



JAMES COOK
UNIVERSITY
AUSTRALIA



**CYCLONE
TESTING
STATION**

Celebrating 40 years

Cairns
Singapore
Townsville

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Vision

To be the pre-eminent, independent research & testing authority on the performance of buildings and infrastructure in response to cyclones and other wind events in Australia and the surrounding region.

Mission

- To improve the safety of those who experience severe wind events, as well as minimising their loss and suffering.
 - To drive technical leadership in the development of effective design & construction practices that lead to practical, durable and sustainable outcomes.
 - Delivery of quality research & monitoring programs, testing services, technical advice and educational programs to support improved building resilience.
 - To build a public resource of good data on wind, buildings and infrastructure, to help guide building regulations and building practices.
 - To be at the forefront of risk mitigation and building resilience, in response to cyclones & other wind events, recognising their essential role in community safety & recovery, as well as insurance affordability.
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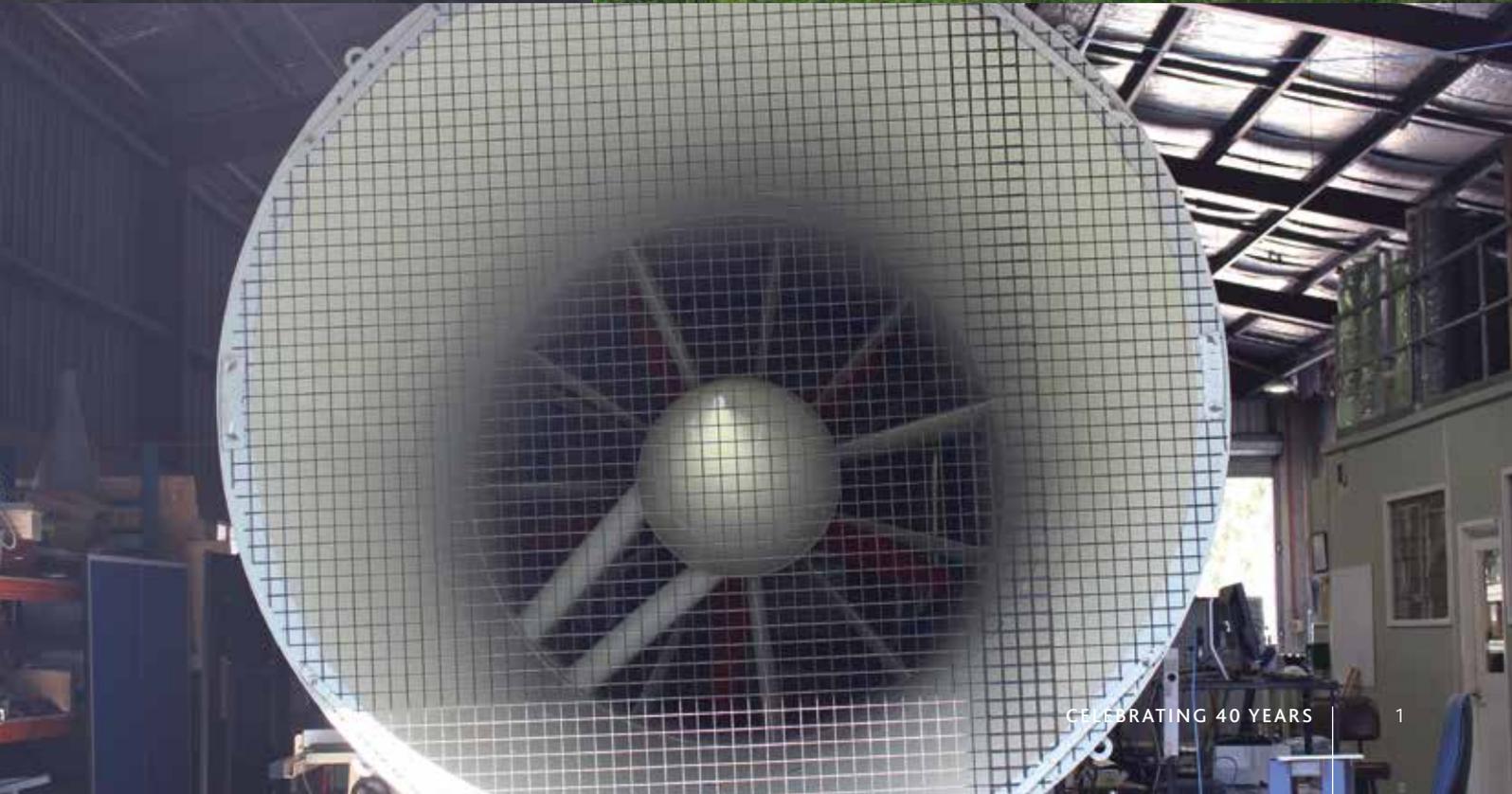
Cyclone Testing Station

James Cook University's Cyclone Testing Station is the pre-eminent independent authority on the performance of buildings and structures in severe wind events.

The CTS carries out research, standardised tests, damage investigations & education that generates the knowledge and data needed to inform government, industry and the wider community on building performance and fosters resilient, sustainable and affordable buildings and infrastructure.

CTS actively collaborates in the development of building regulations, standards and solutions, while developing risk mitigation and building resilience.

The CTS is a NATA (National Association of Testing Authorities, Australia) accredited testing laboratory in the field of mechanical testing and operates in accordance with ISO/IEC 17025.



Dean's Message

In its 40th year of operation, the Cyclone Testing Station continues to improve the safety and resilience of tropical communities to cyclones and extreme wind events – a significant milestone rarely matched in industry.

Since 1977, the Cyclone Testing Station has played a defining role in setting building standards and in ensuring a better understanding of the impact of such events and potential responses to them. With increasing frequency and intensity of tropical cyclones and extreme events, there is renewed impetus for further research, development and testing of materials, products and building codes.

Through its applied research and testing, the Cyclone Testing Station continues to make a powerful contribute to James Cook University's intent of "Creating a brighter future for life in the tropics world-wide through graduates and discoveries that make a difference."

As the Dean of the College of Science and Engineering in James Cook University, it is with greatest respect that I offer congratulations to all those who have played a role in the conception, establishment and operation of the Cyclone Testing Station in this its 40th year. I wish the Station continued success in the future.

Professor Marcus Lane

Dean, College of Science and Engineering



CTS Chairman's message

A New Horizon

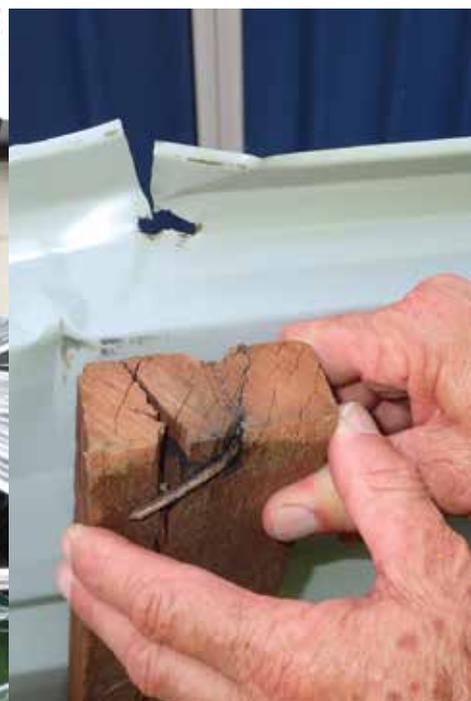
An important milestone in the history of the CTS is reached in 2017 with our 40th anniversary of the founding of the Station. It's incredible to think that in 1977 the station would become a world leader in wind engineering and remain such a crucial link in cyclone research in the new millennium.

Like every organisation we have seen the worst and best of times over the decades. We survived the economic cycles and have endured to become a more mature and responsive team through careful and measured guidance from the Board, our industry partners and stakeholders. Along with our passionate staff, this has been our key to success. The CTS is in a sound financial position.

On behalf of the Board and staff, a huge thankyou to our benefactors, stakeholders and industry colleagues who continue to believe and encourage our research and testing into areas where we once thought not possible. Without your loyal and valuable support we would not have reached such a milestone.

For complete history of the Cyclone Testing Station please visit the webpage and read the article by Prof. George Walker. This can be found here jcu.edu.au/cyclone-testing-station/about-us/history-of-the-station

Mr John Galloway
Chairman, CTS Advisory Board





Areas of research

The Cyclone Testing Station conducts wind engineering research into the performance of houses and other buildings in response to cyclones and other severe wind events. The knowledge gained is used to improve building regulations and standards, to ensure that buildings are safe, economical and sustainable, as well as being disseminated via research papers and building industry forums. This research is directly used by industry in the development of new products and solutions..

Vulnerability of communities and infrastructure to cyclones and storms

The CTS works with industry groups to assess the vulnerability of infrastructure in cyclonic and non-cyclonic parts of Australia. Wind tunnel tests based on scale models and full scale wind load data, combined with observational data collected after cyclone events, are used to produce vulnerability models that estimate damage to a range of house types. The outcomes from this research are being expanded to align with the government regulations on adapting Australia's communities to changing climates.

Post disaster damage investigations

For 40 years, the CTS has been at the forefront of damage investigations after cyclones and other severe wind events. The aim of these investigations has been to understand what building products and systems performed well, as well as identifying areas for improvement in building regulations and standards.

SWIRLnet

The Surface Weather Information Relay and Logging Network (SWIRLnet), is a network of portable anemometer towers that record and store data on wind speed, temperature, relative humidity and pressure and transmit wind speed data every 10 minutes during high wind events. These units and associated weather instrumentation are deployed ahead of a cyclone's predicted landfall to measure the cyclones' max wind speeds in northern Australia.



Working with Industry

Retrofitting strategies to reduce damage and loss for homeowners in cyclonic regions

Cyclones are a common natural disaster affecting the tropical regions of Australia. While the incidence of cyclones cannot be stopped, much can be done to mitigate the impacts on our tropical communities, and infrastructure. Since 1985, building codes in Australia have required that houses in cyclone prone areas are able to withstand higher winds; however insurers, governments and natural disaster management agencies still seek to reduce the risks and limit the compensation from these natural disasters.

Researchers at the James Cook University, Cyclone Testing Station (CTS), in partnership with a prominent Queensland insurer, Suncorp, are conducting innovative research analysing insurers' policy and claims data. This data is being used, in combination with CTS findings on damage investigations and full scale house testing, to highlight mitigation options to reduce the risk of damage from cyclones. Partners Suncorp, along with other insurers, are incorporating these learnings to actively promote mitigation/retrofitting strategies to reduce damage from cyclones as well as to reward homeowner with reductions on their insurance premium for mitigation work undertaken. The benefits are not only for older "precode" housing they can also improve the performance of new construction especially by reducing the damage from wind driven rain water ingress.

Other areas of research

While the CTS primarily work with buildings and infrastructure they also work across other areas and industries which can be effected by serve winds. These include:

- improving the performance of crop protection enclosures to resist wind loads
- assessment of forces on orchards and plantations as well as amelioration methods
- wind and wave impacts on coastal areas
- assessment of wind accelerating and shielding effects from surrounding landscapes
- Best practice guide for timber plantations in cyclonic areas
- Wind induced fatigue of cladding materials
- Full scale testing of houses
- Modelling damage progression

CTS impact on Australian Standards

Since its inception, the Cyclone Testing Station has been a significant contributor to the development and revision of key Australian and New Zealand Standards that relate to wind actions and structural performance to resist wind loads. The CTS has contributed extensively to the development of AS/NZS 1170.2 (chaired at one time by Greg Reardon, previously a CTS Technical Director) and AS 4055 (chaired by Geoff Boughton, a JCU/CTS adjunct).

Research and investigations undertaken by the Station have also contributed valuable data to the development or revision of several product and materials standards. CTS was commissioned to undertake tests to characterise the performance of housing under wind for revisions of AS 1684, and the late Graeme Stark's contributions on BD-014 saw significant improvements to AS/NZS 4505 (garage doors) and AS 1562.1. At present, AS 1562.1 and two parts of AS 4040 are open for public comment following revisions under the committee's current Chairman, David Henderson (CTS Director).

Findings from CTS investigations have also influenced other Australian Standards such as AS 2050 on roof tiles and AS 2047 on windows. The CTS has also participated in the development of industry standards such as the low-high-low test regime for metal cladding products and a draft industry standard for testing of the performance of products to resist wind-borne debris.

The CTS recognises that relevant and appropriate Standards are essential to improve the resilience of buildings to wind events in all parts of Australia; and we continue to conduct research and provide input to Standards committees to support this important work.

Engagement for Mitigation

Damage investigation and research by the CTS over the last 40 years all highlight the need for mitigation measures to reduce losses from severe wind events. The Station has prided itself on actively promoting mitigation such as correct materials, retrofitting and maintenance through reports, updated standards, medial interviews, online tutorials, seminars and experimental demonstrations emphasising engineering solutions to prevent failures. While these solutions are critical to strengthening our communities, our damage investigations have continued to demonstrate a lack of wide spread implementation. To address this, the CTS is shifting to a more cross-disciplined approach that considers holistic and behavioural factors that drive individuals to take mitigation action. Research has suggested three of the key factors include prior event experience, mitigation capacity (e.g. Is it easy to implement – minimal hassle) and social connectedness (e.g., what are the neighbours doing?). To explore these factors and how they may be leveraged to better prepare our communities, the CTS has partnered with HABITT (Health and Behaviour Change in the Tropics), a research group within the Department of Psychology at JCU. As part of project funded by Suncorp and the Queensland Government, the CTS will work with HABITT over the next two years to identify effective methods of risk and mitigation communication based on sound research from both the engineering and behavioural science disciplines.



Advisory Board

CHAIR	DEPUTY CHAIR
Neville Keating 2001–2008	Doug Meecham 2001–2008
Doug Meecham 2008–2011	John Galloway 2010–2011
John Galloway 2011–	Greg DuChateau 2012–2016
	Lindsay Walker 2016–

Current Members

NAME	ASSOCIATION
John Galloway	Chair
Lindsay Walker	Deputy Chair – Director Strategic Policy (Plumbing Drainage Committees and Special Projects), Building Codes Queensland Building Industry and Policy, Department of Housing and Public Works
David Henderson	Director , CTS JCU
Adrian Gabrielli	Director, Gabrielli Construction
Elizabeth McIntyre	Group CEO, Roofing Tile Association Australia
Gary Stick	Manager, Technical Standards Unit, Queensland Building and Construction Commission
George Walker	Adjunct Professor, JCU
John Ginger	Research Director, CTS JCU
John Kralic	Manager, Lysaght Technology Bluescope Lysaght
Julian Benton	Executive Manager, Underwriting & Portfolio Management, PI Customer, product & pricing Suncorp
Karen Messer	Director, Northern Consulting Engineers
Marcus Lane	Dean, College of Science and Engineering JCU
Mark Leplastrier	Senior Manager, Natural Perils IAG
Michael Barkausen	Director, Head of catastrophe analytics Aus & NZ, Willis Reinsurance Australia Limited
Roger MacCallum	Director, MacCallum Planning & Architecture
Ron deVeer	Director, Australian Building Codes Board
Subo Gowripalan	National R & D Manager, Stramit Building Products
Wayne Preedy	Team Manager Emergency Management, Townsville City Council

Past members from last 10 years (not already mentioned)

John Patterson, Graham Stark, Greg O'Brien, Trevor Leverington, Mike Balch, Lindsay Groat, Karl Jones, Cam Leitch, Fabio Finocchiaro, Julie Brice, Allen Morris, Paul Dirks, Frank Turvey, Gavin Hammond.

CTS Staff



Left to right back row: Andrea VanDerWal, John Ginger, Simon Ingham, Don Braddick, David Henderson, Daniel Smith, Alexis Leblais
Left to right front row: Dennis Smith, Geeth Bodhinayake, Korah Parackal, Mitchell Humphreys

Dr David Henderson – Director

David is Director of the Cyclone Testing Station at James Cook University. David has been with the CTS for 25 years and in this time has broken everything from roofing screws to complete houses. He has substantial knowledge on wind induced fatigue failures of building elements and has been intimately involved in the Cyclone Testing Station's full scale house testing program. He has conducted cyclone damage surveys and thunderstorm damage surveys in Australia and in North America. Previous roles included a secondment as a Postdoctoral Researcher at the University of Western Ontario, Canada, where David was collaborating on the 3LP full scale house testing research project in the simulation of realistic wind loads impacting full scale timber framed housing. He is a board member of the Australasian Wind Engineering Society. David is the Chair of the Australian Standards Committee for the design installation and testing of metal cladding as well as a committee member on the Wind Loads on Housing standard.

Prof John Ginger – CTS Research Director

John joined the Cyclone Testing Station as a Research Fellow in December 1996, and was involved with carrying out research and testing in the Boundary Layer Wind Tunnel. John is now a Senior Lecturer in the School of Engineering and Physical Sciences at James Cook University and also the Research Director of the CTS. He has extensive experience in the area of Wind Engineering, resulting from his involvement in a number projects relating to wind loading and environmental wind effects during the past 15 years.

After completing his Masters and PhD, on Wind Engineering based research projects, John joined the Wind Engineering Research Center at Texas Tech in the USA. At Texas Tech he was involved with the operation of the Field Laboratory where research projects on wind loading, gas dispersion, dust transport and atmospheric stability were being carried out at full scale. John joined Vipac Consulting Engineers on his return to Australia, where he was mainly involved with commercial wind tunnel testing projects for major developments in Australia and SE Asia. Wind tunnel projects to date include building facade wind loads, correlation studies, ground level wind climate, natural ventilation of indoor spaces, and dispersion of industrial stack emissions. John has also developed software packages for determining the velocity field, wind resource at a site, and building ventilation.

Mr Simon Ingham – Senior Engineer

Simon joined the CTS in 2013 as an Engineer. He graduated as a Mechatronic Engineer with a Honours Degree in Mechatronic Engineering from the University of Adelaide in 2005. Working in multiple industries based around building materials, Simon is experienced in all aspects of project management and quality assurance.

At CTS, Simon is mainly involved in providing testing services to the clients. He is responsible for coordinating with clients to finalise test programme, supervise testing and prepare test reports. He is also involved in Community Education and Awareness Programs undertaken by CTS. In addition, Simon has upgraded the CTS testing equipment and developed new testing equipment based around process control and automation to expand on the CTS capabilities.

Mr Don Braddick – Senior Engineering Technician

Don joined the Station in 1995. A Fitter and Turner with over 30 years experience, he has been involved in the full scale house testing projects and fabricates and maintains the specialised CTS loading and test equipment. Don installed the Air Box Facility and installs and monitors the building product tests. He also constructs intricate building and terrain models for the Wind Tunnel testing. Don returned to the Station in 2010 after 18 months working at the University of W.A.

Mr Dennis Smith – Engineering Technician

Dennis joined the CTS team in September 2010. Dennis has over 30 years practical experience in the building industry the majority as a plumber in Victoria and since moving to Queensland in 2003 has expanded his skill base to include building and some carpentry. Dennis' role in the team makes good use of his practical trade expertise and critical thinking skills.

Dr Daniel Smith – Research Fellow

Daniel is a post-doc research fellow with the Cyclone Testing Station. His research experience covers a wide range of wind engineering disciplines including: insurance claims analysis for severe wind events, field-deployed anemometry for cyclones, vulnerability and fragility modelling, wind-borne debris trajectory modelling, post-event damage assessment, wind resistance of roofing systems, structural retrofitting for wind and water ingress, wind tunnel testing, behavioural aspects of community cyclone preparedness, etc. Daniel is also the director of ResilientResidence™, a mobile application tool that allows homeowners to self-assess the vulnerability of their home to

wind and wind-driven rain damages. The tool aims to put wind engineering research directly into the hands of homeowners in vulnerable regions.

Korah Parackal – PhD Student

Korah completed his Civil Engineering degree from the University of Queensland in 2012. He then started with the Cyclone Testing Station as a Research Assistant in 2013 while completing a graduate diploma in Business Administration at JCU. Korah then worked in Singapore in 2014 as a Structural Engineer, and returned to JCU to commence his PhD studies in 2015. His PhD research with the Cyclone Testing Station aims to better understand progressive failures in light framed structures due to wind load.

Mitchell Humphreys – PhD Student

Mitchell completed his Civil Engineering degree at JCU in Townsville in 2014 where he completed his Undergraduate thesis on the wind loads in a two-storey contemporary house at the CTS. Mitchell then worked at the CTS the following year as a research assistant and began his PhD in March of 2016, his research aims to better define internal pressures that are generated inside large industrial buildings during wind storms.

Geeth Bodhinayake – PhD Student

Geeth completed his BSc(Hons) degree in the field of Mechanical Engineering in 2006 from University of Moratuwa, Sri Lanka. He then worked as a site engineer to building services consulting company in Dbai, UAE for two years. In 2009, he started a second chapter of life with Ceylon Electricity Board, Sri Lanka as a mechanical engineer for seven years. While he was working, completed his Msc in Industrial Automation in 2014 from University of Moratuwa, Sri Lanka. In August 2016, Geeth joined the CTS as a PhD student. His PhD is on " Wind Induced Internal Pressure Fluctuations In Industrial type Steel Buildings".

Navaratnam Satheeskumar – CTS Post Doc

Sathees completed his PhD at JCU in 2016 on the wind load sharing and vertical load transfer from roof to wall in a timber-framed house. The project involved the full scale load testing on a representative section of a house, accompanied with the development of a numerical model to assess the capacity of the elements of the house. His current work at CTS is extending his research to incorporate numerical modelling of older house construction and incorporating retrofitting strengthening details.

Technical Reports & Articles

The Cyclone Testing Station has published many reports on various aspects on the performance of buildings in response to severe wind events. The reports range from damage investigations following cyclones, tornadoes and thunderstorms, as well as evaluations of wind load resistance of buildings by using the CTS full scale load testing facility.

CTS has now released 63 Technical Reports. These are all listed and available on our website please visit jcu.edu.au/cyclone-testing-station/publications/technical-reports3

For a list of current articles and research, papers by the CTS please visit jcu.edu.au/cyclone-testing-station/publications/conference-and-journal-articles

The CTS website provides a number of resources, including short videos that cover topics aimed at targeted improvements to housing performance, so that we are all safer in future cyclones and storms. This can be found jcu.edu.au/cyclone-testing-station/videos-And-resources



Testimonials



"Suncorp has greatly valued our partnership with the CTS over the last three years. Without the hard work and dedication from David Henderson and his team, Suncorp would not have been able to realise and implement our flagship mitigation program Protecting the North. The Program helps 1000s of home owners living in cyclone prone regions strengthen their homes and reduce the cost of their insurance."

Anthony Day
Suncorp Insurance CEO



"Over its 40 years of existence, the CTS has been instrumental in the development of cost-effective wind design standards and material standards for buildings both for Australia and internationally. The CTS work into full scale house testing and investigations of tropical cyclone and high wind damage have prompted many improvements to standards and materials that have made Australian buildings safer for the community."

Mr Neil Savery
General Manager, Australian Building Codes Board



"The Cyclone Testing Station has played a major role in the past 30 years by reporting on significant weather events and the impact on building techniques and requirements. The reports will continue to assist future builders build even safer homes and infrastructure for our communities."

Paul Bidwell
Deputy CEO of Master Builders Queensland



"The James Cook University Cyclone Testing Station (CTS) has been a consistent presence in the state's disasters for many years. The invaluable information gathered by the team at the CTS is actively used to both brief emergency services after a cyclonic event as to the causes of building failures so we can better prepare the community in our engagement activities, and to assist in the development and enhancement of building codes and building products to ensure new dwellings and constructions are resilient to the adverse effects of tropical cyclones."

Wayne Hepple
A/Assistant Commissioner – Emergency Management and Community Capability
Queensland Fire and Emergency Services



"The Cyclone Testing Station (CTS) is a key partner of ours in the building and construction sector. The work of CTS has contributed to the evolution of codes and standards over many years. Having an independent research centre focused on how buildings perform in high wind events helps us deliver fit for purpose standards for the Australian community. As our climate continues to change the work of CTS has never been more important."

Dr Bronwyn Evans
Standards Australia CEO



"Stramit is proud to have been associated with the Cyclone Testing Station for almost 30 years. The Station has provided leadership and direction to the steel building products industry to meet the needs of today's built environment."

Subo Gowripalan
National R&D Manager, Stramit

Benefactors and Sponsors



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Contacts

Please contact us if you wish to further discuss the services we can offer.

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