

ENDOCRINE DISRUPTERS

## Removing endocrine disruptors

There has been considerable media interest in the feminisation of some wild fish brought about by the action of certain endocrine disrupting compounds (EDCs) associated with effluents from wastewater treatment works.

The EDCs of greatest concern are the steroid oestrogens (SOs), specifically:

- the naturally occurring hormones oestrone and oestradiol
- the synthetic compound ethinyl-oestradiol which is the active ingredient of the contraceptive pill.

The UKWIR project *Endocrine Disrupting Chemicals: Assessment of the Performance of Wastewater Treatment Works in Removing Oestrogenic Substances* has quantified the removal of these compounds by various wastewater treatment processes.

Great care was given to designing the project and the steering group ensured that the data collected was of good quality in order to increase the confidence in any future technical and policy decisions.

The project, part of a National Demonstration Programme (a collaboration between Defra, the Environment Agency and UKWIR) was carried out by WRc with overall project management by UKWIR through **Gordon Wheale**.

UKWIR Client Manager, Yorkshire Water's **Tony Harrington**, said *"the beauty of the project was that everybody was on board and this adds value to the results as well as increasing the value for money for each contributor"*.

All ten water and sewerage companies collaborated to provide fourteen sites for monitoring the efficacy of a broad range of existing treatments. The works' influent was intensively monitored as well as the effluents downstream after primary, secondary and tertiary treatment stages to ascertain the EDC removal.

So what are the findings? At a dissemination seminar WRc's **Ian Johnson** and **Tony Butwell** presented the results.

### Results

At the fourteen works, readings were taken fortnightly over a year including a week of intense sampling and a day of hourly sampling. This means there is now a significant data resource available.

It is not possible to go into detail on all the permutations of treatments available and the related EDC removal. However there are a number of general conclusions.

The two naturally occurring steroid oestrogens, oestrone and oestradiol, have been detected in the influent of all of the works monitored. Nitrifying activated sludge processes removed over 90 per cent, but the performance of biological filter plants was more variable and non-nitrifying activated sludge plants were least effective.

The synthetic steroid oestrogen ethinyl-oestradiol (EE2) was observed in the influent at all works but at significantly lower concentrations than was observed in other studies.

This may be due to the rapid and effective sample preservation suppressing the formation of free compound by the process of deconjugation.

The concentrations observed in the treated effluent were similar to those from other studies but average percentage removal values were lower, at less than 60 per cent in nitrifying activated sludge processes.

### Current technology

As part of the programme, the performance of current treatment technology and the efficacy of more advanced treatment is being monitored at two wastewater treatment works.

**Howard Brett** of Thames Water and **John Churchley** of Severn Trent Water gave preliminary findings from the full scale

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### As seen by others

Two reports on the water sector during April have focused attention on innovation within UKWIR's membership, the water service suppliers in the UK.

A report by the Council for Science and Technology (CST) makes reference to UKWIR's research roadmaps and the *Barriers to Innovation* project.

The CST report states that *'the UK water industry is successful (in innovation) through collaboration and research programmes such as UKWIR'*.

The report concludes that *'R&D investment is low in the sector, there are insufficient regulatory awards for innovative solutions to be given to long-term technology planning'*.

However, included amongst their recommendations is that *'Government, together with Ofwat and the water companies, should .....devise mechanisms to encourage the necessary structures for R&D to be commissioned by and undertaken in partnership with the industry, for example by strengthening the resources of UKWIR or a similar body'*.

### Cave Review

The UK Government commissioned a *Review of Competition and Innovation in the Water Sector* by Professor Martin Cave and after much consultation their final report has been published.

The review recommends that the government, industry, regulators, suppliers, research councils, the Technology Strategy Board and others come together to agree a shared R&D vision for the industry and to co-ordinate their work.

The report quoted UKWIR's suggestions that the industry could support R&D in underground asset maintenance, leakage, energy use, smart meters and water and wastewater treatment technologies.

The main recommendation is for the creation of an industry R&D body, supported by funding of the order of £20m a year.

Together these reports confirm UKWIR's long held view that collaboration is essential in a sector which is not a big investor in research.

By aligning our activities in the UK, we will be better able to bridge the gaps between research, development and application, and to reduce the technological and regulatory risks of failure.

Figure 1. EDC site locations



# Common ground on fire hydrants

The project *Fire Hydrants and Fire Fighting Supplies*, being managed for UKWIR by **Jo Parker**, received a very high score in the UKWIR project appraisal and selection process. Judging by the issues raised at an UKWIR workshop in March it was easy to see why it is seen as a priority.

Anticipating the need to gain agreement from all stakeholders on the objectives and outputs, the workshop was held three months before the start of the nine month project.

Representatives from the water companies, Ofwat and Defra mixed with members of the Fire and Rescue Service as well as the National Fire Sprinkler Network to hear a series of presentations setting out the needs of the different organisations.

Northumbrian Water's **Eric Styan**, Chair of the Water Distribution Infrastructure Network, described the legislative framework under which water utilities operate and their duties to provide wholesome water to their customers as well as supplies for firefighting and how these could conflict.

## Welcome

**Peter Barrow** from the Dorset Fire and Rescue Service and a representative on the National Liaison Group of Fire Fighting Activities, welcomed the invitation to the workshop. He hoped that one of the outcomes would be a single guidance

document, mutually agreed by all the stakeholders, that *'must be useful at an actual fire'*.

Only 5 per cent of fires required the use of a fire hydrant but *'when they are needed, they are really needed'*. He added that fire fighters' safety was paramount but there are also pressures to be economic and effective.

**Ronnie King**, representing the National Fire Sprinkler Group, informed delegates of the importance of fire sprinklers in commercial properties, care homes and schools in tackling fires. However, water pressure needs to be adequate and under-sizing of meters can restrict the flow.

**Steve Mizon**, from the RSIA Insurance Group, said that *'data was needed on the impact on society if the water fails'*. Insurance companies have a great interest in the financial effect of fire fighting but information is still sparse.

## Breakout sessions

There followed a series of breakout sessions, carefully facilitated by **Chris Overton**, to tease out the significant areas of concern and set out the priorities for investigation.

There will be plenty of issues for the contractors to contemplate. Partly as a consequence of fire appliances having a much greater water carrying capacity nowadays, there are many potentially redundant fire

hydrants. But which ones should be removed and how might their removal be funded to reduce on-going maintenance costs?

Pressure reduction is seen as a key element in reducing water leakage. How might this impact on fire hydrants and thus on the task of saving lives and property?

There is still much ambiguity over some of the definitions and the meaning of such words as *'adequate'* when referring to water supply and pressure in the legislation.

UKWIR Client Manager, Thames Water's **Mike Shepherd**, announced that the project steering group would now adjust the original aims, objectives and expected outputs in the light of the day's deliberations.



*'when they are needed, they are really needed'*

## CUSTOMER DEBT

# Understanding the debt

Customer debt levels are rising and, in the current financial circumstances, are expected to rise even further. UKWIR, through its contractor, Emaginating, has been collecting and analysing information to ensure that the debt reduction debate and resulting strategies are based on sound information.

This entailed investigating the correlation between debt collection performance and income deprivation across the industry.

At an UKWIR dissemination workshop, **Richard Stanbrook**, from Bournemouth and West Hants Water and UKWIR Client Manager, praised the companies for *'their fantastic level of participation in supplying detailed information.'*

He added that the study, managed for UKWIR by **Richard Kirby**, was both innovative and thorough and its findings confirmed that the Debt Strategy Group was focusing on the right areas.

**Peter Boden** of Emaginating, set out the scale of UK consumer debt. Average household debt is almost £10k (£60k including mortgages) and the water debt of £1.225bn (£55 for each domestic household in England and Wales) had increased by 56 per cent in the four years since 2004, as

shown in figure 2. Twelve per cent of consumers missed a household bill (gas, electricity, water, council tax, telephone, rent) in the last six months of 2008.

## Debt and deprivation

Modern computing power is vital in analysing the vast quantity of data required to improve the significance of the results. The analysis was greatly dependant on the use of an *'index of multiple deprivation'*, a government measure calculated for each of 34,000 local areas in England and Wales.

The income component of this index was related to water company debt data obtained from thirteen participating companies who together provide water and sewerage services to 81 per cent of the population of England and Wales.

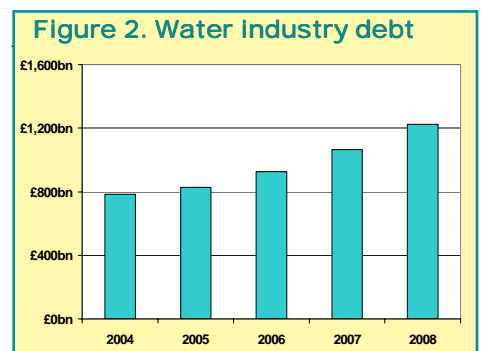
The data included late payments (>3 months and >£10), debt write off and details on payment methods such as direct debit, Water Card, Water Direct, and collection through local authority agreements.

The project report, due shortly, shows that income deprivation is a key factor in driving extremes of indebtedness and goes on to analyse a number of other factors which give

rise to variations between companies. A series of recommendations aimed at supporting improved debt recovery in the industry are made.

Peter Boden emphasised that the industry is a special case and is at a disadvantage compared with other utilities. There is no contract with the customer and hence less contact information such as phone numbers. Water companies do not have the sanction to disconnect customers.

The water industry now has a much sounder base of information on which to base policy in addressing debt collection in local circumstances for a range of customer types.



# VISTA delivers

'The VISTA project, together with the related Mapping the Underworld and Orpheus projects, (see figure 3), has made huge progress and the £10m programme of research has been delivered on time and within budget'.

This was the message given by UKWIR Director **Mike Farrimond** at the dissemination seminar of the three year VISTA (Visualising Integrated Information on Buried Assets to Reduce Street Works) project.

This high profile project was funded jointly by Government (through the Technology Strategy Board) and twenty partners related to the main utilities and was managed by UKWIR through **Jo Parker**.

The 2004 Traffic Management Act (TMA) acted as a catalyst to the project by requiring utilities to produce and exchange digital asset location information.

## Daunting

The scale of utility operations is daunting. To repair, maintain and upgrade the UK network of buried infrastructure, the utility industries undertake, on average, about 1.5 million street works annually.

There is the risk of hitting and damaging buried plant and equipment, with the consequent risk of service disruption and threat to safety.

The annual direct cost to utilities is in excess of £1.5 billion, part of which is attributable to 'dry' holes, where plant and equipment are not found. Damage to third party assets is estimated at £150 million a year.

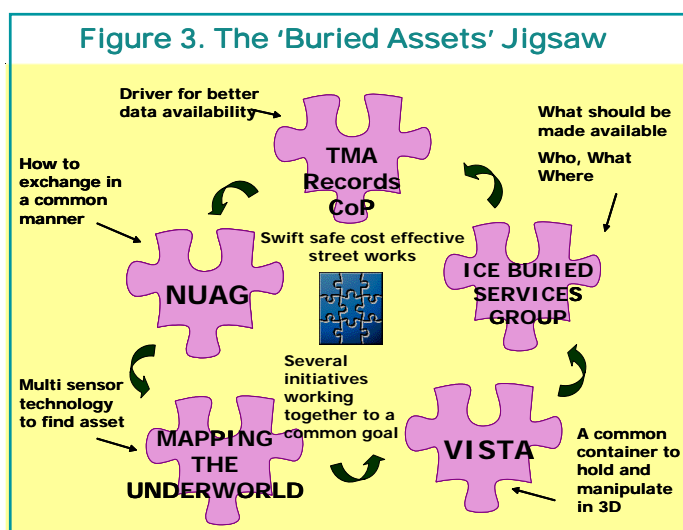
These direct costs are significantly less than societal costs, which include costs of delays to road users, disruption to business,

environmental damage and safety costs.

These amount to an estimated annual cost of £5.5 billion.

VISTA involved two universities. Nottingham investigated how satellite technology could be more widely applied to allow buried asset information to be collected more quickly, easily and accurately from the field.

One particular problem in cities is that communication with a satellite from street level is affected by tall buildings. To mitigate this effect information can be assembled from a numbers of international satellites whose exact positions can be predicted.



Leeds University sought to develop a facility to integrate and access any buried asset records in a uniform way, and to develop appropriate delivery mechanisms, including the internet.

The outputs have to be useful to different classes of user ranging from street workers to office planners.

An important initial step was to produce a dictionary and thesaurus of definitions of asset types as organisations often apply them in different ways.

Leeds University are addressing the particular challenge of producing maps that not only differentiate all the asset information but also illustrate the uncertainties in the data.

## Real life

With so much progress on the research side the next step, Mike Farrimond concluded, 'is to test the results in real life'.

Jo Parker said that VISTA related work will continue through various funding streams. Indeed, February saw the launch of *Mapping the Underworld Phase II* and

[www.mappingtheunderworld.ac.uk](http://www.mappingtheunderworld.ac.uk) has the details.

To hear more about the on-going research you can attend the forthcoming conference 'Transforming the Technology for Buried Asset Records' on 11 June 2009 at Nottingham University.

The event brochure can be found at [www.sbwwi.co.uk/cms/img/seminarpresentation/file-147.pdf](http://www.sbwwi.co.uk/cms/img/seminarpresentation/file-147.pdf)

To find out more about the VISTA project visit [www.vistadtiproject.org/site/vista](http://www.vistadtiproject.org/site/vista) where you can also download the leaflet describing the project.

## ICE date

The Institution of Civil Engineers is hosting NUAG's 'One Jigsaw Delivering a National Common Approach' conference on 22 June 2009 in London when UKWIR Director, Mike Farrimond, will be one of the speakers. There is a 10% discount for UKWIR subscribers and collaborators - visit [www.ice.org.uk/conferences\\_events](http://www.ice.org.uk/conferences_events) for details.

## ENDOCRINE (continued from page 1)

works at Swindon and the pilot works at Ilkeston respectively.

These works have been specifically upgraded to test the effectiveness of treatment processes, including granulated activated carbon and oxidation using ozone and chlorine dioxide.

In all cases, advanced treatment was able to remove EDCs to very low concentrations where adverse effects on fish in receiving rivers would not be expected.

However, further work is required to test the performance with higher EDC loads and to determine the best environmental solution, taking into account costs and carbon footprints. Defra's **Ian MacDonald** concluded by saying that "the success of the collaboration should be celebrated and long may it continue".

## UKWIR & PRICE REVIEWS

# Preparing for PR14

UKWIR held a workshop on 20 April 2009 to address issues and challenges associated with the 2014 Price Review in England and Wales (PR14), the Strategic Review of Charges 2014 (SRC14) in Scotland, and Price Control 2013 (PC13) in Northern Ireland.

Delegates at the workshop represented the water industry and its regulators who generated prioritised responses to the identified challenges.

**Paul Butler**, UKWIR's Chairman, opened the workshop by reminding delegates of the need to start planning now for PR14 and that the ultimate aim of the workshop was to identify research projects that could be developed for inclusion in UKWIR's annual research programme.

After a series of scene setting presentations from stakeholders, **Chris Overton** organised a series of breakout and feedback sessions.

The resulting outputs from the workshop include identified issues and challenges, and ideas for corresponding responses and their key elements and features, all ranked in priority order.

The twenty one highest priority responses were grouped into eight inter-linked 'topic areas'.

These outputs will be used by UKWIR to inform the development of their research programme, as part of a broader collaborative effort.

# Separating surface water

In the past, the most cost effective way of dealing with increased surface water flows in the sewerage system has been to invest in larger diameter sewers. This has the knock-on effect of increased operating costs of power at pumping stations, treatment works and the need to expand the treatment works to cope with the additional flows below formula.

In the future alternative solutions are more likely to come into play now there is a need to carry out cost benefit analysis, demonstrate overall cost effectiveness as well as consider the social and environmental costs.

The UKWIR project *Exploring the Cost Benefit of Separating Direct Surface Water Inputs from the Combined Sewerage System*, managed by **Phil Reaney**, is looking at alternative solutions with the object of producing a simple to use decision support tool that will also assist in the production of the new *Surface Water Management Plans*.

There are a plethora of alternative solutions that can be considered including separating surface water, applying a variety of demand management techniques, constructing wetlands and incorporating various water attenuation systems.

## Engagement

At a workshop to disseminate the project's findings, UKWIR Client Manager, Southern Water's **Barry Luck**, explained how the project was an opportunity to engage with other stakeholders, especially local authorities.

**Kieran Conlan** from the contractor, Cascade Consulting, related how there are increases in flows in the sewerage system due to urbanisation, changes in soil use and paving of gardens and driveways with an attendant increase in flooding and pollution risks.

They had surveyed sources of information on both conventional and alternative solutions with a particular motive of providing cost and benefit information.

The afternoon session was devoted to examining the results of pilot studies, using data from Llanelli and Creswell, calculating and analysing the costs and benefits and discussing how this information could be applied.

Kieran Conlan reminded the practitioners that the tool was an aid to decision making that may well include non-quantifiable factors such as reduced flood risk and water quality improvements.

He added that the drivers for alternative solutions are continuously changing and the decision support tool can be used to decide when and under what conditions such alternative solutions may become viable.

This edition features a listing of UKWIR publications issued since the last newsletter.

### CLIMATE CHANGE

09/CL/01/9 Workbook for Estimating Operational GHG Emissions (I 84057 529 8) £500

### CUSTOMERS

09/CU/02/5 Future Methods of Charging for the Water Industry (I 84057 528 X) £500

### TOXICITY

09/TX/04/16 Endocrine Disrupting Chemicals National Demonstration Programme: Assessment of the Performance of WwTW in Removing Oestrogenic Substances (I 84057 525 5) £50

### WASTEWATER TREATMENT & SEWERAGE

08/WW/11/12 Verification of Bacteroidetes Microbial Source Tracking with Empirical Ground Truth Data (I 84057 527 1) £50

09/WW/17/10 Source Control of Phosphorus from Domestic Sources - Options and Impacts (I 84057 526 3) £300

### WATER RESOURCES

08/WR/01/9 Intelligent Metering Initiative: Methodology for Cost Benefit Analysis of Intelligent Metering (I 84057 518 2) £100\*

08/WR/01/10 Intelligent Metering Initiative: Data Requirements Specification (I 84057 519 0)

08/WR/01/11 Intelligent Metering Initiative: Communications Protocol Project Report (I 84057 520 4)

08/WR/01/12 Intelligent Metering Initiative: A Review of Metering Evidence and Gap Analysis Report (I 84057 521 2)

\* the four reports together cost £100

### WATER MAINS & SEWERS

09/WM/08/39 Large Diameter Trunk Main Failures (I 84057 524 7) £600

UKWIR research reports are available for purchase via the internet on [www.ukwir.org](http://www.ukwir.org)

### TOXICITY

# Tox & Micro Datasheets

UKWIR's *Toxicity Datasheets and Microbiological Datasheets* project is being funded for another three years and will continue to be managed by WRc.

The datasheets are an established independent source of information for chemicals and microorganisms associated with drinking water and are increasingly incorporating information on wastewater contaminants.

They are targeted at the needs of the water and wastewater community, particularly for responding to water contamination incidents in a rapid and effective manner.

