1. Introduction

The roads, the buried utilities, and the ground are interdependent. What is buried in, and on, the ground is to some degree controlled by the ground. Therefore, for an improved and comprehensive asset management, the interdependencies should be thoroughly assessed. As part of the ATU project the effects of trenching on the ground and road as an integrated system is studied in a field trial. Preliminary results show how material and construction practices (e.g. compaction) are critical for achieving durable road infrastructure.

2. Field trenching test site

An existing road on the University of Birmingham campus was excavated at two sections and instrumented to monitor water infiltration, temperature, ground movement and micro-strain caused by traffic loading and the environment (Figure 1a). The site has been subjected to heavy traffic loading from vehicles used for the demolition of a nearby building (Figure 1b and c). The two trenches were reinstated using contrasting characteristics but both complying to the current construction standards:

- **Trench 1** using sub-optimal materials and layer thickness, and poorly compacted.
- **Trench 2** following best current practice with high quality materials, a thicker surface layer and well compacted.

3. The impact of trenching on the road structure as a function of the reinstatement methods

- PANDA Cone Penetrometer tests (CPT) and FWD tests are used to assess road conditions with minimal disturbance.
- Figure 2 clearly shows the impact of the construction and reinstatement method on the two trenches investigated in this study. The poorly constructed trench 1 exhibited significantly lower cone resistance and higher deflection indicating suboptimal characteristics.

4. The impact of weather and traffic loading on the road structure as a function of the reinstatement methods

- The poorly constructed trench 1 exhibited significant infiltration corresponding to rainfall events (Figure 3a) and substantial settlement a few months after being exposed to traffic loading (Figure 3b).
- Traffic predominately consisted of 2-axle vehicles during the investigated period shown in Figure 3c.

5. Conclusions

- An holistic approach is required for dealing with roads, buried utilities and also the ground, that ultimately links everything together. These are all interconnected and changes in the condition of one of these will affect the performance of the others.
- Preliminary results from a field trial demonstrate the importance of appropriate trenching practice in order to maintain road-ground performance. The trial also highlighted the need for an appropriate trenching QA practice to achieve required standards.