Following from trials of the ORFEUS drill head radar:

What is the future potential for reducing risk in no-dig utility installation if new drill head GPR tools and sensors are deployed in ‘look ahead and look sideways’ Horizontal Directional Drilling tools?

Meinolf Rameil, Civ. Eng., Technical Director
Tracto-Technik (TT Group), Lennestadt, Germany
Which risks?

- Health and safety
- Completing the Installation at all?
- Environmental
- Damages to buildings
- Security of supply and waste water management
- Condition of public roads and railways
- Loss in turnover of businesses
- ...
€80,000,000,000
annual cost of traffic congestion in (EU15) by 2010

1,370,000 km
gas mains in (EU15) countries

720,000 km
water mains and sewers in Germany

730,000 km
communication cables in the Netherlands

65,000 km
buried pipes and cables in Rome

3,777,960 km
road network in (EU15) countries

500,000
holes dug by utilities in London last year

€700,000
cost of repairing a single optic fibre cable

€45,000,000,000
cost of repairing Germany’s sewer network in the medium term

€3,000,000,000
indirect cost of retrenching and reinstatement last year in UK

170,000 km
gas distribution system in France

52,500,000
cars on German streets by 2020

ESWRAC
European Street Works Research Advisory Council
The Strand is disrupted by 160 roadworks in 12 months

By Ross Lydall, Local Government Correspondent

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 that drivers have nicknamed their roads.

Abb. 17: Verteilung der Sanierungsverfahren 2004

Dia 17: Verteilung der Sanierungsverfahren 2004
Abb. 17: Verteilung der Sanierungsverfahren 2004
Comparison
Open trenching vs. No-dig construction
from 1984 until 2008 in Berlin:

- 755 km sewer mains and laterals built using No-Dig Methods
- 64 Mio. € saved and invested in other construction projects
- 1,26 Mio. m² road surface had neither to be cut nor to rebuild
- 2,31 Mio. m³ excavation have been saved
- 191,000 truckloads of spoil have not been transported through the city
- 204 Mio. m³ ground water had not to be drained (Berlins water supply for almost one year)

Source www.gstt.de
Why trenchless construction?

$CO_2$-Emission due to traffic jam, open trenching:
100 cars / length of traffic jam 15 min.
(average 2,48 kg CO$_2$/l - average 10 l/h consumption)

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<table>
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<td>0,62 t CO$_2$</td>
<td>(100 cars / 15 min.)</td>
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<tr>
<td>2,48 t CO$_2$</td>
<td>(100 cars / h)</td>
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<td>14,88 t CO$_2$</td>
<td>(2 x 3 h / day)</td>
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<td>74,44 t CO$_2$</td>
<td>(2 x 3 h x 5 days)</td>
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<td>1,041,60 t CO$_2$</td>
<td>(2 x 3 h x 70 days)</td>
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Source www.gstt.de
Damages caused by underground working

Damages in Germany due to civil construction work

200 Million € per annum

93% *despite* information prior to excavation work

79% caused by *various kinds of excavation machines.*

55% *carelessness*

Source: Initiative BaSiBau 2002
Possible interferences in the line of a HDD-drillhead

- boulders
- pipes, cables
- archeologic structures
- contamination, old contaminations

Possible obstacles in the line / trace of a HDD-drillhead

- void
- tunnels, micro-tunnels
- coarse backfill
- piles
- rocky areas

Drilling with bore head radar
Drilling with bore head radar
Drilling with bore head radar

Drilling with bore head radar
Drilling with bore head radar

Drilling with bore head radar
Damages caused by underground working

Damages in Germany due to civil construction work

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Source: Initiative BalSiBau 2002
What needs to be done next?

- robust structure
- reliable operation
- simple handling
- size reduction
- stable high rate data communication
  - competitive cost structure
  - training / qualification
  - standards / rules of best practise
"Whoa! Watch where that thing lands—
we’ll probably need it!"
The ORFEUS project is partly supported by the European Commission’s 6th Framework Program for Community Research (“Thematic Priority” area of sustainable development, global change and ecosystems), managed by Directorate General for Research under the contract n° FP6-2005-Global-4-036856 and would not have been possible without the support of the Commission.