Operation & Maintenance of WSUD Infrastructure
“..Councils are very sensitive to the risk of grant-funded or gifted assets that become long term financial liabilities due to their maintenance and renewal requirements.”

Municipal Association of Victoria
Submission to the Office of Living
Victoria’s Melbourne’s Water Future,
September 2013
How did this workshop come about?

SIA supported initiatives

- Stormwater Harvesting and Reuse Technical Tour, Adelaide 2011
- Industry Testing and Validation Program - Gross Pollutant Traps (GPT)
- Regional Stormwater Projects Tour – Geelong, 2012

IPWEA Vic support of stormwater initiatives

- Independent verification of stormwater treatment devices (joint submission to OLV)
- Stormwater Harvesting Guidelines (joint submission to OLV and Living Rivers)
- Development of expertise in WSUD Assets management

Various Components of WSUD

The differences between WSUD – treatment prior to discharge (TPD) and SWH (capture, treat and use) are not currently well defined and/or clearly understood by the industry.

<table>
<thead>
<tr>
<th>Practice area</th>
<th>Planning &amp; Design Standards</th>
<th>Functionality &amp; Performance assessment rationale</th>
<th>Operation &amp; Maintenance Data &amp; Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage, Conveyance, Flood mitigation</td>
<td>Well established standards and tools (e.g. design tables, software)</td>
<td>Well established practice</td>
<td>50+ years of good data</td>
</tr>
<tr>
<td>WSUD – TPD (treatment prior to discharge)</td>
<td>Guidelines &amp; recommendation (not standards), some software e.g. Music</td>
<td>Not well established</td>
<td>3 – 10 years; scattered data; some guidelines on O&amp;M published</td>
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<tr>
<td>Stormwater Harvesting (collection, treatment, use)</td>
<td>Absence of established standards and tools</td>
<td>Not established</td>
<td>1 -5 years; very little data</td>
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The robust engineering basis for the planning, design, construction, operation and maintenance of urban stormwater harvesting (SWH) is yet to be developed.

In the absence of the established engineering basis for stormwater harvesting – designers of these schemes frequently resort to the approaches borrowed from the more traditional disciplines such as municipal drainage and water sensitive urban design (WSUD).
Guidelines and References


Life of Stormwater project
Assets life cycle

Acquisition

Operation and maintenance

Disposal

Renewal
Life cycle costs

The key components of a life cycle assessment:
• Capital expenditure
• Installation
• Operation
• Ongoing maintenance and labour costs
• Replacement costs and timing for significant expenditure
• Life span
• Decommissioning costs
Indicative LCC chart

Real cost (Non Cumulative)

Total acquisition costs

Use and maintenance and Renewal and adaption costs

Disposal costs

Initially elevated maintenance costs (e.g. landscaping)

Infrequent costs to maintain the measures (e.g. Replacement of a gross pollutant trap’s screen)

- Construction
  - Detailed design and development
  - Preliminary design
  - Conceptual design
  - Definition of need

- Time
  - Typical annual maintenance costs

- Renewal/adaption costs
  - Decommissioning costs

Budgeting for your assets

Expenditure on assets

Recurrent
- Operating
- Maintenance

Capital
- Renewal
- Upgrade
- Expansion
- New
Funding sources

<table>
<thead>
<tr>
<th>Internal sources</th>
<th>External sources</th>
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</thead>
<tbody>
<tr>
<td>Capital works</td>
<td>Melbourne Water stormwater funding</td>
</tr>
<tr>
<td>Asset renewal programs</td>
<td>DSE alternative water sources fund</td>
</tr>
<tr>
<td>Traffic management programs</td>
<td>Water retailers water saving funding</td>
</tr>
<tr>
<td>Parks</td>
<td>Federal funding e.g. Community Water grants</td>
</tr>
</tbody>
</table>

From “City of Melbourne WSUD Guidelines” page 26
Sources of O&M budget

- There is a difference in the source of funding between those two groups
- Who can charge customers for water? Water retailers role and interest in SWH

- TPD (treatment prior to discharge)
  - Stormwater management levy
  - Council Rates
  - WSUD offset
  - Developers

- SWH (capture, treat & use)
  - Offset potable water costs
  - End user contribution

Delivery options

✓ Design – tender – construction
   ✓ Typical delivery option
   ✓ Estimated costs versus the Contractor costs
   ✓ Contractor guarantees the delivery but not the performance
   ✓ Hand over protocol (especially for bio filters/wetlands)
   ✓ Commissioning protocols

✓ Design and Construct
   ✓ Not commonly associated with Stormwater projects but used extensively in waste water treatment
   ✓ Performance guarantee provided by the Contractor
   ✓ Can be expanded to “design, build and operate”
   ✓ Generally more cost effective

Known Issues

- Large percentage of externally funded WSUD projects have underestimated project delivery costs 50% to 100%.
- These discrepancies only transpired at the Construction tender stage (once the funding contracts had been signed).
- The accuracy of estimated O&M costs will be tested in the next few years.

Local Government have certain barriers to overcome in the selection of the best (not cheapest) advice in the areas of WSUD.
Part 1 Questions
Part 2 - Maintenance Planning
Developing an asset management strategy

- current asset stock
- condition of current assets
- operating and maintenance costs
- future renewal profile
- the funding base for operation, maintenance and renewal

The strategy should be converted into action through the asset management plan
Asset management plan

The asset management plan generally requires three (3) different planning horizons:

- 20+ years for forecasts
- 4 years+ tied to the council plan, and
- annual planning tied to the council budget

The asset management plan is not a static document and should be regularly reviewed (every 4 - 5 years) in the light of experience gained and lessons learnt by council.
Assets maintenance

- Proactive planned maintenance
- Reactive unplanned maintenance
- Rectification
- Maintenance of asset records
- Conditions assessments audits
- Renewal

‘failing to plan means planning to fail’
Proactive maintenance

Proactive maintenance is a set of scheduled tasks to ensure that the WSUD asset is operating as designed.
Reactive maintenance

Reactive maintenance is undertaken when a problem or fault is identified that is beyond the scope of proactive maintenance. Reactive maintenance often requires a swift response, and may involve specialist equipment or skills.
Rectification

Rectification of a WSUD asset is undertaken when the system is not functioning as intended, and proactive and reactive maintenance activities are unable to return the asset to functional condition. Asset condition assessment is typically required to inform the decision process e.g. to increase maintenance frequency or to rectify an asset.
Rectification assessment process

- Problem
- Cause
- Investigation requirements
- Rectification
- Feasibility assessment
- Why did it happen?

Condition assessment & audits

It is recommended that audits of WSUD systems are undertaken periodically to:

- monitor the condition of assets
- assess the effectiveness of maintenance (especially important when assets are maintained by an external party)
- determine likely timeframes for renewal
- It is recommended that audits are undertaken of:
  - each asset at least every 10 years
  - all assets covered by a maintenance contract at the start and end of the contract
  - a sample of assets covered by a maintenance contract each year
In house and outsourcing management options
Maintenance of stormwater treatment systems may be:

- undertaken in-house using works crews
- outsourced to a single contractor
- outsourced to separate contractors

Maintenance contract should outline:

- scope of works
- project duration
- performance criteria
- activity specifications
- reporting and audit requirements
Assets maintenance plan

Maintenance plans should be developed for all WSUD assets.

The plans need to clearly identify the maintenance requirements and state who is responsible for the on-going maintenance.

All maintenance plans should be approved by council prior to commencement of the maintenance period.
In brief a maintenance plan should include:

- inspection frequency
- maintenance frequency
- data collection/ storage requirements (i.e. during inspections)
- detailed cleanout procedures (main element of the plans) including:
  - equipment needs
  - maintenance techniques
  - occupational health and safety
  - public safety
  - environmental management considerations
- disposal requirements (of material removed)
- access issues
- stakeholder notification requirements
- data collection requirements
- design details
Part 2 Questions
Part 3 – Performance assessment of WSUD projects
Targets TPD

- All WSUD projects need to be measured, and their contribution to improving water quality logged as progress in meeting a water quality improvement target for that municipality.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Target</th>
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<tbody>
<tr>
<td>total suspended solids</td>
<td>80% reduction</td>
</tr>
<tr>
<td>total phosphorus</td>
<td>45% reduction</td>
</tr>
<tr>
<td>total nitrogen</td>
<td>45% reduction</td>
</tr>
<tr>
<td>litter</td>
<td>70% reduction</td>
</tr>
</tbody>
</table>

- Melbourne Water is providing support to all municipal councils to undertake municipal target setting and reporting.
Targets SWH

• Product water quantity
• Product water quality
• Reliability of supply (is water available when most needed e.g. irrigation season)
• Is system performing as designed
  o Ease of operation
  o Maintenance regime
• Monitoring the environmental impact (e.g. soil tests for irrigation)
• Inspections
• Performance Audits
Sample audit scope

• assess the information like assets location, type and contributing catchment etc.
• calculate the theoretical pollution load per each device per year
• inspect the sites, walk the catchment, confirm the types of assets e.g. GPT's.
• adjust the theoretical model with observations
• assess the theoretical loads against the practical history of cleans based on Council data
• report and recommendations incl. confirm list/type of Council assets, assessment of the devices performs theory vs practice, any discrepancy between theory and records of cleaning, recommendations

Typically this exercise delivers 10% saving on the annual cleaning budget (based on GPT audits)
Project stakeholders

- Assets owner
- Scheme Operator
- Water supplier/distributor to end users
- Customers
- Regulators

It is important to understand the responsibilities and risks (liabilities) associated with each of the listed groups.
Risk management plan is the most appropriate mechanism for legal compliance and liability management of WSUD projects.

A risk management plan should be included on the relevant Council’s risk register and/or on the Council’s Environmental Management System (EMS).
Stormwater Harvesting Scheme

Major Components


BH: 03 9502 4229
Independent verification scheme for stormwater treatment devices
Selecting the right treatment train to meet the water quality objectives is essential for the successful and sustainable operation of WSUD systems.

At present, there are no standard methods or guidelines for the testing, validation and performance assessment of stormwater treatment devices in Australia which leaves a large number of stormwater practitioners dependent on in-house expertise and manufacturer’s advice in selecting appropriate stormwater treatment strategies and estimating costs to operate and maintain these assets.
Development of Storm Water Harvesting Guidelines


BH: 03 9502 4229
One of the major barriers to the wider uptake of WSUD and particularly SWH is the absence of comprehensive guidelines. Such guidelines would allow the stakeholders in schemes (councils, water authorities, regulators, consultants, contractors and other groups) to have a uniform reference document outlining current best practice including legislative framework, design/functionality, construction, operation and maintenance.
Conclusions

- As the number of Storm water assets maintained by VIC Local Government increases – so does the need to have a well defined O&M strategy, clear understanding of expected performance, reliable estimate of all the costs and a competent team to support it.

- WSUD and Stormwater harvesting schemes continue to be managed through voluntary application of national and state guidelines.

- Definitions and interpretations vary greatly across the industry.

- Verification and/or validation requirements for the performance are unclear.

- Number of industry initiatives both at the state and National level.
Looking into the future

✓ The pace that the stormwater market in Australia grows will, to a large degree, depend on the certainty that it can offer to the public, the clients and the government in delivering the stated objectives. Which requires, amongst other things, the clear path on how to achieve the stated objectives (i.e. Guidelines) and the means to verify that it actually works (i.e. validation and verification protocols).

✓ The increased certainty in the requirements for and the performance of the stormwater treatment components delivered by these guidelines and protocols should allow the market to offer/request a guarantee of performance.

✓ This guarantee should open more opportunities for funding, delivery, operation and maintenance of stormwater projects, leading to the greater uptake of stormwater treatment and utilization as a resource.
Where to from now..

As part of this IPWEA initiative we are currently researching the best practice in operation and maintenance of stormwater harvesting projects with the intention of being able to provide some benchmarking data for the industry to use.

Collection of data from operational projects in various states across Australia (SA, NSW, QLD, VIC) has already commenced.

O&M Questionnaires developed and will be distributed via the IPWEA Vic website.

The data collected will not identify the organization and will not be used for any commercial purposes.

Findings will be published on IPWEA website for members to use.
THANK YOU!


BH: 03 9502 4229