

4 SUSTAINABLE DRAINAGE SYSTEMS

The use of sustainable drainage systems is, quite correctly, being strongly promoted in the Dublin Region. This section briefly explains the applicability of such systems to new development, to provide the background information for setting policy on related issues, in particular taking-in-charge.

Information on volume control for flooding and water quality, related to SuDS is contained in Chapter 6 herein.

Full information on the justification, principles and application of sustainable drainage systems is contained in the Regional Drainage Policy on Environmental Management.

4.1 The Need for Sustainable Drainage Systems

Regional Drainage Policy on Environmental Management has confirmed that water quality is deteriorating due to historic and existing drainage practices, combined with rapidly increasing urbanisation. The inevitable result is that the requirements of environmental legislation, encapsulated by the Water Framework Directive (WFD) will not be met.

To date, drainage practices have promoted the rapid collection and conveyance of surface runoff through gullies and pipes away from the site and into watercourses, thus bypassing the natural buffering effect of the natural environment. Consequently both volumes and rates of runoff increase significantly after development incorporating such drainage systems. The resulting problems include flooding, scouring of watercourses and reduced infiltration to recharge aquifers and other sub-soil water bodies.

Runoff from impermeable surfaces associated with urban development is often contaminated by pollutants, such as oils, detergents, trace metals, pesticides and herbicides. Any such pollutants will also bypass any available natural treatment processes, such as percolation through the soil, adversely affecting the water quality in receiving waters.

4.2 Principles of Sustainable Drainage Systems

The principle of Sustainable Urban Drainage is to move away from the traditional approach of managing the volume and rate of runoff from larger storm events, towards integrating flood control and runoff treatment. Wherever practicable runoff flows and pollutants are managed on the site, rather than being directed to the nearest receiving waters.

Sustainable Drainage Systems (SuDS) thus involve a shift in our way of managing run-off from solely looking at volume control, to an integrated approach which considers land use planning, water quality, water quantity, amenity and habitat enhancements.

SuDS thus provide an excellent mechanism through which we can change the way of managing urban drainage, and help achieve the objectives of the WFD.

- **SuDS is therefore mandatory for all new developments**, except where the developer can demonstrate that its inclusion is impractical due to site circumstances. Where SuDS cannot be provided, the developer must provide alternative means of dealing with pollutants.

The assumption must be that SuDS will be used, with the onus of responsibility with the developer to provide SuDS measures to the Councils' satisfaction, or to demonstrate that SuDS cannot be provided or is not applicable.

4.3 SuDS Techniques

The overall objective is to minimise stormwater runoff. Therefore the area of impermeable surfaces, such as pavement and tarmac should be minimised by careful attention to site layouts and the specification of pervious surfacing where practicable.

The objective of SuDS drainage designs is to collect and treat this minimised amount of runoff as close to source as possible. SuDS techniques comprise a flexible series of options, which allow the drainage designer to select those systems that best suit the circumstances of the site. Drainage designers can combine various techniques through a stormwater management or treatment train approach for best effectiveness.

The treatment train approach assures that both runoff quantity and quality are addressed, through the overall techniques of:

- ◆ **Pollution prevention:** spill prevention, recycling, public awareness and participation;
- ◆ **Source control:** conveyance and infiltration of runoff;
- ◆ **Site control:** reduction in volume and rate of surface runoff, with some treatment provided;
- ◆ **Regional control:** interception of runoff downstream from all source and site controls, to provide follow-up flow management and water quality treatment.

The elements of the treatment train approach are shown in Figure 4.1, abstracted from the Environmental Management Policy.

The first element of treatment is **pollution prevention**, essentially good housekeeping, since minimising or preventing pollution in the first place is more practical and cost effective than having to treat it afterwards. Thus the best approach to urban runoff pollution is to prevent chemicals, and other pollutants from coming into contact with rainfall runoff through appropriate storage and management, and through public education.

The second element is to detain or infiltrate runoff as close as possible to the point of origin, including the use of water butts, roof collectors, filter strips, infiltration devices and swales. The use of such **source control** devices reduces the peak runoff rate and attenuates flows, thus reducing stress on downstream facilities, allowing them to be smaller in capacity. Infiltration of flows will ensure that unavoidable pollutants are treated where practicable.

Site control comprises runoff and treatment installations to serve individual developments (or combinations of developments on adjacent sites), using elements such as swales and detention basins. Such sites could be shopping centres, industrial sites or medium sized residential developments of 10 to 50 dwellings.

The final element is **regional control**, comprising treatment facilities to reduce pollutants from contaminated runoff, with the potential to provide biological treatment. These installations deal with runoff on a catchment scale rather than at source level, typically controlling areas of 2 hectares or larger. They are often end-of-pipe facilities.

Localised pollution prevention and source control measures are summarised in Table 4.1, and more drainage design orientated SuDS measures for source, site and regional control are summarised in Table 4.2.

Type of System	Device	Primary Function	Primary Characteristics	Example
Pollution Prevention	Council Maintenance	Minimises presence of pollutants to enter runoff, especially "first flush"	Regular sweeping and collection of rubbish	Maintenance regimes for Council staff and estate O&M.
Pollution Prevention	Public Involvement	Minimises presence of pollutants to enter runoff, especially "first flush"	Education in management of rubbish and domestic pollutants	Information leaflets, local estate management committees
Pollution Prevention	Management of Pollution Sources	Prevention of polluted runoff	Prevention of rainfall on polluted surfaces	Canopies over bin and rubbish storage areas
Pollution Prevention	Management of Pollution Sources	Prevention of polluted runoff	Prevention of runoff from polluted areas	Bunding of oil and chemical product tanks with isolated drainage arrangements
Pollution Prevention	Management of Pollution Sources	Prevention of polluted runoff	Interception of pollutants in runoff	Silt traps, petrol, oil and grease interceptors
Source Control	Water Butt	Minimise runoff, flow attenuation, water re-use	Rainwater collector with overflow to soakaway area	
Source Control	Minimising impermeable areas	Minimise runoff and washoff of pollutants	Gravelled surfaces on parking areas and driveways	
Source Control	Minimising Connected Areas	Minimise and attenuate runoff	Runoff from impermeable areas absorbed	Paved and roofed areas drained to unpaved areas and soakaways
Source Control	Avoiding foul connections to storm systems	Avoid direct pollution of storm systems	Maintaining principle of separate drainage systems	Public education and Building Control

Table 4.1 **Local SuDS Measures**

Type of System	Device	Primary Function	Primary Characteristics
Infiltration systems	Infiltration Trenches, Infiltration Basins, Permeable Paving	Encourage stormwater to soak into the ground while filtering pollutants	Permeable features allowing infiltration
Filtration systems	Swales, Bioretention Systems, Filter Strips	Capture heavy metals, grease, oil, nutrients and sediment	Grassed or planted features such as channels
Constructed wetlands	Stormwater wetlands	Filter stormwater and reduce runoff rate while providing a wildlife habitat	Heavily vegetated hydrologically charged area
Retention systems	Retention ponds	Primarily designed to retain pollutants	Artificial lake with fringing vegetation
Detention systems	Detention basins, filter drains	Primarily designed to reduce runoff rate	Vegetated depressions

Table 4.2 Site and Regional SuDS Measures

The treatment train approach involves the division of the drainage elements of the development into sub-catchments with different drainage characteristics and land uses, each with its own drainage strategy. A sub-catchment could be as small as a single building, with its own water butt, pervious paving, etc.

Dealing with runoff locally reduces the quantity of flow that has to be managed at any one point. Taking advantage of any treatment processes available at sub-catchment level can also successively reduce the pollutants in the runoff flows passing through the treatment train.

4.4 Implementation of SuDS Measures

Since SuDS are central to Environmental Management Policy, it is vital that its measures are implemented successfully. The Policies herein will apply to new development. However the intention would be that SuDS measures also be implemented on existing developments where suitable, i.e. retrofitting.

The issues relating to successful implementation include:

- ◆ Co-operation between stakeholders in promoting SuDS, including developers, designers, the Department of the Environment, Council Drainage, Planning, Parks and Roads Departments and the general public;
- ◆ Mandatory use of SuDS except where found to be impracticable;
- ◆ Agreement on design principles and parameters for SuDS facilities;

- ◆ Ensuring SuDS are designed to operate within current planning and regulatory guidelines;
- ◆ Ensuring effective whole-life solutions are implemented;
- ◆ Agreement on maintenance responsibilities;
- ◆ Agreement on taking-in-charge requirements and procedures;
- ◆ Maintenance of register of SuDS installations;
- ◆ Inclusion of facilities to monitor performance and maintenance.

It must be said that UK experience is that implementation of SuDS has been, and continues to be, a long process, due to the often conflicting interests of the stakeholders. The issues regarding taking-in-charge and maintenance of SuDS facilities are particularly difficult to resolve. Nevertheless the Policy for the Dublin Region must take advantage of others' experience, and set the road map for implementation of SuDS.

4.4.1 Co-operation Between Stakeholders

The best way to achieve co-operation is for all stakeholders to understand the reasons for SuDS and that its implementation is a corner-stone to environmental improvement, in which they all have their part to play.

Inclusion of SuDS in all new development is thus mandatory, with the onus on the developer to demonstrate that he cannot incorporate SuDS facilities. Nevertheless, general acceptance and appreciation of SuDS is best achieved through education and publicity, such as:

- ◆ Publishing and widespread distribution of posters, such as that produced for the Environmental Management Policy, explaining in a straightforward and graphically intensive format, the objectives involved and their role in helping to achieve them;
- ◆ Publishing and widespread distribution of case histories of local developments incorporating SuDS, recorded through the SuDS register;
- ◆ Site visits to local developments incorporating SuDS facilities;
- ◆ Invitations to developers, designers and institutions to seminars on SuDS, to explain the principles, and the Councils' intentions to implement them;
- ◆ Setting up of a SuDS Regional Working Party, involving all stakeholders (DoE, Council Drainage, Planning, Parks and Roads Departments, major developers) to promote implementation and resolve any issues arising.

The principle must be that implementation of SuDS will be an evolving process, and that there will be adoption of its successes and changes to its failures. SuDS implementation in the Dublin region is in its infancy, and the Policy therefore recommends that databases be kept of SuDS installations, and their performance, in order that knowledge can be built up and shared between the stakeholders.

The above measures will ensure that all stakeholders understand that SuDS is required by the Councils, and that their best position is to be involved and contributing positively to its implementation.

4.4.2 Use of SuDS Measures

The use of SuDS is encapsulated in the Regional Policies, and therefore is to be incorporated into drainage designs where possible. However it must be recognised that SuDS measures will need to be selected to suit the particular circumstances of each development. Examples where SuDS selection would be affected by site constraints include:

- ◆ Areas where groundwater is vulnerable to pollution, hence limiting filtration techniques;
- ◆ Areas where ground has low permeability, hence limiting filtration techniques;
- ◆ Areas of unstable soils, where infiltration devices may affect nearby structures;
- ◆ High-density development without adequate space for basins and ponds.

Developers and their designers must recognise that their SuDS installations are to achieve the best stormwater and environmental control for the site, not merely be the cheapest or most compact arrangement.

Drainage departments must recognise site constraints, and also suggest opportunities, such as combining facilities for adjacent sites, when approving designs.

Planners should stipulate in Development Plans that all developments must incorporate SuDS principles in the drainage systems, and must make allowance in their land use and density projections for inclusion of SuDS, particularly on the larger development sites.

Further information on the selection and requirements for SuDS installations is contained in the Regional Drainage Policy on Environmental Management.

4.4.3 Agreement on Design Principles and Parameters

The SuDS information sheets contained in the Environmental Policy contain much general design information for SuDS installations, and should be adopted as part of the New Development Policy. The design and best practice manuals for SuDS, as produced by CIRIA, should be agreed for use by drainage designers.

The Regional Working Party should have responsibility for reviewing and updating the design principles and parameters in the light of international improvements in knowledge and local experience.

4.4.4 Implementing Effective Whole-life Solutions

To be effective, whole-life drainage solutions should demonstrate that:

- ◆ The installations operate efficiently for long periods (say 20 to 50 years) before replacement is needed;
- ◆ The installations operate efficiently for long periods (say 1 to 5 years) before maintenance is needed;
- ◆ Where needed, the maintenance regime (period and type of work) is understood, and known to be effective in keeping the facility operating efficiently;
- ◆ Facilities and finances are available to carry out the required maintenance throughout the life of the installation.

We are used to drainage systems requiring little or no maintenance. Provided gravity pipelines are designed with adequate flows and gradients, they should operate for the life of the material, often 100 years and beyond. Screens and flow controls that could block with detritus are discouraged.

Pumping stations are recognised as needing regular maintenance, minimised by such measures as the installation of “unchokeable” pumps. To the traditional drainage engineer, often working with constrained maintenance budgets, such systems represent the most cost-effective whole-life solution.

However the Environmental Management Policy has demonstrated that such traditional systems are environmentally very inefficient, and therefore can no longer be considered as effective whole-life solutions.

To achieve their purpose, SuDS installations must incorporate containment, treatment or attenuation functions and are therefore to some extent correspond to an “active” system, rather than a “passive” system such as a gravity pipeline network. As such it must be recognised that SuDS installations do require maintenance, as we would expect any other “active” installation, such as a pumping station or a road gully, to require periodic maintenance.

Operations and maintenance information for various SuDS installations is provided on a qualitative basis in the Environmental Management Policy. Experience with SuDS installations and manufacturers’ systems is increasing, and should also be periodically reviewed by the Regional Working Party.

Taking-in-charge of SuDS installations would involve future maintenance and replacements responsibilities for the Council, on a similar basis as for a pumping station. In the UK commuted sums have been charged to the developer to finance such future commitments.

4.4.5 Regulatory Requirements for SuDS

In common with the UK, Irish drainage law was drawn up before the existence and use of SuDS, and hence the responsibility for provision, operation and maintenance of SuDS is not clearly set out.

The ownership and maintenance of conventional drainage systems is clearly understood, and outlined earlier. However, by their nature, many SuDS can be considered as either drainage or landscape features, or a combination of both, and there is no clear guidance on who is responsible for the operation and maintenance of such facilities.

For England and Wales a Framework for SuDS is being prepared for endorsement by Government, the Local Government Association, Water UK, the Association of Highway Authorities, the House Builders Federation, the Association of British Insurers, etc. The Framework is to include the aims of SuDS, SuDS devices, design standards, conservation and habitat enhancement, decision framework to match SuDS to conditions, consents, and maintenance responsibilities and ownership. Unfortunately the Framework is very much in draft with most of the technical and legal content not yet written.

However the Framework does rule that only SuDS corresponding to “sewers”, i.e. having a discharge to a watercourse, other sewer or highway drain, may be adopted (taken-in-charge). Thus swales, infiltration trenches and soakaways can be taken-in-charge provided they have “proper outfalls.” Infiltration basins, permeable surfaces, water butts, ponds and wetlands are not to be taken-in-charge.

In Scotland, the Water Environment and Water Services (Scotland) Bill, passed in 2003, addresses SuDS for the first time. The Bill defines SuDS as “ a drainage system which – (a) facilitates attenuation, settlement or treatment of surface water from 2 or more premises (whether or not together with road water) and (b) includes one or more of the following: inlet structures, outlet structures, swales, constructed wetlands, ponds, filter trenches, attenuation tanks and detention basins (together with any associated pipes and equipment)” In order to be connected and vested (taken-in-charge) the SuDS system must comply with specified construction standards, and its owner has entered into a connection agreement and provided any required security for performance of obligations.

The restriction to 2 or more premises rules out taking in charge of household-based SuDS facilities, such as water butts, but is more flexible on taking in charge of SuDS units without “proper outfalls”.

4.5 Taking in Charge Situation for SuDS

The Councils in the Greater Dublin Area are facing similar problems to international Water Companies in deciding which type of SuDS installation (or part of the installation) will be taken in charge, and which will remain the responsibility of the developer, and thereafter normally the owner of the development. There has been much discussion through articles in the engineering press, such as the *New Civil Engineer*.

The UK Water Companies are concerned that SuDS installations fall outside the definition of Public Sewerage contained in the UK 1980 Water Act, its successors and predecessors, and hence are not recognised by the Water Regulator as an asset. They have therefore been reluctant to adopt SuDS as public sewerage, or only accept SuDS where legal definitions allow.

Natural Step/Environment Agency in their September 2002 Report, entitled "Putting SuDS into practice" proposes that the Water Companies own and maintain all SuDS which discharge into public sewers. Landowners should maintain all assets not draining into sewers, such as above-ground retention ponds. This principle is attractive for its simplicity, but will require new legislation to allow the Water Companies to include such SuDS assets within their asset base, with consequent justification for price increases due to extra maintenance.

CIRIA RP664: Model Agreements for sustainable water management systems has been reviewing the question of eventual ownership of SuDS, and in particular, who will maintain and repair them. This consultation involved representatives of UK Local Authorities, Regulators, Water Companies, practitioners, consultants and end users. The review has not as yet produced firm conclusions, but the consensus was:

- SuDS are in most cases an improvement over conventional and traditional drainage solutions as they generally consider a wider range of social, economic and environmental factors;
- Clarification of the design and construction requirements and definition of responsibilities will help encourage the incorporation of SuDS within developments;
- Arrangements should provide increased security about planning, designing and constructing sustainable water management systems in the knowledge that they will be adopted and maintained in the long term by a competent organisation;
- The most straightforward solution would be for taking-in-charge for SuDS by a statutory organisation, possibly a Local Authority or Water Company.

SuDS on private lands would not be taken-in-charge.

4.5.1 Current Arrangements

The Dublin Councils have the authority to define their taking in charge requirements for SuDS installations. Design and construction of SuDS in Ireland is in its early days, with some use of ponds and attenuation systems. The main emphasis so far has been on providing flow attenuation, with water quality issues not extensively considered. So far there has been little co-operation between developers of large sites for large ponds and wetlands.

However the Councils did generally recognise that their current attitudes are somewhat conservative, due to unfamiliarity with SuDS installations, and in particular their performance, and public reaction. The Councils also recognised that the stormwater management problems facing the Region are so significant that local drainage preferences can no longer be followed. Hence taking in charge of SuDS installations would have to encompass many systems with which they are currently unfamiliar. This will be a developing process, which is allowed for in the following proposals.

Following discussions with the Councils, current views and proposed attitudes (in italics) can be summarised as:

4.5.1.1 Infiltration Systems (stormwater soaking into ground, filtering pollutants)

Pervious Paving

Although being proposed by developers, there are concerns about the long-term blockage of the underlying layers.

It was recognised that pervious paving represented a straightforward SuDS method, and present a solution to high-density development with little open area for swales, etc. They therefore should be encouraged, with suitable outfall. Paving must be properly constructed to suitable specification, but for the most part would be the responsibility of the householder or private property management company.

Infiltration Trenches

Not favoured, with doubts about long-term performance due to blockage, clay ground conditions and high water table;

Not to be encouraged or Taken in Charge, unless further evidence of success is demonstrated. Solid separation needed before entry into the trench.

Filter Drains

Favoured, since essentially similar to existing road drainage systems.

To be taken in charge provided there are dedicated inlet and outlet pipes.

Soakaways

Concerns that unsuitable ground conditions would lead to problems for householders.

Not to be Taken in Charge, but encouraged subject to suitable ground conditions.

Roof Drainage to Gardens

Concerns at potential flow damage and standing water in gardens;

Recognised as possible for large gardens, but not suitable for most urban developments.

4.5.1.2 Filtration Systems (filtering pollutants)

Swales

Maintenance and safety problems are seen with swales adjacent to houses, but swales in open areas and along main roads would be favoured, with maintenance by the Parks Departments;

Swales in open areas and along main roads (and possibly local roads) to be Taken in Charge, subject to agreement of maintenance by the Parks Departments. Further investigation needed into public attitudes for swales in local roads, by trialing developments with supportive residents.

4.5.1.3 Constructed Wetlands (filter, reduce run-off rate, wildlife habitat)

Large Ponds and Stormwater Wetlands

Favoured subject to satisfactory and site-sympathetic design, little experience so far;

Encourage developers to install these systems, especially sharing facilities between sites. Maintenance needs to involve Parks Department, and be feasible. Otherwise maintenance would be

in private hands, subject to satisfactory maintenance plans. Involve the Planning Department in land zoning for such facilities.

4.5.1.4 Retention Systems (primarily to retain pollutants)

Little experience, since SuDS installations have concentrated on flow attenuation rather than pollution reduction;

Further investigation needed, driven by water quality and treatment, rather than the current emphasis on run-off attenuation.

4.5.1.5 Detention Systems (primarily to reduce run-off rate)

Detention Basins

Generally in favour subject to resolution of maintenance and safety aspects; it was recognised that open space in urban development is very limited, and therefore should be designed to maximise public use and aesthetic value when considering its use for stormwater as well. Detention systems for average storm events should not take much space, and extreme events, by their nature, are very rare.

Encourage suitable designs to meet maintenance and safety aspects. Will also be subject to public acceptance. Policy of ownership of land will need to accompany Taking in Charge arrangements.

Underground Tanks

Some tanks have been taken-in-charge. Tanks are normally located on private property and hence not TiC; any underground tanks, whether taken-in charge or privately owned, need to be designed for safe operation and maintenance. The design approach should be to minimise the need for entry by inclusion of self-cleansing arrangements. The tanks would be regarded as confined spaces, with attendant health and safety requirements. Structures would thus need to be appropriately vented and have minimum height for safe man entry.

Designs will need to address access and safety concerns, but generally not in favour of taking in charge. However any decision on Taking in Charge will require further investigation into long-term maintenance requirements.

Underground Attenuation

Oversized pipes for on-line storage are favoured, and some examples of proprietary cellular structures have been installed;

Continue current policy to Take in Charge oversize pipes. Cellular storage structures are normally installed on private property, and hence not Taken in Charge.

Petrol/Oil/Grit Interceptors

Retention tanks used for specific treatment rather than flow and environmental attenuation.

Usually on private lands serving specific premises. Not to be taken in charge.

4.5.1.6 General Principles

System Operation

Systems should operate by gravity. Stormwater Pumping Stations are not favoured, seen as presenting reliability and maintenance problems. However it was recognised that stormwater pumping stations could be needed to protect low-lying areas from flooding.

Policy will be developed to encourage stormwater systems to operate by gravity. Where stormwater pumping stations are unavoidable they should be taken in charge by the Drainage Department.

Ownership

Responsibility for SuDS installations after being taken in charge is unclear, but should be shared between Roads, Drainage and Parks Departments;

This policy will need to be agreed between the Council Departments, ideally on a Region-wide basis. Operation and maintenance of taken in charge SuDS installations should rest with the Department most suited to the work.

SuDS Installed in Public Lands

Favoured as requirement of Taking in Charge of major installations such as ponds, tanks, wetlands, etc. Above ground maintenance by Parks department;

Continue this Policy, which avoids any problems of ownership of land upon which SuDS installations have been constructed.

Table 4.3 summarises the Councils' views and experiences:

SUDS Type	DLRCC	DCC	FCC	MCC	BTC/ WWC	SDCC	KCC
Infiltration Systems							
Permeable Paving	Y	N	Y				
Infiltration Trenches	N	N					
Soakaways	N	N					
Roof Drainage to Gardens		N					
Filtration Systems							
Swales in Spine Roads	Y	N	N				
Swales in Local Roads	N	P	N			P	
Constructed Wetlands							
Small Ponds	Y	Y	Y			Y	
Large Ponds	P	Y				Y	
Stormwater Wetlands	P						
Retention Systems							
Retention Ponds							
Detention Systems							
Underground Tanks	N	N			N	P	
Underground Attenuation	P	N	Y			Y	
Oversized Pipes		Y			Y		
General Principles							
System Operation by Gravity	Y						
Stormwater Pumping Stations	N						
Ownership & Parks Dept. Maintenance	Y	Y					
SUDS Installed in Public Lands	Y						
Off Site Compensation						Y	

Table 4.3 Council Experiences with SuDS

(Y = Yes, acceptable; N = No, unacceptable; P = possibly acceptable)

4.5.2 Proposed Arrangements

We are mindful that local experience and confidence in SuDS is currently limited, but improving as developments using such systems progress. We therefore propose that taking in charge proceeds on the basis of systems that can be accepted now, systems that could be accepted in the future, and systems that cannot be taken in charge. Table 4.4 summarises these arrangements:

SUDS TYPE	TiC Timescale	Comments
Infiltration Systems		
Pervious Paving	Possible	Should be promoted in high-density urban areas, such as car parks for apartments, but should be private/management company responsibility. Can be used in association with underground attenuation. Outfall needed suitable for inspection.
Infiltration Trenches (linear soakaways)	Possible	Subject to suitable ground conditions. Can be used in association with underground attenuation.
Filter Drains	TiC	Constructed along roads with a dedicated outlet/inlet pipe.
Soakaways	Not TiC	To be encouraged in scheme design, subject to suitable ground conditions, being compliance with BRE Digest 365.
Filtration Systems		
Swales in Main Roads	Possible	Approval subject to ongoing maintenance agreement. Maintenance favoured by Parks Department.
Swales in Local Roads	Possible	Subject to successful trial on high quality developments, and successful maintenance.
Constructed Wetlands		
Ponds	Now	Maintenance by LA only if feasible, otherwise to be responsibility of owners. TiC depends on ownership.
Stormwater Wetlands	Now	
Detention Systems		
Detention Basins	TiC	Must be maintained to avoid nuisance, including football pitches.
Underground Tanks	Undesirable to be TiC	Some tanks have been TiC, but not recommended for future TiC due to maintenance issues.
Underground Attenuation	Not TiC	Not TiC if on private property.
Petrol/oil/grit separators	Not TiC	
Oversized Pipes, culverts	Now	Incorporate dry weather flow channel to discourage siltation.
General Principles		
System Operation by Gravity	Now	
Stormwater Pumping Stations	TiC	LA best suited for maintenance. Pumping stations to be used as a last resort.
SUDS Installed in Public Lands	Now	In accordance with Chapter 5 of Regional Policy on New Development.

Table 4.4 SuDS Aspects for Taking in Charge

4.6 Financial Arrangements

The Planning and Development Act, 2000 makes provision for the Planning Authority to charge development contributions in respect of public infrastructure benefiting the area.

Development Contributions that are payable include: general contributions payable under a scheme made under section 48, supplementary contributions under a scheme made under section 49, and special contributions for infrastructure for a particular development in respect of infrastructure benefiting that development under section 48(2). Contributions payable under Section 48 and supplementary contributions payable under Section 49 cannot be appealed to An Bord Pleanála. Special contributions under Section 48(2) can be appealed to An Bord Pleanála.

For general payments, the scheme shall state the contributions for the different classes of infrastructure, including drainage and treatment. Special contributions shall specify the particular works being carried out.

The Development Contribution Schemes came into effect in Dublin in 2004.

4.7 SuDS Specific Procedures

In order to implement the foregoing aspects, a procedure specifically for SuDS has been prepared as the enclosed flow diagram entitled "SuDS Specific Procedures". These procedures are complementary to those in Chapter 3, and should be read in conjunction with them, in that they bring together the various aspects of Chapter 3 procedures as they affect SuDS. However they do not supersede the general requirements of Chapter 3, such as for vetting, monitoring, inspecting, etc.

4.7.1 Proposed Arrangements

The developer needs to be aware at the earliest opportunity of SuDS requirements for his site. With a small development, it may be that independent site-specific measures, such as infiltration trenches, etc only are required. For large developments, it may be that regional SuDS measures are required. These could be site specific, or may involve other developers on adjacent sites.

The Council thus needs to ensure that the developer understands the overall SuDS requirements for his site, and appreciates that SuDS installations are mandatory, unless he can demonstrate that SuDS are impractical, or can only be provided to a limited extent. For example it may not be practical to build infiltration trenches, swales, etc on a high-density inner-city site, but pervious pavement could be readily provided, even as a partial SuDS measure.

The Drainage Department would carry out vetting of SuDS drainage proposals on the same basis as for other drainage aspects. The developer also needs to understand the taking-in-charge arrangements for SuDS facilities, in order that maintenance arrangements can be agreed for facilities that are not to be taken-in-charge. Maintenance may be the householders' responsibility, or the developer could arrange for maintenance to be carried out by a property management company.

Issue of Compliance Notices, site construction monitoring, etc would be carried out in common with other drainage aspects of the development.

Installation of facilities to monitor the performance of significant SuDS facilities should be required by the Drainage Department, to build up knowledge. Monitoring of SuDS performance would be carried out by the Drainage Department, together with maintenance of the SuDS installation database, held on the Planning Database.

The developer would be responsible for preparation and distribution of SuDS maintenance information and its issue to the householders. Copies of all such information should be held on the Planning Database, in order that information can be provided to subsequent householders, to ensure that the maintenance knowledge and practices are not lost in the future years of the development.

SuDS Implementation

All new development shall incorporate SuDS facilities, unless the developer can demonstrate that SuDS is impractical due to site circumstances. Where SuDS cannot be provided, the developer shall provide alternative means of dealing with pollutants

Implementation of SuDS shall be carried out in accordance with the procedures