

Oil Sands Pioneers: How Scientists & Entrepreneurs Made the Unconventional More “Conventional”



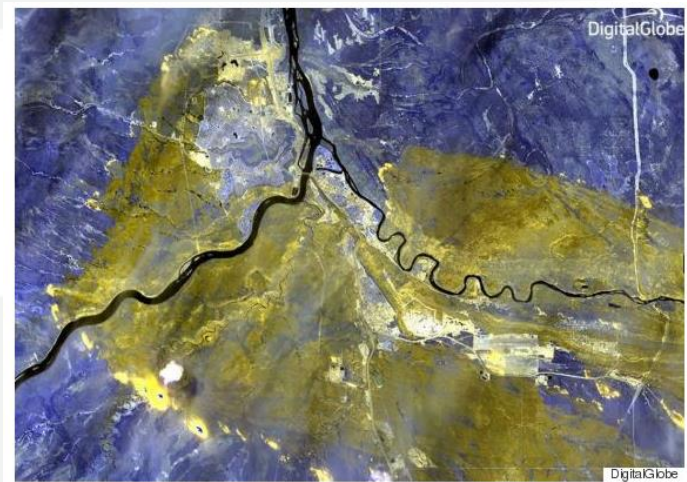
Frances J. Hein, Sr. Geology Advisor, AGS

June 19, 2016

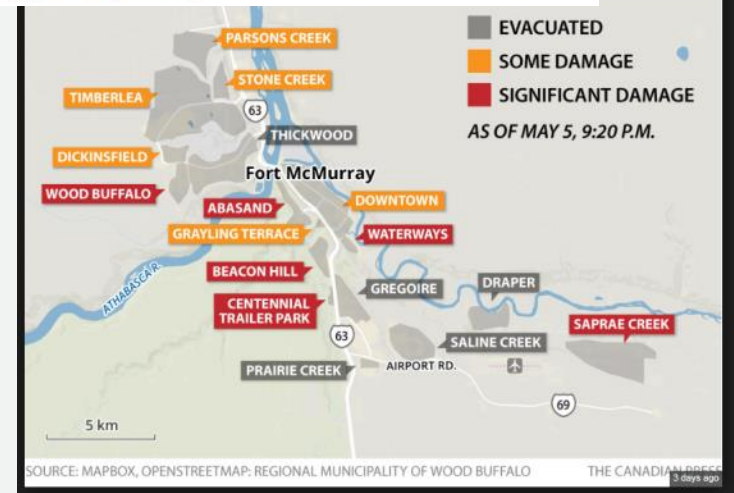


Any use of trade, product, or company name is for descriptive purposes only and does not imply endorsement by the Alberta government.

Out of the 100s (if not 1 000s) of entrepreneurs and scientists who contributed to our understanding of the Alberta oil sands, I can only discuss ~ 20 or so in this talk, and do apologize if I missed you, your friends, and/or relatives.



A look at Fort McMurray through infrared light. Purple areas are untouched and yellow shows where the fire has passed through. Bright spots show where the fire is still burning. (Photo: DigitalGlobe)



The Fort McMurray fire has shut down 40% of oil sands production

Many oil sands production facilities, while not directly harmed by wildfire, have been taken offline as companies evacuate

Fort McMurray fire evacuation biggest in Alberta history

About 88,000 residents of Fort McMurray in northern Alberta were evacuated earlier this month from a wildfire that destroyed or damaged 1,600 structures. Alberta Premier Rachel Notley called the event the biggest evacuation in the history of the province.

The fire was aided by strong winds, high temperatures, and low relative humidity. Officials estimated the fire had covered 718,500 acres and impacted more than a dozen communities.

More than 200 firefighters were involved. Firefighters worked to protect Highway 63, the only major route through Fort McMurray. All commercial flights in and out of the town were suspended.

Alberta Energy Regulator said operators with infrastructure in the possible fire path had AER approval to build berms and walls to protect their facilities on the condition that it didn't create adverse public or environmental impacts. AER also asked operators to provide fuel, firefighters, shelter, and air services.

Suncor Energy Inc. said its foundation had provided a grant of \$150,000 to the Canadian Red Cross. Imperial Oil Ltd. said its foundation had donated \$100,000.

Suncor said its in-situ operations were running at reduced rates with reduced availability of diluent in the region. The company had demobilized noncritical support to allow space for evacuees at its camps.

Shell Canada shut production at its Albian mining operations north of Fort McMurray to focus on getting families out of the region. Shell said 25 flights departed the Albian airstrip on May 4. Its Albian Village work camp had capacity for 2,000 people; beds and food remain available as families leave by plane (OGJ Online, May 4, 2016).

ConocoPhillips Canada said it shut down its Surmont operations. It had evacuated all members of the public sheltered at Surmont, and workers, to Edmonton.

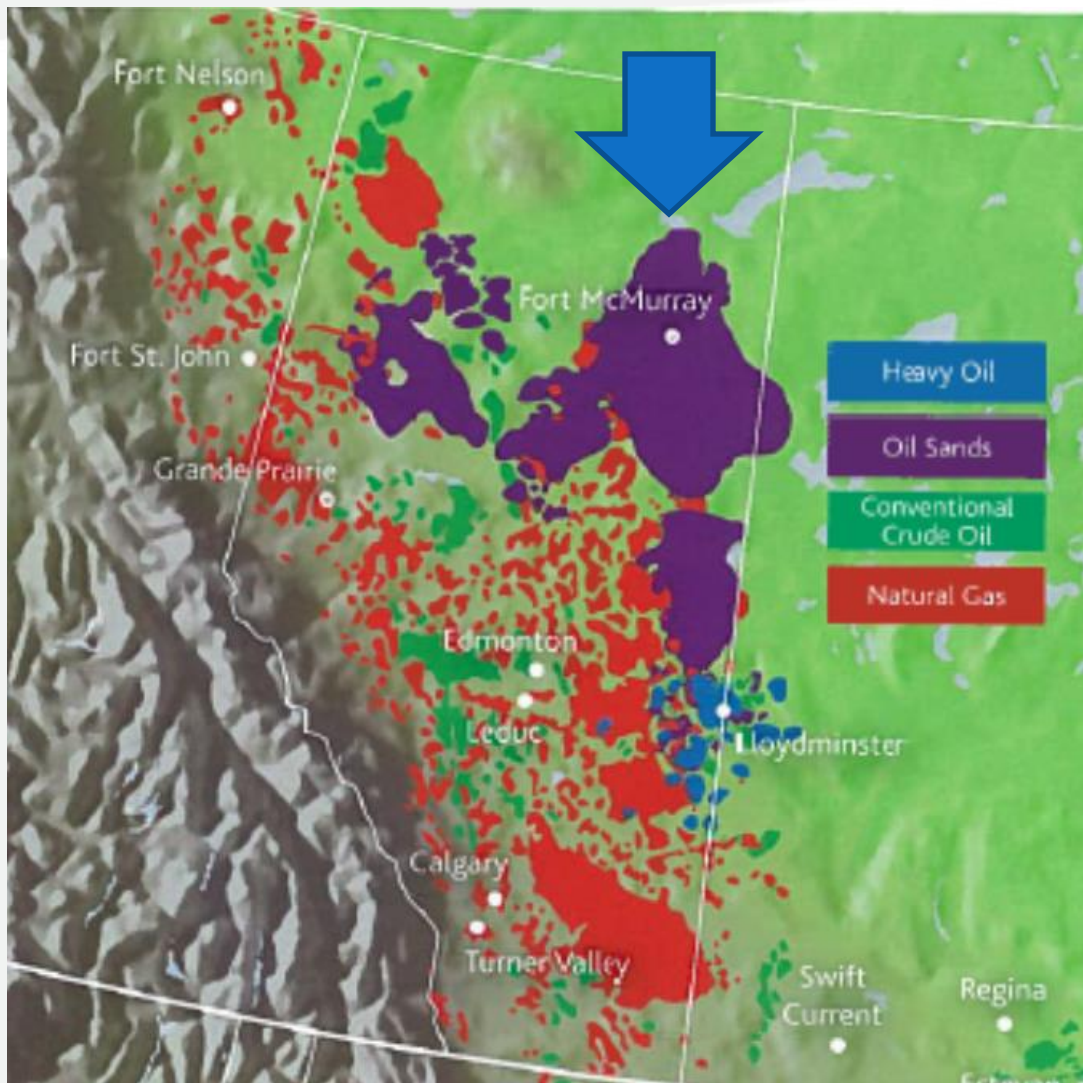
Connacher Oil & Gas Ltd. said it had curtailed production at its Great Divide leases southwest of Fort McMurray.

Athabasca Oil Corp. on May 4 said there were no current impact on operations at Hangingstone as the fire front was about 15 km north. It was trucking diluents to the site as the Polaris diluents line has been shut-in.

Canadian Natural Resources Ltd. said it provided accommodations for evacuees at its camp and that some of its employees and equipment are involved in fighting the fire in Fort McMurray.

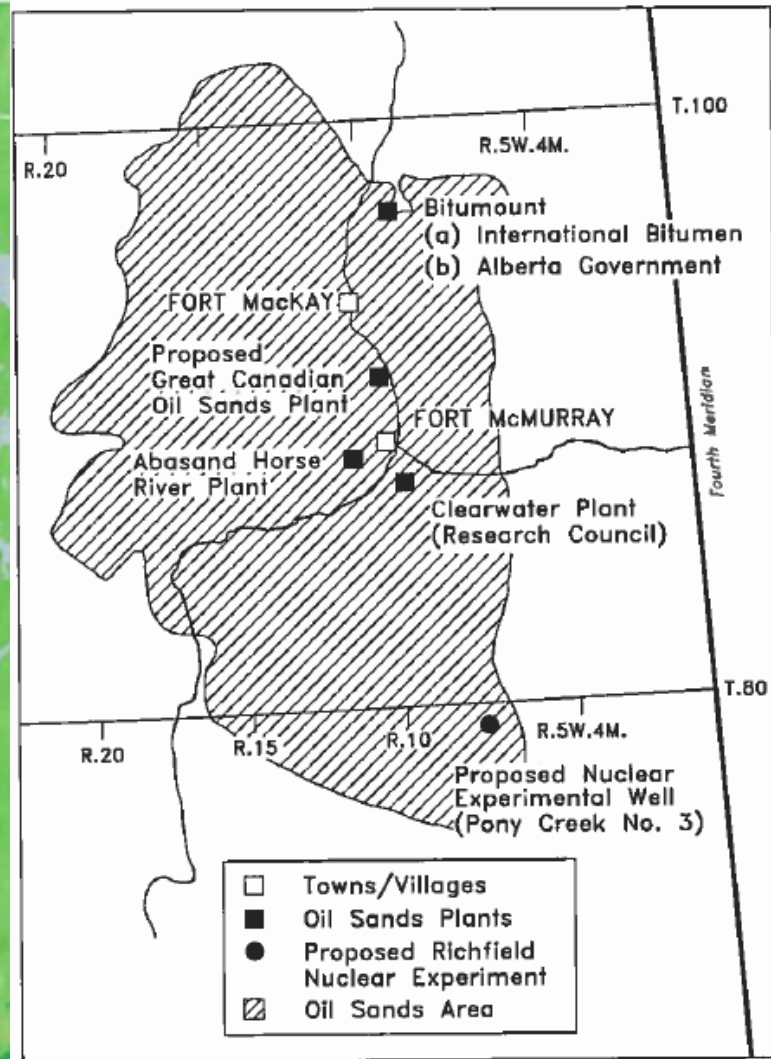
Residents of Gregoire were evacuated south of Fort McMurray, with some going to the Anzac Recreation Centre and others driving toward Edmonton. Residents of other areas were evacuated 21 km north to Noralta Lodge. But Noralta became full and many refugees were sent further north to other work camps.

Staff from the Regional Municipality of Wood Buffalo went door-to-door on May 4 notifying remaining residents of busses that were to depart at midnight. **OGJ**



Hydrocarbon Resources of the Western Canada Sedimentary Basin, NE BC, AB & SK

(modified from CERI, 2009)



Historic and Early Oil-Sands Projects in the Surface Mineable Area, near Fort McMurray, AB

(from Hein and Parks, in press)

Carrigy and Kramers, 1973

Information Series 65

GUIDE TO THE ATHABASCA OIL SANDS AREA

prepared for the
Canadian Society of Petroleum Geologists
Oil Sands Symposium
1973

Editor: M. A. Carrigy
Associate Editor: J. W. Kramers

published by Alberta Research
Edmonton, Alberta
Price \$5.00
reprinted 1974
and 1975



Topset and foreset beds in the Athabasca Oil Sands on the east bank of the Athabasca River about 3 miles north of Fort McMurray.

Plate 1. Type section of the McMurray Formation on the east bank of the Athabasca River.

175

HISTORICAL HIGHLIGHTS LOG OF MAJOR EVENTS IN THE HISTORY OF THE ATHABASCA OIL SANDS

Year	No. of years ago	Event
1778	195	• Peter Pond, a fur trader with the North-west Company, reaches the Athabasca River by way of Methy Portage and becomes the first European to see the tar sands outcrops.



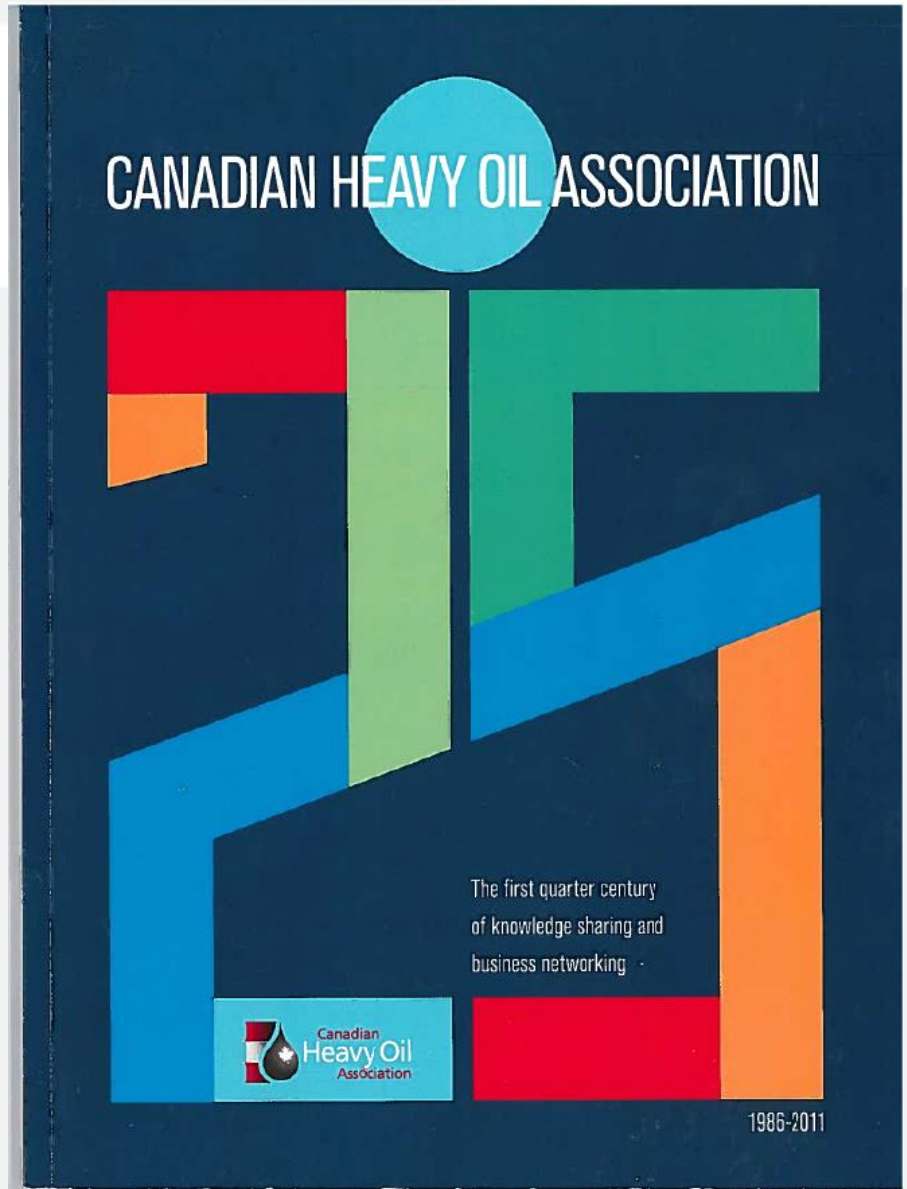
Alexandre MacKenzie
(Photograph courtesy of
the Public Archives of
Canada, Ottawa).



Historical Overview of the Fort McMurray Area and Oil Sands Industry in Northeast Alberta

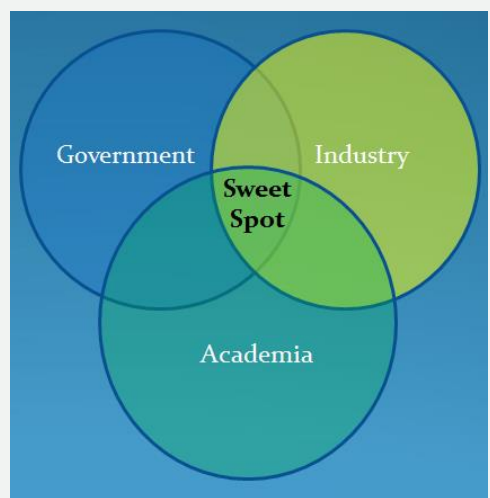
(With expanded bibliographies on oil sands, surficial geology, hydrogeology, minerals and bedrock in northeast Alberta)

Alberta Energy and Utilities Board
Alberta Geological Survey



Oil Sands Development Time & People

- pre-Paleozoic: Very Early
- Paleozoic: Early
- Mesozoic: Middle
- Cenozoic: Later
- Anthropocene: Now and Into the Future



“pre-Paleozoic” Very Early Years Aboriginal Knowledge & Use and First European Discovery

1719

A Cree named Wa-pa-su brings samples of oil sand to York Factory, a Hudson's Bay Company trading post on the edge of Hudson's Bay in Manitoba. He had previously brought samples of salt and brimstone.



1700s

seventeen hundred

1778

Explorer Peter Pond provides the first recorded description of the Athabasca oilsands.



1848

The first geological assessment of the oilsands was done by John Richardson, associated with his search for the lost Franklin Expedition party members.

1894

The federal government field party drills the first wells into the oilsands, looking for light oil at Athabasca Landing under the recommendation of George M. Dawson.

1800s

nineteen hundred

1882

The Geological Survey of Canada sends Robert Bell and his team on an expedition to study the Athabasca Basin.



“Like most of the reports of the age, they are empty of Aboriginal land uses – “ (from imagination.csj.ualberta.ca)

Neil McCrank: 25th CHOA Anniversary Volume said in his Introduction to the Regulator’s Role ...

One of the earliest discoveries of petroleum in Canada was directly attributed to the knowledge of local Aboriginal people who travelled the Athabasca River in northeastern Alberta. They mixed the bitumen that flowed out of the banks of the Athabasca with spruce gum to caulk the seams of their birchbark canoes. This use was documented in the early 1700s by traders of the Hudson’s Bay Company.



(from Alberta Energy Heritage)

Letter from 03/16/2012 from Bert MacKay to CHOA ...
“A historical faux pas ... on the story on natives sealing canoes with bitumen and spruce gum. In fact this never occurred and extensive historical research was done on this over many months... misinterpretation of Peter Pond’s and Alexander MacKenzie’s journals that no such action took place....”

GREAT CANADIAN OIL SANDS [1974, CIM Bulletin]

The Mining and Extraction of Bitumen From the Athabasca Tar Sands

A. R. Allen, Manager, Mining and Extraction,
Great Canadian Oil Sands Limited,
Fort McMurray, Alberta

Abstract

This paper will begin with a history of tar sands development and continue with a complete description of the Great Canadian Oil Sands operation near Fort McMurray, Alberta. Mining methods will be detailed, the large-scale equipment and its maintenance will be discussed, and procedures for extracting the bitumen from the Athabasca sands will be explained.

Introduction

INDIGENOUS PEOPLES along the last 200 miles of the Athabasca River have known about the tar sands for centuries and used the bitumen which oozed from the banks to patch their canoes. European fur traders first saw the sands 200 years ago. In 1930, the first commercial production of bitumen was achieved and the



with Great Canadian Oil Sands Ltd. in Fort McMurray. A

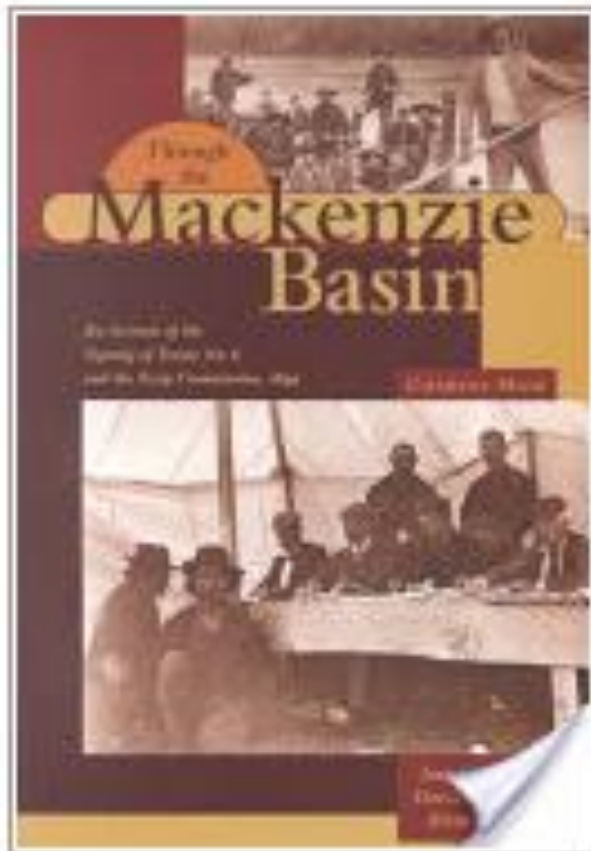
A. R. (Tony) Allen first came to Canada in 1951 as a Nuffield Scholar in Extractive Metallurgy. In 1952, he graduated as a mining engineer and joined Cominco Ltd. at Kimberley, B.C. He joined Eldorado Nuclear Ltd. early in 1954, moving up in that organization to the position of general manager in 1963. Mr. Allen left Eldorado in 1969 to take on the challenge offered by the tar sands industry and is now the operations manager



One of the early bitumen producers—Abasand's plant, circa 1944 (destroyed by fire June 1945).

Through the Mackenzie Basin: An Account of the Signing of Treaty No. 8 and the Scrip Commission, 1899

When “Through the Mackenzie Basin” was published in 1908, it was an immediate success as an adventure book about the unsettled regions of Canada. Originally by Charles Mair, the new edition (co-authored by David Leonard and Brian Calliou), puts this narrative into an historical and First Nations perspective.



CHAPTER IX.

THE ATHABASCA RIVER REGION.

WE were now traversing perhaps the most interesting region in all the North. In the neighbourhood of McMurray there are several tar-wells, so called, and there, if a hole is scraped in the bank, it slowly fills in with tar mingled with sand. This is separated by boiling, and is used, in its native state, for gumming canoes and boats. Farther up are

The gas escapes from a hole in the ground near the water's edge in a pillar of flame about thirty inches high, and which has been burning time out of mind. It also bubbles, or, rather, foams up, for several yards in the river, rising at low water even as far out as mid-stream. There is a level plateau at the springs, several acres in extent, backed by a range of hills, and if a stake is driven anywhere into this, and withdrawn, the gas, it is said, follows at once. They are but another unique feature of this astonishing stream.

“Paleozoic” Early Years Government of Canada



1848

The first geological assessment of the oilsands was done by John Richardson, associated with his search for the lost Franklin Expedition party members.

1894

The federal government field party drills the first wells into the oilsands, looking for light oil at Athabasca Landing under the recommendation of George M. Dawson.

1882

The Geological Survey of Canada sends Robert Bell and his team on an expedition to study the Athabasca Basin.

1800s

1906

Count Alfred von Hammerstein conducts four unsuccessful seasons of drilling between 1906 and 1909.

1910

Experiments in using bitumen for street pavement begin in Edmonton.

1910

Hammerstein forms the Athabasca Oil and Asphalt Co. There is a flurry of speculative activity in the Athabasca region and in the village of Fort McMurray.

1919

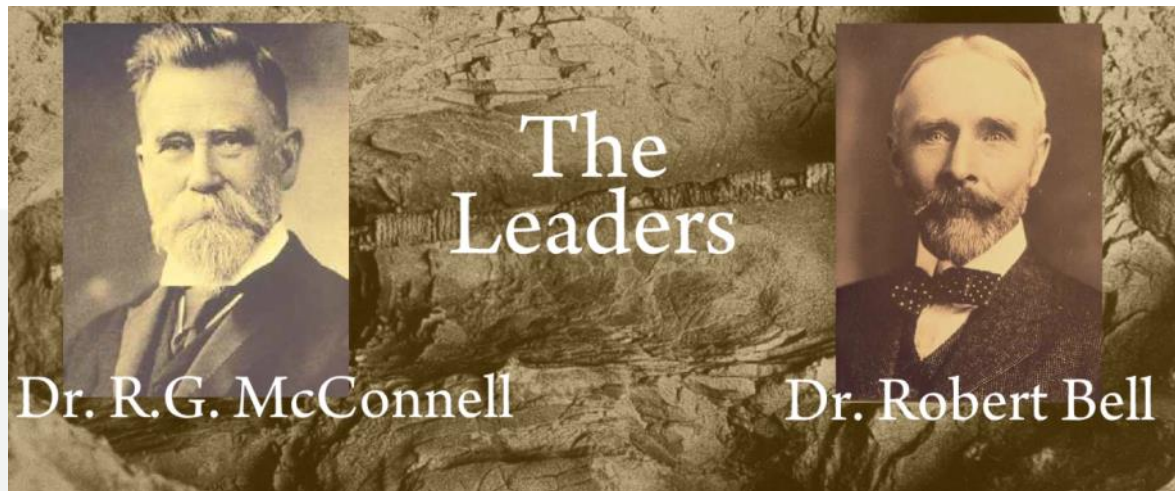
Imperial Oil Limited drills 18 holes in the Lloydminster area. Favourable geological reports are issued.

1900–1919

1848

1882 1894

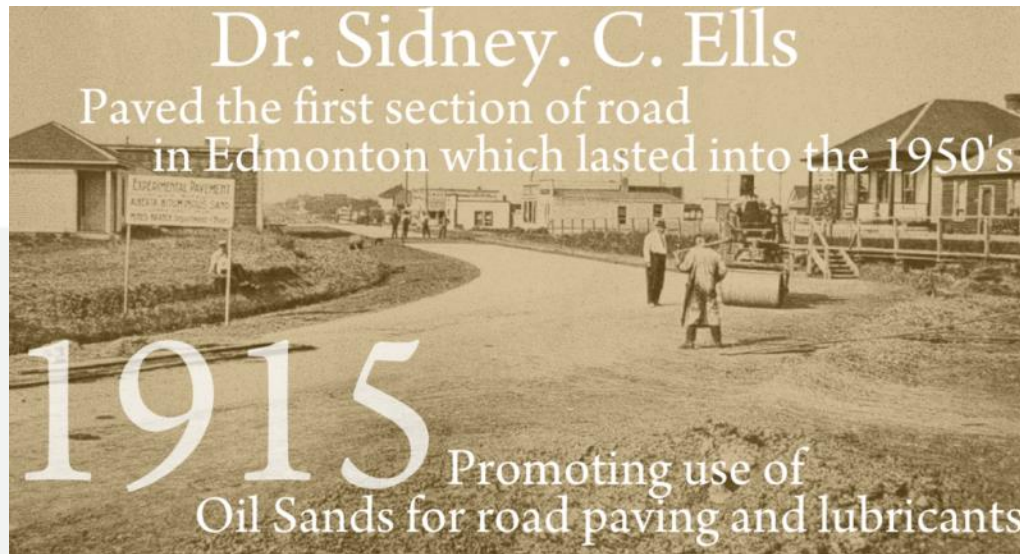
1910



In 1888, McConnell of the Geological and Natural Survey of Canada gave a geological description of the oil sands and correlated the oil sands with the Cretaceous Dakota sandstone of the Western Interior of the USA; reserves estimated to be not less than 4.2 million ‘long tons,’ and lighter oil expected downdip in correlative strata at Pelican Rapids on the Athabasca River. McConnell got a \$7k grant from Parliament and hired a contractor with a drilling rig; well spudded on 15 Aug. 1894, eventually reached 1,600 ft, at which time: “a roar of gas of 500 psi could be heard 3 miles away.”

Previously, in 1882, Bell as Director of the Survey identified the oil sands as Lower Cretaceous in age, and thought that the bitumen was sourced from the underlying Devonian carbonate rocks. From 1883 – 1884 he analyzed samples from Athabasca, initiated hot-water experiments to separate the bitumen; thought it could be feasible (and economic); proposed a pipeline from Lake Athabasca to Hudson’s Bay to transport the extracted oil to foreign markets.

[So, in the late 1880s we had a tide-water solution... but never acted upon].



In 1913, Ells, an engineer and Assistant to the Director, Dominion Department of Mines, Mines Branch, in Ottawa, launched a field party that year to begin a detailed survey of the oil sands in the Athabasca River valley. Was quoted as saying: "I was so enthralled with the possibilities of the oil sands that I preferred resigning my position, rather than being deprived of making an investigation."

During his first survey, they collected 200 samples, totaling nine tons, that were towed by hand on a scow, upstream along the Athabasca River to Fort McMurray; later backpacked out another seventy pounds from Ft. McMurray to Edmonton in 3 weeks. Ells laid bituminous pavement in Edmonton (above) and in Jasper National Park to demonstrate its utility. During World War I he was a Lieutenant and continued his own experiments on hot-water separation at Mellon Institute in Philadelphia, PA.



Provincial Archives of Alberta A12023

Sidney Ells at Fort McMurray oilsands in 1928.



Photo: A wooden oil derrick at Athabasca Landing in 1898. Photo courtesy the Alberta Government, Ernest Brown Collection.

Sidney Ells, an engineer who had been sent by the Dominion Department of Mines to investigate the economic potential of the oilsands, declares its bright future as a source of asphalt.

According to Karl Clark (1949): “In 1913, the engineer S. C. Ells, whose name and work are now inseparably associated with the Athabaska sands, was assigned to the study. He mapped the entire area and located all of the bituminous-sand exposures. His maps are the basis for all present detailed work. Ells also gave particular attention to the utilization of bituminous sand as a paving material.”

Entrepreneurs & Industry

1906

Count Alfred von Hammerstein conducts four unsuccessful seasons of drilling between 1906 and 1909.

1910

Experiments in using bitumen for street pavement begin in Edmonton.



1910

Hammerstein forms the Athabasca Oil and Asphalt Co. There is a flurry of speculative activity in the Athabasca region and in the village of Fort McMurray.



1927

Alcan Oil Company becomes the International Bitumen Company Limited, under the control of Robert Fitzsimmons. By 1930, Fitzsimmons will be operating a small hot-water separation plant at Bitumount, a site approximately 90 kilometres north of Fort McMurray.

1929

The first horizontal well is drilled in Alberta.



1930

Alberta obtains control of its lands and natural resources from the federal government and the Alberta Department of Lands and Mines is formed.

1936

The Abasand experimental oilsands plant starts up.



1938

Oil and Gas Conservation Act is passed and responsible energy development is committed to Alberta law. The Petroleum and Natural Gas Conservation Board, the second iteration of Alberta's energy regulator, is formed.

1927–1929

1929

Edmonton scientist Dr. Karl Clark patents his oilsands hot-water extraction process.



1930s

Monitor Oils, Texecano Oils and Ribstone Oils drill wells in the Lloydminster region. Oil is found, but nothing commercial.

1937

The first heavy oil refinery is built, adjacent to wells south of Lloydminster.

1938

Lloydminster Royalties Ltd. brings in a Lloydminster heavy oil well at 250 barrels on the first day. The next day, it produces only salt water.

1930–1939

1906

1910

1927

1936

1903 - 1906



Alfred von Hammerstein brought a drilling outfit consisting of a rig, drilling tools, casing and machinery to operate it.

In 1906 drilled for oil in the Devonian limestone along the banks of the Athabasca River – hoping to find “pure” oil pools underneath the oil-sands outcrops.



Baron (“Count”) Alfred von Hammerstein at his cable rig on the Athabasca River.

1910: Athabaska Oil & Asphalt Company

Instead, he found salt, at the Horse and Athabasca river confluence. 1925 Alberta Salt Co, opened a mine on Horse River, later closed due to problems of shipping and transportation of salt; 1936 Industrial Minerals Ltd. at Waterways (rail to Lac La Biche); Waterways Salt Plant used hot-water pumping process to extract (injector and producer of brine), which was then evaporated, closed in 1950 [Elk Pt. Plant opened].

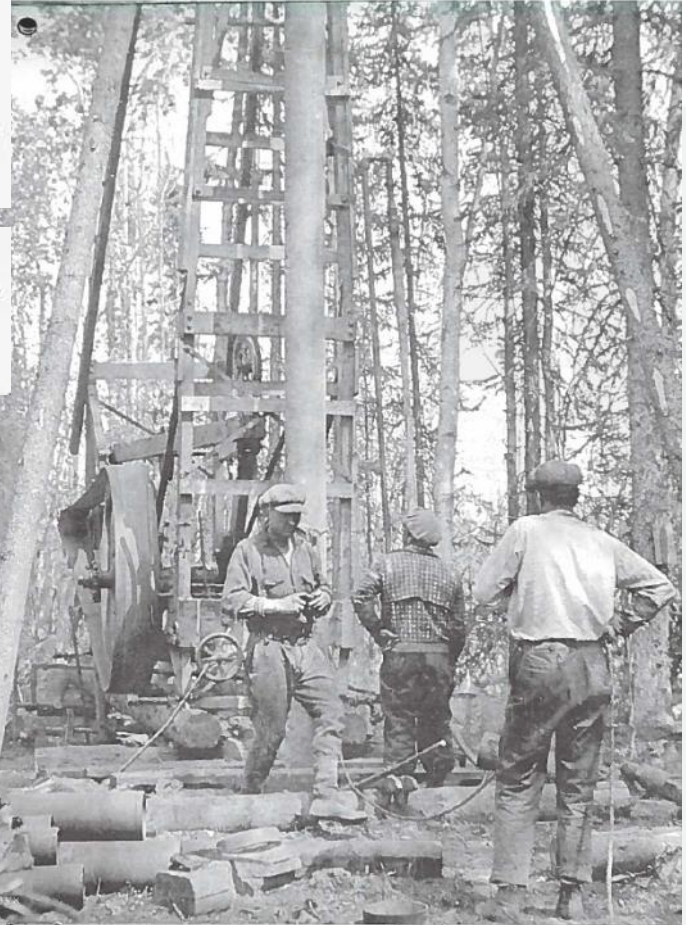


Robert C. Fitzsimmons 1923 - 1938

Fitzsimmons found a small market for various bitumen-based products in the 1920s and 1930s. His persistence in refining various extraction techniques paid off with about 300 barrels of bitumen produced during the summer of 1930.

Fitzsimmons characterizes the early entrepreneurial spirit of the industry.

Fitzsimmons saw many uses for bitumen, listing nearly 50 in his company prospectus, such as; fuels, lubricants, printers' ink, medicines, and fireproof roofing materials. The lack of funds halted operations between 1932-1937. After a brief start up in 1938, he was forced to close and left the country to avoid creditors.



**1927 – Founded (former Alcan Oil Company)
International Bitumen Company at
Bitumount, AB**



Robert Fitzsimmons shows oil sands sample to Lloyd Champion at the Bitumount Quarry.

Alberta Government Historic Places: Bitumount Powerhouse



The powerhouse at Bitumount (photo by David Martin).

1930 - 1936

Engineer Max Ball and Abasand Oils Ltd. plant

The 1930 plant took 6 years to build, produced oil for 15 years, and closed only when demand weakened after the war

Maxwell Waite Ball was born in Illinois in 1885. A jolly man with black-rimmed glasses, he went on to graduate from the Colorado School of Mines in 1906 with a degree in engineering, after which he went to work for the U.S. Geological Survey Department mapping coal deposits in Wyoming.

Ball built and managed a separation plant that would handle over 250 tons of oil sands per day.

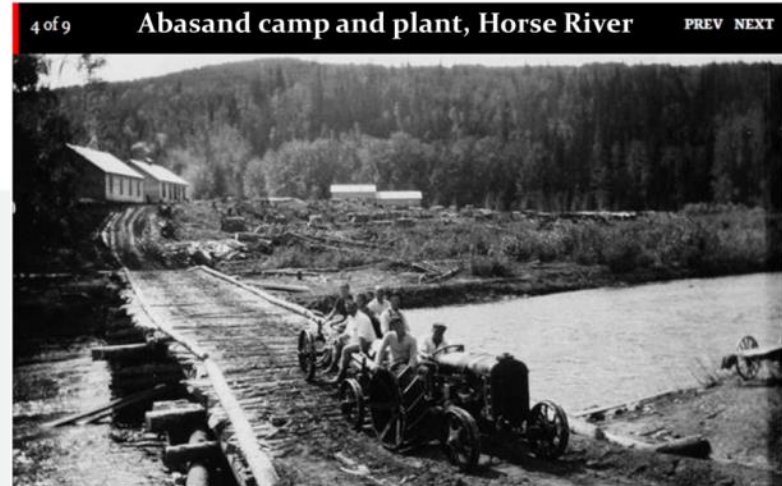
In 1917, Max Ball first got into the oil business when he joined Roxana Petroleum Company, a Shell subsidiary. Ball arrived in Edmonton in 1930 and in that same year he founded Canadian Northern Oil Sands Products Ltd., which would go on to become Abasand Oils Ltd. in 1935.



Max Ball, 1940.

After the Alberta Research Council pilot plant closed in 1930, Max Ball purchased the plant equipment. Around that same time, Sidney Ellis, a Federal government oil sands engineer, was introduced to Ball. Ellis persuaded him to try to obtain a prospecting lease on the Horse River government reserve. Ball was granted the lease and began negotiations with the province to build and manage a separation plant that would handle over 250 tons of oil sands per day.

Max Ball later Director of the Oil and Gas Division in the US Department of Interior



4 of 9

Abasand camp and plant, Horse River

PREV NEXT

1938: Abasand Oils Ltd., the first commercial oil project, begins producing diesel from the oil sands. A photo of the Abasand camp at Horse River, Alta., taken in 1936, shows the mess hall and bunk house in the left background and the separation plant at right. It was sold to the government after WWII and not rebuilt after it subsequently burned down.

(/National Archives of Canada / Canadian Press)

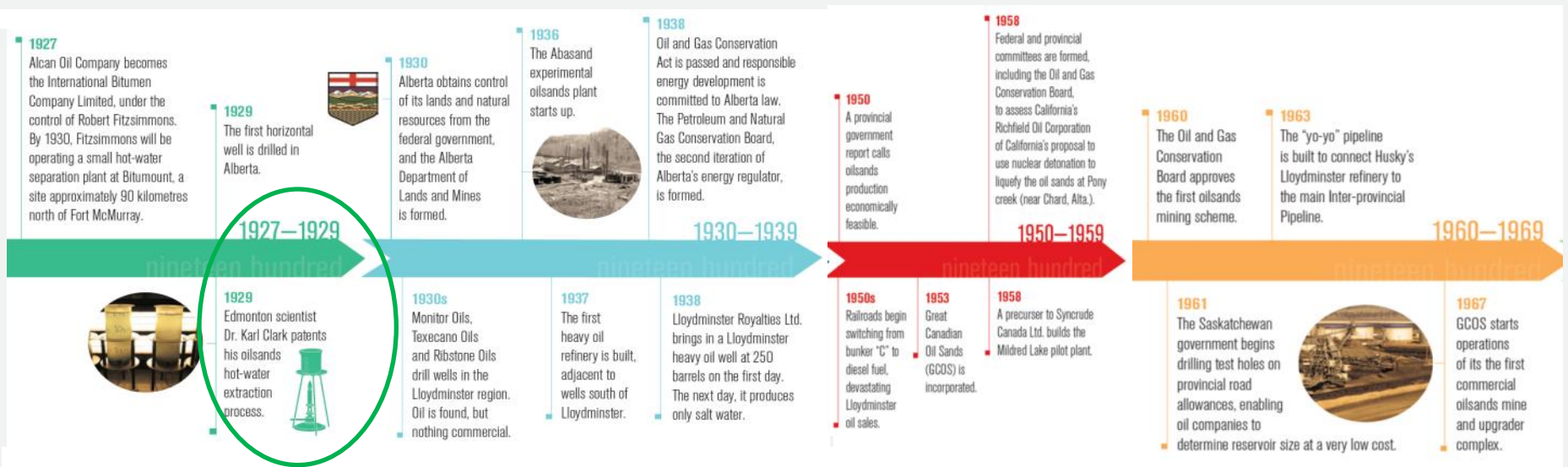


View of the Abasand oil sands extraction plant in April 1941. Credit: Provincial Archives of Alberta A9103 PROVINCIAL ARCHIVES OF ALBERTA A9103 / PROVINCIAL ARCHIVES OF ALBERTA

Abasand Oils Ltd.

“Mesozoic” Middle Years

University of Alberta, Alberta Research Council & Other Government Work



1920 1921

1929

Allan Papers on *Mineral Resources in Alberta, Bituminous Sands*

1949

Clark Paper in *Scientific American*

1957

Carrigy joins Alberta Research Council

1965 - 66

Carrigy et al Alberta Research Council Papers & Geologic Maps

The investigations covered in this report were undertaken by the Dominion Government primarily as a safeguard against the possible development in Canada during the war of a critical shortage of oil that would have greatly hampered the country's war effort. Previous work on the deposits by the Government, dating back to 1913, was mainly of a reconnaissance nature and the investigations reported herein marked the first systematic and concerted attempt by the Government to appraise the possibilities of the deposits.

Although the investigations did not lead to the production of petroleum products on a commercial scale, they have provided a much sounder basis than hitherto existed for an appraisal of the tonnages and grade of mineable material available and of the geological, engineering, and processing problems that are likely to be encountered when the time becomes opportune for the active and full-scale development of the deposits. The information contained in the report will doubtless prove to be a most valuable guide in such development.

The report is being published in three volumes: Volume I, results of investigations, 1942-47; Volume II contains detailed drilling and sampling records; and Volume III, cross-sections and plans of the areas drilled.

W. B. TIMM,

Director,

Mines, Forests and Scientific Services Branch.

OTTAWA, DECEMBER 2, 1948.



Prov. Archives of Alberta

CANADA
DEPARTMENT OF MINES AND RESOURCES

MINES, FORESTS AND SCIENTIFIC SERVICES BRANCH
BUREAU OF MINES

DRILLING AND SAMPLING
OF
BITUMINOUS SANDS OF NORTHERN ALBERTA

VOL. I

Results of Investigations
1942-1947



OTTAWA
EDMOND CLOUTIER, C.M.G., B.A., L.Ph.,
KING'S PRINTER AND CONTROLLER OF STATIONERY
1949

Price, 25 cents

No. 826

WHEELER ISLAND AND STEEPBANK RIVER AREAS

SUMMARY OF EXPLORATION IN 1942

(The Consolidated Mining and Smelting Company of Canada, Limited.)

INTRODUCTION

Commencing July 19, 1942, The Consolidated Mining and Smelting Company of Canada, Ltd., at the request of the Dominion Government, carried out exploration for mineable deposits of bituminous sands in the McMurray area. Based on exploration carried out by the Mines Branch, the Research Council of Alberta, Abasand Oils, Limited, and The Consolidated Mining and Smelting Company in previous years, two areas were chosen that showed:

- (a) Indications of a large tonnage of a good grade of bituminous sand with low clay content.
- (b) Shallow overburden.
- (c) Adequate tailing disposal areas.

These were the Steepbank area, 24 miles below McMurray, and the Wheeler Island area, 56 miles below McMurray, both on the east bank of Athabaska River.

All previous drilling had been done using augers, and as the time for experimentation was limited this method was adopted although it had serious defects and was costly. To get through overburden a Keystone and Hillman churn drill was used and three diamond drills were employed to power-auger the holes through the tar sand to the underlying limestone. Holes were drilled at half-mile centres and by January 26, 1943, eleven holes had been completed at Wheeler Island, exploring an area of 1,400 acres, and ten holes at Steepbank, exploring an area of 900 acres.

Without much further drilling it is impossible to arrive at a satisfactory conclusion regarding the areal extent and average thickness of the bituminous sands. To the west of McMurray the regional southwesterly dip carries the bituminous beds below higher formations and the extent of the concealed beds is a matter of speculation. Ellis¹ conservatively estimated that "the area underlain

¹Sproule, J. C.: Geol. Surv., Canada, unpublished manuscript.

²Dawson, G. M.: Geol. Surv., Canada, Ann. Rept., vol. 10, p. 19A (1937).

³Sproule, J. C.: Geol. Surv., Canada, unpublished manuscript.

⁴Ellis, S. C.: "Some Economic Aspects of the Bituminous Sands of Northern Alberta"; Mines Branch, Dept. of Mines, Rept. 735, p. 11 (1934).

by bituminous sands is not less than 1,500 square miles and the total areal extent of the deposit is probably very much larger"; whereas Ball¹ states that "the saturated sands underlie at least 10,000, probably 20,000 and possibly 30,000 square miles", but the area in which "the sands are accessible and mineable is probably less than 20 square miles". In the Mildred-Ruth Lakes area it was calculated that for an area of 3 square miles where drilling was done there may be as much as 224,000,000 barrels of bitumen to the square mile. This area is relatively rich and the sands are also relatively thick. This may, therefore, represent approximately a maximum content, but in view of the size of the deposit it is not difficult to arrive at an estimate of 100 billion to 250 billion barrels as has been so widely quoted.² The fact that only a small part of this is readily accessible, as Ball points out, still leaves an enormous volume that can be recovered by ordinary mining methods.

¹Ball, Max W.: Bull. Amer. Assoc. Pet. Geol., vol. 19, No. 2, p. 153 (1935).

²Pratt, Wallace E.: "Oil in the Earth"; Univ. of Kansas Press, p. 41 (1943).

FIRST ANNUAL REPORT
ON
THE
MINERAL RESOURCES
OF ALBERTA

BY
JOHN A. ALLAN, M.Sc., Ph.D.
PROFESSOR OF GEOLOGY
UNIVERSITY OF ALBERTA

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY



EDMONTON:
PRINTED BY J. W. JEFFERY, KING'S PRINTER
1920

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EDMONTON:
PRINTED BY J. W. JEFFERY, KING'S
1921

THE ATHABASKA TAR SANDS

They hold one of the world's great collections
of oil. The studies of a practical process for
extracting it are making encouraging progress

by Karl A. Clark



Karl Adolf Clark, M.A. (McMaster), Ph.D. (Illinois), P.Eng. (Alberta)

Profile: Karl Clark, the scientist



Oil Sands Scientist

THE LETTERS OF
KARL A. CLARK
1920-1949

Edited and with an Introduction by
Mary Clark Sheppard

Foreword by S. Robert Blair

THE UNIVERSITY OF ALBERTA PRESS
in association with
ALBERTA CULTURE AND MULTICULTURALISM

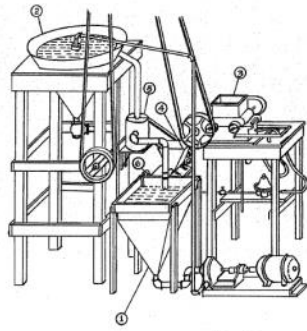


Fig 2

KARL ADOLF CLARK
Inventor
By *Blending*
Attorney

*Certified to be the drawing referred to in the
specification herewith annexed.
Ottawa, Ont. This 26 day of March, 1945.*



Hot-water oil sand separation plant at the Research Council of Alberta: Clark and Blair improved upon process by using reagents & improving procedures. Two patents 1929 & 1945.

3 of 9

PREV NEXT



1929: After field tests in 1924, scientist Karl Clark and associate Sidney Blair patent their water-flotation system. 1930: Mr. Clark starts producing from a small plant at Bitumount, on the shore of the Athabasca River near Fort McMurray (shown here in 2011), pumping 300 barrels a day with a seven-man crew. The product is used largely for roofing and paving.
(Jeff McIntosh/The Canadian Press)



Bitumount - Alberta Energy Heritage
www.history.alberta.ca - 921 x 936 - Search by image
Bitumen separated at the International Bitumen Company Ltd.

Maurice Carrigy Retirement



Green, R., Mellon, G.B. and Carrigy, M.A.



Dr. Mellon (left) with Premier Getty at presentation ceremony.

Bedrock Geology of Northern Alberta,
Eastern Half, AGS Map 24

A BIBLIOGRAPHY OF THE ATHABASCA OIL SANDS:
FORT MCMURRAY, ALBERTA AREA:
SOCIO-ECONOMIC AND ENVIRONMENTAL STUDIES

1982 SUPPLEMENT

Compiled by
Susan Bramm, B.Sc., Researcher
for
Alberta Environment Library

NOTE: THIS SUPPLEMENT IS TO BE USED WITH
THE 1980 CUMULATED UPDATE.

DOE

TAR SAND
SYMPOSIUM



SPONSOR:
U.S. DEPARTMENT OF ENERGY

JULY 7-10, 1986

HOST:
WESTERN RESEARCH INSTITUTE

JACKSON, WYOMING

UNITAR/UNDP



**INTERNATIONAL
CONFERENCE ON
HEAVY CRUDE &
TAR SANDS**

**August 7-12, 1988
Edmonton, Alberta**

C A N A D A



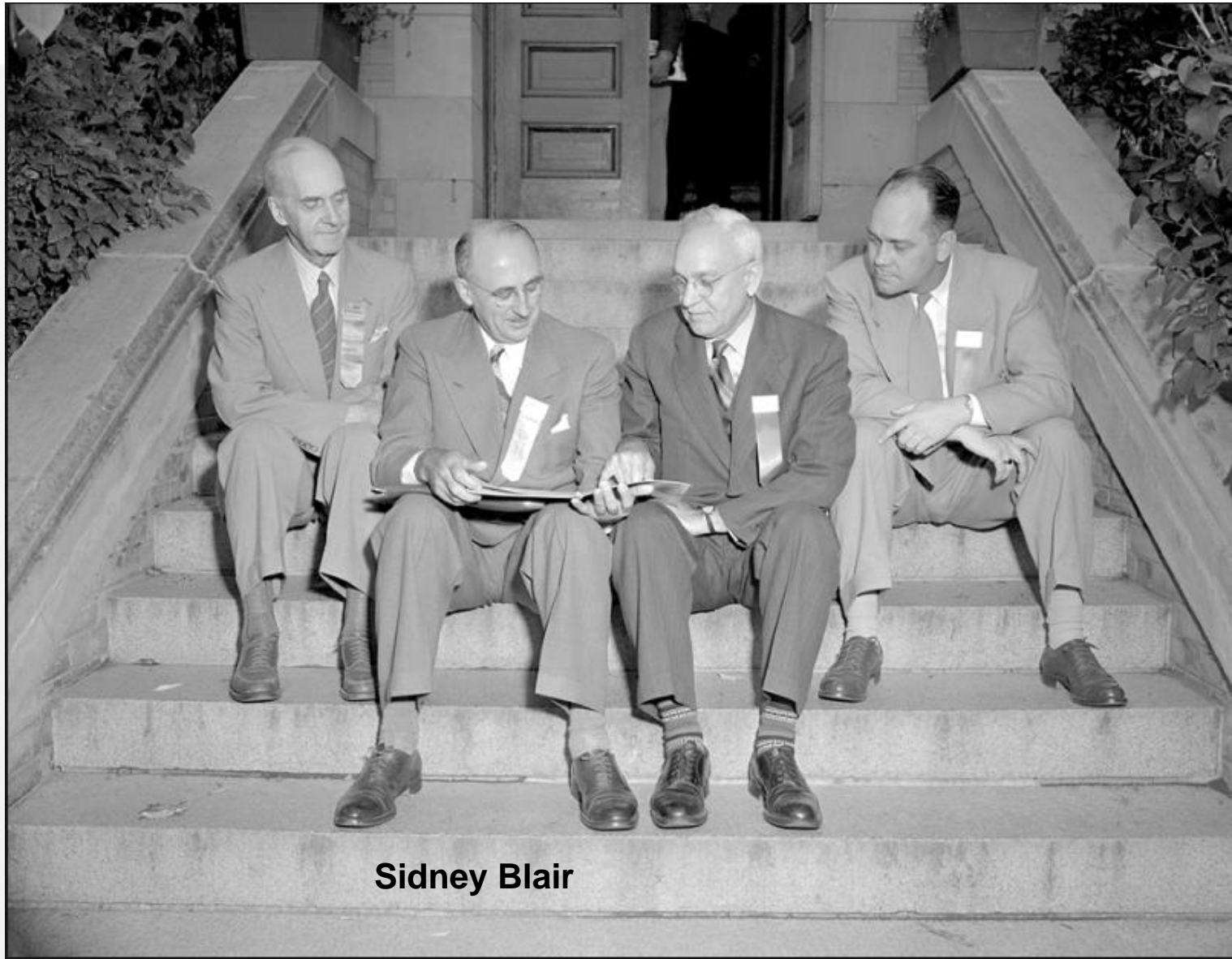
CO-SPONSORS

Alberta Oil Sands Technology and Research Authority/
Petro-Canada/Petroleos de Venezuela/
U.S. Department of Energy

**Dr. M. Carrigy
seconded to
Department of Energy
~ 1973, to work on
drafting of the
AOSTRA Act, creating
mandate & setting it
as a crown
corporation (1974);
real work began in
1975.**

**Dr. Clement Bowman,
Founding Director
AOSTRA, with Carrigy
Assistant Director.
Carrigy later became
in charge of
UNITAR/UNDP.**

1951 – First Oilsands Conference, First Sharing of Views and Technology: Sidney Blair (left centre)



Sidney Blair

Don't Wait till the Oil Boom Comes and Buy Boom Company Shares--Increase Your Holdings in Your Own Company


\$10 TO-DAY


Will Buy What \$1000 Won't Buy in a Year From Now

ARE YOU GOING TO WAIT TILL THE NEWSPAPERS TELL YOU ABOUT
THE GREAT OIL FIELDS?




Staggering as these facts are, no less are these pictures true, proving the immensity of Northern Alberta's oil fields.

 Oil running out of the rocks in Alberta.

This man pointing into a pool of crude oil, Northern Alberta's oil fields. 



 Big Geological Expedition leaving Athabasca Landing backed by large capital. This will show you that the big fellows are there too. Never saw this in the newspapers did you?



Oil prospectors whose faith in Northern Alberta oil fields is founded on the astounding evidences they see with their own eyes. These men bought shares in the Great Northern Oil & Asphalt Co. They ought to know.



Forget That Silly Talk About Calgary Oil Fields

Get Your Ten Dollars in the Mail Today and back up the pioneer oil company of Alberta, which will drill this spring in the Real Oil Fields of the Great North WHERE OIL ACTUALLY IS. We will give \$1000 cash to anyone who will prove these Photographs are not genuine. They are. We can prove it. Fill in the application now.

Reprints by permission of the author.

Oil sands history: author Joyce Hunt

**1949 The Blair Report:
First Detailed Report
Confirming that Bitumen
recovery from the Oil Sands
could be Profitable.**

hourglass

Reflections from the Oil Sands Oral History Project

ERCB reserves numbers: detailed work 1963, talk 1973, memoir 1974.

OIL SANDS
FUEL OF THE FUTURE



ACE UP THE SLEEVE

Alberta regulatory architect George Govier and the oilsands' rise from a science project to a commercial force

By Gordon Jaremko



Through ongoing analysis by ERCB, EUB, ERCB & AER, it is now estimated that Alberta has 167 billion barrels of remaining established crude bitumen reserves; initial volume in place of 2.93 trillion barrels (AER, 2015).

How big is Big Oil? As an engineering professor, chairman of Alberta's Energy Resources Conservation Board (ERCB) and the province's first deputy energy minister, George Govier translated woolly numbers into clear pictures.

“Cenozoic” Later Years Entrepreneurs & Industry

1960

The Oil and Gas Conservation Board approves the first oilsands mining scheme.

1963

The “yo-yo” pipeline is built to connect Husky’s Lloydminster refinery to the main Inter-provincial Pipeline.

1960–1969

nineteen hundred

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The Saskatchewan government begins drilling test holes on provincial road allowances, enabling oil companies to determine reservoir size at a very low cost.



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GCOS starts operations of its the first commercial oilsands mine and upgrader complex.

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Around 3,000 wells in the Lloydminster area produce about 3,000 barrels per month.



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The concept of steam assisted gravity drainage (SAGD) is developed by Dr. Roger Butler for in situ recovery of bitumen.

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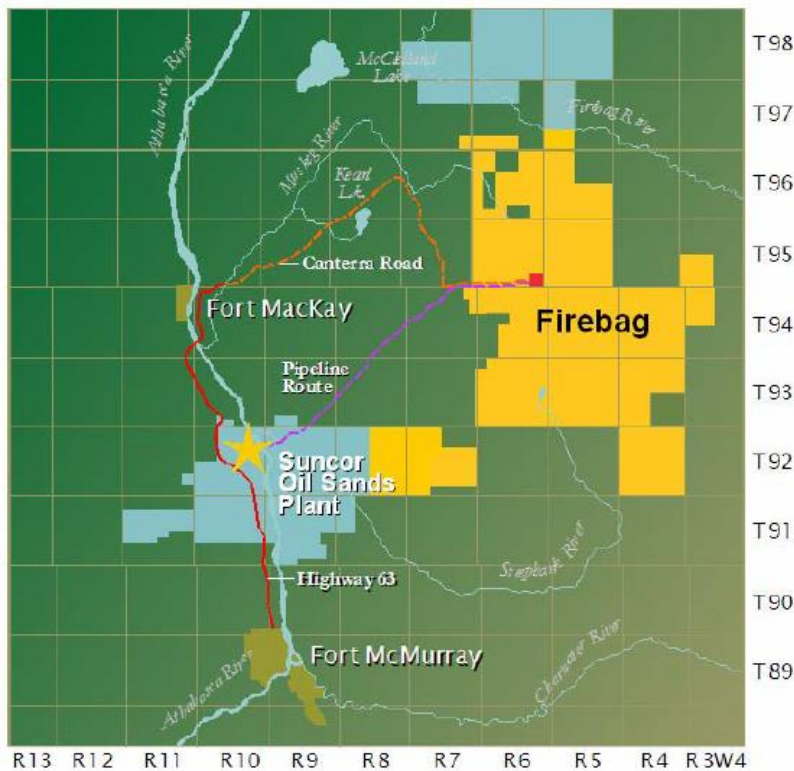
1974

The Alberta Oil Sands Technology and Research Authority is formed as a Crown corporation with a mandate to develop new oilsands technologies.

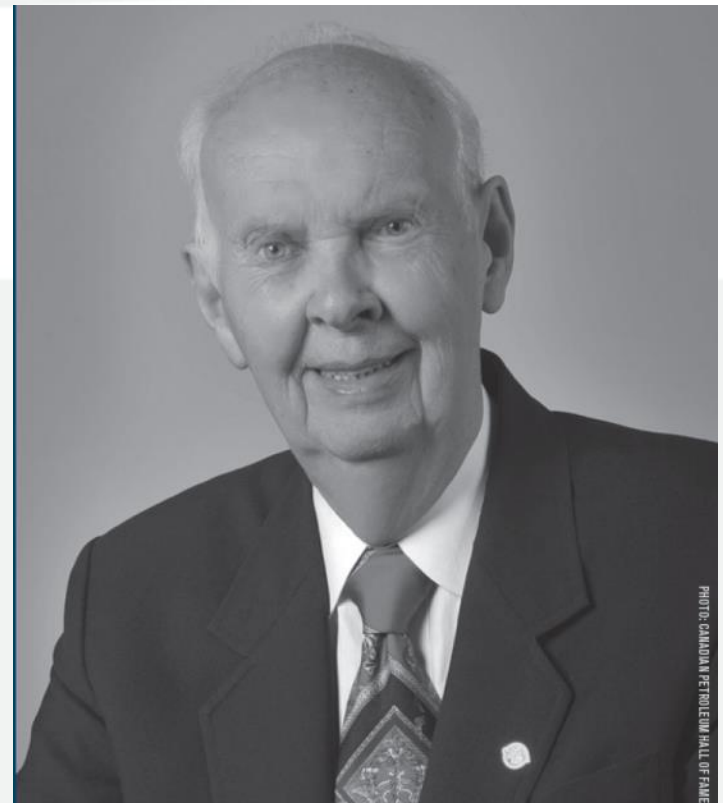
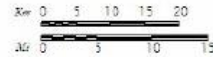
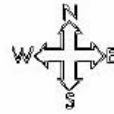


1978

Syncrude, the second commercial mining/upgrading installation, begins production.



Firebag Location Map



Ned Gilbert was Sun Oil's (now Suncor) Calgary single employee, developing prospects and sending to head office in Philadelphia, PA.

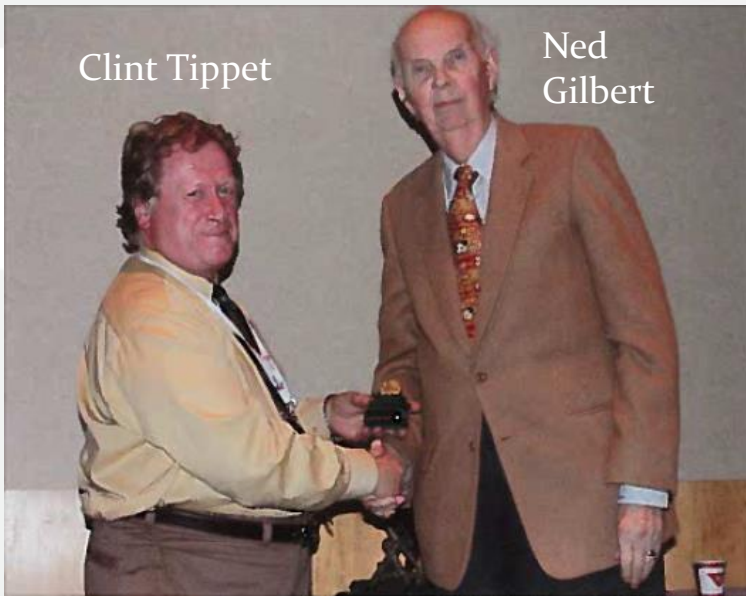
- 1947 obtained first two oilsands permits in Bitumount region and later subsequent leases, now within Suncor's Firebag In-Situ Lease area.
- 1951 Blair report came out and presented at Oil Sands Conference.

EDWARD E. "NED" GILBERT

- Later heard that Sun Oil management was recommending that they get out of the oilsands leases.
- Fall 1951 wrote a letter to the leadership team, and persuaded them that 800 million barrels over 50,000 acres ~ \$1.40/acre.

Clint Tippet

Ned
Gilbert



Stanley Slipper Medal



2001: Marks the first commercial use of SAGD, the technology that produces oil sands using high-pressure underground injections of steam, which melt the bitumen so it can be carried to the surface in wells.
2004: Total oil sands output exceeds a million barrels a day.
2012: In the photo, Ned Gilbert stands before artwork at the Calgary Petroleum club. Mr. Gilbert, 91, an oil sands pioneer, is one of the original members of the club.
(Todd Korol For The Globe and Mail)

The Stanley Slipper Medal is the CSPG's highest honour.

The gold medal is presented annually by CSPG for outstanding contributions to oil and gas exploration in Canada. The contributions of the winner of this award should encompass a number of activities related to aspects of petroleum exploration. Such activities include: initiating and/or leading exploration programs, significant discoveries on new or existing exploration trends, teaching and/or training of explorationists, and involvement in and leadership within geological societies and professional organizations.

1967

(Edmonton Journal, Nov. 1965)

First Great Canadian Oil Sands plant opens in 1967

World's first large scale mining and upgrading bitumen plant extracts a daily average of almost 100,000 tons

Sun Oil Company President J. Howard Pew made history in 1962 with his gutsy decision to invest \$250 million to build the world's first large-scale oil sands mining and upgrading plant on the site of one of Earth's largest known single oil deposits. It took a dedicated army of 2,300 workers almost seven years to build the innovative Great Canadian Oil Sands (G.C.O.S.) plant.

"I am convinced this venture will succeed, and that it will be the means of opening up reserves that will meet the needs of the North American continent for generations to come."

J. Howard Pew

The project proved a formidable task during the 1960s, an era of low oil prices. In addition to insects, mud, isolation, and severe cold, workers were challenged with power failures, fires, leaks, and catastrophic events that caused severe equipment damage and monumental delays.



Great Canadian Oil Sands plant. September 1967.

Located 32 kilometres north of Fort McMurray, workers also dealt with poor housing, inadequate roads, and a dearth of recreational facilities and other infra-structures. When construction was completed, the \$250 million final tab was the largest single private sector investment made in Canada's first 100 years.

Great Canadian Oil Sands plant with a pile of coke used as fuel for the utilities boilers. The structures are coking drums where lighter oils are distilled. September 1967.



Great Canadian Oil Sands (now Suncor)



Royalite Oil Co. Geologists 1954

"What was Royalite?" Royalite was born in Turner Valley, the child of Imperial Oil. After oil was discovered at Leduc in February 1947, Imperial spun off Royalite as an "independent". We pioneered serious exploration and production in the MacMurray oil sands in the 1950's, over-expanded into service stations, refineries and airplanes until the bubble burst. Sold, resold and melted down, Royalite fused into assorted companies, its major vestige is in Syncrude.

The staff?? (this photo) blown to the winds.

Best regards to all!

(Curious) Bert Ellison, ex-Royalite.

Royalite patented 3 inventions related to work on the oil sands; 1969 amalgamated with British American and Shawinigan Chemicals under the new name of Gulf Oil Canada Ltd.



1964: The Syncrude consortium is formed. Nine years later, work begins on the first Syncrude mine, which achieved first oil in 1978.

1967: In the photo, steam rises in minus-20C weather along a conveyor leading to the primary extraction unit at the Athabasca tar sands mining site 30 kilometres north of Fort McMurray, Alta.

(/The Globe and Mail)

Frank Spragins

"He was a man with the courage of his convictions and the resilience only a deep committed individual can bring to a mission"
From: *A Billion Barrels for Canada-the Syncrude Story*.



When the oil sands of Alberta are talked about, one name is brought up as a major force in its development: Frank Spragins. Born in Mississippi, he attended Rice University in Houston and received a degree in engineering. Spragins began his career in the oil industry with Standard Oil but left to help in the war effort in 1942. Instead of being sent into battle, the US War Office sent Spragins to search for oil. He chose Canada and made it his home. Spragins worked with the geophysical team that discovered oil in Leduc. After the Second World War, he worked for Imperial Oil in the Athabasca Tar Sands department. Spragins began to research the technical and economic viability of the oil sands. He spent years presenting papers at international meetings of the oil industry and waded through government bureaucracy to develop the area. He convinced Imperial Oil and other companies to invest in the Syncrude complex. Spragins and his team lobbied the government hard for an agreement to build a plant on the chosen site. His tenacity paid off and in 1964 Syncrude Canada Limited was established. Frank Spragins was the company's president.

Years of construction on the plant followed and in 1977 the Syncrude facility held its official opening. Spragins was given a standing ovation. Everyone knew that without his vision and leadership the project would have never been. He had recently announced his retirement after working on the project for nineteen years. Many people did not know his retirement was due to his failing health. Six weeks after the plant opening, Frank Spragins died.



A photo from 1973 of Syncrude CEO Frank Spragins. SUPPLIED / EDMONTON JOURNAL

Eric P. Newell

Eric Newell stated in the book, *A Billion Barrels for Canada-the Syncrude Story*:

"We have to demonstrate once and for all that oil sands development is Canada's best choice to meet Canada's energy requirements. I know we can do it, if we work as a team."

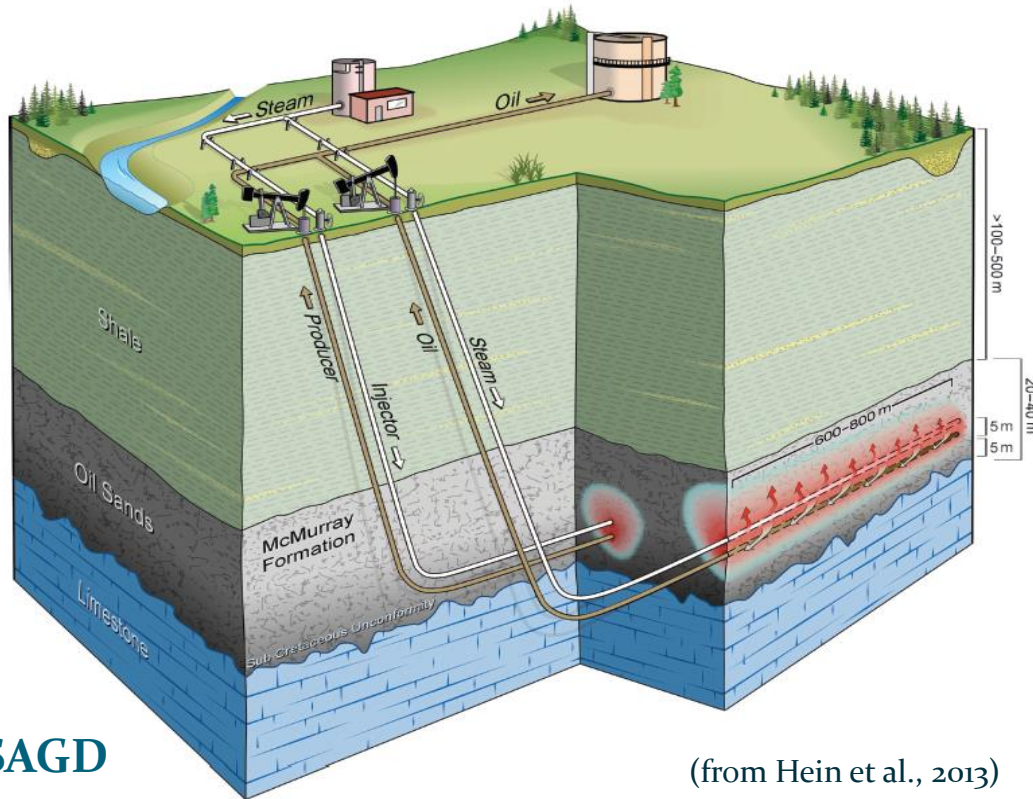


Through his leadership of Syncrude and work with the National Oil Sands Task Force, Eric Newell has been instrumental in the exploration of the oil sands and its benefits to Canada's energy industry. Eric Newell was born in 1944 in Kamloops, British Columbia and raised in Victoria. He has a Bachelor of Applied Science degree in Chemical Engineering from the University of British Columbia and a Master of Science degree in Management Studies from the University of Birmingham, England. His career began with Imperial Oil and Esso, where he was often sent to sites across North America, moving constantly until he settled in Alberta in 1986. The pinnacle of his career was with Syncrude Canada Ltd, where he served as the company's Chief Executive Officer and as Chairman. He also served as president from 1989 to 1997. Under Newell, Syncrude became a major player in Canada as a supplier of oil and gas, with a strong corporate and environmental stewardship program. He retired from Syncrude in 2003.

Currently, Newell serves as Chair for Careers: The Next Generation Foundation and Director for Nexen Inc., Canfor Corporation, Terasen Inc., C.D. Howe Institute, and Policy Advisor to the Learning Partnership. Many of his volunteer and community projects are with various environmental, cultural, and educational organizations. Newell's long-standing association with the University of Alberta, including as Chair of the Board of Governors, continues today as he serves as chancellor since 2004. He is an Officer of the Order of Canada and has had honorary Doctorates conferred on him by the University of British Columbia (2003), the University of Alberta (2002), and Athabasca University (1995). Newell's continued commitment to the engineering profession can be seen in his commitment to his old Alma Mater. Eric P. Newell Leadership Award in Engineering at UBC was created from his endowment to the University in 2004.

A Billion Barrels for Canada – The Syncrude Story

Steam-Assisted Gravity Drainage (SAGD)



SAGD

(from Hein et al., 2013)



DR. ROGER BUTLER

By Qi Jiang

Dr. Butler is considered the “Father of SAGD.”

- Technology nurtured while he was employed at Imperial Oil in the 1970s;
- Developed the concept of using horizontal well pairs – upper one injected with steam; lower one to produce bitumen that had its viscosity reduced by the steam;
- Also introduced VAPEX, a related technology, which used vaporized solvents in the extraction process.
- After a career with Imperial, then headed technical programming for AOSTRA; and then an endowed chair of Petroleum Engineering at the University of Calgary.

“Cenozoic” Later Years

Alberta Oil Sands Technology and Research Authority (AOSTRA)

1960

The Oil and Gas Conservation Board approves the first oilsands mining scheme.

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The “yo-yo” pipeline is built to connect Husky’s Lloydminster refinery to the main Inter-provincial Pipeline.

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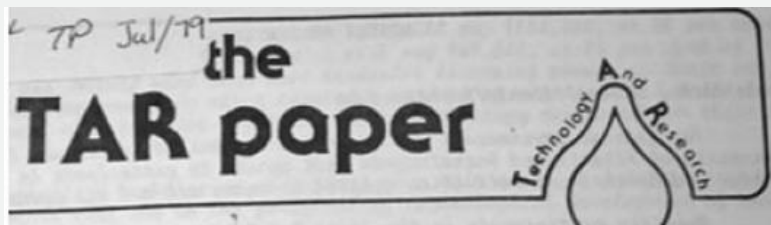
AOSTRA 1974 Crown Corporation

AOSTRA

August 1, 2000

AERI (Alberta Energy Research Institute)
assumed responsibility
for the oil and gas research programs
previously administered by AOSTRA

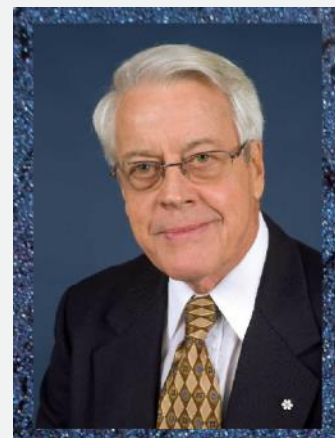
**AERI (Alberta Energy Research Institute)
transformed into AIEES (Alberta Innovates
Energy and Environment Solutions) in 2010**



Throughout the 1970s, the oil sands industry was all about surface mining. But in 1978, Clement Bowman and Maurice Carrigy received a research paper about steam-assisted gravity drainage (SAGD). Industry considered it a boondoggle and many people tried to talk them out of pursuing the idea, convinced it would never work. But they pushed ahead, and today SAGD is perhaps the most game-changing technology to have ever come out of the oil sands.



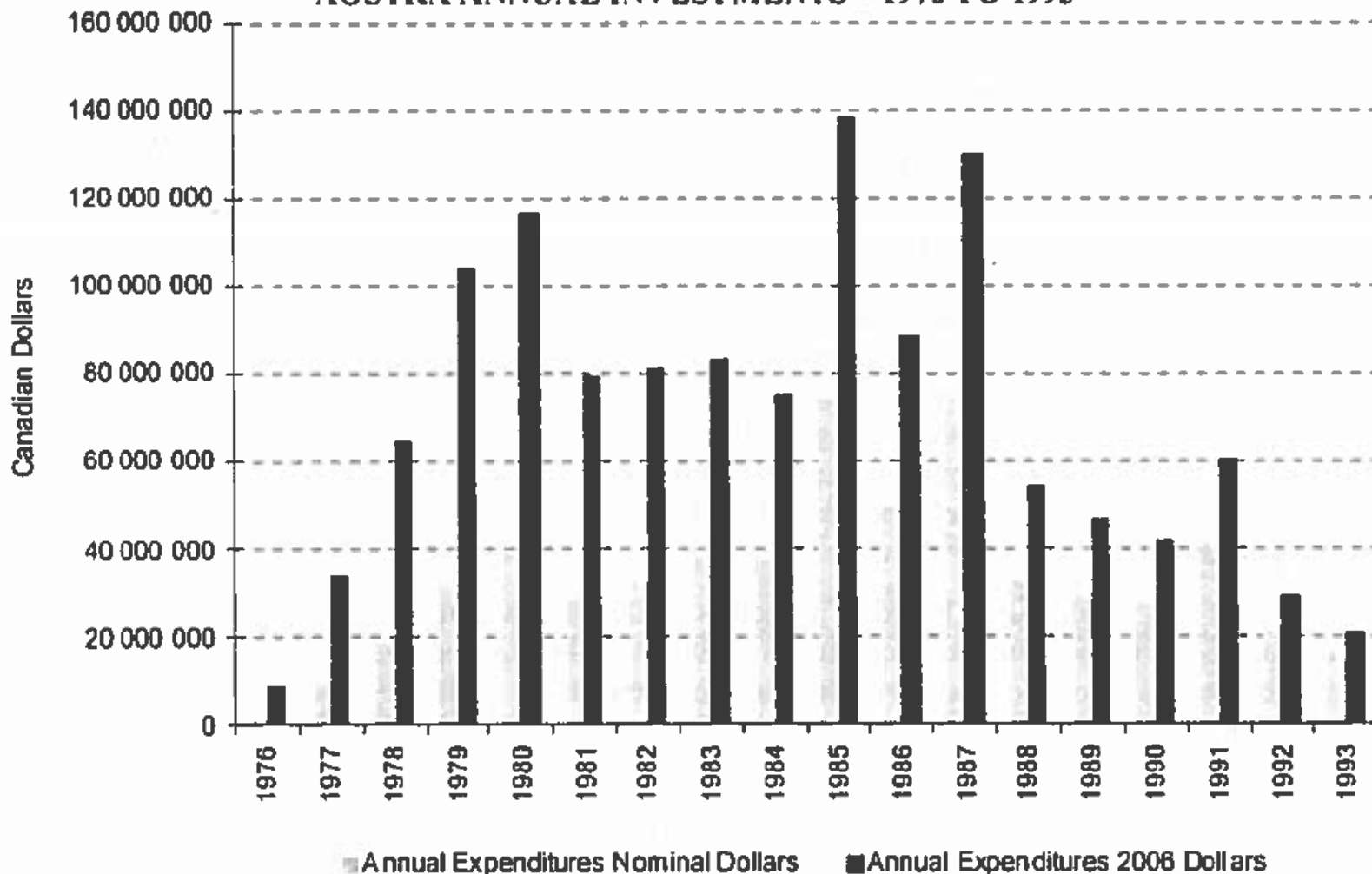
Alberta
Premier
Peter
Lougheed



Dr. Clement
Bowman

VP Esso Research Ctr., Sarnia, ON
Founding Chair, AOSTRA
Later President Alberta Research
Council (ARC, now Alberta Innovates)

AOSTRA ANNUAL INVESTMENTS – 1976 TO 1993



Source: AOSTRA, 1993.

(from Hester and Lawrence, 2010)

Over ~ 18 yrs, AOSTRA spent \$448 million Cdn (almost \$1 billion in 2006) on public-private projects and institutional research – one of largest R&D programs in Canada. Main focus was one commercial in-situ for each OSAs.



Institutional Research

Oil Sands
Research Centre

Sample Bank

Oil Sands
Information
Centre

Geology Project:
mainly ARC &
Universities

Big Blue Books

*Geological Survey Department
Alberta Research Council*

AOSTRA TECHNICAL PUBLICATION SERIES #8

**Resource characterization of the
McMurray/Wabiskaw Deposit in the
Athabasca South region
of northeastern Alberta**

AOSTRA TECHNICAL PUBLICATION SERIES #9

**Resource characterization of the
McMurray/Wabiskaw Deposit in the
Athabasca West region of
northeastern Alberta**

AOSTRA TECHNICAL PUBLICATION SERIES #10

**Resource characterization of the
McMurray/Wabiskaw Deposit in the
Athabasca Oil Sands Area:
A synthesis**

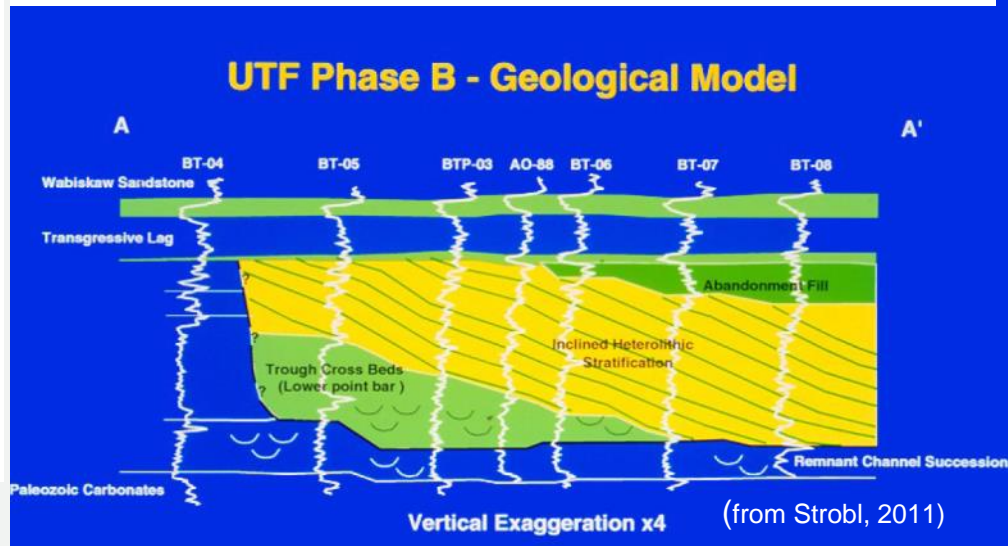
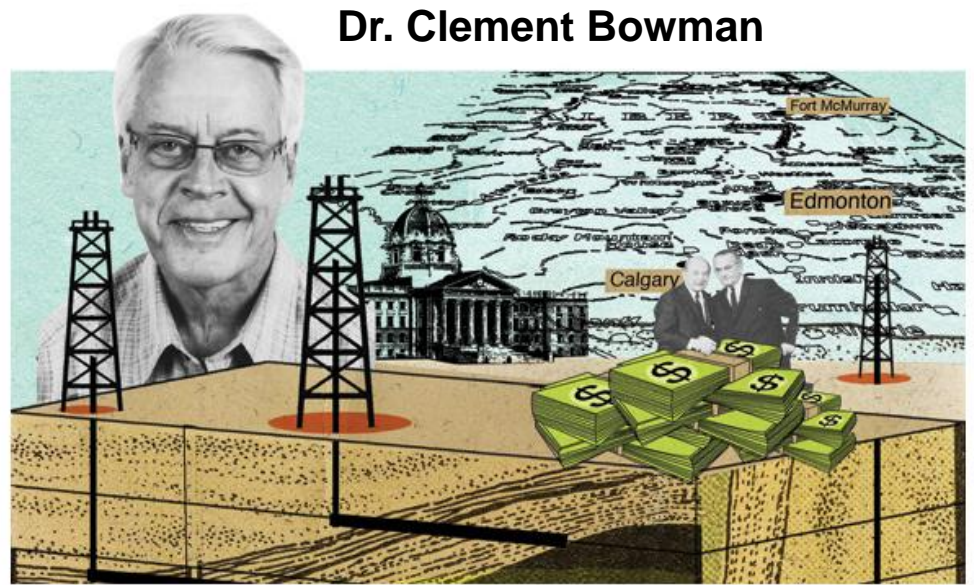
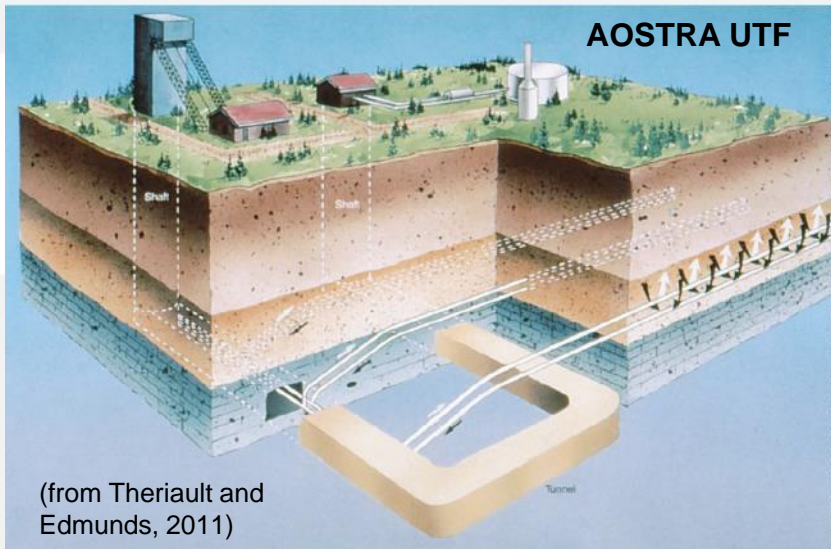
AOSTRA TECHNICAL PUBLICATION SERIES #6

AOSTRA

**Technical Handbook
on Oil Sands, Bitumens
and Heavy Oils**

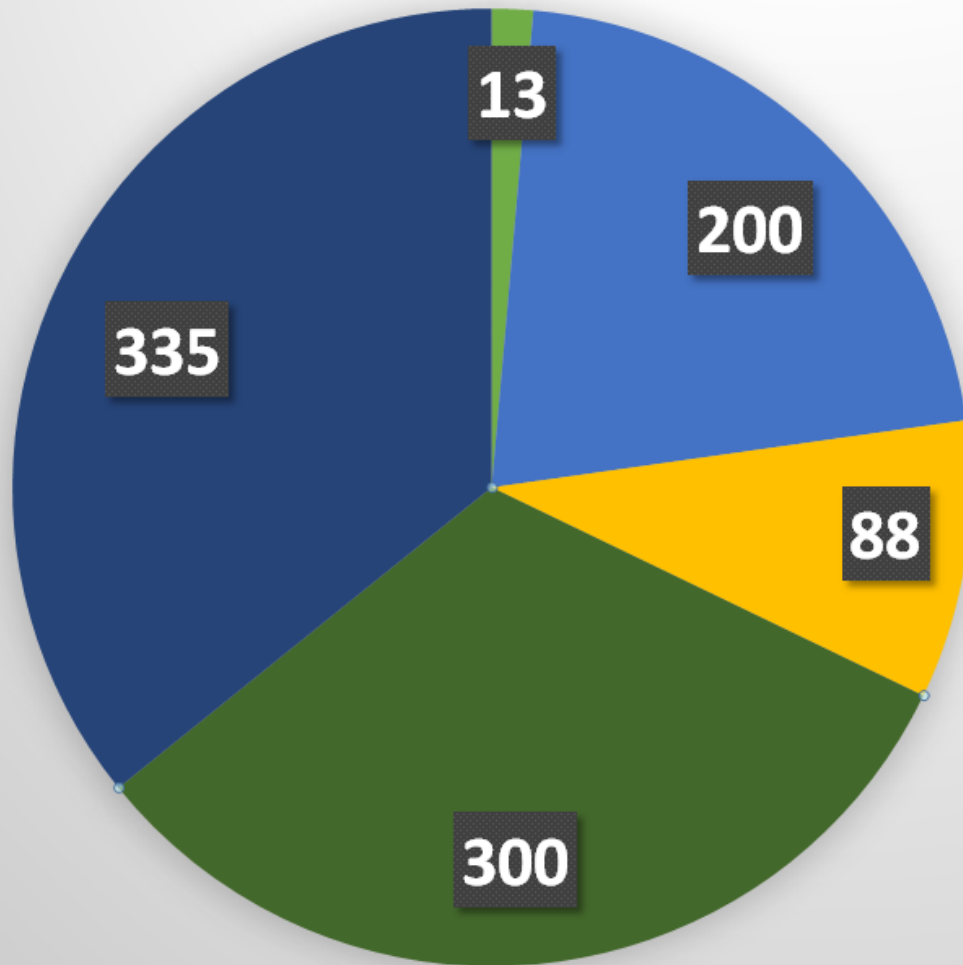
AOSTRA TECHNICAL PUBLICATION SERIES #7

**Resource characterization of the
McMurray/Wabiskaw Deposit in the
Athabasca central region
of northeastern Alberta**



The Alberta Oil Sands Technology and Research Authority (AOSTRA) Underground Test Facility (UTF) north of Fort McMurray revolutionized in situ bitumen recovery by proving that steam assisted gravity drainage (SAGD) would work.

AOSTRA Publications



■ AOSTRA Technical Publication Series

■ AOSTRA Journal of Research

■ Patents

■ Conference Papers

■ Project Reports (Including Theses)

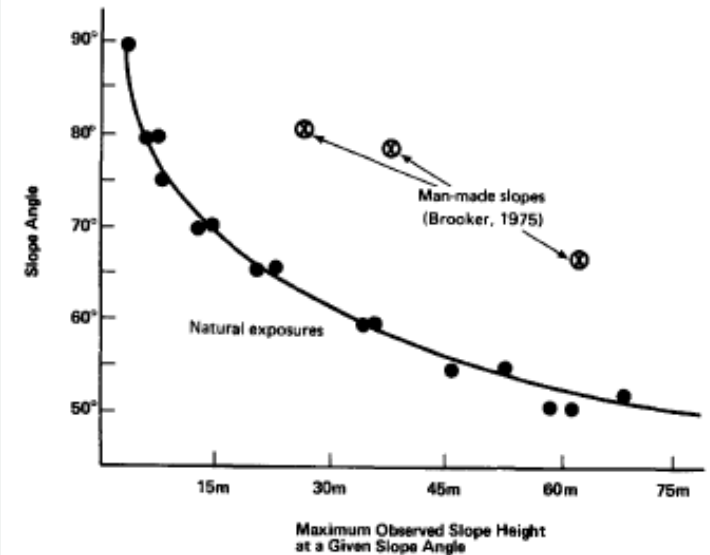
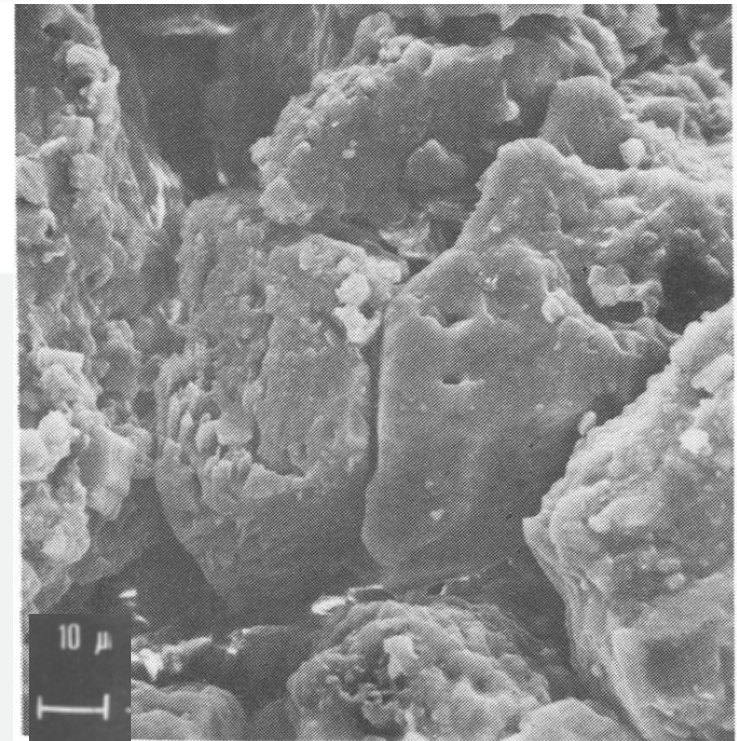
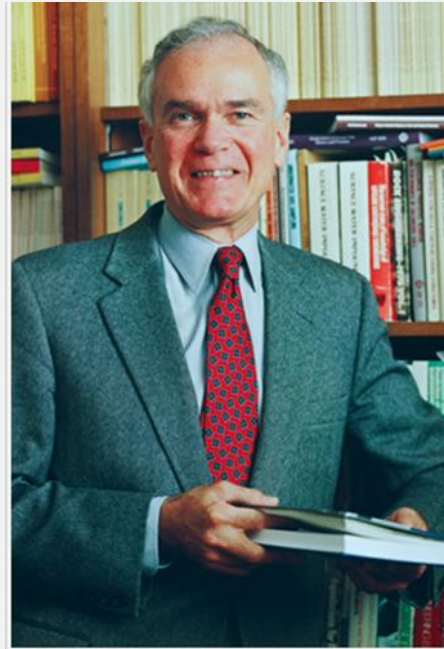
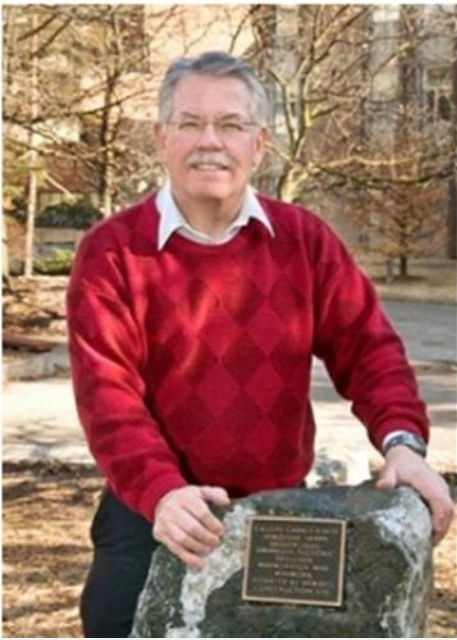
*All amounts are approximations

Total = 936

Source: Alberta Innovates

Locked sands

M. B. Dusseault* & N. R. Morgenstern†



Geotechnical – Material Science Approach:
“Good” Engineering Material – Natural slopes do not shear, but fail along natural planes of weakness. Open pits up to 50 m deep; $\leq 65^\circ$.

FIG. 11. Natural slope heights and maximum inclinations in Athabasca Oil Sand.

Syncrude – Mildred Lake Mine and Plant



DIVISION TALKS **BASS**

*Joslyn Creek
SAGD: Geologic
considerations
related to a surface
steam release
incident, Athabasca
Oil Sands Area,
Northeastern
Alberta, Canada*

SPEAKER
Fran Hein
Energy Resource and Conservation Board

Initial External Tailings Area
- the first 10-12 years of Kearl operation



FOURTH UNITAR/UNDP CONFERENCE ON HEAVY CRUDE AND TAR SANDS

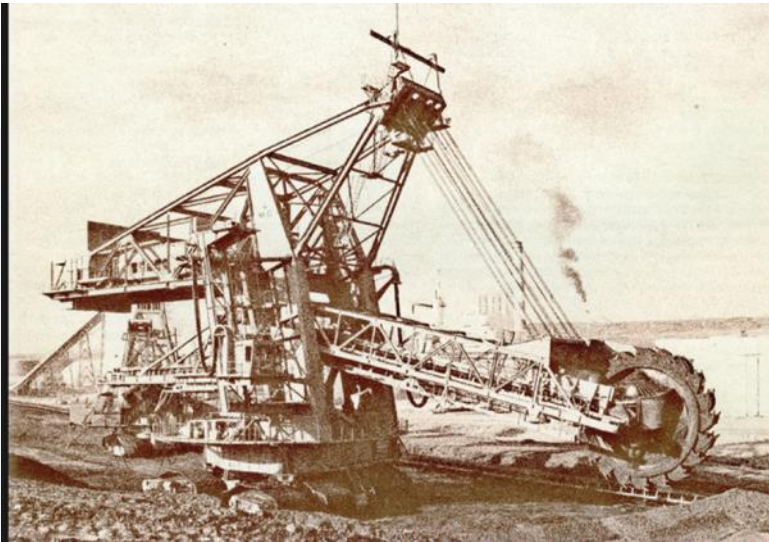
PAPER NO. 32

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SHEAR DILATENCY AND PERMEABILITY ENHANCEMENT IN OIL SANDS

Maurice B. Dusseault and Leo Rothenburg, Departments of Earth Sciences
and Civil Engineering, University of Waterloo; Waterloo, Ontario

“Anthropocene” Present & Future State



Bucketwheel Excavator, used by Suncor from the 1960s – 1970s



Price: **\$5 Million**

Price per Tire: **\$42,500**

Fuel Consumption: **0.3 MPG**

Capacity: **400 tons**

Truck-&-Shovel

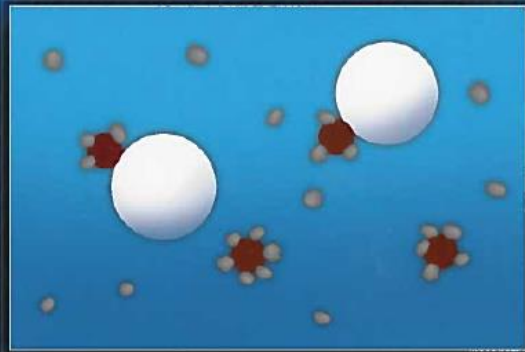
The 797F comes equipped with a new, more powerful and more efficient Cat C175-20 engine and an increased payload capacity of up to 400 short tons (363 t).

(2009 onwards)



Handbook on Theory and Practice of Bitumen Recovery from Athabasca Oil Sands

Volume I: Theoretical Basis



Jacob H. Masliyah
Jan Czarnecki and Zhenghe Xu

Handbook on Theory and Practice of Bitumen Recovery from Athabasca Oil Sands

Volume II: Industrial Practice



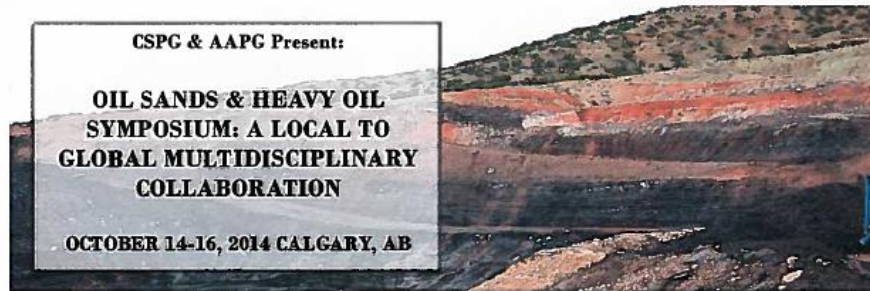
Edited by Jan Czarnecki
Jacob Masliyah, Zhenghe Xu, and Marta Dabros

I am very pleased to share great news with you that our friend and colleague, Jacob Masliyah has been appointed to Alberta Order of Excellence (AOE). This is the highest recognition given by the Alberta Government for outstanding community service and contribution to the Province. Zhenghe Xu, Dept. Chemical and Materials Engineering, University of Alberta (2015)

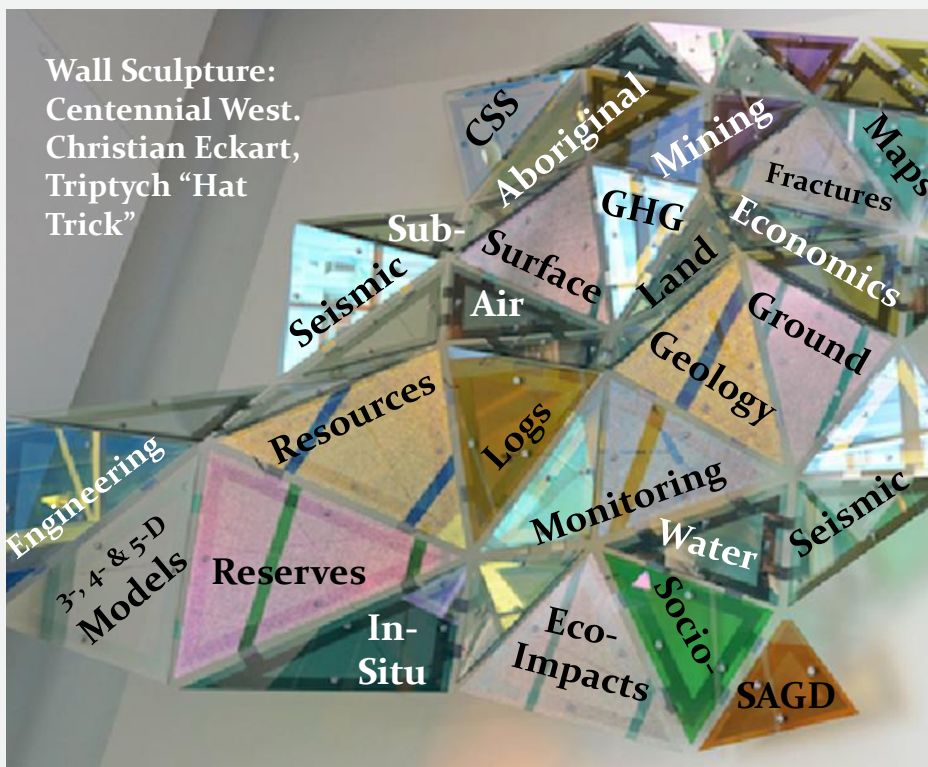
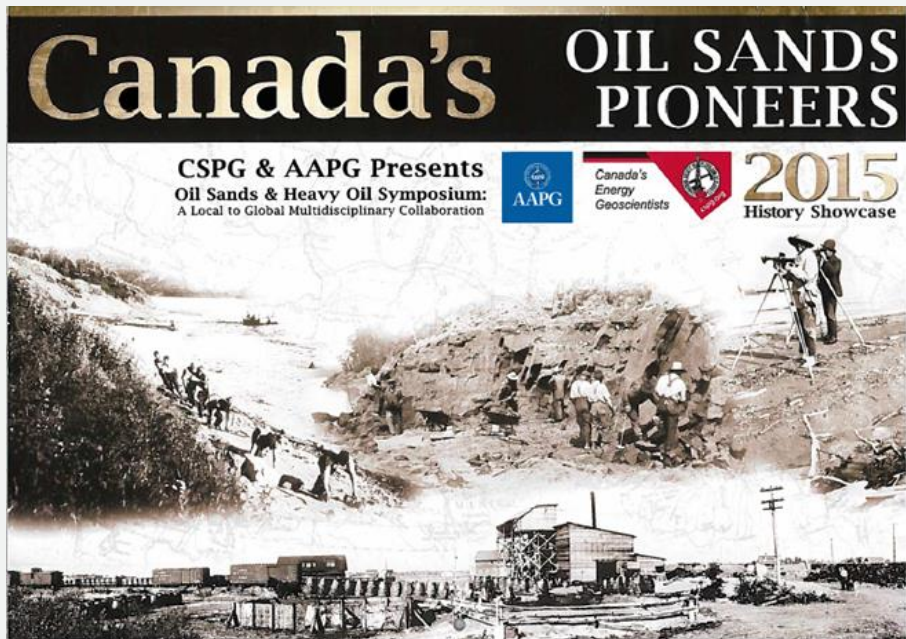
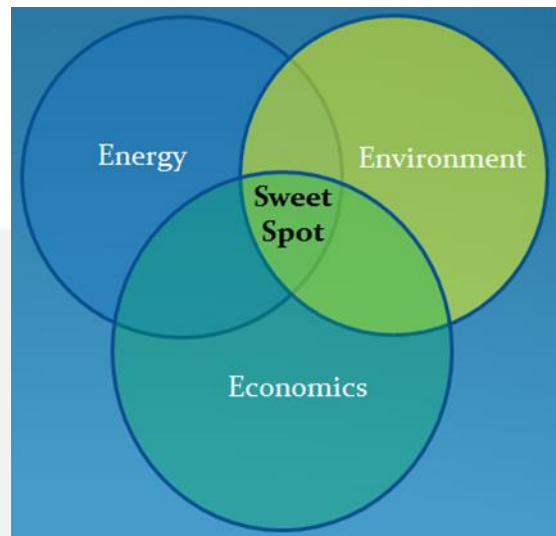
OILS SANDS AND HEAVY OIL SYMPOSIUM

A Great Success!

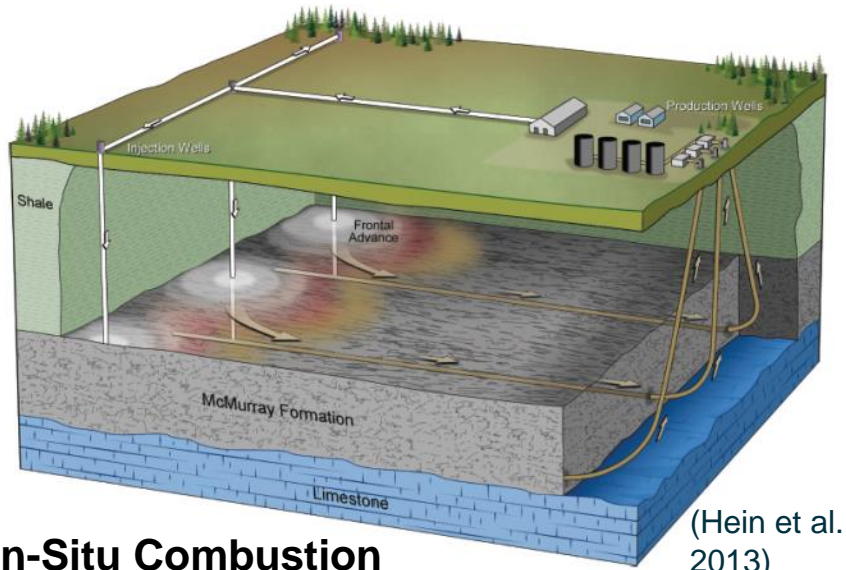
By Fran Hein & Chris Seibel



Hein and Seibel, CSPG Reservoir, December 2014



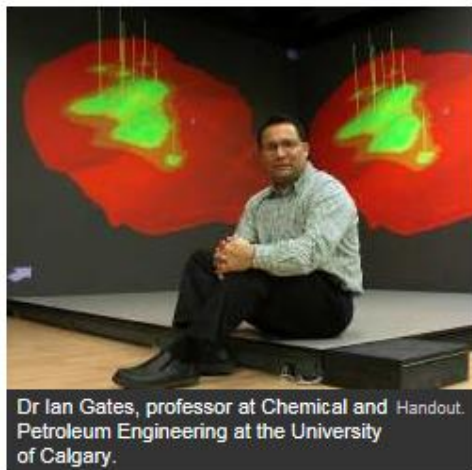
New & Improved Technologies to Commerciality



In-Situ Combustion



The Quest CCS Project, Scottford upgrader; capture CO₂ from oil sands upgrading, transport 65 km north into underground storage in the Basal Cambrian Sandstone



Dr Ian Gates, professor at Chemical and Petroleum Engineering at the University of Calgary.



"I believe that SAGD is sitting probably in the second out of nine innings—we've got a long ways to go, lots of great ideas that are going to continue to improve how we do our business, improve our economics, our returns, and to reduce our environmental footprint."

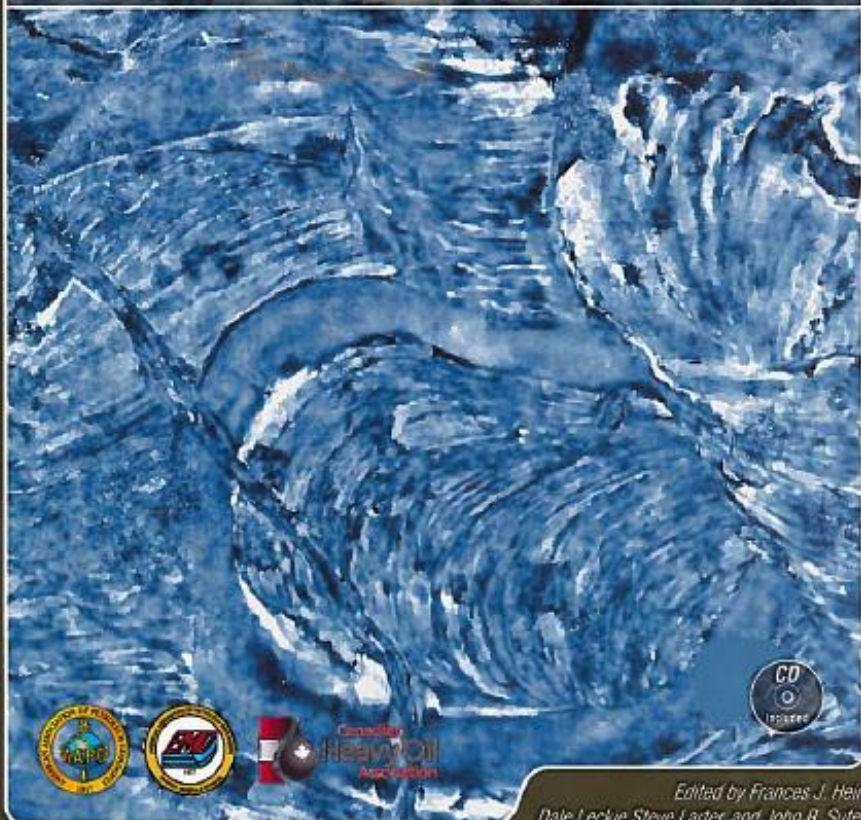
— Harbir Chhina, executive vice-president, oilsands, Cenovus Energy Inc.

Feasibility of In-Situ Combustion in the SAGD Chamber

Oskouel et al., 2011

AAPG STUDIES IN GEOLOGY 64

Heavy-oil and Oil-sand Petroleum Systems in Alberta and Beyond

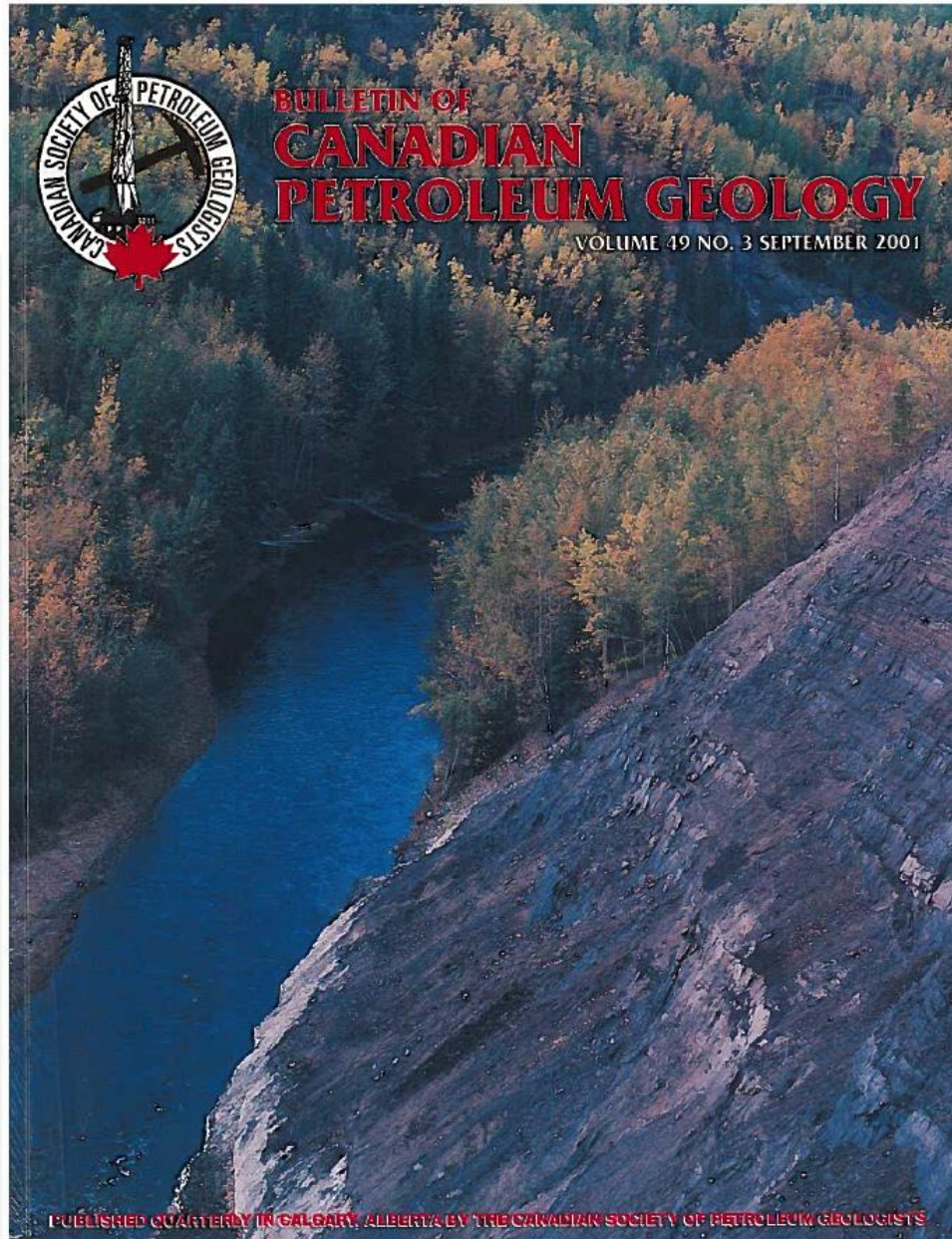


Edited by Frances J. Hein,
Dale Leckie, Steve Lader, and John B. Suter



BULLETIN OF CANADIAN PETROLEUM GEOLOGY

VOLUME 49 NO. 3 SEPTEMBER 2001

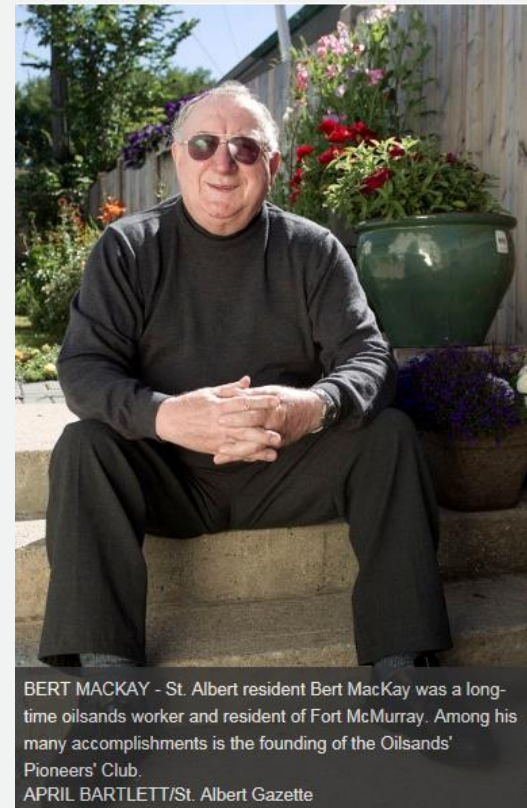


PUBLISHED QUARTERLY IN CALGARY, ALBERTA, BY THE CANADIAN SOCIETY OF PETROLEUM GEOLOGISTS

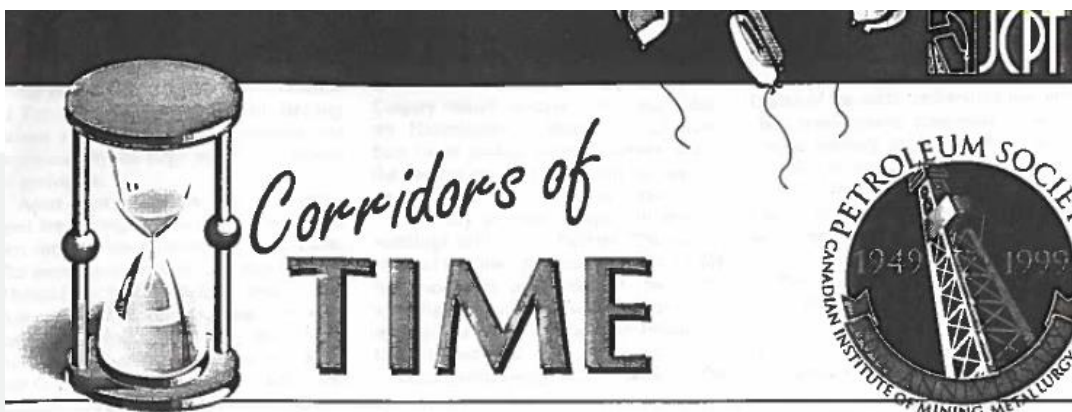
Bert MacKay, former employee of Great Canadian Oil Sands Company (GCOS) & Founder of the Oilsands Pioneers' Club (OPC) and of the popular Oil Sands Discovery Centre.

“I would tell the oilsands companies that they have not told their stories well,” ... “We’re talking about 45 years of oilsands and it’s only in the last few years with the publicity that now they’re starting to tell a reasonable story of the oilsands.”

“We’re dealing with a science story, not a political story. It’s a science story and how that came about and how it’s one of the world’s biggest energy deposits –
The whole story of that is not told.”



BERT MACKAY - St. Albert resident Bert MacKay was a long-time oilsands worker and resident of Fort McMurray. Among his many accomplishments is the founding of the Oilsands' Pioneers' Club.
APRIL BARTLETT/St. Albert Gazette



Aubrey Kerr is the self-published author of four non-fiction best sellers, all of which cover geological, engineering, and land subjects of the early days. He continues to put pen to paper on other oil patch subjects.

Kerr is a life member of the Petroleum Society and a member of CSPG.

Kerr's books continue to be on sale at DeMille's Technical Books, the CSPG office, and the JCPT office.

JACK PORTER-

VIGNETTES OF CANADIAN PETROLEUM GEOLOGY

http://www.edmontonjournal.com/business/oilsands-timeline/index.html?_lsa=c671-491f

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