Report for the Inland Waterways Advisory Council



Information and Communication Technology for the UK's Inland Waterways



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What is the Inland Waterways Advisory Council (IWAC)?

IWAC is a statutory public body which provides independent advice to Government, navigation authorities and other interested parties on matters it considers appropriate and relevant to Britain's inland waterways.

Created in April 2007 by the Natural Environment and Rural Communities Act 2006, IWAC is supported by the Department for Environment, Food and Rural Affairs (Defra) and the Scottish Government. It succeeded the former Inland Waterways Amenity Advisory Council, created in 1968 to give advice on the amenity and recreational use of canals and rivers managed by British Waterways.

In England and Wales, IWAC's remit covers all of the inland waterways such as:

- canals (including those managed by British Waterways, canal companies, local authorities and smaller independent bodies);
- rivers (including those which are the responsibility of the Environment Agency, British Waterways and port authorities);
- the Norfolk & Suffolk Broads; and
- the navigable drains of the Fens.

In Scotland, IWAC's remit covers inland waterways that are owned or managed by, or which receive technical advice or assistance from, British Waterways.

What is IWAC's role?

IWAC's role is to ensure that the inland waterways are sustainably developed to meet the needs of all who use and enjoy them. Once used mainly for freight transport, the waterways now have a strong recreational and amenity use. They act as an effective catalyst for the regeneration of local economies, acting as a focus to bring economic, social and environmental benefits to cities, towns and rural communities.

IWAC has published reports which include: reducing carbon dioxide emissions by moving more freight onto inland waterways, the restoration priorities of disused waterways, good practice guidance on promoting the potential of the inland waterways through the planning process, using the waterways to encourage social inclusion and showing the contribution that waterways can make to rural regeneration.

More about IWAC

For further information on IWAC and to see copies of its reports, visit the website at www.iwac.org.uk

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1.0 Introduction

- 1.1 The development of Information and Communication Technology (ICT) is rapid, varied and of significant importance to businesses. However the cost of development, installation and maintenance along with a low degree of perceived robustness has not overly encouraged the use of operational ICT within the UK's inland navigations.
- 1.2 The ability to monitor and record data using intelligent ICT equipment has now been used by many industries with a high degree of reliability and benefit being gained.
- 1.3 With real costs reducing and considerable experience being gained, it is appropriate for IWAC to look at what can be achieved with off-the-shelf equipment to determine operational and business benefits and to develop common ideas for the future. The sensible use of ICT will enable users to further enjoy the benefits of the UK's inland waterways and aid navigation authorities in improving service delivery and reducing costs.
- 1.4 With Climate Change and the impact of the Water Framework Directive, the ability to manage scarce water resources in an efficient manner is essential. The use of ICT will assist in this process and will build on the existing ability to forecast flooding and aid the decision making processes for flood risk and drought management.
- 1.5 Within the navigation authorities the first wave of ICT investment is now either coming to the end of its working life, is out of date or no longer supported, and thus it is appropriate to share and develop common ideas to provide a cost effective and seamless system for the benefit of users and managers.
- 1.6 This report reviews existing practice within the navigation authorities, identifies lessons learned, highlights benefits that can be shared and makes recommendations for future uses of ICT.
- 1.7 The recommendations made throughout the report are presented as a summary in the following chapter.

2.0 Summary of Recommendations (references to paragraphs as shown)

- A single WiFi supplier should be appointed by the UK's inland navigation authorities to provide services at hotspots and some designated locations across the whole network (5.8)
- All navigation authority websites to be developed to a mobile web format (6.3.7)
- All navigation authority information to be available in a downloaded format (Word or PDF) (6.3.7)
- Navigation authorities to consider creating CDs of waterway maps (6.3.7)
- Navigation authorities or others to create pod and video casts to aid communication, training and safety (6.3.7)
- Hire-boat operators to provide equipment for video-casts, DVDs etc onboard hire boats (6.3.7)
- Navigation authorities to integrate the exchange of information via their websites (6.3.7)
- Registration of mobile phones by users, hire-boat operaters, hotel boats, freight carriers for text messages or RSS feeds for unscheduled closures, restrictions, Strong Stream and flood warnings (6.3.7)
- Greater and more coordinated use of existing branded websites such as Visit Thames and Waterscape.com should be made by all the UK's navigation authorities (6.3.7)
- Navigation authorities to research as part of customer surveys' future ICT demands (6.3.7)
- Consider the development of a UK wide Smart Card for access to, and to charge for, navigational services and facilities (6.4.10)
- The development of Smart Card trail, eg Great Glen Way (6.4.10)
- A bureau system for the SCADA control and monitoring of the UK inland network M&E equipment should be actively considered, or alternatively local SCADA systems (7.15)
- Pumping stations should be monitored in terms of power performance and smart control equipment installed to reduce energy consumption (7.15)
- An M&E working group to be set up to share best practice across the network (7.15)
- The future-proofing of all new build or repair of structures and buildings for the introduction of ICT (7.15)
- The further development and use of GIS and GPS by navigation authorities (8.3.6)
- The setting up of a working group to develop and maintain common GIS standards for navigational use (8.3.6)
- The ability to licence and re-licence all UK inland craft on line should be developed (8.4.10)
- The development of bar code standards for licence administration (8.4.10)
- An automatic link established between navigation authorities' licensing systems and BSS database (8.4.10)

- The possible development of an online database for insurance documentation (8.4.10)
- The recording of CIN on all licence databases (8.4.10)
- The development of a payment card to assist with licence and mooring payments (8.4.10)
- The development of a Variable Message Board system to give advance warning of unscheduled closures, Strong Stream warnings and similar events based at strategic locations around the UK network (9.4.8)
- The development of an online river level information service (9.9.3)
- Greater collaboration between navigation authorities of operational ICT is necessary, ideally led by AINA together with a lead navigation authority or 2 to 3 of the large navigation authorities (10.9)

3.0 Background

- 3.1 ICT has been slow to develop within the UK's inland waterways network due to the high cost of development, the fragmented ownership of the network, a focus on operational maintenance and the lack of any real customer led demand for advancement, with the possible exception of websites.
- 3.2 As a result of the availability of ready-made systems, development in telecommunications technology and greater reliability and robustness, some navigation authorities have been progressively introducing ICT for the benefit of all aspects of the network.
- 3.3 However, the introduction of ICT has been driven by the need to have sophisticated finance and office systems but they have done little to provide information and add improvements to the operational service out on the waterways except where there have been some ad hoc successes such as the recent introduction of hand held devices.
- 3.4 With meeting the demands of improving service delivery, the need to be more diligent in managing the network, and with limited resources, it is timely to see how the wider introduction of ICT could benefit all the UK's inland waterway authorities.
- 3.5 With more and more chargeable services being made available, the ability to collect income using cashless payment systems will become the norm, and ICT will assist in the delivery of Smart Card and web based charging systems.

4.0 The Future

4.1 The rate of change of technological development is getting faster and the greater interoperability of equipment is increasing.

4.1.1 The creation of communications links between equipment is now very simple with the cellular phone network. The provision of remote power packs using a combination of solar panels, small wind turbines and battery packs now means that equipment can be installed virtually anywhere very cheaply and reliably.

- 4.2 Collecting relevant information from remote/unmanned locations can easily be done and the facility to either allow remote installations to operate automatically or to be remotely instructed can only pay dividends. This will be especially applicable to water control for the UK navigational network and dealing with the implications of Climate Change and the EU's Water Framework Directive.
- 4.3 The creation of cashless services using this form of equipment will lead to a significant breakthrough in providing financially viable facilities on the navigation routes. The trials now being undertaken in London based on TfL's Oyster Card (and its integration into credit/debit cards or mobile phones), show the variety of card charging systems that can be created.
- 4.4 However, it is all too often the case that organizations can be swept along by technological improvement and the full cost of change is not fully understood. It is essential when considering investing in any such equipment that the 'Whole Life Project Cost' is assessed.

4.4.1 It is vital when installing ICT equipment that it is regularly maintained to ensure its reliability. Any failure can lead at best to a breakdown in customer satisfaction, and at worst reputational damage and fatalities.

4.4.2 This rate of change of the technology, whilst beneficial, also means that existing equipment rapidly becomes obsolescent and is not supported by its manufacturer. Any proposal must be planned on being totally replaced within a much shorter life span than was previously the case with navigational investments. It is essential that it is designed to common standards whilst ensuring that any new standard are normally *backward compatible* and will accept all previous data.

- 4.5 The variety of systems now available can also lead to problems in that the navigation authorities may well receive conflicting advice even from experts. Accordingly, it is essential that navigation authorities must be *intelligent clients* and need to have clear objectives that a system must fulfil well. Some procedures may be better and more cheaply done manually or mechanically.
- 4.6 It is also essential that there is compatibility across the UK navigational network so that all users have a seamless interface with the technology used, that set up costs and equipment can be shared between the navigation authorities, where possible, and that industry standards can be developed.
- 4.7 The use of this technology can concern its users due to the perceived level of an individual's information held within databases. The ability to track boats and possibly individuals around the network is certainly likely to happen. Even without the development of navigation authority related equipment, the use of cell phones, credit/ debit cards and other systems already means that people are 'visible' wherever they are. The development of ICT systems by the navigation authorities must be done in a professional, inclusive and transparent manner, in line with nationally acceptable standards and Data Protection legislation.
 - 4.7.1 It must be ensured that all personal information held or transmitted is secure.

- 4.8 The demographics of the inland boating community would suggest that its average age is relatively high and getting higher. There is a perception that such users are not ICT oriented and would not welcome the more intrusive use of it. However, surveys undertaken by British Waterways in 2006¹ show the following;
 - 95% of hire boaters have access to the internet at home, the office or other sources
 - 84% of BW boat owners access the internet with half doing so daily
 - 93% of registrations for BW's mooring vacancy tenders were on line
 - 72% of BW boat owners access the internet weekly and 54% do so on a daily basis

4.8.1 The use and development of ICT and especially the use of the web for communicating with customers and users is a fact of life and steps must be taken to ensure that systems are developed and implemented sensibly.

4.9 The rapid rate of development of the hardware and software associated with information technology is so great that its use is almost boundless. New developments will be available and proposals that currently seem expensive will no doubt become financially viable.

¹ British Waterways Boat Owners Survey 2006

5.0 Internet Access

5.1 Access to the internet is now the major form of corporate communication between businesses and day to day customers. Its use is being encouraged by Government to transmit information, to aid procurement, service provision and to allow personal communications by email. For the waterway user however, access to the internet can be difficult due to their high level of mobility (particularly boaters) whether inland or coastal.

5.1.1 Since the inception of the internet, connection has been traditionally by landline either by broadband or *dial up*. Whilst such a connection may be feasible at a dedicated berth at a marina, its availability is extremely limited and certainly is not available at visitor or linear moorings. However, the development of communications technology and the greater availability of radio spectrum have lead to greater mobile interconnectivity for laptops and other ICT equipment as follows:

5.2 WiFi

The development of WiFi has gained significant prominence, especially for the provision of wire free cabling in the home and office although sometimes, allegedly, at the expense of security. It operates on the basis of a low power, high speed radio link between a base station or router and a receive/transmit module either as a *plug in card* or permanently built-in module in a laptop or PC. The current trend appears to be to install a permanent WiFi facility in all domestic IT equipment.

5.2.1 Such a system can operate up to a range of 150 metres and as a consequence, commercial operators have been installing multi channel base stations to create WiFi hotspots at railway stations, service areas or to even create complete urban coverage. These sites operate with the user buying on a 'pay as you go' basis or by having an account. However, some sites provide free connection, but usually limit the amount of content one can access.

5.2.2 In the marina industry, several key suppliers have started creating hotspots within individual marinas and are able to give coverage to a whole marina, or even linear moorings. Operators like Oceanwave <u>http://www.myoceanwave.co.uk/</u> or ADR Communications <u>http://www.adrcommunications.co.uk/</u> are already installing WiFi at coastal and inland marinas.

5.3 Cellular Broadband

An approach that is growing in popularity is the provision of broadband interconnection using the cellular 2G or 3G networks. Whist this was available in a format similar to landline 'dial up' technology, it is now developing to the extent that a plug in USB modem stick or *dongle* can be purchased, and access achieved wherever there is cellular coverage. Typical prices can be \pounds 15/month for 3GB service.

http://online.vodafone.co.uk/dispatch/Portal/appmanager/vodafone/wrp? nfpb=true& pageLabel=te mplate04&pageID=MB_0001&WT_ref=INT-PSHOP-310108-Home-AbtVFAtHome-

5.4 WiMax

Following on from the provision of WiFi, systems are being developed using microwave radio frequencies that will allow cells of up to 10km radius, operating at up to forty megabytes, to link to laptops or PCs. The system will work in a similar manner to WiFi but with far greater range than the standard 150 metres. The operating radius of 10km is akin to the cell spacing for cellular telephones and thus when rolled out nationally full mobile internet connection will be available.

5.5 Hardwiring

Where craft are permanently moored in a basin or marina the ability to hard-wire broadband access obviously exists. The standard option is the provision of a direct telecoms landline to each berth. Where a nucleus of users sign up, network access can be installed and broadband and telephone can be provided over a secure landline.

5.6 Experience to date is that broadband suppliers such as Oceanwave or ADR Communications are prepared to install local hot spot systems free of charge within a marina or popular mooring area. Built into such an arrangement is a 'profit' share between the supplier and the marina operator, in that over a certain level of traffic, a payment is made to the marina operator. Therefore an income can be produced for the marina operator or the navigation authority at no financial risk.

Case Study: British Waterways Marinas Ltd (BWML)

BWML operate eighteen marinas across the UK. At Sawley Marina, where there are over 600 berths, users have asked for broadband provision on their moorings especially those designated for long-term use.

To meet this demand ADR Communications of Nottingham were approached. They installed a base station, and initially a single antenna, to provide a WiFi service to the moorings. To give complete coverage a second antenna was added and now the whole marina is served at speeds of up to 2 megabyte. Initially there were problems with coverage but with the second antenna and the provision of onboard aerials to provide better reception to laptops, a very reliable level of service is provided. Occasionally transmission rates can slow due to users making large downloads such as films.

All installation and service costs are carried by ADR and all that BWML does is to introduce them to moorers, for which they receive a commission. Any failure or poor performance of the system is dealt with directly between the moorers and ADR. A monthly fee of between £12 and £18 is charged for the service. The system is being progressively rolled out to other marinas in the group.

Lessons learnt

Ensure that a suitable agreement is in place to cover the installation of the equipment and its removal. As a marina operator, do not get involved in the direct delivery of broadband!

Issues for the future

- Some moorers wish to have a hard wired connection. If sufficient numbers in a marina will sign up, BT will provide lines as per a domestic installation
- Can a cable network be installed to remove the need for potentially visually intrusive aerial and satellite dishes from boats and be used to improve the service provision by the marina?

5.7 Conclusion

The provision of broadband access to boaters is not a core business activity of the navigation authorities and with the current financial constraints and the focus on existing business opportunities it is extremely unlikely that it would become one. However, it does provide a higher level of service which other leisure industries consider to be the norm. It is a very cost effective way of communicating with, and servicing customers and others. It is also a potential new income stream, although the duration of the opportunity is probably very short due to technical developments in this market.

5.7.1 With the rapid development and ongoing change in technologies it is a high risk business for the navigation authorities to invest directly in as any installation could be rendered out of date or a new form of interconnection maybe developed and provided by others.

5.8 Recommendation

The navigation authorities should offer the facility for a single supplier to purchase the right to install WiFi across the UK inland navigation system. This would be preferable to a multitude of different suppliers who would demand entry fees from each user as they move around the network and create a very disjointed system. Their combined 'procurement power' could realise commercial value for the navigation authorities.

5.8.1 Provided the national access rights were not abused in terms of a monopolistic charging structure, then a high availability of service could be created as well as an income stream at no financial risk to the navigation authorities.

5.8.2 In asking for expressions of interest from WiFi suppliers the navigation authorities should ensure that remote locations are also provided with WiFi as part of a national contract. Typical locations to consider are Denver Sluice or Crinan Lock.

5.8.3 The development of broadband connection from cellular providers may create better access across the whole navigational network rather than by creating hotspots. The market will decide!

6.0 Waterway Customer Service and Information

6.1 **Waterway visitors' use of ICT and devices.** Compared to 10 years ago, the public have become much more sophisticated in their use of information technology and devices in their daily work and leisure life. Data from ipsos-MORI's Technology Research² shows that 85% of UK adults use mobile phones, with usage at similarly high levels across social class, and 63% use text messaging. 63% have internet use 'anywhere'. This figure is higher for particular groups, for example, 71% of 45-54 year olds. 29% of UK adults use an MP3 player. This figure is higher among younger groups but, still, 22% of 45-54 year olds and 11% of 55-64 year olds use one.

6.1.1 Waterway users vary in their broad demographics, depending on the type of use / purpose of their visit (eg angler, boater, pub visitor) and hence their use of ICT. Most boaters would wish to have this service available on board craft either by direct connection to the web or by previous downloads or from CDs and DVDs so as to access information, which ranges from navigation and safety guides, details of facilities, licensing information and navigation closures to leisure / tourism information. Research from British Waterways³ shows that 84% of their boat owners surveyed and 95% of hire boaters surveyed have access to the internet.

6.1.2 Whilst the majority of adults use a mobile phone and many have access to a computer and the internet, there are a growing number of people accessing the internet from mobile devices such as multi-media phones and Personal Digital Assistants (PDA). With the advent of the *i-phone* and similar products, demand for the mobile web will only increase, although there are some limitations which include small display screens, incompatibility with the current format of some websites, a potentially slower speed and some devices being unable to access PDF's or video sites. However the industry is developing standards and best practice with the aim of providing reliable, accessible web browsing. One option is a 'multi-web practice' where the organization provides its website in different formats for different devices.

6.1.3 Internet users are increasingly accessing podcasts (audio broadcasts) and video-casts (video broadcasts). These can be viewed online or downloaded as digital media files onto computers and portable media players, meaning they can be played offline as required.

6.1.4 Whilst there is still a wealth of customer information in printed format, ICT is playing an increasingly important role. Navigation authorities should therefore provide information to customers in formats that are compatible with, and accessible by, the ICT devices used by their visitors. They will of course, need to develop a profile of the type and level of ICT use by their visitors in order to develop the format and content of their customer information accordingly.

6.2 **Waterway visitors' information requirements.** The information required by waterway users could be categorized into several groups. The different types of information lend themselves to different formats as per the following example.

² Ipsos-MORI 2007 Technology Research 2007

http://www.ipsos-mori.com/assets/loyalty/technology/flyer.pdf

³ British Waterways Boat Owners Survey 2006 and Hire Boater Survey 2006

Information	Examples	Suitable format	Current service
Instant alerts	Emergency closures of towpath or waterway, congestion at locks, warnings, eg fallen trees, pollution, weather warnings	Text message Email	Email service for EA and BW stoppages offered on Waterscape.com
Tourism and boating information	Waterway maps and directories showing facilities (eg locks, toilets, visitor moorings) and services (eg shops, pubs), attractions and places to visit, transport connections	Web pages Word document PDF document CD DVD Podcast	Websites with interactive maps and search directories Some downloadable Word and PDF documents The most common source of this type of information (after websites) is found in guidebooks, eg 'Nicholsons'
Users' guides	Boaters' Handbook (navigation advice, how to use locks, moor safely), cycling code of conduct, angling advice, cruising guides	As above, plus Videocast	Website pages Many downloadable Word and PDF documents Video and DVD Printed leaflets and guides

6.3 **ICT devices and information format.** A summary of the main devices publicly available and therefore potentially used by waterway customers follows, along with their functions (although functions vary depending on the model and specification). These functions indicate the format requirements of information being accessed by the user.

Device	Description	Text	Email	Inter- net	Pod- casts	Video -casts	Word docs	PDF	CD	DVD
Mobile telephone	Standard cellular phone	Х								
Multi-media mobile phone, eg i-phone	New generation mobile phone with many functions (i-phone was named Invention of the Year 2007 by Time Magazine)	X	X	Х	Х	X				
Personal Digital Assistant, eg Blackberry	Mini-computer/palm top. Functions depend on the specification		Х	Х	Х	Х	Х	x		
Personal computer	Personal computer, lap-top		Х	Х	Х	Х	Х	Х	Х	Х
Portable media player, eg i-pod, MP3	Plays previously downloaded audio and sometimes video files				Х	X				
DVD player	Plays DVDs (audio-visual)									Х
CD player	Plays CDs (audio)								Х	

6.3.1 Devices which can connect to a network provide the user with instant information on the move. This allows them to look up current and relevant information as they require it, although this is ultimately constrained by the availability of the connection as referred to in Chapter 5. Many of these devices do also store previously downloaded files.

6.3.2 Devices which are 'offline' offer reliability when accessing information, but this has to be researched and stored in advance.

6.3.3 The main navigation authorities either have their own, or support, a customer-oriented website. The standard of these websites is excellent with extensive information and interactive maps, plus many documents in a PDF or Word format for downloading. Interactive waterway maps and the broad range of information they display are an excellent way for all types of user to search and find the information they need. Web pages showing selected sections can be printed or downloaded. Regular updating is obviously good practice. The service is invaluable for planning a trip, inspiring visits to new places and new activities, plus sourcing information to help decisions whilst on the move. Good examples include:

a) <u>www.visitthames.co.uk</u> by the River Thames Alliance.

Along with information for different users, there is the 'plan your trip' feature to search, select and record details about attractions and facilities for a specific trip. Once everything is added, the personalized route can be printed or emailed to the user.



b) Plan your trip



c) <u>www.waterscape.com</u> by British Waterways (BW). This site contains a wealth of information about Britain's canals, rivers and lakes (not just those managed by BW) including an extensive search facility and detailed information for all types of users, plus online licence renewal, mooring vacancies etc.



d) Boaters' guides and useful downloads

>> Canal boat holidays	Our Boaters' Guides list facilities across the waterway network.
>> Hotel boat holidays	Each guide is assembled fresh from our database when you download it - so you
» Day hire and trip boats	always get the latest information.
>> Hire-boat FAQs >> Hire-boat ratings guide	As always, we would like to hear your comments and corrections on the information contained within.
plan a cruise	The maps are automatically generated by computer, and we are continuing to improve them.
» Cruising rings	1 select waterways
>> Waterway dimensions	
>> Stoppages	Choose waterways:
>> Waterway facilities	Airs & Calder Naviantian
other useful info	Ashby Canal Ashton Canal
>> Useful downloads	Birmingham & Fazeley Canal Birmingham Canal Mavingtings
>> Buy boating essentials	Bridgwater & Taunton Canal
>> Canoeing	Calder & Hebble Navigation
	Caldon Canal
latest news	To select more than one waterway, up to a maximum of five, hold CTRL (PC) or the
>> HBS legging Standedge	Apple key (Mac). Scottish waterways are covered in the already-published Skippers'
Tunnel	Guides.
>> Plans to reduce lock	2. download guide
houses along the Thames	
» Paddington canalside to	What would you like your guide to include?
get major green makeover	✓ Navigation notes ✓ Lock and bridge info ✓ Stoppages and restrictions
uncoming events	✓ Facilities and water points ✓ Visitor moorings Larger text
up conning events	✓ Winding holes ✓ Slipways and docks ■ Bridge numbers
>> Art exhibition by Guild of	
Waterway Artists	Download guide
12 Mar - 26 May	The solid soll has to DDE formation does not be to extend to exact the solid does have different
the Museum of the Broads	are using Windows, the window may go blank during that time.
27 Mar - 20 May	
	- Internet

Case study: www.waterscape.com

Waterscape.com is the main website for public information about the UK's inland canals, rivers and lakes. It has a wealth of information targeted at different types of waterway visitor (boaters, walkers, anglers, cyclists...) with an interactive map, search function and downloads.

Launched by British Waterways (BW) the aim was to include information about all UK waterways and waterspaces (not just those managed by BW.) Visitors to the website have grown progressively to 1.65m in 2007/08, demonstrating a strong demand for web-based information and increasing visits to the waterways.

Content management: A strength of the site is the wealth of detailed local information. This relies on the effort of knowledgeable individuals to research and provide the information, and then keep it updated, which is critical to retain user confidence. Content management is currently limited to certain staff, but BW is considering opening up access, provided quality can be maintained. It has been difficult to get some information from other navigation authorities – possibly because they prioritise their own websites –although Waterscape.com could arguably meet their customers' needs and the high volume of visits to the site should encourage them. One success has been incorporating the EA's fishery information so that anglers can now search for a fishery in a particular area or by postcode.

Waterscape.com could also be used as a platform for sharing information between navigation authorities such as water levels, licence evaders or usage levels of facilities, for example. The data would need to be held in a simple 'generic' format, and access to it strictly controlled by codes. The navigation authorities could then download the data and analyse it as required. This collaboration would rely on protocols plus data protection considerations, but the benefits could make it worthwhile.

The cartography is currently subject to Ordnance Survey licensing and hence subject to certain constraints. The navigation authorities have important waterway-specific information ranging from winding holes to water points. In theory, they could create their own cartography using Global Positioning System (GPS) technology, add the layers of waterway information and create detailed maps. Whilst this would require initial additional resource, these maps could bypass the Ordnance Survey and would have a potential commercial value that could be licensed to others.

User interaction: BW is exploring possibilities for enabling greater user interaction. The waterways have their communities of users, many of whom use networks on the internet. As with many product-based websites, there is potential for customer reviews, advice and information which could also contribute to keeping the site up-to-date. There is also potential for greater interaction during public consultations, by allowing people to comment on or edit consultation papers (subject to etiquette rules). Whilst this would require resource from navigation authorities to monitor and respond, it would enhance the debate by easily allowing everyone to see others' views.

Future improvements: Future improvements being considered include:

- Publish all information in a 'platform agnostic' format so that the browser of the user's device can access the information
- Personalisation of the site whereby a user can select preferences and view content only relating to their interests /location
- Allow the user to select Rich Site Summary (RSS) (website feeds) options from the site to give them 'live' updates such as latest news, events, and stoppages
- Develop new RSS feeds from other relevant sites into Waterscape eg weather
- Blogs and podcasts by different staff eg lock-keepers, patrol, environment and heritage specialists to bring information and news to life (the tone needs to engage the public, and not appear too 'corporate')
- Investigate the viability of improvements to online licence renewals whereby the process would link to the Boat Safety Standards and boat insurance databases to automatically check the status of the boat. Currently 10% of BW's licences are renewed online, and customers are only eligible if they do not want to change any details; they make a declaration about Boat Safety and insurance

Waterscape.com has evolved considerably since its inception and is recognised as the definitive site for public information. Other navigation authorities (and the public) would benefit from increased participation and they should explore the potential for closer collaboration.

6.3.4 Other formats of customer information produced by navigation authorities, retailers and associations include DVDs (of mainly boating guides) and traditional printed guidebooks, leaflets and maps as the norm. Whilst printed paper is always to hand and has served users sufficiently well, the information becomes dated and is arguably limited compared to online sources. There is very little information for waterway users in digital format. Simple websites can be created which are informative. The Middle Level Commissioners have recently launched a navigation website at http://www.middlelevel.gov.uk/pdfs/NavNotes2008.pdf which is most informative.

Local cruising plans can be incorporated to give specific advice at hazardous locations, as the Broads Authority (BA) has done at Great Yarmouth.



The rivers, bridges and currents in Great Yarmouth

6.3.5 Further information could be made available to the general public, or users, by the provision of standalone web connected information panels either incorporated into existing buildings such as facility stations or infrastructure or in display booths. The equipment can provide either limited of full access to the internet and provide access to local tourism information, interpretation or even downloads by means of a very localised one way WiFi link. Information could be free, chargeable or downloaded via a Smart Card payment.

6.3.6 Conclusions

As the public become better-equipped with the latest technological devices, their demand for more information in more sophisticated formats will increase. Consequently the navigation authorities need to satisfy this demand. In time they will be able to provide a service that can be accessed by more people and provide increased user satisfaction which should help to engage greater numbers with the waterways and enhance their enjoyment. Navigation authorities must therefore ensure that their systems are able to provide all relevant information in an electronic format capable of being transmitted over the internet to a variety of devices whether home PC, laptop, mobile phone or any reasonable future development.

6.3.7 Recommendations

 Navigation authorities should consider developing their websites in a format compatible with mobile-web devices, or use multi-web practice. Design and development could potentially be costly, and therefore collaboration between navigation authorities could reduce costs and also provide the user with consistent content and seamless transition between waterways managed by different agencies

- With such extensive information available on waterway websites, more pages should be in a downloadable format (Word document or PDF) rather than just printable pages. The user can then store the file on their PC or PDA eg maps, a list of pubs, a guided walk. It is interesting to note that the main producers of printed waterway guidebooks and maps do not offer their guidebooks on CD or as downloadable PDFs (for a fee). The magazine Yachting and Boating World is converting 50,000 articles in its archives into downloadable PDFs; those already available cost £5
- Navigation authorities could create CDs of waterway maps with some level of interactivity, as on their website. These would be useful in laptops whilst on the move and where there is no live internet connection available
- Navigation authorities could create video-casts of information such as users' guides, which the user can download to an i-phone, portable media player or PC and recall as required. Information currently in video or DVD format (such as the Boaters' Handbook produced by BW, the EA, BMF and endorsed by AINA) could also be presented in a video-cast format. The forthcoming Hire Boat Code (being developed by BMF and MCA with technical and operational standards) will need to be easily accessible by the hire boat trade and presents opportunities for different formats, including downloads, interactive CD, DVD and video-cast. The benefits of video-casts include the ability to quickly and cheaply update information as required, potential savings on production and distribution costs of videos and DVD's, plus greater accessibility by users
- Navigation authorities and/or their stakeholders could develop a series of self-guided tours of certain sections of waterway, aimed at specific users, in a podcast format for downloading to an i-phone or portable media player. Users could then access a 'running commentary'. Podcasts for (a) walkers and (b) boaters will probably the most popular. These could be developed in association with local enthusiasts, disability groups, tourism associations and others, and could be funded by sponsorship or inherent advertising
- Navigation authorities could offer a service whereby users could subscribe for mobile phone text
 message or email alerts (eg about closures, congestion, events etc) relating to a specific area
 and/or duration of their visit. Navigation authorities would need to estimate in advance the likely
 level of texts in order to secure the best financial package. Basic enquiries suggest a charge to
 the user of approximately 25p per mobile text message. Alternatively, the service could be
 provided free as part of an enhanced licence
- Navigation authorities should include questions about technology devices in their research of waterway users to help show the likely demand for information in different formats
- Hire boat companies could consider providing devices to holiday-boaters, for a suitable deposit and fee, such as an i-phone or computer with internet access, (possessing previously downloaded podcasts and video-casts, DVD's and CD's with relevant guides and information which will also be accessible when internet access is unavailable)

6.4 Sales of local services

Facilities provided by navigation authorities have usually been free but as more expensive services are required, a charging system has been introduced. Initially this was done using coin operated charging equipment but in the last decade a move to the use of electronic systems involving the use of swipe card technology has been adopted. The predecessors of Waterways Ireland introduced a chipped Smart Card to charge for individual lock passage (as an alternative to a cruising licence) when the Shannon and Erne Waterway was restored. The Broads Authority, Environment Agency and British Waterways introduced cards for the sale of electricity at hook-up bollards. BW also used cards for customer-operated pump-outs and showers.

6.4.1 The use of Smart Cards has greatly increased in society in recent years and, as a result, they are more readily accepted by the public in a variety of contexts such as travel, entry systems, identity and payment systems. However, it is essential that adequate levels of security commensurate with the level of financial transaction are built in to engender confidence in the user and the operating organisation.

6.4.1.1 The current technology offers a large built-in memory both on the card and on the reader unit, swift contact-free cashless transactions/access, robust cards and readers (resistant to water, weather, vandalism etc), remote data transfer from reader units and remote top-up facility via mobile phone technology. Due to wider use, the cost of producing cards and reader units, plus maintenance has become more attractive.

6.4.2 The potential uses for Smart Cards on the inland waterways are significant and could reach a variety of users far outside the current paying customer. Two types of card could be offered:

- I. Cards that are fully prepaid, not rechargeable and not linked to an identifiable person. The fully prepaid cards would be readily available locally across the network and would be suitable for anglers, pedestrians, cyclists and any other organisation that might wish to use or expand the use of waterway facilities
- II. Cards that are available to paying customers, eg boaters. They are issued to identifiable individuals, and can be personalised. They would permit access to operating equipment such as locks and swing bridges, purchase of pump-outs, access to, and charging for, electricity at moorings, showers, laundry and any other facility
- 6.4.3 Both types of card have wider uses and customer benefits:
 - Cashless payments for Pay & Display angling, eg permits for local/day fishing
 - Cashless payments for Pay & Display parking
 - Cashless payments for Pay & Display visitor mooring (eg the purchase of daily permits at sites where there is a charge)
 - Permitted access to restricted areas (eg gated moorings, recycling facilities)
 - The installation of stand-alone readers at key locations would allow users to collect points for 'walking to school' or waterside heath activities, and the possibility of motivational rewards
 - Use as a discount card for visits to waterside events and attractions (the card-holder simply shows the card to get the discount – the service provider does not need to read the card electronically)
 - High users could have a gold card issued with attendant benefits and a loyalty scheme
 - The collection of points for boaters and walkers seeking a 'milestone' or destination award
 - The ability to create joint usage schemes within a given area in conjunction with Tourism Boards and other stakeholders eg Great Glen Way

6.4.4 The potential scale of use provokes the question of whether a fully integrated system could be introduced across the whole of the UK's inland waterways. The main consideration is an internal accounting system that allows all income to be credited to the provider of the particular service regardless of where and when the card was purchased.

6.4.5 DfT's Integrated Transport Services Organisation is currently developing an ITSO card that would allow all paid transport journeys whether by rail, bus or underground to be charged to the card holder's account and credited back to the relevant operators for the individual's journey - similar to the way in which Transport for London's Oyster Card operates.

6.4.5.1 It is not proposed that the inland waterways are integrated within the ITSO system (because of the cost and complexity) but it provides a model for creating a similar system allowing access to all the navigation authorities.

6.4.5.2 To create such a system, an organisation owned by the participating navigation authorities would have to be created. The purpose of the organisation would be to own, develop and provide the necessary equipment for individual navigation authorities to install and operate. It would be responsible for the wholesale distribution of cards, the collection of income and the regular remote monitoring of card readers to determine sales and thus allocate income back to the participating navigation authorities. It would have to be fully auditable, robust both in business delivery and operation, and be extremely cost-effective.

6.4.5.3 Such a system would use off-the-shelf technology with contactless card readers, a master server, Global Packet Radio System (GPRS) communications equipment where telecommunication signals permit, and mains or solar powered readers. Cards would be loaded with a number of prepaid units. Cards could be topped-up either automatically (by the individual setting up a direct debit at the time of purchase) or by the customer at dedicated terminals, or remotely by phone, all in a similar manner to that used for Oyster cards.

6.4.5.4 Security could potentially be a concern to users of personalised cards, but once reported lost or stolen, the card could be disabled. Furthermore, the relatively low value of the financial transactions involved, and low risk of abuse would minimise the problem. Replacement charges for lost cards would reduce negligent use. There would be no need for a high level of security, such as photographs or even biometrics to be included on the card.

6.4.5.5 The advantages of an integrated Smart Card system to the navigation authorities are potentially significant. In addition to the benefits for their customers identified earlier and expanding appeal to new users, navigation authorities could benefit as set out below. Many, if not all, the problems that have been encountered to date could be removed.

- Simplified and automated administration for charging for individual services
- Robust equipment which is operated 'contact-free'. This eliminates the need for keys / inserted cards and reduces the attendant problems and cost caused by vandalism and mechanical breakdown
- o Remote collection of sales information and data
- Remote changing of charging rates/tariffs
- Improved data (stored on the cards, the readers and the server) on patterns of individual and location-specific use which will assist with operational, strategic and marketing planning
- Potential for solar or battery powered card readers, reducing the need for mains power connection and hence use in remote locations
- o Allows secure access to equipment
- o Cross charging of sales to participating organisations
- Access to, and charging for electricity at moorings could be greatly simplified with Smart Cards allowing use of a prepaid supply, ceasing charging at the time of disconnection and crediting unused prepaid electricity back to the card. They could also provide security by ceasing supply if power leads are switched (supply is only reconnected when the correct individual's card is used)

6.4.5.6 The cost of such an installation across the network assuming some 3160 readers are installed is estimated to be £3.36m. The breakdown of these costs is shown in Table 1.

Table 1: Smart Card Usage

Facilities available	Peak Usage									-
	Ŭ				Volume/day					
		No	Fee	Anglers	Boaters	Pedestrians	Cyclists	Unit Cost	Capex	Income
			£							
Toilets	4/hr	300	0.5	2	0	4	2	1000	300,000	1460
Showers	1/hr	100	2		2		2	1000	100,000	2920
P&D angling	10/hr	100	10	5				3000	300,000	18250
P&D Parking	10/hr	100	2	5		5		3000	300,000	7300
P&D Cycle Permits	10/hr	50	5				1		0	1825
Storage Lockers	5/hr	100	1				50	2000	200,000	18250
Pumpouts	1/hr	100	10		2			1000	100,000	7300
Electricity Sales per kWh	1/day	2000	0.1		1			750	1,500,000	36.5
Laundries	1/hr	50	2		2			1000	50,000	1460
P&D Visitor Moorings per day	10/hr	50	5		5			3000	150,000	9125
Premium access per visit	4/hr	10	10		3			3000	30,000	10950
Operating power locks and bridges	4/hr	150	0		0			1000	150,000	0
Access to secure moorings	4/hr	50	0		0			1000	50,000	0
Development costs									130,000	
								TOTAL	3,360,000	78,876.5

P&D Pay and Display

Premium access - Anderton, Standedge

Seasonal use - the above figures may be zero for long periods

Electricity sales - hook up pillars are only connected once a day

0 usage by boaters represents free access

The above figures do not include maintenance or installation

Capex = capital expenditure

6.4.6 In considering the use of such a system it is vital that navigation authorities charge commercially appropriate rates for the services delivered, unless there is a valid reason why certain charges should be subsidised. Whilst there is a possibility of using Smart Card technology to control general access to the towing path, the principles and practicalities of this issue are beyond the scope of this report.

6.4.7 Sales of cruising licences and mooring permits handled by any Smart Card system could prove difficult as these are high value transactions and would need far more sophisticated cryptology to achieve financial security. Also, any national 'pay as you cruise' system would not be straightforward to introduce as it could potentially create a disincentive to cruising and would most likely require a major review of the structure of licence charges. For these reasons, whilst they may justify more research into their likely costs, benefits and disadvantages, this report does not pursue these options further.

6.4.8 There are a number of issues that would have to be addressed in creating any integrated system, particularly:

- Agreement and coordination between the navigation authorities
- The possible requirement for the organisation to be registered as a financial institution with the Financial Services Authority if the cards are deemed to carry a monetary value (as opposed to prepaid units)
- Lack of power supplies at some locations although solar charged readers are viable eg Pay & Display machines
- Some readers must be online to top up the card via a direct debit arrangement
- The concerns of a traditionally minded user group, but who are becoming more computer literate, and the need to provide systems for the future generation of users
- · Ready availability and marketing of prepaid cards
- Cost of distributing cards and the need to reduce the complexity of the system

6.4.9 **Conclusions**

The need for navigation authorities to provide more and more services but be able to recover costs and produce a positive income stream requires a charging system to be readily available. The use of card technology has progressed considerably over the last few years and has gained common acceptance by its users. The UK's navigation authorities should collaborate to set standards for a cashless payment system for day to day services to be progressively adopted as new equipment is installed or old equipment is replaced or updated.

6.4.9.1 However, the cost of actually managing the system must be thoroughly understood as it may well be the case that the financial analysis of the system would not indicate a worthwhile project but the soft benefits that would be derived as well as the need to replace existing systems would.

6.4.9.2 Some of the larger existing systems have been overly complex and as a consequence their owners have limited the range of use of the facilities offered.

6.4.10 Recommendations

- The proposal for a UK-wide Smart Card system should be further developed
- Consideration of undertaking a trial of a system within a contained geographical area eg Great Glen
- A progressive roll-out of a card system should be undertaken when it is shown to be viable in terms of financial and 'soft' benefits

Scenario - Great Glen Way

British Waterways Scotland (BWS) in partnership with Highland Council, the Forestry Commission and Scottish National Heritage have been developing three major tourist routes across the Great Glen to provide access and enjoyment for various users including boaters, cyclists, walkers and now canoeists as part of a canoe trail.

The main provider of service facilities, such as toilets and showers, to all these users is BWS, currently at no charge.

The opportunity exists to introduce some form of charging scheme which could allow BWS facilities to be used free by boaters as part of their registration /passage fee, but chargeable for all other users. Some 10,000 walkers per annum use the Way, with 1000 boats and 3000 crew/passengers transiting the Canal plus 7000 hirers on the resident local hire boat fleets. No figures exist for cycling use but it is believed to be considerable.

New facilities are to be installed by BWS to develop Wayfarer's Rests such as five self composting bio toilets contained in small sheds and serviced with solar powered electricity.

The development of a Smart Card prepayment system could provide the following benefits:

- Charges for facilities could be levied at multi owned facilities
- Downloaded information using GPRS technology would permit income to be allocated to the different owners
- Data on use would be collected
- Electronic 'hand stamps or passports' could be introduced for people to be able to prove they had completed the routes and receive an award
- Profiles for the different routes could be collected
- Income from 75% of the current non paying users would be collected
- Discounting on production of the card could be available at local attractions would engender 'their customers are our customers' marketing

However:

- The charges established for the facilities need to be realistic in terms of giving a return on any investment
- Prices should not be set so high that purchase is discouraged or that the cards could be abused by group usage
- Solar powered electricity and cellular telecoms access should be adequate to service the readers and associated equipment

Case Study: British Waterways

In the early 1990's a demand for hooking up boats to bollards with an electricity supply at BW moorings was identified as a major customer need. Following the installation of pillars offering electricity included in the mooring price, the demand rose astronomically.

Accordingly it was decided to introduce a metered chargeable arrangement for electricity hook ups. Following the introduction of Smart Cards in the Republic of Ireland, a similar arrangement was considered in the UK. The capital and running cost were thought to be high so an Ampy card reader and charging system, which reads a magnetic strip, was introduced. This was connected to a pulse meter which monitored electricity consumption and credits were removed from the pre paid disposable card as electricity was used.



An attempt to allow the card to be used by both BW and the Environment Agency was trialled but due to the problems of identifying cross boundary charging was abandoned. Users requested some modifications so that cards could be left in the reader and electricity consumed on demand with a quasi permanent connection to residential boats. The use of these readers was then rolled out to cover payments for pumpouts and showers. They have not been used to permit entry to these services as this has been done by means of BW's sanitary station key.

The introduction of the Electricity Resale Regulations created many problems as it was very difficult to link a 'credit' to the cost of a kilowatt hour of electricity. Eventually an appropriate tariff was introduced. However this led to another card being introduced for pumpouts and the charge for showers being abandoned.

Lessons learnt

Robustness - equipment must be vandal proof, capable of operating in damp conditions and be extremely reliable

Servicing - to maintain reliability and user confidence, equipment must be regularly serviced by competent staff and/or contractors

Flexibility - the ability to cope with a range of tariffs from a few pence to several pounds is vital **Security -** the readers do need to be kept behind lockable covers and with the current form, cannot be used to control access/entry to equipment, facilities etc

Environmental - the use of readers does limit electrical demand at hook ups, and showers therefore reducing the carbon footprint

Issues for the future

Maintenance - remove mechanical readers and replace with solid state contact-less readers to reduce servicing and improve reliability

Flexibility - ability to charge a wide range of tariffs which are easily changeable. Establish traffic patterns and determine density and congestion Ability to credit income to different organisations

User friendly - greater application of readers to other facilities.
 Available to other waterway and non waterway users
 Cards more locally available through marinas and local shops
 Develop personalised cards to give a choice of services to licence holders
 Access - are the readers sufficiently secure so they can be left exposed. Can they be used to control access to facilities and operating equipment?
 Can they be used to control access to lengths of waterway (congestion charging?)
 Standardisation – unit costs would be reduced, easier/ common customer interface and simple modular replacement of repair

Case Study: Waterways Ireland

When the Shannon and Erne Waterway was restored in the early 1990's, the then navigation authority, now a part of Waterways Ireland (WI), decided to introduce a 'Smart Card' access and payment system to allow operation of the restored locks.

At each lock a simple card reader was installed. A boater would purchase a prepaid disposable Smart Card prior to commencing their journey (or from local shops along the Waterways) and insert it into the card reader. This then unlocked the control system, permitted use of the lock and removed a number of units of 'credit' from the card as payment for using the lock.

This worked very well but users were concerned that they could not see how many credits were left on the card or occasionally felt that too many credits had been removed. This was overcome by pairing the card reader with a bilingual display panel that not only gave information on the credits already used and how many were still available, but could also issue commands for the use of the equipment.

The new approach was very successful and consequently the use of the readers and the card has been extended across the whole of the WI network and is used either to permit free access to some facilities or to charge for the use of facilities such as showers, pumpouts outs and laundry.

In 2005 the Smart Cards that were used were no longer available and as a consequence an updated card specification was introduced. This gave greater functionality but required all the readers to be replaced. The new readers had to have the ability to read not only the new cards but also the old ones as some of these were still in use. The improved readers (Type 2) are suitable for incremental sales such as electricity hook up bollards, where a continuous purchase of electricity is required. The same principle can be applied to pump-outs so that the charge is directly related to the period of use.



The new readers are in fact intelligent terminals and record every transaction which can be downloaded to a laptop. This provides a service history as well as computation of payment to all authorities who provide facilities on the WI system.

Whilst a steady revenue stream is produced which is credited centrally to WI, there is a high level of continuing support cost in terms of ongoing maintenance and distribution of cards. Taking into account the disposable card production costs and the regular replacement of the equipment (expect 20 years life cycle), it is thought that the benefit when calculated as a 'whole life project cost' is marginal. However the non-financial benefits of having such a system add considerably to its value.

Lessons learnt

Robustness - robust and vandal resistant equipment (Proximity cards) Maintenance - reliable and well maintained by trained contractor Availability - card to be readily available locally User friendly - cards liked by users- engenders respect and control of the system Brings respect and control of the system Monitoring and control - needs to be upgraded or replaced regularly due to changes in technology

Issues for the future

Flexibility - greater functionality within the cards to increase range of services available Rechargeable card that can be easily topped up Personalised card with rechargeable credit option Future proofed for updating when software and hardware changes *Access* - can be used by other organisations such as discounted access to local events *User friendly* - proximity card rather than contact cards

Case Study: Gota Canal

We have a card for our pleasure boats; they get two cards when they pay their ticket for the canal. With this card they can use our toilets and showers and the washing machine if there is one.

They can also go into our museum with this card. Our facilities are available all time of the day because of this card. Some years ago the shops in the neighbourhood gave some discounts when the customer showed their card. It was a lot of work for us to put together this small discount, that's why we don't do it any more.

Before we had this card we used codes for our facilities, these codes were easy to tell everybody and the toilets where always dirty. Now when only our customers can reach them there is a big difference.

Lessons learnt

Cost of operation and its complexity can be a problem Control of access to facilities will keep up higher standards

Issues for the future

Reduce operating cost of the system

7.0 Supervisory Control and Data Acquisition (SCADA)

- 7.1 Many of the day-to-day operations involved in operating a navigation network have until very lately been undertaken on a manual basis. However with increasing labour costs, a reducing budget in real terms and the greater availability of off the shelf hardware and software, greater use is being made of remote sensing and operating equipment.
- 7.2 Once a reliable telephone network, the Public Switched Telephone Network (PSTN), was installed across the UK, simple remote sensing devices were installed to provide very simple information to a control room such as the Teletone system for river level and flow information. Whilst these devices worked well, the fact that they operated mechanically and needed to be specially installed by BT's predecessor, the General Post Office, meant they were very limited in application.
- 7.3 The large scale development of remote operating and monitoring systems has been taken forward since the 1950s by the oil and utility industries. Development of telemetry and UHF radio communications led to the development of monitoring equipment to relay operational information from locations not connected to the PSTN.
- 7.4 Reliability has increased significantly with the development of Solid State technology. The replacement of analogue by digital measuring systems has simplified the measurement process. The advent of cellular telecommunications and the General Packet Radio Service (GPRS), along with the development of intelligent remote terminals that think for themselves, has meant that much more sophisticated measurement and operation can now be safely introduced.
- 7.5 The benefits of such equipment have led to the development of Supervisory Control and Data Acquisition systems (SCADA). This equipment can be used to 'self-analyse' its performance at the remote location, take corrective action within a predetermined set of parameters, raise various alarms and allow personnel to undertake remote diagnostics of the installation. This type of equipment can speedily improve customer service, reduce costs and downtime, and provide a useful flow of information to assist the operation of a network.
- 7.6 The introduction of a SCADA system or similar does require an integrated approach to the maintenance of mechanical and electrical (M&E) equipment. However with such equipment now being managed on site by a programmable logic controller (PLC) connected to a Remote Telemetry Unit (RTU) or outstation rather than mechanical switches or relays, the ability to insert some form of intelligence into the control pack and link it via a modem to a central control station is now relatively cheap. The typical cost of connecting up a PLC to a central location is approximately £10k for a typical level monitoring outstation.
- 7.7 This type of system can be designed so that once a fault is detected on site, either a backup duty system can be enabled or an alarm is sent either to the control room where a diagnostic check can be undertaken, or alternatively to page a remote duty supervisor who can then interrogate the site remotely using a laptop or via a Web Access Protocol (WAP) enabled mobile phone, as is the case in BW's *SCADA Live* communication system. By being able to diagnose the problem, supervisors can immediately determine the best course of action, allocate the correct repair resources and advise customers of possible delays. As a consequence, customer service can be improved by the fault being fixed without the customer being aware there was one, or a proactive approach to the customer can be made to help mitigate any delay or inconvenience.



Typical SCADA Mimic diagram

- 7.8 The installation of SCADA systems along with existing telemetry systems (the difference being that the latter only report data) would allow automated measuring and reporting to be used to better control water levels on canals or to commence Strong Stream warning systems on rivers. The ability to be able to monitor and control water supplies such as the remote operation of reservoir valves could save significant quantities of water, reduce staff costs, assist with water regulation and the application of the Water Framework Directive (WFD), and assist in dealing with the impact of Climate Change.
- 7.9 The linkage of such systems to a remotely operated Variable Messaging Board (VMB) or a customer alert system (eg SMS text, email or RSS) warning system etc would allow customers to be advised promptly of potential operating difficulties and thus reduce inconvenience, as is the intention of DfT's motorway signage system.
- 7.10 Whilst the cost of a SCADA system is relatively cheap with typical site costs from £8k for flow monitoring through to £30k for a pumping station, the set up cost for the smaller navigation authorities could be inordinately high. As a consequence it is suggested that a SCADA Bureau Service be set up that would provide economies of scale in terms of central management and operation whilst allowing outstation equipment to be procured more cheaply. Such a system could be operated so that each navigation authority retains control of its own operation and the bureau is merely the electronic hub.





Typical water level telemetry outstations

- 7.11 A further refinement of the use of SCADA is the control of pumping stations. Power-demand sensing equipment can be installed on site and report energy consumption on a half hourly basis. By linking the SCADA system through an analytical software package such as Multismart (www.emeraldsystems.co.uk), the operation of the pumping station can be so controlled as to exploit natural feeds, the storage component within the freeboard of a canal pound, low cost electricity tariffs and thus reduce electrical consumption, reduce costs and carbon emissions. If nothing else the monitoring of electricity consumption can allow an energy broker to obtain better tariffs for the authority (The Energy Broker www.tebl.com).
- 7.12 The development of a SCADA system is not necessarily limited to the operation and monitoring of M&E equipment. Pedestrian, cycle and boat counters can also be interlinked with the system to provide daily or real time feedback of usage. Such information can assist with day to day operation in terms of water resource planning but can also be used at the strategic level for the development of routes, network capacity and facility development.
- 7.13 It must be stressed that wherever investment is made in the installation of any SCADA or telemetry system, that ongoing maintenance and servicing of the equipment is a priority. Any failure to maintain the equipment can very quickly lead to it and the system's failure which can at the least expose inadequacies, but at worst may lead to injuries or fatalities. The normal standard appears to be a six monthly preventative maintenance check, which is critical to ensure reliable operation, together with daily checks of the system by the user.

Case Study: British Waterways (BW)

BW owns and operates some 650 SCADA sites including locks, bridges and pumping stations. Most of these have been refurbished over the last fifteen years and provided with updated control equipment using GPRS enabled outstations, Programmable Logic Controllers (PLCs) and state of the art Pump Controllers (Multismart). The opportunity has been taken to set up a central control point at Hatton which forms the hub of the SCADA system. In most cases communication is by GPRS, although some older sites still use the Public Switched Telephone Network (PSTN) as the primary communications system and/or fallback. Each site is configured with control and operation software within the PLC or outstation. The software controls the pumps automatically depending on water levels and other parameters such as time of day for cheap electricity. The status of all the Mechanical & Electrical (M&E) equipment on site is monitored and usage and operating data, including water levels is recorded for onward transmission and archived at the central hub.

The site can be interrogated at any BW networked PC, or laptop plus mobile phone either from the hub or remotely either through an intranet or internet facility. This means that a local waterway operator is able to check from any location with a mobile phone signal. When the outstation identifies that an operation is outside of its intended scope or a fault has occurred, then an alarm message is sent to the hub and is automatically forwarded to the relevant on-call waterway team or supervisor.

Outside of working hours a page alarm is transmitted to the duty officer who can then call up the site remotely on a laptop/mobile phone, view the error and see whether a specialist response is required (there is a national SCADA maintenance contract now in place) or whether the standby team can deal with the matter.

Lessons learnt

SCADA Live – giving the waterways access to the system anytime, anywhere using a Web Access Protocol (WAP) enabled mobile phone

New maintenance schedules are now completed electronically on laptop. This is a huge improvement on the old paper-based contract which improves reliability and efficiency

Keeping on top of new technology, 95% of BW's flow and lock counter sites are now solar powered

Issues for the future

Vandalism is becoming a big problem in that equipment can be wrecked or abused creating false alarms or damage

As technologies develop, dependence on third parties who provide services such as Vodafone or Fibreway increases significantly. Are their systems and the Service Level Agreement sufficiently robust? Is compensation payable?

Currently sites work independently of each other. Integrated control philosophy of BW's systems is required i.e. looking at how sites communicate with each other and how BW can integrate this information for an overall control strategy.

7.14 Conclusions

The benefits from developing and installing a SCADA system are significant due to the improved maintenance and service delivery that can accrue by being able to monitor the performance of remotely located powered equipment. Reductions in standing time due to breakdowns, operator faults or abuse can be speedily attended to.

7.14.1 The added benefits of being able to control water supplies and thereby economise resources will be vital in the years ahead due to the impact of greater regulation and of Climate Change

7.14.2 The ability to optimise, if not minimise, energy consumption at pumping stations and other sites, will not only reduce green house gas emissions but also make very significant financial savings.

7.15 Recommendations

- All navigation authorities with significant M&E installations should investigate the options and benefits of establishing some form of SCADA system, either as individual authorities or via a bureau to improve M&E service performance
- All sites using significant quantities of electrical energy should be monitored at least, and control equipment installed to reduce power consumption and cost
- With the rapid changes in technology an M&E working group should be set up by the navigation authorities to exchange best practice and develop industry standards

8.0 Waterway Management

8.1 Managing a waterway network is becoming more complex due to the varied functions that it serves, the scale of regulation that applies and the need to be accountable to a host of stakeholders and other organisations. A number of key functions, such as asset management, have to be undertaken to meet these demands and these have to be carried out in a cost effective, efficient, meaningful and accountable manner. The ability to collect and process information in this manner is much enhanced by the use of ICT and especially the use of Geographical Information Systems (GIS) and Global Positioning Systems (GPS).

8.2 Global Positioning System (GPS)

One of the key issues in setting up any kind of network management system, whether to do with assets, licence evasion or estate management is the ability to be able to precisely locate and identify the asset etc. This can be achieved in a variety of ways using off the shelf equipment such as laptops, palmtops or dedicated monitoring equipment using a GPS, a Radio Frequency Identification System (RFID) or Bar-coding.

8.2.1 Global positioning is based on the US Defence system of satellites which allow a device to calculate its own position to an accuracy of at least five metres. Greater accuracy can be obtained on a very local level using an additional radio signal known as Differential GPS (DGPS). The accuracy of this system can be as good as 2cm.

8.2.2 By designating a GPS location to each fixed asset eg a bridge, then some form of hand held computer or Personal Digital Assistant (PDA), equipped with a GPS module, when held adjacent to the structure will be able to identify the structure geographically and then call up the relevant data base or system required. It may be the case that at the bridge a periodic inspection has to be carried out which is looking for any change to the structure and the system will display the previous report allowing the inspector to note any changes that may have occurred. Further integration with the main database can be achieved by means of either a cellular or WiFi link back to the local office allowing for an updated inspection report to be submitted and any remedial works be identified, approved and organised.

8.2.3 Where structures are mobile, for instance construction equipment, or vessels, then some form of unique identifier is required to be lodged on the item. With craft licences being printed, the opportunity to print a unique barcode on the licence disc could enable the details to be automatically scanned using a barcode reader.

8.2.3.1 Depending upon the device used, it may also a have a GPS device built in thereby recording the time and place where the vessel was seen. The benefits of recording craft in this way is that a history can be built up of a boat's movements and mooring which in turn can be used to identify excessive mooring, similar to car parking enforcement. It would also identify those craft that were registered or not, even recognising those that were displaying an out of date licence disc which often happens. The system could be set up to have the ability to manually input index numbers where the licence disc was unreadable for whatever reason.

8.2.4 With suitable reading equipment, Radio Frequency Identification tags (RFID) can be used as the identifier. A PDA, with an inbuilt RFID scanner, can be passed over the tag, whether it is in plain view or concealed, and will register the identity of the equipment and allow records to be immediately displayed. This type of system can be used to identify individual components within a pumping station or a large vessel and assist with planned maintenance or unscheduled repairs. This is similar to the chipping system to identify pets.

Case Study: British Waterways (BW) – Remote Working

BW has a very detailed asset inspection process involving monthly, annually and principal inspections being undertaken by trained staff and recorded on a paper based system. It has long been a wish to undertake this electronically along with enforcement procedures to minimise licence evasion.

The development of smaller physical size mobile devices, which have greater memory capacity, i.e. palmtops, has enabled this. Systems have been set up using a Samsung Q1 UMPC (Ultra Mobile Personal Computer) to be down loaded on a daily basis with an updated report on all assets in a particular reach of a navigation and also relevant details about all craft licences. The length inspector is then able to undertake a pre-programmed routine series of inspections.

When arriving at the site, the location is updated using GPS and a list of assets to be inspected is displayed. The inspector is then able to either add a 'notification' of a new fault or update a previous 'notification' relating to an existing fault that is listed from the earlier download.

At the end of the day or at the next visit to the office, the data can be downloaded directly to a server or passed on using a USB stick. New notifications and updates will then be automatically added to the main computer system and sent to the waterway supervisor for approval and action where appropriate. A full log of inspections is maintained on an archive basis which also records time, date and the details of the inspector.

A similar exercise is undertaken for licence evasion when patrol officers can type in to the device the licence number of any craft seen. The device records time, date, location via GPS, and the patrol officer's details. These are then downloaded at the end of an inspection or on return to the office and a report automatically prepared for follow up. Only minimal details are held within the device to minimise any risks to data security.

Both the asset and licence databases are regenerated every night by BW's mainframe computer and downloaded to local servers. The data, once loaded into the device, has a 'shelf' life of two weeks after which time it is automatically deleted so as to retain a degree of 'freshness'.

Costs of providing equipment are now very cheap with handheld devices now being available for under £400 each (the Samsung Ultra Q1 cost £700). Software and protocol development is perhaps the most expensive item but by using existing software packages a typical set up cost could be £100,000 per system.

The speed of development of 'hand held devices' is now so rapid that managing obsolescence is a major problem. Equally the constraints caused by interconnecting with a main frame system in permitting remote working are significant in terms of cost and rigidity of the operating contract. This has been overcome by creating downloads to local servers which then interface with the remote devices. Migration problems are overcome by using Excel spreadsheets for the handling of all information and locations are derived from standard GPS protocols. Hopefully as new devices are introduced migration will be very quick and cheap.

Lessons Learnt

- The cost of real time on line working is significant and rules out the possibility of working on line all the time
- The data needs to be regularly refreshed as appropriate
- Obsolescence is a problem and all systems must be capable of being moved from one type of machine to another
- Remote machines should be cheap as they may be lost in the water and should not attract a mugger's attention
- The constraints caused by the operating terms for outsourced main frame computers may stifle development either by cost or contract terms or by security needs

- The Ultra Mobile Personal Computers (UMPC) used by BW are intended for indoor use and so a more rugged device is required for full scale investment
- Paying for good quality equipment when working in difficult environments as on the waterway bank pays dividends

Issues for the future

- Greater availability of IT connection for all staff either by use of palmtops/UMPCs or access to online terminals at locks, bridges and depots
- Possibility of real time access with the availability of 3G WiFi or WiMax connections
- The development of caching facilities where there is poor mobile coverage, allowing for Push and Pull updates to occur, will be beneficial
- Development of IT and literacy skills for all staff
- When negotiating new outsourced main frame contracts, the operational use and remote access to it must be included in the terms for any future contract
- Full asset attributes i.e. condition grade and previous inspections to be downloaded to the UMPC

8.3 Geographical Information Systems (GIS)

With the development of a digitally based mapping system for the UK now being completed by the Ordnance Survey (OS), the ability to represent land and other assets in a digital form rather then on scanned maps and plans now exists. The development of software and hardware that can operate within laptops has now brought the benefits of digital mapping and GIS to the everyday user.

8.3.1 One of the key benefits of GIS is that databases can be created for a multi-scale approach involving the interaction of macro and micro databases with wide access to all network users. A framework can be created to facilitate effective integration and coordination of data from many sources and the content can then be used to address various issues ranging from costs, asset management, land management and strategic planning.

8.3.2 The ability to overlay many sheets of data onto a digital map means that the operator can 'pick and mix' a variety of data sets and produce a very simple plan tailored to the specific needs.

8.3.3 With a widely distributed network such as the inland waterways system, the ability to find a location by means of a geographical search through an intranet mapping system akin to using Multimap <u>www.multimap.com</u> or the OS 'Get a Map' site <u>www.ordnancesurvey.co.uk/oswebsite/getamap/</u> and then being able to drill down for different levels of information can allow rapid assembly of data. The benefits of GIS are such that much thought is being given to its use as the basis for any mainframe system of database rather than a pure financial one due to its ease of use.

8.3.4 The key advantages of a GIS approach can be summarised as follows:

- · Facilitates effective communication when set up correctly to deliver the right content
- Enables widespread distribution of data which can be extended over the web for the public to use
- Can provide simple but also complex spatial analysis tools
- Through spatial overlay, an integrated analysis of data can be undertaken
- Facilitates the utilisation of existing public databases
- More accurate and rapid determination of parameters
- Provides a more realistic representation of data

8.3.4.1 However, GIS can be

- Expensive to set up eg server, software and personnel time
- Data quality needs to be kept updated either by the business updating it, or buying updated data from the OS
- Might be hard to deliver the correct content to the user given users' level of IT knowledge

8.3.5 Conclusions

One of the great difficulties of using GIS and GPS is sometimes the lack of coordination of standards between organisations intending to share information between themselves. Whilst international and national standards are agreed, it is essential that each industry produces agreed standards specifically for its own type of unique business. This may even be as minor as to how the precise location of a structure is located or the type of symbol used to represent a particular structure or function eg a listed lock. Similarly the way in which other databases are attached to the GIS dataset must be specified to allow for detailed exchanges of information between navigation authorities, Government, stakeholders etc.

8.3.6 **Recommendations**

Navigation authorities are encouraged to develop the use of GIS and GPS across the whole spectrum of their activities. They should also create a mechanism to allow standardisation of systems which facilitate greater collaboration and common interfacing.

8.4 Licensing

Licensing is one of the main sources of income for navigation authorities but it also provides an opportunity for evasion and abuse to occur. The keys to maximising income are to make the issuing of licences as simple as possible and to reduce evasion. Dealing with the latter first, the ability to monitor the licensing of craft on the waterways is vital to reducing evasion. This can be done manually or electronically, or a combination of the two methods.

8.4.1 The use of staff to monitor licence evasion is sometimes seen as an expensive method of control but provided they can be deployed in a cost effective manner and assisted to collect and process data, then a positive return can be shown along with numerous 'soft' benefits. The use of PDAs as in the BW case study shows how staff can be assisted to check on more craft. It has been a long held view that such devices could make a difference and now that technology has delivered equipment of the correct scale in terms of physical size, capacity and interconnectivity, this is the way forward.

8.4.2 It is possible for craft to be monitored electronically, either passively or actively. The introduction of RFID tags onto craft is a possibility, say by moulding a tag into the craft registration plate. If the tag could be read at a suitable distance then this could be checked against a licensing database and unregistered craft could be identified and the necessary legal processes put in place. However, the ability to read RFID tags at the distances within the operating environment found on waterways currently precludes this as a proposal, let alone dealing with what would be seen as an intrusion onto the craft itself.

8.4.3 A passive option is the use of Optical Character Recognition (OCR) equipment similar to that used by the Driving and Vehicle Licensing Agency (DVLA) to spot unregistered vehicles on the highway. Cameras could be located at strategic locations, index/registration numbers would be read from passing craft and again a central database would be consulted. At the same time it would be possible to build up a picture of movements around the network by logging all the locations that particular registration plates were seen, thus helping to inform operational planning, congestion etc. However, this is discounted as a proposal because the location of index plates on a boat vary, evaders are likely to obscure the plate as they pass the cameras and the number of unlicensed craft actually on the move is less than 10% of those identified as being unlicensed and thus little would be gained over and above the current enforcement system.

8.4.4 Bar-coding has been suggested as a way of identifying craft but it would not currently work on the waterway for the following reasons:

- · Scanning can be difficult where licence discs are inside plastic covers and behind glass
- Scanning has to be done closely and therefore access on to the craft would be required but is not always practical
- Scanning of craft on offside moorings is not always feasible

8.4.5 However, the use of bar-coding in assisting the administration of paper documents could be useful if there was sufficient volume. Application and renewal documents could be bar-coded so on return to a processing office, the code could be read and the licence details would be immediately displayed to the administrator. This would operate in a similar manner to the Post Office arrangements for the issuing of Road Tax discs. 10% of BW's customers currently renew their licences on line, making a barcode redundant in any case, and there are intentions to expand the availability of this service. Therefore with the possibility of increasing the electronic process and the relatively low volumes operated by individual navigation authorities there may not be sufficient benefit. However it might be prudent to look at a unified system for bar-coding that could be used if there were to be an integrated licensing system introduced where there would be a considerable increase in volume of administration at a single location and a further reduction in cost could be identified as a consequence.

8.4.6 The ability to speed up the application and delivery of registration documents is key to increasing customer satisfaction with navigation authorities. All navigation authorities now appear to offer application forms on line as PDF downloads but only BW allows for renewal to occur online. It is recommended that application and renewal should be developed as a full online service, even to the extent of automatic reminders being sent by email.

8.4.7 This does however require a full link up with associated databases to eliminate the need for documents to be exchanged eg Boat Safety and insurance certificates. The facility to link the BSS database to all navigation authorities issuing certificates online should be developed. The possible development of an insurance database should also be taken forward with the Association of British Insurers that would allow for not only an immediate check to be made when a craft is licensed or renewed, but would also allow for spot checks to be made during the lifetime of a licence. It would also be beneficial to include a new craft's unique RCD Craft Identification Number (CIN) number when it is newly registered, to allow craft to be traced if it moves between differing licensing regimes within the UK. With the current number of craft on the network and their longevity, it is likely it will be many years before a comprehensive database can be created but it should be started.

8.4.8 The ability to pay for licences at the convenience of the licensee is also vital. Obviously online payments using direct debit or credit cards are reasonably straightforward. However an alternative for personal payments is to develop the use of a payment card system that, when presented with a renewal statement and cheque, card or cash at a Post Office or other payment centre, would allow the transaction to be speedily done on a local basis. This would require the issue of a payment card on a personal basis to licensees but it could be combined with a Smart Card and therefore allow for high value payments such as moorings and licences to take place whilst allowing smaller day to day transactions to occur such as purchasing electricity etc.

8.4.9 Conclusions

The ability to improve the speed and accessibility of craft licensing would benefit users, potential users and the navigation authorities enormously. However to achieve the economies of scale required to generate considerable savings and to simplify the application procedure, the navigation authorities should align their application processes and at the least set minimum common standards for data acquisition and processing.

8.4.10 Recommendations

- Full development of online application and renewal for licences and moorings
- Development of bar-code standards for licence documentation
- Automatic link between navigation authorities' licensing systems and BSS database
- Possible development of a link to online insurance database
- The recording of CIN on all licence databases
- Development of a payment card to assist with licence and mooring payments

9.0 Navigation information

The ability to access navigational information whether in the form of a chart or up-to-date information regarding closures, restrictions, cruising guides etc. is vital for safety and for planning and enjoying a safe cruise. Hard copy information has always been available but access via the internet or other forms of electronic media to provide information and contact with navigation authorities is vital.

9.1 Electronic Chart Display and Information System (ECDIS)

With the development of GPS and the upcoming European <u>Galileo Positioning System</u>, the ability to locate one's position on the surface of the Earth is now very simple. For seafarers and to a lesser degree those using the main estuarial navigations within the UK, the International Maritime Organisation's (IMO) ECDIS is readily available.

9.1.1 This requires an onboard navigational device which is compatible with IMO standards. The charts can be purchased electronically from the UK's Admiralty Hydrographer and downloaded to the equipment where it can be read and one's position identified by GPS. Courses, alarms and other functions can also be programmed, and tracking and way-marking can be undertaken.

9.1.2 However its inland waterway use is limited because the charts have a relatively small scale and their coverage of inland waterways themselves is also limited.

9.2 River Information Services (RIS)

RIS is the system adopted in 2005 by the EU that requires each member state, and the relevant navigation authorities, to set up a networking system to link all forms of transport, transport authorities, customs, vessels and operators to aid the smooth passage of vessels through river systems. However it is primarily designed to assist in the movement of goods and is not suitable for leisure craft.

9.2.1 For the UK it is not intended that RIS should be introduced as all incoming waterborne traffic will be serviced by Automatic Identification Systems (AIS) which is the marine equivalent and is required for all craft moving between the continent and the UK. Because no infrastructure is provided to service RIS, it will not be available to users of the UK's inland waterways.

9.3 Variable Message Boards

A recurring complaint of users is the lack of information available to them when they are under way should there be a failure of the network at any one location. Advance notice at least two days cruising away from a problem would be very beneficial and allow boaters to adjust their journey and seek another route where possible.

9.3.1 Arguably as the potential for texting, emailing and RSS feeds is developed, this will assist warning boaters and the need to put sign boards up at strategic locations might not be so necessary. However the view of users is that message boards would be most welcome.

9.3.2 In the past attempts have been made to use blackboards, 'A' frame signs or even flipcharts to communicate closures etc. However this has its limitations.

9.3.3 The use of electronic variable message boards (VMBs) would help overcome this problem. They could be discretely located on or within buildings, or alongside locks parallel with the water way and connected to a central control point either by landline or cellular phone using GPRS technology.



Canal-side Variable Message Board

9.4.4 As a closure developed, remote instructions could be issued to the sign to display the relevant information. An additional benefit with the increased availability of river level data is that VMBs could be used to give advance notice of Strong Stream warnings and allow users to moor up safely off river until water levels drop and safe navigation can take place. Signage could be installed for about £2000 per site with a one-off cost of setting up a control system of £1000 for an existing PC or laptop to be modified to act as the control point for either a waterway warning system or even a national one.

Case Study: CalMac Ferry Services

CalMac, the principal ferry operator in Scotland for the Western Isles, provides a system of Variable Message Boards (VMBs) at most of its slipways so that waiting vehicles can be informed of the estimated time of arrival (ETA) of ferries, any delays/postponements caused by bad weather or breakdowns or any other useful guidance.

The boards are all controlled from one central point at the CalMac Head Office and linked either by landline or more predominantly by GSM cellular networks.

The benefit of operating them centrally ensures a coordinated approach to signing and that any faults can be speedily identified and corrected to maintain the public's confidence in the system.

The cost of installation has in the main been met by the Scottish Government with support from local authorities.

The boards have helped the use of the ferries by providing up to date information on site and have greatly reduced the number of daily queries from passengers and drivers awaiting a particular service. It has also speeded up the distribution of information when routes are closed because of bad weather.

9.4.5 A further variation of the use of variable message boards is the use of automatic speed signs typically seen outside schools etc. Similar signs could be erected and triggered by craft when approaching locks or passing moorings too fast and which ask the boater to slow down. Where freeboard is regularly low due to local flood conditions, and the height of wash is crucial to prevent overtopping, similar signs could be used. Where fast cycling on the towing path is a problem, similar signs set to be triggered at a certain speed could help reduce problems.

9.4.6 The signage is now readily available and can be installed, either powered by a mains connection or by solar power. A side benefit of this equipment is that automatic data logging equipment is contained within the device and records details of all craft passing by with a time and date, allowing for a later download to take place thereby building up a picture of traffic movements to assist with network planning and water consumption.

9.4.7 Conclusions

The ability to set up a network of low cost electronic information signs either run nationally or locally would be beneficial in meeting users' needs for information to be made available to them when on a cruise.

9.4.8 **Recommendations**

The navigation authorities should consider how a Variable Message Board network could be set and up and installed to provide current information to users.

9.5 River levels

A request that is made frequently is for up to date online information to be available to boaters and others to ascertain river levels prior to setting out for a voyage on a river. With the recent number of Strong Stream warnings on the Thames and other rivers, the demand for this information is becoming greater and it would assist with safe planning of a cruise for it to be readily available over the web. Such systems are in widespread use on the continent (see, for example, real-time river flow and level data on www.inforhone.fr).

9.5.1 Fish Scotland, which is a marketing and management organisation for the country's game fisheries, has linked up with the Scottish Environment Protection Agency (SEPA) and the Environment Agency to receive water level data twice a day and display it on their website. The information is assessed as height of water above normal summer water level and whether it is falling, steady or rising.

Case study: Fish Scotland

To meet the requirement of fishermen on the major Scottish salmon rivers for current information on water levels and their immediate history, Fish Scotland have set up an automated system to allow a number of sites to be viewed across the country via an internet connection and website.

Data is collected twice a day from the Scottish Environment Protection Agency (SEPA) and the Environment Agency's water level recording system and it is analysed and presented as a height of water above normal summer flows (Q95) and depicted as ' steady', 'rising' or ' falling'. See <u>http://www.fishscotland.co.uk</u> (take 'Salmon' section then 'River levels'). Information is shown per day, per last 28 days and per the last year.

The system is robust and provides well presented information in a meaningful way as a depth of water above normal flows, as is used in the case of reporting Strong Stream Warnings on the UK's river navigations. The service is provided free of charge and is now being progressively extended to the major salmon rivers in England and Wales. Further thought is being given to being able to provide information in the same format for water temperature and turbidity to assist fishermen to select the best option/location for a day's fishing.

Linked to the service is the ability to book a boat or to even book day tickets for coarse fisheries, as on BW Scotland's Forth and Clyde Canal - see: http://www.fishbritain.co.uk/coarsefisheries/Forthandclydecanal

A further service is provided to allow fishermen to register for river level information to be sent for their own particular reach of river by email, fax or text message (for a small charge).

9.9.2 **Conclusions**

The demand for real time river level information is growing and the ability to provide such information has been created now that the procedures have been established to allow for the transformation of up to date river level data to an external body.

9.9.3 **Recommendations**

- It is suggested that the navigation authorities set up a website to provide up to date river level information across all of the major navigations and calibrating the information in line with AINA's Strong Stream Procedure
- Associated with the webpage could be an online weather forecast for the site being examined
- A further development could be to link it to a text messaging service so that when river levels rise into the Strong Stream amber sector, a text message can be sent to pre registered mobiles for nominated locations. This information would allow people to check their mooring in advance of a Strong Stream warning locally and when levels are not expected to go into a flood warning condition

10.0 Summary Conclusions

- 10.1 The opportunity to further develop the services offered by the UK's inland navigation authorities could be significantly improved especially in terms of communicating between customers and staff. The greater access afforded by mobile internet working is one of the major keys to this development.
- 10.2 The development and use of hand held devices are already showing greater efficiencies in asset management and reducing licence evasion. The greater connectivity between these devices in the field either by regular uploads on a shift basis, caching of data when out of range or even live working using the developments in WiMax or 3G connections will aid both customers and operational staff alike.
- 10.3 The development of remote and intelligent control systems creating an integrated control network can reduce maintenance costs, improve service and vitally reduce running costs.
- 10.4 The provision of specific navigation and general information to users and visitors alike can be further enhanced by the development either of corporate websites or preferably a common interface such as Waterscape.com or Visit Thames by the provision of downloads in the form of PDFs, videocasts or podcasts and messaging systems such as RSS feeds, email and SMS texts. Navigation authorities should share data in a standard open format so that each of them can retrieve and use each other's data as they require.
- 10.5 It has become very apparent during the preparation of this report that, whilst there is a great deal of development work being undertaken by some of the navigation authorities, a great deal more could be achieved in developing the whole UK network if there were to be far greater collaboration between all the navigation authorities. This would save time and cost and increase service delivery for the benefit of all concerned, as well as creating a seamless network of comparable standards for all users and customers.
- 10.6 Certainly there is a need to create both new standards and align existing ones, to allow electronic exchange of information which would assist current day to day working and also allow for greater interoperability and cost saving in the future.
- 10.7 However, a number of issues have been identified that should be taken in account when considering any future investment or development.
 - When considering any proposal, the whole life project cost must be considered
 - A full programme of ongoing maintenance must be undertaken to ensure reliability
 - The short life span on ICT hardware and software is a fact of life and must be analysed and costed accordingly
 - All software and data must be capable of easy migration through each generation or change.
 - The collection of data should be aligned to allow for ease of transfer of information between navigation authorities
 - Further data needs to be collected as to the type and number of facilities provided by the navigation authorities to assist with future strategic planning
 - The outsourcing contracts for major corporate computer systems must allow for the development and introduction of remote working and access so as not to preclude future development or to significantly increase costs
 - Security of any development must be of a very high standard to create confidence in staff, users and customers regarding financial transactions and to protect the corporate integrity of the networks and organisations themselves
- 10.8 It is essential that the development and use of ICT, in any form or installation, recognises the vernacular character of the network, to respect its heritage, environment and traditions and to be undertaken in such a way that it supports and benefits the inland waterways users, customers and staff. On-site installations must be handled in a particularly sensitive way so as not to detract from the visual appeal that all the waterways have and must not damage the historic structures that form an integral part of the waterway network.

- 10.9 To achieve these improvements, it is essential that any parochialism within the navigation authorities is overcome and that a strategic lead be taken with this aspect of their operations. Ideally, this would be a role suited for AINA together with a lead navigation authority, or 2 to 3 of the larger navigation authorities.
- 10.10 Table 2 summarises the various technologies that could be used to improve communications and customer service delivery as well as increasing efficiency.

Internet Access	WiFI
	WiMax
	2G and 3G Cellular
Instant Alerts	Web page
Stoppage	Pre-registered email/text
Restrictions	Variable Message Board
Strong Stream Warnings	
Flood warnings	
River level advice	
Guides:	Web page
Navigation Notes	PDFs
User Information	Word documents
	Podcasts
	Videocasts
Facilities/Services	Smart Card, pre-paid or customised
Lock/Bridge operation	
Pumpouts	
Showers	
Laundries	
Toilets	
Cycle lockers	
Milestone points	
Destination/Arrival	
Local facilities (discount card)	
M&E installation monitoring	SCADA by organisation or bureau
Pedestrian, cycling and boat counters	SCADA Telemetry
Waterways management	GIS and GPS
Asset management	UMPCs
Licensing	Bar-coding
Licence evasion	UMPCs

Table 2 – ICT Toolbox

11.0 Glossary/Abbreviations

'A' Frame	Free standing display board
AINA	Association of Inland Navigation Authorities
AIS	Automatic Identification System
BA	Broads Authority
BMF	British Marine Federation
BSS	Boat Safety Scheme
BW	British Waterways
BWML	British Waterways Marinas Limited
BWS	British Waterways Scotland
Capex	Capital Expenditure
CIN	Craft Identification Number
DGPS	Differential Global Positioning System
DVLA	Driver and Vehicle Licensing Agency
ECDIS	Electronic Chart Display and Information System (as defined by the IMO)
GIS	Geographical Information System
GPS	Global Positioning System
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
ICT	Information and Communications Technology
IMO	Internal Maritime Organization
ITSO	Integrated Strategic Transport Organisation
IWAC	Inland Waterways Advisory Council
MCA	Maritime and Coastguard Agency
M&E	Mechanical and Electrical (generic term for powered operating installations)
OCR	Optical Character Recognition (software for reading registration plates)
Podcast	Audio download over the internet to a portable media player
PC	Personal Computer
PDA	Personal Digital Assistant (palmtops, handheld computers)
PDFs	Portable Document Format (fixed layout method for transmitting documents)

PLC	Programmable Logic Controller (for M&E control systems)
PSTN	Public Switched Telephone Network. (The UK's national hardwired telephone system)
Q95	River flow exceeded 95% of the time – used as an indicator of typical summer flows
RCD	Recreational Craft Directive (EU Directive setting manufacturing standards for leisure craft)
RIS	River Information Services
RFID	Radio Frequency Identification System
RSS	Rich Site Summary or Really Simple Syndication (for automatic updating from favourite websites)
RTU	Remote Telemetry Unit
Strong Stream	River warning system when flows are dangerous for craft but flooding has not occurred
SCADA	Supervisory Control and Data Acquisition. (An intelligent electronic monitoring system that can relay information and undertake local operational functions within preset parameters or as instructed from a remote controller)
SEPA	Scottish Environment Protection Agency
SMS	Short Message System (Text)
Telemetry	The remote reporting of data by telephone, radio or computer links
Teletone	A simple audible mechanical device that can transmit detail of water levels over the telephone
TfL	Transport for London
USB	Universal Serial Bus (a serial busbar standard designed to allow many peripheral devices to be connected to a computer without rebooting, using a standard connector)
USB stick	A data storage device (flash drive) connected via a USB connector
WAP	Web Access Protocol
WFD	Water Framework Directive
WI	Waterways Ireland
WiFi	Wireless Internet (Local wire-free internet access up to a range of 150metres)
WiMax	Area based wire-free internet access up to a range of 10 km.
Videocast	Video download over the internet to a portable media player
VMB	Variable Message Board (a matrix sign which can be instructed either locally or remotely to display key messages. As used for providing traffic information on motorways)
UMPC	Ultra Mobile Personal Computer
2G	Second generation mobile phone technology
3G	Third generation mobile phone technology working at higher data transmission rates than 2G

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