

EMERGING IDEAS

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INDUSTRIAL TECHNOLOGY

Helium

"It's a Gas" – A Unique Investment Opportunity in an Emerging Industry

Company Profiles (Page)

Desert Mountain Energy Corp. (<u>14</u>) First Helium Inc. (<u>19</u>) Imperial Helium Corp. (<u>23</u>) North American Helium Inc. (<u>27</u>) Royal Helium Ltd. (<u>31</u>)

This publication seeks to highlight firms that we come across during our travels where, while perhaps not ready for formal research coverage, we see notable developments or inflection points that we believe may be of interest to investors. Unless otherwise denoted, all figures shown in C\$

- Opportunity Overview. With a major global reserve in the US out of the picture, rapidly increasing demand for helium from a variety of highgrowth sectors has brought some spectacular price increases for this coveted noble gas. We see the emerging North American helium sector as an exciting opportunity for investors to gain exposure to small-cap companies that are leveraging conventional oil and gas expertise, and in some cases exploiting existing natural gas discoveries, to tap into the tremendous economics offered by helium extraction.
- Compelling Demand Themes Meet Supply Concerns. Alongside the better-known uses of helium (e.g., balloons, medical equipment), the growing space exploration industry and the world's increasing dependence on technology and high-powered computing will continue to propel demand for the gas.
- As a relatively scarce, non-renewable resource that has no replacements in many of its applications, helium consumers have increased their focus on supply certainty as new projects in Russia, Qatar, and Africa carry significant geopolitical risk.
- **Pricing and Economics.** While a reliable source of helium prices does not currently exist, the last US government auction in August 2018 saw prices spike 135% Y/Y to US\$280/Mcf. With similar/stable pricing, we forecast IRRs of ~140% with payouts just over one year.
- Why Here, Why Now? The void in supply created by the US depleting its helium reserves in 2019 (~25% of global supply) has opened up an enticing opportunity for new North American players to supply helium to a growing market. North America offers an attractive environment for helium extraction given the availability of a vast conventional well database, ample seismic data, drilling/geological expertise, and stable regulatory systems offering favorable lease terms and royalties.
- Investor Sentiment Improving. Since spring, the two publicly listed (TSX-V) helium companies' stock prices have doubled while a number of private placements in the space (several oversubscribed) have closed this year alone.
- Company Profiles. In this report, we are highlighting five companies active in the space – each at varying stages of development. Two companies are publicly listed, Desert Mountain Energy Corp. (DME-V, Not Rated) and Royal Helium Ltd. (RHC-V, Not Rated), while the other three outlined in this report, First Helium Inc., Imperial Helium Corp, and North American Helium Inc., are private.

Helium 101

Uses of Helium	Helium (atomic number 2) is a colorless, odorless, non-toxic, inert (noble) gas and is the second lightest and second most abundant element (after hydrogen) in the universe. With the lowest boiling point of any element (-268.9°C or -452.1°F) and being inert (unlike hydrogen), it lends itself well to cryogenic applications such as cooling superconducting magnets in MRIs (magnetic resonance imaging) and NMR (nuclear magnetic resonance) spectrometers as well as being used as a shielding gas for welding and in semiconductor manufacturing where an inert atmosphere is required. Beyond this, its lightness and low reactivity allow it to be used for leak detection and purging/pressurizing rocket propulsion systems.			
Figure 1	Helium Properties and Applications			
	Property	Application		
	Lowest boiling point	Liquid cooling of low-temp. superconductors Purging liquid hydrogen systems		
	Second lightest element	Lifting medium for balloons / airships		
	Smallest molecular size	Leak detection		
	Chemically and radiologically inert	Carrier gas (analytical, semiconductor) Heat transfer medium in fusion reactors		
	High specific heat / thermal conductivities	Gaseous cooling (fiber optics)		
	Highest ionization potential	Metal / Plasma arc welding		
	Low solubility	Deep sea diving gases		
	High sonic velocity	Metal coating		
	Source: Air Products and Chemicals, Inc., Cormark Se	ecurities Inc.		
	Despite being the second most abundant element in the universe, its occurrence on Earth is relatively rare at ~5.2 ppm (by volume) in the atmosphere. Two stable isotopes of helium exist, ³ He and ⁴ He, with the latter being the more abundant of the two on Earth (comprising more than 99.9%). The bulk of (terrestrial) helium present today on Earth is a result of the alpha decay of certain radioactive elements (predominantly thorium and uranium).			
Commercial Grades / End-Users	With the wide range of possible applications for helium, commercial helium is commonly marketed by a grade representing the purity of the gas. The first number in the grading system before the decimal point reflects the number of 9's in the purity (e.g., grade 6 has purity of 99.9999% while grade 5 helium has purity of 99.999%). The second number in the grading system (the number after the decimal point) represents the last number after the 9's in the purity (e.g., grade 4.8 helium has purity of 99.998%).			
	Grade 6 helium is the closest to 100% hel well as everything in between) is typically manufacturing of semiconductors, MRIs, optics, a shielding gas in welding, and some 4.8 helium (99.998% purity) is generally while Grade 4 helium (99.99% purity) and which, as its name implies, is predominant such as leak detection, air bags, and heat t helium.	lium at 99.9999% and along with grade 5 (as v considered "research grade" and used in the scientific research, a cooling gas for fiber etimes for weather balloons and blimps. Grade the highest of the "industrial grade" heliums I lower are known as "balloon grade" helium, ly used for balloons though other applications transfer applications may use this lower-grade		



Helium can also be classified as "Grade-A" which represents helium with purities of 99.997% (grade 4.7) or greater.

2	Summary of Commercial Helium Grades	
	Grade	Helium Purity
	Grade 6	99.9999%
	Grade 5	99.999%
	Grade 4.8	99.998%
	Grade 4.7 (i.e., "Grade-A")	99.997%
	Grade 4.5	99.995%
	Grade 4	99.99%
	*Note: List does not include all grades of helium	

Source: Cormark Securities Inc.

In the United States, estimated annual domestic consumption of Grade-A helium (99.997% or greater) in 2019 was 1.4 Bcf. It was used for MRIs (30%), lifting gas (17%), analytical/laboratory applications (14%), welding (9%), engineering/scientific applications (6%), leak detection (5%), semiconductor manufacturing (5%), and 14% for various other minor applications.



Demand Constituents of Helium (United States)



Understanding The Helium System

The accumulation of helium in the subsurface shares many characteristics with hydrocarbons, though the nature of the source, maturation, migration, and trapping mechanisms differ (Figure 4).

In a helium system, the *source* of helium (⁴He, the dominant stable isotope of helium) is *radiogenically* sourced from the alpha decay of uranium and thorium (specifically, ²³⁸U, ²³⁵U, and ²³²Th) in the Earth's crust. This is in contrast to a petroleum source which is *biogenically* sourced from the thermal decay of organic matter in the source rock. Typically, Precambrian metamorphic or granitic basement rocks have high concentrations of uranium and thorium and have had enough time for the production and accumulation of helium to occur through radioactive decay versus younger sediments which, although they may have high enough uranium and thorium content, lack the time requirement to produce enough helium.



Figure 4	Petroleum System vs. Helium Syst	iem	
Stage	Petroleum System	Helium System	
Source	Organic matter	²³⁸ U, ²³⁵ U, and ²³² Th decay in the crust	
Maturation	Burial and heating	Time to accumulate vs. volume of crust	
Primary migration	Pressure driven	Heating to above mineral closure temperatures, fracturing of rocks and minerals, mineral dissolution	
Secondary migration	Buoyancy driven	Groundwater / buoyancy driven / stripping	
Accumulation in reservoir	Beneath caprock, capillary entry, pressure seal	Exsolution in presence of existing gas phase beneath caprock / degassing of oversaturated groundwater / direct input into trap of a free gas phase	
Trap integrity / longevity	Microseepage, capillary failure, fracture failure, tectonic destruction of trap	Microseepage, capillary failure, fracture failure, tectonic destruction of trap	
Source: "Helium: Exploration Methodology for a Strategic Resource" (Danablan 2017)			

The migration of helium from its source begins with *primary migration*, a two-stage process versus that of a hydrocarbon system where liquid and gaseous hydrocarbons are expulsed from the source rock due to a phase change from kerogen driven by time/temperature. Helium not only has to migrate out of the source rock but also out of the original source minerals which is primarily a result of advection (fluid flow). For this to occur, a thermal event high enough to overcome the closure temperature of the minerals in which helium is trapped must occur in addition to needing a fluid (e.g., N₂ or CO_2) to allow for movement out of the source rock. *Secondary migration* of helium is generally defined as the lateral movement of helium (and other associated gases) following primary migration (which can be thought of as the vertical migration of helium from the source). Secondary migration can occur as free gas migration (the movement of groundwater holding helium and nitrogen) and/or the stripping of gasses from groundwater by migrating CO_2 or natural gas.

The accumulation of helium beneath a caprock is understood to require a pre-existing gas phase of CO_2 or natural gas in the groundwater carrying dissolved helium and associated nitrogen in order for the helium and nitrogen molecules to de-gas from the groundwater and accumulate into the trap. Given the smaller atomic size of helium, the pore throat radius of the seal is of greater importance than for an oil or gas reservoir. Helium traps are often structural in nature (e.g., drapes over domes or anticlines) as stratigraphic traps are generally more difficult to seal.

How Is Helium Unearthed? Historically, helium has predominantly been extracted as a by-product of natural gas production with natural gas prices largely dictating the economics of these plays. With the recent increases in helium prices and natural gas prices dropping, there has been a resurgence in companies actively exploring for helium with the natural gas now being thought of more as a by-product. A number of companies are also seeking to produce helium from reservoirs where nitrogen and/or carbon dioxide make up the bulk of the carrying gas stream rather than natural gas which is generally cheaper to produce and process.

> Importantly, drilling for helium is nearly identical to the process of drilling for natural gas allowing for the transfer of knowledge from the oil and gas industry and benefiting from a current abundance of idle rigs in North America. As most of the wells targeting helium are simple vertical wells, they don't necessitate the higher-spec (and more in-demand) rigs required to drill longer and deeper horizontal wells.



Helium Separation / Purification Processes	There are three main technologies used to separate helium from the rest of the gas stream: (1) membrane separation; (2) pressure-swing adsorption (PSA) or temperature-swing adsorption (TSA); and (3) cryogenic separation. In membrane separation, high-pressure membranes facilitate the concentration or purification of helium through selective diffusion through the microscopic pores in the membrane. Though the technology isn't new, its use for helium separation is and it remains unclear on its viability for projects with a longer lifetime. PSA and TSA methods use pressure and temperature, respectively, to selectively adsorb different sized gas molecules into a medium with a large surface area comprising uniformly sized pore spaces. The benefit of these technologies is that they are time-tested, reliable, and can be deployed on a small scale while the biggest downside is a lower efficiency than cryogenic separation. Cryogenic separation causes different gases to condense off as a liquid in a fractionation tower using low temperatures. With helium's low condensation point (the lowest of any gas), this process lends itself well to helium but requires a large scale for efficiency given the relatively high initial capital cost.
Helium Supply / Demand	Given the lack of substitutes for helium in a number of its applications and being a non- renewable resource, the demand for the gas should remain largely price inelastic as evidenced by the significant increase of prices in recent years. With increasing space exploration and advancements in technology and healthcare applications, demand is expected to sustain the growth it has experienced over the past decade.
	Industry studies have estimated total global demand for helium reached ~6.3 Bcf p.a. in 2018, though, the opaqueness of the industry remains one of the biggest obstacles in assessing the supply/demand picture. A lack of independent entities tracking of such data compares to the energy sector (with its IEA), for example, adds another wrinkle. As no functional spot market or any futures market for helium exists, insight into the supply/demand balance is further complicated. On the supply side, there is an absence of disclosure on current production from companies as helium production is largely immaterial to investors such as in the case of ExxonMobil's LaBarge facility in Wyoming, comprising a relatively small part of Linde/Air Products' businesses, or no public data in the case of LNG production in Qatar/Algeria. The most significant certainty is the void in supply caused by the termination of the BLM auctions that removed ~25% of global supply (see section titled "US Federal Helium Reserve And The Bureau Of Land Management" on page 6).
Figure 5	Global Helium Supply / Demand
	9,000





					Reserves
	Pr	oduction	(MM m ³)		(MM m³)
Country	2016	2017	2018	2019	2019
United States (extracted from natural gas)	66	63	64	68	3,900
United States (from Cliffside Field)	23	28	26	21	Incl. Above
Algeria	10	14	14	14	1,800
Australia	4	4	4	4	N/A
Canada	<1	<1	<1	<1	N/A
China	N/A	N/A	N/A	N/A	N/A
Poland	2	2	2	2	25
Qatar	50	45	45	51	N/A
Russia	3	3	3	2	1,700
World Total (rounded)		160	158	160	N/A
Source: US Geological Survey, Cormark Securities Inc.					

US Federal Helium Reserve And The Bureau Of Land Management

Established in 1925 by the US government, the National Helium Reserve at Amarillo, Texas was originally created to supply military and commercial airships. In 1927, the Helium Control Act was put into place, banning the export of helium due to its scarcity. The US Bureau of Mines (now the US Bureau of Land Management or "BLM") commissioned the Amarillo Helium Plant and Cliffside Gas Field Facility (Figure 7) in 1929 to produce helium-bearing natural gas from the Bush Dome reservoir near Amarillo.

Following World War II, helium usage dropped but the US expanded its helium reserve in the 1950s with the Space Race and Cold War warranting increased strategic reserves. The Helium Act Amendments of 1960 shifted the mandate of the program from exclusive government production of helium to conservation of the resource with the goal of encouraging private natural gas producers to sell crude helium to the government for storage in the Bush Dome reservoir.

Figure 7

US Federal Helium Reserve - Cliffside Facility

World Helium Production / Reserves



Source: US Bureau of Land Management



To avoid market disruption, the Helium Privatization Act (HPA) of 1996 outlined plans for the BLM to sell off the majority of its helium reserves at a formula-driven sale price. This ended up being lower than the market price of helium which consequently encouraged overconsumption and discouraged new helium production. The HPA was later amended by US Congress in 2013 under the Helium Stewardship Act (HSA) which aimed to ease helium shortages and market disruption by selling off its reserves in three distinct phases with a fourth and final phase to see the government dispose of all facilities, equipment, and other properties held by the Federal Helium System no later than September 30th, 2021.

Phase A ("Allocation Transition") saw the Federal Helium Reserve continue operating as-is until September 30th, 2014 at which point Phase B ("Auction Implementation") would begin.

Pricing

Under Phase B of the US government's Helium Stewardship Act, for FY2015 deliveries, 10% of helium volumes made available for sale were auctioned in July 2014 to "qualified bidders" (i.e., an entity seeking to purchase helium for its own use, refining, or resale to users) with the remaining helium sold to refiners who have connections to the crude helium pipeline. Of the 928 MMcf available for sale in FY2015, 92.8 MMcf was auctioned at an average price of US\$161/Mcf. For each year following the FY2015 sale, the amount to be made available for auction was to increase by at least 15% from the previous year until 100% is achieved and just 3 Bcf of helium reserves remain, excluding privately stored helium (compared to peak storage levels of ~30 Bcf).

The amount available for auction in the FY2016 sale (July 2015) was 300 MMcf sold at an average price of US\$104/Mcf while the FY2017 auction (July 2016) saw 400 MMcf of helium sold at an average price of US\$107/Mcf. In the FY2018 sale (July 2017), the BLM auctioned off 500 MMcf of helium for an average price of US\$119/Mcf with the final auction occurring on August 2018 (for FY2019 delivery) seeing a substantial increase in the auction price to an average of US\$280/Mcf for 210 MMcf of helium with prices ranging from US\$233/Mcf (25 MMcf) to as high as US\$337/Mcf (25 MMcf).



With the Federal Helium Reserve reaching the 3 Bcf threshold, Phase C ("Continued Access for Federal Users") went into place. Under this phase, sales from the reserve have effectively ended with any further sales to be limited to Federal users, thereby opening the door for private producers of helium.



Figure 8

Based on discussions with companies, pricing of helium can vary depending on the nature of the sale (short- vs. long-term) and the type of product (i.e., purity, liquid vs. gaseous). Notably, sales of raw gaseous helium have fetched prices of more than US\$200/Mcf recently in the "spot" market.

Economics

To assess the economics of a potential helium project, we have built a model using conservative assumptions based on our discussions with companies in the space. For a vertical well capable of producing 2.5 MMcf/d of raw gas declining 5% a year (a flat decline profile), a well cost of \$1.5 MM (D&C) would be expected. With conservative assumptions of \$150/Mcf for processing, operating costs of \$50/Mcf, and a flat 4.25% royalty rate, we would expect a well with 1.0% helium to payout in 14 months with an IRR of 144% under helium prices (net of transportation) of \$375/Mcf (US\$280/Mcf). Using the same assumptions but factoring in helium content of 1.5%, we would expect a 10-month payout with a 282% IRR. Figures 9 and 10 below show IRR and payout sensitivities for varying helium prices and concentrations.





Source: Cormark Securities Inc.

Why North America?

We view North America as one of the most attractive regions to develop a robust helium industry as: (1) known occurrences of helium exist throughout the Western Canadian Sedimentary Basin (WCSB) and the US; (2) a long history of oil and gas exploration / development has created a substantial library of well and seismic data; (3) stable regulatory environments with governments eager to attract new industries, particularly in regions where oil and gas development has declined; (4) it lacks the geopolitical risk associated with most other locales having prospective helium resources; and (5) strong local support for the industry given the ability for ex-O&G workers to transfer their skills to the drilling and production of helium.

There are two main approaches companies are currently using to exploit helium in North America. One method is more of a pure-exploration approach with companies targeting areas purely for the helium content in nitrogen-rich accumulations across the WCSB and in the US. In the WCSB, these are concentrated in southern Saskatchewan and Alberta. We would also note that Manitoba does have potential for helium production in the southern part of the province. In southwest Saskatchewan, most operators have historically targeted the Upper Cambrian Deadwood formation which has the highest known concentration of helium in the province (instances of up to 2+%) have been recorded with nitrogen generally comprising over 95% of the gas stream). The highest concentrations found to date are near regional basement (Precambrian) highs – typically sedimentary rocks (e.g., the Deadwood formation) draped over Monadnocks (isolated underground "hills" of bedrock). As Monadnocks are easily identifiable on seismic, this has helped companies in the early stages of exploration. Both North American Helium and Royal Helium are active in this area. Although we do not profile any companies active in southeast Alberta, at a high level, helium prospects there share similar characteristics to those being pursued in southeast Saskatchewan.

The other approach picking up more interest with the decline in natural gas prices is companies looking for conventional natural gas assets and developing them for their previously overlooked higher-value helium content. Though not all of the >800,000 wells drilled in the WCSB are relevant in the exploration / development of helium, ~650,000 wells are in Alberta and British Columbia with ~190,000 having gas analysis and ~2,000 containing helium content of at least 0.5% (economic threshold for redevelopment). These are largely concentrated around the Peace River Arch (PRA) in northwest Alberta / northeast BC and the Sweetgrass Arch in southern Alberta. First Helium and Imperial Helium are taking this approach to helium development with First Helium's assets being near the Peace River Arch in northwest Alberta and Imperial in the process of acquiring its first 1-2 well bores in the basin. Some of the benefits of targeting existing conventional gas properties include: (1) infrastructure has already been put in place, lowering the up-front capital costs; (2) many locations under consideration have not seen significant recent investment, creating the potential to acquire assets at a material discount; and (3) well and seismic data already exists, reducing exploration costs.



Wells Drilled in the WCSB (Excluding MB)



Source: Cormark Securities Inc., geoSCOUT

Saskatchewan is somewhat unique as it offers well licenses specifically for helium rather than natural gas and issued helium leases as early as 1960 when helium exploration in the province had its first wave of interest. Lease terms are very favorable to operators with a non-competitive permitting process (no material cash outlay) and 21-year leases with no requirement to "drill to hold". The Government of Saskatchewan offers attractive royalties at 4.25% net (5.0% gross royalty less a 0.75% royalty credit).

As interest in helium has picked up recently, the Alberta government established a royalty framework for helium earlier this year (effective April 1st, 2020). The structure is effectively the same as Saskatchewan's with a 4.25% net royalty (5.0% gross minus a 0.75% "Helium Royalty Adjustment Factor"). Alberta will review the adjustment factor in 2025.

In the US, the most important sources of helium currently are the Hugoton field in Texas, fields in Oklahoma and Kansas, and ExxonMobil's Riley Ridge field in southwest Wyoming. Arizona's Holbrook Basin has boasted some of the highest concentrations of helium recorded at up to 8-10% but until recently, fields there have not seen activity since the mid-1970s.

Improving Investor Sentiment

This summer has seen investor sentiment in the helium sector improve markedly with stock prices of the two publicly listed helium exploration companies in Canada (Royal Helium and Desert Mountain Energy) more than doubling YTD (Figure 12). Comparing the performance of both Royal (RHC-V) and Desert Mountain (DME-V) to the TSX Energy Index and the Gold Miner Index over the last six months (Figure 13) emphasizes this point.

This increased interest in the sector is further supported by recent equity raises in the space. North American Helium completed two private placements earlier this year – one for \$17.8 MM in January and its most recent \$39.0 MM raise in May. Both Desert Mountain and Royal Helium have also been able to secure additional funding this year with Desert Mountain closing a \$1.6 MM private placement in February and a 30% upsized private placement in June for \$0.65 MM. Royal recently closed an oversubscribed private placement in July for \$1.0 MM (originally offering \$0.5 MM).





DME-V and RHC-V Stock Price and Volume





DME-V and RHC-V vs. Resource Indices



For reference, Cormark's top-ranked technical / quantitative analyst, Mark Deriet, highlights the resistance and support levels for Desert Mountain and Royal Helium in Figures 14 and 15 below with Desert Mountain emerging from a large base targeting \$2.00+ with support at \$0.50 and \$0.40 while Royal's base targets \$0.85+ with support at \$0.30 and \$0.25.





DME-V Technical Chart



Figure 15

RHC-V Technical Chart





Other Considerations

One of the biggest reasons for the recent surge of new entrants into the helium exploration space is a lack of capital investment in the past and the ending of the BLM sales has created a void in supply. Meanwhile, the industry's four largest helium buyers (Praxair, Air Liquide, Linde, Air Products) have shown no willingness to invest directly in producing assets as they typically won't staff geologists or anyone with exploration/drilling experience given that they aren't drilling for other gases. The artificially low prices brought on by the BLM sales prior to the Helium Stewardship Act of 2013 created another obstacle in new exploration prospects attracting capital during that time.

Though any investment in a relatively new industry carries some risks, we believe that the helium sector does boast several characteristics which lowers its risk profile, ceteris paribus. Among these are not needing large pipelines for distribution – an issue plaguing the oil and gas sector in recent years. Secondly, with processing technology already developed and proven in many cases, there is no additional risk associated with putting capital to work developing new technologies. Favorable lease terms in many jurisdictions rich in helium (for example, Saskatchewan with 21-year leases, no "drill to hold" requirements, and a non-competitive bid process) limit the need to put money in the ground just to hold lands. The low-decline production profile (i.e., long-tail flat production) of most helium carrier gas reserves allows for increasing free cash flow after deploying the initial capital outlay. Finally, as most sales are conducted under long-term take-or-pay contracts with helium end-users participating in high-value scientific and industrial activities, commodity price risk is substantially lowered.



Desert Mountain Energy Corp. (DME - \$0.62, TSXV)

Recommendation: N/A

Target Price: N/A

Company Statistics:

Stock Symbol: DME-TSXV

Last Price: \$0.62

Shares Outstanding (Basic): 47.5 MM

Shares Outstanding (Fully Diluted): 59.8 MM

Market Cap: \$29.5 MM

Company Website: desertmountainenergy.com



Area Locator



Source: Cormark Securities Inc.

Corporate Overview

An early mover in the helium exploration space, Desert Mountain Energy is actively engaged in the exploration and development of helium in the prolific Holbrook Basin in Arizona (where grades of up to 8-10% have been recorded). The company has recently completed drilling two exploration wells on its >100 sections of land in the basin with testing expected near-term.

In addition to its project in Arizona, Desert Mountain also holds a small package of land (~1.4 sections) in Oklahoma prospective for helium production in addition to secondary oil and gas production.

Founded by Mr. Irwin Olian (previous CEO), Desert Mountain's E&D program has been led since inception by seasoned O&G executive Mr. Robert Rohlfing (President and CEO) with more than 25 years managing exploration, drilling, development, and production programs worldwide.

Notable Developments

In 2018, the company renamed itself Desert Mountain Energy (formerly African Queen Mines Ltd.) and acquired its first 36,702 acres of prospective helium leases in the Holbrook Basin with an additional 3,040 acres acquired in 2019. Another 23,000 acres in the basin were then added in early 2020 with further acquisitions pending. The Kight Gilcrease Sand Unit property was purchased in early 2019 for US\$180,000 cash and \$288,000 in stock.

Since acquiring its current land base, the company closed a \$1.6 MM private placement in February 2020. In April, the company completed an airborne geophysical survey covering ~377,600 acres in the Holbrook Basin helping locate hotspots coinciding with initial targets for its drill program. The company had previously conducted a 2D seismic study over its priority targets.

Permits for its first two exploration wells in AZ were received in May and an upsized \$0.65 MM private placement closed in June and proceeds going to the drilling of the two exploration wells. Both wells have since completed drilling with completions and testing to commence mid-August.



Asset Overview

After identifying the Holbrook Basin in northern Arizona as a prime candidate for helium exploration given occurrences of high grades (8-10%) of helium produced from the basin historically, Desert Mountain began amassing its 65,911 acres (~103 sections) of prospective helium lands over the past two years. The company's first 42,911 acres (67 sections) of helium leases were granted by the state with an incremental ~23,000 acres optioned from a private mineral lease holder thereafter. Having secured a substantial foothold in the basin, the company has now identified ~55 hotspots after assessing 2D seismic and conducting airborne surveys.

Figure 17 Holbrook Basin Location



Source: Desert Mountain Energy Corp.

A large salt basin, the Holbrook Basin covers an area ~160x100 miles with helium typically found in the Permian Fort Apache limestone and Coconino sandstones at depths of ~1,050'. The basin remains largely underexplored with an average of one well drilled per 100 square miles. Between 1961 and 1976, three fields in the basin (Pinta Dome, Navajo Springs, and East Navajo Springs) produced 9.32 Bcf of helium from 22 wells. The Pinta Dome field was the most prolific of the three, producing 6.5 Bcf over that time from 11 wells with the largest well (Kerr McGee 01 Macie-State) producing an average 304.7 Mcf/d of helium over the 15-year period. The composition of the gas produced from the Pinto Dome was also impressive with 8-10% helium, 90% nitrogen, and 1% CO₂. Helium production from Holbrook ceased in 1976 due to low prices and the US National Helium Reserve liquidating its helium inventories.

Naming its asset base in the Holbrook Basin "Heliopolis", the company's lands never produced as the other Holbrook fields provided ample supply over that time but are now largely depleted. Though Heliopolis is located in a different part of the basin than the Pinto Dome, the area has very similar geology.







Source: Desert Mountain Energy Corp.

Desert Mountain's exploration drilling program commenced this summer with its first well (10-1) spudding on June 17^{th} . The well reached TMD of 2,354' on June 23^{rd} with "significant gas shows" encountered while drilling. The actual composition of the gas mix is yet to be determined as analysis will follow well completion. This first exploration well was followed up with a second well (16-1) on July 8th, reaching TMD of 2,866' on July 20th. The 16-1 well encountered gas in four different zones with an aggregate thickness of ~194'. As is the case with the 10-1 well, the gas composition will be sampled and tested after completion in mid-August with results anticipated back from third-party testing at the end of the month.

In addition to the Heliopolis project, the company also holds ~883.7 acres (~1.4 sections) of land in Oklahoma, known as the Kight Gilcrease Sand Unit ("KGSU"). Historically a region producing light sweet crude (~34-43° API), the company's KGSU asset has seven wells with one currently operational. Though KGSU is predominantly a target for secondary oil recovery, the unit does have potential for helium production with helium concentrations of up to 1.36% found in the existing oil wells from zones above the Gilcrease Sands.

Primary oil production from KGSU has totaled ~1.7 MMB with an estimated recovery of just ~11-14%. The company's longer-term plans for the asset include reworking the seven existing wells and drilling two new verticals to depths of up to 3,500' with the two new wells possibly being drilled in 2021 (already permitted) targeting helium in the upper zones and oil and gas in the Gilcrease. Of the six existing plugged wells, Desert Mountain may convert one or two into waterflood injectors and another into a nitrogen injector at the formation apex. The viability of secondary production at KGSU is supported by the nearby Sasakwa Gilcrease Sand Unit (SGSU), located within one mile on the same structure. Primary production from SGSU totaled 1.2 MMB of oil with secondary waterflood producing 1.0 MMB of oil to date.



Kight Gilcrease Sand Unit (KGSU)



Strategy

With the first two exploration wells now drilled at Heliopolis, Desert Mountain will move to complete and test the wells in August with available cash on hand. Well perforation and completion work on its two initial wells, 10-1 and 16-1, will be completed by mid-August, subject to completion rig availability. If commercial volumes of helium are discovered, the company would initially plan to truck the crude helium to the Four Corners region in New Mexico where it could then be refined. Longer-term plans would be to commit ~50% of its production to long-term offtake agreements with distributors with the remainder being sold to the US government and/or other private end-users. The sale of helium to direct end-users would require processing and/or liquifying the gas, but if the company were to go that route, its proximity to Arizona's and California's technology sector may provide material savings on transportation expenses compared to international producers. Management has indicated that it has no near-term plans for the construction of a refinery at this time as it would prefer to have 6-10 wells drilled to justify the capital outlay.

Initial plans for the development of its KGSU assets are to drill two vertical wells targeting both helium in the upper horizons and oil and gas in the Gilcrease Sands in 2021, partially dependent on the price of crude oil and cost-effective rig availability in this area. Longer-term, the company may convert one or two of the existing plugged wellbores into water injectors and one into a nitrogen injector at the apex of the formation. Upon conversion into injectors and with the two new vertical wells drilled,



management would expect primary production short-term (months) with secondary waterflood production to commence within 18 months.

Financing Desert Mountain closed two private placements earlier this year, including a \$1.6 MM raise in February, issuing 7.29 MM units priced at \$0.22 per unit with each unit comprising one common share and one-half purchase warrant allowing the holder to purchase one share at \$0.33/sh for a period of two years. Proceeds from this raise were used to complete targeting work and to secure lease holdings and for the recent drill program. In June, the company closed a 30% upsized private placement of \$0.65 MM consisting of 1.86 MM units priced at \$0.35 per unit with each unit comprising one common share and one-half purchase warrant allowing the holder to purchase one share at \$0.52/sh for a two-year period post-closing. Proceeds from the June raise were applied to drilling its first two exploration wells in the Holbrook Basin and will be utilized for completion and testing. In addition, the company has now received \$474,000 in connection with exercise of warrants at \$0.30 which expired July 19th, 2020. The company currently has sufficient cash to complete the first two wells through the testing stage. Furthermore, the company has enough finances available to drill a third well to define an additional prospective area for production. **Economics** The company's Holbrook Basin acreage has a 12.5% royalty across the lands in addition to a 4.5% GORR due to finders. Costs for the first two exploration wells drilled in the basin are expected to total ~US\$0.4 MM (D&C) per well. Current pricing for crude helium varies greatly between US\$265/Mcf and US\$412/Mcf dependent upon grade and available volumes. In Oklahoma, the KGSU property has aggregate carried royalties of ~22% with expected costs to rework the existing seven wells estimated at US\$0.1 MM to generate 25-50 B/d of oil. The two new drills tentatively planned would cost US\$0.3 MM and US\$0.35 MM with each well expected to produce 60-100 B/d of oil. Phase II of the KGSU development entails initial waterflood work for a capital outlay of US\$1.25 MM with secondary production expected to increase to 150-200 B/d within the first year. An incremental US\$2.0 MM would be required to complete the entire waterflood and supplement it with gas injection to increase secondary production to over 500 B/d over the next 12-16 months. Management has estimated maintenance costs of the KGSU to be ~\$50,000 per year (pending commencement of the new program). Corporate **Robert Rohlfing** – CEO, President, and Chairman **Scott Davis** – CFO Edward A. Schiller – Senior Geological Consultant and Director **Gregory Sparks** – Director Soren Christiansen – Director **Lee Dunston** – Marketing Director W. Benjamin Catalano – Director



First Helium Inc.

(Last Equity Issue = N/A)

Last Indication: N/A

Company Statistics:

Stock Symbol: N/A (Private)

Last Indication: N/A

Shares Outstanding: N/A

Market Cap: N/A

Company Website: firsthelium.ca

Figure 20



Source: Cormark Securities Inc.

Corporate Overview

First Helium is set up to become one of North America's leading helium producers with a focus on low-cost development. The company's asset base is strategically located to take advantage of Alberta's existing natural gas infrastructure in a region with existing well bores and ample takeaway capacity for the natural gas produced alongside helium, bolstering the economics of the play.

Founded in Vancouver, BC, Executive Chairman and founder, Vance Loeber, started building what would become First Helium in 2017 following completion of a research engagement with a leading Canadian petroleum consulting firm. From this study, the company's initial 15-25 discovery well was selected, and Mr. Loeber began assembling a team to develop the project. An additional ~100 net sections of land was subsequently acquired surrounding the discovery well.

Notable Developments

The "15-25" discovery well was tested in March 2018 with results exceeding management's expectations. The company's current ~100 net sections of land along the Worsley Trend were then acquired in 2018.

Since the fall of 2019, First Helium has solidified its management team and further developed its geological model and technical work on its Worsley project. Initial talks with potential offtake partners have been underway.

Management is now evaluating possible sources of funding to bring the 15-25 well onto production which will require the installation of gas processing, de-nitrification, and helium extraction/purification facilities.



Asset Overview

In 2017, First Helium identified the 15-25 discovery well and signed a farm-in agreement with the respective E&P company to earn P&NG rights on the well. This was followedup with a production test in March 2018 to assess the potential of helium and natural gas production. With test results exceeding management's expectations (Figure 21), First Helium then acquired more than 100 net sections of land along (current acreage is 101.5 net sections) the Worsley Trend in northwest Alberta (~75 km northwest of the town of Peace River).

Figure 21

First Helium 15-25 Well Characteristics

15-25 Discovery Well Helium content = 1.32% Thick high-quality reservoir >10 MMcf/d on DST Re-enterable at minimal cost

Source: Cormark Securities Inc., First Helium Inc.

Originally drilled in 1999, the 15-25 well was never brought on production due to high levels of inert gas in the stream and no infrastructure to handle it at that time. First Helium tested the 15-25 well in 2018 with rates of ~2 MMcf/d (raw gas) and helium content of ~1.32% (~25Mcf/d or ~9 MMcf p.a. of helium). Minimal H₂S was found in the stream at just 50 ppm while nitrogen comprised ~25% of the gas stream and CO₂ made up just ~0.03%. Though oil prices have been depressed recently, the test did record ~12 B/MMcf of free condensate, providing further upside to the project's economics. Importantly, the low quantities of CO₂ in the stream are relevant as high levels of CO₂ can add substantially to the costs.





Strategy

Initial plans are to bring the 15-25 well on production as a "proof of concept" which would require the installation of gas processing, de-nitrification, and helium extraction/purification facilities with the company currently looking at building a modular facility, allowing for easy expansion to accommodate increased volumes from pool delineation and future development. Management expects the 15-25 development project to cost ~\$7.3 MM including all site/civil work and facilities. Once project funding is secured, the company would then commence procurement and fabrication of equipment with site construction to follow approximately six months thereafter. If funding were to be secured this summer, commissioning of the facility could be expected as early as Q1/21 with initial cash flows as soon as ~9-12 months from the close of financing.

Management sees a significant runway for future development within its existing asset base and will continue exploration and development activities across its acreage as the 15-25 well begins producing. First Helium has secured ~30 contiguous sections of land centered on the 15-25 discovery for development and exploration (Figure 23). Further exploration and development opportunities on First Helium lands along the Worsley Trend are significantly enhanced by the numerous additional prospective formations above and below the productive formation in the 15-25 well. Beyond this, a number of distressed companies have assets in the area which may provide an opportunity for First Helium to acquire assets on the cheap. Initially, however, management would prefer to deploy additional capital to the development of its existing assets.

Figure 23 First Helium Acreage Surrounding 15-25 Well



Source: First Helium Inc., Cormark Securities Inc.

Financing

To date, First Helium has raised ~\$3 MM which was deployed to the farm-in, testing of the 15-25 well, and purchase of its current land base.

Requiring \sim \$7.3 MM to get the facilities and 15-25 on production, the company is currently assessing potential sources of capital for the project. This may comprise an equity raise, a joint venture with a potential offtake partner, specialized debt, or a combination of thereof.



Economics	Based on management's analysis, the 15-25 well is expected to produce ~2 MMcf/d of raw gas or ~25 Mcf/d or ~9 MMcf p.a. of helium for approximately nine years before any substantial decline is observed. Though the company's project economics receive some benefit from other hydrocarbon sales, the IRR is most sensitive to helium prices. Current helium gas pricing indications of US\$200+/Mcf provide for extremely attractive project IRRs. Any condensate/NGLs produced along with the gas stream are to be marketed by the company (15-25 tested ~12 B/MMcf of free condensate) while a portion of the associated natural gas produced will be used to generate power at its facilities. Potential alternatives for the processing/sale of the remaining natural gas are also being assessed. The \$7.3 MM capital cost estimate includes the installation of a natural gas pipeline tie- in.				
	At the time of writing, management is currently looking at facilities that would produce crude helium below grade 5. Pricing in the spot market has anecdotally been in the \$400-500/Mcf (~US\$300-650/Mcf) range recently with longer-term (5- to 10-year) contracts being expectedly lower. The company would be likely to enter into a 3-5 year take-or-pay commitment on its production but would prefer to keep some optionality beyond the five-year timeframe.				
	The farmor E&P company holds a GORR on the well with a 10% royalty on natural gas and 2% on inert gases (including helium).				
Corporate	Ed Bereznicki – President and CEO				
	Robert J. Scott – <i>CFO and Director</i>				
	David L. Safton – VP, Geosciences				
	Shaun Wyzykoski – VP, Engineering				
	Vance Loeber – Executive Chairman and Director				
	Thomas O'Neill – Director				



Imperial Helium Corp.

(Last Equity Issue = \$0.05)

Last Indication: \$0.05

Company Statistics:

Stock Symbol: N/A (Private)

Last Indication: \$0.05

Shares Outstanding: 14.6 MM

Market Cap: \$0.73 MM

Company Website: imperialhelium.ca





Source: Cormark Securities Inc.

Corporate Overview

Imperial Helium was founded in 2019 with the intent to acquire low-value natural gas assets in Alberta and British Columbia for their overlooked helium content. The company is a partnership between Cronin Capital ("Cronin"), a natural resource focused merchant bank based in Vancouver, and Petrel Robertson Consulting ("PRCL"), a leading geoscience consulting firm based in Calgary. The management team has more than 80 years of experience in the Western Canadian Sedimentary Basin ("WCSB") which provides a substantial knowledge base to draw from in its search for its first assets. Having already amassed a database with nearly 2,000 existing wells in Alberta and BC with helium content of at least 0.5%, management has been working diligently to acquire the lowest-risk assets in the basin, thereby avoiding the risk associated with exploration.

Notable Developments

Shortly after inception, Imperial announced Dr. Brad Hayes' (President of PRCL) addition to the Board, providing his expertise in the helium potential of the WCSB.

The company has since completed its initial ~\$0.7 MM raise to acquire its first 1-2 wellbores to undergo initial production testing, a more detailed geological assessment, and securing permits for development.



Asset Overview

Currently in its early stages, Imperial Helium plans to acquire discounted natural gas assets in Alberta and BC for their helium content. The company is aiming to purchase its first assets this summer which would then be followed-up with production testing, a resource estimate, and a seismic and field development plan.

These plans differ markedly from other companies that are focusing on exploration in a range of jurisdictions around North America with minimal access to well data. With nearly 650,000 wells in Alberta and BC and ~190,000 wells with gas analysis, management has ample data to minimize risk in acquiring its first asset(s). The company has found that 1,984 wells in Alberta and BC have helium content of at least 0.5% with the bulk of these wells concentrated around the Peace River Arch in northwest Alberta and the Sweetgrass Arch in southern Alberta.

Figure 25 Existing Alberta / BC Wells With >=0.5% Helium



Strategy

Imperial's strategy is based on an emphasis of low-risk capital expenditures and favorable market conditions for helium production in Canada. With its proprietary database of existing helium-bearing wells in the WCSB, management aims to acquire its first asset(s) where target wells have a proven concentration of helium and have necessary infrastructure (i.e., pipelines, power, roads, etc.) already in place. Given the weakness in Alberta's energy sector, an opportunity to farm-in and/or acquire inactive (but accessible) wells at attractive prices exists.

The company's development plan is divided into four phases. Currently in the first phase, Imperial is looking at opportunities to acquire its first asset(s) consisting of one or two well bores. Once acquired, it would then move to production testing, conducting an initial resource estimate, and designing seismic and field development plan, which would be expected to occur over a six- to 12-month period after acquisition. Following this, a "proof of concept" stage would be undertaken with an initial producing well and helium separator equipment generating first cash flows. At present, management anticipates this stage to take 18-24 months. Depending on the opportunity, a longer-term, full field multiwell development with enhanced facilities and helium separator may be desirable.



Financings	After completing a foundation raise of \$34,650, Imperial successfully closed a follow-up seed raise of \$692,900 at \$0.05 per share to get through the asset targeting and acquisition phase. To fund the second phase of development (production testing, NI 51-101, production development plan, facilities engineering, and land acquisition to secure upside), the company is currently planning an IPO to raise \$2.5 MM at \$0.15-\$0.25 per share.				
	A total of 20.0 MM performance shares have been granted that vest upon a schedule that encourages management to complete certain milestones:				
	> 2.0 MM upon initial acquisition,				
	➤ 4.0 MM upon successful listing of a public entity or secondary financing,				
	> 3.0 MM upon production test,				
	 3.0 MM upon a third-party reserves report, 8.0 MM upon commercial production of helium. 				
	Upon IPO, it is anticipated that only 6.0 MM shares will have vested. Founding partners will also receive a 3% GORR on any assets acquired by the company within 36 months of the foundation of Imperial Helium (October 24 th , 2019). After taking into account the above shares, it is anticipated that the company will have 35,600,000 shares outstanding post-IPO with a value of \$5.34 MM based upon a raise at \$0.15 per share.				
Economics	As the company does not have any helium assets at present, management has provided economic sensitivities based on potential project sizes with scenarios for original gas-in- place (OGIP) and helium content as well as the field size distribution in the WCSB (Figures 26 and 27).				
	Based on the company's analysis, a 10 Bcf field would require \$5.0 MM of capital expenditures with \$9.1 MM of operating expenses while a 25 Bcf field would need \$12.5 MM of capital expenditures and \$19.4 MM of operating expenses to develop. On the larger end of the field size spectrum, a 50 Bcf field could potentially cost \$25.0 MM to develop (capex) with \$39.0 MM of operating expenses and capital expenditures to develop a 100 Bcf field would potentially total \$50.0 MM with \$77.6 MM of operating				

expenses.





Project Economics – Helium Price Sensitivity (NPV-10, BT)





Project Economics – Helium Concentration Sensitivity (NPV-10, BT)



Corporate

David Johnson – *CEO and Director* **David Robinson** – *CFO*

Brad Hayes – *Director*

Kyler Hardy – Director



North American Helium Inc.

(Last Equity Issue = N/A)

Area Locator

Last Indication: N/A

Company Statistics:

Stock Symbol: N/A (Private)

Last Indication: N/A

Shares Outstanding: N/A

Market Cap: N/A

Company Website: nahelium.com





Source: Cormark Securities Inc.

Corporate Overview

Based in Calgary, Alberta, North American Helium ("NAH") was founded in 2013 by Mr. Nicholas Snyder with the goal of developing new sources of helium not linked to hydrocarbon projects in North America – the world's largest helium market.

The company holds the largest contiguous helium land position in the world with more than 3.8 MM acres of prospective land concentrated in Saskatchewan and Utah. With 16 helium wells drilled to date in Canada, NAH is also the most active helium driller in the country. Recently securing financing to fund the development of what will be Canada's largest helium purification facility, North American Helium is set to pave the way for the Canadian helium industry.

Notable Developments

In 2017, North American Helium successfully drilled a wildcat exploration well on a prospective helium-trapping structure in southwest Saskatchewan.

NAH also acquired 78 sections of prospective helium lands in Utah (Temple Springs) through the September 2018 BLM lease sale with plans to begin a four-well drill program in Q4/20.

Earlier this year (late January), the company raised \$17.8 MM to advance its exploration and development program in its core southwest Saskatchewan operating area and install a modular helium production facility on one of its wells (now online).

On May 28th, 2020, NAH announced a non-brokered \$39 MM equity financing to fund its second helium purification plant in southwest Saskatchewan (to be the largest in Canada) and a delineation drilling program across the remainder of its asset base (including Cypress and Claydon).



Asset Overview

North American Helium's core operating area is situated in southwest Saskatchewan (Figure 29) with four fields (Battle Creek, Cypress, Claydon NW, and Claydon North) discovered by the company to date. Having drilled 16 wells in Saskatchewan including five drilled, tested, and fully reserved in the Battle Creek field, North American Helium is now moving to commercialize Battle Creek after securing funding (\$39.0 MM) in late May to construct a 20 MMcf/d raw gas (160 Mcf/d or ~58 MMcf p.a. of purified helium) facility with start-up scheduled for July 2021. With a 10+ year life, the plant is expected to cost ~\$25-30 MM and generate annual cash flows of ~\$20 MM.

A portion of the previous (late January) \$17.8 MM equity raise was allocated to equipping one of the five wells already drilled in its Cypress field with a modular single-well purifier. The facility is now on-stream with raw gas capacity of 4-5 MMcf/d (yielding ~30 Mcf/d or ~11 MMcf p.a. of helium). Helium processed for the facility will be loaded and shipped via high-pressure gas tube trailers into the North American market under a long-term take-or-pay contract.

With ~\$10 MM invested in seismic data across its core area, including 17,000 km of 2D seismic and 208 km² of 3D seismic, the company has a significant amount of data across its Saskatchewan assets and plans to shoot incremental seismic in the future as it hones-in on potential "hot spots" worth exploring further.

In 2018, third-party reserve engineers (Ryder Scott) have provided a Risked Prospective Resource estimate of 20.8 Bcf of helium on (approximately) half of its current Saskatchewan acreage.



North American Helium Core Operating Area Acreage

NAH acquired its Utah acreage in 2018, leasing ~49,700 acres (~77.7 sections) from the BLM for ~US\$2.8 MM (~US\$57.2/acre). The region is rich in helium with a well drilled in 1959 (Temple Springs #1) having flowed 2.8 MMcf/d with 97% N₂ and 2.8% helium. This fits well with the company's focus on producing helium alongside nitrogen. The company has yet to drill a well in Utah but plans to begin a four-well program in Q4/20.





Strategy

Since 2013, the bulk of the company's expenditures (more than \$50 MM) have been used on exploration activities and it is now in the early stages of commercializing some of its assets. The single-well purifier installed in the Cypress field is now on-stream with annualized cash flows expected in the range of \$3-4 MM while the Battle Creek plant is expected to come on-stream in July 2021 with more substantial annual cash flows of \$20+ MM given its larger capacity.

NAH has focused on regions where commercial quantities of helium can be found with nitrogen serving as the carrier gas. Management anticipates helium making up ~0.5-2.0% of the gas stream with nitrogen comprising ~98% of the mix. With nitrogen being the primary carrier gas (rather than natural gas or CO₂), NAH will be able to vent the carrier gas as the helium is recovered due to it being inert and making up ~78% of the atmosphere. Though nitrogen may have some economic viability at some point in the future given its use as a fertilizer, further studies need to be done to assess the economic potential.

The company also benefited from having a portion of its exploration costs paid by others in the past with ~110,000 km of existing seismic data across its core operating area along with ~36,000 shallow oil and gas wells (and associated infrastructure) providing ample shallow well control.

With its large asset base, NAH has a multi-decade runway for future growth and the recent financings will allow the company to move further down the risk curve as it begins to commercialize its Battle Creek and Cypress fields. Once generating material cash flow, management expects to allocate 10-15% of cash flow into exploration, 30-35% into development with facilities to be financed through equity and debt this would leave significant free cash flow for acquisitions, dividends, or other returns of capital to shareholders.



Financing	Since inception, North American Helium has raised ~\$114 MM with more than 75% owned by insiders (including the largest institutional investors – Off Road Capital Management and Portal Capital). The company has been active this year, raising \$17.8 MM in late January (closed January 30 th , 2020) and an additional \$39.0 MM this past May (closed May 28 th , 2020). The bulk of the proceeds from the recent financings are being used to move towards commercialization with its single-well purifier in Cypress now online and construction underway on what will be Canada's largest helium plant in Battle Creek.			
Economics	With nitrogen as the carrier gas, the company will be able to strip out the helium from the gas stream and vent off the nitrogen without the need for additional processing/separation as would be the case if the helium were associated with natural gas and/or higher quantities of CO_2 . Costing ~\$1.5 MM to drill and complete a vertical well, payouts are expected to be ~12 months with a ~5x recycle ratio.			
	NAH's core operating area also benefits from Saskatchewan's very attractive terms for helium exploration including 21-year helium leases with no requirement to drill to "hold by production" and a non-competitive bidding process for permits (meaning no material cash outlay). Royalties are also favorable in the province with a 4.25% net royalty (5% gross royalty minus the 0.75% Saskatchewan royalty credit).			
	In Utah, the state offers long-term (10-year) leases with a 12.5% royalty.			
Corporate	Nicholas Snyder – CEO and Chairman			
	Marlon McDougall – President and COO			
	Neil Burrows – CFO			
	Vance Blydo – VP, Operations			
	Patty Thomas – VP, Exploration			
	Donna Bowles – VP, Land and Government Relations			
	William Fennebresque – Director			
	Glenn Fischer – Director			
	Gideon King – Director			
	Phil Kornbluth – Director			
	Robert Mitchell – <i>Director</i>			
	Arthur Spector – Director			
	Jeff Volling – Director			
	Robert C. Watson – Director			
	W.G. "Bill" Young – Director			



Royal Helium Ltd. (RHC - \$0.39, TSXV)

Recommendation: N/A

Target Price: N/A

Company Statistics:

Stock Symbol: RHC-TSXV Last Price: \$0.39 Shares Outstanding (Basic): 56.2 MM Shares Outstanding (Fully Diluted): 79.3 MM Market Cap: \$21.9 MM Company Website: <u>royalheliumltd.ca</u>

Figure 31



Source: Cormark Securities Inc.

Corporate Overview

Royal Helium was founded by Mr. Andrew Davidson (CEO) as a private company in 2016 for the purpose of acquiring prospective helium lands in Saskatchewan. In 2018, the company went public through a merger with an existing issuer.

Now one of the largest helium lease and permit holders in North America, Royal Helium's focus is on the exploration and development of helium-bearing inert gas in southern Saskatchewan. Currently holding more than 200,000 hectares (0.5 MM acres) of prospective helium lands with an additional 164,000 hectares (~0.4 MM acres) applied for, management has already identified several "drillready" targets across its land base. The company's nearterm focus is on de-risking its lands through seismic and airborne magnetic surveys to further delineate current drill targets and correlate with historic producing wells. This will be followed-up with a multi-well drill program to convert its exploration targets into resource and then into reserves and finally, potentially construct a poly-generation facility to process raw gas into 99.999% pure helium gas/liquid, CO₂ for enhanced oil recovery, and nitrogen into ammonia and urea fertilizer.

Notable Developments

In September 2019, Royal completed the first phase of its exploration program at Climax and identified seven drill targets for primary helium production. This was furthered by an airborne geophysical survey conducted across its Climax property in June of this year.

In July 2020, the company closed its oversubscribed private placement, raising \$1 MM and announced that 50.36 km^2 of 3D seismic at Bengough originally acquired in 2017 was reprocessed with five drill targets identified which will be followed up with an aeromagnetic survey.



Asset Overview

Royal currently holds more than 200,000 hectares (0.5 MM acres) of prospective helium lands across southern Saskatchewan through a combination of five-year permits and 21year leases with plans to continue accumulating lands so that the company can deliver at least 1 Tcf of carrier gas.

At present, Royal has two focus areas, one in southwest Saskatchewan (Climax) and the second in south-central Saskatchewan (Bengough) with seven drill targets identified at Climax and five at Bengough. Based on existing data, management estimates that the Climax area has helium content of 1-2% with ~95% nitrogen while the Bengough area may contain 1-3% helium with ~95% nitrogen.

Exploration plans are to prove-up 30 structures of similar size to the existing Wilhelm and Mankota helium pools, or fewer if larger structures such as Climax contain helium, which based on management's estimates may contain between 1.0-2.0 Tcf of raw inert gas with at least 1% helium (implying ~10-20 Bcf of helium). To identify these structures, the company is using a combination of seismic data and aeromagnetic surveys.



Royal Helium SW SK Focus Area (Climax)

Source: Royal Helium Ltd.

The seven drill targets at Climax were identified in late 2019 after the company reprocessed 77.6 km of 2D seismic (purchased in June 2019) and delineated a basement structure of ~3,094 hectares of four-way structural closure. Another 17,676 hectares of helium permits (100% crown) located immediately west of its Climax property were then granted to the company in November 2019. To more accurately identify/define possible inert gas-bearing formations and help management refine its drill targets, an aeromagnetic survey was flown over the Climax central structure in May for a cost of ~\$100,000.



A portion of the proceeds from the recent \$1 MM financing will be used to fly a similar aeromagnetic survey over its Bengough lands to further assess the five drill targets identified in the area by 3D seismic.

Figure 33

Royal Helium South-Central SK Focus Area (Bengough)



Strategy

The company's strategy is built around four primary stages. First, Royal is looking to add to its existing land base so that it will have the ability to achieve a minimum of 1 Tcf of helium-bearing inert gas. This would amount to an incremental ~164,000 hectares (~0.4 MM acres) of land based on management's estimates.

Second, with land acquired, the company would then move to risk mitigation which will comprise completing seismic and magnetic surveys over land blocks to verify and delineate drill targets.

As drill targets become solidified, Royal's third step will be to conduct a multi-well drill program so as to first confirm the presence of helium and define a helium resource, then the company would complete the work to establish a helium reserve. Management's preference for a multi-well (i.e., a ~3-5 well minimum) program rather than drilling one well at a time as this increases the likelihood of success in the program and provides for more rapid infill drilling as more structures can be proved up.

The four-part strategy is ultimately capped with a goal to construct a poly-generation processing facility to convert raw gas into 99.999% pure helium gas/liquids, CO_2 for enhanced oil recovery, and nitrogen into ammonia and urea fertilizer. The viability of this final stage is currently being assessed with Royal announcing a strategic collaboration with the Saskatchewan Research Council ("SRC") in late May to review the development of such a facility.



Financing	Royal has raised \$1.3 MM since going public in 2018 (~20% insider ownership) including its most recent (July 9 th , 2020) \$1 MM oversubscribed private placement. Due to increased demand, the issuance was increased from the \$0.5 MM originally announced on June 15 th . In this most recent round, the company issued 20.0 MM units priced at \$0.05/unit. Each unit comprises one Royal share and one purchase warrant to acquire one common share at \$0.07 per share for a 12-month period. Of the 20.0 MM units issued, management and insiders purchased 1.77 MM units. Proceeds from the offering will be used to further its downstream scoping study and design for a processing facility, marketing/investor relations, and additional geophysical exploration activities.		
	In order to move ahead to the next step of development and commence a multi-well drill program, the company is currently assessing potential avenues for funding. This may include an equity raise, a joint venture in the wells, or a combination of the two. Assuming well costs of \$1.5-2.0 MM per well (D&C), Royal would need ~\$4.5-10.0 MM to begin a 3-5 well program.		
Economics	With initial plans to drill 3-5 wells, helium sales would be sold as raw gas to industrial partners at first or upgraded with mobile processing facilities on-site and sold to end-users or industrial gas companies. Management estimates that to justify construction of its own permanent processing facilities, the company would need a minimum of ~5-10 wells producing. The sale of the company's raw helium gas is expected to bring in prices of ~US\$250/Mcf (~\$340/Mcf) while operating expenses are assumed to be ~\$30/Mcf based on data from actual helium wells in the area. With wells to cost ~\$1.5-2.0 MM per well and assuming rates of ~3 MMcf/d and 1% helium, a single well can be expected to payout in under one year.		
	Also of note, using actual declines from helium wells in Saskatchewan, management expects wells drilled on its lands to have a useful life of ~10 years.		
	Although it is still being studied, the potential for the sale of CO_2 and nitrogen produced alongside the helium may further enhance the economics of larger-scale development with the construction of a poly-generation processing facility. Being located nearby active CO_2 EOR (enhanced oil recovery) projects in Saskatchewan where CO_2 sells for ~\$25/Mcf highlights a potential market for that gas. As for nitrogen, the Saskatchewan government recently announced an incentive program for the production of chemical fertilizers which, coupled with Saskatchewan's substantial agriculture industry, presents an attractive opportunity for the sale of nitrogen to be converted to ammonia and urea fertilizer.		
Corporate	Andrew Davidson – President, CEO, and Chairman		
	Jeff Sheppard – CFO		
	Stephen Halabura – VP, Exploration		
	Dean Nawata – VP, Corporate Development		
	Tom MacNeill – <i>Director</i>		
	Jeff Pringle – Director		
	Sylvain Laberge – Director		



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