Greater Sydney Harbour Coastal Management Program

Stage 2 Investigation into Stormwater Management

Final report

Prepared for Sydney Coastal Councils Group

11 August 2022

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Civille

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Project name:
Stage 2 Investigation into Stormwater Management

Project number: 2164

Date: 11August 2022

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DOCUMENT HISTORY AND STATUS

Revision	Status	Date	Checked
A	Initial Draft	29 April 2022	AMcA
B	Draft	9 May 2022	AMcA
C	Final Draft	18 July 2022	AMcA
D	Final report	11 August 2022	AMcA

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EXECUTIVE SUMMARY

The Greater Sydney Harbour Coastal Management Program (CMP) vision is: ***Improving and sustaining waterway health through improved coordination, consistency and leadership.*** This report has been prepared as part of Stage 2 of the Greater Sydney Harbour CMP with the overarching objective to enable councils, Sydney Water and relevant state agencies, to collaborate more effectively in the management of urban stormwater and marine litter in the Greater Sydney Harbour catchment, and in so doing address community values and expectations.

This report is focused on the investigation into stormwater management across the catchment. It represents the first of three studies. This first study has examined the effectiveness of existing stormwater management measures, Study 2 will investigate management options and Study 3 will examine new governance and funding arrangements.

The investigation into stormwater management across the Greater Sydney Harbour catchment has been informed by a desktop review of published documents, consultation with relevant stakeholders, surveys, and interviews with staff in local government and Sydney Water. These multiple lines of evidence offer a more complete picture of the current state of stormwater management and in particular how this has evolved and what it may mean for the future.

The effectiveness of stormwater management approaches has been assessed in two ways in this study.

First, it has examined the underlying factors affecting the capacity of stormwater managers (particularly local government) to sustain and improve waterway health, identifying three key aspects:

1. Fragmented governance, within which there is poor vertical integration and horizonal coordination. Poor vertical integration is evidenced by a lack of consistency, coordination and collaboration between different levels of government, for example when state and local government policies, service delivery and management practices are misaligned on topics like stormwater quality treatment. Poor horizontal coordination is evidenced by a limited capacity to work across boundaries between organisations at the same level of government, for example between state agencies in charge of different policy issues, or between local councils focused on different local issues. The drivers for this lack of coordination are complex and in part reflect statutory and institutional priorities and capacities related to urban water management, within which there are existing resourcing concerns. The lack of coordination can also be attributed to path dependencies, that is organisations tending to do what they have done in the past and not changing to respond to the aspirations of the community and in turn new policy objectives.

2. Inconsistent and inadequate funding arrangements to effectively deliver on policy intent and operational needs. Funding is inadequate because the basic funding mechanisms available to all councils across the catchment are limited by legislated constraints, and the revenue available from these sources has to satisfy many competing needs. Funding is inconsistent because: (a) only some councils have been able to raise special rate variations for environmental purposes (including stormwater quality/waterway management); and (b) only some landowners (in certain subcatchments) are subject to Sydney Water's stormwater fees. This highlights the inconsistency firstly in how funds are raised and by whom, and in turn how this money can be spent on stormwater management in different parts of the catchment.

3. Collaborative efforts are constrained as a consequence of the fragmented governance arrangements and funding gaps. To some extent, local councils and state agencies are working collaboratively on projects such as the CMP. However, collaboration is operating within a constrained environment. It is more likely to occur on short-term and narrowly focused projects, rather than being embedded as a systematic approach to address shared goals. Difficulties persist when it comes to working across organisational boundaries to tackle a complex challenge like management of diffuse stormwater pollution. Also, silos persist within and between council

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departments and state agencies who remain focused on their core responsibilities, and lack the capacity or willingness to focus on issues of shared responsibility.

Second, it has examined the state of play of stormwater management with respect to how this is undertaken in the public and private domains and how planning for sea level rise is considered:

- In the public domain, some basic stormwater management activities (e.g. street sweeping, gross pollutant traps) are widespread across the catchment, however, it is not clear how consistently these measures are undertaken and how they contribute to overall catchment outcomes. More complex activities requiring cross-boundary collaboration (e.g., determining the catchment-scale (not only the local-scale) performance and benefits of natural treatment systems, and the development and delivery of stormwater education and litter prevention programs) are not applied strategically, consistently nor in a coordinated manner.

- In private development, the state government has set the objectives and expectations for local planning controls that are to be 'operationalised' by councils through LEPs and DCPs. For the Parramatta River catchment councils, this strategic intent has followed the collaborative development of the Parramatta River Master Plan. This planning strategy has yet to be accompanied by the development and application of consistent and effective planning controls by local government and other planning authorities. While stormwater management objectives are generally included by all councils with most adopting the same set of stormwater quality treatment targets, they are applied differently in each council depending on the type and scale of development. There is also a more fundamental question as to whether existing local planning provisions are effective in improving stormwater outcomes. This primarily relates to uncertainties about long-term performance that is also linked to the maintenance of stormwater treatment systems installed in new developments.

- Sea level rise will affect councils and Sydney Water in different ways, so it is not surprising that approaches vary. Councils that are exposed to greater impacts of sea level rise would prefer a more consistent approach to help navigate the complex territory of imposing planning provisions to manage future risks.

The report makes several broad findings with respect to governance, funding and collaboration, which should be further investigated in subsequent studies planned to complete Stage 2 of the CMP:

1. Governance

1.1. Governance arrangements require stronger vertical integration (between levels of government) and horizontal coordination (across boundaries between organisations at the same level of government).

1.2. High-level goals, that are largely set by the State Government, need to flow through to local plans and policies. This vertical policy consistency must have complementary and supporting objectives, targets, and actions that link strategic intent to operational activities.

1.3. Accountability is needed to ensure relevant organisations tasked with specific actions both undertake and report on their progress. Accountability and reporting must operate and coordinate at the local to Sydney Harbour catchment scales.

1.4. Monitoring and reporting require a standardised catchment-based framework.

2. Funding

2.1. Improved funding models are required to provide a consistent and coordinated approach that will complement community aspirations for clean and healthy waterways.

2.2. A more coordinated and strategic approach to funding is required. In the current system, funding determinations are made separately for each organisation involved in managing the catchment, and therefore decisions are defined by local and other specific organisational priorities rather than catchment-scale objectives. Funding

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should be structured to account for needs and community willingness to pay at the catchment scale, so that it can then be allocated more effectively to meet catchment-scale objectives.

2.3. Independent oversight of funding is needed to ensure money is spent where it is needed and that results are being achieved (linking back to improved governance)

3. Collaboration

3.1. Improved collaboration between state and local government is needed to reduce inefficiencies in the management of waterway health policies and projects.

3.2. Reduce the barriers for research institutes, industry bodies, and different parts of government to work in partnership and provide the evidentiary basis for policy formation and operational decisions.

3.3. Continue to support regional organisations of councils, such as Parramatta River Catchment Group and Sydney Coastal Councils Group, as forums to collaborate and exchange ideas and experiences. These organisations bring together the common expertise and needs of councils, and are helping to enable collaboration between state government, private sector and research institutes, as mentioned in points 3.1 and 3.2.

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1 INTRODUCTION

This paper reports on the Investigation into Stormwater Management (the project) and is part of Stage 2 of the Greater Sydney Harbour Coastal Management Program (CMP). The overarching objective of this stage of the CMP is to "enable councils, Sydney Water and relevant state agencies, to collaborate more effectively in the management of urban stormwater and marine litter and in so doing address community values and expectations".

The CMP process is shown in Figure 1. Stage 1 (the scoping study) was completed previously (BMT, 2018). Stage 2 is now underway and includes three proposed studies, as also shown in Figure 1. This Investigation into Stormwater Management completes Study 1. Study 1 has been designed to inform both Studies 2 and 3. Its main purpose is to establish the current situation with respect to the effectiveness of existing management measures, existing management costs and funding sources.

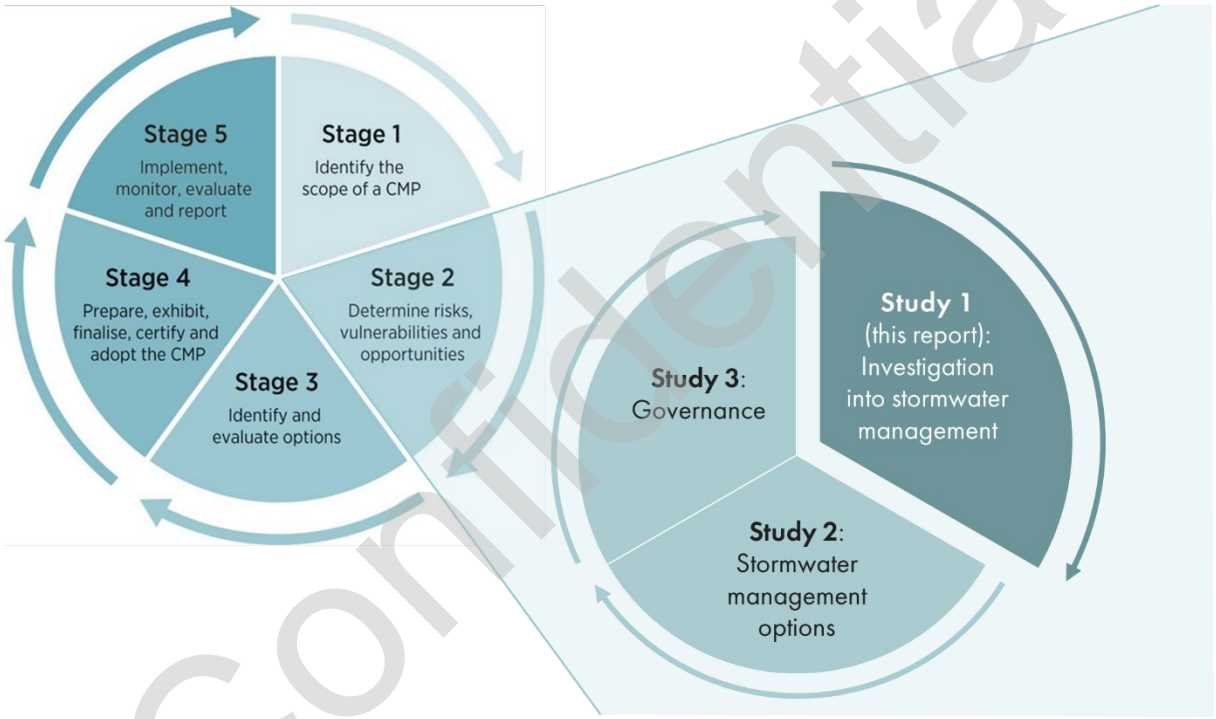

Figure 1: CMP Stages and the three studies comprising Stage 2 of the Greater Sydney Harbour CMP

This report is organised into the following sections:

- Section 2 provides the background information to understand the study context.
- Section 3 explains the methods used to gather data, analyse findings and present results.
- Section 4 outlines the current governance arrangements.
- Section 5 provides a description of current funding.
- Section 6 describes the capacity of state and local government.
- Sections 7 and 8 cover the state of stormwater quality management in the public domain and private domain.
- Section 9 discusses the state of planning for sea level rise.
- Section 10 provides a conclusion and broad recommendations for subsequent studies.

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2 BACKGROUND

2.1 STUDY AREA

The Greater Sydney Harbour (GSH) CMP study area is shown in Figure 2. There are 21 local government areas (LGAs) within the catchment. All but one of these 21 councils (Strathfield is not included) is participating in the CMP. Therefore, throughout this report we refer to the 20 GSH councils. The 20 GSH councils are listed in Table 1.

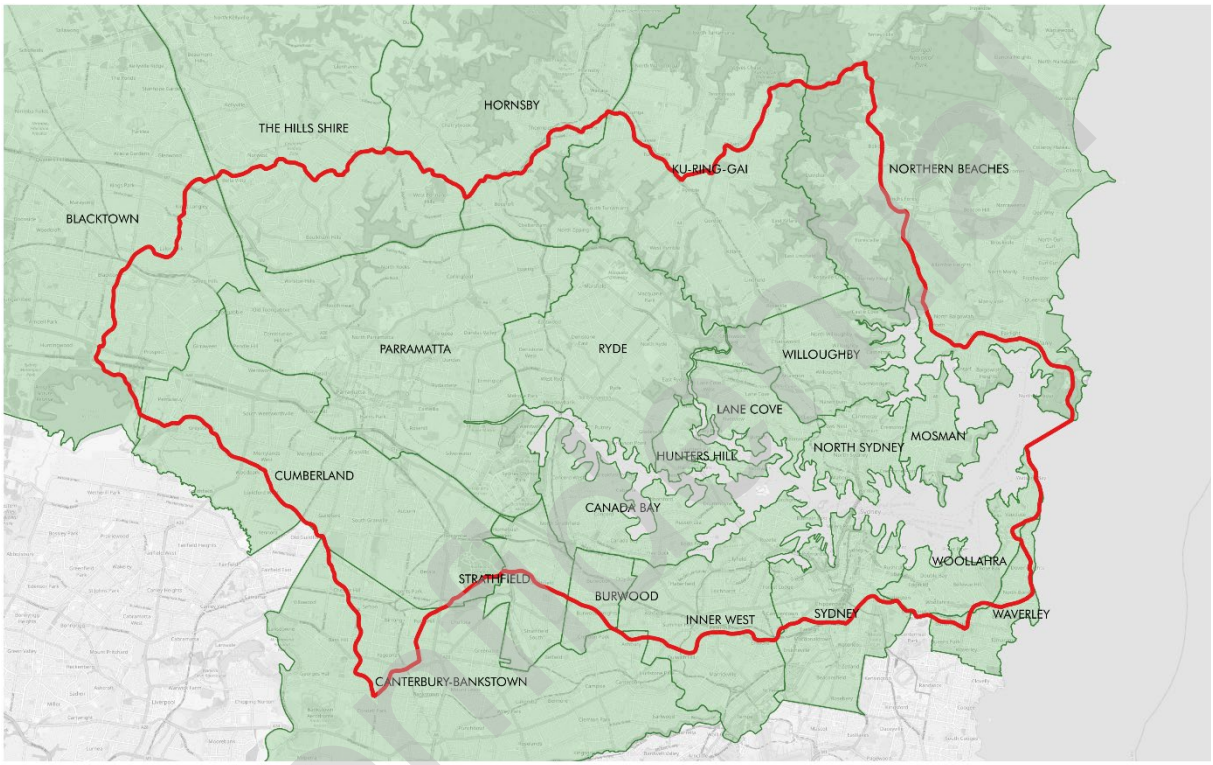

Figure 2: Greater Sydney Harbour catchment showing LGA boundaries

Table 1: Greater Sydney Harbour catchment council areas

LGA	Total LGA area (ha)	Proportion of LGA in the catchment	Proportion of the catchment covered by each LGA
Blacktown	24,020	10.0	4.5
Burwood	714	69.1	0.9
Canada Bay	1,980	100.0	3.7
Canterbury-Bankstown	11,104	8.6	1.8
City of Parramatta	8,380	100.0	15.7
Cumberland	7,163	79.9	10.8
Hornsby	49,959	2.7	2.5
Hunters Hill	562	100.0	1.1

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LGA	Total LGA area (ha)	Proportion of LGA in the catchment	Proportion of the catchment covered by each LGA
Inner West	3,517	62.2	4.1
Ku-ring-gai	8,540	60.2	9.7
Lane Cove	1,044	100.0	2.0
Mosman	851	100.0	1.6
North Sydney	1,049	100.0	2.0
Northern Beaches	27,721	12.4	6.4
Ryde	4,051	100.0	7.6
Sydney	2,645	51.2	2.5
The Hills Shire	38,630	7.7	5.6
Waverley	938	26.2	0.5
Willoughby	2,217	100.0	4.2
Woollahra	1,219	96.0	2.2

2.2 STUDY SCOPE

The CMP scoping study previously identified six (6) priority threats to Sydney Harbour. A subset of these was distilled to become the focus of Stage 2 and therefore are the focus of this study. These are:

- Urban stormwater discharge – in particular, this study has focused on the management of diffuse stormwater pollution.
- Marine debris – in particular, this study has considered the management of land-based litter as a key source of marine debris.
- Sewage discharge – in particular, this study has considered wet and dry weather overflows and leaks from the wastewater network.
- Climate change – in particular, this study has considered sea level rise.

2.3 RELEVANT STAKEHOLDERS

Stakeholders relevant to the project include:

- Sydney Coastal Councils Group (SCCG)
- Parramatta River Catchment Group (PRCG)
- The 20 councils of the catchment who have signed up to be part of the GSHCMP (refer to Table 1)
- Sydney Water Corporation
- Transport for NSW (TfNSW) – Maritime division
- Department of Planning and Environment (DPE) Planning and Assessment – Environmental Policy team
- DPE Environment, Energy and Science (EES) section
- NSW Environment Protection Authority (EPA)
- Sydney Institute of Marine Science (SIMS)

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- The NSW Coastal Council.

The focus of this report has been to engage with the 20 GSH councils and Sydney Water. These organisations have a more active day-to-day involvement in stormwater management. There are references to other state agencies based on published documents (noting that the names and function of state agencies have changed).

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3 STUDY METHOD

3.1 DESKTOP REVIEW

Wherever possible, the research conducted for this project has relied on information in published documents to support its findings. This has included:

- Academic research papers as a reference point to frame key issues
- Documents in the NSW local government Integrated Planning and Reporting Framework, as shown in Figure 3
- Documents in the NSW strategic planning framework, as shown in Figure 4
- Sydney Water's strategic plans and performance outcome reports.

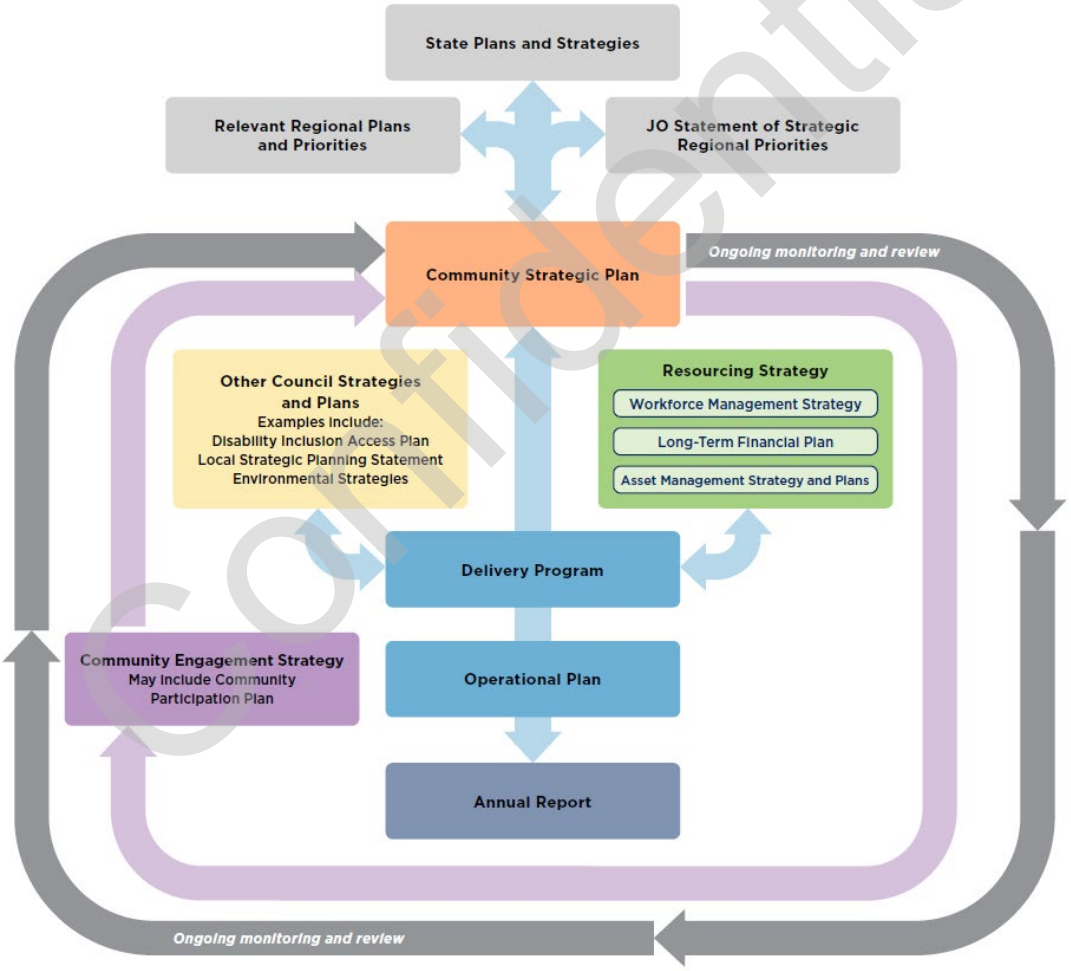

Figure 3: NSW local government Integrated Planning and Reporting Framework (NSW Office of Local Government, 2022)

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Figure 4: NSW strategic planning framework (NSW Department of Planning and Environment, 2018)

3.2 STAKEHOLDER CONSULTATION

With 20 councils to cover, consultation was undertaken systematically using a common approach.

First, each of the GSH councils was asked to answer a set of standard questions about their current practices in relation to management of diffuse stormwater pollution and (where relevant) sea level rise. A summary of the topics covered is listed in Table 2. These questions were collected in a spreadsheet. Wherever possible, basic background information from each councils' published documents and reports was pre-filled in these spreadsheets, so staff could focus on adding depth, where possible, and filling any gaps not well covered in published documents. Note that several of the councils in the PRCG had answered similar questions in 2019 so responses from a 2019 survey were also pre-filled to simplify this task.

Second, interviews were conducted with key staff in each council. These took the format of a 1 hr, semi-structured interview covering the same topics as the set of written questions, inviting staff to clarify written information and talk about examples. Interviews were also conducted with key Sydney Water staff, covering a subset of the topics listed in Table 2 as not all these topics are relevant to Sydney Water's operations.

3.3 ANALYSIS AND REPORTING

Analysis completed for this project has included:

- Extracting quantitative data from reports, for example financial information, for basic analysis
- Aggregating factual information from documents and reports, for semi-quantitative analysis
- Aggregating written responses to questions, and coding responses for key themes.

Where appropriate, quotes were extracted from councils' written responses. Where quotes are given in this report they are given anonymously. Where necessary, they have been lightly edited to correct spelling and punctuation.

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Table 2: Topics covered in consultation with councils

Policy and planning • Planning for stormwater quality, litter, waterways, climate change and sea level rise • For new development (e.g. LSPS, LEP, DCP) • For public projects (e.g. catchment/stormwater/waterway management plans, policy for council works)	Works and services • Recent projects • Maintenance
Asset management (public stormwater quality/waterway/foreshore assets) • Asset register • GIS mapping (drainage systems, water quality devices, • Maintenance records • Audit reports • Identification of assets at risk from sea level rise	Private stormwater quality assets • Processes in place • Available data
Financial management • Recent spending on stormwater management/litter/waterway health/foreshore works (last 5 years?) • Sources of funding including recent grants • Stormwater management service charge (stormwater levy) • Other budget allocation for stormwater management (budget allocation in capital works plan – next 4 years) • Allocation to maintenance, monitoring, reporting, planning, education, other	Monitoring and reporting • Baseline data e.g. population, land use, impervious area, waterway and catchment mapping, litter hotspots, wastewater overflow locations • Monitoring data, e.g. waterway condition assessment, water quality monitoring data, local litter checks • Data on stormwater quality device maintenance/street sweeping/litter clean up • Internal/external reporting
Community engagement • Relevant goals/objectives/actions in Community Strategic Plan • Other community surveys (e.g. community satisfaction) • Stormwater pollution/incident reporting • Involvement in clean ups, litter projects • Education	Capacity • Staff resources (including stormwater quality, waterways, litter) • Internal and external collaboration (e.g. data sharing) • Training/other recent capacity building activities • Plans for capacity building

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4 CURRENT GOVERNANCE ARRANGEMENTS

In the absence of clear catchment-scale objectives or accountabilities for diffuse stormwater pollution, diverse management approaches have emerged, producing uncertain results.

There are persistent and growing community aspirations (stemming back to the community-led objectives of the catchment management committees of the late 1990s) for clean and healthy urban waterways, including those within the Sydney Harbour catchment. More recently, community research conducted for the Parramatta River Masterplan (Parramatta River Catchment Group, 2018) found a strong appetite for water-based recreation in the Parramatta River. These aspirations have been identified in high-level stated government strategic planning documents, such as Sydney's District Plans (Greater Sydney Commission, 2018), and through many of the catchment councils' Local Strategic Planning Statements and Community Strategic Plans. Yet there remains a significant gap between these aspirations and effective management and operational approaches by state and local government to meet this goal.

Important features of this gap include:

- A lack of clear, consistent objectives: There is broad agreement of the need to protect the health of the Harbour and its waterways. This is exemplified by the Parramatta River Catchment Group's Parramatta River Master Plan (2018) developed in consultation with state and local government, the community and other stakeholders. The design and formation of this master plan represents an example of good governance in public sector strategic planning yet the consultative elements that serve as its strength are also its weakness. Multiple studies by various institutions have led to their own specific objectives and recommended management measures that have tended to prioritise activities based on jurisdictional boundaries (e.g. council areas) or at functional level (e.g. scope of or objectives of specific state agencies) and less on the catchment outcomes as a whole. This has led to fragmentation and inconsistent policy direction and coherency. While there is strategic agreement for a cleaner harbour, implementation remains hamstrung as a consequence of the governance arrangements including inconsistent objective/s, policy and priority competition within and between institutions, and insufficient funding to resolve the magnitude and complexity of the issues.
- A lack of accountability: When it comes to diffuse stormwater pollution, roles and responsibilities are not always clear and *ipso facto* accountabilities are clouded. (Davies *et al* 2017, p. 64) found that "No single agency is responsible for water governance, and the role of the many agencies involved is often unclear. This finding is not surprising and reflects the fact that Sydney catchment management has historically lacked a central coordinating body with sufficient powers, funding and whole of government support."
- A patchwork of measures: Catchment-based organisations, grant funding and other programs have come and gone. With each iteration, management approaches have evolved, leaving behind unfulfilled intention and a patchwork of measures applied inconsistently at geographic scales and across different organisations in the catchment. While pockets of good practice have emerged, they have not achieved catchment-scale nor longer term impacts that are required. Where stable, long-term funding is available, it has often focused on traditional priorities (such as maintenance of stormwater drainage assets) and has been unable to stretch to addressing broader community objectives and environmental goals.

A governance review completed for the PRCG (Davies *et al* 2017) points out that as the range and complexity of expected public sector outcomes has increased, and the public policy setting has become increasingly ambiguous and dynamic, there is a need for modern governance to consider a broader range of 'adaptive' mechanisms to foster learning, interaction, integration and experimentation. Implicit in this approach is that new governance ideas support institutional learning through both success and failure. This carries with it a degree of institutional and political risk, particularly where policies or projects may fail to live up to their expectations and are thus avoided. However, the review also makes it clear that it is still important

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to identify clear objectives, establish a framework of responsibilities to achieve an outcome, and then monitor progress and report against this framework. This approach is consistent with conventional policy and management approaches that follow the well-trodden paths of: agenda or policy setting; formulation of strategies and plans; adoption and implementation; and evaluation, review and refinement.

The following sections examine the governance arrangements that exist. This has investigated the framework of goals and objectives, responsibilities, monitoring, and reporting to organise the analysis, while also considering the adaptive mechanisms that do not fit neatly into this framework.

4.1 BROAD GOALS

State and local government land use planning (Metro strategy, District Plans, and Local Strategic Planning Statements (LSPS)) continue to prosecute the importance of the environment (both as an intrinsic and extrinsic concern) and the contribution of a clean environment to liveability outcomes. These higher-level strategies are designed to connect with and inform the direction of subordinate policies (e.g. Local Environment Plans (LEPs) Development Control Plans (DCPs)) and related strategies (e.g. coastal management strategies, Community Strategic Plans (CSPs)).

REGIONAL PLANNING

Although the Greater Sydney Commission (GSC) has identified improved waterway health as a high-level goal to be pursued in Regional Plans, there is no concrete dedication or commitment to improving waterway health in Greater Sydney, and by association Sydney Harbour, in these plans through specific targets. Each District Plan includes a Planning Priority "protecting and improving the health and enjoyment of the district's waterways", and an action "Improve the health of catchments and waterways through a risk-based approach to managing the cumulative impacts of development including coordinated monitoring of outcomes." Responsibility is assigned, without explicit purposeful coordination, to councils, other planning authorities, State agencies and State-owned corporations.

LOCAL STRATEGIC PLANNING STATEMENTS

In response to a requirement introduced into the *Environmental Planning and Assessment Act 1979* (EP&A Act) in March 2018, councils in the catchment have developed Local Strategic Planning Statements (LSPSs). The LSPSs respond to regional level strategic land use priorities in the State Government's Greater Sydney Region Plan – A Metropolis of Three Cities, which sets the long-term planning aspirations for all of Greater Sydney. LSPSs also respond to District Planning Priorities in District Plans, which identify more detailed contextual sub-regional planning priorities, which are then translated into local priorities in the LSPS.

Through responding to these priorities, LSPSs outline a council's long-term planning priorities and actions for the next twenty years. These priorities and actions respond to how public and private land, as well as infrastructure, is to be managed within each local government area by the Council. As LSPSs provide the high-level framework for how a Council manages its land (inclusive of waterways) over time, LSPSs must establish an explicit link that connects water quality outcomes to the activities within the catchment. Specifically, it must identify stormwater as an important contributor to diffuse stormwater pollution, and thus have clear and impactful policy intent to manage this issue across public and private domains.

Councils have responded differently to address waterway health planning priorities in regional and sub-regional plans. Across the twenty councils:

- 90% (18 out of 20) LSPSs include a local planning priority/objective that specifically mentions healthy, clean improved or enhanced waterways, while the remaining two clearly discuss healthy waterways as part of a broader priority.
- 50% (10 out of 20) LSPSs mention diffuse stormwater pollution as an issue to address for the improvement of waterway health outcomes.
- 50% (10 out of 20) LSPSs include commitments to improve local planning provisions to better address diffuse stormwater pollution. Of those who have not made this commitment, six already have a reasonably strong set of local planning provisions.

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- Note that 7 of the above are overlapping, i.e. they both mention the issue and include commitments to improve planning provisions. However, 3 LSPSs identified the issue without including any commitment to improve planning provisions, and 3 included a commitment to improve planning provisions for stormwater pollution, without identifying any link with waterway health outcomes.

- The status of existing planning provisions, and recent and proposed updates is discussed in Section 8.

COMMUNITY STRATEGIC PLANS

Community Strategic Plans (CSPs) outline the long-term aspirations of a local council, as directed by their communities. Part of these aspirations can include addressing environmental issues, including how stormwater quality is managed. As these plans respond to council constituents' priorities directly, there are varying commitments to address stormwater quality issues in these plans across the catchment.

Among the 20 Greater Sydney Harbour councils:

- 90% (18 out of 20) Community Strategic Plans included waterway health or water quality as a high-level goal or priority.
- 35% (7 out of 20) councils had a clear objective outlining responsibility and commitment to reducing diffuse stormwater pollution in their CSPs.

Those with commitments typically state them in very broad terms. For example, "improve the health of our waterways" or "reduce pollutant loads to waterways".

Measurable outcomes are limited to two councils that make a commitment to maintaining a percentage of monitored sites that meet a "healthy" or "good" rating, as defined in their waterway health monitoring and reporting framework. Measurable outcomes, such as these, respond to critical governance concerns related to accountability (for example, to a target) and transparency (with respect to reporting on progress).

SYDNEY WATER STRATEGY BLUEPRINT

Sydney Water's Strategy Blueprint 2020—2030 (Sydney Water, 2020) sets a long-term aspiration for the organisation and identifies its key focus areas. In part, this fills a similar role to the councils' CSPs. It includes the high-level statement, "We deliver world-class products and services to our city and are champions for the environment, public health and resilience", under which two of the success factors are listed as:

- "Our water and waterways are world-class and support thriving, liveable and sustainable cities."
- "Our cities' waterways are clean, healthy and safe for swimming and recreation."

Like the councils CSPs and LSPSs, this Blueprint must also respond to and be consistent with the operational and strategic direction of the NSW government, including Sydney's land use, water and infrastructure plans. The objectives of the *Sydney Water Act* 1994 are also reflected in the Strategy Blueprint (refer to Section 4.3 for more information about the *Sydney Water Act*). Sydney Water is currently updating their strategic plans, or blueprints, which will help deliver broad strategic outcomes. Staff explained that these will include a set of four strategic outcomes, each supported by blueprint documents. Under the theme "Thriving, liveable and sustainable cities", one of the blueprints will be the Healthy Waterways and Environment Strategic Blueprint, which will replace the organisation's former Environment Strategy.

TRANSPORT FOR NSW

Transport for NSW is included for completeness here as a significant land manager in the catchment. They also have responsibilities for navigable waterways in NSW. However, they do not have strategic plans in place for managing diffuse stormwater pollution to improve waterway health. Stormwater quality for TfNSW projects is looked at on a project-by-project basis and is given guidance through a 'Water Sensitive Urban Design Guideline' (Transport for NSW, 2017). However, consideration of this guideline seems to be undertaken in an ad-hoc fashion with no overriding mandate to consider stormwater quality as part of the design or management of projects.

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4.2 PLANS FOR COORDINATED ACTION

The need for improved coordination of catchment management is not new. Dawkins and Colebatch (2006) identified a growing public concern about the fragmented planning and management of Sydney Harbour during the 1990s. Since that time, there have been multiple efforts to refine the approach to management of the Greater Sydney Harbour catchment, with a series of plans attempting to drive coordinated action by defining more specific objectives and management actions. Recent examples include:

- The Sydney Harbour catchment blueprint (NSW Department of Land and Water Conservation, 2003).
- The Sydney Harbour Water Quality Improvement Plan (NSW Local Land Services, 2015).
- The Parramatta River Masterplan (Parramatta River Catchment Group, 2018).

The Sydney Harbour Water Quality Improvement Plan (NSW Local Land Services, 2015) was "the first environmental management plan to encompass the whole of Sydney Harbour's catchment as well as the waterways... [providing] the first coordinated management framework for the 25 local councils, 11 state government agencies and 2 federal government agencies, who have a stake in improving the future health of Sydney Harbour and its catchments" (NSW Local Land Services, 2015, p. ii). The intention was that it would guide more localised planning by local councils and regional groups of councils, as well as regional planning by the NSW State Government. It included a set of actions for all levels of government (plus business and community sectors). While our study has not included a comprehensive review of progress against all these objectives, we have been able to demonstrate that progress in implementing many of its key actions has been piecemeal and coordination remains lacking. However, its highest priority action for all of government, that being to "set up and adequately fund a program or initiative to coordinate management actions in the Sydney Harbour catchment'" (NSW Local Land Services, 2015, p. 60) is being actioned through the current Greater Sydney Harbour Coastal Management Program.

The most recent plan, the Parramatta River Masterplan (Parramatta River Catchment Group, 2018), has adopted a different approach. Instead of a long list of specific actions assigned to different stakeholders, it simply defined a 10-step agenda. The 10 steps are assigned to 'lead agencies' who are expected to collaborate with others to develop workplans and implement actions to progress each step. This process is supported by the Parramatta River Catchment Group (PRCG), which is an alliance of local and state government agencies and community groups – an arrangement that has been in place since 2009. The collaborative efforts underway as part of this process are discussed further in Section 6 of this report, and further work in Study 2 will provide directions to achieve the aims of the PRCG Masterplan.

The recent Greater Sydney Region Plan: A Metropolis of Three Cities (Greater Sydney Commission, 2018) points out the issues with fragmented regulations, policy frameworks and responsibilities, and "promotes integrated approaches to deliver sustainable outcomes." It specifically points out that "to improve the health of catchments and waterways, the cumulative impacts of strategic planning, development controls and management need to be considered." However, it includes no specific plans to take coordinated action on waterway health. It only goes so far as to say: "there may be opportunities to take a more comprehensive view as to how major waterways and their foreshores across Greater Sydney are managed and protected."

All these plans have included management objectives and actions directed towards improving the health of Sydney Harbour. However, in terms of their implementation, they have largely relied on the actions of catchment managers dispersed across various institutions, state and local, with limited coordination and support. Institutional arrangements put in place to support coordinated action have repeatedly changed, from the Sydney Harbour Catchment Management Board (2000-2003) to the Sydney Metropolitan Catchment Management Authority (SMCMA, 2004-2013) and then Greater Sydney Local Land Services (LLS, 2014-present). With each iteration, the focus has geographically expanded and strategically broadened beyond catchment management. Improving coordination has remained a constant theme, and arguably none of the approaches have achieved this intent.

Given the state of waterway health in the Greater Sydney Harbour Catchment and the persistent challenge of implementing coordinated action, it is contestable whether these plans will have a material impact.

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4.3 SHARED RESPONSIBILITIES

Diffuse pollution generally, and stormwater quality in particular, tends to be described as 'shared responsibility' within strategic plans. In practice, there are four interrelated issues that do not fully address the wider implications of dealing with matters that have a shared responsibility:

1) Responsibilities are often assigned to one party as a means of directing accountability. Frequently the term 'lead agency' is used. While this serves to provide some degree of accountability within the plan, often this lead agency does not have full control over the outcome/s, thus it cannot be held to account. This is particularly problematic where it relates to a sector, for example local government, that comprises many different organisations.

   Where specific responsibilities are defined, they are often spread across multiple agencies. Sections within each state agency/department or local council each have their own focus and priority, which may be tangential, narrow or inconstant with waterway health outcomes. For example:

   - Determining what is a pollutant (that legally may be a substance the subject of a pollution licence) or contaminant (one of more pollutants or other substances that are toxic, persist and may bioaccumulate in the environment) and who should regulate or otherwise manage this. This often but not exclusively rests with the state environmental regulatory (NSW EPA), who is concerned, among other matters, with licensed premises. Other state authorities or councils and planning authorities have an interest and role with respect to other contaminants such as sediment loads, total phosphorus and total nitrogen discharges (as contained in DCP controls for stormwater quality outcomes) and then there is litter within which many levels of government have a regulatory interest and powers.
   - Planning provisions for new development and whether these are seen as supporting liveability and environmental outcomes or whether these are considered as additional regulations impacting housing supply (as a higher policy concern).
   - Protection of sensitive waterways or wetlands, and who has the primary interest, responsibility and carriage over that particular natural system
   - What water quality standard needs to be achieved (ecological or recreational) and how this has an impact on risk (e.g. human health).

2) Geographic (multiple sub-catchment areas), political (local government boundaries) and institutional responsibilities (local to metropolitan) vary across the catchment. As such, plans use terms such as 'should consider' not 'must act' when assigning responsibilities and accountabilities. The vagaries of terms, such as should, offer little accountability.
3) Effective management depends on organisations prioritising responsibilities within their suite of functions. Operationally. managerial and responsibility boundaries are more often established around a narrow functional area, such as flooding, within which specific priorities, capital works and operational funding can be explicitly allocated. Diffuse and shared concerns, such as stormwater and waterway health, seem to be institutionally harder to allocate responsibility and therefor accountability.
4) There is no clarity in terms of how lot-based and individual decisions scaffold to the catchment scale. This can, in part, be considered as to how individuals prioritise and justify their own concerns and not to the greater common good.

The above examples highlight the interdependencies of waterway health/water quality outcomes and who has responsibility for the upstream or source impacts (e.g. at the lot), the downstream or catchment outcomes, and critically where the accountabilities lie. While a full review of legislation is beyond the scope of this project, the following paragraphs describe the most important aspects of the legislative framework defining the responsibilities of local government and state agencies.

LOCAL GOVERNMENT ACT 1993

Many local government responsibilities are set out in the *Local Government Act* (LG Act) 1993. This defines significant responsibilities for councils in relation to stormwater drainage, but makes no references to stormwater pollution. Water quality is only mentioned in connection with the management of community land categorised as 'wetland' or 'watercourse'.

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Section 8 of the Act outlines the guiding principles for councils. These offer a foundation to how decisions are to be made that must balance multiple concerns including: best value for rate payers; use the integrated planning and reporting framework from which the CSP is derived in order to meet the needs of the local community; work collaboratively with other councils and the NSW State Government to achieve the desired outcomes of the local community. While these principles may offer guidance for improved waterway outcomes, as articulated by local residents, governance frameworks are open and interpretative, that collectively contributes to the coordination challenges.

PROTECTION OF THE ENVIRONMENT OPERATIONS ACT, 1997

Responsibilities for certain point source pollution are well defined in the *Protection of the Environment (Operations) Act* (POEO Act) 1997. This requires specific activities to be licenced by the EPA, including scheduled activities and others likely to cause pollution of water. The EPA is responsible for maintaining and enforcing licences. The POEO Act is also the primary piece of environmental legislation to reduce littering activity in NSW via enforcement and management measures.

The POEO Act delegates to local councils' certain powers in relation to environmental enforcement and management, including the power to monitor erosion and sediment control on construction sites and issue penalty infringement notices. This has enabled the 'Get the Site Right' program, which is discussed in Section 8.5. Councils can also issue penalty infringement notices for littering, which often forms part of councils' litter prevention activities.

SYDNEY WATER ACT, 1994

Sydney Water is governed by the *Sydney Water Act* 1994, which effectively constitutes Sydney Water as a State-owned Corporation and defines its principal functions. The Act states (Part 5, Section 12): "The Governor may grant one or more operating licences to enable the Corporation in accordance with this Act, in the area of operations, to provide, construct, operate, manage or maintain systems or services for—

(a) storing or supplying water, or

(b) providing sewerage services, or

(c) providing stormwater drainage systems, or

(d) disposing of waste water."

In addition, the Sydney Water Act defines three principal objectives for the organisation (Section 21):

1) The principal objectives of the Corporation are—

   a) to be a successful business and, to this end—

      i) to operate at least as efficiently as any comparable businesses, and

      ii) to maximise the net worth of the State's investment in the Corporation, and

      iii) to exhibit a sense of social responsibility by having regard to the interests of the community in which it operates, and

   b) to protect the environment by conducting its operations in compliance with the principles of ecologically sustainable development contained in section 6 (2) of the Protection of the Environment Administration Act 1991, and

   c) to protect public health by supplying safe drinking water to its customers and other members of the public in compliance with the requirements of any operating licence.

It also has two supporting special objectives (Section 22):

1) In implementing the principal objectives set out in section 21, the Corporation has the following special objectives—

   a) to reduce risks to human health,

   b) to prevent the degradation of the environment.

2) Those special objectives are to be interpreted by reference to the objectives referred to in section 6 (1) (b) of the Protection of the Environment Administration Act 1991, so far as they are relevant to the Corporation.

Sydney Water's specific activities are defined by their Operating Licence (Sydney Water, 2019). Part 5 of the Sydney Water Act defines how Sydney Water's Operating Licenses are to be set up. It includes the opportunity to set performance

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standards, in clause 14(c): "to ensure that the systems and services meet the quality and performance standards specified in the operating licence in relation to water quality, service interruptions, pricing and other matters determined by the Governor and set out in the operating licence". This can include water quality performance standards for stormwater systems. The current Operating Licence refers to stormwater quality, without setting a performance standard. It states: "the provision, management and maintenance of Stormwater Drainage Systems (and Services for providing those Stormwater Drainage Systems)... may include stormwater quality management and other measures as necessary to manage impacts of stormwater on waterway health." (Sydney Water, 2019, p. 7).

Sydney Water also has environmental protection licences issued by NSW EPA under the POEO Act, which covers wastewater treatment plant discharges and wastewater overflows in each of the wastewater catchments.

MARINE SAFETY ACT, 1998

TfNSW has statutory responsibilities respect to improving safety and protecting the environment on the navigable waterways in NSW, including the removal of rubbish from Sydney Harbour (Transport for NSW, 2014). Their actions in this area are discussed in Section 7.5 of this report.

PUBLIC HEALTH ACT, 2010

NSW Health takes a role in managing recreational water quality. Their role is defined very broadly within the NSW *Public Health Act* 2010. This Act does not include a specific reference to recreational water quality.

Existing swimming sites in Sydney Harbour are monitored under the Beachwatch program, which is managed by the Department of Planning and Environment (DPE) in accordance with national guidelines for managing risks in recreational water (National Health and Medical Research Council, 2008). NSW Health has been assisting Sydney Water and the PRCG with planning for new swimming sites beyond these established locations.

4.4 DIVERSE EMERGENT APPROACHES

Despite the lack of formal responsibilities for diffuse stormwater pollution, many organisations, both state and local, are working to address diffuse stormwater pollution, delivering a wide range of projects and programs. Each individual organisation has structured its activities differently to suit its local context, priorities, available funds, and capacity to deliver. These topics are each explored in later sections of this report (funding in Section 5, collaboration in Section 6, and what is actually being delivered in Sections 7, 8 and 9).

The following paragraphs examine the high-level published plans, strategies, and reports from each organisation, to understand how objectives have been formalised, commitments have been made and progress is being reported.

STATE GOVERNMENT

NSW Government plays a supporting role with guidelines, grant programs and partnerships. For example, coastal management plans and subsequent activities are prepared by local councils but supported by guidance (the coastal management manual and coastal management toolkit), technical expertise from DPE staff, funding (NSW Government Coastal and Estuary Grants Program), and partnerships through various state agencies.

Litter management is supported in similar ways. The NSW EPA's Litter Prevention Unit has a litter prevention toolkit, administers a grants program, and works in partnership with grantees to implement litter prevention projects.

Both these examples enable targeted local programs and projects reflecting the specific concerns and needs of their local area. By design they enable a diversity of local approaches, under a flexible and devolved delivery framework, however less certain is where and how the collective impact of the various initiatives are collated, reported and inform future projects and initiatives.

LOCAL COUNCIL DELIVERY PROGRAMS

Each council is required to prepare and publish a four-year Delivery Program. This "turns the strategic goals found in the Community Strategic Plan into actions. It is the point where a council makes a commitment to the Community Strategic Plan, and act upon those issues that are within its area of responsibility." (NSW Office of Local Government, n.d.). Councils must

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also have an Operational Plan. This is "a one-year plan... identifying the individual projects and activities that will be undertaken in a specific financial year" (NSW Office of Local Government, n.d.). These are therefore key documents to define councils' commitments to the community and provides the major mechanism through with a council is held accountable.

The Delivery Programs and Operational Plans were reviewed for all 20 Greater Sydney Harbour councils. 19 councils made some commitment to deliver programs or projects to address diffuse stormwater pollution. Program areas included:

- Capital works projects (e.g. to install new stormwater treatment systems)
- Asset renewal (e.g. to repair/upgrade existing stormwater treatment infrastructure)
- Ongoing maintenance – stormwater treatment systems and cleansing services
- Water quality and waterway health monitoring
- Litter prevention programs
- Education programs
- Participation in partnerships and programs (e.g. Water Sensitive Cities, PRCG, CMPs)
- Developing more specific strategies/plans.

LOCAL GOVERNMENT ENVIRONMENTAL STRATEGIES

Local government can develop more specific strategies that reflect and can give effect to their CSPs and LSPSs. From a strategic land use planning perspective, these strategies are not enforceable, that is they are not deemed environmental planning instruments under the EP&A Act. They can, however, provide the detail to operationalise how LEPs are to be interpreted, either through DCPs or a subordinate strategy or guideline. They can also assist how a council undertakes its own activities on public land.

High-level environment or sustainability strategies of councils can set a clear platform to determine priorities and action. They can offer clear objectives and targets, offer longer-term aspirations, identify the problems to be addressed and why these are important and can identify strategic actions to inform their four-year Delivery Program and annual Operational Plans.

Table 3 lists high level Environmental or Sustainability Strategies, as well as specific water strategies and plans that catchment councils have developed. In total 75% of the councils (15/20) reported some kind of strategic plan that guides action on diffuse stormwater pollution:

- 13 of the GSH councils have a high-level environment, sustainability or similar strategy.
- 12 of these councils included specific content guiding the management of diffuse stormwater pollution. Of these, 2 had a specific and complementary water strategy.
- 3 councils have a specific water strategy, but these were stand-alone and did not link to a higher-level environment or sustainability strategy.

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Table 3: Local strategies and plans addressing diffuse stormwater pollution (current and in development)

Council	Environmental or Sustainability Strategy	Specific water strategies and plans
Blacktown	Responding to Climate Change Strategy 2020	Six streams: Blacktown City Council's Integrated water strategy 2020
Burwood		
Canada Bay	Environmental Strategy: Our Sustainable City 2020	
Canterbury-Bankstown	Clean City Strategic Plan (draft 2022)	Catchment and Waterway Strategic Plan currently under development
City of Parramatta	Environmental Sustainability Strategy 2017	
City of Sydney	Environmental strategy 2021-2025	
Cumberland	Environmental Management Framework 2019 and Sustainability Action Plan 2020	
Hornsby	Sustainable Hornsby 2040 Strategy 2021	Water Sensitive Hornsby Strategy 2021
Hunters Hill	2022 Sustainability Action Plan	
Inner West		
Ku-ring-gai		Water Sensitive Cities Strategy 2022 (completed, to be adopted)
Lane Cove	Sustainability Action Plan 2016-2021	
Mosman	Climate Action Plan – Mitigation Strategy 2020 (Under development) Climate Action Plan – Resilience and Adaptation Strategy	
North Sydney	Environmental Sustainability Strategy 2030	
Northern Beaches	Protect. Create. Live Northern Beaches Environment and Climate Change Strategy 2040	Northern Beaches Waterways and Catchments Action Plan
Ryde		
The Hills Shire	Environment Strategy 2019	
Waverley	Environmental Action Plan 2018–2030	
Willoughby	Our Green City Plan 2028 Sustainability Action Plan for Willoughby City Council	
Woollahra	Environmental Sustainability Action Plan 2013-2025[1]	

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Within the strategies, there are a range of different approaches, which differ in terms of how they define objectives, directions, actions, and (in some cases) quantifiable targets.

In those that included targets, different approaches are used to define targets, which in turn focus on different types of outcomes. Some councils define a target to cover a certain percentage of the LGA with pollution control devices, as a measure of structural outcomes (North Sydney Council, 2020). Some define a target to reduce the total annual pollution loads exported in runoff from the LGA, as a measure of performance that is clearly linked to the council's area of operation (City of Sydney, 2021). Others define a target in terms of a level of compliance to water quality benchmarks, such as the

[1] Woollahra Council updated their environmental sustainability targets in 2016 and incorporated the new targets into the 2018-2022 Delivery Program rather than updating the Environmental Sustainability Strategy. We have counted Woollahra as one of the 12 councils with a current strategy guiding the management of diffuse stormwater pollution.

Australian and New Zealand guidelines for fresh and marine water quality[2] (North Sydney Council, 2020), Beachwatch recreational water quality ratings (e.g., Waverley Council, 2018) or a simple 'no decline in water quality' benchmark (e.g., Willoughby City Council, 2018) as measures of environmental outcomes. The current Woollahra Council Delivery Program (2018-2022) includes a target "100% of swimming beaches rated 'Good' or 'Very Good' by Beachwatch". Northern Beaches Council also has an annual target for 90% of its beaches having a 'Good' or 'Very Good' rating by Beachwatch.[3]

Some plans did not include targets but had more of an emphasis on commitments to specific actions, for example Hornsby Shire Council's 'Sustainable Hornsby 2040' strategy (Hornsby Shire Council, 2021) includes >60 actions from the Water Sensitive Hornsby Strategy (in addition to separate lists of actions for waste, biodiversity, urban forest, and climate). City of Parramatta's Environmental Sustainability Strategy (City of Parramatta, 2017) includes a list of 12 'river and waterways' actions.

Some of the plans (e.g., Canada Bay, Cumberland, Lane Cove, The Hills Shire) adopted a more aspirational approach, providing directions on how to manage stormwater to improve waterway health and therefore natural environment outcomes, but no targets or detailed priorities to facilitate these directions.

One of the strategies examined (Hunters Hill, 2022) did not contain any reference to stormwater pollution or water quality – the only mention of water was in relation to water conservation.

Other councils lacking an environment, sustainability or water strategy tend to also lack relevant targets in their Delivery Program. Burwood, Inner West, and Ryde City Councils lack any relevant targets. Mosman does have a KPI "% of residents satisfied with: overall cleanliness, appearance and management of public spaces; cleaning of streets; litter control and rubbish dumping; management and protection of the environment." While this indicator is not explicit with respect to the desired outcomes for water quality, achieving this indicator is likely to contribute to certain aspects of an improved waterway condition.

SPECIFIC PLANS FOR WATER MANAGEMENT

Five councils have published or are currently developing specific strategies for water management (Table 3). These include:

- Blacktown City Council's Integrated Water Strategy, which provides council-wide targets and actions for stormwater quality improvement and has a goal to work towards sub catchment planning to convert Blacktown to an overall more water sensitive city.
- The Water Sensitive Hornsby Strategy 2021 developed by Hornsby Shire Council has several actions relating to improving stormwater quality outcomes in their LGA, including a comprehensive review of Council's planning policies and internal systems. There is an action to "Review and adopt planning policies, including targets, that elevate water management in planning decisions."
- Northern Beaches Council's Waterways and Catchments Action Plan (2022) makes a commitment to: "Prepare a stormwater quality / water cycle strategy which will identify stormwater quality targets and prioritise public and private stormwater infrastructure needs."
- Ku-ring-gai's Council's Water Sensitive City Strategy has recently been completed and will be published after adoption by Council.
- The City of Canterbury-Bankstown has a Catchment and Waterways Strategic Plan in development. Blacktown and Canterbury-Bankstown also have indicated they are working on more detailed waterway/catchment plans that will sit under their higher-level strategic plans.

4.5 DIVERSE REPORTING OF OUTCOMES

Each council, Sydney Water and NSW State Government reports against its own set of indicators. With the diversity of different reporting formats, it is difficult to get an overall picture of outcomes for the Harbour. The indicators reported tend to be very specific to a particular organisation (e.g., reporting on projects completed), or specific to a particular purpose (e.g., Beachwatch monitoring for recreational water quality monitoring). While these indicators may link to a strategic

[2] https://www.waterquality.gov.au/guidelines/anz-fresh-marine

[3] Those referring to Beachwatch ratings as a benchmark are unclear whether the reference point is the weekly or annual rating, or for how much of the time this rating should be achieved.

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objective (e.g. swimming is one of the key outcomes desired by the community, and targeted monitoring helps to report progress towards or safety of this outcome), it does not provide a complete picture the wider range of management actions that are underway that collectively contribute to or compete with catchment based outcomes.

Waterway health monitoring could potentially provide a more complete picture. While there are a significant number of water quality and waterway health monitoring programs (including 9 council programs and a state-based program) the results from these individual programs are not aggregated in any way.

With DPE currently updating water quality objectives, along with associated indicators and numerical targets, future water quality monitoring programs should be designed to track progress against these indicators. Further consideration of water quality monitoring programs and the coordination and reporting therein will require ongoing focus.

COUNCIL REPORTING

Councils are required to report on their outcomes of their four-year Delivery Program as part of an End of Term report and in their Annual Report as to their 12-month Operational Plan. In the Annual and End of Term reports, outcomes are typically reported against measurable performance indicators. However, the level and detail of these reports vary and there is no consistency in the data or metrics used.

Some councils also produce a State of the Environment (SoE) Report. SoE reporting was previously mandated for local government in which they were required to report under a state, pressure, response model. This environmental reporting has been replaced by the integrated planning and reporting framework. As a consequence, SoE reports are no longer mandatory. Of the councils that still produce an SoE report, the format and data therein is inconsistent, which limits the applicability of the data to be used by other councils and state government.

When it comes to diffuse stormwater pollution, water quality and waterways, 85% (17 out of 20) of the GSH councils report on indicators related to diffuse stormwater pollution, water quality and waterways. These include three types of measures: outputs (activities completed or pollutants captured), outcomes (derived from waterway health monitoring) or community satisfaction:

- 45% (9 out of 20) councils included a measure of their number of projects or activities successfully completed.
- 40% (8 out of 20) councils reported their total quantity of pollutants removed from stormwater quality improvement devices (e.g. tonnes of material removed per year).
- 35% (7 out of 20) councils reported on the outcomes of their waterway health monitoring programs.
- 10% (2 out of 20) councils reported on a measure of community satisfaction, e.g. improving satisfaction with the condition of waterways.

The first two indicators listed above (projects completed and pollutants removed) are simple measures of what councils are doing, but provide no context to explain the significance of these achievements (for example, what is the total pollutant load, and what portion was removed?). The second two indicators (waterway health monitoring and community satisfaction) measure big picture outcomes, but are unable to explain the significance of a council's actions (or any other factors) in achieving these results.

Councils lack the means to measure indicators that might show a link between their actions and the big-picture outcomes. There is an absence of standard monitoring and open access reporting for stormwater / urban water quality at local to catchment scales. This extends to the performance monitoring of GPTs, vegetated stormwater treatment devices (such as swales, wetlands, and bio-retention systems) and how their performance links to local then catchment waterway health.

Various councils included more than one of these metrics. For example, Ku-ring-gai Council included indicators of projects completed, pollutants removed and community satisfaction in its State of the Environment report. Ku-ring-gai also produces a separate water quality report card.

Note also there were 15% of councils (three in total: Burwood, Canada Bay, Cumberland) with no reporting on any of the above.

Some councils are making efforts to address these gaps, with limited results to date:

- Both Blacktown Council and the City of Sydney have created MUSIC[4] water quality models for their LGAs. The

[4] Model for Urban Stormwater Improvement Conceptualisation

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City of Sydney has indicated that this will be used to track progress towards the achievement of the Sydney 2030 water quality improvement targets (based on percentage reduction in pollutants).

- Some other councils have said that they have mapped the catchments upstream of treatment systems and therefore have a picture of the total catchment area with some form of stormwater treatment. However, these results do not indicate how effective the treatment systems are.

Anecdotally, some of the council staff interviewed for this project expressed an opinion that they would like to see better measures of progress, as well as better means to assess which projects or programs are likely to have the greatest benefits. This is something which could be explored in the next stage of the GSHCMP project.

SYDNEY WATER REPORTING

Sydney Water produces an Annual Environmental Performance Report. The most recent available is for 2019-2020 (Sydney Water, 2020). This report is closely linked with their licence requirements, which includes performance measures related to dry weather and wet weather wastewater overflows:

- IPART E3 Total number of controlled wastewater overflows that occur in dry weather that are discharged to the environment, per km of sewer main.
- IPART E4 Total number of uncontrolled wastewater overflows that occur in dry weather that are discharged to the environment, per km of sewer main.

Note that reporting is often system-wide and may not currently give performance at a catchment level, except the discussion of beach swimmability performance and beaches potentially affected by wastewater overflows. Sydney Water's report refers to Beachwatch ratings and discusses where wastewater overflows may have impacted Beachwatch monitoring results.

BEACHWATCH

The Beachwatch water quality program is run by DPE to monitor recreational water quality at swimming sites in the Sydney region and along the NSW coast. Swimming sites are graded as Very Good, Good, Fair, Poor or Very Poor in accordance with the National Health and Medical Research Council's 2008 *Guidelines for Managing Risks in Recreational Waters*. Beachwatch ratings are based on expected levels of water pollution, based on the indicator enterococci - which is generally caused by wastewater and stormwater pollution.

A 'State of the Beaches' report is published each year with summary results from the Beachwatch program.

The NSW 2022-23 Budget has committed $18.5 million over 10 years to expand Beachwatch to a state-wide program (NSW Minister for Environment and Heritage media release, 21 Jun 2022).

Sydney Water is currently developing a 'Riverwatch' program as part of Step 2 of the Parramatta River Masterplan, to monitor new and potential swimming sites in the Parramatta River estuary.

NSW STATE OF ENVIRONMENT REPORTING

NSW EPA is required to prepare a State of Environment report every three years, the latest was published in 2021 (NSW Environment Protection Authority, 2021). In terms of water quality, this is informed by various programs such as Beachwatch and the NSW Estuary Health Monitoring Program. Water quality monitoring undertaken by local government does not appear to inform the state report.

The NSW Estuary Health Monitoring Program monitors waterway health by measuring chlorophyll a concentration, turbidity, nutrient concentrations and physical chemistry. Results are used to calculate an Estuary Health Index, with levels for estuaries ranging from A (very good) to E (very poor) (NSW Environment Protection Authority, 2021). Within Greater Sydney Harbour, there are three results reported – one for the Parramatta River catchment, one for the Lane Cove River catchment and one for Middle Harbour Creek catchment.

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4.6 SUMMARY OF FINDINGS

There are significant actions underway across the catchment to address diffuse stormwater pollution. However, the actions are not coordinated nor integrated within a whole of catchment nor overarching urban water governance framework.

We suggest that the root cause is a twofold and interdependent problem: silos within and between functional structures (departments, divisions within and between government); and *ipso facto* the priorities of these structures. Combined, those with some responsibility focus narrowly on what they can directly control (albeit within competing priorities), and not how they can contribute to a shared outcome that demands interdisciplinary and interdepartmental/inter agency cooperation.

The lack of coordination within organisations (horizontal) and between (vertical) levels of government is a key contributing factor limiting successful action to reduce diffuse stormwater pollution. This reveals a degree of porosity of responsibilities and accountabilities at the institutional level and within institutions, despite broader community and government aspirations for better waterway outcomes.

Key findings are summarised as follows:

1) Goals are clear. Goals articulated in high-level planning documents including the District Plans, CSPs and Sydney Water's blueprint indicate that councils and other key catchment managers have generally heard a consistent message from the community and identified waterway health as a clear priority.
2) Vertical integration is lacking. There is bottom-up community aspiration for healthy waterways and top-down articulation of this in regional, district and local plans. However, this is not consistent particularly within local government plans across the catchment. Despite a legislative requirement for vertical planning integration, in practice this is variable Significant gaps exist between high-level objectives (outcomes) and how funding, programs and activities (commitments) are implemented.
3) Horizontal coordination is lacking. Without clearly defined coordination and assignment of responsibilities, each organisation is tending to pursue their own priorities and when viewed across the catchment these are not consistent. This is particularly apparent across the councils within the catchment and also across state authorities and agencies. The drivers for this lack of coordination are complex and in part reflect statutory and institutional priorities and capacities within current resourcing. The lack of coordination can also be attributed to path dependencies, that is organisations tending to do what they have done in the past not changing to reflect new community and other expectations.
4) The examination of existing local governments policies and plans revealed an embedded gap between what they are doing and have prioritised and what could be described as an illusionary goal to achieve a healthy and in parts a swimmable Sydney Harbour.
5) While accountabilities for actions are often assigned to a lead agency/ies or to local government (generally), diffuse stormwater pollution by nature is a shared responsibly between levels of government. The absence of a coordinated monitoring and evaluation framework that is integrated between levels of government limits the capacity of catchment managers to understand what is actually being achieved.

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5 CURRENT FUNDING ARRANGEMENTS

Catchment managers are funding activities to address stormwater pollution via several different avenues. Each has made their own arrangements and has been able to access different levels of funding.

Across the Greater Sydney Harbour catchment, stormwater quality management lacks sustainable long-term funding. This remains a persistent issue despite a number of notable programs.

The first major program directed to urban waterway management in Sydney was the 5-year 'Clean Waterways Program' (1989-1994), funded via water rates collected and largely implemented by the Water Board (now Sydney Water). While this had a particular focus on improving sewage treatment and infiltration and exfiltration to and from the sewerage system, it also attended to the declining health of the Hawkesbury Nepean River as a consequence of nutrient runoff. This urban waterway momentum was contributed by the Urban Stormwater Pollution Taskforce (1993) which resulted in the NSW EPA taking carriage of the issue and using its regulatory powers to direct local government to prepare stormwater management plans. These planning documents were then used as the conditional starting point by the newly established NSW Stormwater Trust (1997-2001) to fund capital works and education programs to improve stormwater quality outcomes. When this program ended, it left local councils with many new assets and programs but by and large a lack of capital to continue this policy reform (Davies & Wright, 2014). Most critically, many of the structural devices required regular maintenance, that had not been adequately budgeted for by councils. This funding limitation remains impacted by the NSW Government rate pegging policy (Dollery & Wijeweera, 2010).

In 2006, the NSW government enabled councils to introduce a Stormwater Management Service Charge (SMSC). This sought to provide a longer-term dedicated funding scheme for stormwater management, one of many recommendations by the NSW Stormwater Trust.[5] This promised a source of funding independent of rate-based income for councils, however, in practice it has not provided the sufficient revenue needed, with many councils electing to prioritise this new funding source to stormwater drainage (largely with a flood control focus) and not stormwater quality. The significant allocation of SMSC funding to stormwater quantity management (i.e. focused on drainage) as opposed to stormwater quality reflects the deeper and structural funding shortfalls experienced by the local government sector. For the councils in the Greater Sydney Harbour catchment, and others, they must balance competing objectives: renewal of ageing stormwater drainage infrastructure, upgrades of under-capacity drainage systems to meet modern standards, and installation of new stormwater quality infrastructure to meet additional community aspirations. Thus, within the limited funding for stormwater, there exists internal competition for limited resources. There is a clearly documented need for drainage system renewals and upgrades, and the benefits are easily quantified. Therefore, these works tend to be prioritised over investment in stormwater quality treatment.

Some councils have sought to overcome some of the financial pressures through the introduction of separate environmental levies, as permitted under Part 2A of the *Local Government Act* 1993. These are discussed in detail in Section 5.3. Where they are in place, environmental levies have often initially been introduced as a temporary special rate variation. Many have subsequently become permanent after an additional approval process, becoming part of a council's general income (and subject to the rate peg). Introducing a special rate generally involves a separate application to the Office of Local Government and an independent review by IPART because the amount of funds sought in an environmental special rate go over a legislative rate peg for general income. Within this application the council must put forward its case, demonstrate the need, community support, and capacity to pay, and provide a sound financial justification.

[5] See summary of the NSW Stormwater Trust, available at https://www.environment.nsw.gov.au/resources/stormwater/usp/uspeesfdlow.pdf (accessed 17/07/22)

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Councils with environmental levies most often use them to fund a range of environmentally related strategic and operational programs and therefore are only partly committed to addressing diffuse stormwater pollution. However, in most of the councils where these are in place, they provide more substantial funding than the SMSC and a more reliable allocation of funds to projects and programs for stormwater quality improvement.

Development can also be a source of funding via development contributions to fund public infrastructure. This could be important where significant redevelopment is underway. However, any funds raised via development contributions need to be consistent with Part 7, Division 7.1 of the *Environmental Planning and Assessment Act*, 1979.

Sydney Water has a stormwater charge that covers certain catchments across Sydney, including a portion of the Greater Sydney Harbour catchment. Refer to Section 5.3 for more information. This pays for both stormwater drainage and stormwater quality projects, asset maintenance and renewals. The application of the stormwater charge, and related programs, must be consistent with the price and funding decisions made by IPART and set within Sydney Water's Operational Plan.

These different sources of funding are not raised uniformly across all parts of the catchment. This means that property owners pay different amounts for stormwater management depending on the location of their property in the catchment. It also means that there are different amounts of funding directed to diffuse stormwater pollution and stormwater quality improvement in different parts of the catchment.

5.1 A LEGACY SHAPED BY GRANT FUNDING

Prior to the 1990s, diffuse stormwater pollution had received relatively little attention or funding. This changed with the establishment of the Stormwater Trust in 1997. This was a state-wide program, but an important focus was on stormwater pollution in Sydney Harbour its first two rounds of funding. This corresponded to the lead-up to the Sydney 2000 Olympics (NSW Stormwater Trust, 2001). During 1998-2006, the NSW Stormwater Trust provided $66 million in grant funding to address urban stormwater pollution across NSW (Frontier Economics and Alluvium, 2019). This paid for many stormwater treatment systems (mainly gross pollutant traps, but also many constructed wetlands), as well as many local stormwater education programs.

Almost all the Stormwater Trust's grants were directed to local councils (NSW Stormwater Trust, 2001), which helped position stormwater quality management within councils' core business. After the NSW Stormwater Trust program ended in 2001, it left a legacy of many stormwater quality treatment assets as well as raising the skills and capacities of council staff with respect to diffuse stormwater pollution, stormwater quality monitoring, education, and catchment planning. However, over the last two decades, sustainable funding for diffuse stormwater pollution has been a persistent gap that, in particular, has impacted on the ability of many structural stormwater pollution devices to be maintained.

The NSW and Federal Governments have provided other grant programs to support environmental outcomes for councils, but none with the same clear focus on diffuse stormwater pollution.

Responding to the millennium drought, during 2006-2011 there was a focus on stormwater harvesting projects to combat drought and invest in sustainable water supplies. This included the NSW Water Conservation Grants (2006-2008) and the Commonwealth National Water and Desalination Plan until 2011. These stormwater harvesting schemes can reduce stormwater pollution by capturing and treating some stormwater, however, the extent to which these may offer significant water quality outcomes remains contested (see Mitchell, et al., 2001 and Zhang *et al* 2020).

Currently, the main grant program with a direct relationship to diffuse stormwater pollution is the Litter Prevention Program. NSW EPA provides grants to local government to deliver litter prevention projects. Since 2014, $6.7 million has been given to councils across NSW to pursue litter prevention outcomes, as part of an $802m 'Waste less, recycle more' initiative. The total fund for litter grants since 2013 is in excess of $13 million, when it includes Community Litter Grants, Regional Litter Grants and Butt Litter Grants. Many of the GSH councils have completed grant-funded litter prevention projects since 2014 and the most recent round of litter prevention funding has included some projects that take a catchment-based approach to litter prevention, including the Greater Sydney Harbour Litter Prevention Strategy. Litter prevention is discussed in more detail in Section 7.2.

Other current grant programs have an indirect relationship with stormwater management and diffuse stormwater pollution:

- Coasts and Estuaries grants fund projects to manage the health of coastal habitats, wetlands and estuaries, which

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can include water quality treatment projects as well as many other activities.

- Environment Trust grants fund projects that conserve, protect and rehabilitate the NSW environment, or that promote environmental education and sustainability.
- The Metropolitan Greenspace program and the Public Spaces Legacy program both provide significant funds to councils for blue-green open spaces with discretionary capacity for WSUD, dependant on what each open space design may call for, on an ad-hoc basis.

A common theme across NSW Government grant programs is that their funding is directed to capital works, not maintenance. For many stormwater treatment systems, their performance is contingent to a frequent maintenance schedule, that can be costly and outside the capacities of councils. This presents a disincentive to firstly maintain the existing assets to an ideal operational frequency and secondly serve as a longer-term barrier for councils to apply for grant funding when they lack sufficient capital to maintain these in perpetuity (as often required by the grant funder).

5.2 CURRENT CONTEXT: COMPETING PRIORITIES AND LIMITED RESOURCES

For many councils, funding remains a key constraint and water quality competes with other needs. When asked: "Is adequate funding available for the work that needs to be done?" 30% of responses were positive, 70% were negative. Among the negative responses, comments included:

- "Many stormwater renewal projects have been limited".
- "WSUD projects are expensive and have been deferred".
- "While we can access funding for infrastructure, ongoing maintenance is a big issue".
- "Need for more compliance and compliance related education is a big funding gap".
- "Council has limited or no additional funding to invest in more challenging stormwater quality management initiatives."

Funding constraints are not unique to stormwater quality and worth understanding in their broader context. As a sector, the financial sustainability of councils remains an area of concern (KPMG, 2020). In their financial reporting, councils need to report on several standard KPIs designed to track financial sustainability. One of these is the infrastructure backlog ratio, which is a measure of the relative investment required to repair dilapidated assets to a satisfactory standard.[6] The backlog in funding infrastructure is not a new problem and in 2012 the total infrastructure backlog for all NSW councils was estimated to be $7.4 billion (NSW Government, 2013). The recommended benchmark is 2% and in 2019-20, the average infrastructure backlog ratio across the state was 3.7% (NSW Government, 2020).

Infrastructure backlog ratios for GSH councils are shown in Figure 5. They are generally low across the catchment, with 55% of councils (11/20) meeting the <2% infrastructure backlog benchmark. Nine of the catchment councils are over 2% infrastructure backlog, with 3 of these being significantly over at greater than 7%.

A focus on financial sustainability shapes decision-making, tending to shift attention towards improved asset management and budgeting for maintenance and renewals before budgeting for new assets. This is generally a positive for existing stormwater treatment assets, although they are still competing for attention among other asset classes.

55% of councils' financial plans (11/20) identify a current need to reduce the infrastructure backlog, including particular needs for stormwater assets.[7] For example, Canada Bay's Resourcing Strategy 2018-2029 states, "There are two separate issues with Council's drainage systems. One is maintaining existing assets in a functional condition, and the other is bringing them up to modern standards. Condition of drainage assets is generally satisfactory, with a small percentage requiring urgent renewal. However, the capacity of the systems is generally far below modern standards and expectations" (City of Canada Bay, 2018, pp. 14-15).

[6] The infrastructure backlog is the estimated cost to bring assets to a satisfactory standard, while the ratio expresses the infrastructure backlog in proportion to the total written down value of assets (i.e. their present worth).

[7] Some clearly include both stormwater drainage and stormwater quality assets within this category. Where there is a breakdown into stormwater drainage and stormwater quality subcategories, stormwater quality assets are generally a small proportion of the total. Others are unclear but most are understood to include GPTs within the 'stormwater drainage' asset class.

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For most of these 11 councils, there are long-term plans in place to reduce the backlog. For example, Ku-ring-gai Council has prepared a 'Roads to Sustainability' funding strategy, proposing a horizontal service review and divestment of assets to increase available funding. Inner West has the highest backlog ratio identified in Figure 5 and their Long Term Financial Plan indicates they still need to find further savings: "ongoing financial sustainability can only be achieved by further cost savings or income generation proposals or by shedding or reducing existing programs. Council has committed to an ongoing budget review process aimed at identifying cost savings or income generation options throughout the life of this LTFP" (Inner West Council, 2021, p. 11)

Blacktown City Council and the City of Parramatta, in their financial plans, have both identified that although the current infrastructure backlog is low, it is increasing. For Blacktown, the most significant challenge is identified as road infrastructure, while the City of Parramatta's backlog is dominated by stormwater assets ($18M out of $29.3M).

In the majority of councils, there is expected to be a continued focus on maintenance and renewal of existing stormwater assets for many years, and therefore continued constraints on investment in new assets.

Figure 5: Catchment councils' infrastructure backlog ratio (NSW Office of Local Government, 2022)

5.3 A PATCHWORK OF FUNDING SOURCES

Most of councils' revenue is sourced from rates (including special rates variations), State and Commonwealth Government grants, income from assets (rent, fees and charges), and to a lesser extent, development contributions (also known as local infrastructure contributions – section 7.11 of the NSW *Environmental Planning and Assessment Act* 1979). The proportion of income from this diversity of revenue schemes, differs across councils. Figure 6 shows aggregated sources of income across all the GSH councils.

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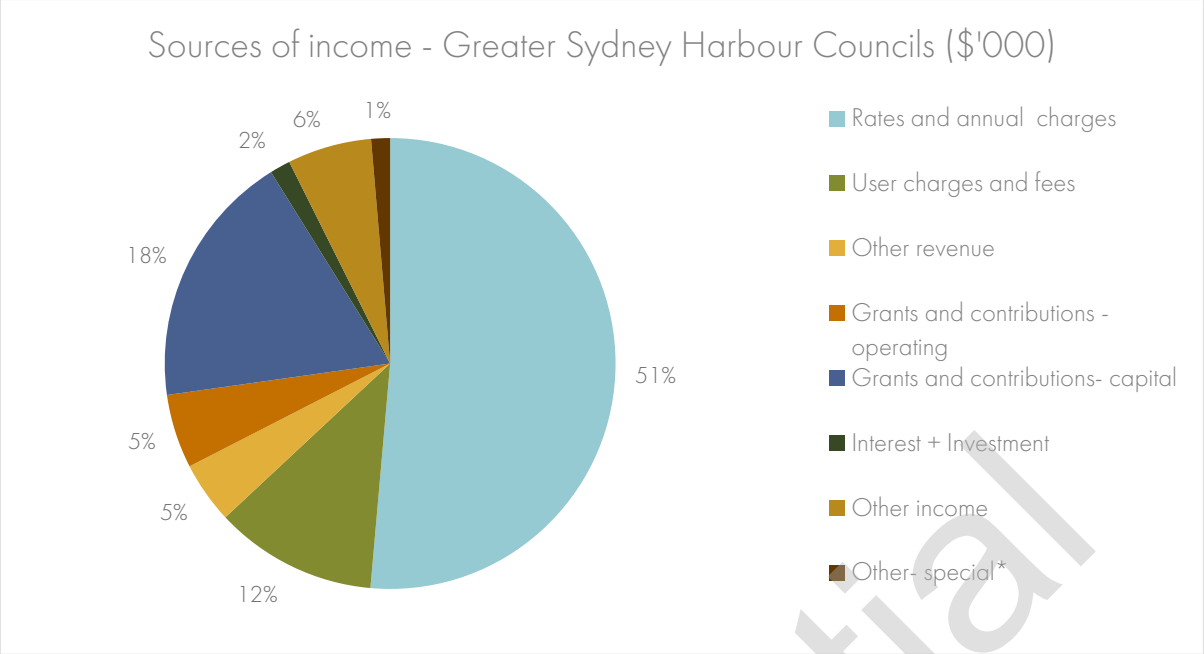

*includes asset disposal, net share of interests in joint ventures, fair value increment on investment properties etc

Figure 6: Sources of income - Greater Sydney Harbour councils (aggregated from 2021 Annual Financial Statements)

Programs and projects to address diffuse stormwater pollution may be funded from any of the sources identified in Figure 6. However, with other priorities competing for resources, and funding constrained across all areas, councils have sought to raise additional revenue specifically to address stormwater and environmental management. Two important sources of long-term funding are:

- The Stormwater Management Service Charge (SMSC), which has been available since 2006 and has been enabled by most of the GSH councils. This can be allocated to projects, programs and resources that address stormwater quality or quantity.
- Environment/sustainability or similar levies. Some of the GSH councils have sought and had approved new or additional income sources in the form of additional levies. Within the councils where these levies are in place, some generate significant revenue that is in part directed to stormwater quality improvement.

These two funding sources, generally, have a closer nexus to stormwater quality improvements than other sources of revenue, therefore they have been the focus of our investigations. Each is discussed below.

Sydney Water also has a stormwater charge that is partially allocated to addressing diffuse stormwater pollution, and this is also discussed below.

STORMWATER MANAGEMENT SERVICE CHARGE

The SMSC is a charge outside of the 'general income' of councils that is fixed, capped, and used to charge residents and businesses within an LGA for the purposes of 'stormwater management'. The Stormwater Management Service Charge allows councils the option to raise additional revenue to cover some or all the costs of providing new/additional stormwater management services within a catchment, suburb, town or local government area (LGA).

It allows councils to charge the following rates for the purposes of stormwater management:

- $25 per residential lot
- 50% of a determined residential lot charge up to a maximum of $12.50 for residential strata lots
- $25 per 350 m^2 for business properties.

The Stormwater Management Service Charge is in operation in 18 out of the 20 Local Government Areas in the catchment. However, the total amount of revenue generated by the SMSC is relatively small. Across the 18 GSH catchment councils with the SMSC in place, the total amount generated by the charge, as last reported from financial records is $23,250,638

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for 2020-2021, with a modest increase foreseen each year due to development. Based on population data from the 2016 Census, this translates to **$8.76 per capita annually**. Ordinary rates revenue across the catchment in 2022-21 was **$1.745 billion** meaning that the **SMSC proportionally was 1.3% the size of ordinary rates revenue overall.** This demonstrates that the levy is a very small cost to ratepayers.

Because the SMSC is excluded from 'general income' (s505 (a) *Local Government Act* 1993) a special variation for the rate cannot be pursued through IPART, and combined with the explicit regulatory caps, there is no mechanism available to vary the amount charged under the SMSC. The SMSC guidelines (NSW Department of Local Government, 2006) state that if council has an identified funding shortfall to meet a stormwater management need even after the SMSC is implemented, they may apply to IPART for a special rate variation to their *general income* on top of their SMSC to meet a funding shortfall.

Limitations of the SMSC have been documented elsewhere. Evaluation of the SMSC by Frontier Economics and Alluvium (2019) is shown in Table 4. Our findings align with this evaluation in all but two crucial aspects. First, the previous evaluation is focused on the SMSC as a source of funding for diffuse stormwater pollution, however, we have found that in most councils, very little of the funds raised are being allocated for the purposes of stormwater quality – the majority is being spent for stormwater drainage purposes. This is in line with councils' priorities to upgrade aging and under-capacity stormwater drainage infrastructure, as documented above. Second, we found that transparency was lacking in terms of how SMSC funds are being spent. The following sections explore these two issues in more detail.

SMSC guidelines allow funds to be allocated to a wide range of projects and programs

Councils are not specifically required to dedicate funds generated from this charge to stormwater quality or waterway health improvement projects and programs. The 'Stormwater Management Service Charge Guidelines' (NSW Department of Local Government, 2006) elaborates on what the charge may be spent on by addressing the definition of stormwater management. The guidelines state through this definition that the charge can be for a broad range of stormwater management services, provided they are tied back to the impact of the private properties they are charging.

Specifically, the guidelines outline that councils may use the SMSC for a range of activities relating to stormwater management services on public and private land as well as restoration activities. This can relate to planning, maintenance, and construction of drainage systems as well as systems aimed at addressing stormwater quality, as well as education programs (NSW Department of Local Government, 2006, pp. 7-8). Of note, this list is not wholly inclusive, the guidance outlines 'potential' stormwater management activities meaning if reasonable other activities may be funded through this charge. The guidelines state a limitation in that the measure that the charge is spent on must be related to the impacts caused by private land. For example, street sweeping is explicitly excluded as it is related to managing public land. However, other than a few specific exclusions along these lines, the guidelines appear to leave room for generous interpretation about what can be funded.

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Table 4: Evaluation of the Stormwater Management Service Charge (Frontier Economics and Alluvium, 2019, p. 58)

CRITERIA	EVALUATION	COMMENTS
Dependability and adequacy		While they represent a dependable source of funding, the cap on the charge limits the level of funding available and over time may be inadequate to meet the upfront and ongoing costs associated with DSWP management.
Efficiency		The SMSC is unlikely to promote efficient (net beneficial) investment, production and consumption decisions as it does not: • signal the average costs of providing DSWP management services to those that use or benefit from the service. • contributions from individual households and businesses do not closely link or reflect the drivers of costs of DSWP management (e.g. land size, % of pervious surface, use of land), recognising the charge varies by dwelling type.
Equity		While ratepayers more broadly are likely to be the primary impactors that induce the need for DSWP investment (and therefore it is likely to be equitable for them to contribute through the SMSC), recovering the cost of DSWP management from SMSC does not recognise that not all individual ratepayers contribute to these costs (or receive the benefits), nor that beneficiaries of DSWP management may go beyond the local community.
Simplicity and transparency		While they represent a dependable source of funding, the cap on the charge limits the level of funding available and over time may be inadequate to meet the upfront and ongoing costs associated with DSWP management.
Assessment		Based on the current levels (impacting adequacy) and its application (impacting efficiency), it is unlikely to represent an appropriate funding source for DSWP management.

The guidelines also allow councils to pool revenue generated by the charge to be spent on large scale projects that require more funding, and to allocate funding to any part of their LGA. This means those council areas which span multiple catchments may choose to invest the majority or all of their SMSC revenue in catchments other than Greater Sydney Harbour. The analysis in Figure 7 attempts to show the relative benefit of the charge to the catchment directly, assuming a council distributed funds equally (in a spatial sense) within their LGA. Some councils, such as Parramatta City Council, have their entire LGA within the catchment. However, Blacktown, Canterbury-Bankstown and The Hills Shire Councils only have a small fraction of its LGA in the catchment, despite them generating a large amount of revenue from the charge. In these LGAs, revenue generated is far more likely to be spent outside the catchment. There is no need for councils to allocate funding evenly across their LGA nor report on their spending by catchment. In total, across the 18 GSH councils with the SMSC in place, $23.3 million was raised in the last reporting year (2020-21). If this was distributed evenly across each LGA, an approximate portion of $11.5 million would be associated with the GSH catchment (based on the proportion of each LGA that falls within the GSH catchment).

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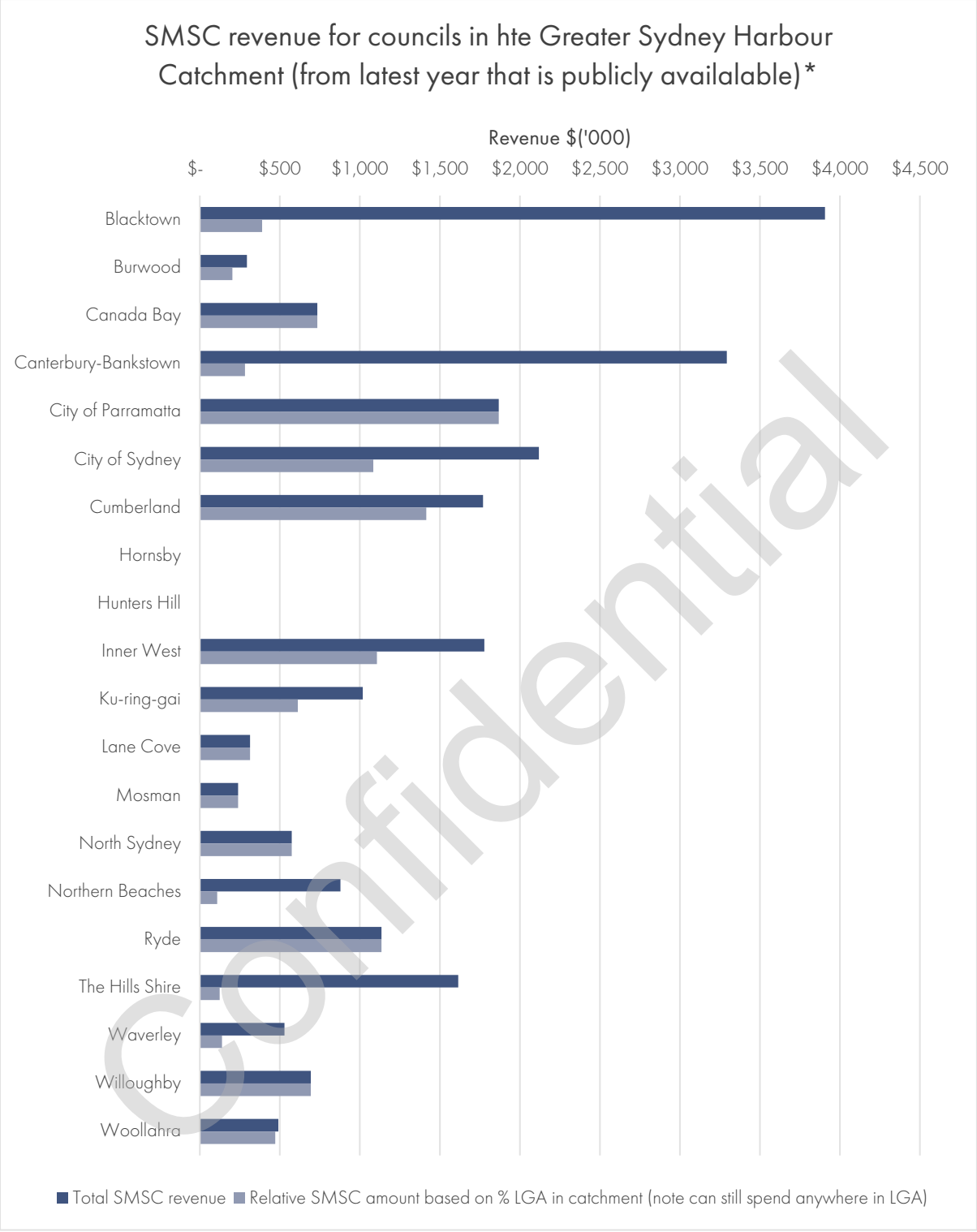

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*Note that SMSC revenue figures were extracted from councils' Annual Financial Statements.

Figure 7: Total SMSC revenue generated for latest year and nominal proportion per GSH catchment area.

Reporting on SMSC spending is unclear

It is challenging to develop a full and clear picture of the activities being funded by the SMSC. Therefore, we contend that the SMSC is not 'transparent' as suggested in Table 4.

Councils must report on SMSC outcomes in their statutory reporting. However, the *Local Government (General) Regulation 2021* only prescribes the following:

"S217 Additional information for inclusion in an [that being a council] annual report:

(e) if the council has levied an annual charge for stormwater management services—a statement detailing the stormwater management services provided by the council during that year"

Over time, accountability for spending appears to have declined. The SMSC Guidelines (NSW Department of Local Government, 2006) provides guidance on additional, detailed reporting requirements for the SMSC. However, these guidelines are out of date in that they refer to a repealed clause in the regulations.

In practice, each council is reporting differently on its stormwater management services funded by the SMSC. This means that comparing what is spent and where cannot be compared between councils or easily characterised as stormwater quality or drainage spending.

Three councils report comprehensively on what the charge is spent on annually and what is budgeted for long term:

- Blacktown Council allocates 100% of their SMSC to support their "Environmental Stormwater Management Program (ESMP)". Their plans and reports clearly identify ESMP projects and activities, which include stormwater quality device maintenance, riparian area management, stormwater harvesting projects, stormwater education, WSUD compliance program, WSUD capacity building, waterway health monitoring.
- In their 2021 Annual Reports, Canterbury-Bankstown Council and the City of Parramatta both provided a detailed list of projects funded by the SMSC and their budgets, with enough information to identify the type of each project or activity (e.g., drainage upgrades, stormwater harvesting, riparian maintenance, stormwater quality device upgrades, green infrastructure construction, stormwater pollution education, waterway monitoring). Based on their 2020-21 figures, Canterbury-Bankstown Council spent 42% of their SMSC budget to waterway and stormwater quality projects, while the City of Parramatta spent 60% in this area.

Others provide some of this information but not all the details, for example in 2021 Annual Reports:

- Inner West provided a simple list of projects/activities funded by the SMSC, without information on budgets.
- Canada Bay listed stormwater projects and budgets, but some of the largest amounts are for projects listed as 'External Loan Repayment' and 'Internal Loan Repayment for Water for Community', which lack clarity.
- Lane Cove Council simply stated that funds were used "to implement stormwater projects identified in a recently completed municipal-wide flood study".

Due to the varying levels of detail from council reports on what the charge is spent on and budgeted for (if a budget exists at all), there is a lack of accountability and transparency regarding how the charge is used. Furthermore, due to the broadness of what the charge may be spent on, how it is being spent (when known) and the relatively small amount of money generated each year, the SMSC currently only contributes to stormwater quality outcomes in a minor way in the catchment.

ENVIRONMENTAL SPECIAL RATES

Councils can charge 'environmental special rates' that are dedicated to some form of *specific* environmental affectation as special rates under the *Local Government Act* 1993 (LG Act). These rates may contribute a little, some or all of councils' stormwater quality funding. Other sources of revenue such as ordinary rates, contributions, and the SMSC can also contribute to councils' budgets for stormwater quality management.

Special rates are those outside of defined 'ordinary rates' (those which are charged to residences, businesses, industries etc). Any change to the Ordinary Rate is subject to rate pegging, set by the NSW Government. A special rate may be raised for any reason a council deems necessary for its operation but the approval for its introduction rests with the NSW Independent Pricing and Regulatory Tribunal (IPART).

When councils are seeking additional funds for environmental purposes but cannot enact a new rate without going above the general income rate caps for a particular year (rate pegging), they can apply to IPART for a special variation. The reasons an individual council may require a special variation are wide and varied. However, it must be noted, that special rate variations are contentious and framed with necessity in mind. Substantial evidence is required to establish a need, one of which can be community desire (ratepayer willingness to pay). An environmental special rate variation may also not be politically palatable to all or any councils. Most critically, they also require IPART approval. This means they are uncertain (politically and subject to external approval) and unstable (most often time bound).

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An application to IPART generally results in one of three outcomes:

1) The application is rejected as there is insufficient evidence to support the additional impact on ratepayers. This may relate to a range of issues extending from the community's willingness and capacity to pay to the council's financial, asset and operational planning.
2) The variation is approved for a specified period within which it sets an amount over and above the annual rate pegging amount. After this period, the council's income returns to the normal rate pegging amount.
3) The variation is included as a permanent addition to council's rate base (e.g. Ku-ring-gai Council).

There is a very broad and general discretion afforded to councils to raise special rates under s495 of the LG Act. This can cover a diversity of programs (s495 LG Act), and may, for example, have an infrastructure, capital works or environmental orientation. An environmental special rate can include none, some, or all its funding dedicated to waterway health or stormwater quality. Due to this 'broadness', stormwater quality improvement outcomes may be a major or minor consideration for an 'environmental' special rate. In the case of Hornsby Shire Council, their special rate is characterised as a 'Catchment Remediation Rate' with a strong focus on waterways and stormwater quality, while others allocate only a portion of funds or none at all to waterway or stormwater quality projects.

Eight out of the 20 catchment councils, shown in Figure 8, charge a levy for services dedicated to environmental outcomes. These levies may be spent to work towards any number of environmental goals, including but not limited to habitat restoration, energy conservation and water quality outcomes. Note that Lane Cove has a pool of funds available from previous years environmental special rates which they have been using to fund a small amount of stormwater quality improvement works, but as of 2021-22 Lane Cove no longer charges an environmental special rate.

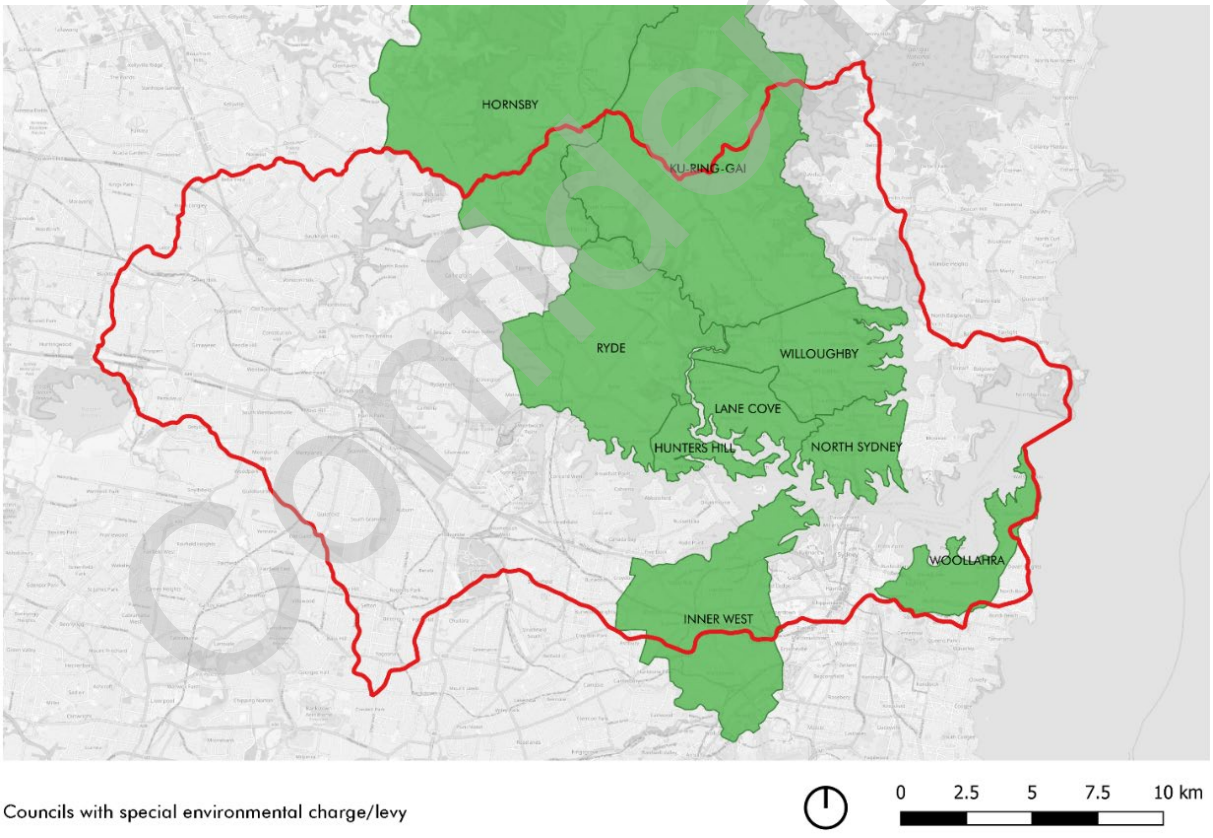

Figure 8: Catchment councils with special environmental rates

Environmental special rates currently in place within GSH catchment councils are listed in Table 5. Note that their names are not all the same, however for the purpose of this section we refer to them collectively as 'environmental special rates'. Table 5 includes information about the amounts charged to households, to provide a point of comparison with the SMSC (see above) and with Sydney Water's stormwater charge (see below). Note that environmental (and infrastructure) special rates are often charged to constituents as a flat percentage of ordinary rates income, but can be charged 'ad valorem' (in relation to the land value of a property). Several include a base rate per property as well as an ad valorem amount. This

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makes it difficult to make comparisons between different council areas or with other charges. Therefore, we have also normalised the total revenue on a per capita basis, to enable comparison with the SMSC, which was estimated to generate $8.76 per capita annually (see above).

Table 5: Environmental Special Rates in place in GSH catchment councils

Council	Name of special rate	Rate basis	Base amount	% of ordinary rates (for households)[8]	Total amount of revenue (2020-21)	Estimated per capita revenue[9]
Hornsby	Catchment Remediation Rate	Ad valorem	NA	5%	$2,971,000	$20.82
Hunters Hill	Environmental Special Levy	Base + ad valorem	$16.22	1.3%	$187,000	$13.36
Inner West	Environmental Levy	unclear[10]			$270,000	$1.48
Ku-ring-gai	Environmental Levy	Ad valorem	NA	5%	$3,161,000	$26.78
North Sydney	Environmental Levy	Base + ad valorem	$30.82	5.2%	$2,153,000	$31.82
Ryde	Environmental Special Rate	Base + ad valorem	$59.20	19.2%	$7,700,000	$66.21
Willoughby	Sustainability Levy	unclear			$5,900,000	$79.41
Woollahra	Environmental and Infrastructure Renewal Levy	Base + ad valorem	$85.45		$4,400,000	$81.12

The total 2020-21 revenue raised by environmental special rates across the eight councils (Table 5) was **$26.7 million.** This represents more than the SMSC across all the GSH councils ($23.3 million – see above). As with the SMSC, not all of the environmental special rates revenue would be spent within the GSH catchment, as many local government boundaries are inclusive of a number of catchments, and not all is spent on stormwater quality or related projects. But for some councils, their environmental special rate is a significant source of revenue for stormwater quality projects and programs.

Environmental special rates allow funding to be allocated to a wide range of purposes. In different councils, stormwater quality management, therefore, receives different levels of investment and different types of investment. Allocation of funds could also shift over time if a councils' priorities change.

There is no need for reporting to follow a standard template and it is not completely transparent where funds are being spent. Based on 2020-2021 annual reports:

- Hornsby Shire Council raised $2,971,000 from a 'Catchment Remediation Rate' in the latest reporting year (2020-21). Up to **100%** of this is spent on water quality improvement initiatives, inclusive of street sweeping and harvesting. This rate has been specifically characterised by Hornsby Shire Council for the exclusive funding of what they determine to be water quality improvement projects. Of note is only 3% of the Hornsby LGA is within the catchment, so benefits of this charge to the harbour may be minimal. The mechanism has significant merit, however.
- Hunters Hill Shire Council raised $187,000 from an 'Environmental Special Levy' (2020-21). None of this was allocated to stormwater quality improvement specifically, though some was allocated to bushland restoration which may have some positive effect on water quality outcomes.

[8] Note that Hornsby and Ku-ring-gai define their environmental special rates as 5% of ordinary rates. For the others we have calculated the ratio between the ad valorem amount for the environmental rate and the ad valorem amount for ordinary rates (for households).

[9] Based on 2016 population (ABS census data).

[10] Inner West is in the process of harmonising rates and the current rating system is complex. It appears the Environmental Levy may only apply to one of the former council areas in the LGA.

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- Inner West Council raised $270,000 from an 'Environment Levy' in 2020-21. It could not be determined what any of this was spent on or budgeted for.
- Ku-ring-gai Council raised $3,161,000 from an 'Environmental Special Rate Variation' (2020-21). 13.3% or $410,930 of this was dedicated to 'water and catchment management'. An additional 23.8% was spent on administration, 27.7% on environmental education, and 18.9% on biodiversity, all of which could have some positive effect on stormwater quality.
- North Sydney Council raised $2,153,000 in 2019-20, of which 12% or $263,162 was allocated to water quality improvements including street sweeping.
- The City of Ryde raised $7,700,000 from an 'Environmental Special Rate' in 2020-21. It was unclear how much of that was being spent on water quality improvements. There is a mention of creek restoration, GPT repairs and various compliance/water quality monitoring and community activities, though there is no direct link to the rate itself. In discussions, Ryde staff said that the council is not currently building new stormwater quality treatment systems, however their environmental special rate is paying for water quality monitoring, rectification works to GPTs, creek restoration and water quality education campaigns. This indicates some level of spend on stormwater quality improvement.
- Willoughby City Council raised $5,900,000 from an 'Environment Levy' in 2020-21. It could not be determined in reporting how much of this was dedicated to stormwater quality improvements, though their 'Our Green City Plan 2018-2028' (Willoughby Council 2021) shows that part of the levy is spent on water quality testing, GPT maintenance and 'other stormwater treatment measures'. In discussions, Willoughby staff indicated that the stormwater quality/WSUD spend is currently >$1M per year or 17% and has increased substantially in the last four years after internal management changes. Willoughby also noted that the advantages of a rolling program without financial specifics allowed them to be responsive and utilise their budget flexibly.
- Woollahra Council raised $4,400,000 from an Environmental and Infrastructure levy in 2020-21, but the information contained in the annual report was not detailed enough to determine what it was spent on. As the levy is for general infrastructure as well as environmental purposes, there is a likelihood a significant portion was spent on non-stormwater quality asset renewals (Woollahra Council Annual Report 2020-21, p.62). In discussions, Woollahra staff indicated that there is currently strong interest in rain gardens and other water quality measures, however this has waxed and waned over recent years and has only picked up again recently.

In addition, in 2020-21 Lane Cove spent $1,227,650 from a 'Sustainability Levy', charged at 6% of annual rates income, of which 3% or $40,000 was dedicated to water quality improvements. Bushland restoration was included in the scope of spending. It was shown that from their annual reports however that for 2020-21 a sustainability levy was not charged for this reporting year, indicating the levy has ended and funds are being spent from a pool that has accrued historically over time from previous years charges.

Note that an application for and expenditure of a special rate variation must be cognisant of any SMSC. The amount pursued for stormwater management, and specifically any stormwater quality improvement, would have to be carefully framed and substantial evidence provided to show a need is to be met that the SMSC cannot meet. If an environmental rate was characterised as exclusively for stormwater management, a council would no longer be able to levy the SMSC. This may be why Hornsby Shire Council has not implemented the SMSC. Both Ku-ring-gai and Willoughby have allocated their SMSC to drainage projects and a portion of their environmental special rates to stormwater quality projects, so the two charges are clearly meeting different needs.

DEVELOPMENT CONTRIBUTIONS

Significant development is underway across the catchment to meet the demands of population growth. To offset the demands that this additional development will place on public infrastructure, or where development will directly benefit from some form of public works such as building next to a train station, councils or the NSW Government may seek contributions from developers to fund any number of public infrastructure considerations. Also note that Sydney Water has the potential capacity to levy developer contributions for their 'brownfield' stormwater assets as a result of the Government's infrastructure contributions review.

Developer contributions manifest as a variable rate dependant on the type or location of development, a fixed rate dependant on the cost of development, or in the form of an agreement between the developer and the planning authority to pay for or build some form of infrastructure. There are development contributions schemes in place developed by local

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councils and state government. They operate at various scales and may apply to single dwellings through to major redevelopment sites.

The NSW development contributions program has recently been updated by DPE with a goal to generate greater amounts of revenue for infrastructure, offer more flexibility to operators, to clarify newer schemes such as for special infrastructure contributions and for streamlining the overall contributions process from planning to collection.

Funds generated may include money or works to improve stormwater quality. However, currently most contributions schemes that contribute funds to stormwater infrastructure focus on stormwater drainage. One example is in the City of Parramatta, where $40 million is to be paid as part of a development contributions package for the entire Parramatta CBD, where significant development is underway. Stormwater quality is listed as a purpose for the revenue generated, therefore it provides opportunities to fund stormwater quality improvement within in the CBD. Of note however, because stormwater quality is not exclusively listed or given its own explicit allocation of funds, an effect like the SMSC may occur where the majority of spend is allocated to drainage improvements. There are significant drainage and floodplain management challenges to be addressed in the Parramatta CBD.

Developer-funded stormwater treatment may also be direct and be placed in the private domain. This is given effect through a council's DCP requiring developers to meet water quality targets through appropriate means (see Section 8).

A unique mechanism for development to fund stormwater quality treatment in the public domain is found in Blacktown, where developers if they meet certain criteria may pay a contribution in lieu of on-site treatment, to pool funds for large scale 'stormwater offset' projects such as regional-scale artificial wetlands.

A limitation of relying on development to fund stormwater quality improvements is that for any of these options (development contributions to fund public infrastructure, treatment in the private domain or offset schemes), there needs to be a direct nexus between the impact of the development and the contribution it makes to stormwater treatment. Councils and Sydney Water have noted that it has been difficult demonstrating the nexus between development growth and the additional impacts this has on waterway health and the capacities of engineered and natural systems. This impact is compounded by many of these engineered and natural systems that are operating at or beyond their ideal or design limits. Addressing this impact could be overcome in the future with clearer and more effective policies, and modelling.

SYDNEY WATER'S STORMWATER CHARGE

Sydney Water charges a 'stormwater service charge' to support its stormwater services. This charge only applies to properties within Sydney Water's stormwater catchments. Figure 9 shows the catchments where Sydney Water's stormwater service charge applies. In these catchments, Sydney Water owns and operates stormwater infrastructure including channels, conduits and GPTs. For properties within these catchments, Sydney Water's stormwater service charge rates are shown in Table 6.

Sydney Water charge $76.70 per year for a stand-alone house, and up to $4,966.43 for large non-residential lots under their stormwater service charge (with the charge being area-based). Note that this is significantly higher than the SMSC (see above).[11]

Note there is an option for properties to apply for a lower "low impact" rate if they have measures in place to reduce runoff (e.g. rainwater tanks, infiltration systems). Sydney Water has noted that this option is not widely used but demonstrates an incentive to reduce the quantity of stormwater discharge via improved retention.

Sydney Water's rates are reviewed by IPART each four years and have generally risen with inflation, although they decreased between 2019-20 and 2020-21. The price setting process involves an 'efficiency review' process and the recent review recommended to set prices lower than 'current' and then increase in line with inflation.

[11] Interestingly in IPART's most recent review of Sydney Water's prices it is noted that there were two public submissions recommending that stormwater pricing should be better aligned with local government rates, however "implementing their proposals would require changes to the legislative framework for local government charges, which is beyond the scope of this review" (Independent Pricing and Regulatory Tribunal NSW, 2020, p. 108)

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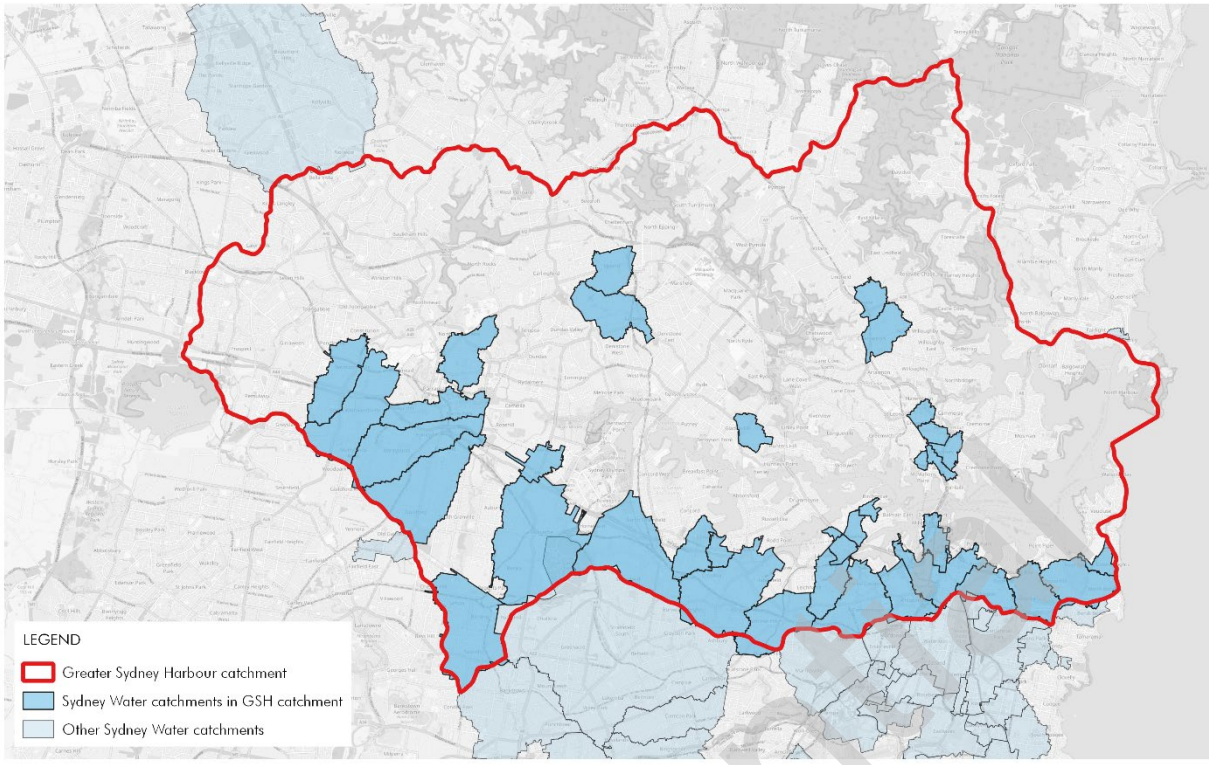

Figure 9: Sydney Water stormwater catchments.

Table 6: Sydney Water Stormwater service charge rates (Independent Pricing and Regulatory Tribunal NSW, 2020)

$ per annum	2019-20 ($2019-20)	2020-21	2021-22	2022-23	2023-24
Residential					
Unit/Low impact	24.62	23.94	23.94	23.94	23.94
Stand-alone house	78.88	76.70	76.70	76.70	76.70
Non-Residential					
Multi-premise/Small (<200 m^2)	24.62	23.94	23.94	23.94	23.94
Low impact/Medium (201-1,000 m^2)	78.88	76.70	76.70	76.70	76.70
Large (1,001 - 10,000 m^2)	459.67	447.00	447.00	447.00	447.00
Very Large (10,001 - 45,000 m^2)	2,043.03	1,986.57	1,986.57	1,986.57	1,986.57
Largest (>45,000 m^2)	5,107.59	4,966.43	4,966.43	4,966.43	4,966.43
Vacant Land					
Vacant Land	78.88	76.71	76.71	76.71	76.71
Low Impact assessed Vacant Land	24.62	23.94	23.94	23.94	23.94
All customers					
Waterways Health Improvement Program	0.00	0.85	0.85	0.85	0.85

Source: Sydney Water pricing proposal, November 2019, p 102, Atkins/Cardno, IPART analysis.

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Sydney Water's latest price proposal to IPART (Sydney Water, 2019, Attachment 9) states that over 2020-24, Sydney Water plans to invest $154.4 million across three stormwater programs focusing on:

- The renewal of assets in poor condition including pipes, culverts and open channels ($111.4 million). This includes condition assessment of around 160 km of network, renewal of open stormwater channels, pipes and culverts, renewal of 6 km open channel fencing and four gross pollutant traps.

- Providing additional network capacity in areas of high flood hazard (26.8 million). This includes increasing the flow capacity of 630 metres of the network and commencing construction of one stormwater detention basin.

Removing pollution from urban stormwater runoff before it discharges to waterways ($16.1 million). This includes installation of litter booms, construction of gross pollutant traps and construction of natural stormwater treatment systems. This again, highlights a much stronger commitment to existing asset renewals than stormwater quality improvement.

In IPART's final determination (Independent Pricing and Regulatory Tribunal NSW, 2020), $22.4m in capital expenditure has been allocated to the 'Waterways Health Improvement Program' (WHIP) over 2020-24, more than the $16.1 million listed above.

The WHIP is listed in Table 6 as a separate 85c charge per year for all stormwater customers. This is characterised by IPART as 'discretionary funding', beyond the requirements of Sydney Water's operating licence.

IPART's determination indicates that if there was a more robust program with stronger evidence behind it, they would be willing to support a far greater amount charged for improving environmental health outcomes (IPART 2020, p.122). IPART approved the full amount of 'discretionary' expenditure on the WHIP because of the sound willingness to pay evidence from customers - with projects supported by 3 metrics. IPART also accepted the efficiency reviewer's recommendation not to defer parts of the program. IPART did say that Sydney Water could do more to understand the willingness to pay for improved customer outcomes generally in future price setting processes.

IPART also noted that future licence obligations could be refined to include expenditure on these types of investments. Currently, the WHIP is classified as 'discretionary' because it is not, currently, required by an Operating Licence or other regulation. Therefore, Sydney Water may or may not pursue additional stormwater quality funding as an outcome in the future. However, if licence obligations were revised to include specific stormwater quality requirements, then Sydney Water would be obliged to continue seeking funding for these purposes.

As the charge applies to land across several catchments, stormwater quality benefits generated may or may not fall within the Harbour catchment. IPART notes that the scope of the program falls both within the Parramatta River and Georges River catchments.

5.4 WIDELY VARYING EXPENDITURE

As documented above, there is only a partial picture available of where councils are investing the SMSC and their environmental special rates, and it is difficult to see exactly what is allocated to addressing diffuse stormwater pollution. Council budgets are primarily allocated to various assets classes including roads, drainage, footpaths, and parks and services such as libraries. In council budgets and financial reports, funding allocated to stormwater quality management tends to be collated within other categories, and not always separately identified. For example:

- Funding allocated to GPTs is often included within a 'stormwater drainage' category.
- Funding allocated to natural treatment systems is sometimes included with other stormwater projects or sometimes with other environmental projects.
- Funding allocated to capital works, maintenance, and services/programs are all reported separately, making it harder to track down all the quantities allocated to stormwater quality.

Table 7 provides a high-level summary of our findings to indicate approximately what different councils are spending to address diffuse stormwater pollution, illustrating both how variable this is and how many gaps there are in this information.

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Table 7: Summary of spending allocated to stormwater quality management

Council	Sources of funding (beyond general revenue)	Approx. proportion dedicated to stormwater quality (or closely related) projects/programs	Approx. amount spent in 20-21
Blacktown	SMSC	100% allocated to the Environmental Stormwater Management Program	$3,907,000
Burwood	SMSC	Zero	$0
Canada Bay	SMSC	Zero	$0
Canterbury-Bankstown	SMSC	42% in 2020-21	$1,367,000
City of Parramatta	SMSC	60% in 2020-21	$1,129,780
City of Sydney	SMSC	Some (unknown proportion) – stormwater quality is one of four categories of capital expenditure to which the SMSC is allocated.	$ 409,229[12]
Cumberland	SMSC	Zero	$0
Hornsby	Catchment Remediation Rate	100%	$2,971,000
Hunters Hill	Environmental Special Levy	Zero	$0
Inner West	SMSC + Environmental Levy	Some (unknown amount)	Unknown
Ku-ring-gai	SMSC + Environmental Levy	13.3% of the Environmental Levy (SMSC is all allocated to stormwater drainage)	$410,930
Lane Cove	SMSC (Environment Levy no longer in place)	A small amount of the former Environment Levy was allocated to water quality monitoring	$40,000
Mosman	SMSC	Some (unknown amount)	Unknown
North Sydney	SMSC + Environmental Levy	12% of the Environmental Levy to water quality improvements including street sweeping	$263,162
Northern Beaches	SMSC	SMSC only in place since July 2021 and proposed to fund works to address flood risk, waterway health and stormwater reuse for irrigating fields	NA
Ryde	SMSC + Environmental Special Rate	Unknown	Unknown
The Hills Shire	SMSC	Unknown	Unknown
Waverley	SMSC	Zero	$0
Willoughby	SMSC + Sustainability Levy	Approx. 17% (based on interview, not reported)	~$1,000,000
Woollahra	SMSC + Environmental and Infrastructure Renewal Levy	Some (unknown amount)	Unknown

Note that where there is a 'Zero' in Table 7, it does not indicate zero spending on stormwater quality management at all – it simply indicates none of the SMSC or environmental special levy spent on stormwater quality management. All councils maintain GPTs and these councils would be allocating a budget to do this from other sources of revenue. Waverley has also been investing in some natural stormwater treatment systems and must be funding these via means other than the SMSC.

[12] This was the cost of WSUD maintenance for 20/21, including GPT repairs, GPT cleaning and raingarden renewals/upgrades.

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5.5 SUMMARY OF FINDINGS

There are significant structural issues with the current funding mechanisms in place for stormwater management. Along with a general lack of funding, often cited as the core issue, there are also problems with funding allocation. Revenue is collected unevenly across the catchment, priorities differ in each local area, and this means that funding allocation also differs substantially between different council areas.

Key findings are summarised as follows:

1) Across most organisations and for most purposes, funding is constrained. For local government, revenue raised via their ordinary rates should be sufficient to meet their needs to deliver the programs and services identified in their strategic plan. Rate capping has substantially curtailed this[13] and increasingly councils are forced to find and then rely on other funding sources such as special rate variations, stormwater management charges and development agreements. Despite these sources of funding, stormwater quality largely remains underfunded relative to the community aspirations for clean waterways. Moreover, there is significant variation as to the quantum and how individual councils allocate funding to stormwater quality and broadly catchment management activities. While councils have differing priorities and pressures, the lack of any consistent framework to support strategy implementation via funding remains a key issue.

2) When stormwater quality competes with stormwater drainage for funding (as occurs with the SMSC), stormwater drainage tends to be prioritised. Councils need to manage their infrastructure backlog, and this means prioritising renewals of ageing infrastructure prior to investing in new projects or programs. Across the GSH catchment, there are significant needs for renewal of ageing stormwater drainage infrastructure. Stormwater drainage systems are a significant asset class, dwarfing stormwater treatment systems in terms of asset value and renewal needs. Furthermore, investment in stormwater quality is seen as discretionary, while investment in drainage is strongly embedded as a core function of local councils and Sydney Water.

3) Environmental special rates seem to be a better vehicle to raise revenue for stormwater quality outcomes, however this revenue pathway is used by less than half of the catchment councils. Several of the councils have established a more reliable funding stream for stormwater quality via an environmental special rate, however there are significant hurdles to implementing a new special rate variation, not least a need to demonstrate community willingness and ability to pay. Furthermore, when these environmental rates are in place, the allocation of funds is spread to many areas of community concern that reflect the diversity of functions of council, and broad ranging community priorities. They do not guarantee funding to address diffuse stormwater pollution.

4) When viewed at catchment scale, funding streams for stormwater and environmental purposes lack consistency. Each of the councils and Sydney Water have different revenue streams, and stormwater charges paid by property owners are therefore non-uniform across the catchment. Property owners can pay significantly different amounts towards stormwater management (quality and quantity), depending on their LGA and whether or not their property is in a Sydney Water catchment. There does not seem to be any coordination between councils (horizontal) and local and state government with respect to strategic and operational funding for stormwater quality outcomes. A common intersection point is IPART. IPART plays a critical role in assessing and making recommendations to the relevant Minister for the approval of local government and Sydney Water rates. This suggests that there is an opportunity for IPART to play a more active and strategic role in where and how funding is raised.

5) There is a lack of transparency in how funding is allocated and where it is being spent. Because stormwater quality (in most cases) lacks a dedicated funding stream, it is difficult to see how much is being spent in this area. Available revenue streams are typically only partially and inconsistently allocated to stormwater quality projects and programs. Expenditure related to stormwater quality is sometimes identified as a separate category but often mixed up with either other stormwater management spending or other environmental spending. Different organisations have also structured their budgets and reporting mechanisms differently, adding another layer of complexity.

[13] Note that the recent NSW Infrastructure Contributions Review (NSW Productivity Commission, 2020) found that rate pegging has constrained local government fiscal flexibility, and recommended amending the local government rate peg to allow councils' general rate income to increase with population.

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6 CURRENT COLLABORATIVE ARRANGEMENTS

While past capacity building efforts have built commitment, knowledge and skills, strong sustained collaboration remains a challenge.

Clearly, significant differences in funding models and priorities have a major impact on the capacity of councils to address diffuse stormwater pollution. Capacity can be difficult to fully separate from the consideration of funding, for example funding can determine priorities and thus what skills and knowledge are sought via recruitment and training. Clearly there are some issues that affect the capacity of councils regardless of their funding situation, while others exacerbate funding constraints.

For the purpose of this report, capacity is defined as individual knowledge, skills and attitudes that aggregate to form the council's competencies to undertake their responsibilities (Franks, 1999). Previous efforts to build capacity for WSUD (e.g., via the WSUD in Sydney program, the work of catchment groups and the SPLASH network) have focused on organisational commitment, leadership, knowledge and skills. There has been significant progress in these areas, and a recent Cooperative Research Centre (CRC) for Water Sensitive Cities 'transitions assessment' found "Greater Sydney has made significant advancements, with strong leadership from champions around specific issues, demonstration projects of successful water sensitive practice, and a range of policy tools to guide new practices." (CRC for Water Sensitive Cities, 2018, p. 5).

The challenge now is to improve collaboration. The CRC report goes on: "To further advance Sydney's water sensitive city transition, particular focus is needed on establishing platforms that will support collaboration across diverse stakeholders to drive new solutions for the broad range of issues associated with water sensitivity" (CRC for Water Sensitive Cities, 2018, p. 5).

A thorough examination of organisational capacity issues was beyond the scope of this project, but the following sections provide some insight into how GSH councils are feeling the effects of capacity constraints today, particularly their effect on collaboration.

6.1 GETTING BEYOND COMMITMENT

Council staff generally felt there was organisational commitment to improve stormwater management, including:

- Strong senior management commitment, involvement and leadership: 79% of responses (11/14) were positive, referring to senior management involvement in programs and commitment to relevant strategic plans. One other response noted that "change is happening after a drought of support", suggesting organisational commitment is improving, yet coming from a low base.

- Strong community and political support: 100% of responses (12/12) were positive, referring to community survey results showing the importance of protecting healthy waterways, strong support for relevant actions and programs, and council resolutions on related topics. One commented, "There is a community expectation that our local waterways are kept as pristine as possible".

Despite this positive picture of managerial, political and community commitment, councils are still finding that sustained, effective internal collaboration is a persistent challenge, particularly when working across team boundaries (intra coordination) and even more so when resources are constrained (priorities) or organisations experience disruption.

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FRAGMENTED RESPONSIBILITIES

Diffuse stormwater pollution is a complex problem, generated by various sources, and by its very nature needs a multi-faceted approach to address all its causes and impacts. In the context of local government, responsibilities are spread across multiple teams in different sections of the organisation, noting also that council management and functional structures are different. These include:

- Engineering teams, with responsibilities for planning, design and renewals of stormwater drainage, floodplain management, seawalls. Engineering teams often, but not always, have responsibilities for planning, design and renewals of GPTs.
- Maintenance teams, with responsibility for the cleaning of stormwater pollution control devices. For many councils their maintenance teams work closely with engineering teams (noting that this responsibility can also rest with environmental or waste teams).
- Asset management teams also typically work closely with engineering teams, given that roads and drainage systems comprise a significant proportion of a council's built assets.
- Environment teams, most often have responsibilities for catchment management, waterways policy and planning and water quality. These teams can have a policy and planning orientation and or have on-ground roles that have responsibilities for maintenance (such as bush regeneration). Environment teams have often taken on WSUD responsibilities where this has either not formed part of the remit of engineering or waste teams. Stormwater education may also fit in here or with the waste teams where this forms part of council's wider litter education programs.
- Open spaces (parks and recreation) teams can have responsibilities for the vegetated stormwater quality, reuse and related landscaping orientated devices. This is most often when they are located within the council's parks and reserves systems.
- Waste teams are responsible for waste and litter management and the most likely leaders of litter prevention projects. However, litter management is often not regarded as a priority by waste management teams.
- Strategic planning teams will often have a narrower focus that is related to council's land use planning functions and the development of strategies and planning instruments. These teams may have individuals with urban water management expertise or seek input from specialists across the council to provide advice on water quality related matters.
- Development assessment teams have responsibilities to ensure council's policies (e.g., LEPs and DCPs) and enabling strategies are implemented as part of the planning and assessment process. Generally, councils have dedicated engineering and environmental experts in this team to provide advice on and assess development applications.
- Compliance teams are often co-located within the development assessment teams. These teams can have a regulatory function, such as the issuing of fines for stormwater pollution (Tier 3 fines under the *Protection of Environment (Operations) Act* 1997). They also have a wide range function to assess the compliance with development consents, that extends to the construction and maintenance of stormwater pollution control devices. Their planning consent compliance functions can be limited if the council is not the principle certifying authority.

Given the significant differences in the size of different councils and the funding allocated to stormwater quality, it is not surprising that staff numbers vary greatly between different organisations. While the larger and better resourced councils reported that they have multiple staff (up to 12 at Blacktown) responsible for different aspects of stormwater quality, waterways and catchment management, those without dedicated funding reported as few as zero or 0.1 equivalent staff with responsibilities in this area. However, regardless of the number of staff, what is common to all, and reflective of the nature of diffuse stormwater pollution, is that responsibilities rest with many parts of the organisation.

This study asked councils to provide information related to policy and planning, capital works, asset management, monitoring and reporting, litter prevention, stormwater education, street sweeping, the maintenance of GPTs and WSUD features, water quality monitoring and planning for sea level rise. Given this spread of functional areas, most councils were able to respond to the survey by allocating one or two people to coordinate responses from others. This coordination in itself suggests there a degree of institutional capacity. However, some of the councils were not able to provide a complete response, suggesting some cases where institutional capacity is wanting. For example:

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- In one council where the person was assigned to seek input from others, they were not able to illicit responses from key staff, including the stormwater engineers.
- In two councils, this task was allocated to staff new to their roles and were not sure how to respond to many of the questions, or even who to ask.
- Two councils had a current gap in key roles, leaving remaining staff lacking the capacity to respond.

Of the 15 councils that were able to respond in a substantive way, several noted the impacts of fragmented responsibilities and challenges of internal collaboration. Their comments included:

- "Directors and managers are happy for staff to have internal water group meetings; however, they rarely have time to participate."
- "We are members of the SPLASH Network which has held informative workshops for both staff and councillors in the past. However, it's been hard to engage members outside the environment team in these."
- "There is collaboration but not to a specific needed level."
- "There are staff members that constantly talk negatively about WSUD and its costs and this then influences the on-ground staff members [who] maintain these assets."
- One person commented about feeling the effects of fragmented responsibilities within their own role: "My position [includes] drainage, marine and floodplain [management], however as one person, has been hard to be able to dedicate equal time to all these areas. Being involved in capital works, floodplain management, and marine foreshore maintenance it is hard to concentrate on WSUD [or] sea level rise".

ORGANISATIONAL CHANGE

Five of the Greater Sydney Harbour councils have been through significant organisational changes since amalgamations in 2016. Amalgamated councils have seen significant changes to the organisational structure, functions of each team, budgets and programs. These changes are still causing ongoing disruption.

Two of the GSH councils have current gaps in key roles relevant to this project (i.e. water, waterways and catchment management roles). Both these councils were unable to respond to our written questions. We were able to have discussions with selected staff. During these discussions, it was clear that there was uncertainty about how diffuse stormwater pollution is and would be managed in the future. Staff indicated that the composition of teams would be changing, and only once new roles were filled, then programs and plans would be refreshed.

Most of the amalgamated councils are still in the significant process of reorganising their strategies, policies and plans to consolidate those of former councils.

6.2 GETTING MORE OUT OF INTER-ORGANISATIONAL COLLABORATION

When asked about collaboration with other organisations, council staff gave many positive examples. There were 12 responses to this question and all but one mentioned something positive. Some commented about specific short-term projects that have involved working with others (including neighbouring councils, Sydney Water and NSW State Government), and many also mentioned longer-term collaborations, particularly the PRCG and SCCG. Seven of the 12 councils who answered this question mentioned their involvement with the PRCG or SCCG, including involvement in projects and committees. One of the councils, that is not aligned with either PRCG or SCCG stated "we collaborate with neighbouring councils... where possible on specific aspects. Since the Sydney Metro CMA was dissolved this collaboration has become harder. [The] lack of a defined catchment group in our area means many projects are very ad-hoc".

The catchment groups therefore appear to be highly valued, however, they are limited in what they can achieve with limited resources. The PRCG's 2020-21 annual report shows that it had income of $360,173 in the financial year (excluding carry over funds). Approximately 85% of its expenses were salaries and on-costs for 2.4 FTE staff. The SCCG's 2020-21 annual report shows that it had income of $444,395 and expenditure of $301,659 in the financial year. This suggests that

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these two regional organisations have invested in staff to support networks and programs, but require their members to fund specific activities.

Among PRCG members, the 2018 Parramatta River Masterplan set new expectations for collaboration between organisations. Following this Masterplan, Sydney Water has taken a leadership role in delivering some of its actions. Step 6 (Improve overflows) is clearly a Sydney Water responsibility. Sydney Water has also taken a leadership role in other areas beyond its traditional responsibilities, including:

- Working to establishing the Riverwatch monitoring program (Step 2).
- Delivering the 'Standardise the standards' project focused on improving planning provisions for new development (Step 4)
- Chairing the Stormwater Subcommittee, focused on improving the capacity of councils to build and manage green infrastructure that will treat stormwater (Step 5).
- Acting as the lead coordinating agency for the governance of the Parramatta River Masterplan (Step 10).

Sydney Water has strengths in its ability to address complex problems at large scale, bringing useful technical expertise and experience with multi-agency collaboration to these actions. However, Sydney Water's commitment to these actions, while it has been strong over the last four years, is not certain in the long-term and remains contingent on their funding quantum and scope as defined by their operating licence.

6.3 WORKING TOWARDS 'NEW SOLUTIONS'

We asked staff whether appropriate resources, guidelines and tools are available from reliable external sources. Six out of 10 responses indicated that there are appropriate resources available, however, within these positive responses, there were several comments indicating that there are limitations to some of the resources available, and a range of reasons why good resources can be hard to access. For example:

- "The CRC provides good resources, however [the] State Government does lack resources that can be used by all councils"
- "I think there [are] some very useful resources overall, but sometimes... [it] seems like you need jump hurdles. Even trying to find someone to talk [to] for advice in a particular area, [it] is hard to find out who the main person is"
- "Great information is available but having the time and funds to use these resources is limited."

These comments indicate that guidelines and tools are available, but human resources are an important constraint.

During the interviews, two of the better-resourced councils, who have invested more intensively in stormwater quality treatment, outlined how they have begun to face new questions that are not well-addressed in existing resources. Essentially, they are looking at where they should invest for the best outcomes, but they have questions that are not well-addressed in existing resources, such as:

- a more nuanced picture of pollutants worth targeting in different parts of the catchment
- reliable information on field performance of water quality treatment systems
- information on performance of systems beyond the 'traditional' rain gardens and wetlands
- information to weigh up different types of interventions, such as street sweeping (this is discussed in Section 7.1 below)
- evidence to demonstrate the benefits for local receiving waters.

These better-resourced and advanced councils are undertaking their own research but would benefit from a collaborative effort to address these questions, including closer collaboration between research, industry and government. Stormwater

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management for waterway health is a complex problem (not merely a complicated problem),[14] involving too many unknowns interrelated factors to reduce to rules and processes. A complex problem requires an adaptive approach.

6.4 SUMMARY OF FINDINGS

The CRC for Water Sensitive Cities (as quoted above) highlights the importance of collaboration and suggests the need for 'new solutions'. Our findings give specific meaning to the CRC's observations:

1) **Collaborative networks operate within the bounds of existing organisational capacity constraints.** Each organisation, team and individual needs to balance competing priorities. In a resource-constrained environment, collaboration is occurring but is limited in what it can achieve. Individuals value the opportunities to work together across boundaries, but this is more likely to happen around a short-term project, within which time and other resource demands can more reliably be prioritised. There is a strong degree of positivity and optimism about the role of catchment groups, indicating a perceived need for sustained collaborative efforts to address more systemic problems. However, this support is also constrained by available resources, particularly with respect to implementing strategic and transformative actions.

2) **Despite high-level commitment to the goals, organisational support for WSUD still has its limits.** Most of the GSH councils have made strategic commitments and undertaken important actions to address diffuse stormwater pollution, in line with their financial capacity. However, for a WSUD based approach to have impact, it requires significant cross-boundary collaboration, and a wide range of councils (representing a range of financial capacities) are still finding it challenging to overcome internal barriers to collaboration.

3) **As well as 'new solutions', stormwater managers are seeking new approaches, which are more collaborative and adaptive.** Stormwater management is a complex challenge. There are a wide range of external resources intended to support WSUD implementation, however arguably, the breadth of resources has contributed to the complexity and uncertainty, creating a perception that there is good information available, but it is difficult to find. Of the few leading councils that are both well-resourced and are making substantive progress on the implementation of WSUD approaches, they are forward looking with respect to information, guidance and standards and note a lack of relevant and accessible information to enable their next steps.

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[14] See https://sloanreview.mit.edu/article/the-critical-difference-between-complex-and-complicated/

7 STATE OF PLAY IN THE PUBLIC DOMAIN

While some source control and stormwater treatment measures have become relatively standard, others have been implemented very differently by different councils.

Every council manages significant areas of public land, including streets, parks and other public open space. They maintain the cleanliness of these areas with activities including servicing public bins, street sweeping and litter picking. Since the EPA's litter prevention grants program commenced in 2014-15, many councils have also completed litter prevention projects focused on these public places. The first two sections below focus on street sweeping and litter prevention as key source control activities addressing stormwater pollution.

All the councils and Sydney Water also own and maintain stormwater treatment systems. Stormwater treatment efforts have been through a few distinct phases, and the stormwater treatment assets in the public domain today reflects these phases. Throughout this report, and in the sections below, we identify two distinct types of treatment systems – Gross Pollutant Traps (GPTs) and natural treatment systems.

Every council and Sydney Water owns and maintains GPTs, some of which are now more than 30 years old. These stormwater treatment systems are therefore a well-established part of councils' and Sydney Water's operations. GPTs are included in asset management systems, maintenance procedures are well-established (typically contracted out), and their condition is well understood. Asset system upgrades and GPT audits completed by many councils recently have helped complete this picture. Given their age, some GPTs are due for renewal, which is planned over the coming years. Several councils have also indicated that they are planning to install additional GPTs to fill gaps in this network.

Most councils and Sydney Water also have at least a small number of natural stormwater treatment systems such as wetlands and raingardens (some have a large number – this varies greatly). Most of these are likely to be less than 15 years old. Councils have found these assets more challenging to maintain and their condition is also less well understood. Many councils are still in the process of adding these natural stormwater treatment systems to their asset management systems. Given the ongoing maintenance challenges and uncertain condition of these assets, many councils are no longer planning to build new natural treatment systems, although some continue to do so.

Note that Transport for NSW (TfNSW) is also a significant manager of public land in the catchment who has not yet been consulted. TfNSW has assets within a significant portion of the catchment, including state roads, ferry, rail, light rail and metro corridors and infrastructure, commuter car parks and land needed to support major transport infrastructure. It is understood that they have a role in some street cleaning and managing some pollutant traps on state roads.

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7.1 STREET SWEEPING

Street sweeping helps improve stormwater quality outcomes by directly removing coarse sediment, organic matter and litter from roads and other paved surfaces. This is important as roads typically represent a significant proportion of the total impervious area in an urban environment, they are directly connected to drainage systems and they generate relatively high pollutant loads. Councils maintain most public roads, while Transport for NSW is also significant, maintaining main roads in the network.

Street sweeping is known to intercept significant pollutant loads, for example Blacktown provided some figures indicating that they had removed 2,000 tonnes of material from streets in their last reporting period, compared to 992 tonnes from their 341 GPT devices. This total weight includes litter, organics and sediment. Blacktown Council also indicated that they sweep residential streets once a year, industrial streets 4 times a year and shopping precincts daily, indicating an effort to

focus on potential litter hotspot areas. Willoughby Council also provided information indicating that 1,140 tonnes/year is collected from streets, while 212 tonnes was collected from GPTs in 2020-21.

A few other councils indicated that they could provide data on material collected via different means including street sweeping (e.g. Canterbury-Bankstown, Ku-ring-gai, North Sydney, Northern Beaches Councils). However, others reported that they had no information, with some explaining that the quantity collected via street sweeping isn't measured separately from other waste collected.

Hornsby Shire Council staff noted that they are currently investigating the efficacy of street sweeping. Specifically, they are seeking to understand the types of pollutants collected, and cost-effectiveness of street sweeping compared to other measures in which they invest. At least two other councils have at least made some high-level comparisons between street sweeping and GPTs, and one other expressed a concern about the significant expense to collect pollutants from GPTs, questioning whether other options offer cheaper, more effective solutions.

In discussions with councils, a few comments suggested that the cost-effectiveness of street sweeping could vary significantly from place to place, depending on the characteristics of the local catchment and local streets, the equipment they use and how targeted the street sweeping program is. For example, where parked cars are present, effective street sweeping is more challenging. Some councils combine street sweeping with an on-ground crew to sweep or blow material out from between parked cars to the middle of the road, increasing the quantity collected but also increasing the cost. Street sweeping frequencies also vary from place to place and pollutant loads are likely to vary depending on the nature of local catchments.

7.2 LITTER PREVENTION

If street sweeping has the potential to be more cost-effective than GPTs to intercept certain pollutants, litter prevention perhaps has even more potential to be a cost-effective measure to intercept litter before it ever reaches the ground. Litter typically becomes more difficult to retrieve as it becomes dispersed in the environment, often breaking into smaller pieces.

The NSW Government has been and continues to invest in litter prevention: in 2015, litter reduction became a NSW Government commitment with a target set to reduce litter by 40% by 2020 (based on volume and a 2013-14 baseline). The 40% reduction target was exceeded in 2020, with a 43% reduction achieved (NSW Department of Planning, Industry and Environment, 2021). To reach this goal, the return-and-earn scheme (introduced in 2017) played a significant role, and NSW Government also provided grant funding and developed tools to help people tackle litter in local places.

The NSW Government litter prevention program has recently been refreshed and the new NSW Waste and Sustainable Materials Strategy 2041 (NSW Department of Planning, Industry and Environment, 2021) sets new targets for litter reduction including an overall litter reduction target of 60% by 2030 and a plastic litter reduction target of 30% by 2025. Commitments to support these targets include plans to ban certain single-use plastic items, and support for local litter prevention:

- $38 million for litter prevention programs over the next six years. The strategy indicates that this will be used to establish partnerships "designed to support capacity building and empower industry, community organisations and stakeholders to take ownership of local litter".
- Continued support for councils' litter reduction and illegal dumping prevention activities with more than $10 million in grants.
- A new litter data framework, which includes litter monitoring on land and in estuaries.

Many of the catchment councils have either previously or are currently undertaking litter prevention activities, and there are a wide range of initiatives in place across the catchment. The nature of activities is dependent on the local context (e.g., where litter is seen as a problem), resources available for litter prevention and the preferred approach. Some councils are more focused on cleaning up litter (e.g. Mosman Council staff mentioned beach cleaning, HarbourCare and the Seaside Scavenge) while others are more focused on prevention at source (including infrastructure, education and enforcement).

Many litter prevention initiatives are funded by the grants mentioned above. Since 2014/15, a total of 39 litter prevention grants have been awarded to Greater Sydney Harbour catchment councils, with a total value over $2.3 million. A

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breakdown is shown in Figure 10, illustrating the distribution of these grants. It suggests that some councils have been more active in litter prevention than others, assuming most council projects are funded by grants.[15]

For many councils, litter prevention projects have been somewhat ad hoc to date, however SCCG and PRCG have developed and are currently implementing a Regional Litter Prevention Strategy for the catchment as a whole (this has received $190,000 in funding over two rounds of EPA litter prevention grants), and some councils have also taken a more strategic approach:

- Two councils have developed strategic plans focused on litter prevention: Blacktown Council's Clean Cities Strategy 2015-2020 and Canada Bay Council's Litter Strategy 2018.
- The City of Canterbury-Bankstown also has a Clean City Strategic Plan in draft, backed by a special variation to councils' rates, with a portion available to fund the plan.
- Some of the councils' broader environmental strategic plans address litter to some extent. For example, Waverley's Environmental Action Plan 2018-2030 includes a strategic direction and set of deliverables focused on reducing litter. However, others give litter only a brief mention.

Two councils have endorsed a 'Zero Litter to the River' position, and one a 'Zero Waste to Ocean' charter, signalling political support, however these do not (yet) appear to be backed up by plans to meet these goals.

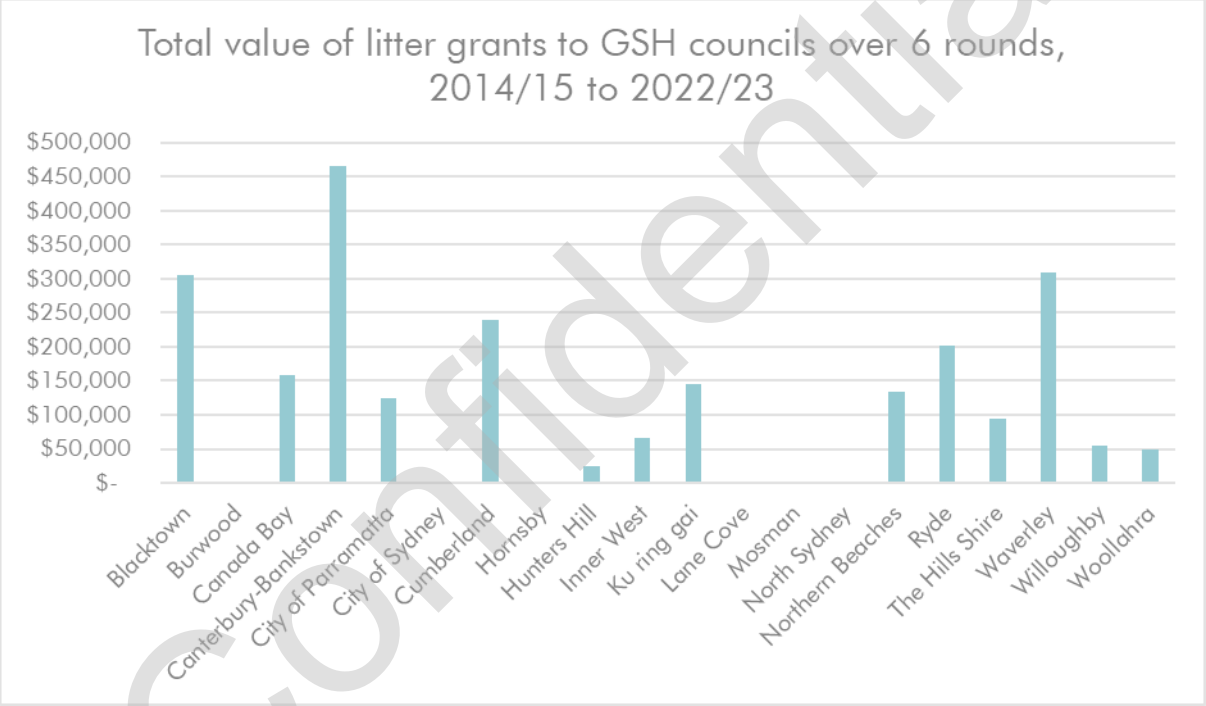

Figure 10: Total value of NSW EPA litter prevention grants to GSH councils since 2014/15 (NSW EPA, 2022)

Measuring litter prevention outcomes is challenging, with project results typically only reported at site scale (e.g. as a percentage reduction in the number of litter items measured at a site). It is difficult to understand the significance of these results at a catchment scale or quantify the benefits to waterways, except in very general terms.

[15] Note that the quantities included in Figure 10 include all grants allocated to the 20 Greater Sydney Harbour councils (and their pre-merger predecessors), for projects both within and outside the Greater Sydney Harbour catchment, as in many cases there was not enough information to identify the exact location of each project. Note also that Figure 10 only includes Council litter grants, and there are also community litter grants, some of which have been allocated to community groups and projects in the Greater Sydney Harbour catchment. One that is easily identifiable as a local project is a current $30,000 grant to the PRCG for a 'Greener Gatherings in Parks' project.

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7.3 GROSS POLLUTANT TRAPS AND OTHER LITTER DEVICES

The term 'Gross Pollutant Trap' (GPT) can refer to a range of different stormwater treatment devices. GPTs include:

- Litter baskets inserted into pits
- Nets placed over stormwater outlets
- Baffle boxes (that can be built into underground drainage systems)
- Filtration devices with fine mesh screens (also typically installed underground)
- Trash racks and 'vane traps' (often built across channels)
- Floating litter booms.

Gross pollutants are typically defined as being >5mm in size. Depending on their design, GPTs capture varying proportions of pollutants of different sizes. Some GPTs also capture notable quantities of coarse sediment.

All the GSH councils and Sydney Water own and maintain GPTs. We have a reasonably complete picture of the number of GPTs in each council area, shown in Figure 11. Most councils could provide more detailed information on these assets from their asset management systems. In simple numbers, there are at least 1,500 GPTs across the 20 council areas, which is an average of more than one per km^2. The density in each LGA is shown in Figure 12. In addition, Sydney Water also has 26 GPTs in the GSH catchment. Sydney Water are also able to provide detailed information on these assets.

Councils have told us that Transport for NSW also owns some GPTs but we have not yet consulted with TfNSW to understand their operations in this area.

Over recent years, councils have been focused on improving asset management across all asset classes, including information on asset condition, current value, remaining life, and renewal cost as well as information on ongoing maintenance schedules and costs. To complete this picture, at least 10 of the GSH councils have conducted GPT (detailed condition assessment) recently, to understand asset life and estimate renewal costs.

Anecdotally, this recent focus on gathering more information on asset condition has led at least some councils to focus on GPT renewals in their recent and current operational plans. Audits may have revealed assets in need of repair and nearing the end of their life. One council officer said: "A detailed audit has recommended that 10 of 26 SQIDs be replaced due to either condition or not functioning efficiently". Another explained verbally that they have just finished a program to repair and renew GPTs, with a focus on bringing bringing existing GPTs up to peak performance.

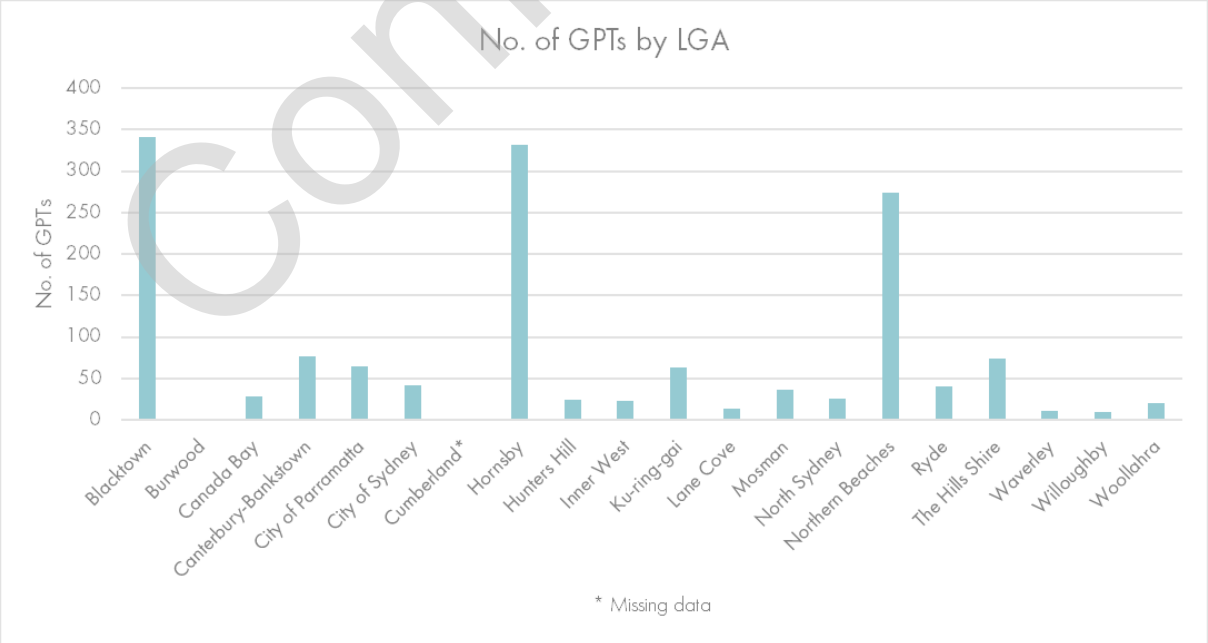

Figure 11: No. of council-owned GPTs by LGA

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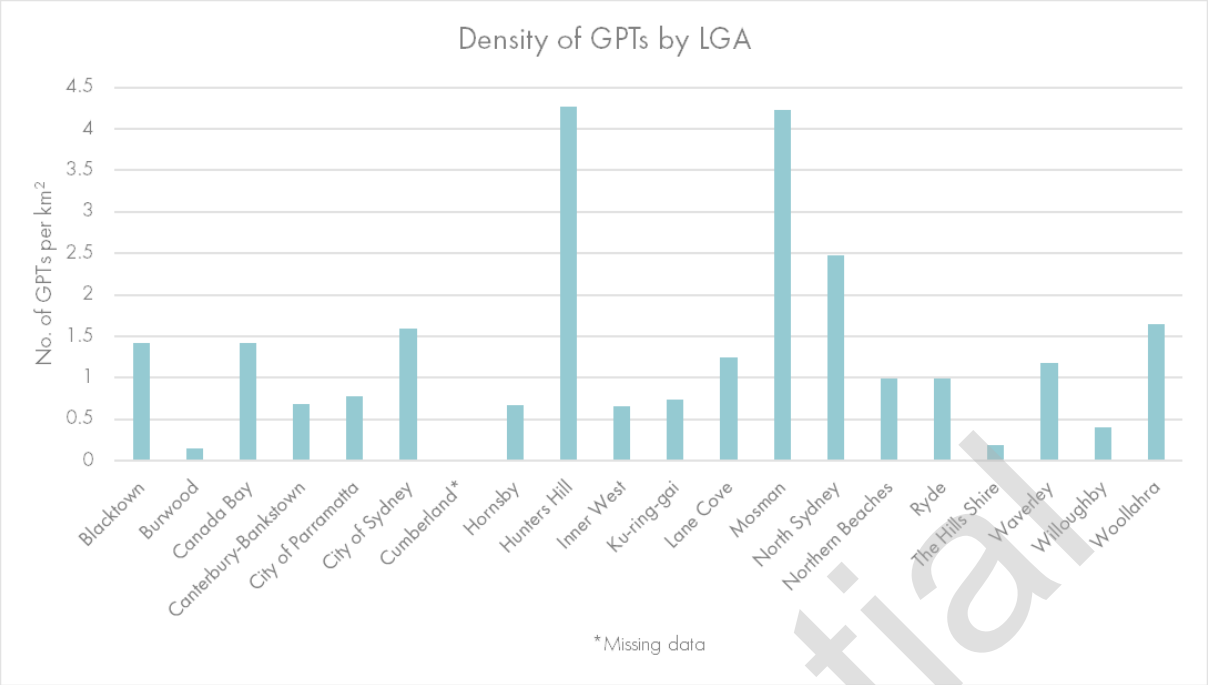

Figure 12: Density of council-owned GPTs by LGA

In most councils, well-functioning asset management systems mean that information is readily available on GPT maintenance. Fourteen of the 20 councils provided information about GPT cleaning frequencies, 11 included information on costs and 13 indicated that they track information on quantities of pollutants removed. These quantities are often reported, for example, in annual reports. There were just two council who told us (verbally) that GPTs are not yet on a maintenance schedule, or that they are 'catching up' on maintenance of GPTs.

While some GPTs are more than 30 years old and many are likely to have been installed during the Stormwater Trust years (1998-2006), councils have continued to install new GPTs since that time. At least ten of the GSH councils have recently installed new GPTs, have current plans to install new ones, or expect new ones to be handed over from new development in their LGA. During interviews, both the City of Sydney and North Sydney Council explained that they are focused on installing more GPTs because they are proven to work well, and there are good opportunities to fill gaps in this network of treatment systems. Both also indicated they are looking to replace older style GPTs with more effective modern units.

7.4 NATURAL TREATMENT SYSTEMS

Natural treatment systems, including wetlands and rain gardens, can treat fine and dissolved pollutants including fine sediments, heavy metals, hydrocarbons and nutrients. These have become more prevalent since the emergence of WSUD as the preferred approach to address diffuse stormwater pollution. The "WSUD in Sydney" program (2002-2007) helped many councils get started with basic guidance and support.

Most councils have installed some natural treatment systems, however, their experiences with them have been very different across the catchment.

- 35% of GSH councils (7/20) are not installing any new natural treatment systems. It appears that some of these councils simply remain focused on GPTs as they made no comments about natural systems at all. Others let us know that they had installed a few rain gardens in the past, but they hadn't worked well. One said: "we are not installing any more rain gardens or similar at this stage due to maintenance costs".

- 25% of GSH councils (5/20) continue to install new rain gardens or other natural treatment systems opportunistically. One council has indicated that Council has resolved to take every opportunity to integrate raingardens in the streetscape where feasible. Another used the term 'ad-hoc', suggesting installations are relatively infrequent: "In the absence of a strategic plan for WSUD installations they are installed on an ad-hoc basis when streetscapes or park areas are upgraded for other purposes". Another indicated that they considered

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a more strategic approach, and then reverted to an opportunistic one: "We engaged a consultant a few years ago to do an evaluation of WSUD opportunities... [however] there are no plans at present for future installation of bioretention systems. [They are only installed] on an opportunistic and feasibility-based system (project by project) where feasible and able to be funded."

- 30% of GSH councils (6/20) are installing new systems in reply to the objectives of a specific strategic plan. Many of these are catchment or place-based, for example, the Inner West Council has sub-catchment plans for some of the sub-catchments in the former Marrickville Council area, as well as WSUD opportunities integrated into park masterplans and public domain precinct plans. Blacktown Council has developed an approach they can apply to the whole LGA: "To assist Council [in] making decisions on water quality treatment measures such as bioretention systems in existing developed areas, we have developed a tool for prioritising our projects. This tool then forms a defendable mechanism for making decisions about where and what stormwater assets should be installed on public land".

- Two GSH councils, who have both installed a large number of natural treatment systems, indicated that they are currently moving away from this approach. One indicated this is because they are running out of suitable sites, while the other indicated that they have shifted their focus back to GPTs. This latter council explained that they have assessed GPTs as providing greater benefits at lower cost. They see good reasons to focus on litter and sediment in catchments draining directly to the Harbour and are finding GPTs easier to fit into constrained spaces. They also feel more confident that GPTs would be well-maintained and therefore that expected outcomes would be achieved.

Many councils noted that they have had natural treatment systems handed over to them from new developments. This has been particularly prevalent in Blacktown and The Hills Shire Councils, where there is more significant larger scale development and subdivisions (mostly outside the GSH catchment). This scale of redevelopment is less prevalent in other LGAs but remains relevant where larger sites are subject to state-led strategic planning or a collaboration between the State Government and councils (e.g. Melrose Park Urban Renewal Precinct). A few others also mentioned treatment systems handed over from development. Two councils referred to challenging examples, where the assets handed over proved difficult to maintain.

Sydney Water owns a few natural treatment systems in other catchment areas. One is planned in the GSH catchment, as part of their Waterway Health Improvement Plan.

Different local priorities appear to be contributing to differences in approach. One council talked about this explicitly in explaining their reasons to focus on GPTs, rather than natural treatment systems – they saw gross pollutants as a higher priority for the waterways in their local area. The local catchment context is different for each GSH council, and their focus is not necessarily on Sydney Harbour. Some have high value freshwater streams to protect, some drain into degraded/modified waterways and some drain directly into the Harbour. Some have beaches and other swimming sites in the Harbour while others do not.

It is difficult to get a clear picture of how prevalent natural treatment systems are across the catchment overall, or their condition, because many councils have not yet incorporated these assets into their asset management systems. This gap is slowly being filled. One council commented "There are many more assets captured as WSUD in our new asset management tool implemented in 2021-22" and another said that they have completed an audit of all WSUD devices in 2019-20, but are still working on adding these devices to the asset management system. Two councils who do have data in their asset management systems commented that they do not have confidence in the data:

- "[For] devices such as wetlands, ponds, basins we only have limited operational data from maintenance crews or asset inspectors. This data is mainly regarding defects rather than performance."

- With reference to a condition rating reported in the Annual Report: "The condition rating for our raingardens is incorrect. The actual value is unknown... This figure is probably taken from an audit that focused on appearance rather than performance."

- It is also difficult to get a clear picture of the maintenance status of natural treatment systems, however several of the comments made by council staff suggest that for many, maintenance remains a key concern and barrier to

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greater uptake. Some of these comments were mentioned above.

7.5 WATERWAY AND FORESHORE CLEANING

Transport for NSW cleans the waters and foreshores of Sydney Harbour and navigable waters of the Parramatta and Lane Cove Rivers. The area covered is 5,020 hectares with a foreshore length of 270km (Transport for NSW, 2014). They target floating litter and on average more than 3,500 cubic meters of rubbish is collected per year (*ibid*).

There is also a land-based component to the program – the 'Joint Foreshore Cleaning Project'. Councils can nominate foreshore areas of the harbour to be cleaned in partnership with Transport for NSW, with labour provided through the Department of Corrective Services Community Service Order and Periodic Detainee Rehabilitation Program.

7.6 SUMMARY OF FINDINGS

While street sweeping and GPTs have become relatively standard practice, litter prevention and natural treatment systems have been implemented very differently by different councils. These differences can be understood as a reflection of their different funding situations, capacity to collaborate on complex, cross-boundary initiatives, as well as possibly the local context shaping their outlook and approach:

1) Most councils have established street sweeping programs and reasonably well-managed GPTs. The efficacy of these programs is uncertain due to the incomplete data collection: higher level figures related to weight of material collected is generally well reported but data on the types of pollutants collected is less well known. Sydney Water also has a well-managed set of GPTs across their catchments. These measures have been simpler to implement, as they do not require significant cross-boundary collaboration. However, they do require funding and therefore their implementation, current condition and maintenance status is non-uniform across the catchment.
2) Natural treatment systems have been implemented differently in each council area (and some by Sydney Water). These measures do require cross-boundary collaboration and have proven more complex to implement well. To maintain natural treatment systems, sustainable funding is also an important factor. Most councils have installed a small number of natural treatment systems opportunistically, however around one third of councils currently have no interest in installing any more. Less than half have developed strategic plans to be more systematic in their approach.
3) Most litter prevention initiatives are opportunistic projects, with only a few councils taking a more strategic approach to litter prevention. Currently there is little connection between litter prevention and stormwater management activities, with litter prevention more focused on maintaining the appearance of public places rather than minimising stormwater pollution. However, the Greater Sydney Harbour Litter Prevention Strategy could initiate a shift in thinking.

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8 STATE OF PLAY IN THE PRIVATE DOMAIN

As local planning provisions are updated, most are strengthening the requirements for stormwater treatment, however consistency remains lacking, and compliance remains a significant challenge.

Water sensitive urban design planning controls have had a gradual emergence into the Sydney's planning system. As design philosophy, WSUD has its genesis in Perth in the late 1980s (Moritz, 1992) and has since influenced a range of infill (e.g. Kogarah Town Square) and greenfield (e.g. Sydney Olympic Park and North West Growth Centre) sites. Local government has moved to introduce WSUD into its planning policies, primarily through development control plans and subordinate policies and at the state level, planning provisions for major developments have specified various WSUD controls and outcomes. Currently, there are a diversity of existing planning provisions that support WSUD outcomes, although there is no standard approach, thus resulting in an inconsistent policy framework and application (McAuley & Davies, 2021).

Across the Greater Sydney Harbour catchment, there is a varying commitment to improving stormwater quality outcomes at the Local Environmental Plan level. Eight of 25 current LEPs have comprehensive objectives or consent considerations relating to improving stormwater quality, 9 specify certain areas have consideration for the impacts of stormwater on surrounding high environmental areas, and 8 others have none.

At the council DCP level, 19 out of 25 DCPs have stormwater quality targets in relation to some type of development. While the water quality targets are very similar between DCPs, however, each DCP is different in terms of exactly where the targets apply. Each council has set their own, locally relevant thresholds to define the types and scales of development where stormwater quality provisions should apply. General trends include a stronger commitment to stormwater quality outcomes for high impact or larger development, with commercial and industrial development having more stringent requirements than residential.

Many councils are currently updating their LEPs and DCPs to respond to the outcomes of their LSPS objectives and as an outcome of the consolidation of plans from former (pre-merger) councils. These updates are expected to reduce the total number of LEPs and DCPs across the catchment and increase the proportion which includes stormwater quality provisions including quantitative targets. Ten out of 20 councils have made a commitment in their LSPS to update stormwater quality provisions and 7 out of 20 are expected to make improvements in the process of updating their LEPs. Some of these improvements capture previous LEPs from now amalgamated councils and are foreseen to make improvements to pre-amalgamation instruments to 6 previous LEPs through harmonisation. A further 12 out of 20 councils are expecting to update their DCPs to improve stormwater quality outcomes.

However, significant variability is expected to remain in terms of where and how stormwater quality provisions apply. Factors adding to this variability are:

- Multiple layers of planning governance, with each layer including stormwater quality in a different way.
- A multitude of site/context-specific local level SEPPs, LEPs and DCPs across the catchment. Many of these apply to specific development precincts and may include relatively stringent stormwater quality controls.
- Not all development types are required to adhere to local DCP provisions or even consider the intent of LEPs – for example an increasing number of developments being completed as complying development under the Codes SEPP.
- Complying development lacks any standalone stormwater quality requirements and is reliant on certifiers following a multitude of varying complex DCPs.
- Other state policies only place stormwater quality provisions on specific areas near the coast and other sensitive waterways.

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This variability creates an impression that stormwater quality treatment is an aspirational, responsive, and contextual requirement and that it's complex, expensive, and not suitable everywhere.

A major challenge for councils now is ensuring compliance with these stormwater quality provisions in development and ensuring long-term maintenance of private stormwater quality treatment devices. Not all DCPs require reporting to show evidence that a design complies with a stormwater quality measure and many LEPs objectives are aspirational or only require 'consideration'. Furthermore, post-development, only one council (Blacktown) currently maintains a record of private stormwater quality assets and conducts follow-ups to ensure maintenance of private stormwater quality assets. This means that outcomes of stormwater quality planning provisions are currently highly uncertain (Ardren & Davies, 2022).

Other initiatives to improve stormwater quality outcomes in the private domain are also proving challenging, but indicate where councils are making efforts to complement planning provisions with other strategies, and suggest some potential opportunities to improve private domain outcomes overall:

- 'Get the Site Right' focuses on improving compliance with erosion and sediment controls at construction sites. Here there are straightforward mechanisms enabling site inspections to be undertaken and fines to be issued for non-compliance. Compliance issues are typically clearly visible in a site walkover. Since the program commenced, compliance rates have improved, however in 2021 across 21 participating council areas across Sydney and the Hunter, there were still only 67% of sites compliant (out of 762 inspections) (NSW Environment Protection Authority, 2021).
- Some councils run stormwater quality engagement programs, aimed at existing residents and businesses. These include education campaigns, workshops and incentives.

8.1 LOCAL POLICIES

The regulation of private development across the catchment is managed at both the local council and state government level. The primary legal mechanism available for councils to shape development outcomes in their LGAs are found in Local Environmental Plans (LEPs). These cover a wide range of matters and can include both stormwater quality management and Water Sensitive Urban Design (WSUD) considerations. Examples of how this may manifest is an objective for high environmental value areas, or local additional provisions mandating that stormwater quality or WSUD to be considered before any consent is given. The way an LEP is worded is generally high level and the wording at the discretion of councils as the primary shaper of the plan, and the Department of Planning and Environment as the approval authority.

The development of LEPs is informed and shaped by priorities found in LSPS, whose priorities are informed by regional and district level plans developed by the Greater Sydney Commission. LSPS's and thus LEPs are also informed by CSPs.

DCPs are developed by councils and are required to be (vertically) consistent with the LEP and other environmental planning instruments. The provisions within DCPs are not mandatory (DCPs are not an Environmental Planning Instrument as defined by the *Environmental Planning and Assessment Act, 1979* s3.4.2)). They can contain detailed controls for various development outcomes, including water quality targets to be met and specific infrastructure types to be considered to meet these targets for different development types.

For WSUD to have a nexus to an environmental planning instrument, it is critical that an LEP includes a local provision within which states an objective or standard to consider stormwater impacts or WSUD as part of any development outcome. This provides the policy legitimacy for a council's DCP to provide the necessary guidance on how stormwater quality improvements are to be achieved across different development types.

For the purposes of this chapter, only specific stormwater quality measures were analysed. Integrated WSUD responses such as high levels of landscaping, deep soil requirements, generous setbacks, open space requirements, green roofs/ walls, permeable paving and beyond BASIX rainwater tanks were not assessed, though they can all have benefit as part of an integrated WSUD response in development.

LOCAL ENVIRONMENTAL PLANS

Councils have varying approaches in their LEPs on how stormwater quality is managed for private development. One-third (8/24) of the LEPs currently in force within GSH council areas have comprehensive provisions for stormwater quality, covering all land within the LGA. These usually have the form of an additional local provision for stormwater management that mandates improving water quality or that the principles of WSUD be considered for all development proposals in the

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entire LGA (e.g., Ku-ring-gai LEP Section 6.5). One-third (9/24) have more **targeted** or area-specific water quality objectives relating to runoff for high environmental value land and/or land adjacent to watercourses (e.g., the Warringah LEP, Section 6.6 has particular requirements for houses in the E3 Zone). There is also one-third (8/24) of current LEPs that do not include any local provision for WSUD or stormwater quality.

DEVELOPMENT CONTROL PLANS

Detailed development controls for private development relating to stormwater management and WSUD are found in DCPs. DCPs are designed to provide guidance in relation to the implementation or effect of an environmental planning instrument (EP&A Act Section 3.42). Councils may prepare a DCP (s3.43) within which it can include its approach to managing water quality from stormwater. There is no standard DCP provision for managing stormwater quality runoff and each council engages with the matter differently. Some have direct controls based on development type, some on location and context, and some, such as Northern Beaches Council rely on reference to a detailed independent policy outside of the DCP to be complied with.

However, there are many common trends across the 25 DCPs in effect across the catchment.

- Water quality provisions tend to target higher impact development types, or development types that would increase impervious surface area. Small site and low-density residential development are excluded in most circumstances.
- The structure of the controls had some similarity, with different levels of engagement of water quality generally split into residential, commercial and industrial and other development. Four of the 25 DCPs had subdivisions as a development type to consider in terms of water quality.
- Nineteen out of 25 DCPs have stormwater quality targets in relation to some type of development. The water quality targets to meet are uniform in their formatting. They take the form of a table engaging post development runoff reduction targets. The targets vary slightly from council to council but are typically very similar to those shown in Table 8.
- Some form of reporting or modelling is required in most circumstances in relation to proving stormwater quality targets have been achieved. In a few cases (e.g. the Marrickville DCP) smaller developments can follow a simple 'deemed to comply' solution.
- DCPs that did not include stormwater targets generally only had aspirational provisions for WSUD or stormwater quality treatment. Arguably, aspirational statements enhance the discretionally nature of DCPs, suggesting that this specific consideration is more likely to be ignored by applicants (developers).
- Notably, a few current DCPs still have no stormwater quality provisions. However, several of these are expected to be updated as part of harmonising planning provisions in amalgamated councils – this is discussed below.
- Some councils, such as Woollahra, also encourage innovative responses such as constructing raingardens or green roofs as part of development.

While the approach of managing stormwater quality in development across the catchment is varied, there are consistent features to WSUD provisions in DCPs, and the main variability is in relation to the specific situations and types of development where stormwater quality targets apply. Councils tend to target developments that have the highest stormwater impact and require these developments to meet specific pollutant load reduction targets (as per those in Table 8).

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Table 8: Example Water Quality Targets table, Hornsby Shire Council Development Control Plan

Pollutant Type	Performance Target Reduction Loads
Gross Pollutants	90% reduction in the post development mean annual load of total gross pollutants
Total Suspended Solids	80% reduction in the post development mean annual load of total suspended solids
Total Phosphorous	60% reduction in the post development mean annual load of total phosphorous
Total Nitrogen	45% reduction in the post development mean annual load of total nitrogen.

UPDATES IN PROGRESS

Councils are currently updating LEPs and DCPs both to harmonise the planning provisions of formerly merged councils and to respond to directions set in the Greater Sydney Region Plan and the District Plans. Many are strengthening provisions for stormwater quality in the process.

The intention within the NSW planning system is that Greater Sydney Region Plan directions and District Plan actions should flow through to local plans: "Each stage [of the preparation of a LSPS] involves alignment with other strategic planning activities at the local, regional and state-level. The LSPS should 'give effect to' the regional or district plan. It delivers the actions in the relevant regional or district plan through councils' local plans." (NSW Government, 2018, p. 8).

Within the Greater Sydney Region Plan there are explicit statements that offer guidance to the value and importance of water quality:

- "The Marine Estate Management Authority has prepared the draft Marine Estate Management Strategy 2018–28 which when finalised, will support a clean, healthy and productive marine environment. Improving water quality and reducing litter is one of the strategy's eight initiatives for improving the health of the coast and estuaries. The strategy notes that urban stormwater is one of the priority threats to the marine estate, and can greatly increase the amount of pollutants such as sediment, nutrients, chemicals, plastic and litter entering waterways." (Greater Sydney Commission, 2018, p. 148).
- "Currently, Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 provides a framework to maintain, protect and enhance and the catchment, foreshores, waterways and islands of Sydney Harbour. There may be opportunities to take a more comprehensive view as to how major waterways and their foreshores across Greater Sydney are managed and protected." (Greater Sydney Commission, 2018, p. 149).

Within their LSPSs, half of the GSH councils make a specific commitment to update stormwater quality provisions. Even where this commitment is not explicit, the overall trend is that planning controls, when they are being updated, are in the majority considering stormwater quality in some form at both the LEP and DCP level.

Five Councils have engagement with water quality at all levels of their ongoing planning reform, from their LSPS making commitments to changing controls for stormwater quality to their draft instruments, to indicating draft LEPs and DCPs are going to consider improved stormwater quality outcomes. They are the City of Canterbury-Bankstown, City of Parramatta, Inner West, Northern Beaches and Waverley Councils. Cumberland Council has already updated their various planning controls to incorporate some level of stormwater quality consideration at all levels.

Six previous catchment LEPs, where stormwater quality was not considered comprehensive, are likely to have stronger engagement with stormwater quality outcomes when consolidated/reviewed, according to council responses and desktop analysis. These are the in cases of amalgamation soon to be previous Auburn, Bankstown, Ashfield, Marrickville, Warringah LEPs, and in the case of main LEPs under review, the Waverley LEP.

Publicly available draft LEPs such as the draft Canterbury-Bankstown LEP and draft Inner West LEP show a marked improvement in terms of stormwater quality considerations.

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Some DCPs are currently being reviewed to harmonise with revised LEPs. These draft DCPs in the majority are envisaged to have substantial attention paid to WSUD provisions as their draft LEPs contain commitments to consider WSUD in design outcomes. Again, an example is the City of Canterbury-Bankstown, where there is a draft LEP objective that specifies WSUD be considered for all development types that will be reflected in a DCP update.

An important note is that some councils, such as North Sydney and Cumberland, have recently completed reviews of their LEPs to align with their LSPSs. Cumberland has a strong clause in its LEP relating to stormwater quality improvement across the whole LGA, backed up by a DCP that has stormwater quality targets for a wide array of development types. North Sydney council has clear objectives in their LSPS, and overall aims in their LEP now for minimising the impact of stormwater on water quality outcomes, but nothing in the LEP specifically requires stormwater management as a method of protecting waterways for new development. This indicates that the objects relating to water quality in District Plans may not be permeating through to LEPs specific local planning provisions through the LSPS mechanism in all instances.

8.2 STATE POLICIES

BIODIVERSITY AND CONSERVATION SEPP AND THE FORMER SYDNEY HARBOUR CATCHMENT REP

The *Sydney Regional Environmental Plan (Sydney Harbour Catchment)* (Harbour REP) 2005 was recently consolidated into the new *State Environmental Planning Policy (Biodiversity and Conservation)* 2021. Chapter 10 covers Sydney Harbour Catchment and according to DPE, it includes most of the provisions of the former REP transferred into the new instrument, without any policy changes.

Chapter 10 of the Biodiversity and Conservation SEPP covers all the waterways of the Harbour, the foreshores and entire catchment. It establishes a set of planning principles to be considered and where possible applied by councils or agencies for the preparation of EPIs, DCPs and masterplans for any land in the catchment. Several of these principles are associated with stormwater quality outcomes:

- "development is to improve the water quality of urban run-off, reduce the quantity and frequency of urban run-off, prevent the risk of increased flooding and conserve water.
- "action is to be taken to achieve the targets set out in Water Quality and River Flow Interim Environmental Objectives: Guidelines for Water Management: Sydney Harbour and Parramatta River Catchment (published in October 1999 by the Environment Protection Authority), such action to be consistent with the guidelines set out in Australian Water Quality Guidelines for Fresh and Marine Waters (published in November 2000 by the Australian and New Zealand Environment and Conservation Council),".
- "action is to be taken to achieve the objectives and targets set out in the *Sydney Harbour Catchment Blueprint*, as published in February 2003 by the then Department of Land and Water Conservation."

It also defines nine different zones covering the Harbour's waterways, to suit the differing environmental characteristics and land uses of the harbour and its tributaries. Utilising these zones, the instrument provides detailed contextual planning controls and a complementary DCP for land immediately adjacent to the Harbour. Therefore there is much more detailed guidance available for foreshore lands than for other parts of the catchment. This presents a dichotomy where the instrument is well considered and is often applied for land immediately adjacent to the foreshore leading to positive stormwater quality outcomes for this small portion of the catchment, but is often forgotten in its catchment scale application to consider water quality outcomes for changes to often impactful planning instruments.

There are no local planning directions or state level directions that mandate consideration of the principles found in the former REP in planning proposals, SEPPs, DCPs or masterplans that apply to the catchment. A review of recent planning proposals available on DPE's Planning Portal has indicated that the former REP was not regularly considered, or its principles applied in planning proposals, environmental studies, and master plans consistently, if at all. This, combined with a lack of local planning directions to assure consideration currently mean these principles are often not considered for important planning initiatives that affect land in the catchment. This inconsistency in consideration is reflected also in Section 8 of this report. The most likely reason is simply that the REP is outdated.

The recent consolidation of the REP into a new SEPP could once again make this planning legislation more visible and consistently applied in the catchment to better facilitate consideration of stormwater quality at the strategic stage by decision makers, however clearly the provisions within it will need to be updated to refer to contemporary objectives, targets and

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guidelines (e.g., including the risk-based framework, updated NSW water quality objectives currently being developed by DPE, and the Sydney Harbour Water Quality Improvement Plan would be a more appropriate reference in place of the 2003 Catchment Blueprint).

This instrument presents a strong foundation for a catchment-based planning mechanism to ensure water quality is considered, though currently there are significant gaps in the instrument for how water quality is addressed and applied.

COASTAL MANAGEMENT ACT AND WATER MANAGEMENT ACT

The *Coastal Management Act* 2016 and associated *State Environmental Planning Policy (Resilience and Hazards)* 2021 and the *Water Management Act* 2000 provide specific statutory schemes for development outcomes in proximity to foreshores and waterways. These policies generally only provide controls for development in high environmental or high exposure areas immediately adjacent to waterways or the Harbour itself:

- Areas within the coastal zone, including the four coastal management areas defined and mapped in the *State Environmental Planning Policy (Resilience and Hazards)* 2021.
- Waterfront land, as defined in the *Water Management Act* 2000.

Provisions within these instruments include promotion of water quality outcomes, however their limited applicability to land within the coastal zone and waterfront land is not conducive to the whole catchment having impact on stormwater quality outcomes in the Harbour. As discussed the current Greater Sydney Harbour Regional Environmental Plan has the skeletal framework of a strong catchment based plan that focuses on stormwater quality outcomes, though crucial elements are missing.

CODES SEPP

The *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* (Codes SEPP) allows for exempt and complying development across the catchment, provided certain development standards are met. It sets out a code for what can be exempt or complying development across the state.

For land across the catchment, in the majority,[16] provided a development type is permissible under a LEP and meets development standards under this SEPP, development can be undertaken without any consent in the case of exempt development, or with a certifier signing off the development for complying development. No council oversight is necessary.

Exempt development tends to be for low impact development that normally wouldn't need any oversight such as minor alterations and additions, and complying development is traditionally for small to medium impact development with more complexities and considerations such as development of a single dwelling or industrial building, provided it satisfies principal development zoning permissibility in LEP's and standard prerequisites in the SEPP.

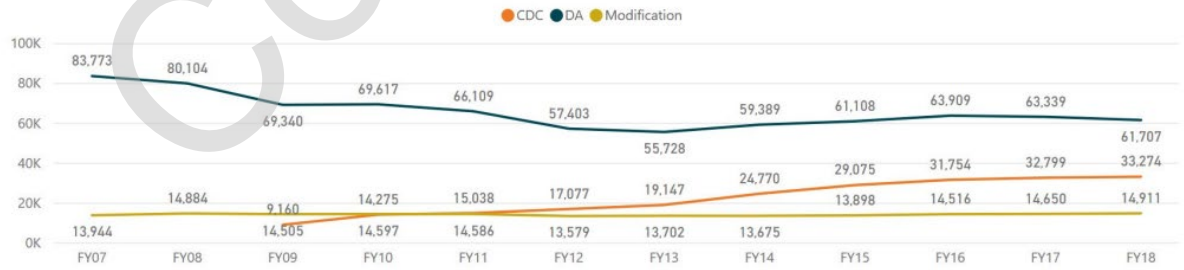

Figure 13: Number of development applications approved by financial year, showing increasing proportion of Complying Development Certificates (CDCs) and reducing proportion of Development Applications (DAs) (NSW DPIE, 2020)

The scope of what is complying development, however, continues to increase in size and complexity. For example. in February 2022, the Codes SEPP was amended to allow specified building types of up to 50,000 sqm to be built in industrial

[16] Certain standards in the codes SEPP go beyond an LEP, for example the height of new industrial buildings in IN1-3 zones for complying development. Going beyond an LEP' zoning and permissible land uses under these zones can also apply for complying development types in other SEPPs such as in the State Environmental Planning Policy (Transport and Infrastructure) 2021.

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zones, and up to 10,000 sqm for B5, B6 and B7 business zones.[17] Complying development for B5-7 Business zones requires adherence to water quality criteria in 'Business Zone Design Guidelines' (NSW DPE, 2022) but all other development under these categories does not have to comply with this guide. Development of this scale, if undertaken through a complying development certificate (CDC), has potentially significant negative implications regarding stormwater quality outcomes for a catchment. CDC's also make up an increasing portion of development approvals in NSW and are increasing in popularity

Councils have indicated they currently have little oversight on how the Codes SEPP is being implemented by private certifiers. There are no specific controls in the Codes SEPP that seek to improve stormwater quality specifically apart from requiring adherence to what is in council DCPs and there is no formal auditing or checking mechanism in the Codes SEPP to check stormwater quality targets in DCPs are being complied with by certifiers, beyond any interaction with a council stormwater engineer that a certifier could pursue. This SEPP can also override principal development standards found in LEP's such as the bulk and scale of development, and detailed considerations such as setbacks or vegetation coverage in DCP's, which typically have secondary benefits on water quality by reducing site runoff flow levels.

Therefore, the Codes SEPP presents a significant gap in knowledge to authorities overall on how or if stormwater quality measures are being successfully implemented across the catchment for significant amounts of development. This can make integrated future planning for stormwater quality challenging.

8.3 OTHER POLICIES

There are a host of other instruments that regulate development within specific parts of the catchment.

PRECINCT AND SITE-SPECIFIC PLANS

Some specific development precincts have their own plans. For example, City of Sydney has The South Sydney Local Environmental Plan 1998 in addition to their primary LEP, as well as several other LEPs and SEPPs regulating development with the LGA. These generally apply to a high intensity precinct or site, each containing differing objectives and controls dependant on the intention of the contexts they apply to. Because of this and the fact they have been developed at different times, they have widely differing controls and outcomes relating to WSUD.

There are also several site or precinct specific water quality provisions that apply throughout the catchment in DCPs. This is apparent in the City of Sydney which has these each have varying amounts of engagement in WSUD, dependant on the goals of the development type each DCP applies to. For example, the Green Square Town Centre precinct has an additional Development Control Plan that considers stormwater quality for specific developments.

Precinct or site-specific schemes at the SEPP, LEP and DCP level are found throughout the catchment.

When a site or precinct scale consideration for stormwater quality or WSUD can present itself through a new control scheme, for example in the City of Sydney's precinct plans, or the previous Sydenham to Bankstown Strategies land use planning framework, this presents a key opportunity for a more intensive WSUD response at an integrated level for a number of high intensity developments. Stronger consideration for WSUD for these special cases could be complemented or bolstered in the future by a councils or the states overall strategies applying to stormwater quality. Due to each specified control scheme in place being developed at different times for different needs and contexts however, engagement with stormwater quality or WSUD in these plans varies significantly.

SYDNEY OLYMPIC PARK AUTHORITY

Sydney Olympic Park Authority has a unique statutory scheme applying to development for the Sydney Olympic Park area. Within their policies for stormwater management, they have strong water quality provisions to be considered for development. SOPA covers a highly sensitive area in terms of waterway health and the growth in the precinct is focused on high density, high impact development.

[17] These zones are foreseen to change to match the new Standard Instrument business zones gazetted under the Standard Instrument—Principal Local Environmental Plan (2006)

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SYDNEY WATER

For development that connects to one of Sydney Water's stormwater assets or natural waterways, for certain development types, stormwater quality targets are to be met even if the relevant council's local controls would otherwise provide an exemption. Sydney Water assesses designs in relation to these targets and may require water quality modelling as part of the assessment. It is not known how many developments require a new connection to a Sydney Water asset and would therefore trigger this requirement, but it is expected to be relatively few.

8.4 COMPLIANCE REMAINS A SIGNIFICANT UNMET CHALLENGE

Planning provisions that include stormwater pollutant load reduction targets effectively require development to include a stormwater treatment system to meet these targets. These treatment systems need to be designed appropriately, installed correctly, and maintained in the long-term to achieve the intended water quality outcomes. However, within the private sector there is little incentive to get this right, and within the public sector there is low capacity to ensure compliance or support ongoing management of private water quality treatment assets (McAuley & Davies, 2021).

Our review of current practices in the GSH councils has shown that there are some basic requirements in DCPs to enable compliance checks, however there are important gaps here:

- DCPs often require a Work-As-Executed Plan for stormwater infrastructure to be submitted as part of an Occupation Certificate to ensure both works are undertaken in line with approved plans, as well as having an archival record of the nature of stormwater infrastructure placed on site.
- Just under a quarter of current DCPs in the catchment councils (6/25) require positive covenants to be generated for stormwater quality related infrastructure on site, as part of an application process. Another two require a positive covenant for specific types of stormwater quality related infrastructure, such as for GPT's only. The majority do not require a positive covenant to be placed for stormwater quality infrastructure at all. These positive covenants ensure that stormwater infrastructure is legally required to be maintained in perpetuity and rests on the property title.

More importantly, only Blacktown Council has a compliance program in place for private stormwater quality assets. This compliance program was reviewed and improved throughout 2020 and 2021 from an inspection-based program to a reporting-based program. As the Blacktown LGA is estimated to have over 10,000 private WSUD/OSD assets it would be impossible to inspect all assets with the resources available. The new program is more time efficient and places the emphasis back on the asset owner to be responsible for their assets. The new program is now being introduced as a trial of 20 industrial properties which will expand to more properties over time.

Blacktown Council provides a unique example of how to manage and track assets in the private domain. Unique to the catchment, they have 2 officers and a full program dedicated to ensuring private stormwater assets are maintained properly.

If private stormwater treatment systems are required on site, as part of their development consent conditions, they require:

- Positive covenants and restrictions on the use of land, which outlines what can and cannot be done to the WSUD system, their legal requirements to the WSUD system, and provides a definition of what a WSUD system is (this includes OSD, WSUD and rainwater tanks).
- A maintenance schedule, which outlines what assets are on the property, what activities need to be done, when they need to be done, and where these assets are.
- Work-as-executed and stormwater management reports help the WSUD compliance team identify what assets are on the property and where they are.
- A maintenance contract is prepaid and ensures that maintenance will occur in the initial phase of occupation.
- A maintenance agreement to ensure that maintenance will occur for the life of the development.
- Ongoing maintenance reports are required after each maintenance activity to ensure compliance and to allow the program to track asset condition over time.

This compliance program is run using a WSUD compliance management system that allows the team to efficiently track compliance on the property or asset level.

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Blacktown City Council is willing to provide the WSUD compliance manual and all process maps once completed to allow other Councils to take advantage of the lessons learnt during this development of this program.

8.5 IMPROVING EROSION AND SEDIMENT MANAGEMENT

Erosion and Sediment control for construction activities is given effect through the *Protection of Environment Operations Act (1997)* (POEO Act). Fines may be imposed by the Environmental Protection Authority or a delegated authority if construction material runoff is likely to be washed into stormwater systems.

Although *reactive* fining may occur, there is no mandate for councils to develop *proactive* measures in relation to managing erosion and sediment runoff from sites. There is public guidance material to help in assisting councils in how they might proactively manage erosion and sediment runoff through their locally enforceable policies, such for development applications which require complying with conditions that can be mandated through a LEP or DCP.

Despite this lack of mandatory requirement, more than three quarters of DCPs (19/25) have erosion and sediment control requirements to help better manage sediment runoff proactively before an application is approved. When councils have proactive erosion and sediment controls, Erosion and Sediment Control Plans (ESCP's) are generally required in their DCPs. For high impact sites or large-scale development of 2500 m^2 further planning is required with more stringent mitigation measures through a 'Soil and Water Management Plan'. These generally uniform planning measures have been developed in accordance with guidance material; "Managing Urban Stormwater - Soil and Construction" (3rd Edition 1998) known as the 'Blue Book'.

Also on the proactive side, 12 of the GSH catchment councils participated in the 'Get the site Right' enforcement blitz in 2021, a program whereby construction sites are assessed across a large area for their compliance against POEO requirements. This is to foster better compliance with the Act and encourage better overall behaviours by builders in how they manage their site runoff.

In 2021 across 21 participating council areas across Sydney and the Hunter, there were still only 67% of sites compliant (out of 762 inspections) (NSW Environment Protection Authority, 2021). Compliance was 50% in 2018, 63% in 2019 and 63% in 2020. Caution around year-on-year trends must be noted as each year different sites are looked at, has different developers that are assessed and has different LGAs involved.

The 33% non-compliance rate in 2021, and previous years non-compliance being 50% to 37% indicates that overall, for erosion and sediment control in construction there is still significant room for improvement and highlights the potential need for more resources for compliance activity across the catchment.

8.6 EDUCATION AND ENGAGEMENT

In addition to the private development, councils can engage with private citizens in the community to promote stormwater quality outcomes. Broadly, this manifests in five ways. Councils can:

- support or organise targeted community clean up events or monitoring events to address stormwater pollution directly, such as 'Clean up Australia Day', Bushcare programs or the 'Harbourwatch' clean-up program.
- organise education campaigns on stormwater pollution as a topic, considerate of impacts and solutions available to groups or individuals such as North Sydney's 'how to manage stormwater in your backyard' or Willoughby placing signage for WSUD infrastructure they maintain.
- organise capacity building events to better equip the public on how they can manage stormwater pollution impacts themselves in their homes, such as Inner West's workshops on rainwater tank maintenance and care.
- provide monetary incentives such as rebate schemes to the community to reduce pollutant loads, such as Ku-ring-gai's rainwater tank rebate scheme.
- provide community grants for specific activities to be undertaken by the public to reduce stormwater pollution such as North Sydney's school-based grants program.

Overall, two councils had comprehensive programs that engaged in all five identified streams of community engagement: Ku-ring-gai, and Willoughby.

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Below is a breakdown of the level of engagement catchment councils had with respect to each of these methods of engaging directly with the community:

Table 9 engagement with the community across the Greater Sydney Harbour Catchment (council responses)

	Councils involved in community clean-up/ monitoring events	Education campaigns on stormwater pollution	Community capacity building events for diffuse source water pollution management	Incentives available to community to reduce pollutant loads	Community grants to reduce stormwater pollution
Yes	11	10	8	4	4
Potentially/ some	0	1	1	1	3
No	1	2	6	8	3
Unknown/ didn't respond	8	7	5	7	10

Education style programs and litter clean up events are favoured by councils over providing direct monetary incentives to individuals such as rebates or grants, with the latter being more complex and costly to implement.

In terms of net benefit, rebate schemes especially have an ongoing guarantee of benefit if engaged with by the community and can be scaled up or down depending on success and budgetary allocation/future State or federal government support. They can be tied to a specific or generalised behaviour providing the strongest incentive in the private domain to engage with the public post development currently. One off events or programs while raising awareness, do not commit funds to incentivise a particular behaviour and are generally one off or once a year. Rebate schemes should be looked at by more catchment councils if appropriate as a mechanism to encourage private citizens to improve existing stormwater quality outcomes for their sites.

8.7 SUMMARY OF FINDINGS

Stormwater quality provisions have been inserted into an already-complex planning system. While this has been done with clear intentions to give effect to higher-level objectives, in execution, two key issues with the approach have manifested in sub-optimal outcomes:

1) Lack of consistency undermines intent. Due to the number of different planning instruments and pathways through the planning system, the strong impression is of complexity and inconsistency in stormwater quality provisions. Even though most local planning provisions are aiming for similar outcomes, and most include very similar stormwater pollutant load reduction targets, each set of provisions has its own unique approach to defining exactly where and how these targets will apply. Meanwhile, the Codes SEPP is designed to facilitate development and bypass local planning provisions. These inconsistencies make it clear that stormwater quality controls are not essential to all development. Previous projects have called for greater consistency in the planning system (Parramatta River Catchment Group, 2018).
2) Significant challenges in implementation undermine effectiveness. While there is no doubt that stormwater quality treatment systems are capable of reducing pollution, their effectiveness is limited by many variables ranging from the appropriateness of design, installation and maintenance. Where councils have insufficient funding to maintain stormwater quality control assets, there is a tendency to shift this responsibility to the private landholder via conditions of consent. The case for this is presented as a source control strategy, but is fundamentally an outsourcing strategy. There is no evidence that private landholders are able to maintain stormwater control devices better or more efficiently that local government. Arguably the opposite is true (Ardren and Davies, 2022). Post approval, councils have little oversight over the state of private stormwater treatment systems. Examples of good practice with respect to compliance to development approvals exist, all be it piecemeal, that tends to reflect the under-resourcing and value of regulation (Ardren and Davies, 2022) that in turn undermines policy intent. The sustainability of funding, or more appropriately the lack of funding, has driven policy outcomes that brings into

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question who is better placed to manage the commons, in this case the Sydney Harbour Catchment and associated waterways. Any discussion about the appropriate split between public and private responsibilities for stormwater treatment is clouded by funding constraints.

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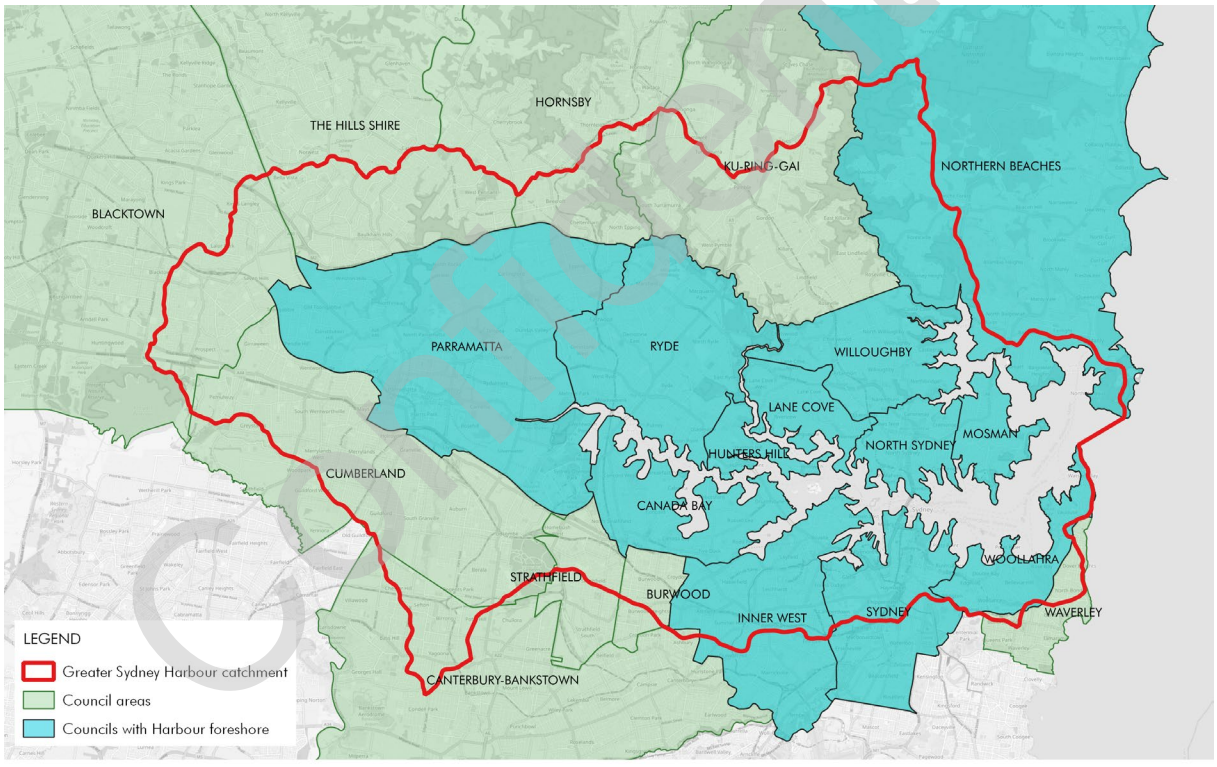
9 STATE OF PLANNING FOR SEA LEVEL RISE

Sea level rise will cause varying impacts around the Harbour and planning for it is a higher priority for some councils than others.

There are twelve GSH councils that include Sydney Harbour foreshores, these are shown in Figure 14. In each of these twelve LGAs, the topography and patterns of development are different, and therefore each of these LGAs are exposed differently to sea level rise. The southern shores of the Harbour are characterised by flatter topography, with larger areas of low-lying land at risk from future tidal inundation. Around tidal creeks, former coastal wetlands have been filled and developed. The southern shores also feature more industrial development and reclaimed foreshores. The northern shores of the Harbour are characterised by steeper topography, and development is often set on higher ground. While many coastal swamps have been filled, most of these low-lying areas are parks. Along the Lane Cove River and Middle Harbour foreshores, much of the development is set back from the foreshore with riparian land preserved around tidal creeks and embayments.



Greater Sydney Harbour catchment councils

Figure 14: councils with Sydney Harbour foreshores

Harbour beaches are generally well protected from ocean waves, but some are more exposed than others (e.g. Balmoral Beach at Mosman, which faces east towards the heads). During storms, significant waves can refract much further into the Harbour, causing erosion (Risk Frontiers, 2018). These variable conditions mean that foreshore councils experience king tides and storm events differently and have taken different steps to begin planning for sea level rise.

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9.1 STRATEGIC PLANNING

COMMUNITY STRATEGIC PLANS

Of the twelve councils with Sydney Harbour foreshores, only three of the current Community Strategic Plans mention coastal hazards. Where coastal hazards do feature in Community Strategic Plans, only one mentions sea level rise explicitly as a future challenge. Woollahra Council's current Community Strategic Plan includes a broad commitment to address the challenge, with a strategy to "monitor and strategically manage environmental risks and impacts of climate change". In two more of the Community Strategic Plans, resilience to natural hazards and climate change/climate-related risks features as one of the goals. However, neither of these mention sea level rise specifically. One makes a broad commitment to minimise risks to life and property from the impacts of climate change and increase the resilience of the environment. The other makes a more specific commitment to upgrade drainage and seawall infrastructure to reduce risks to the environment and community.

RESILIENCE STRATEGIES

Despite being absent from most Community Strategic Plans, eight of the twelve foreshore councils already have or are currently preparing a resilience or climate change adaptation strategy.

Among the existing strategies, these vary greatly in how they cover sea level rise (as might be expected given the variability in topography and development context described above). Where sea level rise is covered more thoroughly, the range of risks identified include:

- Higher storm surge levels
- Submergence and erosion of sandy shorelines
- Salt water intrusion and landward advance of tidal limits within estuaries
- Impeded stormwater drainage
- Compromised sewerage systems
- Lower level of protection provided by existing seawalls and other hard engineering structures
- Damage to private property
- Damage or loss of functionality of public assets and infrastructure
- Reduction in public open space areas.

Some of these strategies identify future actions specifically focused on addressing sea level rise. Some of these actions are simply focused on improved understanding of sea level rise, for example by mapping coastal vulnerability areas. The City of Ryde will "update flood studies to incorporate updated assumptions reflecting climate change projections for rainfall and sea level rise" (City of Ryde, 2020). Others aim to take steps towards adaptation. For example, the City of Sydney will: "Develop a sea level rise adaptation action plan" (City of Sydney, 2017).

The City of Sydney also states that it will "Advocate for a consistent NSW State planning framework to address sea level rise and storm surge" (City of Sydney, 2017). Staff from other councils expressed support for this idea, and it is discussed further below.

9.2 TECHNICAL STUDIES

FLOOD STUDIES

Flood studies have been a routine part of councils' activities for decades, and most of the waterways around Sydney Harbour have had multiple flood studies prepared, revised and updated since the 1990s. Over this time, modelling tools have improved, topographic data has become more accurate and the key industry guideline (*Australian Rainfall and Runoff,* 'AR&R') has been substantially updated.

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Consideration of climate change has been a common feature of flood studies for many years. The 2005 NSW Floodplain Development Manual (NSW Government, 2005) called for climate change to be considered in flood studies, and included basic guidance on an appropriate method, based on information available at that time. Since 2005, the scenarios considered, and parameters tested, have changed as research into climate change scenarios, sea level rise projections and impacts on rainfall intensity has evolved. Therefore, a review of past flood studies would reveal a range of different methods applied.

AR&R Project 19 specifically focused on climate change, aiming to deliver "advice on selecting appropriate planning horizons and climate change projections and the suitability of different methods when calculating the impact of climate change" (Geoscience Australia, 2019). The project has delivered an Interim Climate Change Guideline (Bates, et al., 2015) and the updated AR&R Book 6 (Ball, et al., 2019) includes interim guidance on how climate change should be considered, including its effects on rainfall and ocean levels. It recommends consulting Engineers Australia's "Guidelines for Responding to the Effects of Climate Change in Coastal and Ocean Engineering" (Engineers Autralia, 2017) for estimating changes to ocean levels.

A 2016 NSW Government Guideline (NSW Department of Environment and Climate Change, 2016) gives specific advice on how to address climate change in flood studies, providing a clear basis for examining climate change in projects undertaken under the State Floodplain Management Program and the 2005 Floodplain Development Manual. This guideline also addresses both rainfall and ocean levels.

Councils around Sydney Harbour have, therefore, noted that existing flood studies do address climate change. A list of current flood studies is provided in Table 10. Note that the key gaps are Lane Cove and Mosman LGAs. Both these councils have indicated that they intend to complete or update outdated flood studies. Elsewhere, existing flood studies will also be updated as needed.

Table 10: Current flood studies

Foreshore LGAs	Document name	Document type[18]	Year published	Notes on area covered
Canada Bay	Exile Bay Catchment Flood Study	FS	2020	The Exile Bay catchment covers a 345 hectare area with elevations that range from approximately 33m AHD to sea level at the Saltwater Creek channel and then discharges into Exile Bay proper
Hunters Hill	Hunters Hill LGA Flood Study	FS	2020	Entire LGA
Inner West	Leichhardt Floodplain Risk Management Study	FRMS	2017	Upper Leichardt area flowing to harbour
	Leichhardt Floodplain Risk Management Plan	FRMP	2017	The study area includes the suburbs of Annandale, Balmain, Balmain East, Birchgrove, Leichhardt, Lilyfield, and Rozelle and covers approximately 10.7 square kilometres.
	Hawthorne Canal Flood Study	FS	2015	
	Dobroyd Canal Flood Study	FS	2014	
Lane Cove	N/A			
Mosman	Draft Flood Study	FS	TBC	Mosman have indicated that they are developing a draft Flood Study but it is not yet publicly available.
Northern Beaches	Manly to Seaforth Flood Study	FS	2019	South Manly leading into harbour
North Sydney	Flood Study	FS	2016	Council wide
	Draft Floodplain Risk Management Study and Plan	FRMS/ FRMP	2022	Council wide - in draft

[18] FS = Flood Study; FRMS = Floodplain Risk Management Study; FRMP = Floodplain Risk Management Plan

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Foreshore LGAs	Document name	Document type[18]	Year published	Notes on area covered
Parramatta	Upper Parramatta River Catchment Floodplain Risk Management Study and Plan	FRMP/ FRMS	2003	Upper Parra catchment
	Lower Parramatta River Floodplain Risk Management Study - Flood Study Review	FRMS	2005	Lower Parra catchment
	Lower Parramatta River Floodplain Risk Management Study and Plan - Volume 1 - Main Report	FRMP	2005	Lower Parra catchment
	Lower Parramatta River Floodplain Risk Management Study and Plan - Volume 2 - Planning	FRMS	2005	Lower Parra catchment
	Floodplain Management Review and Supplementary Plan - North Wentworthville	FS/ FRMP	2002	North Wentworthville
	Duck River and Duck Creek Flood Study Review	FS	2012	Duck River
	Duck River Catchment Floodplain Risk Management Plan - Final Report	FRMP	2012	Duck River
Ryde	Flood Study	FS	2013	The Parramatta River – Ryde Sub Catchments include Archer Creek, Denistone, Charity Creek, River and Gladesville catchments. All catchments are tributaries of Parramatta River
	Floodplain Risk Management Study and Plan	FRMP/FRMS	2015	
Sydney	Floodplain catchment: Sydney City	FRMP/FRMS/ FS	2016	Main CBD
	Floodplain catchment: Darling Harbour	FRMP/FRMS/ FS	2016	Darling harbour
	Floodplain catchment: Johnstons Creek	FRMP/FRMS/ FS	2015	The Johnstons Creek Catchment area includes Annandale, Camperdown, Forest Lodge and parts of Glebe and Newtown.
	Floodplain catchment: Blackwattle Bay	FRMP/FRMS/ FS	2015	The Blackwattle Bay catchment area includes Glebe, Chippendale, Darlington and parts of Camperdown, Ultimo and Redfern
	Floodplain catchment: Woolloomooloo	FRMP/FRMS/ FS	2016	Woolloomooloo, Darlinghurst, Kings Cross, Potts Point and parts of Rushcutters Bay are suburbs included in this catchment
	Floodplain catchment: Rushcutters Bay	FRMP/FRMS/ FS	2016	Parts of Paddington, Darlinghurst and Rushcutters Bay are suburbs included within this catchment
Waverley	Waverley LGA Flood Study	FS	2019 (draft)	
Willoughby	Flat rock Creek Flood Study	FS	2018	
	Flat rock Creek Floodplain Risk Management Study and Plan	FRMS/ FRMP	2018	
	Sailors Bay Creek Flood Study	FS	2018	
	Scotts Creek Flood Study	FS	2018	
	Sugarloaf Creek Flood Study	FS	2010	
	Sugarloaf Creek Floodplain Risk Management Study and Plan	FRMS/ FRMP	2013	

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Foreshore LGAs	Document name	Document type[18]	Year published	Notes on area covered
	Swaines Creek Flood Study	FS	2014	
	Blue Gum Creek Flood Study	FS	2016	
Woollahra	Rushcutters Bay Catchment Flood Study	FS	2007	
	Rushcutters Bay Catchment Risk Management Study and Plan	FRMS/ FRMP	2012	In locations where flooding is indicated by both the Rushcutters Bay FRMSP and the Paddington FRMSP the flood information contained in the Paddington FRMSP is to take precedence.
	Double Bay Catchment Flood Study	FS	2008	
	Double Bay Floodplain Risk Management Study and Plan	FRMS/ FRMP	2011	
	Draft Watsons Bay Floodplain Risk Management Study and Plan - May 2016	FRMS/ FRMP	2016	
	Paddington Floodplain Risk Management Study and Plan	FRMS/ FRMP	2019	
	Draft Paddington Flood Study	FS	2016	
	Rose Bay Catchment Flood Study	FS	2010	
	Rose Bay Floodplain Risk Management Study and Plan	FRMS/ FRMP	2014	

ESTUARY STUDIES

In addition to the flood studies, some councils have completed Estuarine Planning Levels (EPL) studies. These EPL studies cover parts of the foreshore that may not have been covered by flood studies, which are often focused on specific drainage catchments. EPL studies incorporate a sea level rise factor as well as accounting for wind, waves, and freeboard.

EPL studies have been completed for the former Leichhardt LGA (Cardno Lawson Treloar, 2010) and Woollahra Council's foreshore area (BMT, 2021). Northern Beaches Council also indicated that they are currently extending their EPLs to the Harbour and other catchments, based on the same method formerly applied to Pittwater (Cardno , 2015). Northern Beaches staff said that North and Middle Harbour EPLs are in draft and have not yet been adopted. However, the former Manly Council completed an Identification of Coastal Hazard Risk Areas to Projected Sea Level Rise for the Manly Local Government Area (UNSW Water Research Laboratory, 2012).

Note that the City of Sydney includes a map showing extent of inundation for a sea level rise scenario within their climate change adaptation plan, attributing the source of the image to Sydney Coastal Councils Group (City of Sydney, 2017, p. 15).

Recent EPL studies follow the guidance in the current Coastal Management Manual (NSW Office of Environment and Heritage, 2018). Some have noted that these guidelines do not define specific sea level rise benchmarks. Benchmarks were previously recommended by the NSW Government (Department of Environment, Climate Change and Water NSW, 2010). Instead, the current guidelines recommend a risk-based approach. This makes assessment more complex, but it is consistent with the well-established approach to flood studies.

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9.3 PLANNING FOR SEA LEVEL RISE

PLANNING FOR PUBLIC ASSETS

Sydney Water is undertaking planning for sea level rise; this is particularly focused on wastewater pumping stations. Wastewater pumping stations are located in low-lying areas and are vulnerable to the impacts of tidal inundation, both:

- Chronic impacts – more frequent saltwater ingress accelerates corrosion of pipes, pumps and other equipment, and can impact on wastewater treatment processes, particularly where biological processes are part of the treatment system.
- Acute impacts – pumping stations include electrical equipment and extreme water levels can damage electrical systems, taking pumping stations offline.

Sydney Water uses a risk assessment screening tool to identify pumping stations at greatest risk and plan site-specific modifications to reduce the risk.

Council assets likely to be affected by sea level rise do not have the same vulnerabilities as Sydney Water's wastewater pumping stations. Typical council assets exposed to future tide levels are seawalls, drainage infrastructure, roads, paths, parks, and reserves. There are also Sydney Water drainage assets.

Four councils (Northern Beaches, Ryde, Willoughby and Woollahra) told us they have done some risk assessments of low-lying assets. Northern Beaches and Ryde referred to internal reports. Willoughby Council said they have only done a high-level assessment, but as the urban area in Willoughby LGA is set back from the foreshore and elevated, this identified low risks and no need for more detailed assessment.

PLANNING PROVISIONS FOR PRIVATE DEVELOPMENT

Several of the foreshore councils were clear that planning provisions for private development are a greater concern and higher priority than planning for their own assets.

Most of the councils have a foreshore building line defined in their LEP, limiting the extent of development near the foreshore, however this is not a level control, only a setback.

Level controls may come in via flood planning levels or estuary planning levels:

- Because sea level rise is considered in flood studies, this consideration flows through to setting flood planning levels and identifying properties subject to flood controls.
- Where separate EPL studies have been completed (Woollahra and former Leichhardt LGAs), EPLs work together with flood planning levels in the DCP.

Some of the other foreshore councils have identified a need to update Flood Planning Levels to account for sea level rise. For example, this is identified in the City of Ryde's Resilience Plan and the City of Sydney's climate change adaptation plan.

As mentioned above, the City of Sydney plans to "Advocate for a consistent NSW State planning framework to address sea level rise and storm surge." Staff from other councils expressed support for this idea. They made a comparison with floodplain management, where a clear framework (as set out in the NSW Floodplain Development Manual and its supporting guidelines) has provided consistency in the planning approach between different LGAs across NSW. This has made it easier for councils to apply new planning controls. Flood Planning Levels have often been poorly received by landowners, as they restrict development, decrease land values and increase development costs on flood prone land. A consistent approach has helped get these planning provisions adopted in most cases.

In addition, Woollahra has indicated that it conditions seawall design specifics for water side development as part of DA consents to allow for sea level rise, including specifying crevices and flowerpot rock pools to encourage habitat growth in the sea wall as sea levels rise.

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9.4 PUBLIC WORKS ADDRESSING SEA LEVEL RISE

Council assets affected by king tides and sea level rise include seawalls, drainage infrastructure, roads, paths, parks and reserves. These assets are subject to ongoing maintenance and planned renewals. It is not clear how sea level rise is being considered when these asset classes are renewed.

At least six of the councils around the harbour are progressively upgrading their seawalls, as they are due for renewal. Some refer to a specific "seawall capital works program" while others identify recent or planned seawall projects. However, in most cases, it is unclear how sea level rise is being considered in these seawall upgrades (in some cases, whether it is being considered at all).

Some councils mentioned ad-hoc projects they have completed to address drainage issues where stormwater outlets are tidally affected. These included:

- Mosman Council has a stormwater outlet on Balmoral Beach that blocks with sand and frequently needs to be jetted. In some locations they have been able to reduce similar issues with strategically placed sandstone blocks (to improve hydraulics) but this isn't possible at all outlets.
- Woollahra Council has a stormwater outlet that was getting clogged due to oyster growth inside the pipe (and other materials were getting caught on the oysters). They have addressed this with a duckbill valve to prevent saltwater ingress.

Some councils mentioned that some roads, paths, parks, and reserves are affected by tidal inundation or poor drainage during king tides, but councils characterised these as an intermittent nuisance and a maintenance issue, indicating they are not yet considering more intensive intervention.

9.5 SUMMARY OF FINDINGS

The GSH councils experience king tides and storm events differently, and have taken different steps to begin planning for sea level rise. There are needs to fill some gaps and interest in a consistent approach:

1) The impacts of sea level rise are not widely considered by councils in their strategic planning nor asset management and replacement programs. Sea level rise is an issue that requires long-term planning and consideration when replacing physical infrastructure with a long asset life, such as sea walls.
2) Flood studies are an important tool to consider the impacts of climate change, including sea level rise, and incorporate this consideration into setting flood planning levels for development. Flood studies are reasonably complete around the Harbour, with Lane Cove and Mosman the key gaps. Some of the older flood studies are also due for an update and some councils have identified this as a priority.
3) Estuary Planning Levels studies have been completed for some areas, to cover parts of the foreshore areas not included in flood studies. If an EPL study could be completed as part of the CMP, this is clearly of interest to some of the councils who still have gaps. Preferably, a consistent approach is taken for the Harbour as a whole.
4) Some councils have assessed the risks to public assets from sea level rise. There is some interest in a framework that can be applied consistently to assess assets at risk and plan for future maintenance, renewals and upgrades, however this is not a high priority for councils.

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10 CONCLUSIONS

CONSTRAINTS ON EFFECTIVE STORMWATER MANAGEMENT

Each section of this report has concluded with a summary of findings. As there are considerable synergies and overlap of these findings, this chapter seeks to consolidate the summaries and makes specific recommendations. The implementation of these will be necessary to overcome the current path dependencies and practices of state and local governments as they seek to tackle this complex problem. These findings should directly inform the investigation into stormwater management options (Study 2) and the governance and funding review (Study 3) planned as part of the GSHCMP and commencing now.

This investigation into stormwater management has found that organisational capacity for effective stormwater management is constrained largely due to three interrelated factors:

- Governance is fragmented, with both vertical integration and horizontal coordination lacking. Within this, there are notable gaps between the high-level waterway health goals and their translation into specific and accountable objectives and actions in the operational plans of relevant state agencies and councils.
- Funding arrangements are inconsistent in terms of what revenue is collected and how it is allocated to waterway health outcomes. Most critically, funding is inadequate to address the aspirations of the community and government to improve waterway heath for Sydney Harbour and its tributaries.
- Effective collaboration is hindered by the gaps in governance and funding, as well as persistent challenges working across organisational boundaries to tackle a complex challenge.

UNCERTAIN STORMWATER MANAGEMENT OUTCOMES

These factors have led to stormwater quality and waterway health practices which are inconsistent across the catchment, and it is not clear how much different practices are contributing to waterway health outcomes.

- In the public domain, some basic stormwater management activities (e.g., street sweeping, gross pollutant traps) are widespread across the catchment, but more complex activities requiring cross-boundary collaboration (e.g., natural treatment systems, stormwater education, litter prevention) are applied inconsistently depending on organisational capacity and local priorities.

- In private development, while there is some consistency in the high-level objectives and targets in various planning provisions, they are applied to different types and scales of development in various state and local provisions, creating inconsistency. There are also questions emerging over the effectiveness of stormwater treatment in the private domain.

This study has also examined how councils and others are planning for sea level rise and the impacts this may have on natural (e.g. estuaries) and engineered (e.g. sea walls) assets. This has revealed similar challenges with respect to coordination, asset planning and renewal, and risk management.

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DIRECTIONS FOR STUDIES 2 AND 3

The following broad findings should be further investigated in Studies 2 and 3, which will complete Stage 2 of the CMP:

1. Governance

1.1. Governance arrangements require stronger vertical integration (between levels of government) and horizontal coordination (across boundaries between organisations at the same level of government).

1.2. High-level goals, that are largely set by the State Government, need to flow through to local plans and policies. This vertical policy consistency must have complementary and supporting objectives, targets, and actions that link strategic intent to operational activities.

1.3. Accountability is needed to ensure relevant organisations tasked with specific actions both undertake and report on their progress. Accountability and reporting must operate and coordinate at the local to Sydney Harbour catchment scales.

1.4. Monitoring and reporting require a standardised catchment-based framework.

2. Funding

2.1. Improved funding models are required to provide a consistent and coordinated approach that will complement community aspirations for clean and healthy waterways.

2.2. A more coordinated and strategic approach to funding is required. In the current system, funding determinations are made separately for each organisation involved in managing the catchment, and therefore decisions are defined by local and other specific organisational priorities rather than catchment-scale objectives. Funding should be structured to account for needs and community willingness to pay at the catchment scale, so that it can then be allocated more effectively to meet catchment-scale objectives.

2.3. Independent oversight of funding is needed to ensure money is spent where it is needed and that results are being achieved (linking back to improved governance)

3. Collaboration

3.1. Improved collaboration between state and local government is needed to reduce inefficiencies in the management of waterway health policies and projects.

3.2. Reduce the barriers for research institutes, industry bodies, and different parts of government to work in partnership and provide the evidentiary basis for policy formation and operational decisions.

3.3. Continue to support regional organisations of councils, such as Parramatta River Catchment Group and Sydney Coastal Councils Group, as forums to collaborate and exchange ideas and experiences. These organisations bring together the common expertise and needs of councils, and are helping to enable collaboration between state government, private sector and research institutes, as mentioned in points 3.1 and 3.2.

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