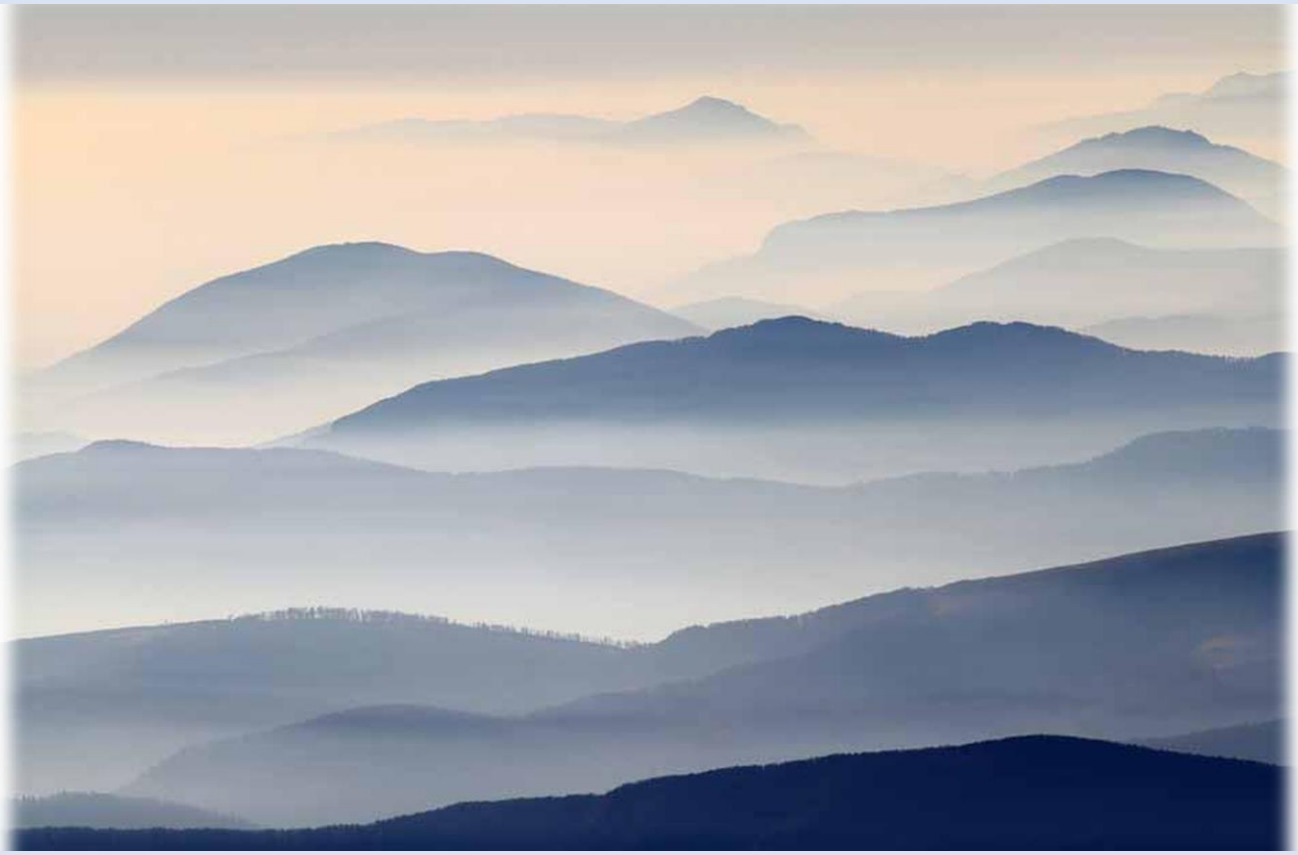

Independent company research and estimated fair value

Rodney Hooper

29 April 2019

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Introduction

ioneer Ltd ("ioneer") is the full owner of the Rhyolite Ridge ("Rhyolite") Lithium - Boron Project, located on Federal land (Bureau of Land Management) 40 kilometres from Tonopah in Nevada, USA. The project is closely situated (25 kilometres) to the Silver Peak lithium mine (~4K-5K MTpa) owned by the Albemarle Corporation ("ALB"). The company is completing a definitive feasibility study ("DFS") due in Q3 2019 and waiting on permitting approvals and to finalize funding. Should all these be achieved according to plans then ioneer will be in production in 2021.

Figure 1: ioneer share price (Source: Google finance)

ioneer raised A$53m in a fully subscribed capital raise in June 2018 at A$0.41 per share. This was exceptionally well timed and has resulted in the company securing adequate funds to finalize all milestones to final investment decision ("FID"), namely the pilot plant, additional drilling and DFS. Further, the company will have ~A$50m remaining (A$70m cash currently) after the DFS to order long lead items.

As ioneer has an exceptionally low projected operating cost (US$2,000/t for Li2CO3 after boric acid credits) and a very experienced board, the company is well placed to secure a long term independent financing and supply agreement for the sulphuric acid plant (further diversified by the excess production of 37.5 MWh of electricity) and a long term off-take contract and prepayment financing for boric acid and potentially lithium carbonate. This would lower ioneer's capex obligations and increase the projects estimated internal rate of return to 30%+.

October 2018 Mineral Resource Estimate (1,050ppm Li and 0.5% B Cut-Off)

Lithium-Boron (Searlesite) Mineralisation

Group	Indicated Mineral Resource								
	Tonnage	Li	B	Li_2CO_3	H_3BO_3	K_2SO_4	Cont. LC	Cont. Boric	Cont. Pot
	Mt	ppm	ppm	%	%	%	kt	kt	kt
Upper Zone	71.9	1,840	14,110	1.0	8.1	2.0	700	5,800	1,420
Lower Zone	32.2	1,430	9,750	0.8	5.4	1.7	240	1,730	530
Total	**104.1**	**1,700**	**12,800**	**0.9**	**7.2**	**1.9**	**950**	**7,540**	**1,950**

Group	Inferred Mineral Resource								
	Tonnage	Li	B	Li_2CO_3	H_3BO_3	K_2SO_4	Cont. LC	Cont. Boric	Cont. Pot
	Mt	ppm	ppm	%	%	%	kt	kt	kt
Upper Zone	14.7	1,970	12,150	1.0	6.9	2.0	150	1,020	300
Lower Zone	2.6	1,620	6,690	0.9	3.3	1.8	20	90	50
Total	**17.3**	**1,900**	**11,300**	**1.0**	**6.4**	**2.0**	**180**	**1,110**	**340**

Group	Total Mineral Resource								
	Tonnage	Li	B	Li_2CO_3	H_3BO_3	K_2SO_4	Cont. LC	Cont. Boric	Cont. Pot
	Mt	ppm	ppm	%	%	%	kt	kt	kt
Upper Zone	86.6	1,860	13,780	1.0	7.9	2.0	860	6,830	1,720
Lower Zone	34.8	1,440	9,520	0.8	5.2	1.7	270	1,820	580
Total	**121.4**	**1,740**	**12,600**	**0.9**	**7.1**	**1.9**	**1,130**	**8,650**	**2,300**

Figure 2: ioneer mineral resource (Source: ioneer Company Reports)

Key advantages

1. **Large resource**: 30-year+ mine life, near surface deposit and soft ore and waste material.

2. **Quality key partners and contractors**: Fluor is leading the DFS, SNC-Lavalin the sulphuric acid plant and Kemetco the pilot plant.

3. **Strategic value**: There is limited boron production outside of Turkey. U.S. Borax is likely to cease production at some point in the next 10 years making Rhyolite Ridge the obvious replacement, especially as it's a large resource with a long life of mine. Once ioneer is capable of producing battery grade lithium carbonate, this will also have strategic value given the United States is the second-largest auto market and cathode / battery plants will have limited availability from local suppliers.

4. **Experienced board members**: For a midsize company (A$257m) ioneer has a very experienced board and management that includes a number of senior ex Rio Tinto staff. This should prove instrumental in securing ioneer off-take / prepayment contracts for its boric acid production.

5. **Low tax rates, royalties** and generous **depletion allowance**: Nevada has a net proceeds tax of 5% and there is a 3.02% Esmeralda County property tax. The Federal Tax rate is only 21%. Furthermore, ioneer can utilize a 22% depletion allowance.

6. **Low opex due to two product revenue streams:** As ioneer will produce both boric acid and lithium carbonate the net operating cost per tonne of ore processed is low. Offsetting the boric acid revenue against operating costs places ioneer as the lowest cost producer of lithium carbonate globally.

7. **Strategic financing alternatives**: The current ratio of the pre-feasibility study ("PFS") capex requirement of US$600m relative to the market capitalization of US$183m is high. However, ioneer released an announcement on the 3rd of April 2019 notifying investors that the capex for the sulphuric acid plant, now designed on a fit for purpose basis, had dropped US$60m and further DFS capex reductions were expected. These cuts are all important, however, the likely success of the project is dependent on the company securing either vendor / offtake funding and / or the sulphuric acid plant (plus 37.5 MWh spare electricity generation) being built by a third party that provides ioneer with electricity and acid on a commercial basis. As a result of its low operating cost and high margins and given the experienced board, these initiatives should come to fruition that would substantially lower the capex amount to be paid by ioneer (model estimates US$275m).

Key risks and issues

1. **Technical grade carbonate:** The market for technical grade carbonate is fast becoming oversupplied as converters struggle to meet battery grade specifications. Demand growth rates in this market segment are limited to GDP like numbers making it imperative that ioneer executes its planned upgrade to battery grade chemicals as soon as steady state production is reached.

2. **Asia shipping costs:** Transportation costs to ship boric acid (US$160/t) to Asia are substantial relative to the assumed selling price (US$700/t). ioneer's margins would be boosted by the sale of boric acid into the domestic United States market.

Fair Value Estimate

For preparation of this report, I have reviewed in detail ioneer's PFS disclosure, undertaken a site visit to the core shack, property and surrounding area on March 14th and 15th, interviewed the CEO and conducted separate independent research.

I have built my own financial model using conservative assumptions regarding capex and operating costs and conclude that ioneer could potentially earn a **steady state EBITDA of US$206m** following the successful construction and ramp of an integrated project including a mine, sulphuric acid plant (independent), crushing and vat leaching, boric acid and lithium plants (producing technical grade carbonate to start and upgrading to battery grade after 5 years).

Based on the current lithium equity market conditions, I have also used certain prepayment and equity issuance assumptions and arrived at an **estimated fair value of ioneer in Jan 2024 of A$1.00 per share should the outlined strategy be achieved, representing a 5x uplift over 4-5 years or a ~40% internal rate of return over this time period**.

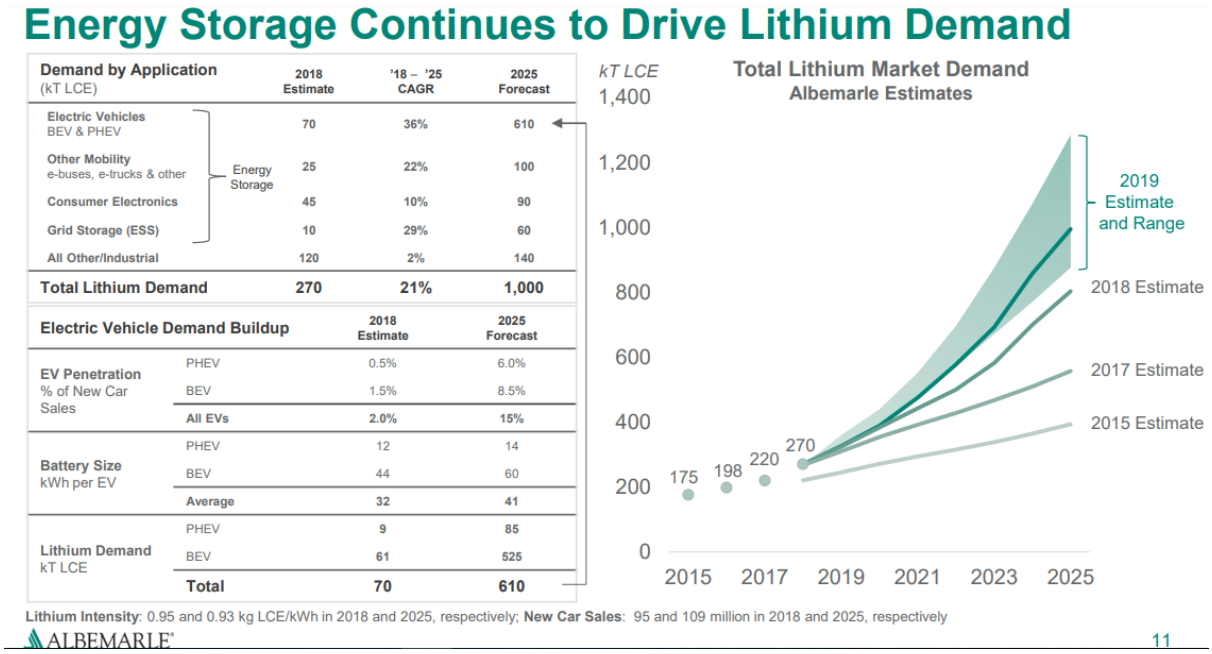


Figure 3: Graphical depiction of Lithium demand patterns due to energy storage. (ALB Company Reports)

The case for lithium - chemical supply / demand fundamentals

According to SQM, 2018 saw lithium demand increase by approximately 25%. With annual future growth estimated by all the "big 4" lithium producers at 21% p.a. to 2025, the expected annual demand will be 1M MT with an upward bias. This represents a material shift as most brokers and producers were still forecasting ~650K MT in 2017/2018. This notable increase is largely driven by **growth in absolute EV sales** and the **increase in average battery size** in EV's. Consequently, the **demand growth rate** from energy storage solutions (45%+) could exceed EV sales and represent a material percentage of lithium demand post-2030.

In reference to Figure 3, which depicts **ALB's** demand forecast graph, a predicted **step change in demand from 2023** is evident. This ties in with Bloomberg NEF's forecast of average battery pack prices falling below US $100/kWh in **2024 (US $94/kWh).** US $100/kWh is considered the inflection point at which EV's will not only be cheaper from a running cost perspective but also from that of sale prices. Cheaper battery prices will be driven by production volume growth at battery "megafactories". Bloomberg NEF research estimates the "learning curve" at 18% for every doubling of capacity.

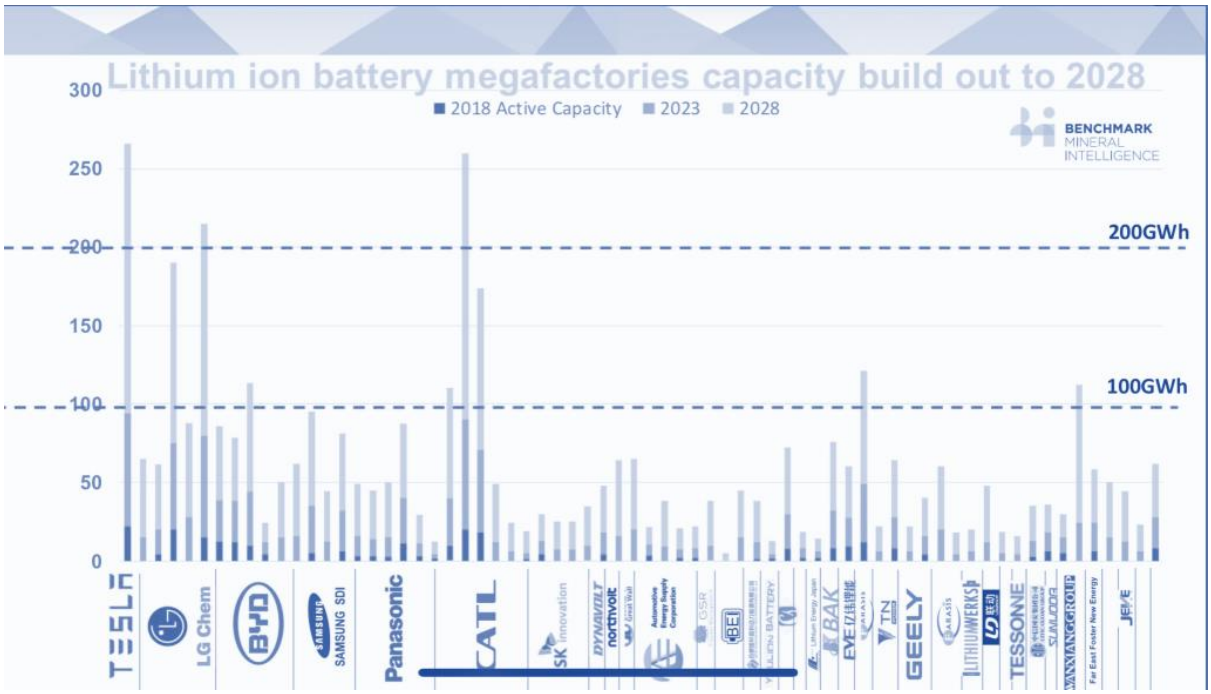


Figure 4: Graphical depiction of Lithium ion battery megafactories' capacity through to 2028 (Benchmark Mineral Intelligence, 2019)

BMI is now tracking over 70 planned megafactories targeting over 1.6 TWh of capacity by 2028.

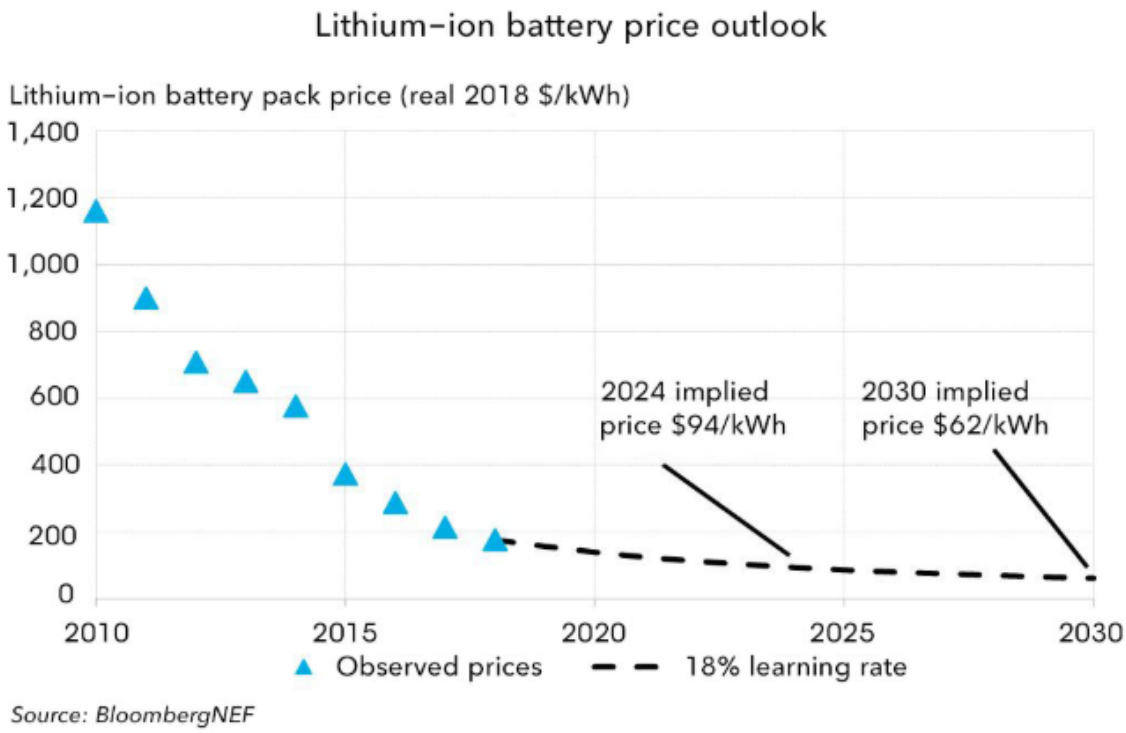


Figure 5: Graphical depiction of Lithium-ion battery price outlook.

A substantially increased penetration in EV sales in the United States auto market is implied in all these demand forecasts. Sales of Tesla's model 3 in 2018 provide an indication of the potential for EV sales volumes. However, the United States EV auto supply chain is inadequately prepared for such an increase. There is a strong likelihood the recent investment announcement by SK Innovation (a battery plant in Georgia) and further cathode / battery cell and pack producers will increase in volume in time. This would enhance the value of ioneer, given its location and planned chemical output of battery grade carbonate (after year 5). For the immediate future, the United States lags China and soon Europe in developing an integrated EV supply chain.

The case for boron - supply / demand fundamentals

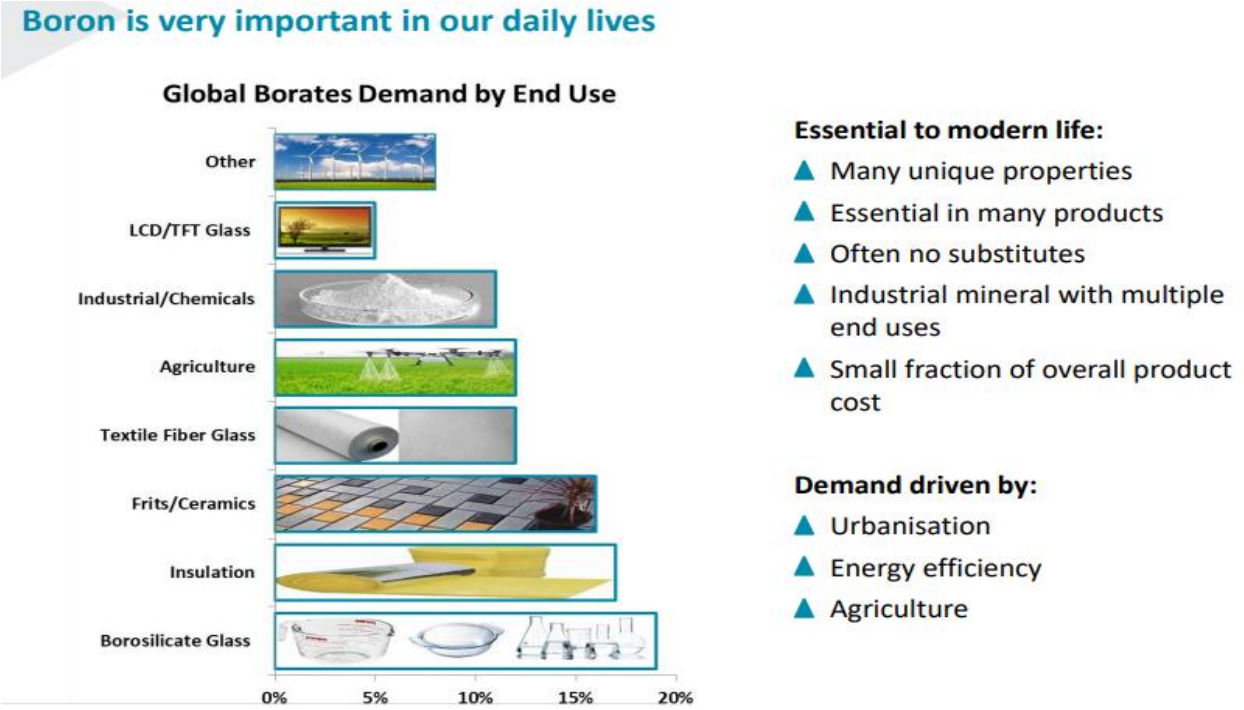


Figure 6: Boron uses (Source: ioneer Company Reports)

Whilst the boron market is of a similar size to lithium it is characterized by even more of a concentration of market participants. Two companies essentially control 80% of supply and in the case of U.S. Borax (Rio Tinto operating in Boron, California) its main operating asset is maturing and costs are rising. Rio Tinto has the Jadar project in Serbia but by all accounts there is still a substantial amount of feasibility and development work to be done. Originally Jadar was targeting production in 2023, that currently looks highly unlikely. No doubt Rio Tinto will want to replace U.S.Borax, however, Jadar is not likely to be operational within the next 5-8 years. With Turkey already supplying about 50% of the boron market,

customers do not want to become more reliant on Eti Maden to supply this essential ingredient for their products. This presents an opportunity for ioneer to step in as a meaningful supplier of boric acid in the United States and Asia.

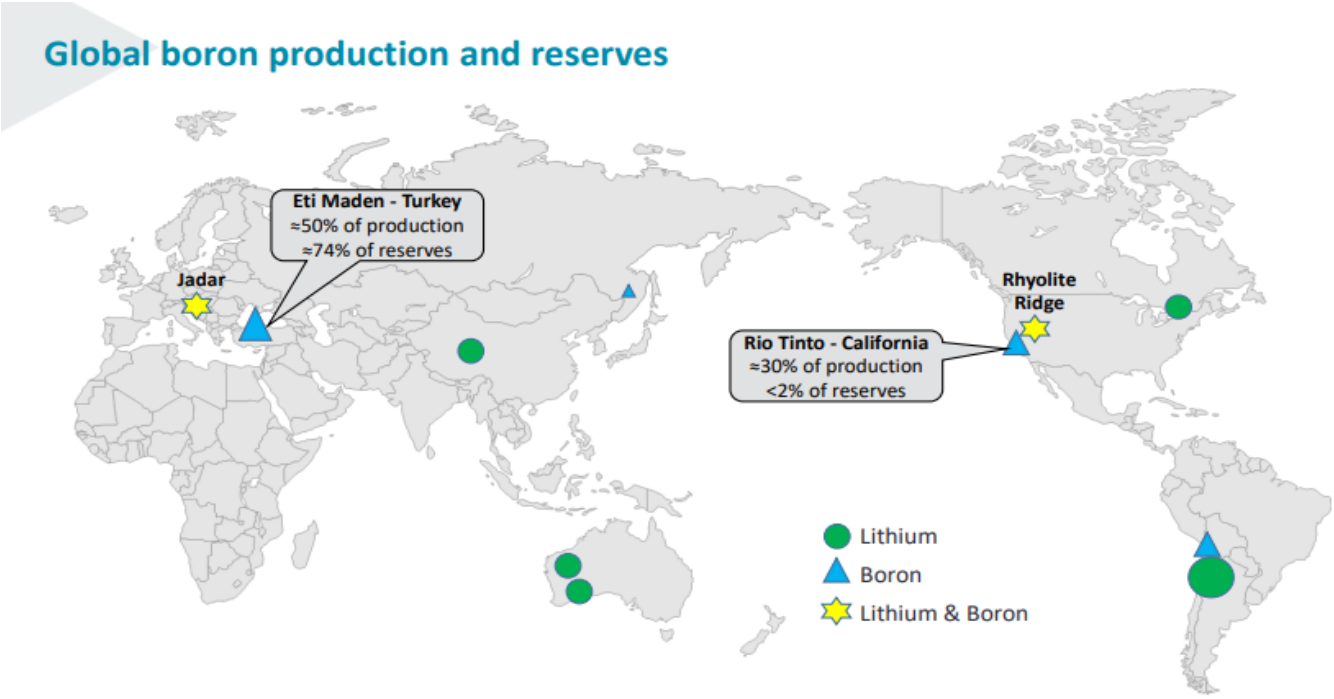


Figure 7: Boron locations (Source: ioneer Company Reports)

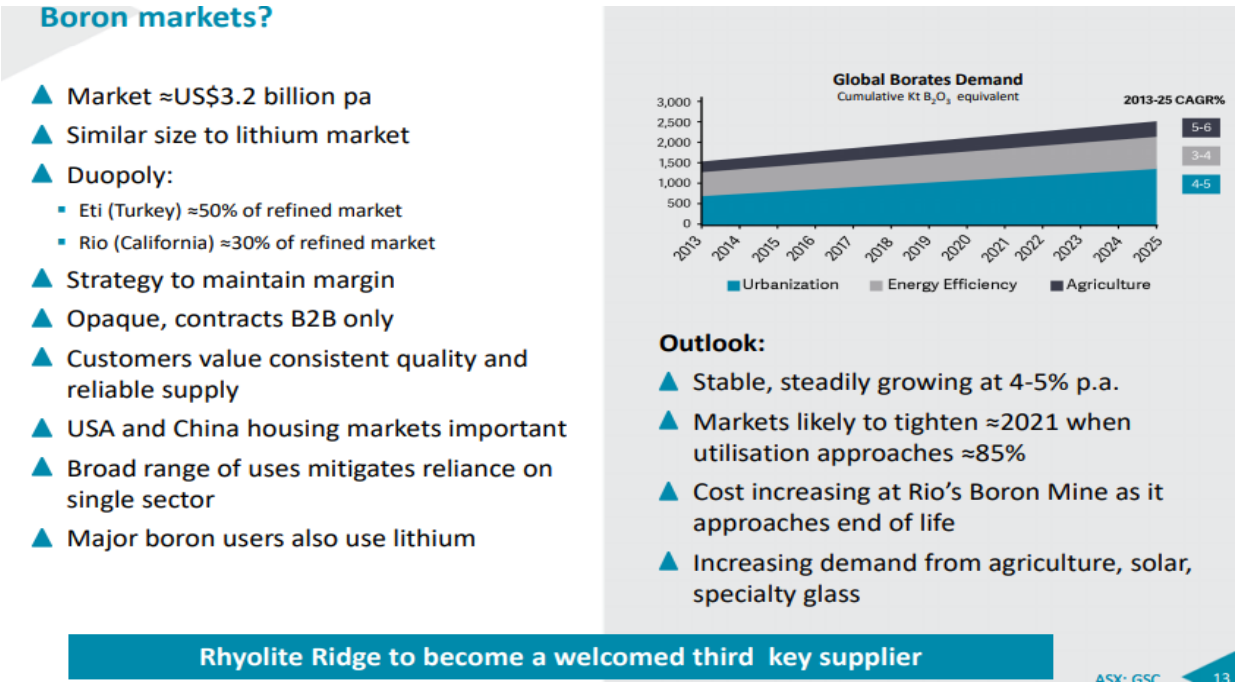
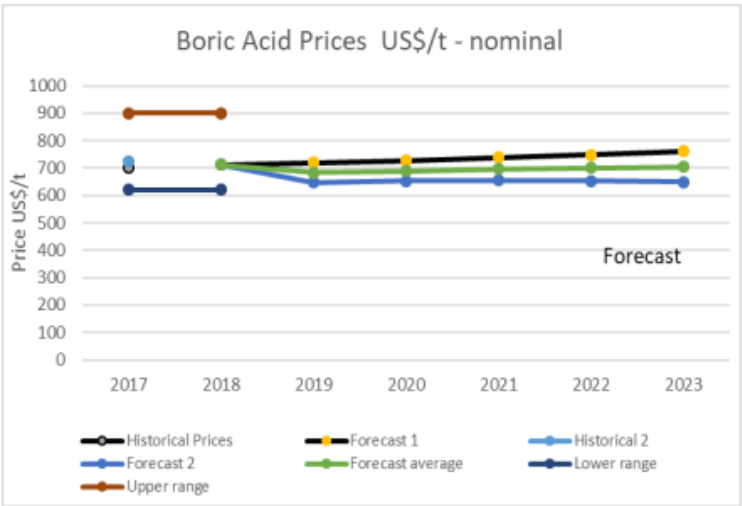


Figure 8: Boron markets (Source: ioneer Company Reports

The demand growth for boron may not be as high as lithium but it is certainly growing in excess of many other commodities on the back of increasing demand from the construction, solar and specialty glass sectors (mobile phones). In addition, boron is used in specialty chemicals, including neodymium-iron-boron permanent magnets used in electric motors. Given its 4-6% consensus projected annual growth rate, the boron market could accommodate an additional supplier and absorb extra material within a reasonable time frame. As boron contracts are very opaque and contracted privately, having experienced board members that were industry insiders is key for ioneer. In addition ioneer has used a long-term price of US$700/t, at the lower end of historic prices.

Market estimates for boric acid range above US$700/t over the next 5-10 years suggesting ioneer could price its quality product at the low end of estimates in return for a long-term off-take agreement and a prepayment facility to help fund upfront capex. With the boron market being a closed affair new supply can only come on stream if there is clear demand for the product. Through a combination of the high industry demand growth rates and the planned slow ramp up in production by ioneer during the first 3-4 years, the market should be able to absorb new supply relatively easily.

Outlook for prices



Boric acid prices:

- Forecast of circa US$700/tonne to 2023
- Annual prices since 2010 have averaged between US$700 to US$900/tonne

As part of the market study for the Rhyolite Ridge PFS, Global Geoscience reviewed multiple independent sources to form the Company's "consensus" price forecasts for boric acid, which is shown in this chart.

Figure 9: Boric acid projected prices (Source: ioneer Company Reports)

Project overview

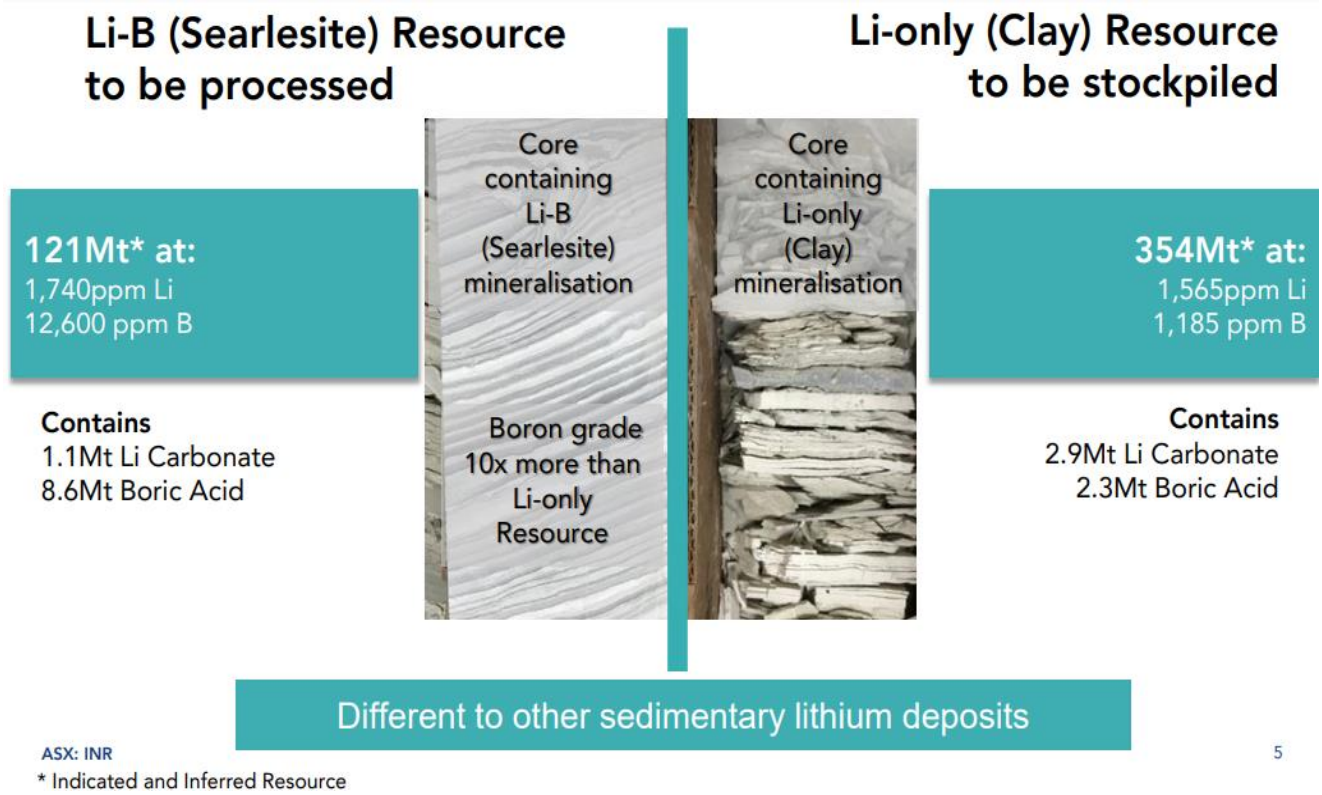


Figure 10: Searlesite versus clay (Source: ioneer Company Reports)

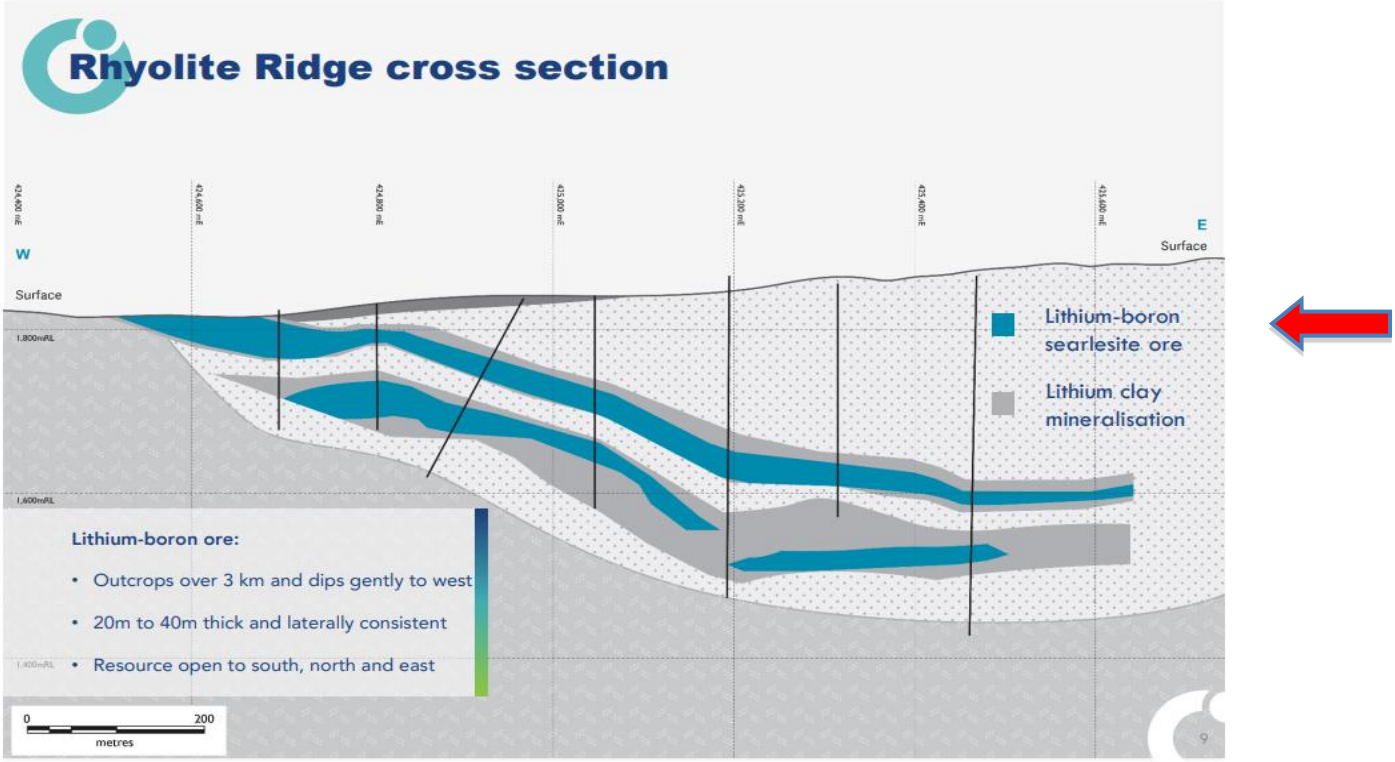


Figure 11: Rhyolite cross section diagram (Source: ioneer Company Reports)

The ioneer Rhyolite project has a number of favourable characteristics:

- Flat terrain with no competing land uses or nearby residents
- Low lying flat deposit with a consistently thick searlesite layer rich in both lithium and boron
- Easily strippable waste material
- Coarse material - produces a high quality boric acid (see Figure 13)
- No need for a tailings dam and no residual acid production
- Lithium-rich clay will be stockpiled, if a new technology can be found to cheaply process this material then ioneer will benefit
- Two revenue streams diversifying price risk (lithium is a critical mineral on the U.S. list)
- Nevada is mining friendly and encouraging of new projects – no major flora or fauna issues at the site (managing the buckwheat plant issue is easily manageable)

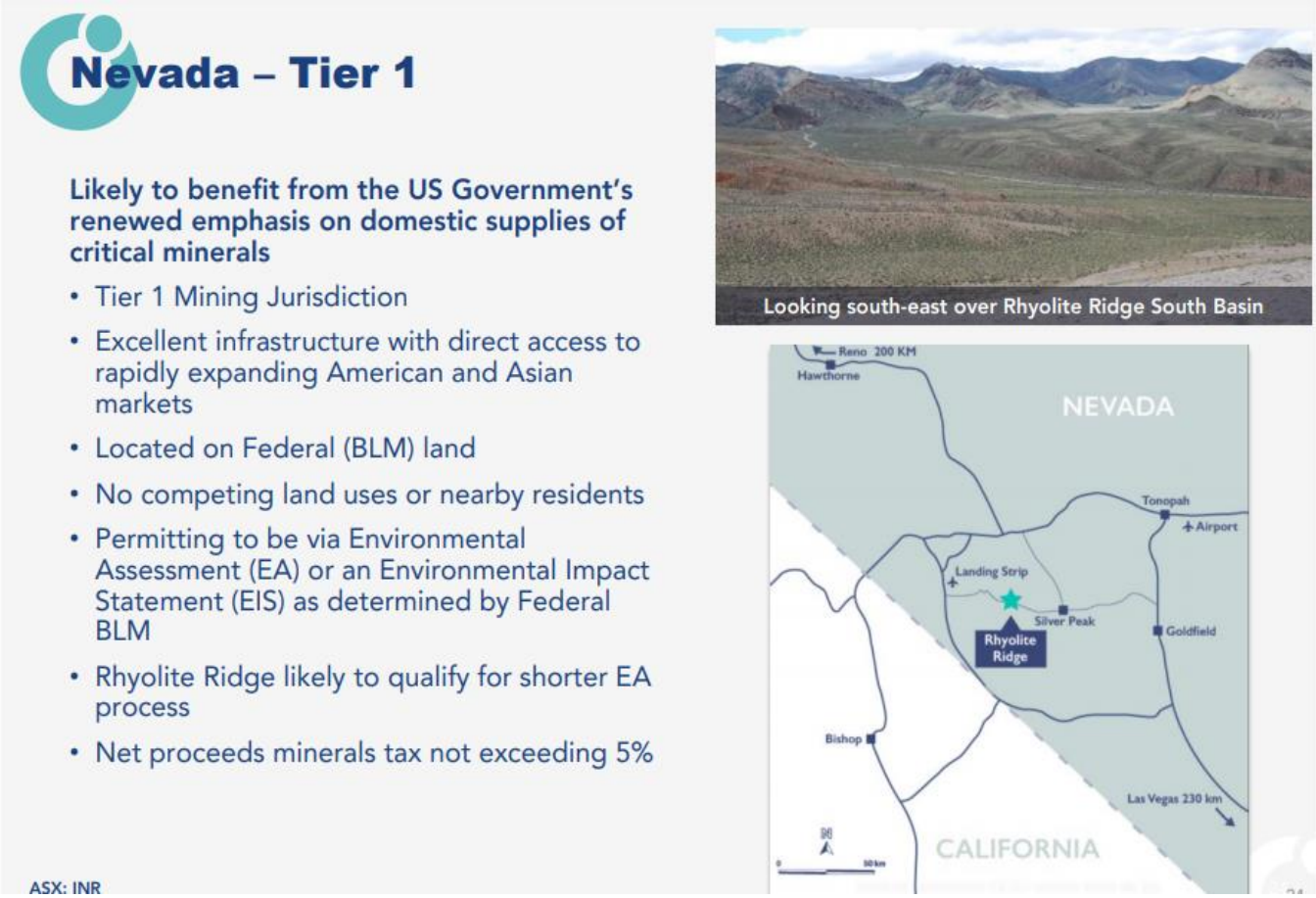


Figure 12: Rhyolite location (Source: ioneer Company Reports)

Purified boric acid sample

Coarse crystals of boric acid

Chemical Analysis of Rhyolite Ridge Boric Acid

Compound or Element	Units	Rhyolite Ridge Boric Acid	Typical Industry Specifications
Boric Oxide (B2O3)	%	>56.5	>56.25
Boric Acid (H3BO3)	%	>99.9	>99.9
Sulphate	ppm	<125	<250
Chloride	ppm	<1	<10
Iron	ppm	<5	<7
Calcium	ppm	13	<50
Sodium	ppm	43	<200
Chlorine	ppm	<5	<10
Lead	ppm	<10	<20
Arsenic	ppm	<10	<100
D50 particle size	microns	550	

Figure 13: Rhyolite boric acid analysis (Source: ioneer Company Reports)

Given the low levels of impurities and large crystal size, coupled with its location, ioneer will produce a premium product highly desirable in the boric acid market. It should be noted that ioneer used the conventional process flow sheet developed for the PFS to produce the samples. The scale of the metallurgical testwork is currently being increased with Kemetco being awarded the pilot plant contract. The plant will run a bulk sample of 30 tons during May-June 2019 and the results will hopefully confirm the PFS flow sheet design. Further, samples of lithium carbonate and boric acid produced will be provided to potential off-take partners and other interested parties.

Processing plant flow sheet

A schematic overview of these proposed steps is provided below.

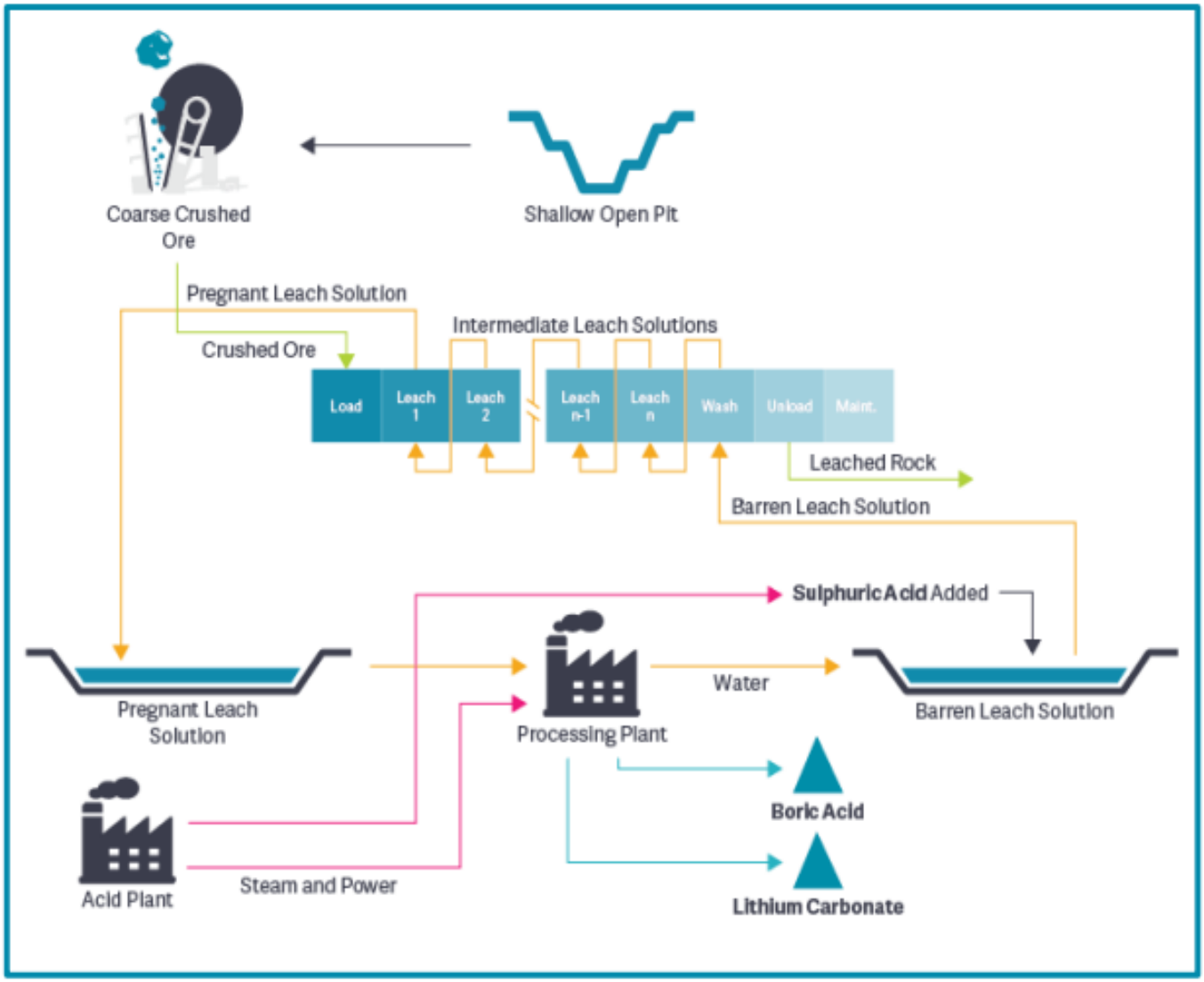


Figure 14: Rhyolite processing flow sheet (Source: ioneer Company Reports)

ioneer will open pit mine and then crush the ore to about an inch. As mentioned, the waste rock and clay mineralisation is soft and easily removable. The crushed ore is then leached in vats to produce a pregnant leach solution ("PLS"). This solution is then processed to first extract the boron and then lithium through a series of evaporation and crystallization steps. Those steps are currently used in the mining industry – the leaching process is similar to copper vat leaching and the crystallization process is similar to that used at other boron operations in the United States and offshore. With respect to the lithium carbonate extraction process, this is similar to brine projects, the difference being the acceleration of the evaporation process with the use of steam (not evaporation ponds that are exposed to vagaries of changing weather conditions). There is no new or unproven technology being used by ioneer to process its ore.

Material Circuits

- PLS into boric acid circuit to be circa:
  - 50-60° C
  - 0.05-0.10% Li / 5.0-5.5% boric acid
- Boric acid separated from the PLS first, primarily by cooling and then evaporation/concentration/ crystallisers
- Brine entering the Li_2CO_3 circuit to contain ~1.0% lithium
- Li_2CO_3 circuit similar to Li brine operations
- Impurities to be removed via precipitation are primarily Na, Mg, Ca, Fe
- Technical grade Li_2CO_3 initially
- Install purification circuit to produce battery grade Li_2CO_3 or LiOH

ASX: INR

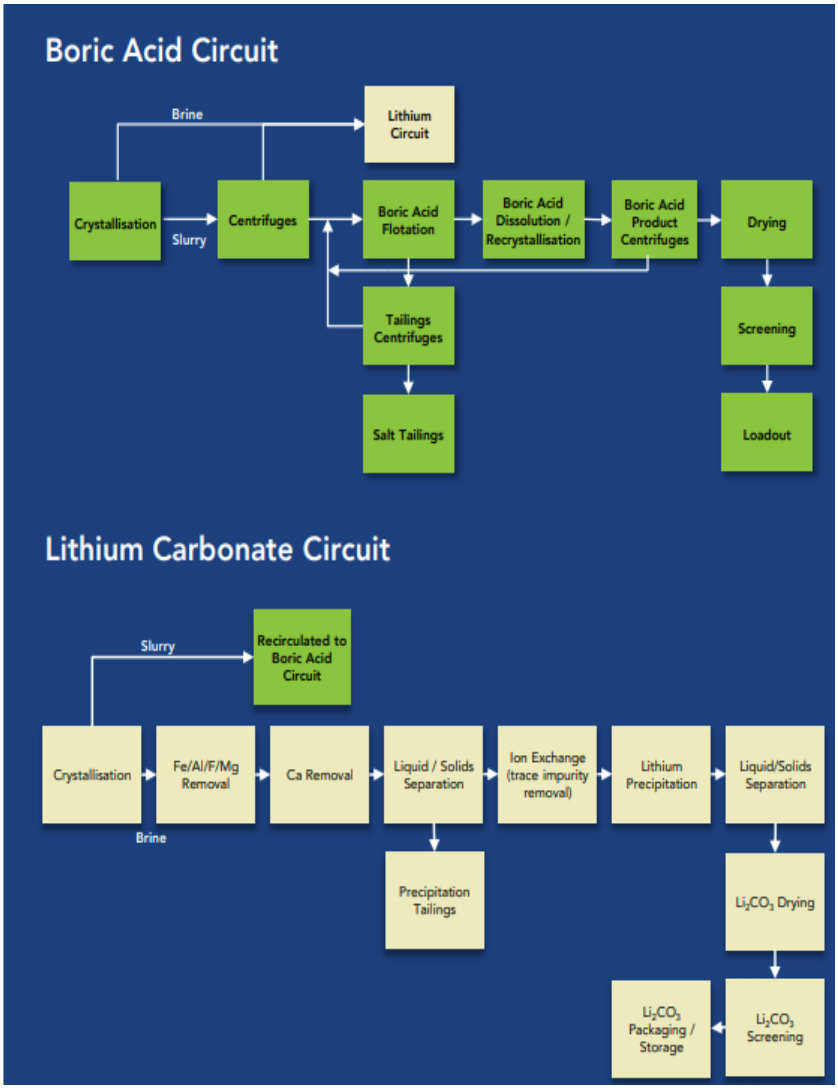


Figure 15: Mine Concentrator Flow sheet

(ioneer Company Reports)

There is very little clay content in the searlesite ore (searlesite represents approximately 40% of the total ore). Using sulphuric acid for leaching the ore results in a very high recovery rate (95%-98%) into the PLS achieved during a short acid residence time. The low clay content of the ore results in the PLS being readily filtered and the residue rock being easily washed without the need for large tanks, thickeners or tailings dams. The ultimate recovery rate estimates for lithium (81.5%) and boron (83.5%) appear reasonable.

Timeline, opex and capex analysis for the processing plant

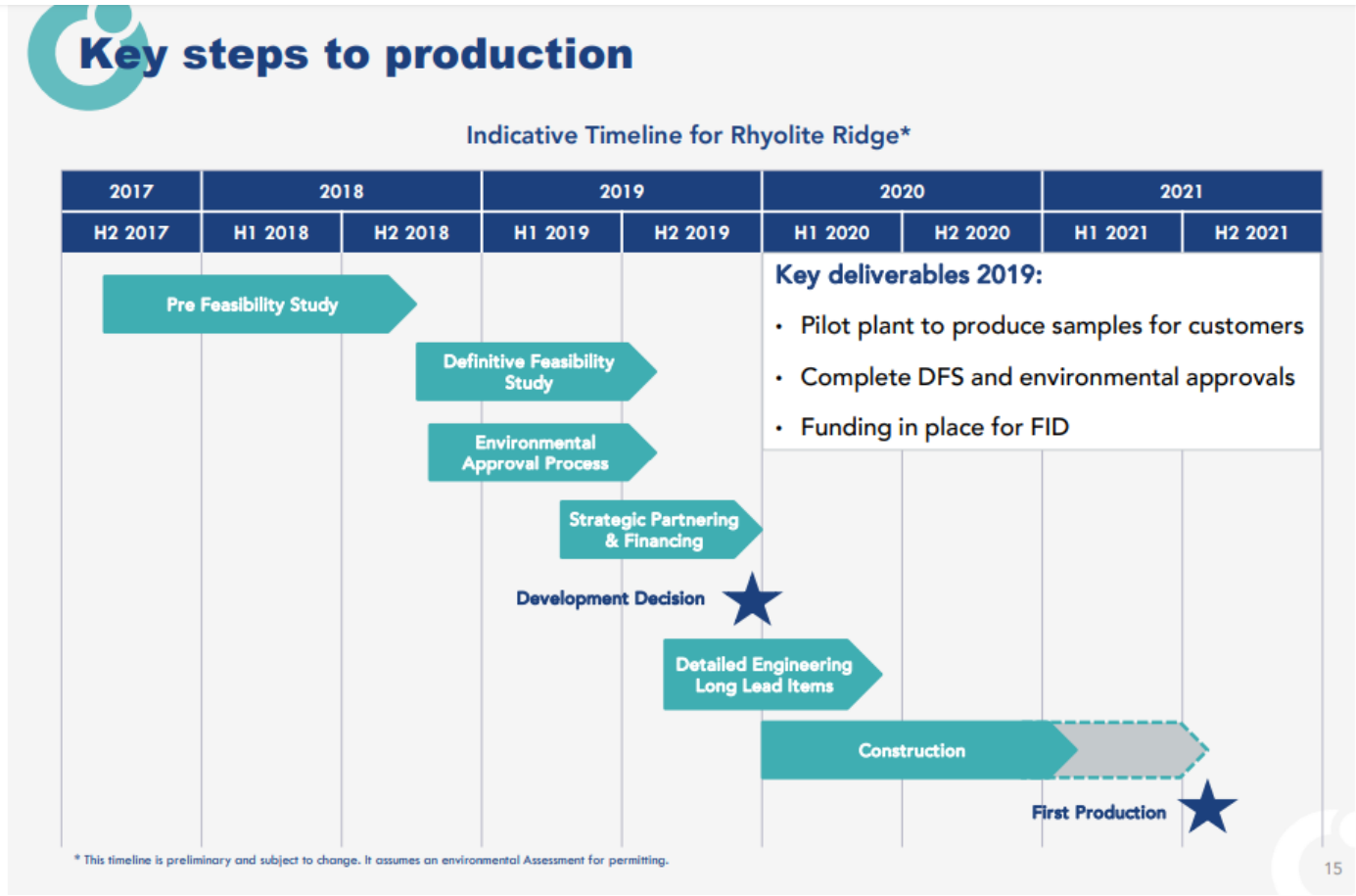


Figure 16: Table depicting ioneer's proposed timeline

(ioneer company reports)

In my opinion the estimated timeline for the DFS is fair, there is however likely to be a slight delay for the environmental approval process and finalization of a strategic partner and financing. The delay is unlikely to be material but the final investment decision could be delayed until H1 2020. ioneer's estimated construction and ramp up period of 18-months appears reasonable subject to confirmation of the independent construction timeline of the sulphuric acid plant by a third party.

The ramp up period after construction involves the commissioning of all four areas of processing plant, crusher, leaching, boric acid and lithium carbonate. There will be some minor adjustments needed and the fair value model has factored in some cost overrun.

Based on management interaction and company releases, the likely operational start date is between the company's targeted Q3 2021 and a more conservative Q1 2022. This reflects a potential delay of up to approximately six months but should provide the company with additional time to secure a strong off-

take arrangement. The lithium market and pricing are anticipated to be firmer in early 2020 and, owing to this, a delay could be opportunistic for ioneer regarding negotiations. **The company will be vulnerable to the pricing of technical grade carbonate and the opportune time to secure an agreement would be during a buoyant market.** With respect to boric acid, ioneer's position as a second producer in the United States alongside a declining production profile from U.S. Borax, should secure a long-term off-take agreement from local buyers for a relatively high percentage of its volumes. Especially given the quality of samples produced and soon to be confirmed by the pilot plant.

By January 2022 there is a high probability that the USA auto market will have made significant progress in securing an integrated domestic supply chain to manufacture EV's. SK Innovation recently announced plans to build a US$1.65bn battery cell plant in Georgia. LG Chem produces some cathode in Michigan and additional plants should follow this lead and the logical extension of that development will be the desire to secure lithium chemicals from US based suppliers. Sourcing chemicals domestically will reduce the risk of potential foreign export taxes or even outright export bans in the event that there is a global shortage of cathode / battery cell / pack supply. **The transition by ioneer from producing technical grade carbonate to battery grade is critical if the company is to sell the majority of its production in the United States at premium pricing.**

Processing cost estimates

In Year 4 of operations, the steam turbine generator is planned to be installed, enabling a net export of power to the grid and an associated reduction in power costs from Year 5 onwards. The turbine is forecast to generate approximately 47 MW of power. As the site uses approximately 9.5MW of power, approximately 37.5MW is forecast to be sold into the grid.

Operating Costs - Processing	Years 1-4		Year 5 onwards	
	US$Mpa	US$/t processed	US$Mpa	US$/t processed
Power	4.1	1.51	-14,444	-5.35
Reagents and Consumables	78.9	29.23	78.9	29.23
Labor	9.1	3.36	9.1	3.36
Mobile Equipment	1.4	0.51	1.4	0.51
Laboratory	1.0	0.37	1.0	0.37
Maintenance Costs	5.0	1.85	5.0	1.85
Battery-Grade Expansion			1.0	0.37
Total	**99.4**	**36.83**	**81.9**	**30.34**

Note: Year 4 has an additional US$1.0 million (US$0.37/t) for the battery-grade plant.

Major design inputs into the processing plant are summarised in the table below

Processing Plant Inputs	ktpa	Cost US$/tonne
Ore feed	2,700	
Sulphur	431	120
Quick lime	66	203
Soda ash	44	300

Other key input costs are:

- Electricity – purchase for $0.0515/kWh, sell for $0.04342/kWh
- Diesel - $2.37/gallon

Figure 17: ioneer processing cost estimates (ioneer company reports)

The PFS highlighted processing costs of US$36.83/t in years 1-4 and then a fall to US$30.34/t once the cogeneration turbines are added to the planned sulphuric acid plant and produce all the electricity required for the project and a surplus of 37.5 MWh of electricity that can be sold into the grid for at least US$0.04 per kWh. As the estimated fair value model assumes the sulphuric acid plant will be funded by a third party, ioneer will be required to pay market related prices for electricity and acid (estimated fair value total opex costs of between US$56.52 – US$56.89/t).

Approximately 52% of all operating costs are for sulphur, electricity represents ~4%. The estimated fair value model assumes the independent funder will levy a price increase of 15% over the PFS estimates to generate an acceptable internal rate of return.

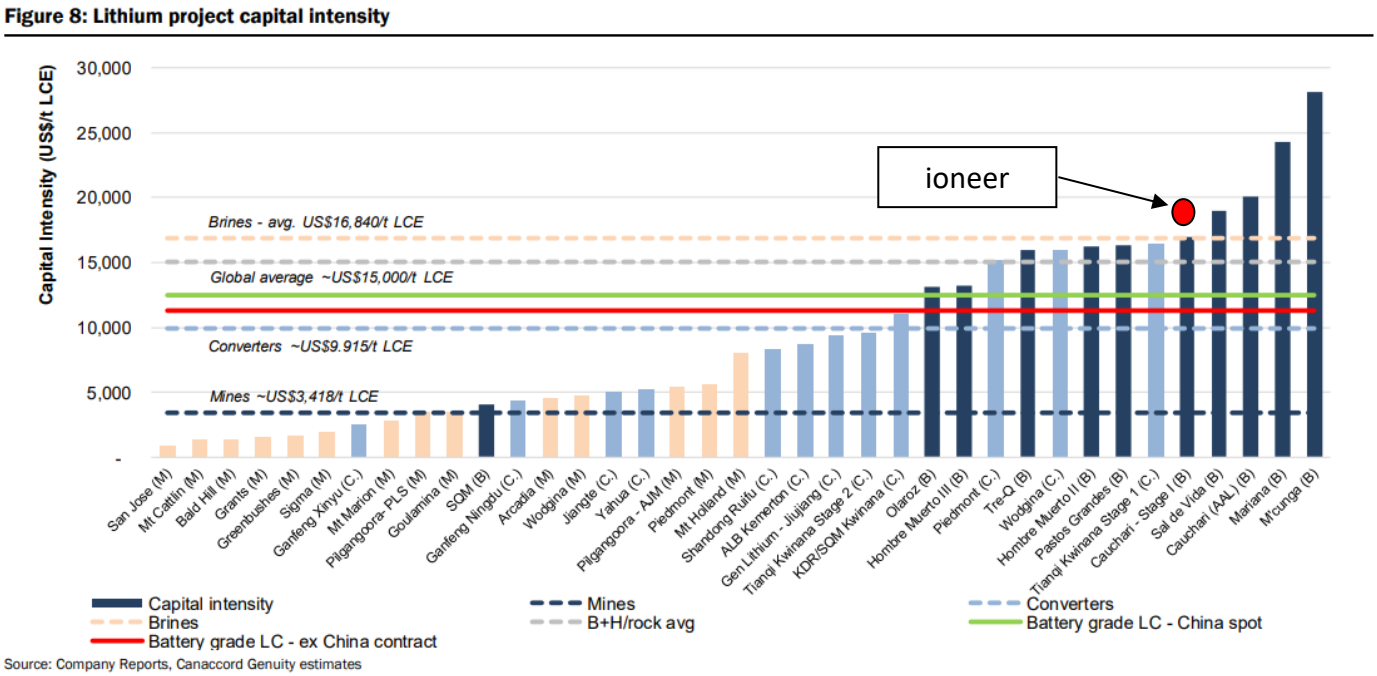


Figure 18: Graph illustrating Conservative Capital budgets

(Company Reports & Canaccord Genuity)

Ioneer has a forecasted capex per tonne of installed capacity of US$18,600/t – this is conservative relative to integrated converters and brines. Given the location of the Rhyolite project in Nevada, capacity and the process flow sheet, ioneer's estimate appears realistic. The estimated fair value model assumes a US$25m cost overrun.

Management, major shareholders and outstanding share options

Experienced Board with lithium-boron development expertise

James D. Calaway	Alan Davies	Patrick Elliott	John Hofmeister	Bernard Rowe
Non-executive Chairman	Non-executive Director	Non-executive Director	Non-executive Director	Managing Director
Former: Non-exec Chairman of Orocobre Ltd	**Former:** CEO, Energy & Industrial Minerals, Rio Tinto	**Former:** Head of corporate finance for Morgan Grenfell Australia Limited	**Former:** President, Shell Oil, US-based subsidiary of Royal Dutch Shell	**Former:** Managing Director of INR since IPO in 2007
Key experience: Building & transitioning junior lithium, oil and gas, solar and software companies into successful commercial enterprises	**Key Experience:** 20-year career with Rio Tinto; Led Rio's division containing the Boron Mine in California and the Jadar lithium-boron deposit in Serbia	**Key Experience:** 30 years experience in investment and corporate management, specialising in the resources sector	**Key Experience:** Extensive energy industry experience and long-term advocate for better energy policies in the United States	**Key Experience:** Qualified geologist with over 25 years international experience in mineral exploration and management, including over 15 years in Nevada

Figure 19: Corporate Snapshot (ioneer Company Reports)

DIRECTORS' INTERESTS IN SHARES AND OPTIONS

Directors' interests in shares and options as at 30th June 2018 and at the date of this report are set out in the table below.

Table 1 – Director's Interest in Shares and Options as at 30th June 2018

	Shares held	Options held	Shares held	Options held
	As at 30 June 2018	As at 30 June 2018	At report date	At report date
JD Calaway	31,600,000	40,000,000	31,600,000	40,000,000
B Rowe	61,475,918	-	61,475,918	-
A Davies	1,912,298	500,000	2,047,298	500,000
P Elliott	19,446,722	-	19,446,722	-
J Hofmeister	310,000	500,000	310,000	500,000

Figure 20: Corporate Snapshot (ioneer Company Reports)

Directors hold a meaningful interest (8%) in the company and, as such, many key members of the board were involved in the project from its initiation. James Calaway, the non-executive Chairman, has invested a substantial amount in ioneer equity and was previously a founder of Orocobre Limited, operator of the first green-field lithium brine project in 20 years. The top 20 shareholders collectively own 60%, indicating a tight and supportive register.

Most of the outstanding options expire between April and May 2022. The financial models assume the issue of share options and the receipt of the strike price if the fair value of the share is higher than the strike price of the relevant option at the time of expiry. The cash flows received by the exercise of these options will be minimal and it's assumed they will be used for corporate expenses as well as working capital.

Estimated fair value analysis

Date	Methodology	EFV AUD	Life cycle	IRR %	Shares in Issue (mn)	New issue (mn)	Price (A$)	Options	Exp date	Strike price	Final shares (mn)
Apr-19		0.20	Current price	40.20%	1470.0						1470.0
Jul-19	P/NPV	0.22	Updated resource	39.87%	1470.0						1470.0
Oct-19					1470.0						1470.0
Dec-19	P/NPV	0.25	DFS	41.27%	1470.0						1470.0
Jan-20					1470.0			5.0	01-Jan-20	0.12-0.20	1475.0
Mar-20	P/NPV	0.32	Permitting	34.45%	1470.0						1470.0
Jul-20	P/NPV	0.32	Funding / offtake	38.30%	1470.0	1093.8	0.32				2563.7
			Construction		2563.7						2563.7
Apr-22			Construction		2563.7			40.5	Apr-May 22	0.15-0.25	2604.2
Jan-24	EV/EBITDA 9x	1.00	Li2CO3 & H3BO3		2604.2						2604.2

Figure 21: Table summarising the base case estimated fair value and issued shares

(Author and Company Reports)

Key assumptions used:

Key model variables	ioneer PFS	Author DFS estimate	Note
Life of mine (years)	32	32	
Ore inventory (Mt)	79	79	
Capex (funded by ioneer)	600	275	275m + sulphuric acid plant 3rd party+US$150m prepayment funding
Plant capacity Mtpa	2.7	2.7	
Opex/t of ore US$	46.86-53.45	56.52-56.89	No electricity credits & mkt related acid costs - plant funded by 3rd party
Lithium price/t US$	12,683-16,893	10,000-13,000	Technical grade for years 1-5 then battery grade Li2CO3
Boric acid/t US$	700	700	
EBITDA steady state av US$	297	206	
IRR using lower Li2CO3 prices	20	30	

The **estimated fair value** of ioneer when fully ramped by Jan 2024 is an EV/EBITDA multiple of 9x steady state earnings of US$206m (A$288.5m) that equates to a share price of A$1.00. This model assumes that ioneer will raise US$250m equity at A$0.32 per share in July 2020.

		ioneer issue price July 2020							
		0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40
	7.5	0.76	0.78	0.81	0.83	0.85	0.87	0.89	0.91
	8.0	0.81	0.84	0.86	0.89	0.91	0.93	0.95	0.97
	8.5	0.86	0.89	0.92	0.94	0.97	0.99	1.01	1.03
EV/EBITDA	9.0	0.91	0.94	0.97	**1.00**	1.02	1.05	1.07	1.09
Multiple	9.5	0.96	0.99	1.02	1.05	1.08	1.10	1.13	1.15
	10.0	1.01	1.04	1.08	1.11	1.14	1.16	1.19	1.21
	10.5	1.06	1.10	1.13	1.16	1.19	1.22	1.25	1.27
	11.0	1.11	1.15	1.19	1.22	1.25	1.28	1.30	1.33
		Estimated fair value for ioneer Jan 2024							

ioneer author potential DFS with externally funded sulphuric acid plant and prepayment (lithium & boric acid)

		Total	Jul-19	Dec-19	Jul-20	Dec-20	Jul-21	Jan-22	Jan-23	Jan-24	Jan-25	Jan-26
Total tonnes mined	kt	631,422					15,500	19,900	33,750	33,750	33,750	33,750
Waste tonnes mined	kt	552,427					14,970	17,730	31,128	31,101	31,387	31,601
Ore tonnes mined	kt	78,995					0,530	2,170	2,622	2,649	2,363	2,149
Li2CO3 grade	%	0.10					1.16	1.13	1.09	1.04	1.15	1.09
H3BO3 grade	%	1.00					4.95	5.74	6.22	6.45	8.50	9.67
Li2CO3 recovered	kt						5.01	20.06	23.27	22.54	22.15	19.09
H3BO3 recovered	kt	700					21.91	104.01	136.18	142.67	167.71	173.52
Transport costs	t	- 10.00					(5,300)	(21,700)	(26,220)	(26,490)	(23,630)	(21,490)
Cost of production	t	0.37					(58,781)	(150,496)	(201,933)	(203,293)	(188,887)	(178,108)
Li2CO3 price							10,000	10,000	10,000	10,000	10,000	13,000
Revenue Li2CO3							50,074	200,582	232,732	225,356	221,514	248,178
Revenue H3BO3							15,334	72,804	95,325	99,868	117,400	121,464
EBITDA							6,627	122,890	126,124	121,931	150,027	191,534
Undiscounted cumulative							6,071	120,664	123,541	37,331	111,427	188,779
Nevada NP Tax	(5.0%)						0,000	(2,528)	(2,098)	(1,930)	(3,194)	(4,941)
Depletion	(22.0%)						(14,390)	(60,145)	(72,173)	(71,549)	(74,561)	(81,321)
Depreciation	(3.3%)						(6,539)	(6,539)	(6,539)	(6,539)	(6,539)	(6,539)
Esmeralda Prop Tax	(3.0%)						(5,843)	(5,645)	(5,448)	(5,250)	(5,053)	(4,855)
Tax rate	(21.0%)						4,230	(10,087)	(8,372)	(7,699)	(12,743)	(19,714)
Sustaining capex	(1.1%)						(0,556)	(2,226)	(2,583)	(84,600)	(38,600)	(2,755)
After tax cash flow	mn		(15,000)	(65,000)	(10,000)	(185,000)	4,459	102,404	107,623	22,452	90,438	159,269
After tax cash flow	mn		(15,000)	(65,000)	(10,000)	(185,000)	4,459	65,792	71,012	(14,159)	53,826	122,657
	7%	NPV	1 259 451									
		IRR	30.13%									
Prepayment	(150,000)					(150,000)	(155,176)	(123,978)	(96,045)	(66,176)	(34,210)	(0,000)
Repayment								36,611	36,611	36,611	36,611	36,611

Assumptions:

1. Sulphuric acid plant externally funded
2. Prepayment funding at 7%, US$150m, amortizing over 5-6 years
3. ioneer funds US$275m (assumed capex overrun of ~US$25m)
4. Cost of production (processing opex) increases to US$40/t from US$36.83/t due to separate sulphuric acid plant

Conclusion

ioneer is strategically located as a potential supplier of both boric acid and lithium to the United States market. As the United States auto market is the second largest globally the need for a stream lined supply chain to OEM's will become critical in years to come. Whilst ioneer can unlock value in the near term with further drilling the major uplift will come from a meaningful reduction in the absolute capex requirement for the project and the lowering of the company's share of overall capex spend. Therefore, securing external funding for the sulphuric acid plant and an off-take partner for both the boric acid and lithium (glass and ceramics industries) is paramount. A further matter of urgency will be the upgrading of lithium production from technical grade to battery grade after year four. The market for technical grade lithium is limited and the demand growth is likely to be GDP related. It is the author's opinion that the price for technical grade lithium carbonate will remain under pressure in the years to come given oversupply from China (and other) brines and poor quality spodumene concentrate and inexperienced converters.

ioneer has excellent key partners, in particular, those delivering the definitive feasibility study (Fluor), sulphuric acid plant (SNC-Lavalin) and pilot plant (Kemetco).

It is advised that ioneer finalises a number of **milestones in 2019.** These follow below.

- Updated reserve and resource replace in 2Q 2019
- Kemetco providing a pilot plant and samples to customers 2Q 2019
- Environmental approval process – target 2019
- Potential vendor financing and strategic partnerships (2019)

Given ioneer's structure, choice of key partners, location and access to infrastructure, the company is unlikely to face major unexpected cost problems for the crushing, vat leaching, boric acid and lithium carbonate plants. Most of the capex relates to equipment that can be determined with a fair level of accuracy or with cost guarantees. The probable cost overruns relate to post-ramp modifications to equipment and possible minor flow sheet adjustments. As a precaution, ioneer is likely to require a temporary working capital drawdown facility during the commissioning phase.

The estimated fair value for ioneer, should they execute on building and ramping the planned boric acid and technical lithium carbonate (ultimately battery grade) plant, is estimated at A$1.00 (~40% compound return expectation at all life cycle stages) with further upside potential should the company raise capital at a higher share price than the estimated fair value model and improve the grade and lower the strip ratio with further drilling success.

APPENDIX

ioneer PFS model (author version)

		Total	Jul-19	Dec-19	Jul-20	Dec-20	Jul-21	Jan-22	Jan-23	Jan-24	Jan-25	Jan-26	Jan-27
Total tonnes mined	kt	631,422					15,500	19,900	33,750	33,750	33,750	33,750	33,750
Waste tonnes mined	kt	552,427					14,970	17,730	31,128	31,101	31,387	31,601	31,101
Ore tonnes mined	kt	78,995					0,530	2,170	2,622	2,649	2,363	2,149	2,649
Li2CO3 grade	%						1.16	1.13	1.09	1.04	1.05	0.99	0.95
H3BO3 grade	%						4.95	5.74	6.22	6.45	7.50	8.67	8.51
Li2CO3 contained	kt						5.01	20.06	23.27	22.54	20.22	17.33	20.59
H3BO3 contained	kt	700					21.91	104.01	136.18	142.67	147.98	155.58	188.23
Transport costs	t	- 10.00					(5,300)	(21,700)	(26,220)	(26,490)	(23,630)	(21,490)	(26,490)
Cost of production	t	-					(56,905)	(142,814)	(192,651)	(193,915)	(180,522)	(156,553)	(176,723)
Li2CO3 price							12,693	12,693	12,917	13,633	14,483	14,488	15,540
Revenue Li2CO3							63,559	254,598	300,620	307,227	292,824	251,116	319,897
Revenue H3BO3							15,334	72,804	95,325	99,868	103,588	108,903	131,764
EBITDA							21,988	184,589	203,294	213,180	215,891	203,466	274,937
Undiscounted cumulative							21,283	181,762	199,957	128,580	177,291	200,679	271,387
Nevada NP Tax	(5.0%)						0,000	(4,703)	(4,895)	(5,278)	(5,542)	(5,332)	(7,907)
Depletion	(22.0%)						(17,356)	(72,029)	(87,108)	(89,561)	(87,211)	(79,204)	(99,365)
Depreciation	(3.3%)						(11,443)	(11,443)	(11,443)	(11,443)	(11,443)	(11,443)	(11,443)
Esmeralda Prop Tax	(3.0%)						(7,303)	(7,064)	(6,833)	(6,610)	(6,394)	(6,185)	(5,983)
Tax rate	(21.0%)						2,964	(18,763)	(19,533)	(21,060)	(22,113)	(21,274)	(31,550)
Sustaining capex	(1.1%)						(0,706)	(2,826)	(3,337)	(84,600)	(38,600)	(2,787)	(3,551)
After tax cash flow	mn		(15,000)	(65,000)	(135,000)	(385,000)	16,944	151,232	168,695	95,631	143,241	167,889	225,946
	7%	NPV (0,000)	1815 632										
		IRR	27.67%										

ioneer PFS model with US$10k Li2CO3 Years 1-5 & US$13k Li2CO3 Years 6 onwards (author version)

		Total	Jul-19	Dec-19	Jul-20	Dec-20	Jul-21	Jan-22	Jan-23	Jan-24	Jan-25	Jan-26	Jan-27	Jan-28	Jan-29	Jan-30
Total tonnes mined	kt	631,422					15,500	19,900	33,750	33,750	33,750	33,750	33,750	33,750	33,750	33,750
Waste tonnes mined	kt	552,427					14,970	17,730	31,128	31,101	31,387	31,601	31,101	31,138	31,101	31,101
Ore tonnes mined	kt	78,995					0,530	2,170	2,622	2,649	2,363	2,149	2,649	2,612	2,649	2,649
Li2CO3 grade	%						1.16	1.13	1.09	1.04	1.05	0.99	0.95	1.01	1.06	0.97
H3BO3 grade	%						4.95	5.74	6.22	6.45	7.50	8.67	8.51	7.57	7.14	7.66
Li2CO3 contained	kt						5.01	20.06	23.27	22.54	20.22	17.33	20.59	21.58	22.88	21.02
H3BO3 contained	kt	700					21.91	104.01	136.18	142.67	147.98	155.58	188.23	165.10	157.93	169.43
Transport costs	t	- 10.00					(5,300)	(21,700)	(26,220)	(26,490)	(23,630)	(21,490)	(26,490)	(26,120)	(26,490)	(26,490)
Cost of production	t	-					(56,905)	(142,814)	(192,651)	(193,915)	(180,522)	(156,553)	(176,723)	(175,231)	(176,723)	(176,723)
Li2CO3 price							10,000	10,000	10,000	10,000	10,000	13,000	13,000	13,000	13,000	13,000
Revenue Li2CO3							50,074	200,582	232,732	225,356	202,185	225,325	267,610	280,538	297,470	273,244
Revenue H3BO3							15,334	72,804	95,325	99,868	103,588	108,903	131,764	115,572	110,552	118,603
EBITDA							8,503	130,572	135,406	131,309	125,251	177,675	222,651	220,879	231,298	215,124
Undiscounted cumulative							7,948	128,345	132,823	46,709	86,651	175,174	219,680	217,765	227,996	212,091
Nevada NP Tax	(5.0%)						0,000	(2,596)	(2,248)	(2,085)	(2,007)	(4,326)	(5,868)	(5,825)	(6,225)	(5,603)
Depletion	(22.0%)						(14,390)	(60,145)	(72,173)	(71,549)	(67,270)	(73,530)	(87,862)	(87,144)	(89,765)	(86,206)
Depreciation	(3.3%)						(11,443)	(11,443)	(11,443)	(11,443)	(11,443)	(11,443)	(11,443)	(11,443)	(11,443)	(11,443)
Esmeralda Prop Tax	(3.0%)						(7,303)	(7,064)	(6,833)	(6,610)	(6,394)	(6,185)	(5,983)	(5,787)	(5,598)	(5,415)
Tax rate	(21.0%)						5,173	(10,358)	(8,969)	(8,320)	(8,009)	(17,260)	(23,414)	(23,243)	(24,836)	(22,356)
Sustaining capex	(1.1%)						(0,556)	(2,226)	(2,583)	(84,600)	(38,600)	(2,501)	(2,970)	(3,114)	(3,302)	(3,033)
After tax cash flow	mn		(15,000)	(65,000)	(135,000)	(385,000)	5,817	108,327	114,773	29,693	70,241	147,403	184,415	182,910	191,337	178,717
	7%	NPV (0,000)	1 200 239													
		IRR	20.60%													