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**ASSESSING
THE
UNDERWORLD
– A THREE-
INFRASTRUCTURE
APPROACH TO
REMOTE
SENSING**

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**ASSESSING THE UNDERWORLD – A THREE-INFRASTRUCTURE
APPROACH TO REMOTE SENSING**

Chris Rogers¹, David Chapman¹ and Nicole Metje¹

¹ Department of Civil Engineering, University of Birmingham, Birmingham, UK

ABSTRACT: Many of the major challenges to a flourishing and pervasive trenchless industry are acutely associated with the complex urban context in which the works are carried out. The first, and most often quoted, challenge, is knowing where the current buried infrastructure is situated, and consequently ‘seeing below the ground’ to detect, locate and map existing pipes and cables is the subject of much research (including the UK’s Mapping The Underworld). Knowing where and what the buried infrastructure is enables both detailed planning and, crucially, de-risking of trenchless projects. However, such knowledge provides streetworks engineers with only part of what they need: this paper takes a broader, systems view of the streetworks context to enable engineering works to be properly conceived, designed and carried out to provide the best long-term outcomes *in the circumstances*. The enabling step is to consider streetworks as engineering interventions in three strongly-interdependent infrastructures – road infrastructure, buried infrastructure and the geotechnical infrastructure that supports them both – all having different structural performance criteria and deterioration models, and all in potentially different current states of structural competence. Disturb any one infrastructure and the other two will be affected in some way; disturb all three and the whole system dynamic is changed. The paper therefore argues that the brief for surveying in advance of trenchless works should be broadened to cover the constitution and the condition of all three infrastructures, from which the engineering consequences of trenching (which almost always adversely affects the condition of adjacent buried pipes and cables, hence all three infrastructures) and trenchless operations (with usually fewer adverse consequences to this system) can be far more accurately determined. The paper describe the outcomes of Assessing The Underworld – a 4-year research programme exploring how surveying approaches and technologies can meet this challenge.