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1.0 INTRODUCTION

1.1 PURPOSE OF THE WATER QUALITY MANAGEMENT GUIDELINES

The main purpose of the Water Quality Management Guidelines is to provide developers, consultants, and Council officers with an understanding of key issues and required measures to effectively manage water quality impacts associated with development activities, as defined under the Queensland *Integrated Planning Act 1997*. In addition, these guidelines provide clear direction as to what key issues must be addressed during the planning, design, construction and operational phases of any development, such as subdivisions.

They also provide guidance on the management of water quality issues associated with smaller development activities (eg swimming pools, service stations). In many circumstances however, more detailed technical guidelines will also need to be used (eg to design a constructed wetland to treat stormwater). In such cases, the Chapters direct users to appropriate references.

While these guidelines primarily aim to assist those persons involved with developments that are to be assessed under Council's *City Plan*, they also provide information to Council's own design and operational areas.

In summary, the use of these guidelines should result in:

- better management decisions involving the City's waterways;
- developments that enhance the livability of Brisbane;
- more consistent decision making across the City with respect to water quality management associated with new developments;
- more certainty in terms of Council's requirements;
- reduced need for interaction between assessment staff and development proponents (thereby minimising costs);
- increased opportunities for Council to adopt 'self certification' for some water quality-related matters; and
- outcomes that comply with relevant environmental legislation (eg the *Environmental Protection Act 1994* and the *Environmental Protection (Water) Policy 1997*) and Council's City Plan.

This document places a strong emphasis on managing key waterway-related pollutants (eg sediment) which may arise from the construction and operation of infrastructure, with the main objective of ensuring that the planners and designers of infrastructure genuinely integrate environmental requirements with other key design criteria. It is Council's belief that identifying key waterway issues and requirements early in the project's life, will foster better designs, cost savings and more integrated outcomes for the Community.

These guidelines should not be confused with ecological assessment guidelines, or guidelines to help manage all social, hydrologic, or ecological aspects of the City's waterway corridors. They relate to water quality management only, but where relevant, they identify related technical guidelines (eg Council's draft *Ecological Assessment Guidelines* [BCC, 1999]), principles and issues (eg safety issues during the design of constructed wetlands).

1.2 USING THE WATER QUALITY MANAGEMENT GUIDELINES

Part C of this document have been structured to allow users to identify which Chapters or Sections need to be applied for infrastructure development, as well as guiding users to additional references as required.

Two flow charts have been prepared to illustrate how the following Chapters or Sections are structured (see Figure C1.1) and interact with related legislation, the City's planning requirements and related detailed technical guidelines (see Figure C1.2). A simple checklist has also been provided in Section 1.6 that advises the user on what steps need to be undertaken to effectively apply these guidelines.

Although continual technical changes are experienced in the way that infrastructure and developments are designed, there are a number of fundamental principles that apply to all sites and which need to be understood by all users of these guidelines. These principles include:

- There are many benefits associated with adopting an integrated or ***multi-disciplinary approach*** to planning and design (eg the benefits of integrating design considerations for water quality and water quantity control).
- ***Water Sensitive Urban Design*** (WSUD) principles should be seen as the preferred approach, where issues such as safety, on-going maintenance of assets and nuisance can be managed. These principles include the consideration of stormwater management within, rather than at the end of the planning and design process, and the integrated use of management practices such as stormwater infiltration, retention and reuse.
- For large, high risk developments, it is essential that relevant ***Water Quality Objectives*** are identified and agreed at the start of the design process.
- To determine necessary on-site stormwater management measures, one must be cognisant of whether ***regional stormwater management facilities*** affect or will affect the development (and thereby remove the need for some or all site-based controls).
- Long term asset ***management requirements*** must be considered at the design stage, not as an 'after thought' to construction.

Section 1.5 provides a more detailed overview of these principles.

Many of these principles stress the need for early consideration of water quality issues in the planning/design phase. Key water quality-related issues that need to be considered at this stage include:

- land requirements for water quality controls (eg constructed wetlands), water quantity controls (eg detention basins) and open space (eg parklands);
- the need to work with ecologists, engineers and planners from Council's development assessment teams from an early stage to assist the multi-disciplinary approach to the development's design;
- the adoption of a 'treatment train' approach to the selection of Stormwater Quality Best Management Practices (SQBMPs[1]);
- responsibility for maintenance of all water quality-related assets after construction is complete and mechanisms to ensure appropriate standards of maintenance will be sustained;
- the need to consider the consequences of installing Stormwater Quality Best Management Practices, particularly large constructed assets like wetlands and gross pollutant traps (eg safety issues, ecological impacts in the waterway corridor); and
- the need to consider carefully the relative merits of structural versus non-structural SQBMPs[2].

1 Refer to the Glossary in Chapter 16 of Part C of this document for a definition.

2 Structural measures include gross pollutant traps, swales, etc, while non-structural measures include source controls such as education, regulation, etc.

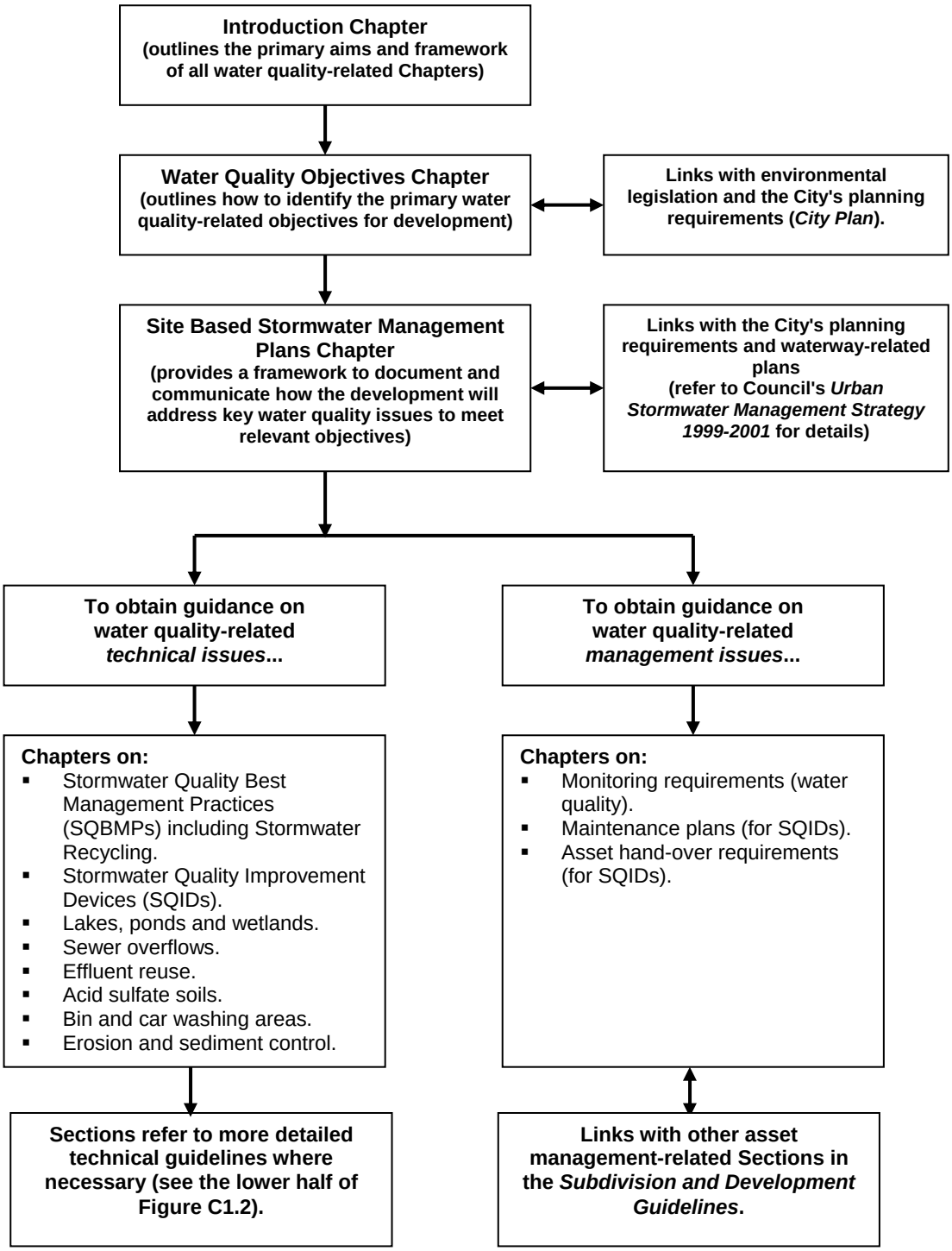


FIGURE C1.1
THE STRUCTURE OF THE WATER QUALITY MANAGEMENT GUIDELINES

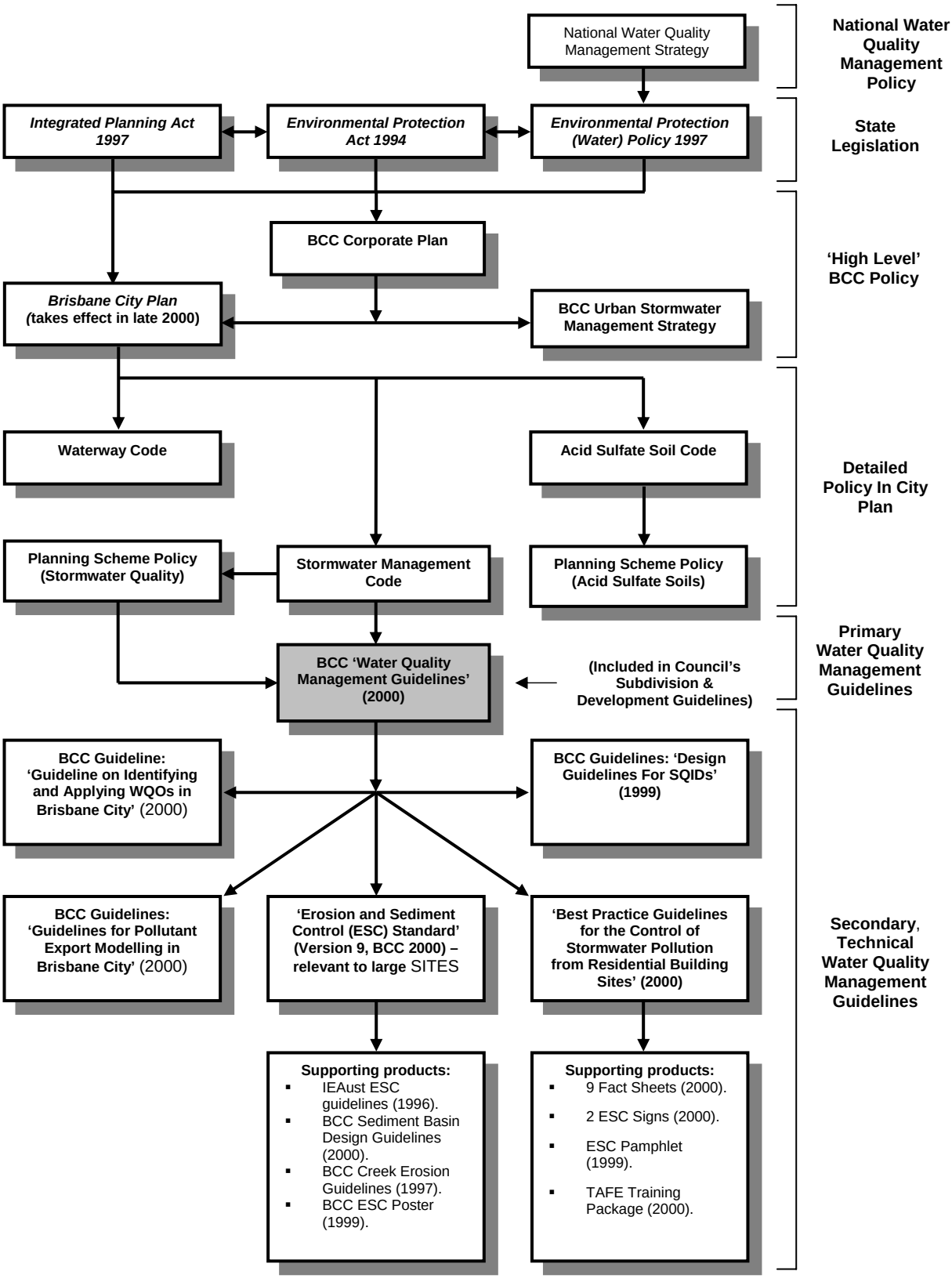


FIGURE C1.2
THE FRAMEWORK FOR WATER QUALITY MANAGEMENT UNDER BRISBANE CITY COUNCIL'S NEW PLANNING SCHEME

1.3 MORE DETAILED REFERENCES

In simple development scenarios, these guidelines may be applied independently of other documents. However in the majority of cases, reference to other more detailed documents will generally be required (see Figure C1.2). For example, other references will need to be utilised for the design of Stormwater Quality Improvement Devices (SQIDs).

To assist the user in selecting the most appropriate documents for use, a list of relevant references is provided at the end of each technical Chapter with a comprehensive list provided in Appendix 1 of Part C of this document. It is important to note that in addition to the wide range of water quality references that currently exist, new supporting documents and technical guidelines are being released on a regular basis.

1.4 LEGISLATION

A description of legislation that is relevant to water quality issues may be found in Council's *Urban Stormwater* Management *Strategy (Version 2) 1999-2001.* This document is updated every two years and is available from the Waterways Program in Council.

In relation to water quality, persons involved with the management of stormwater or wastewater need to be aware of the City's planning requirements as well as the provisions of the *Integrated Planning Act 1997*, the *Environmental Protection Act 1994* and the *Environmental Protection (Water) Policy 1997* as a minimum.

1.5 FUNDAMENTAL PRINCIPLES

This Section provides an introduction to fundamental principles that must be applied in the design of stormwater quality and quantity controls that are part of the development's stormwater infrastructure.

1.5.1 Integrated Planning

'Integrated planning' is promoted through the *Integrated Planning Act 1997* and the Integrated Development Assessment System (IDAS).

The term 'integrated planning' can be defined as the *coordinated planning and design of a development (or infrastructure), using a multi-disciplinary approach.* Successful integrated planning involves a partnership approach and is dependent on all stakeholders meeting early in the life of the project, with ongoing communication occurring throughout the project. Key stakeholders may include:

- the developer;
- the developer's planning and design team (eg planners, engineers, architects, landscape architects, construction service providers);
- the local community (typically represented by key stakeholder groups) for large, high impact proposals;
- Council's development assessment team members (eg including staff with skills in urban and open space planning, ecology, civil and environmental engineering, and maintenance); and
- Council's stormwater and waterway asset managers and maintenance service providers (where relevant).

Many water quality management issues are best addressed early in the design phase. Key issues (such as the required space on the development for stormwater quality best management practices) should ideally be considered at the 'pre-lodgement stage'. The checklist given in Section 1.6 explains the issues to be addressed at various stages in the development assessment process.

The issues to be addressed early in this process include:

- development constraints and opportunities;
- community concerns;
- areas of environmental significance (refer to Terms of Reference issued by Council for the development);
- relevant Water Quality Objectives;
- known problems (eg flooding);
- legal point(s) of discharge; and
- the likely key assessment criteria.

At this stage, background knowledge of the proposed site and catchment also needs to be gathered by the developer's planning and design team. Relevant information should include:

- the identification of potentially affected receiving waters, Environmental Values and Water Quality Objectives (where necessary – see Chapter 2 of Part C of this document); and
- the existence of any Catchment Management Plans (CMPs), Waterway Management Plan (WMPs), Stormwater Management Plans (SMPs), Local Stormwater Management Plans (LSMPs), Flood Studies or other type of Local Plan that may influence the development's management of stormwater or wastewater.

One of the most significant multi-disciplinary decisions that must be made prior to the finalisation of the layout of the proposed development (eg lot layouts, location of trunk sewer, etc) relates to space provided for water quality measures, water quantity measures, open space and ecological protection. The determination of land requirements must be cognisant of mandatory park contributions and space required for ecological protection. That is, there is a need to agree with Council whether land set aside for water quality and/or quantity measures may also serve as part of the development's park contribution and/or ecological protection[3].

Historically, developments that have adopted an integrated planning approach are more likely to be ecologically, economically and socially sustainable. Other significant benefits may include minimising conflict between stakeholders during the assessment process (and hence time and costs), ensuring the requirements of all disciplines are satisfied where possible, and ensuring that adequate land is set aside for the provision of water quality and water quantity controls.

[3] Note that the construction of large wetlands and ponds for stormwater quality treatment in a waterway corridor may impact upon the corridor's role as a pathway for some species to move easily between natural areas.

The concept of integrated stormwater planning is also linked to the principle of Water Sensitive Urban Design (see below) where developers must seek to minimise the need for 'end of pipe solutions' by incorporating sound stormwater management principles into the design at the planning stage. Good planning and design can reduce the need for large scale controls at property boundaries, and can provide a range of opportunities for the integration of recreational and aesthetic features.

1.5.2 Water Sensitive Urban Design (WSUD)

The principles of WSUD involve planning and designing the layout of a development around the natural attributes of a site (ie the 'Best Planning Practice' approach) as well as the incorporation of stormwater management measures as fundamental elements of the development (ie the 'Best Management Practice' approach).

Typical WSUD planning practices include the incorporation of combined public open space, drainage functions and water sensitive streetscapes.

Examples of WSUD management practices include grass swales (as opposed to enclosed drainage), natural channel designs (as opposed to concrete-lined open drains), bioretention systems (vegetated swales with underground infiltration trenches), gross pollutant traps, roof water tanks, porous paving, infiltration areas, aquifer recharge (and extraction), wetlands and ponds with stormwater reuse facilities (eg the use of stored stormwater for irrigation of parkland or public toilet flushing), water conserving landscaping, etc. Clearly some of these practices apply more easily to the 'estate scale' (eg natural channels, wetlands) while others apply more easily to the 'lot scale' (eg underground roof water tanks that are used for toilet flushing and garden watering).

The application of WSUD *management practices* in Brisbane can be thought of as a continuum (see Figure C1.3). The continuum ranges from no consideration of stormwater quality (or flow attenuation) to full WSUD implementation that has only been applied on a small number of developments across Australia. Figure C1.3 indicates where new developments in Brisbane are currently operating on this continuum and the direction that Council is seeking the local development industry to move though the Codes in the City Plan and the use of these guidelines.

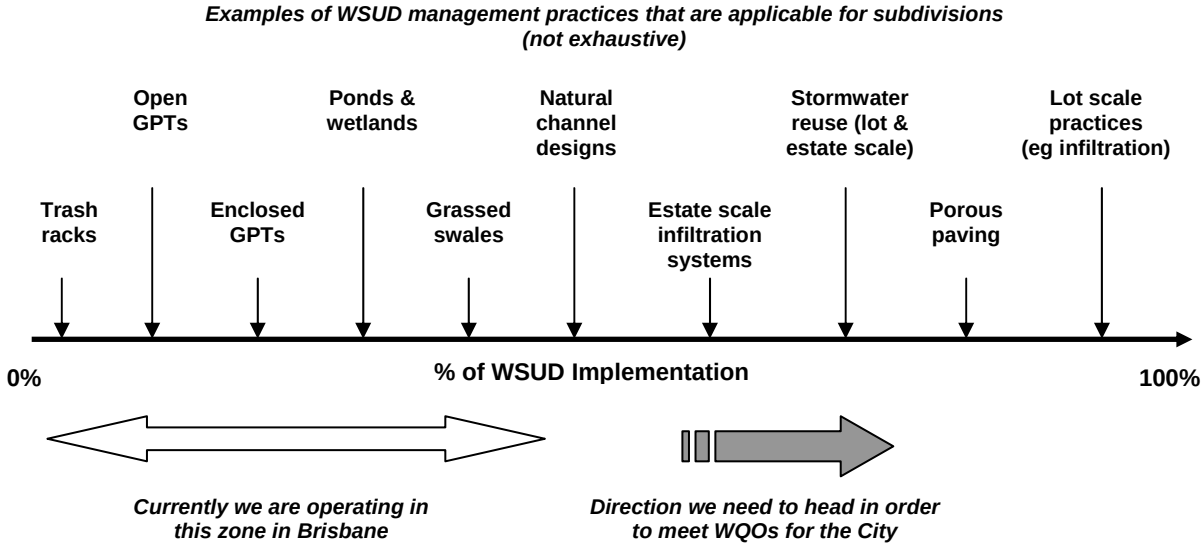
Council accepts that it is unreasonable to expect developers to immediately start designing developments at the extreme end of the continuum described in Figure C1.3. Some of the practices at the extreme end of the continuum are currently being evaluated (locally and/or nationally), and it will take time to:

- build confidence in the broad development community that they are stormwater management assets that are reliable, cost-effective and attractive; and
- develop standard design drawings that are based on locally applicable, empirical research in order to provide engineers with the tools necessary to implement these practices.

In addition, *lot scale* WSUD management practices cannot be undertaken by some subdivision developers, as they may have no control over the practices that are adopted on the lots after they are sold.

The key point however, is that Council believes that the City needs to move towards greater implementation of 'low risk' WSUD planning and management practices if

stormwater quality is to be managed in a way that protects the health of our receiving waters on a sustainable basis.



- A 'zone' is depicted to represent the difference between highly constrained sites (where few WSUD management practices can be applied) and relatively unconstrained sites.
- The pace to which we move towards increased use of WSUD planning and management practices in Brisbane depends upon the ability to produce tested, detailed design information for some of the newer and higher risk forms of WSUD.

FIGURE C1.3
IMPLEMENTATION OF WATER SENSITIVE URBAN DESIGN MANAGEMENT PRACTICES IN BRISBANE

Benefits of moving towards greater implementation of WSUDs include:

- reduction in runoff volumes and the size of required drainage and stormwater quality infrastructure;
- reduction in potable water use;
- ability to meet requirements with respect to on-site water quality and quantity management; and
- increased opportunities to incorporate/enhance visual, recreational and ecological attributes within the development.

In 1997, Brisbane City Council commissioned a comparative design study to compare the costs and benefits of applying WSUD to a typical residential subdivision in Brisbane. For details refer to the report titled: *Water Sensitive Urban Design Case Study* (Brisbane City Council & WBM Oceanics, 1997). This study found that:

- development that incorporated WSUD more closely complied with the intent of the Environmental Protection (Water) Policy 1997;
- WSUD techniques can create living spaces that are visually appealing while minimising environmental impacts;
- lot yields can be equivalent when WSUD is incorporated; and
- construction costs can be similar.

This study identified high priority issues to focus upon during design, identified research and policy needs, and provided a set of detailed design drawings/plans so that the WSUD option could be easily compared to the traditional design option. One surprising result of the Study was the absence of any significant maintenance concerns when the WSUD option was explained to key stakeholders (including Council's maintenance staff).

It is acknowledged that Council, like other development regulators, has been cautious in its acceptance of WSUD elements in recent years. In some cases, innovative stormwater designs have been abandoned for more traditional (lower risk) measures. However, examples of successful implementation, better guidelines, and strengthening drivers for change has led Council to recently accept some WSUD elements in approved developments where the developer can demonstrate that key performance criteria for drainage, safety, water quality and maintenance can be achieved.

Technical guidelines are available for the design and implementation of many WSUD planning and management elements (see Chapter 4 and Appendix 1 of Part C of this document). One of the best guidelines for WSUD in a residential development context is *Planning and Management Guidelines for Water Sensitive Urban (Residential) Design* (Department of Planning and Urban Development, *et. al.* 1994).

1.5.3 Water Quality Objectives – Basic Concepts

The identification of relevant Water Quality Objectives (WQOs) (defined in Chapter 2 of Part C of this document) is one of the most important issues associated with the design of stormwater management infrastructure for larger ('high risk') developments in Brisbane. It is important that these objectives are clear prior to the commencement of a development's design.

It is Council's policy that small, 'low risk' developments[4] (eg duplexes), should not have to identify relevant Water Quality Objectives for downstream receiving waters, or demonstrate to Council that the development will meet them. For 'low risk' developments Council requests that water quality be managed by simply identifying and applying 'best practices' (ie Stormwater Quality Best Management Practices or SQBMPs). Chapter 4 of Part C of this document provides advice on how to identify these practices.

For large, 'high risk' developments[5] (eg large subdivisions), Council requires the identification of relevant WQOs and for the developer to demonstrate how the development proposal can meet these objectives through the use of appropriate SQBMPs. Chapter 3 of Part C of this document provides guidance on how developers can demonstrate that the WQOs can be achieved and what options are available if WQOs cannot be achieved at all times[6]. This approach does allow the proponent flexibility (and the opportunity for innovation) in how WQOs are met. The onus is on the proponent to develop ways to meet the WQOs, although this guideline provides assistance to those that need it.

4 Refer to the Glossary in Chapter 16 of Part C of this document for a definition.

5 Refer to the Glossary in Chapter 16 of Part C of this document for a definition.

6 Council acknowledges that during the construction phase of some developments it may be impossible to meet WQOs (which reflect long term objectives). To manage this circumstance, 'Best Practice Discharge Guidelines' have been developed to quantitatively describe the quality of water that should be produced in such circumstances (see Chapter 2 of Part C of this document).

This guideline has attempted to strike a balance between being very prescriptive (favoured by some stakeholders who want all assessment decisions to be 'black or white') and simply setting water quality related goals (either WQOs or 'best practice' objectives) and giving people little guidance on how to achieve them (favoured by some stakeholders who want total flexibility and freedom for innovation). As Figure C1.4 below explains, this guideline can be used in a prescriptive manner to meet water quality goals or the proponent can seek alternative solutions. It is a reality however that the more 'non-standard' a development proposal is, the more caution Council's assessment teams will exercise.

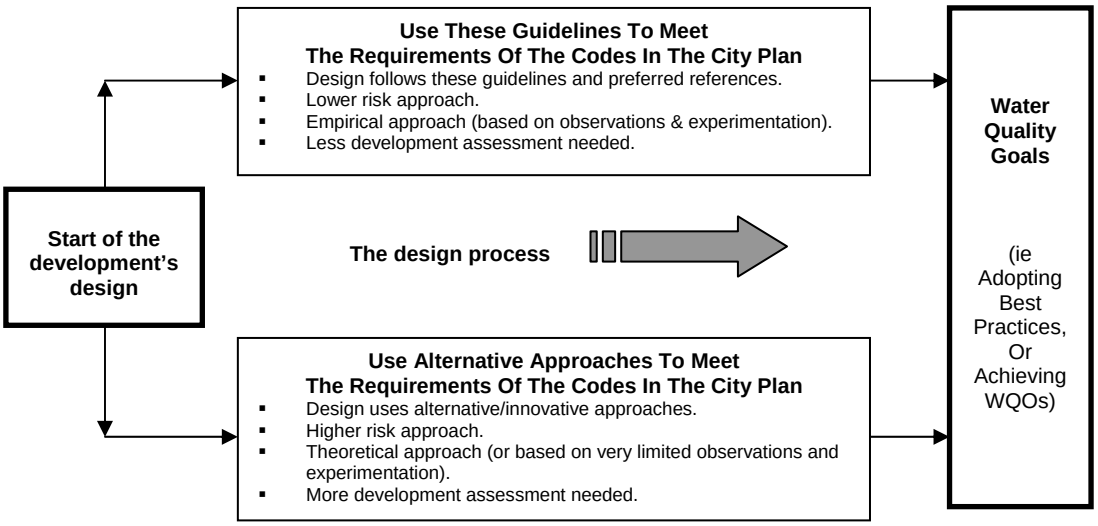


FIGURE C1.4
HOW TO MEET THE WATER QUALITY PERFORMANCE CRITERIA IN THE CITY PLAN

Note that Brisbane City Council has derived WQOs for all catchments in Brisbane City. These objectives will be updated as new information becomes available. Water quality objectives, applicable to design and construction, should be determined with reference to Chapter 2 of Part C of this document and the technical document titled*: Guideline on Identifying and Applying Quality Objectives in Brisbane City* (BCC, 2000).

While WQOs may at first seem to be strict requirements to meet, Council believes they are quite achievable as they are defined as upper limits or ranges within which median values of water quality should lie (rather than never exceed)[7]. The use of 'Best Practice Discharge Guidelines' during the construction phase (where appropriate) also increases the practicality of Council's water quality-related standards. Finally, the option is always available for a proponent to develop a new set of Environmental Values (EVs) and WQOs for an affected waterway if a scientifically rigorous case can be supplied to Council to support the proposition that a new set of EVs and WQOs are superior than those contained in the current version of *Guideline on Identifying and Applying Quality Objectives in Brisbane City* (BCC, 2000).

[7] The only exception to this is when short-term environmental harm can occur due to the nature of contaminants (eg a short term spike in pH associated with an acid sulfate soil development). In such circumstances the provisions of the *Environmental Protection Act 1994* still apply (ie all 'reasonable and practicable measures' must be applied to minimise or prevent environmental harm).

Lastly, it is important to recognise that the concept of 'no worsening' for water quality is not consistent with the use of WQOs or the intent of the *Environmental Protection (Water) Policy 1997*. It should not be used in Brisbane. For example, if a water body is currently not of sufficient quality to meet the desired EVs (eg the River is too turbid for safe swimming), then it would not be appropriate to allow an on-going stormwater or wastewater discharge that maintains the current water quality in the receiving water body.

1.5.4 Water Quality Related Monitoring

Another philosophy that is embedded in this guideline relates to water quality monitoring. While Chapter 13 of Part C of this document goes through Council's requirements in detail for this issue, the key philosophy is that water quality related monitoring should only be undertaken when that monitoring could lead to improvements in the site's management of stormwater or wastewater.

1.5.5 Provision of Regional Stormwater Management Facilities

As a consequence of the *Integrated Planning Act 1997* and the *Environmental Protection (Water) Policy 1997,* Council undertakes regional planning exercises in developing areas to identify infrastructure requirements for drainage and stormwater quality management. For further information on these processes, including the development of SMPs and WMPs, refer to Council's *Urban Stormwater Management Strategy (Version 2) 1999-2001*.

Key outcomes from these plans include the determination of long term infrastructure requirements (ie regional facilities such as constructed wetlands and gross pollutant traps) and Infrastructure Charges Plans. In those areas where SMPs/WMPs have been prepared, it may not be necessary for developers to install site-based controls during the operational phase of the development, particularly for small-scale developments. Instead, developers may be required to make a monetary contribution, through payment of a stormwater infrastructure charge, towards the cost of providing the nominated regional facility. Note that Stormwater Quality Best Management Practices would still be needed during the construction phase.

However, in many areas of the City, Water Quality Objectives cannot be met by regional stormwater quality treatment facilities alone. Consequently, in some cases on-site stormwater management practices may still be needed to supplement regional controls.

Therefore, prior to undertaking planning and design activities for a proposed development, it will be necessary to confirm whether a SMP/WMP has been prepared for the area in which the proposed development is located and refer to the relevant Plan. Similarly, other forms of stormwater/waterway plans may exist that make recommendations for future development (eg Catchment Management Plans, Local Stormwater Management Plans and Waterway Management Plans). The objectives of these plans and how they interact is explained in Council's *Urban Stormwater Management Strategy 1999-2001*.

Council is in the process of highlighting relevant waterway-related plans on Council's BIMAP (GIS) system which is available to the public. This initiative should simplify the process of locating relevant plans, which can then be obtained at Council's central reference library.

1.5.6 Maintenance and Asset Management

It is essential that all infrastructure is designed to allow for safe, regular and cost-effective maintenance. This is especially relevant for large assets such as SQIDs.

A basic requirement for any structural SQID, such as a constructed wetland or gross pollutant trap, is for it to be designed with cost-effectiveness and safety as key criteria, along with the development of an approved Maintenance Plan. Council has developed a Maintenance Plan proforma as part of its Draft *Design Guidelines for Stormwater Quality Improvement Devices* (BCC, 1999).

Responsibility for maintenance may rest with the owner of the development (if on private land), or alternatively, Council may agree to accept long term responsibility for a stormwater asset from a developer (eg a wet pond or trash rack). For Council to accept responsibility, the following requirements would normally need to be met:

- provision of an approved and costed Maintenance Plan for the asset (see Chapter 14 of Part C of this document); and
- the SQID to be inspected and found to be well maintained by Council staff (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).

SQIDs that cannot be efficiently and safety maintained are a liability. Similarly, if the SQID does not meet its design objectives (whether for water quality treatment or other criteria), then Council may require remedial works prior to accepting the asset (see Chapter 15 of Part C of this document).

In summary, the design of all SQIDs must ensure that:

- maintenance can be undertaken using locally available equipment and expertise;
- maintenance inspection and clean-out procedures are clearly defined in a Maintenance Plan;
- the anticipated frequency of maintenance has been specified;
- likely average annual maintenance costs have been accurately assessed;
- public and occupational health and safety issues have been identified and addressed;
- environmental impacts of maintenance activities (eg odour, removing fauna, dewatering, waste disposal, etc) have been identified, assessed and management measures developed as part of the Maintenance Plan;
- maintenance inspections check that the device is operating effectively, it is safe and aesthetic standards are being maintained; and
- suitable access is available for maintenance personnel.

1.6 WATER QUALITY CHECKLIST

The checklist shown below can be used when considering the key water quality aspects associated with a proposed development. Additional detail is provided in Chapter 3 of Part C of this document.

KEY STEP (in chronological order)	REFERENCE	DONE?
PHASE: INITIAL PLANNING AND CONCEPT DESIGN (ie prior to submitting development application)		
1. Form a multi-disciplinary design team that is appropriate for the type and scale of development. Specifically, ensure the key disciplines (planning, civil engineering, ecology, environmental engineering) work interactively throughout the life of the project.	Chapters 1 & 3	O
2. Develop understanding of water quality-related planning requirements (eg Codes in the City Plan), legislation (eg the *Environmental Protection [Water] Policy 1997*), technical guidelines (ie Chapters in this guideline), relevant Local Plans, and waterway-related management plans (eg regional Waterway Management Plans, Stormwater Management Plans, etc).	Council's current *Urban Stormwater Management Strategy*	O
3. Identify whether the development is: ▪ 'High risk' (Water Quality Objectives must be identified for receiving waters and the developer must demonstrate how these objectives will be met); or ▪ 'Low risk' (best practice stormwater quality management practices must be identified and adopted).	Chapters 2, 3, 4 & 16 (Glossary)	O
4. Identify whether there are any existing or proposed *regional* stormwater quality management devices that would fully or partially treat the development's stormwater or wastewater.	Chapters 1 & 3	O
PHASE: PRE-LODGEMENT (ie initial meeting with council - where necessary)		
5. Identify the key water quality issues to address for the site (eg erosion and sediment control, acid sulfate soils, stormwater quality management, wastewater, etc) and the need for any 'baseline' water quality monitoring.	Chapters 2, 3, 7, 8, 9, 10, 11, 12, 13	O
6. For 'high risk' sites: Start discussions with the relevant Council multi-disciplinary development assessment team and maintain effective communications throughout the design stage.	Chapters 1 & 3	O
7. For large, 'high risk' sites with significant potential to affect waterways: Start discussions with relevant key stakeholders (eg community groups) and maintain effective communications throughout the design stage.	Chapter 1	O
8. For 'high risk' developments: Define and agree with Council on: ▪ affected receiving waters; ▪ Environmental Values to be achieved; and ▪ Water Quality Objectives to be met during the construction and post-construction phases.	Chapter 2	O
9. Identify any opportunities and constraints (eg amount of land to be set aside for open space and stormwater measures, final asset ownership, hand-over criteria for major assets, existing infrastructure). Allocating space for sediment basins, ponds and/or wetlands is a critical issue.	Chapters 1 & 3	O
10. Develop a *preliminary/concept design* for an optimal combination of stormwater quality management practices for the site to: ▪ meet relevant Water Quality Objectives in receiving waters (for 'high risk' sites); or ▪ meet best practice (for 'low risk' sites). This design should consider non-structural (eg source controls) and structural measures (eg Stormwater Quality Improvement Devices) for stormwater/wastewater management. For 'high risk' sites, mathematical modelling (eg of pollutant export associated with stormwater) may be required to support the design.	Chapters 3, 4 & 5	O

KEY STEP (in chronological order)	REFERENCE	DONE?
PHASE: POST DEVELOPMENT APPLICATION (required via an 'information request' or via conditions of approval)		
11. Undertake the *detailed design* the site's stormwater quality management system (and/or wastewater management system) with an emphasis on addressing the issues of pollutant removal efficiency, safety, maintenance and aesthetics. (For high risk sites, approval of the detailed design by Council will be required).	Chapters 4 & 5	O
12. For Stormwater Quality Improvement Devices, prepare a Maintenance Plan.	Chapter 14	O
13. Document all proposed stormwater quality management practices for the site (ie the detailed design) in a Site Based Stormwater Management Plan. The Plan must set out those measures that must be used during the construction and post-construction phases. The plan must also specify whether any reliance has been assumed on regional Stormwater Quality Improvement Devices. Note that the management of water quality issues other than *stormwater* would typically be included in the site's Environmental Management Plan (eg industrial wastewater discharges).	Chapter 3	O
14. For 'high risk' sites, and where necessary, prepare a water quality monitoring program. Note that for large, 'high risk' sites with significant potential to affect waterways up to 12 months of 'baseline' ambient monitoring data may be necessary before construction commences.	Chapter 13	O
PHASE: POST CONSTRUCTION (required via conditions of approval)		
15. For Stormwater Quality Improvement Devices that will become Council's responsibility to maintain, ensure that the hand-over process is correctly followed.	Chapter 15	O

Note: These legislative requirements should always be checked with relevant State Government Departments, as the legislation may have been amended (or interpretations may have changed).

1.7 REFERENCES

Main References

1. Brisbane City Council, 1999. *Urban Stormwater Management Strategy 1999-2001*. Brisbane City Council, Brisbane.
2. Brisbane City Council, 2000. *Guideline on Identifying and Applying Quality Objectives in Brisbane City*. Brisbane City Council, Brisbane.
3. Brisbane City Council, 1999. *Draft Design Guidelines for Stormwater Quality Improvement Devices*. Brisbane City Council, Brisbane.
4. Queensland Government, 1994. *Environmental Protection Act (Qld)*. Queensland Government Printer, Brisbane.
5. Queensland Government, 1997. *Environmental Protection (Water) Policy*. Queensland Government Printer, Brisbane.
6. Queensland Government, 1997. *Integrated Planning Act (Qld).* Queensland Government Printer, Brisbane.

Additional References

1. Department of Planning and Urban Development, *et. al.* 1994. *Planning and Management Guidelines for Water Sensitive Urban (Residential) Design*. Whelans, Halpern Glick Maunsell, Perth.
2. Brisbane City Council, 1997. *Water Sensitive Urban Design Case Study*. WBM Oceanics, Brisbane.