Development Plan
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2.2 DEVELOPMENT PLAN

2.2.1 Front End Engineering Design Plan

1) Introduction

This Section 2.2.1 provides a general description of how TransCanada would conduct the FEED portion of the Project and discusses how TransCanada's governance model would be applied to ensure that scope, cost and schedule of the engineering design work meets the requirements of the Development Phase of the Project. The section includes a high-level summary of the engineering and environmental work that would be included in FEED and provides an estimate of the resources that would be needed.

Much of the proposed route lies in regions of continuous or discontinuous permafrost, as well as zones of potentially severe seismic activity. As these conditions necessitate design approaches for which specific guidance is not provided in the applicable pipeline standards, Project-specific design methodologies will be required. Accordingly, an introduction to these design methodologies for the pipeline is also provided in this section.

2) Management Approach

During the Development Phase, TransCanada would put in place a Project Management Team ("PMT") to oversee all aspects of the pipeline and facility work in Alaska and Canada. It is expected that TransCanada would fill key positions within the PMT with core staff for the duration of the Project, supplemented by consultant/contract personnel, as required. The PMT would also include in-house specialists with expertise in areas such as hydraulic and geothermal design, materials and permafrost engineering, and environmental management.

a) Engineering, Procurement and Construction Management Contract Strategy

Project management, engineering, procurement and construction management functions would be handled by external engineering, procurement and construction management ("EPCM") contractors or engineering, procurement and construction ("EPC") contractors that specialize in the execution of major projects. Under the EPC form of contract, the EPC contractor typically assumes all or a major portion of the risk for engineering, procurement and construction costs and contracts directly with construction contactors. With an EPCM contract, contractors or consultants manage the engineering, procurement and construction management of the work on behalf of the owner, and construction contracts are set up between the owner and construction contractors. EPCM contracts are typically cost reimbursable, while EPC contracts are often based on a fixed-price. While an EPC contracting strategy is attractive in terms of providing relative cost certainty, the cost of transferring risk in this way is market-sensitive and can be considerable. The decision as to which contract strategy to use for the APP would be made during the Development Phase, considering the market conditions for such services at that time.

For the purposes of this Application, the term "EPCM contractor" is used with the understanding that the form of contract could be EPC or EPCM. It is TransCanada's current intent to have separate EPC or EPCM organizations for the Alaska Section, the Canada Pipeline Section, facilities in Alaska, facilities in Yukon/BC and the GTP, if

owned by TransCanada, however other approaches may offer greater efficiencies and will be considered early in the Development Phase. The EPCM contractor organizations would be mobilized during the Development Phase and would be expanded as necessary during the Execution Phase. The EPCM contractor would work under the direction of TransCanada's PMT.

b) Environmental Management Contract Strategy

TransCanada intends to have two major Environmental Management ("EM") contractors – one for the Alaska Section and the GTP, and one for Canada Section. The intent would be to maximize procurement of Alaska based environmental consulting expertise as much as possible to support the Alaska portion of the project, recognizing that some degree of support may be provided by other U.S.-based environmental consulting firms. Similarly, TransCanada intends to procure as much of the environmental consulting services as practical from Yukon and British Columbia based companies with support from other Canadian based companies as deemed appropriate, to support the Canada Section of the project.

In Alaska, the EM contractor would be responsible for providing support for environmental strategy development; support for regulatory requirements definition based on discussions with regulatory agency representatives; review of existing publicly available information and analysis of gaps; environmental field program definition and planning; and data analysis and report writing to support regulatory applications. In this phase, the consultants would have expertise in local, State and federal regulatory processes and requirements. The EM contractor for the Canada Section would have similar responsibilities, but with a Canadian / Northern Pipeline Agency focus.

The Environmental Management contracts would be awarded on a cost-reimbursable basis.

c) Owner's Project Organization

The organizational structure proposed for the Development Phase would have a TransCanada Vice President leading the overall PMT. Reporting to the APP Vice President would be four directors; the Commercial Director, a Project Services Director and a Project Management Director for each of the Alaska and Canada Sections. Generally, staff would be located in Alaska, Calgary or other locations depending on where their work is taking place (e.g. an engineering contractor may be located in Houston).

If TransCanada is to develop the Gas Treatment Plant, it would be managed by a fifth director reporting to the APP Vice President. This GTP Director would be supported during the Development Phase by a technical manager, a commercial manager and the managers identified as reporting to the Director of Project Services and the Director of Project Management – Alaska as described below, plus a team of support staff.

Reporting to the Commercial Director would be three managers responsible for finance, commercial law and customer service.

- The Manager of Customer Service would interface directly with shippers, potential shippers, commercial representatives of the GTP and interconnecting

pipelines. This manager would be responsible for all commercial matters relating to shippers and Transportation Service Agreements, including responsibility for the Open Season.

- The Manager of Finance would look after all matters relating to Project financing, insurance, taxation and Project budgeting.
- The third manager in the commercial group, the Manager Legal, would look after legal matters and would likely be a senior commercial lawyer.

The two project management directors would be accountable for the project management of all technical work for the Pipeline Project. Each of these directors would have a team of managers, technical and support staff, and be accountable for all technical work within their region. Each manager would lead an integrated team of TransCanada secondees and consultants who would direct the work of the EPCM contractors throughout the FEED process.

Each of the two project management directors would have the following staff:

- A Manager of Pipeline Project Management, who would lead a team of project managers and support staff. Each project manager would have responsibility for a sub-project corresponding to a geographic area (e.g., Yukon pipeline segment) and would direct the work of the EPCM contractor responsible for that component of the work.
- A Manager of Facilities Project Management, who would lead a group of project managers and support staff and would direct the work of the facilities EPCM contractors within their geographic area.

  Should the North Slope Gas Treatment Plant have an owner other than TransCanada, the Manager of Facilities Project Management for Alaska would be accountable for technical coordination with the GTP.
- A Manager of Environment, who would lead a group of environmental specialists and support staff. Each manager would oversee the work of the EM contractors within their region, coordinate the environmental work between the technical disciplines, provide quality control of environmental work, and interface with regulatory agencies and environmental non-governmental organizations on all environmental matters. While these managers would report to their respective regional directors, they would also have corporate reporting responsibilities to TransCanada's corporate Vice President of Community, Safety and Environment in Calgary.
- A Manager of Regulatory Affairs, who would lead a team of regulatory specialists and support staff. These individuals would oversee the preparation of regulatory applications and represent the Project in all non-environmental dealings with regulatory agencies in their region.
- A Manager of Community, Land and Aboriginal / Alaska Native Affairs, who would each have a team of land and community specialists and support staff. These individuals would be accountable for overseeing land rights activities, public outreach programs, and aboriginal consultation and participation programs.

- A Communications Specialist who would assist the director in dealing with media enquiries, and provide specialist communications advice for public outreach programs.

The Director of Project Services would have accountabilities in both Canada and Alaska and would have staff as follows:

- The Manager of Engineering Services would lead a team of engineering and pipeline operations staff who would be responsible for hydraulic and geothermal design, pipeline and facilities specialty engineering, and pipeline operations planning for both the Alaska and Canada Sections of the Pipeline.

  The pipeline technical specialists in the group would provide expert technical leadership and oversight in such technical specialties as geotechnical engineering, materials engineering, welding technology and structural engineering (including strain-based design).

  The facilities technical specialists would provide expert technical leadership and oversight in such technical specialties as controls engineering, mechanical and materials engineering, and structural design.

  Expert technical support in areas that would only be needed by the Project on an intermittent basis such as measurement, rotating equipment, and pulsation and vibration analysis would be sourced from TransCanada's Head Office or specialist consultants. Expertise on integrity management would also be sourced from TransCanada's Head Office.

  The specialist pipeline operations staff within the group would ensure that operational issues are integrated into the design and operating philosophy and that the operating philosophy is consistent throughout the life of the Project.

  Key members of the pipeline operations component of the group would remain with TransCanada upon completion of the Execution Phase and transition into the Field Operations part of the company. During the Pipeline Operations Phase, hydraulic and geothermal simulations would continue to be needed to support the efficient operation and maintenance of the Pipeline, by optimizing fuel, gas chilling and cooling, and providing geothermal modeling input to the integrity management process.

- The Manager of Supply Chain Services would be accountable for providing procurement and logistics oversight to the EPCM contractors and for administering the contracts with the EPCM and EM contractors. In the initial stages of the Project, TransCanada's corporate Supply Chain Services group in Calgary would provide procurement and logistics planning support. However, EPCM contractors would, when mobilized, take over most procurement and logistics activities, under the direction of the Manager of Supply Chain Services.
- The Manager of Project Controls would be accountable for project cost estimating, risk management, scheduling and cost controls for the Alaska and Canada Sections of the Pipeline. This manager would provide guidance to the project groups on project control issues and gather data on all components of the Project for reporting purposes.

- The Manager of Health and Safety would provide leadership to the Project in Health and Safety Management and would have a team of health and safety specialists. While this manager would report to the Director of Project Services, the role would also have corporate reporting responsibilities to TransCanada's corporate Vice President of Community, Safety and Environment in Calgary.

The organization described above would be mobilized in the months following the Open Season. Between the award of the AGIA License and the Open Season, a smaller organization would be utilized, with all staff located in Calgary. Prior to the Open Season, the organization would include the following leaders:

- Vice President;
- Commercial Director;
- Manager of Customer Service;
- Director of Project Management (for Alaska and Canada);
- Director of Project Services;
- Manager of Pipeline Project Management;
- Manager of Facilities and GTP Project Management,
- Manager of Environment;
- Manager of Supply Chain Services
- Manager of Regulatory Affairs;
- Manager of Community Land and Aboriginal / Alaska Native Affairs, and
- Manager of Project Controls.

TransCanada's corporate staff would provide additional support as required. Refer to Appendix D "Project Organization Chart for the Development Phase" for an organization chart summarizing the above structure.

3) Governance Model

The Governance Model proposed for the Project during the Development Phase would be based on TransCanada's existing management systems, programs and processes. In the later stages of the project, processes would be developed that conform to TransCanada's core policy framework but accommodate the unique characteristics of the Project and incorporate best practices from the EPCM and EM contractors.

For the Development Phase of the Project, the governance model would have several components as follows:

a) Corporate Management Systems

TransCanada's corporate management systems provide a framework for managing all aspects of the company's business. Policies, procedures, management systems and programs are in place that govern Corporate Conduct & External Relations; Respectful Workplace; Health, Safety & Environment; Aboriginal Relations; Corporate and Information Security; Risk Management and Financial Reporting (including Treasury and Budgeting); Pipeline and Facility Integrity Management; and Engineering Standards.

b) Health, Safety and Environment Management System

The Health, Safety and Environment ("HSE") Management System reflects the comprehensive policies and management systems of TransCanada. The System contains eleven key elements and is aligned with the seventeen elements and the principles as set out for such management systems in the international standard ISO 14001. The HSE Management System includes methods to control and facilitate HSE work, manage associated risk and to measure performance. The work is carried out in an effective well-defined structure which emphasizes the importance of impact prevention and continuous improvement. The Management System includes structures and organizations that integrate TransCanada's HSE Commitment into its daily business activities to ensure compliance with all regulatory and other requirements. The management system is based on a successful long term operating history and the implementation of industry Best Management Practices ("BMP") and established standard operating procedures.

The eleven elements of TransCanada HSE Management System are described below (see also Appendix E "Health, Safety and Environment Management System").

i) An HSE Policy Supported by Top Management

The executive leadership team, management and employees at TransCanada are committed to being an industry leader in health, safety and environmental practices; to maintaining a safe and healthy workplace; and to protecting the environment. A copy of the TransCanada Corporate Health, Safety and Environmental Commitment is included in this Application at the end of Section 2.9.1 "History of Compliance with Safety, Health and Environmental Requirements".

ii) Structure and Responsibility

Clear lines of accountability are defined and communicated throughout the organization, showing HSE Management System requirements to be established, implemented, maintained and continuously improved upon. The definition of roles, responsibilities and authorities for attaining environmental compliance by the Project will be established and listed in the Environmental Management Manual ("EMM"). Roles, responsibilities and authorities for Project contractors also will be defined and included in the construction contracts for the Project.

iii) Risk Assessment and Management

The identification and evaluation of HSE risks is essential to prioritize HSE activities, to mitigate HSE exposure, to provide direction toward continuous improvement in a cost effective manner, and to develop a foundation to set objectives and targets.

iv) Objectives and Targets

The development and monitoring of objectives and targets, provides a foundation to communicate TransCanada's commitment to HSE, as well as a process to monitor progress in achieving the commitment as part of the continuous improvement cycle.

v) Operational Control

Operational controls provide a consistent and agreed upon approach to managing TransCanada business activities which have the potential to impact health, safety or the environment.

vi) Contractor Management

TransCanada will endeavor to do business with companies and contractors that share our expectations for HSE performance and commitment. Contractor performance will be regularly assessed and evaluated prior to, during and subsequent to execution of contracted services.

vii) Emergency Preparedness & Response

TransCanada's Emergency preparedness plans and procedures recognize the needs of TransCanada, its employees, contractors, adjacent operations and the community-at-large. Emergency preparedness and response plans are required to limit damage to people, property or the environment in the event of any emergency situation.

viii) Training and Awareness

Through HSE training and awareness, we proactively manage the risks and conditions of our work. Consistent with the HSE Commitment, TransCanada also believes HSE training and awareness are key to continually promoting employee health and safety on and off the job, and continuously improving HSE performance.

ix) Document and Records Management

All associated HSE records and documents must be managed in such a manner that information is available to employees and external agencies, if and when required.

x) Communication and Reporting

Effective communication and reporting is essential to maintain and improve leadership and employee awareness and understanding of HSE objectives and performance, as well as to promote positive relationships with stakeholders.

xi) Health, Safety & Environmental Performance, Audit and Review

Continuous improvement is assured by working towards defined objectives and targets, through ongoing monitoring and measurement activities, and by implementing corrective and preventative actions as necessary.

c) Incident Management System

TransCanada's Incident Management System ("IMS") is the over-arching system that defines how incidents are managed by TransCanada. The purpose of the IMS is to ensure that TransCanada satisfies its health, safety and environmental commitment to meet or exceed all applicable laws and regulations by applying a systematic, timely process for anticipating, preventing and managing unplanned or unforeseen events which result, or may result in undesirable consequences for TransCanada, its personnel and/or stakeholders.

The IMS encompasses separate processes designed to address the unique conditions and responses required with an Incident in accordance with its risk profile and ultimate origin or source (non-operational, operational). The processes are:

- Incident Management Process: The purpose of TransCanada's Incident Management Process is to ensure incident response, notification, investigation, documentation, follow-up and sharing of learnings are completed in a uniform, thorough and timely manner to promote continuous improvement and to help prevent recurrence of a similar incident. This process applies to all employees and contractors. TransCanada's Incident and Issue Tracking ("IIT") is an electronic database tool used to report incidents and issues involving employees, contractors and third parties.
- Emergency Management Process: An emergency response process is in place to protect the health and welfare of people, to limit damage to property, company operations and the environment. Emergency preparedness plans and procedures recognize the needs of TransCanada, its employees and the community-at-large as well as regulatory and legislative requirements.

d) Project Organizational Structure

A Management Committee would be put in place to provide guidance and oversight to the PMT on major Project issues and ensure alignment with corporate requirements and objectives. The Management Committee would include key TransCanada executives who would ensure that a strong link exists between the Project and TransCanada's senior leadership team.

The PMT would have a majority of key positions filled by core TransCanada staff. This would help provide alignment with corporate requirements and objectives and facilitate the ultimate integration of the facilities into the TransCanada system. The PMT would direct the work of the major project management, engineering and environmental management contractors.

e) Project Phasing

The Project would be divided into phases and sub-phases separated by stage gates and check points to mark critical decision points. Each of these decision points would have a requirement for specific deliverables to be in place prior to management approval to advance to the next phase or sub-phase. This process would provide the structure to ensure that work proceeds in an orderly way, that the work and the associated costs do not advance before prerequisite deliverables are in place, and that management is fully informed and engaged in the progress of the Project.

f) Regular Project Reviews

Senior leaders expected to make decisions must have ongoing awareness of each sub-project as it evolves between decision points and stage gates. Regular reviews would be used to build this awareness and to gain approval for significant changes to the Project scope, schedule or cost that require leadership approval. The frequency of these regular reviews would be influenced by scheduling issues.

g) Decisions and Approvals

TransCanada's Spending Limits Policy and the Authority to Execute Documents Policy would be used to determine which business areas should be involved in each approval, which level of leadership should be involved from each of these areas, and the form the involvement should take (formal vs. informal).

h) Project Reports

Detailed and summary-level reporting processes would be developed for the Development Phase as part of an overall Communication Plan to ensure that project information is effectively communicated internally and externally. These would include regular sub-project and Project updates required by management (e.g. monthly status reports, etc.) and reports on particular aspects of the Project, such as procurement, regulatory issues or public outreach. A typical report would include:

- an Executive Summary with a brief review of the Project's scorecard metrics and a brief description of the major risks, activities, and milestones addressed over the last reporting period and a review of the major risks, activities, and milestones that would be addressed over the next reporting period; and
- detailed sections including updates on scope definition, scope changes, financial status (budget, budget variances, cash flow, and forecast), schedule, safety, environment, community outreach, regulatory/legal, project agreements, technical development, key risk issues and scope deliverables such the status of engineering, construction planning and procurement.

i) Project Management Processes

Conformance with TransCanada's Project Management Office ("PMO") Guides will be an additional element of Project governance. These processes are summarized in Section 2.2.1(8) "Project Management Processes".

4) Front End Engineering and Design

a) Project Development Phase, Proposal Sub-Phase

On award of the AGIA License, TransCanada would begin pre-FEED activities. The work in the Proposal Sub-Phase (prior to the Open Season) would be focused mainly on supporting the Open Season. The major deliverables for this Sub-Phase would be a Class 4 cost estimate (based on the Association for the Advancement of Cost Engineering International ("AACE International") Recommended Practice No.17R-97), a Schedule, and a supporting Risk Analysis for the Project. At that time, TransCanada would mobilize its Project Management Team and begin to refine its plans for the subsequent Definition Sub-Phase. It is anticipated that TransCanada staff, supplemented as necessary by qualified consultants, would do much of the engineering, environmental work and procurement work in this sub-phase.

Also during this sub-phase, TransCanada would contact consultants and contractors from Alaska, from elsewhere in the U.S., from Canada, and possibly from other countries to solicit expressions of interest in pre-qualifying for key consulting contracts on the Project. These contracts would include project management, engineering, procurement

and construction management, and environmental management. Because of the size, geographic footprint and unique nature of the Project, it is expected that alliances would be formed between consulting groups to efficiently carry out the work and to provide opportunities for local firms. Requests for Proposals would then be issued to pre-qualified companies for these contracts. These consulting contracts would be triggered immediately after the Open Season. This process is further discussed in Section 2.2.1(2) "Management Approach".

The major work items planned for this sub-phase would include:

i) Pipeline Hydraulics

Hydraulic and geothermal designs to provide the required system flow capability would be further developed to re-evaluate and optimize pipeline diameter and pressure, compressor station size and approximate locations, and chiller/aerial cooler sizes to a level of accuracy needed to support a Class 4 cost estimate and other requirements of the Open Season.

ii) Pipeline Engineering

A reconnaissance of the entire route would be performed. This would entail an examination of the existing alignment sheets and profiles for the Canada Section, and assembling and reviewing all publicly-available data for the Alaska Section. An expert pipeline routing team would examine the route from the perspective of geotechnical engineering, river engineering, pipeline construction, environment and other sub-disciplines as necessary, to confirm that the route is technically sound. Particular emphasis would be placed on special design areas such as Kluane Lake and Atigun Pass.

A GIS-based framework and Master Database for organizing all available spatially-referenced data would be established.

There would be a review of existing geotechnical data to identify gaps in bringing the geotechnical design to a level sufficient for the purposes of advancing the project capital cost estimates to meet the requirements of the Open Season. The review would examine the existing routing alignment sheets for the Canada Section, terrain mapping of the route, aerial photographs and other available remote sensing information to identify geological hazards within the vicinity of the pipeline route. Of particular interest would be fault crossings, terrain with high liquefaction potential, steep or unstable slopes and permafrost. These hazards would have impacts to the pipeline design in many respects including routing, strain demand, and operations and maintenance considerations.

Existing terrain information would be reviewed as it pertains to climatic and permafrost conditions, including the following:

- basic climatic data;
- permafrost locations: continuous, discontinuous, sporadic, unfrozen;
- ground ice contents, by location and as a function of depth;
- locations of massive ice deposits and ice-wedge polygon terrain; and

- ground temperature profiles, by location and with depth.

This information would provide critical input to several design activities including slope design, and frost heave and thaw settlement design. Preliminary plans for gathering field data would be developed at this point. While some field data collection will be necessary in Alaska prior to the Open Season, it is anticipated that most of the field investigation effort would be conducted after the Open Season.

iii) Environment

The first step would be to finalize the environmental regulatory strategy for the Project. The strategy, and introductory discussions with agency representatives, would provide a basis for a preliminary analysis of Project environmental requirements, relative to available existing data. This would lead to a preliminary listing of data requirements for the Definition Sub-Phase.

Preliminary work execution plans, including logistics and protocols for field studies and data collection, would then be developed.

Environmental information would be provided as input to construction planning and the development of a Class 4 cost estimate, schedule and risk assessment.

iv) Pipeline Facilities

The initial configuration of compression, metering and O&M facilities is described in Section 2.1 "Project Description". In the Proposal Sub-Phase, existing facility designs would be reviewed and updated for one typical chilled compressor station, one typical aerial cooled compressor station and one typical meter station.

The review would examine the compressor station and meter station design basis including plot plans, block diagrams, process flow diagrams, major equipment lists, major utilities requirements, flaring and site conditions. The primary purpose of the review would be to identify potential gaps in the available information, as well as key assumptions that may not be current or that do not match site-specific geotechnical, climatic and geographical conditions. Initial options for addressing all gaps and assumptions would be formulated at this stage, with preliminary confirmation of applicability of the solutions.

All design update efforts during this Sub-Phase will be focused on providing the minimum engineering effort necessary to generate a Class 4 cost estimate, schedule and risk analysis commensurate with the Open Season requirements.

v) Construction and Logistics Planning, and Cost Estimating

As noted earlier in this section, key deliverables of the Proposal Sub-Phase would be a Class 4 cost estimate with a supporting risk analysis, and a schedule for the Project. As construction accounts for a major component of the overall estimate and schedule, a large proportion of the work in this sub-phase would focus on construction.

Information would be compiled to assist in construction planning and pipeline cost estimating activities for the Alaska and Canada Sections of the pipeline. Information would include labor rates and recent condition changes, labor availability, equipment

rates, equipment availability and lead times for manufacture, inflation and cost escalation data, and meteorological data. The assessment would also address cost premiums required to attract appropriately skilled labor to remote arctic work sites. Assessments of the availability, cost and productivity of labor and construction equipment may involve workshops attended by industry experts, contractors, specialists and equipment manufacturers.

A construction execution plan, with supporting logistics and infrastructure plans, would be prepared to a level of detail appropriate to support the development of a Class 4 cost estimate, schedule and risk analysis. This plan would incorporate the latest proven construction equipment and construction methodologies applicable to arctic conditions. Key issues that would be addressed in this plan would include the development and production of granular borrow materials, access roads, campsites, laydown sites, facility sites, gravel, ice and snow pad construction, and labor camp operation, maintenance and catering.

Pipeline construction costs would be estimated utilizing a "bottom-up" estimating methodology and would comprise detailed crew build-ups. Facilities estimates would also be developed using a 'bottom-up' costing methodology and be based on material take-offs, current costs for major equipment, and modularization philosophies developed by the engineering disciplines. The construction execution planning and cost estimating exercise would also identify key cost drivers, associated risks and potential mitigation measures.

A key activity associated with the Project cost estimating work is the overall Project risk assessment. This activity would be carried out with the assistance of experts in risk assessment techniques and would attempt to bound the estimated Project cost within probability ranges based on identified risk factors and potential risk mitigation measures.

vi) Gas Treatment Plant

The objectives of the project work in this sub-phase would be the development of preliminary engineering designs and plans to support the preparation of a Class 4 cost estimate for the GTP. Various gas sweetening processes would be evaluated and efforts made to maximize the modularization of the facilities and minimize the number of trains and total modules for land and sea transportation. During this sub-phase, engineering and logistics studies would be undertaken in three major areas: process selection, equipment and modularization.

Process Selection: This study would include a review of the site and local climatic data, study the various gas sweetening processes in use and identify the most feasible process for the Project. The major deliverables at this stage would include: process design basis & safety criteria; process optimization studies; conceptual designs (block diagrams & process flow diagrams (PFDs) with preliminary heat and material balance and stream flow tables; plot plan; preliminary major equipment list; and preliminary electricity, gas and water usage estimation.

Equipment Study: This study would evaluate the capabilities of manufacturers and fabrication shops, worldwide, that can manufacture or fabricate specialized

equipment for the GTP. In conjunction with this study, an economic and operability analysis would be completed, evaluating eight- and four-train designs. If permitted by the ANS Producers and facilities operator, the existing residue gas compressors at the central compressor plant would be evaluated to determine if they can handle the combined acid gas stream from the GTP, for re-injection to the formation.

Modularization Study: The pre-FEED design would identify modularization possibilities for the chosen process and identify possible module sizes. The modularization study would address the capability of existing sea-lift barges and existing dock facilities, maximum module sizes and weights, and capability of module yards. The use of pre-assembled and modularized equipment that would be sea-lifted to Prudhoe Bay will minimize site labor, installation and freight costs.

b) Project Development Phase, Definition Sub-Phase

On conclusion of the Open Season, the Definition Sub-Phase would begin and TransCanada would continue to staff-up its PMT as described in Section 2.2.1(2)(c) "Owner's Project Organization".

Also at the beginning of the Definition Sub-Phase, TransCanada would bring on board EPCM and EM contractors as discussed in Section 2.2.1(2)(a) "Engineering Procurement and Construction Management Contract Strategy" and 2.2.1(2)(b)"Environmental Management Contract Strategy". The EPCM contractors' teams would have responsibilities for the GTP, pipeline, compression & facilities engineering, procurement and construction management; and land administration. The EM contractors would be responsible for all aspects of environmental management including environmental planning and inspection.

The major deliverables for this sub-phase would be a Class 3 cost estimate (based on the AACE International Recommended Practice No.17R-97) with an updated risk analysis and schedule for the Project; and the filing of all necessary documentation required for major permits, including certification from FERC (see Section 2.2.4 "Regulatory Plan").

Specific technical activities during the Definition Sub-Phase would include:

i) Project Management

A Class 3 cost estimate, schedule and risk assessment for the Execution Phase would be prepared.

Project management procedures and processes for the Project would be finalized, based on TransCanada's PMO structure, but including input from the EPCM contractors.

Detailed planning for the remainder of the FEED stage would be carried out in accordance with TransCanada's PMO requirements, including the development of Project schedules, Project resource plans, risk management plans, Project logistics plans, field investigation and testing plans, etc.

Detailed plans would be prepared for the Execution Phase. Many of these plans would be required as part of submittals to regulatory agencies in the U.S. and Canada.

ii) Hydraulic and Geothermal Design

The System Design Report would be prepared to describe the inputs, processes and outputs of the hydraulic design and to identify capacity expansion options. The report would include:

- Finalized gas volumes based on shipper commitments during the Open Season;
- Details of pipe diameter, operating pressure and flowing gas temperature (prior to finalizing the operating temperature range, pipeline design for frost heave and thaw settlement would be completed to ensure adequate safety and integrity);
- Compressor station size selection;
- Optimal locations for compressor stations. Prior to finalizing compressor station locations, field studies would be completed to assess the sites' suitability, based on engineering, environmental and land use considerations.
- System schematics showing proposed operation for selected flow conditions.

Detailed hydraulic analyses would also be completed to simulate planned and unplanned outage impacts to ensure design reliability and alignment with tariff requirements.

Integrated hydraulic and geothermal analysis would identify flowing gas temperatures and provide a basis for optimization of the pipeline design for permafrost, and guide the selection and sizing of chillers at compressor stations.

iii) Geomatics and GIS

The GIS that was initiated during the Proposal Sub-Phase would be further enhanced for alignment sheet generation, detailed mapping, complex spatial analysis and information communication. The GIS would support engineering processes such as:

- Geotechnical design – providing terrain mapping and analysis (longitudinal and cross slope analysis, profiling, 3D modeling etc).
- Hydraulic design (e.g. elevations).
- Water course studies - supporting data management and communication, general mapping, field study support.
- Logistics planning – route selection and planning, mapping of routes, yards/lay down areas and vehicle tracking.
- Construction planning – volumetric calculations, spread mapping and calculations, resource planning and traffic planning.
- Processing and analyzing aerial photography and potentially using LiDAR to produce 3D models and plan profiles.
- Managing information related to land ownership, environment and engineering, third party facilities, and the pipeline alignment and physical attributes.

Detailed mapping of the route would be completed and engineering and environmental personnel would begin a detailed route assessment. Ortho-corrected aerial photography of the entire route would be obtained and these photos would be used to prepare the necessary materials for environmental data collection, and generation of environmental and construction alignment sheets.

iv) Engineering – General

Based on the hydraulic design reports, preliminary designs would be developed for the pipeline system including site plans for compressor stations, equipment layouts, process flow diagrams ("PFDs"), piping and instrumentation diagrams ("P&IDs"), etc.

TransCanada has a large amount of engineering and environmental data that was compiled for the Project in Canada. This data would be re-assessed and refreshed or augmented where necessary to support design and permitting requirements, and to incorporate current industry best practices. Data would be gathered in Alaska to support the design, regulatory and cost estimating processes.

A Design Basis Memorandum ("DBM") would be developed that describes the operating philosophy for the system and provides detailed design criteria and processes to be used in detailed engineering. The basic design, materials and equipment for all facilities, including the pipeline, would be defined prior to beginning detailed engineering.

Technical submittals for all major regulatory applications would be assembled by the EPCM and EM contractors, and filed by TransCanada's Managers of Regulatory Affairs in Canada and Alaska, in accordance with requirements of the applicable processes.

Technical support would be provided for stakeholder consultation.

TransCanada believes that use of new technologies will be a key factor in efficiently implementing the Project. While preliminary project work has been successfully undertaken on a small scale in recent years related to strain-based design, high strength steel pipe, high productivity welding, automatic ultrasonic testing, alternative integrity validation, etc., more work will be required to ensure that regulators in Canada and the U.S. are aligned with this direction. Regulatory liaison efforts would be initiated early in the project to pre-position regulators to receive and support new design methodologies. This work would involve a series of workshops/meetings with industrial/standards/regulatory organizations facilitated by experts/consultants.

v) Routing

Early in the Definition Sub-Phase the routing would be evaluated to identify locations requiring further adjustments to avoid or mitigate any environmental, archaeological/ cultural, safety or construction concerns. The assessment would be conducted initially through desktop work using available data and tools. Field data will be required in Alaska and existing field data in Canada may need to be updated and supplemented.

Where necessary, routing would be refined and realigned to minimize the potential for negative impacts and to allow design of the most cost effective system from an engineering/construction perspective.

Once the route has been finalized, engineering (geotechnical and river engineering specialists) and environmental specialists would develop preliminary site-specific designs for major watercourse crossings and develop design criteria for minor crossings.

vi) Geotechnical Engineering

As part of the activities during FEED, it is expected that route refinements and changes arising from geotechnical issues may be required to be incorporated into the alignment sheets and design documents. Route databases will need to be updated to reflect these refinements. Particular attention will be given to the routing through the northeast British Columbia section where slope instability issues are potentially prominent.

In the Proposal Sub-Phase, geological hazards would be subjected only to a preliminary review and identification effort, combined with nominal hazard assessment or risk review. No attempts would be made during the initial phase to rigorously analyze these hazards. During the Definition Sub-Phase, however, more detailed analysis would be undertaken to confirm the presence of, and spatial distribution of the geological hazards. Potential hazards that are proposed to be assessed include, but are not limited to, the following:

- permafrost;
- avalanche and rock falls;
- debris flows;
- landslides, creep processes, gelifluction;
- seismic/earthquakes/fault movements;
- massive ice, including ice-wedge polygons;
- permafrost;
- liquefaction and lateral spreading;
- boulders;
- erosion (surface and piping);
- channel scour and lateral migration;
- catastrophic lake drainage;

From this effort, the hazards would be ranked in terms of their relative threat to the pipeline. Further rigorous assessments will be undertaken during the detailed design stage.

Certain geological hazards require additional engineering during the FEED stage. In particular, seismic issues such as liquefaction, lateral spreading and tectonic fault crossings would require additional study and preliminary engineering consideration.

Remote sensing imagery, such as LiDAR may be used to further assess the presence of, and risks imposed by geological hazards to the pipeline and related infrastructure.

During FEED, localized areas of the route requiring more rigorous terrain analysis and mapping will be identified. Examples of these sites include route refinements, new or proposed alternative infrastructure sites, and others.

Further analysis of the route and route characteristics as they relate to construction activities would also be undertaken. This would include issues such as trenchability and the existence of boulders. This information would be an important input to construction planning and equipment allocation for each pipeline construction spread.

It is expected that climate and permafrost characterization data would be needed, additional to that identified during the Proposal Sub-Phase. This data would be entered into the project database to support specific engineering or construction planning activities, such as geothermal modeling, frost heave and thaw settlement design, and right-of-way preparation.

Slope design and erosion control strategies and methodologies would be developed and refined during FEED. Gaps and issues identified during the Proposal Sub-Phase would be addressed, with re-engineering or new engineering being undertaken as needed. In general the route has been chosen to avoid terrain with steep cross-slopes. However, where construction through terrain with steep cross slopes cannot be avoided, mitigation techniques would be developed.

vii) Pipeline Design for Permafrost

The pipeline will traverse continuous and discontinuous permafrost areas. Dependent on the operating temperature and ground thermal condition, frost heave and thaw settlement are some of the unconventional design conditions that the pipeline design would be expected to adequately address. Due to the large number of discontinuous permafrost sections and their wide distribution, frost heave and thaw settlement, unlike other types of geotechnical hazards, are expected to impact the baseline pipeline design in terms of selection of appropriate line pipe specification (wall thickness, material properties) and construction specification.

During FEED, supplemental design requirements will be established based on strain-based design methodology. The strain-based design methodology, which is more comprehensively described in 2.2.1(5), consists of predicting strain demand resulting from frost heave and thaw settlement, establishing tensile and compressive strain limits, and demonstrating appropriate safety levels for the targeted design conditions.

The baseline pipeline design would be finalized to meet supplemental design requirements. The baseline design, including planned intervention and maintenance, would be targeted to accommodating all reasonably expected frost heave and thaw settlement events that are accumulated over the expected operating life. Site specific design may be used to address excessive frost heave and thaw settlement at identified locations on an exception basis.

viii) Materials Engineering

As a part of FEED, pipe, component and coating specifications will be developed, including pipe specifications suitable for strain-based design. It is expected that only a limited number of steel and pipe mills will be able to produce pipe for the APP due to the combined requirements for size, wall thickness, grade and material properties. As a result, it will be important to work collaboratively with the candidate mills to establish the required qualification and production capability in order to secure adequate quality and competitive supply of pipe and components.

A fracture control plan will be developed and where necessary the fracture control plan will be validated with appropriate tests. Test programs on pipe materials from candidate mills will be conducted to qualify pipes and collect material property data to support the strain-based design. In addition, appropriate welding processes will be selected and developed for mainline welding, tie-in welding and double joint welding. Typical welding procedures will be developed and tested to ensure that desirable weld metal and heat-affected-zone ("HAZ") properties can be achieved and the welding productivities can be optimized. The platforms for non-destructive testing will also be selected and developed with the appropriate level of confidence and accuracy.

ix) River Crossing Design

During the Definition Sub-Phase, field reconnaissance of major river crossings would be conducted in each of the spring periods comprising the FEED period. These field reconnaissance trips are intended to observe aufeis development and spring run-off conditions. This information would be up-loaded to the river crossing database to assist in the development of site-specific crossing designs.

The engineering team would prepare preliminary engineering designs for the rivers and streams along the route. In cases where special crossing methods are required (such as horizontal directional drills or aerial crossings) specialist sub-consultants will be retained to support the engineering and construction planning teams.

In addition to field reconnaissance, it is anticipated that other site investigations may be conducted during FEED to support designs. These investigations could include bathymetric surveys, geophysical surveys or geotechnical investigations.

x) Road and Third Party Pipeline Crossing Design

Third party crossings would be evaluated based on the characteristics of the road, pipeline or other utility being crossed. Design considerations would include existing geotechnical conditions, insulation requirements due to geothermal effects, drainage and erosion control, access, daylighting, ditching, support of third party pipelines, installation methods, backfill requirements, restoration, ground water concerns, cathodic protection systems, signage and safety of both the APP and the third party facility.

It is noted that the pipeline route would cross the TAPS in a number of places and that considerable effort will be required to coordinate crossing and proximity issues with the system owners and the State.

xi) Land Rights / Acquisition

When the route has been finalized, land ownership information would be compiled in Canada and Alaska, and applications would be filed for all outstanding right-of-way as further described in Section 2.2.4.2 "Rights-of-Way". Land administration personnel and consultants would notify and obtain permission from owners/occupants prior to entry onto the lands, in accordance with all local requirements.

xii) Environment

The desktop review of available data initiated in the Proposal Sub-Phase, supported by discussions with regulatory agencies and identified stakeholders, would be completed and potential information sources to fill data gaps would be identified.

A substantial amount of information relevant to environmental impact and mitigation associated with a buried pipeline along the Project route has been developed since the construction of the TAPS. All public information will be reviewed and relevant findings will be incorporated as appropriate into the mitigation approaches proposed for the Project. Templates for data presentation to meet regulatory and communication requirements would be prepared and input would be provided to route selection and facility siting activities.

A detailed list of required biophysical field surveys would be prepared and detailed planning of the field program would be completed. Survey protocols would be developed and communicated to regulators and other stakeholders with approvals being sought where required by regulators.

Field studies and data collection would be completed and documentation prepared for regulatory filings and other stakeholder information needs. Data assessment and analysis would be in accordance with agreed-upon models.

The GIS would be used to store and support the analysis of all biophysical data, and support the development of regulatory applications and environmental mitigation plans.

Mitigation measures would be developed and proposed, based on results of the assessment and analysis activities, stakeholder input, regulatory direction and industry best practices to avoid or reduce the potential for environmental impact.

Environmental input would be provided to the development of a Class 3 cost estimate, schedule and risk assessment. Environmental input would also be provided to consultation events and regulatory discussions.

Detailed plans for environmental aspects of the Execution Phase would also be developed during this sub-phase.

xiii) Facilities

The initial configuration of the APP would comprise six compressor stations in the Alaska Section and ten in the Canada Section. During FEED, based on fixed volumes from the Open Season, this design would be refined. The conceptual design assumes that seven stations would include propane chillers to cool the station discharge gas to just below the freezing point on a continual basis. During FEED various approaches

will be investigated and the design optimized based on environmental and economic considerations.

The general design approach will to be to advance the design of one typical chilled and one typical aerial cooled station that were developed in the Proposal Sub-Phase, with the remaining stations adhering to the common design basis for each of the typical designs. While in principle this approach is a valid starting point, nominal differences in station designs will nevertheless exist. These differences could arise from multiple combinations of conditions, such as varying degrees of chilling or cooling required at individual stations; differing site conditions potentially leading to nominally altered plot plans; differences in civil and structural requirements based on differing site and soil conditions; differing lengths of access roads; and differing availability of granular material sources.

The principal aim of the design activities during FEED would be to focus on the 'typical' stations. However, sufficient effort will also be expended to identify potential differences amongst the stations and therefore cost adjustments required for the total facilities capital cost estimation.

The main purpose of the design work for a typical compressor station is to generate project total installed cost estimates. A typical compression station would comprise the following components: gas compressor building with a gas turbine-driven compressor package, discharge gas chillers or aerial coolers, motor control centre building, inlet separation, pipeline pig receiver/launchers, utility & fuel gas conditioning, utility maintenance building, pipeline and station blow-down systems, power generation and storage buildings. Chilled stations would also include a refrigeration compressor building, refrigeration condenser and a flare system.

The FEED scope of work for pipeline facilities includes:

- Process design for the compression facilities would be completely defined, reviewed and approved for detailed engineering.
- The design requirements for mechanical, civil, structural, electrical, instrumentation, communication and other disciplines would be defined to a point where the facilities cost estimates can be quantified within the target range.
- The design for the systems, equipment and major materials would be defined, documented and approved for detailed engineering.
- Plot plans for typical sites, equipment and building layouts and pipe rack routings would be approved for detailed engineering.
- The control philosophy for the facilities would be developed, reviewed and approved for detailed engineering.
- Preliminary data sheets would be prepared for major equipment.
- Design procedures would be subjected to process safety, risk, value improvement and quality reviews.

- Procurement, quality management and safety issues and requirements would be approved for further development in detailed engineering.
- All permitting and regulatory requirements would be identified and submittals made for FERC and related certifications.
- Modularization concepts would be developed and preliminary layouts completed.
- Preliminary pricing would be obtained from equipment suppliers.
- Construction execution plans, with supporting logistics and infrastructure plans, schedules and cost estimates would be further developed, building on the work products prepared in support of the Open Season. In the Definition Sub-Phase the level of detail and refinement would be increased to support the development of a Class 3 Cost Estimate, provide sufficient detail to meet the requirements of the major regulatory submittals and to address concerns of stakeholders.

xiv) Construction Planning

Construction execution plans, with supporting logistics and infrastructure plans, schedules and cost estimates would be developed during FEED, based upon the work products prepared in support of the Open Season. In the Definition Sub-Phase the level of detail and refinement would be increased to support the development of a Class 3 cost estimate, provide sufficient detail to meet the requirements of the major regulatory submittals and to address concerns of stakeholders.

Field reconnaissance would be performed during both summer and winter seasons to validate construction execution planning assumptions and to secure additional information to support revisions to previously developed plans, schedules, and cost estimates.

Prior to preparation of updated construction execution plans, schedules and cost estimates, the latest developments in pipeline construction equipment design and operation, as well as applicable pipeline construction methodologies, would be reviewed and assessed to support the upgraded construction execution planning effort. Examples of equipment and methodologies that might be reassessed include:

- welding (mechanized production and mechanized tie-in welding);
- trenching (chain and wheel type trenching machines as well as large capacity excavators);
- ditch spoil processing equipment;
- right-of-way preparation techniques in the context of shoulder and summer season construction operations (extend the available winter construction periods by way of enhanced access to the pipeline right-of-way as well as access along the right-of-way);
- water crossing installations – both horizontal directional drilling (“HDD”) and open-cut techniques;

Certain construction processes are known to drive a wide range of uncertainty in either cost or schedule. The uncertainty may be due to the processes being untried in the arctic environment or because the process or equipment is new. During the Definition Sub-Phase, consideration will be given to performing field trials and demonstrations of such construction equipment or techniques to increase either cost or schedule certainty. Such field work might involve, for example, performance assessment of trenching equipment designed for arctic service, installation and maintenance techniques for snow or snow/ice work pads, installation of pipe anchoring systems, and assessment of installation techniques for a variety of unstable slope stabilization mitigation measures.

xv) Gas Treatment Plant

The primary focus areas for engineering work for the GTP during FEED would be to finalize gas treatment processes and provide the necessary engineering to produce the engineering deliverables discussed below. FEED would begin by reviewing the pre-FEED deliverables from the Proposal Sub-Phase. Work would then begin to develop optimal modularization plans, further refine the design to support the development of a Class 3 Cost Estimate, prepare basic designs to guide the detailed design process and provide all necessary technical input for an application for a CPCN from FERC and other major permits.

FEED would address major elements of the GTP, including the following: inlet separation and filtration; gas sweetening; sales gas dehydration; sales gas compression; sales gas chilling; acid gas dehydration; acid gas (CO2) compression; and roads, power distribution, control philosophy, communication system, waste handling and other infrastructure requirements.

Due to the large quantity of gas requiring processing, it is likely that a minimum of four trains would be required and the principle of 'Design One, Build Many' employed so that the designs could be duplicated. This would set the basis for detailed design, procurement and construction in the Execution Phase of the Project.

The scope of the facilities will be dependent on the chosen technology and environmental factors such as: proximity to the utilities, type of the terrain, and climate. However in general terms, the engineering scope of work during this sub-phase would include:

- The process design for the GTP facilities would be completely defined, reviewed and approved for Execution Phase.
- The design requirements for mechanical engineering (including module engineering), civil, structural, electrical, instrumentation, project controls, communications and other disciplines would be defined to a point where a Class 4 cost estimate can be developed.
- Preliminary data sheets would be prepared for major equipment.
- Preliminary pricing would be obtained from equipment suppliers.

- The preliminary design and preliminary specifications for the systems, equipment and major materials would be defined, and approved for detailed engineering.
- The plot plan, equipment and buildings layout and piperack routing would be approved for detailed engineering.
- The modularization philosophy would be optimized considering climatic, logistic and location constraints, and preliminary layouts completed.
- The control philosophy for the plant would be developed, reviewed and approved for detailed design engineering and for integration with the complete Pipeline Project.
- The designs, specifications and procedures would be subjected to process safety, risk, value improvement and quality reviews.
- Procurement, quality management and safety, environment & all other responsibilities and requirements would be approved for further development in detailed design.
- All permitting and regulatory requirements would be identified and submittals made for all required certifications.
- Construction execution plans, with supporting logistics and infrastructure plans, schedules and cost estimates would be further developed, building on the work products prepared in support of the Open Season. In the Definition Sub-Phase the level of detail and refinement would be increased to support the development of a Class 3 cost estimate, provide sufficient detail to meet the requirements of the major regulatory submittals and to address concerns of stakeholders.

5) Pipeline Design Methodology

In order to ensure the safety and integrity of the Pipeline System throughout its lifetime, and to optimize pipeline design, construction and operational efficiency, TransCanada would utilize a fully integrated design approach, in which the design process, construction methods and maintenance practices work together to achieve the required performance. In this approach, in-service monitoring and, if required, mitigation are used to supplement the initial design, materials selection and construction practices to ensure that system integrity is maintained throughout the lifetime of the pipeline.

The basic design in Alaska would be for a system operating at a maximum pressure of 2500 psig using 48 inch OD, API 5L X80 line pipe. In Canada, the design would be for a 2600 psig system using 48 inch, CSA Z245.1 Grade 550 line pipe. In both cases, supplemental requirements would be specified to support strain-based design and fracture control requirements.

a) Design Conditions

The pipeline would be subject to all the normal operating loads for which detailed design requirements are provided in regulations and industry standards, including those related to operating pressure, temperature differential, self-weight and overburden.

The northern portion of the pipeline in Alaska is located in continuous permafrost, while most of the remainder of the Alaska Section is in discontinuous permafrost. The Canada Section is mostly in a sporadic permafrost area, where frozen sections are sporadically distributed along the route. Conventional, stress-based design methods are not suitable for the load conditions associated with permafrost. The overall design philosophy for such loads would thus be strain-based, and would incorporate both strain demand and strain capacity into a limit states design ("LSD") format. In locations where the mean annual gas temperature is expected to be above the freezing point and permafrost exists, the pipelines would be subject to the effects of thawing soil and differential settlement. This would be considered and excessive thaw settlement would be addressed in the design. In locations with unfrozen soil where the mean annual gas temperature is expected to be below the freezing point, the effect of frost bulb formation and differential frost heave must be taken into account.

The pipeline route passes through active seismic zones in both Alaska and Yukon. Alaska has experienced some of its most severe earthquakes relatively recently. Seismic hazards to pipelines include ground shaking, fault displacement, liquefaction and lateral spreading. All seismic hazards along the Pipeline System ROW would be assessed and quantified, and limit state design methodology applied to derive safe and appropriate designs to adequately mitigate and manage seismic hazards.

Slope instability is also another hazard to be considered in pipeline design. Slope instability can be expressed in terms of creep slope movement accumulating over a long period of time or instant mudslide. As with seismic considerations, the LSD methodology would be applied to derive safe and appropriate designs as well as monitoring and maintenance programs that adequately mitigate and manage hazards resulting from slope instability.

b) Design Standards and Regulations

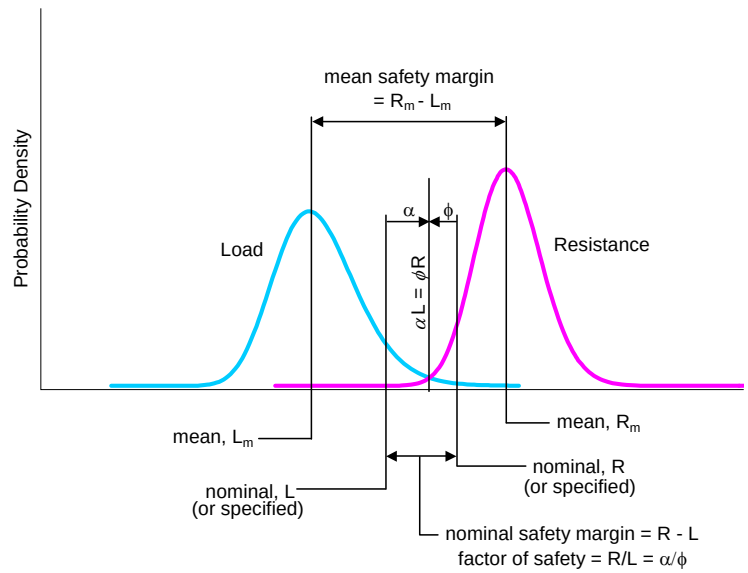
For the Alaska Section, the design methodology would be based on the requirements of 49 CFR 192 and American Society of Mechanical Engineers ("ASME") B31.8 for normal operating loads and on LSD principles, in particular strain-based design, for supplemental design criteria covering loads related to frost heave, thaw settlement, seismic hazards and slope instability. For the Canada Section of the pipeline, the design methodology for normal operating loads would be based on the National Energy Board ("NEB") *Onshore Pipeline Regulations* and CSA Standard Z662, including Annex C (Limit States Design) and Annex O (Reliability-based Design) for supplemental design criteria. Where guidance beyond existing standards and regulations is required, established industry guidelines and practices would be followed.

c) Limit States Design for Permafrost, Seismic Hazards and Slope Instability

LSD is a rational and systematic design methodology to ensure adequate and consistent safety levels against all applicable limit states, which represent all potential failure mechanisms. The main components of the LSD approach are the following:

- identification of all applicable limit states;
- classification of limit states into ultimate limit states and serviceability limit states, dependent on the consequences if the limit states are violated;
- development of limit state functions; and
- establishment of design criteria to ensure safe and effective design.

The following figure is an illustration of load effect and resistance distributions and the effect of the nominal safety factor on the probability of failure.



The process used to establish and calibrate the design criteria leads to two variants of LSD methodology: reliability-based design; and load and resistance factors design ("LRFD").

i) Reliability-Based Design

Reliability-based design is a probabilistic design methodology that recognizes the fact that load effect and structural resistance are uncertain quantities that are best characterized probabilistically. This is illustrated in the above figure, which shows two probability distributions representing the load effect and resistance corresponding to a specific limit state for a given pipeline. The figure shows that, although the resistance is generally higher than the load effect, there is a small area in which the two distributions overlap. This overlap represents situations in which the load effect could exceed the resistance, which would lead to failure as defined by the limit state. The area in the overlap represents the probability of failure.

The basic design criterion in reliability-based design is to ensure that the failure probability is less than an established acceptable level; or, in other words, the

reliability of the pipeline is higher than an established target reliability level. Although this approach does not consider the consequences of the potential failure explicitly, it is common to vary the target reliability levels based on the anticipated consequence of failure. Where consequences are expected to be more severe in terms of human health and safety, environment and economy, higher target reliability levels are stipulated. Variation of the target reliability, as a function of failure consequences, provides an indirect mechanism to achieve consistency in the level of risk.

Implementation of the reliability-based design methodology is dependent on a number of key components, in addition to identifying applicable limit states and developing limit state functions. These include:

- definition of the probabilistic distributions for load effect and resistance;
- establishment of target reliability based on considerations of safety, environment and economy;
- evaluation of reliability-based limit state functions and probabilistic distributions for load effect and resistance; and
- probabilistic calculation to determine the reliability level achieved by a particular design.

ii) Load and Resistance Factors Design

LRFD is a deterministic design approach. The main principle of LRFD is that the factored resistance (e.g. material properties) should be greater than the factored load (e.g. applied conditions) for each applicable limit state. The factored resistance is commonly defined as a nominal resistance multiplied by a resistance factor that is less than or equal to 1.0. Similarly, the factored load is defined as a nominal load multiplied by a load factor that is greater than or equal to 1.0. The load factor and the resistance factor are individual safety factors (also referred to as partial safety factors) applied to the load component and the resistance component of the limit state functions, respectively.

While LRFD is a deterministic design approach, the partial safety factors are typically calibrated to ensure that they will lead to designs that meet, on average, specified target reliability levels. The use of partial safety factors contributes to the achievement of consistent reliability levels because it refines the design process by introducing higher safety factors for parameters with higher levels of uncertainty. The calibration procedure for the partial safety factors is a probabilistic process that has the same requirements as for reliability-based design. It may not be possible to apply this rigorous calibration procedure where one or more of the following conditions are present:

- available data are not adequate to define the probabilistic distribution for load effect and/or resistance;
- consensus on target reliability by all stakeholders cannot be established; and
- project schedule and resources may not permit the extensive calibration process.

When the rigorous calibration procedure cannot be applied, the safety factors are established and agreed to, on the basis of experience, expertise and full-scale tests.

iii) Strain-Based Design

Strain based design is essentially a reduced form of LRFD which is only applicable to a subset of the limit states, for which displacement-controlled loads determine the pipeline response. For a typical pipeline, there are generally limit states driven by both load-controlled loads and displacement-controlled loads. Consequently, strain-based design is often used in combination with other design criteria to adequately design for all the loading conditions. In addition, where rigorous calibration against established reliability targets is not possible, safety factors are established based on the understanding of the variability associated with the strain demand and strain capacity, and on the expected consequence in rare cases where design criteria may be exceeded.

In order to determine the applicability of strain based design, the appropriate classification of load events is critical.

iv) Classification of Load Events

A pipeline may be subjected to many types of load events. Normal operating loads include operating pressure, temperature differential, and sustained force. During installation, the pipeline is subjected to temporary installation loads such as bending during the lowering-in process. During operation, and depending on surrounding conditions, the pipeline may be subjected to various external loads such as fault displacement, ground movement, frost heave, and thaw settlement.

Depending on the nature of a load event, it can generally be classified as a load-controlled event or a displacement-controlled event. In a load-controlled event, the magnitude of the load is independent of the displacement and deformation of the structure to which the load applies. Typical examples of load-controlled loads include self-weight, internal pressure, and the constant external loads (forces) applied to the structure. A load-controlled load is often described in terms of the direction and magnitude of the applied force. By contrast, in a displacement-controlled event, the magnitude of the load applied to the structure is dependent on the displacement and deformation of the structure. Typical examples of displacement-controlled load events are thermal expansion, frost heave, and other imposed displacements. For the simple example of failure under uniaxial tension:

- for the case of load control, instability and fracture ensue as soon as the maximum tensile load capacity is exceeded;
- for the case of displacement control, stability is maintained beyond the point of maximum tensile load capacity, with failure occurring only when the strain capacity is exceeded.

For a structure with more complicated failure mechanisms, such as local buckling, the fundamental difference between the structural responses to a load-controlled event and a displacement-controlled event remains the same, while the peak load capacity may be established differently according to the specific failure mechanisms.

Similarly, the strength and deformation capacity, respectively, govern the resistances of a structure to load- and displacement-controlled loads. Consequently, the design criteria are often strength-based for load-controlled loads and strain-based for displacement-controlled loads. In particular, for the Alaska Pipeline Project, the design criteria for normal operating loads would be established according to the strength-based criteria contained in the applicable industry standards and regulations. For design against loads induced by frost heave, thaw settlement, seismic activity and slope instability, strain based criteria would be applied.

v) Strain Demand

Strain demands resulting from differential frost heave and thaw settlement are dependent on many factors, including:

- soil type and mechanical properties;
- soil temperature and thermal properties;
- gas operating temperature;
- climate condition (ambient temperature and snow depth);
- pipe specification; and
- pipe material properties.

The overall process for determination of strain demands is an integration of three key modeling processes. These are:

- gas hydraulic simulation;
- geothermal analysis; and
- pipeline structural analysis.

TransCanada has developed software interfaces that allow the individual modeling processes and these interdependencies to be efficiently integrated. The software consists of two parts, GEOFLOW and GEOPIPE, each serving separate and well defined purposes.

GEOFLOW is an integrated gas hydraulic and geothermal analysis program which is intended for pipeline system design. GEOFLOW has full hydraulic simulation capability and can accurately model heat exchange between pipeline and surrounding soil and soil thermal states. As a result, it is able to provide reliable prediction of pipeline system requirements and performance as well as soil thermal states.

GEOPIPE is an integrated geothermal and pipeline structural analysis program that is intended for frost heave and thaw settlement analysis and strain demand analysis. GEOPIPE is capable of fully capturing the transient heat exchange between the pipeline and surrounding soil; the history of soil thermal states, frost and thaw bulb growth; frost heave and thaw settlement increments and accumulation; pipeline-soil interaction; and strain demand resulting from frost heave and thaw settlement.

GEOFLOW and GEOPIPE, as two parts under the same software interface, can work seamlessly together to cover the needs ranging from macro system design to site specific strain demand analysis.

Underlying the three modeling processes is the characterization of route conditions in terms of soil types, soil properties, climate condition, and soil thermal condition.

The overall scope of work to determine the strain demand resulting from frost heave and thaw settlement on the Pipeline System would include:

- characterization of terrain and soil conditions along the proposed route;
- gas hydraulic simulation, using a model that couples rigorous hydraulic and soil thermal models to develop accurate temperature and pressure profiles;
- frost heave and thaw settlement prediction, using a model validated against full-scale, long-duration testing; and
- pipeline structural analysis, using a model that couples the geothermal and structural analysis to determine displacements and strains over the life of the pipeline.

Strain demands resulting from seismic hazards and slope instability would be assessed using a process similar to that for frost heave and thaw settlement except on a site-specific basis. The process at a high level would include the following:

- identify and quantify seismic and slope instability hazards at the potential sites along the route;
- determine the magnitude of the hazards in terms of representative quantities such as fault displacement and slope movement; and
- determine the strain demands for the potential hazards identified and quantified by utilizing validated engineering models.

vi) Strain Capacity

The strain capacity of a pipeline is commonly represented by a compressive strain limit and a tensile strain limit. There are many factors that significantly influence the strain capacities, including pipe specification; geometry; material properties and imperfections; girth weld properties and imperfections; operating pressure; and temperature. The integrated process for determining strain capacities is built on a number of engineering disciplines, including structural engineering, materials engineering, welding engineering and fracture mechanics.

The tensile strain capacity is determined by the behavior of girth weld flaws in response to applied strain. The approach is based on the relationship between the longitudinal pipe stress-strain properties, the toughness and stress-strain properties of the weld and heat affected zone, flaw size and location, and the applied loads. Through these relationships, a tensile-strain versus allowable flaw-size criterion can be developed. Finite element analyses and experimental validation can be used to relate critical flaw size to applied strain. An overall safety factor is then applied to reduce these critical strains to allowable strains that can be compared with the tensile strain demand.

The determination of tensile strain capacity requires an understanding of plastic collapse limits, as a function of the relationship between the pipe and weld properties and flaw size. TransCanada has been developing and validating a tensile strain

design methodology for more than a decade and has been leading the industry in this area. It is generally understood that large tolerable tensile strains may be achieved if weld flaws are small, the weld metal strength overmatches the base metal strength, and reasonable fracture toughness is present.

The key factors determining tensile strain capacity are the following:

- shape of the stress-strain curves of the pipe, weld, and HAZ;
- weld strength matching (degree of overmatch);
- loading condition and local strain concentration;
- toughness of the weld and HAZ;
- flaw size, location and orientation; and
- establishment of a safety factor.

The data necessary for determining final tensile strain capacity for the APP would be developed using project-specific materials, welding processes and procedures, through laboratory scale and large-scale testing.

Compressive strain capacity is limited by the formation of local buckling, though, for displacement-controlled loads, a pipe will usually have significant additional deformation capacity before the onset of an ultimate limit state such as loss of containment. The process to establish the compressive strain limit includes the following steps:

- full scale local buckling and post buckling tests;
- finite element model development and validation;
- development of empirical predictive equations; and
- establishment of safety factor.

TransCanada has been actively conducting and sponsoring full scale local buckling and post-buckling test programs for the last two decades and has been leading the industry in this area. As a result, an extensive test database has been established that covers a wide range of key parameters, including diameter/wall thickness ratio ("D/t") from 40 to 100, pipe strength levels from X52 to X100, with and without internal pressure and girth welds. The database has been used to validate finite element models and empirical predictive equations.

While full scale tests have provided a fundamental basis for understanding the local buckling behavior and a core database for validation, full scale tests alone cannot effectively address the variability of various factors and their influences on the compressive strain limit, due to the high cost and long timeline of the tests. In order to apply strain-based design to the Pipeline System for design, construction and operation, predictive capability is required to determine compressive strain limit for a variety of pipes and loading conditions on a timely and cost effective basis. Finite element models validated by full scale test data are commonly used either directly as the predictive model or as an effective means to populate a comprehensive database on which empirical predictive equations can be developed.

To establish the factored compressive strain limit that can be used as the design criterion, an appropriate safety factor must be determined. In determining this factor, it is critical to understand the post-buckling behavior and the consequence when the design criteria are reached or exceeded.

For the Pipeline System, validated empirical equations and finite element models would be used to determine the compressive strain capacity and full scale testing would be used to verify the compressive strain capacities. Adequate compressive strain capacity is provided by considering the following factors:

- D/t ratio in an appropriate range;
- maintaining operating pressure at a reasonable level during normal operation;
- requiring a continuous stress-strain curve (no discontinuous yielding) for pipe material through specification;
- specifying limits for pipe ovality;
- controlling weld misalignment during construction; and
- balancing strain capacity with strain demand.

vii) Establishing an Adequate Level of Safety and Integrity

For strain-based LSD, two approaches are possible to ensure the levels of integrity that are required for acceptable safety, environmental and economic performance. A deterministic approach can be based on the LRFD format, as described previously. This involves, for each limit state, defining a characteristic load (demand) and a characteristic resistance (capacity), both, in this case, being expressed in terms of strain. Load and resistance factors are then selected, the former generally being greater than or equal to 1 and the latter less than or equal to 1. The design check is then:

Factored demand ≤ Factored capacity.

As has already been stated, in the absence of sufficient applicable statistical data, appropriate factors can be determined based on experience, expertise, and large-scale testing and by analogy with stress-based criteria. However, a more rigorous approach involves calibration of the load and resistance factors to provide desired levels of reliability. Clearly, this requires the availability of sufficient data to allow accurate determination of the statistical distributions of load and resistance (see figure of Section 2.2.1(5)(c)). Given the properties of the load and resistance distributions, characteristic values and associated factors can be calibrated to achieve a level of reliability that is appropriate for the consequences associated with each limit state. The more extensive the available data, the more accurate will be the distributions, so that excessive conservatism of the load and resistance factors can be avoided.

If adequate data describing the variables involved in all the applicable limit state functions are available, it is also possible to apply a reliability-based design approach. The principles of this approach have been studied intensively, and have been documented in industry standards such as Annex O to CSA Standard Z662-07. In this case, overall target reliability levels are established for ultimate limit states, leakage limit states and serviceability limit states that are consistent with the

characteristics of the pipeline and consequences of failure. All applicable limit states and associated load cases are identified, limit state functions are developed and annual failure probabilities are calculated over the lifetime of the pipeline. Limit states can be expressed in terms of stress or strain, as appropriate for the loading classification. The reliability level achieved (equal to 1-Pf where Pf is the failure probability from all causes) must be higher than the target reliability for each limit state category.

The advantage of determining safety factors based on experience and testing is the simplicity of the process and the reduced requirement for statistical data. The advantage of using a calibrated LRFD for displacement-controlled loads and conventional, reference stress design for normal operating loads is that a familiar, deterministic framework can be employed while still ensuring that a desired level of reliability against deformation-controlled loads is achieved. Extensive statistical data are only required for those variables that are involved in calibrating the LRFD. The advantage of using a full reliability-based design is that it facilitates the complete integration of the design for all load categories and throughout the operational life of the pipeline, as well as the optimization of lifetime cost. The choice of the approach to be adopted for the APP would be determined by a number of factors, including availability of data and cost and difficulty of acquisition, as well as regulatory acceptance in the different jurisdictions involved in the Project.

d) Fracture Control

The engineering design of the Pipeline System would include a comprehensive fracture control plan that addresses the following key elements:

- resistance to fracture initiation;
  - surface flaws – to maximize the critical flaw size for failure through the pipe wall that could lead to a leak or rupture
  - through-wall flaws – to maximize resistance to the initiation of rupture
- assurance of fully-ductile fracture behavior under all foreseeable operating conditions; and
- control of ductile fracture propagation.

For conventional pipelines, these issues are addressed by adherence to the notch toughness requirements of industry standards such as ASME B31.8 and CSA Z662. For large diameters, higher pressures, lower gas temperatures and rich gas compositions, supplemental toughness requirements are generally needed. For the APP, all of these conditions apply. As a result, project-specific fracture control requirements will be developed.

i) Fracture Initiation Resistance

Though alternative formulations have become available, for FEED purposes, the fracture initiation behavior of pipes containing axial surface and through-thickness flaws is considered to be adequately described by equations developed by Battelle in the late 1960s. On the basis of these equations, the critical defect size is found to increase with increasing material toughness (expressed as Charpy energy), but is

ultimately limited by the flow stress of the material (flow-stress dependent failure). For its existing pipeline system, TransCanada specifies a minimum Charpy energy corresponding to 80-90% of the maximum achievable critical through-wall flaw length. This requirement would be applied to the APP Pipeline System, and will also provide a high degree of resistance to failure of surface flaws. The failure of surface flaws arising from mechanical damage, in the form of gouged dents, can also be assessed on the basis of empirical relationships developed by Battelle. A high level of resistance to failure from typical dent-and-gouge damage can again be assured by the specification of a high minimum Charpy energy.

ii) Assurance of Fully-Ductile Fracture Behavior

Fully-ductile fracture behavior will be assured by specifying a high level of fracture appearance shear area in drop-weight tear tests, as specified in API 5L SR6 and CSA Standard Z245.1 for Category II pipe, conducted at the minimum material design temperature. In general, TransCanada's specifications for shear area are more stringent than those of either standard, and would be applied to the APP.

iii) Ductile Fracture Propagation Resistance

API 5L, ASME B31.8 and CSA Z662 include notch toughness requirements that are intended to provide adequate resistance to the propagation of ductile fracture for conventional pipelines. However, the explicit requirements of these standards are inadequate for a project like the APP, that combines a large diameter, high-strength steel, moderately rich gas, high operating pressure and low operating temperature. For such a combination, a project specific approach will need to be developed.

TransCanada has been directly involved in the study of ductile fracture propagation and arrest for some thirty years, and has access to a wide range of research results, including full-scale test data on pipe in diameters up to 56 inch, strength levels up to X100, pressures up to 2600 psig, and involving rich gas. TransCanada has also carried out a program of qualification of a range of pipe mills for the supply of higher-strength line pipe (up to X100) and the progressive introduction into its operating system of such materials. On the basis of this experience, appropriate approaches to the control of ductile fracture propagation can be selected for each possible design option. The chemical composition of the gas stream is an important factor in determining the driving force for fracture, with richer gases requiring greater fracture resistance.

In the present case, the estimated rich gas composition given in the RFA, in conjunction with 48 inch OD X80 pipe at MAOP of 2500 or 2600 psig, leads to very high calculated values of Charpy energy for fracture arrest under the most severe conditions. It is common to apply the calculated arrest toughness as a requirement for all-heat average ("AHA") Charpy energy in specifications, thus ensuring that a minimum of half the pipe in an order is capable of arresting a propagating ductile fracture. On the basis of TransCanada's experience, it is not considered that pipe mills would be capable of meeting the arrest toughness values required for the rich gas as an AHA. As a result, design against ductile fracture propagation cannot reliably be based on pipe body arrest.

An alternative approach to fracture propagation control, using crack arrestors, has been available since the early 1980s, and has been applied to a number of natural gas and CO_2 pipelines. More recent studies have refined the design principles and have included full-scale tests to establish the effectiveness of external crack arrestors (in situ fiber-reinforced composite or steel sleeves) for very high fracture driving forces. At this point, a fracture arrest design based on the use of crack arrestors can be applied with confidence. Arrestor design can be optimized based on existing modeling techniques, validated by full-scale tests. Spacing and location of arrestors would be determined in a detailed design study, based on considerations of safety and continuity of service. A high AHA Charpy energy would still be specified, to ensure good overall fracture resistance and to provide pipe body arrest capability for conditions of driving force lower than the maximum (e.g. local pressure lower than MAOP).

For lean gas composition, calculated arrest toughness values for conditions of highest driving force are significantly lower. In this case, it is considered that fracture propagation control can be achieved on the basis of pipe body arrest, based on specified AHA notch toughness values that are significantly higher than required by existing industry standards, but that will be achievable by potential suppliers.

The exact approach and requirements for fracture propagation control would be determined on the basis of the final system design, including MAOP, temperature profile and definitive gas composition.

e) Integrity Management Program

TransCanada's Integrity Management Process for Pipelines is described in Section 2.4 Operating Plan. This is a comprehensive program that addresses all of the threats under the nine primary categories listed in ASME B31.8S; and the threat categorizations in CSA Z662.

It is recognized that frost heave, thaw settlement and creeping slope movement are loading mechanisms that accumulate over the operating life of the pipelines. Therefore, an integrated approach based on the entire pipeline life-cycle is required, which includes design, construction, operation and maintenance. The base design for the pipeline is intended to be safe for all design conditions that can be reasonably expected. Due to the natural variability in soil and thermal conditions and the variability in pipe material and other factors, the integrity management process is relied upon to ensure pipeline integrity even under extreme loading conditions. The slow and cumulative nature of the frost heave, thaw settlement and creeping slope movement processes provide an opportunity for effective implementation of an integrity management program for these threats with a high level of confidence. Critical locations and areas where a high level of uncertainty may have existed at the design stage would be monitored during operation as part of the integrity management program, and remedial action would be taken where required to ensure that design strain demands are not exceeded.

For seismic hazards, the design would ensure pipeline integrity and continued transportation services for all seismic events that can be reasonably expected in the pipeline operating life. In addition, the design would ensure pipeline integrity without loss of containment for seismic events that are unlikely to be experienced within the

operating life of the pipeline. After each major seismic event, inspection, assessment and repair if necessary would be conducted to maintain adequate safety and reliability.

6) Emerging Technologies

TransCanada is extensively involved in the advancement of new and developing technologies that can be applied to enhance the economics and integrity of pipelines. The applicability of such technologies to the APP will be assessed on a continuing basis throughout the Development Phase, and where they are beneficial and sufficiently developed to be applied with confidence, they will be included in the Project plan. The following paragraphs describe emerging technologies that are already being studied and, in most cases, applied on the TransCanada system. The philosophy that TransCanada has typically applied to pipeline technology development has been one of progressive implementation, as follows:

- proof of principle;
- controlled implementation with restricted scope and limited sources of supply;
- more extensive implementation (e.g., several miles of pipeline and/or several sources of supply); and
- incorporation into standard company practices and routine implementation.

The following paragraphs describe a number of examples of emerging technologies that will be considered during the Development Phase.

a) Design Factor for Class Location 1

In Canada, a maximum design factor of 0.80 has been permitted in Class Location 1 since the publication of the 1973 edition of CSA Z184, the standard governing gas pipelines at that time. The MAOP has been established by dividing the minimum strength test pressure by 1.25, so that a strength test at 100% of the specified minimum yield strength ("SMYS") is needed to allow operation at a design factor of 0.80.

TransCanada has accumulated approximately 200,000 mile-years of operation of pipelines with an MAOP at or near 80% SMYS, and currently operates over 11,000 miles of such pipelines. Comparisons of TransCanada operating experience with that of other jurisdictions that do not permit operation above 72% SMYS do not indicate any negative effect of the higher design factor on pipeline integrity performance. Recently, extensive discussions between the pipeline industry and U.S. federal pipeline regulators have led to several grants of waiver allowing new and existing pipelines to operate at up to 80% SMYS. The conditions that have been attached to these waivers have mandated additional requirements to those of 49 C.F.R. 192 and 49 C.F.R. 195, but for the most part these do not extend beyond the bounds of current industry best practices. As the APP design is refined, it may well become apparent that economic benefits could be achieved by operating the system in Alaska at a higher design factor. Consideration would be given at that point to applying for a waiver to operate at a design factor exceeding 0.72.

b) Higher Strength Line Pipe

For the APP, the concept for the entire pipeline has been based on the use of API 5L X80 pipe. This has been a standard TransCanada design platform since the early 1990s and is

now considered to be standard practice within the industry for large diameter, high pressure pipelines. The investigation of X100 line pipe began in the mid 1990s; this grade is included in CSA Z245.1 and also in ISO Standard 3183, which is in the process of being adopted by API as its line pipe standard, replacing 5L. TransCanada has been working with several pipe mills with respect to the production and properties of X100 line pipe and, since 2002, has made a number of trial installations on its pipeline system with a total installed length of approximately 8 miles. More substantial installations (up to tens of miles) are planned for expansion projects scheduled for the next few years, and additional pipe mills will be evaluated. The specification and achievement of properties suitable for strain-based design in X100 are also being investigated, and over 3 miles of X100 specified for strain-based design were installed on a recent TransCanada project. It is anticipated that X100 will be established as a product routinely available from a number of pipe mills within the next few years, and that TransCanada will have accumulated sufficient experience in its procurement and installation that technical risks associated with its use in a major project such as the APP will be minimized. As the design is refined, consideration will thus be given to the potential economic benefits to be achieved by the use of X100 line pipe on a portion or all of the APP.

c) Crack Arrestors

As previously stated, for lean gas compositions, it is expected that the arrest of any ductile fracture in X80 pipe can be achieved through pipe body arrest by the specification of a sufficiently high level of Charpy impact energy. If X100 is applied, it becomes unlikely that pipe body arrest can be guaranteed, since recent full-scale tests have indicated that Charpy energy is not always a reliable indication of fracture propagation resistance for this grade. More advanced approaches to the analysis of fracture propagation and arrest are under study, but it is likely that design conditions such as those envisaged for the application of X100 to the APP lie at or beyond the limit for pipe body arrest in commercially available line pipe. An alternative approach to fracture propagation control using crack arrestors has been available since the early 1980s, and has been applied to a number of natural gas and CO_2 pipelines. More recent studies have refined the design principles and have established the effectiveness of external crack arrestors (in situ fibre-reinforced composite or steel sleeves) for very high fracture driving forces by full-scale testing. If X100 line pipe is used on the APP, it is expected that fracture propagation control will be based on the use of crack arrestors.

d) High-Productivity Welding Processes

For major large diameter pipeline projects, TransCanada uses mechanized gas metal arc welding ("GMAW") for mainline girth welds as a matter of course. This process combines high productivity with high quality and immunity from the cracking problems that can arise with the traditional shielded metal arc welding ("SMAW") process. It also facilitates the application of weld acceptance standards based on engineering critical assessment ("ECA") or fitness for purpose principles, as contained in Appendix A of API 1104 and Annex K of CSA Z662. Over the last decade, TransCanada has been involved in the study and development of high-productivity GMAW welding processes, and has applied such processes on a number of recent projects, including those involving X100 line pipe.

Conventional GMAW involves a single torch and a single wire feed. TransCanada has investigated the use of dual torch, tandem (two wires in a single torch) and dual tandem (two tandem torches) for welding line pipe up to Grade X100, and has implemented dual torch and tandem welding on pipeline projects within its system. These processes enable improvements in productivity that would be extremely significant for the wall thickness required for the APP, and would significantly alleviate the project demands on equipment and personnel. The process selected for construction will be based on optimizing productivity, consistent with achievement of high weld quality and properties that meet the requirements of strain-based design, and may vary from spread to spread based on the capabilities of specific contractors.

TransCanada has also studied and successfully applied mechanized processes for tie-in welding, using a combination of GMAW and flux-cored arc welding ("FCAW"). This approach improves both productivity and quality relative to manual SMAW welding. Both aspects will be particularly significant for the APP, because of the large diameter and heavy wall thicknesses involved and the strain-based design requirements.

e) Enhanced Girth Weld Inspection

The pipeline industry has traditionally used radiographic inspection as the primary means of assessing the acceptability of girth welds. Over the last two decades, TransCanada has led the development, implementation and standardization of automated ultrasonic testing ("AUT") for the inspection of mechanized girth welds. This technique has superior capability for the detection of potentially injurious, planar flaws; can provide much more immediate quality feedback to enable prompt corrective action; and removes the need to control a potential radiation hazard on the right of way.

The conventional AUT technique involves multiple focussed probes, each of which is designed to inspect a particular zone of the weld. This approach has been successful but, for heavy wall thicknesses, the number of probes required becomes large and the equipment that must be handled to carry out the inspection of each weld becomes bulky. In addition, the zonal focused approach has limited resolution in sizing flaw height, which is a manageable restriction for a conventional pipeline project but a significant limitation for pipeline projects with strain-based design such as the APP. A relatively recent development is the phased array approach, in which the beams from a limited number of probes are manipulated electronically to complete the inspection of the full weld volume. Apart from the greater convenience of carrying out inspection, phased array AUT is capable of more accurate sizing of flaws, and thus allows a more precise assessment of acceptability, avoiding unnecessary conservatism and repairs. Again, this is of particular significance for heavy wall thicknesses and where strain-based design is applied. TransCanada has successfully applied phased array AUT to a large-scale field project in 2006, and will continue to incorporate the technique into planned construction projects over the next three years. It is anticipated that it will be fully established and available from multiple non-destructive examination ("NDE") contractors by the time the APP is constructed.

f) Alternative Integrity Validation

The strength and leak-tightness of new pipelines has traditionally been verified by the post-construction pressure test. In recent years, there have been considerable advances in pipeline materials, construction and inspection techniques, and in the related quality management systems, such that, for projects of significant scope, ruptures during pressure testing have been virtually eliminated. There are also more effective and more economical means of detecting leaks than by pressure testing. Particularly for remote pipelines and for winter construction, there are serious issues concerning access to and disposal of water for hydrostatic testing, and gaseous medium testing is totally impractical for long, large diameter pipelines. As a result, there has been increasing study of the effectiveness of alternative integrity validation ("AIV"). In principle, this involves relying on a structured and integrated quality management system that covers all stages of a project, including steelmaking and skelp rolling, pipe manufacture, transportation, and every phase of construction, to ensure that no defect that could lead to a loss of containment is present in the pipeline as constructed. Freedom from leaks is confirmed immediately after gas is introduced to the pipeline using aerial leak detection methods. Existing methods for aerial leak detection have been shown to be effective, and new techniques are becoming available that are more sensitive and less influenced by ambient conditions.

TransCanada has received regulatory approval and applied AIV on a trial basis to two projects to date, and plans to use it on additional projects over the next three years. Should the conditions relative to specific pipeline sections warrant, application may be made to implement AIV on the APP. It is expected that the quality management system that will be implemented as a matter of course for the project will be sufficiently rigorous to support the AIV process, so that relatively limited additional activities and documentation will need to be undertaken.

7) Resources

An estimate of the labor hours for the Development Phase for the Pipeline in Alaska and Canada and the Gas Treatment Plant is presented below, allocated for the Proposal Sub-Phase (prior to end of Open Season) and Definition Sub-Phase (post Open Season).

PROJECT DEVELOPMENT ACTIVITY	HOURS PROPOSAL SUB-PHASE	HOURS DEFINITION SUB-PHASE
Project Development	40,000	400,000
Project Management	100,000	1,200,000
Engineering	300,000	1,500,000
Environment	10,000	200,000
Total	**450,000**	**3,300,000**

8) Project Management Processes

TransCanada has developed a suite of processes, guides and templates that have been standardized across the organization under the auspices of the Project Management Office to provide a disciplined, effective and efficient methodology for project management. The PMO Guides are structured to align with, and are based upon, the nine knowledge areas of the Project Management Institute's *A Guide to the Project Management Body of Knowledge*, plus additional knowledge areas of Governance, Safety, Environmental Management, Operations and Regulatory Management. These processes and best practices cover all aspects of project governance, planning and control, are adaptable to all types of project and are scaleable to accommodate projects of varying size, complexity and risk profile.

The PMO Guides define the performance expectations of project managers to help them effectively manage their projects. The PMO Guides are supported by specific templates and examples so that project managers have the tools necessary to quickly develop the appropriate project plans.

Executive governance is provided by: a standardized gating process for the various phases of a project; reporting through standardized scorecards; and risk matrices that determine the amount of control required on a per project basis.

Training in the PMO practices, templates and examples is provided to all project managers and project support groups in TransCanada so all have a common understanding of the key elements of project delivery. Mentoring and lessons learned provide ongoing feedback so that best practices are shared for continued project performance and delivery. Quality Process Reviews are performed on all projects to ensure adherence to the PMO processes and to provide consistency in expectations across the organization.

a) Standard Control Levels

Appropriate control levels would be put in place on each sub-project or component of the Project to ensure that an appropriate level of effort is expended on controlling the work. Three levels (Levels 1, 2, 3) of project management control have been established for use in conjunction with TransCanada's Project Management Guides to accommodate a wide variety (size, complexity, risk, etc.) of project and sub-project. The PMO *Project Controls Level Validation Guide* describes the key considerations in determining the level of project control to be used for a particular project or sub-project (see Appendix B1 "PMO Project Controls Level Validation Guide").

b) Scope Management

During the Development Phase of the Project, a detailed Scope Management Plan would be developed based on TransCanada's PMO *Scope Management Guide* (see Appendix B2 "PMO Scope Management Guide").

Scope Definition, which would entail defining the main Project parameters such as receipt and delivery locations, receipt volumes, gas composition, pipeline route, length, diameter, pressure and compression requirements, as well as the on-stream date, would be finalized soon after the successful conclusion of the Open Season.

Scope management controls are mandatory to ensure an appropriate level of scope definition to support stage gate decisions and requirements (e.g. cost estimates / accuracy, risk identification); and to minimize need for scope changes during a project.

The PMO *Scope Management Guide* would provide a structured and consistent guide for scope management related matters during the Development Phase and support project managers in ensuring the main components of scope management are properly addressed.

A detailed Work Breakdown Structure ("WBS") would be developed early in the Development Phase to provide a structure for defining deliverables to a level of detail sufficient to identify critical scope-related risks and to identify work elements to a suitable level for scope and schedule management.

The scope of the APP is described in Section 2.1 "Project Description".

c) Schedule Management

The purpose of Schedule Management is to identify, schedule, monitor and manage the relationships between the components of the work that must be performed to complete project deliverables and the time required to complete them.

Schedule Management provides sufficient schedule related information to support stage gate decisions; provides a way to assess project performance and progress, and generally increases the certainty in delivering the project components to meet Project and stakeholder schedule requirements.

A scheduling software package would be selected early in the Development Phase to plan, monitor, and report on schedule activities, relationships between activities, activity durations, resources, and schedule constraints. Milestone dates, marking major deliverables and events in the Project would be established at strategic points thought the schedule and used as control points for assessing progress. Other important dates and events would be marked as key dates and used a supplementary control points.

During the Development Phase, a detailed Schedule Management Plan would be developed in accordance with the PMO *Schedule Management Guide* (see Appendix B3 "PMO Schedule Management Guide").

i) Schedule Development

A Project Master Schedule and supporting detailed schedules for all aspects of the Development and Execution Phases would be developed early in the Development Phase and would incorporate all Project considerations including regulatory requirements, and environmental, socio-economic, procurement, logistics and construction lead times and constraints. Schedules would be aligned with the detailed WBS for the project and the established project milestones, and would be maintained and updated continuously throughout the life of the Project. Resource requirements would be linked to the schedules and used to manage productivity and progress.

Early in each phase, an As-Planned Schedule would be established and would form a basis for schedule control through to phase completion. Once the As-Planned Schedule is approved, it will be used as a baseline, against which future revisions (which would be formalized through change order) can be compared.

ii) Project Specific Schedule Information

A high level milestone schedule is included in this Application. This schedule is based on detailed work that was completed by TransCanada in recent years and incorporates AGIA timelines and constraints.

Refer to Section 2.6 "Project Schedule".

d) Cost Management

i) Cost Management Plan

Cost management during the Project Development Phase would be in accordance with TransCanada's PMO *Cost Management Guide* (see Appendix B4 "PMO Cost Management Guide") and as described in Section 2.3.2 "Managing Capital Costs".

Monthly project reports would contain cost updates including actual costs, incurred costs and committed costs, together with project managers' forecasts of costs at completion.

ii) Cost Estimating

This Application includes a Class 5 (based on AACE International Recommended Practice No.17R-97) Cost estimate for the Project that has been developed based on studies that were undertaken by TransCanada in recent years. Costs have been updated to reflect the current market (mid-2007) and are described in Section 2.5 "Project Cost Estimate". More detailed cost estimates for the Project would be prepared in the Project Development Phase based on field studies, and preliminary engineering and procurement work.

A Class 4 cost estimate would be developed during the Proposal Sub-Phase to support the Open Season. A Class 3 cost estimate would be in place at the end of the Definition Sub-Phase and would form a Project Baseline Budget for control during the Execution Phase.

iii) Cost Management by Phase

As described in Section 2.3.2 "Managing Capital Costs," TransCanada uses a phased project structure that includes stage gates and check points to control expenditures as the project progresses, such that the progress of work and the associated expenditures are consistent with the level of scope development and project certainty.

The major project milestone "Decision to Proceed" marks the transition point between the Project Development Phase and the Project Execution Phase. This is the final go/no-go decision point in the Project. Inputs to this decision would include receipt of final regulatory approvals; receipt of binding bids for all major materials and equipment; binding bids for major construction contracts; financing in place; development of a Class 3 estimate that confirms the Project cost estimate to be still in accordance with the parameters laid out in the Precedent Agreements; all Precedent Agreement conditions met or waived; and all final corporate approvals and inputs to the Decision to Proceed have been granted.

e) Quality Management

During the Development Phase, quality management will be in accordance with TransCanada's PMO *Quality Management Guide* (see Appendix B5 "PMO Quality Management Guide").

For pipeline projects, TransCanada has developed and implemented a Quality Management System ("QMS") in compliance with ISO 9001 that covers the entire process of executing a pipeline project from initial concept to design, material procurement and transportation, construction and commissioning. The QMS is based on TransCanada's experience in building large diameter pipelines over many decades, in many regulatory jurisdictions, and has been reviewed and accepted by Canadian regulators as the basis for regulators' waivers for construction hydrostatic tests.

The QMS for pipeline projects has a three-tier document structure in accordance with ISO 9001 as listed below:

- Tier 1 - QMS Manual
- Tier 2 – QMS procedure, and
- Tier 3 – Detailed engineering standards, processes, procedures and specifications.

The QMS is scalable for projects of various sizes. During the Development Phase, the QMS will be reviewed and revisions and enhancements will be made where appropriate (see Appendix F "Quality Management Systems Manual for Pipeline Projects").

f) Risk Management

For a Preliminary Risk Assessment of the overall Project, please refer to Section 2.7 Risk Assessment and Mitigation.

During the Development Phase, a Risk Management Plan would be prepared for the Development and Execution Phases in accordance with TransCanada's PMO *Risk Management Guide* (see Appendix B6 "PMO Risk Management Guide"). This would include a risk register developed with input from content experts from different fields of knowledge who would establish the main risk events that are relevant to this Project. The plan would be refined and maintained as the project moves though the Development and Execution Phases.

g) Procurement Management

During the Project Development Phase, a Procurement and Logistics Plan would be developed in accordance with TransCanada's PMO *Procurement Management Guide* (see Appendix B7 "PMO Procurement Management Guide").

The Procurement and Logistics Plan would include Contractor/Vendor Qualification, Contractor/Vendor Selection, Contract Administration (invoicing, payments, changes etc.), and Contract Closure. Contractor management would be in accordance with TransCanada's *Contractor Safety Management Program* (see Appendix C "Contractor Safety Management Program").

The technical complexity and unique nature of the APP will require worldwide sourcing of certain materials, equipment and services. The Procurement and Logistics Plan will

describe how such Project needs will be met, while complying with the requirements of the State of Alaska, the U.S. and Canada.

During the initial stages of the Development Phase, procurement would be carried out by TransCanada's Supply Chain Services group. As the PMT and the EPCM Contractor are mobilized, materials, equipment and services would be procured by the EPCM contractors under the direction of the Manager of Supply Chain Services within TransCanada's PMT.

h) Human Resources Management

Human resource management would be in accordance with TransCanada's PMO *Human Resource Management Guide* (see Appendix B8 "PMO Human Resource Management Guide").

The PMT would be phased in over the first year following the award of the AGIA License, becoming fully mobilized soon after the Open Season. The structure would be generally as shown on the organization chart in Appendix D "Project Organization Chart for the Development Phase", and as described in Section 2.2.1(2)(c) "Owner's Organization".

i) Communications Management

Communication Management would be in accordance with TransCanada's PMO *Communication Management Guide* (see Appendix B9 "PMO Communication Management Guide").

During the Development Phase a Communication Management Plan would be developed that would describe how the Project would manage communications with key stakeholders. For more information on stakeholder management refer to Section 2.2.2 "Stakeholder Issues Management Plan".

j) Regulatory Management

Regulatory Management would be in accordance with TransCanada's PMO *Regulatory Management Guide* (see Appendix B10 "PMO Regulatory Management Guide") and as more fully described in Section 2.2.4 "Regulatory Plan".

The Regulatory Management Plan would describe how the project would manage regulatory interactions and submissions and would include:

- lists of permits, permit conditions and permit status for Federal, state/provincial, municipal and other jurisdictions;
- regulatory assurance (to ensure that appropriate processes are being followed); and
- regulatory control (to ensure that results are as expected).

k) Safety Management

Safety Management would be in accordance with TransCanada's HS&E Management System; Contractor Safety Management Program; and PMO *Safety Management Guide* (see Appendices E, C, and B11 respectively).

l) Change Control

During the Development Phase, a Change Control Plan would be developed that would include:

- issue identification, submission and recording;
- issue / change evaluation;
- issue / change approval (triggers requiring approval);
  - internal;
  - contracts;
- change implementation; and
- lessons learned.

Additional information on Change Control can be found in the PMO *Integration Management Guide* (see Appendix B13 "PMO Integration Management Guide").

The purpose of the Change Control Plan would be to provide a process for managing change within the Project. This would include the early identification of trends against the control estimate, schedule and scope, which may enable management to proactively mitigate the effects. Changes will need to be managed promptly, effectively and in accordance with the Project requirements to maintain the credibility of the forecast, schedule and project scope. Implementing the Change Control Plan would also ensure that appropriate tracking is used to control, implement and communicate any change requests that arise during the project. Tracking changes and utilizing a trend management process would provide an effective mechanism for the early identification of potential adjustments to scope, budget or schedule.

m) Environmental Management

i) Environmental Management Plan

During the Development Phase, an Environmental Management Plan would be developed in accordance with TransCanada's PMO *Environment Management Guide* (see Appendix B12 "PMO Environment Management Guide").

The Environmental Management Plan would be developed within the policy framework provided by the TransCanada HSE Management System (see Appendix E "Health, Safety and Environment Management System") and would include:

- project-specific environmental management strategies to articulate the approach to compliance with corporate policies and regulatory requirements, and the integration with other project team work products;
- a detailed list of applicable regulations, internal requirements, external/other requirements;
- environmental assurance measures to ensure proper processes are being followed and to ensure results are as expected;
- procedures for monitoring, measuring and documenting those operations with potential for environmental impact;

- a plan to carry out environmental field studies and data collection; and
- project specific environment information would include an Issue and Incident Log as well as a list of permits (conditions) and status.

ii) Environmental Field Studies and Data Collection

Environmental field studies and data collection would be executed in accordance with: the Environmental Management Plan; discussions with and direction from regulatory agency representatives; and the framework established by the logistics plans and protocols described earlier.

The final scope and scale of these studies would be refined once discussions have occurred with regulatory agency and local community representatives, available data has been reviewed, and detailed permit requirements have been defined. This work would be carried out by the EM contractors, directed by the Managers of Environment within TransCanada's PMT. The following lists provide a preliminary view of the proposed field studies for the Alaska and Canada Sections, but it is expected that these lists will be subject to comment and modification resulting from activities to be carried out during the Proposal Sub-Phase.

Preliminary List of Environmental Field Studies for the Alaska Pipeline:

- Water Resources Study
- Fisheries Study
- Wildlife Studies
  - ungulates
  - birds and raptors
  - carnivores
  - threatened and endangered species
- Vegetation and Wetlands Studies
  - rare and medicinal plants
  - threatened and endangered species
  - amphibians and reptiles
- Cultural and Historic Resource Studies
- Air Quality and Noise Modeling Studies
- Soils and Geological studies
- Land use, Recreation and Aesthetics Studies

Preliminary List of Environmental Field Studies for the Canada Section:

- Air Quality and Noise Modeling Studies
- Soils and Geological studies
- Fisheries, Hydrogeology and Hydrology Studies
- Vegetation and Wetlands Studies
  - rare and medicinal plants

  - species at risk
  - amphibians and reptiles
- Wildlife Studies
  - ungulates
  - small mammals and furbearers
  - birds and raptors
  - carnivores
  - species at risk
- Archaeology and Heritage Resources Studies

9) Professional Practice

All engineering work during the Project Development Phase would be in accordance with TransCanada's Practice of Engineering standard. The intent of the document is to ensure that engineering work is prepared, revised, reviewed and approved in accordance with TransCanada policies and procedures. The document covers all activities within TransCanada defined as the "Practice of Engineering" and applies to all such activities that are performed or are to be implemented for all TransCanada projects and facilities in the United States and Canada.

2.2.2 Stakeholder Issues Management Plan

1) Background

TransCanada has well established policies and an extensive positive track record with respect to stakeholder consultation in the advancement of projects.

TransCanada's stakeholder consultation initiatives are aimed at creating meaningful opportunities for stakeholders to provide input to those decisions that have the potential to affect them. TransCanada recognizes that effective stakeholder consultation is an iterative process, which enables TransCanada to proactively incorporate stakeholder input into company decision-making to design and execute projects in a manner that minimizes adverse effects and enhances project benefit delivery. Further, by sharing information about the proposed project, and by integrating stakeholder input into the design of the project, TransCanada is better able to undertake activities with the trust and support of affected stakeholders. This in turn, leads to a more successful project in the short term, and a better, more cost effective operating environment in the long term.

Through Foothills Pipe Lines Ltd, TransCanada has been actively involved in ongoing information, consultation and liaison activities with respect to the Project in Canada since 1977. These activities have included the provision of information to, and meeting with stakeholders, providing stakeholders with the opportunity to identify issues and concerns regarding the Project, and documenting all information, consultation and liaison activities.

In 2004, TransCanada successfully carried out a Public Outreach Program in support of the Alaska State Right-of-Way Lease Application.

The experience gained by TransCanada through these stakeholder consultation initiatives provides the basis for the design of this Stakeholder Issues Management Plan.

2) Purpose

This Stakeholder Issues Management Plan would identify:

- stakeholders in the vicinity of the proposed project in the State of Alaska, the Yukon Territory, and the Provinces of British Columbia and Alberta;
- the types of project information to be exchanged;
- the methods whereby such information is to be communicated;
- the avenues through which stakeholders are to be consulted; and
- a process for issues management documentation.

3) Objective

The objective of TransCanada's Stakeholder Issues Management Plan would be to implement a documented information, consultation and liaison process that:

- provides stakeholders with an opportunity to be well informed about the proposed project;
- provides stakeholders with a forum to communicate their views to TransCanada regarding the proposed project;
- provides TransCanada with a process to become fully informed about and responsive to stakeholder issues;
- assists TransCanada to become the corporate citizen Alaska seeks;
- incorporates concepts and measures identified in the FERC guidance document Ideas for Better Stakeholder Involvement In the Interstate Natural Gas Pipeline Planning Pre-filing Process; and
- meets or exceeds TransCanada's compliance obligations in Canada as set out in the Northern Pipeline Act Socio-economic Terms and Conditions.

4) Identification of Stakeholders

The key to the successful implementation of this Plan is the identification of appropriate stakeholders, such as governments, regulators, Alaska Native entities, including regional and village corporations, tribal entities and native allottees, Canadian First Nations, communities, non-governmental organizations and individuals, who may be affected by the Project.

TransCanada has identified those potential stakeholders who would likely have the greatest interaction with the Project for each of the State of Alaska, the Yukon Territory, and the Province of British Columbia.

These stakeholders would be consulted to determine the nature of information materials and consultation activities that best match their specific interests relating to the Project.

TransCanada would also continue to identify additional potential stakeholders through the development and implementation of this Plan, and consult with them as appropriate.

The stakeholder list for the Alaska Pipeline Project is included in Appendix G "List of Stakeholders".

5) Types of Information to be Exchanged

TransCanada would provide stakeholders with information about the Project on an ongoing basis. The following sets out the types of information TransCanada commits to provide stakeholders. These information materials may be amended from time to time as the Project advances.

TransCanada will focus on providing the most detailed types of information to those stakeholders who have the greatest interaction with the Project. TransCanada will consult with stakeholders to determine the appropriate types, format and timing of information dissemination. It is the company's philosophy to be inclusive and proactive in addressing stakeholder issues and concerns.

As a minimum, TransCanada would make available to all stakeholders the following information:

- methods to contact TransCanada;
- copies of this Stakeholder Issues Management Plan;
- physical Project planning information, including the pipeline route alignment and location of ancillary facilities, stockpile sites and work camp sites;
- the Project schedule;
- opportunities for Project employment and training, and the provision of goods and services to the Project;
- plans for the provision of permanent and temporary housing of workers;
- information required by stakeholders to enable them to participate effectively in the public outreach associated with the regulatory review of Project plans; and
- other information that is requested by an organization or individual with an interest in that information.

Stakeholders having the greatest interaction with the Project would also receive the following information depending upon specific interests relating to the Project:

- information on expected interaction between the Project and existing regional services and infrastructure;
- the proposed use of land and water bodies;
- potential adverse environmental impacts and proposed environmental protection plans; and
- potential adverse socio-economic and/or socio-cultural impacts and proposed protection plans.

It is TransCanada's practice to provide appropriate information to all stakeholders on request and the above categories may be adjusted to meet evolving information needs.

6) Communication and Consultation Methods

a) Provision of Project Information to Stakeholders

TransCanada would use existing regional communication channels, organizations and infrastructure to the greatest extent possible.

It is anticipated that Project information would be provided to stakeholders through a variety of means, including:

- meetings with relevant government departments, agencies and individual representatives;
- community meetings and/or open house format meetings at which knowledgeable TransCanada personnel will provide information to interested stakeholders and will directly respond to stakeholder questions and issues;
- meetings with individual stakeholders and/or groups of stakeholders at which time TransCanada personnel will be available to discuss specific topics of interest as required;
- maintaining information materials at regional TransCanada project offices (Anchorage, Fairbanks, Whitehorse, Fort Nelson), once established, which will be available upon request by stakeholders;
- placing information materials in community libraries and available community public offices;
- maintaining a TransCanada website that will post downloadable versions of selected relevant information;
- publishing update information for public distribution as may be warranted;
- developing and widely distributing information brochures and other appropriate media;
- providing appropriate public information bulletins to regional media for public release;
- providing appropriate specific information to stakeholder organizations for dissemination to their members; and
- advertising in appropriate media and locations regarding upcoming information, consultation and liaison activities.

b) Collection of Information from Stakeholders

TransCanada anticipates that it will collect information from stakeholders through a variety of means, including:

- regular meetings with relevant government departments, agencies and individual representatives;
- advice provided by regional businesses and consultants retained to provide goods and services to the Project;
- advice from regional residents employed to work on the Project;

- community meetings such as open houses and town hall meetings convened to discuss items relevant to the final design process;
- meetings with regional stakeholders to discuss specific issues of interest to those stakeholders;
- TransCanada's project website through which stakeholders will be able to provide TransCanada with their comments with respect to the Project; and
- direct communication with TransCanada's community relations personnel stationed in regional offices.

c) Responsibilities within TransCanada

TransCanada's senior management places a high priority on TransCanada's information, consultation and liaison activities. Senior management officials would continue to actively participate as appropriate in such activities as the Project advances.

Primary responsibility for the implementation of the Stakeholder Issues Management Plan would be assigned to two managers with TransCanada's PMT, namely the Manager of Community, Land and Aboriginal Affairs for Canada and the Manager of Community, Land and Alaska Native Affairs for Alaska. These managers would be supported as required by a number of TransCanada personnel drawn from TransCanada's Community Safety and Environment Department managing and overseeing Alaskan contractors who would assist in implementing the measures outlined above**.**

d) Documentation

TransCanada would document its activities with respect to the Stakeholder Issues Management Plan in order to ensure that stakeholder issues are addressed in a timely and complete manner and to facilitate regulatory compliance reporting.

TransCanada would establish a project wide computerized database which:

- identifies stakeholders;
- records details of information provided to stakeholders;
- records details of TransCanada's consultation, information and liaison activities;
- tracks stakeholder queries and TransCanada's responses; and
- provides data for regulatory reporting as may be required.

7) Implementation Schedule

TransCanada would initiate the implementation of this Stakeholder Issues Management Plan within six months of the completion of a successful Open Season.

8) Preliminary Issues List

Based on experience, TransCanada anticipates that the following stakeholder project-related issues and concerns among others will be addressed through the Stakeholder Issues Management Plan:

- in-migration (the socioeconomic effects of an influx of temporary construction workers and their dependents);

- non-resident workers (the socioeconomic effects of income and related expenditures leaving the state/province where job is located);
- labor force management;
- management of emergencies;
- availability of local employment and training opportunities outside of major cities;
- follow through of training to actual job opportunities (especially for rural residents);
- availability of local contracting opportunities;
- public safety;
- provision of fire protection;
- health care;
- impact to health of local communities (for example, air quality and food contamination concerns);
- housing;
- transportation infrastructure (in Alaska: increased heavy traffic on limited and two-lane road system);
- disruption to subsistence/hunting activities from new transportation routes;
- public utilities;
- cost of living and fuel;
- land use (land ownership patterns, settlement patterns, subsistence hunting and fishing, recreation);
- protection of, and continuing access to, subsistence resources;
- local gas availability (costs of provision);
- local and regional economic benefits (including specific benefits to Alaska Native villages and corporations);
- protection of heritage and cultural resources;
- protection of wildlife;
- effect of Project on climate change;
- protection of air quality;
- noise control;
- protection of water quality;
- protection of visual resources;
- loss of gravel and other resources;
- management of fuels and hazardous materials; and
- waste management.

2.2.3 Commercial Plan

2.2.3.1 Plan Prior to Open Season

1) Objectives

TransCanada firmly believes that AGIA will have a much better opportunity to deliver on its promise to advance the Project if TransCanada and the State, acting both individually and in concert, undertake certain actions prior to the Open Season. The objective of these actions is two-fold:

- to foster as favorable an environment as possible for potential Shippers to sign Firm Transportation Service Agreements for service; and
- to strive to educate Alaskan citizens, Lower 48 natural gas consumers, national media and opinion leaders and U.S. federal government decision makers on the essential economics and attributes of the Project and to solicit their support.

2) TransCanada Actions

Prior to the Open Season, TransCanada would undertake the following activities:

- Monitor exploration activities on the North Slope of Alaska and along the vicinity of the pipeline both in Alaska and Canada. This will allow TransCanada to identify the potential Shippers in the Open Season.
- Explore the interest of ANS Producers, explorers, local distribution companies and gas marketers in committing to shipping capacity on the pipeline.
- Conduct a route review using both aerial and ground reconnaissance. This route review would confirm available access, identify recent erosion events needing attention, consider any new structures or construction on or near the proposed ROW, and ascertain locations of any new crossings (roads, utilities, drainage channels, etc.).
- As the main pre-FEED activity during this time, refine cost estimates for the Gas Treatment Plant and the facilities for the Alaska Section and the Canada Section.

3) State of Alaska Actions

TransCanada would rely on the State of Alaska to take all feasible actions exclusively within its authority as a sovereign power to ensure a favorable economic environment for potential Shippers on the Project. Those actions include:

- engaging with the ANS Producers to reach agreement on a commercially reasonable and predictable upstream fiscal regime that balances the needs of the State and the ANS Producers; and
- encouraging the robust exploration for and development of new natural gas resources and the commitment of such resources to the Project.

4) Joint TransCanada and State Actions

TransCanada proposes that the State of Alaska and TransCanada jointly develop and implement a comprehensive stakeholder outreach and education campaign designed to demonstrate to Alaskans, Lower 48 natural gas consumers, national media and opinion

leaders, non-governmental organizations, State government officials and U.S. government policy-makers that the Project is a national priority. The key messages of this campaign are:

- the overall favorable economics of the Project;
- the significant benefits of the Project to Lower 48 gas consumers and federal government tax revenues;
- the significant benefits of the Project to national energy security, environmental, and climate change objectives; and
- Alaska's role in helping to deliver the Project to the nation through AGIA.

In addition, TransCanada proposes that the State of Alaska and TransCanada jointly develop a plan which would include specific steps the U.S. Government could take to support the Project. The key components include:

- discussions with the U.S. Department of Energy and U.S. Department of Treasury to seek their support for TransCanada's proposal to use the U.S. Loan Guarantee for Capital Cost Overrun;
- discussions on the toll surcharge concept with FERC and the NEB to obtain their feedback on process for recovering Capital Cost Overrun, and
- exploration of the alternative credit concept, i.e. backstop Shipper contract, with U.S. Government to seek its support for the Project in advance of the Open Season, or in the event of a failed initial Open Season.

2.2.3.2 Plan for Open Season

1) Prudhoe Bay to Boundary Lake

TransCanada would conduct the Alaska Open Season and the Yukon-BC Open Season concurrently for capacity on the Alaska Section and Yukon-BC Section, respectively, within 18 months following the date the License is issued.

Ninety days prior to issuing notice of the Open Season, TransCanada will file its Alaska GTP plan (if no third party has yet agreed to undertake it) and the Alaska Open Season plan with FERC for approval, and release an information package to interested stakeholders for the Yukon-BC Section.

Upon FERC approval of its Alaska Open Season plan, TransCanada would provide public notice, 30 days prior to its commencement. Notification would be through postings on TransCanada's website, press releases, direct mail solicitations, and other advertising. TransCanada will also provide the actual notice of the Alaska Open Season to the State of Alaska and to the Federal Coordinator for Alaska Natural Gas Transportation Projects.

In preparing for the Alaska Open Season, TransCanada would either conduct an in-State gas consumption study, or adopt a similar study that is compiled by an appropriate governmental agency, to determine the amount of potential in-State gas demand and the location of in-State points of delivery. This information would provide an estimate of the amount of pipeline capacity that would be used for in-State deliveries and the corresponding transportation tolls at these delivery points.

TransCanada would include all information required under the FERC Open Season Regulations in the Alaska Open Season notice.

Given the proposed pipeline design and to ensure the Project is economically feasible, TransCanada would require a minimum 3.5 bcf/d of firm capacity commitment for the pipeline from Prudhoe Bay, Alaska to the Alberta Hub and a 100% economic cost recovery target. Unless otherwise stated, all tolls and Project economics shown in this application are based on a 4.5 bcf/d throughput from Prudhoe Bay to the Alberta Hub / NIT and a gas heat content of 1,118 Btu/cf.

TransCanada would be willing to revisit the design criteria of the Project if the capacity subscriptions received during the Open Season in aggregate are less than 3.5 bcf/d to the Alberta Hub. TransCanada's objective is to find a way to successfully move the Project forward on a timely basis that is both technically and economically feasible.

TransCanada would require the following information from the prospective Shippers in their response to the Open Season:

- amount of firm capacity requested in mmcf/d or mmBtu/d;
- election of offered service term (25, 30 or 35 years);
- designation of receipt and delivery points;
- selection of recourse rates or negotiated rates;
- heat content of gas in Btu/cf and its composition;
- demonstration that the prospective Shipper has access to gas that can support its capacity request for a significant portion of the term commitment;
- evidence satisfactory to TransCanada that the prospective Shipper has valid removal permits, if necessary;
- commitments to obtain all associated regulatory approvals for the full term of service requested; and
- sufficient information for TransCanada to evaluate the creditworthiness of the prospective Shippers and if required any financial assurances.

TransCanada uses various sources of financial credit and business information to assess creditworthiness of prospective Shippers. This information may include, but is not limited to, the following:

- audited financial statements;
- annual report;
- list of affiliates, parent companies and subsidiaries;
- publicly available information from reports of credit and bond rating agencies;
- most recently filed documents with the United States Securities and Exchange Commission (or an equivalent authority) or such other publicly available information;
- such other information as may be mutually agreed to by the parties; and
- above information for affiliates, parent companies and subsidiaries.

TransCanada would evaluate all bids based on present value such that bids of higher present value receive higher rankings. The present value of each bid will be determined by discounting the product of the selected contract term, the applicable tolls for such term and the subscribed volumes. Capacity would be awarded to the highest ranking bid first, to the next highest ranking bid second and so on until all the capacity has been awarded.

In the event of oversubscription, TransCanada would first look at expanding the capacity of the Project to accommodate all bid volumes (provided that such expansion is in reasonable engineering increments and does not result in a deterioration of Project economics) before allocating capacity among the prospective Shippers based on present value ranking. In the case where there are two or more bids with equivalent present values, the offered capacity will be allocated on a pro rata basis.

Before any bid is considered as nonconforming, TransCanada would seek clarification from the prospective Shipper. Only after clarifying the nonconforming nature of the bid with the prospective Shipper will TransCanada confirm the bid as nonconforming. TransCanada reserves the right to not accept bids that do not conform to the terms laid out in the Open Season notification.

TransCanada expects the Open Season would continue for at least 90 days from the date on which the Open Season notice is given. In consultation with the State, TransCanada may consider extending the Open Season period if circumstances should warrant it.

All bids received prior to the expiry date of the Open Season will be evaluated. A bid would be rejected if it is confirmed to be a nonconforming bid, it does not meet the creditworthiness standard requirements or cannot be accommodated due to economic, engineering, design, capacity or operational constraints, or its acceptance will cause undue impact to the timely development of the Project. TransCanada will provide a written explanation for all bids that are rejected and will file such explanations with FERC consistent with the FERC Open Season Regulations.

The FERC Open Season Regulations require the Project sponsor to accept bids that are submitted late, unless to do so would adversely impact the timely development of the Project, as determined by FERC pursuant to 18 C.F.R 157.34(d)(2). TransCanada is concerned that this might discourage participation by potential shippers in the initial Open Season and thereby has the potential to defer development.

Bids will be evaluated and capacity will be awarded within 30 business days of the closing of the Open Season. TransCanada expects to work with interested stakeholders prior to the Open Season to develop a mutually acceptable Precedent Agreement that will be based on the principles proposed in Section 2.2.3.3 “Precedent Agreements” and release such Precedent Agreement as part of the Open Season documents. Prospective Shippers who are successful in receiving capacity allocation are required to execute Precedent Agreements within 60 business days from the date the capacity is awarded. Within 10 days after the Precedent Agreements have been executed, TransCanada will make available to the public the results of the Alaska Open Season, including the name of the prospective Shipper, amount of capacity awarded and term of agreement, through internet posting and press releases. Within 20 days after the Precedent Agreements have been executed, TransCanada will file copies with FERC of all Precedent Agreements and all correspondence with unsuccessful bidders that explains why their bids were not accepted.

TransCanada would conduct the binding Open Season without undue discrimination or preference in the rates, terms or conditions of services and all capacity allocated as a result of any Open Season would be awarded without undue discrimination or preference of any kind.

Following successful Alaska and Canada Open Seasons, TransCanada will proceed to apply for FERC approval to use the prefiling procedures set out in C.F.R. 157.21.

2) Downstream Of Boundary Lake

As current forecasts of gas production from the WCSB project a decline over time and intra-Alberta gas demand is forecast to increase over the next decade, TransCanada believes there would be significant available capacity for Alaskan gas in the existing gas infrastructure, both gas transmission pipelines and NGL extraction facilities, downstream of Boundary Lake. Even though availability of capacity in the existing infrastructure would considerably reduce the need for new facilities in Alberta, TransCanada estimates there would still be a requirement for incremental facilities within Alberta to accommodate the full volumes of Alaskan gas. Based upon current projections of available capacity on the existing infrastructure and total volumes of approximately 4.5 bcf/d of Alaskan gas, TransCanada currently estimates the cost of these incremental facilities to be constructed by Foothills would be approximately $1.4 billion in 2007 dollars.

The availability of capacity on the existing gas infrastructure provides a unique opportunity for Alaska Shippers to maximize their economics through integration of their Alaskan gas with the existing gas transmission infrastructure at the Alberta Hub / NIT. TransCanada proposes that the Alaskan gas be integrated with its existing Alberta System through a TBO arrangement in order to effect and maximize the integration benefits. The revenue requirement for Foothills' Alberta facilities would be set in accordance with the toll setting principles as described in Section 2.2.3.7 "Negotiated Rates", and TransCanada would apply to the regulator to seek to include such Foothills' revenue requirement in the Alberta System's cost-of-service requirement. The Alberta System would then recover the total annual revenue requirement from all shippers, including Alaska Shippers and WCSB shippers, through tolls for services. Alaska Shippers would contract for capacity with the Alberta System for transportation services to move their gas from Boundary Lake to the Alberta Hub / NIT by paying the Alberta System receipt toll.

The benefits of this TBO arrangement include:

- access to the Alberta Hub where Alaska Shippers could sell their gas at the most liquid gas market in North America, thereby providing the option for an Alaska Shipper to eliminate the need to commit to any shipping arrangement downstream of the Alberta Hub;
- a relatively short-term commitment (approximately 4 years under existing tariff requirements) on the Alberta System from Boundary Lake to the Alberta Hub as opposed to other options which normally would require a long-term commitment; and
- access for Alaskan gas to multiple markets across North America through various pipelines that are connected to the Alberta System.

TransCanada projects the Alberta System receipt toll at Boundary Lake would be in the range of $0.12/mmBtu to $0.17/mmBtu, excluding fuel cost, expressed in nominal dollars.

To ensure that Alaska Shippers would be able to secure capacity to access the Alberta Hub, TransCanada would conduct the Alberta Open Season for capacity on the Alberta System concurrently with the Yukon-BC Open Season and the Alaska Open Season. The Alberta Open Season would be conducted in accordance with the Alberta System procedures for adding new capacity.

3) Fort Nelson Option

TransCanada is exploring options to move the Alberta System receipt point upstream of Boundary Lake to Fort Nelson, British Columbia (the "Fort Nelson Option"). The objective of these options would be to deliver toll savings to the Alaska Shippers by providing them an equivalent toll from Fort Nelson to the Alberta Hub as if the section of the Pipeline System from Fort Nelson to Boundary Lake were integrated into the Alberta System. A TBO arrangement by which the revenue requirement for the Fort Nelson Option would be rolled in to the Alberta System cost of service, similar to that described in Section 2.2.3.2(2) "Downstream of Boundary Lake" for the Foothills' Alberta facilities, is one of these options. The Fort Nelson Option would provide the Alaska Shippers a significant rate savings. TransCanada estimates such savings would be approximately $0.15/mmBtu to $0.20/mmBtu, inclusive of fuel gas. These savings would equal approximately $275 million to $370 million (in nominal dollars) per year in additional netback to the Alaska Shippers. TransCanada believes that moving the Alberta System receipt point upstream to Fort Nelson will significantly improve the economics of the Project for Alaska Shippers and increase the probability of incremental Alaskan and Western Canadian gas volumes being connected to TransCanada's pipeline systems. The increased flows on TransCanada's pipeline systems, such as the Alberta System, Canadian Mainline, etc, will generate toll benefits and improved netbacks for Alaskan and Canadian shippers and producers.

4) Unsuccessful Open Season – Path Forward

In the event that the Open Season does not secure adequate commitments for capacity from creditworthy Shippers to enable the Project to obtain financing, or in the event that the bids contain rates or contract terms that are unacceptable to TransCanada, TransCanada proposes that the State and TransCanada, acting individually and in concert, would develop and implement strategies to overcome the obstacles to financing the Project through traditional market-based commercial arrangements.

a) TransCanada Actions

TransCanada would continue to advance the Project in accordance with the Development Plan as proposed in this Application. TransCanada would also continue to solicit gas commitments from the ANS Producers and other potential Shippers, and be ready to carry out a follow-up Open Season for securing firm shipping commitments on the Project, if required.

b) State of Alaska Actions

TransCanada expects the State to fully utilize all of the authorities at its disposal as a sovereign government, taxing authority, natural resource lessor and royalty owner to encourage, induce and persuade the ANS Producers and explorers for new gas to commit gas reserves to the Project. TransCanada also expects the State to thoroughly evaluate

and seriously consider the financial and commercial feasibility of dedicating significant State resources to underwriting an alternative financing mechanism for the Project.

c) Joint TransCanada and State Actions

TransCanada proposes that the State and TransCanada would focus on initiating stakeholder actions in the Lower 48 designed to develop alternative financing mechanisms that utilize the credit of natural gas consumers and the U.S. government as well as to encourage, induce and persuade the Alaska Shippers to commit their known gas reserves to the Project.

2.2.3.3 Precedent Agreements

TransCanada expects to work with interested stakeholders prior to the Open Season to develop a mutually acceptable Precedent Agreement. Interested parties who subscribe for capacity during the Open Season would be required to execute a Precedent Agreement for service on the Pipeline System. The Precedent Agreement will terminate upon Shippers executing the Transportation Services Agreement that Shippers are required to enter into within 30 days following the receipt of the CPCN from FERC. The Precedent Agreements that TransCanada would offer to Shippers on the Alaska Section and Yukon-BC Section would include the material terms outlined below. While these material terms are indicative of what TransCanada intends to provide in the Precedent Agreement, the final terms and conditions to be included in the Precedent Agreement would be determined during the pre-Open Season period as part of the engagement process with prospective Shippers and other interested stakeholders, such as the State.

1) Obligations of TransCanada

TC Alaska LLC and Foothills, as appropriate, would:

- proceed to apply for and obtain all necessary authorizations from appropriate authorities for the construction, ownership and operation of the pipeline, and for the provision of transportation services to the Shippers;
- enter into a Cooperation and Interconnection Agreement with the owner(s) of the GTP, if the GTP is to be developed and owned by a third party, to ensure that the gas treatment facilities will be ready to provide services to the Shippers on the In-Service Date;
- enter into a Cooperation and Interconnection Agreement to provide interconnection at the Alaska / Yukon border, and coordinate pipe design and timing of service; and
- enter into a Cooperation and Interconnection Agreement with the Alberta System to provide interconnection at Boundary Lake, or at Fort Nelson if the Fort Nelson Option is secured, and coordinate pipe design and timing of service.

2) Obligations of Shippers

Shippers would:

- proceed to apply for and obtain all necessary authorizations from the appropriate authorities to construct and operate any facilities that would be necessary for the

Shippers to deliver their gas to the receipt point on the Pipeline System at Prudhoe Bay;

- proceed to apply for and obtain all necessary authorizations from the appropriate authorities to export gas from Alaska;
- demonstrate to the satisfaction of TransCanada that (i) sufficient volumes of natural gas, covering the first 10 years of shipping commitments, have been secured for delivery to TransCanada at the Receipt Point and (ii) sufficient take-away capacity has been secured at a Delivery Point;
- support TransCanada in all regulatory applications, including provision of written evidence and witnesses in any proceedings, if requested by TransCanada; and
- provide audited financial statements to TransCanada on an annual basis, and if requested, other information that would be necessary for TransCanada to assess the financial well-being of the Shippers.

3) Shippers' Creditworthiness Requirements

To enter into a binding Precedent Agreement ("PA") for initial or expansion capacity and/or a Transportation Services Agreement, and throughout the term of such agreements, Shipper must have and maintain an Acceptable Credit Rating and a Tangible Net Worth that is:

- prior to the In-Service Date, equal to or greater than Shipper's proportional share of the estimated capital costs based on its shipping commitment; and
- following the In-Service Date, equal to or greater than Shipper's proportional share of the Project rate base based on its shipping volume.

If Shipper is the State of Alaska, is guaranteed by the State of Alaska, or otherwise is supported by the full faith and credit of the State of Alaska, Shipper does not need to have and maintain a Tangible Net Worth, although an Acceptable Credit Rating still applies.

If Shipper does not have or maintain an Acceptable Credit Rating, a sufficient amount of Tangible Net Worth as specified above, or both, Shipper must provide either a Guaranty or Collateral, both in a form, amount and term satisfactory to TransCanada prior to the commencement and throughout the term of the PA and the TSA, as applicable.

Prior to the In-Service Date, whether the PA or the TSA is in effect:

- if Shipper or its guarantor does not have an Acceptable Credit Rating, Shipper must provide Collateral in an amount sufficient to cover Shipper's proportional share of the estimated capital costs based on its shipping commitment; or
- if Shipper or its guarantor has an Acceptable Credit Rating but does not have a sufficient amount of Tangible Net Worth, Shipper must provide Collateral in an amount equal to the difference between: (i) Shipper's proportional share of the capital costs based on its shipping commitment, and (ii) Shipper's or its guarantor's Tangible Net Worth.

Following the In-Service Date:

- if Shipper or its guarantor does not have an Acceptable Credit Rating, Shipper must provide Collateral in an amount sufficient to cover Shipper's proportional share of the Project rate base based on its shipping volume; or
- if Shipper or its guarantor has an Acceptable Credit Rating but does not have a sufficient amount of Tangible Net Worth, Shipper must provide Collateral in an amount equal to the difference between: (a) Shipper's proportional share of the Project rate base based on its shipping volume, and (b) Shipper's or its guarantor's Tangible Net Worth.

If requested by TransCanada at any time, Shipper must provide to TransCanada information that would allow TransCanada to calculate (or re-calculate) Shipper's or its guarantor's Tangible Net Worth. If Shipper or its guarantor fails to provide such information within 30 days of TransCanada's request, Shipper or its guarantor will be deemed to have no Tangible Net Worth and must provide Collateral to TransCanada in an amount specified above.

TransCanada may also make a request for Collateral on the following grounds (and Shipper or its guarantor will be deemed not to have an Acceptable Credit Rating):

- TransCanada has reasonable cause for concern with respect to the ongoing performance of any obligation under the PA or TSA; or
- any Guaranty or Collateral previously provided by Shipper no longer provides adequate support for the ongoing performance of Shipper's obligations.

In the event that Shipper has defaulted on any obligation to TransCanada, then TransCanada will have the right to suspend and/or terminate that Shippers' PA or TSA. If suspended, the transportation service will not be available to the Shipper, however, the Shipper will still be invoiced and be obligated to pay for the contracted service until such time as the default is cured. If terminated, the damages owing by the Shipper for failing to perform its contractual obligations will be calculated (all amounts payable now or in the future by Shipper to TransCanada for any and all service) and invoiced to the Shipper as allowed for under the Shippers' PA or TSA. The Recourse and Negotiated Rates will be recalculated for the remaining Shippers based on the new aggregate remaining contract quantities.

4) Conditions Precedent to Proceed to Construction

Commencement of construction by TransCanada would be subject to the following conditions precedent, which may be waived by TransCanada:

- receipt of final authorizations from the appropriate regulatory authorities (FERC in Alaska and Northern Pipeline Agency in Canada) to proceed with construction, and transportation terms and conditions in such authorizations that are acceptable to TransCanada;
- securing of all rights-of-way, easements, accesses and major permits that are in form and substance acceptable to TransCanada;
- receipt of financial commitments from financial institutions on terms that are acceptable to TransCanada for funding the debt requirement of the Project;

- confirmation, to the satisfaction of TransCanada, that all Shippers which have executed PAs with TransCanada and other interconnected pipelines and facilities are not in default of those PAs and have either satisfied or have waived the conditions precedent;
- all Shippers have obtained certificates, permits, orders, licences and authorizations from regulators or other governmental agencies in the United States and Canada as are necessary to enable Shipper, or others designated by Shipper, to export from the United States and import into Canada, and be delivered to the ultimate destination of Shipper's gas;
- confirmation that Shippers which have executed a PA with TransCanada have executed the TSA, and in the opinion of TransCanada that the aggregate shipping commitments under all these executed TSAs are sufficient to meet the minimum volume requirement for the Project; and
- receipt of approval from TransCanada Corporation's, TC Alaska LLC's and Foothills' respective Board of Directors to proceed with construction.

5) Termination Rights

TransCanada understands that the State is seeking binding commitments to the Project at Open Season. Therefore, in the event the above conditions precedent to proceed to construction are not met within six months after certificate issuance or refusal to grant the certificate or the Leave to Proceed, TransCanada will have the option as to whether to proceed with the project. If TransCanada decides not to proceed, then the PAs or TSAs, as the case may be, will terminate and Shippers will be liable to pay TransCanada their proportional share of the Project development and certification costs not already reimbursed by the State.

As an alternative, for consideration by the State, TransCanada would propose that Shippers, as a whole, would have full discretion to withdraw from the Project and terminate their PAs or TSAs for 30 days following the Decision to Proceed, subject to Shippers fully reimbursing all Project development and certification costs including the State reimbursement.

2.2.3.4 Proposed Services and General Tariff Terms

1) Alaska Section and Yukon-BC Section

TransCanada would offer 25-year, 30-year and 35-year Firm Transportation Services to prospective Shippers on the Alaska Section from the outlet of the GTP to the Yukon border; and on the Yukon-BC Section from the Alaska border to Boundary Lake, Alberta.

The terms and conditions of these firm transportation services would include, but not be limited to, those described in the following sections.

a) Shipping Capacity Release and Assignment

With respect to the release and/or assignment of shipping capacity, the following terms and conditions would apply:

- Credit requirements would be continuing obligations from PA through to expiration of the TSA, binding upon the initial Shippers and any successors, including successors by release or assignment.
- TransCanada's consent would be required for any permanent capacity transfer, in the form of assignment or capacity release. Such consent would not be unreasonably withheld.
- There would be no capacity release or contract assignment to third parties prior to the In-Service Date.
- If permissible under FERC and National Energy Board (NEB) regulations, to transfer capacity permanently for the remaining term to another party after the In-Service Date, the permanent replacement Shipper would be required to meet TransCanada's creditworthiness standards.
- For capacity that is released permanently, the releasing Shipper would not remain liable for a permanent replacement Shipper that has an Acceptable Credit Rating and satisfies the Tangible Net Worth requirements.
- For capacity releases at less than the remaining term, the releasing Shipper would remain liable for credit support, including non-payment of the replacement Shipper.

b) Planned and Unplanned Interruptions

For planned interruptions, TransCanada would provide as much notice to the Shippers as is practically possible. In the event of unplanned interruptions, TransCanada would advise Shippers as soon as practically possible once the amount and duration of curtailment, reduction or suspension of services has been estimated.

Subject to FERC regulations, Shippers would continue to pay the pipeline reservation charge or demand charge for the contracted shipping volumes, and the applicable usage charges in the case of partial curtailment, during planned and unplanned interruption periods.

Subject to capacity availability on the pipeline, Shippers with firm shipping commitments on the Pipeline System would have the right to nominate incremental volumes of gas on the pipeline beyond their contracted shipping volumes within 12 months from the date the interruption ends to make-up for any shortfall in nominated firm volumes during the interruption period. Regardless of reason, the volume make-up right would expire at the end of the 12-month period and any unused make-up volumes would be forfeited.

c) Fuel Gas, Lost and Unaccounted-For Gas

Shippers would be required to contribute their share of the pipeline fuel gas in-kind in proportion to the volume of gas shipped by the individual Shipper to the total volumes of gas shipped on the pipeline.

Shippers would be required to contribute their share of the lost and unaccounted-for gas, on an actual tracking basis, through reductions in delivered volumes in proportion to the volume of gas shipped by the individual Shipper to the total volumes of gas shipped on the pipeline.

d) Gas Quality Requirements

i) Gas Quality at Receipt Point

Gas received at a Receipt Point:

- shall be free, at the pressure and temperature in the facilities at the Receipt Point, from sand, dust, gums, crude oil, contaminants, impurities or other objectionable substances which will, as deemed by TransCanada, render the gas unmerchantable, cause injury, cause damage to or interfere with the operation of the Facilities;
- shall not have a Cricondentherm Hydrocarbon Dew Point in excess of 6ºF;
- shall not contain more than 4 ppm of hydrogen sulphide;
- shall not contain more than five grains of total sulphur per 100 cubic feet;
- shall not contain more than two percent by volume of carbon dioxide;
- shall not contain more than one pound of water vapor per million cubic feet;
- shall not exceed 30ºF in temperature;
- shall be as free of oxygen as practicable and shall not in any event contain more than four-tenths of one percent by volume of oxygen; and
- shall have a Gross Heating Value of not less than 967 Btu/cf.

ii) Nonconforming Gas

- If gas received by TransCanada fails at any time to conform with any of the quality requirements set forth in paragraph 2.2.3.4(1)(d)(i) above, then TransCanada will notify the Shipper of such failure and TransCanada may, at TransCanada's option, refuse to accept such gas pending the remedying of such failure to conform to quality requirements. If the failure to conform is not promptly remedied, TransCanada may accept such gas and may take such steps as it determines necessary to ensure that such gas conforms with the quality requirements and the Shipper will reimburse TransCanada for any reasonable costs and expenses incurred by TransCanada.
- Notwithstanding the above paragraph of this Section 2.2.3.4(1)(d)(ii), if gas received by TransCanada fails to conform to the quality requirements set forth in paragraph 2.2.3.4(1)(d)(i) above, TransCanada may at its option immediately suspend the receipt of gas, provided however that any such suspension will not relieve the Shipper from any obligation to pay any rate, toll, charge or other amount payable to TransCanada.
- Notwithstanding the above paragraphs of this Section 2.2.3.4(1)(d)(ii), if gas received by TransCanada contains more than two percent by volume of CO_2, TransCanada will notify the Shipper of such failure. If the failure to conform is not remedied by the Shipper within 30 days, TransCanada will refuse to accept such gas pending the remedying of such failure, provided however that any such suspension shall not relieve the Shipper from any obligation to pay any rate, toll, charge or other amount payable to TransCanada.

iii) Quality Standard of Gas Delivered at Delivery Points

Gas which TransCanada delivers at Delivery Points shall have the quality that results from gas having been transported and commingled in the Facilities.

e) Receipt Point Pressure Requirements

Required gas delivery pressure at the pipeline receipt points would be 2500 psig.

f) Gas Custody

Gas received by TransCanada from the Shippers for transportation would be deemed to be in the custody and under the control of TransCanada from the time the gas is accepted for transportation at any receipt point and until delivered by TransCanada at any delivery point. However TransCanada would not take, nor be deemed to take, title to any gas in its custody. Failure by the Shipper to meet each of the quality specifications, Receipt Point pressure requirements or gas heat content limits set out above could result in TransCanada refusing to accept that Shipper's nomination. The Shippers will remain liable for their full demand charges under their Transportation Services Agreement.

2) Alberta Section

TransCanada would also offer transportation services on the Alberta System to provide Shippers with access to the Alberta Hub and markets beyond. TransCanada expects that the current basic services under the Alberta System tariff would continue to be applicable and be available to the prospective Shippers. As such, prospective Shippers may only be required to contract with the Alberta System for a minimum term of approximately 4 years. For the current terms and conditions, refer to Appendix H "Alberta System Transportation Services – General Terms and Conditions". This document and other related Alberta System tariff documents can be viewed on the following web page www.transcanada.com/Alberta/info_postings/tariff/index.html

3) Alaska Gas Treatment Plant

TransCanada does not intend to own the Gas Treatment Plant on the North Slope of Alaska. However, TransCanada would be prepared to undertake to build, own and operate the GTP if, by 30 days prior to the date that the Open Season notice is issued, no third party has committed to do so. Refer to Section 2.2.3.12 "Plan for North Slope Gas Treatment Plant" for TransCanada's plan for exploring potential interests of other parties in owning the GTP, and for TransCanada's estimated Recourse and Negotiated Rates for the GTP.

4) NGL Processing Facility

As described in Section 2.2.3.15 "Plan for Gas Processing and NGL Markets", TransCanada expects there will be sufficient NGL processing capacity in the existing processing facilities in Alberta to handle the 4.5 bcf/d of gas from Alaska by the expected In-Service Date. Given that the existing NGL processing facilities in Alberta are expected to have spare capacity, TransCanada believes the Alaskan gas and NGLs would be in great demand. Straddle plant owners in Alberta would compete for these NGLs to maximize the utilization of their facilities. This competition would ensure that the Alaskan gas owners would receive the best price for their natural gas liquids.

2.2.3.5 Rate Structure and Supporting Information

In compliance with the RFA requirement, unless otherwise stated, numbers expressed in this Section 2.2.3.5 were calculated without accounting for inflation.

A Recourse Rate will only be available for the Alaska Section. The Recourse Rate concept is not commonly applied in Canada, and as such TransCanada will only offer Negotiated Rates for the Yukon-BC Section.

1) Alaska Section

TransCanada estimates that the 100% load factor Recourse Rate for the Alaska Section would be $1.06/mmBtu in constant 2007 dollars. This Recourse Rate does not include fuel gas nor provide for any allowance for lost or unaccounted-for gas. Refer to Appendix I1 "Recourse Rate Model Output – Alaska Section" for the components of the Alaska Section Recourse Rate. This is also included in MS Excel format on the CDs enclosed with this Application.

Rate structure for the Alaska Section Recourse Rate:

- Recourse Rate will be established using rate design principles that:
  - initially provide for the full recovery of capital costs on a straight-line basis over a 25-year period assuming initial Transportation Services Agreements are for 25 years (if initial Transportation Services Agreements are for a different term, then the Recourse Rate will be adjusted accordingly).
- Charge 100% load factor rates for authorized overrun services;
- The Alaska Section Recourse Rate would be determined in accordance with the following:
  - Initial rate base of the pipeline will include, among other things, Actual Capital Cost, allowance for funds used during construction ("AFUDC"), property tax paid during construction, and initial working capital but excluding the Alaska portion of the $500 million State reimbursement. TransCanada estimates the initial rate base for the Alaska Section would be approximately $11.7 billion (constant 2007 dollars).
  - Alaska Section will be capitalized with 70% debt and 30% equity through initial development, construction and operation. All expansions and maintenance capital will be capitalized with 60% debt and 40% equity.
  - Alaska Section cost of debt will equal the weighted average actual interest rates for funds borrowed to finance the debt portion of the pipeline, including loans for funding the Capital Cost Overrun, if any. Based on the current 10-year U.S. Treasury Note interest rate, TransCanada estimates the Alaska Section cost of debt would be 4.70%, assuming the Alaska Section is completed on budget and the U.S. Loan Guarantee could be used favorably to enhance the credit profile of the Project debt. For the portion of the Project debt that exceeds the U.S. Loan Guarantee cap, TransCanada estimates the interest rate for such portion of the Project debt would be 6.2%.
  - Rate of return on equity will be set in accordance with the formula that is set forth in Section 2.2.3.7(1). This rate will be adjusted for capital cost performance as

described in Section 2.2.3.6(1) "Incentive Adjustments to Return on Equity for Recourse and Negotiated Rates", below.

  - Initial rate base, net of working capital, will be depreciated on a straight-line basis at an annual rate of 4%. All rate base additions, including expansions and maintenance capital, will also be depreciated at an annual rate of 4%.
  - Consistent with FERC policy, income taxes will be calculated and collected on a normalized basis, utilizing federal and state corporate income tax rates on income that are in effect.
  - Actual amount of non-income based taxes, such as property taxes, use and sales taxes, etc. paid on the Alaska Section will be 100% flow through to the Shippers.
  - Actual operating cost for the pipeline will be 100% flow through to the Shippers on the Alaska Section.
  - Initial working capital is made up of one-twelfth of the first year operating expenses and line pack for the pipeline.
  - In addition to the reservation charge, Shippers would also be required to pay a commodity charge which will recover all costs that vary with volumes actually shipped. TransCanada estimates the commodity charge would be nominal.
  - Fuel gas will be recovered in-kind on an actual tracked basis. The fuel rate for the Alaska Section is estimated to be approximately 0.9% at a 4.5 bcf/d inlet volume to the pipeline at Prudhoe Bay and a gas heating content of 1,118 Btu/cf.

- Except in the event of Shippers' default of payment or other term under the Transportation Services Agreement, ownership and title of natural gas shipped on the pipeline will remain with the Shippers at all times. Consequently, TransCanada anticipates that any revenues from selling gas liquids or other gaseous or non-gaseous by-products of the natural gas stream would be earned by Shippers and not TransCanada.

2) Yukon-BC Section

As the concept of a Recourse Rate is not commonly applied in Canada, TransCanada will not offer such rate for the Yukon-BC Section. Instead, a Negotiated Rate will be offered. Refer to Section 2.2.3.7 "Negotiated Rates" for the details and structure of the Negotiated Rate.

2.2.3.6 Alternative Ratemaking Methods and Incentives

TransCanada would offer the following alternative ratemaking methods and incentives:

1) Incentive Adjustments to Return on Equity for Recourse and Negotiated Rates

TransCanada is willing to bear its share of Project risk via downside adjustment of its return on equity. The rate of return on equity for Negotiated Rate Shippers and for Recourse Rate Shippers established by FERC for the Alaska Section and by the NEB for the Yukon-BC Section would be adjusted downward for the first five years following the In-Service Date for up to 2% (i.e. 200 basis points). If the Actual Capital Cost of the Pipeline System is greater than the Base Capital Cost, then the rate of return on equity that TransCanada is entitled to would be reduced by 5 basis points for each 1% by which the Actual Capital Cost of the Pipeline System exceeds the Base Capital Cost up to a limit of 200 basis points.

2) Term Differentiated Negotiated Rates

In order to provide more flexibility on shipping term to the Negotiated Rate Shippers in the Open Season, TransCanada, in addition to the basic 25-year shipping contract, will also offer both the Alaska Section and Yukon-BC Section term-differentiated negotiated rates based upon 30 and 35-year levelization periods and 30 and 35-year contract terms, respectively. In such cases, 100% of the capital costs allocable to the level of such services elected by Shippers will be recovered over the selected levelization/contract periods. The return on equity for term differentiated rates will be the same as the return offered to Shippers under a 25-year negotiated rate shipping contract. The capital structure used to determine term differentiated rates will be the same as that used for rates under a 25-year negotiated rate shipping contract.

In the event of an expansion, Shippers with term differentiated rates that are responsible for 100% of the capital costs allocable to the level of such services will have their tariffs re-calculated on a rolled-in basis.

2.2.3.7 Negotiated Rates

A Negotiated Rate would be offered in the Alaska and Yukon-BC Open Seasons and would be based upon a 25-year levelized rate model and 25-year transportation contracts. Rates will be set to recover 100 percent of the capital costs, including AFUDC and contingencies, approved for cost recovery in the U.S. FERC certificate and the Northern Pipeline Agency certificate over the 25-year term of the transportation contracts.

Negotiated Rates for the Alaska Section will be based on firm transportation commitments for receipts of gas that were qualified bids accepted in the Alaska Open Season, plus an additional quantity for re-deliveries within the State, if any. Negotiated Rates for the Yukon-BC Section will be based on an amount equal to all qualified bids accepted in the Open Season less the Alaska Section fuel retention. For both the Alaska and Yukon-BC Sections, there will be no fixed cost allocation to balancing services, authorized overrun service or pipeline penalties and a 100% load factor for billing determinants for volumetric charges. These amounts will be adjusted for any services subscribed under Recourse Rates and term-differentiated Negotiated Rates. Authorized overrun service for Negotiated Rate Shippers will be charged at the 100% load factor rate for this negotiated firm service.

Negotiated Rate Shippers would be required to agree not to seek or support any changes to the economic parameters that underpinned the Negotiated Rates design at FERC and the NEB for the Alaska Section and the Yukon-BC Section through the term of the Precedent Agreement and the TSA.

Tolls for Shippers who select Negotiated Rates would be determined as follows:

1) Return on Equity

Rate of return on equity will be reset annually at a rate that is equal to the then current yield for the U.S. 10-year Treasury Note at the beginning of each calendar year plus 965 basis points. This rate will be adjusted for capital cost performance as described in Section 2.2.3.6(1) “Incentive Adjustments to Return on Equity for Recourse and Negotiated Rates”, above. For the purposes of tariff/toll calculations herein, TransCanada has assumed the rate

of return on equity would be 14% throughout the Project Development, Execution and Operations Phases.

2) Negotiated Rate Capital Structure

For Negotiated Rate transportation contracts, the capital structure for the Pipeline System (assuming an initial daily capacity of 4.5 bcf) will be determined as described in this paragraph. For both the Alaska Section and the Yukon-BC Section, the capital structure through the end of the construction phase of the Pipeline System will initially be 70% debt and 30% equity, which will be converted to 75% debt and 25% equity following the approval of final project cost by FERC in the U.S. and the Northern Pipeline Agency in Canada, subject to adjustment as necessary as described herein as a result of cost overruns. Subject to U.S. Government approval of TransCanada's proposal for the U.S. Loan Guarantee for capital cost overruns, capital expenditure overruns, if any, will be 100% debt financed and such debt financing shall not be considered in determining the capital structure for Negotiated Rates purposes except that the 75% debt and 25% equity ratio for the approved capital expenditure budget will be adjusted as required in order to maintain an overall project minimum equity percentage of 20%. Subsequent capital expenditures for maintenance and expansions will have a capital structure that consists of 40% equity and 60% debt, which expenditures will be rolled into the overall base capital structure.

3) Annual Depreciation Rates

The initial rate base, net of working capital, will be depreciated with a profile that results in a levelized toll, i.e. the target toll/tariff level would remain the same (in nominal dollars) year after year over the shipping contract term. The Alaska Section and Yukon-BC Section annual depreciation rates for the Negotiated Rate Shippers are provided in Appendices K1 and K2 respectively. In order to provide a more representative levelized Negotiated Rate for the Alaska Section and Yukon-BC Section, the annual depreciation rates as provided in these Appendices were calculated with inflation taken into consideration. In compliance with the AGIA requirement, TransCanada has used the U.S. EIA's most recent projection of annual Consumer All-Urban Price Index. Refer to Appendix L "EIA Forecasts" for the inflation rate assumptions in the calculation of the levelized Negotiated Rates.

In the event of expansions, TransCanada would re-levelize the tariffs/tolls for both the Alaska Section and the Yukon-BC Section by adjusting the annual depreciation rates of each section. This adjustment is accomplished by applying the rolled-in toll treatment for expansion costs and depreciating the outstanding rate base over a longer period of time due to an extension to the weighted average contract term.

4) Initial Rate Base

TransCanada estimates the initial rate base, inclusive of cost escalation using the above inflation assumptions, AFUDC, property tax paid during construction, and initial working capital, but excluding the pipeline component of the $500 million state reimbursement, would be approximately $14.2 billion for the Alaska Section and $12.6 billion for the Yukon-BC Section, expressed in nominal dollars.

5) Other Bases for Negotiated Rates

Other toll setting parameters for the Negotiated Rate, such as cost of debt, income taxes, non-income based taxes, operating costs, commodity charges and fuel gas, would follow the same principles as set forth in Section 2.2.1.5 "Rate Structure and Supporting Information".

6) Indicative Negotiated Rates

With the above inflation assumptions included in the rate calculation, TransCanada estimates the 100% load factor levelized Negotiated Rates for the Alaska Section and Yukon-BC Section would be $0.99/mmBtu and $0.80/mmBtu, respectively. These rates are expressed in nominal dollars and are designed to stay level over the entire term of a 25-year firm shipping contract, subject to adjustment as a result of expansions. These rates are exclusive of fuel gas and no allowance for lost or unaccounted-for gas. Refer to Appendix J1 "Negotiated Rate Model Output – Alaska Section" and Appendix J2 "Negotiated Rate Model Output – Yukon-BC Section" for the rate components of the Negotiated Rates for the Alaska Section and Yukon-BC Section respectively. This is also included in MS Excel format on the CDs enclosed with this Application.

7) Priority of Capacity Allocation

Recourse Rate and Negotiated Rate Shippers would have the same capacity allocation priority so long as they contract for the same term. In the event of over-subscription in the Open Season, capacity allocation between Recourse Rate and Negotiated Rate Shippers will be based on present value ranking. In the event that two or more bids have equivalent present values, the offered capacity would be allocated on a pro-rata basis.

2.2.3.8 Anchor Shipper Incentive Rates and Commitments to Rates for Expansion Capacity

1) Shippers Incentive Rates

TransCanada proposes to offer Shippers incentive rates based on its capital cost performance as described in Section 2.2.3.6(1) "Incentive Adjustments to Return on Equity for Recourse and Negotiated Rates".

2) Ownership Opportunity for Anchor Shippers

TransCanada recognizes the desire of some potential Shippers to have an ownership position in the GTP, Alaska Section and Yukon-BC Section; therefore, as an inducement to attract Shippers in the initial Open Season, TransCanada is prepared to offer an ownership option in these segments of the Project to Shippers that subscribe in the initial Open Season, subject to a minimum threshold volume for each Shipper, and whose volume commitments, in aggregate, meet the minimum 3.5 bcf/d firm shipping capacity requirement for the Project.

TransCanada believes that offering potential Shippers an ownership option could significantly enhance the chance of having a successful initial Open Season. Allowing Shippers to hold an ownership interest in the GTP, Alaska Section and Yukon-BC Section, should encourage alignment of interests between the project sponsors and Shippers in areas such as project cost control; early In-Service Date; co-ordination of upstream development; and GTP integration with existing facilities on the North Slope. TransCanada strongly

believes and envisions that an alignment of interests among the State, ANS Producers, other Shippers and TransCanada would result in the expeditious completion of the Project to the benefit all stakeholders.

3) Commitments to Rates for Expansion Capacity

In compliance with AS 43.90.130(7), TransCanada is committed to offer rolled-in rates, including fuel costs, for capacity expansions on the pipeline. Toll design based on full rolled-in principles will be used for all expansions in Canada. In Alaska, rolled-in rate treatment will apply up to a level that the resulting rates do not exceed the initial rates for the Project by more than 15%. Any expansion costs that would cause the rolled-in rates to exceed 115% of the initial rates would be recovered on an incremental basis. However, if subsequent expansions allow full inclusion of the previous expansion cost without causing the resulting rolled-in rates to exceed the initial rates by more than 15%, the new rolled-in rate will be calculated by including the maximum possible amount of undepreciated expansion costs excluded from the previous rolled-in treatment, to provide a new rolled-in rate that remains within 115% of the initial rates for the Project.

All expansions will be financed with 60% debt and 40% equity. Expansion costs will be included in the rate base and new rolled-in rates would be calculated for all Shippers with the annual depreciation rate adjusted to reflect the new average term of all Shipper contracts.

TransCanada would provide rolled-in toll treatment in accordance with AS 43.90.130(7) for all new facilities that are an integral part of the Pipeline System expansions.

2.2.3.9 Commitment to In-State Service

TransCanada would offer firm transportation service to delivery points in the State as part of the tariff regardless of whether any Shippers bid successfully in the Alaska Open Season for firm transportation delivery service to delivery points in the State, provided that In-State Shippers must execute long-term firm transportation contracts with the Alaska Section for service.

Consistent with FERC Open Season Regulations, the Alaska Section would provide a distance sensitive transportation rate for deliveries and receipts within the State by adopting a zonal rate structure. If permitted under FERC rules, TransCanada proposes that the Recourse Rate for receipts and deliveries within the State will be based on the cost of service factors underlying the Recourse Rates. One single in-State zone will be created to represent all in-state deliveries. The cost of service will be allocated to the in-State zone using accepted weighted average volumetric-mile cost allocation methods as approved by FERC.

In the event there is insufficient capacity for the delivery of in-State gas, TransCanada is prepared to expand the Alaska Section to accommodate such deliveries, provided that such expansions are in engineering increments under commercially reasonable terms and conditions.

As per AS 43.90.130(12), TransCanada commits to provide a minimum of five in-State delivery points. Connections at Fairbanks and at Delta Junction would be included, with one of these points anticipated to make gas available to a potential intrastate pipeline delivering gas to the Anchorage area. TransCanada would work with the State to determine the final locations of the in-State delivery points.

2.2.3.10 Rate Treatment of State's Reimbursement

State reimbursement will not be included in the Project rate base for the purpose of determining rates. TransCanada would deduct the amount of State reimbursement from the rate base for both the Alaska Section and Yukon-BC Section in proportion to their respective expenditures over the development phase of the Project.

2.2.3.11 Minimizing the Effect of Cost Overruns on Rates

1) Incentive Rate of Return on Equity

As discussed in the Section 2.2.3.6(1) "Incentive Adjustments to Return on Equity for Recourse and Negotiated Rates", the rate of return TransCanada would earn from investing in the Project will be adjusted according to its capital cost performance. TransCanada could suffer a return reduction up to 2% depending on the variance between the Actual Capital Cost and Base Capital Cost. This incentive scheme provides considerable motivation for TransCanada to deliver the Project on schedule and on budget.

2) U.S. Loan Guarantee for Capital Cost Overrun

TransCanada proposes to apply a portion of the U.S. Loan Guarantee to minimize Capital Cost Overrun impacts on the Negotiated Rates.

Provided an acceptable agreement is reached with the U.S. Government, TransCanada would allocate a portion of the U.S. Loan Guarantee to backstop the project loans that might be required to finance the Capital Cost Overrun for the three major components of the project - the GTP, the Alaska Section and the Yukon-BC Section. TransCanada proposes that, should there be a Capital Cost Overrun, it would be funded 100% by the U.S. Loan Guarantee backstopped Project loan (the "Capital Cost Overrun Loan"). The effects of funding the Capital Cost Overrun entirely with debt are twofold. First, this is the least cost option to finance the Capital Cost Overrun when compared to 100% equity or a combination of equity and debt. Second, this facilitates the alignment of interest between TransCanada and the Shippers in ensuring TransCanada, as Project sponsor, would not benefit from any incremental investment opportunity as a result of a Capital Cost Overrun. The use of the U.S. Loan Guarantee for a Capital Cost Overrun also ensures there would be sufficient credit to secure the amount of debt needed to fund the Capital Cost Overrun at the lowest possible cost. This structure would also aid in aligning the principal stakeholders, such as the U.S. Government, State of Alaska, Shippers and TransCanada, in completing the Project on budget and on schedule.

TransCanada proposes to use a surcharge concept to service the Capital Cost Overrun Loan. For Negotiated Rate Shippers who have elected the Capital Cost Overrun Surcharge option ("Surcharge Shippers"), their share of the Capital Cost Overrun Loan servicing requirement will be collected via the surcharge. Such surcharge would be required to be paid only when market gas prices at the Alberta Hub are above a pre-determined threshold. If gas prices at the Alberta Hub are less than the threshold or only enough to partially cover the surcharge, Surcharge Shippers would be relieved from paying the surcharge in whole or in part, as the case may be. Any unpaid surcharge will be carried-forward and accrue compound interest until it is fully recovered. Previous period unpaid surcharges and accrued interest would take precedence over the regular surcharge payments.

This surcharge option would not be available to Recourse Rate Shippers. Recourse Rate Shippers and those Negotiated Rate Shippers that have not elected this surcharge option would be required to pay a transportation toll that is inclusive of their share of the Capital Cost Overrun Loan servicing requirement regardless of the level of the market gas prices.

In addition to collecting surcharges from the Surcharge Shippers and tolls from the non-Surcharge Shippers, TransCanada proposes to keep the transportation rates for all Shippers at the initial rate for any expansions that normally would result in lower rolled-in rates, and utilize such incremental revenue to service the Capital Cost Overrun Loan. TransCanada also proposes to use the revenues collected from selling the non-firm based transportation services, such as balancing services and authorized overrun services, for servicing the Capital Cost Overrun Loan, rather than crediting these revenues against the firm Shippers' accounts. The use of these revenues for Capital Cost Overrun Loan servicing would end once the Capital Cost Overrun Loan is paid off. Thereafter, TransCanada would adjust the transportation rates to reflect the full rolled-in toll treatment for expansions and credit all Shippers for the revenues from selling the non-firm based transportation services.

Even though its return on equity would be reduced in the event of a Capital Cost Overrun, TransCanada proposes that Shippers would continue to pay a transportation rate that reflects the full rate of return on equity until the Capital Cost Overrun Loan is paid off. Until the earlier of (i) 5 years following the In-Service Date, or (ii) the date the Capital Cost Overrun Loan is paid off, TransCanada would utilize revenues collected from the spread of the rate of return on equity to service the Capital Cost Overrun Loan.

TransCanada believes that this innovative use of the U.S. Loan Guarantee to support 100% debt borrowing for funding any Capital Cost Overrun can significantly mitigate the challenges in securing financing for a Capital Cost Overrun and at the same time provides more economic certainty to the Surcharge Shippers in a low gas price environment.

The above proposed use of U.S. Loan Guarantee for Capital Cost Overrun credit support and the associated surcharge tolling concept are contingent upon the approvals of U.S. Government and FERC in the U.S. and the NEB in Canada. In the event TransCanada is unsuccessful in securing approvals from these authorities to use the U.S. Loan Guarantee as contemplated above, all Capital Cost Overruns will be financed and treated the same as the Base Capital Cost and Shippers would be required to pay a base toll that includes 100% recovery of Capital Cost Overruns.

2.2.3.12 Plan for North Slope Gas Treatment Plant

TransCanada submits that the current owners of the Central Gas Facility at Prudhoe Bay would be the most logical parties to own, construct and operate the GTP. Associated gas that is currently produced with North Slope crude oil production is treated at the CGF before being re-injected into the reservoir as part of an enhanced oil recovery process. CGF treatment includes dehydration and the removal of hydrocarbon liquids. The new GTP would be required to further process the partially treated gas such that it meets pipeline specifications for transportation. A primary function of the GTP would be for removal of CO_2, H_2S and other impurities from the gas stream. A gas treatment plant that is integrated with the existing CGF could benefit from operational synergies and the sharing of common

infrastructure such as power generation, water treatment, gas compression, fire fighting, and access roads.

As Licensee, TransCanada would approach the owners of the CGF to discuss their possible role in developing and operating the new GTP. Should the CGF owners decline, TransCanada would be prepared to build, own and operate the new facility. In order to maximize the economics of the new plant, TransCanada will endeavour to negotiate with the CGF owners to reach an agreement on the sharing of common services at reasonable cost. Such an arrangement could avoid duplication of facilities and therefore allow TransCanada to minimize the cost of service to Shippers. Should TransCanada build, own and operate the GTP, TransCanada would apply for a FERC CPCN if FERC certification is required.

Since TransCanada is not privy to information pertaining to the design, engineering and operation of the CGF, it is not possible, at this time, for TransCanada to estimate the extent to which common services might be shared with the new GTP. In order to provide an estimate of gas treatment costs for Shippers, TransCanada has carried out an engineering study for the GTP based on the conservative assumptions that there would be no shared services available from the existing facility and that a new GTP would be operated on a standalone basis.

Following the same pipeline Recourse Rate structure as described in Section 2.2.3.5 "Rate Structure and Supporting Information" and assuming no sharing of common facilities/services, TransCanada estimates that the GTP Recourse Rate would be approximately $0.66/mmBtu (constant 2007 dollars). This rate is based on a 4.5 bcf/d gas flow at the outlet of the GTP and is calculated without accounting for inflation. Refer to Appendix I2 "Recourse Rate Model Output – GTP" for the components of the GTP Recourse Rate.

Consistent with the Negotiated Rate structure as described in Section 2.2.3.7 "Negotiated Rates" and with inflation taken into consideration, TransCanada estimates that the levelized Negotiated Rate for the GTP would be $0.64/mmBtu (in nominal dollars) over the entire term of a 25-year service contract. The depreciation schedule for the GTP Negotiated Rates can be found in Appendix K3 "Annual Depreciation Rates – GTP". Refer to Appendix J3 "Negotiated Rate Model Output - GTP" for the components of the GTP Negotiated Rate. This is also included in MS Excel format on the CDs enclosed with this Application.

2.2.3.13 Plan for Canadian Segment

The *Northern Pipeline Act* (Canada) (1977-78, c.20, R.S. 1985, c. N-26) (the "NPA" or the "Act") is the primary legislative vehicle through which necessary regulatory construction approvals have been or can be delivered or coordinated for the Canada Section.

1) The Northern Pipeline Act – History and Purpose

The unique NPA regulatory regime was put in place following a lengthy (214 days) hearing held by the National Energy Board, in which the merits of two competing pipeline proposals for the transmission of Alaskan gas through Canada were adjudicated. That process resulted in the selection of the proposal put forward by Foothills, now a wholly owned subsidiary of TransCanada Corporation.

Once a project proponent and a route had been selected in both Canada and the United States, the two countries entered into the *Agreement on Principles* (September 20, 1977). In

recognition of the magnitude and importance of the APP, the Canadian government took the unusual step of enacting specific legislation – the NPA – to statutorily enshrine the regulatory decision of the NEB and the terms of the *Agreement on Principles*. Both the NPA and the *Agreement on Principles* remain effective Canadian law.

In Canada, there has been no legislation enacted providing for expedited certification of any project other than the Foothills project. This contrasts with the United States where enabling legislation, ANGPA, has been passed. ANGPA confirms the existing ANGTA regime, but also allows for an expedited regulatory process for the certification of an alternate project. This is a seminal distinction between the legal framework for the project in Canada and the project in the United States. The only legislation in Canada relating specifically to a pipeline to transmit Alaskan gas through Canada is the NPA.

2) Certificates of Public Convenience and Necessity

The Foothills Subsidiaries hold certificates of public convenience and necessity granted pursuant to section 21(1) of the NPA for each of the zones of the APP in Canada. The NPA names the Foothills entities that are certificated for each zone, respectively. These certificates of public convenience and necessity are declared in the NPA to be issued pursuant to section 52 of the *National Energy Board Act*, R.S.C., 1985, c. N-7, and are the only existing certificates for the APP in Canada. They provide the Foothills Subsidiaries with the right to construct and own the Canada Section of the first pipeline to transmit natural gas from Alaska through Canada, along the Alaska Highway route, all as more specifically described in the Act. Once that first pipeline is in operation from Prudhoe Bay, Alaska to market, the NPA provides for the reversion of regulatory authority over the pipeline to the National Energy Board.

The Foothills Subsidiaries already own and operate a portion of the Canada Section, known as the Foothills Pre-Build, for which it holds certificates issued under the NPA. The Foothills Pre-Build was constructed in the early 1980s when the price of natural gas fell to levels that made the construction of the entire APP, from Alaska to market, uneconomic at that time. The NPA was amended to allow for the construction of certain sections of the APP (the Foothills Pre-Build) required to move Alberta gas to market. The Foothills Pre-Build has been expanded five times since the original construction using the NPA process, the most recent being in 1998.

The certificates issued to the Foothills Subsidiaries have no expiry or "sunset date" because then, as now, shipping commitments for those portions connecting Alaskan gas have not been made. A uniquely flexible regime was created enabling an expedited approval process as completion of the project becomes viable.

A summary of the historical highlights pertaining to the APP, including regulatory and Foothills' milestones, can be referenced in Appendix M "Historical Highlights – Alaska Pipeline Project".

3) The NPA Process – Regulatory Approval

The Act expedites regulatory approval processes by:

- centralizing or enabling the centralization of federal decision making authority in the designated officer or in the federal minister responsible for the Northern Pipeline Agency;
- authorizing the responsible minister to consult and enter into agreements with provincial and territorial governments; and
- enabling the establishment of advisory committees to facilitate effective communication and consultation.

The NPA enables the designated officer (the "DO") to review and approve the various and comprehensive plans and programs which must be provided before construction can begin. A list of required plans and programs, along with other major regulatory approvals which may be required, is provided in Section 2.2.4.1(2) "Regulatory Approvals".

The Governor-in-Council may, by order, transfer duties and functions of any federal minister, department or agency to the minister responsible for the Northern Pipeline Agency and that minister may carry out those duties and functions in relation only to the Canada Section.

By creating a single window through which federal approvals and decision making can be delivered and provincial or territorial approvals can be coordinated, the NPA has proved to be an effective and efficient approach to timely and complete regulatory authorization.

4) The NPA Process – Updating and Assessing Environmental and Socio-economic Impact Information

The NPA and construction of the Foothills Pre-Build predated the enactment of the *Canadian Environmental Assessment Act* ("CEAA"). S.C., 1992, c. 37, in 1995 and Yukon specific assessment legislation, the *Yukon Environmental and Socio-Economic Assessment Act* ("YESEAA"), S.C., 2003, c. 7, in 2003. Extensive public reviews of environmental, social and economic impacts were conducted under the federal government's Environmental Assessment Review Processes policy in effect at that time. The resulting reports informed the development of comprehensive zone specific environmental and socio-economic terms and conditions to be added to the more general terms set out in Schedule III to the NPA.

As structured, these specific terms establish what conditions must be satisfied and what plans or programs must be developed (and approved) before construction can begin. These plans and programs are intended to ensure protection and enhancement of the environment; provide social and economic benefits and opportunities and, in every case, avoid or mitigate the potential for adverse impacts.

New and additional information will be required to meet mandatory conditions and prepare required plans and programs. The Foothills Subsidiaries will provide updated project, geo-physical, environmental, social and economic information as part of its re-engagement of the NPA process (Intent to Proceed) and fully expects that such information and the sufficiency of plans and programs will be evaluated through a transparent and public process under the NPA and any other applicable federal legislation before receiving approval from the DO.

5) Land Rights and the Interests of First Nations

Part III of the NPA (section 37) enables the federal Governor in Council to transfer the administration and control of lands in Yukon required for the construction, maintenance or operation of the APP to the federal minister responsible for the Northern Pipeline Agency. As discussed in greater detail under Section 2.2.4.2 "Regulatory Approvals", an easement through Yukon for the purposes of the APP has been granted and other required lands reserved through notation. Both the easement and the additional lands reserved by notation are "encumbering rights" within the meaning of the Umbrella Final Agreement entered into by Yukon First Nations, Yukon and Canada and cannot be eroded through ongoing discussions regarding final agreements with individual Yukon First Nations.

Foothills will also require rights to land in British Columbia and Alberta for the APP. The vast majority of such land is Crown land (federal or provincial). Agreements with First Nations to obtain access to land are not required although Foothills is required under the terms of its certificates of public convenience and necessity to consult with, provide opportunities to and address barriers impeding participation of First Nations. In addition, the Crown (federal or provincial) has an obligation to consult with and accommodate the interests of First Nations before taking further action to enable the APP to proceed.

2.2.3.14 Plan for LNG Project

Even though TransCanada is not proposing an LNG project in this Application, TransCanada is willing to provide gas treatment services at Prudhoe Bay and transportation services from Prudhoe Bay to Delta Junction or an LNG terminal should a Shipper request such services and either there are insufficient gas commitments for the pipeline through Canada, or there is sufficient gas committed for the pipeline through Canada and to an LNG terminal.

TransCanada has completed a high level study for a GTP and a gas pipeline that is capable of transporting 2.0 bcf/d of natural gas from Prudhoe Bay to Valdez. TransCanada has also evaluated the option of expanding the Pipeline System from Prudhoe Bay to Delta Junction to 6.5 bcf/d to accommodate the additional 2.0 bcf/d of gas for an LNG terminal at Valdez. Refer to Appendix N "Tariffs for LNG Option" for a brief discussion of the above studies, and the related indicative tariffs for the GTP and pipeline.

2.2.3.15 Plan for Gas Processing and NGL Markets

1) Current Natural Gas Liquid Activities in Alberta

Producers in Western Canada generally treat their natural gas in the field to meet a pipeline's tariff specifications before delivery to a pipeline's metered receipt point. Most producers do not strip out additional natural gas liquids prior to delivering their natural gas to the pipeline although this is an alternative that is available should a producer prefer to remove NGLs from its gas prior to delivery to the Alberta System.

The Alberta System is straddled by a number of large third-party owned plants that strip entrained NGLs prior to the gas being exported from Alberta. The removed NGLs are transported through an extensive infrastructure grid that allows the NGLs to access markets located within and outside Alberta. These straddle plants are projected to have adequate capacity to accommodate export flows, including Alaska volumes.

In Alberta, the value of the NGLs that are contained in the gas and stripped by the straddle plants is obtained by shippers through the sale of "extraction rights" from shippers to straddle plant owners. The NGL extraction rights convention and the associated "extraction rights" is the commercial vehicle that allows a straddle plant to strip NGLs from the shippers' volumes and associated gas stream. Shippers negotiate with the straddle plant owners to receive value for their NGL extraction rights.

2) Alberta's NGL Extraction Rights Convention

The current NGL extraction rights model on the Alberta System allocates extraction rights to export delivery shippers, those exporting gas from Alberta. However, TransCanada is advocating change to this model through a regulatory proceeding presently underway before the AEUB.

The NGL extraction rights model that TransCanada is currently proposing would allocate extraction rights to Receipt Shippers rather than export delivery shippers. Rights would be based on each Shipper's percentage share of the total value of NGL contributed to the system. NGL value would be determined based on the quantity and value of each NGL component received at each receipt point on the Alberta System. The volume of a Shipper's individual NGL components would be multiplied by a publicly available market value to determine each Shipper's total NGL value. Each Shipper's total value of NGL components divided by the total value provided by all Shippers would become the Shipper's percentage share of extraction rights. This methodology of allocating extraction rights to Receipt Shippers based on the value of NGL brought onto the system by Receipt Shippers would ensure that Receipt Shippers receive the value of the NGLs that they placed on the Alberta System. If this new model is approved, TransCanada expects that, as this new NGL extraction rights model matures, the marketplace for extraction rights will further mature and the liquidity for buying and selling extraction rights will increase.

3) Options to Realize NGL Value

Alaska Shippers have several options to realize NGL value. Extraction rights can be sold to the major NGL processing complexes that straddle the Alberta System, thereby realizing value without an investment in new NGL facilities. Alternatively, a new NGL processing complex could be constructed in Alaska, or at any other point on the Pipeline System. NGL products could be sold directly to Alberta's petrochemical industry or delivered to existing large scale fractionation and storage facilities for access into higher value markets across the northern tier of the U.S. and Eastern Canada.

a) Selling Extraction Rights to Straddle Plants

There are a number of key factors that suggest selling extraction rights to the existing straddle plants may be the preferred economic option:

- The Alberta System can accept the minimum and maximum gas specifications outlined in the RFA.
- TransCanada foresees that, even with the addition of Alaskan gas, there will be spare inlet capacity at the NGL extraction plants that straddle the Alberta System. Going forward, it is expected that intra-Alberta demand for natural gas will

increase and supply from the WCSB will remain flat or decline, creating even more spare capacity at these facilities.

- The extensive supporting infrastructure grid and a significant Alberta petrochemical industry will continue to support demand for NGLs extracted in Alberta.
- There is a long history of gas owners selling extraction rights to straddle plants in Alberta. Affiliates of the ANS Producers have been participants in this and are familiar with the current conventions.
- TransCanada is proposing and supporting changes to the current NGL rights convention in Alberta to shift extraction rights to Receipt Shippers. This would be beneficial to Alaska Shippers by providing additional flexibility, liquidity and value in selling extraction rights.

b) Building New NGL Extraction Facilities

Alaska Shippers also have an option to build new NGL extraction facilities in either Alaska or at any other point on the Pipeline System. This could provide viable economic alternatives to:

- build new NGL processing facilities if the proprietary economic view indicates that the required investment would deliver additional NGL value; or
- pursue an ownership interest in the existing NGL facilities and infrastructure if that represents a better economic alternative.

Shippers would be able to use new NGL plant economics to set the benchmark value for Alaska NGL extraction rights in Alberta.

4) NGL Value Estimate

TransCanada does not own NGL processing facilities or sell natural gas extraction rights to straddle plants in Alberta, so it is not in a position to have market sensitive knowledge of the value of NGL extraction rights.

Through participation at the AEUB proceeding currently in progress, TransCanada is proposing and supporting changes to the current NGL rights convention in Alberta that would shift extraction rights to Receipt Shippers. TransCanada believes that this change would be beneficial in that it would provide additional flexibility, liquidity and value to gas owners selling their extraction rights.

Information filed in this hearing provides useful insight into the potential of future NGL value in Alberta. Information filed to date suggests that gas owners have historically received in the order of 3-4 ¢/mcf for NGL extraction rights. Strong liquid/gas price spreads and strong NGL demand combined with proposed changes to the NGL convention will allow Alaska Shippers to realize the value of the NGLs contained in the gas.

Alaska Shippers will also be in the unique position of controlling a significant gas supply in a market which is looking for NGL extraction rights. This should allow them to leverage full NGL value for Alaskan gas in Alberta.

Based upon the 2004 to 2006 average NGL specification product prices that were published by the Alberta Government, TransCanada estimates the NGL value for the Alaskan gas at 1,118 Btu/cf could be approximately $0.20/mmBtu (in 2007 dollars), approximately $330 million of additional revenue per year to the Alaska Shippers, if the committed volume is 4.5 bcf/d. Refer to Appendix O "NGL Value Assessment" for the details of this NGL value assessment.

2.2.4 Regulatory Plan

2.2.4.1 Regulatory Approvals

1) U.S. Regulatory Approvals (Alaska)

TransCanada's application to the State under AGIA is based upon utilizing the *Alaska Natural Gas Pipeline Act* ("ANGPA"), 15 U.S.C. §§ 720 – 720n, for Federal Energy Regulatory Commission ("FERC" or "Commission") certification of the Alaska portion of the Project. TransCanada has elected to propose an ANGPA project because it believes that doing so will facilitate the State's review and comparison of various proposals received in response to the AGIA RFA.

The Project meets the qualification criteria specified under section 103 of ANGPA. Section 103(a) of ANGPA authorizes the Commission to consider and act on application for the issuance of a certificate of public convenience and necessity authorizing the construction and operation of an Alaska natural gas transportation project, in accordance with section 7(c) of the *Natural Gas Act* ("NGA"), 15 U.S.C. § 717f(c). Section 103(b) of ANGPA further directs the Commission to issue a certificate of public convenience and necessity authorizing the construction and operation of an Alaska natural gas transportation project under section 103 if the applicant has satisfied the requirements of section 7(e) of the NGA, 15 U.S.C. § 717f(e). Section 7(e) of the NGA generally requires the Commission to issue a certificate to a qualified applicant, provided it finds that the applicant is able and willing to properly do the acts and to perform the service proposed and to conform to the provisions of the NGA and the requirements, rules, and regulations of the Commission thereunder, and that the proposed service, sale, operation, construction, extension, or acquisition, to the extent authorized by the certificate, is or will be required by the present or future public convenience and necessity.

The Project meets each of these requirements. As an entity engaged in the transportation of natural gas in interstate commerce, with more than 50 years experience in the responsible development and reliable operation of North American energy infrastructure, TransCanada will be a "qualified applicant" for the requested certificate under ANGPA and the NGA and will be subject to the jurisdiction of the Commission. As demonstrated in this application, TransCanada also is able and willing to properly do the acts and to perform the service proposed and to conform to the provisions of the NGA and the Commission's requirements implementing the NGA.

Moreover, the Project is required by the present or future public convenience and necessity. First, Congress has directed the Commission to make certain important presumptions supporting a finding that the Project is required by the public convenience and necessity. Specifically, section 103(b)(2) of ANGPA requires the Commission, in considering an

application, to presume that "a public need exists to construct and operate the proposed Alaska natural gas transportation project" and "sufficient downstream capacity will exist to transport the Alaska natural gas moving through the project to markets in the contiguous United States."

In addition to the congressional statements supporting a finding that the Project is required by public convenience and necessity, the Project satisfies the criteria for justifying a new project under the Commission's Certification of New Interstate Natural Gas Pipeline Facilities Policy Statement ("Certificate Policy Statement"), which provides guidance regarding how the Commission evaluates pipeline construction proposals under section 7(c) of the NGA to determine if the proposed construction is necessary and will serve the public interest (*Certification of New Interstate Natural Gas Pipeline Facilities, Statement of Policy*, 88 FERC ¶ 61,227 at 61,748 (1999), *Order Clarifying Statement of Policy*, 90 FERC ¶ 61,128 (2000), *Order Further Clarifying Statement of Policy*, 92 FERC ¶ 61,094 (2000)). Pursuant to the Certificate Policy Statement, the threshold requirement for a pipeline proposing a new project is that the pipeline must be prepared to financially support the project without relying on subsidization from its existing customers. Once the no-subsidization requirement has been demonstrated, the next inquiry is whether the applicant has made efforts to eliminate or minimize any adverse effect the project might have on the applicant's existing customers; existing pipelines in the market and their captive customers; or landowners and communities affected by the route of the new pipeline. If residual adverse effects on these interest groups are identified after efforts have been made to minimize them, the Commission evaluates the project by balancing the evidence of public benefits to be achieved against these residual adverse effects. The Project clearly satisfies the requirements of the Certificate Policy Statement. None of TransCanada's existing shippers will subsidize the costs of the proposed facilities in Alaska. The Alaska Section will not have adverse effects on existing pipelines or their captive customers. And, the Alaska Section has been designed to minimize impacts on landowners, with most of the Project's right-of-way paralleling the TAPS right-of-way and the Alaska Highway. At the same time, the Project will provide considerable public benefits by providing a system to transport stranded Alaska North Slope natural gas reserves to markets in Alaska and the Lower 48. As such, the Project clearly meets the qualification criteria for issuance of a certificate of public convenience and necessity under section 103 of ANGPA and section 7 of the NGA.

The major regulatory approvals required for the Project are:

- Federal Right-of-Way Grant ("Federal ROW") issued pursuant to section 28 of the *Mineral Leasing Act*, 30 U.S.C. § 185.
- State Right-of-Way Lease ("State ROW") issued pursuant to the *Alaska Right-of-Way Leasing Act*, AS 38.35.10 – AS 38.35.260.
- Federal Wetlands Permits ("404 Permits") issued pursuant to section 404 of the *Clean Water Act*, 33 U.S.C. § 1344, with required State water quality certification pursuant to section 401 of the *Clean Water Act*, U.S.C. § 1341.
- Coastal Zone Management consistency determination issued pursuant to the Alaska Coastal Management Program, AS 46.39.010, et. seq. and AS 46.40.010, et. seq.
- *Clean Air Act*, Title V, Air Quality Operating Permit issued pursuant to AS 46.14.010 et. seq.

- Authorization to construct and operate the GTP under applicable State and/or federal law.

These permitting activities will be subject to environmental analysis and the preparation of an Environmental Impact Statement ("EIS") by FERC, in cooperation with the other permitting agencies, in accordance with the requirements of the National Environmental Policy Act ("NEPA"), 42 U.S.C. §§ 4321, et seq., and as specified by ANGPA.

A comprehensive list of all of the primary required approvals for the Alaska portion of the Project is set forth in Appendix P1 "Major U.S. Regulatory Approvals".

As an ANGPA project, the Project, like any interstate natural gas pipeline project, must commence and complete an initial review pursuant to NEPA prior to obtaining its major permits. Prior to commencement of the NEPA review and filing of formal applications for the CPCN and the Federal ROW, significant pre-filing work will be completed. In accordance with the requirements of AGIA, AS 43.90.130(3)(B), and section 2.2.4.3 of the RFA, TransCanada will apply for FERC approval to use the pre-filing procedures set out in 18 C.F.R. § 157.21. Among other things, during this pre-filing process, TransCanada will develop any additional data and information required for, and prepare, the environmental "resource reports" required under the Commission's regulations implementing NEPA, 18 C.F.R. § 380.12. In accordance with FERC requirements, the resource reports will include a detailed environmental analysis of the potential impacts of the Project on a range of resources—*e.g.*, water use and quality; fish, wildlife, and vegetation; cultural resources; socioeconomics; geological resources; soils; land use, recreation, and aesthetics; and air and noise quality. These resource reports will form the basis for the preparation of an environmental impact statement ("EIS") for the Project.

As specified in section 104 of ANGPA, there will be one EIS that consolidates the environmental reviews of all federal agencies considering any aspect of the Project. Pursuant to section 104 of ANGPA, FERC will be the lead agency for preparing the EIS for the Project, and each other such federal agency will cooperate with FERC and comply with FERC's deadlines in preparing the EIS. Thus, for example, rather than complete their own separate EISs for the Project, the Bureau of Land Management ("BLM") and the U.S. Army Corps of Engineers ("Corps") will work with FERC to ensure that the FERC-prepared EIS is sufficient to support their consideration of the applicant's applications for a Federal ROW and 404 Permits, respectively, and must rely on that EIS in making their permitting decisions. Once FERC determines that the certificate application is complete, it must issue a draft EIS within one year, followed by a final EIS ("FEIS") no longer than 180 days later. Once the FEIS is issued, FERC must issue its final order either granting or denying the certificate application within 60 days.

Once this process is complete, implementation plans will be developed documenting how the Project will comply with the various terms and conditions of the authorizations, including with respect to environmental matters, requiring additional time and expense prior to commencing the Notice to Proceed ("NTP") phase of development. The NTP process is an ongoing process through which the Co-Applicants will obtain authorizations to construct the various Project facilities in a manner that is consistent with all applicable regulatory requirements and fulfill the terms and conditions and stipulations in the various authorizations issued for the Project.

Concurrently with the FERC certification and BLM right-of-way processes, TransCanada will submit applications to the Corps for any required *Clean Water Act* section 404 wetlands Dredge or Fill Permits and *Rivers and Harbors Act* section 10 Work in Navigable Waters Permits required for Project construction activity in about 90% of all wetlands crossed by the Project. In addition, the applicant will seek to obtain any *Clean Water Act* section 401 water quality certifications and *Coastal Zone Management Act* consistency determinations that must be obtained from the State in connection with these federal permits.

2) Canadian Regulatory Approvals

Construction and operation of the APP through the Yukon and BC will require permits, licences and other approvals under federal, provincial and territorial legislation. The primary or major approvals required are described below.

a) *Northern Pipeline Act* (R.S. 1985, c. N-26, as amended)

i) Leave to Proceed (Sections 7 and 22 of the NPA and Schedule III to the NPA, as amended)

Leave to Proceed is the form of order previously adopted by the DO pursuant to s.22 of the NPA to indicate that all preconditions to construction, established under the terms and conditions set out in Schedule III and as amended by zone specific socio-economic and environmental terms, have been satisfied. Preconditions that must be satisfied include:

- approval of the final detailed design by the DO;
- approval of plans and programs by the DO (this is a consolidated list setting out the plans and programs that must be submitted for approval by the DO prior to construction under the combined Terms and Conditions for all regions):
  - Manpower Plan;
  - Procurement Program;
  - Emergency Procedures Plan;
  - Information, Consultation and Liaison Plan;
  - Opportunity Measures Plan;
  - Traditional Resources Protection Plan;
  - Environmental Protection Plans (including Procedures Manual);
  - Archaeological Program;
  - Business Opportunities Plan;
  - Transportation and Logistics Plan;
  - Health Plan;
  - Telecommunications Plan;
  - Resource Inventory and Resource Use Plan;
  - Northern Residents Training and Employment Plan;
  - Orientation and Counselling Plan;

  - Northern Business Opportunity Plan; and
  - Housing Plan;
- evidence of financing sufficient to satisfy the National Energy Board and the Minister responsible for the Northern Pipeline Agency; and
- proof that all (other) necessary regulatory approvals have been obtained.

ii) Approval and Certification of the Plan, Profile and Book of Reference (s.7 of the NPA; s.36 and 38 of the National Energy Board Act)

The PPBR identifies all properties and all landowners affected by the proposed pipeline route. The process of approval provides an opportunity for all affected landowners to object to the proposed route.

b) *National Energy Board Act* (R.S.C. 1985, c.N-7, as amended)

i) Approval of Tolling Methodology and Tariffs (Part IV)

The NPA leaves approval of tolls and tariffs to the jurisdiction of the National Energy Board, taking into account the relevant provisions of the *National Energy Board Act* and Part II of the NPA.

ii) Leave to Open (s. 47 of the NEB Act)

By granting Leave to Open the National Energy Board indicates that it is satisfied that the pipeline may be safely opened for transmission of natural gas.

c) Other Federal Legislation

i) Fisheries Act, R.S.C. 1985, c. F-14.

Section 35(2) Authorization: Depending upon the method and timing of any particular water crossing, an authorization pursuant to s.35 (2) to allow the harmful alteration, destruction or disturbance of fish habitat may be required to avoid prosecution under that legislation.

Section 32 Authorization: An authorization pursuant to this section may be required if blasting near or in a water course is likely to result in the killing of fish.

These authorizations are granted by Fisheries and Oceans Canada.

ii) Navigable Waters Protection Act, R.S.C. 1985, c.N-22.

An approval pursuant to section 5 will be required to construct water crossings over most navigable waters. This approval is granted by Transport Canada.

iii) Species at Risk Act, S.C. 2002, c.29.

Under this legislation, having an effect on a listed species or its critical habitat is prohibited unless a permit pursuant to s.73(1), allowing incidental effects, has been issued by Environment Canada.

d) Provincial and Territorial Legislation

Refer to Appendix P2 "Major Canadian Regulatory Approvals by Jurisdiction" for a listing of major approvals under the laws of Yukon, British Columbia and Alberta that may be required for construction of the APP.

2.2.4.2 Rights-of-Way

1) Alaska

The pipeline alignment in Alaska is approximately 750 miles in length. At present, of the 750 miles, 36% crosses land controlled by the U.S. Government, 50% crosses land controlled by the State of Alaska, and 14% crosses land held by private individuals and trusts, corporations, political subdivisions of the State and other public entities, such as the University of Alaska.

The acquisition of ROW crossing lands under federal authority will be the subject of an application for a Federal ROW Grant by TransCanada to the Bureau of Land Management.

The acquisition of ROW crossing land under State authority will be the subject of a ROW application by TransCanada to the State of Alaska.

The acquisition of ROW across the remaining land held by private individuals and trusts, corporations, political subdivisions of the State and other public entities will be the subject of business negotiations between TransCanada and the individual land holders under the authority and requirements of the federal *Natural Gas Act* and other applicable law.

2) Canada

Foothills has existing or will require rights to land in Yukon, British Columbia and Alberta to complete the Canadian portion of the pipeline project. The vast majority of such land is Crown land (federal, provincial or territorial).

a) Yukon

The Foothills Subsidiaries have easement rights for the entire route through Yukon. The exercise of rights under the easement agreement is subject only to the prior written consent of the Minister responsible for the Northern Pipeline Agency. Land required for compressor station sites, access roads, stock pile and borrow pits has been reserved for the purposes of the pipeline as reservations by notation. Both the easement and the reservations by notation are an "encumbering right" within the meaning of Clause 5.4.2.1 of the *Umbrella Final Agreement*. Accordingly, these lands have been withdrawn from the First Nation settlement process. Land use permits will be required to enable Foothills to make use of such lands for the purpose of constructing and operating the pipeline.

b) British Columbia

Foothills requires both Provincial Crown and (a small percentage of) privately held land to construct and operate the pipeline in British Columbia. All Provincial Crown land

required for the pipeline is subject to Mineral Reserves under the provincial *Mineral Act* and the *Mining (Placer) Act*, and Map Reserves under the *Land Act*.[1] While neither instrument creates a legal interest in Foothills, the effect is to give notice of intended use to all others and effectively removes Provincial Crown land from settlement discussions with First Nations.

To perfect its interest in Provincial Crown land Foothills will require a Licence of Occupation under the *Land Act*.

c) Alberta

Both Provincial Crown (65 – 75%) and privately held (35-25%) lands are required to construct and operate the pipeline in Alberta. Foothills holds a Consultative Notation with respect to Provincial Crown lands. While this does not establish any form of legal tenure it does identify a pipeline corridor and provides Foothills with the opportunity to review and comment upon any conflicting proposed development near that corridor.

To secure land tenure with respect to Provincial Crown lands, Foothills will be required to enter into a Pipeline Agreement (right -of -way) or a Pipeline Installation Lease (other pipeline facilities) under the *Public Lands Act*.

2.2.4.3 Commitments for FERC-Certificated Project

To the extent that the Project will be subject to the jurisdiction of FERC, TransCanada commits as follows:

- To conclude a binding Open Season by September 30, 2009;
- To apply for FERC approval to use the pre-filing procedures set out in 18 C.F.R. Section 157.21 by June 30, 2010;
- To apply for a FERC Certificate of Public Convenience and Necessity to authorize the construction and operation of the Project by December 30, 2011.

These dates are predicated on the issuance of the AGIA License by April 1, 2008 and will be adjusted to the extent that the issuance of the License is delayed beyond that date.

2.2.4.4 Commitments for RCA Certificated Project

This section does not apply to the APP.

[1] Order in Council No. 922, B.C., Regulation 100/1977 and order in Council No. 923, B.C., Regulation 101/1977, made under the *Mineral Act* R.S.B.C. 1960, c. 244, s. 12(5) as amended (repealed and replaced by the *Mineral Tenure Act* R.S.B.C. 1996, c. 292); *Placer Mining Act*, S.B.C. 1974, c. 63, s. 13 as amended (repealed and replaced by the *Mineral Tenure Act* R.S.B.C. 1996, c. 292). Notwithstanding the repeal or both the *Mineral Act* and the *Placer Mining Act*, the mineral reserves created by the above referenced Orders in Council remain in full force and effect through s. 22(3) of the *Mineral Tenure Act*.

2.2.4.5 Commitments for a Canadian Pipeline Project

Foothills subsidiaries hold Certificates of Public Convenience and Necessity for the Canadian portion of the APP.

2.2.5 Local Project Headquarters Plan

TransCanada commits to establishing a local headquarters in Alaska for the Alaska Pipeline Project. Key project management and commercial functions would be managed from these headquarters, along with direct management of Alaska-based contractors and sub-contractors.

During the Development Phase of the Project, after a successful Open Season, this headquarters would likely be located in Anchorage, to be near primary commercial and regulatory stakeholders. Details regarding the final physical location, size and specific staffing levels will be determined once the AGIA license has been issued, and will be commensurate with the level of work being performed through each sub-phase.

Functions within the PMT would be managed in the location where the majority of work is being executed.