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Geospatial Engineering Board Buried Services working group

Use of a common framework for
positional referencing of buried assets

January 2005

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Executive Summary

This report marks the end of the Buried Services Working Group of the Geospatial Engineering Board. Formulated through meetings of industry and academia, the Working Group was designed with the sole objective of producing a report examining the current status of buried services and the efforts that can be taken towards formulating a common framework.

The meetings of the working group served to illustrate the difficulties currently faced by those aiming for a coordinated approach. Frank, open discussion identified the deficits within current buried services initiatives and the subsequent potential solutions. Leading from this, the benefits – both financial and otherwise – of forming a common framework were highlighted. This report emphasises the role of the Traffic Management Act; it must be accepted by all those involved in Buried Services that this Act is arguably the main driver towards any form of coordinated approach.

Essentially this report serves to provide the ‘why’ and ‘how’ – it is now the responsibility of all those invested in buried services to formulate a group to initiate and implement the recommendations clearly defined within the report. The key findings of the Buried Services Working Group were as follows:

- All geospatial data will be recorded using the Digital National Framework (DNF) system
- Locational data is to be recorded to an absolute accuracy equivalent to that of the DNF system for the area under consideration
- Within 3 years new installations or replacement works are to be recorded 3 dimensionally rather than the existing 2 dimensions
- Existing buried apparatus should be recorded within the DNF geographical information system (GIS) but noted that there may be some inaccuracies in the stated position
- The GIS exchangeable information will identify what has been buried (e.g. water main) and who is the responsible body for the apparatus (including emergency contact details)
- A specialist, dedicated “champion” for the continued development of a common framework must be established and maintain independence of any particular group or body
- All transferable recorded data will identify the top of the item and any other information required need not be transferred to interested parties
- A definition is required to establish who is responsible for recording the location of unidentified buried objects (UBO’s)
- Commercial confidentiality and security of recorded data will not be compromised by adoption of a common framework based on the DNF and is likely to be more secure

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Martin Cullen

Introduction

There are aspects of a modern society that are really only appreciated when there are events to remind us of how dependant we have become on them. The Tsunami that struck the Indian Ocean on 26 December 2004 destroyed the infrastructure of whole communities and will take the efforts of many engineers over a number of years, if not decades, to re-establish. In the United Kingdom the infrastructure we enjoy has been created over a very long period. The efforts of great engineers, such as Joseph Bazalgette changed the way society deals with the effects of concentrated centres of habitation that we now accept as the norm. The use of buried services has supported the development of communities by providing water supply, sewerage systems and energy. With the recent advances in technology we have added telecommunications and cable television to the list of buried services.

Historical perspective of positional data storage

From the earliest use of buried services graphical representation (drawings) of where they should be placed has been used to direct those who lay the services, however the accuracy of the position of the finished works in relation to where they should be has been somewhat lacking. Paper-based records of where buried services are located have been kept in varying styles and methods but generally as a relative position, e.g. *gas main in London Road 6ft from kerb*. On the map used as a record, is the information accurately positioned? Which kerb is used as the reference? Is the information the “as-built” record or is it the intended location?

Together with the expansion of the number of services available there has been the need to maintain and upgrade existing services. These factors combine to result in a congested coexistence (see Figure 1, page 3) of the buried services that are out-of-sight and unfortunately out-of-mind to society as a whole until there is disruption to daily life.



Figure 1: A not unusual feature of modern buried services

Road works are a common feature of society as the majority of buried services are contained within the road structure. As a result, the necessary access to lay new or replace exiting services will disrupt the flow of traffic. For good business reasons it is not in the interest of those who dig-up the road to delay the works in anyway. The inefficient use of plant, materials and labour is contrary to values of cost control and maximising profits. Equally, it would be wrong to suggest that utility companies' excavations of the road are the sole cause of disruption to traffic flow. There are suggestions that utilities are responsible for less than 10% of disruptions to traffic flow (see Box 1). However when the other causes that are directly related to the function of the road system (e.g. resurfacing of the carriageway, realignment of carriageway, drain clearance, etc.) are discounted road works by utility companies are the principle cause for avoidable delay.

- 65 % Sheer volume of traffic
- 25% Accidents and Incidents
- 10 % Street and Road Works
- 5 % Utilities
- 5 % Highways Authorities

Source TRL unpublished report for Dept

Box 1: Details as presented by NJUG at Open Forum 18 November 2004

As the number of services increase so does the risk of accidental damage to other services' equipment previously buried within the road structure. Unscheduled repairs to existing equipment can be expensive with direct and indirect costs. Loss of essential services can be extended to include the losses suffered by those not receiving the service and to those affected by consequential losses, e.g. traffic delays due to extended road works causing fuel inefficiency and loss of opportunity in the extended travel time.

Although such losses are seldom accounted for it is possible to take a holistic approach to estimate the financial consequences of delayed road works caused by accidental damage. Taking a general overall view of potential costs associated with disruption to traffic flow due to road works the following costs can be identified (see Box 2).

- Assume a volume of traffic equating to 500 vehicles in each direction per day.
- Allow an average delay of 15 minutes.
- Assumed average earnings of each person (allowing 1 person per vehicle) at £20000.00 per annum. Allowing for normal effective working time this equates to slightly more than £3 per 15 minutes per driver or £3000.00 per day of delay.
- Inefficient use of fuel adds small direct costs but environmental issues associated with burning fossil fuels (e.g. increased carbon monoxide, increased health risk to pedestrians and those living close to the scene, etc.) do have an effect and it would be conservative to allow £100 per day of delay.
- Additional costs could be allowed for minor vehicle accidents caused by driver frustration either at the scene of the roadwork's or immediately before or after the roadwork's. Assuming an average cost of repairs to be £300 and allowing a 20% incidence of the total to be effected £60 is added to the previous figure.

Total cost per day of delayed traffic flow is £3160 per excavation.

Box 2: Potential costs associated with traffic disruption

Given the following statistics provided in the European Street Works Research Advisory Council leaflet (available from <http://www.ukwir.org/news/figures/eswprac-brochure%2026-05-04.pdf>) the cost to UK plc of unscheduled delays is significant.

- About 4 million road excavations a year by utility companies
- Up to 0.5 million excavations a year in London alone
- Glasgow's Great Western Road was dug up 223 times in a year
- From London where there is a significant concentration of population there are further statistics that add to the above figures.
- Congestion costs the London economy £1.2b each year - London Chamber of Commerce 2003
- 1,000,000 holes dug in London's roads every year- Transport for London 2004.

Other members of the community depend on accurate information on where buried services are. For example those who have responsibility for the maintenance of existing roads and those constructing new roads need to know where there is a risk to their operations from buried services; therefore exchange of information is essential to all concerned directly or indirectly.

At present there are Codes of Practice (CoP) that exist to guide those seeking, and those providing, positional information on buried services. Unfortunately as CoPs these documents are at best a form of guidance that do not clearly specify how the information should be presented to interested parties. Where guidance on what information is given, it is in general old fashioned and doesn't reflect developments in geospatial engineering. For example, the National Joint Utilities Group (NJUG) "Recommendations for the Exchange of Records of Apparatus Between Utility Companies"¹ states that there are "Options for Exchange" that include digital data recording, microfilm or paper. Within these formats there are a number of variable options that could result in an undertaker having up to 5 different styles of information for one location. The same document is entitled in such a manner that would suggest that only utility companies have an interest in such information, which is not the case. Understandably methods adopted by individual organisations will be what are seen to be the most appropriate for their individual operational needs, hence the mixture of data formats.

In an effort to reduce the losses to all concerned the Geospatial Engineering Board (GEB) decided to investigate the means and methods adopted by utility companies in recording the location of their buried assets. However, it became clear there were many other parties who were interested in the locational data of buried apparatus e.g. highway authorities, local authorities, emergency services, and others.

This situation was seen by the GEB to be within their objectives of providing a means of advising the civil engineering industry as a whole on the skills available from the geospatial engineering specialist and of the developments in the means and methods in gathering geospatial data, directly or indirectly. Through personal experiences and reported events the GEB became aware that there were examples of significant moves toward a digital system of recording data. Unfortunately there were also examples of inconsistency between different organisations, and conflict of direction within organisations. Some examples of events that caused concern are listed below. Specific details of the organisations involved have been omitted purposefully.

- When it was decided to lay large diameter pipes through private land, not the public highway, the land in which the pipes were planned to occupy was purchased to ensure ease of access for maintenance purposes. Once the pipes had been in place for some time a survey was carried out to confirm their location. Unfortunately the survey showed major sections of the pipe had been laid in locations not as planned because of operational conveniences, i.e. it was easier than the planned route. Therefore there were areas of land owned with little accrued value with no relevance to the owners of the pipe and pipe in land they did not own and had no right of access.
- An organisation that had made significant investment in modernising their mapping system for engineering and planning of new works purchased 5 trundle wheels for the maintenance crew to measure pipe length that were to be replaced. These extremes of geospatial techniques often exist within organisations due to the separate functions of units.

¹ "RECOMMENDATIONS FOR THE EXCHANGE OF RECORDS OF APPERATUS BETWEEN UTILITY COMPANIES" National Joint Utilities Group (NJUG) published by NJUG, London ISBN 0-954364-2-0

- To lay cable in the pedestrian pavement for a television network system the contractor was instructed to be careful when approaching a road junction because a fibre-optic cable had previously been laid as indicated in Figure 2. As can be seen there was a decision taken on site by those responsible for the fibre-optic cable to shortcut the corner rather than follow the kerb-line as instructed. As the cable television contractor's excavation approached the corner it was planned to hand-dig to avoid damage to the fibre-optic cable. Unfortunately the actual location of the fibre-optic cable was discovered by the mechanical digger when it broke the cable causing a significant loss of businesses depending on this key form of IT communication. Repairs to fibre-optic cable are considerably more expensive than for traditional telecommunication cable. It was estimated the direct and indirect costs of this one incident were in excess of £0.5 million.

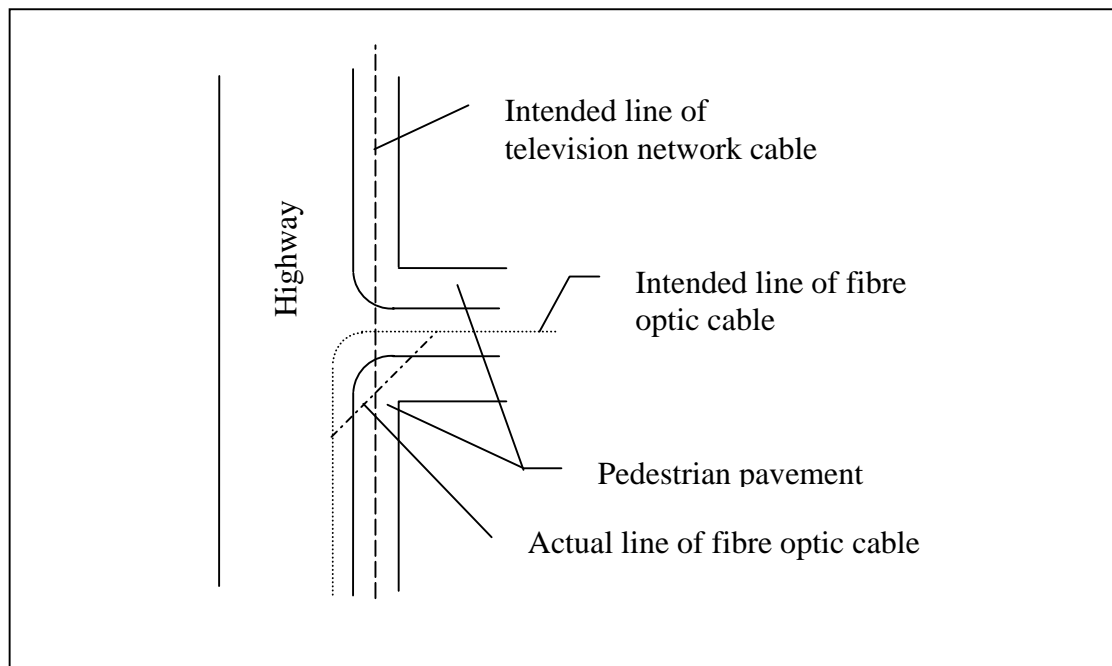


Figure 2: Diagram of how actual and intended may not agree

- Contractors when provided with positional data of existing buried services excavate a trench, generally about 5m in length across the line of the contracted works to locate in reality where the services are. Occasionally this can be counter-productive when the original details are misinterpreted at some stage. For example an on site record on works carried out 30 years previously stated *the pipeline is 5 yards from the East wall on Canal Street*. It was assumed this meant the pipe was in Canal Street whereas it was in the opposite direction in the public park adjacent to Canal Street. The 5m exploratory trench was fruitless in costs for the contractor as well as causing unnecessary disruptions to the traffic.
- A detailed map of a town showed the location of the main feeder pipe to be 2 yards east of the perimeter wall of the town's primary school. The primary school had been demolished, along with most of the significant structural features, 15 years ago and the road re-aligned 8 years ago. Sourcing the pipe to be replaced required extensive exploration by excavation on what had become a key element of a main traffic route.
- During a meeting where positional accuracy of buried services was being discussed one representative of a major contractor stated *"I've given up asking for data as it takes so long and is so difficult to interpret so I just dig and see what we find! Any accidental damage caused to third-party assets is dealt with as and when it happens.*

When it became clear there was a lack of consistency a half-day meeting was arranged to discuss the current situation. Unfortunately the meeting caused more questions to be raised than the hoped for solution, therefore it failed to provide a satisfactory outcome. As a consequence of this lack of consistency the following sequence of events took place and are discussed in more detail in subsequent sections of this report.

- A public letter to the Secretary of State for Transportation
- A Presidential Dinner at the Institution of Civil Engineers (ICE)
- A Buried Service Working Group formative meeting
- An open forum hosted by the GEB and sponsored by Ordnance Survey.
- A Buried Service Working Group Final meeting

It should be noted that it would be inappropriate to suggest there is complacency in the organisations that have responsibility for buried services as there has been significant investment made to modernise their own system. The objective of the report is to show that there are benefits in working together with a common framework and that commercial confidentiality will be, arguably, more secure than it is a present and there should be cost savings to the companies and to the public at large. It has also become evident in the research associated with this report that there are aspects of buried services that are not clearly defined, such as unidentified objects uncovered during excavation. The recommendations of this report will include actions beyond the remit of the Institution of Civil Engineers, the Institution of Civil Engineering Surveyor, Ordnance Survey or any of the utility companies.

As a whole there is a significant thrust by industry as individuals and as a group (e.g. UK-WIR) to modernise the positional data of buried services but it is important to have a consistency to be sure the benefits to all concerned are maximised.

The Role of the GEB

A report on buried services was not a predetermined objective of the Geospatial Engineering Board but was within the Board's mission statement,

"To facilitate the dissemination of modern techniques for surveying"

Members of both Institutions have an active roll in buried services directly or indirectly. However it became clear after an initial superficial view of the industry that there was an inconsistency in how positional data of these important items of apparatus is collated and recorded. To help define what was happening in industry a half-day meeting was organised and well attended, however the net outcome was that more questions were raised than answers. This situation lead to a letter being sent to the Secretary of State for Transportation and an associated press release resulted in a number of utility groups expressing their dissatisfaction. A number of meetings were held with those who had commented on the

press release and it was clear that further discussion with the industry as a whole was necessary.

Half-day meeting at ICE

From the initial investigation of the industry's current practice to record positional data of a number of organisations it became clear there were a variety of actions being taken to make use of modern techniques to produce accurate "maps" of where services were. However, there were almost as many approaches as there were participants. To make the investigation wider an open meeting was held at the Institution of Civil Engineers in April 2003 with speakers from a number of interested bodies:

Ordnance Survey who presented the advantages of the digital national framework (DNF)

Heathrow Airport Terminal 5 contractor who detailed the long term advantages and methods used to digitally record new buried services and those discovered during excavation works,

University of Nottingham who presented details of trials on the use of *Augmented Reality* where the undertaker can "see" the location of all buried apparatus by using computer aided graphics

Insurance brokers who provide a service for many of the utility companies

The UK Society for Trenchless Technology (UKSTT) who provided an insight into the advantages and disadvantages of this new method of working with buried services

Given the enthusiasm for a coordinated system of digital positional data by the presenters it was unfortunate there was, in general, a negative response from those in the audience representing industry. The most consistent meeting outcome was that industry participants were content with the way things were and did not see any need for change despite the lack of consistency.

Two main points were cited as being justification for there being no need to change: national security and commercial confidentiality. Both points of view were maintained despite the discussion that followed that an established common framework would not equate to a loss of ownership or any reason for loss of security.

It was also suggested that Trenchless Technology was the means to reduce the need for undertakers to dig trenches thereby removing the disruption to traffic flow. As was pointed out by the representative of UKSTT "trenchless" means there are less trenches not that there are no trenches, therefore there will still be excavations in the roadway and there will be associated disruptions to traffic flow. In addition there is a greater need for accurate 3-dimensional data of where buried apparatus exists as the operation is "blind" and remote controlled.

Despite these discussions the meeting ended with representatives of organisations in the audience showing no enthusiasm for change to their current practice.

It was decided by the Board to write an open letter to the Secretary of State for Transportation as it was felt there would be no progress on a voluntary basis.

Public letter to Secretary of State for Transportation

To move the discussion on it was suggested to the Department for Transport (DfT) that improvements in the geospatial data relating to buried services would benefit all concerned. Coupled with a positive response from the DfT there was strong negative response from industry to the press releases associated with the open letter. Meetings were arranged to address those concerns forcibly made by industry and it was clear the impression made at the half-day meeting was inaccurate. Significant efforts were being made by all concerned but there was a degree of sensitivity as to who knows what is being done. In other words the majority were working diligently to improve the data recording means and methods but were doing so in isolation. Often the efforts of others were regarded contemptuously. The singular approach by each participant was seen as likely to maintain the existing level of difficulty in correlating the many details associated with buried services rather than simplify the exchange. Equally evident was the willingness to work together towards a common goal. However none of those approached were willing to participate in a discussion that was led by another commercial organisation although most were willing to be the Chair of any discussion. Such feelings were sufficiently strong that the suggestion of an independent coordinator to help create a standardised solution was readily accepted in principle.

To move towards a standardisation would require a strategic change in the organisations' approach to their data collation and recording. The significance of this change required the support of senior management of each organisation; therefore a Presidential Dinner was arranged at the Institution of Civil Engineers to discuss the best way forward.

ICE Presidential Dinner (April 2004)

Despite an initial reluctance to change the established point of view, the agreed confidentiality of the event led to open discussion and frank points of view. To the credit of all concerned there was agreement that change was necessary but the task would be a considerable challenge for all. The agreed outcome of the Dinner was to compile a report on what should be standardised and what the benefits would be. All organisations represented at the Dinner would participate in the drafting of the report. A target date of January 2005 was set for the completion of the report.

Buried Services Working Group (BSWG) first meeting

Further to the Presidential Dinner it was proving difficult to identify a time that suited all potential participants, therefore it was decided to choose a date and those who could make the meeting would do so, but all interested parties would be keep advised. Significant points were agreed in the first meeting. Those who had made noteworthy progress in modernising

their recorded data agreed there were advantages in a common reference system. In addition, after some formative discussion it was agreed that not just the reference system should be standardised but consistency of the data exchanged should be standardised (i.e. what was where and who had responsibility for it). To make the process of change from current practice as effective as possible it was agreed an open forum with specific points of discussion was essential.

Open forum

This first forum to discuss the standardisation of recorded data regarding buried services was called with the purpose to recognise the work that has taken place across a number of organisations. It was made clear at the outset that this meeting was not to decry any individual organisation's effort to bring their records up to date with modern technology nor was it the place to discuss how data is collected. It was accepted there is a need to be able to exchange information between interested parties to minimise the risk for accidentally causing damage to buried assets and reduce the consequences of such damage for users of the service. It was also necessary to clarify there are two distinct areas of the standardisation of data. Recording the data associated with new works, including replacement works, should be viewed as an achievable task with an agreed time, however, the task associated with undisturbed existing works is more challenging. To clarify the discussion the topics concentrated on were those associated with the new/replacement works - with the passage of time the other buried assets will be updated as and when they are located and/or replaced.

Having discussed the presentations made and the concept of the need for change the following points were agreed:

- A common reference for buried services based on GB national grid would be most beneficial
- A coordinated effort would be necessary to bring information to a "shared" status based on the Digital National Framework (DNF) for buried services
- To achieve the common goal for new works within 3 years
- As the task is a significant change in existing practice funding will necessary to establish the "standard"

In addition, a number of points were identified that would be necessary aspects of the final report.

- Identifying the financial consequences of making such a change to establish a business case would be required to establish the benefit, and costs
- A "champion" is required to ensure the continuing development of the processes whilst maintaining a standard approach and commercial independence. The "champion" could be a combination of existing bodies and, possibly, government.
- A plan with time scales is necessary to detail a number of items:
 - A pilot scheme to create the "standard"
 - Central registrar for "unidentified" objects
 - What is in the standard format of the *Where, What & Who* data

Definitive Working Group Meeting 12 January 2005

A sub-group formed after the open forum meeting of 18 November 2004 and met on 12 January 2005. After some discussion the following items were agreed to be the future for all buried services accessories:

- Line of asset (X & Y)
- Preferably line and level (Z)
- Common background
- Who owns it
- What's going through it

It was further suggested that material of the buried asset should be considered, with a mandatory minimum of specific information.

It was noted that the Traffic Management Act shall be the motivator to encouraging individual organisations to adopt a minimum practice.

It was suggested that benefits of a common framework are likely to be greater internally. However, it was noted that there will be significant benefits from the ease of the interaction between the variants. Work already completed by UK-WIR indicates there are numerous cost savings however they can be difficult to pinpoint.

The meeting agreed that there will be benefits (financial and legal) for all by making the move to a standard form and the Digital National Framework for sharing information. It was recognised that the details of what is exchanged between interested parties needs to be defined to provide the most appropriate information. This information may not be the information most suitable to the utility company. For example one company's internal systems may refer to the uppermost external point of the pipe where another many refer to the lowest inner level of the pipe. It is clear there are internal and external needs and was agreed that for the purposes of minimising risk of damage the most appropriate level is the uppermost as this is the most likely first point to be found by the undertaker.

A further point of agreement is the need to recognise the task is divided into two distinct sections:

New and replacement works where modern geospatial techniques can be applied during the works.

Existing works where records are in various forms including digital but predominantly paper based. Conversion of paper based data to a digital system is possible but there is a risk of confusing transferred legacy data with more accurate modern data. It is necessary for a differentiation of the two formats. With scheduled and unscheduled maintenance it should be possible to upgrade the level of confidence of the position of existing buried apparatus.

Information on unidentified buried objects (UBO's) was considered. It was agreed that it was unclear who should hold the information on UBO's that are exposed during excavation. It was proposed the Highway Authority Traffic Manager would be the most appropriate body. However this led to a debate concerning how company's do (or should) communicate with each other. To ensure the effectiveness of this commendable scheme clarification is necessary to define the responsible body that holds the data, and to some degree enforces undertakers do report UBO's.

In conclusion of the meeting it was agreed the Digital National Framework to be the most appropriate basis for the common framework.

Financial benefits of a common framework

Throughout the work of the GEB on the subject of buried service it has been clear the majority of companies have been working towards a more modern approach to the recording of positional data. From examples discussed with utility companies the use of cost-benefit analysis illustrated the potential saving to industry and their customers, plus UK plc as a whole.

Justifying costs associated with use of a common framework cannot be easily defined as there are many different organisations at various stages of modernising their current system. However, it is clear that all recorded positional data is currently being modernised by the majority of industry therefore the only cost that would be truly attributed to adopting the DNF as a standard would be minimal in comparison to the ease of transfer of data between interested parties.

Legislation

There are two Acts that apply to this subject: the New Roads and Street Works Act 1991 and the Traffic Management Act 2004. Currently there are Codes of Practice on how undertakers should record the position of buried apparatus with the most significant being that published by the Department of Transport on behalf of the Highways Authorities and Utilities Committee (HAUC).

New Roads and Street Works Act 1991 and the Traffic Management Act 2004

The HAUC Code of Practice contains the following statement for recording underground apparatus in streets²:

“Under section 79 of the New Roads and Street Works Act 1991 undertakers are required to provide (subject to such exemptions as may be prescribed) keep up to date and make available for inspection, records of every item of apparatus belonging to them in the street as soon as reasonably practicable after placing in the street, altering its position or locating it in the course of executing any other works.”

The HAUC CoP also defines an acceptable level of positional accuracy for buried apparatus. The location of buried apparatus should be measured to +/- 300 mm on the ground and recorded to a minimum accuracy of +/- 500 mm of the actual position of the plant. Unfortunately this requirement is not clear whether the accuracy is an absolute or relative accuracy, i.e. is the accuracy relative to the fixtures close to the apparatus such as a kerb or is the accuracy an absolute relative to grid reference system OSGB36³?

It is difficult to be specific as to what is an acceptable level of accuracy for undertakers despite the fact a number of organisations have carried out trials of modern geospatial engineering techniques. However it is accepted that a standard of acceptable levels of accuracy is necessary and the Regional Technology Steering Group meeting of 6 January 2005 agreed to carryout combined trials to establish acceptable levels of accuracy among other objectives.

Traffic Management Act 2004

Sections 45 and 46 of the Traffic Management Act 2004 contain amendments to Sections 79 and 80 of the New Roads and Street Works Act 1991. These amendments should be read in conjunction with the original Act.

² “CODE OF PRACTICE FOR RECORDING OF UNDERGROUND APPERATUS IN STREETS”
Published by the Department of Transport, London 2002

³ **OSGB36** is a map datum used by the Ordnance Survey of Great Britain in map making started in 1936 until 2000 after which WGS 84 has been used.

For Section 79 three additional clauses are added.

Subsection 1A –“an undertaker may include the location of apparatus belonging to him which is not required to be included with its nature and whether it is being used.”

Subsection 2A – “Regulations which alter the form or manner in which the records are kept may apply to records made before (as well as after) the alterations take effect”.

Subsection 3A – the undertaker’s records are those kept by him under previous subsections.

In Section 80 there are five amendments covering the duties relating to the location of unexpected apparatus. The main thrust of these is to record the location of the unexpected apparatus, try to identify the owner, if possible, inform the street authority and keep them in the appropriate manner as per Section 79. Also that a register of recorded information be kept and this should be open to any responsible person with sufficient interest. Unfortunately it is not clear who should be the “keeper” of this information on the position of unexpected apparatus. Given the diverse format of data recording currently in use it would be reasonable to expect severe complications in the task of compiling a central register for these unidentified buried objects.

Summary and recommendations

Accurately recording the position of buried apparatus was and remains an objective of the Geospatial Engineering Board. From an initial situation in April 2002 where there was a distinct lack enthusiasm to share information and experiences, the Buried Services Working Group has brought together organisations to work towards the use of the Digital National Framework (DNF) for recorded data on the location of the nation’s buried apparatus. There has been a learning process for all individuals involved in terms of knowing what others are doing, successes and failures, to the realisation that there are advantages (legal and financial) in adopting the DNF. In addition the process has identified that there remains a considerable task in creating the individual databases for all concerned and maintaining an active record of modification to include new works and to adjust the legacy information when apparatus is replaced.

However, there have been items identified that require solutions, such as:

A definition of who is responsible for recording the location of unidentified buried objects (UBO’s).

The creation of a national specialist group who meet regularly to continue the development of means and methods of collating geospatial data and the operation of the coordinated effort resulting from the BSWG meeting.

Acceptable levels of accuracy, and whether absolute or relative, should be the first objective.

A standard format of recording data to define what is recorded and to differentiate between new data and data inherited from existing paper based records.

The dissemination of the information on the benefits of a common framework contained within this report and sharing the means and methods that are currently available to all concerned bodies.

Register of UBO's

Whoever is allocated the task of being responsible for a register of unidentified buried objects there will be resource implications. Resources are required to receive any reported objects, acknowledge receipt of the information and recording in digital format that there has been an object found. Ideally the register should check the possible link between the newly uncovered object with previous entries and make efforts to define whether the object is "live" or "dead".

Each of these items has a cost implication. Charging the provider of the information to the register is unlikely to encourage participation in the scheme therefore funding will be required. The source of funding is not part of the scope of this report; however it would most likely be from a levy on users of the information or funding from central government.

National Specialist Group

The Buried Services Working Group was formed with the single objective of providing this report, however the discussions that have taken place have been informative for all concerned. With the advancements in technology it would be reasonable to acknowledge that means and methods of gathering information and the recording methods will be constantly changing. Without a central association of all interested parties dispersal of the efforts by individuals and organisations is a likely scenario.

The formation of a 'Buried Apparatus Geospatial Association' could be along lines of organisations formed for the dissemination of technical issues, such as UK-WIR. Costs could be recouped through either a direct levy on all interested parties or a subscription based on the organisation's annual turnover. The latter would be the preferred option as there is likely to be more enthusiasm in being part of the discussions that would take place as an annual conference with an associated published electronic journal. A steering group of the association would meet quarterly to discuss developments and the strategy of the association.

Membership of the steering group should be limited and devised to ensure no one body gains absolute control and the views of the community as a whole is given its rightful importance.

Standard format of recording data

There is wide approval of the use of the Digital National Framework (DNF) as a basis for a common format. However there is a delineation of organisations' internal needs and needs of the external bodies. The details held for exclusive use by the owner of the apparatus are for them to define, but there needs to be commonality between all parties of what is exchangeable.

In general the following principles for graphical symbols should be applied by all interested parties:

- A solid line representing the uppermost level and the centreline in the x and y directions of a new or replacement item
- A dashed line for an item previously recorded but not verified
- These details are to be recorded digitally together with the following information to form a comprehensive geographical information system (GIS).
- What the apparatus is, e.g. a upvc water main 600mm in diameter, an optical fibre telephone cable 200mm in diameter, etc.
- Who the owner of the apparatus is with contact details, should there be a need to seek advice.

Dissemination of information

The efforts of the working group and all who participated in the discussions could fail if the information is not communicated effectively to those who will operate the day to day businesses that have buried apparatus. To provide information on what can be achieved to the wider audience there are plans afoot to hold meetings in London, Manchester, Edinburgh and Cardiff. These meetings will be held in June to ensure there is a positive move forward to deal with the current and anticipated legislation.

Conclusion

From the positive actions that have resulted from meetings by the BSWG there is strong support for a coordinated, more clearly defined specification on the position of all buried apparatus. Not only are the utility companies interested but there is support from municipal engineers, emergency services and other specialist groups. Consulting engineers and contractors who have projects that include highway sections have, in some ways the loudest voice for a standard system that is more readily available than the current Codes of Practice define as acceptable. There are plans by the department for Transportation to clarify/resolve the existing situation regarding the CoP's by 2008 (www.dft.gov.uk).

Perhaps the most encouraging aspect of the discussion that have taken place is that two pilot projects that will take place in the Thames Water area and Yorkshire Water area with willing, enthusiastic participation of Transco, BT and other interested parties. There are already significant movement towards a modern alternative to the traditional methods of sharing data as indicated in the following examples.

1. The Institution of Civil Engineers who are working to develop a common framework for Data Exchange. The objective is to look at a common framework for recording and exchanging assets records.
2. EPSRC/ UKWIR (United Kingdom Water Industry Research) plan a 3 yr project focusing will be on how technology can be improved and/or combined to better identify existing assets in the ground.

Interest in the subject is national and international as illustrated by the presentation of papers at conferences. For example:

Buried Services – Improving the Location Through the Adoption of a Common Framework by Keith Murray, James Brayshaw and Paul Cruddace presented at AGI 2004.

Models for matching Features. Discussion paper by Adrian Lovegrove, DNF Expert Group. v1.00d 27th September 2004

A common framework for referencing and linking buried services. A DNF discussion paper outlining an approach to: Current situation, Feature Modelling and Adoption for Buried Services. Keith Murray and Marc Hobell. V1.1B4.doc 16th November 2004

Further information on the key items presented the following web site can be found on the following web sites.

Digital National Framework - White Paper, September 2004
http://www.ordnancesurvey.co.uk/oswebsite/aboutus/reports/dnf_white_paper.pdf

Digital National Framework Q&A

http://www.ordnancesurvey.co.uk/oswebsite/aboutus/reports/dnf_qa.pdf

Project Acacia (papers issued in May 2004)⁴ may be of interest in that it considered a similar lack of consistency of postal address. In particular the following sub-sections of the report have relevance to this report.

Research Topic 1: Objects without Postal Addresses – Final Report: which highlighted the need for a feature catalogue and classification system.

Research Topic 3: Towards an integrated address infrastructure: established the need for user view cross referencing

Research Topic 6: Maintenance – Final Report: identified the need for maintaining user view relationships

From a stage where most were diligently working as individuals to the current status where there is a coordinated effort towards a common goal to benefit everyone the efforts of the BSWG have been beneficial. As the Working Group had the singular objective of reporting on the advantages of a coordinated approach based on the use of a common framework it will no longer exist on publication of this report. However it would be wrong to assume the task of creating a common framework is over. A continuing effort is required for all concerned and, perhaps more importantly, is the formation of a group to “champion” the continuing development of the processes whilst maintaining a commercial independence.

⁴ <http://www.ordnancesurvey.co.uk/oswebsite/aboutus/reports/acacia/index.html>