Local Government Association of South Australia State Government of South Australia

Metropolitan Adelaide Stormwater Management Study

Part C

Apportionment of Council Costs Final Report

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LOCAL GOVERNMENT ASSOCIATION AND STATE GOVERNMENT OF SOUTH AUSTRALIA

Metropolitan Adelaide Stormwater Management Study

Part C – Apportionment of Council Costs

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INTRODUCTION

In 2003, the Local Government Association of South Australia prepared the 'Stormwater Management Strategy' dated 27 June 2003, and presented it to the State Government (Minister for Local Government).

The Strategy, targeted specifically at metropolitan Adelaide, was prepared to '*provide a constructive means to address the significant challenges and opportunities in relation to stormwater management in metropolitan Adelaide*'. Endorsed unanimously by all metropolitan council Mayors and Chief Executive Officers, the strategy proposed a partnership approach to stormwater management with equal responsibility for funding between councils and the State Government.

'Step 1' of the proposed strategy—an independent study to clearly define 'The What' subsequently resulted in the preparation of the terms of reference brief for the Metropolitan Adelaide Stormwater Management Study (MASMS). The MASMS is being undertaken in three distinct, although interrelated parts:

- Part A—Audit of Existing Information
- Part B—Stormwater Harvesting and Use
- Part C—Apportionment of Council Costs.

This report presents the outcome of Part C: Apportionment of Council Costs.

The objective of Part C of the MASMS project is to develop a modelling framework to apportion local government costs committed to stormwater management between councils. The model must consider who bears the respective costs (the burden) and who receives the benefits.

In managing the drainage system, there are three key inter-related issues, namely water quality, stormwater management (minor and major)/flood mitigation, and maintenance and replacement programs for existing infrastructure. This Report focuses on the funding of new infrastructure requirements, but similar principles apply to maintenance and replacement of existing infrastructure.

Because flood risk occurs at the local level, the management of stormwater in the urban area has primarily been the responsibility of local government from the founding of the State, while the State Government has also provided funding and an involvement in management issues. Historically, Drainage Authorities have been formed to join councils together to solve drainage issues in major catchments and where catchments cross council boundaries. Whole catchments across metropolitan Adelaide are now also overlaid by the State Government instituted Catchment Water Management Boards. A new level of governance is emerging as a result of the recent Natural Resource Management (NRM) legislation where NRM Boards will be responsible for one or more water catchments.

CONTEXT

Stormwater management is a network management issue

The key issue of stormwater management is that who creates the cost and who bears the cost of managing stormwater are not always the same group. The creation of the costs is through urbanisation, and an area will generate stormwater run-off which will then flow through other areas, increasing the risk of flood.

Where new development causes pressure on a watercourse, requiring an upgrade or extension to the infrastructure, then using marginal or incremental principles the cost sharing story would be quite simple, in that the residents of a new urban area should pay the costs of the upgrade. In large part this is the intention of developer charges for new urban areas.

However, the following major complications exist which change this perspective:

- the upgrade often brings forward maintenance/replacement on the existing trunk, saving future costs for existing residents in other areas;

- new developments do not occur in isolation and joint pressures exist, associated with developments and infill across a number of areas which make it difficult to isolate the incremental cost associated with each area.

On the basis of these factors, all communities should contribute to the upgrade in all but the simplest of cases.

A further significant issue is that areas that bear the highest risk of flood are those downstream. These areas also continue development (urban infill) and incorporate location specific benefits despite being in a floodplain.

Type of rainfall events and implications for stormwater management

There is a need to recognise that there are different pressures for managing usual flows from normal rainfall events versus coping with unusual. The management issues for normal flows usually relate to 'nuisance' flooding, and often include water quality and stormwater use outcomes. The management issues for unusual rainfall events relate to the costs of flooding and flood mitigation.

This dual outcome focus complicates stormwater management in the following ways:

- engineering solutions and consequent costs will be influenced by the dual outcome objective;
- the benefits of a project will be distributed differently based on the nature of the outcome—with flood impacts generally being more localised and environmental outcomes being more broadly spread.

Flood tends to have its biggest effect at a local level, and as such has historically been a focus of local government investment. However, there is also a broader metropolitan (and therefore State Government) interest in flood outcomes based on the risk to state infrastructure (e.g. airport) and social inter-linkages. Given these outcomes, the State Government also provides funds to projects so as to reduce flood risk.

Water quality and environmental outcomes (including stormwater use) by their nature have implications that can extend beyond a specific catchment, and as a consequence have historically attracted policy and funding responses from State Government. However, water quality outcomes also have local dimension with most councils having policy and investment interests in improving this aspect of stormwater management.

Therefore, while both local and state levels of government have interest in both flood and water quality issues, it is clear that if cost apportionment models for local government expenditures are based on flood risk reduction outcomes, the models will be more manageable—logically based on catchment areas and relative contributions and benefits within that catchment area, and applying a more measurable parameter set.

Stormwater as a resource

Increasingly in communities, stormwater is seen as an under-utilised resource. Therefore, research supporting the models and approaches adopted should take this into account, implying that if a particular community directly benefits from stormwater harvesting and use, this should be reflected in the cost apportionment framework. However, stormwater harvesting can also be seen as having a broader implication beyond that for the local community in the context of policies for "water-proofing" the metropolitan area and reducing pollutant loads on receiving waters.

Risk factors in flood mitigation

On the basis of an emphasis on flood mitigation issues in apportioning costs, the key question for framing a cost apportionment model therefore is what factors influence the extent of water flow, and therefore the risk of flooding for a given investment in infrastructure.

These can be summarized as:

- the contributing area (catchment) and characteristics of that area contributing to a stormwater system;
- the extent of new and infill urban development within a catchment—for councils there is something of a potential conflict of interest in that urban development increases rates and scope of operation, but also brings additional cost, including increasing flood risk. The balance between planning requirements and flood risk is an important aspect in this choice;
- the nature of stormwater infrastructure in a given area (i.e. a project designed to increase flows out of an area, or to decrease flows via detention).

Increased flood risk may not occur directly in the council area where the development is occurring. For example, the creation of new urban development in 'upstream' areas of a catchment—the upstream council benefits, but the downstream council incurs some costs.

Current funding arrangements

The funding options currently in use can be generally summarized as:

- stormwater works in large new urban developments are usually a required part of the developer responsibility, but there can be some negotiation at the broader level for contributions by the State and local government. The works considered are primarily local, and consideration of downstream effects has been adhoc with variable arrangements for contributions negotiated;
- significant projects not directly within new major developments are also funded by specific funding arrangements, including all levels of government, with negotiation around the parameters above as a basis for cost sharing;
- significant projects relating to improvements of existing networks are funded jointly by the State Government and the council in which the expenditure will occur under the auspices of the Catchment Management Subsidy Scheme. Some projects have included cost sharing between councils on a variety of bases;
- other smaller (local) projects are funded by local government, as is maintenance for all of the above projects.

Basis for cost apportionment – recent studies

The issue of cost apportionment has received significant attention of late, and has been considered in a number of recent reports around major projects.

The consultant for the Gawler River scheme suggested the following options existed as a basis for distributing costs:

- future costs avoided, i.e. the greatest beneficiaries should bear the greatest cost;
- gross catchment areas;

- watercourse length in each council area;
- capacity to pay, based on an agreed criteria (i.e. size of ratepayer base).

A report on options for Brown Hill and Keswick Creek funding arrangements recommends that the catchment networking issues be recognised with the a measurement of impervious area as the base, with adjustments for extent of non-urbanised area, credits for works that limit downstream flows, and penalties where poor planning has contributed to the problem.

CONCLUSIONS

Possible options for cost apportionment models

In the context of the above discussion, Table 1 summarises the options available for apportioning costs between councils. There is a presumption in the options developed that the State Government will continue to provide funding for stormwater management, both directly and through the involvement of the Catchment Water Management Boards, and the options provided are for apportionment of local government's expenditure component. There are 3 options presented as follows:

- Option 1 Councils contribute on relative costs and benefits within catchment – simply framed model.
- Option 2 Councils contribute on relative costs and benefits within catchment – complex model 1 (flood risk focus).
- Option 3 Councils contribute on relative costs and benefits – complex model 2 (broader focus).

It is noted that during the research process, alternative solutions outside the terms of reference of this project were proposed by stakeholders—which would imply substantial governance changes to stormwater management.

Option 2 is the recommended model from the perspective of the researcher, within a context that the main issues for local government are flood mitigation and that adapting this framework keeps the model simpler than including the range of other factors, and that external funds are often available for these other factors. The cost apportionment of a proportion of the local government contribution (x%) is recommended to follow the model proposed in the

consideration of Brown Hill and Keswick Creek infrastructure, while the balance is distributed based on the number/value of properties in the area multiplied by an assessed probability of flood risk.

RECOMMENDATIONS

This Report considers the development of a methodology for apportioning stormwater management costs borne by local government between councils within a catchment area. The research supports adoption of a model which distributes these costs based on the following guiding principles:

- defining a proportion of the expenditure which will be distributed based on the extent to which an area causes the cost (i.e. the proportion of stormwater incrementally added to the system);
- defining the balance which will be distributed based on future flooding costs avoided if the project proceeds (apportionment based on value of properties at risk with and without the project).

The basis for cost apportionment has been subject to considerable discussion in the past with a variety of modelling frameworks applied. The above model represents a combination of the approaches recommended in recent reports on the Brown Hill and Keswick Creek watercourse (which emphasises the first aspect but excludes the second) and the Gawler River watercourse (where the eventual cost apportionment emphasises the second).

Therefore it is recommended that this framework be adopted for the apportionment of council costs for future stormwater projects.

It is noted that the following incentives exist for councils to achieve consensus on this approach.

- local government has already adopted a policy decision that supports cost apportionment, and the principles proposed are broadly consistent with existing models;
- if projects are delayed due to lack of consensus there is an increased risk of liability claims;
- availability of State Government funding is dependent on agreement being reached;
- the framework recommended "accommodates" the common areas of dispute in reaching a conclusion.

A recommended process for facilitating the use of the framework is seen as requiring 4 separate phases, as follows:

- **Project Development Stage**—Identification of priority projects, and proposed staging within each catchment followed by a Catchment Board facilitated workshop to identify and reach agreement on the recommended engineering approaches to the problem.

- **Cost Apportionment Assessment Stage**—Based on the framework identified above, an assessment of the parameters for cost apportionment needs to be undertaken. Using the framework agreed, this step involves identifying the parameters and modelling the outcomes to produce recommended cost contributions.

- **Cost Apportionment Review Stage**—This step requires a workshop (again maybe Catchment Board facilitated) of CEO's to discuss, modify and agree cost contribution amounts.

- **Cost Contribution Approval Stage**—This is an internal council approval stage.

Despite the incentives that exist for reaching agreement, the research process identified many different views from within local government as to the issues and as such in some cases consensus may not develop. As the delaying of priority projects brings substantial community risk it is recommended that a combination of the following mechanisms is adopted to resolve lack of consensus:

- Use higher level funding access as a lever (eg a council is not eligible to apply for funds if there is/has been an unsuccessful outcome for a higher priority project).

- Adopt a legislative framework that will empower a binding decision from an independent decision making entity, taking into account the issues identified in the process to date. The current legislative framework is insufficient for this purpose. The issue of appeal rights is also important in this context. If the legislation prevents formal appeal (noting that there would still be political venues for "appeal") there would be more incentive to reach agreement, but it may not lead to the right solution.

- Before the application of the external decision, provide mediation and negotiation support (i.e. appoint an external party to assist in mediating a solution).

Table 1 Options

Item	Option 1	Option 2	Option 3
Title	Councils contribute on relative costs and benefits within catchment – simply framed model.	Councils contribute on relative costs and benefits – complex model 1.	Councils contribute on relative costs and benefits –complex model 2.
Description	Dividing Local Govt expenditures (i.e. costs after State/Commonwealth contributions) between councils based on proportion of catchment area (proportion of impervious area).	**Defining a proportion of the local government expenditure** (x%) which will be **distributed based on extent to which an area causes the cost**, acknowledging in theory: • the proportion of stormwater that each council incrementally adds to project watercourse. • the proportion of stormwater currently generated from each council, where the project will bring forward replacement of existing infrastructure. **Defining the balance (1-x%) which will be distributed based on future flooding costs avoided if the project proceeds** (distribution based on value of properties at risk with and without the project)	This option is an extended version of Option 2 with a third factor introduced (instead of 2 as in Option 2) to be used to distribute local government expenditures as follows: Defining a proportion of the local government expenditure (x%) which will be distributed based on extent to which an area causes the cost. Defining the proportion (y%) which will be distributed based on future flooding costs avoided. Defining the balance, the propn of costs based on local benefits of stormwater to the council (1-x-y)% (ie estimating the local (net) value associated with water reuse to each council, estimated aesthetic value, or tourism/recreation value)
Summary of arguments for this option	Because of the network issues in flood mitigation and the significance of stormwater costs, the interlinkage in terms of costs caused must be considered. The simplicity is justified in cases where a catchment comprises areas with similar levels of urbanisation, where urban infill pressures and development etc is likely to be similar across regions, and can be extended across all catchments in that the alternatives are too complex.	Based on the network issues, this option suggests that these factors must be recognised for efficient and equitable outcomes, particularly in the context of the large costs involved and simple models do not reflect all the inter-relationships. If existing infrastructure is old then the model framework can use an average cost sharing approach, but if relatively new incremental and brought forward replacement costs can be used. The distribution should either use directly produced estimates of water flows generated from each area with or without the project, or may apply proxies by using proportion of catchment area, with adjustments for: • Proportion of impervious area (using densities, land use). • Amount of stormwater that would be put into system pre development. • Investments already undertaken or planned in projects to limit water flows at peak times. • Other council policies for reducing flood risk	The implications here are as per Option 2 in terms of calculations for x% and y%, but adds the very difficult aspect of needing an assessment of social and environmental value produced. Every project would be different in this respect, and it would not lead itself to readily identifiable proxies that would need to be agreed.

Item	Option I	Option 2	Option 3
Implications	This option is similar to some current arrangements (eg Barker Inlet, South West drainage scheme). The share of catchment area is proxy for share of average cost contribution, while complexities of incremental costs etc are not sufficient to warrant the costs of a more complex model.	This model is similar to that proposed in models for Brown Hill and Keswick Creeks. However, it includes the future flood cost avoided aspect which has not been included in that discussion. There will need to be detailed assessment of what adjustments are appropriate as there will not be universal agreement as to the relative shares of cost that should be based on cause of cost versus benefits from project, nor on the proxies and adjustments required.	
Other issues	It is recommended that even a simple model should also take into account where the benefits of a project occur (ie avoidance of future costs through floods), as well as where the cost is caused. Therefore the distribution model should allocate x% of the costs on the basis of share of catchment and (1-x)% of costs on the basis of future costs avoided, and share each between the contributing councils on a differing basis in each case (eg like Gawler River model): • [Local government project costs] by x% by [Share of catchment area] • [Local government project costs] by (1-x)% by [Proportion of property value with increased flood risk without project]	Need to consider options where there is an up-stream investment: • Calculation undertaken of likely costs if the project was not undertaken, and downstream councils contribute on that basis. • A similar outcome would be produced if credit is given in required downstream investments for upstream projects (timing issue remains)	

1 Introduction

1.1 BACKGROUND

In 2003, the Local Government Association of South Australia prepared the 'Stormwater Management Strategy' dated 27 June 2003, and presented it to the State Government (Minister for Local Government).

The Strategy, targeted specifically at metropolitan Adelaide, was prepared to '*provide a constructive means to address the significant challenges and opportunities in relation to stormwater management in metropolitan Adelaide*'. Endorsed unanimously by all metropolitan council Mayors and Chief Executive Officers, the strategy proposed a partnership approach to stormwater management with equal responsibility for funding between councils and the State Government.

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This report presents the outcome of Part C: Apportionment of Council Costs.

The objective of Part C of the MASMS is to develop a modelling framework that can be used to agree the apportionment of local government costs committed to stormwater management between councils within a catchment.

The focus on a modelling framework needs to identify the principles relating to who bears the respective costs (the investment burden) and who receives the benefits.

In this context the important outcome is to have a cost sharing structure that will provide the correct signals, so that communities or councils will implement decisions regarding stormwater infrastructure that will maximise the whole community benefit.

To be workable and achieve its objective, a model must have a number of characteristics:

- the structure of a modelling framework needs to be understood and clear, and to be useful must be generally 'accepted';
- recognising that a model will incorporate a number of factors, the weightings in terms of importance placed on various parameters (costs and benefits) need to be logical;
- the parameters, or basis for the modelling, need to be measurable, and therefore there may be a need to use proxies in some cases.

This Report involves the following structure:

- It commences with a discussion as to why stormwater management is an issue for metropolitan Adelaide, and gives a background as to the existing context within South Australia, including a discussion of the legal framework that defines roles and responsibilities. It should be noted that there has been extensive discussion in recent times about the issues, as it is a very practical problem – which is in large part a reason for this study. There are substantially differing views held by stakeholders as to what the problem is (or even if there is a problem) and what is the best solution.
- This analysis then tries to look at the problem from the context of basic principles, but in doing so, it must be recognised that there are a number of complicating issues that make achieving an agreed outcome complex.
- There is a summary of current funding arrangements for various types of projects.
- The perspectives with respect to cost sharing provided by a number of reports are then presented.
- The possible options for modelling frameworks, and the implications thereof are provided.

This Report draws on the literature and theoretical principles that inform the choices that are to be made. This context has been discussed with all metropolitan councils within the study area, to further inform the analysis with respect to practical issues and ensure complete coverage of the problem involved.

Interviews were held with CEOs of metropolitan councils, mostly over the period 4 April to 20 April 2004. The interviews took the form of a qualitative discussion regarding conclusions (distributed beforehand) with respect to the issues discussed in a working paper which provided a preliminary assessment of the issues discussed in this report. In two cases, the interview was delegated at the council level to engineering staff. In many cases, the interview included engineering and/or financial staff as well as the CEO, while in three cases the CEO delegated the task to other council representatives.

The Report attempts to accurately represent all perspectives provided, and again it is noted that there are many.

1.2 A DESCRIPTION OF STORMWATER MANAGEMENT IN SOUTH AUSTRALIA

1.2.1 The nature of the problem

Stormwater management issues are primarily a consequence of (and therefore inextricably linked with) urban development patterns. In undeveloped or rural areas significant amounts of rainfall soak into the ground, and excess is distributed to larger water bodies through natural waterways established over long periods of time – which only occasionally are unable to cope with volumes, resulting in flooding.

However, with urban development, large components of the land areas are covered by impervious structures (buildings/roofs, roads, parking areas etc), increasing the flows that need to reach the larger water bodies, and the natural flows to the waterways are also disrupted. The response is to provide systems of drains that manage the flows to the water bodies. In managing this drainage system, there are three key inter-related issues.

Water quality

Urban stormwater incorporates significant pollutants resulting from the outcomes of urban lifestyles. Unlike sewage, stormwater is not formally treated before it enters our waterways. Stormwater pollutants originate from many different sources ranging from heavy metals and hydrocarbons from our roads, to litter dropped on our streets and sediment from building sites.

Improving stormwater quality requires effective prevention and management of these pollutants at their source, as well as treatment of stormwater before it enters the waterways. In some cases it is filtered by gross pollutant traps or wetlands, usually located at the end of the pipe system, but in most cases it flows directly from our streets and gutters into our creeks, rivers, bays and the ocean. Therefore, maintaining water quality is a challenge, and as the population grows and urban development continues, there is the direct link between the stormwater system and quality of watercourses and water bodies.

Flood risk due to changing catchment characteristics

In urban areas, the increase in the amount of impervious area has reduced the amount of rain that infiltrates the ground or is retained by vegetation. Consequently, increased quantities of stormwater run-off enter the drainage system and the receiving waterways. Urbanisation has also changed the timing for stormwater discharged into water environments.

Traditionally, stormwater drainage systems have been constructed to remove stormwater from urban areas as quickly as possible in order to minimise the risk of flooding and to prevent water from becoming stagnant. The increased volume

entering waterways causes scouring (in-stream erosion) of natural waterways and is also putting 'pressure' on existing systems in terms of the volume that can be managed. Increasing levels of development on the fringes impacts on the capacity of downstream systems, while urban infill puts increasing pressures on existing local systems as well as downstream systems.

It is noted that in a relative sense, metropolitan Adelaide does not deal with the same volumes of stormwater as some urban areas (e.g. Brisbane), but is built on a floodplain, taking water from the surrounding hills. In some areas, urban development is situated on areas which would have been at risk of flooding even without development, a risk that is intensified by urban development.

Maintenance and replacement programs for existing infrastructure

Stormwater infrastructure generally has a long life (50+ years), and as such replacement programs will occur infrequently, but will be required even where there is no requirement for augmentation. Accounting and financing systems for infrastructure (generally) have not well recognized this issue in the past and therefore funds have generally not been built up.

As such, funding is not readily available, particularly given the emphasis on low public debt that currently exists. However, the replaced infrastructure will provide services to a 'new' generation of users for an extended period, so there are time related issues in terms of how new or replacement infrastructure is paid for.

It is also noted that in some cases, the infrastructure represents natural watercourses. In the case of these drainage systems, increased flows may not only increase the risk of flooding, but substantially increase the cost of management of the watercourse (increased erosion).

While throughout this Report the emphasis in the discussion is with respect to investment costs in upgrades of new systems, the principles equally apply to issues of on-going maintenance and replacement of existing systems.

1.2.2 Legislative framework

The responsibility for urban infrastructure provision has traditionally rested with government, and this remains largely so. In the case of stormwater, the responsibility has primarily been with local government. The background is perhaps best summarized by Read, et al. (2000), in a Report entitled *Stormwater Planning* where they note:

> The management of stormwater in the urban has been the responsibility of local government from the founding of the State. In the main local government has shouldered that responsibility well. Almost without exception catchment boundaries do not follow council boundaries and with or without the support of the state government Drainage Authorities have been formed to join councils together to solve drainage issues in major catchments.

> While there are outstanding examples of the success of both local government individually and collectively as a participant in a Drainage Authority in solving stormwater management issues recent years have seen a paradigm shift in stormwater management. This shift is both legislatively and community driven.

From a Legislative view, the key documents/Acts include:

- Metropolitan Drainage Act
- Water Resources Act
- Development Act
- Environment Protection Act
- Local Government Act.

Each of these has requirements as to how stormwater is to be managed, and while these are the key documents, there are a range of other Acts that determine roles and responsibilities in specific areas. These include as an example the South Western Suburbs Drainage Act 1959 (which specifies the contributions of the south western suburbs to the Patawalonga and River Sturt developments of the time).

There has been an increasing emphasis in more recent legislation and framework that tends to see stormwater as a potential resource, rather than simply a cost—and this is likely to continue. Given the situation of the state in terms of water resources, the real value of water is expected to increase and there is an increased focus on water quality and water access (e.g. in water use). On the other hand, there is increasing pressure in the current debate relating to the impact of levies (water catchment levy) and developer contributions in respect to housing affordability, with the development industry arguing that the shift to user charges is harming affordability.

While the role of local government in stormwater management is maintained, the role of Catchment Water Management Boards—to capture the cross local government boundary interactions has become more formalized over time.

The issues have been summarized as follows (extracted from *Summary Paper: Flood and Floodplain Management Responsibilities*, October 2003):

> The provisions of the Local Government Act 1999 (LGA) and Water Resources Act 1997 (WRA) apply independently and cumulatively. Effectively, this means that the potential exists for both councils and catchment water management boards to perform and exercise concurrent statutory functions and powers in respect of the structural flood mitigation component of floodplain management. In the case of conflict between a council and a board in the exercise of the same functions or powers in relation to the same watercourse or infrastructure, the WRA provides that the board may perform its functions or exercise its powers to the exclusion of the council.
>
> The functions of a council also include taking appropriate measures to protect its area from flooding. A council has the power to do anything necessary, expedient or incidental to the performance or discharge of its functions (s 36(1)(c)). Those general functions and powers would clearly include the provision of infrastructure to manage surface water in its area. They would extend also to taking specific measures against

flooding, such as the design, construction, operation and maintenance of structural flood mitigation works.

The LGA and regulations contemplate that councils will take action to protect their area from (or, reduce the risk of) flooding as demonstrated by s.191 of the Act and r 15(c) of the Local Government (General) Regulations 1999. Councils generally require ministerial approval before they can acquire land compulsorily under the Land Acquisition Act 1969. However s.191 provides that such approval is not required if the land is acquired for a purpose that is classified by regulation as an 'approved purpose', which includes 'carrying out work for the prevention or mitigation of floods'.

Given that the catchment area of a board may include several councils, they are ideally placed to provide a strategic and coordinated approach to floodplain management. Whilst a council's concern will be focussed on the narrower subject of localised flood management, the boards are ideally placed to take a catchment wide perspective. This ability is bolstered by the boards' power (through their catchment water management plans) to identify changes that should be made to the way in which councils within the catchment area perform their functions or exercise their powers.

This would extend to identifying the changes (if any) that are necessary or desirable to any activity of a council (or regional authority) in relation to drainage and flood mitigation. By s.86(3) of the WRA, councils must have regard to the plan and consider whether they should implement changes identified therein.

1.2.3 Expenditure on stormwater management

The necessary expenditure on stormwater management is funded from a range of sources, with the primary options being:

- contributions through developers to stormwater works relating to the development (variable);
- State Government expenditure on major projects (variable);
- State Government contributions to projects undertaken by local government through the Catchment Management Subsidy Scheme (current budget of $4 million per year);
- local government expenditure to match the above expenditure;
- local government expenditure on local works;
- expenditure at the local property level.

It is difficult to put a value on aggregate expenditures, but the public expenditure is estimated to be in the order of $10 million per year.

What is clear, and of significant concern, is that this level of expenditure is insufficient. The City of Charles Sturt, in its budget statement outlines the reasons for this:

> The demand on council resources to fund the renewal of infrastructure will escalate over the next 10 – 15 years. This is essentially for three reasons:

- a large proportion of the stormwater infrastructure is either in relatively poor condition or is inadequate and will require significant additional funding
- much of the infrastructure in West Lakes will come to the end of its working life in this period
- the expected population growth and consequent urban regeneration throughout Adelaide's north western suburbs will compound the pressures on the capacity of the existing infrastructure.

City of Charles Sturt Corporate Business Plan & Budget 2003/04.

The councils of Unley and West Torrens particularly are concerned with a problem beyond the replacement issue – looking at the need to upgrade the infrastructure in their areas to manage increasing flows, a study undertaken for the Brown Hill and Keswick Creeks suggests that the required cost to effectively manage flood risk in the catchment is an upgrade expenditure of the order of between $70 million and $150 million.

1.3 WATER CATCHMENT AREAS

As discussed above, there is a clear recognition in historical relationships that stormwater impacts cross local government boundaries. This has been formalized in the creation of Catchment Water Management Boards, focussed on catchment areas. Maps of the catchment areas and council boundaries are provided within the Part A report. In some cases, individual councils fall wholly within a single catchment area. However, because catchment areas and other areas of community interest do not overlap, some councils can be split across multiple boards.

Metropolitan Adelaide is constructed of four separate catchment areas[1], which include:

- Northern Adelaide and Barossa—includes the metropolitan councils of Gawler, Playford and Salisbury, and the Adelaide Hills, and also including rural councils of Light, Barossa and Mallala
- Torrens Valley—Tea Tree Gully, Campbelltown, Norwood, Payneham and St Peters, Adelaide, Walkerville, Prospect, Charles Sturt, Port Adelaide Enfield
- Patawalonga—Burnside, Mitcham, Marion, Unley, West Torrens
- Onkaparinga—Onkaparinga, Mitcham and Adelaide Hills

[1] These catchment areas represent areas with a hydrological connection in that water from the areas enters common water-courses.

The four Catchment Water Management Boards are soon to be amalgamated into one Natural Resource Management Board under new legislation being passed through State Parliament.

2 Identifying benefits and costs in stormwater management

Issues of cost apportionment, and who should pay (and how) need to be framed in the context of economic arguments as to efficiency and equity. In order to consider the issue of who bears the burden, the key question that must be answered is: 'who causes the costs associated with stormwater management and who benefits from stormwater management programs.'

2.1 STORMWATER AS A NETWORK PROBLEM

The key issue of stormwater management is that who creates the cost and who bears the cost of managing stormwater are not always the same group. The creation of the costs is through urbanisation, and an area will generate stormwater run-off which will then flow through other areas, increasing the risk of flood.

The literature and discussion is all based on the perspective that managing stormwater is a cost to the community. In this context, the discussion around the stormwater management problem is in the context of a typical network issue that is often found in infrastructure. However it works in reverse to many infrastructure programs. For example in electricity provision, the product is distributed from a central point to increasingly spread points (from the trunk drain to the branches). Therefore the costing process requires working out the attributable cost of the trunk drain to the individual branch, and user.

In the case of stormwater the product is generated at the 'ends' of the network, and combines together with other product collectively down to the trunk drains. That is 'demand' for stormwater management at Point A combines with 'demand' at another point. There is a clear recognition in all the literature that this conjoint aspect of the problem needs to be recognized for effective delivery of the service.

Consistent with this view, Heaney, Sample and Wright (2002) make the following points with respect to the allocation of benefit:

- The benefits of urban stormwater systems need to be quantified. Flood damages are relatively easy to estimate. However, stormwater quality control benefits are more elusive.
- The overall system evaluation should include structural and non-structural best management practices, as well as conventional stormwater drainage systems.

- The incidence of benefits and costs of alternative drainage systems needs to be quantified. Residents who control their problems on site should receive fair credit for reducing system cost.
- Downstream receiving water impacts should be included in the evaluations.

Another perspective, consistent with this and therefore of benefit, is expressed in the following way:

> The key to determining just who benefits form a community's stormwater management is the concept of 'burden'. Virtually all property has the potential for generating stormwater runoff. Because almost all property generates stormwater runoff, the accumulated or aggregate runoff from all parcels must be managed in an organized and systematic manner if owners are to enjoy the use of their property with some degree of reliability. ... The amount of runoff generated by a parcel and sent to a stormwater system represents its proportionate share of the burden.
>
> *Stormwater Management, Practices and Expenditures Survey (1998)*

2.2 DETAILING THE NETWORK RELATIONSHIPS

To understand the issues and the cause of the debate relating to cost sharing, it is necessary to understand the nature of relationships.

Figure 2.1 is used to attempt to explain the nature of the relationship, though recognising it is in a simplistic way – so as to help understand the issues. It diagrammatically represents a stormwater system, which services existing urban Areas A, B, C and D. These individual areas have a system of local drainage (through local pipes and in the case of heavier flows, through road ways). Water from these communities runs into sub-trunk drains, marked *s*, and then into a main trunk drain which takes stormwater flows out to sea.

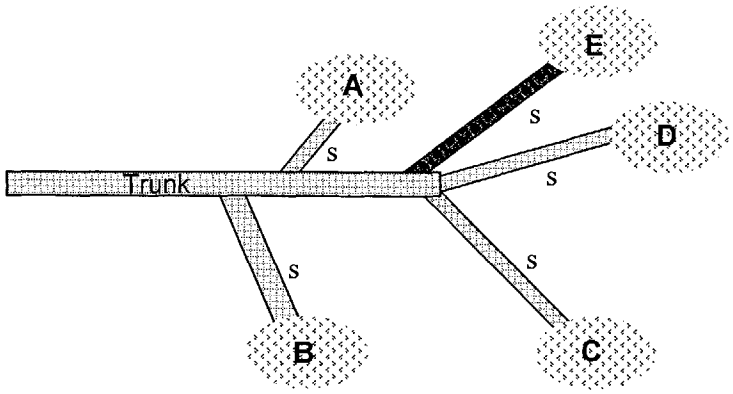

Figure 2.1
Typical stormwater network system

In theory, the size of the sub-trunk drainage system will have been worked out based on predicted densities of development in the various communities, to carry flows such that the infrastructure provides a predetermined standard of flood protection.

In economic terms, it is efficient if each of the Areas A–D should pay the costs of their own sub-trunk drain (i.e. the local area costs), and the areas share the cost of the trunk based on their proportionate share of the burden.

As per the perspectives above, the proportionate share of the burden will be dependent on the water flows (taking into consideration the timing of when those flows enter the system) being put into the trunk drain. This proportionate share of costs can be considered as a payment of each area serviced by the trunk drain.

Later in time, suppose there is the development of an unexpected Area E that is urbanized, a new area. It is clear that the residents or land users of Urban E should be responsible for the costs of the sub-trunk(s). As a consequence, the stormwater flows in the trunk drainage system are increased, putting pressure on the system, such that the trunk drain needs to be upgraded (again worked out using predetermined standards).

Using marginal or incremental principles, if this was the whole case, the cost sharing story would be quite simple in that the residents of the new urban Area E should pay the costs of the upgrade.

It is also noted that if there was not any further pressure produced on the trunk drain (maybe it had been over engineered in the first instance), the community of Area E would not on efficiency grounds need to pay any costs towards the trunk drain, even though it uses the service as the marginal cost of the use of the service is zero. However, on equity grounds this may be a more desirable practice, in that it represents a payment for use.

In general however, the answers are not that simple, with the following major complications likely:

- Unless there is a collective response of some kind, there is a lack of immediate incentive for Area E to make decisions that will maximise the outcomes from a whole of community perspective – therefore there needs to be some 'imposed' requirement to recognise the linkages – this might include a property rights-type solution or a legislated system (i.e. without such a requirement Area E would have an incentive to deny its responsibility and make decisions without regard to implications for the impacts on the trunk drain).

- The upgrade brings forward major maintenance (or replacement) on the existing trunk drain, saving future costs to the residents of areas A–D[2].
- In practice it is unlikely that Area E is not the only change that is putting pressure on the trunk drain. The trunk drain may have been designed for a density that has since been exceeded in all or any of Areas A–D (i.e. through urban infill, or through an expansion of size of the areas), or indeed because the trunk drain size was based on expected values, it could possibly have been under-designed in the first instance (e.g. water flows exceeded the predictions).

On the basis of these factors, the communities of Areas A–D should also contribute to the upgrade – based in the first instance on the benefits of avoided later costs, and in the second that these areas are likely to contribute to the problem itself. If these factors are significant enough (e.g. if the existing infrastructure is old and will require upgrade within a relatively small time, or if growth of flows being generated out of Areas A–D are similar in order of magnitude to the new development or area of E) then the argument would be that an average cost basis could be used to simplify the cost sharing process.

However, even this is not the complete story in an efficiency sense. The additional issue is that Areas A and B are the areas that bear the highest risk of flood as they are downstream. This is particularly the case in Adelaide, where Areas A and B are built on a flood-plain, while the other areas will be (to different degrees) up-hill. Therefore the expected costs of flooding are borne in different degrees than those who cause the cost. Further, Areas A and B might not always have taken wise decisions in the past, and may have approved developments in sections close to the watercourse, enhancing the risk involved.

All of this makes stormwater somewhat different than other products and indeed networks. If we take electricity as an example, the consumer who causes the cost also receives the benefit – i.e. gets access to electricity, and the issues are about incremental cost sharing, as described above. Roads are similar, when a road is upgraded or increased in size; it is the users of the road who receive the benefit (in a collective sense).

If the communities at A and B were limited in where they could build, then the cost of potential flood risk would be minimised. But communities A and B receive benefits from being able to build in that area – the residents and land users receive benefits from being closer to the beach, or the CBD, or other facilities. That people build in

[2] Suppose that the cost of the upgrade of the trunk drain to be shared by the communities is $5 million. But undertaking that upgrade will effectively bring forward the costs of the replacement that would have to be undertaken in 20 years time – which would cost $4.5 million in today's dollars. The value of bringing forward that investment would have a present value of $1.2 million (7% discount rate).

the area suggests that the benefits of building in a flood risk area are greater than the expected cost of the flood risk present, and an increase in flood risk will reduce that net-benefit. This suggests under both efficiency and equity guidelines that communities A and B should contribute on this basis, not just on the basis of their contribution to the volume of water generated by these communities.

It should further be noted that a project undertaken in for example community C may reduce the (immediate and future) pressure on the trunk drainage network (e.g. stormwater detention basin), and there would be similar arguments with respect to funding being allocated from the other communities, because they share in the benefits of this work.

2.3 NORMAL AND ABNORMAL STORMWATER FLOWS

To further understand the issues, it is necessary to make a distinction between what constitutes usual (frequent) and unusual (infrequent) stormwater flows. Usual flows are 'normal' levels within the context of the existing system, while unusual flows are above normal levels of water flow in a given time frame (i.e. an excessive rainfall situation).

The major issues with respect to normal flows are the size of the trunk drainage system to carry these regular flows[3], and thereafter the key issues of water quality/pollution and possibilities of stormwater harvesting and use. Therefore a new urban development will create normal flow levels that may put pressure on existing infrastructure downstream, increasing the risk of flood, and therefore requiring 'improvement' in the downstream systems.

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[3] The question that arises is at what level does a flow of water move from being 'normal' to 'abnormal'. Flood risk is something that can never be fully removed. In theory, the investment in a stormwater management system will be where the marginal benefit equals the marginal cost of the last dollar spent (or alternatively to measure the net present value of the investment).

That principle will decide what size the investment in the stormwater system should be. There does not seem to be any evidence that detailed cost benefit studies have been undertaken with respect to this issue, and instead it is handled at the local level by minimum standard design principles (i.e. pipes designed to move water away up to a 1 in 5 year level of rainfall, roads designed to move from that point to 1 in 50 or 100 year level of rainfall – where road travel would be inconvenienced, but water would be kept out of properties).

It is noted that there are considerably varying views between councils as to what is a reasonable level of risk that should be accommodated – with some officers suggesting that it was unrealistic to invest for 1 in 100 year event flows, that flood was inevitable in this context; while others suggested that this level of risk should be managed. Again, deciding this should actually be dependent on a benefit cost calculation, and this will be different for each area.

Similarly, urban infill may provide similar pressures in both the local infrastructure and downstream. However, given that trunk drains are often built to handle less frequent event (abnormal) flows to some degree (e.g. 1 in 10 year or 1 in 20 year rainfall events), 'scattered' infill development may not impact as significantly in this context.

Stormwater harvesting and use (refer Study Part B Report) projects will also be 'dependent' upon accommodating the frequent event (normal) flows, in that making reasonable use of water means having it generally available.

The major issue for abnormal flows is flood mitigation. Therefore, there can be issues at both the local level (in that a project may be instigated to reduce the risk of local flooding – often and traditionally such projects will emphasize the need to move water away from an area as quickly as possible) and also at the broader level (in that it will have differential impacts downstream putting pressure on the size of the trunk drain required to carry the abnormal flow – particularly in the context that an abnormal rainfall is likely to occur simultaneously across a wider area).

This is of course something of an oversimplification and there is overlap in these issues, in that a flood mitigation project can retain and detain water, therefore achieving environmental benefits, while primarily designed to restrict flow.

A review of the roles and responsibilities of the various agencies, along with consideration of the nature of the burden, suggest that water quality and stormwater harvesting and use outcomes could be considered to have more of a 'regional' perspective, where benefits are more broadly spread. These benefits can include groundwater quality across a large area, quality of stormwater discharge into larger water bodies (Patawalonga, sea) and impact on the sea-side councils (but affecting the broader metropolitan use as a recreational facility for metropolitan Adelaide more generally).

In addition, there is an emphasis at the catchment level and State level agencies on water quality, harvesting and use, amenity, and achievement of other environmental outcomes. Therefore, State initiatives and the role of the Catchment Water Management Boards emphasize this.

However, for individual councils or communities there is also some localised benefit arising from improved water quality, stormwater harvesting and enhanced environmental outcomes. For example, a project with stormwater harvesting outcomes may enhance economic development prospects in a region being of direct benefit to the council through increased rates and reduced water supply costs. Therefore, in these types of situations (i.e. projects with environmental outcomes) there needs to be some recognition of the specific benefits of the project to inform cost apportionment (between tiers of government, and within the local government tier). Many of these projects are 'major' investments and are often subject to separate evaluation.

Stormwater infrastructure has a long economic life, which means that planning must be on an extended time basis, and a key funding/cost issue is the intergenerational question. However, this is a factor in the choice of the tiers of government between funding projects through debt capacity as opposed to out of existing revenue, and in this context is not a question of cost apportionment. The implication is that the factors that might determine an individual council's contribution must be considered in a long term time-frame, and urban development 'projections' must be considered (as opposed to existing circumstances).

The major emphasis of local government in stormwater management historically has been in the area of flood mitigation, which is understandable because this is where specific projects have a local impact.

The focus can be considered as having three local impacts:

- at the individual property level (planning requirements, responsibility of property owner) – where planning requires stormwater to be disposed of correctly so as not to increase the risk of flooding of an adjoining property
- a collective of properties, involving either developer or council investment – where stormwater facilities need to be provided to move the water out of this broader area
- where a stormwater project in a council puts pressure on facilities further downstream within the council itself.

However, as is noted above there are also potential impacts on 'down-stream' councils, where trunk drains with insufficient capacity will result in flooding in other areas, or prevention thereof requires significant investment

The Catchment Water Management Boards and the development of Catchment Water Management and Urban Stormwater Master Plans are recognition that decisions taken in one council can impact on those in another council in both flood risk and in water quality outcomes. Therefore there is general agreement that stormwater issues should be considered within a catchment context, and costs should be distributed in this context.

2.4 OTHER FACTORS OF INFLUENCE

2.4.1 Stormwater as a resource

One aspect of the debate is that increasingly, stormwater is seen as an under-utilised resource. Therefore, models and approaches adopted should take this into account. This would imply that where a localised area benefits from stormwater harvesting those benefits should be recognised in the cost apportionment framework.

This issue becomes increasingly complicated when one considers the issue of the value of water – should it be priced at current prices for potable supply or at some

other value (e.g. including a social value with respect to probability of water shortage or impacts on overall water availability).

WaterProofing Adelaide notes that stormwater use (through some specific capture schemes) is increasing, but points out that the major challenge of stormwater harvesting involves its cost effective storage for winter flows, to be used when they are needed, i.e. primarily in summer. The potential for issues surrounding stormwater harvesting and use are addressed in Part B of this study.

2.4.2 The hidden nature of the problem

Another key feature of the stormwater issue is that the flood risk problem (and generally the infrastructure supporting it) is out of sight until it actually occurs. Therefore it was suggested during stakeholder interviews that there would be a tendency for underinvestment, as more obvious issues took priority unless there was a directive to control the issue.

2.5 LEGISLATIVE RESPONSIBILITY AND POLICY DIRECTION

As noted above, the roles and responsibilities of the tiers of government for managing stormwater are influenced by a number of pieces of legislation (as in the discussion above, such as the Metropolitan Drainage Act and the Water Resources Act), but the management arrangements are currently under review in the context of the new Natural Resource Management Board arrangements.

As well as the legislation itself, there are a number of other reports and practice setting information sources that impact upon accepted roles and responsibilities. Again, one such document is *WaterProofing Adelaide*, which establishes a range of options for thinking of water as a resource, and acknowledging the need to enhance alternative supply option and enhance efficiencies.

The Gawler River report notes that:

> It should also be noted that the Board has recently circulated a Report entitled 'Roles and Responsibilities for Floodplain Management' outlining a suggested breakdown of the respective responsibilities of councils, the Board and other agencies. The Report confirms the role of the Board as 'lead agency' in relation to planning, coordination and attracting funding while it is proposed that local government be a 'lead agency' for floodplain management measures.

2.6 FACTORS AFFECTING FLOOD RISK

In order to assess the concept of burden, of key importance is to understand what factors influence the magnitude of stormwater flow, and therefore increase the risk of flooding for a given investment in infrastructure. These factors then will significantly influence the apportionment of costs between councils for stormwater flood mitigation works.

These factors can be summarized as:

- the extent of new urban development in an area (which leads to the issue of urban development), and type of development (e.g. industrial and commercial more land coverage) – local government benefits through increased rate revenue for more properties, and is responsible for local flood prevention;
- the extent of new urban development in 'upstream' areas – the upstream council benefits, but the downstream council incurs some costs due to increased flood risk caused by the upstream council;
- the extent of urban infill occurring in an existing area;
- the extent of urban infill occurring in an existing area upstream;
- the influences from the above are density and land-use within an area, and also in upstream areas;
- the nature of a stormwater project in a given area (i.e. a project designed to increase flows out of an area, or to decrease flows via detention).
- The way in which a specific property or group of properties influences others is either:
- hydrologic connection;
- comprehensive management area connection for a broader hydrologically defined area (catchment).

These connections will also need to be considered in distributing costs.

2.7 ALTERNATIVE ENGINEERING AND MANAGEMENT APPROACHES

In the past, the focus on stormwater management has been to reduce flood risk by adopting engineering solutions that are generally designed to move water out of the area as quickly as possible. Engineering solutions have become more sophisticated or more innovative, at least in part because it has become recognised that alternative solutions, such as systems designed to detain water in areas and release more slowly (and importantly in a delayed context) bring with them other cross benefits (water quality improvement, options for harvesting and use through aquifer recharge from a holding basin, amenity or tourist outcomes).

Looking at alternative solutions can also produce a lower cost solution than traditional methods might. Conversely however, the cost might also be higher to accommodate these 'other' initiatives. This issue of alternative engineering solutions also provides some complexities with respect to cost sharing options, in that not all council areas have the land resources to accommodate such schemes. Indeed many of the inner suburban councils are limited in this respect, with the Adelaide Parklands providing the only significant resource in this regard. However, it is very much on the agenda, with many councils actively pursuing such schemes.

Further, there has been an additional policy response to put more of the cost on individual households by increasing the extent of responsibility placed on individual property owner to limit flows leaving their site (e.g. development approval requiring construction of retention tanks, so that water flows will not be increased, or in some cases significantly decreased, rainwater tank requirements, being mandated for new homes from 2006). It is noted that these requirements will reduce minor event flood risk in general, but are unlikely to have any significant impact in major (infrequent) rainfall events (refer Study Part A Report).

It is noted that such policies will only have a slow impact over time, as it is only affecting a small proportion of the total number of properties.

It should also be noted that in this context, not all councils agreed that increased urban infill or significant urban developments lead to increased flows – with some noting that there had been a noticeable increase in dwellings in their area apparently without subsequent impact on the stormwater network. Others suggested there were significant impacts from flows being generated as a result of increased levels of development.

3 Current funding arrangements

Stormwater projects are currently funded in a number of different ways, based on the nature of the project. The funding options can be generally summarized as:

- Stormwater works in large new urban developments are funded by negotiation (developer, State and local government contributions). The infrastructure expenditure requirement in this context is estimated at $33 million4. This recognises that developer and local government achieve private benefits (profits, increased rates). Benefits of such large projects are also shared across areas. In many land divisions, the provisions of the Development regulations require onsite drainage works to be funded by the developer. Other situations where offsite drainage works are required as a result of a development may involve a varied approach. Some upgrades are brought forward by councils, sometimes with contributions by developers towards such upgrades. In that situation, the funding approach is more often by negotiation between the parties. Therefore, while the direct issue is for the local government body where the project occurs, it should be noted that there is a wider catchment impact, and the extent of contributions from outside the direct area has been determined on a case-by-case basis. The extent of developer contribution is currently under significant debate with respect to the impact on housing affordability.
- Significant projects not directly within major developments (i.e. infrastructure works – such as trunk drain expansion) are also funded by specific funding arrangements, including all levels of government. There are some examples as to how cost apportionment has been organized in this context:
  - Barker Inlet – takes stormwater from Prospect and Port Adelaide Enfield council areas, and costs have been funded by Port Adelaide Enfield Council, with Prospect Council repaying based on the share of the catchment.
  - Brown Hill and Keswick Creeks – The Brown Hill and Keswick Creek system are major watercourses in the catchment area of the Patawalonga, and impact on the councils of Mitcham, Unley and West Torrens. Cost apportionment models

[4] Reference the *Report of the Catchment Management Subsidy Scheme Review* – June 2002

proposed in this case, and the issues involved are discussed in detail later in this report.

- Gawler River – again there is some more detailed discussion about the cost apportionment model used in this case, where the planned cost sharing is equal between Commonwealth, State and Local Government. The contributions from the councils included are 30% Playford, 25% Mallala, 15% Gawler, and the other 30 % from other councils including Adelaide Hills, Barossa and Light.

- Significant projects (outside of the above – defined under the 40 hectare rule) are funded jointly by the State Government and council(s) in which the expenditure will occur under the auspices of the Catchment Management Subsidy Scheme (CMSS). There is an estimated required funding of some $160 million of work under current funding amounts (refer Study Part A Report). As detailed benefit cost analyses are not conducted, the cross catchment implications are not necessarily mapped, and generally not funded. In many cases, individual councils have funded the whole development despite interactions. In others, cost sharing principles have been applied.

- Other projects are funded by local government, as is maintenance for all of the above projects. Even smaller projects may have (in combination) implications across the catchment area.

Note that local government also collects the Water Catchment Levy on behalf of State Government, which is used to fund major projects. This is a financing issue, rather than a cost apportionment issue – but leads to considerable dissension with respect to whether a council is paying relative to its burden. However, this issue is largely outside the scope of this project.

The role of the Water Catchment Levy is in the context of the provisions of sections 135 to 139 of the Water Resources Act (1997). Importantly, the Catchment Water Management Boards (CWMB) have the power to nominate in catchment plans the contributions towards the total funding of the works, activities, programs, etc by the relevant constituent councils. The councils are then empowered to raise a levy to reimburse themselves for the amount provided to the CWMB. Strictly speaking, the levy is not directly related to any particular work or activity undertaken by the CWMB and is not limited to stormwater management. Instead, it relates to the funding of the entire operations of the CWMB (or a proportion of those entire operations).

4 Options for cost apportionment

4.1 GENERAL PRINCIPLES

The literature tends to suggest that given the nature of stormwater management benefits, a large part of the costs will always need to be covered by a collective payment on behalf of a community. Access Economics (2003) argue the case generally as follows:

> The report proposes a charging regime which focuses on the 'beneficiary pays principle' – that is, the principle that individuals should only finance infrastructure in proportion to the benefits they receive.
>
> A direct charging approach (such as levying of developer contributions) is appropriate where the vast majority of benefits are captured by the user as private benefits, or the benefits are largely confined within a new development (while any broader social benefit is small). This would include many capital works within a subdivision (new development) including reticulation of economic infrastructure services, connection of individual homes, internal roads, drainage and other facilities for use primarily by the residents of the new development.
>
> However, most urban infrastructure facilities provide benefits to existing residents, as well as those in the new development. In these cases, the selected charging mechanism should target all the beneficiaries. Where a subsidy is applied to the activity to account for social benefits, this should be funded by the whole of the relevant community through appropriate general taxation.
>
> *Financing Infrastructure for Residential Development, Access Economics for the HIA (2003)*

The basic issues – in terms of first principles should consider:

- Efficiency—the principle of efficiency says that pricing/charging mechanisms should be such that efficient outcomes should be generated. This should (as per the above discussion) take into account who generates the costs and who receives the benefits. Unless both factors are considered, inefficient outcomes may be applied.
- Equity—this principle suggests that two households who have the same parameters regarding contribution to costs and participation in benefits should pay the same amount.
- Integration Equity—each generation should pay an equitable share over the life of the asset.

- Capacity to Pay—this is really an alternative perspective of equity – where equity is based on a social justice context rather than the receipt of benefits or creation of costs.

In addition, a further principle that needs to be invoked is one of **simplicity**, where the attempt to achieve any or all of the above outcomes is not so complex that it either creates significant administration costs (development of data bases for models, updating costs, negotiation costs), etc. or becomes out-dated quickly (therefore leading to distorted decisions).

In this context, the argument supports current arrangements for funding, in that there are three levels of contribution:

- a private payment made on behalf of individual households, or a collective (through a developer);
- a public payment made on behalf of the broad level community (State and to a lesser extent, Commonwealth contributions);
- a public collective payment on behalf of the community.

The issue of 'how much should each of these levels of payment be' is beyond the brief of this Study, but the issue of 'on what basis these payments are made' is important.

4.2 CONCLUSIONS FROM OTHER STUDIES

There are a number of examples of recent studies and reviews where cost apportionment issues are considered[5].

4.2.1 Gawler River Flood Mitigation Scheme

Northern Adelaide & Barossa Catchment Water Management Board report into the Gawler River Flood Mitigation Scheme notes that:

> The cost sharing consultants to the Board investigated four possible alternatives.
>
> - Future costs avoided. i.e. the greatest beneficiaries should bear the greatest cost. This results in the lower councils bearing most of the cost.
> - Gross catchment areas. Opposite effect to the above and just as inequitable given the rural nature of most of the catchment.
> - Watercourse length in each council area. Under this approach the bias can swing from the upper to the lower councils and vice a versa depending on the extent of

[5] A review of international and interstate issues provided little direct evidence of solutions for this study. Essentially there are too many differences between areas – in terms of roles and responsibilities (in some states, local government has less responsibility for stormwater management), in terms of the size of local authorities (from the extreme of Brisbane with a whole of metropolitan Council to the smaller inner metropolitan councils in Adelaide), and in the nature of flood risk (the extent to which a metropolitan area is built on flood-plain to the likelihood of rain).

watercourse(s) measured. In this case the only watercourse measured was that part named the Gawler River, with a consequent bias towards the lower councils.

- Capacity to pay. A more subjective measure that is independent of the location in the catchment.

The report notes that there was a number of councils, particularly upstream, who were resistant to the idea of jointly contributing to the cost of the project. This reluctance toward contribution was summarised as follows.

> Reasons cited for the reticence of upstream councils to make financial contributions to meeting any residual 'local government' contribution (i.e. any shortfall required after external contributions are finalised) include the following:
>
> - upstream councils (especially Barossa) have undertaken significant past flood mitigation works in their own areas at their own cost;
> - there are competing infrastructure expenditure projects of higher local priority;
> - there is a strongly held view that additional contributions to the floodplain management project would be 'double dipping' on existing rate payer contributions through the Catchment Management levy.

This funding is coordinated through the establishment of an Authority to manage the investment.

As noted in the previous section, the council contributions included 30% from Playford, 25% Mallala, 15% Gawler, and the other 30 % from other councils including Adelaide Hills, Barossa and Light. It is noted that Playford Council and Mallala actually put little stormwater into the River, with most generated up-stream. The contributions from Playford and Mallala can then be considered as based on the following factors:

- future costs avoided – the Playford and Mallala areas represent the flood risk areas (being on the floodplain) and as such their residents will bear the cost in case of flood;
- capacity to pay – in the case of Playford, its additional size and increased urbanisation increase its scope for contributing to the costs.

The report notes the subjective nature of the recommendations, as follows:

> The percentages arrived at are subjective applications of the factors outlined in Section 5 of this Report, together with weightings. For example, a significant subjective weighting has been applied to the 'future costs avoided' factor, with the two downstream councils providing 55% of the contribution.

The more specific arguments provided in the Discussion Report to justify the recommendations are shown in Table 4.1

Table 4.1 Gawler River Flood Mitigation Scheme – Cost Apportionment

Council		$2m/15 yr per annum	$3m/15 yr per annum	Consultant's Rationale
Playford	30%	$72,000	$107,000	• Major beneficiary – future costs avoided • 37% of watercourse length • Intensive high value land use adjacent • Capacity to pay
Mallala	25%	$60,000	$89,375	• Major beneficiary – future costs avoided • 27% of watercourse length • Relatively lower capacity to pay
Gawler	15%	$36,000	$53,625	• Moderate beneficiary – future costs avoided • 16% of watercourse length
Barossa	15%	$36,000	$53,625	• 63% of catchment • No significant local benefits • Recognition of past mitigation works
Kapunda & Light	10%	$24,000	$35,750	• 25% of catchment • 20% of watercourse length • No significant local benefits • Relatively lower capacity to pay
Adelaide Hills	5%	$12,000	$17,875	• 7% of catchment • No significant local benefits
TOTAL	100%	$240,000	$357,500	

As a final comment on this recommendation, it is noted that the model presented primarily is argued on the basis of the flood mitigation as the prime issue (consistent with the arguments above that flood mitigation is the major basis for council spend). This analysis is based on cost sharing that recognises who receives the benefit of a project, as well as who creates the cost.

4.2.2 The Brown Hill and Keswick Creeks Flood Management Group

The most detailed report locally into this issue over recent times has been *Cost Sharing Principles for Flood Mitigation Works*, the Brown Hill and Keswick Creeks Flood Management Group, November 2002. Therefore, a summary of the major findings/conclusions of that report is presented below.

> Given the situation of the Brown Hill and Keswick Creeks system of largely undeveloped hills catchments draining into and being added to by a developed urban area, and with the flooding problems being located in that urban area, it is considered that the cost sharing approach should:
>
> - discount any undeveloped areas (i.e. should not be based on gross catchment area, includes undeveloped Hills Face Zone and native park land areas);

- be only based on the effects of urbanisation (development) and its contribution to the problem (i.e. should be based on reliable hydrological parameters that takes this into account);
- considers only those flood mitigation works that reduce downstream peak flows, at the design downstream design average recurrence interval (ARI), but not otherwise;
- be able to be varied across the catchment depending on the location of the proposed works;
- adopt a different approach for those works that only benefit the location of the works (e.g. levees, channel works) to those works that have a benefit further downstream (e.g. flood control dams);
- apply to main channel or watercourse upgrades but not to subsidiary drains or local drains or side entry pits.

More specifically, the report identified two major situations:

A cost sharing approach for where the benefits of the works are at that location only

Cost sharing for any flood mitigation work, where the benefits are at that location only, is most easily based on the contributing impervious area from each council within the catchment that is directly connected to the drainage system. This allows the cost sharing to be based on measurable or estimable data and allows the cost sharing percentage to vary for different works located at various points within the catchment.

Then the following issues, re-adjustments or details of calculation were presented as being necessary:

- Recognition of the catchment areas in original (pre-European) or basically undeveloped condition. Therefore rural or native vegetation areas in the catchment with a typical run-off coefficient of 0.05 will be acknowledged in the approach to have a very low or zero cost share contribution.
- Why consider directly connected impervious areas? For frequently occurring rainfall events the resulting peak flows will generally be proportional to this impervious area. While it is recognised that for rarer events runoff will occur from other contributing areas that then blurs this simple relationship, any alternative method that seeks to take into account contribution differences with event magnitude would have to be based on hydrological modelling. This in turn introduces an element of subjectivity to the cost sharing analysis, because of the subjectivity of the modelling process.
- How do you estimate these areas? In the absence of hard data on directly connected impervious area (either by direct measurement or by calibrating a hydrological model with reliable rainfall and runoff data) it should be based on planning zones, as these show a high level of correlation with catchment impervious area and by extension, directly connected impervious area.
- Cost sharing for flood mitigation works required as a result of urbanisation of the catchment should only account for the effects of that urbanisation. In other words,

the cost sharing should only take into account the increase in peak flows caused by development.

- It is also considered appropriate that a credit be given for any existing peak flow mitigation works such as regional flood control dams, retention basins, detention basins etc that have been undertaken within a council area.
- In principle, if flow reduction works are in the form of on-site detention or retention, some form of credit could also be given.
- The introduction of other variables such as the density of the drainage network, introduces more work and subjective assessment into the process with only likely very marginal changes to the final outcome.
- Poor planning in the sense of approval of intensive development and resultant increase in runoff should be taken into account in the selection of a directly connected impervious proportion for that area.

A cost sharing approach – where the benefits of the works are downstream of the location

Where peak flow mitigation works such as regional flood control dams, retention basins, detention basins etc are proposed as part of the works package, the above approach (directly connected impervious areas) breaks down as the primary benefits are downstream of the location of the works.

In this case, recognition has to be given in the cost sharing to the benefit being given to the downstream area. This may mean that the costs are contributed by all in the catchment. A complicating factor could be that downstream benefits can taper off as you move further away from such works and additional catchment enters the drainage system.

As the extent of this benefit can vary, engineering advice will be required to ensure that the suggested approach gives a fair and reasonable answer for every situation.

The suggested approach is as follows:

- the point of effective downstream benefit limit of the works should be determined, based on engineering advice;
- assume the works are located at the downstream point so determined and then proceed using the approach outlined above.

As a final comment on these recommendations, it is noted that like the Gawler River model, the model here primarily is argued on the basis of the flood mitigation as the prime issue. However, unlike the Gawler River recommendations, this recommendation only recognises the issue of who is responsible for the cost, and not who receives the benefit of a project in terms of future avoided costs.

4.2.3 General conclusions

In short, the things that need to be considered in the context of who generates the cost include:

- hydrological connection of areas
- broader basin relationship
- distance along catchment area
- population density
- land use proportions
- extent of run-off in an undeveloped situation

While the issue of 'future costs avoided' means that a contribution is called for from those who benefit from the reduction in flood risk, relating benefit to the value tied up in property and how it would be threatened in the case of flood is also to be considered.

4.3 POSSIBLE OPTIONS FOR COST APPORTIONMENT MODELS

When looking at cost apportionment models it is important to return to the principles that should sit behind the models, namely the principles of efficiency, equity and capacity to pay. Therefore in presenting the options below, the arguments for the option, and the implications should be considered in this context.

The alternative options for cost apportionment are in part, currently already in use (at least in general terms). That is they are embodied in arrangements for alternative projects that have been implemented.

It is noted that during the research process alternative solutions, outside the terms of reference of this project, were proposed by stakeholders – which would imply substantial governance changes to stormwater management. These alternative options are summarised as Appendix A to this Report.

Option 1: Councils to fund on relative costs and benefits within a catchment—simple model

This option recognises that there are network relationships between communities/ councils in a catchment area, as discussed above. The most basic form of model in this context would be to use the approach adopted in cases identified above – basically dividing the costs based on the proportion of contributing catchment area that an individual council comprises.

The argument for this option is that it is based on the need for recognising network issues in flood mitigation, and while recognising the reality of the arguments above, the choice of a simplistic model is based on the view that the differences would not be

significant (in the context of the other inter-linkages that exist), and overly finessing the approach would create a basis for argument[6].

The simplicity would be more justified in cases where a catchment comprises areas with similar levels of urbanisation and where urban infill pressures and development etc is likely to be similar across regions. Therefore, such a model has been implemented for example in the case of the Barker Inlet – with Prospect and Port Adelaide Enfield sharing costs in this way.

This option is based on presumption that issues of environmental benefit are included in State and Commonwealth contributions.

The implication of implementing this option is that councils will be in a similar position as to the current debate – there will be similar levels of State funding, and the remaining costs will be shared by local government. In the simplest case where share of catchment area is the adopted approach, this is taken as a proxy for share of average cost contribution, and the implication is that the complexities of incremental costs, of differing degrees of development within the areas etc are not sufficient to warrant the costs of a more complex model.

Other arguments of relevance

A simple model could also take into account the benefits of a project, as well as the cost causation. Therefore the model may allocate x% of the costs on the basis of share of catchment (proxy for stormwater that flows into a drain) and (1-x)% of costs on the basis of future costs avoided, and share each between the contributing councils on a differing basis in each case. This is not unlike the Gawler River model, which also takes into account capacity to pay. Each project would have costs allocated therefore based on:

- [local government project costs] by x% by [share of catchment area];
- [local government project costs] by (1-x)% by [number of properties with increased flood risk without project/total number of properties across catchment area at flood risk].

Option 2: Councils to fund on relative costs and benefits—Complex model 1

This option entails recognition that within a catchment, the complexities of relationships discussed above require consideration. However, even in this context if it is presumed that the major focus of the apportionment model can be flood mitigation

[6] In a number of stakeholder interviews a concern was expressed that an overly complex model would require applying resources for calculation (which would reduce funds available for mitigation works) and possibly result in a situation where, while there was general agreement with the factors and logic of the model, no-one actually agreed with the parameters and therefore the outcome of the modelling, creating frustration.

issues[7], the following parameters form the basis for cost apportionment. The model would need to take account the following factors relating to flood risk.

Cost cause component (x%)

The cost cause component can be defined as:

- proportion of stormwater that each council will incrementally add to the project watercourse over the life of the project;
- proportion of stormwater currently generated from each council, where project will bring forward replacement of existing infrastructure.

If the existing infrastructure is relatively old, then an average cost sharing approach can be used, with the *incremental* and *brought forward replacement cost* concepts combined. In this context, either estimates could be made of the water flows, if possible, or proxies could be used, including proportion of catchment area, with adjustments for:

- proportion of impervious area (which in turn may apply proxies such as densities, land use);
- amount of stormwater that would be put into system pre-development;
- investments already undertaken or planned in projects to limit water flows at peak times;
- other council policies for reducing flood risk (e.g. polices applied to new developments to retain water on site, policies for existing households to increase retention on site).

The proposed model for Brown Hill and Keswick Creeks would be a starting point for this aspect of cost apportionment, with the model described in section 4.2.2 above.

Future costs avoided component (i.e. reduction of risk of flood damage) (1-x%)

This aspect would start with the basic calculation discussed in Option 1, i.e. [local government project costs] *by* (1-x)% *by* [number of properties with increased flood risk without project/total number of properties across catchment area at flood risk], but may also include adjustments for:

- value of properties at risk (i.e. areas with higher property values would pay more as the future cost avoided would be higher);

[7] This presumption can either be based on a view that there is a reasonable dichotomy between issues of flood mitigation (primarily local government responsibility) and environmental outcomes (primarily State Government responsibility), or alternatively that flood mitigation issues, while of joint interest to both Local and State Government, dominates the investment and costs apportionment context.

- local policies to protect individual properties or areas against flood (e.g. properties to be built up).
- Note that the Brown Hill and Keswick Creeks proposal does not consider this aspect in cost apportionment.
- The arguments favouring adopting this option are that:
- Option 1 above seems to be acceptable in cases where the degree of urbanisation across areas is similar, and where councils have had similar investment histories. However, there are many cases where the issues are seen as being much more complicated, with efficient and equitable outcomes requiring recognition of these issues.
- The implications of implementing this option are that:
- this model is similar to the debate that is currently occurring around the investments required in Brown Hill and Keswick Creeks (however, it includes the future cost avoided aspect);
- there will need to be detailed assessment of what adjustments are appropriate as there will not be universal agreement as to the relative apportionment of cost that should be based on cause of cost versus benefits from project, nor on the proxies and adjustments required.

The Brown Hill and Keswick Creek report makes the case for up-stream investments to also have cost contributions. Therefore, it proposes that there should be cross-sharing in such projects. There are two ways in which it can be considered:

- a calculation could be undertaken on the above basis for likely costs if the project was not undertaken, and downstream councils could be required to contribute that proportion of costs;
- it may be considered similar that if credit is given in required downstream investments for upstream projects (as suggested above) that such cost sharing is not necessary except in very large projects.

As an example of how this could work, consider an example of 3 councils in a catchment – councils A, B and C. A priority project to expand an existing storm-water trunk drain is identified in Council A, with an estimated cost of $4 million (and it is accepted that this is the most efficient project from a community perspective). Suppose the State Government has agreed to fund $2 million of this under the CMSS, leaving $2 million for local government to fund. Given that in principle the relevance of a catchment wide responsibility has been accepted by local government, this option could be adopted. The steps would be as follows:

- There will need to be an agreement of what proportion of the costs that are borne by Council A, where the flood risk that the project is to address exists (i.e. (1-x)% discussed above). There is no economic efficiency argument to guide this choice – it is a property rights question or fairness question. While there is no question that it is a part of the calculation, the proportion will be based on a range of qualitative

issues, such as the extent to which development policy in Council A has enhanced the risk. Suppose after negotiation, it is agreed that 30% of the costs will be based on this factor – and so Council A will contribute $0.6 million on this basis

- The remaining 70% of costs, or $1.4 million will be shared by Councils A, B and C based on who causes the cost. Assuming the existing trunk drain is relatively old, we would recommend an average cost basis – in that costs should be distributed based on the proportion of water each council puts into the trunk drain (rather than an incremental measure). If an engineering study was available that provided a measure of expected volume of water in the trunk drain, under the expected infrastructure investments under the catchment management plan, these proportions could be used (it could be assumed that volumes were similar under peak loads as on average, otherwise some adjustment would be made to measure the proportion of load at peak). However if this was not available, an alternative approach would be to use the proportion of impervious area connected to the trunk drain under expected development patterns in each council as a base (suppose this was 25% for Council A, 35% for Council B and 40% for Council C). There could then be agreed adjustments to these proportions for items as follows:
  - Suppose Council C has previously invested in retention basins that slow the flow and means that it will hit the trunk drain after the peak has passed and this has reduced the cost of the investment in the trunk drain;
  - Suppose the area in Council A is relatively flat, and there is some natural ponding so that water stays on the ground in the area rather than rushes into the trunk drain;
  - Etc, etc.

  The adjustments made will have to be negotiated based on the engineering impacts of these factors, and this is beyond the scope of this illustration. But suppose it was agreed that with the relevant adjustments, the proportional share was Council A: 20%; Council B: 45% and Council C: 35%.
- Therefore, including both of these factors would see Council A paying $0.88 million or 44% of total costs (or 30% plus 20% by 70%), Council B paying $0.63 million, or 31.5% of total costs (45% by 70%), and Council C paying the remaining $0.49 million (24.5% or 35% by 70%).

Note that these same principles apply to the cost of a new project upstream that produces benefits downstream (eg retention basins as an "alternative" to expanding the trunk drain).

Option 3: Councils to fund on relative costs and benefits—Complex model 2

This option requires the contribution in the cost apportionment formula of factors relating to non-flood risk issues and outcomes. The argument for this option is that the above models focus on costs and benefit associated with flood risk, based on the perspective argued that local government's primary focus is flood mitigation.

There are a number of reasons why that might not be the case:

- flood mitigation is not necessarily the dominant issue from local government's perspective;
- further, any dichotomy presumed is over-stated, and indeed both local government and the State Government have a shared interest in both flood mitigation issues and environmental issues – because there are significant local benefits and significant collective benefits in both;
- state governments are considered to under-invest in the infrastructure required in this context.

Therefore, the model described above in Option 2 needs to be adapted, and complicated even further, with cost allocations based on three separate factors:

- the proportion of costs that should be based on the extent to which a locality causes the cost (x% of total costs);
- the proportion of costs that should be based on avoided future costs relating to flood (y%);
- the proportion of costs that should be based on local benefits within the council (1-x-y)%.

The arguments as to a basis for how the first two factors are distributed is as above (in Options either 1 or 2). The parameters that need to be considered in the last include:

- potential 'value' in water quality improvements and potential harvesting to a council (locally or event provide back to up-stream or downstream councils);
- potential aesthetic value (recreational use, tourism use or impact on property values) of improvements to watercourse (particularly natural watercourses).

4.4 CONCLUSION AND RECOMMENDATION

The difficulty in framing a model for cost apportionment is that:

- The issues for every council are quite different. Some have greater interest in stormwater harvesting, some place more importance on local aesthetic value, some have little overlap with other councils in a catchment (i.e. limited interaction effect, so that all decisions can be made locally).
- There are significant competing interests in every model in terms of the implications for efficiency, equity and simplicity.

On this basis, it is not really possible to say one model is clearly 'best' or correct. In the end that will be a negotiated decision, as will the actual parameters and weightings adopted within an agreed approach. What is clear is that Options 1-3 are the current operational models for different projects. However overall, the research supports adoption of Option 2 which distributes these costs on the following basis:

- defining a proportion of the expenditure which will be distributed based on the extent to which an area causes the cost (i.e. the proportion of stormwater incrementally added to the system);
- defining the balance which will be distributed based on future flooding costs avoided if the project proceeds (apportionment based on value of properties at risk with and without the project).

The basis for apportionment has been subject to considerable discussion in the past with a variety of modelling frameworks applied. Option 2 represents a combination of the approaches recommended in recent reports on the Brown Hill and Keswick Creek watercourses (which emphasises the first aspect but excludes the second) and the Gawler River watercourse (where the eventual apportionment emphasises the second).

Option 2 described above is therefore the recommended model from the perspective of the researcher, within a context that the main issues for local government are flood mitigation, adapting this framework keeps the model simpler than including the range of other factors, and that external funds are often available for these other factors.

The detailed apportionment for a proportion of local government expenditure (x%) is recommended to follow the model proposed in the consideration of Brown Hill and Keswick Creek infrastructure, while the balance is distributed based on the number/value of properties in the area multiplied by an assessed probability of flood risk.

It is also noted that in cases where the apportionment is 'simpler', with councils in similar phases of urban development, all with some risk of flooding etc, then Option 2 essentially reduces to Option 1. Therefore, adoption of Option 1 should not complicate the processes for councils where agreement is already reached on this simple approach.

5 Financing issues

While it is not directly in the scope of the project, the discussion above occasionally drifts into implications for how the costs of a project are financed. Further, this aspect of the issue was of obvious importance to the individual councils. Some councils suggested that if it wasn't for the size of the investment required this issue would not be a big issue. Others commented that the affordability issue is not as significant as perhaps being suggested (in that the life of the infrastructure is so long). The key areas of debate or interest in this aspect included:

- **Levies** – Many councils commented on the political pressures involved in having water catchment levies which in effect provide a source of funds towards the State Government contribution in stormwater management and other water management issues within the catchment. The debate centres on the observation that an individual council does not spend in its area the value necessarily collected in the area. In this context, it must be noted that the State Government contribution for projects is based on looking beyond local boundaries, so this perspective is not necessarily relevant. The international literature does emphasise that stormwater is 'best' funded by a property based taxation system in the longer term – and it is noted that whether funded up front (by a developer) or over time (by rates) the property owner pays. Developer levies are more likely to be effective where there are significant incremental costs issues and therefore are an important part of the payment system.
- **Private public partnership (PPP) options** – The capacity to attract private funds into this areas is viewed in the international and national literature as being limited. In theory if a project is justified it should not matter whether it is funded by private or public sources, as long as system of payment for the investor can be generated. PPP options are primarily about shifting management risk and improving management incentive – and may be relevant in this context
- **Use of debt** – Much of the literature raises the intergenerational equity issue in stormwater (and general infrastructure provision), advocating the logic behind debt funding for stormwater. Therefore, when investments of $100s of millions of dollars are quoted, if it is recognised the life of the asset will in itself be up to 100 years, this suggests the project will be more affordable if debt is used (e.g. the South Western drainage scheme). The key question is who will be responsible for borrowing the funds in the most efficient manner.

6 Agreement process

The brief for this project requires that guiding principles be prepared that will provide a means for councils within a water catchment to reach agreement on cost apportionment. The guiding principles have been developed above and summarised as:

A model is recommended which apportions local government costs on the following basis:

- *Defining a proportion of the expenditure which will be distributed based on the extent to which an area causes the cost;*
- *Defining the balance which will be apportioned based on future flooding costs avoided if the project proceeds.*

As noted in the discussion, the higher the value of properties at risk, the higher the proportion that would be allocated on this basis rather than on who causes the cost, but other than this there is no apparent theoretical basis for deciding the division, in that it is a property rights or fairness issue rather than an economic efficiency issue.

The ability of the modelling framework depends on councils reaching agreement as to the relevant factors and parameters to be used. Because many of these factors are qualitative or have measurement limitations, the process of achieving consensus on the agreed cost apportionment still may have difficulties. Therefore the issue of incentives such that agreement or consensus can be reached is important. The options discussed in the report above include, but do not specifically identify in this context, a number of incentive factors that should assist in achieving consensus. It is noted that there are two levels of consensus that needs to be achieved:

- agreement of a preferred option – noting that the options are all generally consistent with the principles above, the difference is in terms of how much detail is used in the cost apportionment framework;
- agreement on parameters within a catchment for the factors included within the framework.

The following incentives tend to exist to assist in promoting a consensus outcome with respect to both issues:

- Local government has already agreed policy position that supports cost apportionment at the catchment level, and the principles proposed are broadly consistent with existing models.
- Risk of liability claims. When flooding occurs, if it seen that a body was negligent in undertaking its role, then they could be subject to liability claims. While there will always be some room for argument, the fact that there is general acceptance of cost apportionment principles puts a council who is not prepared to contribute on the basis proposed at risk.
- As noted elsewhere in the report, significant State Government funding is provided towards major projects. The application of this funding can be dependent on agreement being reached (the State Government funds will not be made available until the project is approved).
- The commitment of some funds from "down-stream" councils is more "likely" than upstream as it is the downstream areas where the damage will occur, and therefore upstream councils are more likely to argue the parameters and basis for cost apportionment. Some of the common arguments that were raised during interviews that might constrain possibilities for consensus included the failure of down-stream councils to recognise up-stream preventative works, the failure of the negotiations to consider pre-development flow levels, and the value of water to the down-stream council as a resource. However the framework recommended allows for all but the last of these factors to be recognised. Given the extent of likely value, and the perspective that stormwater use has a broader level of benefits it is suggested that it is appropriate to leave this aspect out of the cost apportionment exercise (i.e. adopt Option 2).

The remaining questions are with respect to what processes to adopt so as to best facilitate reaching consensus. Given that from a benefit cost perspective the delay in commencing priority projects produces a community cost, it is important to have a facilitating process in place. This process is seen as requiring four separate phases, outlined as follows.

Project Development Stage

On the basis of the outcomes of Part A of this study, there needs to be an identification of priority projects, and proposed staging within each catchment. Then progressively for each project (based on priority) there needs to be a Catchment Board facilitated workshop where the objective will be identifying and reaching agreement on the recommended engineering approaches to the problem. Attendance will be council CEO's and engineers as well as stakeholders from State Government.

This approach should co-operatively consider the range of options including trunk drain expansion and upstream retention. The process should identify the most efficient (in benefit cost terms) solution to the problem from a Catchment wide perspective. The local government aggregate cost would be identified in this stage.

Cost Apportionment Assessment Stage

Based on the framework identified above, an assessment of the parameters for cost apportionment needs to be undertaken. The options for this include:

- one council on behalf of the catchment;
- representative of the NRMB at the regional level, or alternatively at the catchment level (i.e. Catchment Board);
- consultant managed by steering committee of council officers.

Using the framework agreed, this step involves identifying the parameters and modelling the outcomes to produce recommended cost contributions.

Cost Apportionment Review Stage

This step requires a workshop (again maybe Catchment Board facilitated) of CEO's to discuss, modify and agree cost contribution amounts.

Cost Contribution Approval Stage

This is an internal council approval stage, where those responsible for the above negotiations put the consensus position to the council for approval of budget, as well as funding recommendations.

Despite the incentives that exist for reaching agreement, the research process identified many different views from within local government as to the issues and as such in some cases consensus may not develop.

In addition, as noted above, there are many aspects of the framework where the parameters have only qualitative indicators, or the have difficulties in quantitative measurement. Therefore, it must be recognised that consensus outcomes may in cases be difficult to achieve. As the delaying of priority projects brings substantial community risk it is recommended that a combination of the following mechanisms be adopted to resolve lack of consensus should it develop:

- Use higher level funding access as a lever. Recognising that the State Government commits large sums to stormwater management, and in some cases Commonwealth funds are also allocated, the allocation process can provide that a council is not eligible to apply for funds if there is/has been an unsuccessful outcome for a higher priority project. This would be a tougher lever if all councils involved in a project where consensus could not be reached could not apply for funds for another project, but may be unfair if most councils are in favour and one is resisting. Note

that this should also be dependent on the processes recommended above being properly pursued, so that issues are fully debated.

- Adopt a legislative framework that will empower a binding decision from an independent decision making entity, taking into account the issues identified in the process to date. This decision must be consistent with the strategic directions in stormwater management for the Catchment. The current legislative framework is insufficient for this purpose. The issue of appeal rights is also important in this context. If the legislation prevents formal appeal (noting that there would still be political venues for "appeal") there would be more incentive to reach agreement, but it may not lead to the right solution.
- Before the application of the external decision, provide mediation and negotiation support (ie appoint an external party to assist in mediating a solution).

7 References

A Summary Report Of The Council Forums Conducted By The Water Conservation Partnership Project, Water Conservation Partnership Project February 2001, SA Department for Environment and Heritage

Catchment Water Management Board reports – various

Cost Sharing Principles For Flood Mitigation Works, The Brown Hill and Keswick Creeks Flood Management Group, November 2002

Establishing a Stormwater Utility, Chapter 4.1 Rate Structure Fundamentals – What is a Stormwater Utility Rate Structure? Internet sourced document

Financing Infrastructure for Residential Development, Access Economics for the HIA, (2003)

HIA response to Productivity Commission's Discussion Draft Report on Home Ownership

James P. Heaney, David Sample and Leonard Wright, *Costs of Urban Stormwater Control*, January 2002, Report for the US Environmental Protection Agency

Kim Read, Ken Schalk, Malcolm Govett, *Stormwater Planning*, (2002)

Minister's local government Forum *Scoping Study to Assess the Potential for Commercial Funding of Draining and Flood Mitigation Works*

Report of the Catchment Management Subsidy Scheme Review – June 2002

Stormwater Management, Practices and Expenditures Survey, Greater Vancouver Sewerage and Drainage District, March 1998

Water Proofing Adelaide, Beyond the Drought, Government of SA, 2003

Appendix A

ALTERNATIVE OPTIONS

Appendix A
Alternative options

Alternative Option A: Councils to hand over cost responsibility to State Government

This option involves stormwater management being funded totally from State Government resources. This could be achieved a number ways that will have different operational implications, including:

- a State Government authority (either existing or new) to take responsibility for operations and investments;
- local governments to bid for funds from state government works.

This operational aspect is beyond the scope of this Report.

The argument for this option is that:

- Stormwater management is a metropolitan wide issue. The risk of flood, along with issues of water quality, both impact well beyond any individual Council boundary.

  This has already been discussed with respect to environmental outcomes, but in some cases it was suggested the issue also applied to flood risk. The arguments advanced included:

  - Where the risk was to industry the risk was extended – in that employees and owners of a given entity will reside outside the area that will be flooded.
  - Some major elements of infrastructure caused the risk to be metro wide (eg. risk of flooding at the airport, where all Adelaide residents, regardless of Council would bear the cost).
  - Over the lifetime of the infrastructure, individuals will possibly live in a number of localities, changing their home. They will also have friends and relatives in other areas and will be considering their well-being. Therefore all residents have an interest in the issue of flood-proofing the whole of metropolitan area.

- The implication of implementing this option is that:

  In itself it means no cost distribution from a given council, but rather all individuals would pay through the taxation system. The alternatives per payment will include:

  - An equal per capita payment or an equal per property payment.
  - Individual capacity to pay – which would imply either an income or wealth based tax (as per the existing water catchment levy approach).

This approach puts the major emphasis on who pays onto the factor of who bears the risk from flood and who benefits from improved water quality, essentially ignoring the issue of who generates the cost – other than through developer contributions or through requiring individual property management solutions.

It also implies a slight reduction in gross funds to local government – as there is cost shifting from local government to State Government.

It is noted that the arguments should also apply to maintenance.

- Other arguments of relevance:

  In addition to the issues above it may be argued this type of arrangement maybe preferable for administrative efficiency as it leaves decision making in one place. Others in interview argued that the opposite affect would result, in that it involves the creation of an extra layer of bureaucracy.

One key risk in this option raised by some councils was that pursuing this approach would limit the capacity of individual councils to make wise decisions about options for stormwater reuse.

Alternative Option B: State Government to fund major trunks and Local Government to fund other works within its area

A number of interviewed people espoused the view that the roads model should be applied to stormwater – in that it was a networking system with similar characteristics that worked. Therefore they suggested the possibility of having a system of arterial stormwater conduits connected to by local components. Dividing the system into so called 'arterial' and 'local' would then see State Government taking responsibility for arterial networks and local government for local components.

The argument for this option is that:

- This option represents something of a compromise between the two options above. It is based on State Government taking responsibility for those aspects of the network where collectively becomes significant, and is based on a combination of both cost causation and wider benefits perspective.

The implication of implementing this option is that:

- There would be a very different sharing arrangement than currently exists. State Government funds are currently allocated to both arterial (and to a lesser extent) some local project under the above definitions, while local government funds both as well.
- It is a simple model – with the most difficult task being in defining what is arterial in the first instance.

Other arguments of relevance:

- While generally recognising the validity of this view, it is important to recognise that while there are similarities between roads and stormwater, there are also significant differences. These can be summarised as:
  - In roads, the generator of the problem (ie the road user) also bears much of the cost of under-provision (lost time through congestion, increased risk of accident) – whereas with stormwater, as discussed above the generator of the problem is upstream of the problem. Therefore as in Option 2, there would need to be some system by which decisions in up-stream councils were influenced.
  - In roads under-provision issues are very visible and on-going, whereas in stormwater, the potential costs from under-provision will occur on an ad-hoc basis, so for much of the time the issues are hidden.

Alternative Option C: Councils to fund all stormwater projects in its area

This option involves councils funding all stormwater projects, and being responsible for the projects in its area, irrespective of where the cost has been created. As noted above, this represents a distribution model of costs, with no exchange of finances. It implies costs are distributed to (and borne by) the council in which the project occurs.

The argument for this option is that:

- The network, cross council or inter-relationship arguments advanced in the above discussion exists in the majority of council provided services, including for example:
  - Beach management
  - Provision parks and gardens
  - Planning decisions.

While it is recognised that interactions exist (in stormwater, and in the above aspects of council services), it is suggested that acknowledging them all is overly complicated, and trade-offs between all aspects of local government service provision balance out, so for an individual item there should not be too much emphasis in trying to find the detailed cost sharing option. This is based on a simplicity argument – arguing that in the end recognising the broad range of interactions is overly complex.

The implication of implementing this option is that:

- councils where the works are required (i.e. councils which included major watercourses) will bear the cost – rather than the councils with the capacity to pay, or communities who cause the problem.
- There might need to be some over-arching requirement (legislative or otherwise) to cause up-stream councils to act in the collective best interest (planning decisions, stormwater project decisions).

Other arguments of relevance in this regard include that:

- One of the issues raised in the discussion was the issue of ownership of stormwater, the issue of considering water more as a resource and less as a cost. This was a very important issue for some councils, and in this option this issue is also somewhat simplified.