AUSTRALIAN
RESEARCH
INDEPENDENT INVESTMENT RESEARCH

Sayona Mining Limited

(ASX: SYA)

July 2017

INDEPENDENT
INVESTMENT RESEARCH

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INDEPENDENT INVESTMENT RESEARCH

Sayona Mining Limited (ASX: SYA)

Initiation - July 2017

Note: This report is based on information provided by the company as at July 2017

Investment Profile	
Share Price as at 12 July 2017	$0.016
Price Target	$0.088
Issued Capital:	
Ordinary Shares	974.8m
Listed Options	0.0m
Options	0.0m
Performance Rights	0.0m
Fully Diluted	974.8m
Market Capitalisation	$15.60m
12 month L/H	$0.014/$0.039

Board and Management

Mr Dennis O'Neill: Managing Director

Alan Buckler: Non-executive Director

James Brown: Non-executive Director

Paul Crawford: Executive Director and Company Secretary

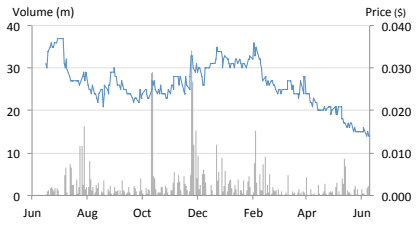
Mr Corey Nolan: Chief Executive Officer

Mr Jonathon Gagne: Country Manager - Canada

Mr Simon Attwell: Exploration Manager - WA

Major Shareholders	
Paul Crawford - Direct and Indirect	9.13%
Alan Buckler - Direct and Indirect	8.82%
Terryjoy P/L	8.56%
Dennis O'Neill - Direct and Indirect	7.34%
Board and Management	27.06%
Top 20	56.08%

Share Price Performance



Senior Analyst – Mark Gordon

LOW COST NEAR DEVELOPMENT LITHIUM

With their Authier Lithium Project ("Authier" or "the Project") in Quebec, Sayona Mining ("Sayona" or "the Company") has a quality, low cost and near term development opportunity in a world-class mining destination, and is in an ideal position to take advantage of the high prices of and growing demand for lithium due largely to the burgeoning electric vehicle battery sector. Since completing a Pre-feasibility Study ("PFS") in February 2017, the Company has expanded and upgraded the resource through additional drilling, and is currently optimising the PFS to incorporate the latest resource and the positive results of current metallurgical test work, which should significantly improve the expected returns of an already robust project. The upgraded PFS is expected to be completed in the current quarter, to be followed by a Definitive Feasibility Study ("DFS"), which is expected to be completed in early 2018. In addition to Authier, Sayona has high quality hard rock exploration tenements in Western Australia that are returning excellent exploration results.

KEY POINTS

February PFS delivers low cost, robust project: Results of the February PFS have highlighted the potential of Authier as a low cost, robust hard-rock lithium project, which returned a pre-tax NPV of C$140 million and an IRR of 39% for an estimated initial capital outlay of C$66 million.

Short term development: Given the size of the proposed project, there is the potential for rapid development given the possibility for reduced permitting time frames.

Subsequent work highlights upside: Subsequent work, including drilling (with a total of ~26,000m now drilled in the Authier project area), metallurgy, geotechnical work and a resource upgrade/expansion has highlighted the upside potential, with this work to be incorporated into an updated PFS expected to be released in the current quarter. New metallurgical test work has confirmed the amenability for Authier concentrates to be converted to beta-spodumene, suitable for downstream conversion to battery grade lithium carbonate and the resource expansion highlights the potential for a significant extension of mine life and/or increase in throughput from the 13 years mining, 15 years processing at 700,000tpa profile used in the current PFS.

Additional upside in an attractive mining destination: There is also upside potential in additional resource expansions, as well as value adding through downstream processing, taking advantage of Quebec's infrastructure, skilled workforce and mining legislation - the Province ranked sixth globally in the 2016 Fraser Institute Survey of Mining Companies.

Infrastructure rich and cheap costs: Authier has ready access to infrastructure, including low-cost energy, water and roads – it is 5km from cheap (C$0.05/kWh) hydro-electric sourced grid power, has access to gas at C$3/GJ), is 45km from the established mining centre of Val-d'Or and 460km by road/rail from port facilities in Montreal.

Australian projects: Very positive results have been gained from Sayona's lithium exploration portfolio in Western Australia, with these including prospective but relatively under explored properties as exemplified by the Mallina discovery – in addition Western Australia, like Quebec, is a well understood and highly ranked mining destination, ranked third globally in 2016 by the Fraser Institute.

Experienced and committed personnel: The Company's Board and Management has extensive experience in the resources industry; in addition insiders hold over 27% of the stock in Sayona, thus aligning their interests with those of shareholders.

Steady News Flow: Ongoing activities should provide steady news flow through 2017 and into 2018, with this including the Authier development studies and WA exploration.

VALUATION SUMMARY

We have completed a valuation for Sayona, with this resulting in a base case Company valuation of A$164 million, or A$0.087/share, diluted for a conceptual funding model for Authier. We would expect this to increase with positive results from ongoing work, with a re-rating on the results of the upcoming PFS update.

SWOT ANALYSIS

Strengths

- **Near development project :**Authier is an advanced, near development project, with much of the expected pre-development costs (including over 26,000m of drilling in the Project area and 19,513m of drilling in the main Authier pegmatite resource) already expended.
- **Reduced permitting requirements:** Due to the planned throughput of <2,000tpd, permitting requirements for Authier should be reduced due to there being possibly no need for a lengthy and expensive full-blown Environmental Impact Assessment ("EIA").
- **Infrastructure rich in an established mining jurisdiction:** Being located in an established mining area, Authier has ready access to infrastructure, including roads, rail, cheap power and a skilled workforce and service providers.
- **Low initial capex:** The initial estimated capex of C$66 million should be able to be readily funded.
- **Strong forecast lithium prices:** Short to medium term price forecasts indicate 6% Li_2O spodumene concentrate prices remaining strong at between US$700 to US$800/tonne, equivalent to lithium carbonate prices of US$9,000 to US$10,000/tonne.
- **Western Australia:** Results in the Western Australian projects have also been positive, highlighting the prospectivity of these projects - these results include the Mallina discovery.
- **Experienced people with skin in the game:** Company personnel have significant experience in the resources game as well as major shareholdings in Sayona.

Weaknesses

- **Small resource:** This is more of a market perception issue, where often "big is better" is the norm - however Authier has sufficient resources, which have a very high resource to reserve conversion, to support a long term cash generating operation.
- **Cash position:** With an estimated $1.5 million in the bank the Company will need to raise cash to fund activities for the rest of 2017 and into 2018 – the current annual burn rate is in the order of A$4.5 million, not taking into account the one off purchase of Authier - this however is expected to decrease given the completion of the major drilling programmes, with an expected A$4.0 million required (including overheads) to complete development studies and permitting.

Opportunities

- **Resource expansion:** Despite having sufficient reserves for a robust, long term operation at Authier, there is good potential to expand these with mineralisation being open down dip and along strike.
- **Downstream processing:** Given the availability of infrastructure and positive spodumene thermal conversion test work, Sayona is investigating downstream processing opportunities - Quebec is the only jurisdiction outside of China to have downstream spodumene processing facilities largely due to low energy costs.
- **Growth in lithium demand:** Sayona is ideally placed to take advantage of the forecast growth in lithium markets, driven largely by the growing battery sector.
- **Exploration success:** The Western Australian properties offer an excellent chance of further discoveries, as highlighted by the recent Mallina discovery.

Threats

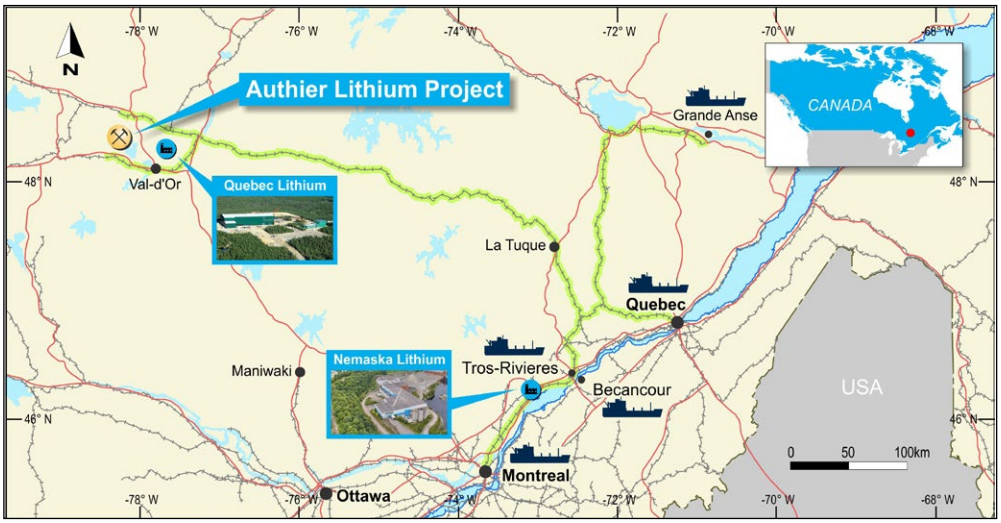
- **Permitting:** This is a perennial threat for near development projects, however in the case of Authier is somewhat mitigated by being in Quebec - our view is that the main risk here may be in permitting taking longer than expected, rather than permits not being granted - this is also mitigated by the expected reduced permitting requirements.
- **Lack of exploration success:** This is self-explanatory with regards to the Western Australia projects, and is threat to any exploration company, however as we see most value in Authier, this is not a major threat to the viability of Sayona.
- **Prices and markets:** These are constant threats to junior resource companies, and will affect the ability to raise capital - although expected capital requirements are modest in the short term, Sayona will be looking to raise development capital in the medium term, with project capital markets still being tight.

OVERVIEW

STRATEGY AND PROJECT OVERVIEW

- Sayona's activities are largely concentrated on the Authier Lithium Project, located in south-western Quebec, Canada (Figure 1).
- Authier is an advanced pegmatite-hosted spodumene lithium project, for which the Company is currently updating a PFS following a recent resource update – this is expected to be completed in the current quarter, and to be followed by a DFS, expected by early 2018.
- The strategy at Authier is the short term commissioning of a readily financed low capital cost project to produce spodumene concentrate to take advantage of current and forecast high lithium prices; in parallel the Company will investigate the economics of downstream processing to potentially increase profit margins.
- Sayona is also undertaking exploration work over a number of hard-rock lithium projects in the Pilbara and Yilgarn regions of Western Australia (Figure 2) – one prospect, Mallina, is located within the Pilbara Lithium Project close to the large Pilgangoora projects of Pilbara Minerals (ASX: PLS) and Altura Mining (ASX: AJM) and has recently completed a reverse circulation "RC" drilling programme, with results being awaited.
- The Company also has 278km^2 of graphite prospective tenements in the Kimberley region of Western Australia, adjacent to Hexagon Resources' (ASX: HXG, A$23 million market capitalisation) McIntosh Graphite Project.
- Most recent work by Sayona has included ~3,000m of RC drilling which has tested only some 6km of 20km strike of prospective stratigraphy identified by geology and electro-magnetic geophysical surveying at the Corkwood prospect - this intersected broad zones of graphite mineralisation.
- Given the main focus on the lithium projects, this project will not be discussed further.

Figure 1: Authier project location map

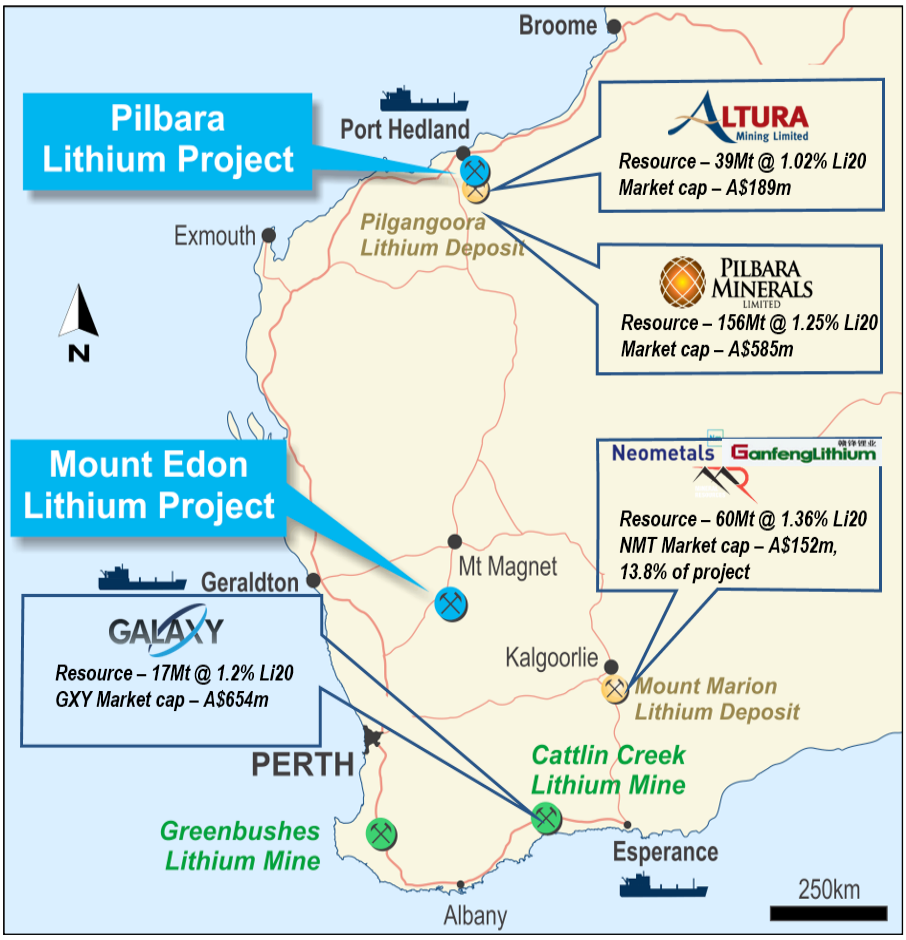


Source: Sayona

FINANCIAL POSITION

- As of March 31, 2017, the Company had A$1.04 million in cash and no debt.
- Subsequent to the end of the March quarter Sayona raised A$1.5 million through a fully underwritten rights issue at $0.017/share – this had an initial take-up of 54%, with the shortfall being placed through Patersons.
- This is included in a total of $12.515 million that has been raised since the beginning of 2016 – this included a placement and rights issue in August 2016 that raised A$7.1 million at A$0.027/share to fund the acquisition of and work activities on Authier, and A$2.5 million being raised through the exercise of options in December 2016.
- Over the same period the Company spent A$3.98 million on exploration and evaluation, $1.511 million on administration and wages, and A$4.122 million on the purchase of Authier.

Figure 2: Western Australian project location map



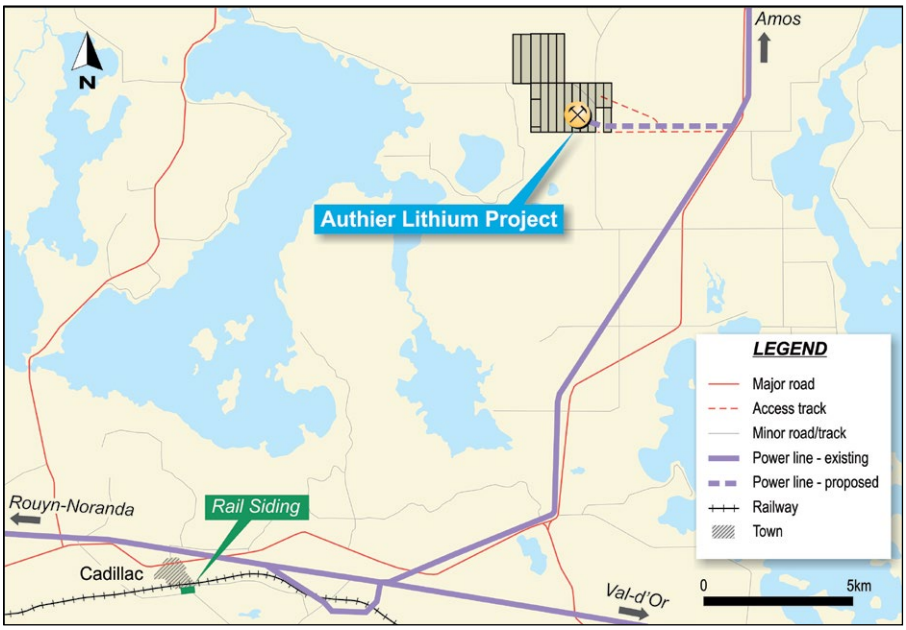
Source: Sayona

AUTHIER LITHIUM PROJECT - SAYONA 100%

Location and Tenure

- Authier comprises 20 mineral claims for 675 hectares (Figure 3), covering an area of 3.4km east-west and 3.1km north-south – the mineralisation is in the south of the claims.
- All claims are in good standing, are located over Crown Land, and are subject to a number of vendor royalties totalling ~2% of gross revenue.

Figure 3: Authier Lithium Project location and claims



Source: Sayona

- Authier is located some 45km north-west of the city of Val-d'Or, a city with a population of ~33,000, and in a mining district some ~460km north-east of Montreal.
- The Project is close to infrastructure, including grid power, water, road and rail; and is just 35km from North American Lithium Corporation's ("NAL") mine and lithium carbonate plant, and 450km from Nemaska's proposed lithium carbonate plant.
- NAL, a private company, is currently in the process of restarting operations, with first concentrate expected to be produced in 2017 and lithium carbonate in 2018.

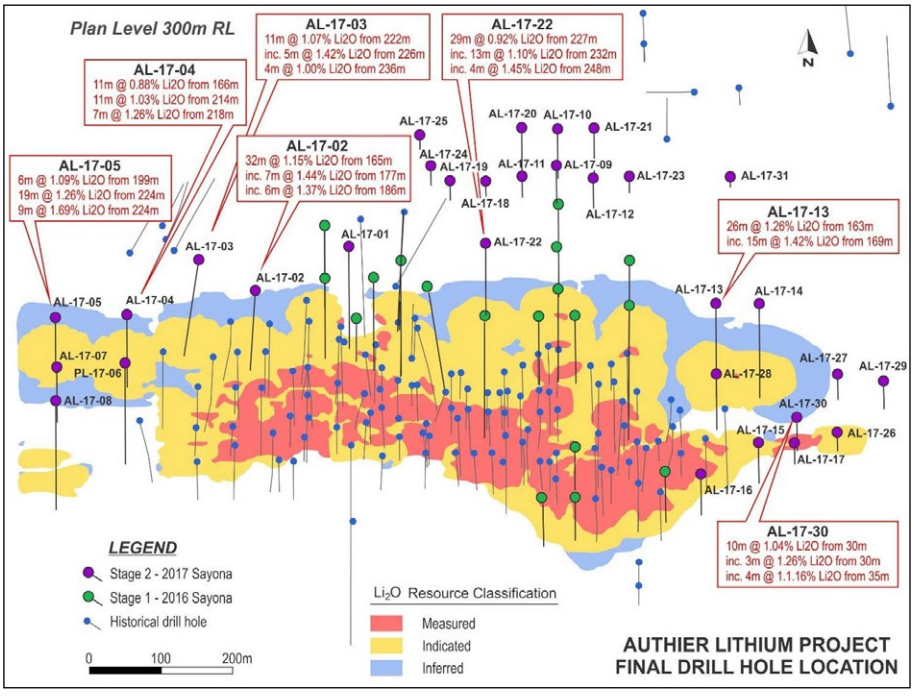
Acquisition

- Initially announced to the market on May 3, 2016 (with the finalisation of the acquisition being announced on July 21, 2016), 100% of Authier was purchased from TSX-V listed Glen Eagle Resources Inc for C$4 million in cash.
- The purchase was subject to a 60-day due diligence programme by Sayona, which was given a three-week extension.
- As part of the due diligence Sayona commissioned an independent JORC-2012 compliant Mineral Resource Estimate ("MRE") for Authier, using the comprehensive historical drilling database – this initial MRE had M,I and I Resources of 9.12Mt @ 0.96% Li_2O, and was a conversion from a historical NI43-101 resource estimate.

Geology and Mineralisation

- Authier is a typical highly fractionated lithium-caesium-tantalum ("LCT") style pegmatite, with spodumene being the lithium bearing mineral, and the pegmatite showing evidence of multiple phases of injection.
- The pegmatite is Archaean in age, and located within the highly mineralised Abitibi Greenstone Belt, which shows similarities in age and geology to the greenstone belts of Western Australia that also host significant pegmatite associated lithium mineralisation.
- Other significant deposits within the Abitibi Belt include Whabouchi (Nemaska Lithium, MI & I Mineral Resources of 32.68Mt @ 1.56% Li_2O) and Rose (Critical Elements, 37.92Mt @ 0.95% Li_2O) and NAL's deposit of 47Mt @ 1.19% Li_2O.
- Mineralisation recognised to date has an east-west strike length of 1,100m, has an average thickness of 25m (ranging from 5m to 65m), and dips at 40° to the north – it has thus far been drilled to ~300m down dip (~200m below surface), and is still open down dip and along strike to the east and west (Figures 4 and 5.)

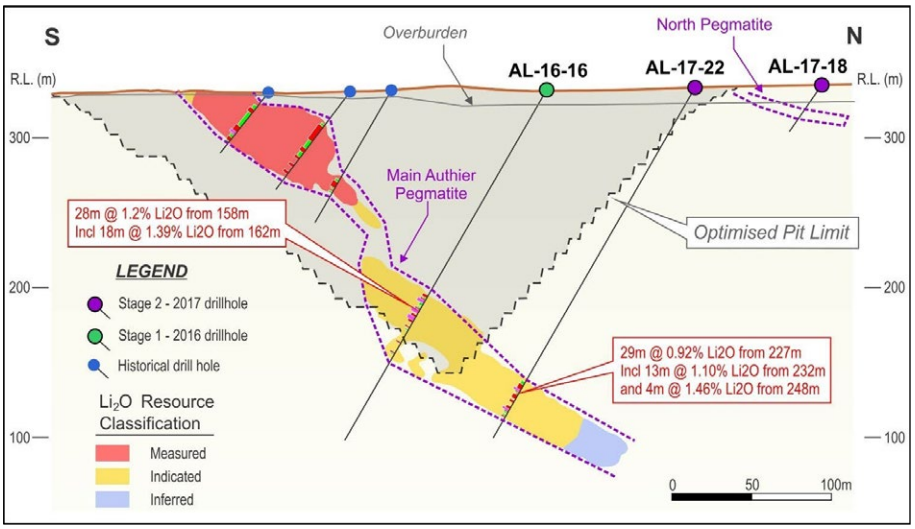
Figure 4: Authier plan shown all drill holes and selected 2017 drill results.



Source: Sayona

- A second parallel pegmatite, Authier North has been intersected in twelve drillholes – this is still open down dip and along strike, as shown in Figure 5 below.

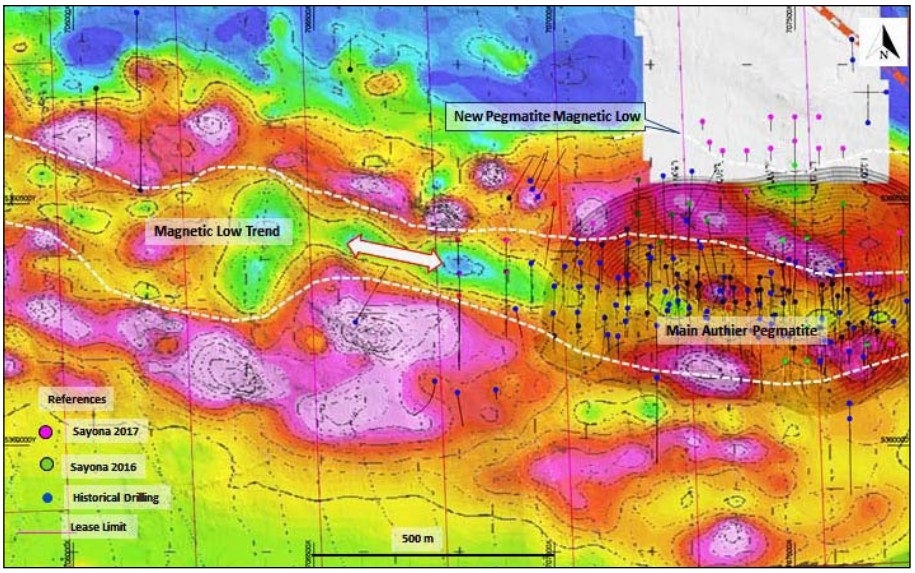
Figure 5: Authier section 707400E showing depth potential and north pegmatite



Source: Sayona

- The pegmatite is within an east-west trending magnetic low, highlighting the potential for additional mineralisation to the west – a magnetic low has also been recognised at Authier North (Figure 6).

Figure 6: Authier magnetics image showing ~east-west trending low



Source: Sayona

Previous Work

- Prior to Sayona's involvement, Authier had seen a significant amount of previous work, including ~15,000m of drilling in the area.
- Initial exploration, in the 1950's and 1960's was for nickel-copper sulphide mineralisation, however the focus changed to lithium following the discovery of the spodumene bearing pegmatite in the late 1960's.
- Work following the discovery included a significant amount of drilling (with delineation drilling from 1991 to 1999), bulk sampling and metallurgical test work programmes.
- The 1990 metallurgical test work was carried out on a 40-tonne bulk sample by Burnigeme Inc., and produced Li_2O concentrate grades of between 3.78% and 5.89% and recoveries of between 67.52% and 70.19% at a head grade of 1.14% Li_2O – at an average head grade of 1.35% Li_2O recoveries were 75% to a 5.96% Li_2O concentrate.
- Between 2010 and 2012 Glen Eagle completed 8,990m of drilling, largely on the Authier pegmatite, but also at other areas – total drilling prior to Sayona's involvement is in the order of 15,000m at Authier and surrounding areas of the project.

- Metallurgical test work on a 270kg composite sample and design of a flow sheet by Glen Eagle in 2012 targeted a conceptual recovery of 85% to a 5% to 6% concentrate using conventional processing routes and a 2,200tpd feed – results of the test work included one sample with an 88% recovery to a 6.09% LiO_2 concentrate.

Work by Sayona

- Initial work by Sayona, as mentioned above, included the estimation of an MRE during the due diligence operation.
- Subsequent work has included infill and extensional diamond drilling, with 8,071m in 49 holes being drilled in two programmes – one in 2016 (3,967m in 18 holes) and the second in 2017 (4,104m in 31 holes) – the drilling includes 12 holes for 639m at Authier North.
- The phase one drilling was used in the first resource upgrade, which grew and upgraded the total resource from 9.12Mt @ 0.96% Li_2O to 13.74Mt @ 1.07% LiO_2, for a 50% increase in tonnage and a 68% increase in contained Li_2O – this MRE was used in the PFS as released to the market on February 16, 2017 (discussed later) and currently being updated.
- The second phase of drilling was largely aimed at extending the mineralisation, with all drill hole collars and selected 2017 results shown in Figure 4.
- The drilling programmes have confirmed the thicknesses and grade of mineralisation, as well as extending it to the east, west and down dip – intersections have included:
  - 62m @ 1.35% Li_2O from 12m in hole AL-16-001 – eastern zone, which has been extended by some 150m at deeper RL's.
  - 28m @ 1.20% Li_2O from 158m in hole AL-16-016 – middle of gap zone, which had not been previously drilled
  - 32m @ 1.15% Li_2O from 165m in hole AL-17-002 – western zone deep, which has been extended by around 300m to the west.
- The drilling has extended the overall strike length of the mineralisation from 850m to 1,100m.
- The results of the Phase 2 drilling highlight the potential to extend the pit along strike and down dip (Figure 5)
- In 2016, metallurgical testwork was carried out by SGS Lakefield in Ontario on 430kg of core collected from 23 historical drillholes, representing the entire deposit.
- Work completed included:
  - QEMSCAM mineralogical analysis,
  - Heavy liquids separation to test the amenability of Authier mineralisation to the process,
  - Grindability testwork,
  - Batch flotation testwork, and,
  - Variability and locked cycle testwork.
- More recent metallurgical test work has include flotation optimisation and successful spodumene thermal conversion work (discussed later).
- The Company is also undertaking comprehensive hydrogeological and geotechnical work, including drilling and a geotechnical review - a key aim of the work is to increase the hanging wall pit slopes from 45° as used in the PFS to 55° - 60°, which will significantly lower waste volumes and hence costs, and also should allow more resources to be converted to reserves.
- Results of work completed subsequent to the original PFS will be used in the ongoing PFS update work, with the Company looking at producing a higher Li_2O grade, lower iron content concentrate.

Resources and Reserves

- The most recent resource upgrade was released to the market on June 14, 2017 – this has increased the tonnes by a further 27% to 17.40Mt as shown in Table 1, with 87.6% being in the Measured and Indicated categories.
- This was not the resource used in the PFS - this used the previously mentioned resource of 13.74Mt @ 1.07% Li_2O as released to the market on November 23, 2016.

Table 1: Authier Mineral Resource Estimate

Authier Mineral Resource Estimate				
Category	**Tonnes (Mt)**	**Grades %Li_2O**	**Contained Li_2O**	**% of total**
Measured	5.62	1.01%	56,762	32.0%
Indicated	9.57	1.03%	98,571	55.6%
Inferred	2.21	0.99%	21,879	12.3%
Total	**17.4**	**1.02%**	**177,212**	**100.0%**

Source: Sayona

- As part of the PFS, Sayona estimated ore reserves for Authier – these used a 5% mining dilution and resulted in a high resource to reserve conversion of 82% (with dilution taken into account) of the November 2016 resource estimate.
- These are shown in Table 2, and will be re-estimated as part of the ongoing PFS update and in light of the June 2017 resource upgrade.

Table 2: Authier Ore Reserve Estimate (pre-June 14, 2017 Resource update)

Authier Ore Reserve Estimate				
Category	**Tonnes (Mt)**	**Grades %Li_2O**	**Contained Li_2O**	**% of total**
Proven Reserve	4.9	0.97%	47,821	46.1%
Probable Reserve	5.3	1.06%	55,904	53.9%
Total Reserves	**10.2**	**1.02%**	**103,725**	**100%**

Source: Sayona

Pre-feasibility Study

- The PFS, which was released to the market on February 16, 2017, highlighted a robust project treating an average of 700,000tpa of pegmatite ore to produce 99,000tpa of a 5.75% Li_2O concentrate over a mine life of 13 years and a processing life of 15 years.
- The rate of 700,000tpa is to allow for a processing rate of less than 2,000tpd, which under Quebec legislation, avoids a costly and lengthy EIA.
- Parameters and outcomes of the PFS are shown in Table 3.

Table 3: Authier PFS parameters and outcomes

Authier PFS parameters and outcomes		
Description	**Unit**	**Value**
Average Annual Plant Treatment Rate	tonnes	700,000
Annual Average Spodumene Production	tonnes	99,000
Life of Mine/Processing	years	13/15
Life of Mine Strip Ratio	waste to ore	6:01
Average Spodumene Price	US$/tonne	515
Development Capital Costs	C$ million	66
Total Life of Mine Capital Costs	C$ million	113
Total Net Revenue (real terms)	C$ million	978
Total Project EBITDA (real terms)	C$ million	449
Average Life of Mine Cash Costs (Montreal Port FOB basis)	C$/tonne	367
Net Present Value (real terms @ 8% DR)	C$ million	140
Pre-Tax Internal Rate of Return	%	39
Project Payback Period	years	2.2
Exchange Rate	CAD:USD	0.76
Metallurgical Parameters		
Process Plant Throughput Rate	tonnes pa	700,000
Metallurgical Recovery	% of mill feed	80%
Average Annual Concentrate Produced	tonnes	99,000
Lithium Concentrate Grade	Li_2O	5.75%
Iron Grade in Concentrate	% Fe_2O_3	1.41

Source: Sayona

- The Project has an estimated initial capital requirement of C$65.9 million (+-35%), with sustaining capital costs of C$47.1 million, largely comprising mining fleet leasing (Table 4) - operating costs are shown in Table 5.
- The use of 2nd hand plant or mobile crushing infrastructure has the potential to further reduce up-front capital costs.
- Our view is that these costs appear reasonable when compared with the results of peers' studies, with Sayona having a competitive capital intensity of C$662/annual tonne of concentrate.

Table 4: Authier PFS capital cost estimate

Authier PFS Initial Capital Cost Estimates	
Cost Area	**Cost C$ million**
Site Establishment	3.7
Mine Development (pre-stripping)	5.6
Process Plant Supply and Install	34.9
Process Plant Support Infrastructure	1.1
Non-Process Infrastructure	4.6
In-directs Costs (including EPCM and working capital	9.2
Contingency	4.3
Mining Fleet Leasing (1st year – pre-production)	2.2
Total Development Capital Costs	**65.6**
Authier PFS Sustaining Capital Cost Estimates	
Mining Fleet Leasing (after commencement of commercial production)	35.2
Mine Sustaining Capital	4.6
Mill Sustaining Capital	4.8
Rehabilitation and Closure Costs	2.5
Total Sustaining Capital Costs	**47.1**

Table 5: Authier PFS LoM cash operating cost estimates

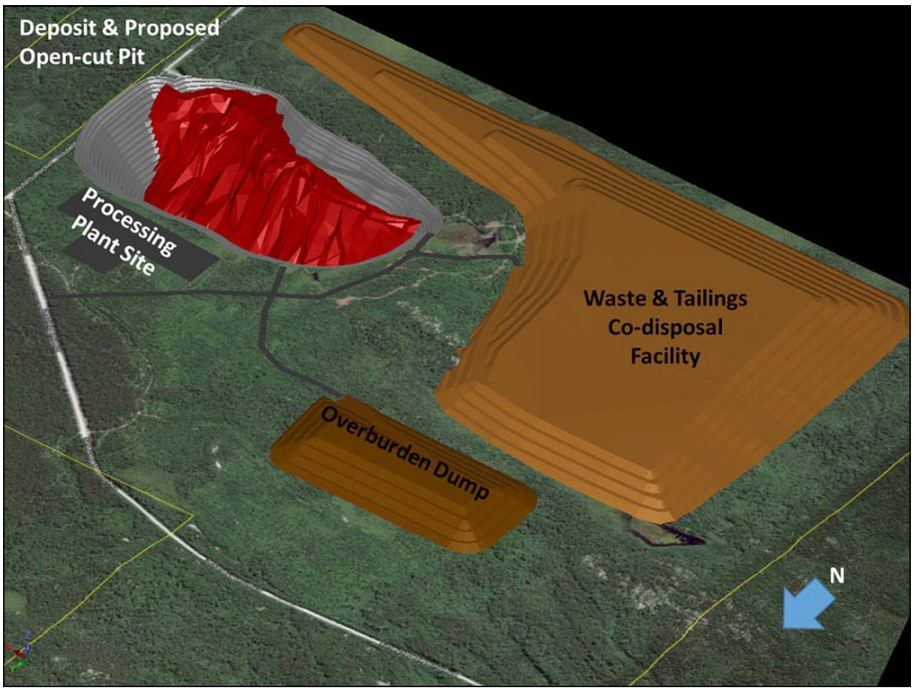
Authier PFS LoM cash operating cost estimates	
Cost Area	**Cost C$/tonne Concentrate**
Mining	141
Processing	137
Transportation FOB Port of Montreal	38
Vendor Royalties	37
General, Administration and Marketing	14
Total Cash Operating Costs	**367**

Source: Sayona

Mining and Processing

- Mining will be traditional drill and blast open pit, with blasted ore being loaded by hydraulic excavators onto trucks for transport to the ROM stockpile - work has indicated a fleet of 46 tonne mining trucks and 125 tonne excavators will be suitable.
- The current plans are for a staged operating including three cutbacks, with pit wall angles of 45° and a LoM strip ratio of 6:1 – as mentioned earlier the Company is currently undertaking further geotechnical test work to look at the potential for steepening up the hanging wall pit wall and hence decreasing the strip ratio and operating costs.

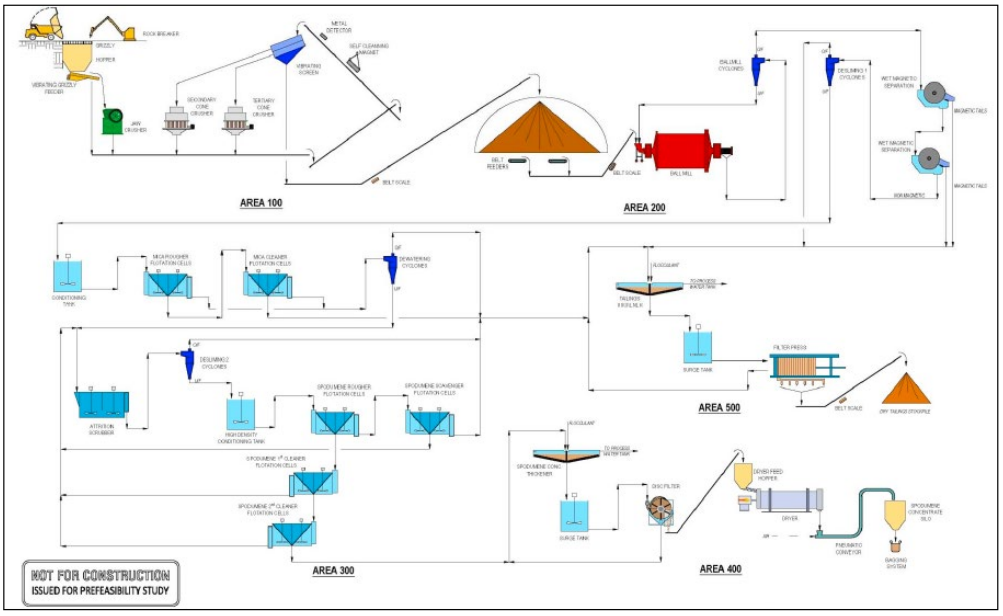
Figure 7: Authier site layout



Source: Sayona

- Processing will involve initial crushing in a jaw crusher, grinding to 150µm in a ball mill, and then rougher and cleaner flotation to produce a spodumene concentrate.
- The Company plans to produce dry tailings which will be stacked with the mine waste rock.
- Further metallurgical test work is underway to look at improving the concentrate grade, improving recovery and reducing the iron content.

Figure 8: Authier processing flowsheet



Source: Sayona

Transport and Logistics

- The Project is located within 20km of the Canadian National Rail at Cadillac, which connects to a number of export shipping ports on the St. Lawrence Seaway (Figure 1).
- Authier is 5km east of a high quality sealed rural road network, which connects to the national highway system.
- Val-d'Or, a mining support town, is 45km from Authier by road, with the main network accessible by 5km of dirt road from Authier – it is expected that all mine personnel will live in Val-d'Or and other regional mining centres.

Power

- Estimated power requirements are 7.2MW, with this to be sourced from the grid 5km from site – the bulk of Quebec's power is hydro-electric, with an estimated cost of C$0.05/kWh, and with gas costs of C$3/GJ.

Water

- Water will be readily available, however will require permitting to be able to be extracted and used.

Sales and Marketing

- The PFS has been predicated on export sales to customers in Asia with an FOB price of US$515/tonne being used - this was based on a benchmark US$550/tonne for 6% Li_2O concentrate discounted for the slightly lower concentrate grade of 5.75%.
- The Company however is looking at a number of sales strategies:
  - Selling concentrates into the Quebec domestic market, with Quebec being the only place in the world outside of China having an established lithium carbonate production facility; as stated earlier NAL is looking to restart concentrate production in 2017 and lithium carbonate production in 2018.
  - Selling concentrates to a Chinese lithium carbonate processor through a Quebec port (the model in the PFS), or,
  - Investigating the feasibility of installing a downstream lithium carbonate/lithium hydroxide processing plant at Authier (see below).
- Sayona is currently holding preliminary talks with potential offtake partners.

Ongoing and Upcoming Work

- Current activities are targeted at completing the updated PFS in Q3, 2017, and then completing a DFS by early 2018.
- Key steps include finalisation of the processing flowsheet before commencement of the DFS and lodgement of the DFS with the relevant authorities to finalise the Mining Lease ("ML") application.
- Activities currently underway include, amongst others:
  - Geotechnical optimisation,
  - Metallurgical optimisation test work,
  - New pit optimisations considering the updated resource, which will feed into a new financial model as part of the updated PFS,
  - Permitting activities – these include environmental permitting from the Quebec Government and various operating permits from the Federal and Provincial Governments, and,
  - First Nations and other stakeholders engagement.

Metallurgy

- Since the PFS, further metallurgical activities are ongoing with a plan to finalise the DFS flowsheet - positive results are being received from this work.
- These include the results of recent successful thermal conversion test work, which has highlighted the suitability of Authier concentrates to be transformed into beta-spodumene, which is the required feedstock for conversion to lithium carbonate and lithium hydroxide.
- This work has increased confidence that Authier concentrates can be converted to battery grade lithium carbonate, and compare favourably with benchmark data collected from other Canadian hard-rock lithium projects.
- These results also highlight the potential for value adding opportunities in Quebec, including the addition of a lithium carbonate and/or lithium hydroxide plant to take advantage of the advantages that the Province has, including available infrastructure and cheap power/gas - sulphuric acid (H_2SO_4), required for the digestion of beta-spodumene in downstream processing is also readily available.
- Optimisation work has been aimed at improving processing recoveries, increasing concentrate grades and decreasing iron grades, although the target is still a chemical grade concentrate to be used to produce battery grade lithium carbonate, and not the higher value technical grade concentrate.

- This has included looking at the effect of mining dilution on the above - amphibole in waste material has been recognised as reporting to the concentrates, thus decreasing lithium concentrate grades and increasing the iron content; flow sheet (and mining method) modifications that should remove the amphibole are being investigated.
- This has included a concept stage using high intensity magnetic separation, which has resulted in concentrate grades of up to 5.98% Li_2O - test work on a larger sample is now underway.

Geotechnical

- As discussed earlier Sayona is undertaking a comprehensive geotechnical review with a view to increasing hanging wall pit slope angles (from 45° to 55° /60°) to cut the strip ratio and hence costs from those used in the PFS.

Environmental

- Baseline environmental studies are currently underway, with expected completion by early 2018 - this is updating and following on from a detailed environmental study that was completed in 2013.
- As mentioned previously, given the size of the proposed operation, a full EIS is not required, however a certificate of authorisations will be required - this, amongst other things, will require completed project engineering and design.

Mining Lease Application

- This is currently underway, with the outline of the proposed ML approved by the relevant authorities - final approval is dependent upon lodgement of the DFS, a formal location survey and environmental certification amongst others - as mentioned above these activities are under way.

Stakeholder Engagement

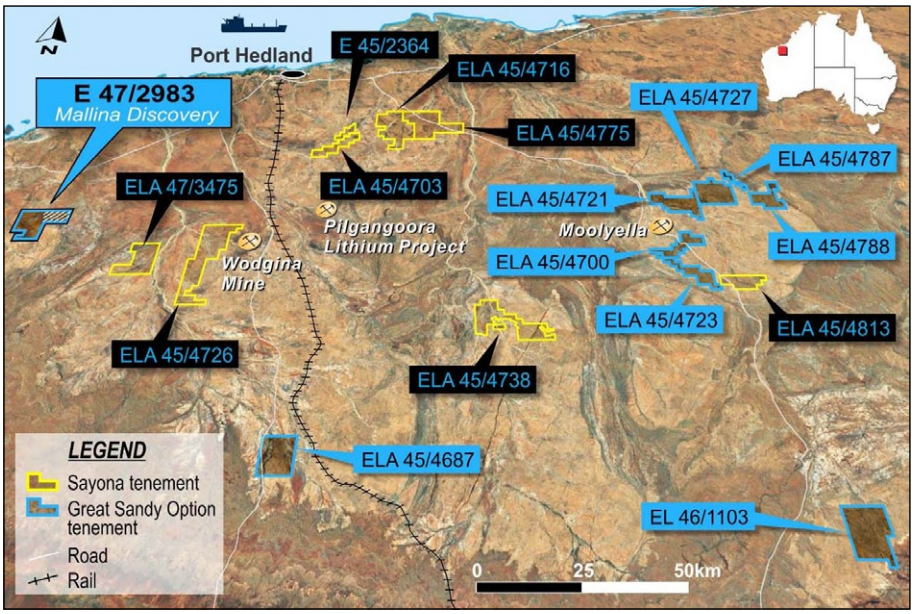
- A stakeholder survey has recently been completed, with the Company soon to commence implementation of the community relations programme which involves all stakeholders.

PILBARA LITHIUM PROJECT – SAYONA 80%, 100%

Location and Tenure

- The Pilbara Lithium Project comprises three granted exploration licences ("EL's") and 14 exploration tenement applications, for a total area of 1,997km^2 (Figure 9), with the granted tenements in good standing.
- The tenements fall into two groups - those held 100% by Sayona (1,126km^2), and those falling under the Great Sandy Option (871km^2), with the Option being entered into in December 2016.
- The 100% held tenements include one, E45/2364, purchased from Attgold Pty Ltd in March 2016 - terms of the purchase agreement (which also includes E59/2055 at Mt Edon) included a A$15,000 payment on signing, and a further payment of A$80,000 within twelve months to earn 100% of the pegmatite rights; there is also a 1% NSR on any production from the tenements.
- Key terms of the nine Great Sandy Option tenements include:
  - A$30,000 non-refundable deposit upon signing
  - 24 month option period where Sayona may acquire 80% of the rights to pegmatite minerals, with Great Sandy holding a 20% free carried interest ("FCI") in the pegmatite minerals, and 100% of all other minerals,
  - Option fees are A$300,000 after 12 months (due December 2017) and A$300,000 after 24 months (due December 2018) - Sayona may acquire the 80% interest by paying A$500,000 within 18 months,
  - Sayona must keep the tenements in good standing, and there is a minimum expenditure commitment of A$100,000 in the first 12 months, and,
  - Great Sandy may convert its 20% FCI to a 2% NSR royalty at any time.

Figure 9: Pilbara Lithium Project



Source: Sayona

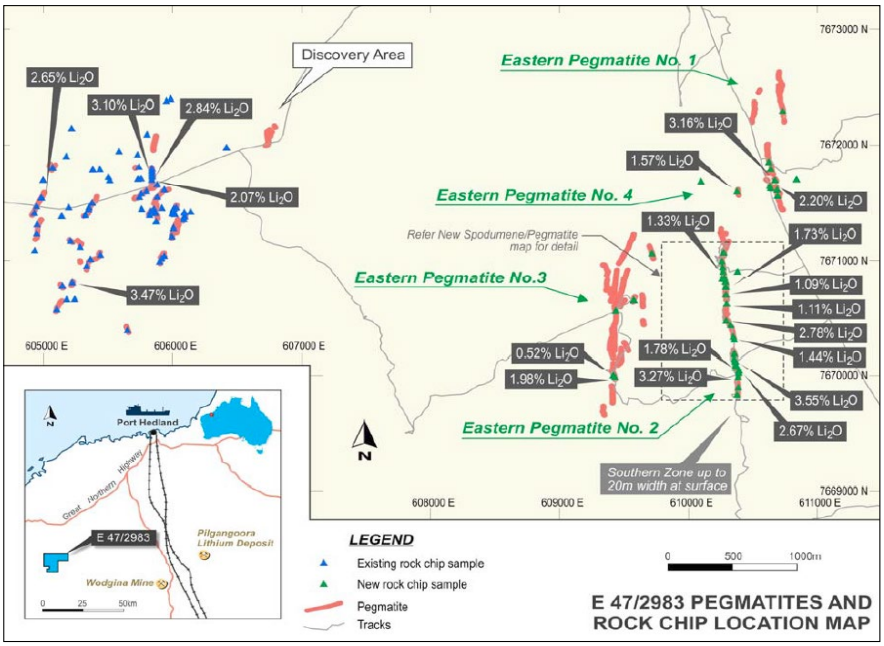
Geology, Mineralisation and Previous Work

- The tenements are all located over areas of identified pegmatites, hosted in Archaean sediments and volcanics of the Pilbara Craton, a recognised lithium/tantalum province, which includes both Pilbara's and Altura's Pilgangoora lithium projects and the historically operated Wodgina and Tabba Tabba tantalite mines.
- The targeted pegmatite types are the highly fractionated LCT type spodumene bearing types which host the known hard rock deposits in Western Australia.
- There has been only limited historic work looking at lithium mineralisation in the Sayona tenements.

Work by Sayona

- The majority of work by Sayona has been reconnaissance rock chip sampling and mapping, with more detailed follow up where required - given the majority of the tenements are still applications additional work is not justified until granted.
- This work, has led to the discovery of the Mallina pegmatites on the granted tenement E47/2983 (Figure 10).

Figure 10: Mallina prospect geology and sampling results



Source: Sayona

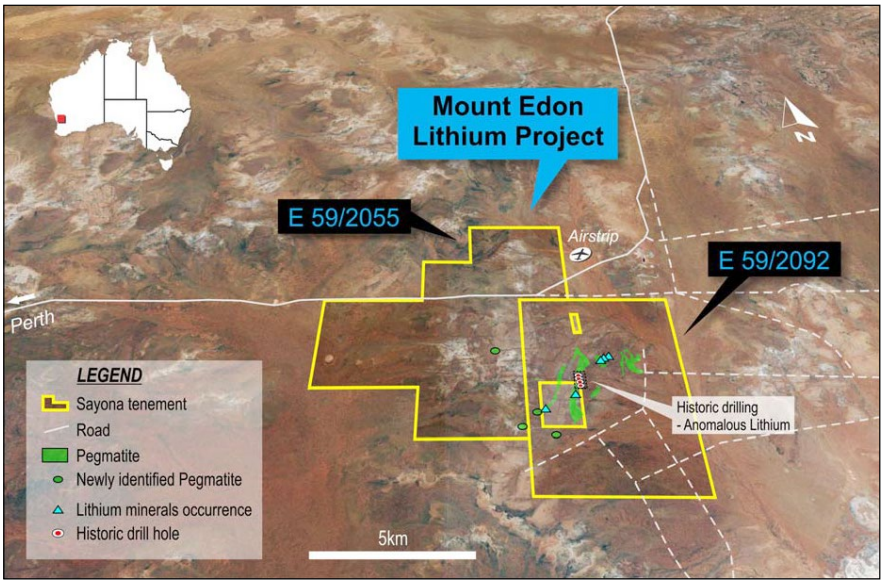
- Rock chip sampling over a number of pegmatites has returned high grade assays of up to 3.55% Li_2O, and mapping has identified two pegmatites which are now the focus of further activities - the Eastern No 2 Pegmatite which strikes for 1,300m north south, and the Eastern No. 3 Pegmatite which strikes for 1,300m north-south.
- In June 2017 the Company commenced a 30 hole, 2,500m drill programme to test six of the pegmatites, including the two mentioned above - results are awaited.

MT EDON LITHIUM PROJECT – 100%

Location and Tenure

- Mt Edon includes two granted EL's for 97km^2 in the South Murchison district of Western Australia (Figure 11), with both tenements being in good standing.

Figure 11: Mount Edon Project location and tenements



Source: Sayona

- E59/2055 was acquired as part of the deal with Attgold as discussed earlier; E59/2092 was acquired from Mr. Bruce Legendre in March 2016.
- The terms of this latter acquisition, which is initially for 80% of the lithium rights, with the option to increase to 100% include:
  - A$15,000 cash plus 1,000,000 share in Sayona for 80%,
  - A$100,000 cash within three years to acquire 100%, and,
  - A 1% NSR royalty on any production.

Geology, Mineralisation and Previous Work

- Mt. Edon is located over the southern portion of the Paynes Find Greenstone Belt, and is host to swarms of pegmatites.
- Pegmatites, which range in style from simple microcline feldspar to the highly fractionated LCT style occur in swarms of up to 1,000m in strike length, and widths of between 5m and 100m at surface - true widths have not been ascertained.
- Outcrop is variable, with some areas covered by colluvium and other cover.
- There has been no previous lithium exploration, however there has been some tantalum prospecting and mining, largely within an excised mining lease.

Work by Sayona

- Sayona has carried out reconnaissance mapping and sampling, and has identified over 70 pegmatites, with rock chip sampling returning up to 1.5% Li_2O (within a lepidolite-rich pegmatite).
- Most recent work has included a 500 sample orientation soil sampling programme which has identified six main areas of lithium and tantalum anomalism and requires follow up.

PEER GROUP ANALYSIS

- Table 6 and Figure 12 presents a group of ASX-listed hard rock lithium explorers, developers and miners.
- As a comparison metric we have used EV/equity resource tonne Li_2O – this shows that Sayona has a multiple near the lower end of the range of peers, however this metric should be considered an indicative comparison only, with this being affected by any number of factors.

Table 6: Sayona peers

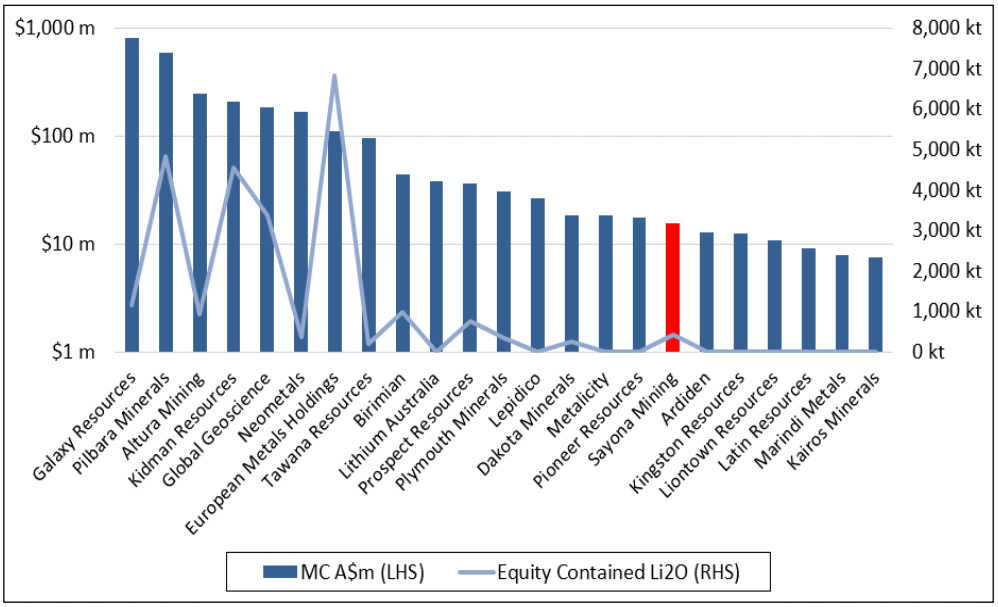
Company	MC ($Am)	Region	Stage	Global Resource (Mt)	Global Li_2O Grade	Equity Contained Li_2O (RHS)	EV/ Tonne Li_2O
Galaxy Resources	$810	Western Australia, Canada, Argentina	Producer	39 Mt	1.20%	463 kt	$1,731
Pilbara Minerals	$595	Western Australia	Development	156 Mt	1.25%	1,953 kt	$229
Altura Mining	$247	Western Australia	Development	36 Mt	1.04%	372 kt	$563
Kidman Resources	$208	Western Australia	Development Studies	128 Mt	1.44%	1,843 kt	$110
Global Geoscience	$186	Nevada, USA	Drilling, metallurgy	394 Mt	0.35%	1,367 kt	$134
Neometals	$166	Western Australia	Producer	78 Mt	1.37%	147 kt	$766
European Metals Holdings	$112	Czech Republic	Development Studies	657 Mt	0.42%	2,769 kt	$40
Tawana Resources	$95	WA, Namibia	Earning 50% into existing Bald Hill Mine	13 Mt	1.18%	75 kt	$1,021
Birimian	$44	Mali	Drilling	28 Mt	1.42%	394 kt	$93
Lithium Australia	$38	WA, Mexico	Various	N/A	N/A	N/A	N/A
Prospect Resources	$37	Zimbabwe	Development studies	57 Mt	1.12%	313 kt	$87
Plymouth Minerals	$30	Spain	Development studies	92 Mt	0.20%	138 kt	$182
Lepidico	$26	Australia, Canada, Argentina, Peru, Brazil	Early Stage	N/A	N/A	N/A	N/A
Dakota Minerals	$19	Portugal	Drilling	10 Mt	1.00%	103 kt	$23
Metalicity	$18	Pilbara, Yilgarn WA	Early Stage	N/A	N/A	N/A	N/A
Pioneer Resources	$18	WA, Ontario	Drilling	N/A	N/A	N/A	N/A
Sayona Mining	$15	Quebec, WA	Development studies	17 Mt	1.02%	177 kt	$78
Ardiden	$13	Canada	Drilling	N/A	N/A	N/A	N/A
Kingston Resources	$13	WA, NT	Drilling	N/A	N/A	N/A	N/A
Liontown Resources	$11	WA, NT, Tanzania	Drilling	N/A	N/A	N/A	N/A
Latin Resources	$9	Argentina	Early stage	N/A	N/A	N/A	N/A
Marindi Metals	$8	WA	Drilling	N/A	N/A	N/A	N/A
Kairos Minerals	$7	Western Australia	Drilling	N/A	N/A	N/A	N/A

Source: IRESS, Company Reports, IIR analysis

- Note that we have used Resources and not Reserves here, as not all projects have declared Reserves - using Reserves will significantly increase the EV/tonne in most cases where Reserves have been published.

- The Company with the lowest multiple, Dakota, has a significant cash balance of ~A$16 million, and thus a very low EV – it is commonly the case that the market does not ascribe full value to cash.
- This does not take into consideration the value of any other projects the companies may have – this is particularly pertinent in the case of Sayona, in that no value has been ascribed to the Western Australia projects in this comparison.
- Note that, given the wide range in market capitalisation of our lithium universe, we have used a logarithmic left hand axis in Figure 12.
- This highlights Sayona's relatively low market capitalisation, as well as the Company having the lowest market capitalisation of any of those with a published MRE.

Figure 12: ASX listed lithium companies



Source: IRESS, Company Reports, IIR analysis

VALUATION

- We have undertaken a valuation of Sayona, using a "sum of the parts" NAV method – this includes Authier, the Western Australian projects and cash, as shown in Table 7.
- We have provided nominal values for the Western Australian exploration tenements - the combined value approximates the value of listed Western Australian focussed lithium explorers.
- We have completed a DCF valuation for Authier, based on a conceptual 15 year operation taking into account the increased resources - we have assumed six years production at 700,000tpa and nine years at 1,400,000tpa which we consider reasonable assuming a 5% mining dilution and 90% conversion of resources to reserves.
- We have also included head office expenses - this have been calculated using annual expenditures of A$1.5 million for the life of Authier discounted at 8%.

Table 7: Sayona valuation

Sayona valuation					
Item	**Total (A$m)**	**Risk Factor**	**Risked (A$m)**	**Risked/Share**	**Notes**
Authier	$226.04	75%	$169.53	$0.090	NPV_8
Pilbara Lithium	$7.00	100%	$7.00	$0.004	Nom
Mt Edon	$1.00	100%	$1.00	$0.001	Nom
Head Office	-$15.78	100%	-$15.78	-$0.008	NPV_8
Cash	$2.00	100%	$2.00	$0.001	Est
Total	**$220.26**		**$163.75**	**$0.087**	

Source: IIR analysis

- This is a funded, after tax valuation - we have assumed that the first stage capex is funded by 60% debt/40% equity, with the equity raised at A$0.04/share.

- Initial capex funding, and an estimate of A$5 million (at A$0.02/share) to finalise development studies and take the project to a decision to mine has been run through the model with dilution allowed for in the per share calculations.
- Company taxation includes the Federal income tax rate of 15%, and the sliding scale Quebec mining tax on profits with values of 16%, 22% or 28% dependent on the profit margin.

Table 8: Authier DCF key inputs and outcomes

Authier DCF key inputs and outcomes		
Description	**Unit**	**Value**
Mine Life	Years	15
Total Ore Mined	Tonnes	16,800,000
Concentrate Produced	Tonnes	2,300,000
Concentrate Sales Price	US$/tonne	$550
NPV, mid-year	C$m	$316 m
IRR, Pre-Tax	%	50%
LoM Revenue	C$m	$1,704 m
LoM Opex	C$m	-$814 m
LoM EBITDA	C$m	$890 m
LoM Capex	C$m	-$141 m
LoM FCF	C$m	$498 m
Peak annual FCF	C$m	$57 m
Peak Annual EBITDA	C$m	$74 m
Discount Rate	%	8.00%
Project Finance Debt	%	60.00%
Debt Amount	C$m	$39.36 m
Financing Term	Years	4
Interest Rate	%	10.00%
Project Finance Equity	C$m	$26.24
Equity Price	A$/share	$0.04
Pre-Development Equity	A$m	$5.00
Pre-Dev Equity Price	A$/share	$0.02
Diluted Shares on Issue	Millions	1,873
Exchange Rate	CAD:USD	0.75
Exchange Rate	AUD:CAD	1

Source: IRR analysis

- Inputs are as largely used by the Company for the PFS, however we have decreased some costs for stage two in line with standard economies of scale multipliers.
- We have used a LoM concentrate sale price of US$550/tonne - this is higher than that used in the PFS, and which we consider reasonable, although actually still may be conservative - recent contracts have seen prices of up to US$905/tonne for 6% Li_2O concentrate.
- Pricing used by Tawana Resources (ASX: TAW) in the PFS for the Bald Hill Project in Western Australia averages US$760/tonne for 6% Li_2O spodumene concentrate out to 2025, with a deduction of US$15/tonne for each 0.1% Li_2O below this benchmark - these prices were as forecast by Cannacord.
- Our overall outcomes and inputs are presented in Table 8, and detailed figures in Table 9.
- The peak EBITDA results in a potential valuation of C$370 million using a 5x multiplier as is typical of resource projects.

Table 9: Authier DCF detailed outcomes

Authier DCF detailed outcomes				
Description	**Unit**	**Phase 1**	**Phase 2**	**LoM Ave**
Mining Rate	tpa	700,000	1,400,000	1,120,000
Strip Ratio	Waste: Ore	5.00:1	6.00:1	5.75:1
Waste Moved	tpa	3,500,000	8,400,000	6,440,000
Con Produced	tpa	96,814	193,627	154,902
Con Grade	%	5.90%	5.90%	5.90%
Mine Life	Years	6	9	15
Mining Cost	C$/tonne moved	$2.90	$2.90	$2.90
Processing Cost	C$/tonne RoM	$18.00	$17.00	$17.25
G & A	C$/tonne RoM	$5.33	$4.00	$4.33
Transport	C$/tonne Con	$38.00	$38.00	$38.00
Mining Cost	C$/tonne Con	$125.81	$146.78	$141.53
Processing Cost	C$/tonne Con	$130.15	$122.92	$124.72
G & A	C$/tonne Con	$38.54	$28.92	$31.33
Total Site Costs	C$/tonne Con	$332.49	$336.62	$335.58
Royalty	C$/tonne Con	$13.65	$13.65	$13.65
Con Sales Price	C$/tonne Con	$682.67	$682.67	$682.67
Operating Margin	C$/tonne Con	$336.52	$332.40	$333.43
Revenue/Costs	C$/tonne Con	1.97	1.95	1.95
Capex	C$ million	$65.60	$49.50	$115.10
Capex Intensity	C$/tonne Con	$678	$511	$594
Sus Capex Intensity	C$m/year	$3.60	$5.46	$4.71

Source: IRR analysis

- As part of our modelling we have completed a sensitivity analysis for Authier.
- This is shown in Tables 10 and 11 - Table 10 shows the individual sensitivity to various factors, whereas Table 11 shows the sensitivity to both price and operating costs.
- The per share capex sensitivity is affected by both the amount of capex and change in issued capital due to modelled equity raisings.
- The sensitivity analysis highlights the robust nature of Authier, which in our modelling will comfortably absorb 20% adverse movements in key inputs.

Table 10: Authier per share sensitivity

Authier per share sensitivity				
Change	Price	Site Costs	Recovery	Capex
-20%	$0.054	$0.101	$0.056	$0.107
-10%	$0.071	$0.097	$0.072	$0.099
0%	$0.090	$0.090	$0.090	$0.090
10%	$0.107	$0.082	$0.107	$0.083
20%	$0.120	$0.076	$0.120	$0.075

Source: IIR analysis

Table 11: Authier unfunded, pre-tax project sensitivity

Authier per share sensitivity						
		Change in Site Operating Costs				
	$148.62	-20%	-10%	0%	10%	20%
Con Price US$/Tonne	US$450	$0.07	$0.06	$0.06	$0.05	$0.04
	US$500	$0.09	$0.08	$0.07	$0.07	$0.06
	US$550	$0.10	$0.10	$0.09	$0.08	$0.08
	US$600	$0.12	$0.11	$0.11	$0.10	$0.09
	US$650	$0.13	$0.12	$0.12	$0.12	$0.11
	US$700	$0.15	$0.14	$0.13	$0.13	$0.13

Source: IIR analysis

CAPITAL STRUCTURE

- Sayona currently has 974.8 million shares, and no options or performance rights on issue.
- The top 20 hold 56.08%, with insiders holding 27.06%.
- The Company has over 1,735 shareholders.

RISKS

- **Exploration:** This is the key risk for any exploration company, with survival largely based on the results of exploration. This is largely mitigated in the case of Sayona in having the near development Authier Project, and also given the results of work to date on the Western Australian projects.
- **Permitting:** This is a risk for any near development project, and for Sayona is applicable at Authier; our view however is that the risk here should not be failure to permit, but time frames being longer than expected.
- **Funding:** This is a perennial issue for junior explorers and developers, with Sayona also facing the prospect of having to look to fund development of Authier (with project funding markets currently being tight) - this however may be somewhat mitigated by the expected relatively low up-front capital for Authier.
- **Markets:** Although relatively buoyant at the moment, markets can turn on a dime and funding for juniors can dry up very quickly.
- **Sovereign:** Both Quebec and Western Australia are well developed and regarding mining jurisdictions - Western Australia ranked 3rd globally in the 2016 Fraser Institute survey, with Quebec 6th - Western Australia was the highest ranked Australian state and Quebec the third ranked Canadian province.

BOARD AND MANAGEMENT

- **Mr Dennis O'Neill – Managing Director:** Dan is a geologist with over 30 years of international mining experience, having worked across Australasia, Africa, Asia and North America.

  Dan has held positions with a number of Australian and multinational exploration companies, as well as managed exploration programs in a diverse range of environments and locations, including Botswana, North America, South East Asia, North Africa and Australasia.

  During his career, Dan has held executive management positions with ASX listed companies and has worked on a range of commodities including diamonds, gold, base metals, coal, oil and gas. He was appointed a director on 10 March 2000.

- **Mr Alan Buckler – Non-executive Director:** A qualified mine manager with more than 40 years coal experience in Australia and Indonesia, Alan joined Sayona on 5 August, 2013.

  He has had key roles in the establishment of several large mining and port operations in both Australia and Indonesia.

  Alan is a former Director and Chief Operations Officer of New Hope Corporation Limited and has led the development of significant operations including PT Adaro Indonesia, PT Indonesia Bulk Terminal and PT Mult Harapan Utama in Indonesia.

- **Mr James Brown – Non-executive Director:** Mr Brown holds formal qualifications in Mining Engineering with more than 25 years' coal experience in Australia and Indonesia, and is the Managing Director of ASX listed Altura Mining Limited.

  His coal development and operations experience includes the New Acland and Jeebropilly mines in South East Queensland, the Adaro and Multi Harapan Utama operations in Indonesia and Blair Athol in Central Queensland.

  Mr Brown was appointed to the Board on 12 August, 2013.

- **Mr Paul Crawford – Executive Director and Company Secretary:** Paul is an accountant with over 30 years of commercial experience in various technical and management roles within the minerals, coal and petroleum industries. He has also had significant corporate experience in the management and governance of ASX listed resource and mining companies.

He is the principal of a corporate consultancy firm he established in 2001, offering a range of commercial and corporate governance services to corporate clients.

Paul is currently an Executive Director and Company Secretary of ASX-listed companies ActivEx Limited and Company Secretary of Elementos Limited. He was appointed to the Board on 10 March 2000.

- **Mr Corey Nolan – Chief Executive Officer:** Mr Nolan is the Chief Executive Officer of Sayona Mining and is responsible for leading the development and execution of the Company's long term strategy to create shareholder value. This includes responsibility for all the day-to-day management decisions and implementing the Company's strategic plans, and engagement with shareholders and stakeholders.

  Mr Nolan is an experienced public company director and senior executive with more than 23 years' experience in advisory, commercial and business development roles focused on the acquisition, funding, and development of resource projects.

  Most recently, Mr Nolan was Managing Director (Feb 2014 – May 2015) of ASX/AIM listed Leyshon Resources Limited, and Executive Director (Oct 2013 – Jan 2014) and Managing Director (Sept 2009 – Sept 2013) of ASX listed, Elementos Limited. In 2011, Elementos completed a merger to become an advanced developer of tin and tungsten resources in Tasmania, Australia. Mr Nolan was instrumental in the identification, negotiation, due diligence, structuring and execution of the merger.

  From 2006 to 2009, Mr Nolan was Business Development and Commercial Manager for Aviva Corporation, responsible for the identification, evaluation and negotiation of coal and energy related acquisition and merger opportunities in Australia and Southern Africa.

  Mr Nolan commenced his career in the financial services industry as a resources equities analyst at firms including Wilson HTM and Morgan Stanley, and as a Director of the Corporate Finance practice of global advisory firm PWC.

  Mr Nolan's qualifications include a Bachelor of Commerce, and a Masters Degree in Mineral and Energy Economics. Mr Nolan is also a diploma graduate of the Australian Institute of Company Directors.

- **Mr Jonathon Gagne - Canadian Country Manager:** Jonathan is a mining engineer with over ten years' experience in the resources industry. Jonathon is a graduate of the École Polytechnique de Montréal in Mining Engineering and has a Master's of Business Administration specialising in corporate finance from Université du Québec à Montréal. Jonathon began his career at the Meadowbank open-pit gold mine, where he participated in the construction and commissioning of the project. In 2011, Jonathon became a consulting engineer with SGS Geostat providing technical support services including, preparation of NI43-101 reports and project evaluations. Jonathon was the principle engineer responsible for the preparation of the 2013, Authier Preliminary Economic Assessment. In 2015, Jonathon joined the technical services department of the Glencore Zinc Division as a senior mine engineer responsible for open-cut mine planning world-wide.
- **Mr Simon Attwell - WA Exploration Manager:** Mr Attwell B.Sc Hons, M.Aus.IMM has 30 years of experience as a geologist in mineral exploration. This has included broad ranging experience in fieldwork, exploration management and corporate and strategic planning. Roles include Exploration Manager, General Manager and Executive Director of ASX listed companies. Project generation has supported three ASX IPO listings. As a company geologist Mr. Attwell has developed major long life exploration projects which have resulted in mineral discovery and mine development.

  Specific exploration skill sets include search for nickel sulphide (in the East Kimberley, leading to the discovery and development of the Copernicus nickel Mine), gold – copper VMS sulphides (maiden exploration to resource definition at Red Bore, Doolgunna) and pegmatite minerals (tantalum and lithium exploration). Most recently, work has been being focused on graphite and lithium exploration.

  Mr Attwell was a founding director of unlisted company Australian Tantalum Ltd which generated six projects in Western Australia before being acquired by Haddington Resources Ltd (now Altura Mining Ltd). Australian Tantalum's tenure included the Pilgangoora lithium project which is now being developed into a lithium mine.

Since 2014 Simon has been consultant and Exploration Manager for Sayona Mining, establishing and exploring its portfolio of graphite and lithium exploration projects in Western Australia.

BACKGROUND – LITHIUM AND MARKETS

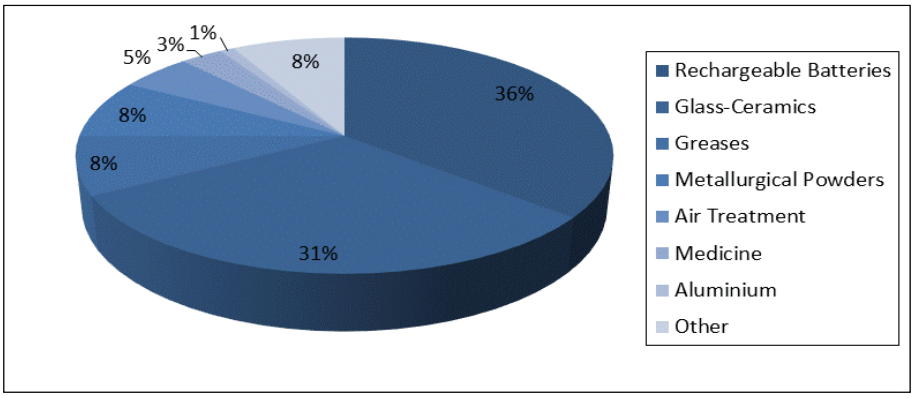
What is Lithium?

- Lithium is an alkali metal; the lightest of all metals and the least dense of any of the elements that are solids at room temperature. Because of its inherent instability and reactivity it never occurs freely in nature, but only in compounds.

Lithium Uses and Demand

- Lithium has a large number of uses, with the most relevant now being in rechargeable batteries, which in 2015 made up some 36% of the then annual demand of around 200,000t of lithium carbonate equivalent ("LCE"), which is the form that lithium grades and prices are most commonly quoted in - current LCE production is around 220,000tpa.

Figure 13: Lithium uses - 2015



Source: Company and research reports

- Some forecasters have the lithium market growing at +10% CAGR over the next 8 years, with this largely driven by demand for rechargeable batteries - this market has reportedly grown by 20% CAGR since 2000 (driven by the growth in consumer electronics and phones), with upcoming growth largely due to the expected increase in sales of electric vehicles.
- This would result in the demand for LCE growing from ~220,000tpa currently to 400,000tpa by 2025.
- More aggressive forecasting by Roskill (9th Lithium Supply & Markets Conference, Montreal, 31st May 2017) has demand growing to between 800,000tpa and 1,600,000tpa LCE by 2026, a growth of between 15% and 23% CAGR, mainly driven by the growth in the electric vehicle market.
- On the more conservative side, Stormcrow, in their 2015 121 Hong Kong conference presentation, presented the possibility that by 2025 minimum additional LCE demand from batteries alone will be 104,000tpa, a 50% increase on current total LCE production and at a 4% CAGR.
- Other growing battery uses include home storage, and the potential for grid scale storage to be used in conjunction with solar and wind power generation.
- In Australia over the last 18 months we have seen AGL Energy launching a home storage product in Australia in line with Tesla's "Powerwall" announcements, and more recently the announcement that Tesla will be constructing a 100MW battery in South Australia.
- The major battery producers are Japan, China and South Korea, with Tesla also now joining the fray.

Lithium Products

- Lithium is supplied as, and prices quoted for a number of products, with the most common being lithium carbonate, followed by lithium hydroxide and lithium concentrates.
- Care has to be used in comparing reported grades, tonnages and expected revenues between companies when they are quoted on different bases.

- Lithium carbonate (Li_2CO_3) contains around 18.8% lithium; therefore one tonne of lithium is equivalent to 5.3 tonnes of lithium carbonate.
- Another compound that is often quoted is lithium oxide – Li_2O – which contains 46.5% lithium, around 2.5 times that of LCE (and in which hard rock concentrate grades are commonly quoted in), with lithium hydroxide (LiOH, 29% Li) also being used – conversion factors are shown in Table 12.

Table 12 :Lithium mineral/compound conversion factors

Lithium mineral/compound conversion factors						
Species	**Formula**	**Lithium content**	**Convert to Li**	**Convert to Li_2O**	**Convert to Li_2CO_3**	**Convert to LiOH**
Lithium	Li	100%	1.000	2.152	5.322	3.451
Lithium Oxide	Li_2O	46.46%	0.465	1.000	2.473	1.603
Lithium Carbonate	Li_2CO_3	18.79%	0.188	0.404	1.000	0.648
Lithium Hydroxide	LiOH	28.98%	0.290	0.365	1.542	1.000

Source: IIR analysis

- Primary hard rock concentrates come in two main products - technical grade, which is used directly in applications such as glass and ceramics, where a high grade (>6.5% Li_2O), low iron concentrate is required, and chemical grade, which is further refined to lithium carbonate and lithium oxide for end products such as batteries - specifications for chemical grade concentrates are less demanding than those for the technical grade product.
- Lithium carbonate products, either processed from hard rock concentrates or directly from brines come in three main specifications, with typical values as follows (source FMC product data sheets), and with these commanding different prices:
  - Industrial grade (+99% Li_2CO_3, 0.60% H_2O, 0.20% Na_2O) - glass, casting powders and greases.
  - Technical grade (~99.3% Li_2CO_3, 0.60% H_2O, 0.20% Na_2O) - ceramics, greases and batteries.
  - Battery grade (>99.5% Li_2CO_3, 0.50% H_2O, 0.05% Na_2O) - high end battery cathode materials.

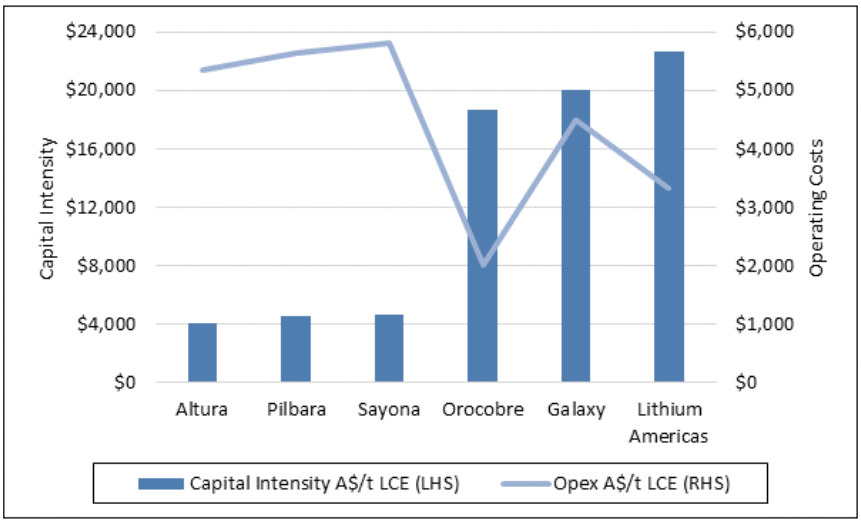
Lithium Supply

- There are two main sources of lithium – brine deposits and hard rock spodumene deposits.
- Production from brine deposits involves the extraction by pumping of lithium rich brines in salt lakes, followed by concentration by evaporation in evaporation ponds. From this, the concentrated solutions are processed to end products, including lithium carbonate and lithium hydroxide.
- Common by- or co-products include potassium and boron salts, which can significantly improve the economics of brine operations.
- Key points that affect potential brine operations include lithium content, magnesium content (this is relatively expensive to remove, with a rule of thumb stating that the ratio of Mg to Li in brines must be below 10:1 for a brine deposit to be economical) and evaporation and rainfall rates – high evaporation rates result in lower costs as smaller ponds and shorter residence times are required.
- Spodumene (which is a lithium pyroxene – $LiAl(SiO_3)_2$ - and other silicate mineral (including petalite and lepidolite) deposits are commonly hosted in pegmatites, and are mined by conventional hard rock open cut mining, followed by crushing and grinding, and extraction using a mixture of gravity, heavy media separation, magnetic separation and flotation to produce a concentrate, largely comprised of the lithium-bearing silicates, but also commonly containing quartz and feldspar.
- Both premium technical grade and the lower value chemical grade concentrates are often produced from the same hard rock deposit, dependent upon customers' requirements. A common by-product is tantalite and other tantalum minerals. The concentrate is then further treated to produce ß-spodumene for downstream uses.
- Brine operations are characterised by high initial capital costs, long lead times for full production, whereas hard rock operations are marked by relatively low capital costs, short lead times but relatively high operating costs to lithium carbonate, when the

estimated conversion costs of US$2,500/tonne are added to the cost of producing a concentrate.

- This is shown in Figure 14, with figures taken from development studies for the various operations - note that we have added the estimated concentrate to lithium carbonate conversion cost to the operating costs for the three hard rock developers, Pilbara, Altura and Sayona.

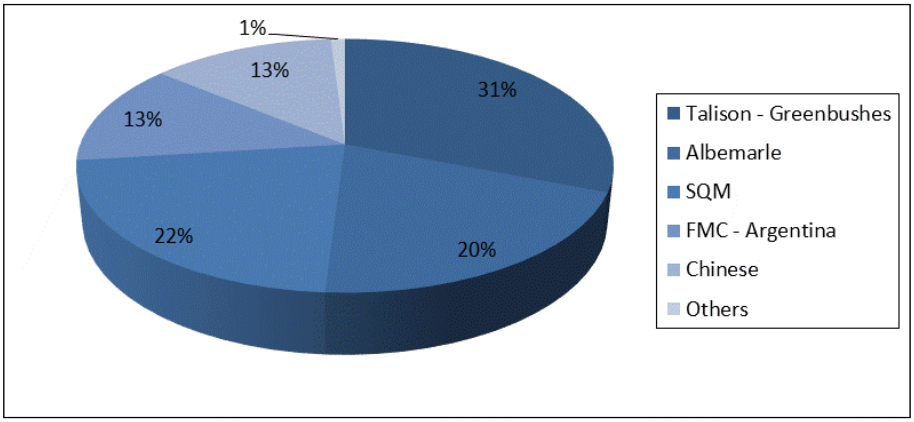
Figure 14: Cost profiles of hard rock and brine operations



Source: IIR analysis

- Figure 15 shows a breakdown of the major producers - what this shows is that production outside of China is highly concentrated, with only a few companies in the business.

Figure 15: Lithium producers by market share 2014



Source: Albemarle Lithium Day presentation - 2015

- Both FMC and SQM operate brine operations in the Altiplano of Chile and Argentina – another company starting up there is Orocobre, which is currently ramping up production at its Olaroz Project.
- The largest single producer is the Greenbushes Mine in Western Australia, which is a hard rock spodumene producer and a joint venture between Albemarle (49%) and Sichuan Tianqui Lithium (51%).
- Greenbushes provides some 78% of global spodumene concentrates, with the balance made up largely by Chinese producers.
- Albemarle's other 20% share in the above graph comes from a number of brine operations in the US and Chile, which, when added to its holding in Talison, makes it the world's largest single producer of lithium with 35% of market share.
- Greenbushes produces some 65,000tpa of LCE, however is looking at expansions, including an LiOH plant at Kwinana, to double production to 130,000tpa of LCE by the end of 2018
- Recent developments in the hard rock space (and not included in the above graph) have seen the restart of Galaxy Resources (ASX: GXY, "Galaxy") Mt. Cattlin operation and the ramp up of the Mt. Marion operation, owned by Neometals Limited (13.8%, ASX: NMT,

"Neometals"). Jiangxi Ganfeng Lithium Co. Limited (43.1%, SHE: 002460, "Ganfeng") and Mineral Resources Limited (43.1%, ASX: MIN, "MinRes").

- Both operations are in Western Australia, with Mt. Cattlin planning to produce up to 137,000tpa and Mt. Marion up to 400,000tpa of spodumene concentrate.
- Other near term expansion projects include Albemarle's Salar de Atacama operation, with the recent granting of the updated quota, and with production expected to increase from Orocobre's Olaroz operation with ramping up of commissioning.

Lithium Pricing

- Like most specialty metals, pricing is opaque and set by direct negotiation between producer and customer - pricing is also dependent upon the type and relative quality of the product.
- Another difficulty involves the plethora of lithium products, however prices trend to track each other.
- Prices have increased significantly over since late 2015, with Chinese spot battery grade lithium carbonate prices recently reaching over US$20,000/tonne CFR.
- This follows on from prices staying around US$5,000 - US$6,000/tonne in the preceding few years.
- These price rises have also been evident in the South American brine producers – according to the TRU Group these averaged around US$4,500/tonne in 2014 (with battery grade product at a premium of US$500-US$1,000/tonne), however reached around US$10,000/tonne in 2016 as presented in Company financial reports.
- Recently announced spodumene concentrate prices include US$905/tonne for 6.0% Li_2O product from Galaxy's Mt. Cattlin operation - this is equivalent to ~US$11,000/tonne LCE.
- Spodumene concentrate prices however vary according to grade and levels of contaminants; however largely track that of lithium carbonate, albeit at a significant discount on an LCE basis due to the requirement for further processing.
- We see prices of lithium carbonate continuing to trade at around US$8,000 to US$10,000/tonne, however this could be considered a conservative view.
- As mentioned earlier, pricing used by Tawana Resources (ASX: TAW) in the PFS for the Bald Hill Project in Western Australia average US$760/tonne for 6% Li_2O spodumene concentrate out to 2025, with a deduction of US$15/tonne for each 0.1% Li_2O below this benchmark - these prices were sourced from Cannacord, and are broadly equivalent to an LCE price of US$9,500/tonne.

Where to From Here?

- This depends upon who you listen to!
- As mentioned earlier, various commentators forecast demand to rise at between 5% and 10% CAGR over the next 8 years, with this resulting in additional demand of at least between 100,000tpa LCE and 200,000tpa LCE by 2025, equating to total demand of between 300,000tp and 400,000tpa LCE, with however Roskill forecasting demand to rise to between 800,000tpa to 1,600,000tpa by 2016.
- Even the most conservative forecast increase in demand should continue to support current prices, and we could conceivably see further price increases.
- However there is the perceived ready potential for the current oligopoly to increase production to meet any demand increases, and also the potential to price new players that are considered a threat out of the market – just two upcoming expansion projects, Greenbushes and Albemarle's Salar de Atacama Project have the potential to add up to 100,000tpa LCE into the market.
- In addition if Mt. Marion and Mt. Cattlin reach their combined targets of 537,000tpa spodumene concentrate have the capacity to supply an additional 50,000tpa of LCE into the market, assuming average concentrate grades of 5.0% Li_2O and metallurgical recoveries of 75%.
- Some commentators however doubt whether the full potential will be reached on the expansion projects.
- Our view is that we will continue to see strong demand increases and prices going forward, and thus there will be significant space for new players in the market.

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