



SUSTAINABLE DRAINAGE IN LEEDS

Supplementary Guidance No. 22

JULY 2004



BACKGROUND

This guidance provides information for developers on the use of sustainable drainage techniques in new developments. It expands current City Council policy and Government guidance and sets out a procedure for dealing with drainage issues through the planning process. It is not intended to provide detailed technical design advice. The guidance is relevant for all developments where buildings and/or hard surfaces will create surface water runoff.

Rain falling on buildings and hard surfaces cannot infiltrate into the ground so it needs to be drained artificially in order to prevent problems of localised flooding. The traditional method of dealing with surface water has been to pipe it away from developments and discharge it to the sewerage system or nearby watercourses. This has implications for water quality, the ecology and amenity of watercourses, including canals, and downstream flooding.

It is predicted that climate change, as a result of human activity, will result in increased rainfall in the UK as well as an increase in the frequency of intense rainfall events. This is likely to exacerbate flooding problems.

Sustainable drainage systems provide an alternative to the traditional approach. Sustainable drainage seeks to mimic more natural drainage processes by allowing rainfall to soak into the ground where possible or by delaying discharges. This reduces both the volume and rate of surface water runoff to sewers and watercourses.

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Flooding at Ring Road,
Wortley, Leeds



Flooding at Ring Road,
Wortley, Leeds



POLICY CONTEXT

The Leeds Unitary Development Plan (UDP) encourages development that fulfils the fundamental requirement of sustainability. This is reflected in Strategic Goal 4:

- ~ **to ensure that development is consistent with the principles of sustainable development.**

Planning permission considerations are covered by general policy 5 (GP5).

The Leeds UDP Review: first and Revised Deposit - propose policy **N39A**:

- ~ **Development proposals should, wherever practicable, incorporate sustainable drainage systems.**

The **Sustainable Development Design Guide** (Supplementary Guidance No. 10) includes a section on Protecting Water Resources (refer to Appendix B).

Planning Policy Guidance Note 1 General Policy and Principles identifies sustainable development as a key objective for the planning system.

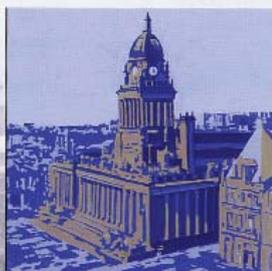
Planning Policy Guidance Note 25 Development and Flood Risk provides guidance on the promotion of sustainable drainage systems through the planning system. Paragraphs 40 - 42 and Appendix E are particularly relevant. Appendix E paragraph E14 lists essential considerations early in the planning and design stages:

- ~ Integration of sustainable drainage systems into the overall site concept and layout;
- ~ The need for investigation and subsequent remediation of contaminated land;
- ~ Agreements on adoption, maintenance and operation of the systems; and
- ~ The need for monitoring long term performance.

The Building Regulations require that adequate surface water drainage is provided. Approved Document H includes a priority for soakaways or other infiltration systems over drainage to watercourses or sewers.

LEEDS UNITARY DEVELOPMENT PLAN

Adopted 1st August 2001



SUSTAINABLE DEVELOPMENT DESIGN GUIDE

Supplementary Guidance No.10



CONVENTIONAL DRAINAGE SYSTEMS

The traditional method of piping surface water away from a development is efficient in preventing localised flooding on a site but it does cause significant environmental and amenity problems. These include:

- ~ Downstream flooding. Rapid drainage of water from urban areas can result in flooding elsewhere in the beck or river catchment.
- ~ Erosion of watercourses. Artificially high flows can result in bank erosion which can be detrimental to property and the amenity and ecology of watercourses.
- ~ Pollution of watercourses. Surface water runoff can contain a range of pollutants including oil, silt, organic matter and heavy metals. Householders often wrongly connect washing machines and dishwashers to the surface water system which will add detergents and other agents. All of this has an adverse impact on aquatic plants and animals.
- ~ Overload of combined sewer systems causing overflows of foul effluent to watercourses. As well as being a health hazard this can also have an adverse impact on flora and fauna and public amenity.
- ~ Reduced groundwater recharge. Large areas of impermeable surfaces prevent rainwater infiltration. This tends to affect the level of the natural water table and can have an adverse impact on trees and other vegetation in the immediate area. It can also lead to low base flows in watercourses as the natural process of infiltration and drainage to the watercourse is disrupted.
- ~ Detrimental effects on navigable waterways. Some watercourses and drains discharge into inland waterways and excess flows can cause pollution and undesirable currents, making navigation unsafe.

High flow in River Aire,
Leeds City Centre



Combined sewer outfall entering
Wyke Beck, Leeds



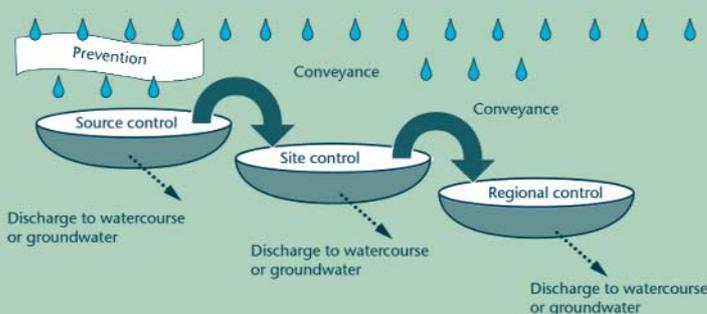
SUSTAINABLE DRAINAGE SYSTEMS

Sustainable drainage systems are designed to address the problems associated with conventional drainage systems by controlling both the quantity and quality of surface water as close to its source as possible. There may also be other benefits of sustainable drainage including reduced costs (the need for gullies, drains and extensive piped networks can be reduced or eliminated) and habitat creation (features such as well designed wet balancing ponds and wetlands can provide valuable wildlife habitats). The Leeds Biodiversity Action Plan includes a great crested newt species action plan which promotes the creation of ponds of value for wildlife, especially as part of sustainable drainage initiatives.

A range of sustainable drainage techniques are available and more than one technique may often be appropriate at a given site. It is good practice to select according to the following hierarchy in order to achieve reductions in the total volume of runoff as well as reductions in the rate of runoff.

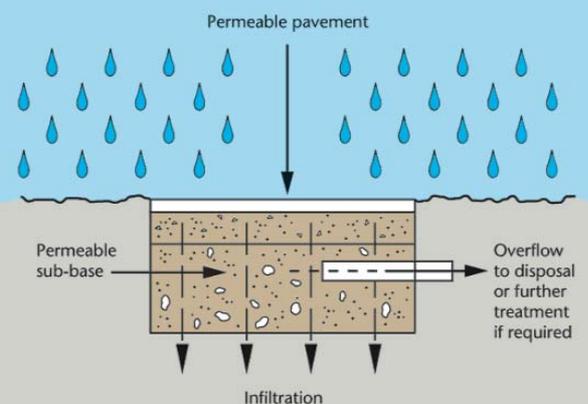
- ~ **1. preventative measures** - these include rainwater collection and use for toilet flushing, garden and landscape watering and other uses. A simple example is a water butt but more sophisticated systems are available to collect roof water and use it to supplement mains water. As well as reducing the amount of surface water runoff to be dealt with there are environmental and economic benefits of reduced demand for mains water. 'Green' (vegetated) roofs can also reduce runoff.
- ~ **2. permeable surfaces** - these are hard or soft surface treatments which allow water to infiltrate to the underlying subsoil. Permeable hard surfaces are becoming more readily available commercially.
- ~ **3. filter strips and swales** - these vegetated landscape features collect water from impermeable surfaces and allow it to soak into the ground.

Surface Water Management Train
Source: Environment Agency



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Permeable paving
Source: Environment Agency



- ~ **4. infiltration devices** - structures which drain water directly into the ground. These can be used at source or the run-off may be conveyed to the infiltration area in a pipe or swale.
- ~ **5. detention techniques** – basins, ponds, wetlands and other structures designed to hold water when it rains and then release it in a controlled manner to a conventional surface water drainage system.

Infiltration techniques are dependent on the suitability of soil conditions. Where surface water is discharged to a sewer or watercourse oil and silt separators will be required as appropriate.

The Construction Industry Research and Information Association (CIRIA) publishes useful guidance including Sustainable Urban Drainage Systems - a design manual for England and Wales (CIRIA Report 522) and Sustainable Urban Drainage Systems Best Practice Handbook (CIRIA Report 523). Detailed design advice should always be sought from qualified and experienced drainage engineers. In addition, advice regarding sustainable drainage for new developments should also be sought from the City Council at an early stage.

The selection of techniques should include consideration of the impact on, and potential benefits to, other elements of the development. Professional input should be sought (for example from landscape architects, highway engineers and ecologists) to optimise the wider benefits for the project at an early stage.

Permeable paving at Hawthorn Park, Leeds



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Permeable paving at residential development - near Wetherby



SUSTAINABLE DRAINAGE AND PLANNING APPLICATIONS

Drainage concepts for a site should be agreed in principle as early as possible in the planning approval process in order to ensure that sustainable drainage features can be incorporated in the development where practicable.

Surface water drainage is a material consideration when determining planning applications. Early consideration of sustainable drainage in the development process is important as there may be implications for land purchase, design concepts and site layout. Conversely it can be very difficult to incorporate sustainable drainage features if detailed consideration is not given to drainage issues until after the basic concepts of the development have become fixed.

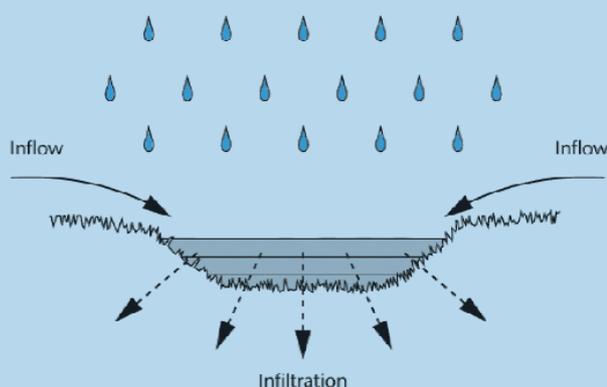
Developers are advised to discuss drainage issues with the City Council at the pre-application stage. Resolving drainage issues at this stage will help to speed decision making when an application is submitted.

In accordance with Council policy and Government guidance Leeds City Council will seek to incorporate sustainable drainage systems for significant developments and will encourage sustainable drainage systems for all other developments.

Early investigation is essential to ensure that the impact of any land contamination on drainage is dealt with correctly.

An **Indicative Drainage Strategy** for the site should be submitted with **outline planning applications**. For significant developments a **Drainage Impact Assessment** will also be required at this stage (a checklist indicating the minimum information required is included as Appendix A).

Swale
Source: Environment Agency



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Swale at Refuse Collection
Agency Depot, Leeds



Significant developments are all developments except:

- ~ individual householder applications
- ~ developments of less than ten new dwellings (unless a sensitive area identified by the Council may be affected)
- ~ non-householder extensions under 100 square metres
- ~ changes to use not involving new buildings on hard surfacing
- ~ developments which are part of a larger development for which a Drainage Impact assessment has been accepted.

A detailed drainage design will be required with reserved matters or full planning applications.

A planning application must demonstrate that a viable drainage strategy is proposed. If it is intended that drainage should be to a public sewer then the specific sewer should be identified.

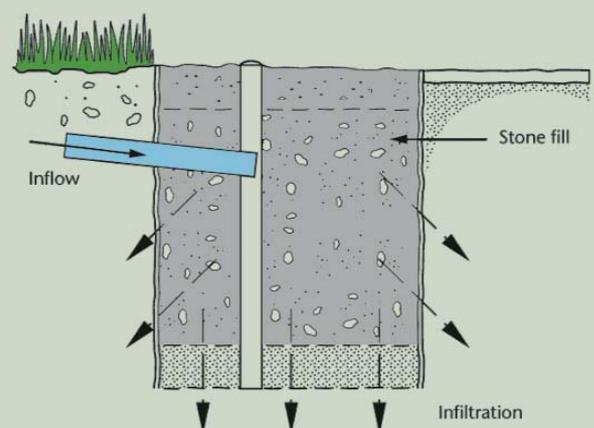
Where drainage details are subject to a planning condition Planning Services will consult Land Drainage officers on the adequacy of the design of proposed drainage systems in order to ensure that they are in accordance with sustainable drainage best management practices. The full impact of proposals on other elements of the development, such as greenspace and existing trees, should be demonstrated.

National Building Regulations (Approved Document H) also has an influence on the positioning and design criteria of drainage infrastructure. Planning Services officers will liaise with Building Standards regarding the suitability of connections to the drainage system and discharges in relation to ground conditions.

Swale at the Eden Project, Cornwall



Soakaway
Source: Environment Agency



FUTURE MAINTENANCE

Unlike traditional piped drainage systems there is currently no guidance on who should be responsible for the operation and maintenance of sustainable drainage features.

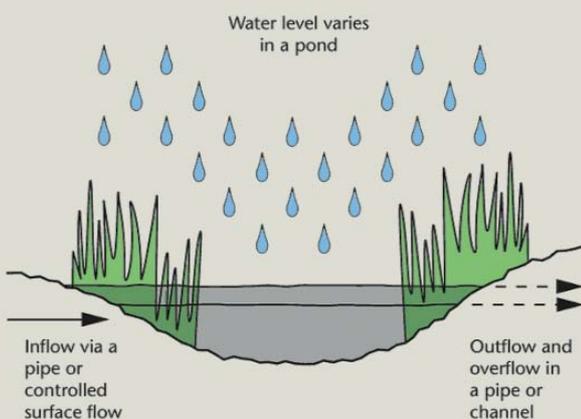
The City Council will insist on clear-cut provisions for the future maintenance of all on-site drainage infrastructure. Future management arrangements may be required in respect of both on and off site features to ensure future maintenance.

REFERENCES

- Building Regulations** (2000) Approved Document H.
- CIRIA (2000) **Sustainable Urban Drainage Systems: Design Manual for England and Wales**. Report C522.
- CIRIA (2001) **Sustainable Urban Drainage Systems Best Practice Manual**. Report 523.
- DETR (2001) **Planning Policy Guidance (PPG) 25 – Development and Flood Risk**
- Leeds City Council (1998) **Sustainable Development Design Guide**. Supplementary Guidance No. 10.
- Leeds City Council (2001) **Unitary Development Plan**
- Leeds City Council (2003) **Unitary Development Plan Review: First Deposit**
- Leeds City Council (2004) **Unitary Development Plan Review: Revised Deposit**
- National SUDS Working Group (2003) **Framework for Sustainable Drainage Systems (SUDS) in England and Wales**
- Scottish Environmental Protection Agency, Environment Agency & Environment and Heritage Service **Sustainable Urban Drainage Systems: An Introduction**

Balancing pond
Source: Environment Agency

8 Balancing pond at Thorpe Park
Business Park, Leeds



USEFUL WEBSITES

Construction Industry Research & Information Association

www.ciria.org.uk

Environment Agency

www.environment-agency.gov.uk

Leeds City Council

www.leeds.gov.uk Drainage pages

Office of the Deputy Prime Minister (PPG25)

www.odpm.gov.uk

Scottish Environment Protection Agency

www.sepa.org.uk/guidance/urban-drainage/index.htm

CONTACTS

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LS2 8HD

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Email: planning@leeds.gov.uk

Development Department

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Middleton
LEEDS
LS10 4AX

Tel: 0113 247 8790

Fax: 0113 247 4117

Balancing pond at the
David Lloyd Centre, Leeds



Green roof at residential development
in Chapel Allerton, Leeds



APPENDIX A PLANNING APPLICATIONS - DRAINAGE EF

PLANNING APPLICATIONS – DRAINAGE EFFECTIVENESS AND IMPACT ASSESSMENT PROCEDURE

New developments must have effective, durable drainage and must not increase flood risk or pollution. All significant developments should be carried out in accordance with the principles of sustainable drainage (SUDS).

In order to ensure this, it is advisable that the City Council is consulted on drainage matters at the pre-Planning Application Stage.

At Pre-Planning Application or Outline Application Stage

A Drainage Impact Assessment (DIA) is required for all significant¹ developments.

The DIA submitted by the developer should include the following checked (✓) items. Note that the Land Drainage Team will insert the appropriate ticks for each specific development:

TOPIC	Req'd (✓)	Item	Date Supplied
EFFECTIVENESS APPRAISAL	✓ ²	Indicative Drainage Strategy	
	✓ ²	A description of current drainage pattern	
		A concept drawing of the development proposal	
	✓ ²	A brief summary of how the drainage proposals provide SUDS techniques	
		A summary of the SUDS to be incorporated	
		The soil classification for the site	
		The results of soil porosity test (preferably at the location of proposed infiltration devices)	
		Confirmation of maintenance responsibility	
IMPACT APPRAISAL		Existing site flood risk assessment	
		Calculations showing pre- and post-development peak run-off rate for the agreed critical rainfall event(s)	
AMENITY APPRAISAL		A survey of the condition of agreed sections of existing downstream culverts and watercourses	
		An assessment of impact on habitats	

¹ Significant developments are all developments except:

- Individual householder applications
- developments of less than ten new dwellings (unless a sensitive area identified by the Council may be affected)
- non-householder extensions under 100 square metres
- changes of use not involving new buildings or hardsurfacing
- developments which are part of a larger development for which a DIA has already been accepted

² This information is always required and should be submitted with the planning application. The Council may also ask for other listed items to assist with the appraisal of the application.

EFFECTIVENESS AND IMPACT ASSESSMENT PROCEDURE

At Detailed Application or Reserve Matters Stage

Before development proceeds, the following items should additionally be submitted, in an approved format, for approval and recording. Note that the Land Drainage Team will insert the appropriate ticks for each specific development:

TOPIC	Req'd (✓)	Item	Date Supplied
IMPACT APPRAISAL		Finished floor, road and footpath levels	
		Flood levels on site for the agreed critical rainfall event(s) – from sewers and watercourses	
		Hydrological/ hydraulic models of receiving watercourse at agreed locations for the agreed critical rainfall event(s)	
		Details of downstream flood mitigation works	
GENERAL DRAINAGE INFRA-STRUCTURE		Scale plan and longitudinal sections of site drainage installations (including dimensions, depths, material types, strengths)	
		Summary of design flow rates	
		Summary of design (structural) loading conditions	
		Calculations to illustrate capacities, performance and strengths	
DETENTION PONDS, RESERVOIRS OR BASINS		Details of any grids, screens or valves	
		Catchment plan	
		Flood inflow calculations	
		Topographic plan of pond, reservoir or basin	
		Flood routing calculations for the design events	
		Flood spillway and outlet hydraulic design	
		Embankment stability and seepage calculations	
PUMPING STATIONS		Plan and section of outlet pipework and valves	
		Description of safety measures to be implemented	
		General arrangement drawing for pumping station	
MAINTENANCE		Summary of design inflows and pumping capacity	
		Details of emergency overflows, alarms, telemetry	
		Confirmation of maintenance responsibility for each element of the drainage system	
	Handbook, manual or guidance given to maintainer		

Some relevant guidelines (for information only):

Reservoir Engineering

Floods and reservoir safety – The Institution of Civil Engineers (ISBN 0 7277 2503 3)

Small embankment reservoirs – CIRIA Report 161 (ISBN 0 86017 461 1)

Design of Flood Storage Reservoirs – CIRIA (ISBN 0 7506 1057 3)

Sustainable Drainage

Sustainable urban drainage systems, Design manual for England and Wales – CIRIA Report 522 (ISBN 0 86017 522 7)

Sustainable urban drainage systems, Best practice manual – CIRIA Report 523 (ISBN 0 86017 523 7)

Pumping Stations

Design of low-lift pumping stations – CIRIA Report 121 (ISBN 0 86017 312 7)

Guide to the design of thrust blocks for buried pressure pipelines – CIRIA Report 128 (ISBN 0 86017 359 3)

Hydraulic and Hydrological Design

Culvert design guide – CIRIA Report 168 (ISBN 0 86017 467 0)

Flood estimation handbook – Institute of Hydrology (ISBN 0 948540 94 X)

General Guidance

Framework for Sustainable Drainage Systems (SUDS) in England and Wales – National SUDS Working Group

APPENDIX B ~ EXTRACT FROM SUSTAINABLE DEVELOP

PROTECTING WATER RESOURCES

UDP Policies: N39 culverting and canalisation of watercourses

The impact on the water environment should be a consideration at the site identification stage. This includes impacts on water quality, protecting the flood capacity of watercourses and protecting features such as ponds and wetlands.

The site layout should seek to minimise impacts on the water environment by reducing the quantity and improving the quality of surface water run off. Developers will be expected to make provision for the long term management of water conservation measures.

NB: Illustrative guide only. Each site should be considered individually.

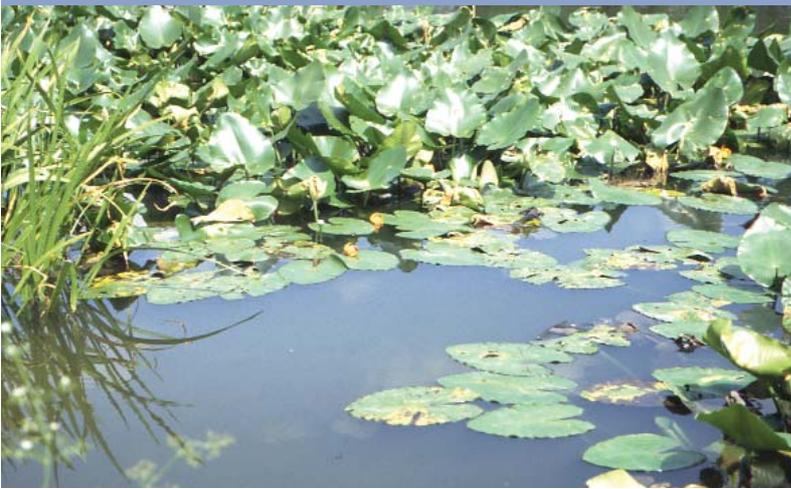
A combination of measures may be used.

	AREA SERVED (HECTARE)					
	<2	2-4	4-7	7-9	9-15	>15
Dry extended detention pond	x	x	x	?	✓	✓
Wet extended detention pond	x	x	?	✓	✓	✓
Wet pond	x	x	?	✓	✓	✓
Infiltration trench	✓	?	x	x	x	x
Infiltration basin	?	✓	✓	?	x	x
Porous pavement	✓	?	?	x	x	x
Grassed swale	✓	?	x	x	x	x
Filter strip	✓	?	x	x	x	x

SOURCE : SEPA/EA (1997)

- KEY
- ✓ Feasible
 - ? Marginal - needs careful design
 - x Not feasible

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MENT DESIGN GUIDE

The following guidelines should be considered:

- ~ the culverting and canalisation of watercourses should be avoided wherever possible, and opportunities to re-establish natural watercourses, channels, margins and wetlands should be maximised;
- ~ the amount of non-porous hard surfacing should be minimised to enable infiltration;
- ~ downstream watercourses should be protected from the adverse effects of excess surface water run-off, both in quantity and quality;
- ~ landscape areas should incorporate such features as swales and filter strips to reduce the volume of piped surface water run off;
- ~ infiltration methods, such as soakaways, should be used wherever possible and where soil conditions permit;
- ~ where surface water cannot be absorbed on site provision should be made for open balancing ponds (NB. These should be designed to maximise their wildlife value);
- ~ where site drainage is to a combined sewer the impact of any increased flow on combined sewer overflows should be considered and minimised;
- ~ install oil interceptors and silt traps to improve the quality of any surface water discharge to watercourses and/or soakaways;
- ~ provide facilities for rainwater collection for re-use;
- ~ where possible, site landscaping should utilise plant species which do not require a lot of water.

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Roadside swale



APPENDIX C ~ ROLES OF RELEVANT AGENCIES

ENVIRONMENT AGENCY (EA)

The EA is a statutory consultee regarding any planning application and it is the relevant land drainage operating authority for **main rivers**, which in Leeds are the rivers Aire and Wharfe, Collingham Beck, Cock Beck and Oulton beck. The EA may advise that sustainable drainage principles be used in connection with any significant development in order to protect against flooding and pollution on a catchment wide scale. However, it is unlikely to have detailed knowledge regarding the potential effects of surface water run-off on local **non-main river** streams and becks, for which the relevant land drainage operating authority in Leeds is the City Council.

The EA is also unlikely to have sufficient resources to check developers' drainage proposals in detail to ensure that they comply with sustainable drainage best management practice.

The legal basis of water pollution control in England and Wales is the Water Resources Act 1991 (as amended). The regulation of the **quality** of surface water discharges is a discretionary power, and the EA seeks instead to encourage the adoption of good practice (through the planning process) so that most discharges need not be subject to a formal discharge consent regarding the quality of the discharge, which in most cases it would be impracticable for the Agency to police. There is no mechanism by which the EA can restrict the **quantity** of surface water discharges and this must be achieved through planning conditions, as emphasised by PPG25. Surface water discharges to soakaways are not subject to a formal discharge consent.

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Flooded beck in Leeds



LAND DRAINAGE AUTHORITY

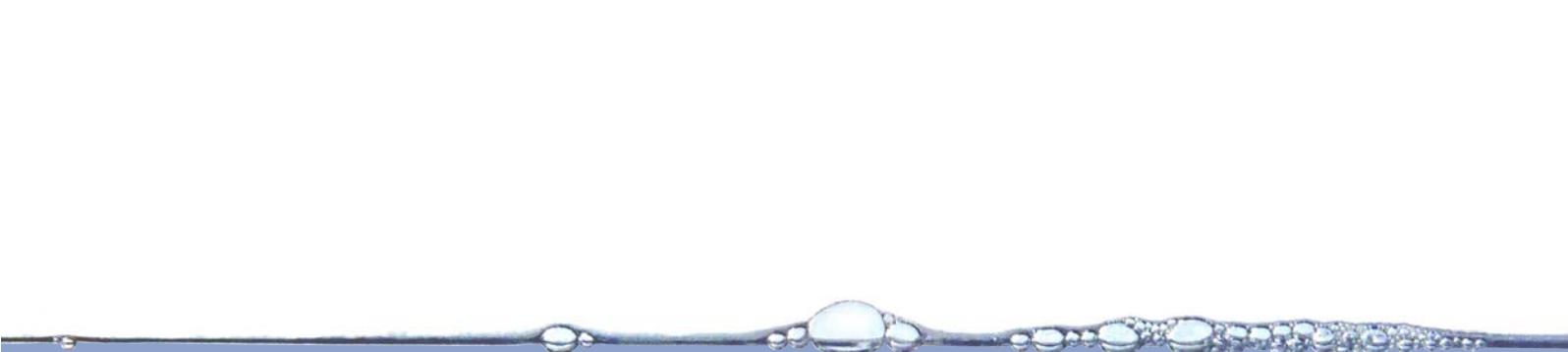
The flood defence operating authority for all non-main river watercourses in Leeds (with the exception of a small area in north east Leeds which comes under Marston Moor and North Wharfe Internal Drainage Boards) is the City Council, these functions being administered by the Development Department, Land Drainage Team. There are some 500 km of non-main river watercourse within the Leeds district compared with 100 km of main river.

The Land Drainage Team has detailed knowledge of the condition of and possible local effects on these watercourses of proposed surface water discharges. They have undertaken some detailed studies of the condition and capacity of watercourses and are responsible for developing sustainable drainage policies for every catchment in Leeds.

They advise Planning Services on the restrictions which should be placed on surface water discharges in planning conditions and scrutinise developers' detailed drainage plans and designs to ensure that they comply with sustainable drainage best management practices. They are also able to advise on a suitable point of connection to the watercourse system, the need for works on the receiving watercourse and therefore for developers to be required to contribute to those works.

The Land Drainage Team also controls the culverting of non-main river watercourses (note that the consent of the Environment Agency is also required for culverting these watercourses).





BUILDING STANDARDS

National Building Regulations lay down technical requirements for below ground drainage systems and their discharge to a suitable point of disposal. Building Standards officers can also provide advice on local ground conditions.

SEWERAGE UNDERTAKER

Yorkshire Water is a consultee to the planning process. It can advise on the adequacy of the existing sewerage infrastructure, which can be a material consideration under PPG23 and PPG12 (paragraph 6.15).

Yorkshire Water may impose a limitation on the flow which can be discharged to existing sewers. Sustainable drainage techniques can be helpful in enabling compliance with such restrictions.

Yorkshire Water will be happy to discuss sustainable drainage proposals with the developer. Tel. 0113 2354154.

HIGHWAY AUTHORITY

The City Council as Highway Authority is responsible for agreeing the design of roads to be constructed in connection with new developments and adopted by the authority under Section 38 of the Highways Act. The use of sustainable drainage techniques needs to be considered in relation to the provision of highway surface water drainage, which may utilise a common surface water drainage system with the rest of the development.

