

ASX Announcement (ASX:AXE)

23 April 2020

Third Quarter Activities Report

For the three months ending 31 March 2020

Significant Activities

- The Company is well capitalised with approximately \$2.2 million cash and no debt.
 - Archer is on-track in building its ¹²CQ quantum computing processor chip.
 - Major commercial milestone achieved for Archer's graphene-based biosensor technology with the lodgement of 100% owned international patent application.
 - Eyre Peninsula Graphite Project ("EPGP") advances with the processing of spherical graphite from EPGP flake graphite for use in the lithium-ion battery industry.
 - Drilling and assay results significantly increase the commercial development potential of the Company's Franklyn Halloysite-Kaolin Project ("Franklyn Project").
 - Franklyn Project beneficiation to commence with a global specialty clay producer while drilling concludes at the Eyre Peninsula Kaolin-Halloysite Project ("EP Project").
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Archer Materials Limited ("Archer", the "Company", ASX:AXE) is pleased to report on its activities for the three-month period ending 31 March 2020 ("Quarter").

Commenting on the third quarter activities Greg English, Executive Chairman of Archer, said, "Despite the COVID-19 pandemic the Company continued to work on the development of its advanced materials and mineral exploration businesses during the Quarter."

"We commenced the next-stage of the development of the ¹²CQ Project which involves undertaking complex quantum measurements using equipment and facilities available at École Polytechnique Fédérale de Lausanne ("EPFL") in Switzerland. The measurements to be performed at EPFL will complement the work undertaken at the University of Sydney Research and Prototype Foundry".

"The successful lodgement of an International Patent Application with the World Intellectual Property Organization to protect and commercialise its graphene biosensor technology was a great achievement by our CEO, Mohammad Choucair and the Archer team."

"Campona flake graphite was successfully used to produce coated spherical graphite and tested in proof of concept lithium-ion battery cells. The anode performance was in-line with industry benchmarks and we will continue to seek a partner to develop this project."

"Results from drilling at Franklyn and EP Projects confirmed the presence of high value halloysite and kaolin at both of these projects. Halloysite from the Franklin Project has been sent to a pilot plant for processing with the resultant material to be sent to potential customers for product testing."

Quarterly Activities to 31 March 2020

Archer is a materials technology company developing materials in quantum computing, biotechnology, and lithium-ion batteries, and exploring for minerals in Australia. The Company has strong intellectual property, broad-scope mineral tenements, world-class in-house expertise, a diverse advanced materials inventory, and access to over \$300 million of R&D infrastructure.

Advanced Materials

Quantum Technology

In the Quarter, Archer commercially advanced the ^{12}CQ room-temperature qubit processor (“chip”) technology by commencing the second-stage of development focusing on completing the quantum measurements required to build a working chip prototype (ASX Ann. 28 Jan 2020). Archer’s progress towards single qubit quantum measurements is on-track (Image 1 and 2).

The Company strategically expanded its direct access to infrastructure, specialised measurement instruments, and internationally recognised researchers in Australia and Europe to accelerate performing the required quantum measurements (ASX Ann. 9 Mar 2020). This included joining the Sydney Knowledge Hub to engage the Australian quantum computing economy, broadening the Company’s Collaboration Agreement with UNSW Sydney to include quantum materials characterisation, and expanding chip building capabilities by securing access to facilities, equipment, and engineers at world-renowned EPFL in Switzerland.

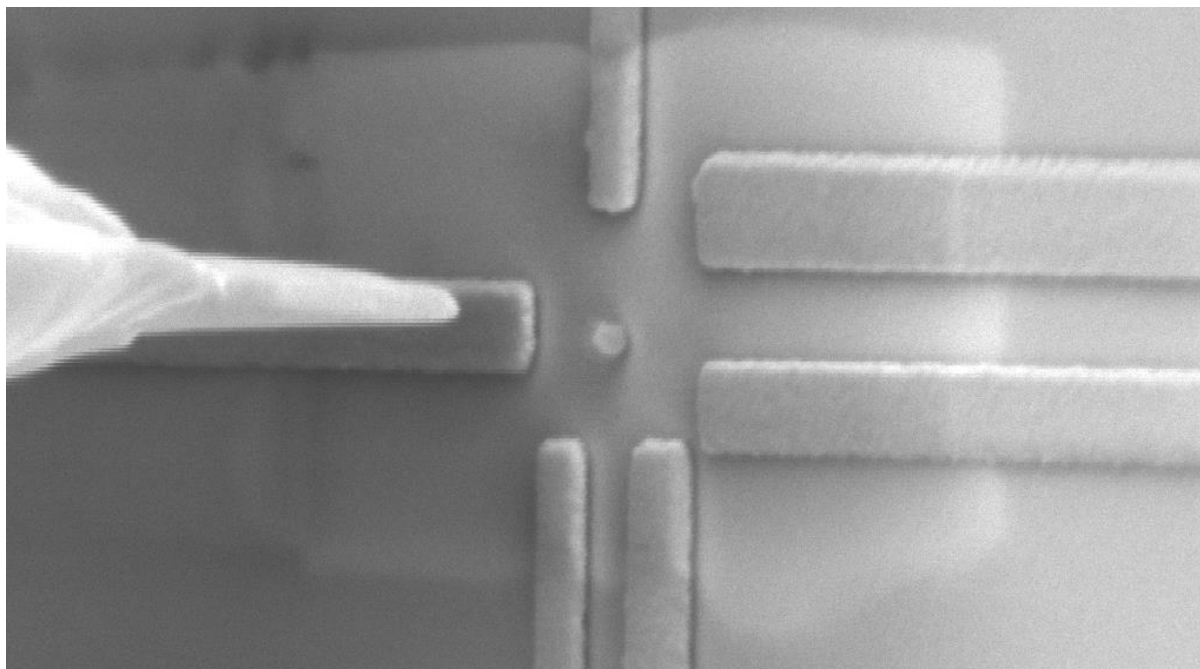


Image 1 A single qubit component undergoing direct quantum measurements related to the materials’ electronic characteristics, with the qubit component observed in the centre of the image (round particle of about 50 nanometres in size) and surrounded by rectangular nanoelectrodes prepared using facilities at the University of Sydney (“University”) Research and Prototype Foundry.

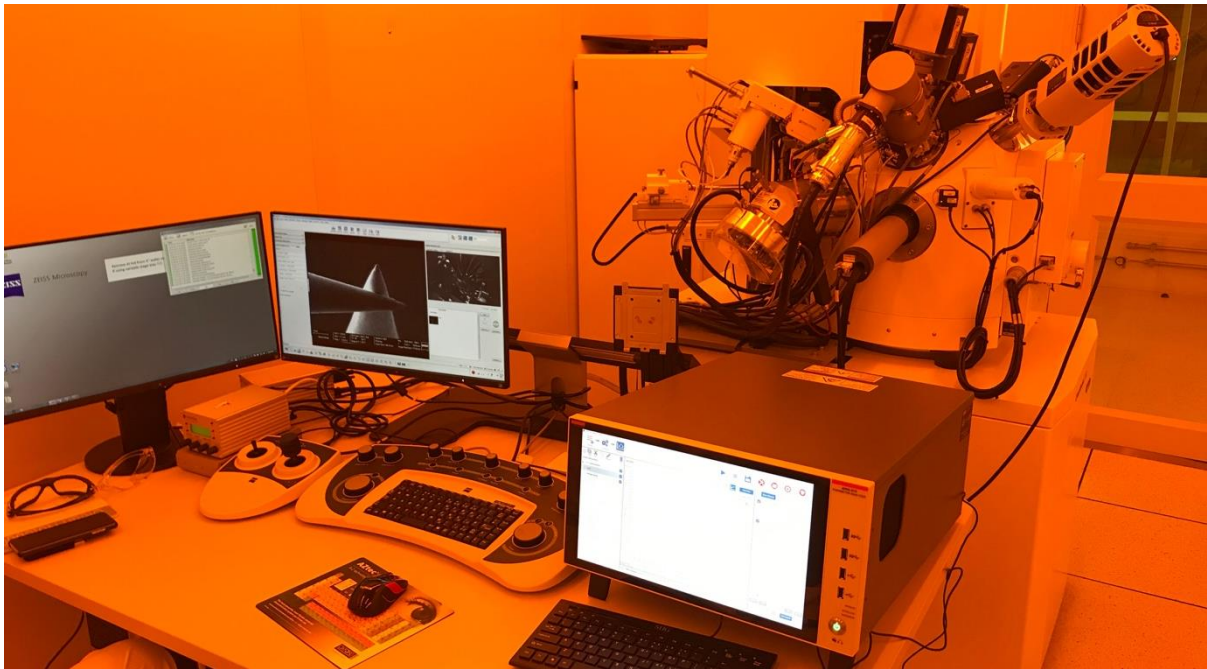


Image 2. Set-up of a measurement being performed on ^{12}CQ chip qubit components at the University Research and Prototype Foundry. The measurements require access and use of specialised instrumentation, like the ones pictured, to be performed successfully. The orange appearance is part of the sterile protocol inside the Research and Prototype Foundry.

Archer is performing various quantum measurements on the chip qubit components. The qubit is the fundamental component of Archer's ^{12}CQ prototype chip, as without the qubit, quantum computing cannot be performed. Archer uses a unique carbon-based qubit that has the potential to enable chip operation **at room-temperature and integrate onboard modern devices**.

Archer is currently performing a variety of quantum measurements and materials characterisation with the aim of achieving quantum control in a single qubit. The quantum control of a single qubit is essential for successful quantum information processing. Further reading with much deeper technical details on what is generally and fundamentally involved in progressing towards [performing quantum measurements](#) on [a single qubit](#) is available online^{i,ii}.

In response to the COVID-19 pandemic, the organisers of the [Quantum Tech conference in London](#) have postponed the event and are in the process of confirming the new dates. Archer was to Chair an entire session on Quantum Computing at the event, which has now been carried over to the next event.

Human Health

Archer is developing the intellectual property ("IP") associated with a potential solution to printable graphene biosensors capable of complex detection of disease. During the Quarter Archer achieved a significant early-stage milestone in the commercial development of its graphene-based biosensor technology by filing a patent application under the Patent Cooperation Treaty ("International Patent Application", "PCT Application") to protect and commercialise the underlying IP. Archer is the sole applicant of the International Patent Application, maintaining 100% ownership (ASX Ann. 17 Feb 2020).

Acknowledgement of receipt by the World Intellectual Property Organization of Archer's PCT Application successfully concluded the patent application lodgement process, and importantly, met the deadline to avoid abandonment of the patent application (ASX Ann. 16 Mar 2020).

The PCT Application is a potential revenue generating asset for Archer, providing the basis for any future licencing or co-development agreements with companies in the biotech industry. Advancing the prosecution of Archer's PCT Application is critical in delivering value to shareholders, together with progressively building a functioning biosensor (Image 3). To do this, Archer is engaged in a collaboration agreement with the University of Adelaide ARC Graphene Hub and a material transfer agreement with a leading German Biotech.



Image 3. Archer's first-phase prototype graphene biosensor technology built at the University of Adelaide ARC Graphene Hub. To create the biosensor components, graphene ink formulations are printed on a 4 x 8 array of interdigitated gold-plated-nickel electrodes (with micron-scale features). Graphene acts as a sensing interface to detect biochemicals. The 32 sensing electrodes are connected to a computer to monitor, test, and collect data in real-time.

Reliable Energy

The ongoing work with UNSW Sydney (ASX Ann. 18 Apr 2018) is focused on addressing the trade-off between cost and battery performance using Archer's Campoona graphite at the anode of lithium-ion batteries and formulating, building, and testing full-cell batteries. Technical development with UNSW to test spherical graphite products in lithium-ion (Li-ion) batteries continued during the Quarter.

Natural flake graphite from the Company's 100% owned Eyre Peninsula Graphite Project ("EPGP", "Campoona", see *Mineral Exploration*) has been successfully used to produce high-value coated spherical graphite ("CSG") (Image 4) and tested in proof of concept lithium-ion ("Li-ion") battery cells (ASX Ann. 30 Mar 2020).

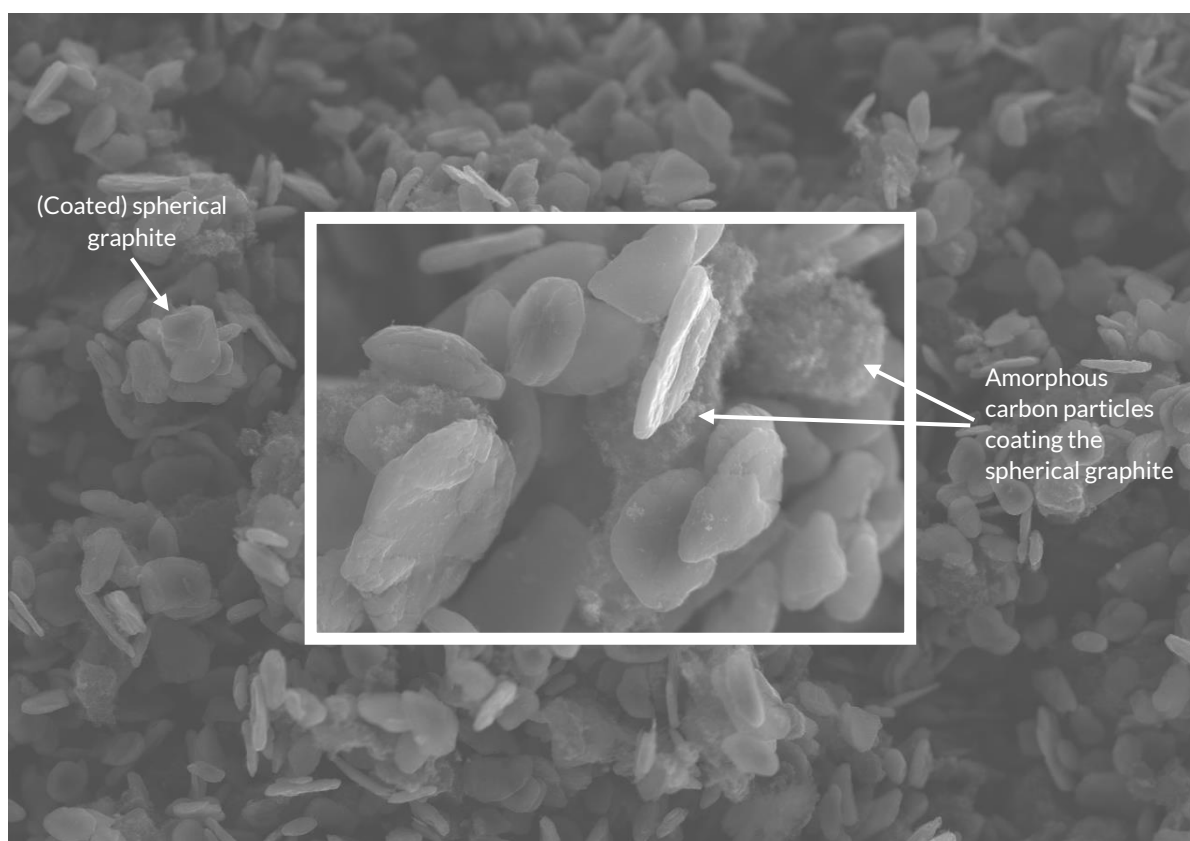


Image 4. Scanning electron microscope images of a region a sample of CSG produced from Campoona graphite. The foreground imaged (centre) is a magnification of the extensive micron-scale sample region (background) showing the rounded spherical graphite coated in amorphous carbon particles. The CSG retains its high-value properties despite undergoing processing.

CSG is one of the highest value-added processed forms of flake graphite concentrate used in the Li-ion battery industry. A commercially available amorphous carbon material was used to coat Archer's spherical graphite (95% and 99%+ concentrates from Campoona) by applying industry accepted methods and the CSG performance tested in Li-ion battery coin cells in half-cell configuration i.e. only the performance of the CSG in the anode was tested.

The CSG materials were characterised using spectroscopy, microscopy, and diffraction methods, which confirmed the coating process was successful (Image 1). The anode performance was in-line with industry benchmarks for CSG materials, including for reversible capacities and few-cycle capacity retention. The CSG could potentially be more conducive to process efficiencies compared to spherical graphite alone, as the reversible discharge capacities could be achieved with a reduction in electrode loadings (i.e. mass to volume/area).

Archer intends to use the outcomes of the CSG testing to pursue commercial opportunities for end-use integration in the Li-ion battery supply chain with potential EPGP co-development partners to ensure that the Company can successfully add value to Campoona, and that the project can be developed to return maximum benefit to shareholders and the community.

Mineral Exploration

Eyre Peninsula Graphite Project

The Company's wholly owned subsidiary Pirie Resources Pty. Ltd. has submitted a Program for Environment Protection and Rehabilitation ("PEPR") to the South Australian Government to seek authorisation to conduct drilling and mining operations in relation to the Campoona Mineral Lease (ML 6470), the site of the proposed Campoona Shaft graphite mine, in South Australia (ASX Ann. 2 Dec 2019).

Submitting the PEPR application was done within the period prescribed by the Mining Act. The work program described in the PEPR allows for a bulk sample up to 60 tonnes to be collected, and for the sample to be processed off-site, including into graphite and graphene materials. The collection of bulk graphite samples would allow Archer to pursue downstream opportunities with Li-ion battery manufacturers.

Halloysite-Kaolin Projects

Franklyn Halloysite-Kaolin Project

The Franklyn Halloysite-Kaolin Project ("Franklyn Project") is located approximately 220 km north of Adelaide, South Australia (Image 5). Archer completed the aircore drill program in Dec 2019 and composite samples were submitted for analyses (ASX Ann. 4 Dec 2019), with a total of 21 holes drilled approximately 500m apart to test and extend the scale of halloysite and kaolin mineralisation recorded in historic drilling. The kaolin clay drillhole samples were tested for chemical composition (i.e. Al_2O_3 grade) and for the presence of halloysite.

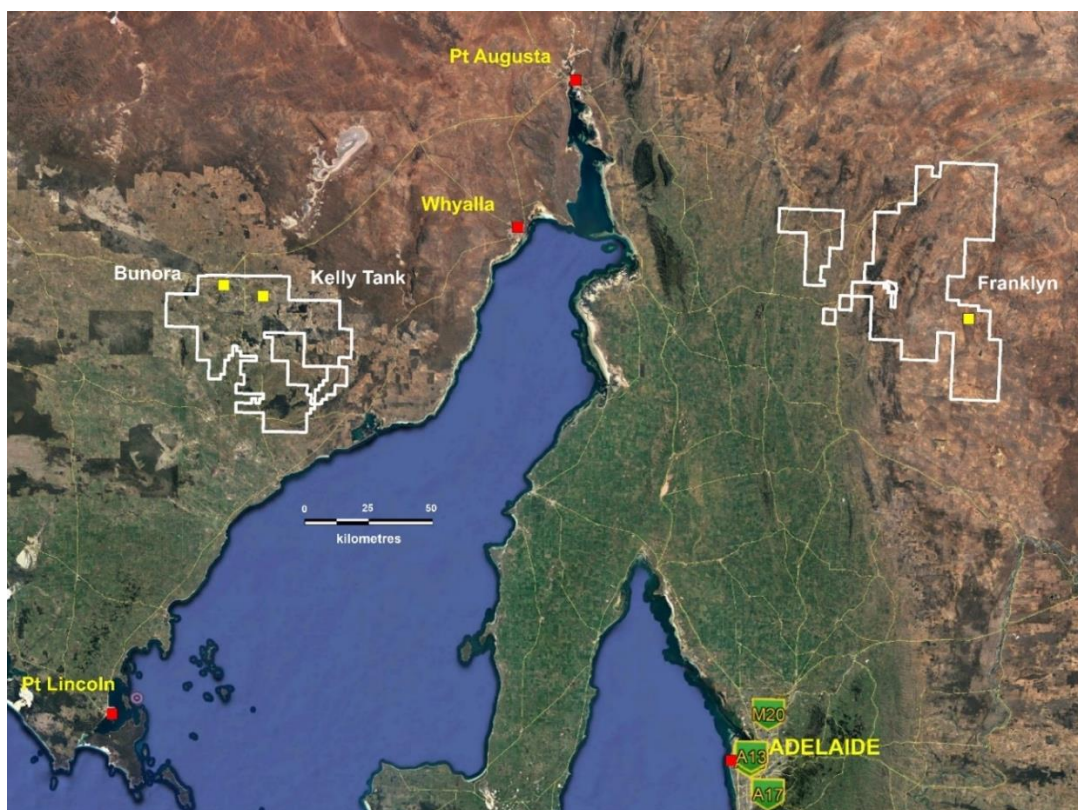


Image 5. Location of Archer's Halloysite-Kaolin Franklyn Project and EP Project.

Kaolinitic clays were intersected in 18 of the holes drilled at the Franklyn Project with a number of drill holes reporting screened **grades above 36% Al_2O_3 and recoveries above 50%** (ASX Ann. 15 Jan 2020). Samples from these holes were then submitted for further testing to confirm the presence of halloysite using X-ray Diffraction (“XRD”) analyses. This test work has confirmed the presence of high-quality halloysite (ASX Ann. 23 Mar 2020) (Image 6) at the Franklyn Project, and together with the kaolin upgrade greatly increases the potential for commercial development of the Franklyn Project.

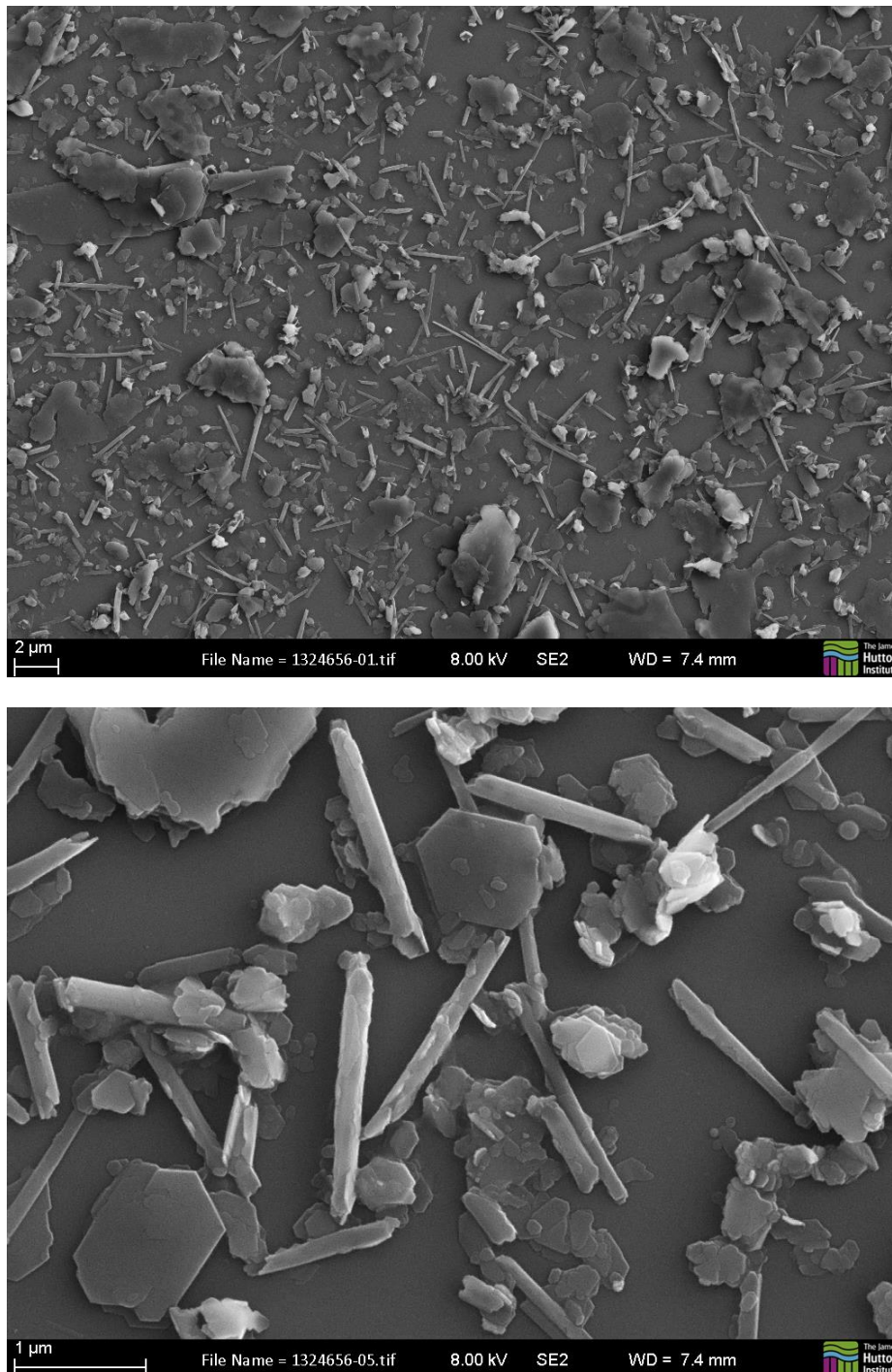


Image 6. SEM images of samples from Franklyn Project, at different magnification showing a mixture of platy and tubular forms, interpreted as kaolinite and halloysite respectively.

A number of samples analysed contained halloysite with unique properties. The halloysite presents as long tubes with large lumen (the “lumen” is the inside of the tube just like the inside of a straw), both highly desirable characteristics by potential customers (Image 6).

The shape of the tubes, being long and cylindrical/tubular, may lead to the halloysite performing well in the materials’ high-value applications dependent on surface area, like catalysis, due to the likelihood of a high aspect ratio (“aspect ratio” is the ratio of the tube length to its diameter). The large lumen observed could allow for applications requiring a high loading of gases, liquids, or nanoparticles. The combination of these properties is also an advantage as high aspect ratio additives are known to improve the mechanical reinforcement of advanced composites.

The Company finds the latest test work encouraging and has sent samples to a kaolin industry processing plant in the USA for processing through a pilot plant with the resultant samples to be distributed to potential down-stream customers for testing thereafter. Potential customers are already aware of the Franklyn Project and the work being done by Archer and are anticipating receipt of the samples.

Eyre Peninsula Halloysite-Kaolin Project

The Eyre Peninsula Halloysite-Kaolin Project (“EP Project”) comprises the Kelly Tank, Bunora and Bunora East prospects (Image 5). The Company recently completed a 21-hole aircore drill program with eleven holes drilled at Bunora, three holes at Bunora East and seven holes at Kelly Tank (ASX Ann. 3 Feb 2020). All holes intersected kaolin mineralisation with some kaolin outcropping at surface and the remaining kaolin covered by less than 3 metres of soils.

The results of the drilling at the EP Project are particularly encouraging with kaolin intervals greater than 15m being observed (Image 7, Image 8 and Image 9). The drill samples from each hole have been prepared and submitted for analysis.

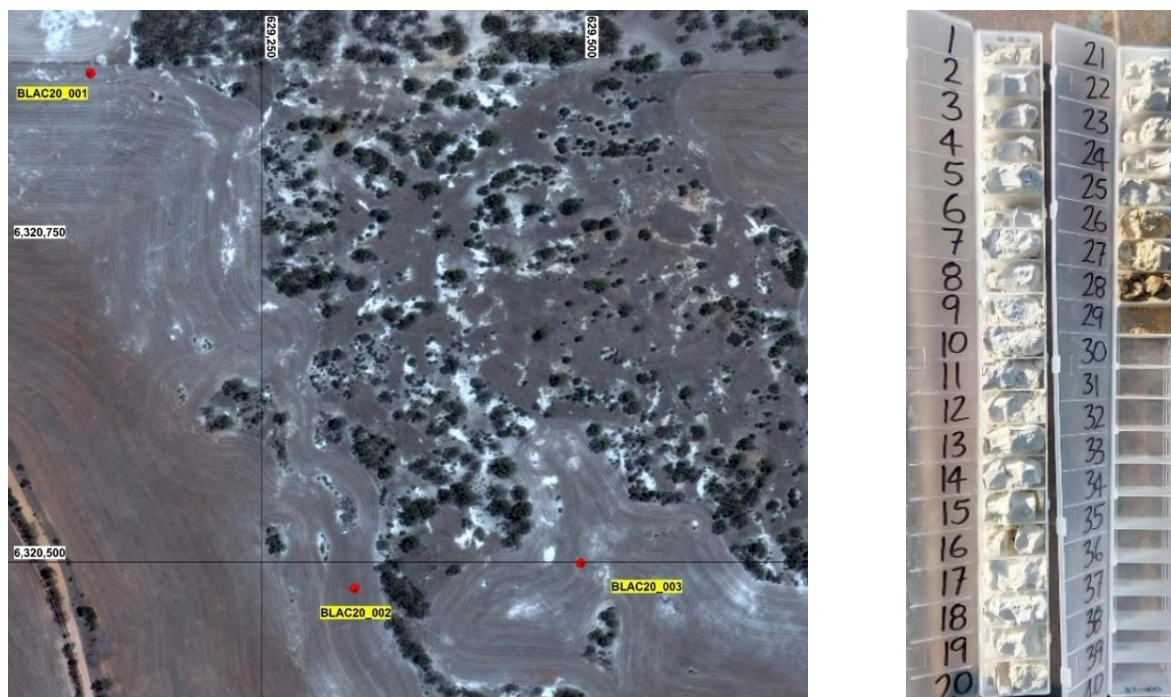


Image 7. Locations of holes drilled at Bunora East and an example of drilled material at BLAC20-002.

Bunora East drilling:

- + Three holes were drilled to test the kaolin around the historical work done by Pechiney in the 1970's, the historical trench dug by Pechiney is backfilled and located 150m north of BLAC20-002. It is in this trench that halloysite was reported by the SA government in (RB 93/37, Sept 1993).
- + Sequences of white to "off white" kaolin clay were intersected by Archer from the surface in all 3 holes drilled at Bunora East (Image 7 shows the profile of the rock intersected with the numbers in the ship tray indicating depth downhole (e.g. "4" means 4 metres downhole from the surface).

Bunora drilling:

- + Eleven holes were drilled by Archer at Bunora. White kaolin clays were intersected from between 2m – 9m of the surface (Image 8). Hole BNAC20-006 (chip tray Image 8) was indicative of the type of mineralisation intersected at Bunora. All holes intersected kaolin.

Kelly Tank drilling:

- + Seven holes were drilled at Kelly Tank (Image 9), with white kaolin intersected from surface to depths of 14m, off white kaolin is reported to depths of greater than 20m. All holes intersected kaolin.

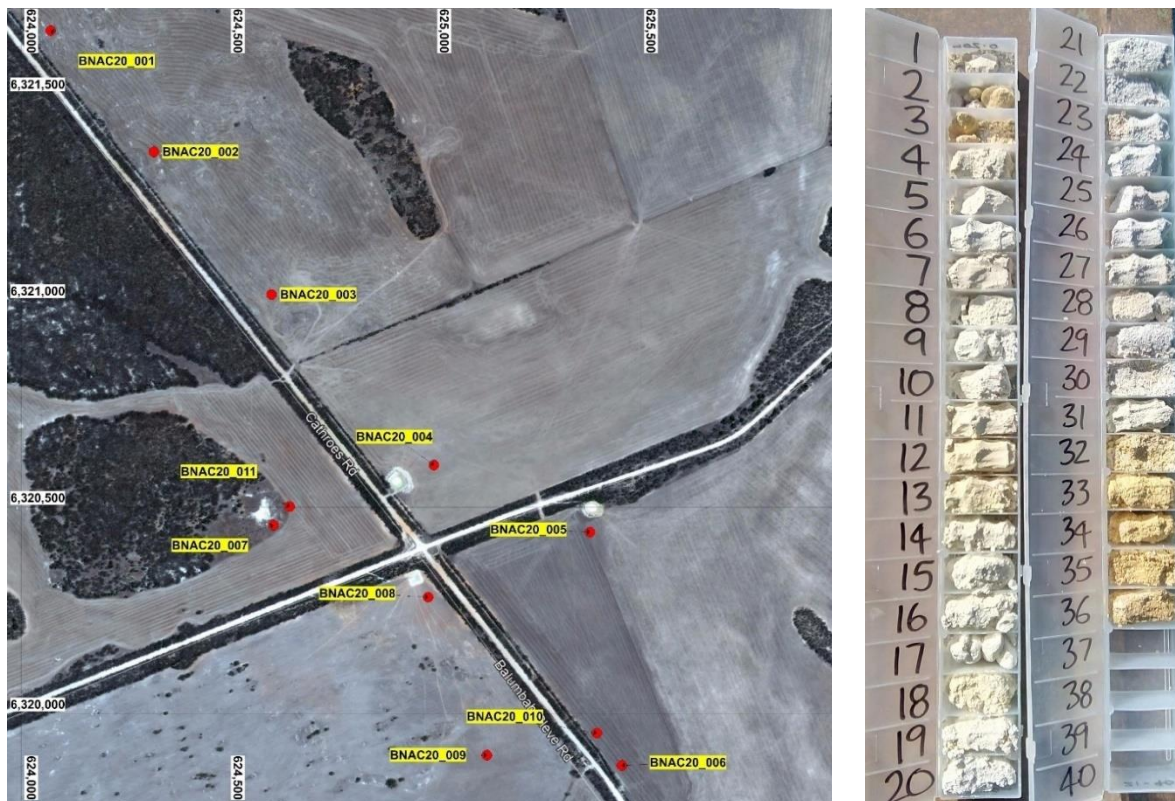


Image 8. Locations of holes drilled at Bunora, with the BNAC20-006 drilled material shown.



Image 9. Locations of holes drilled at Bunora East and an example of drilled material at BLAC20-002.

Background:

Late last year the Company announced a significant kaolin Exploration Target for both the EP Project (ASX Ann. 19 Aug 2019) and Franklyn Project (ASX Ann. 7 Nov 2019):

Project	Tonnes	Grade
Franklyn Project	45 - 91 million	30 – 36% Al ₂ O ₃ (-45 µm size fraction)
EP Project	55 - 135 million	33 – 36% Al ₂ O ₃ (-53 µm size fraction)

Table 1. EP Project and Franklyn Project Exploration Targets.

The potential quantity and grade of the Exploration Targets reported are conceptual in nature, there has been insufficient exploration to estimate a Mineral Resource and it is uncertain if further exploration will result in the estimation of a Mineral Resource for the EP Project or Franklyn Project.

Albion Downs Nickel Project

The Company's 100% owned Albion Downs Nickel Project ("Nickel Project") comprises mineral exploration licence E53/1926 and is located approximately 18km NNW of BHP's Mount Keith Nickel Mine, Western Australia.

The Nickel Project is located within the northern section of the Norseman-Wiluna greenstone belt; part of the Eastern Goldfields Province. This section of the greenstone belt consists of a lower metamorphosed ultramafic to mafic volcanic sequence which passes into an upper succession of felsic to intermediate volcanic rocks and sedimentary lithologies. This volcanic sequence is present at EL53/1926 but it is covered by alluvial and Aeolian sediments.

An independent review of the Nickel Project (ASX Ann. 8 Oct 2019) concluded that:

- + The ultramafic stratigraphy present within E53/1926 forms part of a larger unit which is considered prospective for magmatic nickel sulphides.
- + Potential exists for massive sulphides within the area of the Nickel Project.

In response to the positive results from the independent review, during the Quarter Archer engaged contractors to undertake a ground moving-loop electromagnetic ("MLEM") survey over most of the Nickel Project area (Image 10). A total of 114 points along seven lines, 200 metres apart were tested as part of the MLEM survey (Image 10).

Modelling of the data from the MLEM did not identify any immediate drill targets however, the Company will continue to analyse the available data with the aim of identifying additional opportunities with the area of the Nickel Project.

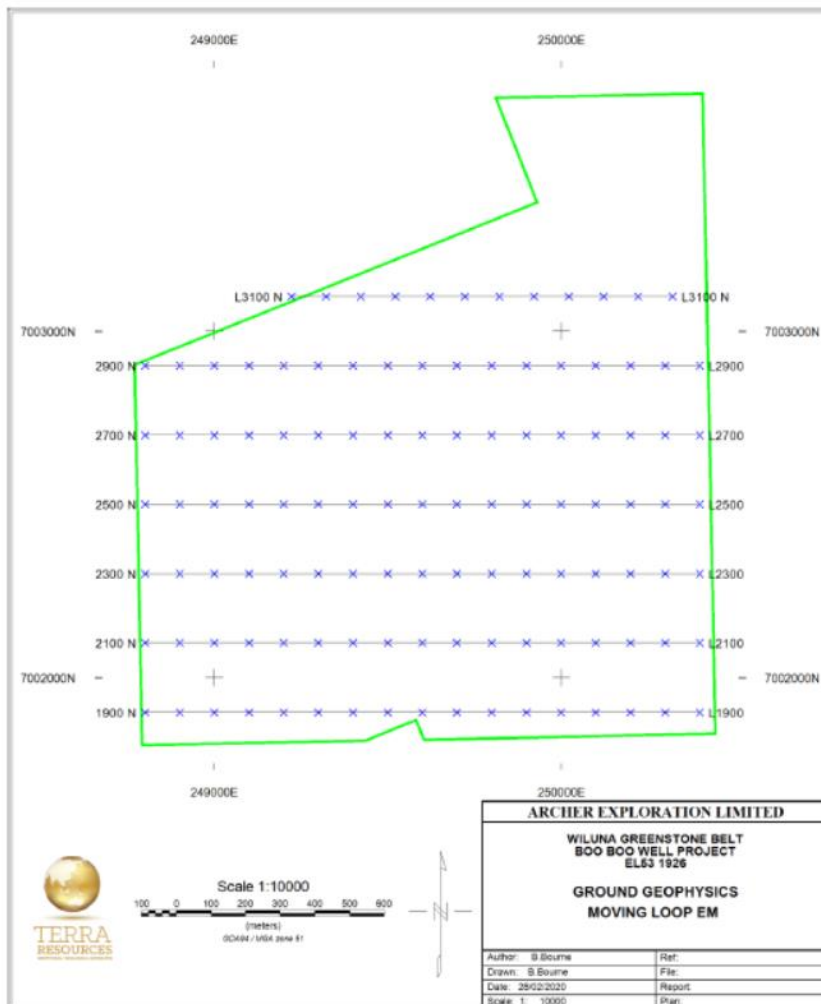


Image 10. Layout of the MLEM survey. Blue crosses indicate loop centres with the Nickel Project tenement boundary in green.

Other Projects

No work was undertaken during the Quarter at Archer's other project areas not mentioned in this report.

Corporate

Cash balance

The Company's cash balance at the end of the Quarter was \$2,216,000.

Shareholder Events and Outreach

During the Quarter, Archer held shareholder events in Sydney and Melbourne focussed on Archer's graphene-based biosensor technology and progress in developing solutions for the graphene economy, a key area of the Company's strategic activities (ASX Ann. 20 Jan 2020):

- + [Archer presentation on graphene and its use in biotech](#)
- + [Questions and Answers to the events as supplementary information](#)

The Company electronically distributed a number of Newsletters and News Spotlights to shareholders during the Quarter, including:

- + [Newsletter 1st Ed. Archer outlines key priorities for the year ahead](#)
- + [Newsletter 2nd Ed. Archer lodges graphene biosensor technology patent application](#)
- + [News Spotlight CEO interview on recent halloysite-kaolin drilling](#)
- + [News Spotlight CEO interview on progress towards building quantum computing chip](#)
- + [Newsletter 3rd Ed. Archer on track to build operational room temperature qubit processor chip](#)
- + [Quantum Tech Conference Interview Q&A](#)

Archer CEO, Dr Mohammad Choucair, also gave interviews with Proactive Investor:

- + [Archer Materials outlines key strategic priorities for 2020](#)
- + [Archer Materials on track to build operational room-temperature qubit processor chip](#)
- + [Archer Materials confirms halloysite presence at Franklyn project in South Australia](#)
- + [Archer Materials lodges graphene biosensor technology international patent application](#)
- + [Archer Materials advances first-phase prototype of graphene biosensor technology](#)

COVID-19 Update

During the Quarter the Company updated shareholders on the tactical steps and direction being taken by the Archer team to build an industry-leading materials technology company in the wake of the COVID-19 pandemic. Despite the COVID-19 pandemic the Company continues to work on its strategic execution priorities and does not anticipate being significantly impacted by the COVID-19 pandemic (ASX Ann. 27 Mar 2020).

Appendix 5B disclosures

Archer's accompanying Appendix 5B (Quarterly Cashflow Report) includes amounts in item 6.1 which were executive and non-executive director fees paid as salaries and wages.

During the Quarter the Company spent \$201,000 on exploration activities, primarily on its Halloysite-Kaolin Projects in South Australia. The expenditure represents direct costs associated with drilling and various sampling activities as part of the development of the Company's Halloysite-Kaolin Projects as well as capitalised exploration staff wages which can

be directly attributed to exploration projects. This amount does not include any costs associated with the Quantum Computing, Human Health and Reliable Energy projects, nor does it include other corporate salaries and other associated overheads.

Issued Capital

Time	Shares	Options	Performance Rights
Start of Quarter	212,419,573	17,500,000 ⁽¹⁾	Nil
New issues during Quarter	Nil	2,000,000 ⁽²⁾	Nil
Exercised/cancelled during Quarter	Nil	Nil	Nil
End of Quarter	212,419,573	19,500,000	Nil
Date of this Report	212,419,573	19,500,000	Nil

- (1) Options are unlisted and are exercisable at \$0.1929 each on or before 31 March 2023. The Options were issued to directors, employees and contractors, following shareholder approval at the Company's 2019 AGM.
- (2) Options are unlisted and are exercisable at \$0.245 each on or before 31 March 2023. The Options were issued to a consultant of the Company (ASX announcement 5 Feb 2020).

List of Archer Tenements

Tenement*	Location	Commodity
<i>South Australia</i>		
EL 6363	North Cowell	Graphite
EL 5791	Cockabidnie	Graphite
EL 5804	Wildhorse Plains	Graphite
EL 5815	Waddikee	Graphite
EL 5870	Carpie Puntha	Graphite
EL 5920	Carappee Hill	Graphite
EL 6019 ⁽¹⁾	Witchelina	Magnesite
EL 5730 ⁽¹⁾	Termination Hill	Magnesite
EL 6351	Burra North	Base Metals
EL 5769	Napoleons Hat	Copper / Gold
EL 5794	Blue Hills	Copper / Gold
EL 5935	Whyte Yarcowie	Cobalt / Copper
EL 6000	Pine Creek	Copper / Gold
EL 6029	Altimeter	Copper / Gold
EL 6160	Franklyn	Copper / Gold
EL 6287	Peterborough	Copper / Gold
EL 6354	Bendigo	Copper/Gold
EL 6478 ⁽²⁾	Caralue Bluff	Kaolin

Tenement*	Location	Commodity
ML 6470	Campoona Shaft	Graphite mining
MPL 150	Sugarloaf	Graphite and graphene processing
MPL 151	Pindari	Process water for Sugarloaf
New South Wales		
EL 8592	Morris's Blow	Cobalt / Copper
EL 8593	Broken Hill	Cobalt / Copper
EL 8594	Broken Hill	Cobalt / Copper
EL 8595	Broken Hill	Cobalt / Copper
EL 8779	Campbells Creek	Cobalt / Copper
EL 8894	Stanthorpe	Tungsten / Tin
EL 8871	Crowie Creek	Copper/Gold
Western Australia		
E53/1926	Albion Downs	Nickel

Notes

- * All tenements are 100% owned by Archer.
- (1) These tenements have been sold with Completion expected to occur by 30 June 2020.
- (2) Tenement was granted during the Quarter

Competent Person Statement

The exploration results reported herein, insofar as they relate to mineralisation, are based on information compiled by Mr. Wade Bollenhagen, Exploration Manager. Mr. Bollenhagen is a Member of the Australasian Institute of Mining and Metallurgy who has more than 20 years' experience in the field of activity being reported.

Mr Bollenhagen has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity that he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" relating to the reporting of Exploration Results. Mr. Bollenhagen consents to the inclusion in the report of matters based on his information in the form and context in which it appears.

About Archer

A materials technology company developing materials in quantum computing, biotechnology, and lithium-ion batteries, and exploring for minerals in Australia. The Company has strong intellectual property, broad-scope mineral tenements, world-class in-house expertise, a diverse advanced materials inventory, and access to over \$300 million of R&D infrastructure.

The Board of Archer authorised this announcement to be given to ASX.

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For more information about Archer's activities, please visit our:

Website:

<https://archerx.com.au/>

Twitter:

<https://twitter.com/archerxau?lang=en>

YouTube:

<https://bit.ly/2UKBBmG>

Medium:

<https://medium.com/@ArcherX>

Sign up to our Newsletter:

<http://eepurl.com/dKosXI>

ⁱ https://en.wikipedia.org/wiki/Measurement_in_quantum_mechanics

ⁱⁱ https://en.wikipedia.org/wiki/Qubit#Operations_on_pure_qubit_states