5. SUSTAINABLE DRAINAGE ISSUES

5.1 Introduction

This chapter highlights some of the issues surrounding sustainable drainage in the Greater Dublin Area. It attempts to show that sustainable drainage must be integrated with overall sustainable development objectives in order to achieve its maximum potential.

National strategies on sustainability and various high profile environmental reports (e.g. Dept. of the Environment 1997 & Stapleton et.al. 2000) have identified the management of both water quality and urbanisation as two of the major challenges facing Ireland today. Drainage networks should therefore be examined within this context, the advantage being that small, but properly integrated solutions can have a wide range of positive impacts, not only for the environment, but also for the socio-economic fabric of urban communities. **Figure 23** below shows the issues to be examined here.

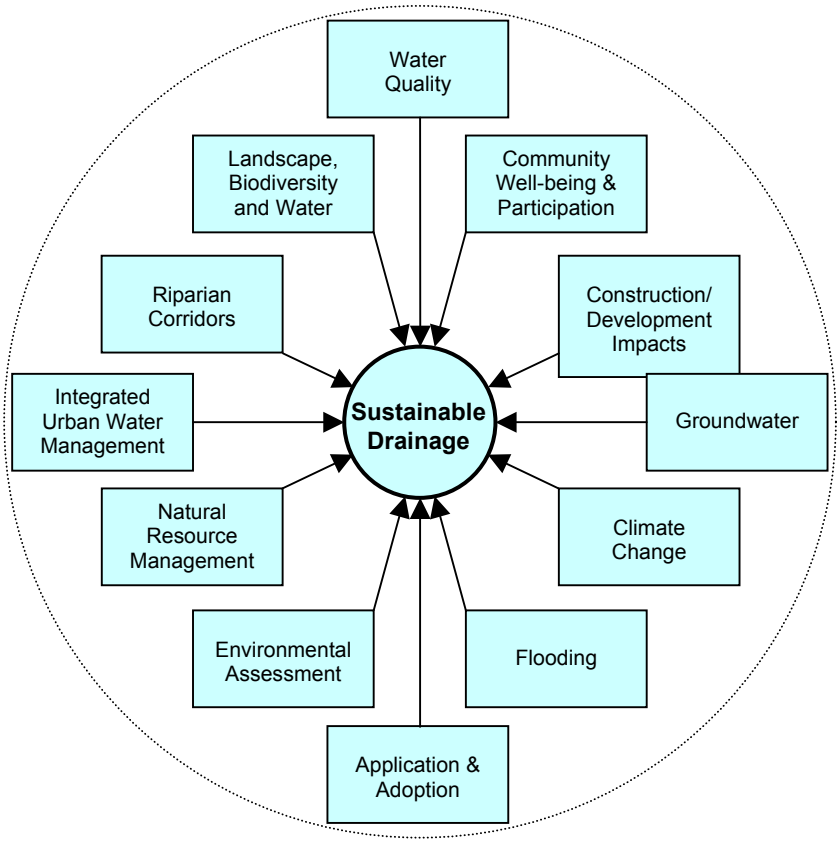

Figure 23: Sustainable Drainage Issues

(Note: Links between issues exist but are not shown)

Until recently, the value of water has for the most part not been widely appreciated in urban planning. At the local level, the provision of piped drainage systems makes the disposal of water an almost invisible process, and moreover, there has been little explicit recognition of water as a valuable and finite community resource.

Sustainable drainage can assist in emphasising the value of water via its integration into the spatially larger frameworks of landscape, floodplain, catchment and river basin management. Integrated urban water management, which examines the overall water supply/drainage cycle and the potential for water reuse, represents probably the best opportunity for fully integrating SuDS.

It is crucial that the relationship between government, private industry and the community is strengthened to bring about a mutual understanding of sustainable drainage and its attendant benefits. The use of strategic environmental assessment, management plans and community participation are some ways of promoting sustainable drainage and are closely tied to both strategic and site-specific planning. County Development Plans will be the key planning instrument in this regard.

Although the management of flooding and water quality are at the heart of this policy, the aim of this chapter is to expand on these and discuss them in relation to broader but related issues. Fortunately, Ireland can build on some recent successes in environmental management and there is also a wealth of international experience that can be referred to. This discussion can then serve as a basis for determining how sustainable drainage can best be applied, and how it can ultimately contribute to Ireland's move towards creating truly sustainable communities (refer DCDB 2002 & DoELG 2001).

5.2 Landscape, Biodiversity and Open Water

5.2.1 Overview

The Greater Dublin region contains a variety of distinctive landscapes, all of which support and are a product of the dynamic interaction between human and natural systems. One such interaction in the region is the expansion of urban areas and the gradual change from an essentially rural to an urban landscape.

In a similar way that past agricultural development had a significant impact on the natural environment at that time, so too is urban development placing increasing pressures on both surrounding agricultural lands and urban green spaces (Stapleton et.al. 2000). This in turn places pressures on open watercourses and their riparian habitat. This has ultimately posed threats to biodiversity in the form of habitat fragmentation and a contraction of species populations, although actual impacts to date have been difficult to quantify in Ireland (Stapleton et.al. 2000, Heritage Council 1999a).

Figure 24 below shows how most urban development in Dublin has occurred adjacent to green areas, giving Dublin a reputation as a green city, although this is not spread equally across the city. This figure shows the Green Edge Index, an environmental indicator which is derived from analysis of databases for monitoring landuse (MOLAND), a project of the European Commission's Joint Research Centre. The index shows how much of a region's urban fabric is adjacent to (i.e. has an edge with) vegetated areas. Areas with a high value for the index will have greater access to recreational facilities (e.g. gardens, parks, wooded areas, sports fields), and will be less affected by noise and air pollution from traffic. ERA-MAPTEC (1998) has recorded a slight decrease in urban green area between 1988 and 1998. There is scope for further assessing the quality of existing areas, particularly in terms of biodiversity and open water.

One of the challenges for planning authorities will be to utilise sustainable drainage to minimise the impact of the urban footprint while simultaneously preserving and enhancing green areas and the overall quality of the landscape. GIS will be a powerful tool to assist in meeting this challenge.

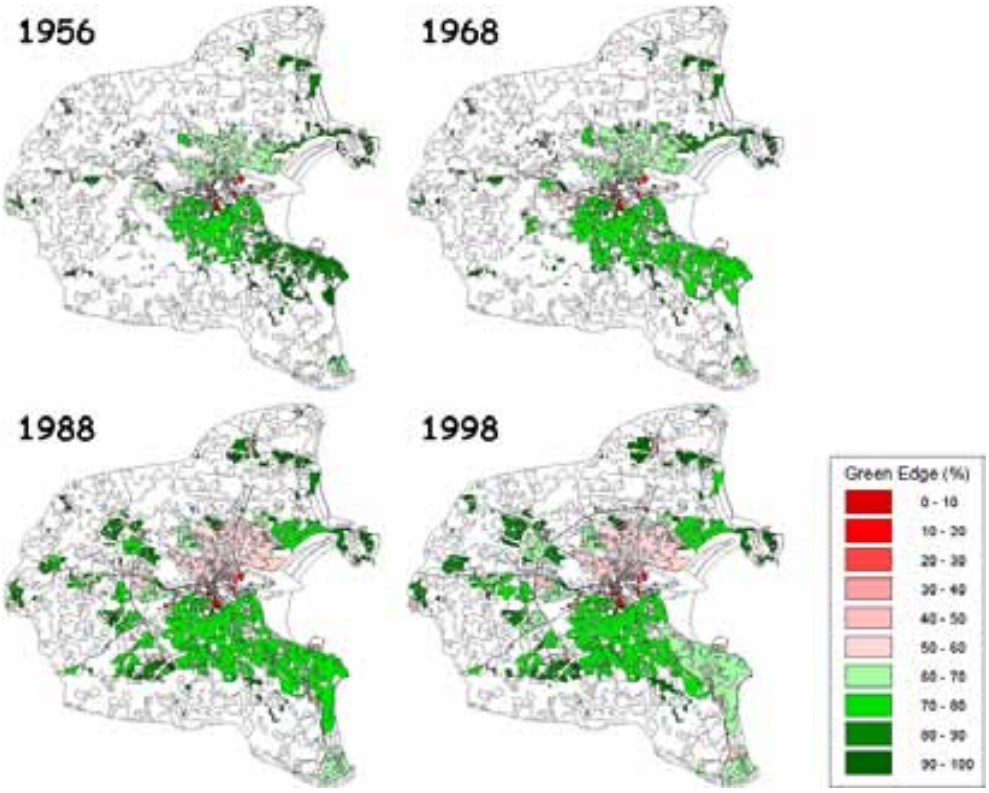

Figure 24: Green edge index for urban fabric in Dublin, 1956-1998

(Source: Institute for Environment and Sustainability 2001)

5.2.2 Existing Practice

Quantitative requirements for open space and habitat in new developments are governed by various planning instruments and guidelines. Traditional site practices however can involve clearing existing vegetation and leaving grassed areas that have comparatively less ecological value. Remnant vegetation, such as riparian corridors, that becomes fragmented is also more fragile and at greater risk of degradation. Retention of vegetation to buffer the high quality SAC, SPA and NHA sites is especially critical.

Riparian vegetation is usually cleared if a watercourse is to be culverted. The culverting of watercourses and provision of grassed areas or sports fields may be seen as a less expensive option for the developer when compared to undertaking more formalised landscaping. In addition, it arguably makes maintenance easier.

Culverting however can often have an even greater ecological impact per unit area than clearing purely terrestrial habitat, as the riparian corridors can be used by proportionally greater numbers of species (both aquatic and terrestrial) for food, shelter and migration. Local Authorities should therefore restrict culverting, similar to the policy adopted by the UK Environment Agency.

5.2.3 Landscape Assessment

The importance of landscape, biodiversity and open water needs to be continuously promoted within urban planning (refer Phillips 1999). There have been criticisms that government authorities do not have sufficient landscape expertise (Webb 2001), however the DoHELG (DoELG 2000) are preparing guidelines for undertaking landscape assessments and placing emphasis on retaining existing natural features in new developments (DoELG 1999). Landscape assessments are an important step in the environmental assessment process (refer Section 5.5 below).

Open water forms a valuable element of any landscape. Landscape assessments should therefore take account of the role of "blue space" and the use of "blueways" to interlink urban water bodies for amenity, ecological and hydraulic reasons (ILAM 2000 & Compass Informatics et. al. 2001). Blueways can be provided by enhancing existing watercourses and by creating new ones, such as ponds, wetlands and dedicated riparian corridors. Sustainable drainage that incorporates greater access to water bodies, good quality habitat and attractive landscaping can be a major selling point for a development and for Greater Dublin as a whole.

Recommendations

1. **For new developments, local authorities to strengthen planning permission requirements for good quality landscaping and habitat through the use of best management practice in sustainable drainage;**
2. **For existing developments, local authorities to evaluate the potential for improving landscape quality and habitat through the use of best management practice in sustainable drainage;**
3. **Local authorities to introduce a policy, similar to that of the UK EA, that restricts the use of culverts;**
4. **Planning authorities to consider incorporating requirements for "blue space" and "blueways" into local/regional planning documents.**

5.3 Urban Watercourses and Riparian Corridors

5.3.1 Responsibilities and Activities

A riparian corridor is an area extending from the edge of a watercourse onto adjacent land, its width being dependent upon its location within the catchment and the adjacent landuse. Like watercourses, riparian corridors form a distinctive unit of the landscape and perform many valuable functions such as providing habitat, trapping nutrients, stabilising banks and providing recreational/aesthetic amenity, hence the importance of their conservation.

Properties within riparian corridors will usually have boundaries extending to the watercourse centreline, such that the landowner is responsible for their individual section of watercourse. Current Irish environmental legislation is not explicit however in setting out the rights and responsibilities of riparian landowners and there has been little education to date regarding this.

Management of open channel watercourses ultimately rests with the riparian owner, although authorities such as Local Councils and the OPW have assumed partial responsibility for bank and in-channel maintenance on selected watercourses. Authorities like DCC, have dedicated river crews that regularly remove blockages on the larger rivers to reduce the risk of flooding or erosion, while maintenance of the smaller watercourses is usually carried out on an as-needs basis. OPW has a mandate to provide priority flood relief on flood-prone rivers and will undertake maintenance dredging, activities that can impact on the riparian corridor.

Riparian corridors in urban areas have come under increasing pressure to the point where some natural corridors have been replaced by development built right to bank top (e.g. carparks, walls, fences, etc). Riparian landowners should apply for consent under the Arterial Drainage Act to undertake works in a watercourse, however the consent process is not strong. Local authorities have the power to enforce the protection of watercourses, but the availability of resources is a critical factor.

5.3.2 River Conservation and Rehabilitation

Government authorities recognise that maintaining urban riparian corridors brings benefits in terms of local habitat, water quality, floodplain management, recreational amenity and maintenance access. To this end, some local authorities have zoned riparian corridors as non-developable green space within their Development Plans, while others will impose a 20 m riparian buffer zone as a planning condition. Another example is the 1997 Dublin Docklands Master Plan which has identified measures to improve the lower reach of the River Dodder. These policies that apply mainly to significant open channel watercourses should now be translated to the many smaller or culverted watercourses found across the Greater Dublin region.

There is now huge scope within Ireland for physically restoring culverted and/or degraded watercourses to a more natural condition, without increasing flood risk. River rehabilitation practices are internationally well established (e.g. RRC 1999, Rutherford et.al. 2000 & FISRWG 2001) and there are many excellent examples that can be highlighted, such as the River Cole in the UK (refer **Figure 25** below), the River Trent in Stoke (refer Case Study and **Figure 28 & Figure 29**, all below).

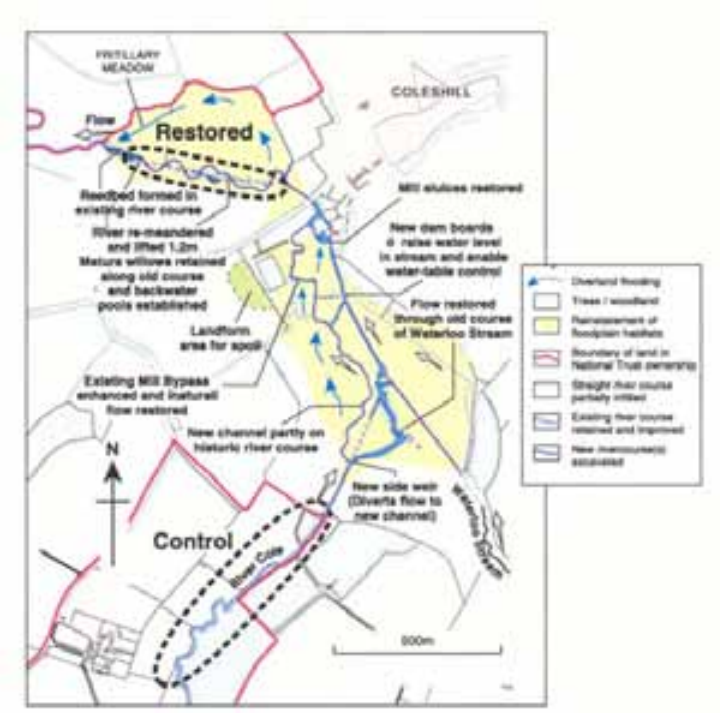

Figure 25: River Cole River Restoration: Demonstration Site

(Source: Sears 2001)

Rehabilitation can involve breaking open culverted watercourses (known as day-lighting), and/or creating a more natural profile with the use of ecologically sensitive landscaping. There are also good opportunities to integrate local/regional sustainable drainage measures with rehabilitation works. Rehabilitation can also extend to the entire river floodplain as is being examined under the EU Wise Use of Floodplains project. In certain circumstances, rehabilitation schemes can be developer-driven, although land-take, funding and community support are perhaps the most vital factors in determining a scheme's success.

Prime options for first-time rehabilitation are the open channel watercourses with available land and good access (refer **Figure 26** below). These watercourses would be relatively easy to rehabilitate and could accrue tangible benefits in a short space of time, thereby garnering immediate community support.

Figure 26: Typical examples of watercourses suitable for rehabilitation

Future schemes should build on that initial experience and could focus on the larger rivers, particularly in the middle to upper reaches. The Tolka and Dodder Valley Parks are perhaps the best examples within the Greater Dublin region of riparian corridors that have previously been improved through landscaping and there is further scope for extending these works into the channelised or degraded sections. By incorporating rehabilitation works under an over-arching catchment management plan, "river improvement" becomes a truer and more inclusive term.

5.3.3 Policy for Urban Watercourse and Riparian Corridor Management

This section addresses policy for optimising the use of urban watercourses and their riparian corridors for drainage and the community at large.

The objective of the policy for urban watercourses and riparian corridors should be to reverse the previous emphasis on "engineering" solutions and maximising of hydraulic capacity, and to encourage maintaining the watercourse as a rich natural habitat within the developed environment. The objectives of the policy should be to:

- Promote the principle of sustainable development, by providing visually and environmentally attractive areas in the urban environment;
- Reduce the cost of drainage and damage caused by flooding;
- Contribute to increased biodiversity, by encouraging habitats and providing wildlife corridors;
- Enhance urban areas, through sympathetic design incorporating natural water features and bankside vegetation;
- Co-ordinate with SuDS installations;
- Maximise the provision of attenuation of stormwater run-off.

Present Arrangements

In common with most major developed areas, the Greater Dublin Area contains a legacy of buried and open urban watercourses, often of little value to nature and to the population. Long stretches are straightened and channelised, with concrete linings and with excavated channels, with little or no vegetation or natural habitat. The watercourses are often cut off from the town, hidden behind fences and walls or buried in pipes and culverts. Many urban developments have excluded watercourses, placing them at the backs of buildings and gardens, based on the perception that they represent hazard and inconvenience to the inhabitants. Open stretches are most often marred with litter and refuse, often of considerable size.

The result of this approach has been to create systems which dealt with stormwater runoff, but :

- encouraged increased flooding and deposition downstream;
- encroached on natural floodplains through embankment construction;
- made maintenance more difficult due to reduced access;
- represented ongoing costs to the community.

Today there is fuller understanding of river catchments and how natural processes can provide the benefits of improved hydraulic performance (both capacity and attenuation), improved environmental quality and reduced construction and maintenance costs.

Policy Principles
The policy should promote the following principles:

- Provide a continuous habitat along the watercourse and its banks;
- Introduce measures to protect the watercourse from pollution;
- Restore the watercourse to a more natural form;
- Provide access and views for local population and visitors;
- Provide amenity areas, seating and sheltered areas;
- Provide safe and attractive routes for pedestrians and cyclists;
- Encourage the watercourse to become the focus for adjacent development;
- Introduce measures to prevent or dissipate storm flows and flooding.

Local Authorities can implement change through their policies, by involving the Councillors, and the Council Departments. The Planning, Environment and Parks Departments have a major role to play. The Policies could be included in the Agenda 21 process, working with developers and the community at large.

Case Study – Upgrading of the River Trent through Stoke, UK

The urbanised length of the River Trent in central Stoke-on-Trent was largely culverted, and even the open sections flowed in steep-sided concrete open channels. Consequently the pre-existing channel represented a barrier to movement of wildlife along one of Britain's most important rivers.

To improve this ecologically impoverished state, the artificial channels have been diverted and altered to provide greatly improved access for wildlife. Lengths of culvert have been radically reduced, and ledges have been incorporated in the channels to encourage development of waterside plants.

The bed of the channel has been designed with a meandering low flow channel, deepened at intervals to create a pool and riffle system for the benefit of fish.

The river upgrading has been carried out in conjunction with major road, underpass and retaining wall improvements in the area.

Specific policies will involve various stakeholders and are outlined below.

Councillors' Role
Upgrading of watercourses represents visible environmental improvement to the public, and therefore Local Authority Councillors may well wish to offer support. The Drainage Department should therefore involve the Councillors as follows:

- Review and promotion of the river rehabilitation guide and public education programme;
- Raise awareness of local flooding issues
- Raise awareness of flood risk for development lands
- Raise awareness of major SuDS facilities, especially those servicing multiple developments

The role of Councillors in each Local Authority will depend on their requirements, but they should be kept aware of the potential for environmental benefit represented by management of urban watercourses and corridors.

Council Department Policies

Ideally Policy on urban watercourses should be guided by a survey of existing watercourses and other water features. The survey should be sufficiently detailed to provide useful guidance on how to go about restoring the watercourse. Coverage should include:

- the general nature and characteristics of the watercourse, and the opportunity to remove barriers to wildlife movement and create other wildlife corridors;
- the existing range of habitats and biodiversity, and the opportunities for their protection and enhancement;
- the historic use of the watercourse, archaeology, buildings, and the possibility for restoration;
- the current use of the watercourse;
- identification of other plans and policies which may influence proposals;
- opportunities to improve existing access for the public;
- opportunities to incorporate watercourse corridors into the town footpath and cycleway network;
- identification of pollution of the watercourse, and possible sources.

The results of surveys and identification of problems and opportunities should be incorporated into a watercourse map, with policy statements identified for each stretch. These policies should include statements on future development, habitat protection and enhancement, discharge from SuDS installations and correction of pollution sources.

It must be recognised that there are frequent problems in carrying out maintenance of rivers due to conflicts with ecological, environmental and archaeological concerns. Such factors need to be considered.

The survey and watercourse map should be prepared and maintained by the Drainage Department, with involvement of other Departments as necessary. This information should be linked with the River Basin Management Plans being maintained under the Water Framework Directive.

Planning Department Policies

The watercourse map should be incorporated into the Local Authority Development Plan, and supported by general policies, requiring:

- Avoidance of placing watercourses in culverts;
- A statement on the merits of restoring urban watercourses for nature, community, commercial and urban regeneration interests;
- The enhancement and restoration of watercourses in redevelopment areas (i.e. the removal of culverts and channels should be encouraged, compatible with hydraulic requirements – refer **Figure 27** below);
- Protection of urban watercourses which are in a natural state;
- Restriction of development adjacent to, or over urban watercourses, where this would prejudice the creation of a future public right of way or a wildlife corridor.

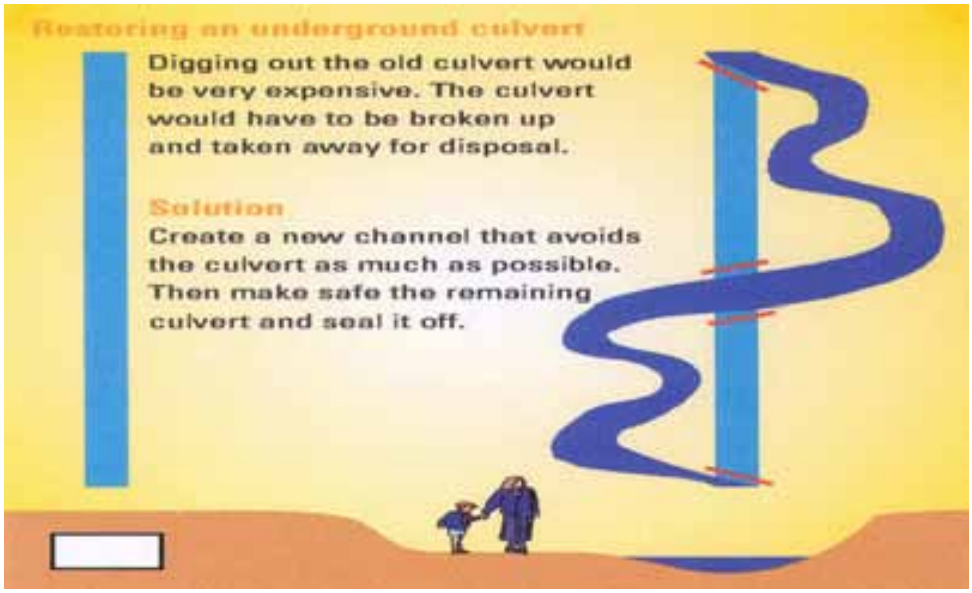

Figure 27: Removal and Re-Use of Culverts

(Source SEPA: Watercourses in the Community)

Specific policies for residential areas should promote situations where a watercourse can be a valuable leisure facility, and where a new public right-of-way along the watercourse can play its part in creating a larger network of footpaths or cycleways connecting with other parts of the town.

Specific policies for industrial areas should promote situations where watercourses can contribute to the general improvement of the environment, recognising the particular risk of pollution.

Specific policies for town centres should promote the creation of water features to form an important attraction for town centre users.

Specific policies for individual watercourses of particular importance and potential, such as the main drainage streams and rivers should state how the watercourse should be included in, and protected from, new developments and how SuDS techniques are to be included.

Figure 28: Urban Decay in Stoke before Culvert Realignment

Figure 29: Realigned Channel with Meanders, Plant Benching, Pools and Riffles

Development Control Policies

- All new developments should be encouraged to incorporate a SuDS approach. The area of impermeable surfaces, such as pavement and tarmac should be minimised by careful attention to site layouts and specification of surfacing construction.
- Developers need to consider SuDS and all other drainage issues as a fundamental part of the design of the development, not as an afterthought, or add-on to an otherwise completed design.
- Proposals and marked-up plans for the treatment of watercourses and drainage should be prepared and submitted concurrently, preferably as part of the detailed Planning Application.
- Developers should obtain advice on flood risk, and have carried out an assessment of the habitats, species and wild life in and around the site and watercourses.
- Culverting, diversion and blockage of watercourses are not permitted.
- Developments realising the potential of the positive use of watercourses, as part of a high quality design, are to be encouraged.
- No structures shall restrict free passage along the watercourse or its banksides.
- Pollution shall be tackled at source before entering the drainage system.

Development Design Policies

- Development design should incorporate SuDS techniques (refer **Figure 30** below).
- The Council's Drainage, Parks and Environmental Departments shall be consulted at the earliest opportunity regarding new developments.
- Habitat and species surveys shall be undertaken before designs are prepared.
- Watercourses should be left unchanged if their habitat quality is good, otherwise physical modifications may be needed to the watercourses to improve flow patterns. Designs need to consider the risk of erosion, siltation and increased flooding downstream.
- Development should not be allowed within the flood plain, as shown on **Figure 30** below.
- Development should incorporate watercourses as a positive aspect, creating a clear identity for the development, greater attractiveness and greater value. Development facing the watercourse, rather than the access roads, should be encouraged.

Figure 30: Plan of Development centred on river frontage, incorporating flood plain and SuDS facilities

(Source: SEPA Watercourses in the Community)

- Safety measures should be incorporated where necessary, such as grading back artificially steep banks to improve public access and safety and increase flood protection potential. The need for safety needs to be balanced with visual and amenity benefits, avoiding watercourses being fenced off and isolated.
- Public rights of way along watercourses should support the policy of linking adjoining sites. The design of access paths is to be balanced with the needs of the natural habitat. Walkways running down one side of the watercourse should be considered in such circumstances.
- Channelised watercourses should be restored through reintroducing natural features, such as pools and riffles, to increase visual amenity, form new habitats and increase flood protection (refer **Figure 31** below).

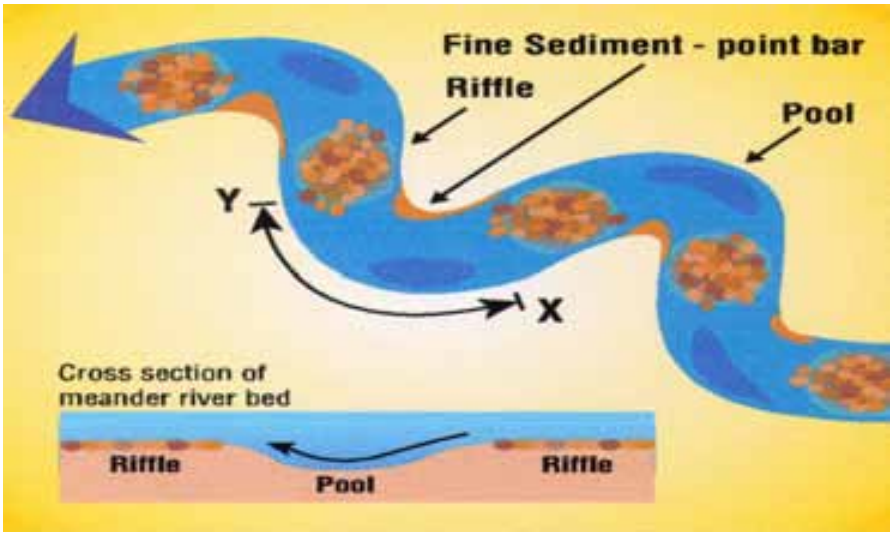

Figure 31: Realignment using Meanders, Riffles and Pools

(Source: SEPA Watercourses in the Community)

- Hard engineering measures should be minimised. Where engineering structures, such as outlets and walls are inevitable, they should be faced with stone or other "natural" material to encourage vegetation. Soft engineering techniques, such as bank stabilisation using gabions and natural vegetation, should be promoted such that the river hydromorphology can be retained.
- Appropriate landscaping is to be provided, with a natural emphasis, including trees to provide shade and control vegetation along the watercourse.
- Opportunities to integrate habitat enhancement and public recreation, including angling, should be encouraged.

Operation and Maintenance Policies
The local agencies should:

- Set high standards of maintenance, including litter and dumping control, and adhere to them;
- Encourage local communities (for example using the Local Agenda 21 process) to take an interest in the management of their watercourses;
- Ensure that landscaping is designed with maintenance in mind and that funding for future maintenance is safeguarded;
- Where possible, secure long-term funding from developers for the monitoring and maintenance of their watercourses.

Recommendations

5. **Planning authorities to clarify riparian rights and responsibilities in urban areas and codify within planning instruments;**
6. **Planning authorities to maintain or create where possible, a 10 – 15m riparian buffer strip either side of all watercourses measured from top of bank. Where feasible, the natural morphology of rivers is to be retained. The use of culverts Is to be restricted.**
7. **DoEHLG, OPW, Central Fisheries Board and local authorities to establish a working group to oversee preparation of a guide on Irish river rehabilitation and a public education programme;**
8. **Local authorities to evaluate all watercourses for rehabilitation potential, particularly in conjunction with sustainable drainage measures; and**
9. **Local authorities to undertake pilot studies for rehabilitation/enhancement of water courses.**

5.4 Integrated Urban Water Management

5.4.1 Overview

Integrated urban water management is evolving as a means of improving on conventional water engineering practice by sustainably managing the entire life cycle of water in urban areas. At present, urban areas consume large volumes of potable water, while simultaneously discharging increasing quantities of foul sewage and stormwater. This traditional supply and disposal of water involves costly, energy-intensive treatment and reticulation systems, with their associated environmental impacts.

Stormwater and wastewater are consequently being re-evaluated as resources to be utilised, rather than waste products to be disposed of. There is now increasing international investigation into alternatives to traditional practices, such as water conservation and reuse/recycling measures (e.g. Heaney et.al. 1999, Mitchell et.al. 1999, Diaper et.al. 2000 and Lloyd 2001). These can offer many benefits including a lowering of potable water demand, less wastewater to be treated, less stormwater runoff and improvements in receiving water quality.

5.4.2 Principles and Options

Four principles of integrated urban water management are:

1. **Encourage water conservation** by minimising use of potable water and promoting reuse of stormwater and wastewater;
2. **Maintain a balanced water cycle** by returning water to the local environment (e.g. aquifers, green spaces, streams);
3. **Protect and enhance natural systems** to improve water quality, minimise erosion and lower flood risk; and
4. **Enhance the role of water** in the landscape to provide visual and recreational amenity.

Heaney et.al. (1999) suggest that the neighbourhood may be the optimal scale for a management scheme as the urban water cycle is kept close to the point of consumption/disposal, thereby minimising the need for expensive infrastructure. **Figure 32** below shows one interpretation of how a reuse scheme might operate.

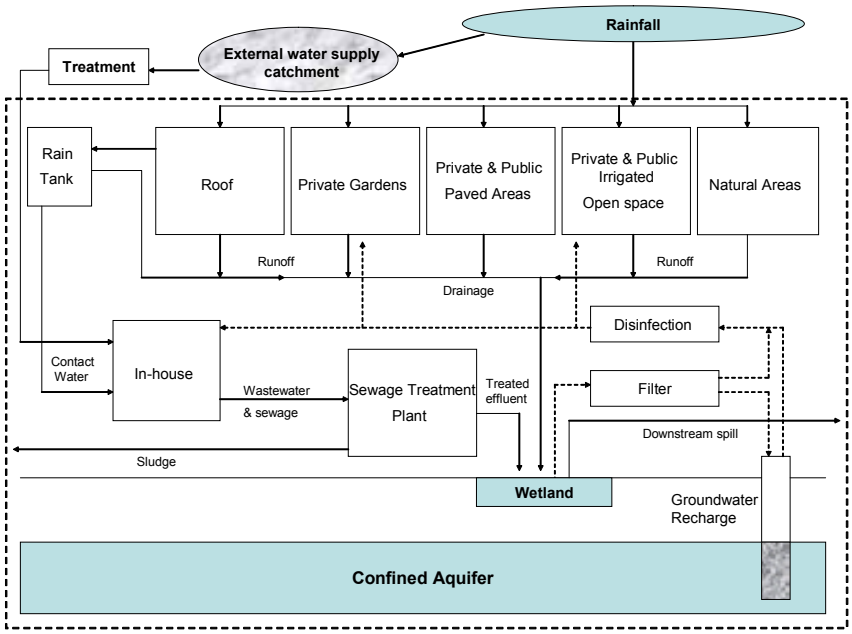

Figure 32: Example of an Integrated Urban Water Management Scheme

(Source: South Australian Government, Water Care Website at www.watercare.sa.gov.au/student/urban12.htm)

There are several factors to be assessed for any urban water management scheme:

- a sound legislative and planning framework is needed to support the principles of integrated urban water management;
- the quality of water must meet requirements appropriate to its final use;
- an urban water balance model must be established to integrate and assess all components of the water cycle e.g. regional climate, local water demand, sewage discharge, stormwater runoff, groundwater characteristics, etc; and

- a site-specific analysis of reuse options, examining environmental impacts, community/developer attitudes, technical feasibility, funding, etc.

Reuse schemes could incorporate many different sized components. Firstly, water saving devices and rainwater tanks (refer **Figure 33 a**) can easily be installed to immediately lower potable water demand. Larger schemes may use retention ponds, underground tanks or oversized pipes to store stormwater runoff that, after preliminary treatment, could be used for car washing, garden irrigation, street cleaning or even industrial processes.

Separation of greywater from the foul sewage stream is also an emerging option with significant potential. Greywater derived from baths, showers and hand basins represents about a third of the total foul sewage load but can be effectively managed using a variety of methods (refer **Figure 33b**) for which international guidelines exist.

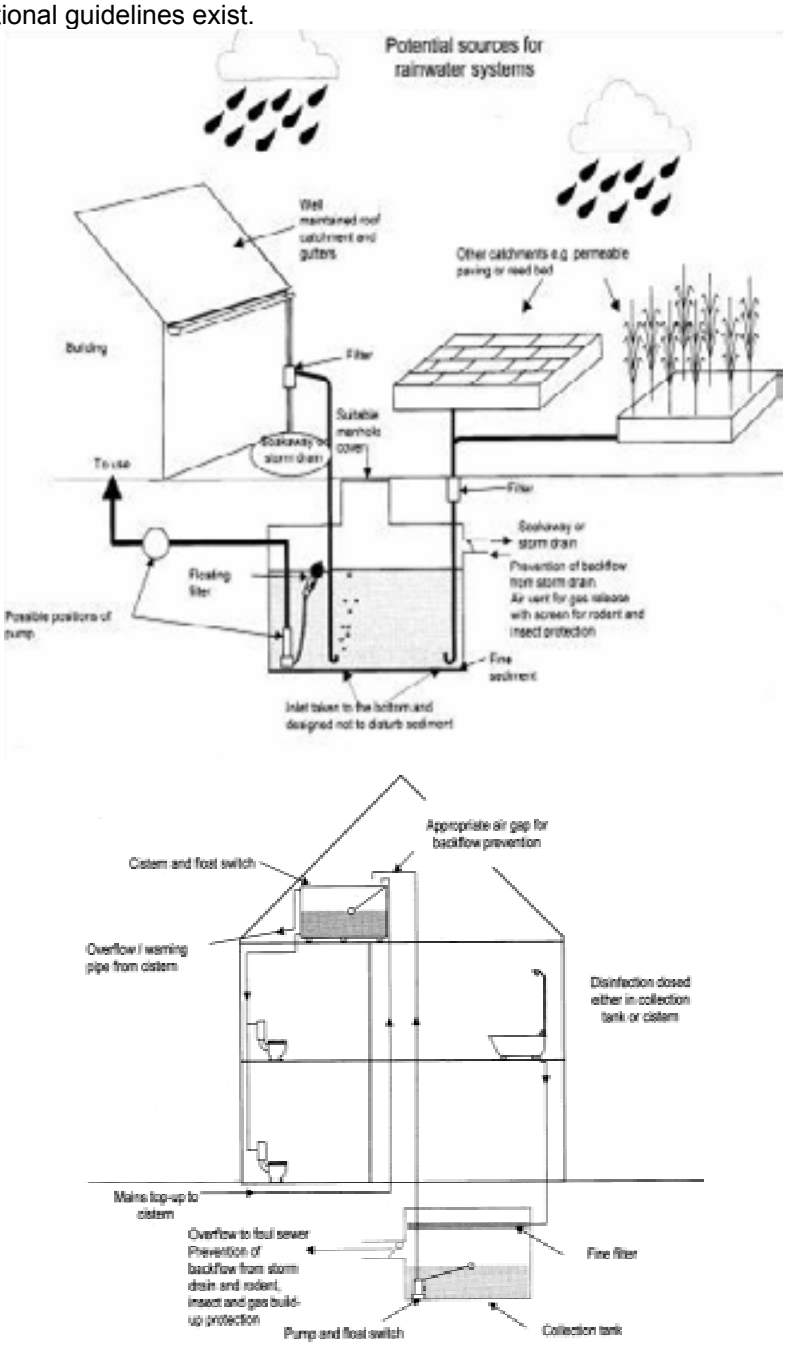

Figure 33: Conceptual Rainwater (a) and Greywater (b) Reuse Systems (Source: Leggett et.al. 2001)

Finally, another option is treating the entire foulwater stream at a treatment plant, but then returning the treated discharge for use at the neighbourhood level. Mitchell et.al. (1999) suggest that this could have the greatest impact on reducing potable water demand and sewage discharge, but would require substantially more infrastructure than neighbourhood based schemes. This option could only realistically be considered during the scoping and design stages of a new treatment plant.

Examples of re-use schemes from the Australian experience are provided in Appendix D.

5.4.3 Water Conservation/Reuse in Greater Dublin

There are several projects related to water conservation/reuse currently underway in Greater Dublin. The Dublin Region Water Conservation Project is helping to maximise water availability principally through eliminating leakage in the water supply network, while promotion of wise water usage and home-based, water saving devices, including rainwater tanks, are initiatives being undertaken by DCC. DoEHLG is also supporting the use of reed bed technology and is trialling a number of schemes in rural areas throughout Ireland, including Co. Meath, but its use is very dependent on local conditions.

The overall aims of these projects could further be served by assessing the feasibility of household, neighbourhood and regional scale water conservation/reuse schemes. Any feasibility study for Greater Dublin must at least examine the major issues of:

- Land-take: reuse schemes can be incorporated with sustainable drainage measures (e.g. ponds, wetlands, tanks) into green open space; current requirements for high housing densities may make neighbourhood scale schemes the most feasible;
- Connectivity: ensuring correct installation and connections on a potentially complex reuse scheme is critical to prevent cross contamination; this will require proven technology, education and tight building controls;
- Maintenance: maintenance of reuse infrastructure (e.g. ponds, reed beds, pipes, pumps, tanks, etc) by private landowners and/or Council must be reliable for schemes to operate effectively; education, funding and maintenance programs are crucial; and
- Stakeholder Attitudes: successful urban water management requires substantial consultation and the support of community, government authorities, developers and professionals.

Integrated urban water management schemes should be considered simultaneously with sustainable drainage measures and sustainable building design/construction methods. The latter are currently being examined in Ireland by both DoEHLG (FCI* 2000) and Sustainable Communities Ireland (SCI 2001), although there are many successful examples of buildings already using water conservation/ reuse measures (e.g. refer Lloyd 2000 and http://web.ukonline.co.uk/ssh/links/links.html).

Initial steps in establishing integrated urban water management schemes for Greater Dublin would include reviewing international best practice, preparing a management strategy / guidelines and undertaking trial operations. With the high rate of new development, Greater Dublin has the potential to become a leader in creating many water-efficient communities using such schemes.

Recommendations

10. **DoEHLG to establish a working group to prepare a national strategy on integrated urban water management;**
11. **Dublin Drainage Consultancy to have regard to integrated urban water management when examining future drainage strategies for the GDSDS.**
12. **Forum for the Construction Industry (FCI*) to further examine and promote green building design using water-efficient technologies; and**
13. **Local authorities to evaluate potential for using sustainable drainage in water reuse/recycling at a local level.**
14. **Pilot scheme for water conservation/reuse to be set up, using an actual development, or part of a development.**
15. **Local Authorities to promote the development of Integrated Water Management Plans incorporating water quality, quantity and hydromorphology.**

* FCI : Body representative of construction industry practitioners and clients, tasked by the Minister of the DoEHLG to oversee the implementation of the recommendations contained in the Report of the Strategic Review Committee entitled ***Building Our Future Together*** (June 1997).

5.5 Environmental Assessment and Management

5.5.1 Overview of EIA and SEA

Environmental impact assessment (EIA) has long been established as a means of preventing environmental degradation by giving decision-makers better information about the potential impacts of a proposed development. The benefits of project-based EIA are widely appreciated, however there has been growing recognition that there was little application to plans/policies/programmes, which could have a significantly greater influence on the environment than just individual projects. This prompted the EU to introduce a directive on strategic environmental assessment (SEA) which will be transposed into Irish Law in July 2004.

The complementary use of SEA and EIA is one way that planning authorities can more proactively control their strategic planning and development control process. This is especially important in times of high demand for new development when it becomes harder to incorporate environmental considerations into development plans.

At the regional/local level, planning authorities will be required to first undertake an SEA of their various strategies and development plans, prior to their adoption. For example, the potential impacts of developing on zoned land would be examined under the SEA and appropriate zoning and policies adopted before development takes place. Theoretically then, a new development should not have a greater impact than allowed for under that zoning or development type.

5.5.2 Implications for Sustainable Drainage

The use of SEA/EIA by Local Authorities will have implications for sustainable drainage. Firstly at the strategic level, zonings must be assessed to determine potential impacts on water quality and flooding. In this regard, the GDSDS is assisting Local Authorities to assess existing and future drainage conditions and is recommending options (refer **Regional Policies Volume 2 New Development** and **Phase 3 Strategy work**) to sustainably cater for future development. It is then envisaged that the options chosen will be introduced in the form of individual projects at the local level, which will be further subject to EIA if necessary.

An important component of the EIA process is a statement of how the developer intends to mitigate and monitor potential impacts, such as flooding and water quality. This is usually included as part of an EIS, however for projects that do not normally require an EIS e.g. some residential developments, planning authorities will have little information aside from the planning application.

INSERT FIGURE 34

Figure 34: Example of an Urban Stormwater Management Plan (Source: Plannning SA 2001)

The assessment of environmental impacts of "non-EIS designated" developments is one response to this and is being requested of developers by some planning authorities internationally e.g. New Zealand and USA. This type of assessment is like a smaller version of an EIS and could lead to the preparation of a management plan. The process should be designed to give the planning authority confidence that the developer understands the impact of their development in light of SEA and that those impacts can be sustainably managed over the long term.

Developments that fall below the threshold level for requiring an EIA under current legislation, could be required by the planning authority to have an environmental assessment of the sustainability of the project undertaken in terms of its drainage.

5.5.3 Stormwater Management Plans

A stormwater management plan (SWMP) is a vehicle by which the above can be achieved. The plan, comprising a written statement and drawings, is submitted by the developer to the planning authority in support of a planning application, and could detail:

- Water quantity and water quality objectives to be met (as set by the Local Authority);
- **Stormwater runoff volumes and pollutant loadings** expected to be discharged from the site, pre- and post-development;
- Drainage philosophy and specific drainage methods to be used to meet objectives; and
- **Responsibilities of principle stakeholders**, particularly with regard to funding, maintenance, monitoring and contingencies.

The size and detail of any SWMP must be commensurate with that of the proposed development, and can range from a small, site-based plan up to a larger, more complex plan as shown in **Figure 34.** The SWMP should be approved by the Drainage Department before works commence and ideally used as a control in the planning approval and taking in charge process.

Some of the major advantages of an SWMP are:

- promotes awareness of stormwater issues and encourages best practice;
- quicker assessment of potential flooding and water quality impacts;
- clarifies responsibilities for maintenance, monitoring, contingencies, etc;
- co-ordinates sharing of drainage measures between different developments;
- comparison of effectiveness of drainage measures between different SWMPs; and
- validation of original SEA and easier input to future SEAs.

The elements involved in Stormwater Management Plans are detailed in the Regional Policy on New Development, together with planning and taking-in-charge approval processes.

5.5.4 Further Considerations

There are several approaches to the stormwater management process as conceptualised in **Figure 35** below. The first consideration for planning authorities is the framework by which SWMPs can be introduced for new development. One option is simply to make it a requirement of the planning process and codify it in the appropriate policies (e.g. DCC Drainage Division 1998, Chapter 3). Another option is to make the development of stormwater management plans a statutory requirement under future amendments to relevant legislation. This would be most applicable if planning authorities were to require greater environmental assessment i.e. extend beyond the current threshold for EIA.

The second consideration for new development is the potential for using an integrated urban water management plan, rather than a SWMP. This in turn could form part of an overall site-based management plan covering all aspects of the proposed development e.g. water cycle, habitat, landscaping, river flooding, etc.

An alternative to the site-based management plan is an Environmental Management System (EMS). EMS's are usually prepared for commercial/industrial enterprises that require EPA licensing, but increasingly more companies are adopting an accredited EMS to reduce risk, control cost and promote a better public image. Guidance documents on EMS schemes have been prepared and the EPA is now encouraging an EMS approach to all environmental management.

An EMS may assist developers to more fully comply with environmental regulations, commit to continual improvement and report on their performance. It could be applicable to any development whether it is private or taken in charge. In theory, EMS could be extended to include catchment management, WwTW operation and even evaluating the environmental performance of local authorities.

A master SWMP can also be prepared for existing urban areas and future zoned areas as is being done by local authorities in the USA and Australia. These master plans can be upgraded to a broader catchment management plan examining all aspects of existing and future development within that catchment, including both urban and rural processes. This eventually informs the River Basin Management Process. Strategic environmental assessment can be undertaken on any of these plans and will ultimately feed back to the planning instruments and policies, of which new development must take account.

The Regional Policy on New Development proposes that such drainage management issues be included in the Development Plan, in planning applications and taking in charge approvals.

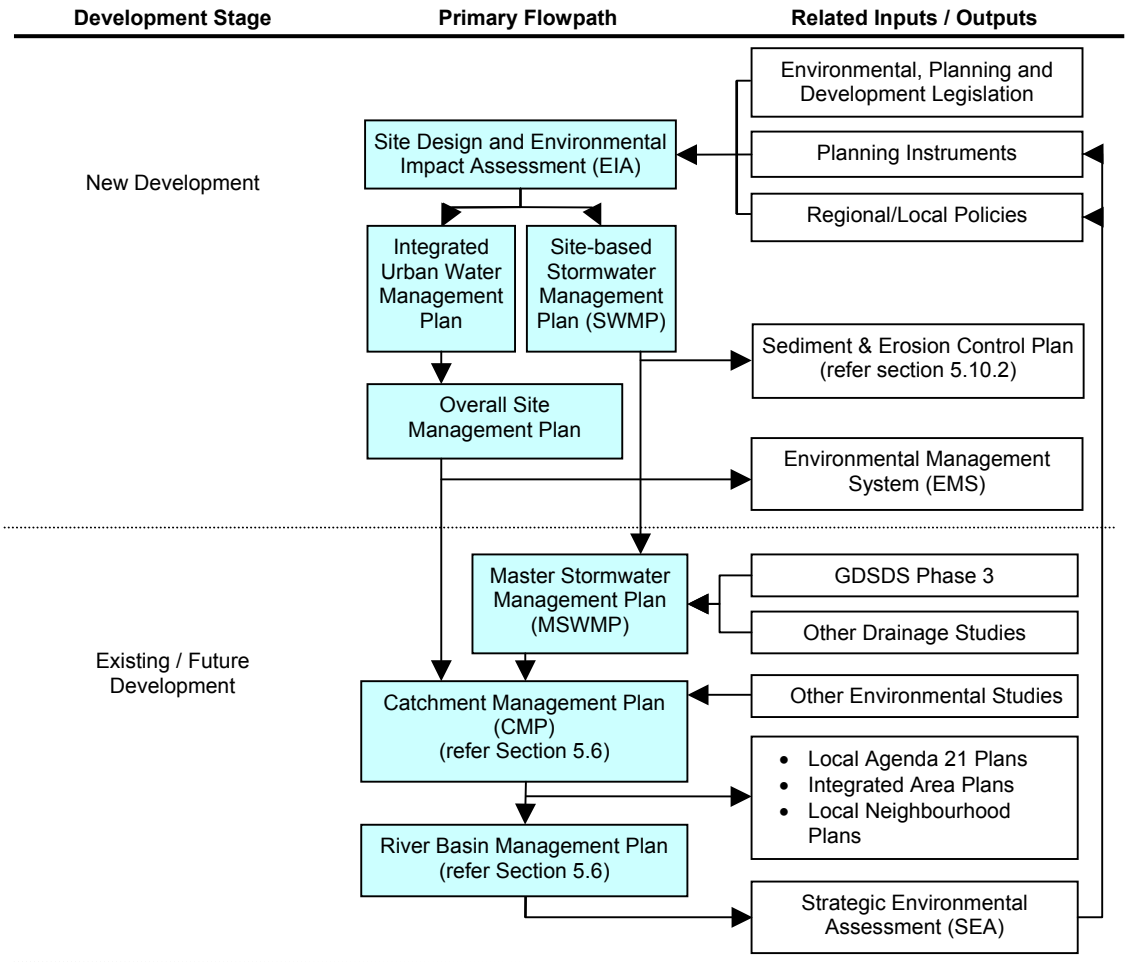

Figure 35: Conceptual Stormwater Management Process

(N.B. The inputs/outputs and relationships shown are not exhaustive)