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# FIRST SOP SAMPLES PRODUCED FROM LAKE WELLS EXCELLENT RESULTS FROM EVAPORATION AND PROCESS TESTWORK

Salt Lake Potash Limited (**the Company** or **Salt Lake**) is pleased to announce that ongoing results from a range of process development testwork have significantly enhanced the Lake Wells process model and reinforced the potential for the Project to become a globally significant Sulphate of Potash (**SOP**) crop nutrient source.

#### Highlights:

- Substantial volumes of brine from Lake Wells have been concentrated into harvest salts (Potassium and Sulphate mixed salts) in three separate trials under simulated and actual site conditions.
- International process development company, Hazen Research Inc. (Hazen), have processed 240kg of Lake Wells brine to produce harvest salts. Flotation trials on the salts achieved excellent separation of halite from the harvest salts. The conversion and crystallisation of the salts then produced the first Sulphate of Potash (SOP) samples from Lake Wells brine.



Figure 1 – Lake Wells' SOP

- An extensive Site Evaporation Trial (SET) has been established at Lake Wells. The SET has to date processed approximately 30 tonnes of brine and begun to produce harvest salts on a continuous basis. The SET will continue to operate for up to 12 months generating site specific evaporation data and producing sufficient harvest salts for bulk production of SOP samples for distribution to potential partners and customers.
- Process testwork at Bureau Veritas (BV) in Perth has processed 90kg of brine to produce 3.25kg of mixed product salts and BV is continuing trials on a further 2,500kg of brine aimed at refinement of the Lake Wells process design.

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#### The Lake Wells SOP Production Process

The proposed process for production of SOP at Lake Wells first sees brine extracted from Lake Wells concentrated in a series of solar ponds to induce the sequential precipitation of salts, firstly eliminating waste halite and eventually producing potassium-containing salts (Harvest Salts) in the harvest ponds.

The Harvest Salts are treated in a processing plant to convert these salts into SOP, while minimising deportment of chloride (a contaminant) to the product. The SOP production process consists of crushing, reverse flotation to remove chlorides, conversion of the mixed sulphate salts to schoenite, and crystallisation of the schoenite to SOP before drying and packaging.



Figure 1 – Simplified Lake Wells SOP Conceptual Flowsheet

#### **Bench Scale Trial – Hazen Research**

Hazen Research, Inc. is a world class industrial research and development firm located in Golden, Colorado that has developed hundreds of hydrometallurgical, pyrometallurgical, and mineral beneficiation processes for most commercial metals and industrial minerals, and many inorganic and organic chemicals, including potash and other crop nutrients.

Salt Lake engaged Hazen to complete an evaporation, flotation and crystallisation trial on a representative sample of Lake Wells brine. The Hazen evaporation test was monitored using a USBM theoretical model; the actual evaporation pattern followed the modelled theoretical pattern very closely.

Hazen first evaporated an initial 240kg charge of brine under simulated site conditions producing 14kg of harvest salts for further testing.





Figure 2 – Brine Evaporation at Hazen – Prior to Halite Harvest.

Sighter rougher reverse flotation tests were then conducted on the harvest salts (see Figure 3). Excellent initial halite separations were achieved in reverse flotation with approximately 90% of the halite removed from the harvest salts. Further rougher tests followed by rougher-cleaner and rougher-scavenger tests are planned to refine the process design in the coming months.





Figure 3 – Rougher Flotation Test On Lake Wells Derived Mixed Sulphate Salts.

Flotation tails (harvest salt concentrate) were then converted to schoenite under controlled temperature and dilution conditions and filtered to recover the schoenite concentrate. XRD and ICP analysis of the converted schoenite showed excellent conversion to approximately 99% schoenite.

The schoenite was added to a saturated  $K_2SO_4$  brine at 55°C. At these conditions, SOP was crystallized from solution by selective dissolution and the Company successfully produced its first solid SOP marketing samples.





Figure 4 – Lake Wells SOP Produced by Hazen

### Site Evaporation Trial

A large scale, continuous Site Evaporation Trial (SET) has been established at Lake Wells to define process design criteria for the halite evaporation ponds and subsequent harvest salt ponds.

The objectives of the SET are to:

- Refine the solar evaporation pathway, under actual site conditions, for Lake Wells brine. The analysis of this pathway will refine the salting points of the various salts along the evaporation pathway allowing for the completion of a detailed mass balance for the pond system;
- Refine the quality and quantity of brine and salts produced at the various points along the evaporation path;
- Define the distribution in various salts of potassium, magnesium and sulphate through the evaporation system;
- Provide design information for brine in-flow requirements, pond area, required number of ponds and flow requirements between ponds for a commercial facility; and
- Determine opportunities for recycle of bittern or salt that may improve potassium, magnesium or sulphate recovery to the harvest salts.
- Provide bulk salt samples for further process testwork and production of bulk SOP samples for potential offtake partners and customers.



The outputs of the ongoing SET test work will also provide key inputs into the basis of costings for the halite and harvest evaporation ponds for the Lake Wells SOP project and assist in the development of a more extensive test work program include:

- Halite Evaporation Pond Design: On-lake pond construction trial;
- **Flotation Test Work:** Collected mixed salts from the harvest ponds will provide the inputs for flotation work;
- **Conversion Test Work:** Outputs from the flotation trials above will provide inputs for conversion design trials; and
- **Crystallisation Trials:** Outputs from the flotation trials above will provide inputs for crystallisation test work.

Brine is introduced to the first Halite Pond, H1, via a small, hand dug surface trench. The brine progresses on a continuous basis through a series of six ponds as it concentrates through evaporation: two halite ponds; two transition ponds; and two harvest salt ponds.



Figure 5 – SET Train 1 with Product Ponds in the Foreground

To date approximately 30 tonnes of Lake Wells brine has been processed through SET Train 1, establishing an initial continuous load of salts and enriched brine. Small quantities of harvest salts have been recovered and the SET will produce tens of kilograms of harvest salts per week on a continuous basis in coming months. The harvest salts recovered from the SET contain 79% Halite (NaCl) and 21% Kainite (KMg(SO<sub>4</sub>)Cl(H2O)<sub>2.75</sub>) (see Figure 6) mirroring the salts recovered from the final stage of the Hazen evaporation trial which formed the basis of the Hazen flotation work.





Figure 6 – XRD trace of Harvest Salts Recovered from SET



Figure 7 – XRD Results showing the Halite and Kainite Split





Figure 8 – Harvest Salt Build up in SET Pond Prior to Harvest

The SET will operate over several months across a variety of weather conditions. Train 1 will process approximately 500kg of fresh brine per day and Train 2 will double that volume when established.

An Automatic Weather Station (AWS) has been established at the SET site, providing comprehensive, continuous data for temperature, solar radiation, pan & theoretical evaporation, relative humidity and wind velocity and direction. The AWS data combined with actual evaporation records from the nearby SET will allow for sizing and detailed production modelling of commercial scale evaporation ponds.



Figure 9 – AWS Installed at Lake Wells



### Bench Scale Trials – Bureau Veritas

The Company engaged international laboratory and testing company, Bureau Veritas (BV) in Perth, to conduct a series of tests evaporating brine at simulated average Lake Wells site conditions. The aim of the BV trials is to monitor the chemical composition of the brine and salts produced through the evaporation process to establish:

- Concentration thresholds in the brine chemistry which can be used to maximise the recovery of harvest salts and minimise the quantity of dilutive salts into a process plant;
- The quantity and composition of harvest salts which will for the plant feed in commercial production; and
- The potential for any internal evaporation pond recycle streams that may improve harvest salt recovery.

The first trial in the series consisted of evaporation of 90kg of brine on a load cell to monitor evaporative loss. The temperature of the brine was controlled to a constant 23°C using infra-red lamps and air flow across the brine surface was provided by a fan.



Figure 10 – BV Evaporation Pan Set Up.



From the initial 90kg charge 3.25kg of harvest salts (dry basis) were collected and analysed for chemical composition and crystal structure.

The results of the trial can be seen in Figure 11, below:



Figure 11 – Concentration of Selected Major Ions in Harvested Salt Plotted Against Evaporation Completion

The chart above shows the sharp transition from Halite dominated salts to harvest salts. Analysis of harvest salts is pending.

The evaporation pathway at BV appears to closely match the pathway demonstrated at Hazen Labs. BV has now commenced evaporation of a further 2,500kg of brine to provide harvest salts for further flotation and crystallisation testwork, for refining the SOP production model and also to provide additional customer samples.

#### **Competent Person Statements**

The information in this report that relates to Process Testwork Results is based on, and fairly represents, information compiled by Mr Bryn Jones, BAppSc (Chem), MEng (Mining) who is a Fellow of the AusIMM, a 'Recognised Professional Organisation' (RPO) included in a list promulgated by the ASX from time to time. Mr Jones is a consultant of Inception Consulting Engineers Pty Ltd. ("Inception"). Inception is engaged as a consultant by Salt Potash Limited. Mr Jones has sufficient experience, which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking, to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr Jones consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.