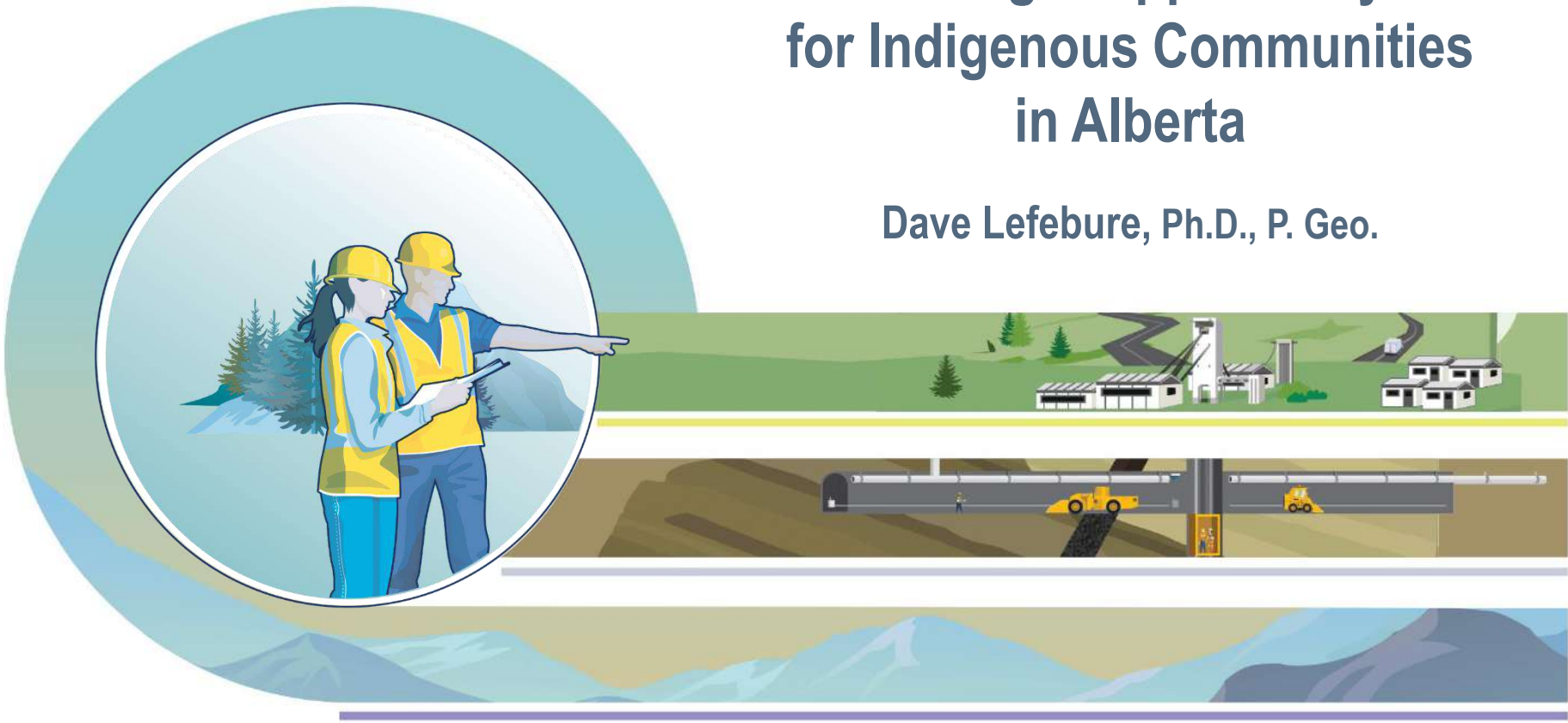
Mining = Opportunity for Indigenous Communities in Alberta

Dave Lefebure, Ph.D., P. Geo.



March 2021 Slide Deck

cando
Inspiring Success

Natural Resources Canada
Ressources naturelles Canada

Canada

At Your Service Today

- Share some examples of Indigenous business opportunities related to mining
- Explain mining in everyday language
- *Answer your questions*
- Share some insights into this unique sector
  - ***"Like forestry, a natural resource sector, but you can count the trees while new mines are hidden."***
  - ***"Like the technology industry, a high risk sector, but work can occur in challenging, remote environments."***
  - ***"Very different from the oil and gas sector, the other extractive industry"***

Why Explore for Minerals?

Society is increasingly dependent on minerals!

- Metals
  - copper for electrical wires, zinc to galvanize steel, gold for jewelry/electronics
- Coal
  - Critical for making steel
- Minerals
  - Gypsum for wallboard, phosphate for fertilizers
- Rocks
  - Gravel for highways and building foundations, limestone to make cement, granite for building

Presentation Outline

1. Opportunities for Indigenous mining jobs, businesses and agreements in Alberta

   question and answer session

2. Lifecycle of mining related to Alberta and potential economic opportunities for indigenous communities
3. End with a few key points relevant to economic development officers related to mining

   question and answer session

Why Talk About Mining Opportunities?

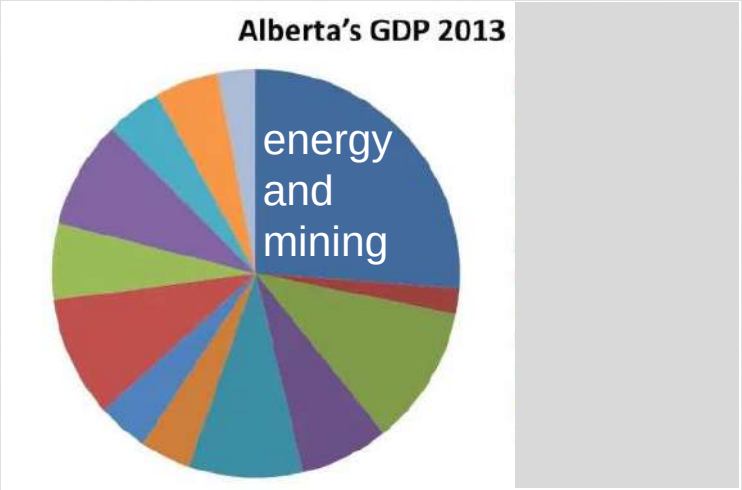
Four reasons:

1. Jobs and contracts
   - mining is #2 employer of Indigenous peoples in Canada
   - goods and services contracted out by mining companies
2. Numerous agreements with Indigenous communities
   - potential for significant benefits
   - a relatively recent development (largely since 2000)
3. Mines are spread across much of Alberta
   - rural and suburban locations
4. Mining sector not well known
   - many people have never visited a mine or learned about them

Don’t miss economic development opportunities!

1a. Indigenous Employment in Alberta Mines

- Across Canada Indigenous peoples working in mining accounted for 12% of the industry's labour force*
  - up from 8% in 2011
  - compares with an all-industry average of 4% Indigenous workers
- For every mining job, there are at least two jobs in the mining supply and service sector
  - ~12,000 jobs related to mining
- Many attractive jobs that build work skills
- Jobs exist in many regions of Alberta



* Statistics Canada, 2016 Census of Population

Wide Variety of Jobs

Wide Variety Mine Jobs

Mine Workings

Surveyor`s helper

Miner

Driller

Heavy Equipment Operator

Shift Foreman

Etc.

Mill/Shop

Trades helper/ apprentice

Warehouse assistant

janitor

Technicians

Certified trades

Etc.

Offices

Students

Secretarial

Admin

Engineers

Geologists

Technicians

Accountant

Etc.

Camp

Janitorial

Kitchen

Cook

Admin

Repairs

Safety

Security

Etc.

Roads, Etc.

Snow removal

Road work

Trucking

Gravel pit Supplies

Diesel fuel

Explosives

Etc.

Over 160 different mining jobs

Mining Occupations

Surface Mining Equipment Operator

Are you into heavy equipment? Do you have stamina and great hand-eye co-ordination? Can you stay alert while repeating tasks? Then you may want to dig into a career as a surface mining equipment operator.

Outlook	Avg. Wage	Min. Education
below avg	**$30.77**	**Varies**

Environmental Auditor

Are you persistent? Are you passionate about protecting our environment? Do you like research and gathering data? Then you may want to assess a career as an environmental auditor.

Outlook	Avg. Wage	Min. Education
below avg	**$44.02**	**2 years post-secondary**

Blaster

Provincially Regulated

Do you have a safety-first attitude? Do you like excitement and have an interest in explosives? Then you may want to find out if a career as a blaster sparks your interest.

Outlook	Avg. Wage	Min. Education
n/a	**$63.62**	**Varies**

Chief Administrative Officer

Provincially Regulated

Do you like the idea of contributing to public service, leading a multi-faceted organization, and guiding the long-term growth of a community? Would you enjoy devising strategies to address local community issues and leading a team to deliver essential public services to residents and businesses? Then a career as a chief administrative officer may be a fit for you.

Outlook	Avg. Wage	Min. Education
n/a	**$75.71**	**2 years post-secondary**

Alberta alis

https://alis.alberta.ca/occinfo/occupations-in-alberta/

EDO Connections

Economic Development Officer

Do you enjoy working with entrepreneurs and businesses? Are you good at networking and motivating others? Then you may want to pursue a career as an economic development officer.

Outlook	Avg. Wage	Min. Education
above avg	**$46.66**	**4 years post-secondary**

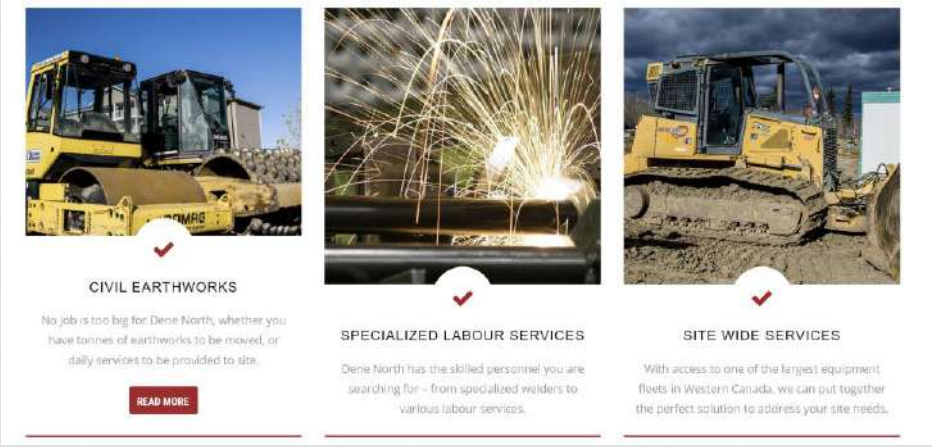
- Keep your eyes open for economic development opportunities
  - “the early bird gets the opportunity”
- You can be a first contact between your community or organization and the mining sector
- As with other industrial sectors, you can provide balanced information to your community leaders and people about mineral exploration and mining

1b. Goods and Services Contracts

- Mines require a wide variety of **goods**
  - Food, lumber, gravel, vehicles and parts, signs, pickets, …
- Mines often **contract** out specific **services**
  - Security, environmental monitoring, snow removal, food services, accounting, road maintenance, transportation, …
- Companies of various sizes bid on these **contracts**
  - Mines generally prefer to contract competent local companies and recognize the value of using Indigenous companies

DENE NORTH
SITE SERVICES

- Prior to forming Dene North Site Services as a partnership with North American Enterprise Limited, the company was a 100% local and aboriginally owned and operated company
- Company's roots continue to run deep through the numerous First Nations communities
  - Dene North maintains a comprehensive employment program that seeks to hire and train local Aboriginal personnel, subcontractors and management
- Head office in Chad, Alberta (southeast of Fort McMurray)



White Buffalo Services

- Preventative maintenance
- Mobile fuel and lube
- High pressure steaming
- Fort McMurray

Nuna Group of Companies

- a heavy civil construction, earthworks and contract mining company
- comprises various companies, ventures, and partnerships
- offices in Cambridge Bay, NU; Yellowknife, NT; Edmonton, AB; Vancouver, BC; and Prince Albert SK
- achieved an average of 35.55% Indigenous employment across all projects in 2018 fiscal year
- Nuna continues to retain it's 51% Inuit ownership and the majority of Nuna's board positions held by Kitikmeot Corporation, a wholly owned business arm of the Kitikmeot Inuit Association

NUNA - Edmonton

$1.3B Cote Gold Project near Gogama to create 450 permanent jobs, officials say

During construction phase, project is expected to create about 1,000 jobs, then eventually 450 permanent jobs

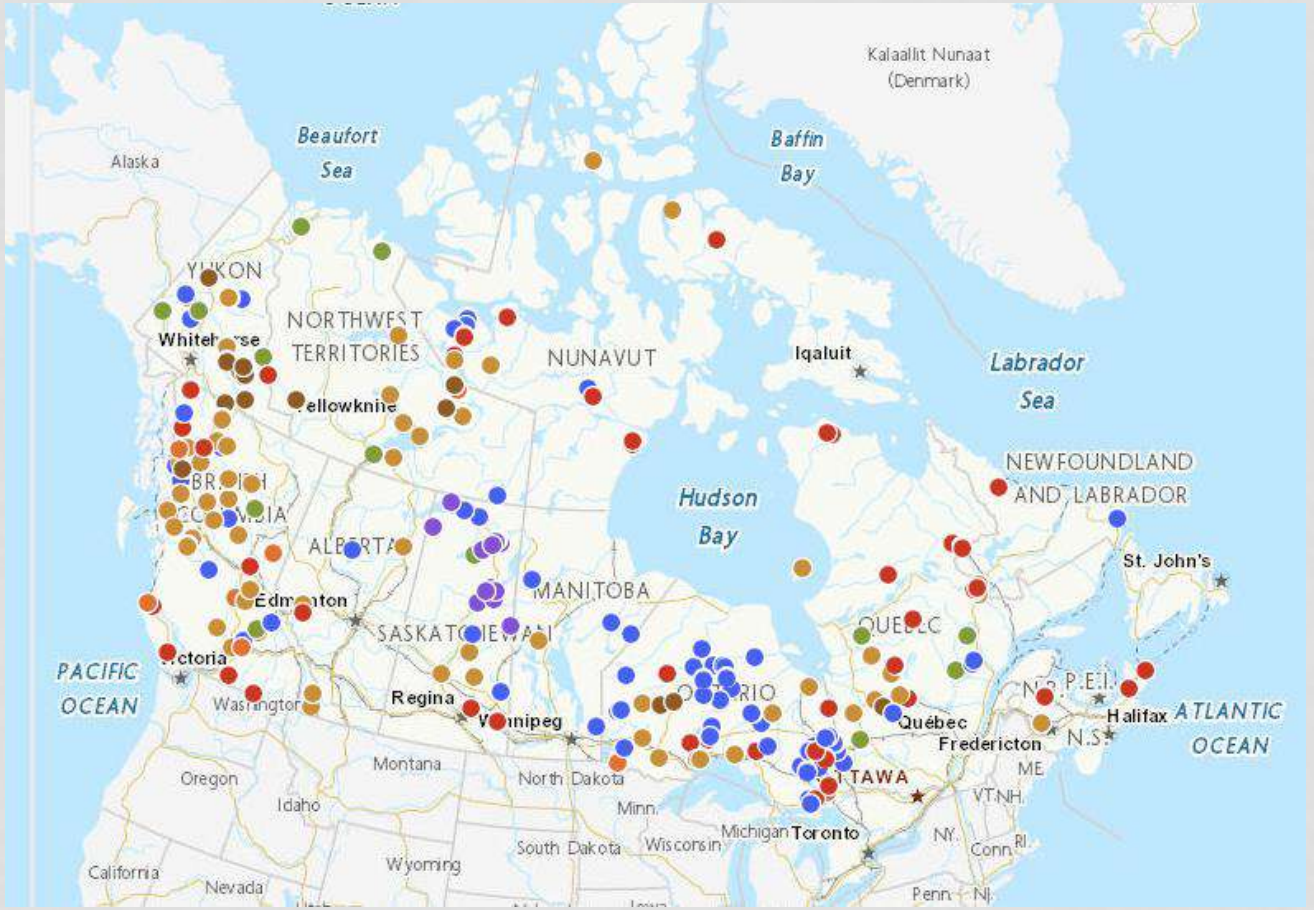
CBC News · Posted: Sep 11, 2020 10:22 AM ET | Last Updated: September 11, 2020

- Two Alberta companies awarded a more than $250-million contract for the Côté mine project in northwestern Ontario
- North American Construction Group (NACG) and the Nuna Group of Companies formed a joint venture partnership to begin construction in 2020 on the earthworks for the mine

2. Indigenous Community Active Mining Agreements

Active Agreements

- Impact and Benefits Agreement
- Socio- Economic Agreement
- Exploration Agreement
- Participation Agreement
- Cooperation Agreement
- Memorandum of Understanding
- Letter of Intent
- Surface Lease Agreement
- Other Agreement Type



Feb. 23, 2021 https://open.canada.ca/en/map/indigenous-mining-agreements

Agreement between Alexis Nakota Sioux Nation and Teck

Cardinal River coal mine

- 2021 Impact and Benefits Agreement (IBA)
- 2019:
  - Engagement initially focused on the regulatory approval process for the MacKenzie Redcap extension
  - Later in the year, it was determined that the mine would begin to close the operation in 2020
  - Engagement shifted to address the implications of this decision with Alexis Nakota Sioux Nation, Ermineskin Cree Nation, Whitefish Lake First Nation, O'Chiese First Nation, Sucker Creek First Nation and Mountain Cree

3. Larger Mines in Alberta

Oil Sands (energy)

oil and gas extractive industry

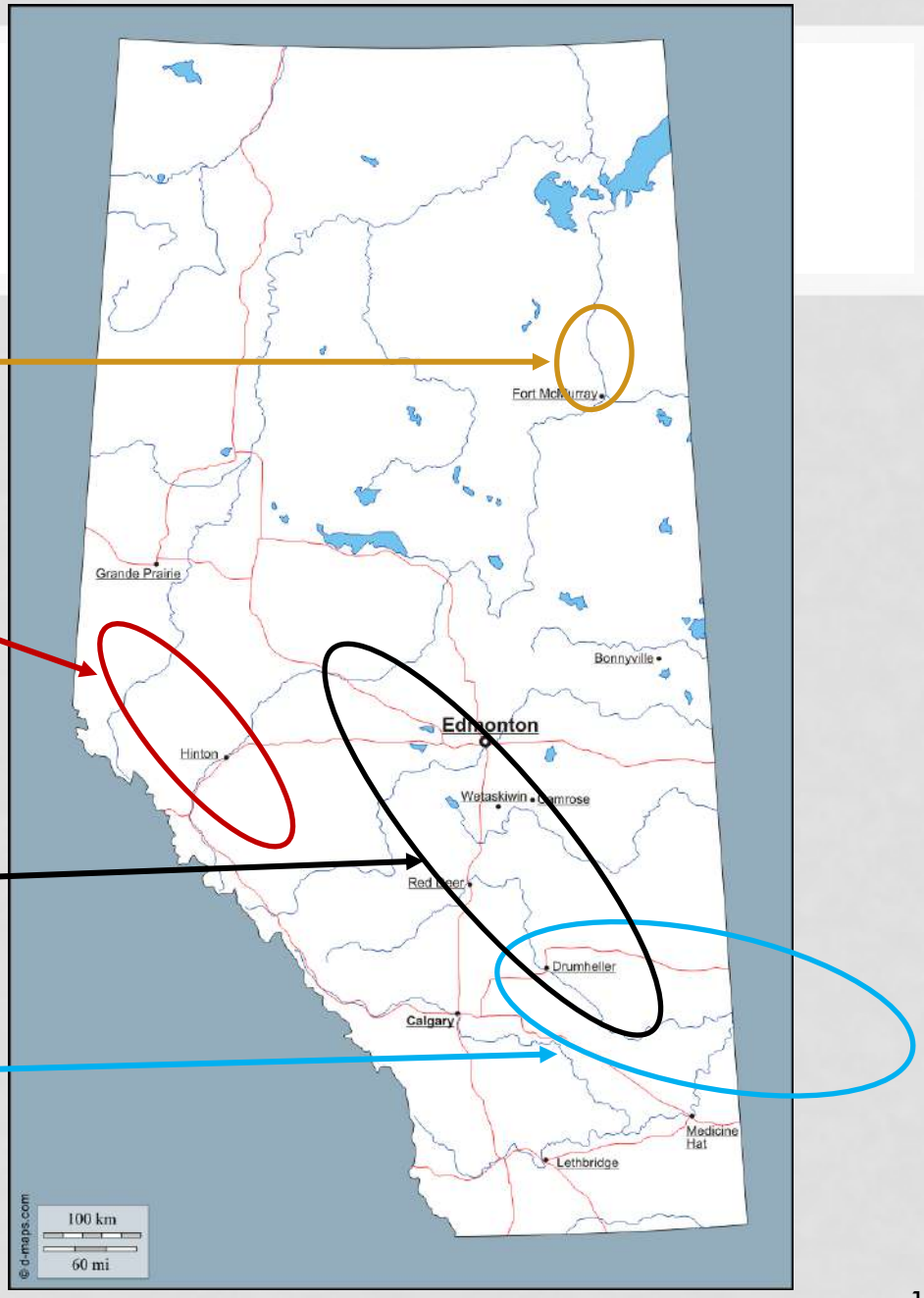
Where to find sand and gravel

Everywhere!

Steel-making Coal (metallurgical coal)

Thermal Coal supplying power plants (electricity)

Salt

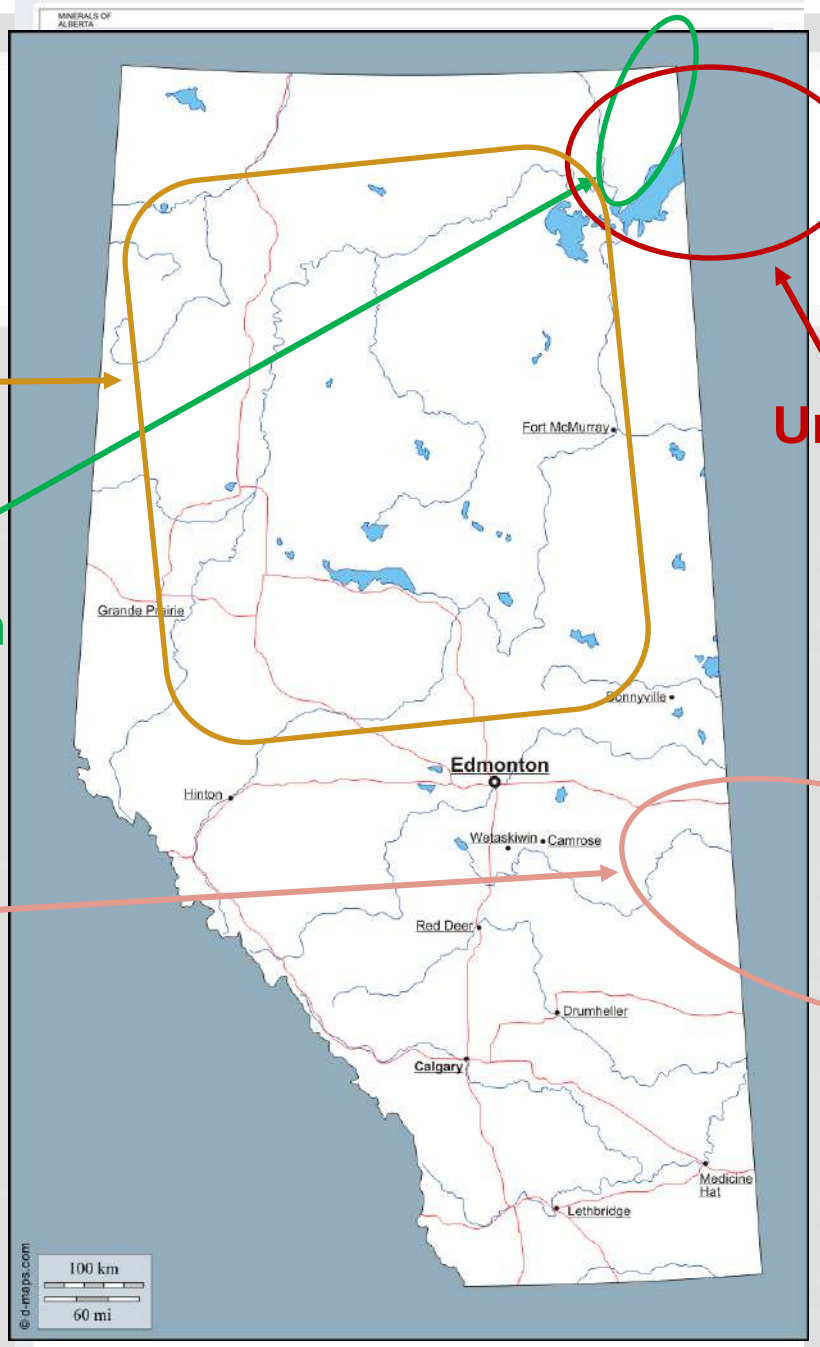


Mine Products

potash

3. Exploration Potential

- Most mineral deposits are found below the earth's surface
- For many of these buried mineral deposits it can be very difficult to find one large enough and/or rich enough to mine economically



4. Mining Not Well Known

- Why?
  - Not generally taught in schools.
  - Many mines are in remote and rural areas.
  - Access to these industrial sites is restricted for safety reasons.
    - Mining is typically the safest heavy industry in Canada.
  - Mining products are often processed to a metal or mineral product before they reach the consumer.

Do you know the following highlights about the mining sector in Alberta?

Alberta
Coal and Minerals Mining

- 9 coal mines
- 3 salt mines
- 23 quarries
- hundreds of sand and gravel pits

- Annual value*
  - Mining production = $2.4 billion ($2.25 billion in 2019)
  - Mineral exploration/deposit appraisal = $37 million
  - Mine complex development = $93.9 million

* PDAC Infographic

Alberta
Mining Commodities 2021

Metallurgical Coal

Thermal Coal

Minerals & Rocks

salt, limestone, shale, sandstone, silica sand, building stone

Construction Materials

gravel, sand, rip rap, crushed rock

Canada is the world's 4th largest exporter of metallurgical coal or coking coal. It is used to produce coke, an essential ingredient for the production of steel.

Questions?

Mining Opportunities Can Come with Concerns

Calgary

Alberta rescinds decades-old policy that banned open-pit coal mines in Rockies and Foothills

Province says 1976 policy was redundant, environmental group calls that 'misleading'

Robson Fletcher, Jordan Omstead · CBC News ·
Posted: May 22, 2020 3:00 AM MT | Last Updated: May 22, 2020

COCHRANENOW

Alberta backsteps and reinstates environmental 'Coal Policy' but protections still fall short

By Jacob Cardinal, Local Journalism Initiative Reporter Alberta Native News
Wed., Feb. 10, 2021 | 4 min. read

LOCAL NEWS

Lengthy list of opponents to proposed gravel pit

Written by Noel Edey Wednesday, Feb 24 2021, 7:40 PM

Province to engage public on future coal development and policy changes

Ask questions and learn about mining if you get involved.

Government Role in Exploration and Mining

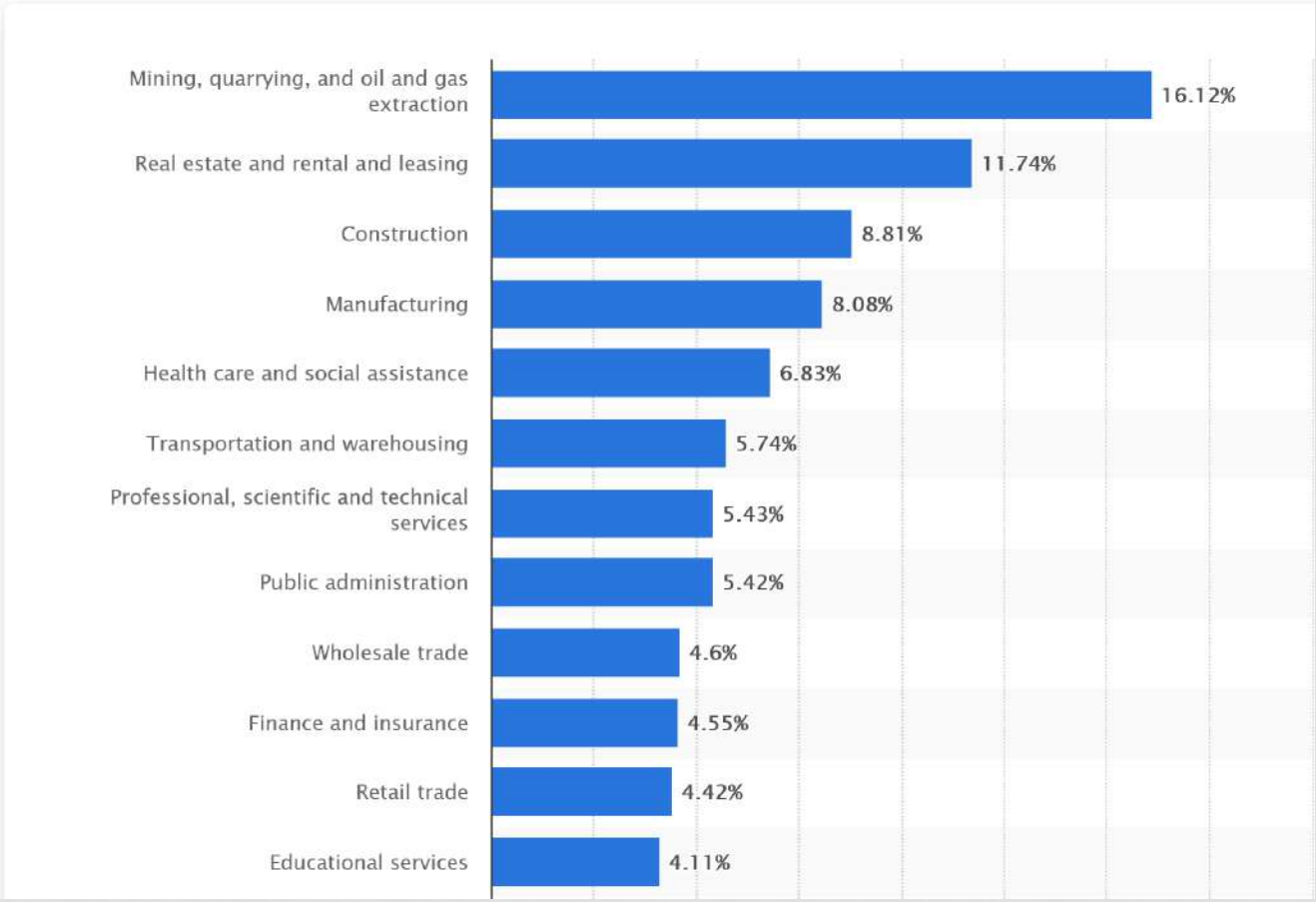
Provincial and Territorial governments:

- Administer mineral claims & regulate exploration activities
- Generate maps and reports to support exploration
- Permit mine developments and mines
- Enforce safety regulations and assist with mine training
- Require reclamation plans and bonds for mines

Federal government :

- Administer mineral rights on reserves
- Can participate in environmental assessments of mine proposals
- Helps administer underground exploration, mining, processing and shipping of uranium

Mining – a Key Source of Government Revenue



 https://www.statista.com/statistics/608354/gdp-distribution-of-alberta-canada-by-industry/

Government Assistance

Alberta Geological Survey (AGS)
Edmonton, Alberta T6B 2X3
Phone: 780.638.4491
General E-mail: AGS-Info@aer.ca

- Delivers geoscience reports, maps, digital data sets, and presentations
- Provides geoscience outreach and advice

Coal and Mineral Development Unit
Edmonton, Alberta T5K 2G6
Phone: 780.638.4034

- Provides annual reports on the mineral exploration and mining
- Deals with permits, leases, assessment reports, etc.

Alberta
Act and Regulations

Mines and Minerals Act

- Provides the Government of Alberta with authority to administer, allocate, and enter into agreements with respect to minerals
- Applies to all mines and minerals and related natural resources belonging to the Crown, including wells, mines, quarries and minerals
- Includes the levying and collecting of bonuses, rental and royalties
- Administered by the Energy and Environment and Parks ministries

Crown Minerals Registration Regulation

Mines and Minerals Administration Regulation

Access to Land for Mineral Exploration and Mining

- A tenure agreement is registered with the provincial government to obtain ownership for:
  - Coal
  - Metallic and industrial minerals
  - Petroleum and natural gas
  - Oil sands
- Different types of tenure can overlap
- 81% of the metallic and industrial mineral rights are owned by the Crown

<u>No Tenure agreement Allowed on Freehold Rights</u>

- Lands held by the federal government on behalf of First Nations
- National Parks
- Lands owned by individuals
- Lands owned by companies

For more information on Alberta government regulations go online to the links listed at the end of this presentation.

Prospecting and Early Exploration Permits

- Limited prospecting is permitted using hand tools without staking a claim or obtaining a mineral agreement (no surface disturbance)
  - Prospecting allowed on privately owned land or land under lease with consent from the landowner or lease holder
- Exploration approval is needed for all activities, except aerial surveys or ground geophysical and geochemical surveys, providing they do not disturb the land or vegetation cover
- Staking to acquire ownership is recommended for those who want exclusive rights to explore on a particular piece of land for metallic and industrial minerals owned by the Province
- Alberta uses an application for agreement process rather than physical claim-staking to secure these Crown mineral rights

All activities require fees be paid!

Alberta Exploration Regulatory Documents

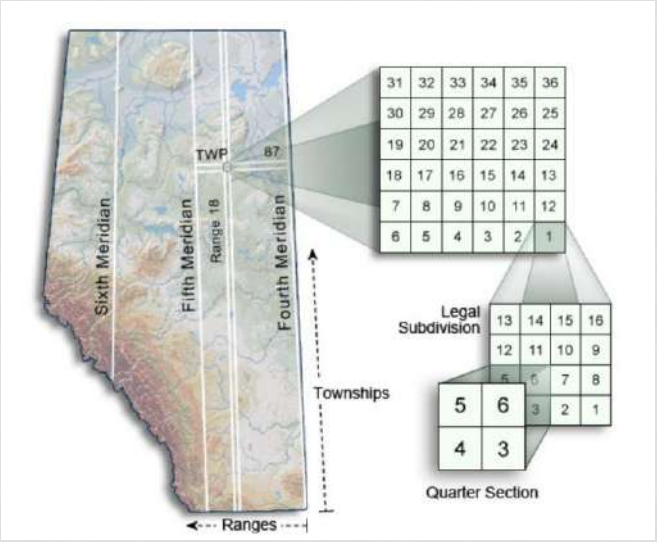
- Submit application with necessary information and fee for review by government
- A final report must be submitted to Land Management (AEP) within 60 days following completion of an approved exploration program. The report must show the actual fieldwork, and include a map

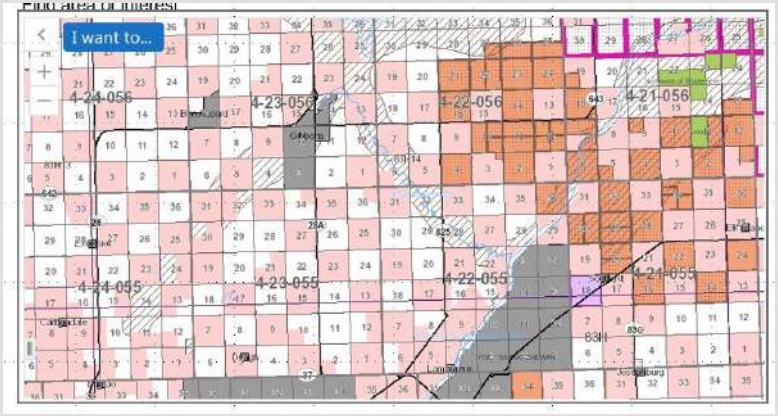
Table 1. Summary of Exploration Regulatory Documents

	Issue To	Purpose	Apply To
Exploration Licence	Company or person wanting to explore	Provincewide permission to explore for metallic and industrial minerals	Operations Division, Provincial Approvals Branch of Alberta Environment and Parks
Exploration Permit	Company or person wanting to operate equipment (often a contractor hired by exploration company)	Provincewide permission to operate exploration equipment	same
Exploration Approval	Company or person wanting to explore	Site-specific permission to conduct exploration which involves environmental disturbance	same

Acquiring Mineral Rights

- A Metallic and Industrial Mineral Licence is required to produce any metals, coal, minerals, rocks or gold and other minerals from placer deposits
- Only some exploration properties become mines
- Environmental management is an important part of developing, running and closing down a mine. Mining companies develop and carry out plans to minimize impacts on air, land, water and wildlife. Companies use a variety of techniques to reclaim mined lands.





Life Cycle of Mining

Prospecting & Early Exploration

Indigenous Business Opportunities

Mine Closure & Reclamation

Mineral Exploration

Mine Development

Mining

Mineral Exploration Path

Prospecting

Geochemistry

Geophysics

Drilling


Early Exploration

How Does Exploration Start?

An Idea!

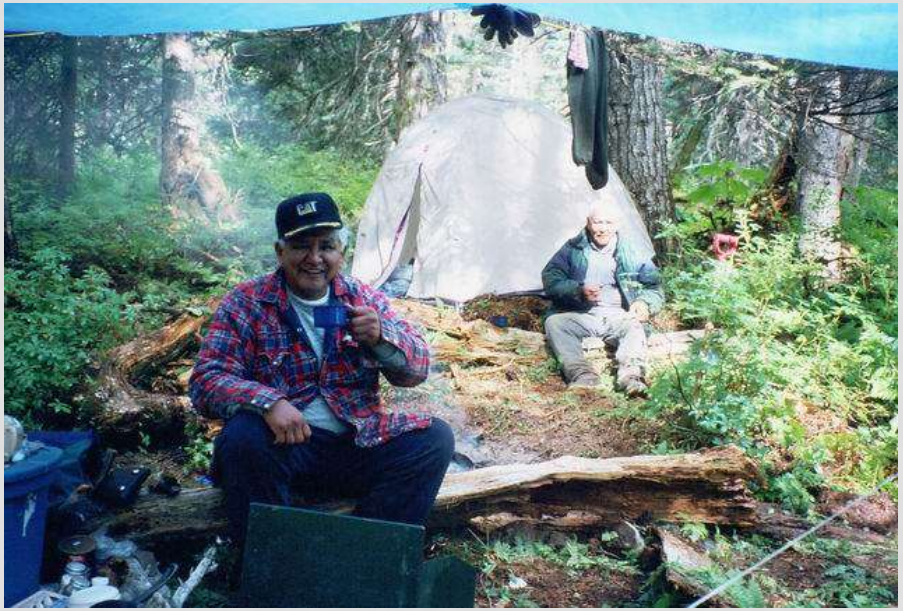
- Same process as moose hunting

- near an existing mine
- similar types of rocks (geology) to an area with mines
- prospecting finds in new areas

If you know where to find a big moose, you aren't telling other hunters!

Early Exploration

Prospectors



- Have discovered many metal and industrial mineral showings
- Hike through the bush, walk new logging roads, follow creek beds, etc.
- Use a rock hammer, GPS locator, gold pan
- Collect rock, soil and stream silt samples looking for evidence of gold, copper, nickel, diamonds, …..
- Hope to find a property to sell to a company


Early Exploration

Small Companies ("junior companies")

- Several to tens of full time employees
- Often a single office (Vancouver, Toronto)
- Shares trade for cents to dollars
- Many do not own a mine
- Many exist for less than five to ten years

STAR DIAMOND CORPORATION

PRISM DIVERSIFIED LTD.

E3 Metals Corp

Early Exploration

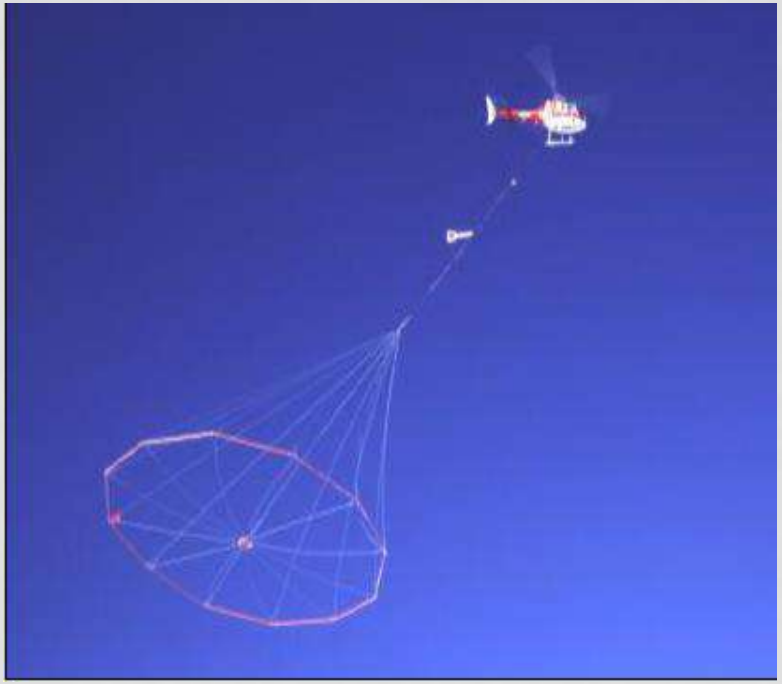
Collecting Samples Soil, Till, Silt or Rock

from Tom Lewis

Early Exploration

Geophysical Surveys

Airborne First



Hinz, USGS for Ministry of Northern Development, Mines and Forestry, 2011 presentation

Ground Later

Early Exploration

Early Exploration Jobs

- Prospector
- Line Cutters
- Samplers (soil, etc.)
- Geophysical Crew
- Geologist
- Drillers
- Kitchen Helper
- Cook
- Camp Expediter
- Jack of All Trades
- Camp Set-Up

Drilling – Key to Many Discoveries

Advanced Exploration

Early Exploration

Geologist Logging Drill Core

Advanced Exploration

Early Exploration

Environmental Studies

Advanced Exploration

- **Environmental sampling and monitoring start on the property**
- **Major focus on studying surface water, fish and wildlife for baseline data**

Early Exploration

Poplar Point Camp Services

Advanced Exploration

- Established in 2002
- Market leaders in providing remote camp services and related support assistance to clients in the Wood Buffalo Region
- A joint venture company that combines the strengths and local expertise of the Fort McKay First Nation, Athabasca Chipewyan First Nation, and ESS Support Services.

POPLAR POINT
CAMP SERVICES

Early Exploration

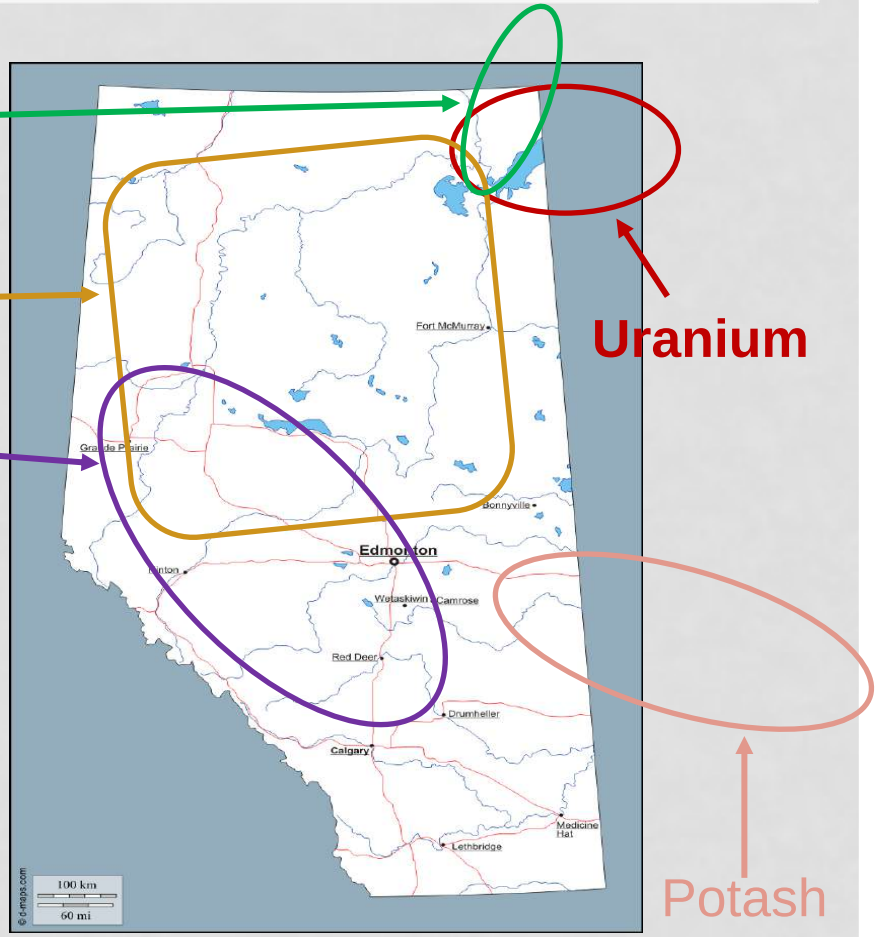
Alberta's Potential for Mining New Commodities

Emerging Potential

- Rare earth elements
- Diamonds
- Lithium brines

Known Potential

- Uranium
- Potash
- Metals (various locations)



Early Exploration

Surprise – Alberta has Diamonds!

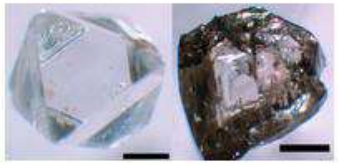
Advanced Exploration

Early Exploration

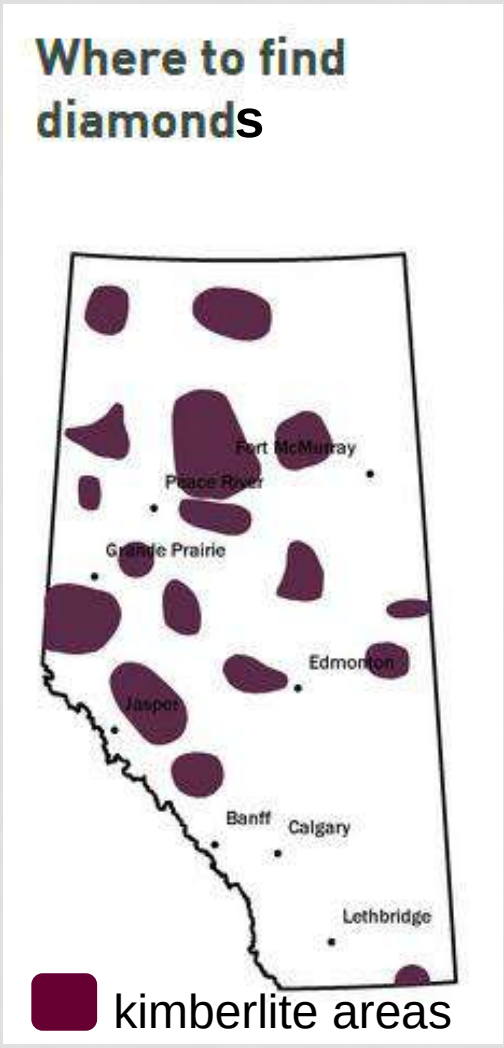
Alberta Diamonds

Advanced Exploration

- A farm worker, Einar Opdahl, discovered a 1 carat, perfect octahedral diamond in west-central Alberta in 1958
- In 1992 a prospector found two microdiamonds weighing 0.14 and 0.17 carats in recent stream sediment in southern Alberta
- Diamonds found in kimberlite rocks
- As of 2015, 55 kimberlitic pipes discovered



Alberta diamonds. A translucent octahedral diamond and a brown diamond, 0.5 mm scale bars.



UNIVERSITY OF ALBERTA

Diamond Exploration Research Training School (DERTS)


Early Exploration

Diamond Mines Very Valuable


Advanced Exploration

- Alberta exploration rush for diamonds - 1995 and 2001
  - mineral exploration companies spent a total of C$61 million
- Most economic diamond pipes have values of $400 million to $4 billion
  - Operate for ~20 years to more than 100 years
- Ekati diamond mine (NWT)
  - contributed over $5 billion to Canada's GDP between 1996 and 2011
  - employed about 1200 people in 2011

STAR DIAMOND CORPORATION

APEX Geoscience Ltd.

DIAVIK DIAMOND MINE

Lucara Diamond Corp.

Early Exploration

Lithium
Exciting New Mineral Product?

- Companies are testing technologies for recovering lithium from Alberta oilfield brines

Uses

- consumer electronics, batteries, and fuel cells
- medications and medical devices like pacemakers
- added to metal sheeting for building aircraft, glass, porcelain and ceramics
- purifies the air in spacecraft and submarines

Canadian Minerals and Metals Plan

- One of the 31 critical minerals on Canada's list that are used to develop clean technologies, from solar panels to EV batteries.
- Essential to lowering emissions and our energy security.

CALGARY HERALD

Local Business / Energy

'A huge opportunity': Alberta oilfields could give rise to lithium industry fuelled by electric cars

Amanda Stephenson • Calgary Herald
Jan 06, 2020 • January 7, 2020 • 4 minute read • 104 Comments

E3 Metals Corp CEO Chris Doornbos poses for a photo on Nov. 28, 2019. PHOTO BY AZIN GHAFFARI/POSTMEDIA

Calgary-based E3 Metals wouldn't exist if it weren't for the work of Elon Musk.

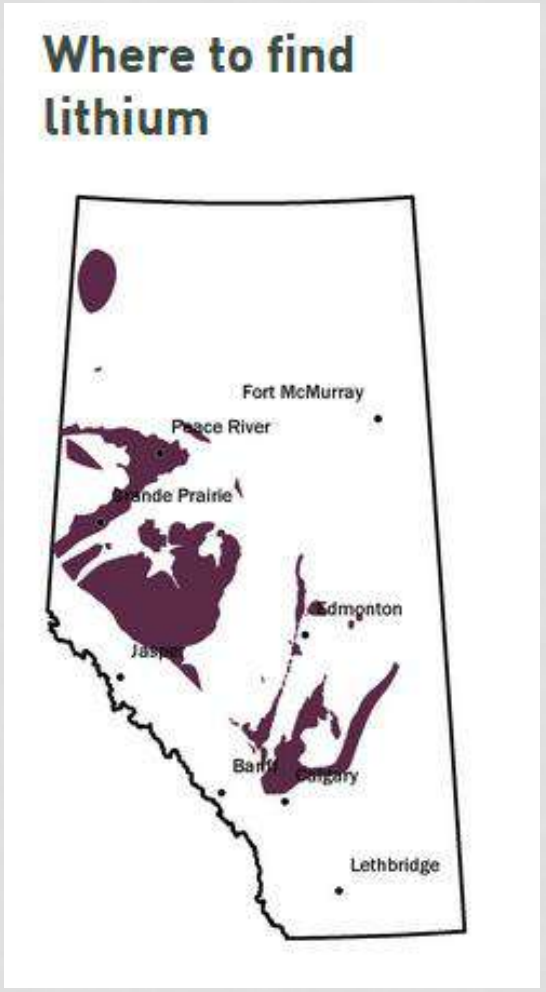
The natural resources company, which was founded in 2016, has developed a patented ion-exchange extraction technology that produces purified lithium concentrate from the light metal that occurs naturally within the province's oilfield brines. The company's goal is to produce battery-grade lithium hydroxide that can be used in the manufacturing of lithium-ion batteries — the same type of batteries that power the electric cars made by Musk's company, Tesla Inc.

Early Exploration

Lithium Brines in Alberta

- Subsurface brines (salty-water) present in Alberta and Saskatchewan
- Some contain high levels of lithium
- Oilfield operations enable sampling brines

Test tube containing lithium-rich brine



Early Exploration

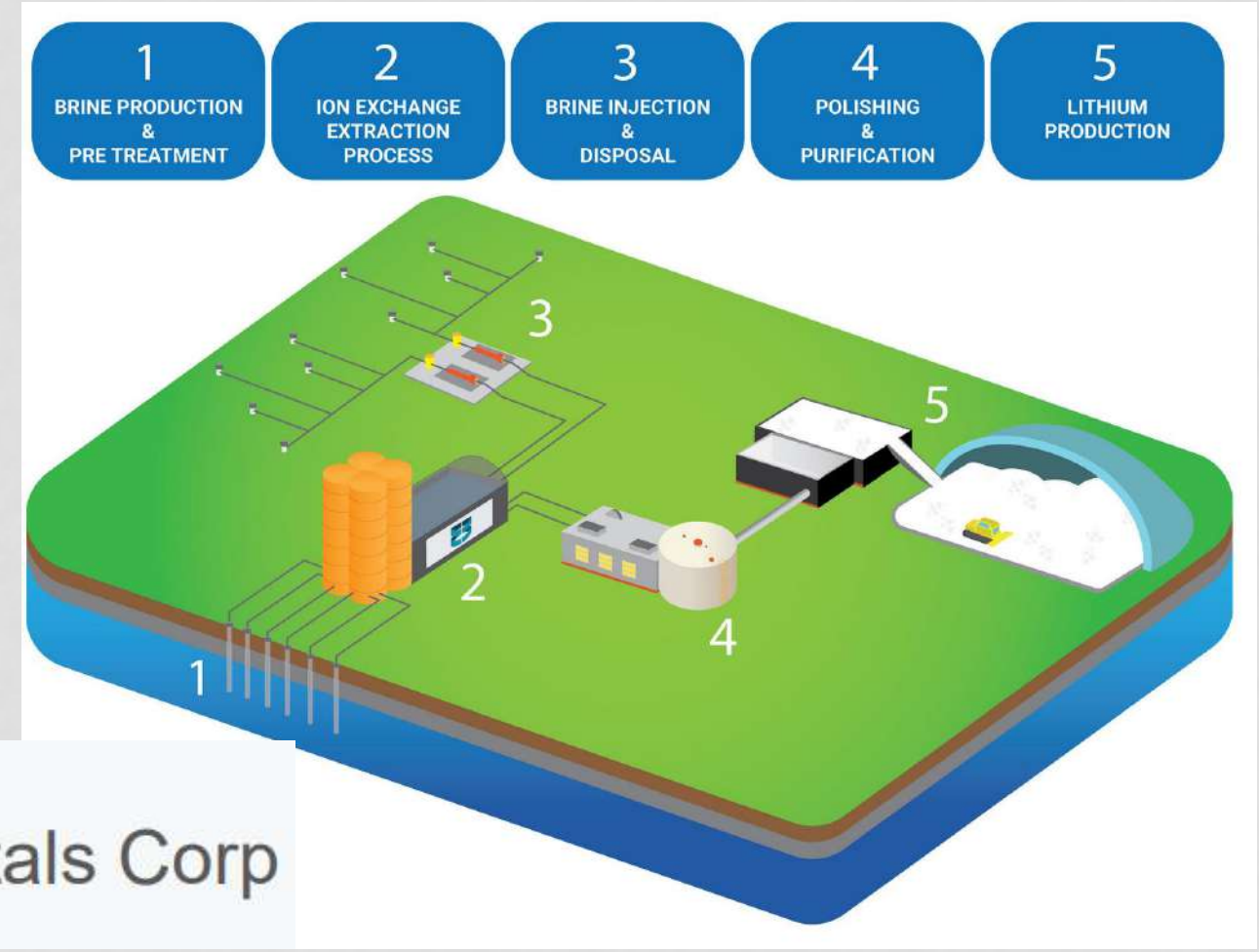
Conceptual Lithium Production Facility

Lithium Companies

Suite 303, 1080 Howe St.
Vancouver, BC V6C 2T1
MGX MINERALS INC.

PRISM DIVERSIFIED LTD.

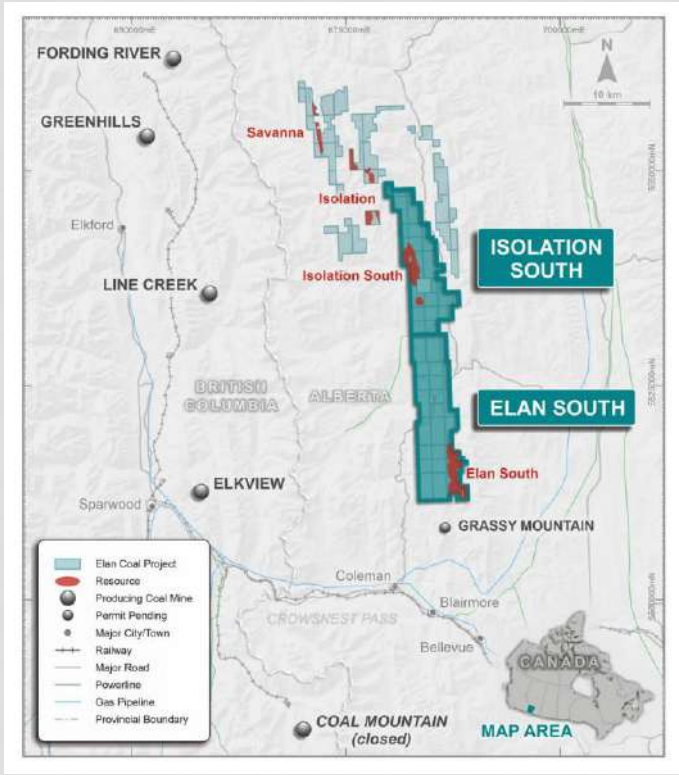
E3 Metals Corp



Advanced Exploration

Advanced Coal Exploration Project

- Atrum Coal Ltd., an Australian company
- proposing a new mine called Elan targeting production of six million tonnes of metallurgical coal a year
- Approved drilling exploration activities will continue through 2024 in order to assess the location and quality of metallurgical coal to the north



Atrum Coal
COAL FOR STEEL

Indigenous Peoples Used Coal

- Indigenous peoples have long known coal would burn as fuel for heat, but taboos against its use in tipi fires were deeply ingrained in the culture probably due to poisoning by carbon monoxide, the gas given off by coal fire
- One of the earliest indigenous people's uses of coal arises from the hands of early artists who carved it
- Blood Tribe warriors darkened their faces with coal dust for a post-battle ceremony

http://history.alberta.ca/energyheritage/coal/early-coal-history-to-1900/albertas-first-discoveries/taboos-charms-and-face-dust.aspx#page-1

Advanced Exploration

Several Exploration Programs in 2019

Phosphate –

- Fertoz International Organics Inc.
- Metallic and industrial mineral permits in the Crowsnest Pass area (south of Highway 3)
- Company received approval to take a bulk sample on the property
- Fertoz is exploring for phosphate-rich shales for use as agricultural fertilizer, sometimes referred to as rock phosphate

Sand

- Sil Industrial Minerals, Source Energy Services and Canadian Silica Industries
- All three companies continued to explore for their own sand deposits at a number of properties throughout Alberta

Heavy Minerals

- Titanium Corporation Inc. aims to commercialize its technology and recover heavy minerals (zircon and titanium-bearing minerals), solvent, and residual bitumen from the froth tailings of oil sands mining operations.


Early Exploration

Exploration Project Characteristics


Advanced Exploration

Require government permits

Early

- Generally 5 to 50 people in the field
- Junior companies and sometimes larger companies
- $50,000 to millions of dollars spent annually
- Often summer field programs and sometimes winter drilling
- Opportunity to provide exploration services and derive community benefits
- Generally limited environmental impacts

Advanced

- Generally tens to hundreds of people in the field
- Junior companies and larger companies
- Up to hundreds of millions dollars spent over years
- Field programs for multiple years and often year round
- Significant opportunities to provide exploration services and sign benefit agreements
- Usually have more significant environmental impacts

Mining Cycle
Mineral Industry Sequence

Prospecting / Early Exploration

Mineral Exploration

Mine Development

Mine Development

Mine Development Path

Environmental Assessments

Bulk Sampling

- Government permits
- Economic feasibility studies
- Raise funds

Mine Development

Evaluation of Potential Value

Factors that determine if a resource is economic:

- Type of mineral
- Market price of the minerals and metals
- Location, accessibility, size and value of the resource
- Access to infrastructure: roads, airstrips
- Distance from markets and supply points
- Regulatory regime: taxes, royalty taxes
- Environmentally safe and socially responsible mining
- Availability of a qualified work force

Mine Development

Stony Valley Project

- Stony Valley Contracting Ltd., a major gravel and sand producer in the Fort McMurray area
- Have applied for a new pit which will require $12M to set up
- Extraction and crushing will take place on a 551 acre area, with the project to be phased in over the next 30 years

Mine Development

Industrial Mineral Development Projects

Firebag property

- Initial exploration began in 2009 looking for metallic and industrial minerals
- Athabasca shifted its focus after high purity surface sand was discovered at this location
- Granted a surface material lease for an 80 acre parcel in 2014
- Indicated resource of 38.2 million tonnes of frac sand that can be used for hydraulic fracturing for oil and gas

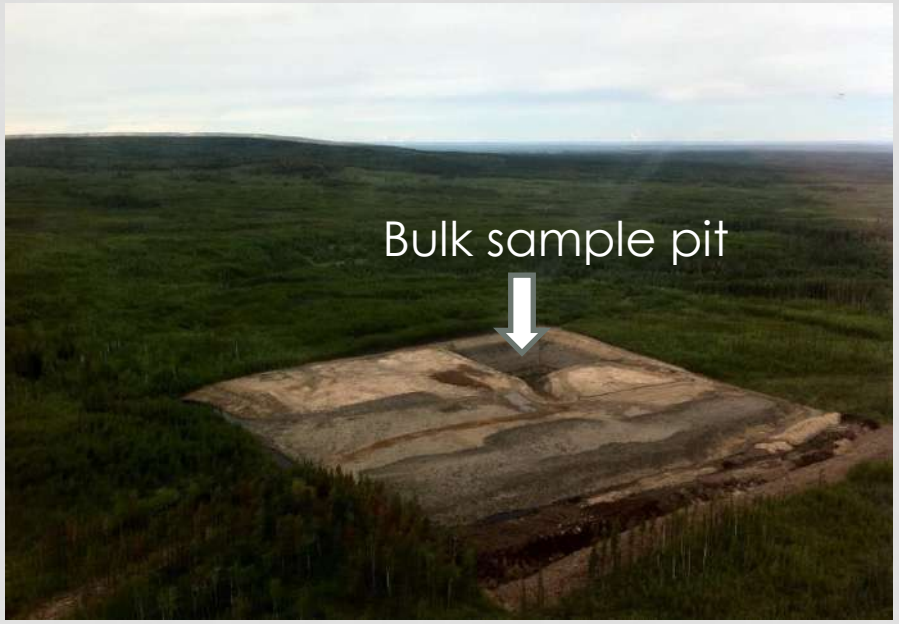
Richardson property

- Planning to develop a construction aggregate quarry
- Estimated resources of 683 million tonnes of dolostone and 65 million tonnes of granite

Mine Development

Clear Hills Mining Project

- Located 200 kilometers north of Grande Prairie
- Drilling in 2008 and 2011 led to defining an indicated resource of 557 million tonnes of iron and 2.45 billion pounds of contained vanadium pentoxide.
- Used to make high-strength, low alloy steel and ferrovanadium products
- Mined a bulk sample
  - stockpiled 11,000 tonnes for process testing
- A $300M mine development project
- Proposed to enter the provincial environmental process in 2016
  - Not happened as of 2020



Mine Development

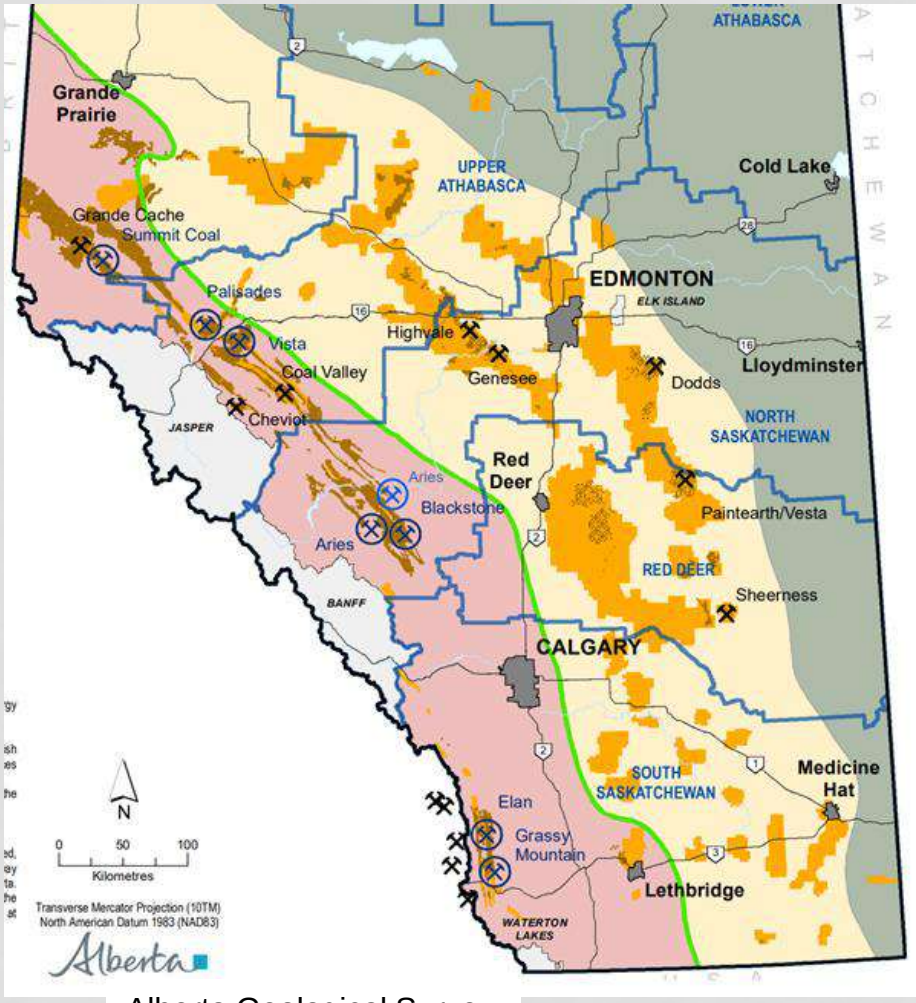
Steel-Making Coal

Possible Mine Development Projects

- *Coal Investing News reports* prices of metallurgical coals will rise to US$147 by late 2022, up from $128 per tonne in January 2021

- "Four proposed Alberta coal mines projects hanging on after a sharp reversal of Alberta government policy on coal development, four coal mine exploration projects are allowed to proceed, but their final approval is in doubt"

WI Staff Western Investor Feb. 9, 2021



Alberta Geological Survey
Map published in 2020

Mine Development

Grassy Mountain Proposed Coal Mine

- Could employ 385 people and produce 4.5 million tonnes of metallurgical coal per year over a 24-year mine life.
- The clean coal would be shipped by rail to the Westshore coal terminal in Vancouver, B.C. for export to international customers.

Mine Development

Alberta Government Environmental Assessment

- Valuable source of information
- Lengthy process
- If approved, followed by regulators reviewing and approving detailed mine procedures and plans
- Indigenous communities important participants

Mine Development

Blackfoot in Alberta look to educate community members on proposed coal mine

Tamara Pimentel
Feb 03, 2021

The pros and cons of the proposed Grassy Mountain coal mine in southern Alberta are still being weighed by members Piikani and Kainai Nations.

On Jan. 21, 2021, Chief Stanley Grier of Piikani reiterated his support in another statement.

"Today's global economy heavily relies on a wide variety of commodities including steel, and as such, there is a strong demand for metallurgical coal. Responsible resource development can create thousands of good-paying jobs, something that our neighbours in surrounding areas have taken advantage of for decades," the statement says.

"Our Nation, through our Consultation Policy, have undertaken exhaustive traditional land use reviews along with environmental and ecological studies and have implemented an extensive cultural and environmental monitoring program for the entire life of the mine. Therefore, we are confident that the proponent Riversdale Resources will mitigate and protect to the highest degree any risk to the environment."

Metal Mine Marathon
Mineral Industry Sequence

Prospecting / Early Exploration

1,000 properties staked

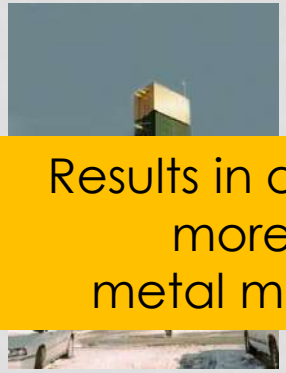
hundreds of mineral exploration properties

Mineral Exploration

Several mine development projects

Mine Development

Results in one or more metal mines



Mining

Mine Production

Senior Companies

- In existence for decades or more, although name may have changed
- Hundreds to tens of thousands of full time employees
- Multiple offices
- Producing mines and sometimes smelters, refineries, or power plants
- Stocks trade for tens of dollars or more

Teck

WESTMORELAND MINING LLC

TransAlta™

Mine Production

Coal Mining in Alberta

Alberta government receives $20-25M in royalties

- Started in the late 1800's
- In 2014, nine mine sites produced ~ 30.8 million tonnes of marketable coal
- Steel-making coal exported to make steel
  - Two have temporarily suspended operations due to Covid-19
- Thermal coal used for generating electricity
  - Six surface mines produce subbituminous coal.
- Mining activities regulated by the Alberta Energy Regulator
- Mine reclamation are subject to review and approval through Alberta Environment and Parks

Mine Production

Grande Cache Steel-Making Coal Mine

https://globalnews.ca/wp-content/uploads/2015/01/grande-cache-coal-north-pit_large.jpg?quality=85&strip=all

Mine Production

Grand Cache Mine Coal Processing Plant

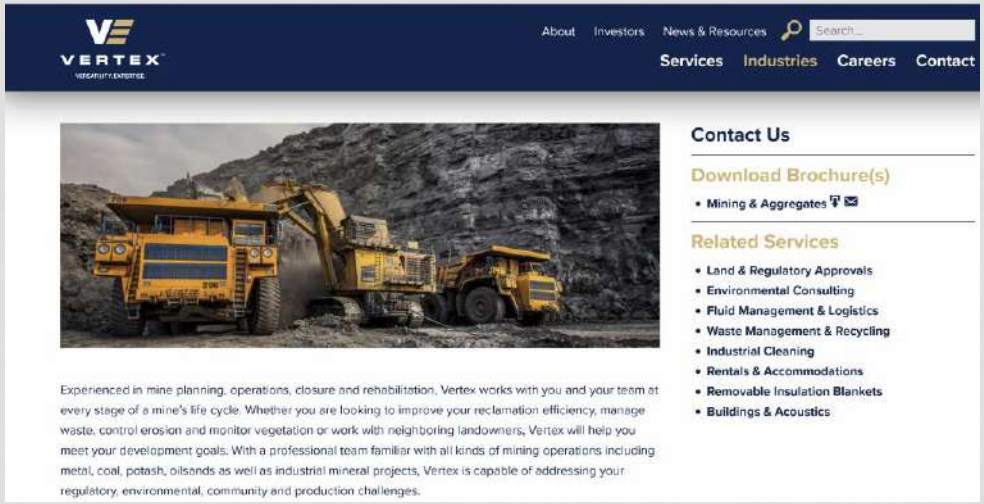
A coal processing plant in the Alberta Rocky Mountain Foothills with reclaimed area in the background.

Mine Production

Multiple Indigenous Partners

Indigenous Partners

- Vertex has developed business relationships with locally operated Indigenous businesses.
- Each has a defined territory and provides an industry leading suite of expert and versatile solutions to meet our clients' needs.



SIKSIKA NATION
VERTEX

ACUEN

ALEXANDER FIRST NATION
#133 Treaty 6

Mine
Production

Thermal Coal Mines

Canada Mines

Westmoreland Mining Holdings LLC

Coal Valley Mine
Alberta

Estevan Mine
Saskatchewan

Genesee Mine
Alberta

Paintearth Mine
Alberta

Poplar River Mine
Saskatchewan

Sheerness Mine
Alberta

Mine Production

Highvale Thermal Coal Mine

coal

TransAlta™

Mine Production

Mining
Canada's Safest Heavy Industry

https://westmoreland.com/wp-content/uploads/2016/04/sheerness-mine-21-years-without-lost-time-incident.jpg

Mine
Production

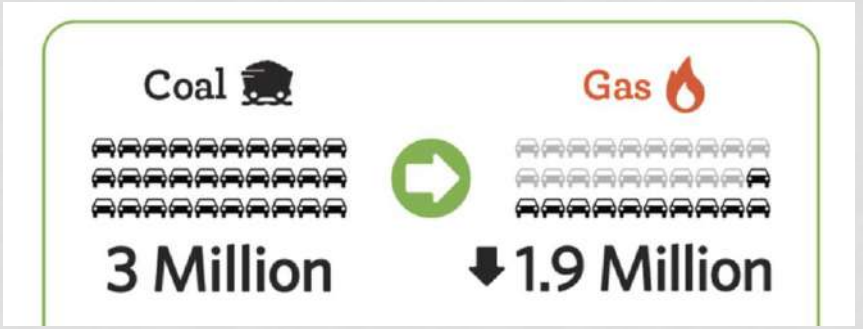
Vista
Thermal Coal Mine

Mine Production

Thermal Coal Power Plants

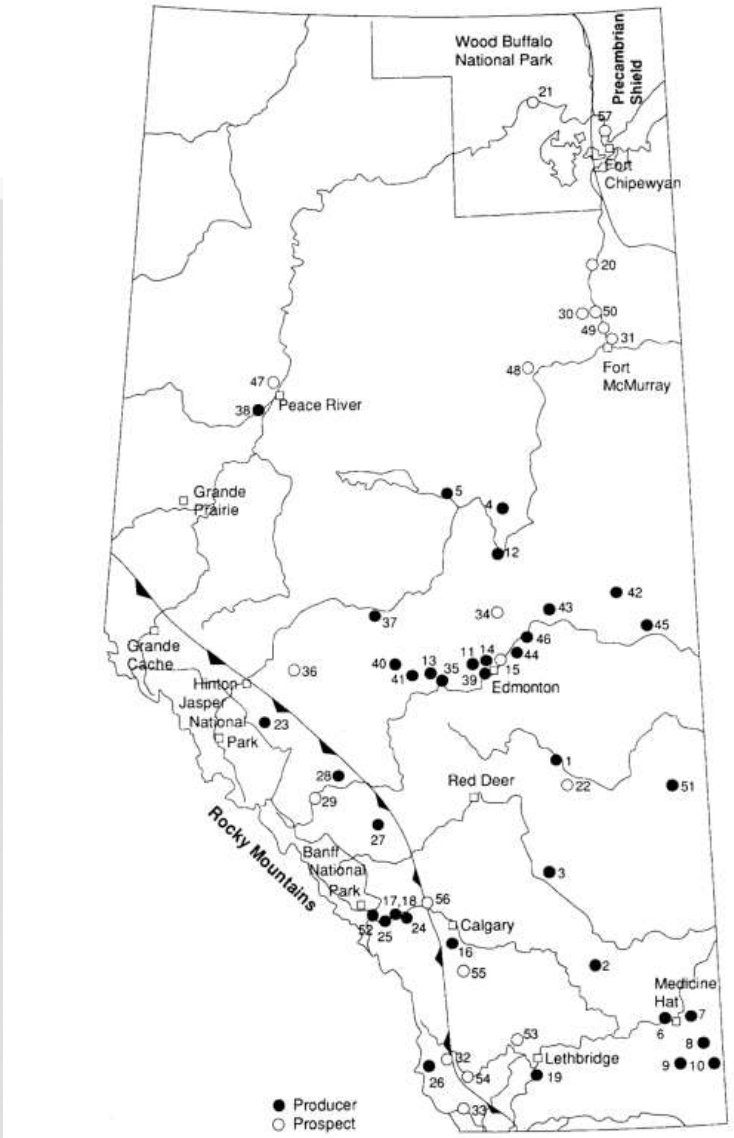
- Currently five in Alberta
- Provided 55 per cent of the electricity consumed by Albertans in 2014
- Thermal coal fuel being replaced by natural gas to reduce greenhouse gas emissions
- Canada is **phasing out traditional coal-fired electricity plants by 2030**
  - Post mine closure work required on these sites which may best be done

Indigenous contractors



Mine Production

Industrial Minerals



1. Rosalind (bentonite)
2. Brooks (calcium chloride)
3. Drumheller (calcium chloride)
4. Calling Lake (calcium chloride)
5. Slave Lake (calcium chloride)
6,7. Medicine Hat (clay)
8-10. Cypress Hills (clay)
11. Edmonton NW (clay)
12. Athabasca (clay)
13. Wabamun (clay, fireclay)
14. Edmonton NW (expandable clay)
15. Namao (expandable clay)
16. DeWinton (expandable clay)
17. Exshaw (shale)
18. Lac des Arcs (shale)
19. St. Mary River (gemstone)
20. Fort McMurray (gypsum)
21. Peace Point (gypsum)
22. Paintearth Mine (leonardite)
23. Cadomin (limestone)
24. Exshaw (limestone)
25. Canmore (limestone)
26. Crowsnest (limestone)
27. Corkscrew Mtn. (limestone)
28. Nordegg (limestone)
29. Windy Point (limestone)
30. AOSTRA UTF (limestone)
31. Clearwater River (limestone)
32. Burmis (magnetite)
33. Dungarvin Creek (magnetite)
34. Halfway Lake (marl)
35. Duffield (marl)
36. Marlboro (marl)
37. McGregor (marl)
38. Grimshaw (marl)
39. Winterburn (peat)
40. Entwistle (peat)
41. Seba Beach (peat)
42. Mallaig (peat)
43. Smoky Lake (peat)
44. Fort Saskatchewan (salt)
45. Lindberg (salt)
46. Bruderheim (silica)
47. Peace River (silica)
48. Pelican (silica)
49. Suncor tailings (silica, Ti-Zr minerals)
50. Syncrude tailings (silica, Ti-Zr minerals)
51. Metiskow (sodium sulfate)
52. Canmore (siltstone-dimension stone)
53. Monarch (sandstone-dimension stone)
54. Brocket (sandstone-dimension stone)
55. High River (sandstone-dimension stone)
56. Cochrane (sandstone-dimension stone)
57. Fort Chipewyan (granite-dimension stone)

Figure 3. Locations of industrial mineral producers and selected prospects in Alberta.

Hamilton, 1991

Mine Production

Salt

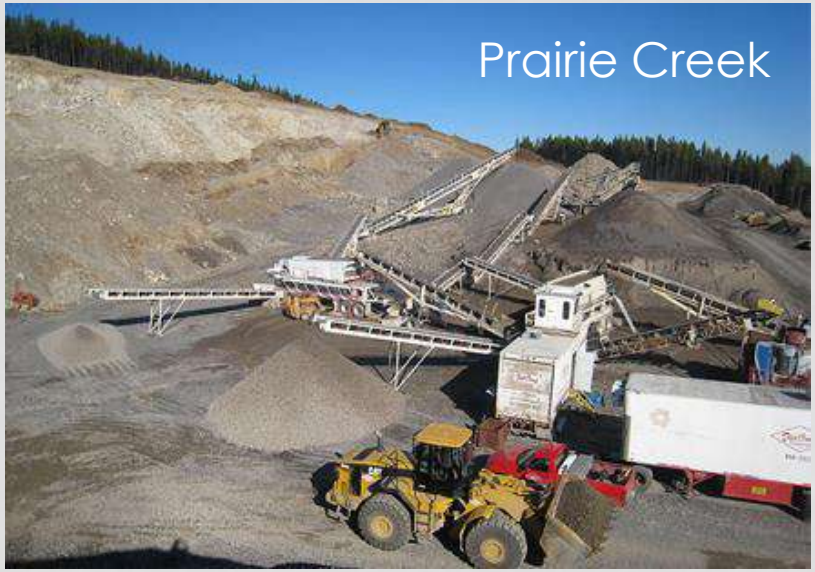
- Alberta is the second largest producer of salt in Canada after Saskatchewan
- Valued by a wide range industries including oil and gas, concrete making, tanning and textiles, pulp and paper, rubber, and metal processing
- **Uses**
  - Most salt is processed into chemicals
  - Salt is in medications and medical solutions, detergents, soaps, and water softeners.
  - Salt is necessary for safe food processing, d preservation, and seasoning
  - Salt melts ice on roads and sidewalks

Salt core with dark-coloured impurities from Fort Saskatchewan, Alberta. Core is 15 cm in diameter.

Large mass of salt crystals

Mine Production

Quarries - Limestone



Near Rocky Mountain House
Produces

- high silica limestone
- dolostone
- limestone

Near Nordegg, 95 km west of Rocky Mountain House
Produces

- dark grey limestone
- High calcium limestone
  - agricultural or acid abatement projects

Mine
Production

Exshaw Lafarge Cement Plant Alberta

Mine Production

Muskeg Valley Quarry

Hammerstone

- Established in 2009 to supply the North Athabasca market
- Covers about 3,600 acres
- 750 million tonnes of directly accessible limestone and gravel reserves
- **Reduce Environmental Footprint** - Roads can be designed and constructed to be 30% thinner than gravel roads

FORT McKAY
FIRST NATION

The Hammerstone Project was named to reflect the significant archaeological resource discovered in September 2003. During initial fieldwork, ancient quarries, workshops and campsites dating from 9,500 - 7,500 years ago were discovered. This find is one of the oldest known sites in the province and reflects the history of human settlement in the region. This site is now known as the Quarry of the Ancestors and is a protected site.

Mine
Production

Korite Ammolite Pit

- Extremely rare gem
- A thin, iridescent shell material found on two species of ammonite fossils
- Only mined for commercial use along the St. Mary River in Southwestern Alberta

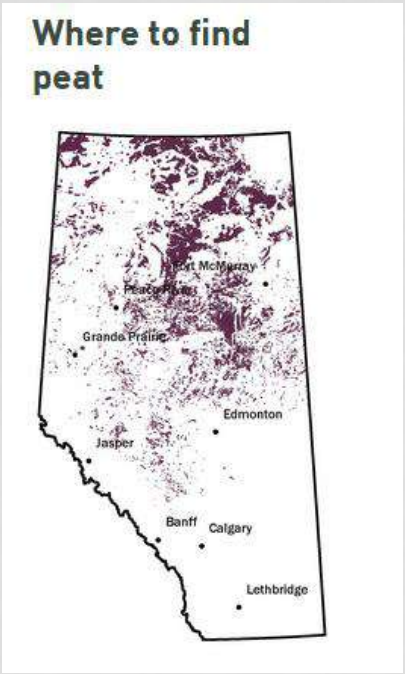
Mine Production

Peat

- Produced for horticultural purposes, such as improving the growing conditions of soil, including: moisture and fertilizer retention, nutrient composition, and porosity.

Layers of peat over 4700 years old are found below ground at Wagner Natural Area, Alberta

Commercial peat operation north of Berrymoor, Alberta



Mine
Production

- McKay Métis Group LTD is a social enterprise owned and operated by the Fort McKay Métis Community (FMMC).

  This enterprise includes companies which specialize in services such as:

  civil construction, security, medical, environmental monitoring, rig moving, site amenities, industrial solutions, catering and transportation.

  Profits generated by the business are reinvested in the community.


Site and MMG signing MMES Contract

Mine Production

Aggregate Sector - Sand and Gravel Pits

- Aggregate describes sand, rocks, gravel and crushed stone and related products that are mined
- Aggregate is used to build roads, schools, houses to hospitals, bridges and water treatment plants
- **On average, each Albertan uses 10-15 tonnes of aggregate per year - that's equivalent to one full truckload**

Local limestone boulders are used for erosion control

Alberta Aggregate Mining

- Approximately 4,120 full-time or equivalent jobs
  - including direct employment of 2,098 FTEs
  - indirect and induced employment of 2,022 FTEs
- In 2015
  - there were 216 establishments in the aggregate industry
  - 2,622 pits on private land and surface material leases on public land across the province

Mine Production

Aggregate – Indigenous Business Opportunity?

Why?

- Sand and gravel found throughout Alberta
- Commonly in demand for local construction
  - typical single family house uses about 160 tonnes (~12 truck loads) of gravel
- Smallest mining operations
- Require least capital investment of any type of mine to start
- Among the simplest mines (pits) to operate
- Usually the easiest mines to reclaim

No business can be successful without expertise!

Everywhere!

Mine Production

Aggregate Legislation

Municipal

- Municipal Government Act

Provincial

- Alberta Land Stewardship Act
- Law of Property Act
- Public Lands Act
- Public Lands Administration Regulation
- Environmental Protection and Enhancement Act
- Conservation and Reclamation Regulation
- Code of Practice for Pits
- Historical Resources Act

Provincial cont.

- Forest Act
- Water Act
- Wetland Policy
- Code of Practice for Watercourse Crossings
- Weed Control Act
- Weed Control Regulation
- First Nations Consultation

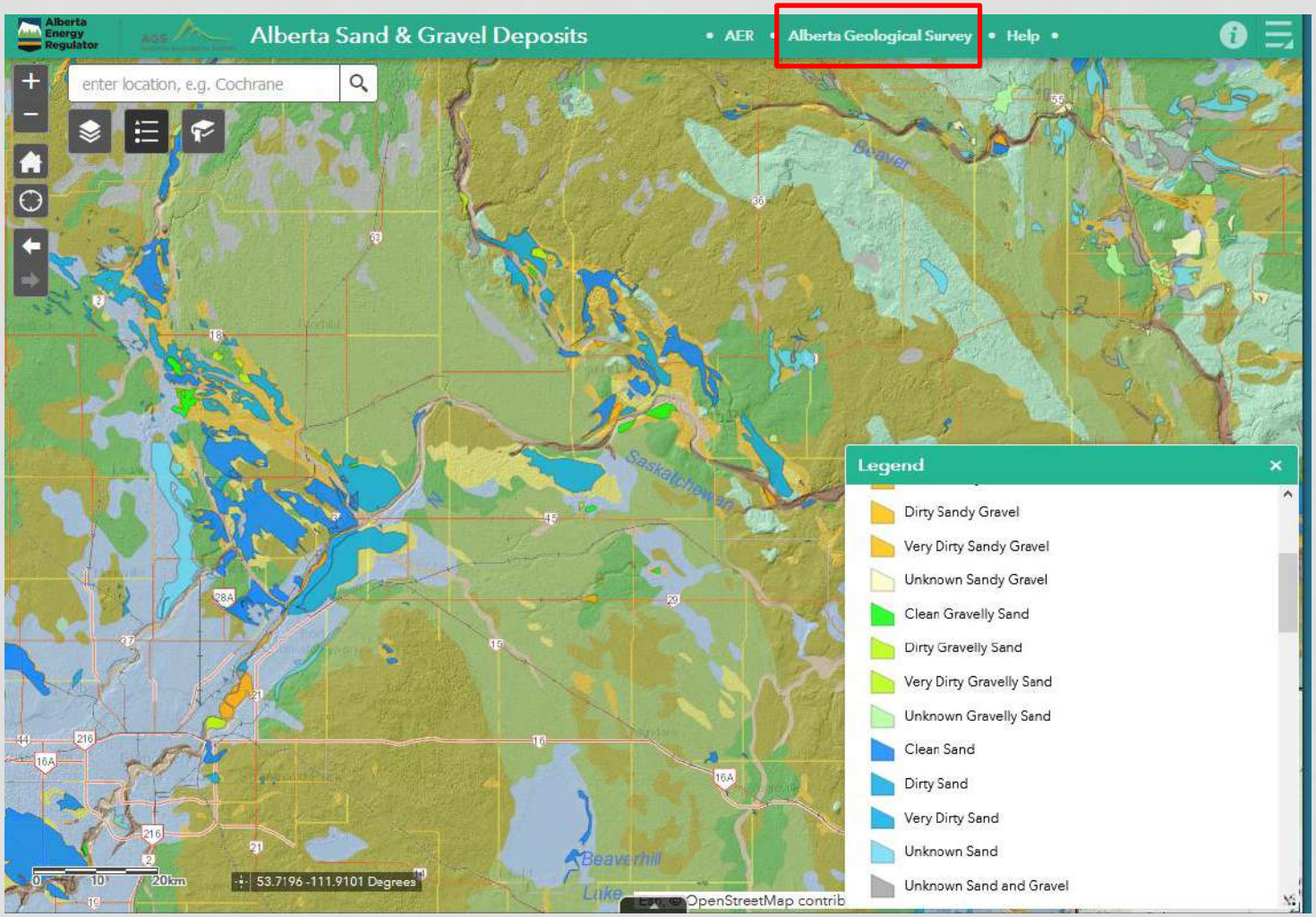
- **Federal**
- Canada Wildlife Act
- Migratory Birds Convention Act
- Species at Risk Act
- Fisheries Act
- Navigable Waters Protection Act

Sand and gravel deposit west of Edmonton, Alberta

asga ALBERTA SAND & GRAVEL ASSOCIATION

Mine Production

Interactive Map for Sand and Gravel Deposits



Life Cycle of Mining

Prospecting & Early Exploration

Indigenous Business Opportunities

Mine Closure & Reclamation

Mineral Exploration

Mine Development

Mining

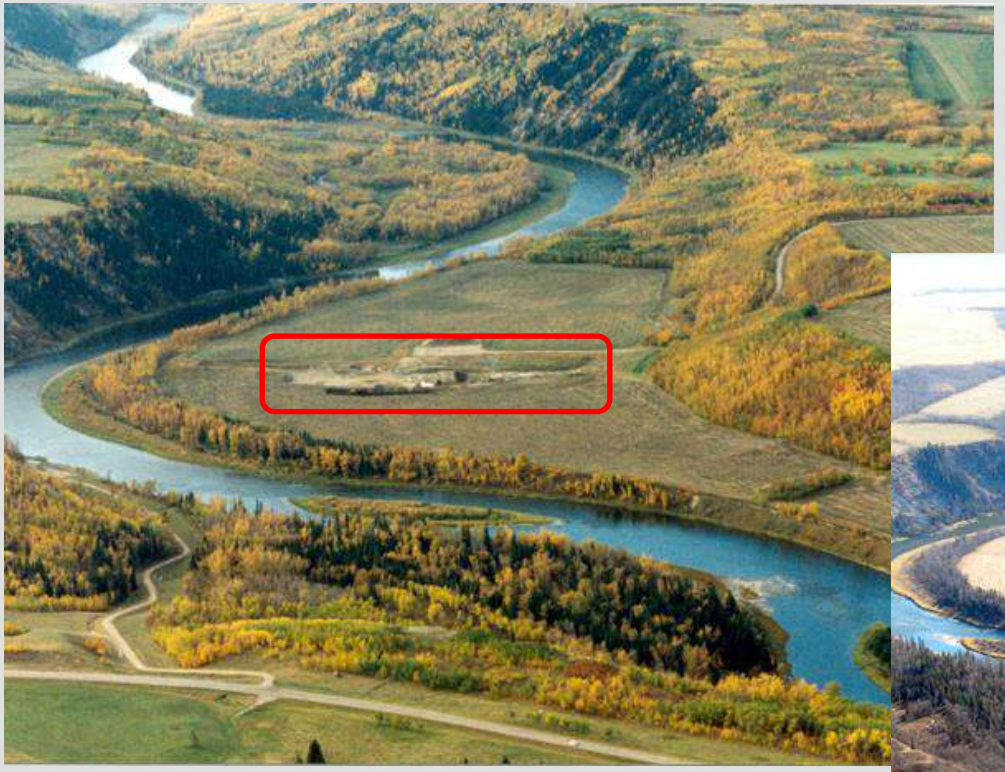
Mine Closure Reclamation

Aggregate Pit Reclamation Required

- Specific plans must be submitted to Alberta Environment regarding development details, conservation strategies, and reclamation
- Typically, lands are returned to their former use as natural areas or agriculture
- Land reclaimed to an equal or better capability
- **Ballachay Pit Reclamation** (west of St. Albert)
- The 15 acre pit opened in spring 2005 and the final cut was removed in mid-2006
- Recontouring was completed by fall 2006 and spring seeding occurred in spring 2007
- Following rotation of crops and weed control, a reclamation certificate was issued in 2010

Mine Closure Reclamation

Reclamation
Hazlett Pit Near Red Deer

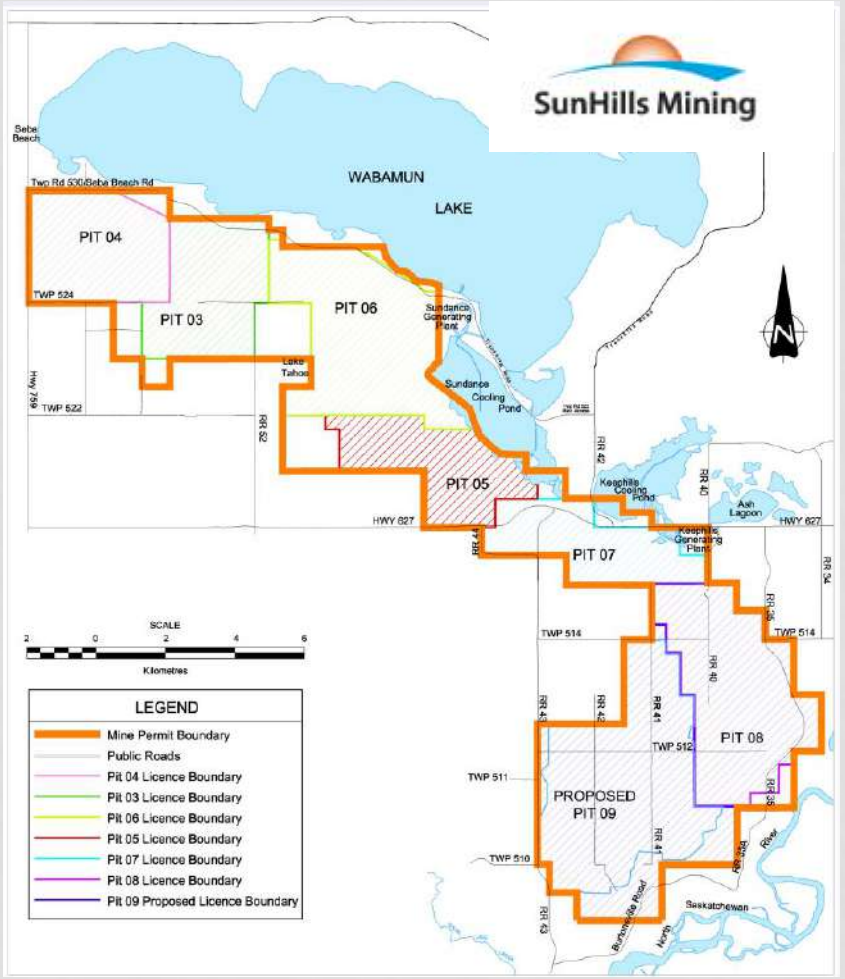


The extraction began at the east end of the pit (look to the top/left side of the following photos) and proceeded to the west, on a yearly basis

Mine Closure Reclamation

Highvale Mine – Mine Started in 1970

- A surface coal mine that involves salvaging of topsoil and subsoil for later replacement, then removing overlying rock layers to expose and extract coal reserves, followed by reclamation of the mined area
- Reclamation certification takes about five to seven years as during this period end-land use and suitability needs to be established
- 1,455 hectares of the 5,865 hectares of disturbed land have been reclaimed to uses such as agriculture, woodlands, wildlife habitat, recreation and wetlands
- Planted 277,000 trees since 2010




Mine Closure Reclamation

Whitewood Coal Mine Reclamation Completed

- Reclamation began in 1962 at the Whitewood mine, where TransAlta led the way in Alberta in developing and implementing land reclamation practices prior to legislation
- “Companies must return the land to an equivalent capability, to what it was before,” says Nixon. “
- The government reviews submissions and works with a company to ensure the reclamation plans are appropriate.
- Reclaiming a site like the Whitewood coal mine located north of Lake Wabamun can take decades to complete.
- Reclaimed area has potential to accommodate agriculture, recreation, commercial and wildlife/wetland habitat (1,913 hectares)

Mine Closure Reclamation

Coal Mine Reclamation Westmoreland Mining

Paintearth Mine

Alberta Innovates is joining federal, provincial, municipal and industry partners in a demonstration project to reclaim land at an Alberta coal mine.
Municipal organic waste from Edmonton will be used to replenish soil at the mine site to grow a willow crop that may be used as a biomass feedstock for renewable energy.

Thomas Kanata Inc.
Mining = New Opportunities?

- A stand-alone company within the Thomas Group of companies
  - Owned and operated by Frog Lake First Nations Reserve members
  - Part of The Confederacy of Treaty Six First Nations in the local Cold Lake area.
  - Offices in Calgary, St. Albert, Grande Prairie, Cold Lake, Rocky Mountain House in Alberta, and other offices are in Langley, British Columbia and Regina, Saskatchewan.

Learn Your ABC's of Mining for Economic Development

Three important ones are:

C = changing commodity prices

P = promotion required to develop new resources

T = time to find/permit/build a major mine

C. Changing Commodity Prices

Rising commodity prices attract investment dollars

More stable prices for products only for local communities

- sand, gravel, stone products

Falling commodity prices reduce investment dollars

Fur Prices Drive Trapping

- Over time fur prices go up and down related to demand
- Stop trapping for certain types of furs when prices slump
- Shortages of popular furs will drive prices up

Wild fur prices on the rebound after 2 year slump, says seller

After 2 years of declining value, some fur prices up by 50%

Josh Campbell · CBC News · Posted: Jan 16, 2018 6:00 AM CT | Last Updated: January 16, 2018

Wolverine pelts with Genuine Mackenzie Valley Fur tags are handled at the Fur Harvesters Inc. auction last week in North Bay, Ontario. (Submitted by Fur Harvesters Inc.)

https://www.cbc.ca/news/canada/north/fur-prices-up-1.4488862

P. Promotion Required to Develop New Resources

- Modern mine developments in Canada require support from all those concerned
  - Governments profile potential resources and permitting/taxation policies
  - Companies explore and develop resources
  - Investors are prepared to risk their money on exploration and mine construction
  - Indigenous and other communities support project plans

T. Takes Time to Find/Permit/Build a Major Mine

Exploration
and Resource
Definition
> 3 years

Mine Permits
> 2-3 years

Construction
> 2 years

mine developed
and opens

T. Takes Time to Find/Permit/Build a Major Mine

Exploration
and Resource
Definition
> 3 years

Mine Permits
> 2-3 years

Construction
> 2 years

mine development project
a) can slow down
or
b) can stall
or
c) can stop and not restart

More Alberta Mining Information

Coal and Mineral Development in Alberta

2018 Year in Review

Metallic and industrial mineral activity - Coal mining and projects - Lithium potential - Industrial mineral and coal production and royalty - Online staking and royalty reporting

Alberta

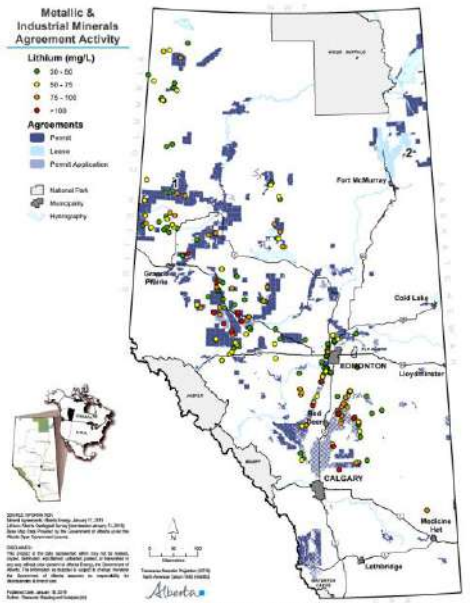


Figure 5. A map of Alberta showing metallic and industrial mineral tenure activity as of January 2018. An interactive, real-time version of this map is available at https://www.energy.alberta.ca/4UIServices/Pages/InteractiveMaps.aspx. The coloured circles show oil field brine samples with greater than 30 mg/L lithium. The lithium data is from the Alberta Interactive Minerals Map (see page 16).

Industrial mineral quarries

Mine/Quarry	Commodity	Location	Operator
Bay Tree	Shale	Grande Prairie	WK Ventures Ltd.
Calling Lake*	Salt	North of Athabasca	Calcium Inc.
Clearwater	Limestone	Rocky Mountain House	Burnco Rock Products Ltd.
Cougar Ridge	Limestone	Rocky Mountain House	Fish Creek Excavating Ltd.
Exshaw	Limestone	Exshaw	Lafarge Canada Ltd.
Fish Creek	Limestone	Nordegg	Fish Creek Excavating
Gap	Limestone	Exshaw	Graymont Western Canada Inc.
McLeod	Limestone	Cadomin	Lehigh Hanson Materials Ltd.
Mitsue*	Salt	Slave Lake	Tiger Calcium Services Inc.
Muskeg	Limestone	North of Fort McMurray	Hammerstone Corporation
Peace River Silica	Silica Sand	Peace River	Contractors Leasing Corp.
Riverview*	Salt	Riverview	K+S Windsor Salt Ltd.
Rundle Stone	Dolomitic Siltstone	Canmore	Kamenka Quarries Ltd.
Seebe	Shale	Kananaskis	Lafarge Canada Ltd.
Sheep Creek	Sandstone	Grande Cache	CST Coal Canada Ltd.
Sprayfalls	Sandstone	Exshaw	Thunderstone Quarries Ltd.
Steepbank	Limestone	North of Fort McMurray	Hammerstone Corporation
Summit Lake	Limestone	Coleman	Graymont Western Canada Inc.
Sunnynook*	Salt	Drumheller	Jarodon Resources Ltd.
Yamnuska	Sandstone	Kananaskis	Lafarge Canada Ltd.

Table 1. A table of the active industrial mineral quarries in Alberta that produced in 2018; there are no metallic mines. *Salt is produced through in situ leaching or from subsurface brines.

Mining Information Sources

Alberta

Exploring for Minerals in Alberta: https://www.alberta.ca/exploring-for-minerals-in-alberta.aspx

Coal and Mineral Development Annual Reviews: https://open.alberta.ca/dataset/35ee97e3-63d7-4c32-9e3b-c64407f31221/resource/35666b7c-7c62-4adc-acf8-fb5106adb74e/download/energy-coal-mineral-development-year-2019-in-review-2020-06.pdf

Minerals of Alberta: https://www.ualberta.ca/earth-sciences/facilities/collections-and-museums/minerals-of-alberta/i

Alberta Chamber of Resources: https://www.acr-alberta.com

Alberta Sand and Gravel Association: https://asga.ab.ca

Coal Association of Canada: https://coal.ca

Overview of a Commercial Aggregate Operator (Edmonton): https://ftaggregates.com/aggregates/

National

https://www.nrcan.gc.ca/our-natural-resources/indigenous-natural-resources/indigenous-participation-mining/indigenous-participation-mining-information-products/7817

- **Interactive map of Indigenous mining agreements**
- **Guide to exploration and mining for Aboriginal communities**
- **Mining essentials: training for Aboriginal Peoples**
- **Partnership agreements**
- **Other useful links**

The Atlas of Canada - Minerals and Mining - https://atlas.gc.ca/mins/en/index.html

Minerals and metals facts - https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/minerals-metals-facts/20507

Minerals and mining publications - https://www.nrcan.gc.ca/maps-tools-and-publications/publications/minerals-mining-publications/18733

Mining Association of Canda - https://mining.ca/

Mining Industry Human Resources Council - https://mihr.ca/

Feel free to email me: Dave.Lefebure@shaw.ca