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Hudson Bay

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*June/1979.*

## A SEARCH FOR OIL

Will the Hudson Bay area of Manitoba some day be one of the world's important oil producing regions? Geologists think there is a good chance that it will.

Oil occurs most commonly when two conditions are met. First, there should be some way for the oil to be trapped. Contrary to general belief, oil is not found in underground pools or lakes. It is contained in a porous sedimentary layer of rock in much the same way as water is held in a sponge. In most cases, there is water beneath the oil which causes it to rise. To prevent the oil from dissipating through a wide area, there must be layers of impermeable rock surrounding the oil. These "traps" may take various forms, but the principle is always the same.

The second condition necessary for oil to form is a source from which it could develop. Although the exact process by which oil forms is not fully understood, it has long been known that oil is derived from the remains of vast deposits of marine organisms. The most favourable environment for such large numbers of organisms is a tropical climate.

Until recently, the Hudson Bay area didn't seem to meet these requirements. Geologists believed the area had only a relatively thin layer of sedimentary material above the Precambrian rocks. Areomagnetic and seismic surveys conducted during the past few years have shown this to be wrong. Sedimentary formations, primarily limestone, extend down to depths of 3,000 feet inland. Under the Bay itself some areas have more than 8,000 feet of sedimentary rocks. Most of the world's oil is found in limestone beds.

As for the necessity of there having once been a tropical climate, the surprising fact is that this region was once on the equator. Scientists are quite certain that three to four hundred million years ago, the equator ran through the Hudson Bay area at an angle that also took it through Australia.

In those days, Manitoba had a warmer climate than Africa.

While the scientific community is not in complete agreement about why the Hudson Bay area was once on the equator, many people believe the "continental drift" theory would explain it. This theory contends that the continental land masses are moving over the earth's surface.

Recent discoveries have led geologists to believe that there is a distinct possibility of oil being present in large quantities in the Hudson Bay area. But knowing where oil could be, and knowing where oil is, are two different things. There's only one way to find out if there is oil in a particular place. Drill! And that's exactly what a group of oil companies decided to do along our Hudson Bay coast.

An air strip was built near the Kaskathama<sup>+</sup> River. Bulldozers, living quarters, a drilling rig and other materials were flown in. In September of 1966, a test hole was started about half a mile inland from the shore of the Bay. After several months of drilling, winter forced suspension of work for six months. In July of last year, the hole was abandoned at a depth of 2,941 feet after having penetrated completely through the sedimentary layer to the Precambrian basement.

Core samples were taken at most depths and carefully examined. Although most of the information obtained is confidential, a trade magazine reported in April of 1967 that oil stain had been found in rock which indicated a good reservoir potential. The probe also provided much information about an area where no outcrops of sedimentary rock occur within a hundred mile radius and where very little geological knowledge can be gained from surface mapping.

A second test hole is now being drilled 40 miles inland to the southwest. This operation is expected to reach its target depth within a couple of months. Although no drilling for oil has yet been done off-shore,



extensive seismic tests have been conducted. Test wells will almost certainly be drilled at sometime in the future under the bay. Because of its much thicker sedimentary formations, the underwater area holds the greatest promise of containing large amounts of oil. Conducting surveys and drilling two test holes has already cost vast sums of money. Many more millions of dollars will be spent in the quest for oil in Northern Manitoba. Why? Because the oil reserves already tapped cannot continue to meet the ever increasing world demand for fuel.

It has been estimated that the world consumption of fuel will triple by the end of this century. Atomic energy will no doubt meet some of this need, but the traditional fuels will still have to provide the bulk of the world's needs. So, to keep the wheels of industry turning, ~~or~~ our homes warm, our cars running, the search for oil will go on.

As pressing as the world's need for fuel is, an oil find in Hudson Bay would not necessarily result in wells going into production. Any reservoirs of oil discovered will have to be extremely large before it will become worthwhile to exploit them. The reason for this is the great difficulty involved in transporting oil from this remote region to the industrialized areas of southern Canada. The most likely method of accomplishing this would be the construction of a pipe line hundreds of miles long. This would cost millions and millions of dollars. Moving oil out by tanker ship would be impractical because of the short navigation period on the Bay and the great distances to major cities.

Nobody knows with certainty at this time how much - if any - oil is contained in the limestone of the Hudson Bay area. The search will continue, however, spurred on by increasing world demand. More test wells will be drilled. More surveys will be conducted. More money will be spent in search of this valuable natural resource.

The next few years should see us gain a much clearer indication of the potential for an oil industry in the Hudson Bay Region.

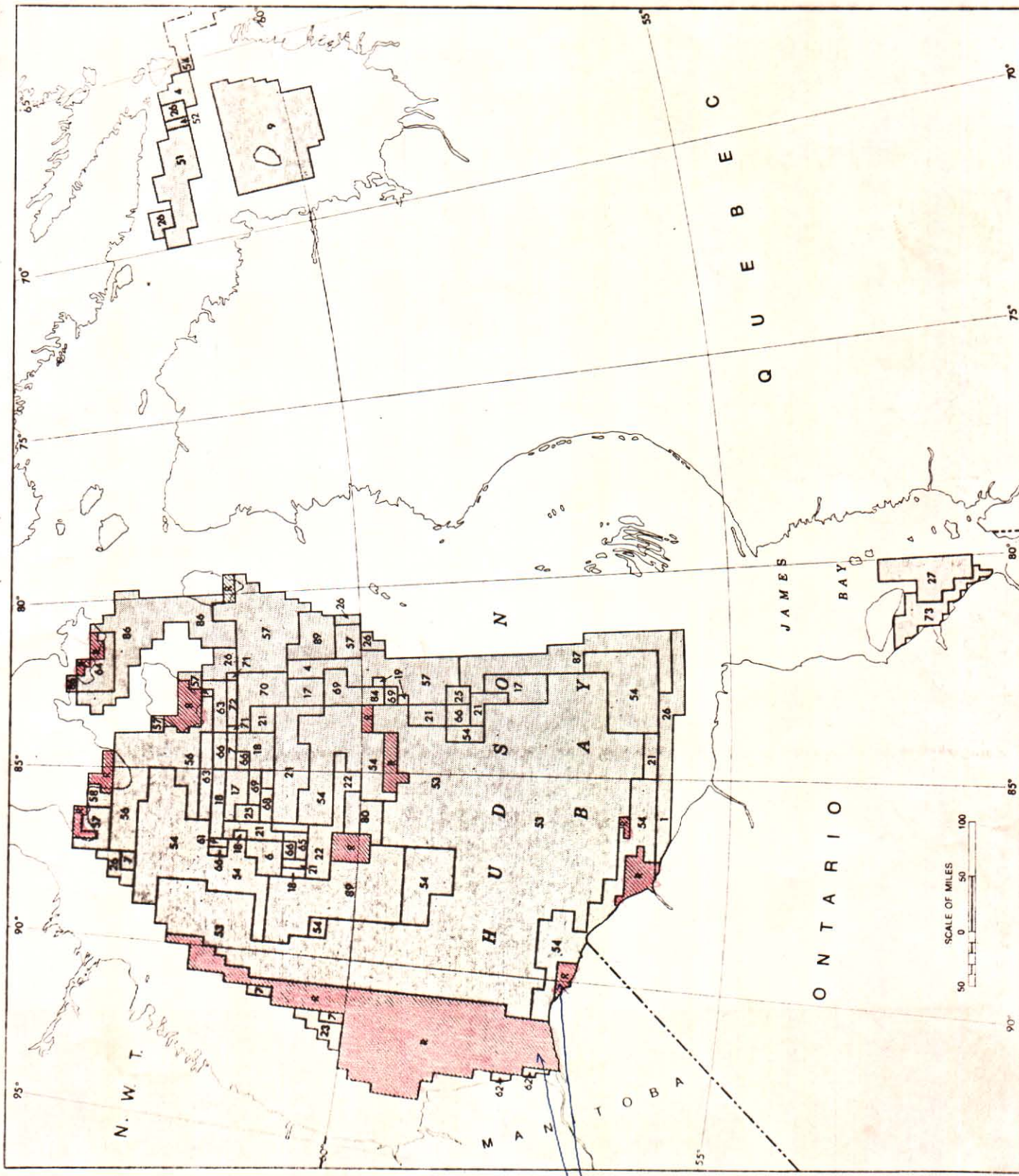
NUMERICAL INDEX TO FEDERAL OIL AND GAS PERMIT MAPS

<u>KEY</u>	<u>PERMITTEE</u>	<u>KEY</u>	<u>PERMITTEE</u>	<u>KEY</u>	<u>PERMITTEE</u>
66	Worldwide Energy Co.	80	Bow Valley Land 50%	93	Western Decalca Petroleum
67	J.F. Lemieux	81	Home Oil Company 50%		Petrol Oil & Gas Company
68	J.C. Millikin	82	Ballindery Explorations		Petrorep (Canada) Ltd.
69	Home Oil Company	83	Buttes Resources Canada		Corexcal, Inc.
70	Blue Water Oil & Gas	84	J.M. Huber Corporation	94	Pacific Lighting Exploration
71	Western Oil Consultants		Axel Heiberg Oil 98%		Sun Oil Company
72	Ulster Petroleum		Artik Leaseholds 2%	95	Canadian Minerals (1960) Ltd.
73	Mid Eastern Oil & Gas 50%	85	J. Ray McDermott Canada Ltd. 50%	96	W.H. Parish
74	H. Cravit 50%		General Crude Oil Alberta Ltd. 50%	97	M.S. Simon
75	North American Energy Co.		Texas Gulf Sulphur 40%	98	Imperial Oil Enterprises Ltd.
76	Offshore Oil & Gas Corp'n.	86	Teck Corporation 20%	99	Patrick Petroleum
	Boswell Minerals Ltd. 25%		Canadian Homestead 20%	100	Siebens Oil & Gas Ltd. 50%
	United Canso Oil & Gas 25%		Sogepet Limited 20%		Canadian Superior Oils 50%
	Canadian Export Gas & Oil 50%	87	Banner Petroleum 40%		
	Transalta Oil & Gas 17.5%		Sogepet Limited 20%		
	Mobil Oil Canada 25.0%		Asamera Oil 20%		
77	Canada-Cities Service 30.0%		Teck Corporation 20%		
	Hamilton Bros. Can. Gas 10.0%	88	Total Petroleum (North America) Ltd. 50%		
	Siebens Oil & Gas Ltd. 17.5%		Amerada Minerals Corporation 50%		
78	Amoco Canada Petroleum 50%	89	Siebens Oil & Gas Ltd. 50%		
	Imperial Oil Enterprises 50%		Transalta Oil & Gas 50%		
79	Houston Oils 25%	90	Colt Exploration Ltd.		
	Asamera Oils 25%	91	Siebens Oil & Gas Ltd. 75%		
	Oceania Oil 25%		Aquitaine Co. of Canada 25%		
	Lochaber Oil 25%	92	Altama Exploration Company		

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<u>KEY</u>	<u>PERMITTEE</u>	<u>KEY</u>	<u>PERMITTEE</u>	<u>KEY</u>	<u>PERMITTEE</u>
1	Citizens Pipeline Limited	21	Mobil Oil Canada Ltd.	45	Standard Oil of B.C.
2	Siebens Oil & Gas Ltd.	22	Dome Petroleum	46	Elf Oil Exploration
3	R.G. Hefoi	23	Joe Phillips Ltd.	47	Hudson's Bay Oil & Gas
4	Syracuse Oils Ltd.	24	Success Oil Ltd.	48	Murphy Oil Company
5	Trudel Minerals Ltd.	25	Wainoco Oil & Chemicals	49	New Associated Development
6	Western Decalita Petroleum 451	26	Sulpetro of Canada Ltd.	50	Paddon Hughes Development
	Petroil Oil & Gas Company 51	27	Western Minerals		Duncan Oil Limited 37, 51
	Petrorep (Canada) Ltd. 251	28	Texasco Exploration	51	Fairlane Resources Ltd. 12, 51
	Corexcal, Inc. 251	29	Canada Permanent Trust		Delta Petroleum Corp'n 15, 01
7	Boswell Minerals Ltd.	30	Transalta Oil & Gas		Trans-Canada Resources 10, 01
8	Ranger Oil (Canada) Ltd.	31	Central-Del Rio Oils	52	Amarex, Inc. 25, 01
9	Canadian Homestead Oils	32	Canadian Superior Oils		J.E. Mitchell
10	Shell Can/Shell Explorer	33	Voyager Petroleum	53	Atlantic Richfield
11	B.P. Exploration Canada 501	34	J.M. Coyne	54	Aquitaine Co. of Canada
	B.P. Oil & Gas 501	35	Jefferson Lake Petrochemicals	55	A.M. Fielding
12	Tenneco Oil & Minerals	36	R.F. Goss	56	Sunlite Land Ltd.
13	Gulf Oil Canada Ltd.	37	A.S. McLean	57	Kestrel Exploration
14	Transalta Oil & Gas 801	38	Anco Exploration	58	Peyto Oils Ltd.
	Marwood Petroleum 201	39	Canada Reserve O & G	59	High Country Minerals
15	Svenandoah Oil Corp'n	40	Inter-rock Oil Company	60	Boswell Minerals Ltd. 501
16	Amoco Canada Petroleum	41	Acroll Oil & Gas		Canadian Export G & O 501
17	Canada Trust Company	42	Columbian Northland Explorn	61	Yellowknife Bear Mines
18	Canadian Industrial G & O	43	Scurry-Rainbow Oil Ltd. 751	62	Pipawa Explorations Ltd.
19	Darling Hydrocarbons Ltd.	44	Northern Oil Explorers 751	63	Teck Corporation
	Lawrence Oil Co. Ltd. 1/91		Audex Oil Company 251	64	Sogepet Limited
	Solar Energy Resources 2/91			65	Opekar Investments
	Success Oil Ltd. 2/91				
	Troy Oils Ltd. 2/91				

J. S. ROPER.



NOTE  
PERMITS  
CANCELLED

DEPARTMENT OF ENERGY, MINES AND RESOURCES  
FEDERAL OIL AND GAS EXPLORATORY PERMITS  
HUDSON BAY AND HUDSON STRAIT  
JANUARY 1, 1971  
RESOURCE MANAGEMENT AND CONSERVATION BRANCH





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## ARCTIC OFFSHORE DRILLING



Most public attention on offshore exploration for oil and gas in the Arctic has been focused on the Beaufort Sea. However, well-developed plans are also underway for large-scale offshore drilling operations in other parts of the Arctic. (For information on offshore drilling in the Beaufort Sea, see *Northern Perspectives*, Vol. II, No. 2.) This issue of *Northern Perspectives* includes an examination of offshore work in three other separate regions: the Arctic Islands; Hudson Bay; and Lancaster Sound. The material is the product of nearly a year's research by Dr. Douglas Pimlott and Dougald Brown. It is excerpted from a book on offshore development in the North to be published by CARC later this fall.

### Arctic Islands

Major offshore drilling operations over the next decade will not be confined to the Beaufort Sea region. Using quite different technology and facing vastly different environmental conditions, oil companies operating in the companion "exploration play" in the Arctic Archipelago also plan to conduct extensive and widespread offshore operations.

Led by Panarctic Oils, the 45 per cent government-owned consortium which operates exclusively in the High Arctic, operators in this region have already discovered far greater reserves of gas than have thus far been found in the Mackenzie Delta and Beaufort Sea. But in the main, firms operating in the remote regions of the Arctic Islands have escaped even the limited public concern that has been focused on operators in the Delta region. And in spite of the federal government's predominant in-

terest in Panarctic, the consortium's attitude to public disclosure of information related to the environmental aspects of its operations is no different from any of its older and more established counterparts in the oil industry.

By the estimate of Panarctic's own officials, 75 per cent of the oil and gas potential of the Sverdrup Basin, the vast sedimentary basin that underlies much of the High Arctic, lies offshore. Even outside the Sverdrup Basin, much of the offshore area is covered by exploratory permits and plans are now underway to drill in Lancaster Sound and other areas of the eastern Arctic Ocean. Significantly, the offshore drilling memo presented to Cabinet from DINA in July 1973 made only a passing reference to offshore drilling in the Sverdrup Basin and other areas of the Arctic Archipelago although the government officials who sit on Panarctic's Board of Directors must have known of the company's plans to push into offshore regions. Nor was the subject of drilling in these areas ever considered at the Northern Canada Offshore Drilling Meeting held in Ottawa in December 1972.

The first public information of any substance on Panarctic's offshore ventures did not surface until April 1, 1974, with the announcement that the consortium had been successful in finding gas at its first offshore well, officially named Panarctic Tenneco et al Hecla N-52 ("Offshore Hecla"). Drilled from a floating "ice island" 400 ft in diameter and 17 ft. thick at the centre, Offshore Hecla was a delineation well designed to confirm the extension of the Hecla gas field out under the ocean floor. The well was located about 8 miles from shore in Hecla and Griper Bay to the west of the Sabine Peninsula of Melville Island. The Hecla field, which may well be the largest reserve in the High Arctic to date with more than 1 tcf of

gas, was discovered in 1972 and was Panarctic's fourth major gas strike. Prior to Offshore Hecla, one successful delineation well (Panarctic Tenneco 1-69) had already been drilled from a sand spit three miles north of the discovery well (Hecla F-62). To pin down the exact dimensions of the field, further offshore delineation wells may be drilled as far as 30 to 40 miles out to sea.

The technology used in drilling from an ice island was, according to Panarctic, a logical extension of the technical approach used the preceding winter to drill four "stratigraphic holes" directly from the ice in Kristoffer Bay off Ellef Rignes Island. These wells were shallow probes (about 1,500 ft) drilled on 6 to 8 ft of ice and in water depths up to 290 ft. In addition to verifying the drilling procedures their purpose was to check the thickness of permafrost layers in order to assist in the interpretation of seismic data covering the area. Although Panarctic has maintained that these stratigraphic tests proved the viability of drilling directly from the ice, the Kristoffer Bay tests were not without problems. At one of the Kristoffer Bay sites, the drilling crew experienced "loss of hole" which caused them to "skid" the entire rig. This problem was apparently caused by operations on the ocean floor associated with the installation of blow-out prevention equipment during the drilling of the first section of the test hole. As a result of this problem and their belief that no oil or gas would be found in the upper sediments of Hecla and Griper Bay, Panarctic engineers requested that they be allowed not to use this equipment during drilling of the surface hole at Offshore Hecla. In fact, Panarctic

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was even prepared to drill a preliminary stratigraphic hole to prove to the government that no oil or gas would be encountered in the first 500 feet and thus that blow-out prevention equipment would not be required during this phase of drilling the delineation well.

The Offshore Hecla delineation well presented engineering problems of a much greater magnitude than the stratigraphic tests on Kristoffer Bay. Whereas the shallow stratigraphic holes had been drilled by a light 150-ton rig, Offshore Hecla required a much heavier 500-ton rig. To support the rig and ancillary equipment, what was in effect an ice-locked floe was used as the drilling platform. This was built up to a maximum depth of 17½ ft by successive floodings. The thickness of the resulting "ice island" reached its maximum at the moonpool (where the drill was lowered into the ocean) and tapered off until, at the edge of the 400-ft-diameter floe, it blended uniformly with the surrounding 7½-ft thick sea ice.

Clearly, much was riding on the outcome of the Offshore Hecla well. In the eyes of Panarctic, successful completion of the well would vindicate several years of research that had begun with ice strength tests and the shallow stratigraphic holes. The assumption was that successful completion would suddenly shift the ice-island technique from the frontiers of technology into the realm of accepted and conventional engineering practice. This assumption was clearly set out in the company's latest annual report:

*Panarctic has pioneered many technological advances in Arctic operations over the years but probably the most significant came in 1973. This was the adaptation of conventional drilling rigs to offshore work using the strong Arctic Ocean ice as a drilling platform.... The importance of this method is that offshore drilling can be done in the Arctic now for about one-quarter the cost of employing other proposed techniques which cannot be available for another four or five years...*

According to the same annual report, the next step in Panarctic's offshore gameplan "will be to use the same 500-ton rig for drilling 6,000-foot wildcats in the Spring of 1975." Panarctic has, in fact, applied to use the same ice-island technique again this winter at a well designated as Jackson Bay G-16. Government officials — certainly those three senior officials who sit on the Panarctic Board — were well aware that the Hecla offshore test was seen as a precedent for

an entire subsequent program of offshore drilling in the High Arctic. This being the case, the Hecla operation ought to have been subjected to an exhaustive review at least within government circles, if not in the public sphere. But that was not to be.

## 'no risk'

In its submission for approval-in-principle from DINA, which was submitted in mid '73, Panarctic confidently maintained that drilling the offshore Hecla well would not constitute a risk to the environment. On the basis of its seismic and stratigraphic data, which Panarctic claimed to have been proven exceptionally accurate, the company predicted that it would hit gas sand at 3,000 ft. So strong was this belief that the original submission included a contingency plan for a gas spill but none for an oil spill. Panarctic also noted that formation pressures (which had forced Imperial to discontinue drilling on the artificial island Immerk) were well known at Hecla.

An environmental impact assessment prepared for Panarctic by F.F. Slaney, a Vancouver consulting firm, outlined the sequence of events in the case of gas blow-out. It is worth taking a close look at this study since assessments along similar lines will no doubt be used to support subsequent offshore operations in coming drilling seasons. Following a gas blowout, the assessment predicted that gas would vent under high pressure resulting in the rapid destruction of the ice platform and causing the whole drilling rig to collapse and sink to the ocean bottom. It was predicted that about 50 million cu ft per day of gas would escape to the surface.

The direct environmental effects of such a release of gas to the surrounding waters would depend on the nature of the impurities in the gas and particularly on the percentage of hydrogen sulphide and hydrocarbons with high molecular weight. Even in minute concentrations, these are highly toxic to aquatic life. Panarctic's data, however, indicated that gas in the Hecla field was very low in these impurities. In such an accident, a further danger would be posed by the loss of fuel, drilling mud and other chemicals at the well-site. Panarctic's initial contingency plan did not include any measures to deal with this problem although this was later altered at the request of the Department of Environment. The potential effects of the discharge of large volumes of methane gas into the atmosphere, burned or unburned, is unknown. Presumably, Panarctic must have considerable data on these matters as a result of the gas blowouts at its King Christian and Drake Point wells.

An oil blowout from any offshore well drilled directly from the ice surface poses far more serious environmental hazards than a gas blowout. During all the negotiations prior to the drilling of Hecla, Panarctic took the position that there was only the most remote chance that the well would encounter oil. Such a reassuring stance will be quite impossible, however, when Panarctic uses the ice-platform to drill wildcat wells in coming seasons. Compared to a delineation well, a wildcat well poses several additional unknowns to the driller; there is far less certainty, if any, of the depth of potential hydrocarbon-bearing strata; there is less indication, if any, of whether discoveries will be in the form of oil or gas; and there is little evidence, if any, to indicate the presence of abnormal geostatic pressures.

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*The Arctic ice pack has been described as the most significant surface area of the globe, for it controls the temperature of much of the Northern Hemisphere. Its continued existence in unspoiled form is vital to all mankind. The single most imminent threat to the Arctic at this time is the threat of a large oil spill...oil would spread immediately beneath ice many feet thick; it would congeal and block the breathing holes of the peculiar species of mammals that frequent the region; it would destroy effectively the primary source of food for Eskimos and carnivorous wildlife throughout an area of thousands of square miles; it would foul and destroy the only known nesting area of several species of wild birds. Because of the minute rate of hydrocarbon decomposition in frigid areas, the presence of any such oil must be regarded as permanent. The disastrous consequences which the presence would have on marine plankton, upon the process of oxygenation in the Arctic, and upon other natural and vital processes of the biosphere, are incalculable in their extent.*

**Prime Minister Pierre Trudeau, April 15, 1970**

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Panarctic's Hecla contingency plan required that oil from a possible blowout be ignited as soon as possible. The plan predicted that this could be done readily because of the natural gas which would be associated with the oil. However, there is far from universal agreement that igniting the oil would be possible. Should oil vent from a number of fractures rather than from the drill hole in the formation, it might well be impossible to set it afire; secondly, it has been suggested that it might be difficult to keep the oil burning at the extremely low temperatures common in the Arctic winter, even though there might be some gas present. Even successful burning might pose problems. It could, for example, result in premature break-up of ice making it much more difficult to prevent oil from spreading throughout entire bodies of water during the summer. But since there has been no experience in cleaning up oil discharged from offshore wells in the Arctic, suffice to say that contingency plans, and criticisms of them, are of a highly speculative nature.

## blowout hazards

The environmental hazards associated with an oil blowout offshore would, of course, be of an entirely different magnitude than with an offshore gas blowout. The environmental impact assessment prepared for Panarctic offered only a very general account — and one that many scientists would hotly dispute — of the potential effect of an oil blowout on marine life:

*"Lighter components will evaporate if exposed to air but at a lower rate in the Arctic because of cold temperatures. Biodegradation due to oxidation by bacteria, yeasts and fungi would be limited and slow. Water in oil emulsions could form readily because of low temperatures.*

*"Little can be documented about effects on fish associated with oil pollution in the High Arctic marine environment. No oil has yet been discovered near the site, thus the possible chemical composition of any oil is in the realm of speculation. The species composition, distribution, relative abundance, and spawning and rearing areas of fish inhabiting the Bay are unknown. There is no doubt that a major oil blowout would affect fish populations within the Bay through direct physical effects, and direct and indirect toxicity. The area of impact would be relatively small, however, given effective containment and cleanup.*

*"An oil blowout would have serious effect on both pelagic and benthic invertebrates near the blowout site. Many aromatic hydrocarbons are toxic, and would in all probability have lethal and sub-lethal effects on many organisms. Also, there would be direct physical effects on those pelagic organisms which come into contact with spill by inhibiting locomotion and/or preventing feeding. Similarly, emulsification would occur and heavier fractions would settle to the bottom where benthic organisms would be exposed to the same toxic and physical conditions.*

*"Sea birds such as the eiders and old squaw duck would be affected by oil on any open water during July, August and September. However, bird involvement should be minimal because spill is unlikely to approach shallow waters or shorelines. Numbers are unknown. A colony of brant near the southern end of Hecla and Griper Bay would not be affected. Chances of a slick penetrating that distance through the sea ice are remote."*

Unfortunately, Slaney's entire assessment was stated in the same general terms. It is obvious that it was prepared almost entirely on the basis of library research. Considering that the assessment was prepared for an operation which obviously had a major objective of testing the feasibility of ice-drilling projects, it is a distressingly inadequate document. Slaney's letter to Panarctic accompanying the assessment maintained that:

*Even without a full complement of environmental data specific to the region the report represents adequate assessment for the following points:*

1. *the project would cause direct environmental effects of only minor nature if operations are normal and environmental safeguards fulfilled;*
2. *a monitoring program would provide data for understanding implications of ice drilling on a larger scale;*
3. *effects of a natural gas blowout would be minor;*
4. *an oil blowout would not have extensive environmental consequence when contained by burning; the consequences of an oil blowout would not interfere with current resource exploitation activities of native people.*

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## The Wild Well Relief Contingency Plan submitted by the company stated quite flatly that it would require close to a full year to construct and drill from a second ice-island to close off a blowout.

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It is difficult to understand the justification for Slaney's conclusions about the impact of oil and gas blowouts. What justification is there for predicting a "minor" impact when baseline data on the area are almost completely lacking? And the proviso on the impact of an oil spill — that it would be contained by burning — is both crucial and doubtful. Scientists within the Department of Environment certainly took a less benign view of the consequences of an oil blowout. An internal departmental report stated flatly that an oil blowout at Hecla would be "an environmental disaster of the highest magnitude".

The inadequacy of the Slaney assessment simply underscores existing questions about the present arrangements under which assessments are made. In this case, Panarctic undoubtedly established the terms of reference and the cost limits of the Slaney study. Certainly, it is difficult to understand how scientists within the federal government could arrive at such radically different conclusions from those expressed in the Slaney report. At the very least, the terms of reference for future environmental assessments should be stipulated by the Arctic Waters Oil and Gas Advisory Committee.

## 'the next step'

Panarctic now plans to proceed with a program of drilling wildcat offshore wells using the same ice-island technique that was used to drill offshore Hecla. The consortium's latest annual report explained that the "next step" in Panarctic's offshore program will be "to use the same 500-ton rig for drilling 6,000-ft wildcats in the spring of 1975". According to this logic, the success of offshore Hecla has created an instant rationale and justification for a whole series of subsequent offshore wildcat wells. Although the petroleum press called the Hecla operation "auspiciously successful" there are a number of constraints that may well limit the future application of the ice-island technique. The length of time required

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to prepare the drill site results in a compressed drilling season and will, therefore, limit the number and depth of future offshore wells. At Hecla, flooding of the ice platform began in early December, however drilling did not begin until March 5. The outer limit of the drilling season is about May 1. Ice movement also poses another limiting factor. Since the drilling rig can tolerate only a limited degree of lateral movement (about 5 per cent of the water depth at the drill site), future drilling locations will be confined to areas of relatively low ice movement. And while movement of the ice platform was well within tolerable limits at the Hecla site, there is little data available for other regions of the Arctic.

***It is difficult to understand the justification for Slaney's conclusions on the impact of oil and gas blowouts. What justification is there for predicting a "minor" impact when baseline data on the area is almost completely lacking?***

But perhaps the single most important limiting factor in Panarctic's ice-platform system is the length of time that would be required to drill a relief well in the case of a blowout. The Wild Well Relief Contingency Plan submitted by the company stated quite flatly that it would require close to a full year to construct and drill from a second ice-island to close off a blowout. In light of the government's own stand in the Beaufort Sea this would seem to be an unacceptable risk. If two drilling vessels are to be required in the Beaufort to overcome this time-lag problem, why is it acceptable to risk an unchecked blowout for a full year in the High Arctic?

The ice-island technique is not the end of the technological road for drilling offshore in the Arctic Islands. Panarctic itself has acknowledged on a number of occasions that other, perhaps safer, drilling systems will be available for use within a few years. The chief advantages of the present technique are that it is cheap — about \$2 million per well — and that it can be used immediately. Despite the grave risks involved in current and prospective operations, Panarctic's major concern appears to be to get on with the job as soon as possible. And as the biggest shareholder in the consortium, the government does not seem inclined to disagree. ■

## Lancaster Sound

Lancaster Sound, one of the most biologically productive regions in the entire Arctic, is the most recent offshore location to capture the attention of the oil industry. Even in the Arctic, where great technological risks seem commonplace, the proposal to drill in Lancaster Sound has a science-fiction aura about it. Submitted to DINA early in 1974 by a firm called Norlands Petroleum Ltd., the proposal outlined plans to drill a wildcat well in 1975 in waters more than 2,500 ft deep—deeper than waters ever drilled in anywhere in the world. Late in the summer, DINA gave its approval-in-principle to the project. To carry out this extraordinary venture, Norlands proposes to use a drillship of the Havdrill class, similar to the "Pelican" which has been operating off the Labrador coast.

Lancaster Sound lies in the eastern end of the Northwest Passage, between the north end of Baffin Island and the south side of Devon Island. Along with McClure Strait and Viscount Melville Sound, it forms the northern part of the Arctic Lowlands geologic province, one of four major geologic provinces occurring in the Arctic Islands sedimentary area. Although only sporadic information has surfaced on the oil and gas potential of the region, the activities of petroleum firms in the area suggest that exploration prospects must be very enticing indeed.

The most active land holder in the Northwest Passage is Magnorth Petroleum Ltd., which holds a total of 14.4 million acres in exploratory permits in the Arctic Islands, most of it in the Northwest Passage. In an arrangement that is common among petroleum exploration firms, Magnorth is sloughing off 25 per cent of its land interests to Norlands in return for Norlands exploration work on the Magnorth permit areas. (This type of arrangement benefits Magnorth by allowing the company to meet the work obligations on its vast permit areas.) The hidden link in the corporate mosaic is Northern Natural

Gas Co. (Nebraska), an American gas distributing company which owns Norlands Petroleum and operates the firm as its Canadian exploration arm.

In 1973, Magnorth and Norlands drew up a five-year plan for exploration in the Northwest Passage. The program was originally estimated to cost \$10 million and, according to *Oilweek*, the original arrangement included plans for test drilling "possibly as early as 1976". By the end of the 1973 season, Magnorth-Norlands had run seismic surveys over more than 13,000 miles of the Northwest Passage, including intensive coverage of Lancaster Sound. It appears that the 1973 seismic work pointed to some exceedingly promising geological structures in the Sound. In spite of the extraordinary water depth, the short drilling season and difficult ice conditions, Norlands moved its drilling schedule ahead by at least a full year, proposing to DINA that drilling begin in 1975.

The Norlands drilling proposal presents a classic case of the conflicts that arise in the North between resource development, environmental protection and native resource use. The Lancaster Sound area is one of the relatively few pockets in the entire Arctic which supports a very rich and varied ecosystem. In Arctic terms, the Sound region is teeming with life—marine mammals, fish, and sea birds. So significant is it, in fact, that the Canadian Committee of the International Biological Programme has proposed that the Sound be established as a major ecological preserve. Bylot Island, at the southeast end of Lancaster Sound has already been designated as a migratory bird and waterfowl sanctuary. Bylot Island, one of the best-studied areas within the Sound, offers an excellent example of the wildlife resources that inhabit the region. The western side of the island contains a critical nesting area for Greater Snow Geese for almost one-third of the world population of the species. Huge colonies of cliff-nesting sea birds such as Murres, Kittiwakes and Guillemots are located on several of the capes and cliffs. Polar bear denning sites have been confirmed at Cape Coutts and several other locations and thousands of Harp Seals, Narwhal, and other marine mammals migrate through the inshore marine areas. One of the

***A large oil spill in Lancaster Sound could have a catastrophic effect on what is quite possibly the most important marine ecosystem in the entire eastern Arctic.***



few detailed population appraisals, conducted in 1957, revealed that approximately 400,000 pairs of thick-billed Murres were nesting in only one of several colonies at Cape Hay.

A recital of wildlife resources in the western part of Lancaster Sound is no less impressive. Large populations of Eider Ducks, Black Brant and other species are found in the wet river valleys of coastal areas. These same parts support large numbers of Harp, Ringed and Square Flipper Seals, herds of Walrus, Narwhal, Beluga and good populations of Polar Bears, as well as large colonies of cliff-dwelling Fulmars, Murres, Kittiwakes, Guillemots and Gulls.

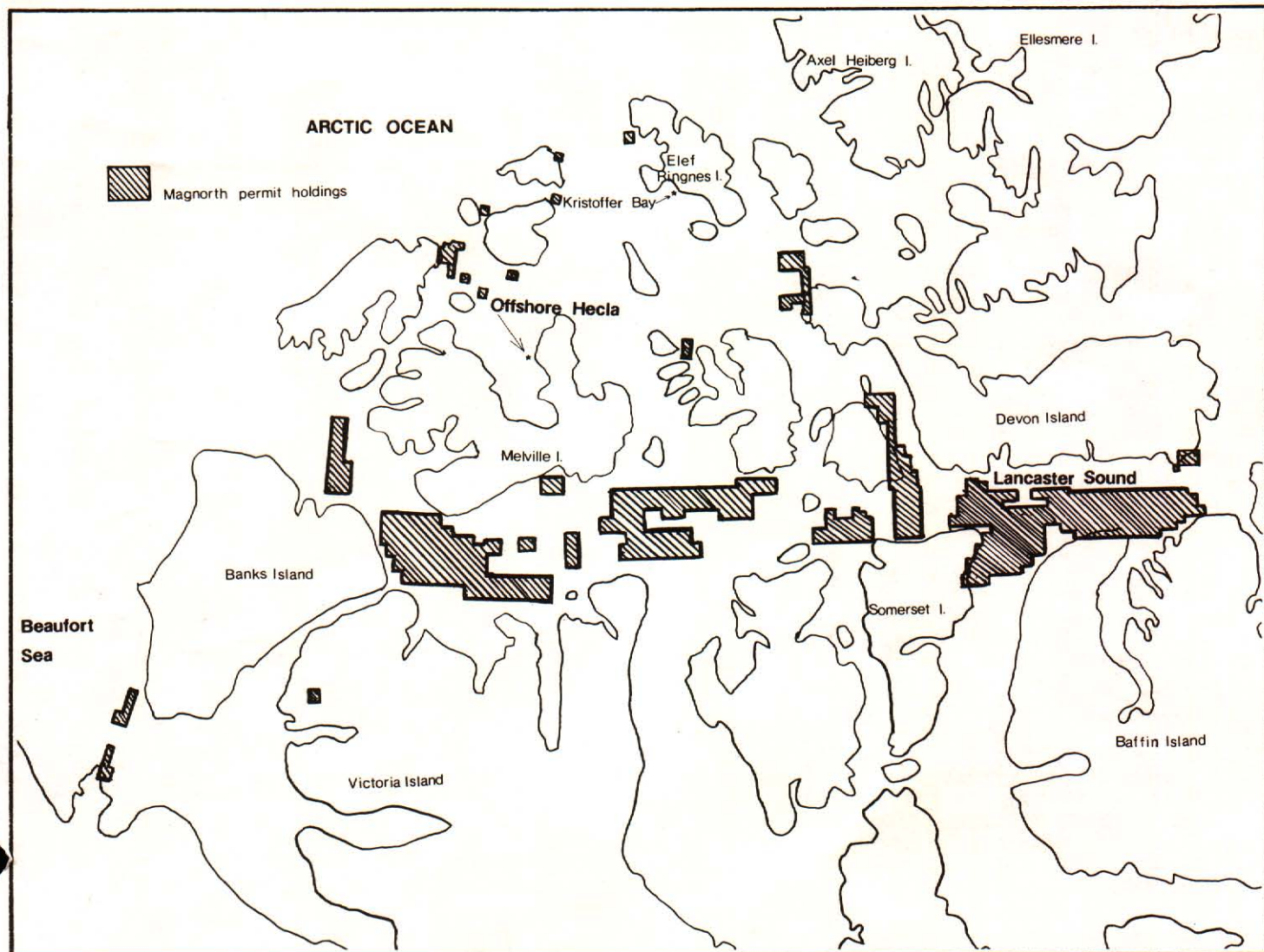
A large oil spill could have a catastrophic effect on what is quite possibly the most important marine ecosystem in the entire eastern Arctic, to say nothing of its impact on the resources used by the Inuit of Pond Inlet, Arctic Bay and Resolute Bay. Despite widespread

fears among biologists of just such a catastrophe, neither Norlands or DINA will release the blowout contingency plans that were part of Norlands' 800-odd-page application. The application included engineering feasibility studies prepared by Westburne Engineering of Calgary and an environmental impact assessment prepared by F.F. Slaney of Vancouver. What little is known about Norlands' contingency plans is hardly reassuring. In the event of a blowout, Norlands has apparently reached an agreement with the operators of the Pelican drillship that calls for the Pelican to leave its drilling location off the coast of Labrador and drill a relief well in Lancaster Sound. But neither ship will be capable of operating in the Sound beyond the short period of open water which normally extends from 60 to 90 days. And of course, there is always the bleak truth that no technology has yet been developed for cleaning up oil spills which could begin to cope with a blowout in the Sound. ■

*The waters of the Canadian Arctic Archipelago constitute a network of shallow channels containing 16 major passages. Circulation is weak with dominant movement easterly through the Barrow Strait-Lancaster Sound Passage. Added to the relatively limited movements of waters through the passages of the Archipelago is the fact that the total arctic island coastline is estimated to be 43,000 km, approximately 2,200 km greater in length than the circumference of the earth. This means that any major accumulation of pollutants in the Arctic Ocean, with a limited opportunity for movement out of the area by oceanic currents, has the potential of influencing a very great length of coastline.*

**E.B. Peterson  
L.C. Bliss**

*Le Havre conference*





## Hudson Bay

Unlike the offshore areas of the Beaufort Sea and the Arctic Islands, Hudson Bay is not regarded by the oil industry as a major "exploration play". Although more than 38 million acres offshore are under exploratory permit, the sedimentary basins underlying the Bay are still largely a mystery to petroleum geologists. But ironically, it was here that the first Canadian offshore well in arctic or sub-arctic waters was drilled. It was an incident that both the industry and the government would prefer to forget and one that now stands in sharp relief to confident expressions of reassurance about large-scale offshore operations in the North.

The well was drilled by Aquitaine Co. of Canada in 1969 and ended in near-disaster when the drilling rig "lost hole" and sustained \$400,000 damage in a severe storm. Aquitaine has returned to the Bay this summer with a new semi-submersible drilling system — the first of its type to be used in Arctic waters — to plug the unfinished 1969 hole and drill two new wildcat wells.

Although a total of 625 exploratory permits are held in the Bay, more than half of the total acreage under permit is held by only four companies: Atlantic Richfield (12 million acres); Aquitaine (4.3 million acres); Sunlite Land Ltd. (3.6 million acres); and Seibens Oil and Gas (1.8 million acres). The acquisition of acreage reached a peak in 1968; since then, it has declined steadily as the companies have diverted their exploration funds to regions with more immediate promise. The Hudson Bay Basin, which includes both the offshore areas and the adjacent onshore Hudson Bay Lowlands, has not been extensively explored although the most extensive seismic survey yet — some 5,000 miles — is scheduled for the 1974 summer season. A recent review of exploration prospects in *Oilweek* offered this appraisal:

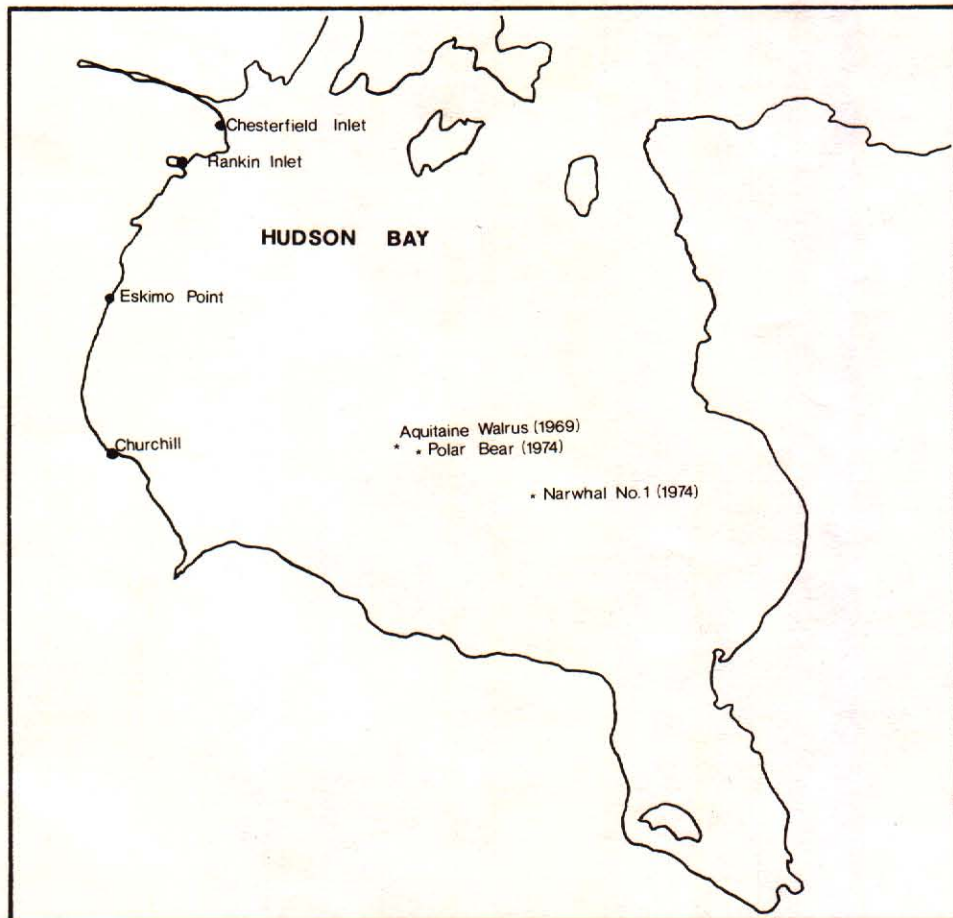
*The hydrocarbon prospects are considered excellent by many and 'dicey' by some. It is a new ballgame and information is scanty. The best and most positive data is held by land-owners and they're not particularly anxious to develop increased competition through disclosure at this time.*

Despite the paucity of published information, the magazine's editors managed an upbeat conclusion. The Bay, they said, "shakes up as a pretty potent energy cocktail". Potent or not, Hudson Bay poses some formidable challenges to drillers. In spite of its "southern" location, the region is remote and logistic support is probably poorer than in any other part of the Arctic. The physical environment of the Bay, while not as harsh as the Beaufort Sea, does pose major risks to any drilling operation, as Aquitaine discovered five years ago. Reliable meteorological and oceanographic forecasts are non-existent. In the middle of the Bay, drillers must also contend with shifting summer pack ice. Aquitaine's exposure in 1969 to these offshore conditions led to a re-evaluation on the part of both the company and government officials of the type of drilling equipment that would be needed for future work in the Bay.

The official name for Aquitaine's first well was "Aquitaine et al Hudson-Walrus 71". Application to drill the well was submitted by the company in the spring of 1969 and approved by officials of the Resource Management and Conservation Branch of the Department of Energy, Mines and Resources (EMR).\* The drilling vessel chosen by Aquitaine for the Walrus operation was the WODECO II a barge-type rig that

had spent most of its drilling life off the coast of California. But, the WODECO II had also drilled in Cook Inlet off the coast of southern Alaska and its crew thus regarded as "experienced in Arctic operations". This was an important factor in EMR's decision to approve Aquitaine's application although subsequent events revealed that conditions in Cook Inlet are in no way comparable to the more difficult conditions facing operators in Hudson Bay. In spite of this, the DINA offshore drilling memorandum to Cabinet three years later blithely attempted to compare conditions in Cook Inlet to conditions in the Beaufort Sea, conditions that are even more harsh than Hudson Bay). Early in the summer of 1969, the WODECO II

*\*Offshore drilling in both Hudson Bay and Hudson Strait falls within the jurisdiction of the Department of Energy, Mines and Resources (EMR). This department administers the Canada Oil and Gas Land Regulations and the Oil and Gas Production and Conservation Act in waters off the east and west coasts and in Hudson Bay and Hudson Strait. The Department of Indian and Northern Affairs administers the same legislation and has jurisdiction over offshore operations in the rest of the Arctic, including Davis Strait and Baffin Bay.*





rig was towed down the California coast, through the Panama Canal, to the east coast of North America and into Hudson Bay via Hudson Strait. Normally, the ice-free "drilling window" in the Bay is about three months, from late July through most of October, depending primarily on ice conditions in Hudson Strait, the only access route to the Bay. With icebreaker support, it is estimated that the drilling season could be extended to about 120 days.

Aquitaine did not get a good start in 1969. Although the company had hoped to begin drilling earlier, the Walrus well was not spudded until August 7 due to the slow break-up of ice at the well location (58 N, 87W). The operation also ended prematurely on October 16 when the well had been drilled to a depth of only 3,926 ft. In a press release shortly afterward, the company gave its explanation for the sudden cessation of drilling:

*Decision to suspend the well was made in anticipation of the seasonal build-up of ice in Hudson Strait which would impede removal of equipment from the Bay ... Late departure of ice from the location prevented spudding before August 7 and wave and weather conditions were causes of difficulty throughout the drilling operation.*

At best, this was a rather bland description of the difficulties encountered during the operation. In an official abandonment report submitted to EMR, Aquitaine gave quite a different account of the events which led to suspension of drilling:

*Due to very severe weather conditions, the connection between the drilling vessel and the well was lost October 16. Because of severe damage to the equipment and the necessity to leave the Bay before the Straits were closed by ice, it was impossible to resume operations and plug the well in a conventional manner.*

The storm that ended the Walrus operation was accompanied by waves of up to 9 metres and winds that gusted up to 70 knots, not unlike the storm conditions that are prevalent on the Beaufort Sea during late summer and early autumn. The storm struck without any warning or advance forecast. As it gained in intensity, all unnecessary personnel were evacuated to Churchill. A subsequent memorandum submitted to EMR and containing excerpts from the log of the project manager for the drilling contractor, Western Offshore Drilling and Exploration Co., provides a vivid picture of events at the height of the storm:

*In the past few years, there has been a large influx of mineral and oil exploration into the Canadian Arctic and still more exploratory activities are coming into existence. Due to the fact that seismic programs and off-shore drilling are now being effected in and on Hudson Bay, the Inuit people feel that the danger to the wildlife and the sea animals has increased tremendously: therefore, some measures of control over the exploration companies should be imposed in consultation with the Inuit people. Specifically, the people of Chesterfield Inlet, are opposed to any seismic activity and off-shore drilling in and on the Hudson Bay since it would greatly affect the sea animals, not only around the immediate area of exploration but within the waters of Hudson Bay. Should there be a discovery of oil under the Bay, there is a great danger of oil spillage or leakage which may float up from the bottom of the Bay and due to sea currents may surface miles away and may not be discovered until enormous amounts of damage have already occurred. An example of oil in the sea and its effects on sea animals was experienced at Chesterfield about a year ago. There was a leak in one of the bulk fuel tanks and during the spring thaw run-off, the oil floated down into Mission Lake and via a small creek, ended out on Spurrell Bay at the mouth of Chesterfield Inlet. Throughout the summer, there were no fish in Spurrell Bay and seals could only be caught far away from their normal habitat around Spurrell Bay.*

**Chesterfield Inlet, public statement, April 29, 1974**

*1200 hrs: Winds changing to NW and gusting to 60 knots. Travelling blocs tore guidance system loose. Blocks were dropped to rig floor. 28 stands drill pipe broke loose from lashing, tearing out racking fingers and boards, breaking and bending girders and braces. Noise was terrible. Rig floor has suffered much damage. Vessel motion still severe.*

In fact, the WODECO II rig had been plagued with problems from the beginning of the operation\*. A former Aquitaine official later reported that the rig had been subjected to "bothersome" movements because the wave period of the drilling vessel was discovered to be the same as that prevalent on Hudson Bay. Reporting on the Walrus operation, Oilweek noted that "at that time (1969), little was known about waves, currents, and weather patterns in the area". According to an official at EMR, it was believed at the time of the application that the company's previous geophysical work in the Bay would have given Aquitaine adequate foreknowledge of some of these problems.

In retrospect, the Walrus incident appears to have been a case of proceeding by trial and error. Neither the company or EMR had any real appreciation of physical conditions in the Bay. At the time, the staff of the Energy Conservation Branch responsible for granting the drilling authority was far too small to conduct a thorough assessment and other government agencies were given little, if any, opportunity to review Aquitaine's plans. According to depart-

mental procedure at the time, all off-shore proposals were to have been sent to a number of federal agencies for review and comment, including the Department of National Defence, the Ministry of Transport, the National Research Council, and the Department of Fisheries and Forestry (the forerunner to the Department of Environment). It appears, however, that Aquitaine's proposal was never forwarded to Fisheries and Forestry. A letter from the Resource Management and Conservation Branch to Aquitaine requesting that the company send a copy of its proposal to Fisheries and Forestry appears in the files with the comment "never sent". In any case, the drilling application submitted by Aquitaine did not include supporting environmental data, documentation of environmental research, or contingency plans in the event of a blow-out. No federal studies on possible environmental effects were undertaken either prior to or concurrent with the drilling program. Had an accident occurred late in the "drilling window", it would have been impossible to drill a relief well until the following season when equipment could again be moved through the Hudson Strait. Had the Walrus well been "kicking" (actively encountering an oil pool) at the time of the Oct. 16 storm, the possibility of a blowout would have been almost certain. Although the drill did encounter some trace findings of hydrocarbons, there has been no evidence of oil seeps during the five years the well was left unplugged.

Since 1970, it has been common knowledge that Aquitaine would return to the Bay to complete plugging the Walrus hole as well as to drill new wildcats. But in spite of the apparent lessons of the 1969 drilling fiasco, the administrative machinery for assessment once

\*Two years later, the ill-fated WODECO II rig was destroyed in a blowout and fire in the offshore waters of Peru. The \$4 million disaster took 7 lives.



again seemed unable to keep pace with events. On May 22, 1974, Aquitaine officials met with officials of EMR to outline the final details of their application for a drilling permit under the Oil and Gas Conservation Act. By the time of this meeting, however, there was no doubt that Aquitaine would indeed be drilling in Hudson Bay in the summer of 1974 since "program approval" (equivalent to approval-in-principle) had already been granted at an earlier date. At the May 22 meeting Aquitaine outlined the final details of its plan to use a semi-submersible rig — the Pentagone P-82 — in the 1974 drilling program, the first use of semi-submersible technology in Arctic waters. The rig was to be towed off its location in the North Sea early in June, arrive at Cape Chidley early in July and receive icebreaker support through the Strait and into Hudson Bay where it was scheduled to begin operations in late July. The current drilling program will be a far more costly effort than the earlier Walrus venture. For a price of \$12 million, Aquitaine hopes to drill two wells — Narwhal No. 1, 185 miles southwest of the original Walrus well and Polar Bear, 15 miles to the east of Walrus. The designation of the Narwhal well no doubt belies plans for future years. Working interest in the program is divided among four firms, Aquitaine having a 26.3 per cent interest in the venture; Shell Canada Ltd. 60.5 per cent, Petrofina Canada Ltd., 6.6 per cent and Sogepet, 6.6 per cent.

By any standard, semi-submersibles of the Pentagone type are impressive machines — "the Cadillacs of the offshore drilling business", in the words of one official. The P-82 is 325 ft long, 338 ft wide and 134 ft high to its upper deck. The rig has been ice-reinforced and is able to break new ice up to one ft in depth and is reported able to withstand contact with small ice floes. Aquitaine had originally ordered the rig in 1970 in anticipation of drilling during the 1973 season, but due to an EMR policy that no rig be allowed to drill its inaugural well in waters under EMR jurisdiction, it was sent to the North Sea until the start of the 1974 summer drilling season.

By the time the Department of Environment became involved in the assessment process, the drilling program had been set in all but the smallest of details. Confronted with this *fait accompli*, the department once again found itself on the defensive, as it has on so many other offshore questions. The material forwarded to DOE was too little and too late.

Clearly, Aquitaine did not regard environmental assessment as a crucial

or deciding factor in its application for a drilling permit. As though to underscore its indifference to the whole matter of environmental assessment, its submission to DOE did not include even a contingency plan to deal with an oil spill. The assessment did not outline any provisions for securing a rig to drill a relief well in the event of a blowout, nor even any indication of how quickly a blowout might be dealt with. Nor did the assessment offer any clues as to how adverse weather conditions might affect any relief operations. In spite of the Walrus episode in 1969, Aquitaine's assessment conveniently omitted any reference to the factors that led to the improper abandonment of the Walrus well although one of the major objectives of the 1974 program is to complete that hole in a proper fashion. Perhaps most amazing was the company's assertion that winds in the Bay are "light but steady"! One wonders if those are the same light but steady winds that caused \$400,000 damage to the WODECO II rig? In fact, records from the Churchill weather station indicate that in September, the station experiences the highest mean wind speed of any weather station in Canada.

Aquitaine's drilling program had been five years in the planning, but officials in Environment Canada had time only to give the Aquitaine assessment a cursory review and prepare a short statement reflecting the department's concerns about the drilling venture before events began closing in. By late June, only a few weeks after DOE had received the assessment, the Pentagone rig was ready to move from the North Sea to Hudson Bay to begin drilling. To delay the start of drilling would cost Aquitaine and its partners millions of dollars, a predicament that would be unacceptable to both the company and EMR.

On July 5, officials of EMR and DOE met to discuss the environmental implications of the program. EMR agreed to incorporate four suggested conditions in the drilling permit issued to Aquitaine, including a request for clarification of contingency procedures, a requirement for studies of the effects of drilling on aquatic life, a request for data on weather conditions, and restrictions on the discharge of liquid wastes from the drilling rig.

In the light of DOE's own statement of its concerns about the drilling program, the four conditions are indeed a modest response to the Aquitaine program. In the statement, entitled "DOE Environmental Concerns", departmental officials had concluded that:

*The magnitude and duration of the effects of a major oil spill are*

*expected to be beyond compensation due to the sensitivity and slow rate of recovery of northern ecosystems. An oil spill or oil blowout could contaminate vast areas of shoreline in Hudson Bay, and because of the emulsification of oil in cold water, large areas of bottom could be disrupted. Oil on the surface could have extremely adverse effects on the sea bird populations by either directly killing them by coating with oil and destroying the insulating properties of the feathers or by ruining the birds' food supply and eliminating them by starvation. Oil spills could be deleterious to the marine mammals and oil-in-water emulsives could prove extremely lethal to fish and fish food organisms. Of major importance are the ringed seal, walrus and beluga. The result of such damage could affect the resource base available for native people's use.*

The DOE statement also made clear that Aquitaine's 1974 drilling venture, no less than the 1969 fiasco, is a matter of technological trial-and-error:

*In the offshore the possible effects of the physical environment on the drilling system constitute one of the principal risks in such an enterprise. ...Wind and wave forecasting services in Hudson Bay are non-existent. If various aspects of the operation depend on advance notice of critical values of wave heights, the lack of such a service may pose an unacceptable risk.*

On July 22, *Oilweek* reported that the Pentagone rig was waiting in Hudson Strait until the ice cleared from the Bay. On Aug. 5, it was reported that the rig had anchored at the Narwhal well location and was preparing to drill.

## Canadian Arctic Resources Committee

Chairman:  
Executive Secretary:  
Production:

A. R. Thompson  
M.K. Vincent  
D. Brown

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## Hudson Bay

1965

3 wells were drilled on shore: No oil shows.

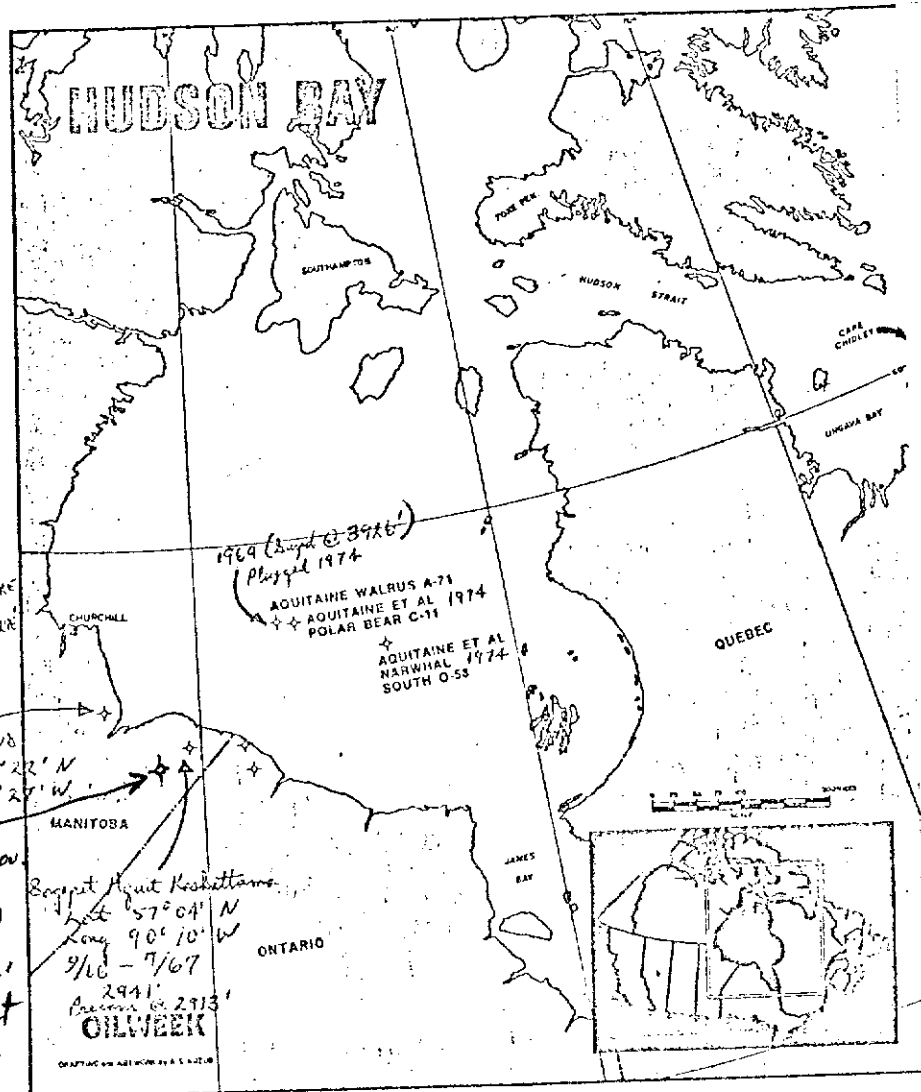
The wells were drilled on basis of regional reconnaissance, estimation of thickest sedimentary section accessible, depth to basement, aeromagnetic interpretation was made use of in one case only. Kaskattama well was an oblique hole looking for possible Silurian reef build up, but no reef was encountered. The well was a stratigraphic test not based on seismic closure. Approximately 10 miles near shore of seismic refraction shooting was run to determine thickness of sediments.

### On shore wells:

Kaskattama well No. 1                      Aquitaine  
Merland et al White Bear Creek No. 1  
Houston et al Comeault No. 1

### Offshore wells

Aquitaine et al Hudson Warlus A-71  
" " " Narwhal South #1  
" " " Polar Bear C-11



TOTAL CORE  
Revised 11/8  
1401'  
6/70  
MERRAND

LAT. 57° 22' N  
LONG. 92° 27' W

Houston  
Cormeau Prov.  
Lat. 56° 40' N  
Long. 90° 55' W  
Oct 1968  
Total core 2125'  
Basement Test

Baypit Aquit Keskittans  
Lat 57° 04' N  
Long 90° 10' W  
9/66 - 7/67  
2941'  
Basement @ 2913'  
**OILWEEK**

INTER-DEPARTMENTAL MEMORANDUM

FROM Dr. K. A. Phillips,  
Chief Geologist.

SUBJECT Precambrian beneath Hudson Bay Lowlands



DATE September 10th, 1968

TO Mr. J. S. Roper,  
Director of Mines

→ Bill file?

DEPARTMENT OF MINES  
 & NATURAL RESOURCES  
 SEP 10 1968  
 DIRECTOR OF MINES

I was asked by Mr. Cobert to comment on what approaches would be feasible in exploring the Precambrian beneath the Palaeozoic cover around Hudson Bay for economic purposes, and what would be the main limiting factors. The following notes are of an informal nature:-

The Palaeozoic strata are thickest to the east, reaching a maximum of a little less than 3,000 ft. near the mouth of the Kaskatama river. They thin out westwards to about 200 ft. on the line of rail 20 miles north of the Nelson river, covered, however, by another 200 ft. of overburden. At Churchill there is an inlier of Precambrian sediments derived from granitic material; hence the Palaeozoics thin to zero here and it would seem possible that other Precambrian high points would occur at shallow depths and could be revealed by geophysical methods. However, drilling costs would practically rule out effective exploration east of the railway line at present.

The approach used by Cominco to date in exploring north of Lake Winnipeg has been (i) combined aeromag/EM (Input), (ii) ground EM (Turam) and (iii) diamond drilling to intersect Precambrian at depths of 150 to 300 ft. Input and other EM techniques, including AFMAG and VLF, are being constantly improved, and theoretically can produce data from somewhat deeper levels; sensitivity decreases rapidly with depth however and figures of 1,000 ft. or more are at present mainly of academic interest, since the data would generally be too vague to justify deep drilling, except under special circumstances such as the tracing of a known, rich ore-zone from a Precambrian surface beneath a Palaeozoic contact. This is in fact the position north of Lake Winnipeg, where a projection of the known Setting Lake ore-zone beneath the Palaeozoic is indicated (though not yet proved) by the aeromagnetic trends.

The NE extension of the Nickel Belt structures are less definite; in fact the aeromagnetic and geological maps indicate that the NE trends swing east-west somewhere in the vicinity of 56°, as reflected by the Fox River



greenstone belt. This means that an extended exploration programme must commence west of the Palaeozoics in order to pick up any favourable throughgoing structures that could be traced under the Palaeozoics. If and when a breakthrough is made in this area, it is conceivable that exploration programmes similar to that of Cominco might attempt to follow through towards the line of rail. East of the railway, however, barring some unpredictable information arising from oil well drilling, I cannot, at present, foresee any likelihood of methodical Precambrian exploration.

KAP/el

*K.A. Phillips*  
K.A. Phillips,  
Chief Geologist.

c.c. to: Mr. M. J. Gobert,  
Assistant Deputy Minister

# Hudson Bay summer drilling program successfully completed by Aquitaine

By ERIK V. PETERSEN  
Exploration Editor

In a race with closing ice conditions, two of the world's most powerful workboats are towing the Pentagone-82 rig from Hudson Bay toward Hudson Strait to deliver the semi-submersible to the Oceanic Tug, a deepsea vessel that will take the rig back to the UK sector of the North Sea. When the rig passes Cape Chidley, or 64°W, it is released as a responsibility of Aquitaine Company of Canada Ltd.

The Pentagone has completed a successful season in the bay, overcoming many obstacles to finish a \$14.5 million program that completed two wildcats and cleaned up and plugged the

Walrus A-71 test drilled in 1969. It was left incomplete as the first drilling vessel in Hudson Bay was chased off the hole by weather.

Last week, the Pentagone was logging the Polar Bear C-11 wildcat completed at 5,170 feet. It had to recover the stack, and anchors by Oct. 20th and head for Cape Chidley, aiming at release date of Nov. 3.

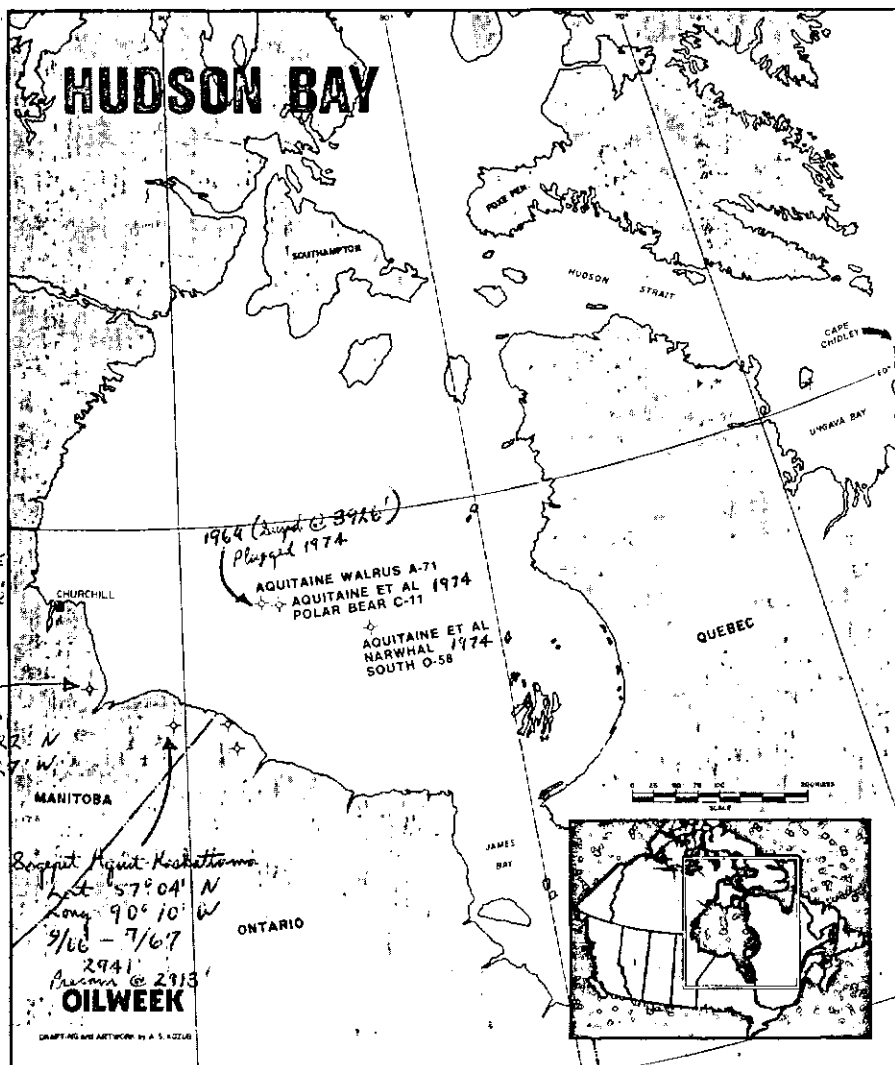
Both wells are tight. It is known the first hole Aquitaine et al Narwhal South was located on a seismic anomaly, hitting basement at 4,341 feet. Whether or not shows were encountered is not known. The Walrus well was left incomplete at 3,926 feet in 1969 and it did not hit basement but apparently contained some hydrocarbon shows. It

could not be completed this season because the old vertical stack was not deemed safe enough. On all three wells in the bay, drillers have experienced problems with high pressure calcium chloride water in the upper part of the holes. The same condition was found on the wells drilled on shore. There was potential leaking at the top of the Walrus casing, but in an extensive diver operation, it was cleaned up and plugged.

The Polar Bear C-11 well was hitting hard formations toward the bottom of the hole, making about 250 feet per day. Whether it actually hit basement as originally planned, (around 5,400 feet), or whether it stopped short because the rig had to get out of the bay (unless it was going to be ice-logged for the entire winter at an added cost of \$7 million) isn't yet known. Nor did Aquitaine talk about any shows, although its proximity to Walrus suggests there probably were some.

The play in the old cratonic basin is a controversial one. Considered one of the last virgin basins within close reach of major Canadian markets, Aquitaine and partners Shell, Petrofina, Arco and Elf Sogepet, are bullish about the prospects, but other explorationists show a bearish attitude ruling out possibility of major production to offset expensive drilling and production. But Jaques Payan, Aquitaine president, does not rule out elephants. "We could hit the big ones," he said. At the same time, with some humor, he quipped, "it's a cheap lottery ticket!" The program accounts for only a tenth of Aquitaine's exploration budget, and is deemed a worthwhile risk.

The cost of the program is being spread over several years although that wasn't done altogether by plan. Aquitaine wanted to start drilling last year. The Pentagone-82, built in Texas embodying special design modifications for the planned Hudson Bay program was originally promised for delivery in December 1972, but was not commissioned until September 1973, making this past season the first time it could get to the short summer season in the bay.



Whether it will be back next year is a moot point. The final decision will be made by the operator and partners early in November. With the new data, including sedimentation thickness, acquired this year, Aquitaine will likely want time to re-evaluate the already considerable seismic from the basin. This year, three seismic vessels operated in the bay, CGG's Arctic Orion, Kenting's Thorarinn and Shell's Hans Egede. "We have increased our knowledge tremendously," said Gerard Kuhn de Chizelle, operations manager ramrodding the Hudson Bay operations.

The bottleneck of the operation is Hudson Strait and is a matter of access. This year it took 25 days to get from Cape Chidley to the first location with the rig held up by ice, delaying operations by at least two weeks and putting pressure on the completion of the last well and escape from the area before the Strait closes up. This situation dictated an insurance premium at about \$2.5 million with Lloyds of London.

At the entry to the Strait Pentagone sat on the northern shoreline waiting for a breach in ice caused by prevailing winds. The winds shifted, opening up the southern shore instead, and the icebreaker — Labrador — cut a swath through the pack enabling the rig to reach the southern opening. It was being towed at a conservative speed of three knots, using its rear thrusters of 2,000 hp each to negotiate around heavier floes. The five pontoons had been ice reinforced with this operation in mind.

Towing the rig, owned by Sea and Land Drilling Contractors Inc., subsidiary of Forex-Neptune, were two Tidewater workboats from Dundee, Scotland, the Supreme Tide and Giant Tide. These 218 foot vessels are each powered by four diesels giving a total of 10,340 hp per boat, by far the most powerful workboats in the world. A third Canadian workboat assisted in drilling operations, the Federal 6 out of Halifax.

During actual drilling, Aquitaine was faced with major logistics problems. The rig had left the North Sea complete with valuable deck cargo of 1,500 tons of drillstring and collars. Conoco, which had operated with rig, also supplied the first 30 and 20-inch casing and the stack so drilling could begin

immediately. The rig will carry similar equipment back to the North Sea, so Conoco can resume drilling immediately.

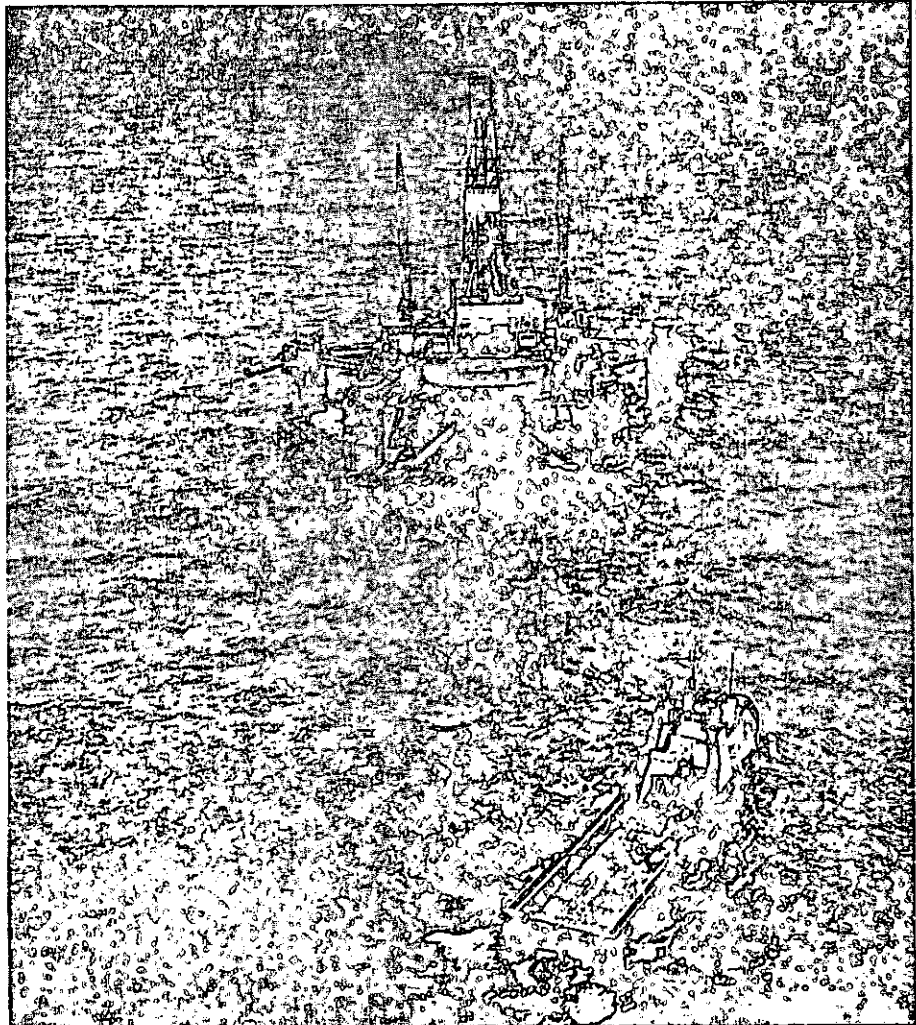
All other working materials came from Canada and USA, mud and cement products from Canada and subsea equipment from the USA. Aquitaine opened an office in Churchill and a outlying base at Pen Island. The only access to Churchill is through CNR and it took an average of two weeks to ship cargo from Calgary. At one point a train with cement cars was derailed and the operator was scrambling for alternate sources. Another time rig was held up for 24 hours waiting for mud products.

The first week was truly hairy, however. One of the Tidewater vessels had made its maiden voyage from Norway to Hudson Bay and during initial operations it was discovered that a valve had been reversed so it was pumping cement instead of barite and vice versa. Then initially, there was no

mud available, and the start of the first hole was made using sea water. Then the supply DC-3 taxiing at Pen Island airstrip stuck a wheel into soft ground causing plane to stand on its nose, crumbling a propellor and a new prop had to be shipped in. All of this made the first week of operations memorable for the operator, who had spent two years planning a smooth operation.

The crew represented an international mixture of Scots, French, Germans and Canadians, and occasionally squabbles would erupt in true European tradition. Communications were at times a problem, but a toolpush said, "it's amazing how quickly everybody could pick up some of the basics in the two working languages, which were French and English."

Talking to Scottish seamen on the rig and the workboats, Oilweek learned the crews were actually looking forward to a North Sea winter! It would be stormy, but less cold."



Giant Tide workboat approaching Pentagone 82 in Hudson Bay.

ns & Developments Limited  
five Appointments



J. R. Zimmer

R. W. Lavigne

ngs & Investment Properties and additionally will act as Project  
follow Manager, Sarnia Operations.  
J. R. Zimmer has been appointed Vice President - Market-  
ing and will also continue to function in the area of New  
to us Business Development.  
R. W. Lavigne, Treasurer, has additionally assumed the  
post of Secretary of the company.  
The above changes are designed to foster the current  
expansion plans of Major Holdings.

ases in six-month period

Share Profit	Revenue	Profit
Year Ago	Latest	Year Ago
1	47,580	30,468
3	6,279	5,379
6	16,516	12,156
4	0.62	
18	48,372	42,409
4	10,522	6,845
Toronto		
6	135,348	116,030
	24,430	15,281
	20,451	14,387

Rio Algon's profit improvement resulted primarily from higher earnings in steel operations, higher copper prices and increased uranium earnings, partly offset by a substantial increase in provisions for income and mining taxes and government royalty.

NEB CABLE

Profit of Maclean-Hunter Cable TV Ltd. in the three months ended June 30 was \$464,000 (\$374,000) or 22.9 cents a share (17.5 cents) on revenue of \$3,417,000 (\$2,932,000).

The company applying to the Canadian Radio-Television Commission, to increase the monthly charges to cable TV subscribers on several of its systems.

Subsidiary Maclean-Hunter Communications Ltd. operated at a break-even level for the six months, a substantial improvement over last year when it lost 4 cents a common share in the corresponding period.

Drills set to probe off Hudson Bay shore

By THOMAS KENNEDY  
Special to The Globe and Mail  
CALGARY — Drilling of the first of a pair of offshore wells in Hudson Bay by a consortium headed by Aquitaine Co. of Canada Ltd., Calgary, is expected to start this week.

The first exploratory venture, at the Narwal N-58 location, is expected to be started as soon as calm weather prevails in the often ice-infested and fog-bound central sector of the bay.

It will be the second offshore probe in an area regarded as promising for both crude oil and natural gas.

The first offshore well in Hudson Bay was taken down in 1969, also by Aquitaine, in an experiment that was cut short by severe weather conditions.

A specially prepared drilling vessel, Pentagon No. 82, will attempt to drill the two wells during the short summer season. The drill ship must complete its work and leave the bay before freezeup in early fall.

Working interest in the program is shared by Aquitaine, 26.3 per cent; Shell Canada Ltd. of Toronto, 30.5 per cent; and Petrofina Canada Ltd. of Montreal and Sogepet Ltd. of Calgary, 6.6 per cent each.

Earlier, Shell agreed to fund the respective interests of Atlantic Richfield Co. Inc. — 52.6 per cent — and Elf Exploration and Production Ltd. — 7.9 per cent — in the venture to become its largest single interest holder.

Shell is reported to have agreed to pay up to \$5.4 million toward the cost of the offshore program, which is estimated to cost a total of about

\$12-million. It could earn a maximum of 50 per cent over-all interest in the program if all work is carried out as planned by 1976.

The second well planned in the program will be 175 miles southwest of the initial location. Code named Polar Bear No. 2, it will be taken down adjacent to the abandoned Walrus A-71 test-drilled and suspended at 3,926 feet, the first offshore well in Hudson Bay.

The first well recorded hydrocarbon showings that might be given some significance by the additional exploration work this summer.

About half a dozen exploratory wells have been drilled so far on land along the southern coastline of Hudson Bay in the Nelson River estuary region. All have been abandoned.



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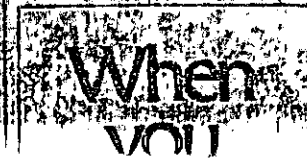
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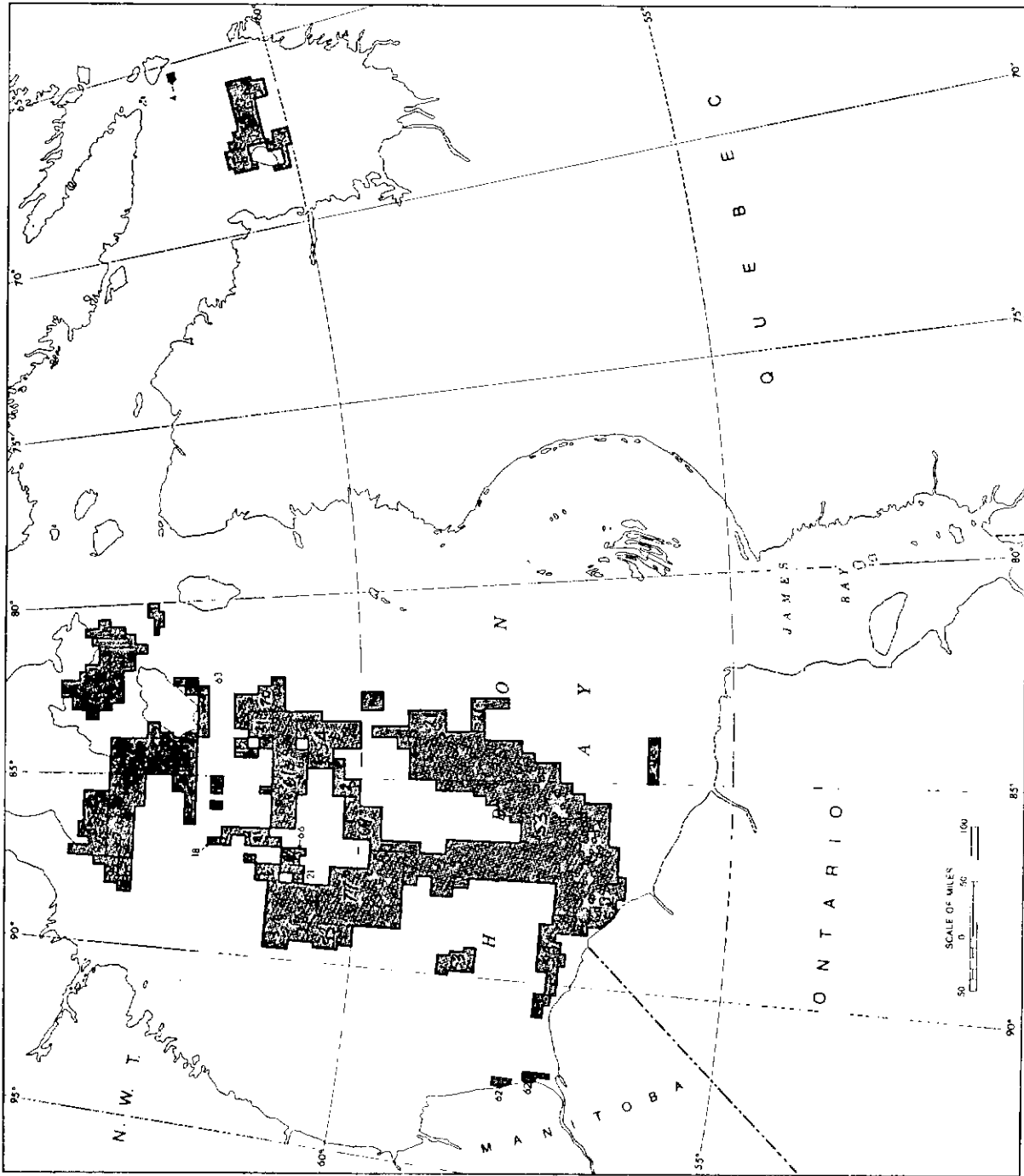
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NEB increases export level for propane

Special to The Globe and Mail  
OTTAWA — The National Energy Board has authorized the export of 912,687 barrels of propane to the United States during August, up slightly from this month's authorized export of 909,227 barrels.





DEPARTMENT OF ENERGY, MINES AND TECHNICAL SERVICES  
 FEDERAL OIL AND GAS EXPLORATORY PERMITS  
 HUDSON BAY AND HUDSON STRAIT  
 RESERVE MANAGEMENT AND CONSERVATION BRANCH  
 JULY 1, 1974

## INDEX

### KEY PERMITTEE

1.	Lochiel Exploration Ltd.	
2.	Siebens Oil & Gas Ltd.	
3.	Hudson's Bay Oil and Gas Company Limited	10%
	Ranger Oil (Canada) Limited	57%
	Bow Valley Industries Ltd.	8%
	Canadian Superior Oil Ltd.	25%
4.	Bow Valley Industries Ltd.	
5.	Canada Geothermal Oil Ltd.	1/3
	Bow Valley Industries Ltd.	2/3
6.	Western Decalta Petroleum Limited	45%
	Petrol Oil & Gas Company, Limited (The)	5%
	Petrorep (Canada) Ltd.	25%
	Corexcal, Inc.	25%
7.	Ulster Oil Enterprises Ltd.	
8.	Ranger Oil (Canada) Limited	
9.	Canadian Homestead Oils Limited	
10.	Shell Canada Limited	50%
	Shell Explorer Limited	50%
11.	BP Exploration Canada Ltd.	50%
	Supertest Investments and Petroleum Limited	50%
12.	Total Petroleum (North America) Ltd.	5.00%
	Amerada Minerals Corporation of Canada Ltd.	16.67%
	Eastcan Exploration Ltd.	28.33%
	Aquitaine Company of Canada Ltd.	13.33%
	AGIP Canada Ltd.	10.00%
	Sunoco E & P Limited	10.00%
	Gulf Oil Canada Limited	16.67%
13.	Gulf Oil Canada Limited	
15.	Shenandoah Oil North America Ltd.	
16.	Amoco Canada Petroleum Company Ltd.	
17.	Lochiel Exploration Ltd.	50%
	Texaco Exploration Canada Ltd.	50%
18.	Canadian Industrial Gas & Oil Ltd.	
19.	Mobil Oil Canada, Ltd.	50%
	Aquitaine Company of Canada Ltd.	50%
20.	Bow Valley Industries Ltd.	1/3
	Troy Oils Ltd.	2/9
	Solar Energy Resources	2/9
	Michigan Wisconsin Pipeline Company	1/9
	American Natural Gas Production Company	1/9
21.	Mobil Oil Canada, Ltd.	
22.	Dome Petroleum Limited	
23.	Star Oil & Gas Ltd.	
24.	Shenandoah Oil North America Ltd.	93%
	Canadian Superior Oil Ltd.	7%
25.	Wainoco Oil Ltd.	
26.	Sulpetro of Canada Ltd.	
27.	Canadian Homestead Oil Limited	50-1/2%
	Premium Iron Ores Limited	12-1/2%
	Lone Star Mining and Exploration Co. Ltd.	37-1/2%
28.	Texaco Exploration Canada Ltd.	
30.	Transalta Oil & Gas Ltd.	
31.	Canada Northwest Land Limited	
32.	Canadian Superior Oil Ltd.	
33.	Voyager Petroleum Ltd.	

### KEY PERMITTEE

34.	Mobil Oil Canada Ltd.	50%
	Solar Energy Resources Ltd.	25%
	Michigan Wisconsin Pipeline Company	12-1/2%
	American Natural Gas Production Company	12-1/2%
36.	Canada Geothermal Oil Ltd.	3-1/3%
	Mobil Oil Canada Ltd.	33-1/3%
	Michigan Wisconsin Pipeline Company	16-2/3%
	American Natural Gas Production Company	16-2/3%
	Canadian Export Gas & Oil Ltd.	30%
37.	McLean, A.S.	
38.	Anco Exploration Ltd.	
39.	Canadian Reserve Oil and Gas Ltd.	
40.	Siebens Oil & Gas Ltd.	40%
	Transalta Oil & Gas Ltd.	40%
	Hudson's Bay Oil and Gas Company Limited	10%
	Canadian Superior Oil Ltd.	10%
41.	Husky Oil Operations Ltd.	
42.	Columbia Northland Exploration Ltd.	
43.	Scurry-Rainbow Oil Limited	
45.	Standard Oil Company of British Columbia Limited	
46.	Elf Oil Exploration and Production (Canada) Ltd.	
47.	Hudson's Bay Oil and Gas Company Limited	
48.	Murphy Oil Company Ltd.	25%
	Candex Development Limited	25%
	Francona Oil & Gas Ltd.	12 1/2%
	Husky Oil Ltd.	25%
	CNG Development Company Ltd.	12 1/2%
50.	Paddon Hughes Development Co. Ltd. (The)	
51.	Soget Limited	33-1/3%
	Teck Corporation Limited	33-1/3%
	Canadian Homestead Oil Limited	33-1/3%
52.	Gulf Oil Canada Limited	92-1/2%
	Global Marine Arctic Ltd.	7-1/2%
53.	Atlantic Richfield Canada Ltd.	52.6%
	Aquitaine Company of Canada Ltd.	26.3%
	Elf Oil Exploration and Production Canada Ltd.	7.9%
	Petrofina Canada Ltd.	6.6%
	Soget Limited	6.6%
54.	Aquitaine Company of Canada Ltd.	
56.	Sunlite Oil Company Limited	
57.	Kestrel Exploration Limited	
58.	Pan Ocean Oil (Canada) Ltd.	45%
	Peyto Oils Ltd.	28%
	high North Petroleum Ltd.	14%
	Norris Holdings Ltd.	13%
59.	Pennant-Puma Oils Ltd.	66-2/3%
	Provident Resources Ltd.	16-2/3%
	Colonial Oil & Gas Limited	16-2/3%
60.	Ulster Oil Enterprises Ltd.	12-1/2%
	Canadian Export Gas & Oil Ltd.	50%
	Westcoast Petroleum Ltd.	37-1/2%
61.	Mobil Oil Canada, Ltd.	50%
	Canadian Export Gas & Oil Ltd.	50%
62.	Northwest Oils Ltd.	
63.	Teck Corporation Limited	
64.	Soget Limited	
66.	Worldwide Energy Company Ltd.	

### KEY PERMITTEE

67.	Ram Petroleum Limited	
69.	Home Oil Company Limited	
70.	Bluewater Oil & Gas Limited	
75.	Union Oil Company of Canada Limited	
76.	Ulster Oil Enterprises Ltd.	25%
	United Canso Oil & Gas Ltd.	25%
	Canadian Export Gas & Oil Ltd.	50%
77.	Mobil Oil Canada, Ltd.	25%
	Canada-Cities Service, Ltd.	30%
	Hamilton Brothers Canadian Gas Company Ltd.	27.5%
	Siebens Oil & Gas Ltd.	17.5%
78.	Amoco Canada Petroleum Company Ltd.	50%
	Imperial Oil Enterprises Ltd.	50%
79.	Houston Oils Limited	25%
	Asamera Oil Corporation Ltd.	25%
	Pan Ocean Oil (Canada) Ltd.	25%
	Lochaber Oil Corporation Ltd.	25%
80.	Trans-Prairie Pipelines, Ltd.	
82.	Buttes Resources Canada, Ltd.	
84.	Axel Heiberg Oil Company	98%
	Artik Leaseholds Inc.	2%
86.	Texas Gulf Inc.	40%
	Teck Corporation Limited	20%
	Canadian Homestead Oils Ltd.	20%
	Soget Limited	20%
89.	Siebens Oil & Gas Ltd.	50%
	Transalta Oil & Gas Ltd.	50%
90.	Canadian Homestead Resources Limited	60%
	Bow Valley Industries Ltd.	40%
91.	Siebens Oil & Gas Ltd.	75%
	Aquitaine Company of Canada Ltd.	25%
92.	Altana Exploration Company	
93.	Western Decalta Petroleum Limited	30.0000%
	Petrol Oil & Gas Company Limited (The)	3.3334%
	Petrorep (Canada) Ltd.	16.6666%
	Corexcal, Inc.	16.6666%
	Pacific Lighting Exploration Company	33.3334%
94.	Sunoco E & P Limited	50%
	Canadian Homestead Oils Limited	18.75%
	Pacific Petroleum, Ltd.	25%
	Castle Oil & Gas Limited	6.25%
96.	OSFC Petroleum Canada Limited	
98.	Imperial Oil Enterprises Ltd.	
101.	Sultan Exploration Ltd.	50%
	Pan Northern Petroleum Ltd.	50%
102.	Fairholme Development Limited	
104.	Oil Ventures International Inc.	
105.	Douglas F. Smith	
106.	Transalta Oil & Gas Ltd.	60%
	Offshore Exploration Oil Company	20%
	Marwood Petroleum Ltd.	5%
	Scurry-Rainbow Oil Limited	15%
107.	Transalta Oil & Gas Ltd.	40%
	Offshore Exploration Oil Company	20%
	Marwood Petroleum Ltd.	13%
	Scurry-Rainbow Oil Limited	20%
	Canadian Superior Oil Ltd.	7%
109.	Pan Northern Petroleum Ltd.	66 2/3%
	Sultan Exploration Ltd.	33 1/3%

# Pentagone semi-submersible was ideal for short, stormy Hudson Bay season

By **ERIK V. PETERSEN**,  
Exploration Editor

Units of the Pentagone series no longer are the biggest semi-submersible rigs in operation but they are still considered the most stable drilling platforms afloat by virtue of the five-column-pontoon design. More stable than tripods or quadropods, a Pentagone is particularly more stable than the biggest semi-subs even though they feature six to eight columns.

The multi-column designs terminate in two pontoons which, however large, can convert the biggest rigs into giant rocking chairs. The stability of the quinto-pod was a prime reason that Aquitaine Co. of Canada Ltd. picked the Pentagone P-82 for operation in Hudson Bay. The choice was made on the basis of experience with the ill-fated drilling barge Wodeco II which was blown off the first hole punched in the bay in 1969.

Even with its inherent stability, the P-82 can comfortably handle roll and pitch up to 5°. Peak roll (sideway rocking) experienced in the Bay was 2½°, and pitch (for-aft motion) was 1¾°. At that time the rig was heaving (up-down motion) six feet and bucking 80-knot winds. Weather forecasts were for worse conditions so drilling was stopped on the Narwhal hole but it turned out that had not been necessary. The rig is designed to handle 75-foot waves and 150 knot winds.

The P-82 has a length of 325 feet, width of 338 feet and an overall height of 317 feet. It weighs in at 10,200 tons and it carries a crew of 74. Each column is 31 feet in diameter. Specific modifications made to P-82 during construction in Marathon LeTourneau yards in Brownsville, Texas, included the ice-strengthening of pontoons and enclosure of the drilling deck to protect roughnecks from icy Hudson Bay winds. Other modifications were special insulation for water tanks, added steam piping to cut down on icing and a blower unit for hydraulic fluid capable of mixing soluble oil and water.

When drilling, the P-82 is ballasted to a draft of 22 metres at which point its gross tonnage reaches 19,338 metric tons. In towing configuration, draft is reduced to 7½ metres.

Reviewing the Hudson Bay performance, Gerard Kuhn de Chizelle, drilling specialist on loan from Aquitaine's Paris office, said the only major improvement needed to make a rig ideal for the short Hudson Bay season, would have been dynamic positioning. "We lost too much time in anchoring. The added cost of dynamic



Sophisticated electronics aboard P-82 were used to assure rig was level during drilling. Double-check of electronics was an old-fashioned plumb-line in radially market bucket.

*When the Pentagone P-82 entered Hudson Bay this year, it made history as the northernmost semi-submersible rig operating in the world. Although its exploits have been covered fairly extensively in Oilweek, the pioneering effort was of a significance requiring review from technological and drilling angles.*

*The P-82 was the biggest semi-sub to operate in Canadian waters, the first of its breed to have ice-strengthened pontoons and its operation was a considerable success technologically although drilling results may have been disappointing to its operators.*

*The operation was erroneously referred to as "the first use of semi-submersible technology in Arctic waters" in an ecologically critical article in Northern Perspectives Vol. 2, No. 4, 1974, published by the Canadian Arctic Resources Committee. The operators made no such claim since the closest Pentagone came to the Arctic Circle was about 225 miles. That was in the Hudson Strait entry to the Bay. The Arctic Circle bisects Foxe Basin to the north of Hudson Bay.*

positioning on the semi-sub (no such unit is yet in operation) would have made the difference between three instead of two holes drilled this season."

Total time for anchoring and anchor removal on the three locations was 17 days or 408 hours. The period includes rig refit during first location anchoring, and strip-down for return journey during last location anchor removal.

Here is the time analysis of the Polar Bear C-II and Narwhal South O-58 holes. Both wells went into granite basement (indicating disappointingly shallow sedimentation). Completed depths were 5,170 feet on Polar Bear, and 4,341 feet for Narwhal:

	Polar Bear hours	Narwhal hours
Drilling .....	322:45	281:00
Downtime .....	45:30	57:15
Casing .....	122:15	129:30
Fishing .....	8:30	0:30
Abandon .....	52:45	52:00
Repairs .....	18:30	1:00
Waiting (weather, supplies, equipment) .....	33:30	78:15
<b>TOTAL .....</b>	<b>764:45</b>	<b>739:00</b>

Toward the bottom of the holes,



drilling slowed down to about 250 feet per day. An insert bit was used for hard formations and lasted from 34½ hours to 67 hours. Trip times were one hour per 1,000 feet, plus one hour for bit change, plus an additional hour for green floor crew. Experienced roughnecks are still in international shortage.

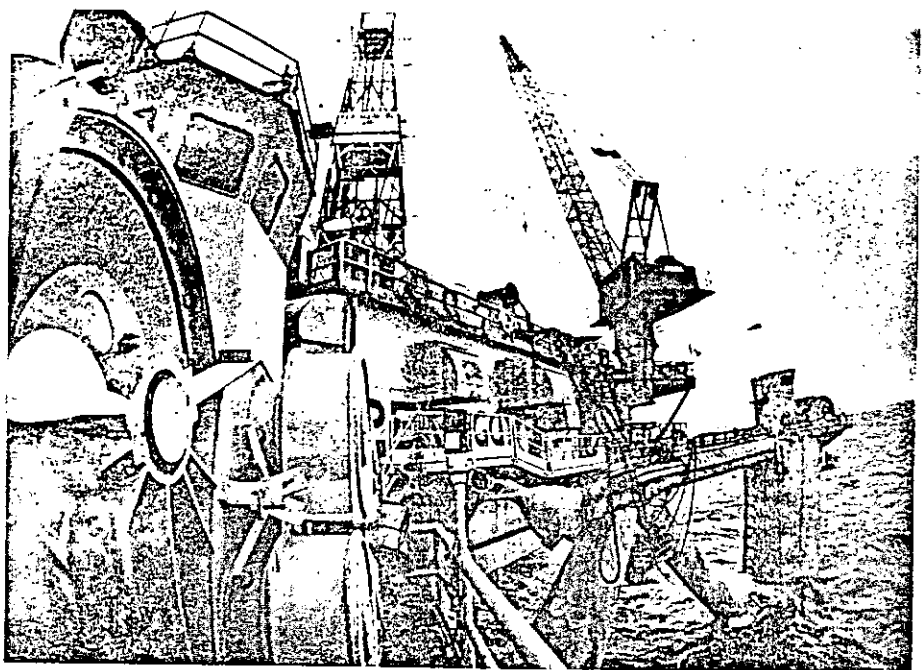
Cleanup and abandonment of the Walrus A-71 well, left incomplete at 3,926 feet in 1969, had following time analysis:

	Hours
Location and anchoring .....	105:00
Cleaning top of old stack .....	83:00
Plugging well .....	126:00
Dismantling stacks, retrieving anchors .....	60:30
Waiting on weather for critical operation .....	59:30
<b>TOTAL .....</b>	<b>434:00</b>

In the diving operation on the Walrus well, six divers were under saturation for 219 hours and the total working time spent by all divers during the 11 wet dives outside the bell was 32:04 hours.

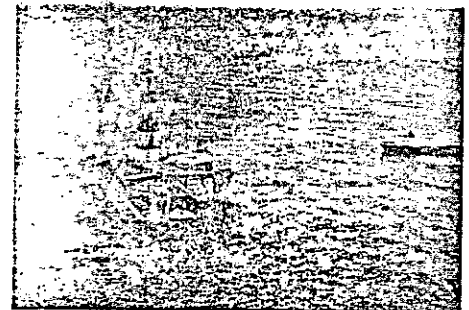
One 30,000 pound anchor was lost when it became snagged in old anchors and cables abandoned by Wodeco II.

The BOP stack recovered from the Walrus well was rust free and had perfectly functioning hydraulics. Currently being re-conditioned is a Hydрил 16¾ inch 5,000 MSP bag type BOP; two Shaffer 16¾ inch 5,000 LWS double BOPs, and two Shaffer 5,000 psi

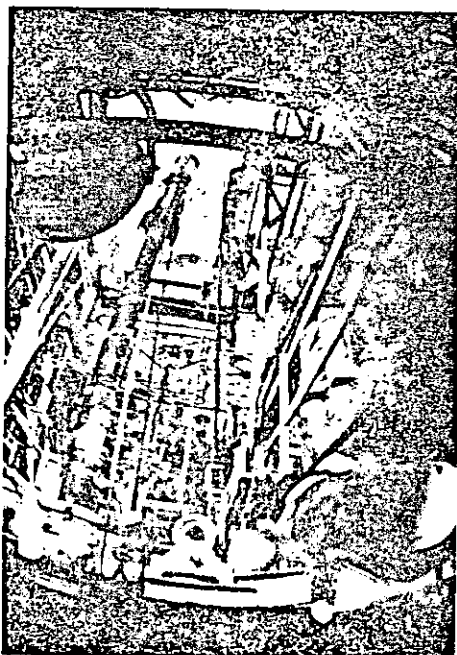


Platform was rock-steady when this Oiteek photo was taken. Waves were nine feet at the time.

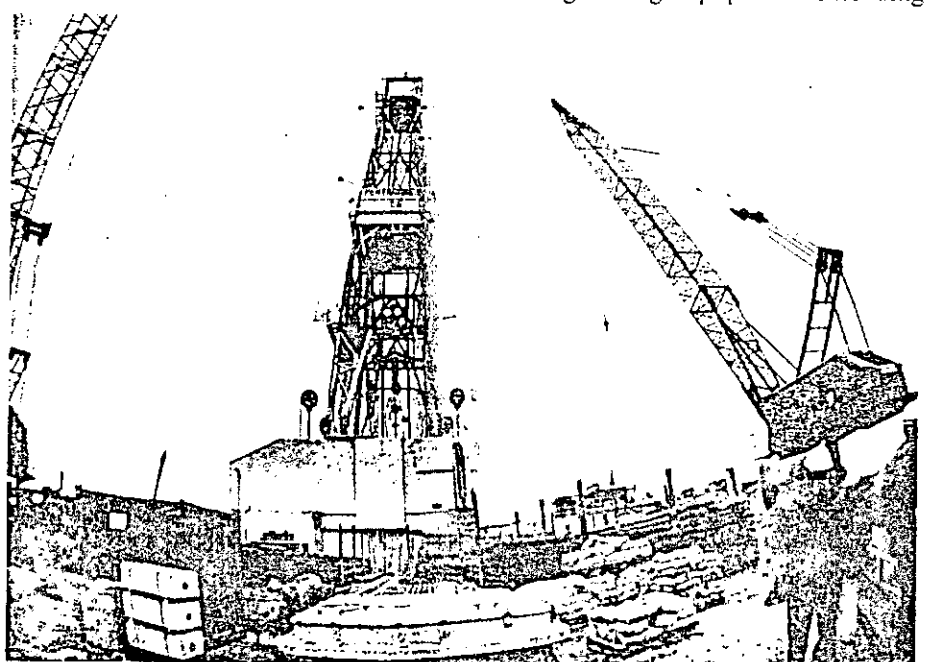
three-inch hydraulic fail safes. Also being reconditioned are Vetco connectors, BOP guide frames and post and three 20-inch BTM riser connectors left by Wodeco II. Equipment damaged either when drill barge was blown off the hole or during salvage, or considered obsolete today, were an F&R Multiball flexjoint, two choke and drill line connectors, choke, kill and ser pipe, and one kooomey rod. These re-conditioned BOP stack is likely to end up on the Havdrill drillship which has its stack along with 8,000 feet of drillpipe during a storm on the BP Columbia Bonavista C-99 wildcat off Newfoundland in October.



At the present time, the P-82 is in Stavanger Bay, Norway, for pontoon repairs and new equipment required by Conoco, its new operator in North Sea including diving equipment extending



Marine riser easily coped with six-foot heave in Hudson Bay.



Semi-fisheye view from P-82's deck shows enclosed drilling floor for Hudson Bay operations and two Manitowoc cranes.



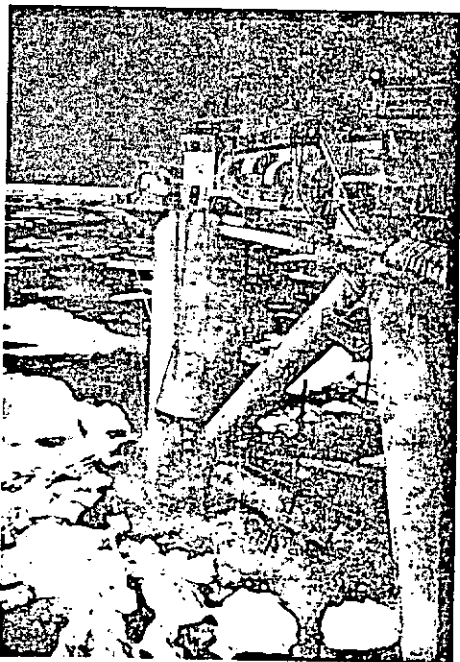
the diving limit from 600 feet to 1,000 feet and a 750 hp bow thruster unit.

Damage to one pontoon occurred in Hudson Strait during entry in July. All five pontoons were ice-reinforced, but only the forward parts. At one point ice floes began overtaking the rig from the rear and the pontoon was dented over a two square metre area. Hull integrity remained and no leak occurred.

The P-82 is thruster assisted with two 2,000 hp units and one 750 hp unit. The latter had been damaged in the North Sea and was not functioning during the entire Hudson Bay venture, but since both bigger rear thrusters were still working well, this was deemed unimportant. The thrusters proved handy for turning the rig during tow to avoid the biggest ice floes. Fuel consumption of thrusters amounted to about 18 tons per day.

The operation could perhaps have been carried out more cheaply with a drillship instead of the semi-sub, but the length of available drilling time would have been tremendously reduced. Add reduced drilltime to less stability in the bucky Bay and a drillship was quickly ruled out. At \$14.5 million the venture rates as one of the most expensive offshore undertakings to date.

Here is the complete P-82 schedule: It left the North Sea June 12, arrived at Cape Chidley July 11 and reached Narwhal on July 26. It left Walrus Sept. 2 and Polar Bear Oct. 20, arriving at Cape Chidley Oct. 31, and docked in Stavanger Bay, Nov. 23.



Going through 2/10 ice cover in Hudson Strait. Aquitaine photo.

# We custom-built and barged Brinkerhoffs 42-man camp to the Aleutians

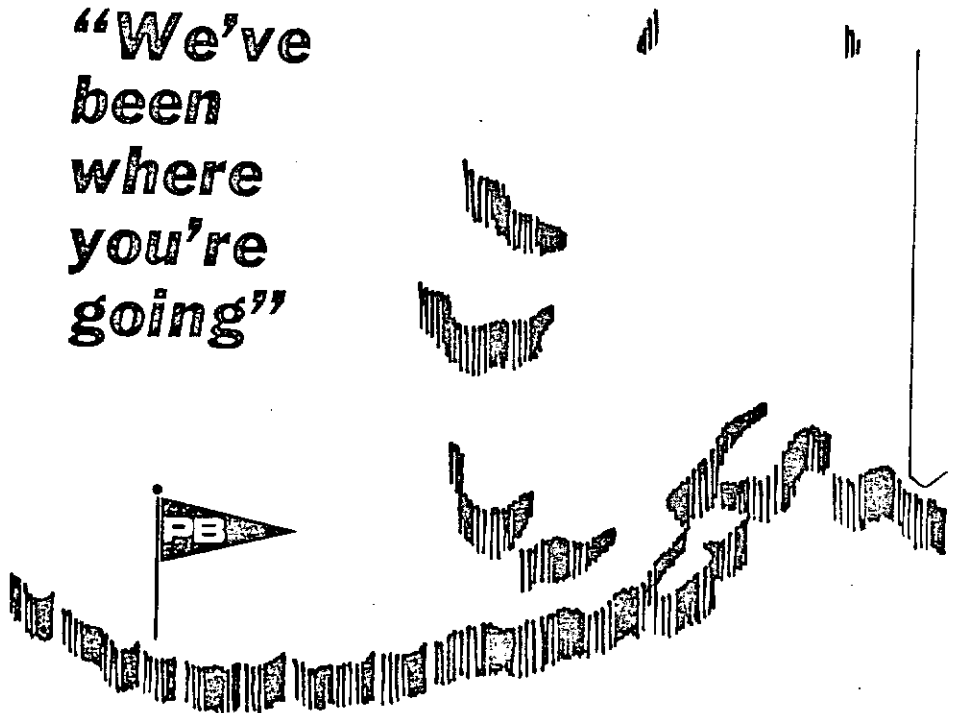
The weather can get quite nasty in the Aleutian Islands, but the men who work for Brinkerhoff Bros. are snug and secure in a Hercules transportable, 42-man camp built especially for them by Porta Built. The camp consists of 14 modular units 39 feet in length, and is completely electric. Whenever you are ordering modular buildings for the oilfields or for any other use, remember Porta Built's reputation for extra attention to detail. Our units are built stronger to last longer.



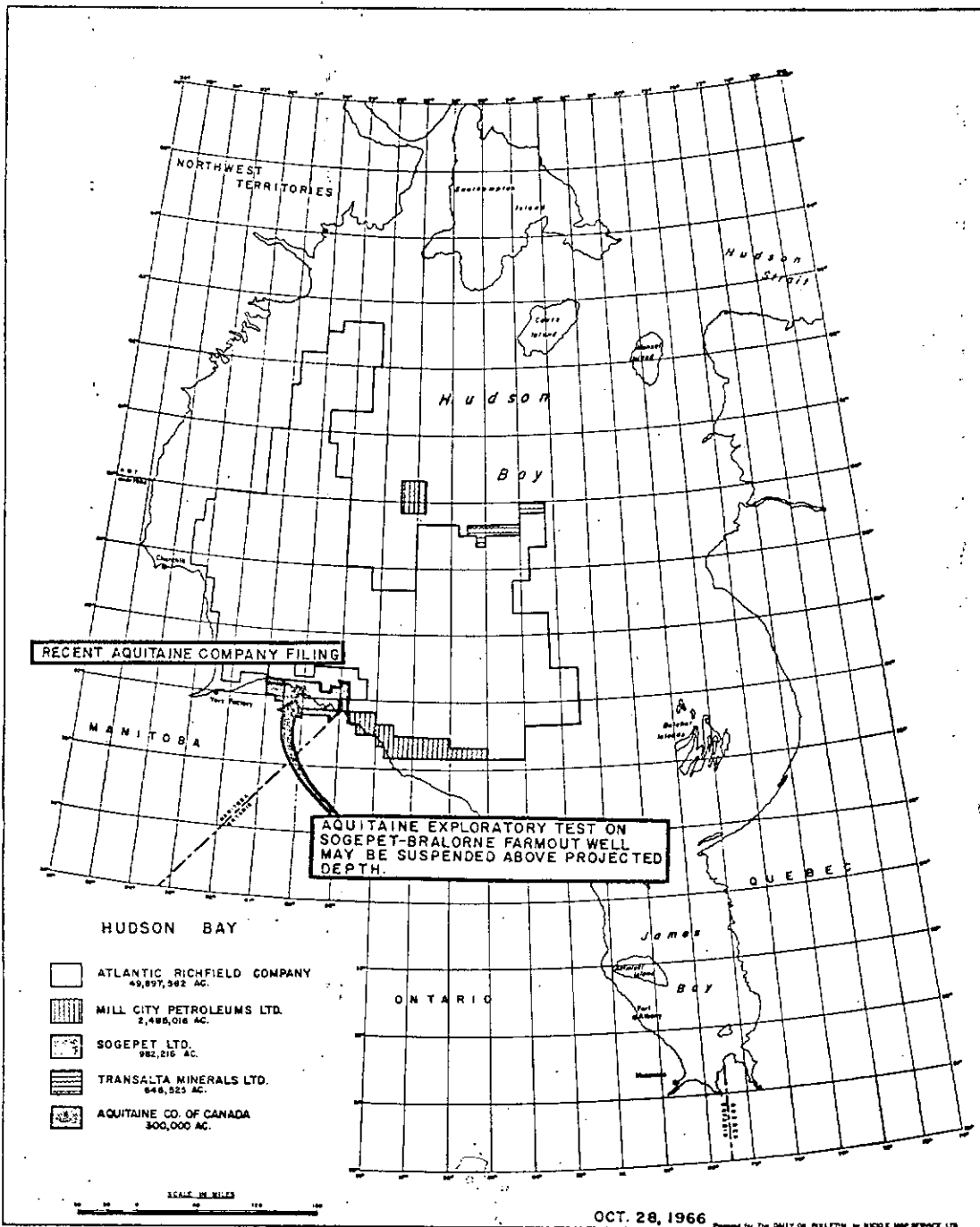
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AQUITAINE COMPANY OF CANADA FILING ADJACENT TO RIGHTS HELD UNDER FARMOUT FROM SOGEPET.....



The adjacent map details the 300,000 acres that Aquitaine Company of Canada Limited filed from the Manitoba Government on October 25th, 1966. The spread of rights it will be noted are adjacent to lands previously held under exploration agreement from the team of Sogepet Limited and Bralorne Petroleum Ltd.

At the presently drilling Sogepet Aquitaine Kaskattama Prov. No. 1 wildcat (57 degrees and 4 minutes North Latitude and 90 degrees and 9 minutes West Longitude) the most recent depth report shows the venture at 1,700 feet. The well is scheduled to test all prospective sediments to basement. It must be realized that in a geological province as previously untested as the Hudson Bay district thickness of sediments is relatively unknown and it may therefore be necessary to suspend operations prior to reaching basement. A determining factor in the depth reached will very definitely be weather and operating conditions. Big Indian Drilling Co. Ltd., project contractor, has one of its specially equipped Failing 1500 rotary drills on the wildcat and it can drill to a maximum of

4,000 feet if required. At last report it was making hole below 1,761 feet. Drilling operations will be carried out as long as possible, or basement is reached.

SUMMARY ALTA, GOV'T LAND TRANSACTIONS (Continued from Page Five)

PETROLEUM AND NATURAL GAS PERMITS TERMINATED - NIL  
 PETROLEUM AND NATURAL GAS RESERVATIONS ISSUED - NIL  
 PETROLEUM AND NATURAL GAS RESERVATIONS TERMINATED

	No.	TwpRge.	Mer	Acres.
Muskeg Oil Company	674L	53 5	5	15,360
		54 5, 6	5	
<b>APPLICATIONS FOR PETROLEUM AND NATURAL GAS LEASES</b>				

**Thick reef sections**

Both wells have penetrated several hundred feet of porous dolomite and some limestone in the Lower Keg River to Rainbow member (Keg River reef) named Rainbow member by Banff Oil's Dr. M. A. Hriskevich) intervals and varying amounts of porous development in the Muskeg and Sulphur Point. Porous limestone occurs in the Slave Point formation, top interval of the Middle Devonian carbonate section.

Seaboard somehow managed to drillstem test the tight zones when drilled its wildcat to 5,376 feet in the Precambrian in 1956. Rumors persist that Tenneco logged and tested the thick porous stretches in the section and struck oil pay. The White Rose well tested salt water from the Keg River reef — an indication that it could lie updip from the well.

This Larne Creek-Steen River Middle Devonian reef complex may stretch for some 50 miles from southeast of these two wells in a north-westerly direction until it joins the east-northeast trending Bistcho reef complex in the north, site of another promising exploration district, where Placid Oil is sitting pretty with two rich gas-condensate wells, one of which has also a rumored oil leg (reported in the March and April issues of OILWEEK).

Keg River reef development is not the only play in the Zama North-teen River area. The shown section of the C&E Steen R 10-28 (Lsd.

10-28-117-4 W. 6) abandonment has only tight limestone in the Lower Keg River formation and evaporite and dolomite stringers in the Rainbow member but gave up two feet of oil from the Slave Point together with mud and salt water and oil flecked and gas cut mud together with salt water from the Sulphur Point formation. Quite conceivably oil and gas could occur in porous intervals of these formations updip from the abandonment.

As operators gear for the next drilling rush in northwest Alberta this district should be one of the hot spots.

**Aquitaine to spud soon at Hudson Bay site**

Aquitaine Co. of Canada Ltd., Canadian subsidiary of Societe Nationale des Petroles d'Aquitaine of Paris, will spud the first hole in the budding Hudson Bay exploration play which was kicked off by Richfield Oil with the acquisition of 45 million acres in Hudson Bay. Currently a rig is being moved from Edmonton to a port on the Bay, from where it will be taken by barge to the Kaskattama River. Exact location has not been surveyed yet. Spud date will be in second half of August.

Stake is on one-million-acre permit farmout from Sogepet Limited and Bralorne Petroleum Limited involving onshore Manitoba provincial permits and offshore federal permits in

about equal portions along the west side of the Bay. Drill site will be in the Kaskattama River area. Actual drilling operation will be handled by Banff Oil under contract from Aquitaine. Venture will earn Aquitaine a half interest in the total acreage, Sogepet 40 percent and Bralorne 10 percent. Banff has no interest in the transaction.

Aquitaine is also rumored to be negotiating a farmout option from Atlantic Richfield Company covering 50 million acres of federal offshore permits in Hudson Bay. Initial drilling might be possible by 1968.

Total federal offshore holdings in Hudson Bay amount to 53,473,919 acres, of which Atlantic Richfield holds 50,034,519 acres; Sogopet Exploration 493,438 acres; Mill City Petroleum, 2,399,437 acres, and Transalta Minerals, 546,525 acres.

Seismic profiles shot by the Geological Survey of Canada last year indicated about 7,000 feet of sediments containing considerable structure in the central basin of the bay.

**Bralorne to seek helium in Manitoba**

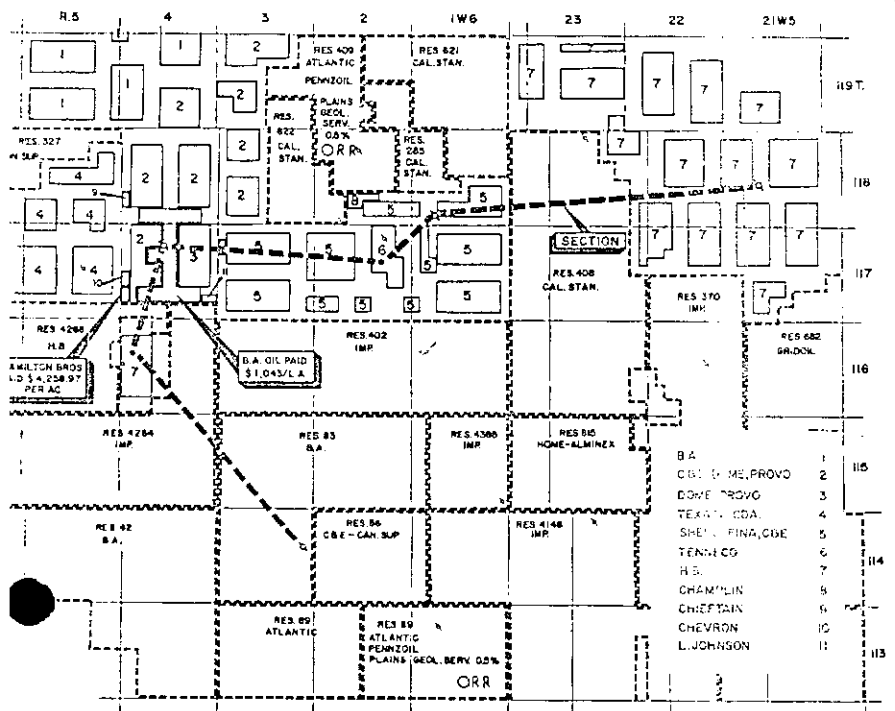
Bralorne Petroleum Limited has announced acquisition with three partners of oil, natural gas and helium exploration rights on 200,000 acres of Manitoba Crown land in the Lake St. Martin area of the interlake region. This brings its total holdings in the area to 600,000 acres.

Five exploratory wells are planned at a total cost of \$60,000. This is the value of the refundable deposit which had to be lodged with the Manitoba Government as a work commitment. The information was contained in the half-year report of the parent Bralorne Pioneer Mines Limited.

**Foothills parcels draw little interest**

Only two of six reservation parcels offered by Alberta Director of Minerals received bids at Aug. 9 sale.

Texaco Exploration was successful bidder for 5,760-acre parcel about 20 miles northwest of Nordegg with bonus of \$32,140.89, while Siebens Oil and Gas picked up 13,130 acres north of the Waterton field for \$232. Parcels not getting bids were west of Turner Valley field and southwest of Jumping Pound.



# A new look at the permafrost problem

**One half of Canada, comprising the Yukon, North-west Territories and northern parts of many of the provinces are underlain by "perennially frozen ground".**

By **E. W. Brooker, president, and D. W. Hayley, chief engineer, Brooker and Associates, Edmonton**

Permafrost or "perennially frozen ground" is the condition of earth materials, including all soils (clays, silts, sands, gravels) and rock remaining continuously below 0°C (32°F). One half of Canada, comprising the Yukon, North-west Territories and the northern parts of the province is underlain by permafrost.

The approximate distribution of permafrost in the north circumpolar regions of the world is shown in Figure 1. The phenomena is often a major controlling factor in the environment of the north and has a profound influence on future economic and social development. Because of the impact of permafrost on northern development, new and essential knowledge concerning its nature and distribution is now evolving. Research is underway and practical experience is presently being acquired, both of which are valuable to the extraction industries, comprising mining and the production of oil and gas. Transportation and communication facilities to support such operations also requires the application of permafrost engineering knowledge.

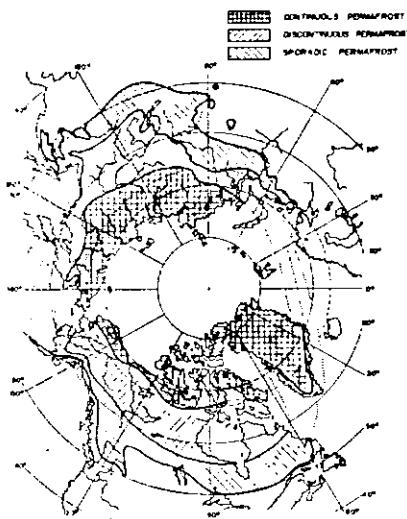


FIGURE 1 PERMAFROST DISTRIBUTION NORTHERN HEMISPHERE  
FIG. NO. 1

### Control of permafrost

Decay of permafrost is determined by a variety of constant and variable factors (Muller, 1947) as tabulated below.

#### A. Constant Factors include:

1. Geographic Position (Latitude, Longitude and associated environmental factors).
2. Topographic Relief.
3. Natural Air Temperature (extremes and duration).
4. Precipitation.
5. Direction of Prevailing Winds.

#### B. Variable Factors include:

1. Snow Cover.
2. Vegetation.

3. Moisture Content of the Ground.
4. Thermal Conductivity of the Ground.
5. Surface Evaporation.
6. Localized Thermal Regime due to Construction.
7. Local Geologic Circumstance (soil types, distribution and pattern of stratification).

The practical distinction between these two groups lies in the fact that those of group A tend to stabilize local climatic conditions, and if correctly evaluated provide a rational basis for establishing local construction practice. The factors in the Group B, however, can to some extent be controlled and are thus utilized to alter the thermal balance to advantage. Permafrost engineering involves the assessment of the various factors outlined above and their advantageous control.

Seasonal climatic circumstances and

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**John K. Burrell**

Mr. Burrell has been appointed Manager—Engineering and Construction for both Alberta and Southern Gas Co. Ltd. and Alberta Natural Gas Company, and will be responsible for all engineering and construction activities for both companies. Mr. Burrell was formerly Chief Engineer of both companies.

Born and educated in Alberta, Mr. Burrell is a graduate of the University of Alberta and a registered professional engineer in the provinces of Alberta and British Columbia. He will continue to reside in Calgary.

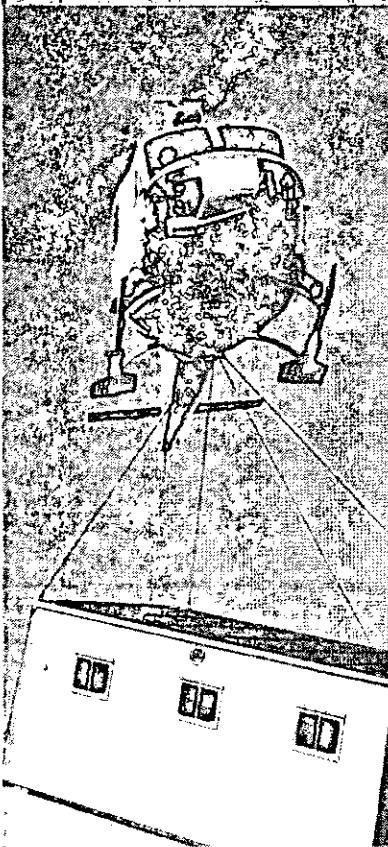


**Douglas R. Fenton**

Mr. Fenton has been appointed Manager of Operations, Alberta and Southern Gas Co. Ltd. with responsibility for supervising the gas dispatching, gas accounting and measurement for the Company and negotiations of gas exchange agreements and sales within Alberta. Prior to his appointment, Mr. Fenton was Supervising Engineer—Operations of the Company.

Born and raised in Alberta, he obtained a Bachelor of Science in Civil Engineering from the University of Montana in 1962. He will continue to reside in Calgary.

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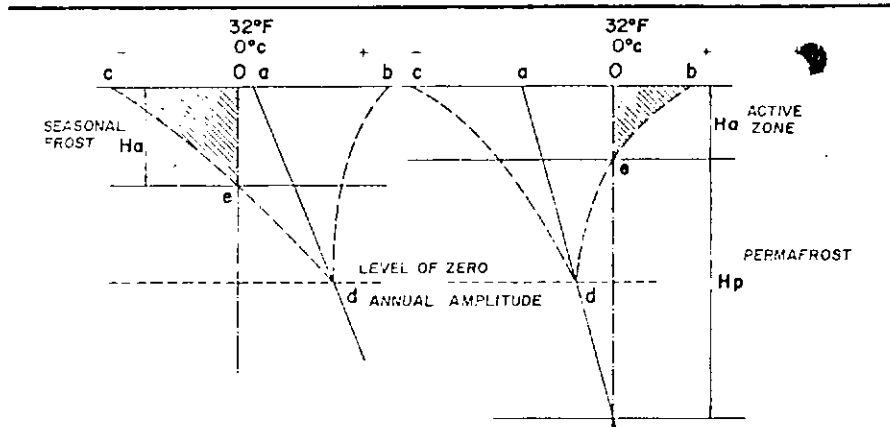
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2a TEMPERATE CLIMATE      2b ARCTIC CLIMATE

FIGURE 2 SEASONAL VARIATIONS OF GROUND TEMPERATURE IN REGIONS WITH TEMPERATE AND ARCTIC CLIMATES

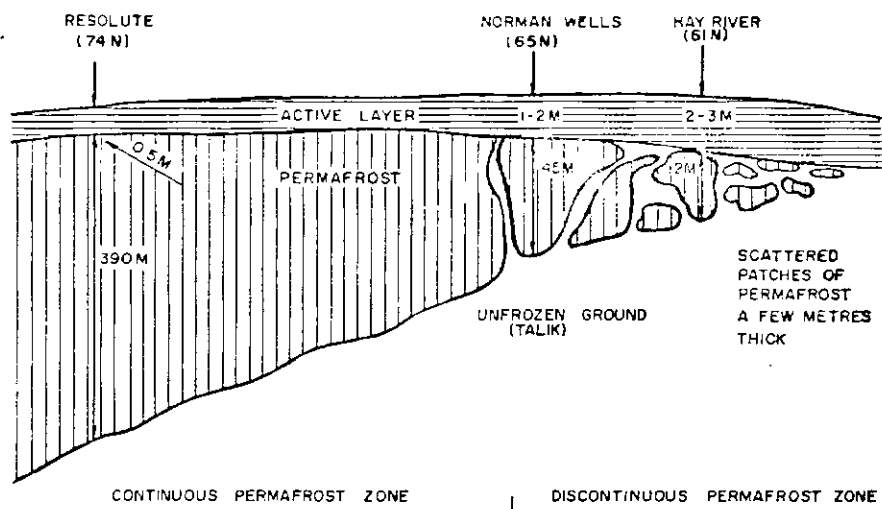


FIGURE 3 PROFILE OF PERMAFROST CONDITIONS

ground temperature are related phenomena. The influence of seasonal variation of ground temperature on frost conditions is illustrated by Figure 2. In a temperate climate the mean annual ground temperature is above freezing as shown in Figure 2a.

Due to the fluctuation of surface and subsurface temperatures the temperature gradient varies throughout the year between the limits c and b shown. Where the gradient line c-e-d lies in the minus zero centigrade condition the ground is frozen seasonally, as indicated by the shaded area. The depth of frozen ground is a theoretically predictable quantity. In temperate or subarctic climates the seasonally frozen zone is not permanent since the temperature gradient is periodically greater than freezing (b-d) and thus "permafrost" by definition does not prevail.

In an Arctic climate the mean temperature gradient is below zero for some distance into the ground as indicated

by Figure 2b. During warm summer seasons the gradient may be in the position b-c-d. That portion shown shaded in Figure 2b is then thawed. This upper thawed layer is referred to as the "active layer" and is very sensitive to minor environmental changes. As a consequence it is the seat of many problems associated with construction in permafrost. The thickness of the active layer is variable and dependent upon thermal micro environments created by construction or ground disturbance as suggested in the tabulation of variable factors outlined above. Below the active layer the ground remains permanently frozen to the depth  $H_f = H_a + H_p$ . At depths greater than  $H_f$  the ground is once again at an above-freezing temperature. However, the depth  $H_p$  is continuous and may be 1,200 feet deep. Between Arctic and temperate climates an erratic permafrost situation prevails and the permafrost in such areas is termed discontinuous. Figure 3 diagrammatically illustrates the trans-

from continuous to discontinuous permafrost with decreasing latitude.

### Applied engineering

Applied permafrost engineering involves the following aspects:

(1) The physical properties of soils as they pertain to foundation support as well as the influence of freezing and thawing on these properties.

(2) Design methods and construction practice for projects in permafrost regions.

### Freezing of soils

Soils may be broadly considered as fine grained or coarse grained from an engineering point of view. Among the fine grain soils are clays and silts. The important characteristics which determine the behaviour of these soils are their natural water contents, their plasticity characteristics (liquid limit and plastic limit) and the clay mineralogy. Clay sizes are less than 2 microns in equivalent diameter and possess many unique properties governed by mineralogic composition. The behaviour of coarse grained soils such as sands and gravels is determined by the relative density of the deposit as well as its grain size distribution.

Clays and silts possess higher water

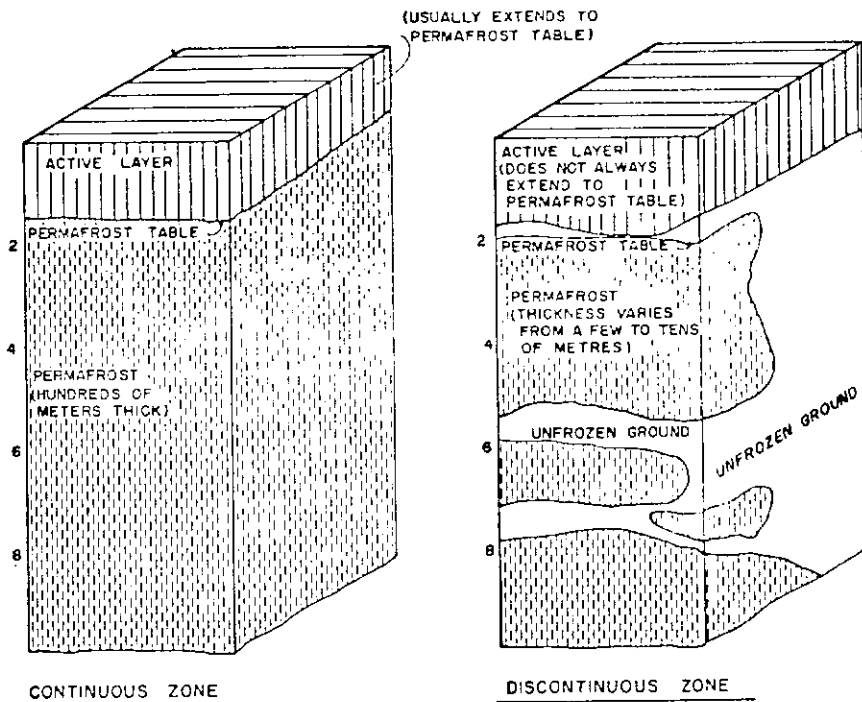


FIGURE 4 PERMAFROST STRATIGRAPHY

holding capacity than sands and gravels, thus freezing has a greater influence on their engineering properties. During a

freezing process ice lens may be developed in soils. The criteria for the development of ice lens and frost heaving are:

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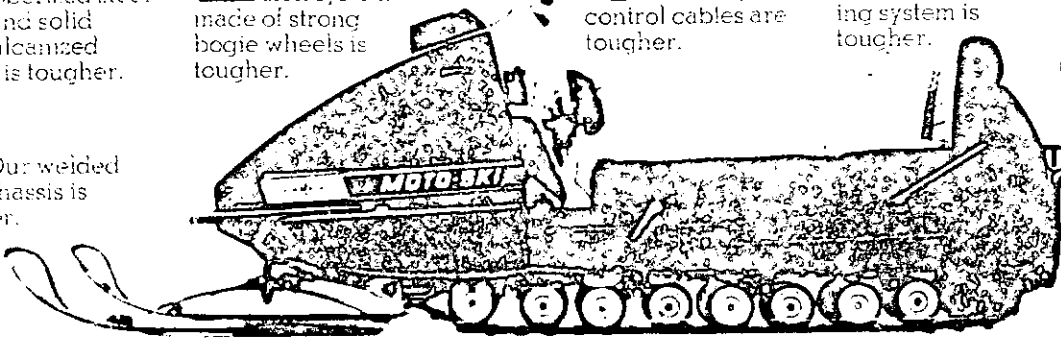
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(1) The existence of a frost susceptible soil — If in a well graded soil 3% or more of the soil particles are less than .02 mm. (clay size) in equivalent size, frost heave is possible.

(2) The soils must possess both permeability and capillarity properties which will favour the migration of water under thermal and hydraulic gradients.

(3) Freezing temperatures must penetrate into the soil. The rate of freezing must be relatively slow or temperatures must alternate about the freezing point for some time to allow for the build-up of ice lenses.

(4) There must be a supply of water available at shallow depth. The freezing regime must be within the capillary fringe zone.

Many soils in permafrost regimes satisfy the stated criteria and develop pronounced ice-soil structures. In both permanently or temporarily frozen ground, ice commonly occurs as uniformly disseminated minute grains or crystals or large separate inclusions regularly distributed between layers of soil as indicated by Figure 4. Ice may also occur in large solid masses (ground ice), usually of sheet-like or lens-like form or as veins, dyke-like wedges and pipes.

Soils commonly classified as silts are most susceptible in the development of

lenses. Upon the thawing of a lens, a large void filled with water is created. When load is applied, the soils will settle dramatically and unevenly under even small pressures. This can cause destruction of buildings, roads, airstrips, pipelines and other earth supported structures. Thus soil type identification, definition of vertical and horizontal extent of stratigraphy and associated engineering properties are of vital importance.

Saturated gravels in a frozen state can contain relatively large volumes of ice filling the voids and cementing the grains to form a rigidity. However, segregation of the ice into lenses does not occur and upon thawing there is little or no collapse of the granular structure. As a consequence the influence of freezing and thawing on gravel deposits is scarcely noticeable. Thus, natural gravel deposits and artificial gravel pads constitute suitable foundation conditions for many types of structures.

#### Site exploration

Exploration and investigation of sites or routes underlain by permafrost is an exacting and intensely significant aspect of engineering. The importance of this aspect cannot be over-emphasized. Modern investigation methods include:

- (1) Precise seismic surveys.
- (2) Air photo interpretation.

(3) Subsurface exploration by borings.

(4) Analyses of indirect results of seismic surveys and laboratory tests: define the physical properties of permafrost deposits.

The methods enumerated above provide the working tools for distinguishing the soil foundation conditions both generally and specifically. Geotechnical methods may be applied to diagnose the potential problems and provide the basis for corrective treatment associated with construction at a particular site or, more objectively, to establish the preferential sites for construction where a fixed position is not predetermined.

#### Engineering techniques in permafrost areas

Basically, engineering in permafrost regions can be considered from two points of view, depending upon the analyses of specific circumstances.

Case 1: Design and construction of structures where the specific locations are designated and must be dealt with.

Case 2: Design and construction where the location, route and other situations may be selected.

The engineering methods and analyses required in the first case may be very detailed unless a particularly fortuitous situation is encountered. The informa-

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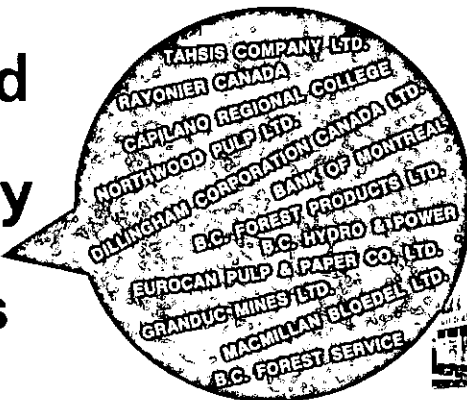
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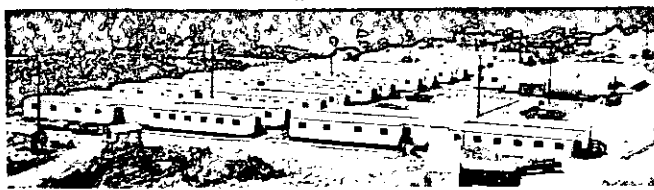
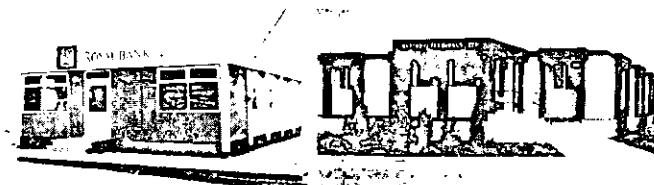
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...on necessary to accomplish the design is obtained from boring and sampling; seismic or other geophysical survey data, as well as field and laboratory analyses of samples. A variety of foundation possibilities exist, with the choice depending on the circumstances defined from analysis.

Successful construction techniques have developed from an understanding of the nature of permafrost rather than from practical experience with it. Essentially, two design philosophies presently exist.

(1) Preservation of permafrost conditions. Where permafrost is continuous, the key to successful engineering and construction is to prevent thawing. Natural insulation, provided by surface organic soils, must not be disturbed. Successful construction is carried out by utilizing gravel pads on the surface and providing cold air circulation as illustrated in Figure 5. Piles, installed in pre-drilled holes, where the soil and water is allowed to re-freeze before construction, are usually utilized for large structures or where a shortage of gravel exists. Permafrost below roadways and airport runways is often protected by a thin layer of high strength expanded polystyrene insulation.

(2) Anticipate permafrost thaw in design. In regions where permafrost is

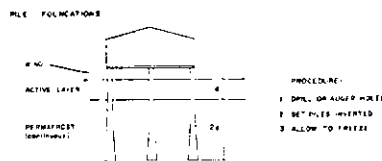
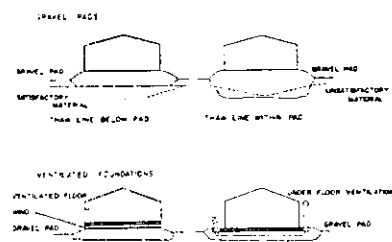


FIGURE 5. CONSTRUCTION ON PERMAFROST

found to be discontinuous or sporadic, a delicate equilibrium exists between frozen and thawed soil. The ground temperature is usually very close to the freezing point and the slightest alteration in thermal regime will cause complete retreat of the permafrost. For these circumstances, structural loads are usually carried through the permafrost on piles which are seated in some hard, unfrozen stratum below. If the soil above has a high ice content, full structural capacity of the piles cannot be

utilized for design as subsidence of the thawed soil will cause downdrag loads to be transferred to the piles.

Roadway embankments and earth or rockfill dams situated on sporadic permafrost have been designed by predicting deformations due to thaw subsidence. With careful investigation to evaluate the quantity and distribution of ice in the subsoil, crude settlement estimates can be made and prior compensation provided.

### Special challenges in permafrost engineering

The following cases illustrate some of the major areas where immediate attention is required to foster technical development in permafrost engineering.

(1) Enormous amounts of gravel will be required for construction of pipelines and ancillary works in Arctic projects. This will necessitate comprehensive air photo study followed by ground exploration to define the extent of deposits. Geophysical methods may prove important in this regard. Boring, sampling and testing of aggregates will be required.

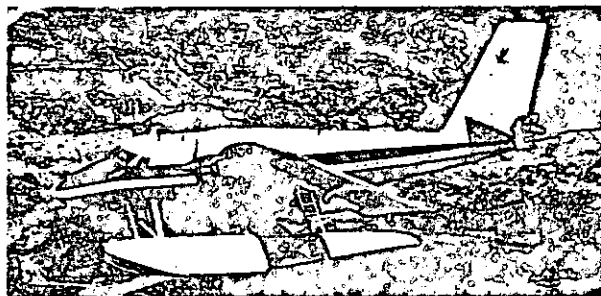
(2) Large working forces along pipeline routes will create special housing requirements with resultant demands for water supply and sewage disposal. Both of these aspects necessitate ingenious methods of satisfying the requirements

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in a climate where water is in short supply except near a few rivers which continually flow. Sewage disposal becomes difficult because permafrost is impervious, making ordinary septic tank and disposal fields unworkable. In addition the low temperatures retard or cause cessation of normal biological decay.

(3.) Design and construction of roads and airport run ways. These require special attention to drainage details and ground stability. Protection of the natural permafrost environment with insulation is usually necessary for construction in areas where the soil possesses a high ice content. Many such facilities will be required for maintenance purposes during operation of the system and must therefore be constructed for long life. Thousands of miles of service road and numerous small air fields will be needed.

(4.) Piling may be required to support many miles of large diameter pipeline at 14 to 16 feet above the ground surface. The pipe will weigh in the order of 900 lbs. per lineal foot when insulated and operating. The source of this piling may be local timber which would require the orderly development of limited and localized forest resources where available.

(5.) Location, design and construction of pumping stations, microwave towers

and power plants are required to service the expanding oil industry.

Other special problems include the design of oilwell casing to withstand possible large downdrag forces resulting from the thawing of permafrost adjacent to the vertical casing over depths as great as 1,500 feet. Oil from depths greater than 1,200 feet will flow at temperature of approximately 150°F, causing an adjacent annular body of permafrost to thaw and become suspended on the pipe. Should the resultant downdrag stresses cause casing failure, substantial losses of oil and a very difficult pollution problem could result. The oilwell casing problem is one of the most pressing problems of production. Several oil companies are already involved in special studies to consider this and are developing unique means of assessing the significant design factors.

One great disadvantage of frozen gravel is its almost unbelievable abrasive property which causes pipeline trenching equipment to drop production from a normal temperature winter average tooth life of 4,000 feet, per set to 50 feet per set. Metallurgical technology is being applied to develop even more abrasion resistant teeth than presently in use in order to increase production.

Economic and social development of

the Arctic have raised serious questions in the minds of conservationists. They accuse the exploration companies of assaulting the fragile ecology of the Arctic without first establishing behavioural rules for preventing irreparable damage to the tundra and wildlife.

Irrational development in permafrost regions can have a profound effect on the environment. It will be necessary for major construction projects to include in their design stages an assessment of the ecological and sociological impact on the environment. A study of this nature would provide scope for the scientist and engineer to work together in order to minimize the effect of disturbance caused by construction activities.

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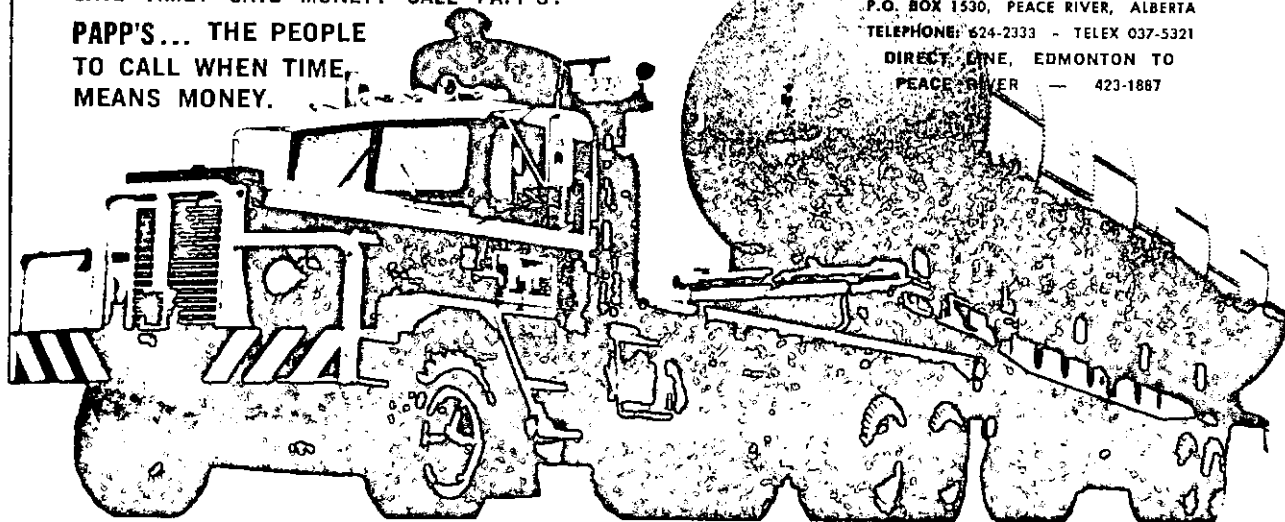
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## Aquitaine gets more Hudson Bay acreage

Aquitaine has again added to its offshore holdings in the Hudson Bay, this time with the acquisition of 1.8 million permit acres from Mill City Petroleum.

This brings Aquitaine's total offshore holdings in Hudson Bay from the previous 540,000 acres (175,000 acres net) to 2.3 million acres. In addition the company has interest in 1.1 million acres in adjacent areas onshore in Manitoba, of which its net interest amounts to 379,000 acres, and 986,000 acres Ontario onshore rights, amounting to a total of all rights on and offshore in this play of 5.1 million acres.

Aquitaine's biggest stake, of course, is in the 49.9 million acre block Atlantic Richfield holds in the most prospective portion of Hudson Bay. Aquitaine has "made arrangements with Atlantic Richfield on behalf of itself and its partners in the Kaskattama farmout for joint exploration of the block."

It is understood that the Aquitaine group will earn a 25 percent interest in the big block by conducting seismic work next summer and will then have an option on another 25 percent for an undisclosed cash consideration. This summer Aquitaine conducted no offshore seismic but deepened its Kaskattama well in the mouth of Kaskattama River and had a seismic

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Aquitaine's interest in the half onshore, half offshore one-million-acre farmout from Bralorne Petroleum and Sogepet, and in its offshore holdings is split between itself (50 percent), French Petroleum (25 percent), Petropar (15 percent), and Sun Oil (10 percent). On the one million-acre farmout from Bralorne and Sogepet the farmers have subsequently farmed out on their own behalf, so that the interest in this spread now stands at Sogepet 30 percent, Aquitaine 25 percent, French Petroleum 12½ percent, Bralorne 10 percent, Petropar 7½ percent, and Sun, Teek Corporation and Western Decalta five percent each.

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It is understood that the Aquitaine group will earn a 25 percent interest in the big block by conducting seismic work next summer and will then have an option on another 25 percent for an undisclosed cash consideration. This summer Aquitaine conducted no offshore seismic but deepened its Kaskattama well in the mouth of Kaskattama River and had a seismic

onshore program planned for the fall and winter of this year.

Aquitaine's interest in the half onshore, half offshore one-million-acre farmout from Bralorne Petroleum and Sogepet, and in its offshore holdings is split between itself (50 percent), French Petroleum (25 percent), Petropar (15 percent), and Sun Oil (10 percent). On the one million-acre farmout from Bralorne and Sogepet the farmers have subsequently farmed out on their own behalf, so that the interest in this spread now stands at Sogepet 30 percent, Aquitaine 25 percent, French Petroleum 12½ percent, Bralorne 10 percent, Petropar 7½ percent, and Sun, Teck Corporation and Western Decalta five percent each.

## HUDSON BAY AREA

### AQUITAINE COMPANY OF CANADA LTD.

Aquitaine holds a total of 35 permits aggregating 1,538,162 acres. Twelve of these permits, aggregating 492,778 acres, were originally granted to Sogepet Limited in October, 1963, and assigned to Aquitaine in January, 1967. Of the remaining permits, 15 were issued in October and November, 1966, and 8 were issued in January, 1967. One of these permits was issued to Bralorne Petroleum Ltd., and assigned to Aquitaine in January, 1967.

Prior to the acquisition of the older permits by Aquitaine, Sogepet Limited had carried out preliminary geological and geophysical investigations. In 1966 Aquitaine, with a subsidiary company Benff Oil Ltd. acting as operator, drilled the Sogepet Aquitaine Kaskattara Prov. No. 1 well, and reached a depth of 2,680 feet before winter weather forced suspension. Drilling was resumed in 1967, and the well reached a total depth of 2,941 feet before contacting the Precambrian.

Aquitaine has several partners in its Hudson Bay venture, both in respect to the Manitoba acreage and the more than 50 million Federal offshore acres and almost one million acres in Ontario.

The complex partnership involved is outlined in the attached extract from Oilweek of November 6, 1967.

The company is presently carrying out an on-shore seismic program in the area from York Factory in Manitoba to Fort Severn, Ontario. This survey will not be completed until April, and will be serviced by air and a winter road from Gillam to York Factory. The on-shore program will be followed by an offshore seismic survey next summer which will involve three vessels.

The results of these surveys will determine where further drilling may be carried out.

### HOUSTON OILS LIMITED.

Eleven permits, aggregating 689,461 acres, were issued to Houston Oils in February, 1967. The first period of the permits is 18 months, and the company has posted a bond of 5 cents per acre as a guarantee that an equivalent exploration expenditure will be undertaken. A further deposit of 15 cents per acre will be required in August, 1968.

The company is undertaking a gravity survey.

### CITY SAVINGS AND TRUST COMPANY.

Eleven permits, aggregating 700,552 acres, were issued to this company in May, 1967. A deposit of 5 cents per acre has been made; a further deposit of 15 cents per acre will be required in November, 1968.

# Oil Hunt Scheduled

## On Shore Of Bay

FREE PRESS NOV 23/67

A full-scale bid to find oil on the south shore of Hudson Bay in northern Manitoba is scheduled to get under way Dec. 1.

Men and machines are already being flown in to the head of the Kaskattama River, 185 miles southeast of Churchill and 50 miles from the Ontario border, to set up a base camp for the explorations.

Aquitaine Company of Canada Ltd., which has taken over the area from Banff Oil, will start work on a seismic line along the shoreline Dec. 1, and continue through April, 1968. After the winter breakup, three chartered French ships will steam into the Bay to aid in seismic work on the open water.

Most of the equipment is being flown in from Churchill, where assembly has been going on for some weeks. Moving the equipment will take at least two weeks.

Roadbuilding, including a 140-mile stretch from York Factory to Gillam — one of the sites of Manitoba Hydro's Nelson River project — is part of the exploration scheme.

Much of the flying work will be done by a giant Hercules transport, with a special runway already prepared.

For the men on the frigid camp sites, some of the luxuries of home will be provided through portable showers, kitchens, washers and dryers to be hauled along the camp line by tractor.

Extent of the first seismic line is from York Factory, in Manitoba to Fort Severn, Ont. The long haul will have to be kept open by tractors and plows throughout the winter.

Depending on the results of machine readings taken through the winter and early summer, derrick work could begin sometime next winter. With work due to finish on the seismic line in the spring, results should be known in the early summer.

For the men, Mid-West Aviation, of Winnipeg, will run a steady air supply and mail line. The workers will be flown out at Christmas for a six-day holiday.

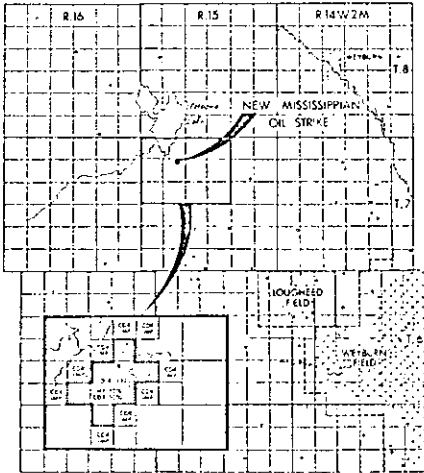
Work on the roadway is to be handled by Johnson Transport of Clearwater Lake, near The Pas, and Athabasca Airways will supply the Hercules, expected to have to fly night and day.

**EXPLORATION**

**Sask. discovery flows Mississippian oil**

A southeast Saskatchewan wildcat being drilled as deep test northwest of Weyburn field has struck Mississippian Midale oil, thus opening up a new area for this target.

Imperial Oil and Central-Del Rio



Oils are jointly drilling the IOE CDR Tatagwa 15-29 (Lsd. 15-29-7-15 W. 2) six miles north-northwest of Lougheed field on a drilling reservation acquired last year for \$76 per lease acre. In two drillstem tests in the Midale formation the operator recovered 500 feet of clean, 28 API degree oil in the pipe, and got an oil flow to surface for 35 minutes with a full pipe recovery. Test intervals are not available on this tight venture.

Nearest previous Midale oil strikes were three hits, one by Mobil and two by Whitehall, five and 5½ miles south of the new success. All three have since been abandoned. The strike is significant since it again extends the northwestern end of the Midale productive belt to the west and north. It can be expected that it will prompt a number of further exploratory holes in the area.

**Seismic program set for Hudson Bay**

Aquitaine's offshore seismic survey next summer on Atlantic's Richfield's 50-million acre permit block in Hudson Bay will feature three boats performing several types of surveys. Contractor will be Calgary based Compagnie Generale de Geophysique. During the two to three months operation, CGG will utilize refraction, conventional reflection and flexotir

shooting. For the refraction part all three boats are required, with one serving as a recording vessel, and the other two doing the shooting. Requirements go down to two vessels for conventional reflection surveys, and to only one with the flexotir method.

Flexotir shooting is a method developed by the Institute Francais du Petrole in cooperation with CGG. It features a perforated steel sphere which allows the use of very small explosive charges at relatively great depths, avoids the signal disturbing bubble effect, is safe for marine life, is fast, and requires only one boat.

**Transalta files on Atlantic acreage**

A surprise filing on Atlantic offshore acreage by Ottawa lawyer R. C. Belfoi Oct. 26 on 2.4 million acres south and southwest of Nova Scotia was made on behalf of Transalta Oil & Gas of Calgary. The firm filed on the acreage with both the federal and Nova Scotia governments.

The acreage, shown in the last issue of OILWEEK (p. 16), abutts Shell's, Texaco's, Chevron's, Eastern & Chartered Trust's, and Mobil's acreage at the southwestern tip of the large acreage spreads held east and south of Nova Scotia in the Atlantic. Right in the middle of the

**Saskatchewan gas field gets boost**

Field experience and business acumen of an experienced gas producer and a subtle change in the business policy of the government owned Saskatchewan Power Corporation were married in a deal this fall, which will:

- Produce lands which would otherwise have been left undeveloped for at least five years.
- Turn a profit for the private operator.
- Save SPC about \$4 million investment.
- Bring a guaranteed flow of gas into gas hungry SPC distribution lines within a specified time.
- Give the gas to SPC at a cheaper price than it could have produced it.

Under the terms of the agreement, North Canadian Oils Limited of Calgary acquired the gas rights on 104 sections in the northeastern portion of the Hatton gas field in the south-

west corner of Saskatchewan, adjacent to its previously developed gas production from 82 wells in the Horscham area. Since the deal was clinched in mid-September NOC has drilled and cased 20 wells of which 10 have already been placed on production. The operator has until Sept. 1/70 to drill an additional 60 or more wells and establish a deliverability of 32 mmcf/d for SPC. Spacing is 6-10 acres. NCO can begin delivery of the required contract amount any time.

**CIG now drilling third North Sea test**

Canadian Industrial Gas is participating in its third North Sea wildcat, 30 miles offshore, 16 miles southwest of British Petroleum's West Sole Permian gas field and 12 miles north-west of Placid's recent gas discovery.

CIG/Burmah 47-20-1 started drilling Nov. 5, using the semi-submersible drilling platform "Ocean Prince." On completion of the test, interest in the 61,000-acre production licence will be split 30 percent to Canadian Industrial Gas (U.K.) Limited, 50 percent to the Burmah North Sea group and 20 percent to Total Oil Marine Limited and associates.

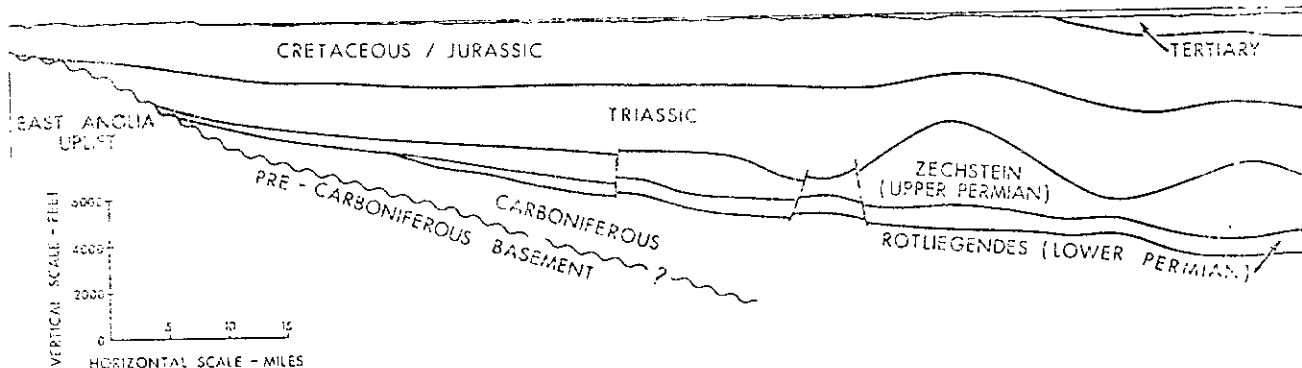
CIG, through its subsidiaries Canadian Industrial Gas (U.K.) Limited and Northern and Central Gas (U.K.) Limited, holds an interest in a gross 792,000 acres in the North Sea. First test for CIG in block 4S/23 obtained a substantial flow of light gravity Permian oil on test. CIG holds a 10 percent interest with an option to increase this to 20 percent. Second test, drilled early this year in block 4S/22, was abandoned.

**Saskatchewan gas field gets boost**

NCO estimates that total investment including acquisition of the rights and their development plus gathering system at between \$3¼ and \$4 million. SPC made its own calculation on this and found a \$4 million tag for development cost entirely reasonable.

SPC would not have touched the area for at least another five years in favor of holdings more accessible

(Continued on page 14)



HYPOTHETICAL CROSS SECTION  
EAST ANGLIA UPLIFT TO THE CENTRAL PART OF  
THE OFFSHORE PERMIAN BASIN

(Continued from page 13)

Reefs occurring in the Zechstein formation have been found as a more or less parallel chain to the Carboniferous backbone outcropping farther onshore. Home's Lockton gas discovery was presumably drilled in one of these reefs. By plain extrapolation this trend can be thought to continue into the sea north of The Wash, and turn east north of the East Anglia Uplift, thus running through a considerable spread of the Canadian corner. The Middle Magnesian Limestone oil discovery of the Burnah group is believed to be off-reef, but it may well have been near one. In any case the oil discovery makes it likely that at least some of the reefs will be oil-bearing.

What makes exploration a bit tricky is the oscillating nature of the Permian shoreline. Salt deposition is decidedly cyclical, and so will no doubt be the reef growth and its location.

Other prospective horizons include the Triassic and the Cretaceous/Jurassic sections over an area where much basin relief, salt dome structures, and tectonics have given a great variety of trap possibilities. The Arpet group, for instance, has already found excellent gas reservoirs in the Lower Triassic Buntsandstein formation. (Hewitt field).

### Kaskattama wildcat reaches total depth

Aquitaine's pioneering wildcat at the mouth of Kaskattama River on the southwest shore of Hudson Bay has finally reached total depth at 2,941 feet in the Precambrian basement which was contacted about

1,100 feet lower than expected, thus increasing the prospectiveness of the much thicker than forecast sedimentary column in the area.

The well, Sogepet Aquit. Kaskattama Prov. No. 1, which had been suspended last winter at 2,880 feet was re-entered this summer. Previously the basement had been mapped from seismic surveys at what turned out to be actually the Silurian. When drilled it showed oil stain and a good smell of oil in drill cuttings, plus a crystalline dolomite promising to be a good potential reservoir rock. Main target of the test were the basal sands of the Ordovician.

Nothing has been said about this horizon by well-backer Aquitaine, which is keeping all information on this wildcat tight. But the report on the found evidence of oil in the well confirms the oil prospectiveness of the region, including the important deep portions of the basin in Hudson Bay and its surrounding mainland.

Test is on a one-million-acre, on- and-offshore farmout of Aquitaine from Bralorne Petroleum and Sogepet. Since spudding of the well, Aquitaine has farmed out part of its 50 percent interest in the lands to French Petroleum (25 percent) and to Sun Oil (10 percent), Sogepet and Bralorne have made farmouts on their own, leaving the current holdings in the block as follows:

Aquitaine 25 percent; Sogepet 30 percent; French Pete 12½ percent; Bralorne 10 percent; Petropar 7½ percent; and Sun, Teck Corporation and Western Decalta Petroleum five percent each. Aquitaine holds an option on a farmout on all of Atlantic Richfield's 50 million-acre Hudson Bay offshore spread. Additional

acreage is held offshore by Mill City Petroleum and Transalta Minerals.

Plans now are for a seismic program onshore during the coming winter season, for which equipment has already been airlifted in. Next summer marine seismic will follow in Hudson Bay on the Atlantic Richfield block.

### Brett Oils gets strike near Bantry

Brett Oils of Calgary has found a new Basal Quartz oil pool in a wildcat three miles northeast of oil production in the Bantry field of south Alberta. Successful well Brett Abdn et al Bantry 6-6 (Lsd. 6-6-19-12 W. 4) flowed oil to surface in 11 minutes at a rate of from 200 to 300 b/d during a 7½-hour drillstem test. Pipe recovery was 960 feet of oil with no indication of water. Since the discovery 4½-inch production casing has been set. Presently production equipment is being moved to the site for further testing of the discovery.

The discovery was drilled on a CPR land farmout from Chevron Standard for an undisclosed overriding royalty. The test had earned Brett and partners three sections. Part of the agreement provides for two development wells to be drilled by the same group in the Bantry field which will earn them another 1½ sections of land. Drilling rig is currently moving onto the first of the development locations.

Partners of Brett include Aberdeen Minerals Ltd. of Calgary 12½ percent, Largo Mines Ltd. of Vancouver 25 percent, Parliament Mines Ltd., Toronto 6¼ percent, Deauville Ex-



## ENABLING LEGISLATION PASSED FOR NEW NEWFOUNDLAND REFINERY

Enabling legislation was pushed through last week to let Newfoundland Premier Joseph Smallwood establish the Avalon Core Chemical Corporation. This Crown company is intended to be the vehicle through which the Come-By-Chance petroleum refinery is financed. Newfoundland Refining Company Limited, the wholly owned subsidiary of Shaheen Natural Resources Company Incorporated (New York), will lease the 30,000 b/d facilities to be built at the neck of the Avalon Peninsula, and will take title to them only after it has paid out \$30 million over the next 15-25 years to redeem the bonds floated by the Crown Corporation.

The \$97 million investment figure - and the 100,000 b/d crude input - used by Premier Smallwood in his announcement last week - referred to more than the \$45 million refinery. Within two years of initiating construction of phase one of the plan - which involves the hydrocracking of residuals to produce an ammonia-plant feedstock, jet fuel and other petroleum products - Newfoundland Refining hopes to double the size of the operation. In this second stage (to 60,000 b/d) more reformat would be produced to feed a BTX extraction unit. The benzene can be exported quite readily, says NRC, while the toluene would be run through a hydrodealkylation unit to augment benzene output. Raffinate for the BTX tower is intended for a naphtha cracker in order to produce olefins. No naphtha pyrolysis could be contemplated, however, unless and until Newfoundland Refining can line up some potential ethylene or propylene customers ready to locate at the Newfoundland site.

## CANADIAN OIL EXPORTS MAY BE UNDER FIRE AT U. S. HEARINGS

WASHINGTON: Canada's oil exports to the United States will be under scrutiny again May 22-24 at public hearings on the mandatory U. S. oil import control program called by Interior Secretary Stewart Udall.

The hearings, similar to sessions held in Washington two years ago, are intended to deal with the multiple problems that have developed in the detailed implementation of existing oil quotas and to consider the broad outlines of the program as it should develop in the future. First day of the hearings will consider the general issues, while remaining two days will be concerned with particular problems that arise out of the establishment of foreign trade zones, feedstocks for petrochemical plants, refinery quotas, shortage of special types of petroleum such as propane and jet fuel, and "incentives and import program changes to encourage exploration for new petroleum reserves."

Also singled out for discussion in the last two days is the issue of oil imported from Canada under overland exemption from the quota imposed on all other countries

except Mexico which has voluntarily agreed to limit its exports to 30,000 b/d. Growth of Canadian oil imports - 10 percent last year - is causing concern on two counts:

(1) Interior Department projections have consistently underestimated Canadian imports each year when setting import quotas, with the result that total imports have exceeded formula rate by the amount of this error. Last year, the error amounted to 32,000 b/d. This has brought repeated complaints from the Independent Petroleum Association of America.

(2) U. S. administration, and some major oil companies, are reportedly concerned about proportion of Canadian oil imports in relation to those from other countries, particularly Venezuela. A rumor in Washington is that at the recent Latin American summit meeting in Punta Del Este, President Lyndon Johnson gave assurances to Venezuela President Raul Leoni that the administration would not permit Canadian oil imports to continue to grow at the expense of Venezuela's market in the United States.

## AQUITAINE CONFIRMS HUDSON BAY STAKE

Aquitaine Company of Canada Ltd. has confirmed its rumored stake in Atlantic Richfield's 49.9-million-acre offshore spread in Hudson Bay. In its 1966 annual report, Aquitaine says it has "made an agreement with Atlantic Richfield Company for joint exploration" of the total spread on behalf of itself and its partners in the Kaskattama well on the southwest shore of the Bay at the mouth of the Kaskattama River in Manitoba. The interest split of Aquitaine's portion of the venture was 50 percent Aquitaine, 25 percent French Petroleum, 15 percent Petropar, and 10 percent Sun Oil.

It is understood that the Aquitaine group will earn 25 percent interest in the offshore block by conducting seismic work during the summer of 1968 and will then have an option to acquire an additional 25 percent for an undisclosed cash consideration. This summer Aquitaine plans no offshore seismic, but will deepen its suspended Kaskattama well and run seismic onshore surveys during the fall and coming winter.

In land-locked Saskatchewan, the company has begun geophysical evaluation of the 1.12-million-acre tract it holds together with Banff Oil and Jefferson Lake Petrochemicals in Winnipegosis-prospective areas of the province. Aquitaine and Banff farmed out one third of their equal interests to Jefferson Lake Petrochemicals, according to the report. Geophysical work included nine crew months of seismic and six crew months of microgravimetric surveys.

# BC TO TAKE DISPUTE OVER OFFSHORE RIGHTS TO COURT

The British Columbia government plans to take the federal government to court to find out who really owns the oil and gas rights off the British Columbia coast. At present, both governments claim ownership with the result that in some cases one oil company has filed on offshore acreage with the federal government while another company has filed on the same acreage with the provincial government.

The long-standing dispute between the federal government and the British Columbia government about the ownership of offshore mineral rights will soon bring new developments. The British Columbia government has applied to the provincial Court of Appeal for a ruling under the provincial statute determining constitutional questions.

Hon. W. K. Kiernan, BC minister of mines, told OILWEEK Wednesday that the Court of Appeal is the highest forum the provincial government can go to in order to get jurisdiction. "We have studied this problem very closely for quite some time now, and we have not yet found anything under the provincial statute or the Confederation Act which would point to the federal government's right to these offshore areas.

## Want To Hear From Ottawa

"For years we have been trying to get the federal government to state its case, but have received no explanation yet." By taking the matter to court, the provincial government hopes, for one thing, that the federal government will offer an explanation. "We might have overlooked something," says Mr. Kiernan, "and the federal government may have some grounds to justify its action, but we would certainly like to hear about it."

But the provincial government feels certain that the court ruling can only be in favor of the province, but even if so, the federal government can take the matter to higher forums.

"We have not obtained our mineral rights from Canada," Mr. Kiernan explained. "We obtained them from Great Britain as a separate entity a long time before joining the confederation. There was nothing in the Confederation Act which could take them away from us."

The dispute between Victoria and Ottawa first broke out in August, 1961, when Shell filed on 11 million offshore acres with the federal government. Shortly after the BC government offered some 15 million acres off-setting its coast line, a large portion of it already filed on by Shell. A total of 1.69 million acres were filed on with the provincial government. Some of the acreage picked up was filed on previously by Shell.

As the dispute did not come to a settlement, the industry took a "wait and see" position.

There was speculation at that time that only the first significant offshore discovery will bring about a solution as the question will then definitely be brought to a head.

## Double Rentals

The BC government, however, is apparently anxious to fight out a decision sooner, as the uncertain situation is unfavorably influencing the province's leasing revenues. Some of the companies have been paying rentals to both the province and the federal government, but this situation cannot be held for too much longer.

Spokesman for Socony Mobil, which owns offshore acreage at the other end of Canada, said he would be "extremely interested" to see the results of Mr. Kiernan's endeavours.

He added, however, that his company's wet permits off Sable Island fell into a slightly different category than the BC acreage inasmuch as the mineral rights on the island itself were also claimed by both the federal government and Nova Scotia.

## Back to The BNA

The spokesman doubted if any court decision arising out of the BC situation would have much effect on the Mobil acreage: "Ours is really a problem of interpreting documents. Goes back to the British North America Act, you know."

## U.S. Oil Company Seeks Control Of Charter Oil

Officials of Charter Oil Company Ltd. are awaiting reaction "possibly within two weeks," to an answer to an American oil company interested in gaining control on one of Canada's few remaining independent oil companies.

Ralph K. Farris, president of Charter Oil with offices in Vancouver, said Wednesday his firm had replied to a letter of intent from the American company to purchase 2,500,000 shares of the treasury stock of Charter. The letter was received from a Montreal based trust company.

If negotiations are consummated, Charter will ask for change in capitalization increasing its authorized shares from four million to six million. The company has issued 2,397,582 shares. Providing the offer is acceptable to both parties, control of Charter Oil will pass into the hands of the American company.

The increased capitalization would cover the sale of treasury stock and all outstanding debentures, according to Mr. Farris. The transaction would require the approval of shareholders and directors of Charter and shareholders of the American company.

The Canadian independent is currently engaged in exploration in Snipe Lake, Alberta and Pink Mountain, BC.

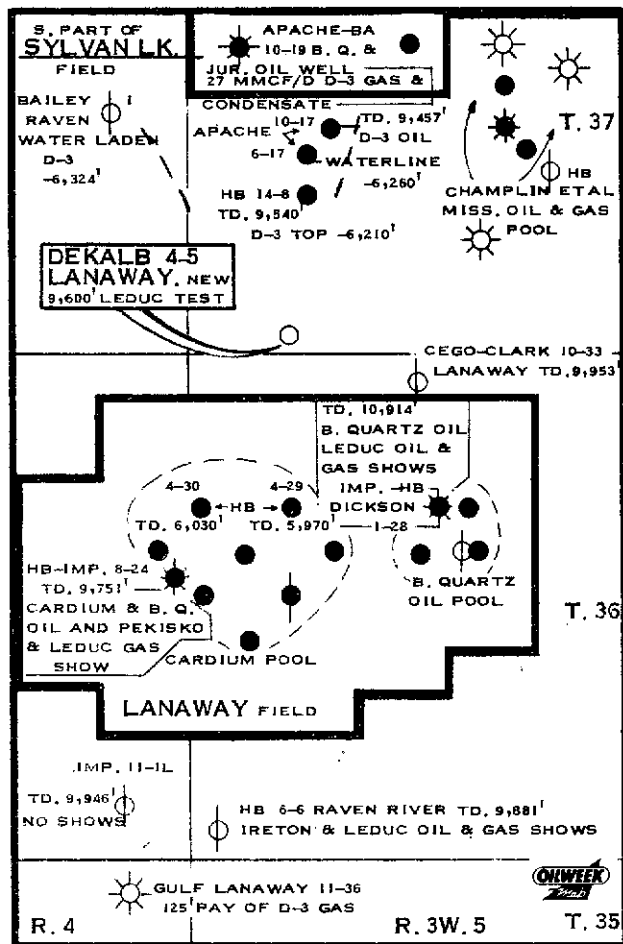
Deepest oil well in the world was drilled to a depth of 25,340 feet in Pecos County, Texas.

## NEW WILDCATS

### DeKalb to test D-3 north of Lanaway

DeKalb Petroleum Corp. has staked a 9,600-foot D-3 test two miles north of Cardium oil production in the Lanaway field, the first in an accelerated drilling program planned for 1963.

The D-3 test, DeKalb Lanaway 4-5 (Lsd. 4-5-37-3 W. 5), will go down 1¼ miles south of a small D-3 oil pool discovered last year by the Apache Corporation and 6½ miles north of Gulf Lanaway 11-36, which found 125 feet of gas bearing D-3 reef. Contractor Regent Drilling is moving in rig.



The well will be drilled on drilling reservation 858, a 9,920-acre block (16 quarter sections leaseable) purchased by DeKalb on Aug. 1, 1961 for \$304,000. In the same area, DeKalb also holds drilling reservation 895, an 8,480-acre block purchased for \$176,000 and convertible to 14 quarter sections of lease.

In addition to the Lanaway test, DeKalb plans an immediate start on a six-well program at Leafland and a three-well Cardium program at Garrington, plus additional drilling at Sundre, Judy Creek and Swan Hills, according to a company spokesman.

### Pure to drill at Gleichen

The Pure Oil Company has staked its fourth wildcat in the Gleichen area in less than two years. The latest project, in conjunction with Canadian Pacific Oil & Gas Ltd., is Pure CPOG Gleichen 4-25 (Lsd. 4-25-22-23 W. 4), about 40 miles east-southeast of Calgary and half a mile

southwest of abandoned Pure Gleichen 7-25 (Lsd. 7-25-22-23 W. 4).

Gleichen 4-25 is shared equally by Pure and POG. Operations are slated to begin sometime next week on freehold lands near the Blackfoot Indian reserve.

The abandoned well, drilled in November, 1961, showed Viking gas at the 4,243-foot depth and some oil in the Basal Quartz sands formation at 5,132 feet on drillstem and wireline test, respectively.

### AP Con spots two near Wainwright

Alberta Pacific Consolidated Oils Limited has staked two Devonian tests in the Wainwright area of eastern Alberta.

AP Con et al Wainwright 12-11 (Lsd. 12-11-46-7 W. 4) will go down 3½ miles northwest of heavy gravity production in the Wainwright field and 1½ miles south of abandonment Husky Wainwright 1-22. Projected depth is 2,550 feet.

AP Con et al Hope Valley 4-22 (Lsd. 4-22-46-4 W. 4) will be drilled 11 miles northeast of production in the field and 2½ miles south of abandonment Homestead Admiral Hope 8-33. Projected depth is 2,600 feet.

Bernco Drilling has been awarded the contract for the Wainwright 12-11 test, and Precision Drilling has been awarded the contract for the Hope Valley test.

### Skelly spots two tests at Kaybob

Skelly Oil Company has staked a wildcat and plans to drill a shallow stepout to its 1961 gas discovery near the Kaybob oilfields.

Skelly Berta P-1 Meekwap 10-2 (Lsd. 10-2-66-17 W. 5) is planned as a Gilwood test at a depth of 9,500 feet on property acquired about a year ago. The site is about 10 miles northeast of the Kaybob field and 22 miles due west of the Virginia Hills field.

Skelly Berta J-3 Kaybob 10-16 (Lsd. 10-16-65-17 W. 5) is a stepout to Skelly Berta J-2 Kaybob 10-31, 3¾ miles to the southwest, which hit Notikewin gas at the 5,565-foot level in 1962. It is also planned as a Notikewin test at a shallow (4,550 feet) level.

It is the third well to be drilled on drilling reservation No. 803 purchased by Skelly March 2, 1962 for \$79,564.80, nearly \$35 per leaseable acre. P-1 Meekwap 10-2 is also located on the same 10,240-acre reservation.

### CPOG — Followup to Blairmore find

Canadian Pacific Oil and Gas has staked a 3,200-foot Mississippian test in southern Alberta, CPOG Alderson 4-29 (Lsd. 4-29-15-11 H. 4), on CPR-owned rights. Site is 25 miles west of the Medicine Hat gas field and four miles northwest of the company's Basal Blairmore oil discovery, Alderson 10-3. Nearest previous test is a dry hole drilled by CPOG two miles north. Contractor is Precision Drilling.

### Central Del Rio spots Manitoba test

Central Del Rio Oils Ltd. last week staked a 3,350-foot Mississippian wildcat four miles northwest of the Pierson field in Manitoba. The firm has moved in a rotary rig and spudding was expected in "the next day or two". CRD Imp. N. Pierson 8-21 (Lsd. 8-21-3-29 W. 1) is the first of two planned wells on a farmout basis from Imperial Oil Ltd. CRD recently completed a well for the California Standard Co. in the same general area.

  
**Regulations Under The Regulations Act**

## MANITOBA REGULATION 71/62

being

A Regulation under The Mines Act  
to amend Manitoba Regulation 14/47  
(Filed August 28th, 1962.)

1. Manitoba Regulation 14/47 is amended by adding thereto, immediately after section 212 thereof, the following Part:

Part VI  
Far North

## 213. (1) In this Part

(a) "development well" means a well, the location of which is, in the opinion of the director, so related to the location of producible wells that there is every probability that it will produce from the same pool as the producible wells;

(b) "exploratory well" means any well that is not a development well;

(c) "exploratory work" means test drilling, aerial mapping, surveying, bulldozing, geological, geophysical and geochemical examinations and other investigations relating to the subsurface geology and all work, including the construction and maintenance of those facilities necessarily connected therewith and the building and maintenance of airstrips and roads required for the supply of or access to exploratory operations;

(d) "legal survey" means a survey made in accordance with section 223;

(e) "licensee" means the holder of a licence issued under section 91;

(f) "period" when used in respect of a permit means

(i) the period of a term of a permit in respect of which a deposit is required to be made under section 247 and Schedule B,

or

(ii) the term of a renewal of a permit, or

(iii) the term of an extension of a permit;

(g) "permit" means an exploratory permit issued under this Part;

(h) "permittee" means the holder of a permit.

(2) Subject to subsection (2) of section 214, the provisions of Parts I to V that apply to reserving geological and geophysical reservations and to geological and geophysical reservations apply, in so far as is practicable, to a permit and the area covered by a permit respectively.

214. (1) This Part applies only to lands in the province that are north of latitude 56° north, and east of meridian of longitude 95° west.

(2) Where a provision of this Part conflicts with or is repugnant to a provision of any other Part of this regulation, in so far as it affects land to which this Part applies, the provision of this Part supersedes the conflicting or repugnant provision of the other Part.

## Land Division

215. For the purposes of this Part, land shall be divided into grid areas.

216. (1) A grid area shall be bounded on the east and west sides by successive meridians of longitude of the series 83° 00' 00", 83° 15' 00", 83° 30' 00", which series may be extended as required, and on the north and south sides by straight lines joining the points of intersection of the east and west boundaries with successive parallels of latitude of the series 55° 00' 00",

55° 10' 00", 55° 20' 00", which series may be extended as required.

(2) Every grid area shall be referred to by the latitude and longitude of the northeast corner of that grid area.

217. (1) Every grid area shall be divided into sections.

(2) A Section shall be bounded on the east and west sides by meridians spaced at intervals of one-tenth of the interval between the east and west boundaries of the grid area.

(3) A section shall be bounded on the north and south sides by straight lines drawn parallel to the north and south boundaries of the grid area and spaced at intervals of one-tenth of the interval between the north and south boundaries of the grid area.

(4) A section shall be identified by the number to which it corresponds as follows:

100	90	80	70	60	50	40	30	20	10
99	89	79	69	59	49	39	29	19	9
98	88	78	68	58	48	38	28	18	8
97	87	77	67	57	47	37	27	17	7
96	86	76	66	56	46	36	26	16	6
95	85	75	65	55	45	35	25	15	5
94	84	74	64	54	44	34	24	14	4
93	83	73	63	53	43	33	23	13	3
92	82	72	62	52	42	32	22	12	2
91	81	71	61	51	41	31	21	11	1

218. The boundary

(a) between the north and south halves of a grid area is the north boundary of sections 5, 15, 25, 35, 45, 55, 65, 75, 85 and 95; and

(b) between the east and west halves of a grid area is the west boundary of sections 41 to 50.

219. (1) Every section shall be divided into subdivisions.

(2) Every subdivision shall be bounded on the east and west sides by meridians spaced at intervals of one-quarter of the interval between the east and west boundaries of the section.

(3) Every subdivision shall be bounded on the north and south sides by straight lines drawn parallel to the north and south boundaries of the section and spaced at intervals of one-quarter of the interval between the north and south boundaries of the section.

(4) Every subdivision shall be identified by the letter to which it corresponds in the following diagram:

M	N	O	P
L	K	I	I
E	F	G	H
D	C	B	A

220. (1) A target area is an area of land six hundred feet square lying within a subdivision and oriented due north-south and east-west and situate symmetrically about the intersection of a line joining the midpoints of the east and west boundaries of the subdivision with a line joining the midpoints of the north and south boundaries of the subdivision.
- (2) A target area shall be referred to by the letter of the subdivision in which the target area is located.

221. All latitudes and longitudes used in these regulations shall be referred to the North American Datum of 1927.

Surveys

222. For the purposes of this Part, no person other than a Manitoba Land Surveyor shall make a legal survey.

223. (1) Every legal survey made pursuant to this Part shall be made in accordance with instructions of the Director of Surveys.

(2) Every plan of a legal survey made pursuant to this Part shall be signed by the surveyor and submitted to the Director of Surveys accompanied by the surveyor's field notes annexed to an affidavit of the surveyor verifying that he has executed the legal survey faithfully, correctly and in accordance with this Part and with any instructions issued to him by the Director of Surveys.

- (3) Every plan of a legal survey made pursuant to this Part shall, where relevant, show
- (a) the position, direction and length of the boundaries of grid areas and divisions thereof;
  - (b) the position of existing wells;
  - (c) the nature and position of any monument used to mark, or placed as a reference to, any boundary or position referred to in clause (a) or (b); and
  - (d) any road allowance, surveyed road, railway, pipeline, high voltage power lines or other right-of-way, dwellings, industrial plants, permanent buildings, air fields and existing or proposed flight ways.

224. Every permittee or lessee shall, as soon as possible after an exploratory well is completed, send to the Director of Mines a plan of a legal survey in quadruplicate, approved by the Director of Surveys, showing the position of the well relative to the nearest target area.

225. (1) Every permittee or lessee shall, before the suspension or abandonment of any exploratory

well, send to the Director of Mines a plan that clearly shows the surveyed position of that well relative to

- (a) a reference referred to in section 229; or
- (b) a topographical feature that is identifiable on
  - (i) a map that has been published by or on behalf of the Government of Canada or the Province of Manitoba; or
  - (ii) a vertical aerial photograph, of mapping standard, obtained from the National Air Photo Library or from such other source as may be acceptable to the Director of Surveys.

(2) Where an aerial photograph is used pursuant to clause (b) of subsection (1), that photograph shall be sent to the Director of Mines with the plan.

(3) A permittee or lessee may, in lieu of sending the plan referred to in subsection (1), send to the Director of Mines the aerial photograph referred to in sub-clause (ii) of clause (b) of subsection (1), on which the position of the well has been clearly marked in a manner acceptable to the Director of Mines after the position thereof has been determined by a field comparison between the site and the photograph.

226. (1) Every permittee or lessee shall, before drilling a development well, send to the Director of Mines four prints of a plan of a legal survey approved by the Director of Surveys showing the target area and on which the approximate position of the proposed well relative to the target area has been superimposed in ink.

(2) The position of each development well relative to the target area shall be precisely determined after drilling has commenced and the permittee or lessee shall inform the Director of Mines of any difference in the position of the well from the position shown on the plan of legal survey referred to in subsection (1).

227. (1) Where any uncertainty or dispute arises respecting the position of any boundary, the Director of Mines may require a permittee or lessee to file a plan of legal survey, approved by the Director of Surveys, showing the boundary in respect of which the uncertainty or dispute has arisen.

(2) The plan of legal survey shall show the position of such boundaries and references as the Director of Mines may specify.

228. The Director of Surveys may, at the request of a permittee or lessee, approve a plan of legal survey of the whole or part of a grid area, permit area, lease area, section, subdivision or target area or the position of a well.

#### Monuments

229. The ground position of a grid area, permit area, lease area, section, subdivision, target area or well may, in the discretion of the Director of Surveys be surveyed by reference to

- (a) a monument shown on a plan of survey that has been approved by the Director of Surveys pursuant to section 223;
- (b) a geodetic survey triangulation station;
- (c) a geodetic survey Shoran station;
- (d) a marker placed for the purpose of marking a territorial boundary;
- (e) a monument as defined in The Surveys Act or the Domintion Lands Surveys Act (Canada) or the Canada Lands Surveys Act (Canada);
- (f) a physical feature, the geographical position of which has been determined by means of a Shoran-controlled photogrammetric process;
- (g) a marker, the geographic position of which has been determined by astronomic means;
- or
- (h) any other marker approved by the Director of Surveys.

230. Where the position of any boundary of a grid area, permit area, lease area, section, subdivision or target area or the position of a well has been established by a legal survey approved by the Director of Surveys pursuant to this Part, the position of that boundary or well shall be deemed to be the true position thereof, notwithstanding that the boundary or well is

found not to be located in the position required by this Part and shall determine the position of all other sections, subdivisions or target areas that lie within that grid area.

231. (1) Where, due to a discordance of reference points or imprecisions in measuring, a subsequently surveyed grid area, section, subdivision or target area appears to overlap a grid area, section, subdivision or target area the position of which is deemed to be true by section 230, the subsequently surveyed grid area, section, subdivision or target area shall be laid out and surveyed as though no overlap existed except that it shall be reduced by that portion that lies within the overlap.

(2) Subject to subsection (1), a grid area that has been reduced pursuant to subsection (1) shall, for the purposes of this Part, be considered to be a whole grid area.

(3) Where, due to a discordance of reference points or imprecisions in measuring, a parcel of land appears not to lie within a grid area, that parcel may be disposed of pursuant to section 264.

232. Any legal survey made pursuant to this Part shall be made by and paid for by the permittee or lessee as the case may be.

233. (1) Where a monument is damaged, destroyed, moved or altered as a result of the operations of a licensee, permittee or lessee

(a) he shall report the matter to the Director of Surveys as soon as possible; and

(b) he shall be responsible for the cost of its restoration.

(2) Every permittee or lessee shall maintain and keep in good repair all monuments that are situated on or mark the boundaries of his permit area or lease area as the case may be.

234. Every licensee, permittee or lessee who finds that a monument has been destroyed, damaged, moved or altered shall report the matter to the Director of Surveys as soon as possible.

235. Every licensee who carries out work on lands not held by him under permit or lease shall, upon completion of the work, furnish the Director of Mines with three copies of

(a) a map on a scale of not less than four miles to one inch showing the area covered by the examination and indicating the location of all roads and airstrips;

(b) information obtained as to the presence of water, coal, gravel, sand or other potentially useful minerals; and

(c) all reports, photographs, maps and data referred to in section 260.

236. A licensee shall upon request by the Director of Mines report the location and progress of any field party employed by the licensee.

#### PERMITS

##### Permit upon Application

237. (1) Where the Director of Mines is satisfied that exploratory work will be carried out, he may, upon application, issue an exploratory permit for lands that have not previously been held under permit or lease.

(2) Every application for an exploratory permit shall be made to the Chief Mining Recorder and shall be accompanied by

(a) a fee of \$250.00;

(b) the deposit required by section 247;

(c) a statement of the extent and character of the examination to be made and the estimated cost thereof; and

(d) a description of the area for which application is made.

(3) The Chief Mining Recorder shall cause to be endorsed on each application the date and time that the application is received.

238. (1) Where an application is not accepted, the fee and deposit shall be returned to the applicant.

(2) Where an application is withdrawn by the applicant before the permit is issued, the deposit



shall be returned to the applicant.

*Permit - Sec 32  
renewed & added to*

*Permit-upon-Tender 264, Redeemed here.*

239. (1) Every permit, except a permit issued under section 264 in respect of lands referred to in subsection (3) of section 231, shall be issued for a grid area or one-half of a grid area.

(2) A permit shall not be issued to

- (a) a person who is less than twenty-one years of age; or
- (b) a company unless that company is licensed or registered to do business in Manitoba.

240. (1) A permittee must be the holder of a license issued under section 92 before he may carry out exploratory work under this Part.

(2) Where a permittee is authorized to carry out exploratory work under this Part, that work may be performed by any person employed or hired by the permittee.

(3) A permittee may, for the purpose of carrying out exploratory work for oil and gas,

- (a) enter upon the lands described in his permit; and
- (b) use such part of the surface of the lands described in his permit as may be necessary for that exploratory work.

(4) A permittee may produce from the lands described in his permit such quantity of oil and gas as, in the opinion of the Director of Mines, is necessary for test purposes or for conducting operations of the permittee on that permit area.

241. Subject to sections 261 to 267, a permittee has, until the permit expires, the exclusive option to obtain an oil and gas lease not more than one-half of the sections of the land described in his exploratory permit.

#### Term of Permit

242. A permit is valid for three years from the date of issue.

243. A permittee may at any time surrender the grid area or one-half of the grid area for which he holds a permit but, except as provided in section 248, no deposit shall be refunded to the permittee.

#### Renewal of Permits

244. (1) The director shall, upon application, renew a permit for the term of one year.

(2) The application for renewal shall be made before the expiry date of the permit and shall be accompanied by the deposit required by section 247.

(3) A permit may be renewed pursuant to subsection (1) not more than six times.

245. (1) Where

- (a) a permit has been renewed six times;
- (b) a well is being drilled in a manner satisfactory to the director; and
- (c) in the opinion of the director, the well will not be completed or abandoned before the expiration of the permit,

the director may, upon application extend the term of the permit for one or more periods of ninety days.

(2) The application for extension shall be made to the director before the expiration of the permit or a valid extension thereof, and shall be accompanied by the deposit required by section 247.

246. Where a permit has been renewed six times, the minister may, upon application, renew the permit for such term and subject to such conditions and deposits as he may prescribe.

#### Deposits

247. (1) Subject to section 249, every permittee shall deposit with the director, before the commencement of a period, money or bonds of a value equal to the deposit required for that period.

(2) The deposit required for the period set out in Column I of Schedule B is the amount set out in Column II of that Schedule.

248. (1) The portion of a deposit equal to the allowable expenditure made during the period, shall be returned to the permittee.

(2) Subject to subsection (3), the portion of the deposit not returned to the permittee is forfeited to Her Majesty.

(3) Where in the opinion of the director a permittee has not been able to make allowable expenditure equal to the deposit required for any period, and the permittee has given notice to the director, and during the renewal period next following the permittee makes allowable expenditure equal to the aggregate of

(a) the deposit required for the renewal period next following; and

(b) the portion of the deposit for the period, heretofore not returned to the permittee,

the portion of the deposit heretofore not returned shall be returned to the permittee.

(4) The notice required under subsection (3) shall be given before the end of the period and shall state the reasons that the permittee has not been able to make allowable expenditures equal to the deposit required for that period and that the permittee intends to make allowable expenditure, during the renewal period next following, equal to the aggregate of

(a) the deposit required for the renewal period; and

(b) the portion of the deposit for the period heretofore not returned to the permittee.

249. Where during a period a permittee expends an amount in excess of the aggregate of

(a) the deposit set out in Schedule B for that period; and

(b) any amount returned to the permittee pursuant to subsection (3) of section 248 for allowable expenditures made during that period,

the deposit required for any succeeding period shall be reduced by the amount of that excess.

Expenditures

250. The director may at any time determine the amount of allowable expenditure made by the permittee on evidence submitted by the permittee and on such other evidence as the director may require.

251. (1) Every permittee shall within ninety days after the end of a period submit to the director a statement in triplicate of the expenditures made for exploratory work done on the permit area or group of permit areas during that period.

(2) A permittee may submit interim statements of expenditure from time to time during the term of the permit.

(3) Every statement of expenditure shall be verified by a statutory declaration *and independent audit* and shall include

(a) the items of expenditure;

(b) the number of the permit area on which the work was done;

(c) the number of the permit area upon which the expenditure is to be applied;

(d) the specific purpose for which each item of expenditure was made; and

(e) three copies of all reports, photographs, maps and data referred to in section 260 concerning work for which expenditure is claimed.

(4) Where the information referred to in this section has been sent by the permittee to the director pursuant to section 235, the permittee is not required to send that same information to the director pursuant to this section.

252. Where expenditures are made for exploratory work done on or off a permit area for the purpose of obtaining information of a general nature that may be of value to the permittee in connection with work being done by the permittee, the director may consider the expenditures to have been made in such amounts as the permittee may request on any permit area or groups of permit areas for which, in the opinion of the director, the work done is beneficial.

253. Where the director has designated a well as an exploratory deep test well, the amount expended on drilling that well shall be deemed to be an amount equal to twice the amount actually expended on drilling that well.

254. An amount expended for road building, airstrip, or geophysical examination or as a contribution to a well drilled outside a permit area may not be considered to be an allowable

*Approved of audit returned*

*25 must done on the not done by him  
the dir, permit or least.*

expenditure unless prior approval for the work was obtained from the director.

#### Grouping

255. (1) A permittee may apply to the director to group permit areas

- (a) any part of which are within a circle having a radius of one hundred miles or that are contiguous; and
- (b) that do not cover an area in aggregate of more than two million acres.

(2) The application for grouping shall be made in triplicate on a form approved by the director and shall state the permit areas that are to be included in the group.

(3) A grouping shall commence on the date on which the application for grouping is approved by the director.

256. (1) Allowable expenditure made on any permit area within a group, during the period of the grouping shall, at the request of the permittee, be applied to any or all of the permit areas within the group.

(2) Where allowable expenditure is applied to a permit area pursuant to subsection (1), that expenditure shall not be transferred to any other permit area.

257. A permittee may from time to time regroup his permit areas.

#### Reports

258. Every licensee, permittee or lessee shall, at least fifteen days prior to commencing exploratory work, send a written notice, in triplicate, in a form approved by the director, to the director stating

- (a) the date on which he expects to commence the work and to complete the work;
- (b) the purpose and nature of the work;
- (c) the approximate acreage of the area on which the work is to be done together with a map showing the boundaries of the area;
- (d) the equipment he intends to use;
- (e) the name of the person in charge of the work; and
- (f) the number of persons to be employed.

259. A licensee, permittee or lessee shall, upon request by the director, report the location of field parties and any change in the intended exploratory work.

260. (1) Every permittee shall, within sixty days after the third, sixth, and ninth anniversaries of the date on which the permit was issued and within sixty days of the expiration, cancellation or surrender of the permit, forward to the director in triplicate

- (a) copies of all aerial photographs taken by the permittee;
- (b) a geological report of any area investigated including geological maps, cross-sections and stratigraphic data;
- (c) a geophysical report of the area investigated; and
- (d) reports of all surveys not referred to in clauses (a) to (c) that were conducted on the permit area.

(2) The geophysical report referred to in clause (c) of subsection (1) shall include

- (a) where a gravity survey has been conducted, maps showing
  - (i) the location and ground elevation of each station,
  - (ii) the final corrected gravity value at each station,
  - (iii) the gravity contours drawn on the gravity values, and
  - (iv) the boundaries of the permit areas;
- (b) where a seismic survey is conducted, maps on a scale of not less than one inch to one mile showing
  - (i) the location and ground elevation of each shot hole,
  - (ii) the corrected time value at each shot hole for all horizons determined during the course of the survey,
  - (iii) contours and isochrons drawn on the corrected values with a contour interval of not more than one hundred feet or the equivalent in time, and

- (iv) the boundaries of the permit areas; and
- (c) where a magnetic survey is conducted, maps showing
  - (i) the location of the flight lines,
  - (ii) the magnetic contour lines at intervals of ten gamma, and
  - (iii) the boundaries of the permit areas.
- (3) Where the information referred to in this section has been sent by the permittee to the director pursuant to section 235 or 251, the permittee is not required to send that same information to the director pursuant to this section.
- (4) The director may at any time request that a licensee, permittee or lessee supply factual information and data, or a copy thereof, that are necessary for the interpretation of any survey conducted for the purpose of searching for oil or gas and, without restricting the generality of the foregoing, may request factual information and data concerning
  - (a) seismograms and other recordings of seismic events together with all relevant data;
  - (b) magnetic profiles and other recordings of variations in the magnetic field of the earth; and
  - (c) any observations or readings obtained during the course of a survey that was conducted for the purpose of searching for oil or gas.
- (5) No person shall destroy any of the factual information referred to in subsection (4) without the consent of the director, unless copies of that information has been sent to the director pursuant to this regulation.

#### Oil and Gas Leases

##### Oil and Gas Lease upon Application

261. Upon application to the minister, a permittee shall be granted an oil and gas lease subject to this regulation.

262. (1) The land to be included in an oil and gas lease granted pursuant to section 261 shall be selected by the permittee from his permit area.

(2) The minister shall not grant an oil and gas lease pursuant to section 261 for more than one-half of the number of sections in the permit area held by the applicant.

(3) An oil and gas lease granted pursuant to section 261 shall commence on the day the application is received by the minister.

263. Every application for an oil and gas lease shall be made on a form approved by the director and shall be accompanied by

- (a) the fee set out in Schedule A;
- (b) the annual rental for the first year of the term of the lease; and
- (c) a diagram and description of the area for which the application is made.

→ *Other Leasing Tenders for Permits & Permits?*  
 264. (1) The minister may grant an oil and gas lease or permit or call tenders for the purchase of an oil and gas lease or permit for lands

- (a) that have been held under a permit or oil and gas lease which permit or oil and gas lease has expired, been cancelled or been surrendered;
- (b) referred to in subsection (3) of section 231; or
- (c) that are a combination of the lands referred to in clauses (a) and (b) or either of them.

(2) An oil and gas lease or permit granted pursuant to this section may be granted upon such terms and conditions as the minister may direct.

(3) Where tenders are called pursuant to this section and

- (a) no tender is received, or
- (b) a tender has been received and the minister has refused to accept that tender,

the minister may dispose of those lands by an oil and gas lease or permit pursuant to this section in such manner and upon such terms as the minister may determine.

##### Powers of Lessee

265. (1) A lessee who is a licensee may



- (a) carry out exploratory work and drill wells in the lands included in his lease; and
  - (b) produce any oil, gas or related hydrocarbons (other than coal or valuable stone) or any minerals or substances that are produced in association with any of the foregoing from the lands included in his lease.
- (2) Where a lessee is authorized to carry out work or operations under this regulation, that work or those operations may be performed by any person employed or hired by the lessee.

#### Lease Area

266. (1) A lease area shall be composed of quadrilateral blocks of sections not larger than five sections by three sections or four sections by four sections.

- (2) The lease areas within a permit area shall
- (a) corner one another;
  - (b) be separated from one another by at least one section; or
  - (c) be a combination of the blocks referred to in clauses (a) and (b).

(3) Except in the case of

- (a) sections that are reduced pursuant to subsection (1) of section 231; and
- (b) land referred to in subsection (3) of section 231;

no oil and gas lease shall be granted for less than one section.

(4) Nothing in this regulation shall be construed so as to prevent a permittee from leasing a total of one-half of the number of sections in the permit area.

(5) Subsections (1) and (2) do not apply to an oil and gas lease granted pursuant to section 264.

267. (1) Subject to subsection (2), where an oil and gas lease is granted pursuant to section 261, the land within the permit areas, but not included in the lease shall be surrendered to the Crown.

(2) Where an oil and gas lease is granted pursuant to section 261, the director may allow the permittee to retain under permit all or some of those sections of the permit area that are not

- (a) included in the oil and gas lease, or
- (b) contiguous to the lease area.

#### Obligation to Lease

268. The director may at any time declare in writing that a well within a permit area contains oil or gas in commercial quantity.

269. (1) A copy of the declaration referred to in section 268 shall be sent by registered mail addressed to the permittee at his last known address.

(2) The permittee shall, within one year from the date of the mailing to him of the declaration made pursuant to section 268, apply for an oil and gas lease of the area within which the well is located.

270. (1) A permittee may, within ninety days from the date of mailing the declaration, serve on the minister a notice of objection setting out the reason for the objection and all relevant facts.

(2) A notice of objection under this section shall be served by being sent by registered mail addressed to the minister at Winnipeg.

(3) Upon receipt of the notice of objection, the minister shall consider the declaration and vacate, confirm or vary the declaration and the minister shall thereupon notify the permittee of his decision by registered mail.

271. Where a declaration has been made pursuant to section 268 and no application has been made pursuant to section 269, no person shall drill a well in that permit area within four and one-half miles of the well to which the declaration refers.

272. (1) Where an oil and gas lease is granted subsequent to a declaration made pursuant to section 268 or 270, all sections within the permit area contiguous to, but not cornering, the lease area shall be surrendered to the Crown.

(2) Where an oil and gas lease is granted subsequent to a declaration made under section 268

or 270, all that part of the permit area not included in the oil and gas lease and not surrendered pursuant to subsection (1) may be retained under permit by the permittee.

(3) Where part of the permit area is retained under permit pursuant to subsection (2), the permittee shall send the permit to the director for amendment.

#### Publication upon Surrender or Cancellation

273. (1) Where lands have been held under a permit or an oil and gas lease which permit or oil and gas lease or any part thereof has expired, been cancelled or been surrendered, the director shall publish in The Manitoba Gazette a notice of the expiration, cancellation or surrender of that permit or oil and gas lease.

(2) The notice referred to in subsection (1) shall state

- (a) the number of the permit or oil and gas lease; and
- (b) whether the permit or oil and gas lease has expired, been cancelled or been surrendered.

#### Transfer of Permit or Lease

274. No transfer or assignment of a permit or oil and gas lease shall pass any interest in the permit or oil and gas lease until the transfer is approved by the minister.

275. (1) Subject to subsection (2), where a transfer or assignment is executed in a manner satisfactory to the minister and is accompanied by a transfer fee of \$10.00, the minister may approve the transfer or assignment of

- (a) the whole or any sections of a lease area;
- (b) the whole or one-half of a permit area; or
- (c) a specified undivided interest in a permit or oil and gas lease to not more than five transferees.

(2) The minister shall not approve the transfer of

- (a) a lease area smaller than one section; or
- (b) a permit area of other than one grid area or one-half of a grid area.

(3) Subsection (2) does not apply to an oil and gas permit in respect of less than one-half of a grid area.

#### Reports

276. (1) Every lessee shall, within sixty days after

(a) the third, sixth, ninth anniversaries of the date on which the lease was granted or renewed; and

(b) the expiration, cancellation, surrender or renewal of the lease, forward to the director in triplicate, copies of all reports, photographs, maps and data referred to in section 260.

(2) When the information referred to in this section has been sent by the lessee to the director pursuant to section 235, 251 or 260, the lessee is not required to send that same information to the director pursuant to this section.

#### Information to be Confidential

277. (1) Except as provided in this section, the information furnished under this regulation shall not be released.

(2) Information furnished pursuant to clause (a) or (b) of section 235 may be released at any time.

(3) Information submitted by a permittee or lessee concerning an explorato well may be *classified* released thirty days after the completion, suspension or abandonment of that well.

(4) Information submitted by a permittee or lessee concerning an explorato well may be *exploratory* released two years after the completion, suspension or abandonment of that well.

(5) Information submitted by a permittee or lessee concerning a surface geological or photo-geological survey and factual information obtained from a magnetometer, gravity, seismic or other survey may, in the discretion of the minister, be released.

(a) Two years after the cancellation, surrender or expiry of

- (i) the permit of the area on which the work was done, or
- (ii) all oil and gas leases granted pursuant to section 261 within the permit area on

- which the work was done,  
 whichever is the later; or  
 (b) two years after the cancellation, surrender or expiry of the oil and gas lease of the area on which the work was done.
- (6) Information submitted by a licensee, permittee or lessee may, in the discretion of the minister, be released at any time with the consent of the licensee, permittee or lessee.
- (7) General topographical information, legal surveys and elevations of well locations, the current depths of wells and the current status of wells may be released at any time.

Enforcement

278. (1) Where a permittee does not make the deposits required by section 247 within ninety days after the date on which the deposit is to be made, the permit may be cancelled without notice by the director.
- (2) Where a permittee violates any provision of this regulation, other than that referred to in subsection (1), the minister may give written notice to the permittee and unless the permittee remedies or prepares to remedy the violation, to the satisfaction of the minister, within ninety days from the date of the notice the minister may cancel the permit.
2. Manitoba Regulation 14/47 is further amended by adding thereto, immediately after Schedule A, the following Schedule:

Schedule B  
 Deposits

Column I	Column II
Period	Deposit
1. The first eighteen-month period of the original term of the permit,	five cents for each acre to be included in the permit.
2. The second eighteen-month period of the original term of the permit,	fifteen cents for each acre included in the permit.
3. The first renewal period,	thirty cents for each acre included in the permit.
4. The second renewal period,	forty cents for each acre included in the permit.
5. The third renewal period,	fifty cents for each acre included in the permit.
6. The fourth renewal period,	fifty cents for each acre included in the permit.
7. The fifth renewal period,	fifty cents for each acre included in the permit.
8. The sixth renewal period,	fifty cents for each acre included in the permit.
9. The period of an extension granted pursuant to section 39	ten cents for each acre included in the permit.

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Period 1. Deposit 50,000.

Period 2. Deposit 100,000.

Actual work required = \$150,000

Work done \$200,000

Applies \$100,000 to obtain refund of Period 2 deposit.  
" 50,000 " " " " Period 1 " (carried forward)  
Has cred of 50,000 which can be a deposit for Period 3.



Jack Palmer

5<sup>th</sup> Initial period must be done within the 18 month  
period.

Reference. Section 42 (5) should be in to  
allow previous statement. Federal propose  
removal reason why we left it out.

15<sup>th</sup> 2<sup>nd</sup> period 18 months.

249. Deposit \$100,000

Work 200,000

allowed to carry 100,000 as a credit into  
next period.

Allocates \$100,000 & has refunded \$100,000

Q. T. W. HYSLOP  
Tom.

J. C. Palmer.

Page 313 Section 289(1) Permit upon fence  
removed.

Section 32 removed and added into  
Section 264 and word 'act' added

Section 264 Reading something different  
from other hearing (Tenders for  
Plans and Permits).

Section 277 sub(3) should read development  
rather than well.  
sub(4) should be expressed as:

Schedule 245 - 39.

H.B. Concern re crisis areas - permits. Can be done.

Surveyor General - Recent photos low water mark &  
delineate acreage.

All permits bounding pres. lands, still held  
pending clarification, acreages and out  
permits - 1-grid.

Suggest we recall all permits > 1 crisis area  
and issue est. 1-grid area.

# Joubin Seeks Oil Around Hudson Bay

Uranium mine-finder, Fran-  
co Joubin is looking for oil  
around Hudson Bay.

It was a disputed theory of  
Joubin's, involving leaching  
action of time and weather on  
northern Ontario outcrops, that  
led to proving the uranium de-  
posits of Elliot Lake. Now Joubin  
has joined a private group  
which has acquired a petroleum  
permit covering some 2.5 mil-  
lion acres in Manitoba, along  
the Hudson Bay shore.

Joubin suggests that sedi-  
ments underlying this stretch  
have all possibilities. He finds  
support for his theory in a re-  
cent Geological Survey of Can-  
ada paper which showed sedi-  
ment in this area may be much  
thicker than was earlier  
thought.

Ontario Department of Mines  
did some drilling southeast of  
this area, around James Bay,  
nearly 10 years ago. Results in-  
dicated strata were not neces-  
sarily oil-bearing, but were  
deemed interesting.

A private company, Sogebet  
limited, has been formed to  
undertake exploration. It is  
headed by Latin American  
Mines President, Stephen, and  
Joubin is a director.

There is a possibility that first  
field work surveys, including  
geological and geophysical  
testing, may get underway  
this fall. Under terms of the  
permit the company is com-  
mitted to spend a minimum of  
\$125,000 an acre, or about \$125,000.

## Ice threat shuts down wildcat in Hudson Bay

HUDSON BAY drilling operations have ceased for the winter and Aquitaine Co. of Canada Ltd. is hustling to get its drilling vessel out of the bay before ice shuts the door.

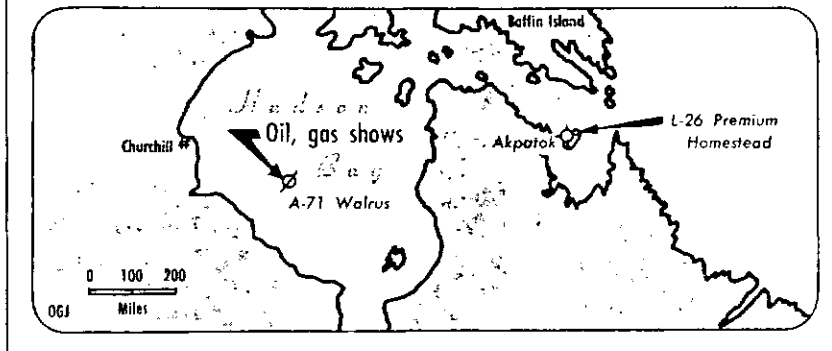
Aquitaine, operator for a six-company group, said the A-71 Walrus was suspended last week at 3,926 ft after encountering separate and non-commercial shows of oil and gas. No tests were run, although the hole was logged to total depth.

Basement rock had not been reached, but an Aquitaine official said expected ice conditions required that the effort be suspended. The company hoped to have Western Offshore Drilling & Exploration Co.'s Wodeco II out of the bay early this week.

The drillship will winter at Halifax and move off Prince Edward Island next spring where it is scheduled to drill two holes in a \$4-\$6 million program for Hudson's Bay Oil & Gas Co. and Canadian Fina Ltd.

Aquitaine said late departure of ice from the location prevented spudding the A-71 Walrus before Aug. 7, and wave and weather conditions caused difficulties throughout drilling operations. It added that geological and logistical data from the hole "will be of great value in the group's future exploration operations in Hudson Bay."

### Suspended hole, failure marked in far north



The hole was left in condition for reentry in the future, but no quick decision on such a measure is expected, an official said. Also, there will be no quick verdict on whether or when to drill a second location announced earlier for this summer's campaign.

Participants in the program are -- Aquitaine, 25%; Atlantic Richfield Co., 50%; Sun Oil Canada Ltd., 5%; Elf Oil Exploration & Production Canada Ltd., 7½%; Camerina Oil & Gas Ltd., 6¼%; and Canadian Fina Oil Ltd., 6¼%.

The A-71 Walrus is located on a

block of over 55 million acres of federal exploratory permits held by these companies. The drill site is 125 miles offshore and 250 miles east of Churchill. It lies in 600 ft of water.

**Basement shallow.** Meanwhile, the Canadian Homestead Oils Ltd. wildcat in Ungava Bay has been plugged and abandoned after reaching basement rock at a shallow 1,217 ft.

Premium Homestead Akpatok L-26, drilled on a farmout from Premium Iron Ores Ltd., was located on the west side of Akpatok Island at 60° 24' N. Lat., 68° 17' W. Long. It was the first probe in the area.





Provin Manitoba

August 27, 1962

Date

MANITOBA OIL EXPLORATION  
MOVES TO THE SUBARCTIC

The subarctic waters of Hudson Bay will soon be the scene of new activity as the search for oil moves to Northern Manitoba.

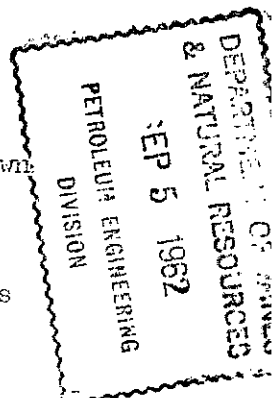
Premier Duff Roblin announced last Thursday at Flin Flon that Manitoba and the federal government are issuing exploration permits, totalling two million acres, on the coast of Hudson Bay at Cape Tatnam, about 160 miles south-east of Churchill. They are the first exploration permits ever awarded for oil searches in Hudson Bay and mark the first efforts of private enterprise to find oil in these waters.

The exploration work will be done by Franc R. Joubin and Associates of Toronto. The approximately two-million-acre area consists of 400,000 acres of Manitoba territory and 1.6 million acres of Government of Canada territories.

To facilitate the exploration work, however, the minister of mines and natural resources, Hon. C. H. Whitney, has worked out arrangements with Ottawa to simplify routine procedure. The oil explorers will be able to deal with the two governments as if they were one.

The exploration work will start in the near future and a minimum of \$100,000 will be spent in the search.

Premier Roblin said Manitoba is delighted that Mr. Joubin and his associates have undertaken the project. Mr. Joubin is well known in mining and exploration circles as the geologist who supplied the impetus for the discovery and development of the major uranium mines in Ontario.



OCT 31/69 WPB Tribune

# Oil search surrounded by top-level secrecy

By BARRY MULLIN  
Tribune Northern Reporter

CHURCHILL — Closed-circuit TV and a diving bell in the freezing depths of Hudson Bay were used this summer in an effort to locate oil which — if it's found — could spark a full-scale, federal-provincial fight about who gets the profits.

The huge drilling ship, WODECO II, is now plowing back to eastern waters after the summer probe in Hudson Bay — after drilling a well in the bay bed in an operation covered by top-level secrecy.

The well never reached the 6,600-7,000-foot level anticipated by Aquitaine, operator for a group of six oil companies who hold lease rights to more than 22,500,000 acres in the bay.

High level secrecy was maintained throughout the operation because the well was a wildcat — the first well drilled in an unfamiliar formation. The well only went to about 3,400 feet.

No oil or gas strikes were made and no tests were conducted for shows or pay zones within the drilled zone. Several electrical and seismic logs were taken, however.

The effect that the setback will have on future explorations in Hudson Bay has not been determined yet.

And Aquitaine has not announced if it will continue explorations here in 1970. They have not retained leases on the warehouse area where drilling supplies were stored or on the Beluga Motel where most of the engineers and superintendents lived during the drilling season.

However, one thing was certain. Although there appeared to be very little interest shown in the well, the provincial government and Churchill residents were watching progress closely but quietly.

An oil or gas strike would have raised the hopes of local residents who have waited patiently for any industry which will provide a stable economic base for the town. If oil had been discovered, many

when the swell started to come in," said one roughneck from southern California.

He said waves looked at least eight or 10 feet high and when they would strike the drilling vessel — which is naturally top heavy because of the 150-foot drilling rig situated amidships — pallets of cement, each weighing a ton would jump off the deck and slide across them.

There were times when we had to shut down because we couldn't work up on the floor (the drilling floor)," he explained because the ship was rocking too much.

The swell posed the greatest problems to engineers working on the hole. Direct communication with France was set up and a team of oceanographers measured waves, movement, changes in winds and tides. All this information was relayed to Paris, fed into computers, digested and broken down for the oil field engineers.

There was very little data about the swells on Hudson Bay," Rene J. Clerc from Societe Nationale des Petroles d'Aquitane, the former parent company of the Calgary base firm. "There was some data but most of it we had to collect ourselves and this held us up."

### OLD TIMERS

Aquitane interviewed local fishermen and old timers in an attempt to learn more about the unpredictable movements of the bay.

And when it wasn't the swell it was temperature and depth problems.

Special materials had to be flown into Churchill after drilling fluids froze up on the bottom. Temperatures at the 600-foot depth in salt water are just below freezing and posed problems for engineers.

For one week no progress was made in drilling while the hole was thawed and flushed.

"We realized there were a great many things we did not know about Hudson Bay before we started drilling," explained operations superintendent Pierre Paul Allibaud.

The Aquitaine and SNPA official explained that the company considered the

been determined yet.

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However, one thing was certain. Although there appeared to be very little interest shown in the well, the provincial government and Churchill residents were watching progress closely but quietly.

An oil or gas strike would have raised the hopes of local residents who have waited patiently for any industry which will provide a stable economic base for the town. If oil had been discovered, many residents felt that the area could prove to be as valuable to Manitoba as the oil discovery along Alaska's north slope.

#### OIL: THE ANSWER

"Oil would do the trick," said one resident. "We're not too far from Winnipeg, eastern Canada or from Montreal, if we found oil maybe the federal government would have to take a closer look at locating a good industry here."

The provincial government would have welcomed a strike at this time because of the demand for new industry in the province.

But two things have seriously retarded the future of oil exploration in Hudson Bay.

Weather conditions and a limited knowledge of the bay's swell hampered operations aboard the Western Offshore Drilling and Exploration Co. Barge.

The WODECO II was towed into Hudson Bay in late July.

On Aug. 7, the drilling vessel was manoeuvred into position in 600 feet of water, 260 miles southeast of Churchill. The eight anchors used to keep the shape stable were dropped and the first well on Hudson Bay was spudded.

Located 125 miles offshore, the well was labelled by the federal government Hudson Wairus A-71 but most of the roughnecks and drillers working on board thought they had a tiger by the tail when the bay began to act up.

"You should have seen this ship roll

and old timers in an attempt to learn more about the unpredictable movements of the bay.

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"We realized there were a great many things we did not know about Hudson Bay before we started drilling," explained operations superintendent Pierre Paul Allibaud.

The Aquitaine and SNPA official explained that the company considered the hole mainly an information well at this time. "Our company was prepared to learn more about the area, formations and conditions than we were about striking oil or gas," stated Mr. Allibaud.

"But I'm certain that we would be very happy if we find something," he said during an interview before drilling operations ceased.

Water depth also poses a problem because of the pipe that must extend from the ship to the bottom. A telescoping pipe is used so that when the ship rises with the swell, the pipe will not pull loose from the bottom.

All blowout equipment must be located on the bottom to prevent the well from blowing in if a high-pressure pocket of gas or oil is hit while drilling.

A closed circuit television camera was used to see the equipment on the bottom and to inspect pipe and stab-ins used for blowout prevention.

A diving bell was also used and divers were considered but bottom temperatures were too severe.

But despite many handicaps and unforeseen difficulties, Aquitaine and the western Offshore crews overcome many obstacles thrown in their way.

High winds and snow hampered drilling operations near the end of the short season. When pipe swings in the derrick as connections are being made to put more pipe in the hole, nothing can be done to overcome the motion of ship and derrick.

Sogepet file

## Sun Applies For Salt Water Disposal Scheme at Hastings

Sun Oil Company has made application to the Saskatchewan Department of Mines and Minerals to convert one of its suspended oil wells in the Hastings field into a salt water disposal well.

Sun proposes to convert its **McKenzie No. 6-27 (Lsd. 6-27-3-33 W. 1)** into a salt water disposal well, through which the company would re-inject 2,600 barrels per month into the South Frobisher Beds.

The well has been suspended since August 8, 1961, when water-oil ratios became too high for production to remain economical.

The well would be converted by squeezing existing perforations between 3,954-3,959 feet, which is approximately seven feet above the oil-water interface, and perforate interval 3,985-95 feet. Injection would then take place some 18 feet below the interface, thus minimizing the tendency to cause a premature break-through into the producing wells.

Sun Oil Company stated in its submission that it would be able to accept water from other operators for injection if this water is delivered into the disposal system in such a manner and condition that is satisfactory to Sun Oil.

## Exploration Program Planned For Large Hudson Bay Spread

Steven Low, president of Latin American Mines Limited, has announced that he and a group of associates will undertake petroleum exploration both on and off shore of Hudson Bay.

In association with Dr. Franc R. Joubin, the discoverer of the famed Blind River uranium camp, Mr. Low has formed a new private company, Sogepet Limited, Societe Generale des Petroles. Its offices are in the Latin American Mines suite at 88 University Avenue, Toronto.

Sogepet now holds exploration permits for some 2.5 million acres in northern Manitoba, between York Factory and Fort Severn, including a larger off-shore area into Hudson Bay. The area is approximately 53 miles north-west of Winnipeg.

Immediately, the company will undertake geophysical and seismic aerial and ground surveys, and "slim hole" drilling in the shallow flats, along the Hudson Bay shore.

"We hope that this initial work will provide the justification for subsequent, standard drilling tests," Mr. Low commented.

## CONSERVATION BOARD DELINEATES WORSLEY FIELD

The Alberta Oil and Gas Conservation Board has delineated the limits for the Worsley field in northwestern Alberta.

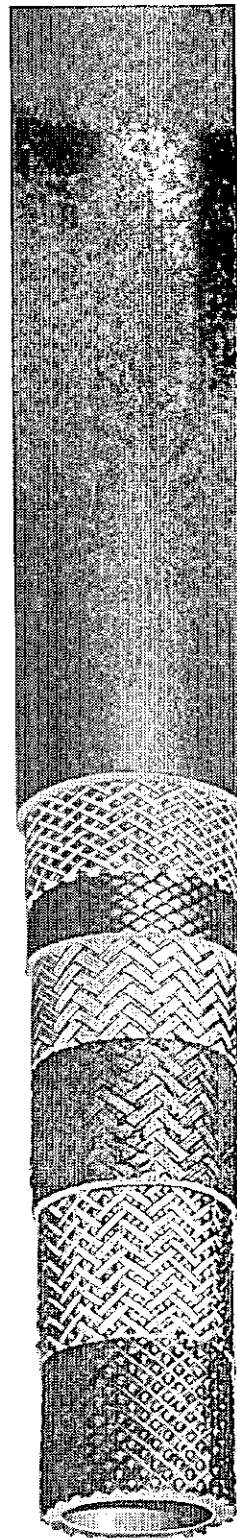
The field comprises a total of 46,720 acres and includes six gas and two oil wells. The acreage is contained in the following sections: Range 5, sections 8, 9 and 10, and 15 to 22 inclusive; Range 6, sections 13 to 26 inclusive; Range 7, sections 7 and 8, and 13 to 30 inclusive; Range 8, sections 12 to 30 inclusive, and Range 9, sections 13, 14 and 15, and 22 to 27 inclusive, all in Township 87, west of the Sixth Meridian.

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## SEC Convention To Draw 1,500 Delegates From Around World

Some 1,500 delegates and their wives are expected in Calgary next week for the 32nd annual international meeting of the Society of Exploration Geophysicists, to be held Sept. 16 - 20.

Hosted by the Canadian Society of Exploration Geophysicists, it will be the first time that the parent SEG has even held its annual meeting outside of the United States.

Delegates from North and South America, Europe, Africa and Australia are expected to attend.

### Second Largest Branch

Founded in 1930, the SEG has a current membership of 6,000 throughout North and South America and Africa. The Canadian branch, with 500 members, is the second largest chapter in the SEG organization.

Hotel convention headquarters will be the Palliser Hotel, while technical sessions will be held at the Jubilee Auditorium. Transportation between downtown hotels and the auditorium has been arranged by the CSEG.

Registration will start at 2 p.m., Sunday, at the Palliser, with the convention proceedings starting with the "kickoff luncheon" at the auditorium at noon Monday.

Featured speakers at the luncheon will include: Dr. J. Tuzo Wilson, director of the Institute of Earth Sciences, University of Toronto; Dr. Lawrence Faust, president of the SEG; Dr. R. E. Rettger, president of the American Association of Petroleum Geologists, and Sir Charles Wright, Defense Research Board of Canada, Pacific Naval Laboratory, Esquimalt, BC. SEG awards and honors will also be presented at the luncheon.

At the mining luncheon on Tuesday, Dr. J. M. Bruckshaw, professor of applied geophysics, Imperial College, London, will be the guest speaker, and will discuss "geophysics — now and then."

### 70 Technical Papers

A total of 70 technical papers will be presented at sessions running from Monday afternoon through Thursday afternoon.

A feature of the convention will be displays of geophysical and electronic equipment by more than 50 firms. Several million dollars worth of the most advanced geophysical equipment will be on display.

On Wednesday afternoon, a field demonstration of tracked vehicles will take place near Bragg Creek, west of Calgary. The display will take place in a muskeg-covered area under conditions similar to those encountered in northern Canadian field operations.

## W. O. Twaits Warns: Don't Make Fetish of Self-Sufficiency

Canada has a much greater capacity for expanding its industrial production than is generally accepted, according to Imperial Oil's president W. O. Twaits.

But he warned that "if, under the spur of nationalism, provincialism, or even municipalism, we make a fetish of self-sufficiency, we do so at far greater risk than may be realized."

Speaking at the Industrial Expansion Conference in Ottawa September 7, Mr. Twaits said that in the oil industry's experience "Canadian industry has demonstrated a remarkable ability to compete, despite inherent disad-

vantages of volume and distribution costs. There is no doubt that the prolonged premium on the Canadian dollar in recent years resulted in a painful but important wringing-out process in all Canadian industry. With our traditionally low-tariff protection further reduced by the premium on the dollar during that period, industry in this country has generally met the challenge of exposure to foreign competition, probably more severe than in any other area in the world.

### Surcharges Not The Answer

"I am concerned, as I am sure others are, that the efficiency and productivity gains which have been accomplished during this process should not now be diluted by the sharp decline in the value of the Canadian dollar and by inflationary cost increases. It is one thing to suffer a premium on the dollar but let's not delude ourselves that surcharges or a substantial discount on the dollar are the whole answer to the problem or are free from accompanying complications in the longer term."

Mr. Twaits told delegates to the conference that the growth of Canadian crude oil and gas production in the past 15 years "is a classic in the history of the world petroleum business because of the speed with which it was developed, and despite the great financial and marketing handicaps."

He said that today, "Canadian oil and gas production is currently worth \$740 million in the national accounts — and more in our international accounts."

Imperial's president said that as a primary industry,

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# LARGE LAND FILING IN AND OFF MANITOBA

## Newest land play is in Hudson's Bay.

Noted uranium explorer Franc R. Joubin has filed on some two million acres of oil permits, three quarters of them offshore. The offshore acreage was filed on with the federal government; the land acreage with the Manitoba government. There is an 18-month, \$100,000 work commitment.

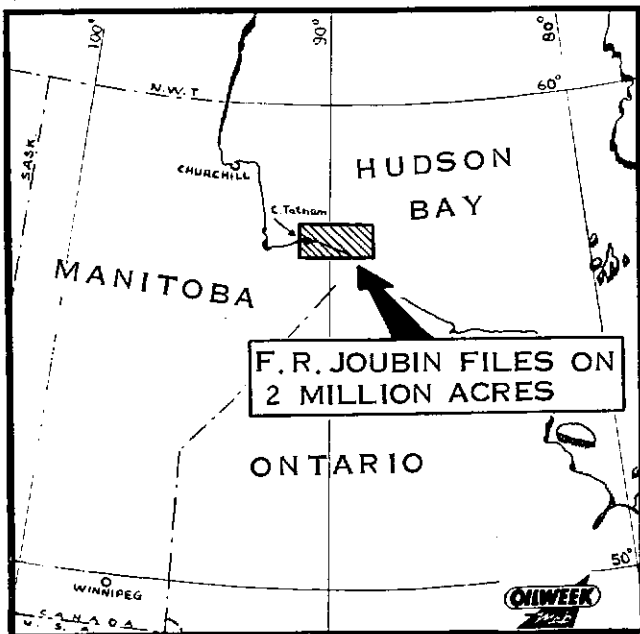
Toronto-based consultant and geologist Franc R. Joubin has filed on approximately two million acres, three-quarters of it offshore in the Cape Tatnam area of southwestern Hudson Bay.

The offshore permits, numbered from W. 260 to W. 268 and covering approximately 1.5 million acres, are situated between 56 degrees 50 minutes and 57 degrees 30 minutes north latitude and 88 degrees 15 minutes and 91 degrees no minutes north longitude. Description of the onshore acreage is not immediately available but it is understood to be contiguous with the wet permits.

Filing for the offshore acreage was made with the Department of Northern Affairs and National Resources, for the land permits with the Manitoba government.

### No Dispute

Manitoba's deputy minister of mines and natural resources Anderson told OILWEEK that ownership of the offshore acreage was not a matter of dispute between his province and the federal government and would not become one—at least not until commercial production was found.



He said Manitoba has a "very amicable arrangement with Ottawa"; they have jointly set up a two-man com-

mittee to deal with such situations and industry has only to deal with the Manitoba person to get both governments' point of view.

"Private enterprise has to deal with the same restrictions with Ottawa as it has with us," he said.

### \$100,000 Work Commitment

Joubin & Associates have an approximate \$100,000 work commitment to perform on their acreage in the first 18 months, and according to Mr. Anderson all work can be performed onshore.

He said that a recent aerial survey made in Hudson Bay by the Geological Survey of Canada "appeared" to show "reasonably thick sediments in the Bay; the question now is how far do they extend inland."

Mr. Anderson added that his own mines branch thought the area had possibilities "and we are pleased that private enterprise agrees and will put up some money to find out."

Mr. Joubin is considered one of the world's leading experts in uranium exploration. His discoveries in Blind River, Ontario; Beaver Lodge, Saskatchewan and in British Columbia accounted for considerably more than half of Canada's uranium production as recently as 1955.

Born in San Francisco in 1911 and educated in BC, he is a member of the AIMM, AIME and CAC and was awarded the engineering institute's Leonard Medal in 1956 and the CIMM's Blayoc Medal in 1957.

## DMR Earns Meager \$5,000 For 55,246 Acres August 16

The sale of 55,246 acres out of the total 349,848 acres offered netted the Director of Mineral Rights a meager \$5,116.13 on August 16. Of the eight parcels offered only two and part of a third were sold.

Imperial Oil paid \$4,534.13 for a 17,920-acre tract 10 miles north of Waterton, Siebens Leaseholds purchased a 17,600-acre parcel 15 miles west of Turner Valley for \$181 while Dynalta Oil & Gas Ltd. paid \$401 for 19,726 acres some 50 miles west of Calgary. Dynalta purchased only part of the 28,686-acre tract initially offered, including Sections 16, 17, 20, 21, 28, 29, 30, north 1/2 and southeast 1/4 of section 32 and sections 33 to 36 inclusive, all in township 23, range 9, W. 5 and all advertised rights in township 24, range 9, W. 5.

## Northern Alberta Reservations Net Average 50 Cents Per Acre

Eight reservation blocks covering 565,902 acres were sold by the provincial director of mineral rights in Edmonton recently for a total of \$270,930.45, or less than 50 cents an acre.

Most of the revenue came from three parcels in the

extreme northwest corner of the province, purchased by British American Oil. B-A paid \$225,379.50 for 197,606 acres in parcels 2382 and 2384. The three adjacent blocks are centred approximately 70 miles south of the Northwest Territories and 50 miles east of British Columbia. B-A's three bids worked out to an average price of about \$1.14 per acre.

Home Oil Company, Alminex and Kern County Land Company paid \$26,824.96 for 176,480 acres in two parcels located some 30 miles east of the Swan Hills field: Imperial Oil purchased two reservations 30 to 40 miles north of the Westlock field for \$3,244.09, and Murphy Oil paid \$15,488.88 for 85,120 acres located 45 miles northwest of the Red Earth field.

Following are the complete results of the sale:

Parcel No.	Location	Acreage Purchased	Price
2376	13 MILES N. OF WESTLOCK FIELD	74,400	IMPERIAL OIL LIMITED 2,321.56
2377	8 MILES N. OF WESTLOCK FIELD	6,124	IMPERIAL OIL LIMITED 822.33
2378	8 MILES NW OF WESTLOCK FLD.	41,980	HOME OIL CO., ALMINEX LIMITED, KERN COUNTY LAND COMPANY 12,660.34
2379	8 MILES E. OF SWAN HILLS FIELD	92,000	HOME OIL CO., ALMINEX LIMITED, KERN COUNTY LAND COMPANY 13,181.06
2380	10 MILES NW RED EARTH FIELD	85,120	MURPHY OIL 15,488.88
2381	10 MILES N. OF TOWN OF PEACE RIVER	10,000	NO OFFERS
2382	10 MILES, ROTCHO LK. BC, 10 MI. E. OF BC BORDER.	74,085	BRITISH AMERICAN OIL COMPANY 75,126.52
2383	10 MILES, ROTCHO LK. BC, 10 MI. E. OF BC BORDER.	74,085	BRITISH AMERICAN OIL COMPANY 75,126.52
2384	10 MILES, ROTCHO LK. BC, 10 MI. E. OF BC BORDER.	14,480	BRITISH AMERICAN OIL COMPANY 15,126.58

\$ 270,907.45

## Big Calgary Lease Sale Nets \$380,000 For 19,000 Acres

Forty lease blocks covering 19,840 acres in southern Alberta were sold by the Calgary mining recorder office last Wednesday for cash bids totalling \$379,673.04 or an average of approximately \$19 per acre.

Successful bids ranged from a low of 25 cents per acre to a top of \$127.57 per acre. Top bid of \$40,822.40 for a half section in the Cessford area was made by Canadian Pacific Oil & Gas Limited. California Standard got by with just 25 cents per acre for three sections in the Claresholm area.

Following are the complete results of the sale:

Parcel No.	Location	Acreage Purchased	Price
C37	STEVEVILLE	100	KERR-MCCOY OIL INDUSTRIES, INC. 80.00
C38	RED COULES	310	MURPHY OIL COMPANY LIMITED 120.00
C39	DRUMHELLER	16,000	THE BRITISH AMERICAN OIL COMPANY 26,474.25
C40	FENN	310	THE BRITISH AMERICAN OIL COMPANY 4,273.83
C41	BUFFALO LAKE	310	HUNT OIL COMPANY 3,424.84
C42	RUMSEY	310	THE BRITISH AMERICAN OIL COMPANY 5,177.41
C43	TWINING	640	MURPHY OIL COMPANY LIMITED, CANADIAN OIL COMPANIES LIMITED, UNITED PRODUCERS COMPANY, INC. 16,563.20
C44	RUMSEY	310	DEVON-PALMERS OILS LIMITED, PRAIRIE OIL ROYALTIES COMPANY LTD. 3,681.77
C45	HURLEY	640	CANADIAN OIL LTD. 4,828.00
C46	LOUBANA	310	TEXAS PACIFIC COAL & OIL COMPANY 4,770.00
C47	"	310	TEXAS PACIFIC COAL & OIL COMPANY 6,720.00
C48	"	320	TEXAS PACIFIC COAL & OIL COMPANY 6,720.00
C49	"	480	TEXAS PACIFIC COAL & OIL COMPANY 10,080.00
C50	"	480	AMERADA PETROLEUM CORPORATION 9,002.88
C51	"	480	AMERADA PETROLEUM CORPORATION 9,002.88
C52	"	140	AMERADA PETROLEUM CORPORATION 2,217.44
C53	TWINING	640	TRIAD OIL COMPANY LIMITED 10,264.81
C54	THREE HILLS	340	PACIFIC PETROLEUM LIMITED 46,400.00
C55	PINE LAKE	310	AMERADA PETROLEUM CORPORATION 4,018.40
C56	"	310	AMERADA PETROLEUM CORPORATION 3,217.44
C57	"	640	AMERADA PETROLEUM CORPORATION 12,844.88
C58	JOFFRE	800	SKELLY OIL COMPANY 11,961.11
C59	SUNNYSLOPE	640	TRIAD OIL COMPANY LIMITED 10,264.81
C60	"	320	OLENDALE INVESTMENTS LIMITED 1,280.00
C61	WIMBORNE	160	DOMS PETROLEUM LTD., PRODVO GAS PRODUCERS LIMITED 4,025.00
C62	PINE LAKE	640	CANADIAN OIL COMPANIES LIMITED 2,600.00
C63	"	640	SKELLY OIL COMPANY 6,781.60
C64	HILLSDOWN	640	THE BRITISH AMERICAN OIL COMPANY 9,086.72
C65	CLARESHOLM	640	THE CALIFORNIA STANDARD COMPANY 162.58
C66	"	640	THE CALIFORNIA STANDARD COMPANY 162.58
C67	"	640	THE CALIFORNIA STANDARD COMPANY 162.58
C68	BLACKIE	640	TRANSALTA MINERALS LIMITED 2,280.00
C69	RED DEER	640	THE BRITISH AMERICAN OIL COMPANY 9,087.48

C70		640	THE BRITISH AMERICAN OIL COMPANY 16,812.28
C71	BARRHAVE	640	PACIFIC PETROLEUM LTD. 1,000.00
C72	INNISFAIR	310	BOGGS MOBIL OIL OF CANADA LTD. 219.20
C73	CROSSFIELD	320	CANADIAN PACIFIC OIL & GAS LTD. 4,822.40
C74	NETOGA	640	CANADIAN OIL COMPANIES LIMITED 4,110.06
C75	WINTLAW	310	CANADIAN OIL COMPANIES LIMITED 2,610.00
C76	STURBURY	320	TRANSALTA MINERALS LIMITED 619.20

\$ 774,673.04

## Alberta Sale Nets \$700,000 For 167,000 Acres of Permits

The Director of Minerals netted a total of \$694,634.15 from the sale of 167,635 acres of permits out of a total of 210,293 acres offered.

The highest spender at the sale, who also made the highest single bid, was King-Stevenson Gas and Oil Company which spent a total of \$309,111.08 with one bid of \$161,777.77 for a 20,929-acre parcel west of the Cessford field. Highest per-acre price was achieved by the team of Uno-Tex Petroleum Corporation and the Calgary & Edmonton Corporation, with a \$150,202.12 bid for a 12,000-acre tract near the Drumheller field to arrive at a \$12.52 per-acre price.

One parcel was bought by private capital, a 1,920-acre parcel also in the Drumheller area, for \$15,840.00 by J. M. Forgotson and L. Simpson Burk.

A complete description of all acreage sold follows:

Parcel No.	Location	Acreage	Purchaser	Price
10	SINGLOSS - MERRICK NAT AREA	18,200	TEXACO EXPLORATION	49,152.42
11	SE OF SIBBALD GAS FIELD	22,800	MEDALLION PETROLEUM LIMITED	31,238.84
12	EAST OF HARTBERG AREA	18,600	HOME OIL, KERN COUNTY LAND CO., ALMINEX LIMITED	41,600.50
13	18 MI. N OF SINGLOSS	21,100	NO OFFERS	
14	13 MI. NW OF SINGLOSS	15,300	KING-STEVENSON GAS & OIL CO.	23,377.77
15	BIG STONE AREA, NORTH OF CESSFORD	8,700	NO OFFERS	
16	WEST OF CESSFORD	10,910	KING-STEVENSON GAS & OIL CO.	161,377.32
17	15 MI. W. OF ENCHANT	14,900	NO OFFERS	
18	HALKIRK SOUTH AREA	6,120	NO OFFERS	
19	HALKIRK SOUTH AREA	21,400	BRITISH AMERICAN OIL CO. LTD.	11,821.31
20	10 MI. WEST OF ENCHANT	19,300	KING-STEVENSON GAS & OIL CO.	40,377.37
21	WEST OF CESSFORD'S NW TIP	11,900	KING-STEVENSON GAS & OIL CO.	78,317.37
22	DRUMHELLER AREA	11,800	UNO-TEX PETROLEUM CORP., CALGARY & EDMONTON CORP., CALIFORNIA STANDARD COMPANY	150,202.12
23	JOZANAM AREA	6,800	J. M. FORGOTSON, L.S. BURK	15,840.00
24	DRUMHELLER AREA	1,920	J. M. FORGOTSON, L.S. BURK	15,840.00

\$ 694,634.15

## COMING LAND SALES

Aug. 28—Fifteen permits comprising 210,293 acres will be offered by the Alberta director of mineral rights in Block "A."

Sept. 5—The Edmonton mining recorder will offer nine tracts comprising 2,880 acres.

Sept. 6—Twelve reservations covering 90,400 acres scattered throughout the province will be offered by the Alberta director of mineral rights.

Sept. 11—The Alberta director of mineral rights will offer eight parcels comprising 340,960 acres in northern parts of the province.

Sept. 12—The Calgary mining recorder will offer 7,200 acres in central Alberta.

Sept. 13—The federal government's Indian affairs branch will offer 21,420 acres of P & NG rights in the Blackfoot Indian Reserve.

Sept. 20—Fifteen parcels comprising 2,508 acres of P&NG rights will be offered by the department of northern affairs in various parts of Alberta and Saskatchewan.

Sept. 25—The government of Saskatchewan will offer 892,881 acres of leases permits and drilling reservations, comprising 41 lease parcels, 10 permits and five drilling reservations.

## Regulations Under The Regulations Act

### MANITOBA REGULATION 71/62

being

A Regulation under The Mines Act  
to amend Manitoba Regulation 14/47  
(Filed August 28th, 1962.)

1. Manitoba Regulation 14/47 is amended by adding thereto, immediately after section 212 thereof, the following Part:

Part VI  
Far North

213. (1) In this Part

(a) "development well" means a well, the location of which is, in the opinion of the director, so related to the location of producible wells that there is every probability that it will produce from the same pool as the producible wells;

(b) "exploratory well" means any well that is not a development well;

(c) "exploratory work" means test drilling, aerial mapping, surveying, bulldozing, geological, geophysical and geochemical examinations and other investigations relating to the subsurface geology and all work, including the construction and maintenance of those facilities necessarily connected therewith and the building and maintenance of airstrips and roads required for the supply of or access to exploratory operations;

(d) "legal survey" means a survey made in accordance with section 223;

(e) "licensee" means the holder of a licence issued under section 91;

(f) "period" when used in respect of a permit means

(i) the period of a term of a permit in respect of which a deposit is required to be made under section 247 and Schedule B,

or

(ii) the term of a renewal of a permit, or

(iii) the term of an extension of a permit;

(g) "permit" means an exploratory permit issued under this Part;

(h) "permittee" means the holder of a permit.

(2) Subject to subsection (2) of section 214, the provisions of Parts I to V that apply to reserving geological and geophysical reservations and to geological and geophysical reservations apply, in so far as is practicable, to a permit and the area covered by a permit respectively.

214. (1) This Part applies only to lands in the province that are north of latitude 56° north, and east of meridian of longitude 95° west.

(2) Where a provision of this Part conflicts with or is repugnant to a provision of any other Part of this regulation, in so far as it affects land to which this Part applies, the provision of this Part supersedes the conflicting or repugnant provision of the other Part.

Land Division

215. For the purposes of this Part, land shall be divided into grid areas.

216. (1) A grid area shall be bounded on the east and west sides by successive meridians of longitude of the series 88° 00' 00", 88° 15' 00", 88° 30' 00", which series may be extended as required, and on the north and south sides by straight lines joining the points of intersection of the east and west boundaries with successive parallels of latitude of the series 55° 00' 00",



55° 10' 00", 55° 20' 00", which series may be extended as required.

(2) Every grid area shall be referred to by the latitude and longitude of the northeast corner of that grid area.

217. (1) Every grid area shall be divided into sections.

(2) A Section shall be bounded on the east and west sides by meridians spaced at intervals of one-tenth of the interval between the east and west boundaries of the grid area.

(3) A section shall be bounded on the north and south sides by straight lines drawn parallel to the north and south boundaries of the grid area and spaced at intervals of one-tenth of the interval between the north and south boundaries of the grid area.

(4) A section shall be identified by the number to which it corresponds as follows:

100	90	80	70	60	50	40	30	20	10
99	89	79	69	59	49	39	29	19	9
98	88	78	68	58	48	38	28	18	8
97	87	77	67	57	47	37	27	17	7
96	86	76	66	56	46	36	26	16	6
95	85	75	65	55	45	35	25	15	5
94	84	74	64	54	44	34	24	14	4
93	83	73	63	53	43	33	23	13	3
92	82	72	62	52	42	32	22	12	2
91	81	71	61	51	41	31	21	11	1

218. The boundary

(a) between the north and south halves of a grid area is the north boundary of sections 5, 15, 25, 35, 45, 55, 65, 75, 85 and 95; and

(b) between the east and west halves of a grid area is the west boundary of sections 41 to 50.

219. (1) Every section shall be divided into subdivisions.

(2) Every subdivision shall be bounded on the east and west sides by meridians spaced at intervals of one-quarter of the interval between the east and west boundaries of the section.

(3) Every subdivision shall be bounded on the north and south sides by straight lines drawn parallel to the north and south boundaries of the section and spaced at intervals of one-quarter of the interval between the north and south boundaries of the section.

(4) Every subdivision shall be identified by the letter to which it corresponds in the following diagram:

M	N	O	P
L	K	J	I
E	F	G	H
D	C	B	A

220. (1) A target area is an area of land six hundred feet square lying within a subdivision and oriented due north-south and east-west and situate symmetrically about the intersection of a line joining the midpoints of the east and west boundaries of the subdivision with a line joining the midpoints of the north and south boundaries of the subdivision.
- (2) A target area shall be referred to by the letter of the subdivision in which the target area is located.

221. All latitudes and longitudes used in these regulations shall be referred to the North American Datum of 1927.

Surveys

222. For the purposes of this Part, no person other than a Manitoba Land Surveyor shall make a legal survey.

223. (1) Every legal survey made pursuant to this Part shall be made in accordance with instructions of the Director of Surveys.

(2) Every plan of a legal survey made pursuant to this Part shall be signed by the surveyor and submitted to the Director of Surveys accompanied by the surveyor's field notes annexed to an affidavit of the surveyor verifying that he has executed the legal survey faithfully, correctly and in accordance with this Part and with any instructions issued to him by the Director of Surveys.

- (3) Every plan of a legal survey made pursuant to this Part shall, where relevant, show
- (a) the position, direction and length of the boundaries of grid areas and divisions thereof;
  - (b) the position of existing wells;
  - (c) the nature and position of any monument used to mark, or placed as a reference to, any boundary or position referred to in clause (a) or (b); and
  - (d) any road allowance, surveyed road, railway, pipeline, high voltage power lines or other right-of-way, dwellings, industrial plants, permanent buildings, air fields and existing or proposed flight ways.

224. Every permittee or lessee shall, as soon as possible after an exploratory well is completed, send to the Director of Mines a plan of a legal survey in quadruplicate, approved by the Director of Surveys, showing the position of the well relative to the nearest target area.

225. (1) Every permittee or lessee shall, before the suspension or abandonment of any exploratory

well, send to the Director of Mines a plan that clearly shows the surveyed position of that well relative to

- (a) a reference referred to in section 229; or
  - (b) a topographical feature that is identifiable on
    - (i) a map that has been published by or on behalf of the Government of Canada or the Province of Manitoba; or
    - (ii) a vertical aerial photograph, of mapping standard, obtained from the National Air Photo Library or from such other source as may be acceptable to the Director of Surveys.
- (2) Where an aerial photograph is used pursuant to clause (b) of subsection (1), that photograph shall be sent to the Director of Mines with the plan.
- (3) A permittee or lessee may, in lieu of sending the plan referred to in subsection (1), send to the Director of Mines the aerial photograph referred to in sub-clause (ii) of clause (b) of subsection (1), on which the position of the well has been clearly marked in a manner acceptable to the Director of Mines after the position thereof has been determined by a field comparison between the site and the photograph.

226. (1) Every permittee or lessee shall, before drilling a development well, send to the Director of Mines four prints of a plan of a legal survey approved by the Director of Surveys showing the target area and on which the approximate position of the proposed well relative to the target area has been superimposed in ink.

(2) The position of each development well relative to the target area shall be precisely determined after drilling has commenced and the permittee or lessee shall inform the Director of Mines of any difference in the position of the well from the position shown on the plan of legal survey referred to in subsection (1).

227. (1) Where any uncertainty or dispute arises respecting the position of any boundary, the Director of Mines may require a permittee or lessee to file a plan of legal survey, approved by the Director of Surveys, showing the boundary in respect of which the uncertainty or dispute has arisen.

(2) The plan of legal survey shall show the position of such boundaries and references as the Director of Mines may specify.

228. The Director of Surveys may, at the request of a permittee or lessee, approve a plan of legal survey of the whole or part of a grid area, permit area, lease area, section, subdivision or target area or the position of a well.

#### Monuments

229. The ground position of a grid area, permit area, lease area, section, subdivision, target area or well may, in the discretion of the Director of Surveys be surveyed by reference to

- (a) a monument shown on a plan of survey that has been approved by the Director of Surveys pursuant to section 223;
- (b) a geodetic survey triangulation station;
- (c) a geodetic survey Shoran station;
- (d) a marker placed for the purpose of marking a territorial boundary;
- (e) a monument as defined in The Surveys Act or the Dominion Lands Surveys Act (Canada) or the Canada Lands Surveys Act (Canada);
- (f) a physical feature, the geographical position of which has been determined by means of a Shoran-controlled photogrammetric process;
- (g) a marker, the geographic position of which has been determined by astronomic means;
- or
- (h) any other marker approved by the Director of Surveys.

230. Where the position of any boundary of a grid area, permit area, lease area, section, subdivision or target area or the position of a well has been established by a legal survey approved by the Director of Surveys pursuant to this Part, the position of that boundary or well shall be deemed to be the true position thereof, notwithstanding that the boundary or well is

found not to be located in the position required by this Part and shall determine the position of all other sections, subdivisions or target areas that lie within that grid area.

231. (1) Where, due to a discordance of reference points or imprecisions in measuring, a subsequently surveyed grid area, section, subdivision or target area appears to overlap a grid area, section, subdivision or target area the position of which is deemed to be true by section 230, the subsequently surveyed grid area, section, subdivision or target area shall be laid out and surveyed as though no overlap existed except that it shall be reduced by that portion that lies within the overlap.

(2) Subject to subsection (1), a grid area that has been reduced pursuant to subsection (1) shall, for the purposes of this Part, be considered to be a whole grid area.

(3) Where, due to a discordance of reference points or imprecisions in measuring, a parcel of land appears not to lie within a grid area, that parcel may be disposed of pursuant to section 264.

232. Any legal survey made pursuant to this Part shall be made by and paid for by the permittee or lessee as the case may be.

233. (1) Where a monument is damaged, destroyed, moved or altered as a result of the operations of a licensee, permittee or lessee

(a) he shall report the matter to the Director of Surveys as soon as possible; and

(b) he shall be responsible for the cost of its restoration.

(2) Every permittee or lessee shall maintain and keep in good repair all monuments that are situated on or mark the boundaries of his permit area or lease area as the case may be.

234. Every licensee, permittee or lessee who finds that a monument has been destroyed, damaged, moved or altered shall report the matter to the Director of Surveys as soon as possible.

235. Every licensee who carries out work on lands not held by him under permit or lease shall, upon completion of the work, furnish the Director of Mines with three copies of

(a) a map on a scale of not less than four miles to one inch showing the area covered by the examination and indicating the location of all roads and airstrips;

(b) information obtained as to the presence of water, coal, gravel, sand or other potentially useful minerals; and

(c) all reports, photographs, maps and data referred to in section 260.

236. A licensee shall upon request by the Director of Mines report the location and progress of any field party employed by the licensee.

#### PERMITS

##### Permit upon Application

237. (1) Where the Director of Mines is satisfied that exploratory work will be carried out, he may, upon application, issue an exploratory permit for lands that have not previously been held under permit or lease.

(2) Every application for an exploratory permit shall be made to the Chief Mining Recorder and shall be accompanied by

(a) a fee of \$250.00;

(b) the deposit required by section 247;

(c) a statement of the extent and character of the examination to be made and the estimated cost thereof; and

(d) a description of the area for which application is made.

(3) The Chief Mining Recorder shall cause to be endorsed on each application the date and time that the application is received.

238. (1) Where an application is not accepted, the fee and deposit shall be returned to the applicant.

(2) Where an application is withdrawn by the applicant before the permit is issued, the deposit



shall be returned to the applicant.

#### Permit upon Tender

239. (1) Every permit, except a permit issued under section 264 in respect of lands referred to in subsection (3) of section 231, shall be issued for a grid area or one-half of a grid area.

(2) A permit shall not be issued to

(a) a person who is less than twenty-one years of age; or

(b) a company unless that company is licensed or registered to do business in Manitoba.

240. (1) A permittee must be the holder of a license issued under section 92 before he may carry out exploratory work under this Part.

(2) Where a permittee is authorized to carry out exploratory work under this Part, that work may be performed by any person employed or hired by the permittee.

(3) A permittee may, for the purpose of carrying out exploratory work for oil and gas,

(a) enter upon the lands described in his permit; and

(b) use such part of the surface of the lands described in his permit as may be necessary for that exploratory work.

(4) A permittee may produce from the lands described in his permit such quantity of oil and gas as, in the opinion of the Director of Mines, is necessary for test purposes or for conducting operations of the permittee on that permit area.

241. Subject to sections 261 to 267, a permittee has, until the permit expires, the exclusive option to obtain an oil and gas lease not more than one-half of the sections of the land described in his exploratory permit.

#### Term of Permit

242. A permit is valid for three years from the date of issue.

243. A permittee may at any time surrender the grid area or one-half of the grid area for which he holds a permit but, except as provided in section 248, no deposit shall be refunded to the permittee.

#### Renewal of Permits

244. (1) The director shall, upon application, renew a permit for the term of one year.

(2) The application for renewal shall be made before the expiry date of the permit and shall be accompanied by the deposit required by section 247.

(3) A permit may be renewed pursuant to subsection (1) not more than six times.

245. (1) Where

(a) a permit has been renewed six times;

(b) a well is being drilled in a manner satisfactory to the director; and

(c) in the opinion of the director, the well will not be completed or abandoned before the expiration of the permit,

the director may, upon application extend the term of the permit for one or more periods of ninety days.

(2) The application for extension shall be made to the director before the expiration of the permit or a valid extension thereof, and shall be accompanied by the deposit required by section 247.

246. Where a permit has been renewed six times, the minister may, upon application, renew the permit for such term and subject to such conditions and deposits as he may prescribe.

#### Deposits

247. (1) Subject to section 249, every permittee shall deposit with the director, before the commencement of a period, money or bonds of a value equal to the deposit required for that period.

(2) The deposit required for the period set out in Column I of Schedule B is the amount set out in Column II of that Schedule.

248. (1) The portion of a deposit equal to the allowable expenditure made during the period, shall be returned to the permittee.

(2) Subject to subsection (3), the portion of the deposit not returned to the permittee is forfeited to Her Majesty.

(3) Where in the opinion of the director a permittee has not been able to make allowable expenditure equal to the deposit required for any period, and the permittee has given notice to the director, and during the renewal period next following the permittee makes allowable expenditure equal to the aggregate of

(a) the deposit required for the renewal period next following; and

(b) the portion of the deposit for the period, heretofore not returned to the permittee, the portion of the deposit heretofore not returned shall be returned to the permittee.

(4) The notice required under subsection (3) shall be given before the end of the period and shall state the reasons that the permittee has not been able to make allowable expenditures equal to the deposit required for that period and that the permittee intends to make allowable expenditure, during the renewal period next following, equal to the aggregate of

(a) the deposit required for the renewal period; and

(b) the portion of the deposit for the period heretofore not returned to the permittee.

249. Where during a period a permittee expends an amount in excess of the aggregate of

(a) the deposit set out in Schedule B for that period; and

(b) any amount returned to the permittee pursuant to subsection (3) of section 248 for allowable expenditures made during that period,

the deposit required for any succeeding period shall be reduced by the amount of that excess.

#### Expenditures

250. The director may at any time determine the amount of allowable expenditure made by the permittee on evidence submitted by the permittee and on such other evidence as the director may require.

251. (1) Every permittee shall within ninety days after the end of a period submit to the director a statement in triplicate of the expenditures made for exploratory work done on the permit area or group of permit areas during that period.

(2) A permittee may submit interim statements of expenditure from time to time during the term of the permit.

(3) Every statement of expenditure shall be verified by a statutory declaration and shall include

(a) the items of expenditure;

(b) the number of the permit area on which the work was done;

(c) the number of the permit area upon which the expenditure is to be applied;

(d) the specific purpose for which each item of expenditure was made; and

(e) three copies of all reports, photographs, maps and data referred to in section 260 concerning work for which expenditure is claimed.

(4) Where the information referred to in this section has been sent by the permittee to the director pursuant to section 235, the permittee is not required to send that same information to the director pursuant to this section.

252. Where expenditures are made for exploratory work done on or off a permit area for the purpose of obtaining information of a general nature that may be of value to the permittee in connection with work being done by the permittee, the director may consider the expenditures to have been made in such amounts as the permittee may request on any permit area or groups of permit areas for which, in the opinion of the director, the work done is beneficial.

253. Where the director has designated a well as an exploratory deep test well, the amount expended on drilling that well shall be deemed to be an amount equal to twice the amount actually expended on drilling that well.

254. An amount expended for road building, airstrip, or geophysical examination or as a contribution to a well drilled outside a permit area may not be considered to be an allowable

expenditure unless prior approval for the work was obtained from the director.

#### Grouping

255. (1) A permittee may apply to the director to group permit areas

- (a) any part of which are within a circle having a radius of one hundred miles or that are contiguous; and
  - (b) that do not cover an area in aggregate of more than two million acres.
- (2) The application for grouping shall be made in triplicate on a form approved by the director and shall state the permit areas that are to be included in the group.
- (3) A grouping shall commence on the date on which the application for grouping is approved by the director.

256. (1) Allowable expenditure made on any permit area within a group, during the period of the grouping shall, at the request of the permittee, be applied to any or all of the permit areas within the group.

- (2) Where allowable expenditure is applied to a permit area pursuant to subsection (1), that expenditure shall not be transferred to any other permit area.

257. A permittee may from time to time regroup his permit areas.

#### Reports

258. Every licensee, permittee or lessee shall, at least fifteen days prior to commencing exploratory work, send a written notice, in triplicate, in a form approved by the director, to the director stating

- (a) the date on which he expects to commence the work and to complete the work;
- (b) the purpose and nature of the work;
- (c) the approximate acreage of the area on which the work is to be done together with a map showing the boundaries of the area;
- (d) the equipment he intends to use;
- (e) the name of the person in charge of the work; and
- (f) the number of persons to be employed.

259. A licensee, permittee or lessee shall, upon request by the director, report the location of field parties and any change in the intended exploratory work.

260. (1) Every permittee shall, within sixty days after the third, sixth, and ninth anniversaries of the date on which the permit was issued and within sixty days of the expiration, cancellation or surrender of the permit, forward to the director in triplicate

- (a) copies of all aerial photographs taken by the permittee;
  - (b) a geological report of any area investigated including geological maps, cross-sections and stratigraphic data;
  - (c) a geophysical report of the area investigated; and
  - (d) reports of all surveys not referred to in clauses (a) to (c) that were conducted on the permit area.
- (2) The geophysical report referred to in clause (c) of subsection (1) shall include
- (a) where a gravity survey has been conducted, maps showing
    - (i) the location and ground elevation of each station,
    - (ii) the final corrected gravity value at each station,
    - (iii) the gravity contours drawn on the gravity values, and
    - (iv) the boundaries of the permit areas;
  - (b) where a seismic survey is conducted, maps on a scale of not less than one inch to one mile showing
    - (i) the location and ground elevation of each shot hole,
    - (ii) the corrected time value at each shot hole for all horizons determined during the course of the survey,
    - (iii) contours and isochrons drawn on the corrected values with a contour interval of not more than one hundred feet or the equivalent in time, and

- (iv) the boundaries of the permit areas; and
- (c) where a magnetic survey is conducted, maps showing
  - (i) the location of the flight lines,
  - (ii) the magnetic contour lines at intervals of ten gamma, and
  - (iii) the boundaries of the permit areas.
- (3) Where the information referred to in this section has been sent by the permittee to the director pursuant to section 235 or 251, the permittee is not required to send that same information to the director pursuant to this section.
- (4) The director may at any time request that a licensee, permittee or lessee supply factual information and data, or a copy thereof, that are necessary for the interpretation of any survey conducted for the purpose of searching for oil or gas and, without restricting the generality of the foregoing, may request factual information and data concerning
  - (a) seismograms and other recordings of seismic events together with all relevant data;
  - (b) magnetic profiles and other recordings of variations in the magnetic field of the earth; and
  - (c) any observations or readings obtained during the course of a survey that was conducted for the purpose of searching for oil or gas.
- (5) No person shall destroy any of the factual information referred to in subsection (4) without the consent of the director, unless copies of that information has been sent to the director pursuant to this regulation.

#### Oil and Gas Leases

##### Oil and Gas Lease upon Application

261. Upon application to the minister, a permittee shall be granted an oil and gas lease subject to this regulation.
262. (1) The land to be included in an oil and gas lease granted pursuant to section 261 shall be selected by the permittee from his permit area.
- (2) The minister shall not grant an oil and gas lease pursuant to section 261 for more than one-half of the number of sections in the permit area held by the applicant.
- (3) An oil and gas lease granted pursuant to section 261 shall commence on the day the application is received by the minister.
263. Every application for an oil and gas lease shall be made on a form approved by the director and shall be accompanied by
  - (a) the fee set out in Schedule A;
  - (b) the annual rental for the first year of the term of the lease; and
  - (c) a diagram and description of the area for which the application is made.

##### Other Leasing

264. (1) The minister may grant an oil and gas lease or permit or call tenders for the purchase of an oil and gas lease or permit for lands
  - (a) that have been held under a permit or oil and gas lease which permit or oil and gas lease has expired, been cancelled or been surrendered;
  - (b) referred to in subsection (3) of section 231; or
  - (c) that are a combination of the lands referred to in clauses (a) and (b) or either of them.
- (2) An oil and gas lease or permit granted pursuant to this section may be granted upon such terms and conditions as the minister may direct.
- (3) Where tenders are called pursuant to this section and
  - (a) no tender is received, or
  - (b) a tender has been received and the minister has refused to accept that tender,
 the minister may dispose of those lands by an oil and gas lease or permit pursuant to this section in such manner and upon such terms as the minister may determine.

##### Powers of Lessee

265. (1) A lessee who is a licensee may



- (a) carry out exploratory work and drill wells in the lands included in his lease; and
  - (b) produce any oil, gas or related hydrocarbons (other than coal or valuable stone) or any minerals or substances that are produced in association with any of the foregoing from the lands included in his lease.
- (2) Where a lessee is authorized to carry out work or operations under this regulation, that work or those operations may be performed by any person employed or hired by the lessee.

#### Lease Area

266. (1) A lease area shall be composed of quadrilateral blocks of sections not larger than five sections by three sections or four sections by four sections.
- (2) The lease areas within a permit area shall
- (a) corner one another;
  - (b) be separated from one another by at least one section; or
  - (c) be a combination of the blocks referred to in clauses (a) and (b).
- (3) Except in the case of
- (a) sections that are reduced pursuant to subsection (1) of section 231; and
  - (b) land referred to in subsection (3) of section 231;
- no oil and gas lease shall be granted for less than one section.
- (4) Nothing in this regulation shall be construed so as to prevent a permittee from leasing a total of one-half of the number of sections in the permit area.
- (5) Subsections (1) and (2) do not apply to an oil and gas lease granted pursuant to section 264.
267. (1) Subject to subsection (2), where an oil and gas lease is granted pursuant to section 261, the land within the permit areas, but not included in the lease shall be surrendered to the Crown.
- (2) Where an oil and gas lease is granted pursuant to section 261, the director may allow the permittee to retain under permit all or some of those sections of the permit area that are not
- (a) included in the oil and gas lease, or
  - (b) contiguous to the lease area.

#### Obligation to Lease

268. The director may at any time declare in writing that a well within a permit area contains oil or gas in commercial quantity.
269. (1) A copy of the declaration referred to in section 268 shall be sent by registered mail addressed to the permittee at his last known address.
- (2) The permittee shall, within one year from the date of the mailing to him of the declaration made pursuant to section 268, apply for an oil and gas lease of the area within which the well is located.
270. (1) A permittee may, within ninety days from the date of mailing the declaration, serve on the minister a notice of objection setting out the reason for the objection and all relevant facts.
- (2) A notice of objection under this section shall be served by being sent by registered mail addressed to the minister at Winnipeg.
- (3) Upon receipt of the notice of objection, the minister shall consider the declaration and vacate, confirm or vary the declaration and the minister shall thereupon notify the permittee of his decision by registered mail.
271. Where a declaration has been made pursuant to section 258 and no application has been made pursuant to section 269, no person shall drill a well in that permit area within four and one-half miles of the well to which the declaration refers.
272. (1) Where an oil and gas lease is granted subsequent to a declaration made pursuant to section 268 or 270, all sections within the permit area contiguous to, but not cornering, the lease area shall be surrendered to the Crown.
- (2) Where an oil and gas lease is granted subsequent to a declaration made under section 268

or 270, all that part of the permit area not included in the oil and gas lease and not surrendered pursuant to subsection (1) may be retained under permit by the permittee.

(3) Where part of the permit area is retained under permit pursuant to subsection (2), the permittee shall send the permit to the director for amendment.

#### Publication upon Surrender or Cancellation

273. (1) Where lands have been held under a permit or an oil and gas lease which permit or oil and gas lease or any part thereof has expired, been cancelled or been surrendered, the director shall publish in The Manitoba Gazette a notice of the expiration, cancellation or surrender of that permit or oil and gas lease.

(2) The notice referred to in subsection (1) shall state

- (a) the number of the permit or oil and gas lease; and
- (b) whether the permit or oil and gas lease has expired, been cancelled or been surrendered.

#### Transfer of Permit or Lease

274. No transfer or assignment of a permit or oil and gas lease shall pass any interest in the permit or oil and gas lease until the transfer is approved by the minister.

275. (1) Subject to subsection (2), where a transfer or assignment is executed in a manner satisfactory to the minister and is accompanied by a transfer fee of \$10.00, the minister may approve the transfer or assignment of

- (a) the whole or any sections of a lease area;
- (b) the whole or one-half of a permit area; or
- (c) a specified undivided interest in a permit or oil and gas lease to not more than five transferees.

(2) The minister shall not approve the transfer of

- (a) a lease area smaller than one section; or
- (b) a permit area of other than one grid area or one-half of a grid area.

(3) Subsection (2) does not apply to an oil and gas permit in respect of less than one-half of a grid area.

#### Reports

276. (1) Every lessee shall, within sixty days after

- (a) the third, sixth, ninth anniversaries of the date on which the lease was granted or renewed; and
  - (b) the expiration, cancellation, surrender or renewal of the lease, forward to the director in triplicate, copies of all reports, photographs, maps and data referred to in section 260.
- (2) When the information referred to in this section has been sent by the lessee to the director pursuant to section 235, 251 or 260, the lessee is not required to send that same information to the director pursuant to this section.

#### Information to be Confidential

277. (1) Except as provided in this section, the information furnished under this regulation shall not be released.

- (2) Information furnished pursuant to clause (a) or (b) of section 235 may be released at any time.
- (3) Information submitted by a permittee or lessee concerning an exploratory well may be released thirty days after the completion, suspension or abandonment of that well.
- (4) Information submitted by a permittee or lessee concerning an exploratory well may be released two years after the completion, suspension or abandonment of that well.
- (5) Information submitted by a permittee or lessee concerning a surface geological or photo-geological survey and factual information obtained from a magnetometer, gravity, seismic or other survey may, in the discretion of the minister, be released.
  - (a) two years after the cancellation, surrender or expiry of
    - (i) the permit of the area on which the work was done, or
    - (ii) all oil and gas leases granted pursuant to section 261 within the permit area on

- which the work was done,  
 whichever is the later; or  
 (b) two years after the cancellation, surrender or expiry of the oil and gas lease of the area on which the work was done.
- (6) Information submitted by a licensee, permittee or lessee may, in the discretion of the minister, be released at any time with the consent of the licensee, permittee or lessee.
- (7) General topographical information, legal surveys and elevations of well locations, the current depths of wells and the current status of wells may be released at any time.

#### Enforcement

278. (1) Where a permittee does not make the deposits required by section 247 within ninety days after the date on which the deposit is to be made, the permit may be cancelled without notice by the director.
- (2) Where a permittee violates any provision of this regulation, other than that referred to in subsection (1), the minister may give written notice to the permittee and unless the permittee remedies or prepares to remedy the violation, to the satisfaction of the minister, within ninety days from the date of the notice the minister may cancel the permit.
2. Manitoba Regulation 14/47 is further amended by adding thereto, immediately after Schedule A, the following Schedule:

#### Schedule B Deposits

Column I	Column II
Period	Deposit
1. The first eighteen-month period of the original term of the permit,	five cents for each acre to be included in the permit.
2. The second eighteen-month period of the original term of the permit,	fifteen cents for each acre included in the permit.
3. The first renewal period,	thirty cents for each acre included in the permit.
4. The second renewal period,	forty cents for each acre included in the permit.
5. The third renewal period,	fifty cents for each acre included in the permit.
6. The fourth renewal period,	fifty cents for each acre included in the permit.
7. The fifth renewal period,	fifty cents for each acre included in the permit.
8. The sixth renewal period,	fifty cents for each acre included in the permit.
9. The period of an extension granted pursuant to section 39.	ten cents for each acre included in the permit.

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## approach best Vibroseis

is came into being through a  
inded approach to seismic needs,  
mple approach still remains the  
is was the theme of talks by  
Crawford and Wm. Laing of  
al Oil Company and Earle  
i Hudson's Bay Oil and Gas  
Limited, before a packed audi-  
adian Society of Exploration  
ists members in Calgary

ee speakers showed tantalizing  
of interpreted Vibroseis records  
ver North America to illustrate  
ility of the seismic technique,  
moving presentation.

s became an operating con-  
Continental went to a sweep  
it is, to changing frequencies,  
aid. She waves match many  
one receiver to the next, but  
ual matches only once.

ing the common problem with  
hosts, the speaker suggested  
tions of downsweep (high fre-  
ow) or upsweep (low frequen-  
"A noise signal has no advan-  
sweep," Crawford said.

re second speaker, showed  
amples of Vibroseis records  
ontinental United States and  
roseis has good penetration  
ter and on land, most times  
000 feet without severe loss  
At the same time, the techn-  
swers the need for shallow  
ul has produced good records  
llow as 110 feet, he said.  
eices are now becoming in-  
alized.

of his presentation, Laing  
show that there was a great  
the Vibroseis technique, and  
with the skill and ability to  
parameters and other re-

## draw interest

Because most current logs are field  
available on scales that are mutually  
compatible, this allows overlay data com-  
parisons that display visual solutions to  
specific interpretation questions. Ian  
Norqvist, of Schlumberger of Canada,  
gave illustrated talks on compatible  
overlays to the Edmonton and Calgary  
branches of the Canadian Well Logging  
Society recently. He also noted that  
suitable scales have been developed to  
retrieve numerical answers (water satur-  
ations, porosity, lithology) from these  
overlays.

Advantages of the technique, Norqvist  
said, lie in the focusing of attention on  
the zones of interest, and in the rapid  
quantitative analysis through the use of  
scales which becomes possible. This  
analysis is accurate when the technique  
is correctly applied.

## Sogepet boosts interests in Hudson Bay region

All oil permit equities of Camerina Oil  
and Gas Ltd. and French Petroleum of  
Canada Ltd. held in the Hudson Bay  
region have been acquired by Sogepet  
Ltd., including holdings in the 53 million  
acre Atlantic Richfield-Aquitaine oper-  
ated offshore block as well as lesser hold-  
ings in other groupings.

Camerina and French Pete retain gross  
over-riding royalty rights, payable by  
Sogepet, on all petroleum products pro-  
duced from the permits involved.

Marine seismic surveying of most of  
the acreage is in full swing with Aquit-  
aine as operator.

Sogepet now holds a combined eight  
million acre (net) position in the 74  
million acre (gross) Hudson Bay program  
of the Atlantic Richfield-Aquitaine  
group; the Sogepet-Aquitaine group; the  
Texas Gulf-Sogepet group; and the Ban-  
ner (TransCanada PipeLine)-Sogepet  
group.

## Aquitaine gets more Hudson Bay acreage

Aquitaine has again added to its offshore holdings in the Hudson Bay, this time with the acquisition of 1.8 million permit acres from Mill City Petroleum.

This brings Aquitaine's total offshore holdings in Hudson Bay from the previous 540,000 acres (175,000 acres net) to 2.3 million acres. In addition the company has interest in 1.1 million acres in adjacent areas onshore in Manitoba, of which its net interest amounts to 379,000 acres, and 986,000 acres Ontario onshore rights, amounting to a total of all rights on and offshore in this play of 5.1 million acres.

Aquitaine's biggest stake, of course, is in the 49.9 million acre block Atlantic Richfield holds in the most prospective portion of Hudson Bay. Aquitaine has "made arrangements with Atlantic Richfield on behalf of itself and its partners in the Kaskattama farmout for joint exploration of the block."

It is understood that the Aquitaine group will earn a 25 percent interest in the big block by conducting seismic work next summer and will then have an option on another 25 percent for an undisclosed cash consideration. This summer Aquitaine conducted no offshore seismic but deepened its Kaskattama well in the mouth of Kaskattama River and had a seismic

onshore program planned for the fall and winter of this year.

Aquitaine's interest in the half onshore, half offshore one-million-acre farmout from Bralorne Petroleum and Sogepet, and in its offshore holdings is split between itself (50 percent), French Petroleum (25 percent), Petropar (15 percent), and Sun Oil (10 percent). On the one million-acre farmout from Bralorne and Sogepet the farmors have subsequently farmed out on their own behalf, so that the interest in this spread now stands at Sogepet 30 percent, Aquitaine 25 percent, French Petroleum 12½ percent, Bralorne 10 percent, Petropar 7½ percent, and Sun, Teck Corporation and Western Decalta five percent each.



## 5 million ft. samples to be re-logged, digitized

Some 5.4 million feet of rock samples from wildcats drilled in western Canada before 1957 will be re-logged and recorded in digital format by 15 Canadian Stratigraphic Service geologists during the next three years.

Most of CanStrat's oil company customers have been or are currently changing their exploration data files into quickly retrievable computer storage systems. This means that all data must meet a uniform standard and allow its use in modern geological exploration methods, such as detailed and regional facies analyses, diagenetic trend analyses, (e.g. dolomitization), fossil distribution, porosity development, etc.

CanStrat changed its sample description to the fuller requirements of modern sedimentary geology in 1957. Only a portion of the wildcats drilled before 1957 have been gradually re-logged and coded as time and staff allowed. Complete areas include all of northeastern British Columbia and northern Alberta south to Township 60. The remainder of Alberta and all Saskatchewan harbor another 1,200 wildcats which penetrated the Devonian. Oil company clients want complete coverage which with the previous staff of CanStrat would have taken at least seven years to complete. To speed the program up an agreement was reached with interested clients enabling CanStrat to put 15 experts on the job. The accelerated program started with the new year. Except for two geologists, who will finish their university courses this spring, all of the 15 staff members have been hired or committed.

All of the new staff will have to undergo a basic training for four months to ensure continuity of CanStrat standards. Most oil companies in Canada use the firm's sample description format. Many customers send geologists to a training course conducted by L. E. Workman who has counted 559 "students" so far.

The re-logging program not only upgrades sample descriptions to today's higher levels but also streamlines a great number of formation top names so they can easily be used for computer coding. Both, uniform terminology of stratigraphic

names and a uniform system of sample description are essential for computer coding of data.

### One million cards

Once the log data are on computer cards any lithology for any area can be extracted at will. Average card count per 5,000 to 7,000-foot well will be about 200. Each lithologic interval will take a new card. Where there are no changes the complete interval can go one card, which may be long stretch or just one foot.

At the beginning of this year 1,500 wildcat wells had been coded on 350,000 cards. Sample logs ready to code number 755 which will take 180,000 cards. To code the 1,190 pre-1957 wildcat wells still to be reworked will take 270,000 computer cards. Current wells expected for the three-year period envisaged for the re-logging and coding program until Jan. 1, 1971 number 1,000 wells requiring an additional 200,000 cards. Total card count at that time will be at least one million. Counting current wells to be drilled during the three-year period and scheduled re-logging, CanStrat will process 981 wells per year and put the sample data on 218,000 cards. To keep current after the re-logging program is completed 333 deep wildcats are expected each year after 1970 necessitating coding of 70,000 computer cards.

### Drilling contract let for Arctic Islands

Panarctic Oils has awarded its first drilling contract for the Arctic Islands to newly formed Commonwealth-Hi-Tower Arctic Contractors, a recently formed joint venture of Commonwealth Drilling and Hi-Tower Drilling of Calgary. Contract is to run for three years, the initial stage of Pan Arctic's \$20 million exploration program.

No spud-in date has been fixed yet, but it is assumed that drilling will likely start during the second half of this year. The rig is scheduled to be assembled late this summer, probably in Edmonton. It will incorporate new ideas for year-round

Arctic drilling and is expected to include many new technical features. Envisioned is a 10,000 to 12,000-foot diesel-electric rig.

Panarctic has budgeted for a 17-well program of which nine will be deep tests. The contracted rig could likely drill two to three deep holes per year. Currently Panarctic is carrying out a seismic survey on Melville Island.

Commonwealth and Hi-Tower joined forces for the bid to "use their joint resources of equipment and manpower." The two firms could fall back on 62 rigs ranging in capacity from 2,000 to 14,000 feet, and 1,200 qualified personnel. Commonwealth was contractor for the Dominion Explorers Group's 1963 venture on Bathurst Island. The 12,000-foot National 50A rig is still in top shape, "and it could go to work to-morrow if needed."

### Contract let for Hudson Bay survey

A two-year, \$400,000 contract for the supply, installation and operation of a long-range positioning system for offshore exploration in Hudson Bay, has been awarded by Aquitaine Company of Canada Ltd. to Computing Devices of Canada Limited.

The Decca Lambda navigation system, currently being manufactured by the Decca Navigation Company in London, England, is similar to that supplied by Computing Devices for petroleum exploration off the Pacific and Atlantic coasts and for the Canadian Hydrographic Services.

Personnel of Computing Devices are presently establishing station housing, power generating equipment and the transmitting antenna foundations on the west shore of Hudson Bay in preparation for the 1968 program, which is scheduled to run from July through October.

The Lambda system requires the establishment of two complex shore installations which, when coupled with specialized shipboard control and transmitting equipment, will provide the vessel with accurate distances from two known shore positions. These two distances will continuously and automatically change with any movement of the vessel and enable the vessels engaged in geophysical exploration surveys or drilling operations to determine their position with an accuracy of better than 100 feet over the greater portion of the offshore lease, even at ranges exceeding 300 miles.

## Digital computers expand seismic scope

Application of digital computer techniques to analysis of well log data is designed to put many technical men out of business — out of the business of tedious work habits and operations which restrict geologic, reservoir and stratigraphic thinking.

This was the prospect held out by Dr. David H. Walsh, president of Geophysical Trade Service Corp., New Orleans, in a talk to Canadian Well Logging Society in Calgary.

The impact of the computer in seismology has been most dramatic, Walsh commented. Nearly all seismic field recording is in reproducible format, 40 percent in digital form. Every major oil company has devoted at least one large scale computer primarily to processing seismic data. A geophysical budget now is rather evenly divided between data acquisition and data processing and interpretation.

The common depth point stacking technique, now almost universal in Canada, would not have been possible without the computer, Walsh explained.

As petroleum prospects have become smaller, deeper and more complex, the true competitive advantage has lain with the company whose seismic system permitted more detailed geophysical mapping techniques, Walsh said. One automated scanning system translates older photographically recorded seismograms to analog and digital magnetic tape at the rate of 56 million samples per day. By this means a company can vastly extend its areas of exploration both economically and most rapidly without additional data acquisition costs.

The first and thus far the largest application of digital computer techniques to digitized well log data has been in the study of seismic velocity variations and in the application of theoretical seismograms. Lithologic-porosity-saturation logs are currently available through a service company, as synergistic log systems, and locally in Calgary as a lithologic log system.

Extension of these analytical techniques in formation evaluation and in petrophysics to the field of exploration is an immediate step. Indirect methods of exploration with well log data are more attractive than purely prospect hunting, Walsh explained. Relatively simple computation procedures applied to the digital well log data can be most effective

in exploration. Various modes of display are available in digital form. For example the SP log can be displayed in wiggle trace, variable density and variable area form.

Filtering, deconvolution, etc., applied to the well log response, are now available and await exploitation by the exploration companies, Walsh said. Frequency analysis may grow to be a most powerful tool, particularly in exploration studies. The key to all well log translation is its placing in digital format.

Several months ago Walsh's own company began the digitization of all Western Canada well logs as an independent and speculative service. The Rainbow-Zama areas have been completed. All other available well logs will be digitized to form a copyrighted data bank available for purchase. This project is independent of some other similar programs which it is understood are being financed by groups of oil exploration companies.

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## Shell to drill off Nova Scotia

Shell Canada will start wildcat drilling on its east coast offshore exploration permits in 1969. It will do additional seismic work this summer on 24 million acres, following up programs done from 1964 through 1966. Southeastern Commonwealth Drilling Ltd. of Calgary will do the drilling, using a new semi-submersible drilling vessel similar to the Sedco 135-H which has been drilling for Shell off Vancouver Island since last year. Sedco has awarded construction contract to Halifax Shipyards, a division of Desco Industries Limited. The self-contained vessel will cost more than \$10 million. Concurrent announcements were made March 21 by Donald M. Smith, NS minister of mines, Jean-Luc Pepin, dominion minister of energy, mines and resources, and William L. Grossman of Calgary, Shell's vice-president in charge of exploration and production.

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## BOOK REVIEW

### Stereogrammetry in the Rocky Mountains

"Stereogrammetry applied to Rocky Mountain structure in the Mt. Yamnuska area, Alberta." Dr. Peter J. Haman and Orhan Ozseginer, West Canadian Research

Publications of Geology and Related Sciences, P.O. Box 997, Calgary, Alberta.

The 28-page publication introduces a new technique applicable to precise measurement in three dimensional setting of geologic features from airphotos. Full terminology for the technique would read "stereographic projection analysis from stereo-photogrammetric data," shortened to "stereogrammetry" by the authors, of whom Dr. Haman is a structural geologist and Ozseginer a photogrammetrist. Application of the technique is not restricted to geological observation.

Strike and dip of linear and planar elements are determined by photogrammetric methods and data analyzed by stereographic projection procedures. To this, the authors explain, the full potential of photogrammetry to structural analysis has never been tested so far. This involved development of new techniques of analyzing data obtained from standard routines of quantitative photogrammetry. Photogrammetric plotting was then combined with stereographic projection analysis into the new technique of stereogrammetry.

Photogrammetric plotting instruments can be applied advantageously to microscopic structural analysis, which is presently done by taking compass readings of dip and strike in the field. Disadvantage of this approach is the effect of unwanted deflections from the regional due to minor structural deformations or bedding plane roughness, the authors explained.

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## New firm offers exploration service

A new company, Mantle Explorations Ltd., has been formed in Calgary to manage exploration programs, with particular reference to smaller companies.

The facility has been oriented specifically towards better overall management and surveillance of seismic exploration for firms without adequate staff to provide proper management. Its scope runs from original assignment to delivery of final stacked sections and interpretation.

Services include procuring crews, with a view to minimizing move costs by locating nearby crews; supervising shooting operations, especially for quality control; and coordination of data processing, specializing in the digital route.

Rb-Sr contribution to the location of Churchill-Superior boundary  
in northeastern Manitoba

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and

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Abstract

Whole rock Rb-Sr age determinations on basement cores from the Hudson Bay Lowlands define an isochron of  $1975 \pm 45$  m.y. ( $\lambda_{\text{Rb}} = 1.39 \times 10^{-11} \text{ yr}^{-1}$ ) with an initial  $^{87}\text{Sr}/^{86}\text{Sr}$  of  $0.7018 \pm 0.0005$ . Thus the basement in this area belongs to the Churchill province and the Churchill-Superior boundary must have an easterly trend under the Paleozoic cover in northeastern Manitoba.

There are three schools of thought on the location of the Churchill-Superior boundary in northeastern Manitoba (Figure 1). Innes (1960) and Wilson and Brisbin (1961, 1962) postulated a northeasterly trending boundary and note that the projection of this trend through the Hudson Bay on a northeasterly strike would connect with the Smith Belt on the Ungava Peninsula, a possible continuation of the boundary. The second hypothesis, proposed by Kornik and MacLaren (1966), suggests that the boundary is northerly but changes to an easterly strike and parallels the  $56^\circ$  latitude. The third most recent suggestion by Gibb (1968) places the boundary along the southern limit of the Cross Lake subprovince.

The above hypotheses are based principally on the interpretation of gravity and aeromagnetic data. Available age determinations (Wanless *et al.*, 1968) are not conclusive and are used as support in all three theories. Unfortunately K-Ar ages on minerals from polymorphic areas are always difficult to interpret. Moreover, the Paleozoic rocks covering the shield around the Hudson Bay preclude the dating of the shield in this critical area. Recently two boreholes were drilled in the Hudson Bay Lowlands and penetrated the basement. The Aquitaine-Sogepet Group put down

a borehole at latitude  $57^{\circ} 04'$  and longitude  $90^{\circ} 10'$  designated Kaskattama Prov. #1 Well. The second hole, Houston et al. Comeault Prov. (STH) No. 1, was drilled by Houston Oils at latitude  $56^{\circ} 40'$  and longitude  $90^{\circ} 55'$ .

In an effort to assign the basement rocks here to either the Churchill or Superior Province we have analyzed eight samples by the Rb/Sr whole rock method. Seven of these are granites, medium to coarse grained, some weakly foliated, one of them (K2922.6) is a hornblende granite and another (K2937.0) is a Kaligranite. The eighth samples (K2920.0) is a hornblende-biotite gneiss.

The analytical results are reported in Table 1. All analyses were made by isotope dilution at the U. S. Geological Survey laboratories in Denver. The regression treatment used to evaluate our results is that of McIntyre et al. (1966). The uncertainties quoted with the both ages and initial ratios are the 95% confidence limits. For more information on the analytical method and the error parameters used in the regression see Turek and Peterman (1968).

The regression of the five Kaskattama samples defines an isochron within experimental error of  $2000 \pm 70$  m.y. and an initial  $^{87}\text{Sr}/^{86}\text{Sr}$  of  $0.7016 \pm 0.0009$ , while the isochron for the three Houston samples is also within experimental error giving an age of  $1910 \pm 420$  m.y. with an initial  $^{87}\text{Sr}/^{86}\text{Sr}$  of  $0.7021 \pm 0.0036$ . The high uncertainties of the above regressions are a consequence of having only three and one degree of freedom, respectively. Combining these results, the data for the eight points is collinear within experimental error, and the indicated age is of  $1975 \pm 45$  m.y. (Figure 2) we regard as an isochron defining the age of emplacement.



The initial  $^{87}\text{Sr}/^{86}\text{Sr}$  common to all samples is low,  $0.7018 \pm 0.0005$ , which precludes the interpretation of this result as a metamorphic age.

Our result is also in line with the available muscovite ages of 1840 and 1665 m.y. (Lowdon et al., 1963) on basement cores north of the Nelson River. These being K-Ar measurements are only minimum ages. Moreover, the general experience is that K-Ar ages tend to be about 5% lower than the corresponding Rb-Sr determinations, the latter calculated using the longer half life ( $T_{\frac{1}{2}} = 5.0 \times 10^{10}$  years). We therefore submit our results as evidence that the Churchill-Superior boundary does not follow a northeasterly strike through to Ungava but must swing east as proposed by Kornik and MacLaren (1966) or as postulated by Gibb (1968) follows the southern boundary of the Cross Lake subprovince.

We are greatly indebted to the Aquitaine Co. of Canada Ltd., Sogepet Ltd., and Houston Oils Ltd., for permission to publish these results ahead of the declassification date for information on the two holes. This work was done at the U.S.G.S. laboratory in Denver while the senior author was on study leave from the Manitoba Mines Branch.

Table 1

Analytical Results. The sample numbers are actual footage depths. The prefixes K and H refer to Kaskattama and Houston holes respectively.

Sample No.	$^{87}\text{Rb}$	$^{86}\text{Sr}$	$^{87}\text{Rb}/^{86}\text{Sr}$	$^{87}\text{Sr}/^{86}\text{Sr}$
	( mols/gram)			
K2922.6	0.01555	0.27762	0.056	0.7031
H2121.5	0.12956	0.51960	0.249	0.7086
H2098.0	0.18055	0.42654	0.423	0.7136
K2920.0	0.17720	0.21889	0.810	0.7250
K2937.0	0.45169	0.34245	1.319	0.7389
K2940.0	0.43570	0.32745	1.331	0.7395
K2936.4	0.45122	0.31469	1.434	0.7410
H2117.0	0.26133	0.14463	1.807	0.7505

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# Exploration Activities ...

## Aquitaine Spuds First Hudson Bay Offshore Test

Initial test of Hudson Bay offshore oil potential, estimated at 2.9 billion bbl of crude and 10.9 trillion cu ft of natural gas, is underway by Aquitaine Co. of Canada Ltd.

Drill site of test commencing early this month is 250 miles due east of Churchill, Manitoba, on western shores of the bay. At least two wells will be drilled on a vast offshore block permit from the Canadian federal government. (See map).

Aquitaine operations are on a 55,500,000-acre farmout from Atlantic Richfield Co. Breakdown of acreage allocation is as follows: Atlantic Richfield, 50%; Aquitaine, 25%; Elf Oil Exploration and Production Canada Ltd., 7.5%; Petrofina, 6.25%; French Petroleum Co. of Canada, 6.25%; and Sun Oil Co., 5%.

### Offshore Oil Potential

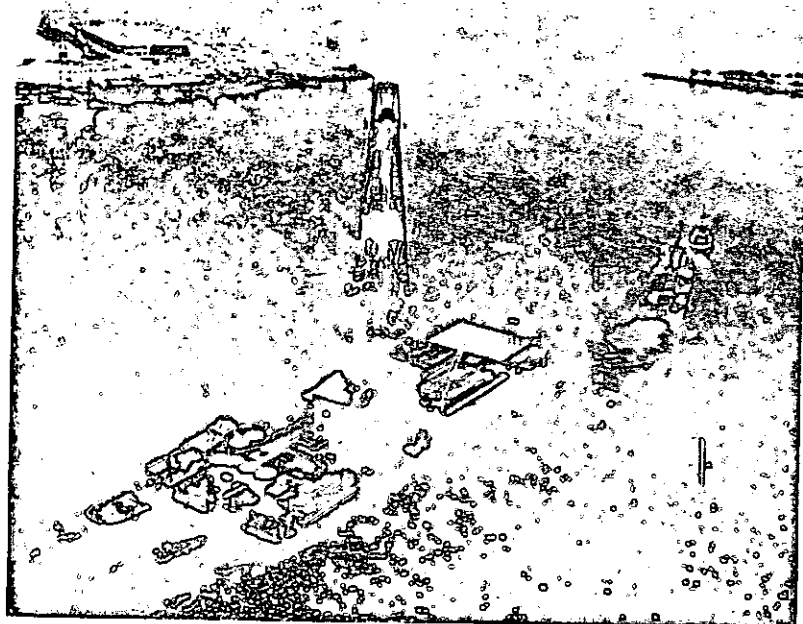
Estimated potential, given above, was calculated by Canadian Petroleum Association from an estimated oil yield factor of 20,000 bbl/cu mile applied to the 145,000 cu miles embraced by Hudson Bay. Total surface covers 365,000 sq miles, which far surpasses area of the 250,000-sq mile Arctic offshore region. Total federal permit holdings in Hudson Bay now exceed 110,600,000 acres.

### Regional Geology

Hudson Bay is a geological embayment of principally Lower Paleozoic sediments. Principal surface outcrops flanking the bay range from Ordovician through Silurian and Devonian systems.

At one time, the present Devonian outcrops and subcrops extended all the way from Illinois northwestward into Canada. A great anticlinal uplift during pre-Pennsylvania time reaching from the vicinity of Victoria Island on the Arctic Ocean in a south-southeasterly direction into Wisconsin and Illinois formed the Illinois-Wisconsin arch.

This regional uplift thus trun-



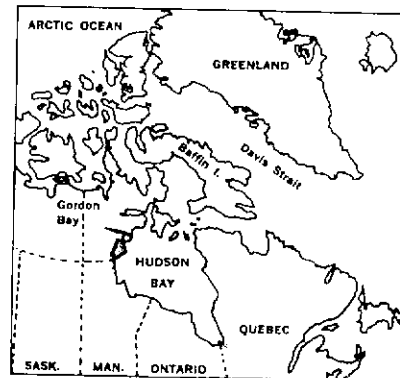
cated to the Paleozoic strata including the Devonian. A remnant of the eastern portion of the Illinois-Wisconsin arch may be seen at the southern end of Hudson Bay where Cretaceous sediments rest unconformably and disconformably upon Devonian formations.

### Drilling Equipment

Drilling contract has been awarded to Fluor Corp. of Los Angeles, Calif., which will employ its deep-water drilling vessel Wodeco II to conduct operations during ice-free summer months.

The Los Angeles-based ship left Halifax, Nova Scotia, during mid-July under tow by Dutch towboat Mississippi. Depending upon ice breakup the vessels were due to rendezvous later in July at Cape Chidley, Newfoundland, with Canadian tugboat Foundation Vigilant, as well as two or more European supply boats and the local ice breakers.

Convoy of cold-water drilling and service vessels will then enter the Hudson Strait and proceed to initial drillsite.



### Arctic Logistics

Supply base for the 100-day project is Churchill. All men, equipment and vessels must leave location and return to the seaward mouth of Hudson Strait by mid-November in order to avoid severe icing that begins about that time.

One of the major problems faced by this unique operating group is communications concerning departures and arrivals of vessels at various locations. This data is vital to assure ice-breaker supply available at all times when required.

main in constant contact with the Canadian Dept. of Transport together with its various ice-reporting services. These include vessels operated in Hudson Bay itself, Frobisher Bay Aircraft, Halifax Central, as well as the Churchill base.

Barge specifications of Wodeco II are length 280 ft and breadth 68 ft, with a depth of 23 ft 4 in. Operating draft is 13 ft, operating displacement 5430 tons. Vessel is capable of drilling to 20,000 ft in 600-ft waters.

Drilling equipment comprises a 140 ft by 30 ft by 30 ft all-welded, 952,000-lb capacity winterized derrick. Designed for 100-mph wind load with 15,000 ft of 5-in. drill pipe racked, it is mounted on a 30 ft by 30 ft by 22 ft 6 in. substructure and has a 350,000-lb capacity set back.

Drawworks is a Model 1320-DE double-drum electric d-c driven by two 1000-hp motors. Prime movers are four Model PTDS 8's turbocharged with four 750-hp d-c generators. Auxiliary generators are two 400-kw a-c diesel generator sets and one 125-kw a-c set on standby service.

Mud pumps are two Model G-1000-C's, 1000-hp rating each, electric driven. Two centrifugal 5-in. by 6-in. electric driven mixing pumps have a rating of 40-hp each.

EDITOR'S NOTE: Above article was prepared for PETROLEUM ENGINEER by Joseph A. Kornfeld, president, Kornfeld International, Tulsa, Okla.

**Alberta** — Seven exploratory wells with total initial production of 5410 b/d were completed recently in the Virgo field. Skelly Oil Co. and Sunray DX Canada Oil Co. jointly own four of the wells and three are owned by those two companies plus Sinclair Canada Oil Co. The wells are located in the Zama-Rainbow trend some 600 miles northwest of Calgary. Heaviest production was from Sunray-Skelly Virgo well, Lsd. 2, sec. 16-115-6, W6, which flowed at the rate of 1273 b/d of 38.5-gravity crude through a 24/64-in. choke.

**Ecuador** — Ada Oil Co., Houston, Tex., heads an 8-company consortium to drill on 3.5 million acres of offshore concessions in Gulf of Guayaquil. Final geological and geophysical work is underway to select drillsites. According to K. E. Adams Jr., Ada president, there is a possibility that marine or land drilling from one of larger islands in the concession will be undertaken before end of summer.

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Pump Setting Depth.....	1,444 ft.	Length of Run.....	3 1/2 yrs.

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## NOTES ON HUDSON BAY

1. Boundary definition 2 George V Chapter 32  
The Manitoba Boundaries Extension Act, 1912.

"thence northeasterly ..... to the point where the eighty-ninth meridian ... intersects the southern shore of Hudson Bay; thence westerly and northerly following the shores of the said Bay..."

2. Territorial Waters using general accepted terminology are "the marginal seas within 3 marine miles of the coast of Canada or of base lines delimiting the national waters of Canada ..." (The Boundaries of Canada its Provinces and Territories. Memoir 2, Geographical Branch, Ottawa). Dr. Gaucer agrees that the base lines referred to would be lines established "in accordance with international law and practice" where the coast is very irregular. This same publication states that "Hudson Bay and Hudson Strait were regarded (by the Canadian Government) as national waters..."

3. Order-in-Council 857/52 granted custody and control of an area adjacent to Hudson Bay to the Department of National Defence, Canada. The north boundary of this area included "the area designated as "Sand Mud and Boulders" on Map Sheet 54L/216 ..." This area is generally less than 600 yards wide and at its widest part is only about 1300 yards. Elsewhere on the shores of the Bay the sand mud and boulders reaches a maximum of 6 miles and averages 1 to 3 miles.

- A. Memo from L. J. Hallgrimson, Departmental Solicitor to the Attorney-General (June 30, 1960).
  - (a) Federal Government failed to get agreement of Standing Committee on Natural Resources that provinces had no off-shore mineral rights in the Bay (January, 1958).

- (b) Federal Government maintains Hudson Bay is an inland water or enclosed sea and that provincial boundaries only extend to its shores as set out in Statute referred to in (1) above.
- (c) Federal Government willing to concede that shore means low water mark. The basis for this statement is not set out. However, Mr. Gauer is satisfied from consulting the various editions of the Manual of Instructions for the Survey of Dominion Lands that the shore would be defined by mean low tide.
- (d) Mr. Hallgrimson states it is "absolutely essential to our case to establish that the Bay is not an inland water". He further states that there is some support for the position of the Federal Government but also indicates it is not universally recognized.
- (e) If the Bay is an open sea then Manitoba could establish a claim based on Section 109 of the British North America Act and the Agreement transferring the resources to the province in 1930. In Mr. Hallgrimson's opinion it could be argued successfully that Manitoba is entitled to the off-shore rights in order to be in the same position as the original Provinces, as set out in Section 1 of the said agreement.

As pointed out by Mr. Hallgrimson the Federal attitude has been that if the Provinces do not agree with its stand they are free to take the matter before the Courts.

It would appear that our only stand can be (1) that in our opinion the Bay is a coastal water or open sea and (2) that the agreement transferring the resources to the Province in 1930 provides that Manitoba is entitled to be in the same position as the original Provinces.

As there is considerable doubt about (1) our main argument must be (2).

Mr. P. J. Kulcay, Deputy Minister, Department of Mines and Petroleum Resources, B.C. was asked if there was any agreement between B.C. and the Federal Government in respect to off-shore mineral rights. The answer was NO. When asked if the Federal Government had conceded that B.C. had rights to 3 miles off-shore he advised that no distance had been discussed because the Federal attitude was that the ownership of these rights was a matter for settlement in the Courts.

August 6, 1962.

Oct 31/69 WPG Tribune

# Oil search surrounded by top-level secrecy

By BARRY MULLIN  
Tribune Northern Reporter

CHURCHILL — Closed-circuit TV and a diving bell in the freezing depths of Hudson Bay were used this summer in an effort to locate oil which — if it's found — could spark a full-scale, federal-provincial fight about who gets the profits.

The huge drilling ship, WODECO II is now plowing back to eastern waters after the summer probe in Hudson Bay — after drilling a well in the bay bed in an operation covered by top-level secrecy.

The well never reached the 6,600-7,000-foot level anticipated by Aquitaine, operator for a group of six oil companies who hold lease rights to more than 22,500,000 acres in the bay.

High level secrecy was maintained throughout the operation because the well was a wildcat — the first well drilled in an unfamiliar formation. The well only went to about 3,400 feet.

No oil or gas strikes were made and no tests were conducted for shows or pay zones within the drilled zone. Several electrical and seismic logs were taken, however.

The effect that the setback will have on future explorations in Hudson Bay has not been determined yet.

And Aquitaine has not announced if it will continue explorations here in 1970. They have not retained leases on the warehouse area where drilling supplies were stored or on the Beluga Motel where most of the engineers and superintendents lived during the drilling season.

However, one thing was certain. Although there appeared to be very little interest shown in the well, the provincial government and Churchill residents were watching progress closely but quietly.

An oil or gas strike would have raised the hopes of local residents who have waited patiently for any industry which will provide a stable economic base for the town. If oil had been discovered, many residents felt that the area could prove to be as valuable to Manitoba as the oil discovery along Alaska's north slope.

## OIL THE ANSWER

"Oil would do the trick," said one resident. "We're not too far from Winnipeg, eastern Canada or from Montreal, if we found oil maybe the federal government would have to take a closer look at locating a good industry here."

The provincial government would have welcomed a strike at this time because of the demand for new industry in the province.

But two things have seriously retarded

when the swell started to come in," said one roughneck from southern California.

He said waves looked at least eight or 10 feet high and when they would strike the drilling vessel — which is naturally top heavy because of the 150-foot drilling rig situated amidships — pallets of cement, each weighing a ton would jump off the deck and slide across them.

"There were times when we had to shut down because we couldn't work up on the floor (the drilling floor)," he explained because the ship was rocking too much.

The swell posed the greatest problems to engineers working on the hole. Direct communication with France was set up and a team of oceanographers measured waves, movement, changes in winds and tides. All this information was relayed to Paris, fed into computers, digested and broken down for the oil field engineers.

"There was very little data about the swells on Hudson Bay," Rene J. Clerc from Societe Nationale des Petroles d'Aquitane, the former parent company of the Calgary-based firm. "There was some data but most of it we had to collect ourselves and this held us up."

## OLD TIMERS

Aquitane interviewed local fishermen and old timers in an attempt to learn more about the unpredictable movements of the bay.

And when it wasn't the swell it was temperature and depth problems.

Special materials had to be flown into Churchill after drilling fluids froze up on the bottom. Temperatures at the 600-foot depth in salt water are just below freezing and posed problems for engineers.

For one week no progress was made in drilling while the hole was thawed and flushed.

"We realized there were a great many things we did not know about Hudson Bay before we started drilling," explained operations superintendent Pierre Paul Allibaud.

The Aquitaine and SNPA official explained that the company considered the hole mainly an information well at this time. "Our company was prepared to learn more about the area, formations and conditions than we were about striking oil or gas," stated Mr. Allibaud.

"But I'm certain that we would be very happy if we find something," he said during an interview before drilling operations ceased.

Water depth also poses a problem because of the pipe that must extend from the ship to the bottom. A telescoping pipe is used so that when the ship rises with the swell, the pipe will not pull loose from the bottom.





Oct. 18/69

Among larger losses: Home A \$2.50, Home B \$2, Asamera \$1.50 and Falconbridge \$1.

Mattagami Lake rose 25 cents to \$18.75 on 61,390 shares as the third most active mining issue, and was up \$1.25 on the week. Abitibi gained 25 cents to \$10.75 on 37,481 shares as the third most active industrial, and was up 75 cents on the week.

The prices have risen with speculation that Mattagami soon will announce drilling results on a property northwest of the Lakehead in which Mattagami has a 60 per cent interest and Abitibi 40 per cent. Earlier this month, Mattagami reported zinc, copper, lead and silver values in the first hole.

W. S. Row, Mattagami president, said after the market closed that assays on the second and third holes will be released during the weekend.

An Abitibi official said: "We have to assume that buying in our stock today (Friday) is based on anticipation of drilling results from Mattagami."

Aquitaine was unchanged at \$18.37 and Petrofina Canada was off 12 cents at \$17.62. A group in which the two companies have an interest has suspended drilling in Hudson Bay because of the seasonal buildup of ice in Hudson Straights. Non-commercial evidences of gas were encountered but not tested and drilling will resume in another season.

Varying interests in about 55 million acres of federal exploratory permits in the Hudson Bay area are held by the group, in which Atlantic Richfield Co. holds a 50 per cent interest. Aquitaine 25 per cent, Elf Oil Exploration and Production Canada Ltd. 7.5 per cent, Canadian Pina Oil Co., a subsidiary of Petrofina Canada, 6.25 per cent, Camerina Oil and Gas Ltd. 6.25 per cent and Sun Oil Co. Ltd. 5 per cent.

Chemcell was unchanged at \$10.25 and Bralorne Pioneer Mines rose 50 cents to \$3.25. Chemcell and a Bralorne Pioneer subsidiary, Bralorne Oil and Gas Ltd., announced an agreement under which Chemcell expects to invest more than \$15-million in the oil and gas industry during the next five years. Chemcell will acquire a controlling interest in Bralorne Oil and Gas by the end of 1974.

The agreement is subject to approval by Chemcell's directors. Bralorne Oil and Gas will manage investment of Chemcell funds in the oil and gas business in Canada, and Chemcell will be given options to acquire sufficient Bralorne Oil and Gas treasury shares at \$2 a share to give it controlling interest by Dec. 31, 1974.

Bralorne Oil and Gas, which is engaged in oil and gas exploration and development in Western Canada, will earn fees and working interests for

Closing index yesterday was highest since Sept. 25:

Table with columns: Stock, Sales, High, Low, Close, Change. Includes sub-sections for INDUSTRIALS, MINES, OILS, and SHARE TRADING.

Table with columns: Stock, Sales, High, Low, Close, Change. Includes sub-sections for DOLLAR TRADING VALUE, SHARE TRADING, and TRANSACTIONS.

Table with columns: WEEK'S DOLLAR TRADING VALUE, SHARE TRADING, TRANSACTIONS, NEW HIGHS, NEW LOWS.

managing Chemcell oil and gas funds and also will participate directly with Chemcell in the exploration and acquisition of petroleum properties.

Chemcell, which terms the arrangement a major diversification step, says it will involve setting up a new wholly owned subsidiary, Chemcell Resources Ltd. Chemcell makes organic and inorganic chemicals, fibres, fabrics and carpets.

Bralorne Oil management said it expects the agreement to enable it to diversify its exploration programs.

Chemcell says the \$15-million investment, which will come from internationally generated funds, will be used for investment in a controlling interest in Bralorne Oil and for direct exploration costs. The controlling interest will be acquired only by purchasing Bralorne treasury shares.

Chemcell does not require shareholder approval to complete the acquisition but will seek bondholder approval, a company spokesman says.

Hudson Bay Mining, which rose 75 cents to \$83, plans to start underground exploration next spring on a group of silver-lead-zinc claims in the Yukon.

The claims were staked by Hudson Bay in 1951 and are along the Canol Road near the Yukon-Northwest Territories border. Surface drilling in 1967 and 1968 indicated about 5.1 million tons averaging 8 per cent zinc, 8 per cent lead and 2.73 ounces silver a ton in two zones.

Diamond drill hole No. D-1 on the Eastmain River claims in Northwestern Quebec averaged 1.31 per cent copper, and 0.21 ounces silver over a core length of 30.5 feet starting at depth of 247 feet. Drilling is to continue until freeze-up near the end of October.

Hudson Bay is managing and directing the exploration program, which it is financing in partnership with Anglo-American Corp. of Canada and Denison Mines.

Falconbridge declined \$1 to \$14. M. A. Cooper, president, said yesterday the next stage for the company's copper properties near Windhoek in Southwest Africa is an underground development program to be followed by surface plant construction. At the annual meeting in April, Falconbridge said drilling at the copper ore body had indicated several million tons of 1.5 per cent copper.

Dusthane Enterprises, which rose \$1.12 to \$20, plans a two-for-one stock split. There are 700,000 shares issued of 800,000 authorized.

A company official said there are no plans to increase the dividend. The company pays 27 cents a share semi-annually.

The annual report for the June 30 year will be mailed on Oct. 27 and will show sales and earnings ahead of last year, the official said.

A special meeting to consider the proposed split will be held with the annual meeting Nov. 13.

MPG. Investment did not trade. Asset value a common share at Sept. 30 declined to \$7.89 from \$8.02 a month earlier.

Alarco Developments rose \$1 to \$8. Profit was 45 cents a share in the nine months ended July 31, compared with 36 cents a year earlier.

Stelo declined 62 cents to \$23, although it was up \$1.12 on the week. A strike of 14,500 employees was settled late Thursday, 78 days after it began. Yesterday the union steward body recommended rejection of the agreement although the union negotiator's unanimously recommended acceptance. A ratification vote will be taken Sunday.

S. H. Strelbel of Bennett and Wright Contractors Ltd., Toronto, has been elected president of the Mechanical Contractors Association, Toronto.

Large table of stock prices with columns for Bid, Ask, and various stock symbols like C, M, R, etc.

LEGEND: C-per cent; K-initial dividend; D-1 dividend; P-paid to date in latest 12 m dividend in arrears; V-payable in U X-extra declared in latest 12 months; DIV-dividend; Z-less than board lot.

BID AND AS

STOCKS NOT TRADED OCTOBER 17, 1969, F

Table of stock prices under the heading 'BID AND AS' with columns for Bid, Ask, and stock symbols.

MARKET HIGHLIGHTS OF THE WEEK

Table with columns: Stock, Latest Price, Ch'ge on Week, 1969 High, 1969 Low, Background. Lists stocks like Canadian Tire A, Kaps Transport, Mattagami Lake, Royal Bank, Sietco, Westcoast Trans.

UNLISTED INDUSTRIALS

# COPY

O.P. 287 Ship Magnetometer and Continuous Sub-bottom  
Profile Reconnaissance of Hudson Bay

Personnel:

Hood, P. J.

Bower, Miss M. E.

Reveler, D.

A total of 6,500 nautical miles of ship magnetometer records and 225 nautical miles of continuous sub-bottom profiles had been obtained in Hudson Bay during the 1961 summer cruise of the M. V. Theta which was under charter to the Oceanographic Research Division of the Department of Mines and Technical Surveys. The instruments used were the G.S.C. proton precession magnetometer and a sparker type seismic recorder.

The sparker profiles shed some light on the extent of the Palaeozoic sediments in the bay and indicate a Palaeozoic-Proterozoic contact about 20 miles west of the Belcher Islands. In the Belchers themselves, an anticlinal structure is indicated along the central part of Omarolluk Sound with tightly folded synclines on either side.

A quantitative interpretation of the ship magnetometer records show that, in general, the depths to basement are least around the margin of the bay with the greatest calculated depths occurring (up to 10,000 feet) in the central part of the bay to the northeast of Churchill. This thickness of sediments is rather more than had hitherto been expected, but much of it may include Proterozoic and possibly Cambrian sediments.

*Soggett*  
The Doppler effect, the apparent change in frequency of a wave train because of relative motion between source and observer, plays a key role in this new navigation system.

## Ship Navigation with Satellites

E. S. Keats  
Manager, Transit Project  
Electronics Division  
Westinghouse Electric Corporation  
Baltimore, Maryland

Satellites in space can provide highly accurate position information to ships with radio receivers than can measure and interpret the Doppler frequency shift of the satellite signal, and decode the orbital and time information contained in the transmission. A satellite navigation system can be exceptionally accurate because it depends on the measurement of time and frequency, which can be remarkably precise. Satellite navigation is suitable for surface craft and submarines all over the world.

### History

A satellite navigation system for Navy submarines was conceived by the Applied Physics Laboratory of Johns Hopkins University; technical direction of the system development has been carried out by the Applied Physics Laboratory for the Navy.

Westinghouse participation in the satellite navigation program began with a contract in January 1961 to study and design a receiver set. Additional contracts for building prototypes and production equipments have followed. The first equipment, delivered in December 1961, has exceeded most of the performance requirements.

In addition to the design and construction of the receiver set, Westinghouse is responsible for the integration of the antenna, data processor, and computer with the receiver to form the *Navigational Shipboard Receiver* (AN/BRN-3). Associated with Westinghouse in the development of the AN/BRN-3 are: the Applied Physics Laboratory of the Johns Hopkins University, the technical director for the Navy; Chu Associates, builders of the antenna; and Thompson Ramo-Wooldridge, Inc., builders of the data processor and computer.

Seven experimental navigational satellites have been built by the Applied Physics Laboratory for the Navy, of which five have been launched into orbit by the Air Force to prove the practicability of the navigation concept.

### The Navigation Satellite System

When the Navy's satellite navigation system becomes operational, present plans call for four polar-orbiting

satellites (600-mile altitude) plus a ground network. The ground stations track the satellites and transmit Doppler-versus-time information to a computer center. The computer calculates and predicts the orbit of each satellite for at least twelve hours in advance. This orbital information, in the form of Keplerian orbital elements and correct time, is transmitted to each satellite once every twelve hours as it passes over a ground transmitter station. The satellite stores these orbital elements in its memory, and transmits them, together with timing information, every two minutes as it orbits the earth. The satellite carrier signal, provided by a precision frequency source in the satellite, is phase modulated with this orbital data and timing information in digital code.

### How Satellite Navigation Works

As the navigational satellite orbits the earth, the relative motion between the satellite and a receiving station on earth is a combination of satellite orbital motion, earth rotation beneath the orbital path, and motion of the receiving station with respect to earth. Satellite orbital velocity is about 25 000 feet per second; rotation of the earth's surface varies with the latitude of the receiving station, from zero at the poles to a maximum of 1600 feet per second at the equator; and ship velocity is usually 20 to 40 feet per second. The change in position of a ship during the time that signals from the satellite are being received requires that all calculations be related to a common position.

The relative motion between the satellite and the receiving station produces an apparent frequency shift (Doppler effect) in the signal received from the ultra-stable radio transmitter in the satellite. The amount of the frequency shift depends upon wave length of the transmitted signal and relative velocity of the satellite according to the relationship:

$$\Delta f = \frac{V_r}{\lambda}$$

where  $\Delta f$  is the apparent of Doppler frequency shift,  $\lambda$  is

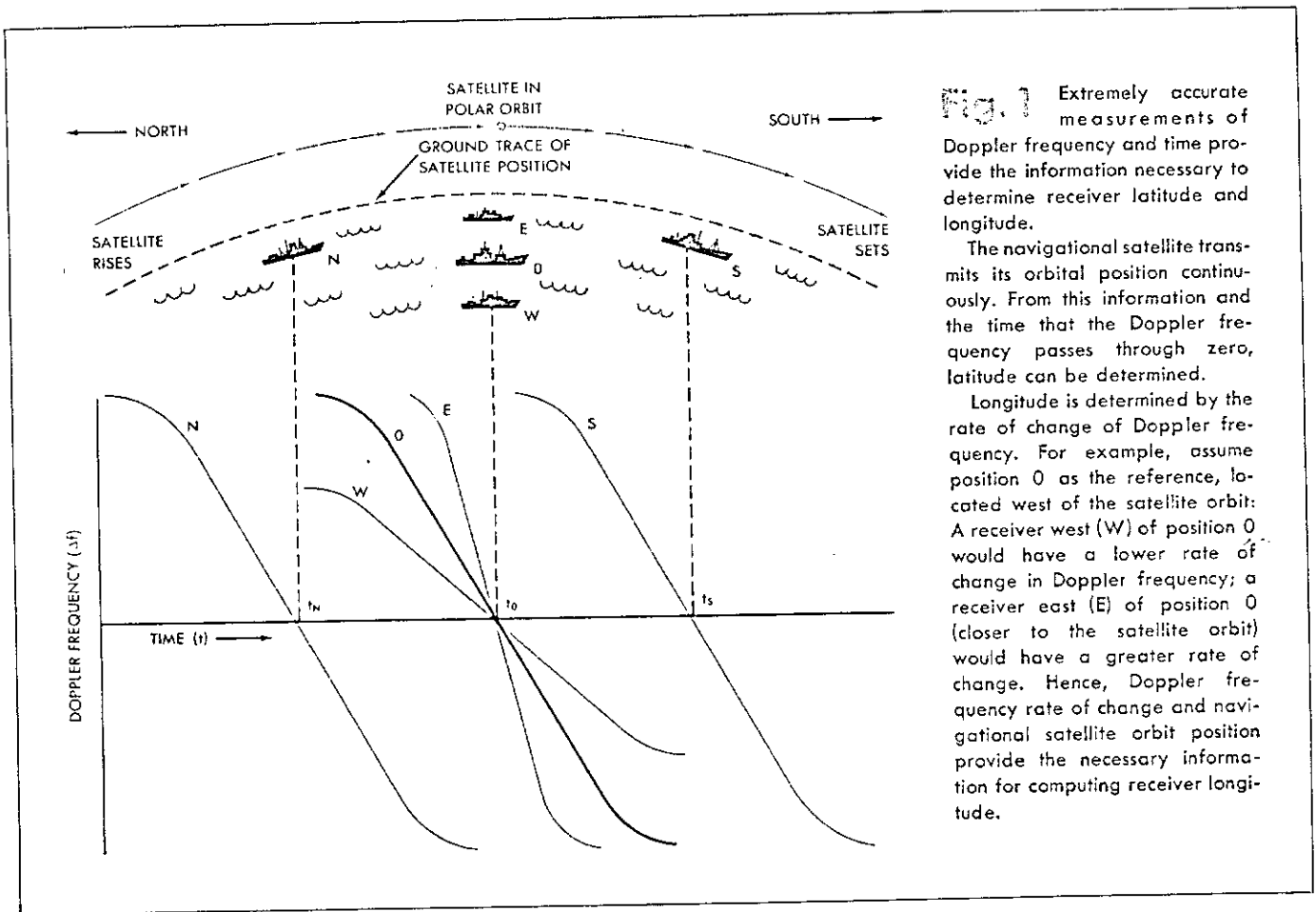


Fig. 1 Extremely accurate measurements of Doppler frequency and time provide the information necessary to determine receiver latitude and longitude.

The navigational satellite transmits its orbital position continuously. From this information and the time that the Doppler frequency passes through zero, latitude can be determined.

Longitude is determined by the rate of change of Doppler frequency. For example, assume position O as the reference, located west of the satellite orbit: A receiver west (W) of position O would have a lower rate of change in Doppler frequency; a receiver east (E) of position O (closer to the satellite orbit) would have a greater rate of change. Hence, Doppler frequency rate of change and navigational satellite orbit position provide the necessary information for computing receiver longitude.

the wave length of the transmitted signal, and  $V_r$  is the relative velocity of the satellite with respect to the receiving station.

The relative velocity of the satellite with respect to the receiver is a maximum at the time of satellite rise, when the satellite is more nearly headed toward the receiver. The relative velocity decreases to zero when the satellite reaches the point of closest approach, and increases in a negative sense until it sets.

For example, maximum excursion of the Doppler frequency shift, at time of rise or set, for a satellite operating in the ultra-high-frequency band, with a wave length of say 2 feet, is:

$$\Delta f = \frac{25\,000}{2} = 12.5 \text{ kcs}$$

Typical Doppler frequency versus time plots that would be received at different locations relative to the satellite orbit are shown in Fig. 1. The receiver to the north observes that the satellite rises, passes its zenith, and sets earlier than the center location. The plot of Doppler frequency versus time has essentially the same\* shape but is recorded earlier on the time base. The receiver to the south records a similar plot but later on the time base. The

\*There would be a slight difference because (1) the component of velocity due to rotation of the earth is less at a location nearer the pole and (2) meridians converge toward the pole so that the distance to the satellite's track is less for a given difference in longitude.

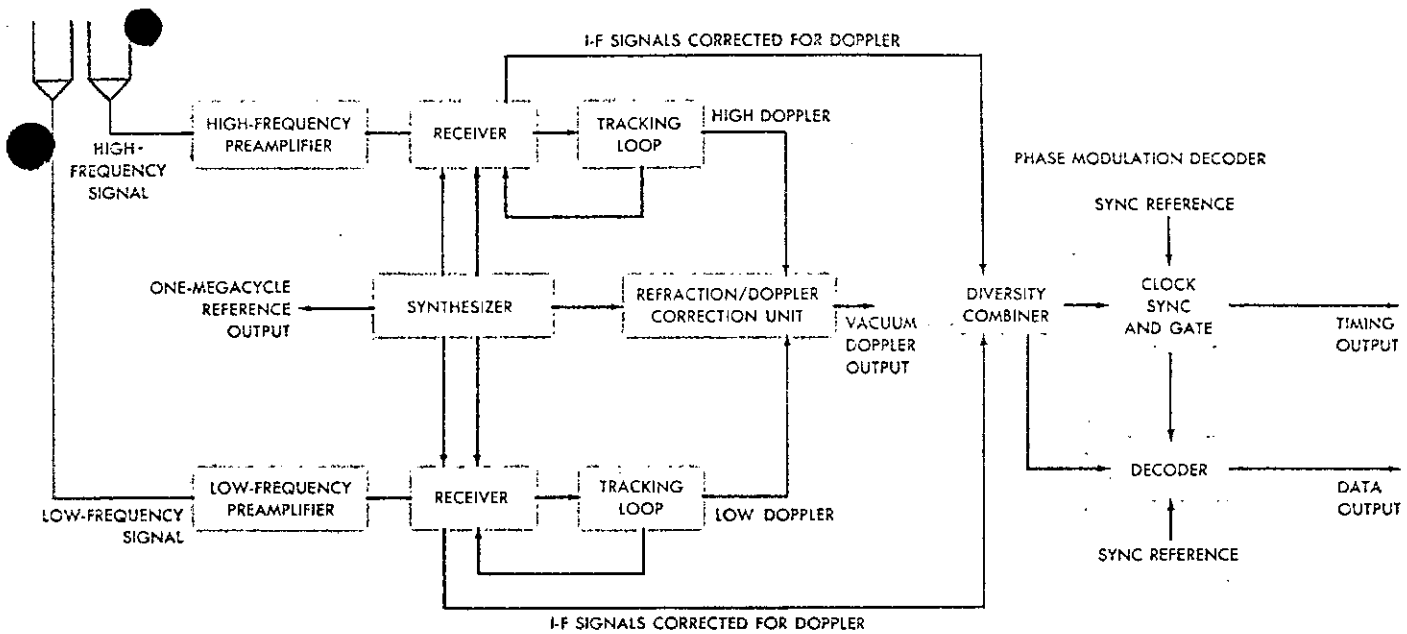
receiver to the east observes that the satellite passes the zenith at the same time as the center location and thus has the same time base. The eastern position is closer to the satellite, however, so that the rate of change of Doppler frequency is greater. The receiver to the west is farther from the satellite and, therefore, will record a lesser rate of change of Doppler frequency.

Thus, *latitude* is basically determined by the time that the Doppler frequency becomes zero, and *longitude* by the rate of change of Doppler frequency with time. The ellipticity of the satellite orbit and the nonspherical shape of the earth affect this to a slight degree. A number of measurements are made so that an averaging process overcomes fading and noise effects.

Since the satellite orbit is known precisely, very small differences in latitude and longitude can be determined by making the receiver sufficiently sensitive to record small variations in Doppler frequency as a function of time.

A number of methods exist for computing receiver position, once Doppler frequency versus time is measured and the orbital elements have been obtained. The AN/BRN-3 equipment employs an electronic computer with a pre-established program to perform the calculations, which are made after the satellite has completed its pass.

The transmission path of radio waves from a satellite to the earth is bent by the ionosphere. If the Doppler frequency were not corrected for this refraction, the rate of change of Doppler frequency would appear to be less, so



**Fig. 2** The satellite signals, transmitted on two frequencies, are received on dipole antennas of essentially unity gain. Both low- and high-frequency signals are amplified and passed through frequency-selective circuits in low-noise *preamplifiers*, which are located near the antennas. Signals from the preamplifiers are passed to the *receivers* via coaxial transmission line. After conversion to intermediate frequencies, further amplification and selection is provided up to the *tracking loops*. The tracking loops consist of phase-locked oscillators and active filters, which follow (or track) the Doppler frequency. The tracking loop operates under computer control to automatically acquire the satellite signal, and to switch the active filter bandwidth to provide the optimum compromise between phase error due to the tracking loop dynamics and phase error due to receiver thermal noise. A manual mode of acquisition and bandwidth selection is also provided.

Doppler signals from the high- and low-frequency tracking loops are passed to the *refraction/Doppler correction unit*. Here,

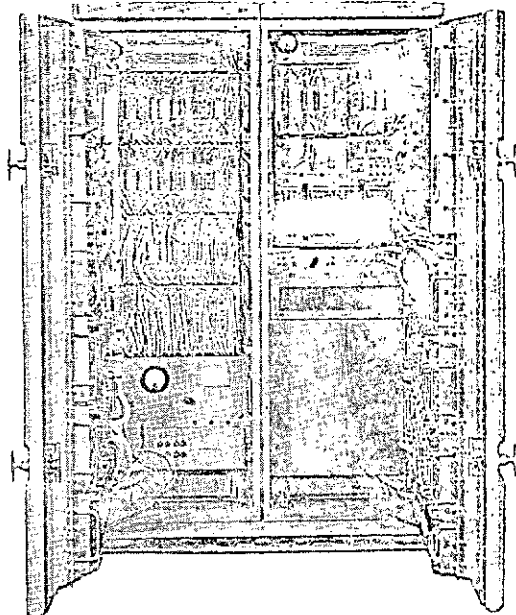
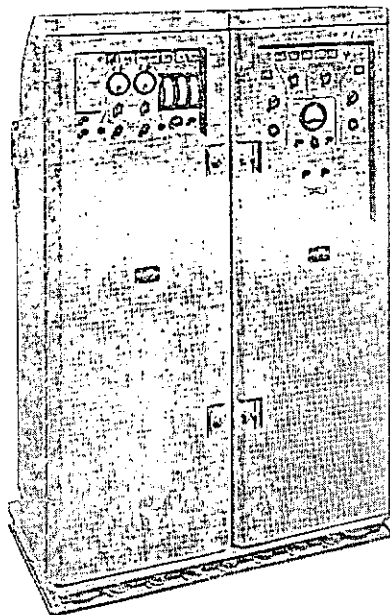
by a multiplication and subtraction process, two simultaneous equations are solved to provide vacuum Doppler output.

The tracking loop maintains i-f signals of constant frequency regardless of the Doppler frequency variations of the incoming signals. The signals from each receiver go to the *diversity combiner* in the *phase-modulation decoder*. The combiner delivers output signals with a signal-to-noise proportional to the combination of the signal-to-noise in the input signals. The same phase modulation is transmitted on each frequency. One output of the combiner goes to the *decoder*, where the phase-modulation signals are decoded. The other combiner output goes to the *detector and synchronizing circuits* that synchronize a local clock to the incoming bit rate. Timing pulses are generated and gating signals are generated for the decoder circuits previously described.

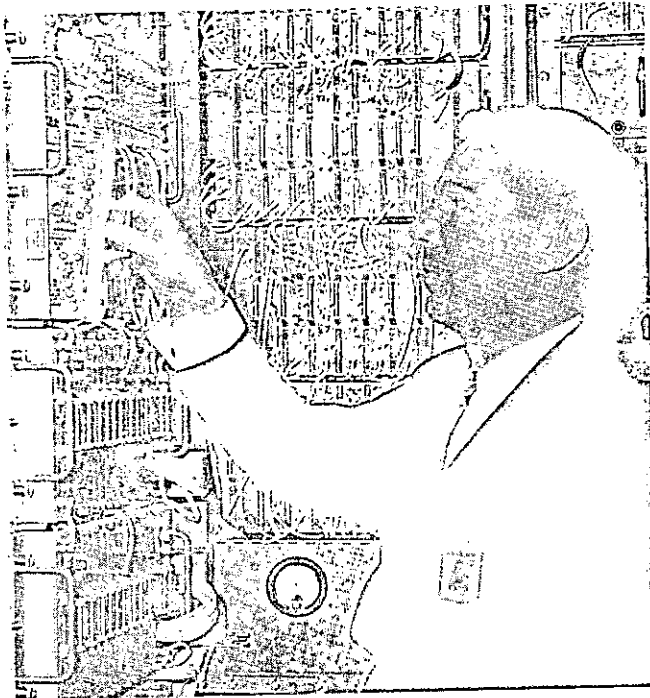
The *synthesizer* generates a one-megacycle reference signal, derived from a precision one-megacycle frequency standard. This unit provides ultra-stable frequencies throughout the equipment.

Left The receiver set is 60 inches high, 42 inches wide, and 15 inches deep. The receiver control panel is on the left, and the readiness control panel on the right.

Right Inside, the amplifier portion of the two receiver units is located above the frequency synthesizer on the left; on the right, the readiness test equipment is above the phase modulation decoder.







Module construction is used throughout the receiver. The module is being inserted in the control portion of the receiver units (inside left door); above the control portion is the diagnostic test equipment.

that the receiving station would seem farther from the satellite. Fortunately, refraction is inversely proportional to the frequency of the transmitted signal\*. Therefore, the satellite transmits on two frequencies, which have an integral relation and are combined in the receiver in inverse proportion to frequency to give a single, true frequency called *vacuum Doppler frequency* (i.e., information that would be received in a vacuum, where there is no refraction).

#### The Receiver Set

The receiver set consists of preamplifiers, receivers, refraction correction unit, frequency synthesizer, phase modulation decoder, and operational test equipment (Fig. 2). Frequency conversion, amplification, automatic gain control, and filtering are carried out with extreme precision since any incremental change of phase as a function of time would constitute a frequency error in the output Doppler and become a position error for the navigator.

The receiver provides four basic outputs, which are needed for the navigation solution: vacuum Doppler frequency (corrected for refraction); data bits that furnish the navigator with satellite orbital information; timing pulses that provide accurate time information from the satellite; and a station reference frequency at one megacycle, which runs the station clock and, through the frequency synthesizer, provides all the conversions and reference frequencies that are needed in the system.

Westinghouse  
**ENGINEER**  
Jan. 1963

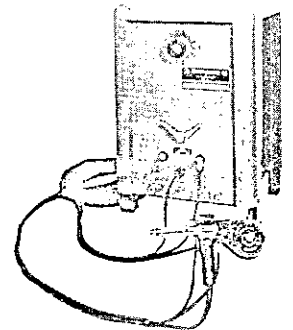
\*To a first order approximation. When the refraction is great enough to require use of a second order term, the receiver indicates the deterioration of vacuum Doppler information on the operator's control panel, and indicates "no-go" to the computer.

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Westinghouse Elevator Division, Jersey City, N. J.



**SEMI-AUTOMATIC WELDING SYSTEM** has a constant-voltage single-phase silicon rectifier power source. A voltage-sensing control automatically corrects for variations in the weldor's hand movements. The SA-150 system's hand gun has an amperage control device in its handle and a mechanized wire reel with adjustable feed rate.  
Westinghouse Westing-Arc Division, Buffalo, N. Y.



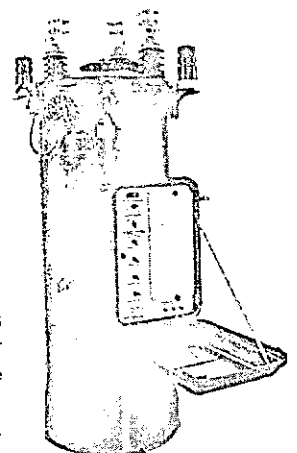
**MOTOR PROTECTION RELAY** provides staggered starting of a number of motors energized from the same feeder line and also gives undervoltage protection for motor and contactor. Designed for 440-volt motors, the SVP relay has a 550-volt continuous rating. Contact rating is 10 amperes. Dropout is adjustable between 365 and 440 volts, with pickup at 112 percent of setting. Time delay is adjustable over a 2- to 30-minute range by turning a knob on the front of the unit. The relay mounts in a standard watt-hour meter socket for indoor or outdoor service.

Westinghouse Electric Corporation, P. O. Box 2099, Pittsburgh 30, Pa.

#### POLE-MOUNTED SINGLE-PHASE FEEDER VOLTAGE REGULATORS

are rated from 2400 volts delta to 24 960 volts wye. Power ratings range from 19.1 to 250 kva. The units require less exciting current than previous models, and they have an improved coil structure. Bushings are keyed to the cover, the control panel is hinged to the side of the unit, and a switch on the control panel facilitates changing the current transformer ratio when using the load range selector.

Westinghouse Electric Corporation, P. O. Box 2099, Pittsburgh 30, Pa.



March 20, 1963



Expedition leader George Hobson points to exploration area.

The party will operate from a main camp at Churchill, Man., and be supplied periodically and moved about Hudson Bay by a DC-3 aircraft.

The party will drill 10-inch holes through the ice with a mechanical drill. A dynamite charge weighing 150 pounds will be lowered some 650 feet to the ocean floor and exploded.

Mr. Hobson said that because of the dangers involved, a 24-hour guard will be maintained.

He said pressure ridges of ice occur when a moving ice pan propelled by wind or current smashes into one that is not moving. The tremendous force of the impact piles ice up to heights of 40 feet within minutes.

He said the party will be armed against polar bears. It will be linked with Churchill by two-way radio and each aircraft will carry crash-position indicators.

**PENCER  
(IPEG)**

# Five-man team hunts oil on Hudson Bay ice fields

OTTAWA (CP)—A five-man survey team from the Geological Survey of Canada leaves today for a risky oil-hunting expedition on the dangerous ice fields of Hudson Bay.

The team, headed by 40-year-old George Hobson, a federal geophysicist, will face two main dangers during the five weeks it will spend on the huge shifting, crunching ice pans of the bay, 500 miles from shore.

Major danger will be from pressure ridges of ice which rise suddenly and silently to heights up to 40 feet. The second will be from polar bears

which infest the ice fields and consider anything that moves edible.

This will be the first time any survey party has attempted to work on ice in the bay.

The party's objective will be to determine by seismic methods the depth, shape and other features of the sedimentary basin under the bay's relatively shallow waters. It is the last unexplored sedimentary basin in North America.

Dr. L. W. Morley, chief of the geophysics division of the Geological Survey of the federal technical surveys depart-

ment, said the existence of the sedimentary basin was confirmed by ship magnetometer readings.

"If the basin is as thick as we think it is, it could very well contain oil," he said.

Mr. Hobson will be accompanied by Hugh MacAulay, 37, and Ronald Hodge, 30, technicians with the Geological Survey. The two other members of the party will be the pilot and the mechanic of a chartered helicopter which will be used for transportation on the ice.

Log file

FIELD OFFICE CLIPPING

WINNIPEG FREE PRESS

DATE March 2, 1963

# Off To Hunt For Oil

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The team, headed by 40-year-old George Hobson, a federal

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Main danger will be from pressure ridges of ice which rise suddenly and silently to heights up to 400 feet. The second will be from polar bears which infest the ice fields and consider anything that moves edible.

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F.L. SPENCER  
(WINNIPEG)

## ENABLING LEGISLATION PASSED FOR NEW NEWFOUNDLAND REFINERY

Enabling legislation was pushed through last week to let Newfoundland Premier Joseph Smallwood establish the Avalon Core Chemical Corporation. This Crown company is intended to be the vehicle through which the Come-By-Chance petroleum refinery is financed. Newfoundland Refining Company Limited, the wholly owned subsidiary of Shaheen Natural Resources Company Incorporated (New York), will lease the 30,000 b/d facilities to be built at the neck of the Avalon Peninsula, and will take title to them only after it has paid out \$30 million over the next 15-25 years to redeem the bonds floated by the Crown Corporation.

The \$97 million investment figure - and the 100,000 b/d crude input - used by Premier Smallwood in his announcement last week - referred to more than the \$45 million refinery. Within two years of initiating construction of phase one of the plan - which involves the hydrocracking of residuals to produce an ammonia-plant feedstock, jet fuel and other petroleum products - Newfoundland Refining hopes to double the size of the operation. In this second stage (to 60,000 b/d) more reformat would be produced to feed a BTX extraction unit. The benzene can be exported quite readily, says NRC, while the toluene would be run through a hydrodealkylation unit to augment benzene output. Raffinate for the BTX tower is intended for a naphtha cracker in order to produce olefins. No naphtha pyrolysis could be contemplated, however, unless and until Newfoundland Refining can line up some potential ethylene or propylene customers ready to locate at the Newfoundland site.

## CANADIAN OIL EXPORTS MAY BE UNDER FIRE AT U. S. HEARINGS

WASHINGTON: Canada's oil exports to the United States will be under scrutiny again May 22-24 at public hearings on the mandatory U. S. oil import control program called by Interior Secretary Stewart Udall.

The hearings, similar to sessions held in Washington two years ago, are intended to deal with the multiple problems that have developed in the detailed implementation of existing oil quotas and to consider the broad outlines of the program as it should develop in the future. First day of the hearings will consider the general issues, while remaining two days will be concerned with particular problems that arise out of the establishment of foreign trade zones, feedstocks for petrochemical plants, refinery quotas, shortage of special types of petroleum such as propane and jet fuel, and "incentives and import program changes to encourage exploration for new petroleum reserves."

Also singled out for discussion in the last two days is the issue of oil imported from Canada under overland exemption from the quota imposed on all other countries

except Mexico which has voluntarily agreed to limit its exports to 30,000 b/d. Growth of Canadian oil imports - 10 percent last year - is causing concern on two counts:

(1) Interior Department projections have consistently underestimated Canadian imports each year when setting import quotas, with the result that total imports have exceeded formula rate by the amount of this error. Last year, the error amounted to 32,000 b/d. This has brought repeated complaints from the Independent Petroleum Association of America.

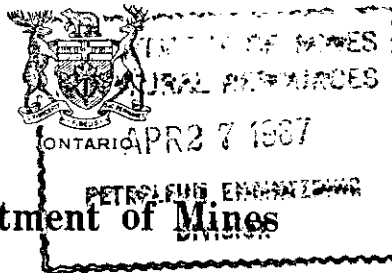
(2) U. S. administration, and some major oil companies, are reportedly concerned about proportion of Canadian oil imports in relation to those from other countries, particularly Venezuela. A rumor in Washington is that at the recent Latin American summit meeting in Punta Del Este, President Lyndon Johnson gave assurances to Venezuela President Raul Leoni that the administration would not permit Canadian oil imports to continue to grow at the expense of Venezuela's market in the United States.

## AQUITAINE CONFIRMS HUDSON BAY STAKE

Aquitaine Company of Canada Ltd. has confirmed its rumored stake in Atlantic Richfield's 49.9-million-acre offshore spread in Hudson Bay. In its 1968 annual report, Aquitaine says it has "made an agreement with Atlantic Richfield Company for joint exploration" of the total spread on behalf of itself and its partners in the Kaskattama well on the southwest shore of the Bay at the mouth of the Kaskattama River in Manitoba. The interest split of Aquitaine's portion of the venture was 50 percent Aquitaine, 25 percent French Petroleum, 15 percent Petropar, and 10 percent Sun Oil.

It is understood that the Aquitaine group will earn 25 percent interest in the offshore block by conducting seismic work during the summer of 1968 and will then have an option to acquire an additional 25 percent for an undisclosed cash consideration. This summer Aquitaine plans no offshore seismic, but will deepen its suspended Kaskattama well and run seismic onshore surveys during the fall and coming winter.

In land-locked Saskatchewan, the company has begun geophysical evaluation of the 1.12-million-acre tract it holds together with Banff Oil and Jefferson Lake Petrochemicals in Winnipegosis-prospective areas of the province. Aquitaine and Banff farmed out one third of their equal interests to Jefferson Lake Petrochemicals, according to the report. Geophysical work included nine crew months of seismic and six crew months of microgravimetric surveys.



DEPARTMENT OF MINES  
& NATURAL RESOURCES  
APR 26 1967  
DIRECTOR - MINES

Department of Mines

*To*  
*Thank you*

To the Editor  
Telephone 365-1345

For Release  
ON RECEIPT

In the hope that a concentrated exploration program may lead to the discovery of economically important oil deposits in the northwestern corner of Ontario, the provincial government has issued an exploratory license covering 986,560 acres to the Aquitane Company of Canada, a wholly-owned subsidiary of a very large French oil company. Announcement of the agreement was made in the Legislature today by Hon. G.C. Wardrope in introducing the estimates of the Department of Mines.

Aquitane is a major operator in the Rainbow field of Alberta and it has recently done preliminary drilling just over the Ontario border in Manitoba. The exploration agreement with the Ontario government is based on drill results in this Manitoba field.

The minister also announced that an exploration permit has been granted to Madsen Red Lake Mines Limited for the development of magnetic iron sands discovered on the bed of MacDowell Lake in northwestern Ontario.

A third new exploration permit has been granted to Canada Glazed Papers Limited, giving this company the right to search for a specific type of clay that is used in the paper-making process. The minister stated that the exploration rights cover Kipling and Wright townships.

*FILE - AQUITANE SOGEPET.*



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# OIL PROSPECTS ATTRACTIVE IN HUDSON'S BAY AREA

By DR. F. R. JOUBIN

One or more "standard" drilling tests will be put down in the Hudson Bay area by Dr. F. R. Joubin and Associates if initial geophysical work proves worthwhile.

Dr. Joubin considers the region geologically encouraging, is working on the "quite reasonable assumption" that most, if not all of the Bay could consist of Paleozoic strata.

The first move into the area was through the acquisition of some two million acres of exploration permits (OILWEEK, September 3), followed by the formation of a new company, Sogepet Limited based in Toronto (OILWEEK, September 10).

Dr. Joubin notes that the area of similar Paleozoic formations which appears to underlie the Hudson and James Bay has received only minimal and intermittent exploration activity, but it has confirmed the presence of Ordovician, Silurian and Devonian formations.

Much of Canada's oil and gas production is found in middle-period Paleozoic marine sediments in western, northwestern, mid-western Canada and in southern Ontario.

Similar geological areas have been recognized in the Hudson Bay and James Bay area and in the Eastern Arctic islands group.

An energetic program of exploration is now underway in the Eastern Arctic islands.

The area of similar Paleozoic formations which appears to underlie Hudson and James Bay has received only minimal and intermittent exploratory attention. The work undertaken to date has, however, confirmed the presence of Ordovician, Silurian and Devonian formations which are productive elsewhere in Canada.

Quite recent airborne geophysical work has provided confirmatory evidence as to the large area covered by the Paleozoic formations beneath Hudson Bay and more importantly, suggests that the succession is much thicker and, therefore, more favourable than originally assumed.

The approximate 35,000 square miles of the Hudson Bay sedimentary basin is relatively accessible in terms of present day petroleum exploration. The southeastern and southwestern edges of the basin area are terminal points for the Ontario Northland and Canadian National (Churchill line) railways, respectively.

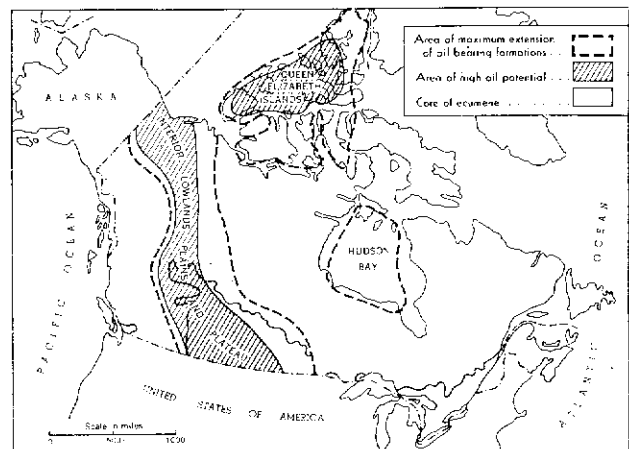
The Hudson Bay sedimentary basin falls in the domain of the federal government and the Manitoba and Ontario

provincial governments. Most of the federal area underlies the water of Hudson Bay.

A private Toronto group plans to undertake petroleum exploration in the general southwesterly to central sector of the basin. For this purpose, they have acquired exploration licence areas in Manitoba, approximately between York Factory and Fort Severn and a larger offshore area into Hudson Bay.

It is proposed to undertake air photograph interpretation, ground geological mapping, some geophysical work, both airborne and on ground, and some initial "slim hole" drilling for stratigraphic and structural detail. It is hoped this work will provide the justification for one or more standard drilling tests.

Several earlier published maps of the Geological Survey of Canada show the general distribution of Paleozoic sedimentary rocks along the entire James Bay coast and south coast of Hudson Bay to Churchill. The formations identified in this south coastal region include Ordovician, Silurian and Devonian age strata. Geological Survey maps also show unclassified Paleozoic sediments on several of the islands spread across the northern region of Hudson Bay. Map No. 1045 A, Geology of Canada, shows this situation (Fig. No. 1).



The quite reasonable assumption that most, if not all of the Hudson Bay basin could consist of Paleozoic strata, slowly developed in recent years, a concept given impetus by the recent revelation that the eastern Arctic archipelago is largely composed of Paleozoic and Mesozoic sediments, locally of considerable thickness. This concept of a possible 250,000 square mile, water covered Paleozoic area was recently suggested in Geographical Bulletin No. 15, Department of Mines and Technical Surveys, from which the accompanying illustration (Fig. No. 2) is taken.

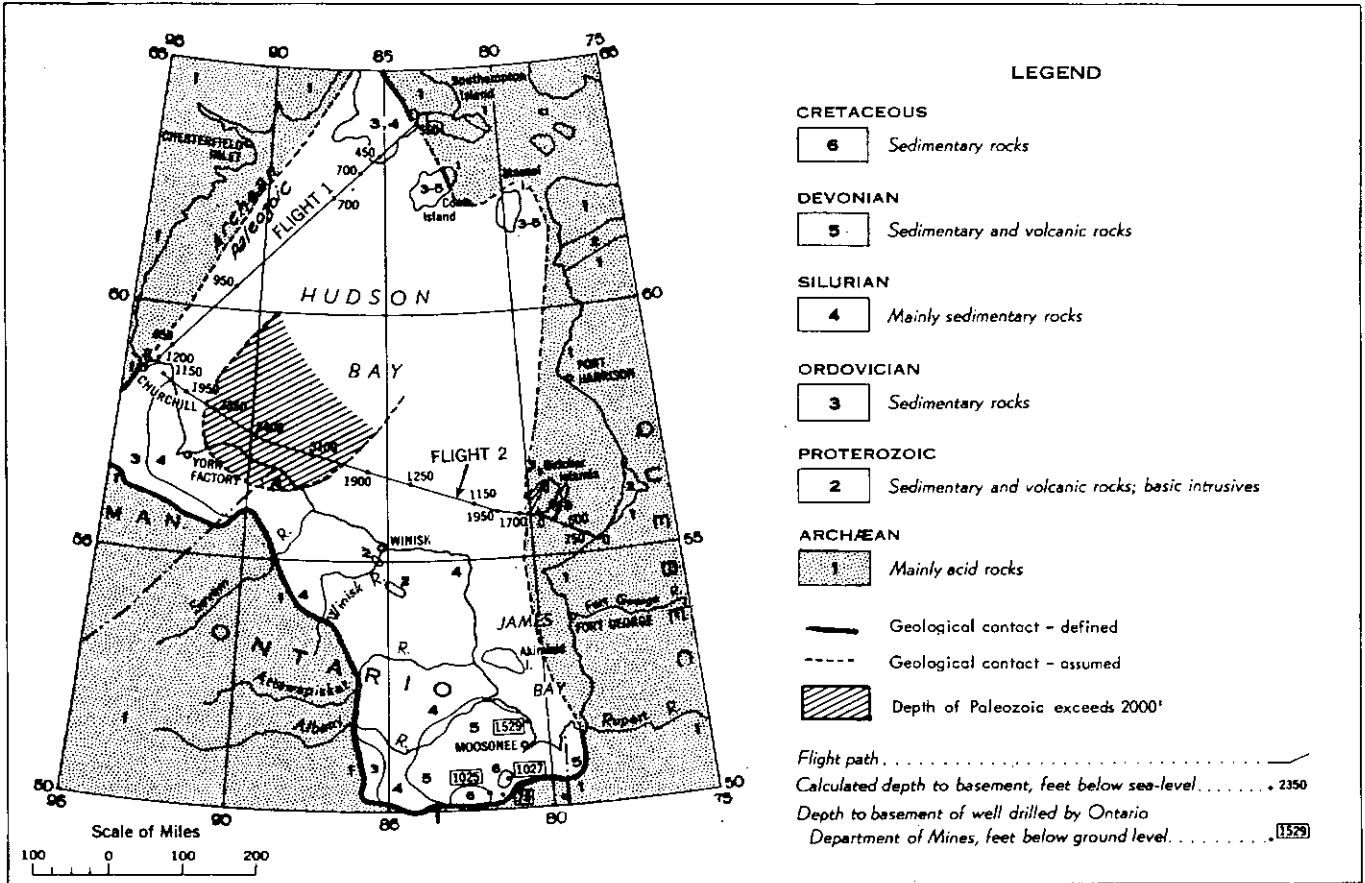
Intermittently during the period 1923 to 1942, some exploratory search for oil and gas was conducted in the Moosonee-Albany region situated southwest of James Bay and 600 miles southeast of the current Sogepet program. The James Bay activity was stimulated by the results

of a Geological Survey study of that section by M. Y. Williams who verified the presence of oil-bearing shale in the lower Devonian Long Rapids formation. This phase of activity culminated during 1948-51 when the O.D.M. undertook the drilling of three core holes to an average depth of slightly over 1,000 feet where the Precambrian basement was reached.

### Porous Reef Structures

The final conclusion drawn from this work by Dr. M. E. Hurst, then Ontario Provincial Geologist, was: "Besides establishing the presence of a substantial thickness of Paleozoic sediments, the drilling confirmed the view that these rocks occupy a basin in which successively younger formations overlap the Precambrian from north to south. Porous reef structures containing traces of pyro-

Bay. One profile, from Churchill to Coral Harbour confirms a considerable north-south extent to the Paleozoic assemblage but the profile route obviously "skirted" the western edge of the sedimentary basin and the average thickness of the Paleozoic is only about 850 feet. The profile line from Churchill in an easterly direction to the Belcher Islands tell a much different story. See illustration No. 3 which is a slightly modified version of the illustration in the G.S.C. text referred to above. A sudden thickening of the Paleozoic assemblage from 1,000 to 3,100 feet off-shore between Cape Tatnam and the Manitoba-Ontario boundary, indicates a relatively deep Paleozoic-filled trough about 100 miles wide and trending in an approximate northeasterly direction. More recent geophysical data suggest Paleozoic thicknesses of 5,000 feet or more. All airborne data to date concerns only the



Sketch map of Hudson Bay area showing aeromagnetic flight paths, geology and depths of basement rock.

bitumen have been recognized, but it remains for future exploration to determine whether conditions favourable to the accumulation and retention of petroleum and natural gas are present in the area." The detailed results of this exploration program are well summarized in Ontario Department of Mines Report, Vol. 61, Part 6, 1952.

During the past decade of intensive oil exploration across Canada, the Hudson Bay area has no doubt been considered by many, but the relative thinness of sedimentary assemblage has proven the principal deterrent. New information provides important and much more favourable data on this question.

In 1960, the Geological Survey published Paper 59-13 "Aeromagnetic Surveys across Hudson Bay from Churchill to Coral Harbour and Churchill to Great Whale River" describing results of two aeromagnetic depth profiles as determined for the Paleozoic assemblage underlying Hudson

water-covered area of Hudson Bay and the single traverse line of immediate importance roughly parallels and is about 30 miles offshore. Because of the unique flatness of the Hudson Bay continental shelf, the water depth, even 25 miles off-shore, is locally only about 150 feet.

It is interesting to note that a strong magnetic "ridge" (perhaps an expression of the Precambrian basement topography?) is indicated on the hydrographic charts of Hudson Bay and seemingly forms at least the west "rim" of the Tatnam trough.

The present mapping data on the Ordovician and Devonian formations along the Manitoba coastal strip and for 100 miles inland, provides some plausible evidence that the Tatnam trough may have a land surface expression and, indeed, may correspond to the "mirror-reflection" distribution of Ordovician and Silurian (in southwestern Manitoba). If these two regions of Paleozoic rocks were at one time related (and there is plausible

evidence of an impressive synclinal axis for such a trough in the basement rocks) then the two regions have been separated by a cross arch of northwesterly trend.

#### Coastal Strip Favourable

On the basis of present evidence, the most favourable terrain appears to be the coastal strip between Cape Tatnam and the Manitoba-Ontario boundary extending about 25 miles offshore. A block of about 2,500,000 acres, roughly 100 miles wide by 40 miles long has been acquired by Sogepet Limited (Societe Generale des Petroles). Maximum depth of water over the acreage is 180 feet; the average about 80 feet. Although there is reportedly from five to six feet of ice over the sea-covered area during the six winter months, it is not yet known if the ice surface will lead itself to feasible oil exploration activities.

## King Stevenson Rates 408 b/d At Basal Quartz Oil Discovery

King Stevenson Gas and Oil Company production tested its East Scandia wildcat for 408 b/d. The well is 16 miles south of the small Tilley oil field and 10 miles south and slightly west of the company's Tilley No. 10-9 Basal Quartz oil discovery, which was tested for 720 b/d.

King Steve East Scandia No. 10-25 (Lsd. 10-25-14-14 W. 4) drilled to 3,270 feet total depth, set 5½-inch casing at 3,265 feet and perforated an 11-foot interval below 3,140 feet. A test was run after an acidizing and fracturing job, through ⅝-inch choke, giving the 408 b/d flow. The Viking pay zone, which flowed up to 8.2 mmcf/d gas during drillstem tests, has not further been explored.

Both the Tilley and the East Scandia wells will be put on production after the installation of receiving tanks.

## Ambassador Gets Big Producer At Half-Mile Midale Stepout

Ambassador Oil Corporation tested an East Midale field well for a maximum flow of 676 b/d, one of the best ratings achieved in this part of Saskatchewan.

Ambassador E. Midale No. 1-22 (Lsd. 1-22-6-10 W. 2) drilled to 4,690 feet total depth and tested two intervals.

Interval 4,537-42 feet in the Midale flowed and pumped 22 b/d. After treatment, the rate went up to 528 b/d.

Interval 4,623-30 in the Frobisher Beds flowed 148

b/d natural through a 12/64-inch choke, to bring total figures for the well up to 676 b/d.

The Midale No. 1-22 is one of the best wells drilled in this part of the province so far. It is one-half mile north of other production in the East Midale field.

Ambassador has announced that it will drill two immediate followups to the new successful completion.

## Hudson's Bay Asks Pilot Flood For Virginia Hills Field

Initial injection rates of 15,000 b/d through two wells is expected to give Hudson's Bay Oil and Gas an opportunity to gather data, necessary to establish a full-scale waterflood operation in the Beaverhill Lake reservoir of the Virginia Hills field.

The company has made an application to the Alberta Oil and Gas Conservation Board for itself and the other operators in the field to evaluate problems concerned with such an operation. The application states that the company seeks to gain experience in equipment handling, water supply and treatment, and to collect data on injectivity rates and pressures by injecting the 15,000 b/d.

No field data have been made available as yet, but studies are being made to determine a water source. Named as possibilities were the Paskapoo layer in the field which is being drilled up at present for evaluation purposes and a potential dam in the Freeman River, 21 miles northeast of the proposed pumping and treatment plant in the field.

The Virginia Hills field was discovered in 1957. Average well depth is 9,200 feet in the Beaverhill Lake reef. At present the field, which has a productive area of some 13,120 acres, comprises 82 wells. Primary recoverable oil was estimated by the conservation board last year as some 70 million barrels of 39 degrees API crude. Average net pay is 62 feet.

Other operators in the field, next to Hudson's Bay, are: Union Oil of Canada, Skelly Oil, Home Oil and J. Ray McDermott & Co.

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# Aquitaine boosts Hudson Bay acreage

Group holdings total 3.3 million acres

Aquitaine and its partners, now numbering six after several consummated farmouts deals, continues to bolster its acreage position on and off the southwest shores of Hudson Bay. Latest acquisition is a 986,560-acre spread from the Ontario government, bringing the total acreage in which Aquitaine holds an interest to 3.3 million acres, situated in Ontario, Manitoba and on federal rights in the Bay itself.

High point of exploration in the area has been the Sogepet Aquit. Kaskartama Prov. No. 1, which was temporarily suspended at a depth of 2,550 feet due to winter conditions and will be resumed during the summer season. Hole has so far brought better than expected results in that basement had still not been reached at present TD which is already 1,000 feet beyond the depth anticipated for the Precambrian. Main target in the prospect, the basal sands of the Ordo-

vician, have also not been penetrated so far, but oil stain has been found to support oil prospectiveness of the area.

Seismic marker thought to represent the basement prior to drilling of well turned out to be only the Silurian, leading to a readjustment of all seismic readings. The Silurian itself showed oil stain and a good smell of oil in samples, with findings indicating a good reservoir potential for a crystalline dolomite penetrated in the system.

Test is on a one-million-acre, on and offshore farmout from Bralorne Petroleum and Sogepet. Since spud-in of well, Aquitaine farmed part of its 50 percent interest in the lands out to French Petroleum (25 percent) and to Sun Oil (10 percent). Sogepet and Bralorne have made farmouts on their own, so that currently the acreage is held by operator Aquitaine

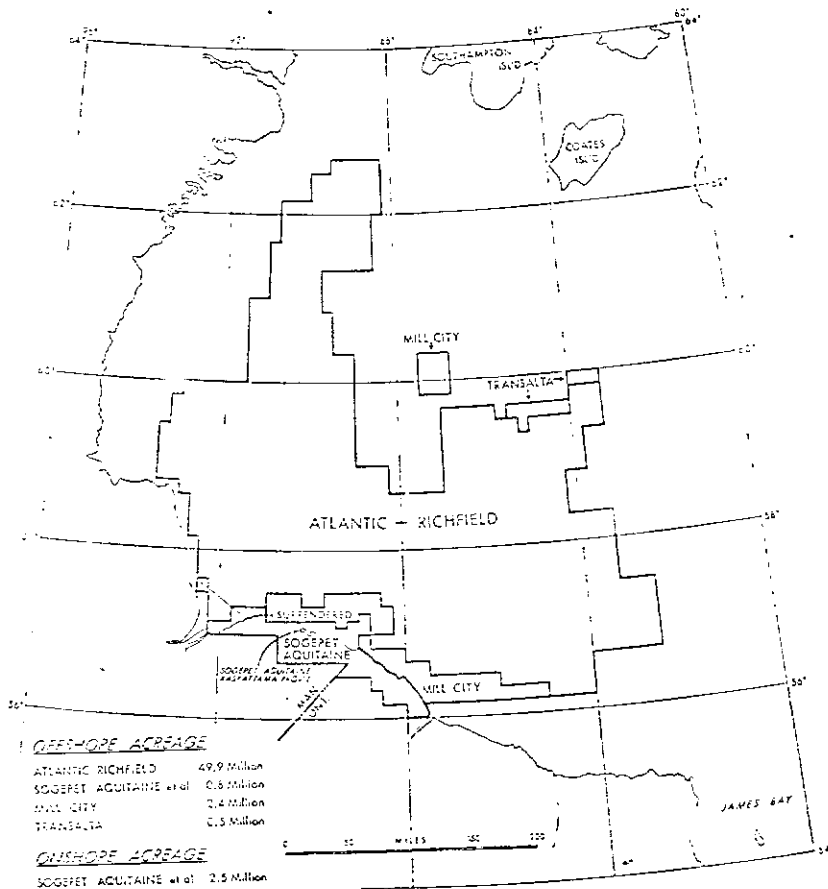
with 25 percent, Sogepet 30 percent, French Pete 12½ percent, Bralorne 10 percent, Petropar 7½ percent, and Sun, Teck Corporation and Western Decalta Petroleum five percent each.

According to the annual report of Bralorne Pioneer Mines, affiliated with the project through Bralorne Petroleum, \$500,000 has been earmarked for seismic exploration and other work this summer in addition to the drilling expenses.

Largest block in Hudson Bay is held by Atlantic Richfield with about 50 million acres, with additional blocks being held by Mill City Petroleum and Transalta Minerals.

It is expected that Aquitaine will come to an agreement with Atlantic Richfield soon to take a farmout on their block. Results of the well have certainly not discouraged the belief of geologists that oil will be found in the Bay.

"Main problem is not the geology but to keep an offshore rig there during the very severe winter conditions, which are far tougher than any encountered elsewhere in the world," one exploration manager connected with the group said recently.



## Miss. gas rumored at Turner Valley

Pacific Petroleum's affiliate Bailey Selburn Oil & Gas has found Mississippian gas 4½ miles east of Turner Valley field in southern Alberta. Indicated gas well Baysel et al Black Diamond 4-13 (Lsd. 4-13-20-2 W. 5) was cased with seven-inch string to total depth at 9,375 feet (from 3,519 feet KB), which places the casing shoe likely in the Shunda formation. Unconfirmed reports quote recoveries of about one mcf/d on drillstem test. Hole is only half a mile north of old Shell Ang. Pine Creek No. 1 which tested a meagre 200 mcf/d from the Mississippian Mount Head and the Upper Porous Turner Valley formations. This one was abandoned.

Porosities in this area tend to be streaky. Any real good well would be of great interest to industry.

## NOTES ON SOGEPET LIMITED

In October, 1962, Sogepet Limited acquired 12 Manitoba Permits aggregating almost 493,000 acres, and Canada Permits aggregating approximately 1,968,000 acres.

The expenditures incurred by the company, approved by my Department and the Department of Northern Affairs and National Resources, as acceptable in satisfaction of the obligations of the Manitoba and Federal Regulations, total \$185,168, of which \$38,705 has been allocated to the Manitoba acreage. All of these expenditures have been incurred in respect to geological and geophysical investigations, and a considerable part have been incurred in respect to acquisition of information outside of the area comprising the permits. The regulations recognize the value of such off-permit work and authorize the approval of such expenditures. No drilling has as yet been commenced. The portion of the total expenditures allocated to the Manitoba Permits and the Federal Permits has been in the same ratio as the respective acreages. This allocation is approximately 21% Manitoba and 79% Federal. The total of \$38,705 approved, leaves \$59,850 still to be expended to complete the company's Manitoba obligations.

The regulations under which the company's permits were acquired required the expenditure of 5 cents for each acre during the first 18 months, and 15 cents per acre during the second 18 months, in respect to the Manitoba permits. The company's obligation in respect to the Canada acreage was 5 cents per acre for a term of 3 years. The higher Manitoba exploration obligation was identical to the "Canada Oil and Gas Regulations" in effect in 1962, and applicable to land areas south of latitude 65°.

In 1963 the Canada Oil and Gas Land Regulations were amended, but the Department of Northern Affairs and National Resources failed to notify my department of the new regulations.

The main changes effected in the Canada regulations were to extend the term of the permits in the areas between latitudes 68° and 70° and to reduce the expenditures required in this area, and in water areas, in the second 36-month period. These amendments are the latest in a series of changes which have progressively made the term and conditions of Canada permits less onerous. Canada has recognized that operating conditions in the Far North are extremely difficult and should receive consideration.

The company first made representation to my department that the terms and conditions of the Manitoba regulations were somewhat onerous in April, 1964. At this time we did not consider that this contention was valid as we were unaware that the Canada regulations had been amended. The company made a further representation in September, 1965, emphasizing



Besides all the announced wells, numerous other wells will be drilled on and in close proximity to Ranger rights during the winter drilling season.

Oil production increased 21 percent in the nine months ending Sept. 30, to 166,661 from 137,767 barrels. Gas production dropped 31.3 percent to 1.4 from 2.1 bcf. Operating income was down 3.6 percent to \$405,419 from \$420,404. However the company estimates total income from all sources will rise nearly one third in 1966 to \$1 million from \$761,666 in 1965. The twentieth shared well in the Mitsue program is on production and the twenty-first is now drilling. Two development wells are under way in North Dakota.

## Well data project proceeds on schedule

A monumental undertaking by Petrodata, Calgary, to record all available well information in western Canada into a computer for instantaneous retrieval for any geological or engineering program, computation, or study in printout, map, or digital tape or punched card form, is nearing completion.

All wells in northeast British Columbia have already been recorded with 10,000 of Alberta's 28,000 wells also on tap and the rest to be finished by February or March next year. Saskatchewan wells should be completely computerized in July/67. On the remaining Alberta well data, only the formation tops are missing.

Formation tops have been tied in a rather unique way with all 14 Alberta customers of the system agreeing on type cross-sections across the province, a previously unheard of undertaking among competing oil companies. All wells are guaranteed to tie in and to correlate to all field wells. Total number of subscribing companies for all of western Canada or part of it has reached 18.

As of Oct./66 some 46,000 wells had been drilled, logged, tested, completed, or abandoned in western Canada. For each single well all data have to be verified at the source; for instance each drillstem test back to the original recordings, with suspicious looking data being checked out as the work proceeds. Each single well requires an average 62 punchcards, for which input forms have to be completed from the well data, with each card then being verified by the computer system.

Petrodata, a division of Lowe Petroleum Engineers, Inc. has its own card punch and verifying equipment, but utilizes the IBM 7044 computer at the IBM Calgary data center. Part of the validation following the original data control in the recording stage is a system of criteria which lets the computer throw out any information which does not fit. A series of such checks is built into the verification program. A final printout is again checked against the original hard copy before the information is allowed to remain in the computer memory. Any correction will then again be sent through the whole check system.

Concept of the system is to provide a means of quickly turning out a regional picture for any geological or engineering question with all back-up data available for detailed local studies. No interpretation is provided by the system, just the bare data, but all of them, and for any purpose and in any combination requested at high retrieval and printout or plotting speed. System is suitable for adaption by individual company programs and concepts.

## Hudson Bay test still above basement

The basement lies a lot deeper than Aquitaine had expected at its Sogopete Aquitaine Kaskattama Prov. 1 wildcat in the Kaskattama River delta on the west shore of Hudson Bay in northeast Manitoba. Instead of finding it at about 1,800 feet none was in sight at that depth. So logs were run and a seismic survey shot, which showed a marker at 2,400 feet, which was then thought to be the basement, several hundreds of feet deeper than originally expected. Now the well is drilling between 2,700 and 2,800 feet with still no basement in sight. Plans are to call it quits at about 3,200 feet if basement has not been found, due to limited capacity of portable rig flown in with a Bristol aircraft. Currently the drill is in Ordovician rocks.

As the section was sampled the seismic market turned out to probably be the top of the Silurian instead. In the Silurian a good smell of oil and some oil stain was found in crystalline dolomite indicating its potential as reservoir rock in the Hudson Bay basin.

Realizing that there was more prospective area than expected Aquitaine added another 300,000 permit acres to its holdings west and southeast of

an approximately one million acre block it farmed out from Bralorne Petroleum and Sogepet. Farmout acreage lies in roughly equal portions offshore and on land.

## Study is optimistic about Keg River play

More than a billion barrels of oil reserves have so far been found in the Keg River oil play of northern Alberta "and there are prospects of further significant finds," according to a recent investment study published by James Richardson & Sons.

Entitled "Winter activities of the Canadian oils," the study examines the anticipated growth position of the Canadian oil industry, reviews activity in the Rainbow area, and provides an analysis of several companies active in the area.

### Record high activity

Because of the search for production from pinnacle Keg River reefs, exploration activity in northern Alberta will be at a record high this winter, according to the report.

The study forecasts a six percent annual growth rate in crude and gas liquids production to 1970 (from a rate of one million b/d this year). Exports are projected to grow at a rate of seven percent a year with "a more substantial increase around 1970." Sale of natural gas is expected to grow at 10 percent a year.

"... unless the U.S. can develop unexpectedly large additional oil sources, the reserves-to-production ratio will continue to decline and more and more oil imports will have to be obtained," the study states. "Canada, which can supply crude directly by pipeline, is looked upon as the most secure foreign source of crude and, therefore, should obtain a share of the increasing volume of oil imports."

The study quotes a forecast by Mobil Oil Corporation that U.S. oil imports will rise from 2.5 million b/d in 1965 to 3.4 million b/d in 1975 and 5.5 million b/d in 1985.

"The rates of production increase over the next few years in western Canada are not expected to match those of recent years but should be reasonably good. The soft spot in the industry at present appears to be the unfavorable influence that production of large oil reserves developing in northern Alberta will have on the production allowables of other Alberta oil fields."

2--Notes on Segepet Limited

that the unique logistical problems of the Hudson Bay Area have made it impossible to complete the work normally undertaken during this period. In addition to severe climatic and ice conditions, the company has been hampered by a lack of a position control system. The company carried out an aeromagnetic survey during the summer of 1965, but the results and interpretation of this survey are not yet available. The company requested that the original term of its Manitoba permits be extended.

Climatic conditions and operational problems in the Hudson Bay Area are, at least, as severe as those between latitude 65° and latitude 68° in a large part of the Northwest Territories, because the climatic zones parallel the west shore of Hudson Bay and not the parallels of latitude. The Canada regulations provide that the original term of the permits issued in respect to that area between latitudes 65° and 68° north shall be four years, and that the required expenditure in the last thirty-month period of this term shall be 15 cents per acre. Consequently, our regulations were amended to provide that the original term of the Manitoba Permits shall be four years, and that the required expenditure in the last 30-month period of this term shall be 15 cents per acre. In other words, the company was granted an additional period of one year, to October 17, 1966, to expend the additional \$59,850 required to complete its exploration obligation in respect to the Manitoba acreage.

In November, 1965, the company relinquished Canada Permits aggregating 1,478,562 acres.

The company has advised that, if the interpretation of the aeromagnetic survey, carried out in 1965, is favourable, it plans to drill a well on the area comprising the Manitoba Permits, in 1966.

THANK YOU

J. S. Roper

... shortage of money will certainly result in an immediate increase in Arctic activity.

END

Resources Ltd. Budgeted \$50 million are to be spent over the next 4 to 5 years, indicating that this pro-

## Summer seismic season opens

THE summer seismic season in huge Hudson Bay is in session. Aquitaine Co. of Canada Ltd. will do marine seismic work this summer. Operations by Compagnie Generale de Geophysique on the ship Andromede will continue all summer with more than 3,000 miles of lines planned in the 3-month drilling season. No drilling plans are expected for 1 year. Associated with Aquitaine are: Atlantic Richfield, French Petroleum Co., Elf, Canadian Fina, and Sun Oil. Satellites will be used in positioning seismic lines. The distance from the Deca Recording system installed in 1967 and 1968 makes use of this system for northern operations impossible. The Deca units will be used, however, for part of this year's work.

For zeroing in on northern shot points, Aquitaine will use the ITT Transmitting Satellites. Positioning by using these will give almost perfect conditions and accuracy down to the foot. In addition to the 3,000 miles of

refraction shooting, the group plans a series of reflection seismic tests to evaluate this method in this section. The team controls almost 70 million acres of exploratory permits in the bay.

**Labrador sea.** There's some seismic work in the Labrador sea off Canada's East Coast this summer, too.

Tenneco Oil & Minerals Ltd. is doing the work on behalf of itself and French Petroleum, Amerada-Hess, and AGIP. The team plans 1,500 miles of seismic line shooting this summer over their spread of about 31 million acres.

## DISCOVERIES

### MONTANA

Richland County:

Continental Oil Co. 1 Grosvold-35, SW NW 35-26n-58e. IPF 244 b/d, 120 bw/d, 20/64-in. choke, 24 hours, FTP, 275 psi, GOR 1,570:1. Red River Ordovician 12,650-660 ft. TD 12,788 ft. Comp. 4-1-70. Elev. 2,136 ft KB. Contractor Noble Drilling Co.

AQUITAINE

HUDSON Bay.

AUG. 1970

SEP 10 1970

U.S. 2000

Oil & Gas Exploration - July 1970.

THE OIL AND GAS JOURNAL

NEWSLETTER

July 20, 1970

News in the making

Canadian drilling is taking a beating. Completions for the first 6 months fell 18% to 1,226 wells in the four western provinces, and the Northwest Territories and the Arctic region . . . and wildcatting took a worse walloping . . . down 22% to 523 wells.

Cutback on imports to the U.S., and current tax policy are scaring away investors . . . tight money situation has thinned wildcatters ranks in the southern parts of the Mapleleaf oil patch. The big money and machines have fled to the Arctic where drilling is in its infancy but an expensive babyhood. The second half? Things don't look much better . . . with drilling expected to continue its downward slide.

However, there still are wildcatters interested in Canada. Aquitaine Co. of Canada will begin a marine seismic program in Hudson Bay this week. More than 3,000 miles of line will be shot before October.

Aquitaine and its associates, Atlantic Richfield, French Petroleum, Elf Oil Exploration, Canadian Fina, and Sun Oil have operated an exploration program in Hudson Bay for several years. Last year, the program resulted in the drilling of the A-71 Walrus offshore exploratory test. The team has no plans for drilling this year.

Another Canadian exploration venture--this one in the Arctic Islands--is being joined by Canada-Cities Service Petroleum Corp. and Getty Oil (Canada) Ltd. The team has entered an agreement with Sunlite Land covering 1,279,760 permit acres on Axel Heiberg and Ellesmere islands in the Sverdrup basin. Cities Service and Getty will select a full-interest block of 258,000 permit acres and have options to earn a 50% interest in the remainder. The team has a second agreement covering a full interest in a 313,277-acre block on Axel Heiberg with Consolidated Ad Astra Minerals.

## Where is information available?

Where do you get the massive amounts of information you will need if you're going to conduct operations in Canada's far north?

Where, for example, can you get core samples and geologic maps, air photos and information on explosive regulations and building codes, hydrographic charts, offshore regulations and weather and ice conditions?

Most of it is available through the federal government.

The following directory of government offices and agencies connected with the development of resources in northern Canada will help facilitate getting the information you need. In addition, several private organizations are also listed.

### GOVERNMENT OFFICES AND AGENCIES —

- (1) **Geological maps, reports:** Publications Office, Geological Survey of Canada, Department of Energy, Mines and Resources, 601 Booth Street, Ottawa 4, Ontario.
- (2) **Cores, samples geological maps:** Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, Department of Energy, Mines and Resources, 3303 - 33rd St. N.W. Calgary, Alberta. Phone 403-284-0110.
- (3) **Marine geology, Atlantic coast and Arctic:** Dr. B. R. Pelletier, Head, Marine Geology Group, Department of Energy, Mines and Resources, Bedford Institute, Box 1006, Dartmouth, Nova Scotia. Phone 902-426-3870.
- (4) **Marine geology, Mackenzie River and delta, etc:** Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, Department of Energy, Mines and Resources, 3303 - 33rd St. N.W. Calgary, Alberta. Phone 403-284-0110.
- (5) **Information on geological-seismic work by Government of Canada:** Dr. Y. O. Fortier, Director, Geological Survey of Canada, 601 Booth Street, Ottawa 4, Ontario.
- Seismic methods —** George D. Hobson, phone 613-994-5789.
- \* **Information on Canadian seismograph stations, earthquake observations, crustal seismic exploration:** Dr. K. Whitham, Seismology Division, Observatories Branch, Department of Energy, Mines and Resources, Ottawa, Ontario.
- Seismic station network:** R. J. Halliday, phone 613-994-9091.
- Crustal seismics:** K. G. Barr, phone 613-994-5334.
- (7) **Gravity:** Dr. M. J. S. Innes, Chief, Gravity Division, Observatories Branch, Department of Energy, Mines and Resources, Ottawa, Ontario, phone 613-994-9035.
- (8) **Aeromagnetic surveys, magnetic prospecting:** Dr. Y. O. Fortier, Director, Geological Survey of Canada, 601 Booth Street, Ottawa 4, Ontario.
- Magnetic methods:** Dr. P. J. Hood, phone 613-994-5652.
- Fed/Prov. aeromagnetics:** Dr. A. S. MacLaren, phone 613-994-5125.
- (9) **Magnetic observatories, geomagnetic research:** Dr. P. Serson, Chief, Geomagnetic Division, Observatories Branch, Department of Energy, Mines and Resources, Ottawa, Ontario, phone 613-994-5359.
- \* (10) **Heat flow, instrumentation of drill holes:** Dr. A. M. Jessop, Chief, Heat flow section, Seismology Division, Observatories Branch, Department of Energy, Mines and Resources, Ottawa 4, Ontario, phone 613-994-5459.
- (11) **Mineral production statistics, economics:** Mineral Resources Division Department of Energy, Mines & Resources, Ottawa 4, Ontario.
- Energy Minerals unit:** R. A. Simpson, phone 613-994-5803.
- Ferrous Minerals:** D. B. Fraser, phone 613-994-5350.
- Industrial Minerals:** W. E. Koepke, phone 613-994-5270.
- Taxation and Legislation:** E. C. Hodgson, phone 613-994-5075.
- \* (12) **Explosives regulations, inspectors, etc:** J. E. Fraser, Explosives Division, Department of Energy, Mines and Resources, Ottawa 4, Ontario. Phone 613-994-5095.
- (13) **Topographic maps, indexes, aeronautical charts, ice atlas:** Map Distribution Office, Department of Energy, Mines and Resources, 615 Booth Street, Ottawa 4, Ontario. Phone 613-994-9160.
- (14) **Air Photos:** National Air Photo Library, Surveys & Mapping Branch, Department of Energy, Mines & Resources, 615 Booth Street, Ottawa 4, Ontario. Phone 613-994-5457.
- (15) **Geodetic positions, control points, precise level benchmarks, etc:** Dominion Geodesist, Geodetic Survey of Canada, Department of Energy, Mines and Resources, 615 Booth Street, Ottawa 4, Ontario. Phone 613-994-9065.
- (16) **Legal survey records, Indian Reservations, parks, Crown reservations:** Canada Lands Surveys Records Office, Legal Surveys Division, Surveys & Mapping Branch, Department of Energy, Mines and Resources, Ottawa 4, Ontario. Phone 613-994-9065.
- (17) **Hydrographic charts, Pilots, publications:** Hydrographic Chart Distribution Office, Department of Energy, Mines and Resources, 615 Booth Street, Ottawa 4, Ontario. Phone 613-994-5594 Telex 013-228 (MARS-OTT).
- Tides and coastal water levels information, publications:** 613-994-9122.
- Dominion Hydrographer:** Dr. A. E. Collin.
- (18) **Inland Waters Information — rivers, lakes:**
- (a) **River levels, water Resources:** Water Survey of Canada, Inland Waters Branch, Department of Energy, Mines and Resources, Ottawa 4, Ontario. E. Peterson: Phone 613-994-5624.
- (Field offices in Calgary, Peace River, Fort Smith, Whitehorse and many other centres)
- (b) **Research on lakes, limnology, pollution:** Canada Centre for Inland Waters, Inland Waters Branch, Department of Energy, Mines and Resources, Burlington, Ontario. Phone 416-632-1940. Dr. J. F. Bruce, Director.
- (c) **Water quality:** R. H. Millest, Water Quality Subdivision, Hydrologic Sciences Division, Inland Waters Branch, Department of Energy, Mines and Resources, Ottawa 4, Ontario. Phone 613-996-3104.
- (d) **Groundwater information — general:** Dr. P. Meyboom, Groundwater subdivision, Inland Waters Branch, Department of Energy, Mines and Resources, Ottawa 4, Ontario. Phone 613-994-5192.
- (e) **Groundwater research:** Dr. J. G. Fyles, Chief, Quaternary Research & Geomorphology Division, Geological Survey of Canada, Department of Energy, Mines and Resources, Ottawa 4, Ontario. Phone 613-994-5116.
- (f) **Glacier Surveys, accumulation and runoff:** — for southern Cordillera and Baffin Island: Dr. O. H. Loken, Chief, Glaciology Subdivision, Inland Waters Branch, Department of Energy, Mines and Resources, Ottawa 4, Ontario. Phone 613-994-9858.
- for western Arctic Islands: Dr. W. S. B. Paterson, Polar Continental Shelf Project, Department of Energy, Mines and Resources, Ottawa 4, Ontario. Phone 613-996-1529.
- for northern Arctic Islands: Dr. G. F. Hattersley-Smith, Defence Research Establishment Ottawa, Defence Research Board, Shirley Bay Laboratories, Ottawa, Ontario. Phone 613-992-4431 (ext. 293).
- (19) **Sea Ice Research:** Dr. E. L. Lewis, Frozen Sea Research Group, Marine Sciences Branch, Department of Energy, Mines and Resources, 825 Devonshire Road, Esquimalt, B.C. Phone 604-386-7571 or 7572.
- Polar Continental Shelf Project,** Department of Energy, Mines and Resources, Ottawa 4, Ontario. Phone 613-996-3388.
- (20) **Weather, ice conditions:** Meteorological Liaison Officer, Department of Transport, No. 3 Temporary Building, Ottawa, Ontario. A. G. MacVicar: Phone 613-992-4217.
- (21) **Sea Ice forecasts, facsimile maps of ice conditions, regional and seasonal summaries, for Atlantic coast, Hudson Bay and Arctic:** Ice Central, Department of Transport, P.O. Box 792, Halifax N.S. W. E. Markham, Officer-in-charge. Phone 902-426-2078, 2079.
- (22) **Canadian Arctic Weather Stations (including joint Canadian-U.S. stations):** — information re facilities, regulations, services, etc. Director, Meteorologi-

cal Branch, Department of Transport, 315 Bloor Street West, Toronto, Ontario. D. C. Archibald: Phone 416-369-4919.

(23) **Permafrost:** Geotechnical Section, Division of Building Research, National Research Council, Montreal Road, Ottawa, Ontario. Phone 613-993-2088.

(24) **Building codes, construction practices in northern areas:** Building and Construction Codes Secretariat, Division of Building Research, National Research Council, Ottawa 7, Ontario. Phone 613-993-9116.

(25) **Radio regulations:** Controller, Radio Regulations Division, Government Telecommunications Policy and Administration Bureau, No. 3 Temporary Building, Ottawa, Ontario. Phone W. J. Wilson: 613-992-0804.

(26) **Hudson Bay rocket range:** Head, Range Section, Space Research Facilities Branch, National Research Council, Montreal Road, Ottawa 7, Ontario. Phone J. F. Aitken: 613-993-9225.

(27) **Maritime commanders:** Commander, Maritime Command, Department of National Defence, F.M.O., HMC Dockyard, Halifax, Nova Scotia. Maritime Commander (Pacific), Department of National Defence, F.M.O., HMC Dockyard, Victoria, British Columbia.

(28) **Notices to shipping and mariners:** Chief, Aids to Navigation, Marine Works Branch, Department of Transport, Hunter Building, Ottawa, Ontario. J. N. Ballinger: Phone 613-992-2736. Publications and charts: 613-992-6770.

(29) **Marine regulations:** Director, Marine Regulations Branch, Department of Transport, Hunter Building, Ottawa, Ontario. R. R. Macgillivray: Phone 613-992-8892.

(30) **Territorial Governments:** Commissioner of Northwest Territories, Yellowknife, N.W.T. Commissioner of Yukon Territory, Whitehorse, Y.T.

(31) **Northern resources activities:** Chief, Oil and Mineral Division, Department of Indian Affairs & Northern Development, 400 Laurier Ave. West, Ottawa, Ontario. Dr. H. W. Woodward: Phone 613-992-5179.

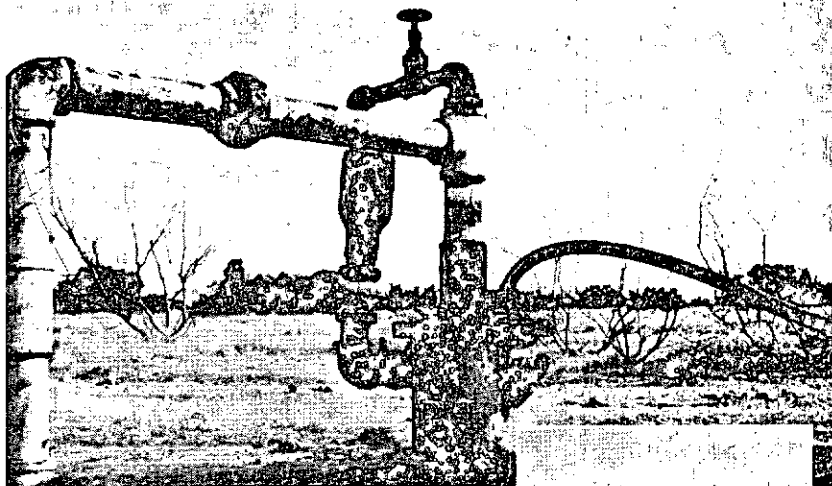
(32) **Offshore regulations and activities, adjacent to Yukon and N.W.T. Chief, Oil and Mineral Division, Department of Indian Affairs & Northern Development, 400 Laurier Ave. West, Ottawa 4, Ontario. Dr. H. W. Woodward: Phone 613-992-5179.**

(33) **Offshore regulations and activities, Atlantic and Pacific coasts:** Dr. D. G. Crosby, Chief, Resources Administration Division, Department of Energy, Mines and Resources, Ottawa 4, Ontario. Phone 613-994-5065.

(34) **External and International Affairs, sovereignty, etc. Legal Division, Department of External Affairs, Daly Building, Ottawa, Ontario. Phone 613-992-2728.**

(35) **Marine operations, icebreakers, eastern arctic and arctic islands, sea-lift, marine search and rescue:** Marine Operation Branch, Department of Transport, Hunter Building, Ottawa, Ontario. Di-

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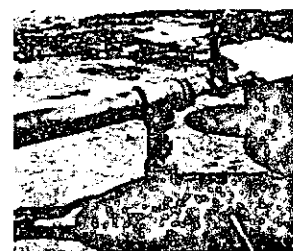
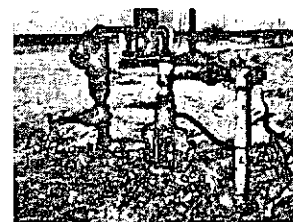
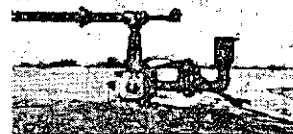
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rector, Marine Operations, A. H. G. Storrs; Phone 613-992-4209. Cargo, Arctic sealifts: Phone 613-992-0940. Northern area superintendents: Phone 613-992-8952.

(36) Mackenzie River, western Arctic coastal shipping: Northern Transportation Co. Ltd., 10040 - 105 St., Edmonton, Alberta. Phone 403-422-2161 Telex 037-2480.

(37) Arctic administration:— general regulations, services, education, welfare, engineering: Northern Administration Branch, Department of Indian Affairs & Northern Development, 400 Laurier Avenue West, Ottawa 4, Ontario. Secretariat: 613-992-9643. Administrator of the Arctic: A. Stevenson: 613-992-5735. Advisory Committee on Northern Development: L.A.C.O. Hunt, secretary: 613-996-4424.

(38) Postal Services, northern areas: Postal Services Branch, Post Office Department, Sir Alexander Campbell Building, Ottawa, Ontario. 613-997-4193.

(39) Workmen's Compensation — Northwest Territories: — administered by Alberta Workmens Compensation Board, 10048 - 101A Avenue, P.O. Box 2415, Edmonton, Alberta.

(40) Medical Services: Dr. G. C. Butler, Regional Director, Northern Region, Medical Services Branch, Room 500, Chancery Hall, No. 3 Sir Winston Churchill Square, Edmonton, Alberta. 413-429-4371 (Ext. 45).

(41) Customs & Excise, offshore areas: Director, Port Administration Division, Customs and Excise, Department of National Revenue, Ottawa, Ontario. A. Senecal: 613-992-4952.

(42) Government of Canada Telephone Directory (Ottawa area) Queen's Printer, Ottawa, Ontario. \$4.50 + \$2.00 annually for supplement.

(43) Royal Canadian Mounted Police — northern operations: Information: Royal Canadian Mounted Police Headquarters, 1200 Alta Vista Drive, Ottawa 8, Ontario. 613-992-9031. "Air" Division: 613-995-3476.

(44) Fisheries: information and regulations: Director, Resource Development Service, Department of Fisheries, Sir Charles Tupper Building, Riverside Drive, Ottawa 8, Ontario. K. C. Lucas: 613-997-4597.

(45) Wildlife, conservation: Director, Canadian Wildlife Service, Department of Indian Affairs & Northern Development, 400 Laurier Ave. West, Ottawa, Ontario. J. S. Tener: 613-992-3826.

(46) Game regulations: Mr. Paul Kwatrowski, Superintendent of Game, Government of Northwest Territories, Yellowknife, N.W.T. Mr. J. B. Fitzgerald, Superintendent of Game, Government of Yukon Territory, Whitehorse, Y.T.

#### (47) Archaeology:

Regulations re archaeological sites: Assistant Deputy Minister, Northern Affairs, Department of Indian Affairs and Northern Development, 400 Laurier Ave. West, Ottawa 4, Ontario. 613-992-0866 — or any R.C.M.P. office.

Information re archaeological sites, artifacts, etc: Archaeology Section, National Museum of Man, Metcalfe and McLeod Sts. Ottawa 4, Ontario. Dr. W. E. Taylor: 613-992-5952.

(48) Historical items (monuments, papers, expeditionary remains): — any R.C.M.P. office.

— Director, Historical Branch, Public Archives of Canada, 395 Wellington Street, Ottawa 2, Ontario. 613-996-1569.

— Assistant Deputy Minister, Northern Affairs, Department of Indian Affairs and Northern Development, 400 Laurier Avenue West, Ottawa 4, Ontario. 613-992-0866.

(49) Aeronautical Charts, Canada Air Pilot: Legal Surveys and Aeronautical Charts Division, Surveys and Mapping Branch, Department of Energy, Mines and Resources, 615 Booth Street, Ottawa 4, Ontario. Air information: 613-994-9007. Chart and air pilot distribution: 613-994-9498.

(50) Military installations and regulations (including Distant Early Warning Line matters): G. Y. Loughhead, Director-General, Finance and programs, Department of National Defence, Ottawa 4, Ontario. 613-992-7970.

#### NON-GOVERNMENT OFFICES AND AGENCIES

(51) McGill University Press, 3458 Redpath Street, Montreal 109, P.Q.

(52) Pallister and Associates, 524 11th Avenue S.W., Calgary 3, Alberta.

(53) The Canadian Institute of Mining and Metallurgy, 906-1117 Ste. Catherine St. W., Montreal 110, Quebec.

(54) The University of Toronto Press, Toronto, Ontario.

(55) Swedish Research Institute of National Defence, Stockholm, Sweden.

## ARCTIC BIBLIOGRAPHY

Here is a brief bibliography of recent publications dealing with a multitude of aspects of northern Canada resources development.

The reference numbers are keyed to the addresses listed in the preceding northern directory.

List of publications on the geology of the Arctic Islands; Geological survey of Canada; revised yearly. References 1, 2; no charge.

List of geological reports of the Yukon Territory; as above.

List of geological reports of Northwest Territories; as above.

List of general geological reports and maps of Canada; as above.

List of geological reports and maps of Canada relating to areas of petroleum potential; as above.

Oil and Gas, North of 60; 1968. Reference 31; no charge.

This report of activities in 1968, of the oil and gas industry in the Yukon Territory and Northwest Territories, covers land, regulations, activity and highlights, reserves, revenues and other topics.

Two pamphlets, "Letter of instruction for the preservation of the northern environment in the Northwest Territories and Yukon Territory," and "Notes for the guidance of oil, gas and mineral exploration parties working in the north," are also available through this reference. Another publication, "Technical reports available for inspection at the office of the Oil Conservation Engineer, Calgary, Alberta," will also be of interest.

Index of publications, reports and maps, prepared by the Gravity Division of the Dominion Observatory. Reference 7; no charge.

The scientific and technical reports by the officers of the Gravity Division are assembled in four series: (a) Publications Series, consisting of major papers and memoirs originating from all units of the observatories Branch and pub-

lished by the Queen's Printer; (b) Contributions Series, includes reprints of virtually all articles and papers originating at the Observatories Branch that are first published in scientific and technical journals; (c) Gravity Map Series, designed for publication of gravity anomaly maps accompanied by brief reports prepared by officers of the Gravity Division; and (d) Unpublished Manuscripts, compiled at the Gravity Division and containing data such as gravity control station information that is subject to revision at frequent intervals.

Permafrost Map of Canada; National Research Council of Canada; 1969. References 1, 2, 23. \$50.

A new permafrost map of Canada in colour shows the extent of the continuous and discontinuous permafrost zones and the occurrence of permafrost at high elevations in the western mountains. Ground temperatures and thickness of permafrost at 24 stations are included. Isotherms of mean annual air temperature, and the physiographic regions show the relation of permafrost distribution to climate and terrain, respectively. Explanatory notes on the definition of permafrost, distribution and occurrence, physical factors influencing permafrost and bibliography of source information are printed on the map. The scale is 120 miles: 1 inch and the single sheet measures 40 x 30 inches. Published jointly as NRC 9769 and GSC Map 1246A.

The Arctic oil rush and attendant conservation problems; by A. H. Macpherson and H. Boyd; Aug. 1969. Reference 45; no charge.

Pointing out that the Arctic is a region of low biological activity, this valuable pamphlet discusses problems created by garbage, oil spills, pollution, removal of permafrost, drilling and pipelining. A guide as to where to look concerning present and forthcoming regulation is included.

Ice Atlas of Arctic Canada; by Charles

(Continued on page 54)

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donations to help meet expenses, reasoning that it is to the advantage of the natural resource industries to guarantee a quality congress. Prior to the late June meeting, the mining industry had donated \$171,500, and the petroleum industry \$75,000. This imbalance is expected to be corrected following a presentation which was made to the board of governors of the Canadian Petroleum Association, during a break in the Organizing Committee meeting.

Delegate accommodation, it appears, should be no problem. Commercial establishments are sufficiently numerous in downtown Montreal to handle most visitors, and student residences at McGill University will be available to handle any overflow.

Considerable discussion was sparked over matters of public relations. The congress could provide an opportunity for geologists and the related industries, government agencies and educational institutions to make the Canadian public aware of their contribution to the progress of the country. Confusion arose, however, over whether such an activity fell within the scope of the congress, and how much funds need be allotted in order to be effective. Any decision on such

#### PHOTOS

A specially modified Foremost Husky Eight tracked carrier is now working for Panarctic Oils on Ellesmere Island. The vehicle, weighing 45 tons, was carried in three Hercules trips and has a load capacity of up to 45 tons. It is equipped with the new flat track which ensures minimum disturbance to the delicate terrain, even with full loads, and will give longer track life. Other innovations for Arctic use include improved engine and cab insulation and heating systems. The radiator fan is thermostatically controlled and the engine housing is fitted with automatically controlled shutters in the rear, as well as in front, to maintain operating temperatures in the most severe weather conditions. The unit was built by Foremost Tracked Vehicles in Calgary at a cost of about \$120,000.

action will likely be made at the next meeting in October in Ottawa, after members have considered the matter.

Responses to the 55,000 first circulars sent out last winter will continue to be evaluated for a short time more. Second circular mailings to about 10,000 people will be out next January. Anyone still intending to send in preliminary applications or make enquiries should do so immediately through: Pauline Moyd, Organizing Secretary, The Organizing Committee, 601 Booth Street, Ottawa 4, Ontario, Canada.

### ARCO spuds Quebec well

Drilling is underway on the Atlantic Richfield Canada Ltd., 12,000 foot wildcat near the south shore of Anticosti Island in the Gulf of St. Lawrence in the province of Quebec. Target is the Precambrian.

The test is located on a Quebec exploration license held by New Associated Developments Ltd. of Montreal and is being drilled by Garnett Drilling Co. of Calgary.

Under the agreement with New Associated, ARCO can earn about 261,000 net license acres and has further options to acquire an additional 568,000 net license acres in the area.

### Atlas scores big Chilean mineral success

A rich copper/molybdenum discovery on the Sierra Gorda project in northern Chile has been claimed by Atlas Exploration Ltd. of Vancouver. The project is being explored by its wholly owned subsidiary Cima Mines Ltd. and associates.

According to the announcement, the latest vertical drill hole completed in June returned a 413-foot intersection averaging 2.13% copper and .182% molybdenum disulphide. The announcement goes on to say that some 10-foot sections assay over 10%, indicating a significant zone of higher grade mineralization in the deposit.

Drilling has been in progress since

February 1969. The project reportedly indicated a tonnage potential of 30 to 50 million tons grading 0.6% to 1% copper molybdenum equivalent at a depth of 450 feet and preliminary feasibility study was started by Chapman, Wood and Grisgold of Vancouver before results of the latest hole were known.

Situated about 5,500 feet elevation in the Atacama desert, the property is about 80 miles from the major seaport of Antofagasta and is serviced by a paved highway and railway line to the village of Sierra Gorda, about four miles from the property.

The mineralization is said to occur in a tourmaline breccia zone about 300 feet wide, extending over 2,000 feet to the north, and widening to about 2,000 feet to the south in the vicinity of the last high grade hole. The company claims that the overall structure is suggestive of a ring breccia similar to the major Braden mine in southern Chile and its ultimate potential is open.

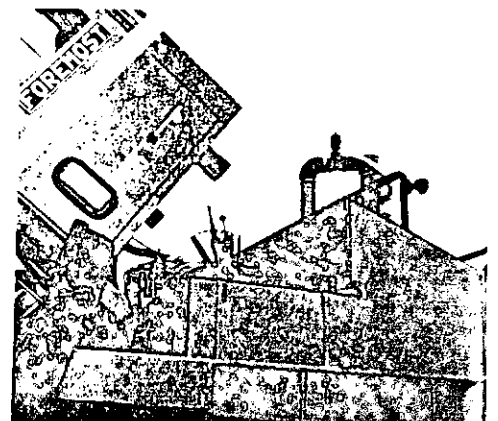
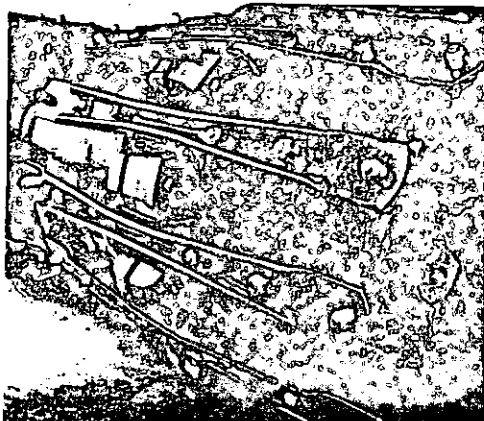
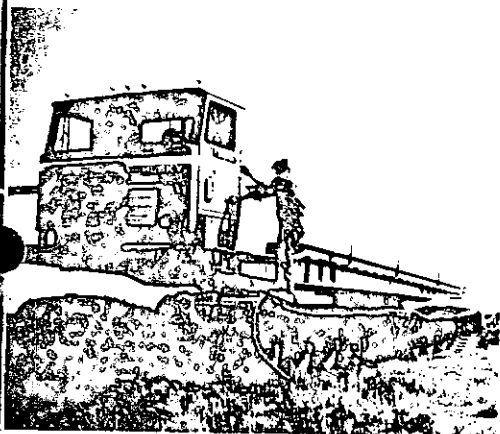
Atlas Explorations, with associated firm Dynasty Exploration, is also engaged in an exploration program budgeted at over \$1 million, mainly in the Yukon.

### Hovercraft employed for Arctic survey

The federal Department of Energy, Mines and Resources has awarded a charter to Pacific Hovercraft Ltd., for use of an SRN6 Hovercraft in support of the Polar Continental Shelf project in the Beaufort Sea.

Capable of speeds up to 60 mph and can carry up to six tons on water and eight tons on land, the craft will be used as an echo sounding vehicle for hydrographic surveys, transport personnel and supplies and serve as a working platform or laboratory in carrying survey, geophysical and other instruments. It will also act as a search and rescue craft in Arctic areas.

The government contract is a renewal of work carried out in 1969 and was valued in excess of \$250,000.



## Oil drilling licensed near polar bear site

The provincial government has granted an oil drilling licence to Merland Explorations Ltd. for an area just 20 miles from the polar bear denning area which was discovered in northern Manitoba this spring.

However, in a statement to the House, Natural Resources Minister Sid Green assured members that strict pollution and conservation restrictions have been written into the licence.

The licence has been granted for the mouth of the Whitebear Creek, above the 57th parallel.

To safeguard the polar bear population, the licence will require:

- Restriction of firearms to persons authorized by a senior officer of the mines department.
- Prohibition on all shooting of polar bears or searching for or hazing them.
- Prohibition of all vehicles in the camp except a small tractor, which will be confined to the beach area.
- All garbage must be burned and buried at least one-half mile from the camp site.

In addition, the drilling operations will be supervised by mines department officials, and additional pollution precautions have been called for, including the setting of the surface casing into bed rock; and installation of a blow-out preventer to control any water, gas or oil which may be encountered under pressure.

If any 'oil shows' are found, the well must be shut at once until facilities are available to test the oil, and until the company can hold further talks with the government as to the best and safest way to extract the oil.

The company has posted a \$5,000 drilling bond which will not be released until the department is satisfied that the well has been properly plugged and the drilling site cleaned adequately.

Mr. Green stated that because this licence has been granted, others will not be automatically given, but will each be considered on their individual merits with all information available at the time.

## BUSINESS BRIEFLY

### Polymer Corp. diversifying

Polymer Corp. Ltd. of Sarnia announced today that it has reached agreement to acquire control of Com-Share (Canada) Ltd., a computer time-sharing firm.

Financial terms of the agreement under which Crown-owned Polymer will acquire 51 per cent of Com-Share stock and hold an option for more were not announced.

Polymer said the acquisition will permit Com-Share, which has its head office in Toronto and branches in Ottawa, Montreal and London, Ont., to "expand in a more tangible and positive manner." It said plans are also being made to expand to Europe.

### Confidence over offshore oil

Energy department officials are confident they have safe control over offshore drilling operations in the search for oil on Canada's continental shelf.

D. G. Crosby, chief of the department's resource administration division, told the Commons Natural Resources Committee yesterday that any deep drilling by companies holding exploration permits on the shelf must first be cleared with Federal authorities.

No permission is given without careful examination.

Mr. Crosby said that since 1967, 14 deep holes have been drilled off the west coast and seven off the east coast. So far, none has resulted in a producing well.

He told the committee the department has refused permission to drill in the Boundary Bay area south of Vancouver, in the Gulf of St. Lawrence near the French islands of St. Pierre and Miquelon and in the Bay of Fundy.

### 99.9 million vehicles in U.S.

There were 99.9 million cars, trucks and buses in the United States last year, almost half of the world total of 216.3 million, the U.S. commerce department reported yesterday.

The department said there were 17.1 million trucks and buses and 82.8 million cars — one for every 2.5 Americans.

The department said that by contrast, in the African nation of [unclear] there was only one car for every 1,600 people.

### Core rig at Hudson Bay

The Merland Oil Co. of Canada Ltd. corehole drilling rig, together with camp and supplies, has successfully reached a drill site on the shore of Hudson Bay at the mouth of White Bear Creek at 57° 22' N. and 92° 27' W.

The 3,000-foot 'slimhole' basement test is expected to core the lower portion of the Devonian and a full section of the Silurian and Ordovician. Prospective horizons are the Middle Silurian and the Ordovician. Merland, through a wholly owned subsidiary Northwest Oils Ltd., will own or control approximately one million acres in the area, to support the well, if all options are picked up.

OILWEEK April 27/70