



National Energy Board

Reasons for Decision

**Souris Valley Pipeline
Limited**

MH-1-98

October 1998

Facilities

National Energy Board

Reasons for Decision

In the Matter of

Souris Valley Pipeline Limited

Application dated 10 October 1997, as
amended, for Facilities

MH-1-98

October 1998

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Abbreviations

Act	<i>National Energy Board Act</i>
Bcf	billion cubic feet
Board, NEB	National Energy Board
CEAA	<i>Canadian Environmental Assessment Act</i>
Certificate	Certificate of Public Convenience and Necessity
CO ₂	carbon dioxide
CVN	Charpy V-notch
CSA	Canadian Standards Association
CSA Z662	CSA standard Z662-96, <i>Oil and Gas Pipeline Systems</i>
DGC	Dakota Gasification Company
EOR	Enhanced Oil Recovery
EPZ	emergency planning zone
ERP	Emergency Response Plan
ft.	feet
ft-lb	foot-pound
H ₂ S	hydrogen sulfide
IDLH	Immediately Dangerous to Life or Health
kg	kilogram
km	kilometre
kPa	kilopascal
lb	pound
LC _{Lo}	Lethal Concentration Lower Limit
m	metre

m ³	cubic metre
m ³ /d	cubic metre per day
MAC	Mouvement au Courant
mi.	mile
mm	millimetre
MMcf/d	million cubic feet per day
MPa	megapascal
NIOSH	National Institute of Occupational Safety and Health
OD	outside diameter
PanCanadian	PanCanadian Petroleum Limited
ppm	parts per million
psi	pounds per square inch
Report	Environmental Screening Report
SCADA	Supervisory Control and Data Acquisition
Souris	Souris Valley Pipeline Limited

Recital and Appearances

IN THE MATTER OF the *National Energy Board Act* and the regulations made thereunder;

IN THE MATTER OF an application dated 10 October 1997, by Souris Valley Pipeline Limited, filed pursuant to section 52 of the Act for the construction and operation of a carbon dioxide transmission pipeline and related facilities; and

IN THE MATTER OF the National Energy Board Hearing Order MH-1-98.

HEARD at Regina, Saskatchewan, 4 May 1998.

BEFORE:

J.A. Snider	Presiding Member
A. Côté-Verhaaf	Member
G. Caron	Member

APPEARANCES:

D.A. Holgate	Souris Valley Pipeline Limited
L.E. Smith	PanCanadian Petroleum Limited
M.A. Fowke	Board Counsel

Chapter 1

Introduction

1.1 The Application

On 10 October 1997, Souris Valley Pipeline Limited ("Souris") applied pursuant to Part III of the *National Energy Board Act*¹ ("Act") for a Certificate of Public Convenience and Necessity ("certificate") to authorize the construction and operation of a carbon dioxide ("CO₂") transmission pipeline in southern Saskatchewan. Souris filed amendments to this application by letter dated 31 December 1997. The Souris Valley Pipeline would interconnect with the proposed Dakota Gasification Company ("DGC") CO₂ Pipeline at the Canada/U.S. border and would transport CO₂ to the existing Weyburn oil field in Saskatchewan where the CO₂ would be used for enhanced oil recovery ("EOR").

The Souris Valley Pipeline would consist of approximately 61 km (38 miles) of 324 mm (12.75 inch) outside diameter ("OD") pipeline extending north from the Canada/U.S. border to a terminal facility owned and operated by PanCanadian Petroleum Limited ("PanCanadian"), near Goodwater, Saskatchewan. No pumping stations or metering facilities are required on the pipeline. Souris will own the proposed CO₂ pipeline, with operation of the pipeline the responsibility of Souris' parent corporation, DGC. The 272 km (169 mile) U.S. portion of the pipeline, to be owned and operated by DGC, would originate from the Great Plains Synfuels Plant near Beulah, North Dakota.

The applied-for facilities are depicted in Figure 1-1, and are more particularly described in Chapter 3.

The initial operating capacity of the Souris Valley Pipeline would be 2.7 10⁶m³/d (95 MMcf/d). Delivery is scheduled to commence in December 1999.

1.2 National Energy Board Jurisdiction over Carbon Dioxide Pipelines

As a result of the *Canada Transportation Act*², which came into force on 1 July 1996, jurisdiction over interprovincial and international commodity pipelines in Canada was transferred from the National Transportation Agency³ to the National Energy Board ("Board"). In order to assume this jurisdiction, the definition of "pipeline" in the *National Energy Board Act* was broadened to include pipelines transporting commodities other than oil or gas, but excluding municipal sewer and water lines.⁴ The Souris hearing was the first hearing dealing with an application to the Board for the construction and operation of a commodity pipeline.

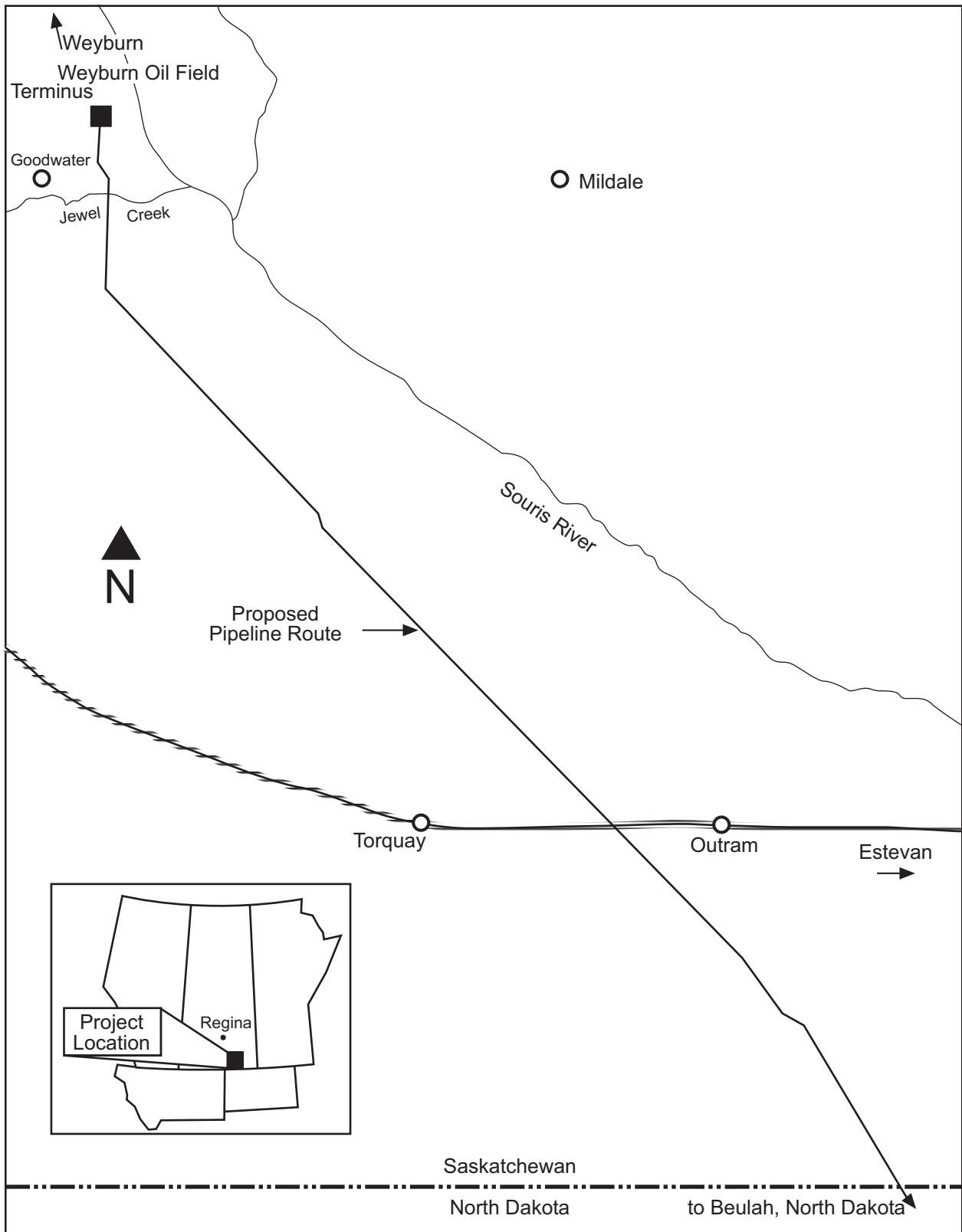
¹ R.S.C. 1985, c. N-7

² S.C. 1996, c.10

³ Now the Canadian Transportation Agency

⁴ *Supra*, note 3 at s. 237

Figure 1-1
Souris Valley CO₂ Pipeline Project



The Souris Valley Pipeline would be the only carbon dioxide pipeline under the Board's jurisdiction.

Due to the wide variety of the fluids transported on commodity pipelines, the Board determined that it would be more practical to regulate these lines on a case-by-case basis, rather than developing new regulations that would address all potential commodity issues. The Board therefore issued Order MO-CO-3-96, which exempted commodity pipelines from the provisions of the *Onshore Pipeline Regulations*¹ ("OPR"). Given this exemption, the Board has included many of the issues from these Regulations as conditions to any certificate issued in respect of the proposed facilities.

1.3 Environmental Assessment

The Board conducted an environmental screening of the applied-for facilities in compliance with the *Canadian Environmental Assessment Act*² ("CEAA"). The Board ensured that there was no duplication in the requirements under its regulatory process and the CEAA.

The Board determined that, taking into account the implementation of Souris' proposed mitigative measures and those set out in the attached conditions, the project is not likely to cause significant adverse environmental effects. This represents a decision pursuant to paragraph 20(1)(a) of the CEAA.

1.4 The Hearing Process

The Board decided to consider the application in an oral public hearing and issued Hearing Order MH-1-98 on 28 January 1998, which set out the Directions on Procedure for the hearing. The hearing was held in Regina on 4 May 1998. Souris filed the last of its undertakings, given during the oral portion of the hearing, on 21 July 1998.

¹ SOR/89-303

² S.C. 1992, c. 37

Chapter 2

Purpose, Justification and Financial Matters

2.1 PanCanadian Weyburn Miscible Flood Project

PanCanadian has been investigating the EOR potential in the Weyburn Unit for six years. Detailed geological and reservoir simulation models have been constructed to quantify increased oil recoveries following the injection of miscible fluids in the oil-bearing rock of the Midale formation. These models predicted significant increases in oil recoveries as a result of CO₂ injection. The CO₂ miscible flood is a process which uses proven technology and is the most common tertiary flooding technique in medium to light oil reservoirs. Based on its investigation, PanCanadian proposes to inject CO₂ into the Weyburn Unit and expects that the miscible flood project will extend the life of the existing Weyburn oil field by some 25 years.

In the Weyburn Unit, different injection strategies have been identified to maximize recovery and production from the different reservoir management patterns in the flood area. The injection options have been matched to both the reservoir geology and other characteristics for optimum recovery using simulation models and analogies to other floods in operation.

At startup, purchased CO₂ would be injected into the most responsive part of the reservoir in order to maximize an initial production response in the minimum practical time. Phase 1a of the miscible flood project would consist of 19 flood patterns¹ for the injection of CO₂ and water. The CO₂ solvent would be delivered to the Weyburn Unit by DGC through the proposed Souris Valley Pipeline.

DGC has signed an agreement with PanCanadian to provide 2.7 10⁶m³/d (95 MMcf/d) of CO₂ to the Weyburn oil field near Goodwater, Saskatchewan. The agreement became effective 1 April 1997 and continues in force for a period ending 15 years from the date of initial delivery. Initial deliveries are expected to commence in December 1999. PanCanadian is obligated to nominate for a minimum of 2.1 10⁶m³/d (75 MMcf/d) for the first ten years of the agreement and may then elect to reduce its daily obligation to 1.3 10⁶m³/d (47.5 MMcf/d). It is anticipated that, over the life of the CO₂ project, approximately 10.1 10⁹m³ (357 Bcf) of CO₂ from DGC would be sequestered in the Weyburn reservoir. Phase 1a will require approximately 3.4 10⁹m³ (120 Bcf) of source CO₂ over a period of about five to six years.

As CO₂ response occurs in the initial flood area and produced CO₂ becomes available for reinjection, new CO₂ injection patterns would be incorporated into the project. PanCanadian plans to apply to Saskatchewan Energy and Mines for approval of the additional injection patterns at a later date. The total EOR project area, including the anticipated future phases of development, would ultimately encompass 75 patterns in PanCanadian's base case. Source CO₂ is expected to be required for 13 to 14 years for the 75 patterns. Purchased volumes are expected to exceed 2.3 10⁶m³/d (80 MMcf/d) for the first eight years and decline thereafter for the remainder of the contractual term. While these

¹ Most flood projects are based on a pattern of wells, i.e. the areal layout of injection and producing wells used to sweep the oil in the reservoir from the injection wells to the producing wells.

estimates were based on a simulation study, PanCanadian indicated that it could commit to purchase the minimum $2.1 \times 10^6 \text{m}^3/\text{d}$ (75 MMcf/d) for the first ten years and then reduce its take over the last five years of its agreement.

Potentially, the entire Weyburn Unit could be flooded, depending on the results of the 75 patterns in the EOR area. PanCanadian indicated that it is quite possible that the CO_2 flood could extend out to 90 patterns because the 75 patterns only cover 60 percent of the unit. PanCanadian indicated that ten years from now, it may be looking at flooding the entire unit.

In addition to PanCanadian's Weyburn Miscible Flood Project, Souris indicated that there are several other companies interested in buying CO_2 from DGC: Shell Canada Limited for its Midale Field, Numac Energy Inc. for its Elswick Field and Vista Energy Inc. for its Carrduff Field (all in Saskatchewan), as well as Chevron Canada Resources Limited for its North Virden and Waskada fields in Manitoba. Souris indicated that collectively the demand for CO_2 for these fields would be about equivalent to PanCanadian's requirements for Weyburn.

2.2 Source of CO_2

PanCanadian indicated that it had evaluated potential sources of CO_2 supply based on the following criteria: security of supply, sufficient volume, appropriate quality, integrity of process being used to generate CO_2 , commercial terms and delivered price to the Weyburn Unit. Subsurface production of CO_2 from known reservoirs and estimates of the exploration potential indicated that developing a subsurface source would be more expensive and much more risky than a number of other options.

Five alternative sources of produced CO_2 were pursued: namely, supplies from facilities at Syncrude Canada Ltd. and Suncor Inc. (Alberta oilsands operations), Transalta Corporation (Wabamun Power Plant), Exxon Corporation (LaBarge), Dakota Gasification Company (Great Plains Synfuels Plant) and Saskatchewan Power Corporation (SE Saskatchewan Power Plant). Specific proposals to supply approximately $2.8 \times 10^6 \text{m}^3/\text{d}$ (100 MMcf/d) of appropriate quality CO_2 at the injection pressure required for the Weyburn Unit were requested from each of the five. The DGC option was deemed the best source of CO_2 due to the availability of supply in both the quantity and quality that was required for the flood as well as the fact that the cost of the CO_2 was the lowest, making the miscible flood project economically viable.

Acquiring CO_2 via pipeline was the preferred option for PanCanadian's Weyburn EOR project. PanCanadian advised that the only alternatives to using a pipeline for transportation of the CO_2 would be rail or trucking. The cost of both of these options would be economically prohibitive and would result in a substantial increase in traffic and infrastructure in southeast Saskatchewan as well as the associated environmental impacts of such increases.

2.3 Other Regulatory Authorizations

A number of other regulatory approvals are required before Souris can construct the applied-for facility. Some of these approvals have already been obtained while others will be applied for in due course, as needed for construction. Federal, provincial and municipal approvals are required for construction of the pipeline in Canada covering such matters as stream crossings, hydrostatic testing, heritage resources, easements, and road and railway crossings.

2.4 Financing and Form of Regulation

The estimated capital cost of the proposed facility is \$13.67 million. The project would be financed using a mix of financial instruments, with an anticipated debt/equity ratio of 80/20.

Souris has applied to be regulated in a manner similar to Group 2 pipelines as provided for in the Board's Memorandum of Guidance dated 6 December 1995. The Board has no accounting regulations to provide for commodity pipelines. However, Souris has agreed to maintain books and records in Canada and file annual audited financial statements.

It should be noted that while the Board's *Cost Recovery Regulations*¹ do not currently apply to commodity pipelines, Souris may become subject to cost recovery charges at some future date. Cost recovery charges, if any, would be determined in accordance with the terms of the regulations at that time.

Views of the Board

The Board is satisfied that there is a need for the proposed CO₂ pipeline over the majority of the term of the agreement between PanCanadian and DGC. There is also considerable interest and potential in the area to provide a long-term need for CO₂ shipments on the proposed facility.

The Board is satisfied with the proposed method of regulation and of financing the project. The Board will require Souris to maintain separate books of account in Canada in a manner consistent with generally accepted accounting principles and to file annual audited financial statements.

¹ SOR/91-7

Chapter 3

Facilities and Pipeline Safety

3.1 Pipeline Design and Facilities

In evaluating system designs for the proposed pipeline, Souris considered two different scenarios for the DGC and Souris pipelines: a 406 mm (16 inch) OD pipeline with no pumping requirements except at the initiation point near Beulah, North Dakota; or a 356 mm (14 inch) OD pipeline from the initiation point to the midway point, and a 324 mm (12.75 inch) OD pipeline from the midway point to the termination point near Goodwater, Saskatchewan. Both scenarios would allow initial sales volumes to be delivered with pumping required only at the initiation point. Using the second design proposal, if more delivery points are established in the future, additional pumping capacity would be installed in the United States at the midway point. The second design option, incorporating a 324 mm (12.75 inch) OD pipeline in Saskatchewan, was chosen since it was found to be the most economical and to provide the most flexibility.

The proposed pipeline would be located in a sparsely populated region of southeast Saskatchewan. It would have a maximum design capacity of $2.8 \times 10^6 \text{ m}^3/\text{d}$ (100 MMcf/d), originating at the Canada/U.S. border at a tie-in to the DGC CO₂ pipeline and extending 61 km (38 miles) northwest to the Weyburn Oil Field terminus at a PanCanadian metering facility.

The wall thickness of the proposed pipeline would be 9.53 mm (0.375 inch). In accordance with CSA Z662, the pipeline is classified as, and would be designed to, a Class 1¹ sour service CO₂ pipeline and would operate at 72 percent of specified minimum yield strength. The Canadian section of the pipeline would be equipped with two sectionalizing block valves, one located approximately 30 km (18.6 miles) from the border tie-in and the other located at the pipeline terminus. The proposed pipeline terminus facilities include valving for a temporary scraper receiving barrel, a mainline blowdown vent, and the Supervisory Control and Data Acquisition ("SCADA") facilities.

3.2 Pipeline Safety

3.2.1 Operating Conditions

Operating conditions such as temperatures, pressures and gas composition were determined by Souris in its pipeline design. The limits of these operating conditions were established based on pipeline safety and integrity considerations.

¹ CSA Z662 defines a sour gas pipeline as service in which the hydrogen sulphide partial pressure exceeds 0.35 kPa (0.05psi). Class 1 is the CSA class location designation of the area, extending 200 m (656 ft.) on both sides of the centreline of any continuous 1.6 km (1.0 mi.) length of the pipeline, that contains ten or fewer dwelling units intended for human occupancy.

Souris considered statistical data for both above and below ground temperatures to arrive at a minimum below ground design temperature of -7°C (19°F) and a minimum above ground design temperature of -46°C (-51°F) for the pipeline. These temperatures are important factors for fracture prevention and control safety design.

The proposed pipeline was designed for a maximum operating pressure of 20.4 MPa (2964 psi) over the entire length of the pipeline. Normally, this pressure would be reached only at the discharge side of the compressor located at the beginning of the DGC pipeline at the Great Plains Synfuels Plant near Beulah, North Dakota. The Canadian section of the pipeline would operate at lower pressures due to internal flow losses downstream of the compressor. In the future, the operating pressure of the Canadian section could be higher if a pumping facility were installed on the DGC pipeline.

Another design consideration associated with a CO_2 pipeline is the effect of cooling caused by a rapid change in pressure. Such a situation may occur when the line is being filled with CO_2 prior to placing it into service, or when a section of pipeline is blown down. To mitigate this concern, Souris has proposed to fill the line slowly to ensure that the product will remain near ground temperature. Souris also designed the blow down vents to prevent any undesirable CO_2 expansion and the associated cooling within the pipeline.

The anticipated normal composition of the pipeline gas mixture would be 97 percent CO_2 and 0.8 percent hydrogen sulphide (" H_2S ") with not more than 2 percent by volume of nitrogen or 2 percent by volume of methane. Souris stated that the maximum concentrations of CO_2 and H_2S would be 98 percent and 2 percent, respectively. The H_2S concentration in the gas stream is a function of the amount of sulphur present in the coal being fed into the gasifier at the Great Plains Synfuels Plant. There is no equipment at the plant to control the amount of H_2S that could enter into the pipeline. Sulphur sampling is carried out only at the coal mine. The historical mine sample data show that the sulphur content in the coal has not exceeded levels that would contribute to H_2S concentrations in the CO_2 stream higher than 1.2 percent. In order to maintain H_2S concentrations within the anticipated range, low sulphur coal would be mixed with any high sulphur coal prior to gasification.

From a pipeline integrity standpoint, the level of water is also important given that carbon dioxide and hydrogen sulfide combine with free water to form acids which would corrode the pipeline steel. Therefore, it is important that free water not enter the pipeline. In order to mitigate this concern, the product stream would be dehydrated through a methanol mist extractor before entering the proposed pipeline. In addition, the product stream would be continuously monitored for moisture content. The moisture monitoring device would shut down the compressor if the moisture concentration in the product stream reaches 16 kg per million cubic meters (1 lb/MMcf).

3.2.2 Fracture Control and Prevention

Souris provided special measures in its proposed pipeline design for the protection of the public, company employees, environment, and property by considering prevention of brittle fracture and ductile fracture initiation and propagation. This was accomplished by calculating the required fracture toughness of the pipeline steel. Fracture toughness is a mechanical property which defines a material's resistance against fracture initiation and propagation. Fracture toughness is determined by a standardized method called a Charpy V-notch (" CVN ") test. The unit of measurement for fracture toughness in the metric system is the joule and in the imperial unit system it is the foot-pound

("ft-lb"). The higher the CVN energy value, the greater the resistance of the pipeline steel against fracture.

Fracture mechanics design methods enable engineers to calculate the CVN energy values required to control and prevent fracture initiation and propagation in a specific material. A method developed by the Battelle Memorial Institute was used by Souris to determine the CVN energy value for ductile fracture arrest at the discharge side of the compressor, the point where the pressure and temperature would be the greatest (20.4 MPa, 49°C or 2964 psi, 120°F). The proposed pipeline configuration results in lower operating pressures and temperatures in the Canadian section of the pipeline than the pressures and temperatures downstream of the compressor on the American side.

Souris has taken compressor discharge operating conditions into consideration in its fracture propagation calculations and has calculated a fracture arrest value of 39 joules (29 ft-lb). This value should be compared to the 81 joules (60 ft-lb) which Souris plans to specify as the minimum value for each lot of 50 pipe lengths to be manufactured for this project. This means that each pipe length will substantially exceed the required arrest value (roughly double that required) under the most severe operating conditions. Since the operating conditions in the Canadian section of the pipeline are less severe than the conditions at the discharge side of the compressor, the required arrest value for the Canadian section is estimated to be only 11 joules (8 ft-lb).

The specified 81 joules (60 ft-lb) CVN energy was used by Souris in its calculation of the critical flaw length. Critical flaw length is the maximum length of pipeline material that could be penetrated yet would not support fracture initiation. This value was calculated to be 87 mm (3.43 inches). This means, for example, that a penetration of the pipeline by excavating equipment up to the critical flaw length would not be sufficient to initiate a fracture. The content of the pipeline would leak at that point, but the pipeline would not rupture.

3.2.3 Pipeline Control

The Canadian section of the pipeline would be controlled from the pipeline control centre located at the Great Plains Synfuels Plant. The SCADA system would continuously monitor the pipeline operation parameters and process the pressure data from each valve and flow meter. The SCADA system would also process volumetric data from flow meters located at the pipeline initiation and terminal stations. Based on this data, the SCADA and leak detection system would relay the commands for the operation of the control valves.

Each control valve would be equipped with a pressure transducer, a programmable controller, an electro-hydraulic valve operator, and an antenna. Depending on the signal received, each valve would be automatically or remotely operated, and there would be provision for manual operation of each valve. In the event of a pipeline leak or break, the valves would close automatically. The signal for closure would result from the detection of low pressures or a rapid rate of the pressure drop.

The SCADA and leak detection system would also continuously monitor the volumetric balance of the line by comparing the inlet and outlet volumes of the gas. Information concerning the minimum volume loss, the volume loss rate which could be detected by the leak detection system, and the maximum volume loss during a pipeline break will be available when Souris makes its selection of a leak detection system in the fall of 1998.

In the event of pipeline failure, a combination of the SCADA system, the leak detection system, the spacing of sectionalizing valves, and the fracture control and prevention measures would minimize the release of gas into the atmosphere.

3.2.4 Risk Assessment

In order to confirm that public safety in the vicinity of the pipeline would not be at significant risk of exposure to high levels of CO₂ and H₂S accidentally released by the pipeline, Souris conducted a study entitled *Impact Probability Analysis of Accidental Carbon Dioxide and Hydrogen Sulphide Exposures Associated with the Souris Valley Pipeline Limited CO₂ Pipeline Project* ("Impact Probability Analysis"). The primary objectives of this study were to determine potential consequences of accidental airborne releases of CO₂ and H₂S due to pipeline leaks or ruptures and to quantify the potential probability of impacts at receptor points along the route. The results of the study are intended for use in determining the level of protection required for human health and safety as it pertains to potential pipeline failures and will be incorporated into the Emergency Response Plan ("ERP").

3.2.4.1 Human Health Effects

Exposure thresholds for CO₂ and H₂S were selected with the intent of protecting workers and the public from immediate danger in the event of a release. Concentration thresholds were established from a review of literature published by the National Institute of Occupational Safety and Health ("NIOSH"), the American Conference of Governmental Industrial Hygienists, and the Canadian Centre for Occupational Health and Safety. The following threshold concentrations from NIOSH were chosen:

- *Lethal Concentration Lower Limit* ("LC_{Lo}"), which is the lowest concentration in air that is known to be lethal; and
- *Immediately Dangerous to Life or Health* ("IDLH"), which is the 30-minute exposure concentration which will allow someone to escape from the contaminated environment when respiratory protection is not available and exposure could cause death or could result in immediate or delayed permanent adverse health effects.

For CO₂ and H₂S, the LC_{Lo} and IDLH values are as follows:

**Table 3-1
Exposure Thresholds**

Component	Threshold	Averaging	Concentration
CO ₂	LC _{Lo}	1 minute	100,000 ppm
CO ₂	IDLH	30 minutes	40,000 ppm
H ₂ S	LC _{Lo}	5 minutes	800 ppm
H ₂ S	IDLH	30 minutes	100 ppm

The probability calculations used the following three basic elements to determine the total impact probability that harmful exposures to CO₂ or H₂S would occur:

- probability that a leak or rupture will occur anywhere along the pipeline (Leak or Rupture Probability);
- probability that a particular location will be impacted by a threshold concentration (Probability of Impact); and
- probability that meteorological conditions (wind speed, stability and wind direction) could carry the CO₂ or H₂S from the pipeline to the receptor (Meteorological Probability).

The Impact Probability Analysis results indicated that threshold concentrations could exist out to specific distances as noted in Table 3-2. Further, using data on accident probabilities, meteorological probabilities, and impact probabilities, the total impact probability for thresholds capable of impacting a residence were determined to be as follows:

**Table 3-2
Impact Probability Analysis Results**

Component	Threshold Type	Concentration	Distance from Pipeline	Total Impact Probability
CO ₂	LC _{Lo}	100,000 ppm	210 metres for ruptures 70 metres for leaks	would not impact a residence
CO ₂	IDLH	40,000 ppm	170 metres for ruptures 110 metres for leaks	would not impact a residence
H ₂ S	LC _{Lo}	800 ppm	390 metres for ruptures 100 metres for leaks	would not impact a residence
H ₂ S	IDLH	100 ppm	1,180 metres for ruptures 290 metres for leaks	1 in 36,000 impact a residence

Souris stated that none of the LC_{Lo} concentrations for CO₂ or H₂S would reach an identified residence. Only the IDLH concentration of 100 ppm for H₂S would be exceeded at a residence. IDLH values are based on the effects of a 30-minute exposure, which is the exposure concentration that will allow someone to escape from the contaminated environment or take protective measures when respiratory protection is not available.

On 21 July 1998, Souris filed the results of a hazard analysis using a threshold concentration of 20 ppm. This 20 ppm concentration represents the value recommended for urgent and mandatory evacuation of the public by Alberta Health in the *Report on H₂S Toxicity* dated 1988. Results of modelling indicated that the maximum distance to concentrations of 20 ppm H₂S would be about 12.7 km (7.9 mi.) from a catastrophic rupture of the pipeline.

Souris stated that concentrations of H₂S between 20 ppm and 100 ppm are known to cause discomfort in the eye and nasal passages and are linked to long term chronic risks, such as might be experienced by workers in an industrial environment. However, chronic effects are unlikely to occur in a pipeline

rupture due to the limited duration of such an event. Frequency analysis for pipeline leaks and ruptures indicates that a leak or rupture of the Souris CO₂ pipeline could occur about once every 143 years, with the frequency of ruptures alone being approximately one incident every 325 years. Since the expected operational lifetime of the pipeline is approximately 50 years, the likelihood of a leak or rupture occurring on the Souris pipeline and affecting a permanent residence is very low. Souris therefore recommended that the ERP include an emergency planning zone ("EPZ") based on a threshold concentration of 100 ppm, the IDLH concentration, and not the Alberta Health concentration of 20 ppm.

3.2.4.2 Malfunctions and Accidents

An accident or malfunction that could potentially affect public safety would be a leak or rupture of the line resulting in the release of CO₂ and minor amounts of H₂S. Souris submitted that, due to design features such as pipeline strength, automatic block valve closure, and corrosion control, chances of this happening are extremely remote. Statistics, as reported in the 1990 American Gas Association report *An Analysis of Reportable Incidents for Natural Gas Transmission and Gathering Lines* submitted by Souris, show that pipeline failures occur at a rate of about 0.25 incidents per 1 609 km (1,000 mi.) of pipeline each year. Roughly half of these incidents occur as leaks and half as ruptures.

If an accident resulting in gas release did occur, the heavier-than-air CO₂ gas mixture is expected to stay close to the ground until it is dispersed. As CO₂ displaces air, it could be a potential asphyxiant for humans and animals. Souris conducted dispersion modelling studies to determine the potential consequences of accidental airborne releases of CO₂ and H₂S and to quantify the potential probability of impacts at receptor points along the route. The results of the studies were used to prepare a draft ERP, which identified an EPZ adjacent to the proposed project alignment and covers pre-emergency planning and education, operational safety precautions, emergency response procedures and agency coordination.

Souris indicated that the draft ERP was based upon an EPZ of 1.5 km (0.9 mi.). The EPZ was determined by calculating H₂S concentrations at a range of distances from a simulated pipeline failure where the concentration of H₂S in the gas was 2.0 mole percent. The calculations were performed using a rupture release and dispersion model.

The perimeter of the EPZ is equal to the NIOSH IDLH value of 100 ppm for H₂S - the 30-minute exposure concentration discussed earlier. This zone defines the area around the pipeline or facility where the public could be adversely affected by a worst-case accidental release of gas.

The predicted EPZ was determined to be 1 180 m (3,871 ft.) for the maximum 2.0 mole percent H₂S. A conservative rounding up of the impact zone to the next 0.5 km (0.3 mi.) produced an EPZ of 1.5 km (0.9 mi.). Souris submitted that in the unlikely event of an accident or malfunction, the public within the emergency planning zone would be evacuated under the following conditions:

- when ambient H₂S concentrations of 10 ppm averaged over 3 minute periods are recorded in unevacuated areas; or
- when ambient H₂S concentrations of 5 ppm averaged over 8 hours are recorded in unevacuated areas.

3.2.5 Emergency Response

Pursuant to paragraph 48(1)(l) of the Onshore Pipeline Regulations, pipeline companies must have effective emergency response procedures and policies on file with the Board. Such procedures and policies should address the preparedness and involvement of residents along the pipeline system. These groups must be fully informed, and it is the pipeline company's responsibility to provide adequate and appropriate information on pipeline emergencies. In the Board's *Report of the Inquiry Concerning Stress Corrosion Cracking on Canadian Oil and Gas Pipelines* (MH-2-95), a recommendation regarding community relations was made to pipeline companies. On page 99 of that report, it was recommended that

the Board review companies' emergency response practices to ensure that adequate training is provided to the first responder organizations and that appropriate information is provided to the communities on the proper procedures to follow in the event of pipeline emergencies.

Souris stated that one-on-one discussions and annual public awareness sessions involving residences, businesses, and first responder agencies in the area of the pipeline will be conducted prior to the line being put into service. Souris's parent company, DGC, operates a natural gas pipeline in North Dakota which interconnects with the pipeline of Northern Border Pipeline Company.

Souris filed a draft Emergency Response Plan and will be filing its final ERP at a later date for Board approval.

Views of the Board

The Board is of the view that the selection of the 324 mm (12.75 inch) OD option for the proposed pipeline is appropriate. The Board is satisfied with Souris' commitment to design the proposed facilities to meet the CSA standards for a Class 1 sour service CO₂ pipeline.

Given the unique design considerations for a CO₂ pipeline, the Board is satisfied with Souris' proposed operating conditions and control measures. To reinforce the Board's concern for safety during operation of the proposed pipeline, two conditions relating to the prevention of internal corrosion will be included in the certificate. The first condition relates to excessive levels of H₂S entering the pipeline and requires that the pipeline be operated with a maximum of 2.0 mole percent H₂S in the product stream. The second condition relates to the amount of free water entering the pipeline and requires that the pipeline be operated with moisture concentration levels below 16 kg per million cubic metres (1 lb/MMcf).

The Board is concerned that the Souris application, prepared evidence and responses to information requests contained many unit conversion errors. The Board expects that Souris will be careful in preparing its detailed design and will ensure that the final design will be free of similar mistakes which could jeopardize the safety of public and employees during both construction and operation of the proposed pipeline.

A prudent fracture control design provides sufficient CVN energy to eliminate the possibility of brittle fracture propagation. Regarding the fracture prevention design, the Board agrees that the specified CVN energy is appropriate for the prevention of brittle and ductile fracture initiation and propagation. Therefore, the Board is satisfied that Souris has undertaken adequate fracture prevention measures to exceed the level of safety specified in CSA Z662.

The Board finds that the proposed SCADA system will provide for the level of safety required by CSA Z662. Since information with respect to the performance of the leak detection system is not available at this time, the Board will require Souris to file this information for Board approval prior to commencement of construction.

The Board is satisfied that, taking into account design features, accident probabilities, meteorological probabilities, and the Impact Probability Analysis in conjunction with the hazard analysis filed on 21 July, the likelihood of a release impacting public safety is remote.

The Board is satisfied with the information provided by Souris with respect to emergency planning zones and the specific criteria that the public within the emergency planning zone would be evacuated in the event of a release.

The Board notes that DGC, the operator of the proposed pipeline, has experience in dealing with landowners and emergency personnel in rural areas since it currently operates a natural gas pipeline in North Dakota. The Board expects the necessary action will be taken to ensure that affected residents are educated on proper procedures in the event of a pipeline emergency. The Board will continue to examine Souris' emergency response practices as part of its ongoing safety auditing function.

Chapter 4

Environment and Land Matters

4.1 Environmental Screening Report

In November 1997 the Board initiated a scoping process for the Souris project in accordance with the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements*¹. Prior to making a final scoping determination, the Board solicited comments from the public and other federal departments and agencies on a draft scope of the environmental assessment. To facilitate public awareness of the scoping exercise, the Board required Souris to publish notices in two national and seven regional newspapers. The draft scoping package was released on 21 November 1997. The Board requested that written comments on the draft scope be filed by 15 December 1997. The Board received only one letter as a result of this process, from Environment Canada.

The decision on the scope of the environmental assessment was attached to the hearing order setting down the Souris application. The hearing order, which was distributed on 28 January 1998, allowed for letters of comment on the application to be filed with the Board by 4 May 1998. While *Mouvement au Courant* ("MAC") did not comment on the scope of the environmental assessment by 15 December 1997, it did file a letter of comment dated 4 May 1998 commenting on the scope of the assessment. In its letter of comment, MAC argued that the PanCanadian Weyburn Miscible Flood Project ought to have been included in the environmental assessment. Both Souris and PanCanadian provided responses to this letter of comment. The Board found no reason to expand the scope as all arguments raised by MAC had been considered by the Board prior to the decision being made.

The Board conducted an environmental screening of the applied-for facilities in compliance with CEAA and completed an Environmental Screening Report ("Report") pursuant to CEAA and the Board's own regulatory process. In addition to matters directly pertaining to the environment, the Report also addressed matters pertaining to public consultation.

The Report was released on 10 August 1998 to parties who requested an opportunity to comment. In its letter of 21 August 1998, MAC requested that the Board reconsider its scoping decision in light of *The Friends of the West Country Association v. Minister of Fisheries and Oceans, Director, Marine Programs, Canadian Coast Guard*² decision. The Board is of the view that there is no need for it to decide whether or not it can or should consider such a request at this stage of the proceedings as there is no discrepancy between the court case and the Board's decision. *Sunpine* confirms that discretion with regard to scoping remains with the Board, particularly where a project that might be included in the scope is being proposed by a party other than the proponent. The Board is satisfied that the scope of the environmental assessment is appropriate for the Souris Valley CO₂ Pipeline project.

¹ SOR/97-181

² (7 July 1998), F.C.T.D., T-1893-96 ("*Sunpine*")

In addition to those environmental mitigative measures set out in the application and the attached conditions, Souris undertook to implement the following:

- No hazardous materials or dangerous goods would be stored at the SCADA building at Goodwater, Saskatchewan.
- Should the hydrostatic test water require additives, Souris would obtain permission from the appropriate authorities concerning the disposal of the hydrostatic test water.
- Planned blowdown events would be activated between breakfast and dinner hours.
- Sensitive wildlife periods would be respected when scheduling planned blowdown events, and Souris will contact the provincial wildlife authorities prior to scheduling a planned blowdown.
- Construction would be suspended when soil horizon mixing occurs or rut depth is greater than or equal to 10 cm (3.9 inches).

Copies of the Report are available upon request from the Board's Regulatory Support Office.

4.2 Land and Right-of-Way Matters

4.2.1 Criteria and Route Selection

During the initial planning of the project, a route evaluation was conducted taking into account environmental matters and land use concerns. Using this information, a preferred 5 km (3 mi.) corridor was identified. Additional analyses were then conducted to determine an appropriate route within the corridor. The criteria used to determine the appropriate route included:

- proximity to critical wildlife habitat;
- amount of native vegetation crossed;
- historical archaeological heritage sites; and
- general terrain features.

The proposed route will originate at the United States border at the proposed tie-in at 1-1-10 W2M. The pipeline route travels in a northwest direction approximately 21 km (13 mi.) to SW 8-2-10 W2M, where it crosses Highway 18 and the Canadian Pacific Railway line approximately 3 km (2 mi.) west of Outram. The pipeline would then continue northwest for 34 km (21 mi.), crossing primary grid road 606, and extend to a location 5 km (3 mi.) southeast of Goodwater at SW 3-5-13 W2M. From this point, the pipeline would turn north and cross approximately 4 km (2.5 mi.) of the Lomond Prairie Farm Rehabilitation Administration pasture. The route then leaves the Lomond pasture at SW 22-5-13 W2M and extends north another 2 km (1.2 mi.) to the receiving terminus at SW 34-5-13 W2M. The proposed route will pass through three Rural Municipalities (Cambria, Cymri, and Lomond).

Souris indicated that it had considered paralleling existing linear disturbances during its route selection process. However, with the exception of roads, there were no such disturbances available which would not bring the route within closer proximity to inhabited facilities. A primary goal during route selection was to maximize separation distance between the pipeline and such inhabited facilities.

4.2.2 Land Requirements

The pipeline would be contained within a permanent new right-of-way access easement of 15 m (50 ft.). An additional 7.6 m (25 ft.) of easement would be sought from landowners along the route to facilitate construction. The temporary easement may need to be expanded an additional 7.6 m (25 ft.) in areas requiring special construction methods.

With respect to land acquisition, Souris stated that notices pursuant to section 87 of the Act had been served on all affected landowners and that easements have been acquired for all privately owned land.

Views of the Board

The Board has considered the Environmental Screening Report and is of the view that, taking into account the implementation of the proposed mitigative measures in the application, adduced in evidence and set out in the attached conditions, the Souris project is not likely to cause significant adverse environmental effects. This represents a decision pursuant to paragraph 20(1)(a) of CEAA.

The Board finds the criteria identified by Souris to be acceptable for the purpose of route selection. The Board further finds that Souris' approach to route selection was acceptable and resulted in an appropriate general route for the pipeline.

The potential impacts of the construction of the pipeline on affected landowners, including the amount of land required for easements and temporary work space, have been considered by the Board. The Board finds that Souris' anticipated requirements for easements and temporary work space are reasonable and justified in this application.

Chapter 5

Disposition

The foregoing constitutes our Reasons for Decision in respect of the application heard by the Board in the MH-1-98 proceeding. The Board is satisfied from the evidence that the applied-for facilities are and will be required by the present and future public convenience and necessity.

The Board approves Souris' application made pursuant to section 52 of the Act for the construction and operation of the Souris Valley Pipeline and will recommend to the Governor in Council that a certificate be issued, subject to the conditions set out in Appendix II.

J.A. Snider
Presiding Member

A. Côté-Verhaaf
Member

G. Caron
Member

Calgary, Alberta
September 1998

Appendix I

MH-1-98 List of Issues

In the Direction on Procedure the Board identified, but did not limit itself to, the following issues for discussion in the hearing:

1. The economic feasibility of the proposed Souris Valley CO₂ Pipeline Project.
2. The potential commercial impacts of the proposed Souris Valley CO₂ Pipeline Project.
3. The adequacy of the public consultation process.
4. The potential environmental effects and socio-economic effects of the proposed Souris Valley CO₂ Pipeline Project including those factors outlined in subsection 16(1) of the *Canadian Environmental Assessment Act*.
5. The routing and location of the proposed facilities and the land rights acquisition.
6. The safety of the design and operation of the proposed facilities.
7. The method of toll and tariff regulation, including whether Souris should be regulated as a Group 2 pipeline.
8. The terms and conditions to be included in any order which may be granted.
9. The need for the proposed facilities.
10. The appropriateness of the proposed method of financing the project.

Appendix II

Certificate Conditions

General Conditions

1. Souris shall cause the approved facilities to be designed, constructed, operated and abandoned in accordance with the applicable provisions of CSA Z662.
2. Unless the Board otherwise directs:
 - (a) Souris shall cause the approved facilities to be designed, manufactured, located, constructed and installed in accordance with those specifications, drawings and other information or data set forth in its application, or as otherwise adduced in evidence before the Board, except as varied in accordance with paragraph (b) hereof; and
 - (b) Souris shall cause no variation to be made to the specifications, drawings or other information or data referred to in paragraph (a) without the prior approval of the Board.
3. Unless the Board otherwise directs, Souris shall implement or cause to be implemented all of the policies, practices, recommendations, and procedures for the protection of the environment included in or referred to in its application, the environmental reports filed as part of its application or its undertakings made to other government agencies, or as otherwise adduced in the evidence before the Board.

Prior to the Commencement of Construction

4. Unless the Board otherwise directs, at least ten (10) days prior to the commencement of construction of the approved facilities, Souris shall file with the Board a detailed construction schedule or schedules identifying major construction activities, including, but not limited to, intermittent drainages and water crossings, and shall notify the Board of any modifications to the schedule or schedules as they occur.
5. Souris shall file with the Board copies of any permits or authorizations which contain environmental conditions for the applied-for facilities issued by federal, provincial, and other permitting agencies, as these authorizations or permits are received. In addition Souris shall maintain, in the construction office(s), files containing any such information.
6. Unless the Board otherwise directs, Souris shall, at least fourteen (14) days prior to the commencement of construction of the approved facilities, file with the Board a copy of the spring and summer Rare Plant Surveys and the Wildlife Survey and comments provided by Saskatchewan Environment and Resource Management on the surveys.

7. Unless the Board otherwise directs, Souris shall, at least fourteen (14) days prior to the commencement of construction of the approved facilities, file with the Board for approval the detailed specifications for both the line pipe and components to be used on the pipeline.
8. Souris shall establish a quality assurance program, which may comprise the requirements of a recognized standard, to ensure that the line pipe and components to be used on the pipeline meet the detailed specifications referred to in its application.
9. Unless the Board otherwise directs, Souris shall retain the detailed information with respect to its quality assurance program referred to in condition 8 for one year after the date on which leave to open the pipeline is granted.
10. Unless the Board otherwise directs, Souris shall, at least fourteen (14) days prior to the commencement of construction of the approved facilities, demonstrate to the Board's satisfaction that it has obtained the necessary approvals and authorizations relating to any federally regulated railway crossings which fall within Transport Canada's mandate.
11. Unless the Board otherwise directs, Souris shall, at least fourteen (14) days prior to the commencement of construction of the approved facilities, file with the Board for approval the detailed specifications and standards set out for the leak detection system.
12. Unless the Board otherwise directs, Souris shall, at least thirty (30) days prior to the commencement of field joining, file with the Board for approval a field joining program which provides for a level of safety at least equivalent to the level of safety generally provided for by CSA standards and sets out:
 - (a) the field joining specifications;
 - (b) the field joining procedures;
 - (c) the requirements for the qualification of field joining procedures;
 - (d) the nondestructive examination procedures;
 - (e) the requirements for the qualification of field joiners;
 - (f) the requirements for the qualification of field joining inspectors;
 - (g) the requirements for the qualification of the personnel engaged in nondestructive examination;
 - (h) the standards of acceptability of imperfections; and
 - (i) the procedures for the repair or removal of field joint defects.
13. If Souris contracts for the provision of services in respect of the construction of the pipeline, Souris shall:

- (a) inform the contractor of the presence of any special conditions associated with the pipeline construction;
 - (b) inform the contractor of the special safety practices and procedures necessitated by the conditions or features specific to the construction;
 - (c) take all reasonable steps to ensure that construction activities are conducted in accordance with the construction safety manual referred to in condition 15; and
 - (d) authorize a person to halt a construction activity in circumstances where, in the judgment of that person, the construction activity is not being conducted in accordance with the construction safety manual referred to in condition 15, or is creating a hazard to any person at the construction site.
14. Where the safety of the public may be adversely affected by the construction of the pipeline, all reasonable steps shall be taken to ensure that:
- (a) the construction activities do not create a hazard to the public; and
 - (b) any member of the public at the construction site is informed of the practices and procedures that are to be followed for the member's safety.
15. Unless the Board otherwise directs, Souris shall, at least thirty (30) days prior to the commencement of construction of the pipeline, file with the Board for approval, a construction safety manual which provides for a level of safety at least equivalent to the level of safety provided for by CSA standards and sets out:
- (a) the general safety practices and procedures to be followed in the construction of the pipeline which may incorporate provincial regulations respecting occupational health and safety for construction projects, or other regulations;
 - (b) the special safety practices and procedures necessitated by the conditions or features specific to the construction of the pipeline;
 - (c) a description of the method or program in place to fulfil the responsibilities of the company in conditions 13 and 14; and
 - (d) the name or position, and qualifications, of the person authorized to halt construction pursuant to condition 13.

During Construction

16. Unless the Board otherwise directs, Souris shall, during construction, ensure that specialized habitat for wildlife and plants with a designated status will be avoided, relocated or restored in consultation with Saskatchewan Environment and Resource Management.
17. Where the pipeline is carried across a utility or private roadway, Souris shall:

- (a) ensure that there is no undue interference with the use of the utility or roadway during construction;
 - (b) on request, submit to the Board a crossing report setting out:
 - (i) the description and location of the private roadway or utility, and
 - (ii) the name of the owner of or the authority having control over the private roadway or utility.
- 18. Unless the Board otherwise directs:
 - (a) Souris shall construct the pipeline in accordance with the construction safety manual approved by the Board pursuant to condition 15; and
 - (b) a copy of the construction safety manual referred to in condition 15 or the relevant parts thereof, shall be kept at each construction site of the pipeline in a location where the copy is accessible to every person engaged in the construction at that site.
- 19. Souris shall, during construction, maintain for audit purposes at each construction site, a copy of the joining procedures and non-destructive testing procedures used on the project together with all supporting documentation.
- 20. Unless the Board otherwise directs, subject to condition 22, where Souris conducts field joining it shall do so in accordance with the specifications, procedures, requirements or standards set out in the field joining program for the construction of the pipeline approved by the Board pursuant to condition 12.
- 21. Unless the Board otherwise directs, Souris shall nondestructively examine the entire circumference of each field joint.
- 22. Where an imperfection contained in a field joint does not meet the standards of acceptability of imperfections set out in the field joining program pursuant to condition 12(h) and Souris proposes to accept the imperfection, Souris shall submit an engineering critical assessment of the field joint to the Board for approval.
- 23.
 - (1) Souris or an agent independent of any construction contractor retained by Souris shall inspect the construction to ensure that it is in accordance with this certificate and with any commitments made by Souris in the pipeline project application.
 - (2) The inspection referred to in this condition shall be performed by a qualified inspector.
- 24. Souris shall pressure test the main line and terminus piping and components used in its pipeline in accordance with the pressure testing program referred to in condition 25 and with conditions 29 to 32 before it operates the pipeline.
- 25. The pressure testing program shall consist of the information filed pursuant to condition 26 and the approved pressure testing manual submitted pursuant to condition 27.
- 26. Unless the Board otherwise directs, Souris shall, at least thirty (30) days prior to pressure testing the piping and components used in the pipeline, file with the Board:

- (a) a diagram of the test section that indicates the portion of the pipeline to be tested and, where appropriate, the configuration and physical parameters of the piping and components to be tested;
 - (b) the proposed date of the test; and
 - (c) a confirmation that any permits that are required to be obtained from any authority other than the Board in respect of the use and disposal of water for test purposes have been obtained.
27. Unless the Board otherwise directs, Souris shall, at least thirty (30) days prior to pressure testing the pipeline, file with the Board for approval, a pressure testing manual which provides for a level of safety at least equivalent to the level of safety provided for by CSA standards, and sets out the test procedure and a detailed description of:
- (a) the instruments to be used and the degree of accuracy and the calibration of the instruments;
 - (b) the safety procedures to be implemented during the test;
 - (c) the test medium and the additives;
 - (d) the procedures to be used during line filling, pressurizing and depressurizing and the environmental protection measures, if any, to be implemented; and
 - (e) the criteria by which the results of the test are to be evaluated.
28. Unless the Board otherwise directs, if Souris changes the date of any pressure testing to be conducted from the date submitted pursuant to condition 26, Souris shall notify the Board of the change at least 48 hours before the new test is scheduled to start.
29. (1) The pressure testing shall be performed under the direct supervision of Souris or an agent appointed by Souris, any agent being independent of any contractor who carries out the pressure testing program and of any contractor who constructed the pipeline.
- (2) Souris or the agent shall date and sign any logs, test charts and other test records that are referred to in clauses 8.6.2.4 and 8.6.3.3 of CSA Z662-96.
30. The pressure-recording and temperature-recording instruments used in a pressure test shall be located so as to obtain accurate measurements of the temperature and pressure of the test medium and, where applicable, the ground temperature and the air temperature.
31. The test pressure shall not fall below 97.5 per cent of the minimum strength test pressure specified in Table 8.1 of CSA Z662-96.
32. All pressure losses and additions and withdrawals of test medium that are required to maintain the test pressure shall be recorded and reconciled with the test data within the degree of accuracy of the instruments.

33. Where pre-tested pipe assemblies or segments are installed in the pipeline, the number of welds in the installations not subjected to a pressure test shall be minimized to the extent practicable.

Post Construction

34. Souris shall, prior to the commencement of seeding, provide confirmation that the approval of any seed mixtures or other revegetation actions, required in the revegetation of work sites, has been received from the appropriate regulatory body.
35. Souris shall file with the Board, prior to seeding, any variations in the recommended seed mixes or other revegetation actions, required in the revegetation of work sites as outlined in the assessment reports, that may have occurred as a result of discussions with Saskatchewan Environment and Resource Management and Prairie Farm Rehabilitation Administration, as appropriate.
36. Unless the Board otherwise directs, Souris shall file with the Board a post-construction environmental report within six (6) months of the date that the pipeline is placed in service. The post-construction environmental report shall set out the environmental issues that have arisen up to the date on which the report is filed and shall:
 - (a) where options have been provided for, provide a description of which practices, procedures and recommendations have been implemented during the construction process and the reasons for the choice of the option;
 - (b) indicate the issues resolved and those unresolved; and
 - (c) describe the measures Souris proposes to take in respect of the unresolved issues.
37. Unless the Board otherwise directs, Souris shall file with the Board on or before the 31 December that follows each of the first two complete growing seasons following the filing of the post-construction environmental report referred to in condition 36:
 - (a) a list of the environmental issues indicated as unresolved in the report and any that have arisen since the report was filed; and
 - (b) a description of the measures Souris proposes to take in respect of any unresolved environmental issues.
38. Unless the Board otherwise directs, the right of way and temporary work areas of the pipeline shall be restored to the condition described in the application.
39. Unless the Board otherwise directs, Souris shall, at least thirty (30) days prior to placing the pipeline in operation, file with the Board for approval, operation and safety manuals which provide for a level of safety at least equivalent to the level of safety generally provided for by CSA Standards.

40. The operation and maintenance manuals referred to in condition 39 shall set out, in addition to the information and procedures referred to in clause 10 of CSA Z662-96, the following information and procedures in respect of the operation and maintenance of the pipeline:
- (a) information on materials and equipment;
 - (b) procedures for the operation of terminus station, control and data acquisition systems, instrumentation and alarms, and the safety precautions in respect of those operations,
 - (c) a description of the pipeline's hydraulic characteristics;
 - (d) the maximum operating pressure for the pipeline;
 - (e) a description of the pressure control devices installed on the pipeline;
 - (f) a description of the communication facilities and their operation;
 - (g) the procedures and equipment for accident prevention and fire protection;
 - (h) a description of the corrosion prevention and corrosion monitoring systems;
 - (i) the maintenance procedures for the pipeline and the right of way of the pipeline;
 - (j) the monitoring and surveillance programs for the protection of the pipeline and the environment;
 - (k) the location of the pipeline and a description of the access thereto;
 - (l) the emergency procedures; and
 - (m) a description of the significant physical characteristics of the fluids to be transported in the pipeline.
41. Souris shall:
- (a) at each station of the pipeline, keep up-to-date copies of the pipeline's operation and maintenance manuals;
 - (b) conduct operation and maintenance activities on the pipeline in accordance with the pipeline's operation and maintenance manuals; and
 - (c) inform all persons associated with an operation and maintenance activity on the pipeline of:
 - (i) the safety practices and procedures to be followed, and
 - (ii) the relevant portions of the operation and maintenance manuals.
42. The emergency procedures referred to in condition 40(l) shall include:
- (a) a statement of the scope of application of the emergency procedures;

- (b) a detailed description of the facilities to which the emergency procedures apply, including:
 - (i) the location of and means of access to the facilities, and
 - (ii) the size of the piping involved;
 - (c) a description of the pressure, flow rate and other normal operating conditions of the pipeline;
 - (d) the procedures for the documentation of emergencies;
 - (e) the instructions and warnings to be given to persons reporting an emergency;
 - (f) the initial action to be taken on discovery of an emergency;
 - (g) the names and telephone numbers of company personnel or departments to be contacted in the case of an emergency and the respective responsibilities of the personnel or departments;
 - (h) the names and telephone numbers of public services and other agencies that might have to be contacted in the case of an emergency;
 - (i) the plans for cooperation with appropriate public agencies during an emergency;
 - (j) a description of the types and locations of available emergency equipment and, a description of the types and locations of portable emergency shut-off devices;
 - (k) the procedures to be followed at the site of the emergency;
 - (l) the safety precautions to be taken during an emergency, including:
 - (i) the handling of the fluid transported by the pipeline,
 - (ii) the isolation and shut-off procedures for stations of the pipeline, and
 - (iii) the methods for monitoring the hazard level at the site;
 - (m) a list of the environmentally sensitive areas that would require special attention during an emergency;
 - (n) contingency plans for the immediate protection of the environment; and
 - (o) evacuation procedures.
43. Souris shall update the pipeline's operation and maintenance manuals in respect of the plans and procedures referred to in condition 42(i) and (o) on a regular basis in conjunction with the appropriate authorities.
44. Souris shall have safety training programs for its employees who are directly involved in the operation and maintenance of the pipeline, which programs shall instruct the employees on:

- (a) the safety regulations and procedures applicable to the day-to-day operation of the pipeline and on the proper operation of the equipment that the employees could reasonably be expected to use; and
 - (b) the emergency procedures referred to in condition 42 and the operation of all emergency equipment that the employees could reasonably be expected to use.
45. Souris shall require its employees to attend the safety training programs referred to in condition 44 and to have a good knowledge of the subject-matter of those programs.
46. Souris shall:
- (a) have communication facilities for the safe and efficient operation of the pipeline and for emergency situations;
 - (b) test instruments and equipment of the pipeline periodically to demonstrate their proper and safe operation;
 - (c) clearly mark sectionalizing valves on the pipeline to identify their open and closed positions;
 - (d) clearly mark isolating valves, blowdown valves and other major valves within a station of the pipeline to identify the open and closed positions and their function; and
 - (e) post, along the boundaries of the stations of the pipeline, the name of the company and the telephone number to be called in the event of an emergency involving the pipeline.
47. Souris shall ensure that the noise levels during operation of any facilities:
- (a) meet the noise level requirements of any applicable provincial or municipal legislation;
 - (b) do not constitute a hazard to the public; and
 - (c) do not adversely affect any wildlife known to exist within the vicinity of the facilities.
48. Souris shall ensure that the maximum concentration of H₂S in the product stream does not exceed 2.0 mole percent.
49. Souris shall ensure that the moisture content of the product stream remains below 16 kilograms of water per million cubic metres (1.0 lb/MMcf) of product.
50. Unless the Board otherwise directs, where the Class location of a section of a pipeline changes to a higher designation having a more stringent location factor, Souris shall, within three months of the change, submit to the Board for approval Souris' proposed plan to deal with the change.
51. Souris shall report to the Board every incident relating to the construction, operation or abandonment of its pipeline that:

- (a) results in the death of a person or in an injury that requires a person to be hospitalized;
 - (b) results in an explosion;
 - (c) results in the removal from service of any main line piping;
 - (d) results in an inadvertent and uncontrolled escape of gas;
 - (e) results in the discharge of toxic substances on land or into a body of water;
 - (f) results in an interruption in the operation of the pipeline;
 - (g) represents an emergency situation as set out in the scope of application of the emergency procedures referred to in condition 42(a); or
 - (h) in the judgment of the company is significant even though it does not meet any of the criteria set out in the above paragraphs.
52. Notwithstanding condition 51, Souris need not make a report on an incident that meets only the criterion of paragraph 51(c) or (f) if the incident occurred solely as a result of planned or routine maintenance.
53. Unless the Board otherwise directs, where, pursuant to condition 51, Souris makes a report, it shall make the report forthwith after the occurrence of the incident and the report shall set out, to the extent that the information is available:
- (a) the area affected, the material released and the nature, location, date and time of the incident;
 - (b) the name and occupation of every person hospitalized or killed as a result of the incident and the condition and location of any person so hospitalized;
 - (c) a description of any interruption of or reduction in service resulting from the incident;
 - (d) a description of any action taken by the company to protect the public and to return the pipeline to operation;
 - (e) the availability of the damaged parts of the pipeline; and
 - (f) the nature and extent of environmental concerns.
54. Where, pursuant to condition 51, Souris makes a report, it shall, as soon as detailed information on the incident is available, submit a written report to the Board setting out, where applicable:
- (a) confirmation of the accuracy of the information submitted pursuant to condition 53;

- (b) the history of failure, if any, of the type of pipe or component involved in the incident and a description of the repairs that have been made to that type of pipe or component as a result of the past failures;
- (c) the cause, nature and analysis of the incident;
- (d) the chemical composition of the substance being transported in the pipeline at the time and location of the incident;
- (e) the pressure in the pipeline at the time and location of the incident;
- (f) a detailed description of the events leading up to and following the incident;
- (g) where the incident involved a break in the pipeline, the relevant details of any failure or malfunction of any equipment that may have contributed to or resulted from the break;
- (h) an estimate of the loss of volume, if any, that resulted from the incident;
- (i) the date or expected date of return to operation of the pipeline;
- (j) a detailed description of any repairs and restorations to the pipeline made necessary by the incident;
- (k) the name and occupation of every person hospitalized or killed as a result of the incident and the condition and location of any person so hospitalized;
- (l) a detailed description of the impact of the incident on terrain, property, livestock, fish, wildlife and habitat of fish and wildlife;
- (m) a description, sketch or photograph of the area affected by any product that escaped from the pipeline as a result of the incident;
- (n) a detailed description of any interruption or reduction of service as a result of the incident;
- (o) a description of the weather conditions at the time and location of the incident;
- (p) the names of the agencies or authorities to whom the incident was reported and the date and time of the reporting;
- (q) a description and evaluation of the environmental impact of the clean-up and disposal methods used;
- (r) where the incident involved a spillage of a liquid test medium or toxic substance, an outline of the program the company proposes to follow to rehabilitate the affected area; and

- (s) any comments relevant to the incident that are necessary for a complete understanding of the incident.
55. Where an incident described in condition 51 occurs, Souris shall, on request, submit to the Board a written report describing the proposed permanent repairs to the pipeline required as a result of the incident and the measures the company has taken or will take for the restoration and monitoring of the terrain where the incident occurred.
56. Souris shall:
- (a) keep separate books of account in Canada in a manner consistent with generally accepted accounting principles until the expiration of one year after such time as the Board grants leave to abandon the operation of the pipeline; and
 - (b) file a set of audited financial statements with the Board within one hundred and twenty (120) days after the end of each fiscal year of the company.
57. Souris' accounting records referred to in condition 56(a) shall provide sufficient particulars to show fully the facts pertaining to all entries made in the accounts.
58. The books, accounts and records referred to in these conditions shall include not only accounting records in a limited technical sense, but all records such as minute books, capital stock records, reports, correspondence memoranda, computer printouts and data files that may be useful in determining the history of or facts pertaining to any transaction.
59. The books, accounts and records shall be readily accessible for examination by representatives of the Board.
60. Should Souris propose to deactivate the pipeline for 12 months or more, Souris shall apply to the Board for approval of the deactivation.
61. Where the pipeline has been deactivated for 12 months or more, Souris shall not reconnect or reactivate the pipeline unless:
- (a) it has applied for and received Board approval for the reconnection or reactivation; and
 - (b) the pipeline has been retested in accordance with conditions 24 to 33.
62. Should Souris abandon the pipeline and leave it in place, the company shall:
- (a) disconnect the abandoned pipeline from any pipeline that continues to operate;
 - (b) fill the abandoned pipeline with a medium approved by the Board pursuant to an application for leave to abandon;
 - (c) seal the abandoned pipeline; and
 - (d) maintain the cathodic protection of the abandoned pipeline if so ordered by the Board.

63. For one year after leave to abandon the operation of the pipeline is granted pursuant to paragraph 74(1)(d) of the Act, Souris shall retain:
- (a) information in respect of manufacturing procedures used for line pipe and components in the pipeline, including, where available:
 - (i) the steel-making procedures,
 - (ii) the casting procedures,
 - (iii) the hot and cold forming procedures, the rolling procedures outlining the degree of cross-rolling, the schedule and temperature of reductions, any special thermal control procedures and the hot coiling temperatures,
 - (iv) the heat treatment procedures,
 - (v) the size of the production heats in the case of plate or skelp manufacture,
 - (vi) the method of forming and welding,
 - (vii) the mill welding procedures and, where applicable, the type and size of welding consumables, the grade of flux, the electrical conditions and welding head and joint alignment,
 - (viii) the method of cold expansion, where applicable, and
 - (ix) the manufacturing qualification procedures;
 - (b) the production reports and mill certificates on the line pipe and components, including:
 - (i) the number and size of heats used,
 - (ii) the total number of pipe lengths obtained from each heat,
 - (iii) the results of chemical composition, mechanical property and metallurgical testing performed in accordance with the detailed specifications referred to in the application including retest results where applicable,
 - (iv) the number of rejected pipe lengths and principal components out of the total number manufactured for the company's order, the causes of rejection, and documentation of the types of rejectable weld and parent metal defects found during inspection and testing, and
 - (v) the actual pressure test levels and the number and cause of failures encountered during mill hydrostatic testing;
 - (c) the specifications and name-plate data, if any, of major equipment of the pipeline; and
 - (d) the reports of any surveillance and inspection programs of the pipeline.
64. After leave to abandon the operation of the pipeline is granted pursuant to paragraph 74(1)(d) of the Act, Souris shall retain accurate records of the location of all buried facilities of the pipeline until they are removed.
65. Souris shall catalogue and store, for five years after the date on which leave to open the pipeline is granted evidence of the nondestructive examinations required by condition 20 and shall take reasonable care to preserve the quality of the evidence.
66. Souris shall keep the documentation on any reported incidents related to the transmission facilities of the pipeline or section thereof for one year after leave to abandon the operation of the pipeline or section thereof is granted.

67. Unless the Board otherwise directs prior to 31 December 2000, this certificate shall expire on 31 December 2000 unless the construction and installation of the proposed Souris Valley Pipeline has commenced by that date.