

# Linton Bridge – Monitoring Distressed Structure

CLIENT: BAM NUTTALL / MOTT MACDONALD / LEEDS CITY COUNCIL

## How wireless condition monitoring helped safeguard historic masonry bridge hit by damaging storms

### Challenge

In 2015, Storm Eva hit the north of England. Heavy rain and winds measuring up to 84mph caused power cuts and major flooding. Soon afterwards, cracks appeared on the carriageway of the historic Grade II listed Linton Bridge and there was visible damage to the parapets. Bridge deck settlement was also apparent.

#### KEY POINTS

- **Storm-damaged historic bridge showed signs of settlement and cracking.**
- **high-precision monitoring solution installed in just three hours.**
- **provided assurance to repair teams that the structure was safe to work on and quantified ongoing long-term movement.**

BMM JV (a BAM Nuttall and Mott MacDonald joint venture) was contracted to investigate the flood damage, protect the structure from further damage and design repairs in partnership with Leeds City Council. Due to safety issues and cost, it proved difficult to find a way to continuously and effectively monitor the movement of the bridge manually.

### Solution

Mott MacDonald brought Senceive on board to provide a wireless solution to monitor settlement of the bridge remotely to sub 1mm resolution. The stable and robust monitoring system was easily installed by the BAM team within just three hours. A series of ten high-precision triaxial sensors fixed to tilt beams were mounted on each parapet wall.

The FlatMesh™ wireless sensors communicated data to a solar powered cellular gateway, allowing the monitoring to be completely wire and mains power free. Data was immediately available on the FlatMesh™ WebMonitor visualisation software. This helped the city council assess the ongoing stability of the bridge without putting anyone at unnecessary risk.



### Outcome

Both parapets showed approximately four millimeters of movement over the following four months. A temporary piling platform was then built on both sides of the bridge; steel tubular piles were installed into the river bed and filled with concrete.



As part of the stabilisation works, cracks in the arches were stitched and grout was injected into the ground beneath the south pier. This made the bridge safe to work on and sufficiently robust to carry the construction equipment. The wireless monitoring continued for a further period of approximately 10 months to assess whether there was any further settlement. The system was finally removed one year after Storm Eva.