canadian affiliate, Westcoast Transmission Company, Limited) plus Alcan's assumption not to deliver gas to Sumas, Washington, as originally proposed, have resulted in a shorter total system following an alignment which adheres to existing transportation corridors generally as did the original Alcan proposal.

Finally, the 48" diameter of the alternate proposal offers Alcan the opportunity to expand its system in the future if additional volumes of gas become available. Such expansion may be accomplished by adding compression at existing compressor stations or by adding new compressor stations at points intermediate to the eight locations previously described. Looping will not be required to achieve the necessary system expansion.

Absent the need to loop its original proposal, Alcan was selected by the FPC staff from among the three applicants competing for the certificate as the system which possesses the greatest degree of environmental compatibility. In addition, wildlife agencies within the State of Alaska, as well as knowledgeable conservation and resource preservation groups on the national level, have identified Alcan's original proposal as having environmental advantages not offered by its competitors.

Fairbanks Alternative. A Final Environmental Impact Statement concerning the Alaska Natural Gas Transportation System was published by the FPC on April 9, 1976. In that document, FPC selected the "Fairbanks Alternative" as the system which possessed the greatest environmental benefit.

The Fairbanks Alternative, as proposed by the FPC staff, consists of a new, large diameter, high pressure pipeline which would require no future looping. Such a pipeline would leave Prudhoe Bay and follow the Alyeska right-of-way to Delta Junction. At Delta Junction, the alignment would proceed southeast generally paralleling the Alaska Highway through the Yukon and British Columbia to a point near Dawson Creek. The alignment would then proceed southeast along the highway to Windfall, Alberta where it would join the existing Alberta Gas Trunk Line (AGTL) right-of-way. After paralleling AGTL to the Alberta/ Saskatchewan border near Empress, the right-of-way would parallel the Trans-Canada Pipe Lines alignment to Emerson, Manitoba. Crossing the international border, it would proceed south along the Mid-Western Gas Transmission Company right-of-way to Ada, Minnesota and then to eastern markets. Deliveries to western U.S. consumers would be accomplished by displacement, i.e. no pipeline would be constructed to directly serve the west.

The route of the Fairbanks Alternative is based primarily on Staff's preferential utilization of existing transportation corridors. Alcan subscribes to this principle and has designed a system which follows established corridors for more than 85% of its length. The Alcan system route and staff's Fairbanks Alternative are virtually identical from Prudhoe Bay to Empress.

As noted above, the Fairbanks Alternative as originally proposed by FPC paralleled Trans-Canada eastward from Empress. However, FPC has altered this earlier position by abandoning the Trans-Canada alignment in recommending in its "Position Brief" to the administrative law judge that the Northern Border proposal be certified. Certification of Northern Border also requires new pipeline construction from Empress to Monchy on the U.S. border in order to connect to the Northern Border system (and eastern markets) as proposed by Alcan.

Alcan's position on the route has been supported by Congressional mandate in the Alaska Natural Gas Transportation Act of 1976. Section 5 (b) (1) of the Act contains the following clear and unequivocal language regarding any recommendation regarding an Alaska gas transportation system made by the FPC:

> "shall (A) ... (B) ... (C) ... include provision for new facilities to the extent necessary to assure direct pipeline delivery of Alaska Natural Gas contemporaneously to points both east and west of the Rocky Mountains ..." (Emphasis added.)

Thus, even though divergent from the Fairbanks Alternative concept preferred by the FPC staff, Alcan maintains that it has adopted the correct response to the national need for a "western leg."

Conclusions. As a result of design changes described above, the environmental impact of Alcan's proposed 48" system is similar, but somewhat reduced as compared to the original proposal due to the reduction in the number of compressor stations. Reducing the number of compressor stations required in Alaska results in a significant reduction of acreage committed to permanent above-ground facilities for the life of the project. Additionally, total system emissions of water vapor, particulates, sulfur compounds and other potential pollutants are correspondingly diminished. In fact, the sole serious environmental disadvantage of the original system, the remote possibility that looping would be required in order to achieve incremental system expansion above 2.9 Bcf/d, has been completely eliminated.

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SECTION 6

CAPITAL COSTS

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SECTION 6

CAPITAL COSTS

Introduction

This section summarizes the estimated cost of facilities required for the Alcan Pipeline Project 48-Inch Alternative and details the cost estimate for the Alaskan segment, Alcan Pipeline Company (Alcan), as described below.

Exhibits 6-1 and 6-2 summarize total project capital costs on 1975 dollar cost basis and escalated dollar cost basis, respectively. For purposes of Exhibit 6-2, Alcan Pipeline Project companies have escalated the construction cost estimates embodied in Exhibit 6-1 through the year of construction expenditures to reflect the effects of anticipated general price level increases.

The estimate for Alcan facilities (Alaskan segment) is described under Cost Basis, Cost Categories, General Construction Schedule, and Detailed Cost Estimates; and includes the costs of labor, materials and supplies, construction equipment, logistics, contract work, insurance, injuries and damages, privileges, overheads charged to construction, and allowance for funds used during construction. The Alaskan segment of the alternative system when fully developed will consist of approximately 731 miles of 48-inch O.D. pipeline, 8 compressor/chiller stations, and the necessary ancillary facilities for complete system operations at an average day Prudhoe Bay input volume of 2.40 BCFD. The system would supply natural gas to two delivery points: Fairbanks and the Alaska/Yukon border near Scotty Creek.

ALCAN PIPELINE PROJECT
48-INCH ALTERNATIVE
SUMMARY OF CAPITAL COSTS
STATED IN 1975 DOLLARS
(Dollars in Millions)

Line No.		1977	1978	1979	1980	1981	1982	Total	Line No.
1	Alcan Pipeline Company [1]	$ --	$ --	$ 777.3	$ 986.9	$ 665.1	$ 16.2	$2,445.5	1
	Foothills Pipe Lines Ltd. [2]								
2	Yukon Section	16.7	121.8	317.5	364.9	150.3	11.7	982.9	2
3	Saskatchewan Section	2.7	1.9	3.2	75.1	42.9	10.7	136.5	3
	Alberta Gas Trunk Lines [3]								
4	(Canada)	--	--	--	404.2	232.3	44.8	681.3	4
	Westcoast Transmission Company Limited [4]								
5	Northern Section	--	60.5	126.8	294.3	226.6	27.7	735.9	5
6	Southern Section	--	.7	1.3	30.0	60.6	--	92.6	6
7	Subtotal Alaska-Canada Segment	$ 19.4	$ 184.9	$1,226.1	$2,155.4	$1,377.8	$ 111.1	$5,074.7	7
8	Pacific Gas Transmission [5]	--	--	61.4	142.4	51.0	--	254.8	8
9	Pacific Gas & Electric [5]	--	--	--	--	255.5	--	255.5	9
10	Northern Border Pipeline [6]	--	--	47.2	387.1	662.4	--	1,096.7	10
11	Total Project Capital Costs	$ 19.4	$ 184.9	$1,334.7	$2,684.9	$2,346.7	$ 111.1	$6,681.7	11

ALCAN PIPELINE PROJECT

NOTES

1/ Based on Exhibit D of Section 8 contained herein.

2/ Based on Volume 9 - Alaska Highway Project - 48-Inch Alternative filed by Foothills Pipe Lines (Yukon) Ltd., in February 1977 before the National Energy Board but adjusted to 1975 dollar costs.

3/ Based on Volume 2 - Alaska Highway Project - 48-Inch Alternative filed by Alberta Gas Trunk Line (Canada) Limited in February 1977 before the National Energy Board but adjusted to 1975 dollar costs.

4/ Based on Volume 10 - Alaska Highway Project - 48-Inch Alternative: Overview filed by Foothills Pipe Lines (Yukon) Ltd., in February 1977 before the National Energy Board but adjusted to 1975 dollar costs.

5/ Based on CP-76, Exhibit No. AP-15, Schedule F-3 (Revised) dated October 6, 1976, filed by Alcan Pipeline Company before the Federal Power Commission but adjusted to 1975 dollar costs.

6/ Based on CP-76, Exhibit No. AP-15, Schedule F-2 (Revised) dated October 6, 1976, filed by Alcan Pipeline Company before the Federal Power Commission but adjusted to 1975 dollar costs.

ALCAN PIPELINE PROJECT
48-INCH ALTERNATIVE
SUMMARY OF CAPITAL COSTS
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.		1977	1978	1979	1980	1981	1982	Total	Line No.
1	Alcan Pipeline Company [1]	$ --	$ --	$1,031.0	$1,418.7	$1,022.1	$ 26.7	$3,498.5	1
	Foothills Pipe Lines Ltd. [2]								
2	Yukon Section	16.7	149.9	415.3	504.1	206.3	17.5	1,309.8	2
3	Saskatchewan Section	2.7	2.2	3.5	104.2	63.6	16.0	192.2	3
	Alberta Gas Trunk Lines [3]								
4	(Canada)	--	--	--	559.5	342.1	70.0	971.6	4
	Westcoast Transmission Company Limited [4]								
5	Northern Section	--	93.6	196.1	455.3	364.4	36.3	1,145.7	5
6	Southern Section	--	1.2	2.1	47.8	96.7	--	147.8	6
7	Subtotal Alaska-Canada Segment	$ 19.4	$ 246.9	$1,648.0	$3,089.6	$2,095.2	$ 166.5	$7,265.6	7
8	Pacific Gas Transmission [5]	--	--	82.0	204.6	77.3	--	363.9	8
9	Pacific Gas & Electric [5]	--	--	--	--	387.8	--	387.8	9
10	Northern Border Pipeline [6]	--	--	61.9	546.3	1,005.1	--	1,613.3	10
11	Total Project Capital Costs	$ 19.4	$ 246.9	$1,791.9	$3,840.5	$3,565.4	$ 166.5	$9,630.6	11

ALCAN PIPELINE PROJECT

NOTES

1/ Based on Exhibit D of Section 8 contained herein.

2/ Based on Volume 9 - Alaska Highway Project - 48-Inch Alternative filed by Foothills Pipe Lines (Yukon) Ltd., in February 1977 before the National Energy Board.

3/ Based on Volume 2 - Alaska Highway Project - 48-Inch Alternative filed by Alberta Gas Trunk Line (Canada) Limited, in February 1977 before the National Energy Board.

4/ Based on Volume 10 - Alaska Highway Project - 48-Inch Alternative: Overview filed by Foothills Pipe Lines (Yukon) Ltd., in February 1977, before the National Energy Board.

5/ Based on CP75-96, Exhibit No. AP-15, Schedule F-3 (Revised) dated October 6, 1976, filed before the Federal Power Commission.

6/ Based on CP75-96, Exhibit No. AP-15, Schedule F-2 (Revised) dated October 6, 1976, filed before the Federal Power Commission.

DETAILED COST ESTIMATES

OF

ALCAN PIPELINE COMPANY - ALASKA SEGMENT

EXHIBIT 6-3
ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
TOTAL PROJECT COST SUMMARY
(1975 Dollar Costs)

COST CATEGORY	1979	1980	1981	1982	TOTAL ($1,000)
1. Pipeline	563,204	596,621	344,385	-	1,504,210
2. Compressor Station	21,390	137,431	42,377	9,814	211,012
3. Communications	685	1,875	2,440	-	5,000
4. General Plant	-	-	11,324	-	11,324
5. Sales Tax	40	40	20	-	100
6. Total Direct Cost	585,319	735,967	400,546	9,814	1,731,646
7. Temporary Facilities	48,164	3,773	4,286	92	56,315
8. Service & Supplies	4,350	24,621	21,741	682	51,394
9. Total Indirect Cost	52,514	28,394	26,027	774	107,709
10. Project Management	37,701	26,817	26,816	3,057	94,391
11. Intangible Plant	16,000	9,500	9,500	1,000	36,000
12. Subtotal	691,534	800,678	462,889	14,645	1,969,746
13. Contingency	31,119	36,031	20,830	659	88,639
14. Subtotal	722,653	836,709	483,719	15,304	2,058,385
15. AFUDC	54,600	150,200	181,400	900	387,100
16. TOTAL	777,253	986,909	665,119	16,204	2,445,485

EXHIBIT 6-4
ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
TOTAL PROJECT COST SUMMARY
(Escalated Dollars)

COST CATEGORY	1979	1980	1981	1982	TOTAL ($1,000)
1. Pipeline	743,483	865,168	543,932	-	2,152,583
2. Compressor Station	28,798	195,447	66,857	15,892	306,994
3. Communications	931	2,755	3,872	-	7,558
4. General Plant	-	-	17,597	-	17,597
5. Sales Tax	52	56	30	-	138
6. Total Direct Cost	773,264	1,063,426	632,288	15,892	2,484,870
7. Temporary Facilities	63,133	5,292	6,432	148	75,005
8. Service & Supplies	5,918	36,176	34,500	1,169	77,763
9. Total Indirect Cost	69,051	41,468	40,932	1,317	152,768
10. Project Management	51,292	39,403	42,554	5,239	138,488
11. Intangible Plant	21,768	13,959	15,075	1,714	52,516
12. Subtotal	915,375	1,158,256	730,849	24,162	2,828,642
13. Contingency	41,192	52,122	32,888	1,087	127,289
14. Subtotal	956,567	1,210,378	763,737	25,249	2,955,931
15. AFUDC	74,400	208,300	258,400	1,500	542,600
16. TOTAL	1,030,967	1,418,678	1,022,137	26,749	3,498,531

ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
TOTAL PROJECT COST SUMMARY
Breakdown By Material And Installation
(1975 Dollar Costs)

COST CATEGORY	1979	1980	1981	1982	TOTAL ($1,000)
1. Pipeline					
Material	457,814	171,677	29,748	-	659,239
Installation	105,390	424,944	314,637	-	844,971
2. Compressor Station					
Material	6,093	97,110	4,531	8,586	116,320
Installation	15,297	40,321	37,846	1,228	94,692
3. Communications	685	1,875	2,440	-	5,000
4. General Plant					
Material	-	-	4,335	-	4,335
Installation	-	-	6,989	-	6,989
5. Sales Tax	40	40	20	-	100
6. Total Direct Cost	585,319	735,967	400,546	9,814	1,731,646
7. Temporary Facilities	48,164	3,773	4,286	92	56,315
8. Service & Supplies	4,350	24,621	21,741	682	51,394
9. Total Indirect Cost	52,514	28,394	26,027	774	107,709
10. Project Management	37,701	26,817	26,816	3,057	94,391
11. Intangible Plant	16,000	9,500	9,500	1,000	36,000
12. Subtotal	691,534	800,678	462,889	14,645	1,969,746
13. Contingency	31,119	36,031	20,830	659	88,639
14. Subtotal	722,653	836,709	483,719	15,304	2,058,385
15. AFUDC	54,600	150,200	181,400	900	387,100
16. TOTAL	777,253	986,909	665,119	16,204	2,445,485

EXHIBIT 6-6
ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
TOTAL PROJECT COST SUMMARY
Breakdown By Material And Installation
(Escalated Dollars)

COST CATEGORY	1979	1980	1981	1982	TOTAL ($1,000)
1. Pipeline					
Material	600,101	240,786	44,643	-	885,530
Installation	143,382	624,382	499,289	-	1,267,053
2. Compressor Station					
Material	7,987	136,202	6,800	13,787	164,776
Installation	20,811	59,245	60,057	2,105	142,218
3. Communications	931	2,755	3,872	-	7,558
4. General Plant					
Material	-	-	6,506	-	6,506
Installation	-	-	11,091	-	11,091
5. Sales Tax	52	56	30	-	138
6. Total Direct Cost	773,264	1,063,426	632,288	15,892	2,484,870
7. Temporary Facilities	63,133	5,292	6,432	148	75,005
8. Service & Supplies	5,918	36,176	34,500	1,169	77,763
9. Total Indirect Cost	69,051	41,468	40,932	1,317	152,768
10. Project Management	51,292	39,403	42,554	5,239	138,488
11. Intangible Plant	21,768	13,959	15,075	1,714	52,516
12. Subtotal	915,375	1,158,256	730,849	24,162	2,828,642
13. Contingency	41,192	52,122	32,888	1,087	127,289
14. Subtotal	956,567	1,210,378	763,737	25,249	2,955,931
15. AFUDC	74,400	208,300	258,400	1,500	542,600
16. TOTAL	1,030,967	1,418,678	1,022,137	26,749	3,498,531

EXHIBIT 6-7
ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
COST OF PIPELINE PORTION SPLIT BY YEAR
1975 Dollar Costs ($1,000)

	1979	1980	1981	TOTAL
A. Land & Land Rights				
R.O.W.	987	261	-	1,248
Royalty	1,596	423	-	2,019
Damages	100	26	-	126
	2,683	710		3,393
B. Material				
Pipeline	403,703	155,901	29,748	589,352
Valves & Fittings	9,674	4,530	-	14,204
Coating	8,072	1,624	-	9,696
Weights	19,882	5,261	-	25,143
Miscellaneous	13,800	3,651	-	17,451
	455,131	170,967	29,748	655,846
C. Construction				
Mainline	75,715	306,689	226,976	609,380
Double Jointing	1,782	7,100	5,264	14,146
Aerial & Road Crossings	911	3,629	2,689	7,229
Civil	26,982	107,526	79,708	214,216
	105,390	424,944	314,637	844,971
TOTAL	563,204	596,621	344,385	1,504,210

EXHIBIT 6-8
ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
COST OF PIPELINE PORTION FROM 1975 BASE TO YEAR REQUIRED
(Escalated Dollars $1,000)

	COST BREAKDOWN	1979	1980	1981	TOTAL
	PIPELINE				
A.	Land & Land Rights				
	R.O.W.	1,294	366	-	1,660
	Royalty	2,092	593	-	2,685
	Damages	131	36	-	167
		3,517	995		4,512
B.	Material				
	Pipeline	529,172	218,659	44,643	792,474
	Valves & Fittings	12,681	6,354	-	19,035
	Coating	10,581	2,278	-	12,859
	Weights	26,061	7,379	-	33,440
	Miscellaneous	18,089	5,121		23,210
		596,584	239,791	44,643	881,018
C.	Construction				
	Mainline	103,009	450,627	360,182	913,818
	Double Jointing	2,425	10,432	8,353	21,210
	Aerial & Road Crossings	1,239	5,332	4,267	10,838
	Civil	36,709	157,991	126,487	321,187
		143,382	624,382	499,289	1,267,053
	TOTAL	743,483	865,168	543,932	2,152,583

EXHIBIT 6-9
ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
COST OF PIPELINE FACILITIES - COMPERSSOR STATIONS
(1,000's of 1975 Dollar Costs)
July 1, 1975 Cost Base By Calendar Year

DESCRIPTION	1979	1980	1981	1982	TOTAL
Station 1					
Material	$ 1,527	11,844	65	-	13,436
Installation	1,974	5,371	4,326	-	11,671
Station 2					
Material	1,527	13,844	65	-	15,436
Installation	1,974	5,371	5,326	-	12,671
Station 3					
Material	563	12,698	44	2,879	16,184
Installation	1,974	5,047	5,326	420	12,767
Station 4					
Material	543	12,570	2,906	-	16,019
Installation	1,875	4,747	5,472	-	12,094
Station 5					
Material	508	10,401	16	2,864	13,789
Installation	1,875	4,746	4,068	404	11,093
Station 6					
Material	497	12,934	11	-	13,442
Installation	1,875	5,091	4,069	-	11,035
Station 7					
Material	441	9,780	6	2,843	13,070
Installation	1,875	4,746	4,068	404	11,093
Station 8					
Material	486	12,873	22	-	13,381
Installation	1,875	5,091	4,068	-	11,034
Meter Stations					
Material	1	166	1,396	-	1,563
Installation	-	111	1,123	-	1,234
TOTAL MATERIAL	6,093	97,110	4,531	8,586	116,320
TOTAL INSTALLATION	15,297	40,321	37,846	1,228	94,692
TOTAL	21,390	137,431	42,377	9,814	211,012

EXHIBIT 6-10
ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
COST OF PIPELINE FACILITIES - COMPRESSOR STATIONS
(1,000's of Dollars)
July 1, 1975 Cost Base Escalated to Year of Construction

DESCRIPTION	1979	1980	1981	1982	TOTAL
Station 1					
Materials	$ 2,002	16,612	98	-	18,712
Installation	2,686	7,893	6,865	-	17,444
Station 2					
Materials	2,002	19,417	97	-	21,516
Installation	2,685	7,892	8,452	-	19,029
Station 3					
Materials	738	17,810	66	4,623	23,237
Installation	2,685	7,416	8,452	721	19,274
Station 4					
Materials	712	17,630	4,361	-	22,703
Installation	2,551	6,975	8,683	-	18,209
Station 5					
Materials	666	14,588	24	4,599	19,877
Installation	2,551	6,973	6,455	692	16,671
Station 6					
Materials	651	18,140	17	-	18,808
Installation	2,551	7,480	6,458	-	16,489
Station 7					
Materials	578	13,717	9	4,565	18,869
Installation	2,551	6,973	6,455	692	16,671
Station 8					
Materials	637	18,055	33	-	18,725
Installation	2,551	7,480	6,455	-	16,486
Meter Stations					
Materials	1	233	2,095	-	2,329
Installation	-	163	1,782	-	1,945
TOTAL MATERIALS	7,987	136,202	6,800	13,787	164,776
TOTAL INSTALLATION	20,811	59,245	60,057	2,105	142,218
TOTAL	28,798	195,447	66,857	15,892	306,994

EXHIBIT 6-11
ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
COST OF FACILITIES
GENERAL PLANT
(1975 Dollar Costs)

	ITEM	($1,000)
1.	District Headquarters	
	Civil work	$ 436
	Materials	2,998
	Installation	6,989
2.	Office Furniture & Equipment	51
3.	Transportation Equipment	339
4.	Maintenance Equipment	511
	TOTAL MATERIALS	4,335
	TOTAL INSTALLATION	6,989
	TOTAL	$ 11,324

EXHIBIT 6-12
ALCAN PIPELINE COMPANY
(48" ALTERNATIVE)
COST OF FACILITIES
GENERAL PLANT
(Escalated To 1981)

	ITEM	($1,000)
1.	District Headquarters	
	Civil Work	654
	Materials	4,500
	Installation	11,091
2.	Office Furniture & Equipment	78
3.	Transportation Equipment	507
4.	Maintenance Equipment	767
	TOTAL MATERIALS	6,506
	TOTAL INSTALLATION	11,091
	TOTAL	17,597

Cost Basis

The Cost of Facilities estimates are based on 1975 costs of labor, materials, equipment and supplies as quoted by vendors, contractors and consultants. The estimate has been developed by estimating the direct material purchase and installation costs of the separate facilities required for the system, and adding allowances for project overheads, contingencies, and funds used during construction.

The 1975 dollar cost base has been escalated through the appropriate year of material purchase or installation. Escalation rates used were as follows:

Labor	Eight percent per annum
Material	Seven percent per annum

Material costs for pipeline and stations are based on vendors' quotations.

It is emphasized that a major advantage offered by the Alcan proposal is that the Alcan project is not subject to the same cost and scheduling uncertainties which face typical frontier-area construction projects. Alcan system costs are more predictable as a result of the advantages of the proposed pipeline route and system construction plan. These advantages include:

a) An existing civil infrastructure, including road systems, borrow pits, the Alyeska work pad and air fields.

b) Existing construction support systems used for Alyeska construction, including construction camps, communication systems and pipeyards.

c) Established logistics patterns and capabilities, and year round continuous access along the entire route.

d) The use of an extended Alyeska work pad will make summer construction possible over the first 539 miles of the route. Summer construction will also be possible over much of the remainder of the route, where the line will parallel the Alcan highway.

e) Established construction techniques used on the Alyeska project will be used for Alcan pipeline construction where applicable.

f) As a result of the above advantages, the scale and complexity of construction operations will be such that effective project control and delegation of a share of construction cost responsibilities to the contractors will be possible.

Difficulties associated with unproven construction techniques in a remote and unserviced area will not be encountered by the Alcan system construction, thereby making project costs and schedules more predictable.

Cost Categories

The cost estimates for Alcan's proposed system have been presented in Exhibits 6-3 through 6-12 in terms of the following cost categories:

I. Pipeline

This category includes:

a) Land Costs. The costs of purchasing or leasing land for temporary and permanent pipeline facilities, including pipeline right-of-way, pipeline construction zone requirements, and appurtenance land requirements.

b) Material Costs. Material costs for mainline pipeline material include mainline carrier pipe and coating, scraper trap assemblies and bypass, mainline block valve assemblies, cathodic protection materials and frost heave mitigation. Materials generated on site---e.g., granular materials and riprap--- are included in pipeline installation costs. Included in the material costs are costs to ship the material to Alaska, and inland freight charges to haul the material to stockpile sites.

c) Installation Costs. Installation costs include all mainline construction operations, including pipe double-jointing operations, and the cost of installing pipeline appurtenances, Costs for the installation of the work pad extension required for construction of Alcan's system are also included in this section, as are right-of-way revegetation costs. The costs include construction materials and supplies, and contractor overhead and profit.

II. Compressor Stations and Meter Stations

Costs in this category include all costs associated with the installation of compression and metering facilities as described in Section 2. These costs include:

a) Land Costs. The costs for the purchase or lease of land required for station sites and access roads.

b) Material Costs. Compressor station costs are for a nominal 26,500 horsepower gas compression units, chiller units and ancillary station facilities for 8 stations. The cost of materials includes freight costs to Alaska, and inland freight costs to the compressor station sites.

c) Installation. Station installation costs include site development costs, material receiving costs, startup costs, and contractors' overhead and profit. The cost of construction materials and on-site generated materials are also included.

III. Communications

Costs include:

a) Leasing of a temporary construction communications system from the central Fairbanks project office to the contractors' jobsite offices. Field communications system costs are included in the direct contractor cost estimates for civil and pipeline construction.

b) Provision for a permanent supervisory control system as described in the original 42" filing with the FPC.

IV. General Plant

Costs for general plant include all costs associated with the installation and provision of operating and maintenance facilities and equipment.

V. Sales Tax

This category includes Federal and State taxes applied to the purchase price of all permanent and temporary material and equipment.

VI. Temporary Facilities

Temporary facilities provides for the costs of new camps required for construction crews, and the cost of mobilizing the existing Alyeska camps. Camp fuel costs are also included in this category.

VII. Service and Supplies

Service and supplies costs provide for catering services supplied to construction labor. These costs include food, transportation, preparation and service, laundry services, commissary services, cleaning equipment and supplies, linens, etc. Catering costs for project management personnel are included in the project management estimate.

VIII. Project Management and Associated Costs

This cost provides for the estimated cost of a project management contract. The project management contract would provide for all design and construction coordination functions of the project management group, and for project quality control, and reporting requirements. Costs in this category also provide for detailed engineering costs, and costs of head office operations prior to system startup.

IX. Intangible Plant

Intangible plant costs include pre-permit costs associated with the preparation of pipeline application supporting material, hearing costs, costs for engineering and construction planning prior to permit receipt, and costs associated with the requirements for interfacing with regulatory agencies. These costs include funds for regulatory agency studies and monitoring over the construction period.

X. Contingency

These costs represent unforeseen costs which may be encountered during the design and construction of the system.

XI. Allowance for Funds Used During Construction

These costs represent the cost of funds used during construction of Alcan's system.

General Construction Schedule

The construction schedule proposed for Alcan's Pipeline Company 48" Alternative system will span approximately three years prior to the initial flow of gas. An additional year, after the system is in operation, will be used to install needed compressor equipment to enable the system to transport the design capacity of 2.4 Bcf per average day. This is based on the forecasted gas availability at Prudhoe Bay.

The first year, 1979, will be devoted to the movement of materials and equipment, civil construction, and support facility construction. These programs will continue into the second year of construction.

Pipeline and compressor station construction will be started the second year, 1980. Five (5) full compressor stations, gas compressor and refrigeration, and three (3) refrigeration only stations are planned for the initial gas flow volume. Also, the three (3) required meter stations will be started.

The third year of construction, 1981, will involve the completion of the mainline and initial compressor and meter stations. The latter portion of this construction is planned to be devoted to testing, purging and packing the system.

The remaining three (3) gas compression units will be installed at the existing station sites during the additional construction year, 1982. This will complete the system required for the 2.4 Bcf/d.

SECTION 7

COST OF SERVICE

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SECTION 7

COST OF SERVICE

Introduction

This section summarizes the cost of service for the Alcan Pipeline Project 48-Inch Alternative and provides cost of service detail for the Alaskan segment.

Exhibits 7-1 and 7-2 depict cost of service to Western and Eastern markets on the 1975 dollar cost basis and escalated dollar cost basis, respectively. The cost of service summaries show both the transportation charges of the project companies and the cost of fuel (assumes $1.00/MMBTU) required to operate the system beginning October 1, 1981 and reaching full capacity by January 1, 1983. Additionally, it should be noted that a net fuel savings occurs in 1981 and 1982 along the western leg of the system due to improved operating efficiencies from greater volumes flowing through the Pacific Gas & Electric and Pacific Gas Transmission segments of the system. This is reflected incrementally as a reduction in the total cost of service for those two years, thereby reducing the unit cost of service associated with the Alaska gas.

Exhibits 7-3 through 7-12 detail the cost of service for Alcan's portion of the system for the years 1981 through 1987. As in the original Alcan proposal, a return on equity investment of 15 percent has been assumed. Similarly, debt expense rates, interest rates, and commitment fee rates are equivalent to those assumed in the original proposal.

ALCAN PIPELINE PROJECT
48-INCH ALTERNATIVE
COST OF SERVICE SUMMARY
STATED IN 1975 DOLLARS
(Dollars in Millions)

Line No.		1981	1982	1983	1984	1985	1986	1987	Line No.
	Western Leg								
1	Alcan, Net of Fairbanks Delivery	$ 40.5	$ 158.9	$ 151.8	$ 145.8	$ 139.2	$ 130.4	$ 121.4	1
2	Foothills - Yukon	11.5	56.5	57.8	55.8	54.7	53.6	52.7	2
3	Westcoast - Northern Section	10.8	42.7	43.7	43.1	42.2	41.5	40.5	3
4	AGTL (Canada)	7.4	40.1	40.8	38.6	37.2	35.8	34.7	4
5	Westcoast - Southern Section	4.8	18.5	18.0	17.8	17.4	17.1	16.7	5
6	PGT	7.4	43.7	44.1	43.0	41.5	40.8	40.2	6
7	PG&E	1.8	19.1	20.1	23.3	32.0	36.1	39.8	7
8	Subtotal	84.2	379.5	376.3	367.4	364.2	355.3	346.0	8
9	Fuel Cost to Lower 48 Markets ($1.00/MMBTU)	(1.3)[1/]	(3.7)[1/]	12.8	12.8	12.8	12.8	12.8	9
10	Total Cost of Service	$ 82.9	$ 375.8	$ 389.1	$ 380.2	$ 377.0	$ 368.1	$ 358.8	10
11	Volumes Delivered to Lower 48 Markets (MMBTU)	49.0	194.3	274.2	274.2	274.2	274.2	274.2	11
12	Unit Cost Delivered ($/MMBTU)	$ 1.69	$ 1.93	$ 1.42	$ 1.39	$ 1.37	$ 1.34	$ 1.31	12
	Eastern Leg								
13	Alcan, Net of Fairbanks Delivery	$ 99.2	$ 384.3	$ 365.4	$ 350.9	$ 335.0	$ 313.9	$ 292.1	13
14	Foothills - Yukon	27.9	136.6	139.0	134.1	131.8	128.9	126.8	14
15	Westcoast - Northern Section	26.5	103.4	105.3	103.9	101.8	99.8	97.5	15
16	AGTL (Canada)	18.2	97.0	98.1	92.9	89.6	86.3	83.4	16
17	Foothills - Saskatchewan	5.3	26.0	27.3	26.3	25.8	25.3	24.9	17
18	Northern Border Pipeline	115.1	221.2	214.6	208.9	203.6	192.3	180.3	18
19	Subtotal	292.2	968.5	949.7	917.0	887.6	846.5	805.0	19
20	Fuel Cost to Lower 48 Markets ($1.00/MMBTU)	5.4	25.5	50.5	50.5	50.5	50.5	50.5	20
21	Total Cost of Service	$ 297.6	$ 994.0	$1,000.2	$ 967.5	$ 938.1	$ 897.0	$ 855.5	21
22	Volumes Delivered to Lower 48 Markets (MMBTU)	111.2	435.9	640.6	640.6	640.6	640.6	640.6	22
23	Unit Cost Delivered ($/MMBTU)	$ 2.68	$ 2.28	$ 1.56	$ 1.51	$ 1.46	$ 1.40	$ 1.34	23
	Total Lower 48 Deliveries								
24	Total Cost of Service	$ 380.5	$1,369.8	$1,389.3	$1,347.7	$1,315.1	$1,265.1	$1,214.3	24
25	Total Delivered Volumes (MMBTU)	160.2	630.2	914.8	914.8	914.8	914.8	914.8	25
26	Average Unit Cost ($/MMBTU)	$ 2.38	$ 2.17	$ 1.52	$ 1.47	$ 1.44	$ 1.38	$ 1.33	26

1/ Incremental fuel savings on Lower 48 pipeline systems

Exhibit 7-1
Page 1 of 2

ALCAN PROJECT

NOTES

1/ Based on Exhibit 7-3 contained herein with cost of service allocated between western and eastern legs based on volumetric split at James River.

2/ Based on Volume 9 - Alaska Highway Project - 48-Inch Alternative filed by Foothills Pipe Lines (Yukon) Ltd., before the National Energy Board at Ottawa, Canada in February 1977, but adjusted to 1975 dollar costs. Allocation between western and eastern legs based on volumetric basis.

3/ Based on Volume 10 - Alaska Highway Project - 48-Inch Alternative: Overview filed by Foothills Pipe Lines (Yukon) Ltd., before the National Energy Board in February 1977, but adjusted to 1975 dollar costs. Allocation of cost of service for northern section of the pipeline based on volumetric basis between western and eastern legs.

4/ Based on Volume 2 - Alaska Highway Project - 48-Inch Alternative filed by Alberta Gas Trunk Line (Canada) Limited, before the National Energy Board in February 1977, but adjusted to 1975 dollar costs. Allocation of cost of service between western and eastern legs made on volumetric basis.

5/ Based on CP75-96, Exhibit AA-71 (JAJ-1) filed before the Federal Power Commission in May 1976.

ALCAN PIPELINE PROJECT
48-INCH ALTERNATIVE
COST OF SERVICE SUMMARY
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.		1981	1982	1983	1984	1985	1986	1987	Line No.
	Western Leg								
1	Alcan, Net of Fairbanks Delivery	$ 57.6	$ 226.0	$ 218.3	$ 209.7	$ 198.9	$ 187.3	$ 176.2	1
2	Foothills - Yukon	15.4	76.1	78.7	76.5	75.6	74.6	73.5	2
3	Westcoast - Northern Section	16.7	64.9	67.8	67.4	66.4	65.6	64.6	3
4	AGTL (Canada)	10.6	57.4	58.8	55.9	54.1	52.5	50.9	4
5	Westcoast - Southern Section	7.6	29.6	28.9	28.6	28.2	27.7	27.2	5
6	PGT	11.5	67.6	68.2	66.5	64.2	64.3	62.1	6
7	PG&E	2.7	28.9	30.6	35.3	48.6	54.8	60.4	7
8	Subtotal	122.1	550.5	551.3	539.9	536.0	526.8	515.4	8
9	Fuel Cost to Lower 48 Markets ($1.00/MMBTU)	(1.3) 1/	(3.7) 1/	12.8	12.8	12.8	12.8	12.8	9
10	Total Cost of Service	$ 120.8	$ 546.8	$ 564.1	$ 552.7	$ 548.8	$ 539.6	$ 528.2	10
11	Volumes Delivered to Lower 48 Markets (MMBTU)	49.0	194.3	274.2	274.2	274.2	274.2	274.2	11
12	Unit Cost Delivered ($/MMBTU)	$ 2.47	$ 2.81	$ 2.06	$ 2.02	$ 2.00	$ 1.97	$ 1.93	12
	Eastern Leg								
13	Alcan, Net of Fairbanks Delivery	$ 140.7	$ 546.5	$ 525.5	$ 504.7	$ 478.9	$ 450.7	$ 424.4	13
14	Foothills - Yukon	37.5	183.9	189.4	184.0	182.0	179.6	178.0	14
15	Westcoast - Northern Section	40.7	157.1	163.3	162.3	159.9	158.0	155.4	15
16	AGTL (Canada)	25.8	139.0	141.5	134.5	130.2	126.4	122.6	16
17	Foothills - Saskatchewan	7.5	37.3	39.4	38.2	37.6	37.1	36.8	17
18	Northern Border Pipeline	169.2	325.4	315.7	307.3	299.6	282.8	265.2	18
19	Subtotal	421.4	1,389.2	1,374.8	1,331.0	1,288.2	1,234.6	1,182.4	19
20	Fuel Cost to Lower 48 Markets ($1.00/MMBTU)	5.4	25.5	50.5	50.5	50.5	50.5	50.5	20
21	Total Cost of Service	$ 426.8	$1,414.7	$1,425.3	$1,381.5	$1,338.7	$1,285.1	$1,232.9	21
22	Volumes Delivered to Lower 48 Markets (MMBTU)	111.2	435.9	640.6	640.6	640.6	640.6	640.6	22
23	Unit Cost Delivered ($/MMBTU)	$ 3.84	$ 3.25	$ 2.22	$ 2.16	$ 2.09	$ 2.01	$ 1.92	23
	Total Lower 48 Deliveries								
24	Total Cost of Service	$ 547.6	$1,961.5	$1,989.4	$1,934.2	$1,887.5	$1,824.7	$1,761.1	24
25	Total Delivered Volumes (MMBTU)	160.2	630.2	914.8	914.8	914.8	914.8	914.8	25
26	Average Unit Cost ($/MMBTU)	$ 3.42	$ 3.11	$ 2.17	$ 2.11	$ 2.06	$ 1.99	$ 1.93	26

1/ Incremental fuel savings on Lower 48 pipeline systems

ALCAN PROJECT

NOTES

1/ Based on Exhibit 7-8 contained herein with cost of service allocated between western and eastern legs based on volumetric split at James River.

2/ Based on Volume 9 - Alaska Highway Project - 48-Inch Alternative filed by Foothills Pipe Lines (Yukon) Ltd., before the National Energy Board at Ottawa, Canada, in February 1977. Allocation between western and eastern legs based on volumetric basis.

3/ Based on Volume 10 - Alaska Highway Project - 48-Inch Alternative: Overview filed by Foothills Pipe Lines (Yukon) Ltd., before the National Energy Board in February 1977. Allocation of cost of service for northern section of the pipeline based on volumetric basis between western and eastern legs.

4/ Based on Volume 2 - Alaska Highway Project - 48-Inch Alternative filed by Alberta Gas Trunk Line (Canada) Limited, before the National Energy Board in February 1977. Allocation of cost of service for western and eastern legs based on volumetric basis.

5/ Based on CP75-95, Exhibit AA-71 (JAJ-1) filed before the Federal Power Commission in May 1976.

ALCAN PIPELINE COMPANY - ALASKAN SEGMENT

COST OF SERVICE

1975 DOLLAR COSTS

ALCAN PIPELINE COMPANY
PRO FORMA COST OF SERVICE
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN 1975 DOLLAR COSTS
(Dollars in Millions)

Line No.	Description (A)	Period of Initial Construction and Capacity Buildup 1979 (B)	1980 (C)	1981 (D)	1982 (E)	Initial Years of Full Operation 1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	Line No.
	Cost of Service										
1	Operation and Maintenance	$ --	$ --	$ 2.4	$ 9.5	$ 10.3	$ 10.3	$ 10.3	$ 10.3	$ 10.3	1
2	Administrative and General	--	--	1.1	4.7	4.7	4.7	4.7	4.7	4.7	2
3	Depreciation	--	--	24.3	97.2	97.8	97.8	97.8	97.8	97.8	3
4	Taxes Other Than Income	--	--	11.7	49.8	46.4	43.7	40.9	38.2	35.4	4
	Income Taxes										
5	Current (Federal and State)	--	--	--	--	--	35.5	75.7	71.6	67.0	5
6	Deferred (Federal and State)	--	--	31.4	120.4	119.7	86.2	43.8	37.2	30.7	6
7	Return on Rate Base	--	--	70.5	268.1	244.4	224.4	206.6	189.8	172.5	7
8	Total Cost of Service	$ --	$ --	$ 141.4	$ 549.7	$ 523.3	$ 502.6	$ 479.8	$ 449.6	$ 418.4	8
9	Allocated to Fairbanks	$ --	$ --	$ 1.7	$ 6.5	$ 6.1	$ 5.9	$ 5.6	$ 5.3	$ 4.9	9

Exhibit 7-3

ALCAN PIPELINE COMPANY
PRO FORMA STATEMENT OF REVENUES, EXPENSES AND INCOME
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN 1975 DOLLAR COSTS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
		1979	1980	1981	1982	1983	1984	1985	1986	1987	
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	
	Gas Transportation for Others										
1	Annual Contracted Receipts - BCF	--	--	147.2	584.0	876.0	876.0	876.0	876.0	876.0	1
2	Operating Revenues	$ --	$ --	$ 141.4	$ 549.7	$ 523.3	$ 502.6	$ 479.8	$ 449.6	$ 418.4	2
	Operating Expenses										
3	Operation and Maintenance	--	--	2.4	9.5	10.3	10.3	10.3	10.3	10.3	3
4	Administrative and General	--	--	1.1	4.7	4.7	4.7	4.7	4.7	4.7	4
5	Depreciation	--	--	24.3	97.2	97.8	97.8	97.8	97.8	97.8	5
6	Taxes Other Than Income	--	--	11.7	49.8	46.4	43.7	40.9	38.2	35.4	6
	Income Taxes										
7	Current (Federal and State)	--	--	--	--	--	35.5	75.7	71.6	67.0	7
8	Deferred (Federal and State)	--	--	31.4	120.4	119.7	86.2	43.8	37.2	30.7	8
9	Total Operating Expenses	--	--	70.9	281.6	278.9	278.2	273.2	259.8	245.9	9
10	Net Operating Income	$ --	$ --	$ 70.5	$ 268.1	$ 244.4	$ 224.4	$ 206.6	$ 189.8	$ 172.5	10
11	Rate Base	$ --	$ --	$2,408.7	$2,272.1	$2,070.8	$1,870.1	$1,707.3	$1,569.0	$1,437.2	11
12	Rate of Return	-- %	-- %	11.7%	11.8%	11.8%	12.0%	12.1%	12.1%	12.0%	12

Exhibit 7-4

ALCAN PIPELINE COMPANY
PRO FORMA RETURN ON RATE BASE
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN 1975 DOLLAR COSTS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
	(A)	1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
	Rate Base										
1	Average Plant in Service	$ --	$ --	$2,429.3	$2,429.3	$2,445.5	$2,445.5	$2,445.5	$2,445.5	$2,445.5	1
2	Less: Average Accumulated Depreciation	--	--	(12.2)	(72.9)	(170.4)	(268.2)	(366.0)	(463.8)	(561.6)	2
3	Average Net Plant	--	--	2,417.1	2,356.4	2,275.1	2,177.3	2,079.5	1,981.7	1,883.9	3
	Average Working Capital										
4	Cash Working Capital	--	--	1.5 2/	1.5	1.6	1.6	1.6	1.6	1.6	4
5	Materials and Supplies	--	--	3.2	3.2	3.2	3.2	3.2	3.2	3.2	5
6	Prepayments	--	--	2.6 2/	2.6	2.6	2.6	2.6	2.6	2.6	6
7	Total Average Working Capital	--	--	7.3	7.3	7.4	7.4	7.4	7.4	7.4	7
	Deduct:										
8	Average Accumulated Deferred Taxes	--	--	(15.7)	(91.6)	(211.7)	(314.6)	(379.6)	(420.1)	(454.1)	8
9	Rate Base	$ --	$ --	$2,408.7	$2,272.1	$2,070.8	$1,870.1	$1,707.3	$1,569.0	$1,437.2	9
10	Rate of Return	-- %	-- %	11.7%	11.8%	11.8%	12.0%	12.1%	12.1%	12.0%	10
11	Return on Rate Base	$ --	$ --	$ 70.5 1/	$ 268.1	$ 244.4	$ 224.4	$ 206.6	$ 189.8	$ 172.5	11

1/ Adjusted to reflect operations in fourth quarter only (1/4 x 11.7 x $2,408.7 = $70.5).

2/ Adjusted to annualized basis

ALCAN PIPELINE COMPANY
PRO FORMA RATE OF RETURN
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN 1975 DOLLAR COSTS
(Dollars in Millions)

Line No.	Description (A)	Period of Initial Construction and Capacity Buildup: 1979 (B)	1980 (C)	1981 (D)	1982 (E)	Initial Years of Full Operation: 1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	Line No.
	Average Capitalization										
1	Average Outstanding Debt, Less Average Unamortized Debt Expense	$ --	$ --	$1,719.0	$1,611.3	$1,395.4	$1,179.5	$1,035.5	$ 963.3	$ 891.1	1
2	Average Equity Including Retained Earnings	--	--	746.0	728.9	675.5	690.6	671.8	605.7	546.2	2
3	Total Average Capitalization	$ --	$ --	$2,465.0	$2,340.2	$2,070.9	$1,870.1	$1,707.3	$1,569.0	$1,437.3	3
	Capitalization Percentage										
4	Debt Percentage	-- %	-- %	69.7%	68.9%	67.4%	63.1%	60.7%	61.4%	62.0%	4
5	Equity Percentage	--	--	30.3	31.1	32.6	36.9	39.3	38.6	38.0	5
6	Total	-- %	-- %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	6
	Rate of Return										
7	Total Interest Charges	$ --	$ --	$ 43.8	$ 166.6	$ 143.0	$ 121.2	$ 105.3	$ 98.0	$ 90.7	7
8	Weighted Cost of Debt	-- %	-- %	10.2%	10.3%	10.2%	10.3%	10.2%	10.2%	10.2%	8
9	Rate of Return on Common Equity	-- %	-- %	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	9
	Rate of Return Components										
10	Debt Component	-- %	-- %	7.1%	7.1%	6.9%	6.5%	6.2%	6.3%	6.3%	10
11	Equity Component	--	--	4.6	4.7	4.9	5.5	5.9	5.8	5.7	11
12	Rate of Return	-- %	-- %	11.7%	11.8%	11.8%	12.0%	12.1%	12.1%	12.0%	12

Exhibit 7-6

ALCAN PIPELINE COMPANY
FEDERAL AND STATE INCOME TAXES
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN 1975 DOLLAR COSTS
(Dollars in Millions)

Line No.	Description (A)	Period of Initial Construction and Capacity Buildup 1979 (B)	1980 (C)	1981 (D)	1982 (E)	Initial Years of Full Operation 1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	Line No.
1	Return on Rate Base	$ --	$ --	$ 70.5	$ 268.1	$ 244.4	$ 224.4	$ 206.6	$ 189.8	$ 172.5	1
2	Less: Interest Charges	--	--	43.8	166.1	143.0	121.2	105.3	98.0	90.7	2
3	Equity Portion of Return	--	--	26.7	102.0	101.4	103.2	101.3	91.8	81.8	3
4	Book Depreciation of Equity Return Capitalized During Construction	--	--	1.3	5.2	5.2	5.2	5.2	5.2	5.2	4
5	Equity Return After Taxes	--	--	28.0	107.2	106.6	108.4	106.5	97.0	87.0	5
6	Federal Income Tax Expense	$ --	$ --	$ 25.8	$ 99.0	$ 98.4	$ 100.1	$ 98.3	$ 89.5	$ 80.3	6
7	Income After State Income Tax Expense	$ --	$ --	$ 53.8	$ 206.2	$ 205.0	$ 208.5	$ 204.8	$ 186.5	$ 167.3	7
8	State Income Tax Expense	$ --	$ --	$ 5.6	$ 21.4	$ 21.3	$ 21.6	$ 21.2	$ 19.3	$ 17.4	8
	Tax Timing Adjustments										
9	Interest Capitalized	37.3	100.0	118.4	.5	--	--	--	--	--	9
10	Tax Depreciation	--	--	115.1	217.8	199.5	187.9	175.4	163.0	150.6	10
11	Book Depreciation Less: Depreciation of Equity Return	--	--	(23.0)	(92.0)	(92.6)	(92.6)	(92.6)	(92.6)	(92.6)	11
12	Tax Loss Carry-Over	(37.3)	(100.0)	(151.1)	101.3	119.4	67.7	--	--	--	12
13	Total Adjustments	$ --	$ --	$ 59.4	$ 227.6	$ 226.3	$ 163.0	$ 82.8	$ 70.4	$ 58.0	13
	Deferred Income Taxes										
14	Federal	$ --	$ --	$ 25.8	$ 99.0	$ 98.4	$ 70.9	$ 36.0	$ 30.6	$ 25.2	14
15	State	--	--	5.6	21.4	21.3	15.3	7.8	6.6	5.5	15
16	Total Deferred Income Taxes	$ --	$ --	$ 31.4	$ 120.4	$ 119.7	$ 86.2	$ 43.8	$ 37.2	$ 30.7	16
	Tax Summary										
17	Current - Federal	$ --	$ --	$ --	$ --	$ --	$ 29.2	$ 62.3	$ 58.9	$ 55.1	17
18	- State	--	--	--	--	--	6.3	13.4	12.7	11.9	18
19	Deferred - Federal	--	--	25.8	99.0	98.4	70.9	36.0	30.6	25.2	19
20	- State	--	--	5.6	21.4	21.3	15.3	7.8	6.6	5.5	20
21	Total Tax Expense	$ --	$ --	$ 31.4	$ 120.4	$ 119.7	$ 121.7	$ 119.5	$ 108.8	$ 97.7	21
	Operating Loss Carry-Over										
22	Beginning Balance	$ --	$ 37.3	$ 137.3	$ 288.4	$ 187.1	$ 67.7	$ --	$ --	$ --	22
23	Less: Operating Loss Carry-Over Utilized	37.3	100.0	151.1	(101.3)	(119.4)	(67.7)	--	--	--	23
24	Ending Balance	$ 37.3	$ 137.3	$ 288.4	$ 187.1	$ 67.7	$ --	$ --	$ --	$ --	24
	Investment Tax Credit										
25	Beginning Balance	$ --	$ --	$ --	$ 187.3	$ 187.3	$ 188.3	$ 173.7	$ 142.5	$ 113.0	25
26	Additions	--	--	187.3	--	1.0	--	--	--	--	26
27	Less: Investment Tax Credit Utilized	--	--	--	--	--	(14.6)	(31.2)	(29.5)	(27.6)	27
28	Ending Balance	$ --	$ --	$ 187.3	$ 187.3	$ 188.3	$ 173.7	$ 142.5	$ 113.0	$ 85.4	28

Exhibit 7-7

ALCAN PIPELINE COMPANY - ALASKA SEGMENT

COST OF SERVICE

ESCALATED DOLLAR COSTS

ALCAN PIPELINE COMPANY
PRO FORMA COST OF SERVICE
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.	Description (A)	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
		1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
	Cost of Service										
1	Operation and Maintenance	$ --	$ --	$ 3.6	$ 14.2	$ 16.4	$ 17.4	$ 18.5	$ 19.7	$ 21.0	1
2	Administrative and General	--	--	1.7	7.1	7.8	8.4	9.0	9.7	10.4	2
3	Depreciation	--	--	34.7	138.9	139.9	139.9	139.9	139.9	139.9	3
4	Taxes Other Than Income	--	--	16.4	71.3	66.8	62.6	58.4	54.6	50.9	4
	Income Taxes										
5	Current (Federal and State)	--	--	--	--	--	53.3	102.6	97.3	93.4	5
6	Deferred (Federal and State)	--	--	44.4	170.0	171.6	119.5	63.4	54.0	44.5	6
7	Return on Rate Base	--	--	99.9	380.2	350.1	321.8	294.1	270.4	247.7	7
8	Total Cost of Service	$ --	$ --	$ 200.7	$ 781.7	$ 752.6	$ 722.9	$ 685.9	$ 645.6	$ 607.8	8
9	Allocated to Fairbanks	$ --	$ --	$ 2.4	$ 9.2	$ 8.8	$ 8.5	$ 8.1	$ 7.6	$ 7.1	9

ALCAN PIPELINE COMPANY
PRO FORMA STATEMENT OF REVENUES, EXPENSES AND INCOME
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
	(A)	1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
	Gas Transportation For Others										
1	Annual Contracted Receipts - BCF	--	--	147.2	584.0	876.0	876.0	876.0	876.0	876.0	1
2	Operating Revenues	$ --	$ --	$ 200.7	$ 781.7	$ 752.6	$ 722.9	$ 683.9	$ 645.6	$ 607.8	2
	Operating Expenses										
3	Operation and Maintenance	--	--	3.6	14.2	16.4	17.4	18.5	19.7	21.0	3
4	Administrative and General	--	--	1.7	7.1	7.8	8.4	9.0	9.7	10.4	4
5	Depreciation	--	--	34.7	138.9	139.9	139.9	139.9	139.9	139.9	5
6	Taxes Other Than Income	--	--	16.4	71.3	66.8	62.6	58.4	54.6	50.9	6
	Income Taxes										
7	Current (Federal and State)	--	--	--	--	--	53.3	102.6	97.3	93.4	7
8	Deferred (Federal and State)	--	--	44.4	170.0	171.6	119.5	63.4	54.0	44.5	8
9	Total Operating Expenses	--	--	100.8	401.5	402.5	401.1	391.8	375.2	360.1	9
10	Net Operating Income	$ --	$ --	$ 99.9	$ 380.2	$ 350.1	$ 321.8	$ 294.1	$ 270.4	$ 247.7	10
11	Rate Base	$ --	$ --	$3,443.4	$3,249.7	$2,966.8	$2,681.8	$2,451.0	$2,253.0	$2,064.4	11
12	Rate of Return	-- %	-- %	11.6%	11.7%	11.8%	12.0%	12.0%	12.0%	12.0%	12

ALCAN PIPELINE COMPANY
PRO FORMA RETURN ON RATE BASE
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
	(A)	1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
	Rate Base										
1	Average Plant In Service	$ --	$ --	$3,471.8	$3,471.8	$3,498.5	$3,498.5	$3,498.5	$3,498.5	$3,498.5	1
2	Less: Average Accumulated Depreciation	--	--	(17.4)	(104.2)	(243.6)	(383.5)	(523.4)	(663.3)	(803.2)	2
3	Average Net Plant	--	--	3,454.4	3,367.6	3,254.9	3,115.0	2,975.1	2,835.2	2,695.3	3
	Average Working Capital										
4	Cash Working Capital	--	--	2.2 2/	2.2	2.5	2.7	2.9	3.1	3.3	4
5	Materials and Supplies	--	--	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5
6	Prepayments	--	--	3.6 2/	3.9	4.2	4.5	4.8	5.2	5.6	6
7	Total Average Working Capital	--	--	11.2	11.5	12.1	12.6	13.1	13.7	14.3	7
	Deduct:										
8	Average Accumulated Deferred Taxes	--	--	(22.2)	(129.4)	(300.2)	(445.8)	(537.2)	(595.9)	(645.2)	8
9	Rate Base	$ --	$ --	$3,443.4	$3,249.7	$2,966.8	$2,681.8	$2,451.0	$2,253.0	$2,064.4	9
10	Rate of Return	--	--	11.6%	11.7%	11.8%	12.0%	12.0%	12.0%	12.0%	10
11	Return on Rate Base	$ --	$ --	$ 99.9 1/	$ 380.2	$ 350.1	$ 321.8	$ 294.1	$ 270.4	$ 247.7	11

1/ Adjusted to reflect operations in fourth quarter only (1/4 x 11.6% x $3,443.4 = $99.9).

2/ Adjusted to annualized basis.

ALCAN PIPELINE COMPANY
PRO FORMA RATE OF RETURN
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
	(A)	1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
	Average Capitalization										
1	Average Outstanding Debt, Less Average Unamortized Debt Expense	$ --	$ --	$2,440.7	$2,295.4	$2,004.2	$1,713.0	$1,514.8	$1,409.7	$1,304.6	1
2	Average Equity, Including Retained Earnings	--	--	1,049.9	1,020.7	962.4	968.5	936.0	843.1	759.7	2
3	Total Average Capitalization	$ --	$ --	$3,490.6	$3,316.1	$2,966.6	$2,681.5	$2,450.8	$2,252.8	$2,064.3	3
	Capitalization Percentage										
4	Debt Percentage	-- %	-- %	69.9%	69.2%	67.6%	63.9%	61.8%	62.6%	63.2%	4
5	Equity Percentage	--	--	30.1	30.8	32.4	36.1	38.2	37.4	36.8	5
6	Total	-- %	-- %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	6
	Rate of Return										
7	Total Interest Charges	$ --	$ --	$ 62.3 2/	$ 237.3	$ 205.0	$ 175.6	$ 153.9	$ 143.3	$ 132.6	7
8	Weighted Cost of Debt	-- %	-- %	10.2% 1/	10.3%	10.2%	10.2%	10.2%	10.2%	10.2%	8
9	Rate of Return on Common Equity	-- %	-- %	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	9
10	Rate of Return Components										
	Debt Component	-- %	-- %	7.1%	7.1%	6.9%	6.6%	6.3%	6.4%	6.4%	10
11	Equity Component	--	--	4.5	4.6	4.9	5.4	5.7	5.6	5.6	11
12	Rate of Return	-- %	-- %	11.6%	11.7%	11.8%	12.0%	12.0%	12.0%	12.0%	12

1/ Annualized basis

2/ Adjusted to reflect fourth quarter only

FEDERAL AND STATE INCOME TAXES
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
	(A)	1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
1	Return on Rate Base	$ --	$ --	$ 99.9	$ 380.2	$ 350.1	$ 321.8	$ 294.1	$ 270.4	$ 247.7	1
2	Less: Interest Charges	--	--	62.3	236.4	205.0	175.6	153.9	143.3	132.6	2
3	Equity Portion of Return	--	--	37.6	143.8	145.1	146.2	140.2	127.1	115.1	3
4	Book Depreciation of Equity Return Capitalized During Construction	--	--	1.9	7.6	7.7	7.7	7.7	7.7	7.7	4
5	Equity Return After Taxes	--	--	39.5	151.4	152.8	153.9	147.9	134.8	122.8	5
6	Federal Income Tax Expense	$ --	$ --	$ 36.5	$ 139.8	$ 141.1	$ 142.1	$ 136.5	$ 124.4	$ 113.4	6
7	Income After State Income Tax Expense	$ --	$ --	$ 76.0	$ 291.2	$ 293.9	$ 296.0	$ 284.4	$ 259.2	$ 236.2	7
8	State Income Tax Expense	$ --	$ --	$ 7.9	$ 30.2	$ 30.5	$ 30.7	$ 29.5	$ 26.9	$ 24.5	8
	Tax Timing Adjustments										
9	Interest Capitalized	48.9	134.7	166.8	.9	--	--	--	--	--	9
10	Tax Depreciation	--	--	164.3	312.3	286.4	269.9	252.0	234.2	216.3	10
	Book Depreciation Less:										
11	Depreciation of Equity Return	--	--	(32.8)	(131.3)	(132.2)	(132.2)	(132.2)	(132.2)	(132.2)	11
12	Tax Loss Carry-Over	(48.9)	(134.7)	(214.4)	139.5	170.2	88.3	--	--	--	12
13	Total Adjustments	$ --	$ --	$ 83.9	$ 321.4	$ 324.4	$ 226.0	$ 119.8	$ 102.0	$ 84.1	13
	Deferred Income Taxes										
14	Federal	$ --	$ --	$ 36.5	$ 139.8	$ 141.1	$ 98.3	$ 52.1	$ 44.4	$ 36.6	14
15	State	--	--	7.9	30.2	30.5	21.2	11.3	9.6	7.9	15
16	Total Deferred Income Taxes	$ --	$ --	$ 44.4	$ 170.0	$ 171.6	$ 119.5	$ 63.4	$ 54.0	$ 44.5	16
	Tax Summary										
17	Current Tax - Federal	$ --	$ --	$ --	$ --	$ --	$ 43.8	$ 84.4	$ 80.0	$ 76.8	17
18	- State	--	--	--	--	--	9.5	18.2	17.3	16.6	18
19	Deferred Tax - Federal	--	--	36.5	139.8	141.1	98.3	52.1	44.4	36.6	19
20	- State	--	--	7.9	30.2	30.5	21.2	11.3	9.6	7.9	20
21	Total Tax Expense	$ --	$ --	$ 44.4	$ 170.0	$ 171.6	$ 172.8	$ 166.0	$ 151.3	$ 137.9	21
	Operating Loss Carry-Over										
22	Beginning Balance	$ --	$ 48.9	$ 183.6	$ 398.0	$ 258.5	$ 88.3	$ --	$ --	$ --	22
23	Less: Operating Loss Carry-Over Utilized	48.9	134.7	214.4	(139.5)	(170.2)	(88.3)	--	--	--	23
24	Ending Balance	$ 48.9	$ 183.6	$ 398.0	$ 258.5	$ 88.3	$ --	$ --	$ --	$ --	24
	Investment Tax Credit										
25	Beginning Balance	$ --	$ --	$ --	$ 265.6	$ 265.6	$ 267.2	$ 245.3	$ 203.1	$ 163.1	25
26	Additions	--	--	265.6	--	1.6	--	--	--	--	26
27	Less: Investment Tax Credit Utilized	--	--	--	--	--	(21.9)	(42.2)	(40.0)	(38.4)	27
28	Ending Balance	$ --	$ --	$ 265.6	$ 265.6	$ 267.2	$ 245.3	$ 203.1	$ 163.1	$ 124.7	28

SECTION 8

FINANCING

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SECTION 8

FINANCING

Introduction

The 48-inch alternative will be financed within the conceptual framework established for the original Alcan proposal as filed with the FPC in July, 1976. The newly established companies, Alcan, Foothills (Yukon) and Northern Border will raise funds via project financing whereby revenues from the facilities to be constructed will provide cash flow to pay all costs and expenses, including debt service. The operating companies, AGTL, Westcoast, PGT and PG&E will raise funds in a conventional manner by expanding their existing capital structures relying upon their general corporate credit.

The capital costs of the 48-inch alternative stated in escalated dollars, are estimated to be $9.6 billion, as shown above in Section 6. The financing requirements of the sponsoring companies for the years of construction are presented in Exhibits A, B and C attached herein. These exhibits show the total corporate requirements of each company by type of security expected to be issued, by country and by year.

Credit Support

The project companies will build facilities to transport Alaska gas and will provide a transportation service for natural gas transmission companies (shippers) who will have contracted for the purchase of Alaska gas. The natural gas will be owned by the shippers during its transportation to their respective markets, not by the transportation companies. The transportation service will be provided pursuant to tariffs, or contractual agreements prior to the tariffs becoming effective, since the Natural Gas Act prohibits tariffs from becoming effective until service is rendered. The cash flow that is essential for the financing of the Alcan Pipeline Project will be provided by the tariffs or their contractual counterparts which will require as a minimum that as of a date certain shippers will begin to make monthly payments to the transportation companies in amounts sufficient to cover prudently incurred operating expenses and debt service. The date certain will be negotiated between the transportation companies, shippers and lenders; but for this discussion and the preparation of pro

forma financial statements, is assumed to be four years from the commencement of construction, or one year after scheduled completion.

Shippers must have the ability to "track" such costs through to their customers much in the same manner that purchased gas costs are currently handled under purchased gas adjustment clauses. Alcan's financing plan places primary reliance upon the tariff mechanism and complete tracking of the resultant charges. If such tracking is not obtainable in a form satisfactory to lenders, Alcan believes that some kind of contingent financial support from the U.S. government or other creditworthy parties is necessary.

The credit underpinnings of the Alcan Pipeline Project, being based upon financial access to a large number of consumers of natural gas, require that the revenue streams provided by the tariffs or contractual agreements continue under all circumstances, including the situation where no transportation service is provided because of noncompletion or extended interruption of service. Investors will not invest in the project unless shippers have an unconditional obligation to continue to make the monthly payments. The issue of tracking assumes such importance because the shippers are otherwise unable to make payments during extended periods when no service is being provided. It is only in the absence of reliable tracking during periods of no service that Alcan suggests supplementary financial support from the U.S. government or other creditworthy parties. Alcan believes that it is proper that the final decision as to whether the ultimate financial support for the system be provided by the natural gas consuming public in the form of tracking or by the taxpaying public in the form of guarantee or insurance programs, be made in the regulatory and political arenas.

Alcan does not feel that tariff mechanisms are adequate alternatives to economically and technically viable projects. Alcan believes that the economics of its project are sound, and that it will be able to convince investors of this important fact. It believes that adequate gas reserves are in place to support its project, that the technical aspects of its proposal, including the routing, are superior to those of Arctic Gas or El Paso and that lenders will take strong comfort from these features, including its use of existing utility corridors. Alcan's belief that lenders will receive assurance from its technology is a major reason why Alcan does not categorically state that U.S. government guarantees are absolute necessities, as does Arctic Gas.

The financing plans of members of the Alcan Pipeline Project provide that the project financed companies obtain commitments prior to commencement of construction for 120 percent of the escalated capital requirements, thereby providing a contingency for cost overruns and delay in generation of funds from operations. The operating companies will contract to complete their respective portions of the transportation system and must either be considered by investors as having the financial integrity required to obtain the funds as needed, or arrange to have them committed to in advance. The companies feel strongly that such commitments will not be necessary and their financial plans, therefore, do not utilize such a technique. Furthermore, it should be noted that relying solely on committed funds denies the issuing company the flexibility of using public markets.

Alcan believes that the following regulatory steps which will assist in the financing, some of which will require legislation, should be taken:

1) Order that Alaska gas be priced to the distribution companies on a rolled-in basis.

2) Authorize full cost of service tariffs for the project companies, thereby permitting the transportation companies to recover from the shippers of Alaska gas all prudently incurred costs.

3) Provide all regulatory approvals necessary to permit shippers to provide for tracking all costs incurred pursuant to the transportation company's cost of service tariff or to the contractual agreements entered into in lieu of such tariffs.

4) Allow regulated natural gas companies to include their investments in a project transportation company in their rate bases at least until the project becomes operational.

5) Provide a method to insure that local regulatory authorities cannot impede the distribution company's ability to recover, on a timely basis, all project costs from the ultimate consumer.

6) Assure that required regulatory approvals will remain in effect during the life of the project.

Alcan Pipeline Company Financing Plan

A general description of the financing of the Alcan Pipeline Company is shown below. Pro forma financial statements for Alcan Pipeline Company are shown in Exhibit D.

Class of Investors	Escalated Dollars in Millions: Estimated Capital Requirements	Estimated Contingency Requirements	Estimated Total Commitments
(a) Institutional lenders	$1,900	$380	$2,280
(b) Commercial banks	563	113	676
(c) Equity holders	840	168	1,008
	$3,303	$661	$3,964

Institutional Lenders

This plan assumes that U.S. institutional lenders, consisting of major life insurance companies and others, will provide approximately 57.5 percent of the external cash requirements of the Alaskan facilities. Such lenders' commitments will exceed their share of the estimated capital requirements by 20 percent to provide for contingencies. The commitments will be in place prior to the initiation of construction and Alcan Pipeline Company will pay a commitment fee on all unused portions of the commitments.

The mortgage bonds will have a maturity of twenty-one years; or, in the event operations begin as scheduled (as shown in the financial statements in Exhibit D), a maturity of twenty years. The following table summarizes the timing of the first mortgage bond takedowns and repayments:

Amount	Takedown	Term 1/	Number of Annual Sinking Funds Payments 1/	Percent of Issue Retired Annually
$ 500 million	1979	20 Years	17	5.88%
$1,000 million	1980	20 Years	18	5.56%
$ 400 million	1981	20 Years	19	5.26%

1/ In the event operations are delayed, the initiation of sinking fund payments would be delayed by one year thereby extending the term of the bonds by one year.

Commercial Banks

A commercial bank loan commitment for $676 million will be obtained from a syndicate of U.S. commercial banks. The commitment exceeds the projected bank borrowings by 20 percent as a contingency for unforeseen increases in construction costs. The bank loan will be structured as a four-year revolving credit, which will be converted to a term loan to be amortized equally over three years. Although Exhibit B reflects a conversion of the revolving credit during 1982, the revolving credit commitment will be available through the end of 1982, thereby providing an additional year of credit availability in the event operations do not begin as scheduled. During the construction period, borrowings under the bank credit will periodically be reduced by the proceeds from the sale of other long-term debt. The bank credit will be secured and rank pari passu with the first mortgage bonds.

Equity Holders

At least $340 million of equity will be contributed prior to the date of commencement of construction. Subsequent equity contributions of $250 million and $750 million, respectively, will be made no later than 12 months and 24 months after such date. Lenders will have to be satisfied that the subsequent infusions of equity will, in fact, be forthcoming. If they cannot be satisfied, they will require that all of the equity funds be in place before any borrowings are taken down.

In addition, the equity investors will be committed to contribute additional amounts up to 20 percent of their share of the estimated capital requirements, as shown on the table on the previous page, as part of the plan to provide for contingencies.

Conclusion

Alcan has retained Lodb, Rhoades & Company, Inc., and Bank of America National Trust & Savings Association to advise it with respect to alternatives and requirements relating to long-term financing and commercial banking, respectively.

Dominion Securities Limited, The First Boston Corporation and Canadian Imperial Bank of Commerce have performed similar roles for Foothills (Yukon). Dominion Securities Limited and Pitfield, Mackay, Ross & Company Limited, have advised AGTL with respect to long-term financing; and McLeod, Young, Weir & Company Limited, have similarly advised Westcoast. All of the financial advisors have studied the capacities of financial markets within their respective areas of expertise and believe that:

1) the financing plans of their respective clients represent feasible bases for financing each company's requirements;

2) the overall plan for financing of the Alcan Pipeline Project, as shown herein, is reasonable; and

3) the financial markets that are planned to be utilized have sufficient capacity to provide the necessary funds.

SUMMARY BASIC FINANCING REQUIREMENTS
OF COMPANIES ASSOCIATED WITH THE
ALCAN PIPELINE PROJECT 48-INCH ALTERNATIVE
(Dollars in Millions)

	1978		1979		1980		1981		1982		1983		Total 1978-1983	
	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
Bank Loans	$ 20	$-	$ 65	$170	$ 315	$105	$ 325	$578	$(160)	$-	$ (63)	$-	$ 502	$853
Long-Term Debt	50	100	185	963	290	2175	230	1705	-	120	-	-	755	5063
Preferred Stock	60	88	75	117	150	-	-	-	-	-	-	-	285	205
Common Stock	80	-	165	356	100	386	60	500	-	-	-	-	405	1242
Subtotal	210	188	490	1606	855	2666	615	2783	(160)	120	(63)	-	1947	7363
Total	$398		$2096		$3521		$3398		$(40)		$(63)		$9310	

NOTE: Includes Foothills (Yukon), AGTL, Westcoast, Alcan, PG&E, PGT and Northern Border before duplications.

Exhibit A

FINANCING REQUIREMENTS
OF COMPANIES ASSOCIATED WITH
THE ALCAN PIPELINE PROJECT 48-INCH ALTERNATIVE
(1978 - 1983)
(Dollars in Millions)

	1978	1979	1980	1981	1982	1983	Total Basic Requirements1/	Estimated Contingency Requirements	Total Estimated Requirements
Foothills (Yukon)									
Canadian Banks	$ --	$ 85	$ 170	$ 70	$ --	$ --	$ 325	$ 65	$ 390
Canadian Long-Term Debt	--	70	70	60	--	--	200	40	240
U.S. Long-Term Debt	--	70	330	75	--	--	475	95	570
U.S. Preferred Stock	88	117	--	--	--	--	205	41	246
Canadian Common Stock	80	60	--	--	--	--	140	28	168
Total	168	402	570	205	--	--	1,345	269	1,614
AGTL									
Canadian Banks	--	--	85	75	--	--	160	400	560
Canadian Long-Term Debt	50	55	70	70	--	--	245	--	245
U.S. Long-Term Debt	--	125	150	150	--	--	425	--	425
Canadian Preferred Stock	60	--	75	--	--	--	135	--	135
Canadian Common Stock	--	55	--	60	--	--	115	--	115
Total	110	235	380	355	--	--	1,080	400	1,480
Westcoast									
Canadian Banks	20	(20)	60	180	(160)	(63)	17		240
Canadian Long-Term Debt	--	60	150	100	--	--	310		310
U.S. Long-Term Debt	100	140	80	150	120	--	590		590
Canadian Preferred Stock	--	75	75	--	--	--	150		150
Canadian Common Stock	--	50	100	--	--	--	150		150
Total	120	305	465	430	(40)	(63)	1,217		1,440
Alcan									
U.S. Banks	--	170	105	288	--	--	563	113	676
U.S. Long-Term Debt	--	500	1,000	400	--	--	1,900	380	2,280
U.S. Common Stock	--	340	250	250	--	--	840	168	1,008
Total	--	1,010	1,355	938	--	--	3,303	661	3,964
PG&E									
U.S. Banks	--	--	--	--	--	--	--		--
U.S. Long-Term Debt	--	--	--	388	--	--	388		388
U.S. Common Stock	--	--	--	--	--	--	--		--
Total	--	--	--	388	--	--	388		388
PGT									
U.S. Banks	--	--	--	--	--	--	--		--
U.S. Long-Term Debt	--	82	205	77	--	--	364		364
U.S. Common Stock	--	--	--	--	--	--	--		--
Total	--	82	205	77	--	--	364		364
Northern Border									
U.S. Banks	--	--	--	290	--	--	290		290
U.S. Long-Term Debt	--	46	410	465	--	--	921		921
U.S. Common Stock	--	16	136	250	--	--	402		402
Total	--	62	546	1,005	--	--	1,613		1,613
LESS: Duplications									
AGTL	40	30	--	--	--	--			
Westcoast	40	30	--	--	--	--			
Total	80	60	--	--	--	--			
Total Fund Requirements for Alcan Pipeline Project 48-Inch Alternative									
Canadian Funds	$ 210	$ 490	$ 855	$ 615	$ (160)	$ (63)	$1,947		$ 2,703
U.S. Funds	188	1,606	2,666	2,783	120	--	7,363		8,160
Total	398	2,096	3,521	3,398	(40)	(63)	9,310		10,863
Less Duplications	(80)	(60)	--	--	--	--	(140)		(140)
Grand Total	$ 318	$2,036	$3,521	$3,398	$ (40)	$ (63)	$9,170		$10,723

SUMMARY OF TOTAL ESTIMATED REQUIREMENTS
OF COMPANIES ASSOCIATED WITH
THE ALCAN PIPELINE PROJECT 48-INCH ALTERNATIVE
(Dollars in Millions)

	Total 1978 - 1983	
	Canada	U.S.
Bank Loans	1,190	966
Long-Term Debt	795	5,538
Preferred Stock	285	246
Common Stock	433	1,410
Subtotal	2,703	8,160
Total	10,863	

NOTE: Includes Foothills (Yukon), AGTL, Westcoast, Alcan, PG&E, PGT and Northern Border before duplications.

ALCAN PIPELINE COMPANY - ALASKA SEGMENT

FINANCIAL STATEMENTS

1975 DOLLAR COSTS

ALCAN PIPELINE COMPANY
PRO FORMA CASH FLOW STATEMENTS
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN 1975 DOLLAR COSTS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
	(A)	1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
	Source of Funds										
	Operations										
1	Net Income	$ 17.3	$ 50.2	$ 134.0	$ 103.3	$ 101.4	$ 117.8	$ 132.5	$ 121.3	$ 109.4	1
	Noncash Operating Charge/(Credits)										
2	Depreciation	--	--	24.3	97.2	97.8	97.8	97.8	97.8	97.8	2
3	Deferred Income Taxes	--	--	31.4	120.4	119.7	86.2	43.8	37.2	30.7	3
4	Amortization of Debt Expense	.1	.4	.9	2.2	2.2	2.2	.8	.8	.8	4
5	Allowance for Equity Funds Used During Construction	(17.3)	(50.2)	(63.0)	(.4)	--	--	--	--	--	5
6	Allowance for Debt Expense Amortized During Construction	(.1)	(.4)	(.5)	--	--	--	--	--	--	6
7	Total Funds Provided From Operations	--	--	127.1	322.7	321.1	304.0	274.9	257.1	238.7	7
	Other Sources										
8	Long-Term Debt, Net of Debt Expense	495.0	495.0	297.0	--	--	--	--	--	--	8
9	Other Debt	34.9	266.3	129.6	--	--	--	--	--	--	9
10	Common Stock	230.0	175.0	175.0	--	--	--	--	--	--	10
11	Total Funds Provided	$ 759.9	$ 936.3	$ 728.7	$ 322.7	$ 321.1	$ 304.0	$ 274.9	$ 257.1	$ 238.7	11
	Application of Funds										
12	Plant Additions	$ 777.3	$ 986.9	$ 665.1	$ 16.2	$ --	$ --	$ --	$ --	$ --	12
13	Less: Allowance for Equity Funds Used During Construction	(17.3)	(50.2)	(63.0)	(.4)	--	--	--	--	--	13
14	Allowance for Debt Expense Amortized During Construction	(.1)	(.4)	(.5)	--	--	--	--	--	--	14
15	Long-Term Debt Retirements	--	--	--	218.1	218.1	218.0	73.0	73.0	73.0	15
16	Cash Dividends	--	--	--	208.6	102.9	86.0	201.9	184.1	165.7	16
17	Increase/(Decrease) in Working Capital	--	--	127.1	(119.8)	.1	--	--	--	--	17
18	Total Application of Funds	$ 759.9	$ 936.3	$ 728.7	$ 322.7	$ 321.1	$ 304.0	$ 274.9	$ 257.1	$ 238.7	18

Exhibit D-1

ALCAN PIPELINE COMPANY
PRO FORMA STATEMENT OF DEBT RETIREMENTS
FOR THE CALENDAR YEARS 1982 - 1987
STATED IN 1975 DOLLAR COSTS
(Dollars in Millions)

Year	Term Bank Loans	Mortgage Bonds	Total Retirements
1982	145.1	73.0	218.1
1983	145.1	73.0	218.1
1984	145.0	73.0	218.0
1985	--	73.0	73.0
1986	--	73.0	73.0
1987	--	73.0	73.0

ALCAN PIPELINE COMPANY
PRO FORMA BALANCE SHEETS
AS OF DECEMBER 31 FOR THE YEARS 1979 - 1987
STATED IN 1975 DOLLAR COSTS
(Dollars in Millions)

Line No.	Description (A)	Period of Initial Construction and Capacity Buildup 1979 (B)	1980 (C)	1981 (D)	1982 (E)	Initial Years of Full Operation 1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	Line No.
	ASSETS										
	Property, Plant and Equipment										
1	Plant in Service	$ --	$ --	$2,429.3	$2,429.3	$2,445.5	$2,445.5	$2,445.5	$2,445.5	$2,445.5	1
2	Construction Work in Progress	777.3	1,764.2	--	16.2	--	--	--	--	--	2
3	Gross Plant	777.3	1,764.2	2,429.3	2,445.5	2,445.5	2,445.5	2,445.5	2,445.5	2,445.5	3
4	Less: Accumulated Depreciation	--	--	(24.3)	(121.5)	(219.3)	(317.1)	(414.9)	(512.7)	(610.5)	4
5	Net Plant	777.3	1,764.2	2,405.0	2,324.0	2,226.2	2,128.4	2,030.6	1,932.8	1,835.0	5
	Current Assets										
6	Materials and Supplies	--	--	3.2	3.2	3.2	3.2	3.2	3.2	3.2	6
7	Other Working Capital, Net	--	--	123.9	4.1	4.2	4.2	4.2	4.2	4.2	7
8	Total Current Assets	--	--	127.1	7.3	7.4	7.4	7.4	7.4	7.4	8
	Deferred Charges										
9	Unamortized Debt Expense	4.9	9.5	16.0	13.8	11.6	9.4	8.6	7.8	7.0	9
10	Total Assets	$ 782.2	$1,773.7	$2,548.1	$2,345.1	$2,245.2	$2,145.2	$2,046.6	$1,948.0	$1,849.4	10
	LIABILITIES AND STOCKHOLDERS' EQUITY										
	Capitalization										
11	Common Stock	$ 230.0	$ 405.0	$ 580.0	$ 580.0	$ 580.0	$ 580.0	$ 580.0	$ 574.3	$ 518.0	11
12	Retained Earnings	17.3	67.5	201.5	96.2	94.7	126.5	57.1	--	--	12
13	Total Equity	247.3	472.5	781.5	676.2	674.7	706.5	637.1	574.3	518.0	13
14	Long-Term Debt	500.0	1,000.0	1,300.0	1,227.0	1,154.0	1,081.0	1,008.0	935.0	862.0	14
15	Other Debt	34.9	301.2	435.2	290.1	145.0	--	--	--	--	15
16	Total Capitalization	782.2	1,773.7	2,516.7	2,193.3	1,973.7	1,787.5	1,645.1	1,509.3	1,380.0	16
17	Accumulated Deferred Income Taxes	--	--	31.4	151.8	271.5	357.7	401.5	438.7	469.4	17
18	Total Liabilities and Stockholders' Equity	$ 782.2	$1,773.7	$2,548.1	$2,345.1	$2,245.2	$2,145.2	$2,046.6	$1,948.0	$1,849.4	18

Exhibit D-3

ALCAN PIPELINE COMPANY
PRO FORMA STATEMENTS OF INCOME AND RETAINED EARNINGS
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN 1975 DOLLAR COSTS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
	(A)	1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
1	Operating Revenues	$ --	$ --	$ 141.4	$ 549.7	$ 523.3	$ 502.6	$ 479.8	$ 449.6	$ 418.4	1
2	Operation and Maintenance	--	--	2.4	9.5	10.3	10.3	10.3	10.3	10.3	2
3	Administrative and General	--	--	1.1	4.7	4.7	4.7	4.7	4.7	4.7	3
4	Depreciation	--	--	24.3	97.2	97.8	97.8	97.8	97.8	97.8	4
5	Taxes Other Than Income	--	--	11.7	49.8	46.4	43.7	40.9	38.2	35.4	5
	Income Taxes										
6	Current (Federal and State)	--	--	--	--	--	35.5	75.7	71.6	67.0	6
7	Deferred (Federal and State	--	--	31.4	120.4	119.7	86.2	43.8	37.2	30.7	7
8	Total Operating Expenses	--	--	70.9	281.6	278.9	278.2	273.2	259.8	245.9	8
9	Net Operating Income	--	--	70.5	268.1	244.4	224.4	206.6	189.8	172.5	9
	Other Income/(Expense)										
10	Investment Tax Credit	--	--	.9	.9	--	14.6	31.2	29.5	27.6	10
11	Allowance for Funds Used During Construction	54.6	150.2	181.4	.9	--	--	--	--	--	11
12	Total Other Income/(Expense)	54.6	150.2	182.3	1.8	--	14.6	31.2	29.5	27.6	12
	Interest Charges										
13	Interest on Long-Term Debt	26.7	91.8	113.9	162.6	140.8	119.0	104.5	97.2	89.9	13
14	Other Interest Expense	10.5	7.8	4.0	1.8	--	--	--	--	--	14
15	Amortization of Debt Expense	.1	.4	.9	2.2	2.2	2.2	.8	.8	.8	15
16	Total Interest Charges	37.3	100.0	118.8	166.6	143.0	121.2	105.3	98.0	90.7	16
17	Net Income	$ 17.3	$ 50.2	$ 134.0	$ 103.3	$ 101.4	$ 117.8	$ 132.5	$ 121.3	$ 109.4	17
18	Retained Earnings, Beginning of Year	--	17.3	67.5	201.5	96.2	94.7	126.5	57.1	--	18
19	Cash Dividends	--	--	--	(208.6)	(102.9)	(86.0)	(201.9)	(184.1)	(165.7)	19
20	Retained Earnings, End of Year	$ 17.3	$ 67.5	$ 201.5	$ 96.2	$ 94.7	$ 126.5	$ 57.1	$ --	$ --	20

ALCAN PIPELINE COMPANY - ALASKA SEGMENT

FINANCIAL STATEMENTS

ESCALATED DOLLAR COSTS

ALCAN PIPELINE COMPANY
PRO FORMA CASH FLOW STATEMENTS
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.	Description (A)	Period of Initial Construction and Capacity Buildup 1979 (B)	1980 (C)	1981 (D)	1982 (E)	Initial Years of Full Operation 1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	Line No.
	Source of Funds										
	Operations										
1	Net Income	$ 25.5	$ 73.6	$ 130.0	$ 145.2	$ 145.1	$ 168.1	$ 182.4	$ 167.1	$ 153.5	1
	Noncash Operating Charge/(Credits)										
2	Depreciation	--	--	34.7	138.9	139.9	139.9	139.9	139.9	139.9	2
3	Deferred Income Taxes	--	--	44.4	170.0	171.6	119.5	63.4	54.0	44.5	3
4	Amortization of Debt Expense	.1	.6	1.4	2.7	2.7	2.7	1.0	1.0	1.0	4
5	Allowance for Equity Funds Used During Construction	(25.5)	(73.6)	(91.6)	(.6)	--	--	--	--	--	5
6	Allowance for Debt Expense Amortized During Construction	(.1)	(.6)	(.7)	--	--	--	--	--	--	6
7	Total Funds Provided From Operations	--	--	118.2	456.2	459.3	430.2	386.7	362.0	338.9	7
	Other Sources										
8	Bank Loans	170.4	104.5	283.0	--	--	--	--	--	--	8
9	Long-Term Debt Net of Debt Expense	495.0	990.0	396.0	--	--	--	--	--	--	9
10	Common Stock	340.0	250.0	250.0	--	--	--	--	--	--	10
11	Total Funds Provided	$1,005.4	$1,344.5	$1,047.2	$ 456.2	$ 459.3	$ 430.2	$ 386.7	$ 362.0	$ 338.9	11
	Application of Funds										
12	Plant Additions	$1,031.0	$1,418.7	$1,022.1	$ 26.7	$ --	$ --	$ --	$ --	$ --	12
13	Less: Allowance for Equity Funds Used During Construction	(25.5)	(73.6)	(91.6)	(.6)	--	--	--	--	--	13
14	Allowance for Debt Expense Amortized During Construction	(.1)	(.6)	(.7)	--	--	--	--	--	--	14
15	Long-Term Debt Retirements	--	--	--	293.9	293.9	294.0	106.1	106.1	106.1	15
16	Cash Dividends	--	--	--	242.1	164.8	135.7	280.1	255.3	232.2	16
17	Increase/(Decrease) in Working Capital	--	--	117.4	(105.9)	.6	.5	.5	.6	.6	17
18	Total Application of Funds	$1,005.4	$1,344.5	$1,047.2	$ 456.2	$ 459.3	$ 430.2	$ 386.7	$ 362.0	$ 338.9	18

ALCAN PIPELINE COMPANY
PRO FORMA STATEMENT OF DEBT RETIREMENTS
FOR THE CALENDAR YEARS 1982 - 1987
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Year	Term Bank Loans	Mortgage Bonds	Total Retirements
1982	187.8	106.1	293.9
1983	187.8	106.1	293.9
1984	187.9	106.1	294.0
1985	--	106.1	106.1
1986	--	106.1	106.1
1987	--	106.1	106.1

ALCAN PIPELINE COMPANY
PRO FORMA BALANCE SHEETS
AS OF DECEMBER 31 FOR THE YEARS 1979 - 1987
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
	(A)	1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
	ASSETS										
	Property, Plant and Equipment										
1	Plant in Service	$ --	$ --	$3,471.8	$3,471.8	$3,498.5	$3,498.5	$3,498.5	$3,498.5	$3,498.5	1
2	Construction Work in Progress	1,031.0	2,449.7	--	26.7	--	--	--	--	--	2
3	Gross Plant	1,031.0	2,449.7	3,471.8	3,498.5	3,498.5	3,498.5	3,498.5	3,498.5	3,498.5	3
4	Less: Accumulated Depreciation	--	--	(34.7)	(173.6)	(313.5)	(453.4)	(593.3)	(733.2)	(873.1)	4
5	Net Plant	1,031.0	2,449.7	3,437.1	3,324.9	3,185.0	3,045.1	2,905.2	2,765.3	2,625.4	5
	Current Assets										
6	Materials and Supplies	--	--	5.4	5.4	5.4	5.4	5.4	5.4	5.4	6
7	Other Working Capital, Net	--	--	112.0	6.1	6.7	7.2	7.7	8.3	8.9	7
8	Total Current Assets	--	--	117.4	11.5	12.1	12.6	13.1	13.7	14.3	8
	Deferred Charges										
9	Unamortized Debt Expense	4.9	14.3	22.5	19.8	17.1	14.4	13.4	12.4	11.4	9
10	Total Assets	$1,035.9	$2,464.0	$3,577.0	$3,356.2	$3,214.2	$3,072.1	$2,931.7	$2,791.4	$2,651.1	10
	LIABILITIES AND STOCKHOLDERS' EQUITY										
	Capitalization										
11	Common Stock	$ 340.0	$ 590.0	$ 840.0	$ 840.0	$ 840.0	$ 840.0	$ 840.0	$ 799.0	$ 720.3	11
12	Retained Earnings	25.5	99.1	229.1	132.2	112.5	144.9	47.2	--	--	12
13	Total Equity	365.5	689.1	1,069.1	972.2	952.5	984.9	887.2	799.0	720.3	13
14	Bank Loans	170.4	274.9	563.5	375.7	187.9	--	--	--	--	14
15	Long-Term Debt	500.0	1,500.0	1,900.0	1,793.9	1,687.8	1,581.7	1,475.6	1,369.5	1,263.4	15
16	Total Capitalization	1,035.9	2,464.0	3,532.6	3,141.8	2,828.2	2,566.6	2,362.8	2,168.5	1,983.7	16
17	Accumulated Deferred Income Taxes	--	--	44.4	214.4	386.0	505.5	568.9	622.9	667.4	17
18	Total Liabilities and Stockholders' Equity	$1,035.9	$2,464.0	$3,577.0	$3,356.2	$3,214.2	$3,072.1	$2,931.7	$2,791.4	$2,651.1	18

Exhibit D-7

ALCAN PIPELINE COMPANY
PRO FORMA STATEMENTS OF INCOME AND RETAINED EARNINGS
FOR THE CALENDAR YEARS 1979 - 1987
STATED IN ESCALATED DOLLARS
(Dollars in Millions)

Line No.	Description	Period of Initial Construction and Capacity Buildup				Initial Years of Full Operation					Line No.
	(A)	1979 (B)	1980 (C)	1981 (D)	1982 (E)	1983 (F)	1984 (G)	1985 (H)	1986 (I)	1987 (J)	
1	Operating Revenues	$ --	$ --	$ 200.7	$ 781.7	$ 752.6	$ 722.9	$ 685.9	$ 645.6	$ 607.8	1
2	Operation and Maintenance	--	--	3.6	14.2	16.4	17.4	18.5	19.7	21.0	2
3	Administrative and General	--	--	1.7	7.1	7.8	8.4	9.0	9.7	10.4	3
4	Depreciation	--	--	34.7	138.9	139.9	139.9	139.9	139.9	139.9	4
5	Taxes Other Than Income	--	--	16.4	71.3	66.8	62.6	58.4	54.6	50.9	5
	Income Taxes										
6	Current (Federal and State)	--	--	--	--	--	53.3	102.6	97.3	93.4	6
7	Deferred (Federal and State)	--	--	44.4	170.0	171.6	119.5	63.4	54.0	44.5	7
8	Total Operating Expenses	--	--	100.8	401.5	402.5	401.1	391.8	375.2	360.1	8
9	Net Operating Income	--	--	99.9	380.2	350.1	321.8	294.1	270.4	247.7	9
	Other Income/(Expenses)										
10	Interest Income	--	--	.8	.8	--	--	--	--	--	10
11	Investment Tax Credit	--	--	--	--	--	21.9	42.2	40.0	38.4	11
12	Allowance for Funds Used During Construction	74.4	208.3	258.4	1.5	--	--	--	--	--	12
13	Total Other Income/(Expense)	74.4	208.3	259.2	2.3	--	21.9	42.2	40.0	38.4	13
	Interest Charges										
14	Interest on Long-Term Debt	33.5	122.2	221.3	231.7	202.3	172.9	152.9	142.3	131.6	14
15	Other Interest Expense	15.3	11.9	6.4	2.9	--	--	--	--	--	15
16	Amortization of Debt Expense	.1	.6	1.4	2.7	2.7	2.7	1.0	1.0	1.0	16
17	Total Interest Charges	48.9	134.7	229.1	237.3	205.0	175.6	153.9	143.3	132.6	17
18	Net Income	$ 25.5	$ 73.6	$ 130.0	$ 145.2	$ 145.1	$ 168.1	$ 182.4	$ 167.1	$ 153.5	18
19	Retained Earnings, Beginning of Year	--	25.5	99.1	229.1	132.2	112.5	144.9	--	--	19
20	Cash Dividends	--	--	--	(242.1)	(164.8)	(135.7)	(280.1)	(255.3)	(232.2)	20
21	Net Income	25.5	73.6	130.0	145.2	145.1	168.1	182.4	167.1	153.5	21
22	Retained Earnings, End of Year	$ 25.5	$ 99.1	$ 229.1	$ 132.2	$ 112.5	$ 144.9	$ 47.2	$ --	$ --	22

SECTION 9

TARIFF SUMMARY

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SECTION 9

ALCAN PIPELINE PROJECT

TARIFF SUMMARY

Introduction

The Alcan Pipeline Project will provide an integrated system for transportation of Alaska gas from the Prudhoe Bay area of Alaska's North Slope to two delivery points on the Canadian-United States border. One delivery point is near Kingsgate, British Columbia for delivery to Western United States markets and the other delivery point is near Monchy, Saskatchewan for delivery to Eastern United States markets.

Each of the sponsor companies in the Alcan Pipeline Project will have a tariff setting forth the provisions under which transportation services will be rendered to the various companies contracting for transportation service. The contracting companies will be later referred to as "Shippers." The tariffs of each of the sponsor companies have been designed with the same major provisions for rendering the transportation service and will thus assure coordinated service for the Shippers from Alaska to the Canada-United States border. The tariff of Alcan Pipeline Company will be subject to the approval and jurisdiction of the Federal Power Commission and the tariffs of the Canadian sponsor companies -- Foothills Pipelines (Yukon) Ltd., Alberta Gas Trunk Line (Canada) Limited, and Westcoast Transmission Company Limited -- will be subject to the approval and jurisdiction of the National Energy Board of Canada. Since both the United States and Canadian Regulatory Agencies operate under similar principles and procedures Shippers can be further assured of a coordinated system for transportation of the Alaska gas volumes.

This summary contains a description of the tariffs involved in the Alcan Pipeline Project to the Canada-United States border and the transportation service which will be provided by each of the sponsor companies. Each of the sponsor companies have submitted detailed tariffs to their respective Regulatory Agencies. The Tariffs have been identified in the proceedings as follows:

Alcan Pipeline Company	FPC Exhibit AP-16
Foothills Pipe Lines (Yukon) Ltd.	NEB Exhibit, filed 2/28/77
Alberta Gas Trunk Line (Canada) Limited	NEB Exhibit, filed 2/28/77
Westcoast Transmission Company Limited	NEB Exhibit, filed 2/28/77

Tariff Description

Each of the four sponsor companies have a Tariff consisting of the following parts:

(1) Rate Schedules setting forth the basic terms for the transportation service and the method for allocating the transportation costs among the various Shippers.

(2) General Terms and Conditions setting forth the provisions relating to definitions, measurement of gas, gas quality specifications, billing and payment, allocation of gas used or lost, force majeure and liability and other such topics. These provisions apply to all rate schedules in the Tariff.

(3) A Service Agreement which states the basic contractual agreement of the parties -- the Company and a Shipper. The Service Agreement sets forth such items as the receipt and delivery points for gas, the volumes to be transported, the receipt and delivery pressures, and a term for service.

The major provisions of the tariffs are summarized below. Certain of the provisions are required to assure adequate financing of the project and the provisions take into account the requirements of the Shippers.

(1) The tariffs provide solely for transportation of gas so that the various Shippers will own the gas and will be required to furnish a proportionate share of the gas required for fuel usage, line pack and losses.

(2) The tariffs provide for a monthly charge equal to the actual cost of service including an approved return to the equity owners. This charge will be made each month regardless of the volumes being transported except that the equity return and income taxes will be proportionally reduced if in any month the co-sponsors are unable to receive at least 80% of the gas tendered for transportation due to any reason under their control.

(3) Billing will commence when the facilities are ready to render service. For the Canadian segments, billing will commence when all segments in Canada are ready to render service.

(4) For the Canadian sponsor company tariffs the total cost of service will be allocated among Shippers on the basis of a Shippers daily transportation quantity in relation to the total of all Shippers daily transportation quantities. Since there are no delivery points in Canada this assures equal treatment for all Shippers. For the Alcan tariff the total cost of service for transportation in Alaska will be allocated among Shippers on the basis of a Shippers Mcf-miles (volume and distance) in relation to the total of all Shippers Mcf-miles. This is appropriate for transportation in Alaska since it is contemplated that some deliveries will be made within the State of Alaska.

(5) The tariffs provide for transportation of gas under a firm rate schedule which assures delivery of the contracted volumes each day except for situations of pipeline maintenance requirements or force majeure situations. The tariffs also provide for transportation under an overrun rate schedule in situations where the Company has available capacity.

Transportation Service

The area wherein transportation service will be rendered by the various sponsor companies is as follows:

Company	Firm Rate Schedule	Area of Transportation
Alcan Pipeline Company	T-1	Prudhoe Bay via Fairbanks to the Alaska-Yukon border for connection with Foothills Pipe Line.
Foothills Pipe Lines (Yukon) Ltd.	T-1	Connection with Alcan at the Alaska-Yukon border to connection with Westcoast Transmission at the Yukon-British Columbia border.

Company	Firm Rate Schedule	Area of Transportation
Foothills Pipe Lines (Yukon) Ltd. (cont'd)	T-2	Connection with Alberta Gas Trunk Line at the Alberta-Saskatchewan border to connection with Northern Border Pipeline at the Saskatchewan - United States border near Monchy.
Westcoast Transmission Company Limited	MDQ-1	Connection with Foothills Pipe Line at the Yukon northern British Columbia border to connection with Alberta Gas Trunk Line at the British Columbia-Alberta border.
	MDQ-2	Connection with Alberta Gas Trunk Line at the Alberta-southern British Columbia border to connection with Pacific Gas Transmission Company at the British Columbia-United States border near Kingsgate.
Alberta Gas Trunk Line (Canada) Limited	T-2	Connection with Westcoast Transmission at the northern British Columbia-Alberta border to (1) connection with Westcoast Transmission at the southern Alberta-British Columbia border and (2) connection with Foothills Pipe Line at the Alberta-Saskatchewan border.

SECTION 9

TARIFF SUMMARY

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SECTION 9

ALCAN PIPELINE PROJECT

TARIFF SUMMARY

Introduction

The Alcan Pipeline Project will provide an integrated system for transportation of Alaska gas from the Prudhoe Bay area of Alaska's North Slope to two delivery points on the Canadian-United States border. One delivery point is near Kingsgate, British Columbia for delivery to Western United States markets and the other delivery point is near Monchy, Saskatchewan for delivery to Eastern United States markets.

Each of the sponsor companies in the Alcan Pipeline Project will have a tariff setting forth the provisions under which transportation services will be rendered to the various companies contracting for transportation service. The contracting companies will be later referred to as "Shippers." The tariffs of each of the sponsor companies have been designed with the same major provisions for rendering the transportation service and will thus assure coordinated service for the Shippers from Alaska to the Canada-United States border. The tariff of Alcan Pipeline Company will be subject to the approval and jurisdiction of the Federal Power Commission and the tariffs of the Canadian sponsor companies -- Foothills Pipelines (Yukon) Ltd., Alberta Gas Trunk Line (Canada) Limited, and Westcoast Transmission Company Limited -- will be subject to the approval and jurisdiction of the National Energy Board of Canada. Since both the United States and Canadian Regulatory Agencies operate under similar principles and procedures Shippers can be further assured of a coordinated system for transportation of the Alaska gas volumes.

This summary contains a description of the tariffs involved in the Alcan Pipeline Project to the Canada-United States border and the transportation service which will be provided by each of the sponsor companies. Each of the sponsor companies have submitted detailed tariffs to their respective Regulatory Agencies. The Tariffs have been identified in the proceedings as follows:

Alcan Pipeline Company	FPC Exhibit AP-16
Foothills Pipe Lines (Yukon) Ltd.	NEB Exhibit, filed 2/28/77
Alberta Gas Trunk Line (Canada) Limited	NEB Exhibit, filed 2/28/77
Westcoast Transmission Company Limited	NEB Exhibit, filed 2/28/77

Tariff Description

Each of the four sponsor companies have a Tariff consisting of the following parts:

(1) Rate Schedules setting forth the basic terms for the transportation service and the method for allocating the transportation costs among the various Shippers.

(2) General Terms and Conditions setting forth the provisions relating to definitions, measurement of gas, gas quality specifications, billing and payment, allocation of gas used or lost, force majeure and liability and other such topics. These provisions apply to all rate schedules in the Tariff.

(3) A Service Agreement which states the basic contractual agreement of the parties -- the Company and a Shipper. The Service Agreement sets forth such items as the receipt and delivery points for gas, the volumes to be transported, the receipt and delivery pressures, and a term for service.

The major provisions of the tariffs are summarized below. Certain of the provisions are required to assure adequate financing of the project and the provisions take into account the requirements of the Shippers.

(1) The tariffs provide solely for transportation of gas so that the various Shippers will own the gas and will be required to furnish a proportionate share of the gas required for fuel usage, line pack and losses.

(2) The tariffs provide for a monthly charge equal to the actual cost of service including an approved return to the equity owners. This charge will be made each month regardless of the volumes being transported except that the equity return and income taxes will be proportionally reduced if in any month the co-sponsors are unable to receive at least 80% of the gas tendered for transportation due to any reason under their control.

(3) Billing will commence when the facilities are ready to render service. For the Canadian segments, billing will commence when all segments in Canada are ready to render service.

(4) For the Canadian sponsor company tariffs the total cost of service will be allocated among Shippers on the basis of a Shippers daily transportation quantity in relation to the total of all Shippers daily transportation quantities. Since there are no delivery points in Canada this assures equal treatment for all Shippers. For the Alcan tariff the total cost of service for transportation in Alaska will be allocated among Shippers on the basis of a Shippers Mcf-miles (volume and distance) in relation to the total of all Shippers Mcf-miles. This is appropriate for transportation in Alaska since it is contemplated that some deliveries will be made within the State of Alaska.

(5) The tariffs provide for transportation of gas under a firm rate schedule which assures delivery of the contracted volumes each day except for situations of pipeline maintenance requirements or force majeure situations. The tariffs also provide for transportation under an overrun rate schedule in situations where the Company has available capacity.

Transportation Service

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Company	Firm Rate Schedule	Area of Transportation
Foothills Pipe Lines (Yukon) Ltd. (cont'd)	T-2	Connection with Alberta Gas Trunk Line at the Alberta-Saskatchewan border to connection with Northern Border Pipeline at the Saskatchewan - United States border near Monchy.
Westcoast Transmission Company Limited	MDQ-1	Connection with Foothills Pipe Line at the Yukon northern British Columbia border to connection with Alberta Gas Trunk Line at the British Columbia-Alberta border.
	MDQ-2	Connection with Alberta Gas Trunk Line at the Alberta-southern British Columbia border to connection with Pacific Gas Transmission Company at the British Columbia-United States border near Kingsgate.
Alberta Gas Trunk Line (Canada) Limited	T-2	Connection with Westcoast Transmission at the northern British Columbia-Alberta border to (1) connection with Westcoast Transmission at the southern Alberta-British Columbia border and (2) connection with Foothills Pipe Line at the Alberta-Saskatchewan border.

SECTION 10

DEFINITIVE AGREEMENT

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SECTION 10

Foreword

This Section includes a compilation of the Definitive Agreement between Alcan, Foothills, AGTL, AGTL (Canada), Westcoast and Northwest Pipeline.

The basic agreement was entered into on July 5, 1976 and was subsequently amended on October 15, 1976, October 21, 1976 and February 28, 1977. This compilation has been prepared for convenience by reflecting all additions and deletions up to March 1, 1977.

The Definitive Agreement covers the implementation of gas transportation systems for Alaska gas along the Fairbanks Corridor route through Canada to the lower 48 states of the U.S., such as the original proposal and the 48-inch alternative proposed herein.

THIS IS A COMPILATION OF CURRENT CONTRACT PROVISIONS OF THE DEFINITIVE AGREEMENT AS OF MARCH 1, 1977. THIS IS NOT A LEGAL DOCUMENT. IT DOES NOT SUPERSEDE OR REPLACE ANY PORTION OF THE DEFINITIVE AGREEMENT.

MEMORANDUM OF AGREEMENT made and entered into as of this 5th day of July, 1976, as amended October 15, 1976, October 21, 1976 and February 28, 1977, by and between:

FOOTHILLS PIPE LINES LTD., a body corporate with an office in Calgary, Alberta, Canada

OF THE FIRST PART

-and-

THE ALBERTA GAS TRUNK LINE COMPANY LIMITED, and THE ALBERTA GAS TRUNK LINE (CANADA) LIMITED, bodies corporate with their head offices in Calgary, Alberta, Canada

OF THE SECOND PART

-and-

WESTCOAST TRANSMISSION COMPANY LIMITED, a body corporate with its head office in Vancouver, British Columbia, Canada

OF THE THIRD PART

-and-

NORTHWEST PIPELINE CORPORATION and ALCAN PIPELINE COMPANY, bodies corporate with their head offices in Salt Lake City, Utah, United States of America

OF THE FOURTH PART

WHEREAS the parties have heretofore agreed to participate in the Project upon the terms and conditions hereafter set out;

AND WHEREAS the parties deem it expedient that their arguments relative to the Project be reduced to writing;

NOW THEREFORE THIS AGREEMENT WITNESSETH the parties hereto in consideration of the covenants herein expressed have agreed together as follows:

ARTICLE I

DEFINITIONS AND APPENDICES

1.1 Definitions

In this agreement, in context, the plural means the singular and vice versa, the pronoun "it" refers to one of the parties and the following words and phrases have the meanings ascribed:

"Alaska Gas" means natural gas produced in the State of Alaska including, inter alia, natural gas produced in the Prudhoe Bay area of that State.

"Alcan" means Alcan Pipeline Company.

"Alcan Pipeline" means a Pipeline for the transmission of Alaska Gas to a point of interconnection with the Yukon Pipeline at a point on the Alaska/Yukon border at or near Scottie Creek.

"Alberta Gas Trunk" means The Alberta Gas Trunk Line Company Limited and/or The Alberta Gas Trunk Line (Canada) Limited, as the case may be.

"Alberta Pipeline" (Amended February 28, 1977) means the Pipeline required for the transmission of Alaska Gas through Alberta. The Alberta Pipeline shall be (i) a wholly new express line for Alaska Gas only, (ii) a looping of existing facilities or (iii) a combination of an express line and looped facilities.

"B. C. Pipeline" (Amended February 28, 1977) means the Pipeline or Pipelines required for transmission of Alaska Gas through British Columbia. Depending on the system ultimately adopted, the Pipeline or Pipelines will terminate at points at or near Sumas, Washington and/or Kingsgate, British Columbia and/or Boundary Lake, Alberta.

"Day" means a period of twenty-four consecutive hours beginning at 8:00 A.M. local time.

"F.P.C." means the Federal Power Commission or any successor thereto.

"Foothills" means Foothills Pipe Lines Ltd. or a subsidiary or an affiliated company.

"Heating Value" means the number of B.T.U. produced by the combustion in a recording calorimeter at constant pressure of the amount of gas which would occupy a volume of one (1) cubic foot at a temperature of sixty degrees Fahrenheit (60^{O}F.) if saturated with water vapour, and under a pressure equal to that of thirty (30) inches of mercury at thirty-two degrees Fahrenheit (32^{O}F.) and under standard gravitational force (acceleration nine hundred and eighty and six hundred and sixty-five thousandths (980.665) cm. per second per second) with air of the same temperature and pressure as the gas, when the products of combustion are cooled to the initial temperature of the gas and air, and when the water formed by combustion is condensed to the liquid state.

"Maple Leaf Project" means a joint Pipeline project of Foothills, Alberta Gas Trunk and Westcoast to construct a Pipeline under Canadian ownership to transport Canadian gas to Canadian consumers.

"Month" means a calendar month beginning on the first day thereof.

"N.E.B." means the National Energy Board or any successor thereto.

"Northwest" means Northwest Pipeline Corporation.

"Operating Representatives" means individuals with duties as set out in Section 6.6 herein.

"Pipeline" means a pipeline as defined in the National Energy Board Act and such other works and facilities as may be necessary for or incidental to the Project.

"Project" means the design, financing, construction and installation of the Project Pipeline and any and all studies, filings and applications related thereto.

"Project Pipeline" means and includes the Alcan Pipeline, the Yukon Pipeline, the B.C. Pipeline, the Alberta Pipeline and the Saskatchewan Pipeline.

"Saskatchewan Pipeline" means the pipeline facilities utilized from the connection with the Alberta Pipeline at or near Empress, Alberta to delivery points on the U.S. Canadian border at or near Monchy, Saskatchewan.

"Segment" means one or other of the Alcan Pipeline, the Yukon Pipeline, the B.C. Pipeline, the Alberta Pipeline and the Saskatchewan Pipeline.

"Service Agreement" means the contract for the transportation of gas between Shipper and the owner of a Segment pursuant to a transportation tariff.

"Shipper" means those parties owning or having rights to Alaska Gas who transport such gas through the Project Pipeline.

"Westcoast" means Westcoast Transmission Company Limited.

"Yukon Pipeline" (Amended February 28, 1977) means the Pipeline required for the transmission of Alaska Gas through the Yukon connecting with the Alberta Pipeline and/or the B.C. Pipeline.

1.2 Appendices

The following appendices annexed to this agreement form a part hereof and are incorporated herein to all intents and purposes as though the same had been written out in full herein:

(a) (Deleted October 15, 1976)

(b) Map showing the proposed routing of the Project Pipeline (Appendix "B")

(c) The proposed schedule of construction for the Alcan Pipeline (Appendix "C").

(d) (Added February 28, 1977) Map showing the alternative routing of the Project Pipeline (Appendix "D").

(e) (Added February 28, 1977) The proposed alternative schedule of construction for the Alcan Pipeline (Appendix "E").

ARTICLE II

GENERAL

2.1 Representations (Amended October 21, 1976)

Foothills, Alberta Gas Trunk and Westcoast have assumed the responsibility for, and are firmly committed and dedicated to obtaining the necessary approvals and financing for, the Maple Leaf Project. Northwest supports the Maple Leaf Project.

(a) Each party represents to the other that it has the right, power and authority to enter into this agreement.

(b) Each party represents to the other that it will diligently seek to obtain all necessary approvals, authorizations and financing as are required to implement the Project subject to qualifications set out in Section 3.6(b).

(c) Each party represents to the other that it will promptly undertake, as appropriate, to arrange with such other parties as may be necessary to implement the Project in a timely manner.

(d) (Added February 28, 1977) The parties contemplate that there will be an interval of at least thirteen (13) months between the commencement of operations for the Project and the Maple Leaf Project, with the Project commencing first. The parties shall communicate this to all governmental agencies reviewing the Project and the Maple Leaf Project and to all other appropriate persons and entities.

2.2 Letter of Intent

This agreement is entered into pursuant to the letter of intent dated the 5th day of May, 1976 executed by Northwest, Foothills, Alberta Gas Trunk and Westcoast and in the event of any conflict between provisions of this agreement and the said letter of intent or any other agreement or understanding between the parties, other than the cost sharing agreement between Alberta Gas Trunk and Westcoast, the provisions of this agreement shall prevail.

2.3 Term

This agreement shall come into force and be effective on the day and date first above written and shall thereafter continue in full force and effect until terminated pursuant to Section 5.7.

ARTICLE III

THE PROJECT

3.1 General Description

(a) (Amended October 15, 1976 and February 28, 1977) The Project provides for the construction, installation, operation and maintenance of a high-pressure, large diameter natural gas pipeline ("Project Pipeline") designed to transmit present and future Alaska Gas for markets in the lower 48 states of the U.S.

(b) (Amended February 28, 1977) The Project Pipeline will be built and operated in Segments. The Alcan Pipeline will be operated by Alcan, the Yukon Pipeline and the Saskatchewan Pipeline will be operated by Foothills, the Alberta Pipeline will be operated by Alberta Gas Trunk. Any B.C. Pipeline will be operated by Westcoast.

(c) (Amended February 28, 1977) Although it is presently contemplated that approximately thirty percent (30%) of the volumes of Alaska Gas will be delivered at or near Sumas, Washington with the balance transported to Kingsgate, British Columbia and Monchy, Saskatchewan, the parties recognize that the ultimate volumes of Alaska Gas to be delivered at each of such points depends on the markets for which Alaska Gas is actually acquired and the determination of an efficient route to transport such gas to such markets. Subject to the receipt of necessary governmental authorizations, the parties intend to optimize the design of the Project Pipeline to reflect such considerations when the production plans for Alaska Gas have been promulgated and the markets acquiring such gas have been determined.

3.2 Ownership of Alaska Gas

(a) None of the owners or operators of the Segments of the Project Pipeline in Canada shall:

(i) have or take legal title to Alaska Gas while it is in their respective Segments of the Project, save that used or consumed as fuel or deemed lost;

(ii) be liable or subjected to demand for payment with respect to such use or loss;

and subject as aforesaid each such party shall have possession thereof and the rights and obligations including any liability imposed by law for injuries or damages while in such possession.

(b) None of the owners or operators of the Segments of the Project Pipeline in Canada shall voluntarily accede to the request of any person, firm, corporation or body politic to transport and/or deliver any Alaska Gas from its particular Segment of the Project Pipeline other than as provided herein, except as specifically directed in writing by the owner(s) of such Alaska Gas and/or as approved by the F.P.C. or the N.E.B., as the case may be, and it is acknowledged that all Alaska Gas transported through the Canadian Segments of the Project will be subject to the regulation of the N.E.B.

(c) All deliveries of Alaska Gas at the Alaska/Yukon border at the discharge of each of the Segments in Canada and again at the United States/Canadian boundary at the various delivery points on the 49th parallel shall be measured for Heating Value. In each instance the Heating Value equivalent to the Alaska Gas received during such Day, less actual calculated fuel use and losses, shall be redelivered. Balancing of the Heating Value of the volumes of Alaska Gas shall occur not less frequently than Monthly.

(d) While all of the owners of the Segments of the Project Pipeline in Canada have committed not to take legal title to Alaska Gas while it is in their Segments of the Project, save that used as fuel or deemed lost, it is planned that a Canadian Gas Distribution Company will arrange with one of the Shippers of Alaska Gas to exchange some portion of that Shipper's gas for service to Yukon and British Columbia communities and industry and return to that Shipper at a mutually agreeable point in the Province of Alberta a volume of gas of an equivalent Heating Value for delivery by southern Segments of the Project Pipeline to the 49th parallel for that Shipper's market in the lower forty-eight States of the United States of America.

3.3 General Undertaking

(a) Each party will design, construct, install, operate and maintain that particular Segment of the Project allotted to it in a good and workmanlike manner and in timely fashion to the end that its Segment will be completed and put into operation concurrently with the other Segments.

(b) The owners of the Canadian Segments of the Project agree that as of the date hereof the proposed schedule of construction for the Alcan Pipeline as set out in Appendix "C" is compatible with the construction schedule for the Canadian Segments.

3.4 Specific Undertaking

Each party in connection with its Segment of the Project will, subject to Section 3.6:

(a) Prepare, file and prosecute diligently all applications necessary to obtain all authorizations to enable it to construct, install, operate and maintain its particular Segment in connection with the transmission of Alaska Gas and no application pursuant to this agreement nor any future application pursuant to this agreement or otherwise, except F.P.C. Docket No. CP76-174, including that of Northwest and/or Alcan, will contain any component which would interfere with the expeditious achievement of the Maple Leaf Project and/or the Project Pipeline.

(b) Do, perform and carry out all such acts, matters and things as may be necessary for or incidental to the design, financing, construction, installation, operation and maintenance thereof, and in this connection, but not by way of limitation, each party will accept delivery of and will transmit that portion of the Alaska Gas delivered to it by one or other of the parties through its Segment and deliver the same to the delivery point applicable to its particular Segment, minus such part thereof as is used and consumed for fuel or other Pipeline purposes or unavoidably lost through shrinkage or other causes.

(c) (Amended October 15, 1976 and February 28, 1977) Each party shall design and construct its Segment to permit incremental build-up or full initial deliveries as authorized by the governmental entities having jurisdiction. Such Segment of the Pipeline Project shall be sized to permit the transportation of the volumes of Alaska Gas authorized to be produced and sold to markets in the lower 48 states of the U.S., plus providing for any excess capacity required for expansibility as authorized by the governmental entities having jurisdiction. In considering the ultimate sizing and design of each Segment, due consideration shall be given to (i) the ability to finance such facilities, including any necessary U.S. governmental guarantees or insurance, (ii) the approval of the pipeline design, including the safety thereof, by all the governmental entities

having jurisdiction, and (iii) the ability to ensure that for the Canadian Segments that necessary engineering services, construction crews, equipment, materials and supplies can be met with a reasonable degree of certainty from Canadian sources.

3.5 Financing

Each party shall arrange for financing in connection with its particular Segment and no party as a result of this agreement shall be under any obligation, either express or implied, to assist another party in raising the necessary monies.

3.6 Applications to Regulatory Agencies

(a) Northwest and/or Alcan will, in a timely manner, make application as necessary to the proper authorities of the United States of America and to its apposite regulatory agencies, particularly the F.P.C., for permission to construct, install, operate and maintain the Alcan Pipeline in conjunction with the other Segments, filing the requisite data in that connection. Notwithstanding the foregoing, Northwest and/or Alcan shall not be required by the terms hereof to make any filing with the U.S. Department of Interior or any subdivision or agency subject to its control or successor thereto or with the State of Alaska and its apposite agencies until deemed appropriate by Northwest and/or Alcan but shall do so in not less than thirty (30) Days after obtaining and accepting the requisite authorizations from the F.P.C.

(b) Upon receipt by Alberta Gas Trunk, Foothills and Westcoast of information, which is in their opinion adequate, that the F.P.C. will hear and rule upon Northwest's application concurrent with its hearing and ruling on the applications of Alaskan Arctic Gas Pipeline Company and El Paso Alaska Company presently being heard by that body in F.P.C. Docket Nos. CP75-96, et al, then Alberta Gas Trunk, Foothills and Westcoast will each, as soon thereafter as practicable, from time to time file and prosecute such applications to the authorities of Canada, particularly the N.E.B., and its provinces and territories and to their apposite regulatory agencies for such permits, licenses and other authorizations as may be necessary or requisite to enable each to proceed with the phased construction of its respective Segments of the Project. Subject to the foregoing, it is presently contemplated that appropriate filings with the N.E.B. will be in August or September, 1976.

3.7 Approvals

Upon receipt by any party of any of the approvals required in Section 3.6 in a form satisfactory to such party, it shall promptly notify the other parties hereto.

3.8 Filings After Initial Approvals

After receipt of all the approvals required in Section 3.6, in the event that thereafter any party makes any filing with any governmental entity in connection with the Project or otherwise related directly thereto, such party shall contemporaneously with such filing serve a copy thereof on all parties hereto.

ARTICLE IV

TARIFF OBLIGATIONS

4.1 Contract Carrier

Northwest and/or Alcan acknowledges and agrees that the transportation charges for the Canadian Segments will be on a contract carrier cost of service tariff.

4.2 Tariff Charges (Amended October 15, 1976)

Notwithstanding any provisions of this agreement to the contrary, all billings for tariff charges applicable to the transportation of Alaska Gas in the Segments in Canada shall be rendered by the owner of each Segment. Such billings and payments shall be rendered and paid as provided in the respective effective tariffs and Service Agreements approved by the N.E.B. from time to time. It is presently contemplated that such tariffs and Service Agreements will be in a form substantially similar to those submitted in evidence in FPC Docket CP75-96, et al.

4.3 Contracts for Shipment (Amended October 15, 1976 and February 28, 1977)

The parties shall coordinate all efforts to negotiate with the persons having the right to transmit Alaska Gas to market to ensure a degree of uniformity in the various transmission contracts.

4.4 Transportation Charges

(a) (Amended February 28, 1977) Unless otherwise agreed by the parties hereto, the cost of service and rate base calculations will be on the basis of full incremental costs of service for all new facilities required to transport Alaska Gas only, plus full incremental costs of service for all additions to existing facilities required to transport Alaska Gas, plus allocated costs of service for existing facilities or additions thereto to be utilized to carry both Alaska Gas and Canadian Gas. Existing surplus capacity will be available for the transmission of Alaska Gas until such time as that capacity is required for the transmission of Canadian Gas. When Canadian gas needs this capacity, other capacity will be provided on a timely basis by the owner of the apposite Canadian Segment or its designee for the transportation of Alaska gas, as required.

(b) The cost of service will commence when the Canadian Segments are completed and ready to accept delivery of Alaska Gas and will continue whether any gas is being transported through them or not and for a term sufficient to amortize the cost of the Canadian Segments.

(c) The cost of service will not include a charge for fuel which will be deemed to be Alaska Gas. In effect, Canadian gas will not be used to transport Alaska Gas. The amount delivered at the discharge of each of the Canadian Segments will be the Heating Value equivalent to the amount received at the inlet of each, less the actual amount of compressor fuel and other typical pipeline uses and losses in the Segment for transporting the Alaska Gas.

4.5 Rate of Return

The parties recognize that U. S. shippers of U. S. gas across Canada will be expected to pay a rate for this service which will produce a return on common equity comparable to the highest return on common equity authorized to be earned by any of the three major natural gas pipelines in Canada* under substantially similar circumstances, and if any of these three pipeline companies are authorized to earn a rate of return which produces more than 16% after taxes on common equity on pipeline operations other than the subject Project, the Canadian companies will be entitled to apply for such higher return.

It is agreed that the cost of service will initially provide, for all newly constructed facilities, a rate of return on rate base sufficient to cover the embedded cost of debt and of other securities plus 16% on common equity after income taxes,and for jointly used facilities, at the owner of each Segments option, either the same rate of return as on new facilities or the return on rate base then in effect on such jointly used facilities.

4.6 Exchange Protection

Tariff payments for transportation through Canadian Segments will be made in Canadian funds, but if the owner of a Canadian Segment shall require for its part of the Project, financing in whole or in part by way of the

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*(Amended February 28, 1977) The "three major natural gas pipelines in Canada" shall mean Westcoast, Alberta Gas Trunk and TransCanada Pipelines Limited, and their successors in interest.

sale of securities requiring repayment of principal and/or payment of interest in United States dollars, then Shipper will in its payment for the transportation of its portion of Alaska Gas through such Segment substitute for the same number of Canadian dollars, and the owner of such Segment will accept in substitution the number of United States dollars required in the manner as set out in the tariff for the owner of such Canadian Segment.

4.7 Normalization of Taxes (Amended February 28, 1977)

The treatment of normalization of taxes shall be as provided in the tariffs and Service Agreements applicable to the Segments of the Project Pipeline approved and in effect from time to time.

ARTICLE V

LIABILITIES

5.1 Governmental Authority (Amended February 28, 1977)

Notwithstanding any other provision hereof, this agreement and the rights and obligations of the parties are subject to all present and future laws, rules, regulations and orders of any government or governmental authority or court now or hereafter having jurisdiction.

5.2 Force Majeure (Amended February 28, 1977)

No party shall be liable to any other under this agreement for a default or failure in the performance by it of any obligation in whole or in part when such default or failure results from causes, other than financial difficulties, beyond its reasonable control, PROVIDED that a defaulting party takes all reasonable steps, save the settlement of a labour dispute, to remedy the cause of such default; AND FURTHER PROVIDED that where the cause of the default or failure results from negligence or the contributing negligence of a party the cause of the default or failure shall not be deemed to be beyond its reasonable control.

5.3 Effect on Title

Nothing in this agreement shall operate to or be so construed as a transfer by any party of a legal or equitable estate in such party's Segment of the Project Pipeline to any other party or group of parties.

5.4 Partnership Denied

(a) The relationship of the parties the one to the other created by this agreement is not that of a partnership, which is specifically denied, but is more in the nature of a syndicate or consortium formed for the purpose of carrying out the Project through the coordination of the efforts of the individual members of the group as herein provided for. The liability of each party therefor to third parties is neither joint nor joint and several but individual, and each party shall be liable to third parties whether in tort or in contract only for damages resulting from its acts of commission or omission, save where there is contributory negligence of another party.

(b) Notwithstanding any other provision hereof, no party hereto shall be, nor considered to be, the agent, servant or employee of any other party.

5.5 Delegation

The parties may individually or jointly delegate to one of them or to a third party the right to operate the Project Pipeline as an independent contractor on behalf of all of them and any party may appoint a third party to operate its Segment of the Project Pipeline for it, but no such delegation or appointment shall relieve a party of its obligations and liabilities under this agreement, but no party is required to delegate its right to operate without its consent.

5.6 Default

(a) Should a party commit an act of default in the performance of its obligation under this agreement to construct, install, operate and maintain its particular Segment of the Project Pipeline, or should it make an assignment in bankruptcy, the other parties may, but shall not be obligated to, subrogate the defaulting party and at the risk, cost and expense of the defaulting party rectify the default or advance the necessary monies so to do and any such cost, expense or advance shall be and become a debt due and owing by the defaulting party to those parties which rectified the default.

(b) A waiver by any party of one or more defaults by a party hereto shall not operate as a waiver of any future default or defaults, whether of a like or different character.

5.7 Termination Provisions

(a) This agreement may be terminated upon written notice:

(i) If all the parties hereto so agree or if it is reasonably apparent that the arrangement contemplated hereunder has no reasonable chance of obtaining the necessary approvals in the United States and/or Canada; or

(ii) If all the applications referred to in Section 3.6 have not been granted and accepted by the parties pursuant to Section 3.7 on or before January 1, 1978.

(b) Upon termination, this agreement shall cease to have any force or effect, save as to unsatisfied

obligations or liabilities of any party hereto arising hereunder prior to 12:00 Midnight on the date of such termination or arising thereafter as a result of such termination, and such obligation or liability shall continue and survive the termination of this agreement.

5.8 Indemnification

(a) There shall be reasonable and proper indemnification to each of the parties by the others for any loss or damage caused by a breach of any obligation hereunder save where there is reasonable cause.

(b) In the event that any party shall fail to diligently proceed with preparing, filing and prosecuting any of the applications to be made in the United States and/or Canada required hereunder, in addition to all other remedies at law, any party may seek to recover for all loss or damage occurring as a result of any such failure to proceed with due diligence. Any adverse governmental decision in the United States and/or Canada shall not provide a basis for seeking damages.

ARTICLE VI

MISCELLANEOUS

6.1 Assignment

No party may assign its interest in this agreement in whole or in part, except (i) by a party to its parent, affiliate or subsidiary, or (ii) by a party as a collateral assignment to secure indebtedness or to obtain financing, without the consent of each of the other parties hereto which consent, however, shall not be unreasonably withheld.

6.2 Headings

The headings used herein are for convenience only and are not to be construed as interpreting this agreement.

6.3 Notices

Notices shall be served in writing upon each party herein at the following addresses:

Foothills Pipeline Line Ltd.
1600 Bow Valley Square
205 - 5th Avenue, S. W.
Calgary, Alberta T2P 2W4

The Alberta Gas Trunk Line Company Limited
The Alberta Gas Trunk Line (Canada) Limited
205 - 5th Avenue, S. W.
Box 2535
Calgary, Alberta T2P 2N6

Westcoast Transmission Company Limited
1333 West Georgia Street
Vancouver, British Columbia V6E 3K9

Northwest Pipeline Corporation
P. O. Box 1526
Salt Lake City, Utah 84110

Alcan Pipeline Company
P. O. Box 1526
Salt Lake City, Utah 84110

Each party hereto may change its address by notice in writing to each of the other parties.

6.4 Enurement

This agreement shall enure to the benefit of and be binding upon the parties hereto, their successors and approved assigns. This agreement may be signed in counterpart and the four (4) counterparts so signed shall be and constitute one agreement as though all parties had signed the one instrument.

6.5 Amendment

This agreement shall only be amended by an instrument in writing executed by all parties hereto.

6.6 Operating Representatives

(a) The purpose of the Operating Representatives is to establish an orderly and continuing means of dealing with the design, engineering, installation, operating and accounting for the Project Pipeline during the term of this agreement.

(b) As soon as practicable after the execution of this agreement, Northwest and/or Alcan shall designate one individual and Westcoast, Foothills and Alberta Gas Trunk shall each designate one individual. The designated individuals shall act as Operating Representatives. Alternates shall also be designated to act when the Operating Representative is unable to do so.

(c) Although the Operating Representatives shall not be entitled to amend this agreement, they shall coordinate and make joint recommendations regarding the matters set forth in (a) above. Such joint recommendations shall be submitted to the parties with such explanatory report as is deemed appropriate. Such recommendations shall become effective when approved in writing by all parties hereto. Such approved recommendations shall be deemed to be part of, and within the scope of, this agreement without being deemed an amendment. In addition to the general matters set forth in (a) above, the Operating Representatives may:

(i) recommend standard operating practices and procedures for the Project Pipeline, including measurement practices;

(ii) recommend accounting and reporting details to carry out the provisions hereof;

(iii) exchange technical and environmental data and information related to the Project

Pipeline;

(iv) recommend such other studies or actions, including alternatives not previously considered, appropriate to ensure proper implementation of the Project in a timely manner;

but such recommendations shall not be binding until agreed to in writing by the parties hereto.

6.7 Resolution of Disputes (Amended October 15, 1976)

(a) In the event a dispute arises which is not subject to the primary jurisdiction of a governmental regulatory agency, no party shall be entitled to seek any legal or equitable remedy in any forum until it has first notified the other party in writing of the particulars of such dispute. If such dispute is not resolved within fifteen (15) days after sending such notice, either party may within ten (10) days thereafter elect by written notice to the other to have such dispute resolved by binding arbitration. If binding arbitration is not so elected, either party may thereafter pursue such matter in any appropriate court having jurisdiction in accordance with the rules of such forum.

(b) If either party elects that the matter is to be arbitrated, the party electing arbitration shall set forth the notice of election in adequate detail concerning the issues to be arbitrated, and within ten (10) days from the receipt of such notice, the other party may set forth in adequate detail additional related issues to be arbitrated. Such arbitration shall be conducted in accordance with such rules as the parties may mutually agree to or if, but only if, the parties fail to agree, in accordance with the Rules of Conciliation and Arbitration of the International Chamber of Commerce by three arbitrators appointed under said Rules and shall be decided according to English Common Law and equity. Arbitration proceedings shall take place in such place as the parties may agree or if, and only if, such agreement cannot be reached, such arbitration shall be held in Paris, France and shall be carried out in English. Each party to the arbitration shall submit to the panel of arbitrators the issues to be decided and their position thereon. The arbitrators may request additional or such other evidence, including oral argument, as they deem necessary. Upon determination of any such dispute, the arbitrators

shall assess the cost attributable to such arbitration to the party or parties whose position is farthest away from the actual decision rendered. In the case of monetary dispute, the arbitrators shall be entitled to assess interest. The arbitrators shall be empowered to divide the costs related to such arbitration equally if they deem it appropriate. Subject to (c) below, any party seeking to set any arbitration decision aside or to thereafter seek another remedy, either legal or equitable, in any other forum shall be deemed to have breached this contract and liable to all costs, damages, including consequential, and attorneys fees related to the enforcement and satisfaction thereof.

(c) Notwithstanding the other provisions of this Section 6.7, the parties shall pay within the period of time set forth in any executed Service Agreement all amounts billed thereunder without any resort to the arbitration as provided hereon. The parties shall be entitled to seek any remedy at law or equity in any forum having jurisdiction to enforce collection of such amounts and no such party will in any collection proceedings in such forum raise as a defense to such collections any provisions for arbitration herein provided. Payment of such amounts shall not be deemed to be a waiver of the right to arbitrate the appropriateness of any such billing.

(d) The parties shall offer to include in all tariffs and Service Agreements executed with Shippers of Alaska Gas a provision offering comparable rights of arbitration; however, no Shippers of Alaska Gas shall be required to accept such provision.

IN WITNESS WHEREOF the parties hereto have caused these presents to be executed in six (6) duplicate originals as of the day and year first above written.

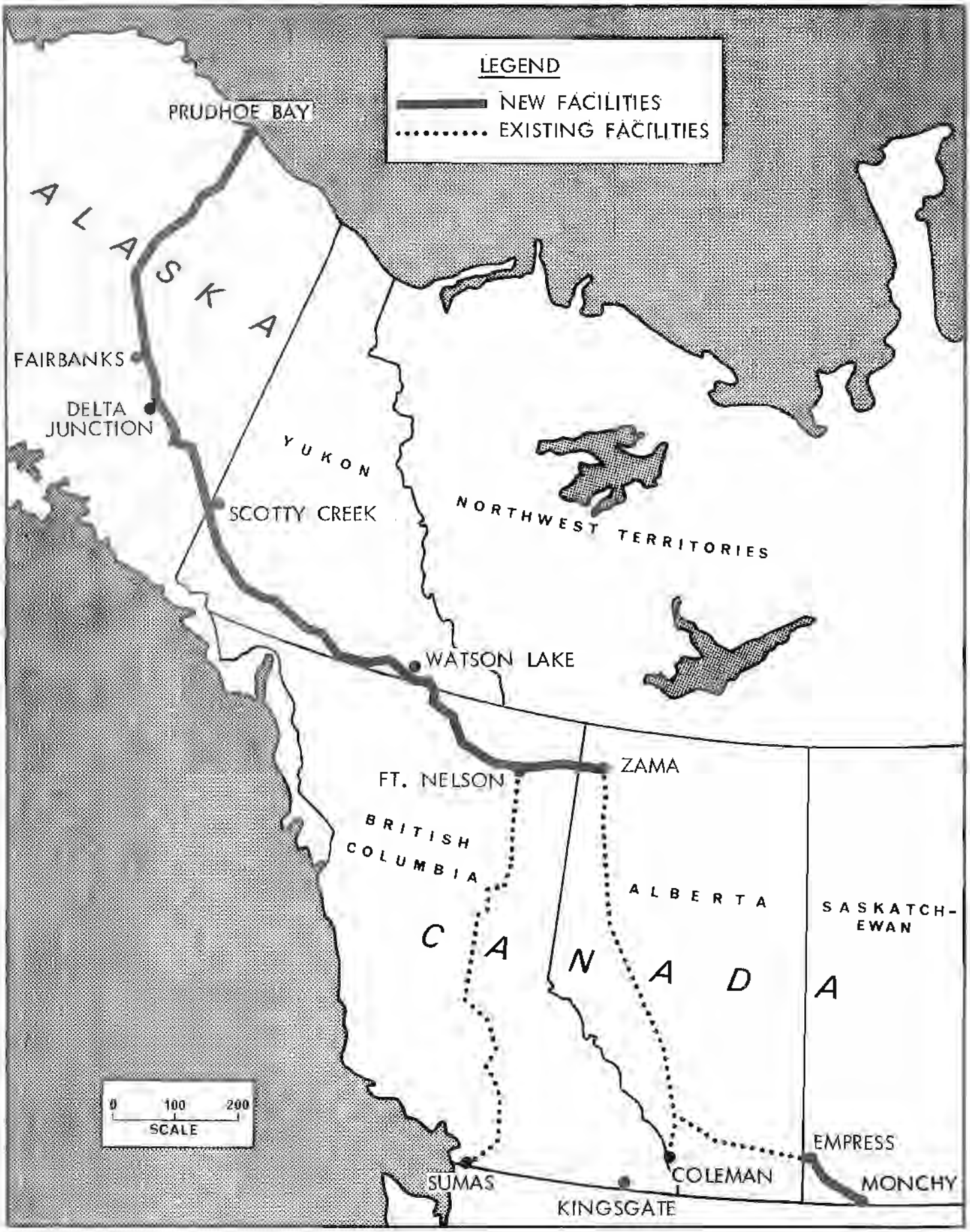
FOOTHILLS PIPE LINES LTD.	WESTCOAST TRANSMISSION COMPANY LIMITED
/s/	/s/
/s/	/s/
THE ALBERTA GAS TRUNK LINE COMPANY LIMITED	NORTHWEST PIPELINE CORPORATION
/s/	/s/
/s/	/s/

THE ALBERTA GAS TRUNK LINE (CANDA) LIMITED	ALCAN PIPELINE COMPANY
/s/	/s/
/s/	/s/

APPENDIX A

(DELETED)

APPENDIX "B"



PROJECT PIPELINE

APPENDIX C

PROPOSED GENERAL CONSTRUCTION SCHEDULE

FOR ALCAN PIPELINE

Phase 1

Phase 1, which will require three (3) years will consist of the construction of approximately 730 miles of 42-inch diameter pipeline from Prudhoe Bay to the Alaska-Yukon border. In connection with such pipeline, thirteen (13) compressor stations with 106,000 installed horsepower for compression and 173,620 installed horsepower for refrigeration will be constructed. Three (3) meter stations will also be installed in Alaska. At the completion of Phase 1 this system will transport approximately 1,200 MMcf per average day.

Phase 2

Phase 2, which will require one (1) year will consist of additions to the existing thirteen (13) compressor stations in Alaska with 79,500 compressor horsepower. Approximately 1,600 MMcf per average day will be transported through this system.

Phase 3

Phase 3, will consist of one (1) year during which the remaining two (2) compressor stations with a total of 212,000 horsepower of compression and 15,320 horsepower for refrigeration will be constructed in Alaska. Upon completion of Phase 3 full capacity will be achieved and the system will transport approximately 2,400 MMcf per average day.

OUTLINE OF SPECIFIC PLANT CONSTRUCTION

ASSUMING GOVERNMENTAL APPROVALS AND FINANCING RECEIVED

BY JANUARY 1, 1978

1978

1. Anticipated Major Activities

   A. Ordering Materials

   B. Selection of Contractor

   C. Civil Construction

   D. Construction of Communication Facilities

2. Percentage Completion

A. Design and Preliminary Work	97 percent
B. Field Construction	10 percent
C. Major Equipment and Materials	

1979

1. Anticipated Major Activities

   A. Pipeline Construction

   B. Station Construction

   C. Hydrostatic Testing

   D. Clean Up and Reclaim, as Appropriate

2. Percentage Completion

A. Design and Preliminary Work	99.6 percent
B. Field Construction	60 percent
C. Major Equipment and Materials	55 percent

1980

1. Anticipated Major Activities

   A. Pipeline Construction

   B. Station Construction

   C. Hydrostatic Testing

   D. Clean Up and Reclaim, as Appropriate

2. Percentage Completion

A. Design and Preliminary Work	100 percent
B. Field Construction	97 percent
C. Major Equipment and Materials	97 percent

1981

1. Anticipated Major Activities

   A. Station Construction

   B. Clean Up and Reclaim, as Appropriate

2. Percentage Completion

A. Design and Preliminary Work	100 percent
B. Field Construction	98 percent
C. Major Equipment and Materials	98 percent

1982

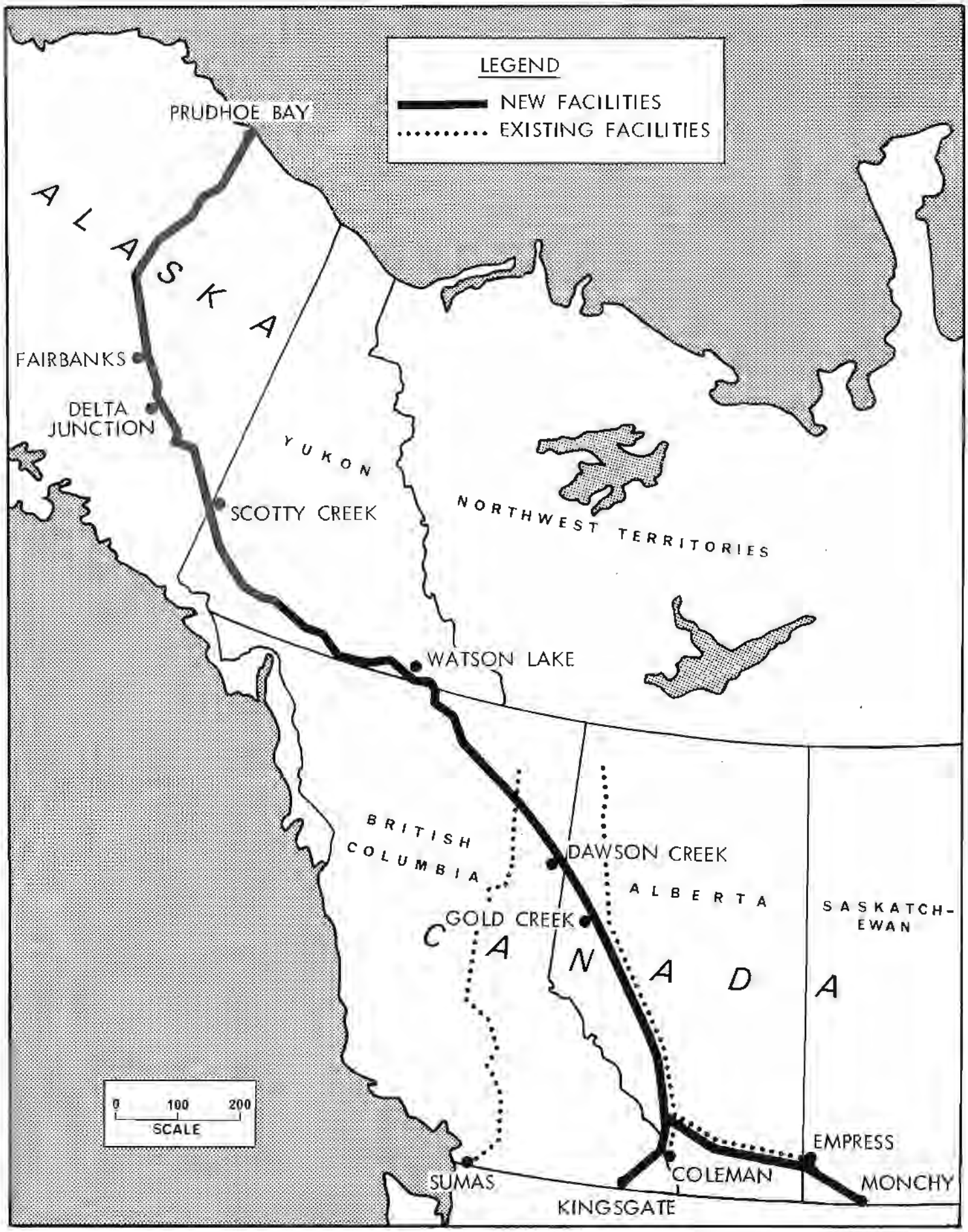
1. Anticipated Major Activities

   A. Station Construction

   B. Clean Up and Reclaim, as Appropriate

2. Percentage Completion

A.	Design and Preliminary Work	100 percent
B.	Field Construction	100 percent
C.	Major Equipment and Materials	100 percent



PROJECT PIPELINE

APPENDIX E

PROPOSED GENERAL CONSTRUCTION SCHEDULE

FOR ALCAN PIPELINE

Phase 1

Phase 1, which will require two (2) years will consist of the construction of approximately 730 miles of 48-inch diameter pipeline from Prudhoe Bay to the Alaska-Yukon border. In connection with such pipeline, eight (8) compressor stations with 132,500 installed horsepower for compression and 98,300 installed horsepower for refrigeration will be constructed. Three (3) meter stations will also be installed in Alaska. At the completion of Phase 1 this system will transport approximately 1,600 MMcf per average day.

Phase 2

Phase 2, which will require one (1) year will consist of additions to the existing eight (8) compressor stations in Alaska with 79,500 compressor horsepower. Approximately 2,400 MMcf per average day will be transported through this system.

OUTLINE OF SPECIFIC PLANT CONSTRUCTION

ASSUMING GOVERNMENTAL APROVALS AND FINANCING RECEIVED

BY JULY 1, 1978

1978-79

1. Anticipated Major Activities

   A. Ordering Materials

   B. Selection of Contractor

   C. Civil Construction

   D. Construction of Communication Facilities

2. Percentage Completion

A. Design and Preliminary Work	97 percent
B. Field Construction	10 percent
C. Major Equipment and Materials	0 percent

1980

1. Anticipated Major Activities

   A. Pipeline Construction

   B. Station Construction

   C. Hydrostatic Testing

   D. Clean Up and Reclaim, as Appropriate

2. Percentage Completion

A. Design and Preliminary Work	99.6 percent
B. Field Construction	60 percent
C. Major Equipment and Materials	55 percent

1981

1. Anticipated Major Activities

   A. Pipeline Construction

   B. Station Construction

   C. Hydrostatic Testing

   D. Clean Up and Reclaim, as Appropriate

2. Percantage Completion

A. Design and Preliminary Work	100 percent
B. Field Construction	97 percent
C. Major Equipment and Materials	97 percent

1982

1. Anticipated Major Activities

   A. Station Construction

   B. Clean Up and Reclaim, as Appropriate

2. Percentage Completion

A. Design and Preliminary Work	100 percent
B. Field Construction	98 percent
C. Major Equipment and Materials	98 percent

SECTION 11

COMPARATIVE SUMMARY

INDEX

Contents	Page
Introduction	1
Comparison With Original Alcan Project	1
Comparison With Competing Projects	2

SECTION 11

COMPARATIVE SUMMARY

Introduction

This section provides a summary overview comparing the Alcan Project 48-Inch Alternative with existing Alaska gas transportation system proposals. Specifically, comparisons are made with (1) the original Alcan Pipeline Project as filed, (2) the amended Arctic Gas proposal recently filed with the National Energy Board of Canada ("NEB") as to the Canadian system and its original filing with the Federal Power Commission ("FPC") as to U.S. systems, and (3) the El Paso proposal as filed with the FPC.

This comparison is made on an escalated and unescalated basis. Alcan submits that the proper comparison is on an escalated basis because the use of an escalated basis reflects the predicted impact of inflation on costs, and thus in the real world is a very meaningful consideration in determining the actual economic impact on the gas consumer. Alcan's proposal assumes commencement of operations at least two years earlier than either Arctic Gas or El Paso thereby realizing capital cost savings due to inflation.

Comparison with Original Alcan Project

A detailed comparison of the 48-Inch Alternative with the 42-inch system is summarized on Exhibit 11-1. Exhibit 11-1 shows the differences in the proposals as to delivered volumes, capital costs, and transportation charges including fuel. Despite an increase of $918.3 million in escalated capital costs ($405.6 million on an unescalated basis), unit transportation charges including fuel have decreased an average of 15 cents per MMBTU (18 cents per MMBTU on an unescalated basis) as compared to the 42-inch proposal. This decrease is almost solely attributable to a 51 percent reduction in fuel consumption resulting from the 48-inch design change. It should be noted that a minor revision in the Btu content of Prudhoe gas volumes has been incorporated to reflect a more reliable estimate of expected gas processing methods of the Prudhoe Bay gas.

Comparison with Competing Projects

Exhibit 11-2 compares the Alcan 48-Inch Alternative with the Arctic Gas proposal and with the El Paso proposal. Data used in the summary reflects volumes, capital costs, and cost of service as filed by the parties involved with adjustments made to escalate 1975 dollar costs for use in the escalated comparisons. Similarly, data filed before the NEB on an escalated dollar cost basis has been adjusted to arrive at 1975 dollar cost figures for comparative purposes. The Arctic Gas estimates reflect the recent filing with the NEB which includes several significant design changes and an increase in escalated capital costs of approximately $600 million.

Exhibit 11-2 shows that the Alcan 48-Inch Alternative will deliver Alaska gas to consumers in the lower 48 states sooner and at a comparable unit cost to the Arctic Gas "best case" situation, and at a unit cost which is less expensive than the El Paso proposal. For example, comparing 1984 through 1987, the first four years of full operation for all three projects, the escalated transportation cost for the 48-Inch Alternative is $2.02 per million Btu versus $2.21 per million Btu for Arctic Gas and $3.04 per million Btu for El Paso. Even if the build-up periods are included, which Alcan does not believe presents a fair comparison since it is delivering gas sooner, the average escalated cost for the period 1981 through 1987 would be $2.22 per million Btu for Alcan versus $2.20 per million Btu for Arctic Gas and $3.04 per million Btu for El Paso. In this instance, the Arctic Gas comparison is based upon the so-called "base case" which assumes volumes from Prudhoe Bay of 2.25 Bcf per day and ultimate volumes from the Mackenzie Delta of 2.25 Bcf per day. If volumes from Mackenzie Delta only reach approximately 1 Bcf per day (as presently anticipated), the Arctic Gas delivered costs would increase approximately six percent. Further, this comparison does not take into account the substantial risk of cost overruns and schedule delays inherent in the Arctic Gas Project. Previous comparisons show that Arctic Gas transportation costs are subject to a probable additional increase of 35 percent due to such overruns and delays.

ALCAN PIPELINE PROJECT - COMPARISON
48-INCH ALTERNATIVE VERSUS 42-INCH AS FILED

Line No.	Description (a)	Alcan 48-Inch Alternative Unescalated (b)	Alcan 48-Inch Alternative Escalated (c)	Alcan 42-Inch As Filed Unescalated (d)	Alcan 42-Inch As Filed Escalated (e)	Alternative vs. As Filed Increase (Decrease) Unescalated (f)	Alternative vs. As Filed Increase (Decrease) Escalated (g)
1	Volumes (Billion BTU)						
2	Daily Volumes						
3	Prudhoe Bay Input	2731.2	2731.2	2692.8	2692.8	38.4	38.4
4	Delivered - Fairbanks	51.2	51.2	49.5	49.5	1.7	1.7
5	- Lower 48	2506.3	2506.3	2288.9	2288.9	217.4	217.4
6	Percent Fuel Consumption	6.4	6.4	13.2	13.2	(6.8)	(6.8)
7	Annual Deliveries - Lower 48	914,800	914,800	835,449	835,449	79,351	79,351
8	Capital Costs (Million Dollars)						
9	Total Project	$6681.7	$9630.6	$6276.1	$8712.3	$405.6	$918.3
10	Transportation Cost ($/MMBTU) 1/						
11	Calendar Year of Full Operation - 1983	$1.52	$2.17	$1.71	$2.33	($0.19)	($0.16)
12	- 1984	1.47	2.11	1.66	2.28	(0.19)	(0.17)
13	- 1985	1.44	2.06	1.62	2.21	(0.18)	(0.15)
14	- 1986	1.38	1.99	1.56	2.13	(0.18)	(0.14)
15	- 1987	1.33	1.93	1.50	2.06	(0.17)	(0.13)
16	Weighted Avg. Unit Cost 1983-1987($/MMBTU)	1.43	2.05	1.61	2.20	(0.18)	(0.15)

Footnotes:

1/ Includes fuel @$1.00/MMBTU

Exhibit II-1

ALASKA GAS TRANSPORTATION SYSTEMS ECONOMIC COMPARISONS

Line No.	Description (a)	Alcan 48-Inch Alternative Unescalated (b)	Alcan 48-Inch Alternative Escalated (c)	Arctic Gas NEB Filing Unescalated (d)	Arctic Gas NEB Filing Escalated (e)	El Paso FPC Filing Unescalated (f)	El Paso FPC Filing Escalated (g)
1	Volumes (Billion BTU)						
2	Daily Volumes						
3	Prudhoe Bay Input	2731.2	2731.2	2576.3	2576.3	2668.4	2668.4
4	Delivered - Fairbanks	51.2	51.2	-	-	-	-
5	Lower 48	2506.3	2506.3	2399.5	2399.5	2377.5	2377.5
6	Percent Fuel Consumption	6.4	6.4	6.9	6.9	10.9	10.9
7	Annual Deliveries - Lower 48	914,800	914,800	876,400	876,400	867,788	867,788
8	Capital Costs (Million Dollars)						
9	Total Project	$6,681.7	$9,630.6	$9,134.7	$12,939.9	$6,618.1	$10,281.6
10	Total Allocated to U. S.	6,681.7	9,630.6	6,170.8	9,002.4	6,618.1	10,281.6
11	Transportation Cost ($/MMBTU) 1/						
12	Calendar Year of Operation - 1981	$2.38 2/	$3.42 2/	$ -	$ -	$ -	$ -
13	1982	2.17	3.11	- 3/	- 3/	- 4/	- 4/
14	1983	1.52	2.17	1.47	2.11	-	-
15	1984	1.47	2.11	1.55	2.22	1.96	3.14
16	1985	1.44	2.06	1.59	2.27	1.91	3.07
17	1986	1.38	1.99	1.56	2.21	1.88	3.01
18	1987	1.33	1.93	1.50	2.14	1.84	2.94
19	Cumulative Volumes Delivered						
20	to Lower 48 Through 1987 (MMBTU)	5,364.4	5,364.4	3,767.8	3,767.8	3,471.2	3,471.2
21	Weighted Avg. Unit Cost Through 1987 ($/MMBTU)	$1.54	$2.22	$1.54	$2.20	$1.90	$3.04
22	Weighted Avg. Unit Cost 1984 - 1987 ($/MMBTU)	$1.41	$2.02	$1.55	$2.21	$1.90	$3.04

Exhibit 11-2

1/ Unit costs include fuel at $1.00/MMBTU.
2/ Reflects initial flow of gas beginning October 1, 1981.
3/ Reflects initial flow of gas beginning July 1, 1983.
4/ Reflects initial flow of gas beginning late 1983, an interim rate will be charged by El Paso for this period.

SECTION 12

ALCAN PIPELINE PROJECT
(48-INCH ALTERNATIVE MAPS)

System Map

Alaska Section

Market Delivery

ALCAN PIPELINE COMPANY

SYSTEM MAP

ALCAN PIPELINE PROJECT
(48" ALTERNATIVE)

LEGEND

- ALCAN PIPELINE COMPANY
- FOOTHILLS PIPE LINES (YUKON) LTD.
- WESTCOAST TRANSMISSION COMPANY LIMITED
- ALBERTA GAS TRUNK LINE (CANADA) LIMITED
- © COMPRESSOR STATION
- Ⓜ METER STATION

Date 3-1-77

Prudhoe Bay
Fairbanks
Delta Junction
Tok Junction
Haines Junction
Whitehorse
Watson Lake
Fort Nelson
Zama Lake
Fort St. John
Dawson Creek
Grande Prairie
James River Jct.
Coleman
Kingsgate
Empress
Monchy
WEST
EAST

48"
42"
36"

SCALE
1 INCH = APPROX. 100 MILES
0 50 100 200 300
MILES

Prudhoe Bay

Milepost 0

Compressor Station AL-1 @ MP 75

AL-2 @ MP 133

AL-3 @ MP 243

AL-4 @ MP 331

AL-5 @ MP 416

AL-6 @ MP 504

MP 593

AL-7

AL-8 @ MP 674

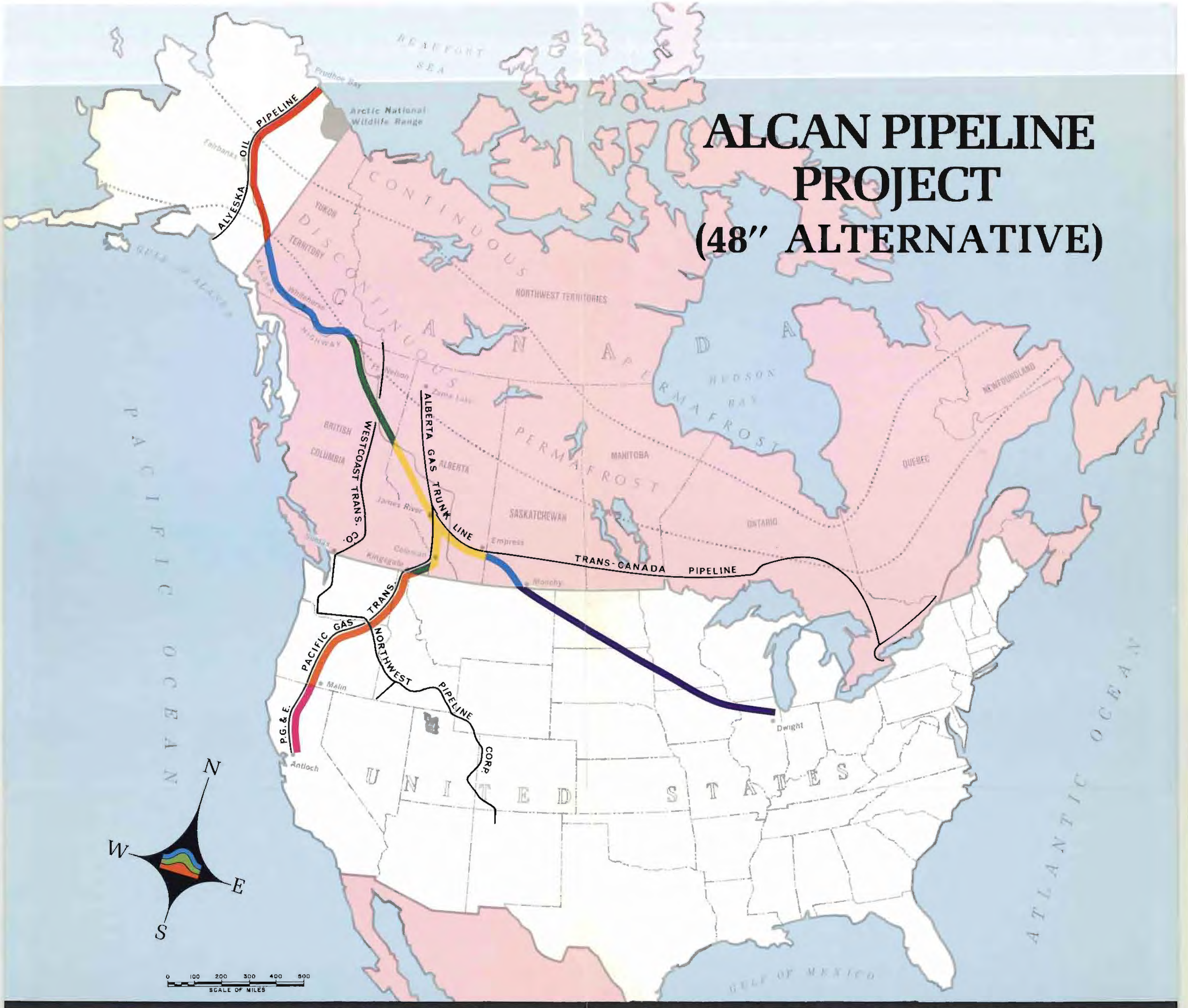
MP 731

ALCAN PIPELINE COMPANY

ALCAN PIPELINE PROJECT
(48" ALTERNATIVE)

ALASKA SECTION

ALCAN PIPELINE PROJECT
(48″ ALTERNATIVE)



COMPANY	ROUTE SEGMENT	DISTANCE (MILES)
ALCAN PIPELINE COMPANY	ALASKA	731
FOOTHILLS PIPE LINES (YUKON) LTD.	YUKON	513
	SASKATCHEWAN	160
WESTCOAST TRANSMISSION COMPANY LIMITED	YUKON/B.C. BORDER TO B.C./ALBERTA BORDER	439
	COLEMAN TO KINGSGATE	105
ALBERTA GAS TRUNK LINE (CANADA) LIMITED	B.C./ALBERTA BORDER TO JAMES RIVER	395
	JAMES RIVER TO COLEMAN	176
	JAMES RIVER TO EMPRESS	235
	TOTAL ALASKA & CANADA	**2,754**
PACIFIC GAS TRANSMISSION COMPANY	KINGSGATE TO MALIN	612
PACIFIC GAS & ELECTRIC COMPANY	MALIN TO ANTIOCH	299
NORTHERN BORDER PIPELINE COMPANY	MONCHY TO DWIGHT	1,117
	TOTAL LOWER 48 STATES	**2,028**