

13<sup>th</sup> January 2013

## Quarterly Activities Report Period ended 31<sup>th</sup> December 2013

### HIGHLIGHTS FOR THE QUARTER

#### CAMPOONA GRAPHITE

- Samples of flotation concentrates for initial marketing assessment have been completed. A total of 6.6 kilograms of high grade graphite concentrate with an average grade of 97.5% TGC has been recovered. A further 1.4 kilograms of graphite concentrate is in final preparation.
- Grades of the re-cleaned flotation concentrates have been steadily increasing with latest tests in the high 98 – low 99 percent C.
- A series of tests using industry standard acid cleaning followed by ashing analysis produced concentrates grading to 99.7% C.
- Archer has committed to a two-year program of Research and Development into graphene and graphene-related products with the University of Adelaide.
- Product development research as part of ongoing collaboration between Archer and the University of Adelaide, School of Chemical Engineering (Prof Dusan Losic Nano Research Group) successfully produced a wide number of graphene and intercalated graphite products from raw Campoona graphite and from Campoona medium-grade (92% TGC) graphite concentrates. Key products produced were:
  - graphene oxide sheets.
  - graphene sheets.
  - graphene based composites.
  - intercalated graphite.
- The ability of Campoona graphite and Campoona graphite concentrates to deliver a wide spectrum of graphene and graphene-related products greatly enhances the probability of Archer being able to deliver two 15-20 year business streams:
  - high grade fine natural flake graphite; and
  - the manufacture of high tech, high-value graphene products.
- Graphene is a one-atom thick layer of carbon that has outstanding mechanical, electrical, optical, thermal and chemical properties. Many have dubbed graphene as The New Age material. Graphene's uses include as conductive formulations and inks, in composite materials, in energy storage materials, in catalysis, as transparent conductive layers, in carbon semi-conductors, in bio-related applications and for waste and water treatment.
- Substantial progress has been made on studies to support the Campoona Mining Lease Proposal planned to be submitted to government in Q3 calendar 2014. Studies completed include:

1. Project Stakeholder Engagement Plan.
2. Commenced Community Consultative Committee meetings.
3. Issued the first two periodic Community Newsletters.
4. Hydrogeological desktop baseline assessment.
5. Surface water study.
6. Indigenous and Non-Indigenous Desk-top Cultural Heritage Survey.

#### LEIGH CREEK MAGNESITE

- A third party has sought the Warden's approval to peg and apply for registration of new mineral claims over the Mt Hutton portion of Archer's greater Leigh Creek magnesite deposits for the purpose of extracting dolomite. The initial Warden's Court hearing is set for 14<sup>th</sup> January 2014. Archer will vigorously defend its mineral rights.
- Leigh Creek Magnesite Pty Ltd a wholly owned subsidiary of Archer Exploration Limited applied for an additional exploration licence at Leigh Creek covering the Screechowl magnesite deposit.

#### FINANCIAL

- Cash in bank on 31<sup>th</sup> December 2013 of \$7.225 million.
- \$537,000 was spent on exploration and project evaluation during the quarter.

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## Summary of the December 2013 Quarter Exploration Activities

### 1. CAMPOONA GRAPHITE

#### Flotation

Flotation testing has delivered the required mass of concentrates to commence initial marketing assessment. A total of 6.6 kilograms averaging 97.5% TGC has been produced to date. Tests have recovered progressively higher grade graphite concentrates with latest results in the high 98 – low 99% TGC range. A further 1.4 kilograms of concentrate is in final stages of re-cleaning. A composite sample will be ashed to provide full trace element geochemistry.

#### Acid Cleaning

Acid cleaning techniques have been developed in-house. Initial trials used a mix of HCl + HF in line with published research. This mix of acids is known to be effective on the dissolution of remnant mineral compounds that are Campoona's main trace contaminants in the high purity concentrates.

The successfully cleaned graphite samples were then ashed to determine pre-acid and post-acid cleaning ash to give a good indication of the effectiveness of the acid cleaning.

### CAMPOONA ACID CLEANING

Sample	Starting Assay	Acid-cleaned Assay
TRIAL – BF-5 combined cons	89.5% TC	97.7% TC
TRIAL – BF-8 combined cons	91.3% TC	99.0% TC

Sample	Starting Assay	Acid-cleaned Assay
BF-2 Comb. Recleaner Cons	98.1% TC	99.5% TC

### CAMPOONA ASHING

	Starting Ash content w/w (TC - Total Carbon content)	Acid-cleaned Ash Content (TC - Total Carbon content)
TRIAL - BF-5 combined cons	89.8% TC	98.0% TC
TRIAL - BF-8 combined cons	91.7% TC	98.6% TC
BF-2 Comb. Recleaner Cons	98.8% TC	99.7% TC

Chemical cleaning methods for bulk float concentrates or flotation-re-cleaned bulk float concentrates can now be upgraded in their purity using (HCl + HF) mixes to achieve TC% levels of >99.5%.

The results achieved to date are very good and results should improve as the method is perfected.

#### Ashing and Trace Element Analyses

Ashing techniques have now been trialled as a necessary precursor step to analyses of trace element contents. The process developed included drying the samples and heating the samples through critical temperature ranges for up to 48 hours.

The most recent acid cleaning of a re-cleaned bulk float which started at 98.1% TC cleaned to 99.7% TC as determined by the more accurate analysis method of ashing. It would be a significant achievement for the project to claim a 99.9% TC purity for its natural product as it would place the project as one of the two or three most advanced natural graphite development projects in the world, particularly for its product purity.

Chemical cleaning methods for bulk float concentrates or flotation re-cleaned bulk float concentrates can now be upgraded in their purity using (HCl + HF) mixes to achieve TC levels of +99.5% providing high purity market samples on a larger scale of kilogram-sized samples.

## 2. RESEARCH & DEVELOPMENT

During the December quarter a wide range of graphene and graphene-related products were readily produced from raw Campoona graphite samples as well as from medium-grade (92% C) graphite concentrates. The research was part of ongoing collaboration between Archer and the University of Adelaide, School of Chemical Engineering (Prof Dusan Losic Nano Research Group).

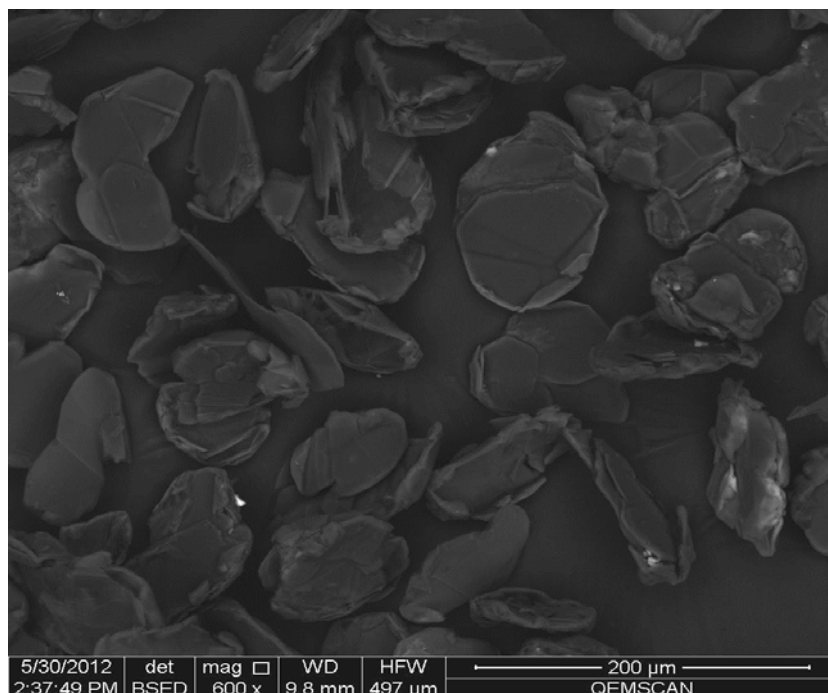
The key graphene products produced from the Campoona graphite were:

- Graphene oxide sheets
- Graphene sheets
  - Graphene nanosheets with controllable size (20 nm to 1,000 nm)
  - Functionalised graphene nanosheets
  - Graphene powders
  - Graphene films
  - Graphene membranes
  - Graphene electrodes
  - Graphene nanocarriers
- Graphene based composites
  - Graphene aerogel composites
  - Graphene conductive hydrogels
  - Graphene/carbon nanotube aerogels
  - Graphene magnetic aerogels
- Intercalated graphite

Whilst graphene has been known since the 1940s, it was not until 1994 that researchers were able to isolate graphene. Geim and Novoselov were awarded the Nobel Prize for Physics in 2010 in recognition of their work. Graphene has many attributes that gives rise to multiple applications that can be applied across a range of commercial areas.

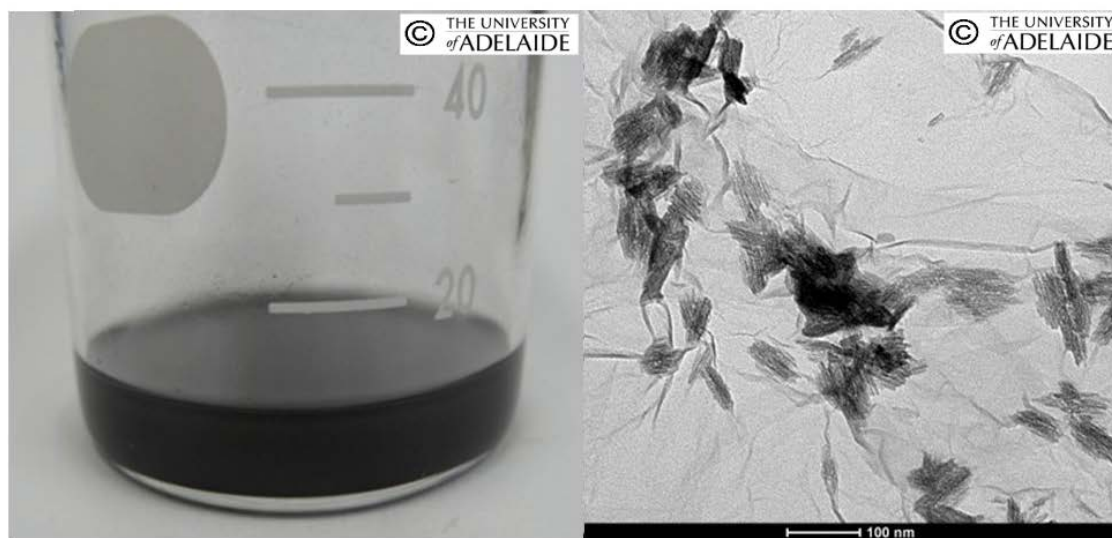
**Table 1. Graphene Applications by Commercial Area.**

Commercial Area	Applications
<b>Conductive formulations and Inks</b>	Printable electronics
	E-textiles
	Coatings
<b>Composite Materials</b>	Mechanical reinforcement
<b>Energy Storage</b>	Lithium-ion batteries
	Supercapacitors
<b>Transparent Conductive Films</b>	Organic photovoltaic cells
	Organic light emitting diodes
	Display/touchscreens
<b>Carbon Semi Conductors</b>	Field effect transistor
	Spintronics
	Integrated circuits
<b>Bio-Related</b>	Targeted drug carrier
	Si-RNA carrier
	Sensors for single molecule detection
<b>Water treatment</b>	Capacitance de-ionization
	Filtration

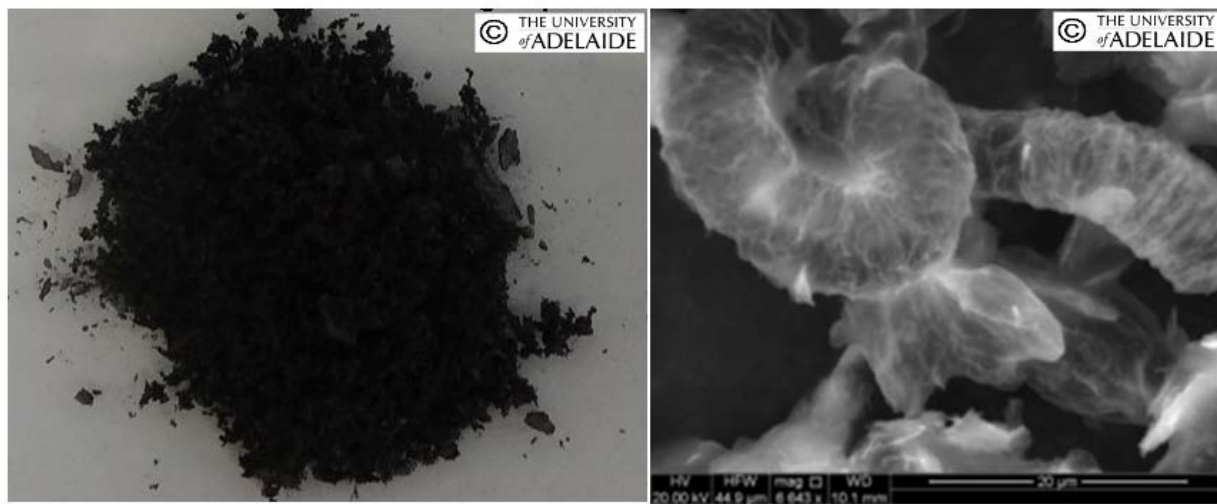


**Plate 1. Morphology typical of the ultrafine highly crystalline graphite concentrate (-75 micron) showing high grade to ultra pure crystalline fine graphite flake. Such concentrate is easily reprocessed to remove trace contaminants to achieve grades >99%C.**

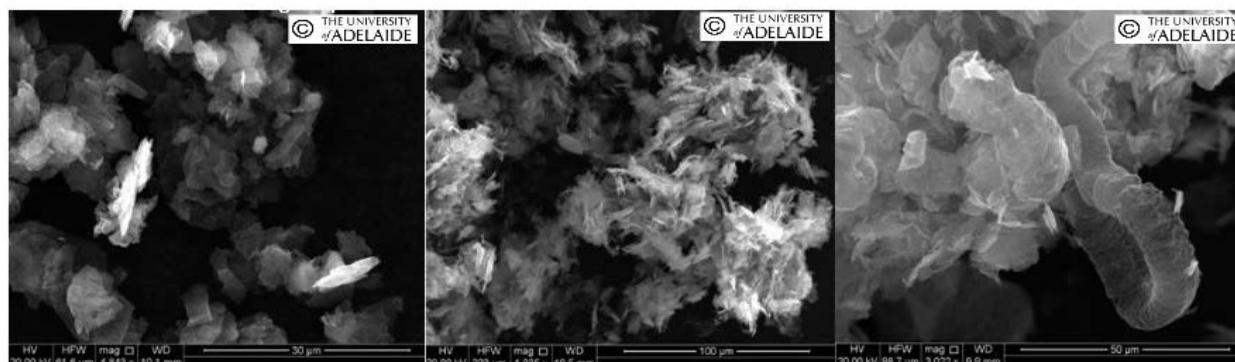
Archer’s business plan is to produce the highest quality natural graphite concentrates in the world that can rival synthetic graphite in terms of grade. However, given the projected very long life of the Campoona project, the Company has invested in research into developing new products and potentially new commercial applications for graphite and graphene products.



**Plate 2. Prepared graphene nanosheets in solution from raw Archer Campoona graphite. (Left is TEM image)**



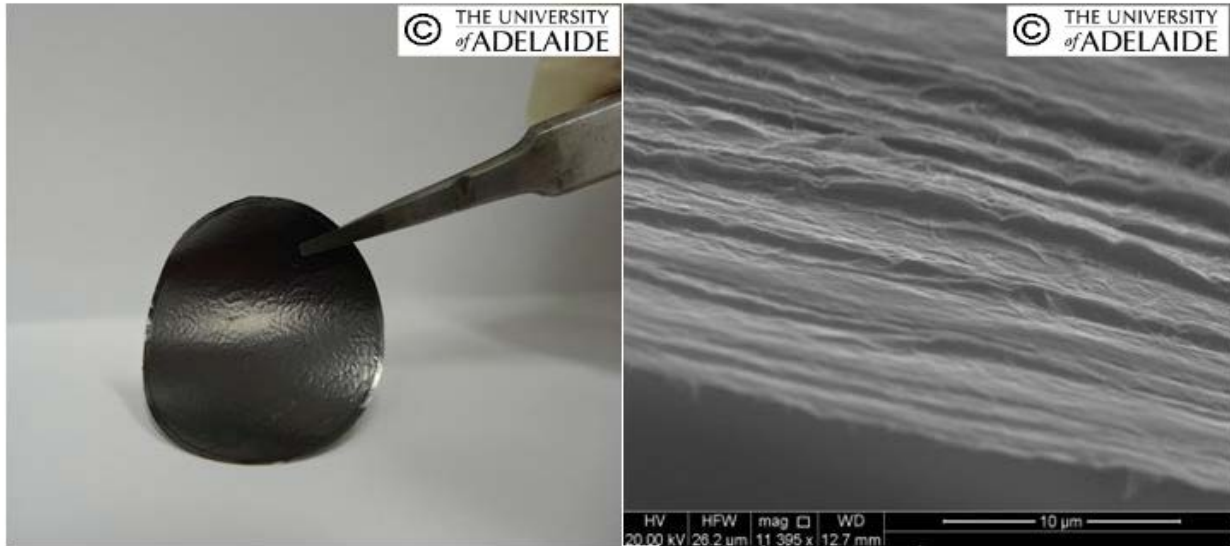
**Plate 3.** Prepared intercalated graphite microparticles (left) with characteristic worm-like structure (right) from 92% TGC concentrate



**Plate 4.** SEM images of Archer Campona graphite flakes (92% TGC) (left) used for preparation of chemical and electrochemical prepared intercalated graphite microparticles (middle and right)



**Plate 5.** Prepared graphene aerogel filters for water and air purification from raw Campona graphite



**Plate 6. Prepared filtration membrane of graphene sheets extracted from raw Campoona graphite. This electroconductive membrane can be used for filtration separation and as an electrode for batteries and supercapacitors.**

These few selected examples of new materials show the enormous potential of the Campoona graphite in the development of new highly valuable materials and devices across a broad range of applications.

Archer has committed to a sustained two-year Research and Development program into graphene and graphene-related products with the University of Adelaide. Final contract arrangements will be finalized early in 2014 enabling the research to advance the already impressive progress established under a less formal collaboration.

### **3. CAMPOONA LAND PURCHASE**

During the September quarter Archer executed a legally binding Heads of Agreement which covers the sale and purchase of land at Campoona Shaft (“Campoona Property”). Throughout the December quarter both party’s legal representatives have been working to finalise the agreements.

Geotechnical drilling is planned to commence in the 3<sup>rd</sup> week of January 2014. The diamond coring program will provide rock quality and joint/fracture information needed to finalise the pit design and also to finalise the exact location of the 120 acres of land being purchased.

### **4. MINE LEASE PROPOSAL**

Studies required for the submission of a Mining Lease Proposal are on track to see submission during Q3 calendar 2014. Studies completed to date include:

1. Project Stakeholder Engagement Plan.
2. Commenced Community Consultative Committee meetings.

3. Issued the first two periodic Community Newsletters.
4. Hydrogeological desktop baseline assessment.
5. Surface water study.
6. Indigenous and Non-Indigenous Desk-top Cultural Heritage Survey.
7. Winter and Spring Ecological surveys

## **5. FINANCIAL**

The Company's cash balance at the end of the quarter was \$7.225 million.

\$537,000 was spent during the quarter on exploration and development activities.

## **6. TENEMENTS**

Leigh Creek Magnesite Pty Ltd a wholly owned subsidiary of Archer Exploration Limited applied for an additional exploration licence at Leigh Creek covering the Screechowl magnesite deposit.

A third party has sought the Warden's approval to peg and apply for registration of new mineral claims over the Mt Hutton portion of Archer's greater Leigh Creek magnesite deposits for the purpose of extracting dolomite. The initial Warden's Court hearing is set for 14<sup>th</sup> January 2014. Archer will rigorously defend its mineral rights.

## **7. ACTIVITIES FOR MARCH QUARTER 2014**

Geotechnical drilling to determine the Campoona Shaft final pit design is planned to commence by the third week of January 2014 and should be completed by late February.

Infill RC drilling will be completed on the two northern graphite pods in Central Campoona concurrently with the geotechnical drilling at Campoona Shaft.

A small drill program will further test highly anomalous epithermal gold occurrences at Bartel which has previously recorded 29m @ 0.57 g/t Au including 1m at 2.15g/t Au .

Community consultation will continue right up to the point of submission of the Mining Lease Application and PEPR. The Community Consultative Committee ("CCC") meets every 2 months and Community Newsletters are distributed prior to each CCC meeting.

Critical studies to support the Mining Lease Application will continue throughout the March 2014 quarter.



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Archer Exploration Tenement Position 31<sup>th</sup> December 2013