

**RANGER OIL LIMITED  
COLD LAKE OIL SANDS AREA  
PRIMARY RECOVERY SCHEME**

**Decision 2000-23  
Applications No. 1025853, 1025855 and 1025857**

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## **1 INTRODUCTION**

### **1.1 Application**

Ranger Oil Limited (Ranger) applied to the Alberta Energy and Utilities Board (the Board), in accordance with section 10 and section 14 of the Oil Sands Conservation Act, for an amendment to Primary Recovery Scheme Approval No. 8043 for the recovery of crude bitumen from the Mannville Formation in the Cold Lake Oil Sands Area. Ranger proposed to amend Approval No. 8043 by adding the areas identified in the attached figure and reducing the drilling spacing unit to 4 hectares (ha) within the proposed amendment area and the existing approval area (Applications Area). A maximum of four wells would be drilled per legal subdivision (LSD) and a minimum interwell distance of 100 metres (m) would be maintained. A 50 m project boundary buffer would be maintained where a different lessee holds adjacent oil sand leases.

### **1.2 Interventions**

Interventions opposing the Applications were filed by:

- Axell, David and Ulfsten, comprised of Connie J. Axell, landowner of Northeast 22-63-3W4 and Northwest 23-63-3W4, George R. David, landowner of Northwest 19-63-2W4 and Northwest 20-63-2W4 and Paul Ulfsten, landowner of Southwest 25-63-3W4 and Northwest 26-63-3W4.
- William and Henrietta Bodnar, landowners of Southeast 10-62-4W4.
- Cold Lake First Nations (CLFN), whose lands under Cold Lake Indian Reserve #149B border the Ranger oil sands leases.
- Ron and Carol Pernarowski (the Pernarowskis), landowners of Southeast 6-64-3W4.
- Saddle Lake First Nation (SLFN), landowner of Southeast 15-62-4W4.
- Don Savard, landowner of Southeast 1-64-3W4.

The lands of Axell, David and Ulfsten are within the Applications Area and the CLFN lands offset the development area. The Pernarowski property is approximately 6 kilometres (km) from the Applications Area.

### 1.3 Pre-hearing Meeting

After reviewing the submissions filed by various parties in response to the original Notice of Hearing issued April 19, 1999, the Board identified the need to reschedule the hearing and conduct a pre-hearing conference to consider various matters preliminary to the hearing. The pre-hearing conference was held on June 15, 1999 at Cold Lake South, Alberta before the presiding panel. The Board's decision on the matters raised at the pre-hearing meeting are contained in EUB's Memorandum of Decision, dated July 29, 1999.

The Bodnars, SLFN, and Mr. Savard withdrew their objections following the pre-hearing meeting and prior to the start of the re-scheduled hearing.

### 1.4 Hearing

The Applications were considered at a public hearing which took place from November 23 to November 26, 1999 at Cold Lake South, Alberta before Acting Board Members J. R. Nichol, P.Eng., M. J. Bruni, Q. C., and R. H. Houlihan, P.Eng., Ph.D.

The public hearing was subsequently re-opened at the offices of the Board, Calgary, Alberta on February 22, 2000 to consider further technical and economic information which had been submitted to the Board following the close of the November hearing.

The following table lists the participants in the hearing and the abbreviations used in this report.

#### **THOSE WHO APPEARED AT THE HEARING**

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##### Principals and Representatives (Abbreviations Used in Report)

##### Witnesses

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Ranger Oil Limited (Ranger)  
T. R. Owen  
S. A. Thomas

J. E. Fitzgibbon, P.Eng.  
C. D. Flanagan, P.Eng.  
K. V. Kindjerski, P.Eng.  
J. Newman, P.Eng.  
K. W. Reed, P.Geol.  
P. G. Weiler  
P. A. Carson, Ph.D.  
D. Callbeck  
D. R. Hurl  
of D. R. Hurl & Associates Ltd.  
A. Boyda  
of Serecon Management Consulting  
Inc.  
R. G. Patching, P.Eng.  
of Patching Associates Acoustical  
Engineering Ltd.

## THOSE WHO APPEARED AT THE HEARING (cont'd)

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Principals and Representatives (Abbreviations Used in Report)	Witnesses
Ranger (cont'd)	R. J. Clissold, P.Geol. of Hydrogeological Consultants Ltd. J. Schubert, P.Eng. of AGRA Earth and Environmental Limited S. H. Roth, Ph.D. A. Amundrud, P.Eng. of BAR Engineering Ltd. T. J. Cassidy, P.Eng. of Canadian Natural Resources Limited
Ron and Carol Pernarowski (The Pernarowskis) R. Pernarowski	R. Pernarowski
Cold Lake First Nations (CLFN) G. Appelt	
Don Savard	D. Savard
Connie J. Axell, George R. David and Paul Ulfsten (Axell, David and Ulfsten) R. C. Secord K. E. Buss	S. A. Ulfsten C. J. Axell P. Ulfsten D. J. Picard, P.Eng. of Clearstone Engineering Ltd. J. Argo, Ph.D. of IntrAmericas Centre for Environment and Health Inc. E. Nyland, Ph.D.
Alberta Energy and Utilities Board staff D. Larder, Board Counsel K. W. Sadler, P.Eng. K. Eastlick, P.Eng. A. Louie	

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## **2 ISSUES**

The Board believes that the issues raised during the hearing can be categorised as follows:

- the need for the reduced drilling spacing units
- project design and operations
- technical issues
- environmental and social impacts
- public consultation

## **3 THE NEED FOR THE REDUCED DRILLING SPACING UNITS**

### **3.1 Views of the Applicant**

Ranger indicated because of high bitumen viscosity and the relatively low mobility of the bitumen within the oil sands in comparison with conventional light oil reservoirs, smaller spacing between wells is required to optimize recovery of the bitumen in place.

Based on Ranger's experience in the Cold Lake and Lindbergh areas, and the experience of other bitumen operators, Ranger considers that, in general, 8 ha spacing provides the most economic method of recovering bitumen reserves in the area. Where thick channel formations or good regional sands are encountered, wells may be drilled on 4 ha spacing. Generally, the oil sands in the area are in narrow channels which are not areally extensive. Although Ranger applied for 4 ha spacing, it stated that in the majority of the area, wells would be drilled on 8 ha spacing or greater with a density of 1-2 wells/LSD. The projected recovery factor was between 5 to 10 per cent of the bitumen in place or potential recoverable reserves of 12 to 24 10<sup>6</sup> m<sup>3</sup>. Approval of the 4 ha spacing would give it the required flexibility to maximize the recovery when the thick channel formations or good regional sands are encountered without having to re-apply for further spacing changes in small areas within the overall project boundary.

Ranger estimated a capital expenditure of \$164 million based on a cost of \$265 thousand per well with new well development to the year 2004. The project would have significant economic benefit to the Province of Alberta in terms of increased provincial royalties and taxes and to the local community as the expenditures made by Ranger would generate additional employment and economic activity in the region. Ranger estimated that the total economic value to the province would be \$444 million over the next 11 years, of which, \$299 million would be distributed locally.

### **3.2 Views of Axell, David and Ulfsten**

The position of the interveners Axell, David and Ulfsten was that Ranger had not demonstrated a need for 4 ha spacing in the areas of application. Axell, David and Ulfsten submitted there was confusion in the three applications in terms of identification of the areas of application and location of existing and proposed pads. They also submitted that there were no detailed analyses of net pay maps identifying where the proposed pads would be located and suggested that Ranger's own evidence presented a compelling case for nothing beyond 8 ha spacing.

Axell, David and Ulfsten expressed concerns that a recovery of 10 per cent of the bitumen in place at the risk of destruction of aquifers was unacceptable and that recovery should not take place until technology improved to allow increased recoveries of at least 40 per cent.

### **3.3 Views of Cold Lake First Nations**

CLFN supported Ranger's project provisional upon a 100 m project buffer for all project lands adjacent to the boundary of the CLFN reserve. The economic impact of the project would be substantial and would provide economic benefits for local residents, including aboriginal people. CLFN noted that Ranger has committed that a fair and representative number of its members will be engaged in the project as both employees and contractors.

### **3.4 Views of the Board**

The Board acknowledges that Ranger has not provided definitive evidence to support the need for 4 ha spacing for the entire project area and that the majority of the project area will likely be developed on 8 ha spacing. However, the Board does recognize that the geology of the oil sands deposits in this area (intermittent and channel sands) is such that 4 ha spacing will be required to maximize bitumen recovery in those areas where thick channels or good reservoir sands are encountered. Also, the Board notes that the majority of the primary recovery projects in the Cold Lake Oil Sands area are being developed on 4 ha spacing. Therefore, the Board is prepared to approve 4 ha spacing for the entire project area to provide operational flexibility and to ensure maximization of the bitumen recovery under a primary recovery scheme provided that the technical and impact issues, to be addressed later in report, are within acceptable limits.

The Board agrees that the proposed project would result in an increase in provincial royalties and taxes and would create employment opportunities for the local residents. The Board notes Ranger's commitment that opportunities for employment and contracts would be open to local residents.

## **4 PROJECT DESIGN AND OPERATIONS**

### **4.1 Views of the Applicant**

Ranger stated that the project development would proceed in phases. The first phase would consist of drilling delineation wells on quarter section spacing to assess the geology and production potential in each area. Should the geology and production prove to be prospective in a particular area, Ranger would proceed with development wells at reduced spacing. The density of drilling would be dependent on reservoir thickness, potential recoverable reserves, economics, and surface accessibility.

Ranger stated that wherever the potential for multiple wells per LSD exists, wells would be drilled from multiwell pads using slant and/or directional drilling. Following the Board guideline, no more than 4 pads per quarter section are to be utilized and for the most part, Ranger would attempt to use only 2 pads per quarter section. Total pad disturbance area would not exceed 5.7 ha per quarter section. Pads would normally contain 4 or less wells but in some cases, up to 8 wells per pad are possible. For full development, Ranger estimated that 170 pads would

be required. Wherever possible, Ranger would use or expand existing pads to accommodate future drilling. The selection of new pad locations would be dependent on surface and geological restrictions as well as the target reservoir depth and slant-well reach capabilities.

Ranger's applications requested primary production only, since it had no current plans for any enhanced oil recovery (EOR) operations. The area covered by the applications is geologically complex and may consist of up to 9 different bitumen pools within the Upper Mannville unconsolidated sands. Within the Applications Area, a number of the oil sands reservoirs may overlap resulting in some areas with thicker pay. Bottom water and/or gas caps may also be present and Ranger considers gas cap production would significantly reduce the potential bitumen recovery.

Due to the relatively thin and discontinuous nature of the sands and the presence of bottom water, EOR potential is limited. Thermal processes involving heat being introduced into the reservoir through steam injection would be inefficient and uneconomic as there would be significant heat loss to non-productive formations. Currently there is no other available technology which has proven to be effective and economic in this type of reservoir. Non-thermal methods, such as VAPEX, are only in the theoretical and experimental stages.

All wells would be equipped with 244.5 mm surface casing for well control and to minimize the risk for groundwater contamination, Ranger committed to setting the surface casing at least 15 m below the deepest useable water zone and to cement it to surface. Production casing (177.8 mm) will be set below the producing horizons and cemented to surface with thermal cement to maintain wellbore integrity. Ranger committed to taking cement bond logs at a frequency to be determined by the EUB.

Production pads would be graded to ensure surface rainwater is collected on site. Required water would be trucked to wellsites and no water source wells would be drilled into underground aquifers. Quality and deliverability tests would be conducted on all water wells located within a 500 m radius of pad sites before drilling and on an as needed basis during the project life. Outside of this radius, water wells would be tested at the request of the water well owner. Ranger also agreed to work with Mrs. Axell to correct the work previously done on her well and pump.

Each bitumen well would be equipped with a downhole progressive cavity pump hydraulically driven and powered by natural gas, propane, or electricity. Each well would be initially equipped with a 120 or 160 m<sup>3</sup> (750 or 1000 bbl) tank, which may be replaced with a main group tank and a test tank after production rates have stabilized. Ranger will review each pad development to determine the need for electrification of the pump drivers. The cost of electrification is dependent upon several factors including distance from the power source and the requirement for a fixed five year term with the power provider. Therefore, Ranger must be assured that the pad or the well can remain productive for the full five year term. Ranger indicated that there would be electrification at some of the multiwell pads; however, Ranger said that it is not economically feasible to electrify all wells and pads.

Ranger indicated that all pads and associated equipment would meet the requirements of EUB's *ID 99-8: Noise Control Directive*.

All production would be trucked from the well sites to either Ranger's Cold Lake battery at 16-15-62-4W4 or Ranger's Lindbergh facility in section 28-55-6W4. Clean bitumen treated at the Cold Lake facility would be hauled to Ranger's Lindbergh facility until the Cold Lake facility was operational. The 16-15 battery is currently shut-in due to low production volumes. It would resume operations once the area and production volumes are sufficient to support battery operations. Production from this facility would be pipelined to market.

Current sand rates are low due to the low production levels but would increase as more wells are drilled and production increases. Sand production was estimated to peak at 250 m<sup>3</sup>/d, coincident with peak bitumen production of 3500 m<sup>3</sup>/d, and would be trucked to Ranger's storage pit at 15-15-62-4W4.

Ranger recognized there would be increased truck traffic in the area and estimated truck trips per year in the order of 60 000 to 70 000. Trucking will be limited to 12 hours a day on designated truck routes, which were chosen by representatives of the MD of Bonnyville in consultation with local Ranger staff. Ranger relied on the public to alert them to situations where trucks are not operating within the guidelines established by Ranger and had issued vehicle identification cards to the public so that delinquent drivers may be readily identified. The Bonnyville area transportation committee was formed to address oilfield transportation issues. Representatives from Ranger, Numac Energy Inc., Koch Exploration Canada, Ltd., Canadian Natural Resources Limited (CNRL), Murphy Oil Company Ltd., the EUB Bonnyville Field Centre, the MD of Bonnyville, and volunteers from the public serve on this committee.

Ranger indicated that wells in the Applications Area would produce very little gas. The produced gas is not sour and Ranger would utilize casing vent gas to run tank burners and engines on some wells where the stabilized gas rate exceeded 140 m<sup>3</sup>/d. Gas not utilized would be vented to atmosphere.

Ranger indicated that dust concerns had been minimized by the use of a cold mixture, consisting of gravel, produced sand, and bitumen which were mixed into a cold mix asphalt material. This was applied to roads and particularly in front of residences. Noise from trucks would be minimized by discouraging the use of engine retarders on all trucks.

Ranger's view was that ground subsidence would not occur as a result of the proposed operations.

#### **4.2 Views of Axell, David and Ulfsten**

The interveners Axell, David and Ulfsten stated that the significant number of low bitumen producers on Ranger's leases showed that Ranger is not capable of producing large amounts of bitumen and therefore cannot justify its proposed development.

Axell, David and Ulfsten indicated that up to 10 acres per quarter section of viable agricultural land would become unproductive over the Applications Area. Axell, David and Ulfsten suggested that no well sites be allowed to be developed in the middle of a productive field. Ranger should locate the pad sites in corners of the quarter section or in locations least intrusive to the operations of the landowners.

It was the view of Axell, David and Ulfsten that all abandoned wells or well sites be reclaimed and surface leases be returned to the agricultural base within the next operating year. In addition, all existing well sites producing less than 25 m<sup>3</sup>/month be fully abandoned and reclaimed within one operating year of reaching this level, that the well sites be paratilled prior to replacement of top soil, that Ranger complete testing of the soils and that the analytical results be attached to the reclamation certificate provided to the landowners. The interveners would like a condition in the approval that Ranger inspect the suspended or abandoned sites on a more regular basis and more than once every six months.

Mrs. Axell expressed concerns regarding whether cement jobs were properly done in slant well drilling operations and whether technology had advanced enough to sufficiently protect the aquifers. Further, Axell, David and Ulfsten requested that cement bond logs be run at a frequency to be determined by the EUB.

Axell, David and Ulfsten expressed concerns for groundwater being lost either through a leaking casing into the annulus which would provide a pathway for the water or a loss of the water downward into lower formations due to a pressure decrease in the area. As a condition of any Ranger approval, Axell, David and Ulfsten would like Ranger to be required to do a baseline study on the groundwater in the area.

Mrs. Axell expressed a concern that there were high arsenic levels in her water which have exceeded the Canadian Drinking Water (CDW) guidelines. She also stated that Ranger had replaced a damaged pump with a smaller pump and would like Ranger to replace the pump.

Axell, David and Ulfsten stated that electrification of the pad sites would reduce the noise impacts and would like that put forth as a condition of any approval granted to Ranger.

Axell, David and Ulfsten expressed concerns related to increased truck traffic, the suitability of the roads, safety, noise, and dust. Axell, David and Ulfsten stated that Ranger's estimate of trucking movement was grossly understated and estimated 100 000 truck trips per year. As well, there was a concern that 24 hour trucking may occur and should be prohibited and made a condition of any approval.

Safety was a major concern expressed by Mrs. Axell, who stated that many near accidents have occurred in the Applications Area. Any increase in truck traffic would make the situation extremely dangerous to the residents in the area.

Subsidence was presented as a concern by the interveners Axell, David and Ulfsten; however, it was conceded by Dr. Nyland that if his worm hole theory was at all correct, subsidence would be negligible.

Axell, David and Ulfsten argued that if the proposed conditions could not be met, their lands should be deleted from the Applications Area.



### **4.3 Views of CLFN**

CLFN supported the project as proposed which would include a 100 m buffer zone in areas adjoining the CLFN lands. CLFN indicated that dust and noise are issues which could be dealt with on a case-by-case basis through the application of the appropriate mitigation measures as they are not cost prohibitive issues. These issues were of particular concern to Mr. Charland, as his residence is located along a truck route on the western boundary of the reserve; however, Mr. Charland was satisfied with Ranger's commitments to address these concerns.

### **4.4 Views of the Pernarowskis**

The Pernarowski property is located approximately 6 km from Ranger's Applications Area. Mr. Pernarowski indicated the project would have adverse impacts on his family and farm. Mr. Pernarowski expressed concerns regarding water quality, in particular increases in the arsenic, iron, and manganese content which are near, or have exceeded CDW guidelines. He believed that there is a direct relationship between the quality of water and the increase in activity from Ranger and other companies in the area. Mr. Pernarowski would like Ranger to conduct a test on his water well as part of a baseline study.

Mr. Pernarowski negotiated a resolution, in principle, with Ranger to monitor the noise on a site specific basis. However, Mr. Pernarowski did express his support for electrification of sites to reduce the noise from the engines.

Mr. Pernarowski expressed concerns on road maintenance, safety, and dust. There are several roads that are in a bad state of repair and require maintenance. Any increase in truck traffic would worsen the state of repair. With regards to safety, Mr. Pernarowski indicated that discussions to alleviate his concerns by use of signs, road bans, and discussions with the MD of Bonnyville are underway. Mr. Pernarowski indicated a need for cold mix for roads near his residence.

Mr. Pernarowski requested that any conditions imposed on any bitumen project in the Cold Lake area be met prior to granting approval and failing that, the applications be denied.

### **4.5 Views of the Board**

The Board notes Ranger's plan to use multiwell pads in developing the oil sands reservoirs within the Applications Area. This is consistent with the Board's direction as stated in Board *Decision 98-2* and *Decision 98-5*, which noted advantages in terms of reduced land disturbance and enhanced opportunities for gas collection and bitumen handling due to centralization of production facilities. Further, the Board noted that Ranger has committed to limiting the number of pads per quarter section to no more than 4, which is also consistent with the Board's guidelines. The Board encourages Ranger, through consultation with landowners, to select pad sites and access road locations which would minimize impacts on agriculture operations and residences to the extent possible.

The Board notes Ranger's plans to set surface casing below the lowest possible useable water zone and to cement all casing strings to surface. Given this, the Board believes that groundwater contamination would not likely occur from well production operations. To provide further

confidence respecting the integrity of the cement on the slant wells, the Board will require Ranger to run cement bond logs on at least one slant well per quarter section. The cement bond logging requirement may be reviewed in the future, depending on the results encountered during the initial development phases of this project.

The Board accepts Ranger's commitment to test water wells within a 500 m radius of the pad sites prior to drilling, as well as to entertain requests for water well testing outside the 500 m radius. The Board notes the request by Mr. Pernarowski in this regard. Given the concerns for groundwater quality in the Cold Lake area, the Board will require Ranger to develop a water well testing program in order to establish a baseline on the water quality. The Board requires that Ranger submit a proposal by September 30, 2000 outlining the water well testing program. The program should allow the wells to be monitored for changes to water quality on an ongoing basis. The Board believes that there would be more significant value to conducting such a water well testing program on a regional basis and thus would encourage Ranger to work with other operators in the area to develop a regional water well testing program. The Board would consider the development of such a regional program as preferable to Ranger developing an individual program.

Also, the Board notes the interveners' concerns for high arsenic levels in the water but are of the view that arsenic occurs naturally in this area and that the proposed project is unlikely to affect arsenic levels in the area water wells.

The Board is cognizant of the many factors Ranger must consider when reviewing the feasibility of electrification of its wells; however, the Board would expect Ranger to include the need to bring its operations into compliance with EUB's *Interim Directive (ID) 99-8: Noise Control Directive*. Noise impacts were indicated by several interveners to be a major concern. The Board notes Ranger's intent to monitor the project and to ensure that it is in compliance with *ID 99-8*. The Board also notes Ranger's specific commitment to Mr. Pernarowski regarding noise impacts relative to his residence.

With respect to trucking issues, there would clearly be a significant increase in vehicular traffic in the Applications Area during the development and production phases of the scheme. The Board notes Ranger's commitment to use designated truck routes, to limit trucking to 12 hours per day, and its efforts related to traffic enforcement which resulted in Ranger issuing vehicle identification cards to the residents. The Board is of the view that trucking concerns can most effectively be addressed if industry operators, the MD, and the public work together to address this problem. The Board notes Ranger's participation in the Bonnyville area transportation committee which was established to address transportation issues. The Board accepts that trucking of bitumen is currently required; however, is also of the view that more efforts are required on the part of industry to develop pipelining options. This matter is discussed further in section 5.1.

Similarly, the Board believes that the industry practice of venting gas from casing and tanks needs to be improved upon. This matter is discussed further in section 5.2.

The Board is concerned about the evidence, which was submitted at the hearing, respecting wells at which the surface abandonment had not been completed and where there was some evidence that the subsurface abandonment plugs were leaking. The Board is also concerned that Ranger may not have taken adequate precautions to fence these sites to protect the public. The Board expects Ranger to complete the surface abandonment of these sites, and any other sites which were not brought to the Board's attention, by June 30, 2000. The Board also expects Ranger to initiate internal procedures to ensure that abandonment operations are completed in a timely fashion and to ensure no sites, where abandonment operations have been initiated but not completed, are left in an unsafe or unprotected condition.

The Board also notes the interveners reference to abandoned but unreclaimed well sites. Although surface reclamation does not fall within the jurisdiction of the EUB, the Board encourages Ranger to initiate timely reclamation of all abandoned sites so that the site can be returned to the productive use of the landowner.

The Board notes the interveners Axell, David and Ulfsten's concerns regarding subsidence but does not believe that subsidence associated with cold flow production would occur; therefore, does not believe that it is necessary or appropriate to conduct surveys to monitor the extent of any subsidence.

## **5 TECHNICAL ISSUES**

### **5.1 Pipelining**

#### **5.1.1 Views of the Applicant**

Ranger stated that it is unable to utilize pipelines to transport well effluent from the wellsites to the treating facility. In its view, no technology is available at this time that permits transport of produced effluents over a long distance due to the high viscosity and high sand content of the produced fluids. Ranger had participated in a joint industry study, performed by the Centre for Frontier Engineering Research (C-FER), to assess the current state of flowlining technology. The conclusions of that study indicated there may be some possibilities for pipelining in certain situations; however, pipelining was not economically feasible at this time. Ranger stated that there may be certain wells that could be pipelined into central areas under specific conditions but pipelining for all the wells to the facility was not foreseeable within the next ten years. Specifically, wells with lower viscosity, or higher water cuts and lower sand cuts, may have their production consolidated and piped out to a central location. Pipelining technology was continually being reviewed and Ranger will continue to participate in studies addressing this issue.

#### **5.1.2 Views of Intervenors**

The view of Axell, David and Ulfsten was that trucking would have an adverse impact and pipelining should be required as an alternative. The intervenors Axell, David and Ulfsten pointed out that in previous Board *Decisions* 98-2 and 98-5, operators were alerted to the need to evaluate pipelining to the maximum extent possible in their future development plans. Axell, David and Ulfsten contend that Ranger did not pay attention to this advice; therefore, its

application should be denied.

CLFN did not express any comments with regards to pipelining. Mr. Pernarowski stated that pipelining would be the preferred method to trucking of the produced effluents.

### **5.1.3 Views of the Board**

The Board is concerned with the volume of truck traffic required to transport the bitumen from the individual well and pad sites to the central treating facility and the impacts associated with trucking at projects of this type. The Board believes that there is potential for pipelining but it will not occur without considerable research and development work, including field testing. Consequently, the Board sees a need for additional information, in particular field data, to investigate and develop pipelining of bitumen and produced fluids. The Board notes several industry groups have been investigating the feasibility of pipelining; however, much of this work is at the preliminary stage, with the majority of testing limited to laboratory bench scale modelling of very conservative scenarios. Little or no field testing has been conducted utilizing actual field production conditions. The Board expects major operators to play a lead role in the continuation of these investigations and the development of pipelining options. The Board urges Ranger to work with other oil sands primary bitumen producers respecting the development and application of pipelining and related technology, with a view to replacing trucking as the primary means of transporting produced fluids. The Board expects Ranger to continue, in a timely manner, with collaborative efforts with other primary bitumen producers and agencies to research the fundamentals of produced fluids pipelining, to develop findings using pipeline test loops and, finally, to field test and apply developments. The Board believes that much greater attention to this work is required to reduce the impacts of trucking on the environment and to public safety and that growth in primary production is only sustainable with a reduction in those impacts. The Board will require Ranger to report annually on its progress to research, develop and apply pipelining.

## **5.2 Air Emissions/Gas Collection**

### **5.2.1 Views of the Applicant**

#### **Gas Recovery**

Ranger indicated that it does not take gas samples on a regular basis because gas analyses in the Cold Lake region indicated that gas produced in conjunction with the oil sands is predominantly methane with traces of ethane and higher molecular weight hydrocarbons ( $C_2^+$ ) and  $CO_2$ . Ranger estimated that 25 per cent of the emissions were from tank vents and 75 per cent of the emissions would be from casing vents. The normal practice is to vent the casing and tank vent gases to atmosphere; however, Ranger stated that it utilized casing gas to run tank burners and engines on some wells where stabilized gas flow rates were sufficient to justify this option. Casing gas from 6 wells in the Application Areas plus 10 additional wells in the Cold Lake area outside the Applications Area had been successfully utilized for this purpose. A minimum of approximately  $140\text{ m}^3/\text{d}$  at 70 kPa(g) was identified as the general threshold for utilizing the gas. Ranger expects that over the whole Applications Area, it would be able to utilize 75 per cent of the casing gas (56 per cent of the total project gas emissions) as fuel for the engines and tank burners. Ranger also indicated that the tank vent gas is highly saturated with vapour making it a

very poor fuel source without prior conditioning. Ranger stated that it had no plans to use tank vent gas as a fuel source for this project.

Ranger evaluated the economics of various options for the collection and utilization of casing and tank vent gas, as alternatives to venting this gas to atmosphere, including incineration systems, flaring systems, and full conservation. Ranger submitted conceptual designs and cost estimates for a number of all weather operating systems for capture of casing and tank emissions. In Ranger's experience, bitumen wells can be adversely impacted with casing back pressures as low as 2 psig and tanks are constructed with an allowable working pressure of 0.5 psig; therefore, any system design must take these operating constraints into account. Ranger's vent gas collection design incorporates two independent gas collection systems which would ultimately combine any unused gas volumes at a common combustion unit.

Ranger stated that a requirement to flare or incinerate the volume of casing and tank vent gases at all sites would result in significant negative impact on the project economics and would result in a large number of wells not being drilled. A centralized gas collection scheme could reduce the duplication of some of the high costs components; however, that saving would be offset by the additional cost of equipment to collect and transport the gas to the central site. The volume of gas required for a conservation and sales scheme to be economically feasible is far in excess of the gas rates observed in the Ranger's Cold Lake operations.

Ranger stated that they would like to run a profitable operation but would also like to be able to protect the environment and the public in a reasonable manner. If odour problems arise, Ranger would like the opportunity to investigate the problem and to take the appropriate remedial action prior to the Board imposing enforcement action. Ranger committed that it would investigate and mitigate odour issues on a case by case basis.

### **Dispersion Modelling**

Ranger presented a report on an air dispersion model used to estimate and assess the impacts of emissions on air quality in the Applications Area. Ranger submitted that its modelling work represented an acceptable proxy for the actual measurement of emissions and is an acceptable scientific practice. Three gas samples were collected from existing sites and the model was based on the expected maximum development of the proposed project. Additional modelling was performed to show the impact that collection and utilization of 75 per cent of the casing gas would have on the ground-level concentrations of emissions from the project. The studies targeted the largest sources of the emissions, which were the emissions from the surface casing vents and the storage tank vents. The modelling was used to examine the potential concentrations of aromatic compounds that may be in the air as well as the concentration of sulphur compounds. The model was also used to determine whether SO<sub>2</sub>, NO<sub>2</sub>, and CO emissions were in compliance with the ambient air quality standards established by Alberta Environment. The modelling results indicate that the NO<sub>2</sub> values exceeded the guidelines on three occasions a year and Ranger viewed this as unacceptable. Ranger committed to performing baseline and periodic monitoring for NO<sub>2</sub> which will be used to confirm the modelling results and to ensure that the Alberta ambient air quality guidelines are not exceeded. Ranger pointed out the largest sources for NO<sub>x</sub>, CO, and SO<sub>2</sub> emissions were from engines and not the casing and tank vents. Appropriate tuning of the engines is expected to reduce NO<sub>x</sub> emissions.

Ranger indicated that electricity may be utilized at some sites to reduce the noise associated with the pumping equipment and this will also reduce the NO<sub>x</sub> emissions associated with the use of gas driven engines. Electrification of the sites will not reduce the other gaseous emissions from the sites as the casing and tank vent gases will continue to be used as fuel in the tank burners, where feasible, or vented to atmosphere.

Ranger commissioned a study to determine if vapours emitted from the tanks resembled a plume of heavy oil aerosols containing heavy oil and sulphur compounds. Casing and tank gases are both composed primarily of methane; however, the production tanks contain a heavy oil which does contain small amounts of volatile material. Therefore, the composition of the gas emitted from the tanks will be different from the composition of the casing gas as it will contain more compounds with a higher molecular weight. Based on the study, Ranger does not believe that there are aerosols of heavy oil being emitted from the tanks.

Ranger also suggested that the interveners' theory of a chemical evolution, which converts some sulphur compound into other sulphur compounds, is not plausible under tank conditions. These reactions would only occur in very acidic conditions (low pH) or very basic conditions (high pH) and in the absence of water. Tanks contain significant volumes of water and cannot operate under extreme acid or base conditions. Ranger further stated that the interveners' theory also implies that the chemical reaction only occurs when the aerosol contacts the atmosphere. Therefore, Ranger suggested that if this theory was correct then sulphur dioxide should be detected in the tanks as this gas is exposed to air in the tanks; however, gas analysis indicate no detectable sulphur dioxide.

### **5.2.2 Views of Axell, David and Ulfsten**

The interveners Axell, David and Ulfsten expressed concerns regarding gas emissions from the casing and tank vents and with the corresponding odours associated with the venting of these gases to atmosphere.

Axell, David and Ulfsten submitted that no additional information had been supplied by Ranger since the hearings held in 1997 regarding development projects by Numac and CNRL even though Ranger was fully aware of the air related issues raised at these hearings. The air dispersion model presented by Ranger was deficient in the following areas:

- Modelling was based on unrepresentative sampling. Although the applications cover a substantial area, there were only 2 samples from within the proposed Applications Area. There was also a concern that contamination of the samples had occurred between the sampling date and the date of the gas analysis and that the sampling protocol did not have regard for the formation of aerosols. The samples did not represent all of the different pay zones in the Applications Area.
- The gas analyses of the samples collected are incomplete as the hydrocarbon analysis was stopped at decane and no cyclic or naphthalene fractions were included.
- The use of single value averages to represent broad ranges of components was fundamentally unacceptable.

- The model did not take into account cumulative effects from fugitive emissions from other industrial projects in the area.

Therefore, the interveners submitted that the modelling work and the results were incomplete, unrepresentative, and cannot be used to assess the health impacts due to fugitive emissions.

The interveners' expert witness presented a theory that a chemical evolution was occurring resulting in an aerosol plume being emitted from the tank vents. This aerosol plume was postulated to contain sulphur compounds as well as other inorganic and organic chemicals. The expert noted that there is a difference (sulphur gap) between the measured total sulphur content of gas sample data reported by Ranger and the sum of sulphur contained in the individual sulphur compounds identified by the sample analysis. Further the sulphur gap is low for the casing gas but large for the tank vent gas. This sulphur gap is hypothesised as the result of sulphur associating with some of the bitumen vapour in the head space of the tanks forming an aerosol as it encounters air.

Axell, David and Ulfsten argued that venting the gas from the casing vents and tank into the atmosphere would do considerable harm to the environment as well as to human health and that Ranger had underestimated the potential for odours from these sites. Axell, David and Ulfsten contend that it was preferable to collect and conserve the gas for use to fire the tank burners or combust the gas rather than vent to the atmosphere.

Axell, David and Ulfsten expressed a concern that the cost data submitted by Ranger to conserve or incinerate the gas was much higher than necessary and in contradiction to the evidence presented by the interveners' expert witness. The expert witness suggested that other less expensive alternatives to incineration were available to the applicant. The interveners' view was that Ranger was not prepared to respond to a problem concerning odours and toxic gas streams. As a minimum condition to any approval, Ranger should be required to have a prepared plan in-place in order to respond to any odour problems that may arise. Included should be equipment specifications and ongoing modifications to the existing equipment.

### **5.2.3 Views of Cold Lake First Nations**

CLFN expressed the understanding that gas conservation is an important issue; however, the total cost of gas conservation or incineration was prohibitive for this project. CLFN believed that Ranger would act on its commitments respecting air emissions from this project.

### **5.2.4 Views of the Pernarowskis**

Mr. Pernarowski stated that the fugitive air emissions may be a contributing factor to his family and livestock's health problems. Mr. Pernarowski argued that Ranger should be required to collect and combust the gaseous emissions from this project and urged the Board to give serious considerations to the alternatives proposed by Axell, David and Ulfsten. He also expressed concerns regarding emissions from the increase in vehicular traffic if the project was approved.

### **5.2.5 Views of Don Savard**

Mr. Savard indicated that he had reached agreement with Ranger respecting his concerns and that both parties would like the following commitments as conditions to any approval granted to Ranger:

- 1) If he or his family experience air quality problems with respect to his property, notification to Ranger personnel will result in a prompt investigation to determine the nature and source of the problem;
- 2) If the air quality problems are chronic over a period of 30 days or longer, Ranger will install at Mr. Savard's request, suitable air monitoring equipment at or near his property to determine the nature and source of the problem;
- 3) If Ranger is found to be the source of the problem, it will promptly correct it.

### **5.2.6 Views of the Board**

The Board recognizes Ranger's use of air dispersion modelling to determine the potential air quality impacts from the Applications Area. Modelling is a complex and involved process; however, it became apparent that Ranger's study could have been improved. There were concerns and questions such as sampling technique, including possible sample deterioration and representative sampling, and incomplete gas analyses. These could have been avoided by taking greater care in sampling and analyzing the gas. The Board also notes that cumulative effects from other sources and other projects were not accounted for in this study. Notwithstanding these shortcomings in the dispersion modelling, the Board is satisfied that Ranger's commitment to perform baseline and periodic monitoring for NO<sub>2</sub> will confirm whether the air ambient guidelines are being exceeded or not. Furthermore, if the monitoring results indicate site specific or regional problems with respect to adherence to the ambient air quality guidelines, the Board expects Ranger to take immediate steps to correct the problem.

The Board's view of the interveners' theory of an aerosol plume being emitted due to a chemical evolution occurring in the tank is that the theory is unsubstantiated at this time. The Board is however aware that the matter has raised serious concerns in the minds of landowners in this area; therefore, the Board believes that it would be prudent to conduct additional sampling or studies to provide factual information respecting the emissions from the tank vents. This issue, if it exists, would not be limited to Ranger facilities but would be associated with all primary recovery schemes in this area. The Board strongly urges the Lakeland Operators Group to take this sampling work on as one of its first regional studies.

The Board finds that in the absence of evidence identifying serious environmental or public health impacts associated with the venting of casing and tank gases to atmosphere, the economics associated with gas collection, and use or combustion do not support a blanket requirement to collect all casing and tank vent gases. The Board accepts Ranger's commitment to collect casing vent gas and to use at least 75 per cent of this gas for fuel in engines or tank burners when the total casing vent gas volumes at a well or pad site exceeds 140 m<sup>3</sup>/d of gas on a sustained basis and expects Ranger to follow through on this commitment as soon as possible after the threshold is reached.



To ensure that any exceedance of the threshold volume is established in a timely and effective manner, the Board will require Ranger to determine (measure) the initial casing vent gas flow rate for each well within six months of initiating production and to check the casing vent gas flow rate annually thereafter. Ranger shall provide the Board with an annual report outlining the casing vent gas flow rate for all wells in the project area and the steps that have been taken to implement collection and use of casing vent gas at all sites where the threshold volume has been exceeded. The Board also expects Ranger to keep the local residents advised of the steps it has taken to control the venting of gas to atmosphere.

The Board also notes that ambient air evaluations could have addressed the variability of the gas analyses used for input parameters to ensure that an appropriate level of conservatism was incorporated into the evaluations. These observations notwithstanding, the Board notes that predicted concentrations of sulphur compounds and hydrocarbons are low relative to ambient air criteria. Given the low predicted SO<sub>2</sub> and hydrocarbon concentrations, the Board believes that Ranger's proposed operation will be acceptable.

The Board notes interveners' concerns that the odour issues may have been underestimated. The Board is aware that there may be sites where the release of casing and tank vent gases to atmosphere may become an odour problem and notes Ranger's commitment to take immediate action to identify and address the source of the odour problem. While concentrations of odorous compounds may well exceed values predicted by Ranger, the Board believes the odours can be appropriately controlled on a case by case basis. In that regard, the Board expects Ranger to meet its commitments to manage odour sources and to be very diligent in dealing with odour complaints and will instruct its Field Staff to monitor this situation closely. The Field Staff will follow their normal inspection protocols and will initiate the appropriate level of enforcement action to deal with any site specific odour problem when it arises, consistent with EUB *Guide 60: Upstream Petroleum Industry Flaring Guide*, Section 8.

## **6 HEALTH IMPACTS**

### **6.1 Views of the Applicant**

Ranger provided evidence, based on air dispersion modelling, regarding the potential health related impacts associated with emissions from tank and casing vents in the Applications Area. Ranger conceded that emissions from crude oil were complex and included such chemical compounds as benzene, toluene, ethylbenzene, xylene (BTEX), sulphur and n-hexane. Ranger stated that based on its analysis of the emissions from the proposed project, the release of these chemicals would not be in the proportions that would pose a risk to human health. This is based on their expert's analysis of the extensive studies conducted by such agencies as the United States Environmental Protection Agency (EPA) and National Institute for Occupational Safety and Health (NIOSH), which established safe threshold levels. These threshold levels have a high degree of conservatism built into them but constituted the best scientific estimate of the risk of chronic low level exposures to these chemicals.

Ranger considered two scenarios: firstly, that the casing and tank gases would be vented to atmosphere and secondly, that 75 per cent of the casing gas would be conserved. In both cases,

Ranger concluded that the emissions vented would not pose any potential health hazard to the local population because the concentrations of these compounds and the duration of exposure to the public were below accepted guidelines (EPA's Reference Concentration – the threshold limit at which a chemical may have a potential health impact) or below the ambient levels (rural or urban areas) presently existing on any hourly or yearly average basis.

Ranger acknowledged that, in general, there was a dearth of scientific studies on the cumulative effects on low level exposure to a number of substances over time. While this was problematic in attempting to predict what may happen to persons who are exposed to a mixture of substances, Ranger stated that an acceptable approach was to identify the predominant compounds in a mixture, assess the combine effect of these substances, and draw conclusions about their cumulative effects. Ranger was satisfied that cumulative health impacts were not a concern, due to the predicted low level of emissions, although, reducing emissions was generally always desirable from a health perspective.

Ranger commented on the evidence provided by the interveners' expert. Ranger submitted that the interveners did not make the fundamental toxicological distinction that any chemical, man-made or natural, will be toxic to persons if the concentration of the substance is sufficiently intense and its exposure to humans is of sufficient duration. It is erroneous to characterize substances as toxic if they are only deleterious at high dosages over sustained periods of time.

## **6.2 Views of Axell, David and Ulfsten**

The interveners Axell, David and Ulfsten submitted that the emissions—the BTEX, sulphur compounds, n-hexane and others—in the form of a sulphurous aerosol plume from the bitumen in the holding tanks presented a serious health risk to the local population. They argued that the aerosol plume behaved differently from the plume from the casing gas in that it travelled over great distances relatively undiluted. The aerosol plume was a plausible pathway of exposure of a multitude of chemicals to the residents in the area.

Axell, David and Ulfsten believed that the data pertaining to the Northern Rivers Basin area monitoring study was relevant to Cold Lake. The interveners deduced that issues and medical problems associated with the Northern River Basins would also exist to the same extent as in the Cold Lake area.

Axell, David and Ulfsten further expressed concerns about odour levels predicted from the Applications Area on the health of the local population. They referred to a study which demonstrated that odours, some at very low levels, can cause physiological symptoms in humans. They submitted that the potential health effects from the emissions from the Applications Area were understated in Ranger's evidence because the gas dispersion modelling was flawed.

### **6.3 Views of CLFN**

CLFN stated that it accepted the expert evidence tendered at the hearing to the effect that the health risk from the casing and tank gas emissions were extremely low. CLFN accepted, in particular, the evidence of Ranger's expert that there is no indication of a real risk to the local population and no indication that aboriginal people in the area are more sensitive to these types of emissions than other people. CLFN noted that this was the best current information that was available.

### **6.4 Views of the Pernarowskis**

Mr. Pernarowski expressed the view that the most important issue for him and his wife was one of health. He noted that a good deal of oil related activity was underway in the Cold Lake area, which contributed to the cumulative effects experienced by the local residents. Mr. Pernarowski questioned whether some of his family and livestock's health related problems could be associated with the quality of air and water in the area.

### **6.5 Views of the Board**

The Board believes, that in assessing the potential impacts of an energy facility on the health of a local population, it is important to have the best current scientifically accepted information available, presented by knowledgeable experts in the field. When experts fundamentally disagree on the health consequences to an area's residents because of the operation of a facility, it is especially critical for the Board to scrutinize the competing opinions before accepting one over the other. Inherent in this process is a judgement of what constitutes a societally acceptable level of risk.

Ranger has submitted that the casing and tank vent gas emissions will not pose an unacceptable risk to human health because the types and quantities of chemicals vented will not reach unsafe concentration levels nor will the exposure to these concentrations of chemicals be of sufficient duration to result in adverse health effects. The Board accepts the view that evidence of the negative effects of chemicals on human health is of limited value unless the concentration levels of the chemical and the duration of exposure to humans are known. The evidence of the interveners falls short of providing this essential information in context with the proposed project.

The interveners' evidence suggests that Ranger has overlooked a more harmful source of emissions, that originating from the holding tanks, which is characterized as a sulphurous aerosol plume. However, little detail on the concentrations of chemicals and on exposure to humans is provided. The Board finds that the interveners also failed to provide physical or chemical evidence to support their aerosol plume theory.

The Board has difficulty treating the Northern Rivers Basin Study as an appropriate surrogate for assessing the health of the residents of the Cold Lake area. Further, the Board notes that the monitoring study cautions that further research is necessary to establish a cause and effect between contaminants and health, noting that genetic and lifestyle factors are much more important in determining the risk of disease. The Board also does not believe that the comparison of findings related to the emissions from a small number of high volume point sources to a large

number of low volume point sources, as will be the case in the Cold Lake area, is a valid or appropriate way to characterize the impacts of this project.

All interveners raised the issue of the cumulative impacts of emissions from oil and gas operations on their health. The Board acknowledges that the question of cumulative effects is a difficult one but that the most effective method of reducing the potential for long-term health impacts is to reduce the volume of emissions. It notes that Ranger expects to conserve at least 75 per cent of the casing gas once the threshold levels have been met and to take the appropriate action to deal with site specific odour problems. Further, the Board is satisfied that the predominant substances comprising the emissions from the proposed development have been appropriately identified by Ranger and that the values generated by the modelling show very low levels of these substances in the atmosphere. It is the Board's opinion that these low levels will present a minimal level of risk of cumulative impacts on the health of the residents.

Evidence from both Ranger and the interveners showed that the detection of low level unpleasant odours, primarily sulphides and mercaptans, may produce negative health effects for sensitive individuals in addition to being a nuisance to the general population. The Board accepts Ranger's commitment to investigate and correct odour sources on a case by case basis.

## **7 PUBLIC CONSULTATION**

### **7.1 Views Of The Applicant**

Ranger stated it had consulted extensively with the public in the Applications Area and had obtained 230 consents from 256 residents and occupants within and immediately adjacent to the Applications Area. Ranger held an open house on June 18th and 19th, 1998 with all residents and occupants invited to attend. The open house was advertised in the local papers and individual invitations were hand delivered to the landowners in the Applications Area and adjacent lands. Approximately 75 people attended the open house and bus tour to a Ranger site. Ranger staff and expert witnesses attended the open house and were available to answer any questions and address concerns brought forth by the public.

At the pre-hearing conference held in June 1999, several Ranger staff were available to deal with any concerns. Each intervener to the application, including Mr. Pernarowski, was provided with copies of all the expert reports as soon as they were available. Ranger advised that it has hired a community affairs adviser. His role will be to deal with matters on a proactive basis and not simply on a response to complaint basis.

With respect to presenting the development area in three separate applications, Ranger stated that it was presenting the big picture of the overall development. Ranger submitted that if it was expected to provide exact information on all aspects of the proposed project, it could only be accomplished if Ranger applied on a much smaller scale. For that case, it argued the public would then be justified in complaining that the big picture was lost. Ranger stated that it was prepared to group its well licences together in those situations where 4 ha reduced spacing development was likely to occur. This would allow the landowners to assess the development of this more intensive phase.

## **7.2 Views Of Axell, David And Ulfsten**

Axell, David and Ulfsten did not believe that Ranger embarked on a full and thorough consultation process with area residents. The proposed development was fashioned into three separate areas which was confusing. Axell, David and Ulfsten questioned whether the maps presented in the applications were drawn appropriately and whether they were actually shown to the area residents.

## **7.3 Views of Cold Lake First Nations**

CLFN indicated that several productive meetings with Ranger were held, since the June 1999 pre-hearing conference. These meetings dealt with economic, technical, and environmental issues and went a long way in dealing with the concerns of CLFN. CLFN expressed a desire to be invited to any future stakeholder meeting or any other consultative process if approval is granted.

## **7.4 Views of the Pernarowskis**

Mr. Pernarowski indicated that he was not granted advanced intervener funding but acknowledged that Ranger had forwarded all reports and submissions to him since the June 1999 pre-hearing meeting.

## **7.5 Views of the Board**

The Board considers the public consultation program conducted by Ranger to be satisfactory and notes that the vast majority of residents and landowners signed letters of consent. The Board encourages Ranger to continue with its public consultation program with the area residents and the public. The Board is encouraged by Ranger's appointment of a community affairs adviser to assist in facilitating communication with the public.

The Board further notes Ranger's active role in the establishment of a community consultative group. The Board anticipates that this group will be an effective mechanism in public/industry consultation. The Board notes that the collaborative approach being suggested has been used with some success in examples such as the Lindbergh Operators Committee and the Sundre Petroleum Operators Group. Industry collaboration can be beneficial in addressing the public's requirement for information on all potential developments and their impacts. The presence of several developers in an area provides opportunities for collaboration on resolution of both technical and communication issues, including gas analysis, cumulative emissions, gas collection and disposal, pipelining, trucking issues, and odour complaints. The Board believes that an ongoing forum would provide quality information to the public and would address concerns in a coordinated manner.

## **8 OTHER MATTERS**

As noted above, the Board is pleased that Ranger and other operators in the Cold Lake area have initiated steps to develop a Public/Industry Liaison or Operators Group (Operators Group); however, the Board is concerned with the apparent lack of real progress with respect to initiating

steps to address some of the regional concerns that have been raised at this and other recent hearings in the Cold Lake area. The interveners to this and other hearings have raised cumulative impact concerns related to air emissions, groundwater, noise, and traffic which the Board believes can be addressed more effectively and efficiently on a regional and cooperative basis than if each operator tries to address these matters on a project specific basis.

The Board expects that the Operators Group will take immediate action to develop and implement a monitoring program that will assess the current ambient air and groundwater quality, as well as noise and traffic in areas that will be impacted by new development. This information, although not strictly a pre-development baseline, will provide a benchmark for future monitoring results and a basis for assessing the effects of ongoing petroleum industry development. The Board believes that an initial monitoring program in this regard should be completed in 2000 and that development of relevant ongoing monitoring programs should be in place by March 31, 2001. If the Board has not received confirmation that the Operators Group has initiated concrete steps to address regional concerns by September 30, 2000, it may take further action to ensure that the appropriate regional studies are initiated in a timely fashion to ensure commitments made with respect to Board decisions are fulfilled.

With respect to the Ranger applications, the Board notes that Ranger has committed to conduct certain activities within the Applications Area. These commitments are referenced in Appendix No. 1.

## **9 DECISION**

The Board believes that it is appropriate to attach conditions to the approval. The conditions imposed in the present approval are summarized below. Conditions, generally speaking, are requirements in addition to, or which otherwise expand upon, existing regulations and guidelines. Conditions must be complied with by an applicant or it is in breach of its approval and subject to enforcement action of the Board. Enforcement of an approval includes enforcement of the conditions attached to that approval. Sanctions imposed for breach of such conditions may include the suspension of the approval resulting in the shut in of a facility.

The Board, subject to the authorization of the Lieutenant Governor in Council, approves Applications No. 1025853, 1025855 and 1025857. The approval is subject to the following conditions:

- a) Complete abandonment of all partially abandoned wells by June 30, 2000. Initiate a policy to ensure well abandonments are completed in a timely fashion in the future and that the appropriate safety measures are put in place where the subsurface and surface abandonment operations cannot be completed at the same time.

- b) Determine the initial casing vent gas flow rate for each well within six months of production and annually thereafter. Implement the collection and use of at least 75 per cent of casing gas when the stabilized casing vent gas flow rate exceeds 140 m<sup>3</sup>/d at any well or pad site on an annual average basis. Provide the EUB with a report respecting the casing vent gas flow rates for the project area and the steps taken to implement gas collection and use where the threshold volume of 140 m<sup>3</sup>/d has been exceeded, by March 31, 2001 and provide subsequent reports as required by the Board.
- c) Unless the Operators Group has initiated regional air quality monitoring by September 30, 2000, Ranger shall perform baseline monitoring studies for H<sub>2</sub>S, SO<sub>2</sub>, NO<sub>x</sub>, and hydrocarbon compounds within its project area and submit a report summarizing results and its plans for future monitoring by March 31, 2001. The Board expects that the monitoring program will enable evaluation of the effects of Ranger's development on air quality. The Board expects that the Operators Group or Ranger will consult with Alberta Environment on the design of the ambient air monitoring program.
- d) Unless the Operators Group has initiated studies respecting the emission or formation of aerosol plumes from tank vents by September 30, 2000, Ranger shall conduct additional sampling and/or evaluation to assess the issue and report its findings to the Board by March 31, 2001.
- e) Unless the Operators Group has initiated a regional groundwater testing program by September 30, 2000, Ranger shall submit a work plan outlining the testing program within its development area by March 31, 2001. The Board expects that the program will assess current groundwater quality and incorporate plans to determine if the development has affected groundwater during its operations phase. The Board expects that the Operators Group or Ranger will consult with Alberta Environment on the design of the monitoring program.
- f) Run cement bond logs on at least one well per quarter section. Ranger shall submit a report on cement integrity including a statistical analysis of the results by March 31, 2001. Ranger shall provide subsequent reports as required by the Board.
- g) Continue collaborative efforts with C-FER and others to research the fundamentals of produced fluids pipelining. The Operators Group or Ranger shall submit a report by March 31, 2001 and subsequent reports as required by the Board, on its progress to research, develop, and apply pipelining.

DATED at Calgary, Alberta on April 10, 2000.

**ALBERTA ENERGY AND UTILITIES BOARD**

*(Original signed by)*

J. R. Nichol, P.Eng.  
Acting Board Member

*(Original signed by)*

M. J. Bruni, Q.C.  
Acting Board Member

*(Original signed by)*

R. H. Houlihan, P.Eng., Ph.D.  
Acting Board Member



## APPENDIX 1

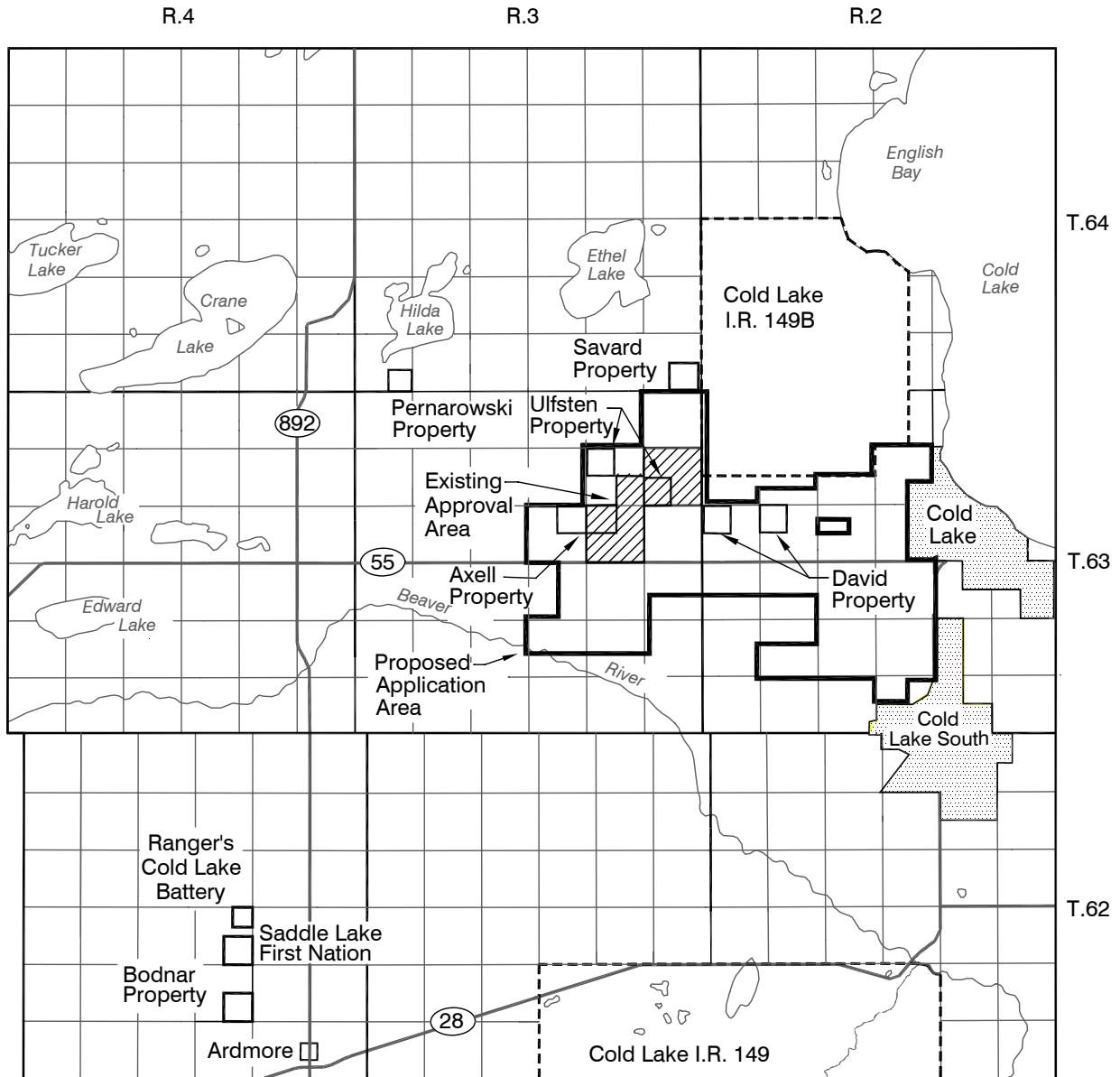
The Board notes that throughout the Decision Report, Ranger has undertaken to conduct certain activities in connection with its operations that are not strictly required by the Board's regulations or guidelines. These undertakings are described as commitments and they are summarized below. It is the Board's view that when a company makes a commitment of this nature, it has satisfied itself that the activity will benefit both the project and the public and the Board takes these commitments into account when arriving at its decision. Having made the commitment, the Board expects the applicant to fully carry out the undertaking or advise the Board if, for whatever reason, it cannot fulfill the commitment. It is at that time, that the Board will assess whether the circumstances of the failed commitment may be sufficient to trigger a review of the original approval. Affected parties also have the right to ask the Board to review an approval if certain commitments made by an applicant remain unfulfilled.

### Commitments by Ranger


- Maintain a 100 m project buffer for all project lands adjacent to the boundary of the CLFN reserve
- Provide for reasonable opportunities for employment and contracts to local residents including a fair and representative number of CLFN members.
- Test water wells within a 500 m radius of well pads before drilling and on an as needed basis. Outside of 500 m radius, test at the request of the water well owner (Note: Mr. Pernarowski's request)
- Correct previous work done on Mrs. Axell's well and pump
- Use designated truck routes and limit trucking to 12 hours per day
- Monitor the project to ensure that it is in compliance with the EUB's *Interim Directive 99-8: Noise Control Directive* (Note: Mr. Pernarowski's request regarding noise impacts to his residence)
- Take immediate action to identify and correct the source of odour problems on a case-by-case basis
- Group the applications for well licences together in those situations where 4 ha reduced spacing development will occur
- Honour commitments made to Don Savard
  - 1) If he or his family experience air quality problems with respect to his property, notification to Ranger personnel will result in a prompt investigation to determine the nature and source of the problem;
  - 2) If the air quality problems are chronic over a period of 30 days or longer, Ranger will

install at Mr. Savard's request, suitable air monitoring equipment at or near his property to determine the nature and source of the problem;

- 3) If Ranger is found to be the source of the problem, it will promptly correct it.



**Legend**

 Existing approval area

**Cold Lake Area**

Applications No. 1025853, 1025855 and 1025857

Ranger Oil Limited

Decision 2000-23