

## Rhyolite Ridge Pilot Plant Produces First High-Purity Boric Acid

### Highlights

- Rhyolite Ridge pilot plant now operational and the main run processing lithium-boron ore has commenced
- Premium quality boric acid successfully produced, with lithium carbonate to follow
- Boric acid samples dispatched to potential off-take partners
- Rhyolite Ridge uniquely positioned to become a major, low-cost supplier of lithium and boron products to major markets in the USA and Asia
- Rhyolite Ridge one of only two known large lithium-boron deposits globally

Tuesday, 9 July 2019 – Emerging lithium-boron supplier, **ioneer Ltd (ioneer or the Company) (ASX: INR)** announces initial boric acid production from its pilot plant and that the main run of ore processing has commenced.

The pilot plant in Vancouver, Canada forms a key part of the Definitive Feasibility Study (DFS) for the Company's 100% owned Rhyolite Ridge Lithium-Boron Project (**Rhyolite Ridge or the Project**) in Nevada, USA.

The pilot plant will simulate the commercial flowsheet processes in a continuous cycle and:

- optimise and finalise the processing flowsheet for the DFS;
- collect the data required for detailed design engineering of the processing plant;
- assess the quality of the final boric acid and lithium carbonate products;
- generate sufficient products to support ioneer's off-take marketing efforts; and
- serve as a demonstration plant for strategic and financing partner discussions.

The main run of processing Rhyolite Ridge ore will continue for several weeks. The pilot plant will process a total of approximately 28 tonnes of outcrop and drill core ore samples.

Output from the plant will provide lithium and boron products within defined industry specifications for supply to potential customers as part of ongoing off-take negotiations. The Company is also hosting potential customers and partners for inspections of the pilot plant while the main run is ongoing.

Managing Director of ioneer, Mr Bernard Rowe, commented:

"The pilot plant enables us to demonstrate the integrated process flowsheet, produce lithium carbonate and boric acid for marketing activities and collect the required data for the engineering design and scale up.

"The initial production of boric acid has resulted in premium quality product which will be well received by the market and suitable for toughened glass products such as phone and television screens. We are now sending the first of our boric acid samples to potential off-take customers who have expressed strong interest in our product.

"We expect the pilot plant will demonstrate the ability of Rhyolite Ridge to produce premium end-products using a highly efficient and low-cost process, which can be readily scaled for commercial production.

"The successful result from the initial run of ore through the pilot plant gives us strong confidence that our commercial process is both straightforward and scalable."

Kemetco Research Inc (**Kemetco**) is operating the pilot plant which will be available for Ioneer to undertake further test work as the project progresses. Kemetco is one of Canada's largest privately-owned contract research and development laboratories, specialising in extractive metallurgy, chemical processing and specialty chemical analysis. Kemetco has extensive experience with the Rhyolite Ridge lithium-boron flowsheet having completed prior bench-scale test work as part of the Company's Pre-Feasibility Study (PFS) in 2018.

As detailed below, the initial boric acid produced by the pilot plant contains very low levels of impurities and is a premium-grade product.

### Chemical Analysis of Boric Acid from Rhyolite Ridge Pilot Plant

Compound or Element	Units	Rhyolite Ridge Boric Acid	Typical Industry Specifications
Boric Acid (H <sub>3</sub> BO <sub>3</sub> )	%	>99.9	>99.9
Sulphate	ppm	141	<250
Chloride	ppm	<5	<10
Iron	ppm	<4	<7
Calcium	ppm	<4	<50
Sodium	ppm	54	<200
Lead	ppm	<8	<20
Arsenic	ppm	<8	<100
D50 particle size	microns	310	

Note: Analyses were conducted by Kemetco using ICP methods.



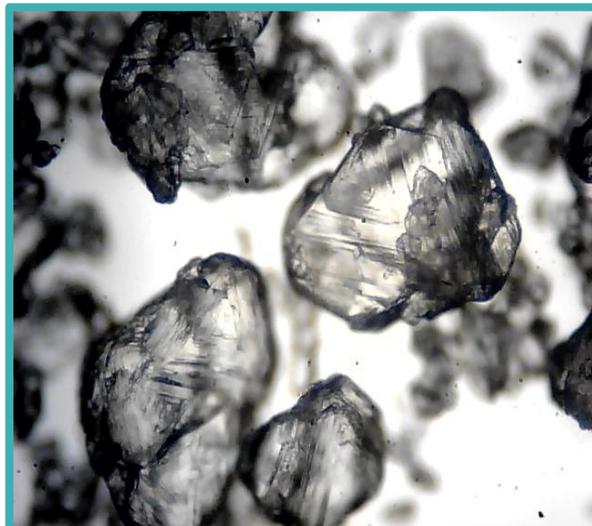
Second stage boric acid crystalliser at Ioneer's pilot plant in Vancouver.



Premium quality boric acid, successfully produced by Ioneer, is suitable for inclusion in high-end strengthened glass products such as used for phone/television screens and in solar panels.



*Premium quality boric acid.*



*Boric acid crystals at 100x magnification.*

Lithium and boron are leached from the coarse crushed rock using sulphuric acid. The pregnant leach solution (**PLS**) then undergoes a series of evaporation and crystallisation steps to remove the boric acid and the lithium. The boric acid is purified using conventional steps including washing, filtration and recrystallisation. No reagents are used in the production of boric acid.

On 11 June 2019, ioneer announced that Veolia Water Technologies Inc. (**Veolia**) had successfully produced battery-grade lithium hydroxide from Rhyolite Ridge ore. In parallel with the main processing through the pilot plant, Veolia is undertaking testwork on several different pathways to produce battery-grade lithium carbonate from the Rhyolite Ridge technical-grade lithium carbonate.

## Contacts

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## About ioneer

The Company's 100%-owned Rhyolite Ridge Lithium-Boron Project in Nevada, USA provides a substantial foundation for ioneer to become a responsible and profitable producer of the materials necessary for a sustainable future.

The Rhyolite Ridge Pre-Feasibility Study demonstrated the Project's scale, long life and potential to become the lowest cost lithium producer in the world as well as the largest lithium producer in the United States.

With forecast annual production of 20,200 tonnes lithium carbonate and 173,000 tonnes boric acid, Rhyolite Ridge will be a globally significant producer of both lithium and boron.

Lithium and boron are both used in a diverse range of everyday items and innovative technologies that are essential to modern life and emerging clean technologies such as electric vehicles.

### **Competent Persons Statement**

The information in this report that relates to Exploration Results is based on information compiled by Bernard Rowe, a Competent Person who is a Member of the Australian Institute of Geoscientists. Bernard Rowe is a shareholder, employee and Managing Director of Ioneer Ltd. Mr Rowe has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken 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' (JORC Code 2012). Bernard Rowe consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

In respect of production targets referred to in this report and previously disclosed, the Company confirms that it is not aware of any new information or data that materially affects the information included in the public report titled "Outstanding Results from Rhyolite Ridge Pre-Feasibility" dated 23 October 2018. Further information regarding the production estimates can be found in that report. All material assumptions and technical parameters underpinning the estimates in the report continue to apply and have not materially changed.

# Appendix 1

## Rhyolite Ridge Lithium-Boron Project, Nevada, USA

### JORC Code, 2012 Edition – Table 1

#### Section 1 Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
<b>Sampling techniques</b>	<ul style="list-style-type: none"> <li><i>Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.</i></li> <li><i>Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.</i></li> <li><i>Aspects of the determination of mineralisation that are Material to the Public Report. In cases where ‘industry standard’ work has been done this would be relatively simple (eg ‘reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay’). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.</i></li> </ul>	<p>A 24 tonne bulk sample was collected for the purpose of processing through the company’s pilot plant located at Kemetco Research Inc, Richmond BC, Canada.</p> <p>The sample comprised material from a surface pit excavated into in-situ bedrock material. The bulk sample pit measured 12 metres by 12 metres and a maximum depth of 1 metre.</p> <p>The bulk sample pit was excavated and sampled by ioneer in April, 2019. The entire sample was crushed to -25mm before being transported to the pilot plant.</p>
<b>Drilling techniques</b>	<ul style="list-style-type: none"> <li><i>Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).</i></li> </ul>	Not applicable as no drilling was undertaken for the exploration results being reported.
<b>Drill sample recovery</b>	<ul style="list-style-type: none"> <li><i>Method of recording and assessing core and chip sample recoveries and results assessed.</i></li> <li><i>Measures taken to maximise sample recovery and ensure</i></li> </ul>	Not applicable as no drilling was undertaken for the exploration results being reported.

Criteria	JORC Code explanation	Commentary
	<p><i>representative nature of the samples.</i></p> <ul style="list-style-type: none"> <li><i>Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.</i></li> </ul>	
<b>Logging</b>	<ul style="list-style-type: none"> <li><i>Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.</i></li> <li><i>Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.</i></li> <li><i>The total length and percentage of the relevant intersections logged.</i></li> </ul>	<p>Not applicable as no drilling was undertaken for the exploration results being reported.</p> <p>The bulk sample pit was not logged as it was entirely within the one rock unit (B5) that represents part of the Upper Zone of the Rhyolite Ridge Mineral Resource.</p>
<b>Sub-sampling techniques and sample preparation</b>	<ul style="list-style-type: none"> <li><i>If core, whether cut or sawn and whether quarter, half or all core taken.</i></li> <li><i>If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.</i></li> <li><i>For all sample types, the nature, quality and appropriateness of the sample preparation technique.</i></li> <li><i>Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.</i></li> <li><i>Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.</i></li> <li><i>Whether sample sizes are appropriate to the grain size of the material being sampled.</i></li> </ul>	<p>No sub-sampling was undertaken. The entire sample was collected, crushed and then transported to the pilot plant.</p> <p>The nature, type and quality of the sample preparation technique is considered appropriate.</p> <p>The sample is considered representative of the in-situ rock for the Upper Zone lithium-boron mineralisation. It is not intended to be representative of the entire deposit.</p> <p>The sample size and type are considered to be appropriate for a pilot plant bulk sample of this type.</p>
<b>Quality of assay data</b>	<ul style="list-style-type: none"> <li><i>The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered</i></li> </ul>	<p>The bulk sample was processed by Kemetco Inc using a purpose-built pilot plant located in Richmond BC, Canada. The process flowsheet for the pilot</p>

Criteria	JORC Code explanation	Commentary
<b>and laboratory tests</b>	<p><i>partial or total.</i></p> <ul style="list-style-type: none"> <li><i>For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.</i></li> <li><i>Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.</i></li> </ul>	<p>plant was developed as part of the Rhyolite Ridge Pre-Feasibility Study (PFS) and is described in detail in the public report titled “Outstanding Results from Rhyolite Ridge Pre-Feasibility” dated 23 October 2018.</p> <p>Boric acid produced from the pilot plant was analysed by Kemetco using ICP methods. The analytical results being reported are qualitative and only relate to the boric acid produced in the pilot plant.</p> <p>The methods and procedures are appropriate for the type of mineralisation and the techniques are considered to be total. Grades are not being reported.</p>
<b>Verification of sampling and assaying</b>	<ul style="list-style-type: none"> <li><i>The verification of significant intersections by either independent or alternative company personnel.</i></li> <li><i>The use of twinned holes.</i></li> <li><i>Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.</i></li> <li><i>Discuss any adjustment to assay data.</i></li> </ul>	<p>Not applicable as no intersections are being reported.</p> <p>There has been no adjustment to analytical data.</p>
<b>Location of data points</b>	<ul style="list-style-type: none"> <li><i>Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.</i></li> <li><i>Specification of the grid system used.</i></li> <li><i>Quality and adequacy of topographic control.</i></li> </ul>	<p>The location of the bulk sample site is 424 709E and 4185 960N. It is located at the northern end of the Mineral Resource and is entirely within the Resource.</p> <p>The location was surveyed by DGPS and is accurate to within one metre.</p> <p>The coordinates are shown in UTM Zone 11, NAD83 grid system.</p>
<b>Data spacing and distribution</b>	<ul style="list-style-type: none"> <li><i>Data spacing for reporting of Exploration Results.</i></li> <li><i>Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.</i></li> </ul>	<p>Not applicable as only a single bulk sample site is being reported.</p> <p>Not applicable as the data is not being used for a Mineral Resource estimation.</p> <p>No sample compositing was undertaken.</p>

Criteria	JORC Code explanation	Commentary
	<ul style="list-style-type: none"> <li>• <i>Whether sample compositing has been applied.</i></li> </ul>	
<b><i>Orientation of data in relation to geological structure</i></b>	<ul style="list-style-type: none"> <li>• <i>Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.</i></li> <li>• <i>If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.</i></li> </ul>	<p>The bulk sample was excavated into sub-horizontal strata to a maximum depth of one metre.</p> <p>The orientation is considered appropriate and provides unbiased sampling of the mineralisation within the applicable part of the deposit. The sample is not intended to be representative of the entire deposit.</p>
<b><i>Sample security</i></b>	<ul style="list-style-type: none"> <li>• <i>The measures taken to ensure sample security.</i></li> </ul>	<p>The bulk sample was crushed and stored on-site and then transported by truck to Kemetco Inc.</p> <p>ioneer personnel supervised the collection, processing and transportation of the sample to Kemetco.</p>
<b><i>Audits or reviews</i></b>	<ul style="list-style-type: none"> <li>• <i>The results of any audits or reviews of sampling techniques and data.</i></li> </ul>	<p>Not applicable as no audits were undertaken for the exploration results being reported.</p>

## Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
<p><i>Mineral tenement and land tenure status</i></p>	<ul style="list-style-type: none"> <li><i>Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.</i></li> <li><i>The security of the tenure held at the time of reporting along with any known impediments to obtaining a license to operate in the area.</i></li> </ul>	<p>The mineral tenement and land tenure for the South Basin of Rhyolite Ridge comprise 386 unpatented Lode Mining Claims (totalling approximately 3,150 hectare (Ha)); claim groups SLB, SLM and RR are held by Ioneer Minerals Corporation, a wholly owned subsidiary of Ioneer Ltd. The Competent Person is not aware of any agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings relating to the 386 Lode Mining Claims for the Project.</p> <p>The mineral tenement and land tenure referenced above excludes 241 additional unpatented Lode Mining Claims (totalling approximately 2,000 Ha) for the North Basin which are located outside of the current South Basin Project Area. These additional claims are held by Ioneer subsidiaries (NLB claim group; 160 claims) or they hold an option to acquire 100% ownership of the claims (BH claim group; 81 claims).</p>
<p><i>Exploration done by other parties</i></p>	<ul style="list-style-type: none"> <li><i>Acknowledgment and appraisal of exploration by other parties.</i></li> </ul>	<p>There have been two previous exploration campaigns targeting Li-B mineralisation at the Project site.</p> <p>US Borax conducted surface sampling and drilling in the 1980s, targeting B mineralisation, with less emphasis on Li mineralisation. A total of 57 drill holes (totalling approximately 14,900 m) were drilled in the North Basin area, with an additional 12 drill holes (unknown total meterage) in the South Basin area.</p> <p>American Lithium Minerals Inc and Japan Oil, Gas and Metals National Corporation (JOGMEC) conducted further Li exploration in the South Basin area in 2010-2011. The exploration included at least 465 surface and trench samples and 36 drill holes (totalling approximately 8,800 m), of which 21 were core and 15 were RC. Data collected from this program, including drill core, was made available to Ioneer.</p>
<p><i>Geology</i></p>	<ul style="list-style-type: none"> <li><i>Deposit type, geological setting and style of mineralisation.</i></li> </ul>	<p>The Li-B mineralisation at Rhyolite Ridge occurs in two separate Miocene sedimentary basins; the North Basin and the South Basin, located within the Silver Peak Range in the Basin and Range terrain of Nevada, USA. The South</p>

Criteria	JORC Code explanation	Commentary
		<p>Basin is the focus of the Study presented in this Report.</p> <p>The South Basin stratigraphy comprises lacustrine sedimentary rocks of the Cave Spring Formation overlaying volcanic flows and volcanoclastic rocks of the Rhyolite Ridge Volcanic unit. The Rhyolite Ridge Volcanic unit is dated at approximately 6 mega-annum (Ma) and comprises rhyolite tuffs, tuff breccias and flows. The Rhyolite Ridge Volcanic rocks are underlain by sedimentary rocks of the Silver Peak Formation.</p> <p>Li-B mineralisation is interpreted to have been emplaced by hydrothermal/epithermal fluids travelling up the basin bounding faults; based on Li-B grade distribution and continuity it is believed the primary fluid pathway was along the western bounding fault. Differential mineralogical and permeability characteristics of the various units within the Cave Spring Formation resulted in the preferential emplacement of Li-B bearing minerals in the M5, B5 and L6 units. Li-B mineralisation occurs in isolated locations in some of the other units in the sequence, but with nowhere near the grade and continuity observed in the aforementioned units.</p> <p>For further information on Geology refer to public reports titled “Outstanding Results from Rhyolite Ridge Pre-Feasibility” dated 23 October 2018 and “Rhyolite Ridge Mineral Resource Upgrade” dated 26 June 2019.</p>
<p><i>Drill hole information</i></p>	<ul style="list-style-type: none"> <li>• <i>A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:</i></li> <li>• <i>easting and northing of the drill hole collar</i></li> <li>• <i>elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar</i></li> <li>• <i>dip and azimuth of the hole</i></li> <li>• <i>down hole length and interception depth</i></li> <li>• <i>If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from</i></li> </ul>	<p>Not applicable as no drilling was undertaken for the exploration results being reported.</p>

Criteria	JORC Code explanation	Commentary
	<p><i>the understanding of the report, the Competent Person should clearly explain why this is the case.</i></p>	
<p><i>Data aggregation methods</i></p>	<ul style="list-style-type: none"> <li>• <i>In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.</i></li> <li>• <i>Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.</i></li> <li>• <i>The assumptions used for any reporting of metal equivalent values should be clearly stated.</i></li> </ul>	<p>Not applicable as no data aggregation was undertaken for the exploration results being reported.</p>
<p><i>Relationship between mineralisation widths and intercept lengths</i></p>	<ul style="list-style-type: none"> <li>• <i>These relationships are particularly important in the reporting of Exploration Results.</i></li> <li>• <i>If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.</i></li> <li>• <i>If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. 'down hole length, true width not known').</i></li> </ul>	<p>Not applicable as no widths or lengths of mineralisation are being reported.</p>
<p><i>Diagrams</i></p>	<ul style="list-style-type: none"> <li>• <i>Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.</i></li> </ul>	<p>Not applicable as no significant discovery is being reported and no drill hole data is included in the exploration results being reported. The location of the bulk sample site is included above in this table.</p>
<p><i>Balanced Reporting</i></p>	<ul style="list-style-type: none"> <li>• <i>Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.</i></li> <li>• <i>Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of</i></li> </ul>	<p>The report is believed to include all representative and relevant information and is believed to be comprehensive.</p>

Criteria	JORC Code explanation	Commentary
	<i>Exploration Results.</i>	
<i>Other substantive exploration data</i>	<ul style="list-style-type: none"> <li>• <i>Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples - size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.</i></li> </ul>	<p>All material information has been reported in the current and previous reports released by the Company.</p> <p>The Company completed a Pre-Feasibility Study on the Rhyolite Ridge Project in October 2018. For more information refer to public report titled “Outstanding Results from Rhyolite Ridge Pre-Feasibility” dated 23 October 2018.</p>
<i>Further work</i>	<ul style="list-style-type: none"> <li>• <i>The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large- scale step-out drilling).</i></li> <li>• <i>Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.</i></li> </ul>	<p>The Company is currently undertaking a Definitive Feasibility Study (<b>DFS</b>) on the project. The DFS will include an updated Mineral Resource and Reserve Statement.</p>