Communicating the value of WSUD and the role of 'best-practice' pollutant removal targets. A Waverley case study

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Abstract

Communicating the value of water sensitive urban design (WSUD) to a body of decision makers can be a key challenge faced by local councils in getting WSUD projects off the ground. The problem often begins with the adoption of stormwater quality objectives that are not appropriate for the local context. This paper discusses an approach for determining meaningful stormwater quality objectives that places emphasis on understanding the local catchments, the values of the receiving environments and threats to those values. It also explains how this approach provides a robust foundation for communicating the value of WSUD projects from a water quality perspective and beyond.

The approach is discussed in the context of a stormwater quality strategy development project with Waverley Council. The Waverley local government area is a unique geography that has catchments draining to some of Sydney's most iconic and well-loved water bodies that each face different environmental issues.

1. INTRODUCTION

The value of WSUD projects are generally poorly understood among decision makers, which can pose a fundamental barrier to the success of a project and to the success of the industry at large. Issues with communicating the value of stormwater quality projects often begins with adopting the wrong objectives. Setting appropriate objectives is important as they define the project and provide clarity of expectation for the stakeholders. Industry standard stormwater quality objectives in Australia are to meet stormwater pollutant reduction targets of 85% removal of total suspended solids (TSS), 60% removal of total phosphorous (TP) and 45% removal of total nitrogen (TN). These load-based pollutant reductions are considered 'best practice' water quality targets and are widely adopted by councils as their stormwater quality objective.

There are a number of issues with adopting these targets as objectives. Firstly, explaining the origins and relevance of these target values to a proposed WSUD project is technical and often inaccessible to decision makers. The target values represent the point of optimal treatment size efficiency and are derived from years of empirical experiments and sophisticated model development.

Secondly, the treatment footprint area required to meet optimal efficiency, on which the targets are based, is often unavailable within established urban catchment areas. Established urban catchments typically struggle with a scarcity of open space and high competition for its use. Defending the placement of a WSUD project within these highly valued open spaces becomes considerably harder to justify when the water quality improvement targets cannot be met.

Thirdly, to communicate the value of a WSUD project it is important that there are visible or measurable results that can be assessed against the project's objectives. The objective to meet best practice targets relates to a suite of stormwater pollutants that are effectively invisible to the eye, and as such the environmental benefits of WSUD projects to their receiving environments are difficult to observe. In order to measure the effectiveness of the projects, water quality field testing is required which is complex and costly and is therefore seldom pursued.

Lastly, adopting generic stormwater quality targets across all catchments can often displace consideration of what it is that is being protected and why and in doing so can lead to WSUD projects not addressing the actual water quality issues faced by the catchment's receiving environments, or unnecessary investments being made. For example, high energy marine environments are not particularly sensitive to nitrogen and other nutrients, in fact, high nutrient loads can be beneficial to the environment. High sediment loads and litter however can be harmful to those environments. In a catchment that drains to a high energy marine environment, there is therefore little justification in investing in a raingarden that would remove TN and TP loads to best practice.

Rather than a universal adoption of best practice targets as stormwater quality objectives, stormwater quality objectives should be developed on a catchment by catchment basis from a sound understanding of the value of the local receiving environments and the threats to those values.

The proposed approach facilitates the development of meaningful and targeted objectives and addresses the issues associated with adopting best practice targets discussed above, which can often hinder the justification of WSUD projects. Furthermore, this approach produces answers to likely stakeholder questions such as:

- What is it the environment that requires protection? (e.g. is it marine, freshwater, bushland?)
- Why are works being proposed? (e.g. Does it have high environmental or socio-economic value? Should it be a priority area?)
- What are the key threats to the environment? (e.g. High sediment loads? High nutrient loads? Litter?)
- What are appropriate treatment systems to address the key threats? (e.g. GPT? Bioretention system?)

Being able to provide straightforward and logical responses to these questions sets the foundations for a robust business case for WSUD projects.

2. CASE STUDY – WAVERLEY LGA STORMWATER QUALITY STRATEGY

2.1. The Case Study Site

Waverley LGA is a densely populated LGA located on the east coast of Sydney. From a stormwater management perspective, the LGA is quite unique as its catchments drain to a wide range of receiving environments, many of which are high profile sites with high environmental and socio-economic values. The receiving environments of Waverley's catchments include some of Australia's most iconic beaches including Bondi Beach, popular swimming sites in Sydney Harbour including Rose Bay and Double Bay, artificial ponds in one of Australia's oldest and well-used parks and local bushland waterways and remnant coastal heath vegetation that are highly valued by the local communities and provide important urban ecology corridors across the LGA.

Waverley's broad catchment areas coloured coded by their receiving environment are shown in Figure 1 with images of three of Waverley's most iconic receiving waters.

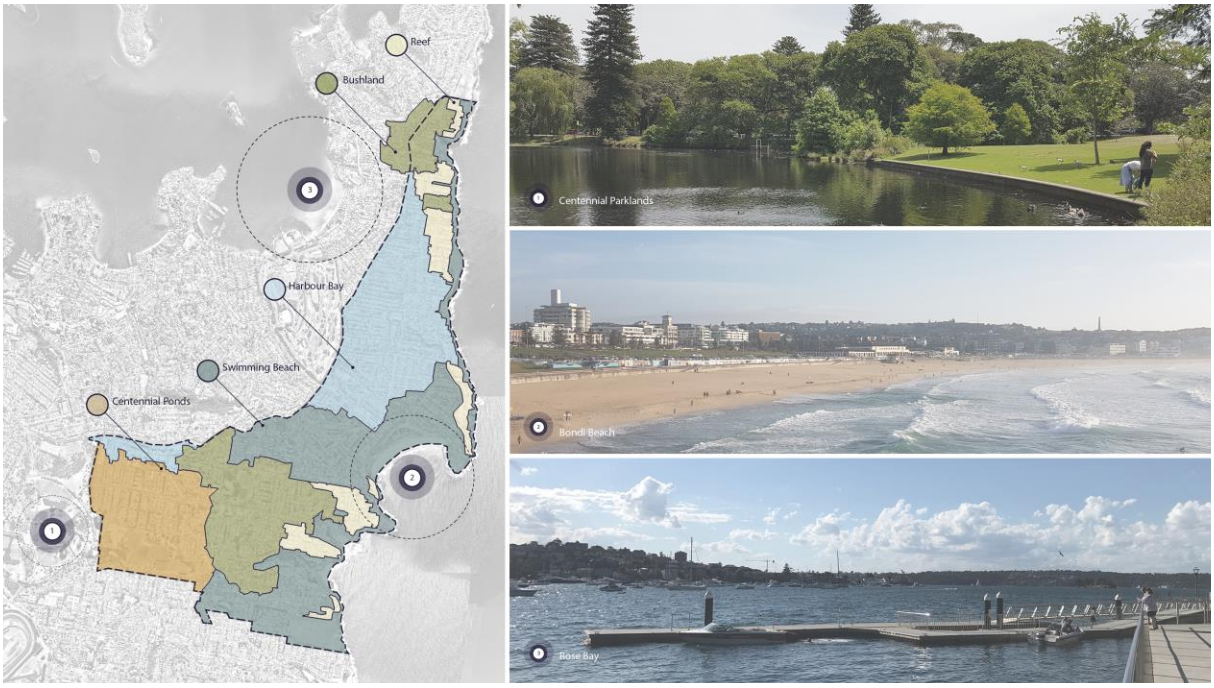


Figure 1: Waverley LGA stormwater catchments and their receiving environments.

To date, Waverley's environmental stormwater goal as documented in the LGA's Action Plan is to:

"Minimise sediments and suspended solids, bacteria and nutrients discharged into waterways and vegetation."

The breadth of this goal allows for flexibility in the method of achieving stormwater quality improvements, however it does little to inform a strategy or to create tangible milestones of water quality improvement that can be important political tools for securing support and funding for ongoing works.

2.2. Case Study Project Objectives

Waverley Council was seeking to evaluate the value and impact of their existing assets and identify and priorities opportunities for future stormwater quality improvement infrastructure.

To achieve this, the following project objectives were set:

- Set meaningful water quality improvement objectives for individual subcatchments within the Waverley LGA
- Provide Council with strategic direction for the pursuit of their LGA wide stormwater goals
- Provide feasibility and concepts for water quality improvement projects that meet local catchment objectives and that are considerate of the local landscapes, ecosystems and social values.
- Create support for stormwater quality improvement works across multiple project teams within Council to assist in realising the proposed stormwater improvement works.

2.3. Catchment Analysis and Setting Stormwater Quality Objectives

Waverley Council, as with most other local governments, have defined large stormwater catchment areas largely for the purpose of flood modelling and management. In order to set locally specific catchment objectives, the 14 catchments across the LGA were dissected in 60 subcatchments defined by each stormwater pipe outlet. The subcatchments were categorised by area, dominant landuse, existing treatment infrastructure and importantly the receiving ecology.

From this high-level analysis, a simple but powerful matrix was developed that rationalises water quality objectives for catchments that drain to each receiving environment. This matrix is shown in Figure 2.

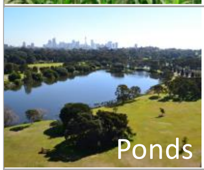
	Values	Issues	Catchment objectives
	High value marine habitat & recreational value	Sediments reducing light, heavy metal toxicants and litter.	Minimise sediment and litter discharges
	High recreational and aesthetic values	Compromised aesthetics, human health risk from swimming	Minimise litter and microbial pathogens
	High estuarine habitat value including for threatened seagrasses Recreation and aesthetic value	Smothering of seagrass, eutrophication, human health risk from swimming	Minimise pathogens, nitrogen, sediment and litter
	Aquatic habitat, heritage and aesthetic	Fine and dissolved pollutants bypassing existing GPTs, algal blooms	Minimise fine sediment, dissolved nutrients
	Forms terrestrial habitat corridor, strong community interests in bush care	Weed infestations, rubbish	Minimise dissolved nutrients and organic matter e.g. grass clippings

Figure 2: Matrix of receiving environments of Waverley LGA, their values, issues and proposed water quality objectives.

Identifying a long list of potential projects was undertaken through a detailed catchment profile analysis observing characteristics such as topography, stormwater pipe network, soil types, sewage overflows/outfalls, high socio-economic value sites, open space availability, vegetation and ecologically important linkages. This analysis facilitated the identification of a long list of technically feasible project sites (through elimination of non-feasible sites) and a preliminary understanding of what value a treatment system at those locations might offer to the surrounding landscape and the receiving environment.

2.4. Multicriteria analysis, workshops and shortlisting

A key element of this project was the collaboration with a multi-disciplinary Council project team through a series of workshops to better understand the local context in particular of the proposed project sites. The workshops also served to involve the Council team in the Multi Criteria Analysis (MCA) shortlisting and prioritisation process, and in so doing, raise awareness and interest around WSUD and its potential value and help to foster a sense of ownership over the strategy within the organisation.

MCA is a decision-making tool to assist in the process of prioritisation. The intention of MCA is to help facilitate the prioritisation process, rather than to provide a definitive ranking, and it is important that the numerical assessment be complemented with open discussion about the results. There are many methods of MCA; the method that was adopted in this study was the Simple Multiple Attribute Rating Method which used a combination of quantitative and semiquantitative criteria to assess and rank the project sites.

The criteria used to assess the long-list of potential project sites related to the objectives of the project and addressed environmental, financial, social and project risk criteria. A score of 1-5 was collectively attributed to each project site for each test criteria to determine a project ranking. Re-weighting exercises were also undertaken, giving higher importance to different criteria and re-evaluating the project ranking for change to test the robustness of the method and stimulate discussion across the project team about priorities at different project sites.

The multicriteria assessment served two important purposes. The first was to simply provide a method of prioritising projects. The second was to demonstrate the spread of considerations for each project that appealed to the interests of the multidisciplinary project team and their different priorities and agendas.

2.5. Feasibility and concept design

The feasibility and concept design phase of this project was designed to consolidate the work behind each of the priority project sites into an accessible and attractive document that could provide much of the information required for a project business case. The purpose of the document was to not only to provide the technical and financial feasibility of the projects, but also to inspire a vision of the site's potential and the social and amenity value that might also be gained through WSUD intervention. An example of a project concept design option is shown in Figure 3 below. Feedback from Council has been that the succinct and accessible documentation for each of the priority sites has been a significant outcome of the project and has been helpful in fostering interest in the projects across a range of departments.

Figure 3: An example concept design option showing the integration of the treatment system into an holistic park upgrade.

2.6. Conclusions and Lessons Learnt

This paper identifies that justifying the value of WSUD projects to broad stakeholder groups is a common challenge faced by councils and has proposed that the setting of inappropriate stormwater quality objectives does little to assist in the general understanding of the value of WSUD and can in fact be damaging to the success of implementing WSUD projects.

Setting stormwater quality objectives based on a comprehensive understanding of the local environmental and social values of individual catchments and receiving environments lays a robust and logical foundation on which to propose and justify a WSUD project.

Lessons learnt through the case study project are associated with appreciating the value of bringing a multidisciplinary team along on the project journey to gain a holistic understanding of the site context and foster wider support for WSUD. Key methods by which this was achieved were through use of communication and engagement tools such as, face to face workshops, decision-making tools such as multi-criteria assessments and graphic-focussed communication.

3. ACKNOWLEDGMENTS

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