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1 BACKGROUND

1.1 INTRODUCTION

The requirement for a new policy for Environmental Management relates to the prime functions of a local authority and the belief that the existing policy is not effective. The policy requires a regional application because of the interconnection / interdependency of the existing drainage infrastructure.

A Local Authority fulfils two prime functions, that of Planning Authority and as Sanitary Authority. The first function is responsible for Planning and Policies and the second function is responsible for Drainage Policies and their Implementation.

As Planning Authority, the Local Authority has a duty to promote, encourage and facilitate future development. In promoting future development the Local Authority has already enshrined in the most recent Development Plans a commitment to "sustainable" future development and a commitment to protect and enhance the built and natural environment.

As Sanitary Authority, the Local Authority has a duty to facilitate future development through the provision of drainage infrastructure. However, there are concerns over the adequacy of the existing drainage infrastructure to cater for existing flows and loads, never mind the flows and loads from future development. There is also concern over the deteriorating quality of the water bodies in the region and the impact that drainage discharges has in this deterioration. In providing solutions for these concerns there is a desire to introduce best national and international management practice (BMP) to drainage undertakings.

The general principles of the environmental management policy is to focus on the commitment to protect, maintain, improve and enhance the natural environment and to make features in the natural environment, such as watercourses, focal points of future development. The key focus is the development of Integrated Water Management Planning across the region and the implementation of best management practice in all aspects of sustainable drainage addressing water quantity and water quality objectives on a catchment/river basin scale. These policies generally fall into the medium to long term objective category and are outlined in general below. Specific policy recommendations which relate to natural amenities and recreation are detailed in **Volume 3 Environmental Management**.

1.2 KEY ISSUES

The operation of stormwater and foul water drainage systems is critically related to environmental management, insofar as such urban drainage systems can impact negatively on the natural water environment, in a number of respects:

- **Stormwater runoff**; Storm Drainage from developed areas has a negative environmental impact on receiving waters in two respects:

  - **Quality impact;** whereby pollutants (organic, inorganic sediments, metals and chemicals such as nutrients) picked up from paved areas by runoff are carried via the drainage system into the water body. There is a particular problem with early runoff from heavy rainfall after a dry spell (first flush) when stormwater runoff can have a polluting impact comparable with that of foul sewage. This can coincide with low flows in the receiving water thus further exacerbating the problem.

- **Volume effect;** whereby the increase in impermeable surfaces and the conveyance of runoff through pipes, causes the volume and rate of runoff to increase significantly due to new development. The natural buffering effects of soils and vegetation are bypassed, leading to substantially higher peak flows. This can result in flooding as well as reducing recharge to groundwaters, consequently reducing baseflows in rivers and streams (i.e. resulting in lower dry weather flows).

However, the quantum of stormwater inflow to separate foul sewerage systems needs to be controlled to reduce requirements for large scale upsizing of pipes downstream and to reduce the volume of effluent requiring treatment.

- **Foul sewerage;** historically, foul sewers collected stormwater as well as foul sewage (combined sewer systems). More recently, separate storm sewers have been provided, but a percentage of the stormwater runoff in urban areas will always find its way to the foul system. Pumping, treatment and even pipe systems are limited in the flows for which they are designed, usually a multiple of the expected average dry weather (foul) flow, typically 3 – 6 times. Storm runoff to combined systems can be considerably higher than this. Consequently it has been the practice to provide overflows, known as combined sewer overflows (CSOs), to relieve overloading of combined sewers during rainfall, by permitting overflows to rivers and streams. This practice has significant polluting potential in terms of:

  - Degradation of water quality due to organic and other polluting characteristics of diluted sewage, especially if overflows occur during the “first flush” period following onset of rainfall after a dry period.
  - Aesthetic nuisance due to carry-over of floating debris such as plastics and fabric elements to the receiving water.
  - Damage to the biological ecosystem of the river due to deposition of sediments on the stream bed.

- **Infiltration/Exfiltration:** Whereby groundwater enters the sewerage system via defects in the sewerage fabric. With fluctuating groundwater levels, infiltration often occurs along with exfiltration of foul sewerage through the same defects. As a result, contamination of soils, groundwater and surface water can occur. The Regional Policies (**Volume 2 New Development** and **Volume 4 Inflow, Infiltration and Exfiltration**) propose short, medium and long-term measures to address infiltration/exfiltration which are outlined in **Section 4.2** below.

Surveys of water quality of urban streams and rivers in the Greater Dublin area (GDA) have shown that water quality generally deteriorates significantly as rivers flow downstream through the urban environment. This change is most dramatic for smaller rivers such as the Santry, Camac, Slang and Carrickmines Rivers and is also evident in both the Dodder and the Tolka. Other minor rivers have suffered complete loss of their natural ecosystems as a result of extensive culverting, whereby flows are forced underground for a significant distance, in effect, making them urban stormwater sewers. This total transformation of streams into sewers removes the considerable environmental and amenity benefits, which should be derived from natural river systems. It is more difficult to detect pollution in culverted rivers due to their hidden nature. There is also less incentive to keep a river clean if it cannot be seen. Moreover, these sewers cause considerable impairment to the rivers or coastal waters to which they outfall eventually.

In the context of existing policies, these impacts are practically unavoidable. To eliminate all overflows would require major upsizing of the sewerage infrastructure, which is impractical both from the point of view of feasibility and cost. Similarly, eliminating the polluting impact of traditional stormwater sewerage, particularly the first flush through the system, requires treatment systems at end of pipe locations, combined with rigorous policing of connections to eliminate inappropriate discharges such as:-

- Stormwater (including misconnections) inflow to foul sewerage systems;
- washing machine/dishwasher effluents;
- wash-down of vehicles and yards in industrial/commercial areas and
- inappropriate disposal of household chemicals, waste oil, etc.

Therefore, future development in a sustainable environment requires alternative means of providing urban drainage, while conserving river systems and their environments. In addition, measures are required to address the existing problems (a programme to remove misconnections from the system), which are causing deterioration of the existing environment.

1.3 KEY DRIVERS

With the adoption of the Water Framework Directive, EU and National legislation requires an approach to river basin management which aims to restore and maintain "good ecological status" to surface waters and good status to groundwaters. For GDA rivers, an assessment of EPA water quality data for the period 1998-2000 indicates that 70% of monitored sites are polluted. An assessment of the same data also indicates that only 9% of the GDA Rivers are likely to comply with the requirements of the Water Framework Directive. The WFD recognises the impacts of diffuse source pollution and requires best environmental practices, as set out in a number of related Directives, to be implemented and complied with by 2012 (Article 10).

In addition to EU Directives there are several international agreements to which Ireland is signatory which require action in the area of sustainable drainage if compliance is to be achieved. These include:

- the Ramsar Convention on wetlands, an intergovernmental treaty requiring Ireland to include wetland conservation in national landuse planning. Ramsar Sites in the GDSDS area include the North Bull Island and Rogerstown estuary;
- Local Agenda 21, which requires national government to implement sustainable development at the local level;
- the Convention on biodiversity, which requires the conservation of biodiversity through the principle of sustainable use;
- the Aarhus Convention, which requires Ireland to guarantee the rights of access to information, public participation in decision-making, and access to justice in environmental matters.

Clearly Ireland's legal requirements cannot be satisfied by current practices and policies in urban drainage.

This document sets out to address the issues raised above. Implementation of these policies is necessary to comply with the various objectives and legal requirements despite the costs implications.

2 LEGAL REQUIREMENTS

The Water Framework Directive (WFD), now incorporated into Irish law, requires as an objective the achievement of "good ecological status" for surface waters by 2015. A key tenet of this policy document is that the requirements of the WFD cannot be met unless sustainable drainage systems and a commitment to best practice and continual improvements are implemented.

Implementation of the WFD will involve the development of catchment management strategies incorporating Stormwater Management Plans (SWMP) which will address volume and water quality objectives. Such strategies will be applied on a River Basin District (RBD) basis and will incorporate best environmental practice for land uses generally, including urban development. It follows that a future policy for urban drainage must be in accordance with best environmental practice. The Eastern RBD is relevant for the Greater Dublin area. Strategic Environmental Assessment (SEA) should be undertaken to assess the environmental consequences of all such policies. Thus the SEA process provides a vehicle through which stormwater management plans can be implemented.

The Water Framework Directive will gradually supercede other specific Directives relating to water abstraction for drinking, freshwater fish, shellfish waters, dangerous substances, etc. The development of "good ecological status" would cover the requirements of fresh and coastal waters for their various uses within an integrated management system and framework of measures. These measures will have to include future arrangements for urban drainage.

The timeframe for implementation of the WFD key tasks is outlined in **Table 1** below.

Current strategies relate to existing standards. As a result of evolving legislation, future standards may results in tighter discharge consent levels which would have implications for treatment capacities and proposals.

Appendix C of this Executive Report contains a drawing outlining the existing situation relating to drainage in the Greater Dublin Study Area. It encompasses existing drainage practice, flooding, water quality, bio-diversity and amenity, and outlines the implications with regard to the Water Framework Directive.

Task	Deadline
Set up River Basin Districts. Identify Key stakeholders.	**December 2003**
Characterisation of RBD and review of pressures and environmental impacts. • Identify and agree key water management issues within the RBD. • Economic analysis of water use. • Establish register of protected areas for birds, habitats, drinking water.	**December 2004**
Monitoring programmes to be operational to establish status of surface waters and groundwaters.	**December 2006**
River Basin Management Plans to be presented to the public.	**December 2008**
River Basin Management Plans to be published.	**December 2009**
Pricing Policies in place.	**December 2010**
Programme of measures operational and to include requirements of: • Bathing Water (76/160/EEC) • Drinking Water (98/83/EC) • Urban Waste Water Treatment (96/271/EC) • Nitrates (91/676/EEC) • Conservation of Wild Birds (79/409/EEC) • Integrated Pollution Prevention and Control (91/61/EEC) • Major Accidents (Seveso II 96/82/EEC) • Environmental Impact Assessment (97/11/EC) • Sewage Sludge (86/278/EEC) • Plant Protection Products (91/414/EEC) • Habitats (92/43/EEC) These Directives must be complied with by 2012.	**December 2012**
Waters to meet 'good ecological status'	**December 2015**
Review RBMP on 6 yearly basis	**December 2021, December 2027…**

Table 1 Water Framework Directive, Key Deadlines.

3 STORMWATER DRAINAGE – FUTURE POLICY

3.1 SUSTAINABLE DRAINAGE OPTIONS

When the original sewerage infrastructure in Dublin was constructed at the beginning of the 20th century, it was developed as a combined system catering for both storm and foul flows, with overflows to relieve capacity during rainfall. At the time, this was a major improvement on the previous systems in that it brought the bulk of foul sewage to a treatment facility at Ringsend before it was discharged to the Liffey estuary. At the time, that scheme resulted in a major improvement in water quality in the River Liffey.

For developments in the last 50 years, drainage has been implemented by separate foul and stormwater systems. Since there should be little stormwater present, the foul systems have fewer overflows, with discharges generally caused by misconnections of stormwater. However any such stormwater overflows tend to be even less acceptable since the sewage spilling is less dilute than the combined system. Storm systems collect and convey the majority of run-off directly to rivers and streams.

Various techniques have been developed to overcome the adverse environmental effects of urban stormwater systems internationally. These techniques include:

- **Stormwater Treatment;** Measures to deal with pollution in storm sewers before discharge which have included low flow connections to the foul system (diverting flows from stormwater pipes to foul sewers during times of low flow), up to the provision of full treatment facilities to remove sediment and pollution load prior to discharge. Such measures are likely to be seen more as remedial measures to overcome problems in existing systems rather than as a sustainable approach to new development.

- **Source control systems;** involve delaying run-off from rainfall using local storage and infiltration techniques, whereby run off from roofs and other paved areas is directed onto grassland or other porous surfaces or into infiltration trenches or swales. The effect of these measures is to slow down the rate of run off similar to that which would occur in an undeveloped catchment while at the same time, facilitating a significant degree of infiltration into groundwater to maintain re-charge of groundwater following rainfall. Such systems also trap pollutants close to source preventing their transport to water bodies.

  Source controls can also consist of devices such as water butts, which can be incorporated into developments as small as the size of a single house. The collection of surface water on such small sites, individually may not be very important, but collectively can have a significant impact.

- **Stormwater attenuation/pond treatment;** an alternative approach is to provide pond storage at the end of the stormwater network before discharge to rivers and streams. Storage comprises two elements, a permanent pond into which stormwater discharges and which facilitates settlement and biological treatment before discharge, combined with temporary storage volumes where high intensity run off flows would be balanced before discharge so that flood flows in rivers and streams are not significantly increased as a consequence of development. Such temporary storage areas could function as amenity areas when not in use for flood relief.

- **River management and conservation;** a key requirement in development planning is the conservation of rivers and streams and their riparian areas. This requires that the river channel and a significant riparian strip (typically 10 – 15m width on either side of the water course, or more if appropriate), is maintained in a natural state so that river ecosystems can survive and flourish to the benefit of communities. In these circumstances, it is important to retain riverbank ecosystems intact with native meadow grasses allowed to flourish adjacent to the rivers. These natural areas bordering on rivers can also offer significant benefit in attenuating pollution from run off before it reaches the river.

  Where possible, culverting of watercourses should be avoided. Existing culverted watercourses should be evaluated for their rehabilitation potential. Channelised watercourses should also be addressed in this regard. The removal of culverts and channels should be encouraged where feasible. Guidelines are provided in the **Regional Policies – Volume 3 Environmental Management** document **(Ref: GDSDS/NE/02057/028-03F).**

These techniques work best within the framework of a SWMP. This would address volume and water quality objectives and can be implemented as catchment management strategies under the Water Framework Directive (Eastern River Basin District).

Internationally, these systems are being developed to suit local conditions. Examples of current practices are:

- **Australia;** where storage and infiltration systems are systemically used, with conservation of rivers and significant investment in the reinstatement of natural river systems to replace culverted and canalised watercourses.

- **United States;** where the low density residential development in suburban areas is particularly suited to attenuation of stormwater within the development both by infiltration and storage methods. It is also notable that swales and ponds are features of highway drainage systems in many States.

- **Sweden & Germany;** experience in Malmo demonstrates that source control techniques can be systemically implemented as part of new urban development. Infiltration trenches to control runoff from residential lots have been used successfully by covering the top of the trench with a grass layer. The grass layer filters stormwater as it passes though the soil, while the trench keeps the overlying soil filter from becoming saturated. In Essen, Germany, a similar application has been successful.

- **Britain**; under the direction of the Scottish EPA (SEPA) and the Environment Agency (EA) in England and Wales, there has been considerable progress in the development of SuDS. SuDS vary in type from place to place depending on local circumstances and include infiltration systems, swales, ponds and storage channels. Based on experience to date, basic design manuals have been prepared for implementation of sustainable drainage systems (CIRIA Reports C521 and C522).

The basic concepts for sustainable drainage systems are illustrated in summary form in Table 2 overleaf. These concepts are expanded in detail on “Information Sheets” contained in **Appendix A** of this Executive Report. These information sheets describe the design, function, maintenance, advantages and limitations of the most widely used methods for SuDS.

Appendix B contains case studies in sustainable drainage systems based on both national and international experience.

The overall approach of SuDS therefore, can include a range of options from source to discharge, that will attenuate quality and quantity impacts of runoff, to suit the constraints of the site. Review of existing policies, within Local Authorities in the Dublin area, indicates that the majority are already committed in principle to this approach.

Type of System	Device	Primary Function	Primary Characteristics	Example
Water conservation & re-use (Source Control)	*Water butts, Rainwater tanks, Greywater tanks, Rooftop Greening.*	Collection and re-use of surface water	Provides offline attenuation of stormwater	
Infiltration[1] systems (Source Control)	*Infiltration Trenches, Soakaways, Permeable Pavements.*	Encourage stormwater to soak into the ground while filtering pollutants	Permeable features allowing infiltration	
Filtration[1] systems (Source Control)	*Swales, Bio-retention systems, Filter strips, Filter drains*	Capture heavy metals, grease, oil, nutrients and sediment	Grassed or planted features such as channels	
Retention systems (Site Control)	*Retention ponds, Oil Interceptors*	Primarily designed to retain pollutants	Artificial lake with fringing vegetation	
Detention systems (Site Control)	*Detention basins*	Primarily designed to reduce runoff rate	Vegetated depressions	
Constructed wetlands (Regional Control)	*Stormwater wetlands*	Filter stormwater and reduce runoff rate while providing a wildlife habitat	Heavily vegetated, hydrologically charged area	

[1] Infiltration Devices are designed primarily to allow stormwater to soak into the ground. Filtration devices generally have a conveyance function. Both devices provide filtration of pollutants.

Table 2: Functions of SuDS Structural Devices

Within the Dublin area, the major impact of new development upstream in catchments is an increase in floodwater flows in rivers, streams and storm sewers reaching the city. Therefore, the primary emphasis in SuDS policy in urban areas has been on volume attenuation. For that reason and recognising that the majority of developments in the city area comprise infill developments on confined sites and involving high density development, attenuation options such as underground tanks have been used. These options can deliver effective attenuation of run off volume but would be unlikely to achieve significant quality improvement.

In the Dublin county areas, developments have the potential to affect the environments of natural rivers and streams. Therefore, water quality protection is an important focus in the existing policies of these Local Authorities.

3.2 STORMWATER DRAINAGE- POLICY PROPOSALS

In line with the objectives of a sustainable environment complying with the Water Framework Directive and associated water quality Directives and Regulations, the following policy proposals are made:

1) **Sustainable drainage systems (SuDS)** must be incorporated for all new development, using best practical environmental practice and techniques, to mitigate the impact of development on the aquatic environment. The proposals should provide for control of quantity and quality of water discharges, conservation and enhancement of water bodies and the river / coastal environment. Local Authorities should rethink stormwater drainage techniques to suit application of SuDS, including the redevelopment of codes and standards to account for site factors and conditions, design, operational and maintenance requirements.

2) **River management and conservation;** It should be a requirement that all rivers and streams, comprising as a minimum all tributaries marked on 1 to 50,000 OS mapping, be subject to conservation of their natural channels and a significant riparian strip (typically 10-15 m on either side depending on the size of the watercourse) within any development proposal. The narrower the riparian strip, the more easily the watercourse is adversely affected. Local Authorities should identify riparian areas to be conserved, clarify riparian rights / responsibilities and develop guides to river restoration and rehabilitation in existing development areas, including the promotion of pilot rehabilitation schemes. In conjunction with the Office of Public Works (OPW), full floodplain mapping and floodplain management policies should be developed for all rivers within the development area. Planning policies should, as far as practicable, prevent loss of floodplain storage and obstruction to flow during flood conditions and should ensure that development datum levels are higher than flood levels for a return period of at least 1:100 years based on historical flood data. It is recommended that all rivers and watercourses are evaluated for their rehabilitation potential.

3) **Groundwater;** Stormwater management systems should be developed such that, as far as is practicable, the annual recharge to groundwater from the post-development site should approximate the annual recharge from the pre-development or existing site conditions. In endeavouring to achieve this, alternative BMP designs and locations should be evaluated. A management train/treatment train approach to stormwater runoff is recommended for the protection of groundwater, as no one technique is capable of removing all pollutants. Risks to groundwater must be considered when developing sustainable drainage strategies, particularly in high risk areas around groundwater supply sources. This is covered in more detail in the **Regional Policies – Volume 3 Environmental Management** document (Ref: GDSDS/NE/02057/028-03E). Groundwater also forms a major component of the Eastern River Basin District Project work.

4) **Environmental assessment;** Large scale developments should be subject to detailed environmental assessment, up to full environmental impact assessment where necessary and development proposals should include site management plans to cover drainage, conservation of natural heritage and amenity sites, prevention of erosion during construction and to incorporate good quality landscape design to complement and reinforce sustainable drainage systems.

5) **Drainage management and maintenance systems;** In conjunction with the implementation of SuDs drainage systems, Local Authorities are required to agree operation and maintenance responsibilities between relevant departments (roads, drainage, parks). SuDS, when appropriately designed, can be extremely cost effective. In general the capital costs are low in relation to traditional drainage systems, and although ongoing maintenance costs apply during the lifetime of the device, maintenance costs can be considerably less than the cost of maintaining traditional drainage systems. Any cost assessment of SuDS drainage systems should have regard to costs of environmental restoration associated with conventional systems.

6) **Health and Safety**; Particular standards and criteria should be developed to minimise risk of accidents particularly associated with SuDS drainage systems such as ponds, ditches and other systems. While generally, the risk is considered low, health and safety considerations should be an integral part of the planning, design, construction and maintenance phases of these systems.

7) **Public awareness;** Local Authorities should encourage public awareness and public participation in resource management and conservation generally. This would include the planning, design and implementation phases of SuDS systems to promote their use, and good housekeeping practices in relation to foul and stormwater drainage. The development of education programmes aimed at all stakeholders on the subject of water conservation and re-use and the reduction of stormwater pollution from household and business activities should form an integral part of any SWMP.

Systematic implementation of best environmental practice in urban stormwater drainage should regulate peak flows to rivers and streams to levels similar in scale and quality to those which obtained prior to development. With such arrangements, the need for large scale regional storm drainage infrastructure would not arise with only local necessary pipe connections linking stormwater control structures and receiving waters being provided. Regional sewerage infrastructure would relate to the foul sewerage system solely. The use of source control devices, such as bioretention, water butts or devices which allow water re-use, are recommended for small areas which are difficult to drain satisfactorily.

3.3 STORMWATER DRAINAGE POLICY – IMPLEMENTATION

Sustainable drainage should form part of a holistic integrated catchment management approach. This would ensure that the environmental, technical and planning disciplines are fully integrated in developing sustainable infrastructure. Implementation of the proposed urban drainage policies for stormwater will require actions by Local Authorities at various levels as follows:

Planning Department; Adoption of the policies in principle and any necessary measures for their successful implementation through planning and development control is a priority. Currently rapidly developing policies exist in the UK which can be drawn upon to develop appropriate policies for Ireland. In addition, area action plans and strategic plans should incorporate these policies including studies of their optimum implementation as an integral part of such plans.

1) **Drainage Planning and Design;** A framework of information is required to support the implementation of these policies, Local Authority involvement will include:-

   - Identification of river and stream networks for conservation and their incorporation in catchment management plans (to include floodplain definition, criteria for development in relation to the floodplain and any other constraints on development.)

   - Co-ordinated and consistent implementation of sustainable drainage systems should proceed on the basis of emerging best practice standards and codes of practice being developed in the UK. However, as experience is gained and issues arise relative to local conditions, it is desirable, if not essential, that codes of practice and design standards be developed and implemented for Greater Dublin/Ireland. This is to ensure that robust designs, suitability for local conditions and reasonable operation and maintenance requirements are developed so that sustainable drainage systems operate adequately. The Policy Implementation Committee (refer **Section 5**) should keep this issue under review.

2) Construction; Appropriate specifications are to be developed for the construction of sustainable drainage systems for satisfactory quality standards, including testing/acceptance procedures and standards of completion (surface finish, landscape treatment, testing and validation of the works, health and safety standards, provision of design and construction records in appropriate format).

3) Operation and Maintenance; Most critical of all to the success of sustainable drainage systems, will be the adoption by the relevant Local Authority departments of responsibility for operation and maintenance of these facilities including the development of procedures for such maintenance to ensure effective long-term operation. This will require at the outset, an agreement within Local Authorities and their departments on the roles and responsibilities for the maintenance of river and riparian area environments, SuDS including ponds and wetlands incorporated into landscaped amenity areas, infiltration systems such as swales, etc. Maintenance procedures are required for inspection, cleaning and renewal, disposal of sediments, interception and removal of hydrocarbons.

SuDS implementation will vary, depending on site circumstances. Green field suburban developments may utilise the full range of options from source control to storage attenuation, with site contours and soil / geological conditions influencing the design arrangement. For inner city “brownfield” developments involving higher densities, fewer options may exist with consideration of porous pavement systems combined with in-sewer or tank storage, where open storage is impractical. Other source control techniques suitable for high density urban areas, such as devices which allow re-use of rainwater and bioretention, should also be considered. Flow control may also be relaxed where discharge is to a large water-body (e.g. River Liffey or to the sea) subject to environmental requirements being met.

The most critical requirement within the Local Authorities therefore, is for a common agreement on the implementation of sustainable drainage systems and their long-term management and maintenance. This will require addressing technical requirements, legal responsibilities, financial implications and budgets, skills and training of operatives and appropriate information management systems to track system records, cleaning and maintenance operations, performance indicators and costs. A schematic diagram of a proposed management structure is shown in Figure 1 below. Further discussion of implementation is provided in Section 5 below.

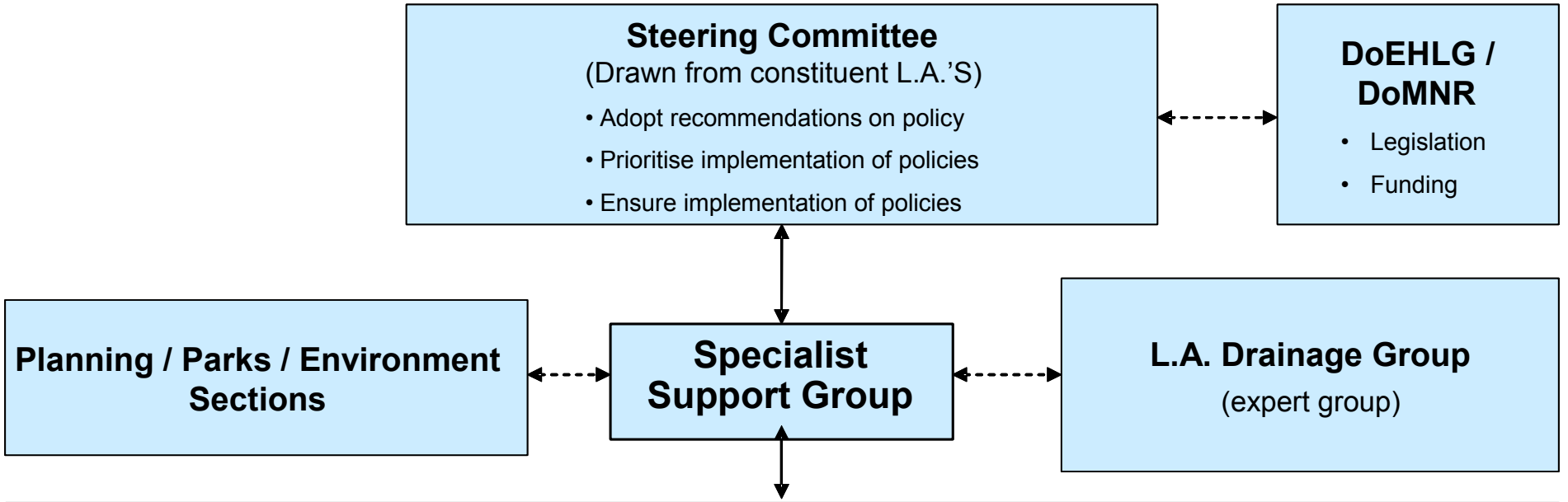

Figure 1: Proposed Management Structure – Catchment/Regional Scale

4 FOUL/COMBINED DRAINAGE – POLICY PROPOSALS

For new developments, with stormwater to be managed at source, connected to local streams, regional sewerage infrastructure should comprise only a foul sewer network. While inevitably collecting some stormwater connections, the system capacity should be capable of conveying such flows to treatment. This requires that sewer pipes be sized for peak foul flow (as a minimum) and that systems be tested and surveyed (CCTV and Impervious Area tests) before taking in charge to check for infiltration or unnecessary stormwater connection. Policy proposals in this area are outlined below.

4.1 COMBINED SEWER OVERFLOWS

For existing combined systems or partially separate systems with high levels of stormwater connection, overflows may be unavoidable, both at pumping stations and within the network. For that reason, criteria are required for overflows to receiving waters, to allow for intermittent discharges.

The key policy recommendations proposed for intermittent discharges from combined sewer overflows are:

- The standards for intermittent discharges should be determined from the requirements of the receiving water. This requires a total catchment approach having regard to all of the pressures on the river. For discharges to rivers, dilution criteria and first flush containment will be paramount, with spill frequency an important indicator especially for bathing and recreational use waters, and with debris control being essential to protect amenity.

- Detailed consideration of the environmental performance of each CSO as part of an overall strategy will involve significant new infrastructure involving tanks, overflow structures etc. These require careful planning, particularly in a built up environment. Previously, the design of overflow structures was based on Department of the Environment circular (1994) “Procedures and Criteria in relation to stormwater overflow”. This set criteria for spill locations and discharge limitations, minimum downstream hydraulic capacity and efficient design of the structure. It relied on the characteristics of the structure to minimise carry-over of solids and the consequence was generally for relatively large structures. Siting of these structures presents difficulties in the built-up urban environment. In any event, recent UK experience indicates that screening is necessary to achieve effective separation of solids. The WaPUG (Wastewater Planning Users Group) Guide for the design of CSO chambers to incorporate screens (2001), currently represents best practice and involves the design of chambers to suit the chosen screen type, permitting significantly smaller chambers which may be more easily accommodated.

The following measures are recommended:

- Assessment of all CSOs in the GDSDS CSO database, as part of the network modelling exercise. Additional CSO information, from networks not included in the GDSDS modelling exercise (for example, Shanganagh and Bray Main Drainage Scheme) should be included to give a comprehensive CSO database for the entire GDSDS area.

- Consideration of the CSO impact by monitoring of the receiving environment using modelling or other measures to establish the impact of the CSO on receiving waters. Key considerations will be retention of first “foul flush” flows as far as practicable and adequate dilution before spilling commences.

- Consideration of all alternative options including storage, upgrading sewer capacity and rationalisation of CSOs to minimise the number of overflows.

- Reduction in upstream flows may be possible by sewer rehabilitation or removal of stormwater connections.

- Reduction in litter nuisance may be achieved by incorporating baffles or screens into existing and future structures.

- Provision of storage tanks may be on-line or off-line, depending on site circumstances and should include appropriate measures for drain-down and flushing/cleaning of the tanks, odour control measures and satisfactory access/maintenance facilities.

Therefore, consideration of the CSOs in the network will result in a general CSO management plan. Detailed assessment of each overflow may then be required following which a CSO upgrading programme may be determined. The Urban Pollution Management (UPM) procedure (UK) provides a practical, structured method that can be followed to assess the status of individual overflows and to derive the most cost effective solutions.

For designated bathing waters and recreational use waters, the spill frequency standards currently used should continue to be applied. It is recommended that hydraulic models should, in general, be used to analyse the behaviour and performance of networks, including CSOs, using the historical Time Series of rainfall events recommended for assessment of intermittent discharges. The effects of spills on receiving waters should also be modelled.

The implications of this policy are that each Local Authority must develop a works programme for the management of overflows within the networks. This would include a monitoring programme leading to the development of a detailed capital programme. It also requires a maintenance programme, including monitoring and inspection of overflows and screens, to ensure that upgraded CSO structures operate satisfactorily.

4.2 INFILTRATION/EXFILTRATION

Inflows of stormwater to the foul sewer have been discussed above. Further illegitimate loads to foul sewers occur when groundwater enters the sewerage system via defects in the sewerage fabric. With fluctuating groundwater levels, infiltration often occurs along with exfiltration of foul sewerage through the same defects. As a result contamination of soils, groundwater and ultimately surface water can occur. Exfiltration involves modest flows and as such the scale of the problem is difficult to identify. However, one can assume that in an area of high infiltration, exfiltration must occur. The problem should be addressed for existing sewers by rehabilitation.

The **Regional Policies** (**Volume 2, New Development** and **Volume 4, Inflow/Infiltration and Exfiltration**) propose short, medium and long-term measures to address infiltration/exfiltration. These include improvements to construction and inspection standards to reduce defects, correction of mis-connections and on-going monitoring. It is recommended that studies be undertaken into the true level of inflow / infiltration / exfiltration in the drainage network across the region and to implement pilot projects within the lifetime of the Development Plan; to develop an I/I/E Reduction Procedure to reduce inflow, infiltration and exfiltration flows to economic levels in the most cost-effective manner and to develop a systematic programme of rehabilitation works across the region.

4.3 CONTINUOUS DISCHARGES

Final effluent discharge from municipal wastewater treatment works (WwTW) and discharges from trade and industrial premises are subject to regulation / licensing. Enforcement of the regulations / licences is a key element in protecting receiving waters from damage due to continuous discharges. Regulations vary with time and standards for continuous discharges and should be determined from detailed studies of receiving waters and of loads to be dealt with in order to establish appropriate treatment standards.

Whether licensed discharges are to sewers or receiving waters, all discharges should be reviewed with regard to good practice and minimising risks to the environment. An integrated regional approach to licensing is recommended to ensure consistency of approach.

Licence conditions must provide for effective monitoring both of flow and of key pollution indicator parameters and with requirements for continuous monitoring of large loads (>1000 p.e.).

Current continuous discharge loads reflect little attempt at source control. A clear objective must encourage source control to reduce loads arriving at treatment and in the process to reduce risk from effluents to receiving waters. Equally, new industries must be encouraged to exercise a best practice approach to source

control and minimising effluent loads. It is suggested that licensed standards for discharge from industries should at a minimum not exceed standards equivalent to domestic sewage. This will contribute to better performing treatment plants by reducing shock loads as well as day to day variations which contribute to operational problems in treatment plants.

4.4 GENERAL POLICIES

General Policy Proposals in the area of foul/combined drainage include:

- Review and, if necessary, upgrade treatment capacities.
- Acceptance in principle of the policy elements.
- Resource L.A.s, develop skills and commit funding in order to implement policies.
- Incorporate policies into planning instruments.
- Agree and adopt design standards.
- Legal and operational requirements to be agreed.
- Commit to best practice and continual improvement.

The proposed management of implementation structure has been outlined in Figure 1 above.

5 IMPLEMENTATION

5.1 MANAGEMENT OF IMPLEMENTATION

The implementation strategy revolves around the establishment of a Regional Management Group, the commitment of adequate resources and funding and the testing of certain policies at Catchment Level through pilot programmes and education and awareness programmes.

A template for the Regional Management Group is shown in Figure 1 above. It is comprised of a Steering Committee, an Implementation Group and a Specialist Support Group. The Steering Committee would have responsibility for adopting the policies, prioritising them for implementation, ensuring adequate funding and resources are made available and auditing the effectiveness of their implementation. The Implementation Group would be tasked with the implementation of the policies in individual Local Authorities. This group will require a "policy champion" who has been empowered to take ultimate responsibility for the implementation of the policies. The Specialist Support Group should comprise members of the Drainage / Planning / Parks and Environment Sections of individual Local Authorities. Additional support would be provided by a panel of experts, whose function is to monitor, audit and review the effectiveness of the implementation strategy and to recommend refocusing the strategy if required.

5.2 KEY PLAYERS IN IMPLEMENTATION

Key Players in the Regional Management Group are therefore the:

- DoEHLG; who have responsibility for legislation, provision of funding, and to audit expenditure.
- OPW; who have responsibility for flood management of river catchments.
- L.A.'s; who are statutorily responsible under existing legislation, they are required to adopt and prioritise the policies, to ring fence all funding provided, to seek additional funding (polluter pays, serviced land initiatives) where feasible, to develop educational awareness programmes, and ultimately to implement the policies.
- National Flood Management Agency, should such an agency be established on the recommendation of the National Flood Policy Review Group, who would advise on all aspects of flood management.
- EPA; who are responsible for the protection of Ireland's natural environment and for control of environmental pollution.
- GSI; who have responsibility for provision of advice on the protection of groundwaters.
- The Fisheries Board who are responsible for the protection, conservation and management of inland fisheries and sea angling.
- Construction Industry Federation and Forum for the Construction Industry.

6 IMPACT OF THE POLICIES

6.1 IMPACTS ON THE LOCAL AUTHORITY

Examination of the policies shows that quite a number of them require each and every local authority in the Greater Dublin Region to consider and undertake a number of defined actions ranging from undertaking studies; developing design standards and guidance documents; to piloting certain policies in priority areas. These will require committed funding and resources if they are to be successfully implemented.

The successful implementation of the policies also requires improved co-operation and communication between the 7 local authorities in the region and across the various disciplines within each local authority, particularly the drainage and planning departments. This might entail changes to current Council procedures.

It is also essential that the environmental impacts of development are considered at catchment level earlier in the planning process and that the potential conflict between higher density requirements for housing and land required for SuDS are resolved. This could be facilitated by considering elements of SuDS, such as attenuation ponds, to be regional or catchment issues and to make provision for the necessary lands in the Development Plans.

6.2 IMPACTS ON OTHERS

Policies, such as the requirement to provide Flood Impact Assessments for all developments impacting on flood risk areas and the requirement for Sediment and Water Pollution Control Plans for all developments, will impact on land owners and developers. However the biggest impact on land owners and developers, and through them on house owners, will arise from the policies to control development in the flood plain and any requirement to provide attenuation storage, either as a flood relief measure or as a regional SuDS measure. It could be argued that these policies will result in the loss of the development potential of some lands heretofore considered prime development land and could give rise to claims for compensation for land identified as ‘attenuation storage’. Restrictions on the development of land in the flood plains could also result in increased costs of development as the more easily developed and therefore cheaper to develop; lands in the flood plains are removed from the developers net.

7 SUMMARY

This Executive Report briefly outlines future policy proposals for:-

- Implementation of SWMP on a catchment basis, addressing volume and water quality objectives, within the framework of Catchment Management Plans as required by the WFD. Education programmes aimed at all stakeholders should form an integral part of SWMP.

- Use of SuDS for urban stormwater drainage to satisfy best environmental practice in controlling the quality and quantity implications of development for stormwater run-off to receiving waters.

- Control of I/I/E in the drainage network across the region; including improvements to construction and inspection standards to reduce defects in the sewerage fabric, correction of mis-connections and on-going monitoring.

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- Control of intermittent discharges from combined sewer overflows (CSOs); including containment/spill frequency, screenings and detritus control and other general limitations on spills to receiving waters.

- Control of continuous discharges from municipal wastewater treatment works through strict enforcement of licence conditions and the encouragement of best practice approach to source control and minimising effluent loads.

The most critical requirements within the Local Authorities, as a result of this proposed Environmental Management Policy, are as follows:-

- Acceptance in principle of the policy elements.
- Resource L.A.s, develop skills and commit funding in order to implement policies.
- Incorporate policies into planning instruments.
- Agree and Adopt Design Standards.
- Agree legal and operational requirements.
- Commit to best practice and continual improvement.

A supplementary Technical Report on Environmental Management Policy (**Regional Policies Volume 3**), along with its accompanying appendices provides detailed, technical information on these future policy proposals.

It is recommended that the Environmental Management Policy be adopted to form part of a holistic integrated catchment management approach whereby the environmental, technical and planning disciplines are fully integrated in developing sustainable infrastructure.

APPENDIX A

SuDS Information Sheets

SuDS Information Sheets

Source Control

- Permeable Pavements
- Filter Drains
- Infiltration Trenches and Soakaways
- Bioretention
- Oil Interceptors
- Swales
- Small Scale SuDS for Individual Buildings

Site Control

- Detention Basins
- Retention Ponds

Regional Control

- Stormwater Wetlands

APPENDIX B

SuDS Case Studies

SuDS Case Studies

Scotland

- M74 Motorway
- Briery Hill Wetlands
- Motorway Services, Johnstone Bridge.
- Dunfermline Eastern Expansion

Ireland

- City West Business Campus

Australia

- Lynbrook Estate, Melbourne
- Figtree Place, New South Wales
- Homebush Bay, Sydney
- 'Healthy Home', Gold Coast
- Mawson Lakes, Adelaide

APPENDIX C

Existing Environmental Situation 2004