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Hill End Gold Limited (ASX: HEG)

July 2018

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**Note:** This report is based on information provided by the company as at 26 July, 2018

Investment Profile	
Share Price as at 25 July, 2018	A\$0.071
12 Month L/H	A\$0.051/ \$0.23
12 Month Price Target/Share	A\$0.38
Issued Capital:	
Ordinary Shares	147.8m
Listed Options	42.2m
Unlisted Options	29.2m
Fully Diluted	219.2m
Market Capitalisation - UD	A10.49m
Current Cash (31/3/18)	A\$2.37m

Board and Management	
Mr Tom Eadie: Chairman, Non-Executive Director	
Mr Martin McFarlane: Managing Director	
Mr Graham Reveleigh: Non-Executive Director	
Mr David Leavy: Executive Director	
Mr Robert Boston: Non-Executive Director	
Mr Mike Ware: Exploration Manager	
Mr Steve Peterson: Chief Financial Officer	
Mr Kevin Lynn: Company Secretary	

Major Shareholders	
Tolga Kumova	6.69%
Merrill Lynch Nominees	5.60%
Board and Management	2.61%
Top 20	42.26%



Senior Analyst – Mark Gordon

The investment opinion in this report is current as at the date of publication. Investors and advisers should be aware that over time the circumstances of the issuer and/or product may change which may affect our investment opinion.

## JOINING THE HPA REVOLUTION

In acquiring the Yendon High Purity Alumina Project ("Yendon" or "the Project"), Hill End Gold ("Hill End" or "the Company") has seen the opportunity in the forecast growth of the high purity alumina ("HPA") market. Although being around for some time, the market for HPA is forecast to grow by a CAGR of between 15% and 20% over coming years, largely on the back of expected demand from LED lighting and separator sheets in Li-ion batteries.

Historically, HPA has been produced from the dissolution of metallic aluminium, an expensive process that we estimate costs in the order of US\$17,000/tonne of HPA produced. Recent years have seen companies investigating producing HPA directly from high purity kaolin through HCl leaching and purification, with ASX listed Altech Chemicals Limited (ASX: ATC, "Altech", market capitalisation of A\$72 million) now commencing construction on a plant in Malaysia that will use kaolin from Meckering in Western Australia. This is a potentially disruptive technology, with significantly lower costs of production than the traditional method.

The success of Altech opens the door for Hill End, which is developing a similar technology, and has successfully produced the required 99.99%  $Al_2O_3$  ("4N") in bench scale work from material from its 100% owned Yendon kaolinite deposit, just 100km from Melbourne in Victoria, and which has resources for a multi-decade operation. The production of 4N HPA was part of a recently completed Pre-feasibility Study ("PFS"), which returned an after-tax NPV<sub>10</sub> of US\$692 million, for a 39 year, 8,000tpa HPA operation with estimated up-front capex of US\$271 million and operating costs of US\$7,668/tonne of HPA.

The company will now commence a Definitive Feasibility Study ("DFS"), which will include a pilot plant to demonstrate the scalability of the process. It is expected that this study will be completed in Q3, 2019, with planned production, predicated on a positive DFS, approvals and financing targeted for late 2022.

## KEY POINTS

**Growth market:** With the market for HPA expected to grow at between 15% and 20% over coming years, there will be room for new players, particularly with disruptive, lower cost production technologies.

**4N HPA produced:** The production of the required purity 4N HPA has demonstrated, at least on a bench scale, that the Company's HCl leach processing works, and that the Yendon kaolinite is fit for purpose.

**Long life operation:** The resources at the Yendon kaolinite deposit are more than adequate for the 39 year operation modelled by the Company in the PFS - there is also the potential to source kaolin from Imery's nearby mining operations.

**Process plant site optionality:** Given the relatively low tonnages of material that will need to be shipped (and the relatively low cost of freight compared to operating costs and product prices) there is optionality to site the processing plant in areas with relatively low operating costs; Hill End will be conducting a plant site study as part of the upcoming DFS.

**Infrastructure rich:** The proposed mine site and plant site (as it stands) are well served by transport and power infrastructure; in addition they are proximal to residential skilled work forces.

**Leveraged to success:** With a current market capitalisation of only A\$11.5 million, Hill End is well leveraged to positive news flow from ongoing studies related to the DFS; this has been demonstrated by Altech which has moved from a sub-A\$10 million market capitalisation in mid-2015 to over A\$70 million currently.

**Experienced personnel:** Company personnel have significant experience in technical and commercial aspects of the junior resources sector.

## VALUATION SUMMARY

- ◆ We have a base case valuation/12 month price target of A\$0.38/share for Hill End, with 90% of this for Yendon - this is based on a capital structure diluted for 20 million outstanding consideration shares.
- ◆ Key drivers in value will be successful pilot scale production of 4N HPA, which is expected during the upcoming DFS.
- ◆ We see considerable upside in this with material success in ongoing activities.

## SWOT ANALYSIS

### Strengths

- ◆ **Forecast growth market:** The HPA market is forecast to grow strongly over coming years, with Hill End poised to take advantage of this.
- ◆ **Disruptive technology:** The proposed HCl leach/solvent extraction processing technology is disruptive, and could turn the HPA industry around; the potential for cheaper processing, although potentially leading to lower HPA prices, could lead to increases in demand over and above that currently forecast.
- ◆ **Precedent set by Altech:** The success of Altech in obtaining finance for a similar process should smooth the way for new entrants considering entering the industry.
- ◆ **Ideally located:** Both the planned mine and processing facility are in a stable jurisdiction that is well served by infrastructure and has a readily available skilled work force.

### Weaknesses

- ◆ **Unproved technology:** Hill End's technology is yet to be proved on a pilot or commercial scale; there can be issues in scaling up processing from bench scale test work.
- ◆ **Costs:** Victoria (and indeed most of Australia) is marked by relatively high costs, including labour and power which are two key inputs into the production of HPA.

### Opportunities

- ◆ **Plant location:** To take advantage of lower operating costs there is the potential, given the need to only ship relatively small tonnages of feedstock and relatively low transport costs compared to the overall potential value of the product, to site the processing plant in a different jurisdiction
- ◆ **Expansion and licencing:** Once commerciality is established and should the market warrant it, there may the potential to licence the technology, else look for expansion opportunities; there will also be the opportunity to enter into the faster growing and higher priced 5N HPA market.

### Threats

- ◆ **Metallurgy/processing:** The key threat to the viability of the Project is getting the processing to work consistently in scaled up testwork; this will also apply to the performance of any completed commercial plant.
- ◆ **Predatory pricing by existing producers:** Existing HPA producers may react to lower cost newcomers through cartel behaviour or predatory pricing with increased production, however the lower cost of production through the acid leach process does provide some protection from this. On the positive side existing players may look to buy the new process once it is established.
- ◆ **Growth in demand not as expected:** Forecasting is an inexact art at best, and there is always the risk that the demand may not grow as expected, particularly in relatively new or niche commodities; this may affect the ability to fund a full scale development, else lead to lower prices resulting in lower returns to shareholders.
- ◆ **Funding:** This takes two forms; the ability to fund the upcoming study and then, should a decision to mine be made, funding the development. The Company has estimated that it will cost ~A\$5-6 million to complete the DFS in a addition to the ordinary costs of running the business of A\$1-2 million. To offset this there are a few potential sources of funding, including exercise of options (a number of options are just out of the money) and proceeds from the sale of the gold assets, which may cover costs through to the completion of the DFS. In addition the Company is in discussions with potential development finance providers, with the potential to become involved in the Project through the DFS so as they become aware of the opportunities and risks prior to making any decision on development.

## OVERVIEW

### STRATEGY AND PROJECT OVERVIEW

- Hill End's activities are concentrated on the Yendon High Purity Alumina Project, located approximately 100km NW of Melbourne and 15km SE of Ballarat in southern Victoria (Figure 1); the Company also owns the Pittong Project, centred approximately 35km west of Ballarat (Figure 1).

Figure 1: Yendon project location map



Source: Hill End Gold

- The rationale is to supply the forecast upcoming strong growth in demand for “4N” (99.99% purity) HPA, a key constituent in LED light globes (which currently use 85% of the product), with another key growth market to be separator sheets in Li-ion batteries.
- The market for 4N HPA was ~25,700t in 2017, with forecasts for demand in 2025 ranging from ~60,000tpa to over 120,000tpa; most of the difference here is due to different forecasts for the separator sheet market, with these ranging from ~15,000tpa to 76,000tpa.
- Current production is from the conversion of aluminium metal, with our estimate of operating costs being in the order of US\$17,000/tonne, based on prices for the finished product averaging ~US\$25,000/tonne.
- Hill End and a handful of other developers globally are looking at disruptive HCl leaching technology, to convert high purity kaolin to HPA, with costs of production estimated to be in the range of ~US\$7,500 - US\$10,000/tonne; the technology, which largely uses “off the shelf” equipment was originally developed in the 1940’s in the US; differences between developers lies largely in the purification steps to produce HPA of the required purity from leach solutions.
- The Company is targeting high purity kaolin to use as a feedstock for HPA production from its 100% owned Yendon deposit; both the Yendon and Pittong projects are in areas where French company Imerys is mining kaolin, with this being treated at a plant at Pittong.
- Current plans are to build an 8,000tpa HPA processing plant at Altona in Melbourne, however the Company is investigating other processing options, including offshore, to take advantage of lower operating costs, particularly power and labour.
- Altech, the most advanced of the ASX-listed HPA developers is doing just that - construction is due to begin on their 4,500tpa plant in Johore, Malaysia, which will use feed from the Meckering deposit located approximately 100km east of Perth in Western Australia.
- Hill End also owns the Hill End and Hargraves gold projects in NSW; given that these are currently up for sale they will not be discussed further.

### FINANCIAL POSITION

- As of March 31, 2017, the Company had A\$2.372 million in cash and no debt, with A\$0.075 options that are currently just out of the money having the potential to bring in A\$3.36 million; in addition a successful gold asset sale may bring in the cash required to fund the DFS.



- ◆ Over the twelve months to March 31, 2017, the Company spent A\$1.055 million on exploration and A\$1.615 million on administration; exploration expenditure accelerated from the September, 2017 Quarter following the Yendon acquisition.
- ◆ Over the same period the Company raised A\$4.176 million from the issue of shares and conversion of options; this included a placement of ~37.5 million shares at A\$0.10/share to raise A\$3.75 million before costs; the issue included one A\$0.20, 30/7/2020 option for each two shares subscribed for.

## YENDON HPA PROJECT - HILL END GOLD 100%

### Location and Tenure

- ◆ The combined Yendon and Pittong Projects comprise four exploration licences ("EL"), covering a total area of 94km<sup>2</sup> (Yendon) and 221km<sup>2</sup> (Pittong); there is also a Retention Licence Application over the Yendon kaolinite deposit that is yet to be granted.
- ◆ All tenements are in good standing, however one, EL5457, due for renewal in September 2018, is in the process of being renewed.
- ◆ The area has a history of kaolin mining, with Imerys currently active in the region, and the nearby regional centre of Ballarat having a long history of gold mining.
- ◆ The region is well served by transport and power infrastructure, and within ready trucking or rail distance to Melbourne, either for processing if the Altona option is retained, else for shipping if an overseas option is chosen.

### Acquisition Details

- ◆ The proposed acquisition of the Project was announced to the market on May 9, 2017, with completion of the acquisition, following due diligence being announced on July 17, 2017.
- ◆ The agreement involved the acquisition of 100% of Pure Alumina Limited ("PAL"), a private company controlled by Tom Eadie and Tolga Kumova, who were founders of Syrah Resources Limited (ASX: SYR).
- ◆ Details of the acquisition are presented below:
  - Upon completion of due diligence and conditions precedent, a Sale Agreement will be entered into and HEG will issue 8m shares and pay \$100,000 in cash (completed),
  - HEG will be operator of the assets and will pay for all costs,
  - Upon completion of conditions precedent and signing of a Sale Agreement, the vendors will have the right to appoint one director to the HEG board (Tom Eadie has recently been appointed to the Board),
  - On completion of a Pre-feasibility Study, HEG will issue 20m shares to PAL and HEG will own the tenements, HPA information and related rights (the PFS has been completed, however the shares are yet to be transferred),
  - Completion of a viable Definitive Feasibility Study ("DFS") is expected to occur within 2 years and at such time HEG will issue \$1.5m shares at the lesser of A\$0.20 per share and the 30 day VWAP,
  - If a viable DFS is not achieved within two years then \$100kpa payments, pro rata per month, will be payable to PAL until achieved or up to 31 December 2022; and,
  - Upon receipt of a sales contract for 100% of offtake for 1.5 times the capital payback period, HEG will issue \$0.5m in shares at the lesser of 20c per share and the 30 day VWAP.
- ◆ Key points of the acquisition include that the majority of the consideration is performance based and in HEG shares - this has involved only minimal up-front cash payments.

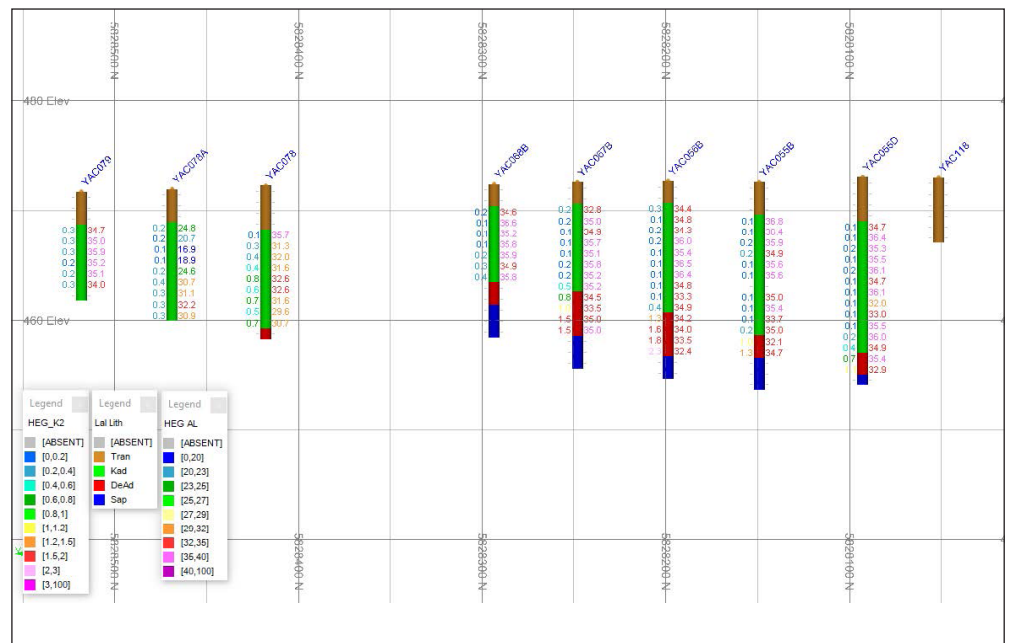
## Geology, Mineralisation and Resources

### Geology and Mineralisation

- ◆ The kaolin deposits in the Ballarat region are developed over Siluro-Devonian granitoids of the Macquarie Arc, with the granites related to the rifting of an earlier turbiditic sediment package.
- ◆ At Yendon, the kaolin is formed by the strong weathering of an adamellite (which is composed largely of quartz and feldspars, with some accessory mafic and oxide minerals) - this weathering removes the majority of the mobile elements, with silica (quartz) and kaolin (weathered feldspars) remaining.

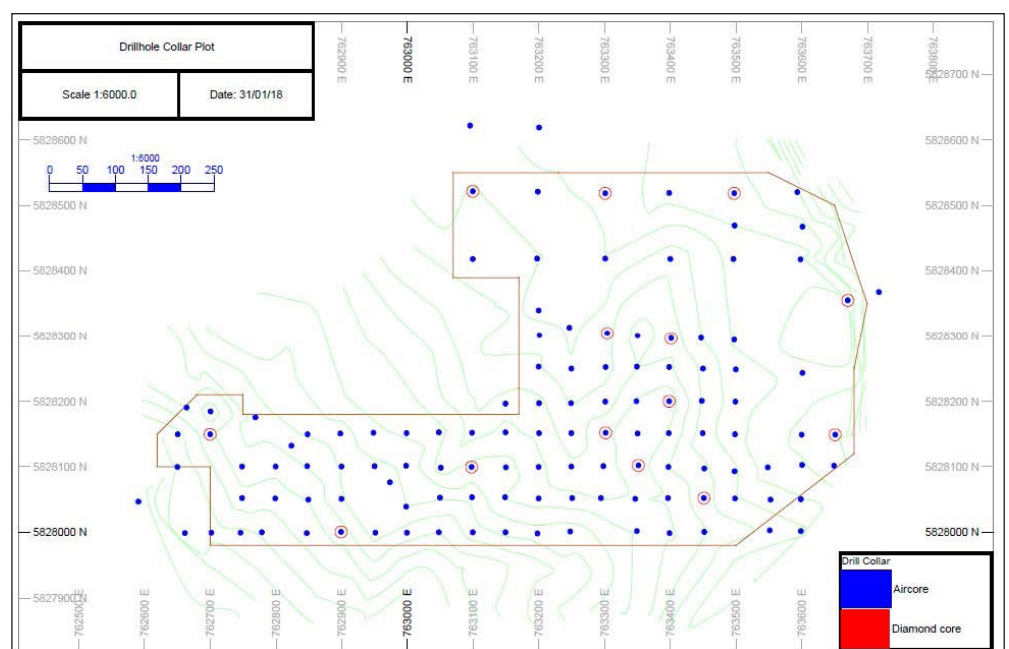
- ◆ The nature of formation of the kaolin results in the deposits being shallow and flat lying, with this within a profile which includes (Figure 2):
  - Overburden of transported soils, clays and silts, with this averaging 2m - 3m in thickness, with a maximum thickness of 8m,
  - The kaolin zone, which averages 8m in thickness, with a maximum of 22m,
  - Decomposed adamellite, which is transitional between the kaolin and fresh adamellite; and,
  - Fresh adamellite (which was not intersected in the drilling).
- ◆ The recognised mineralisation covers an area of ~40ha, extending for up to ~1,000m east-west and up to 600m north-south (Figure 3).
- ◆ The nature of the mineralisation will result in a simple, free dig mining operation with a low strip ratio and little (if any) contamination from the wall rocks.

**Figure 2: Yendon kaolin deposit typical cross section**



Source: Hill End Gold

**Figure 3: Yendon kaolin deposit drilling plan**



Source: Hill End Gold



## Exploration and Development Activities

- ◆ Activities completed by Hill End to date have been targeted at completion of the recently completed PFS.
- ◆ Key technical activities have included:
  - Resource drilling,
  - Estimation of an initial MRE; and,
  - Metallurgical test work.
- ◆ The results of this work have been used in the PFS, with, given the nature of the proposed operation, metallurgy being by far the most critical facet.

### Resource Drilling

- ◆ Resource drilling (undertaken by Hill End Gold in late 2017) included 121 aircore holes for 1,607m (of which 84 holes/926m were assayed) and 15 diamond holes for 228m - diamond holes largely twinned aircore holes (Figure 4) and were used for density measurements and not assayed.
- ◆ Drill spacing was 50m x 50m in priority areas, with this expanded to 100m x 100m largely in the northern area.

### Mineral Resource Estimate

- ◆ The initial Yendon MRE is presented in Table 1; given the nature of the proposed operations this is sufficient for a multi-decade nominal 8,000tpa HPA operation which will only require ~87,000tpa of mined material.

**Table 1: Yendon JORC 2012-compliant Mineral Resource Estimate**

Class	Tonnage (Mt)			<63 µm concentrate grades (%)							
	In situ	Con Mass	Mass Recovery	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	SiO <sub>2</sub>	TiO <sub>2</sub>
Measured	1.7	0.8	43.1	35.1	0.1	0.8	0.2	0.1	0.2	47.8	1.1
Indicated	2.0	0.8	43.1	34.3	0.1	0.9	0.3	0.1	0.2	48.9	1.1
Total	3.7	1.6	43.1	34.7	0.1	0.8	0.2	0.1	0.2	48.4	1.1

Source: Hill End Gold

### Metallurgy

- ◆ The metallurgy, and more specifically, the ability to produce 4N quality HPA from the kaolin feedstock is the critical facet of any proposed operation; any operation needs to produce a reliable, consistent supply of HPA to attract offtake agreements.
- ◆ Metallurgical test work was initially commenced by the vendors, with Hill End Gold continuing on with the work; this work is ongoing, being a critical part of the DFS, which is expected to include a pilot leach/extraction plant.
- ◆ Although the planned circuit will be largely comprised of off the shelf components, some processes, especially in the extraction and cleaning areas have been developed in conjunction with the Project metallurgist and engineers (BHM and Primero), and hence are proprietary, and cannot be discussed in detail here.
- ◆ As announced to the market on January 10, 2018, 4N HPA was successfully produced using conventional processes in a bench scale trial at Nagrom Laboratories in Perth (using the -63µm fraction of 2kg representative sample of Yendon kaolin), with results of this work presented in Table 2.
- ◆ This was followed on by processing a bulk sample as part of the PFS using a ~425kg composite; this produced an HPA sample with a purity of 99.9936% Al<sub>2</sub>O<sub>3</sub>, with reportable impurities well within acceptable limits - iron was the main impurity in the product.

**Table 2: Yendon preliminary 4N production assay results**

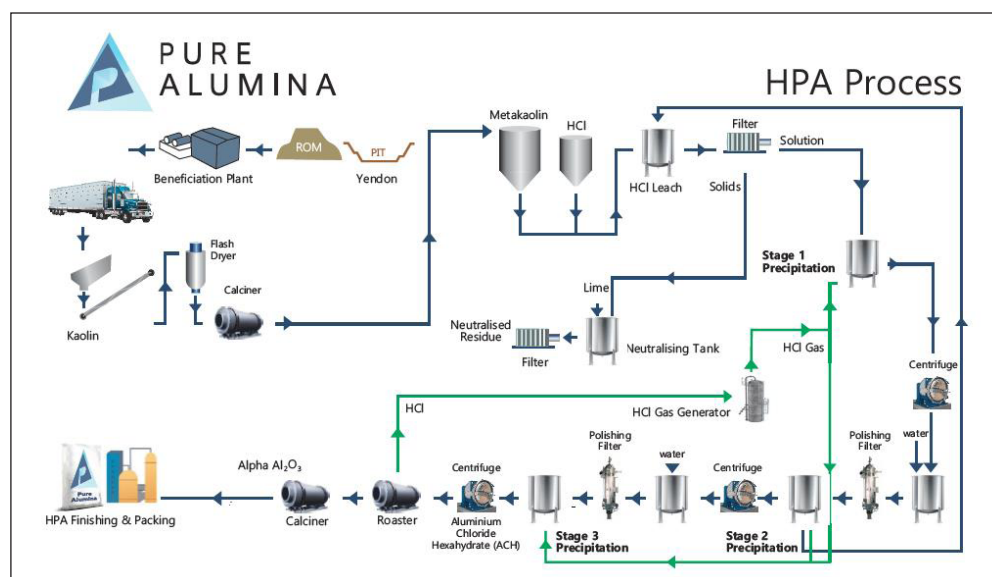
Yendon preliminary 4N production assay results	
Element	Assay
Al <sub>2</sub> O <sub>3</sub> (alumina)	99.995%
Iron	21.5 ppm
Sodium	12.3 ppm
Magnesium	6.8 ppm
Calcium	2.6 ppm
Arsenic	2.3 ppm
Zinc	1.6 ppm
Manganese	1.1 ppm
Potassium	0.3 ppm
Gallium	0.2 ppm
Lead	0.2 ppm
Barium	0.2 ppm
Tungsten	0.1 ppm
Copper*	< 1 ppm
Silicon*	< 1 ppm
Boron*	< 1 ppm
Other	0.7 ppm

Source: Hill End Gold

\* Values were below the limit of detection of the equipment

- ◆ The comminution and leaching process route used included:
  - Attritioning of the sample at ~1kWh/t (this is a low power load, reflecting the softness of the ore),
  - Screening at 63µm, with 42% of the mass reporting to the undersize (the PFS uses a mass pull of 35%) and containing 35.3% Al<sub>2</sub>O<sub>3</sub>, representing a kaolin content in the concentrate of ~89%,
  - Flocculation, thickening and filtration,
  - Calcining at 600° for 90 minutes to produce metakaolin; and,
  - Leaching in concentrated hydrochloric acid for 45 minutes - the starting temperature for this exothermic reaction was 70°, with this needing to be carefully controlled, and with ~90% of the aluminium being leached.
- ◆ The next stages involved the recovery and cleaning of the aluminium from the leach solution:
  - Aluminium chloride hexachlorite ("ACH", AlCl<sub>3</sub>.6H<sub>2</sub>O) crystals were precipitated by injecting with HCl gas, with this achieving Al recoveries of >90% whilst leaving impurities in the solution,
  - The ACH crystals were washed, redissolved using ultra-pure water and reprecipitated using HCL gas - three cycles of washing and reprecipitation were used,
  - The final ACH was washed with HCl to remove impurities; and,
  - The purified ACH was calcined for four hours at 1150° to produce the finished HPA.
- ◆ This product had a purity of 99.9936% Al<sub>2</sub>O<sub>3</sub>, very similar to that from the initial test.
- ◆ The resulting process flow sheet, as used as the basis for design and costing in the PFS is shown in Figure 4.
- ◆ Recovery parameters used in the PFS include a 35% mass pull of a 35% Al<sub>2</sub>O<sub>3</sub> concentrate from the mined ore, and a 75% Al<sub>2</sub>O<sub>3</sub> process recovery from concentrate to final product.
- ◆ The upshot of this is production of 8,000tpa of HPA will require the treatment of 30,500tpa of concentrate from 87,000tpa of ore.

Figure 4: Proposed metallurgical flowsheet



Source: Hill End Gold

## Pre-feasibility Study

### Summary and Costs

- ◆ The positive results to the Pre-feasibility study were announced to the market on June 14, 2018, with key outcomes presented in Table 3.
- ◆ We have also included the comparable figures from Altech's Final Investment Decision ("FID") Study as a comparison; one reason we have this comparison is that Altech's project has recently had debt financing approved, and hence these projects can stack up financially.

Table 3: Yendon PFS and Altech FID study summary results

Yendon PFS and Altech FID study summary results		
Parameter	HEG PFS	ATC FID Study
<b>Annual HPA Production</b>	8,000 tpa +99.99% $\text{Al}_2\text{O}_3$	4,500 tpa +99.99% $\text{Al}_2\text{O}_3$
<b>Capital Cost</b>	US\$271 million (incl contingencies of \$53m)	US\$298 million
<b>Capital Cost per t of HPA</b>	US\$33,875 based on 8,000 tpa HPA	US\$66,222 based on 4,500 tpa HPA
<b>Average Cost of Production</b>	US\$7,668 /tonne of HPA	US\$9,900 /tonne of HPA
<b>Forecast Sale Price</b>	US\$25,200 /tonne	~US\$27,000 /t
<b>Average EBITDA</b>	US\$133m per annum	US\$76m per annum
<b>Payback Period</b>	4.1 years	3.9 years
<b>Project NPV</b>	US\$692m (10%, post tax)	US\$505m (7.5%, pre-tax)
<b>IRR</b>	34%	22%

Source: Hill End Gold, Altech, IIR analysis

- ◆ The Yendon Project is predicated on a 39 year mine life, with mining and beneficiation at Yendon, and then trucking the kaolin concentrate ~100km to the processing plant at Altona, to the southwest of the centre of Melbourne.
- ◆ That for Altech, for which financing has been approved by the German KFW-IPEX Bank, supported by the German export credit agencies, is for mining at the Meckering deposit near Perth, trucking to Fremantle and then shipping to the processing plant in Johor, southern Malaysia.
- ◆ Yendon production parameters are shown in Table 4, with operating and capital cost breakdowns presented in Tables 5 and 6.

Table 4: Yendon production parameters

Yendon production parameters		
Parameter	Unit	Quantity
Total Mined	million tonnes	5.82
Ore Milled	million tonnes	3.26
Strip Ratio		0.78:1
Al <sub>2</sub> O <sub>3</sub> grade	%	13
Contained Al <sub>2</sub> O <sub>3</sub>	tonnes	424,233
Recovery Al <sub>2</sub> O <sub>3</sub>	%	69.752
Recovered Al <sub>2</sub> O <sub>3</sub>	tonnes	295,912
HPA Price	US\$/tonne	25,200
Revenue from HPA Sales	US\$ million	7,457

Source: Hill End Gold

Table 5: Yendon capital cost breakdown - US\$

Yendon capital cost breakdown - US\$	
Parameter	Cost Estimate
Mine and Beneficiation plant	\$ 20,257,225
Engineering & Design	\$ 16,317,079
Contractor Management	\$ 3,732,525
Construction	\$ 25,862,760
Mechanical Equipment	\$ 92,813,954
Piping	\$ 20,614,397
Electrical	\$ 22,991,531
Equipment & Tools	\$ 3,382,271
Contingency	\$ 50,260,825
Owners Costs	\$ 14,767,536
Total Capex	\$ 271,000,103

Source: Hill End Gold

Table 6: Yendon operating cost breakdown

Yendon operating cost breakdown				
Parameter	US\$ Million	US\$/tonne HPA sold	US\$/t Processed	US\$/t Mined
Mining Cost	68.18	230	20.89	11.71
Beneficiation Plant cost	96.17	325	29.47	16.51
HPF Plant Operating cost	2,105	7,113	644.95	361.38
Total Operating Cost	2,269	7,668	695.32	389.6
Royalties	2.22	7.49	0.68	0.38
Total Cash Cost	2,271	7,676	696	389.98
Earnings Before Interest Taxes (EBIT)	4,960	16,762	1,520	851.66
NPV (10.0%)	691.83			
IRR	34%			

Source: Hill End Gold

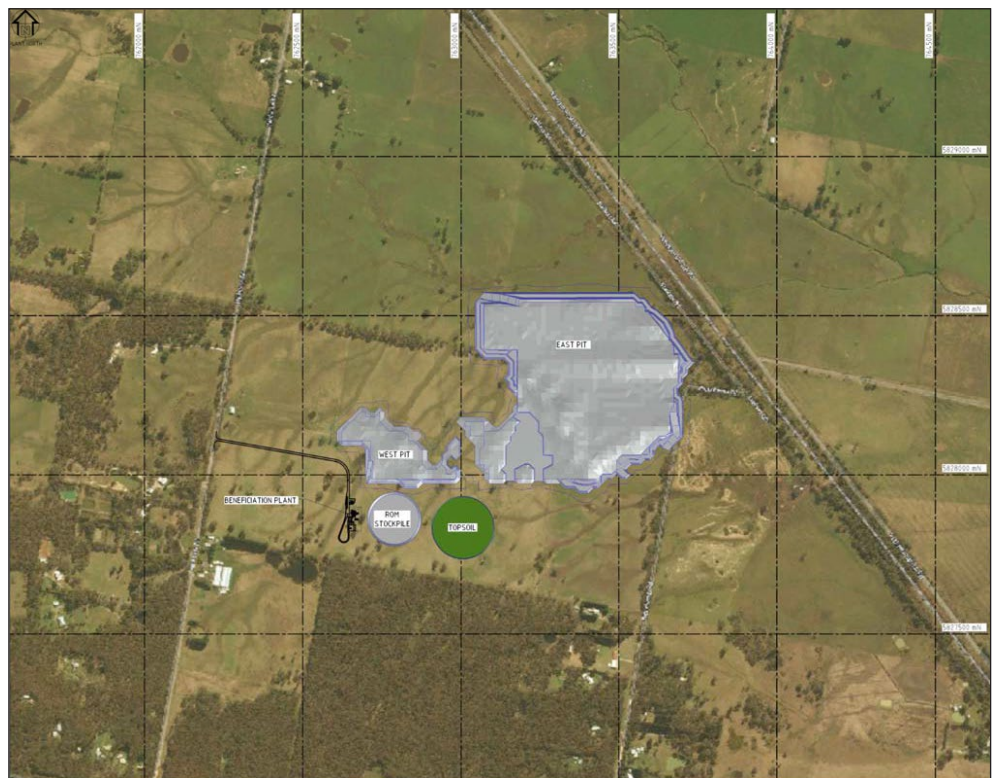
- ◆ Hill End Gold and Altech are the only two companies to publish the results of studies for an acid leach HPA project in recent times; Canadian Orbite Technologies (currently under creditor protection) built a smaller scale plant in 2012 at an estimated capital cost of \$30 million, however this has never reached production.
- ◆ Therefore any view on the costs in Hill's PFS will be in comparison with Altech's FID Study, which was the result of intensive due diligence by the German credit providers and export credit agencies, with credit now being approved, and the capital cost reflecting a fixed-price, lump sum engineering, procurement and construction contract for the Malaysian process plant to be undertaken by a consortium led by major German engineering group SMS Group GmbH.
- ◆ Given the above, and that the general accuracy of a PFS is +/-25%, our view is that Hill End's PFS figures are reasonable, and well within the ball park of what may be expected.

- ◆ The estimated capital cost, when scaled (using industry standard scaling factors) for a 4,500tpa operating is US\$191 million, some 35% lower than Altech's fixed price of US\$298 million.
- ◆ This may reflect a number of factors, including the requirements of the due diligence process and the SMS led construction contract.
- ◆ As discussed in our valuation section Yendon will be able to absorb significant increases in capital without unduly affecting the financial viability of the Project.
- ◆ Operating costs are comparable; Hill End's estimated operating costs scaled to a 4,500tpa operation are US\$10,800/t HPA, some 10% higher than Altech's published FID figure of US\$9,900/t HPA.
- ◆ This may in part reflect higher costs in Australia, particularly power and labour; energy and labour costs both make up some 23% each of the estimated operating costs of Yendon, thus savings in both will have major impacts on the overall operating cost.

#### Yendon Site Activities

- ◆ A plan of the proposed Yendon site facilities, which includes mining, beneficiation and truck loading is shown in Figure 5.
- ◆ It is planned to campaign mine for 2-4 weeks per year, utilising 120 tonne excavators and a fleet of 90t rigid body mine haul trucks.
- ◆ Run of mine ("RoM") material will be stored on a 130kt stockpile, which will allow for the nominal 90ktpa required for concentrate production and 40ktpa for blending; overburden will be used to construct a coarse rejects storage facility.
- ◆ Following beneficiation (which will operate year round), concentrate will be stored undercover, with the storage shed also including space for front end loader operations to load trucks for transport to the processing facility or shipping terminal.

**Figure 5: Preliminary Yendon mine site layout**



Source: Hill End Gold

#### Processing Facility

- ◆ The processing facility has been discussed in the previous section on metallurgy, and will also include a bagging facility for the finished product.
- ◆ As mentioned, although the PFS was predicated on the processing being located in the industrial area of Altona, SW of Melbourne, the DFS will include a site optimisation study to look at options for the processing facility, including overseas if necessary.

- ◆ Key requirements for the processing facility include a ready supply of cheap power and HCl and ready access to transport facilities; these factors will take a major part in any final decision on the plant location.

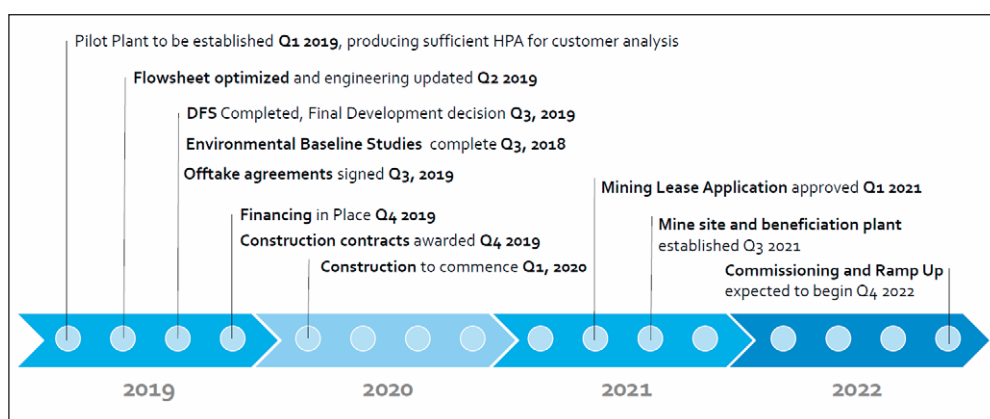
### Access and Infrastructure

- ◆ Both the Yendon and Altona sites are well served by transport and energy infrastructure, and have a ready resident workforce.
- ◆ Power for both is available from the 220kVa high tension electricity grid, with Altona also being served by a gas pipeline owned by APA, with gas being a key requirement in the processing facilities; it still needs to be determined whether there is the potential for a gas offtake agreement, however this to be undertaken as part of the DFS.
- ◆ It is planned to use bores for the water supply at Yendon.

### Upcoming Activities

- ◆ A proposed time line of planned activities is shown in Figure 6, with a targeted first production by the end of 2022.

**Figure 6: Indicative activities timeline**



Source: Hill End Gold

- ◆ Key activities will include construction of a pilot plant, to demonstrate the commerciality of the process; in addition marketing samples will be produced for potential offtake partners.
- ◆ The estimated cost (including overheads) to a decision to mine is A\$7-8 million.

### PEERS

- ◆ Hill End is one of only a handful of companies looking at HPA production through leach processes globally, with five out of the six we are aware listed on the ASX; the sixth is Canadian based Orbite technologies, which is currently under creditor protection.
- ◆ The ASX-listed companies are presented in Table 7, ranked in order of decreasing EV.
- ◆ The most advanced is Altech, with debt funding in place and now set to commence construction on the 100% owned Malaysian processing plant.
- ◆ Hill End, with the PFS completed, is the next most advanced however with the second lowest EV; the high EV of Collarina may be largely be due to their project being associated with a Central Western NSW Ni-Co laterite project, with projects of this type achieving attractive valuations over recent times.
- ◆ We would consider the main impetus for price movement for Hill End will be further advances in the metallurgy, and progress on the DFS; we note that ATC's share price remained fairly flat until the DFS was released in July 2015, at which time the price started moving.
- ◆ However, given the success so far of ATC, we may expect more interest in the sector (ATC was the pioneer), and hence value creation earlier for Hill End than that for Altech.
- ◆ The comparison shares the significant value uplift potential in Hill End.



Table 7: Hill End Gold peers

Hill End Gold peers					
Company	Altech	Collarina Cobalt	FYI Resources	Hill End	Andromeda
Code	ATC	CLL	FYI	HEG	ADN
Last Price	A\$0.175	A\$0.115	A\$0.085	A\$0.071	A\$0.008
On Issue	426,540,542	508,272,744	185,899,454	147,790,933	898,028,227
MC Undiluted	A\$74.64 m	A\$58.45 m	A\$15.80 m	A\$10.49 m	A\$7.18 m
Cash (31/3/18)	\$6.9 m	\$1.4 m	\$1.4 m	\$2.4 m	\$1.3 m
EV	A\$67.71 m	A\$57.01 m	A\$14.40 m	A\$8.12 m	A\$5.88 m
Mining Project	Meckering, WA	Homeville, Nyngan NSW	Cadoux, WA	Yendon, Ballarat, VIC	Poochera, Eyre Peninsula, SA
Ownership	100%	100%	100%	100%	Earning 75%
Geology	Weathered Granite	Laterite over Serpentine	Weathered Granite	Weathered Granite	Weathered Granite
Processing	Malaysia	Site	Perth?	Altona, will look at alternatives	?
4N Produced?	Pilot Scale	Batch Scale	Batch Scale	Batch Scale	No
Planned Production	4,500 tpa	~10,000 tpa	5,000 to 10,000 tpa	8,000 tpa	N/A
Capital Cost	US\$298 m	N/A	N/A	US\$271 m	N/A
Operating Costs	US\$9,900/t HPA	N/A	N/A	US\$7,688/t HPA	N/A
Stage	Financed, commencing construction, figures from FID Study, October 2017	PFS Underway	PFS Underway	PFS Completed	Testwork completed for other kaolin uses
Notes	Pure play HPA	Looking at Ni, Co, HPA	Pure play HPA	Pure play HPA	ADN has a portfolio of other projects

Source: IRESS, Company Reports, IIR analysis

## CAPITAL STRUCTURE

- ◆ The Company currently has 147.97 million shares on issue, 42.2 million A\$0.075 listed options and 29.2 million unlisted options on issue; all have an exercise date of July 30, 2020, with 2.60 million unlisted options having an exercise price of A\$0.075 and 26.6 million with an exercise price of A\$0.20.
- ◆ 44.80 million options are just out of the money, with the potential to bring in A\$3.36 million should they be exercised.
- ◆ The largest shareholder is Tolga Kumova (one of the vendors of Yendon), with 6.69% of the issued ordinary shares.
- ◆ Management directly and indirectly hold 2.61% of the shares in Hill End, with the Top 20 holding 42.26%.

## VALUATION

- ◆ We have completed a valuation for both the Yendon HPA Project and the Company which is presented below.
- ◆ The Yendon valuation is the average of the NPV<sub>8</sub> and a 7.5x EBITDA multiple using the Project's peak EBITDA; we have applied a discount factor of 95% to this to reflect the stage of the Project and the risks, particularly with regards to technology/metallurgy - this also reflects the requirement to raise cash down the track with the resultant dilution.
- ◆ The gold projects (Hargraves and Hill End) have been nominally valued at their FY2017 book value of A\$2.5 million, with cash as of March 31, 2018 - we have not applied any formal valuation to the gold assets, and hence this nominal figure may not represent the actual value that may be realised in the sale of the projects.
- ◆ We have also diluted the current share structure by the 20 million shares due on the completion of the DFS but yet to be issued to the vendors of Yendon.

- ◆ We have not diluted the capital structure by the 44.8 million options that are just out of the money, however including them and the cash on conversions changes the valuation to A\$0.31/share.

**Table 8: Hill End valuation summary**

Hill End valuation summary					
Parameter	Full Value	Risk Factor	Riskd Value	Riskd per Share	Notes
<b>Yendon HPA</b>	A\$1,161 m	5%	A\$58.04 m	A\$0.346	Blended DCF/ EBITDA Multiple
<b>Gold Projects</b>	A\$2.50 m	100%	A\$2.50 m	A\$0.015	Book Value
<b>Cash</b>	A\$2.37 m	100%	A\$2.37 m	A\$0.014	Actual 31/3/18
<b>Total</b>	A\$1,166 m		A\$62.91 m	A\$0.375	
<b>Shares on Issue</b>	167.79 m	Current shares on issue plus 20 million consideration shares			

Source: Hill End Gold, Altech, IIR analysis

## YENDON HPA PROJECT VALUATION

- ◆ We have valued Yendon using both a DCF analysis (using an 8% discount rate) and an 7.5x peak EBITDA multiple, with outcomes and inputs included in Table 9.
- ◆ Key inputs, including operating and capital costs, and HPA pricing are as used by Hill End, and we have also completed sensitivity analyses around the key inputs.
- ◆ We have assumed a 20 year operating life (the Hill End PFS assumes 39 years) - this makes only a little difference to the valuation given that cash flows post 20 years are heavily discounted.
- ◆ We have also used the EBITDA multiple valuation method given that the Project is more of a long life specialty chemical industrial operation than a mining project - EBITDA multiples for specialty chemical companies are commonly in the range of 5x to 10x (and more commonly at the upper end of this) - we have used 7.5x in our valuation of Yendon.

**Table 9: Yendon valuation parameters and results**

Yendon valuation parameters and results			
Parameter	Units	Amount	Notes
<b>Inputs</b>			
Mine Life	Years	20	
Total HPA Produced	Tonnes	154,000	Year 1 - 4,000t, Year 2 - 6,000t, then 8,000tpa for 18 years
Annual HPA Production	Tonnes per Annum	8,000	Nameplate capacity
Total Ore Mined	Tonnes	1,676,190	
Total Waste Mined	Tonnes	2,148,962	Strip ratio of 0.78:1 waste:ore
Capital Cost	US\$	\$271 m	Hill End figures
Operating Cost	US\$/tonne HPA	\$7,668	Hill End figures
HPA Price	US\$/tonne HPA	\$25,200	Hill End figures
Discount Rate	%	8%	
AUD/USD Exchange		0.75	
Australian Tax Rate	%	30%	
Royalty Rate	%	2.75%	
Assumed Royalty Value	US\$/tonne kaolin	\$70	US\$100/tonne less US\$30/tonne transport - Hill End figures
<b>Outputs</b>			
NPV	US\$	\$690 m	
NPV	A\$	\$920 m	
IRR	%	34%	
Peak EBITDA	US\$	\$140 m	
Peak EBITDA	A\$	\$187 m	
EBITDA 7.5x Multiple	US\$	\$1,051 m	
EBITDA 7.5x Multiple	A\$	\$1,402 m	
Average NPV/EBITDA	US\$	\$871 m	
Average NPV/EBITDA	A\$	\$1,161 m	

Source: IIR analysis

- ◆ Our sensitivity analysis is presented in Tables 10 to 13; Table 10 shows the sensitivity to various operating parameters, which shows that the project is reasonably robust, however showing that it is quite sensitive to changes in the HPA price.

**Table 10: Yendon HPA Project NPV<sub>10</sub> sensitivity - US\$**

Yendon HPA Project NPV <sub>10</sub> sensitivity - US\$				
Change	Mining Cost	Processing Cost	Capex	HPA Price
-20%	US\$696 m	US\$765 m	US\$737 m	US\$424 m
-10%	US\$693 m	US\$727 m	US\$713 m	US\$557 m
0%	US\$690 m	US\$690 m	US\$690 m	US\$690 m
10%	US\$687 m	US\$652 m	US\$666 m	US\$823 m
20%	US\$684 m	US\$615 m	US\$643 m	US\$956 m

Source: IIR analysis

- ◆ Tables 11 and 12 present the sensitivity of both the NPV and EBITDA multiples to changes in operating costs and HPA prices.

**Table 11: Yendon HPA Project price and operating cost NPV sensitivity**

Yendon HPA Project price and operating cost NPV sensitivity						
Operating Costs US\$/tonne HPA						
		US\$6,000	US\$7,000	US\$8,000	US\$9,000	US\$10,000
HPA Price US\$/Tonne	US\$20,000	US\$474 m	US\$421 m	US\$368 m	US\$315 m	US\$263 m
	US\$22,500	US\$606 m	US\$553 m	US\$500 m	US\$447 m	US\$395 m
	US\$25,000	US\$738 m	US\$685 m	US\$632 m	US\$579 m	US\$527 m
	US\$27,500	US\$870 m	US\$817 m	US\$764 m	US\$712 m	US\$659 m
	US\$30,000	US\$1,002 m	US\$949 m	US\$896 m	US\$844 m	US\$791 m

Source: IIR analysis

**Table 12: Yendon HPA Project price and operating cost 7.5x EBITDA multiple sensitivity**

Yendon HPA Project price and operating cost 7.5x EBITDA multiple sensitivity						
Operating Costs US\$/tonne HPA						
	US\$1,051	US\$6,000	US\$7,000	US\$8,000	US\$9,000	US\$10,000
HPA Price US\$/Tonne	US\$20,000	US\$806 m	US\$746 m	US\$686 m	US\$626 m	US\$566 m
	US\$22,500	US\$956 m	US\$896 m	US\$836 m	US\$776 m	US\$716 m
	US\$25,000	US\$1,106 m	US\$1,046 m	US\$986 m	US\$926 m	US\$866 m
	US\$27,500	US\$1,256 m	US\$1,196 m	US\$1,136 m	US\$1,076 m	US\$1,016 m
	US\$30,000	US\$1,406 m	US\$1,346 m	US\$1,286 m	US\$1,226 m	US\$1,166 m

Source: IIR analysis

- ◆ Table 13 presents the risked, per share blended valuation for Yendon.

**Table 13: Yendon HPA Project risked per share sensitivity**

Yendon HPA Project risked per share sensitivity							
Operating Costs US\$/tonne HPA							
		US\$1,051	US\$6,000	US\$7,000	US\$8,000	US\$9,000	US\$10,000
HPA Price US\$/Tonne	US\$20,000	A\$0.254	A\$0.232	A\$0.209	A\$0.187	A\$0.165	
	US\$22,500	A\$0.310	A\$0.288	A\$0.266	A\$0.243	A\$0.221	
	US\$25,000	A\$0.366	A\$0.344	A\$0.322	A\$0.299	A\$0.277	
	US\$27,500	A\$0.422	A\$0.400	A\$0.378	A\$0.355	A\$0.333	
	US\$30,000	A\$0.478	A\$0.456	A\$0.434	A\$0.411	A\$0.389	

Source: IIR analysis

## RISKS

- ◆ **Resources and geology:** The resources have been largely de-risked – the defined aluminous clay resources are more than adequate to meet the Company's requirements for the foreseeable future, and should extra be required it may be sourced from Imerys. One risk here will be any variability in the feedstock, which can affect the processing,

however the Company plans to use blending to control this, and the drilling completed has confirmed the general homogeneity of the mineralisation.

- ◆ **Technology and metallurgy:** We see this as being the main risk in the project. Although most components of the proposed flow sheet are well understood and proven processes, and bench scale test work has produced 4N HPA, there is a significant jump to take this to a full blown commercial operation. The Company is aware of this, and will be undertaking pilot-scale optimisation test work during the ongoing BFS to assess the scalability; the process may also be sensitive to changes in the composition/purity of the kaolin feedstock.
- ◆ **Market Risk:** Available forecasts suggest an extremely strong market for HPA, with expected shortfalls requiring new capacity to come on-stream. However current supply is concentrated amongst a relatively small number of powerful players, and an important issue is how they react to the threat of a potentially low cost newcomer that is likely to undercut their higher cost operations. Although on the face of it there will be room for all, there is always the risk of “cartel” style behaviour by larger players to drive out newcomers.
- ◆ **Permitting Risk:** Permitting is a perennial consideration in any resources and industrial development. This is mitigated at both potential sites – The Ballarat area of Victoria has a history of mining, including the current kaolin operations of Imerys, and the small scale of the proposed Yendon clay mine should be a positive in the approvals process. The Company also has the option to purchase material from Imerys should there be delays in permitting. The proposed location of the HPA plant in an established chemical producing industrial area which should be positive for the permitting of the processing facilities. Waste products are generally benign, however the use of HCl in operations will impact upon the permitting requirements.
- ◆ **Stock Markets and Funding:** Although the junior resources sector is performing well at the moment and funding is flowing to the right projects, these can turn on a dime - this is a perennial risk for the sector, and given that funds will be required to progress the DFS Hill End is not immune to this. However there is the potential for a successful sale of the gold assets to provide sufficient funding for the DFS, and, should the share price remain at current levels or higher, the potential to bring in cash from the conversion of options.

## BOARD AND MANAGEMENT

- ◆ **Mr Tom Eadie - Non-Executive Chairman:** Mr Eadie is a geologist/geophysicist with extensive experience across many commodities and as a Company Director. He is currently a Non-Executive Director of ASX listed companies Strandline Resources, Alderan Resources and New Century Resources. Mr Eadie was the founding Chairman of Syrah Resources (ASX: SYR). During his time in this role, Syrah discovered and began the development of the world-class Balama graphite project in Mozambique.
- ◆ **Mr Martin McFarlane - Managing Director:** Mr McFarlane has more than 25 years resources experience with major resource companies including Minerals and Metals Group, OZ Minerals Limited, Zinifex Limited, Pasminco Limited and Conzinc Rio Tinto of Australia including successfully holding senior roles for the past 13 years either as CEO / President of the company or being responsible for major business units reporting directly to the CEO.
- ◆ **Mr Graham Reveleigh - Non-Executive Director:** Mr Reveleigh has wide experience in the mining industry, covering exploration, development, construction and mine operations including Mine Manager at Noble's Nob, where he ran the operations for seven years. He has worked as a consultant on numerous projects both in Australia and overseas such as at Hill End in New South Wales, Red Dome in Queensland and as Project Manager at the Moline Gold Mine in the Northern Territory, at Gold Ridge in the Solomon Islands and as part of the Kennecott team at Lihir and in other assignments in the Philippines, New Caledonia, Siberia and most States in Australia. Mr Reveleigh was the Site Manager for Nugget Resources Inc at Hill End NSW since the commencement of the project, and for four years was Managing Director of the Company.
- ◆ **Mr David Leavy – Executive Director:** Mr Leavy has over 25 years of experience in the banking and mining industries covering a wide range of commodities. He has significant experience in debt and equity markets, physical and derivative commodity markets, specifically in gold, bauxite, iron ore, base metals, oil and LNG. Recent roles have included CFO of several mining companies undergoing project development, requiring

implementation of appropriate business processes, government negotiations, team establishment, logistics etc. in Australia, Ghana, Guinea and Sierra Leone. Prior to this Mr Leavy held a number of roles at Westpac through financial markets (FX and commodity derivatives), project finance, relationship management, credit analysis and capital solutions. A significant focus for these roles was on the Mining and Oil & Gas sectors.

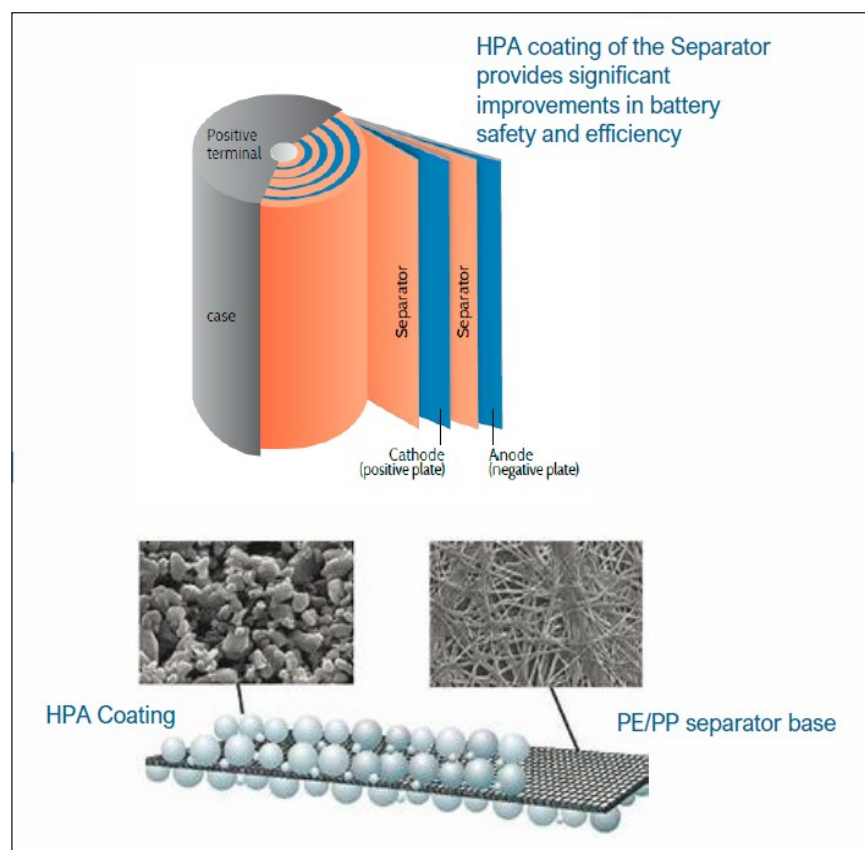
- ◆ **Mr Robert Boston - Non-Executive Director:** Mr Boston is an experienced resources corporate executive having worked in legal, business development, strategy, marketing and commercial positions with BHP Billiton (Nickel West), Rio Tinto Exploration and Poseidon Nickel Limited. Robert holds a law degree having worked for national law firms Freehills and Mallesons Stephen Jaques. Robert has multi commodity expertise in particular exploration, early stage resource development, M&A, joint ventures and marketing. Robert also holds a Bachelor of Commerce, Bachelor of Laws, a Post Graduate Diploma in Applied Finance (FINSIA), and a Diploma of Management. Robert is admitted to the Supreme Court of Western Australia and High Court of Australia.
- ◆ **Mr Stuart Peterson - Chief Financial Officer:** Mr Peterson has over 25 years experience in senior finance positions with public listed companies, primarily in the resource industry. Prior to joining Hill End Gold Limited, he was Chief Financial Officer for Austral Coal Limited for eight years.
- ◆ **Mr Kevin Lynn - Company Secretary:** Mr Lynn is a Chartered Accountant and is Company Secretary of a number of public listed companies including Uranium Exploration Australia Limited, Burleson Energy Limited and Silver Mines Limited. He was appointed as Company Secretary of the Company in October 2001.

## BACKGROUND - HPA AND MARKETS

### WHAT IS HPA AND WHAT ARE ITS USES?

- ◆ As its name suggests, HPA is a high purity form of aluminium oxide, commonly known as alumina. Alumina is the basic feedstock for aluminium production, albeit in a lower purity form, which comprises approximately 90% of the demand for alumina. The remaining 10% is used in the non-metallurgical market for specialty or chemical use.
- ◆ The gemstone sapphire is also a form of HPA, and can occur naturally as well as being formed in the laboratory from 99.99% HPA, with artificial sapphire being one of the key uses for HPA. Artificial sapphire is produced by heating HPA powder in an autoclave to its melting point of 2,000°C under intense pressure, at which point an individual crystal is formed. The crystal is then allowed to cool (~22 day cycle), and then can be cut using diamond cutting equipment to suit individual applications.
- ◆ Around 85% of HPA is currently converted to synthetic sapphire, which has a number of desirable properties that make it an important part of the technology industry:
  - Hard and strong– sapphire has a hardness of 9 on the Mohs scale, second only to diamond, and is important for abrasive applications, including sapphire single crystal applications (phone screens amongst others).
  - Resistant to corrosion – important in semiconductor manufacturing and display screens, where corrosion by plasma is an issue.
  - High brightness – key in effective LED lighting, which is more energy efficient than traditional incandescent bulbs – different jurisdictions have mandated requirements to introduce LED lighting as a replacement for incandescent lighting.
  - Biocompatibility – important in prosthetic devices including implants.
- ◆ Around 55% of the current global HPA market is in the growing LED sector, where LEDs are produced from artificial sapphire crystal; other key markets include semiconductors (22%), phosphor in plasma display panels (16%) and other uses (7%).
- ◆ A recently adopted growth market for HPA is in anode/cathode separator sheets in LI-ion batteries - this has been due to increasing energy density and changes in battery chemistry, with the resultant increase in higher operating temperatures (Figure 7).

**Figure 7: HPA battery separator diagrammatic**



Source: Hill End Gold

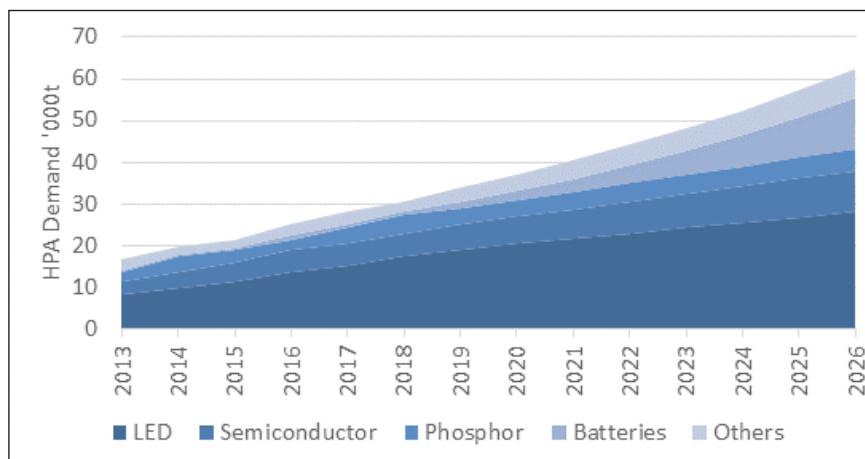


- ◆ The use of HPA as a coating to the usual polyolefin separators has a number of positive effects, including reducing flammability and increasing the battery's shrinkage temperatures, thus making batteries safer.
- ◆ Added positives include increased discharge rates, lower self discharge and lengthened battery life cycles.

## DEMAND AND PRICING

- ◆ The demand forecast by Roskill (as presented in Hill End releases) is shown in Figure 8.
- ◆ Roskill forecast growth in demand to ~60,000tpa by 2026; other parties have forecasts of up to 120,000tpa, with a significant part of the variability due to differences in forecast demand as separator sheets in Li-ion batteries.

**Figure 8: HPA Uses and forecast demand**



Source: Adapted from Roskill in Hill End presentation

- ◆ The forecast demand as a separator sheet in Li-ion batteries varies from 15,000tpa to 76,000tpa by 2025, although this is supported by the estimated strong growth over coming years in the current core applications, especially in LED globes.
- ◆ Smartphone glass is not at present a significant demand driver of sapphire glass; however it does have the potential, if widely adopted, to significantly increase the above forecasts. Smartphone maker HTC currently uses the material for screens, with Apple using it for camera lenses and fingerprint readers on iPhones.
- ◆ Demand is concentrated in the Asia Pacific region, with some 70% of demand, followed by the EMEA at 16% and the Americas at 14%.
- ◆ Price predictions likewise are variable, however range from steady, to slight decreases over coming years due to increased supply and the emergence of new production technology.
- ◆ According to the Hill End PFS, Roskill estimated that global prices ranged from US\$25-35/kg for 4N, US\$48-60/kg for 5N and US\$160-170/kg for 6N; the lower purity 98.5% alumina has a current price of ~US\$400/tonne.
- ◆ Average prices of various alumina products are shown graphically in Figure 9.

**Figure 9: HPA pricing**



Source: Hill End Gold

- ◆ Current research indicates operating costs to produce 5N HPA are in the order of US\$30-35/kg; at current sales prices averaging in the order of US\$50/kg this equates to a gross margin of around 30%.
- ◆ Applying this margin to current 4N prices of ~US\$25/kg results in estimated current production costs in the order of US\$17/kg.

## SUPPLY

- ◆ Current supply is dominated by a number of major players, with Sumitomo being the largest. Table 14 below lists the major producers as of 2014 - the smaller producers are largely located in China.
- ◆ Recent research indicates that, particularly in the case of Chinese companies, producers are increasing capacity to take advantage of the expected demand increases, and may lead to further concentration of supply.
- ◆ These forecast increases in demand however leave room for new players, such as Hill End, to enter the market.

**Table 14: Estimated HPA Production in 2014**

Estimated HPA Production in 2014	
Company	Current HPA production (tpa)
Sumitomo Chemicals (Japan)	3,020
Hebei Pengda (China)	3,000
Zibo Xinfumeng	2,500
Sasol (South Africa)	1,800
Xuacheng Jing Rui (China)	1,200
Balkowski (France)	1,200
Nippon Light Metals (Japan)	1,100
Huandou (China)	800
Dailian Rail (China)	600
Others	3,570

Source: Technavio Research, in Altech presentations

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