



WESTERN Regional Advisory Panel

Meeting No. 11

MN1: Project Meeting Notes

WA Trustees
Building, L2, 133
St Georges Tce
Board Room @
8:00am

18/01/2017

1.	<p>B1.2 Catchment Scale Landscape Planning for Water Sensitive Cities in an Age of Climate Change (Project Leader Darryl Low Chow, WRAP contact Ben Harvey)</p> <ul style="list-style-type: none"> A report addressing how scenario planning can demonstrate that a science-based approach needs to be taken to planning for population growth is being finalised. The report will include a review of existing policies and decision-making frameworks relating to total water cycle management in Melbourne, Perth and Brisbane. A second paper is being prepared that addresses how evaluation processes can support scenario planning that is focused on accommodating population growth in the context of climate change. The final report, due in June, will identify the planning methodologies needed to establish a science-based approach for whole-of-catchment planning and management to accommodate population growth.
2.	<p>B2.23 Protection and restoration of urban freshwater ecosystems: informing management and planning (Project Leader Peter Davies, WRAP contact Antonietta Torre)</p> <ul style="list-style-type: none"> The WA component of the project has been in stasis over the last 3 months as the key researchers have been on leave due to health and family reasons. Therefore the dot point summary is basically the same as last time. The Victorian component of the project is complete. The WA component is due to be completed by 30 June 2017. The draft fact sheets to instruct managers on repairing the nine ecosystem components shown in the RESTORE tool are being finalised and will be made available for review by industry stakeholders.
3.	<p>B2.4 Hydrology and Nutrient Transport Processes in Groundwater/Surface Water Systems (Project Leader Carolyn Oldham, WRAP contact Antonietta Torre)</p> <p>Prof. Carolyn Oldham and Dr Carlos Ocampo presented their research findings at a highly successful workshop held on 25 November 2016. The workshop was facilitated by Shelley Shepherd and attended by 33 representatives from state and local government, consultancies, research and industry groups. The objective of the workshop was to understand key findings regarding hydrology and nutrient transport processes in groundwater/surface water systems and discuss implications for future urban development.</p> <p>Key research findings included:</p> <ul style="list-style-type: none"> Urban development fundamentally alters subsurface hydrology, creating preferential flow pathways (via drains and pipes) that reduce the travel time of nutrients and impact on their cycling. Nutrient treatment performance by WSUD elements was highly variable across day, season and yearly timeframes, largely in response to dissolved oxygen and redox conditions. Seasonal interception of the WSUD elements by groundwater often resulted in reduced nutrient removal performance and under these conditions some of the systems were dominated by organic nutrients.



	<ul style="list-style-type: none"> A major recommendation from the research was to design stormwater treatment systems specifically to slow down flows and manage dissolved oxygen and redox conditions, and to consider a catchment-scale treatment train approach using multiple elements with alternating redox conditions. <p>Participants undertook group work during the workshop to discuss how they could apply the research findings and to identify the persisting and emerging research needs to inform management of urban water in high groundwater environments.</p> <p>Key priorities identified by stakeholders for the next phase of research include:</p> <ul style="list-style-type: none"> How should we manage for organic nutrients – what is the fate of dissolved organic nitrogen (DON)? What are the recharge and runoff rates for all urban typologies, including those with lower water tables? How do we design for optimal treatment effectiveness under a range of hydrogeological conditions and development scales? How do we optimise water monitoring? How do we challenge business as usual development – considering different development construction and catchment-scale solutions? <p>The workshop presentations are available on the New Water Ways website at http://www.newwaterways.org.au/Research/CRCWSC-Project-B2.4-Hydrology-and-nutrient-transport-processes-in-groundwatersurface-water-systems. A report on the workshop outcomes will be made available to the WRAP.</p> <p>The penultimate draft of the “Guide for monitoring performances of WSUD elements in areas of shallow groundwater” has been completed and is being reviewed by key stakeholders. Comments are due by 16 January 2017, with the aim of sending the report to the CRCWSC for publication by the end of the month.</p> <p>The report on “Performance of two urban stormwater biofilters in an area with seasonally high groundwater” has been finalised and sent to the CRCWSC for publication.</p>
4.	<p>B4.2 Social-Technical Flood Resilience in WSC – Adaption across spatial & temporal scales. (Prct Leader Richard Ashley, Phd Student Amar Nanda, WRAP contact Nominations tbc Neil Burbridge)</p> <ul style="list-style-type: none"> .
5.	<p>B5.1 Statutory Planning for Water Sensitive Cities (Project Leader Barnaby McIlrath, PhD Don Williams, WRAP contact Ben Harvey)</p> <ul style="list-style-type: none"> .
6.	<p>C5.1 Intelligent urban water systems (Project Leader Rachel Cardell-Oliver WRAP Contact Sergey Volotovskiy) As at 31 October 2016</p> <ul style="list-style-type: none"> A revised version of the report and software for the optimisation of pump operations in water distribution systems that use alternative water sources (POAWS algorithm) has been prepared and is being internally reviewed. A media release about the POWAS algorithm has been published in the CRC newsletter and a different version is planned for the newsletter of the Environment Institute at the University of Adelaide. The analysis of the Unley case study (SA) is continuing and preliminary results of the analysis and optimization have been obtained. A paper on this case study is being prepared.



	<ul style="list-style-type: none"> • South East Water case study provided a new (2 year) data set. Analysis ongoing. Full technical report near completion. • Anomaly detection algorithm (PhD1) new approach identified based on optimizing a collection of detectors. Paper in progress. • Leak quantification algorithm (PhD2) new approach identified based on graph theoretical analysis. Paper in progress. Prof Amitava Datta (UWA) added to supervision team. • Dr Jin Wang (Research Associate) has resigned; Rui Wang was to start in November 2016.
7.	<p>D1.4 'Learning through Integration and Demonstration' (Project Leader Celeste Morgan, WRAP contact Antonietta Torre)</p> <p>A Project Advisory Group meeting was held on 24 November 2016. The preliminary results of the national industry survey (seeking information on projects used as WSUD demonstrations/case studies) were discussed. Proving technical viability was cited as the most common reason for use of case studies. The survey close on 9 December 2016. 170 people participated in the survey, identifying 254 suggested WSUD reference projects across Australia and internationally. 38 of these suggested sites/projects are in WA. The Project Advisory Group is currently reviewing these projects for potential inclusion in a compendium / flipbook of WSUD snapshot case studies.</p>
8.	<p>D5.1 Urban intensification and green infrastructure: towards a water sensitive city (Project Leader Diego Romirez-Lovering, WA led by - Geoffrey London (UWA) WRAP contact Greg Ryan)</p> <ul style="list-style-type: none"> • Geoffrey London has been invited to present at IRP3 & 4 workshop 18 January 2017
9.	<p>IRP1 WSC Transition Strategy and Implementation Plans (Project Leader Briony Rogers, WA Regional Representatives Don Crawford and Cara Bourne)</p> <ul style="list-style-type: none"> • IRP1 in Perth is currently at the stage of delivering 3 x 2-day workshops (held from November 2016 to May 2017) to inform the development of a transition strategy and implementation plan for Perth (to be delivered by end of June 2017). • The IRP1 project team agreed that the focus of the 3 workshops, which have the overarching objective of producing content for the transition strategy and implementation plan, should centre around the 'focus areas for change' that emerged from project A4.2 <i>Mapping Water Sensitive Cities Scenarios</i>, those being: <ul style="list-style-type: none"> ○ 'engaging the community', which captures the A4.2 focus areas of <i>Shared vision and message</i> and <i>Community mandate</i> ○ 'influencing on-ground practice', which captures the A4.2 focus areas of <i>Professional culture and capacity</i> and <i>Research and technology</i> ○ 'influencing policy', which captures the A4.2 focus areas of <i>Governance</i> and <i>Leadership</i> • The first workshops were held on 29 and 30 November 2016. Day 1 focused on 'engaging the community', and in particular considered the current water messages that exist and how they could be strengthened to increase the community mandate for a water sensitive Perth. Kelly Fielding and Angela Dean facilitated the session, which involved an application of their research on community engagement to the Perth context. Day 2 focused more specifically on developing the transition strategy and implementation plan, and in particular focused on 'prioritisation' and how the CRC's various tools can help us in our prioritisation activities. In addition to the work of the IRP1 project team to incorporate the workshop outputs into the transition strategy and implementation plan, the 'Community engagement sub-group' of the Water Sensitive Transition Network (a group that brings together communications practitioners in Perth to progress WSC messaging) will also consider what action this group can take to progress the workshop findings. • Workshop 2 is scheduled for 21 and 22 February. Under the banner of 'influencing on-ground practice', Day 1 is proposed to focus on developing a business case to justify investment in water sensitive cities approaches in Perth. Day 2 will trial a process for



	<p>measuring and monitoring the identified strategies and actions. The agendas for workshop 2 are currently being developed.</p> <ul style="list-style-type: none">• Workshop 3 is scheduled for 2 and 3 May. Day 1 will focus on water governance and decision-maker influence to address key barriers in Perth's water sensitive city transition. Day 2 will involve discussions on models for effective governance of Perth's transition journey.• In the 3 workshops, emphasis will be placed on producing actions to inform the development of the transition strategy and implementation plan.• The Regional Manager, Water Sensitive Transition Network and IRP1 project team will all have significant involvement in using the workshop outputs, as well as CRC research and other local information, in preparing the transition strategy and implementation plan.
10.	<p>IRP2 Comprehensive Economic Evaluation Framework (Project Leader Sayed Iftekhar, WRAP contact Naomi Rakela)</p> <ul style="list-style-type: none">• IRP2 proposal has been approved by the CRCWSC Board (MN2 attached).• Steering Meeting to be convened sometime in January 2017.
11.	<p>WSC Tools & Products (TAP) (Project Leaders Jurg Keller & Christian Urich, WRAP Contacts Nick Deeks, Giles Pickard)</p> <ul style="list-style-type: none">• TAP1 - WSC Index• TAP2 - WSC Integrated Modelling tool kit• TAP3 - DanCE4Water modelling tool kit <p>A Steering Committee for the TAPs program has been established. A draft program proposal will be sent to the EPRG and RAPs for comment before being presented to the CRCWSC Board for endorsement at the February 2017 Board meeting.</p>
12.	<p>Knowledge Transition Tools and Services (KATS) (Project Leader Barry Ball, WRAP contact Shelley Shepherd) Capacity Building Collaboration - New WAter Ways & CRCWSC</p> <ul style="list-style-type: none">•
13.	<p>Research Synthesis</p> <ul style="list-style-type: none">•

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Late additions

5. B5.1 Statutory Planning for Water Sensitive Cities

(Project Leader Barnaby McIlrath, PhD Don Williams, WRAP contact Ben Harvey)

Key findings from Report 2016: Western Australia's Planning Framework for Water Sensitive Urban Design are:

As WA prefers a 'performance-oriented approach [that] will give greater flexibility to developers and designers' (WAPC 2009), there are generally no mandatory targets or requirements to achieve WSUD objectives for each development, or classes of development. Under the P&D Act, a council is required to have 'due regard' to any SPP affecting its district when preparing or amending their local planning scheme (P&D Act s 77). Similarly, the Planning and Development (Local Planning Schemes) Regulations 2015 (P&D Regulations) requires councils to give 'due regard' to any relevant SPP in considering an application for development approval within its scheme area. Consequently, planning authorities have a wide discretion to adopt the provisions of the SPF into the region or local planning schemes and apply policy.

While water quality targets are identified as an important matter in policy, achieving them remains discretionary. Unlike Victoria and Queensland, WA does not have an overarching Environmental Protection Policy (EPP) setting out water quality targets underpinning the State's planning policy for stormwater quality and environmental values. For stormwater quality and flow targets, planners and designers are directed to BUWM and the Stormwater Management Manual for Western Australia (Stormwater Management Manual) (Department of Water [DoW] 2004). These documents are not overarching requirements of environmental legislation, but are planning policy documents applying in a more discretionary manner. To this extent, it may be possible for decision makers to place greater emphasis on other competing policy objectives in the exercise of discretion.

The fragmented nature of responsibilities for stormwater management is cited as a barrier to greater uptake of WSUD in WA.

Providing a clearer legislative requirement to adopt and apply WSUD:

- there is strong policy support for WSUD in WA but the policy framework can be implemented in quite different ways by councils. Some suggest relevant provisions of the P&D Act could be amended to require planning authorities to prepare or amend the local planning schemes and make decisions that are consistent with the SPP (Bancroft and Gardner 2015);
- achieving stormwater quality objectives and targets will potentially improve if the WA planning framework specifies binding objectives for all urban development or classes of development, rather than applying local approaches to policy on a case by case basis. To this end the State's EPP could be given a more central role to establish the legislative basis for enforcing urban water quality targets and objectives currently contained in the BUWM and the Stormwater Management Manual;
- responsibilities for urban stormwater management are dispersed across a number of bodies having the potential to undermine integrated approaches to water management and land use planning; and
- the need to navigate discretionary policy settings for different councils may increase the costs of planning for WSUD in WA. Stronger integration of WSUD policy into the Model Provisions (MPs)

for local planning schemes and the RSs could assist in a transition to a more efficient and consistent policy framework

Preliminary findings of Don William's research on the Influence of Statutory Land Use Planning on the Adoption of Water Sensitive Urban Design Practices in Australia - The survey results indicate that statutory land use planning does encourage the adoption of some WSUD practices, while suggesting ways to refine planning frameworks, so they better support the implementation of WSUD. A key finding was that current Australian statutory land use planning frameworks do not adequately recognise WSUD as a concept that encompasses the whole urban water cycle, and that strongly links water management and urban design.

12. Knowledge Transition Tools and Services (KATS)

(Project Leader Barry Ball, WRAP contact Shelley Shepherd)

Capacity Building Collaboration - New Water Ways & CRCWSC

In summary, the following topics for deliverables are recommended for consideration by the WRAP.

Deliverable	Topic
Local work plan for 2017 to 2020	Local Work Plan to 2020 prepared
Short list of priority policy initiatives	<ul style="list-style-type: none"> • Review of SPP 2.9, 2.10 and 2.1 • Review of SPP 2.2, 2.3 & 2.7 • Preparation of SPP 7.3: Precinct design • City of Armadale WSUD LPP • City of Melville green infrastructure policy
Two (2) focused events	<ul style="list-style-type: none"> • City of Armadale WSUD policy • City of Gosnells rebuilding the vision
Two (2) WSC workshops with key stakeholders	<ul style="list-style-type: none"> • Delivering better maintenance – practical activities and planning • Delivering street trees in existing neighbourhoods – design exercise in Melville with other local governments
One (1) Industry practice note/ guidance	Car park retrofits for WSUD – improving stormwater and microclimate outcomes
Three (3) Researcher presentations	<ul style="list-style-type: none"> • Valuation of economic, social and ecological costs and benefits (Project A1.2) and Economic incentives and instruments (Project A1.3), Prof. David Pannell • Hydrology and nutrient transport processes in groundwater/surface water systems (Project B2.4), Carolyn Oldham and Carlo Ocampo • Angela Dean, Engaging communities with water sensitive cities (Project A2.3)
Two (2) Cross-agency forums and networking events	<ul style="list-style-type: none"> • LIAWA Symposium – 17 March 2017 • AWA/SWA/NWW/CRC community day – 21 April • Possible UDIA joint event
One (1) demonstration tour	WGV in February or March 2017

Supporting information is attached

Project Proposal

1. **Project title:** IRP2 Integrated economic assessment and business case development for Water Sensitive Cities
2. **Summary:** IRP2 will develop and apply an economic evaluation framework to identify and quantify economic, environmental and community values of investments in water sensitive practices and systems. The ultimate output of the project would be an accepted and well-aligned evaluation framework that users will apply to business case development and decision making at multiple levels in public and private sector organisations. The framework will help in better decision making to achieve water sensitive, liveable and resilient cities. Building on existing CRC work on economic evaluation and, existing literature (such as studies on customer willingness to pay, water literacy, etc.), the framework will be developed in close engagement with key stakeholders¹ throughout the project. A Project Steering Committee will guide each stage of the project. Additionally, local government and industry practitioners will be directly involved in developing key inputs and testing of the proposed framework to support the acceptance and ongoing adoption from all key stakeholders across Australia.

The essentials

The key outputs of this project are as follows:

1. A tool to assist in the identification and monetisation of non-market or intangible benefits from various types of investment in water-sensitive cities. It will cover benefits related to ecology, water quality, recreation, aesthetics, and urban heat (affecting mortality, health, power costs, economic productivity and comfort). Generate new information on non-market benefits for selected cases.
2. A comprehensive tool specifically designed for conducting benefit-cost analysis of investments in water-sensitive cities, integrating non-market benefits, market benefits, bio-physical effects, behaviour change, risk and uncertainty, time delays, and costs (including up-front and maintenance costs). It will be developed to meet the needs and contexts of end users. It will be flexible and scalable.
3. Advice on finance models and policy approaches to foster investment in water-sensitive cities where benefits are not necessarily captured by those who bear the costs.
4. A diverse set of case studies where the tools are applied, tested and adapted.

The work will be underpinned by a strong strategy for stakeholder engagement, overseen by an end-user-driven steering committee, which has already been formed.

Project leader & deputy:

Leader: Dr Sayed Iftekhar, The University of Western Australia (UWA)

Deputy: Dr James Fogarty, The University of Western Australia (UWA)

¹ We have used the term interchangeably with end users, industry partners and partners

3. Project type and activity: Integrated Research Project, Co-developed with CRC end users (directly through integrated testing and/or co-developed case studies)

4. Participating organisations & team structure:

Name	Title	Affiliation	Contribution/role
Sayed Iftekhar	Dr	CRCWSC / UWA	Project Leader / Project Steering Committee Member
James Fogarty	Dr	CRCWSC / UWA	Deputy Project leader
David Pannell	Professor	CRCWSC / UWA	Researcher / Project Steering Committee Member
Nigel Tapper	Professor	CRCWSC / Monash University	Researcher (valuation of urban climate benefits) / Project Steering Committee Member
Maksym Polyakov	Dr	CRCWSC / UWA	Researcher
Mark Siebentritt	Dr	Seed Consulting Services	Researcher (stakeholder engagement strategy)
Kym Whiteoak	Mr	RCMG	Researcher (valuation of urban climate benefits, depending on case study)
Sara Lloyd	Dr	E2Design	Researcher (valuation of urban climate benefits, depending on case study)
Grace Tjandraatmadja	Ms	Melbourne Water	Project Steering Committee Member
Greg Finlayson	Mr	GHD	Project Steering Committee Member
Ursula Kretzer	Dr	Dept of Water, WA	Project Steering Committee Member
Naomi Rakela	Mrs	Eastern Metropolitan Regional Council	Project Steering Committee Member
Craig Miller	Mr	Healthy Waterways and Catchments	Project Steering Committee Member
Simon Leiva	Mr	Cooks River Alliance	Project Steering Committee Member
Mellissa Bradley	Ms	Water Sensitive SA	Project Steering Committee Member
Jill Fagan	Dr	WSAA	Project Steering Committee Member
Ben Fallowfield	Mr	Northern Beaches Council	Project Steering Committee Member

5. *Project aim(s) and objectives:*

The overall aim of this project is to develop, test and apply a broadly applicable framework for conducting integrated economic assessment to support business case development for investing in water sensitive, liveable and resilient cities. The economic evaluation tools and framework developed under the project will help utilities, governments and private sector organisations to clearly articulate the benefits of transitioning towards water sensitive, liveable and resilient cities². Building on findings and lessons learned from economic assessment studies and more generally from a range of other research conducted under Tranche 1, we will do this by addressing the following **objectives**:

1. Build a common understanding amongst stakeholders on which elements of water sensitive cities provide the greatest benefits to the community (which includes benefits to the environment), clearly articulating market and non-market values, and contributing to transition towards liveable and resilient cities. This will also include identifying where there are gaps in assigning values to those key community values and developing appropriate solutions through research (synthesis of existing information, collection of primary information and development of manuals and guidelines).
2. Understand the requirements of stakeholders in government and industry in the design and delivery of economic evaluation tools and frameworks and monetisation of non-market values of key components of water sensitive and liveable cities, and ensure that the tools and frameworks can be readily integrated into stakeholders' processes for decision making and policy making.
3. Review the currently available benefit-cost analysis tools and integrate the key elements of existing tools and identify gaps and improvements needed to deliver comprehensive, flexible and broadly applicable tools for benefit-cost analysis and monetisation of non-market values for various elements of water sensitive cities.
4. Develop an economic evaluation framework which would allow inclusion of benefits and costs and will help users to identify who the beneficiaries are. This can form the basis of an understanding/negotiation of how projects should be funded.
5. Test, refine and apply the economic evaluation framework in selected case studies in collaboration with industry partners.
6. For selected cases, review the existing finance models and policies and recommend suitable approaches for investment in water sensitive systems and practices. This will include identification of innovative finance models incorporating market-based instruments and policy incentives.
7. Develop effective adoption pathways to promote and support the use of economic evaluation frameworks and tools.

² WSAA has suggested that "Liveability is all of those things that make a place somewhere people want to live, communities flourish and businesses choose to invest. ... A liveable city or region must consider the needs of future generations and use systems thinking to understand and respond to shocks and long-term change. (p5)" It has identified three key elements - amenity and community wellbeing, productivity and sustainability and future focus (WSAA, 2016, Liveability Indicators. A report prepared for the water industry).

6. Identified transition needs:

This project is one of the two ‘High Priority’ projects based on the combined ranking in the RAP priority matrix. In all the Needs and Opportunities workshops, the need for an economic evaluation framework was identified. The project will address the following needs that were identified during the CRC consultations: (a) to guide decision making about priorities for investment in water sensitive systems and practices; (b) To build compelling businesses cases for investment in water sensitive systems and practices; and (c) To develop innovative financing models and policy mechanisms for various contexts, including cases where there is a disparity between who benefits and who pays. Needs (a) & (b) were identified by all five RAPs, need (c) by several of them³. All RAPs were keen to see the application of the preferred outcome via a range of case studies that reflect the scale of investment (ranging from swales to major urban development), different jurisdictions and regulatory structures (water utilities, state governments and local governments), and different outcomes (investment in on-ground works to changes in public policy).

7. Knowledge base and research gaps:

The project will build on knowledge and outputs generated in Tranche 1. In the first phase, there was strong emphasis on generating non-market values for different elements of water sensitive cities to understand the scope of the opportunities and problems. Examples from Tranche 1 include:

- Valuing environmental services associated with local stormwater management in Melbourne and Sydney
- Valuing alternative land uses adjacent to traditional wastewater treatment facilities in Western Australia
- Valuing Australia’s green infrastructure using hedonic pricing analysis for various parts of Australia
- Valuing restoring urban drains to living streams in Perth
- Estimating the capitalised value of rainwater tanks in property prices in Perth
- Valuing ecosystem services of raingardens in Sydney and Melbourne
- Valuing constructed wetlands in Australia and China
- Valuing water sensitive gardening styles in Perth

IRP2 will build on the results from these studies. In addition, we will draw in existing information on market and non-market values from broader (published and grey) literature set, CRC end users and industry practitioners, particularly for the costs of

³ More specifically, the project provides for the following needs specified by each RAP: NSW1, WA1 and VIC1 (socio-econ advantages as part of vision and narrative), NSW3 (econ evaluation of making Parramatta River swimmable again), NSW4 (values, benefits, costs, incentives in regional towns), NSW5 (discussed at O&N workshop but not in documentation – economic evaluation and risk assessment of WSC for infill development), WA4 (benefits and costs to broader community, beyond project scale, in demo project), WA7 (full life-cycle benefit-cost analysis including non-monetary values), QLD3, QLD4, QLD5, VIC2, VIC5, SA3 (potential case-studies for BCA including non-market values), VIC3 (quantifying liveability), VIC4 (planning and evaluation incl. health). SA RAP is especially keen on RQ (iii), into which RQ (i) feeds. RQ (iv) addresses need (c) and links to NSW2 (appropriate funding model), WA2 (governance – mechanisms for incentives, risk sharing), WA7 (new financial models and incentives), and QLD2 (financing for sustainable water resource management).

implementing water sensitive cities elements. In addition, relevant studies conducted under other CRC programs (such as, from Project B3.2 on the design of the public realm to enhance urban microclimates, statutory planning for water sensitive cities under Project B5.1, and Engaging communities with water sensitive cities under Project A2.3) will be consulted. Prof Nigel Tapper (Project B3.2) and his team is an important component of the project as the project's urban climate case study has been identified as one of the priority issues. Review of existing studies and stakeholder consultations reveal three main gaps, which will be addressed in this project.

The first gap addressed by the project is the need for economic tools to allow end users to effectively and easily apply the results from Tranche 1 in benefit-cost analysis to inform business cases.

The second gap is the need for new non-market valuation studies to address issues and contexts in relation to a broader range of liveability and resiliency criteria than were addressed in Tranche 1. There is also a need to understand how these concepts of liveability and resilience can effectively be applied, the risks in applying them and the transferability of findings from one circumstance to another. The state RAPs have identified a number of such cases.

The third gap is research on innovative financing models and policy mechanisms for various contexts, including cases where there is a disparity between who benefits and who pays.

8. Research questions and approach:

To fulfil the above mentioned objectives the following research questions will be addressed;

- RQ1: What are the current gaps in enabling implementation of integrated economic assessment of key elements of water sensitive, liveable cities?
- RQ2: What is the best way to capture existing evidence about non-market benefits (usually expressed as Willingness to Pay) of key elements of water sensitive cities and identifies how users can transfer or extrapolate values to new contexts needed for decisions or business cases?
- RQ3: How should economic tools (for benefit-cost analysis and non-market valuation) be designed to maximise their usefulness to end users for evaluating investments in water sensitive cities?
- RQ4: How should finance models and policies be designed to optimise public and private investment in water-sensitive cities in situations where benefits are not necessarily captured by those who bear the costs?
- RQ5: How can we best promote and support end-user adoption of the economic evaluation frameworks and tools for water sensitive cities?

Overall Approach: There are four major stages in the project: 1) needs assessment to understand the key gaps and barriers; 2) review existing frameworks and tools and prepare a framework and tools designed to best meet the needs of CRC end users; 3) conduct several case studies to test the framework and tools; 4) finalise the evaluation framework and resources for training & capacity building (Figure 1). End users will be engaged at every stage of the project to ensure wider uptake of the

findings and capacity building. To organise the tasks, the following work packages (WP) have been defined.

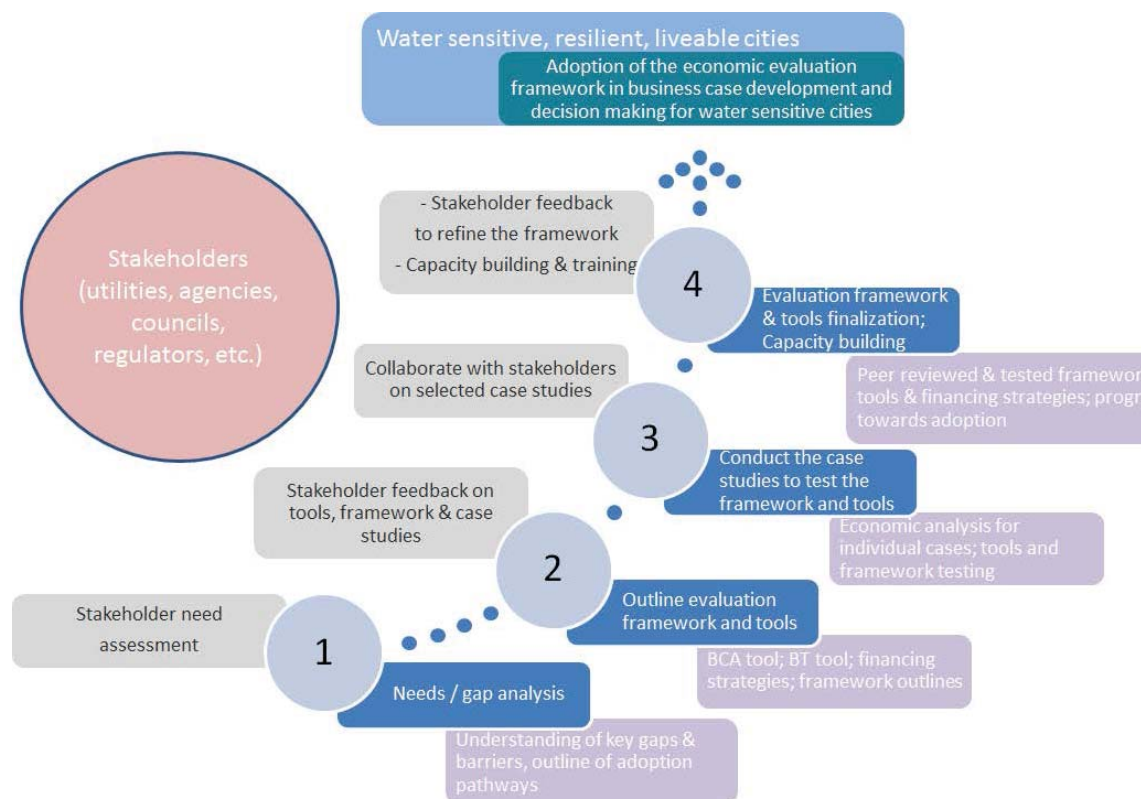


Figure 1: Key stages of IRP2

WP1: Stakeholder engagement (RQ1 and RQ5)

Approach: Based on the learnings from the stakeholder engagement activities in Tranche 1 (particularly, Program D) and information provided by the Project Steering Committee, we shall engage with the stakeholders to assess their needs and to ensure appropriate dissemination and adoption of the economic evaluation framework. This will be done in accordance with the needs of our partners and broader stakeholders. There are several steps in our stakeholder engagement method⁴: regularly **inform** stakeholders about the outcomes from various activities of the project; **consult** with the stakeholders to understand their needs and provide feedback on how the needs could be addressed; **involve** stakeholders in sharing data and information and capacity building, and; **collaborate** with them on particular case studies (Figure 2). While the first three steps will be carried out under this WP aiming at broader range of stakeholders the last one will be addressed under WP5 in close collaboration with selected stakeholders / partners.

⁴ Following Bradley, M. (2015). Stakeholder engagement plan. Water Sensitive SA.

WP1.1: Inform the stakeholders about the current knowledge on economics of water sensitive urban designs – A number of primary non-market valuations of water sensitive urban designs have been carried out in Tranche 1. Further, relevant literature on non-market values was captured and reviewed early in Tranche 1. We will expand and update the collection and update the review, adding new published studies (from CRC and others), grey literature and existing relevant economic tools. There is a wealth of knowledge, models and tools existing within industry and the consulting world that need to be identified, understood and analyzed. Input will be sought from industry partners to identify which gaps are more important. Synthesis and compilation of such information will help in assessing current gaps in knowledge.

WP1.2: Stakeholder engagement strategy – We will use our interstate network of stakeholders and the Steering Committee to develop a stakeholder engagement strategy, which will focus on the regular communication and information dissemination. The engagement strategy will include options to seek regular feedback from a wider range of stakeholders.

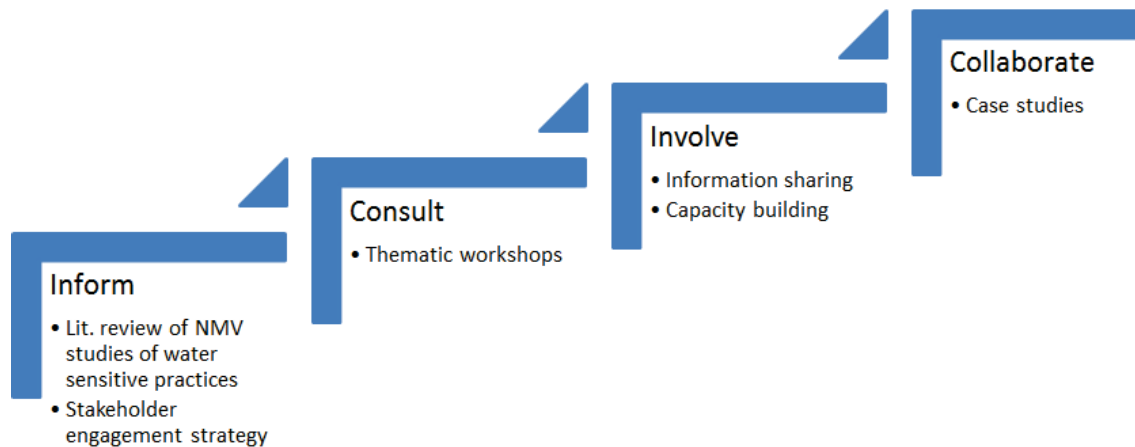


Figure 2: Steps in stakeholder engagement strategy

WP1.3: Stakeholder consultations for needs assessment – A thorough stakeholder needs assessment will be carried out to determine needs and agreed types of values/benefits and costs that need to be incorporated into the tools. This will build a common understanding on which type of elements of water sensitive cities are important to communities. The Water Sensitive Cities Index and WSAA's work on Liveability Indicators will provide relevant reference tools for this work. To understand industry needs or gaps, there will be a selected number of issue-based or thematic workshops on:

1. The range of water sensitive cities elements to which the economic evaluation framework could be applied to assess their costs and/or benefits (lessons learned from the on-going IRP1 project will be integrated);
2. Desirable features or design aspects of cost-benefit analysis and benefit transfer tools. Understand industry requirements in terms of their needs for an economic valuation framework to support decision making, and their needs, abilities and decision making processes to develop business. (Multiple workshops will be organised to cater for diversified needs from different groups



- such as developers, local government, catchment managers and/or water service providers);
3. Barriers faced in the implementation of water sensitive cities, addressing beneficiary pays, funding availability, etc. and assessment of the suitability of an economic evaluation framework to reduce these barriers by:
 - a. local governments,
 - b. developers, and
 - c. agencies and regulators (such as IPART, Essential Services Commission and the ERA).

The workshops will be held in several states to capture variation in local contexts in different parts of Australia. Where possible, some of these workshops will be organized in collaboration with IRP1 (and other CRC researchers) to incorporate a wider community view point.

WP1.4: Training and capacity building – Building on the outputs (such as manuals, tools and learnings) produced by other parts of the project, we will develop a training module and deliver training in the application of economic tools and framework. We will target practitioners from a range of sectors such as utilities, local councils, agencies, state governments, and peak bodies (such as WSAA). To deliver the training, the team will work closely with industry partners, of which many will be key members on our Steering Committee across Australia.

WP2: Updated collation of existing non-market valuation information and development of a benefit transfer tool (RQ2)

It is not always possible or appropriate to conduct original non-market valuation studies. Benefit transfer is the systematic extrapolation of existing non-market valuation results to new contexts. Its main attraction is that it saves on cost, relative to conducting original studies for every case where a decision is needed. Using benefit transfer methods, findings (values, functions) from the original study site are transferred to the site where benefits need to be calculated. If carefully conducted, benefit transfers have the potential to provide a reasonable approximation of the value for situations that lack an original non-market valuation study. There are different methods to conduct benefit transfer: meta-analysis, function transfer and unit value (means) transfer. Each of these methods have their strengths and weaknesses. The following two tasks will be carried out to develop an efficient and rigorous system for transferring or extrapolating values to new contexts...

WP2.1: Updated comprehensive database of existing non-market values of water sensitive practices – We will take the collation of studies and results from WP1.1 and include them in a database that allows them to be easily and efficiently accessed. We will add relevant studies to the database that have been conducted outside the CRC since we reviewed the literature in Tranche 1. The processed data will be used to underpin various benefit-transfer methods. The database will be designed in a way that is easy to update to allow the system to be maintained into the future (preferably as an online system), beyond the life of the CRC. Moreover, a number of original non-market valuation studies will be conducted as part of the case studies to test the tools and framework (see WP5 for further details). The database will be continuously updated as new information is generated.

WP2.2: Development of benefit-transfer guidelines – There is growing literature on benefit transfer. The UWA team has existing close links and collaborations with some of the world experts in these methods: Prof Rob Johnston from Clark University, USA; Prof Peter Boxall from University of Alberta; and Prof John Rolfe from Central Queensland University (Johnston et al. 2015). We will work with these experts to develop accessible guidelines for end users on how to conduct benefit transfer for water sensitive practices, including choosing appropriate methods for the particular context. The guidelines will be tested with the stakeholders and adapted accordingly.

WP3: Development of a user-friendly Benefit-Cost Analysis (BCA) tool tailored to water sensitive cities investments (RQ3)

There are three major elements in a benefit-cost analysis; benefit assessment, cost assessment, and comparison of benefits and costs using an appropriate framework.

Benefits. Benefits need to include market and non-market values. Multiple methods exist to estimate the benefits of both types, and these will be employed as needed, depending on the types of benefits that are relevant, and on the availability of existing information about the benefits. Benefits are likely to include cost-savings from delaying or reduced investments in traditional infrastructure, as well as improved liveability and improved environmental conditions.

Costs. Information on the costs of implementing various features of water sensitive cities will be obtained from various relevant sources, particularly from end users with experience in implementation. They must include full lifecycle costs, not just the upfront costs. In some cases, it is not possible to obtain estimates of market and non-market benefits. In those cases, a cost-effectiveness approach could be applied, which uses cost estimates against physical performance.

Framework. A standard benefit-cost analysis framework will be used to combine and compare benefits and costs. This crucially involves use of a baseline (business as usual) so as to capture and include the cost of doing nothing. It also provides a rigorous approach to comparing benefits and costs that occur at different times to various parties, and allows easy sensitivity analysis to allow for uncertainty about benefits or costs.

WP3.1: Review of existing benefit-cost analysis tools relevant to water-sensitive cities – Existing literature and relevant stakeholders will be consulted to understand what tools are already being used (and by whom) and the extent of their use in decision making processes. Existing tools for benefit-cost analysis will be reviewed to determine their suitability for assessing water sensitive systems and practices at different scales and for users of varying capacity (including urban green space, water sensitive urban designs, and other features identified by the Steering Committee). Existing tools, both local and international, to be assessed may include: the i-Tree suite of tools; Social Environmental Tool (SET) developed by WA Water Corporation; CIRIA BeST (Benefits of Sustainable Drainage Systems Tool); Marsden Jacob – AWRCOE Recycled Water Economic Assessment Tool; Natural Capital Coalition; MetroNet by Metropolitan Water Directorate; and INFFER (Investment Framework for Environmental Resources). Suitability of tools will be determined with respect to

quantifying benefits for a range of possible factors e.g. ecosystem health, human health/well-being, economic prosperity, and climate change adaptation/mitigation, ease of use and data availability.

WP3.2 Provide standardised costing data to inform the BCA tool. WP2.1 and WP2.2 will provide data for non-market valuation. Here we will also collect and collate information to support judgements about the costs of implementing water sensitive cities in different contexts (e.g., lifecycle costs of new green infrastructures).

WP3.3: Develop a BCA tool – Based on the review and existing tools and approaches under WP3.1, we will make a decision about whether to adapt an existing tool or develop a new tool to meet the specific needs of Australian end users. Answering the following questions will help in selecting an appropriate approach: (i) what outcomes the tool / framework should deliver, (ii) how/where it will be used (which decision framework that the economic framework would support, scalability), (iii) which categories of value/benefits need to be included, (iv) what input data (e.g., technical inputs, scale, time frames, units etc.) are available from stakeholders, (v) analysis of trade-offs between elements (such as costs and benefits, benefits to agreed level of service) and different discount rates (benefit time scales), and (vi) what standards for data collection, management and maintenance should be used? The tool will be implemented in Microsoft Excel initially, but after a period of testing and further adaptation, it may be implemented in a web-based system (depending on the preferences of users).

WP3.4: Guidelines for benefit-cost analysis tool - Develop a guideline document to support the application of the BCA tool. This will provide guidance on critical concepts and approaches that underpin the tool, step-by-step guidance on how to apply it, and information about its assumptions and limitations. It will also provide several examples based on the case studies under WP5 on how to apply the framework in practice. This would include a discussion on alternatives for assisting decision-making when some elements (such as monetized benefits) are not available.

WP4: Finance models and policies to foster investment in water sensitive cities (RQ4)

WP4.1: Review existing finance models and policies. We will work with end users to identify existing finance model, policies and mechanisms (such as financial incentives) used to foster public and private investment in water sensitive cities⁵. We will also review policies and models for investments in other sectors that aim to foster investments that generate public goods. A set of different funding approaches will be presented, with examples/case studies on where these approaches have been used, factors will be identified that help/hinder project funding, and principles from the economic evaluation framework will be highlighted that could be used to support, direct

⁵ Lessons from CRC Program B5.1 will be considered. The Project team will be conscious of the continuously changing landscape of the regulatory environment. For example, the Victorian Essential Services Commission has released their Water Pricing Framework and Approach on the 27 October 2016, which puts the customer at the centre of decision making. There are potentially clear implications to finding a suitable integrated economic evaluation process and decision making framework when we start thinking about ecosystem services/ liveability/community value considerations.

or negotiate a funding approach suited to the circumstance. Often, larger water utilities may not be well equipped to do things that are a bit different / decentralised and private sector (such as developers) may be more suitable to deliver. We will evaluate the effectiveness of existing models and policies, and identify successful approaches and the requirements for success.

WP4.2: Engage with regulators and agencies to design new approaches. Building on findings from WP4.1 and WP1.2, design a small number of alternative approaches to investment financing and policy that appear likely to be effective in the context of water sensitive cities. These approaches could include beneficiary identification methods, risk sharing, cost-sharing principles as well as payment mechanisms such as value capture. We will workshop these approaches with CRC end users, policy makers and experts in financing projects to evaluate their likely success. If we are able to identify approaches that are judged to be likely to succeed, then we can work with policy agencies to explore the legal, practical, political and financial feasibility of implementing the approach. This procedure would help in understanding how to engage and negotiate with policy makers to facilitate investment.

WP5: Testing the integrated economic evaluation framework in selected case studies (RQ3, RQ4, RQ5)

Approach: In each of the case studies, the following steps will be carried out (Figure 3): 1) understand the issue or problem and knowledge gap analysis by collecting and reviewing relevant information (such as benefits, costs, timeframe, major stakeholders, regulatory framework, current business model, etc.); 2) Assess the potential of benefit transfer to use existing data. If required, conduct original studies to estimate non-market values. Collect cost data from agencies. Workshop economic analysis methods and data requirement with relevant stakeholders; 3) Conduct economic evaluation (benefit-cost analysis) of several alternatives or options, and; 4) Engage with end users to understand the feasibility of implementing various options and generate a set of recommendations for the implementing organisations. The case studies will be conducted in such a way that the intermediate results are continually disseminated to allow for transferability and quick uptake.

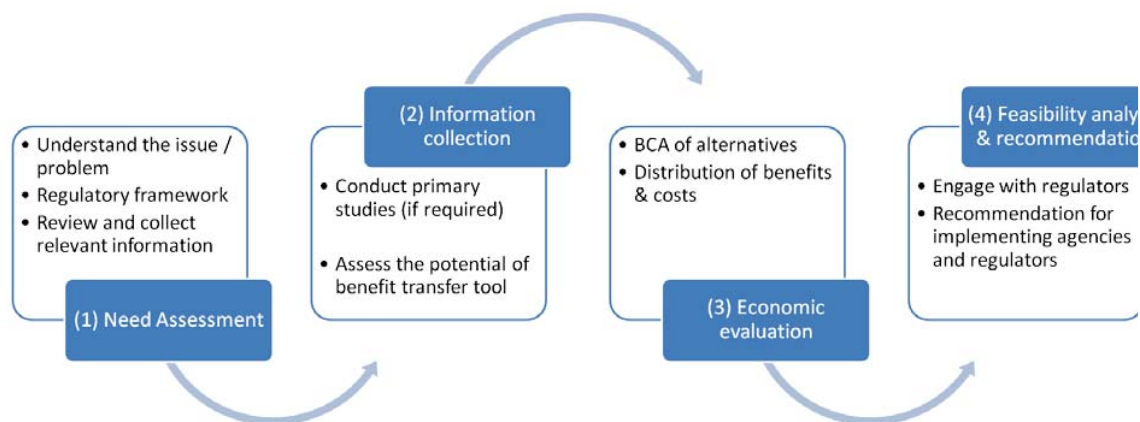


Figure 3: Steps in conducting a case study

Selection of case studies: The case studies are important tools to test the economic valuation framework. They should reflect diversity in scale, jurisdiction, complexity and types of issues. The key criteria for selection of a case study are to ensure that:

- (a) the economic valuation tool and framework could be tested in various contexts;
- (b) they address the needs of stakeholders;
- (c) there are sufficient resources available to undertake them, and;
- (d) they address the priority needs of the CRC.

Consultations with the Project Steering Committee and key stakeholders have been carried out. Based on their feedback, the following case studies have been selected for inclusion in the current work plan (which are feasible to implement within existing resources). The key features of the case studies in terms of their capacity to test various elements of the economic evaluation framework and key social and environmental benefits are presented in the following table.

Table 1: Key features of the selected case studies.

	WP5.1: Greening the Pipeline	WP5.2: Strategic Water Resource Precincts (Subiaco Strategic Water Resource Precinct)	WP5.3: Converting an open drain into a living stream	WP5.4: Arden Macaulay Urban Redevelopment	WP6: Urban climate improvement**
Potential to implement various elements of the economic evaluation framework					
Scale	Sub-city	Local government	Local government	Sub-city / Local government	Sub-city / City
Primary non-market valuations (survey and / or hedonic)	X	X		X	
Other methods (e.g., damage costs)	X				X
Benefit transfer tool	X		X	X	X
Cost-benefit analysis tool	X	X	X	X	X
Finance models / Regulatory framework analysis	X	X		X	
Key social and environmental benefits addressed					
Ecological conditions*			X		
Quality of water in waterways*	X		X	X	
Amenity / Public open space / Recreation / Sense of place*	X	X	X	X	X
Groundwater management		X			
Reducing pressure on drainage system / wastewater and stormwater recycling		X		X	
Reduced mortality and morbidity*	X			X	X
Cost and emission reductions*	X			X	X

* Key elements of liveability

** Urban climate improvement study is large and complex enough to present as a separate work package

Brief descriptions of the proposed case studies are presented below. A list of potential additional case studies has been presented under WP5.5 with elaboration of selected

ideas in Appendix A. In recent days, a significant number of new case studies have been proposed. Rather than rushing to make decisions about all of these, we propose to engage our steering committee in a process (including broader consultation) that leads to balanced decisions about how many more case studies we can manage to do (considering trade-offs with our other project goals), and which of them are the highest priorities considering the above criteria. These decisions can be finalized once the project has commenced.

WP5.1: Case study on greening the pipeline in Melbourne

Key stakeholders: Melbourne Water, Wyndham City Council, VicRoads, City West Water

Key issues / Research or Management questions:

- How to best improve liveability and environmental outcomes through restoration activity and parkland construction works along a 27km linear section of the heritage listed Main Outfall Sewer.
- Assess the economic, environmental, and social benefits of an on-ground liveability improvement pilot project – Williams Landing.
- Provide quantifiable economic justification for investment spending that targets activities that improve liveability.

Importance / significance of the case study: Greening the Pipeline is a flagship liveability improvement project for Melbourne Water in partnership with Wyndham City Council, City West Water, and VicRoads.

Why and how an integrated economic evaluation framework would be useful in addressing the key issues?: There are multiple beneficiaries from the creation of parkland and active space: nearby residents receive benefits in the form of higher house prices due to the proximity to an amenity asset; non-local residents receive benefits in the form of access to a new amenity area; all members of society benefit from environmental improvements (i.e. additional revegetation and stormwater capture and reuse); local governments receive higher revenue due to higher property tax revenue; and the State and Commonwealth governments receive benefits in terms of lower public health care costs. An integrated economic evaluation framework is needed to capture this diverse range of benefits.

Expected outcomes from the case study (how it will be useful for the stakeholders): The project is a pilot project that will be developed in stages. As such, the economic evaluation involves an ex ante assessments of costs and benefits. The case study will provide a detailed guide for how benefit transfer methods can be used to develop the ex ante business case for investment in liveability projects.

The benefit transfer method will draw on both hedonic price studies and travel cost studies. This type of evidence is currently seen as the strongest by economic regulation agencies.



The core final output will be a case study demonstrating how the benefit transfer method can be used to develop and a business case that satisfies the requirements of economic regulation agencies for future investment in liveability projects. Please note that prior to the completion of the case study it is impossible to say for any given specific project or project variant that costs are less than benefits.

Available In-Kind support (could include data, information, experts, etc.): Asset data (eg maps, construction drawings, cost information), access to project sponsors/stakeholders, Melbourne Water liveability team in-kind support, access to Melbourne Water liveability research materials, Melbourne Water liveability/multiple land use related policies and procedures

Available Cash (co-investment) support: Melbourne Water's confirmed contribution to the overall project (\$250k).

WP5.2: Case study on economic evaluation of land use scenarios and funding options for Strategic Water Resource Precincts (Subiaco Strategic Water Resource Precinct)

Key stakeholders: Water Corporation, City of Nedlands, WESROC group of local governments (Municipalities of Nedlands, Subiaco, Cottesloe, Peppermint Grove, Claremont, Mosman Park), Department of Water, WA Planning Commission/Department of Planning

Key issues / Research or Management questions:

- What are the costs: benefits (market and non-market) of land use options (major land use options are nature conservation (including rehabilitation), sporting and recreation, horticulture and agriculture, commercial and industry).
- What are the available tools for evaluating land use options / scenarios and what is their level of utility for users.
- What are the available funding and policy tools (e.g. development / infrastructure contribution schemes, differential rating) to support equitable implementation.

Importance / significance of the case study: The WA Planning Commission's State Planning Strategy states "wastewater treatment plants are increasingly being recognised as secure sources of alternative water (treated wastewater and stormwater). Facilitating beneficial and synergistic land use in and around the odour buffers of treatment plants will improve the efficient use of land and infrastructure and reduce the risk of land use conflicts." There are 100+ WWTPs across Western Australia and 1,200+ across Australia which are becoming increasingly important to water security and helping to ensure the climate resilience, liveability and sustainability of cities and towns.

The Subiaco Wastewater Treatment Plant (WWTP) is a State significant asset which currently services a catchment of about 230,000 people (including the Perth CBD) and growing. The WWTP already provides treated wastewater (TWW) to irrigate nearby playing fields and there is increasing demand by surrounding local governments and

others to use TWW for irrigation of green spaces and environmental purposes. The WWTP has also been identified as a potential source of TWW for groundwater replenishment (indirect potable reuse).

The area also contains significant sub-regional drainage infrastructure which may also provide a source of alternative water, while the existing compensating basin and corridors could be retrofitted to provide community benefits e.g. living stream.

The WWTP odour buffer, which is about 250 hectares in area and in a combination of private and public ownership, is unsecured and considered to be at high risk of encroachment by odour sensitive land uses e.g. residential.

This case study will identify approaches to collaborative planning, evaluating and implementing (including funding) beneficial land uses in the odour buffer of the Subiaco WWTP, also known as the Subiaco Strategic Water Resource Precinct (SWRP). It will provide a model, tools, information and data which can be applied by planners and communities state-wide and nationally.

How an economic evaluation framework would be useful?: Following on from the non-market values study, it is proposed that a "Synthesis workshop" (additional to current project scope) be undertaken for the precinct to identify the range of land use and infrastructure options and issues. The economic evaluation framework will enable the costs and benefits (including non-market values) to be evaluated for the range of land uses and help determine the distribution of costs associated with implementation. This will also inform which funding and policy tools to use to support implementation.

Expected outcomes from the case study (how it will be useful for the stakeholders):

1. An understanding of the costs and benefits (economic, social and environmental) and values for implementing beneficial land uses.
2. An understanding of the available mechanisms to support implementation of the plan.
3. Development of a tool(s)/framework for evaluating and distributing economic costs and benefits associated with alternative land uses.
4. Inform a collaborative process, methodology, tools and data for planning beneficial land uses in the odour buffers of wastewater treatment and water resource recovery plants.
5. Assist with developing collaborative arrangements for planning and implementing Strategic Water Resource Precincts across WA and nationally.
6. A structure / master plan for the Subiaco Strategic Resource Precinct.
7. This case study will inform the potential "Synthesis workshop" for Subiaco Water Resource Precinct project, Western Suburbs groundwater restoration and Reuse project and potential structure planning.

Available In-Kind support: The Water Corporation will commit involvement by the following:

- Land Planning Section, including a Senior Town Planner;
- Liveable Communities program, including a Senior Infrastructure Planner and a Financial Analyst;

- Support in use and evaluation of the Water Corporation's Socio-Economic Tool (SET) and provision of associated values / data.

Available cash (co-investment) support: \$75K from WA Water Corporation

WP5.3: Case study on converting an open drain into a living stream (Lot 800 Katharine Street Belleview)

Key stakeholders: Shire of Mundaring, Developer – Taliska Securities Pty Ltd (TBC), City of Swan (TBC), Department of Water (TBC), Water Corporation (TBC), Department of Parks and Wildlife (Rivers and Estuaries Division) (TBC)

Key issues / Research or Management questions:

- How can a main drain conversion to Public Open Space via a living stream be incorporated into a future residential development.
- How best to allocate the cost and liabilities associated with construction where issues of drainage and flood mitigation are a priority, and legacy issues related to nutrient load need to be considered.
- What governance arrangements best facilitate the delivery of water sensitive urban design, where there are multiple stakeholders with varying responsibilities -- water utility, water regulator, developer, and local government - and where there is the potential to deliver non market benefits through waterway pollution load reductions.

Importance / significance of the case study: Demonstration of how water sensitive urban design can be implemented in practice, in a location with complex drainage interactions, flooding issues, and complex multi stakeholder agency arrangements.

Why and how an integrated economic evaluation framework would be useful in addressing the key issues?: An integrated economic evaluation framework would help identify and quantify:

- The costs and benefits associated with converting an open drain into a living stream, where the area is flood prone.
- The ongoing benefits, liabilities, and responsibilities of different stakeholders and the revenue needed for the project to be viable from the perspective of each individual stakeholder, and as a whole.

Expected outcomes from the case study (how it will be useful for the stakeholders): Demonstrating the application of the benefit transfer method to support the implementation of water sensitive urban design.

Developers, the water utility, the water regulator, and local government to understand the costs and benefits of converting a drain to a living stream.

Available in-Kind support: In-kind time from Shire of Mundaring staff, the developer and EMRC. In-kind time from Department of Water, Water Corporation and

Department of Parks and Wildlife – Rivers and Estuaries Division, WAPC, City of Swan
(all TBC)

Available cash (co-investment) support: Nil

WP5.4: Case study on Arden Macaulay Urban Redevelopment

Key stakeholders:

Direct Stakeholders - City West Water, Melbourne Water, City of Melbourne
City of Moonee Valley, Victorian Government (via Victorian Planning Authority)
Indirect Stakeholders - South East Water Yarra Valley Water, Department of
Environment, Land and Water Planning, Melbourne Metro Rail Authority and all
other authorities undertaking in fill redevelopment

Key issues / Research or Management questions:

When water authorities are faced with developing the servicing strategies for major urban infill / redevelopments the opportunity exists to assess options outside of business as usual. These options are principally related to exploring new ideas that enable an integrated solution to creating liveable / water sensitive outcomes. For authorities like CWW, their approach for developments like Arden Macaulay, has been to develop the costs of business as usual, assess a range of plausible water sensitive / liveability options with stakeholders, undertake an economic assessment to identify the best community outcome and then make decisions.

In many cases there is a considerable gap between the financial and economic costs of “water sensitive solutions”, because the latter includes broader environment, amenity and health outcomes. In general, there are multiple beneficiaries for the broader outcomes, but beneficiaries may or may not be aware of benefits. In addition, water authorities and often beneficiaries lack knowledge to value these broader outcomes. All these issues lead to not being able to develop justifiable business cases to implement “water sensitive solutions”, which results in providing “business-as-usual” urban water services to infill developments.

The key research questions relates to ensuring the best data is available to identify all benefits (and values) and all costs for the options such that a thorough evaluation can be taken in order to allow for the appropriate trade-offs to be considered. For example, alternatives considered would include considering recycled wastewater against recycled stormwater. Arden Macaulay will allow each of the proposed research questions be considered in the context of an integrated solution taking into account the whole of the water cycle.

Importance / significance of the case study:

Infill redevelopment impacts both water authorities and local government across all of Australia. Across Melbourne the majority of new lots are from redevelopments. Each of these developments are a unique opportunity to create a sustainable future and having clarity of understanding of the economic values – across the whole water cycle - are critical. Without a robust economic framework – with a clear understanding of values, benefits transfer and willingness to pay, opportunities may be lost.



Arden-Macaulay case study provides an opportunity to explore benefits associated with infill development, which can be transferable to other infill developments. It is located some 1.5 km north west of Melbourne CBD, in lower reaches of Monee Ponds creek catchment, with a potential to become an integral part of the CBD, and in an area subject to flooding. Hence there will be benefits associated with improved productivity as well as improved flood resilience, in addition to usual liveability benefits (e.g. increased canopy cover, healthy waterways, micro climate, etc.). Therefore, this case study can be used learn benefits that are not fully understood (e.g. improved productivity) as well as for applying existing knowledge on benefits (e.g. increased greenspace).

In terms of the expected growth, Arden Macaulay will be home to some 25,000 residents and support 43,500 jobs, by 2051. The expected increase in water demand by 2051 is 2.3 GL

Why and how an integrated economic evaluation framework would be useful in addressing the key issues?: The benefits of this project will allow all stakeholders to identify the options, identify the benefits, have clarity about their values and be informed to make rational decisions on servicing the area, including funding for service provision.

Expected outcomes from the case study (how it will be useful for the stakeholders): The expected outcomes of this case study include an improved understanding of benefits, beneficiaries and approaches for valuing of benefits related to an infill redevelopment. This requires an evaluation framework that must overlay multiple agencies with multiple objectives and different financing arrangements.

Available in-Kind support:

Melbourne Water, City West Water, City of Melbourne, Victorian Government (via Victorian Planning Authority and DELWP) and South East Water are currently involved in identifying a water servicing strategy that has the potential to provide multiple benefits. All of these organisations may be contacted, as required to obtain data and information.

In addition, City West Water can provide \$10,000 worth of in-kind support, which may include provision of data and information, and a contribution to developing research concepts.

Available cash support: TBA

WP5.5: Potential additional case studies (not part of current project scope)

A wider set of project ideas presented or mentioned during the project planning workshop and through follow-up discussions are presented below. This list could be used to identify potential additional case studies for inclusion in the project, subject to co-investments available from local/regional partners.

Serial Number	Case study Idea	Potential Location
1.	Value of urban trees (mental health)	
2.	Value of irrigation of public open space (social cohesion) - Irrigated versus non-irrigated parks - Cost of alternative water sources for irrigation of public and private spaces	City of Wyndam, Shire of Kalamunda, White Gum Valley (City of Fremantle), Brabham (City of Swan) or South Pinjar (City of Wanneroo)
3.	Restoration of degraded waterways (actual improvement of water quality)	
4.	Analysis of decision making process (post-hoc analysis)	
5.	Flood protection (stormwater harvesting, risk aversion, risk transfer)	
6.	Cost of maintaining vegetated WSUD assets across a local government – work with a local government to assess the costs and benefits of its vegetated assets (tree pits, biofilters, living streams, swales, detention basins)	City of Subiaco or City of Armadale
7.	Assessment of different land use strategies for reduction in nutrient loads	
8.	Conversion of drainage infrastructure (including basins) into functional open space and opportunities for water quality, flood protection and potentially water harvesting in addition to amenity and liveability gains, including an assessment of maintenance (operational) costs.	
9.	Legislative requirement of putting rain water tank in new developments (design stormwater capture option)	Brisbane
10.	Different land-use or landscape designs (green space)	WA / SA
11.	Urban infill - Test strategy against the 30 Year Plan for Greater Adelaide	Adelaide
12.	Transition / restoration of Sunshine employment centre (infill/ greenfill) - 2100 hectares, waterways challenges	Melbourne
13.	Restoration of Cooks River (Cooks River alliance)	NSW
14.	Restoration of Breakout creek in SA*	SA
15.	Benefit-cost analysis of South Creek Living Waterway Corridor in Sydney*	Sydney
16.	WESROC Recycled Water Managed Aquifer Recharge for Public Open Space and Other Social Benefits*	WA
17.	Site 1 - North Stoneville and/or Site 2 - North Parkerville (2 separate developments – potentially 2 different projects)*	WA
18.	City-wide costs and benefits of rainwater harvesting*	Brisbane
19.	Economic value of urban climate improvement: Sub-tropical case study*	Brisbane

* These last six case study ideas are presented in more detail in Appendix A. These have been developed with potential co-investors in this project, but are subject to additional funding being provided to undertake them as part of the current project.

WP6: Economic value of urban climate improvement: Urban Heat Island (UHI) mitigation

This work package will explore the UHI mitigation produced from different scales of investment in urban greening, and quantify in dollar terms the value of this benefit, for example by reduced mortality/morbidity, reduced energy demand and increased productivity. The list of possible areas for benefit-transfer will be fully developed in WP3 and WP4.

Increasing levels of investment in green public open space, and associated investments in passive and active irrigation of those spaces, produce increasing benefits in UHI mitigation. In Tranche 1 CRCWSC research was able to show the clear physical urban cooling benefits of different levels and types of urban greening, but there is currently no credible estimate of the economic value of the cooling produced under different scenarios of WSUD adoption. Therefore there is currently no way to use UHI mitigation in any policy position or business case for greening cities and integrated water management policy changes. This work package will seek to overcome this critical barrier in policy knowledge, combining expertise in economic assessment (UWA and RMCG), UHI modelling (Monash University) and urban design response (E2DESIGNLAB)⁶. Outputs will be dollar value estimates of the UHI mitigation value produced under different greening and integrated water management settings.

The first phase of this work will involve development of the modelling and scenario-building approach for Study Site 1, the Sunbury growth area in Melbourne. This location is preferred because of a considerable amount of pre-existing material assembled by the researchers that can be used in scenario development, therefore saving time and money for the project. The general approach is shown in the Figure below.

⁶ Relevant experts on public health, such as Professor Fiona Bull (Centre for the Built Environment and Health), Dr Paula Hooper (School of Sport Science, Exercise and Health, The University of Western Australia) and/or Dr Helen Brown (School of Public Health, Curtin University) will be consulted and / or their research findings will be used.

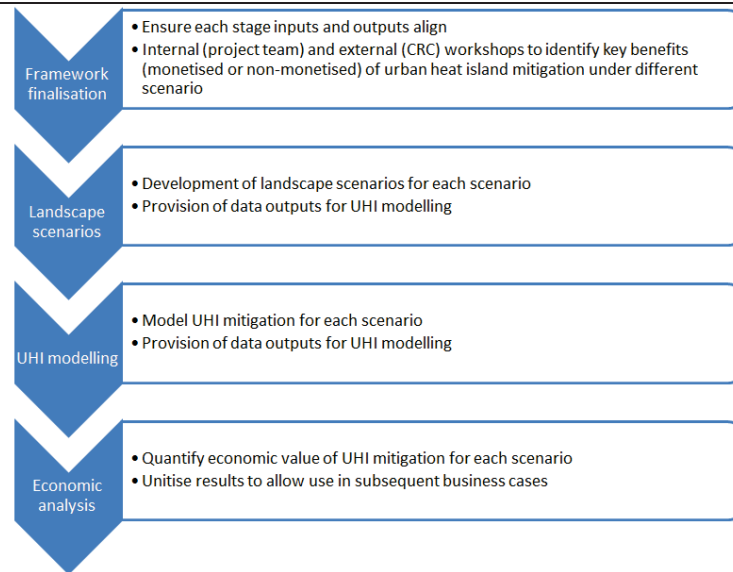


Figure 4: Steps in conducting WP6

UHI mitigation value will be regionally specific. i.e. the benefits in Western Melbourne may be very different from Brisbane. Therefore, once developed, tested and evaluated for Study Site 1, the approach and resulting economic evaluations may be applied in three other Study Sites in Perth, Sydney and Brisbane (subject to availability of funding). This will allow testing of the approach in a range of climatic and landscape development scenarios, across greenfield, brownfield and infill developments. After finalisation of the framework (see Figure above), development of landscape scenarios will involve derivation of a range of physical variables critical for modelling (e.g. plan area fraction of paved area, buildings, trees, grass, open water bodies, etc.) for four different scenarios, 1. No WSUD or whole of water cycle management (WWCM), 2. Current regulatory settings for WSUD/WWCM, 3. Proposed changes for WSUD/WWCM, and 4. A targeted UHI mitigation scenario to achieve a desired cooling (e.g. 2 degrees on extreme heat days). UHI modelling will compare the heat mitigation performance of each development scenario against the base case for typical summer conditions, as well as extreme heat summertime conditions.

In subsequent economic analyses results can then be translated to quantify in dollar terms the UHI mitigation benefit produced by each scenario. Economic values associated with different settings for urban greening at the precinct level generated under this work package would be relevant for urban planning in both greenfield developments and established suburbs. This could be used for business cases for urban greening in future. Following the successful application of the approach to Case Study 1 in Melbourne, the work will be extended to Brisbane, Sydney and Perth case studies (subject to additional funding availability).

9. *Intended project outcomes and expected project impact:*

The project outputs will include:

1. A widely tested and supported **economic evaluation framework to support business case development** for decision making for investment in water sensitive cities designs and practices;
2. A peer reviewed and tested **benefit-cost analysis (spreadsheet/database) tool** with user friendly interface and a comprehensive set of peer reviewed input metrics for the tool based upon practitioner data and best available research;
3. A peer reviewed and tested **benefit transfer tool and guideline** to allow users to transfer non-market values of different elements of water sensitive cities;
4. **Valuation of certain (non-market) benefits** of water sensitive cities (such as urban heat island mitigation), filling important and relevant gaps in the existing body of evidence;
5. **Supporting guideline/user manual** to support application of economic evaluation framework and tool (which would include examples of application of the framework in different case studies);
6. **Cross-state network of stakeholders and practitioners** which will provide a vehicle for continued engagement regarding delivery of economic evaluation framework and tool

The outputs generated under the project will help to standardise the economic evaluation of water sensitive cities systems and practices. The non-market values of various elements of water sensitive liveable cities generated under the project will help end users in estimating the multi-functional benefits of such practices. Further, application of the economic evaluation framework will help the end users to justify (or not) investment in water sensitive cities tools and practices, which will help the decision makers to make more economic sound investment decisions on water sensitive cities and gain approval from regulators. This will help the cities transition towards more water sensitive cities.

10. *Targeted end-user group(s):*

Stakeholders from various industry / end user groups (such as utilities, agencies, councils, regulators and consultants) will be engaged in the project. Stakeholders will benefit by being part of the project directly (such as through participation in the case studies or workshops) or indirectly (such as through our communication and adoption activities). The stakeholders directly engaged will gain first-hand experience from the development and testing of the economic evaluation framework. Further, participants of the case studies will benefit from the case specific economic evaluation which will help them to devise appropriate water management strategies for their particular problem / issue. We will engage with other end users through our wider communication and adoption activities to help them to adopt the standardised economic evaluation framework and improve their decision making.

11. Commercialisation and Intellectual Property (IP):

The CRCWSC has recently established a Commercialisation Committee and is implementing a commercialisation framework for opportunities which arise from current projects. IP will be actively identified and managed within this framework to ensure long-term benefits can be achieved from this project. We do not expect significant commercialisation outcomes, in the sense of income generated for the CRC, because the objective will be to have the tool and guidelines adopted as widely as possible.

12. Industry/end-user participation:

The Steering Committee of the project consists of at least one representative from each Regional Advisory Panel and representatives of key sectors and industries. The Committee members have extensive experience in water management issues and knowledge of the specific regional context. They have already contributed substantially in the development of this proposal. They will be actively involved in the subsequent stages from design and delivery of the project activities to communication and adoption of the project outputs. The Committee members will also facilitate wider connections with other end users and industry groups.

Beyond the Steering Committee members, there will be participation of many other Officers from end user organisations and other relevant organisations. People will be involved in providing data, input on the design of the framework, advice about the context for tool usage, testing tools and workshops of various types. There will be some significant, and highly valuable, input required from end user (industry) participants and that those entities who want to have their case studies addressed will need to ensure that this engagement and collaboration capacity (and relevant data etc.) is made available to the project.

To ensure regular communication a bi-monthly tele-conference and six monthly in-person meetings will be organised. These meetings will keep the full project team updated on the overall progress all the project and sharing new lessons from individual activities. Further, they will meet (as required) during the workshops organised under individual work packages and communicate through telephone and emails. To ensure communication with other CRCWSC projects (such as IRP1), in association with the CRC HQ a communication plan will be developed for wider engagement and learning from other activities.

13. Translation/adoption pathways:

Effective industry engagement for adoption and utilisation of outputs will be an integral aim from inception and throughout the project with on-going involvement of the Project Steering Committee. The development of a stakeholder dissemination strategy and adoption pathway will be the focus of WP1 of the project. The target audience for adoption will be informed by the Project Steering Committee and will include:

- Service providers and Regulators;
- Local Governments and State Government planning departments;
- Developers;
- UDIA and consultants;

- Peak industry bodies, including WSAA, Nursery and Garden Industry Australia; and
- Green infrastructure and WSUD design and implementation practitioners.

The intention is that the tools will be trialled with a subset of stakeholders in major capital cities in Australia, but that the adoption phase will reach all metropolitan and major regional stakeholders.

14. Work plan, project timelines and milestones:

14.1 Work plan

The research work plan including methods and outputs have been described under individual work packages above.

15.2 Timeline of tasks/activities and milestones

Project Milestone / Deliverables	Accountable team members	Timeline of Tasks											
		Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19
WP1: Working paper on existing non-market values of water sensitive systems and practices	Sayed Iftekhhar & James Fogarty	Report											
WP1: Stakeholder engagement strategy	Mark Siebentritt, Sayed Iftekhhar & David Pannell	Strategy											
WP1: Stakeholder needs assessment report	Sayed Iftekhhar & James Fogarty	Report											
WP1: Training sessions	Sayed Iftekhhar & James Fogarty							Sessions				Sessions	
WP2: Database on existing non-market values of water sensitive systems and practices	Sayed Iftekhhar & James Fogarty				Database				Revised Database			Revised Database	
WP2: Benefit-transfer guidelines	Sayed Iftekhhar & David Pannell						Guideline						
WP3: Report on existing BCA tools and lessons for our tool	Sayed Iftekhhar & David Pannell	Report											
WP3: Benefit: Cost Analysis tool (draft version for testing)	Sayed Iftekhhar & David Pannell		Tool										
WP3: Benefit: Cost Analysis tool (revised version)	Sayed Iftekhhar & David Pannell								Updated tool				
WP3: Guidelines for Benefit: Cost Analysis tool	Sayed Iftekhhar & David Pannell											Guideline	
WP4: Review of existing finance models and policies for selected cases	James Fogarty & Sayed Iftekhhar									Report			
WP4: Finance models and policies for selected cases (tested and finalised)	James Fogarty & Sayed Iftekhhar										Report		
WP5: Integrated economic valuation report: Final report (WP 5.1) Greening pipeline	Sayed Iftekhhar & James Fogarty	Scoping workshop						Presentation of preliminary results			Report		
WP5: Integrated economic valuation report: Final report (WP 5.2) Wastewater Precinct	Sayed Iftekhhar & James Fogarty			Synthesis workshop									
WP5: Integrated economic valuation report: Final report (WP 5.3) Living stream	Sayed Iftekhhar & James Fogarty									Report			
WP5: Integrated economic valuation report: Final report (WP 5.4) Arden Macaulay	Sayed Iftekhhar & James Fogarty												
WP5: Integrated economic valuation report: Final report (WP 5.5) Unspecified	Sayed Iftekhhar & James Fogarty												
WP6: Landscape scenarios development for Study Site 1 (Sunbury, Melbourne) and report	Kym Whiteoak & Sara Lloyd	Tool & Report											
WP6: UHI modelling and heat mitigation for Study Site 1 (Sunbury, Melbourne) scenarios and report	Nigel Tapper, Ashley Broadbent & Kym Whiteoak				Tool & Report								
WP6: Integrated economic valuation of Study Site 1 (Sunbury, Melbourne) Report	Kym Whiteoak & Nigel Tapper					Tool & Report							
WP6: UHI modelling and heat mitigation for Study Sites 2-4 (Sydney, Brisbane and Perth) and report (subject to funding)	Nigel Tapper & Ashley Broadbent						Tools & Report						

* The dates assume Year 1 begins Jan 2017 and the project receives active support from stakeholders.

15. Resources: Provide a yearly budget estimate including anticipated annual cash and in-kind budget over the duration of the project

IRP2 budget		Year 1 2016-17 Six months	Year 2 2017-18	Year 3 2018-19	Year 4 2019-20 Six months	Total
Tied funding committed by partners						
Melbourne Water		\$150,000	\$50,000	\$50,000	\$0	\$250,000
WA Water Corp		\$25,000	\$25,000	\$25,000	\$0	\$75,000
Water-Sensitive SA		\$0	\$30,000	\$0	\$0	\$30,000
Total tied funding		\$175,000	\$105,000	\$75,000	\$0	\$355,000
Expenditure	Detail					
Salaries						
Sayed Iftikhar (UWA)	0.90 FTE	\$72,990	\$150,146	\$158,854	\$81,697	\$463,687
Maksym Polyakov (UWA)	0.8 FTE months 13-36	\$0	\$61,400	\$123,800	\$62,400	\$247,600
UWA Postdoc to be appointed (TBA)	0.75 FTE first 12 months	\$39,375	\$39,375			\$78,750
UWA research assistant	0.40 FTE	\$13,000	\$26,400	\$27,200	\$13,800	\$80,400
Ashley Broadbent (Postdoc, Monash with Nigel Tapper)	0.75 FTE months 1-12 0.5FTE months 13-24, WP6	\$57,547	\$99,397	\$41,850		\$198,794
Kym Whiteoak (RMCG) -TBC (case-study dependent)	WP6 - economics of urban climate		\$30,000	\$20,000		\$50,000
Sarah Lloyd (E2Design) -TBC (case-study dependent)	WP6 - biophysical modelling		\$40,000	\$10,000		\$50,000
Mark Siebentritt	WP1.3 Stakeholder engagement strategy	\$5,000	\$10,000	\$10,000		\$25,000
Mark Morrison (Southern Cross Uni) - Postdoc	0.5 FTE year 1, Sydney Case study dependent					\$0
Sub-total - salaries		\$187,912	\$456,719	\$391,704	\$157,897	\$1,194,232
Operating costs						
Workshops		\$0	\$18,000	\$26,000	\$8,000	\$52,000
Case studies		\$0	\$30,000	\$65,000	\$0	\$95,000
Other general operating costs		\$7,500	\$31,000	\$28,500	\$31,000	\$98,000
Sub-total - operating costs		\$7,500	\$79,000	\$119,500	\$39,000	\$245,000
Total expenditure		\$195,412	\$535,719	\$511,204	\$196,897	\$1,439,232
Cash funding from CRC	Total expenditure – Total tied funding	\$20,412	\$430,719	\$436,204	\$196,897	\$1,084,232
Potential additional tied funding		(prospective only, will increase number of case studies and overall budget accordingly)				
Sydney Water		\$50,000	\$100,000	\$100,000	\$50,000	\$300,000
WA Water Corp (additional)		\$25,000	\$25,000	\$25,000		\$75,000
SEQ participants & partners						\$0
Water-Sensitive SA & Partners (additional)			\$42,000			\$42,000
Other partners						\$0
Total potential		\$75,000	\$167,000	\$125,000	\$50,000	\$417,000
WSAA (running separate project through WRA)	Value yet to be determined based on industry contributions					\$0
In-Kind contributions (indicative only, to be finalised after review)						
David Pannell (UWA)	Researcher/Steering committee	0.1	0.2	0.2	0.1	
James Fogarty (UWA)	Researcher	0.1	0.2	0.2	0.1	
Nigel Tapper (Monash)	Researcher/Steering committee	0.05	0.1	0.1	0.05	
Grace Tjandraatmadja	Steering committee	0.025	0.05	0.05	0.025	
Greg Finlayson	Steering committee	0.025	0.05	0.05	0.025	
Ursula Kretzer	Steering committee	0.025	0.05	0.05	0.025	
Naomi Rakela	Steering committee	0.025	0.05	0.05	0.025	
Craig Miller	Steering committee	0.025	0.05	0.05	0.025	
Simon Leiva	Steering committee	0.025	0.05	0.05	0.025	
Melissa Bradley	Steering committee	0.025	0.05	0.05	0.025	
Jill Fagan	Steering committee	0.025	0.05	0.05	0.025	
Ben Fallowfield	Steering committee	0.025	0.05	0.05	0.025	

Please see Appendix B for explanations of the specific budget items.

16. Risk assessment and management: *Identify key risks that may impact on project progress or deliverables/outcomes, including barriers to adoption, and how they will be proactively managed. Identify financing implications if there are co-contributors.*

Risk	Impact	Management action
Lack of support from local end users	Failure to conduct appropriate number of case studies and reduced ability to fulfil project objectives	Building on the successes of industry engagement in Tranche 1 in getting broad support and buy-in. Secure commitments of support during project development and negotiation. To achieve those commitments, ensure that the project is well designed to meet end user needs.
Lack of data	Failure to test the tools and framework comprehensively	Develop an adaptive approach to identify potential roadblocks very early in the process and define project scope appropriately
Reluctance to use estimates based on non-market valuation studies (such as willingness to pay based on survey)	Limiting the scope to consider wide range of evidence for economic evaluation	Build confidence on the method and estimates through engagement with both industry and experts
Reluctance to use an economic evaluation framework for decision making by the end users	The adoption of the outputs from the project will be limited and the impact of the project will be reduced	Engage with the regulators and policy makers from the beginning of the project and clearly communicate the benefits of using an evaluation framework
Expectations beyond the scope of the project from end users	Frustration at failure to meet expectations.	Convey the scope and outputs of the project through interactive engagement and clear communication Invite end users to invest additional resources to generate additional outputs (if required)
Lack of integration with the other CRC projects and failure to learn from each other	Full potential of the project is not realised	Establish a well-designed plan for engagement with other projects to ensure smooth information exchange
Loss of key research personnel	Delay in the delivery of the project	Employed researchers will be part of productive and well-respected research groups. Mentor and support early-career researchers. Create opportunities for professional development and career progression.

17. References:

Johnston, R.J., J. Rolfe, R.S. Rosenberger and R. Brouwer, eds. 2015. *Benefit Transfer of Environmental and Resource Values: A Guide for Researchers and Practitioners*. Dordrecht, the Netherlands: Springer.

WSAA, 2016. *Liveability Indicators: A report prepared for the water industry*. Occasional Paper No 31, Water Services Association of Australia Ltd, 40pp.

Appendix A: Details of selected potential case studies (subject to funding availability)




Case study A1		Benefit-cost analysis of South Creek Living Waterway Corridor in Sydney
Key stakeholders:		Sydney Water, Greater Sydney Commission Department of Planning and Environment, IPART, Camden, Liverpool, Fairfield, Blacktown + Penrith Councils, Office of Environment and Heritage, NSW EPA, Metropolitan Water Directorate
Key issues / Research or Management questions:		<p>The scale of population growth in Western Sydney presents a significant problem in wastewater management (sewage and stormwater). In summary, it will result in a water surplus that far exceeds the capacity of existing waterways. There is significant risk that business as usual approaches to water, wastewater and stormwater services will not deliver the desired community and customer outcomes.</p> <p>Further to this, the shift toward a hotter drier climate on top of increased population density will present significant challenges to liveability in the region. Managing thermal comfort, and access to recreation and natural amenities will become critical factors in community health and economic prosperity. There is a shortage of high grade recreation areas in the west. There is significant potential investment in stormwater management across Council areas but initiatives are poorly integrated. The limited remaining areas of high ecological value will deteriorate without active intervention.</p> <p>The Living Corridor presents an integrated approach to water management within the South creek corridor and establishing highly valuable and accessible recreation areas within the corridor as well as providing a framework for innovative, decentralised water servicing, open space irrigation and ecological preservation.</p>
Importance / significance of the case study:		By valuing the outcomes of the South Creek Living Corridor an argument can be made of significant alternative land planning, water servicing and environmental regulation of this major region of Sydney's growth. To elevate regulation conversations above the existing paradigms to a city outcome conversation these benefits must be valued.
Why and how an integrated economic evaluation framework would be useful in addressing the key issues?:		<p>Water management across Sydney is managed by potentially inconsistent and often competing interests and organisations with little agreement on greater city wide goals. Water utility assets are capitalised and regulated on a "least cost" site by site basis as a protection for customer affordability. As a result services for water, sewerage and recycled water are not only viewed in isolation from one another, but also from other water cycle elements such as stormwater, flooding, waterway health, city aesthetic and green space outcomes. These other elements are coordinated by a collection of local government and other agencies. Overall, this can create inefficiencies in water and financial resources whilst also potentially failing to capture significant benefits that are available. The living corridor proposal is an attempt to integrate such management in to a greater landscape outcome for the west.</p> <p>An integrated economic framework is required to present and articulate for alternate (WSC) servicing scenario of the Corridor and how it will provide city wide benefits.</p>
Expected outcomes from the case study (how it will be useful for the stakeholders):		This will provide a regional case study that sums up multiple threads of the tranche 1 research into one real example.
Available support: In-Kind (could include data, information, experts, etc.)		Sydney Water is looking to partner on the case study to articulate the scenario with real data from the Western Sydney Regional Masterplan process.
Available support: Cash (co-investment)		Sydney Water expects to financially contribute.



Case study A2 WESROC Recycled Water Managed Aquifer Recharge for Public Open Space and Other Social Benefits	
Key stakeholders:	WESROC – Western Regional Organisation of Councils (Town of Mosman Park, Shire of Peppermint Grove, Town of Cottesloe, Town of Claremont, City of Nedlands, and City of Subiaco); Department of Water; Water Corporation
Key issues / Research or Management questions:	<p>The WESROC region covers 64 km² in the western suburbs of Perth. The councils rely heavily on the superficial aquifer to water public open spaces (POS). Declining groundwater levels and quality are affecting their ability to maintain POS, street trees, vegetation.</p> <p>Department of Water (DoW), WESROC and Water Corporation are working together to evaluate different water management strategies including recycling treated wastewater for irrigating POS, to:</p> <ol style="list-style-type: none"> 1) Secure a future water supply for POS in a drying climate; 2) Maintain groundwater quality, dependent wetlands and existing users in the area under drying climate. <p>Phase 1: Pre-feasibility investigations. Funded by DoW, completed in July 2016.</p> <ul style="list-style-type: none"> • Subproject 1-1: Western suburbs hydrogeological study (DoW, 2016) • Subproject 1-2: Pre-feasibility study of western suburbs MAR of treated wastewater (GHD, 2016) <p>Phase 2: Feasibility, groundwater investigations and numerical model development. The current focus of the project is:</p> <ul style="list-style-type: none"> • Evaluate water recycling options and determine preferred options, using Marsden Jacob's 'Economic viability of recycled water schemes' cost benefit framework. • Scoping MAR supply options. • Groundwater investigation and model conceptualisation. • Develop a groundwater numerical model to simulate the impact of public and private abstraction on water levels and quality. <p>Phase 3: Detail design and approvals. Use groundwater model to evaluate engineering designs and assess risks of MAR options.</p>
Importance / significance of the case study:	<p>Key drivers of the project include:</p> <ul style="list-style-type: none"> • Ability to meet demand for watering POS in a drying climate, without adversely impacting on groundwater quality, groundwater dependent ecosystems and existing users. • High demand for groundwater for POS where allocation limits are constrained, with little scope for accommodating future growth. • Possible saline intrusion (extent and source). • Evaluation of management response options and fit-for-purpose supply options; e.g. MAR using treated wastewater and stormwater. • High social and environmental values associated with groundwater dependent environments (e.g. lakes, trees, vegetation).
Why and how an integrated economic evaluation framework would be useful in addressing the key issues?:	<p>The framework would help identify and quantify:</p> <ul style="list-style-type: none"> • costs and benefits associated with recycled water MAR schemes – particularly the wider public and environmental benefits as part of developing business cases; • beneficiaries to inform future funding models for regional schemes.
Expected outcomes from the case study (how it will be useful for the stakeholders):	<p>Assist councils to identify the scale of benefits (and who benefits) from different water management strategies to maintain POS and environmental assets, in order to develop:</p> <ul style="list-style-type: none"> • business cases; • funding models (e.g. sharing across regional councils, Government grants, Water Corporation, industry). <p>Assist DoW and Water Corporation to better understand the wider benefits of recycled water MAR schemes.</p>
Available support: In-Kind (could include data, information, experts, etc.)	<p>Phase 1 of the study was funded by DoW, approximately \$150k operating costs plus in-house staff salary costs. Phase 2 is jointly funded by DoW and WESROC, approximately \$700k for operating costs plus staff salary costs.</p> <p>Costs and funding arrangements for Phase 3 will be determined at the conclusion of Phase 2.</p> <p>DoW would be able to provide most of the estimated costs for recycled water MAR schemes, so the focus of the framework would be in assessing the associated benefits of maintaining groundwater quality, dependent wetlands and existing users in the Western suburbs area under drying climate.</p>
Available support: Cash (co-investment)	Existing contribution to the overall project

Case study A3	
Site 1 - North Stoneville and/or Site 2 - North Parkerville (2 separate developments – potentially 2 different projects)	
Key stakeholders:	Shire of Mundaring Site 1 – Developer - Satterley (TBC) Site 2 - Developer - Parkerville Residential Pty Ltd (TBC) Independent Water Utility (TBC)
Key issues / Research or Management questions:	<ul style="list-style-type: none"> Two future townsites to the north of Stoneville, Parkerville & Hovea are proposed They are zoned 'Urban Deferred' until wastewater treatment issues are resolved North Parkerville investigating scheme water management by strata Use of non-Water Corporation sewage system, possible third pipe systems in a new residential development Development currently cannot go ahead until above is resolved
Importance / significance of the case study:	Development of this area is currently inhibited due to no waste water treatment system. Solutions could be applied to developing or extending townsites in regional areas with water and/or wastewater limitations. Shire information sheets available - North Stoneville & North Parkerville
Why and how an integrated economic evaluation framework would be useful in addressing the key issues?:	Provide information on decentralised waste water systems - costs and benefits, business case for future developers, local governments – particularly of interest to regional and peri-urban local governments. Resolution of the wastewater treatment issue will likely involve minimising water use in other areas, so developers have an incentive to reduce, reuse and recycle water wherever possible.
Expected outcomes from the case study (how it will be useful for the stakeholders):	The developer is looking at development of a stand-alone, decentralised waste water system (not connected to Water Corporation infrastructure). Development cannot proceed without resolving water and wastewater issues.
Available support: In-Kind (could include data, information, experts, etc.)	In-kind support from the Shire of Mundaring, Developer, private waste water provider, EMRC, possibly Department of Water and Department of Parks and Wildlife (all TBC).
Available support: Cash (co-investment)	Nil at this stage However it would be expected the developer would implement project findings



Case study A4	Breakout Creek Wetlands
Key stakeholders:	<ul style="list-style-type: none"> Adelaide and Mt Lofty Ranges NRM Board as project driver. Community – whole community benefiting from improvements to Breakout Creek and Gulf St Vincent. SA Water as watercourse capacity manager. City of West Torrens as a land manager. City of Charles Sturt as a land manager.
Key issues / Research or Management questions:	Creating a linear wetland environment at Breakout Creek has well-quantified capital works costs and ongoing management costs. The substantial ongoing benefits to people, ecosystems and the economy can be described qualitatively but aren't readily quantified. With works completed in two reaches of Breakout Creek, how can we articulate a robust business case for the creation of a linear wetland in the third and final reach to the sea, valuing the currently unmonetised benefits to justify the appropriate investment?
Importance / significance of the case study:	<p>Breakout Creek is the last few kilometres of Adelaide's iconic River Torrens – an artificial channel dug in the 1930s to connect the Torrens directly to Gulf St Vincent. It's part of Adelaide's landmark Torrens Linear Park, established in the 1980s, but as a weedy, grassed open channel leased for agistment by a local horse club, it offered little value as an ecosystem or to the community beyond the horse club. In the late 1990s the Torrens Catchment Water Management Board reconstructed 500m of Breakout Creek, relocating horses, creating permanent deepwater pools, improving community access, and planting thousands of native aquatic and terrestrial plants. In the late 2000s the AMLR NRM Board reconstructed the next 700m of river downstream, further improving and extending habitat and accessibility. In the 2010s the AMLR NRM Board is engaging with the community about potential outcomes for the final reach of Breakout Creek to the sea. The importance of this case study encompasses:</p> <ul style="list-style-type: none"> One stage of reconstructed river nearly 20 years old. One stage of reconstructed river over 5 years old. One stage of river with the potential for reconstruction actively under consideration with engagement with the community already commenced. Adelaide's most well-known river. <p>Breakout Creek, February 2009:</p>  <p>Breakout Creek, October 2013:</p>  <p>Breakout Creek, September 2016:</p> 
Why and how an integrated economic evaluation framework would be useful in addressing the key issues?:	The first two stages of works at Breakout Creek were enabled by socio-political environments at those times supportive of public-good ecological improvement works without the imprimatur for hard-nosed financially-based business cases. People were comfortable with weighing qualitative benefit descriptions against quantitative costs. However, the socio-political landscape for this type of project has changed since the second stage of works was considered and its social licence to progress was confirmed in the early to mid-2000s. Now, a business case expressed in hard financial terms, clearly articulating the economic, social and ecological benefits and costs, is necessary to progress the next stage of works from engagement and feasibility to hard, cash action.
Expected outcomes from the case study (how it will be useful for the stakeholders):	A case study resulting in a real evaluation of market and non-market benefits will be an invaluable tool for the stakeholders to build the business case for the next stage of Breakout Creek watercourse reconstruction. It could be the key to continuing the amazing social and ecological outcomes of the first stages all the way to Gulf St Vincent.
Available support: In-Kind	Significant support from DEWNR Natural Resources AMLR staff.



Available support: Cash (co-investment)	\$42,000 from Water Sensitive SA, Adelaide and Mt Lofty Ranges NRM Board, SA Department of Environment, Water and Natural Resources.
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Case study A5		City-wide costs and benefits of rainwater harvesting	
Key stakeholders:		Brisbane City Council, Ipswich City Council, Logan City Council, Redland City Council, Gold Coast City Council, SEQWater, Queensland Urban Utilities	
Key issues / Research or Management questions:		<p>Stormwater management is an increasingly expensive issue for city Councils and their ratepayers. Largely impervious urban catchments rapidly direct rainfall into stormwater systems for discharge into waterways. This increases the volume and rate of peak flows, requiring large capacity drainage systems for short term events, causing localised flooding, increasing erosion and sediment run off from construction sites, and changing the hydrology of urban waterways with consequent impacts on local biodiversity.</p> <p>Capturing rainfall in domestic rain water tanks offers a potential cost-effective solution if it occurs at the right scale across the urban environment, with the water being used to supplement domestic supply, watering domestic gardens or public green spaces, or being discharged into the stormwater system once the peak has passed.</p> <p>Can domestic rainwater tanks make a cost-effective system-wide contribution to stormwater management in south east Queensland?</p> <p>What are the relative cost: benefits for all agents and stakeholders in the urban water cycle?</p> <p>What cost:benefit sharing models are available to create an incentive for domestic uptake at the scale required?</p> <p>What innovative options are available for rainwater harvesting, storage, and use within suburbs and neighbourhoods?</p>	
Importance / significance of the case study:		Rainwater tanks have been a political football in south east Queensland over the last two decades, being seen as a water conservation solution during drought conditions, through to an unnecessary cost for developers and landholders at other times. For example, the State Government required rainwater tank installation during the drought and removed that requirement after the drought ended.	
Why and how an integrated economic evaluation framework would be useful in addressing the key issues?		This problem requires a system-wide stock-and-flow with feedback analysis of the relative costs and benefits to different but interrelated agents in the urban ecosystem. It requires consideration of, and the testing of, different funding models and an examination of the intended and potential unintended consequences of changes to the funding model on the different agents relative to the benefits of stormwater harvesting.	
Expected outcomes from the case study (how it will be useful for the stakeholders):		Evidence-based policy regarding domestic rainwater capture, storage and use; equitable and effective cost: benefit allocation across stakeholders and beneficiaries; improved waterway condition	
Available support: In-Kind (could include data, information, experts, etc.)		Brisbane City Council Healthy Waterways and Catchments - Delivering Queensland stormwater, erosion and sediment control strategy for Department of Environment and Heritage Protection in 2016/17.	
Available support: Cash (co-investment)		TBC	

Case study A6	Economic value of urban climate improvement: Sub-tropical case study
Key stakeholders:	Brisbane City Council, Ipswich City Council, Gold Coast City Council, Logan City Council, Healthy Waterways and Catchments
Key issues / Research or Management questions:	Add to existing research questions: Does the Living Waterways framework provide a cost-effective means for urban climate improvement in sub-tropical cities?
Importance / significance of the case study:	The cities of south east Queensland are rapidly growing, with both greenfield development, and infilling brownfield development. Sustainable development requires consideration and mitigation of climate impacts on human health and amenity. Understanding the economic value of cooling through Greening in these environments is critical to the establishment of policy and business cases for ongoing and future urban development.
Why and how an integrated economic evaluation framework would be useful in addressing the key issues?	SEQ is planning for significant growth through urban development; urban heat islands may be an unintended consequence of business as usual if not explicitly addressed through policy and planning. It will be important to identify the relative costs and benefits of new approaches to development that mitigate the heat island effect, deliver liveable and sustainable communities, and equitably allocate the costs.
Expected outcomes from the case study (how it will be useful for the stakeholders):	This information will inform the business case for Greening in urban development and support SEQ city strategic plans for sustainable urban development.
Available support: In-Kind (could include data, information, experts, etc.)	Brisbane City Council Healthy Waterways and Catchments - Proprietary analytic methods and thermal mapping of urban, peri urban and rural areas in Queensland at 30m resolution. Living Waterways framework
Available support: Cash (co-investment)	TBC

Estimated level of effort required to complete each case study

Serial Number	Case study Idea	Level of effort (tentative)
WP5.1	Greening the pipeline	6
WP5.2	Strategic Water Resource Precincts	4
WP5.3	Converting an open drain into a living stream	2
WP5.4	Arden Macaulay Urban Redevelopment	3
A1	Benefit-cost analysis of South Creek Living Waterway Corridor in Sydney	6
A2	WESROC Recycled Water Managed Aquifer Recharge for Public Open Space and Other Social Benefits	2
A3	Site 1 - North Stoneville and/or Site 2 - North Parkerville (2 separate developments – potentially 2 different projects)	2
A4	Breakout Creek Wetlands	3
A5	City-wide costs and benefits of rainwater harvesting	3
A6	Economic value of urban climate improvement: Sub-tropical case study	3

Appendix B: Explanations of budget items

Employed staff

Sayed Iftekhhar (UWA)	Project leader, overall coordination and reporting. Broad expertise in economic analysis. Will contribute to all work packages and all case studies. Needed for a high FTE percentage throughout the project. (Would prefer 100% but current budget is for 90%.)
Maksym Polyakov (UWA)	Expert on aspects of non-market valuation (hedonic pricing analysis), cost-benefit analysis and economic modelling broadly. Will particularly contribute to WP1.4 (training), WP2.2 (non-market values), WP3.3 (BCA tool), WP3.4 (BCA tool guidelines), and WP5 (all case studies). Needed for a high FTE percentage (80%, preferably 100%) for the last two years of the project.
Postdoc to be appointed (UWA) (TBA)	A non-market valuation specialist, but with general economics expertise. Needed for WP2, particularly in the absence of Maksym Polyakov in the first 12 months of the project. Will contribute to WP1.3 (consultation), WP1.4 (training), WP2.1 and WP2.2 (non-market values), WP3.2 (costing), WP5 (case study 2). Needed 75% FTE for one year. Will create a full-time position by combining funds from a different (non-CRC) project that deal with non-market values.
Research assistant (UWA) (TBA)	Skills in stakeholder and community engagement, and in organisation of workshops and stakeholder engagement activities. Will contribute to stakeholder engagement (WP1.3 and WP1.4), non-market valuation guidelines (WP2.2), BCA tool guidelines (WP3.4), organisation of workshops, and project reporting. Will contribute to other work packages as required. Budgeted at 0.4 FTE for the duration of the project.
Postdoc (with Nigel Tapper)	Climate modelling and health benefits. Will contribute to WP6.1 (heat island). 0.75 FTE in first 12 months of project, 0.5 FTE in second 12 months.
Kym Whiteoak (consultant)	Skills in economic evaluation. Has worked with Nigel Tapper previously. Could be engaged to conduct the economic analysis in WP6.1 (heat island)
Sarah Lloyd (consultant)	Skills in biophysical modelling. Could be engaged in WP6.1 (heat island)
Mark Siebentritt (consultant)	Expert on community engagement. Will assist with WP1, including advising on strategy to ensure that the tools are widely adopted.

Operating costs

Workshops	The project includes six workshops for engagement and consultation. The budget of \$5000 per workshop allows for interstate travel and accommodation for 2-3 project team members and 1-2 key end users who lack access to travel funds, plus funds for venue and catering.
Training	Four training workshops at \$8000 each, covering interstate travel and accommodation for 2 project team members and up to 8 end-user trainees, plus funds for venue and catering.

Dissemination strategy	Costs cover design, assistance with document preparation, printing and dissemination, plus costs of a variety of complementary dissemination and engagement activities.
Online implementation of BCA tool.	Once the tool design is completed and well tested, online implementation has a number of advantages and, based on experience, is likely to be more attractive to users than a spreadsheet version. We will use our own expertise in web development to limit the cost to around \$10,000.
Case studies	The case studies involve a number of surveys (at \$15,000 to \$20,000 each for cost of access to a suitable sample of respondents and implementation of the survey), travel and meeting costs.
Urban heat island work package	Consumables, travel and computing \$2K, \$2K, \$5K in each of 2017 and 2018.
Equipment	Replacement and maintenance of computers and software.
Conferences	Two team members attending one national research conference per year. Registration, accommodation and travel estimated at \$3500 each.
General travel	To CRC meetings not connected with case studies or workshops that are part of work packages.

In-kind staff

David Pannell (UWA)	Broad expertise in economics, policy and end-user engagement. Will contribute to WP1.2 (dissemination), WP2.2 (non-market valuation guidelines), WP3.3 (BCA tool), WP3.4 (BCA tool guideline), and case studies.
James Fogarty (UWA)	Broad expertise in economics and policy. Will contribute to WP1.4 (training), WP3.2 (costing), WP3.3 (BCA tool), WP4.1 and 4.2 (finance models and policies), and WP5 (case studies 2 and 3).
Nigel Tapper (Monash)	Will lead WP6.1 (urban heat island).

Steering Committee

Members: Grace Tjandraatmadja Greg Finlayson Ursula Kretzer Naomi Rakela Craig Miller Simon Leiva Mellissa Bradley Jill Fagan Ben Fallowfield Nigel Tapper David Pannell Sayed Iftekhar	Role of the steering committee: <ul style="list-style-type: none"> • Provide overall guidance for the project, including assistance with prioritisation of case studies. • Advise on and assist with collection of data required for the project, particularly for the case studies. • Facilitate networking and connections between the project team and various organizations and key people to successfully implement various tasks. • Advise on and assist with dissemination and sharing of information, knowledge and tools generated from the project. • Actively seek opportunities in their respective organizations to implement lessons and tools from the project.
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NWW/CRCWSC - WA Stakeholder needs analysis

Background

New Water Ways Inc has been engaged by the Cooperative Research Centre for Water Sensitive Cities (CRCWSC) to deliver locally relevant knowledge broker and capacity building activities during the 2016/17 financial year to facilitate improved understanding and adoption of the outcomes of CRCWSC research. Key deliverables which have been agreed are:

- Local work plan for 2017 to 2020
- Short list of priority policy initiatives
- Two (2) focussed events to assist in the integration of CRCWSC messages and research findings and recommendations into agency policy/ strategy/ systems
- Two (2) WSC workshops with key stakeholders
- One (1) Industry practice note/ guidance
- Three (3) Researcher presentations
- Two (2) Cross-agency forums and networking events
- One (1) demonstration tour

In order to guide the delivery of the above activities, a WA stakeholder needs analysis has been undertaken. This involved an on-line survey and phone calls to CRCWSC member agencies. The survey sought to understand the current level of knowledge of CRCWSC research; identify priority topics on which to focus knowledge transfer activities and optimise implementation by identifying preferred delivery mechanisms.

Survey results

The survey was completed by 33 practitioners however only 18 provided contact details. Most responses came from State Government (15), with nine from local government. Most respondents worked in regulatory/policy and environmental science areas.

The top 6 water topics requiring increased knowledge and capacity were:

- Alternative water supplies;
- Economics (valuation techniques – costs and benefits);
- Landscape design and public open space;
- Microclimate & urban heat;
- Integrated planning; and
- Water literacy and behaviour change.

Flood resilience was ranked the lowest at zero.



Most respondents had knowledge of the range of CRCWSC projects, with the least well known being B4, C1, C3 and D4.

The most well-known publications/outputs were the Perth Vision report; biofilter adoption guidelines; and WSC Index.

The areas of research most required by the respondent's agency were

- Alternative water supplies
- Economics
- Governance and policy
- Urban planning
- Water literacy and behaviour change
- Microclimate and urban heat

This translated into the need for better skills and knowledge in the following areas:

- Integrated water management
- Strategic planning for water sensitive cities
- Policy and regulations regarding water sensitive cities
- Designing for water sensitive outcomes

Project management was ranked the lowest.

The most preferred formats for capacity building were training/workshop sessions; case studies and fact sheets; and research presentations. Mentor/individual instruction and discipline specific activities were ranked lowest.

The key activities to be undertaken in the coming financial year were agency policies, demonstration/pilot projects and community engagement activities. Key opportunities include:

- City of Gosnells – Local planning strategy/ scheme; Public open space strategy; and Activity centre structure plan;
- City of Mandurah - Public open space strategy; Design guidelines; and Operational guidelines for construction or maintenance of public assets;
- City of Melville - Urban forest strategy;
- Department of Water – agency policy;
- EMRC – agency policy; Urban forest strategy; community engagement; and demonstration/pilot projects;
- LandCorp - Local planning strategy/ scheme; Public open space strategy; Urban forest strategy; Activity centre structure plan; Design guidelines; Community engagement plan/strategy; and Demonstration/pilot projects; and
- Water Corporation – agency policy; Design guidelines; Community engagement plan/strategy; and Demonstration/pilot projects.

Unfortunately, 21 responses were not accompanied by contact details. These respondents identified all the opportunities that were provided. Accordingly, a number of phone calls were then made to partner agencies to try to identify the opportunities. This is outlined in Attachment 1.

Key partner opportunities

The following opportunities for knowledge broker and capacity building activities were identified as a result of phone conversations and the survey.

Partner	Opportunity
City of Armadale	Revision of WSUD policy
City of Canning	Drainage retrofit projects
City of Gosnells	Rebuilding the visions and engaging the engineers
City of Joondalup	Engaging the infrastructure team and more opportunities for retrofit
City of Mandurah	TBA
City of Melville	Tree canopy strategy
City of Nedlands	Local Planning Strategy
City of Subiaco	WSUD retrofit projects
Housing Authority	Year of Water, water innovation projects (Sth Pinjar, Brabham, Bentley)
Department of Water	TBA
Eastern Metropolitan Regional Council	Drainage optimisation
LandCorp	TBA
Department of Parks and Wildlife	TBA
Water Corporation	Drainage for liveability – mostly an external than internal focus
Department of Planning	Review of water SPPs – mostly an external than internal focus

Recommendations

The following topics for deliverables are recommended.

Deliverable	Topic
Local work plan for 2017 to 2020	Local Work Plan to 2020 prepared
Short list of priority policy initiatives	<ul style="list-style-type: none"> Review of SPP 2.9, 2.10 and 2.1 Review of SPP 2.2, 2.3 & 2.7 Preparation of SPP 7.3: Precinct design City of Armadale WSUD LPP City of Melville green infrastructure policy
Two (2) focused events	<ul style="list-style-type: none"> City of Armadale WSUD policy City of Gosnells rebuilding the vision
Two (2) WSC workshops with key stakeholders	<ul style="list-style-type: none"> Delivering better maintenance – practical activities and planning Delivering street trees in existing neighbourhoods – design exercise in Melville with other local governments
One (1) Industry practice note/ guidance	Car park retrofits for WSUD – improving stormwater and microclimate outcomes
Three (3) Researcher presentations	<ul style="list-style-type: none"> Valuation of economic, social and ecological costs and benefits (Project A1.2) and Economic incentives and instruments (Project A1.3), Prof. David Pannell

Deliverable	Topic
	<ul style="list-style-type: none"> Hydrology and nutrient transport processes in groundwater/surface water systems (Project B2.4), Carolyn Oldham and Carlo Ocampo Angela Dean, Engaging communities with water sensitive cities (Project A2.3)
Two (2) Cross-agency forums and networking events	<ul style="list-style-type: none"> LIAWA Symposium – 17 March 2017 AWA/SWA/NWW/CRC community day – 21 April Possible UDIA joint event
One (1) demonstration tour	WGV in February or March 2017

Attachment 1: NWW/CRCWSC Needs and Opportunities Analysis Survey

A critical component of the delivery of the Cooperative Research Centre for Water Sensitive Cities (CRCWSC) long term outcomes is to mainstream water sensitive cities practices by building knowledge and capacity through influence, impact and collaboration. New Water Ways has formed a partnership with the CRCWSC to deliver locally relevant capacity building activities through a range of knowledge broker activities.

During the 2016/17 financial year, New Water Ways will deliver a number of activities to increase access to effective knowledge, tools and products to facilitate our transition towards a Water Sensitive City (WSC). This survey has been prepared for partner agencies of the CRCWSC to identify priorities for building skills and capabilities. The survey seeks to understand the current level of knowledge of CRCWSC research; identify priority topics on which to focus knowledge transfer activities and optimise implementation by identifying preferred delivery mechanisms. The first round of research projects, delivered between 2012 and 2016 is collectively known as Tranche 1.

Thank you for taking the time to complete the survey. Your responses will be used to inform the design and delivery of NWW/CRCWSC knowledge broker and capacity building activities.

1. What are the top 5 water topics which you feel require increased knowledge and capacity to improve **delivery of water sensitive cities outcomes in WA**?
 - Alternative water supplies
 - Development in areas of high groundwater
 - Economics (valuation techniques – costs and benefits)
 - Flood resilience
 - Green infrastructure
 - Groundwater availability
 - Landscape design and public open space
 - Liveability
 - Microclimate & urban heat
 - Resilience
 - Stormwater
 - Sustainability
 - Integrated planning
 - Urban waterways
 - Wastewater treatment
 - Water literacy and behaviour change
 - Other – please specify and/or add context for your responses above
2. Which of the following CRCWSC Tranche 1 (T1) projects have you heard about? (tick all that apply)
 - Valuation of economic, social and ecological costs and benefits (Project A1)
 - Understanding social processes to achieve water sensitive futures (Project A2)
 - Better governance for complex decision-making (Project A3)
 - Society and institutions (Project A4)
 - Urban rainfall in a changing climate (Project B1)
 - Stream ecology (Project B2)

- Hydrology and nutrient transport processes in groundwater/surface water systems (Project B2.4)
 - Green cities and microclimate (Project B3)
 - Social-technical flood resilience in water sensitive cities (Project B4)
 - Statutory planning for water sensitive cities (Project B5)
 - Sustainable technologies (Project C1)
 - Resource recovery from wastewater (Project C2)
 - Managing interactions between decentralised and centralised water systems (Project C3)
 - Integrated multi-functional urban water systems (Project C4)
 - Intelligent urban water systems (Project C5)
 - Learning through demonstration and integration (Project D1)
 - Water sensitive cities modelling toolkit (Project D1)
 - Science-policy partnerships (Project D3)
 - Strengthening educational programs to foster future water sensitive cities leaders (Project D4)
 - Urban intensification and green infrastructure: towards a water sensitive city (Project D5)
 - Water sensitive cities Index (Project D6)
3. Which of the following outcomes of CRCWSC T1 research (reports/tools) are you familiar with?
- Adoption guidelines for stormwater biofiltration systems
 - Community knowledge about water – Who has better water-related knowledge and is this important?
 - Community profiles of engagement with water: Identifying ‘footholds’ for building engaged communities
 - DANCE4Water
 - Designing raingardens for community acceptance
 - Governance structures and strategies to support innovation and adaptability
 - How influencing behaviours can accelerate the transition to a water sensitive city: Behaviour Assessment Database
 - Performance assessment of the Anvil Way Compensation Basin living stream: 2004-2013
 - Ranking projects for water-sensitive cities: a practical guide (2015)
 - Results of a legislative stocktake for Western Australia
 - Risks to long term viability of residential non-potable water schemes: a review
 - Shaping Perth as a water sensitive city: outcomes and perspectives from a participatory process to develop a vision and strategic transition framework
 - The value of restoring urban drains to living streams
 - Vulnerability mapping: <http://www.mappingvulnerabilityindex.com/>
 - Water Sensitive Cities (WSC) Index
 - Water Sensitive Cities skills and knowledge needs - report
 - Water Sensitive Cities Toolkit
 - None of the above
 - Other – please specify and/or add context for your responses above
4. Which of the following areas of **CRCWSC research** are most required **by your agency** to improve delivery of water sensitive cities outcomes? (choose top 5)
- Alternative water supplies
 - Benchmarking and decision support
 - Community engagement
 - Design and implementation
 - Development in areas of high groundwater
 - Economics (valuation techniques – costs and benefits)

- Flood resilience
 - Governance and policy
 - Green infrastructure
 - Groundwater
 - Infill development
 - Landscape design and public open space
 - Leadership and influence
 - Liveability
 - Microclimate & urban heat
 - Monitoring and evaluation
 - Operation and maintenance
 - Regulation and legislation
 - Resilience
 - Stormwater
 - Sustainability
 - Training and capacity building
 - Urban planning (statutory, strategic, land use)
 - Urban waterways
 - Wastewater
 - Water conservation and efficiency
 - Water literacy and behaviour change
 - Other – please specify and/or add context for your responses above
5. Which of the following **skills and knowledge needs** are most required by **your agency** to improve delivery of water sensitive cities outcomes? (Choose top 3)
- Benchmarking and decision making for water sensitive cities outcomes
 - Community and stakeholder engagement.
 - Designing for water sensitive cities outcomes
 - Economics of water sensitive cities
 - Integrated water management
 - Land use planning (including GIS, modelling, etc.)
 - Leadership and change management
 - Management and maintenance of WSUD assets
 - Policy and regulations regarding water sensitive cities
 - Project management (proposals, planning, management, evaluation)
 - Risk analysis (strategic risks and water related risks)
 - Strategic planning for water sensitive cities
 - Other – please specify and/or add context for your responses above
6. In what format would you most prefer knowledge transfer and capacity building? (top 3)
- Research presentations
 - E-learning courses
 - Training/ workshop sessions
 - Case studies and fact sheets (for download)
 - Detailed guidelines and specifications
 - Bus trips/ demonstration tours
 - Industry accredited short-courses
 - Agency-focussed workshops
 - Networking events
 - Mentor / individual instruction
 - Discipline specific

- Other (please specify) and/or add context for your responses above
7. What type of activity are you undertaking as an agency in the next financial year? (tick all that apply)
- Strategic community plan
 - Local planning strategy/scheme
 - Agency policy which may address urban water, urban form, public open space or streetscape
 - Public open space strategy
 - Urban forest strategy
 - Activity centre structure plan
 - Design guidelines
 - Operational guidelines for construction or maintenance of public assets
 - Community engagement plan/strategy
 - Demonstration/pilot projects
 - Other – please specify and/or add context for your responses above
8. Would you be willing to work with the CRCWSC/NWW to integrate water sensitive cities principles and learnings into this activity? (yes/no/maybe)
9. What is your role in water management?
- Regulatory
 - Planner
 - Engineer
 - Asset management
 - Environmental officer/practitioner
 - Open space management
 - Landscape design
 - Other (please specify)
10. What sector do you represent?
- State Government
 - Local Government
 - Developer
 - Consultant
 - Academic/research
 - Other (please specify)
11. Would you be willing to participate in a workshop to further develop priority capacity activities? (yes/no/maybe)
12. Please add any further general comments below
13. Please provide relevant contact details if you would like NWW to follow up on your comments

Name

Agency

Phone number

Email address

Attachment 2: Targeted phone call results

Department of Water

- Perth Peel Regional Water Supply Strategy
- Framework for water recycling
- Review of implementation of Better Urban Water Management

Housing Authority

- Delivering innovative water projects in Bentley and Brabham
- Committed to best practice urban water management in other strategic areas such as Pinjar South and Ellenbrook
- “Year of Water”- although not completely sure of the activities that will be undertake to support this denomination
- Could improve delivery of WSC outcomes in general housing delivery

DPaW

- TBA

EMRC

- EMRC is an active member of CRC and is keen to get all 6 regional councils involved with WSC
- In-house workshops, tours and discussions are very important to share information and discuss achievements and opportunities.
- EMRC preparing a Regional Environment Strategy which may provide a good opportunity for incorporation of WSC messages
- Also looking at opportunities for improvements to drainage networks to deliver multiple outcomes.

LandCorp

- Water management policy currently under internal review
- Other activities indicated in the survey: Public open space strategy; Urban forest strategy; Activity centre structure plan; Design guidelines; Community engagement plan/strategy; and Demonstration/pilot projects.
- Opportunities for WSC principles to be further incorporated into LandCorp developments – possibly greater engagement with project directors and project managers.

City of Armadale

- Commenced program of monitoring of WSUD assets due for completion this year
- Review and update WSUD policy
- Continue implementation of WSUD position paper

City of Canning

- Drainage retrofit with Water Corporation
- Creation of urban stream in Canning City Centre
- Bentley Regeneration Project (with Housing Authority)

City of Melville

- Still developing in-house knowledge of WSUD and opportunities for the City including working across departments
- Released a policy on street trees (Urban Forest and Green Space Policy) and developing recommendations for medium/high density that require green infrastructure.
- Have just released a Stormwater Strategy

City of Joondalup

- Joondalup have a strong strategic focus – emphasis on delivering a leafy city. Work well across the agency.
- Could make better use of CRCWSC training and findings
- Focus on Yellagonga and other Catchment management projects
- Also program of infrastructure development, upgrade and retrofit

City of Nedlands

- Preparing a local planning strategy and new scheme
- Working with WESROC on managed aquifer recharge project
- Commenced a program of strategic assessment and retrofit of the City's parks to deliver multiple outcomes including improved water efficiency and stormwater management

City of Gosnells

- Limited strategic focus or vision largely due to stressed resources
- Lack of cross agency coordination with engagement often occurring late in the process
- Some perceived issues with raingardens and maintenance of WSUD assets

City of Subiaco

- Very supportive of WSUD but resources are very stretched with a much reduced environmental team. Changes in staff have seen support from engineering but could increase opportunities for working with planning
- Participated in the WSC Index workshops which was beneficial for the City and really engaged some managers
- Working with WESROC on groundwater project – opportunity to deliver a workshop which enhances how this partnership can work together
- Also opportunity to increase awareness and education of Councillors around WSC issues to facilitate better decisions.

CRCWSC Western Region EVENT SCHEDULE 2016-2017

	Event	Topic	Organisation(s) in Charge
Thurs 17th November	Regional Advisory Panel	WA Capacity Building 2017/2018 & beyond	CRCWSC WR
Sat 19th November	Waterwise Irrigation Workshops	Workshop to learn how to efficiently water your garden	Water Corporation
Wed 23rd November	Perth Water - Catch it if you can	techniques and technologies that can help you to maximise the potential of your local catchment	AWA
Thurs 24th November	Board Meeting	Final Approval IRP2 program	CRCWSC
24-25 November	QWater in NSW	Cities and Regions learning from each other	AWA
Friday 25th November	B2.4 Findings Workshop	Hydrology and Nutrient Transport Processes in Groundwater/Surface Water Systems WA Transition & Implementation Plan	Carolyn Oldham NWW
Sat 26th November	Waterwise Irrigation Workshops	Workshop to learn how to efficiently water your garden	Water Corporation
Tuesday 29th Nov	IRP1 Workshop 1	WA Transition & Implementation Plan	Bryony Rogers Transition Network
Tuesday 29th Nov	B4.2 Stakeholder Engagement	Introducing framework for urban wetland management	Amar Nanda Neil Burbridge
Friday 2nd December	A1.2 Lunch time Seminar	Valuing the economic, social and ecological costs and benefits of WSUD	NWW David Pannell
16 Dec– 31 Jan 2017	WA School Holidays	T4 WA School Holidays	
2017	2017	2017	2017
Wed 18th January	Regional Advisory Panel	Trustee Building 8am – 9am	CRCWSC WR
Wed 18th January	IRP3 & 4 Workshop	DoW 9:30am – 12:30pm	CRCWSC WR
Friday 20th January	WSC Index Review	TAP	CRCWSC
Thurs 2nd February	2017 WA Wetland Management Conference	Discuss latest developments about how to effectively manage and restore wetlands.	City of Cockburn DPAW
Thurs 2nd February	Annual Meeting	Annual Board/Executive/EPRG/Advisory Committee Meeting - Melbourne	CRCWSC
Mon 6th February	Water 360 Workshop		CRCWSC
Tue 7 & W 8 February	IRP3 & IRP4 Workshops	Proposal Development - Melbourne	CRCWSC
Wed 15th February	Exec & Leadership Meeting		CRCWSC
Tue 21 & 22 February	IRP1 Workshop 2	IRP1 Perth Workshop 2	CRCWSC Water Corp
Tues 21st Feb 2017	NWW introductory training session	Better Urban Water Management	NWW
Mon 27th February	Board Meeting	TAP program introduced	CRCWSC

	Event	Topic	Organisation(s) in Charge
FEB/MAR ???	CRC demo project bus tour	Proposed event	NWW
Wednesday 15 th March	Regional Advisory Panel		CRCWSC WR
??? March tbd	IRP5 Workshop	Proposal Development – Perth	CRCWSC
8 - 23 April 2017 14 April	WA School Holidays Good Friday	T1 WA School Holidays	
14 th April 17	WSC Index Review	TAP	CRCWSC
2-3 May 17	IRP1 Workshop 3	TBA Proposed Event – Water Corp –	CRCWSC Water Corp
21 st Apr 17 Tentative	Community Involvement Day	AWA/SWA/NWW/CRCWSC	NWW
Mid May 17	AWA's Ozwater		AWA
Wednesday 17 th May	Regional Advisory Panel		CRCWSC WR
Tuesday 23 rd May	NWW introductory training session	Groundwater management for urban development	NWW
Monday 22 th May	Board Meeting		CRCWSC
Tuesday 20 th June 2017	NWW introductory training session	Local Water Management Strategies - how to get it right	NWW
1 – 16 July 2017	WA School Holidays	T2 WA School Holidays	
18 & 19 July	3 rd Water Sensitive Conference	Perth, Western Australia	CRCWSC Nat
10-13 July Tentative	B2.4 Wrap up	Wrap up	CRCWSC
Wednesday 19 th July	Regional Advisory Panel		CRCWSC WR
Tuesday 25 th July	NWW introductory training session	Biofilters	NWW
Tuesday 15 th August	NWW introductory training session	Retrofitting for WSUD	NWW
Tuesday 19 th Sept	NWW introductory training session	Maintenance	NWW
23 Sep – 8 Oct 2017	WA School Holidays	T3 WA School Holidays	
15 Dec – 28 Jan 2018	WA School Holidays	T4 WA School Holidays	
February 2018	10th International Water Sensitive Urban Design	(WSUD) Conference, Perth	Engineers Au, AWA Stormwater WA
CRC Board, Executive Or Committee Meeting	CRC Project Event	CRC Special Event	
CRC Project Team Meeting	CRC Synthesis Event	National External Event	
Regional Advisory Panel Meeting	Capacity Building -Public	WA External Event	
	Capacity Building - Invite	WA School Holidays	