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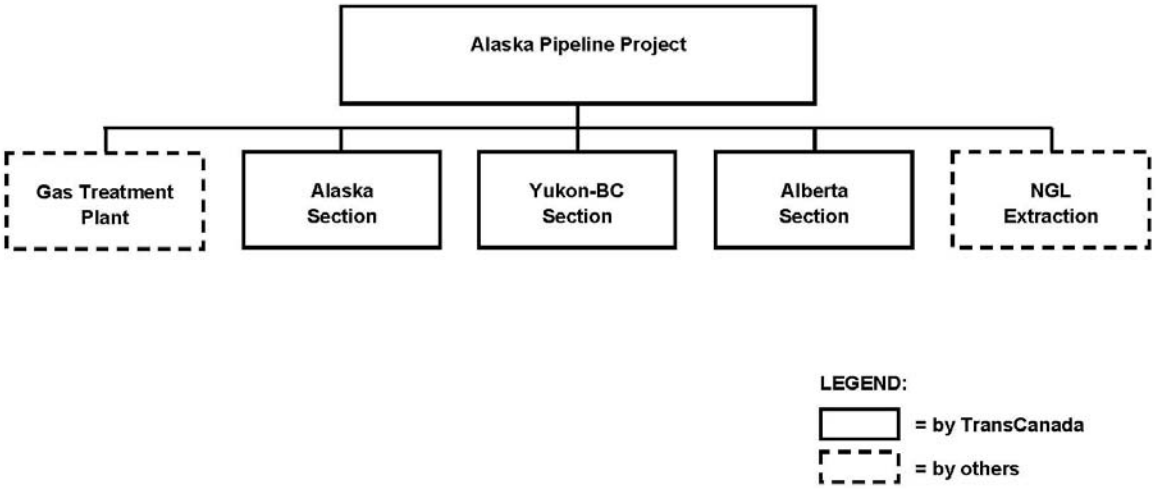
2.1 PROJECT DESCRIPTION

1) Project Components

The Alaska Pipeline Project as proposed by TransCanada would connect natural gas from the North Slope of Alaska to all major markets in North America via the existing Alberta Hub. The Project would include the following general components:

- a gas treatment plant (the "Gas Treatment Plant" or "GTP") that will process approximately 5 bcf/d of residue gas from the existing Central Gas Facility at Prudhoe Bay. TransCanada does not intend to develop, own, and operate the GTP, but is prepared to do so if it is not possible to contract with a third party;
- a new pipeline system (the "Pipeline System") which would extend from the GTP near Prudhoe Bay, Alaska to Boundary Lake on the British Columbia, Alberta border in Canada and which would include pipeline, compression, measurement and other related permanent and temporary facilities;
- new build and existing pipeline infrastructure within Alberta, extending from Boundary Lake to the Alberta Hub and providing connections to the existing Foothills Pre-Build; and
- a new NGL facility in Alaska (to be developed by others) and/or access to natural gas liquids ("NGL") extraction at existing facilities in Alberta. The Alberta System is straddled by three natural gas liquids processing complexes owned by third parties. TransCanada expects that there will be excess capacity at these plants sufficient to process Alaskan gas.

In this Application, TransCanada has separated these components into discrete subprojects, as generally summarized below:



2) Project Phases

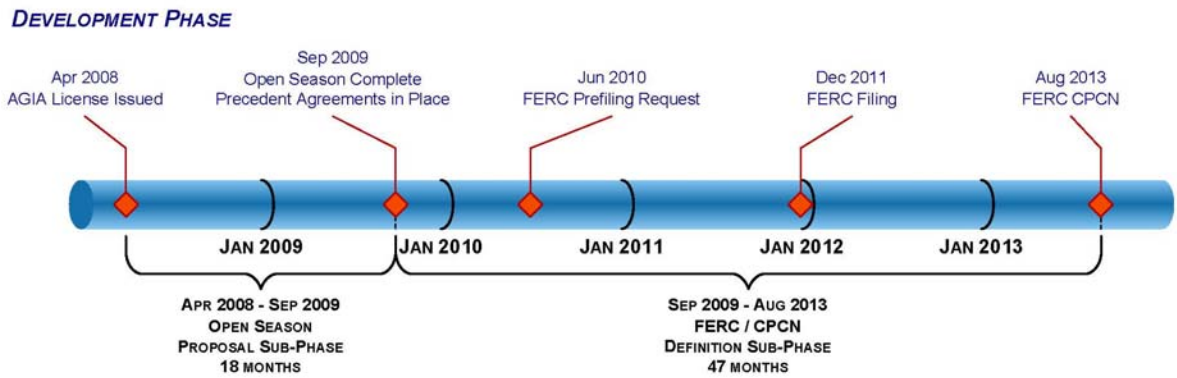
In carrying out the Project, TransCanada would organize its efforts around three main Project phases:

- Project Development
- Project Execution
- Pipeline Operations

A summary of the major work activities and deliverables in each phase, and the relationships between phases are described below, and a chart describing the major activities and deliverables in each phase is in Appendix A "Project Phases". Refer to Section 2.6 for a Project Schedule.

a) Project Development:

The Project Development Phase would be as generally illustrated on the following timeline. This timeline and any other timeline set forth in this Application are conditional on the License being issued on April 1, 2008:



The Project Development Phase would be divided into two sub-phases:

- Proposal Sub-Phase (Prior to End of Open Season)
- Definition Sub-Phase (Post Open Season)

i) Proposal Sub-Phase (Prior to End of Open Season)

This sub-phase begins with the award of the AGIA Licence and ends with the conclusion of the Open Season. Front end engineering design ("FEED") work planned for this sub-phase includes the development of cost estimates, project schedules and associated engineering and environmental work to support the Open Season. Detailed plans for the next sub-phase would also be prepared prior to the Open Season.

ii) Definition Sub-Phase (Post Open Season)

This sub-phase would begin with the conclusion of the Open Season and would end when the Project obtains all major Project approvals and the final Decision to Proceed has been made. For the purposes of this Application, the term "all major approvals" includes the receipt of a Certificate of Public Convenience and Necessity ("CPCN") from FERC; confirmation that the estimated Project cost and schedule are within the

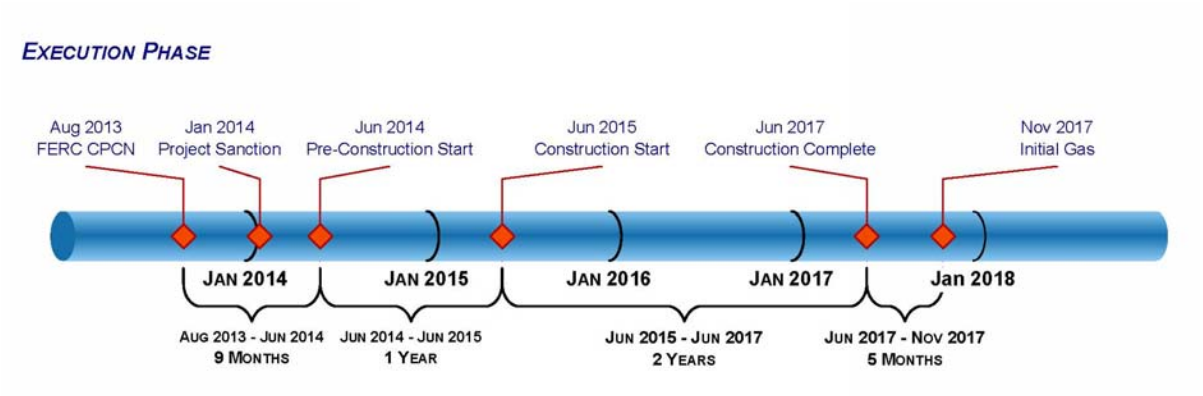
bounds established in the Precedent Agreements or this condition has been waived; approval of financing; and granting of all internal corporate approvals.

FEED planned for this sub-phase would include all technical work required to prepare cost estimates, Project schedules and associated engineering and environmental work to support the preparation of all major regulatory filings. This would include system hydraulic design, basic/preliminary engineering, field studies and a portion of detailed engineering. Detailed plans for the Execution Phase would also be prepared during this sub-phase.

A portion of detailed engineering, procurement and environmental planning/design for the Project may take place concurrently with this sub-phase to support the issuance of Requests for Proposals for major materials, equipment and construction. Receiving and evaluating such proposals prior to the final Decision to Proceed would provide an enhanced level of cost and schedule certainty for the Project prior to embarking on the Execution Phase. While this detailed engineering, environmental and procurement work may overlap the Development Phase, it would nevertheless be part of the Execution Phase.

b) Project Execution

TransCanada estimates that the Project Execution Phase would be as generally illustrated on the following timeline. This timeline and any other timeline set forth in this Application are conditional on the License being issued on April 1, 2008:



The Project Execution Phase would begin once "all major approvals" have been received as defined above and the final Decision to Proceed has been made.

As defined in the RFA, Project Sanction would occur when the amount of external commitments exceeds $1,000,000,000. It is anticipated that this event would be in January 2014, which is five months after the estimated date for receipt of major regulatory approvals in the U.S. and Canada. The Project Execution Phase would end when all remaining permits and authorizations are secured, all pre-construction, construction, testing and commissioning activities are completed, the pipeline is loaded, all major components are functioning satisfactorily and there is Commencement of Commercial Operations.

If the credit support for the Project is not sufficient to finance construction of the Project and the Project is not sanctioned as provided in AS 43.90.200(c), TransCanada will not proceed with the Execution Phase of the Project, will comply with any State requests under AS 43.90.200(d) (in which case, it will be entitled to payment of its net qualified expenditures under AS 43.90.200(e)) and will have no further obligations or liabilities to the State.

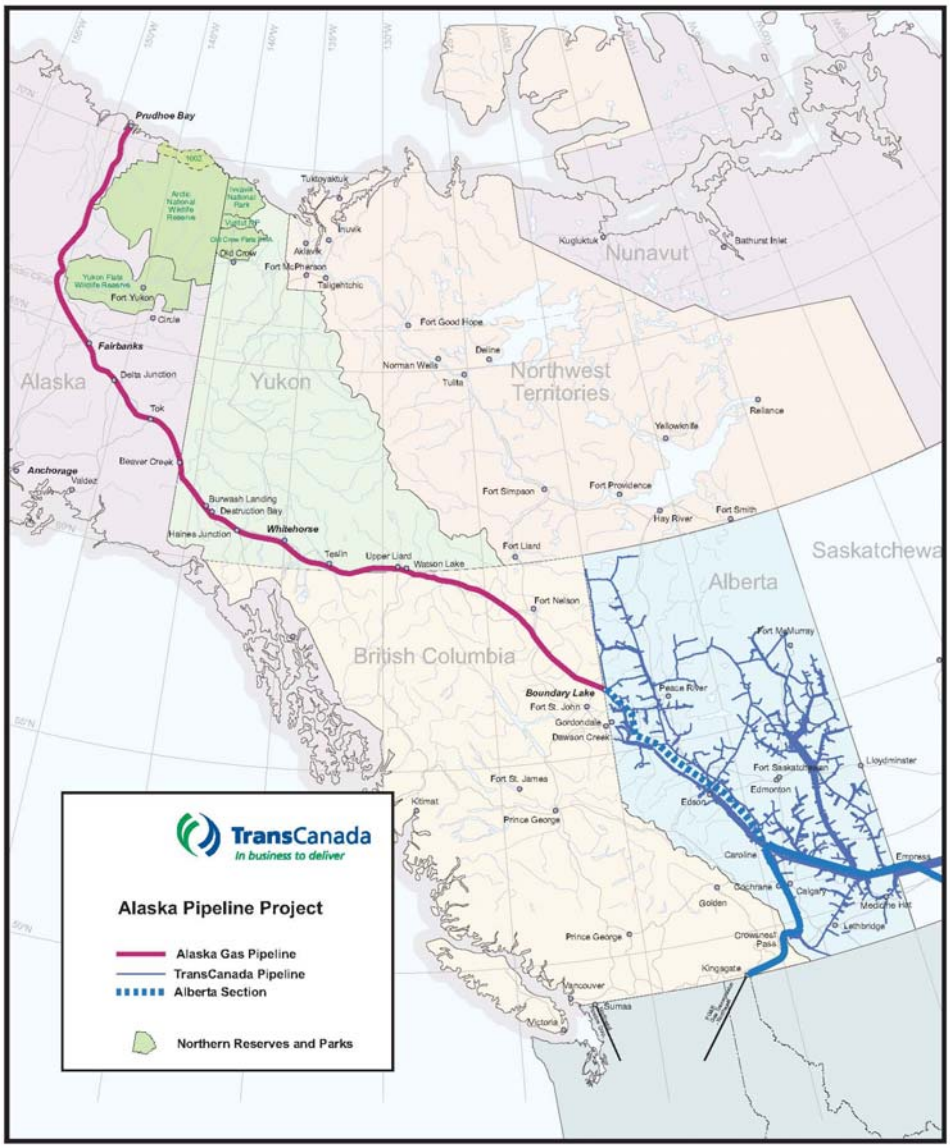
c) Pipeline Operations

The Pipeline Operations Phase would begin with the Commencement of Commercial Operations and would end when the Pipeline System is no longer required and is removed from service.

2.1.1 Pipeline

1) Pipeline Route

The route that is proposed by TransCanada for the Pipeline System is generally illustrated on the following map. In Alaska, the route generally follows the Trans Alaska Pipeline System ("TAPS") and the Alaska Highway, and in Canada it follows the route set out in the *Northern Pipeline Act* ("NPA"), 1977-78, c-20, R.S., 1985, c.N-26.



2) Alaska

Based on preliminary analysis, and subject to confirmation during the Development Phase, the major components of the Alaska Section of the proposed Pipeline System are summarized as follows:

- Pipeline
  - approximately 750 miles in length, 48-inch diameter, Grade X80 steel pipe, wall thickness of 1.042 inch as required for Class 1, Div. 2 pressure containment (increased wall thickness may be specified at crossings and to meet other design requirements);
  - buried throughout, except at compressor stations, metering stations, certain river crossings, and major faults;
  - 2,500 psig maximum allowable operating pressure ("MAOP"), gas chilled to just below freezing temperatures.

- Compressor Stations
  - 6 stations at start-up; 13 stations ultimately;
  - 44,000 hp (ISO) gas turbine driven centrifugal compressors, Rolls Royce RB 211-6761 DLE or equivalent;
  - propane cycle gas chiller plants utilizing 6,000 hp (ISO) propane compressors, Solar Centaur 50 or equivalent;
  - gas turbine driven electric power generators, two per station, each 3,000 hp;
  - fenced, gravel pad, pile-foundation metal buildings.
- Other Permanent Facilities
  - one custody transfer gas metering station;
  - operating and maintenance ("O&M") center;
  - workpads, storage yards.
- Temporary Facilities
  - material sites (gravel pits);
  - access roads;
  - workpads (gravel, ice, snow or grade);
  - construction camps;
  - miscellaneous (bridges, etc.).

a) Pipeline

The route would originate near Prudhoe Bay in northern Alaska, immediately downstream of the proposed Prudhoe Bay metering station. The Prudhoe Bay metering station would be located immediately downstream of the proposed GTP.

The pipeline route would generally align with TAPS in a southerly direction from Prudhoe Bay to a location near Prospect Creek. The pipeline would then follow TAPS in a south-easterly direction to Delta Junction. Here the line would diverge from the TAPS route, and continue in a south-easterly direction following the Alaska Highway to the Alaska/Yukon border. The Alaska Section of the pipeline would connect with the Canada Section at a metering station on the Alaska/Yukon border.

Pipe size would be 48-inch outside diameter. The pipeline MAOP would be 2500 psig. Initial annual average daily capacity of the pipeline would be 4.5 bcf/d. The system would be capable of being expanded, through the addition of seven compressor stations, to provide an annual average daily throughput of 5.9 bcf/d. Expansions beyond 5.9 bcf/d would include a combination of compression and pipeline looping.

The mainline pipe material will meet the requirements of the Code of Federal Regulations ("C.F.R.") Title 49, Part 192 and American Petroleum Institute ("API")-5L, Grade X80. Pipe wall thickness will be 1.042 inch for pressure containment in Class 1, Div. 2 locations, and will increase according to class location and other design requirements. The pipe will be externally and internally coated. Pipeline corrosion control will be provided by a combination of external coating and a cathodic protection system.

There are provisions for a minimum of five intermediate gas delivery points along the Alaska Section.

Mainline block valve assemblies would be provided at a nominal spacing of 20 miles and at compressor station locations. Launchers and receivers for pipeline in-line inspection devices (pigs) would be installed at compressor and metering stations.

The pipe would be buried, except at compressor and metering stations, and at fault crossings and some large river crossings.

b) Compressor Stations

Six compressor stations would be constructed at the same time as the pipeline. Ultimately there could be up to thirteen stations built. The locations of compressor stations along the pipeline would be based on hydraulic design criteria and adjustments for compatibility with surrounding land use and sensitive environmental areas. The number and location of compressor stations may change or need to be further optimized based on final capacity and design parameters. Each compressor station site will be a fenced gravel pad requiring about 25 acres.

Compression equipment assumed in TransCanada's preliminary analysis would consist of a 44,000 hp (ISO) Dry Low Emission ("DLE") gas turbine powered single stage centrifugal compressor with dry gas seals. The compressor packages would be equipped with "low noise" compressor intake and exhaust, and a sound reducing unit enclosure and compressor building. Alternative compression platforms would be considered during Front End Engineering Design.

Compressor station components would be extensively modularized to minimize on-site construction and commissioning work in remote locations. These modules would be constructed at suitable facilities in Alaska, the Lower 48, or elsewhere, depending on Project economics. Each compressor station would include areas for periodic habitation (for maintenance and emergency occupancy), control and service functions. Permanent living quarters may be required at some compressor stations.

Foundations would generally use steel piles. In permafrost areas, the gas compressor and warehouse buildings would sit on insulated, ventilated gravel pads with thermopiles to remove heat dissipated from the building. Other buildings and small skids would be designed with an airspace or insulation between the building and the ground to preserve the ground thermal regime. Active or passive refrigeration systems would be used where required to minimize settlement in permafrost.

Compressor stations would include gas-chilling facilities to control the natural gas discharge temperature. Multiple trains of propane cycle gas chillers would chill gas, provide operating flexibility and support a modular approach to design and construction.

Electrical power requirements would generally be supplied through on-site generation, although detailed design may utilize grid power, where available.

Pipeline gas would be used to power the drivers for the gas compressors, refrigerant compressors and electric generators.

The compressor station sites would consist of a fenced gravel pad, with a pile-foundation metal building housing the turbine, compressor and chiller units.

The Pipeline System would be controlled remotely from a central operations control center using a Supervisory Control and Data Acquisition ("SCADA") system.

Compressor stations and mainline block valves would have local control systems capable of shutting down the compressor station or closing a mainline block valve automatically in the event of an emergency. Each compressor station would include a control system that would interface through the SCADA link to the central gas control facility and O&M Center.

c) Measurement

There would be one custody transfer gas metering station in Alaska. It would be located between the outlet of the GTP and the start of the Pipeline System. It is anticipated that the meter station site would be a five acre gravelled, fenced site, utilizing ultrasonic flow metering.

3) Canada (Alaska/Yukon Border to Boundary Lake)

The route for the Yukon-BC Section of the Pipeline System generally follows that as set out in the NPA. The scope, based on designs completed to date and subject to confirmation during the Development Phase, is summarized as follows:

- Pipeline
  - 965 miles in length, stretching from the Alaska/Yukon border near Beaver Creek to Boundary Lake, located on the BC/Alberta border. Of that total distance, 517 miles would be located in the Yukon Territory and 448 miles in British Columbia. The pipeline would be a 48-inch diameter, Grade X80 steel pipe, wall thickness of 0.975 inch as required for Class 1 pressure containment (increased wall thickness may be specified at crossings and to meet other design requirements);
  - buried, except at compressor stations, metering stations, certain river crossings;
  - 2,600 psig MAOP, gas chilled to near freezing temperatures to a location upstream of Kluane Lake. Downstream of that point, the gas will flow above freezing point.
- Compressor Stations
  - 10 stations at start-up; 19 stations ultimately;
  - 44,000 hp ISO gas turbine driven centrifugal compressors, Rolls Royce RB 211-6761 DLE or equivalent;
  - propane cycle gas chiller plants utilizing 6,000 hp ISO propane compressors, Solar Centaur 50 or equivalent;
  - gas turbine-driven electric power generators, two per station, each 3,000 hp;
  - fenced, gravel pad, pile-foundation metal buildings.
- Other Permanent Facilities
  - one or more custody transfer gas metering stations;
  - one or more O&M Centers;

  - storage yards.
- Temporary Facilities
  - material sites (gravel pits);
  - access roads;
  - construction camps;
  - miscellaneous (bridges, etc.).

a) Pipeline

The Canada Section of the route originates at the Alaska/Canada border near Beaver Creek, Yukon. The pipeline route would adhere to the corridor concept, following the Alaska Highway. The 517 mile, 262 yard wide easement in the Yukon Territory is held on Foothills' behalf in the name of the Northern Pipeline Agency. There are numerous reservations by notation held in the name of the Northern Pipeline Agency. Reservations by notation are plots of land set aside for proposed borrow sites, campsites, and material and fuel storage sites to support construction of the Pipeline System as well as compressor station sites. See Section 2.2.4.2(2) "Rights of Way – Canada" for further details on the easement.

The pipeline route would follow the Alaska Highway for 517 miles where it crosses into the Province of British Columbia. There is a map reserve 1640 yards wide held in the name of Foothills Pipe Lines Ltd. Of the 448 miles across British Columbia, the APP route parallels the Alaska Highway for 60 miles. Although there are numerous service roads that intersect the highway, some access roads would have to be constructed to support pipeline construction.

Pipe size would be 48-inch outside diameter. Maximum allowable operating pressure would be 2600 psig. The difference in MAOP in Alaska and Canada is due to different design codes (refer to Section 2.2.1(5)(b) "Design Standards and Regulations" for further details). Initial annual average daily capacity of the pipeline would be 4.5 bcf/d. The system would be capable of being expanded, through the addition of nine compressor stations, to provide an annual average daily throughput of 5.9 bcf/d. Expansions beyond 5.9 bcf/d would include a combination of compression and pipeline looping.

The mainline pipe material would meet the requirements of the Canadian Standards Association ("CSA") Z662, Grade X80. Pipe wall thickness would be 0.975 inches for pressure containment in Class 1 locations, and would increase according to class location and other site-specific design requirements. The pipe would be externally and internally coated. Pipeline corrosion control would be provided by a combination of external coating and a cathodic protection system.

There are provisions for eight intermediate gas delivery points along the Yukon-BC Section of the pipeline (these locations are identified in the *Northern Pipeline Act*):

- Beaver Creek
- Burwash Landing
- Destruction Bay
- Haines Junction

- Whitehorse
- Teslin
- Upper Liard
- Watson Lake

Mainline block valve assemblies would be provided as required by applicable design codes. Launchers and receivers for pipeline in-line inspection devices (pigs) would be installed at certain compressor and metering stations.

The pipe would be buried, except at compressor and metering stations. The pipeline would cross 115 major water crossings requiring construction considerations such as heavy wall pipe, continuous concrete coating or set-on concrete weights. At some locations, aerial crossings may be used. There would be approximately 38 major highway crossings, all uncased and using heavy wall pipe.

b) Compressor Stations

Ten compressor stations will be constructed at the same time as the pipeline. Ultimately there could be up to nineteen stations built. The locations of compressor stations along the pipeline will be based on hydraulic design criteria and adjustments for compatibility with surrounding land use and sensitive environmental areas. Upstream of Kluane Lake, the compressor stations would utilize propane chilling, similar to the stations described above for the Alaska Section. Downstream of Kluane Lake, most stations will utilize aerial cooling to maintain temperature control.

c) Measurement

There would be two custody transfer gas metering stations in Canada. One would be located at the Alaska/Yukon border. The second meter station would be located at Boundary Lake, Alberta. It is anticipated that ultrasonic flow measurement would be implemented and that each station site would be five acres, gravelled and fenced.

4) Canada (Downstream of Boundary Lake)

The route for the Alberta Section of the Pipeline System generally follows that as set out in the NPA. Given the current WCSB natural gas supply and intra-Alberta demand forecasts, TransCanada expects there would be available capacity in the existing gas infrastructure downstream of Boundary Lake for the transportation of a portion of the initial Alaska gas. This available capacity in the existing gas infrastructure would be supplemented by new incremental facilities to handle the remainder of the 4.5 bcf/d from Alaska. These new facilities will be built and owned by Foothills under the NPA connecting to the existing Pre-Build, and would consist of pipe looping and new compressor stations. The facility plan for the Alberta Section will be updated from time to time to reflect the latest information on the market supply and demand situations as well as the volumes of gas committed in the initial and subsequent Open Seasons.

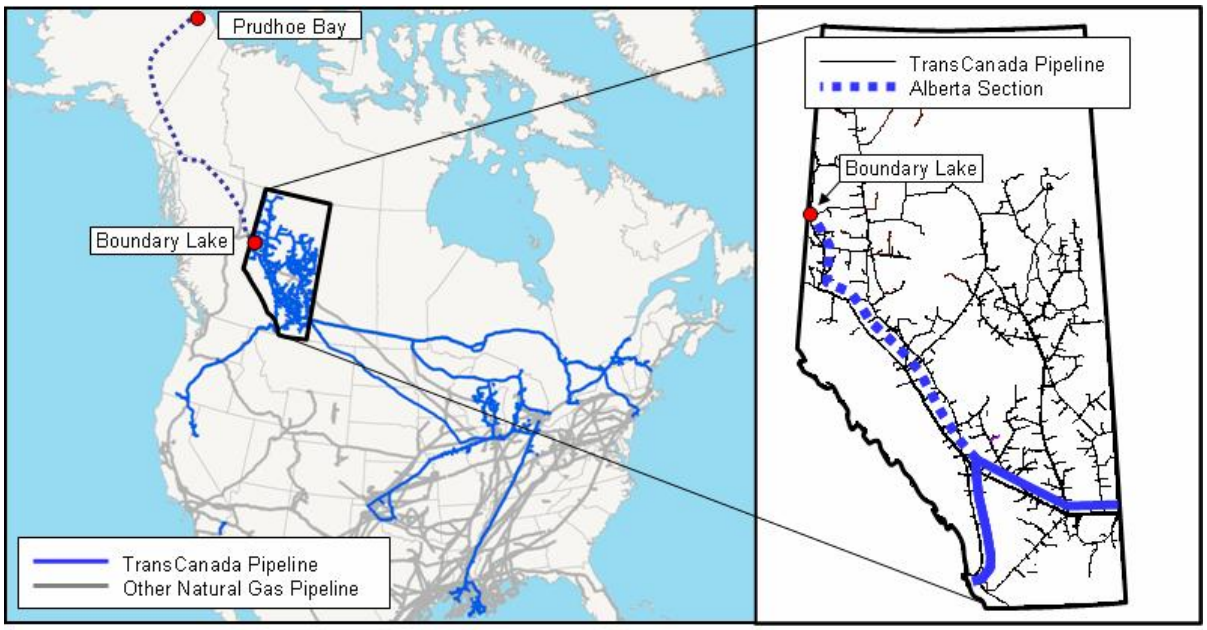
5) Major Markets Served

a) North American Natural Gas Pipelines

The United States and Canada have an integrated energy market that is supported by extensive infrastructure for the transportation of natural gas. This pipeline grid has been significantly expanded during the past 20 years to support increasing flows of Canadian natural gas to the United States.

Currently the Alberta System has a Transportation by Others ("TBO") arrangement for Foothills Pre-Build facilities located within Alberta to transport WCSB gas. Such TBO arrangement between the Alberta System and Foothills would allow the Alberta System to utilize the new and existing Foothills facilities in Alberta to offer transportation services to the Alaska Shippers. When Alaska's natural gas reaches the BC/Alberta border, Shippers would contract with the Alberta System and enter the Alberta Hub.

As the above figure shows, TransCanada's Alberta System is the hub for the physical receipt and delivery of natural gas across Western Canada, connecting with the other major pipelines to transport natural gas to the United States and other Canadian provinces. Currently, approximately 17 bcf/d of natural gas is produced in western Canada and roughly 9 bcf/d is exported to the United States.



North American Natural Gas Transmission Grid | **TransCanada Alberta System**

b) TransCanada's Alberta System

As illustrated on the map above, TransCanada's Alberta System is connected to major gas pipelines that carry gas from the WCSB to major gas consuming markets in North America. The connecting pipeline grid can move Alaska gas to the Pacific Northwest and California, the Midwest and Chicago, the Northeast and New York, and all Canadian markets east of Alberta.

The Alberta System is more than a set of interconnecting pipes. In addition to reaching into every corner of the province, it is both a physical and commercial system that through its services, offers buyers and sellers one of the largest trading hubs in North America.

As a physical pipeline system, it is a province-wide, fully integrated, gas gathering and transportation system that has evolved over almost 50 years of operation. Today, the Alberta System consists of approximately 15,000 miles of pipe, 50 compressor stations with 1.2 million hp of compression power, 1000 receipt points and 200 delivery points. Gas is transported to intra-Alberta delivery points as well as to ex-Alberta border points where it then connects to other pipeline systems serving North American markets.

2.1.2 North Slope Gas Treatment Plant

The GTP would process approximately 5 bcf/d of residue gas from the existing Central Gas Facility ("CGF") at Prudhoe Bay. TransCanada does not intend to develop, own and operate the GTP, but would contract with a third party do so. If no third party agrees to undertake the GTP 30 days prior to TransCanada issuing notice for the Open Season, TransCanada would include GTP as part of the Alaska Open Season. To facilitate evaluation of the Application, TransCanada has included relevant Project and cost data for the GTP, based on a conceptual design.

The gas would be sourced upstream of the existing residue gas compression and would contain a maximum H_2S content of 20 ppmv and 12 mol% CO_2. The GTP would extract acid gas components from the CGF residue gas stream in order to provide a sales gas stream that meets the Project sales gas specifications including maximum 1.5 vol% CO_2 and maximum 16 ppmv H_2S. Gas to the GTP is assumed to be available from the CGF at 650 psig and 60°F. The gas is further assumed to have passed through a CGF dew point control unit and meet the hydrocarbon dew point specification for sales gas.

A number of technologies are available to treat the gas to the required specifications. A comprehensive study of available technologies would be undertaken in the Development Phase and a process chosen as the basis for design. However, for the purposes of developing a Class 5 Cost Estimate for this Application, a conceptual design for a conventional gas treatment plant was prepared. This conceptual design consists of:

- inlet separation and filtration;
- gas treatment using formulated methyldiethanolamine ("MDEA");
- sales gas dehydration using molecular sieves;
- sales gas compression and cooling;
- sales gas chilling using propane refrigeration; and
- acid gas (CO_2) dehydration using tri-ethylene glycol ("TEG").

The 4.5 bcf/d sales gas stream would be compressed to 2500 psig and chilled to 28°F. The CO_2 would be fed into the existing residue gas stream and reinjected into the reservoir.

The process equipment would consist of several parallel trains, arranged on modules. The trains would be designed for incremental expansion.

The modules would be constructed at suitable facilities in Alaska, the Lower 48, or elsewhere depending on their sizes and project economics. They would be barged to Prudhoe Bay, transported to site, and placed on piles for permafrost protection. Docking facilities and road access for the module transport already exists.

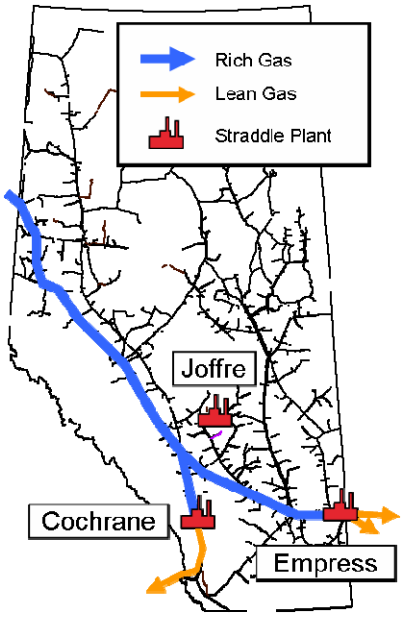
The site for the GTP would be to the east of the CGF and would be covered with gravel. It would be sized to accommodate the process modules, utilities, tankage, control centre and staff facilities.

2.1.3 LNG Project

TransCanada has not proposed an LNG project. However, in the event that the Project through Canada does not attract sufficient volumes in the initial binding Open Season, or Shippers commit sufficient volumes for both the pipeline through Canada and an LNG project, TransCanada is willing to offer gas treatment and pipeline transportation services from Prudhoe Bay to Delta Junction or Valdez in the event a Shipper requests such services. Refer to Appendix N "Tariffs for LNG Option" for a brief discussion of these offerings.

2.1.4 Gas Processing and NGL Markets

In the absence of any NGL processing capacity in Alaska, TransCanada's project is premised on NGL processing taking place in Alberta. The Alberta System is straddled by three NGL processing complexes located at Empress, Cochrane, and Joffre, as shown on the accompanying map.



LIQUIDS EXTRACTION FACILITIES FOR ALASKAN GAS

The processing facilities, owned by third parties, have a total inlet capacity of approximately 13 bcf/d. Currently, there is spare capacity, as the actual flow to these facilities is approximately 8 to 9 bcf/d. The Empress and Cochrane facilities benefit from substantial economies of scale as the individual processing trains generally have capacities in excess of 1 bcf/d. Each plant is capable of removing in excess of 96% of the propane-plus components, while average ethane recovery is currently 67% with several plants recovering more than 80% of the ethane. Furthermore, operators of two of these facilities have proposed modifications to increase ethane recoveries. In the future, it is expected that intra-Alberta gas demand will increase and supply from the WCSB will remain flat and therefore the spare capacity at these facilities is expected to grow.

All of the ethane recovered from these facilities is segregated at the point of recovery and transported by an integrated pipeline system for consumption by Alberta's well established petrochemical industry or for export to NGL markets in North America. Alberta is Canada's largest petrochemical producing area, with annual shipments totalling almost $15 billion and exports of more than $7 billion in 2006. The remaining NGL mix is delivered by pipeline to large scale fractionation and storage facilities located at Fort Saskatchewan, Alberta or Sarnia, Ontario. Much of the resultant

specification product is sold into high value markets across the northern tier of the U.S. and Eastern Canada.

The following map shows NGL facilities within Alberta together with major connecting pipelines in the province and to significant markets across North America.