

Retro ideas for a modern world



In this briefing Dr Chris Digman, MWH explains how managing surface water differently can provide an opportunity to change urban areas.

Retrofitting urban areas, whether it is to replace aging infrastructure or for major regeneration work, is not a new concept. Even in times of austerity there is a need to continually improve urban areas. Given the current economic climate it is more important than ever to realise the opportunities available and maximise the benefits when retrofitting urban areas. This should include the management of surface water.

Out of sight, is out of Mind

Managing surface water has traditionally taken place below ground, using pipes, culverts and tanks to convey and attenuate surface water.

However, points in the network such as combined sewer overflows can pollute watercourses. If, and when, this infrastructure fails it can lead to flooding. Retrofitting surface water management measures (SWMM) still recognises the need for these approaches where appropriate, but these measures should be combined with a new suite of alternative measures that manage surface water both above and below ground, such as SuDS. Mixing and matching the approach will be vital for success.

Realising the opportunities for change

Current regulation and legislation, including the Flood and Water Management Act 2010 and the EU Water Framework Directive will continue to create the need for improvements to our drainage assets. Work to address the need is likely to continue for many years and should create opportunities for surface water to be managed using a range of measures. For example, Figure 1 shows a typical suburban semidetached housing estate. Recent work replaced many of the grassed verges with hard-standing for parking. This is a missed opportunity to retrofit such a street to manage surface water resulting in the use of both green and blue infrastructure (Figure 2) and

retaining the below ground infrastructure for an enhanced level of performance.



Figure 1 A typical UK suburban street where recent resurfacing works have taken place and a missed opportunity to manage the surface water

There are two key approaches to retrofitting SWMM in urban areas:

1. In an opportunistic way, where gradual improvements to the urban realm are carried out step by-step, picking off opportunities.
2. By taking a more strategic approach where a specific need is addressed, such as reducing combined sewer overflow spills, pollution from surface water outfalls or risk of flooding. This will look for and create the opportunities to retrofit measures.

Ideally these approaches should use a selection of SWMM that combine both above and below ground solutions. Where possible any work should be aligned with other urban improvement works, providing far greater benefits to the community.

The benefits of retrofitting

Selecting the correct SWMM will depend on the local conditions and context where retrofitting is taking place. For example, if it is possible to



Figure 2 A diagram showing how opportunities to retrofit could be realised

infiltrate water into the ground, and this does not create other consequences, then this should be done, as has been carried out in the United States in places such as Portland, Oregon (see Figure 3). However, where this is not possible then there are many other measures that can be used that will attenuate water, slow it down, and convey it to another place. Wherever possible, this should be done on the surface.

When using a wide range of SWMM, especially those that are above ground, a far wider range of benefits become possible, which are often not seen when traditional below ground measures are used. These benefits can include:

- Reducing the financial and carbon costs of wastewater treatment and pumping
- Increasing property values through an enhanced urban area
- Greater replenishing of water resources and reducing water use
- Reducing air and noise pollution
- Enhancing biodiversity by creating new or improved habitats
- Better health through increasing levels of exercise and outdoor activity from improved urban spaces
- Mitigating the urban heat island effect
- Creating greater awareness and understanding of water by involving society.

It is now possible to start valuing these extra benefits, which is important given the current emphasis being placed on demonstrating the benefit and cost of solutions to manage surface water. Work overseas, particularly in Australia and the USA, has shown that these benefits can be quantified on large infrastructure projects. For example, in Philadelphia, USA, a combined surface water management approach of a tunnel and above ground (green infrastructure) features will create an estimated \$3bn of benefits over a 40

year lifetime. The green values calculator from the Center for Neighborhood Technology (CNT, 2010) was used, which includes a range of multi-value extra benefits.



Figure 3 A recently constructed stormwater planter on a street in Portland, Oregon

The importance of good urban design

Where possible, retrofit SWMM should be integrated into an urban area in an appropriate way. Understanding the views of the local community is extremely important, and it is likely that their views will be influenced by how SWMM look. This can take time, and experience shows that early involvement of local communities and explaining problems some time before delivering solutions can lead to success.

To ensure that measures are appropriate for an area (beyond the key drainage considerations), the context in which retrofitting occurs must be understood. This includes understanding each place's characteristics, building typology, layout and orientation, ecology, and the views of the local community. To ensure that any retrofit measures are successfully integrated, an understanding of the scale of the retrofit will also be required.

Depending on whether the measures are to be incorporated on a single plot, across a street, throughout a neighbourhood or within the whole catchment will influence the choice of measures used and their design.

Planning ahead is important. Any space that has an ambiguous function will most likely fall into disrepair. Retrofitted SWMM should have a clear function and where possible measures should have more than one use. For example, an auditorium in a school playground in Sweden (Figure 4) also functions as a surface water storage area during heavy rainfall.



Figure 4 An auditorium in a Swedish school playground that also acts as a detention basin during heavy rains (courtesy Dick Fenner)

How to retrofit SWMM

In the UK, retrofitting of SWMM is relatively new. Therefore the number of examples are currently limited. However, there are a small number of exemplar projects where SWMM have been successfully implemented (such as the Islington rain garden, see Figure 5), proving that retrofitting can be achieved in the UK. This is often due to local champions making it happen.

To help UK stakeholders successfully retrofit SWMM, CIRIA have been working with MWH and the University of Sheffield to develop and write guidance due to be published in the New Year. The guidance will support a diverse range of practitioners across the many disciplines needed to successfully retrofit measures. Urban design is firmly at the heart of the guidance and its framework, with examples shown of how retrofit measures could be implemented into different urban areas. The guidance also explains key information relevant to retrofitting SWMM, particularly where this may be different from delivering traditional solutions. Areas of the guidance that will help practitioners to deliver retrofit schemes include preparing for retrofitting, assessing the feasibility, developing the options, appraisal, implementation and performance monitoring.

What happens next?

Several local authorities and sewerage undertakers are already seeking and finding the opportunities to retrofit a range of SWMM. Some of these are simply opportunistic, while others are more strategic. The drivers exist to retrofit SWMM where there is a risk of flooding or where water quality improvements can be made. Currently, such work is normally carried out when it is

deemed to be cost beneficial (using a narrow band of benefits). However, by taking a more comprehensive approach and working closely with the different stakeholders involved in improving the urban realm, it should help to provide greater value for retrofitting. If the benefits are recognised by the multiple stakeholders involved in the delivery of retrofit SWMM, then this could substantially help this approach be embedded as business as normal.



Figure 5 A rain garden retrofitted into a social housing estate, Ashby Grove, Islington

References

CNT (2010) The value of green infrastructure. *A Guide to recognizing its economic, environmental and social benefits*. Center for Neighborhood Technology, Chicago, USA.

Go to: www.cnt.org/repository/gi-valuesguide.pdf

Statutes

Flood and Water Management Act 2010 (c.29)

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive)