

# Galaxy Resources: “first in, best dressed” in the Lithium space

With the revival of interest in the Lithium space and us having declared 2016 to be the **Year of Lithium**, it seems timely to visit one of the veterans of the space which has ridden the bucking bronco of the markets, been tossed off once and is now back in the saddle.



Galaxy Resources Limited (ASX:GXY) has gone full circle. It was the outlier hard rock Lithium story at the start of the Lithium boom with its focus being the Mt Cattlin spodumene deposit in Western Australia when everyone else was off chasing LatAm *salares*. After bringing that to production, then focusing on the downstream with a processing plant in China, then disposing of that plant and then JVing out the Australian mine, it has parallel processed an Argentine *salar* in recent years and that has now moved into poll position in its list of focuses.

Nevertheless with its residual stake in Mt Cattlin and now its evolving Latin brine focus, Galaxy is the only listed company we can think of (though Talison used to be an example) that straddles the two types of mineralisation (and the two continents. Clearly it hopes the ultimate outcome will be as profitable for shareholders as the ultimate fate of Talison.

## **Salt of the Earth**

We jest though the project is called Sal de Vida which is Spanish for Salt of Life. The project is located in north-west Argentina in what is known as the ‘Lithium Triangle’, the current source of more than 60% of the world’s annual

production of lithium.



Galaxy controls 100% of the brine mineral rights over more than 385 square kilometres on the eastern half of the Salar del Hombre Muerto, which lies in the high altitude Puna, a plateau comprised of basins and ranges discrete from the much larger Cordillera-bounded Altiplano basin to the north.

The Salar de Vida lies approximately 1,400 kilometres north-west of Buenos Aires at an altitude of 4,025 metres and is accessible from the city of Salta via an all-seasons road, and there is a major powerline 115 kilometres away.

The western half of the Salar de Vida is the site of Argentina's only commercial scale lithium mining operation owned by Minera del Altiplano.

### **Brines in LatAm**

Much of the current production comes from brines in the Salar de Atacama (in Chile) and the Salar del Hombre Muerto (in Argentina). As we have written in the past there are a number of listed and unlisted players in the Argentine space. Orocobre listed on the ASX is the most advanced with the Salar de Olaroz but we first starting looking at this area when Admiralty Resource's Rincon project was in its formative stages. That was later acquired by the resources hedge fund, Sentient, and has fallen behind Orocobre.



As mentioned earlier the western half of the Salar de Vida is the site of Argentina's only commercial scale lithium mining operation exploited by a subsidiary of FMC Corporation. The Fenix operation has been producing lithium since 1997 and according to FMC's website has a mine life of over 75 years.

## **Location and Geology**

The Salar del Hombre Muerto lies in the high altitude Puna, a plateau comprised of basins and ranges. Outcropping basement at Farallon Catal divides the basin into Western and Eastern sub-basins. The origin of lithium in the brines of the Puna is not well known. The area is underlain by an extensive magma chamber at depths of only 4km and this could be the ultimate source, lithium being transported to the surface via volcanic activity, especially hydrothermal vents. It is not known whether the transfer was as a result of the leaching of lithium-bearing volcano clastic sediments or by the recycling of trapped lithium-bearing solutions.

The Sal de Vida brines average about 780mg/L Li. They also have potassium concentrations averaging around 0.87mg/L K, low magnesium and sulphate. High magnesium content can increase the production costs of lithium carbonate. The Sal de Vida Mg:Li ratio of approximately 2.2 and SO<sub>4</sub> Li ratio of 11.5 are low by industry standards. The Salar de Atacama in Chile, the largest lithium producing brine operation in the world, reports Mg:Li ratios of more than 4 and Salar de Uyuni in Bolivia has an Mg:Li ratio of more than 14. In addition to the brines, the Salar hosts near surface deposits of ulexite, a sodium-calcium borate mineral mainly used for the production of boric acid.

## **The Resource**

A maiden JORC-compliant Reserve estimate of 1.1 million tonnes of retrievable lithium carbonate equivalent and 4.2 million tonnes of potassium chloride (potash or KCl) equivalent supports total annual production over a 40 year period.

## **The “Secret” of the Salares**

A *salar* is a predominantly dry lake bed within a restricted drainage basin. Normally, the dry climate and lack of drainage results in the deposit of salt and borate minerals with sand

and clay intervals. Just below the surface, the pore spaces of the unconsolidated sands, silts and salt bodies are filled with water. Near surface, the water is brackish and below approximately two metres in depth, the water is consistently very salty (brine). In addition to ordinary salt (sodium chloride), the brines also contain high concentrates of dissolved potassium chloride, lithium chloride and boron.

All mining is a chemical process to some degree. The production of lithium and its by-products highlights this fact. Firstly the brines are evaporated into lined evaporating ponds, with the evaporation rate at the *salar* being around 3,000mm per annum. Then the output from the evaporating ponds requires the selective precipitation of calcium and magnesium cations (positively charged ions) that interfere in the recovery of lithium of sufficient quality.



These pre-treatments require the input of lime and sodium sulphate. To produce 15,000 tpa of LiCl will require approximately 84,000 tpa of sodium sulphate.

The brine passes through a series of evaporation ponds (phases B, C & D above). These are all of one metre in depth. If Magnesium is an issue then it is removed at Phase C. Then the potash is extracted at the concentrated brine phase (E). Finally the ionization plant (at phase F) creates the finished chemicals for bagging and then export.

## **The DFS**

In Galaxy's estimation the Sal de Vida deposit is "one of the world's largest and highest quality" undeveloped lithium brine deposits. In the words of Mandy Rice-Davies, they "would say that wouldn't they". But they have good reason to do so considering that they own the other part of a *salar* with one of the most substantial producers in the world.

In April 2013, Galaxy released a Definitive Feasibility Study positing a low-cost, long-life lithium and potash operation. The DFS outlined a project site that, when completed, would include evaporation ponds, a battery grade lithium carbonate plant and a potash plant.

This study estimated, at a 10% discount rate that the pre-tax net present value would be US\$645 million or US\$380 million post tax. Sal de Vida has the potential to generate total annual revenues in the region of US\$215 million and operating cash flow before interest and tax of US\$118 million per annum at full production rates.

### **Scalability**

After production, scalability is our second most favorite word and we when use it we imply smaller rather than larger. It is pleasing to see that Galaxy have also taken this issue to heart and have also considered alternative low-cost, scalable development options at Sal de Vida. The options targeted have an initial capital investment limited to US\$100 million and output of saleable product within two years of construction commencing. All development options consider modular designs, providing the flexibility to add units and scale up to the capacity of 25,000 tonnes per year of lithium carbonate and 95,000 tonnes of potassium chloride.

### **Mt Cattlin – on the Move Again**

When J.P. Morgan was asked how he got so wealthy, he sagaciously commented “I sold too soon”. Well might we say that about Galaxy’s transaction passing management of the Mt Cattlin asset over to General Mining (ASX:GMM) which was struck on the eve of the Great Lithium Rebound.

When first mooted the Mt Cattlin was aiming to produce 137,000 tonnes of 6% spodumene concentrate per annum. The mine also has a Tantalum by-product credit which was expected to be 56,000 lbs per annum of Tantalum Oxide if production reached

the aforementioned spodumene tonnages.

For a couple of years now Mt Cattlin has been mothballed. It was for a brief period the “other” Australian Lithium producer from spodumene with the “big” producer being the Greenbushes mine, which was owned by Talison, until that company was taken over for around \$760mn by a consortium of a Chinese producer and Rockwood.

In February of last year, General Mining cut a deal with Galaxy under which it was granted the right to solely operate at the Mt Cattlin Project for three years with an option to purchase 100% interest in Mt Cattlin for AUD\$30mn plus a 3% net smelter return, at any time during the three year period. GMM would pay a lease fee of AUD\$2.5mn per annum to Galaxy, and a 10% production royalty. GMM at the time planned to commence Tantalum production at Mt Cattlin within approximately 6 months with Lithium not even in consideration.

However the deal was recomposed along the way (early June 2015) as a 50/50 deal and here we are nearly a year later and it is drawing nearer to production but is not there yet. In recent weeks GMM announced that it had met its 31 December 2015 deadline under the altered agreement by committing to an initial AUD\$7mn capital spend on the recommencement of production at Mt Cattlin.

This means that, upon the restart, General Mining will earn its initial 14% equity and 50% profit interest in the Mt Cattlin Project as per the June agreement.

All long lead items required for the restart were ordered in late December 2015, with the 2016 production timeline comprising:

- Fines circuit commissioning – late March 2016
- Coarse circuit commissioning – late June 2016
- First export of concentrate – estimated July 2016
- Plant optimisation process – completed December 2016

In October it was announced that Mitsubishi would buy 100% of the spodumene output of Mt Cattlin. Understandably GMM's stock price has been on an absolute tear as a result of these developments.

As for Mt Cattlin, the comparative cross-sections below are a good visualisation.



Greenbushes is the long-producing property of Talison. Mt Cattlin is now owned by the GMM/Galaxy's JV. Talison has the most problematical property logistically but is compensated with a good grade. Neometals' Mt Marion has the advantage of a minimal strip ratio and a grade that is double Mt Cattlin's. Strip ratios for the Mt Marion deposits range from 1:1 to 2:1. Meanwhile Mt Cattlin has the Tantalum credits.

## **Conclusion**

Galaxy was "first in, best dressed" in the Lithium space and learnt the lessons before many of the others. At least from the outside it appears a lesson to learn is to be wary of "Chinese bearing gifts". Fortunately Galaxy eventually managed to escape from that relationship and managed to get the "money and the house" in the form of the Mt Cattlin asset. It has since sliced and diced that asset, and up-focussed its Sal de Vida property.

Now it seems ready to enter the fray as a producer again using its cred as a mine-builder to lure the ever-wary Japanese and Korean seekers of Lithium sources with Galaxy's past track record of "getting it done". The goal is having them panting for some Sal de Vida.