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ASX Announcement (ASX:**AXE**) 20 July 2020

Halloysite confirmed across the Eyre Peninsula Halloysite-Kaolin Project

Highlights

- Microscopy and microanalysis confirm the presence of halloysite at the Company's Kelly Tank, Bunora and Bunora East prospects ("Prospects").
- It is the first time the naturally occurring high-value mineral halloysite has been visually confirmed in the Prospect areas.
- Kaolin and halloysite are feedstock materials in deep-tech applications such as light-emitting diodes and lithium-ion batteries.
- Archer intends to undertake further value-added activities towards commercialising its 100% owned Eyre Peninsula Halloysite-Kaolin Project.

Archer Materials Limited ("Archer", "Company", "ASX: **AXE**") is pleased to announce the latest results from the Company's 100% owned Eyre Peninsula Halloysite-Kaolin Project ("EP Project"). The EP Project comprises the Kelly Tank, Bunora and Bunora East prospects ("Prospects") that are approximately 14km apart and connected by established roads (Fig. 1).

The EP Project is located 115km west of the Whyalla Port, South Australia and is separate to the Company's Franklyn Halloysite-Kaolin Project, which is located approximately 220km east of the EP Project.

The recent drilling completed at the EP Project was successful in recovering kaolin which in some instances has reported grades of up to **36.8% alumina (chemical formula Al_2O_3)** over downhole lengths of 18m (ASX announcement 6 Apr 2020). A number of these samples were submitted for analysis with Scanning Electron Microscopy ("SEM") results the subject of this announcement.

Kaolin and halloysite are alumina-based clays that can naturally occur intermixed and may undergo beneficiation to high-value and hard-to-substitute high-purity alumina ("HPA"). Halloysite has a nanostructure that could allow its application as an efficient catalyst in the petrochemicals industry, amongst other high value end-uses (*see Industry Background section*).

Commenting on the latest results, Archer Executive Chairman Greg English said, "We have directly identified halloysite, which is a high value form of the alumina-silicate clay kaolin, at Kelly Tank, Bunora and Bunora East prospects. This is an excellent result that confirms reports of the [kaolin] mineralisation by historic explorers, as well as the presence of halloysite across a large geographical area with all samples tested being close to surface.

The results highlight the Company's continued success in exploring our broad-scope tenement portfolio, and in particular, the commercial development of Archer's Halloysite-Kaolin Projects."

Confirmation of the presence of naturally occurring halloysite

The Company has previously announced the screened results from the drilling at the EP Project with the results from 67 composite samples from Kelly Tank, Bunora and Bunora East reported (ASX announcement 6 Apr 2020). Archer selected 25 of these samples for halloysite identification through SEM.

The results from the SEM analysis are exceptional, especially for the Kelly Tank and Bunora East prospects, where naturally occurring halloysite is clearly evident in the SEM imagery. The SEM results obtained of corresponding materials' morphologies at an early stage of exploration indicates that the halloysite-kaolin mineralisation could be suitable for a number of potential end-uses and markets. Low iron values (ASX announcement 6 Apr 2020) and minimal halloysite at Bunora, is in contrast to compositions at Kelly Tank that contain higher halloysite content.

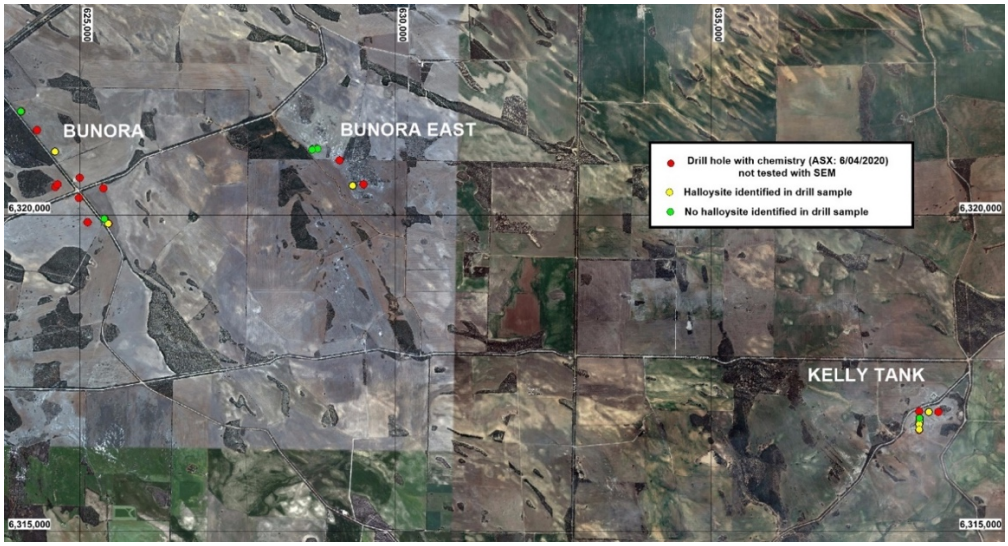

Fig. 1. Location of holes where samples were submitted for SEM analyses. 'Chemistry' in the figure legend refers to kaolin materials.

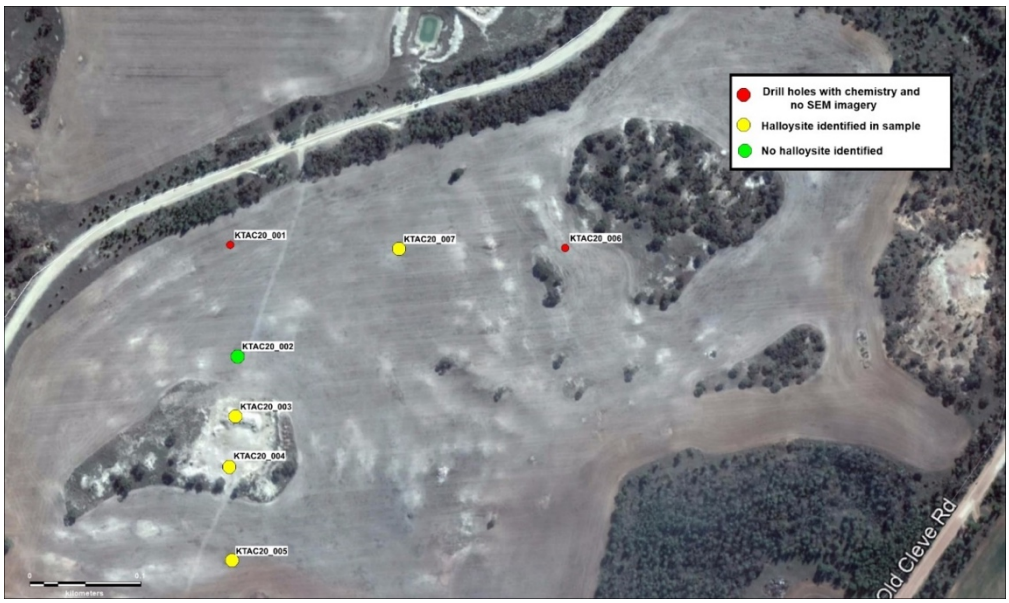

Fig. 2. Kelly Tank, location of the five samples (yellow and green dots) that underwent SEM analysis and their halloysite response. Chemistry' in the figure legend refers to kaolin materials.

Kelly Tank

Five composite samples were selected for SEM imagery: the samples were collected from separate holes representing variable depths of the halloysite-kaolin material with the deepest sample being 11 to 16m (KTAC20-007) and the shallowest being 1 to 5m (KTAC20_005). A further 16 samples remain untested.

The halloysite reported at Kelly Tank is the first visual representation of this form of kaolin in the area. The following images show the halloysite and in particular the tubular nature of the halloysite (Image 1) which is potentially ideal for a number of end-use applications.

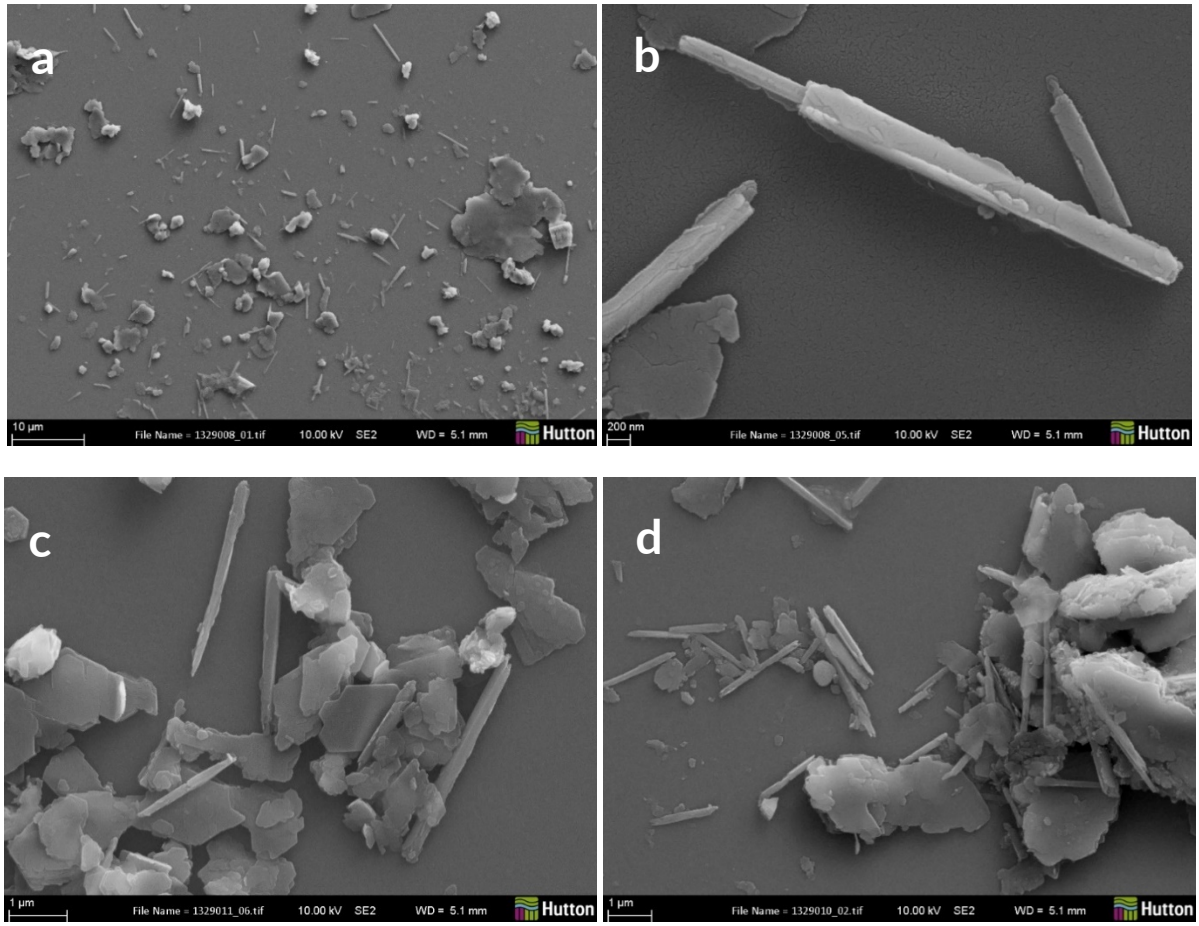

Image 1. (a-b) SEM images at various magnifications from hole KTAC20_003 (3-6m) (c) KTAC20_005 (1-5m), (d) KTAC20_007 (11-16m) that show the extent of halloysite formation in the sample. The platelet structures correspond to kaolin and the tubular structures are halloysite. The halloysite tubes are a few micrometres in length (a millionth of a meter, and comparable to the width of a human hair) and nanometres in thickness (few billionths of a meter). This size ratio of length to width in halloysite and the corresponding chemistry of kaolin materials, gives rise to a number of potential end-uses spanning catalysis and energy storage.

Bunora

Ten composite samples were selected for SEM imagery: the samples were collected from four holes representing variable depths of the kaolin material with the deepest interval being 17 to 21m (BNAC20-006) and the shallowest being 1 to 3m (BNAC20_001). A further 13 samples remain untested. The most promising intervals were BNAC20-003 (3 to 7m) and BNAC20_006 (8 to 11m & 17 to 21m).

The halloysite reported at Bunora is the first visual representation of this form of kaolin in the area (Image 2).

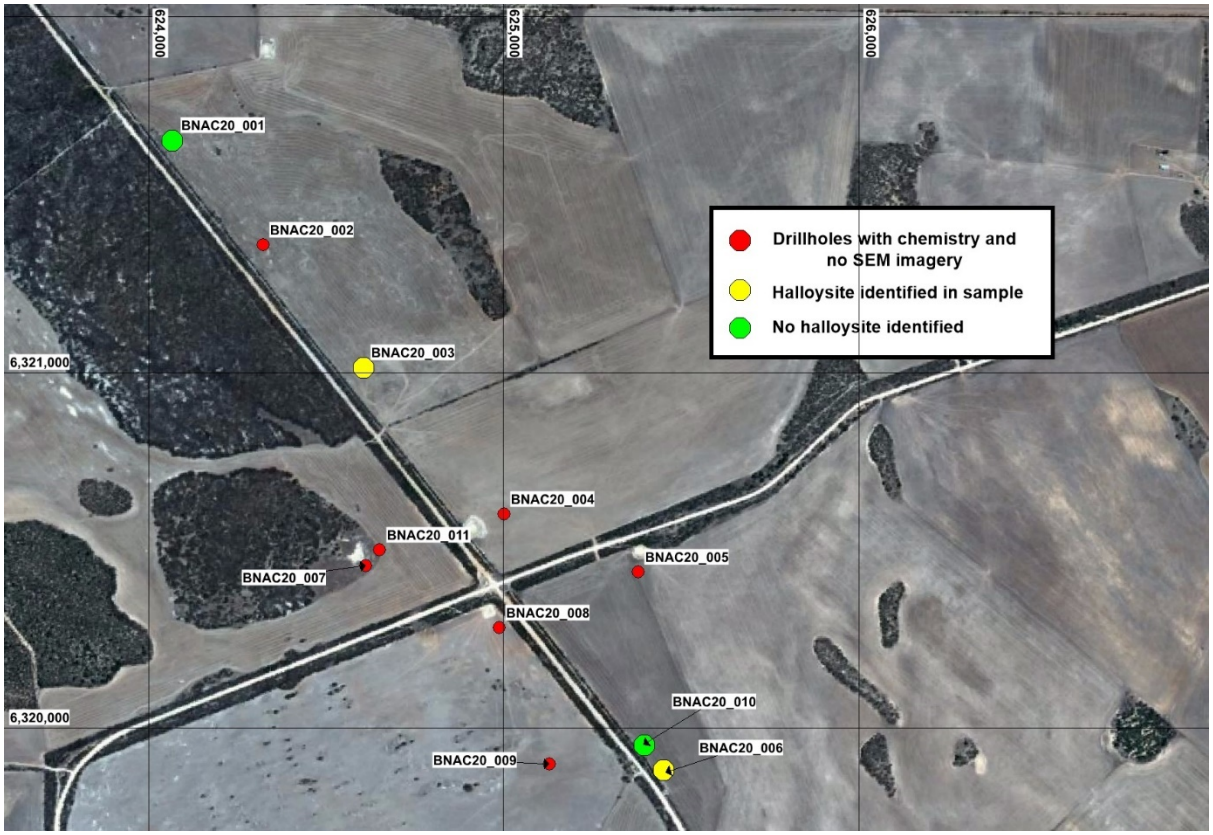

Fig. 3. Bunora, location of samples that underwent SEM analysis (yellow and green dots) and their halloysite response. Chemistry' in the figure legend refers to kaolin materials.

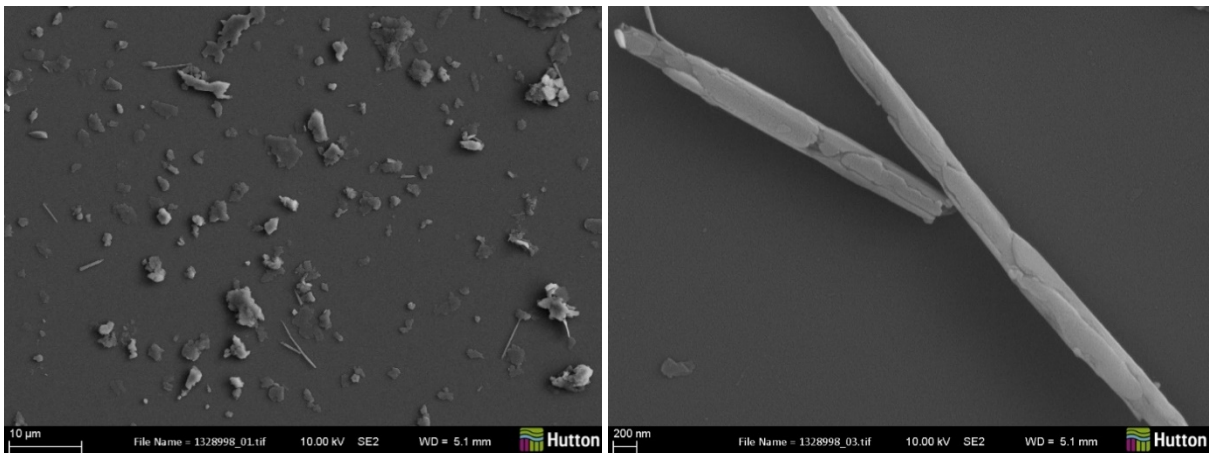

Image 2. SEM images at various magnifications from BNAC20_003 showing the extent of halloysite formation (left) and halloysite tubes (right).

Bunora East

Ten Bunora East composite samples were selected for SEM imagery: the samples were selected from four holes representing variable depths of the kaolin material with the deepest interval being 19 to 24m (BLAC20-002) and the shallowest being 1 to 5m, in the same hole. A further 13 samples remain untested. The most promising intervals were BLAC20-002 (1 to 19m). The halloysite reported at Bunora East is the first visual representation of this form of kaolin in the area (Image 3).

Fig. 4. Bunora East, location of samples (yellow and green dots) that underwent SEM analysis and their halloysite response. 'Chemistry' in the figure legend refers to kaolin materials.

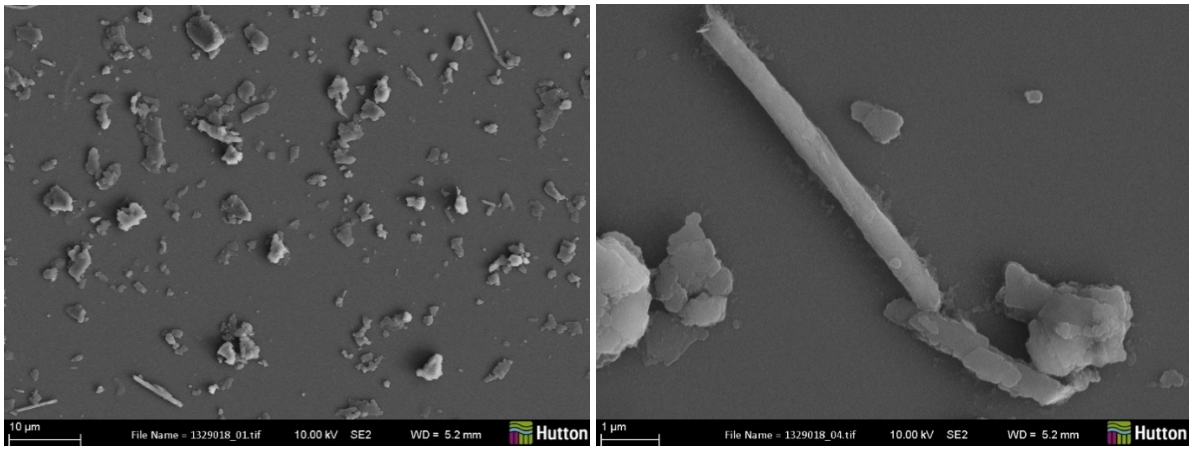

Image 3. SEM images at different scales from BLAC20_002 showing the extent of halloysite formation (left) and halloysite tubes (right).

Next Steps

The EP Project is a large project in the early-stage of development with multiple outcropping exploration, and is in close proximity to ports, townships and other infrastructure with high voltage power lines and fresh water pipelines traversing the EP Project area. These advantages allow for efficient exploration, and the Company intends to undertake further value-added activities towards commercialising the EP Project through sale or joint venture, which the Company has successfully achieved with its other industrial mineral projects.

Industry Background

Kaolin and halloysite are alumina-based clays, that can naturally occur intermixed, and are part of a larger A$3 billion construction materials industry in Australia[†]. These materials have recently emerged as a potential feedstock in processing high-value and hard-to-substitute high-purity alumina (HPA)[‡] that could be used in deep-tech applications such as light-emitting diodes and lithium-ion batteries; with halloysite having a nanostructure that may allow its use as an efficient catalyst in the petrochemicals industry.

Fig. 5. Borrow pit, where kaolin is exposed and visible as a white surface material at Kelly Tank.

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.

[†] https://www.ibisworld.com.au/industry-trends/market-research-reports/mining/rock-limestone-clay-mining.html
[‡] https://www.qut.edu.au/news?news-id=153588

Competent Person Statement

The information in this announcement that relates to Exploration Results is based on information compiled by Mr Wade Bollenhagen, a Competent Person who is a Member of the Australasian Institute of Mining and Metallurgy. Mr Bollenhagen has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". Mr. Bollenhagen consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

For further information, please contact:

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:
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JORC Code, 2012 Edition – Table 1 Section 1 Sampling Techniques and Data *(Criteria in this section apply to all succeeding sections.)*

Criteria	JORC Code Explanation	Commentary
Sampling Techniques	• Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as downhole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling. • Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used. • Aspects of the determination of mineralisation that are Material to the Public Report. • In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases, more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.	• All samples were collected through a cyclone into plastic bags, composite samples were created from selected 1 metre intervals, which have been sent for chemical analyses. • Intervals were determined to be kaolin dominant through visual observations, laboratory testing of this assumption is then undertaken. • Composite intervals were created based upon the geology and colour. As such the composite intervals created vary in length from 2m to 5m. Composite samples weigh roughly 0.5kg for initial test work
Drilling Techniques	• Drill type (e.g. core, reverse circulation, open hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).	• Aircore (AC) drilling was undertaken to collect the sample, rod diameter was 75mm. • Reverse Circulation (RC) drilling was undertaken in 2014 first reported 1st February 2015 (page 7).
Drill Sample Recovery	• Method of recording and assessing core and chip sample recoveries and results assessed. • Measures taken to maximise sample recovery and ensure representative nature of the samples. • Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	• No measurements of recovery were undertaken, all drilling was dry, loss to fines was considered to minimal.

Criteria	JORC Code Explanation	Commentary
Logging	• Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies. • Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography. • The total length and percentage of the relevant intersections logged.	• All logging was qualitative, all sample intervals were recorded.
Sub-Sampling Techniques and Sample Preparation	• If core, whether cut or sawn and whether quarter, half or all core taken. • If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry. • For all sample types, the nature, quality and appropriateness of the sample preparation technique. • Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples. • Measures taken to ensure that the sampling is representative of the in-situ material collected, including for instance results for field duplicate/second-half sampling. • Whether sample sizes are appropriate to the grain size of the material being sampled.	• From the raw -45µm fraction of composite sample reported in ASX 6th April 2020, a 10g sub sample was taken and submitted to the James Hutton Institute for Scanning Electron Microscopy work. • Not all sample intervals have been submitted for analyses, some material was not considered for assay due to geology, ie not kaolin or kaolin levels too low due to the weathering of the rock. • All Industry Standard practices are used in laboratory. • Depending on the outcome of this work, additional samples may be submitted. • Subsequent samples, representing the single metre intervals may be taken and submitted for analyses if the composite samples support this.

Criteria	JORC Code Explanation	Commentary
Quality of Assay Data and Laboratory Tests	• The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total. • For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc. • Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.	• All wet chemistry laboratory work was undertaken by ALS, which included the blunging and screening work. • ALS Geochemistry code ME-XRF26 is the code representing the technique used for analyses. • All work is very early and indicatory. • All Industry Standard practices are used in laboratory. • No quality control has been used except for internal laboratory standards.
Verification of Sampling and Assaying	• The verification of significant intersections by either independent or alternative company personnel. • The use of twinned holes. • Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols. • Discuss any adjustment to assay data.	• The program was designed to test sites nearby to historically drilled holes, that have had kaolin reported in them, as such new holes were required to confirm the historical ones and recover material for test work. • No twinning has occurred, but holes have been drilled within 50m of historical ones. • Data entry was by paper logs in the field, entered into spreadsheet at a later point.
Location of Data Points	• Accuracy and quality of surveys used to locate drillholes (collar and downhole surveys), trenches, mine workings and other locations used in Mineral Resource estimation. • Specification of the grid system used. • Quality and adequacy of topographic control.	• Sample positions are shown in images and co-ordinates reported. • Grid system MGA94 Zone 53, a hand held Garmin GPS was used for co-ordinate recording.
Data Spacing and Distribution	• Data spacing for reporting of Exploration Results. • Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied. • Whether sample compositing has been applied.	• The locations of the holes were determined by access and were a first pass check of historical drilling, as such they were drilled close to and between historical holes. • The first pass sampling has been undertaken on variably composited intervals, where necessary single metre intervals will be analysed if the results provide support for this.

Criteria	JORC Code Explanation	Commentary
Orientation of Data in Relation to Geological Structure	• Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type. • If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	• All 2020 drill holes were drilled vertically and as such reflect a true width for that location. • All 2014 drill holes were drilled at an angle of -60 degrees, as such the intervals do not reflect true widths. • The types of rocks that have been weathered to produce the kaolin cover very large aerial extents, far beyond the areas being reported. • Faults and other fracture type systems can enhance local weathering, i.e. deepen the system, it is unknown what influence if any these have played in the kaolin development,
Sample Security	• The measures taken to ensure sample security.	• All samples were transported from site to secure storage by staff.
Audits or Reviews	• The results of any audits or reviews of sampling techniques and data.	• No audits undertaken. • One review by the SA government in 1993 and summarised in Report book 93/57.

Section 2 Reporting of Exploration Results

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

Criteria	JORC Code Explanation	Commentary
Mineral Tenement and Land Tenure Status	• Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings. • The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.	• Tenement status confirmed on SARIG • All work being reported is from EL 5815, Archer Energy & Resources Pty Ltd (a subsidiary of AXE) owns the tenement. • The granted tenement is in good standing with no known impositions.
Exploration Done by Other Parties	• Acknowledgment and appraisal of exploration by other parties.	• Pechiney (1968 - 1971) and CSR (1971 – 1973). • WMC (CRA) mid 1980's, exploring for base metals. • Other explorers have held exploration licences over the ground up till the current date. Exploration has been for precious metals
Geology	• Deposit type, geological setting and style of mineralisation.	• Deep weathering of the Cleve Uplands, south of Kimba on northern Eyre Peninsula, has resulted in widespread kaolinisation of early Proterozoic Hutchinson Group schist and Lincoln Complex.

Criteria	JORC Code Explanation	Commentary
Drillhole Information	• A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes: – Easting and northing of the drill hole collar – Elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar – Dip and azimuth of the hole – Downhole length and interception depth – Hole length • If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.	• Drill hole collars are shown in plan images. • The table of drill hole collars are reported in ASX release 3rd March 2020. • Chemistries are reported in ASX release 6th April 20-20. • Historical drill information was reported 19th August 2019.
Data Aggregation Methods	• In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated. • Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail. • The assumptions used for any reporting of metal equivalent values should be clearly stated.	• All composited sample intervals assay results are presented at the end of this release, a summary table is reported in the body of the text under the corresponding prospect.
Relationship Between Mineralisation Widths and Intercept Lengths	• These relationships are particularly important in the reporting of Exploration Results. • If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported. • If it is not known and only the downhole lengths are reported, there should be a clear statement to this effect (e.g. 'downhole length, true width not known').	• All assay intervals for 2020 are downhole in nature, as they represent a weathering profile, they are expected to represent a true width. • The lateral extent of these 'true widths' is unknown at this early stage of exploration, additional drilling is required to determine this.
Diagrams	• Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.	• Plan locations of drill holes are shown in the body of the report.

Criteria	JORC Code Explanation	Commentary
Balanced Reporting	• Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.	• The reporting is considered to be balanced.
Other Substantive Exploration Data	• Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.	• None to report at this stage of the review. • Previous ASX releases 26th September 2019, 18th November 2019, 3rd February 2020, 3rd March 2020 & 6th April 2020 provide information updates by Archer.
Further Work	• The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling). • Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	• Exploration work is required to confirm the historical work and advance the projects towards a more certain nature, which will hopefully lead to a confidence level where resources can be estimated.