

Operation and Maintenance of Stormwater Control Measures for Stream Protection

Little Stringybark & Dobsons Creek Projects
Fact Sheet Series: 7

The Little Stringybark Creek (LSC) and Dobsons Creek projects were long-term catchment-scale experiments designed to test if Stormwater Control Measures (SCMs)—primarily rainwater tanks, raingardens and infiltration systems—applied across an urban catchment can help restore stream condition. Commencing in 2008, the projects were led by The University of Melbourne and Melbourne Water, in collaboration with local government, industry, and property owners. We monitored changes to stream water quality, hydrology, and ecology (Fact Sheet 10), and also assessed techniques for local government collaboration (Fact Sheets 3 & 4), community engagement (Fact Sheet 5), as well as SCM design, performance and maintenance (Fact Sheets 6 & 7).

About the fact sheets

These fact sheets summarise our scientific and practical findings and insights on catchment-scale stormwater management over the long-term LSC and Dobsons Creek projects. We hope that they might inform and guide the planning and delivery of future waterways management projects for improved stream health.

Maintaining SCMs

The two projects collectively constructed close to 1,000 SCMs (620 at LSC and 372 at Dobsons Creek). The majority of these were located on private land and mainly consisted of rainwater tanks designed for water harvesting for reuse (e.g. toilet flushing) and localised infiltration. Participation by homeowners was encouraged through multiple incentive programs (see Fact Sheet 5). Public land installations included a wider variety of SCMs such as rainwater tanks, raingardens, vegetated infiltration basins, swales, and membrane filters. These public SCMs were designed, constructed, and operated in collaboration with local government and varied in surface area (2 m²- 1900 m²) and the area of impervious surface they treated (80 m²- 5 ha).

Like all infrastructure, SCMs must be maintained to prevent system failure and deliver the benefits for which they were installed. Unfortunately, insufficient maintenance of SCMs is common, with inadequate

Findings and insights

1. Proactive and regular maintenance is critical
2. Design SCMs with maintenance in mind
3. Define SCM maintenance responsibilities during the design phase
4. Construction budgets should include both short- and long-term maintenance costs
5. Having a dedicated officer responsible for maintenance can be highly valuable
6. Community-based maintenance requires ongoing support and education
7. Constructing 'public-good' SCMs on private property can present a challenge to longer term service delivery
8. Ensure 'as-constructed' plans are prepared and available

See over for more details

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communication between stakeholders, unclear responsibilities, lack of knowledge, and financial barriers often cited reasons for this (Blecken *et al.* 2017).

Project findings & insights

This fact sheet is not intended to be a comprehensive guide to operating and maintaining SCMs. Rather, it is intended to share the experience and knowledge gained from our two decades of applied research on stormwater management. See the Further Information section at the end of this fact sheet for additional guidance on the operation and maintenance of SCMs.

1. Proactive and regular maintenance is critical. All SCMs installed were designed so that stormwater would bypass around them if they stopped functioning, so they would not impact nearby assets (e.g. properties). This means that for any casual observation of the SCM, it could appear that the SCM is still operating. The projects found that only through regular, thorough inspection – ideally during rainfall events – could faults be identified. It was also noted that insufficient maintenance was directly responsible for the rapid deterioration of SCM performance. This was typically a result of sediment accumulation, leading to blocked inlets, clogging of filter media, and loss of vegetation. For the LSC project, employing a dedicated SCM maintenance officer to undertake regular monitoring and intervention (maintenance) resulted in a dramatic improvement in SCM performance.

2. Design SCMs with maintenance in mind. Consideration should be given to the expected maintenance requirements during the design phase of an SCM. This includes both the type of maintenance (e.g. sediment removal, weed control, electrical systems) and the likely frequency of those tasks. Doing so will require an understanding of the local context of the SCM (e.g. proximity to sediment sources such as gravel driveways). Consideration should also be given to who will be responsible for maintenance and their capacity to do this (i.e. knowledge, skills, and access to resources and equipment). Ideally, those responsible for maintenance would be consulted during the design phase, including maintenance program coordinators and those physically performing maintenance tasks. Considering maintenance during the SCM design phase helps to make maintenance as easy as possible and could build redundancies into the system if the maintenance capacity or schedule is in any way restricted. Some of the design considerations will be simple, such as ensuring access to sediment traps and the selection of locally appropriate vegetation.

3. Define SCM maintenance responsibilities during the design phase. Creating a network of SCMs will likely mean there are multiple actors operating and maintaining individual SCMs. This can be people from different agencies (e.g. water authorities, local governments), different departments

within the same agency, and private landowners. Defining maintenance responsibilities for each SCM – or components of SCMs – prior to construction is important to ensuring continued operation. It also allows for those responsible for maintenance to contribute to the design (see previous finding) and ensure that there is a clear understanding of, and commitment to, maintaining the SCMs prior to investment in construction. For example, in the LSC project, vegetated SCMs were initially a maintenance challenge, since it required involvement from two local government departments - civil engineering to manage the 'grey' components (e.g. pipes and pits) and parks/bushlands to manage the 'green' components (i.e. vegetation). The project team had initially worked with the environmental and civil engineering teams and failed to incorporate the parks/bushlands management team into planning discussions. This caused delays in establishing an effective maintenance program.

4. Construction budgets should include both short- and long-term maintenance costs. For the LSC project, adding multiple SCMs to Yarra Ranges Council's asset register required a significant uplift in maintenance costs. Since SCMs require ongoing maintenance to function effectively, insufficient resourcing for maintenance puts their performance at risk – which is what happened in the early phases of the LSC project. One strategy to support the ongoing maintenance of SCMs could be to incorporate, and set aside for later use, the ongoing cost of maintenance as part of the total project costing. Similarly, consideration should be given to contingency funding for rectification works, should significant post-construction performance issues be identified. For the LSC Project, maintenance costs were found to be highest within the first 1-2 years post-construction and this was largely due to the weeding effort required until plants were established, as well as any necessary rectification works.

5. Having a dedicated officer responsible for maintenance can be highly valuable. Perhaps the single biggest improvement to the ongoing maintenance and performance of SCMs in the LSC project was the employment of a dedicated maintenance officer through the local government. The maintenance officer ensured that SCMs were monitored



Blocked inlet, roadside infiltration basin, Mount Evelyn.

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regularly (especially after rainfall events, when sediment deposition could block inlets) and that any rectification or repair works were completed promptly. They also enhanced the SCMs' appearance, sustaining community support.

6. Community-based maintenance requires ongoing support and education. Although community members are generally willing to maintain SCMs installed on their properties (mainly rainwater tanks), sufficient and timely maintenance does not always occur. There are two likely reasons for this: reduced motivation and insufficient capacity. It is difficult to influence motivation. One approach is to maintain a long-term relationship with the asset owners and communicate the ongoing value of their asset to both themselves (e.g. water savings) and the broader community (i.e. flood mitigation, waterways protection). To build capacity, private SCM owners need both knowledge of the likely maintenance requirements of their asset (i.e. what is most likely to 'fail', how often they need to inspect) and the capability to undertake the necessary repairs (or, at least, the knowledge of who can assist them with repairs). Scheduled reminders or sensors could provide alerts for maintenance tasks (e.g. cleaning roof gutters, checking tank filters) or failures (e.g. pump malfunction). All this aside, it is possible that a repair lag will still occur because the cost of SCM repairs competes with other financial demands. In the LSC project, the repair of common household assets, such as cars, heaters, and washing and cooking appliances, was given higher priority.

7. Constructing 'public-good' SCMs on private property can present a challenge to longer term service delivery. Whilst rainwater tanks on private land benefit both property owners (e.g. reduced water bills, alternative water supply) and the public (e.g. reduced runoff volume), other SCMs on private land primarily serve public interest through infiltration, evapotranspiration, and improved

water quality. For the first of the larger, public-good, infiltration-based SCMs built on privately-owned properties in the LSC project, maintenance was negotiated to be the responsibility of the property owner. There were several problems with this approach, the most notable being the reduced capacity and motivation to maintain the SCM in the long-term, and changes in property ownership that required the project to engage with the new owners, often unsuccessfully. Later in the LSC project, responsibility for maintenance of public-good SCMs installed on private land was retained by the local government. However, this also presented difficulties. First, these systems were typically less visible, so their maintenance needs were not as easily identified. Second, local government staff were required to seek permission to access the property whenever inspecting or undertaking maintenance – adding friction to the maintenance regime. Whenever SCMs must be placed on private land, authorities must ensure appropriate measures are in place for the long-term management of those assets.

8. Ensure 'as-constructed' plans are prepared and available. Having accurate records of an SCM's design, as it was constructed, is important to ensuring ongoing operation. Construction cannot always follow the pre-determined design. For example, previously unidentified services (e.g. gas pipes) and local soil conditions can require changes to the design during construction. The importance of documenting any adjustments made to the SCM increases with time, as memories fade and people move to different roles or organisations. Additionally, records could also include a process diagram, which can also be helpful in setting up effective maintenance programs/schedules.

References

Blecken, G. T., W. F. Hunt, A. M. Al-Rubaei, M. Viklander and W. G. Lord (2017). "Stormwater control measure (SCM) maintenance considerations to ensure designed functionality." *Urban Water Journal* 14(3): 278-290.

For more details on the outcomes of this project and guidance on the operation and maintenance of SCMs, please refer to:

- Walsh, C. J., D. G. Bos, M. J. Burns, M. Imberger and T. D. Fletcher (2023), "Restoring the health of urban streams through stormwater management: A synthesis of the Little Stringybark and Dobsons Creek research projects", Technical report 23.2, Melbourne Waterway Research-Practice Partnership.
- DEECA (2024), "How to get the most out of your rain water tank", Department of Energy, Environment and Climate Change, Victoria State Government.
- Melbourne Water (2013), "WSUD maintenance guidelines: A guide for asset managers".
- Water by Design (2012), "Maintaining Vegetated Stormwater Assets".
- Little Stringybark Creek and Dobsons Creek Projects: Fact Sheet Series
 1. Managing Stormwater at the Catchment Scale
 2. Collaborative Stormwater Management: Co-design and Co-delivery for Long-Term Success
 3. Collaborating with Local Government on Stormwater Management
 4. Enacting Stormwater Management through Local Government Planning Schemes
 5. Enhancing Community Engagement and Participation in Stormwater Management
 6. Design and Performance of Stormwater Control Measures for Stream Protection
 7. Operation and Maintenance of Stormwater Control Measures for Stream Protection
 8. The Stormwater Metric 'S': A Tool for Predicting Benefits from Improved Stormwater Management
 9. Monitoring the Effectiveness of Stormwater Control Measures
 10. Stream Health Response to Catchment-Scale Stormwater Management