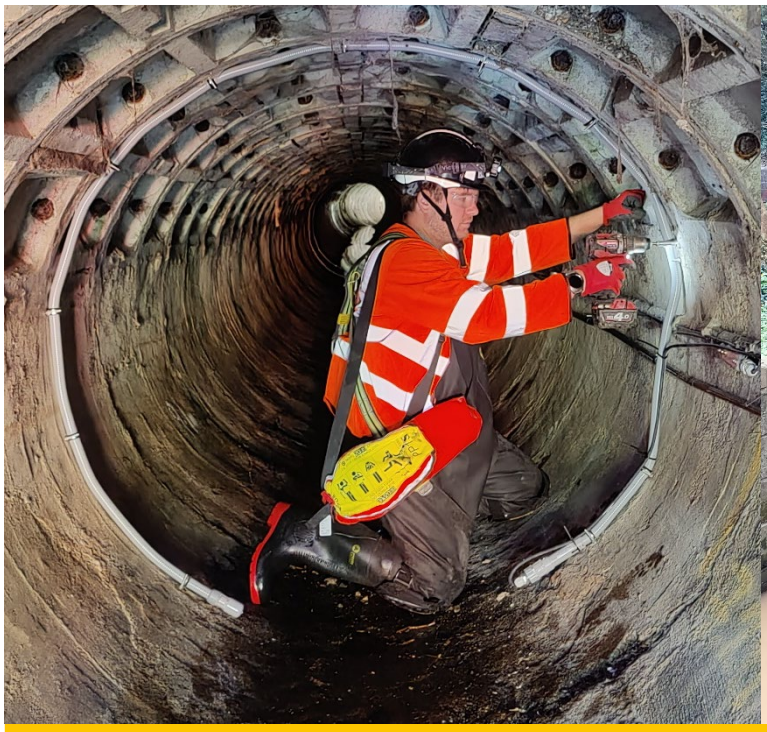
# CULVERT CONVERGENCE MONITORING

## STRUCTURAL MONITORING



## Key achievements

- **Complex install safely undertaken within a challenging environment**
- **Automated monitoring system to provide uninterrupted, 24-Hour data**

## The Project

A major rail infrastructure project is tunnelling under London Underground and Network Rail lines in West London. The new tunnels will be constructed below key assets including two rail bridges and the culverts running underneath.

## The Challenge

The monitoring scheme must determine the existing structures daily trends before, during, and after the Tunnel Boring Machine passes below the area.
A long period of baseline data would be needed to adequately understand any movement in the assets
These sensitive structures are old and susceptible to damage from settlement of deformation. The culverts and areas below the bridges and rarely accessed and heavily vegetated. The culverts are still in use so had varying amounts of water throughout. They are also considered a confined space so appropriate precautions must be taken when undertaking any works.

## The Solution

Teams installed a monitoring scheme consisting of 8 circumferential ShapeArrays, 3 longitudinal ShapeArrays up to 47m in length and 6 Tilt Beams. Depending on where they were installed, the circumferential ShapeArrays ranged in length from 2.75 to 5.75 metres.
The ShapeArrays were installed within the culverts and the Tilt Beams were fixed along bridge headwall of the bridge.
Digital loggers were installed outside the entrance to the culverts to collect and transmit data 24 hours a day. The associated wireless nodes were connected to an existing network from a nearby site. These node were ideally suited to this application as they have long range and low power requirements

Access to the culverts required wearing waders and the support of a confined space team. The subcontractor was responsible for the safe access and entrance to the culverts, a specialist or experienced 5-man confined space team provided gas monitors, safety harnesses, start of shift safety briefings and an emergency rescue plan.

**Application**
Structural Monitoring

**Technique**
Automated Instrumentation

**Market**
Infrastructure

**Project Duration**
Ongoing

**Instrumentation**
ShapeArray (SAA)

Tilt Beams

**Keller companies**
GEO-Instruments