

8 November 2021

## **ZEOTECH TO DEVELOP PRODUCTS FOR CARBON MARKETS IN COLLABORATION WITH GRIFFITH UNIVERSITY**

Emerging mineral processing technology company, Zeotech Limited (ASX: ZEO, “Zeotech” or “the Company”) is pleased to advise that, following promising pilot trials<sup>1</sup> led by Griffith University (“Griffith”) which identified potential to develop products for agricultural markets, it has executed an additional comprehensive research program with Griffith. The research program will involve pilot trials and establish scientific validation aimed at developing Zeotech product applications in two high potential areas of carbon markets and agricultural nutrient management.

The goal of the program to be undertaken by Griffith is to conduct research that will underpin agronomic opportunities for Zeotech products that aim to provide competitive advantages to existing soil amendments such as fertilisers and soil conditioners, with the early and substantial focus on the ‘carbon markets’ program.

Griffith’s trials will run concurrently, and comprise of two streams of agricultural product development:

- **‘Zeotech Products for Carbon Markets’** - Enhanced soil carbon storage and climate change mitigation in agricultural landscapes, targeting a substantial share of the carbon mitigation market – an estimated 15-20% of total human greenhouse gas emissions; and
- **‘Zeotech Products to Improve Agricultural Nutrient Management’** - Agricultural pollutant interception, removal, and recycling.

Griffith University, School of Environment and Science | Australian Rivers Institute,  
Dr. Chris Pratt commented:

*“I’m excited at the opportunity to work with Zeotech to develop products for the challenges that climate change presents to farmers. Of particular interest is the potential to extend carbon market solutions to rural communities to aid the transition required in meeting Australia’s commitment to net zero emissions by 2050.*

*The promising results gathered from our initial 9-month agronomic studies, and the unique characteristics of synthetic zeolites, presents a compelling opportunity for the application of Zeotech products for carbon sequestration.*

*Griffith looks forward to undertaking expanded pilot trials to evaluate solutions for advanced fertiliser delivery and the management of agricultural pollutants – representing a tangible opportunity to support sustainable food production.”*

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<sup>1</sup> Refer to ASX announcement 06/09/2021 “Griffith University Agronomic Studies deliver Promising Results”

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Griffith University, Vice President Industry and External Engagement Dr Peter Binks added:

*“Griffith is very pleased to be working with Zeotech on this important and innovative program of research. Zeotech is a leader in this space, through its innovative approach to carbon mitigation, which strongly aligns with our own objectives.*

*The strategic research partnership allows Zeotech to draw on Griffith’s considerable research strengths in soil biogeochemistry and climate change mitigation.*

*Zeotech’s own proprietary technologies are an important complement to our research.”*

Zeotech, Managing Director Peter Zardo added:

*“Zeotech values the opportunity to be working with Griffith University’s Soil and Land Use team, which provides one of Australia’s most highly-specialised and well-resourced groups in the area of agricultural carbon and nutrient management.*

*The opportunity to make a meaningful contribution to developing solutions to potentially aid the agricultural sector help meet Australia’s emission reduction targets, is important to Zeotech and we will continue to explore opportunities within the carbon capture, utilisation, and storage (CCUS) sector, with our highly capable project partners.*

*Zeotech remains committed to applying its proprietary low-cost zeolite synthesis technology to deliver solutions aimed at addressing sustainability challenges.”*

### **Zeolites offer soil carbon sequestration potential**

Research undertaken by Griffith indicates potential for the surfaces of reactive zeolites to be effective for carbon sequestration, for both organic and inorganic phases. Further, the mechanisms underpinning these sequestration processes suggest positive prospects for long-term soil carbon storage.

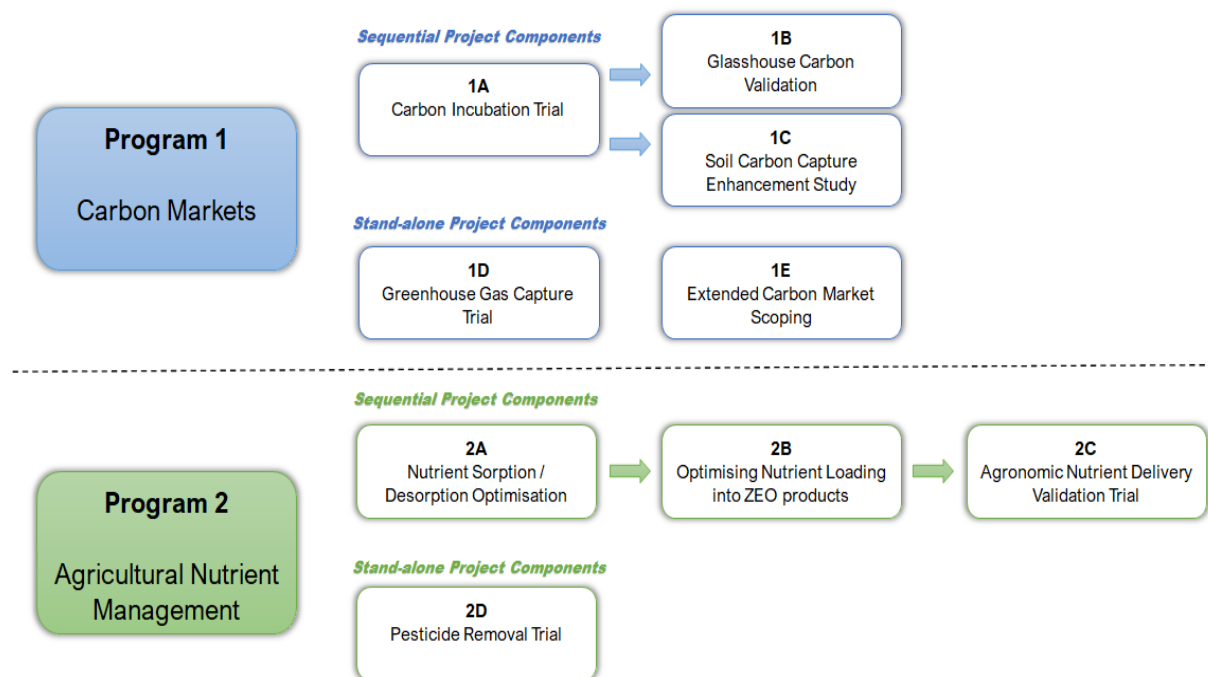
The program is supported by promising results achieved during previous agronomic studies<sup>2</sup> undertaken by Griffith, which showed that synthetic zeolites were capable of high nutrient retention, pesticide removal, enhanced moisture retention and decreased soil acidification.

Zeotech’s aim is to leverage the economic benefits of its proprietary mineral processing technology for the low-cost synthesis of zeolites to develop products that help agronomic systems cope with widespread existing and emerging challenges, including fertiliser resource scarcity and increasingly difficult growing conditions wrought by changing climates.

Griffith’s work will run over 22-months and comprise two programs, undertaken in parallel:

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<sup>2</sup> Refer to ASX announcement 28/09/2020 “Exploring Agricultural Applications for Synthetic Zeolites”



### Program 1: Zeotech Products for Carbon Markets

The work program scheduled in 1A through 1D is targeting a substantial share of the carbon mitigation market - estimated at 15-20% of total human greenhouse gas emissions.

Key activities and anticipated outcomes include:

- Carbon incubation trial - establishment of Zeotech product quantities required for baseline carbon sequestration;
- Glasshouse carbon validation - quantitative establishment of Zeotech product effectiveness to sequester carbon in agriculturally active soils;
- Soil carbon capture enhancement study - proof of concept demonstration of Zeotech product effectiveness in both soil organic and inorganic carbon sequestration;
- Greenhouse gas capture trial - proof of concept demonstration of Zeotech product effectiveness in mitigating CO<sub>2</sub> and CH<sub>4</sub> emissions from common agricultural emission source points;

In addition, Griffith estimates that there are further opportunities for materials-based carbon mitigation technologies, which will be explored in the following activity:

- Extended Carbon Market Scoping Exercise - this component is strategically tailored to commence at the front-end of the program, Griffith will synthesise the state of development and prospects for these technologies with a particular emphasis on current barriers to uptake. Specific areas that will be explored in the review include:
  - 1) Methane Markets - evaluating technologies for methane mitigation from sectors including solid waste management, wastewater treatment, cropping and mineral extraction;

- 2) **Nitrogen GHG Markets** - appraising opportunities for alternatives to urea fertiliser use (which entails significant direct CO<sub>2</sub> and nitrous oxide emission at the manufacture and land application phase) as well as mitigation of ammonia emissions;
- 3) **Broadened Carbon Capture Markets** - focusing on opportunities for soil organic and inorganic carbon capture beyond the agricultural contexts explored in this program.

The anticipated outcome of this activity is a synthesis report, highlighting opportunities and barriers for carbon capture through material-based technologies. It will present a range of potential directions for future market development opportunities and identify expertise targeted to these opportunities, including through Griffith University-based institutes such as the Climate Action Beacon<sup>3</sup> and Griffith's Environmental Economics Group.

### **Program 2: Zeotech Products to Improve Agricultural Nutrient Management**

The work program scheduled in 2A through 2D is targeting emerging agronomic challenges, including fertiliser resource scarcity and increasing residual agricultural pollutants.

Key activities and anticipated outcomes include:

- **Nutrient sorption/desorption optimisation** - development of an operational field, highlighting maximum nutrient retention by Zeotech products treating waste streams;
- **Optimising nutrient loading onto Zeotech products** - delivery of a practical Zeotech product formulation that is suited to application in agricultural soils;
- **Agronomic nutrient delivery validation trial** - quantitative determination of Zeotech product agronomic performance, benchmarked against conventional soil inputs; and
- **Wider pesticide removal trial** - quantitative establishment of Zeotech product effectiveness in treating key pesticide groups in agronomic settings.

### **The Project Team**

Research Project team comprises of lead, Dr Chris Pratt, supported by highly experienced academic colleagues Professor Chengrong Chen and Dr Ali El Hanandeh. Additionally, the project will benefit from the full-time appointment of a postdoctoral researcher as a dedicated resource to support the delivery of research outputs.

#### **Dr Chris Pratt**

Dr Pratt is a Senior Lecturer at Griffith University and a member of the Australian Rivers Institute. His research interests span several high-level challenges relating to soil management, particularly in the areas of: 1. Sustainable Agriculture, 2. Climate Change Mitigation and Adaptation, and 3. Soils' roles in Waste Management. He has developed and currently leads a research initiative aimed to help instil resilience into Australia's agricultural sector through improving soil function.

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<sup>3</sup> <https://www.griffith.edu.au/research/climate-action>

His research outputs include: publications in high-ranking international journals, development of best-practice guidance documents for primary producers, and findings adopted by the Australian and New Zealand Greenhouse Gas Inventories. Dr Pratt's possesses a unique mix of research experience in soil function, climate change mitigation and nutrient cycling, which sees him ideally placed to lead Zeotech's product development research program.

#### Professor Chengrong Chen

Professor Chengrong Chen is one of Australia's leading soil scientists, managing several large industry-focused research programs of national and international importance. He was trained as a Soil Scientist in Fujian Agricultural and Forestry University, obtaining a MSc in Biological Sciences in the University of Waikato in 1997 and a PhD in Biogeochemistry at Lincoln University, New Zealand in 2000. He was awarded an ARC Future Fellow (2009-2014).

He is currently leading the Soil Environmental Biogeochemistry Research Group and the 4R Waste Hub at Griffith University. His key research areas include: biogeochemical cycling of carbon and nutrients in terrestrial ecosystems, recycling of wastes for enhancing soil carbon sequestration, improving soil quality and health, and mitigating drought, nutrient pollutant tracing in reef, and restoration of degraded ecosystems.

#### Dr Ali El Hanandeh

Dr El Hanandeh is a Senior Lecturer at Griffith University, the School of Engineering and Built Environment. His research focuses on challenges relating to soil and waste management with emphasis on: sustainable agriculture; green chemistry applications, ecological engineering, and circular economy. He currently leads research initiatives aimed to implement green chemistry and circular economy principles by developing value-added products from waste to improve soil functions.

#### Griffith University

Ranking in the top 2% of universities worldwide, Griffith has come to be regarded as one of Australia's most innovative tertiary institutions and one of the most influential universities in the Asia-Pacific region.

#### Research Institutes and Specialist teams

The project draws on Griffith's significant research record and is supported by a network of highly experienced research institutes and teams, accustomed to managing large scope research programs for industry, government, and international partners.

#### Australian Rivers Institute

The Australian Rivers Institute (ARI) is a multi-disciplinary research institute leading significant national and international research programs across land and water under its 'Catchment to Coast' mandate.

ARI was established in 2006 and is now Australia's pre-eminent and largest university-based land and water research institution, with over 150 research staff and post-graduate students, including eleven professors.

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ARI has established a record of delivering high quality, collaborative research, building Griffith's profile of expertise and capability in environmental, water and soil sciences, and underpinning the university's reputation as a research performer with capability to address issues of global and national significance.

ARI's research outputs underpinned the University's 'Well above world standard' rankings for Environmental sciences, Ecological applications, Environmental science and management and Ecology, and 'Above world standard' ranking for the Soil sciences and Physical geography in the 2018-19 ERA (Excellence in Research for Australia) assessment. It positions Griffith as the top freshwater and catchment sciences research institution in Australia and in the top 30 in the world.

### Soils and Land Use Team

Griffith University's Soil and Land Use team is one of Australia's most highly-specialised and well-resourced teams in the area of agricultural carbon and nutrient management. Access to the team's state-of-the-art analysis suite – which includes a carbon fractionation analyser, a carbon greenhouse gas chromatograph and a soil microbial community detector – along with the team's unique skill sets in applied environmental processes, offers Zeotech a genuine opportunity to pursue a high-value work program in partnership with Griffith.

The group comprises expertise spanning multiple high-level themes, including Climate Change Mitigation and Adaptation, Sustainable Fertiliser Development, and Soil Waste Management. The team has led and managed a diverse range of similar large-scale research programs, often in the form of integrated industry-government-community funding structures, working with partners including: the Australian Centre for Agricultural Research, Farmlink, the Australian Livestock Industries Partnership, the Grains Research and Development Corporation and the Department for Agriculture, Water and the Environment. With an extensive range of outputs generated from these programs – including publications in high-ranking journals, contributions to national greenhouse gas inventory accounting, and development of best-practice guidance documents for primary producers – our Soil and Land Use team is uniquely-positioned to undertake and lead the opportunities identified in the proposed works.

### Environmental Engineering group

Griffith University's Environmental Engineering group is one of Australia's most established practicing teams in its field. With a strong emphasis on developing realistic solutions to meet industry-government needs, the group's expertise in nutrient waste management and recycling, as well as materials science, will be invaluable in transitioning the key underlying science identified in the proposed works into practical approaches that are able to be deployed at field-scale.

This announcement has been approved by the Board.

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## About Zeotech

Zeotech Limited (ASX: ZEO) is a team of dedicated people, working together to build a future focused company, leveraging proprietary technology for the low-cost production of advanced materials 'synthetic zeolites' to deliver solutions aimed at addressing sustainability challenges.

## About Zeolites

Synthetic zeolites are manufactured aluminosilicate minerals with a sponge-like structure, made up of tiny pores (frameworks) that make them useful as catalysts or ultrafine filters. They are commonly known as molecular sieves and can be designed to selectively adsorb molecules or ions dependant on their unique construction.

Zeolites play an important role in a cleaner and safer environment.

- zeolites are an effective substitute for harmful phosphates in powder detergent, now banned in many parts of the world because of blue green algae toxicity in waterways;
- as catalysts, zeolites increase process efficiencies = decrease in energy consumption;
- zeolites can act as solid acids and reduce the need for more corrosive liquid acids;
- zeolites adsorbent capabilities see them widely used in water treatment i.e., heavy metal removal including those produced by nuclear fission; and
- as redox catalyst sorbents, zeolites can help remove exhaust gases and CFC's.

## Forward-looking Statements

This release may contain certain forward-looking statements with respect to matters including but not limited to the financial condition, results of operations and business of Zeotech and certainty of the plans and objectives of Zeotech with respect to these items.

These forward-looking statements are not historical facts but rather are based on Zeotech current expectations, estimates and projections about the industry in which Zeotech operates, and its beliefs and assumptions.

Words such as "anticipates," "expects," "intends," "plans," "believes," "seeks," "estimates", "guidance" and similar expressions are intended to identify forward looking statements and should be considered an at-risk statement.

Such statements are subject to certain risks and uncertainties, particularly those risks or uncertainties inherent in the process of developing technology and in the endeavour of building a business around such products and services.

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Zeotech cautions shareholders and prospective shareholders not to place undue reliance on these forward-looking statements, which reflect the view of Zeotech only as of the date of this release. The forward-looking statements made in this announcement relate only to events as of the date on which the statements are made. Zeotech will not undertake any obligation to release publicly any revisions or updates to these forward-looking statements to reflect events, circumstances or unanticipated events occurring after the date of this announcement except as required by law or by any appropriate regulatory authority.