The ESWRAC Initiative

Dr. Mike Farrimond
Director
UK Water Industry Research Limited
London, United Kingdom

Abstract

Every year, on average, utilities dig four million holes in the UK's highways and footpaths to install new services or repair and maintain existing ones (AA, 1997). These activities inevitably contribute to a reduction in road space, restricting traffic flow, and leading to congestion. And in the UK, the market research organisation, MORI, has revealed that 'Road maintenance is one of the worst regarded services in Britain'. The costs of utility work in UK streets is in excess of €1.5Bn per annum, with consequent indirect costs in excess of €3Bn per annum.

Every time a hole is dug, there is the risk of hitting and damaging other utilities' buried plant and equipment. A significant number of holes are 'dry' i.e. the equipment is not found. Despite the disruption, our cities could not function without utilities: gas, electricity, water, drainage, sewerage, telecommunications, cable TV, street lighting, traffic control; but these services are usually buried, unseen, and ignored by the general public, until they need to be repaired or replaced.

The recent EU Commission report "Towards a Thematic strategy for the Urban Environment" pays little attention to the need for utilities to work in the street and so a group of likeminded utilities, cities and transport organizations responded to the Commission and also established the European Street Works Research Advisory Council – ESWRAC, to promote the need for more research in this difficult technological environment (www.eswrac.org)

Keywords: streetworks, ESWRAC, traffic congestion, utilities, buried assets

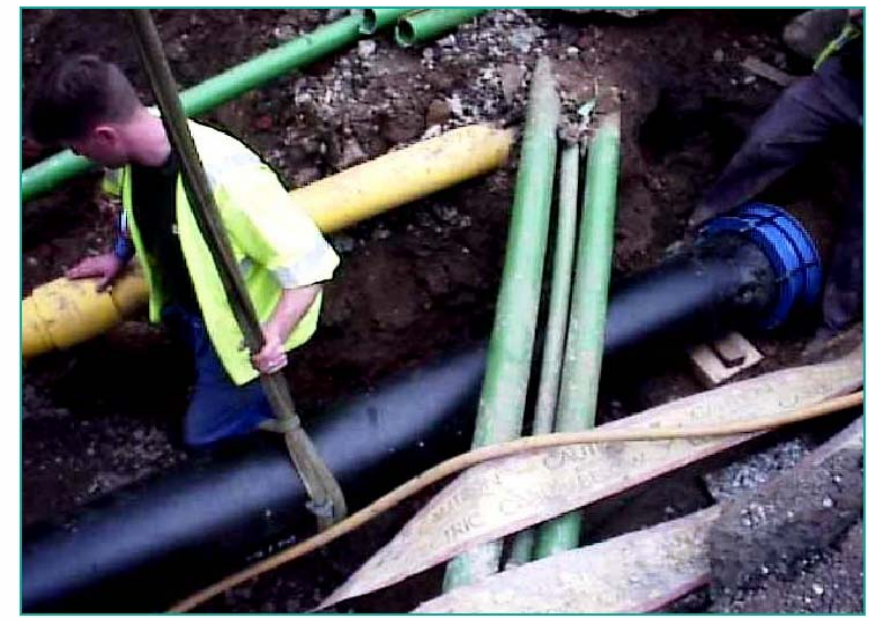

Fig. 1: A typical assortment of buried infrastructure in urban areas

1. Introduction

Traditionally, work on buried plant and equipment involves digging a trench, doing the work, and reinstating the filled hole. In recent years, far more use has been and is being made of trenchless technology, which reduces the number and extent of excavations, thus helping reduce, in particular, the level of indirect costs.

Fig. 2: … and trenchless doesn't always mean less holes!

Whichever method is used – trench or trenchless – there is an absolute need to understand the nature of the underground environment about to be disturbed when planning new installations and when excavating to maintain existing infrastructure. What pipes and cables are there? Where are they? How deep are they? … and so on. Historically, location of underground plant and equipment has been based on record information held by utility companies on two-dimensional media, supported by on-site trial hole investigations. This information, even if it exists (and much of it does not) is often inaccurate, incomplete or out of date.

Various non-destructive detection techniques exist for locating underground equipment from above ground. Over the years, advances have been made, and are still being made, but without further research and development, the technologies will remain of limited use as a consequence of their unreliability and slow speed.

Research by UKWIR in 2000 and 2001 has concluded that at best existing technologies had no better than a 50% success rate in identifying buried assets. The report concluded '***These trials show the need for substantial improvements in equipment performance***'

Figure 3 shows the variety of materials used in the UK gas distribution network where ferrous pipelines are to be largely replaced with polyethylene. These large replacement programmes with plastic pipes and ducts are increasing plant detection problems as plastic pipes are more difficult to locate than ferrous materials. This is exacerbated by the non-compatibility of different GIS systems used by utilities.

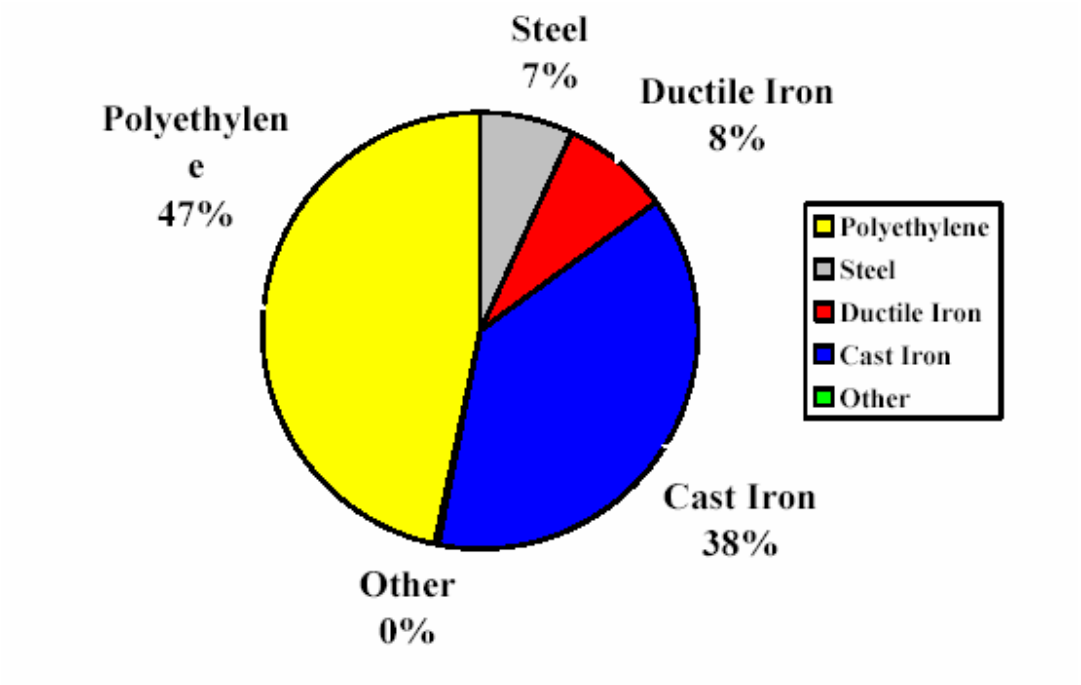

Fig. 3: Materials used in UK Gas system

3. Pressures on utilities and society

Utilities are faced with the continuing need for high levels of access to an increasingly congested underground environment, with little or no real knowledge of it, and the inevitable costs. The UK Government's stated objective of generally available broadband access by 2005 will add significantly to the amount of work done in roads and footpaths. In addition, the next thirty years will see gas main replacement programme activities at higher levels than ever before.

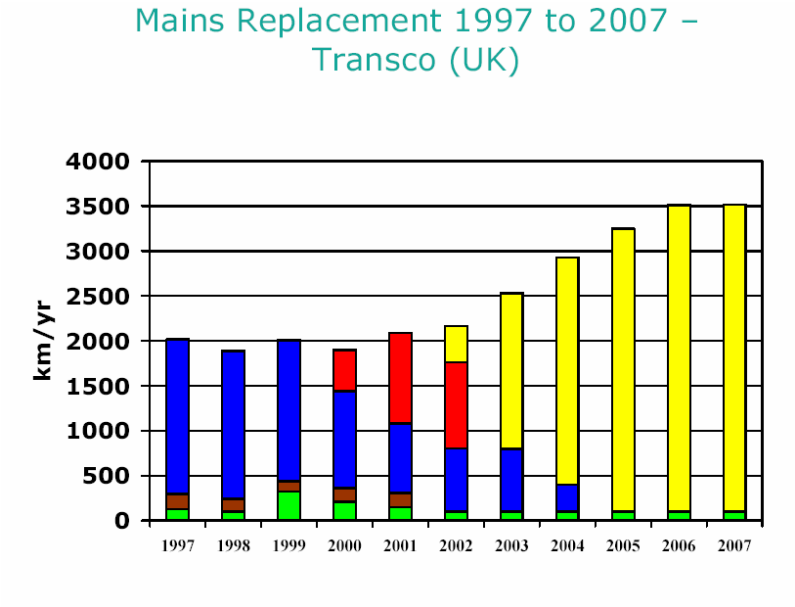

Fig. 4. Transco infrastructure replacement 1997 to 2007

Growth in the economy, the introduction of competition into utility services and increasing customer demand for essential services has brought with it a greater number of excavations in the streets in

order to supply these services. The increase in the number of utilities licensed to lay mains and cables within our streets brings with it the increased potential for conflict between the utilities, who have the statutory rights to use the streets for provision of essential services, the highway authorities and others who maintain them, and those who use the streets for transport purposes who are also the recipients of those services. To this we can also add increasing volumes of traffic in urban areas, and increasing investment by utilities in asset replacement programmes (between £500 and £1000 per day per street opening).

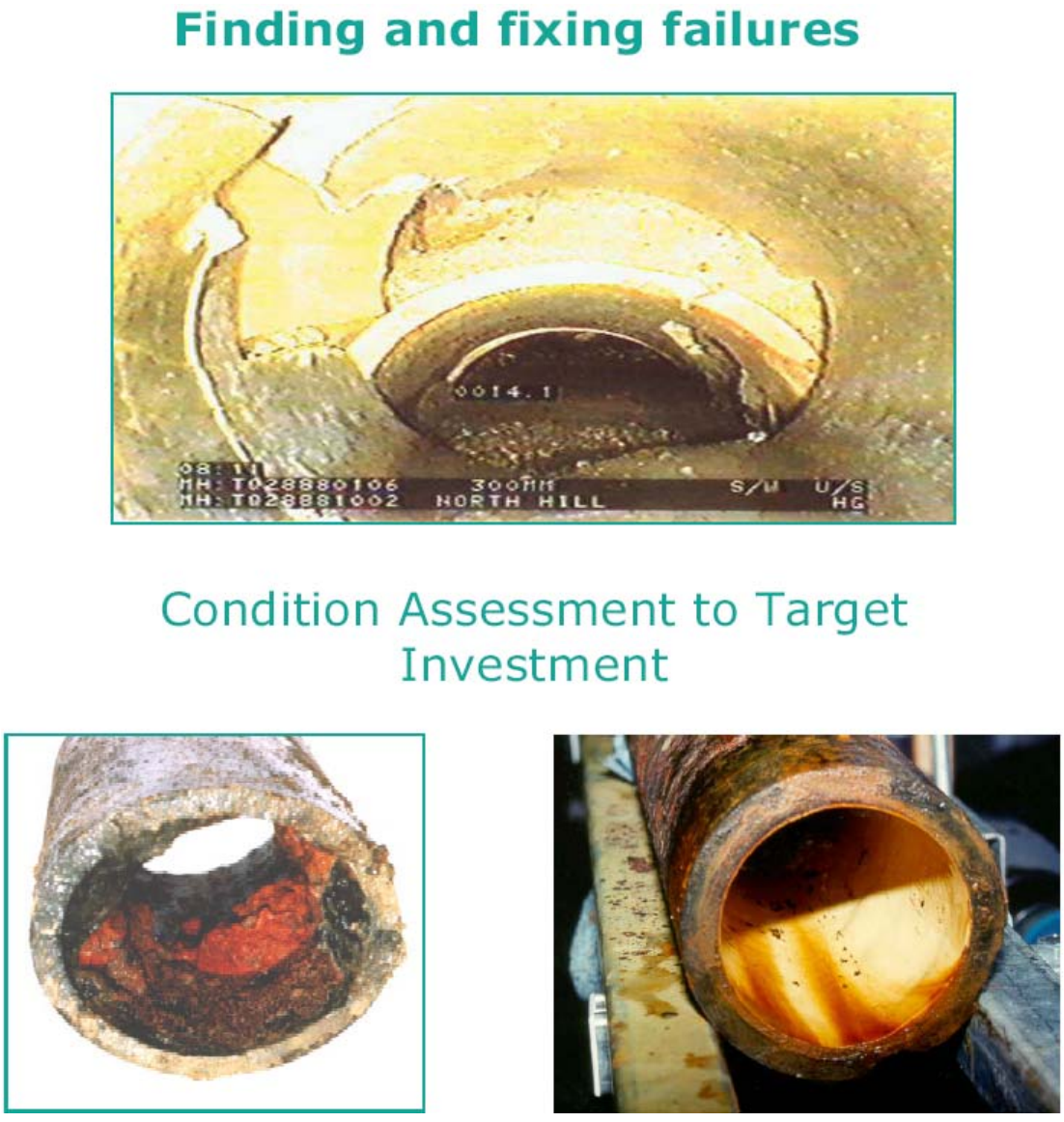

Fig. 5: Water companies need to repair or replace failing infrastructure

As a society, the impact of utility work in roads and footpaths on people and the environment continues to grow, with an increasing recognition of the need to mitigate its effects, evidenced by Landfill Tax, the Aggregate Levy and the announcement by the Transport Secretary to introduce so-called ‘congestion tsars’ to ease traffic congestion, much of it due to roadworks. Lane rental charges, recently under trial,

will also increase cost pressures if implemented across the UK. Government traffic forecasts show an anticipated increase of 50% in urban traffic volumes between 1996 and 2031, as shown in Figure 6.

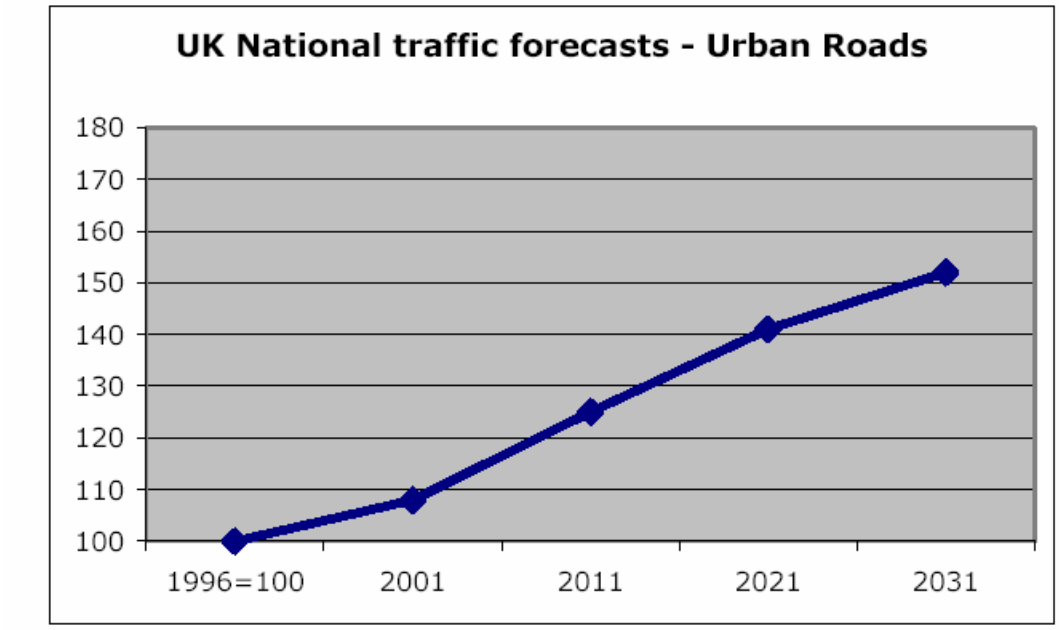

Fig. 6: UK Department of Transport; forecasts of urban traffic growth, 1996 to 2031

4. Consequences

The direct cost of trenching and reinstatement work in UK highways for utilities is in excess of £1 Billion per year (JCL, 1992) part of which is attributable to dry holes and damage to third party assets. In 1987 it was estimated that, each year, there were some 75,000 incidents of third party damage to utility equipment, with an associated cost of £25 Million per year (Clow, 1987). By 2000, the UK water industry alone incurred £15 million of costs of repairing third party damage (Sonden, 2002). Growth in the use of fibre optic cable poses a further risk: one particular incident of damage to a single cable alone cost £0.5 Million to repair! (Brady et al, 2001).

Large though they are, direct costs are significantly less than indirect costs. Those affected by the impact of utility road works include:

- Highway users, through the cost of congestion, delays and accidents.
- Business, through reduced output and turnover.
- Local communities, through reduced - or lost - access to amenities and premises, and overloaded diversionary routes.
- The environment, through damage to trees, increased pollution (noise, fumes and visual), extended use of natural resources and generation of waste.
- Third parties, through damage to property.
- Highway authorities, who have to repair damaged pavements and deal with the consequences of the compromised life of road structures.
- Utility companies, through adverse publicity, abortive costs and the cost of repairing damage.
- Operatives working in the road exposed to health and safety risks.

In total, these indirect costs are of the order of £2 Billion per year (JCL, 1992; Brady et al, 2001). Total direct and indirect costs to utilities, industry, society and government of over £3 Billion per year will continue to rise unless better information and more effective technologies can be made available to those doing the work.

The Strand is disrupted by 160 roadworks in 12 months

THE STRAND has been dug up 160 times in the past 12 months by utility companies — an increase of more than 75 per cent in two years.

Such is the scale of the disruption caused by roadworks that traffic

By Ross Lydall, Local Government Correspondent

tion to the fines Westminster can impose on contractors who miss

The Strand: riddled with roadworks

Fig. 7: Utilities in the news!!

The rights to open excavation or the use of no-dig techniques could be questioned if existing legislative measures of controlling road congestion and disruption to the public do not improve the current situation.

5. Addressing the problem – a research programme

Research into performance of current technologies (Ashdown, 2001; Chapman et al, 2001 and Weston, 2001) identified shortfalls and future needs. An international workshop was held in May 2002 to outline the research programme required to address the problems described above. The workshop was attended by experts from the UK, US and the Netherlands, representing utilities, contractors, manufacturers, research organisations and academia, who identified potential research opportunities (Overton 2002).

A Working Group has further developed the outputs from the original workshop into the research programme presented in the following pages. The Group comprises Marilyn Burtwell (TRL Limited) representing the Transport sector and Government; David Neville and Ed Faragher (Advantica Technologies Limited) representing the gas and electricity industries; Professor Chris Rogers (University of Birmingham) representing NETTWORK, the EPSRC-funded engineering project network for Trenchless Technology and Tony Woodward (Thames Water) representing UKWIR and the water industry.

The programme has four themes:

- **Making the best of what we have currently.**
- **Improved future surface-based survey techniques.**
- **Below-ground survey techniques.**
- **Future developments and possibilities.**

It is based around the premise that, over time, we need to:

- better understand user needs and the real costs and risks associated with installing and maintaining underground infrastructure;
- implement best practice and improve the skills base;
- have a positive influence on regulators;
- move from open cut excavation to trenchless technology, to reduce impact on the above ground and underground environment;
- develop further existing location technologies and give us new location technologies that will reduce the time spent in the highway, and
- develop radical longer-term solutions to the problems.

This programme has been discussed by the ESWRAC members and supplemented in the light of experience in other European countries and other (i.e. non water) utilities. All ESWARC members share a common mission – " to identify and develop opportunities for reducing the societal and environmental impact of roadworks". This supports the view of the Commission in their document "Towards a Thematic Strategy for the Urban Environment", to which ESWRAC members responded with the following comments

- modern cities can't survive without utility services
- most utility services are buried, unseen and trouble free
- some utility services will (continue to) need maintenance and renewal
- streetworks practitioners need better tools to detect assets and minimize third party damage
- new techniques and improved practice will minimize disruption to traffic and to citizens and will safeguard the environment
- new technologies will ensure that future generations can locate buried assets easily

and finally and perhaps most importantly

- this is an international problem, which should be addressed ata European level, if only to ensure that the scale is sufficient to encourage investment and adoption of best practice.

Further discussions about this programme with the ESWRAC members has extended the range of the proposals to include the following two additional themes

- Better construction methods
- Better asset management

These aim to extend the functionality of trenchless technologies and also to develop techniques for asset condition assessment and lifetime prediction.

6. Benefits of the programme

The ESWRAC programme will deliver a wide range of benefits, including:

- Reduced whole-life costs (direct; indirect; social and environmental), at a national level, for government, society, business and utilities.
- Reduced disruption, delay and congestion as a consequence of the reduced time needed to locate and/or install underground assets. The risk and associated costs of damaging plant and equipment will reduce, as will abortive costs.
- Improved health and safety.
- A more technically skilled workforce.
- More sustainable construction.
- More effective technology.
- Improved accuracy of records and locating technologies will facilitate increased use of no-dig and trenchless technology, with consequently reduced disruption, congestion, waste and reinstatement.
- Cutting-edge research, with increased export potential.
- Reduced installation and maintenance costs.
- More economic maintenance of assets.
- Improved relations with regulators.
- The opportunity to influence government and regulators in strategy development, particularly in the areas of streetworks and access charging legislation.
- Improved cross-utility communications and co-operation.
- Improved image of utilities as a result of being seen by their customers, society, government and regulators as being proactive in promoting research that targets disruption and co-ordination.

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