Discussion Paper

Verification and Certification for Water Sensitive Urban Design

waterbydesign

Water by Design is a program of the South East Queensland Healthy Waterways Partnership

HEALTHY WATERWAYS
Because we're all in the same boat

Version 1, December 2009

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This document is available for download from www.waterbydesign.com.au/certification

Disclaimer

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Consultation and Feedback

Through circulating this discussion paper, Water by Design seeks to stimulate ongoing exploration of the issues relating to verification and certification for improved water sensitive urban design outcomes.

In particular, feedback is sought from interested parties including state and local governments, companies, non-governmental organisations and industry associations and individuals.

Responses to this discussion paper should consider the following questions:

- Considering both the likelihood and consequences, how significant is the risk associated with poor water sensitive urban design outcomes? How does this change from the development scale to the regional scale?
- In your experience, how effective are existing verification or certification schemes?
  - What schemes are most effective and what are the key attributes of effective schemes?
  - What factors contribute towards ineffective schemes?
- Is a verification scheme needed for water sensitive urban design?
  - If so what do you consider to be the preferred model for this?
  - Who should administer the scheme?
  - How could the scheme address the interdisciplinary nature of water sensitive urban design?

Feedback on this discussion paper should be sent to: info@waterbydesign.com.au.

The first round of feedback is sought by 30st April 2010

Executive Summary

This discussion paper explores the issue of certification for the design and delivery of water sensitive urban design (WSUD).

Regulatory and policy requirements for compliance with water quality and stormwater management objectives for urban developments are strengthening. Implementing WSUD within urban developments is an effective way to ensure water quality and stormwater management objectives are met.

However, WSUD practitioners are not achieving a consistent quality level across projects. Some key contributing factors to the lack of consistency across WSUD implementation include:

- difficulty of keeping pace with the rapidly changing nature of WSUD techniques and guidelines
- failure to adequately coordinate and integrate the various disciplines involved in WSUD
- lack of accountability by proponents and developers
- complexity and lack of consistency between of local government design and approvals processes.

Verification and certification are proposed as ways of addressing these issues.

The methodology used for this discussion paper included a workshop with key stakeholders; an analysis of relevant, existing verification schemes; and consideration of existing legislative frameworks and technical standards and procedures.

Verification processes could be applied to WSUD in a number of ways. For example, verification could accredit designers, contractors or operators, certifying the input processes of a WSUD system. Alternatively, verification could accredit auditors to certify the outcomes of WSUD.

Four options are proposed:

Option 1 presents the 'do nothing' or the business-as-usual case, where no specific verification scheme is introduced but existing guidelines and training programs are used and further developed.

Option 2 considers adapting an existing verification scheme, such as the Registered Professional Engineer Queensland (RPEQ) scheme, improving its relevance to, and effectiveness for, WSUD.

Option 3 explores the development a new verification scheme with WSUD professionals seeking accreditation from a new, purpose-established body, housed within an existing organisation such as the Stormwater Industry Association (SIA) or South East Queensland Healthy Waterways Partnership (SEQHWP).

Option 4 suggests a new scheme is developed increasing the level of control through third party and regulatory auditing. The Urban Land Development Authority's (ULDA) development application certification process is an example of this approach.

A WSUD verification scheme could deliver a range of benefits including improved WSUD outcomes, more accountability for WSUD implementors, greater confidence of success for regulators, and reduced costs and approval timeframes for developers. However, there is uncertainty about whether a verification scheme is the best method for achieving these improvements. Many disciplines in engineering, which are equally as complex as WSUD and where the consequences of failure are severe, do not have discipline-specific verification systems, but are controlled by a range of established legislation and industry codes of practice and guidelines.

However, WSUD is a relatively new and rapidly evolving discipline that does not have the benefit of long-established accepted practice and guidelines. In light of this, the discussion paper recommends that non-verification processes are bolstered by introducing additional WSUD guidelines, promoting awareness of both good and bad applications of WSUD across Queensland, and further investigating the root-cause of WSUD failures and proposing remedial actions. Better value may also be obtained by incorporating the best aspects of ` certification' schemes into existing WSUD training programs.

Many of the existing verification schemes, from which lessons could be learned for potential WSUD schemes, are young and have not been fully tested. They also vary in their coverage and quality of attributes. It may be warranted to further investigate verification schemes, including surveying WSUD stakeholders, evaluating the efficiency and effectiveness of alternative schemes and developing a preferred model for a verification scheme, specifically designed for Queensland.

Water by Design is circulating this discussion paper, seeking input and comments from interested parties.

Acronyms

TERM	DEFINITION
AAC	Association of Accredited Certifiers
AAEE	American Academy of Environmental Engineers
ACCC	Australian Competition and Consumer Commission
AIBS	Australian Institute of Building Surveyors
AILA	Australian Institute of Landscape Architects
AMI	Australian Mining Industry
ASBEC	Australian Sustainable Built Environment Council
AusIMM	Australian Institute of Mining and Metallurgy
BAs	Building Authorities
BCA	Business Council of Australia
BCC	Brisbane City Council
BCEE	Board Certified Environmental Engineer
BPEQ	Board of Professional Engineers Queensland
BSA	Building Services Authority
C3	Stormwater Management Facilities Design Compliance
C4	Stormwater Management Facilities Construction Compliance
CABs	Conformity Assessment Bodies
CEnvP	Certified Environmental Professional
CPD	Continuing Professional Development
CPESC	Certified Professional in Erosion and Sediment Control
CPSWQ	Certified Professional in Stormwater Quality (Proposed)
CWP	Certified WSUD Professional
DAs	Development Approvals
DERM	Department of Environment and Resource Management
DIP	Department of Infrastructure and Planning
DLGSR	Department of Local Government, Planning, Sport and Recreation
D. WRE	Diplomate, Water Resource Engineer
EA	Engineers Australia
EIANZ	Environment Institute of Australia and New Zealand
EP Act	Environmental Protection Act 1994
EP & A Act	NSW Environmental Planning and Assessment Act 1979
EPP	Environmental Protection Policy
ESD	Ecologically Sustainable Development
EVs	Environmental Values

TERM	DEFINITION
GBCA	Green Building Council of Australia
GCCC	Gold Coast City Council
GSAP	Green Star Accredited Professional
ICCP	Institute of Certification of Computing Professionals
IECA	Institution Erosion Control Association
IPA	*Integrated Planning Act 1997*
IPWEA	Institute of Public Works Engineering Australia
ISO	International Organization for Standardization
JAS-ANZ	Joint Accreditation System of Australia & New Zealand
LGAQ	Local Government Association of Queensland
MOU	Memorandum of Understanding
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
NATA	National Association of Testing Authorities
NERB	National Engineers Registration Board
NGO	Non Government Organisation
NPER	National Professional Engineers Register
OPW	Operational Works
PDU	Professional Development Unit
PI	Professional Indemnity
PIN	Penalty Infringement Notice
QUDM	Queensland Urban Drainage Manual
RPEQ	Registered Professional Engineer of Queensland
SEQ	South East Queensland
SEQHWP	South East Queensland Healthy Waterways Partnership
SIA	Stormwater Industry Association
SIAA	Simulation Industry Association of Australia
SPP	State Planning Policy - Healthy Waters (Draft)
UDIA	Urban Development Institute of Australia
ULDA	Urban Land Development Authority
USQM	Urban Stormwater Quality Management
WSUD	Water Sensitive Urban Design
WQO	Water Quality Objectives

1 Introduction

Water by Design engaged Bligh Tanner and EnviroPartners to prepare a discussion paper to explore the issue of certification for the design and delivery of water sensitive urban design (WSUD).

WSUD is a relatively new approach to planning that aims to integrate urban planning with managing, protecting and conserving the urban water cycle. While there are many examples of good WSUD outcomes throughout Queensland, there are also a number of examples of developments that have achieved less than optimal WSUD outcomes. This is largely attributed to poor consideration of WSUD at all stages of the delivery of developments from concept design through to establishment.

The concept of a certification scheme has been mooted as a way of:

- improving WSUD outcomes
- providing greater accountability for WSUD design and construction
- increasing the confidence of regulators that design objectives are being achieved
- reducing assessment timeframes through placing the onus onto certified practitioners rather than development assessment personnel.

The discussion paper provides a review of potential certification needs for WSUD and a review of other relevant, existing certification schemes. It also identifies the range of possible certification options for WSUD and discusses issues that would need to be addressed in implementing a certification scheme.

2 Background Considerations

2.1 Implementation of WSUD in Queensland

Regulatory and policy requirements for compliance with water quality and stormwater management objectives for urban developments are strengthening.

Implementing WSUD within urban developments is an effective way of ensuring the water quality and stormwater management objectives established by the regulations and policy are met. WSUD is an interdisciplinary practice that, in most cases, requires teams of professionals, incorporating expertise from civil and environmental engineering, biological and physical sciences, urban design and landscape architecture.

The objectives of WSUD are to[1]:

- minimise impact on existing natural features and ecological processes
- minimise impact on natural hydrologic behaviour of catchments
- protect water quality of surface and ground waters
- minimise demand on the reticulated water supply system
- improve the quality of and minimise polluted water discharges to the natural environment
- incorporate collection treatment or reuse of runoff, including roofwater and other stormwater
- reduce run-off and peak flows from urban development
- re-use treated effluent and minimise wastewater generation
- increase social amenity in urban areas through multi-purpose greenspace, landscaping and integrating water into the landscape to enhance visual, social, cultural and ecological values
- add value while minimising development costs (e.g. drainage infrastructure costs)
- account for the nexus between water use and wider social and resource issues
- harmonise water cycle practices across and within the institutions responsible for waterway health, flood management, pollution prevention and protection of social amenity.

Within the industry, there is recognition that WSUD practitioners are not achieving a consistent level of quality and that improvement is required. Some key contributing factors to the lack of consistency across WSUD implementation include:

- difficulty of keeping pace with the rapidly changing nature of WSUD techniques and guidelines
- failure to adequately coordinate and integrate the various disciplines involved in WSUD
- lack of accountability by proponents and developers
- complexity and lack of consistency between local government design and approvals processes.

Poor WSUD practices can lead to:

- delayed assessment and approvals
- diminished water quality or water conservation outcomes
- increased capital cost
- poor integration and aesthetics (e.g. creating eyesores)
- increased maintenance requirements
- reduced lifespan of infrastructure
- high rectification costs
- reduced confidence in innovative and sustainable approaches
- increased risk.

2.2 WSUD certification workshop

A workshop was held on 19 June 2009 to discuss issues associated with certification and to inform the preparation of this discussion paper. Complete details of the workshop are in Attachment 1. The workshop was used to debate the need for a certification scheme and the preferred approach to certification and to discuss the issue of implementation of a certification scheme.

Workshop participants were asked to rate the level of risk associated with WSUD using a standard risk matrix. The general conclusion was that the risks associated with WSUD are 'medium' to 'medium–high'. However, they

1 http://www.nwc.gov.au/www/html/216-water-sensitive-urban-design.asp?intSiteID=1 (accessed Dec 2009)

were not deemed to be 'high', 'severe' or 'extreme', which are risk levels that require urgent policy action.

The outcomes of the workshop elicited a number of key issues:

- While there is a need for practitioners to lift standards and improve outcomes, submission requirements vary across local governments. These requirements could be strengthened and standardised.
- Any certification scheme needs to recognise the multi-disciplinary nature of WSUD practice. There is currently a problem with effective 'integration' and co-ordination across various disciplines, which can lead to problems of accountability. Any process also needs to involve the developer as a significant party.
- There is a need to learn from the experiences gained from other similar certification systems. Any new certification scheme would add another layer of bureaucracy and red tape to development processes, without necessarily achieving the required improvements.
- Rather than creating a new scheme, existing systems could be used. For example, a 'tightened up' form of the Registered Professional Engineer of Queensland (RPEQ) scheme could be adopted.
- Any certification scheme needs to be flexible to accommodate changing and improving requirements over time. It may be preferable to develop a multi-pronged approach to verification incorporating improved guidelines, risk management and approvals processes.
- A certification scheme may place too much emphasis on stormwater quality aspects at the expense of other aspects of WSUD (water conservation, amenity, behavioural change).
- The consequences of not implementing a certification scheme may not be great. The lack of a certification scheme may not be the primary cause of poor WSUD outcomes.
- A certification scheme may be a barrier to entry into the industry and could be used to limit competition without necessarily improving outcomes.
- Unscrupulous practitioners with sound technical knowledge would likely gain certification but may continue to operate below best practice standards unless adequately monitored.

3 Potential Certification Needs of WSUD

3.1 Penalties and incentives

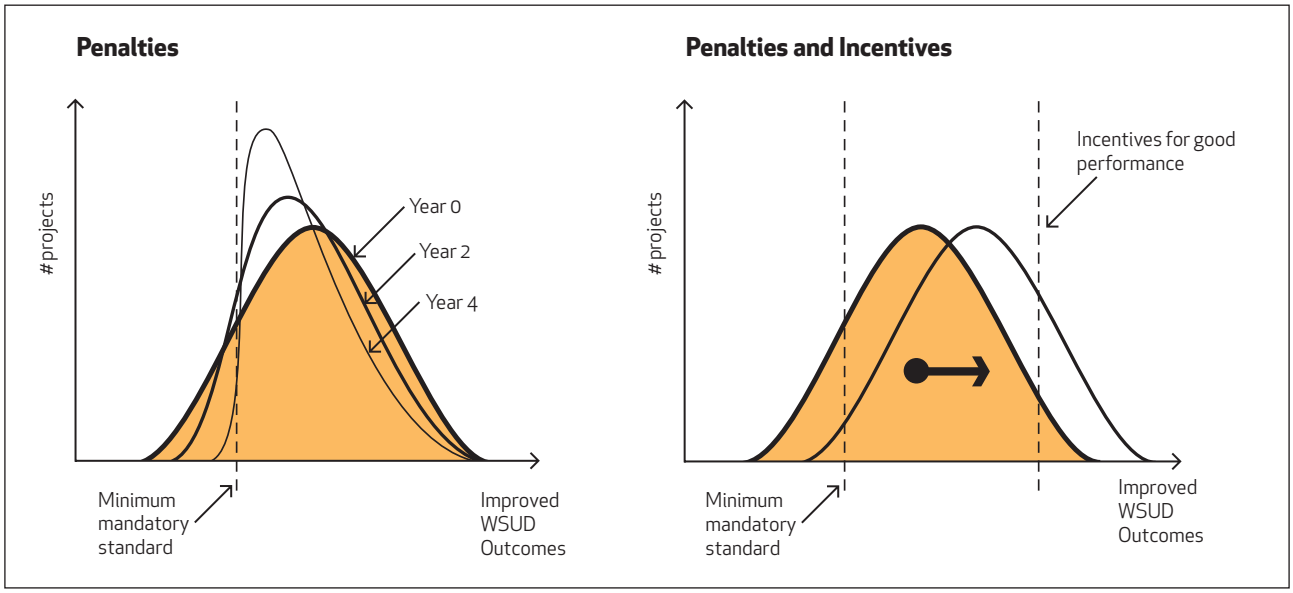
While it is arguable that, like all new technologies and social change, WSUD will take time before it is fully and consistently adopted, both incentives and penalties can be used as a means of improving performance.

Governments recognise the need to apply a 'push-pull' approach to controlling behaviour. Pushing by imposing standards (with penalties for non-compliance) can result in general compliance. Pulling with incentives can improve overall performance beyond the mandatory standard.

Incentives are designed to encourage good practice whereas penalties are intended to discourage poor practice. Understanding this context is important for the role that certification may play in WSUD — whether the emphasis should be on developing approaches to facilitate good WSUD outcomes or on providing mechanisms to penalise practitioners for poor WSUD outcomes.

Further elaboration and a few industry examples are presented in Attachment 3.

Figure 1 Penalties and Incentives



3.2 Risk

Risk management is a useful means of prioritising issues to determine what should be controlled and how.

In simple terms, risk assessment considers the probability (and exposure) of a hazard occurring and its consequences.

If a risk is assessed as sufficiently high, something needs to be done to control the hazard. A hierarchy of control is often suggested — starting at 'avoidance' of the risk moving to 'managing' the risk as a last resort. A hierarchy of control should be applied to WSUD technologies and the way WSUD is designed, constructed and maintained.

Risk management should be considered in the context of WSUD certification because the decision to implement a certification scheme must consider the level of risk associated with not introducing such a scheme. For example, if the risks are considered to be low and already well managed, there may not be any significant value in a certification scheme. However, if the risks are high and poorly managed, then a scheme may be warranted.

For WSUD, the scale of potential risks is also relevant. For example, the risks associated with a single small project may be low although the cumulative risk to local government of a large number of small projects may be significant.

The workshop considered certification in the context of risk and the results are discussed in Attachment 1.

3.3 Competency

For any form of certification, competency and maintaining competency, is essential.

Training, accompanied by tests and exams, can provide some assurance of competency. The South East Queensland Healthy Waterways Partnership, through its Water by Design program, offers a range of WSUD training programs, including:

- Introduction to WSUD
- Concept design of WSUD
- Fundamentals and advanced bio-retention design
- Fundamentals and advanced constructed wetlands design
- Design of stormwater wetlands
- Fundamentals of swale and sediment basin design
- Construction and establishment of vegetated stormwater systems
- Stormwater harvesting
- MUSIC assessment.

These training courses are generally short courses (one day), do not involve any testing, and have only recently incorporated follow-up mechanisms to confirm learning outcomes. While these courses are a useful part of capacity building within the industry, in order to form part of a certification scheme they would need to include formalised testing and demonstration of learning outcomes.

For most certification schemes, ongoing competency is measured in years of experience and Continuing Professional Development (CPD) activities. Initial competency may also need to be verified through written or oral presentations.

4 Terminology

For the purposes of this project, 'verification' is used as an overarching term that includes accreditation, certification and audit.

Table 1 provides a glossary of key terminology used in this paper. Table 2 defines the range of verification roles that could be implemented.

Table 1 Verification glossary

TERM	DEFINITION
Verification	The overarching term covering all aspects of accreditation, certification and audit.
Accreditation	The process of verifying the competency and registering certifiers and auditors.
Certification	Sign-off that the work meets the required standards; often undertaken by the person responsible for delivering the work. Also 'third-party attestation related to products, processes, systems or persons' (ISO/ IEC 17000:2004).
Audit	Independent checking by an external (third) party, by the customer or buyer (second party) or by an internal (first) party to ensure that the work complies with the standards as certified.

Table 2 Verification roles

TITLE	FUNCTION	EXAMPLE 1	EXAMPLE 2
Accreditor	Accredits certifier or auditor	Board of Professional Engineers Qld (BPEQ), Engineers Australia (NPER)	JAS-ANZ
Certifier	Certifies outcome and process	Building Certifier, Registered Professional Engineers Qld (RPEQ) or NPER	SAI Global for ISO 9001
Third-party auditor	External audit verifies outcome and process	Building Certifier, Registered Professional Engineers Qld (RPEQ) or NPER	SAI Global or external party
Second-party auditor	Customer or buyer audit verifies outcome and process	Regulatory officer in local government	Buyer
First-party auditor	Internal audit verifies outcome and process	Developer's representative	Company

5 Existing Verification Schemes

5.1 Existing verification schemes relevant to WSUD

A number of existing verification schemes that are relevant to WSUD have been identified and reviewed. These existing schemes include:

- Registered Professional Engineer of Queensland (RPEQ)
- National Professional Engineers Register (NPER)
- Certified Environmental Professional (CEnvP)
- Certified Professional in Erosion and Sediment Control (CPESC)
- Certified Professional in Stormwater Quality (CPSWQ) (Proposed)
- Australian Institute of Landscape Architects (AILA) Registration Scheme
- Urban Land Development Authority (ULDA) Self Certification
- Private Certification of Building Work (Qld)
- Private Certification of Building and Subdivisional Work (NSW)
- Green Star Accredited Professional (GSAP)
- RiskSMART.

These schemes are summarised in Table 3 and additional detail is provided in Attachment 4.

5.2 Typical attributes of verification schemes

Analysis of existing verification schemes showed that there are a number of common or 'typical' attributes across certification schemes. These typical attributes include:

- a 'target' person, product, process or combination of all three
- an aim or purpose that applies to the target
- entry qualifications and eligibility criteria
- a register of applicants — this commits all parties to a course of action
- roles and responsibilities for all stakeholders, including registered verifiers
- requirements to comply with a relatively prescriptive set of technical guidelines and standards
- a dedicated 'owner' and a sound governance structure
- support in the form of procedures, forms and checklists
- training, CPD and promotion
- a verification or audit system to evaluate the implementation and success of the scheme.

5.3 Broad conclusions about existing verification schemes

The analysis of the existing schemes concluded that:

- many schemes are comparatively young and evolutionary, and their efficiency and effectiveness has not been fully tested
- coverage and quality of typical attributes of these schemes is variable
- most schemes seek to 'verify' a person to 'certify' a product, while government schemes include the 'process'
- many rely on stringent upfront assessment and less on ongoing maintenance of competency.

Table 3 Summary of existing certification scheme attributes

SCHEME	TARGET	OWNER	AIM	ENTRY	ROLES & RESPONSIBILITY	REGISTER	GOVERNANCE	CONTINUING PROFESSIONAL DEVELOPMENT	RE-CERTIFICTION	COST TO APPLICANT	COMMENTS
RPEQ	Professional engineers working in Queensland (person and product)	BPEQ	Protect the public by ensuring professional engineering services are provided by a RPEQ. Maintain public confidence in services provided by RPEQs. Uphold standards of practice by RPEQs.	Application meeting minimum requirements for educational qualifications and three years' relevant experience (assessed by EA). 150 hrs CPD. Fitness to practice.	Legal requirement in Queensland for all engineers to be an RPEQ or work under the direct supervision of an RPEQ.	List and profile.	BPEQ	Requires 150 hours over 3 years.	Annual renewal.	$45 application fee plus $213 annual fee.	Has the legal power to enforce compliance. Forces compliance with CPD through regular audits. Operates under Engineers' Code of Practice.
NPER	Professional Engineers Australia-wide (person and product).	EA	Safeguard the community at no cost to government. Emphasis on public safety and risks associated with asymmetry of knowledge in an engineer–client relationship.	As above.	National register of professionals competent to work in particular areas of practice.	List and profile.	National Engineers Registration Board (NERB) (EA).	Requires 150 hours over 3 years.	Annual renewal with EA subscription.	$550 application fee plus $77 annual fee.	Forces compliance with CPD through regular audits.

Table 3 Summary of existing certification scheme attributes (continued)

SCHEME	TARGET	OWNER	AIM	ENTRY	ROLES & RESPONSIBILITY	REGISTER	GOVERNANCE	CONTINUING PROFESSIONAL DEVELOPMENT	RE-CERTIFICTION	COST TO APPLICANT	COMMENTS
CEnvP	'Accredited' Certified Environmental Professional (person).	EIANZ	Boost confidence in Environmental Professionals as competent professionals. Assist with professional indemnity insurance. Facilitate interaction between professionals. Promote environmental knowledge and awareness. Advance ethical and competent practice.	Application form including eligibility. Referees form. Interview by assessment panel.	Provides professional recognition.	List and profile.	Certification Board. Appeals process. Third-party complaints process.	Requires completion of a log over 2 years.	Every 2 years.	$120–$360 application plus $115–$265/ year. Range depends on EIANZ member and category.	Certification Board is auditable. Consistent with ISO/IECA 17024. ACCC conformity. CEnvP since 2004.
CPESC	'Accredited' Certified Prof. in Erosion and Sediment Control. (person and product).	IECA	Recognised specialist in erosion and sediment control.	Application form including eligibility. Judged by Application Review Committee. Pass exam.	Certified professional can lead projects. Associate cannot lead projects.	List and profile.	Unclear. Procedures and standards are good.	Requires 60 PDU/ 3 years.	No. Audit PDU possible.	$450–$495 application + ($120 re-test fee) + US$80–$100/yr	CPESC since 2006 and also in US. Rated professional experiences are positive.
CPSWQ	Certified Stormwater Quality Professional (modelled on CPESC).	SIA (proposal only).	Recognised specialist in stormwater quality (excluding erosion and sediment control).	Not defined.	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 3 Summary of existing certification scheme attributes (continued)

SCHEME	TARGET	OWNER	AIM	ENTRY	ROLES & RESPONSIBILITY	REGISTER	GOVERNANCE	CONTINUING PROFESSIONAL DEVELOPMENT	RE-CERTIFICTION	COST TO APPLICANT	COMMENTS
Registered Landscape Architect	Professional Landscape Architects (person and product).	AILA	Professionally recognised, experienced landscape architects.	12-month assessment following 2 years post-graduate experience. AILA conducts one set of registration assessments per year.	Provides professional recognition.	List	AILA	Requires 30 CPD points per year. Report required with annual renewal.	Annual	$220–$500 application (depending on membership) plus $528 annual fee depending on membership grade.	
DA Certification	Certification of Operational Works (OPW) process (process and product).	ULDA	Ensure satisfactory certification and construction of operational works and compliance works in accordance with ULDA conditions and standards.	Five parties are: 1. Proponent (accountable) 2. Project coordinator (responsible for certification requirements) 3. Certifier e.g. RPEQ (certifies work) 4. ULDA (may impose certification process and undertake process audit) 5. Auditors (audit risks and their controls).		No register. Proponents complete agreement with ULDA.	ULDA	Via source, e.g. RPEQ.	n/a	Self-certification by proponent.	Piloted in 2008 and launched in June 2009. Likely to be used by BCC.
Private Certifier (Qld)	Accredited person to certify building work (person and product).	Qld Building Services Authority	Provide private certification for building works in Queensland.	Tertiary qualifications required. Accreditation through AIBS. Licensing by BSA.	Provide advice to builders and owners. Assess building plans. Issue building permits. Issue compliance certificates.	List and profile	*Queensland Building Act 1975*.	n/a	Annual or 3 years for site supervisors and fire occupational.	$88–$579 application plus $88–$463 annual fee depending on contractor type (individuals).	Adopted throughout Queensland.

Table 3 Summary of existing certification scheme attributes (continued)

SCHEME	TARGET	OWNER	AIM	ENTRY	ROLES & RESPONSIBILITY	REGISTER	GOVERNANCE	CONTINUING PROFESSIONAL DEVELOPMENT	RE-CERTIFICTION	COST TO APPLICANT	COMMENTS
Private Certifier (NSW)	Accredited person to certify building work C3 and C4 (person and product).	Association of Accredited Certifiers (AAC).	Provide private certification for building and subdivisional works in NSW.	Individual: • Demonstrate skills, qualifications etc. • Fit and proper person • Indemnity insurance. Requirements set out in Circular BS 07-002.	Issue subdivision certificates, construction certificates related to compliance with BCA, complying development certificates and act as principal certifying authority.	Apparently available on-line, but not working.	*NSW Environmental Planning and Assessment (EP&A) Act 1979.* *Building Professionals Act 2005.*	Two courses annually (approved by Board). Training and education in relevant field.	Annual renewal required.	$750–$1,500 application and annual fee depending on accreditation category (individuals).	Adopted throughout NSW.
Green Star Accredited Professional (GSAP)	Accredited person to certify building ratings (person and product).	Green Building Council of Australia (GBCA).	Gain a deep knowledge behind the rating tools and a strong capability of applying this knowledge.	Attend training. Pass exam.	Green Star certification of buildings.	List and profile.	Board Green Star/ Education Teams. Fail/pass exam.	None — suggests further training.	No	$800 training + $250 exam (rating manuals $600).	GBCA use a list of 'accredited' trainers. Direction of GSAP is unclear, e.g. whether it should apply to specific tools or versions of those tools.

Table 3 Summary of existing certification scheme attributes (continued)

SCHEME	TARGET	OWNER	AIM	ENTRY	ROLES & RESPONSIBILITY	REGISTER	GOVERNANCE	CONTINUING PROFESSIONAL DEVELOPMENT	RE-CERTIFICTION	COST TO APPLICANT	COMMENTS
Risk-SMART	Accredits consultant (person) to certify specific development types (person and process).	BCC	Accredits consultants to help proponents get low-risk development proposals approved by BCC.	Apply with respect to eligibility criteria. Training on RiskSMART processes and tools. Enter into MOU with local authority. Monitor.	Apply knowledge of BCC application process and specifically RiskSmart tool. Sign report.	List (not by development type).	Guideline October 2007. Unclear.	No	No	No	BCC will perform process audit. Approval process guideline (part of main guideline) is useful.
CABs	Conformity Assessment Bodies (CABs). Accredited certifiers for a number of schemes, e.g. ISO management system certification.	JAS-ANZ	Accredits CABs that provide certification services.	CAB applies with respect to eligibility criteria. JAS-ANZ assessment and report. Accreditation Review Panel decides.	Accredits CABs for system, product and people certification.	List by scheme.	Government -appointed board. Secretariat and Technical Advisory Council. Complaints and appeals process.	None —training offered on ISO's conformity assessment (ISO 17011 etc.).	Regular checks, every 4 years.	n/a	Includes a register of certifiers too.

6 Approaches to Verification

6.1 Verification alternatives

There are many different ways that a verification scheme could be approached. In brief, these could include:

- do nothing
- accreditation of the designer, contractor or operator to certify the various input processes associated with developing a WSUD system
- accreditation of auditors with responsibility to certify the various outputs associated with developing a WSUD system.

If a verification process is adopted, it is important to identify the focus of the verification and determine who should take responsibility. A possible framework is provided in Table 4. This does not suggest that all aspects of this framework should be included in every scheme. It also does not preclude other alternatives, for example, the possibility of making one discipline (say the designer) responsible for certification of both the design and the construction of the works. This approach has been adopted by the Gold Coast City Council with reasonable success. An outline of the existing legal and administrative framework and existing technical standards and procedures is in Attachment 5.

Table 4 Verification framework

	WHO	POSSIBLE REQUIREMENT	RESPONSIBILITY
Standards and guidelines	Technical agency (e.g. SEQ Healthy Waterways Partnership through its Water by Design program)	Represents all key government and industry stakeholders	Development and maintenance of design standards and guidelines.
Certification by those doing the work	Designer (engineer, architect, planner, landscape architect)	Accredited designer	Certify that design is in accordance with required standards.
	Contractor	Accredited contractor	Certify that works are constructed in accordance with required standards.
	Operation and maintenance	Accredited maintainer	Certify that works are operated and maintained in accordance with required standards.
Verification of outputs, products and services by third party	Design auditor	Accredited WSUD auditor	Verify that design is in accordance with required standards.
	Construction auditor		Verify that constructed works are in accordance with required standards.
	Operation and maintenance auditor		Verify that works are operated in accordance with required standards.
Accreditation of certifiers or auditors	Accreditation authority or agency	Independence from certifiers	Develop and maintain accreditation procedures. Maintain register of accredited practitioners.

6.2 Alternative administration frameworks for a WSUD verification system

Administration frameworks to manage and implement any WSUD verification system could include:

- developing a new program under the South East Queensland Healthy Waterways Partnership or within an existing government agency such as the Department of Infrastructure and Planning (DIP) or the Department of Local Government, Sport and Recreation (DLGSR)
- developing a new program under an existing professional body, such as the Stormwater Industry Association (SIA) or Engineers Australia
- creating a new certification authority
- expanding an existing certification framework, such as a Registered Professional Engineer of Australia (RPEQ), the National Professional Engineers Register (NPER) or certification under the *Queensland Building Act 1975*.

7 Possible Implementation Options

7.1 Introduction

Four alternative approaches to the verification of WSUD in South East Queensland have been identified for consideration. These approaches do not represent an exhaustive list of alternatives, but cover the possible range of options from very simple to more complex.

The schemes are described below and a comparative summary is presented in Table 5.

7.2 Option 1 — Do nothing

This is the business-as-usual case, where no specific verification scheme is introduced but existing guidelines and training programs continue to be used and further developed. This option could also include the development of improved processes to facilitate better design integration and outcomes through local government and the development approval process, for example through the Smart eDA process <https://www.smarteda.qld.gov.au/>.

Option 1 is the least complex and the cheapest approach. While it provides no opportunity to improve WSUD outcomes through a verification scheme, it does allow for continuous improvement through the progressive development of guidelines, training and other systems and process.

7.3 Option 2 — Use an existing verification scheme

Option 2 involves adapting an existing verification scheme to improve its relevance to, and effectiveness for, WSUD. In South East Queensland, the most logical scheme to adapt is the registration scheme to become an RPEQ under the *Professional Engineers Act 2002*. A new 'area of practice' would need to be approved by the Minister and practitioners seeking WSUD verification would need to apply for specific accreditation in this area. Any proposal of this nature would need to be negotiated and agreed with the Board of Professional Engineers Queensland (BPEQ).

Option 2 avoids the need for new administrative structures and would, therefore, be relatively low cost. Incorporating WSUD within the requirements for RPEQ would allow WSUD capital works to be certified giving some surety that the minimum standards will be maintained. However, inclusion under a process such as the RPEQ would not incorporate the review and audit stages of WSUD solutions.

An issue with this approach is resolving how it would adequately address the interdisciplinary nature of WSUD. For example, an engineering-based scheme would diminish the importance of landscape architects or ecologists in achieving good outcomes, and may give preference to a single aspect or small subset of WSUD, such as quantifiable stormwater quality targets.

7.4 Option 3 — Develop a new scheme with medium-level verification

Options 3 and 4 establish the concept of a specialist area, 'Certified WSUD Professional (CWP)' with increased levels of audit and scrutiny to improve compliance with standards.

Option 3 proposes that a new verification scheme is created to provide medium-level control. Professionals would seek accreditation from a new, purpose-established body. If possible, this body should be created within an existing organisation such as the SIA or South East Queensland Healthy Waterways Partnership. Alternatively, a totally new body could be established.

The main disadvantage of Options 3 and 4 is that establishing a new organisational structure will involve a significant cost. For Option 3, it may also be difficult to find a host organisation prepared to take on this role.

7.5 Option 4 — Develop a new scheme with high-level verification

Option 4 is similar to Option 3 except that the level of verification would be much higher, increasing the level of control through third-party and possibly regulatory auditing. An example of this is the Urban Land Development Authority's (ULDA) development application certification process. The ULDA process requires independent review of complex applications and process or product audits by the ULDA or third-party auditors.

Table 5 Comparison of possible implementation options

OPTION	ADMINISTRATION	VERIFICATION LEVEL	IMPLEMENTATION	BENEFITS	DISADVANTAGES
1. Do nothing	-	None	Continue with development of existing guidelines and training.	Simple, low cost. Avoids fragmentation.	No guarantee of improvements.
2. Use an existing verification scheme	For example, Board of Professional Engineers (BPEQ).	Medium–low	As above with a new area of practice (WSUD) specifically defined. New application for registration in this area is required.	Uses existing structure and administration. Defines WSUD as aspecific area of practice. Increases onus on individuals to be proficient.	Fails to address interdisciplinary nature of WSUD. No procedures for certification or auditing of work undertaken. Continues to rely on individual self-regulation. Requires ministerial approval for change.
3. Develop a new scheme with medium-level verification	New structure possibly established under SIA or SEQ Healthy Waterways Partnership.	Medium — requires WSUD work to be undertaken and certified by a 'Certified WSUD Professional'.	As above plus defined prerequisites, application process, fees, administration structure and CPD requirements.	Provides improved confidence that work is undertaken by appropriate professionals and meets minimum standards. May reduce fragmentation within professional practice. May reduce costs.	Requires establishment of new administrative structure. May increase fragmentation within professional practice. May add cost and complexity to developments.
4. Develop a new scheme with high-level verification	New structure possibly established under SIA or SEQ Healthy Waterways Partnership.	High–very high — requires WSUD work to be undertaken and certified by a 'Certified WSUD Professional'. Providing for third party and possible regulatory audits.	As above.	Provides highest level of confidence that work meets minimum standards. May reduce fragmentation within professional practice. May reduce costs.	Requires establishment of new administrative structure. May increase fragmentation within professional practice. May add cost and complexity to developments.

8 Discussion

8.1 Is WSUD verification required?

Poor WSUD practices can lead to:

- delayed assessment and approvals
- diminished water quality or water conservation outcomes
- increased capital cost
- poor integration and aesthetics (e.g. creating eyesores)
- increased maintenance requirements
- reduced lifespan of infrastructure
- high rectification costs
- reduced confidence in innovative and sustainable approaches
- increased risk.

Many disciplines in engineering, which are equally as complex as WSUD, do not have discipline-specific verification systems, but are controlled by a range of established legislation and industry guidelines under the broad control of the RPEQ and NPER programs. However, WSUD is a relatively new and rapidly evolving discipline that does not have the benefit of long-established accepted practice and guidelines.

The workshop participants rated the need for WSUD verification as 'medium', but no so high as to necessarily require urgent policy action.

8.2 Benefits of a successful verification scheme

A verification system would improve the delivery of WSUD infrastructure by ensuring WSUD designs comply with current best practice, that WSUD solutions are properly constructed and established and that adequate provision is made for long-term operation and maintenance. Improved delivery of WSUD infrastructure will also result in improved water quality outcomes and better urban design outcomes (refer to http://www.waterbydesign.com.au/businesscase). Better design and construction also leads to minimal operational and maintenance intervention due to replication of 'natural' systems.

A formal verification system would need to have a greater focus on the importance of integrating all disciplines involved in delivering WSUD by improving co-ordination and integration of disciplines to produce a more efficient delivery process. Improved coordination will also lead to greater accountability for WSUD outcomes through the design and construction process and an increased incentive to perform well.

Regulators and owners (both public and private) would also have greater confidence that design objectives will be achieved. This would also lead to increased understanding, uptake and improvement of WSUD as verifiers offer a new service and verification provides a set of useful checks. It should also lead to shorter assessment timeframes through placing the onus for appropriate design on certified practitioners rather than on development assessment personnel, leading to reduced development costs through better design.

Finally, a verification system would provide a quality framework to support changing regulatory requirements for compliance with water quality and flow management objectives for urban development such as the South East Queensland Regional Plan 2009–2031 *Implementation Guideline No. 7: Water Sensitive Urban Design — Design Objectives*.

8.3 Disadvantages of a verification scheme

Many other areas of professional practice are not subject to a verification scheme and the introduction of a verification system provides no guarantee of improved outcomes. A certification system does not guarantee that only the right people are certified. Many stakeholders are committed to WSUD principles and, therefore, do not need certification.

If it is not executed well, a new certification scheme could detract from integrating the various disciplines involved in developing successful WSUD solutions, fragmenting the industry by creating an 'in' group that is isolated from other practitioners. A poorly executed system could also create a mechanism for excluding competition.

It could be argued that there are adequate existing frameworks to control WSUD practitioners and outcomes, for example via the RPEQ or through legal penalties. Better use could be made of these existing

frameworks by employing competent management systems, competency-based training, and risk assessment, rather than imposing new frameworks.

The effectiveness of a new system of certification will depend on the quality of verifiers and may encourage 'box ticking' that reduces the individual sense of ownership of the design, fails to result in any better quality outcomes, and stifles innovation.

Introducing a verification scheme would add another bureaucratic layer to the already complex development process, which could increase costs to the development industry and delay the design development and approval processes. Depending on the option considered, a new verification program could also be costly to implement, with costs likely borne by government.

9 Conclusions

There is a recognition in the industry that WSUD practice does require improvement and that not all practitioners are achieving a consistent quality level. Key contributing factors are identified as:

- difficulty of keeping pace with the rapidly changing nature of WSUD techniques and guidelines
- failure to adequately coordinate and integrate the various disciplines involved in WSUD
- lack of accountability by proponents and developers
- complexity and lack of consistency of local government design and approvals processes.

A WSUD verification scheme could deliver a range of benefits including better projects, greater confidence at the regulatory level, reduced costs and approval timeframes. There is, however, uncertainty that a verification scheme is the best method of achieving these improvements.

Many existing verification schemes, from which lessons could be learned for any WSUD schemes, are fairly young and have not been fully tested to confirm their effectiveness. They also vary in coverage and quality of attributes and have stringent initial assessments.

Some practitioners argue that the focus of any verification scheme should be on the planning and design phases of projects and on the importance of the integration of disciplines.

There is potential for a WSUD-specific scheme to be established under an existing program, such as the RPEQ, or for a new scheme to be run within an established organisation, such as SIA, or South East Queensland Healthy Waterways Partnership.

9.1 Recommendations

It is recommended that Water by Design:

- circulate this discussion paper for comment
- consider bolstering non-verification processes, including additional guidelines, promotion of awareness of good and bad applications of WSUD, and undertake further investigation of root cause failures and remedial actions
- consider certification attributes that may give better value than establishing a formal verification scheme, for example incorporating the best aspects of 'certification' schemes into training programs
- consider investigating verification schemes further, including a survey of WSUD stakeholders, collation of responses to this discussion paper, evaluating the efficiency and effectiveness of alternative schemes and developing a preferred model for Queensland.

10 References

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Attachments

Attachment 1 — Outcomes of WSUD certification workshop

General

A workshop was held on 19 June 2009 to discuss issues associated with certification in relation to WSUD and to inform the preparation of this discussion paper. The workshop aimed to bring together key stakeholders representing government, industry and organisations with experience implementing similar schemes.

Workshop objectives

The workshop was used to:

- debate and (where possible) agree on the need for a certification scheme and the preferred approach to certification
- canvas input on already identified options as well as any alternatives not previously identified
- discuss issues associated with implementation of any certification scheme.

Stakeholders

The list of the key stakeholders, determined in conjunction with Water by Design, is shown in Table A1-1.

Table A1-1 List of stakeholders and workshop attendees

ORGANISATION	REPRESENTATIVE	ATTENDANCE
Project team		
SEQHWP	Alan Hoban	Attended
Bligh Tanner	David Hamlyn-Harris	Attended
EnviroPartners	Simon Cavendish	Attended
Government		
DERM	Peter Curley	Apology. Contacted following workshop for comment.
GCCC	Kendall Bott	Apology. Contacted following workshop for comment.
Ipswich CC	Gary Ellis	Attended
Sunshine Coast RC	Damien McGarry	Apology. Contacted following workshop for comment.
Logan CC	Kylie Holmes	Apology. Contacted following workshop for comment.
BCC	Charlotte Beresford	Attended
Professional bodies		
SIA	Belinda Chapman	Apology. Contacted following workshop for comment.
Engineers Aust	Michael Bevan and Ian McEwan	Apology. Contacted following workshop for comment.
Board of Professional Engineers Queensland	Clare Murray	Apology. Contacted following workshop for comment.
AILA	Stephen Pate	Attended
EIANZ	David Carberry	Apology. Contacted following workshop for comment.
UDIA	Kirsty Chessher	Attended

Table A1-1 List of stakeholders and workshop attendees continued

ORGANISATION	REPRESENTATIVE	ATTENDANCE
Practitioners		
BMT-WBM	Brad Dalrymple	Attended
Bligh Tanner	Chris Tanner	Attended
Brown Consulting	Andrew McPhail	Attended
Gilbert and Sutherland	Chris Anderson	Attended
Cardno	Martin Giles	Apology. Contacted following workshop for comment.
Cardno	Daniel Niven	Attended

Workshop outcomes

General

The outcomes of the workshop are reflected throughout the discussion paper. In addition, a number of the key issues and findings are highlighted here.

Level of risk associated with WSUD

Participants were asked to rate the level of risk associated with WSUD using a standard risk matrix (refer to Attachment 2). The results of the exercise are summarised inTable A1-2 and the scatter diagram shown in Figure A1-1. The responses indicated that:

- none of the participants rated the risks as extreme
- most participants rated the level of risk as 'medium' to 'medium–high'
- different WSUD types and different WSUD activities rated differently along the axis between 'high consequence' and 'remote likelihood' and clustered towards 'low consequence' and 'high likelihood'
- in this simple exercise participants struggled with the question of scale and how that affected the perception of risk.

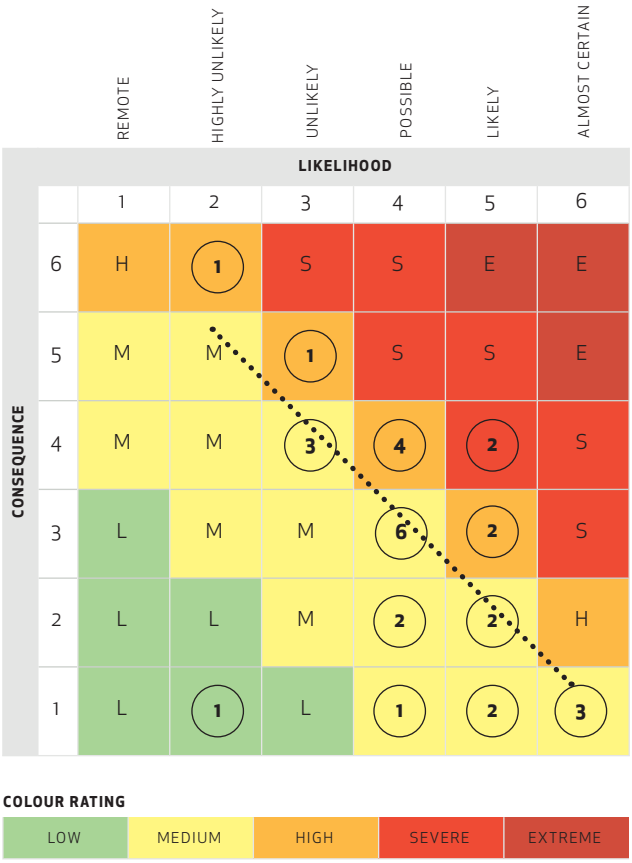
In summary, the workshop participants rate the risks associated with the failure to implement WSUD, or the failure to implement WSUD appropriately, as 'medium' to 'medium–high' but not 'high', 'severe' or 'extreme', which would require urgent remedial policy action.

Table A1-2 Level of risk associated with no or poor implementation of WSUD

LEVEL OF RISK	NO. OF RESPONSES
Extreme	-
Severe	2
High	8
Medium	19
Low	1

Risk matrix

Figure A1-1 Responses to workshop risk assessment



Verification framework options

Participants were also asked to consider a range of Verification framework options (refer to Table A1-3). The generic options presented a range from 'low importance' (i.e. certification against broad WSUD principles) up to 'very high importance' incorporating multiple verification opportunities and audits. The results of the exercise are also summarised in Table A1-3. The responses indicated that:

- none of the participants rated the importance as 'high', 'very high' or 'low'
- most responses rated the level of importance as 'medium–low' to 'medium'
- discussion focused on whether verification should consider either:
  - the 'process', i.e. the design and approval processes and the need for standardisation of development approval processes and submission requirements
  - the 'person', i.e. the individual practitioner involved in the design, construction or implementation processes
  - the 'product', i.e. the design or the completed infrastructure
- three participants mentioned 'process' verification specifically as the most important consideration.

Workshop participants rated the need for WSUD verification as 'medium' but not so high as to necessarily require urgent policy action.

Table A1-3 Verification framework options

IMPORTANCE OF VERIFICATION	THEORETICAL MODEL	EXAMPLE	NO. OF RESPONSES
Very high	Multiple verification opportunities: designers, constructors and operator certification. Third-party project audit and regulator process audit.	ULDA	0
High	Multiple verification opportunities tailored to WSUD risk: e.g. design certification, construction certification, third-party project or process audit.	?	1
Medium–high	Certify practitioner to certify WSUD types and third- party process audit.	?	2
Medium	Certify practitioner and require them to work on WSUD design and construction.	GSAP	2
Medium–low 1	Certify practitioner in WSUD broadly.	CPESC NPER/RPEQ	4
Medium–low 2	Certify practitioner in part of the WSUD process, e.g. risk assessment, and apply third-party process audit.	RiskSMART	0
Low	Certify person broadly in WSUD principles.	CenvP	1
None	Use existing standards, due diligence and training.	Existing	1

Stakeholder comments

General

Workshop participants were given a number of opportunities to express their views regarding the key issues and preferred conclusions from this exercise. Following is a summary of the key comments.

- Any scheme needs to recognise the multi-disciplinary nature of WSUD practice (not all practitioners are engineers) — architects, planners and landscape architects need to be included.
- There is a problem of accountability and a need for practitioners to lift standards and improve the quality of outcomes within the existing framework of legislation and guidelines.
- There is a problem of ineffective 'integration' and co-ordination of the various disciplines to achieve the required outcomes.
- Submission requirements vary across local governments and could be strengthened and standardised. In particular this could be used to move the onus for discipline integration from local government to the proponent.
- Any scheme should focus on the initial design and allow the rest of the process to follow.
- Views differed about whether there should be a single point of accountability and sign-off on each project, for example, an engineer signing off that the work is complete and all disciplines have been fully integrated. The counter view is that it cannot be assumed that any one profession is qualified to sign-off on the work of another and there is a need for shared responsibility across disciplines. In practice this would mean that the discipline-leader, responsible for signing off on overall completion, would need to rely on 'back-to-back' certification from the individual disciplines.
- There was concern that a certification scheme could certify individuals who were not suitable or appropriately qualified.
- There was also concern that, with a scheme in place, some practitioners may follow the process without adequately understanding what they were doing or without considering the outcomes.
- There was concern about creating a new scheme and a preference to use existing systems. For example, it was suggested that a 'tightened up' RPEQ process could be used.

- Any certification scheme needs to be flexible to accommodate changing and improving requirements over time.
- The process also needs to involve the developer or proponent as a significant party to make them more aware of the risks and benefits of good WSUD outcomes.
- There is concern that a new verification or certification scheme would add another layer of bureaucracy and red tape without necessarily achieving the required improvements.
- A scheme that tries to satisfy everyone's requirements may end being too weak to be effective.
- A scheme that is designed to control the work of the 'lowest common denominator' practitioner is likely to end up being excessively prescriptive and not earn the respect of all disciplines.
- There is a risk that a certification scheme may place too much emphasis on stormwater quality aspects to the detriment of broader urban outcomes.
- It may be preferable to develop a multi-pronged approach incorporating improved guidelines, risk management, incentives, penalties and approvals processes.
- The consequences of not implementing a certification scheme may not be so great, i.e. an intensive process could come with a high cost and provide marginal added value.
- The lack of a WSUD certification scheme may not be the primary cause of poor WSUD outcomes.
- There is a need to learn from the experiences gained with other similar certification systems.
- Any WSUD certification process needs to consider requirements for erosion and sediment control.
- Any scheme needs to be auditable.

Attachment 2 — Risk assessment matrix

Risk matrix instructions:

Risk can be considered as the product of the likelihood that a particular risk event occurs and its resultant consequence. Likelihood is based on the probability that an event will occur and the amount of time (exposure) that the event could occur in.

- Identify the risk under consideration.
- Should the risk occur, consider possible consequences referencing the consequence categories.
- Identify the consequence rating (1–6) corresponding to the maximum reasonable impact.
- Identify the probability rating (P1–P6) from the likelihood rating table that the consequence could be realised, i.e. the probability of the event occurring.
- Identify the exposure rating (E1-E6) from the likelihood rating table, based on the frequency of the activity undertaken, i.e. exposure to the risk.
- Based on the probability and exposure ratings, identify the likelihood rating (1–6) from the intersecting cell in the likelihood rating table.
- A likelihood rating of 0, denotes that the likelihood may not be considered credible. Consider rechecking the probability and exposure to ensure satisfaction with this outcome. This risk may be recorded in a risk register, the risk ranking will be denoted as 'N/C' — not crediable.
- A likelihood rating of 1–6 should be used in conjunction with the consequence rating in the risk matrix to identify risk ranking.

Risk matrix — likelihood rating table

			EXPOSURE					
			NOT IN 100 YEARS	AT LEAST ONCE IN 100 YEARS	AT LEAST ONCE IN 10 YEARS	AT LEAST ONCE A YEAR	AT LEAST 4 TIMES A YEAR	AT LEAST ONCE PER WEEK
			E1	E2	E3	E4	E5	E6
PROBABILITY	Not known to occur in a comparable activity internationally, but plausible. 1 in 100,000 to 1,000,000	P1	0	0	0	0	1	1
	Known to occur in a comparable activity internationally, but unlikely. 1 in 10,000 to 100,000	P2	0	0	0	1	1	2
	Has occurred or could occur for this or a comparable activity in Australia. 1 in 1,000 to 10,000	P3	0	0	1	1	2	3
	Expected to occur infrequently during this activity. 1 in 100 to 1,000	P4	0	1	1	2	3	4
	Expected to occur occasionally during this activity. 1 in 10 to 100	P5	1	1	2	3	4	5
	Expected to occur frequently during this activity. 1 in 10	P6	1	2	3	4	5	6

Risk matrix (continued)

	CONSEQUENCE CATEGORIES					
	IMPACT TO ORGANISATION OR CONTRACTING PERSONNEL	NATURAL ENVIRONMENT	COMMUNITY DAMAGE/ IMPACT/ SOCIAL/ CULTURAL HERITAGE	FINANCIAL IMPACT (E.g. DUE TO LOSS OF REVENUE, BUSINESS INTERRUPTION, COMMODITY TRADING, ASSET LOSS)	DAMAGE TO REPUTATION, SERVICES INTERRUPTION, CUSTOMER INTERRUPTION	BREACH OF LAW OR CRIMINAL PROSECUTION OR CIVIL ACTION (E.g. OHS, ENVIRONMENT, INDUSTRIAL RELATIONS, TRADE PRACTICES, INDUSTRY ACTS)
6. CATASTROPHIC	Multiple fatalities ≥ 4 or severe irreversible disability to large group of people (>10).	Long-term destruction of highly significant ecosystem or very significant effects on endangered species or habitats.	Multiple community fatalities, complete breakdown of social order, irreparable damage of highly valued items of great cultural significance.	EBIT: Impact, loss or deterioration expected greater than $100m. Cash Flow: Severe cash flow crisis, unable to source funds.	Negative international or prolonged national media (e.g. 2 weeks). Continued severe degradation of services to customers > 1 month or > 10,000 customer days.	Potential jail for executives and or very high fines for the company. Prolonged multiple litigations.
5. CRITICAL	1–3 fatalities or serious irreversible disability (>30%) to multiple people (<10).	Major offsite release or spill, significant impact on highly valued species or habitats to the point of eradication or impairment of the ecosystem. Widespread long-term impact.	Community fatality. Significant breakdown of social order. Ongoing serious social issue. Major irreparable damage to highly valuable structures or items of cultural significance.	EBIT: Impact, loss or deterioration expected greater than $30m but less than $100m. Cash flow: Severe cash flow crisis, difficulty to source funds. Probable credit rating downgrade.	Negative media national for 2 days or more. Significant public outcry. Severe degradation of services to customers up to 1 month or >5,000 customer days.	Very significant fines and prosecutions. Multiple prosecution and fines.
4. MAJOR	Serious permanent injury or illness or moderate irreversible disability (<30%) to one or more people.	Offsite release contained or immediately reportable event with very serious environmental effects, such as displacement of species and partial impairment of ecosystem. Widespread medium-term impact and some long-term impact.	Serious injury of member of the community, Widespread social impacts. Significant damage to items of cultural significance.	EBIT: Impact, loss or deterioration expected from $3m but less than $30m. Cash flow: Loss of flexibility or increase in costs to source funds. Market explanation may be required.	Negative national media for 1 day, Individual customers or segments disadvantaged up to 1 week. Customer interruption >500 customer days. NGO adverse attention.	Major breach of regulation and significant prosecution including class actions.
3. SERIOUS	Serious reversible, temporary injury, illness (e.g. lost time 5+ days or hospitalisation or alternate/ restricted duties > 1 month)	Moderate effects on biological or physical environment and serious short-term effect to ecosystem functions. (e.g. oil spill impacts on shoreline).	Media attention and heightened concerns by local community and criticism by NGOs. Ongoing social issues. Permanent damage to item.	EBIT: Impact, loss or deterioration expected greater than $0.3m but less than $3m. Cash flow: Material impact to cash flow. Review of project or business unit risks or strategy and assumptions will be required.	Negative state media. Heightened concern from local community. Service interruption up to 1 day or > 10 customer days. Criticism by NGOs.	Serious breach of law or regulation with investigation or report to authority with possible prosecution. Performance Infringement Notice (PIN).
2. MODERATE	Reversible temporary injury or illness requiring medical treatment (e.g. lost time <5 days or alternate/restricted duties for < 1 month).	Event contained within site. Minor short-term damage to area of limited significance Short-term effects but not affecting ecosystem functions.	Medical treatment injury of a member of the community. Minor adverse local public or media attention and complaints. Minor medium-term social impact on local population, mostly repairable.	EBIT: Impact or loss greater than $0.03m but less than $0.3m. Cash flow: Impact to project or business unit cash flow. Business unit or project level investigation may be required.	Public concern restricted to local complaints. Negative local media. Internal escalation to senior management. Few hours service interruption. Adverse local public attention.	Breach of law or regulation or non-compliance. Minor legal issues, minor litigation possible.
1. MINOR	Injury or illness requiring medical treatment (no lost time, no alternate/ restricted duties), first aid, report only.	Minor consequence, local response. No lasting effects. Low-level impacts on biological and physical environment to an area of low significance.	Public concern restricted to local complaints, low-level repairable damage to common place structures.	EBIT: Impact or loss greater than $3,000 but less than $30,000. Cash flow: No significant impact.	Public concern restricted to local complaints.	Local investigation, minor breach or regulation, on-the-spot fine or technical non-compliance. Prosecution unlikely.

Risk matrix (continued)

CONSEQUENCE	1. REMOTE (NOT IN 100 YEARS)	2. HIGHLY UNLIKELY (AT LEAST ONCE IN 100 YEARS)	3. UNLIKELY (AT LEAST ONCE IN 10 YEARS)	4. POSSIBLE (AT LEAST ONCE A YEAR)	5. LIKELY (AT LEAST 4 TIMES A YEAR)	6. ALMOST CERTAIN (AT LEAST ONCE PER WEEK)
6. CATASTROPHIC	H	H	S	S	E	E
5. CRITICAL	M	M	H	S	S	E
4. MAJOR	M	M	M	H	S	S
3. SERIOUS	L	M	M	M	H	S
2. MODERATE	L	L	M	M	M	H
1. MINOR	L	L	L	M	M	M

LIKELIHOOD

COLOUR RATING

LOW	MEDIUM	HIGH	SEVERE	EXTREME

Attachment 3 — Incentives and penalties in social change

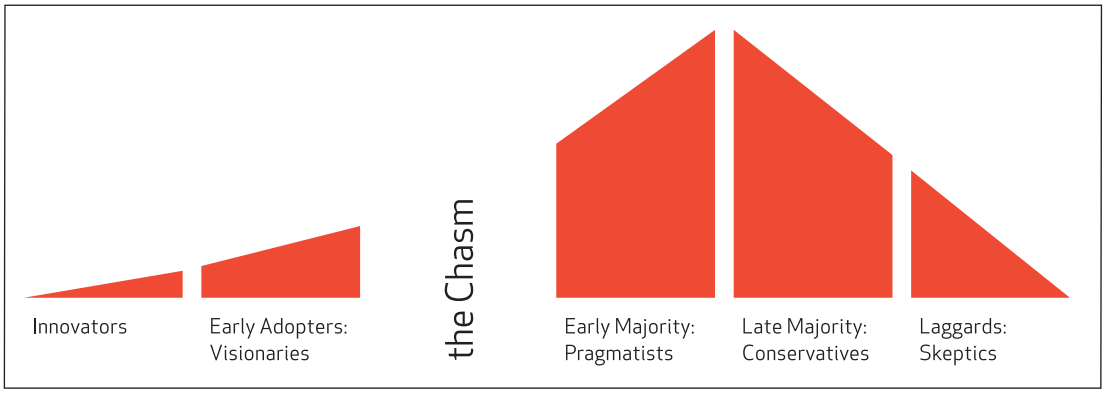
Background

This overview discusses the motivations for people to change, what seems to happen under penalties and incentives, and some experience with certification.

Social change

Society seems to exhibit of a range of motivations for social change from innovators to sceptics in the proportions and distribution shown in Figure A3-1. The majority of people are the pragmatists and conservatives who need encouragement to meet standards.

Figure A3-1 Social change model



Motivations may be different. Sceptics and some conservatives may need penalties. Pragmatists and early adopters may respond to incentives.

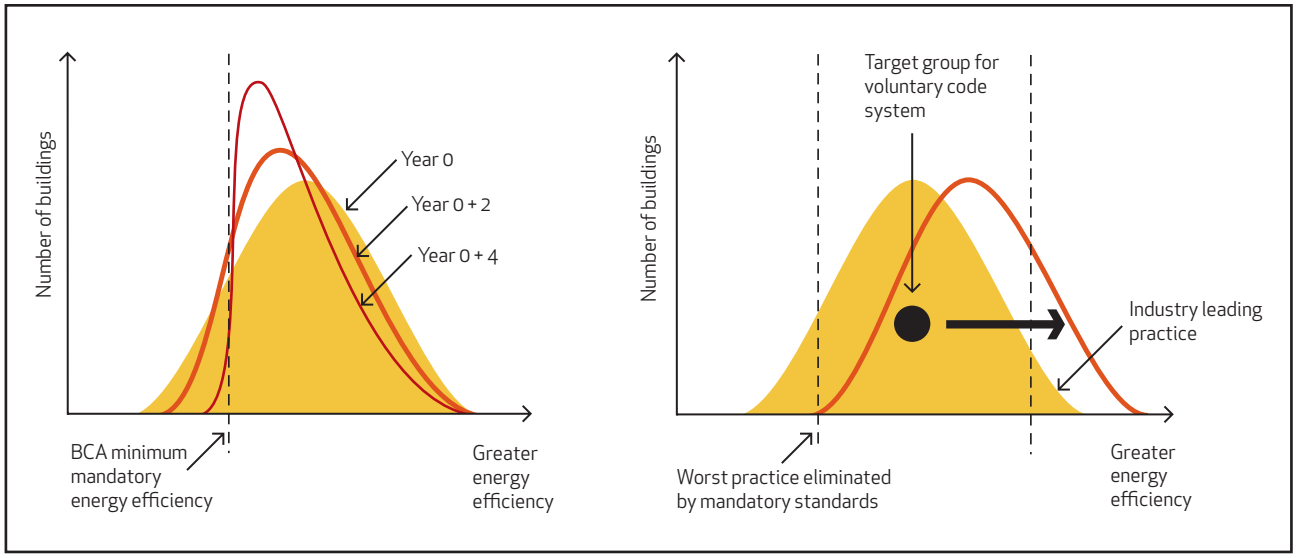
Missing in the equation is education, which is needed for both, and may encourage the majority to respond to incentives.

Certification is a way of having someone, usually a third party, verify that standards have been met.

Performance incentives and penalties

Typically, government has recognised the need to apply a push-pull approach to improving performance. Figure A3-2 illustrates what happens under standards (with penalties) and under a voluntary arrangement (incentives). Pushing with penalties causes the majority to drive at the (speed) limit. Pulling with incentives can improve overall performance beyond the mandatory standard.

Figure A3-2 Building industry uptake of energy efficiency



Source: Australian Sustainable Built Environment Council (ASBEC)

Verification

Verification is a checking system to confirm that the prescribed standards have been met. It is the feedback loop in management systems, e.g. ISO 9001, 18001, 14001. It may include certification, auditing or review.

For example, the reduction in per capita water consumption in South East Queensland was accompanied by:

- regulation, for example Water Efficiency Management Plans and dedicated watering times
- incentives, for example for water tanks and water audits
- auditing and reporting provided important feedback loops.

Industry examples

Penalties, incentives and certification are used in many industries across Australia.

Mining

The Australian Mining Industry (AMI) is regulated by the State with penalties for poor performance.

AMI also has a voluntary scheme, 'Enduring Value', which is an internal 'incentive' system structured and aimed towards ecologically sustainable development (ESD), without articulating clear standards. Most of the major mining companies apply third-party verification audits to confirm performance. Verifiers are not necessarily certified.

Buildings

Building development is regulated in Queensland by local government using Development Approvals (DAs) and Building Authorities (BAs), with penalties for poor performance.

The Green Building Council, among others, offers rating schemes with clear standards (stars) that are revised over time. Third-party verifiers are 'certified' and confirm performance to the standards.

Infrastructure

Infrastructure is regulated by Impact Assessment conditions, with penalties for poor performance.

The UDIA offers rating schemes with standards that change over time. The recently formed Australian Green Infrastructure Council will offer the same. Verifiers confirm performance to the standards.

Lessons

The lessons from social change and various industry approaches is that people will change their behaviours with a mix of penalties (for the laggards), incentives (for the leaders) and education (for all). An underlying motivator is the threat of penalties if incentives don't work.

Certification is used to support incentives and add value.

Attachment 4 — Existing certification scheme attributes

Overview of relevant existing schemes

Registered Professional Engineer of Queensland

The *Queensland Professional Engineers Act 2002* provides for the registration of professional engineers in Queensland (RPEQ) via the Board of Professional Engineers Queensland (BPEQ). The Act requires that any professional engineer wanting to practice in Queensland must either be registered or be working under the direct supervision of a registered engineer.

This is a state-based, government-run system that defines certain general professional requirements without being very specific about particular disciplines. For example, WSUD is included implicitly within the very broad category of 'Civil Engineering'. The Board maintains a register of practitioners in certain general areas and requires that they work only within their field of competency. It is largely left to the individual to maintain their accreditation and to ensure compliance with the requirements of registration. BPEQ audits are limited to auditing individuals' compliance with continuing professional development (CPD) requirements rather than competence or quality of work.

National Professional Engineers Register

The National Professional Engineers Register (NPER) is a national system under the auspices of Engineers Australia (EA), and administered by the National Engineers Registration Board. It is very similar to the RPEQ process defining certain general requirements without being very specific with respect to any particular disciplines.

Since July 2008, EA (and where relevant the Australasian Institute of Mining and Metallurgy (AusIMM)) has been accredited by the BPEQ to verify the qualifications and experience of applications for RPEQ. The effect of this is that there are now common admission requirements for both NPER and RPEQ.

Certified Environmental Professional

The Environment Institute of Australia and New Zealand (EIANZ) operates a Certified Environmental Professional (CEnvP) scheme to boost community and business confidence in environmental professionals. CEnvP certification involves completion of a comprehensive application followed by assessment and interview by a panel of peers. Certification is reviewed biennially and depends on completion of CPD and confirmation of ethical conduct.

Certified Professional in Erosion Control

The International Erosion Control Association (IECA) Australasia manages the Certified Professional in Erosion and Sediment Control (CPESC) program. CPESC certification involves an exam, acceptable professional experience, provision of referees and acceptance of a Code of Ethics.

Proposed Certified Professional in Stormwater Quality

Similar to the CPESC program, it has been proposed that a Certified Professional in Stormwater Quality (CPSWQ) program be established, possibly under the Stormwater Industry Association (SIA). This proposal has not progressed at this stage. This proposal has similarities with a WSUD Practitioner Certification scheme; however, it is restricted to the stormwater quality aspects of WSUD.

Australian Institute of Landscape Architects Registration Scheme

The Australian Institute of Landscape Architects (AILA) is Australia's peak professional body for landscape architects. An AILA professionally recognised landscape architect is referred to as being a Registered Landscape Architect. As a minimum, a registered member has satisfied the requirements of the twelve-month assessment, which may be undertaken following at least two years' practice since graduation from an accredited university landscape architecture program. Once registered, all Registered Landscape Architects are required to undertake annual professional development (30 points annually) and to report on their annual CPD with their annual renewals. The AILA Registered status is recognised throughout Australia as being the professional benchmark for practising landscape architects.

Urban Land Development Authority Development Assessment Certification

The Urban Land Development Authority (ULDA) requires developers to self-certify operational and compliance works applications within ULDA-controlled precincts. The system relies on the RPEQ system, or similar, to ensure that certifiers are appropriately qualified and accredited. The process also allows for independent review of some complex applications and process or product audits by the ULDA or third-party auditors.

A set of procedures has been prepared to control the process. These procedures are available at <http://www.ulda.qld.gov.au/01_cms/details.asp?ID=173>.

Private Certification of Building Work (Qld)

The Queensland *Building Act 1975* provides for the certification of Private Building Certifiers for construction works in Queensland. A building surveyor or certifier is a building professional who performs building surveying and certification work on building structures. Building surveyors or certifiers assess and approve building plans for compliance with the Building Code of Australia and related Australian Standards. They inspect building work to ensure compliance with laws and regulations, codes and local government planning requirements. They interpret, advise on and enforce laws and regulations regarding building construction and safety.

Building surveyors and certifiers can:

- provide pre-lodgement advice and assistance to builders and owners
- assess building plans submitted for approval
- inspect buildings during construction to ensure conformance to building regulations
- assess the condition of existing buildings
- issue building permits
- issue compliance certificates on completion.

An Australian bachelor degree level qualification is one of the entry requirements to work as a building surveyor or certifier.

In Queensland, licensing is compulsory for building surveyors and certifiers. All building professionals wanting work in Queensland as a building surveyor or certifier must apply for an appropriate licence from the Queensland Building Services Authority (BSA). Accreditation determines a building surveyor's or certifier's Practice Level. The Australian Institute of Building Surveyors (AIBS) provides a range of accrediting functions that assess the educational qualifications, experience and commitment to continuing professional development of building surveyors and certifiers.

Private Certification of Building and Subdivisional Work (NSW)

The NSW *Environmental Planning and Assessment Act 1979* also provides for private certification of building and subdivision work. Accredited certifiers can issue subdivision certificates, issue construction certificates related to compliance with the Building Code of Australia, issue complying development certificates and act as a principal certifying authority.

The New South Wales scheme differs from the Queensland system because it identifies specific categories of accreditation.

- C3 Stormwater Management Facilities Design Compliance includes issuing compliance certificates for designs for stormwater management facilities related to subdivision or building work. This includes WSUD systems and stormwater quality management systems.
- C4 Stormwater Management Facilities Construction Compliance.

The Association of Accredited Certifiers (AAC) was established in 2003 to represent the interests of professionals actively participating in the certification of building and subdivision works in New South Wales. The AAC promotes the activities and services of accredited certifiers to the building and development industry and the public, as responsible, reliable and effective alternatives to local government certifiers. Members of the association are bound by a system of values that ensures the public and customers of AAC members are confident they will receive consistent, reliable and responsible service by a qualified professional suitably accredited in their area of expertise.

Certifiers need to be accredited under the accreditation scheme administered by the Building Professionals Board under the *Building Professionals Act 2005*. The certificates and work that an accredited certifier can do depends on the terms of their accreditation.

Green Star Accredited Professional

The Green Building Council of Australia (GBCA) offers a Green Star Accredited Professional program (GSAP). GSAP is for building professionals to gain a deep knowledge behind the environmental rating tools and a strong capability of applying this knowledge to the design, construction and operation of buildings. GSAP

accreditation involves training on one rating tool and the GBCA rating scheme, followed by an exam. There is no CPD or need for renewal.

RiskSMART

Brisbane City Council's RiskSMART provides a process to expedite low-risk development approvals. It accredits competent and experienced consultants to review and condition applications using a risk framework supported by an on-line assessment tool.

JAS-ANZ

JAS-ANZ is the government-appointed accreditation body for Australia and New Zealand responsible for providing accreditation of Conformity Assessment Bodies (CABs) in the fields of certification and inspection. Accreditation by JAS-ANZ demonstrates the competence and independence of these CABs.

Professions Australia

Professions Australia is a national organisation of professional associations with 29 member associations representing around 400,000 professionals across Australia. It advances and promotes professionalism for the benefit of the community. It does this by:

- complementing and supporting its member associations
- communicating the benefits of professionalism and ethical practices
- providing the means for sharing information, ideas and experience among the professions
- developing and promoting policies on issues of interest to the professions
- providing government with reliable and objective advice on relevant issues
- supporting member associations in the promotion of professionalism.

Professions Australia and its member associations place a high priority on pursuing initiatives to enhance professional standards and increase the contribution the professions make to the broader community, including:

- maintaining and developing the ethical standards of professionals
- working in partnership with the higher education sector to ensure excellence in professional education
- encouraging continual professional development and the updating of professional knowledge
- contributing to the recognition by governments and the community of the need to maintain as a 'public good' the highest levels of professional practice
- supporting volunteering and community service by individual professionals.

Urban Stormwater Quality Management Working Group

The Urban Stormwater Quality Management (USQM) Working Group has been set up by the South East Queensland's CEO's committee on Natural Resource Management to help improve WSUD outcomes. While this is not an accreditation system, it is relevant to include it here for reference.

Other management systems

Management systems, some certified to ISO 9001 and 14001, use a 'checking' step and have been adopted by many businesses. They have the flexibility to be applied at any stage in the WSUD process and are recognised for offering due diligence. The 'checking' step is for audit and review, not certification.

Other schemes

A number of other schemes and systems are of interest, but not directly relevant to WSUD:

- Examples of building, mining and infrastructure certification listed in Attachment 4.
- The National Association of Testing Authorities, Australia (NATA) is the peak (and only government recognised) accreditation body for laboratory and testing centres in Australia. NCS International Pty Limited (or NCSI) is a wholly owned subsidiary of NATA and is a business assurance and training organisation that helps companies measure conformance against standards, industry benchmarks and specifications.
- Simulation Industry Association of Australia (SIAA) 2005 propose to establish an SIAA Professional Certification Program.
- The website <http://www.standardsportal.org> is a US-based directory of CABs designed to help business identify and get information on CABs.
- The Institute for Certification of Computing Professionals (ICCP), is a US-based system of certification for IT professionals.
- The American Academy of Environmental Engineers (AAEE) certification scheme creates Board Certified Environmental Engineers (BCEE).

- American Academy of Water Resources Engineers certification is a Diplomate, Water Resource Engineer (D.WRE), a voluntary, post-licence credential providing recognition of advanced expertise in a speciality discipline of water resources engineering, advanced professional experience, strong ethics and a commitment to life-long learning and CPD.

Attachment 5 — Existing frameworks and standards

Legal and administrative framework

Generally, stormwater management is regulated in Queensland by local governments through the *Integrated Planning Act 1997 (IPA)* and local government planning schemes.

Legislation and policy underpinning stormwater management include:

- Powers under IPA. Note that IPA is soon to be replaced by the new *Sustainable Planning Act*.
- The *Environmental Protection Act 1994*, which defines the General Environment Duty, i.e. 'a person must not carry out any activity that causes or is likely to cause environmental harm unless that person takes all reasonable and practical measures to prevent or minimise the harm'.
- The Environmental Protection legislation framework 2008 (*Environmental Protection Act 1994*, amendment legislation and Environmental Protection Regulation 2008) has raised penalties for minor and wilful water pollution with powers devolved to local government to direct mitigation actions.
- Amendments to the *Environmental Protection Act 1994* also strengthen the requirement for work that has the potential to pollute to be carried out by appropriately qualified persons.
- Environmental Protection Policies developed under the *Environmental Protection Act 1994* include:
  - the Environmental Protection Policy (EPP) (Water) 1997 developed to help protect Queensland's waters while allowing for development that is ecologically sustainable
  - the Environmental Protection (Water) Amendment Policy (No. 1) 2007 updates current Environmental Values (EVs) and Water Quality Objectives (WQOs) under Schedule 1 of the EPP Water.
- State Planning Policies.
- The South East Queensland Regional Plan.

Federal legislation that may also come into play where receiving environments are of national significance include the *Environment Protection and Biodiversity Conservation Act 1999*.

Technical standards and procedures

Existing technical guidelines relevant to WSUD include:

- Queensland Urban Drainage Manual (QUDM).
- Implementation *Guideline No 7 Water Sensitive Urban Design: Objectives for Urban Stormwater Management* (SEQ Regional Plan 2009–2031) including the requirements:
  - to minimise the change in frequency of disturbance to aquatic ecosystems
  - to control the impacts of urban development on channel bed and bank erosion
  - to control the impacts of urban development on pollutant loads to receiving waters.
- The Environmental Protection Policy (EPP) (Water) 1997 developed to help protect Queensland's waters while allowing for development that is ecologically sustainable.
- The Environmental Protection (Water) Amendment Policy (No. 1) 2007 updates current Environmental Values (EVs) and Water Quality Objectives (WQOs) under Schedule 1 of the EPP Water.
- The *Queensland Water Quality Guidelines* (EPA QLD 2006).
- *Australian Runoff Quality: a guide to water sensitive urban design* (Wong, T. H. F. & Engineers Australia. National Committee on Water Engineering, 2006).
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Primary Industries Ministerial Council and Natural Resource Management Ministerial Council, 2000).
- EPP/SPP (Healthy Waters) — currently under preparation, but not yet publicly available.
- The suite of WSUD guidelines produced by the South East Queensland Healthy Waterways Partnership (SEQHWP) to standardise and improve the quality of WSUD practice in Queensland. These documents include technical design guidelines, deemed to comply solutions, standard drawings, construction and establishment guidelines and concept drawing guidelines. They are also being expanded to include guidelines for stormwater harvesting.

- The Queensland Development Code, which consolidates Queensland-specific building standards into a single document. The code covers Queensland matters outside the scope of, and in addition to, the Building Code of Australia (Department of Infrastructure and Planning).
- Institute of Public Works Engineering Australia (IPWEA) Standard Drawings.
- Local authorities' standard drawings.
- Relevant general Australian Standards.