Archer Materials Limited (ACN: 123 993 233)
Lot Fourteen, Frome Road, Adelaide SA 5000
www.archerx.com.au

ASX Announcement (ASX: **AXE**) 24 January 2024

Q2 FY24 Activities Report and Appendix 4C

For the quarter ended 31 December 2023.

Overview

- Archer Materials progresses its qubit readout technology development for the ^{12}CQ quantum chip operation and function.
- Quantum electronic devices in development designed for foundry runs in the US and Europe.
- The Company demonstrated multiplexing readout for its Biochip, which could potentially enable end-users to detect multiple diseases from one single chip.
- Biochip graphene field effect transistor sensor devices for multiplexing validated by whole wafer runs with a commercial foundry partner in the Netherlands.
- Completed first joint-fabrication through a multi-project wafer run of Biochip graphene sensor designs with a commercial foundry in Germany.
- New Biochip graphene sensor designs sent to a foundry in Spain.
- Archer continues to strengthen its relationships with global foundry partners to deliver its chips using a streamlined 'fabless' commercialisation model.
- Strong cash position to fund activities with $21.5 million and no debt.

Archer Materials Limited ("Archer", the "Company", "ASX: AXE"), a semiconductor company advancing the quantum computing and medical diagnostics industries, provides its Quarterly Activities Report and Appendix 4C for the quarter ended 31 December 2023 ("Quarter").

Commenting on Q2 FY24 activities, Greg English, Executive Chairman of Archer, said

"Archer continued to develop its two chip technologies, including its ^{12}CQ quantum processor chip and Biochip, during the Quarter.

"The team progressed the ^{12}CQ chip readout capabilities, including starting measurements on Archer designed readout circuits. Readout is important for semiconductors as it provides the results from quantum calculations.

"The Company's Biochip gFET designs have progressed closer to acting as a 'lab-on-a-chip'. Archer validated its gFET designs through wafer runs with foundry partners in Germany and the Netherlands, and the team was also able to demonstrate multiplexing. Multiplexing allows the Biochip to detect multiple diseases at once on one chip.

"Continuing to build our team, developing our foundry and industry relationships, and utilising our strong cash position will help further develop our semiconductor technologies to shape the next phase of computing and medical diagnostics."

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Technology development and commercialisation activities

^{12}CQ chip

The Archer ^{12}CQ qubit processor chip requires high fidelity control (data input) and readout (data output) to function. Readout allows for interpretation of quantum calculations for the user, while minimising the loss of quantum information to the surrounding environment. During the quarter, Archer's focus involved designing and developing several quantum state readout technologies for Archer's ^{12}CQ chip.

Archer designed, developed, fabricated, and began measurements on its readout circuits, including devices incorporating the unique carbon nanomaterial used for the ^{12}CQ chip. Faraday shielding for the readout devices was also designed, manufactured, and implemented. The Company completed the integration of electronic equipment to interface between readout technology and state-of-art measurement systems in facilities in Australia.

Early-stage measurements commenced on readout devices, including employing the microwave reflectometry technique. The readout devices were based on a single electron radio-frequency-box architecture and were fabricated using scanning electron microscopy and electron beam lithography. The work validated the readout device's sensitivity to a single electronic energy level and demonstrated the tuneability of the respective resonant circuit using a varactor technology. This tuneability is significant in the context of optimising the signal-to-noise ratio of the device's microwave readout tone.

Radio-frequency reflectometry measurements at Archer involve the nanoscale precision placement of particles embedded within quantum electronic devices. These devices are then incorporated within a specialised circuit and RF reflectometry is used as a measurement tool.

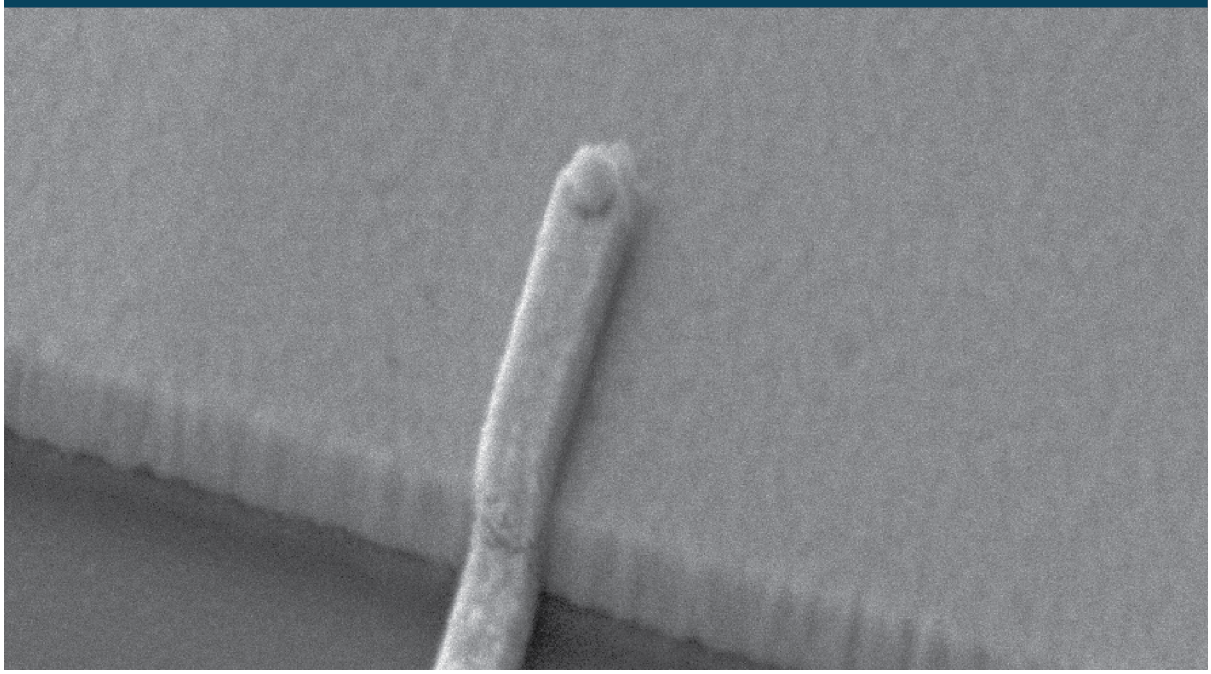

Image 1. Readout device components fabricated by Archer for the ^{12}CQ technology. The components show the result of ultra-precise nanometre alignment applied in multiple fabrication steps between nanosized electrodes and a discrete 50 nanometre (spherical) particle of the carbon material.

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The readout devices and components required a high level of nanoscale precision between multiple fabrication steps. More advanced fabrication included the nanometre (one billionth of a metre) alignment between nanosized electrodes and discrete 50 nanometre particles of the carbon material used in the ^{12}CQ technology (Image 1).

The development of optimised reflectometry-based readout was awarded a UNSW Science Translational Impact Seed Funding grant to support the R&D required for the associated cryogenics and high-end electronic equipment. Archer has also gained access to an Australian-based Helium Ion Beam microscope, providing ultra-precise imaging resolution and ion beam based milling for the formation of quantum nanodevices as part of Archer's R&D.

The Company also developed and tested low-temperature operation devices for the quantum spin state detection in few- and single-carbon nanostructures using electron spin resonance measurement techniques. Initial measurements indicated a strong correlation between the simulated and real devices. Archer intends to manufacture wafer-scale runs of these devices within a commercial foundry in the United States. The design and manufacture of readout hardware, technology, and associated techniques for the ^{12}CQ chip is ongoing.

Archer has brought in specialist staff from the semiconductor industry, with experience developing and commercialising semiconductor products and technology. Archer is also working with commercial tier-one foundry partners in Europe for the scaled production of prototyped readout circuit and device designs, including the potential use of cutting-edge 28 nanometre Fully Depleted Silicon on Insulator Complementary Metal-Oxide-Semiconductor ("FDSOI CMOS") process technology.

Archer's Biochip

Archer's Biochip innovation aims to integrate graphene field effect transistors ("gFETs") into advanced fluidic systems to create miniaturised lab-on-a-chip device platforms for medical diagnostics. This could enable the ability to parallelise the detection of multiple biologically relevant targets on a chip.

The Company demonstrated multiplexing readout for its advanced Biochip gFET devices by designing and developing new hardware and software systems to readout the signal from four gFET sensors at once on a single chip. This is a significant advancement over the earlier generations of the Biochip system, which could only activate one-sensor-at-a-time, as announced on 14 September 2023. Archer intends to apply its multiplexing capability in the Biochip to test for multiple diseases on a single chip at once.

The new Biochip system with multiplexing capability also provides automated hands-free operation, as it integrates liquid handling automation and data acquisition. The software developed by Archer can display all single and time series measurements in real-time for the four gFET sensors simultaneously.

The Company validated a Biochip gFET design through a multi-project wafer ("MPW") run by its external German foundry partner during the Quarter. The gFET device manufacturing was also the first joint fabrication between Archer and an external foundry partner, as the final fabrication processes were performed in-house by the Company in Australia.

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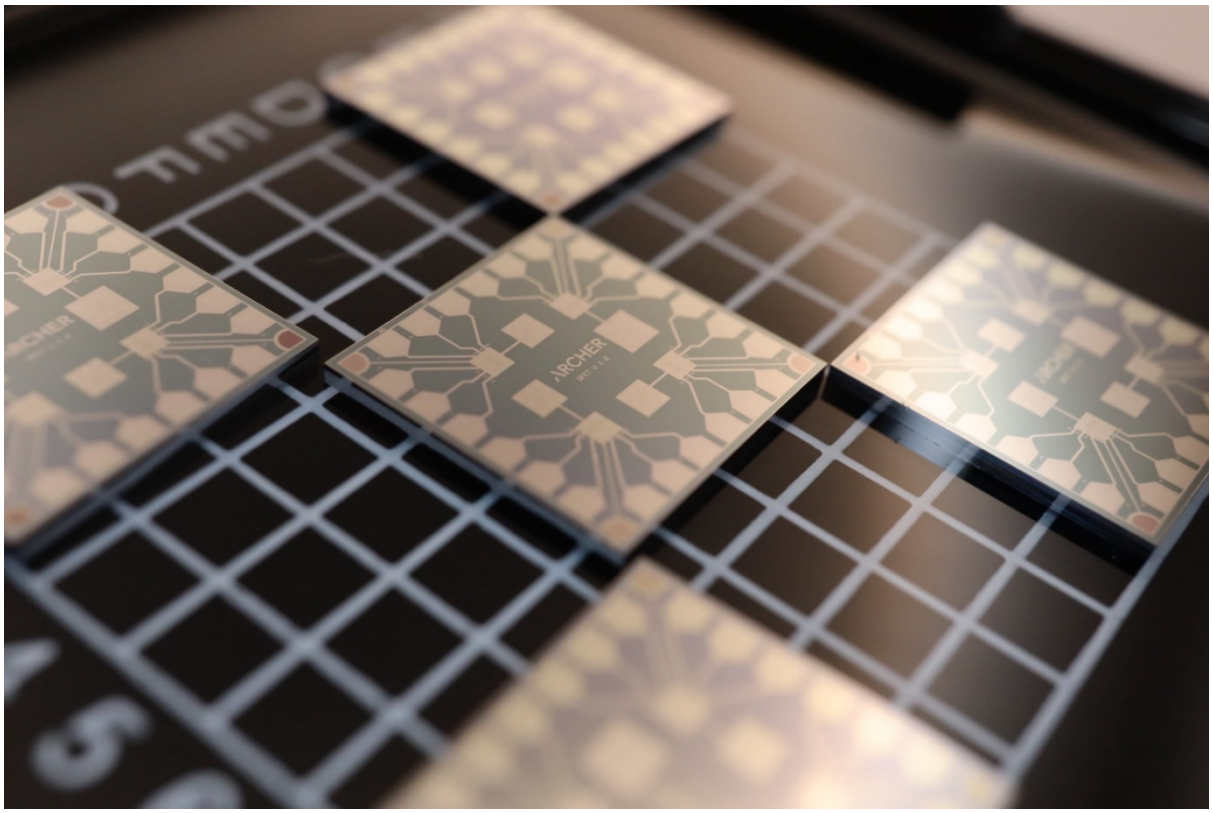

Image 2. Archer's Biochip gFET chips are diced from the 6-inch multi-project wafer manufactured by a German foundry partner. As announced in Q1FY24, Archer had submitted first-generation Biochip gFET designs to a commercial foundry in Germany for an MPW run.

The MPW-produced gFETs were fabricated on a 6-inch wafer and diced into individual chips (Image 2). An MPW is where Archer's device designs are imprinted on a small area of a wafer with the designs of other companies on the same wafer. The gFET devices have been measured and function as expected, including the demonstration of liquid gating, and are compatible with the Archer Biochip system platform.

This development follows Archer's progress on validating its Biochip gFET designs for multiplexing through a whole four-inch wafer run by a commercial foundry partner in the Netherlands. The MPW and whole wafer gFET fabrication are consistent with Archer validating its chip designs to ensure scalability for the manufacturing process of the Biochip graphene devices. Archer will use the outcomes of the runs to evaluate foundries best suited to Archer's technology.

Archer sent a new Biochip gFET design to a foundry partner in Spain for fabrication through a four-inch whole wafer run. The foundry in Spain has ISO 13485 certification to manufacture medical device components, an important hallmark for future manufacturing partnerships. The gFETs are designed to be fabricated with structures suitable for liquid multiplexing, with advances over previous chip design features, including in gating and channel definition.

Archer plans to test the chips diced from the wafer in its laboratory in Australia, with delivery of the new gFETs anticipated in the first half of 2024. Archer is also working with the foundry partner in Spain to integrate testing of the gFET devices at the point of manufacture to improve the efficiency of the Company's technology development processes.

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By developing various designs for Archer's Biochip gFET sensors, the Company can broaden its foundry network, improve quality control of its chips, and expand possible applications. Working with an ISO certified foundry to manufacture medical device components aligns with the nature and purpose of the Biochip, which is to potentially transform the medical diagnostics industry by providing better access for disease detection.

The Company also progressed two provisional patent applications related to the Biochip technology to patent pending by the Patent Cooperation Treaty pathway. The patent applications cover graphene field effect transistors, and a system of chip readout electronics, fluidics, and integration with liquid delivery automation and software.

Foundry and semiconductor industry partnerships

Archer continues to strengthen its relationships with global foundry partners to deliver its chips using a streamlined 'fabless' commercialisation model. Archer is currently developing various gFET design techniques by engaging several commercial semiconductor foundries in Europe.

The Archer team recently examined the facilities of its foundry partner in the Netherlands and discussed the prospect of moving to an 8-inch whole wafer graphene process. Archer is continuing discussions with its commercial foundry partners that specialise in graphene fabrication to secure future semiconductor product manufacturing capability and to support technology development of its Biochip, including further plans for device design validations.

The semiconductor chip manufacturing processes and technology in each graphene foundry will differ, including the characteristics of graphene within the devices. Performing wafer runs in several foundries is required as part of the gFET chip development process to optimise the gFET design and manufacturing for foundry readiness and compatibility.

Financial and corporate update

The Company's cash balance at the end of the Quarter was $21,562,000, with no debt.

The Company holds 1,633,944 shares in Canadian Stock Exchange listed Volatus Capital Corp (CSE:VC) and 11,571,119 shares and 2,892,780 quoted options in ASX listed ChemX Materials Ltd (ASX:CMX).

Archer's accompanying Appendix 4C cashflow report for the Quarter includes an amount of $145,000 at item 6.1, relating to executive and non-executive director fees paid as salaries and wages.

R&D Tax Incentive

Archer received a $1,455,936 cash rebate from the Australian Federal Government's Research and Development Tax Incentive program. The cash rebate was provided in respect of eligible Research and Development activities conducted during the financial year ended 30 June 2023, related to the Company's ^{12}CQ chip and Biochip technology.

Annual General Meeting

The Company's 2023 Annual General Meeting was held in Sydney on Wednesday, 29 November 2023. All resolutions put to the meeting were passed on a poll.

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Investor briefings

The CEO of Archer Materials Dr Mohammad Choucair spoke at the Automic Invest conference where he discussed Archer's business model as a fabless semiconductor company, its activities, how it manages supply chain risks, its IP, and how its chips could potentially contribute to the next generation of computing and medical diagnostics.

Events and outreach

Archer is the first Australian company to partner with the World Economic Forum ("WEF") Centre for the Fourth Industrial Revolution ("C4IR"). The WEF partnership complements Archer's work at a macro level through its other strategic cooperation with foundry partners and École Polytechnique Fédérale de Lausanne ("EPFL").

Archer participated in the WEF Quantum Economy Meeting 2023 as a C4IR partner and WEF Quantum Economy Network member. This event was attended by a large number of global corporations that are exploring how they will participate in a quantum technology world, and it provides an invaluable networking opportunity for Archer to explore potential partnerships and collaborations.

Archer also distributed several newsletters, explainers, a CEO interview, and AGM presentation including:

- December 2023 Newsletter: Biochip engagement expands to include foundry in Spain
- Explainer Article: Graphene field effect transistors
- CEO Interview: Automic Invest conference December 2023
- Explainer Article: Radio-frequency reflectometry
- Annual General Meeting Presentation: November 2023 AGM Presentation
- November 2023 Newsletter: Capitalising on Australia's semiconductor industry
- October 2023 Newsletter: gFET designs for Biochip multiplexing

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

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About Archer

Archer is a technology company that operates within the semiconductor industry. The Company is developing advanced semiconductor devices, including chips relevant to quantum computing and medical diagnostics. www.archerx.com.au

Appendix 4C

Quarterly cash flow report for entities subject to Listing Rule 4.7B

Name of entity	
Archer Materials Limited	
ABN	**Quarter ended ("current quarter")**
64 123 993 233	31 December 2023

Consolidated statement of cash flows		**Current quarter $A'000**	**Year to date (6 months) $A'000**
1.	**Cash flows from operating activities**		
1.1	Receipts from customers	-	-
1.2	Payments for		
	(a) research and development (exclusive of wages allocated to R&D)	(518)	(1,175)
	(b) product manufacturing and operating costs	-	-
	(c) advertising and marketing	-	-
	(d) leased assets	(29)	(32)
	(e) staff costs	(946)	(1,861)
	(f) administration and corporate costs	(486)	(960)
1.3	Dividends received (see note 3)	-	-
1.4	Interest received	789	879
1.5	Interest and other costs of finance paid	-	-
1.6	Income taxes paid	-	-
1.7	Government grants and tax incentives	1,456	1,456
1.8	Other (provide details if material)		
1.9	**Net cash from / (used in) operating activities**	**266**	**(1,693)**

2.	**Cash flows from investing activities**		
2.1	Payments to acquire or for:		
	(a) entities	-	-
	(b) businesses	-	-
	(c) property, plant and equipment	(16)	(24)
	(d) investments		
	(e) intellectual property	(33)	(38)

Consolidated statement of cash flows		Current quarter $A'000	Year to date (6 months) $A'000
	(f) other non-current assets	-	-
2.2	Proceeds from disposal of:		
	(a) entities	-	-
	(b) businesses	-	-
	(c) property, plant and equipment	-	-
	(d) investments	-	-
	(e) intellectual property	-	-
	(f) other non-current assets	-	-
2.3	Cash flows from loans to other entities	-	-
2.4	Dividends received (see note 3)	-	-
2.5	Other (provide details if material)	-	-
2.6	**Net cash from / (used in) investing activities**	**(49)**	**(62)**

3.	**Cash flows from financing activities**		
3.1	Proceeds from issues of equity securities (excluding convertible debt securities)	-	-
3.2	Proceeds from issue of convertible debt securities	-	-
3.3	Proceeds from exercise of options	-	-
3.4	Transaction costs related to issues of equity securities or convertible debt securities	-	-
3.5	Proceeds from borrowings	-	-
3.6	Repayment of borrowings	-	-
3.7	Transaction costs related to loans and borrowings	-	-
3.8	Dividends paid	-	-
3.9	Other (provide details if material)	-	-
3.10	**Net cash from / (used in) financing activities**	**-**	**-**

4.	**Net increase / (decrease) in cash and cash equivalents for the period**		
4.1	Cash and cash equivalents at beginning of period	21,345	23,317
4.2	Net cash from / (used in) operating activities (item 1.9 above)	266	(1,693)
4.3	Net cash from / (used in) investing activities (item 2.6 above)	(49)	(62)

Consolidated statement of cash flows		Current quarter $A'000	Year to date (6 months) $A'000
4.4	Net cash from / (used in) financing activities (item 3.10 above)	-	-
4.5	Effect of movement in exchange rates on cash held	-	-
4.6	**Cash and cash equivalents at end of period**	**21,562**	**21,562**

5.	Reconciliation of cash and cash equivalents at the end of the quarter (as shown in the consolidated statement of cash flows) to the related items in the accounts	Current quarter $A'000	Previous quarter $A'000
5.1	Bank balances	491	1,800
5.2	Call deposits	21,071	19,545
5.3	Bank overdrafts	-	-
5.4	Other (provide details)	-	-
5.5	**Cash and cash equivalents at end of quarter (should equal item 4.6 above)**	**21,562**	**21,345**

6.	Payments to related parties of the entity and their associates	Current quarter $A'000
6.1	Aggregate amount of payments to related parties and their associates included in item 1 * The above payments relate to fees and salaries paid to Directors during the quarter.	145
6.2	Aggregate amount of payments to related parties and their associates included in item 2	-

Note: if any amounts are shown in items 6.1 or 6.2, your quarterly activity report must include a description of, and an explanation for, such payments.

7.	**Financing facilities** *Note: the term "facility' includes all forms of financing arrangements available to the entity.* *Add notes as necessary for an understanding of the sources of finance available to the entity.*	**Total facility amount at quarter end $A'000**	**Amount drawn at quarter end $A'000**
7.1	Loan facilities	-	-
7.2	Credit standby arrangements	-	-
7.3	Other (please specify)	-	-
7.4	**Total financing facilities**	**-**	**-**

7.5	**Unused financing facilities available at quarter end**	n/a

7.6 Include in the box below a description of each facility above, including the lender, interest rate, maturity date and whether it is secured or unsecured. If any additional financing facilities have been entered into or are proposed to be entered into after quarter end, include a note providing details of those facilities as well.

n/a

8.	**Estimated cash available for future operating activities**	**$A'000**
8.1	Net cash from / (used in) operating activities (item 1.9)	266
8.2	Cash and cash equivalents at quarter end (item 4.6)	21,562
8.3	Unused finance facilities available at quarter end (item 7.5)	-
8.4	Total available funding (item 8.2 + item 8.3)	21,562

8.5	**Estimated quarters of funding available (item 8.4 divided by item 8.1)**	N/A

Note: if the entity has reported positive net operating cash flows in item 1.9, answer item 8.5 as "N/A". Otherwise, a figure for the estimated quarters of funding available must be included in item 8.5.

8.6 If item 8.5 is less than 2 quarters, please provide answers to the following questions:

8.6.1 Does the entity expect that it will continue to have the current level of net operating cash flows for the time being and, if not, why not?

Answer: n/a

8.6.2 Has the entity taken any steps, or does it propose to take any steps, to raise further cash to fund its operations and, if so, what are those steps and how likely does it believe that they will be successful?

Answer: n/a

8.6.3 Does the entity expect to be able to continue its operations and to meet its business objectives and, if so, on what basis?

Answer: n/a

Note: where item 8.5 is less than 2 quarters, all of questions 8.6.1, 8.6.2 and 8.6.3 above must be answered.

Compliance statement

1 This statement has been prepared in accordance with accounting standards and policies which comply with Listing Rule 19.11A.

2 This statement gives a true and fair view of the matters disclosed.

Date: ..... 24 January 2024.....

Authorised by: ..... By the Board.....
(Name of body or officer authorising release – see note 4)

Notes

1. This quarterly cash flow report and the accompanying activity report provide a basis for informing the market about the entity's activities for the past quarter, how they have been financed and the effect this has had on its cash position. An entity that wishes to disclose additional information over and above the minimum required under the Listing Rules is encouraged to do so.

2. If this quarterly cash flow report has been prepared in accordance with Australian Accounting Standards, the definitions in, and provisions of, *AASB 107: Statement of Cash Flows* apply to this report. If this quarterly cash flow report has been prepared in accordance with other accounting standards agreed by ASX pursuant to Listing Rule 19.11A, the corresponding equivalent standard applies to this report.

3. Dividends received may be classified either as cash flows from operating activities or cash flows from investing activities, depending on the accounting policy of the entity.

4. If this report has been authorised for release to the market by your board of directors, you can insert here: "By the board". If it has been authorised for release to the market by a committee of your board of directors, you can insert here: "By the [*name of board committee – eg Audit and Risk Committee*]". If it has been authorised for release to the market by a disclosure committee, you can insert here: "By the Disclosure Committee".

5. If this report has been authorised for release to the market by your board of directors and you wish to hold yourself out as complying with recommendation 4.2 of the ASX Corporate Governance Council's *Corporate Governance Principles and Recommendations*, the board should have received a declaration from its CEO and CFO that, in their opinion, the financial records of the entity have been properly maintained, that this report complies with the appropriate accounting standards and gives a true and fair view of the cash flows of the entity, and that their opinion has been formed on the basis of a sound system of risk management and internal control which is operating effectively.