WSUD Life Cycling Costing

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Why is WSUD asset management important?

Current situation

- Increasing number of WSUD assets constructed by councils
- Increasing number of WSUD assets handed over to councils from developers
- Uncertainty around location, maintenance regimes and life cycle costs
- Generally means they are not identified on asset management systems or databases
- Asset management is required to ensure they meet their intended design and function.

Risks of not developing a WSUD asset register

Asset becomes a LIABILITY

- Key staff move on and the local knowledge is lost
- Assets may fall into disrepair
- Asset may not function as intended and stormwater quality is not treated
- Investment is ‘wasted’
- Community and council perception is that they don’t work, look ugly etc.
- Increased barriers for implementation going of new projects

Benefits of WSUD asset management

Knowing the asset exists

Enable maintenance

- Understanding maintenance requirements, levels of service and responsibility
- Budgeting

Financial planning and reporting

Asset handover status

Understanding catchment performance

- Assist in tracking against treatment targets
- Assist in planning future works
- Enable catchment scale modelling

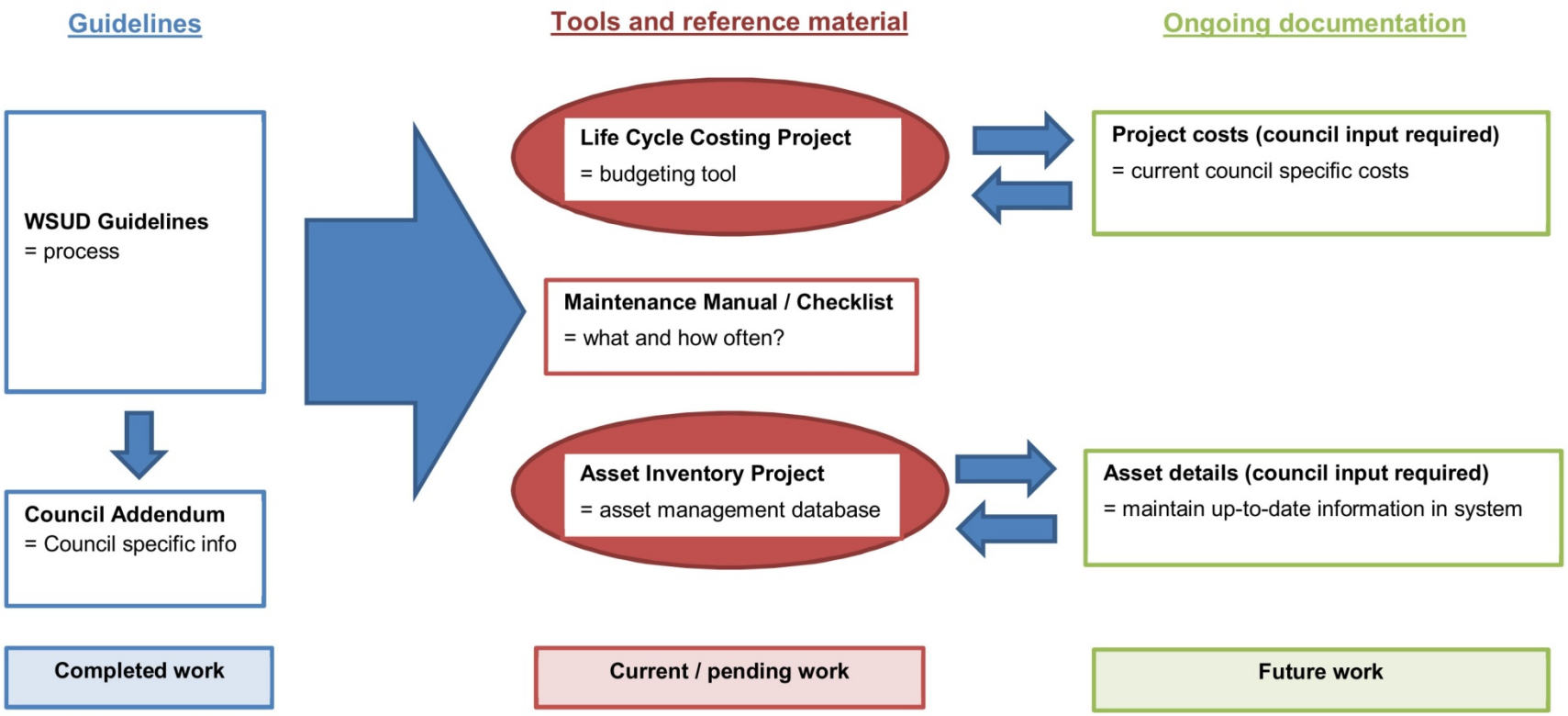
Industry need

Needs Analysis

Results show

- **18%** have an in-depth understanding of where their WSUD assets are located
- **5%** have an in-depth understanding of maintenance requirements
- **3%** have an in-depth understanding of life cycle maintenance costs

Project context



LCC Project Approach

Stage 1A – Literature review and pilot	
Literature review	Complete
Confirm council and stakeholder participation	Complete
Pilot data collection	Complete
Stage 1B – Data collection and collation	
Life Cycle Costing survey	55% councils completed
Council workshop and data collection	Complete
Data collection - other stakeholders	Complete
Collate data and gap analysis	Complete
Stage 2 – Data analysis and documentation (LCC tool)	
Data analysis and documentation	Pending review stage 1B

Data Collection Process

Melbourne Water and councils and developers collected all readily available cost data at various stages of the life cycle.

- asset type, size and location
- maintenance service level / frequency service level)
- traffic management
- works undertaken in-house or under contract

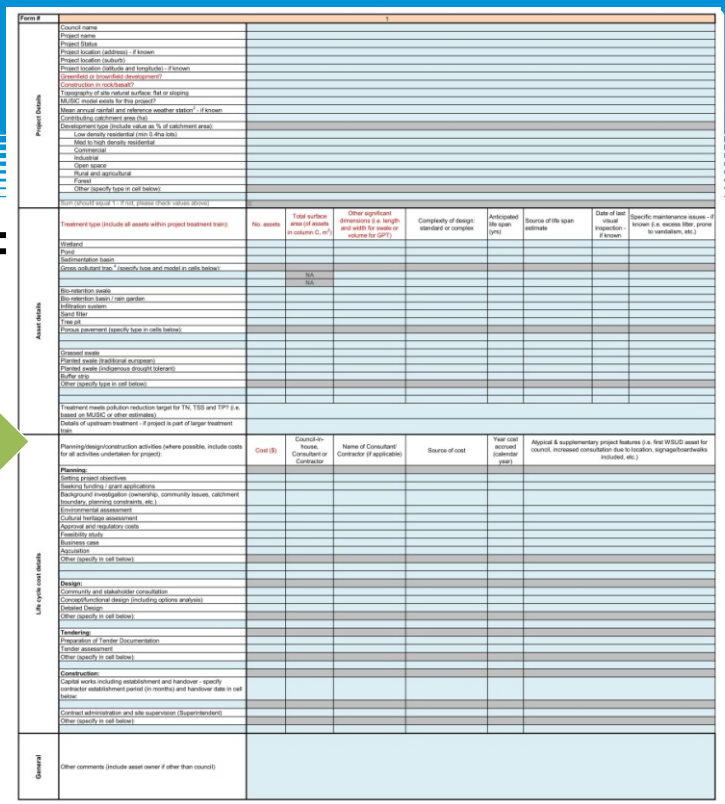
Data Limitations

- single source data (i.e. based on single contract)
- cost of equipment hire not included in estimate
- combined maintenance cost estimates for asset groups)
- few sources of data for each asset type
- small data sets (i.e. $0 < n < 70$ for each asset type)

Stage 1B: Data Collect

Life Cycle Costing Data Template =

Assets/projects with cost info



Asset Inventory Template = All assets

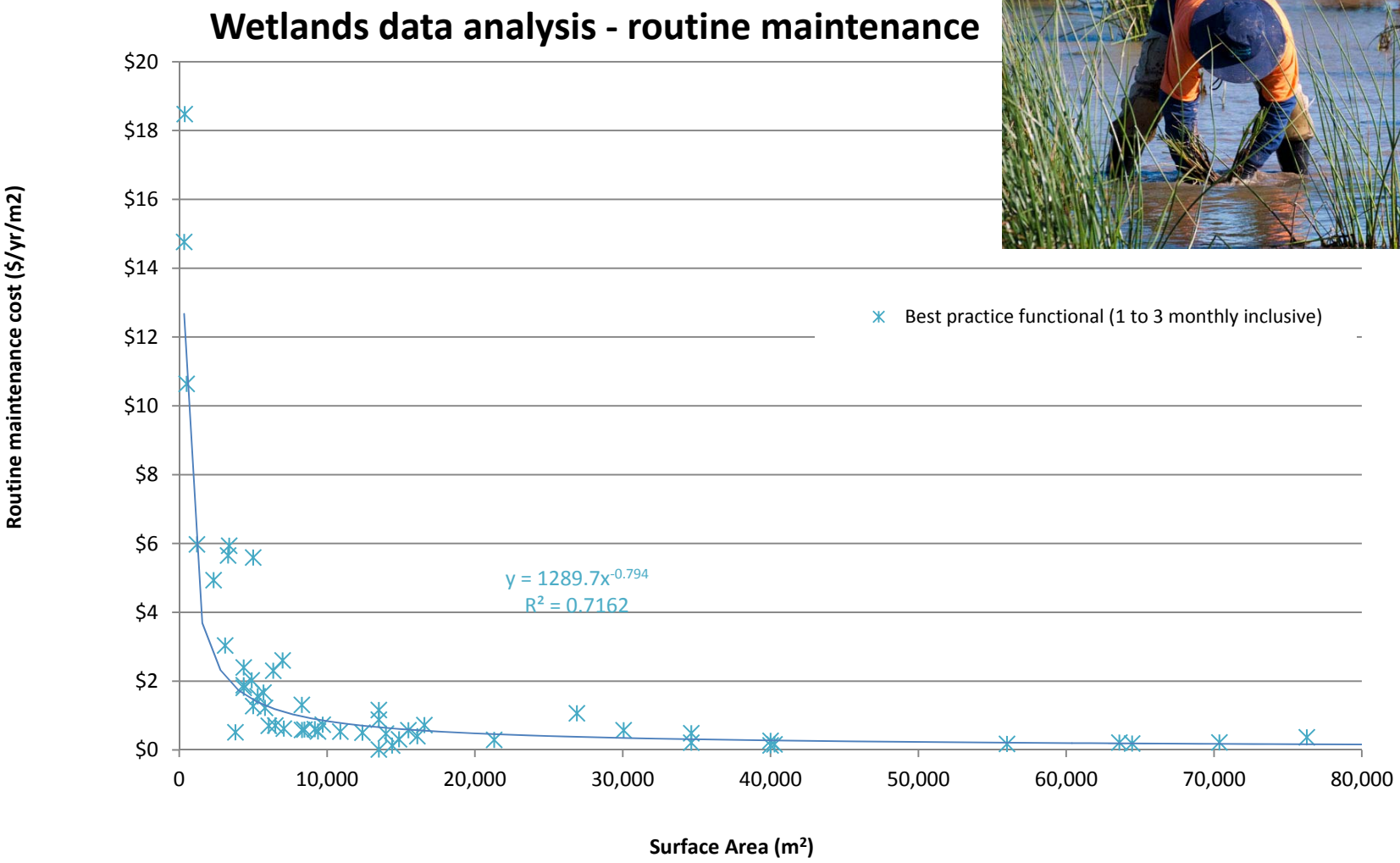
Label	Council	Address	Suburb	Latitude	Longitude	Year Constructed	Who Installed	Type of Asset	Owner	Reference #	Size (m²)	Description	Number	Dimensions	Catchment size (ha)	Catchment type	MAINTENANCE (if known)				MUSIC output (if available)				
																	Requirements	Cost	Frequency	Specific Issues	Flow reduction	MUSIC model	TP removal	TN removal	TSS removal
Example only:	Kingston	Wells Rd, Thames Pde to Lynne St	Chelsea Heights	-38.0464	145.140979	2001	Council	Bioretention & Raingarden	Council	DPT0118-127	300	Wetland & swales in median strip	10	500m long x 0.6m wide bio filter swale, 10 raingardens from mapinfo file											
Example only:	Knox	Amanda Crt,	Rowville	-37.93997	145.250049	01/06/2009		Raingarden		Complaint/Reactive	20	1 x raingarden	1		0.03	Low density residential	Maintenance of slotted pipe & pit required - through Reactive Drainage team	Get IT to put onto dataworks - WSUD file							

*Note: Data templates sent in e-mail titled 'Revised Life Cycle Costing Data Template and FAQs' (20/02/12)

Key results

- Good range of data for wetlands
- Reasonable range of data for bioretention systems and tree pits under contract
- Poor range of data for sediment basins and GPTs
- No suitable data for swales, porous pavement, ponds, infiltration systems and sand filters
- Some data sets (e.g. wetlands) included data sourced primarily from confidential rates within a single contract
- Proactive maintenance on WSUD assets is likely to produce significant cost saving compared to reactive maintenance

Wetlands data routine maintenance



Bioretention Maintenance

Activity	Service level (frequency)	No. data points	R^2	Equation of fitted trendline	No. data sources	Unit cost estimate	Comment / Recommendation
Plan, design and construct							
Design	NA	4	0.27	NA	4	\$120 and \$330 /m²	Do not publish due to limited data points
Construction (on-street raingardens)	NA	27	0.37	NA	5	Small (5 to 50 m²) = \$1,000 to \$2,500 /m² Med (100 m²) = \$750 /m² Large (> 250 m²) = \$500 /m²	Somewhat higher than industry values for smaller assets. Recommend publish as starting point for discussion.
Construction (bioretention system)	NA	7	0.68	NA	4	Small (100 m²) = \$800 /m² Med (300 m²) = \$250 /m² Large (500 m²) = \$50 /m²	Within range of industry values. Recommend publish as starting point for discussion.
Routine maintenance							
On-street raingardens – based on contracted rates	Best practice functional (1 to 3 monthly)	19	0.67	$199*A^{-0.55}$ (\$/yr/m²)	4	Small (< 50 m2) = \$20 to \$35 /yr/m² Med (100 m²) = \$15 /yr/m² Large (> 250 m²) = \$5 to \$10 /yr/m²	Publish range of estimates.
On-street raingardens – based on in-house estimate or case study	Best practice functional (1 to 3 monthly)	5	NA	NA	5	Small to medium (< 100 m²) = \$5 to \$16 /yr/m²	Publish range of estimates.
Bioretention basin – based on in-house estimate or case study	Best practice functional (1 to 3 monthly)	5	NA	NA	5	Large (400 to 700 m²) = \$3 to \$5 /yr/m²	Publish range of estimates.
Renewal maintenance							
Major reset - incl. underdrainage and full landscape	Not required for well designed, constructed and maintained asset	3	NA	NA	3	\$100 to \$230 /m² Only found to be required due to poor quality control during construction	Publish range of estimates. Increase upper limit to \$250 based on data validation (refer Appendix D).

WSUD LCC estimates

Table 2-1: WSUD LCC estimates - quick look-up table

Asset type	Plan, design and construct	Establishment [7]	Ongoing routine maintenance [1]	Ongoing renewal maintenance [1]
Wetlands	**$1911*A^{0.8435}$ ($/asset);** Small (500 m^2) = $210 /$m^2$ Med (5,000 m^2) = $90 / m^2 Large (50,000 m^2) = $40 /$m^2$ *Estimate based on MUSIC manual v4, eWater	2 to 5 x routine cost [2]	**$1289.7*A^{-0.734}$ ($/$m^2$/yr);** Small (< 500 m^2) = $9 to $10 /$m^2$/yr Med (5,000 m^2) = $1.5 /$m^2$/yr Large (> 50,000 m^2) = $0.2 /$m^2$/yr *Estimate based on good range of LCC project data	NA
Sedimentation basins	**685.1*A0.7893 ($/asset);** Small (250 m2) = $215 /$m^2$ Med (500 m2) = $185 /$m^2$ Large (1,500 m2) = $145 /$m^2$ *Estimate based on MUSIC manual v4, eWater	2 to 5 x routine cost [2]	Small (< 250 m^2) = up to $18/$m^2$ Small (250 m^2) = $12 /yr/$m^2$ Med (500 m^2) = $5 /yr/$m^2$ Large (> 1,500 m^2) = $2 /yr/$m^2$ *Estimates based on limited range of LCC project data	Sediment removal and disposal: Dry waste [3] = $250 /$m^2$ Liquid waste [4] = $1,300 /$m^2$
On-street raingarden	**Construction only:** Small (5 to 50 m^2) = $1,000 to $2,500 /$m^2$ Med (100 m^2) = $750 /$m^2$ Large (> 250 m^2) = $500 /$m^2$ *Estimates based on reasonable range of LCC project data	2 to 5 x routine cost [2]	**Based on contracted rates:** Small (< 50 m^2) = $20 to $35 /yr/$m^2$ Med (100 m^2) = $15 /yr/$m^2$ Large (> 250 m^2) = $5 to $10 /yr/$m^2$ **Based on in-house estimates / case studies:** $5 to $16 /yr/$m^2$ (< 100 m^2) *Estimates based on reasonable range of LCC project data	Sediment removal and disposal = ID Minor reset [5] = $50 to $100 /$m^2$
Bioretention basin	**Construction only:** Small (100 m^2) = $800 /$m^2$ Med (300 m^2) = $250 /$m^2$ Large (500 m^2) = $50 /$m^2$ *Estimates based on limited range of LCC project data	2 to 5 x routine cost [2]	**Based on in-house estimates / case studies:** $3 to $5 /yr/$m^2$ (400 to 700 m^2) *Estimates based on reasonable range of LCC project data	Sediment removal and disposal = ID Minor reset [5] = ID

Asset type	Plan, design and construct	Establishment [7]	Ongoing routine maintenance [1]	Ongoing renewal maintenance [1]
Tree pit	**Construction only:** Small (< 10m² combined) = $4,000 to $8,000 /m² [4] Med (25 m² combined) = $2,000 /m² Large (> 50 m² combined) = $1,000 /m² *Estimates based on limited range of LCC project data	2 to 5 x routine cost [2]	**Based on contracted rates:** Minimal traffic management and no access issues = $20 to $180 /asset/yr Traffic management / access issues / requires lifting of grate = $150 to $700 /asset/year **Based on in-house estimates / case studies:** ID *Estimates based on reasonable range of LCC project data for contracted tree pits	Reset (replace filter / cover / tree) = ID
Grassed swale and buffer strip	**Construction only:** Seeded = $8 to 18 /m² and up to $25 /m² (with subsoil drain) Turfed = $13 to $22/m² and up to $35/m² (with subsoil drain) Established or native grass = up to $62/m² *Estimates based on range of industry values (Refer Appendix D)	2 to 5 x routine cost [2]	$1 to $3 /m²/yr *Estimates based on range of industry values (Refer Appendix D)	Sediment removal and disposal = ID Reset / returf = ID
Vegetated / bioretention swale	**Construction only:** $130 to $170 /m² *Estimate based on WSUD – Greater Adelaide Region, Technical Manual, 2010 (Refer Appendix D)	2 to 5 x routine cost [2]	$2 to $6 /m²/yr *Estimates based on range of industry values (Refer Appendix D)	Sediment removal and disposal = ID Reset (replace filter / vegetation) = ID
In-ground GPT [6]	Small (< 300 l/s) = $20 to $75k Med = $90 to $125k Large (> 2200 l/s and up to 200 ha treated area) = $195 to $250k *Estimate based on range of supplier estimates	NA	**Based on contractor quotes/estimates:** Inspection = $60 to $100/visit Cleanout (typical) = $750 to $900 /visit Cleanout (range) = $350 to $1,500 /visit depending on size and # GPTs in contract *Based on estimates from 2 metropolitan service providers	NA

Where to now . . . . .

- This project enables practitioners to
  - Have a better understanding of the life-cycle costs of existing assets (e.g. ongoing maintenance costs) and this can help with undertaking a CBA (cost-benefit analysis) for future IWCM projects.
  - Substitute an element of uncertainty with actual costs in the decision making process
  - Highlight through the CBA how IWCM or green infrastructure projects enhance or contribute to community amenity and liveability.