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All full papers in the table of contents were reviewed by the technical committee.

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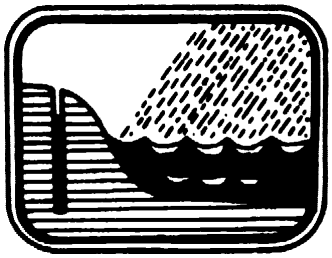

The Hydrological Society of South Australia Inc.

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Water and the Law

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Contents

The *Water Resources Act 1997*; a quantum leap in funding for sustainability

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Summary
The *Water Resources Act 1997* requires many things of Catchment Water Management Boards, in association with the Minister for Water Resources. Two of these requirements collectively provide the best opportunity for achieving sustainable natural resource management outcomes of any piece of environmental legislation developed to date in South Australia.

The requirement to develop and implement catchment specific management plans and water allocation plans is coupled with the annual collection of a levy from catchment constituents. The levy funding, in addition to non-levy monies garnered by the catchment boards, is used to develop long-term strategic plans, and provides the financial stability required to ensure that these plans are implemented.

1. INTRODUCTION

A plan or two in the hand and stable financial backing are not the only requirements for the successful application of South Australian water resource management legislation. But "ongoing"[1] financial backing has generally been the missing link in the sustained implementation (and updating) of natural resource management plans - terrestrial, freshwater or marine.

The old cliché emanating from the experience of many a natural resource management employee of "documents gathering dust, sitting on a shelf" has been a serious one for natural resource management projects reliant upon ephemeral funding. Funding is allocated for the development of a plan, a strategy, or research required for the development of strategies or plans. But invariably the funding closes and these documents are never implemented.

The difference in South Australia since 1997 with the commencement of the *Water Resources Act 1997*, is that this Act requires not only that a catchment plan be developed, but that it be implemented and updated. Also, it requires Boards to use one or both of two alternative routes for ongoing funding. This funding must be used only for the development, implementation, and regular updating of the plans.

Other major points of significance in this Act which will not be further discussed in this paper but are also significant in achieving the aims of the *Water Resources Act* are the following:

This is the first piece of natural resource legislation originating from South Australia, which formally recognizes that land and water management issues are not bounded by State and Local Government areas, but by geographical boundaries. In this legislation, it is acknowledged that natural resources management needs to be undertaken within a framework which utilizes natural resource boundaries such as catchments, rather than anthropocentric administrative boundaries. The most efficient way to manage these resources is by a body which considers management issues from a whole of catchment perspective.

Another feature is that community participation and government support are in-built mechanisms of the catchment planning process as outlined in the Water Resources Act. The effective execution of the community-inclusive consultation process outlined in the Act is necessary to attain the social acceptance required for effective implementation of the resultant plan.

For community acceptance to be gained and sustained, government bodies must ensure that they are giving some form of incentive to the community, via engendering some sense of autonomy. To this end, government bodies must utilize true and effective consultative processes rather than simply devolving responsibility without allowing influence over decision making.

Conversely, engaging in covert cost shifting whether in kind (by increasingly using volunteer time and activities), or financially (via a levy) to the community is a mechanism which will turn the community away.

Other aspects of the Act, such as linkages to the Development Act, and hence the Planning System, are vital for the prevention of further non-water sensitive development. The requirement for the catchment plans to be consistent with other natural resource legislation in the State is also highly significant in achieving integrated natural resource management.

However the bottom line is that all of the above cannot be effectively achieved without a stable funding base for

[1] For the rolling five year life of a plan, subject to annual reviews by the Minister for Water Resources and Economics and Finance Committee of Parliament.

the development and implementation of natural resource management plans, in this case, catchment water management plans.

2. CATCHMENT WATER MANAGEMENT BOARD ROLE

The Catchment Water Management Boards (CWMBs) have been established under the Water Resources Act to fulfil three main functions:

- prepare and implement a catchment water management plan;
- advise the Minister and Councils about water resources management in its area;
- raise community awareness about water resource management issues.

In general, the Onkaparinga CWMB, for instance, aims to improve water quality in the catchment, facilitate sustainable and efficient use of water resources, educate the community about catchment care and engender a sense of ownership of water resource management.

3. THE CATCHMENT ENVIRONMENT LEVY

The Board funding is mostly[2] raised from those who live, own property, or use 'prescribed' water in the Onkaparinga CWMB area, via the catchment environment levy. Payment is obligatory under the Water Resources Act, where the total amount of money to be raised each year is defined by the catchment water management plan developed by each Board and endorsed by the Water Resources Minister (the budget subsequently approved by the Economic and Finance Committee of Parliament).

The quantum of the levy collected is determined by the amount required to fund both the development and implementation of the catchment water management plans, and where relevant, water allocation plans. These are five year rolling plans, (the major consultative process is undertaken every five years) but the activities and expenditure are reviewed in a minor way on an annual basis.

There are two ways of charging the levy.

Water Based Levy

(Water Based) Division 1 is based on use of a 'Prescribed Water Resource'. There is only one Prescribed Water Resource in the Onkaparinga Catchment, the underground water in the Willunga Basin, defined as the McLaren Vale Prescribed Wells Area.

Only those who are licensed to extract water from that resource can be required to pay this type of levy. Those who pay a Water Based Levy will not be required to pay a Division 2 land based (property based) charge, outlined below.

The Minister responsible for water resources gazettes the levies payable by water license holders. That levy may be payable on the right to use the prescribed resource or the quantity of the resource used, or both. It is possible to have different levies for different parts (eg. North or South) of the resource and for different water use (eg. irrigation or recreation).

This levy is to be used in the same manner as the property based contribution received from the rest of the catchment community.

Property Based Levy

(Property Based) Division 2 contributions are paid by councils and are based on each council's proportionate share of the Board's planned and approved annual expenditure. The councils are then reimbursed by passing the levy onto council ratepayers.

Table 1: Basis of property based water levy contribution
(Part 8 *Water Resources Act 1997*)

Minister will determine amount using one of these bases	**Means by which local government may recover contribution from ratepayers in Onkaparinga water management catchment**
a) Capital value of rateable land	• If general rates are based on other than capital value, local government may use that method to levy ratepayers
b) Fixed levy of same amount on all rateable land	• No levy for less than single allotment • Allows for a single levy for contiguous pieces of rateable land owned by 1 owner
c) Fixed levy of amount depending on purpose for which rateable land is used	• No levy for less than single allotment • Allows for a single levy for contiguous pieces of rateable land owned by 1 owner • The purpose for which the land is used must be prescribed by regulation
d) Area of rateable land	• No specific requirements under the Water Resources Act
e) Use and area of rateable land	• No specific requirements under the Water Resources Act

Note: The requirements of the Local Government Act must also be met.

[2] The CWMBs in the Mount Lofty Ranges watershed also receive ex-gratia payments from SA Water, and add to the levy funding by building partnership projects and by attaining grant funding.

The Minister determines the total amount to be paid by councils and the basis for the levy for each CWMB (based on the budget required to implement the catchment plan, as recommended by the CWMB) and after consultation with councils in each Catchment. Councils recover the amount paid by a property-based charge (catchment environment levy) on all those landholders, except Division 1 levy payers, in the Onkaparinga CWMB area.

There are 5 methods the Minister is permitted to use as a basis for determining the amount of Council contribution. Table 1 below, aims to show the 5 ways the Minister can use to determine the payments and what variation each Local Government Body can use to recover the money.

Special Purpose Levy

In addition, there is an option to charge a Special Purpose Levy to be used exclusively for a particular Management Activity or Other Defined Purpose.

This Special Purpose Levy requires written consent of the majority of those involved.

4. THE LEVY AS AN INVESTMENT

Unlike a tax, which inputs into governments consolidated revenue, this levy is directed back into the community from whence it came, in the form of a long-term investment. In addition, the community has an opportunity to have a say about the manner in which the levy is spent, and the quantum of the levy collected via the consultation process outlined in the Water Resources Act.

Whether through the provision of long-term sustainable water resource management strategies and the implementation of these on the ground, or land and water rehabilitative works, or educational and awareness activities, the levy is used to the benefit of the whole community. It is used to provide assistance for community group participation via the work of "friends" groups, catchment and Landcare groups, or individual landholder actions, such as fencing of stock from streams (together with provision of alternative watering points), erosion control and revegetation.

The levy also serves to facilitate;

- the sharing of resources and value add to existing projects,
- new projects on a partnership basis that otherwise would not have had the means to come into fruition, and
- provides seed funding, and acts as leverage to secure external funding, from the private sector, or federal government - in this case, bringing dollars into the State.

These first two points are highly significant in engendering a sense of ownership and participation at the catchment scale. This in turn can lead to attitudinal change and most importantly, the more elusive behavioural change in regard to personal and corporate activities relating to water resource management. Such behavioural change, gained by relatively little financial investment, is invaluable. The participation of community members for little if any financial reward is contingent upon being listened to and in the knowledge that they are making a difference. This can more easily be achieved at the local or regional level, underscoring the appropriateness of boundaries being set at the catchment scale.

The third point (above) is one which, in monetary terms, is significant. Hundreds and thousands of dollars can be lured into the catchment via ex-gratia payments by SA Water, Natural Heritage Trust (NHT) and other federal funding, catchment management subsidy scheme funding (generally with Local Government), and the sponsorship and partnerships with other government bodies, where multiple benefits can be gained by all parties.

The seed funding leverage can also link a board to other substantial programs with a relatively small amount of financial input. By entering into the ring the Boards can join in to share the benefits of already established programs. For example, joining in with water related aspects of Local Agenda 21 programs and utilizing expertise and resources of the River Murray Urban Water Users Group.

CWMB activities will improve the value of associated properties and increase the value of the resource including, importantly, in the eyes of the general community. This can in turn lead to other positive changes, such as people conserving water and preventing pollution, and accepting the use of stormwater and treated wastewater.

5. STABILITY OF FUNDING

One of the failures of the decade of Landcare, which in the most recent years has been linked to NHT funding, is the limited capacity of natural resource management employers to offer extension officers on a medium to long term basis, as funding is either project based, and/or is (generally) annually renewed. Often it is the case that as soon as an officer develops expertise in an area, and gains the trust and interest of that local or regional community, they leave due to contract closure or, for those anticipating this, off to greener pastures which provide a longer tenure.

The efficiencies lost in constantly changing personnel are not only those related to the persons directly involved. Networks need to be reformed, personal knowledge bases of the local area at the officer level is lost and local information is lost. Local people can be expected to give of information so many times before

they too become weary of having to "break in" yet another enthusiastic young officer.

Under this scenario, unless information is well documented (not a major emphasis of NHT funded projects, which generally have an on-ground works focus), much time and resources, including historical knowledge, are lost due to constantly changing personnel. Through this, information pertinent to sustainable management of the local resources will be lost along the way.

The catchment environment levy, by comparison, enables funding for long term studies, longer-term employment, and sustainable management.

With the advent of long-term funding, the Onkaparinga Catchment Water Management Board has attained many firsts for the region in only two years. It has developed for its catchment areas the first:

- whole of catchment, integrated catchment water management plan
- whole of catchments surface water quality monitoring program
- whole of catchment groundwater quality monitoring program
- whole of catchment water for the environment studies
- whole of catchments community perception and awareness survey
- implementation of whole of catchment watercourse rehabilitation programs, land management courses and other aspects of the OCWMB Initial Plan
- joint board/state and local government programs, for example, septic tank and aerobic systems audits, education and awareness activities etc.

6. ONKAPARINGA CATCHMENT WATER MANAGEMENT BOARD APPROACH

The Board's approach is to direct its efforts three ways; to rehabilitate degraded land and water resources, reverse the current trend to degrade natural capital and to prevent further non-sustainable practices. This cannot be done without the long-term funding of long-term strategic and evolving plans.

Most would be familiar with the South Australian catchment board works programs such as rehabilitation of watercourses, water conservation programs, investigations into aquifer storage and recovery, etc. But some would say the real causes of non-sustainable practices are beyond degradation of our biophysical resources, and are related to the influences which shape the degradation of our biophysical resources – social and economic factors. It follows, therefore, that a change in culture, incorporating a change in human attitudes and behaviour is required before we will attain sustainable water resources management.

At this early stage in the catchment board's history, the above biophysical programs are necessary to redress previous water resource impacting activities and search for new information and application of technologies. However, for the boards to undertake a whole-of-catchment role as required by the Act, social, economic and environmental factors relating to catchment management need to be addressed. The Board must also look beyond the restoration of waterways and even the utilization of the whole water cycle, to the source of the problems on a broad scale.

To this end, the Onkaparinga Board, for instance, is looking to "mainstream" water resource issues via the planning system, and the economic system. The Board is, for instance, facilitating, on behalf of its constituent councils, a whole-of-catchment Plan Amendment Report under *the Development Act 1994*, to require water sensitive urban design, determine whether current land use zoning is appropriate etc. In addition, the Board, in conjunction with partner bodies, and on a whole-of-catchment basis will initiate a study on the use of economic instruments as incentives for improved water use and develop a model to assess the impact of the Board's activities and potential activities from social, environmental and economic perspectives.

Again, these are not short-term exercises and require a stable funding base to develop and implement what will be invaluable outcomes well into the future.

7. NATIONAL LINKS

The Water Resources Act was developed to be aligned with the current Council of Australian Governments (COAG) water policy reform framework. This requires, amongst other things, governments to account the true value of water, allow for the water requirements of the environment, and to include appropriate market mechanisms to facilitate improved water resource use. These principles are carried through to the level of the catchment water management plan.

In a recent paper, the movers of the Landcare decade, Phillip Toyne and Rick Farley, consider the need to place natural resource issues in a wider arena than that which only directs biophysical activities such as "planting trees". They consider that market systems, macroeconomic policy, economic incentives and appropriate regulatory and regional structures, amongst others, are required for long term sustainability. Some of this must come from state and federal levels, but not all. In fact one of the features of the paper is a ten point plan, which includes as two points:

- "Landcare should be based on regional plans that would be given effect by legislation";
- "Commonwealth funding should be allocated on the basis of regional plans to encourage a whole of region approach. Project funding would be a regional responsibility with grants in accordance with the regional plan."

In addition, two of the remaining 10 points acknowledge the role of a stable long-term funding base:

- "A 1% National Landcare tax should be imposed for the next ten years to raise funds in the order of $30 billion";
- "There must be a "tollgate" mechanism attached to policy development, integrated under the national natural resources management umbrella to ensure that policy objectives are achieved."

A further of the ten points also recognizes the importance of community consultation and participation:

- "This national initiative should commence with a meeting of stakeholders from across Australia to lay down the broad policy direction for its implementation."

All of the above points are principles already incorporated into the South Australian Water Resources Act, via the collection of a catchment environment levy, the processes of development, implementation and 5 yearly evolution of catchment water management plans and water allocation plans.

8. CONCLUSION

The Board's approach is to direct its efforts three ways: to rehabilitate degraded land and water resources, reverse the current trend to degrade natural capital and to prevent further non-sustainable practices.

This levy is a positive strategic mechanism, which provides the long-term funding required for sustainable water resource management. The development, implementation and continuous revision (to meet present and future needs) of long-term catchment water management plans and water allocation plans can only be achieved with stable funding.

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To regulate or to market – striking the balance for sustainable water use

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Summary
Presently, most Australian jurisdictions are in the process of introducing new water legislation in fulfillment of their obligation under the National Competition Policy. Such legislation includes provisions for the use of market instruments, public participation in and devolution of water resources management. This paper argues, that such legislation is not sufficient, to solve the issue of reallocating water resources to more efficient and higher valued users, which is necessary to ensure sustainable growth of water dependent industries and rural communities as well as the environment and local ecosystems. A framework of Local Water Management Plans and a locally defined 'Duty towards water' is required to ensure socially, environmentally and economically sustainable water management. To ensure effective implementation, as well as local policing and monitoring, of such Water Management Plans, they have to be developed with real and not tokenistic public participation in decision-making, following processes that are perceived to be fair and equitable. Within such framework, water markets can be used as an efficient servant, to move water around between competing uses. More sophisticated market instruments, combined with appropriate tax incentives, will maximize socio-economic benefits from water available for, and committed to, consumptive uses.

1. INTRODUCTION

The traditional approach to water management is of a centralized nature, a control and command framework, where government regulations and central authorities define how water resources can be used and by whom – a top-down approach. This paradigm evolved, during a period where water resources were relatively abundant, and new demand was met by increasing supply. Conflicts over water allocation issues were therefore not so common and severe.

This relative harmony stated to fall apart during the 1970s, conflicts intensified during the 1980s, culminated toward the end of the 1990s, and water management issues have to be comprehensively addressed, and new paradigms entrenched, during the first decade of the new millennium.

The disintegration of the old paradigm became apparent as the water economy entered its mature phase, where both the economic and environmental costs of augmenting supply increased sharply. Community awareness of environmental issues was increasing, and the political implications of not acknowledging such concern were clearly demonstrated in the Tasmanian Franklin Dam case. While increased supply in this way started to dry up, demand continued to increase, not only within the agricultural sector, but also from other sectors of the community such as industry, recreation and the environment. Conflicts over water allocation issues increased, and the traditional command and control framework proved inadequate to solve these conflicts, and the political will to take hard and unpopular decisions was absent.

Two politically opportune solutions presented them self. Economic rationalism proposed to remove the government from many of these processes by introducing market mechanism. Public participation in the process of natural resource management and conflict resolutions, emerged as a part of Ecologically Sustainable Development (ESD) (Stein, 2000).

This development took place simultaneously with an increased understanding of the need for ESD for both present and future generations. The *National strategy for ecologically sustainable development* (NSESD) in 1992 was a cornerstone in this process. It calls for improved public participation in water allocation and management, and improved use of water markets and full cost-recovery pricing. Importantly, it uses terms such as 'where appropriate' and 'using the most effective mix of pricing policies and regulatory measures' and 'have regard to the full range of technological, economic, environmental and social factors'. It is not a full-scale promotion of unfettered free market mechanisms, as the solver of all problems.

This was not a unique Australian phenomenon, but part of an evolving international process. The NSESD was Australia's response to Agenda 21 and the Bruntland Report. Market based mechanism, and the devolution of the management and control of natural resources to the community level, have been adopted by many international organizations and national governments.

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COAG's Water Reform Agenda took pace during the middle of the 1990s and significantly builds on the NSESD. It calls for a balanced approach to water management, treating water as an economic good, using pricing mechanism and market instruments, to reallocate scarce resources among competing uses promoting higher valued and more efficient water use. It however emphasizes the need to keep the operation of markets within ecological and social constraints of catchments and has community participation and the devolution of water management at its core.

The COAG Reform Agenda ended up as a part of the National Competition Policy (NCP), which is a brainchild of economic rationalism. During this process, environmental and social concerns took the back seat. Policy objectives, such as social welfare and ESD, were only included in the final intergovernmental agreements due to considerable lobbying by unions and community groups in the closing stages (Ranald, 1995). Two significant differences emerged between the NSESD and the NCP. First, a considerable body of scientific evidence underpins the NSESD, while significant uncertainty is associated with the impact of the NCP. Second, the NSESD evolved through a transparent and inclusive process, with significant public participation and involvement, while the NCP process was far from inclusive and transparent. Despite this, it is the NCP, which is pursued with vigor and purpose through legislative and fiscal controls.

In compliance with the NCP Agreements, and to avoid fiscal penalties for non-compliance, jurisdictions are scrambling to pass new water legislation. SA was the first state to comprehensively revise its water legislation with the *Water Resources Act 1997*. NSW has its *Water Management Bill* under development (DLWC, 1999), Queensland its *Water (Allocation and Management) Bill* (DNR, 1999), Western Australia the *Rights in Water and Irrigation Amendment Bill* (Banyard and Kwaymullina, 2000), and Tasmania *The Water Management Act 1999* (Dalton, 2000).

The question arises – is this new legislation sufficient to address the underlying issues, and solve the significant environmental and social problems associated with water reallocation? It is essential to address these issues now, in a thorough and fundamental manner, since the need for their solutions are so important and escalating so rapidly, and the potential environmental, social and economic consequences of failing to adequately and comprehensively resolve them so severe, that there is no room for complacency.

A recent study, by the Australian Academy of Technological Sciences and Engineering and the Institution of Engineers, Australia (1999), concluded that water resources do not need to be a limiting factor in the sustainable growth of Australia's water dependent industries. Two important provisos to this statement were made. First, this is only the case if significant reallocations of water resources, from low value inefficient users to higher value efficient users, take place. Second, the production of some irrigated commodities should be relocated, to areas where water is more readily available, or substitute goods, produced on dry land, should replace such commodities. An example of this is substituting irrigated pastures with feeding grain. The need for structural adjustment and use of more sophisticated market instruments was pointed out. In addition, such development could not be implemented without significant community participation in conjunction with education and awareness programs providing sufficient community insight and understanding to accept these changes.

This paper will discuss a water management concept, which at its core has well defined property rights in water and its use, within a hierarchy of community based Water Management Plans defining the local 'Duty towards water'. Within such framework, water markets can be used as an effective means of moving water around between competing users within community defined environmental and social constraints. This is a report on work in progress.

2. UNDERLYING PHILOSOPHIES

The proposed water management concept builds on a number of fundamental philosophical beliefs, which will be outlined in this section.

To avoid any misunderstandings, or belief that this proposal should be anti-irrigator, the first point is that any system should be founded on long-term, secure and well-defined property rights in water. It is acknowledged that efficient and responsible high value water use requires significant long-term capital investments. Without adequately protected property rights, such investments can not be justified. The need for such rights has been widely accepted, and the shortcomings of existing rights widely acknowledged. Some fundamental requirements of such rights are discussed in Bjornlund and McKay (2000a).

Second, and equally important, such secure property rights should come with a fundamental reciprocal obligation, to use the water for the welfare of the community as a whole, and not only the water user, in which the community has vested the water. Just like it has recently been proposed for recipient of future Landcare funding (Toyne and Farley, 2000). This belief is founded on the fact that the water industry, compared to other sectors of the economy, employs a significant proportion of the public sector asset base (Industry Commission, 1990). The taxpayers, and the wider community, therefore, have a valid interest in the way this resource is used. Such interests are environmental, social, cultural and economic in nature. Interestingly, Syme et al. (1999) found, that one of the most important principles underlying peoples judgment of fairness in water allocation issues, is that water is owned by everyone and therefore should be managed for the overall public good.

Third, effective definitions of efficient and socially and environmentally responsible water uses and allocation issues can only be defined on local community levels. If such definitions are to be adhered to, adopted by the local water users, and effectively policed and implemented, local stakeholders and community groups must be actively involved in the decision-making process. Most public involvement in Australia today is consultative in nature and often the outcome has already been decided. Such tokenistic approaches result in lack of community ownership of the final outcome and difficulties in implementation (van der Lee, 2000). Syme et al. (1999) found that 'fair decision-making processes are of paramount importance to community acceptance of water allocation decisions' and that 'efficiency of use is a major determinant of the fairness of water allocation systems' (p 67).

Fourth, overall water policy aims and objectives need to be defined on the national or state level. How much water is available, and how much is needed for various sectors and regions of the community? Such priorities, aims and objectives need to be set down in a State Water Plan such as the one in SA (Government of SA, 2000). Catchment and Local Water Management Plans will have to be subject to such aims and objectives.

Fifth, the environment and riverine ecosystems have a legitimate right to water, and must be provided for in the form of in-stream flow definitions, and water rights to ensure particular environmental events such as flooding of the Barmah forest. Syme et al. (1999) found that a large proportion of people believe in the 'rights of the environment and its preservation for the range of uses for future generations' (p 67).

Sixth, water markets, in their own right, can not solve the re-allocation issue under the environmental and social constraints discussed above. Markets should be considered as good servants but poor masters (Young, 1999). This means, that markets can be successfully used to move water around between competing uses, within constraints set by a master, in the form of regulation, community produced Water Management Plans or other policy imposed limits. If the market was left as the master, water allocation issues would be driven by self-interests, with no ability to consider issues external to the parties conducting the transfer. Syme et al. (1999) also found that 'water markets alone are not considered fair or acceptable processes for allocating and reallocating water' (p 67).

3. THE WATER MANAGEMENT CONCEPT.

The water management concept pivots around four nodes. First, the separation of existing water rights into two distinctly different rights a new Water Right, separated from the land to which it traditionally was appurtenant, and a Water Use Right attached to a particular parcel of land or water using industry. Second, a hierarchy of water management plans, setting out aims and objectives of water resources use on state, catchment/regional, local and farm levels. Third, an overriding 'Duty towards water', produced on the local community level, defining efficient water use within the local area and setting environmental and social parameters for its sustainable use. This concept thus encompasses the duty of care for the environment proposed by the Industry Commission (1997). Fourth, a cost effective and timely market in Water Rights. With new innovative and flexible instruments, water markets can operate without the need for extensive evaluations of individual transfers.

3.1 The hierarchy of Water Management Plans.

A hierarchy of Water Management Plans should be developed with considerable community participation in the decision-making processes, to ensure coherent water planning from state to farm level. South Australia presently has part of such a hierarchy under the Water Resources Act (Scanlon and Burston, 2000). This feature of the Act, 'allows the water resources management plans to combine flexibility with legal enforceability, strong policy direction, comprehensive community participation and the raising of funds' (p1). The hierarchy consists of a State Water Plan, produced by the state government, defining the resource and setting the strategic directions for water management through out the state. Catchment Water Management Plans, produced by Catchment Water Management Boards, set out how water is going to be used and managed on a catchment level. Water Allocations Plans, produced by Catchment Water Management Boards or Water Resources Planning Committees, deal with allocation of prescribed water resources. Local Water Management Plans, produced by Councils, address water issues on the local government level.

This proposal acknowledges the concept of a hierarchy of Water Management Plans. It proposes changes to the Water Management Plans on the local level, and extends the concept to the individual farm level. The State Water Plan and the Catchment Water Management Plans are retained. The Catchment Water Management Plans cover too large an area, with too different social, environmental and economic conditions, to allow for sufficient detailed planning. The catchment should be divided into sub-catchments, or stretches of the river with uniform conditions for separate evaluation, and production of Local Water Management Plans. Looking at the River Murray in SA, different conditions apply within the highland irrigation areas, the swamp areas and the lower reaches around the lakes. The River Murray Water Resources Committee (1993) acknowledged this, and identified different impact zones. These could be used as the foundation for areas suitable for Local Water Management Plans to be produced by local Water Management Committees setting the social, environmental and economic constraints of water use within the area, in fulfillment of the State Water Management Plan.

The inclusion of Farm Water Management Plans is not new. The River Murray Water Resources Committee (1995) suggested the production of Irrigation and

Drainage Management Plans for all irrigated properties. This was, however, never implemented due to the complications associated with implementation and policing. This would, however, be significantly easier if the underlying conditions for such plans were set out in Local Water Management Plans, in conjunction with comprehensive community education and awareness programs. If local community members were aware how people ought to behave, and knew the consequences, to themselves, future generations and the environment, of community members violating such behaviour, self-policing would be very powerful.

Upon introduction, farmers should be given a suitable period to produce a Farm Water Management Plan. To ensure a socially equitable outcome, an advisory body could be set up assisting farmers in this process. Such a body could be funded through a rural adjustment program or a Catchment Levy, which is possible in both SA and Victoria.

Under this scenario, there is always the risk that special interest groups, within the community, take over the Committees and make decisions against the best interest of the wider community (Townsend and Pooley, 1995). The legislation will therefore have to clearly specify the hierarchy of water management plans and the composition of the catchment and local water management committees. The Act should also provide for a review process of the Local Water Management Plans by the Minister or a statewide expert panel. This review should be carried out against the provisions of the Act, the State Water Management Plan and the Catchment Water Management Plan.

3.2 'The Duty towards Water'

Reflecting the public good nature of water, a key concept in the process of Local Water Management Plans is the 'Duty towards Water'. The community has the rightful expectation that water users, in which the privilege of water use and ownership has been vested, are under an obligation to fulfill this 'Duty towards water'. The State Water Plan and the Catchment Water Management Plans will identify how much water is available within this particular stretch of the river. The local community will then first have to define how much is needed for the local ecosystems. Once this has been done the local committee can commit the rest of the water available for consumptive uses. Such process should take place in several stages.

First a code of best practice should be established for each water user group within the area. Such codes are in operation in Arizona in the USA, where the Department of Water Resources sets firm limits for how much water can be used by each class of users. For example, a mine can only use X ML of water per ton of ore crushed. Such limits incorporate that efficient mining practices reuse between 75% and 85% of the water. In a similar fashion it sets limits for how much water irrigators can use, dependent on crop water use figures within local areas and efficient irrigation methods. Such water use limits have been increasingly stringent as irrigation and water conveyance methods have become more efficient (Johnston and Caster, 1999).

Second, based on such codes, the water planning committee defines the local 'Duty towards water' for each water user group to ensure the fulfillment of the overall aims and objectives of the State Water Plan.

Third, such codes of best practice and 'Duty towards water' definitions should then be submitted to all existing Water Right holders and water users.

Fourth, based on these, individual water users will have to produce a Farm Water Management Plan or equivalent for other water users, specifying how the 'Duty towards water' will be fulfilled in their case.

The 'Duty towards water' definitions' once embedded in the Local Water Management Plans, will constitute minimum standards and be legally enforceable.

3.3 The separation of the Water Use Right from the existing Water Right.

Water Right holders should automatically have their existing right converted to a new Water Right. This should however only include the ownership of the water, and not any right to use it. Water use can only be activated by the granting of a Water Use Right. The Water Right should clearly specify within which geographical constraints a Water Use Right can be activated, and set out all other relevant conditions specifying the holder's long-term rights and obligations. Since the Water Right is removed from ownership of land, it can be owned by any legal entity, irrespective of where such entity is located. Since the Water Right does not convey any right to use the water, no assessment is necessary when such right is traded.

If the Water Right is given as freehold property, it must be defined as a share of the total resource. The Local Water Management Plan should define how the resource available for consumption is defined. If the Water Right is defined on a volumetric basis, it would be difficult to adjust, as the nature and condition of the resource changes, without giving cause for compensation, as was the case with fishing quotas in New Zealand (Young and McKay, 1995).

The Water Right should include a commitment, to ensure the water is actively used every year, by a holder of a Water Use Right. Such a clause would prevent speculators from withholding water from the market, and ensure that the community gets the defined benefit from the water. Failing to comply with this condition will cause the Water Right to be forfeited. The owner of such right will have to sell it, or it will be sold on auction, with the proceeds less cost going to the owner.

Based on Farm Water Management Plans, the local committee issues Water Use Rights, specifying the

permitted level of water use. This right should be volumetric, and the sum of all Water Use Rights should equate the total volume available for consumption. The Water Use Right does not convey any entitlement to receive the water, only a right to use. Access to water will be provided by a Water Right. Water Use Rights should not be subject to the holder having a Water Right, only that he or she has the ability to use the water so that the 'Duty towards water' is fulfilled.

Water Use Rights should only be given for a period of time, long enough to warrant the necessary investments in efficient high value water use, while short enough to ensure that the 'Duty towards water' can be adjusted to reflect changes in water use efficiency. A drop through mechanism, such as the one working within the NSW fisheries could be applied (Young, 1995). Under this, a Water Use Right would be granted for say 30 years, long enough to justify investment within most areas. The 'Duty towards water' would however be adjusted every 10 years, to reflect improvements in water use technologies. Every time the 'Duty towards water' is revised, the Water Use Right holders can revise their Water Management Plan, to fulfill the new 'Duty towards water'. Those who do this will automatically get their 30 years period extended by 10 years. Holders of Water Use Rights can opt not to revise their Water Management Plan, and still retain their original 30 years period. As an incentive, to actually renew the Water Management Plan every 10 years, a penalty could be imposed by a reduction in the Water Use Right, if/when the Water Management Plan is eventually renewed after 20 or 30 years.

Failing to fulfill the 'Duty towards water', after the initial grace period, or at any given time during the period of the Water Use Right, will result in the holder loosing the right but not any underlying Water Right. Such Water Right can be leased or sold.

3.4 Water markets within this scenario.

With the above framework in place, water trading can be made simpler and less costly, and more sophisticated market instruments can be adopted. With the separation of the Water Right and the Water Use Right, the former can be freely traded, since it includes no right to use the water. Any person can buy as much water as they like, but can only use the volume of water defined in a Water Use Right. The monitoring of this is quite simple, and is already carried out for billing purposes. The 'duty towards water' is thus ensured, and there is no environmental or third party concern, these were all sorted out in the process of developing the Local and Farm Water Management Plans.

The separation of the two processes removes the pressure from all parties involved. The developer of a new enterprise, or those planning to expand an existing enterprise, can either purchase the water in advance, as an opportunity arises, or can go through the water planning process first, and buy the water subsequently. The authority, and the local committee involved in approving the Water Management Plan, can do this thoroughly, without pressure from a buyer and seller eager to conclude a transaction. The process of producing and approving the Water Management Plan should also be reasonable straight forward, and associated with a high level of certainty about the outcome, due to the existence of the Local Water Management Plan, the code of best practice and the 'Duty towards water' specification.

Water can now be traded, invested and speculated in, much as any other commodity, opening up new avenues for water users. Irrigated farming, is becoming very capital intensive. Efficient, sustainable and high value water use requires significant investments. Lack of capital within farming is often a significant impediment to this process. Under the new framework, lease-back arrangements can be made, where persons with opposite tax positions can benefit from the ownership and use of a capital asset. This will convert the farmer's water asset into cash, enabling him or her to invest in more water efficient infrastructures, while retaining the long-term control of the water.

To fully comprehend the need for more sophisticated market instruments, it is necessary to understand the changes taking place in the demand structure within such markets, now and in the near to medium future. The success of the first generation of water market policies, the final impact of the cap on extractions from the Murray Darling Basin, as well as the final outcome of the process of allocating water to the environment, will generate cross-sectoral demand (Bjornlund and McKay, 2000a). Until now, almost 100% of all water trade has been agricultural to agricultural. As water trade moves water to more intensive and higher valued uses, regional centres grow, and demand from the associated industries and services, as well as from domestic, recreational and community uses, will increase and soon outstrip the licences such communities hold. Adelaide is under risk of exceeding its 5-year rolling average allocation under the Cap. Once this happens, the only way such centres and cities can obtain more water, is via the market, and there is only one potential source of supply – agriculture. Already one such urban community, along the River Murray, has introduced a levy for the approval of new urban sub-divisions to finance the purchase of additional water.

Until now water trade has mainly activated unused sleeper and dozer water (Bjornlund and McKay, 1998, 2000b) influencing the level of water prices, with social implications for irrigators forced, for financial or personal reasons, to sell actively used water (Bjornlund and McKay, 2000b, 1999). Once the market has absorbed the unused water, prices will have to rise to levels, which will fully reflect the water's value as a productive component of an irrigated property. The need to raise water prices to such levels is especially imperative within the discussed framework, since farmers not capable of fulfilling the 'Duty towards

water' will have to sell or lease their water right. Such irrigators would be active water users, most likely to suffer a financial loss at present market prices, making the process inequitable.

The use of more sophisticated market instruments, as well as some tax changes, would facilitate this process by justifying higher water prices. The use of instruments such as lease-back, options, and futures contracts, would enable water users with different risk, tax and financial positions, to benefit from such differences and improve their risk management options (Bjornlund and McKay, 2000c). There is no reason why investment companies should not hold a portfolio of water rights as part of their general property portfolio. These Water Rights could be leased to holders of Water Use Rights, under various pre-determined climatic or commodity conditions. This would allow supply sensitive water users, such as urban and horticulture/viticulture, to reduce the volume of Water Right held to a level of say 1 in 80 years and secure the remaining years by future rights or options. This would significantly increase the total value of the Water Right, because users each year would maximize the marginal value of using the water.

Present tax structures constitute an impediment to this process by favoring temporary trade. Under the proposed framework governments might be inclined to change depreciation rules since the whole concept ensures a more sustainable and efficient use of water resources (Bjornlund and McKay, 2000c).

4. CONCLUSIONS

Presently, most Australian jurisdictions are in the process of introducing new water legislation, in fulfillment of their obligation under the NCP. Such legislation includes provisions for the use of market instruments, public participation in, and devolution of, water resources management. It is, however, argued that such legislation is not sufficient to solve the issues of reallocating water resources to more efficient and higher valued users, which is necessary to ensure sustainable growth of water dependent industries and rural communities, as well as the environment.

It is argued that Local Water Management Plans, combined with a 'Duty towards water', are required to ensure socially, environmentally and economically sustainable water management. To ensure effective implementation, as well as local policing and monitoring, of such water plans, they have to be developed with real and not tokenistic public participation in decision making, following processes which are perceived to be fair and equitable.

Within such a framework, setting the social and environmental constraints for water reallocation, water markets can be used, as an efficient servant, to move water around between competing uses while overcoming the concerns raised by Syme et al (1999). Without such framework markets are likely to produce socially and environmentally undesirable outcomes.

5. ACKNOWLEDGEMENT

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The role of the Environment, Resources and Development Court in water resource appeals

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Summary
The Environment, Resources and Development Court in South Australia has jurisdiction to hear appeals under the *Water Resources Act 1997*. The appeal process is managed by the Court and recognises that many appellants will be lay people who have never appeared in a Court before. All parties to an appeal must attend a compulsory conference that seeks to obtain a settlement between the parties. If a settlement cannot be reached, then the matter proceeds to a hearing where members of the Court decide the matter. Expert witnesses who appear before the Environment, Resources and Development Court need to be aware of their obligations to the Court.

1. INTRODUCTION

Appeals made under the *Water Resources Act, 1997* are heard by the Environment, Resources and Development Court. The *Water Resources Act 1997* requires that all parties to the appeal attend a compulsory conference. If the parties at the conference do not settle the matter, then it proceeds to a hearing and the members of the Court determine the matter.

This paper discusses the Water Resources appeal process and the role that the Environment, Resources and Development (ERD) Court plays. The duty of expert witnesses who appear before the Court is also discussed.

2. THE ENVIRONMENT, RESOURCES AND DEVELOPMENT COURT

The ERD Court commenced operation on 15th January 1994 and was created as one of the outcomes of the 1990 State Planning Review. The ERD Court was established and operates under the *Environment, Resources and Development Court Act, 1993*.

The ERD Court has jurisdiction over the following Acts.

- *Development Act 1993*
- *Environment Protection Act 1993*
- *Heritage Act 1993*
- *Local Government Act 1934*
- *South Eastern Water Conservation and Drainage Act 1992*
- *Water Resources Act 1997*
- *Irrigation Act 1994*
- *Native Title (South Australian) Act 1994*
- *Land Acquisition (Native Title) Act 1994*
- *Mining Act 1971*
- *Opal Mining Act 1997*

The ERD Court is comprised of;

- Two District Court judges (one of whom is the Presiding Member)
- One Master
- Three full time Commissioners
- 24 part-time Commissioners (non-legally qualified members appointed for their specialist qualifications and expertise in areas relevant to the Court's jurisdiction).

The appointment of the part-time Commissioners by the Governor of South Australia is quite specific and states in the case of Water Resource Commissioners;
"**PURSUANT** to *Section 10 of the Environment, Resources and Development Court Act 1993* and *Section 144 of the Water Resources Act 1997*, **I, the Governor**, with the advice and consent of the Executive Council, appoint you to be a part-time Commissioner of the Environment, Resources and Development Court on the basis of my opinion that you have wide practical knowledge of, and experience in, the use, conservation or management of water resources, and I designate you as a Commissioner for the purposes of the Court's jurisdiction under the Water Resources Act 1997……"

At this time, there are five Commissioners who have been appointed to hear appeals under the *Water Resources Act 1997*.

Having accepted the commission from the Governor, all Commissioners are obliged to make themselves available to hear the appeals before the Court.

The ERD Court holds training and development sessions for all of its members. These sessions especially help the part-time Commissioners in developing skills in holding conferences and introducing them to alternative dispute resolution techniques.

3. OBJECT OF THE WATER RESOURCES ACT

The object of the *Water Resources Act 1997* is to establish a system for the use and management of the water resources of South Australia-

(a) that ensures that the use and management of those resources sustain the physical, economic and social well being of the people of the State and facilitate the economic development of the State while-

(i) ensuring that those resources are able to meet the reasonably foreseeable needs of future generations; and

(ii) protecting the ecosystems (including their biological diversity) that depend on those resources; and

(b) that, by requiring the use of caution and other safeguards, reduces to a minimum the detrimental effects of that use and management.

In dealing with Water Resources appeals, the ERD Court must act consistently with, and seek to further, the object of the *Water Resources Act 1997*.

4. WATER RESOURCES APPEALS

Section 29 of the *Water Resources Act 1997* states that a water licence is required by a person to take water from a prescribed watercourse, lake or well or to take surface water from a surface water prescribed area. These water resources are prescribed by the Governor, based on a recommendation of the Minister that the proposed regulation is necessary or desirable for the proper management of each respective water resource.

Section 142 of the *Water Resources Act 1997* stipulates the rights of appeal to the ERD Court. Appeals may be made to the Court on the following grounds;

1. refusal to grant a water licence, a well driller's licence or the imposition of conditions in relation to the licence,
2. refusal to grant an application for the transfer of a water licence or allocation,
3. variation, suspension or cancellation of a water licence,
4. a direction of the Minister or other Authority under the Water Resources Act 1997, and
5. restrictions imposed by the Minister to protect the ecosystem of a water resource that has not been prescribed.

In addition, the State of Victoria has a right of appeal to the Court against a decision to grant a water licence on the ground that the decision is contrary to the Borders Groundwater Agreement.

The majority of Water Resources appeals made to the Court relate to the Minister's refusal to grant a licence or a transfer of a licence within a prescribed watercourse or water resource.

All Water Resources appeals will involve the Minister responsible for the Water Resources portfolio being one of the parties to the appeal.

5. THE APPEALS PROCESS

The following sequence, as illustrated on Figure 1, is typical of an appeal under the *Water Resources Act 1997*.

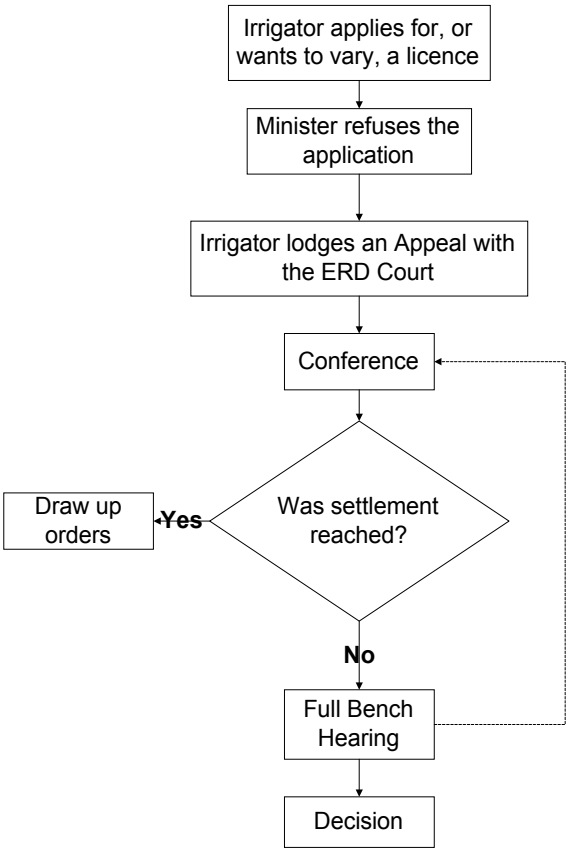

Figure 1: Water Resource Appeals Process

1. An irrigator applies to the Minister's delegate for a licence or to transfer or vary an existing licence.
2. The Minister's delegate may refuse the application, in which case a letter is forwarded to the applicant from the Minister setting out the grounds for the refusal together with an explanation of the applicants right of appeal to the ERD Court.
3. The applicant lodges a written appeal within six weeks to the ERD Court. The appeal must contain grounds for the appeal.
4. The appellant and a representative of the Minister are required to attend a conference, chaired by a member of the Court. The aim of the conference is to seek a settlement between the parties involved. If a satisfactory settlement can be reached, orders are drawn up by the Court to effect the agreement.

5. If the conference does not result in a full settlement, then the matter is listed by the Court Registrar for a hearing.
6. The matter is heard before the Full Bench of the Court, either in Adelaide or at a country location if the Court considers it appropriate.
7. The decision of the Court is published, together with reasons for it being made.
8. A right of appeal against a decision or order of the ERD Court lies with the Supreme Court of South Australia.

6. CONFERENCES

The *Water Resources Act 1997* requires an appeal to be referred in the first instance to a conference under section 16 of the *Environment, Resources and Development Court Act 1993*. Water Resources appeals will always have the Minister's representative as one of the parties. The other party is usually a landowner who may or may not be represented by legal counsel.

The compulsory conference is a venue where the parties involved in the dispute have control over the outcome through a negotiated settlement. Conferences are normally held within four weeks of an appeal being lodged. It is not unusual to have the conferences held in country areas near the prescribed area.

Conferences are chaired by a part-time commissioner who decides who can attend. The commissioner's role is to assist the parties to explore any possible resolution of the matter(s) in dispute. It should be realised that the commissioner is not a neutral facilitator at the conference.

Conferences are informal and confidential. Due to the confidentiality of a conference, parties are free to make any offers or suggestions they like in order to explore possible settlement options. Nothing said at a conference can be referred to at a subsequent hearing. In addition, the commissioner who chairs the conference will not sit on the bench to hear the appeal.

The conference may be adjourned and reconvened by the commissioner if it is thought that the adjournment will help in reaching a settlement. Adjournments are often made to allow a party time to gather information that is considered to be helpful to resolving the dispute. A conference may be reconvened even after it has been closed if the Presiding Member believes that the parties may reach a settlement. Adjournments also serve as valuable periods over which the parties may rethink their positions.

Parties to a dispute must send people who have been given the authority to make a settlement to the conference.

Any settlement reached at a conference;

- is legally binding on all parties, and
- must be consistent with the *Water Resources Act 1997*, and
- must not materially affect some third party who is not represented, and
- must not be significantly altered from the original application.

About 40% of all matters before the ERD Court obtain settlement at the conference, but only 25% of all matters go on to a hearing. This means that a significant number of appeals are withdrawn following the conference.

So, if a conference has not resulted in a settlement, has it failed? The answer is definitely not. Conferences allow for the exchange of all relevant information between the parties and thus allow for a greater understanding of the issues involved. They help to clarify the real issues in dispute, which allows the hearing to focus on these.

Conferences provide a venue where lay people, who may never have been to court before, can be introduced to the legal system and have the hearing process explained to them. They are also advised about bringing evidence and witnesses to support their claims.

7. HEARINGS

If a matter proceeds to a hearing before the ERD Court, then it is usually heard about 8 to 12 weeks after the conference, depending on whether the hearing is conducted in Adelaide or at a country location. Water Resources appeals are heard before a Full Bench, which consists of a Judge and 2 Commissioners.

The Court has an obligation to hear and determine any matter before it. That is, the Court must determine a matter. Once an appeal is lodged, it must be heard and determined. A matter may be referred back to the Minister for reconsideration, but will still return to the Court for determination.

A hearing is an adversarial approach to resolving a conflict between two or more parties. This is typical of all courts. The parties being heard at the hearing do not have a direct say in the outcome. This is determined by the Bench.

The ERD Court is not bound by the rules of evidence, but the parties to the appeal are. This means that the Court will allow evidence to be tendered if it can be of assistance to the Court in determining a matter.

Hearings are conducted in a relaxed but controlled manner. It is not uncommon that the appellant and his or her witnesses have never appeared in Court before. On the other hand, the Minister's delegate and his or her witnesses are usually very familiar with the Court system. Due to this, the Court provides assistance and direction on occasions to the inexperienced appellants and witnesses in so far as attempting to ensure that they put their case fully.

Evidence from the Minister is based on the numerous proclaimed areas in the State. The Minister presents a series of reports, policies and statements for each of the proclaimed areas, which is usually done at the first appeal in each particular proclaimed area. In subsequent appeals within the same proclaimed area, the Minister's evidence is accepted by the Court as having been previously tendered and can be referred to by the parties. The Minister's representative should make copies of these tendered documents available to the appellants.

The appellant is always asked whether they would like to challenge any part of the previously tendered evidence. If so, they will be given the opportunity to do so, and it is incumbent on the Minister to provide the relevant expert to the hearing to answer questions from the appellant.

Intervention from the Bench during the course of a witness presenting evidence can occur;

- if necessary to ask a technical question to properly follow and appreciate what the witness has said,
- to clarify an answer given by a witness,
- to protect a witness from undue harassment under cross examination,
- to keep parties to relevant issues,
- to keep a witness to his or her expertise, and
- to assist an unrepresented party to fairly present their case.

Questions from the Bench will be asked of witnesses at the end of cross-examination or re-examination;

- to test facts or opinions not already put to the witness, and
- to obtain his or her expert opinion on relevant matters within their expertise not already sought under examination or cross-examination.

If a member of the Full Bench holds significantly different views to that expressed by any witness, then those views will be put to the witness during the hearing for comment and opinion.

After the conclusion of the hearing, a written judgement is issued. The judgement will usually consist of;

- the question to be decided,
- the facts,
- the law (and criteria) to be applied,
- the reasoning to and the conclusions reached, and
- the order made.

8. EXPERT WITNESSES

Expert or technical witnesses appear in most Water Resources appeals. It is common for the Minister to rely on the statement and testimony of one or more expert witnesses. Appellants do not use expert witnesses as frequently as the Minister. However, in most cases where the appellant is represented by legal counsel, the appellant will also use an expert witness.

Expert witnesses that have appeared at hearings for Water Resources appeals include;

- hydrologists,
- hydro geologists,
- water resource managers,
- agronomists,
- economists, and
- land valuers.

The ERD Court has published

"GUIDELINES FOR EXPERT WITNESSES"
Practice Direction 5
Environment, Resources and Development Court.

All expert witnesses should make themselves familiar with this Practice Direction.

An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise. An expert witness cannot be an advocate for a party.

The opinion, and supporting reasons, of an expert witness should be put into a written report or statement. All opinions in the report should be qualified with reasons. It is important that all assumptions are clearly identified in the report.

Expert witness reports must be provided to the Court and exchanged between the parties prior to the start of the hearing. After the exchange of expert reports, it may be necessary to modify one or more of the reports based on the contents and opinions of the other expert reports. This can save valuable time during the hearing.

9. SUMMARY

The Environment, Resources and Development Court in South Australia has jurisdiction to hear appeals under the *Water Resources Act 1997*. The appeal process is managed by the Court and recognises that many appellants will be lay people who have never appeared in a Court before. All parties to an appeal must attend a compulsory conference that seeks to obtain a settlement between the parties. If a settlement cannot be reached, then the matter proceeds to a hearing where members of the Court decide the matter.

Expert witnesses who appear before the ERD Court need to be aware of their obligations to the Court.

Potential common law liability for the sale of treated wastewater for agricultural use[1]

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Summary
This paper addresses the potential common law liability of sellers of treated wastewater (private, State Government and municipal corporations) and those who discharge to sewers where farmers incur damage as a result of use of the treated water. The paper considers principally the law of negligence and addresses the law of contract only in relation to clauses purporting to exempt from liability for damage. The paper does not address any pollution control and other environmental legislation or trade practices legislation.

1. THE SITUATION TODAY - TURNING WASTE INTO DOLLARS

Like the Governments of many developed economies, Australian governments seem engrossed with the notion of commercialising public sector activities.

Both the private and public sectors are tending to view effective environmental management as being feasible only if it can be integrated into the market place to some degree or other; that is, if there can be a commercial return. Whatever the merits and ideological acceptability of this approach, it is currently with us and likely to remain so for the forseeable future.

The goal of government water management agencies to pursue commercial benefits from their activities is exemplified by section 27(1) of the West Australian *Water Corporation Act, 1995*. This clause stipulates that among other functions of the Corporation, the organisation is:

(a) *to collect, store, treat, market and dispose of wastewater and surplus water;*
(b) *to manufacture and market any product or by-product that relates to, among other functions, the treatment of wastewater.*

Treated wastewater is one product which has economic and commercial value. It would appear far more acceptable for such "waste" to be put to productive use rather than have it discharged to the marine or other environments where its potential for damage and the creation of future economic loss is now well documented.

However, as is the case with all products placed on the market, the issue arises as to the potential legal liability of those selling the waste. It also arises in the case of third parties such as industry which may be more remotely contributing to the quality of that waste product through the discharge of industrial wastes to the sewerage system.

It is recognised that local governments in Australia may also be engaged in the treatment and on-selling of wastewater. Although historically the law has offered some protection to local governments in relation to their liability for nonfeasance (the failure to do an act which ought to be done), there is no such protection offered to local authorities for misfeasance; that is, the improper performance of a lawful act (see *Sutherland Shire Council v Heyman*). Whilst the courts have not provided a totally unambigious distinction between misfeasance and nonfeasance, it is likely that the on-selling of treated wastewater by a municipal authority would be a misfeasance and therefore place the authority in the same position as that of any other corporation.

2. LEGAL RISK - A HYPOTHETICAL

Imagine a situation where a public or private corporation ("the operator") is operating a wastewater treatment plant receiving domestic and industrial waste from the State's sewerage system. The operator of the plant on-sells and delivers treated water to an agricultural user ("the purchaser") under a contract between those parties. The treated wastewater contains a damaging impurity which has been discharged illegally to the sewers by an industry with its consequent entry to the wastewater treatment plant.

Imagine, further, that the Corporation is aware of the existence of the impurity, but was not aware of its potential damage to a particular crop or stock which is adversely affected by its use.

Assume also that the particular impurity is traceable to an individual industrial manufacturer ("the manufacturer") who has been discharging the substance to the sewers in breach of its trade waste discharge authorisation under the relevant State legislation. However, the company also was not aware of the potential of the substance to damage crops or stock although it was aware that the operator of the

[1] This paper is not legal advice and should not be used as such. Any person who believes he or she has a legal problem raised by or relevant to this paper should obtain legal advice from an appropriately qualified lawyer before taking further action.

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wastewater treatment facility intended to on-sell the treated water.

In these circumstances, the injured party would almost certainly bring legal action against the two parties to recover damages. What is the potential liability of the operator and the manufacturer, respectively?

2.1 The principles of common law liability

Contract

On the assumption that there exists a contract between the user and seller of the treated wastewater it would be open to the purchaser who sustained loss to sue for breach of contract. Subject to the terms of the contract, the purchaser would in all likelihood seek damages for the breach. The issue of contractual liability is likely to be closely linked to the issue of negligence and claims in both negligence and breach of contract would be brought in the same proceedings.

The manufacturer, however, has no contractual relationship with the purchaser. Consequently, although it is likely that the manufacturer would be joined by the purchaser as a party to the proceedings, the claim would be framed in negligence, not contract.

Negligence

In broad terms, to establish liability in negligence the following elements have to be proved by the party claiming damages or any other remedy:

- a duty of care owed by the respondent to the plaintiff;
- a breach of that duty of care;
- the incurring by the plaintiff of foreseeable loss or damage; and
- a causal link between the breach and the damage.

2.2 Establishing a duty of care

The basic test for establishing a duty of care owed by the operator in this situation is to ask the question "Was the consumer (the purchaser) so closely and directly affected by the actions and behaviour of the operator in treating and supplying the wastewater that the operator ought reasonably have had the consumer in contemplation when treating and supplying the wastewater?" If the answer is "yes" a duty of care is owed by the operator to the consumer (purchaser) and the other three elements mentioned above must be addressed.

The same formula would be applied in establishing whether the manufacturer owed a duty of care to the ultimate consumer of the treated effluent - the farmer.

2.3 Establishing a breach of the duty of care

Whether a person who owes a duty of care has breached that duty is a question of fact in each case. Importantly, the existence of a foreseeable risk of injury does not of itself indicate a breach. The magnitude of the risk and its degree of probability must be considered along with other factors *(*see *Wyong Shire Council).*

The extent of the duty of care (that is, how much care has to be taken by the respondent) is not absolute. It is proportional to the risk involved (see *Adelaide Chemical and Fertilizers*).

What happens therefore, as in the hypothetical situation considered above, where neither the operator nor the manufacturer was aware that the impurities in issue could damage crops or stock using the wastewater? And what if there is a body of literature relatively recently developed which, at the very least, raises the issue of the risks associated with those particular impurities if applied to crops or consumed by stock? That is, the literature indicates some risk associated with the use of water containing the impurities.

Would the courts determine that the operator should have known of the existence of the literature and, thus, the risk? And if it were aware of the risk what is the responsibility of the operator to undertake further research to more clearly establish the extent of the risk involved? Furthermore, what is the responsibility of the manufacturer who is knowingly discharging wastes in breach of it trade waste discharge authorisation?

The Supreme Court of Victoria has addressed this type of issue in *Thompson's Case.* There, the Supreme Court relied on a judgement of the Court of Appeal in England (*Wright v. Dunlop)* dealing with the supply of an allegedly cancer-causing product. The Supreme Court held that the supplier of a product had a duty to take all reasonable steps to be satisfied that there was not substantial risk of any substantial injury to health on the part of the persons likely to use or to be brought into contact with the substance in its normal use.

In answer to the question "What are reasonable steps?" the Supreme Court stated that this depended on the particular facts. However, failure to take reasonable steps in the circumstances to keep up to date with knowledge of developments regarding the safety of the product and to act promptly and appropriately if the information indicated particular consequences of the product's use was a breach of the duty of care owed by the manufacturer.

The Court of Appeal also indicated that if the manufacturer later discovers scientific evidence indicating a lack of safety in its product, the manufacturer must fulfil its duty of care by taking appropriate action. This may include possible withdrawal of the product from the market, depending

upon the gravity of the consequences if the risk should become a reality.

On the basis of the above, if the operator of a wastewater treatment plant were aware that its product contained potentially deleterious substances, there is little doubt that it exposes itself to potential liability through a breach of its duty of care that it owes to the consumer if it fails to act to avoid harm arising to the consumer.

If the operator subsequently becomes aware of a possible risk involved with the consumption or use of the water, it would appear to have a duty to further investigate the likelihood and extent of potential harm and, depending on its finding, to act accordingly to protect the consumer of the water.

Whilst it is clear that what is reasonable in the circumstances will depend entirely upon the prevailing facts, it is equally clear that an operator of a wastewater treatment plant may not turn a "blind eye" to the possibility of damage to another party as a consequence of its provision of the water to that party. It would appear that a duty is imposed on the provider of the water to take reasonable steps to establish the risks involved to other parties should it continue to provide water which contains impurities at levels which are potentially damaging to that consumer.

Although the case law does not consider circumstances envisaged in the hypothetical situation considered here, it is equally likely that if the manufacturer owes a duty of care to the consumer of treated wastewater, then it also would be unable to plead as a defence ignorance of the damaging qualities of the substance it discharges to the sewers.

2.4 Proving loss or damage

To succeed in negligence, the plaintiff must prove damage and also prove that the damage was reasonably foreseeable. In the hypothetical being considered here, the possibility of the users of treated effluent containing impurities being damaged would, in all likelihood, be regarded by the courts as foreseeable although this may depend to some degree on the state of scientific knowledge regarding the risks to crops and stock associated with exposure to certain chemicals.

2.5 Causation

In any claim in negligence the plaintiff must prove that the defendant's breach of a duty of care caused the damage sustained and that there has been no break in the chain of causation between the defendant's damage and the plaintiff's actions.

The issue of what circumstances can contribute to a break in the causal link is particularly important with respect to the manufacturer because the law provides that the chain of causation may be broken if there is the opportunity for intermediate inspection.

Although the law appears unclear on the issue, it is arguable that the operator has had the opportunity for intermediate inspection through water quality testing prior to sale. This may give an indication of the risk and the means of warning the subsequent user of the product - the farmer, thus breaking the chain of causation (see *Griffith v. Arch Engineering Company*).

On the other hand the courts could apply the principle that a person who has created a potentially damaging situation cannot hide behind a reasonable expectation of intermediate inspection unless the expectation was strong enough to justify him in regarding the contemplated inspection as an adequate safeguard to a person who might otherwise suffer harm (see *Jull v. Wilson*).

2.6 Exclusion clauses

Davis v Pearce Parking Station and *Macleay Pty Ltd v Moore* are authorities for the proposition that one can contract out of liability for negligence. In most cases sellers of water would be endeavoring to include a clause in the contract excluding liability for damage arising from the use of treated wastewater. However, it would be equally likely that a purchaser would refuse to sign a contract which purported to exclude liability in relation to an issue as critical as the fitness of the water for application to crops or stock.

Even if such an exclusion clause were to be incorporated into the contract, the issue arises as to whether or not as a matter of construction the court would uphold the validity of a clause purporting to exclude such a fundamental term of the contract: that is, that the quality of water is suitable for the contracted use (See *Smeaton Hanscomb & Co Ltd v Sassoon I Setty Son & Co (No 1)*).

2.7 Statutory protection

It would be open to statutory corporations to have introduced into their legislation provisions which protect the body from liability in the circumstances considered in this paper. However, the courts are generally reluctant to allow too wide a scope of protection from such statutory provisions.

The recent case of *Puntoriero v. Water Administration Ministerial Corporation* dealt with a claim in negligence by potato farmers against the Corporation for damage arising from the supply of polluted irrigation water.

The farmers appealed against a determination of the New South Wales Court of Appeal that a statutory immunity protected the Corporation from liability. A majority of the High Court held that such provisions must be jealously or strictly interpreted and confined the application of the provision in this case to the functions of the Corporation which involved interferences with other persons and properties. The Court held the

protection did not extend to the entry into contractual relationships for the supply of water.

3. CONCLUSIONS

3.1 Common law liability

The sale and provision of treated wastewater by operators of wastewater treatment plants carries with it the risk of liability in negligence for damage sustained by a consumer of that product. This will depend upon whether the damage was reasonably foreseeable and this, in turn, will depend on the law's expectations about the knowledge that the operator should possess or obtain regarding the risks involved.

Although not in a direct relationship with the consumer of the treated water, a company which discharges damaging substances to the sewers in breach of its authorisations also faces potential liability. It will not necessarily be open to that party to rely on the fact that the operator had the opportunity to intervene by way of its quality control practices and take appropriate protective action if it in fact did not.

Any attempt by the seller to rely on an exclusion clause will not necessarily be successful.

3.2 Entrepreneurship and risk

Successful entrepreneurs take risks. It is preferable, however, that the risks, including potential legal liability for actions, be appreciated when undertaking a business venture. These should apply even if the arrangement has not only a commercial return for the supplier of a product such as treated wastewater but also a public environmental benefit.

It should also be borne in mind that the trend to commercialisation of public sector services will encourage those charged with responsibility for "profitable service delivery" to provide a perspective on risk which may be somewhat different from the views of engineers and scientists. Corporations involved in the commercialisation of wastewater products would be wise to introduce and maintain risk management processes which take account of this type of conflict.

It is also important that manufacturers recognise that the shift by governments from publicly- funded pollution management to the commercialisation of the community's waste stream may expose them to common law liability with respect to their contribution to the waste stream and its potential to damage consumers.

4. LIST OF CASES

Adelaide Chemical and Fertilizers Company Pty Ltd v. Carlyle (1940) CLR 514

Davis v Pearce Parking Station Pty Ltd (1954) 91 CLR 642

Griffiths v. Arch Engineering Co (Newport) Ltd and Another (1968) 3 A11ER 217

Jull v Wilson and Horton (1968) NZLR 88

Macleay Pty Ltd v Moore (1992) Aust Torts Reports ¶81-151 at 61,151

Puntoriero v. Water Administration Ministerial Corporation (1999) HCA (9 Sept. 1999)

Smeaton Hanscomb & Co Ltd v Sassoon I Setty Son & Co (No 1) [1953] 1 WLR 1468 at 1470

Sutherland Shire Council v Heyman (1985) 157 CLR 424

Thompson v Johnson and Johnson Pty Ltd and Anor (1991) Aust. Torts Reports 81-075

Wright v. Dunlop Rubber Co (1972) 13 KIR 255

Wyong Shire Council v. Shirt (1979 - 80) 146 CLR 40

The role of the expert witness
Advocacy v obligations

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1. WHAT IS AN EXPERT?

An expert is a person who has gained a specialised knowledge of a particular field of endeavour by reason of training, study or experience. As a result of having such knowledge the person is entitled to give evidence in the form of opinions rather than merely as to facts.

An expert is therefore in a privileged position in litigation. He or she may give opinions on which the Court is likely to rely heavily being (in theory at least) being concerned with material in relation to which the Court lacks the same degree of expertise.

Having recognised the privileged position of the expert along with that privilege comes the inevitable obligation.

The need for the expert to pay heed to these obligations is accentuated when one appreciates the sceptical, some might say cynical, attitude that the Courts have exhibited to expert witnesses and their testimony over the years.

As one English Judge put it:

> "In matters of opinion I very much distrust expert evidence for several reasons. In the first place, although the evidence was given on oath, in point of fact the person knows that he cannot be indicted for perjury, because it is only evidence as to a matter of opinion …. but that is not all. Expert evidence of this kind is evidence of persons who sometimes live by their business, but in all cases are remunerated for their evidence. An expert is not like an ordinary witness who hopes to get his expenses, but he is employed and paid in the sense of gain, being employed by the person who calls him Now it is natural that his mind, however honest he may be, should be biased in favour of the person employing him, and accordingly we do find such bias …. Undoubtedly there is a natural bias to do something serviceable for those who employ you and adequately remunerate you".

Lord Arbinger v Ashton (1873) 17 CR Eq. 358 at 373-374 (per Sir George Jessell):

One hundred years later the Federal Court had this to say:

> "Experience suggests that too often expert witnesses display a degree of partiality whereas Court appointed experts may be expected to be indifferent as to the result of the case"
> Newark Pty Ltd v Carl & Civic Pty Ltd (1987) 75 ALR 350 at 351.

2. THE OBLIGATIONS

The expert's obligations fall into three areas:

General Duty to the Court

- An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise.
- An expert witness is not an advocate for a party.
- An expert witness' paramount duty is to the court and not to the person retaining the expert.

The Form of the Expert Evidence – The Report

- An expert's written report must give details of the expert's qualifications, and of the literature or other material used in making the report.
- All assumptions made by the expert should be clearly and fully stated.
- The report should identify who carried out any tests or experiments upon which the expert relied in compiling the report, and give details of the qualifications of the person who carried out any such test or experiment.
- Where several opinions are provided in the report, the expert should summarise them.
- The expert should give reasons for each opinion.
- At the end of the report the expert should declare that "[the expert] has made all the inquiries which [the expert] believes are desirable and appropriate and that no matters of significance which [the expert] regards as relevant have, to [the expert's] knowledge, been withheld from the Court".
- There should be attached to the report, or summarised in it, the following: (I) all instructions (original and supplementary and whether in writing or oral) given to the expert which define the scope of the report; (ii) the facts, matter and assumptions upon which the expert has been instructed to consider.
- If, after exchange of reports or at any other stage, an expert witness changes his or her view on a material matter, having read another expert's report or for any other reason, the change of view should be communicated in writing (through legal representatives) without delay to each party to whom the expert witness's report has been provided and, when appropriate, to the Court.

- If an expert's opinion is not fully researched because the expert considers that insufficient date is available, or for any other reason, this must be stated with an indication that the opinion is no more than a provisional one. Where an expert witness who has prepared a report believes that it may be incomplete or inaccurate without some qualification, that qualification must be stated in the report.
- The expert should make it clear when a particular question or issue falls outside his or her field of expertise.
- Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the opposite party at the same time as the exchange of reports.

3. GIVING EVIDENCE

"An expert witness called may have a number of duties. Sometimes he will be an employee of a party to an appeal, sometimes he will be a private consultant retained by a party to an appeal, whilst at other times he may be a person neither in the employ of a party to an appeal nor retained by that party to an appeal but a person whose knowledge is not normally available to a private individual but is considered by a party to an appeal to be necessary called as an expert witness so that the Board may take into account all relevant maters pertaining to the appeal in reaching its determination.

Sometimes such a witness may come voluntarily. At other times that witness may come only pursuant to a notice issued by the Board, at the request of a party, compelling attendance. Not ever expert witness to whom a notice is issued will for reasons elsewhere referred to, be an involuntary witness, but any one who subpoenas an unwilling expert witness should not complain unnecessarily if that witness does not meet the expectations of the party calling him. The duty to the party calling him of an expert witness, whether he comes voluntarily or under subpoena, is not of concern to the Board.

The Board itself is entitled to and has called an expert witness of its own motion and in that case no question of any duty to a party to an appeal arises.

Each expert witness does owe a duty, no matter how he arrives before the Board, which concerns the Board.

That is the duty of the expert witness to the Board which represents in its particular sphere a special arm or branch of the State. An expert witness, like any ordinary witness, may give evidence of pure facts, but his principal function as an expert is not to relate facts but give evidence of his opinion. The expert witness is the only kind of witness who is allowed to state his opinion. The opinion must be the expert's own opinion. It is of little use to this Board or to a Court unless it is carefully formed.

Like any other witness, an expert witness, should carefully listen to a question asked of him, answer exactly that question, truthfully and as shortly as possible, without any concern at all for the apparent consequences of the answer. To the expert witness, in answering a question, it should be a matter of complete indifference what the Board believes about his answer. The expert is before it simply to tell the truth and to give his opinion and what weight the Board attaches to his evidence should be absolutely no concern of the expert.

In cross-examination every question should be answered "yes" or "no" by the expert, if it is possible to do so. It may not be possible to do so, but in such a case, then the expert should give the shortest answer which the nature of the question allows. At the same time it should be remembered that it is quite permissible for an expert, when asked a question in cross-examination, to reply, "Yes, but I would like to qualify that answer in the following way", and then go on to qualify the simple answer. Indeed when a general question is put to an expert and he give s a general answer "yes" or "no" which is true, but where there are qualifications, they ought to be stated by him.

It may be that in the course of, and perhaps as a consequence of, being asked questions, an expert witness may be persuaded to a contrary opinion. If that happens the expert should admit it.

An unfavourable impression can so easily be given by an expert witness who considers for some reason or other, which no longer appears from his answers to questions to be justified, that he should not budge from the opinion he expressed in the first place. If during his evidence an expert witness becomes convinced that his first opinion was not quite so good as he first thought, then he should say so.

A court or tribunal will, from a nature of things, take much more notice of a man who concedes that, on second thoughts, perhaps he was not quite right on a point than it will of a man who obstinately refuses to conceded what has patently been made out as a good point against him but looks around for reasons for supporting something that is all too obviously, from his own words and perhaps his demeanour, no longer supportable. An expert witness should always concede, in such a situation, what he genuinely thinks ought to be conceded. One does far less harm that way than by sticking to something which is untenable. An expert witness, like every other witness, must be sure that every answer is absolutely honest.

An expert witness may in answer to a question say that he has no opinion on a particular matter if he

truly has no opinion. If he is asked a question requiring an expression of opinion outside his field he should say so.

However an expert witness must appreciate that generally speaking he has no right to refuse to answer any question put to him whilst he is before the Board.

The expert witness is, of course, not allowed to express his opinion on what the law is, unless of course he is a qualified expert called to give evidence about foreign law, for what the law is for the Board, after considering submissions made to it as to what the law is by counsel or other advocates, to determine.

An expert witness in answering questions is required, as we have said, to give his own opinion: it is not his obligation to express through his own evidence the policy, say, of a government department, although if a question touching such a policy is put to him and he is aware of that policy and he is authorised to reveal such policy, in planning appeals, at the least, we can see no objection to him doing so.

We can perceive difficulties arising under the Act in cases in which an expert planner holding the office of Director of Planning under the Act might be called as a witness. This situation could arise in a case such as the present. The appeal is against a decision of the respondent Director of Planning and the respondent Council. The Director of Planning as a respondent did not tender as a witness the expert planner who as an individual holds that office. Whilst we do not decide the point in this case our present feeling is that it would be most improper for one of the other parties to an appeal against more than one planning authority to attempt to compel the attendance before the Board of the individual holding the office of Director of Planning as an expert witness, whilst the Director of Planning if a party as a party did not present himself as an individual as a witness on his own behalf.

The position may be quite different in a case in which the Director of Planning is not a party, but in such a case if the individual holding that office should be called as an expert, he would be called purely as an expert witness in his own field and not as Director of Planning.

Generally speaking it would appear to us that it would be most unreasonable for the parties to appeals who are in a position to call evidence from expert witnesses outside the Government Service to assist their case in any particular appeal, to attempt to make unnecessary use of the services of experts in the Government Service by seeking from the Board an order requiring the attendance of an expert in the Government Service before it.

A member of the Public Service, if qualified as an expert and a witness, must, in our opinion, divorce himself from his position as a member of the Public Service and as an expert give to the Board his views as an expert untrammelled by any position he may hold. The views will be those of the expert as an expert, not the views of the Public Service or of a government department or branch of the Public Service". See *Regano Ind v D of Planning and Meadows DC* 1969 SAPR 89 at 105.

4. ADVOCACY

Whilst it is true to say that an expert is not an advocate for a party he may nevertheless engage in advocacy albeit only in a limited sense.

As S Shaw wrote in *The law and the expert witness* (1976):

> "One often hears it said that an expert witness should not appear to be an advocate in the case. In one sense this is true. He must not contend for a particular outcome or result one way or the other. That is not his business. But he must be an advocate for the opinion he expresses about a matter which may have a bearing on the ultimate outcome of the trial… He must not be a protagonist of the party by whom he has been called but he is a protagonist of the opinion he expresses."

A witness who is seen as a representative or agent of a party exposes himself to a change of bias.

Some areas where the potential for a charge of bias may arise are:

(a) Preparation of the application to the Council:
In Alvaro v City of Charles Sturt [1999] SAERD 6 the expert had been engaged from the outset by the appellant.

In the course of his involvement he had provided an initial advice prior to the application for development authorisation to the appellant. He had also signed the application for development authorisation.

Commissioner Wallman concluded that his professional integrity, independence and objectivity was not in question but that it was "not conducive to a perception of independence for a consultant engaged by an applicant, who may some day be called as an expert witness, to sign the form of application for consent ... or a notice of appeal".

(b) Preparation of the Report:
In Whitehouse v Jordan (1981) 1 WLR 246 at 256-257 Lord Wilberforce noted that the role of lawyers in the preparation of experts' reports may not always be salutary, especially if it is taken to extremes:-

> "While some degree of consultation between expert's and legal advisers is entirely proper, it [is] necessary that expert evidence presented to the court should be, and should be seen to be, the independent product of the expert."

Lord Denning in the Court of Appeal said:

> "The joint report suffers to my mind from the way it was prepared. It was the result of long conferences between the experts and the counsel and it was actually "settled" by counsel."

(c) Evidence Outside Expertise

In Tysoe v City of Unley & Eldercare (1998) EYLR 613 the Court expressed its concern about experts giving evidence on subjects beyond their level of expertise.

The Court observed that the expert had given an opinion (on parking and traffic matters unsupported by any research or relevant knowledge and not expressed to be reliant on any qualified expert in traffic and parking sufficiency matters) that the number of carparking spaces was insufficient.

The Court acknowledged that an expert planning witness is qualified to comment on matters addressed by the Development Plan but expected the opinion to be supported either by research or comparative knowledge or the opinion of another suitably qualified expert.

The Court found that the expert's unsupported opinion raising as it did no more than the possibility of a carparking insufficiency was not helpful to the Court.

(d) General Advocacy

(a) In Barossa Region Residents v D C Angaston and Grosser (1996) EDLR 667 commenting on the expert as an advocate the Court said:

> "At least one of the expert planning witnesses who appeared before us perceived that his role in giving expert evidence to the Court was different from his role in preparing and speaking to a statement of effect for a development application for a kind of development that is non-complying and "acting on behalf of (his client)". We do not accept that the role of a professional planning expert, in preparing and giving evidence to this Court should extend to being an advocate for his or her client's proposed development. While it is not for us to comment on the role of a planner advising his or her client prior to the matter coming to this Court, we would be surprised if the planner's role in preparing and advancing a statement of effect, should extend to one of advocacy. We comment thus because it seems to us that the credibility of the evidence of a professional expert in this Court might be affected by evidence that tends to show that the same professional expert, by his action prior to the matter coming to this Court, clearly acted as an advocate for his or her client's proposed development and not as an independent professional expert."

The highwater or perhaps the low-water mark of experts as advocates occurred in Ward v The Queen (1993) 96 CR App. R 1 at 51, the case of the alleged IRA bombers which inspired the film "In the Name of the Father".

In that case the Court of Appeal noted that:

> "Three senior RARDE scientists took the law into their own hands, and concealed from the prosecution, the defence and the court, matters which might have changed the course of the trial. The catalogue of lamentable omissions included failures to reveal actual test results, the failure to reveal discrepant Rf values, the suppression of the boot polish experimental date, the misrepresentation of the firs firing cell test results, the concealment of subsequent positive firing cell test results, economical witness statements calculated to obstruct enquiry by the defence, and, most scientists knowingly placed a false and distorted picture before the jury. It is in our judgment also a necessary inference that the three senior RARDE forensic scientists acted in concert in withholding material evidence"".

The court later commenced on the process which had brought about these results:

> "Forensic scientists may become partisan. The very fact that the police seek their assistance may create a relationship between the police and the forensic scientists. And the adversarial character of proceedings tends to promote this process. Forensic scientists employed by the government may come to see their function as helping the police. They may lose their objectivity. That is what happened in this case".

5. CONCLUSION

A truly independent expert is a vital ingredient in our system of litigation. An entirely objective analysis of the problem before the Court, reflecting on both the strength and weaknesses of the case, is of inestimable value to the Court and ultimately to a decision in accordance with the substantial merits of the case.

On the other hand an expert acting as advocate effectively undermines the system and leads to the Court as mistrusting the very witness upon whom it should be able to most safely reply.

In the end however the expert who acts as an advocate loses the most important thing for a professional witness namely independence and ultimately his or her integrity.

6. CASE LIST

Alvaro v City of Charles Sturt [1999] SAERD 6
Barossa Region Residents v D C Angaston and Grosser (1996) EDLR 667
Lord Arbinger v Ashton (1873) 17 CR Eq. 358 at 373-374 (per Sir George Jessell)
Newark Pty Ltd v Carl & Civic Pty Ltd (1987) 75 ALR 350 at 351.
Regano Ind v D of Planning and Meadows DC 1969 SAPR 89 at 105.
Tysoe v City of Unley & Eldercare (1998) EYLR 613
Ward v The Queen (1993) 96 CR App. R 1 at 51,
Whitehouse v Jordan (1981) 1 WLR 246 at 256-257

Environmental flows in South Australia: science, law and reality

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Summary
Currently, a number of scientific and legal factors impede the determination and implementation of environmental flows in South Australia. Four priority responses are suggested if better provision of environmental flows is to be achieved. These include proactively addressing the environmental flows needs of under-developed catchments; the formation of stronger links between environmental flows policy and system operating rules; adoption of a commitment to an ecosystem services approach in managing water resources; and finally, implementation of effective monitoring to enable continuous review and improvement, and accountability in delivery of environmental flows outcomes.

1. A LEGISLATIVE FRAMEWORK FOR ENVIRONMENTAL FLOWS

The development of water resources for irrigation, industrial and urban purposes has underpinned much of Australia's economic growth. But historically, the process of allocating water has had little regard for other uses, or the need to manage the environmental and social impacts of water use. We now understand that it is essential to provide adequate water to protect the physical and ecological processes and features of a riverine system. Failure to do so will cause degradation of the very resource that underpins our economy and society.

The need for reform of the Australian water industry has been recognised by both Federal and State Governments through the Council of Australian Governments (COAG) Water Reform Agenda (ARMCANZ, 1995). The elements of this agenda that are specific to the environment require that:

- the environment be recognised as a legitimate user of water;
- environmental water entitlements be legally recognised as an essential component of any water allocation system;
- environmental water allocations be made on the basis of the best scientific information that is available;
- environmental allocations be reviewed 5 years after they have been determined; and
- any future water developments, such as dams or irrigation schemes, be ecologically sustainable.

Following from the COAG agreement, the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ & ANZECC, 1996) defined a goal and twelve supporting principles for providing water for the environment within the broader context of water allocation. The document defined environmental water requirements (referred to here as environmental flows) as 'the water regimes needed to sustain the ecological values of aquatic ecosystems at a low level of risk'.

Given that some water resources are over-allocated in the sense that the full environmental flow requirement cannot be met, negotiation between stakeholders is required to establish flows for environmental protection. Such flows are defined to be environmental water provisions, meaning 'that part of environmental water requirements that can be met' (ARMCANZ & ANZECC, 1996).

South Australia is a signatory to both the COAG *Water Reform Agenda* (ANZECC, 1995) and the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ & ANZECC, 1996). These national policies are reflected in the State's *Water Resources Act 1997* (the Act). The object of the Act is *inter alia*, to establish a system for the use and management of the water resources of the State in order to protect the ecosystems (including their biological diversity) that depend on those resources (Section 6(1)(a)(ii)). The Act provides for a modern approach to water management, which involves:

- A more holistic and ecologically sustainable approach to water resources management. The object of the Act clearly articulates the core elements of ecologically sustainable development. All parties involved in the administration of the Act must act consistently with, and seek to further, this objective.
- Management of water resources via a hierarchy of water plans that are prepared and reviewed every 5 years, through a process that requires extensive community involvement. These plans are the:
  - *State Water Plan*, prepared by the Minister, which establishes the strategic policy framework for water resources management and use in the State;
  - *catchment water management plans*, prepared by catchment water management boards to provide long-term direction, impetus and coordination to water management initiatives at the regional;
  - *water allocation plans*, prepared for prescribed water resources by boards or water resource

planning committees, and providing a range of controls over the allocation, licensing, transfer and use of that prescribed resource; and

– *local water management plans* prepared by councils for their respective municipalities.

The *State Water Plan* (Government of South Australia, 2000) adopts the goal of the *National Principles for the Provision of Water for Ecosystems*, which is 'providing water for the environment to sustain and where necessary restore ecological processes and biodiversity of water dependent ecosystems'. The *State Water Plan* also presents policies and principles for developing and implementing water plans, to protect and manage the ecological values of water-dependent ecosystems in South Australia.

While all of the plans outlined above influence the determination and implementation of environmental water needs, the legislative requirements for water allocation plans are most prescriptive. According to Section 101 of the *Water Resources Act 1997*, a water allocation plan must:

101. *(4)(a) include an assessment of the quantity and quality of water needed by the ecosystems that depend on the water resource and the times at, or the periods during, which those ecosystems will need that water; …*

(c) provide for the allocation (including the quantity of water that is to be available for allocation) and use of water so that:

(i) an equitable balance is achieved between social, economic and environmental needs for the water; and,

(ii) the rate of use of the water is sustainable; …

101. *(6) Where the taking, or the taking and use, of water from a water resource has, or is likely to have, a detrimental effect on the quantity or quality of water that is available from another water resource, take into account the needs of persons and ecosystems using water from its own resource.*

Therefore, the combination of the COAG water reforms, the *National Principles for the Provision of Water for Ecosystems*, and State legislation including the *Water Resources Act 1997*, forms the legal framework for determining and implementing environmental flows in South Australia. However, our ability to deliver environmental flows is debatable.

2. DETERMINING ENVIRONMENTAL FLOWS

As outlined above, South Australia has gained the legislative power to determine and implement water for the environment in the past 5 years. The two key questions are:

- Do we currently have the scientific know-how to determine environmental flow requirements?
- Does the law, or the current legislative framework, provide for meaningful and useful specification and provision of environmental flow requirements?

The *National Principles for the Provision of Water for Ecosystems* suggest that the science of environmental flows is, as yet, inadequately developed. The single principle related to determining environmental water provisions states that the 'provision of water for ecosystems should be on the basis of the best scientific information available'. Moreover, there is an explicit principle stating that 'strategic and applied research to improve understanding of environmental water requirements is essential'. These principles highlight that the science of environmental flows is a field still in its infancy.

Various environmental flow determination techniques exist and have been applied in Australia, including the Tennant Method (Tennant, 1976), the Expert Panel approach (Swales & Harris, 1995), Multiple Transect Analysis (Stalnaker & Arnette, 1976), Instream Flow Incremental Methodology (IFIM) (Bovee, 1982) and the Holistic Method (Arthington *et al,* 1992). For a review of these methods, the reader should see Kinhill (1988), Arthington & Pusey (1993) and Arthington & Zalucki (1998). Techniques vary from establishing a relationship between discharge and available habitat for salmon populations, to preserving set percentiles of streamflow for environmental protection. At the current time, there is no consistent approach to determining environmental flows across Australia. This in part reflects the diversity of river system types and water resource development issues. But it is also undeniably a reflection of the fact that there is little consensus on the *best way* to determine environmental flows.

There is ongoing refinement of existing techniques such as IFIM (Zampatti & Raadik, 1997) and the Scientific Panel approach (EPA, 1999), and the continual development of new approaches such as the Cascading Seasonal Flow (CSF) method (Doeg, 1999) and the Annual Proportional Flow Deviation (Gehrke *et al,* 1995). Fundamental to all methods is establishing or assuming a relationship between streamflow and ecosystem requirements. However, this remains difficult to demonstrate without targeted, long-term monitoring projects measuring a range of ecosystem responses to streamflow variations. Moreover, given the variability associated with many of Australia's rivers, detecting responses even over years is often not feasible. Further,

this inherent variability, combined with the unique biological communities adapted to this variability, means that international advances in environmental flow determination techniques are generally not directly transferable to Australian conditions, the exception being work in southern Africa. For example, recent work in Lesotho sponsored by the World Bank appears to have set a new bench-mark in terms of the best scientific information on environmental flows and is likely to be applicable, at least in part, to Australian conditions (Dr J. King, *pers. comm*. September 2000).

The question of scale also influences our ability to determine environmental flows. Flows are managed in an operational sense at the channel scale yet biota can be sensitive to flow changes, for example, at the hydraulic scale of a rock. Superimposed on hydraulic scale requirements are the requirements of a river system at the landscape scale, such as flooding and geomorphic processes. Gaining an understanding of the inter-relationships between requirements at varying scales and resolving how to meet these requirements through the provision of water at the channel scale is very complex.

Other fundamental issues include understanding the impact of varying flow duration, the importance of the sequence of flows and the implications of drought. While there has been some work on these subjects, scientists are still struggling to define limits of change to these aspects of streamflow behaviour and the associated ecological implications. For this reason, there is a current shift from trying to define such limits to specifying the likely risk to the environment associated with changes to the flow regime. For example, a current review of the State-wide guidelines for determining environmental flows in Victoria is formalising an environmental risk assessment approach as part of the guidelines.

It is clear that we currently face a significant scientific challenge in resolving issues associated with determining environmental flows. There is, however, much research currently underway that will build on the existing knowledge base and improve our best scientific information. For example, several projects underway in South Australia include the Lake Eyre Basin project, determination of environmental water requirements in the Onkaparinga River catchment, and the Eastern Mount Lofty Ranges streams project. Importantly, the lack of complete scientific knowledge of environmental water requirements, and the best method to determine those requirements, should not be used as reason for inaction. What we do know is a useful basis for providing water for the environment. Waiting for perfect scientific understanding is both unrealistic and harmful, as it will only lead to further degradation of the ecosystems we are aiming to protect. Moreover, it can be argued that implementing environmental water provisions is the greater hurdle.

3. IMPLICATIONS OF PROVIDING ENVIRONMENTAL FLOWS

The implementation of environmental flows can occur under two different scenarios: (i) in a catchment that is over-committed from a water resource allocation and development perspective, and (ii) in an under-committed catchment. The implications are profound.

The *Water Resources Act 1997* recognises the need to pursue sustainable development and to protect the environment in catchments where water resource development is negatively impacting the environment. To achieve this, the Act allows for the prescription of water resources and has a range of associated legal instruments that can be used to implement environmental flows. For example, the Minister administering the Act has the legal power to require a reduction of water allocations or the removal of structures in catchments where there is sufficient risk of not meeting future demands or ecosystem requirements (pursuant to Sections 15, 16, 30 and 37 of the Act).

Yet the question must be raised – would the Minister actually use this legislative power to achieve environmental improvements? Realistically, the social and economic impacts likely to be associated with such a move would raise undesirable political risks. Thus it appears that implementing environmental flows will largely depend on the use of proactive rather than reactive management measures to ensure water resource development is sustainable.

Proactive implementation of environmental flows and measures to achieve sustainable water resource development would best occur in under-committed catchments. Ideally, environmental flows would be determined and implemented well before water resources became heavily developed. This would minimise the social and economic impacts on existing and future users, while also providing greater certainty of water availability to developers and the conditions that apply to its use. Yet the prescription of water resources under the Act is costly in an administrative sense, and politically undesirable as it can be viewed as negatively impacting economic development. Yet without a prescribed status, there is little legal support for proactive measures to protect the environment.

The Act does allow for the management of specific 'water-affecting activities' in non-prescribed systems via a system of permits (refer to Sections 9(3) and 9(4) of the *Water Resources Act 1997*). Although not intended for the purpose, policy makers and managers are tending rely on this legislation, in lieu of other appropriate legislation or regulatory controls, to protect the water environment of unprescribed catchments. Yet permits for water-affecting activities provide only indirect control of water resource development, and are of limited value in the proactive management of the water environment. For example, a permit can be required for an activity under Section 9(4) of the Act,

which relates to the erection, construction or enlargement of a dam, wall or other structure that will collect or divert water flowing in a watercourse or flowing over any other land. This section allows for the control of farm dam construction or modification (where it is not 'development' in accordance with the *Development Act 1993*), but does not regulate the taking and use of water directly from a watercourse by use of a pump, for example.

Furthermore, under the Act, a permit cannot place limits on the rate of taking and use of a water resource. Hence, any size limitation that may be placed (via conditions to a permit) on a farm dam is based on a series of assumptions about the rate of use of water. For many emphemeral streams, such as those in the Eastern Mount Lofty Ranges, water will be captured during winter and used for irrigation or stock water supply during summer. In this case, it can be reasonably assumed that the volume of the dam is the maximum volume of water that will be used by its owner. However, if the dam was used to divert water to an aquifer storage and recovery scheme, and that water was diverted throughout winter, the dam could actually divert an amount of water that is significantly greater than its physical capacity. Therefore, a system of permits for water-affecting activities has limited value when aiming to protect the water environment and provide environmental flows.

In addition to the lack of legislative support, under-committed systems are generally a lower priority for action. It is the over-committed resources, and the issues that arise from their use and management, that tend to attract most attention and funding from the State.

4. THE WAY AHEAD

This paper has identified a number of scientific and legal impediments to determining and implementing environmental flows. The discussion that follows suggests four priority areas of action for ensuring the future of environmental flows in South Australia.

Proactive management. The State should be proactive in providing environmental flows in catchments that are currently under-allocated, not waiting to react to problems of over-committed systems. The *Water Resources Act 1997* establishes a strong legislative framework exists for dealing with the latter situation. However given the political nature of water resource allocation these powers are typically enacted only when systems are under immense stress. It is argued that there is relatively little to gain in such situations. Moreover, reactive measures do not address the need to avoid over-commitment of water resources in the first instance.

Proactive management is the realisation of the pre-cautionary principle, where action is taken even where our scientific understanding is limited. This is a key principle in the *State Water Plan* (Government of South Australia, 2000). However, a strong legislative framework to support such management is needed. Implementing proactive management and the legislative amendments that may be appropriate requires commitment from lead agencies, development of technical tools, and the understanding and strong support of the community.

Modifying the operation of water systems. It is necessary to raise the awareness and understanding of key agencies and authorities that manage water systems and associated infrastructure. There is a need to secure a link between policy and the system's operating and flow sharing rules. In general, the provision of water for the environment in over-committed systems will rely on the improvement of operating and/or flow sharing rules rather than explicit environmental water allocations. For example, the operation of dam releases can be altered to better satisfy the needs of the downstream environment without necessarily requiring a greater allocation to the environment. Similarly, licensed water users could be restricted so that the volume they use is the same but it is accessed over a longer time period. In this case the flows at which restrictions are implemented are formulated to include consideration of the environment such that the risk of reduced flows is shared equitably between licensed users and the environment. Applying conditions to water trade to benefit the environment would also be appropriate.

The *State Water Plan* refers to this explicitly in Appendix 1(b), principle seven: environmental water provisions will not be defined as a tradeable water allocation. Instead they will be defined in terms of operational or consumptive constraints relevant for each water resource management unit. Therefore, there is a need to formulate policy and controls at the appropriate level (likely to be water allocation plans) that link directly to onground system operations and/or flow sharing rules so that environmental flows can be legally protected.

Implement an ecosystem services commitment. Explore the notion a commitment to the preservation of 'ecosystem services' as a core responsibility of all agencies and authorities with a role in natural resource management. This would make explicit the requirement of such bodies to place value on the range of integrated services that are provided by a healthy ecosystem, thereby overcoming one of the major impediments to sustainable development as identified by the Australian Productivity Commission. For example, most water is filtered and treated by natural ecosystems, not treatment plants. This is an ecosystem service that currently has unrecognised value for industries and society (Cork, 2000). The CSIRO Division of Wildlife and Ecology is currently working to operationalise this approach to ecosystem management.

Implement effective monitoring. There are two reasons why monitoring is fundamental to determining and implementing environmental flows. Firstly, it enables ongoing review of scientific knowledge by testing whether the adopted approach has achieved specific objectives. While the limitations of our present scientific knowledge concerning the determination of environmental flows are acknowledged, there has been little commitment of resources for monitoring in order to improve scientific understanding. (Indeed, monitoring, data collection and analysis are activities that are poorly supported; additional funds and greater integration of effort is required to target and/or expand data collection activities, and to make the best use of valuable data that is available.) Secondly, monitoring is required for improving accountability. It is important to demonstrate both that environmental water provisions have been met and the efficient use of water for environmental protection.

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Some observations on recent water resources cases and legislative changes

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1. INTRODUCTION

The management of water resources in South Australia and Australia as a whole has been undergoing significant change over the past decade. The issue of water quantity, quality and availability is now a matter of significant political and public concern. There are almost daily media reports on issues touching water and land degradation. Considerable attention has been focussed on water policy at both a Federal and State level. In 1997 the State Government introduced a new Water Resources Act, 1999 as one measure to try and address the myriad problems associated with the use and management of the State's water resources.

Levinson observed in December 1999, that,

> *"As the value of water increases, it is likely that those who possess or seek right to use water will pursue their interests with increased vigour. Similarly, the community will be concerned to ensure that the Act is properly administered and that the obligations contained within it are complied with. This will almost certainly result in an increase in litigation concerning water."*

He might also have added that, for similar reasons, pressure will from time to time be exerted on the politicians to try and influence changes to legislation and policy.

In this paper I will look at some of the recent decisions of the Environment, Resources and Development Court (ERD Court) made following appeals to that Court under the Water Resources Act and one recent decision of the Supreme Court on the definition of a "watercourse". Pressure from constituents for legislative reform has already occurred and the paper will look at the new Sections 35A and 35B of the Water Resources Act which reflect those pressures. It is still relatively early for comments on the operation and impact of the Water Resources Act, 1997 and to date there has been a limited number of appeals on water resource issues.

2. RECENT CASES

Matters to be considered by the ERD Court on appeal

The *Water Resources Act, 1997* is silent on the approach to be taken by the ERD Court to any appeal. However, by the very nature of the powers given to the Court in s.142(7) and consistent with the ERD Court's practice under other statutes (such as the *Development Act, 1993* and the *Environment Protection Act, 1993*) the Court presumably acts as a *de novo* body when making a decision on any merits appeal. This means the ERD Court may have before it all the information which was before the primary decision maker plus any additional information which any of the parties may wish the Court to take into account before making its decision.

The Court has stated on a number of occasions that it will have regard to and take into account the same factors that the primary decision maker was required to have regard to and take into account. For example, if there is an appeal against a refusal by the Minister under s.35 of the Act to grant or vary a water licence, then the matters which the ERD Court will be required to have regard to include:-

1. That any water allocation to be endorsed on any licence granted must be consistent with the relevant Water Allocation Plan;

2. That any conditions attached to a licence must not be seriously at variance with the relevant Water Allocation Plan;

3. That the two decisions outlined in (1) and (2) above must be made in the public interest;

4. That the above decisions must be consistent with any requirements prescribed by Regulation.

In *Spinato v Minister for Environment and Heritage* – Judgment No. [2000] SAERDC 48 25 July 2000 the Court said that, "although there are no provisions in the Act specifically requiring us to make a decision either consistent with or based upon the relevant water allocation plan we consider that, we do so when reviewing the Minister's decision unless extraordinary circumstances prevail."

In addition to the above "matter specific" requirements, the Court is also required to act consistently with and seek to further the object of the Act, which is set out in s.6(1) and have regard to a number of matters listed in s.6(2)(b) of the Act such as the need to protect watercourses, improve water quality and identify alternative sources of water.

The first appeal under the *Water Resources Act, 1997* to be considered by the ERD Court was *Saunders v. Minister for Environment and Heritage* 1998 EDLR 97. In that case the Court noted that s.35 of the *Water*

Resources Act requires the Minister, when issuing a water licence, to issue a water allocation consistent with the relevant Water Allocation Plan. It said:

> *"However, this Court, when deciding an appeal from a decision of the Minister, is not subject to the same requirement. However, if the various water policies formulated and implemented under the Act are to be sensibly and fairly administered, common sense requires this Court to have the same regard to those policies as must the Minister. Accordingly, we think it appropriate to say that this is what this Court will do in future cases unless very good reason is advanced why it should not."* (p.102)

The second issue considered by the Court related to the appropriate policy by which to consider any application and appeal. The Court noted that a number of policies applicable in that case were interim policies, which were subject to review and possibly substantial variation. It noted that because of the uncertainty at the time of formulating the policies, the policies were quite conservative erring on the side of safety. The Court was not critical of this approach but noted that this meant that at some future stage the policy may change, resulting in a more lenient policy being adopted at a later time. To deal with this concern the Court has indicated in the Saunders case that when considering future appeals it will have regard to the policy as it exists at the time and not to the policy as it may be some time later. It said:

> *"The Court will not, when determining appeals, either make assumptions as to what changes may be made to the policy or award allocations on the basis that the allocations specified by the policy are conservative."* (page 102 and 103).

The relevant policy document in *Saunders case* included a requirement that evidence of financial commitment to the establishment of new water using activities or the expansion of existing water using activities during a specified period be submitted. On the basis of that evidence an allocation commensurate with the level of commitment "may be approved".

Saunders had clearly expended considerable sums to convert his property from primarily wool production to stud sheep and fat lambs. Irrigation equipment was needed to water 25 hectares of lucerne. He had planted the lucerne and upgraded the sheep flock. The establishment of irrigation was the next step. The Court found Saunders had produced evidence of financial commitment to the establishment of new water using activities. The Court did however note that aspirations which included a desire to increase the farm's income sufficient to support two families before Saunders retired and similar personal circumstances have no relevance to whether a person has made a sufficient "financial commitment to the establishment of new water using activities". The commitment must be one of substance, one of which is being or has been followed through and one of which there is adequate evidence.

2.1 "A cautionary approach"

The requirement of Section 6(1)(b) that a system be established for the use and management of the water resources of the State which, by requiring the use of caution and other safeguards, reduces to a minimum the detrimental effects of that use and management was considered in the case of *Dukalskis v. Minister for Environment and Heritage* 1998 EDLR 141. Mr Dukalskis applied to the Minister for a licence to take underground water from a well which he proposed to sink on land situated within the Hundred of Blanche. The land had an area of 18.29 hectares and was owned by other people. Mr Dukalskis had a contract to purchase the land subject to the issue of a water licence with an adequate water quota. He was wanting to obtain sufficient water to irrigate 8 hectares of onions and 8 hectares of cabbage and carrot. He already owned other land in the area and it was clear and accepted by everyone that not all 18 hectares would be used every year. The proposal was that crops would be rotated and some land within Mr Dukalskis land ownership would be left fallow for various periods of time.

The problem for Mr Dukalskis was that his land was approximately 1 ½ to 2 kms south of the City of Mt Gambier and lay within the groundwater capture zone for the Blue Lake. The Minister refused Mr Dukalskis application on the basis that the hydrogeological assessment of his application indicated that the land was within the groundwater capture zone of the Blue Lake and that with the existing level of groundwater allocation in the vicinity of Mr Dukalskis land and of extraction from the Blue Lake, the current rate of decline of water level in the lake was already excessive.

In its judgment, the Court noted that the subject land was located within a zone in which there was no shortage of underground water. The volume of water available for extraction, which was 71,000 ML substantially exceeded the 18,000 ML allocated, which in turn exceeded the estimate of 9,500 ML actually used. It was a bone of some contention with Mr Dukalskis that many people had access to wells or bores in the area and had a substantial water allocation, but were not using much of that water. The Court in fact noted that the question of water allocation versus actual use was one of great concern to people whose applications for water had been refused on the basis of the allocations issued and that the issue brought with it a taint of unfairness. However, it also understood why it was necessary to base a determination of future and prospective water extractions on water allocation presently either fully used or used for part of the time, and that does not mean that within a year or so the water may not be used to its fullest extent. It noted that it was a policy issue which really had to be dealt with by the Minister and the other relevant policy makers.

The Court also noted that there was some undue depletion from the unconfined aquifer due solely to the pumping from the Blue Lake to supply the township of Mt Gambier with towns water.

There appeared to be no salinity reasons why an extra water grant could not be made. It would require further research before anyone could definitively state with any accuracy the predicted impact upon the unconfined aquifer, which was likely to flow from the approval of applications such as this particular application.

The Court went so far as to say that were it not for the falling water levels within the Blue Lake and the importance of the Blue Lake to the South-East, it may have been inclined to allow the appeal. However, what prevented the Court from doing so was the requirement in the Act that the Court adopt a cautionary approach and have regard to the need *"to protect watercourses, lakes, surface and underground water from degradation."*

This decision is a clear indication that the Court is going to be prepared to apply a cautionary approach where it deems such an approach is appropriate. Arguably, as discussed later in this paper the Minister did take on board the Court's suggestions for changes to policies which were causing much of the angst and disappointment with the system applicable at the time of the appeal.

2.2 Relationship between the *Water Resources Act* and the *Development Act*

Dukalskis case is also interesting because of the comments which the Court made about the relationship between the *Development Act* and the creation of policy under that legislation and the *Water Resources Act* and policy under that Act. The land over which Mr Dukalskis hoped to gain his licence was zoned Horticultural by the District Council of Grant provisions of the Development Plan. The Court noted that it was very fertile land and should be put to valuable commercial use. There was concern about the possibility of the land being rezoned for rural living purposes given its proximity to the City of Mt Gambier and therefore its permanent removal from use for a purpose consistent with its very high level of fertility.

Whilst the Court expressed some sympathy with this particular view, it noted that the policies applicable to the area made no provision with respect to the special allocation of water to land of particular fertility or value. It noted:

> *"There appears to be no correlation between the land use provisions of the Development Plan administered pursuant to the Development Act, 1993 and the contents of Water Allocation Plans (and consequential water allocations) administered pursuant to the Water Resources Act, 1997. Whether such a correlation is either reasonable or appropriate in hydrogeological terms is a matter upon which we can pass no comment. It is a matter which we must leave to be considered by those responsible for reviewing the policy. All that we can say at the moment is that such a correlation does not, at present, exist, and the issue of whether the District Council of Grant may be forced to rezone all or a portion of the Horticultural Zone in which this land lies as a consequence of restrictions placed on the use of underground water is one which we cannot take into account in proceedings of this type."* (page 143).

Further consideration of the relationship between the *Development Act* and the *Water Resources Act* and the policy documents under each piece of legislation can be found in the case *Conservation Council of South Australia and Mewett & Wesley v. Tatiara District Council and Kangaringa* (Judgment No. OE 62 (1999) SA ERDC 62 (12 August 1999)). That case involved an appeal under the *Development Act* not the *Water Resources Act*. Kangaringa Proprietors had applied to the District Council for approval to undertake two developments, namely a land division to be undertaken pursuant to the *Community Titles Act* creating 19 primary lots and one common property lot and the establishment of an olive orchid on the lots thereby created. The Council granted development approval to both proposals. The Conservation Council of South Australia Incorporated and Mewett & Wesley, who had made third party representations against the proposal all appealed against the approvals.

The Court noted that the provisions of the *Water Resources Act, 1997* were such that the legal impact of the Act upon a water resource depends upon the nature of the resource and where it is located. The subject land was within the Hundred of Makin, which was not subject to any declaration or notice issued pursuant to the Act. This meant there were no restrictions on the taking and use of water within the Hundred, and in particular, underground water, nor were there any quotas or limitations in respect of the taking of that water. The area had however, prior to the application being made, been the subject of a moratorium declared by the Minister pursuant to s.16 of the *Water Resources Act*. This moratorium for a period of 12 months prohibited the taking of underground water within the Hundred of Makin with two exemptions.

The applicant had argued that the Court should not embark on any issue regarding the water availability or quantity because the proper exploration of these issues would lead to a lengthy and technical inquiry, a vast quantity of expert and technical evidence and consume a considerable amount of time. The Conservation Council as appellants alleged that the withdrawal of the proposed quantity of underground water would have a detrimental impact upon the supplies of underground water to abutting land and therefore inflict an impairment relevant in planning terms upon such land and would have a detrimental impairment upon

surrounding native vegetation, particularly that in the abutting National Park. The Court noted that there were provisions of the Development Plan which demonstrated the relevance of these concerns in a planning sense. For example, Principle 55 provides *"Development should take place in a manner which will not interfere with the utilisation, conservation or quality of water resources."*

The applicant had argued that the underground water related issues overlapped with the jurisdiction of the Minister for Environment and Heritage relating to those matters under the *Water Resources Act* and that according to the principles in the case of *Lane v. Duxsel Pty Ltd and District Council of Stirling* (1988) 143 LSJS 454, the Court should leave issues relating to underground water to be dealt with by the Minister for the Environment and Heritage in accordance with the *Water Resources Act, 1997*.

Lane v Duxsel involved a proposed tavern at Mylor. Before it could lawfully commence operation it required approvals under the *Planning Act, 1982* and the *Liquor Licensing Act, 1985*. It was determined that there should not be a crossing of the boundaries between the matters requiring consideration under the *Planning Act* and the matters requiring consideration under the *Liquor Licensing Act*. The Court in the *Conservation Council case* noted the terms of the Duxsel decision, but believed the situation confronting it in that case was quite different. It noted first that the detrimental impacts which the appellants claimed would flow from the withdrawal of the required quantity of underground water were matters to which the Development Plan refers. It also noted as a second point that once the Minister for Environment and Heritage's proclamation ran out in January 2000, the situation would be that there was no control exercised or a review relevant to the use of underground water within the Hundred of Makin. In that situation the Court would not be usurping the function of the Minister because the Minister has no function for the Court to usurp. The Court is required to have regard to all relevant provisions of the Development Plan, even though at some stage the Minister for Environment and Natural Resources may also be weighing up the proposal against the *Water Resources Act* requirements.

Furthermore, the Court held that the mere fact that an action which gives rise to adverse consequences may be illegal under a particular statute does not mean that those consequences are irrelevant in planning terms and should not be taken into account by the Court when considering whether a development approval should issue.

2.3 Water Allocations

The ERD Court made some comment and observations about water allocations in *Spinato v Minister for Environment and Heritage*. Mr & Mrs Spinato owned 6.151 ha at Aldinga. Mr Spinato appealed to the Court against the refusal of the Minister's delegate to issue him with a licence authorising him to take water from a well for the purpose of irrigating olives and almonds which he had planted on his land. The refusal was based on the fact that the application did not comply with the provisions for the allocation of water set out in the McLaren Vale Prescribed Wells Area Water Allocation Plan. In refusing his application the Court noted that if approved, Spinato's application was unlikely to have an impact in excess of any other well within the basin and arguably an impact significantly below that of some of his neighbours. They said,

> *"However, the current problems of declining groundwater levels and increasing salinity being experienced throughout the basin are occurring as a result of over 400 small volumes of groundwater currently being taken from the aquifer. If his application is approved, Mr Spinato will be one more user of underground water, and he will make his contribution to the total impacts of underground Water withdrawal. The Water Allocation Plan directs both the Minister and this Court's attention to the total impact of the withdrawal of water from the aquifers, rather than at the impact of each individual well in isolation. The Plan speaks with some strength against additional levels of withdrawal other than in those cases falling within the Guidelines. The current levels of water withdrawal from the aquifers strongly indicate that such withdrawals are not ecologically sustainable in the long term."*

2.4 The meaning of "watercourse"

Under the Water Resources Act 1997 "water resources" is defined to mean a watercourse or lake, surface water, underground water and effluent. There are frequent references in the legislation to watercourses. For example, Section 7 deals with the right of a person with lawful access to a watercourse to take water from that watercourse; Section 9 prohibits the placing or construction of any buildings or structures in a watercourse contrary to a water plan for the area; Section 14 enables a Catchment Water Management Board, a Council or the Minister in certain circumstances to issue a Notice directing an owner or occupier of land to take specific action to maintain a watercourse in good condition and Section 17 imposes a duty on the owner and occupier of land on which a watercourse is situated or that adjoins a watercourse to take reasonable steps to prevent damage to the bed and banks of the watercourse and the ecosystems that depend on the watercourse.

Clearly, it is necessary to ascertain what constitutes a watercourse in order to properly interpret these provisions. The Act purports to assist by defining a watercourse in the following terms: -

> *"Watercourse means a river, creek or other natural watercourse (whether modified or not) and includes –*

(a) a dam or reservoir that collects water flowing in a watercourse; and
(b) a lake through which water flows; and
(c) a channel (but not a channel declared by regulation to be excluded from the ambit of this definition) into which the water of a watercourse has been diverted; and
(d) part of a watercourse."

As can be seen the definition is somewhat circular in that it refers to a watercourse as including part of a watercourse. It is therefore necessary to consider what constitutes a watercourse at common law as determined by decisions of the Courts on this point over the years. Few decisions have considered the matter in an Australian context. Most of the common law has been developed by very old decisions of English Courts based on English climate and geography. It would seem decisions on what constitutes a watercourse made in the context of English conditions may not be entirely suitable to Australian conditions.

Nevertheless in the High Court decision of *Gartner v Kidman* (1962) 108 CLR 12 the High court looked and had regard to those English authorities as they were rules which were an important part of the common law that Australia has inherited.

In May 2000 a single Judge in the South Australian Supreme Court considered the term "watercourse" as used in the Water Resources Act 1997 and after an examination of the common law authorities found that a particular channel in which water intermittently flowed did not constitute a water course. The decision *Macag Holdings v Torrens Catchment Water Management Board* (Judgment of Justice Debelle [No. 2000] SASC 115 delivered 5 May 2000 may be of limited use to persons who are required to consider from time to time whether any particular formation is a watercourse for the purposes of the application of the various provisions of the Water Resources Act 1997 because of the particular factual circumstances around the case.

Macag Holdings owned a substantial piece of land on the eastern side of Duncan Road at Beaumont. The land was in the foothills of the Mt Lofty Ranges. A small valley about 30 metres deep runs from south to north on the land. The sides were relatively steep and reasonably well covered with trees, bushes and grasses. The valley continued uphill for quite a distance from the southern boundary of Macag land. Immediately adjacent to Macag's southern boundary was a site owned by Burnside Council and previously used as a rubbish dump (Dashwood Road Tip). The valley floor had been raised on this land due to the filling of the valley with unconsolidated rubbish over which a topping of soil was placed. The finished surface sloped downwards towards Macag's land. A large concrete pipe approximately 300 metres long had been placed beneath the tip. It ended close to the south boundary of Macag's land. The pipe was intended to drain water from the upper reaches of the valley but the evidence was that the pipe had been crushed and was no longer functional.

Water flowed at times along the valley floor on Macag's land. There were two channels; one described by the Court as the old channel which was now used as a walkway and trail bike path. The evidence before the ERD Court had indicated that much of the original flow in this channel had ceased since the filling of the valley to the south of Macag's land. There was a new and much smaller channel clearly created by water erosion. It was approximately 200-300mm wide (8-12 inches) and 100-150mm deep (4-6 inches) and ran alongside and, in places, within the old channel. The issue for the Court's consideration was whether this new channel constituted a watercourse.

Water flowed in the new channel only occasionally. There were three sources of that water :

(a) rainfall which ran off the sides of that part of the valley forming part of Macag's land.
(b) rainfall which ran off the sides of the valley south of Macag's land (i.e the Dashwood tip land) the evidence was that in times of light flow almost all the water will flow from the tip onto Macag's land but in heavier flows most of the water flowed onto Duncan Road.
(c) water which was collected on Duncan Road and discharged onto the subject land. Water was collected on Duncan Road from the rubbish tip, from water falling on the road itself, water running onto the road from adjacent roads and water running from adjacent properties. Some of that water found its way onto Macag's land through cuts in the kerbing and guttering designed to permit the water to flow into the valley and hence the channel on Macag's land.

Macag Holdings had commenced clearing part of the land and filling the valley. The Torrens Catchment Water Management Board issued two notices to Macag Holdings. The first under Section 14 of the Water Resources Act required Macag to take certain action to maintain the watercourse situated on the land in good condition. The second under Section 17 required Macag to take reasonable steps to prevent damage to the bed and banks of the watercourse situated on the land. Both notices required Macag to :

1. Take reasonable steps to prevent damage to bed and banks of the watercourse situated on the land; and
2. Refrain from and prevent the placement of any soil, rock or other material in the watercourse.

Macag Holdings appealed against both notices to the Environment, Resources and Development Court. One

of the grounds of the appeal was that there was no watercourse on the land. The ERD Court found that although water would flow along the channel only on about 20 occasions in each year, the channel was sufficiently defined to constitute a watercourse. It so found even though the channel was very small and water would not flow in the channel for more than four hours after a rain event. Macag appealed against this decision to the Supreme Court. The Supreme Court, comprising Justice Debelle, had to consider what constitutes a watercourse at common law.

Debelle J noted that the meaning of the word will depend on the context in which it appears. He looked at a number of English authorities, the dicta in Gartner v Kidman and a US text on watercourses. (Angel) He said (at page 6):

> *"What is clear from all of these definitions is the requirement that there be a defined channel with something in the nature of banks. These definitions recognise that watercourses are sometimes dry but they do require that there be beds and banks. The definition also distinguishes between flows of water of short or occasional duration and a regular flowing stream. While it is recognised that a flowing watercourse may sometimes be dry, the converse does not apply so that a flow of water along a channel for a few hours is not a watercourse. That is clear from Angel's reference to a freshet. It is also clear from the distinction drawn in the cases between a stream of water which may be dry at times and water of a casual or temporary character."*

Debelle J further noted that a distinction had always been drawn between a watercourse and a fold or depression of contour in land to which surface water gravitates and along which it flows. That distinction must be preserved he said *"in order that the statutory powers are not used in an unauthorised way."*

The Water Resources Act 1997 distinguishes between surface water and watercourses. Issues associated with water flowing along a fold or depression in land can be addressed using the Acts provisions in relation to surface water. The Act uses the term watercourse, says Debelle J to refer to those watercourses which have the quality of rivers and streams, that is, readily identifiable beds and banks along which water flows, albeit they may on occasions run dry.

The Supreme Court found that the ERD Court had misconceived the effect of the authorities and erred in its definition of a watercourse. Well known watercourses in Australia such as Cooper Creek and Todd River were, said Debelle J, dry for long periods. However after days of rain they will flow for a period of days, if not longer. They also have substantial banks. By contrast the channel in question flowed at most for a few hours after a "rain event" and the channel was very small and "almost insignificant". It was a "small shallow and irregular rut or furrow" which ran along the small valley. It would be a misuse of language, the Court held to call the sides of a rut or furrow measuring 100-150mm high "banks".

In conclusion what can we draw from the Supreme Court's decision in this case on the meaning of a watercourse? It is clear that no-one characteristic will necessarily determine whether a watercourse exists. It will often be a question of fact and degree. Characteristics that assist in making the determination are :-

1. Does it have identifiable beds and banks along which water flows as distinct from being a mere depression on land which serves to relieve upper land of excess water in times of major rainfall?
2. If water does not flow continuously along it, does the water nevertheless flow for a regular period of time as distinct from a flow of a short or occasional duration?

3. LEGISLATIVE AMENDMENTS

The Water Resources Act 1997 came into operation on 2 July 1997. There have been a number of minor amendments to the Act since then. This year significant changes were made to the provisions in the Act dealing with water allocation by the Water Resources (Water Allocations) Amendment Act 2000. These legislative amendments arose from the findings of the South Australian Parliament's "Report of the Select Committee on Water Allocation in the South East" which was tabled in the House of Assembly on 3 August 1999. The Select Committee had been established by the House of Assembly on 10 December 1998 to enquire into the issues involved in the allocation of groundwater resources in the south east of South Australia. It was required to investigate the methodology used for all water allocations in the south east and develop a clear set of guidelines for the management and allocation of groundwater in the south east.

The Select Committee found that the south east community of the State of South Australia held "clearly polarised schools of thought on water allocation within the south east." The first view advocated that water be allocated "on demand" with people having the capability of transferring water allocations on a permanent (sale) or temporary (lease) basis. The other school believed that water allocation should be related to land holding and allocated on a pro-rata basis. They believed no permanent transfer or sale of water should be permitted but a land owner who was unable or did not intend to use the water allocated to that land owner could temporarily transfer or lease that allocation to someone else. In support of the pro-rata approach, people stated that land holders had a right to the water located under their land and should not lose that right once the water resource became prescribed. They further believed that in the past land values for land in

the south east had reflected the fact that the land holders could freely access the groundwater resource.

Critics of the "on the demand" approach maintained that it did not allocate the resource fairly (one person could own the rights to take the entire available water resource in one area) nor did it ensure that water was available to meet the needs of future generations, a view which the Select Committee endorsed in its findings. Advocates of the "on demand" system maintained that it was the most effective means of encouraging development and investment in the south east as it allowed water to be available for persons who are able and prepared to develop the water resource.

The Select Committee expressed concern about the number of licence holders who consistently did not use all, or a substantial part, of the water allocated to them. It noted,

> *"The committee, and the community, is concerned that in most prescribed areas a significant proportion of the available water resource has been allocated but is not being used. Many people suggested that unused water allocations should be re-allocated, unless there is a valid reason for non-use. This situation may be hindering development and may prevent others from deriving an economic benefit from that water"* (report finding No. 15-page 7).

Among the recommendations made by the select committee was one that the methods for allocating and managing water reflect a move to a total market place system. It proposed that the remaining water resources be allocated on the basis of land holding but the resultant water licences confer a property right that would be held separately from land. Licensed water allocations could be transferred either temporarily (by way of a lease) or permanently (by way of sale) subject to a hydrogeological assessment.

The State Government supported all but one of the select committee's recommendations. Upon the reports release on 3 August 1999 the Government amended the Water Resources Act to enable the Minister to vary the existing South East water allocation plans and freeze any further consideration of applications for water in the five prescribed wells areas in the south east until the Minister had varied the plans.

The Water Resources (Water Allocations) Amendment Act which was introduced to the House of Assembly on 4 April 2000 varied the provisions of the Water Resources Act to provide for two types of water allocations: a water (taking) allocation and a water (holding) allocation. The pro-rata allocations (the allocation given to persons because they own a land holding) is known as the water (holding) allocations. The water (taking) allocations are issued to those who wish or need to take and use the water resources.

It needs to be remembered that a water allocation whether taking or holding must be made having regard to the relevant water allocation plan (Section 35). Section 101(4) provides that, among other things, a water allocation plan must…,

> *"c provide for the allocation (including the quantity of water if it is to be available for allocation) and use of that water so that;*
> *(i) an equitable balance is achieved between social, economic and environmental needs for the water;*
> *(ii) the sale and use of the water is sustainable; and*
> *d in providing for the allocation of water take into account the present and future needs of the occupiers of land in relation to the existing requirements and future capacity of the land and the likely effect of those provisions on the value of the land…"*

A person obtains a water allocation through endorsement of that allocation on a water licence granted by the Minster under Section 29 of the Act. If a water licence is endorsed with a water taking allocation, the licensed holder is authorised to take water from the prescribed water resource. If the licence is endorsed with a water holding allocation but not a water taking allocation then the licence does not authorise the taking of any water. However, it gives the holder of the licence a right to request the Minister to convert the allocation to a water taking allocation.

Section 35 requires that the Minister's decision on the grant or variation of a water licence:

(a) as to the water allocation to be endorsed on the licence be consistent with the relevant water allocation plan and any conditions to be attached to the licence must not be seriously at variance with the relevant water allocation plan. In addition the Minister's decision in both cases must be made in a public interest and consistent with any requirement prescribed by regulation (there are none prescribed at the present time).

The amending Act's main changes were to insert two new provisions, Section 35A and Section 35B. Section 35A enables the Minister to endorse a water holding allocation on a water licence where such a practice is provided for in the relevant water allocation plan.

The water holding allocation preserves the right of the holder of the licence to subsequently obtain a water taking allocation for the quantity of water reserved to that licence holder by the water holding allocation. The water reserved by a water holding allocation cannot be subsequently granted to another person by the Minister. However the owner of the water holding allocation is able to transfer their allocation to another licence. Thus in a year when the licence holder chooses not to use the water the licence holder could, if they wished, transfer it

to someone who would seek to make use of that allocation (once it was transferred to a water taking allocation).

Once a water (holding) allocation is endorsed on a licence, the holder for the time being of the licence on which the allocation is endorsed, may pursuant to Section 35A(7) request that the Minister convert the whole or a part of the water (holding) allocation to a water (taking) allocation. The Minister has to apply the same criteria to determining this request as the requirement for an application for endorsement of a licence with a water (taking) allocation. The Minister must have regard to the water allocation plan and that plan and other factors (such as a severe drought on other pressure on a water resource) may result in the Minister determining that the quantity of the water (taking) allocation will be less than the quantity of the water (holding) allocation or that part of it, that is converted to the water (taking) allocation (Section 35A(9)).

Section 35B provides that a water allocation plan may give precedence for a limited period to applications for the allocation of available water from the plans water resource by the owner of land identified in the plan. Basically, it means that provided water allocation plans identify land owners within their area and provide for those land owners to seek endorsement of a water holding or taking allocation on their water licence, they may do so ahead of anyone else that wishes to gain access to some of the water resources in the area covered by the relevant water allocation plan.

Section 35B(3) provides that the water allocation plan must specify:

(a) the quantity of water, or the means of determining the quantity of water for which owner of land can apply under Section 35B, and

(b) the period during which applications under that section may take precedence over all other applications for allocation of water from the same water resource.

The section also makes it quite clear that the fact someone is entitled have their application determined ahead of all others because they were an owner of land does not guarantee that they will be able to take water. That will be determined by reference to the terms of the relevant Water Allocation Plan.

Thus by the insertion of two sections into the Act, the Government has been able to address the primary concerns of south east land owners that they were not being given priority to obtain a water licence to take water from a water resource under their land in preference to others. It would seem that those land owners now get first choice!

The other change to the Act necessitated by these changes is to one the provisions in Part 8 of the Act on imposing levies in relation to taking water. The Minister has the power to declare a levy payable by persons authorised by a water licence to take water. This may seem to cause some unfairness where someone has a holding licence and cannot actively take and use the water. The Act recognises this and in Section 122(8a) provides that different levies for the right to take water may be delayed in respect of the same water resource based on whether the water allocation is a water (taking) or (holding) allocation. Thus a person cannot simply take a water (holding) allocation without some consequences. Presumably this is designed to encourage persons to use the water resources. If they do not use it and are having to pay a levy on it may encourage them to transfer it to someone who can use it.

It is my understanding that the arrangements for the allocation of water in the south east have now been completed. Although the amendments described above were initially prepared for the purposes of dealing with the south east problems the amendments are not confined to the south east and can apply anywhere in the State. There will undoubtedly be further situations in the State where water allocations are a contentious issue.

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Statutory plans for water resource management

The four plans under the *Water Resources Act 1997*

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Summary
This paper outlines the purpose and content of the four water resource management plans under the *Water Resources Act 1997* ("the Act"). Those four plans are the State Water Plan ("SWP"), Catchment Water Management Plans ("Catchment Plans"), Water Allocation Plans ("WAPs") and Local Water Management Plans ("Local Plans").

1. GENERAL

The Act provides a scheme for the strategic regulation and management of water by the interrelation of the four plans. All plans must be consistent with the very broad object of the Act[1] which embodies the principles of ecologically sustainable development, although in a unique formulation. For example, a plan could not promote the unsustainable exploitation of a water resource. Similarly, as statutory plans under the Act, all plans must be consistent with the scheme and purpose of the Act as a whole[2]. This would prevent a plan, for example, from creating an alternative licensing scheme or purporting to alter the powers and functions of a Board.

All plans must be consistent with the SWP and can be relatively readily modified to ensure that consistency is maintained[3]. Section 6(2)(b) obliges the authors of all plans to have regard for "the need to integrate the administration of the Act and other legislation dealing with natural resources" in all of their activities, including the drafting and adopting of plans. Regard must also be had to the benefits of consistency between certain statutory plans and policies under other Acts and, as far as is practicable, for some plans, consistency must be achieved[4]. However, it is important to note that the Act does not require water plans to be consistent with other statutory policies absolutely in all cases.

The integration of the four plans themselves is not detailed to any great extent in the Act. The requirement to be consistent with the SWP and the general obligation to further the object of the Act clearly has some unifying and integrating effect. WAPs prepared by Boards form part of the Board's Catchment Plan and the procedures for preparation of the two plans can be undertaken together[5]. However, this is not strictly a requirement for any particular consistency of policy, although that is unlikely to cause real problems at this point in the evolution of water policy. It should be understood (as will be examined in detail below) that each of the plans has a distinct purpose under the Act. It is unlikely that inconsistent policies (say in a Catchment Plan and a WAP) will cause any real conflict for the reason that they will be operating in different, but related spheres. In any event, policy consistency is rather difficult to define, particularly at the margins. Problems of grossly inconsistent policy can be resolved by the Minister (who adopts all plans), and by the other factors mentioned above. Problems of less obviously inconsistent policy are likely to manifest themselves over the longer term, for example, when it is revealed that the results of implementing a certain policy of water allocation compromised a policy of catchment management. There is no real legislative tool to prevent this occurring.

Each water plan is prepared by an extensive process of public consultation[6] and then adopted by the Minister. The effect of having all water plans adopted by the Minister is significant, as the Minister is the only body under the Act who is elected[7]. The Minister also has the ultimate power to determine the content of water plans by deciding whether to adopt, alter or reject plans[8] prepared by Boards, Committees and councils. Furthermore, the Minister's power to direct Boards and Committees[9] can be exercised to have substantial influence on the preparation of water plans and their ultimate content.

None of the water plans under the Act should be seen as a document to educate the public on water management. They are public documents that serve a very important public role and are subjected to extensive public comment, but they should not be written to educate or placate the public. The plans each perform a function clearly defined in the Act and constitute a statutory

Note (a): The views expressed in this paper are those of the author and do not necessarily reflect those of the Crown Solicitor or the State of South Australia. This paper represents an outline of the four statutory plans under the Act but is not to be relied on as legal advice on any issue.

[1] See section 6.
[2] See for example South Australia v Tanner (1989) 166 CLR 161, Bienke & Ors v Minister for Primary Industries and Energy and Ors (1996) 135 ALR 128 and Minister for Primary Industries and Energy v Austral Fisheries Pty Ltd (1993) 112 ALR 211.
[3] See sections 97(5), 106, 113 and 118.
[4] See sections 92(7) and (8), 101(9) and 108(4) and (5).
[5] Section 101(3).
[6] See sections 91, 93(3)-(5), 94(2), (4)-(12), 97(5), 102(3)-(5), 103(2), (4)-(12), 109(3)-(5) and 110(2), (4)-(12).
[7] That is, elected to Parliament and answerable to Parliament and the electorate. Boards, committees and the Water Resources Council are all appointed by the Governor, not elected.
[8] Sections 95(4) and 104(4).
[9] Sections 55(2)(c) and 82(2)(c).

instrument for the purposes of the Acts Interpretation Act 1915[10]. In no way should the plans themselves go outside their function, for example by containing extraneous material designed solely to inform the public about water management, water use or water policy, or to promote or market certain policies etc.

These comments are not intended as a suggestion that education, promotion etc are irrelevant to water management. Rather, that every thing has its place. Water plans themselves are not the sole instruments to solve every water resource issue. Some things are addressed by certain powers and functions set out in the Act and vested in certain bodies. Other actions are clearly the province of Catchment Boards, and are to be undertaken in accordance with a Catchment Plan. A good example is education. A Catchment Plan should not contain information solely to educate the public about biodiversity of waterways for example. However, it is entirely proper for a Catchment Plan to contain goals for public education about that topic and to list a program for implementing such goals. Similarly, all water plans should be clearly and concisely drafted to allow precise application and implementation and to ensure widespread understanding.

2. STATE WATER PLAN

Section 90 provides for the adoption of a document prepared in 1995, prior to the operation of the Act and for the substitution of that document with a later version. This substitution has occurred once, with the most recent SWP being released in September 2000. The Minister is obliged to "…keep the [SWP] under review and must amend the plan or substitute a new plan whenever it is necessary…" to comply with the Act or achieve an object of the Act[11].

When preparing an amendment or replacement to the SWP, the Minister is required to invite public submissions on the draft plan by notice in gazette. The draft must be made available for inspection and regard must be had to any submissions before adopting an amendment[12]. The process for amendment does not require any consultation where information on which the SWP is based is superseded with more reliable or accurate information.[13]

The purpose of the SWP is to "set out policies for achieving the object of [the] Act throughout the State"[14]. The significance of this purpose is illustrated by the role the SWP plays in the scheme of water management set out in the Act. It is the only plan that is required to seek to achieve the object of the Act throughout the State, as other water plans relate to prescribed resources, catchment areas or council areas. It is the only plan with which all other water plans must be consistent and the only plan prepared by the Minister. In essence it is the highest order water plan for the State, similar to the Planning Strategy under the Development Act 1993[15].

The SWP must contain an assessment of (1) the state and condition of the water resources of the State and (2) the monitoring of changes in the state and condition of those resources[16]. Interestingly the plan must not only determine the condition of the resource, but also assess the monitoring regime established to monitor that condition. The SWP must identify both existing and future risks of damage or degradation to the State's water resources. With this background, the SWP is required to contain various proposals for (a) the use and management of the resources to achieve the object of the Act and (b) the monitoring of changes to the condition of the resources. It is these "proposals" that form the basis for the policies referred to in the purpose of the SWP.

The SWP may also contain provisions governing the granting of permits under section 9(3) and (4). In particular, permits for activities under section 9(3)(a) to (c) that are undertaken outside the area of a Board or outside the area of a WAP are only governed by any relevant provisions in the SWP[17].

3. CATCHMENT WATER MANAGEMENT PLANS

Catchment Plans are prepared by Boards for their area and are adopted by the Minister.[18] They are the primary plan for the management of water resources for each catchment area. Catchment Plans address catchment management broadly (except water allocation which is dealt with by WAPs) and are essentially the statutory instrument that governs the operations of the relevant Board. Boards are empowered to raise funds by a variety of means, including levies and may spend moneys without further appropriation from Parliament.[19] The constraint on this extensive power is that Boards may only act in accordance with the express functions and duties in the Act and must not undertake an activity that is not contemplated, or incidental or ancillary to an activity contemplated, by a catchment plan.[20] In short, not only does a plan set out the management regime for the water resources of the Board area, it also provides the authorisation for the detailed actions of the Board, and the funding of those actions. Plans therefore play an important administrative role in the activities of a statutory

[10] Section 4.
[11] Section 91(1).
[12] See section 91 generally on the process of consultation.
[13] Section 91(5).
[14] Section 90(2).
[15] Section 22 of the Development Act 1993.
[16] As to the content of the SWP generally see section 90(3).
[17] See section 18(3).
[18] Where the Board proposes to fund all or part of its actions by a levy under Part 8, the plan is referred to the Economic and Finance Committee of Parliament who may object, resolve to suggest amendments or not object to the levy proposal. This is not a power to amend the plan, it only relates to the levy proposal (eg the amount and type of levy). If the EFC objects, the plan must be laid before the House of Assembly. See section 95 generally.
[19] Sections 122, 135 and 63(4) respectively.
[20] Section 65.

authority as well as playing the primary role in catchment management policy.

Precise distinctions are obviously difficult to draw however, Catchment Plans are not focussed to any great degree on the regulation of the taking and use of water. Instead, they address all other issues relevant to the management of water catchments. They may include a range of features including construction of water management infrastructure, water management practices (including the diversion or holding of water), water management works (including the modification of watercourses, removal of weeds etc), education and behavioural change strategies and monitoring and research.

Section 92 of the Act specifies the content of Catchment Plans and most significantly requires them to contain "goals" for water resource management and a program to implement the plan.[21] The goals are the policy component of Catchment Plans as they embody the strategic elements that are implemented by the implementation program and funding sources etc. The goals are obviously constrained by the scheme of the Act (eg a goal of abolishing the licensing system would probably be invalid, although a goal of investigating and advising on alternative regulatory models probably would be valid). Similarly, goals must be consistent with the scope purpose and expressed object of the Act (eg a goal of overturning the federal goods and services tax or establishing a regime of aboriginal reconciliation would be invalid).

Goals should not restate the policy inherent in the object of the Act. The object section[22], and the obligation to further it[23] effectively amount to statements of policy about the management of water resources, in the formulation of ESD principles set out in that section. This policy statement is very broad, and already applies to Boards by virtue of section 6(2). For this reason there is little point in Catchment Plans merely restating "sustainability", or "ecosystem protection" or "precaution" as goals. Instead there is more utility in plans making far more specific goals, for example, "reduce the weeds in Rocky Creek", "reduce the volume of stormwater discharge to detention basin 1 by 20% in three years" etc.

The program of implementation is effectively the work program or action list for the operations of the Board. It should contain details of what the Board will actually do and when to achieve the goals set out in the plan. The program needs to contain sufficient detail to clearly indicate what the Board will be doing for the purposes of authorising that action under section 65. Having set out the program, the plan must also set out expenditure estimates and funding sources for that program.

[21] Section 92(3)(e) and (g).
[22] Section 6(1).
[23] Section 6(2).

The Act requires Catchment Plans to contain an assessment of the water needs of ecosystems that depend on water in the catchment area.[24] Plans must also set out the method that the Board will use to assess its success in implementing the plan (eg an implementation audit) and the method for assessing the extent to which the implementation of the plan has succeeded in achieving the Board's goals (eg an implementation plan review).[25]

The other significant feature of Catchment Plans is the ability to identify changes that are necessary to Development plans under the Development Act 1993 or to any other Act or subordinate legislation.[26] In short the plan may identify legislative change that is necessary to further the object of the Act and more effectively manage the catchment area. Merely identifying the necessary changes obviously does not bring them into effect, but it is clearly an important part of the process. A Catchment plan may also identify changes that are necessary or desirable to any activity of a council or any other person. If changes to council activities are identified, the Council must have regard to the possibility of implementing those changes when it undertakes the relevant activity.[27]

Once adopted, the program of implementation of the plan must be reviewed annually and every five years the entire plan must be reviewed.[28] On the annual review the plan must be amended to provide the implementation program, expenditure estimates and funding sources for the next three years (eg a year is added every year to maintain a three year program). If only the program, estimate and funding issues are amended then a relatively simple public consultation process is allowed. If more substantial amendments occur, then the full consultation process (commencing with a proposal statement etc) is required.[29]

Catchment plans may specify that any or all of the activities listed in section 9(4) of the Act require a permit from the relevant authority nominated in the Plan. The criteria for the grant of permits must be set out and the plan must state whether the public notice and third party appeal provisions of section 19 apply to those permits.[30]

4. WATER ALLOCATION PLANS

WAPs are prepared by Catchment Boards or Water Allocation Planning Committees (where there is no Board for that area). They are adopted by the Minister signing a certificate to that effect on the plan and thereafter, they are assumed to be prepared, adopted and

[24] Section 92(3)(b).
[25] Section 92(3)(f).
[26] Section 92(3)(i).
[27] Section 86(3).
[28] Section 97.
[29] Section 97(5) & (6).
[30] Sections 9(3)(e), 10(2)(d), 19(1) and 92(3)(l).

in force under the Act in the absence of proof to the contrary.[31]

WAPs play the most important role in the regulation of the taking and use of water in this State. The Minister's decisions to grant a licence, the allocation to be endorsed on the licence and the transfer of allocations are all required to be consistent with the relevant WAP.[32] The Minister's decision to impose any conditions on the licence or allocation must not be seriously at variance with the relevant WAP.[33]

The Minister may also amend existing licences to make them consistent with a WAP, even to reduce the amount of water allocated.[34] Since 13 July 2000, WAPs are also able to provide for water (holding) allocations.[35]

Although not directly regulated by licences, water resources that are not prescribed may only be taken and used in a manner that does not contravene a WAP that applies in relation to that water.[36] Section 101(7) of the Act allows WAPs to include provisions relating to the taking and use of water other than water in the prescribed resource to which the WAP directly relates. The effect of these provisions is difficult to precisely define, but nonetheless significant. In effect, WAPs can control the use of water remote from a particular prescribed resource. The most obvious examples include WAPs for underground water that directly refer to the use of water from watercourses that recharge the aquifer, or WAPs for watercourses that refer to the use of surface water further up the relevant catchment. However, these provisions may also operate to indirectly constrain the use of non prescribed resources where such use is indirectly inconsistent with specific criteria or the cumulative tenor of a WAP.

The content of WAPs is dictated by section 101 of the Act. They must contain an assessment of the quantity, quality and time or period that water is needed by water dependent ecosystems, an assessment of the effect that the taking and use of water from the prescribed resource will have on any other resource and an assessment of the capacity of the resource to meet demand. A WAP must also provide for the monitoring of that capacity.

Perhaps the most essential component of a WAP is the criteria for the allocation and transfer of water. These criteria probably have the most significant effect of any portion of any of the four plans under the Act. They must set out clearly and concisely and in sufficient detail the rules for the allocation of water. These criteria will be interpreted and applied by the community (throughout the consultation process), by water users and their consultants, investors in businesses that use water, by the Minister and by the Court. They must be written so that the fundamental policies they contain can be readily understood and consistently and predictably applied.

Section 101(4)(c) requires the plan to provide for the allocation and use of water balancing social, economic and environmental needs, at a rate that is sustainable.[37] The WAP must also define the extent of the resource that is being allocated (eg the quantity available for allocation). In doing so WAPs need to set out a basis for allocation or the allocation model eg percentage share, proportional allocation based on land ownership or some other factor, area of irrigation, volume etc. The options for the basis are limited largely by imagination. Having set out the basis, a plan must also set out the criteria to be applied to the individual applications eg the water uses or the circumstances of taking water that are to be prohibited or discouraged and those that are to be promoted. These criteria can be as lengthy and detailed as the current scientific knowledge allows.

As with Catchment plans, the terms of the basis of allocation and the criteria for allocation must be consistent with the scheme as well as the object of the Act. For example, a WAP could not prescribe the conditions that the Minister will impose (that being a matter for the Minister's discretion under sections 29 and 34 etc).

WAPs have considerable effect in determining the amount of water to be allocated and the way in which that allocation will take place. In this way they can reduce the amount allocated and alter the allocation regime (which changes are effected by the Minister varying existing licences under section 30).

The same applies to transfers of allocations. The basis of allocation will apply to those transfers, however WAPs may contain discrete criteria for transfers. Only transfers may be made subject to the public notification and third party appeal provisions of section 40.[38] In short, these provisions can not be made to apply to new licences or new allocations, only the transfer of existing allocations.

WAPs may specify that any or all of the activities listed in section 9(4) of the Act require a permit from the relevant authority nominated in the WAP. Again, the WAP must set out the criteria for the grant of permits and whether the public notice and third party appeal provisions of section 19 apply to those permits.[39]

[31] Section 152(5).
[32] Sections 29, 35 and 41.
[33] Sections 35 and 41.
[34] See Sections 30 and 101(8).
[35] Section 35A.
[36] Sections 7(8) and 9(2).

[37] As to the issue of sustainability, see Levinson, J "Sustainable water allocation by judges, The scope of judicial review of water allocation plans under the Water Resources Act 1997" paper presented at the 1st Australasian Natural Resources Law and Policy Conference – Focus on Water, Canberra, March 2000.
[38] As to public notification see also section 157 and Regulation 14 of the Water Resources Regulations 1997.
[39] Sections 9(4), 10(2) and 19.

5. LOCAL WATER MANAGEMENT PLANS

Local Plans may be prepared by councils or controlling authorities[40] for their relevant council area. Unlike the other water plans, there is no obligation for them to be prepared.

Councils may amend their plans at any time, and must amend them to ensure consistency with the SWP or if directed to do so by the Minister.[41] Councils must review their plans every five years or if so directed by the Minister.

Local Plans guide the relevant council in exercising its powers and functions relating to water under the Act and any other Act. Unlike Catchment Plans and WAPs, Local Plans are focussed far more on the actions of the council than on regulating the behaviour of others or regulating water resources generally. Local Plans operate as a discrete water plan for a council along with other plans that the council may have covering other subject matter.[42] Except activities under section 9 of the Act, Local Plans have little regulatory function. For example they cannot be used to regulate the taking of water, nor do they have any power to authorize any activities except those within the scope of a council's powers under any relevant legislation.

The functions and powers of councils under the Act are limited to the issuing of notices under sections 13, 14 and 17 (when the council is the relevant authority), granting permits under section 9(4) and any other power or function delegated to a council by a Board or the Minister. However, a Local Plan can not be used to guide the use of the enforcement powers in sections 13, 14 and 17. Therefore, the primary role of a Local Plan is to set out which activities listed in section 9(4) require a permit, and setting the criteria, the relevant authority and any public notification requirements. The extent to which these powers can be fully exercised depends largely on the existence of a Catchment Board, as it would be invalid for a local plan to require a permit for an activity that also required a permit under the Catchment Plan or even a WAP.

Local Plans can also address matters relating to the management of water resources under other Acts that vest powers and functions in councils. The most obvious are the powers under the Development Act and the Public and Environmental Health Act.

6. CONCLUSION

The Act provides for the adoption of four water plans. They each have discrete functions to perform within the scheme of the Act. Their ultimate scope and purpose is therefore limited not only to the general limitation of a piece of natural resources legislation such as the Act, but also by the role of each other plan. For the system to work effectively, each plan must be carefully drafted to fit within the scope defined by the Act.

[40] Now "subsidiaries" and "regional subsidiaries". See sections 42 and 43 Local Government Act 1999.
[41] Section 113.
[42] See the Local Government Act 1999, sections 50, 110, 122, 196 etc.

Legal issues in water recycling[1]

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Summary
Reuse of wastewater from the population who have access to potable reticulated water in pipes is going to be necessary in the future in many parts of the world. Reuse has recently been described as, potentially, a very lucrative business by Anglian Water, American Water and Suez Lyonnaise des Eaux. It is potentially a lucrative business all over the world. In Australia we have some very good examples of reuse schemes designed to reduce the demand for potable water. However, these are of recent origin and hence there has not been much community reaction to the issue. There is one legal case in NSW, which disallowed a turf farm using recycled and treated water on the basis that the processes were experimental. That was in 1993 and local environmental factors were also important in that decision (Rudman v Tweed Council).

There are many legal issues associated with the reuse of water and these are explained in this paper. Presently water management in Australia is undergoing a revolution due to the Council of Australian Governments and many jurisdictions are still having public consultations on proposed new laws. Despite this uncertainty, it is true to say that there are very many legal issues involved in setting up and running a wastewater scheme and a myriad of Acts apply in each Australian State. Whilst the general thrust all State laws is to impose safeguards to ensure public and environmental health and whilst the common law of negligence applies in each State, the legal issues in each State will require careful consideration.

This paper outlines the legal issues and draws on two cases: one on reuse and one High Court decision on the supply of contaminated water by an irrigation Authority in NSW (Puntoriero v Water Administration Ministerial Corporation). The paper also looks at existing schemes in other States.

1. INTRODUCTION

The reuse of wastewater is essential in some regions of Australia and this need is likely to increase in response to changing climate, increased population and increased per capita demand. Societal demands are the main drivers for reuse (Anda et la 2000). The reuse potential of urban stormwater and wastewater has been considered recently to be a feasible way to reduce demand on potable water supplies (Mitchell, Mein and McMahon 1999). In response to local conditions water reuse has been practised in some parts of Australia by the former public utilities. Presently there are many innovative schemes on the drawing Board and part way through implementation.

In concert with the increased urgency to create systems, so that the community can reduce the overall demand for potable water supply, there has been a push by all levels of Government to adopt ecologically sustainable development (ESD) measures. The *Intergovernmental Agreement on the Environment* was signed in 1992 by Commonwealth, State and Local Governments. This Agreement in part arose out of international conventions (Bjornlund and McKay 1998) but also out of some home grown examples of cases where ways of dealing with waste created a continual flux of nutrients and toxic substances being transferred to land, water systems and food chains (Wright 1994, COAG 1999) Hence, Ecologically Sustainable Development (ESD) is now a part of the decision making of all governments and is defined to be *development which meets the needs of the current generation without compromising the ability of future generations to meet their own needs*. ESD principles are proposed to be included in the new Water Management Act in NSW (Amery 2000, p17) and is presently in the Sydney Water Act 1994 and Queensland (Water reform discussion paper 1999) and are in the new Victorian, South Australian. Western Australian and Tasmanian Acts. So ESD and the need to

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maximize economic benefits are the other governmental drivers of water reuse.

In relation to wastewater treatment the centralised systems which existed prior to the COAG reforms in 1994 were described as unsustainable both financially and environmentally. The latter largely because of the limited amount of funds available: up to 85% was spent on capital investment in low value-adding pipes and pumps and only 15% on wastewater treatment (ESD Working Group 1992). The scale of the operations was also considered to be too big. These large-scale plants were then, from time to time, causing a flux of nutrients to be transferred to the land and water. Hence, since 1992 there has been a new approach to wastewater management in Australia, which has been considered by Niemczynowicz 1992 to have these elements:

- an integrated systems approach comprising both structural and non structural elements as opposed to a narrow minded technological approach;
- multi-disciplinary;
- of small scale;
- focussed on source control instead of end of pipe control;
- using biological and ecological engineering in wetlands; and
- localised using local disposal and reuse.

Over the last eight years many examples of these approaches have been created in Australia. The schemes are innovative and many have evolved in South Australia. Many laws governing the areas have been changed and many are still in the process of public consultation on a wide range of changes. The immunities from prosecution inherent in the old centralised systems have been abolished, as now the wastewater treatment plant is likely to be operated by a private sector partner using existing infrastructure. This private sector partner has no immunities from prosecution and will find it hard to seek any leniency from the Government regarding the application of environmental protection.

2. LEGAL ISSUES

There are a wide number of legal issues surrounding the reuse of reclaimed water. The most realistic way to describe the legal issues is to use the lawyers' method of case study. Legal rights and obligations exist on us all in various contexts but to understand the legal method it is best to describe the fact situations.

The legal issues mostly arise under State Laws (see Moeller and McKay 2000) and are potentially in these categories:

- tort law, the law of negligence and *Rylands v. Fletcher;*
- public nuisance;
- compliance with the various environmental planning and assessment Acts in each state (case study here of *Rudman v Tweed Council* 1993 NSW Land and Environment Court);
- Statutory Corporations exclusion of liability for damages for the supply of contaminated water (*Puntoriero v Water Administration Ministerial Corporation NSW* High Court of Australia 1999);
- breach of contract;
- public health laws.

The reuse of wastewater in Australia has taken these forms:

- recycling of greywater for toilet flushing and garden and lawn watering;
- recycling of industrial wastewater for dust suppression, wash water and cooling water;
- the recycling of stormwater for the above purposes;
- the reuse of effluent for agroforestry, recreational facilities, ground water recharge; and
- injection into an aquifer as a barrier to prevent salt water intrusion into fresh groundwater.

2.1 Common law

There are risks to public health and to the environment from the reuse of water. These risks increase in inverse relationship to the degree of treatment of the water. The less it is treated and the least information about the reuse locality the greater the risk. In general terms the courts will recognize a best practice standard after proof by witnesses and then seek to apply that standard to the actual events in issue. The difficulty for everyone involved in such a case will be the inherent uncertainty in the behaviour of aquifers and the inability of the best hydrologist to give a definitive answer as to the exact behaviour of water in an aquifer. Clearly, an aquifer can never be as well known as a machine.

Some impacts on the environment include:

- obvious contamination of the aquifer and soils by detectable heavy metals and also phosphorous, but also by more subtle contamination such as by grit, silt and heat;
- changes to the water table leading to sinking or overuse leading to cave-ins;
- changes to soil structure leading to vegetation change; and
- perverse interactions between naturally occurring minerals in the soil and a component of the water reused.

Any such impacts on the environment are most likely since the 1970's to be regulated by statute in each Australian State. It is true to say that environmental protection had to become the domain of statute, as the common law was very ill equipped to deal with such concerns. The common law approach to resources has been one of emphasising rights and obligations between parties to a resource such as water, but paid scant regard to protection of the environment. Indeed, the common law we inherited from England was not really useful here as it evolved where there were no droughts of any major consequence and in ignorance of the groundwater.

However, some common law doctrines did apply to water held in dams and the riparian doctrine did mention that the downstream neighbour is entitled to water not sensibly diminished in quality and quantity. Finally, the common law did recognize the action of public nuisance.

Taking these in turn:

Rylands v Fletcher 1868-Negligence
This doctrine arose out of a case where water was impounded on one property and escaped, flooding the mine of the neighbour. The case became the basis for a tort of strict liability. This was expressed as *If anyone brings something dangerous onto their property and keep it then they will be liable for its escape.* This tort or civil wrong was initially one of strict liability, that is, no defences were allowed, but increasing exceptions were made such as to protect the keeper of the dangerous thing from the acts of a malicious third party. This tort applied in Australia to the escape of gas *Benning v Wong* but in 1994 was incorporated into the general Tort of Negligence in the case *Burnie Port Authority v General Jones Pty Ltd (*McKay and Pisaniello 1995).

Riparian Doctrine
The riparian doctrine did refer to water quality and there have been cases throughout Australia on this issue. Generally the riparian doctrine is unsatisfactory as an environmental protection measure as it only gave rights to riparian owners. The system of riparian rights was superseded by a system of licences early in this century to promote development of land for agriculture (McKay 2000) with again little attention paid to longer term consequences.

Public Nuisance
This is a difficult Tort to prove, as the plaintiff needs to show that the personal injury suffered was special or over and above that suffered by the public at large (Fleming 1997). This limitation served to restrict the application of this tort. The Attorney General was the proper plaintiff in situations where the public was affected. Even then, however, the law here was not aiming to impede commerce. It saw that many people may be affected but many more benefited when there was some inconvenience to all, say, through road works. Hence this action was limited in use. It ill befits our renewed consciousness for safeguarding the environment (Fleming 1977, p 396).

Some public health risks associated with the reuse of wastewater include:

- sickness from pathogens;
- unacceptable levels of odour;
- concentration of residues on children, animals and food;
- mosquito infestation; and
- visual pollution.

Generally, the common law of negligence would now apply to all these public health risks. Statutory laws would also apply to these instances and these would set the burden for the plaintiff at a much lower level than set by the laws of negligence. Most governments through the last one hundred years have been interested in preserving public health and clean water.

Negligence has recent a history in the common law dating from 1932. Negligence was first created in a case about a woman getting gastroenteritis from drinking "ginger beer" out of a bottle where the manufacturer had left the residue of a snail. The case is known as *Donoghue v Stevenson*. Prior to this case, a person could only recover damages if they were in a contractual relationship and were injured. In the case of *Donoghue v Stevenson,* the ginger beer was bought by a friend for the plaintiff, and without the judicial activism of Lord Atkin, Donoghue would never have been able to recover.

Lord Atkin created a famous dictum in this case. It reads:

"You must take reasonable care to avoid acts or omissions which you can reasonably foresee would be likely to injure your neighbour".

Hence the elements of negligence have been described as:
duty of care;
breach of the standard of care
causing
damage, which was
reasonably foreseeable.

This series of steps requires methodical approaches to the facts. If one is not shown then the whole case fails. For the first, the plaintiff must show that a defendant owed the plaintiff a duty of care. They must be metaphorically neighbours. The plaintiff must then prove that the defendant failed to observe the standard of care that would have been observed by a reasonable person.

In a situation where the damage was caused by many defendants then the damage attributable to each defendant will apportioned. Courts are accustomed to making these difficult decisions about apportionment. To do this they will rely on expert witnesses.

3. LEGISLATION

There are a variety of statutes in each State to control the use of wastewater, but there is no one piece dealing with wastewater reuse.

3.1 Commonwealth Acts

Major Commonwealth acts include the *Murray-Darling Basin Act 1983*, which controls the pollution of rivers in the basin in accordance with the Inter-Governmental Agreement. Other Commonwealth Acts apply to the marine environment mainly. The Commonwealth has

been active in producing guidelines such as on Water Quality and specifically for the reuse of reclaimed water (National Health and Medical Research Council 1987).

3.2 State Laws

Here there is a wide range of laws arising out of the environmental protection acts in each state and the development acts and finally the local government acts. The actual patchwork of acts in each jurisdiction will determine the parameters within which any wastewater reuse scheme can operate. These laws will be in addition to any common law requirements. In the case of most water supply and wastewater collection bodies they will also be subject to the legislation setting up the corporatised body such as the *State Owner Corporations Act 1989* (NSW) and the specific act such as the *Sydney Water Act 1994*.

3.3 Case studies

In order to illustrate the issues a case study will be selected to look at the legal issues in one jurisdiction. This case study will examine legal cases and the statute law in order to present a case study on the outcomes for a plaintiff suing a hypothetical reuse plant for damages caused to the plaintiff by water contamination. The case study will also have regard to the environmental damage caused by reuse water of poor quality. In each case the quantum of damages likely to be awarded will be guessed at by looking at relevant local cases.

Case Study 1

Rudman v Tweed Shire Council NSW 1993

This case study presents the arguments made about NSW State policy on potentially hazardous industries, and the response of the Court to the Environmental Impact Statement (EIS), especially the finding that the proposal had the potential to pollute surface waters through natural runoff from the site.

The major potential types of pollution are organic, suspended solids and nutrients from the application of sewage sludge and fertilizers to the soil. There is also a risk from pathogenic organisms attached to sludge. Groundwater could also be polluted. The court held that the EIS was in favour of the applicant. However, the Court went on to reconsider the application. In this regard the Court held that the application should be refused because:

- the essential unsuitability of the site; and
- the unsuitability of the proposed development being conducted by a private entrepreneur in circumstances where the reuse (a combination of treated effluent and sludge) is acknowledged to be the first such experiment and is an experimental project calling for the strictest and vital environmental monitoring of the conduct of the development.

Case Study 2

The details of the reason for the decision in Puntoriero v Water Administration Ministerial Corporation NSW by the High Court gives important national direction to water suppliers on the issue of liability for the supply of contaminated water.

3.4 Procedures to set up a wastewater reuse scheme

In order to set up a plant, development approval will be required and, for this to occur, local development plans will need to be consulted. The relevant environmental protection statutes will prohibit pollution of water and generally this is given a wide definition. For example, in NSW, water pollution has a 500 word definition, which includes:

Placing any matter whether solid liquid or gaseous in a position where it falls, descends, is washed, is blown or percolates (sic) or is likely to do any of the above into any waters.

Waters means the whole or any part of;

(a)Any river, stream, lake, lagoon, swamp, wetlands, unconfined surface water, natural or artificial watercourse, dam or tidal water (including the sea, or
(b) any water stored in artificial works, any water in water mains, water pipes or water channels, or any underground or artesian water.

3.5 Protection of the Environment Operations Act 1997(NSW)

This clearly covers all the subtle types of water pollution mentioned earlier. The storage of nitrogen rich reuse water in a potable aquifer would clearly be caught. There have been many cases in all jurisdictions applying these provisions to pollution caused by heated water. Prosecutions have occurred and these have generally been of a criminal nature imposing huge liability on the company to clean up the pollution at the site. Directors can be personally liable and the companies in many instances have been fined exemplary damages.

3.6 Water quality laws and reuse

Australia has a system of non-binding water quality guidelines (McKay and Moeller 2000) such as those developed under the *National Water Quality Management Strategy* by the National Health and Medical Research Council 1996. These guidelines have been made legally enforceable by incorporation in various statutes and in water supply licences in every state for example, Sydney Water Customer Contract and the Yarra Valley Customer Contract. The standards set in this document are high and if water is to be reused as potable then this is the standard that a court would look to. A court would be encouraged to see so many bodies incorporating the voluntary guidelines into their customer contracts.

Many scientists have stated over and over again that reliable data on chemical contaminants in water is incomplete and insufficient. (Australian Institute of Health and Welfare 1996.)

3.7 Non potable reuse

Here there are no set standards but a court would require the defendant (the water supplier) to demonstrate that they monitored the water and they had some idea of how it was going to be used. Clearly, watering a playing field in a school with reclaimed water may be cost-effective, but if children tumble on the ground then the water would need to be free from major pathogens. Clearly, the standard of the water quality would need to match the proposed use. Smaller, localised schemes would enable this matching to take place. The burden on the supplier is high and the risks are also high, as public health statutes and the common law impose large financial burdens on defendants.

4. SUMMARY

Wastewater reuse schemes are a feature of modern Australia. The development, planning and operation of such schemes opens up wide avenues of legal liability for the operators. A water recycler would need to undertake at least these steps:

- keep up to date with international experience in the management of effluent;
- monitor and have fail safe regimes in place;
- use the results of the above;
- consider most effective ways to warn the community using the water of any seasonal risks;
- provide information in an effective way to the community;
- provide advice to users.

The philosophy of promoting environmentally sustainable development will require some reuse of water but will also impose obligations to protect both public and environmental health. ESD is clearly a driver in water reuse schemes and the challenge for legislators and courts is to find a balance to enable reuse of wastewater but with appropriate safeguards.

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Is there power in the Australian Constitution to make federal laws for water quality?

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Summary
A number of powers listed in the Australian Constitution permit the Commonwealth to impose legislation in the subject field of national water quality. This paper examines the three most important powers: (a) Section 51 (i), the commerce and trade power, (b) Section 51 (xx), the corporations power and, (c) Section 96, financial assistance to the States. Section 51 (i) is the most important of the three Sections above, and has the ability to control imports and exports. This clause allows for the control of imported materials and machinery used in water technology and industry, and foreign capital required for business finance. However, the power is severely curtailed because the interstate trade portion of the clause is restricted to barter exchange, which has been judged not to include manufacturing and production. Hence legislation aimed at water pollution abatement associated with production by-products could not use the trade and commerce power. It is also limited in relation to newly corporatised water authorities as it does not include intrastate trade. The corporations power, however, has the potential to endorse a large breadth of water quality and environmental regulations. This power is sufficient to regulate the major water suppliers in Australia and probably also, in the light of recent High Court decisions, water pollution that is produced as a result of corporate activities. Lastly, Section 96, allowing the Commonwealth to tie conditions to financial grants, has almost unlimited application, and could be used to host any variety of legislative packages designed to protect water quality.

1. INTRODUCTION

The endeavour of societies to control the problems of economic growth and limit the costs of such outcomes are some of the problems that have developed during the industrial age. Policies are generally aimed at conflicting issues with multiple components such as: efficient utilisation of resources, the control and minimalisation of pollutants and effluents, and development that has a less negative impact upon the environment. In Australia, however, the implementation of a national environmental standard is minimal and the States are left to nationalize these conflicting ideals.

A number of Commonwealth powers listed in the Australian Constitution have the ability to enable environmental and water quality laws. This article explores three sections of the Australian Constitution and the likelihood of them supporting national water quality laws.

2. THE AUSTRALIAN CONSTITUTION

In 1901, the six separate colonies of the Australian continent, including Tasmania, joined together as one single federated union. The Australian Constitution, the document that formalized this union, imposed a superstructure upon the existing colonial frameworks.

2.1 General principles of interpretation

James Crawford (1991) has established three basic principles used for the interpretation of federal powers under the Australian Constitution:

- "The heads of power in Section 51 are to be interpreted separately and disjunctively, without any attempt being made to avoid overlap between them."

- "The powers conferred by Section 51 are to be construed liberally in accordance with their terms, and without any assumption that particular matters are intended to be excluded from federal authority or "reserved" to the States."

- "There is no requirement that Commonwealth legislation be exclusively about one of the granted heads of power" or "that in terms of its intent or practical effect, the legislation be primarily, predominantly or even substantially concerned with the granted head of power."

3. SECTION 51 (I)

3.1 Section 51 (i), trade and commerce with other countries, and among the states

The trade and commerce power in the Constitution, Section 51 (i) is a positive power that confers upon the Commonwealth the legislative ability to regulate interstate and overseas trade. This is a significant power for environmental affairs because it allows the Commonwealth government to oversee international business, and also any major industrial projects that have an interstate component.

The terms trade and commerce refer to the 'normal' meaning of the words and includes at minimum the buying and selling activities between two localities. However, the limitation of this clause is that it does not

apply to intrastate trade and this is further reinforced by Section 92 of the Constitution which guarantees that trade is not hindered by duties. Section 92 states:

"On the imposition of uniform duties of customs, trade, commerce, and intercourse among the States, whether by means of internal carriage or ocean navigation, shall be absolutely free."

Both these sections overlap each other, and in this sense "trade and commerce" are interchangeable and can be assumed to mean the same thing (*James v. The Commonwealth*, p 60; *W. & A. McArthur Ltd. V. State of Queensland* 549). Section 92 is primarily an injunctive power that protects the free flow of goods across state borders. The case *Cole v. Whitfield* (1988) ensures that federal environmental laws do not contravene Section 92, as long as they do not discriminate between interstate trade.

The trade and commerce clause also bestows unlimited power to inhibit imports (Id.), including foreign capital (*Bank of N.S.W. v. The Commonwealth*, p 381), and conditions can be imposed depending on the nature of the trading enterprise. This also includes commercial activities involved in transportation (*Australian National Airways Pty. Ltd. V. The Commonwealth*; *R. v. Wright, ex parte Waterside Workers' Federation of Australia*; *Airlines of New South Wales Pty. Ltd. v. New South Wales*), the transmission of energy and money, and information (*Bank of New South Wales v. The Commonwealth*, p 381-382; *W. & A. McArthur Ltd. V. State of Queensland*, p 546-549). Early decisions on manufacturing and mining indicate that these forms of activity were outside the trade and commerce power (*Huddart, Parker & Co. Pty. Ltd. V. Moorehead; Grannall v. Marrickville Margarine Pty. Ltd.*, *Beal v. Marrickville Margarine Pty. Ltd.*). In *Beal v. Marrickville Margarine Pty. Ltd.* a distinction was made between the manufacturing of a product and the distribution or trade of merchandise, and Section 92 was found not to be applicable to manufacturing, even though it was evident that the production itself was a development of a trading economy, and the company held a contract for the sale of margarine interstate.

The most pertinent case involving the extent to which the Commonwealth can intrude into commercial activities as incidental to the commerce power, was decided 45 years ago in *O'Sullivan v. Noarlunga Meat*. In this case a distinction was made between 'production simpler' or production in general, and production used for the exporting of meat. The High Court found the Commonwealth law regulating meat exports valid under Section 92, and that production orientated towards overseas trade was also regulable, even though in this case the Abattoirs was an in-state process. This gives the Commonwealth the power to govern particular vestiges of a manufacturing or mining process, or the entire process, which can be identified to be likely to affect an export market. In the *Noarlunga* case, the Commonwealth imposed public health standards, which overrode State conditions.

3.2 Section 51(i) & Section 92 and water quality laws

The present distinction between intrastate and interstate trade inhibits the introduction of water quality legislation designed for pollution abatement, because it would be difficult to show how discharges from a manufacturing plant affected interstate or overseas trade. Pollution generally acts on the economy in a less obvious and pervasive manner but it is nevertheless a real and destructive agent. The nature of pollution as a macro phenomenon with indefinite and often multiple causes and reactions conflicts with the need to find a direct casual relationship between trade and production processes. The rationale of the *Noarlunga* case would allow legislation for the quality of water used in a manufacturing or production process, but this would have to be part of the process 'skeletally' linked to export or interstate trade. A disadvantage of this system is that a production line can be re-arranged within a short time period, and such a system would rely on for example a licensing system that had attached conditions for environmental or hygiene work practices. Another drawback is that legislation aimed at drinking water quality could only be enforced upon companies engaged in interstate or overseas trade, not water utilities that sell water within State borders.

The greatest difficulty of any federal government wishing to introduce national water quality legislation, is the power of trade and commerce clause to control mining, industry and activities incidental to commerce. In the present climate, it would not be possible to legislate for clean water standards aimed at discharges, since production processes are not considered commerce. Whether the federal government can intrude into intrastate processes linked to overseas and interstate trade is unclear and bewildering to decipher. Presently, there are no clearly established pre-ordained 'discernable elements' that comfortably distinguish the difference between a company geared to exporting or that which is predominantly a domestic producer. Even the most general interpretation of the *Noarlunga* case would only allow the federal government to regulate activities that in some manner could be differentiated for export and interstate trade. The trade and commerce power alone is sufficient to control international trade and can be used to prevent the importation of undesirable materials, including foreign capital for finance. Under this power it would be possible to implement environmental legislation aimed at larger business enterprises that are associated either to interstate or international exchange, but would be severely constrained by the need for a direct causal link. However, without being used in combination with another power, Section 51(i) would not provide sufficient regulatory scope for environmental legislation.

4. SECTION 51 (XX)

4.1 Foreign corporations, and trading or financial corporations formed within the limits of the commonwealth.

An increasingly important power under the constitution is Section 51(xx), the corporations power. This power may prove to be a substantial means by which the Commonwealth can introduce national environmental legislation and water quality laws.

It is arguable that the Commonwealth under Section 51 (xx) has the power to regulate State government water authorities since a substantial part of their purpose is to supply and sell water to the general public. The National Competition Policy (NCP) requires all government water authorities to implement administrative and accountability reforms (Productivity Commission, 1998). Commonwealth payments are subject to the States making satisfactory progress under the NCP and related reforms, the last payment being in year 2001 in which all reforms must have been adopted (National Competition Council, 1998). This has, in most jurisdictions, resulted in the move to corporatisation from the original traditional government structures (Id., p 133). In this decade the largest water suppliers serving the bulk of the Australian population have become corporations and can be more strongly, in contrast to previous structures, classed as trading corporations, and hence are regulable. It is also clear that this would extend to non-government activities such as mining, manufacturing and industry. However, State government bodies that cannot be depicted as a trading organization or could not be shown to have a substantial commitment to a public service of importance would not be regulable by the Commonwealth. This would not include water authorities because they have clear community service obligations.

The *Tasmanian Dam Case* has been remembered largely for the use of the external affairs power, although it important case in respect to the clarification of the corporations power and the extent of the clause on trading corporations. In this case, a majority opinion decided that the Tasmanian Hydro-Electric Commission, a government instrumentality, was a trading corporation. It also prohibited the construction of dam that was connected to the sale of electricity, even if, in itself, it was not a trading activity. Three members (Id., p. 496, 510, 549) of the court held that this power extended to deeds whether for the purposes of trade or not. It has also been acknowledged that trading corporations comprise all activities that are substantially connected to trading or financial activities or where there are no activities but it can be established that it is part of the nature of the organization to be trading or financial corporation (*Fencott v. Muller*; R. *v. Federal Court of Australia, ex parte Western Australian National Football League; State Superannuation Board v. Trade Practices Commission*; *Actors and Announcers Equity Association of Australia v. Fontana Films Pty. Ltd; The Commonwealth v. State of Tasmania*).

4.2 Application of section 51 (xx) to corporatised water authorities and water pollution control legislation

Two major obstacles need to be clarified before the scope of Section 51(xx) can be realized. First, what exactly does the term "trading corporation" encompass, and second to what extent can their operations be regulated?

Assuming the Court upholds that near all activities of corporations in the future can be regulated, and that trading corporations are essentially business corporations engaged in the trading of goods, then the potential of the Section is wide-reaching with the ability to reach a vast portion of commercial operations. This would allow legislation to be passed for the control of water pollution caused by corporations.

During the 1990s many of the water utilities in Australia were corporatised, directed at the need for greater accountability and performance (Productivity Commission, 1998, p. 37-38, 133). These corporations (Id., p 127) would definitely be under the scope of Section 51 (xx), and government bodies engaged in the selling of drinking water for consumption would also probably meet the criteria of a trading corporation.

However, regulatory bodies such as the Western Australian Office of Water-Regulator and the Victorian Office of the Regulator-General, which are charged with the regulation of the water supply industry in their respective States, would not be subject to the corporations power. However they are subject to the *Trade Practices Act 1974* (Cwth) (TPA) and any regulations introduced by the Australian Competition and Consumer Commission (ACCC) to promote fair and safe trading, and eradicate market abuses. These state regulatory bodies have the ability to check performance standards and quality issues, but do not trade in bulk water or any other commodities.

At present, it is clear that legislation can be passed that controls or prohibits the trading actions of trading and financial corporations. The corporations are presently subject to the TPA that prohibits restrictive and anti-competitive trade practices and can enforce a number of remedies, including industry and customer consumer codes.

4.3 The Trade Practices Act 1974

In 1995 the Council of Australian Governments (COAG), consisting of the Commonwealth, the six States, the Australian Capital Territory, and the Northern Territory of Australia all reached agreement on a NCP for Australia as outlined in the Hilmer Report (Report by the Independent Committee of Inquiry, 1993). The premise of these agreements was the need for microeconomic reform and competitive markets (National Competition Council, 1998, p. 3). The CCA, requires all businesses and agencies, including water authorities of the Commonwealth and State governments to adhere to the competition laws of Part

IV of the TPA, and related sections (Idid., p. 4, 27 – 33). Utilizing Section 96 of the Constitution, the Commonwealth undertook to make ongoing payments to the States and Territories subject to satisfactory adherence to the agreements (Id., p. 5, 35 – 41). In concert with this process most Australian water authorities since the early 1990s, have moved from traditional government agencies to corporatised bodies, and are therefore trading corporations subject to the TPA (Productivity Commission, 1998, p. 37-38, 133).

Regulations are generally an important factor in the shaping of institutional environments and are used to achieve certain social outcomes or reduce risk associated with market failure. Where public monopolies are not accountable to the public, or have gained greater independence through corporatisation the need to set standards to ensure that they do not abuse their position is paramount. In the case of privatization, and to some degree in government corporatisation, the coupling of monopoly 'comfortability' and the dangers of short-term profit maximization, may put at risk public welfare and safety (Allan Asher, p. 10).

There are two major sections in the TPA 1974, giving the ACCC the regulatory capability of introducing water quality criteria. They are:

- Part IVB – Industry Codes. Industry codes can be declared by regulation and can be used to regulate the activities of industry participants (TPA 1974, s. 51AE). For example, water quality and enforcement codes could be implemented as an industry code, binding all participants to basic health and consumer standards. Section 51 AD prohibits corporations from contravening mandatory industry codes.

- Part V - Consumer Protection. Section 65E allows the Minister to declare product safety or information standards (TPA *1974*, s. 65D). The section could be used to prescribe water quality and enforcement standards on water corporations and authorities.

Criteria enforced under the TPA 1974 may not only apply to State water corporations and authorities, but also to local governments that supply water. State government regulatory bodies, such as the Victorian Office of the Regulator General and the Western Australian Office of Water Regulation would be obliged to enforce federal standards and codes that were more stringent than their own State requirements. All State regulatory agencies are subject to Part IV and related sections of the TPA 1974 (National Competition Council, 1998, p. 4, 27 – 33). However the final enforcement of these regulations would be the responsibility of the ACCC.

5. SECTION 96

5.1 Section 96, the Parliament may grant financial assistance to any state on such terms and conditions as the Parliament thinks fit.

To date the Commonwealth's major constitutional forum for influencing State policy has been the use of cooperative financial arrangements, under Section 96 of the Constitution. With the use of federal grants and moneys the federal government can cajole or induce a State into agreeing to specified administrative and financial conditions. These grant programs have included requiring such things as water resources evaluation and audit, national competition reforms, and extending the coverage of federal Acts.

In *Second Uniform Tax Case*, the States of Victoria and New South Wales maintained that the Commonwealth could not compel the States to cease income tax collection with the use of the grants power or dictate policy. This was rejected by the High Court and the phrase "on such terms and conditions as the Parliament thinks fit" was accepted literally by a majority. The Court made the point that money tied to the grant was only a inducement to comply with conditions, not a legal necessity. However, any State that did not comply with grant stipulations would be threatened with financial penalties and isolation in future years by the Commonwealth.

5.2 Section 96 and water quality laws

Section 96 has already been applied to a number of areas, and considering the political advantages for States that receive extra revenue, this is obviously a very powerful tool for the Commonwealth to intervene in State matters. Not only can the Commonwealth enforce comprehensive policy reforms on the States, it is also able to leverage a State into adopting uniform legislation. This is particularly attractive where uniformity is advantageous, such as national water legislation.

6. CONCLUSION

The foremost difficulties inhibiting the introduction of national environmental legislation in Australia is the interpretation of "trade and commerce" and "trading corporation" in Section 51(i), and 51(xx) respectively. Three major problems occur with the present interpretation of commerce. First, that commerce excludes production, mining and manufacturing, and second, that for activities to be incidental to commerce and therefore regulable they have to show a direct causal link. Third, Section 51(i) does not occupy intrastate trade, and this is reinforced by Section 92 that guarantees free trade amongst the states. In reference to a trading corporation, the question of what exactly encompasses a trading corporation, and what activities of the trading organization, if not all, can be regulated, still remains partially unresolved. However, it is very likely that government instrumentalities not formally corporations but created for trading will be deemed

trading corporations, and all associated activities of trading corporations will be regulable.

The trade and commerce power could not be utilized for legislation related to the control of pollutant discharges from manufacturing or production. The High Court continually maintains the distinction that activities preparatory to the final barter exchange are not trade, and that only the selling and buying of produce is trade and commerce. This vastly reduces the scope of Section 51(i) to introduce controls for water quality. The *Noarlunga* case allowed the federal government to impose environmental and hygiene conditions on a slaughterhouse in South Australia because it was directly linked to export trade. Although an important decision in determining the extent of Commonwealth powers, it has relatively little consequence for national water quality legislation for two major reasons. First, only activities directly linked to exporting can be regulated. Not only is this restrictive in that it only applies to companies in interstate trade or export, but it also only applies to particular elements of the production process directed affiliated with export or interstate trade. Second, the changeable attention of the producer could at any time change the production process, and hence this Section does not afford a stable or constant basis upon which federal legislation can be built. However a very important and extremely advantageous part of this power, Section 51 (i), is the ability of the Commonwealth to control imports and exports, including foreign exchange.

An emerging power garnishing larger potential due to more open decisions on the definition of a trading corporation is Section 51 (xx) of the Constitution, the corporations power. This is likely to provide a strong framework for environment legislation. Section 51 (xx) as plainly stated allows for the regulation of financial and trading corporations. At present it is clear that this includes trading activities of trading corporations, and it is more than conceivable that future High Court decisions will allow the regulation of all activities of trading corporations, and government organizations that have a substantial commitment to public service. In its restricted definition this would defiantly allow drinking water quality legislation to be implemented upon Australian water corporations who service the vast bulk of the population. It would also promote a very profitable channel for the procurement of legislation safe guarding the quality of open water bodies, lakes and streams, by regulating the pollution discharges of industry and manufacturing. Although this provides for very broad application, any gaps or loopholes could be closed by this Section 51 (xx) in conjunction with a fellow power such as Section 51 (i), the trade and commerce power. The TPA 1974 presently relies mainly on Section 51 (xx) of the Constitution, Section 51 (i) to a lesser extent, and agreements made with the States under Section 96.

Section 96 of the Australian Constitution confers an almost unlimited endowment upon the Commonwealth in which it can intrude into legislative areas generally only a prerogative of the States. Past decisions by the High Court have unequivocally maintained the ability of the Commonwealth to induce the States into any subject field in which it so pleases. This has an enormous scope and suitability for the implementation of any legislative program aimed at uniform water quality practices across Australia.

At present in Australia there exists no federal regulations for water quality. A number of Acts, including TPA 1974 and National Environmental Protection Council Act 1994 have the ability to introduce national regulations but are either limited in their scope, or confined to a context not directly targeted at water quality.

7. ABOUT PAPER AND AUTHORS

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Huddart, Parker & Co. Pty. Ltd. V. Moorehead (1909), 8 CLR 330, Isaacs J. at p. 392.

James v. The Commonwealth (1936), 55 CLR 1, p 60.

O'Sullivan v. Noarlunga Meat Ltd. (No. 1). (1954), 92 CLR 565. O'Sullivan prosecuted Noarlunga Meat for failing to meet the conditions of a South Australian exporting licence under the *Metropolitan and Export Abattoirs Act 1936 – 1952* (SA). The case came before a South Australian magistrate and then was removed to the High Court to determine whether the SA Act was valid. Noarlunga Meats was already registered under a federal law, the Commerce (Meat Export) Regulations implemented under the Customs Act 1901-1953 (Commonwealth). The State Act was found to be inconsistent with s.109 of the Constitution, and the Commonwealth Act valid under s.51 (I) of the Constitution. The slaughtering process of the in-state operation was also found regulable as a process aligned (identifiable tangible elements) towards export.

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Legal liability for burst water mains

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Summary
This paper will review the legal liability for damage resulting from a burst water main in South Australia that has been laid and maintained pursuant to the statutory provisions contained in the Waterworks Act 1932.

1. BACKGROUND

In South Australia a statutory Corporation was established on 1 July 1995- South Australian Water Corporation (SA Water)- to provide water and wastewater services to South Australia. Prior to Corporatisation the Engineering and Water Supply Department operated and maintained all assets of the Ministers (including water mains) under the *Waterworks Act 1932* and the *Sewerage Act 1929*. On establishment of SA Water all assets and liabilities of the Minister vested in the newly established Corporation.

SA Water is a statutory Corporation subject to the provisions of the *Public Corporations Act 1993*. It is an instrumentality of the Crown and holds its property on behalf of the Crown.

SA Water entered into a major Outsourcing Contract with United Water for a term of fifteen years for United Water to operate and maintain the water and wastewater assets of SA Water in metropolitan Adelaide. All assets are still owned by SA Water and for the purposes of this paper I do not intend to discuss any contractual arrangements that have been entered into between SA Water and United Water that may arise in relation to maintenance or operational issues.

To get a better understanding of the magnitude of the water mains that have been laid for the benefit of the people of South Australia and that are operated and maintained pursuant to the *Waterworks Act 1936*, I have set out below some brief statistics:

Water mains total length (km)

total	24 976
metropolitan	8 572
country	16 404

Major pipeline lengths (km)

Murray Bridge-Onkaparinga	48
Morgan - Whyalla (#1)	356
Morgan - Whyalla (#2)	281
Mannum - Adelaide	60
Swan Reach - Stockwell	53
Tailem Bend - Keith	133

Major pipeline rated capacities (ML/day)

Murray Bridge - Onkaparinga	514
Morgan -Whyalla	206
Mannum - Adelaide	380
Swan Reach - Stockwell	80
Tailem Bend - Keith	31

Population served

metropolitan	1 045 million
country	413 000

Volume of water delivered in an average year 269 000 ML

In South Australia there are an average of 2000 to 2500 water mains bursts per annum and a further 4500 to 5500 service pipe bursts per annum. Most bursts result in only minor damage to roadways or footpaths.

2. LEGAL POSITION

Where the Crown (SA Water is an instrumentality of the Crown) has statutory authority for doing a particular act then it can not be sued for that act unless that act is performed negligently. If a water main bursts then the Crown is only liable if it has been negligent, it is not responsible in nuisance or trespass for any damage caused by a leaking or burst pipe.

Pursuant to Section 12 of the *Waterworks Act 1932* the Minister has certain powers to construct or maintain waterworks or lay water mains. The construction and maintenance of the water mains is authorized by statute and SA Water will therefore not be liable in nuisance or trespass for damage that is the inevitable result of the operation of authorized works. However, this does not necessarily absolve SA Water from liability if there has been negligence.

A useful starting point in case law is the South Australian case of *Cox Brothers (Australia) Ltd and another v The Commissioner of Waterworks 50CLR 108.* Cox Brothers operated a department store in the Ruthven Mansions which was seriously flooded by a burst main in Pulteney Street in 1931. The Commissioner of Waterworks laid and maintained water mains in the streets in Adelaide. At 11.15 p.m. on the night in question a water main burst in Pulteney Street. At 12.30 a.m. it became dangerous to the department store and it was reported to the Waterworks Department a few minutes later. The Waterworks Department did not commence to turn off the water until 1 am and the water was not turned off until 1.10 a.m. The Waterworks Department relied on the police and members of the public to report leaks. The water that escaped damaged the department store between 12.30 and 1.10 am. The South Australian Supreme Court held the Commissioner was not liable for the damage

because he had not been negligent. Piper J concluded that:

"the defendant was not negligent in any respect- (a) in or about the provision or laying of the main; (b) in not maintaining any inspection for or which would lead to early discovery of leaks ; (c) in relying on the public to report leaks ; (d) in not reducing the pressure at about 10 p.m. ; (e) in not knowing of the leak before about 12.40 p.m. ; (f) in not having shut off water from this main sooner than it was (1) after the leak began or (2) after it was reported."

The case went on appeal to the High Court and the majority of the High Court agreed with the South Australian Supreme Court's decision.

Justice Dixon stated "In my opinion it follows from the nature of the defendants statutory authority that he is not liable for damage caused by an escape of water from his pipes unless he has been negligent and that proof of negligence lies with the plaintiffs…… It may appear unsatisfactory that a water authority should not be responsible unless negligent for damage done by the failure of its mains, but I think that neither principle nor authority sanctions any other conclusion."

The majority of the High Court concluded on the facts of the Cox Brothers case that the Commissioner of Waterworks had operated that section of the waterworks in accordance with his statutory authority under the *Waterworks Act 1882* and that he had not been negligent in carrying out his legislative mandate.

The High Court decision in *Benning v Wong 122CLR 249* discusses in detail numerous cases brought against statutory authorities where damage or injury was caused as a result of the authorities exercising their statutory powers. The High Court held that the mere fact of an escape of gas from pipes being used by the authority in pursuance of its statutory powers did not constitute actionable wrong and that to bring on to land in exercise of a statutory authority something which will cause damage to adjoining owners if it escapes does not give rise to strict liability for damage caused by an escape, but to a liability only if negligence is proved.

At common law there is a duty to take reasonable care to protect others from injury or damage. In most cases a duty of care arises in respect of positive acts which cause injury or damage. A duty of care arises in such cases if the injury is reasonably foreseeable if a reasonable person would have taken action to prevent that risk of injury or damage this is the general duty of care that applies to all persons.

In Donohue v Stevenson 1932 AC 562 Lord Atkin stated:
"You must take reasonable care to avoid acts or omissions which you can reasonably foresee would be likely to injure your neighbour. Who, then, in law is my neighbour? The answer seems to be persons who are so closely and directly affected by my act that I ought reasonably to have them in contemplation as being so affected when I am directing my mind to the acts or omissions which are causing question".

In relation to public authorities assuming that a duty of care exists, then the scope of the duty of care depends upon the circumstances of the particular case and relevant considerations will include fairness, reasonableness and public policy (refer *Sutherland Shire Council v Heyman 157CLR 424* at 441, 487, 498). The scope of the duty of care will be determined by balancing various factors and then deciding what action a reasonable person in the position of the public authority would have taken. Factors will include such matters as the nature and size of the foreseeable risk of injury, the likelihood of its occurrence, the cost difficulty and inconvenience of preventing the risk and social or political factors and constraints.

The High Court has recently confirmed that it is willing to hold statutory authorities responsible in tort where they have failed to prevent a reasonably foreseeable danger. The case of *Pyrenees Shire Council v Day 1998 (151) ALR 147* concerned the failure of a Council to exercise a statutory power regarding an unsafe chimney which failure resulted in damage to the respondent premises. The Council was held liable for the damage. Although the circumstances where a duty of care will arise were limited by the Court, if an authority has means of preventing harm or danger particularly where others do not know of that danger it is likely to have a duty of care to safeguard others.

SA Water like other corporate entities has to comply with relevant legislation such as the Environment Protection Act ensuring that a burst water main causes as little harm as possible to the environment. In 1998-1999 of 118 incidents reported to the Environment Protection Authority 4 related to burst water mains. The majority of the incidents related to sewer blockages/overflows.

There are two main areas in relation to burst mains which may result in successful claims from parties suffering damage:

1. Where there has been negligence on behalf of SA Water in relation to laying mains, maintenance and asset replacement.
   Examples such as faulty workmanship in laying the original main, failing to repair a main which is known to be leaking and failing to replace a pipe which is known to be faulty and has a history of bursts in a particular location. These are all general examples and any claim would be dependent on the particular circumstances surrounding that claim.

2. Where there is negligence in relation to operational issues.

An example of this is set out in a recent decision of the District Court of South Australia *Kirkbright v The State of South Australia Judgement Number 1999SADC18.*

A burst water main occurred in the carpark of a shopping centre on Peachy Road, Daveron Park. The plaintiff was driving his motor vehicle in the car park when the front wheel of his car broke through a weakness in the bitumen and dropped into a hole which had been caused by water undermining the bitumen surface of the car park caused by the burst water main. The plaintiff sustained injuries. The accident happened at about 4.10 or 4.15 p.m. in the afternoon and at 3.24 p.m. a report was received from a member of the public that there was water leaking on the road. The telephone operator who took the call was aware at the time that the problem was in a car park of a shopping centre and that he regarded the problem as an emergency and deserving priority attention.

The Court held that the plaintiff's injuries were the result of the defendants negligence "a delay of fifty or so minutes given the nature of the emergency and the absence of evidence from the defendant to the contrary, would not have occurred without a breach of duty on the part of the defendant or its employees."

There are certain members of the public who consider it to be "unfair" if they suffer damage or injury due to a burst water main and as an totally innocent party receive no compensation because there is no negligence on behalf of SA Water in relation to the particular burst. It may be a bold move to take but if public opinion were strong enough Parliament could introduce legislation (to be included in the Waterworks Act) which provided compensation to any party that suffered damage or injury as a result of a burst water main. This may open the floodgates to a number of additional claims and may unreasonably increase the cost of the supply of water to take into account the claims that would have to be paid if liability were not an issue. I raise this point as an issue for possible discussion and not as a suggestion that there is any intention or likelihood of change proposed for the legal liability for damage resulting from a burst water main.

3. SUMMARY

SA Water, a statutory Corporation of the Crown provides water to residents in South Australia by means of thousands of kilometres of water mains located in the metropolitan and country areas of South Australia. The water mains are constructed and maintained pursuant to the *Waterworks Act 1932*. The construction and maintenance of the water mains is authorized by statute and therefore SA Water will only have a liability for damage if a water main bursts when it has been negligent. However, it is not responsible in nuisance or trespass for any damage caused by a leaking or burst main.

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5. LIST OF CASES

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Benning v Wong 122 CLR 249.

Donohue v Stevenson 1932 AC 562.

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Pyrenees Shire Council v Day 151 ALR 147.

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The role of the expert witness: What to do and what not to do

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Summary
The role of the expert witness has developed over the last 100 years as the overall knowledge base of society has increased. During that period the Courts have developed protocols and procedures to control the format and style of presentation of expert evidence. The most recent development is the publication of Court Practice Directions laying down guidelines for expert witnesses.

These guidelines lay down the role and responsibilities of expert witnesses, the format of their reports and the requirement to exchange reports with other parties to the action.

Since the primary role of the expert witness is to the Court, it follows that the claims of clients are secondary. This must be made clear to clients at the outset of the case.

With experience, a witness gradually learns the other, less documented aspects of being an expert witness.

1. INTRODUCTION

The expert witness has been a feature of litigation for sometime. The earliest expert witnesses were probably medical doctors. One hundred year ago such experts were looked on with suspicion, but by the 1930's the forensic pathologist was an accepted feature of Court trials. Today, the use of DNA tissue sample in evidence is an example of developments in this area.

Since the rise of the expert witness, the field of expertise has broadened. Experts from many different disciplines now appear in Court ranging from the hard sciences through to the soft sciences.

Text books have been written on the expert witness. Some are instruction manuals written to instruct budding barristers on their handling of the expert witness. Others, such as Freckelton (1988) are in-depth reviews of expert witnesses of all types covering everything about the qualifications, uses and dangers of expert evidence.

The establishment of tribunals to review planning decisions against a range of legal, social and scientific principles, saw a growing use of experts in all these particular areas tendering evidence to support or oppose various developments.

Expert witnesses tend to belong in one of two groups. The first group appear regularly in Court cases. Members of this group know from past experience what sort of information a tribunal requires and how to present that information clearly both in Court and by written statement. The second group contains the occasional or first-time witness. Such a witness may be learned with impressive paper qualifications, but ignorant of Court rules and requirements, and the wiles of cross-examining Counsel. The resulting impact of inexperienced witnesses can be limited by these factors.

To try and minimise the differences between expert witness, and to maximise the benefit of expert evidence to the tribunal, a number of Courts have issued guidelines for expert witnesses to follow. Examples are the Federal Court of Australia guidelines issued 15 September 1998, and the Environment, Resources and Development Court Guidelines (1999) issued 15 October 1999 (Practice Direction 5). The guidelines cover the basic duties of an expert witness in two succinct pages, and must be provided to every expert witness before they appear in Court.

These guidelines are a short summary of the thinking and writing on this subject over a period of many years. They are not breaking new ground. The guidelines are useful, not only to the witness, but also as a guide to the client. Some clients have no accurate conception of what an expert witness is supposed to do, but strong opinions on what their expert should do for them in a trial.

2. WHO CAN BE AN EXPERT WITNESS

In order that an expert witness may give an opinion in court, it must be shown:

- That an organised discipline, or body of knowledge exists;
- That there are accepted ways of acquiring such knowledge;
- That the expert has personally acquired such knowledge and would be recognised as an "expert" by other practitioners in the field.

Freckelton (1988) reviewed a number of judgements from a range of Australian Courts. He concluded that there was a strong tendency to equate expertise with the attainment of formal academic qualifications. However, Freckelton also quotes a number of contrary Australian judgements which favour the approach of English courts, where it has consistently been held that the expert need not have formal academic qualifications, and that expertise can be acquired by experience.

The personal impression of this writer gained through experience as an expert witness is that our Courts prefer a combination of formal academic qualifications combined with a depth of experience in the area of expertise.

3. THE ROLE OF THE EXPERT WITNESS IN RELATION TO THE COURT

As far as the Environment, Resources and Development Court is concerned the role of the expert witness is determined by Practice Direction 5: Guidelines for Expert Witnesses (1999), issued 15 October 1999. A key section of the guidelines is Section 5 General Duty to the Court, which states:

- An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise;
- An expert witness is not an advocate for a party;
- An expert witness must truthfully, objectively and fully express his or her expert opinion, without regard to any view or influence which the person retaining or employing the expert may have or seek to exercise.

The first and third points above are making the same point but from different viewpoints. The expert's role is to be accurate and informative. The expert's duty is primarily to the Court, and then to the client. The strains which this can put on the relationship between the witness and the client is discussed further in Section 5 below.

The second point of Section 5 of the Guidelines briefly distinguishes between the roles of witness and barrister. A barrister once summed up this difference in the following words:

> "Your job (as an expert witness) is to be right: My job (as a barrister) is to win the case".

The remaining sections in the Guidelines deal with the following points:

- An extensive discussion of the format of the written statement noting the need to include the expert's qualifications, the clients instructions which define, or limit the scope of the report, documents consulted or referenced, data, conclusions and qualifications of opinions (Section 6);
- The requirement for exchange of expert reports at least 5 business days prior to the date of the hearing (Section 3). This requirement is an attempt to insulate the expert from some of the dramatic surprises which occasionally occur in Court, as well as provide a time for each expert to think through the evidence of the opposing expert. It is a time to correct any errors you have made, or point out any errors the opposing expert has made in an unhurried atmosphere. Sometimes dramatic Court surprises are avoided, and sometimes they are not;
- Section 7 of the Guidelines deals with Expert Conferences where the opposing experts meet at the direction of the Court. Experts are not to accept (or be given) instructions from clients not to reach agreement;
- Section 9 of the Guidelines notes that where any party to Court proceedings chooses to use their own employee as an expert, all the provisions of the Guidelines still apply. That is, the expert witness's primary duty is to the Court, not to his or her employer. This is discussed further in Section 5 below.

Summing up, the Guidelines specify the duty of an expert witness toward the Court. However, the Court does not necessarily have to give any weight to the evidence of an expert. Bray, CJ in Samuels v Flavel (South Australian State Reports Annual Series, 71, 1968) observed:

> "… no Court should abdicate its own judgement in favour of an expert or refuse to give proper weight to other evidence in the case, even non-expert evidence, which is contrary to the expert's opinion."

4. THE ROLE OF THE EXPERT WITNESS IN RELATION TO THE CLIENT

The duty of the expert witness to the client is typically discharged under the following headings:

- To provide an accurate statement of the technical evidence, data, assumptions, inferences and opinions which are relevant to the matter before the Court;
- To review the statement of the opposing side's expert witness and explain the content of the statement to Counsel, indicating the assumptions, inferences and relevance or weight of the statement to the matter of the hearing;
- To appear in Court to explain and answer questions about your statement from your Counsel, cross-examining Counsel and the Bench, so that your evidence is clearly understood by all;
- To do the work yourself, or at least to check very carefully those calculations that you delegate out.

With respect to the last point, there is a division of opinion among experts on the appropriate procedure. Some experts will let junior staff do most of the work under their close supervision, but write the final report themselves. Other experts will put their name to reports totally prepared by junior staff.

It is the opinion of the writer that the written statement should be the expert's own work, and that the expert should have carried out the bulk of the analysis and research underlying his or her statement. After all, it is

the expert's reputation which is on trial, not the reputation of a junior colleague. Dr Ross James (undated), an experienced forensic pathologist, put the same viewpoint more strongly:

> "… I strongly object to reports being prepared by other than the purported author, or of reports being re-typed leaving only that which is held to be useful."

5. SOME OBSTACLES IN THE WAY OF THE EXPERT

5.1 Introduction

There are problems in every field, and an expert witness has a few problems and obstacles to surmount. The following examples, although not covering every eventuality, may be helpful to anyone who has to appear in Court.

5.2 Private Client Expectations

Many private clients do not appreciate the expert witness' role, or the expectations that the Court will have of such a witness. Generally, a client will retain an expert because his solicitor tells him he needs an expert "to win the case". Having hired an expert, the client often assumes that the expert is an advocate, who minimises or omits unfavourable facts and maximises favourable facts. This is not the case.

On occasion, Counsel will review the expert's opinion and, if this is not favourable to the client's case, simply dispense with the expert's services. This is far more satisfactory to the expert, than conducting arguments with the client about what the client thinks he or she should say.

Less often, a client's lawyers will go "expert shopping". That is, a number of experts will be asked for an opinion, until one is found who will support the client's case. If all experts were equally knowledgeable or equally honest there would be no advantage to be gained in such a course.

5.3 Government Client Expectations

Government decision-makers, particularly at State or Commonwealth level, usually have access to experts who are fellow employees. Occasionally, decisions are made which are subject to appeal, and in fact attract an appeal on various grounds. In such situations the decision-makers (usually senior) call upon their experts (often but not exclusively junior) to support the official line. When the decision has pressed scientific knowledge to the limit, this can occasionally put the government expert in an invidious position. This is particularly the case when the government expert has not had much Court experience. Those government experts with extensive Court experience handle the pressures of government client expectations with skill.

5.4 The Cross-examining Counsel

To quote Dr Ross James (undated) again:

> "No one would deny Counsel their right to test the evidence by cross-examination. The competent witness who has given his evidence fairly has nothing to fear in cross-examination".

The job of cross-examining Counsel is to probe your evidence for any weaknesses. If Counsel has a competent expert behind him, you can expect a fairly vigorous review of your work.

This process of review can have real benefits. For example in the field of odours the last five years have seen a rapid advancement in the science of measuring, assessing and modelling of odours. In part this has arisen because the numerous planning hearings on applications to develop intensive animal rearing industries have caused those industries to fund research to address gaps in knowledge first exposed in Court.

However, cross-examining counsel will try to "muddy the waters of enquiry with the stick of precaution" on occasion, particularly with witnesses with limited Court experience. Common lines of attack are:

- attempts to induce a witness to give opinions outside of his area of expertise;
- attempts to make a witness lose his temper or become argumentative. This writer was once asked if his opinion reflected his fee!
- attempts to confuse you so that you give different answers to essentially the same questions;
- attempts to induce a witness to be partisan and supportive of his client; that is, to be seen as an advocate rather than an impartial and unbiased expert.

A somewhat more serious problem for an expert witness is the one described by Dr Ross James (undated):

> "In recent years there have been some aggressive and protracted attacks on some key expert witnesses. These witnesses, in general, are poorly equipped to cope with a prolonged attack of this sort. They are not hired for their rhetorical gymnastic ability. While breaking a witness in this fashion can have a favourable result for the particular case, there is a long-term price to pay. No witness treated in this way can be unaffected by the experience. In my view it should be appreciated that the great majority of expert witnesses are genuinely trying to present valid evidence in a fair and unbiased way to our Courts."

This sort of attack is very rare in the Environment Resources and Development Court, but may still occur in major criminal or civil damages cases in higher jurisdictions.

5.5 The Litigation Process

The actual litigation process is not primarily concerned with the advancement of science, or even with examining all the available scientific evidence in a particular field. Walters, Wells and Jacobs, JJ in R v Van Beelen (South Australian State Reports 9, 195 1974) observed that:

> "A judicial trial of litigated facts must be held at a fixed time and place, and the decision must be then made, once for all. This feature, in contrast with the scientific laboratory, makes it inevitable for the tribunal to reject certain kinds of evidence and to depend largely upon other kinds…"

Looking back over a number of years, the writer's impression is that although scientific knowledge has increased in some areas to the extent that statements written ten year ago would be now considered incorrect, generally speaking the decisions made would not alter. Obviously the Court has taken account of qualifications on the evidence expressed in those statements, and uncertainties apparent in answering questions, and either discounted or given less weight to such evidence.

Another feature of litigation is that even with formal guidelines enforcing exchange of written statements with time to review those statements built into the system, there can still be surprises.

To quote the above three judges again, in R v Van Beelen (South Australian State Reports 9, 197, 1974):

> "The laboratory of the scientist is quiet and solitary, the subjects of his inquiry are lifeless substances; the atmosphere is matter-of-fact and routine. But the courtroom is a place of surging emotions, distracting episodes, and sensational surprises; the parties are keyed up to the contest, often in open defiance; and the topics at issue are often calculated to stir up the sympathy, contempt, prejudice, or ridicule of the tribunal. Hence, necessarily, some precautions have to be taken by the trial rules, in controlling what might otherwise be the natural course of the evidence. To prevent the emotional conditions of litigation from unduly influencing the tribunal's reasoning-process, some kinds of evidential data – especially when of inferior value – may be eliminated, or surrounded with safeguards that the abstract science of proof does not need".

In the Environment, Resources and Development Court, surprises are generally less common than, say, major criminal cases at Supreme Court level.

6. CONCLUSION

Expert evidence will remain a feature of Court hearings, particularly in the planning and environment areas. The quality of such expert evidence will depend upon the ability of the experts to master their own discipline as well as balance the expectations of the Court, which is paramount, against the expectations (possibly unrealistic) of their clients, public or private.

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Flood damage to commercial and industrial businesses

Part 1 Introduction to urban flood risk on Keswick Creek, Adelaide.

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Summary
A flash flood risk problem has been identified on Keswick Creek in the inner suburbs of Adelaide. High value commercial and industrial development has been permitted to take place within an area of known flood risk. The damage potential has been estimated at $100 million. It is not clear that the owners and developers within this area were made aware of the risk, even though floods were known to have occurred and there was documentation held by Local Councils which identified the high-risk locations. A large proportion of the flood damage can be avoided by relatively low cost self protection measures. A flood warning system will only be effective if proper self help prevention and preparation is undertaken.

1.1 INTRODUCTION

Floods are the consequence of heavy rainfall over a catchment and are, to a large extent predictable. In South Australia there has been a tendency to put floods in the category of "Act of God"; phenomena over which we have no control, but must accept and react to, after they have happened. In the case of Keswick Creek in the inner suburbs of Adelaide, this is perhaps an unreasonable attitude to take for those of us with the responsibility for the safety of the community. For a particular urban catchment with a high concentration of commercial and industrial development, the potential damages bill for a 100 year Average Recurrence Interval (ARI) flood is $100 million (Wright, 2000), most of which will be borne by 10 of the larger businesses. It is believed that about 50% of this damage is preventable, by self-protection, relocation of vulnerable facilities and individual building protection, at relatively minor cost. Knowledge of the risk is in the hands of Local, State and Commonwealth agencies: flood risk maps for urban areas have been produced, under State and Local Government funding. However, there is no clear path of responsibility for advising those in the floodplain that they are at risk and that there are remedies available.

It is considered that this situation has come about due to the concept that floods can be eliminated by building mitigation works (levees, dams, bigger channels etc). However, there is abundant evidence that although flood risk can be reduced by these measures, total removal of flood risk is almost impossible as there is always a risk that a rarer and bigger flood will overwhelm the defences. For Keswick Creek, there are no practical or cost-effective mitigation works that will remove flood risk entirely, neither is there any proper provision to protect those who are in the path of a flood. So the risk remains, and there is no procedure in place for advising floodplain occupants about the risk they are exposed to. This is a particular concern because a risk reduction program for individual businesses is feasible and cost effective, but is not being implemented or promoted.

1.2 FLOOD RISK FROM KESWICK CREEK.

Keswick Creek flows through the inner suburbs of Adelaide, and extensive urban development has occurred within its flood plain. The capacity of the creek is sufficient to carry the 1-in-5 year flood, and a 1-in-20 year flood will cause major damage. Although much of the flood plain is covered with suburban housing, there are large zones of commercial and industrial businesses which are exposed to flood damage, and which contribute the major portion of the flood damages potential cost.

Keswick Creek is subject to "flash" flooding, typically occurring within an hour or less after the storm. This type of flooding is very difficult to predict and even if flood forecasts were successful and warnings issued, it is most unlikely that there would be time to protect or move critical high-value facilities before the flood.

1.3 CONFIRMATION OF THE FLOOD RISK

Flood risk was positively identified in a report by engineering consultants (WBCM) in 1984. This was a professional engineers' report, with maps which delineated the flood risk areas up to the 200 year ARI flood. The study was supported financially by Local Councils within the catchment, each of which received a copy of the report and maps.

The WBCM study was done to the highest standard possible at the time, but was acknowledged to be preliminary, and to require updating, when sufficient hydrological data had been collected. In 1992 the Bureau of Meteorology, in conjunction with Councils, installed rainfall and water level monitoring equipment throughout the catchment, and a full hydrographic record has been kept since then.

Hydrology studies have been completed by Kemp, for Keswick Creek (Kemp, 1997) and for Brownhill Creek (Patawalonga Catchment Water Management Board, 1998) and a new flood mapping study began in August 2000. The results and mapping will be available in

early 2001. It is expected that the study will confirm the findings of the WBCM study, and will provide more detailed information about flood water levels and flood risk for individual properties and buildings. Options for flood mitigation will also be considered.

1.4 RECENT DEVELOPMENT IN THE FLOODPLAIN

The critical locations that have the highest potential for flood damage include the Royal Adelaide Showgrounds at Wayville, the Keswick industrial area, including the Army Barracks, the Mile End industrial area, and a concentration of industrial businesses at the west end of Richmond Road.

Earlier this century the type of industry in these areas was predominantly heavy engineering, including a vehicle manufacturing plant at Keswick, railway workshops, Perry Engineering, Humes Concrete Products and other mechanical workshops at Mile End. Flood damage has occurred in the past. Figure 1 shows a photograph of a flood through Humes factory. However, these types of industry were not particularly vulnerable to flood damage, and production may not have been severely affected by flooding through the premises.

Recent years have brought change of ownership and redevelopment of many of these sites, including:

- The recently developed RAA Vehicle Inspection Depot on Richmond Road, (replacing Humes);
- A major high-tech redevelopment of a printing works;
- The main distribution centre and storage facility for a large furniture retailer, located at a former vehicle plant;
- A rapidly expanding food processing plant;
- Several smaller manufacturers and distributors, mostly with a high percentage of electronic equipment;
- A Local Council depot.

With few exceptions, the new businesses and developments appear to have taken place without reference to, or knowledge of, flood risk leading to relatively high exposure. A notable exception is the RAA development where flood risk information was incorporated in the design and flood damage exposure has been kept to a minimum. However, in most cases, development without awareness of flood risk has left high value goods, electronic equipment and process machinery very vulnerable.

1.5 CURRENT SITUATION AND VULNERABILITY TO DAMAGE.

Recent studies (Wright, 2000), have shown that:

- flood warning is very difficult, and can only be successful if the threatened facilities and businesses are fully prepared and protected;
- the estimated damage by a major flood on Keswick Creek is $100 million, most of which is potential losses to businesses. (By contrast, the estimated flood loss exposure on Brownhill Creek is less than $1. million);
- few owners of businesses were aware of the flood risk to their plant, equipment and goods, or of the potential protracted disruption to their operations that a flood would cause;
- even in cases where the owners are aware of the risk and ready to respond to a flood situation, there will be very little time to detect a flood and issue warnings. Therefore, avoiding flood damage "on the day", is not likely to be an effective remedy;
- there is considerable potential for reducing flood exposure by relocating plant, protecting vulnerable facilities, and flood-proofing of buildings. This could result in reducing flood damage potential by as much as 50%.

1.6 PLANNING AND DEVELOPMENT ISSUES AND IMPLICATIONS.

Clearly flooding presents a significant risk to areas which have been fully developed for commercial, industrial and residential purposes.

Much of the urban development of Adelaide has been in existence for more than 100 years. On the basis of current knowledge of the hydrology of the area, a 100 year flood or greater would result in huge damage to the community. Statistically the risk of occurrence of a 100 year flood in any 100 years, is 63%. (Linsley et al, 1972). The fact that in recent years there has not been a major flood should not be a cause for complacency.

It is unreasonable to consider the term "Act of God" to apply to a natural event caused by rainfall of predictable occurrence and intensity. Flood disasters are perhaps the most predictable of natural disasters, caused by the interaction of water and communities. Therefore, if the disaster is predictable, what would be the desirable actions for a community to take?

- Assess the hazard - evaluate the risk;
- Remove the hazard - carry out civil engineering works to diminish its effects;
- Where there is residual risk,

a) Inform those who are subject to the risk about the nature of the risk and how to avoid damage to people and property;

b) Ensure that further development within the risk area is carried out in a way which minimizes the potential for damage;

c) Provide backup support to ensure continuing knowledge of the risk and what to do about it.

In the case of Keswick Creek, the most vulnerable flood prone facilities are non-Government commercial and industrial businesses. There are also some 600 private dwellings, and buildings, services and facilities owned by Local, State and Commonwealth Government within the floodplain. Most of the current development has been undertaken with the knowledge and approval of the Local Council, which administers the appropriate planning legislation.

Before the risk of flooding was positively identified, Council may not have been aware of the risk, hence limiting any obligation to warn developers that floods from Keswick Creek could affect them.

However, publication of the flood maps in 1984 showed beyond doubt that there were significant areas subject to flood risk. The question whether the risk was significant to the particular application is one that the owners of the business or proposed development are best able answer. As discussed in Section 1.4, some businesses are more vulnerable to flood risk than others, but knowledge of the flood risk is essential to the decision-making processes for site and building development. It has been argued from a legal perspective (Smith et al, 1996), that in South Australia, Councils are well protected against any claims based on failure to advise of the risk of floods. However, in the specific case of flood risk in an urban area where:

- the risk is significant (>1% in any year);
- Council has knowledge of that risk; and
- there are no other obvious ways for an owner or developer to obtain that knowledge

it is at least possible that a "Duty of Care" obligation may be found to rest with Council.

1.7 SUMMARY

A flash flood risk problem has been identified on Keswick Creek in the inner suburbs of Adelaide. High value commercial and industrial development has been permitted to take place within an area of known flood risk. The damage potential has been estimated at $100 million. It is not clear that the owners and developers within this area were made aware of the risk, even though floods were known to have occurred and there was documentation held by Local Councils which identified the high risk locations. A large proportion of the flood damage can be avoided by relatively low cost self-protection measures. A flood warning system will only be effective if proper self help prevention and preparation is undertaken.

Part 2 of this paper considers the question whether there may be Duty of Care obligations imposed on authorities which control the planning and development processes, and any implications which might come out of exercise or non-exercise of these responsibilities. It considers in the event of a severe flood and consequential damage to facilities in the floodplain, how a case for recovery of damages might proceed.

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Figure 1: Flood through Humes Ltd pipe factory. The RAA now occupies this site on Richmond Road (photo taken from Marles, 1980)

Flood damage to commercial and industrial businesses

Part 2 Possible legal ramifications consequent upon flood damage

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Summary
A hypothetical case is presented of a severe flood in Keswick Creek and its effects on a thriving businesses within the floodplain. The cost to the businesses, which includes direct damage to buildings, facilities, plant equipment, raw and processed materials and business interruption, could be very large and may not be fully covered by insurance. The injured parties may well look to the Courts for remedies, with possible claims against the Local Council, upstream Councils, State Government, engineers, architects, builders, Bureau of Meteorology and the owners of neighbouring properties. In recent times the Courts have shown willingness to impose positive obligations upon Local and State authorities for losses arising out of situations where they have knowledge of a reasonably foreseeable risk.

2.1 HYPOTHETICAL - "FLOODS HIT ADELAIDE"

Sid Briggs has for twenty years operated the "*Briggs Whitewood Centre*" a South Australian manufacturing icon, whose factory and showroom are situated on Richmond Road.

The centre was redeveloped by Sid on the site of an earlier factory 5 years ago, and comprise a factory and 8 large office/showrooms owned by Sid.

The new structures met all Council approvals, and were opened by the Mayor, who was quoted in the local paper as "proudly supporting local investment".

* * * * *

On Saturday 21st October gentle rain falls across the Adelaide plains. At first inconvenient, the rain persists, and despite the aid of technology and to the surprise of all at the Bureau, develops in intensity.

By mid-Sunday afternoon flood warnings are issued and Sid is worried. The electricity supply has failed. Floor stock has been water damaged. Raw materials are soaked, and it is fast becoming apparent that he will be unable to meet his export order, due on the following Friday.

Gutters on adjoining properties are overflowing, and down-pipes of his own building are having difficulty coping with the monsoonal downpour. Water begins to pond in the carpark, and on Richmond Road itself. At first buses seem to have no difficulty aquaplaning through the water, but soon even they are keeping to the centre of the road. Water enters the factory at 4.45 pm, rising to 8 inches within 35 minutes. At that point Sid notices the galvanised iron fence to the rear of the complex fail, and thousands of litres flow onto his premises from the adjoining carpark. Whilst able to keep stock off the ground at first, water is now at a depth of 12 inches with no sign of letting up. He looks towards Richmond Road and sees that water is gushing *out of* the stormwater drains. Emergency services are contacted and Sid nervously awaits their arrival. They are undoubtedly stretched to the limit.

Waters peak at 6.47 pm. The timing is quite certain, as the clock on Sid's office desk, 1.2m above the floor records the moment.

* * * * *

Alan Eglin, of "Richmond Road Insurance Brokers" is frantic. The calls started at about 4.45 pm, and access to his office (across the road from *Briggs Whitewood Centre*) is inundated at the same time as he takes the call from Sid.

Happily, his first floor office has escaped damage from the rising waters of Richmond Road, although he has lost his reception area due to a blocked box gutter. Still, surveying the inflatable dinghy cruising down Richmond Road he realizes it could be worse for him.

* * * * *

"Richmond Flood Report - Extracts from the State Government's Hydrology report into the flooding of 21st October

2.1 Mymar Consulting Engineers

Consulting Engineers have relied upon and presumed accurate certain information (or absence thereof) relative to the Richmond Road region provided by Government authorities and officials….

Description of Flooding
The initial heavy rainfall was at an intensity greater than the capacity of the drainage system, and water

ponded in a number of locations. This was most prevalent in localised low points near inlets to piped drainage. There were, in addition, locations where water could not flow quickly enough in drains. From discussions with residents in a number of locations it is apparent that a number of properties were inundated initially by this stormwater before the main flood reached the area. Most of these properties were subsequently inundated by the main flood event of water rising from stormwater drains."

After the flood waters have subsided insurance loss adjusters attend to ascertain the extent of Sid's insurance cover and losses. The losses are extensive and fall into the following classes:

- Damage to Premises
  The business premises have been subject of damage. Stud walls have been saturated. Gyprock walls have disintegrated. Electrical cabling, conduits need replacement. Carpets are ruined. Mud needs to be removed, landscaping reinstated and drains cleared.

- Damage to plant and equipment
  Machinery required for the manufacture of goods has been saturated. Some can be repaired. More modern equipment with integrated circuitry will remain useless when dry, and will need to be replaced.

- Damage to Stock
  Floor stock and goods in the process of being manufactured have been saturated, and are unfit for sale. Raw materials have been destroyed.

- Loss of margin / profits
  Sid has lost both completed goods, as well as goods being produced. He held orders for those goods. He will lose some orders, by virtue of his inability to meet deadlines. He will lose "off the street" sales from his showroom, until it is reopened and re-stocked.

- Business interruption.
  Sid will have to relocate to alternative premises, whilst the factory and showroom are being cleaned up, refitted and declared safe. While some machinery will be useable when dry, other equipment damaged by water will need to be replaced. He has been advised by his equipment suppliers that his replacement machinery will be ready for delivery in 8 weeks. As a consequence, production time will be lost, and with that profits.

2.2 INSURANCE CONSIDERATIONS - WHAT IF ANYTHING IS SID COVERED FOR IN RESPECT OF HIS LOSSES?

While calculation of losses can be seen to be reasonably straightforward, the question of application, and response of insurance to the losses is a separate matter altogether. The public expects insurance to be affordable. Insurers look to the precise wording of the policy, and apply it. The following issues can arise:

2.2.1 Does he have flood cover?

If the area is known to be prone to flooding, some insurers may exclude high risk events such as flooding. There may be argument as to whether damage has been caused by flooding, or the ponding of stormwater (for example, Katherine floods). Is water from a neighbour's property flood, or stormwater?

2.2.2 Damage to premises

As the building requires substantial repair/modification post-flood, and the Council requires remedial work to meet flood requirements; will the policy extend to cover this cost? Will the cover extend to relocation, whilst the premises are being repaired and / or re-instated?

2.2.3 Damage to plant and equipment

Is his equipment covered by "new for old" cover? If the equipment is old, but serviceable, he may only be entitled to its "replacement" value; that is, what the plant would bring second hand. The fact that such second hand equipment is not available is irrelevant to the insurer but is very relevant to the assessment of Sid's loss.

2.2.4 Damage to stock

What is the extent of cover? Does it extend to the ticket price of goods on the showroom floor, or just materials plus labour cost? If the cost of materials has gone up, is he entitled to the increase in cost of materials, or just what he has spent? If Cuban mahogany veneer has gone up because of the decline in the dollar, will he be able replace it at the higher price? If goods were manufactured and in stock pre GST, will this make any difference?

2.2.5 Does he have loss of margin / profits insurance?

Many policies do not cover loss of profits. If they do, they often rely on declared figures. If Sid has failed to update his broker with the details of his export deals (and taken into account currency fluctuations) he may be underinsured. This can have significant flow on problems (averaging of losses). The area is complex.

2.2.6 Does he have business interruption cover?

His policy may not provide for the relocation of his business whilst his premises are repaired. He may lose contracts, due to his inability to meet deadlines. He may lose passing trade. He will certainly lose a lot of his own time as a

consequence of the need to re-establish the business. If he is not out there selling his goods, will the policy cover the shortfall in cashflow / turnover?

Summary of Insurance Position

As can be seen there is a significant and real potential that even if Sid's business has insurance protection many of the losses he might sustain are either not covered by the insurance or may be underinsured. The end result is that his business may fail if he is unable to recover his losses from another source.

2.3 WHAT LEGAL REMEDIES DOES SID HAVE AGAINST THE LOCAL AUTHORITIES TO RECOVER HIS LOSSES/ UNINSURED LOSSES?

For present discussion purposes the following factors are assumed:-

- The Keswick Creek flows under the city of Adelaide, which has undergone major development within its flood plain over the last 50 years. Much of the flood plain is residential but there are areas of significant commercial and industrial usage.

- The areas expected to suffer most from a flood having been identified as Wayville and the Showgrounds, Keswick and the Army Barracks, and much of the industrial area of Mile End and immediate surrounding areas.

- There is evidence that minor flooding occurs frequently and that a major 50 year or 100 year flood can be expected and/or anticipated.

- In 1984 engineering consultants identified flood risk areas and supplied this information and maps to Local Councils that supported the study.

- A hydrology study and flood mapping is currently being undertaken and is expected to confirm the 1984 study and provide more detailed information re water levels and flood risks. This is likely to become available early next year.

- Sid would not have re-established his business in the area had he known of the flood danger.

This paper is not meant to be exhaustive nor is it a discussion of planning requirements or application for land information but merely a question of the Duty of Care owed by the authorities.

By way of background normally issues relating to water supply and disposal of storm water have vested in State Governments and Local authorities. The Courts have traditionally been averse to placing any significant obligations upon State Governments or Local authorities relative to civil liability arising out of perceived duties of care on their part on the grounds of public policy, namely that if such authorities are constantly under threat of civil liability they will be less inclined to undertake positive action which would result in ultimate downgrading of resources to the detriment of the public.

In recent times the Courts have been more willing to attach civil liability to Local authorities and State Governments where damage has occurred resultant upon a breach of their Duty of Care. This is a significant alteration in position from the law that has existed in the past.

There does not appear to be any regulation or legislation imposing upon a Council or the State Government an obligation to act in relation to flood risk or flood management. There are various statutes dealing with the powers of the Local Government to attend to construction works for drainage in Council areas including the West Torrens Council area and including Keswick Creek.

Where there is a Council discretion to act or even if there is not, the question is of a common law Duty of Care. The ordinary principles of negligence apply, subject to adjustment that Policy making and discretionary decisions are exempted; acts of omission only give rise to liability where there is a Duty of Care to act in a certain way which is referable to particular damage suffered by a particular claimant.

A Duty of Care arises where the positive conduct of a public authority causes physical injury or creates the risk of such injury. Where there has been a failure to take positive action there needs to be something more in the relationship to give rise to a duty to respond to the risk of injury that has been created by a third party or a cause independent of the defendant for example a flood.

There is a duty to safeguard others from harm in circumstances where the person or body is aware of the likelihood of others being in danger and had the means to prevent or advert this danger. This duty may arise due to a responsibility for the particular danger and therefore presupposing a knowledge of that danger or due to a responsibility for the circumstances in which a claimant becomes exposed to the danger, therefore presupposing a knowledge of the plaintiff's circumstances.

Recent cases where Courts have been prepared to find liability on the part of the State and/or Councils include:-

Pyrenees Shire Council -v- Day; Eskimo Amber Pty. Ltd. -v- Pyrenees Shire Council 1998 Australian Torts Reports 81-456;

Ryan -v- Great Lakes Council (Wallis Lake Oyster case) 1999 FCA 177;

Armidale City Council -v- Finlayson Pty. Ltd. Australian Torts Reports 37-280.

In the present case the Local Council is assumed to be

aware of the danger of flooding to certain areas and arguably has the means to prevent or avert the danger by both ensuring there is adequate drainage in place and also ensuring that approval for building works complies with requirements for flood protection of the premises being erected.

If it is able to be established that the risk of flooding is reasonably foreseeable and there exists a relationship of proximity between the Council and the potential claimant and there is no policy reason making it neither unfair nor unjust for the claimants to recover the losses for their damaged property the issue moves as to what the Council is able to do to discharge its duty. This would appear to consist of warning occupiers of the risk concerned and a requirement that within their approval process they require proper precautions to be undertaken in erection of any building works or taking precautionary measures with existing structures.

A policy consideration against a Duty of Care in the Pyrenees case was the "undesirability of adopting a rule which would result in insurance companies, under their rights of subrogation, recouping themselves from the purse of a public authority". No evidence was gathered on this point, and similarly no evidence was gathered on the likely difficulty in public authorities obtaining insurance as a result. As can be seen from the hypothetical situation referred to in this discussion paper there may well be significant uninsured losses in any event and there ought not be any bar for recovery of those losses.

It would seem that it is reasonable to argue that there ought not be any difference between the Council's requirement to warn occupiers in pre 1984 buildings as opposed to those in post 1984 erected buildings. Whenever the building came into existence the question is of the danger that the Council is aware of now and is able to guard against at this time. With regard to the latter group it would appear that they, had they been warned of the flood danger, could have taken flood precautionary measures into account in their building plans. They therefore may be in a stronger position than those in buildings erected prior to 1984.

Likewise based on the reasoning in the recent cases the State Government may also be under a Duty of Care to local land users deriving from its control over planning and development. In the Wallis Lakes case the State of New South Wales was held to be under a Duty of Care to have undertaken a sanitary survey before the area was used for commercial shell fish production. In that case the only way of protecting consumers was to prevent the shell fish from being contaminated and ensuring that the waters remained unpolluted. It was held that as the State was the ultimate manager of the fishery it ought to have ensured that a competent sanitary survey was undertaken or alternatively to have closed the fishery. The State was negligent in failing to do one or the other of those two things. In that case the Local Council was also held liable for breach of its Duty of Care.

2.4 SUMMARY AND CONCLUSIONS

This paper is designed to highlight the very significant expense which may be incurred by a business owner in the event of flood damage caused to his premises. Consequential losses may ultimately lead to demise of the business. Insurance is not always the answer. Even where insurance cover exists, rarely are all losses sustained covered in total. Losses paid out by the insurers are entitled to be recovered by the insurers from persons or authorities legally liable to the sufferer of the damage (the insured) through rights of subrogation provided by the insured to the insurer under the contract of insurance policy. Even if the insured is not able to pursue wrongdoers for financial reasons, the insurer is not under the same financial constraints.

The following types of claims may therefore be considered:-

(i) against the Local Council;
(ii) against other Councils upstream;
(iii) against the State Government;
(iv) against the builder;
(v) against the architect;
(vi) against the consulting engineer;
(vii) against the Bureau of Meteorology;
(viii) against the neighbours for failure to contain their storm water.

Until relatively recent times actions against Local authorities or the government for losses of the nature discussed in this paper were effectively doomed to failure in most cases. The recent trend has revealed a willingness in certain situations for the Courts to impose positive obligations upon Local and State authorities for losses arising out of situations where they have knowledge of the risk which exists and a degree of control over that risk where that risk is reasonably foreseeable.

It may well be that the Courts will not be prepared to extend the Duty of Care to a Council or a State Government for losses arising out of flood damage such as may have occurred in Sid's case for public policy reasons and/or specific evidential reasons. It should be noted, however, that in the event of such significant losses there can be little doubt that serious consideration would be given by Sid and his insurers to bringing an action against those instrumentalities to recover their losses. They would have little to lose and much to gain by such action.

In the event of a successful action against the Council in the event of flooding and flood damage being caused, it is always open to the State Government to legislate to provide immunity to itself and Councils for such loss or alternatively to restrict exposure to such losses.

2.5 DISCLAIMER

The hypothetical and opinions offered in this paper are provided for discussion purposes only. The paper is neither exhaustive nor offered as legal advice. No criticism inferred, implied or otherwise is intended of any individual, Governmental or semi-Governmental authority.

Flood damage to commercial and industrial businesses

Part 3 Looking for remedies - before the flood.

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Summary
Keswick Creek presents a high risk of flash flooding to businesses within the floodplain. When a flood occurs, claims for damages may be made against both Local and State Government agencies. There is an opportunity to reduce the level of exposure to the risk, but proper floodplain management measures have to be put in place. Legislation is needed as a foundation for flood management, together with the formation of an advisory committee, in the first instance for Keswick Creek. This could then become a model for other catchments, both in Adelaide and interstate.

3.1 INTRODUCTION

The situation described in the first two parts of this session appears to have the following implications:

- development has been approved by Councils in areas which, although there had not been any floods in recent years, were shown clearly on flood maps to be at risk. It appears that the developers were not given advice about flood risk;
- businesses have been developed in such a way that they are very vulnerable to floods, and that this vulnerability was due at least in part to lack of knowledge of the risk;
- tenants have moved into flood prone business premises, with no information about flood risk; and
- when the next flood strikes there are no provisions for flood warning, and much avoidable damage is likely to occur.

If it is accepted that the situation regarding flood risk on Keswick Creek is unsatisfactory, and at the time of writing there has not been a serious flood to put these considerations to the test, what possible ways are there of addressing the problem? What combination of planning measures, flood mitigation, education and training programs, could be introduced so that when the next flood arrives, damage will be kept to a minimum, and the grounds on which to base a claim for recovery of damages would be reduced.

Possible actions:

- Do nothing. This may be a viable option, provided that knowledge of the risk is not withheld from those who may be affected by a flood;
- Confirm the risk and quantify it by undertaking flood studies and flood mapping (under way);
- Mitigate the risk. In an urban situation, engineering solutions will be costly, but this cost must be balanced against the flood risk reduction benefits. Who bears the risk, who pays for the engineering works?
- In some situations protection may not be viable, and relocation is the only practical solution. The challenge is to undertake this prior to a flood disaster rather than after;
- Encourage self-protection for existing businesses and properties. This may be assisted through direct or indirect funding (subsidy, tax relief, direct protection grants etc.);
- Introduce effective planning controls. Through the State Government, a regulatory framework could be provided to prevent unsuitable development. This will obviously not help solve problems with existing development, but must help to ensure that future development is properly safeguarded against the risk;
- Involve and educate the businesses and residents at risk through public forums/flood awareness days etc.;
- Support and develop flood warning processes to cover the residual risk.

3.2 THE NEED FOR LEGISLATION

Current State legislative framework for South Australia, within the current Planning Act does make some provision for floodplain management but does not suggest a risk management approach, and provides little in the way of guidance to Local Councils with flood problems. Some Councils have undertaken flood management, usually as a consequence of flood damage, a reactive, rather than a pro-active approach. In the aftermath of future floods, claims through the courts to recover damage after a flood event could well lead to high costs to our community through protracted legal action. Legislation that encourages responsible flood management strategies by Local Government authorities, backed by the State Government, will lead

in due course to better protection of flood prone communities, and to appropriate development in the floodplain. Chapter 5 of the recently published "Floodplain Management in Australia, Best Practice Principles and Guidelines" (SCARM, 2000) concluded that:

"***Shortcomings have been identified in existing legislation*** *across Australia. The legislative basis of floodplain management could be improved by the following principles.*

- ***A single piece of coherent and integrated State or Territory legislation*** *– single issue State policies could then be enabled and embodied under this single Act. In most States and Territories, responsibilities, actions and liabilities for floodplain management are scattered across several Acts. The existing State and Territory legislation is often cumbersome and responsibilities are unclear.*
- ***Clearly defined responsibilities and liabilities of Local agencies*** *and the various State agencies involved in floodplain management.*
- ***Clearly identified lead agencies with respect to key aspects of floodplain management*** *(e.g. land-use planning, flood emergency management, flood warning, recovery operations).*
- ***Clearly identified appropriate consent authorities and consent mechanisms for dealing with floodplain planning*** *matters. ……..."*

(Note: Italics added for emphasis)

Examples where this has been done satisfactorily can be seen at Fairfield in Sydney (May et al, 1996), and Tulsa and Fort Collins in the USA (Hilmes, 1998).

At Fairfield, the residents initially fought against the production of flood risk maps in the early 1980s. In 1986, there was a major flood through the city and much damage was done. Subsequently a residents group has become very active in floodplain management, the Council is a leader in flood mitigation, and has succeeded in raising or relocating many flood prone buildings.

Tulsa, a city in Oklahoma has suffered many severe floods, and has now relocated several suburbs to flood-free areas. The local contractors have developed expertise in moving large buildings.

Fort Collins City Council identified flood risk as an issue in the early 1980s, and introduced a floodplain management plan, which included laying back the river banks, relocating high risk housing and a caravan park to safer locations, and construction of a very large flood retention dam. An enormous flood occurred in 1997, estimated at around 500 Year ARI, although 4 people were drowned, it was estimated that the mitigation program had saved almost 100 lives, and resulted in significant reduction in property damage.

3.3 PLANNING CONSTRAINTS AND OPPORTUNITIES

Planning guidelines for flood prone areas need to be developed by the State Government, which will encourage zoning of flood prone land for development appropriate to the risk. Local Councils need to be given guidance and support for preparing Planning Amendment Reviews (PAR) to take account of flood risk and ensure that development proposals within floodplains are subject to control. The current unsatisfactory situation is that:

- a Council may reject a development proposal in a floodplain on the basis that it is at risk;
- the rejection may be over-ruled subsequently by the Planning Appeals Tribunal;
- the development goes ahead and at a later date is damaged by floods;
- the owner sues Council for flood damage! (Reference *Price v Willunga Council, 1987*).

3.4 REQUIRED ACTION IN THE INTERIM

The New South Wales State Government has provided a remedy. In situations whereby a Council which has prepared a floodplain management plan and had it approved, and is taking steps to implement it, that Council is protected against liability for flood damage suffered by residents/occupants (Smith et al, 1996). There is urgent need for the State Government in South Australia to follow such steps and to take action on Keswick Creek floodplain, so that the risk of flood damage to existing commercial and industrial businesses can be minimized and possible sources of litigation avoided.

Guidelines for floodplain management are set out in (SCARM, 2000). This document has grown out of the Floodplain Development Manual, published by the New South Wales Government (NSW, 1987), and provides an excellent reference for sound floodplain management.

3.5 STEPS TOWARDS EFFECTIVE FLOODPLAIN MANAGEMENT

- introduce legislation to support effective management of floodplains (Action by State Government);
- set up floodplain management planning guidelines for Keswick Creek;
- start the flood risk reduction process by setting up a Floodplain Management Advisory Committee with representatives of local businesses, Catchment Board, Councils, State Government and the Bureau of Meteorology.

The committee would prepare an interim flood risk

management plan aimed at immediate action to inform the occupants of the floodplain and provide guidance for minimizing the risk to facilities and property. The Floodplain Management Advisory Committee could address each of the points raised in Section 3.1

Once the process has been developed and become effective, it could be extended to other floodplains in the city in order of priority.

3.6 CONCLUSIONS

- Keswick Creek presents a risk of flash flooding to businesses in the floodplain;
- if a flood occurs, it can be expected that claims for damages may be made against Local and State Government agencies;
- there is an opportunity to reduce the flood risk before flooding has occurred;
- there is a need to introduce legislation to encourage proper floodplain management measures;
- planning guidance is required to assist Local Councils in ensuring appropriate use of flood risk land;
- setting up a Floodplain Management Advisory Committee for Keswick Creek is recommended;
- the management of flood risk in Keswick Creek could become a model for other catchments in Adelaide and interstate.

3.7 REFERENCES

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Lore of the land and water

Henry J Rankine OAM
Elder of the Ngarrindjeri Nation

I am one of the Elders of the Ngarrindjeri Nation and I love speaking to the younger generation of the Ngarrindjeri nation, to explain about our dream time, and the way our people lived with what our Fathers and Mothers have handed from one generation to the next to this day and age.

For example, our Lore about land and the waters around us plus Nature, Wind, Rain and Fire. All of the birds and animals, all that were created by our God Ngurrindrei.

My mum and dad would sit with us as children with fire light plus a couple of candles. They would tell us about the Lore of the Ngarrindjeri, like when we go fishing we would call out in Ngarrindjeri to Lake water or Coorong water to please give us a big fish so when we would catch the first big fish, then who ever is sitting next to a person who caught a big fish, that person would have to give the fish away so that we can catch more fish.

Our lore was always to share food, so no person or people would go hungry. There is a dream time story about two Ngarrindjeri men who were fishing with a net from their canoe, when they caught a lot of fish one day. They came into the shore then they saw this other man coming towards them. They quickly covered their catch up with some rushes mat. When the man asked if they had caught any fish they answered no. The man walked away then he turned around and said, I know you have got fish there and from now on they will be the boniest fish in the lake. To this day they are. They are called Silver Bream; they are the only fish I believe you can not catch on a hand line or rod.

This dreaming story was told by Auntie Leila Rankine and it is called the Tukerie Story about two greedy men.

Progress is good but progress also destroys a lot. Before the Barrages were built in the 1930s both lakes were brackish water. My people lived around both lakes. They knew where the fresh water was; there is still fresh water right through the Coorong along Young Husband Peninsula. Progress of all the lucerne that has been put in around the lakes has dried up all the wells in our area and that's only in my lifetime.

Our Ngarrindjeri Lore in our Nation was administrated by our Ngarrinjeri Tendi; this was the governing body of our 18 different Lakinyeris that covered about 25 000 square miles. Then in the late 1800s up to 1930 the old people said they would take their knowledge with them to the grave, for example, initiation. Then only a few kept talking about the Lore, and only a few I believe were privileged, because it was only the people who sat and listened and did not ask too many questions.

The old people of our Ngarrindjeri Nation used the night skies, stars, moon, wind and animals plus birds to know what's coming their way. The old people knew all the fishing spots right through all the river, lakes, Coorong and sea. Different spots for different species of fish. I was up at Gerard one day for a meeting with one of the older brothers, I asked if any Pilarki were biting up here, he said yes do you want a feed? I said yes, so we went down to the river. Before he threw the line out he made a small fire; we call this smoking ourselves, part of our lore. Within 10 to 15 minutes he had caught 3 callop, then he said that's enough. I said, yes brother; we just got a feed, that's good.

Same principle when hunting ducks or any thing just for a feed. Travelling on the lake when there is clouds, or when the wind is from a certain area, swan eggs a certain time of year.

There are two Laws, one is law and the other is Lore, so I will quote my parents, there are two sides of any road even if the road is a one way street. So I believe never mind what nationality we come from we must try to share this road of life together.

Thank you all very much.

The experience of developing water allocation plans

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Summary
Water allocation plans are important statutory documents under the *Water Resources Act 1997*. They can have far reaching effects on anyone taking water from a prescribed water resource. Essentially, the water allocation plan determines how much water can be allocated, what the criteria are for obtaining an allocation and the criteria for allowing the transfers of allocations. The water allocation plan will also form an important basis for the conditions that will be imposed on a licence regarding the manner in which the allocation is used.

The *Water Resources Act 1997* sets out in detail the content of a water allocation plan and prescribes a lengthy and detailed consultation process for the development of such plans.

The presentation will focus on the experience of developing water allocation plans for two very different prescribed water resources: the Mallee Prescribed Wells Area and the Clare Valley Prescribed Water Resources Area.

The Mallee Prescribed Wells Area has been a prescribed groundwater resource since 1983. There is extensive knowledge about the resource, its size, its movement, its yield and quality. Little is known about the actual usage of the resource, because the taking of water is not metered. There is a long history of previous management strategies and a major problem with "sleeper" allocations: people obtained an allocation in the past and never developed it, but prevent others from actively using the water. Another major issue is the localised impact of concentrated irrigation development on stock and domestic wells. The size of landholdings and allocations is generally large: 50-100 ML is a normal size for an allocation. Allocations are mainly used for the irrigation of olives, potatoes, onions and lucerne.

The Clare Valley Prescribed Water Resources Area has prescribed groundwater, surface water and watercourses. Groundwater and watercourses have been prescribed since 1996, surface water was prescribed in 1999. Very little is known about the actual water resources: groundwater is mainly a fractured rock aquifer with unpredictable yields and quality. Watercourses and surface water are largely ephemeral and the capacity of the resource will depend on the needs of ecosystems and downstream users. Dams are a major issue in Clare Valley Prescribed Water Resources Area: How many? How large? What percentage of the run-off? Off-stream or on-stream? There is little experience with the actual management of the water resource. All licensed taking of water is metered and a clearer picture of usage is emerging. In most cases the yield of the well or the percentage of the dams filled limits the actual use levels. The size of landholdings and allocations is relatively small: many allocations would be equivalent to 5–10 ML.

So how to assess the capacity of resource to meet demands in such situations? What about the assessment of the needs of water dependent ecosystems? The assessment of the impacts on water users just outside the prescribed area? How to use the extensive consultation process to get some valuable input into the development of the water allocation plan? How to deal with important water management issues in a community that are not addressed in the water allocation plan? How to develop policies that strike the balance between economic, social and environmental needs?

The presentation will give examples of how these issues and assessments were dealt with in both the Clare Valley and the Mallee.

Conclusions will be drawn about what can be learnt from these experiences with regard to the process for development of the plans and the content of the plans. Some suggestions for changes to the *Water Resources Act 1997* and/ or its regulations will be given based on these experiences.

Groundwater resources – an issue of "sustainability" and allocation

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1. INTRODUCTION

Groundwater is an important natural resource for the State of South Australia and the Nation as a whole. It is an important source of water that is used for irrigation in areas such as the State's southeast, and in market gardening and wine producing areas of the State, all of which contribute substantially to the State's economy and quality of life. In addition, groundwater is a major contributor of flow to many streams and rivers, and is often critical to maintenance of river and wetland habitats.

The South Australian Water Resources Act 1997 [1] (the Act) has established a water resources planning and management hierarchy for the State of South Australia. Water allocation planning, which is a requirement of the Act, will provide a framework and policies from which to ensure water resources (including groundwater) are adequately protected to meet the reasonably foreseeable needs of future generations and to protect ecosystem health.

This paper presents a discussion of the concept of the sustainable use of groundwater and the basic limitations that apply to calculating "sustainable" allocations. A definition of basic hydrogeological concepts / parameters referred to in this paper are provided as Section 5 of this paper.

2. SUSTAINABILITY OF GROUNDWATER RESOURCES

2.1 The Water Budget Concept

The *water budget* for a natural groundwater system can be simply expressed as

$$\text{Inflow}_{\text{(water entering)}} = \text{Outflow}_{\text{(water leaving)}} \pm \text{change } (\delta) \text{ in Storage} \qquad \text{Eq.[a]}$$

In a closed catchment, "inflow" will be entirely sourced from recharge, whereas in a portion of an open system "inflow" will comprise throughflow (from outside the study area) and recharge (over the study area).

Where a stress, such as pumping, is placed on a groundwater system the *water budget* equation is altered to account for that stress, eg.

$$\text{Inflow}_{\text{(water entering)}} = \text{Outflow}_{\text{(water leaving)}} \pm \delta\,\text{Storage}_{\text{(groundwater level)}} + \text{Pumpage} \qquad \text{Eq.[b]}$$

C.V. Theis [2], a pioneer in the science of hydrogeology, stated that for groundwater systems put under stress (say from pumping)

> "A new state of dynamic equilibrium is reached only by an increase in recharge (induced recharge), a decrease in discharge, or a combination of the two."

Pumpage, or groundwater abstractions, is the critical issue around which groundwater allocation planning centres, and section 101.4(e) of the Act requires that a water allocation plan must provide an equitable balance between social, economic and environmental water needs, at rates that are sustainable.

2.2 Sustainable Use of Groundwater / Safe Yield

From a groundwater perspective, the important word that appears in section 101.4(e) of the Act is the word *sustainable*, which hydrogeologists often interchange with the term *safe yield*. Fetter [3] defines safe yield as:

> "The amount of naturally occurring groundwater that can be economically and legally withdrawn from an aquifer on a sustained basis without impairing the native groundwater quality or creating an undesirable effect such as environmental damage. It cannot exceed the increase in recharge or leakage from adjacent strata plus the reduction in discharge, which is due to the decline in head caused by pumping."

In general, Fetter's definition of safe yield is consistent with Theis' observation. Over time, if pumping is maintained at a constant rate, the change in storage component of Eq.[b] becomes negligible and there are three possible outcomes if the water budget is to balance:

- additional recharge occurs to the system, through leakage from surface water bodies or adjoining aquifers;
- discharge to surface water bodies must diminish; or
- a combination of both.

Induced recharge in response to a development is difficult to measure [4][5] and, in many cases as recharge is largely controlled by rainfall [4], it is unlikely to change in response to a development. In effect then, the most critical component of the water budget that will change in response to groundwater pumping is aquifer discharge to surface water ecosystems (including streams, lakes, wetlands and the ocean), with the amount of water *captured* by a development essentially being taken from aquifer discharge.

2.3 Summary

Safe yield, or sustainability, in groundwater resources, then, is a notion that is inherently difficult to determine or assess since any withdrawal from a groundwater system by pumping will produce an hydrologic change of some sort, eg. a decline in aquifer storage, stream flow depletion or sea water intrusion. For this reason, the concept of *safe yield* should be redefined as *acceptable impact*, and in this context, the task of water policymakers and planners is to determine what is an acceptable impact (in terms of society, economy or environment) from which to develop groundwater allocations.

Finally, a dilemma facing water policymakers today is that of increasing population and the ever increasing stress this places on our water resources, in particular the ecosystems that are dependent on them. These stresses arise through the greater basic need for water, in a purely subsistence sense, as well as the constant demand for economic growth. So, in response to greater future demands on water, and to adequately address the requirements of section 101 of the Act, one or both of the following must be achieved:

- better management of existing water resources such that existing demand can be reduced to accommodate growing future demand; and / or
- continually redefine the *safe yield* / *acceptable impact* for a water allocation planning area so as to strike an ongoing balance between social, economic and environmental needs for water.

3. CALCULATING A GROUNDWATER ALLOCATION

3.1 Limitations to the Calculation of a Groundwater Allocation

Margins of Error

The mathematical solutions generally applied to calculate aquifer parameters, such as aquifer discharge (Q), hydraulic conductivity (K) and storativity (S), allow very definite determinations of those parameters. However, hydrogeologists work very much on the basis of what is a significant figure, based on margins of error, for a calculation and in some cases this can represent an order of magnitude (i.e. within 1, 10, 100, 1 000 etc. units).

Margins of error are associated with a number of physical uncertainties that arise in any water balance calculation, eg.:

- the area over which an aquifer outcrops at the surface;
- aquifer recharge rates;
- aquifer thickness;
- hydraulic gradients;

- estimates of aquifer parameters, eg. K and S; and
- aquifer discharge rates to surface water systems.

From an hydrogeological perspective, working within margins of error is probably the single biggest limitation in water allocation planning.

Unknown Stresses

As the whole area of water allocation planning is a relatively new "science" there are problematic issues associated with groundwater systems that have been exploited over long periods of time for social or economic benefit. For example, in any water allocation planning area there may be an unknown volume of groundwater used for stock watering or domestic supply purposes.

In addition, calculation of the quantities of water required to maintain groundwater dependent ecosystems in an healthy condition has its own level of complexity and warrants more attention then can be presented in this paper.

3.2 Safely Determining a Water Allocation

Given that margins of error exist for most, if not all, calculations that describe various aspects of a groundwater system there is the potential for over allocating a groundwater resource. Experience has shown that, in social or economic terms, once a resource has been allocated it will not be an easy process to rescind that allocation, either in part or in full.

As indicated above, determining a water allocation that will be protective of a resource (whether for social, economic or environmental benefit) is not necessarily a straightforward process. The concept of margins of error must be incorporated in the decision making process so as to ensure an *acceptable impact* or better is achieved once exploitation of the resource commences, or to manage groundwater abstractions that already take place.

Some appropriate ways in which water allocations can be determined include:

- Trend analysis, i.e. assessing changes in groundwater levels in response to pumping, rainfall patterns, stream flow events etc.
- Adopting a conservative approach, i.e. adopt estimates of aquifer parameters used in the calculation of an allocation such that an underestimate of the amount of water required to achieve an acceptable impact, or better, is determined.
- In the case of phreatophytic vegetation (i.e. plants that rely upon groundwater for all or part of a year), determining a groundwater level that is protective of plant health is often easier than exactly determining a volume of water for the same purpose.

Caution should be used in using recharge as a means of determining a *safe yield*, as pumping does not have to exceed recharge for an adverse impact (such as depletion of stream flow) to occur [4]. Further, estimating recharge is one area where especially large margins of error can creep into a water balance calculation as small errors in this parameter, applied over a large surface area, can result in large errors in volume estimation, eg. the difference between a 10 and 12 mm annual recharge rate over an area of 100 km^2 (1 000 000 Ha) is 20 000 m^3/yr.

The most effective way in which to determine a water allocation that achieves an acceptable impact, or better, is through the collection of data (say, over 10 years or more), critically reviewing those data (trend analysis) and having the capacity to review the allocation on a regular basis (say, less than 5 years) The review period adopted will undoubtedly be constrained by social, economic, environmental and even political perspectives.

Finally, determining a water allocation with a paucity of data is not recommended as the appropriateness of any allocation will, in most cases, be proportional to the level of investigation and data collection that has been undertaken in the planning or review stages.

4. CASE STUDY

4.1 Introduction

The following presents a simple case study to assist in demonstrating issues of "sustainability" and allocation -

An aquifer that discharges to a stream is planned to be exploited for an irrigation development (refer Figure 1). The stream ecosystem (which includes aquatic flora and fauna, and riparian vegetation) is dependent on groundwater discharge during dry summer periods. The irrigation development requires 7 000 m^3/d, particularly during dry summer months when the water needs of crops are at an optimum.

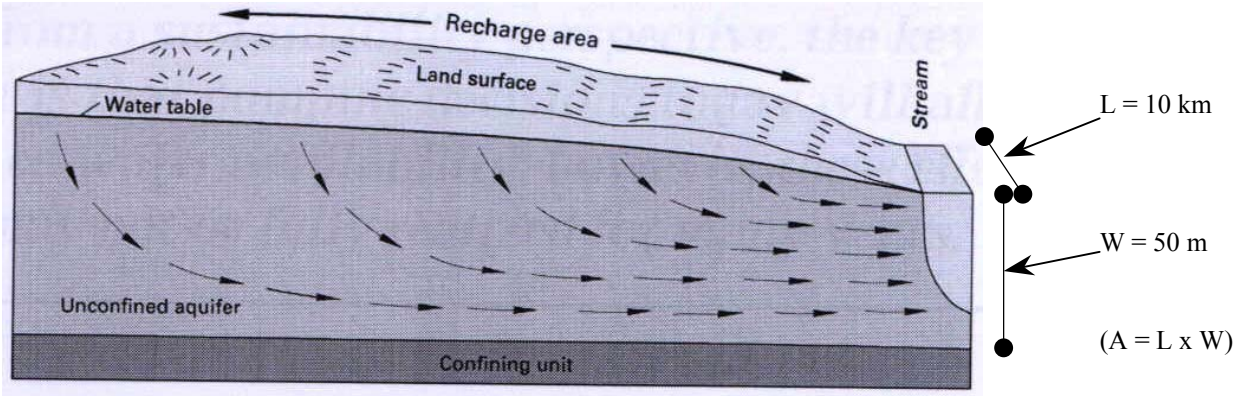

Figure 1. Conceptual aquifer that maintains stream flow and ecosystem health (after [6]).

The water needs of the development are likely to compete with the water requirements of the stream, and ecologists and hydrogeologists have determined that a minimum groundwater discharge to the stream of 4 000 m^3/d is required to achieve an *acceptable level of impact*, or better, for stream ecosystem health along the 10 km development zone. However, it is understood that any reduction in the natural discharge of the aquifer will have some level of impact on stream ecosystem health and, further, no account is given to the level of impact that might occur outside of the water allocation planning area, eg. reduced flows to town water supply reservoirs or fish nurseries in tidal inlets.

4.2 Discharge to the Stream - Undeveloped Aquifer

Table 1 presents a comparison of aquifer discharge for the example groundwater system (Figure 1) based on three models, i.e.:

Model 1. Base example, not allowing for margins of error, aquifer testing undertaken at two locations.

Model 2. Hydraulic conductivity rounded down.

Model 3. Hydraulic conductivity and hydraulic gradient rounded down.

The calculations presented in Table 1 are derived from Darcy's Law, which states that aquifer discharge (Q) is a product of hydraulic conductivity (K), the cross sectional area of an aquifer (A) and hydraulic gradient (*i*). The table shows that allowing for even small margins of error significantly different values of aquifer discharge can be derived.

4.3 Discharge to the Stream - Developed Aquifer

Figure 2 re-presents the same groundwater system that is presented in Figure 1, but now developed to provide a water supply of 7 000 m^3/d from 5 wells located at approximately 1 km centres along the 10 km stream reach. The figure shows that whilst the wells do not directly capture stream flow (i.e. they do not induce recharge), they do capture groundwater prior to its discharge into the stream, effectively depriving the stream and its ecosystem of 7 000 m^3/d.

Table 1. A comparison of aquifer discharge estimates on the basis of margins of error.

Parameter	Model 1 ⊕	Model 2 ∅	Model 3 Ω
Area (m^2)	500 000	500 000	500 000
Hydraulic conductivity (m/d)	21.935	20	20
Hydraulic gradient (m/m)	0.0015	0.0015	0.001
Aquifer discharge (m^3/d)	**16 451**	**15 000**	**10 000**
Aquifer discharge (ML/yr)	**6 008**	**5 479**	**3 653**
% difference	**0**	**9**	**39**

Notes: ⊕ base example, not allowing for margins of error, aquifer testing undertaken at two locations
∅ hydraulic conductivity rounded down
Ω hydraulic gradient reduced by 33%

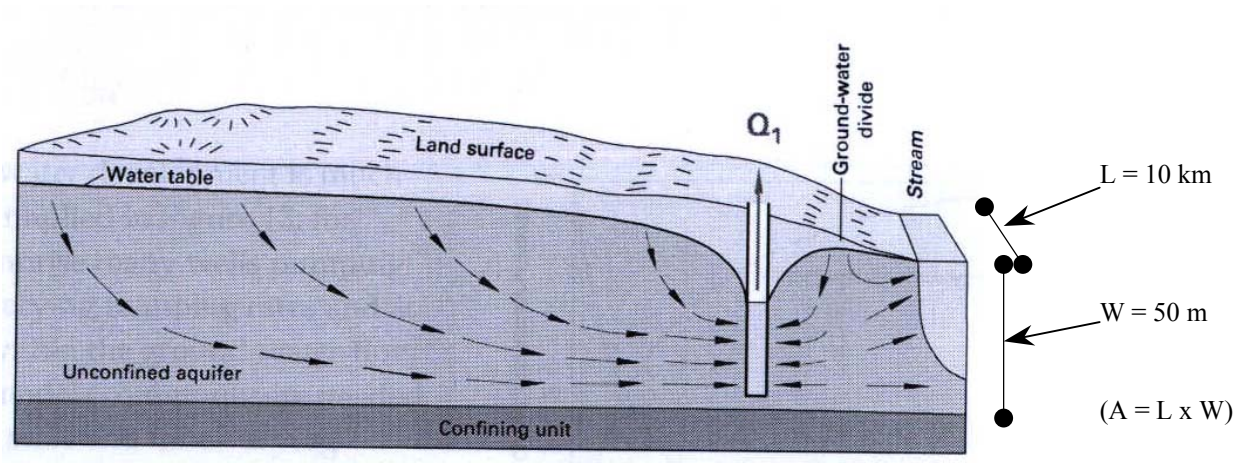

Figure 2. Conceptual aquifer with operational wellfield (Q_1 = 1 400 m^3/d/well).

Table 2 re-presents the data presented in Table 1, but incorporates the new stress of pumping on the system. The table shows:

- The effect of pumping on aquifer Model 3 is predicted to have an adverse impact on stream ecosystem health along the 10 km zone of development, i.e. there is a net deficit for the environment of 1 000 m^3/d.
- If the aquifer more closely fits aquifer Models 1 and 2 the development is predicted to have an *acceptable level of impact* on the stream environment.

Table 2. The impact of groundwater pumpage on aquifer discharge (m^3/d).

Parameter	Model 1 ⊕	Model 2 ∅	Model 3 Ω
Aquifer discharge (pre-development)	16 451	15 000	10 000
Less pumpage	7 000	7 000	7 000
Aquifer discharge (post-development)	**9 451**	**8 000**	**3 000**
Deficit for environment	**5 451**	**4 000**	**(1 000)**

Notes: ⊕ base example, not allowing for margins of error, hydraulic gradient assumed unchanged
∅ hydraulic conductivity rounded down
Ω hydraulic gradient reduced by 33%

4.4 Determining a Water Allocation for the Base Case

Depending on the size of water allocation required, a proponent could be expected to argue for the least conservative allocation, for purely economic reasons. However, the Case Study presented herein indicates there is the potential for an adverse environmental impact to arise from the proposed development and clearly there needs to be some sort of trade off between economic and environmental benefits based on the concept of *acceptable impact*.

1. In environmental terms, there is really only one option available to determine a safe yield, or acceptable level of impact, for the proposed development. That option is to adopt the most conservative model and limit pumpage to no more than 6 000 m^3/d. (Other contingencies could also be built into the allocation allowing for very dry years when stream flow is very low and more than 4 000 m^3/d is required to maintain ecosystem health, although this is sure to be a contentious issue in the allocation).
2. In economic terms, the development can only proceed if the acceptable level of impact, as measured by the daily volume of groundwater required to maintain stream ecosystem health, is reduced to say 3 000 m^3/d.

Unfortunately a trend analysis approach cannot be undertaken to assist in determining an allocation as there are no historic data available by which to assess aquifer response to climatic factors, pumping and stream flow events. However, should the development be allowed to proceed monitoring of various aspects of the development should be undertaken such that a trend analysis of data can be undertaken at some future time which might allow the allocation to be reviewed.

5. GLOSSARY

Aquifer
A geological formation that can provide suitable quantities of water (to wells, springs or surface water bodies) that allows beneficial use. An aquifer can comprise hard rock or sedimentary formations.

Hydraulic conductivity (K – $m^3/d/m^2$ or m/d)
The volumetric rate of flow of groundwater through an aquifer under a unit hydraulic gradient.

Hydraulic gradient (*i* – m/m)
The rate of change in groundwater level per unit distance in a given direction.

Aquifer throughflow (Q – m^3/d)
Lateral movement of groundwater through an aquifer, also the volume discharge per unit width of aquifer.

Storativity (S - unitless)
The volume of water that an aquifer releases or takes into storage (per unit surface area per unit change in head). Distinct from porosity.

Aquifer discharge (Q)
Calculated by applying Darcy's Law -

$$Q = K \cdot i \cdot A \qquad \text{Eq.[c]}$$

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