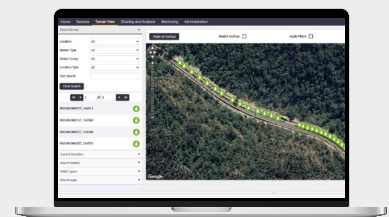


# Engineering success: Achieving stability in a complex reconstruction project



# About the project & implementation

Construction  
Geotechnical  
UPG & Leigh Surveyors  
Cunninghams Gap, Australia



**54**

Tiltmeters

**1**

4G Rugged Gateway

**1**

T4D software  
integration

## Context

Cunninghams Gap is a critical pass through the Great Dividing Range in Queensland, Australia serving as a primary corridor for the Cunningham Highway. This route is essential for transporting freight and passengers between the Darling Downs and the Port of Brisbane.

In late 2019, the “Black Summer” bushfires caused extensive damage to the 2-kilometre stretch of highway at the Gap, destabilizing slopes and increasing the risk of rockfalls. The [Cunninghams Gap Reconstruction Project](#), a joint initiative between the Australian and Queensland Governments and led by McIlwain Civil, was launched to restore the highway’s safety and functionality. The work involves complex geotechnical improvements, including the construction of seven new downslope retaining walls and extensive rockfall protection systems within the sensitive Gondwana Rainforests World Heritage Area, a designation that adds significant environmental constraints to all construction activity.



## Solution

The project, located near Tarome, presented a significant logistical hurdle for Leigh Surveyors, the company in charge of the project’s monitoring, supported by Worldsensing’s partner UPG. The project required 3D (X, Y, and Z) positional monitoring of newly built retaining walls to measure settlement and rotation.

However, the site conditions were extreme. Surveyors had no physical access to the downhill side of the walls, which sat perched above a steep drop directly opposite a high-volume highway. To meet strict design requirements, the team needed to monitor the wall’s “toe”, the base of the structure, yet this critical point was both physically unreachable and invisible to traditional line-of-sight surveying methods.

**“With the tilt reading from the sensor, we can now calculate displacement of the toe of the wall, a position on the wall that was not accessible.”**

Rupert Leigh  
Director, Leigh Surveyors



To overcome the lack of access, Leigh Surveyors implemented a sophisticated hybrid monitoring solution combining traditional optical measurements with Worldsensing's wireless IoT technology.

The team installed:

**54 Tiltmeters** and prisms mounted at the top of the wall, enabling real-time, high-precision 3D rotation measurements beyond what optical instruments alone can capture.

**One 4G Rugged Gateway** ensures reliable data transmission from the rugged terrain of the Gap.

**Multiple** vertical omni-directional antennas enhancing signal strength to maintain connectivity across the mountainous site.

**A T4D software integration:** Data from the Tiltmeters was combined with Total Station measurements to mathematically calculate the displacement of the wall's inaccessible toe.

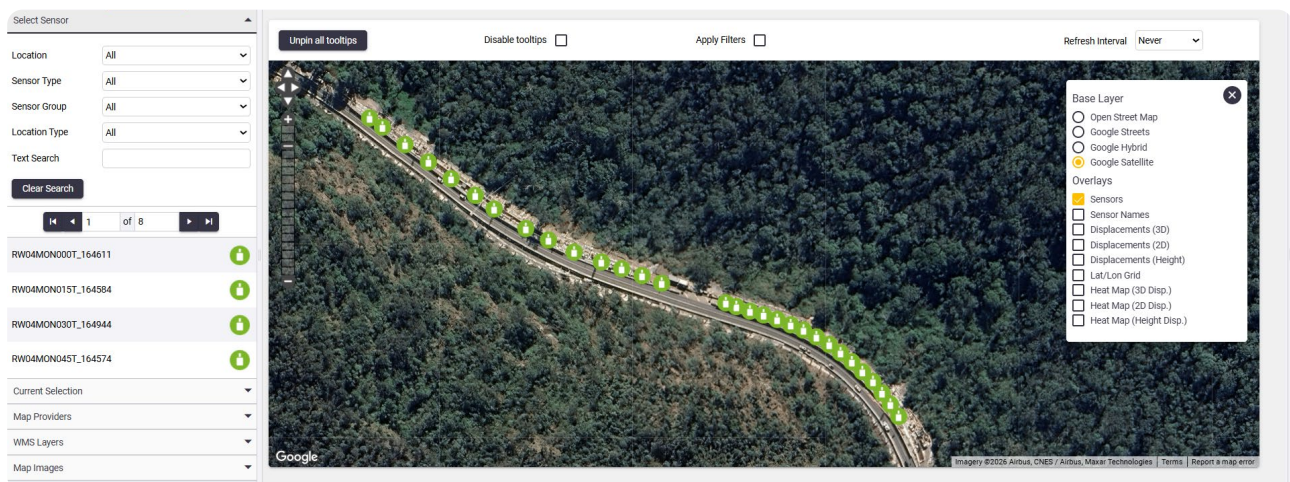
By combining the tilt readings with Total Station data via T4D software, they successfully calculated the displacement of the inaccessible toe of the wall. This ensured that every part of the structure was monitored to the required precision without ever putting personnel at risk near the busy highway or on the steep downhill slopes.

## Advantages

- **Enhanced safety:** Eliminated the need for surveyors to enter high-risk downhill areas
- **Precision and reliability:** Delivered effective and accurate readings that met the strict design monitoring requirements of the project
- **Streamlined reporting:** The client was able to present rationalised data to Transport and Main Roads (TMR), Queensland, infrastructure satisfying TMR's requirements and demonstrating the long-term structural stability of this vital corridor.

## Benefits

The deployment allowed Leigh Surveyors to bypass the physical constraints of the highway and the dangerous terrain. By receiving remote readings at specified intervals (epochs), the team could effectively filter out environmental noise and generate a comprehensive 3D profile of the wall's movement.



# Leading connectivity for remote monitoring

At Worldsensing we deliver secure, reliable, and cost-effective connectivity for critical monitoring applications—streaming data from sensor to dashboard with minimal latency and maximum uptime.

Designed for real-world monitoring

## ✓ **Versatile applications**

Supports geotechnical, structural, geospatial, and environmental monitoring.

## ✓ **Broad sensor compatibility**

Integrates seamlessly with analog and digital sensors, including in-ground, environmental and structural monitoring devices.

## ✓ **Multi-RAN architecture**

Operates on LoRa, cellular, or hybrid networks to adapt to site conditions.

## ✓ **Remote-ready**

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## ✓ **Open ecosystem**

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