AUSTRALIAN RESEARCH
INDEPENDENT INVESTMENT RESEARCH

Kalium Lakes Limited (KLL)

Date April 2018

INDEPENDENT INVESTMENT RESEARCH

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Kalium Lakes Limited (KLL)

Note: This report is based on information provided by the company as at March 2018

Investment Profile	
Share Price ($) as at 29 March 2018	0.40
Issue Capital:	
Ordinary Shares (M)	169.8
Options (M)	14.2
Performance Rights (M)	20.0
Fully Diluted (M)	204.0
Market Capitalisation ($M)	67.9
12 month L/H ($)	0.33/0.555

Board
Malcolm Randall Non Executive Chairman
Brett Hazelden Managing Director and CEO
Rudolph van Niekerk – Executive Director
Brendan O'Hara – Non Executive Director

Major Shareholders	
Agricultural interests	49.1%
Management	10.4%
Institutions	10.4%

Share Price Performance

Source: ASX

The investment opinion in this report is current as at the date of publication. Investors and advisers should be aware that over time the circumstances of the issuer and/or product may change which may affect our investment opinion.

DEVELOPING A SCALEABLE PREMIUM POTASH PROJECT

Kalium Lakes Limited is the most advanced and has the lowest initial capital cost of any potash project in Australian at the time of writing. Potash fertilizer delivers potassium to depleted soils for sustaining crop production. There is currently no domestic production in Australia. Kalium Lakes' 100% owned Beyondie SOP Project has a completed Preliminary Feasibility Study, a Reserve, is fully funded to completion of Bankable Feasibility Study and is able to support production levels of between 75Ktpa SOP to 300Ktpa SOP. Kalium Lakes also has an 85% interest in the Carnegie Potash Project with BCI Minerals.

THEMES: FOOD SECURITY, VALUE PROPOSITION, GROWTH

Kalium Lakes fully funded through to completion of BFS – Following the raising of A$14.6M in the recent institutional placement and accompanying SPP, Kalium Lakes is fully funded through to the completion of the Bankable Feasibility Study (BFS) and up to the Financial Investment Decision (FID) for the Beyondie SOP project. Kalium Lakes appears to be the closest to project go ahead out of the current Australian contingent of potash projects.

Beyondie project de-risking rapily– Large pilot scale evaporation ponds have been operating since September, feeding salts to K-UTEC's pilot purification plant in Germany. Key risks are brine acquisition, evaporation pond performance, and chemistry of the pond outputs. KLL engaged multiple parties to verify each step independently eg DRA (ponds, plant and infrastructure), David Butts (ponds) and Saskatchewan Research Council (plant).

Approvals expected by Q3 this year – Kalium Lakes has issued a number of market updates this year confirming completion of Native Title Mining Agreements. Granting of the Mining Lease is expected in Q2, and Environmental approval in Q3 of calendar 2018.

Food security and production efficiency a key investment theme – The global population is growing and increasing in affluence, increasingly demanding more food both in volume and variety from a smaller amount of agricultural land per person. The solution must include more fertilizer. We have seen a surge in demand for SOP with demand growing from 3.5Mtpa of potash (K_2O) in 2009 to 7Mtpa in 2016. Kalium Lakes' potash resources gives the company a significant exposure to this theme.

Favourable peer comparison – Kalium Lakes's Beyondie SOP project has the highest grade of the Australian brine deposits, its operating cost at 150Ktpa in A$/t SOP to FOB stage is the equal lowest of its peers, and its costings are at PFS level compared to scoping level for the other projects. While its capital cost in A$/tpa of installed capacity is higher than most peers, it is deliberately so because of management's strategy to chose pump, pond, and plant designs that enhance reliability, and reduce unit operating costs, which in turn derisks the investment from the shareholders' and bankers' point of view.

Project scalability means continued growth from a low cost start – Kalium Lakes could start Beyondie at 75Ktpa and grow into a 300Ktpa producer, subject to market demand. The company will retain 50% of the Carnegie Project, representing another growth opportunity.

Additional chemical products likely to add value over time – Kalium Lakes is looking at producing magnesium products following positive test work by EcoMag.

Valuation – NPV A$1.00/sh with NPAT of 10.3cps in first year at 150Ktpa

Beyondie PFS indicates a robust value proposition – Our base case is the 75Ktpa start, expanding to 150Ktpa, giving a Net Present Value at a 10% discount rate of A$1.00/sh, rising to A$1.61/sh if the project is expanded to 300Ktpa. At a share price of A$1.00/sh, Kalium Lakes would be trading on a Price Earnings Ratio of 9.6x in the first full year of production at the 150Ktpa rate, which is still a low PER given the expansion potential. In determining this valuation, we have made assumptions about the funding of the project, including the appropriate level of debt, and the dilution current shareholders are likely to experience as the Project is developed. These assumptions are discussed in detail in the Valuation section.

OVERVIEW

- Potash production is a new industry for the Australian resources equity market, and represents an opportunity for investors to benefit from the global trends of rising middle class populations in emerging countries and the reducing amount of farm land per head of population.
- Within that macro theme, the production of Sulphate of Potash (Potassium Sulphate or SOP) looks particularly interesting, because of the steepness of the supply cost curve, with 60% of the current 7Mtpa capacity producing at a cash cost of over US$400/t SOP ex works, and more if delivery costs to customers are included. The strength of the SOP price compared to the historically weaker MOP (Potassium Chloride or Muriate of Potash) price over the last 6 years is particularly encouraging, because it suggests that the marginal cost SOP producers, which use MOP as the base feedstock, are experiencing rising costs, offsetting the benefit of the 6 year fall in MOP price.
- The lowest cost SOP production globally comes from brine production, which is what Kalium Lakes is proposing to produce from.
- The barrier to becoming a SOP producer from a brine source is chemistry. The brine must contain economic grades of both potassium and sulphate, and to be really competitive, the brine must be located in a region of high evaporation.
- Of the current crop of Australian projects, Kalium Lakes' Beyondie project has the highest potassium grade (smaller evaporation ponds), excess sulphate availability, the lowest NaCl to Potassium Sulphate ratio (equating to less waste), is situated close to the highest evaporation rates in Australia (and by implication, the world), and is the closest to low cost transport (back haul rates from the Pilbara) and infrastructure (sealed roads, gas pipelines).
- Kalium Lakes is further de-risked relative to its Australian peers because it is the only project to have reached Preliminary Feasibility Study stage, and to have reported a Reserve signed off by a consultant external to the company. It is using off lake lined ponds for evaporation, which are significantly more expensive, but give it greater control over the evaporation process and brine retention. It also has the smallest tonnage starting output (75Ktpa vs 150-400ktpa), which will be easier to cover with sales contracts as required by the banks as a necessary condition for funding.
- Kalium Lakes' management team has progressed very quickly to Preliminary Feasibility Study and Reserves, and after the recent equity issue is fully funded to Bankable Feasibility Study completion.
- The prize for the first Australian domestic producers is a share of the 70Ktpa domestic demand, where the suppliers to that market will have a freight advantage worth between A$60/t to A$100/t. This premium has not been factored into our valuation.
- For all the Australian projects, the main markets are in Asia, including China. Kalium Lakes is in the process of building an offtake portfolio, and has announced its first offtake agreement.

Latest Developments

- July 2017 – EcoMag successfully trialed the recovery of Hydrated Magnesium Carbonate
- August 2017 - 55 million litres pumped from bores and trenches
- September 2017 – First salts from the large scale pilot ponds, MOU with Yunnan Jingyifeng Supply Chain Management for sale of SOP in south west China
- October 2017 – Delivery of Preliminary Feasibility Study and Reserves statement
- November 2017 – Funding in place to complete the Bankable Feasibility Study
- January 2018 - Second Native Title Agreement
- February 2018 - Environmental Approval update, Successful EcoMag trials. Purification Plant optimization, Mining Tenure Application sumbitted. 164 million litres pumped.

Future News Flow

- Bankable Feasibility Study outcome
- Ongoing results of bulk sample purification plant pilot works in Germany and Canada
- Updating of hydrological modelling and the Mine Plan, Resources and Reserves
- Final Approvals and grant of mining tenure

- Securing binding offtake agreements
- Detailed investigation of magnesium and NaCl byproducts
- Securing project funding – Kalium Lakes has the support of Burnvoir and Macquarie Bank
- Carnegie Project Scoping Study

VALUATION AND EARNINGS FORECAST SUMMARY

Figure 1 Kalium Lakes valuation summary

Valuation				
	75Ktpa	75-150Ktpa	150Ktpa	150-300Ktpa
Beyondie	140.8	283.1	360.9	481.5
Carnegie	25.0	25.0	25.0	25.0
Corporate Overhead	-25.5	-23.5	-23.3	-20.5
Cash on hand	34.0	34.0	-1.9	-1.9
Debt	-50.0	-50.0	-50.0	-50.0
Net Working Capital	-11.6	-11.6	-18.7	-18.7
Valuation A$M	112.7	257.0	292.0	415.4
Valuation A$/sh	0.44	1.00	1.13	1.61

Source: IIR estimates as at June 2019

- Our base case is the 75-150Ktpa staged expansion giving a company NPV of A$1.00/sh
- That valuation is highly sensitive to SOP price changes, but we believe that the likelihood is that prices will rise in the next few years, and be higher than our base case assumption of US$500/t.
- Carnegie is adjacent to Salt Lake Potash (SO4) and close to Australian Potash (APC). The farm in by BCI Minerals means that the venture is sufficiently cashed up to be able to bring its project up to the current status of its neighbours.
- The 150Ktpa case assumed that the company starts production with a single 150Ktpa production train, vs our base case which is based on two 75Ktpa production trains.
- The 150-300tpa case assumes that the operation is increased to 300Ktpa by adding a 150Ktpa train to the two 75Ktpa trains.

Figure 2 Sensitivity on the 75-150Ktpa base case

NPV change in A$/sh	Change	Impact on NPV of a decrease	Impact on NPV of an increase
SOP Price	US$50/t	-0.28	0.28
AUDUSD	0.05	0.20	-0.17
Operating Cost	A$20.00/t	0.08	-0.08

Source: IIR estimates

Figure 3 Earnings summary

Y/E June	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Revenue ($M)	0.0	0.0	14.6	55.7	56.8	115.9
EBITDA ($M)	-3.0	-3.0	-3.1	24.0	24.5	63.5
Reported NPAT ($M)	-2.1	-2.1	-2.9	7.9	6.7	30.1
Normalised NPAT ($M)	-2.1	-2.1	-2.9	7.9	6.7	30.1
Reported EPS (A$)	-0.010	-0.008	-0.009	0.027	0.023	0.103
Normalised EPS (A$)	-0.010	-0.008	-0.009	0.027	0.023	0.103
PER	NA	NA	NA	15.1	17.8	4.0
DPS	0.00	0.00	0.00	0.00	0.00	0.00
NPV (A$/sh)	1.18	0.99	0.95	1.06	1.16	1.31

Source: IIR estimates

- Our earnings forecast is based on the 75Ktpa option, ramping up to 150ktpa, with the cash flow from the earlier stage assisting in the funding of the second stage. We have assumed the A$220M capital cost for the two stages is covered by the one debt funding package of A$155M, with the balance covered by a combination of equity (A$40M raised at A$0.45/sh) and cash flow from operations.

- The Sulphate of Potash (SOP) price assumed over the life of the project is US$500/t in 2017 dollars, and the AUDUSD 0.75. 50% of the output is expected to be sold in granulated form at a 10% premium.
- The current SOP price landed in Australia and the average selling price in the February 2018 ex China was US$755-770/t, and we expect this price to appreciate over the next two years before declining back to our forecast.
- On our forecast first full year of earnings at 75Ktpa, Kalium is trading on a PER of 15x at the current share price. The multiple does not reflect the strong growth expected from the expansion, which we forecast will reduce the PER to 4x in the first full year of 150Ktpa production.
- At the 150Ktpa rate, our forecast earnings put the company on a PER of 9.6x our NPV valuation of A$1.00/sh, which is still a conservative PER for a company with the expansion potential of Kalium Lakes beyond 150Ktpa to 300Ktpa plus byproducts.
- Kalium Lakes has the resource base to support 150Ktpa for 20 years and an exploration target that allow for further expansions, providing earnings growth potential to levels of production above 300Ktpa. The exploration target is an assessment of the potential in areas where there is insufficient drilling to declare a resource.

Figure 4 Profit and Loss summary

Profit & Loss						
	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Revenue	0.0	0.0	14.6	55.7	56.8	115.9
Operating Costs	0.0	0.0	-14.6	-28.6	-29.2	-49.2
Corporate OH	-3.0	-3.0	-3.0	-3.1	-3.1	-3.2
Costs	-3.0	-3.0	-17.6	-31.7	-32.3	-52.4
EBITDA	-3.0	-3.0	-3.1	24.0	24.5	63.5
D&A	0.0	0.0	-1.1	-4.1	-4.1	-8.2
EBIT	-3.0	-3.0	-4.2	19.9	20.4	55.3
Interest Costs	0.0	0.0	0.0	-8.6	-10.8	-12.4
PBT	-3.0	-3.0	-4.2	11.3	9.6	42.9
Tax Expense	0.9	0.9	1.2	-3.4	-2.9	-12.9
NPAT	-2.1	-2.1	-2.9	7.9	6.7	30.1
Shares on Issue	169.8	258.7	292.9	292.9	292.9	292.9
EPS A$/sh	-0.010	-0.008	-0.009	0.027	0.023	0.103

Source: IIR Estimates

Figure 5 Cash Flow Summary

CASH FLOW						
	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Receipts From Customers	2.3	0.0	13.0	51.2	56.7	109.5
Payments to Suppliers	-3.2	6.7	-16.3	-42.0	-24.9	-51.0
Financing Costs	0.0	0.0	0.0	-8.6	-10.8	-12.4
Taxes Paid	0.0	0.0	0.0	0.0	-3.4	-2.9
Net Cash from Operations	1.4	6.7	-3.3	0.6	17.6	43.2
PP&E	-10.8	-69.0	-70.0	0.0	-45.0	-43.7
Mine Development	0.0	0.0	-1.2	-2.1	-2.1	-2.8
Investing Activity	-10.8	-69.0	-71.2	-2.1	-47.1	-46.5
Share Issues	0.0	0.0	0.0	0.0	0.0	0.0
Dividends	15.8	40.0	4.9	0.0	0.0	0.0
Net Borrowings	0.0	50.0	50.0	15.0	40.0	0.0
Financing Activity	15.8	90.0	54.9	15.0	40.0	0.0
Net Increase in Cash	6.4	27.7	-19.5	13.4	10.5	-3.3
YE Cash on Hand	6.4	34.0	14.5	27.9	38.4	35.1

Source: IIR Estimates

Figure 6 Balance Sheet summary

BALANCE SHEET						
	Jun-18	**Jun-19**	**Jun-20**	**Jun-21**	**Jun-22**	**Jun-23**
Cash	6.4	34.0	14.5	27.9	38.4	35.1
Receivables	0.0	0.0	1.6	6.1	6.2	12.7
Inventories	0.2	0.2	1.4	2.6	2.7	4.3
Total Current Assets	10.6	38.3	21.5	40.6	51.3	56.2
PP&E	11.3	80.3	149.2	145.1	186.0	221.5
Expln & Mine Devt	0.0	0.0	1.2	3.3	5.4	8.2
Deferred Tax Asset	0.9	1.8	3.0	3.0	3.0	3.0
Total Non Current Assets	12.2	82.1	153.4	151.4	194.5	232.8
Total Assets	22.8	120.3	174.9	192.1	245.8	288.9
Trade Payables	2.2	11.8	14.4	5.2	12.7	15.8
Borrowings	0.0	50.0	100.0	115.0	155.0	155.0
Current Tax Liabilities	0.0	0.0	0.0	3.4	2.9	12.9
Provisions	0.1	0.1	0.1	0.1	0.1	0.1
Total Liabilities	2.2	61.9	114.5	123.7	170.6	183.7
Net Assets	20.5	58.4	60.5	68.4	75.1	105.2
Total Equity	20.4	58.3	60.3	68.2	75.0	105.0

Source: IIR Estimates

Figure 7 Beyondie Project Summary: 150Ktpa Operation

Key Area / Characteristic	Details/Comments
Mine	Beyondie Paleo Valley, 78 km East of Kumarina Road House
Tenements	E69/3306, E69/3309, E69/3339, E69/3340, E69/3341, E69/3342, E6/3343, E69/3344, E69/3345, E69/3346, E69/3347, E69/3348, E69/3349, E69/3351, E69/3352
Tenement Area	>2,400 km^2 granted tenements
Product Sales K_2SO_4	Targeting Australian Potash market initially
	No Australian production of Potash
	Mix of standard and granular SOP product – 50:50 split, potential for soluable as well
	Initial Export and Expansion into Asian Markets
Low Na:K Ratio	8.8 : 1
Cut Off Grade	3,500mg/l K
K_2SO_4 Resource (JORC/CIM)	Indicated 4.37 Mt SOP @ 6,278 mg/L K, 14.0 kg/m3 K2SO4
	Inferred 13.74 Mt SOP @ 5,735 mg/L K, 12.8 kg/m3 K2SO4
	Total 18.1 Mt SOP @ 5,865 mg/L K, 13.1 kg/m3 K2SO4
	Exploration Target 3.7 to 18.0 Mt K, 19.8 to 34.6 Mt SOP
Non-CIM Mineral Resource	Total Stored Brine Estimate 196.5 Mt SOP
Mg Mineral Resource (JORC/CIM)	Indicated 1.68 Mt Mg @ 5,396 mg/L Mg
	Inferred 6.62 Mt Mg @ 6,158 mg/L Mg
	Total 8.30 Mt Mg @ 6,003 mg/L Mg
	Exploration Target 1.9 to 8.9 Mt Mg
K_2SO_4 Reserve (JORC/CIM)	Probable 2.66 Mt SOP @ 6,373 mg/L K, 14.2 kg/m3 K2SO4 Stage 1 Approval Footprint Only
Pumping Equipment	Diesel/Solar Powered Brine Extraction Pumps and Piping
Stage 1 Extraction Bores	30-40 Bores
Stage 1 Extraction Trenches	~45 km trenches and 8 extraction pump stations
Communications	Bore and Pump Station telemetry
Stage 1 Approval Footprint	Assumes Beyondie, 10 Mile and Sunshine Only
Evaporation ponds	762 ha located off the lake surface to minimise pond leakage
Pond Seal	1mm HDPE liner
Equipment	Trucks, harvesting equipment, pipes, pumps and telemetry
Potassium Recovery	87.0% for the evaporation stage only
Purification Plant Operating hours	8,760 hours per year
Excess Salt Stockpile	Stockpiled on lake and/or sold as a product
SOP Plant Summary	Front end loader (FEL) reclaim from raw salt stockpile, crushing, flotation, conversion, crystallisation, compaction, product stockpiling and packaging
Production Level	150ktpa SOP – ability to phase the project with a ramp up of 75 to150ktpa SOP
Potassium Recovery	Overall ie evaporation and purification is 70-85% (we assume 70% in our valuation)
Operating hours	7,200 hours per year, 85% asset utilisation
Product Packaging	1-2 tonne Bulk Bags and/or Container Bulk and/or Bulk Product
General	Buildings & workshop facilities to support construction, processing, road haulage, port and maintenance operations
Support Infrastructure	Cooling towers, chillers, condensers and steam production
Communications	Satellite & microwave data plus mobile data communications
Water Supply	4 supply areas, water bores, pipeline and water treatment plants
Waste Water Treatment (WWT)	WWT plant located at village. Septic tanks at all other locations
Operations Accommodation	55 permanent ensuited rooms inclusive of shut down & visitor allowance
Gas Supply	78km connection to Goldfields Gas Pipeline (150Ktpa) or Gas Bullets supplied by truck
Power Generation	Gas or Diesel Installed capacity of 6,780kW
Diesel Storage	4 off 110kl self-bunded tanks

Source: Kalium Lakes Reserve release 3 October 2017

PEER COMPARISONS

Kalium Lakes' high grade means it can start small and build

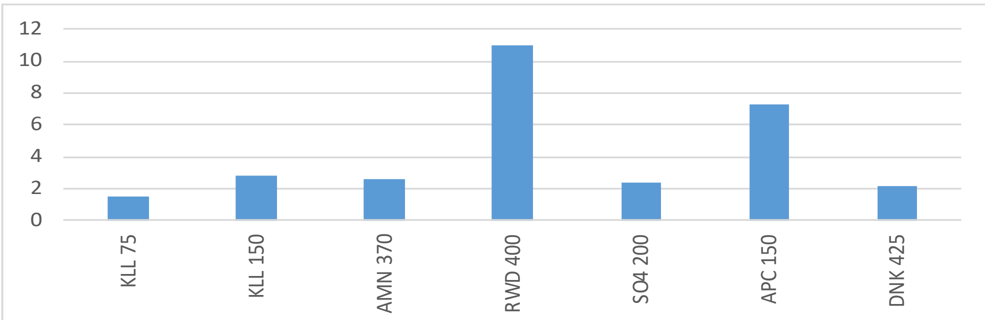
Figure 8 Peer market capitalization vs initial capex

Project	Kalium Lakes	Agrimin	Reward	Salt Lake	Aust. Potash	Danakali
Stock Code	KLL	AMN	RWD	SO4	APC	DNK
Local Market Currency	AUD	AUD	AUD	AUD	AUD	AUD
Share Price Local/sh	0.40	0.85	0.22	0.55	0.09	0.70
Shares on Issue M	169.8	156.1	135.8	175.0	261.9	252.9
Market Capitalization A$M	67.9	132.7	32.6	91.0	25.4	176.1
Initial Capital A$M	124.00	345.8	319.8	223.7	174.9	386.7
Production Rate Ktpa SOP	75	150	300	200	300	425
Initial Capital/Market Cap	1.43	2.61	10.96	2.32	7.26	2.18

Source: Company reports, ASX, LSE share prices

- In the following tables we use the stock code or name rather than the project name. For clarity, Agrimin refers to Lake MacKay, Reward refers to Lake Disappointment, SO4 refers to Lake Wells within its Goldfields Salt Lakes Project, Australian Potash refers to its Lake Wells project, and Danakali refers to the Colluli project in Eritrea.
- The table above shows a selection of Potash project developers, showing market capitalization, and the initial capex for the lowest throughput version of their projects. Of these, Danakali has completed its DFS and is seeking funding, Kalium has a PFS and the rest have released scoping studies.
- The ratio of initial project cost divided by market capitalization measures the current credibility gap between the cost of the project and the equity base available to fund it.
- Kalium Lakes has an initial capex/market cap of 1.43 significantly better than the other Australian brine projects. This means that Kalium Lakes has an excellent chance of funding its initial project, while the others have to get their share price up, or reduce the initial size of their projects.

Figure 9 Ratio of initial capital cost vs current market capitalization

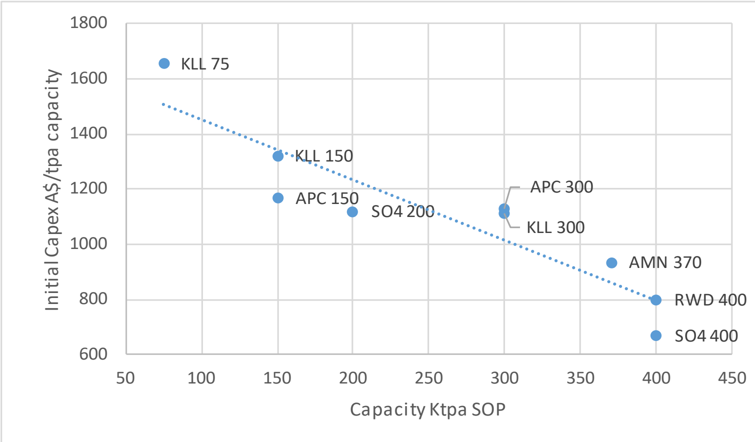


Source: Company reports, ASX share price

Kallium Lakes' capital intensity is consistent with other projects

- Economies of scale mean the larger the project, the lower the capital intensity in A$/tpa of capacity. The purification plant component across all projects shows a high degree of costing consistency, with plants on similar size costed within 10% of the trendline. Infrastructure and transport costs are highly site specific. Brine extraction,and pond capital intensity differences are almost entirely due to the choice of lined or unlined ponds.

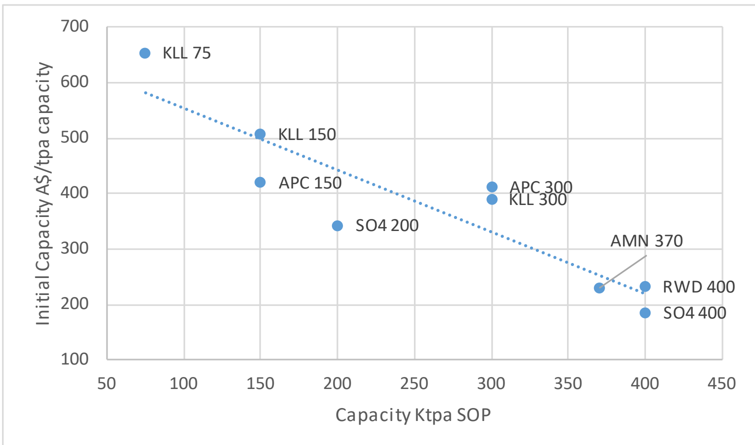
Figure 10 Initial Capital Cost A$/tpa of capacity vs project capacity



Source: See Figure 15 for data sources and calculations

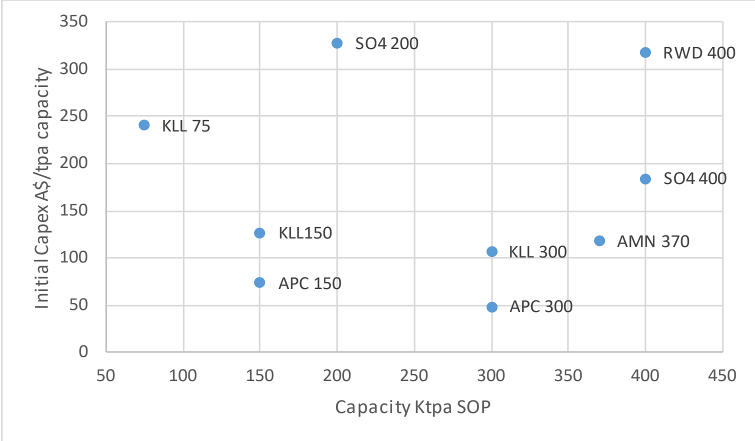
- There is a clear trend in initial capex per tonne of annual capacity. The bigger the project, the better is the economies of scale. If Kalium Lakes expanded to 400Ktpa, it too is likely to have capex costs in the region of those of Agrimin, Reward and SO4, and it may expand to that size in time.
- The Beyondie Project is the only Australian project at PFS stage, and therefore costed to a higher level of detail and accuracy. At a capital intensity of US$1098/tpa its 150Ktpa project compares favourably with Crystal Peak and Archean outside Australia. Archean's Hajipir, Gujarat operation (Arch 130Ktpa) and the PFS stage Crystal Peak 300Ktpa Lake Sevier project (CPM 300), have capital intensities of US$1,230/tpa and US$1,260/tpa respectively.
- It is noted KLL capex includes a gas pipeline in the 150Ktpa and 300Ktpa cases, which increases its capital intensity by $73/tpa in the 300Ktpa case $146/tpa in the 150Ktpa case. This is not allowed in the other projects, and removing this cost would make Kallium Lakes' capital intensity similar to those of Australian Potash (see Fig 11).

Figure 11 Capital intensity of the purification plant component. Economies of scale are largely at this stage



Source: Company reports (KLL Kalium Lakes, AMN Agrimin, RWD Reward, SO4 Salt Lake, APC Australian Potash)
Kalium Lakes KLL150 and KLL300 include A$146/tpa and A$73/tpa respectivel for a gas pipeline

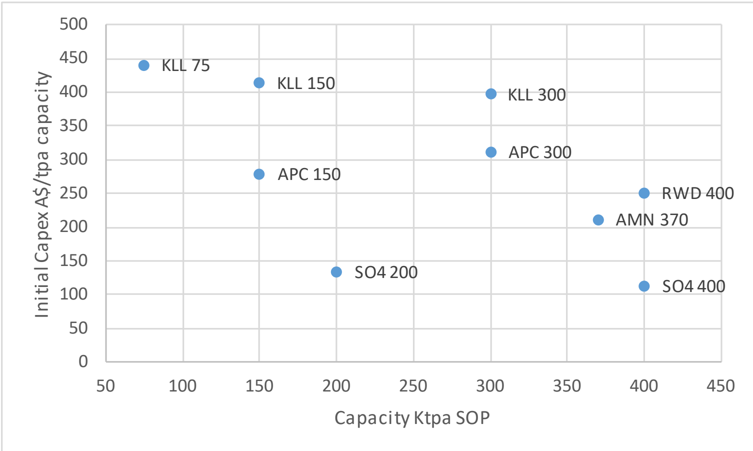
Figure 12 Capital intensity in the infrastructure and transport components of the projects – KLL data excludes the gas pipe line costs of A$146/tpa for 150Ktpa and A$73/tpa for the 300Ktpa case. Low economies of scale.



Source: Company reports (KLL Kalium Lakes, AMN Agrimin, RWD Reward, SO4 Salt Lake, APC Australian Potash)

- While there are some economies of scale, they are small in the scheme of the projects costs and what dominates is the location and logistical advantages, which clearly favour Kalium Lakes' Beyondie and Australian Potash's Lake Wells projects.

Figure 13 Capital intensity of Brine Extraction and Ponds for each project - Low economies of scale



Source: Company reports (KLL Kalium Lakes, AMN Agrimin, RWD Reward, SO4 Salt Lake, APC Australian Potash)

- Again there are some economies of scale, but they are also small in the scheme of the projects costs. What dominates in the extraction method and pond construction choices, in particular, whether to have lined ponds off lake, or unlined ponds on lake, and whether brine is extracted from trenches only or from pumped wells.
- Kalium Lakes is planning to have all ponds off lake and all lined. In a release of 5 September 2017, they indicated a total pond construction cost of A$5.40/m^2 of which we understand the lining cost was around A$4/m^2 leaving A$1.40/m^2 for earthworks off lake.
- The difference in costing of this stage between Kalium Lakes and the similiar sized projects of Australian Potash, Reward, and Agrimin (ie around A$200/tpa), is explained by the cost of lined ponds. Kallium Lakes' needs 762 Ha of ponds for its 150Ktpa case, costing A$30M, a capital intensity of A$200/tpa. Removing that A$200/t would place Kallium Lakes capital intensity of A$200/tpa,in line the A$200-300/tpa range of those of comparable size, apart from SO4, which is an outlier relative to all the others.
- The SO4 projects differs in capital intensity from the pack by around A$150/tpa, explained by the difference between SO4's and Kalium Lakes' published assessment of pond construction costs. Kalium Lakes' all up cost for only the pond earthworks is around A$1.40/m². SO4's estimated cost for a 400Ha on-lake unlined pond system is A$1.6M or A$0.40/m^2 (SO4 release 16 October 2017). There appears to be a gap which may come down to the exact definition of what is included in each costing, and also the specific workability of the SO4 lake surface. The SO4 200Ktpa case requires 2990Ha (29.9Km^2) of evaporation ponds, costing A$12M at SO4's costing of A$400K/Km^2, or A$42M at Kalium Lakes' costing. The difference of A$30M turns out to be A$150/tpa of capacity.

Figure 14 Key phsical metrics for the AUstralian SOP potash projects

	Kalium	Agrimin	Reward	Salt Lake	Aust. Potash	Crystal Peak USA
Using CIM Brine Standard	Yes	Yes	No	No	Yes	Yes
Using AMEC Potash Guidelines	Yes	?	No	No	Yes	No
CIM/JORC SOP Drainable Resource Mt	18.1	23.2	153 (?)	?	14.7	
Resource Brine Grade (kg/m3 SOP)	14.012	8.250	11.340	8.740	7.896	6.258
Resource Brine Grade (kg/m3 K)	5.865	3.600	4.747	3.814	3.541	3.280
K/SOP ratio	0.419	0.436	0.419	0.436	0.448	
Cutoff Grade (kg/m3 SOP)	7.8	None	None	None	None	
Sodium/Potassium Ratio	8.8	?	15.2	21.5	17.6	
CIM/JORC SOP Drainable Reserve Mt	2.66	None	None	None	None	None
SOP Production Ktpa	75-150	370	400	200-400	150-300	
Brine Extraction GL pa	8-15	66.5	63	32-64	17-37	
Evaporation Rate mm pa	3800	3400	4100	3200	3200	1219
Evaporation Pond Location	Off Lake	On Lake	On Lake	On Lake	On & Off	On Lake
Evaporation Pond Lined	Yes	None	None	None	Partly	None
Area Disturbed Km2	8-13	59	75	29-32	13.25	
Distance from sealed road Km	78	590	355	195	168	1
Distance to gas pipeline Km	78	400	175	245	245	40Km to grid
Distance to Port Km	700-862	2000	776-1371	968	940	
Large scale trial approved	Yes	No	No	No	No	
Scoping Study	Yes	Yes	Yes	Yes	Yes	Yes
Prelim. Feasibility Complete	Yes					Yes

Source: Company reports (KLL Kalium Lakes, AMN Agrimin, RWD Reward, SO4 Salt Lake, APC Australian Potash)

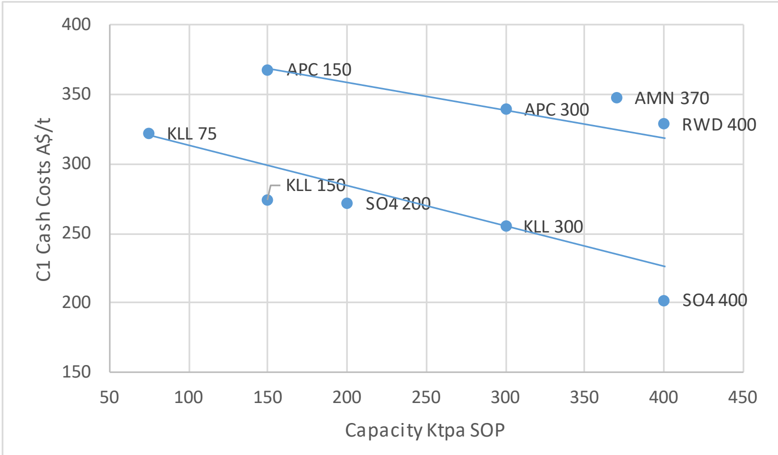
Figure 15 Capital and operating cost comparison - Australian SOP potash projects

	KLL 75Kt	KLL 15Kt	KLL 300Kt	AMN 370Kt	RWD 400Kt	SO4 200Kt	SO4 400Kt	APC 150Kt	APC 300Kt
Capital Cost (Date)	Oct-17	Oct-17	Oct-17	Aug-16	Apr-15	Aug-16	Aug-16	Mar-17	Mar-17
Study Quality	PFS	PFS	PFS	Scoping	Scoping	Scoping	Scoping	Scoping	Scoping
Brine Supply, Ponds Harvesting	33	62	119	78	100	27	45	42	93
Purification Plant	49	76	117	85	93	68	74	63	123
Infrastructure	11	33	44	26	71	54	62		
Road, Port, Haulage	7	8	10	18	56	11	12	11	15
EPCM & Owners Cost	13	21	34	70	?	31	37	35	59
Contingency	11	20	32	69	?	33	38	24	48
Total Pre-Prodn Capital	124	220	356	346	320	224	268	175	338
Less Gas Pipeline		22	22						
Adjusted Pre-Prodn Capital	124	198	334	346	320	224	268	175	338
Capital A$/annual installed tonne	1653	1320	1113	935	800	1118	669	1166	1126
Operating Cost									
Site Cost A$/t	216	176	163	151	199	166	110	282	259
Haulage & Port A$/t	67	67	70	191	124	75	75	69	69
Cash Costs A$/t	283	243	233	342	323	241	185	351	328
Corporate Costs A$/t	39	31	22	5	5	31	17	17	11
Operating costs (C1) A$/t	322	274	255	347	328	272	202	368	339
Sustaining Capex A$/t	20	15	12	22	34.75	?	?	NA	NA
All In Sustaining Costs A$/t	342	289	267	369	363			368	339

Source: Company reports (KLL Kalium Lakes, AMN Agrimin, RWD Reward, SO4 Salt Lake, APC Australian Potash)

Operating cost comparison: Kalium Lakes lowest for given capacity

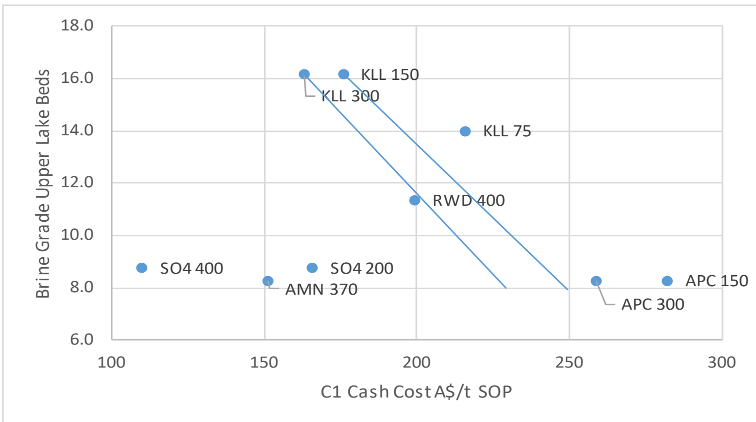
Figure 16 Operating (C1) Cost is partly related to scale, partly project specific



Source: Company reports (KLL Kalium Lakes, AMN Agrimin, RWD Reward, SO4 Salt Lake, APC Australian Potash. Cost includes cost to FOB, excluding royalty, and sustaining capex. (refer Figure 15)

- Cash Cost in A$/t SOP comprises location specific logistics costs, chemistry specific site mine gate costs, and volume dependent overhead costs.
- Australian Potash (APC 150/300Ktpa operation) is a little different in that its cost includes buying in MOP to convert into SOP on site. APC assumes a low purchase MOP price based on "degraded" material.
- Overall, Kalium Lakes is best in class for any given level of capacity, enjoying an advantage of A$75/t or more. This is no surprise, given it has the highest grade brine, and the lowest Sodium to Potassium ratio (less waste salt).
- Kalium Lakes' unit cash cost at 150Ktpa SOP is similar to those of Crystal Peak's Sevior Lake Project (also at PFS level). Relative to Crystal Peak, Kalium Lakes has double the brine grade, and triple the evaporation rate, and comparable transport and infrastructure costs, so we would be confident that there is little chance of Kalium Lakes' operating costs being understated.

Figure 17 Mine gate cash costs vs brine grade - SO4 and AMN outliers compared to the other three

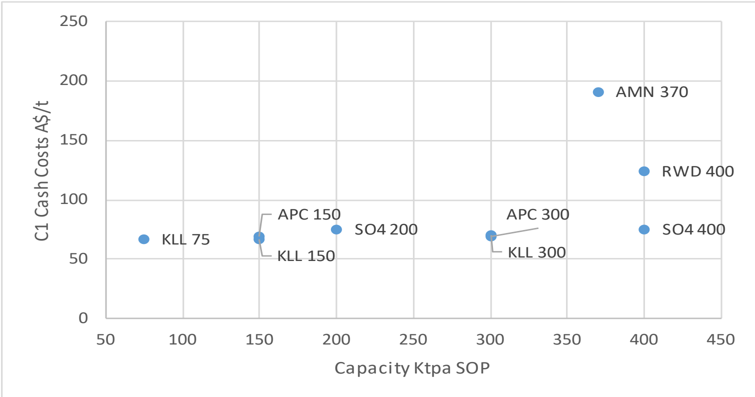


Source: Indicated & Inferred average grades used. Cost to mine gate, ex royalty, sustaining capex. (refer Figure 15)

- Unit mine site costs should be strongly correlated with brine grade, which determines the volume of brine to be extracted, and the size of the evaporation ponds required to sustain the planned product capacity. This appears to be the case with Kalium Lakes, Reward and Australian Potash, with Salt Lake and Agrimin appearing to have site costs some A$100/t lower than grade would suggest. The explanation may be that these latter two companies intend to run at higher than average resource grade, that they are trenching only with no bore production or pumping, or some other modification to costs.

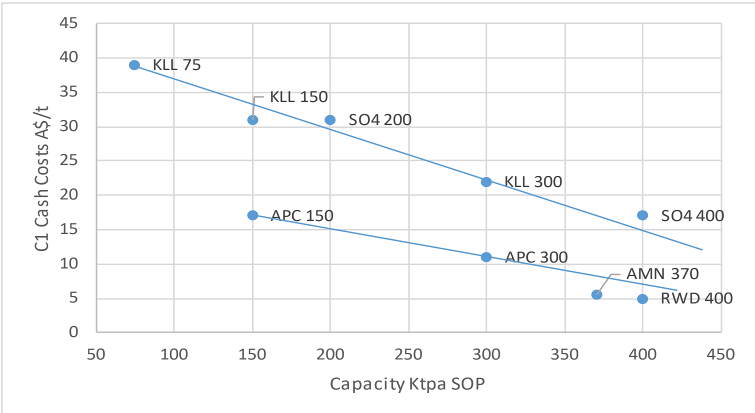
- Using Australian Potash in this analysis is difficult because the actual onsite potassium generation is only around 65% of the total with the rest being purchased in the form of degraded MOP, so the cost differential between on site SOP brine into the purification plant and purchased MOP is important. Only Reward splits site costs into pond costs and purification costs, and the implication is that its brine cost is A$210/t SOP versus A$400/t for MOP less an unknown degradation discount plus A$70/t transport cost to site. If the MOP delivered cost was A$100/t more expensive on 35% of the feed, APC's cost of on site SOP production should be reduced by A$35/t moving it closer to, but still far from SO4 and Agrimin, as indicated by the lines drawn in Figure 17
- The Kalium Lakes 75Ktpa case (KLL 75) is different to the other KLL cases in that we have assumed the grade for the Indicated Resource, while for Kalium Lakes' bigger projects we have assumed the higher average for the indicated and inferred resource.
- Project capacity does have an influence on site unit costs, but as can be seen from both Kalium Lakes and Australian Potash, the difference between A$13/t and A$23/t for every 100Ktpa increase. The large unit cost difference between the 200Ktpa SO4 stage and 400Ktpa stage is around A$56/t or $28/t per 100tpa of capacity. What is clear is there is not much costing consistency between the 400Ktpa projects of SO4, Reward and Agrimin.

Figure 18 Transport costs are entirely a function of geography with no economies of scale



Source: Company reports (KLL Kalium Lakes, AMN Agrimin, RWD Reward, SO4 Salt Lake, APC Australian Potash. Cost is transport and logistic only excluding sustaining capex. (refer Figure 15)

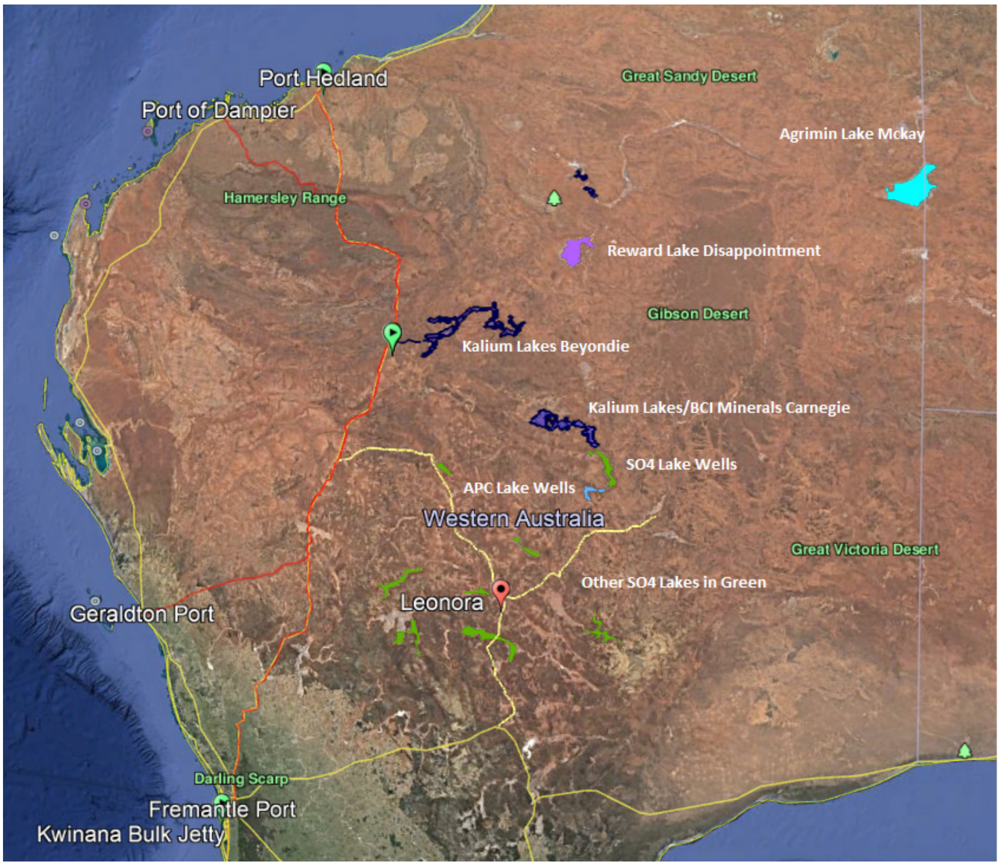
Figure 19 Corporate overhead unit costs are highly dependent on scale



Source: Company reports (KLL Kalium Lakes, AMN Agrimin, RWD Reward, SO4 Salt Lake. Cost is overhead only. (refer Figure 15)

POTASH PROJECTS

Figure 20 Location of Beyondie and Carnegie projects



Source: Google Earth, company reports

- Beyondie is the company's 100% owned flagship project, planned to produce between 75Ktpa and 300Ktpa of Sulphate of Potash (SOP). The operation is 700Km trucking distance to Port Hedland, 862Km to the port of Geraldton and 1030Km to Freemantle, and the industrial centre of Kwinana. wGeraldton Port has signed an MOU with Kalium Lakes.
- Carnegie is under Kalium Lakes' ownership and management but is being funded by BCI Minerals, which can earn up to 50% by sole funding A$10.5M in exploration and development expenditure. This project is close to the projects of Salt Lake Potash (SO4) and Australian Potash (APC), and 940-968Km trucking distance to port. Australian Potash has a market capitalization of A$24M and SO4 is A$96M, indicating that Carnegie, while not the focus of this report, has a significant value in its own right.

BEYONDIE POTASH PROJECT

Key analytical issues

- Will the stated Reserves deliver the required brine, will resources convert to Reserves at the expected rate over time, and will the Exploration Target convert into resources? The answers to these questions relate to the available brine in the ground, the extractability of that brine, and the recharge rate over time.
- Will the initial process of solar concentration work as expected? This question goes to evaporation rate, where the Australian projects generally have a global advantage, as well as pond mechanics, including leakage, use of gravity to shift solutions from pond to pond, and access and operating stability for heavy machinery.
- Will the separation and refinement process operate as expected? This question is related to the performance of the processing route and selection of equipment, over which the project sponsor has a high degree of control, so it comes down to the competence of the designers.

Brief description of process route

- **Brine collection** by trenching the surface (surface aquifer) and basal aquifer drainage by pumped boreholes (paleochannel aquifer).
- **Solar evaporation of brine**. In the first set of ponds, the waste products of gypsum, halite (ie NaCl) and astrakainite precipitate out and are left in the ponds, to be harvested when full. The remaining brine crystalizes out in the next set of ponds, producing separate leonitic, schoenitic and carnallitic mixed salts which are harvested and stored separately as feedstock for the purification plant. The remaining bittern can be sent to further ponds for extraction of byproducts, specifically epsomite ($MgSO_4$).
- **Pre-treatment of raw salt** to separate NaCl and $MgCl_2$. The mixed salts still contain halite (NaCl), and that is removed at this stage to produce a pure schoenite. Schoenite is a hydrated mix of potassium and magnesium sulphates ($K_2SO_4MgSO_4.6H_2O$). The schoenite is separated out using flotation, hydrocycloning and filtration, followed by leaching.
- **Schoenite decomposed into SOP**. Following pre-treatment, the schoenite is broken down using processes of heating and recrystallization.
- **Possible production of magnesium products** such as epsomite, bischofite,and hydrated magnesium carbonate from the remaining bittern in the evaporation ponds.

First issue: will the resources deliver?

Beyondie resource testing so far in summary

- 478 auger and drill holes across the resource
- 1130 Km of geophysical traverses
- 11 large diameter (200-250mm) cased boreholes
- 13 mini aquifer tests
- 10 constant rate pumping tests
- Over 10 weeks of test pumping, with continuing test underway
- 1000m of trenches installed up to 5m in depth with over 60 days of trench pumping
- Over 164 million litres of brine pumped from aquifers
- First Australian brine project to report Reserves signed off by expert external to the company

In more detail: All about the recoverable brine

- Kalium Lakes' has adopted the AMEC and CIM standard for resource reporting where resource volume is calculated from aquifer volume x Specific Yield (Sy) and is the standard used by Australian Potash (APC), Reward Minerals (RWD) and Agrimin (AMN), but not Salt Lake (SO4). The alternative is to use aquifer volume x porosity. Porosity measures 100% of the brine held within the aquifer, while Specific Yield estimated that amount of brine that will leave the aquifer under conditions of gravity drainage, and in Kalium Lakes case, the drainable brine generated using Specific Yield is 20% of the total brine that would be generated by the porosity calculation. The remaining brine is held in the aquifer by capilliary action and is effectively not extractable.
- Kalium Lakes is the first of the Australian brine project developers to report a Reserve, signed off by independent brine industry expert K-UTEC, and independently reviewed by Snowdon. The requirements for Reserve reporting are more restrictive that Resource reporting.
- There appears to be some differing opinions among anaylsts covering different project developers regarding the merits of drilling vs trenching. We see these activities as complimentary. Drilling provides point data necessary to build up the aquifer data variograms for grade, chemistry, porosity, specific yield etc that can be compiled into Reserves and Resources. Trenching provides a bulk test of the brine production behaviour and brine chemistry for a specific section of aquifer. Both are necessary, but very different in purpose.

Figure 21 Number of drill or auger holes by deposit and horizon

	Total	Auger	Surficial Drilling	Clay Drilling	Basal Sand Drilling	Bedrock Drilling
Sunshine	23	58	6	4	4	9
Beyondie	42	14	15	0	1	27
10 Mile	65	22	18	8	9	29
Aerodrome	54	54				
Central	123	123				
Terminal	19	19				
T Junction	25	25				
White Lake	55	55				
Wilderness	18	18				
Yannen	32	32				
Other	22	22				
Total	478	442	39	12	14	65

Source: Kalium Lakes reserve report 3 October 2017

- The resource and reserve estimates are supported by the auger and drilling database in the figure above. The reserve is located at only Beyondie and 10 Mile due to drilling density available, while the Resource and Exploration Target is spread over the 150Km drainage system.
- Kalium Lakes has produced over 164 million litres of brine in testing per the company release of 22 March 2018, and more will be pumped over the coming months as the large scale evaporation ponds continue to be evaluated.

Figure 22 Beyondie Potash Project Resources and Reserves

Beyondie Potash Project Mineral Resource and Reserve						
JORC/CIM Resources	Drainable Brine (M m^3)	Potassium (mg/l)	Potassium (Mt)	SO4 (Mt)	Drainable Brine SOP (Mt)	Total Brine SOP (Mt)
Indicated Resource	311	6278	1.96	5.56	4,37	35.15
Inferred Resource	1075	5735	6.16	18.37	13.74	161.32
Total Resource	1386	5865	8.12	23.67	18.11	196.47
Exploration Target			3.7-18.0		19.8-34.6	
Reserve	187	6373	1.19	3.34	2.66	

Source: Maiden Reserve announcement 3 October 2017 (cut-off at 3500mg/l K or 7800mg/l SOP)

- Reserve and resource reporting for brines is a relatively new area for the Australian resources industry, and to some extent is still work in progress. Kalium Lakes is a member of the Association of Exploration and Mining Companies (AMEC) Potash Working Group which has developed guidelines for brine resource and reserve reporting. These standards are in line with existing Canadian best prectice guidelines for resource and reserve estimation for lithium brines as published by the Canadian Institute for Mining, Metallurgy, and Petroleum.
- Of significance in the Drainable Brine column. This represents the estimated extractable component of the deposit, and is substantially smaller than the total brine present.
- Also of significance is the SO_4 content, which determines whether the brine will produce MOP or the higher value SOP. The minimum SO_4:K ratio for SOP production is 1.23:1 vs Beyondie at 3:1.
- The Sodium Potassium (Na:K) ratio for the Beyondie Project is 9.4 vs 15-22:1 for other deposits. Sodium Chloride is table salt or swimming pool additive and sells for around US$35-65/t which is less than the cost of transport from most of the Australian brine potash projects, so it is a waste product, and a cost to potash production. It is a portenial byproduct for Kalium Lakes if the Beyondie haul rate can be reduced to A$40/t by back hauling on trucks returning from the Pilbara.
- The SO_4 to calcium ratio is also important, with a minimum SO_4:Ca ratio of 2.4:1 required for SOP production. These ratios are discussed in the Kalium Lakes prospectus of 28 November 2016, on p22 of the expert report by Snowden, quoting potash industry expert K-UTEC.

Second Issue: Evaporation pond performance

Australia benefits from high evaporation

- The Australian projects benefit from having the world's best evaporation rates, with three times the evaporation rate available in the USA. China (Luobupo in the Gobi Desert) has high evaporation rates overall, but strongly biased to summer due to the freezing conditions in winter. The Atacama in Chile/Argentina appears to have similar evaporation rates to the USA, both of which are highly seasonal.
- While sunshine is free, for a given brine grade and production output, the evaporation rate determines the size of the ponds and the residence time in the ponds.

Figure 23 Beyondie Potash Project Resources and Reserves

	Kalium	Agrimin	Reward	Salt Lake	Aust. Potash	Luobupo China	Compass USA	Crystal Peak US
Evaporation Rate mm pa	3800	3400	4100	3200	3200	3500	1300	1219

Source: Company reports

Lined off lake ponds cost more but are lower risk

- Kalium Lakes has decided to build lined ponds away from the lake surface, because the brine losses from unlined ponds in its case was considered unacceptable, and the delay in accessing lake ponds is also an issue. This is an interesting decision, because this is the only brine project in Australia to choose this approach. All the others are proposing on-lake unlined ponds for all or some of their ponds, relying on compaction of surface clays to retain the brine during the evaporation process. Kalium Lakes cites the following issues:
  - Ponds built on Beyondie or 10 Mile Lakes would experience significant leakage
  - Lake sediment is sufficiently boggy that to generate sufficient surface hardness to support heavy salt harvesters, the evaporation pond would have to build up a thick salt bed, which in turn requires higher pond retaining walls, and thicker salt accumulation as a base, which requires time.
- Each project will decide what works in its specific environment. Some projects (eg Australian Potash) are planning to have the initial halite ponds unlined on-lake, with downstream ponds with the higher concentration potassium brines in lined off-lake ponds. Having bitten the cost bullet, the Kalium Lakes' all off-lake lined pond approach may be more costly, but it results in a higher degree of technical deliverability, lower risk to investors, and increased bankability from a lender's perspective.
- Kalium's higher grade also means that the brine is more valuable in the early stages of the process, which impacts cost benefit considerations relative to its peers.
- The benefit of lined ponds is increased efficiency and operational predictability. SO4 states that seepage of less than 0.25mm/day is acceptable. Their initial ponds seeped at 2.4mm/day, but SO4's modelling extraploation (release 28 March 2018) indicates that the larger ponds seepage will be less than 0.125mm/day. On SO4's 29 August 2016 scoping study numbers, at 200Ktpa SOP it will pump 3,650 m^3/hr or 31.97 million m^3/yr into 29.9Km^2 of ponds. 0.125mm/day of seepage on that pond area amounts to 1.3 million m^3/yr or 4% of total pumped, if the seepage is in the earlier lower concentration ponds.

Putting Resource/Reserve/Yield/Recovery in context

Figure 24 Relationship between resources and plant output

	Kalium	Aust. Potash	Salt Lake	Reward	Agrimin
	KLL	APC	SO4	RWD	AMN
M&I Resources				(Accessible)	
Aquifer Volume Mm^3	5225	4036	4120	6202	17050
Brine Volume Mm^3	1558	1816		2877	
Specific Yield	6.00%	12.50%	13.54%	13.0%	8.90%
Drainable Brine Mm^3	311	505	558	806	1521
Resource GL	311	505	558	806	1521
Grade K mg/l	6278	3603	6013	4009	3707
Cut Off Grade	3500				
Contained K Mt	1.96	1.93	3.35	3.23	5.70
Contained SOP Mt	4.37	4.30	7.48	7.20	12.70
Recovery	**69.60%**	**69.30%**	**70.00%**	**70.00%**	**70.00%**
Annual Prodn Ktpa SOP	150	370	400	200	150
K required Ktpa	96.6	239.4	256.2	128.1	96.1
K Purchased Ktpa	0	0	0	0	33.3
K from Brine Ktpa	96.6	239.4	256.2	128.1	62.8
Life yrs	**20.3**	**8.1**	**13.1**	**25.2**	**90.7**

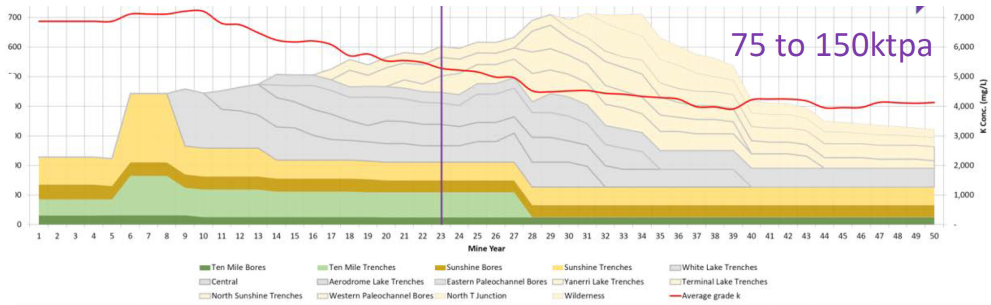
Source: Company reports, IIR estimates for Reward and Australian Potash recovery and the Specific Yield for SO4, the only company not to provide its own estimate. That Sy is based on all its production coming from surface aquifers, and the average reported by Reward and Australian Potash.)

- The table above starts with Measured and Indicated Resources only, because Reserves can only be calculated from Measured and Indicated Resources. From the outset, we note that this analysis is unfair to Agrimin which has 4.3Mt SOP Indicated and 18.9Mt SOP as Inferred Resources, a larger proportion in inferred than the other companies.
- The table works the key project metrics down from aquifer volume to drainable brine, and from proposed capacity in Ktpa SOP back through recoveries and potassium grades to the annual potassiun in brine before losses. This gives a "mine life" estimate of Measured and Indicated Resource divided by annual potassium in brine required. The overall message is that all the Australian projects have resources sufficient to support their initial project size, and more in Inferred Resources are included. Kalium is actually covered for 40 years at its initial rate of 75Ktpa. Clearly there will be resource to reserve conversion losses, but this analsysis attempts to put the different projects on the same footing.
- Kalium Lakes uses a cutoff grade that is close to the average grade of some other operations.
- The Beyondie Project has estimated its recoveries at 87% in the evaporation stage and 80% in the processing stage for a total recovery of 69.6%, the same as the other projects that have published recoveries (Salt Lake/SO4 and Agrimin). In the US, Crystal Peak (Sevier Lake Project) reports pond recovery of 85% (unlined on-lake ponds) and plant recovery of 80%. The recent test work undertaken as part of the BFS in Germany and Canada has indicated that plant recoveries for individual batches of Beyondie brine have achieved 90-98% plant recovery, vs the 80% PFS estimate.
- Given the stated recoveries of SO4 and Agrimin of 70% with unlined ponds, they must be expecting extremely low rates of leakage. Note we are not disputing the reported expected leakages, but we do believe that lined ponds with the leakage detection systems proposed by Kalium Lakes provides more management control and lower risk to investors, particularly in relation to leakage in the downstream higher concentration ponds.
- The Specific Yield used to convert SO4's Aquifer Volume to Drainable Brine is 0.13. This is close to the top end of the 0.04 to 0.14 range that SO4 published for Lake Wells in its recent release of 28 March 2018. There is therefore a risk that its Drainable Brine could be lower than our estimate.

Brine source modelling for the 75Ktpa to 150Ktpa case

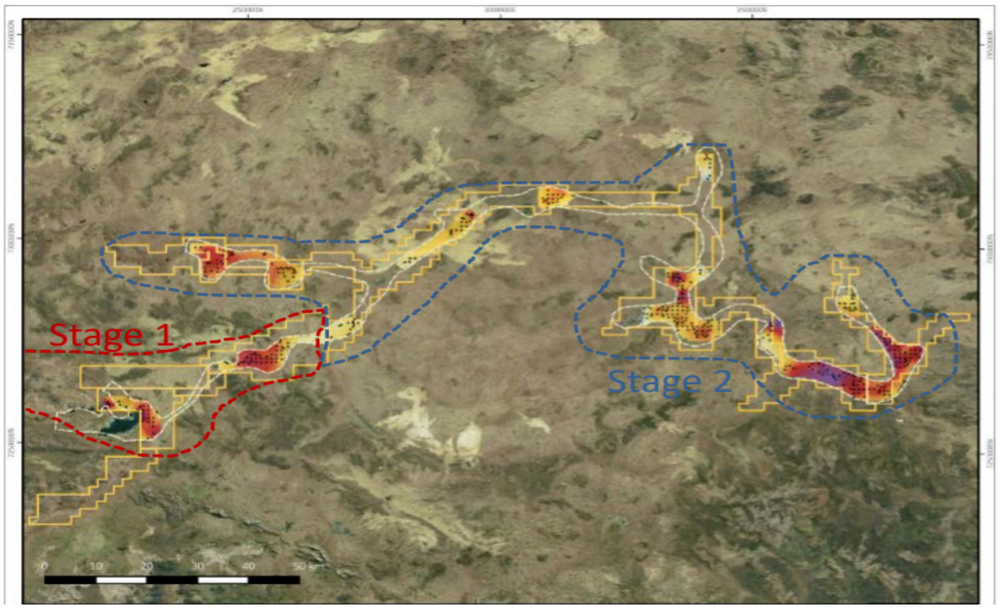
- Figure 25 shows the proposed brine sources for a 50 project year life, starting at 75Ktpa SOP and ramping up to 150Ktpa SOP. Our financial model assumes a faster step up to 150Ktpa.
- The two green layers represent bore and trench supply from Beyondie and 10 Mile Lake (Reserves) and the brighter yellow layers represent bore and trench supply from Sunshine Lake (Figure 25). The grey bands represent trenches and bore sources from White Lake. Central, and Aerodrome Lake. The light yellow bands include Yanneri Lake, Terminal Lake, North Sunshine.

Figure 25 Production profile for the 75Ktpa expanding to 150Ktpa option



- At the 150Ktpa rate, the Stage 1 production from Beyondie/10 Mile/Sunshine will comprise 45Km of trenches with 8 pumping stations and 30-40 bores as in Figure 7. Stage 1 is the green and strong yellow shadings in the figure above.

Figure 26 Lake locations and location of reserves and resources



Source: Kallium Lakes presentation 27 March 2018

- According to the Kalium Lakes PFS, the recovery at the evaporation stage is 87% and 70-85% in processing, giving an overall recovery from Reserves of 61% to 74%. To produce 150Ktpa of SOP for 20 years, a Reserve of 4.1-4.9Mt SOP would be required.
- The current Reserve is sufficient to cover the 75Ktpa stage for 20 years, or the 150Ktpa case for a bit over 10 years. The Inferred Resource is substantial, and we would expect that with additional drilling, there is a high probability of Reserve additions and at a higher grade than in the current profile.

Resource and Reserve estimates

- The current Reserve is entirely within Beyondie and 10 Mile due to drilling density.
- Reserves can only be derived from Measured and Indicated Resources. The table below details the M&I resource, and the related Reserve. The conversion of lake surface sediments from Resource to Reserve is 93%, while the other sources are lower at 26%.
- The overall conversion of Indicated Resources into Reserves is 60%.

Figure 27 Calculation of Resources and conversion to Reserves

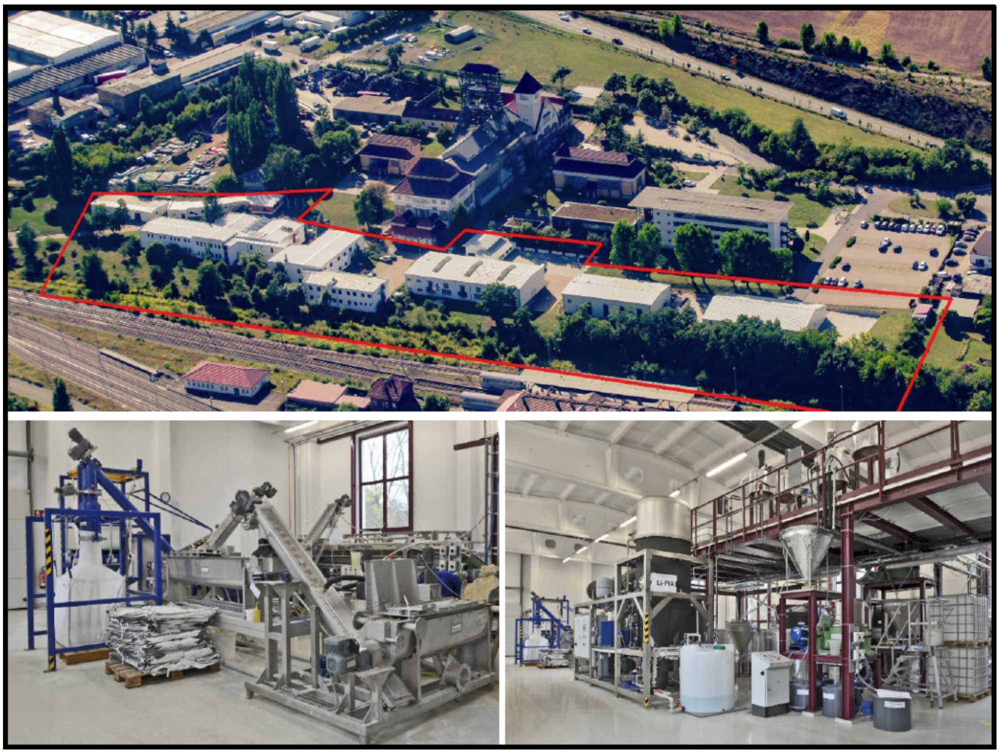
	Area Km^2	Volume M m^3	Porosity	Brine Volume M m^3	Specific Yield	Drainable Brine M m^3	K mg/l	K Mt	SOP Mt
Inferred Resources									
Lake Surface Sediments	260	1559	0.45	701	0.12	182.43	6344	1.16	2.58
Paleovalley Clay	665	23275	0.50	11638	0.03	698.25	5730	4.00	8.92
Paleovalley Sand	97.2	682	0.39	266	0.28	188.95	5101	0.96	2.15
Fractured Bedrock	9.7	97	0.10	10	0.05	4.85	8170	0.05	0.09
Total		25612		12615	0.042	1074.48	5735	6.16	13.74
Indicated Resources									
Lake Surface Sediments	288	1066	0.46	492	0.14	150.59	6685	1.01	2.24
Paleovalley Clay	105	3901	0.50	1951	0.03	117.03	5733	0.67	1.50
Paleovalley Sand	19	146	0.39	57	0.27	38.64	6004	0.23	0.52
Fractured Bedrock	7	113	0.10	11	0.05	5.63	8200	0.05	0.10
Total		5225		1558	0.060	311.88	6278	1.96	4.37
Reserves									
Lake Surface Sediments						138.44	6793	0.94	2.1
Production Bores						48.61	5179	0.25	0.56
Total						187.06	6373	1.19	2.66
Conversion (reserve/ indicated)						60.0%		60.7%	60.9%

Source: Kallium Lakes Reserve release 3 October 2017

Third Issue: Processing plant operation

- The performance of the processing plant comes down to the experience of the designers. K-UTEC is involved in the brine testing, and plany design. It is an active worldwide engineering and research institute, working for 60 years in all fields of the salt minerals industry: exploration, engineering and design, mining and production.
- The group works on international mining standards (CIM, JORC, PERC etc.), covering expertise in geology, geophysics, hydrogeology, processing, and owns and operates large testing facilities for all steps of salt processing at a pilot scale, with facilities for testing compaction, magnetic separation, and a climate chamber for solar evaporation simulation.
- K-UTEC has worked on an number of projects in recent years eg Archean's Gujarat 130Ktpa SOP operation, and a number of lithium brine projects.
- Kallium Lakes has also used the Saskatchewan Research Council (SRC) to independently verify the test work, and has used other parties to provide verification in other areas of work, a fact that should give comfort to the banks and investors regarding the processing and production targets.

Figure 28 K-UTEC facilities in Germany



Source: KLL Reserve release 3 October 2017 p44

Beyondie Financial Model

- Our model starts production at the 75Ktpa rate and ramps up to 150Ktpa SOP by 2023.
- First production January 2020
- 50% of the SOP is sold granulated at a 10% premium to our $500/t trend price in 2017 $.
- Unit revenues and costs are inflated by 2% pa
- We have assumed a total Life of Mine production of 4220Kt SOP at 70% recovery

Figure 29 Beyondie Project Summary

BEYONDIE PROJECT SUMMARY	Sum	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun-23
Assumptions							
SOP US$/t FOB		500.0	510.0	520.2	530.6	541.2	552.0
US$/A$		0.75	0.75	0.75	0.75	0.75	0.75
Granulated Premium		10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Inflation		2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Production Kt SOP	4220.0	0.0	0.0	20.0	75.0	75.0	150.0
Granulated Share		50%	50%	50%	50%	50%	50%
SOP Revenue A$M	2011.7	0.0	0.0	6.9	26.5	27.1	55.2
SOP Gran Revenue A$M	2212.8	0.0	0.0	7.6	29.2	29.8	60.7
Revenue A$M	4224.5	0.0	0.0	14.6	55.7	56.8	115.9
Operating Cost $/t							
Ex Works		138.7	141.5	144.3	147.2	150.2	153.2
Logistics		68.8	70.2	71.6	73.0	74.5	75.9
Corporate		13.3	13.6	13.9	14.2	14.4	14.7
Total		220.9	225.3	229.8	234.4	239.1	243.8
Fixed Cost A$M pa							
Ex Works		0.0	0.0	6.5	6.6	6.8	6.9
Corporate		0.0	0.0	3.2	3.3	3.4	3.4
Operating Cost $M							
Ex Works	1100.7	0.0	0.0	9.4	17.7	18.0	29.9
Logistics	415.1	0.0	0.0	1.4	5.5	5.6	11.4
Corporate	212.3	0.0	0.0	3.5	4.4	4.5	5.7
Total	1728.1	0.0	0.0	14.3	27.5	28.1	46.9
Royalty %	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Royalty A$/t	0.0	0.7	0.7	0.7	0.7	0.7	0.7
Royalty	83.3	0.0	0.0	0.3	1.1	1.1	2.3
COGS	1811.4	0.0	0.0	14.6	28.6	29.2	49.2
Revenue	4224.5	0.0	0.0	14.6	55.7	56.8	115.9
Costs	-1811.4	0.0	0.0	-14.6	-28.6	-29.2	-49.2
Depn	-230.0	0.0	0.0	-1.1	-4.1	-4.1	-8.2
EBIT	2183.1	0.0	0.0	-1.2	23.0	23.5	58.5
Tax	-654.9	0.0	0.0	0.3	-6.9	-7.1	-17.6
NPAT	1528.2	0.0	0.0	-0.8	16.1	16.5	41.0
Capex	328.6	10.8	67.0	65.2	2.1	47.1	46.5
Cash Flow pre Tax	2084.5	-10.8	-67.0	-65.2	25.0	-19.5	20.2
Cashflow Post Tax	0.0	-10.8	-67.0	-64.9	18.1	-26.6	2.7
NPV pre tax		337.6	438.3	547.4	577.2	654.4	699.6
NPV post tax		194.7	281.1	374.1	393.5	459.4	502.7

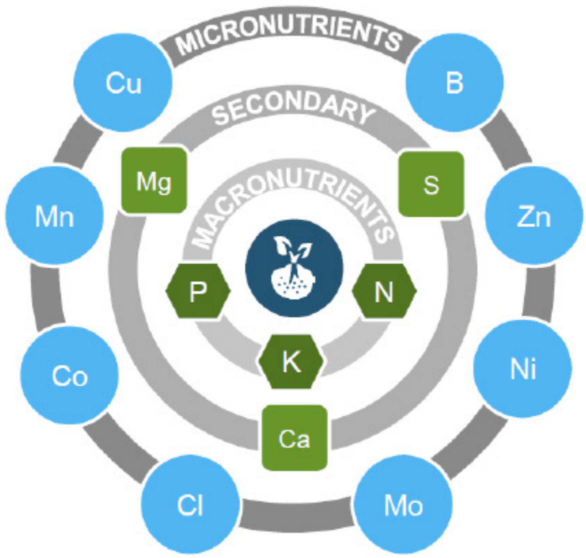
Source: Kalium Reserve release 3 October 2017, IIR estimates

FERTILIZER INTRODUCTION: SOP VS MOP AND POLYHALITE

Potassium is one of the big three macronutrients that make up fertilizers

- The increasing demand for food is increasing the demand for fertilizers of which potassium (atomic symbol K) is one part. Potassium is classed as a major nutrient, as opposed to a trace element, and is required in quantity. In regions of heavy cropping, potassium is required each cropping cycle.
- In 2017, the FAO estimated demand for nitrogen was 119.4Mt (as N), phosphate 46.8Mt (P_2O_5) and potassium 34.5Mt (as K_2O or potash). Of the secondary elements, sulphur consumption as fertilizer was 16Mt in the same year (The Sulphur Institute).

Figure 30 Crop nutrients -



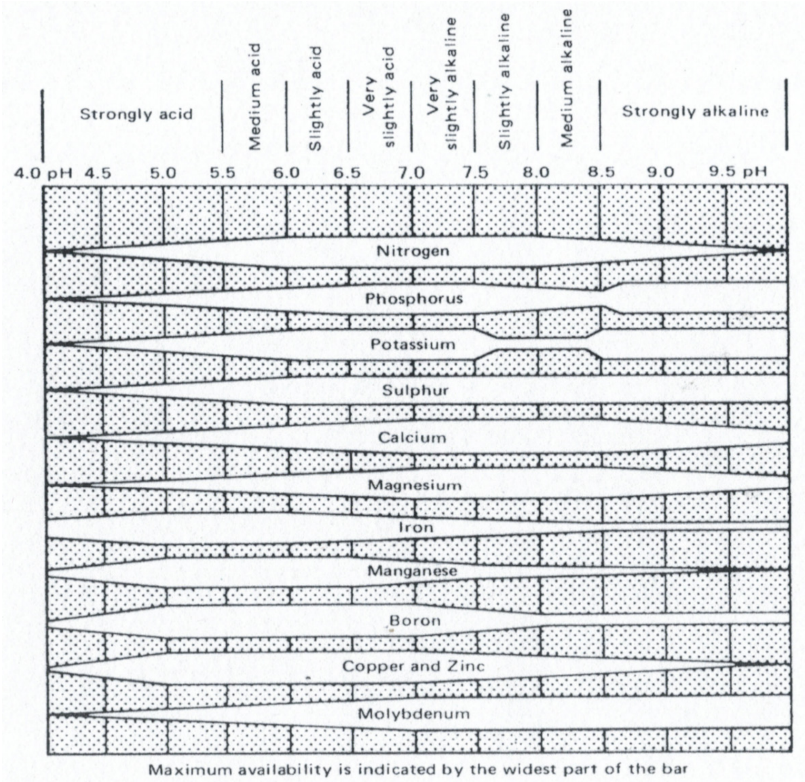
Source: Compass Minerals 2016 Annual Report

- Potassium has many different roles in plants:
  - In photosynthesis, potassium regulates the opening and closing of stomata, and therefore regulates CO2 uptake.
  - Potassium triggers activation of enzymes and is essential for production of Adenosine Triphosphate (ATP). ATP is an important energy source for many chemical processes taking place in plant tissues.
  - Potassium plays a major role in the regulation of water in plants (osmo-regulation). Both uptake of water through plant roots and its loss through the stomata are affected by potassium. Increased potassium is known to improve drought resistance.
  - Protein and starch synthesis in plants require potassium as well. Potassium is essential at almost every step of the protein synthesis. In starch synthesis, the enzyme responsible for the process is activated by potassium. Potassium has an important role in the activation of many growth related enzymes in plants.

Effective nutrient delivery depends on balance

- When applying fertilizer, more is not necessarily better, and this is where SOP has special advantages. Soil acidity and competition for uptake between competing elements affect plants' ability to absorb specific minerals, and different fertilizer products release their minerals over different time frames (eg slow release fertilizer products).

Figure 31 Effect of soil acidity on the take up of minerals



Source: Discovering Soils CSIRO 1977

- Figure 31 demonstrates the impact of acidity on mineral uptake. In acid soils (pH below 5.5) the plant's ability to absorb nitrogen, phosphorus and potassium is reduced, and ability to take up iron, manganese and boron is increased, reducing yield and in extreme cases rendering the plant poisonous. Where acidity is an issue, SOP is preferred over MOP because of the absence of chloride. Soil acidity is cumulative, and very expensive to reduce, so cumulative build-up is to be avoided.
- There is also some strange behaviour if the soils become too alkali, and at marginally high alkali levels of over 7.5, the take up of potassium is severely restricted. Alkalinity can be increased by the presence of ions like calcium (adding calcium carbonate is the most common way to reduce acidity or increase alkalinity). We will discuss polyhalite later, but the calcium in polyhalite can be a problem in some soils.
- For some crops, root and leaf structures are sensitive to chloride burn and so MOP is not used.
- Fertilizer is a cost to farmers, so there can be a preference for applying the minimum as late in the cropping cycle as possible. That typically means application during the period of peak growth, and only apply the minerals required. In the potash context, this factor is why MOP is generally preferred, because it is the simplest and most concentrated form of potassium available, if the chemistry allows its use.

Sources of potassium to agriculture

- The major sources are Muriate of Potash (MOP) and Sulphate of Potash (SOP). Other sources available to agriculture include Nitrate of Potash (NOP), and potash in various forms with trace elements like magnesium (SOPM). Polyhalite is a new product that emerged in 2011.
- MOP is the cheapest source potassium, and has the greatest market share. However, MOP cannot be used in soils where acidity is an issue, or for a number of plant types. Where soil chloride levels are higher than 600 mg/kg in the top 30 cm, the use of MOP should be avoided. Soil acidity is a major control over a plants' ability to absorb nutrients. The acidity issue means that SOP is effectively serving a separate market to MOP. Acidity is less of an issue in regions where there is sufficient rain to dilute or wash away the chloride. The more arid the environment, the bigger an issue chlorine and acidity becomes.
- SOP also provides sulphur, which is also essential for plant growth.

New Products - Polyhalite

- Polyhalite has typically 6-10% water in the crystal lattice with 14% potash (K_2O) 19% sulphur, 6% magnesia (MgO) and 17% calcium oxide (CaO_2). Polyhalite contains virtually no chloride.
- Some polyhalite was produced in the US during World War 2 but ceased when MOP became plentiful. The only operating polyhalite mine in the world at present is the Boulby operation of ICL in the UK. This mine started potash production in 1969. It first produced a polyhalite product in April 2011, and reached one million tonnes of cumulative production in August 2017. Boulby is ramping up from 130Ktpa to 600Ktpa, and is expected to produce 450Ktpa in 2017.
- Sirius is proposing a 10Mtpa polyhalite mine close to Boulby, and has reported negotiating 4Mtpa in take or pay contracts. In its 2017 prospectus, Sirius indicated it intended to sell its product at US$130-160/t FOB Teeside. At 14% potash, that is around US$1000/t of contained potash (K_2O) vs US$320/t for potash in MOP and US$1200/t for potash in SOP.
- The availability of polyhalite is likely to create new markets for fertilizer. Polyhalite sells itself as a package of minerals (potassium, sulphur, magnesium, calcium) and for certain applications it should be a very useful product. An example may be the very sandy and highly leached soils in the Brazilian Amazon Basin, where polyhalite may have a role as a relatively cheap, complete soil builder, and a supplier of a large range of minerals missing from the native soil.
- Sirius has established the Poly4 website with technical studies of polyhalite application and benefits. From a review of this site, a large number of studies appear to be targeting MOP markets. The strategy appears to be to recommend a blend of MOP and polyhalite (in say a 75:25 split). The polyhalite inclusion would reduce the MOP usage and add a number of other elements to the soil, and it is this overall balance that produces higher crop yields. This would impact the MOP market rather than the SOP market.
- There will be a significant amount of the production from Sirius that will end up competing directly with SOP. This impact would be start around 2023 and 2024 as the project ramps up to the 10Mtpa rate. However, in a number of environments, the high calcium content may take the soil into the alkali range where uptake of potassium is virtually shut down. We believe this is likely to be the case in typical Australian soils, for example.
- If a grower is seeking potassium specifically, MOP and SOP are likely to be preferred. MOP is a significantly cheaper source of potassium, and while SOP is currently comparable to polyhalite in cost of contained potassium, it is a third of the volume so cheaper to handle and spread, and it does not have the additional elements that could damage soil chemistry.
- Polyhalite is less soluble than MOP or SOP. There are some applications where this could be a major issue, but for most applications, soluability rate is less of an issue as long as differences in application timing and technique are adjusted (refer https://juniperpublishers.com/artoaj/pdf/ARTOAJ.MS.ID.555690.pdf).
- The impact of polyhalite on the SOP market is discussed in more detail in the next section.

Figure 32 Estimated annual production of various fertilizers expressed in different ways

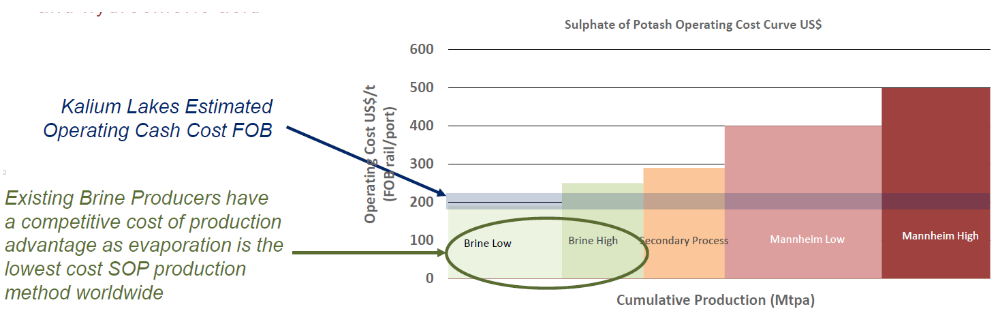
	MOP	SOP	NOP	SOPM
	KCl	K2SO4	KNO3	
Annual Product Sales Mtpa	55.0	6.0	1.4	1.3
Equivalent K_2O Mtpa	34.7	3.0	0.7	
Contained K Mtpa	28.8	2.5	0.5	

Source: http://farmercommunity.incitecpivotfertilisers.com.au/Latest%20News/MOP%20vs%20SOP

SOP PRICE DYNAMICS: MESSAGES FROM THE MARKET

- Muriate of Potassium (MOP) and Sulphate of Potassium (SOP) are markets with surprisingly separate price dynamics. The evidence for this is the stability of the SOP price since 2010, in a period of falling MOP prices (see Figure 34).
- SOP can be produced from MOP using the Mannheim process, accounting for almost 50% of current supply. The cash cost of the Mannheim is typically in the range of US$400-500/t but depending on the cost of MOP, energy and acid by-product disposal. Most of this capacity is in China. As a rule of thumb, Mannheim SOP carries a cost burden of US$200/t plus the MOP price.

Figure 33 SOP cost curve on an Ex Works basis to which must be added freight

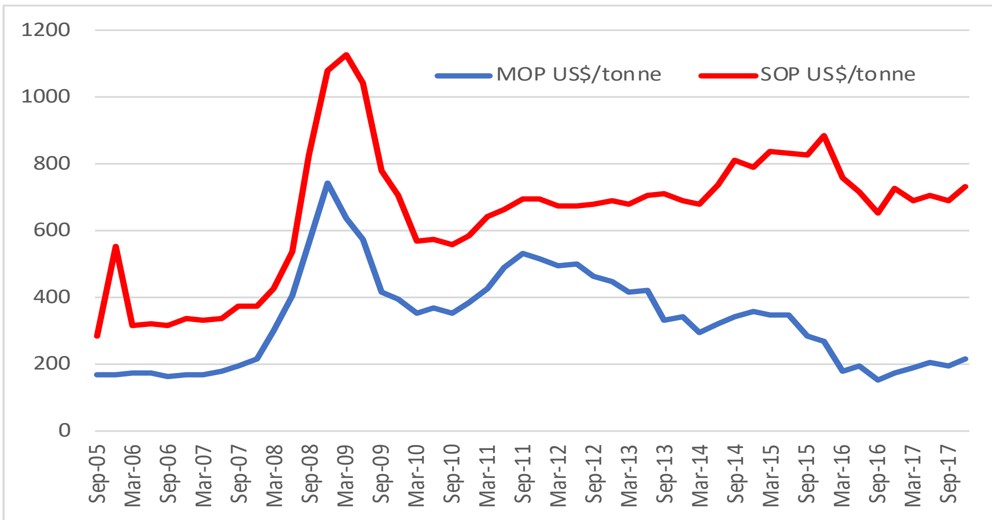


Source: Kalium Lakes presentation October 2017

- However, neither the cost curve, the value of the sulphur in SOP, nor the MOP price plus US$200/t of conversion costs explain the high level of the current SOP price of US$755-770/t (Profercy Report February 2018), which is trading at a US$400-500/t premium to MOP.
- The long term SOP price we have used in our valuation is US$500/t in 2017 dollars, which is supported by the cost curve in the figure above. While the tonnage base in not shown in Figure 33, it represents the current 7Mtpa global SOP supply.
- Market commentators forecast this premium will erode, without saying why it is currently so large. We believe there are some very powerful messages in the current price level, including shortage of supply, and rising costs of waste disposal, and the possibility that the premium may not erode as much or as fast as we are assuming in our US$500/t estimate.

PRICE DATA

Figure 34 Potash Corp & Compass Minerals MOP and SOP average realized prices US$/tonne delivered



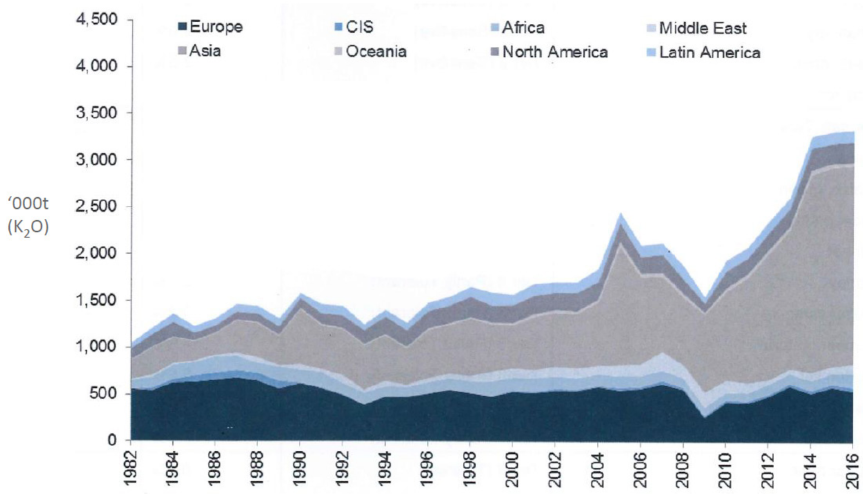
Source: Prices are the average quarterly realized including freight for North American sales for Potash Corp (MOP) and Compass (SOP)

- The Australian price of bulk fertilizer direct from port on 15 March 2018 was A$495/tonne for MOP (US$380/t) and A$950/tonne for SOP (US$760/t) ex Pinkenbah Port (Brisbane) with the same price at other ports, according to https://www.feedcentral.com.au/buy/buy-fertiliser/.

The MOP Market

- Average December 2017 quarter realized MOP price reported by Potash Corp was US$214/tonne and SOP price reported by Compass Minerals was US$734/tonne. Shipping costs to Australia are of the order of US$100/t, which will work in favour of Australian producers when selling to the local market.
- Until 30 July 2013, major and low cost MOP producers Uralkali and Beloruskali were part of a common marketing agreement (BCP). That agreement ended on that date, and the impact of the collapse on supplier discipline and resulting the MOP price weakness in Figure 34. However. The MOP price has been on the rise since September 2017.
- The global potash market (MOP + SOP) is well supplied over the next two years (see section on supply demand). This means that the current upward trend in MOP prices will be capped, and consensus appears to take the view that a MOP price of US$300/t ex works represents a long term balance, to which freight should be added.

Figure 35 SOP demand in tonnes of potash



Source: Fertecon, from Agrimin presentation 4 August 2017

The SOP Market

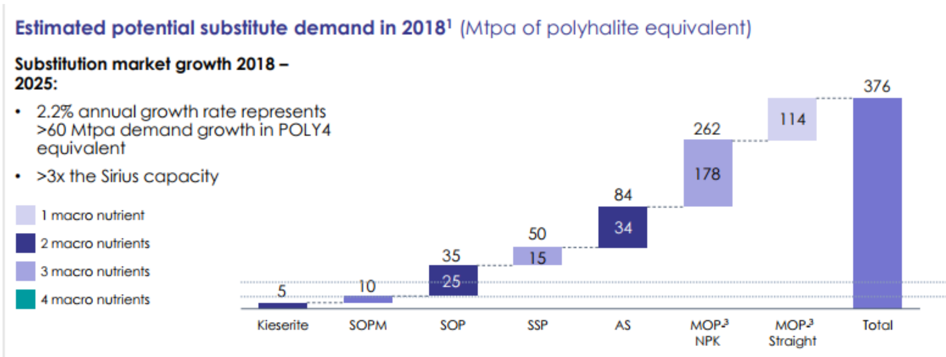
- Consumers of SOP have little or no ability to switch to MOP either because they are cropping in more arid environments where acidity is an issue, their crops are intolerant of chloride, or where MOP would cause unacceptable leaf and root damage. Soil acidity is cumulative, and while there can be some short term switching, permanent use of the wrong potash product can cause lasting damage to the soil chemistry.
- To the extent that switching has occurred, that happened some time ago, and if anything, a reduction in the SOP premium over MOP would probably add additional SOP demand as those users switched back.
- The SOP demand has seen very strong growth, doubling since 2010 (Figure 35).
- The historical premium of US$200/tonne of SOP over MOP generally relates to the differential in cost of production. About 50% or 3Mtpa of current SOP supply comes from Mannheim furnaces consuming MOP, pure sulfuric acid, and a significant amount of energy, and producing SOP and hydrochloric acid.
- The stability of the SOP price in the face of falling MOP (a feedstock) and lower oil and gas prices suggests that something else is at work.
  - First is the very strong growth in SOP demand over the period from 2009, driven by Asia and particularly China (Figure 35).
  - Second, the cash cost curve is either wrong, or is correct in terms of cash cost of production, but does not reflect the incentive price required to encourage new supply, ie adding the capital service charge to the A$200/t operating cost differential. This means that today we are seeing the incentive cost of building additional Mannheim furnaces, probably in China.
  - The cost curve may be wrong in that it is very hard to cost the impact of waste hydrochloric acid disposal, which has become an increasing issue in China in recent years. A number of Mannheim producers in China are adding calcium chloride circuits to deal with the HCl disposal issue, adding capital cost and operating cost.

- The current SOP price levels are encouraging new supply to enter the market, and the operating cost of these new mines is likely to be substantially lower than the Mannheim producers. It will be important that the Mannheim production remains the marginal cost source of supply, to maintain the SOP price premium over MOP, otherwise we will see a structural change in the SOP market price formation mechanism, and the premium would be at risk.
- The risk of SOP premium falling below US$300/t is low for three reasons.
  - The 3Mtpa of current Mannheim production is large relative to the new SOP supply proposed.
  - SOP demand is growing relatively strongly. Major new supply additions are still some years away.
  - A moderate lowering of the SOP price relative to the MOP price is likely to boost demand for SOP from current levels, creating more room for the new entrants, because anyone who can substitute SOP with MOP is likely to have done so.
  - Most of the new SOP projects are in the hands of new entrants, rather than incumbent producers, and the incumbents are likely to acquire the new producers and manage supply in due course.
  - We believe large polyhalite supply will be absorbed into new markets, into MOP replacement, and into growth in SOP demand, and its impact is accommodated in our selection of US$500/t SOP as a long term price.

More on the placement of polyhalite

- Sirius has made their own estimates of where the substitution markets may be, as shown in the figure below. They estimated that total polyhalite equivalent demand in 2018 would be 376Mt, and the SOP/SOPM markets would amount to 45Mt or 12%. If Sirius' full production is placed on this basis, 12% of the initial 10Mtpa would be 1.2Mtpa of polyhalite, or 340ktpa of SOP, which the SOP market would find very manageable.
- ICL has taken from 2011 to 2017 to find markets for 450Ktpa of polyhalite.
- Sirius reports having 4Mtpa of binding take or pay sales contracts, and 8.1Mtpa of binding and non-binding agreements in total. This represents a substantial increase on the ICL penetration rate, and points to a broad new market take up and broad multi-product substitution, rather than a focussed attack on the SOP market alone.

Figure 36 Sirius estimate of substitution potential for polyhalite



Source: Sirius presentation September 2017

Supply Demand forecasts for potash in all forms

- The Australian market is entirely supplied by imports. Domestic demand is around 70,000tpa of SOP and Kalium Lakes is targeting that market for its initial 75Ktpa of production. Kalium Lakes would have a strong freight advantage delivering into the Western Australian market. We have not assumed any such premium in our earnings.
- The Food & Agriculture Organization of the United Nations provides forecasts of fertilizer supply demand and capacity each year. We have included the 2017 forecast below.
- The data does not separate SOP from MOP. In general terms, of the 43.5Mt supply in 2015, about 40Mtpa is MOP and 3.5Mtpa is SOP measured on terms of potash or K_2O. In straight tonnage of SOP, that works out to be 7Mtpa.
- The tables are expressed in terms of Potash (K_2O), and highlight that there are industrial (ie non-food related) uses of potassium, and that there appears to be a continuing large surplus of capacity.

- Given the MOP prices have been falling since 2011, there has been and may still be excess capacity, but we believe that much of the capacity that has been unused over a period as long as 5 years, is likely to be significantly degraded and some is likely to have been permanently withdrawn from the market. Typically, the plant owners fund a new use for the assets, making some other more profitable cjemical product. The uptick in MOP price since September 2017 may be evidence of this reduction in capacity.
- Globally, the FAO forecast is for a rising surplus of capacity in the next few years. At present, most of this capacity is MOP production from Canada and Russia/Belorussia.
- Getting a picture of the SOP market on its own is much harder, which is why we pay more attention to the behaviour of the SOP price relative to the MOP price as discussed above.
- The current MOP price is low, equal to levels of 10 years ago, and at the present time the weakness is likely due to the arrival of new low cost capacity. THe current lift in MOP prices suggest that this surge in new capacity has been digested. We expect the lift in MOP prices from current levels to continue into the US$300-400/t range.

Figure 37 Potash (MOP + SOP etc) supply and demand- World and Oceania

'000 tonnes Potash (K2O)	2015A	2016A	2017F	2018F	2019F	2020F
WORLD						
K2O capacity	52942	55974	58111	61576	62136	64486
K2O supply capability	43571	42772	44868	47249	48898	49545
Non-fertilizer K2O demand	5626	5524	5586	5654	5720	5886
K2O available for fertilizer	37945	37249	39281	41596	43178	43659
K2O fertilizer demand	32838	33149	34048	34894	35978	37042
Potential K2O balance	5107	4100	5233	6701	7200	6617
Capability/Capacity	82.3%	76.4%	77.2%	76.7%	78.7%	76.8%
Balance/Capability	11.7%	9.6%	11.7%	14.2%	14.7%	13.4%
Demand Growth						
Non-fertilizer	nc	-1.8%	1.1%	1.2%	1.2%	2.9%
Fertilizer	nc	0.9%	2.7%	2.5%	3.1%	3.0%
OCEANIA						
K2O capacity						
K2O supply capability						
Non-fertilizer K2O demand	8	8	8	8	8	8
K2O available for fertilizer	-8	-8	-8	-8	-8	-8
K2O fertilizer demand	392	378	379	385	388	393
Potential K2O balance	-400	-386	-387	-393	-396	-401
Demand Growth						
Non-fertilizer	nc	0.0%	0.0%	0.0%	0.0%	0.0%
Fertilizer	nc	-3.6%	0.3%	1.6%	0.8%	1.3%

Source: Food & Agriculture Organization of the UN – World Fertilizer Trends and Outlook to 2020 (2017)

Figure 38 Asia and the Americas potash supply demand balance

"000 tonnes	2015A	2016A	2017F	2018F	2019F	2020F
ASIA						
K_2O capacity	10307	10453	11556	11556	11956	12076
K_2O supply capability	10082	10152	10773	11031	11072	11180
Non-fertilizer K_2O demand	3112	2964	2978	2995	3011	3125
K_2O available for fertilizer	6969	7187	7795	8035	8060	8055
K_2O fertilizer demand	16023	16084	16593	17077	14597	18182
Potential K_2O balance	-9054	-8896	-8799	-9042	-9536	-10127
West Asia						
K_2O capacity	3995	3995	4030	4030	4050	4080
K_2O supply capability	3656	3671	3704	3704	3723	3831
Non-fertilizer K_2O demand	97	100	103	106	110	113
K_2O available for fertilizer	3558	3570	3601	3597	3613	3718
K_2O fertilizer demand	260	276	291	308	326	347
Potential K_2O balance	3298	3295	3309	3290	3287	3371
South Asia						
K_2O capacity	65	65	65	65	65	65
K_2O supply capability	16	33	49	49	49	49
Non-fertilizer K_2O demand	415	364	375	389	401	412
K_2O available for fertilizer	-399	-331	-326	-340	-353	-363
K_2O fertilizer demand	2958	2991	3226	3407	612	3812
Potential K_2O balance	-3357	-3322	-3552	-3748	-3964	-4175
East Asia						
K_2O capacity	6247	6393	7461	7461	7841	7931
K_2O supply capability	6410	6448	7020	7278	7300	7300
Non-fertilizer K_2O demand	2600	2500	2500	2500	2500	2600
K_2O available for fertilizer	3810	3948	4520	4778	4800	4700
K_2O fertilizer demand	12805	12817	13076	13362	13659	14023
Potential K_2O balance	-8995	-8869	-8556	-8584	-8859	-9323
AMERICAS						
K_2O capacity	22305	25185	25225	25780	25780	25780
K_2O supply capability	16085	15476	16582	17407	17842	17942
Non-fertilizer K2O demand	1759	1792	1825	1859	1895	1931
K_2O available for fertilizer	14326	13684	14756	15548	15947	16011
K_2O fertilizer demand	11589	11833	11977	12129	12488	12830
Potential K_2O balance	2736	1851	2779	3419	3461	3181
North America						
K_2O capacity	20180	23060	23100	23655	23655	23655
K_2O supply capability	14381	13720	14826	15565	16000	16100
Non-fertilizer K2O demand	1159	1192	1225	1259	1295	1331
K_2O available for fertilizer	13222	12528	13600	14306	14705	14769
K_2O fertilizer demand	4856	4916	4929	4951	4978	4989
Potential K2O balance	8366	7612	8671	9354	9728	9780
Latin America & Caribbean						
K_2O capacity	2125	2125	2125	2125	2125	2125
K_2O supply capability	1704	1756	1756	1842	1842	1842
Non-fertilizer K_2O demand	600	600	600	600	600	600
K_2O available for fertilizer	1104	1156	1156	1242	1242	1242
K_2O fertilizer demand	6733	6917	7048	7178	7510	7841
Potential K_2O balance	-5630	-5761	-5892	-5935	-6267	-6599

Figure 39 European potash supply demand balance

"000 tonnes	2015A	2016A	2017F	2018F	2019F	2020F
EUROPE						
K_2O capacity	20330	20336	21330	24240	24100	26330
K_2O supply capability	17405	17146	17514	18812	19969	20423
Non-fertilizer K_2O demand	647	660	676	691	706	721
K_2O available for fertilizer	16758	16486	16839	18120	19263	19702
K_2O fertilizer demand	4187	4193	4390	4539	4669	4741
Potential K_2O balance	12571	12293	12449	13581	14594	14961
Central Europe						
K_2O capacity						
K_2O supply capability						
Non-fertilizer K_2O demand	52	53	54	56	57	58
K_2O available for fertilizer	-52	-53	-54	-56	-57	-58
K_2O fertilizer demand	650	650	700	750	780	800
Potential K_2O balance	-702	-703	-754	-806	-837	-858
West Europe						
K_2O capacity	5630	4946	4940	4840	4840	4640
K_2O supply capability	4088	3593	3589	3538	3569	3423
Non-fertilizer K_2O demand	495	507	522	535	549	563
K_2O available for fertilizer	3593	3086	3068	3002	3020	2860
K_2O fertilizer demand	2150	2100	2200	2250	2300	2300
Potential K_2O balance	1443	986	868	752	720	560
East Europe and Central Asia						
K_2O capacity	14700	15390	16390	19400	19260	21690
K_2O supply capability	13317	13553	13925	15274	16400	17000
Non-fertilizer K_2O demand	100	100	100	100	100	100
K_2O available for fertilizer	13217	13453	13825	15174	16300	16900
K_2O fertilizer demand	1387	1443	1490	1539	1589	1641
Potential K_2O balance	11830	12010	12335	13635	14711	15259
AFRICA						
K_2O capacity					300	300
K_2O supply capability					15	
Non-fertilizer K_2O demand	100	100	100	100	100	100
K_2O available for fertilizer	-100	-100	-100	-100	-85	-100
K_2O fertilizer demand	647	662	708	765	838	897
Potential K_2O balance	-747	-762	-808	-865	-923	-997

Source: Food & Agriculture Organization of the UN – World Fertilizer Trends and Outlook to 2020 (2017)

Sulphate of Potash (SOP) – Products and applications

Figure 40 SOP products and specifications

Name/Grade	Min. K_2O	Min. SO_4	Max. Cl	Applications
Compass Minerals USA				
Soluble Fines SOP Organic	50.0%	17%	0.8%	For liquid fertilizer solutions and suspensions.
Standard Fines SOP	50.0%	17%	0.8%	For solutions that will either be decanted or filtered.
Standard Fines SOP Organic	50.0%	17%	0.8%	For solutions that will either be decanted or filtered.
Industrial Fines SOP	50.0%	17%	0.8%	A sugar- fine crystalline SOP used industrial applications.
Greensgrade SOP	50.0%	17%	0.8%	For micro-sized blends or direct application (eg golf greens).
Choice Granular SOP	50.0%	17%	0.8%	Typically used by the turf and ornamental markets.
Choice Granular SOP Organic	50.0%	17%	0.8%	Typically used by the turf and ornamental markets.
Mid Granular SOP	50.0%	17%	0.8%	Sized for use by turf and ornamental markets.
Mid Granular SOP Organic	50.0%	17%	0.8%	Sized for use by turf and ornamental markets.
Ag Granular SOP	50.0%	17%	0.8%	For agricultural grade nutrient sources in broadcast spreaders.
Ag Granular SOP Organic	50.0%	17%	0.8%	For agricultural grade nutrient sources in broadcast spreaders.
K&S Germany				
Sulphate of Potash granular	50.0%	18.0%	1.0%	For mechanised spreading and bulk blending
Sulphate of Potash standard	50.0%	18.0%	1.0%	For manufacture of compound fertilizers
Sulphate of Potash low chloride	51.0%	18.0%	0.5%	For horticulture and making compound fertilizers
HORTISUL	52.0%	18.0%	0.5%	Virtually free of chloride for fertigation and foliar spray
Tessendelo Chemie Belgium				
SOP Standard	50.3%	52.6%	2.1%	For direct application or manufacture of compound fertilizers
GranuPotasse	50.3%	52.6%	2.1%	For bulk blending or for direct application
SoluPotasse	50.9%	55.8%	0.6%	A fast dissolving highly soluble form for fertigation
K-Leaf	52.0%	55.8%	0.2%	A very fast dissolving, highly soluble for foliar application
SQM Chile				
Agricultural Grade - Granular	51.0%	54.0%	1.5%	Agricultural Grade - Granular
Soluble Grade – Crystallized	51.0%	54.0%	1.0%	Soluble Grade - Crystallized
Ultrasol SOP-52	52.0%	53.0%	1.0%	Ultrasol SOP-52

Source: http://www.sopib.com/characteristics.html

- SOP is a combination of the two essential nutrients, potassium and sulphur, forming a highly concentrated fertilizer. As both nutrients are soluble in water SOP is considered as a quickly acting fertilizer to prevent potassium and sulphur undersupply, to correct existing nutrient deficiencies in crops, and imbalances in soils.
- In the soil, sulphate of potash immediately dissociates into the cation K^+ and the anion SO_4^{2-}; nutrient forms which are readily available for plant uptake. As no oxidation or reduction processes are involved to release these nutrients into the soil an application of SOP has no impact on soil pH.
- All grades and forms of SOP offered in the market have a maximum content of 1 % Chloride which makes SOP the best source of potassium for chloride sensitive crops and intensive cropping systems.
- Grades of fine, standard or granulated SOP fertilizers are suited for mechanized spreading, bulk blending or straight application. Special grades of highly concentrated crystalline SOP are available for liquid formulations, foliar application and fertigation systems.
- The Beyondie Potash project will produce standard and granulated products

FINANCIAL STRUCTURE

	Million
Issued Shares 22 January 2018	169.80
Of which shares escrowed until 1 Dec 2018	57.77
Performance Shares	20.00
Options Exercise 25cps until 16 Dec 2019 escrowed to 21 Dec 2018	9.00
Options Exercise 42.5cps until 29 Sept 2020	0.33
Options Exercise 52.5c 22 Jan 2020	0.84
Options Exercise 52.5c 11 Jan 2021	4.00
Total Diluted Capital	203.97

Source: Company 3B release 22 January 2018

BOARD AND MANAGEMENT

- **Mr Malcolm Randall, Chairman** (Dip Applied Chem, FAICD) holds a Bachelor of Applied Chemistry Degree and has more than 45 years' of extensive experience in corporate, management and marketing in the resources sector, including more than 25 years with the Rio Tinto group of companies. His experience has covered a diverse range of commodities including iron ore, base metals, uranium, mineral sands and coal. Mr Randall has held the position of chairman and director of a number of ASX listed companies. Past directorships include Consolidated Minerals Limited, Titan Resources Limited, Northern Mining Limited, Iron Ore Holdings Limited and United Minerals Corporation NL. Current directorships include MZI Resources Limited, Thundelarra Limited, Summit Resources Limited and Magnetite Mines Limited.
- **Brett Hazelden, Managing Director and CEO** (B.Sc. MBA GAICD) is a Metallurgist who brings more than 19 years' experience in project management, engineering design and operations servicing the Australasian resources industry. His previous responsibilities include project management, feasibility study evaluation, engineering and design, estimating, financial evaluation, cost control, scheduling, contracts and procurement, business risk and strategic development. As well as other roles, he has held senior positions at Rio Tinto, Fluor, Newcrest Mining and Iron Ore Holdings. Brett Hazelden has studied, managed and executed projects from small scale works up to multi-billion dollar complex developments. He has been responsible for environmental permitting and approvals, heritage, native title negotiations, external relations, as well as tenure management. Brett has also been involved in numerous mergers, acquisitions and due diligence reviews in recent years.
- **Rudolph van Niekerk Executive Director** (B.Eng. Mechanical GAICD) is a professional in the mining and resources industry with more than 12 years' experience in project and business management. Previous positions include senior engineering roles for Ausenco, Anglo Gold Ashanti and BCI Minerals. During his career Rudolph van Niekerk has held a range of different roles in the management of projects and operations. His various responsibilities have included financial evaluation, risk review and management, project management, development of capital and operating cost estimates, budget development and cost control, design management, planning, reporting, contract administration, quality control, expediting, construction, commissioning, production ramp-up and project hand-over to operations.
- **Mr Brendan O'Hara Non Executive Director** (BJuris, LLB, SF Fin) holds a Bachelor of Jurisprudence (Hons) and Bachelor of Laws. He is a Senior Fellow of FINSIA, a former legal practitioner of the Supreme Court of WA and former member of the Business Law Section of the Law Council of Australia. Mr O'Hara has many years' experience as a director of Australian listed companies, including eight years as Executive Chairman of an ASX listed company (Summit Resources Limited). His earlier roles with the ASX (as State Executive Director and Manager – Listings), underpin a wealth of experience involving international transactions, corporate governance, risk management systems, contract negotiation / execution and government relations.

BACKGROUND DATA

Figure 42 Chemical Formulae

Mineral	Formula	Alternative Formula	Alternate Name
Anhydrite	$CaSO_4$		
Astrakanite	Na_2SO_4-$MgSO_4$-$4H_2O$	$Na_2Mg(SO_4)_2$-$4H_2O$	
Bischofite	$MgCl_2$-$6H_2O$		
Bitterns	$MgCl_2$ or $MgSO_4$		
Borates	BO_3 or BO_4		
Boron	B_2O_3		
Bromine	Br_2		
Calcite	$CaCO_3$		
Calcium	Ca		
Carnallite	$KMgCl_3$-$6H_2O$		
Chloride	Cl		
Epsomite	$MgSO_4$-$7H_2O$		
Glauberite	Na_2SO_4-$CaSO_4$	$Na_2Ca(SO_4)_2$	
Gypsum	$CaSO_4$-$2H_2O$		
Halite	NaCl		
Hexahydrite	$MgSO_4$-$6H_2O$		
Kainite	$MgSO_4$-KCl-$34H_2O$	$KMgSO_4Cl$-$3H_2O$	
Korshunovskite	$Mg_2(OH)_3Cl$-$4H_2O$		
Leonite	K_2SO_4-$MgSO_4$-$4H_2O$	$K_2Mg(SO_4)_2$-$4H_2O$	
Lithium	Li		
Magnesium	Mg		
Magnesium chloride	$MgCl_2$		
Magnesium oxide	MgO		
Magnesium sulphate	$MgSO_4$		
Pentahydrite	$MgSO_4$-$5H_2O$		
Picromerite (Schoenite)	K_2SO_4-$MgSO_4$-$6H_2O$	$K_2Mg(SO_4)_2$-$6H_2O$	
Potassium	K		
Potassium oxide	K_2O		
Potassium Sulphate	K_2SO_4		Sulphate of potash (SOP), potash
Potassium magnesium sulphate	K_2SO_4-$Mg_2(SO_4)_2$	$K_2Mg_2[SO_4]_3$	Sulphate of potassium magnesium (SOPM)
Potassium nitrate	KNO_3		Nitrate of potassium (NOP)
Schoenite (Picromerite)	K_2SO_4-$MgSO_4$-$6H_2O$	$K_2Mg(SO_4)_2$-$6H_2O$	
Sodium	Na		
Starkeyite (Cranswickite)	$MgSO_4$-$4H_2O$		
Sulphates	SO_4		
Sylvite (Potassium chloride)	KCl		Potash or muriate of potash (MOP)
Thenardite	Na_2SO_4		Salt cake
Uranium	U_3O_8		
Water	H_2O		

Source: Crystal Peak - Lake Sevier Project 43-101 2013

- Fertilizer commentators talk about potash volumes in a number of different ways, which can cause confusion, including:
- MOP (KCl), Muriate of Potash
- SOP (K2SO4), Sulphate of Potash
- Potash, which generally means potassium oxide (K2O), and
- Contained potassium (K).
- For SOP, world consumption is around 7Mtpa of SOP or 3.5Mtpa of K2O equivalent.
- 2.23 tonnes of SOP contains 1 tonne of potassium (K).

NOTES:

NOTES:

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