CANADA’S OIL & NATURAL GAS PRODUCERS

CANADA’S

Oil Sands

CANADASOILSANDS.CA
The future of Canada’s oil sands industry is changing –

and we are excited about it. Like the entrepreneurs who established our industry and helped fuel our world over the past 100 years, we share Canadian values and have built our industry focused on solutions and continuous improvement.

We are going to be using oil for a long time to come – both in Canada and around the world. Canada has a tremendous resource base combined with a stable political environment and skilled people that make it the ideal place to responsibly develop our natural resources.

We know we have an impact on the planet. Just as we are committed to growing our businesses, we are equally committed to improving our environmental performance. We collaborate on our biggest environmental challenges, and develop technologies that lessen our impact on air, land and water, and benefit our country.

We know that our innovation and technological advances will help Canada achieve its global environmental commitments and transition to a cleaner energy future. We know it, because we are working on tomorrow’s energy, today.

So, when it comes to helping the globe meet the need for increasing demands for energy – all forms of energy – we believe the world needs more Canada.
OUR ENERGY FUTURE

The world relies on an energy mix that includes oil, coal, natural gas, hydro, nuclear and renewables. All forms of energy production must increase to meet growing global demand. Canada is uniquely positioned to provide an abundance of safe, secure energy.

165 BILLION BARRELS

Canada has 171 billion barrels of oil that can be recovered economically with today’s technology. Of Canada’s 171 billion barrels of oil, 165 billion barrels are located in the oil sands. SOURCE: AER 2016 and Oil and Gas Journal 2015.

Canada has the third-largest oil reserves in the world.

TECHNOLOGY

New technology and innovation are critical to developing the oil sands and improving environmental performance.

INVESTMENT

The majority (80%) of world oil reserves are owned or controlled by national governments. Only 20% of total world oil reserves are accessible for private sector investment, 50% of which are found in Canada’s oil sands. SOURCE: CAPP 2015

The oil sands are a vital energy source for Canada and the world.
ENERGY

Energy Demand

GLOBAL NEEDS
Global demand for energy is expected to increase 31%* by 2040 as economies in both developed and emerging countries continue to grow and standards of living improve.

SOURCE: IEA 2016 World Energy Outlook
*Growth from 2014 to 2040, New Policies Scenario.

UNCONVENTIONAL
All sources of energy, developed responsibly, will be needed to meet growth in global demand. With conventional oil supply declining, the need for unconventional resources, like oil sands, is increasing.

GLOBAL PRIMARY ENERGY DEMAND
Billion tonnes oil equivalent

SOURCE: IEA 2016, WORLD ENERGY OUTLOOK, NEW POLICIES SCENARIO

Energy Supply

SECURITY OF SUPPLY
Supplying energy to Canada and beyond generates economic benefits across the country. For global customers, importing energy from Canada makes sense. Canada is politically stable, infrastructure is robust and environmental standards are high.

FUELLING CANADA
Oil sands production provides secure and reliable supply, reducing reliance on foreign imports and providing economic growth in both Canada and the U.S.

PRODUCTION
Over the last 35 years, Canadian crude oil production has increased by 2.4 million barrels per day mostly due to the growth in supply from the oil sands.

CANADIAN PRODUCTION:
BARRELS PER DAY

<table>
<thead>
<tr>
<th></th>
<th>1980</th>
<th>2015</th>
<th>2025 F</th>
<th>2030 F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil</td>
<td>1.5 million</td>
<td>3.9 million</td>
<td>4.6 million</td>
<td>4.9 million</td>
</tr>
<tr>
<td>(incl. oil sands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Sands</td>
<td>0.1 million</td>
<td>2.4 million</td>
<td>3.3 million</td>
<td>3.7 million</td>
</tr>
</tbody>
</table>

In 2015 more than 60% of Canada’s crude oil production was from the oil sands.

SOURCE: CAPP 2016
Oil is an important part of daily life in Canada, providing energy for transportation, residential and industrial uses.

**USES**

**Energy Use**

Canadians consume a lot of energy. We need it to stay warm, do our work and get from place to place.

Crude oil derived from the oil sands is sent to refineries across North America to make gasoline, diesel, aviation fuel and other consumer products.

**FUELS**

**GASOLINE**

Gasoline is the fuel designed for spark-ignition internal combustion engines. It is commonly used in automobiles.

**AVIATION FUELS**

Aviation fuels are specialized petroleum-based fuels used to power various types of aircraft.

**DIESEL**

Diesel is a fuel designed for engines commonly used in trucks, buses, locomotives, and farm and heavy equipment. It contains more energy and power density than gasoline.
USES
Energy Use

CANADIAN CONSUMPTION
Transportation accounts for 23% of the total energy that Canadians consume — second only in consumption to Canada’s industrial sector. That translates to 200 million litres of gasoline and diesel pumped into fuel tanks across the country on a daily basis just for mobility, without which our modern lifestyle would be impossible.

ENERGY DEMAND BY SECTOR, 2014

SOURCE: NEB 2016

PRODUCTS
Thousands of everyday products get their start from crude oil. Raw materials used to create items including ink, crayons, dishwashing liquids, deodorant, eyeglasses, cosmetics, tires, ammonia, telephones and heart valves are derived from feedstocks from crude oil.

AVERAGE OUTPUT FROM A BARREL OF OIL (%), CANADA

SOURCE: CFA 2013

*INCLUDES PETRO-CHEMICAL FEEDSTOCKS, NAPHTHA, LUBRICATING OILS AND GREASES, STILL GAS, AND OTHER BY PRODUCTS.
Canada has the third largest oil reserves in the world. 97% of these reserves are located in the oil sands.

OIL SANDS
Oil sands are a natural mixture of sand, water and bitumen.

BITUMEN
Bitumen is oil that is too heavy or thick to flow on its own. It must be diluted, pumped without being diluted or heated. Some bitumen is found within 70 metres (200 ft) from the surface but the majority is deeper underground.

LOCATION
Canada’s oil sands are found in three deposits - the Athabasca, Peace River and Cold Lake deposits in Alberta and Saskatchewan. The oil sands are at the surface near Fort McMurray but deeper underground in other areas.
THE RESOURCE

Recovering the Oil

Oil sands are recovered using two main methods: drilling (in situ) and mining. The method used depends on how deep the reserves are deposited.

IN SITU METHOD

80% of all oil sands reserves are too deep to be mined. These reserves are recovered in place, or “in situ”, by drilling wells. Drilling methods create minimal land disturbance and do not require tailings ponds.

Advanced technology is used to inject steam, combustion or other sources of heat into the reservoir to warm the bitumen so it can be pumped to the surface through recovery wells.

80% of oil sands could be recovered through drilling. 20% of oil sands could be recovered through mining.

CYCLIC STEAM STIMULATION DRILLING (IN SITU) METHOD

Stage 1
Steam injected into the reservoir

Stage 2
Steam heats the viscous oil

Stage 3
Heated oil and condensed steam pumped to the surface

STEAM ASSISTED GRAVITY DRAINAGE DRILLING (IN SITU) METHOD

Stage 1
Surface wellhead: Horizontal wells are drilled based on the location of bitumen deposits

Stage 2
Steam is injected underground to liquefy the bitumen

Stage 3
Bitumen is pumped to the surface through a recovery well
THE RESOURCE
Recovering the Oil

MINING METHOD

Stage 1
Mining shovels dig into sand and load it into trucks.

Stage 2
Trucks take oil sands to crushers, where it is prepared for extraction.

Stage 3
Hot water is added to the oil sands and then transported via hydrotransport to the extraction plant.

Stage 4
Bitumen is extracted from the oil sands in the separation vessels.

20% of the oil sands reserves are close enough to the surface to be mined using large shovels and trucks.

20% of oil sands could be recovered through mining.
80% of oil sands could be recovered through drilling.

UPGRADING AND REFINING
Once recovered, bitumen from the oil sands can be upgraded from heavy to light oil and sent to refineries in Canada and the U.S. to be converted into petroleum products such as gasoline, diesel and jet fuel.

1.2 MILLION
In 2015, about 1.2 million barrels per day or 48% of the total bitumen produced in Canada was upgraded in Canada.

SOURCE: CAPP 2016
Canadian crude oil producers continue to build new markets for their expanding production.

**Markets**

Today essentially all of Canada’s oil exports go to one customer — the United States. Access to multiple customers beyond the United States is crucial to strengthen Canada’s energy future.

**DIVERSIFICATION**

Without better access to tidewater and domestic markets Canada receives fewer economic benefits from oil sands development.

The West Coast is a critical outlet for Canadian oil to reach customers in Asian markets. Exporting Canadian oil creates significant economic benefits including jobs for Canadians across the country.

Eastern Canada currently imports almost 60% of the crude oil it processes from foreign suppliers such as the U.S., Saudi Arabia, and Algeria. This cost almost $17 billion in 2015.
Bitumen and crude oil are transported three ways: pipeline, marine transport and rail car.

Canada needs more pipelines in all directions to move our growing oil supply to more customers.

Today, Canada has limited pipeline infrastructure to move crude oil from Western Canada to Eastern Canada and beyond to global customers.

A number of pipeline projects are being proposed to connect the growing supply with growing markets in India, China and Eastern Canada.

To flow, the bitumen — which was separated from the sand at the source — is diluted with condensate or upgraded light crude oil. Once mixed with a diluent, the dilbit does not separate but is a new mixture.
MARINE TRANSPORTATION

SAFE FOR 80 YEARS
Oil tankers have been moving safely and regularly along Canada’s West Coast since the 1930s.
SOURCE: Transport Canada 2016

DOUBLE-HULLED
Large single-hulled crude oil tankers were prohibited in 2010 and can no longer operate in Canadian waters. Double-hulled means the bottom and sides of a vessel have two complete layers of water-tight hull surface.
SOURCE: Transport Canada 2013

580 MILLION BARRELS
Each year, about 580 million barrels of oil are safely transported along Canada’s East and West coasts via tanker.
SOURCE: Transport Canada 2016

500 TANKER VISITS
At present, fewer than 500 oil tankers transit along Canada’s West Coast each year. While most West Coast oil tankers are U.S.-bound, about 200 call on Port Metro Vancouver.
SOURCE: IHS CERA 2013

HIGH STANDARDS
All oil tankers using Port Metro Vancouver are subject to the same international agreements, rules and strict national and port authority standards.
SOURCE: IHS CERA 2013

CLOSER TO ASIA
Asian markets are an eight-day to an 11-day sail from proposed West Coast terminals, two days closer than most of our international competitors.

CROSS SECTION OF A DOUBLE-HULLED MARINE VESSEL

Canada has the world’s longest coastline at more than 243,000 kilometres.
Canada’s oil sands industry provides economic benefits across Canada.

Without new pipelines, every new barrel of oil will move by rail. In 2015, about 140,000 barrels per day of crude oil – or about 4% of Western Canada’s production – were moved by rail.

SOURCE: CAPP 2016

Rail loading capacity in Western Canada is currently about 754,000 barrels per day. SOURCE: CAPP 2016
$4 TRILLION
Oil sands development is expected to contribute more than $4 trillion to the Canadian economy over the next 20 years — about $200 billion per year.
SOURCE: CERI 2015

$1.5 TRILLION
The oil sands industry will pay an estimated $1.5 trillion in provincial and federal taxes and provincial royalties over the next 20 years. Governments use this economic contribution to help pay for things Canadians value and want such as healthcare, education and public infrastructure.
SOURCE: CERI 2015

In addition to paying significant royalties and taxes, the oil sands industry is a major employer and creates jobs across Canada.

225,000 JOBS
Direct employment in Canada as a result of new oil sands investments is expected to grow from 151,000 jobs in 2014 to 225,000 jobs in 2038. When including indirect jobs, employment numbers more than double across Canada in both years.
Source: CERI 2014

The goods, materials and services used to construct and operate oil sands projects, mines and upgraders come from across North America. Many of the components — tires, trucks, gauges, valves, pumps, etc. — are produced in Ontario and Québec.

JOB CREATION
For every direct job created in the oil sands industry, about one indirect and one induced job will be created in the rest of Canada.
Source: CERI 2011
Canadian Benefits

NUMBER OF COMPANIES THAT HAVE DIRECT BUSINESS WITH THE OIL SANDS — PROVINCES OUTSIDE ALBERTA

SOURCE: CAPP 2016

OVER 3,400 DIRECT SUPPLIERS

In 2014 - 2015, more than 3,400 companies from across Canada had direct business (goods and/or services) with the oil sands.

Source: CAPP 2016

“The oil sands are tremendous for Ontario. We’ve been selling equipment to the oil sands for a decade now. It’s bringing business and new job opportunities to us.”

Don Berggren, President
Berg Chilling Systems Inc.
Toronto, Ontario

“The economic impact of supplying goods and services to the oil sands on our region is phenomenal. For Prevost, the development of the oil sands has meant the creation of stable jobs. The oil sands are good for Prevost, good for Québec and all of Canada.”

Gaétan Bolduc, President and CEO
Prevost Coach Manufacturer
Sainte-Claire, Québec

“We developed specialty gloves for the oil sands. The company started in B.C. and has now expanded across the country, and is an example of B.C. people making a difference.”

Martin and Michele Moore
Watson Gloves
Vancouver, B.C.
ECONOMY

Canadian Benefits

B.C.
$1.3 BILLION
$1.3 billion was spent by oil sands producers on procurement in British Columbia between 2014 and 2015.
Source: CAPP 2016

Ontario
$3.9 BILLION
About $3.9 billion was spent by oil sands producers on procurement in Ontario between 2014 and 2015.
Source: CAPP 2016

Québec
$1.2 BILLION
About $1.2 billion was spent by oil sands producers on goods and services in Québec between 2014 and 2015.
Source: CAPP 2016

Aboriginal Communities

Canada’s oil sands industry continues to build positive and mutually beneficial relationships with aboriginal communities where we work.

Consultation
Industry works with potentially affected aboriginal groups to seek ways to mitigate impacts of oil sands development. Aboriginal groups, through consultation and engagement in regulatory processes, and through Canada’s legal system, are afforded multiple levels of due process.

Community
In 2013, oil sands companies contributed more than $6 million to aboriginal communities in the Wood Buffalo and Lac La Biche regions for school and youth programs, celebrations, cultural events, literacy projects and other community programs.
Source: OSCA 2014

Over 300 Companies
In 2013 and 2014, more than 300 aboriginal companies from across Alberta had direct business (goods and/or services) valued at $4 billion with oil sands operators. These companies represent 54 communities across Alberta.
Source: CAPP 2015
ECONOMY
Aboriginal Communities

LOCATION OF ABORIGINAL COMPANIES THAT HAD DIRECT BUSINESS WITH OIL SANDS OPERATORS IN 2013 AND 2014.

INDUSTRY IN ACTION

The Fort McKay Group of Companies LP (FMGOC), which works extensively with oil sands operations through its six divisions, brings in more than $150 million in revenue annually. FMGOC is completely owned and controlled by the Fort McKay First Nation.

Source: Fort McKay Group of Companies

ENGAGING INDIGENOUS BUSINESSES
Finding solutions to engage, create and sustain opportunities for the indigenous business community is a fundamental goal at Imperial. At the company’s existing operations, it has local and indigenous suppliers providing a wide variety of services including charter aviation, janitorial, construction, security, road maintenance, scaffolding, environmental services and well servicing.

The company also offers local and indigenous suppliers information and training on its procurement process and requirements and offers in-depth debriefs to unsuccessful local and indigenous vendors to help them succeed in the future.

Since 2009, Imperial has spent in excess of $1.5 billion with indigenous suppliers, spending $329 million with more than 100 different indigenous suppliers in 2015 alone.

Source: CAPP 2015
Canada’s oil sands producers are committed to developing solutions for a cleaner energy future.

ACCELERATING PERFORMANCE
As Canada’s oil sands industry works to help meet global energy demand, at the same time we are accelerating environmental performance.

CANADA’S OIL SANDS INNOVATION ALLIANCE (COSIA)
COSIA is an alliance of oil sands producers focused on accelerating the pace of environmental performance in Canada’s oil sands through collaborative action and innovation.

COSIA brings together thought leaders from industry, government and academia to improve measurement, accountability and environmental performance in four priority areas: tailings, water, land and greenhouse gases.

To date, COSIA’s 13 member companies have shared 936 distinct technologies and innovations that cost more than $1.33 billion to develop.

www.cosia.ca
ENVIRONMENT
Protection Spending

$4.7 BILLION
Canadian businesses reported spending $10.9 billion on environmental protection in 2012 (the latest year for which Statistics Canada has published data). $4.7 billion was spent by the oil and natural gas industry. About half of this money was spent on capital investment projects; investments designed to improve long-term pollution prevention, abatement and control.
SOURCE: Statistics Canada 2012
ENVIRONMENT

Regulating and Monitoring

Reliable, long-term environmental monitoring based on sound science is in everybody’s best interest. Oil sands operators must adhere to stringent regulations. Approvals from numerous regulatory agencies are required at every phase, from construction and operation to decommissioning and reclamation.

Existing monitoring systems gather valuable data for independent scientific review and inform new monitoring needs as industry grows.

JOSM
JOINT OIL SANDS MONITORING
The Alberta and Canadian governments are working together to implement JOSM, a world-class monitoring program that integrates all environmental components.

WBEA
WOOD BUFFALO ENVIRONMENTAL ASSOCIATION
WBEA manages programs that include air, land and human exposure monitoring, and operates the most extensive ambient air network in Alberta.

WBEA reports continuous ambient air quality data, in real time, directly to their website.

LARP
THE LOWER ATHABASCA REGIONAL PLAN
LARP established new environmental frameworks to safeguard regional air and surface water quality and increase the amount of land set aside for conservation to more than two million hectares.

Through the Land-use Framework process and the Lower Athabasca Regional Plan (LARP), the Government of Alberta has committed to setting cumulative environmental limits to inform oil sands development.

The total conserved land through LARP is three times the size of Banff National Park.
Canada, with 0.5% of the world’s population, produces about 2% of global CO₂ equivalent emissions.

**GLOBAL GHG EMISSIONS 2012**

- **24% China**
- **14% United States**
- **10% European Union**
- **2% Canada**
- **50% Other**

**GHG EMISSIONS**

Oil sands account for 9.3% of Canada’s GHG emissions and about 0.13% of global GHG emissions.

**CANADA’S GHG EMISSIONS BY SECTOR 2014**

- **10% Emission Intensive and Trade Industries**
- **12% Buildings**
- **23% Transportation**
- **11% Electricity**
- **9.3% Oil Sands**
- **10% Agriculture**
- **7% Waste and Others**
- **13% Other Upstream**
- **5% Downstream and Transmission**

Carbon dioxide (CO₂) is a GHG. CO₂ is emitted into the air by burning fossil fuels for electricity generation, industrial uses, transportation and for heat in homes and buildings.

**WELLS-TO-WHEELS**

Measuring GHG emissions from the start of oil production (wells) through to combustion (wheels) is called a wells-to-wheels or life cycle analysis.

**INTENSITY**

Oil sands crude has similar CO₂ emissions to other heavy oils. It is 9% more intensive than the U.S. crude supply average on a wells-to-wheels basis.

**FULL-CYCLE GHG EMISSIONS OIL SANDS AND U.S. REFINED CRUDES**

- **WELL-TO-TANK**
- **REFINED PRODUCT COMBUSTION**

- **Venezuela - Petrozuata**
- **U.S. - Kern River**
- **Average Oil Sands Refined in the U.S. (tight boundary)**
- **Most Recent Oil Sands in Situ**
- **Venezuela - Bachaquero**
- **Mexico - Maya**
- **Most Recent Oil Sands mining**
- **Average U.S. barrel refined in the U.S. (2005)**

**AVG. BARREL REFINED IN THE U.S. (2005)**

- **+20%**
- **+9%**
- **+9%**
- **+5%**
- **+4%**
- **+3%**
- **+2%**

**KG CO₂E PER BARREL OF REFINED PRODUCT**

SOURCE: World Resources Institute 2016

SOURCE: Environment and Climate Change Canada 2016

SOURCE: IHS CERA 2012
**ENVIRONMENT**

**Air Quality**

**24 | 7 | 365**

The Wood Buffalo Environmental Association (WBEA) monitors the air in the oil sands region in and around Fort McMurray 24 hours a day, 365 days a year. WBEA’s air quality monitoring network is one of the most extensive in North America.

Air monitoring information is available in real time at [wbea.org](http://wbea.org).

**IMPROVING OR STATIC**

Data collected over the past 10 years at monitoring stations across Alberta indicate air quality is improving in some areas and remaining consistent in others.

SOURCE: WBEA and CASA

**NO DETERIORATION**

Based on analysis of average concentrations of common air pollutants, overall air quality has not deteriorated in the Wood Buffalo region even with an increase in industrial activities and population growth.

SOURCE: WBEA and CASA

Air quality in Fort McMurray is better than many North American cities - including Toronto, Edmonton and Seattle - benchmarked by the Clean Air Strategic Alliance (CASA).

**INDUSTRY IN ACTION**

**COSIA IN SPACE**

COSIA is literally going out of this world to achieve its vision of accelerating the pace of environmental performance in Canada’s oil sands. Through COSIA, oil sands operators will investigate the use of satellite technology to measure greenhouse gas (GHG) emissions from tailings ponds and mine faces.

Imperial Oil is leading the joint industry project with Canadian Natural, Shell and Suncor to work with GHGSat (a global emissions monitoring company based in Québec) to investigate the use of satellite technology to provide more accurate and frequent measurements of GHG emissions.

The satellite named “Claire” launched on June 22, 2016 and will remain in orbit for at least one year. It will circuit above Alberta’s oil sands mining operations once every two weeks and conduct concentration measurements and transmit them back to Earth.

[www.cosia.ca](http://www.cosia.ca)
ENVIRONMENT

Water

Canada’s oil sands industry recycles water and continues to look for ways to reduce fresh water use.

0.3 BARRELS
In 2014, drilling (in situ) production required an average 0.3 barrels of fresh water for every barrel of bitumen produced.
SOURCE: CAPP 2015

2.8 BARRELS
In 2014, mining required an average 2.8 barrels of fresh water for every barrel of bitumen produced.
SOURCE: CAPP 2015

80 - 95%
Oil sands producers recycle 80 - 95% of water used.
SOURCE: Government of Alberta

188 MILLION M³
Oil sands fresh water use in 2014 was about 188 million m³.
SOURCE: CAPP 2015

Water Use

REGULATED
The Alberta Energy Regulator oversees the industry’s use of water. Large water users must apply to divert fresh water from its original source. The amount of water allocated is based on sustaining Alberta’s groundwater and surface water.

Each sector applies for water licences and the government allocates water based on these applications. In 2012, the oil sands industry represented about 8% of total provincial water allocations. But not all of that water was actually used. The oil and natural gas industry uses less than a third of its total water allocation per year.

Strict provincial regulations restrict water withdrawal when river flow is low.

ALBERTA WATER ALLOCATIONS 2014

8% OIL SANDS
2% CONVENTIONAL OIL & NATURAL GAS
30% COMMERCIAL
43% IRRIGATION/AGRICULTURE
11% MUNICIPAL
6% OTHER
SOURCE: AER
ENVIRONMENT

Water Use

ATHABASCA RIVER
The Athabasca River is the main source of water for oil sands mining projects.

LESS THAN 3%
In 2014, 59% of the fresh water used for oil sands mining was from the Athabasca River (100 million m³). This is 0.5% of average annual river flow and 2.2% of the minimum monthly flow in 2014.
SOURCE: CAPP

WATER SUPPLY
Northern Alberta, where oil sands operations occur, has more than 86% of Alberta’s water supply.
SOURCE: Alberta Environment and Parks 2015

Water Quality

MONITORED
There is a joint federal - provincial monitoring program in the oil sands region carried out by Environment Canada and the Government of Alberta’s Environmental Monitoring and Science Division.

MANAGED
A Surface Water Quality Management Framework was developed as part of the Lower Athabasca Regional Plan (LARP). The framework includes ambient surface water quality triggers and limits. Triggers are intended to give advance notice of less favourable trends, while limits are established as the upper boundaries that must not be crossed. A management response is required if quality triggers or limits are exceeded.
ENVIRONMENT

Tailings Ponds

TAILINGS
Tailings are a mixture of water, sand, clay and residual bitumen, and are the by-product of the hot water treatment process used to separate the oil from the sand and clay. Tailings are stored in large engineered dam and dyke systems called tailings ponds, designed to settle out the solid particles from the water.

WATER RECYCLING
Water is continuously recycled from the tailings ponds back into the extraction process, reducing new withdrawals of fresh water from the Athabasca River and other sources.

FLUID TAILINGS
Although sand separates quickly from the tailings, smaller particles of clay and silt remain in suspension and form fluid tailings that take up to 30 years to separate. New technologies are accelerating the settling process.

RECLAMATION
To ensure fluid tailings volumes are managed appropriately, the Government of Alberta released the Tailings Management Framework in March 2015 which will ensure fluid tailings are in a ready-to-reclaim state within 10 years of the end-of-mine life.

$1.2 billion has been invested in tailings-reduction technology by oil sands operators.

WATER QUALITY
All tailings ponds are constructed with containment dykes and groundwater monitoring facilities to capture run-off and minimize seepage.

BIRDS
Residual bitumen can be found at the surface of most tailings ponds, posing a threat to birds and waterfowl that land on ponds. Several mechanisms are in place to deter birds, including propane cannons and radar/laser-activated acoustic deterrent systems, like those used at airports.
INDUSTRY IN ACTION

RIFLE TUBE TECHNOLOGY

Through COSIA, oil sands companies are looking at ways to increase energy efficiency while reducing boiler blowdown and water use in SAGD operations.

Rifle Tube Technology involves using a “rifled” or “ribbed” tube instead of the smooth tubes currently used in boilers and heat exchangers that produce steam for SAGD. The internal ribbing of rifle tubes introduce centrifugal force in the tubes helping to uniformly and more efficiently turn water into steam, which means higher energy efficiency and less water use.

Devon Energy just completed a 10-month demonstration pilot at their Jackfish in situ facility and will use the results to conduct additional tests to further advance the technology.

www.cosia.ca

LIDEA PROJECT

The LiDea Project uses innovative techniques to restore some of the original characteristics of the forest to areas of linear disturbance. During the spring and summer, conifer seedlings are planted along older seismic lines using specially prepared mounds. The mounds protect the seedlings from invasive grasses, which could impair their growth. Recently 100% of the 237 km of legacy linear features within the LiDea area have been restored.

FLYING DRILLING RIG

Picture a drilling rig. Now, picture a flying drilling rig. The SkyStrat™ drilling rig is a new rig Cenovus developed to improve the drilling of stratigraphic wells in the oil sands. It is about two-thirds the size of a conventional rig and can be transported by helicopter, allowing the companies to access remote drilling locations year-round.
ENVIRONMENT

Land

LAND IMPACTS
Alberta’s oil sands lie under 142,000 km² of land. Only about 3%, or 4,800 km², of that land could ever be impacted by the mining method of extracting oil sands.

The remaining reserves that underlie 97% of the oil sands surface area are recoverable by drilling (in situ) methods which require very little surface land disturbance.

OIL SANDS LAND USE

Canada’s oil sands industry is committed to reducing its footprint, reclaiming all land affected by operations and maintaining biodiversity.

94%
An Alberta Biodiversity Monitoring Institute (ABMI) report states that the Lower Athabasca region’s living resources are 94% intact. This compares to 54% in Southern Alberta.

SOURCE: Alberta Environment and Parks

0.02%
0.02% of Canada’s boreal forest has been disturbed by oil sands mining operations over the past 40 years.

SOURCE: Alberta Environment and Parks

10%
Since operations began in the 1960s, about 10% of the active mining footprint has been or is being reclaimed by industry. Reclaimed land will be certified by government when it can be returned to public use.

SOURCE: Oil Sands Portal 2015

90,000 KM²
In Alberta alone, about 90,000 km² (or about 24%) of the boreal forest is protected from development (includes national parks, etc.).

SOURCE: CAPP 2015

*For more information on how oil sands are extracted, see pages 12 - 15.
ENVIRONMENT
Land Reclamation

HOW BIG IS 904 KM²?

<table>
<thead>
<tr>
<th>Area (KM²)</th>
<th>City Proper</th>
<th>Greater Metropolitan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calgary, Alberta</td>
<td>848</td>
<td>5,107</td>
</tr>
<tr>
<td>Hamilton, Ontario</td>
<td>1,117</td>
<td>1,371</td>
</tr>
<tr>
<td>Madrid, Spain</td>
<td>605</td>
<td>4,609</td>
</tr>
</tbody>
</table>

THE SIZE OF ENGLAND?
Some organizations claim the oil sands are destroying an area the size of England (about 130,000 km²). In fact, the total mining footprint covers an area about 0.6% the size of England and 10% of that land has been or is being reclaimed. The total area that could be impacted by mining is about 4% the size of England.

LAW
Alberta law requires all lands disturbed by oil sands operations be reclaimed. All companies are required to develop a reclamation plan that spans the life of the project.

CERTIFICATION
Reclamation is an ongoing process during the life of a project. Companies apply for government reclamation certification when vegetation is mature, the landscape is self-sustaining and the land can be returned to the Crown for public use.

PROCESS: IT TAKES TIME
The reclamation process involves monitoring, seeding, fertilizing, tree planting, seed collecting, topsoil salvaging and replacing. It also involves significant landform creation and contouring.

SOURCE: CAPP

It can take up to 80 years for a conifer tree to grow to maturity.
THE FACTS

Research indicates that Canadians want a balanced discussion about energy, the economy and the environment. This pocket book is designed to give you fast, easy access to oil sands facts that will help you get in on the discussion.

Facts are sourced from credible third parties or are developed using CAPP data that is checked against other data sources, including government reports.

DIG DEEPER

We couldn’t cover it all in this little book! So we have provided links to various sources at the end of the book.

Go ahead, dig deeper.

MORE FACTS?

Are you curious about facts that aren’t covered here? Send your questions to publications@capp.ca. We will respond.

To order printed copies of Canada’s Oil Sands, email publications@capp.ca.

UPDATES

The facts provided in this book are current as of November 2016.

A regularly updated version is available online at: www.canadasoilsands.ca.

Discover the oil sands with social media: @can_oilsands Canadas Oilsands

FIND OUT MORE

About the Oil Sands Industry

ALBERTA BIODIVERSITY MONITORING INSTITUTE (ABMI)
abmi.ca

ALBERTA CHAMBER OF RESOURCES
acr-alberta.com

ALBERTA ENERGY
energy.alberta.ca

ALBERTA ENERGY REGULATOR
aer.ca

ALBERTA ENVIRONMENT AND NATURAL RESOURCES
alberta.ca/environment-natural-resources.aspx

IHS MARKET
cera.com

CANADIAN FUELS ASSOCIATION
canadianfuels.ca

CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS (CAPP)
capp.ca and canadasoilsands.ca

CANADIAN ENERGY RESEARCH INSTITUTE (CERI)
ceri.ca

CANADA’S OIL SANDS INNOVATION ALLIANCE
cosia.ca
THE CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS

capp.ca

The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP’s member companies produce about 85 per cent of Canada’s natural gas and crude oil. CAPP’s associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP’s members and associate members are an important part of a $120-billion-a-year national industry that provides essential energy products.

CAPP’s mission, on behalf of the Canadian upstream oil and natural gas industry, is to advocate for and enable economic competitiveness and safe, environmentally and socially responsible performance. Competitiveness, in North America and globally, is necessary so as to attract the capital necessary to grow production and expand markets to deliver value to the Canadian public and to our investors. Public confidence, from governments, Aboriginal Peoples, the public, stakeholders and the communities in which we operate, will be determined by our collective performance and the effectiveness of our communications and outreach.