WASTEWATER RESEARCH & INDUSTRY SUPPORT FORUM

THE THIRTY SECOND MEETING OF THE FORUM WILL BE HELD ON

Tuesday 6th March 2007 Commencing at 10:30 at

FOUNDATION FOR WATER RESEARCH, MARLOW,
Allen House, The Listons, Liston Road, Marlow, SL7 1FD

Notes of Meeting

1. Apologies for absence

See Appendix 1 for attendance and for reference to initials.

2. Notes of the Thirty First Meeting 23rd November 2006

These had been circulated previously, the only correction was the Prof. Peter Matthiessen is a Fellow of CEH, not an associate as stated incorrectly in the draft notes.

3. Matters arising and not on the agenda

None

4. Sewerage in an age of climate change – do we continue with combined or do we separate?

Dr Virginia Stovin and Professor Richard Ashley of Sheffield University and Pennine Group gave simulating presentations to introduce and provoke the debate. These have been circulated as separate PDFs.

VS dealt mainly with the toolbox of techniques that is SuDS (Sustainable urban Drainage Systems). She contended that stormwater should in future be regarded as a resource rather than as a nuisance (especially in drought-prone areas) and that combined sewer systems are not future-proof because of the predicted uncertainty of intense rainfall. The immediate problem is urbanisation and hard-surface-creep which frequently mean that rain that falls on this expanding area runs off and feeds into the combined sewer system. There has been significant expenditure on remedying unsatisfactory sewer overflows by installing storage chambers in sewers and improving CSOs, but in some cases SuDS might have been a better solution. A difficulty with SuDS in England and Wales is that they are not really consistent with the regulatory framework. The largest of the 'hard engineering' schemes is the Thames Tideway 7 m diameter tunnel that would connect the CSOs and deliver the excess flow to a new treatment works, the tunnel would also serve as 1.6 M m^3 storage; on 23 March 2007 the Government backed the proposal; its estimated cost is £2 bn and completion is expected in 2020. It will reduce the number of spills from 35-60 to 2-3 per year.

Scotland is a more SuDS-friendly than England and Wales. Permeable pavement (right) eliminates runoff from supermarket carparks; greenroofs on offices control roof runoff and also provide amenity for officeworkers. Of course, SuDS involving infiltration are only applicable where soils and rocks

are permeable and where there is sufficient depth to the groundwater table.

Planning Policy Statement 25: Development and Flood Risk (PPS25) http://www.communities.gov.uk/index.asp?id=1504640 encourages consideration and application of SUDS in England but without obligation.

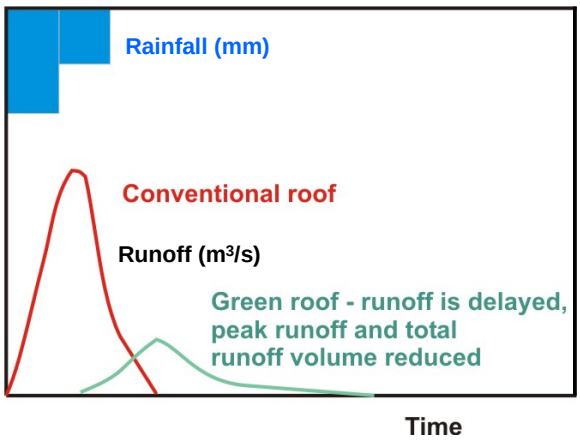
Augustenborg (an inner-city suburb of Malmo, Sweden) had problems of surface-water flooding and CSO discharges. In 2001 it disconnected surface water from the existing combined sewer and drained the area by means of an open stormwater system and clever and innovative changes – see VS PDF. For example, a school has an outdoor amphitheatre for teaching which doubles as surface-water attenuation storage in wet weather, i.e. when staff and pupils would not want to use it. Stormwater is now led through a complex arrangement of green roofs, swales, channels, ponds and small wetlands.

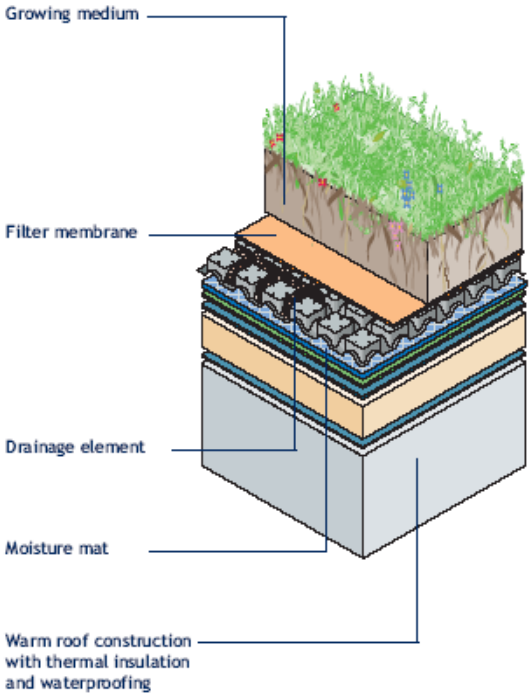
VS gave several case study examples of UK suburbs. For example, in an area with a mix of permeable and impermeable soils, if 46% of the area of residential roofs were disconnect using soakaways and water butt storage used for attenuation of the remaining roofed area (which was in areas unsuitable for infiltration) and if 31% of the paved area was disconnected using swales-based off-site controls (infiltration basins) there would be a 68% reduction in the ten year design storm flood volume.

Although the EA and SEPA are enthusiastic about SuDS, the legislation concerning the water industry restricts their participation to sewer solutions. This is an example of the situation that the Forum comes across frequently where sustainable and cost-effective solutions are impeded by the unintended consequence of regulation.

Green roofs are a particular interest of Sheffield University. They are not new, indeed they are a traditional roofing solution in Scandinavian countries. Norsk Folkemuseum in Oslo, Norway (right) has many examples of buildings, hundreds of years old, roofed with birch bark overlain with green roof. They give thermal insulation and attenuate roof runoff. They can also support biodiversity and provide amenity for urban populations. 21st century implementations replace birch bark with synthetic waterproof membranes and filter membranes and drainage elements replace some of the depth of soil.

Good green roof data are available from Germany Sweden and the USA. Although the UK has come rather late to the subject, it will have the largest green roof retrofit in Europe, this will be 6000 m^2 of roof on the Ethelred Housing Estate, Lambeth, London. The estate was considered for demolition in the early 1990s because extensive refurbishment was required, including roofing repairs but the Tenant Management Organisation opposed demolition and proposed green roof for phased installation www.lambeth.gov.uk/Services/**Housing**Planning/Planning/**EthelredGreenRoof**s_EXTRA.htm.





Sheffield University is researching the design parameters and performance of green roofs in a UK climate context. The literature reports 45-70% retention of annual rainfall volume and up to 100% reduction of peak runoff. In the spring of 2006 Sheffield found 34% average volume retention and 56.9% average peak reduction. A 9.2 mm rainfall event resulted in only 3.55 mm runoff with 61% peak reduction and significant attenuation.

Richard Ashley contended that the primary driver for considering alternatives to "conventional" combined sewerage should be uncertainty (about climate, urban development, etc.) and that there is no "right" engineering solution. A "managed adaptive" approach might be more future proof than big infrastructure investment. In addition to climate change and changing urban development, society's expectations also change.

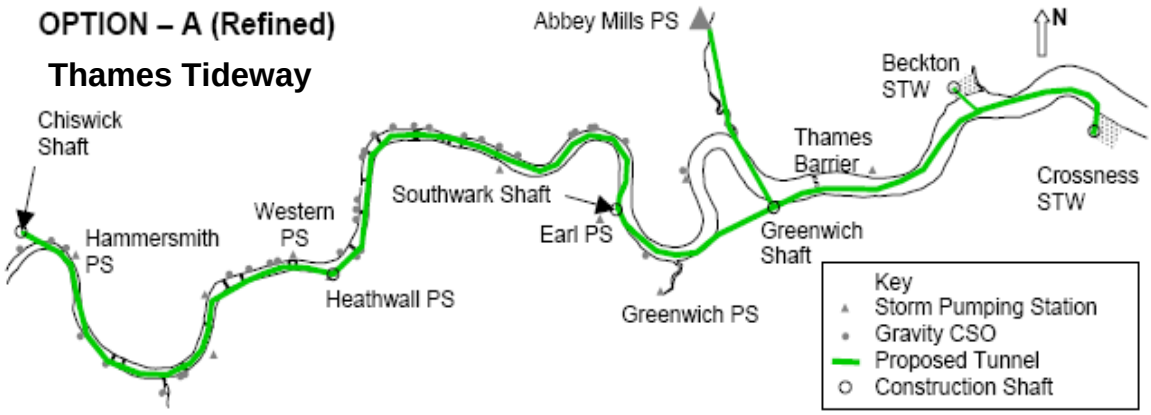
Some of the House of Lords' inquiry into water management are striking. Whereas public health was the original motivation for water management [and continues to be in the developing world] environmental legislation is now the greatest single change driver in the EU, the EA is more interested in the environment than people and Ofwat is more interested in costs than value.

The Priority Substances Directive [and hence Water Framework Directive] does not have *de minimis* concentrations and since urban wastewater contains all 32 of the priority hazardous substances [albeit not necessarily large concentrations] it will be impossible to comply. The climate change consequences of treatment processes to remove some of these substances far outweighs any environmental benefit.

The Dutch 4th Policy Plan of Water Management (NW4) aims not to transport rainwater over long distances or to purify it, hence it needs to be stored, used and managed at source. A step in this policy objective is that by 2006 rainwater will be separated in 60% of new developments and in 20% of existing systems. The town of Alkmar estimates it is saving €80M by separating sanitary sewage and rainwater compared with using CSO chambers. In the USA (re)development is being required to manage rainwater. Control at source is preferable to end-of-pipe treatment if it is possible. Boston has switched from a one big interceptor (estimated cost in 1993, $1.3bn) to 29 smaller schemes ($835M, 2002) this has involved many disconnections and the creation of separate stormwater utilities with citizens on their Management Boards. Seattle has switched to source control with swales, etc. and prominent promotion of the benefits: 91% of the rainwater is managed by infiltration; there

have been substantial fines (>$1M) for contractors contaminating streams during construction. In Portland, Oregon, 70% of the demand on stormwater systems has been transporting the water; 44,000 out of 110,000 homes have been disconnected, which has removed 1 billion gallons a year. Participating homeowners proudly display signs in gardens showing their involvement, which builds peer pressure on others. Green roofs are being invoked as part of the solution in many cities in N. America. In Germany Hannover started to separate the existing combined system in the 1970s to reduce CSOs to the rivers Ihme and Leine. Today about 2/3 of the system is separated. However, if the storm water is separated and goes directly to river, any pollutants is scavenges from roads, roofs, etc. can be transferred as well, rather than being sorbed into sewage sludge. A system called INNOLET® has been developed for retrofitting into street inlets to sorb pollutants and solids and has been found to reduce the overall system pollution load emitted by 21% for copper, 30% for zinc and 29% for PAH http://www.sieker.de/english/modules/wfsection/article.php?articleid=15. However gully cleansing in much of the UK is woefully neglected.

Regarding the UK, RA said that we need to move to Water Sensitive Urban Design; the driver has been building the value of assets, it is becoming the Water Framework Directive and in the fullness of time it will become Climate Change. However, the regulated structure of the water industry does not encourage or even allow big picture solutions because inevitably some aspects are outside the [tightly constrained] remit of the water companies. There is a certain gradual inevitability about creeping disconnection because it will be required for new build.



Discussion by members of the Forum noted that the Thames Tideway project reported in 2005 and decided against SuDS and IUD because of the required speed of build. Thames Water has developed considerable tunnelling expertise and merely connecting CSOs to an interceptor would be relatively quick and would minimise disrupting London's traffic. When it is empty the tunnel will provide 1.6M m^3 storage. It will take 12MW peak pumping to empty the tunnel in 48 hours. Reducing the size of tunnel by 20% would have little effect on the total cost so if source control and disconnection were to have been part of the solution they would have had to be very extensive. Unfortunately much of London is built on clay and therefore impossible for soakaways. Currently the system is near its hydraulic capacity for much of the time and only 4mm rain is need to trigger an overflow. Green roofs would be a nice technical solution and could modulate 50% of the rainfall if there were public acceptance. If there were rainwater storage of 1 m^3 per person and if this was used for toilet flushing it could have a similar effect to the tunnel. However, starting where we are with the heritage of Bazalgette, the time requirements imposed on the construction and compliance with the WFD, the Tideway Tunnel could be the only solution. Whether it is future proof and whether the time and compliance constraints are appropriate are other questions.