Bringing Water Sensitive Design Into The Mainstream

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EXECUTIVE SUMMARY

Despite water sensitive design being widely promoted with numerous examples constructed, it is not yet considered to be in the mainstream in New South Wales. Indeed, much of the recent success in producing Development Control Plans for water sensitive design can be attributed to the current drought which has focused the community's attention on water issues.

This paper explores some of the reasons for the limited adoption of water sensitive design in New South Wales and provides commentary based on the broad experiences of water sensitive design consultants, STORM Consulting.

The authors suggest several key factors which will assist in bringing water sensitive design into the mainstream including: one dedicated authority empowered with the responsibility to champion water sensitive design; ongoing and increased education and capacity building for government, developers and their consultants; more information on the costs and benefits of water sensitive design to enable comparisons with traditional approaches; and increased emphasis on inter-disciplinary approaches and early involvement of design teams.

INTRODUCTION

Water sensitive design continues to emerge as the preferred design approach to achieve sustainable stormwater management, and indeed contribute to sustainable development. Broadly, water sensitive design principles rely on a consideration of natural systems and of the total water cycle, with biodiversity, water quality and water quantity managed to deliver improved social and environmental outcomes.

Being a relatively new concept, it is fair to say that the stormwater industry is in a state of flux as guidelines and policies are developed and implemented to keep pace with the designs being submitted. For most practitioners, this flux is difficult to grapple with, as it seems an amorphous movement with new information being continuously released. This paper attempts to provide some insight and commentary into the adoption of water sensitive design based on numerous case studies and industry-wide dealings, particularly in New South Wales.

INDUSTRY PERCEPTIONS

Being a new approach, some authorities perceive water sensitive design as an impediment to development. This is certainly the case for cash-starved smaller and/or rural Councils where development is often welcomed. Such Councils consider that if developers are burdened by too many environmental requirements that they will take their developments elsewhere. In these cases the opportunities for water sensitive design are almost always lost. One method that has been successfully employed in partnership with

Stormwater Extension Officers has been design workshops where we have participants develop and cost traditional stormwater designs for an actual subdivision, then compare the results to a water sensitive design which is also costed. Part of the exercise has participants list the social, environmental and planning implications of each design. They are then able to make an informed decision about which water sensitive and traditionally engineered components to include.

For the ten or so years since water sensitive design have been described in technical literature, the messages have certainly come to prominence. However acceptance and adoption of water sensitive design has been restricted in general to the innovators and early adopters. Many people are nervous about water sensitive design. Developers may perceive:

1. Higher costs of construction
2. Time delays in getting approval (from a determining authority who may not appreciate the subtlety or sophistication of the design)
3. Increased up-front costs for a development with no certainty of being approved for other reasons
4. Inconsistency of understanding between and within different local government authorities
5. Lack of consistency with government proposal not requiring/demonstrating the principles, and
6. Market demand does not justify changing design approaches – especially in housing/development booms where all properties invariably sell regardless.

Determining authorities may perceive:

1. Negative feedback from the community, e.g. based on increased cost for compliance
2. Operational and functional issues associated with altered infrastructure design
3. Doubts about performance
4. Increase in maintenance and requirements for specialised maintenance, and
5. Concern about the design life of water sensitive components compared to traditional ones.

Much of this resistance to water sensitive approaches will diminish with increasing industry information, especially those based on case studies where benefits, costs, constraints and opportunities are explored and an attempt is made to quantify these. As consumer awareness of the benefits of sustainable design principles grows, demand for developments that incorporate these principles will likely increase.

COSTS AND BENEFITS

While more cost information is being derived over time for water sensitive design there is a general lack of understanding of the benefits of water sensitive design. First principles enable us to predict the following benefits arising from water sensitive design:

- lower stormwater volumes and peak flows
- less pollutants in stormwater
- reduced potable water demand
- reduced headworks costs
- potentially reduced sewage loads and sewerage costs, and
- healthier receiving environments.

While some aspects of these benefits can be costed (as the Department of Environment and Conservation's Stormwater Team is attempting in NSW) others cannot. Indeed their benefits go beyond what can be costed. For example, how does one quantify the benefits of a stable stream with healthy riparian and in-stream vegetation? Better quantification the benefits of water sensitive design approaches will enable a more accurate comparative assessment against traditional approaches.

GRAPPLING WITH OBJECTIVES

The States' environment protection agencies have been active in requiring and setting guidelines for preparation of Stormwater Management Plans (SMPs). The objectives for new development are the key area driving water sensitive design. Water quality objectives can readily be met by end-of-pipe treatment technologies. However, it is the water quantity objectives that are causing a rethink of design approaches.

Some authorities are shifting from peak flow mitigation to managing lower flows and indeed the volume of flows from new developments, e.g. down to the 2 yr ARI event where there is an attempt to mimic pre-and post-development flow volumes. Informed authorities see managing these lower flows as the key to improving receiving water's ecological health. Only water sensitive approaches, which include retention, are able to satisfy such objectives as demonstrated through water balance modelling.

Our experience has shown that unless the wording of water quantity (flow and volume) objectives is carefully constructed, some designers will be compelled to short-circuit water sensitive approaches – instead attempting to match a detention solution where a retention one is intended.

Generally, SMPs require percentage retention rates for pollutants to compare proposed development conditions to the pre-developed condition. This is an entirely arbitrary requirement. It can fail to deliver sustainable outcomes because: 1. The pre-developed condition can be quite degraded, and 2. It does not directly link the pollutant retention to specific ecosystem requirements. For instance, if pristine development yields 1 quantum of a pollutant and the pre-development condition yields 10, a 50% retention requirement is will still yield significantly high loads of the pollutant with long-term effects on receiving environments. Revisions of SMPs need to focus on objectives that are better linked to ecologically sustainable development, as is a requirement of the NSW Local Government Act.

APPROACH VERSUS PROCESS

When industry practitioners adopt water sensitive design there is a tendency to oversimplify it. This can be likened to a Now, Where, How analogy. We know where we are NOW and we probably know WHERE we would like to be; the challenge is HOW to get there.

Water sensitive design is an approach and it therefore cannot be prescriptive. It is more complex than a prescriptive methodology can adequately manage as it attempts to deliver sustainable outcomes (social, economic and environmental). As such it is critically reliant on a broad systems understanding (including both natural and engineered systems) and this is best managed in an interdisciplinary manner. Indeed, interdisciplinary approaches are most likely to yield feasible and viable solutions.

All this takes time, effort and understanding and so we perceive some practitioners fail to grasp that water sensitive design is an approach and instead try to turn it into a process. This will stifle innovation and fail to deliver true sustainability. To maintain the interdisciplinary nature of water sensitive design, the professions involved must be aware of the skills that each brings to the table. It must be recognised that neither architects, planners, landscape architects or engineers have a monopoly on the knowledge necessary for successful water sensitive design. From experience, the most successful designs have stemmed from early and continual involvement of at least these three professions.

There is also a need to plan for water sensitivity early in the design process. A typical situation that water sensitive consultants deal with is being given a subdivision lot layout to "make it water sensitive". By this stage, many of the opportunities to improve environmental and social outcomes have already been lost. For this to change, developers need to be presented with examples where water sensitive lot layouts provide the same economic return from lower lot yields. This might occur by attracting a higher price per lot in subdivisions that are designed with enhanced community amenity.

BREAKING DOWN THE BARRIERS

Engineering in the past has adopted a “command and control” approach to the environment. Engineers have sought to cushion society from the impacts of natural systems by creating barriers between society and the environment (e.g. putting dirty stormwater in a pipe). Water sensitive design seeks to remove the barriers and re-establish that vital link between people and their environment. For example, a development in East Bowral that uses grassed swales instead of piped systems has made residents note with disbelief the large volumes of runoff that their houses and road produce.

In addition to increased awareness of the water cycle, the movement away from hard-edged engineering structures has increased the livability and connectivity of developments. Water sensitive design layouts often seek to make streams a focal point for public activity rather than “rear ending” them by placing backyard fences along the boundary. Through the use of a softer engineering approach, the landscape and streetscape of an urban development can be more visually appealing and provide for greater interaction within and between communities and the environment. The benefits of this may also include increased public health through better livability and decreased incidences of anti-social behaviour such as vandalism.

SPECIAL APPLICATIONS

While they make up a fraction of our land mass and have small populations, Australia’s ski resorts are urban centres within vulnerable and important alpine ecosystems. Given that most of Australia’s ski resorts are within National Parks, it is arguable that no areas need water sensitive approaches more.

The difficulty of applying water sensitive approaches in alpine areas is due to the extremely fragile nature of receiving environments and the comparatively little known effects of snow and ice in Australia. Currently, intense debate is being fuelled by the question of whether roof snow and ice melt can sustain water demand in ski lodges. Trials are underway in Perisher Valley to ascertain an answer to this fundamental question.

Stormwater discharges from impervious areas to wet heath and bog vegetation communities is another problem in ski resorts. Increased peak flows rut out these ecosystems and irreversibly alter the very hydrology they depend on to live. Trials are underway in Falls Creek to disperse and treat flows into bogs while at the same time restoring soil profiles and bog vegetation. This is a challenging trial in an area with slow vegetation growth, high flows and steep slopes.

Equally challenging is the general inability to infiltrate stormwater in ski resorts. The Thredbo disaster has rightfully taught us to value geotechnical stability (public safety) above all else.

Reuse of treated sewage for snowmaking is occurring in one resort in Victoria, but others do not seem keen to adopt such schemes for economic and public perception reasons.

The Victorian ski resorts have united to answer some of these vexing challenges to water sensitive approaches. WBM Oceanics and STORM Consulting have teamed to provide some answers, including case studies.

SENSITIVE AREAS

Certain areas that are politically or environmentally sensitive typically have quite stringent development controls. An example is in Sydney's drinking water catchments which encompass a vast area to the south and west of Sydney. Legislation administered by the Sydney Catchment Authority (SCA) calls for development to demonstrate a Neutral or Beneficial Effect (NBE) from development on the water quality of the drinking water catchments.

These catchments comprise large areas that are rural and the proposed lot sizes in subdivisions are around 40 Ha. Because of the assumptions involved, current water cycle models are not intended to provide fine-tuned answers to demonstrate such a neutral or beneficial effect, and indeed there is no appropriate water quality model for these rural developments. In this instance, a special water quality model may be required to determine NBE.

DROUGHT EFFECTS

As this paper is penned, much of Australia is in extended drought. As much as everyone wishes this drought never happened, it has had a remarkable effect in focusing the community's attention on water issues, and galvanising a spirit of water conservation. Despite having no real economic payback, city dwellers are installing rain tanks in never before seen numbers. Rebates from water authorities are fuelling this demand to a limited extent. The truth is that people are making choices to consider water on their properties as a resource for mainly ethical reasons.

For water cycle policy lobbyists, this has been a bonanza. Examples from regional Australia prove time and again that advocating stormwater and environmental benefits alone to drive policy change is particularly challenging. However, if the message piggy-backs on water restrictions and potential drought proofing as demonstrated benefits, impediments to policy evaporate in sync with the shrinking water supply dams.

SHIFTS IN TECHNOLOGY

It is only a short time ago that gross pollutant traps were touted as the panacea that the stormwater industry sought to address water quality issues. Then attention focused for a time on the rather fashionable constructed wetlands. Both of these stormwater quality improvement devices have their place but now, thankfully, there are a plethora of alternatives for water cycle managers.

It is true that while some in local government and developers love them, constructed wetlands are often disliked because of a perception that they are difficult and expensive to maintain. Sub-surface flow wetlands and sand filters offer excellent alternatives with less and simpler maintenance and often with a smaller land take.

Vegetated drainage lines (grass swales are one example) are another water sensitive measure that are perceived to have a high maintenance requirement. There is also the concern of damaging swales either from cars parking on the verge, or from mowing the swales. Bollards are promoted as overcoming this problem but this conjures up images of expensive landscaping whereas the same effect can be achieved using traffic guideposts. The Southern Councils Group in NSW has researched the use of native grass species in swales which are designed to withstand frost and drought and which also require less mowing.

The challenge is to select technology based on simple but realistic life cycle costing and maintainability. By maintainability, we mean the ability of Council to maintain a water sensitive system without having to outsource, employ extra staff or to purchase extra equipment or invest in staff training. Simple life cycle costing means to factor in not only the capital cost of a piece of technology, but also to account for maintenance over the life of the technology, and the replacement cost. When this exercise was conducted in Kiama comparing an end-of-pipe solution and an in-pit solution, the economics came out even. Council then opted for the easiest maintenance option which meant that they did not have to outsource Sydney-based contractors, preferring instead to do it in-house.

INSTITUTIONAL ISSUES

While there has been a large push for water sensitive design form the state government in New South Wales, this momentum is waning. State government is not unified behind water sensitive design and there is currently no one department or authority with ownership of water sensitive design to promote it. Name changes, integration and re-structuring of natural resource agencies has been a hallmark of the current NSW Government. This may yield positive long-term benefits, but the community finds the situation after eight years confusing, frustrating and inefficient. The NSW Government also has a perception problem in regional parts of the state where local government sees their state counterparts as ignoring them in favour of metropolitan areas. There is a general wariness of state policy and guidelines and this flows through to water sensitive design.

At the Local Government level business is often undertaken within departments and with little interaction between departments. This makes an interdisciplinary design approach almost impossible to achieve. Some Councils will happily consult with the community, but will exclude their counterparts from other departments in discussions. There are a range of reasons for this and despite the fact that the obvious answer is to set up inter-

departmental committees, there needs to be a willingness to do so which can be encouraged by linking it to managerial performance targets.

Local Government is also under immense stress of workload. Changing to water sensitive design is often seen as a time-consuming diversion away from an already busy schedule. Nevertheless, state and local governments who promote it need to demonstrate commitment to water sensitive design. This should come through in the designs they produce themselves as is currently being done in Grafton, Kiama, Goulburn, Grenfell, Snowy River, Bombala and Cooma Councils that we are aware of.

CONCLUSION

There is no doubt that there are significant issues and impediments to widespread adoption of water sensitive design in New South Wales. State government has provided guidelines and seed funding for some projects but their future involvement is in question. Local government is overloaded and struggling to keep abreast with information about how to assess and implement water sensitive design. Developers are willing to implement water sensitive design as long as it costs no more than traditional approaches but are concerned that the enthusiasm for it is highly variable between and within Councils.

Despite these issues and impediments, excellent examples of water sensitive design continue to be produced in a range of climates and for differing scales of development.

The widespread adoption of water sensitive design would receive a significant boost should one state authority be given the mandate to champion it. This authority could also promote further targeted capacity building for local government, developers and their consultants to ensure early adoption of water sensitive approaches in new developments. Once these key issues are addressed we believe it will catalyse significant progress in the widespread adoption of water sensitive and sustainable development throughout NSW and Australia.

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