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Time Capsule

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Geotechnical research at the Transport Research Laboratory

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Introduction

The purpose of this resume is to provide a short introduction to the current benefits of the past geotechnical research undertaken at the Transport Research Laboratory (TRL) and to set the context for the TRL reports included in this time capsule. Originally established in 1933 as the Road Research Laboratory (RRL), the laboratory changed its name to the Transport and Road Research Laboratory (TRRL) in 1972 and became TRL in 1992. Originally it was part of the UK government's research and development into transport. This reflected a national and mainly public approach to research in different sectors which included Building Research Establishment (BRE), Royal aircraft Establishment (RAE), Water Research Centre (WRC), Hydraulics Research Station (HRS) and others in energy and environment. TRL was privatised in 1996; others were also privatised about this time. TRL published its research findings in its own set of reports, as it still does today.

Geotechnical engineering was a major part of TRL's work from 1945 to the late 1990's. The research during this period was extensive and highly varied, covering all aspects of geotechnical engineering including earthworks, retaining walls, settlement, material properties, site investigation, rock quality, drainage, slope stability, use of geosynthetics, and ground borne vibration. There were strong geotechnical research links with other European and USA establishments. Valuable work on climate change effects, landslides, sulfate effects and compaction continued into the 2000s. In addition, tunnelling, tunnelling effects and pipes were a major part of the TRL's past work although outside the scope of this resume.

The type of research

TRL at its peak had the benefit of considerable geotechnical resources (people, facilities, and funding) and influence, which as a public body benefited the UK industry directly. In the 1970s and 1980s there were around 200 people (estimate) working together in geotechnical engineering with technical support, laboratories, pilot-scale facilities and full-scale facilities. The full complement of TRL was about 1700 at that time.

This level and type of commitment in geotechnical engineering was unique and it allowed a range of activity from large teams of 10 or more working together on full-scale experiments, to individuals who were specialists in their areas. Some geotechnical projects continued for several decades so that time effects could be studied, and the variability of construction, soil properties and behaviour covered in detail. Communication and joint projects with industry and academia were essential and commonplace and allowed the flow of knowledge in both directions. Most of the research was for the UK's use but has been employed by others elsewhere. Overseas work in geotechnical engineering was also undertaken, mainly from UK government aid funding.

Today's benefits from past TRL research

It is easy to forget where current geotechnical practice comes from. Much of what is used today has developed from government research, university research, professional practice and learning lessons from the past. TRL made a major contribution to this pool of knowledge. Much of the research has been implemented in current highway specifications,

standards and codes of practice. In geotechnical engineering these include the Specification for Highway works and accompanying Notes for Guidance, British Standards and Eurocodes on retaining walls, reinforced soil and earthworks. Many of these documents are also used outside the UK. The implementation of TRL's research through these documents leads to financial and programme benefits for Clients and the industry in general, and supports the UK's reputation as one of the leaders in geotechnical engineering.

Time capsule

The three publications chosen for the time capsule highlight and illustrate the unique geotechnical engineering contribution made by TRL and reflects the approach taken to national research. 'Study of the efficiency of site investigation practices (PR 60)' by Mott MacDonald and Soil Mechanics was project managed by TRL and demonstrates the strong links with industry. This Client based report was an essential contribution to the site investigation, main works and design industries. 'Compaction of soils and granular materials' by Anthony (Tony) W Parsons presents the accumulation of over 50 years of research into compaction and is the backbone to the compaction clauses in the Specification for Highway Works. 'Survey of slope condition on motorway earthworks in England and Wales (RR199)' by John Perry was an 8-year earthwork condition study of most of the motorway network. It provided a milestone assessment, and the results provide a springboard for further research that continues to this day.

The future

The origin of the knowledge used today should not be forgotten, as the research behind it may never be repeated, but not for reminiscence reasons but because geotechnical engineering changes, albeit relatively slowly. Not only is this a technical and societal change but also a contractual and financial one. By understanding the method, results, and interpretation of past research, the research can be reused or adjusted in a contemporary world to the profession's advantage. For example, some current geotechnical specification clauses may be built up from some conservatism or be related to other clauses which rely on each other. Without the knowledge of the research behind design methods and construction clauses, and their implementation, any changes to these methods and clauses has no starting knowledge or awareness of what has been tried in the past. It is imperative that past research is built upon in new approaches and for the new needs of industry and are not repeated due to a lack of awareness of past activity.

References

BS EN 16907: 2018 Earthworks (in 7 parts)

BS 6031:2009 Code of practice for earthworks (cross references to Eurocode 7 where necessary and to be aligned with BS EN 16907)

BS EN 1997-1:2004 (Eurocode 7, part 1)

HA44/91 Earthworks: design and preparation of contract documents (1996 now withdrawn). HMSO, London, UK.

HA70/94 Construction of highway earthworks (1994 now withdrawn). HMSO, London, UK.

HS2 Specification for civil engineering works (SCEW) 600 series specification.

MCHW Specification for highway works 600 Series. SO, London, UK.

MCHW Notes for guidance 600 Series. SO, London, UK.

Mott MacDonald and Soil Mechanics (1994). *Study of the efficiency of site investigation practices.* Project Report 60. Transport Research Laboratory, Crowthorne, Berkshire, UK.

Parsons A.W. (1992). *Compaction of soils and granular soils and granular materials: a review of research performed at the Transport Research Laboratory*. HMSO, London.

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