



PURE
ALUMINA

Corporate Overview



Board of Directors

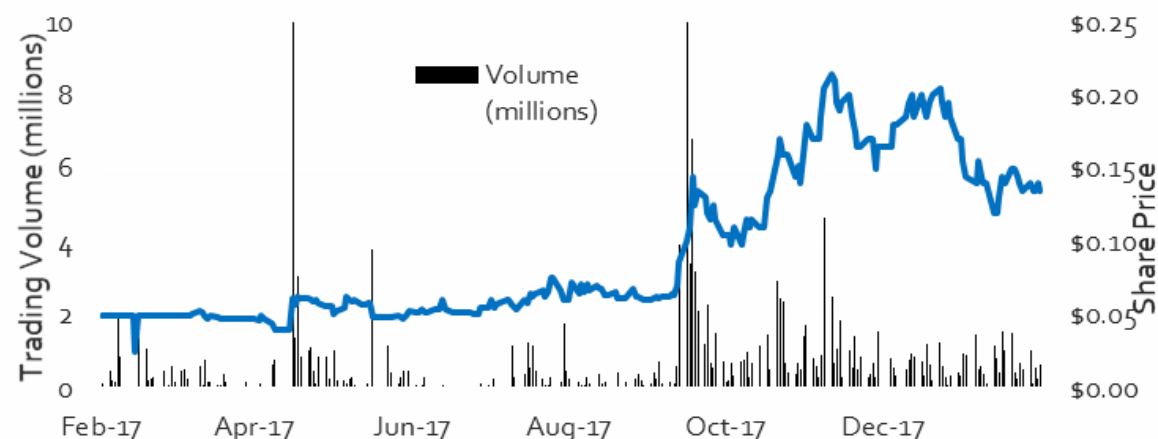
- Graham Reveleigh: Chairman
- Martin McFarlane: Managing Director
- David Leavy: Executive Director
- Robert Boston: Non-executive Director

Top 5 shareholders

Tolga Kumova	6.72%
Merrill Lynch Nominees	5.59%
JP Morgan Nominees	4.44%
CitiCorp Nominees	3.39%
Quartz Mountain Mining	2.14%

Capital Structure

- Shares on issue: 148.190 mil
- Options on issue: 45.4 mil @ 7.5c, exp July '20
26.6 mil @ 20c, exp July '20
- Market Capitalisation: \$19.3 m at 13c
- Cash: \$2.9m at December 31, 2017



Hill End Gold/Pure Alumina: Overview



- The global high purity alumina (HPA) **market is currently worth >US\$600m** pa and doubling every 5-7 years.
- Hill End Gold acquired 100% of Pure Alumina Pty Ltd, which owns the **high grade, low impurity Yendon kaolin deposit** near Ballarat in Victoria in August 2017 to develop and process into HPA.
- Hill Ends aim is to become a **leading supplier of high quality, low cost HPA** to the global market by 2021.
- Hill End is considering ways to maximise the value to shareholders of its gold assets near Bathurst in NSW.



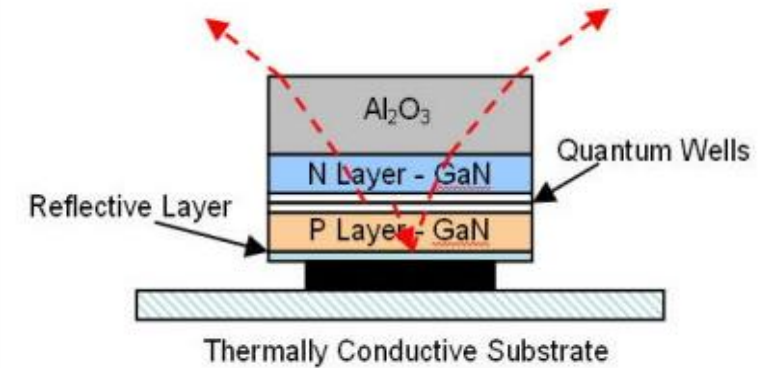
What is High Purity Alumina

- HPA is a very pure form of aluminium oxide ie, **>99.99% pure**, it has <100 ppm of impurities. This is known as **4N HPA**.
- 5N or 99.999% HPA is increasingly in demand for high performance technology. It contains <10 ppm impurities.
- HPA is chemically inert in most environments, has a very high melting point, doesn't conduct electricity and is very abrasive.



What is High Purity Alumina?

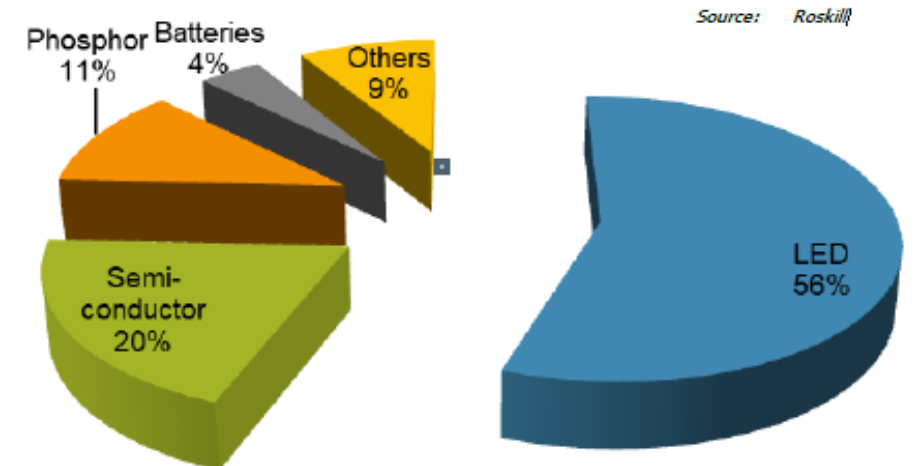
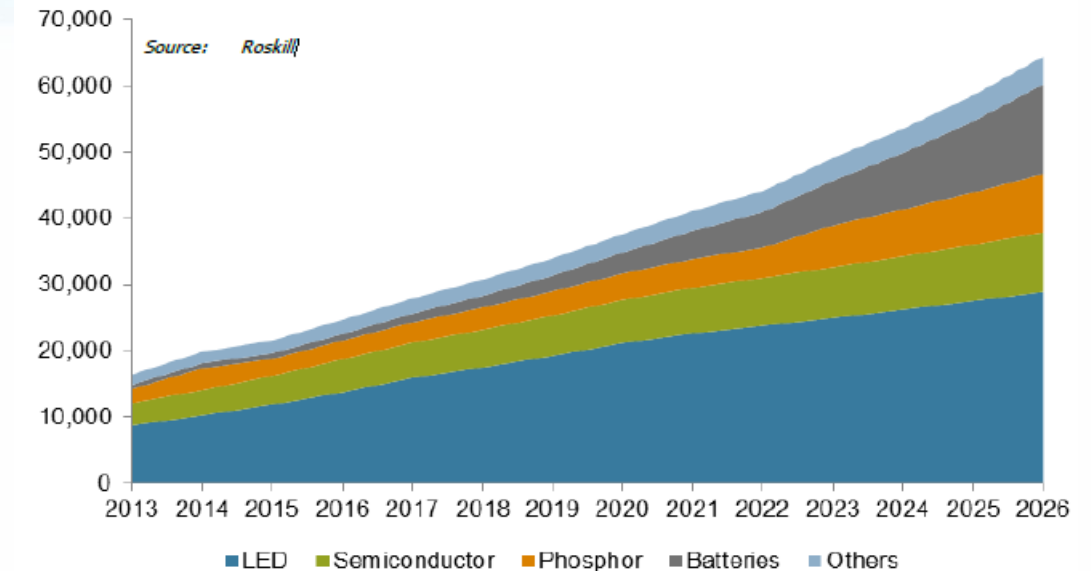
- HPA's properties make it desirable for high-growth industries such as lithium batteries and photonic technologies
- When HPA is grown into Synthetic Sapphire crystal it is used in:
 - LED light / Semiconductor substrates
 - Phosphors / Diodes
 - Lasers
 - Optical lenses
- HPA adds significant performance and safety characteristics when used in lithium battery separators
- New applications are forecast to extend the growing demand for HPA



HPA's strong growth driven by technology

Demand for HPA has risen eight-fold since 2003 and is forecast to triple by 2030

- LEDs consume more than half the annual HPA production and is growing strongly. LED's currently have ~20% of the lighting market with saturation expected above 80%.
- Lithium batteries are an emerging HPA market and forecast to grow strongly as batteries penetrate the auto and power storage markets
- Additional demand includes medical, optical, smart phone screens, watch glass and bullet proof windows



Synthetic Sapphire: Driving HPA Demand



The largest use of HPA is to make synthetic sapphire. Properties of Synthetic Sapphire

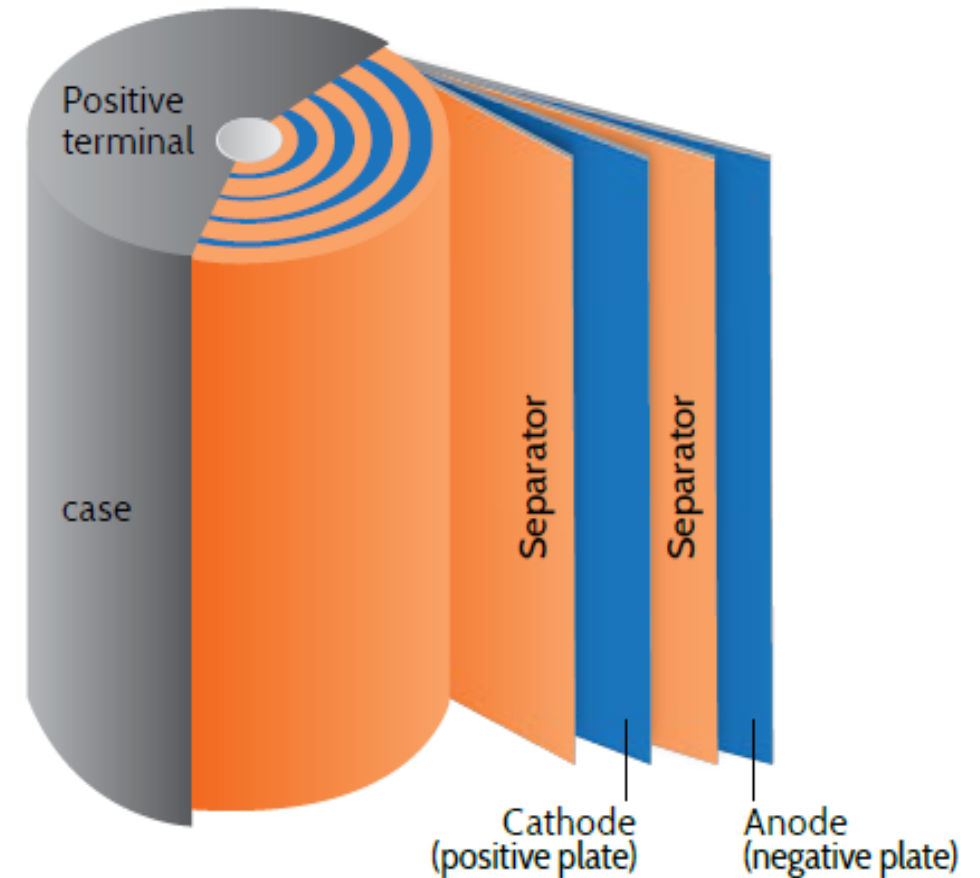
- Extreme hardness (2nd only to diamonds on the Mohs scale)
- Transmits in UV, visible and IR wavelengths
- High heat resistance and excellent thermal conductivity
- High electrical resistance
- Chemically inert and insoluble (biocompatible)

C O M P A R I S O N C H A R T				
	KRYSTAL Sapphire	Corning® Gorilla Glass II	Common Tempered Glass	Common PET Film
Fully Transparent	✓	✓	✓	✓
Smooth Surface	✓	✓	✓	✗
Nano-Silicone Adhesive	✓	✓	✓	✗
Hover Touch Applications	✓	✓	✗	✓
Shatterproof	✓	✗	✓	✗
Oleophobic Coating	✓	✗	✓	✗
Touch-Screen Optimized	✓	✓	✗	✗
Beveled Edges	✓	✗	✗	✗
3.3x Harder than Glass	✓	✗	✗	✗
Scratchproof	✓	✗	✗	✗
Hardness of 9H	✓	✗	✗	✗

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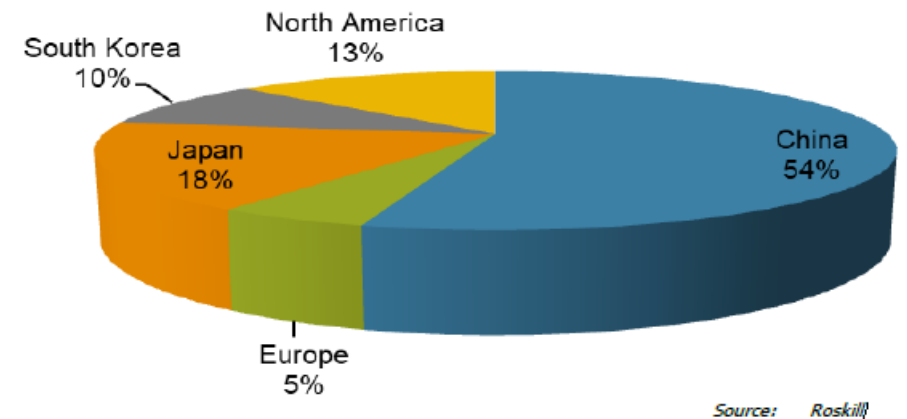
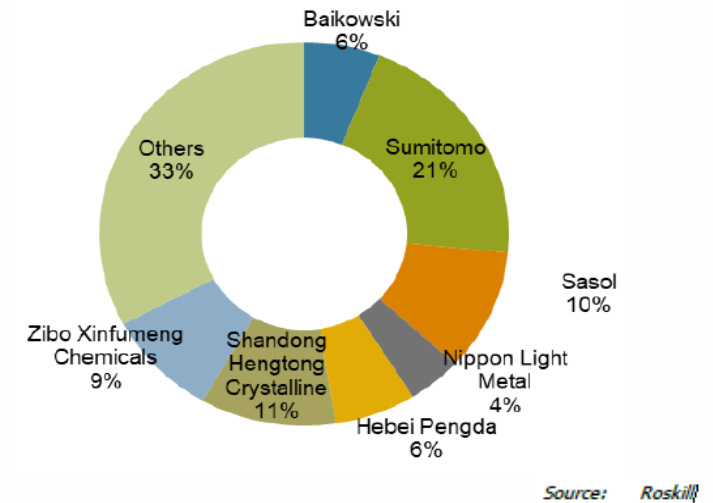
Lithium Batteries: New Uses of HPA

- Lithium batteries have been known to catch fire; Coating the separator in HPA addresses this issue. This market is forecast to grow strongly.
- The high melting point of HPA provides greater thermal stability to the battery, improving safety
- HPA is a good electrical insulator while allowing ions to flow freely
- HPA significantly improves impedance (Macmullan number < 3) allowing for high power capability and low temperature performance
- HPA filled separators improve battery life cycle and lower self-discharge



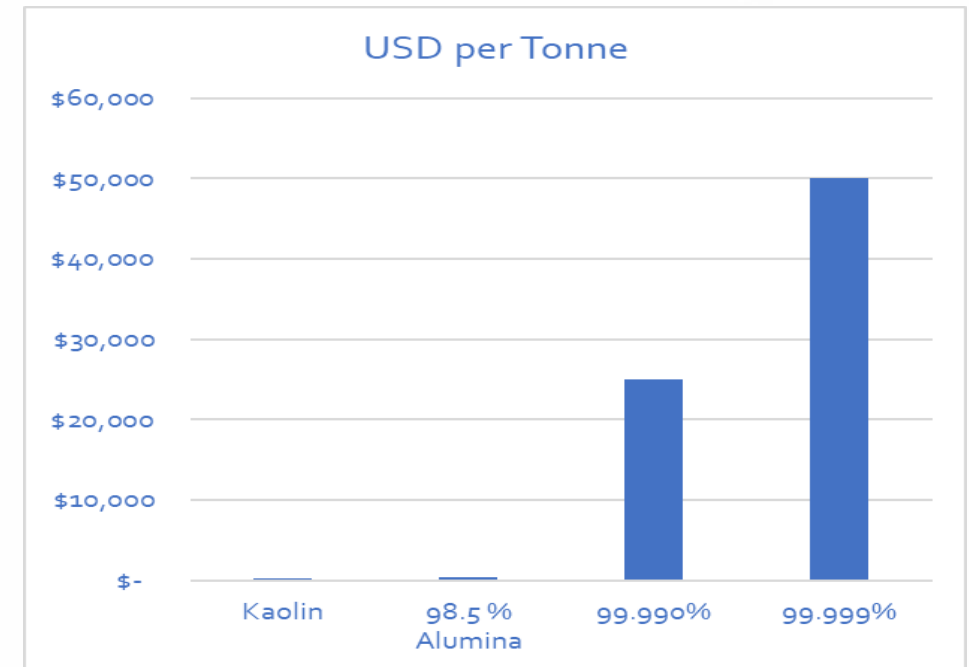
HPA supply is concentrated and high cost

- Global production is very concentrated in the Asia with 7 companies producing 67% of the total output.
- There are 3 processes used to make HPA. All start with high cost aluminum metal:
 - Alkoxide
 - Modified Bayer
 - Choline Hydrolysis
- Sumitomo Chemicals was the first producer of HPA 30 years ago. It is the benchmark for quality and price.



HPA prices are attractive and forecast to remain so

- 4N HPA currently sells for US\$25-35,000/t
- 5N HPA sells for US\$50-60,000/t
- Smelter grade 98.5% Alumina sells for circa US\$400/t
- HPA prices are forecast to remain strong with new demand growth matching or exceeding supply growth.
- Quality challenges will constrain supply growth

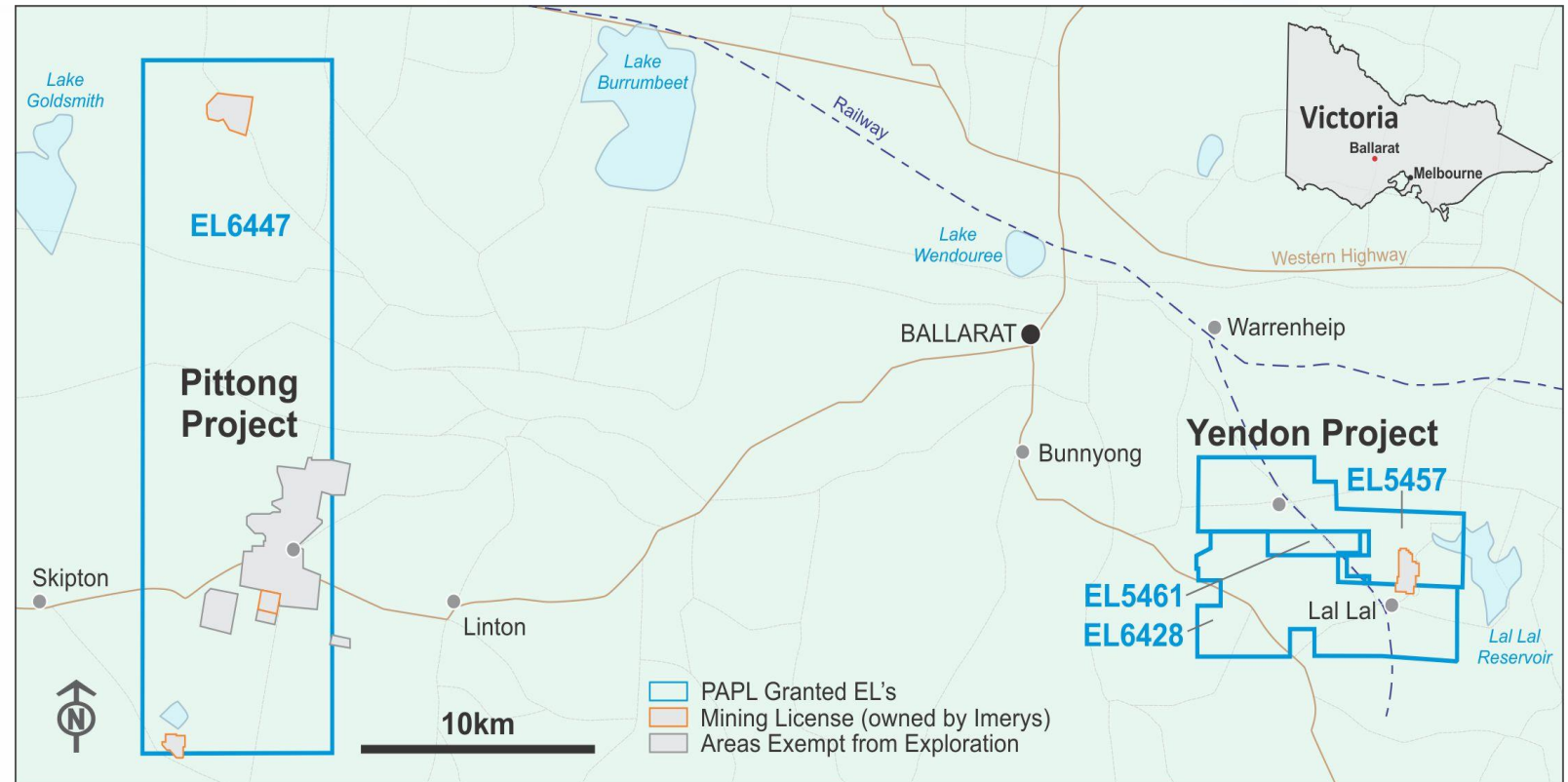


	Europe	North America	Asia Pacific	Other	Global
4N	\$31-\$36	\$32-\$40	\$25-\$32	\$30-\$35	\$25-\$35
5N	\$50-\$60	\$55-\$60	\$48-\$55	\$50-\$60	\$48-\$60
6N	\$160-\$175	\$170-\$175	\$150-\$160	\$160-\$170	\$160-\$170

Source: Roskill

Yendon Kaolin Deposit – Great Location

- Yendon is located near Ballarat in Victoria, 100km from Melbourne port and possible process plant location
- Mining friendly – kaolin has been mined in the area for decades
- Possibility of purchasing kaolin from nearby Imerys mine



Yendon Resource- Long Life, High Grade

Maiden JORC (2012) kaolin resource for the Yendon HPA Project

Class	Tonnage (Mt)		<63 µm Concentrate Grades (%)								
	In situ	Concentrate*	Mass Rec	Al ₂ O ₃	CaO	Fe	K ₂ O	MgO	Na ₂ O	SiO ₂	TiO ₂
Measured	1.73	0.75	43.13	35.08	0.08	0.79	0.19	0.09	0.16	47.84	1.13
Indicated	1.95	0.84	43.14	34.33	0.07	0.85	0.25	0.10	0.17	48.94	1.12
Total	3.68	1.59	43.14	34.68	0.08	0.82	0.22	0.10	0.17	48.42	1.12

- Yendon resource contains enough kaolin to produce 8,000 tpa of HPA (1/3 of current global HPA demand) for at least 35 years. Further drilling is expected to increase the resource as the deposit is open to the north and south and other kaolin deposits exist on Pure Alumina tenements
- Yendon's kaolin is high grade with low levels of critical impurities which assists the HPA purification process.
- Consistent grades across the ore body, shallow overburden (~2m), shallow open pit mining to a maximum depth of 30m means a simple, small scale mining operation.

Yendon Kaolin – Concentrates Readily

- Yendon kaolin is fine grained so it is easily concentrated at site using a cyclone over a 63 micron screen.
- This removes around 57% of waste material (mainly silica), increasing Al_2O_3 grades to >34% while having little impact on Al_2O_3 recovery.
- Benefits of on site beneficiation include:
 - Simple, physical process at the mine site, with no chemicals required
 - Lower cost logistics – only 43% of material transported to process plant
 - Improved hydrometallurgical characteristics, fewer impurities to be removed by the metallurgical process

Size (Microns) 100% passing	Yield%	$\text{Al}_2\text{O}_3\%$	$\text{SiO}_2\%$	$\text{Fe}_2\text{O}_3\%$	$\text{TiO}_2\%$
1000	77.5	21.0	67.1	0.87	0.58
106	49.8	32.2	49.9	0.93	0.89
75	47.5	32.9	48.7	0.94	0.92
63	46.3	33.2	48.2	0.95	0.93
53	44.9	33.4	47.7	0.96	0.95
45	43.6	33.6	47.3	0.97	0.96



Initial metallurgical test work confirms Yendon kaolin is ideal for HPA production

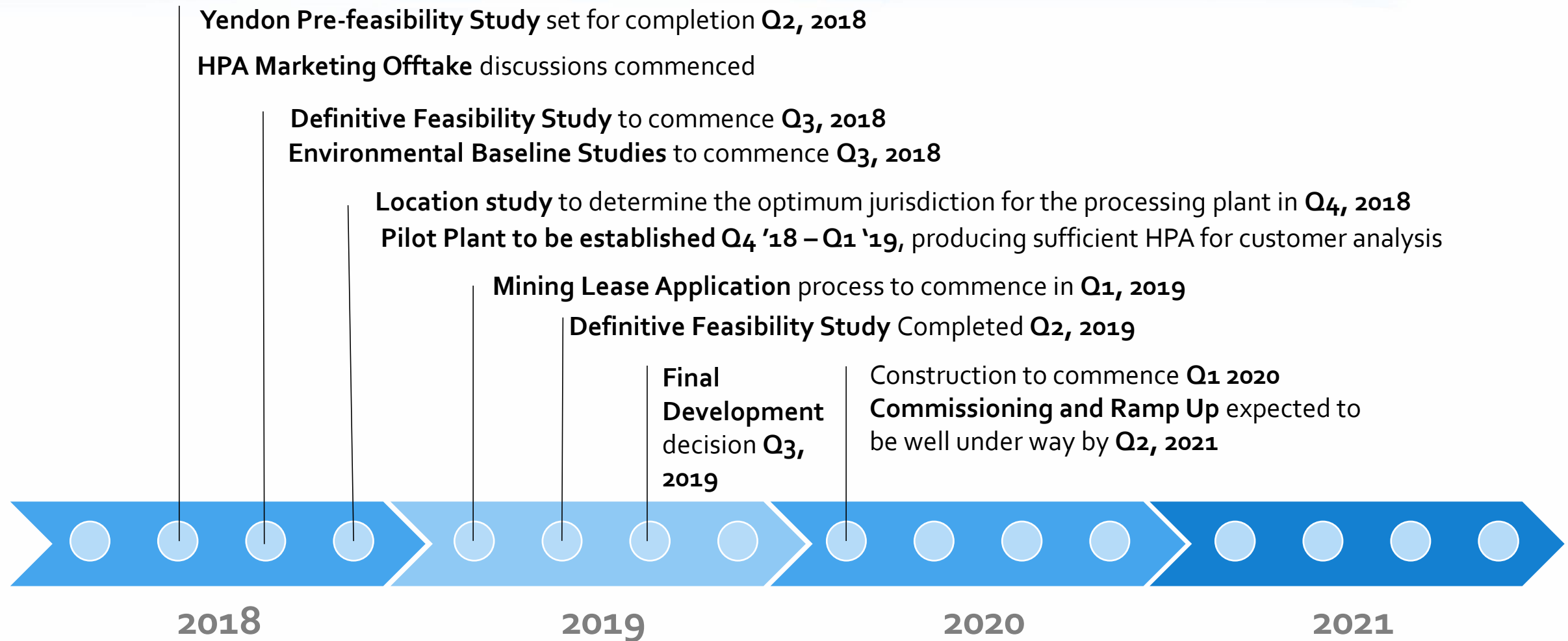


- A representative sample of beneficiated ore was processed at the Nagrom Laboratories using the traditional HCl leaching process as a “proof of concept”. The results were exceptional.
- Yendon kaolin rapidly dissolved in low temperature and moderate strength hydrochloric acid.
- After only 2 leach and precipitation cycles and calcining, the process produced a 99.995% pure HPA product.
- This study also provided a substantial amount of information to refine the parameters used in the PFS metallurgical test work currently underway.

Element*	Assay
Al ₂ O ₃ (alumina)	99.995%
Iron	21.5 ppm
Sodium	12.3 ppm
Magnesium	6.8 ppm
Calcium	2.6 ppm
Arsenic	2.3 ppm
Zinc	1.6 ppm
Manganese	1.1 ppm
Other**	2.9 ppm

*The analysis was conducted using ICP plasma mass spectrometry. Results shown are for elemental assays not the compound the element may be present as. Volatile elements such as Chlorine, Sulphur, Phosphorus, Carbon and Oxygen were not tested as the analysis method was not appropriate or the detection limit was insufficiently sensitive. These elements are generally not of concern to HPA buyers as they either do not impact the properties of the end product or are removed in the synthetic sapphire production process. **There were 59 other elements analysed for whose results were each below 1 ppm, totalling 2.9ppm. Some elements were tested for but not detected and have been included at the detection limit of the equipment.

Significant global producer of HPA by 2021



Seeking value for gold assets

- Total resources of 561,000oz at 3.4 g/t, pre-feasibility study completed
- Initial production of ~100,000 ounces over four years (300,000 tpa mined at 2.5g/t from two initial open pits)
- Gold recovery of +90%, simple gravity separation
- <A\$900/oz cash cost. Total capital cost of A\$15m. Net profit of ~A\$40m after full cost recovery / royalty payments at A\$1,600/oz
- Potential for Hargraves development extensions and Red Hill deposit may add significant ounces
- HEG considering options to maximise value of gold assets for shareholders



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