Misconnections

Purpose

The purpose of this PPS is to set out our priorities to achieve a sustained reduction in the incidence of misconnections and to reduce avoidable impacts to both foul and surface water sewer systems.

CIWEM's position and recommendations

1. Property owners and plumbers are frequently unaware whether a property is connected to combined or separate drainage. Every water bill should state the type of drainage.

2. Mortgage lenders, conveyancers and insurers should require a drainage survey when property changes ownership to check for (illegal) misconnected drainage.

3. Property searches should include information on drainage systems and highlight the possibility and risk of misconnections.

4. Local Authorities (LAs), environmental regulators[1] (ERs), OFWAT and water and sewerage companies (WaSCs) should work to investigate and rectify both foul and clean misconnections based on prioritised areas where there are water quality impacts. This should be included in their business plans.

5. Key professionals and service sectors such as Building Control, surveyors, the Law Societies in Great Britain, Chartered Surveyors, Environmental Health Officers, the construction industry, architects, retailers of white goods etc should become involved in tackling the problem. Competency, assurance and approval schemes such as Watersafei and those operated by training bodies should address the misconnection issue.

6. Government should explore statutory instruments such as General Binding Rules as a means of preventing pollution of surface water systems by requiring treatment of surface water discharges if they are contaminated, e.g. some type of sustainable drainage system, or at risk of contamination by misconnection.

7. Manufacturers, suppliers and retailers of wastewater discharging appliances should help raise awareness about correct drainage connections.

8. Building control approval bodies should do more to ensure drainage practice accords with building regulations, e.g. requiring provision of photographs.

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[1] Environment Agency (EA), Scottish Environment Protection Agency (SEPA) , Natural Resources Wales (NRW) and Northern Ireland Environment Agency (NIEA)

9.   Defra and the Scottish Government should require new surface water drainage systems to be in the form of open channels wherever practicable so that the risk of misconnections is minimised by being detected rapidly.

CIWEM is the leading independent Chartered professional body for water and environmental professionals, promoting excellence within the sector.

Context

Sewer systems are designed to be either 'separate' (one for foul, one for surface water) or 'combined' (one sewer conveying foul and surface water, possibly with an overflow for excess flow). Misconnections are where wastewater is discharged into surface water drainage or surface water is discharged into a foul sewer. This applies to separate sewer systems rather than combined ones. A bathroom misconnected to a surface water drain can put toilet waste straight into a stream. Pollution of 'controlled' water by misconnections is illegal, although difficult to enforce.

Historic development of sewer and drainage networks

In Britain, sewer networks have developed over many years since industrialisation and the growth of urban areasii. The first sewers were almost always combined i.e. they collected both rainfall and foul flows. Most of the older, inner city urban areas are therefore served by combined sewer networks. With the continued growth of urban areas the extension of combined sewer networks was not a practicable solution because of the overall volumes of water needing to be accommodated. Consequently from around the 1950s (but as early as pre-World War I in some areas), sewer systems in developments became separated. For about 50% of properties, foul water is collected separately and taken for treatment whilst surface water from rainfall is piped separately to a nearby receiving watercourse or to groundwater. This principle is based on the premise that surface water is relatively free from polluting material and causes fewer water quality issues for the receiving watercourse.

The separation of the flow between the two sewer systems has presented a number of problems for water quality. The principal one is that any foul sewage misconnections of drainage from domestic, commercial and industrial premises can easily enter watercourses and so impact directly on water quality; this has had serious consequences in some areas. Over the last twenty years there has been more development and 'urban creep' coupled with a trend for house improvements and some of this has resulted in misconnections.

The scope of Building Control and planning regulation is limited and doesn't extend to all drainage work so is not effective to prevent misconnections. A 2009 MORI Ipsos reportiii found a lack of awareness of the concept of separate sewer systems amongst professionals, building trades and the public and which type applies to a particular property and, worryingly, that awareness is becoming worse.

What is misconnection?

Misconnections or wrong connections are where drainage from a building or site has been connected to the wrong part of the sewer network. These can be one of two types; a foul water misconnection to a surface water system, whereby sewage and polluted water is discharged directly to a river, stream or the sea/beach or groundwater; or where rainwater enters foul sewers rather than discharging to surface or ground waters.

With clean misconnections there can be indirect pollution due to combined sewer overflows i.e. when there is so much rainwater in the sewer that it overflows. Misconnections affect the quality of the water and how we use it, as well as damaging the local ecology and recreation. Clean misconnections to foul or combined sewers also take up sewerage capacity and result in additional energy and conveyance costs.

Misconnections can be above ground whereby appliances or drains are wrongly connected, for example refitting domestic toilets, kitchens and bathrooms. They can also include below ground misconnections often due to mistakes by builders or developers or from infrastructure such as dual manholes. The contamination of surface water sewers can also occur due to infiltration or leakage from contaminated ground, foul sewers, sewer blockages and failures.

For the purposes of this paper, a misconnection is defined as being: "any direct discharge by third parties of wastewater to a separate surface water sewer, or of surface water or groundwater to a separate foul sewer or road drain".

Pollutants

Most of the UK population lives in urban areas. Urban streams, rivers, lakes, canals and the sea are important features of their environments and often the most common way for people to interact with nature. The aesthetics of urban watercourses are particularly adversely affected by misconnections. Water can become cloudy, discoloured and smelly, there can be "litter" and in drier weather, sewage fungus or the effects of eutrophication may become more apparent just at the time when more people want to use these open spaces. Many urban redevelopments now have water bodies as a central element of their design, emphasising how highly communities value these features. Ensuring good water quality of shellfish waters and at beaches is also critical to the tourism industry and local economies. Any adverse publicity about shellfish or bathing water quality at beaches can therefore have serious consequences.

Foul sewage discharges contain many pollutants including nutrients like phosphorus and nitrogen, pathogens, sewage derived debris or oxygen depleting organic matter. In addition, untreated sewage discharges may contribute to Environmental Quality Standard failures for certain EU priority substances and UK specific pollutants.

Pollutants of particular relevance to misconnections are; Nonyl-Phenols (NPs) and their Ethoxylates (NPEs) commonly found in imported clothing and released into the aquatic environment via washing clothes, (approximately 35% of all misconnections are from washing machines); steroids; (EE2), plasticisers; (DEHP); and biocides (TBT, tryclosan). These pollutants contribute to the overall pollution load and pose a risk of future non-compliance with EU Water Framework, Bathing Water and Shellfish Waters Directives. EA operational staff estimate that up to 49 bathing waters (9%) are impacted to some extent by misconnections.

Scale of the challenge

The challenge of misconnections is significant because of its ubiquity in most built-up areas. Areas with separate sewers bordering combined sewers can be especially problematic because even professionals can assume wrongly that a property is on a combined sewer. Residents need to be more aware of the type of drainage serving their property; an easy way to achieve this would be for it to be displayed on every water bill.

There are various estimates of the extent of sewer misconnections. In 2007 the Environment Agencyiv considered that as many as one in five properties have misconnections that discharge effluent into rivers. An UKWIR projectv estimated the potential number of misconnections in each of the water company catchments and a national total of around 140,000 properties. This was based on a 0.5% misconnection rate, property housing stock, types of drainage system and incidents of polluted outfalls. Investigation of known polluted outfalls by Thames Water and Severn Trent Water from 2008-2012 estimated an average of 2.3% of properties have some sort of misconnection. Of these misconnections approximately 35% are due to above ground connections of washing machines, 10% dishwashers and 20% sinks with 5% being toilets and 1% being the whole property. A significant number of other problems are due to infrastructure such as dual manholes. Dual manholes allow shared access to both foul and surface water sewers that are sometimes in open channels. As such they can allow cross contamination of foul to surface or surface to foul to occur.

Building Control approval does require new drainage to be made to the correct sewer. However in practice the knowledge of site specific drainage systems and the priority attached to misconnections amongst Building Control Officers needs to be improved.

Rectifying the problem

There has been an extensive effort to investigate and rectify misconnections since the 1990s by regulators, WaSCs and LAs. WaSCs own most foul and surface water sewers since the transfer of private foul sewers in England and Wales in October 2011. Highway authorities own most road drains. This has generally focused on the most obviously polluted outfalls and such effort is still essential for many watercourses. Extensive investigation effort to ensure Bathing and Shellfish Water compliance is also ongoing particularly in the North West, South West and the South coast of England investigation projects, as in Wales. These surveys are expensive and difficult to do, in contrast to the ease of causing a misconnection. The total spend on investigation effort to date is not known. The UKWIRvi report estimated investigation costs for all foul sewer misconnections might amount to £450M with rectification costs of around £50M.

LAs are key partners in providing support by using their legal powers to ensure rectifications but their capacity to do this is diminishing. The EA is currently undertaking a trial to assess how it might use its own Anti Pollution Works Notices (APWNs) powers, where property owners fail to act voluntarily. This should be completed later in 2014 and may provide evidence to support the use of APWNs in future. However, EA APWN powers are generic and not as effective as those available to LAs. Regardless, legal action to rectify misconnections will remain costly, cumbersome and resource intensive.

Multiple interventions

Taking into account these uncertainties, the way forward would perhaps be to develop a mix of measures including both practical investigations and activity based on behaviour change and awareness.

Raising awareness of which type of drainage serves a property and the consequences of misconnections is in the hands of the WaSCs. There is no reason why this information could not be included on water bills.

Practical measures might be incorporated into catchment-based planning to focus on problem stretches and outfalls. In some situations this might include the bespoke design of solutions by the key partners i.e. water companies, EA and local authorities. This suggests a requirement to firstly investigate and rectify misconnection problems from polluted outfalls alongside additional measures, to address aspects such as sewer maintenance, capacity improvements and removing surface water misconnections from foul sewerage systems. In some situations it may be more cost effective and assured to incorporate treatment via sustainable drainage infrastructure (SuDS) rather than trace misconnections. SuDS would also have other benefits relating to urban runoff and flood water management as well as improving habitats, amenity and providing a 'safety net' for water quality.

Ongoing vigilance is needed to prevent problems re-occurring. The diffuse nature of pollution from misconnections also means that regulatory and legal remedies are cumbersome and inefficient so cannot be relied upon. Resolving the problems caused by misconnections, especially at the catchment level, cannot be achieved through one-off interventions alone. Consequently, approaches based on education, awareness and collaboration are needed to complement investigation and rectification effort to remove misconnections. There needs to be a 'step change' in raising awareness with both the public and professionals alike about misconnections alongside similar communication regarding the misuse of surface water sewers and diffuse urban drainage.

Awareness

The National Misconnections Strategy Group supported by, amongst others, all WaSCs, Consumer Council for Water, the Chartered Institute of Plumbing and Heating Engineers and the Local Authority Building Control organisation has embarked on some initiatives to raise awareness with the public and professionals at a more strategic level. A 'connectright' websitevii has been developed that incorporates a property checking facility to indicate the risks of having a misconnection, provides information and advice and directs visitors to Watersafe approved plumbers.

There should be a legal requirement to check the drainage when a property changes ownership. This might be a slow process but it could be a very effective means of contributing to curing misconnections. The costs for homeowners would be significant but not excessive (typically less than £300 for an average house). It would also raise awareness of the subject, which could deter people from misconnecting and/or cause people to correct misconnections.

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Note: CIWEM Policy Position Statements (PPS) represents the Institution's views on issues at a particular point in time. It is accepted that situations change as research provides new evidence. It should be understood, therefore, that CIWEM PPS's are under constant review and that previously held views may alter and lead to revised PPS's. PPSs are produced as a consensus report and do not represent the view of individual members of CIWEM.

References

i www.watersafe.org.uk

ii Evans, T. D. and Orman, N. (2013) Urban Drainage and the Water Environment: a Sustainable Future. FWR FR/R0011 www.fwr.org/urbndnge.pdf

iii MORI Ipsos Misconnections research 2009 – J34687

iv Environment Agency (2007) The unseen threat to water quality, Diffuse water pollution in England and Wales report

v UKWIR Project WM07E305; Sewer misconnections – what is the true non-agricultural diffuse water pollution impact.

vi UKWIR Project WM07E305; Sewer misconnections – what is the true non-agricultural diffuse water pollution impact.

vii www.connectright.org.uk