



National Energy
Board

Office national
de l'énergie

Reasons for Decision

Westcoast Energy Inc.

MH-1-2001

October 2001

Sulphur Pipeline

National Energy Board

Reasons for Decision

In the Matter of

Westcoast Energy Inc.

Pine River Gas Plant - Sulphur Pipeline

MH-1-2001

October 2001

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Abbreviations & Definitions

Act	<i>National Energy Board Act</i>
ASME/ANSI	American Society of Mechanical Engineers, Inc./American National Standards Institute
auto ignition	temperature at which sulphur dust-air mixture or sulphur will ignite without an external ignition source
Board	National Energy Board
°C	degrees Celsius
circulated glycol/ water jacket system	a heat tracing method where a mixture of glycol and water is heated by boiler and circulated in a jacket that surrounds the pipeline
CAP	Communication and Awareness Plan
Comprehensive Plan	Pine River Gas Plant Sulphur Pipeline Comprehensive Plan
EHSMS	Environment, Health and Safety Management System
electric skin effect heat tracing	an industrial electric heat tracing method utilizing the skin effect of an alternating current phenomenon developed on the inner surface of a ferromagnetic tube
ESD valve	emergency shutdown valve
ER	emergency response
°F	degrees Fahrenheit
FERP	Field Emergency Response Plan
flash point	lowest temperature at which vapours from liquid sulphur will ignite momentarily upon the application of a small flame under specified conditions
H ₂ S	hydrogen sulphide
heat tracing	a method employed to keep the liquid sulphur from solidifying in the pipeline by applying an external heat source
km	kilometre
hydraulic shock	shock waves created when a column of liquid sulphur moving in the pipeline is stopped suddenly

hydrostatic testing	process of filling the sulphur pipeline with water under pressure to confirm the pressure retaining capacity of the pipeline and detect leaks
m	metre
magnetic particle inspection	process to allow visual detection of flaws in the sulphur pipeline by magnetizing the pipeline and applying a magnetic powder to the surface
mineral insulated heat tracing	a heat tracing method using a cable having bare solid conductors supported and insulated by a highly compressed refractory material enclosed in a liquid- and gas-tight metal tube sheathing
mm	millimetre
ppm	parts per million
SO ₂	sulphur dioxide
SERP	Sulphur Pipeline Emergency Response Plan
split body valve	a valve whose body is in two pieces and held together by bolts
stem packing	a system that consists of a deformable material, usually in the form of rings compressed in a box to provide an effective pressure seal
Streamlining Order	Order XG/XO-100-2000 issued by the Board to allow certain routine projects that do not require environmental assessment under the <i>Canadian Environmental Assessment Act</i> , nor have the potential to affect the public, to proceed without an application
sulphur pipeline	Pine River Gas Plant Sulphur Pipeline
sulphur plug	solid sulphur in the pipeline preventing flow of liquid sulphur
thermal expansion	increase in the length of the sulphur pipeline when heated
ultrasonic inspection	process to detect flaws or defects in the sulphur pipeline using high frequency sound waves
valve body	the portion of the valve through which the liquid sulphur flows
valve stem	a spindle which can be manually rotated or automatically moved to close or open the valve
Westcoast	Westcoast Energy Inc.

Recital and Appearances

IN THE MATTER OF the *National Energy Board Act* (the Act) and the Regulations made thereunder;

AND IN THE MATTER OF the 16 March 2001 National Energy Board (the Board) Order MO-06-2001, directing Westcoast Energy Inc., pursuant to sections 12 and 48 of the Act, to stop all further work on the Pine River Gas Plant Sulphur Pipeline (sulphur pipeline), other than work required in an emergency situation, and further directing that the sulphur pipeline not be used for transmission until the Board has made a determination that the sulphur pipeline is safe to operate;

IN THE MATTER OF National Energy Board Hearing Order MH-1-2001;

HEARD in Chetwynd, British Columbia on 9 to 12 April 2001;

BEFORE:

R.J. Harrison	Chairman
D.W. Emes	Member
C.L. Dybwad	Member

APPEARANCES:

G.K. Macintosh, Q.C. K. Wharton	Westcoast Energy Inc.
G. Delisle	National Energy Board, Operations Business Unit
C. Wagner	Province of British Columbia, Oil and Gas Commission
D. Mersereau	Burlington Resources Canada Energy Ltd.
M. Iliffe	Enersul Limited Partnership
F.C. Basham M. Bell	Talisman Energy Inc.
D. Embree	On his own behalf
R. Embree	On her own behalf
A. Mackie	On his own behalf
K. Sheen	On his behalf
L. Spenst	On her own behalf

D. Winland	On his own behalf
J. Winland	On behalf of W. Winland
W. Winland	On his own behalf
C. Lasser	District of Chetwynd
D. Gauthier	On his own behalf
S. Napoleon	On his own behalf
D. Reinheimer	On his own behalf
D. Porter	On her own behalf
C. McKinnon	National Energy Board Counsel

Chapter 1

Introduction

In June 1993, the National Energy Board (the Board) granted Order XG-W5-28-93, pursuant to section 58 of the *National Energy Board Act* (the Act), to Westcoast Energy Inc. (Westcoast) for the construction and operation of the Pine River Gas Plant and Grizzly Pipeline System expansion facilities, which included the construction and operation of an above-ground sulphur pipeline. The Pine River Gas Plant Sulphur Pipeline (sulphur pipeline) was designed to be 168 mm (6 inches) in diameter, 5.5 km (3.4 miles) in length, and to carry liquid sulphur from the sulphur recovery plant at the Pine River Gas Plant to a sulphur pelletizing plant. The pipeline was designed for a flow rate of 2000 tonnes/day with a maximum flow rate of 3000 tonnes/day.

Since the sulphur pipeline was commissioned in 1994, there have been a number of operational problems. In several instances sulphur leaks at fittings have ignited resulting in fires, the most serious of which occurred 9 September 2000. This fire destroyed the building housing the line block valve at km 3.26. On 14 September 2000 a Board inspector visited the site of the fire and met with Westcoast employees and area residents. During the 19 September 2000 attempt to start up the sulphur pipeline, the pipeline moved off its supports and a fire occurred at the km 1.5 valve. Board inspectors returned to the sulphur pipeline on 20 to 21 September 2000. This visit resulted in the issuance of an order on 28 September 2000 for Westcoast to stop work on the pipeline until the concerns that had been noted during the 20 to 21 September 2000 visit had been addressed to the satisfaction of the inspectors. These steps resulted in the sulphur pipeline being out of operation between 9 September and 20 October 2000. A further fire occurred on 14 March 2001. Area residents, who were concerned that Westcoast was neither advising them of situations with the potential to adversely affect their safety and health nor addressing their questions, contacted the Board on a number of occasions with their concerns.

By letter dated 7 March 2001, the Board advised Westcoast that, in light of ongoing concerns regarding the operation of the sulphur pipeline, the Board had appointed an investigative Panel to look into the matter. In response to further concerns raised by area residents, including the fire of 14 March 2001, the Board, on 16 March 2001, issued Order MO-06-2001 directing Westcoast to stop all work on the sulphur pipeline and to keep the sulphur pipeline out of service until the Board was satisfied that all safety precautions it considered necessary had been taken or put into place by Westcoast. Following the issuance of this Order, the Board convened an oral hearing under Hearing Order MH-1-2001, issued pursuant to sections 12 and 48 of the Act. The hearing in Chetwynd, British Columbia commenced 9 April 2001 and concluded 12 April 2001. The Board heard evidence and submissions from parties to determine whether:

- the sulphur pipeline requires any reconstruction, repairs or alterations to operate in a safe manner;
- Westcoast's operating procedures are sufficient to ensure the safe operation of the sulphur pipeline;
- there is any risk to health or safety of individuals or the environment from the operation of the sulphur pipeline; and
- the Board should impose terms and conditions on Westcoast should it decide to permit the operation of the sulphur pipeline.

At the conclusion of the hearing, the Board issued oral directions to Westcoast. The Board stated that it continued to have concerns about the adequacy of the design and operation of the sulphur pipeline, but that, from an environmental and public safety perspective, a pipeline was clearly preferable to trucking the sulphur, provided that the pipeline was properly designed and operated.

The Board directed that the sulphur pipeline not be reopened until Westcoast developed a Comprehensive Plan to address the operation of the pipeline, and the Comprehensive Plan had been approved by the Board.¹ Westcoast was advised that the Comprehensive Plan must address, at a minimum, the various commitments that Westcoast had made in the hearing, including:

- proposed modifications to engineering and design of the pipeline to improve the safety and integrity of the facilities;
- operating procedures to ensure the safety of the public, company employees and the environment;
- improved management policies and processes; and
- communication plans for both internal and external communications, including awareness programs and training as appropriate.

The Board encouraged Westcoast to engage the community in the preparation of the Comprehensive Plan, particularly in respect of emergency response and safety issues. Westcoast's Sulphur Pipeline Comprehensive Plan (the Comprehensive Plan) was submitted to the Board on 26 July 2001. Copies of the Comprehensive Plan were provided to parties, and they were given the opportunity to submit comments to the Board.

These Reasons for Decision constitute the Board's findings regarding the issue of whether the sulphur pipeline should be permitted to resume operations. The decision is based on the Board's consideration of the Comprehensive Plan filed by Westcoast and comments on the Comprehensive Plan received from parties to the MH-1-2001 proceeding.

The Board has made a number of findings which will form conditions to its Order. In addition, the text of these Reasons contains a number of recommendations which, while not constituting mandatory conditions, are intended to encourage Westcoast to ensure proper procedures are instituted. These recommendations will also be considered by Board auditors in any future Westcoast audit under the *Onshore Pipeline Regulations*.

¹ On 24 April 2001, the Board provided to Westcoast the scope for the sulphur pipeline Comprehensive Plan (Appendix 1).

Chapter 2

Background

2.1 Pine River Gas Plant Sulphur Pipeline

The sulphur pipeline (refer to figure 2-1) transports sulphur, which is removed from raw natural gas processed at the Pine River Gas Plant, to the Enersul Limited Partnership Plant where it is formed into sulphur pellets. The pipeline includes emergency shut down (ESD) valves at both plants, line block valves at km 1.5 and 3.26 to minimize the volume of sulphur released in the event of a pipeline rupture, and a low point drain between these valves. To facilitate maintenance and provide loops for thermal expansion, the sulphur pipeline is located above ground on pipeline supports. The sulphur is transported in liquid form at a temperature above 119°C using gravity flow. To maintain the sulphur in a liquid form, the pipeline is insulated and three different methods of heating are used. At the pipeline inlet, a circulated glycol/water jacket system is used for heating. Electric skin effect heat tracing is used for the portion of the sulphur pipeline that is located outside of the gas plant and buildings. Mineral insulated electric heat tracing is used at the two line block valves and the terminus building.

The sulphur pipeline was designed in accordance with ASME/ANSI B31.3 Chemical Plant and Petroleum Refinery Piping, 1990 edition.

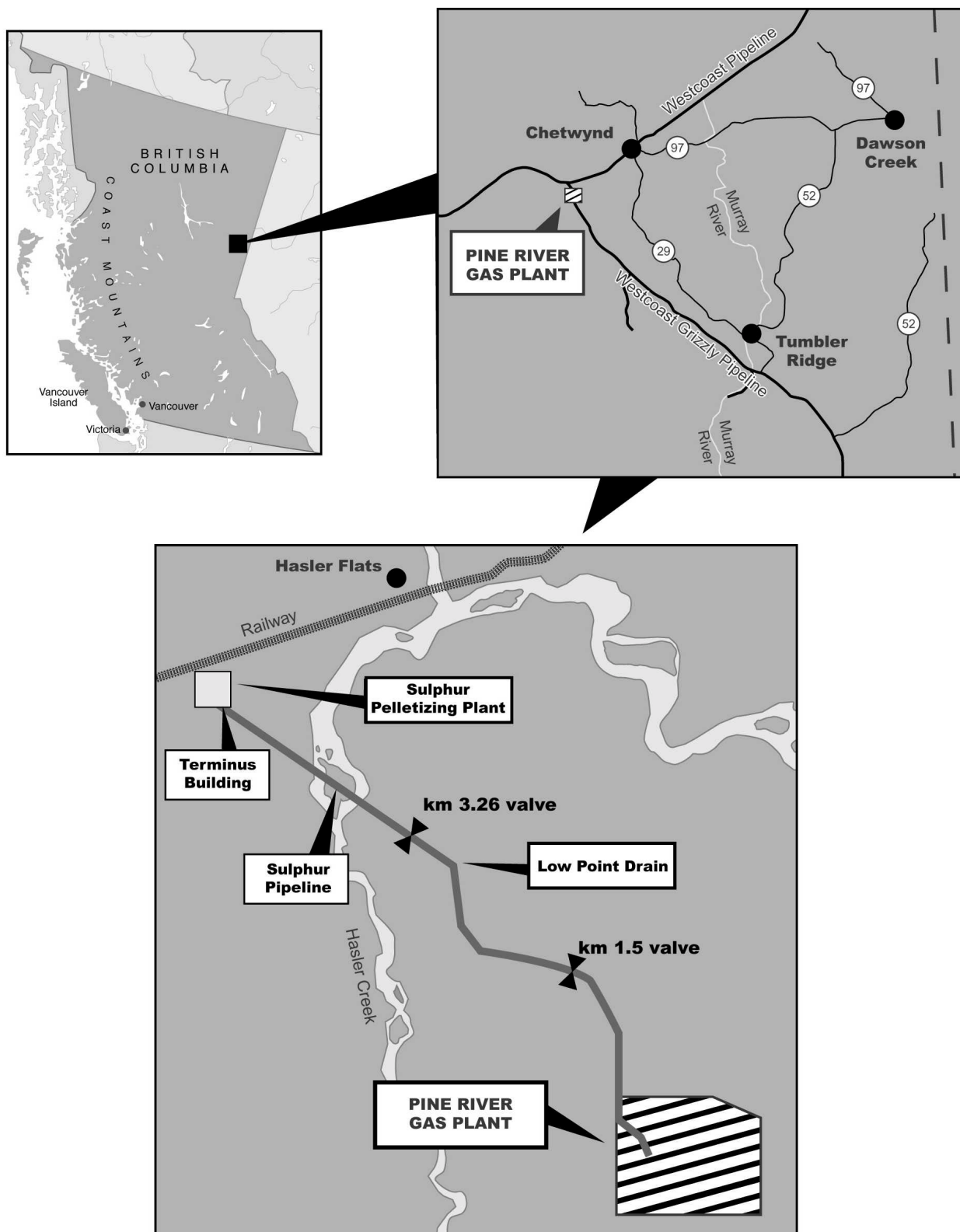
2.2 Operational History

The Pine River Gas Plant currently produces sulphur at a rate of approximately 2,000 tonnes/day. Since commissioning in 1994, the sulphur pipeline has moved approximately 4 million tonnes of sulphur and Westcoast estimated that less than one tonne of sulphur has leaked or spilled from the pipeline.

As the liquid sulphur can contain trace amounts of hydrogen sulphide (H_2S), a recovery system at the Pine River Gas Plant is used to reduce residual H_2S in the liquid sulphur to 10 ppm. Westcoast stated that the concentrations of H_2S in the sulphur pipeline were typically less than 2 ppm; however, between January 1999 and January 2000 there was one incident where H_2S levels exceeded 46.2 ppm. Exposure to levels of H_2S greater than 500 ppm would result in unconsciousness and possibly death.

The sulphur pipeline experienced 114 shut downs between 1994 and 2001; 18 were planned and 96 unplanned. Westcoast identified a potential for sulphur leaks, fires and hydraulic shock incidents during startup if the sulphur solidified in the pipeline during a shutdown. Westcoast also identified a potential for sulphur leaks and fires during normal operations. Maintenance staff reported a history of mechanical and electrical instrumentation problems with the pipeline since it was first commissioned. Mechanical problems were related to leaks on the pipeline. These were confined to a few very specific components, namely small flanges within the terminus building, the split body line block valves located at km 1.5 and 3.26 and valve stems. Westcoast observed that the mineral insulated electric heat tracing at the valves and terminus buildings was operating at high temperatures and igniting the sulphur. Liquid

Figure 2-1
Westcoast Pine River Gas Plant Sulphur Pipeline Map



not to scale

sulphur has a flash point of 168 - 199 °C (334 - 379 °F) and an auto ignition temperature of 232 °C (450 °F). Stress relieving cables, open flame, and electrical components in the buildings also provided potential ignition sources. Westcoast tried to remove sulphur as a source of combustible material but was not successful in eliminating small sulphur leaks at all flange connections and valve stems. Westcoast stated at the hearing that the integrity of the rest of the pipeline was not in question.

Westcoast relied on operators to check for sulphur leaks in the buildings at km 1.5 and 3.26 and the pipeline terminus. Cleaning the sulphur dust¹ that collected in the buildings was a necessary housekeeping task as sulphur dust can be explosive when mixed with air in confined spaces. However there was no set procedure or frequency for these checks. On some occasions, leaks resulted in fires on the sulphur pipeline as shown in Table 2-1.

Table 2-1
Fire Incidents on the Sulphur Pipeline

Date	Incidence
14 December 1996	Sulphur fire in the terminus building on the sulphur pipeline
2 September 2000	Unconfirmed fire on the sulphur pipeline (believed to be at km 3.26)
5 September 2000	Fire at km 3.26 on the sulphur pipeline
7 September 2000	2 fires at km 3.26 on the sulphur pipeline (at 08:30 and 14:00)
8 September 2000	2 fires reported
9 September 2000	Sulphur pipeline fire in the building at km 3.26 - destroyed building
19 September 2000	Fire at km 1.5 on the sulphur pipeline - pipeline shifted off its anchor supports
14 March 2001	Fire occurred at the terminus building on the sulphur pipeline

Sulphur plugs and minor fires were experienced early in the life of the sulphur pipeline. Westcoast senior management had not been advised of some of the smaller fires on the sulphur pipeline. It was not until the fire at the terminus building in 1996 that Westcoast considered that a significant incident with the potential to impact health, safety and the environment had occurred.

2.2.1 Hydraulic Shock

Westcoast stated that two hydraulic shocks had occurred on the sulphur pipeline. Both incidents occurred during remelting of the solid sulphur in the pipeline. The first hydraulic shock experienced on the sulphur pipeline occurred in late spring 1999. A sulphur plug formed at one of the pipeline supports,

¹ Sulphur dust is an irritant to the eyes and airways.

which was subsequently heated with a stress relief cable to melt the sulphur plug. No fire was reported during this incident.

The second hydraulic shock, which moved the sulphur pipeline off the pipeline supports, was experienced just prior to the 19 September 2000 fire. Westcoast submitted that in trying to start up the sulphur pipeline a void had been created downstream of a sulphur plug. On 19 September when Westcoast melted the sulphur plug, the liquid sulphur descended rapidly through the void. Westcoast believes that the liquid sulphur, when it hit the closed valve at km 1.5, created a shock wave (hydraulic shock) that moved the pipeline off the pipeline supports.

2.2.2 9 September 2000 Fire

A flange on the valve at km 3.26 failed on 9 September 2000. The liquid sulphur leak contacted the mineral insulated electric heat tracing, which was likely operating in a temperature range of 315 to 370 °C (600 to 700 °F). The resulting fire destroyed the building.

Westcoast employees used buckets of water from the nearby creek to fight the fire. Both Westcoast employees and residents were exposed to SO₂ emissions during the fire. Although workers stayed upwind to minimize their exposure to emissions, residents travelled through the smoke and SO₂ emissions, and several were downwind tending to a bison herd. Workers fighting the fire did not have either respirators or fire extinguishers and it was 10 minutes before these arrived from the sulphur pelletizing plant. Assistance from the Pine River Gas Plant did not arrive until after the fire was out.

When burned, sulphur combines with oxygen to create sulphur dioxide (SO₂). Sulphur dioxide is highly soluble in water and reacts with moisture in the eye, nose, mouth, respiratory tract and lungs to create sulphurous acid. The effect of exposure to SO₂ is irritation of the mucus membranes and lungs, which is experienced as a burning sensation.¹

Subsequent to the fire, one Westcoast employee reported to the doctor, with flu-like symptoms, and remained off work for four days. A family with a young child who drove through the smoke also went to the doctor, where one individual received oxygen. They were informed by a lung specialist that there were no tests available to determine the potential effect of SO₂ exposure on a young child. Residents noted that concerns about their health after being exposed to emissions from the fire created extremely high stress levels. Dr. Sehmer, on behalf of Westcoast, stated that in his opinion, based on symptoms described by employees who were on site during the fire, employees may have been exposed to 20-30 ppm of SO₂ during this incident. He stated that long-term negative health effects for these employees were not expected.

Westcoast estimated that approximately 107 kg of elemental sulphur burned during the fire on 9 September 2000. Modelling of SO₂ dispersion and concentrations was undertaken by Westcoast subsequent to the fire. Westcoast stated that both the model and the input data are considered to provide

¹ Occupational exposure limits for sulphur dioxide have been set by a number of different agencies, including Emergency Response Planning Guidelines (ERPG) set by the American Industrial Hygiene Association (AIHA), British Columbia Occupational Health and Safety Guidelines, American Conference of Government Industrial Hygienists (ACGIH), and the National Institute for Occupational Safety and Health (NIOSH). (Refer to Appendix 2).

a conservative estimate of what happened. Input data were based on observed meteorological site conditions, local terrain and estimated fire characteristics.

Model results predicted that a maximum SO₂ concentration at ground level of 82 ppm would occur about 30 m downwind of the fire. At 200 metres downwind, the concentration was estimated to be approximately 1 ppm. These concentrations exceeded provincial and national guidelines for occupational exposure as well as emergency response planning (see Appendix 2). Concentrations 1000 m downwind exceeded 0.38 ppm, which were slightly lower than British Columbia Occupational Health & Safety Regulation (8-hour occupational exposure limit) of 2 ppm but higher than the British Columbia Level B Objective (1-hour average) of 0.34 ppm and the ERPG-1 (AIHA) of 0.3 ppm. A secondary maximum concentration (i.e., 1 ppm) was predicted 1 km east-southeast of the fire. This secondary concentration was located at the southwest corner of a bison pasture.

While the model results predicted acute injury to vegetation within 100 m of the fire, it also predicted that no damage to vegetation would occur beyond 500 m from the fire. During this incident, SO₂ emissions affected 14 species of plants. Injury to trees and shrubs was observed to be severe within 50 m downwind of the fire and gradually decreased to minor levels 300 m east-northeast of the fire. The rapid decrease in observed acute foliar injury was concluded to be a result of two factors: (1) normal atmospheric dispersion processes and (2) absorption of SO₂ by the vegetation, which was enhanced by the fact that much of the vegetation was wet from an early morning rain. Westcoast concluded that the effects were short-term and the plant communities would recover quickly. Analysis of sulphur levels in the vegetation samples supports this conclusion. Furthermore, on the basis of laboratory test results, Westcoast concluded that the soils were not adversely affected by SO₂ emissions from the sulphur fire, which also supported the conclusion that the vegetation would recover quickly.

In addition to affecting workers, residents and vegetation, livestock and wildlife in the area may have been affected. In particular, a bison herd was pastured downwind of the fire.

2.2.3 Incidents Following the 9 September 2000 Fire

Another fire occurred on 19 September 2000 at the valve at km 1.5 while Westcoast was attempting to restart the sulphur pipeline. Liquid sulphur contacted the mineral insulated heat tracing. Just prior to the fire the sulphur pipeline had experienced a hydraulic shock that moved it off the pipeline supports.

The last fire on the sulphur pipeline occurred on 14 March 2001. Westcoast reported that a small sulphur fire occurred at the terminus building while the sulphur pipeline was being shut down for maintenance. Westcoast submitted that while draining the sulphur pipeline less than a gallon of sulphur ignited. Area residents contacted the Board to inquire as to whether the fire had been reported. The Board was also advised that Westcoast had not notified residents of the fire as the company had promised to do at a town hall meeting.

2.3 Local Concerns

Residents of Hasler Flats were concerned that it was only through witnessing incidents such as fires and other activities on the sulphur pipeline that they became aware of problems. Westcoast had not advised of any problems or contacted them during incidents, even when there was a potential for health and safety impacts. Further, Westcoast had not responded to questions from the residents concerning the

operation and safety of the sulphur pipeline. In addition, Native participants at the hearing raised concerns that Westcoast had not addressed or assessed impacts on wildlife that could be affected by the operation and incidents on the sulphur pipeline.

Residents had concerns about their health and that of their livestock as a result of exposure to emissions from the fire on 9 September 2000. A number of individuals drove through the smoke during the fire. Exposure times and potential SO₂ concentrations varied for each of the individuals. Residents questioned Westcoast about the long-term effects of exposure to SO₂ emissions on adults, young children and on livestock.

Area residents also identified several general safety concerns pertaining to the operation of the sulphur pipeline. Specifically, the emergency response plan and Westcoast's ability to protect individuals (employees and the public) from potential exposure to SO₂ and H₂S were identified as significant safety issues. Residents requested clarification from Westcoast on several aspects of the emergency response plan, including:

- notification time;
- use of resident volunteers who were trained in the use of Scott air packs and evacuation procedures;
- use of a siren to notify residents who were unavailable by phone in the event of an emergency; and
- follow-up procedures after an incident.

Residents questioned the length of time that Westcoast estimated it would take to notify them in the event of an emergency, and indicated that they thought the 30 to 60 minutes Westcoast estimated it would take to contact residents was a safety concern. Residents also had specific questions for Westcoast employees on management practices, operational procedures and emergency response communication with the local community.

Westcoast indicated that it was willing to discuss revised emergency response procedures with the community and address the areas of confusion. Westcoast also acknowledged that it has a responsibility to ensure the pipeline is safe, and perceived to be safe, by the community. At the hearing Westcoast stated that communication with the community had been lacking recently, and this had to be resolved before Westcoast could gain the trust of local residents.

Chapter 3

Comprehensive Plan

In accordance with the Board's direction at the close of the hearing on 12 April 2001, and the Board's written direction of 24 April 2001, Westcoast submitted its Pine River Gas Plant Sulphur Pipeline Comprehensive Plan to the Board on 26 July 2001. Subject areas addressed in the Comprehensive Plan include:

- management organization, responsibility and policies;
- engineering and design modifications;
- operating procedures;
- emergency response; and
- communications and awareness.

The Comprehensive Plan sets out target completion dates for each of the implementation strategies identified by Westcoast.

In developing the Comprehensive Plan, Westcoast worked with area residents, some of whom were parties to the hearing, and representatives from Chetwynd. All participants at the open houses conducted by Westcoast were provided draft copies of the Comprehensive Plan. A copy was also made available for viewing at the public library in Chetwynd.

Those residents of Hasler Flats who were parties to the hearing were requested to provide comments on the Comprehensive Plan to the Board. Generally, residents agreed that a pipeline was preferable to trucking sulphur, and commended Westcoast for its commitments in the Comprehensive Plan. However, concerns persist pertaining to notification during emergencies, the need for Westcoast to continue rebuilding trust, and demonstrating that the pipeline can be safely operated. Concerns also persist that Westcoast has not addressed health effects of the 9 September 2000 fire to the satisfaction of residents and has not been responsive to following-up on the potential effects on the bison. Finally, it was observed that, as the residents continue to work with Westcoast, new questions will arise.

3.1 Management Organization, Responsibility and Policies

During the hearing, the Board identified concerns regarding the effectiveness of Westcoast's management systems related to risk assessment, operation and maintenance of the sulphur pipeline and reporting requirements for minor and significant incidents.

In its Comprehensive Plan, Westcoast included overarching safety, health and environmental policies, and associated management systems which apply to the operation of all Westcoast facilities, including the sulphur pipeline. These policies demonstrate senior management leadership and commitment to one of Westcoast's core values: protecting the environment and the safety and welfare of Westcoast's employees and neighbours. In general, the policies establish clear direction and expectations that safety and environmental protection will be taken seriously by all Westcoast employees. In the Comprehensive Plan, Westcoast described the Environment, Health and Safety Management System (EHSMS) as a key component of its periodic management review process. An important provision of the EHSMS is conducting regular "unbiased" system evaluations to measure effectiveness. The EHSMS also provides

for continuous improvement. However, Westcoast did not present any results that would provide an assessment of the effectiveness of the EHSMS with respect to the sulphur pipeline.

It is the view of the Board that senior management at Westcoast should periodically evaluate the Company's safety and environmental policies and systems to ensure that the policies are appropriate and the systems are effective in achieving the principles set out in these policies. Senior management should also ensure that risk assessments undertaken on the operating system address how the principles set out in Westcoast's policies are being achieved. The Board is of the view that for an evaluation to be of maximum use it should be conducted by an independent auditor.

Condition: Westcoast shall, within one year of restarting the sulphur pipeline, provide the Board with a copy of the Environment, Health and Safety Management System evaluation(s) undertaken for the sulphur pipeline and Westcoast's plans to address any recommendations arising from the evaluation(s).

The Vice-President of Operations is responsible for the safe operation of all the Westcoast facilities located in British Columbia. These facilities include Westcoast's mainline transmission facilities, raw gas pipelines and gas processing plants, and the sulphur pipeline. The Area Manager is responsible for managing the safe operation of the Grizzly Valley Area facilities, including the Grizzly Valley gathering system and the Pine River Gas Plant, and is also directly responsible for the Area Management Team. Maintenance and operating responsibilities for the Pine River Gas Plant, including the sulphur pipeline, are divided between the Operations and Maintenance Team Leaders. Approximately 28 operators on four shifts work at the Pine River Gas Plant. As a result, five to six employees operate and are responsible for the gas plant and the sulphur pipeline during each shift. Extra operators are on duty during non-routine operations, such as the startup of the sulphur pipeline from a cold state. Approximately 15 employees assist in day-to-day maintenance activities. Three other people work on maintenance planning activities. Different operators may be assigned to sulphur pipeline activities on any given day. Maintenance work is assigned daily, based on priority, via a work order system.

Westcoast stated in response to an information request that it had not made any changes to the organizational charts or reporting roles and responsibilities following the September 2000 fires. In the Comprehensive Plan, responsibilities for the sulphur pipeline were not changed; however, titles have been changed to reflect the direct responsibility and accountability of the Team Leaders for Operations and Maintenance for the sulphur pipeline.

The Board recognizes that different organizational structures have varying advantages and disadvantages. One potential weakness of the proposed organizational structure is that the same operators and maintenance staff are responsible for both the sulphur pipeline and the Pine River Gas Plant. To avoid potential problems Westcoast must ensure that plant staff are trained to work on the sulphur pipeline and are cognizant of its unique operating conditions.

The Board recommends that senior management at Westcoast periodically assess the effectiveness of, and update where necessary, the management structure for the sulphur pipeline to ensure that safety and environmental protection issues are fully addressed by managers, team leaders and other employees. (Refer to Appendix III for a complete list of Recommendations.)

3.2 Engineering and Pipeline Integrity

The sulphur pipeline did not operate as expected due to a combination of design problems, unanticipated operating conditions and inadequate maintenance and operational procedures. The resulting shutdowns, sulphur plugs, leaks, fires, and the hydraulic shock causing the pipeline to move off its supports, all created concerns for the Board and local residents regarding the integrity and safe operation of the pipeline.

Westcoast conducted an internal multi-disciplinary hazard and operability analysis to identify design upgrades following the incidents of September 2000. Westcoast's position is that all incidents occurred at valves or flanges, and that there is no issue with the integrity of the pipe itself. As a result of the hazard analysis, Westcoast's Comprehensive Plan outlines a number of proposed physical modifications to the pipeline, corresponding changes to its operating procedures and a schedule for undertaking this work. A consultant has been retained by Westcoast to conduct an independent engineering assessment of the integrity of the pipeline and related facilities. This work is still underway.

Westcoast's proposed changes for the sulphur pipeline focus on eliminating sulphur leaks and fires. At the terminus building, redundant flanges have been removed and the balance of the flanges are proposed to be upgraded. In response to leaks at the split body valves, Westcoast proposes to install and evaluate a new one-piece valve at km 3.26. If this valve proves to be satisfactory, the ESD valves and the valve at km 1.5 would also be replaced. Westcoast proposes daily checks of all valves and the terminus building, and replacement of any leaking valves or flanges. Improved valve packing maintenance and housekeeping practices are proposed to keep sulphur dust to a minimum in the buildings. Modifications and actions to eliminate potential ignition sources are also proposed. These include replacement of local heat tracing at the valves and terminus building, a lower set temperature control for the valve heat tracing, upgrading electrical systems to hazardous area classifications in buildings containing valves and fittings, and modification of procedures for melting sulphur plugs.

To address problems with shutdowns and reliability, Westcoast proposes modifications to the power supply for the pipeline, a reduction in the number of splices, and a redesign of the splice boxes on the skin effect heat tracing. Westcoast also plans to use removable sections to upgrade insulation at the valves and terminus building. This will reduce heat loss on the pipeline and facilitate maintenance inspections. Upgrading the insulation at the pipeline supports is also proposed. Further to these design modifications, Westcoast proposes to implement a comprehensive preventive maintenance program where all pipeline components would be inspected or tested on a 6-month or annual basis.

Concerns with the integrity of the pipeline after hydraulic shock moved it off its supports were raised by the Board and area residents. Westcoast submitted that, following the hydraulic shock, it had undertaken an examination of the pipeline that included visual inspection for deformation, ultrasonic inspection of welds at the elbows, magnetic particle inspection of the welds at the pipeline supports to which the pipeline is anchored, and hydrostatic testing of the pipeline to the original specifications. The current design for pipeline supports was found to be inadequate to address pipeline movement in the event of hydraulic shock, which could be experienced during remelting. Westcoast proposes to redesign and upgrade the supports as necessary. Westcoast also proposed to install reference markers on the pipeline supports to detect any movement and to check these on a minimum six month schedule.

In addition to the modifications to the sulphur pipeline, Westcoast proposes to have firefighting equipment stationed at all pipeline buildings and to construct a heated building to house a water trailer for firefighting near the pumphouse.

Proposed modifications to the electrical and heating systems for the pipeline would address problems encountered with keeping sulphur in the pipeline in a liquid state and, therefore, avoid problems associated with remelting sulphur. Physical modifications and implementation of maintenance procedures proposed by Westcoast would address safety concerns other than hydraulic shock. Westcoast has not, however, committed to upgrading pipeline supports prior to potentially subjecting the pipeline to hydraulic shock associated with remelting. The Board has concluded that deficiencies in the pipeline support design will need to be addressed prior to any remelt of sulphur that is solidified, either partially or totally, in the pipeline.

Condition: At least one week prior to restarting the sulphur pipeline, Westcoast shall advise the Board in writing that all work necessary to upgrade the pipeline supports to accommodate hydraulic shock has been completed.

The Board also concludes that further refinements to the design of the sulphur pipeline may be necessary based on operational experience gained once the pipeline is restarted. This will include the evaluation of the new valve at km 3.26 as a possible replacement for the line block valve at km 1.5 and the ESD valves. To ensure that the Board and parties are aware of events following the startup of the pipeline that may warrant further work, Westcoast will be required to report on the operation of the sulphur pipeline.

Condition: Westcoast shall notify the Board and parties forthwith of any problems encountered following the restarting of the sulphur pipeline including, but not limited to, sulphur plugs, fires and hydraulic shock.

In the past, much of the work undertaken on the sulphur pipeline was considered by Westcoast to be routine. Accordingly, Westcoast undertook some of this work under the Board's Streamlining Order. However, in light of the need to evaluate the effectiveness of the proposed modifications to the sulphur pipeline, and the potential need to undertake further modifications, this work is not considered routine by the Board. Therefore, Westcoast will not be permitted to rely on the Streamlining Order in respect of work on the sulphur pipeline. As a result, Westcoast will be required to apply to the Board for any work that is not set out in the Comprehensive Plan. The Board expects that residents of Hasler Flats who have expressed interest in the sulphur pipeline, either as parties to the MH-1-2001 hearing, or while attending open houses conducted by Westcoast, will be copied on any such application.

The independent engineering assessment of the integrity of the sulphur pipeline and related facilities has not been completed. The Board observes that recommendations to Westcoast contained in the assessment, and the Company's response to these, will need to be considered to determine whether actions further to those proposed in the Comprehensive Plan are necessary.

Condition: Westcoast shall, within 4 months of the date of this Order, submit to the Board and parties a copy of the engineering assessment of the pipeline, together with Westcoast's response to any recommendations set out in the assessment.

Since September 2000, Westcoast has assessed the design and integrity of the sulphur pipeline, and its operations and maintenance procedures. Three risk assessments have been completed since December 2000. These actions have enabled Westcoast to identify many opportunities to enhance the design and operation of the sulphur pipeline. Periodic assessments would address any new concerns with the operation of the sulphur pipeline.

The Board recommends that Westcoast periodically complete a risk assessment of the sulphur pipeline to ensure that all new critical tasks, risks, and hazards have been addressed in the design and operation of the pipeline.

3.3 Operations

3.3.1 Operation Procedures

The Comprehensive Plan states that operating procedures have been in place since the sulphur pipeline was commissioned in 1994. Operating procedures are based on the original Delta Hudson Operating Manual, which was updated in 2000, subsequent to the fires. Westcoast indicated that there was no specific staff training for the operation of the sulphur pipeline other than review of this manual. It was clear from Westcoast's evidence that, although procedures existed for the pipeline, these were not always followed. For example, there were written procedures for staff to record operating conditions, any unusual findings, and to inspect the entire length of the pipeline every six hours. However, these inspections were not conducted at the specified frequency, nor on the steep portion of the pipeline because of safety concerns for employees. Records were also not kept as prescribed by the procedures. Moreover, procedures for aspects critical to the safe operation of the pipeline, such as housekeeping and maintenance, were not developed by Westcoast.

In the Comprehensive Plan, Westcoast stated that it is currently developing a comprehensive sulphur pipeline operating manual, which will be completed prior to startup of the pipeline. The manual will include practices specific to the sulphur pipeline with respect to operation, maintenance and management, safety, communication and emergency response. Westcoast will require operators to review and understand the manual prior to being deemed qualified to operate the pipeline. In addition, provisions will be in place to ensure all tradesmen working on the pipeline are qualified to complete the work assigned to them. In its Comprehensive Plan, Westcoast included a draft outline of the comprehensive sulphur pipeline operating manual.

The Board recommends that Westcoast document how the Company will verify that the sulphur pipeline operating manual is understood by operators working on the sulphur pipeline.

Following the hearing, Westcoast proposed modifications to the existing procedures, as well as new procedures. Several of the operating procedures submitted incorporate changes corresponding to proposed design modifications. Westcoast provided:

- specific procedures for flange tightening;
- procedures for the operation of the skin effect heat tracing to avoid failure of the splices when heating the pipeline from a cold state;
- new procedures for remelt, pipeline shutdown, and startup from a full and liquid state; and

- processes for creating and revising operating procedures, tracking changes and communicating these changes.

Westcoast also noted that work on external reporting procedures was underway.

Three areas of concern remain for the Board. These pertain to the use of open flame on the pipeline, setting the temperature of the skin effect heat tracing, and emergency shutdown by the sulphur pelletizing plant. Westcoast proposes to update the procedure for melting sulphur plugs to preclude the use of open flame or tiger torches on flanges and valves. A tiger torch could be used on the pipe itself to melt sulphur plugs; however, the revised procedure would require operators to ensure that there are no leaks in the work area prior to using open flame. Given the proposed modifications to the heat tracing and insulation, the need for any supplemental heating should be reduced or eliminated. In the event that supplemental heating is required, the use of stress relieving cables would appear to be the preferred option, with open flame used only as a last resort. Furthermore, the need for supplemental heating on an ongoing basis should trigger an evaluation of additional modifications to the design and operation of the pipeline.

The Board recommends that Westcoast, as part of its evaluation of the effectiveness of modifications to the pipeline, review any need to apply supplemental heat to melt sulphur plugs and determine whether further changes to the pipeline design are warranted to prevent the formation of sulphur plugs. The Board further recommends that Westcoast update the procedure for melting sulphur plugs to identify the use of stress reliever cables as the preferred option.

Current operation practices allow for manual operation of the skin effect heat tracing system for “test operations or special purposes”. Westcoast does not define “special purposes” or identify a frequency for manual operations.

The Board recommends that in order to ensure that manual operation does not become the norm, Westcoast modify the operating procedure for the skin effect heat tracing system to require senior manager approval and signature prior to manual operation.

The third issue relates to the provision of operational procedures for draining the pipeline in the event that the pelletizer plant activates the ESD valve. In such a situation Westcoast could have little, if any, notice prior to the shutdown of the sulphur pipeline. Furthermore, Westcoast would have no control over the length of time that the sulphur pipeline would remain inoperable. A plan to ensure that the sulphur does not solidify in the pipeline is required under these circumstances.

The Board recommends that Westcoast develop a plan for draining the sulphur pipeline, or otherwise ensuring that the sulphur in the pipeline is not allowed to solidify when the ESD valve in the sulphur pelletizing plant is actuated.

3.3.2 Maintenance Procedures

During the hearing, concerns were raised about Westcoast's maintenance practices for the sulphur pipeline. Many work orders from 1994 until 2000 indicated problems with these systems; however, in some cases the maintenance work was not completed for several months. Many of the sulphur pipeline systems did not have preventive maintenance programs. For example, the ESD system did not receive preventive maintenance, a procedure for tightening flange bolts with torque wrenches did not exist, and the electrical systems and local heat tracing were not on a preventive maintenance program.

Westcoast has a computerized maintenance system in which employees identify and prioritize maintenance work requests with a notification form. Team leaders can modify work priorities. Backlogged maintenance requests are reviewed by team leaders and follow-up actions are identified.

The Comprehensive Plan submitted by Westcoast contains a detailed maintenance system for the sulphur pipeline and many new or enhanced procedures that address concerns regarding preventive maintenance. For example, Westcoast stated that the ESD valves at the ends of the sulphur pipeline are essential for safe operation of the pipeline. For the ESD valves to function properly, the valves, actuators, pressure transmitters, flow transmitters, communication systems from the valves to the control room and control room alarms need to work. All of these components have been reviewed by Westcoast through several risk assessments undertaken since September 2000. The detailed maintenance system was developed in conjunction with the proposed physical modifications and updated operating procedures. To ensure that the maintenance system is effective, Westcoast will need to monitor its implementation.

The Board recommends that senior management at Westcoast implement a system to verify the continual effectiveness of its maintenance system for the sulphur pipeline. The verification should assess the implementation of new programs and the competence of staff to ensure that the maintenance system is being used. Periodic risk assessments, unbiased system evaluations and subsequent management action plans would contribute to an effective top management verification process.

3.3.3 Training

Operators responsible for day to day operation of the Pine River Gas Plant are trained and tested in standard operating procedures for specific areas of the plant. The procedures are reviewed annually by operators and management. However, no training specific to the sulphur pipeline was provided to operators, as discussed in section 3.3.1.

During the hearing, Westcoast stated that employees were trained in firefighting and emergency response. All employees receive basic safety training, including general fire fighting training, every three years. Emergency response training (Incident Command System (ICS) level 100, 200 or 300) is a one-time training course with management requiring a higher level of training (e.g., 200 or 300 level). All three ICS levels were revised in May 2001. Evidence was presented that some employees were working on the sulphur pipeline without this training.

In the Comprehensive Plan, Westcoast proposed that staff training specific to the handling of liquid sulphur, exposure to SO₂ and use of the proposed water trailer for firefighting would be undertaken prior

to the startup of the sulphur pipeline. Given the importance of emergency response training in protecting employees and area residents, the Board is of the view that one-time training is not sufficient.

The Board recommends that Westcoast develop an ongoing training program so that training on ICS does not occur just once for each employee. The program should track the training requirements and completed courses for each employee.

3.4 Emergency Response

Westcoast's emergency response program consists of two components - a generic emergency response plan that applies to all Westcoast field facilities (i.e., the Field Emergency Response Plan - FERP) and site-specific emergency response procedures for each field operation. For the Pine River Gas Plant, the site-specific procedures did not include activities specific to the sulphur pipeline. Westcoast's emergency response plans are based on company policies and used risk assessment protocols to identify emergency situations and their probability.

In its Comprehensive Plan, Westcoast included the Sulphur Pipeline Emergency Response Plan (SPERP), which is now a separate chapter in the Pine River Gas Plant Field Emergency Response Plan. Westcoast is still in the process of consulting the public on its proposed emergency response plan.

The basic elements of an emergency response plan include:

- general and site specific emergency response procedures;
- monitoring protocols to verify adherence to public evacuation and shelter criteria;
- a description and location of response equipment;
- an estimation of response times for different emergency scenarios;
- a procedure to establish and maintain liaison with all parties that may be involved in an emergency situation;
- a training plan;
- a communication plan; and
- a procedure to ensure that emergency response exercises and response activities from incidents are reviewed and incorporated into the emergency procedures manual, staff training, and continuing education programs.

While the SPERP contains these basic elements, the Board has identified the following three concerns:

- a discrepancy between the SPERP and FERP with respect to monitoring protocols to verify adherence to public evacuation and shelter criteria¹;

¹

Section 2 of the SPERP states that a hazard zone shall be established based on a concentration of 15 ppm of SO₂ in accordance with the guidelines in sections 4 and 5 of the FERP. However section 4 of the FERP states that a hot zone shall be established if there is a concentration of 5 ppm SO₂ for 15 minutes, while section 5 states that Westcoast will recommend an evacuation and sheltering when the following conditions exist:

- the time weighted average SO₂ concentration exceeds 0.3 ppm SO₂ for 3 hours; and
- the time weighted average SO₂ concentration exceeds 1.0 ppm for 15 minutes.

Additionally, section 5.4 of FERP states that a concentration of 5 ppm SO₂ is the 15 minute occupational exposure.

- training on the Incident Command System is a one time only requirement (see section 3.3.3) for each level; and
- the omission of a definite commitment to post incident follow-up.

Westcoast must clarify its monitoring protocols to ensure there is no short- or long-term risk to health or safety of individuals or the environment from the operation of the sulphur pipeline. Further, given the importance of training in the area of emergency response, Westcoast should develop and track an employee training program as discussed in Section 3.3.3.

The Board recommends that Westcoast, prior to restarting the pipeline, address the discrepancies between the Company's SPERP and FERP regarding SO₂ levels, monitoring protocols and the public evacuation and shelter criteria. Once clarified, these requirements need to be communicated to employees and the public. The Board further recommends that Westcoast review training requirements to identify those staff that require additional training to maintain a high level of emergency preparedness.

The SPERP states that employee familiarization with the plan may consist of briefing sessions, table top exercises or simulations. Westcoast will also provide an opportunity for the Hasler Flat residents to participate in the emergency exercises on a scheduled basis. Emergency response (ER) exercises are unique opportunities for all parties potentially involved in an emergency to practice their roles and identify opportunities to improve emergency preparedness.

The Board recommends that Westcoast invite all persons that would either respond to an incident, or may potentially be affected by an incident, to participate in regularly scheduled full scale ER exercises. In selecting the appropriate type of incident for the exercise, the Board encourages Westcoast to have regard to all of the facilities that Westcoast operates in the vicinity of Hasler Flats. The Board further recommends that Westcoast ensure information and lessons learned from the ER exercises are shared with, and accessible to, all Westcoast staff and exercise participants.

Although there is a mechanism for post incident follow-up in the SPERP, the Board notes that this commitment is not definitive. It is the Board's view that corporate implementation, activation and application of the emergency response plan through exercises and operational experience will be necessary to provide the evidence required to evaluate the adequacy and effectiveness of the SPERP. Westcoast has included in the SPERP a procedure to ensure that information from emergency response exercises and response activities from incidents are reviewed and incorporated into the emergency procedures manual and into staff training and continuing education programs, as necessary.

Condition: Westcoast shall hold an emergency response exercise to evaluate the effectiveness of the emergency response plan within 4 months of restarting the pipeline. At least 30 days before it is scheduled to occur, Westcoast shall advise the Board, in writing, of the date of the exercise and the efforts that will be undertaken to advise local residents of the exercise. The exercise shall provide for the participation of all interested residents of Hasler Flats.

Condition: Within 30 days of the completion of the emergency response exercise, Westcoast shall submit to the Board and all participants in the exercise a report that outlines the scale and nature of the exercise and which demonstrates how lessons learned will be incorporated into the emergency response plan.

3.5 Communication Plans

During the hearing, the Board heard from area residents that they were concerned about the safety of the sulphur pipeline and the lack of communication between Westcoast and the public. Also, some area residents were concerned about the cycle time for conducting public awareness surveys (every three years). Westcoast acknowledged that it had not handled public consultation very well and that relationships with the community had slipped since 1996. It was also made evident at the hearing that there was a lack of communication between Westcoast management and operators of the gas plant and sulphur pipeline.

Following the hearing, Westcoast developed a Communication and Awareness Plan (CAP) to support open communication and the sharing of information between Westcoast management, employees and community members. The CAP includes protocols for communications and provides contact information, commitments to meetings every six months and a procedure for resolving concerns. The plan also addresses dispute resolution in the event that a disagreement arises that cannot be resolved. The CAP outlines responsibilities regarding internal and external communication of management and staff operating the pipeline.

The CAP was implemented by having area residents and Westcoast employees participate in the development of the Comprehensive Plan. Though the CAP was developed for the sulphur pipeline, Westcoast submitted that the commitments central to the plan will also apply to the Pine River Gas Plant. Westcoast identified three target audiences for its CAP: Hasler Flats and area residents; Peace River Regional District and District of Chetwynd; and Westcoast employees.

Westcoast submitted that it would conduct an annual awareness-emergency response visit in the Hasler Flats area and will pose specific questions concerning residents' satisfaction with Westcoast's communication and response to residents' concerns. The Hasler Flats residents group agreed to the principles of the CAP for on-going communication with Westcoast.

A number of issues remain outstanding with respect to on-going consultation with the area residents. These include whether Westcoast will monitor for SO₂ on a continuous basis or only during high risk periods, recommendations on the size and location of the emergency planning zone, the use of protective gear for employees, and the health effects of the 9 September 2000 fire on residents and bison. The Board expects that Westcoast will engage in meaningful dialogue with residents to continue to address

these and other matters that may arise. The Board notes the importance of Westcoast gaining the trust of area residents.

The Board recommends that Westcoast use the semi-annual management and resident meetings and other forms of communication to address concerns identified by area residents.

The Board is of the view that Westcoast and the residents need to discuss restrictions on activities in the vicinity of the sulphur pipeline. Restrictions are established under the Act to protect public safety, the integrity of the pipeline and the environment. Residents have advised that in the past they hunted, biked, trapped and sledded on and around the sulphur pipeline right-of-way.

The Board recommends that Westcoast and the residents use the semi-annual meetings to identify and resolve any potential conflicts related to public use of the sulphur pipeline right-of-way.

The Board observes that the process of rebuilding trust with the community will require a consistent long-term effort by all parties and, therefore, will monitor progress through the semi-annual meetings.

Condition: Westcoast shall notify the Board, in writing, a minimum of 2 weeks prior to the semi-annual management and resident meetings of the date, time and place of the meetings. Within 30 days of the meeting Westcoast shall file with the Board a copy of the minutes of the meeting.

Westcoast proposes to maintain regular information sharing with elected officials in Chetwynd and the region. Furthermore, Westcoast advised that it will inform elected officials of incidents that may have threatened the safety of local residents as soon as possible after they occur. However, the Board observes there is no indication that municipal and regional leaders have agreed to these proposed CAP procedures.

Condition: Westcoast shall file with the Board a copy of any agreement reached with municipal and regional leaders regarding the proposed procedures in the Communication and Awareness Plan.

Chapter 4

Conclusions

The record in this proceeding demonstrates inadequacies with the management systems, design, operating practices, and emergency response procedures associated with the sulphur pipeline. In several cases these inadequacies, coupled with inappropriate responses, resulted in the escalation of minor problems into potentially significant incidents. Subsequent to the hearing, Westcoast reviewed its management systems, the pipeline design, and operating and maintenance procedures, and engaged the local community in reviewing its emergency response procedures. Proposed revisions are documented in Westcoast's Comprehensive Plan.

While problems were evident with the management system used by Westcoast to operate and maintain the pipeline, the Board is satisfied with the changes to the management system proposed in the Comprehensive Plan. However, the Board notes that the management system for the sulphur pipeline needs to be evaluated periodically to assess effectiveness, risks, and appropriateness. Specific concerns to be reviewed include operating and maintenance procedures, training of employees, procedures for reporting and responding to incidents (both minor and emergencies), the conduct of risk assessments, and evaluation of the effectiveness of the management system.

It is the Board's view that the sulphur pipeline requires repairs and alterations before it can be operated in a safe manner. During the hearing it became evident that there were problems, and in some cases inadequacies, with the design of the pipeline. It also became evident that changes to the design of the pipeline alone would not address concerns pertaining to the safe operation of the pipeline. To the extent that modifications to the design will contribute to the safe operation of the pipeline, the Board is satisfied with the Comprehensive Plan submitted by Westcoast. However, the Board observes that the effectiveness of the modifications has yet to be field tested and that further engineering and design modifications may be identified in the independent engineering assessment yet to be filed. Accordingly, monitoring and follow-up on the design modifications will be necessary to ensure the ongoing safe operation of the pipeline. In addition, deficiencies in the pipeline support design will need to be addressed prior to any remelt of solid sulphur in the pipeline.

The Board is of the view that changes to the operating, maintenance, emergency response and training procedures are required to ensure the safety of the public, company employees and the environment. Evidence provided by Westcoast made it clear that, although operating procedures existed for the pipeline, these were not necessarily followed in the field. In addition, aspects critical to the safe operation of the pipeline, such as housekeeping and monitoring, were not being followed. The Board is satisfied that, if followed, the procedures contained in the proposed operating manual are sufficient to ensure the safe ongoing operation of the pipeline. However, the Board observes that these procedures will need to be evaluated and updated regularly to reflect any further changes to the pipeline design and continuing operating experience.

Westcoast has addressed key issues with respect to emergency response through the development of an Emergency Response Plan for the Sulphur Pipeline (SPERP). The Board notes that Westcoast is still in the process of consulting the public on its proposed emergency response plan and a number of issues

require clarification. It is the Board's view that corporate implementation, activation and application of the emergency response plan through exercises and operating experience will be necessary to provide the evidence required to evaluate the adequacy and effectiveness of the SPERP. In order to ensure that there is no short- or long-term risk to health or safety of individuals or the environment from the operation of the sulphur pipeline, Westcoast will need to review information from emergency response exercises and response activities from incidents, incorporate the results into the emergency procedures manual, staff training and continuing education programs, and communicate this to local residents.

Westcoast prepared and implemented a Communication Action Plan (CAP) subsequent to the hearing. The CAP identifies effective communication lines between Westcoast and residents, in particular the direct contact of persons at the Pine River Gas Plant. The CAP also outlines responsibilities for management and staff operating the pipeline regarding internal and external communication. A key component of the CAP are semi-annual meetings between Westcoast and its neighbours. Westcoast and the residents of Hasler Flats have agreed to the principles of the CAP for on-going communication. The Board is of the opinion that the CAP is a satisfactory vehicle for beginning the rebuilding of trust between Westcoast and its neighbours. However, a number of issues remain outstanding with respect to on-going consultation with the local residents. While the approach set out in the CAP is encouraged by the Board, it will be critical for Westcoast to maintain and enhance lines of communication with area residents when the sulphur pipeline is in operation. The Board will therefore use the semi-annual meetings and the minutes of these meetings to monitor progress.

Recommendations (see Appendix III) and conditions identified in these Reasons are intended to clarify inconsistencies within the Comprehensive Plan, fill data gaps, and ensure that Westcoast follows up on the implementation of the components of the Comprehensive Plan.

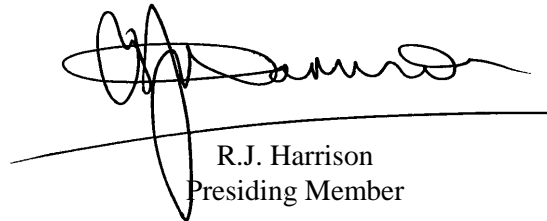
In conclusion, the Board satisfied that, with the implementation of the Comprehensive Plan, Westcoast can operate the sulphur pipeline in a safe manner. However, it is the Board's view that periodic evaluation and updating of the operating and maintenance procedures, especially the emergency response procedures, as well as the maintenance of clear lines of communication with the local community, are critical to ensuring the integrity of the sulphur pipeline and the safety of the public and Westcoast employees.

Subject to the conditions set out in the body of these Reasons, the Board approves Westcoast's Comprehensive Plan. An order to this effect is appended to and forms part of these Reasons (refer to Appendix IV).


Chapter 5

Disposition


The foregoing chapters constitute our Decision and Reasons for Decision on matters considered in the MH-1-2001 proceeding.



R.J. Harrison
Presiding Member



D.W. Emes
Member



C.L. Dybwad
Member

Calgary, Alberta
October 2001

Appendix I

Scope of Westcoast's Sulphur Pipeline Comprehensive Plan

1. Management Organization, Responsibility and Policies

- 1.1 Management structure, responsibilities and accountabilities for the sulphur pipeline.
- 1.2 Safety policy, including information on:
 - protection of employees and the public; and
 - the review of safety issues and the process for disseminating lessons learned.
- 1.3 Environment policy, including information on how the environment is protected during the operation, maintenance, and incidents on the sulphur pipeline.
- 1.4 Process outline for periodic management review.

In developing the procedures for the sulphur pipeline Westcoast should:

- 1.5 conduct a hazard analysis, risk determination or similar assessment to identify critical tasks/risk/hazards and evaluate their likelihood and severity; and
- 1.6 categorize the risks and identify the corresponding preventive measures and the emergency response resources that would be required.

2. Engineering and Design Modifications

Westcoast's plans for evaluating the appropriateness of the overall design of the sulphur pipeline and related facilities. This includes Westcoast's plans for the following areas:

- 2.1 leak prevention and management;
- 2.2 assessment of the adequacy of all heat tracing systems for fitness-for-purpose;
- 2.3 thorough design review of the pipeline supports in order to ensure stability under all operating conditions, including upset conditions such as hydraulic shock;
- 2.4 reliability of power supply for the sulphur pipeline;
- 2.5 re-design/upgrade of sulphur pipeline electrical systems to hazardous area classification;
- 2.6 ongoing monitoring and testing of the pipeline and related facilities; and
- 2.7 independent engineering assessment of the integrity of the sulphur pipeline and related facilities.

3. Operating Procedures

Westcoast's plans to compare, and where necessary reconcile, the operating and maintenance procedures with appropriate regulations, generally accepted engineering standards and practices, and operating conditions. This includes the following:

- 3.1 shutdown procedures;
- 3.2 draining procedures;
- 3.3 startup procedures;
- 3.4 re-melting procedures;
- 3.5 maintenance procedures including housekeeping and preventive maintenance for the pipeline and electrical systems;
- 3.6 internal and external reporting procedures for incidents; and
- 3.7 process for communicating and providing training to company employees on procedures.

4. Emergency Response

Westcoast has divided its emergency response plan into two binders. The first binder, the Field Emergency Response Plan, includes Section 1.0 through 6.0 of the plan and contains information that is common throughout the Westcoast facilities. The second binder contains Section 7.0, the Pine River Gas Plant Field Emergency Response Plan. The main focus of these binders is emergency response procedures for H₂S emissions. The Board expects Westcoast to also include emergency response procedures that specifically address potential emergencies for the sulphur pipeline, including SO₂ releases.

The Board expects Westcoast to amend its emergency response plan (manual) to include the following for the sulphur pipeline:

- 4.1 a description of general and site specific emergency response procedures including but not limited to monitoring for emission exceedences (triggers for different levels of emergency);
- 4.2 monitoring protocols to verify adherence to public evacuation and sheltering criteria described in Section 5.0 of the Field Emergency Response Plan;
- 4.3 a description and location of response equipment (type, location, frequency checked, etc.);
- 4.4 an estimation of response times for different emergency scenarios;
- 4.5 a procedure to establish and maintain liaison with all parties that may be involved in an emergency situation;

- 4.6 a training plan for employees and the public (if necessary);
- 4.7 a communication plan that addresses the needs of employees, first responders and the public; and
- 4.8 a post incident follow up (monitoring for health and safety of staff, public and environment) including a procedure to ensure that information from emergency response exercises and response activities from incidents are reviewed and incorporated into the emergency procedures manual and into staff training and continuing education programs, if necessary.

Appendix I provides a list of expected elements that the Board typically examines when conducting an audit of corporate emergency response plans.

5. Communications and Awareness

Westcoast's communication plan for conveying information on the sulphur pipeline to employees and community members. The plan should be developed in consultation with the local community and include the following elements:

- 5.1 purpose;
- 5.2 identity of target audiences;
- 5.3 strategy or key messages that are specific to each target audience;
- 5.4 communication tools/tactics. Communication tools describe, in sequence, what methods will be used to accomplish the stated goals. Tactics involve using these tools to reach audiences with key messages;
- 5.5 action plan: a timetable that includes the date an action takes place, the action, the target audience and the person(s) responsible for performing the action;
- 5.6 evaluation: the techniques that will be used to determine the effectiveness of the plan.

Appendix II

Exposure Guidelines for SO₂

SO ₂ concentration (ppm)	Description	Agency
0.17	British Columbia Level A Objective (1-hour average)	BC Ministry of the Environment
0.3	ERPG-1 - The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odour.	AIHA
0.34	British Columbia Level B Objective (1-hour average)	BC Ministry of the Environment
2	British Columbia Occupational Health & Safety Regulation (8-hour occupational exposure limit)	BC Occupational Health and Safety Regulations. 1999.
2	Threshold Limit Value (8-hour average)	(ACGIH)
3	ERPG-2 - the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.	AIHA
5	Short-term exposure limit - limit on exposure excursions lasting up to 15 minutes, designed to protect workers from acute effects	ACGIH
15	ERPG-3 - the maximum airborne concentration below which, it is believed, nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects	AIHA
100	Immediately dangerous to life or health. The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 30 minutes without experiencing or developing life-threatening health effects. Based on acute inhalation toxicity data in humans and animals.	(NIOSH)

Appendix III

List of Recommendations

Management Organization, Responsibility and Policies

1. The Board recommends that senior management at Westcoast periodically assess the effectiveness of, and update where necessary, the management structure for the sulphur pipeline to ensure that safety and environmental protection issues are fully addressed by managers, team leaders and other employees.

Engineering and Pipeline Integrity

2. The Board recommends that Westcoast periodically complete a risk assessment of the sulphur pipeline to ensure that all new critical tasks, risks, and hazards have been addressed in the design and operation of the pipeline.

Operations

3. The Board recommends that Westcoast document how the Company will verify that the sulphur pipeline operating manual is understood by operators working on the sulphur pipeline.
4. The Board recommends that Westcoast, as part of its evaluation of the effectiveness of modifications to the pipeline, review any need to apply supplemental heat to melt sulphur plugs and determine whether further changes to the pipeline design are warranted to prevent the formation of sulphur plugs. The Board further recommends that Westcoast update the procedure for melting sulphur plugs to identify the use of stress reliever cables as the preferred option.
5. The Board recommends that in order to ensure that manual operation does not become the norm, Westcoast modify the operating procedure for the skin effect heat tracing system to require senior manager approval and signature prior to manual operation.
6. The Board recommends that Westcoast develop a plan for draining the sulphur pipeline, or otherwise ensuring that the sulphur in the pipeline is not allowed to solidify when the ESD valve in the sulphur pelletizing plant is actuated.
7. The Board recommends that senior management at Westcoast implement a system to verify the continual effectiveness of its maintenance system for the sulphur pipeline. The verification should assess the implementation of new programs and the competence of staff to ensure that the maintenance system is being used. Periodic risk assessments, unbiased system evaluations and subsequent management action plans would contribute to an effective top management verification process.
8. The Board recommends that Westcoast develop an ongoing training program so that training on ICS does not occur just once for each employee. The program should track the training requirements and completed courses for each employee.

Emergency Response

9. The Board recommends that Westcoast, prior to restarting the pipeline, address the discrepancies between the Company's SPERP and FERP regarding SO₂ levels, monitoring protocols and the public evacuation and shelter criteria. Once clarified, these requirements need to be communicated to employees and the public. The Board further recommends that Westcoast review training requirements to identify those staff that require additional training to maintain a high level of emergency preparedness.
10. The Board recommends that Westcoast invite all persons that would either respond to an incident, or may potentially be affected by an incident, to participate in regularly scheduled full scale ER exercises. In selecting the appropriate type of incident for the exercise, the Board encourages Westcoast to have regard to all of the facilities that Westcoast operates in the vicinity of Hasler Flats. The Board further recommends that Westcoast ensure information and lessons learned from the ER exercises are shared with, and accessible to, all Westcoast staff and exercise participants.

Communication Plans

11. The Board recommends that Westcoast use the semi-annual management and resident meetings and other forms of communication to address concerns identified by area residents.
12. The Board recommends that Westcoast and the residents use the semi-annual meetings to identify and resolve any potential conflicts related to public use of the sulphur pipeline right-of-way.

Appendix IV

Order XG-W005-33-2001

IN THE MATTER OF the *National Energy Board Act* (the Act) and the regulations made thereunder, filed under National Energy Board (the Board) File 3050-W005-1.

BEFORE the Board on 17 October 2001.

WHEREAS on 16 March 2001 the Board issued Order MO-06-2001, as amended, directing Westcoast Energy Inc. (Westcoast), to stop all further work on the Pine River Gas Plant Sulphur Pipeline (the sulphur pipeline), except work required in an emergency situation, and to keep the sulphur pipeline out of service pending further order of the Board;

AND WHEREAS, pursuant to Hearing Order MH-1-2001, the Board conducted a public hearing into issues concerning the operation of the sulphur pipeline;

AND WHEREAS following the hearing the Board directed Westcoast to prepare a Comprehensive Plan addressing the future operation of the sulphur pipeline;

AND WHEREAS the Comprehensive Plan submitted by Westcoast proposes that certain work be done to improve the operation and safety of the sulphur pipeline;

AND WHEREAS the projects set out in the Comprehensive Plan are excluded from environmental assessment pursuant the *Exclusion List Regulations* of the *Canadian Environmental Assessment Act*;

AND WHEREAS, the Board has considered the environmental implications of the projects pursuant to Part III of the Act;

AND WHEREAS having examined the Comprehensive Plan together with comments from the MH-1-2001 parties, the Board is satisfied that, subject to the conditions set out in this order, Westcoast can safely undertake the balance of the work set out in the plan and reopen the sulphur pipeline for operation;

AND WHEREAS the Board considers it to be in the public interest to grant relief from sections 30, 31 and 47 of the Act for the projects set out in the Comprehensive Plan;

IT IS ORDERED that Order AO-3-MO-06-2001 is rescinded;

IT IS FURTHER ORDERED that, pursuant to section 58 of the Act, Westcoast is exempt from sections 30, 31 and 47 of the Act for the projects set out in the Comprehensive Plan, subject to the following conditions:

1. Westcoast shall, within one year of restarting the sulphur pipeline, provide the Board with a copy of the Environment, Health and Safety Management System evaluation(s)

undertaken for the sulphur pipeline and Westcoast's plans to address any recommendations arising from the evaluation(s).

2. At least one week prior to restarting the sulphur pipeline, Westcoast shall advise the Board in writing that all work necessary to upgrade the pipeline supports to accommodate hydraulic shock has been completed.
3. Westcoast shall notify the Board and parties forthwith of any problems encountered following the restarting of the sulphur pipeline including, but not limited to, sulphur plugs, fires and hydraulic shock.
4. Westcoast shall, within 4 months of the date of this Order, submit to the Board and parties a copy of the engineering assessment of the pipeline, together with Westcoast's response to any recommendations set out in the assessment.
5. Westcoast shall hold an emergency response exercise to evaluate the effectiveness of the emergency response plan within 4 months of restarting the pipeline. At least 30 days before it is scheduled to occur, Westcoast shall advise the Board, in writing, of the date of the exercise and the efforts that will be undertaken to advise local residents of the exercise. The exercise shall provide for the participation of all interested residents of Hasler Flats.
6. Within 30 days of the completion of the emergency response exercise, Westcoast shall submit to the Board and all participants in the exercise a report that outlines the scale and nature of the exercise and which demonstrates how lessons learned will be incorporated into the emergency response plan.
7. Westcoast shall notify the Board, in writing, a minimum of 2 weeks prior to the semi-annual management and resident meetings of the date, time and place of the meetings. Within 30 days of the meeting Westcoast shall file with the Board a copy of the minutes of the meeting.
8. Westcoast shall file with the Board a copy of any agreement reached with municipal and regional leaders regarding the proposed procedures in the Communication and Awareness Plan.
9. This order shall expire on 31 December 2002 unless work on the projects has commenced by that date.

NATIONAL ENERGY BOARD

Michel L. Mantha
Secretary