



Pipeline Construction

The majority of pipeline construction work for the proposed Mackenzie Gas Project will take place over two winter seasons. When construction is completed, the pipeline right-of-way will be reclaimed and maintained.

Three types of pipelines will be built as part of the Mackenzie Gas Project.

- The gathering system, which carries both natural gas and natural gas liquids, will deliver those fluids from the producing fields and deliver them to a gas processing facility in the Inuvik area.
- A natural gas liquids pipeline will deliver natural gas liquids from the Inuvik area facility to an existing Enbridge pipeline at Norman Wells.
- A natural gas pipeline will deliver natural gas from the Inuvik area facility to northwestern Alberta.

The natural gas pipeline and the natural gas liquids pipeline will share a new pipeline right-of-way from the Inuvik area facility to Norman Wells, where the natural gas liquids pipeline will join the Enbridge system.

The natural gas pipeline will continue south to northwestern Alberta in a new right-of-way, where it will connect with an extension of the existing TransCanada pipeline system.

A preliminary plan has been developed based on three years of construction activity for the pipelines and related facilities. The first year of construction involves clearing the right-of-way and starting to build the infrastructure, such as camps, storage facilities and roads, which will be needed during the major construction. The pipeline and related facilities and the remaining infrastructure will be constructed in the second and third years.

Several crews known as "spreads" will build the pipeline in sections. The plan assumes that the pipeline will be separated into five construction sections for each year of construction. The spreads will construct sections ranging in length from 120 to 160 kilometres. The shorter sections will involve construction of both the natural gas and natural gas liquid pipelines. The longer sections will involve construction of only the natural gas pipeline.

The peak field workforce is estimated to be between 6,500 and 7,000 people for the first season of pipeline construction.

The remote location and seasonal constraints of this Project require significant preparation and preplanning. Lighting will be required some of the time for safety. The preliminary plan will be modified as detailed design progresses. This includes consideration of field studies and further input from northern communities.

STEPS IN PIPELINE CONSTRUCTION

Surveying and clearing the right-of-way.

The right-of-way is a narrow strip of land that contains the pipeline(s) and is where all onsite construction activities occur. It is surveyed, cleared of brush and trees, and levelled to give workers and equipment access to build, inspect and maintain the pipeline.

Right-of-way preparation. The right-of-way will be graded, and ice and snow or gravel pads will be built to allow for the movement of ditchers, additional equipment, materials and other pipeline construction activities.

Hauling and stringing the pipe. Lengths of pipe are moved from stockpile sites and lined up along the right-of-way, ready for welding.

Bending the pipe. A specialized pipe-bending machine is used to bend some pipe to the shape of the land. The pipe retains its strength and remains circular where it is bent because of the characteristics of steel and the bending techniques used.

Welding. Welding is a technique where another metal is melted and used to join lengths of pipe. The area of the weld where the two pipes are joined is actually stronger than the pipe, by design. This step is repeated a number of times until multiple pipe sections are joined to form a pipeline. Automatic welding machines are used where possible and some hand welding also takes place to do this type of joining. A rigorous quality assurance and quality control program is followed to ensure the strength and quality of the welding.

Digging the trench. A trench, or ditch, must be dug to bury the pipeline. The way the trench is dug, and what equipment is used, depends mainly on the type of soil. Alternatives include bucketwheel trenchers, like those used for the Norman Wells pipeline, and chain trenchers, like those used for the Ikhil pipeline. Other digging equipment will include backhoes.

Lowering the pipe. Tractors with special arms called sidebooms are used to lower the pipe into the trench. Care is taken to avoid damaging the pipe and its exterior coating.

Installing valves and special fittings. Valves, including shut-off valves that can block off sections of the pipeline for maintenance, and other connections are installed as the pipeline is constructed.

Crossings. Along a pipeline, rivers and streams, roads and other pipelines will be crossed. Plans are developed in advance. Water crossings can be completed either by "open cut" techniques or by horizontal directional drilling. The selection of a crossing method depends upon site specific criteria such as fish habitat, water flow, and soil conditions such as rocks and boulders. Generally, horizontal directional drilling is selected for major river crossings where local soil conditions permit.

Backfilling the trench. Prior to testing, the ditch is backfilled. Sometimes the excavated soil is used to fill the trench and sometimes other selected backfill is used. Care is taken to protect the pipe coating from potential damage.

Testing. A variety of methods will be used to ensure the integrity of the assembled pipeline and to comply with code.

The final step in the construction phase is to reclaim the pipeline right-of way and temporary facilities such as camps.

CONSTRUCTION PLANS

Preparation of access roads, sites to store equipment and pipe, and camps could begin as early as the fall of 2006, assuming the Project proceeds. Equipment, materials and supplies would be moved by rail, truck, barge and air transportation to staging sites near locations where the pipeline and facilities would be built.

Construction activities will meet applicable Canadian environmental standards.

PIPELINES	ROUTE	LENGTH	PROPOSED PIPE SIZE
GATHERING SYSTEM	<ul style="list-style-type: none"> from natural gas fields in the Mackenzie Delta to a gas processing facility near Inuvik 	<ul style="list-style-type: none"> Niglintgak to Taglu: 15 kilometres Taglu to Storm Hills: 82 kilometres Parsons Lake to Storm Hills: 28 kilometres Storm Hills to Inuvik Area Facility: 51 kilometres 	<ul style="list-style-type: none"> Niglintgak to Taglu: 16 inches Taglu to Storm Hills: 26 inches Parsons Lake to Storm Hills: 18 inches Storm Hills to Inuvik Area Facility: 30 inches
NATURAL GAS LIQUIDS PIPELINE	<ul style="list-style-type: none"> from the gas processing facility near Inuvik, along the Mackenzie River Valley to the existing Enbridge pipeline at Norman Wells 	<ul style="list-style-type: none"> 480 kilometres 	<ul style="list-style-type: none"> 10 inches
NATURAL GAS PIPELINE	<ul style="list-style-type: none"> from the gas processing facility near Inuvik, along the Mackenzie River Valley to Fort Simpson, then southward to an interconnect facility in northwestern Alberta 	<ul style="list-style-type: none"> 1,220 kilometres 	<ul style="list-style-type: none"> 30 inches



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