Beyond Eco-terrorism:
The Deeper Issues Affecting Alberta's Oilpatch

Prepared by
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About the Pembina Institute

The Pembina Institute is an independent, citizen-based organization involved in environmental education, research, public policy development and corporate environmental management services. Its mandate is to research, develop, and promote policies and programs that lead to environmental protection, resource conservation, and environmentally sound and sustainable resource management. Incorporated in 1985, the Institute is based in Drayton Valley, Alberta with research associates in Edmonton, Calgary, Victoria, and Ottawa.

The Energy Watch Program is a key advocacy arm of the Pembina Institute. The Program focuses much of its effort in three areas:

- the environmental impacts of conventional energy and oilsands developments,
- air quality issues in Alberta, including acidifying emissions, ground-level ozone, particulate matter, and air toxics; and
- the development of provincial and national energy and air quality protection standards and regulations.

Program staff monitor the sources and impacts of pollutants linked to these environmental issues and advocate for practices and policies that minimize the environmental and human health impacts and risks associated with the emissions. This paper is part of the Program's continuing effort to monitor and assess (a) the significance of changes being imposed by the Government of Alberta on sections of provincial agencies responsible for environmental protection, and (b) the impacts of reduced regulatory vigilance on the behavior of the oil and gas industry.

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Copies of this report can be downloaded from the Institute's website at: **www.pembina.org**

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Executive Summary

Over the past several months, substantial media attention has been focused on several isolated acts of sabotage in the Peace River country of northwestern Alberta. This attention was significantly enhanced by the arrest of two men and by the release of evidence that the RCMP themselves, along with Alberta Energy Company, collaborated in the blowing up of an oil well shed. In the midst of this controversy, the root causes of the problem – growing and legitimate concerns about the health and environmental impacts of pollution from the oil and gas industry – have been largely ignored.

These concerns are increasingly being expressed by many members of rural communities across Alberta and northeastern British Columbia. They have been spurred on by:

- the government’s inability and unwillingness to provide effective environmental regulation and enforcement;
- a rapidly expanding oil and gas industry; and
- new, hard scientific evidence that invalidates the industry’s claim that no harmful impact is associated with their pollution.

This government indifference and a seemingly unstoppable industry are causing more and more Albertans to react with fear, frustration, and anger. This is the fundamental cause of the problem in the Peace River country – and the same situation currently exists almost everywhere the oil and gas industry operates in Alberta.

Since 1992, the provincial government has dramatically slashed the financial resources and personnel available to the two key provincial bodies responsible for protecting the environment – the Alberta Energy and Utilities Board and Alberta Environmental Protection. Such downsizing and deregulation were driven by an overall government imperative to eliminate the deficit as well as by the narrow ideological view that regulating industry’s compliance with environmental protection measures represented an impediment to economic growth. In every sense, the “Alberta Advantage” meant getting government out of the way of business, regardless of collateral environmental or social costs. As a result, the government has lost its capacity to provide a meaningful level of auditing and inspection coverage for oil and gas activities and has created a situation of *de facto* voluntary compliance.

Several studies that have been publicly released during the past few years (some only after private citizens sued for their release under the Freedom of Information Act) demonstrate that many substances of concern are being released into the air, land, and water by oil and gas industry activity. More disturbingly, other studies demonstrate links between the release of such substances and significant negative health impacts on livestock. These studies corroborate the anecdotal evidence that has been presented by agricultural producers through public hearings and the media during the past two decades. The issues of gravest concern are the possible human health effects from this pollution. Based on their own personal experience, many rural residents strongly believe that their health and that of their families is being harmed but, to date, no formal studies have been undertaken to investigate possible linkages and impacts.

Increased scientific evidence supporting the claims of rural residents is only one aspect of the problem of pollution by the oil and gas industry. These issues have been exacerbated by two things: a dramatic expansion in the intensity of industry development across the entire province, and the segregation of the industry over the past two decades from 70 to more than 1200 companies. Most of these are smaller companies with low overhead and few resources to invest in managing environment and health issues. Already cost-conscious and highly competitive, the pressure on the industry to cut corners on expenditures and maximize the bottom line is being

further enhanced by persistently depressed oil prices. Furthermore, as the province’s high-producing fields are depleted, companies are left to pursue riskier, less economic, smaller and deeper reserves. This is causing the oil and gas industry to encroach on populated areas, leading to increased conflict with landowners.

While Alberta is unlikely to see many incidents of overt violence, it is almost certain that rural residents will increasingly oppose unfettered oil and gas development in their backyards. For the most part, these residents will use available legal mechanisms to intervene in hearings, appeals, and inquiries, as well as using the courts and lobbying the government in order to protect themselves.

Indeed, grassroots organizations of landowners and concerned citizens are springing up all over the province to take charge of their own environmental and health protection interests. This reflects a complete lack of confidence in the Alberta government’s ability to protect the environment and to ensure their safety.

To date, the Alberta government and the oil and gas industry have continued to focus on a handful of violent incidents rather than addressing the underlying causes of the problem. In our view, these problems will not disappear from public discourse through the simple act of arresting a few members of the public.

Unless meaningful and effective measures are implemented to deal with the situation, an increasingly concerned and mobilized public will become much more active in slowing or stopping the granting of public license for oil and gas companies to operate. The short-term economic benefits of saving a few million dollars in enforcement and regulatory infrastructure will be offset by hundreds of millions of dollars of annual losses from higher regulatory and public intervention costs and delayed project timelines.

Introduction

For many years, rural Albertans have identified serious problems from the health and environmental impacts associated with the oil and gas industry. In their view, these activities – such as the drilling and testing of wells, laying of pipelines, and the flaring of solution gas – generate air emissions as well as solid and liquid wastes that reduce the quality of air, water, and soils, harm the health of their livestock and crops, and have a direct impact on human health.

These residents have traditionally used the regulatory mechanisms available to them to make their case. However, for many, the harrowing experience of attempting to have their concerns seriously addressed in quasi-judicial forums such as public hearings – where the emphasis is on adversarial deliberations, and the views of scientific “experts” hold sway – left them feeling frustrated and ignored.

The provincial government has instituted measures to reduce emissions of some compounds – such as toxic hydrogen sulphide and sulphur dioxide. However, very little has been done to identify and understand the impacts of a much broader range of hazardous compounds that are now known to be released as air emissions from various oil and gas activities. Recent commitments by industry to voluntarily reduce some air emissions have come primarily in response to public and political pressure rather than from recognition by industry that such emissions are harmful.

When increasingly stringent measures were being applied to the management of solid and liquid wastes from industrial sources (through the Alberta *Environmental Protection and Enhancement Act*), the oil and gas industry sought, and received, a special exemption in this legislation that would allow it to dispose of similar wastes through less costly, and potentially less secure, means. As discussed in this paper, with recent changes in the regulatory requirements applied by the Energy and Utilities Board, the standards for disposal of such wastes have continued to be lowered.

During the past few months a great deal of media attention has been focused on so-called “acts of eco-terrorism” in northwestern Alberta – acts that are alleged to have been inspired by frustration and anger over oil and gas pollution. Despite this attention, the general response of government and industry has been to portray the issue as being limited to a few “fringe lunatics.” The much more broadly based feelings of anger, frustration and fear being expressed across the province have generally been denied or ignored.

The Pembina Institute has issued this paper to:

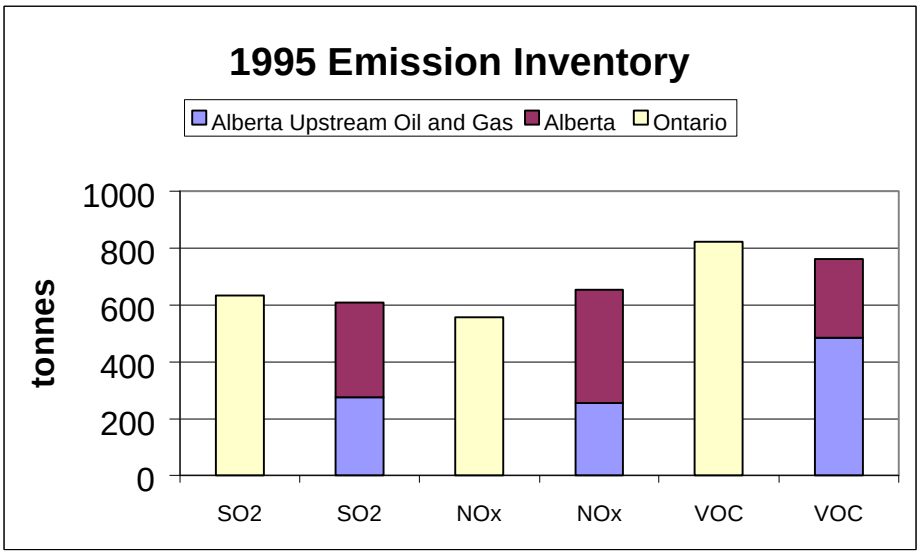
- identify the broad range of environmental and health issues that are currently known to be associated with the oil and gas industry (Section A);
- discuss the findings of several independent scientific studies that corroborate the experiential evidence submitted by rural residents (Section B);
- describe some of the key socio-economic and political factors that are increasing the risk of environmental and health impacts and further exacerbating tensions between the industry and rural residents (Section C);
- offer some concrete recommendations for action by government and industry to respond to these issues (Section D); and
- describe the potential social and economic risks of inaction by government and industry in responding pro-actively to these issue (Section E).

Section A. The Environmental Issues

Many regional and local environmental and health issues are linked to pollution caused by the oil and gas industry – pollutants that have an impact on the air, surface water, groundwater, and land. The following discussion outlines a number of the concerns associated with these impacts, and identifies the industry practices that are the main contributors to these impacts.

A1.0 Air Impacts

With the exception of greenhouse gases (such as carbon dioxide and methane) and their impacts on climate change, the primary air contaminants of concern in Canada are: sulphur dioxide, nitrogen oxides, volatile organic compounds, ground level ozone, fine particulate matter, and air



toxics (such as carbon monoxide and benzene). Alberta is second only to Ontario as the highest emitting province in Canada.[1] Within Alberta, the oil and gas industry is the predominant contributor of such air emissions.

- Sulphur dioxide (SO_2) is produced by combustion of fossil fuels containing sulphur and through the combustion of hydrogen sulphide present in “sour” natural gas. SO_2 is a key emission associated with acid deposition, which has widely-documented impacts on lakes, forests, crops, and buildings. SO_2 can also combine with other compounds in the air to form fine particulates. Acute exposure to high concentrations of SO_2 can lead to irritation of the upper respiratory tract and increase susceptibility to respiratory infections. Long-term exposure may increase the risk of developing chronic respiratory disease.
- Nitrogen oxides (NO_x) are by-products formed from the combustion of fossil fuels. As with SO_2, NO_x contributes to acid deposition and the formation of fine particulate matter. NO_x also plays an important role in the formation of ground level ozone through a complex photochemical reaction with volatile organic compounds.
- Volatile organic compounds (VOCs) refer to a broad class of hydrocarbon compounds. These compounds are released directly through the volatilization of raw and refined oil and gas products and are also formed from the combustion of fossil fuels. VOCs include compounds

[1] *1995 Criteria Air Contaminant Emission Inventory Summaries*. December 1998, Environment Canada Prairie and Northern Region Internet Web Site.

(such as benzenes) that are known to be carcinogenic and toxic to humans. VOCs contribute to the formation of particulate matter and react with NOx to produce ground level ozone.

- Unlike stratospheric ozone, which plays an important role in protecting the environment from harmful ultraviolet radiation, ground level ozone causes adverse effects on humans, including irritation of the eyes, nose and throat; reduced lung function; and the development of chronic respiratory disease. Ground level ozone also reduces the productivity of agricultural crops and forests. Ground level ozone is a major constituent of smog. The 1-hour and 24-hour guidelines for ground level ozone are often exceeded in rural Alberta.
- Air toxics are substances that can have an immediate or long-term harmful effect on human health and/or ecosystems. Examples of air toxics include SO_2, VOCs, carbon monoxide (CO), and nitrogen oxides as well as benzene, styrene, and toluene. Nitrogen dioxide (NO_2), a component of NO_x, is known to irritate the lungs and increase susceptibility to respiratory infections in humans. Combined with ozone or sulphur dioxide, low concentrations of NO_2 can cause injury to plants. Carbon monoxide impedes the absorption of oxygen into the bloodstream and can cause permanent injury or death in high enough concentrations. Compounds such as benzene, styrene, and toluene are listed on the National Pollutant Release Inventory (NPRI) and are monitored because of their toxicity or carcinogenicity.
- Particulate matter (PM) is tiny pieces of solid and liquid matter small enough to be suspended in the air. The finest of these particulates are primarily soot and exhaust combustion products, from both natural and human-induced sources, that may irritate the respiratory tract and contribute to smog formation. Secondary sources of PM result from SO_2, NO_x, and VOCs, which act as precursors to PM formation in the atmosphere. Of special concern are PM_{10} and $PM_{2.5}$ particulates – fine particulates smaller than 10 and 2.5 microns in size that can penetrate deeply into the lungs. These particulates can have a serious effect on respiratory function and have been linked to respiratory and cardiac disease.

A1.1 Solution Gas Flaring

The most prominent air quality concern in rural Alberta in recent years has been emissions from flaring, predominantly solution gas flaring from oil wells and gas flaring at smaller processing facilities. These flares are familiar to rural residents as thin pipe-like structures with a flame at the top. In 1996, there were 5246 solution gas flares in Alberta. These flares burned 1.8 billion cubic metres of gas, 8% of the total volume produced.[2] Solution gas is natural gas that comes to the surface along with crude oil, and it can be sweet or sour (containing hydrogen sulphide). The oil and gas industry applies to the government for permission to flare gas that is not profitable to send by pipeline to a gas facility.

For years, residents living near flares have documented problems with their health, the health of livestock, and environmental impacts associated with flaring. Concern over the environmental and health implications of emissions from flares increased dramatically in 1996 when the Alberta Research Council released the results of a flare efficiency study. This study found that flares fully combust only 64 to 85% of the gas that is directed to them.[3] Emission characterization tests in this study also revealed that more than 250 different compounds were being emitted from flares, including hydrogen sulphide, benzene (a known carcinogen), polycyclic aromatic hydrocarbons, and a host of other highly toxic products of incomplete combustion.

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[2] *Management of Routine Solution Gas Flaring in Alberta*. Clean Air Strategic Alliance, 1998

[3] *Investigations of Flare Gas Emissions in Alberta.* M. Strosher, Environmental Technologies, Alberta Research Council. November 1996.

In response to these new findings and the subsequent public outcry, a multistakeholder body, consisting of industry, government, and environmentalists, negotiated an agreement to reduce flaring. In this agreement, the province’s oil and gas industry committed to reduce volumes of solution gas flared by 25% by the year 2001, with longer-term goals of reducing volumes of gas flared by 40-50% by 2003 and 60-70% by the year 2007. The agreement also identified ways to facilitate the implementation of alternatives to flaring, such as using the gas as a fuel for mini-turbines to generate electricity. Other actions to be taken include implementing regulations to improve flaring efficiency, and improved notification and consultation by companies with members of the public who live near wells requiring flares.

While this agreement is a significant achievement, it is limited in that flares that combust less than 100,000 cubic metres of gas per year (representing 50% of all flares) are unlikely to be affected by the reduction targets. Furthermore, this agreement does not extend to other types of industry flaring, such as well testing and gas plant flares.

A1.2 Well Test Flares

Once a new gas well has been drilled, the well is allowed to flow at its maximum rate for anywhere from 4 to 21 days while the rate and pressure of the gas reservoir is measured. The information gathered is used to size pipelines and determine processing requirements. After an initial period of direct venting, the well is ignited and allowed to burn for the duration of the test. One large well test can release more pollutants during the single well testing period than a large gas plant will release in a month. This source of emissions can lead to very high ground level concentrations of pollutants, which could damage vegetation and affect human and animal health.

With improved well-logging instrumentation and the use of existing reservoir data from previous well tests, the duration of testing of new wells can now be shortened substantially. Furthermore, in regions where a pipeline network is already in place, emissions from a well test can be directed into a pipeline, avoiding the need to release any emissions to atmosphere.

A1.3 Gas Plant Incinerators

Incinerator stacks are the very tall stacks located at sour gas plants. Sour gas plants extract hydrogen sulphide (H_2S) when processing sour gas. H_2S that is not recovered and converted to elemental sulphur is burned at a high temperature through tall incinerator stacks in order to convert the H_2S into sulphur dioxide (SO_2). Emissions from these stacks are then dispersed high into the air with the expectation that by the time the plume reaches the ground, it will be sufficiently diluted. Large gas plants in Alberta emit between 700 and 7000 tonnes of sulphur dioxide per year from their incinerator stacks.

Through a grandfathering exemption, many gas plants currently in operation continue to be exempt from the more stringent sulphur recovery regulations that were introduced in 1988. If these plants were required to be upgraded to current recovery standards, considerable reductions in SO_2 emissions could be achieved.

Small gas plants, which have lower sulphur recovery requirements than larger gas plants, represent another source of SO_2 emissions. The smallest class of sour gas plants process one tonne of sulphur or less per day, and are not required to recover any sulphur at all. Increased focus on exploiting smaller gas reserves has lead to a trend towards the proliferation of small plants and reduced recovery. Growth in SO_2 emissions from these sources could be reduced if the government restricted the approval of small gas plants to very limited, exceptional circumstances.

A1.4 Glycol Dehydrators

The natural gas industry uses glycol dehydrators to remove water from gas prior to introducing the gas into pipelines. This helps prevent freezing and corrosion in the pipeline. Unfortunately,

the process also results in the extraction of benzene and other hydrocarbons from the gas; in most instances, these extracted compounds are vented directly to the atmosphere. As mentioned previously, benzene is a known human carcinogen with no safe exposure level.

There are approximately 3500 glycol dehydrators in use in Canada, 80% of which are in Alberta.[4] In 1995, glycol dehydrators emitted 9000 tonnes of benzene into the atmosphere. For the natural gas industry, the vast majority of dehydrators are located in rural areas next to producing gas wells or gas gathering stations.

Given the potential exposure of the public to benzene from glycol dehydrators, the gas industry was targeted by Environment Canada for significant reduction. After two years of extensive negotiations the industry reluctantly agreed to a target of a 90% reduction in this source of benzene by the year 2005.

Currently, the gas industry is committed to voluntarily comply with emission limits of three tonnes per year for all new glycol dehydrator units and three tonnes per year for existing units within 750 metres of a residence (five tonnes/year for other existing units). These actions are expected to result in benzene reductions of 40 to 45%. Most of the reductions will come from the 7% of dehydrators with pre-1999 emissions of nine tonnes a year or more.

Although this is an important first step, there are no plans in place to achieve the additional 45 to 50% reduction required to reach the 90% target. Furthermore, even a 90% reduction may not be sufficient given the scientific understanding that there is no safe level of exposure to benzene.

A1.5 Fugitive Emissions, Accidental Releases, and Spills

Fugitive emissions are vapors that “leak” from wells, pipe connections, and oil tanks. Although the volume from each source is usually quite small, the extremely large number of sources makes fugitive emissions a significant source of hydrocarbon vapor and H_2S across Alberta. The venting of the gas from heavy oil wells in northeastern Alberta is a particularly significant source of such emissions. Fugitive emissions can be minimized by installing vapor recovery systems on tanks and wells, and through proper leak detection and repair systems in processing facilities.

Accidental release of sour gas poses serious safety concern. Wells, pipelines, and facilities are prone to leaks and accidents of many kinds that may result in exposure of people and animals to dangerous levels of H_2S. For this reason, the oil and gas industry is required to put in place emergency response plans to address accidental releases of sour gas. Pipeline leaks and spills can be prevented through improved integrity testing and corrosion prevention measures, increased rates of government inspections, more stringent requirements on the types of material used in pipelines, and through increased restrictions on companies wishing to use sweet gas and oil pipelines to transmit sour products.

Aside from water and soil contamination, spills of crude oil can result in a large volume of air emissions. A significant fraction of most crude oil streams will easily volatilize (evaporate) if exposed to the air, resulting in air emissions. Some of the approved spill clean-up methods, such as land spreading, rely at least in part on volatilization to remove hydrocarbon from soils. The burning off of contaminants through deliberate ignition of spills also results in significant air emissions.

[4] *Best Management Practices for the Control of Benzene Emissions from Glycol Dehydrators*, by the Working Group on Benzene Emissions from Glycol Dehydrators, November 1997.

A2.0 Surface Impacts

Pollution from the oil and gas industry has two key types of direct surface impacts: the contamination of surface water and soil as a result of spills and leaks of oil and produced fluids, and the impacts on ecosystem habitat caused by linear disturbances.

The primary soil contaminants related to the oil and gas industry are hydrocarbons, salts, heavy metals, and process chemicals.

- Crude oil is a complex and variable mixture of different hydrocarbon compounds. These compounds have differing impacts on the environment. Some compounds, such as aromatic hydrocarbons are volatile and dissolve readily in water. As a result, they can move through soil and water relatively quickly, potentially leading to more widespread contamination. Such compounds (which include benzene) are also toxic. Crude oil also contains polycyclic aromatic hydrocarbons (PAHs), which can be toxic and carcinogenic. PAHs do not break down quickly in the environment and may be transmitted up the food chain, causing bio-accumulation in higher order species. Other hydrocarbon compounds are more complex, less mobile, and less toxic. These compounds do not break down easily and may prevent seed growth and water uptake by soils.
- Crude oil and produced water commonly contain high concentrations of salts, such as sodium chloride and calcium chloride. Salts are also added to drilling muds. Salts can be introduced into the environment through pipeline breaks, spills, and land disposal of oilfield waste and drilling muds. Salts dissolve in water and thus are highly mobile. At high concentrations, salts can be toxic to plants and aquatic life. At lower concentrations, salts can contribute to degradation of water quality and soil quality.
- A range of heavy metals is found in oilfield wastes at varying concentrations. Most of these metals are introduced during drilling and processing stages of oil and gas production. Metals do not bio-degrade and will remain in soils or be transported by water. Repeated spreading of wastes containing metals onto soils can elevate metal levels in soils. Some heavy metals are toxic, carcinogenic, and bio-accumulative.
- “Process chemicals” refers to a broad category of compounds used in the oil and gas industry. They include drilling mud additives, lubricants, cleaning and degreasing compounds, pesticides, pipe dope, and others. Many of these chemicals can end up as contaminants in oilfield wastes. These compounds have various impacts on soil and surface waters.

A2.1 Spills and Leaks

Leaks and accidents resulting in contamination of land and surface water with crude oil, produced water, and oilfield wastes occur frequently in oil and gas producing areas. A major source of contamination is pipeline leaks. Between 1980 and 1997, there was an average of 674 pipeline failures per year, but with the growing number of pipelines in Alberta, the average for the last five of those 17 years has actually increased to 734 pipeline failures per year.[5] Landowners are often the first to discover pipeline ruptures and are usually the most affected by them.

Spills and leaks can directly expose crops and livestock to contaminants and contribute to overall degradation of soil and surface waters. Clean-up projects can take years or even decades to complete. Landowners are on their own when seeking fair compensation from the company for damages.

[5] *Report 98-G, Pipeline Performance in Alberta 1980-1997.* Alberta Energy and Utilities Board, December 1998.

A2.2 Waste Disposal

The Energy and Utilities Board (EUB) condones a number of oilfield waste disposal practices that have the potential to seriously pollute soils and surface waters. These practices include on and off-site disposal of drilling muds, one-time on-site land treatment of oilfield wastes, and road spreading.

The disposal practices described below are all based on maximum loading or application rates. In other words, they rely primarily on the dilution of contaminants (salts, metals, hydrocarbons) in the environment rather than on actual treatment of the waste. In addition to the potential impacts that the incremental additions of these contaminants may have on soils, contaminants may be transported from the disposal location into ground and surface waters. Also, given the fact that most of the practices listed below receive very little or no oversight by the EUB, the risk of getting caught breaking the rules is very low. This is particularly true for activities occurring in remote locations.

A2.3 On- and Off-site Disposal of Drilling Muds.

Drilling muds are used during the drilling of a well to carry rock cuttings from the active drilling area to the surface and to maintain retention pressure on subsurface gases and liquids. Most drilling muds are water-based but a fraction are invert muds. Invert muds contain diesel fuel or other hydrocarbons. Invert muds are used when there is a risk of encountering a subsurface rock formation that is sensitive to water while drilling for oil or gas. Inverts have been used to drill many wells in Alberta’s Eastern Slopes. They can also be used for some horizontal well drilling programs. Less toxic alternatives to diesel oil exist, such as canola oil, but these oils are moderately more expensive and not widely used.

Drilling muds vary greatly in their chemical composition, depending on the type of salts and chemicals that are added to them. The EUB permits the addition of a wide range of potentially toxic compounds, including bactericides, emulsifiers, de-emulsifiers, corrosion inhibitors, foaming agents, lubricants, polymer stabilizers, polymer breakers, shale control inhibitors, and surfactants, among others. Toxicity testing is only required if the concentrations of the individual substances that were added are *expected* to result in toxicity. No consideration is given to the risk of impacts that may result when combining multiple toxic additives or to sub-toxic impacts. Incredibly, if a drilling mud is toxic, but the toxicity is shown to be caused by hydrocarbons then normal disposal of the material is allowed.

Oil and gas companies have many options available for disposing of drilling wastes.[6] Two of these options require approval by the EUB, while the others simply require notification.

- Mix-Bury-Cover – Three parts subsoil are mixed with one part waste and buried one metre above the groundwater and one metre below the surface.
- Landspreading – Waste is spread on-site and incorporated into the subsoil.
- Landspraying – Waste is sprayed off-site onto topsoil and may or may not be incorporated.
- Pump-off – Clear liquids are applied off-site, normally onto vegetated land.
- Land Treatment – This option is intended for invert drilling wastes, hydrocarbon-contaminated drilling wastes, and/or wastes with high salt content. Applications from one waste site are made on a dedicated parcel of land. The land is managed in a manner that allows the soil system to degrade, transform, and assimilate the waste constituents. This activity requires EUB approval.

[6] *Guide 50, Drilling Waste Management*. Alberta Energy and Utilities Board, October 1996.

- Alternative Disposal – This "other" category requires regulatory approval prior to waste disposal.

There are environmentally safer methods for treating and disposing of invert and hydrocarbon-contaminated muds, including various forms of thermal destruction. These methods are implicitly discouraged by the EUB due to the fact that the methods are not detailed in the regulations and would require special approval by the EUB.

A2.4 One-time On-site Land Treatment of Oilfield Waste

The EUB permits the disposal of several forms of oilfield wastes directly onto the land; these wastes include hydrocarbon- and salt-contaminated soils and subsoils, spill materials, flare pit sludges, and storage pond sludges from oil lease sites.[7] As with the land treatment of drilling wastes, this practice is based on maximum application rates and relies as much on dilution and vaporization as it does on biodegradation.

This practice requires neither approval from, nor notification of, the regulator. There is no regulatory mechanism to prevent highly toxic materials being added to "acceptable" materials by cost-conscious and environmentally irresponsible members of industry.

A2.5 Road Spreading

"Road spreading" refers to the practice of spreading oily by-products on road surfaces. Oily by-products are materials that contain oil or bitumen generated during heavy oil production and typically consist of sand and slop oil. This practice is based on maximum loading rates for salt, metals, and hydrocarbons. The EUB requires companies to provide them with records of the activity but does not require notification or approvals. Minimal regulatory oversight of this activity raises the risk of abuse or non-compliance by irresponsible companies. Road spreading is carried out primarily in the northeastern part of Alberta.

A2.6 Linear Disturbances

"Linear disturbance" refers to the cutting of seismic lines, construction of roads and pipelines, and the presence of well leases, facilities and utility corridors. These disturbances have a direct and profound impact on landforms, soils, plants, and wildlife. At a landscape level, such disturbances result in habitat fragmentation, which can negatively affect sensitive species, such as grizzly bears, who require large contiguous tracts of wilderness for survival. Some species of songbirds are also negatively affected when fragmentation causes their habitat to be opened to predators and parasites. Linear disturbances also permit increased access for hunting and other recreational uses into formerly inaccessible wilderness areas.

A3.0 Groundwater Impacts

Contaminants that affect soils and water on the surface can have similar impacts on groundwater. An important difference is the fact that groundwater is the only source of drinking water for a large percentage of rural Albertans, thus increasing the risk of human exposure and health impacts.

The issue of potential impacts of oil and gas activity on groundwater supplies has been a long-standing concern for many rural Albertans. Landowners have reported anecdotal evidence linking deterioration of drinking water quality and quantity with nearby oil and gas activity, however it is extremely difficult to prove a direct causal link in many such cases.

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[7] *Guide 58, Oilfield Waste Management Requirements for the Upstream Petroleum Industry*. Alberta Energy and Utilities Board, November 1996.

Oil and gas industry activity can affect both groundwater quality and quantity. Groundwater quality can be affected by hydrocarbon contamination percolating downwards from surface and subsurface leaks from wells, facilities, and pipelines. Seismic exploration involves drilling of numerous "shot-holes" or "blast-holes" ranging in depth from 10 to 100 metres.[8] If these holes are not adequately filled or plugged, they may become an avenue for surface waters to contaminate groundwater zones. Drilling sumps (dugout earthen pits used to store drilling muds) are a potential source of groundwater contamination. Holes or cracks can occur in the well bore casing, allowing well fluids to escape into a groundwater zone. Bridging of fluids between rock formations as a result of natural or pressure-induced cracks in confining layers of rock can also lead to contamination of groundwater.

Water quantity impacts may be linked with oil and gas activities that require the use of fresh groundwater. One such example is "water flood," where large volumes of groundwater are used to maintain pressure in hydrocarbon-producing zones in order to improve oil production. In some cases, the use of groundwater by industry may affect other groundwater users in the area.

A3.1 Cold Lake Regional Groundwater Deterioration

The concern about Imperial Oil's impact on groundwater in the Cold Lake region is one example of oil and gas industry activity that has resulted in groundwater contamination. This example also highlights the fact that it is very difficult to definitively prove cause and effect.

Since 1994, several catastrophic casing failures caused by the injection of extremely high-pressure steam to extract heavy oil at the Imperial Oil Cold Lake Project have resulted in significant contamination of groundwater at particular locations in the project area. Investigations into the severity and extent of the groundwater contamination from these incidents showed widespread deterioration in groundwater quality, including increased levels of arsenic in drinking water supplies. Landowner groups in the region are convinced that Imperial Oil is to blame for the decline in regional water quality. Landowners also complain that Imperial Oil's activities, which require huge inputs of water, have also resulted in a decline in available groundwater volumes.

Alberta Environmental Protection (AEP) stated during a recent public hearing that, while the six casing failures are to blame for the decline in local groundwater quality, they are not to blame for the decline in regional groundwater quality.[9] However, AEP did go on to point out that the high subsurface pressures created by the company to extract oil are strong enough to cause the surface of the ground to heave, and may have caused the proliferation of interconnections between subsurface water-bearing zones. AEP is of the view that further research is required to determine whether or not Imperial Oil is to blame for the decline in regional groundwater quality.

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[8] *Cattle and the Oil and Gas Industry in Alberta: A Literature Review with Recommendations for Environmental Management*, by the Alberta Environmental Centre for the Alberta Cattle Commission, July 1996.

[9] Alberta Environmental Protection and Alberta Health hearing submission for the Cold Lake Expansion Project, November 16, 1998.

A4.0 Safety

Public safety issues relating to the oil and gas industry are dominated by the risk of exposure of the public to hydrogen sulphide (H_2S) as a result of the exploration, transmission, processing, and disposal of sour gas. H_2S is acutely toxic to humans at low levels. Humans can smell H_2S at levels as low as 0.01-0.3 parts per million (ppm). Levels of 1-5 ppm can cause nausea, tearing of eyes, and headaches. Lung irritation and damage to eyes can occur at levels of 20 ppm. At levels of 100 ppm, olfactory paralysis occurs resulting in the disappearance of the odor of H_2S. Instantaneous death results at levels of 1000 ppm.[10] The Lodgepole blowout report inquiry noted that health effects can occur at levels below 1 ppm among sensitive individuals.[11]

H_2S is heavier than air and therefore tends to follow valleys and other similar landforms rather than dispersing evenly.

While the risk of sour gas releases has been reduced in the past 20 years, particularly from activities such as sour gas well drilling, accidental releases still occur; for example:

- On September 23, 1998, approximately 30,000 cubic feet of 18% sour gas were released from a Husky Oil drilling site 50 km northeast of Nordegg.[12]
- On September 25, 1997, a well-servicing accident caused the release of sour gas at a Mobil Oil well at Rainbow Lake, resulting in the need to evacuate residents and workers within a one-kilometre radius.[13]
- In September 1994, a sour crude oil well blow-out preventor failed, resulting in the release of hydrogen sulphide and crude oil and forced the evacuation of two households in the Sundre/Red Deer River area.[14]

As Alberta’s reserves of oil and gas are gradually depleted there will be more pressure by oil and gas companies to pursue sour gas reserves that are located near communities. This effect is already apparent in Alberta with respect to critical sour gas well drilling. Critical sour gas wells are extremely dangerous because of their high H_2S content. Several coalitions of landowners and concerned citizens have joined together in Drayton Valley, Edson, Rocky Mountain House, and in northwest Calgary to fight proposals for critical sour gas wells near their communities. The key issue in each of these cases is the risk to humans should there be an uncontrolled release of H_2S, coupled with the company’s inability to ensure that potentially affected individuals would be evacuated before they were exposed to H_2S.

[10] “Hydrogen Sulphide,” T.L. Guidotti, *Occupational Medicine,* Volume 46, No. 5, 1996.

[11] Lodgepole Blowout Inquiry, Energy Resources and Conservation Board, December 1984.

[12] Husky Oil News Release, September 23, 1998

[13] Mobil Oil News Release, September 25, 1997

[14] *1994 Livestock Field Investigations of Two Ranches Associated with a Pipeline Break*, Alberta Research Council, 1998.

Section B. Emerging Scientific Evidence

Rural landowners have long complained that pollution from the oil and gas industry is having an adverse impact on their operations and their health. Farmers have reported that air emissions (flares, releases of gas, leaks and spills) have caused numerous health problems in livestock including death, abortions, neurological problems, reduced reproductive success, higher incidences of twins, reduced rate of growth, immune system problems, and red and running eyes. Concerns have been raised about impacts on soil quality and water supplies. In many cases, industry and government have treated the presentation of such evidence as “anecdotal” and insufficient proof that there is a real problem. However, a growing body of hard scientific evidence is emerging that supports these long-standing concerns and seriously challenges industry claims that their activities have no negative health or environmental impacts.

Examining the Association Between the Petroleum Industry and Beef Herd Productivity. Dr. Cheryl Waldner, University of Saskatchewan, January 1999

This study is the first of its kind in Alberta to look at actual sulphur emission exposure and reproductive outcomes in cattle. Herds of about 1200 cattle in the Sundre area of Alberta were tracked over an eight-year period. A small association between sour gas flaring and reproductive outcomes in cattle was found. Of the six reproductive outcomes examined over four production cycles, the most consistent association was for stillbirth.

There were also single-year associations with increased risk of non-pregnancy, abortion and stillbirth, and there was an increased risk of twin births in two of the three years examined. The data also showed some examples of associations between sulphur emissions and reproductive outcomes in beef cattle. There were single-year associations with increased risk of non-pregnancy, abortion, and stillbirth and there was also an increased health risk of twin births in two of the three years examined.

1994 Livestock Field Investigations of Two Ranches Associated with a Pipeline Break. Alberta Research Council, 1998

Prompted by a Freedom of Information Request, in 1998 the Alberta Research Council finally released the results of a study conducted in 1994 on the effect of a multi-phase pipeline spill on the health of cattle from two ranches on the Red Deer River. The release of natural gas, sour gas, and crude oil into the ice-covered Red Deer River started on January 6, 1994. Direct emissions and emissions from the clean-up attempts (which included two separate ignitions of the spill) exposed cattle on both ranches to a mixture of gases including sour gas, hydrocarbon vapors, and sulphur dioxide. Emissions from the first ignition forced the residents of both ranches to evacuate. One of the households evacuated as a result of emissions from the second ignition.

The study concluded the following:

- There was an increase in illness and death in both herds.
- Calves suffered a “failure-to-thrive” syndrome (i.e., failure of calves to nurse, slow weight gain, prone to infection).
- Changes in maternal behavior were observed in both herds.
- Histopathological changes (such as lesions and other evidence of exposure to irritating substances) were observed in the upper respiratory tract of calves.
- Some cattle had difficulty in the placement of their limbs.

The company involved in this incident has suggested that the cattle health effects and deaths were caused by cold weather experienced in the winter of 1994. However, the study specifically addressed and ruled out cold weather as the factor responsible, by itself, for the health effects that were recorded.

In order to take into consideration previous exposure of cattle to oil and gas related pollutants, the authors of this report documented previous incidents. The following list highlights the types of impacts and disruptions experienced by some landowners who live with the oil and gas industry in their backyards.

Date	**Incident**
November 1993	Water in a creek flowing through one of the ranches was found to contain quantities of crude oil.
December 1993	Sour gas emitted from two oil wells affected both ranches.
July 1994	Hydrocarbon emissions from oil well pipeline spill located west to northwest of both ranches
September 1994	Hydrocarbon emission from another oil well pipeline spill also located west to northwest of both ranches
September 1994	Hydrogen sulphide and crude oil release – sour crude oil well blow-out preventor failed, spraying the pasture, trees, and hay bales of one ranch with sour crude oil. Residents of both ranches were evacuated.
1993 – 1994	Residents of both ranches reported incidents of upset conditions in other oil and gas facilities that affected air quality.

Effects of Air Emissions From Sour Gas Plants on the Health and Productivity of Beef and Dairy Herds in Alberta, Canada. Harvey Morgan Scott, Doctoral Thesis, University of Guelph, July 1998

This study has been widely touted by the oil and gas industry as proof that their operations are having no impact on cattle. However, this is not an accurate interpretation of the study’s findings. Industry chooses to ignore the important caveat that the author places on the findings, that the study provided only an initial, exploratory analysis of associations between exposure of licensed levels of sour gas emissions on cattle and that the study was hampered by a number of limitations.

Rather than using direct exposure measurements, the study was forced to rely on dispersion modeling. Such models are not able to provide specific estimates of exposure for any given time or place. Cattle health and productivity measures were restricted to data available from pre-existing sources. These measures were not specific as to pathological process but rather were indices of productivity and health status, and thus could have been affected by a number of factors. The study also relied on the assumption that no actions were taken by farmers in high exposure areas to maintain productivity (through improved care, sale of low-performing cows, etc.) relative to those in low exposure areas.

Despite these limitations however, the author did find a small but statistically significant association between levels of exposure to licensed (routine) levels of sour gas emissions and the age at first calving and average herd calving interval.

While solution gas flaring and the potential impact on cow-calf operations was a component of the study, the available historical data was not sufficient to make any assessment.

Investigations of Flare Gas Emissions in Alberta. Prepared by M. Strosher, Environmental Technologies, Alberta Research Council, November 1996

The purpose of this study was to determine experimentally the degree to which flared gases are unburned, and to characterize the products of combustion in the emissions. The study found that only 66 to 84% of the solution gas that is directed to flares is fully combusted. This differs dramatically from previously held assumptions that flaring was a very efficient (greater than 98%) method of disposing of solution gas. The characterization tests revealed that the products of incomplete combustion from flares contain over 250 different compounds including known carcinogens (benzene, polycyclic aromatic hydrocarbons, and others).

The study also attempted to predict ground level concentrations of products of incomplete combustion using dispersion modeling techniques. This analysis predicted that maximum ground level concentrations of contaminants from flares occurred within several hundred metres of the flare stack, and the largest maximum calculated ground level concentrations of polycyclic aromatic hydrocarbons were comparable to levels observed in large industrial cities.

To many people living with flaring in their region, this study confirmed what they believed they already knew based on experiences of odors and effects on human and animal health.

Cattle and the Oil and Gas Industry in Alberta. Prepared by the Alberta Environmental Centre for the Alberta Cattle Commission, July 1996

The release of a revised version of this report by the provincial government was forced by action through a Freedom of Information Request. This report is a literature review of studies that document a broad range of impacts of oil and gas activities on cattle. Some of the report’s conclusions were:

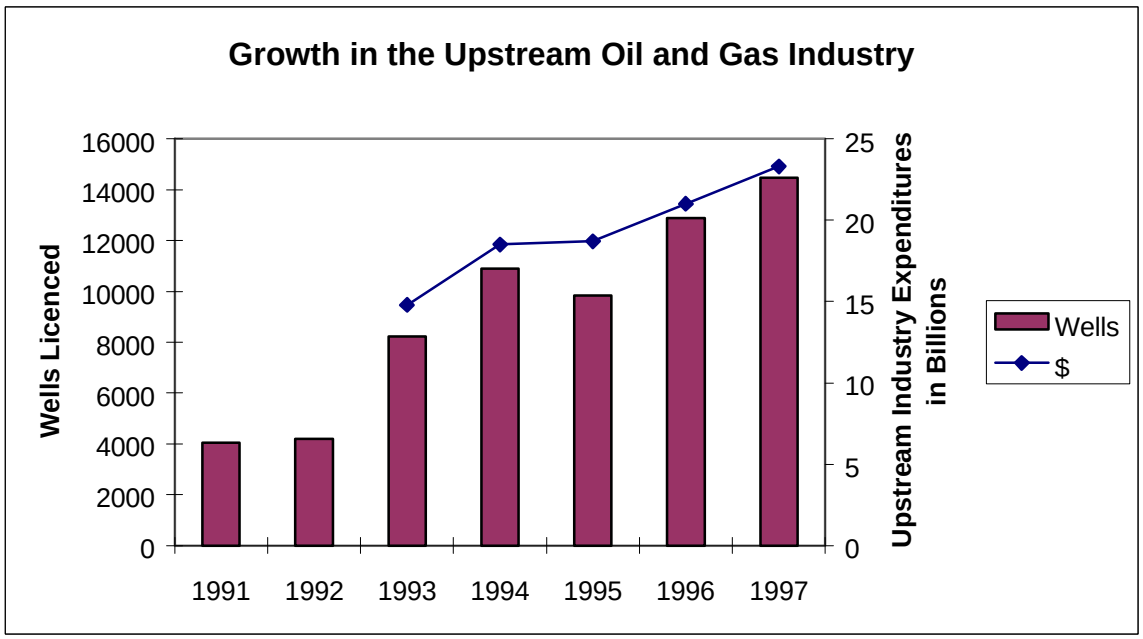
- Spills of crude oil and salt water pose a direct and identifiable risk to cattle.
- Hydrogen sulphide has an effect on cattle at a concentration less than 50 ppm and can cause death to cattle at higher concentrations.
- There is insufficient research to determine if there is a risk to cattle from aromatic hydrocarbons, liquid condensate, and sulphur compounds other than H_2S
- There is insufficient research to draw definite conclusions about potential contamination from volatile organic compounds and ground level ozone.
- Heavy metals associated with the oil and gas industry may affect cattle through the ingestion of soil, but it is not known how much contaminated soil is ingested by cattle grazing in Alberta.
- There is not enough information on exposure of glycol and methanol, and the toxicological effects of monoethanolamine, diethonolamine and sulphinol to form conclusions about the potential risk of these compounds to cattle.

Section C. Socio-economic and Political trends: Why environmental risks and impacts are increasing

The oil and gas industry has been active in Alberta for over 50 years. During this time, several significant waves of public concern have led to changes in industry practices and to improvements in the province’s regulatory systems. This section discusses several key socio-economic and political trends which, along with the release of new studies supporting public concerns about environmental and health impacts, have emerged to fuel the dramatic increase in public concerns and conflict that we are beginning to experience.

C1.0 Growing Activity: A Larger Footprint

Alberta has experienced substantial growth in the oil and gas industry during the past five years; for example, four times more wells were drilled during fiscal 1996/97 than in 1992.[15] Similarly, expenditures by industry for upstream activities increased by over 57% between 1993 and 1997.[16]



C2.0 Industry Restructuring: The Rise of the “Little Guys”

The make-up of players in the oil and gas industry has changed considerably since the early 1980s. Where once there were 70 large companies operating in Alberta, there are now more than 1200, most of which are small- to medium-sized exploration and development companies.[17] These new companies, some as small as two- or three-person outfits, are significantly different entities from the traditional large integrated resource companies.

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[15] *Annual Reports: 1995/96, 1996/97, 1997/98*, Alberta Energy/Alberta Energy and Utilities Board

[16] *Petroleum Industry Fast Facts*, Canadian Association of Petroleum Producers

[17] Andrew Nikiforuk, Special to the *Globe and Mail*, January, 1999.

Lacking the financial mass of their heavyweight counterparts, these smaller operators survive by maintaining very low overhead costs. As a result, many do not have experience or trained personnel dedicated to managing environmental and health and safety issues. Many do not have sufficient resources to prevent and clean up accidents or spills. With a smaller presence in the field (e.g., active only in one or two regions, or with a few wells), these companies are less exposed to broader public and regulatory scrutiny. They are willing to take more risks than larger companies, including the risk of cutting corners on safety and environmental protection and the risk of being caught violating environmental regulations. Similarly, many of these operations are far less concerned about developing a poor reputation with landowners, as the likelihood of the reputation following them to the next location is small.

C3.0 Thinning Profit Margins

With the increase in industry players, the intensity of competition between producers increased dramatically. Furthermore, as the high-producing fields are depleted, companies are left to pursue riskier, less economic, smaller and deeper reserves. Fewer reserves also results in the encroachment of the oil and gas industry onto populated areas, leading to increased conflict with landowners, particularly in cases of sour gas drilling and processing. At the same time, international oil prices began a downward slide from $20 in 1997 to a twelve-year low of less than $12 a barrel. Industry observers expect these low prices to remain between $11 and $13 for at least another year.[18]

Higher risks and lower returns combine to create tremendous pressure that drives all players to find ways to minimize their costs – including the operating costs associated with protecting the environment and complying with environmental regulations.

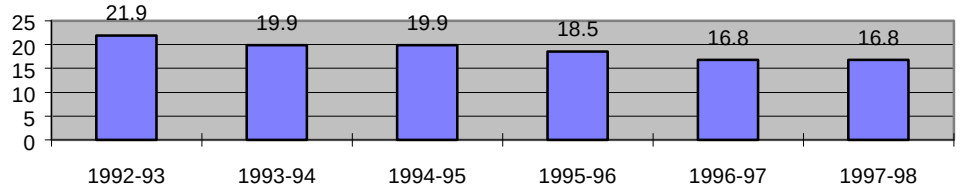
C4.0 Downsizing of Government Environmental Protection Agencies

Since 1992, the provincial government has slashed financial resources and personnel available to the two key provincial bodies responsible for protecting the environment – the Alberta Energy and Utilities Board, and Alberta Environmental Protection. Such downsizing was driven in part by the public imperative to eliminate the province's deficit, but also by the narrow political ideology that regulating industry's compliance with environmental protection measures would impede economic growth. Ignoring the fact that "sustainability" can only be achieved by keeping the economy, society, and the environment *all* healthy *at the same time*, the government limited its focus to "economic sustainability." In every sense, the "Alberta Advantage" meant getting government out of the way of business, regardless of collateral environmental or social costs.

Thus, during the same period that major changes were occurring in the oil and gas industry, the key provincial body responsible for regulating this industry, the EUB, experienced substantial reductions in its financial and staffing resources. Between 1992 and 1998, funding for the EUB was reduced by 23% and staffing by 19%.

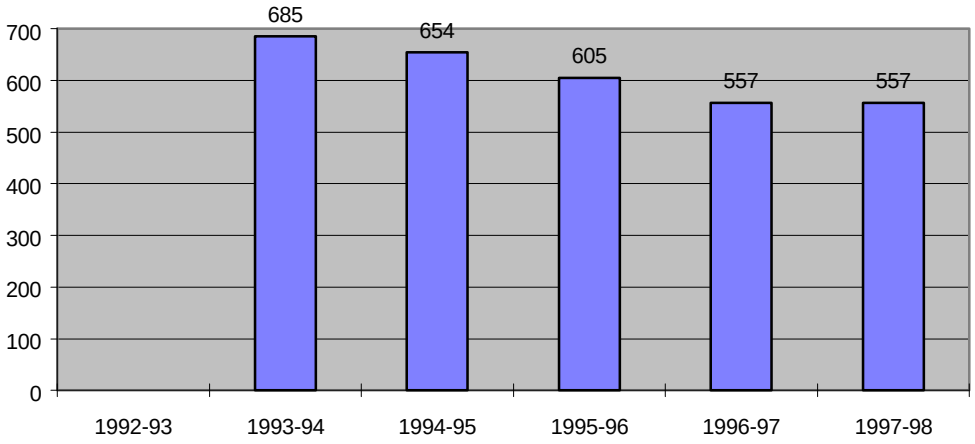
[18] "Oil industry stoic in the face of unending price plummet." Raquel Exner, Journal Staff Writer and News Services, *Edmonton Journal*, February 10, 1999.

EUB Spending*
(in millions of dollars)



*Source: A Better Way II: 1995/96 - 1997/98 Update

EUB: Reductions in staff positions*
(full-time equivalents)



*Source: A Better Way II: 1995/96 - 1997/98 Update

Most severely hit by these reductions were the size and staffing strength of field offices. Prior to 1994, the EUB had sufficient field staff resources to provide a physical presence in the oilpatch. Accidents, cleanups, sweet and sour gas plants and new activities were likely to receive at least occasional visits by EUB personnel. Cruising inspectors ensured that an act of non-compliance carried a small but still real risk of getting caught by the EUB. After the cuts, this field capacity was virtually eliminated.

C5.0 Government Deregulation of Environmental Protection

Challenged with continuing to uphold its mandate in the face of increased industry activity and with reduced resources, the EUB underwent a radical reorganization by adopting a strategy which was reactive and passive. Key elements of the strategy included:

- eliminating the practice of up-front review of applications for many activities;
- leaving companies on their own to figure out and implement environmental protection measures, whereas previously, Board staff would work with industry, assisting them in understanding and complying with the rules; and
- shifting to only requiring companies to keep records in-house, or submit compliance data and reports to the Board.

In addition, the Board stated its intention to:

- conduct random audits of this information to identify activities and companies that required extra scrutiny;
- implement random as well as problem-specific spot inspections to reinforce compliance; and
- implement the use of "escalating enforcement ladders"[19] to rein in repeat offenders.

Although the theoretical structure of such a system might be made to work, the speed and severity of budget and staff cuts imposed by the Alberta government did not leave the EUB time or resources to develop and implement the replacement system. After five years, key components of the new program are still not in place except for a very limited number of so-called "priority areas."

One example of partial implementation of this system is the regulation governing the practice of one-time on-site land treatment of oilfield waste, discussed in Section A2.4. In regulating this activity the EUB expects companies to know and comply with the requirements of the regulation without the Board's involvement. No application or notification needs to be filed with the Board, although the company is expected to document the activity and produce this information upon request. As a result, virtually no EUB staff supervision or application processing time is required.

For such a system to work there needs to be a commitment by the EUB to audit documentation and conduct field testing of a meaningful percentage of the industry players to ensure that companies understand there is a risk of being caught if they do not follow the rules. However, the Board does not have the capacity to provide even this basic level of auditing and inspection.

Similar circumstances apply to several other oilfield waste management activities for which the Board is responsible. Finally, with the exception of two specific instances, the Board's use of a system of "escalating enforcement ladders" has not been implemented.

As a result, the new EUB has emerged as a reactive organization tailored to best suit the needs of the oil and gas industry. Unable even to provide a minimal level of effective monitoring and enforcement capacity, a regulatory vacuum has been created, from which a *de facto* system of voluntary compliance has emerged.[20] Given the range of oil and gas industry activity in Alberta – from wells sited on busy farms to remote and ecologically sensitive environs – the potential for impacts on health and the environment due to industry non-compliance is significant. Experiencing a dramatic growth in bad practice and pollution in the field *and* a loss of regulatory presence first-hand, the public's already limited faith in the government to act to protect their interests has evaporated.

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[19] The concept of "enforcement ladders" consisted of the EUB tracking each company's compliance record and imposing penalties in the form of longer application processing delays to those companies with poor records. Repeat offenders would face increasingly longer delays affecting a wider array of applications.

[20] **The Problems with Voluntary Compliance.** A recent review of enforcement initiatives in British Columbia and the Yukon (*Enforcement vs. Voluntary Compliance: An Examination of the Strategic Initiatives Implemented by the Pacific and Yukon Regional Office of Environment Canada*, 1998) found high levels of non-compliance when the government relied on a system of voluntary compliance. The report reviewed 19 different regulatory groups and found that those industrial sectors that relied only on self monitoring or voluntary compliance had a compliance rating of 60 percent versus the 94 percent average-compliance-rating of industries subject to federal regulations combined with a consistent inspection program.

Section D. Recommendations for Action by Government and Industry

To establish a reasonable balance between effective regulation and enforcement and reduction of risk to health and the environment, the following actions must be taken by the provincial government and industry:

1. **The provincial government must reinvest in the capacity of the Energy and Utilities Board to conduct spot field inspections and increased enforcement in order to ensure a minimum level of auditing and inspection coverage for all oil and gas activities.** The elimination of the EUB’s capacity to provide regular and systematic spot inspections has lowered the incentive for industry players to comply with environmental regulatory standards, and has caused a dramatic loss in the public’s trust that the government is present to act on behalf of rural residents. A significant reinvestment in staff dedicated to fieldwork is essential to rebuild this trust and ensure that a level playing field is enforced upon all oil and gas companies. It is important that spot-inspection activities include areas within the Green Zone where not even private landowners are present to monitor industry activities.

2. **For similar reasons as above, increased resources are required in staffing for Alberta Environmental Protection.**

3. **The Alberta government should ensure that the planned review of environmental regulations meets the following two criteria: (1) it must be conducted with full public participation, including the environmental community and affected members of the agriculture sector; and (2) it must examine the appropriateness of the regulations, the degree of compliance with them, and the capacity of provincial agencies to enforce them**. Premier Ralph Klein has made a number of statements during the past four months regarding a plan to review Alberta’s environmental regulations. Although no details about such a plan have been publicly released, the Premier stated during his recent provincial address that his government is currently conducting such a review. For this review to be credible, it is critical that it be done in an open and transparent manner. Specifically, the review should be conducted with the participation of a broad range of members of the public, including industry, environmentalists, and rural residents. This will help to ensure that the issues of concern and the gaps that many people believe currently exist are adequately identified and addressed. Most importantly, the review must not be limited to the regulations as they are written, but must also examine their appropriateness, the degree of compliance with them, and the capacity of provincial agencies to credibly enforce them.

4. **The EUB must ensure that approvals for new and existing waste treatment facilities are adequately reviewed *prior* to issuing an approval.** Recent procedural breakdowns have demonstrated that the area of oilfield waste management is seriously under-resourced within the Board. An example is a recent oilfield waste facility development in Drayton Valley, in which the Board neglected to review the project’s application prior to public notification, allowed the company to proceed with construction of the facility prior to receiving an approval, and failed to ensure that even basic industry standards were maintained during construction.

5. **The EUB must ensure that environmentally-protective regulations are established for new activities prior to allowing such activities to proceed.** In the Cold Lake-Bonnyville region, companies were allowed to dispose of large volumes of oilfield wastes directly into public roadbeds, despite the fact that no EUB guidelines or regulations for this activity have been developed.

6. **An informal dispute resolution panel must be available to rural residents as a forum for addressing concerns associated with oil and gas activities that have already been licensed and constructed.** Currently, the primary formal opportunity for residents to voice their concerns regarding an oil or gas facility is during the initial review process. Once the EUB has made a decision to grant a license, there are few other opportunities for the public to raise concerns associated with the operation of such a facility. Instead, responsibility is left to the operating company and residents to “work things out.” In many cases, depending on the public consultation experience and philosophy of the company in question, residents feel that their needs are being ignored. Thus, there is a need for a formal back-up mechanism to mediate and attempt to resolve disputes.

   It is worth noting that the EUB has recently expanded the mandate of its field offices to act as informal mediators in disputes between the public and oil and gas companies. For this to be successful, it is clear that additional staff resources and proper dispute resolution training will be required. While such a change in field staff activities may help to minimize some disputes, it does not displace the need for a more formal mechanism – such as a panel – to deal with more difficult situations.

7. **The Energy and Utilities Board must place strict limitations on well testing to minimize well test flaring and maximize the use of in-pipeline capture for well tests**. Currently, it is standard practice in the industry to obtain well data by test flaring new wells directly to atmosphere for periods as long as three weeks. Given recent technological improvements, it is now feasible to substantially reduce the length of time for a test and in some cases to prevent these emissions from being released into the environment by testing the well into a pipeline. Flare testing should only be permitted in cases where there is insufficient reservoir data to reasonably estimate pipeline and processing capacity needs and when it is not economically feasible to tie the well into a pipeline. It is essential that public consultation precede such well testing. Furthermore, steps must be taken – including the use of air quality monitoring – to prevent exposure of humans and animals to venting and flaring emissions during well tests.

8. **The projected mid-term targets for industry-wide reduction in gas flaring should be accelerated and established as firm targets.** The current gas flaring reduction agreement identified reviewable mid-range reduction targets of 40-50% by 2003, and 60-70% by 2006/7. Decisions to commit to specific targets and deadlines are to be made during the first quarter of 2001. However, four factors suggest that decisions should be made as early as mid-2000 to establish firm, accelerated targets for the deeper reductions in solution gas flaring. Firstly, the public concerns associated with flaring are significant now and targets set for eight years hence may be viewed as having little benefit to those who are currently being affected; secondly, industry is already ahead of schedule in reaching the initial reduction targets; thirdly, important regulatory barriers have been removed by both the provincial and federal governments; and fourthly, technological improvements that facilitate economic use of flared gas are already occurring.

9. **The Energy and Utilities Board should immediately eliminate the practice of land treatment and road spreading and restrict other waste disposal methods that rely on dilution of waste in order to achieve “treatment” objectives.** Given the minimal compliance monitoring being provided by the EUB, the ease and high probability of abuse of the guidelines governing these practices, and the potential for significant local environmental and economic impacts on agricultural soils, restrictions should be placed on these practices and some should no longer be permitted. Safer and more secure treatment and waste disposal options are already in place and available at competitive cost. Furthermore, the EUB should increase monitoring and enforcement of these activities.

10. **Regional airshed monitoring zones should be immediately expanded to all areas of Alberta**. Although this was a key recommendation in the 1993 *Report to the Ministers* by the Clean Air Strategy for Alberta, only three regional airshed monitoring zones have been established in the province, and only two are operational. A large portion of the province is not represented, including the Peace Country of northwestern Alberta. Completing a system of airshed monitoring zones will provide an important base for assisting the public, industry, and government in understanding changes in air quality and their environmental effects.
11. **The government and industry should expand research on the potential human and animal health effects and ecological impacts of pollutants associated with the oil and gas industry.** While the reports referenced by this paper indicate that there are good reasons for concern and that action should be taken to limit releases and impacts of oil and gas pollution, much more work is required to further our understanding of these impacts. In particular, very little is known about the effects of these pollutants on human health. To be credible, such research must be conducted in an open and transparent manner, guided by government, industry, *and* independent, knowledgeable members of the public.
12. **The Alberta government should initiate a consultation process to establish mechanisms for achieving a minimum of 90% reduction in benzene emissions from glycol dehydrators by the year 2005.**
13. **Alberta Environmental Protection and the EUB should review the system of codes of practice and checklists and restore a system of approvals for those activities that are sensitive to public concern and vulnerable to non-compliance.** Codes of practice and checklists do not provide an adequate level of regulatory review and public comment for some activities and projects nor are they supported by adequate levels of inspection and enforcement to ensure compliance.
14. **All levels of the oil and gas industry must commit to develop and implement appropriate and pro-active public consultation and dispute resolution practices.** The Canadian Association of Petroleum Producers (CAPP) has initiated a process of delivering such an education program to its members. However, given the structure of the industry, such a program will not reach the large number of small- to medium-sized companies.
15. **The EUB should adopt more protective evacuation and ignition requirements for exposure of the public to sour gas from accidental releases.** Currently the EUB's only firm requirement (in the form of Information Letter 89-15) is that mandatory evacuation of the public is required if ambient levels of H_2S reach 20 ppm. This level is the maximum occupational health and safety limit for workers and is completely inappropriate as an exposure limit for the general public. Furthermore, under no circumstances should the general public be exposed to levels approaching the 8-hour Occupational Exposure Limit of 10 ppm, nor should they be exposed to levels of H_2S approaching 1 ppm for a prolonged duration (60 minutes). The Lodgepole Blowout Inquiry found that concentrations as low as 0.1 ppm for a short duration can result in reactions by sensitive people.[21]
16. **The Alberta government should take steps to reduce overall sulphur dioxide emissions from gas plants in Alberta.** This should be done by establishing a schedule that would require currently "grandfathered" facilities (plants that held approvals to emit SO_2 prior to 1988) to comply with current gas plant regulations for sulphur recovery within a set time frame. The Alberta government should also institute more stringent restrictions to prevent the proliferation of small sour gas plants. Because these plants emit less than one tonne per day, no sulphur recovery is currently required.

[21] *ERCB Lodgepole Blowout Report.* Report of the Lodgepole Blowout Inquiry Panel (section 11.4.5), December 1984.

Section E. Implications of Inaction

Given the significance of the concerns being expressed by the public and the limited, defensive track record demonstrated by government and industry to date, it is clear that continuing and increased pressure by ordinary Albertans will be essential to create meaningful change.

While the Pembina Institute does not condone the use of violence, we do believe that members of the public must not accept, unquestioningly, routine development of the oil and gas industry in their regions. The public should use all available political, regulatory, and judicial processes at its disposal to seek assurances that government and industry will take the concerns about human health and the environment seriously and act to address them.

A substantial change in attitude and approach is required on the part of government and the oil and gas industry to reverse the erosion of public confidence in the ability of current regulatory, monitoring, and enforcement systems to protect them and their families. If this shift does not materialize, no one should be surprised if members of the public begin to use these same regulatory and legal mechanisms to deliberately stop or delay further oil and gas development.

It can also be expected that powerful and effective provincial coalitions of environmental and legal experts will be reactivated to assist local affected communities and citizens in protecting their health, the health of their herds, and their local environment.

The shortsighted decision to slash environmental protection agencies flies in the face of mounting concern by rural and urban residents alike about their own health and its relationship to the quality of their air, water, and soils. The short-term economic benefits of saving a few million dollars on enforcement and regulatory infrastructure may quickly be lost several times over through increased costs to industry and the public revenue base.

Government and industry have two choices: they can move quickly to restore a reasonable balance of effective regulation and enforcement and take action to reduce sources of pollution; or they can risk incurring hundreds of millions of dollars of annual losses from higher regulatory and public intervention costs and delayed project timelines.