Alpha **HPA**

ABN 79 106 879 690

ASX: **A4N**
ASX Announcement
23 September 2019

The Manager Companies
ASX Limited
20 Bridge Street
Sydney NSW 2000

(11 pages by email)

HPA FIRST PROJECT UPDATE

- **HPA assays for first 6 (of 9) batches of Pilot Plant HPA all returned >4N (>99.99%) purity**
- **Production of remaining HPA pre-cursor to be accelerated**
- **First 3.0kg HPA sample despatched to USA for milling, ahead of end-user delivery**
- **Chemical counter-party discussions substantially advanced**
- **HPA First DFS design and layout being finalised**

Alpha HPA Limited ('Alpha' or 'the Company') is pleased to provide an update on its HPA First Project, including results from the Pilot Plant operations in Brisbane, discussions with chemical counterparties and progress on the HPA First DFS.

Pilot Plant HPA Purity Confirmed at >4N Purity

Purity assays from the first 16 HPA samples produced from the Pilot Plant, representing 6 individual batches of HPA from campaigns CB1, and CB2, have all returned >4N (>99.99%) purity, **averaging 99.994%** (ref: Appendix 1). Several samples with purity of 99.995 and 99.996% were achieved. The samples were assayed using GDMS (glow discharge mass spectroscopy) in the USA, following an unscheduled delay at USA customs. The Company is delighted with these results, demonstrating the ability to deliver consistent, repeatable high-purity alumina, which further validates the process at Pilot Plant scale as well as the Company's materials handling protocols.

First end-user HPA sample despatched to USA

The first 3.0kg HPA sample for end-user verification has been despatched to the USA for product milling, ahead of forwarding to a USA based end-user for qualification testwork. This sample will be milled by a specialist milling company, however future end-user samples will be milled by the Company's own dedicated jet mill, to be established in October within a dedicated battery lab in Binghamton, New York, USA.

HPA Refining Accelerated

With confirmation on the purity of HPA generated from the Pilot Plant process, the Company is now accelerating its HPA refining programme. This includes a 5-day, 24-hour HPA pre-cursor run commencing today, as well as the introduction of a second static calciner and a larger capacity, 3-zone rotary calciner due at the Brisbane Pilot Plant facility next week. In addition, a third solvent extraction (SX) pilot run has been provisionally planned for November, to generate production volumes to meet expected end-user demand.

Chemical counter party discussions advanced

Alpha has substantially advanced discussions with its potential chemical counterparties. These discussions are centred around the supply of the two dominant process reagents and the offtake of the process by-product. A supply and offtake agreement with a chemical counterparty will in large part determine the final HPA First Project location. These discussions have included site visits, technical risk reviews and first pass commercial structures.

HPA First DFS Update

With two end-to-end operations of the HPA First Pilot Plant now having been run, the process mass balance has now been settled, allowing for DFS engineering work to accelerate.

- DFS process design basis is now being updated using the Pilot Plant results.
- All equipment enquiries issued for budget quotation.
- Evaluation of technical/commercial quotations now underway.
- Plan layout being finalised.
- Operating cost being confirmed and refined.
- Finalisation of plant utilities/infrastructure requirements.

Managing Director, Rimas Kairaitis, commented; "*The Company is very pleased with the progress of all elements of the HPA First Project and, in particular, to now demonstrate the ability of the HPA First Process to repeatably deliver consistently high purity product.*"

For further information, please contact:

Rimas Kairaitis
Managing Director
rkairaitis@alphaHPA.com.au
+61 (0) 408 414 474

Cameron Peacock
Investor Relations & Business Development
cpeacock@alphaHPA.com.au
+61 (0) 439 908 732

About the HPA First Project

The Company's HPA First Project represents the evaluation and intended commercialisation of the production of ~10,000tpa of high purity alumina (HPA) using the Company's proprietary licenced solvent extraction and HPA refining technology. The technology provides for the extraction and purification of aluminium from an industrial feedstock to produce 4N (>99.99% purity) alumina for the intended use within the lithium ion battery and LED lighting industry. Following a successful testwork programme and Pre-Feasibility Study (PFS), updated in March 2019, Alpha HPA is now completing a pilot plant program at its dedicated laboratory facility in Brisbane, as part of a full definitive Feasibility Study (DFS) due for delivery in CY2019.

Key highlights of the PFS (ASX: 7 March 2019):

- Unit production costs of **US$5,123** per tonne of HPA (after by-product credits)
- Annual Free Cash Flow (FCF) at full production rate, of **US$199 million** (assuming US$25,000/t HPA)
- Capital Expenditure of US$149 million

Competent Persons Statement (Process Development Testwork)

Information in this announcement that relates to metallurgical results is based on information compiled by or under the supervision of Dr Stuart Leary, an Independent Consultant trading as Delta Consulting Group. Dr Leary is a Member of The Australasian Institute of Mining and Metallurgy (AusIMM). Dr Leary has sufficient experience to the activity which he is undertaking to qualify as a Competent Persons under the 2012 Edition of the 'Australasian Code for reporting of Exploration Results, Mineral Resources and Ore Reserves'. Dr Leary consents to the inclusion of the technical data in the form and context in which it appears.

For further information on testwork results and processes see ASX announcements dated 28 August 2019, 5 August 2019, 25 July 2019, 2 July 2019, 3 June 2019, 17 April 2019, 7 March 2019, 4 December 2018, 20 November 2018, 6 September 2018, 31 August 2018, 9 July 2018, 30 April 2018, 26 April 2018, 21 March 2018, 6 March 2018, 21 February 2018, 8 December 2017, 30 November 2017, 29 November 2017, 24 November 2017 and 13 November 2017.

Cautionary Statement

The Pre-Feasibility Study (PFS) referred to in this announcement has been undertaken to assess the technical and financial viability of the HPA First Project. Further evaluation work including a Definitive Feasibility Study (DFS) is required before the Company will be in a position to provide any assurance of an economic development case. The PFS is based on the material assumptions about the availability of funding and the pricing received for HPA. While the Company considers all of the material assumptions to be based on reasonable grounds, there is no certainty that they will prove to be correct or that the range of outcomes indicated by this PFS will be achieved. To achieve the range of outcomes indicated in the PFS, Pre-Production Capital in the order of $198 million plus working capital will likely be required. Investors should note that there is no certainty that the Company will be able to raise the amount of funding when needed. It is also possible that such funding may only be available on terms that may be dilutive to or otherwise affect the value of the Company's existing shares. It is also possible that the Company could pursue other "value realisation" strategies such as a sale, partial sale or joint venture of the project. If it does, this could materially reduce the Company's proportionate ownership of the project. Given the uncertainties involved, investors should not make any investment decisions based solely on the results of the PFS.

Forward Looking Statements

This PFS contains certain forward-looking statements with respect to the financial condition, results of operations, business of the Company and certain plans and objectives of the management of the Company. These forward-looking statements involve known and unknown risks, uncertainties and other factors which are subject to change without notice and may involve significant elements of subjective judgement and assumptions as to future events which may or may not occur. Forward-looking statements are provided as a general guide only and there can be no assurance that actual outcomes will not differ materially from these statements. Neither the Company nor any other person give any representation, warranty, assurance or guarantee that the occurrence of the events expressed or implied in any forward-looking statement will actually occur. In particular, those forward-looking statements are subject to significant uncertainties and contingencies, many of which are outside the control of the Company. A number of important factors could cause actual results or performance to differ materially from the forward looking statements. Investors should consider the forward looking statements contained in this PFS in light of those disclosures.

pjn10077

Appendix 1: Summary GDMS (glow discharge mass spectroscopy) – HPA assay purity results

	Sample No							
	C2B B1 190826	C2B B2 190828	C2B B2 190827	C2B B3 190830	C2B B5 190831	C2B B4 RD 190902	HPA C2B B2 + 3UNMILLED	HPA BP11 190808
Element	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]
Li	0.24	0.27	0.24	0.36	0.22	< 0.05	0.37	0.42
Be	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
B	0.23	0.22	0.07	0.10	0.06	0.10	0.12	< 0.05
O	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix
F	9.6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Na	20	21	15	32	26	7.9	33	21
Mg	4.5	6.8	1.1	1.2	1.1	2.0	1.4	1.2
Al	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix
Si	1.8	2.3	3.7	1.9	1.3	9.5	1.7	1.4
P	0.29	< 0.1	0.18	1.7	1.2	0.39	1.5	0.20
S	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.3	< 0.5	< 0.5
Cl	1.4	2.2	< 0.1	0.22	< 0.1	1.2	< 0.1	< 0.1
K	4.2	2.8	3.1	2.3	4.3	3.3	2.2	4.6
Ca	16	16	13	9.0	12	16	11	9.9
Sc	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ti	0.11	0.13	0.07	< 0.05	0.07	0.13	0.06	< 0.05
V	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.06
Cr	2.8	3.3	3.0	2.8	3.0	3.4	3.2	3.4
Mn	0.20	1.3	0.08	0.11	0.06	0.08	0.07	0.11
Fe	3.3	4.6	2.9	2.2	1.3	3.4	2.2	2.5
Co	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ni	< 0.5	< 0.5	< 0.5	0.56	1.1	4.5	< 0.5	< 0.5
Cu	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Zn	2.0	2.0	1.7	1.6	1.2	2.6	1.6	5.3
Ga	7.3	6.6	6.8	10	9.6	9.2	8.4	19
Ge	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
As	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Se	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Br	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Rb	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Sr	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Y	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Zr	< 0.1	0.20	< 0.1	< 0.1	0.55	0.15	< 0.1	< 0.1
Nb	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Mo	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Ru	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Rh	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

	Sample No							
	C2B B1 190826	C2B B2 190828	C2B B2 190827	C2B B3 190830	C2B B5 190831	C2B B4 RD 190902	HPA C2B B2 + 3UNMILLED	HPA BP11 190808
Element	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]
Pd	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ag	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Cd	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
In	Binder	Binder	Binder	Binder	Binder	Binder	Binder	Binder
Sn	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Te	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
I	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cs	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ba	0.31	0.68	0.76	1.1	0.72	1.0	0.69	0.15
La	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ce	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pr	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Nd	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Eu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Gd	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dy	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ho	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Er	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Yb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Lu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hf	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ta	Electrode	Electrode	Electrode	Electrode	Electrode	Electrode	Electrode	Electrode
W	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Re	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Os	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ir	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Pt	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Au	Interference	Interference	Interference	Interference	Interference	Interference	Interference	Interference
Hg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Tl	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bi	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Th	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
U	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Imurities (ppm)	52.08	68.2	48.7	48.05	60.78	63.05	67.51	69.04
Purity (%)	99.995	99.993	99.995	99.995	99.994	99.994	99.993	99.993

	Sample No								
	C1B1 1190718	C1B2190719	C2B B1 190821	C2B B2 190819	C2B B3 160819	C2B B3 190819	C2B B3 190821	C2B B4 190820	C2B B5 QAQC
Element	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]
Ag	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Al	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix
As	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Au	Interference	Interference	Interference	Interference	Interference	Interference	Interference	Interference	Interference
B	0.17	0.15	0.09	< 0.05	< 0.05	0.08	< 0.05	0.09	0.08
Ba	0.43	0.61	0.62	0.59	< 0.1	0.34	0.38	0.72	0.54
Be	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bi	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Br	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ca	13	48	14	7	14	11	14	13	7.8
Cd	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ce	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cl	< 0.1	0.87	0.21	0.17	0.63	0.21	0.25	0.18	< 0.1
Co	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cr	1.1	3.6	2.4	2.6	3.2	2.9	5.1	3.2	2.9
Cs	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cu	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Dy	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Er	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Eu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
F	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Fe	2.6	3.3	5.5	3.7	2.9	2.5	7.1	2	1.3
Ga	18	20	11	7	10	13	12	11	11
Gd	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ge	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Hf	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Hg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ho	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
I	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
In	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ir	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
K	3.5	5.2	2.3	3.3	1.7	1.7	2	0.78	2.9
La	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Li	0.16	0.38	0.08	< 0.05	< 0.05	0.18	< 0.05	0.18	0.77
Lu	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Mg	3.2	15	3	0.8	1.6	1	2.6	1.8	1.2
Mn	< 0.05	0.09	0.17	0.15	< 0.05	0.1	0.22	0.1	< 0.05
Mo	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

	Sample No								
	C1B1 1190718	C1B2190719	C2B B1 190821	C2B B2 190819	C2B B3 160819	C2B B3 190819	C2B B3 190821	C2B B4 190820	C2B B5 QAQC
Element	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]	[ppm wt]
Na	4.3	14	13	9.8	3.7	5.2	4.8	6.6	34
Nb	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
Nd	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ni	< 0.5	< 0.5	1.5	< 0.5	1.3	1.3	2.4	3.1	1.6
O	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix	Matrix
Os	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
P	8	3.7	3.2	1.8	0.8	5.5	5.6	2	2.8
Pb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pd	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Pr	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pt	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Rb	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Re	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Rh	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ru	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
S	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sc	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Se	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Si	3.6	4.9	9.9	2.3	3.7	1.5	19	2.6	1.5
Sm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sn	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.7	< 0.5	< 0.5
Sr	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ta	Electrode	Electrode	Electrode	Electrode	Electrode	Electrode	Electrode	Electrode	Electrode
Tb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Te	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Th	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ti	< 0.05	0.3	0.58	< 0.05	< 0.05	0.1	1.7	0.09	0.06
Tl	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tm	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
U	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
V	< 0.05	< 0.05	0.07	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
W	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Y	< 0.05	0.09	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Yb	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Zn	1.5	4.2	2.9	2.3	< 0.5	2.6	2.5	2.3	2.3
Zr	< 0.1	0.14	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total Imurities (ppm)	59.56	124.53	70.52	41.51	43.53	49.21	81.35	49.74	70.75
Purity (%)	99.994	99.988	99.993	99.996	99.996	99.995	99.992	99.995	99.993

1. JORC CODE, 2012 EDITION – TABLE 1

1.1 Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	• *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.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *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.*	• Samples of high purity alumina were taken as ~20g splits of homogonised, crystalline powder
Drilling techniques	• *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).*	• Not Applicable. The samples were generated from a feedstock of industrial chemicals.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *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.*	• Not Applicable
Logging	• *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.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• Not Applicable
Sub-sampling techniques and Sample Preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in situ material*	• Samples were presented as a homogonised, crystalline aluminium salt generated from a crystallisation and centrifuge process

Criteria	JORC Code explanation	Commentary
	collected, including for instance results for field duplicate/second-half sampling. • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *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.* • *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.*	• The purity analysis of the high-purity alumina (HPA) was determined by EAG Eurofins USA by glow discharge mass spectroscopy
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• Not Applicable
Location of data points	• *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.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• Not Applicable
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *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.* • *Whether sample compositing has been applied.*	• Not Applicable
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *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.*	• Not Applicable
Sample security	• *The measures taken to ensure sample security.*	• Duplicates of all samples submitted were retained at the Company's Brisbane laboratories to insure against any sample loss
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• Not applicable

1.2 Section 2 Reporting of Exploration Results

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

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *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.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• Not Applicable
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• Not Applicable
Geology	• *Deposit type, geological setting and style of mineralisation.*	• Not Applicable
Drill hole Information	• *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:* ○ *easting and northing of the drill hole collar* ○ *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar* ○ *dip and azimuth of the hole* ○ *down hole length and interception depth* ○ *hole length.* • *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*	• Not Applicable
Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated.* • *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.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	• Not Applicable
Relationship between mineralisation widths and intercept lengths	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').*	• Not Applicable
Diagrams	• *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.*	• Not Applicable

Criteria	JORC Code explanation	Commentary
Balanced reporting	• *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 Exploration Results.*	• Not Applicable
Other substantive exploration data	• *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.*	• Not Applicable
Further work	• *The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).* • *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	• On the 2nd July 2019, the Company is commencing an extensive pilot plant operation to validate the process flow sheet on a semi-continuous, end-to-end basis