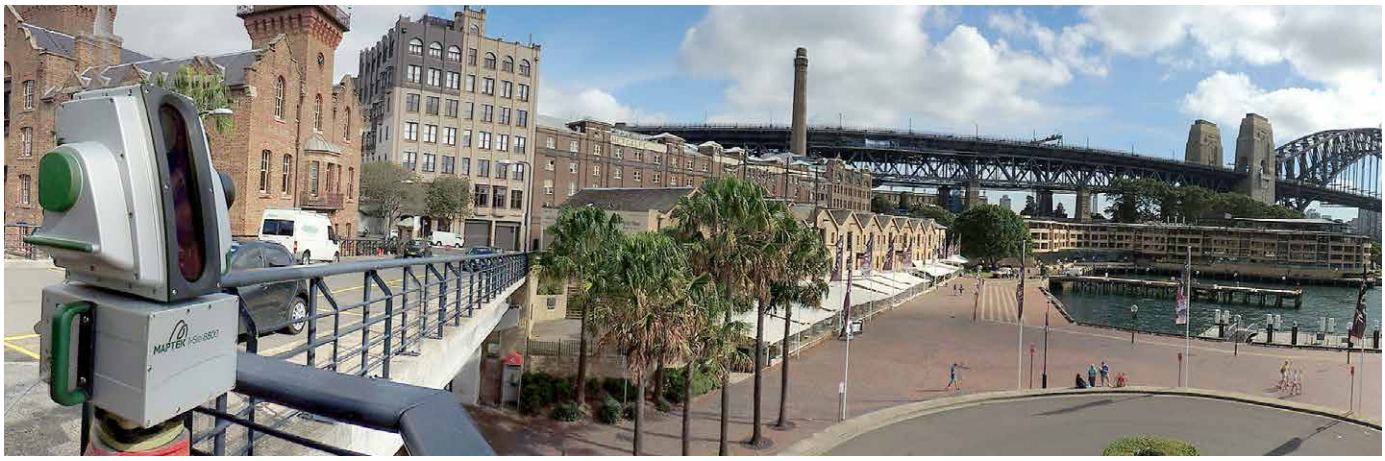
Scanning the Sydney Opera House

Maptek™ I-Site™ high performance laser scanning technology proved its value during a recent project by the Scottish Ten to record the Sydney Opera House in 3D.



The Maptek™ I-Site™ 8810 and I-Site 8800 ultra long-range scanners captured the Opera House from all sides, including critical surroundings such as the plinth that the Opera House sits on and the main structure itself. The dramatic setting of the Opera House is complemented by the Sydney Harbour Bridge and Circular Quay which are all iconic images of Sydney, and Australia.

The Scottish Ten is a project which brings together Historic Scotland, Scotland's Government heritage organisation, 3D scanning experts from the Digital Design Studio at Glasgow School of Art, and California-based digital heritage organisation CyArk. The Scottish Ten team worked closely with the Sydney Opera House Trust to facilitate the 3D scanning project.

The Sydney Opera House is one of the world heritage sites being scanned for the Scottish Ten project. The ultimate goal is to cover five sites in Scotland and five in other parts of the world. Laser scan data will be used to create 3D models to preserve the sites for posterity.

Maptek technical services laser scanning experts, Chris Little and Kono Rodriguez were supported by staff from Adelaide and Sydney offices. Maptek was approached because our 3D technology, designed primarily for mining, is able to quickly cover large geographical areas.

Scanning from vantage points on the harbour such as Fort Denison, Mrs Macquarie's Chair, the Sydney Harbour Bridge and Circular Quay ensured capture of the best possible detail of the Opera House from all angles.

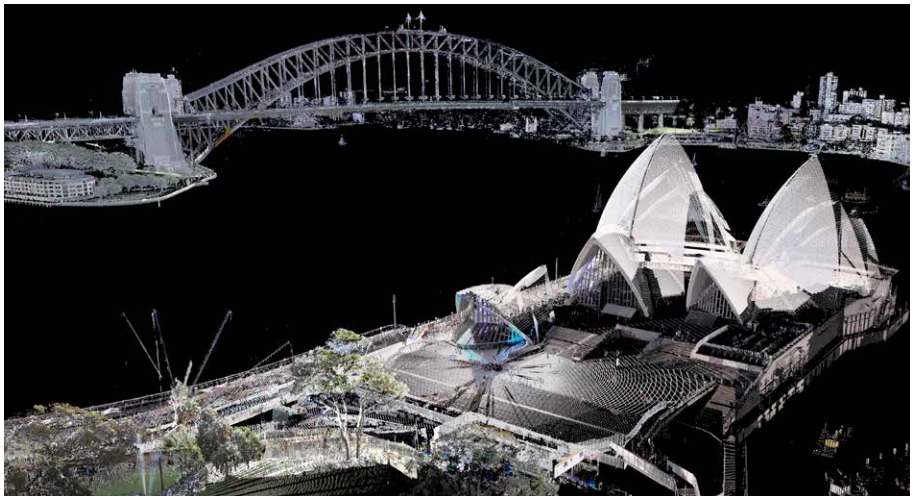
'I want to express my thanks to Maptek. Chris, Kono and the team covered a huge amount of ground in their time on site with us. The data looks fantastic. Their enthusiasm and support for the project has been phenomenal. It has been our pleasure and privilege to work with them,' said Dr Lyn Wilson, Scottish Ten and CDDV Project Manager.

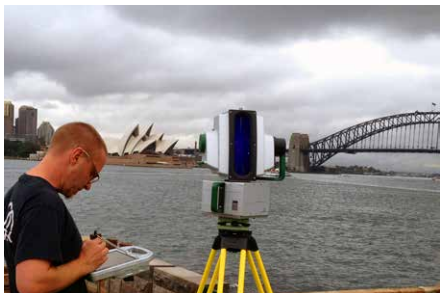
The Scottish Ten is a five-year project aiming to produce high quality models of Scotland's five United Nations Educational, Scientific and Cultural Organisation (UNESCO) designated World Heritage Sites, plus another five international heritage sites.

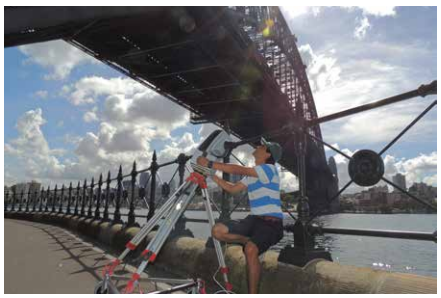
The project, a partnership between Historic Scotland and the Digital Design Studio at Glasgow School of Art, resulted in the creation of the Centre for Digital Documentation and Visualisation LLP (CDDV) in 2010.

The goal is to preserve the historical sites as 3D models which can be used for education, management and research by future generations.

Maptek technology has also been used to capture the landscape and ruins on the remote island of St Kilda, about 100 miles off the west coast of Scotland. This is one of only 28 World Heritage Sites around the globe with dual recognition for natural and cultural characteristics.







The I-Site laser scanner was mounted on a vehicle to drive through the Royal Botanical Gardens to scan the southern and eastern aspects of the Opera House and Harbour Bridge.

'We also had complete access to the 13th floor of No.1 Macquarie Street, known as 'The Toaster', for some unique scanning perspectives,' said Rodriguez.

The ability to set up so quickly, obtain the scans and move between strategic locations meant Maptek could 'fill in the pieces of the puzzle' that the Scottish Ten scanning pass did not capture.

The Scottish Ten team has used aerial scanning to collect data of the setting for other sites. Using I-Site terrestrial laser scanners for this project allowed them to collect the same type of data for the exterior and interior of the Opera House.

More importantly it meant accurate portrayal of vertical structures and the complex engineering of the underside of the Sydney Harbour Bridge, not possible with aerial methods. The intricate shapes of the structures required many scanning angles and setups to ensure the surrounds were recorded in detail.

The long range scanning ability of the I-Site 8800 and I-Site 8810 was ideal for this project, which was not without its challenges. Complicated access to built and natural environs, including an island in the middle of the Harbour, and tight deadlines meant efficiency was crucial. In all, 144 scans of different resolutions were captured over 3 days, with more than 100 different setups.

> Simultaneous capture of high resolution colour imagery with I-Site systems allows for spectacular animations and realistic models which reflect the unique beauty of the Opera House in its setting.

Maptek provided two scanning teams to record data as quickly as possible. Logistics support from the Opera House coordinators helped schedule efficient access to all the locations.

'Excellent coordination between Scottish Ten and the Sydney Opera House resulted in unique access to the whole complex, including the Green Room, as well as Government House and other locations,' said Rodriguez. 'This provided optimum scanning vantage points.'

Maptek™ I-Site™ Studio software easily handled the challenge of registering the scans in local coordinates. The Maptek team conducted five base scans from key positions around the Opera House to establish survey control. This streamlined the setup and capture of remaining scans without having to coordinate each one.

Dynamic transformation and registration tools adjusted the new scans to the reference scans, bringing the data into its correct spatial location for modelling.

Thanks to
Scottish Ten and the Sydney Opera House
Find out more at www.scottishten.org