



Dedicated to a better Brisbane

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5.0 STORMWATER QUALITY IMPROVEMENT DEVICES

5.1 BACKGROUND

The purpose of this Chapter is to identify some of the key design issues that should be considered if Stormwater Quality Improvement Devices (SQIDs) are to be a part of a development's stormwater management strategy. The Chapter is to be used in conjunction with:

- Chapter 3 of Part C of this document;
- Chapter 4 of Part C of this document; and
- Council's *Draft Design Guidelines for Stormwater Quality Improvement Devices* (BCC, 1999).

Chapters 3 and 4 of Part C of this document provide details of what steps are required to determine the necessary types of water quality controls for developments. The need for SQIDs may result from following these steps.

SQIDs is a collective term to define infrastructure (ie structural SQBMPs) that is designed primarily to improve or protect the health of the City's waterways. SQIDs work by reducing the amounts of pollutants that enter the City's creeks, the Brisbane River and Moreton Bay.

Types of SQIDs that are typically constructed as part of major developments in Brisbane include:

- **Trash racks:** remove large objects and rubbish including bottles, cans, leaves and branches.
- **Gross pollutant traps (GPTs):** remove litter and sediment as well as helping to remove minor amounts of pollutants such as nutrients (ie nitrogen and phosphorus), heavy metals and organic compounds that are carried by finer sediment particles. Some GPTs are located above ground, whilst others are built below ground and have fine screens to trap small particles of litter and sediment.
- **Constructed (artificial) wetlands:** remove large to very small particles of sediment, nutrients and toxicants like heavy metals. Wetlands need to cover a large area in Brisbane to remove pollutants effectively, but can produce excellent treatment results. It is essential that wetlands be preceded by sediment basins, GPTs and/or trash racks as 'pre-treatment units'.
- **Gully Pit Baskets and Nets:** collect litter, leaves and other pollutants in baskets within gully pits at the side of roads or in nets at the end of stormwater pipes.



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Key points to note about the use of SQIDs in Brisbane are:

- SQIDs are not the only way that stormwater quality can be improved to protect downstream receiving environments. SQIDs are one category of Stormwater Quality Best Management Practice (SQBMP, see Chapter 4 of Part C of this document). Other options include non-structural measures (eg education, enforcement strategies) and Water Sensitive Urban Design elements such as porous paving, grass swales, infiltration areas, etc.
- Although the design and construction of SQID is a relatively new field of waterway management in Brisbane, there is already a very wide variety of SQID types being used with new proprietary designs regularly appearing on the market.
- SQID design is a relatively specialised field, especially for SQIDs such as wetlands, ponds and custom built GPTs. For this reason, Council's *Draft Design Guidelines for Stormwater Quality Improvement Devices* (BCC, 1999) references more detailed design guidelines for many of the types of SQID that are typically built in Brisbane.

5.2 WHEN ARE SQIDS REQUIRED

SQIDs are required when it is impossible to prevent significant quantities of pollutants (eg litter, sediment) entering the stormwater drainage system and where a reduction in the loads/concentrations of such pollutants is needed. Given that SQIDs are always associated with on-going maintenance costs and often significant construction costs, alternative strategies (ie source controls) should be carefully evaluated before committing oneself to the installation of SQIDs.

SQIDs may be installed to meet agreed Water Quality Objectives for downstream water bodies (eg a river or creek), or to simply implement 'best practice' stormwater quality management.

In some areas, *regional* devices for stormwater treatment may be in place or planned for a developing area. These are described in Council documents, such as Stormwater Management Plans and Waterway Management Plans. In such circumstances, on-site stormwater treatment that is required as a part of the development may be minimal or non-existent.

Most SQIDs are designed and built to manage pollutant loads during the *operational* phase of the development. However, in some circumstances, the SQID may also serve as a sediment and litter trap during the construction phase (eg a sediment basin that is used to trap sediment during the construction phase could be converted to a permanent wetland or pond for the operational phase).



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5.3 KEY ISSUES/DESIGN CRITERIA

Key issues and design criteria for common types of SQID are detailed in Council's *Draft Design Guidelines for Stormwater Quality Improvement Devices* (BCC, 1999). Importantly, the aforementioned document outline a step-wise process to guide a developer, consultant or development assessment officer through the design process (refer to Sections 2.1 and 2.2 of the SQID Design Guidelines). In short, the key steps to successful SQID design are:

- Determine objectives (what is required to be achieved?).
- Determine site constraints and environmental issues (what may prevent achievement?)¹.
- Ascertain suitable SQID types (how is it possible?).
- Assess the potential SQID types (what are the relative merits of these options?).
- Select the best SQID or 'treatment train' arrangement (which is the best option?).
- Undertake detailed design and address site-specific needs (what are aspects to be considered during the design?).
- Compile necessary documentation (what is needed to ensure achievement?).

The SQID Design Guidelines also provide detailed advice on issues such as:

- Pollutants of concern in the Brisbane region (eg litter and fine sediment).
- Environmental impact assessment (eg ensuring SQIDs do not sever important ecological corridors, applicable licence requirements).
- SQID evaluation processes (including proforma work sheets to evaluate the merits of several options).
- Performance criteria (eg treatment objectives, hydrologic aspects, hydraulic aspects).
- Design and construction issues (eg health and safety considerations, mosquito control, environmental management during construction).
- Maintenance requirements (including Maintenance Plan proformas, Inspection Form proformas, and guidance on procedures).
- Operational requirements (eg inspections and monitoring).
- Community involvement (eg signage).

¹ Environmental impact assessment occurs at this stage. For more information on ecological assessment methodology, refer to the *Environmental Impact Assessment Planning Scheme Policy, Brisbane City Plan 2000*.



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In summary, some of the key SQID design issues that still need improvement in Brisbane are:

- Aesthetics (eg improved landscaping and 'softer' designs, particularly for open GPTs).
- Maintenance considerations (eg ensuring maintenance procedures are simple, safe, cost-effective, minimise impacts upon the environment and are followed).
- Integration with surrounding land uses (eg parkland).
- Community awareness (eg mechanisms to use the device as an educational opportunity).
- High flow bypass systems to prevent scouring of trapped pollutants.
- Appropriate sizing using the most respected and locally applicable research findings.
- Safety (eg ensuring that people are prevented access to polluted water or locations where injury or drowning could occur).
- Maintenance of sustainable environmental flows in affected waterways.
- Ensuring ecological corridors (ie where faunal movement occurs) are not severed.

5.4 MAINTENANCE PLAN

All SQIDs must be designed with simple, safe, cost-effective maintenance in mind. A Maintenance Plan that documents all maintenance requirements and responsibilities must be developed in parallel with the SQID design. The Plan must set out how the device should be maintained by addressing issues such as inspection frequency, likely clean-out frequency, dewatering and waste disposal procedures, access, consumables (eg oil absorbing pillows), staff training and equipment needs, occupational health and safety requirements, likely annual maintenance costs, and performance monitoring.

Note that people with practical experience with SQID maintenance should be heavily involved with the development of the Plan (as well as the design). For SQIDs with proprietary designs (eg CDS units, Ecosol Units, Humes products, etc) model Maintenance Plans should be readily available and only require minor modification.

For more information, refer to Chapter 14 of Part C of this document and Council's *Draft Design Guidelines for Stormwater Quality Improvement Devices* (BCC, 1999)².

² Note that these guidelines include information on typical maintenance-related issues (see Section 4.2 of the SQID Design Guidelines), as well as proformas for SQID Inspection Forms and Maintenance Plans.



5.5 ASSET HAND-OVER

Occasionally, Council may agree to accept responsibility for a large, regional SQID as part of the development's stormwater infrastructure. To hand-over such an asset to Council, the developer must provide relevant information and undertake certain actions. The keys to a successful hand-over process are:

- Clear agreement at the development approval stage on the timing and terms of asset hand-over.
- Provision of an adequate Maintenance Plan prior to hand-over.
- Provision of accurate costing to support the Maintenance Plan prior to hand-over.
- Provision of a well maintained asset prior to hand-over (ie the asset is in a condition that is consistent with the relevant development conditions, the commitments made in the development application and the Maintenance Plan).

For more information, refer to Chapter 15 of Part C of this document.



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**Urban Management Division
Subdivision and Development Guidelines
Part C Water Quality Management Guidelines**

5.6 REFERENCES

Preferred References

1. Brisbane City Council & GeoEng Pty Ltd, 1999. *Draft Design Guidelines for SQIDs*. Brisbane City Council, Brisbane.
2. Cooperative Research Centre for Catchment Hydrology, 1997. *Best Practice Environmental Management Guidelines for Urban Stormwater (Report 97/7)*. Cooperative Research Centre for Catchment Hydrology, Melbourne.
3. Victoria Stormwater Committee, 1999. *Urban Stormwater: Best Practice Environmental Management Guidelines*. CSIRO, Melbourne.
4. NSW EPA, 1997. *Treatment Techniques: Managing Urban Stormwater*. EPA, NSW.
5. Hunter, G.J. April 1999. *Evaluation of Some Readily Available Stormwater Quality Control Technologies*. Waterfall Journal: p.16. Stormwater Industry Association Inc., Sydney.
6. Hunter, G.J., 1999. *Stormwater Treatment Devices*. Workshop Proceedings, 8th International Conference on Urban Stormwater Drainage. Stormwater Industry Association Inc., Sydney.

Additional References

1. SKM, 1999. Brisbane City Council Waterways Program: *SQID Restoration and Maintenance, Final Report*. Brisbane City Council, Brisbane. [predominantly for internal use by BCC]
2. SKM, 1999. *Brisbane City Council SQID Strategic Planning Process*. Brisbane City Council, Brisbane. [predominantly for internal use by BCC]