Metallic and industrial mineral activity
Coal mining and projects
Caribou
Industrial mineral and coal production and royalty
Online staking and royalty reporting
Contents

Introduction 3
Metallic and industrial minerals 3
  2017 metallic and industrial mineral exploration highlights 4
  2017 industrial mineral quarry activities 9
Coal 10
  2017 coal exploration and advanced project highlights 10
  2017 coal mine activities 12
Alberta Energy Updates 13
  Online staking and royalty reporting 13
  Mineral Exploration Roundup 14
Energy and Mines Ministers’ Conference 14
Alberta Geological Survey 15
  2017 Geological Framework 15
  Alberta Interactive Minerals Map 15
  AGS Open Data Catalogue 16
Selected new publications 16
  Alberta Geological Survey 16
Land-use planning 17
  South Saskatchewan Regional Plan and the Castle Parks 17
Caribou range planning 17
  Mineral sales restriction and tenure extensions 17

The information contained within this report has been collected from publicly available government information, company websites, press releases, and reports filed on Sedar (www.sedar.com). All figures quoted are current as of the time of publication. Please consult the company websites for specific information regarding any projects outlined in this report. Any other references are noted within the document. The authors make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

Cover photos

Oil well sampled for lithium concentration (courtesy of E3 Metals).
Outcrop of inclined coal beds near Cadomin (courtesy of the Alberta Geological Survey)
Former Gregg River coal mine
Folded coal beds at the Cardinal River mine

Coal and Mineral Development in Alberta Year in Review
January 2018
ISBN 978-1-4601-3730-7 (Print)
ISBN 978-1-4601-3731-4 (PDF)

ISSN 2291-1545 (Print)
ISSN 2291-1553 (Online)

“Coal and Mineral Development in Alberta Year in Review” is published annually by Alberta Energy
© Her Majesty the Queen in Right of Alberta, as represented by the Minister of Energy, 2018

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A PDF of this document can be downloaded from http://open.alberta.ca/publications/2291-1553.

CMD Year in Review-07 (2017)
Introduction

Alberta’s mineral exploration activity in 2017 focused on laboratory testing for the recovery of iron, lithium and heavy minerals. The sampling of lithium-enriched wastewater brine at oil and gas production wells replaced traditional exploration activities including prospecting, soil sampling, stream sampling, geophysical surveys, and drilling. Diamond, uranium and gold exploration activities were minimal or non-existent. Industrial mineral operators continued to produce limestone, dimension stone, salt and silica sand, but overall industrial mineral exploration and development activity in 2017 was restrained.

Metallurgical coal prices stabilized through 2017 after considerable price volatility in 2016. Exploration of metallurgical coal properties in Alberta continued in 2017 and an application for a new coal mine is under review by the Alberta Energy Regulator.

Metallic and industrial minerals

Mineral exploration activity in Alberta in 2017 was focused mainly on lithium potential in Alberta. This interest was energized by a sharp rise in lithium carbonate prices in 2016 and the publication of lithium concentration data from oil field brine samples on the Alberta Geological Survey’s Alberta Interactive Minerals Map (go to the Alberta Geological Survey website for access to this map).

The total land area held as Metallic and Industrial Minerals Permits increased slightly in 2017, following a multi-year decrease (Figure 1); this increase was driven primarily by the acquisition of rights in prospective lithium areas. The total area held as Metallic and Industrial Minerals Leases remained consistent from 2016 to 2017 (Figure 2). The number of Metallic and Industrial Minerals Licences (required for recreational placer gold mining) saw the first decrease in almost 10 years.
years, likely due to the expiry of licences that were issued when interest began to rise sharply in 2012 (licences are valid for five years; Figure 3). Mineral assessment expenditures filed in 2017 are up from 2016 (some are still pending acceptance by the department); however, the number of assessment reports and number of permits submitted for assessment is down (Figure 4).

2017 metallic and industrial mineral exploration highlights

Iron

In early 2017, Ironstone Resources Ltd. conducted further metallurgical testing of bulk samples from the Clear Hills iron-vanadium deposit. The company is interested in directly refining their Clear Hills iron-vanadium resource into high-purity, high-value metallurgical powders. The very small particle powders are used for producing complex automotive and aerospace parts, for 3-D printing, and for use in pharmaceuticals. In addition, Ironstone is evaluating a process to extract vanadium and cobalt after the iron is refined. Both of these elements are in demand for rechargeable batteries and renewable energy storage systems.

After the test work is complete, the company plans to prepare a feasibility study. The initial intent is to build and equip a 10,000 tonne per year carbonyl iron powder manufacturing plant.

Ironstone owns a 100 per cent undivided interest in the Clear Hills iron-vanadium project, located approximately 200 kilometres north of Grande Prairie in northwest Alberta. The region hosts a near-surface iron-vanadium deposit that extends along the eastern flank of the Clear Hills. In 2012, SRK Consulting (Canada) Inc. prepared a resource estimate for the Clear Hills project outlining an Indicated Resource of 557.7 million tonnes grading 33.3 per cent iron and 0.2 per cent vanadium pentoxide ($\text{V}_2\text{O}_5$), and an Inferred Resource of 94.7 million tonnes grading 34.1 per cent iron.

Lithium

A little known metal was responsible for the majority of mineral exploration activity in Alberta during 2017.

Metallic and Industrial Minerals Licences

![Bar graph showing the total number of active metallic and industrial minerals licences from 2013 through 2017.](image)

**Assessment Report Expenditures**

![Graph of assessment report statistics for 2013 through 2017.](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>Reports</th>
<th>Permits</th>
<th>Area (ha)</th>
<th>Accepted expenditures ($)</th>
<th>Payment in lieu</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>24</td>
<td>193</td>
<td>1,101,370</td>
<td>$5,746,824</td>
<td>$0</td>
</tr>
<tr>
<td>2014</td>
<td>15</td>
<td>81</td>
<td>282,960</td>
<td>$3,905,340</td>
<td>$0</td>
</tr>
<tr>
<td>2015</td>
<td>8</td>
<td>25</td>
<td>116,519</td>
<td>$347,853</td>
<td>$0</td>
</tr>
<tr>
<td>2016(e)</td>
<td>15</td>
<td>90</td>
<td>378,541</td>
<td>$1,100,902</td>
<td>$0</td>
</tr>
<tr>
<td>2017(e)</td>
<td>13</td>
<td>20</td>
<td>85,264</td>
<td>$1,262,066</td>
<td>$0</td>
</tr>
</tbody>
</table>

Figure 4. A graph of mineral assessment report statistics for 2013 through 2017. The number of permits and area are those reported in submitted reports. The accepted expenditures are those accepted by Alberta Energy; the total amount claimed is not reported, but is higher than the accepted expenditure value. Numbers at the base of each bar are the number of reports received. (e) Accepted values for 2016 and 2017 are preliminary because not all report reviews were completed at the time of publication.
Previously, lithium was an uncommon element used in the production of glass and ceramics, lubricants, air treatment devices, cast-iron objects, and medicines. More recently, lithium is used in batteries due to its light weight and high electrochemical potential. Rechargeable lithium-ion batteries are essential components of smartphones, laptops, power tools, and hybrid-electric and electric cars.

The price of lithium compounds has significantly increased in recent years due to an increase in demand and perceived shortages of supply. The primary catalyst for lithium demand is the increasing market share of electric vehicles as opposed to traditional internal combustion-powered vehicles. Another growth area is in renewable energy, as lithium-ion batteries are used for energy storage and load leveling within solar, wind, and tidal-powered electric generation systems.

Lithium is traditionally mined from shallow brines (for example, in Chile and Argentina) or from lithium-bearing minerals in hardrock mines. During the 1990s, the Alberta Geological Survey identified elevated levels of lithium and other elements in saline brine (formation water) associated with oil and gas reservoirs deep in the subsurface. Mining company interest in Alberta's lithium brine potential first manifested in 2009 with several companies acquiring metallic and industrial mineral permits in the Fox Creek and Valleyview regions of west central Alberta. Some initial work was completed but in 2012 the global mining industry collapsed and lithium exploration activities in Alberta diminished.

By the end of 2015 and early in 2016, interest in Alberta’s lithium potential rebounded, and several new companies announced lithium exploration projects in the province. By the end of 2017 lithium exploration accounted for a significant portion of metallic and industrial mineral permits in the province (Figure 5).

Companies are evaluating whether compounds such as lithium carbonate, and potentially other commodities, can be extracted from oil field wastewater before it is re-injected into the subsurface.

MGX Minerals Inc. continued to advance their Alberta lithium project throughout 2017. In January, 2017 the company reported successful crystallization of lithium carbonate in the laboratory from heavy oil evaporator blowdown wastewater. Further bench scale testing resulted in upgrading a sample of brine collected from operating water batteries from 67 mg/L lithium to 1600 mg/L lithium and the removal of magnesium, boron and potassium.

In April, 2017, MGX reported it had received independent laboratory-testing results from the Saskatchewan Research Council (SRC) using MGX’s proprietary process. The SRC recovered up to 83.7 per cent lithium and increased the concentration of lithium from a 71 ppm lithium representative sample of formation brine from the Sturgeon Lake oilfield to 461 ppm lithium.

MGX engineering partner, PurLucid Treatment Solutions, announced in November, 2017 that it has received government funding from Sustainable Development Technology Canada and Emissions Reduction Alberta (up to $3.2 million and $5 million, respectively) to support the commercialization of a low energy water treatment system for the oil and gas industry. This is a separate but associated project with the lithium recovery work.

As of December 6, 2017, MGX reported that PurLucid has partially commissioned a commercial-scale lithium recovery system at a manufacturing facility in Calgary, Alberta. According to the company, the system is capable of processing 750 barrels (120 cubic metres) of brine per day and is expected to be deployed in early Q1 2018.

In spring, 2017, E3 Metals Corp. acquired the Clearwater and Exshaw projects covering the Leduc reservoir in south-central Alberta. The project area covers ten metallic and industrial mineral permits over 87,965 hectares.

On May 31, 2017 the company posted a Technical Report on the project area: “Geological Introduction to E3 Metals Corp. Clearwater and Exshaw Lithium-Brine Properties in South-Central Alberta”. Shortly after, the company signed a collaboration agreement with the University of Alberta for the purpose of developing lithium extraction process technology.

In July, 2017 E3 announced it received approval for additional permits covering 390,000 hectares over the Leduc reservoir in southern Alberta, bringing the company’s land position up to 477,898 hectares. In August, the company signed an agreement to acquire an additional three metallic and industrial mineral permits from Fathom Minerals Ltd.
Coal and Mineral Development in 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 www.energy.alberta.ca/OurBusiness/1072.asp. 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 15).
On October 19, 2017, E3 announced results from the first round of sampling in collaboration with oil and gas producers. A total of 43 brine samples were collected (Figure 6). Lithium values range from 29.1 mg/L to 84.8 mg/L from within the Leduc Formation (39 samples) and 41.4 mg/L to 74.6 mg/L from within the Nisku Formation.

In November, 2017, E3 released an Inferred Mineral Resource estimate of 1.9 million tonnes lithium carbonate equivalent from 4.6 cubic kilometres of brine formation water at an average grade of 77.4 mg/L for the Central Clearwater project area. They also released an Inferred Mineral Resource of 0.93 million tonnes of lithium carbonate equivalent (with an average grade of 52.9 mg/L) from 3.3 cubic kilometres of brine formation water at their Rocky property.

On December 15, E3 released new sampling results and summarized the 2017 program. The samples were collected from actively producing oil and gas wells. The company re-sampled 13 previously sampled wells. The sampling to date confirms generally consistent lithium concentrations across a broad area. Results from four re-sampled wells showed variances in lithium content averaging 5.6 per cent over two to five month periods.

In January, 2017, Power Metals Corp. announced it acquired 23 metallic and industrial minerals permits over two areas. The South Leduc Brine project area covers a large area in the Fox Creek area of the province and the Red Deer lithium brine project is located northeast of the City of Red Deer. In March, 2017 the company added to its portfolio of Alberta lithium projects by acquiring additional permits in the Drumheller and Peace River regions.

LithAlta, a wholly owned subsidiary of Ironstone Resources Ltd., gathered information and made industry contacts during 2017 to inform a two-phase work plan to evaluate the geological potential and lithium extraction potential of the Clear Hills region.

Power Americas Minerals Corp. (formerly Victory Ventures Inc.) acquired an additional six metallic and industrial mineral permits in 2017 near its Spirit River lithium project located in northwest Alberta. The company’s total land package is ten metallic and industrial permits covering more than 90,000 hectares and containing more than 1,000 well sites, and more than 200 new and deep-basin wells that were drilled since 2010. The company completed brine sampling from 10-20 separate wells in cooperation with oil and gas producers; however, no significant results were returned and the company is considering the next stage of exploration.

Other companies holding properties with lithium potential in Alberta include Empire Metals Corp., US Cobalt Inc. (formerly Scientific Metals Corp.), and Softrock Minerals Inc.

Silica sand

In early 2017, Athabasca Minerals Inc. announced it has received First Nations Consultation approval for its Firebag project. The company is considering the feasibility of a pilot project for its Firebag Frac Sand project located 95 kilometres north of Fort
McMurray. The Firebag project has potential to produce high quality silica sand (frac sand) for use in the hydraulic fracturing of oil and gas bearing formations. A Preliminary Economic Assessment released by the company in 2015 contemplated an average production of 897,072 tonnes of frac sand per year for 25 years. The Inferred resource is 39.2 million tonnes of frac sand.

Heavy minerals
Titanium Corporation Inc. is working on deploying technology designed to recover bitumen, solvent and minerals (titanium minerals and zircon) from oil sands tailings.

In February, 2017 the company, with the support of industry and government partners, commenced a laboratory scale testing program at an Alberta university research facility to remove and recover bitumen from legacy pond tailings using the company's technology. The program will assess the potential for bitumen recovery to improve the remediation of pond tailings.

On July 7, 2017 the company announced that the project “Reducing Methane Emissions and other Environmental Impacts from Oil Sands Tailings and Ponds – Deployment of Sustainable Technology” was approved for funding from Emissions Reduction Alberta up to the lesser of $5 million or 50 per cent of the total eligible project expenses. On September 28, 2017, Titanium announced that it will contribute up to $1.5 million and Canadian Natural Resources will fund up to $3.7 million for the project, bringing the total funding up to $10.2 million. The final agreement with Emissions Reduction Alberta was announced October 19, 2017.

Titanium is working with Canadian Natural Resources to conduct engineering design for an oil sands tailings treatment system that eliminates certain tailings streams while recovering bitumen, solvent, and high value minerals. The goal is to significantly decrease methane emissions from mined oil sands operations by preventing solvent and bitumen release. The technology is targeted towards froth treatment tailings which are estimated to be responsible for more than 90% of methane emissions from tailings ponds.

In October, Ucore Rare Metals Inc. announced the completion of analytical characterization of a pregnant leach solution derived from the

---

**Quarriable Mineral Production**

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (t)</th>
<th>Royalty</th>
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<tbody>
<tr>
<td>2013</td>
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</tr>
<tr>
<td>2014</td>
<td>10,583,127</td>
<td>$500,671</td>
</tr>
<tr>
<td>2015</td>
<td>10,934,343</td>
<td>$527,966</td>
</tr>
<tr>
<td>2016</td>
<td>10,121,480</td>
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<tr>
<td>2017</td>
<td>7,244,297</td>
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**Salt Production**

<table>
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<tr>
<th>Year</th>
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<th>Royalty</th>
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<td>2014</td>
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<td>2015</td>
<td>213,004</td>
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<tr>
<td>2016</td>
<td>212,826</td>
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</tr>
<tr>
<td>2017</td>
<td>221,067</td>
<td>$99,480</td>
</tr>
</tbody>
</table>

---

Figure 7. The total quarriable mineral production and royalty collected for the last five years, including 2017. The report period is from October 1 to September 30. Quarriable minerals include dolomitic siltstone, limestone, sandstone, shale, and silica sand.

Figure 8. The total salt production and royalty collected for the last five years, including 2017. The report period is from October 1 to September 30.
### Industrial Mineral Quarries

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

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

Alberta oil sands. From their sample testing Ucore reported two main findings: 1) rare earth elements (REE) were successfully dissolved into a solution amenable to treatment by Molecular Recognition Technology (MRT); and 2) there are no technical barriers that would indicate an inability to extract REE from the source material using an MRT circuit. Their next step is to adjust the dissolution procedures to maximize the concentrations of the REE in solution, followed by testing for the purpose of REE class separations at bench scale.

In 2016, Ucore had announced a partnership with an oil sands producer, which is developing a commercial process for recovery of metals-enriched concentrates from the Alberta oil sands.

2017 industrial mineral quarry activities

**Production and royalty.** The production of quarriable minerals (including limestone, dolomitic siltstone, sandstone, and silica sand) decreased significantly in 2017 as compared to the previous five years (Figure 7). Salt production remained approximately the same year over year from 2016 (Figure 8). Limestone continues to be the most significant quarriable commodity produced in Alberta during the last five years. Salt production, from the Devonian Elk Point Group, is from in situ leach and brine extraction operations (rather than traditional mining methods).

Table 1 lists all operating industrial mineral quarries in Alberta.
Coal

The total area and number of coal leases in the province decreased in 2017 (Figure 9), which continues a four year trend. The number and area of coal lease applications has followed the same trend and decreased further in 2017. Coal lease applications are located on areas classified as Coal Category 2 or 3 in “A Coal Development Policy for Alberta (1976)” that restricts the issuance of new leases. Requests for coal rights in these areas remain as applications. See Figure 10 for a map of Alberta’s coal fields, coal ranks, mines, and projects.

Bituminous coal (for both thermal and metallurgical use) mined in the Foothills/Mountain region is exported overseas, primarily to the Asian market for use in steel-making. Subbituminous coal is mined in the Plains region and used domestically for electricity generation.

2017 coal exploration and advanced project highlights

The Alberta Energy Regulator (AER) issued a Notice of Application for Benga Mining’s Grassy Mountain Coal Mine project. The application proposes a metallurgical coal mine, with a coal processing plant, associated infrastructure, an overland conveyor system, a rail load-out facility, and a new section of rail track to connect to the Canadian Pacific Railway mainline. The mine would produce 4.5 million tonnes of clean coal per year over a 24 year mine life.

Subject to regulatory timelines, Benga’s goal is to begin construction in early 2019 and begin production of cleaned metallurgical coal by early 2021.

Benga’s application requests approvals under four acts: Coal Conservation Act (mine licences to construct, operate, and reclaim an open mine pit; three rock disposal areas; and approval to construct and operate a new coal processing plant), Environmental Protection and Enhancement Act (approval to construct, operate, and reclaim the project), Public Lands Act (a Mineral Surface Lease to use Crown land within a mine permit boundary), and Water Act (approval to capture, control, treat, and manage surface runoff and groundwater as part of a water management program, including the development of an end-pit lake; and transfer surface water licences to divert water for use in the project).

The project will go through a public joint provincial-federal review. As of publication, the collection of statements of concern to the AER has closed and the AER is reviewing the project.

The Grassy Mountain project is located seven kilometres north of Blairmore in the Crowsnest Pass. Benga is a wholly owned subsidiary of Riversdale Resources.

Coalspur Mines made application to the Alberta Utilities Commission for an exemption under section 24 of the Hydro and Electric Energy Act to construct and operate an electric distribution system within its Vista Coal Mine site. The installation would include a mobile substation and 25 kilovolt electric distribution lines in the mine area.

Coalspur received full regulatory approval to begin construction of the Vista bituminous coal mine in 2014. The company has not started construction on the site.

Altitude Resources was granted a two year drill permit for up to 2,000 metres of rotary and core drilling on its Palisades property, which is located northwest of Hinton. The company reported that the $1.2 million program would target a new area defined in their 2016 drill program as well as drilling on their Palisades Extension for the first time. The Palisades project is a joint venture with the Japanese Oil, Gas and Metals Corporation (JOGMEC).
Figure 10. A map of Alberta showing coal tenure activity (dark brown), and coal mines and projects, as of January 2018. Coal fields (light brown) and approximate coal rank distribution (coloured bands) are also shown. An interactive, real-time version of the coal tenure on this map is available at www.energy.alberta.ca/OurBusiness/1072.asp.
Altitude planned a two-phase program in 2017 for their Altitude North property (located next to the Grande Cache metallurgical coal mine): two to three weeks of detailed mapping and drill hole targeting, followed by a resource and coal quality drill program.

In late 2017, Altitude agreed to sell 100 per cent of its Elan property to Atrum Coal.

**Ram River Coal Corp.** completed a prefeasibility study in March 2017, a National Instrument 43-101 technical report in April 2017, and a prefeasibility optimization study in August 2017 on its Aries bituminous metallurgical coal project located 50 kilometres west southwest of Rocky Mountain House.

The technical report defines a surface mineable 215 million tonne Measured and Indicated Resource and Proven and Probable Reserves of 183 million tonnes (run of mine) and 121 million tonnes (clean coal). The proposed mine plan has production of six million tonnes per year run of mine, or four million tonnes clean coal, over a 33 year mine life. With a reported CSR (coke strength after reaction) of 50-55 per cent, Ram Coal sees the coal quality as superior to semi-soft coking coal and comparable to semi-hard coking coal from Australia. Additional Resources have also been defined for the South Block of the Ram River coal project.

The prefeasibility study has used a progressive reclamation model in its mine plan using a conventional truck and electric shovel mining method.

### 2017 coal mine activities

**Production and Royalty.** Bituminous coal production in Alberta was slightly lower in 2017 as compared to the previous two years. Royalties have increased over the same period due to higher and more stable metallurgical coal prices at the end of 2016 and through 2017. The 2016 royalty amount was adjusted upwards from what was reported in the “Coal and Mineral Development in Alberta 2016 Year in Review” due to additional royalties reported at annual reconciliation in April 2017. Bituminous coal royalty for 2017 is expected to continue its upward trend and be higher than 2016 (Figure 11).

Although subbituminous coal production was up slightly from 2016 (Figure 12), the Crown royalty collected was down because of a decrease in the Crown-owned portion of the total production.

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**Figure 11.** The total bituminous coal production and royalty collected for the last five years, including 2017. The report period is from October 1 to September 30. *2016 royalty is higher than reported in the 2016 edition because of year end reconciliation in April 2017. (e) 2017 royalty and production is an estimate until final reconciliation in April 2018.

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (t)</th>
<th>Royalty</th>
</tr>
</thead>
<tbody>
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<tr>
<td>2014</td>
<td>6,915,435</td>
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<tr>
<td>2015</td>
<td>4,066,285</td>
<td>$5,107,884</td>
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<tr>
<td>2016*</td>
<td>4,060,223</td>
<td>$11,372,650</td>
</tr>
<tr>
<td>2017(e)</td>
<td>3,474,228</td>
<td>$17,508,804</td>
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</table>

**Figure 12.** The total subbituminous coal production and royalty collected for the last five years, including 2017. The percentages are the portion of the production from Crown coal rights. Alberta Energy only collects royalty on coal production from Crown-owned coal rights. The report period is from October 1 to September 30.

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (t)</th>
<th>Crown %</th>
<th>Royalty</th>
</tr>
</thead>
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<td>59%</td>
<td>$7,209,349</td>
</tr>
<tr>
<td>2014</td>
<td>24,230,326</td>
<td>70%</td>
<td>$9,314,753</td>
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<tr>
<td>2015</td>
<td>23,613,875</td>
<td>72%</td>
<td>$9,324,471</td>
</tr>
<tr>
<td>2016</td>
<td>21,422,954</td>
<td>68%</td>
<td>$8,061,524</td>
</tr>
<tr>
<td>2017</td>
<td>22,303,049</td>
<td>60%</td>
<td>$7,331,674</td>
</tr>
</tbody>
</table>
Grande Cache Coal Mine

The Grande Cache coal mine remained suspended in 2017 and the company continued to be under control of a receiver. On January 8, 2018, the receiver was granted court approval for a potential sale of the mine.

Alberta Energy Updates

Online staking and royalty reporting

In fall 2017, Alberta Energy received funding to complete two projects to add functionality to the department’s Electronic Transfer System: 1) online submission of applications for metallic and industrial mineral, coal, and ammonite shell tenure, and 2) online submission of royalty reports for metallic and industrial minerals and coal.

At the time of publication, development and testing of the new online functions is underway. Online tenure applications are expected to be available the first week in March 2018, with online royalty payments two weeks after.

Coal Mines

<table>
<thead>
<tr>
<th>Mine</th>
<th>Coal rank</th>
<th>Location</th>
<th>Owner/Operator</th>
<th>Main use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheviot (Cardinal River)</td>
<td>Bituminous</td>
<td>Hinton</td>
<td>Teck Coal Ltd.</td>
<td>Export: metallurgical</td>
</tr>
<tr>
<td>Coal Valley</td>
<td>Bituminous</td>
<td>Hinton</td>
<td>Westmoreland Coal Co.</td>
<td>Export: thermal</td>
</tr>
<tr>
<td>Dodds</td>
<td>Subbituminous</td>
<td>Ryley</td>
<td>Dodd’s Coal Mining Company Ltd.</td>
<td>Small-scale sales</td>
</tr>
<tr>
<td>Genesee</td>
<td>Subbituminous</td>
<td>Warburg</td>
<td>Capital Power LP / Westmoreland Coal Co.</td>
<td></td>
</tr>
<tr>
<td>Grande Cache*</td>
<td>Bituminous</td>
<td>Grande Cache</td>
<td>Grande Cache Coal Corp.</td>
<td>Export: metallurgical</td>
</tr>
<tr>
<td>Highvale</td>
<td>Subbituminous</td>
<td>Wabamun</td>
<td>Transalta Corp / SunHills Mining LP</td>
<td>Electricity: Keephills and Sundance generating stations</td>
</tr>
<tr>
<td>Paintearth/Vesta</td>
<td>Subbituminous</td>
<td>Forestburg</td>
<td>Westmoreland Coal Co.</td>
<td>Electricity: Battle River generating stations</td>
</tr>
<tr>
<td>Sheerness</td>
<td>Subbituminous</td>
<td>Hanna</td>
<td>Westmoreland Coal Co.</td>
<td>Electricity: Sheerness generating stations</td>
</tr>
</tbody>
</table>

*As of the end of 2017 the Grande Cache mine is suspended.

In the Plains region of Alberta, coal rights are a mixed patchwork of Crown and Freehold rights. The proportion of Crown coal versus Freehold coal mined varies from year to year depending on how each mine advances.

Table 2 lists all operating coal mines in Alberta.

Coal Valley Coal Mine

In 2017, Sherritt International was fined $1 million for releases of wastewater from the Coal Valley bituminous coal mine in 2011 and 2012. Fines were for violations of the federal *Fisheries Act*; most of the fine will be used for preservation and research of fish habitat.

Sherritt also received a $4.5 million fine for a 2013 release of tailings material after a tailings dam failed at the now closed Obed Mountain bituminous coal mine. The fine was from both the federal and provincial governments.

Sherritt sold its coal assets, including the Coal Valley and Obed Mountain mines to Westmoreland Coal in 2014 after both incidents occurred.

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The Electronic Transfer System (ETS) is a secure web application that receives and validates requests from authorized users for a number of different services provided by the system. Originally created in 1998 to transfer information between industry and the department of Energy, ETS has grown to be a critical interface for petroleum and natural gas and oil sands business in Alberta: including online posting and bidding for tenure rights, transfer of agreements, and payment of royalties. The addition of this new functionality is the first step to allow the metallic and industrial mineral and coal sectors to do online business with Alberta Energy.

Mineral Exploration Roundup

Alberta Energy, with support from the Alberta Geological Survey, hosted a tradeshow booth at the Mineral Exploration Roundup event in Vancouver from January 23-26, 2017. One of Canada’s largest mining conventions and trade shows, Roundup provides an opportunity to meet a wide cross-section of companies working in the mineral exploration and development sector in western Canada. Alberta Energy’s booth highlighted Alberta’s metallurgical coal and mineral potential.

Energy and Mines Ministers’ Conference

Alberta Energy participated in the Energy and Mines Minister’s Conference (EMMC), in St. Andrews, New Brunswick, from August 13 to 15, 2017. The EMMC is an annual gathering of federal, provincial and territorial ministers responsible for energy and mining portfolios.

Key topics discussed by mines ministers during the conference included enhancing public confidence in mineral development, promoting the participation of Indigenous peoples throughout the mining cycle, supporting mineral exploration by junior mining companies, and building on the mining industry’s success in both the adoption of green technologies and being a critical supplier of minerals and metals needed for clean growth.

Ministers committed to work together to develop a new Canadian minerals and metals plan to help position Canada as the leading mining nation and to lay the foundation for lasting success at home and abroad. This will be a shared vision developed with federal, provincial, and territorial ministers, Indigenous peoples, industry, and stakeholders. This will also include an investment strategy for Canada’s minerals and metals industry.

The five-year renewal of the Intergovernmental Geoscience Accord was highlighted by participating ministers as an example of collaboration among different orders of government. The accord defines the roles and responsibilities of participating federal/provincial/territorial government geoscience agencies and establishes mechanisms for generating, disseminating and sharing geoscience information. They also highlighted the importance of increasing Indigenous partnership and collaboration and incorporating traditional knowledge in the expansion of publicly available geoscience data.

During EMMC, mines ministers approved three deliverables:

Common Principles for Engagement and Participation in Energy and Mineral Development. This document identifies common principles and a checklist of considerations for engagement and participation to help governments and regulators build and maintain constructive relationships in communities where energy and mineral resource development is taking place or being considered. The principles were developed based on success factors identified in public confidence and community engagement research and the 2016 National Workshop on Public Confidence, prior to the 2016 EMMC.

Building Trust in Canada’s Natural Resource Development. This fact sheet highlights government efforts to strengthen public confidence of Canadians in how our natural resources are developed.

National Collaboration Strategy for the Mining Industry – Driving Innovation in the Canadian Mining Industry. The objective of this report is to review the current mining ecosystem in Canada and provide a strategy to improve collaboration between various sector stakeholders for the purposes of supporting mining innovation and the adoption of green mining technologies by Canada’s mining industry.

These publications can be viewed on Natural Resources Canada’s website: www.nrcan.gc.ca/publications/11102.
Alberta Geological Survey

The Alberta Geological Survey (AGS) is the official provincial geological survey of Alberta. The AGS operates by the guiding principles of the Canada Intergovernmental Geoscience Accord, which identifies the provincial survey as being the principal steward, resident authority, and principal investigator for public geoscience. The AGS resides within the Alberta Energy Regulator and is responsible for the systematic description of the geology and resources within Alberta, as well as providing geoscience information to support regulatory decision making related to resource development, land-use planning, environmental protection as well as public health and safety issues.

The AGS delivers geoscience in several key areas, including surficial and bedrock mapping, geological modelling, resource evaluation (hydrocarbons and minerals), groundwater, and geological hazards. The AGS creates and disseminates geoscience information and knowledge through reports, maps, and digital data sets, as well as technical presentations and a variety of outreach activities. Many AGS products are built within a publicly accessible, interactive GIS environment, which includes the development of 3D geological models that enable the visualisation of surface and subsurface features and allow users to incorporate their information within the models.

The AGS website (ags.aer.ca) contains a wide range of information on the geology of Alberta, including over 2500 reports, 400 maps, and 1300 datasets (digital data, shapefiles, and digital imagery). Current projects and activities are also highlighted, along with additional geoscience information about Alberta.

2017 Geological Framework

The AGS continues to develop the three-dimensional (3D) Geological Framework of Alberta, which provides a provincial-scale representation of Alberta’s subsurface geology. The 3D Geological Framework Model covers approximately 602,825 square kilometres and is composed of 32 provincial-scale units from the modern land surface to the Precambrian basement. The 3D Geological Framework acts as a repository for subsurface data and forms the geological foundation for much of the work at the AGS. Recent work includes the integration of 8 coal zones (Ardley, Carbon-Thompson, Daly/Weaver/Garden Plain, Wayne/Rockyford Standard, Basal Drumheller, Lethbridge, Taber, and Mackay) within the Upper Cretaceous and Paleogene intervals of the 3D Geological Framework. Visit the AGS website (ags.aer.ca/bedrock-modelling.htm) for more information about the geological framework and other 3D modelling efforts at the AGS.

In 2017, AGS staff developed tools to enhance stakeholder engagement and communication of geology and mineral resources by developing interactive Minecraft models for select regions of Alberta. The Minecraft models allow people of all ages to explore Alberta’s surface and subsurface geology within this popular gaming platform. For more information on the Minecraft models developed by AGS, please visit (ags.aer.ca/geology-alberta-minecraft-edition).


Current activities at the AGS include the development of a Mineral Resource Map (1:1,000,000 scale) of Alberta. This map will display the locations of known mineral deposits and selected occurrences in addition to outlining geological units (or areas) favourable for the concentration of minerals by deposit type. The Mineral Resource Map will constitute a repository of mineral-related data and interpretations to inform government, industry, and the public of Alberta’s metallic and industrial resources.

Other activities of the minerals group include the evaluation of the metal endowment of shale and mudstone in Alberta’s basin, the distribution and amount of helium in producing oil and gas fields, and the origin of lithium-rich brines based on new chemical data from formation water collected from a number of oil/gas pools in west-central Alberta during the summer of 2016.

Alberta Interactive Minerals Map

The AGS provides web-based interactive maps, which help users visualize geological and mineral data within the province. The Alberta Interactive Minerals Map (AIMM) was developed in 2015 as a joint project between the AGS and Alberta Energy to provide the Government of Alberta, the public, and industry with an interactive application for viewing and querying mineral resources data. These data are accessible through an open data portal which connects users to the AGS Open Data Catalogue which allows free access to and download of all data contained in AIMM.
AIMM is regularly updated as AGS staff continue to migrate data holdings and maps into this portal. During 2017, AIMM datasets have been updated with additional mineral occurrences identified in government and industry reports. To explore the AIMM site, please visit the interactive geology map page on the AGS website (ags.aer.ca/data-maps-models/interactive-maps).

AGS Open Data Catalogue
The Open Data Catalogue features a subset of GIS data published by the AGS. Data can be downloaded in spreadsheet, shapefile, or KML format. Each dataset is accompanied by a full metadata record so that users understand the original intent of the data and to help them assess its usefulness for their purposes.

The Open Data Catalogue is available at geology.ags-aer.opendata.arcgis.com or can be accessed through the AIMM application.

Selected new publications

Alberta Geological Survey
All reports, maps, and digital datasets are available for free from the AGS website: www.ags.gov.ab.ca. Selected releases in 2017 are provided below:


Land-use planning

South Saskatchewan Regional Plan and the Castle Parks

Three of the eight new South Saskatchewan Regional Plan (SSRP) conservation areas impacted portions of a small number of metallic and industrial mineral (MIM) agreements. The management intent of new conservation areas does not allow MIM or coal exploration and development as defined in the SSRP under the Alberta Land Stewardship Act. As such, it is expected that there will be no additional tenure to be available in the area of the Castle Parks region.

The Castle Provincial Park and Castle Wildland Provincial Park are part of the SSRP and protect valuable watersheds, head waters, and habitat for more than 200 rare species.

Caribou range planning

Under the federal government’s Woodland Caribou Recovery Strategy, all provinces and territories were instructed to develop a plan for each caribou range (Figure 13) that outlines how industrial and recreational activities will be managed over time and space to support self-sustaining caribou populations, and to achieve a target of 65% undisturbed habitat. The Woodland Caribou Recovery Strategy is enabled under the federal Species at Risk Act. The federal government released a progress report on October 31, 2017 and touched on the work that Alberta is doing to balance caribou habitat and the socio-economic health of Albertans. On December 19, 2017, Alberta released a Draft Provincial Woodland Caribou range Plan for public comment.

Mineral sales restriction and tenure extensions

In April 2013, a restriction on mineral tenure sales was placed in the Little Smoky and A La Peche caribou ranges to support and maintain flexibility for range planning. To support the recommendations of the mediator’s report, a mineral tenure sales restriction was placed in all caribou ranges in September 2016. The restriction provides government and industry time to align management approaches across all caribou ranges.

Since November 4, 2016 the Government of Alberta has offered the option for existing agreement holders to apply for extensions until March 31, 2019 for Petroleum and Natural Gas Agreements, Metallic and Industrial Mineral Permits, and Oil Sands Leases that fall in whole or in part within a caribou range (For further details, please see Alberta Energy Information Letter 2016-34).

Government is expected to consider resuming mineral sales in caribou ranges when range plans are completed.
Caribou Ranges of Alberta

SOURCE INFORMATION:
Caribou Range: 2011 Woodland Caribou Policy for Alberta
Alberta Environment and Sustainable Resource Development
Base Map Data provided by the Government of Alberta under the Alberta Open Government Licence.

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Published Date: November 23, 2016
Author: Resource Mapping and Analysis

Figure 13. A map showing the caribou ranges within Alberta.
About Alberta’s regulatory system

The Crown owns 81 per cent of the mineral rights in Alberta. The other 19 per cent are Freehold mineral rights and are owned by individuals, companies or the federal government on behalf of First Nations. The Coal and Mineral Development Branch is responsible the administration of the Crown’s mineral rights for metallic and industrial minerals and coal.

The mineral rights for coal, and metallic and industrial minerals are managed using a variety of agreements, depending on the specific substance and/or activity a client wishes to pursue. Each agreement type is defined and governed through the Alberta’s Mines and Minerals Act, and the Metallic and Industrial Minerals Tenure Regulation. Fees and rentals are set out in the Mines and Minerals Administration Regulation.