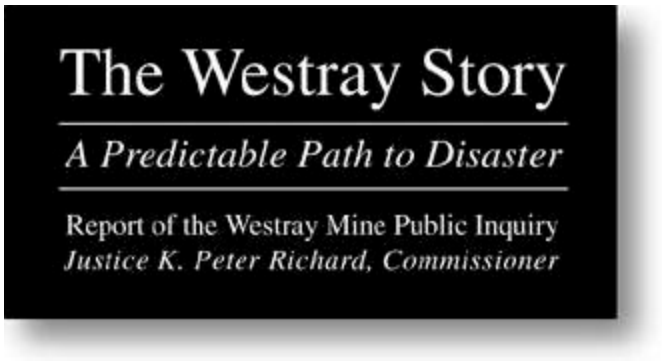

Published on the authority of the Lieutenant Governor in Council by the Westray Mine Public Inquiry.

Transcribed to this format by Douglas Wilhelm Harder.

Executive Summary

Report of the Westray Mine Public Inquiry

Justice K. Peter Richard, Commissioner

November 1997

"The most important thing to come out of a mine is the miner."
Frédéric Le Play (1806-1882)
French sociologist and inspector general of mines of France

At 5:20 am on 9 May 1992 the Westray mine exploded taking the lives of the following 26 miners.

John Thomas Bates, 56
Bennie Joseph Benoit, 42
Ferris Todd Dewan, 35
Robert Steven Doyle, 22
Roy Edward Feltmate, 33
Myles Daniel Gillis, 32
Randolph Brian House, 27
Laurence Elwyn James, 34
Stephen Paul Lilley, 40
Angus Joseph MacNeil, 39
Harry A. McCallum, 41
George S. James Munroe, 38
Romeo Andrew Short, 35
Larry Arthur Bell, 25
Wayne Michael Conway, 38
Adonis J. Dollimont, 36
Remi Joseph Drolet, 38
Charles Robert Fraser, 29
John Philip Halloran, 33
Trevor Martin Jahn, 36
Eugene W. Johnson, 33
Michael Frederick MacKay, 38
Glenn David Martin, 35
Eric Earl McIsaac, 38
Danny James Poplar, 39
Peter Francis Vickers, 38

This Report is dedicated to their memory.

In the early morning of 9 May 1992 a violent explosion rocked the tiny community of Plymouth, just east of Stellarton, in Pictou County, Nova Scotia. The explosion occurred in the depths of the Westray coal mine, instantly killing the 26 miners working there at the time. On 15 May 1992, I was appointed by Order in Council to inquire into and report on this disaster.

During the formative days of this Inquiry, as my understanding of the underground coal mining industry developed, I was struck by two notions that have persisted throughout. The industry is very close-knit with an interdependence, camaraderie, and fellowship that may be unique in modern-day business. And people in the industry, at all levels, regard what occurred at Westray as a personal matter affecting them as if it had happened in their own backyard. It is for them a family tragedy. I suspect that these attitudes have deep historic roots. There are few industries in which one's safety, indeed one's very survival, is so inextricably linked to the attitudes, practices, concerns, and behaviour of fellow workers. Truly, in the underground coal mining environment, you are "your brother's keeper." The miner who sneaks a smoke while underground is risking the lives of his fellow miners. On 7 December 1992, the flick of a cigarette lighter underground caused the death of eight miners at the Southmountain Coal Company in Virginia.

The Westray tragedy is regarded in the industry as a black mark against coal mining in general rather than as a merely localized event. As a result, I received a remarkable degree of cooperation from the industry, which, while being most encouraging, underscored the solemn responsibility I had assumed. The coal industry — miners, managers, operators, and regulators — is most anxious to determine what can be learned as a result of this tragedy and what can be done to prevent another.

The 1981 Report of the Joint Federal-Provincial Inquiry Commission into Safety in Mines and Mining Plants in Ontario (the Burkett Report) is aptly entitled Towards Safe Production. As its title suggests, the entire thrust of the report is to increase and to promote safe practices in mines. The only completely safe mine is a closed mine. By the same token, the only completely safe aircraft is on the ground with the engines off. The only truly safe automobile is the one parked in the garage. Once a mine is open, there begins the constant process of trade-off between production and safety. From the chief executive officer to the miner at the working face, the objective must be to operate the mine in a manner that ensures the personal safety of the worker over the economic imperatives of increased production. The two seemingly competing concepts — safety and production — must be so harmonized that they can co-exist without doing harm to each other. It is here that the regulator must assume the role of monitor and aggressively ensure that the balance is understood and maintained. In this sense, the function of the regulator is both instructive and supervisory. As one provincial mine inspector in Ontario told me, "Ideally, if we perform our duties properly we will eventually work ourselves out of a job." As I read Towards Safe Production, I was impressed with the clarity and wisdom of this regulatory role.

The Order in Council that established this Inquiry gives me power to "inquire into . . . whether the occurrence was or was not preventable." Of course it was. For this Report we have chosen the title The Westray Story: A Predictable Path to Disaster to convey that message. The message is that the Westray tragedy was predictable and, therefore, preventable. The Report contains recommendations and suggestions aimed at avoiding a similar occurrence in the future.

Anyone who hopes to find in this Report a simple and conclusive answer as to how this tragedy happened will be disappointed. Anyone who expects that this Report will single out one or two persons and assess total blame for the tragedy will be similarly disappointed. The Westray Story is a complex mosaic of

actions, omissions, mistakes, incompetence, apathy, cynicism, stupidity, and neglect. Some well-intentioned but misguided blunders were also added to the mix. It was clear from the outset that the loss of 26 lives at Plymouth, Pictou County, in the early morning hours of 9 May 1992 was not the result of a single definable event or misstep. Only the serenely uninformed (the wilfully blind) or the cynically self-serving could be satisfied with such an explanation.

This Report has been written with the benefit of hindsight, which, as the saying goes, provides 20/20 vision. Many of the incidents that now appear to fit into the mosaic might at the time, and of themselves, have seemed trivial. Viewed in context, these seemingly isolated incidents constitute a mind-set or operating philosophy that appears to favour expediency over intelligent planning and that trivializes safety concerns. Indeed, management at Westray displayed a certain disdain for safety and appeared to regard safety-conscious workers as the wimps in the organization. To its discredit, the management at Westray, through either incompetence or ignorance, lost sight of the basic tenet of coal mining: that safe mining is good business. As one mining executive remarked to me in June 1996 during a mine visit to Alabama, "We could not afford to operate an unsafe mine, due to the high cost of accidents and downtime." Certainly, the validity of this concept was never more obvious than in the horrible aftermath of Westray.

The tale that unfolds in the ensuing narrative is the Westray Story. It is a story of incompetence, of mismanagement, of bureaucratic bungling, of deceit, of ruthlessness, of cover-up, of apathy, of expediency, and of cynical indifference. It is a tragic story, with the inevitable moments of pathos and heroism. The Westray Story concerns an event that, in all good common sense, ought not to have occurred. It did occur — and that is our unfortunate legacy.

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Summary

The following is a brief synopsis of the more significant facts that came to light during the course of this Inquiry. This summary is provided as an introduction to the consolidated findings and recommendations, which have been abstracted from the Report and included here. I urge the reader to refer to the full report for a more comprehensive discussion of the testimony and other evidence from which the numerous findings and recommendations are derived. This summary, which is organized according to the structure of the Report, includes key points from the first four parts: Prelude to the Tragedy, The Explosion, The Regulators, and The Aftermath. The reader should also consult the photographs, maps, and other material found in the Reference volume.

The first of the Terms of Reference of this Inquiry deals with the direct cause of death of the 26 miners in an underground explosion in the Westray mine at 5:20 in the morning of 9 May 1992. Accordingly, this Inquiry must address two main questions: How did those 26 miners die? And why did those 26 miners die? The "how" is relatively straightforward. The "why" is decidedly more difficult and involves multifaceted considerations — of planning, development, supervision, management, working practices, and regulations. The Inquiry heard testimony from miners and mine experts, and examined all the expert opinions and anecdotal evidence. As the findings specify in detail, I find that the source of ignition was sparks struck by the cutting bits of the continuous miner working in the Southwest 2 section of the mine. But it became apparent as the Inquiry proceeded that conditions at Westray were of greater significance to what happened than was the source of ignition. Had there been adequate ventilation, had there been adequate treatment of coal dust, and had there been adequate training and an appreciation by management for a safety ethic, those sparks would have faded harmlessly.

Prelude to the Tragedy: History, Development, and Operation

The Westray mine is located at Plymouth, near Stellarton, in Pictou County, Nova Scotia. Westray was the only operating underground coal mine in Pictou County at the time of the explosion. The Pictou coalfield had been mined for some 200 years, and elements of the disaster rest in the nature of that coalfield with its thick and gassy seams. The Foord seam, which Westray was mining, has hosted at least eight mines. The Allan mine, the most productive and the one that lay just northwest of Westray's workings, finally closed in the 1950s, but during its 40-year lifetime, it experienced eight methane explosions.

The Westray project was controversial from the outset. Although various companies — including Brinco Mining Limited, Suncor Inc., and Placer Development Limited — had been interested in the area with its low- sulphur coal, it was Curragh Resources Inc. that eventually put the pieces together, incorporated Westray Coal in November 1987, and some 16 months later began underground development. In seeking government funding (and later in preparing its development and operating plans), Curragh relied on feasibility and planning studies, some of them quite preliminary works, prepared for Suncor and Placer. On 9 September 1988, Westray finalized a deal for Suncor's coal interests in Pictou County and signed an agreement with Nova Scotia Power Corporation, which agreed to purchase Westray coal for its new coal-burning generating stations at nearby Trenton, Nova Scotia. A letter dated that same day was sent to Westray by Donald Cameron, provincial minister of industry, trade, and technology, which committed the province to a mining lease, a loan of $12 million, and a take-or-pay agreement for 275,000 tonnes of coal per year for 15 years. The cabinet did not approve the take-or-pay agreement until two years later.

The proposed mine developed amid opposition from the bureaucracy and unwavering support from the provincial government. As development proceeded, the mine was the subject of debate and criticism in the legislature and in the media. It also proceeded with an uncompromising and abusive Curragh negotiator, chief executive officer Clifford Frame, at the helm. For these reasons, it is not surprising that the negotiations for financial assistance between Curragh and government proved to be arduous and taxing. In the end, the strong and single-minded political backing for the project, by Donald Cameron in particular, prevailed. Westray received tremendous financial support from the public sector, which resulted in minimal equity investment by the company. In addition to the $12 million provincial loan and a most unusual take-or-pay agreement with the province, Curragh managed to secure a federal loan guarantee of approximately $85 million, a direct contribution against interest, and an $8 million interim loan.

Before all the financing was in place, the underground work began. Early in 1989, Curragh's subcontractor, Canadian Mining Development (CMD), began driving the main access slopes. The Department of Natural Resources had approved Curragh's application for the mining lease in 1988, and, in January 1989, the department discovered that the tunnel alignment had been changed from the approved layout. CMD was to drive the two main slopes to the limits of the planned workings, and Westray would then take on the development of coal-producing sections off the mains. Meanwhile, several provincial government departments were engaged in continuing negotiations with Curragh. The Department of the Environment had a number of concerns about the effect of the development on the area. The Department of Labour expressed concern about training and certification, equipment approvals, plans for emergencies, and delays in setting up a workplace safety committee. The Department of Natural

Resources was concerned that the new tunnel alignment would intersect major geological faults at oblique angles, resulting in extensive tunnel development through bad ground. Poor roof conditions in the earliest days of tunnel development gave credence to that concern.

In late July 1989, with the funding for the project still not finalized, development was suspended. Construction did not resume fully until fall 1990, when the federal government guaranteed financing for the project, less than a year before the mine was supposed to begin shipping coal to the new Trenton power plant.

Roof conditions emerged as a major problem in 1991. Westray took over development from CMD in early April 1991, at a much earlier stage of development than originally planned, and began using continuous mining machines to drive the mains. The company decided to scrap the original mine layout and to change direction so it could tap into the coal seam sooner. That change took development into the Southwest section of the mine. During the summer, development also continued down into the North mains, splitting the mine into two distinct sections, each with its own crews and supervisors. In the rush to reach saleable coal, workers without adequate coal mining experience were promoted to newly created supervisory positions. Workers were not trained by Westray in safe work methods or in recognizing dangerous roof conditions — despite a major roof collapse in August. Basic safety measures were ignored or performed inadequately. Stonedusting, for example, a critical and standard practice that renders coal dust non-explosive, was carried out sporadically by volunteers on overtime following their 12-hour shifts.

The official opening of the mine was on 11 September 1991. For that occasion, the mine was "spruced up" and stonedusted.

Four more roof falls were reported in September and October. The mine manager, Gerald Phillips, minimized the seriousness of roof problems, claiming that the falls were controlled and that they posed little threat to the miners or to production. To the contrary, realistic accounts of the miners' experiences revealed a series of near misses and increasing danger. There were approximately 160 employees at the site by October, a large majority of them working shifts underground. Management trivialized the concerns of workers, some of whom quit their jobs at the mine. Although the mine inspectors asked the company for roof support plans, as well as stonedusting plans, it repeatedly deferred supplying them. Westray is a stark example of an operation where production demands resulted in the violation of the basic and fundamental tenets of safe mining practice.

The first drive to unionize the workforce at Westray was officially begun on 2 October 1991 by local 26 of the United Mine Workers of America. The union was defeated by 20 votes in January 1992. In the spring of 1992, the United Steelworkers of America succeeded in its drive to unionize the workers, but certification was not granted until after the 9 May explosion.

The Southwest section was plagued with roof problems. The decision to drive into the Southwest section was proving a serious mistake. The levels of production and the quality of the coal were less than anticipated. Production remained behind schedule, and the company was not able to meet its commitments to supply coal. In late March 1992, the workforce was literally chased out of the Southwest 1 section by rapidly deteriorating ground conditions. In its determination to save equipment, the company put employees at extreme risk during the abandonment.

The Department of Natural Resources staff expressed concern about proximity to the old Allan mine workings, potential subsidence problems, and deviations from the approved mine plan. The department suggested that non-compliance could threaten the company's mining permit but inexplicably retreated from its position. Skeletal new plans submitted by the company were approved, and the department assisted the company in developing a surface mining operation to help meet its coal supply obligations. Federal and provincial money and expertise met most of the costs of technical studies for monitoring roof conditions and subsidence.

The regulatory framework in Nova Scotia requires that almost every person employed in underground coal mining hold a certificate of competency issued by an appointed provincial board of examiners. Section 11 of the Coal Mines Regulation Act (1989) sets out the education and work experience required for the various certificates. The administration of certification for mine rescue and for competency as a coal miner was delegated to the Department of Labour. In Nova Scotia, the company is responsible for training miners. The role of the Department of Labour is to ensure that the company complies with the Coal Mines Regulation Act and the Occupational Health and Safety Act.

It is clear that the company was derelict in carrying out its obligations for training. The testimony of the miners shows that training fell far short of need. Don Mitchell, mining consultant for the Department of Labour, concluded from his post-explosion investigation that the mine "had no program that was appropriate to the needs of that mine." And expert witness Dr Malcolm McPherson referred to the inadequate training of mine workers as making an equally potent contribution to the propagation of a mine explosion as did the ventilation engineering deficiencies.

Quite simply, management did not instil a safety mentality in its workforce. Although it stressed safety in its employee handbook, the policy it laid out there was never promoted or enforced. Indeed, management ignored or encouraged a series of hazardous or illegal practices, including having the miners work 12-hour shifts, improperly storing fuel and refuelling vehicles underground, and using non-flameproof equipment underground in ways that violated conditions set by the Department of Labour — to mention only a few. Equipment fundamental to a safe mine operation — from the cap lamp to the environmental monitoring system — did not function properly.

It was equally clear that the Department of Labour was derelict in its duty to enforce the requirements of the two acts.

The Explosion: An Analysis of Underground Conditions

Early in this Inquiry, I reached the conclusion that ventilation is the most crucial aspect of mine safety in an underground coal mine. Methane fires and explosions cannot happen if the gas is kept from accumulating in flammable and explosive concentrations. A coal mine can be quite "forgiving" with respect to other aspects of safety, as long as the ventilation system is properly planned, efficient, and conscientiously maintained. The other major requirement of coal mine safety is control of coal dust, through strict clean-up procedures and regular stonedusting.

The ventilation system of any underground mine is a network of interconnected passages, many of which are also used as transportation routes for personnel, vehicles, and the products of mining. Fresh air is drawn from the surface atmosphere. As the air passes through the underground passages, its quality deteriorates as a result of pollutants produced from the strata and from the effects of machines and mining procedures. The contaminated air is returned to the surface. A mine ventilation system has to deal with both gaseous and particulate pollutants. Methane is a dangerous pollutant present in coal. Although non-toxic, it is hazardous because of its flammability. It will explode in concentrations of between 5 and about 15 per cent by volume in air, and it reaches maximum explosiveness at about 9.6 per cent.

Methane is a natural component of coal, a by-product of the decomposition of the plant matter from which coal is formed. Methane is released as the coal-cutting machines break coal away from the face. As methane continues to emerge from the coal, it moves through fissures in the coal that remains after mining, and it can escape into the active roadways from abandoned or mined-out sections, depending on the effectiveness of the stoppings constructed at the entrances to abandoned sections. One of the principal functions of a ventilation system is to clear the methane at the working face of the mine and to exhaust it from the mine in non-explosive concentrations. It is clear that the Westray ventilation system was grossly inadequate for this task. It is also clear that the conditions in the mine were conducive to a coal-dust explosion.

The miners, faced with management pressure for production, undoubtedly indulged in many dangerous and foolhardy practices in the days immediately preceding 9 May 1992. In his various comments reported in the media following the explosion, Gerald Phillips blatantly blamed the miners for the explosion. In light of all the evidence of mismanagement, neglect, and incompetence at Westray, this simplistic explanation can only be regarded as a defensive ploy to deflect attention away from the real causative factors. Unfortunately, this explanation was picked up by former premier Donald Cameron. From all the evidence and the extensive analysis and studies by mining experts, however, it becomes abundantly clear that ventilation in the Westray mine was woefully deficient in almost every respect. The airflow was inadequate for the purpose of clearing methane from the working face during mining and preventing the layering of methane on the roof.

Therefore, I should like to put to rest the question raised by Cameron's testimony, as well as the statements of Phillips and Frame to the media: Had it not been for these unsafe practices attributed to the miners, would the explosion of 9 May have occurred? The answer must be yes, it would have. The consensus of the experts suggests strongly that Westray was an accident waiting to happen.

The Regulators: Departmental and Ministerial Responsibility

The Department of Natural Resources (the Department of Mines and Energy before September 1991) was charged with regulatory authority over the mine-planning approval process. As the testimony at the Inquiry unfolded, it became clear that the Department of Natural Resources had failed to carry out its statutory duties and responsibilities as they related to the Westray project. Natural Resources witnesses had mixed views on fundamental regulatory issues, such as whether the department was within its mandate to regulate for "safety," or whether its duty included monitoring Westray to ensure that it was operating in conformity with the approved mine plan.

The mandate of the department vis-à-vis the Department of Labour and the mine inspectorate was not formally defined in any way, and the changes affecting the departments over their history contributed to this lack of definition. Before 1986, both the mine engineering unit and the mine inspection unit were part of the Department of Mines and Energy, and their duties overlapped somewhat. When the inspectorate transferred to the occupational health and safety division of the Department of Labour in 1986, it lost its link to the engineering section. When the chief inspector left a short time later, the liaison between the two functions effectively ended. It is clear that the Department of Natural Resources, in spite of these changes, retained legislative responsibility to ensure, before permits are granted, that mining plans are not only efficient but safe.

In the view of the Department of Natural Resources, its responsibility for monitoring the Westray operation for compliance with the approved mine plan was limited to an annual review of plans submitted by the operator. Section 93 of the Mineral Resources Act (1990) is explicit: the permit holder "shall conduct mining operations in conformity with the approved mining plan." The Department of Natural Resources was ill-advised in approving the Westray mine proposal in the form submitted. The department did not insist that the company submit sufficient information to support its application. Furthermore, it did not insist that the company submit any changes to approved plans. Consequently, for a critical period, the department was not aware that Westray was working an unapproved section of the mine. The department's explanation was that such day-to-day monitoring was the responsibility of the Department of Labour. What it did not explain was why the department failed to shut down a company that was undeniably in violation of the Mineral Resources Act — an action that fell squarely within its own mandate. The evidence of the public servants of the Department of Natural Resources is replete with examples of neglect of duties, submissiveness to Westray management, and just plain apathy.

The Department of Labour shares with the Department of Natural Resources the responsibility for failure to coordinate the several aspects of mine regulation. The Department of Labour was responsible for regulating occupational health and safety at the mine, and as such was the body most responsible for the exercise of regulatory authority respecting safe mining at Westray. What is clear from the testimony of Labour witnesses at the Inquiry is that the department did not discharge its duties with competence or diligence, and thereby failed to carry out its mandated responsibilities to the workers at Westray and to the people of Nova Scotia.

The Report enumerates in detail the many ways in which Westray Coal violated the regulations governing mine operations. The Department of Labour's mine inspectorate should have detected these violations and ensured compliance. To give just one example, despite the company's repeated violations of the Coal

Mines Regulation Act in the matters of clearing coal dust from the working sections of the mine and applying stonedust to render the coal dust inert, the mine inspectorate did not use the means at its disposal to ensure compliance. It was not until 29 April 1992 that inspector Albert McLean gave oral orders, followed up by written orders, to Westray underground manager Roger Parry and mine manager Gerald Phillips to clean up and treat the coal dust immediately and to produce the stonedusting and dust sampling plans that had been promised in September 1991. McLean failed to follow up on his orders during his visit to the mine on 6 May 1992.

The Report also examines the involvement of politicians in the development of the Westray project and their very active support of a project that would mean jobs in Pictou County. The three provincial politicians most involved with the Westray project were John Buchanan, Donald Cameron, and Leroy Legere. Cameron had the most prominent and enduring role in the project, serving as minister of industry, trade, and technology from April 1988 until he succeeded Buchanan as premier in February 1991, a position he held until late spring 1993. Legere was appointed minister of labour in February 1991. It became clear in the course of the Inquiry that Buchanan, Cameron, and Legere had disparate understandings of their roles as ministers of the crown. The fact that they had such an imperfect understanding of the nature of their responsibilities suggests that a formal clarification of constitutional responsibilities is required. In the Report, I recommend establishing a program offering guidelines to ministers on their responsibilities, perhaps modelled on the one used in the United Kingdom. At the same time, there appears to be some misunderstanding respecting the concept of ministerial responsibility, and for that reason I have devoted some attention to what it means in modern government.

As part of the preparation before the public hearings began, I undertook a general review of legislation pertaining to mining and safety in Nova Scotia and in other jurisdictions. Clearly, the aim of mining legislation should be the protection of the miner in the mining environment. Coal mining is inherently hazardous, and safety regulations must protect the miner in a way that is consistent with the economic viability of the undertaking. This goal has been expressed in terms of safe mine production. "Attitude," which may be the most significant single factor in attaining safe mine production, cannot of course be legislated. It must, however, be cultivated within an organization, whether it be a mining company, a union, or a government agency charged with enforcement of safety legislation.

The Aftermath: Rescue Efforts and the Inquiry

I would be remiss if I did not comment on the selfless bravery shown by the rescue teams in the days following the explosion. The conditions in the mine were terrifying. The force of the explosion resulted in severe instability within the roof and walls of the mine. Rock falls, of varying degrees of intensity, were almost continuous. Signs of the devastation were rampant, as were signs of impending danger. The poisonous, unbreathable atmosphere and the actively "working" ground surrounding the mine openings, with the attendant grinding and cracking, were extremely stressful. Yet these men, miners trained in mine rescue, each wearing his personal life-support system, went unquestioningly into that perilous environment with the hope of finding some of their comrades alive. The rescuers came from mainland Nova Scotia, Cape Breton, and New Brunswick. We can only be thankful for this valiant display of concern for fellow workers. I also wish to recognize the entire community for its selfless work in those difficult days.

I must point out that Westray Coal was ill prepared for a disaster. I have made a number of recommendations pertaining to what a company can do in preparation, as well as what the regulator's role should be.

Finally, I describe my preparations for the public hearings of this Inquiry, which was established six days after the explosion amid grief, calls for recrimination, and confusion. I then record the factors that caused the delay in concluding the Inquiry.

In Conclusion

The conclusions below are additional to the observations and comments made throughout the Report.

Responsibility

As the evidence emerged during this Inquiry, it became clear that many persons and entities had defaulted in their legislative, business, statutory, and management responsibilities. There is always the danger that when so many are implicated and bear some degree of responsibility the principal focus may be somewhat diminished by the sheer multiplicity of defaults. In the case of Westray, there is a clear "hierarchy" of responsibility for the environment that set the stage for 9 May 1992 — and we ought not to lose sight of this hierarchy.

The fundamental and basic responsibility for the safe operation of an underground coal mine, and indeed of any industrial undertaking, rests clearly with management. The internal responsibility system merely articulates this responsibility and places it in context. Westray management, starting with the chief executive officer, was required by law, by good business practice, and by good conscience to design and operate the Westray mine safely. Westray management failed in this primary responsibility, and the significance of that failure cannot be mitigated or diluted simply because others were derelict in their responsibility.

The Department of Labour through its mine inspectorate must bear a correlative responsibility for its continued failure in its duty to ensure compliance with the Coal Mines Regulation Act and the Occupational Health and Safety Act. Indeed, the many and varied faults of Westray management and its derelict attitude towards safety should have prompted the Department of Labour inspectorate to adopt a firm and uncompromising position on strict compliance. Instead, the evidence indicates that the demeanour of the inspectorate was one of apathy and complaisance.

With its "hands-off" attitude, its general indifference to the quality of mine planning, and its lassitude about any safety responsibility, the Department of Natural Resources failed to discharge its duties in a creditable manner. The general attitude of wilful blindness pervaded the department's dealings with Westray. Thus, the stage was set for Westray management to maintain an air of arrogance and cynicism, knowing that it was not going to be seriously challenged.

Compliance with the Coal Mines Regulation Act

Much has been said throughout this Inquiry about the inadequacy of the Coal Mines Regulation Act. As outdated and archaic as the present act is, it is painfully clear that this disaster would not have occurred if there had been compliance with the act.

If the “floor, roof and sides of the road and the working places”[1] had been systematically cleared so as to prevent the accumulation of coal dust;

If the “floor, road and sides of every road”[2] had been treated with stonedust so that the resulting mixture would contain no more than 35 per cent combustible matter (adjusted downward to allow for the presence of methane); and

If the mine had been "thoroughly ventilated and furnished with an adequate supply of pure air to dilute and render harmless inflammable and noxious gases,”[3] then . . .

. . . the 9 May 1992 explosion could not have happened, and 26 miners would not have been killed.

Compliance with these sections of the Coal Mines Regulation Act was the clear duty of Westray management, from the chief executive officer to the first-line supervisor. To ensure that this duty was undertaken and fulfilled by management was the legislated duty of the inspectorate of the Department of Labour. Management failed, the inspectorate failed, and the mine blew up.

[1] Section 70(1)
[2] Section 71(3)
[3] Section 71(1)

What If?

In the opening statement to this Report on pages vii—ix, I comment that the Westray story is a "complex mosaic of actions, omissions, mistakes, incompetence, apathy, cynicism, stupidity, and neglect." It seems fitting that I ought now, in this conclusion to the Report, revisit this comment and relate it to the extensive evidence that has been summarized in the preceding pages. The following questions are posed, in a somewhat rhetorical manner, to underscore the proposition that the Westray story is, indeed, a "complex mosaic."

What if — Clifford Frame, as Westray's chief executive officer, had acknowledged that the motivation for mine safety begins at the top? What if he had sent a clear message to Westray management that a safe working environment was paramount?

What if — Gerald Phillips, Roger Parry, Glyn Jones, and other Westray managers, with a clear directive from the chief executive officer, had conscientiously directed compliance with the Manager's Safe Working Procedures?

What if — the Coal Mines Regulation Act had been applied and enforced by the inspectorate of the Department of Labour? Would it have made a difference if the executive director of occupational health and safety had even read the act?

What if — the public servants at the Department of Natural Resources had fulfilled their legislative responsibilities and determined, before issuing mining permits, that the mine plans submitted by Westray assured "safe and efficient" use of the resources and then followed up to determine that Westray was mining in accordance with those plans?

What if — the Westray miners, at the certification vote on 5 and 6 January 1992, had voted in favour of the application of the United Mine Workers of America to represent them as the bargaining agent under the Nova Scotia Trade Union Act?

What if — Department of Labour inspector Albert McLean, while at Westray on 6 May 1992, had returned underground to evaluate the company's progress in complying with the several oral and written orders issued during the inspectors' visit of 29 April 1992?

Consolidated Findings

PART ONE

Prelude to the Tragedy: History, Development, and Operation

Chapter 2 Development of the Westray Project

The Arrival of Curragh

It seems that Curragh was interested in the Pictou coal project only if it was able to secure significant government support; Curragh seemed less interested in the merits of the project itself. And it was this mind-set that set the tone for the negotiations and developments to follow. [See page 33.]

The Final Deal

The arrogance and the tough negotiating stance of Curragh officials were probably rooted in their awareness of, and reliance on, the political backing for the project. [See page 44.]

Provincial Support

Donald Cameron, a Pictou County MLA, was totally committed to the concept of having a coal mine in that county. This commitment is laudable and represents the sort of activity expected of politicians. It is, perhaps, one of the most rewarding of their duties. Cameron, as minister of industry, trade and technology, continued with the same single-minded determination to work to ensure that Westray became a reality. In this context, he may have exceeded the limits of ministerial prudence and responsibility. He became an advocate of the project in much the same way that the promoters were in their dealings with the government of Canada. [See page 48.]

Take-or-Pay Agreement

The evidence is unequivocal that, by September 1988, the cabinet had not approved a take-or-pay agreement with Westray for 275,000 tonnes of coal per year. Although the issue may have been discussed in cabinet, there was no existing authority for the minister to confirm that the province was willing to enter into the agreement. In spite of this, Cameron, in his letter of 9 September 1988, committed the province to the take-or-pay agreement. That action on the part of the minister was clearly improper. Cameron may have felt secure that the negotiations, which were all that had been authorized by cabinet, would mature into formal approval for the agreement. It would appear that Cameron allowed his determination to cloud his judgment. The fact that the agreement received cabinet approval two years later in no way excuses Cameron's earlier unauthorized action. [See page 56.]

Opposition to the Take-or-Pay Agreement

The whole question of the take-or-pay agreement was fraught with difficulties. It was an unusual agreement in that it provided for a third party, the province, to commit public funds for the purchase of coal for which it had no immediate market. The agreement was roundly criticized as a bad deal for the province, and, moreover, the agreement was not really required in order to conclude the deal with Westray.

Cameron piloted this agreement through cabinet, which finally gave its approval. Although a minister is under no obligation to accept the advice of his or her departmental staff, the minister does at least have an

obligation to consider that advice. The evidence is strong that Cameron did not give prudent and thoughtful consideration to the advice coming from his, and other, government officials. Notwithstanding the overwhelming opposition to the take-or-pay agreement, the political support for it became the final and decisive factor in pushing it through. [See page 60.]

Enforceability of the Take-or-Pay Agreement

The take-or-pay agreement executed by Curragh, Novaco, and the province was enforceable, notwithstanding a purported understanding between Cameron and Curragh officials that the agreement would never be exercised. To exercise the agreement for a given production year, the company had to choose to do so, well in advance, by a date specified in the agreement. The company would have to demonstrate at that time that the mine was capable of full production for the forthcoming year. Curragh indicated its intent to avail itself of the agreement when it requested an extension to that date, presumably to give itself time to get up to full production. Cameron's support for the agreement was based only on Curragh's word that the take-or-pay agreement would never be exercised. This attitude indicates startling naivety for a person of experience in the political milieu. If not naivety, it is another compelling example of Cameron's obdurate and single-minded determination to bring Westray to reality.

Having criticized Cameron for his conduct throughout the development stage of the Westray project, I must carefully note that my criticisms cannot be construed as evidence of any sort of complicity in the many defaults and oversights that led to the terrible event of 9 May 1992. There is no evidence that Cameron was ever told by his staff that the Westray mine was poorly or inadequately planned, poorly and unsafely operated, or operated in contravention of the Coal Mines Regulation Act and the Occupational Health and Safety Act. [See page 64.]

Chapter 3 Organization and Management at Westray

Organization and Management

The foremen and overmen at Westray had little or no opportunity to perform their duties as set out in the Coal Mines Regulation Act. They had little or no say in the day-to-day operation of the mine and were expected only to carry out the orders of Westray mine manager Gerald Phillips as delivered to them by him personally or through his underground manager, Roger Parry. [See page 80.]

Management at Westray was closed, and four of the senior staff — Gerald Phillips, Roger Parry, Glyn Jones, and Bob Parry — ran the mine with little or no input from others. Input was not sought, and when offered was usually disdainfully rejected. It is probable that Phillips, as vice-president and general manager, would be the most influential of the four. [See page 81.]

Qualifications — The Westray Managers

The evidence raises serious questions as to the qualifications of the mine manager and the underground manager at Westray. Gerald Phillips represented himself (at least in his resume) as having attained standing as a "mining engineer," and he listed several such positions held. This representation is clearly misleading.

Roger Parry was granted a provisional certificate by the director of mine safety, Claude White, even though there is no authority for such action. Parry's resume also listed employment as "underground manager" in Alberta, despite his having attained only the assistant underground mine manager certificate. [See page 87.]

Chapter 4 Training at Westray

Early Assessments of Training Needs

Westray management, from the chief executive officer down, paid little attention to the requirement for adequate training in underground coal mine safety and operations. The several training proposals produced by Westray seem to have been formulated to satisfy the inspectorate and the board of examiners while the company sent insufficiently trained persons into the mine. The record shows that the inspectorate did little to monitor compliance with the training proposals. [See page 104.]

Actual Training

The miners, supervisors, and underground tradesmen at Westray were not provided with adequate training in safe underground work practices. They went into the mine with little or no safety orientation. [See page 130.]

Lacking a proper appreciation for the special dangers inherent in underground coal mining, many of the tradesmen were prone to accede to directions to perform unsafe tasks or to take dangerous shortcuts in their work. [See page 131.]

Chapter 5 Working Underground at Westray

Dust Conditions

There is no question that management was aware that coal-dust accumulations underground at Westray were at hazardous levels. There is no question that management was aware, or ought to have been aware, that safe mining practice — as well as section 70(1) of the Coal Mines Regulation Act — requires operators to clear or treat coal dust to render it non-explosive. Notwithstanding the legislative requirement and the fact that management was cognizant of the hazard, management failed to order and enforce sufficient and systematic stonedusting underground at Westray. [See page 139.]

Gas Conditions

There is no question that management knew that the levels of methane underground at Westray were hazardous. Management was aware, or ought to have been aware, that, under section 72 of the Coal Mines Regulation Act, such conditions mandated the withdrawal of workers from the affected area. [See page 141.]

Roof Conditions

Westray management was preoccupied by problems of ground control. Management focused only on those safety issues, such as ground control, that directly interfered with immediate production of coal. Management's drive to produce and its failure to advocate safety in the workplace rendered any harmonization of production and safety difficult. Thus, Westray failed both to meet production demands and to address safety concerns. [See page 142.]

Hazardous and Illegal Practices

The many instances of hazardous and illegal practices encouraged or condoned by Westray management demonstrate its failure to fulfil its legislated responsibility to provide a safe work environment for its workforce. Management avoided any safety ethic and apparently did so out of concern for production imperatives. [See page 142.]

Twelve-Hour Shifts

Shifts at Westray for underground workers were 12 hours in length. In scheduling these shifts, Westray was in violation of section 128(1) of the Coal Mines Regulation Act. Twelve-hour shifts increase the risk of injury and accident to the workers because of their mental and physical fatigue. [See page 144.]

Tagging System

No effective system existed at Westray to keep track of the whereabouts of people underground. Management and supervisors failed to set up and enforce the use of an appropriate system for keeping track of who was underground and where they were. [See page 146.]

Storing Fuel and Refuelling Vehicles Underground

Westray management instructed that fuel be stored underground and that vehicles be refuelled underground. In so doing, Westray management acted in violation of section 69(6) of the Coal Mines Regulation Act and of its own codes of practice. These fuel storage and refuelling practices were illegal and hazardous. [See page 147.]

Torches Underground

The unsafe use of torches underground was a common practice at Westray. Management was aware of the practice, condoned the practice, and reprimanded those who condemned it. In so doing, management sent a clear message to the underground workers. Management's unsafe mentality was, in effect, filtering down to the Westray workforce. [See page 149.]

Methane Detection Equipment

Methane detection equipment at Westray was illegally foiled in the interests of production. [See page 150.]

Lockout System

No true system was in place at Westray for locking out the main conveyor belt, a standard procedure in underground coal mine operation. [See page 152.]

Unqualified Underground Personnel

Westray management sent underground both foremen with little or no coal mining experience and novice miners who were untrained and inadequately supervised. This practice can only be construed as a further example of Westray management's laxity in applying basic principles of coal mining safety. [See page 153.]

Non-flameproof Equipment Underground

Westray management failed to provide adequate instruction on the use, and the limitations imposed on that use, of non-flameproof equipment. By its example, Westray management condoned, and even encouraged, illegal use of this equipment underground. [See page 155.]

Cable Damage

Westray management seemed to condone the dangerous and haphazard practice of allowing temporary cable repairs to remain as permanent repairs. In so doing, management was in violation of section 85(2), rule 75, of the Coal Mines Regulation Act, which requires that such cables be properly vulcanized. [See page 157.]

Main Ventilation Fan

The main ventilation fan in any mine is fundamental to the safe operation of that mine and the safety of its underground workers. Notwithstanding, Westray management failed to instil any understanding of this fact in its workforce. On the contrary, workers were instructed to shut the fan down for maintenance without any provision for the safety of the workers. [See page 157.]

Environmental Monitoring System

The environmental monitoring system at Westray was not effective. Its problems were inherent not in the equipment, but in the manner in which it was installed and maintained. They can be summarized as follows:

- Equipment was installed improperly and an incorrect transmission cable was used.
- Initial difficulties were not resolved and the system was inoperative most of the time.
- Maintenance and resolution of faults in the system were left to an engineer-in-training with no previous experience in coal mines or with this type of equipment.

- That same engineer was allocated duties that conflicted between mine production and safety.
- There were not sufficient monitoring stations in strategic locations, especially in the Southwest sections.
- There was no scheduled maintenance or recalibration of gas sensors. [See page 163.]

Equipment

Roof bolting in conditions such as those experienced at Westray clearly jeopardized the health of the workers who were "gassing out" on a continual basis. The issue of methanometers on roof bolters leads us directly to the adequacy of ventilation in mining headings. If the ventilation of the headings had been adequate, methane would be cleared before bolting began. Westray management's trivialization of methane in working areas illustrates a serious disregard for or a misunderstanding of proper ventilation. [See page 168.]

Westray management failed to provide properly maintained and appropriate equipment. Management thus failed in its fundamental and overriding responsibility to ensure that underground workers were able to do their work in a safe environment. [See page 168.]

Management-Worker Relations

Westray managers not only failed to promote and nurture any kind of a safe work ethic but actually discouraged any meaningful dialogue on safety issues. Management did so through an aggressive and authoritarian attitude towards the employees, as well as by the use of offensive and abusive language. Westray workers quickly came to realize that their safety concerns fell on deaf ears and that management's open-door policy was mere window dressing. [See page 176.]

Occupational Health and Safety Committee

Westray's joint occupational health and safety committee was ineffective. It never functioned as the Occupational Health and Safety Act envisaged, and for that management must bear responsibility. Management actively discouraged a safety mentality on the part of the workforce and failed to respond to safety concerns raised by committee members. [See page 183.]

Production Bonus System

It is clear from the evidence of the miners and from an outside expert's analysis of that evidence that the incentive bonus scheme based solely on productivity was not conducive to safety in the Westray workplace. [See page 187.]

Working Underground — Conclusion

The evidence before this Inquiry compels but one conclusion — the Westray operation defied the fundamental rules and principles of safe mining practice. Regardless of the theories, philosophies, and procedures that management espoused on paper, most notably in its employee handbook, it clearly rejected industry standards, provincial regulations, codes of safe practice, and common sense in the operation of the Westray mine. Management failed to adopt and effectively promote a safety ethic underground. Instead, management, through its actions and attitudes, sent a different message — Westray was to produce coal at the expense of worker safety.

Westray management, from the chief executive officer, Clifford Frame, and the mine manager, Gerald Phillips, down to the line supervisor, had a fundamental duty to instil in the underground worker a respect

for safety beyond other considerations. Management could do this through training, by example, and with continued monitoring at all levels. In trivializing and ignoring safety concerns, Westray management was significantly derelict in its duty to the workforce and seemed actively to promote a disdainful and reckless attitude towards safe mining practices. [See page 188.]

PART TWO

The Explosion: An Analysis of Underground Conditions

Chapter 6 The Explosion

Sources of Ignition

The source of ignition that caused the methane accumulation to catch fire, most probably, was the cutting mechanism or picks of the continuous miner, which, when they struck either pyrites or sandstone, caused sparks of sufficient intensity to light the gas. The gas would be ignited in much the same way that the spark from the flint of a cigarette lighter will ignite the gas emitted from the lighter reservoir. [See page 197.]

Propagation

The ignition caused a rolling methane flame to travel away from the working face of SW2-1 Road and also propagated into the Lefthander, consuming all the oxygen in the roadways and leaving deadly quantities of carbon monoxide in its place. The rolling flame moved to SW2-2 Cross-cut, where it followed SW2-B Road both inbye and outbye the cross-cut and continued as a rolling methane fire inbye SW2-2 Cross-cut towards the roof bolter at the face. The rolling flame did not develop into a methane explosion, although it did increase in intensity.

As the flame turned outbye SW2-2 Cross-cut, three factors combined to cause the flame to propagate into a methane explosion, which, in turn, generated a preceding shock wave: the boom truck located in the intersection, the auxiliary fan in the cross-cut, and the change of direction of the flame down SW2-B Road towards SW1-B Road. The resulting shock wave then created greater pressure and increased turbulence, which caused dust particles to become airborne — just in time for the extreme heat of the trailing methane explosion to generate a full-blown coal-dust explosion. It is probable that this coal-dust explosion started at or near the Stamler feeder-breaker located about 30 m down SW2-B Road outbye SW2-2 Cross-cut. The resulting coal-dust explosion then moved rapidly through the entire mine, causing death and devastation in a matter of a few seconds. [See page 206.]

Methane Layering

Methane layering, the result of inadequate ventilation, was permitted to propagate, virtually undetected, throughout the Southwest 2 section. It provided a rich source of fuel for any ignition source to feed upon. [See page 217.]

The Barometer

Westray mine management did not monitor the barometric pressure in any acceptable manner and neglected this significant factor in the maintenance of a safe and effective ventilation system. [See page 218.]

The Water Gauge

Westray mine management failed to provide a water gauge to monitor the ventilation conditions of the mine from the surface and, as a result of this omission, deprived the mine workforce of another significant safety-monitoring device. [See page 219.]

Auxiliary Ventilation Ducting

The combination of poor ventilation pressure, small ducting, lack of bratticing, and deficient ventilation controls made it almost impossible to clear methane from the working faces of the mine. Together, they are a further indication of incompetence or negligence in the safety planning and administration of the Westray mine. [See page 220.]

Management Response

During the period leading up to 9 May 1992, there was excessive untreated coal dust in the mine. Little or no effort had been made either to clean up that dust or to render it inert by the addition of sufficient stonedust. Mine management was aware of this problem, but failed to respond to complaints by employees or to the orders of 29 April 1992 from the Department of Labour. [See page 221.]

Methanometer Tampering The evidence indicates that there was tampering with the methanometer on the continuous miner in the Southwest section. The evidence does not support a finding that this tampering in any way caused the explosion. [See page 227.]

The Explosion — Conclusion

It is unfortunate that we are unable to state with complete certainty what caused the death of the 26 miners in the early morning of 9 May 1992. Failing that, we must analyse the known facts, and the opinions based on those facts, and arrive at the most probable cause of death. To support these findings, we relied on the anecdotal evidence of miners and mine rescuers, the photographic evidence gained as a result of the RCMP investigations, and the opinions, based on this evidence, of the several experts. The opinion evidence of Andrew Liney, Don Mitchell, and Malcolm McPherson, although not always in agreement on every issue, leads to the conclusion that the miners in the Southwest 2 section were overcome by carbon monoxide and died almost immediately. This conclusion is consistent with an intense methane fire that consumed all the oxygen, producing carbon monoxide among other products of combustion. It is also consistent with the findings of the chief medical examiner as set out above. The miners in the North mains and the Southwest sections most probably died of a combination of carbon monoxide poisoning and severe bodily injuries. They would have died instantaneously. This is consistent with a coal-dust explosion and the severe physical force exerted by the shock wave preceding the actual coal-dust conflagration.

Chapter 7 Ventilation

The Main Ventilation System at Westray

Generally, the regulating, control, and monitoring of the main airflow was inadequate and poorly planned. In some cases, the regulating devices contravened the requirements of the Coal Mines Regulation Act. In other cases, these devices were simply improperly constructed, as in the regulator in No. 2 Main between No. 9 and No. 10 Cross-cuts. [See page 243.]

Throughflow Ventilation: North and Southeast Sections

The ventilation system in the North Mains and Southeast sections of the mine was haphazard, reflecting little or no planning. Plastic stoppings were generally in a state of disrepair — increasing the leakage of air, promoting the recirculation of air, and decreasing the quality and flow of ventilation air. Faulty placement of auxiliary fans further decreased the flow and caused problems such as collapsed ducting, which remained in that state for unduly long periods. The placement of the auxiliary fans in these sections further diminished the airflow — to the extent that it was incapable of flushing liberated methane from the headings. The combined effect of all these deficiencies was to perpetuate poor air quality, the air circulating or recirculating within the sections at velocities too low to remove dangerous contaminants. Significantly, these conditions appear to have been tolerated, or even ignored, by a complacent or careless management. [See page 249.]

Throughflow Ventilation: Southwest Sections

The ventilation system in the Southwest section was consistently defective and inadequate. The ventilation system in the North Mains and the Southeast sections was also defective and inadequate. The defects included:

- poorly constructed plastic stoppings, permitting air leakage of up to 55 per cent of the total airflow;
- the broken anemometer (with no replacement on site), which prevented the taking of airflow measurements for two weeks;
- low ventilation pressures and low airflows, which provided little or no air movement at the working faces where required to clear methane;
- intake air directed past the two plastic stoppings inbye the SW1-3 Cross- cut, which were leaking quantities of methane from the abandoned areas into the active workings of the Southwest 2 section and contributing to the methane-layering problem; and
- placement of conveyors in an intake airway, necessitating the movement of non-permissible vehicles in the return airways.

All these factors lead inexorably to the conclusion that Westray's management was either apathetic or, through incompetence, unaware of the implications of its actions and decisions in these crucial matters. [See page 256.]

Auxiliary Ventilation at Westray

The auxiliary ventilation system at the Westray mine was defective in several ways. Some of the more hazardous defects were:

- It was ineffective in removing the methane from the working face.

- The exhaust system of auxiliary ventilation (used in all but one location) was contrary to the Coal Mines Regulation Act and Westray's own Manager's Safe Working Procedures.
- In most cases, the ventilation ducting was too small for the size of the auxiliary fans. This situation resulted in high resistance in the ducts and excessive suction, which caused collapsing of the ducts and loss of ventilating air to the working faces.
- Poor airflow to the face permitted the accumulation of high levels of methane, which, in turn, caused the continuous miner to shut down until the methane was cleared and safe operating levels attained. To alleviate this gas accumulation and direct more intake air to the working face, miners would, on occasion, block the ventilation ducting serving the roof bolters — a reckless and foolhardy practice. [See page 264.]

Ventilation Planning for Westray Ventilation planning for the Westray mine did not address the requirements for a comprehensive system of fresh-air circulation and methane removal. The plan on which the ventilation was based was merely a brief outline in a feasibility study. A comprehensive engineering study by competent ventilation experts was not completed and documented before approvals were requested. The regulating agency, in this case the Department of Natural Resources, could not assess the efficiency or the safety of the ventilation system of the proposed Westray mine. [See page 271.]

Chapter 8 Methane

Methane Problems during Active Mining

At Westray, the machine-mounted methanometers and their automatic shut-off feature were regarded as a nuisance to be outwitted or eliminated, rather than as essential safety devices. The deliberate interference with the methanometers makes it clear that production of coal was to be maintained at all costs, and with blatant disregard for safety. [See page 292.]

Any of several situations could easily have resulted in an ignition of methane leading to a coal-dust explosion. It follows, therefore, that the incident that actually caused the ignition in the early hours of 9 May 1992 was not an aberration, but simply one more in a frightening series of events that, sadly, had become commonplace at Westray. [See page 292.]

The Explosive Environment

The problems associated with methane gas at the Westray mine originated with a failure to recognize the significance of the permeability of the Foord seam, and in not giving due consideration to the mining history of the Pictou coalfield. They ended with the explosion on 9 May 1992. Between those two points in time, there is a sad litany of causal factors relating to the emissions of methane at Westray and the attempts made to maintain coal production within poorly and incompetently managed ventilation systems. The following circumstances, which existed at various times and at various locations throughout the mine, coupled with the apparent management attitude of "coal production at any cost," provided the environment that would convert a spark at the continuous miner heading into a rolling methane fire and explosion:

- failure to plan adequately for substantial emissions of methane or to take into account the historical evidence of such emissions;
- continued mining in areas where pillars were crushing, hence producing higher quantities of gas;
- falling barometric pressure for 42 hours prior to the explosion and the resulting increase in gas emission;
- failure to maintain a barometer on the surface of the mine to track changes in atmospheric pressure;
- insufficient ventilation in headings to dilute methane efficiently;
- inadequate air velocities to promote mixing of the gas or to inhibit the formation of methane layers;
- use of series ventilation, which resulted in a loss of air quality;
- uncontrolled partial recirculation of air within the ventilation structure;
- failure to keep auxiliary fans operating continuously;
- failure to employ a degassing procedure before switching on an auxiliary fan when a flammable atmosphere had been observed in a heading, contrary to company guidelines;
- inadequate ventilation ducting, which was allowed to fall into disrepair;
- obstruction or constriction of ventilation ducting in headings being roof bolted, to keep the continuous miner from gassing out in adjoining headings;
- travelling of intake air past the entrances to old workings — particularly the Southwest 1 workings, which were known to contain large volumes of methane and were improperly sealed;

- relocation of machine-mounted methanometer monitor heads away from their correct location on the continuous miner jibs, thus defeating their purpose;
- interference with the set points or readouts of continuous miner methanometers so that the machine would operate in higher concentrations of methane;
- operation of a continuous miner with no machine-mounted methanometer;
- operation of roof bolting equipment where methane layers existed to the extent that workers near roof level presented symptoms of oxygen deficiency;
- failure to keep dust scrubbers operating at all times when a continuous miner was working;
- use of compressed air equipment to remove methane from a roof cavity;
- failure to provide roof bolting crews with the means of detecting methane;
- failure to contain methane accumulation in an abandoned area by adequate seals, or to control it by adequate ventilation;
- failure to detect and control a layer of methane issuing from an abandoned area;
- inclined workings that promoted methane accumulations in the higher elevations without the necessary air velocity to disperse this accumulation;
- falls of ground that left roof cavities in which methane could accumulate without any attempt to clear those cavities or fill them;
- inclined entries that facilitated the upward progression of methane layers;
- failure to check for methane layers or to provide the equipment necessary to perform such searches; and
- an appalling lack of safety training and indoctrination, especially respecting new underground miners, on the general properties of methane and its propensity to rise to the roof and form layers that at some point would be explosive.

It should be understood that not all these conditions were necessary, at any one time, to provide the explosive environment that was present on 9 May 1992. They are all listed here to give some indication of the laxity, or the incompetence, or the apathy, or the carelessness that seemed to permeate Westray management and in turn to have a negative effect on the underground workers, who were lulled into a sense of "it can't be all that bad." [See page 304.]

The attitude of Gerald Phillips towards the methane problem is both difficult to understand and dangerous: difficult to understand because his early training in the United Kingdom would have trained him in the perils of dealing casually with methane; dangerous because his casual attitude permeated Westray management, creating and perpetuating a serious safety defect. Phillips, by his training and experience, must have known better.

Chapter 9 Dust

Summary of Dust Problems at Westray

Mine management, led by Gerald Phillips and Roger Parry, had the primary responsibility to keep the mine safe. With regard to coal dust, safety measures included:

- removing coal dust from the mine;
- ensuring that the mine floor, ribs, and roof were adequately stonedusted so as to render inert any remaining coal dust; and
- regularly collecting and testing coal-dust samples to monitor combustibility.

Management was aware of these duties, as evidenced by the schemes set out in the Manager's Safe Working Procedures, yet it failed to discharge these responsibilities by ignoring its own procedures as well as the requirements of the Coal Mines Regulation Act. Westray management seemed to have adopted a cavalier attitude towards mine safety generally and the treatment of coal-dust hazards in particular. [See page 347.]

The Department of Labour inspectorate knew, or ought to have known, that management was continually out of compliance with even the most basic safety requirements of the act in respect to treatment of coal dust in the Westray mine.

In spite of the continued failure of mine management to comply with requests and demands respecting treatment of coal dust, the inspectorate made no effort to enforce those demands. This failure to enforce the law was painfully and tragically evident when the orders of 29 April 1992 were ignored, even though two of them required immediate action, and even though an inspector was at the mine site on 6 May 1992. The inspectorate was derelict in its responsibility to safeguard the welfare of the underground miners at Westray by failing to ensure compliance with the housekeeping and treatment requirements of the Coal Mines Regulation Act respecting coal dust. [See page 347.]

Chapter 10 Ground Control

Mining Conditions

The following combination of mining conditions made Westray a potentially difficult mine to develop and operate:

- depth of coal in the mining area
- thickness of the seam
- relatively steep pitch of the seam
- virtually unknown faulting in the mining area
- poor roof quality
- wide entries.

The cost of operating in such an adverse environment and the inherent uncertainties would suggest that the financial viability of the Westray project should have been in doubt from the very beginning. [See page 356.]

Lack of Continuity in Planning

In spite of several warnings of potentially serious ground control problems, the management of Westray proceeded with mine development without having completed verification of many of the tentative estimates contained in several feasibility studies. [See page 366.]

Ground Control Problems

Mining at Westray consistently encountered unexpected and adverse geological conditions. It is obvious that Westray managers were ill prepared to deal with these conditions, and, as a result, when they encountered an unexpected condition, they did not know how to deal with it. [See page 372.]

Southwest 1

Miners were chased out of the Southwest 1 section in March 1992 as a result of horrific ground conditions. This is a clear indication that Westray management had not yet learned to operate the mine safely and productively. Without adequate planning, management was confronting each problem on an ad hoc basis and was still searching for solutions up to the time of the explosion. [See page 377.]

External Expertise

Westray management, from the chief executive officer down, seemed unable to implement the advice of competent professionals. This incapacity discloses a serious defect in the Westray management mentality that is probably related to a combination of incompetence and inexperience.

Several basic points may be drawn from the Westray experience:

- Comprehensive planning should be done as far in advance as possible so that problems may be anticipated and surprises kept to a minimum. This was not evident in the manner Westray attempted to deal with its ground control problems.
- It seems almost axiomatic that an underground coal mine should retain the services of competent management and engineering personnel with proven experience and technical competence. Westray was significantly lacking in this regard. [See page 380.]

Impact of Ground Control on the Explosion

Perhaps the most serious effect of the ground control problems that burdened the Westray mine was not physical but mental. The adverse roof and rib conditions posed a continuous hazard and hampered production. Major falls week after week, daily overbreaks, and the ultimate loss of Southwest 1 must have constituted a serious threat to the mining crew and placed Westray management under considerable stress. It was probably obvious to everyone concerned that the very existence of the mine was in question. Senior managers were preoccupied with finding the solution to the ground control problems. As a result, attention was diverted from other major issues and hazards. Although it is impossible to quantify the contribution of such a major diversion to the disaster, it was likely significant.

Diversion of Attention

The entire ground control situation at the Westray mine is singularly significant in that it typifies the lack of planning, of competence, and of responsibility of senior Westray management. The response of Westray management to these continuing problems seemed to exacerbate them and divert attention from other serious safety concerns. In the result, the entire safety mentality at Westray deteriorated while management was consumed with its apparent inability to deal with ground control. [See page 382.]

PART THREE

The Regulators: Departmental and Ministerial Responsibility

Chapter 11 Department of Natural Resources

After the transfer of the inspectorate from the Department of Natural Resources to the Department of Labour in 1986, there was little or no communication between these departments even though communication and cooperation were essential for the proper conduct of their respective statutory regulatory duties. [See page 392.]

Duty to Ensure Safety

The various officials in the Department of Natural Resources either misunderstood or overlooked the overriding responsibility to ensure that Westray's mine plans were inherently safe. The department also failed, either through the Department of Labour inspectorate or through its own initiative, to ensure that any inherent safety concerns were being met by the company. [See page 401.]

Duty to Monitor for Compliance with Approved Plans

The transfer of the inspectorate from the Department of Natural Resources to the Department of Labour created serious gaps in the inspection and approval process, which neither department attempted to address. Officials in each department were satisfied to eschew any responsibility for these matters, assuming that the other department would fill the gaps. Those responsible for the regulation of Westray did not turn their minds to the issues until the mine blew up, at which time they were forced to seek some explanation for the failure of the regulatory regime. [See page 403.]

The Department of Natural Resources failed to accept responsibility for enforcing provisions of the Mineral Resources Act and to perform its regulatory role with the rigour required to ensure that Westray was running a safe and efficient operation. [See page 404.]

Geological Background

The strongly expressed position of Robert Naylor, a Department of Natural Resources geologist, that further geological work was required before the Westray project was approved, appears to have been well founded. It deserved more attention than it was accorded by more senior professionals in the department. By not addressing his concerns, Pat Phelan and Don Jones were remiss in their duty to take reasonable measures to ensure that the Westray mine plan would "result in efficient and safe mining." [See page 410.]

Westray Mining Proposal

The lack of a final mine plan was a significant factor in the overall planning of Westray. The department should have insisted that the company prepare a mine plan that addressed the issues of safe and efficient mining. [See page 410.]

Provincial Approval Process

The Department of Natural Resources issued a mining lease without satisfying the overriding provisions of section 90(1) of the Mineral Resources Act —namely, that "the project will result in efficient and safe mining." The department was wrong to do so. [See page 415.]

Submission and Review of Westray's Application

The review of the Westray application by the Department of Natural Resources was inadequate. The director of mining engineering infringed his own responsibilities by not maintaining the department's operating practices at a high level to keep pace with changing technology. Westray was a so-called high-tech mining operation, using mining techniques and equipment new to the Nova Scotia regulators. Before approving the Westray application, the department should have familiarized itself with this new technology in order to judge its suitability in the context of the Foord seam. The department's approach was not acceptable, and the expressed view that the application met the basic requirements of the legislation cannot rationalize that approach. [See page 416.]

Tunnel Realignment 1

Westray Coal failed to advise the Department of Natural Resources of its first tunnel realignment. When the department learned of the change and informed the company of the proper channels to be followed, the company proceeded to request departmental approval. Although the department appeared to express valid concerns about the realignment, the record indicates that the department approved the change without the company's first having addressed those concerns. [See page 422.]

Extent of the Department's Responsibility

The Department of Natural Resources had a statutory duty to ensure that the mine plans provided for safe and efficient mining. In light of the inadequacy of the mine plans submitted by Westray and the ineffectual reviews of these plans by the department, it was in breach of this "safety" responsibility. [See page 445.]

Monitoring for Compliance with Approved Plans

It is highly probable that officials of the Department of Natural Resources knew of the unapproved changes to the mining plan at Westray but declined to take any action to ensure compliance with the legislation. [See page 448.]

The Department of Natural Resources failed to monitor the Westray mine operation to ensure that the mining permit holder was conducting the mining operations at Westray "in conformity with the approved mining plan as revised from time to time." [See page 448.]

Chapter 12 Department of Labour

Mine Inspection Division

The training and experience of the inspectors responsible for Westray were inadequate. Their performance was also diminished by a lack of guidance and supervision. Claude White, the director of mine safety, did not do his job of monitoring the system and ensuring that any difficulties were corrected. [See page 463.]

The inspectorate did not routinely review Westray's mine plans. A review of approved plans might have revealed potential safety problems that were not obvious during inspections. Competent review by regulators might have moved the company to consider changes more carefully. [See page 467.]

Albert McLean was not competent to perform all the duties of a mining inspector or to enforce routinely the provisions of the Coal Mines Regulation Act. Even in those areas where he should have had competence, he failed to perform his duties with diligence or concern. His performance was unacceptable, and this fact ought to have been obvious to his supervisors. His supervisors ignored or glossed over his inadequacies and made no effort to supervise, train, or direct him, or to monitor his activities at Westray.

John Smith was qualified for his position as electrical-mechanical inspector. In those areas he seemed to perform with some competence. He did not perform his duties with the aggressiveness and vigour needed to offset the attitudes and laxity of Westray management.

Neither Smith nor McLean was given a clear indication of his duties and responsibilities. Both Smith and McLean followed the version of the internal responsibility system as determined by Jack Noonan and promoted by Claude White.

By and large, the performance of Smith and McLean as mine safety inspectors at Westray was inadequate and did little to convey to an aggressive and disdainful Westray management that safety was paramount and that non-compliance with safety rules and regulations would not be tolerated. [See page 468.]

Perception of Mandate

Jack Noonan erred in advocating his version of the internal responsibility system (IRS), and in claiming that inspectors could enforce the Coal Mines Regulation Act properly while following directives based on his version of the IRS. [See page 468.]

Department of Labour and Internal Responsibility

Jack Noonan, as executive director of occupational health and safety, held a perspective of the internal responsibility system inconsistent with usage in other jurisdictions and with the statutory obligations of the inspectorate. This passive and apathetic approach sent two messages to those in the inspection service: (1) that health and safety were primarily the responsibility of employer and miner; and (2) that the inspectors' role was one of training and persuasion, to be undertaken usually in response to the initiative of management or workers. For whatever reason, Noonan virtually abdicated any leadership role and must bear substantial responsibility for the failures of the inspectorate. [See page 471.]

Internal Responsibility in Nova Scotia

It is abundantly clear that the provincial inspectorate used the concept of the internal responsibility system to divert attention from its own responsibilities. It is not so clear whether this was done as a matter of

practice or after the fact to justify many of the deficiencies of the inspectorate, which only became apparent after the explosion of 9 May 1992. [See page 477.]

The Inspectorate at Westray: Applying the Regulatory Regime

The Westray joint occupational health and safety committee was given little assistance or encouragement from either the company or the inspectorate. The company clearly did not want an effective committee. The inspectorate, operating under Noonan's strange interpretation of internal responsibility, adopted a passive and non-interventionist approach, ensuring that the committee would be ineffectual. [See page 483.]

Pattern of Inspections

The inspectorate normally gave Westray management notice of its impending inspections. By so doing, the inspectors could not be assured that the conditions they encountered truly reflected the regular condition of the mine. [See page 488.]

Department of Labour inspectors were regularly accompanied by management on their inspections. One consequence was to discourage the miners from discussing conditions with the inspectors. Workers underground did not have open communication with the inspectors. [See page 489.]

The inspectorate relied on Westray management for guidance and choice of inspection routes. Such reliance led to careless inspection and ignorance of the true state of operations underground at Westray. [See page 489.]

Records of Inspections

The department's own records of dealings with Westray were sometimes altered. The editing removed some references to potentially embarrassing matters. In one instance, for example, references to extended deadlines for producing stonedusting and dust sampling plans were changed.

Claude White's explanations for the altering of departmental records were not credible. The altering of official minutes made it more difficult to follow up on important safety matters that were central to the Department of Labour's mandate. [See page 491.]

The Carl Guptill Saga

The inspectorate's actions in the Carl Guptill incident were a disservice to a miner with a legitimate complaint, and a clear message to other members of the Westray workforce that the inspectorate was not going to support them in any safety-related confrontation with the management. The significance of this incident ought not to be understated. It is clear: (1) that the Department of Labour did not investigate all the complaints raised by Guptill; (2) that department officials, in the cursory investigation conducted, relied on statements prepared by the company without sufficient verification; (3) that department officials revealed the name of the complainant to the company; and (4) that references to the complaint were removed from meeting minutes in an apparent effort to avoid confrontation with the company. [See page 498.]

Extent of the Department's Responsibility

Claude White is a professional and experienced mining engineer. His job was to see that the mine inspectorate enforced the Coal Mines Regulation Act and the Occupational Health and Safety Act. He failed to do so. [See page 500.]

The inspectors' handling of the equipment permits was inadequate. They made errors in paperwork and communicated poorly among themselves. They permitted Westray management to intimidate them and ignored the concerns of the miners and the input of the safety committee. They left the enforcement of the conditions for equipment use with Westray officials. [See page 501.]

The Department of Labour in general, and the inspectorate in particular, was markedly derelict in meeting its statutory responsibilities at the Westray mine. This company demonstrated a disdain for any regulatory regime, whether the regime concerned the safe design of the mine or the safe operation of that mine. The inspectorate had its own duties to carry out, as enumerated in the legislation, and it failed to do so. It must be profoundly unsettling to the people of Nova Scotia to realize that the department's safety inspectorate is so demonstrably apathetic and incompetent.

The Department of Labour was ill prepared for the task of regulating Westray. The inspectorate was untrained, poorly supervised, and improperly motivated. No efforts were made, through either training or motivation, to develop a competent inspectorate capable of monitoring a safety program at Westray. Even those sections of the Coal Mines Regulation Act that could have been of benefit to the Westray worker were largely ignored. By and large, through incompetence and apathy, the inspectorate of the Department of Labour did a disservice to the Westray miners and the people of Nova Scotia. [See page 506.]

Chapter 13 The Politicians and Ministerial Responsibility

Political Involvement in the Westray Project

The take-or-pay agreement between the province and Westray was a legal and enforceable contract. Donald Cameron was clearly in error when he so firmly stated that the province would never be called on to honour it. [See page 515.]

Ministerial Responsibility and the Transcript Evidence

Donald Cameron, both as cabinet minister and as premier, did not have a clear understanding of his role or that of cabinet respecting the acceptable level of political support for projects or the relationship between the minister and his department in dealing with such projects. [See page 522.]

PART FOUR

The Aftermath: Rescue Efforts and The Inquiry

Chapter 15 Rescue Efforts

Observations of the Rescuers

Although the Westray mine-rescue teams and the teams from other parts of Nova Scotia and from New Brunswick were well trained and proficient in the performance of their rescue duties, the company was ill prepared for any disaster, let alone one of the magnitude of 9 May 1992. The company lacked a cohesive disaster plan, including a call-out list and an emergency procedures manual. [See page 559.]

The mine-safety personnel from the Department of Labour seemed to have a rather ill-defined role in the rescue operation, and director of mine safety Claude White seemed to play only a peripheral role in the operation. [See page 560.]

There appeared to be a shortage of self-contained breathing devices on site, which resulted in some delay while self-contained self-rescuers were brought in from elsewhere. There was a lack of the safety tools and testing devices essential to reduce the hazards of post-explosion rescue attempts. [See page 560.]

Community groups, volunteer medical emergency persons, volunteer firefighters, the telephone company, the RCMP, and other support groups responded with admirable haste and dedication. A more precisely defined role and more efficient on-site organization could have assisted these support groups in carrying out their respective tasks more productively. [See page 560.]

Consolidated Recommendations

PART ONE

Prelude to the Tragedy: History, Development, and Operation

Chapter 3 Organization and Management

Provisional certification

1 No provisional mining certificates should be issued in any circumstance. The process of granting certification based on status in other jurisdictions must be refined to ensure that qualifications are consistent with provincial requirements. The burden should be on the applicant to establish that his or her qualifications are sufficient to support the requirements for the certification sought. Any person granted certification based on status in another jurisdiction should be required to be examined in Nova Scotia for such certification at the earliest reasonable time. [See page 87.]

Job descriptions

2 Every position in a mine should have a written job description setting out the duties and responsibilities of that position, with particular reference to safety. Each employee should be provided with a copy of his or her job description. A copy of all job descriptions should be prominently displayed in an area frequented by employees. [See page 87.]

Chapter 4 Training at Westray

The key to any successful regulatory regime is compliance, and the key to compliance is enforcement. As has been so graphically illustrated in the Westray experience, regulations, no matter how effective on paper, are worthless when they are ignored or trivialized by management and when their enforcement is in the hands of an apathetic and insensitive inspectorate. The recommendations that follow are neither innovative nor unique. They merely present a minimal outline of the basics to ensure that workers are "safety trained."

Role of the regulator

3 One regulatory organization (such as the Department of Labour or a board of examiners) should be responsible for certifying workers in underground coal mines in Nova Scotia. [See page132.]

4 Before approving the start-up of any underground coal mine, the regulator should review and amend the standards of certification to ensure the following:

(a) Standards of certification fit the mining methods and technology of the proposed mine.
(b) All positions in the mining operation are filled by people with the qualifications and experience necessary to do their jobs safely.
(c) The system of certification applies to every person required to work underground. Categories of certification should include (at a minimum) coal miner, electrical tradesperson, mechanical tradesperson, surveyor, engineer, mine rescue person, and the various levels of supervisors and managers.
(d) Trainers have the necessary qualifications and experience. [See page 132.]

5 The regulator should establish a model curriculum consistent with established standards and practices in the coal mining industry. [See page 132.]

Role of the mine operator

6 The mine operator should be required to have in place a training program, approved by the regulator, for every position in the workplace. The mine operator's training proposal must:

(a) conform to or be more rigorous than the model curriculum;
(b) show when, how, and what training will be done;
(c) incorporate annual refresher training and safety education;
(d) provide for adequate orientation to the mine for all new employees, including those with experience in coal mines; and
(e) include complete and sufficient training for operators of individual pieces of mining equipment prior to their being assigned operating positions. [See page 133.]

Role of the mine operator and the regulator

7 The mine operator should be required to keep training and work history records for applicants for certification. The regulator should:

(a) check applicants' records, making sure that training is taking place; and
(b) test applicants for certification in a manner that establishes whether underground workers are trained sufficiently to work safely. [See page 133.]

Role of the joint occupational health and safety committee

8 The mine's joint occupational health and safety committee should periodically review training standards, policies, and programs to make sure that they adequately reflect changing technology and mining conditions and practice within the mine. [See page 133.]

Chapter 5 Working Underground at Westray

Incentive plans

9 Incentive bonuses based solely on productivity have no place in a hazardous working environment such as an underground coal mine. Such schemes should be replaced, where practical, by safety incentives that include three principles:

(a) The incentive plan should be developed cooperatively with the employees to whom it will be addressed.
(b) Both group safety performance and individual safety performance should be rewarded.
(c) All employees, whether underground or on surface — workers, supervisors, and middle managers — should be included.

If properly instituted, such a safety incentive plan may well have its own productivity rewards. [See page 188.]

PART TWO

The Explosion: An Analysis of Underground Conditions

Chapter 7 Ventilation

Overriding principles

10 The overriding principle in mine ventilation must be that the mine is properly ventilated at all working times. It is the primary duty of the mine manager to ensure this proper ventilation.

(a) All active working places should be ventilated by a current of fresh air containing not less than 19.5 per cent by volume of oxygen and not more than 0.5 per cent by volume of carbon dioxide.
(b) Each working face should receive fresh air of sufficient volume and velocity to dilute and render harmless all noxious or flammable gases and maintain all working and travelling areas in a safe and fit condition. [See page 276.]

Ventilation plan

11 No mine should start up without a comprehensive ventilation plan approved by the regulator. The ventilation plan should be subject to at least an annual update, and any changes in the interim should be subject to approval by the regulator. [See page 276.]

12 The ventilation plan should contain details of the system proposed, or of amendments to the existing approved system, and should indicate:

(a) the limits of the mine property and any adjacent workings, as well as any abnormal conditions;
(b) the location and detailed specifications of all surface fans and all surface openings;
(c) the direction, velocity, and volume of air at each mine opening;
(d) all underground workings, including location of all stoppings, overcasts, undercasts, regulators, doors, and seals;
(e) the method of sealing worked-out areas, provisions for air sampling behind any such seals, and the manner in which such sealed areas will be vented into return air passages (ensuring that no intake air is or could be passing any sealed-off area);
(f) the location of all splits and the volume of fresh air entering each split and of return air at each cross-cut in a room-and-pillar mine and at each working face; and
(g) the locations for the measurement of air in the mine to ensure the proper ventilation at all times. [See page 276.]

13 The mine operator should employ or retain the services of a qualified ventilation engineer to assist in the preparation of all ventilation plans or amendments to such plans. The ventilation engineer should sign any ventilation plans or amendments before they are submitted to the regulator. [See page 277.]

14 The regulator may submit plans or amendments to a qualified mine ventilation engineer for review, and any fee for such review should be the responsibility of the mine operator. The regulator may require modifications to the plan in the interests of safety. [See page 277.]

Fans

15 The regulator, in consultation with a qualified ventilation engineer, should draft regulations dealing with main fans and auxiliary fans. These regulations should include:

(a) details of the design, installation, operation, maintenance, and inspections of such fans; and
(b) requirements for instrumentation, the recording of data from such instrumentation, and the filing of this data with the regulator. [See page 277.]

16 No booster fan should be installed underground without the approval of the regulator. [See page 277.]

17 Every main ventilating fan should be mounted above ground in a fireproof fan house located at a safe distance from any mine opening and offset from any such openings or connections. The fan house should be equipped with a weak wall or explosion door located in a direct line with any possible explosion forces. Every main fan should be equipped with an audible alarm that sounds automatically if the fan stops or slows down. [See page 277.]

18 Where any fan used in ventilating a mine stops for any reason, the area affected should be immediately evacuated. No auxiliary fan should be restarted until a qualified person has inspected the area and found it to be safe and free of gas. The area should not be re-entered until the ventilation has been restored to the required level and the area has been found to be safe and free of gas by a qualified person. If any fan remains stopped for more than 30 minutes, the mine operator should report the relevant circumstances to the regulator. [See page 277.]

Equipment and materials

19 The regulator, in consultation with a qualified ventilation engineer, should draft regulations dealing with requirements for ducting, brattice, stoppings, locations of measuring devices, and sealing of abandoned sections of the mine. All brattice cloth, ducting, and materials used for constructing stoppings should be of fire-resistant material. [See page 277.]

20 Equipment used to ventilate an underground coal mine should be of a type approved by the regulator and should be installed in an approved manner. Equipment, materials, or procedures not previously approved may be approved if the regulator is satisfied that the same measure of protection is provided to the underground worker. [See page 277.]

Operation of the ventilating system

21 Unless specifically approved in writing by the regulator, no more than one mechanized coal mining unit should operate in each ventilation split. Each split should be provided with a separate supply of fresh air. [See page 278.]

22 Ventilating air should not be recirculated without the written consent of the regulator. [See page 278.]

23 The mine operator should employ a qualified mine ventilation technician to be responsible for the operation and maintenance of the ventilation system. The ventilation technician should measure the airflow and sample the air quality in the mine at approved intervals of at least once a month for the whole mine and weekly for working areas. The results of ventilation and air quality tests should be recorded and a copy of such record should be filed with the regulator. [See page 278.]

Air quality

24 Workers should be removed from any area in a mine where the concentration of dust or noxious gases in the air exceeds the standards set out by the American Conference of Governmental Industrial Hygienists (ACGIH). [See page 278.]

25 Devices used for testing air quality, velocity, and volume should be of a type certified and approved for such use by the Canada Centre for Mineral and Energy Technology (CANMET), the Approval and Certification Center of the Mine Safety and Health Administration (MSHA), the Canadian Standards Association (CSA), or other such equivalent testing body. [See page 278.]

Chapter 8 Methane

Methane is an integral part of coal and coal mining, a by-product of the natural geological and decaying forces that caused the coal to form. My recommendations address issues of monitoring and control, as well as degasification. With respect to the former, the U.S. ventilation requirements, set out in Part 75 of Title 30, Mineral Resources, of the Code of Federal Regulations [30 CFR 75], provide an excellent reference point. I have been greatly influenced by their specificity, which I have considered in the context of the terms of reference of this Inquiry as set out in the Order in Council.

Monitoring and control: Basic requirements

26 The level of methane in an air intake to the working face of the mine should not exceed 0.5 per cent by volume.

(a) If the methane level exceeds 0.5 per cent by volume, the ventilation technician or other qualified person must take steps to adjust the ventilation system to dilute the methane to acceptable levels.
(b) If the methane level in any part of a mine reaches or exceeds 2 per cent by volume, all workers must be evacuated from the affected area.
(c) The airflow throughout the mine, including the mine face, should be such that methane will be diluted to a level below 0.5 percent by volume, as measured at least 30 cm from the roof or ribs.
(d) The velocity of air throughout the mine should be sufficient to prevent the formation of methane layers. [See page 313.]

Monitoring and control: Measuring methane

27 Each crew at the working face of a mine should include a person trained in the use of a methanometer. This person should carry, while in the mine, an approved device or devices capable of testing for both methane and oxygen, and capable of testing at the roof and in roof cavities for layering. [See page 313.]

28 The mine operator should provide suitable testing and calibrating facilities on the mine surface. Methanometers should be tested for accuracy before each shift and calibrated as required. [See page 313.]

29 If the locked flame safety lamp is used at all, it should be handled only by persons who have received adequate training in its assembly and operation. No lamp should be reignited underground unless the methane content in the ambient air is 0 per cent, as determined by a methanometer. [See page 313.]

Mining equipment

30 If the methane level in the area reaches or exceeds 1 per cent by volume, any electrically operated equipment in use should be shut down, and any shotfiring being carried out should be discontinued.

(a) In addition to other safety devices, any electrical equipment operating at the mine face or in reasonable proximity, as established by the regulator, should be equipped with a methane-monitoring device capable of continually monitoring the methane content of the air.
(b) If the methane content exceeds 1 per cent by volume, the methane monitoring device should automatically shut down the electrical equipment.
(c) The electrical equipment should not be re-energized until a qualified person certifies that the methane content in the air has been diluted to a safe level. (30 CFR sets out this requirement as it applies to mines under the jurisdiction of the U.S. Mine Safety and Health Administration.)

(d) The methane monitors installed on electrical equipment should be kept operative at all times and tested weekly for accuracy. Sensors should be affixed to the equipment as close to the working face as practicable. [See page 313.]

31 The operation of mobile diesel-powered equipment underground should be regulated to ensure that the health and safety of the workforce is not endangered or impaired by such operation. [See page 314.]

Atmospheric monitoring system

32 The regulator may require, as part of the mine development plan, a plan for the installation of a remote system for monitoring the mine atmosphere, with appropriate audible alarms and recording devices. Such a monitoring plan should include the provision that a qualified person must be at the remote monitoring station at all times that the mine is operating. [See page 314.]

Degasification

33 As a prerequisite to the resumption of underground coal mining at Westray or elsewhere in the Pictou coal basin, the province should require the completion of a study into the safety and economic factors involved in drainage of the coalbed methane in the mining area concerned. [See page 314.]

34 Every mine development plan should include complete details of any program or process designed to drain methane from the coal seam before, during, and after mining. The regulator could waive this requirement if satisfied that the program or process would be impractical and that general mine safety would not be compromised. [See page 314.]

Chapter 9 Dust

Coal dust is a major health and safety hazard in underground coal mines. When the hazard of methane is combined with excessive and untreated coal dust, the potential for disaster, as tragically demonstrated at Westray, is very real. In Nova Scotia, section 70(1) of the Coal Mines Regulation Act requires that the floor, roof, and sides of the road and the working places in a mine "shall be systematically cleared so as to prevent, as far as practicable, the accumulation of coal dust. . . ." Section 345 of the Alberta Coal Mines Safety Regulations requires that "[b]efore a part of a road is dusted for the first time with rock dust, it shall be cleaned as thoroughly as possible of all combustible dust." The U.S. regulations go into greater detail respecting this "housekeeping" function.

Housekeeping

The first line of defence in the battle to neutralize the coal dust seems to be good, old-fashioned housekeeping.

35 Every coal mine operator should prepare a program for the regular clean- up and removal of coal dust and other combustibles from the floor, roof, and ribs of roadways and work areas in the mine. A copy of the program should be filed with the regulator, who may require changes in the clean-up program if it does not comply with accepted industry standards. [See page 348.]

Wetting coal

It is prudent that all areas close to the working face and areas in which coal is transferred from one device to another be wetted so as to maintain the coal dust in an incombustible state. Such areas are the cutting surface of the face, the location of the transfer of the coal to the conveyor, and transfer points from one conveyor to another. It is not practical to stonedust these areas.

36 Sufficient water should be provided in the mine to ensure that an adequate supply is available to wet the coal being mined and transported within the mine.

(a) All coal-cutting picks should be equipped with water-spray jets of sufficient number and size to ensure that the areas of the coal face being worked are maintained in a damp condition so as to render any coal dust incombustible.
(b) All transfer points where coal is moved from one mode of transport to another should be equipped with water-spray devices sufficient to render any coal dust incombustible. [See page 349.]

Barriers

My research on barriers — stonedust or water, passive or triggered — has led me to conclude that their use is somewhat problematic, especially in room-and-pillar mining. Barriers may, in some circumstances, serve as supplemental explosion suppressors, but they ought not to be seen as diminishing the need for adequate stonedusting.

37 The Department of Labour and the Department of Natural Resources should consider active research in the development and use of passive and triggered stonedust and water barriers for the drives and entries of underground coal mines. This research should be aimed at the development of such techniques for use in room-and-pillar mining operations. If the development of barrier technology indicates that substantial

safety benefits may accrue, the regulator could order a mine operator to install water or stonedust barriers in the mine. [See page 349.]

Stonedusting

After basic "housekeeping," the most widely accepted method of controlling coal dust is to render it inert by mixing it with finely ground incombustible rock, such as limestone or dolomite. It would seem from our review that stonedusting requirements in the Coal Mines Regulation Act are not far off the mark from any industry standard. Nevertheless, a discrepancy between the legislative requirements and the actual practice occurred and has persisted.

38 All underground areas of a coal mine should be stonedusted to within 12 m of the working face and all cross-cuts less than 12 m distant from the face should be stonedusted. This would not apply to those areas within the mine containing sufficient moisture to render the coal dust incombustible or for which the regulator, after examination, has granted exemption. [See page 349.]

39 A mine operator should file with the regulator a copy of the stonedusting program for the mine, including the method and frequency of testing; the type of testing equipment used; the type and number of dust-spreading machines used; the frequency of dusting; and the location and quantity of stonedust stored in the mine for emergencies (as opposed to normal usage). [See page 350.]

40 The material used for stonedusting should be of a type approved by the regulator for that purpose and should meet accepted industry standards as to size, composition, and incombustibility. [See page 350.]

Sampling

41 Dust samples should be taken at least once a week using a method approved by the regulator for that purpose. Samples should be taken according to a regularly updated and approved plan. The regulator may require additional testing and may grant exemptions, providing that the overall safety of underground workers is not compromised. [See page 350.]

Chapter 10 Ground Control

External expertise

42 Consultants, when required, should be selected carefully to ensure that their background and expertise are consistent with the specific requirements of the problem to be analysed. Any conflicts in the advice from these consultants ought be resolved through discussion and, if necessary, through further advice. Conflicts in technical advice must be resolved, not ignored. [See page 380.]

Legislation and Regulations

43 A legislative regime should be put in place to ensure regulatory involvement in all areas of ground control in which safety is a consideration. The regime should encompass planning approval, materials and equipment certification, and any other aspect of ground control having safety implications. [See page 383.]

44 The regulations should specify the following at a minimum:

(a) Ground control plans and any revisions to those plans should be prepared by the mine operator and submitted to the regulator for approval prior to the implementation of any such plans.
(b) The ground control plan should show the existing geological conditions and the mining system to be used. The plan should also indicate any unusual hazards and outline the manner in which these will be handled.
(c) Approved plans should be available to miners and other underground workers and should be posted in the mine at the area affected by the plan.
(d) What the plan is required to specify should be set forth by the regulator from time to time, and should include:
    (i) a columnar section of mine strata;
    (ii) planned width of openings and size of pillar (if required);
    (iii) thickness of seam;
    (iv) method of support to be used;
    (v) type, sequence, and spacing of support materials;
    (vi) requirements for temporary roof support systems; and
    (vii) type and thickness of strata in the roof and in the floor for a depth of 3 m below the coal bed.
(e) The regulator may require further and better information on the plan and may require that the plan be reviewed by a qualified specialist in rock mechanics.
(f) The regulator may require revisions to the plan at any time if satisfied that conditions or accident experience indicate that such revisions are necessary or conducive to safety.
(g) The ground control plan should be reviewed at least once every six months by the regulator.
(h) The mine operator should record on the plan and report to the regulator any unplanned fall of roof or rib or any significant rock burst (more than 0.3 m in thickness) that occurs above the bolt anchorage area, impairs ventilation, impedes the passage of persons, causes injury to miners, causes miners' withdrawal from the area, or disrupts activities for more than one hour.
(i) All roof control materials should conform with standards as established by various testing agencies such as the Canadian Standards Association (CSA) or the American Society for Testing

and Materials Specifications (ASTMS). In the absence of standards, such materials could be approved by the regulator.

(j) The regulator should from time to time issue directions, such as found in 30 CFR, respecting the use of roof bolts, torquing requirements for roof bolts, and testing requirements for roof bolts and for other types of roof support systems.

(k) All entries and drives where roof bolting is the main means of roof support should have imbedded warning devices that monitor any downward movement in the roof strata. Such warning devices should be of a type approved by the regulator and should be placed at intervals specified on the plan. Installation of such devices should not relieve the operator from making regular inspections as prescribed. (The type of device referred to here is that generic category in which the "tell-tale" extensometer — the simple mechanical gauge produced at the CANMET Coal Research Laboratory in Cape Breton — would be included.) [See page 384.]

Internal Expertise

45 The legislation governing coal mines should be revised to ensure that every underground coal mine operator be required to engage, when required, the services of a qualified mining engineer with specialized post-graduate training in rock mechanics relating to coal mines. [See page 385.]

46 The legislation and regulations governing coal mines should be reviewed to ensure that all personnel working underground receive training in ground control as appropriate to their activities and responsibilities. In particular:

(a) Coal miners should receive a course on ground control as part of their basic mine training, plus annual refresher courses on ground control.

(b) Mining supervisory staff, including mine managers, underground managers, and overmen, should receive extensive training in ground control.

(c) Non-mining personnel employed underground should receive sufficient training in ground control to enable them to recognize potential hazards.

(d) Training programs for these three categories of employee should be developed by mine management in cooperation with the joint occupational health and safety committee and the regulator. The regulator should review these training programs to ensure that they reflect changing technology and mining practices. [See page 385.]

PART THREE

The Regulators: Departmental and Ministerial Responsibility

Chapter 11 Department of Natural Resources

Mandate

47 The mandate of the Department of Natural Resources should be formally reviewed and clarified vis-à-vis the mandate of the Department of Labour to ensure that there are no gaps in the regulatory process. [See page 404.]

48 A formal procedure should be put in place to provide for adequate communication and cooperation between the Department of Natural Resources and the Department of Labour to ensure that there is adequate provision for all aspects of the regulatory process. [See page 404.]

49 The Mineral Resources Act should be amended to identify clearly the role of the Department of Natural Resources in monitoring mine planning in the province. Such a role should encompass the duty to make site inspections to ensure that an operator is mining in conformity with plans approved by the department. [See page 405.]

50 The Mineral Resources Act should be amended to identify clearly the role of the Department of Natural Resources in ensuring the "safe" operation of mines in the province. [See page 405.]

Responsibility of a deputy minister

From testimony during the Inquiry, I formed the opinion that the role of a deputy minister in Nova Scotia was largely determined by the attitude and approach of the incumbent. There appear to be few guidelines for deputy ministers, as chief executive officers of their respective departments, to help define an approach to the proper conduct of the office of deputy minister. The recent tendency to place generalist "managers" in these important positions seems to result in some deputy ministers' having an incomplete and inconsistent understanding of the job. The proper role of deputy minister was canvassed during testimony and deserves careful attention.

By mid-1991, when Westray most needed firm scrutiny and guidance from the department, the new deputy minister of natural resources did not consider it important to be familiar with the relevant legislation; he did not know at the time that the company was out of compliance with the legislation; and he had not made much effort to follow up on warnings from his staff that all was not well at the Westray mine. That, in my view, is an unacceptable position for a deputy minister.

51 The province should act to ensure that deputy ministers' positions are adequately described in detailed job descriptions. Such job descriptions should include but not be limited to the following requirements:

(a) Upon appointment, the deputy shall forthwith familiarize himself or herself with all the operations of the department as set out in a current organizational chart.
(b) The deputy shall have a working knowledge of all the legislation and regulations the department is administering.

(c) Where there is more than one department with responsibilities for common projects or interests, the deputy shall ensure that proper procedures are instituted and maintained to provide adequate liaison with the other department or departments, with the result that no gaps exist in the administration of the legislation. [See page 431.]

Function of the department

52 The Department of Natural Resources should no longer act as both promoter and regulator of the development of mineral and energy resources in the province, since this dual mandate constitutes a conflict-of-interest situation. The department should assume the role of helping the developer to formulate a plan that ensures both the safe and the efficient exploitation of the resource. The department must, first and foremost, work to ensure compliance with the general structure of the legislation in keeping with the purposes for which such legislation was enacted. [See page 437.]

Review of the department

53 The structure and staff of the Department of Natural Resources should undergo a complete and intensive review, preferably by an outside agency, with the objective of establishing an efficient and responsible mechanism for the supervision and husbanding of our natural resources. [See page 449.]

Chapter 12 Department of Labour

Notice of inspection

54 Visits by the inspectorate to the industrial site should not always be subject to prior notice. The inspectorate should schedule visits irregularly, and the operator should expect inspections at any time. Frequency of visits should be dictated by the safety performance of the operator. [See page 488.]

Mine-safety inspectors

55 The unacceptable performance of Claude White and Albert McLean in the conduct of their duties as mine-safety inspectors and regulators, coupled with their demeanour at the Inquiry hearings, must surely have destroyed any confidence the people of Nova Scotia might have had in the department's safety inspectorate. Accordingly, both White and McLean should be removed from any function relating to safety inspection or regulation. [See page 506.]

Independent review of inspectorate

56 The lassitude that paralysed the inspectorate and rendered it ineffectual in dealing with Westray seems deep-seated and pervasive. Therefore, an independent and professional safety consultant should evaluate the inspectorate and its personnel. The consultant should make recommendations for the restructuring of the safety inspectorate and its staff to ensure that the workers and the people of Nova Scotia benefit from a competent, well-trained, and properly motivated safety inspectorate. [See page 506.]

Occupational Health and Safety Act

57 The Occupational Health and Safety Act, 1996, should be revised to incorporate the following changes:

(a) Except in the case of a demonstrated emergency, any communication respecting health and safety concerns should go initially to the first-line supervisor. If the first-line supervisor is unable or unwilling to resolve the matter, then the complaint should be taken directly to a member of the joint occupational health and safety committee, for resolution by the committee as expeditiously as possible.

(b) Provisions should be adopted to clarify how interests of non-union employees in a union shop will be met on the joint occupational health and safety committee.

(c) No member of management whose principal duty or concern relates to production quotas should be eligible for membership on the joint occupational health and safety committee.

(d) No member of the executive of any employee organization or union, or any person who has served in such capacity within the preceding year, should be eligible for membership on the joint occupational health and safety committee.

(e) Provisions should be adopted to define clearly the health and safety obligations of employees to workers on site who are employed by contractors other than the principal employer. Those contractor employees should have obligations similar to those of the employees of the principal employer.

(f) For greater certainty, the terms "serious injury" and "bodily injury" should be replaced with the one term "serious injury," defined as any injury that requires immediate medical aid or hospitalization or renders the employee unable to perform his or her regular duties for a period in excess of 24 hours. [See page 510.]

Chapter 13 The Politicians and Ministerial Responsibility

Guidelines for ministers

58 The province of Nova Scotia should immediately study the British approach to ministerial responsibility, as illustrated by the publication Questions of Procedure for Ministers (1992), and move to adopt this type of program. Other jurisdictions should be canvassed for information on similar programs. The program adopted should include a codified and published statement of guidelines for ministers outlining ministerial responsibilities.

(a) The guidelines for ministers program should be provided to all new ministers. It should include definitions of the nature and extent of the responsibility and accountability for the actions of the department over which a minister presides.
(b) A minister should have clear guidelines to the frequency and detail of division briefings and the circumstances under which the immediate division head should participate in the briefing along with the deputy minister.
(c) A minister should have access to independent advice about the nature and the extent of ministerial responsibility in specific situations. Such advice could be provided, ad hoc, by a person with recognized expertise in the field. [See page 533.]

Chapter 14 Legislation

What should the aim of mining legislation and regulations be? Clearly, the aim should be the protection of the miner in the mining environment in a manner consistent with safe production. It is obvious that legislative change will not, of itself, ensure that future coal mining in this province will be carried out with safety as the paramount consideration. Attitudes must be directed towards safe mine production, and mine operators, unions, and government must dedicate themselves to this concept. To further relieve the pressure on mine operators and miners, there must be a safety factor built into production schedules.

Underground coal mining permits

59 Any applicant for an underground coal mining permit should make a clear and unequivocal commitment to the concept of mine safety in the context expressed in the phrase — safe mine production. This clear commitment must be manifest in mine development proposals and plans. Therefore, before a mining permit is granted, the applicant should have to show that it has sufficient financial and other resources to ensure a reasonable margin of safety. The existence of this margin of safety will minimize the possibility that safety measures may be overlooked or avoided to maintain production schedules. [See page 537.]

Underground coal mining regulations

After a disaster, there is a temptation to overreact. With respect to the formulation and implementation of mining regulations, two general observations need to be remembered. First, the requirements of the regulations should not be unreasonably onerous. If this golden rule is overlooked, mine management will go through the motions of observance but without the attention to the substance of the regulations. Second, excessive volumes of regulations and restrictions are often counterproductive. It is critical to their success that mining regulations are reviewed in substance originally and revised thoughtfully when circumstances change.

60 All rules and regulations relating to the operation of coal mines should be contained in Regulations made pursuant to the Occupational Health and Safety Act. The Coal Mines Regulation Act and the portions of the Mineral Resources Act dealing with operations should be repealed. [See page 540.]

Legislative review committee

61 A legislative review committee should be established to review periodically the underground coal mine regulations to ensure that the regulations reflect current technology and that the use of such technology is consistent with mine safety. The committee should have the power to engage mining consultants with specific expertise consonant with the technical matters being considered. This committee could be modelled after the Mining Legislative Review Committee of the province of Ontario and should contain representation from the provincial departments involved in the planning and regulation of underground coal mines. [See page 540.]

Variances to the regulations

Some flexibility is needed so that new techniques or technology can readily be introduced into a mine without compromising safety. Exemptions or variances to the regulations should be subject to approval by the legislative review committee within a fixed time after their implementation, thus providing another level of review.

62 The regulator should be given authority to grant exemptions to or variances in the regulations if satisfied that such exemptions or variances will in no way detract from the safety of the miners and other underground workers. The burden is on the mine operator to demonstrate to the satisfaction of the regulator that safety considerations have not been prejudiced. [See page 540.]

Approval of mine plans

63 A mine developer or mine operator should submit all mine plans, including plans for the development, construction, or alteration of an underground coal mine, to the regulator for approval. No such plans should be acted upon or otherwise implemented until they have been approved in writing by the regulator. The regulator may require further detailed plans of the mine or the surrounding geological configurations. The regulator may require that the developer or operator have the plans, or portions of them, reviewed at the expense of the developer by mining consultants having expertise in any or all of the following disciplines: rock mechanics, mine ventilation, roof control, underground equipment, and electrical applications. [See page 541.]

New regulatory regime

A regulatory regime should be formulated so that any prospective operator of an underground coal mine will have a clearer idea of the regulatory environment. At the present time, Nova Scotia coal mines are regulated by two separate regimes, federally by the coal mining regulations made pursuant to the Canada Labour Code, and provincially by the Coal Mines Regulation Act. Labour Canada's inspectorate in Sydney administers the Canada Labour Code regulations at the Devco mines. In my view, it is unrealistic to have two such regimes in place in a province the size of Nova Scotia.

64 The province should take immediate action to reach agreement with the federal Department of Labour for the inspectorate of that department to assume the underground coal mine regulation and inspection functions currently under the aegis of the provincial Department of Labour. [See page 542.]

65 The province should collaborate with the federal Department of Labour to draft updated underground coal mining regulations applicable to all coal mines in Nova Scotia. These common regulations would then be administered throughout the province by the inspectorate at present functioning under the provisions of the Canada Labour Code regulations. Such regulations should be drafted with the advice and assistance of competent coal mining professionals with demonstrated expertise in the various fields of ventilation, ground control, electrical applications, training, and mine rescue. [See page 542.]

Method of regulation

It is essential that the administration of underground mining regulations be competent and aggressive. Regulations are only as good as the enforcement and administration of them. It has been stressed on several occasions that mine inspectors must be certified mining engineers. This follows the approach to mine inspection adopted in the United Kingdom and in most Canadian jurisdictions. The U.S. approach is to engage technicians who enforce very comprehensive regulations and who have engineering back-up when needed. Virtually all mine managers and most underground mine managers are professionally trained mining engineers. The inspectorate must be able to face them on an equal professional basis.

66 If it is decided to pattern the Nova Scotia coal mine regulation regime after that of the United Kingdom, all mine inspectors should have at least a degree in mining engineering, with some specialist training in both rock mechanics and ventilation relating to underground coal mining. If the U.S. Mine

Safety and Heath Administration approach is adopted, all mine inspectors should receive adequate initial training. In either case, all mine inspectors should be required to take periodic training, of at least one week per year, at an institute specializing in mine inspection and safety. [See page 543.]

Smoking

One of the most disturbing aspects of mine safety, and one that the individual miner can control, is the practice of tobacco smoking underground with its attendant risk of explosion. In the face of good common sense and judgment, smoking remains a problem in underground mines. According to numerous mining officials, the clandestine transport of smoking materials by workers into underground coal mines remains a nagging and frightening reality. This problem concerns the wilful and wanton disregard for not only one's own safety, but also the lives of fellow workers.

67 Labour and management should work together to educate and regulate the underground miner with a view to eradicating the practice of smoking in the coal mining environment. The following requirements should apply:

(a) Tobacco smoking and the possession of smoking materials and lighters by any person underground should be grounds for immediate dismissal from employment, the reason for dismissal to be recorded in the employee's record.
(b) Proof of tobacco smoking underground or possession of smoking materials underground should provide sufficient grounds for dismissing any grievance taken by an employee for unjust dismissal, and any arbitrator should be prohibited from substituting any other penalty in lieu of dismissal.
(c) Labour and management, with the cooperation of the Department of Labour, should investigate the feasibility of acquiring tobacco detection devices that would monitor miners entering the mine. [See page 545.]

PART FOUR

The Aftermath: Rescue Efforts and the Inquiry

Chapter 15 Rescue Efforts

Owing to the devastating nature of this explosion, the mine rescue efforts proved ultimately futile. No one in the Westray mine in the early morning hours of 9 May 1992 survived for more than one minute following ignition of the methane. The ensuing rescue operation demonstrated the bravery and dedication of the mine rescuers and the other volunteers who rallied so quickly in support of their lost friends, fellow miners, and neighbours. Much can be learned from this rescue operation to assist others in the future. It is so unfortunate that we must await a tragedy such as Westray to initiate improvements designed to avoid such similar situations. We must strive to perfect a system of review, both in the context of underground mining and in the industrial community generally, wherein the advancement of safety is not disaster driven but, rather, results from continued review, earnest safety-oriented consultation, and aggressive enforcement of the regulatory regime. Anything less may only result in sustaining the disaster-driven safety mentality.

Emergency procedures

68 Every mine operator, indeed, every industrial plant or facility, should have a well-defined and comprehensive emergency procedures manual containing a complete and up-to-date list of all persons involved in any emergency operation. This list should contain an organization chart listing the individuals and their respective tasks, and a current telephone listing for each person. The manual should be prepared by the company in consultation with both the joint occupational health and safety committee and the safety coordinators with the appropriate government departments. The manual should set out, in detail, the quantity and location of all emergency supplies and equipment and the details of the deployment of these materials. A current copy of any such approved emergency procedures manual should be filed with the director of occupational health and safety, and copies should be provided to each person assigned any duty under the manual. [See page 560.]

Involvement of the regulator

69 The Department of Labour, in consultation with the operator, should establish such rules and regulations that would ensure the department a full and active role in every mine-related emergency procedure or rescue operation in the province. The rules and regulations should set out the duties and responsibilities of each department inspector or safety examiner in any mine-related emergency or rescue operation. [See page 561.]

Emergency preparedness

70 Rescue and emergency equipment should be standardized so that those persons trained in rescue procedures will be completely familiar with the equipment available. Similarly, the various testing devices should be standardized so that the rescuers are able to use these devices without losing valuable time and without the danger of mistaken or inaccurate readings. [See page 561.]

71 Every community at or near which underground mining operations are carried out should have a plan to provide emergency medical, fire, and other support services. The plan should include providing

emergency training to the appropriate people in those communities. Some familiarity with the underground environment could be helpful in the event of a disaster. [See page 561.]

Mine-rescue competitions

72 Mine-rescue competitions, long a fixture in the underground mining industry, provide a valuable training incentive for miners. These competitions should be continued. [See page 561.]

Chapter 16 The Inquiry

Corporate accountability

73 The Government of Canada, through the Department of Justice, should institute a study of the accountability of corporate executives and directors for the wrongful or negligent acts of the corporation and should introduce in the Parliament of Canada such amendments to legislation as are necessary to ensure that corporate executives and directors are held properly accountable for workplace safety. [See page 601.]

74 The province of Nova Scotia should review its occupational health and safety legislation and take whatever steps necessary to ensure that officers and directors of corporations doing business in this province are held properly accountable for the failure of the corporation to secure and maintain a safe workplace. [See page 601.]