ADAPTIVE PLANNING FOR RESILIENT URBAN WATER SYSTEMS UNDER AN UNCERTAIN FUTURE

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ABSTRACT

Water planners are familiar with some form of variability in climate and demand. However, the uncertainty associated with the frequency and magnitude of the variations, coupled with broader performance expectations, means that long term deterministic planning needs to give way to a new approach. The structured adaptive planning process proposed in this paper aims to meet those objectives and accommodate the uncertainty in the future by developing a portfolio of measures that are both flexible to gradual changes in trends and robust to sudden shocks. A step-by-step process of the planning framework is presented. This is followed by a case study of the inputs and results based on its implementation by the Melbourne water businesses.

INTRODUCTION

Historically, water planners in Australia have had a good appreciation of the variability in rainfall, which is one reason why Australia has one of the highest per capita water storage volumes in the world (World Bank 2005). In addition, the challenge of ensuring water security under growing demands has become increasingly significant. The recent droughts experienced in Australia have highlighted this variability of the climate and the water sector's vulnerability to climate change impacts.

In the past, reserve supplies and water restrictions were the default strategy, however more recently water service providers are seeking 'diversified portfolios' and 'flexible strategies' as a means toward providing improved security and resilience at reduced costs. The emergence of this new way of thinking represents a challenge to existing conceptual and analytical models underlying resource planning decisions. It requires a shift from deterministic approaches to an approach that builds in flexibility based on the information at hand and one that delivers much needed information on phasing and sequencing under different circumstances.

Such an approach should identify and deliver flexible and robust outcomes to plan and manage, future uncertainties which may include climate change, population growth, economic activity and unexpected shocks. Further, the multiple values of water, such as the way in which water contributes to a sustainable, liveable, prosperous and healthy city as well as values attached to individual supply options, should ideally be incorporated into the decision making approach.

A number of advanced methods from finance and decision theory have been suggested in the literature, but these methods are often too complex for practical implementation. An alternative approach is required that translates and situates these methods in the context of water resource planning.

As such, an adaptive planning approach was designed for the development of the next fifty year strategic plan for the Melbourne based water utilities (Mukheibir & Mitchell 2011). It provides a guide for the strategic planning process, and supports operational decisions, in order that the portfolio of investments deliver a resilient water system over the long term.

The paper firstly provides an introduction to the new terms and concepts introduced by the framework, and then discusses methodological steps required to undertake the options assessment process. A case study of the process undertaken and outcomes achieved by the Melbourne water businesses is used to illustrate this process.

INNOVATIONS INTRODUCED BY THIS FRAMEWORK

This options assessment framework uses a variety of terms and concepts that are relatively new to the water sector. Although these terms are being used more and more frequently, they are at this stage likely to mean different things to different people and within different organisations. The key terms and concepts that make up this framework have specific meanings and are defined in the footers.

This kind of assessment framework is new, and is pushing the frontiers of best practice. Whilst there are various theoretical methods for decision-making under uncertainty, some of which have been applied in other sectors (e.g., finance), they generally have not been applied to the water sector and have not been brought together in an integrated, practically-grounded process to guide strategic planning and project level decisions. As

such, this framework is a significant conceptual step forward that will mature over time.

In broad terms, this framework comprises three significant innovations in thinking and planning:

1. The first innovation is to characterise the *uncertainties*[1] as trends or shocks in order to distinguish and better respond to the impacts of these uncertainties. That is, uncertainty should be characterised in order to respond effectively to it. In this framework, the term *influence*[2] is used to mean the changing pressures and drivers that impact on the *context*[3] in which water businesses operate, and therefore on the performance of supply and demand options. The way that influences occur is significant, because it determines the nature and scale of the impact on system performance. These *influences* can manifest in one of three ways: as trends that change over the longer term(such as reduced run-off or demand growth), as shocks that lead to new norms(such as unexpected step changes in the trends), or as extreme variability in the short term. The latter is not of interest here because it is addressed through other planning and management mechanisms (such as the drought response processes). Separating and characterising how the *influences* occur is important because different supply and demand *measures*[4] will respond differently to trends and shocks. Adaptive management through flexible responses deals well with changing trends. Together with flexible responses, robust responses deal well with shocks. Therefore, responses that are both flexible and robust deliver resilience.
2. The second innovation is the idea of *scenario paths*. A scenario path brings together a specific combination of trends (or drivers), and considers the impact of that combination on the supply-demand balance i.e. whether or not a shortfall exists. The scenario path approach draws on the richness of traditional scenario analysis methods and integrates it into water planning. The water sector has to contend with multiple trends in various combinations. Increasing the number and combinations of potential trends has an exponential effect on the number of scenarios and analyses required, which generally leads to numerical optimisation, such as probabilistic approaches. The quality of the outcomes of these approaches is determined by the quality of the inputs and calibre of the models. These methods are not well established in practice, so both of these are questionable for the water sector at this time. 'Scenario paths' is a reasonable and practical way forward at this stage.
3. The third innovation is the framework's focus on *investment strategies*[5]. Investment strategies set the hierarchy for the sequencing of types of measures. Investment strategies should be drawn from current policies. In order to set the sequence in which the types of measures are chosen, an investment strategy nominates thresholds and triggers for new measures; predecessors and constraints where necessary; and lead times before the benefit of a measure can be realized.

Therefore the framework provides a structured process for planners when thinking through the impact that uncertainty in influences has on both the context and measures, and therefore on the strategy's capacity to meet the defined objectives whilst avoiding a shortfall (termed in this framework as an *objective shortfall*[6]). The aim is for the strategy to provide resilience[7], through the investment strategies that combine flexibility[8] and robustness[9] in the *portfolio of measures*[10] they recommend.

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[1] *Uncertainty* is the possible range within which an influence will manifest itself. An envelope of this range should be considered when analysing the impact of the influence on the proposed portfolio of measures.

[2] *Influences* are the pressures and drivers that have an impact on the context and the likely outcome of a measure.

[3] *Context* refers to the system and global environment within which the analysis is undertaken.

[4] *Measures* refers to the options identified in response to influences in the context.

[5] *Investment Strategy* is a set of policy rules and instructions as to the sequence in which the types of measures are chosen, the thresholds and triggers for new measures, predecessors for some measures and the constraints of the system.

[6] *Objective shortfall* refers to deficiencies in the portfolio of measures to meet the requirements of the objectives e.g. volumetric shortfall in supply requirements or shortfall in meeting minimum GHG

[7] *Resilience* is a characteristic of a portfolio of measures that displays both flexibility and robustness

[8] *Flexibility* is a characteristic of a portfolio of measures that can be altered to suit changing trend conditions at minimal additional community cost, e.g. avoiding large centralized supply systems with long lead times.

[9] *Robustness* is a characteristic of a portfolio of diverse measures that are not all dependent on the same influences and hence the impact of the variability in the influences is mitigated i.e. to not have all one's eggs in one basket, e.g. conjunctive supply sources.

METHODOLOGY FOR THE ASSESSMENT FRAMEWORK

Based on the purpose and innovative thinking described above, the framework presented here consists of seven distinct steps:

Step A: Objectives

This framework begins by setting objectives, boundaries, and key performance criteria, consistent with both statutory obligations and industry and stakeholder visions. In this paper and the associated case study, the assumption is that the objectives are focused on balancing supply and demand. However, the assessment framework is a generic process that could equally be applied to other objectives within the water sector, such as managing nitrogen or greenhouse gas emissions.

Step B: Trend Influences

In order to plan and manage a resilient water system it is necessary to identify what factors may change in the future. In this paper these factors are referred to as influences. Influences include factors which impact on the context in which a water business operates (for example changes in population) and also factors which impact on specific measures (for example a shift in energy price).

Specifically this step is concerned with identifying, characterizing, assessing and prioritising influences. The method is only interested in influences that have a material impact on ensuring water security – that is, those that have high levels of uncertainty and high significance for whether or not the objectives are achieved. Influences can manifest as trends or shocks (step changes) where the impact is experienced in the long term (as shown in Table 1), or extreme variability that impacts are experienced in the short term. Longer term trends and shocks shift operations into a different realm – a new norm or a different baseline – so they are the focus of this framework. For example the impact that bush fires has on a catchment are sudden in terms of water quality, but the run-off effect will be felt for years thereafter.

Extreme variability, on the other hand, impacts in the short term, after which things return to existing operational norms, such as energy pricing spikes or a short term increase in demand due to a heat wave. Extreme variability is dealt with through short term planning processes, which are separate from this framework.

Characterising these longer term *influences* as either trends or shocks provides two key benefits. Firstly, the different impacts of the *influences* can be distinguished, and therefore more clearly assessed. For example, a *measure* may be able to cope with gradual change, but may not be able to respond quickly enough to a shock. Secondly, more appropriate response *measures* can be identified to manage the different impacts (see Table 1). Together, flexibility and robustness deliver resilient adaptive capacity to future uncertainties.

Table 1: Changes in the planning assumptions

Types	Description	Responses
Trends	Gradual changes (but we don't know the rate or direction) Eg. run-off, water demand	Flexibility in decision making by maintaining the opportunity to consider a range of options (taking into consideration lead times)
Shocks	Step changes (we don't know the scale or timing) Eg. Bush fires, energy pricing	Flexibility and Robustness. Ensuring resilience through enough buffering capacity.

Trends and shocks need to be separated for the analysis, and there are various ways to do that. In this framework, trends are analysed first, responses are developed to ameliorate the impacts of those trends, then those responses are tested against shocks and the responses modified accordingly. There are more complex ways of analysing trends and shocks in combination, potentially involving probabilities. However, those more complex approaches are 'black-box' in nature and often require data that is not readily available. The approach advocated here is preferable because it provides transparency in the analysis, which is key for helping decision-makers and stakeholders to follow and understand the logic of the process.

Step C: Scenario Paths

Scenario paths are created by combining the significant trend influences to describe a future state. Each of these scenario paths is equally possible because probabilities have not been assigned to them. This approach of using scenario paths is intended to address the shortcomings of scenario approaches (limited to just two sets of trends at a time) and probabilistic approaches (i.e. portfolio analyses, which are limited by the quality of available models and inputs).

The current system's capacity to respond to the compound effects of these trends is then assessed. This step identifies gaps between the objectives and what is achievable under different

[10] *Portfolio of measures* are a group of measures that satisfies an investment strategy

combinations of significant trend influences. Where the objectives relate to supply demand balances, this gap is the potential shortfalls in water supply.

Step D: Measures

In this step, individual measures or options are identified that respond to the objectives and help meet the shortfall in the existing system under the future scenario paths. These measures are first assessed against the objectives using economic, social, and environmental performance assessment methods. The measures are then assessed for their vulnerability to impacts from the significant trend influences.

This step also involves describing the interaction and relationship between each influence and each proposed measure for incorporation in the suite of analytical models. The relationships can be described in terms of objectives such as yield, GHG targets etc.

Step E: Investment Strategies

Within this framework, investment strategies provide the logic for packaging up sets of measures into portfolios, to respond to the shortfalls identified under various scenario paths above. Investment strategies set the hierarchy for the sequencing of types of measures, and therefore should be drawn from current policies. Examples may include prioritising the next preferred centralized large scale potable supply measure with the least community cost, or proactively prioritising decentralised non-potable supply options as the city grows before considering the large scale potable options.

Step F: Portfolios of Measures

Portfolios of measures are packaged up according to particular investment strategies, to meet the identified shortfalls in the objective. The performance of these portfolios is then assessed against the objective of least community cost in the broadest sense i.e. the aim here is to identify the economically, socially, and environmentally preferred portfolios.

Step G: Shock Influences

Shock influences identified and assessed earlier in the process are now finally brought into consideration, in the form of a sensitivity analysis. The performance of the top few investment strategies (preferred portfolios) is assessed against significant shock influences, following a process similar to that for the trend influences: shortfalls are again calculated, and portfolios are modified where necessary, and re-assessed against the broad performance criteria.

Outcome

The outcome of this series of steps is a resilient strategy that has addressed uncertainties in both trend and shock *influences*, and identified *portfolios of measures* that can meet the shortfall whilst performing sufficiently well against the key performance criteria.

CASE STUDY: MELBOURNE METROPOLITAN WATER BUSINESSES (WSDS 2012)

The strategic intent of Melbourne's water sector is: "Sustainable water services that enable a healthy, liveable and prosperous Melbourne". This has been developed based on extensive engagement with the community.

To achieve this, the Melbourne Metropolitan water industry faces a number of key changes and challenges to the way water is sourced and used. These include:

- valuing and using water in a way that fully supports the continued development of Melbourne's liveability and productivity objectives,
- a growing population,
- the changing urban form needed to accommodate more and more people,
- increased climate risk and variability, including rainfall patterns and bushfires,
- energy price rises, growing community concern about the rising costs of water.

The challenge presented by these issues for urban water planning is the uncertainty in the shifts in the magnitude (nature and scale) of the associated variations. The framework presented in this paper was followed by the Melbourne utilities in their preparation of the long term supply and demand strategy and their experience is described further.

Every five years the Melbourne Metropolitan water businesses undertake strategic planning for long term supply and demand management. The aim of this process is to balance the supply of water to meet Melbourne's consumptive, environmental, industrial and agricultural water needs. The strategy examines long term future supply augmentations for the city.

Setting the objectives:

Drawing on the strategic intent, the following measurable objectives were set:

- Potable water demand met
- Open space demand met
- Nitrogen discharge reduced
- Stormwater in priority areas intercepted

Identifying the influences:

Based on the government guidelines (DSE 2011) and supporting literature (CSIRO 2011, DPCD 2008), the influences in Table 2 were selected for consideration. Specific detail on each influence can be found in Table 4.

Shock influences can be induced to any of the above trend influences.

Table 2: Key trend influences

Influence	Key driver for:
Climate change	supply
Catchment bushfires	supply
Population growth	demand
Water consumption patterns	demand
Energy prices	cost

Developing scenario paths:

Based on the trend influences, a set of four scenario paths were developed and described in Table 3.

Table 3: Scenario paths

Scenario path	Description
Very unfavourable	Step change to 1997-2009 dry climate Very high demand
Pessimistic	Projected dry climate High demand
Neutral	Medium climate Medium demand
Optimistic	Very little drying climate Low demand

The results of the scenario paths produced an envelope of supply and demand curves, illustrated in Figure 2.

Identifying measures:

A wide range of measures were identified that covered large scale supply options, demand-side management options, large scale non-potable supply options, and local and small scale non-potable supply options. Their performance was assessed the supply-demand imbalance, water industry and society costs, social and environmental costs.

Applying investment strategies:

For simplicity, two investment strategies were applied to the four trend scenario paths, viz.:

- A reactive strategy which drew on the large scale potable supply options as a first choice;
- A proactive strategy that first considers the small scale non-potable options before introducing the large scale potable supply options.

The investment strategies were further tested for sensitivity to a number of shocks. These included energy price increases of 300%, sudden increases in demand and sudden drops in supply.

Key outcomes:

The analysis indicated that proactive strategy was better able to cope with more extreme circumstances and was better able to absorb future shocks and respond to changing objectives. This resilience however, comes at the price of potential over-investment under the more mild scenarios.

Significantly, the cost variability for the proactive strategy was considerably less than those for the reactive strategy. This is because under the proactive strategy, options are not triggered by a supply/demand imbalance but rather by urban growth and planning. This means that they are still implemented under the optimistic and neutral scenario in spite of a relatively small shortfall.

The proactive strategy performed better on an environmental basis as well. Alternative sources and water efficiency provide positive environmental impacts. It deferred potable augmentation and therefore defers the adverse environmental impacts of these options.

Finally, the proactive strategy allows for the unlocking of co-investment such as investment between sewerage and supply customers; drainage and stormwater customers; and waterways and stormwater customers.

CONCLUSION

The shift in focus from long term deterministic planning to a more flexible adaptive planning and management approach, means that large scale centralised supply infrastructure will in future compete with small scale and decentralised options in order to address the uncertainty in the future while still maintaining water security. By undertaking the planning process as described in this paper, uncertainty in future influences and impacts can be accommodated by developing a portfolio of measures through the application of a proactive investment strategy that delivers resilience and flexibility.

By periodically reviewing the response of the investment strategy to the influences based on new information, the portfolio of measures can be modified and if necessary strengthened through the options assessment process outlined in the paper.

ACKNOWLEDGMENT

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Table 4: Details of the trend influences

Trend	*Trajectory*
Climate change	*Wet (very little drying) climate scenario (CSIRO 2011)* *Medium climate scenario(CSIRO 2011)* *Dry climate scenario(CSIRO 2011)* *Return to the 1997-2009 dry conditions(DSE 2011)*
Bushfires	*Long term streamflow trends associated with natural forest aging following the 2009 bushfires.* *Gradual decline in average annual yield accruing 5-25 years after the bushfire* *Future change in the frequency, severity and extent of bushfires*
Population growth	*Victoria in Future (DPCD 2008)* *ABS population growth projections* *Household size forecasting*
Water consumption	*Changes in water use behaviour* *Adoption of water efficient appliances* *Housing characteristics* *Changes in climatic conditions including temperature and rainfall*
Energy pricing	*Based on the long term trends from the WSAA Forecasting project (SKM 2011)*

Figure 1. The assessment framework (Mukheibir & Mitchell 2011)

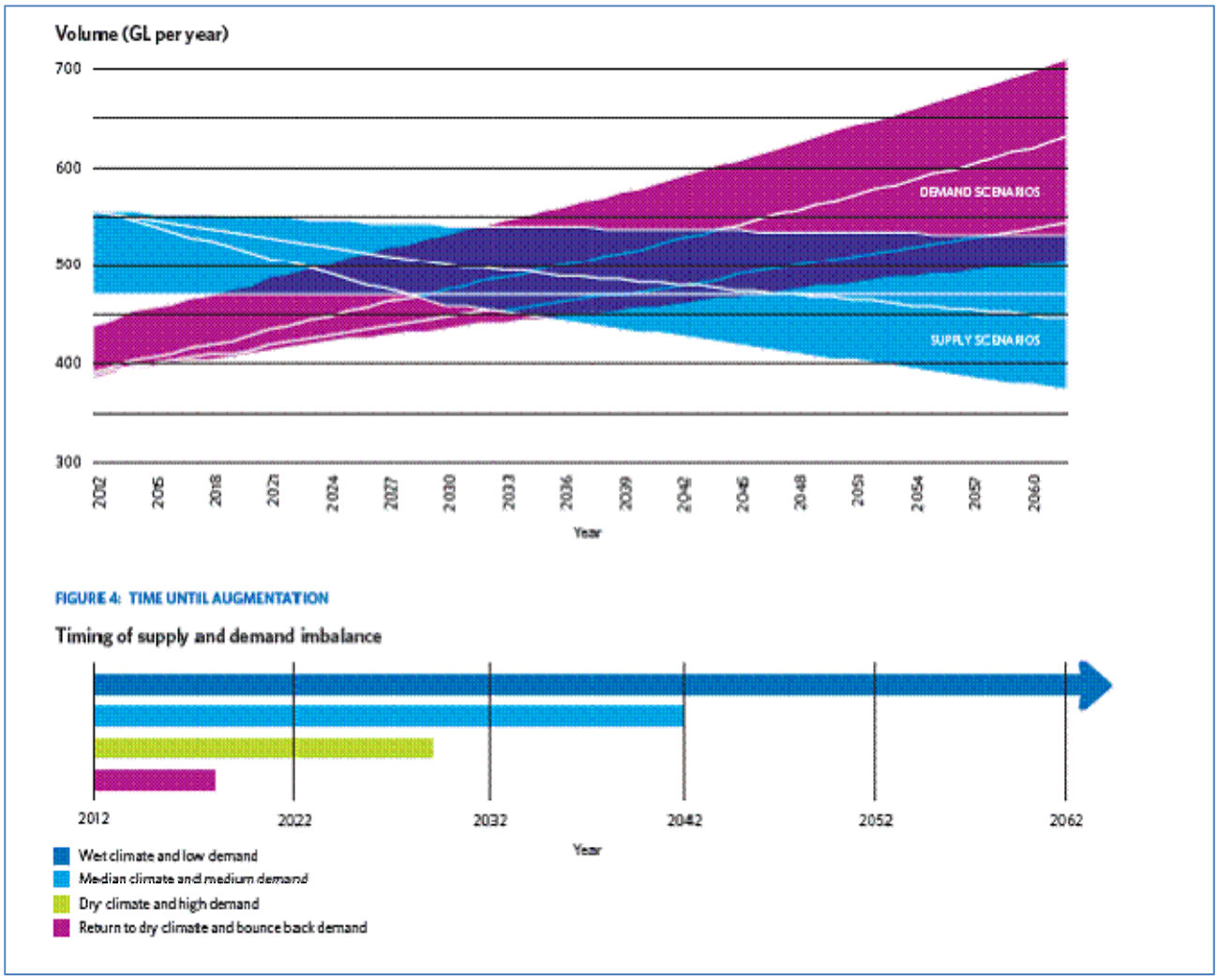

Figure 2. Envelope for supply and demand (in GL) under various scenario paths (WSDS 2012)

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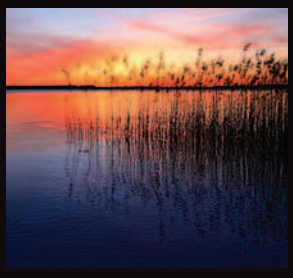

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Abstracts for papers may only be submitted through the official Ozwater'12 website (www.ozwater.org) from Monday June 6, 2011. Emailed or faxed abstracts will not be considered.

All abstracts must be submitted in English and clearly state the objectives and desired outcomes of the proposed presentation.

Please note the following abstract submission guidelines:

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    - 10 point Arial font
    - 1 ½ line spacing
    - Up to 3 additional A4 pages of supporting tables and graphics may be included
    - Include the title, authors and affiliations as per the template
    - Do not include references, footnotes or keywords
- Abstracts should contain brief introduction (purpose), methodology, results and conclusion together with a discussion
- The title should be clear and concise
- Please select your preferred presentation type (platform, poster or either)
- You must select from the list the conference theme in which your abstract fits
- You may submit more than one abstract, however only one may be accepted for platform presentation
- Abstracts may be amended or withdrawn before September 1, 2011
- By submitting an abstract it will be assumed that all authors have consented to its submission and that all copyright provisions listed elsewhere have been met *
- Abstracts will appear in print as submitted

* The paper accepted into the Ozwater'12 program must not have been presented or published previously.

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- A full paper must be submitted for review in January 2012.

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WEDNESDAY MAY 9, 2012
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THURSDAY MAY 10, 2012
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- Conference and Exhibition close

FRIDAY MAY 11, 2012
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IMPORTANT DATES

Thursday 1 September 2011
Abstract submission deadline

September 2011
Abstract review

October 2011
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Friday 12 January 2012
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January/ February 2012
Full paper peer-review

Friday 9 March 2012
Presenter conference registration due

Friday 30 Mar 2012
Revised full papers due (if required)
Poster presentations due

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0800 - 0900	Opening Ceremony								
0900 - 0930	**Kevin Young, Managing Director, Sydney Water, AUSTRALIA** LOOKING BACK, THINKING FORWARD. **Abstract No. KEY01**								
0930 - 1000	**Hugh Mackay, Social Researcher, AUSTRALIA** ADVANCE AUSTRALIA...WHERE? THE FACTORS RESHAPING AUSTRALIA AND THEIR IMPLICATIONS FOR WATER MANAGEMENT. **Abstract No. KEY02**								
1000 - 1045	**Morning Tea**								
	Room 204A	**Room 204B**	**Room 203**	**Room 102**	**Room 103**	**Room 104**	**Room 105**	**Room 201**	**Room 202**
1045 - 1215	**Floods and Flooding** **Chair:** Lee Foster, Seqwater, QLD **Assistant Chair:** Sally Rewell, Sydney water, NSW **Session Code: 01**	**Strategic Approach to Water** **Chair:** Peter Burgess, PBWATER Pty Ltd, ACT **Assistant Chair:** Ruben Muller, Sydney Water, NSW **Session Code: 02**	**Balancing Science, Technology and Social Issues** **Chair:** Michele Akeroyd, Goyder Institute for Water Research, SA **Assistant Chair:** Nathalie Horsfield, AECOM, WA **Session Code: 03**	**Operation and Management - Wastewater** **Chair:** Iain Fairbairn, Sydney Water, NSW **Assistant Chair:** Jaques Ostrowski, Sydney Water, NSW **Session Code: 04**	**Wastewater Treatment - Membranes** **Chair:** Justin Watts, Monadelphous, QLD **Assistant Chair:** Zenah Bradford-Hartke, University of New South Wales, NSW **Session Code: 05**	**Water Treatment** **Chair:** Stuart Khan, University of New South Wales, NSW **Assistant Chair:** Anna Yeung, University of New South Wales, NSW **Session Code: 06**	**Undergraduate Water Prize Presentations and Judging** **Chair:** Richard Stuetz, University of New South Wales, NSW **Assistant Chair:** Will Lawler, University of NSW **Session Code: 07**	**Sydney Water presents:** Future Sydney – Meeting the challenge of urban growth in the Sydney Metropolitan area **Facilitator:** Adrian Miller | Manager Growth Strategy, Urban Growth, Sydney Water, NSW **Session Code: WS01**	
1050 - 1115	**Peter Donaghy, AECOM, QLD** MANAGEMENT OF RESIDUALS PRODUCTION DURING EXCESIVE WET WEATHER EVENTS AT WATER TREATMENT PLANTS **Abstract No. 001**	**Paul Mulley, Sydney Water, NSW and Damien Connell, City West Water, VIC** PARTNERING TO BENCHMARK BUSINESS WATER EFFICIENCY AT A NATIONAL LEVEL **Abstract No. 004**	**Josh Tickell, NSW Public Works, NSW** BRACKISH GROUNDWATER DESALINATION: A VIABLE COMMUNITY WATER SUPPLY OPTION? **Abstract No. 007**	**Scott McPhee, Water Corporation, WA** CRITICAL CONTROL POINT MONITORING AND REPORTING FOR WASTEWATER SYSTEMS **Abstract No. 010**	**Geoffrey Frost, Parsons Brinckerhoff Australia, VIC** TREATMENT OF HIGH DOC/TDS INDUSTRIAL WASTEWATER BY NANOFILTRATION AND REVERSE OSMOSIS **Abstract No. 013**	**Craig Jakubowski, Hunter Water Australia, NSW** TREATED WATER STABILISATION FOR PH CONTROL IN TWEED SHIRE **Abstract No. 016**	**019 - UWP01** 1050 - 1105 **Mathew Dimoski, University of Wollongong, NSW** CONTAMINATED GROUND WATER: MEASURES TO ELIMINATE EXPOSURE PATHWAYS IN A RESIDENTIAL/ COMMERCIAL DEVELOPMENT **019 - UWP02** 1107 - 1122 **Joshua Putnam, University of New South Wales, NSW** OPTIMISING FLOC STRUCTURE AND STRENGTH IN COAGULATION FLOCCULATION OF ALGAL CELLS **019 - UWP03** 1124 - 1139 **Ronnie Ling, University of Adelaide, SA** OPTIMUM USE OF SUBSIDIES FOR REDUCING DOMESTIC WATER CONSUMPTION **019 - UWP04** 1141 - 1156 **Ana Martins, RMIT University, VIC** DEVELOPMENT OF A PORTABLE FLOW INJECTION ANALYSIS SYSTEM FOR THE DETECTION OF HERBICIDES USING CHEMILUMINESCENCE **019 - UWP05** 1158 - 1213 **Raphael Flavigny, Murdoch University, WA** AMMONIA RECOVERY FROM WASTEWATER USING A MICROBIAL ELECTROLYSIS CELL	The workshop objective is to provide a forum for discussion and development of practical initiatives for Water Utilities to partner with the Development Industry to deliver Urban Growth that meets the vision of Future cities. The Sydney Metropolitan Strategy aims to enhance liveability, strengthen economic competitiveness, ensure fairness, protect the environment, and improve governance. The strategy forecasts 769,000 new dwellings by 2036. Approximately 70% of the new dwellings are to be located in the existing urban footprint and 30% in new release area. The investment in water infrastructure to service that growth over the next 5 years is $1 billion. 90% of that investment is required to service development in the new release areas. Developers are constrained in the rate at which they can bring lots to market due to the limitation of available infrastructure.	
1120 - 1145	**Richard Marks, KBR, SA** AUSTIN TEXAS WALLER CREEK TUNNEL: FLOOD CONTROL TAX INCREMENT FINANCING AND ENTRAINED AIR BLOW BACK RISK MANAGEMENT **Abstract No. 002**	**Mark Sullivan, ACTEW Corporation, ACT** IN THE MIDDLE OF THE BASIN AND POLITICS: A CAPITAL STORY **Abstract No. 005**	**Andrew Bath, Water Corporation, WA** OUTCOMES FROM WA PARLIAMENTARY INQUIRY - RELEVANCE TO SOURCE PROTECTION, RECREATION AND SUSTAINABILITY **Abstract No. 008**	**Ramon Ganigue, Advanced Water Management Centre - University of Queensland, QLD** ON-LINE CONTROL OF MAGNESIUM HYDROXIDE DOSING FOR SULFIDE MITIGATION IN SEWERS **Abstract No. 011**	**Amarnath Reddy, SeqWater, QLD** POST-CONSTRUCTION AUTOMATION OF MF/ RO SYSTEMS WITHIN A LARGE ADVANCED WATER REUSE PLANT FOR INTERMITTENT OPERATION **Abstract No. 014**	**Emma Sawade, SA Water, AWQC, SA** DEVELOPMENT AND VALIDATION OF THE BIOLOGICAL FILTRATION POTENTIAL TEST FOR THE REMOVAL OF CYANOBACTERIAL METABOLITES **Abstract No. 017**			
1150 - 1215	**Simon Toze, CSIRO, QLD** PATHOGEN DECAY IN A RESERVOIR IMPACTED BY THE JANUARY FLOODS **Abstract No. 003**	**Dan Stevens, Opus International Consultants and Tracey Willmott, Dunedin City Council, NEW ZEALAND** DUNEDIN THREE WATERS - A TIME FOR CHANGE **Abstract No. 006**	**Jarrah Muller, Sinclair Knight Merz, SA** PROTECTING CONCURRENT USE OF THE DE GREY RIVER ALLUVIAL AQUIFER FOR MINING, ECOSYSTEMS AND WATER SUPPLY **Abstract No. 009**	**Ray Mizzi, Industrial Plant & Service Australia Pty Ltd, WA** NEW ODOUR CONTROL TECHNOLOGY DEALS WITH DIFFICULT ODOURS - A CASE STUDY FROM ONE OF EUROPE'S LARGEST WWTP **Abstract No. 012**	**Craig Heidenreich, Allwater, SA** FULL SCALE MS2 TESTING OF THE GLENELG RWTP UF MEMBRANE PROCESS **Abstract No. 015**	**Lionel Ho, SA Water Corporation, SA** FATE OF CYANOBACTERIAL METABOLITES IN LAKE BURRAGORANG **Abstract No. 018**			
1215 - 1315	**Lunch**								
1315 - 1515	**Policy, Regulation and Legislation** **Chair:** Kate Miles, AECOM, NSW **Assistant Chair:** Sally Rewell, Sydney water, NSW **Session Code: 08**	**Strategic Approach to Water** **Chair:** Paul Freeman, Sydney Water, NSW **Assistant Chair:** Ruben Muller, Sydney water, NSW **Session Code: 09**	**History and Heritage** **Chair:** Krey Price, Tetra Tech Australia, WA **Assistant Chair:** Nathalie Horsfield, AECOM, WA **Session Code: 10**	**Operation and Management - Water** **Chair:** Cheryl Marvell, Sydney Water, NSW **Assistant Chair**: Jaques Ostrowski, Sydney Water, NSW **Session Code: 11**	**Wastewater Treatment - Membranes** **Chair:** Andrew Kasmarik, Sydney Water, NSW **Assistant Chair:** Bradford-Hartke, University of New South Wales, NSW **Session Code: 12**	**Water Treatment** **Chair:** Tony Cartright, Sydney Water, NSW **Assistant Chair:** Anna Yeung, University of New South Wales, NSW **Session Code: 13**	**AWA Program Innovation Award Finalist Session** (1315 - 1415) **AWA Infrastructure Project Innovation Award Finalist Session** (1415 - 1515) **Chair:** Bruce Pollard, ALS Environmental, VIC **Assistant Chair:** Will Lawler, University of NSW **Session Code: 14**	**Sydney Water presents:** Water recycling – who really benefits? Who really pays? **Facilitator:** Darryl Lloyd, Manager, Recycled Water Development, Sydney Water Corporation, NSW" **Session Code: WS03**	**AWA WASH Specialist Network presents:** Water safety planning – the planning is in your hands! **Facilitator:** Asoka Jayaratne, Infrastructure Planning Division, Yarra Valley Water, VIC. **Assistant:** Nat Newman, Australian Water Association **Session Code: WS04**
1320 - 1345	**Chris Davis, National Water Commission, ACT** NATIONAL PERFORMANCE REPORTS: RURAL WATER SERVICE PROVIDERS AND URBAN WATER UTILITIES **Abstract No. 022**	**Ian White, Brisbane, QLD** WHAT DO URBAN WATER RESTRICTIONS REALLY COST? **Abstract No. 026**	**Ross Young, GHD, VIC** A BRIEF HISTORY OF WATER RIGHTS:DID ALFRED DEAKIN GET IT RIGHT IN 1886? **Abstract No. 030**	**Darren Bailey, Hunter Water Australia, NSW** LESSONS - FOURTEEN YEARS OF TREATMENT OPERATIONS IN THE HUNTER **Abstract No. 034**	**Trang Trinh, University of New South Wales, NSW** FATE OF ENDOCRINE DISRUPTING CHEMICALS DURING WASTEWATER TREATMENT BY A MEMBRANE BIOREACTOR **Abstract No. 038**	**Kamal Fernando, NSW Public Works, NSW** LESSONS LEARNT FROM LAKE CARGELLIGO WATER SUPPLY **Abstract No. 042**	This panel session includes presentations from: **Ellen Schwab, Actew Corporation, ACT** COTTER DAM EDUCATION PROGRAM **Ian Maggs, Water Directorate and Local Government and Shires Association, NSW** WATER LOSS MANAGEMENT PROGRAM FOR REGIONAL NSW WATER UTILITIES **Angela Ganley, City West Water, VIC** STEAM SYSTEM EFFICIENCY PROGRAM **John Brennan, Water Corporation/ Department of Water/ ICLEI, WA** WATERWISE COUNCIL PROGRAM --- This panel session includes presentations from: **Chris Webb, Bulk Water Alliance, ACT** GOOGONG DAM SPILLWAY REMEDIATION **Linda Gyzen, AquaNet Sydney (a Division of Jemena Group), NSW** ROSEHILL RECYCLED WATER SCHEME **Christian Truscott, Logan Water Alliance, QLD** LOGAN WATER ALLIANCE **Michael Durkay, Department for Water, SA** UPPER SOUTH EAST DRYLAND SALINITY AND FLOOD MANAGEMENT PROGRAM **Tim Grogan, Aqua Guardian Group, VIC** AQUAARMOUR™ DEPLOYMENT - EVAPORATION AND ALGAL CONTROL **Peter Spencer, Water Corporation, WA** CALCITE FOR pH AND ALKALINITY CORRECTION	Presenters: • **Darryl Lloyd, Recycled Water Development, Sydney Water, NSW** • **Andrea Turner, Research Director, Institute for Sustainable Futures, NSW** • **Phil Pickering, Director, Marsden Jacobs Associates, NSW** • **Rachel Watson, PhD Candidate, University of Technology, NSW** This workshop is for water practitioners interested in developing water recycling schemes but finding it difficult to establish a viable business case. Current industry and community understanding of the full range of costs, benefits and risks limits investment in recycling options. This workshop will consider the costs and benefits of water recycling and identify beneficiaries who could contribute funding. The workshop will draw extensively on two current Australian Water Recycling Centre of Excellence funded research projects examining the social, economic and environmental value of water recycling. It will also draw on another research project examining the costs and benefits of decentralised systems. Workshop attendees will be able to share their experiences in developing and assessing business cases for water recycling schemes.	**David Sutherland, Regional Coordinator, Asia Pacific Region, WHO, Bangkok, THAILAND** OVERVIEW OF WHO GLOBAL WSP INITIATIVE: WSP ACTIVITIES IN ASIA PACIFIC REGION **Mien Ling Chong, WSP Network Coordinator, WHO, Manila, Philippines** OVERVIEW OF WHO GLOBAL WSP INITIATIVE: ASIA PACIFIC REGION **Asoka Jayaratne, Water Quality Specialist, Yarra Valley Water, VIC** WSP CONCEPTS & TOOLS/ CASE STUDIES FROM URBAN WATER UTILITIES IN VIETNAM, INDIA AND PHILIPPINES **Kathryn Green, Power and Water Corporation, NT** CASE STUDIES FROM RURAL WATER SUPPLIES IN NEPAL, AND NORTHERN TERRITORY Group Work APPROACH TO DEVELOP WSPS IN URBAN, RURAL AND COMMUNITY SETTINGS Group Work Presentations Q&A SESSION **Nicole Teo, SKM, Australia** NEXT STEPS
1350 - 1415	**Amanda Chadwick, Independent Pricing and Regulatory Tribunal, NSW** CONTEMPORARY CHALLENGES OF THE ECONOMIC REGULATION OF THE WATER INDUSTRY **Abstract No. 023**	**Darren Broad, Optimatics, SA** OPTIMISING THE OPERATION OF SOUTH AUSTRALIA'S BULK WATER SUPPLY SYSTEM **Abstract No. 027**	**Mark Pekin, Australian Antarctic Division, TAS** WATER SUPPLY AT DAVIS, ANTARCTICA - A HISTORY OF HARDSHIP **Abstract No. 031**	**Glenn Fernandes, NSW Public Works, NSW** STRESS TESTING OF A WATER TREATMENT PLANT THROUGH PILOT PLANT SIMULATION **Abstract No. 035**	**Ashok Aryal, Curtin University, WA** APPLICATION OF BIOLOGICAL ACTIVATED CARBON TO REDUCE FOULING ON NANO FILTRATION MEMBRANE **Abstract No. 039**	**Julie Culbert, SA Water, SA** OCCURRENCE AND MANAGEMENT OF NITROSAMINES IN AUSTRALIAN DRINKING AND RECYCLED WATER **Abstract No. 043**			
1420 - 1445	**Richard Priman, Department of Environment and Resource Management, QLD** A RATIONALE FOR ASSESSING AND RESPONDING TO URBAN WATER SECURITY RISKS - A THINK PIECE **Abstract No. 024**	**Graeme Dandy, University of Adelaide, SA** INTERACTIONS BETWEEN ENERGY, GREENHOUSE GAS EMISSIONS AND CLIMATE FOR URBAN WATER SUPPLY **Abstract No. 028**	**Yvonne Kaiser-Glass, Sydney Water Corporation, NSW** SYDNEY'S SWAMP SOURCED WATER SUPPLY (1788-1886) **Abstract No. 032**	**David Brooker, Mackay Regional Council, QLD and Chris Andrews, Taggle Systems, NSW** COST EFFECTIVE DOMESTIC AMR - AN AUSTRALIAN FIRST **Abstract No. 036**	**Katie Jones, Hunter Water Australia, NSW** LESSONS - MEMBRANE BIOREACTOR COMMISSIONING AND OPERATION **Abstract No. 040**	**Peta Thiel, Research Laboratory Services, VIC** BIODEGRADABLE DISSOLVED ORGANIC CARBON (BDOC) AND ASSIMILABLE ORGANIC CARBON (AOC) IN DRINKING AND RECYCLED WATER PLANTS **Abstract No. 044**			
1450 - 1515	**Freya Hartley, Sydney Water, NSW** EXAMINING THE LIKELY IMPACTS OF A CARBON PRICE USING SUPPLY CHAIN CARBON FOOTPRINTS **Abstract No. 025**	**Gordan Kennedy, USA** EVOLUTION OF ALTERNATIVE WATER SUPPLIES IN CAPE CORAL FLORIDA: IMPLICATIONS FOR A THIRSTY CONTINENT **Abstract No. 029**	**Joel Byrnes, AECOM, VIC** AUSTRALIA'S URBAN WATER INSTITUTIONS - A SHORT HISTORY **Abstract No. 033**	**Andrew Crawford, Water Corporation, WA** OPTIMAL SCHEDULING OF SOURCES IN AN INTEGRATED WATER SUPPLY SYSTEM **Abstract No. 037**	**Yogeshwar Gokhale, CH2M HILL, NSW** SAVINGS AND BENEFITS OF MBR ON THE HUNTER TREATMENT ALLIANCE **Abstract No. 041**	**Erik Tynes, GHD Pty Ltd, WA** FLUX BALANCED RO DESIGN FOR A HIGHLY VARIABLE FEED WATER **Abstract No. 045**			
1515 - 1600	**Afternoon Tea**								
1600 - 1730	**Policy, Regulation and Legislation** **Chair:** Mark Bartley, DLA Piper, VIC **Assistant Chair:** Sally Rewell, Sydney Water, NSW **Session Code: 15**	**Strategic Approach to Water** **Chair:** Erin Cini, Element Solutions, NSW **Assistant Chair:** Ruben Muller, Sydney Water, NSW **Session Code: 16**	**Specific Water Basins** **Chair:** Tony Church, SKM, NSW **Assistant Chair:** Nathalie Horsfield, AECOM, WA **Session Code: 17**	**Operation and Management - Water** **Chair:** Karen Eaton, UGL Infrastructure, NSW **Assistant Chair:** Jaques Ostrowski, Sydney Water, NSW **Session Code: 18**	**Wastewater Treatment** **Chair:** Richard Stuetz, University of New South Wales, NSW **Assistant Chair:** Zenah Bradford-Hartke, University of New South Wales, NSW **Session Code: 19**	**Water Treatment** **Chair:** Ivan Reolon, Aquatec-Maxcon, NSW **Assistant Chair:** Anna Yeung, University of New South Wales, NSW **Session Code: 20**	**American Water Works Association and Australian Water Association presents:** Managing the Perfect Storm: Rising costs, expanding infrastructure, but no price rises please **Moderator:** Peter Moore, Water Corporation, WA **Assistant Chair:** Will Lawler, University of NSW **Session Code: 21**	**Australian Water Recycling Centre of Excellence presents:** Overcoming barriers to the acceptance of potable reuse as an alternative water source **Facilitator:** Gary Bickford, Director, Nestis Consulting, NSW **Session Code: WS05**	**AWA Asset Management Specialist Network presents:** Practical Implications for the Water industry of the ISO standard Asset Management **Facilitator:** Chris Adam, National Convenor, AWA Asset Management Specialist Network **Assistant:** Laura Evanson, Australian Water Association **Session Code: WS06**
1605 - 1630	**Frank Spaninks, Sydney Water, NSW** A NEW APPROACH TO FORECASTING DEMAND IN SYDNEY **Abstract No. 050**	**Owen Phillis, Melbourne Water and Neil Moody, Urban Water Solutions, VIC** SEWAGE RESOURCE MANAGEMENT - A MODELING TOOL TO INFORM THE STRATEGIC DECISION MAKING PROCESS **Abstract No. 053**	**Vincent Puech, SKM, VIC** WATER BALANCE TOOL DEVELOPMENT AND APPLICATION TO THE UPPER-CAMPASPE AND UPPER-LODDON CATCHMENTS **Abstract No. 056**	**Amanda Byrne, SA Water, SA** NETWORK IMPLICATIONS OF BLENDING DESALINATED WATER INTO A DISTRIBUTION SYSTEM: A MODELLING APPROACH **Abstract No. 059**	**Cindy Wallis-Lage, Black & Veatch, USA** PHOSPHORUS RECOVERY WITH A NEW ULTRA-LOW ADSORPTION PROCESS **Abstract No. 062**	**Kathy Northcott, Veolia Water Australia, VIC** TROUBLESHOOTING BAC FILTER HEADLOSS ISSUES AFTER RAW WATER QUALITY CHANGES **Abstract No. 065**	This interactive discussion will explore further the current and emerging pressures on our water utilities. How are they responding, what options are open to them and what does the future hold. Panellists - AWWA **Craig Woolard, General Manager, Anchorage Water and Wastewater Utility, Anchorage, AK, USA** **Nilaksh Kothari, General Manager, Manitowoc Public Utilities, WI, USA** **Rich Nagel, General Manager, West Basin Municipal Water District Board, CA, USA** Panellists - AWA **Jon Black, Chief Executive Officer, Unitywater, QLD** **Eleanor Underwood, Chairman, Melbourne Water, VIC** **Kim Wood, Managing Director, Hunter Water, NSW** **Session Code: 68**	**Ian Law, IBL Solutions, Australia** WELCOME **Gary Bickford, Nestis Consulting, NSW Australia** WORKSHOP PURPOSE **Marsi Steirer, Deputy Water Department Director, San Diego, USA** SAN DIEGO'S TOILET TO TAP EXPERIENCE **Catherine Ferrari, General Manager Communications, Water Corporation, WA, Australia** WATER CORPORATION'S RECYCLING TRIAL **Asa Wahlquist, freelance rural and science journalist, NSW, Australia** HOW TO GET A GOOD NEWS STORY PUBLISHED **Adina Cirson, Advisor to the Chief Minister, ACT Australia** DEVELOPING PUBLIC POLICY DISCUSSION AND RECOMMENDATIONS TO BE EXPLORED	**Chris Adam, National Convenor, AWA Asset Management Specialist Network** WELCOME **Paul Freeman, General Manager, Asset Management , Sydney Water, NSW** UTILITIES' PERSPECTIVE ON THE DEVELOPMENT AND POSSIBLE IMPACT OF THE STANDARD **Peter Way, Chairman, IPWEA NAMS Committee** AUSTRALIA'S INTEREST IN THE DEVELOPMENT OF THE ISO STANDARD **Carly Price, Technical Analyst, IPART** REGULATORS' PERSPECTIVE Group Work **Chris Adam, National Convenor, AWA Asset Management Specialist Network** WRAP UP AND CLOSE
1635 - 1700	**Paul Byleveld, NSW Health, NSW** PUBLIC HEALTH ACT 2010 DRINKING WATER RISK-MANAGEMENT IN NEW SOUTH WALES **Abstract No. 051**	**Storm Stickland, SEQ Water Grid Manager and James Moffatt, LinkWater, QLD** WATER SUPPLY RESILIENCE - A GRID FOR ALL SEASONS **Abstract No. 054**	**Anne Pye, Department of Natural Resources, Environment, the Arts & Sport, NT** SUSTAINABLE GROUNDWATER MANAGEMENT IN THE ARID ZONE **Abstract No. 057**	**James Link, savewater! Alliance Inc. and Tony Campbell, Yarra Valley Water, VIC** EASYFILL TM - WATER TANKER BILLING AND MANAGEMENT SYSTEM - HOW TO IMPROVE HYDRANT PERMIT MANAGEMENT **Abstract No. 060**	**Humphrey Archer, Beca Infrastructure Ltd and Stuart Donaldson, Marlborough District Council, NEW ZEALAND** TURNING WINE INTO WATER – COPING WITH RAPID GROWTH IN WINERY WASTEWATER AT THE BLENHEIM WASTEWATER TREATMENT PLANT **Abstract No. 061**	**David Leinster, Aquatec-Maxcon Pty Ltd, QLD** THE USE OF FENTON'S REAGENT TO REDUCE MEMBRANE FOULING IN POTABLE WATER REUSE PLANTS **Abstract No. 066**			
1705 - 1730	**Annalisa Contos, Atom Consulting, NSW** NOW YOU SEE IT: APPLYING BOW TIE ANALYSIS TO WATER QUALITY RISKS **Abstract No. 052**	**Jason Ruszczyk, Warringah Council, NSW** MULTIPLE LINES OF EVIDENCE - INVESTIGATING ECOLOGICAL CONDITION TO IMPROVE STRATEGIC MANAGEMENT IN MANLY LAGOON **Abstract No. 055**	**Maree Abood, Office of the Hawkesbury-Nepean, NSW** PEOPLE AND THEIR RIVER: INTEGRATED MANAGEMENT OF THE HAWKESBURY-NEPEAN RIVER, NSW **Abstract No. 058**	**Andrew Chua, Water Corporation, WA** APPLICATION OF WASTEWATER PROCESS CONTROL TABLES TO MANAGE AND IMPROVE WASTEWATER OPERATIONS **Abstract No. 061**	**Ben van den Akker,Water Research Centre UNSW, NSW** VALIDATION OF A FULL-SCALE MEMBRANE BIOREACTOR FOR WATER RECYCLING: CHARACTERISING PROCESS VARIABILITY **Abstract No. 064**	**Peter Baudish, SKM, NSW and Lee Foster, Seqwater, QLD** THE USE OF CFD MODELLING TO IMPROVE CONVENTIONAL WATER TREATMENT FLOW AND CHEMICAL MIXING **Abstract No. 067**			
1730 - 1830	**Happy Hour - Ozwater Exhibition**								

PROGRAM – TUESDAY

PROGRAM WEDNESDAY 9 MAY 2012

KEY
- Award Presentations and Affiliate Streams
- Changing Times
- History and Heritage
- Rural and Regional Water
- Water and People
- Water and Wastewater Systems and Processes
- Workshop (Limited capacity)

OZWATER12

0810 - 1000 — **Keynote Session, Bayside Auditorium B, Chair:** Lucia Cade, President, Australian Water Association

James Cameron, Chief Executive Officer, National Water Commission, AUSTRALIA AUSTRALIA'S WATER FUTURE - CHALLENGES AND OPPORTUNITIES. **Abstract No. KEY03**

Herbert Dreiseitl, Atelier Dreiseitl, GERMANY ECOLOGICAL WATERSCAPES - THE ART OF CONSENSUS FOR SITE-RESPONSIVE INTERVENTIONS AND URBAN INVESTMENT. **Abstract No. KEY04**

Xavier Leflaive, Principal Administrator, OECD Environment Directorate, FRANCE THE WATER OUTLOOK TO 2050. **Abstract No. KEY05**

1000 - 1045 — Morning Tea

	Room 203	Room 204A	Room 204B	Room 105	Room 102	Room 104	Room 103	Room 201	Room 202
1045 - 1215	**Community Consultation and Community Participation** **Chair:** Walter King, Vienna Waterworks, AUSTRIA **Assistant Chair:** Jo McNarn, Hunter Water, NSW **Session Code: 22**	**Climate Change - Adaptation** **Chair:** Therese Flapper, GHD, ACT **Assistant Chair:** Juan Pablo Alvarez, University of New South Wales, NSW **Session Code: 23**	**Future Cities** **Chair:** Rod Lehmann, Water Strategies Pty Ltd, QLD **Assistant Chair:** Trevor Lynn, Emerson Stewart, WA **Session Code: 24**	**Operation and Management** **Chair:** Paul Macinante, SKM, NSW **Assistant Chair:** Sam Dransfield, Sydney Water, NSW **Session Code: 25**	**Asset Management** **Chair:** Kim Falster, Downer Australia, SA **Assistant Chair:** Tung Nguyen, Water Corporation, WA **Session Code: 26**	**Water Treatment** **Chair:** Peter McCafferty, ChemCentre, WA **Assistant Chair:** Amos Branch, University of New South Wales, NSW **Session Code: 27**	**Water Services Association of Australia presents:** Updating the National Urban Water Reform Agenda **Session Code: 28**	**AWA Water Law and Policy Specialist Network presents:** Sustainable Development in Water Management: Regulatory vs Market Approach **Facilitator:** Jennifer McKay, Director, Centre for Comparative Water Law and Policy, University of South Australia, SA **Assistant:** Nat Newman, Australian Water Association **Session Code: WS07**	**AWA Water Efficiency Specialist Network presents:** The future role of water efficiency in Australia: developing and promoting a common approach **Facilitator:** Damien Connell, Contract Manager, Smart Water Fund, Melbourne, VIC, Australia **Assistant:** Ann Hinchliff, Australian Water Association **Session Code: WS08**
1050 - 1115	**Paul O'Donohue, Central Highlands Water and Jessie Harman, University of Ballarat, VIC** DURABILITY OF WATER CONSERVATION BEHAVIOURS IN THE HOME: PERSISTENT OR TRANSIENT? **Abstract No. 071**	**Selvaratnam Maheswaran, Sydney Catchment Authority, NSW** CLIMATE CHANGE IMPACT ASSESSMENT FOR SYDNEY'S WATER SUPPLY **Abstract No. 074**	**Matthew Ferguson, Sydney Water, NSW** A 12-MONTH RAINWATER TANK WATER SAVINGS AND ENERGY USE STUDY FOR 52 REAL LIFE INSTALLATIONS **Abstract No. 077**	**Stan McLeod, SA Water Centre for Water Management and Reuse, SA** EMERGING MONITORING TECHNIQUES FOR AMMONIA IN CHLORAMINATED WATER SUPPLIES **Abstract No. 080**	**Paul Louws, Western Water, VIC** SEWAGE SPILL PREVENTION STRATEGY **Abstract No. 083**	**Yaode Yan, Hunter Water Australia, NSW** USE OF POWDERED ACTIVATED CARBON FOR THM CONTROL REVISITED **Abstract No. 086**	The purpose of this session is for the urban water industry to gather together to inform the National agenda by writing a new roadmap for where the industry should head over the next 10 years. This is critical in the context of the recent NWC and Productivity Commission reviews.	**Jennifer McKay, Centre for Comparative Water Law and Policy, SA** OVERVIEW OF THE TWO POSSIBLE MODELS IN SUSTAINABLE DEVELOPMENT IN WATER MANAGEMENT: A MARKET DRIVEN APPROACH AND A REGULATORY DRIVEN APPROACH **Barry Dennien, SEQ Water Grid, QLD** CASE STUDY ON WATER RESTRICTIONS – MARKET DRIVEN POLICY: BENEFITS OF A PURELY MARKET DRIVEN APPROACH TO SUSTAINABLE DEVELOPMENT IN WATER MANAGEMENT **SA Water Representative** CASE STUDY ON WATER RESTRICTIONS – REGULATION OF SUPPLY DRIVEN POLICY: BENEFITS OF A REGULATORY APPROACH AND WATER RESTRICTIONS **Catherine Ferrari, Water Corporation, WA** CASE STUDY ON COMMUNITY ENGAGEMENT: NEW APPROACHES IN COMMUNITY ENGAGEMENT TO REDUCE WATER USE **Group Work** WORKING IN GROUPS, DELEGATES WILL DEBATE THE PRO'S AND CON'S OF BOTH MODELS - A MARKET APPROACH OR A REGULATORY ONE **Group Work Presentations** **Jennifer McKay, Centre for Comparative Water Law and Policy, SA** WRAP UP AND CLOSE	**Damien Connell, Smart Water Fund, Australia** **WELCOME AND INTRODUCTION** **Damien Giurco, Institute for Sustainable Futures, Australia** EXPLORING THE ECONOMICS OF WATER EFFICIENCY **Cilla De Lacy, WSAA, Australia** WATER UTILITIES AND EFFICIENCY **Reid Butler, BMT WBM (AWA Water Efficiency Network representative), Australia** PRESENTATION OF THE AWA WATER EFFICIENCY POSITION PAPER THE FUTURE OF WATER EFFICIENCY **Group Work** BREAK OUT INTO 3 GROUPS TO IDENTIFY THE PRIORITY ACTIONS IN THE FOLLOWING AREAS: VALUING EFFICIENCY IN WATER SUPPLY/DEMAND MANAGEMENT; RETAINING WATER EFFICIENCY KNOWLEDGE AND SKILLS; EFFICIENCY AND RESILIENCE **Group Work Presentations** **AWA Water Efficiency Network Panel** WRAP UP AND CLOSE
1120 - 1145	**Nadia Jebbour, Parsons Brinckerhoff, WA** SECURING SAFE DRINKING WATER FOR REMOTE INDIGENOUS COMMUNITIES IN WESTERN AUSTRALIA **Abstract No. 072**	**Chris Hertle, GHD Pty Ltd, QLD** ADAPTING TO CLIMATE CHANGE BY USING LOW ENERGY, FIT -FOR -PURPOSE WATER RECYCLING SYSTEMS **Abstract No. 075**	**Steven Wallner, AECOM, VIC** SOUTHBANK: COSTS AND BENEFITS OF AN INTEGRATED SUSTAINABLE SERVICING STRATEGY **Abstract No. 078**	**Russell Beatty, SKM, NSW** THE DEVELOPMENT OF A MODEL OF NIGHT WATER USAGE FOR SYDNEY **Abstract No. 081**	**Tony Wells, School of Engineering, The University of Newcastle, NSW** A COLLABORATIVE INVESTIGATION OF THE MICROBIAL CORROSION OF CONCRETE SEWER PIPE IN AUSTRALIA **Abstract No. 084**	**Jennifer Dreyfus, SA Water, AWQC, SA** OPTIMISATION OF CONVENTIONAL TREATMENT FOR THE REMOVAL OF CYANOBACTERIA CELLS **Abstract No. 087**			
1150 - 1215	**Lynne Powell, Cairns Regional Council, QLD** INDIGENOUS PARTNERSHIPS - OPPORTUNITIES AND OBSTACLES **Abstract No. 073**	**Mohamad Fared Murshed, University of South Australia, SA** RAPID TREATABILITY ASSESSMENT OF NOM IN THE RIVER MURRAY WATER DURING HIGH FLOW WATER PERIOD **Abstract No. 076**	**Benjamin Taylor, University of Southern Queensland, QLD** ENHANCING RAINWATER HARVESTING WITH SHORT-TERM RAINFALL FORECASTS IN WATER SENSITIVE CITIES **Abstract No. 079**	**Matthew Whitelaw, East Gippsland Water, VIC** TRACER STUDIES: AN EFFECTIVE TOOL FOR DETERMINING HYDRAULIC MIXING AND WATER AGE IN STORAGE AND DISTRIBUTION SYSTEMS **Abstract No. 082**	**David Nicholas, Nicholas Corrosion Pty Ltd, NSW** THE EFFECTIVENESS OF LOOSE POLYETHYLENE SLEEVING FOR THE PROTECTION OF DICL PIPELINES: A REVIEW **Abstract No. 085**	**Noel Dow, Victoria University, VIC** POWER STATION WATER RECYCLING USING MEMBRANE DISTILLATION - A PLANT TRIAL **Abstract No. 088**			

1215 - 1315 — Lunch

1315 - 1515	**Community Consultation and Community Participation** **Chair:** Corinne Cheeseman, Sydney Water, NSW **Assistant Chair:** Jo McNarn, Hunter Water, NSW **Session Code: 29**	**Sustainable Decision Making** **Chair:** John Howard, SA Water, SA **Assistant Chair:** Juan Pablo Alvarez, University of New South Wales, NSW **Session Code: 30**	**Future Cities** **Chair:** Chris Davis, Natioanl Water Commission, NSW **Assistant Chair:** Trevor Lynn, Emerson Stewart, WA **Session Code: 31**	**Operation and Management** **Chair:** Murray Thompson, AWA NSW Branch President, NSW **Assistant Chair**: Sam Dransfield, Sydney Water, NSW **Session Code: 32**	**Asset Management** **Chair:** Peter Robinson, MWH Global, VIC **Assistant Chair:** Tung Nguyen, Water Corporation, WA **Session Code: 33**	**Water Treatment** **Chair:** Lionel Ho, SA Water, SA **Assistant Chair:** Amos Branch, University of New South Wales, NSW **Session Code: 34**	**Water Services Association of Australia presents:** The Future of Urban Water Customer Services **Session Code: 35**	**Netherlands Water Partnership presents:** Dealing with floods: between prevention and preparedness. What can Queensland and the Netherlands learn from each other? **Facilitator:** Lennart Silvis, Director, Netherlands Water Partnership, The Hague, The Netherlands **Session Code: WS09**	**Urban Water Security Research Alliance presents:** Collaboration in stormwater harvesting – moving from theory to practice **Facilitators:** Brian McIntosh, Senior Lecturer, Integrated Water Management, International Water Centre, QLD and Don Begbie, Director, Urban Water Security Research Alliance, QLD **Session Code: WS10**
1320 - 1345	**Emily Callaway, CH2M HILL, USA** TALKING ABOUT THE WATER CYCLE: COMMUNICATION IN CONTEXT TO FACILITATE PUBLIC ACCEPTANCE **Abstract No. 092**	**Mark Noonan, Sydney Catchment Authority, NSW** SPATIAL DECISION SUPPORT SYSTEMS FOR ASSESSING WATER QUALITY RISKS IN SYDNEY'S DRINKING WATER CATCHMENT **Abstract No. 096**	**Joe Flynn, Global Water, SA** SMARTER WATER: ENSURING WATER SUSTAINABILITY VIA INFRASTRUCTURE, INCENTIVES AND INFORMATION **Abstract No. 100**	**Kalan Braun, Australian Water Quality Centre, SA Water, SA** FLOW CYTOMETRY AS A MICROBIOLOGICAL MONITORING TOOL FOR TREATMENT AND DISTRIBUTION SYSTEMS **Abstract No. 104**	**John Gabbedy, Degremont Thiess Services JV, VIC** LIFECYCLE MANAGEMENT THROUGH THE DEVELOPMENT OF AN EFFECTIVE ASSET MANAGEMENT SYSTEM ON THE VICTORIAN DESALINATION PROJECT **Abstract No. 108**	**Kelvin O'Halloran, Seqwater, QLD** MEETING THE PROPOSED NEW CHLORATE GUIDELINE OF 0.3MG/L **Abstract No. 112**	In a constantly changing world for the industry, water utilities must start thinking about what a contestable urban water market might look like and what services other than those that are traditional services they can offer. This workshop will explore international trends and opportunities for urban water utilities.	**Lennart Silvis, Netherlands Water Partnership, Netherlands** **WELCOME** **Leanne Reichard, Hydrologic BV, Netherlands** THE DUTCH APPROACH: ROOM FOR THE RIVER **Greg Claydon, QLD Department of Environment and Resource Management, Australia** QUEENSLAND: BEING PREPARED **Greg Claydon, QLD Department of Environment and Resource Management, Australia** **Nancy Esler, QLD Department of Environment and Resource Management, Australia** **Leanne Reichard, Hydrologic BV, Netherlands** **Winfried Pietersen, DHV, The Netherlands** PANEL DISCUSSION **Lennart Silvis, Netherlands Water Partnership, Netherlands** WRAP UP AND CONCLUSIONS	**Facilitators (Brian McIntosh and Don Begbie)** WELCOME AND CONTEXT **David Hamlyn Harris, Principal Engineer, Water and Environment, Director, Bligh Tanner, Brisbane Australia.** MAJOR OPPORTUNITIES AND "HEADACHES" EMERGING IN STORMWATER HARVESTING: WATER SUPPLY **Simon Toze, Principal Research Scientist, CSIRO Land and Water, Brisbane, Australia** MAJOR OPPORTUNITIES AND "HEADACHES" EMERGING IN STORMWATER HARVESTING: HEALTH **Fran Sheldon, Griffith University, Brisbane, QLD, Australia (TBC)** MAJOR OPPORTUNITIES AND "HEADACHES" EMERGING IN STORMWATER HARVESTING: ECOLOGY **Presenter to be Confirmed** MAJOR OPPORTUNITIES AND "HEADACHES" EMERGING IN STORMWATER HARVESTING: URBAN PLACE **Brian McIntosh, Senior Lecturer, Integrated Water Management, International Water Centre, QLD** GROUP WORK BRIEFING **All participants** STORMWATER PLANNING ACTIVITY GROUP PRESENTATIONS AND PANEL REVIEW **Facilitators (Brian McIntosh and Don Begbie)** IMPLICATIONS, MESSAGES AND WRAP UP
1350 - 1415	**Rachel Clarke, ACTEW Corporation, ACT** WATER FOR OTHERS: ENGAGEMENT OF NON-BENEFICIARIES IN A WATER PIPELINE PROJECT **Abstract No. 093**	**Philippa Charlton, MWH, VIC** BREAKING THE WATER-ENERGY NEXUS **Abstract No. 097**	**Jay Witherspoon, CH2M HILL, NSW** TRUE COSTS FOR GREEN BUILDING CERTIFICATION PROGRAMS FOCUSED ON DECISION MAKING AND APPROACHES FOR SUSTAINABLE WATER INFRASTRUCTURE **Abstract No. 101**	**Kathryn Gamble, Sydney Water, NSW** VALIDATION OF A MOLECULAR METHOD TO CONFIRM CLOSTRIDIUM PERFRINGENS **Abstract No. 105**	**Tony Cartwright, Sydney Water, NSW** FEEDBACK ON THE METHODOLOGY FOR INTRODUCING ASSET CONFIGURATION MANAGEMENT INTO A WATER AUTHORITY **Abstract No. 109**	**Kalinda Watson, Griffith University- Smart Water Research Centre, QLD** DISINFECTION BY-PRODUCT (DBP) PRECURSOR REMOVAL: POWDERED ACTIVATED CARBON (PAC) TREATMENT AND ITS EFFECT ON DBP SPECIATION **Abstract No. 113**			
1420 - 1445	**Dena Fam, Institute of Sustainable Futures, NSW** SOCIAL LEARNING IS ESSENTIAL IN TRANSITIONING TO SUSTAINABLE WATER SERVICES **Abstract No. 094**	**Udaya Kularathna, Melbourne Water, VIC** DECISION SUPPORT FOR MANAGEMENT OF MELBOURNE'S WATER SUPPLY SYSTEM **Abstract No. 098**	**Louise Van den Broek, Western Water, VIC** TOOLERN – TOWARDS A WATER NEUTRAL SUBURB WITH LOW RAINFALL **Abstract No. 102**	**Lee Foster, Seqwater, QLD** TASTE AND ODOUR, MANGANESE AND CYANOTOXIN RISK ASSESSMENT **Abstract No. 106**	**Scott Gould, CSIRO Land and Water, VIC** COMPARISON OF ASSET FAILURE DATA FROM UTILITIES AROUND AUSTRALIA **Abstract No. 110**	**Satiya Wati, SA Water, SA** CHLORINE DISINFECTION OF HUMAN PATHOGENIC VIRUSES IN RECYCLED WATERS **Abstract No. 115**			
1450 - 1515	**Sue Jenkins, Sydney Water, NSW** WHAT CUSTOMERS REALLY WANT - FINDINGS OF A VALUE SEGMENTATION STUDY **Abstract No. 095**	**Christopher Dey, The University of Sydney, NSW** FULL CARBON AND ECOLOGICAL FOOTPRINTS FOR WATER ORGANISATIONS **Abstract No. 099**	**Linda Gyzen, Jemena, NSW** ROSEHILL RECYCLED WATER SCHEME - A CASE STUDY FOR CENTRALISED RECYCLED WATER SUPPLY **Abstract No. 103**	**Rolando Fabris, Australian Water Quality Centre, SA** FIVE-YEAR EXPERIENCE IN USING ON-LINE UV-VIS SPECTROLYSER FOR RIVER WATER QUALITY MONITORING **Abstract No. 107**	**Aravinda Stanley, Sydney Water, NSW** INTEGRATION OF LEAKAGE MANAGEMENT INTO ASSET MANAGEMENT **Abstract No. 111**				

1515 - 1600 — Afternoon Tea

1600 - 1730	**Community Consultation and Community Participation** **Chair:** Simon Webber, ACTEW Corporation, ACT **Assistant Chair:** Jo McNarn, Hunter Water, NSW **Session Code: 36**	**Sustainable Decision Making** **Chair:** Peta Maddy, Sinclair Knight Merz, VIC **Assistant Chair:** Juan Pablo Alvarez, University of New South Wales, NSW **Session Code: 37**	**Future Cities** **Chair:** Peter Moore, Water Corporation, WA **Assistant Chair:** Trevor Lynn, Emerson Stewart, WA **Session Code: 38**	**Operation and Management - Bulk Water** **Chair:** Graham Attenborough, Sydney Catchment Authority, NSW **Assistant Chair:** Sam Dransfield, Sydney Water, NSW **Session Code: 39**	**Asset Management** **Chair:** Carmine Ciccocioppo, Osmoflo, SA **Assistant Chair:** Tung Nguyen, Water Corporation, WA **Session Code: 40**	**Water Treatment** **Chair:** Jaques Ostrowski, Sydney Water, NSW **Assistant Chair:** Amos Branch, University of New South Wales, NSW **Session Code: 41**	**Water Services Association of Australia presents:** The Customer **Session Code: 42**	**Sucrosolutions for Water presents:** Improve Safety, Increase Sustainability and Innovate Strategically **Facilitator:** Julie Tawadros, Project Manager - Water, Sugar Australia, VIC **Session Code: WS11**	
1605 - 1630	**Martin Anda, ENV Australia Pty Ltd and Murdoch University, and John Brennan, Water Corporation, WA** RESIDENTIAL WATER USE EFFICIENCY IN WA: RESULTS FROM NORTHWEST TOWNS AND PERTH BEHAVIOURAL CHANGE PROGRAMS **Abstract No. 120**	**Pierre Mukheibir, Institute for Sustainable Futures, NSW** ADAPTIVE PLANNING FOR RESILIENT URBAN WATER SYSTEMS UNDER AN UNCERTAIN FUTURE **Abstract No. 123**	**Phillip Jordan, SKM, QLD** AN INTEGRATED DEMAND AND SUPPLY MODELLING FRAMEWORK FOR INTEGRATED WATER RESOURCES PLANNING **Abstract No. 126**	**Chris Hepplewhite, ACTEW Corporation, ACT** FILLING A RESERVOIR: MORE THAN JUST WAITING FOR RAIN **Abstract No. 129**	**Sejla Alimanovic, CH2M HILL, VIC** INNOVATIVE INLET WORKS COVER TECHNOLOGY FOR ODOUR MANAGEMENT **Abstract No. 132**	**Russell Yap, UNSW, NSW** THE SELECTIVITY OF PH REGULATED ALUM COAGULATION IN DISSOLVED AIR FLOTATION OF ALGAE LADEN STABILISATION POND EFFLUENT - A CASE STUDY **Abstract No. 135**	What do different generations and customer segments value about urban water services? How does a water supplier cater for these differing expectations? This workshop will explore which existing services offered by urban water utilities are valued and what customer expectations could be in the future.	Presenters: • **Phil de Groot, Operations Manager, Fleurieu Region, Trility Group, SA** • **Stewart Burn, Senior Principal Research Scientist, CSIRO Land and Water, VIC** • **Geoff Hamilton, Director, GH Consultant Engineers, QLD** • **Rakesh Patel, Process Engineer, Untied Water, Ballarat Region, VIC** • **Josephine Gualtieri, Technical Manager, Sucrosolutions for Water, VIC** Find out how you can lower your nitrogen outflow and lower the safety risks at your plants with a sucrose solution. Sucrose has been used as the premier carbon source at many wastewater treatment plants the Australian Wastewater Industry for several years. Plants have switched from more dangerous carbon sources to sucrose whist other plants have been created to dose the sucrose solution.	
1635 - 1700	**Emma Wiggan and Amy Bromhead, Priority Sewerage Program, NSW** DELIVERING KEY SOCIAL AND ENVIRONMENTAL BENEFITS THROUGH EFFECTIVE COMMUNITY CONSULTATION **Abstract No. 121**	**Tim Clune, North East Region Water Corporation, VIC** ONE RESOURCE - ADAPTING TO A NEW SERVICE DELIVERY PARADIGM **Abstract No. 124**	**Lizzie Adams, Umow Lai, VIC** TOWARDS WATER NEUTRALITY IN COMMERCIAL OFFICE BUILDINGS **Abstract No. 127**	**Jason Martin, Sydney Catchment Authority, NSW** SCARMS - CASE STUDIES OF APPLICATION OF SYDNEY CATCHMENT AUTHORITY'S RESERVOIR MANAGEMENT SYSTEM **Abstract No. 130**	**Baher Zaghlool, CPG Australia, VIC** DURABILITY AND BEARING CAPACITY OF SHALLOW CROSSINGS OF MELBOURNE'S TRUNK SEWERS **Abstract No. 133**	**Dylan Thorpe, Arup, VIC** ZERO LIQUID DISCHARGE SOLAR DESALINATION PILOT PLANT EVALUATION **Abstract No. 136**			
1705 - 1730	**Tim Bartrand, Tetra Tech, USA** COMMUNITY PARTICIPATION IN DEVELOPMENT OF DECENTRALIZED GREEN INFRASTRUCTURE **Abstract No. 122**	**Jacqueline Grove, Warringah Council, NSW** ADOPTING BEST PRACTICE WATER QUALITY MONITORING TO REDUCE PUBLIC HEALTH RISKS: THE CASE OF MANLY DAM **Abstract No. 125**	**Helena Amaro, Sydney Water, NSW** THE SMART HOME OF THE FUTURE **Abstract No. 128**	**Ian Monks, City West Water, VIC** MASS BALANCE SIMULATION OF RCW SCHEME **Abstract No. 131**	**Andrew Kasmarik, Sydney Water Corporation, NSW** INTRODUCING LEAKTIGHT SEWERS TO SYDNEY WATER **Abstract No. 134**	**Andrew Groth, Siemens Water Technologies, NSW** OPTIMISATION OF PRE-COAGULATION AND POWDERED ACTIVATED CARBON FOR SUSTAINABLE MEMBRANE MICROFILTRATION OPERATION **Abstract No. 137**			

PROGRAM – WEDNESDAY

PROGRAM THURSDAY 10 MAY 2012

KEY
- Award Presentations and Affiliate Streams
- Changing Times
- History and Heritage
- Rural and Regional Water
- Water and People
- Water and Wastewater Systems and Processes
- Workshop (Limited capacity)

OZWATER12

0830 - 1000 — **Keynote Session, Bayside Auditorium B, Chair:** Paul Freeman, Director, Australian Water Association

0830 - 0915 — **Paul Greenfield, Chair, ANSTO, QLD, AUSTRALIA** INHERENT CHALLENGES TO ACHIEVING SUSTAINABILITY IN THE WATER SECTOR. **Abstract No. KEY06**

0915 - 1000 — **Rich Nagel, General Manager, West Basin Municipal Water District, USA. Abstract No. KEY07**

1000 - 1045 — Morning Tea

	Room 109	Room 204A	Room 204B	Room 102	Room 103	Room 104	Room 105	Room 201	Room 202	Room 203
1045 - 1215	**Disaster Recovery** **Chair:** Annalisa Contos, Atom Consulting, NSW **Assistant Chair:** Matthew Renshaw, AECOM, NSW **Session Code: 43**	**Skills Development and Education** **Chair:** Grant Leslie, Water Services Association of Australia, NSW **Assistant Chair:** Lauren Dragicevich, AECOM, NSW **Session Code: 44**	**Climate Change - Mitigation** **Chair:** Angus Simpson, The University of Adelaide, SA **Assistant Chair:** Mukhlis Mah, University of New South Wales, NSW **Session Code: 45**	**Recovery of Nutrients and By Product Manufacture** **Chair:** Bill Barber, AECOM, NSW Assistant Chair: Zenah Bradford-Hartke, University of New South Wales, NSW **Session Code: 46**	**Wastewater Treatment** **Chair:** Christopher Saint, Centre for Water Management & Reuse, SA Assistant Chair: Juan Pablo Alvarez, University of New South Wales, NSW **Session Code: 47**	**Wastewater Treatment - Biosolids** **Chair:** Paul Keighery, Parsons Brinckerhoff, NSW **Assistant Chair:** Bei Wang, University of New South Wales, NSW **Session Code: 48**	**Reticulation and Collective Systems** **Chair:** David Cox, WSAA, NSW **Assistant Chair:** Chitwan Jawanda, Sydney Water, NSW **Session Code: 49**	**Urban Water Security Research Alliance presents:** Using Ozone and Biofiltration for Producing Recycled Water **Facilitator:** Don Begbie, and Stephen Kenway, Urban Water Security Research Alliance, Australia **Session Code: WS13**	**National Water Commission presents:** Australia's Groundwater Challenge – past, present, future **Facilitator:** Adam Sincock, Senior Manager Groundwater, National Water Commission, ACT, Australia **Session Code: WS14**	**IWA Cities of the Future Working Group presents:** Cities of the Future: From principles to best practice **Session Code: WS15**
1050 - 1115	**Andy Gibson, AECOM, NEW ZEALAND** WHAT LIES BENEATH **Abstract No. 141**	**Petra Kelly, Australian Water Association** NEW DIRECTIONS AND OPPORTUNITIES IN WATER SECTOR TRAINING **Abstract No. 144**	**Graham Costin, ActewAGL, ACT** CUTTING CARBON: THE ENVIRO-NORMAL APPROACH **Abstract No. 147**	**Matthew Ferguson, Sydney Water, NSW** SYDNEY WATER'S BIOSOLIDS STRATEGY REVIEW FRAMEWORK: SITES, PROCESS STREAMS AND MARKETS **Abstract No. 150**	**Alexandra Keegan, Australian Water Quality Centre, SA Water Corp, SA** SEASONAL CHANGES IN FILAMENTOUS BACTERIA IN ACTIVATED SLUDGE AT SOUTH AUSTRALIAN WWTP'S **Abstract No. 153**	**Faisal Geheshah, RMIT University, VIC** ENHANCEMENT OF BIOGAS PRODUCTION POTENTIAL (BPP) OF SLAUGHTERHOUSE (SH) AND MEAT PROCESSING (MP) WASTES USING PRE-TREATMENTS **Abstract No. 156**	**Graeme Hamer, CH2M HILL, NSW** WATER INDUSTRY COLLABORATION TO IMPROVE SEWER VENTILATION KNOWLEDGE AND PLANNING **Abstract No. 159**	**Don Begbie, CEO, Urban Water Security Research Alliance, Australia** WELCOME **Dr Julien Reungoat, Research Fellow, University of Queensland, Australia** REMOVAL OF ORGANIC MATTER AND MICRO-POLLUTANTS USING THE OZONE/ BAC PROCESS FOR RECYCLED WATER PRODUCTION. **John Mieog, Planning and Process Technical Specialist, Melbourne Water, Australia** OZONE AND BIOLOGICAL FILTRATION FOR THE PRODUCTION OF HIGH QUALITY FIT-FOR-PURPOSE RECYCLED WATER. **Joe Lane, University of Queensland, Australia** LIFE CYCLE IMPACTS OF TREATMENT PROCESSES **Group and Panel Discussion** IDENTIFY (A) KEY KNOWLEDGE GAPS (B) BARRIERS TO ADOPTION AND (C) NEXT STEPS **Dr Judy Blackbeard, Melbourne Water, VIC** SESSION RAPPORTEUR **Don Begbie, CEO, Urban Water Security Research Alliance, Australia (Chair)** WRAP UP AND CLOSE	**SESSION 1: AUSTRALIA'S HIDDEN WATER RESOURCE – CURRENT GROUNDWATER MANAGEMENT AND ACTIVITIES** **Chris Davis, Commissioner, NWC, Australia** WELCOME **Matt Kendall, General Manager, Sustainable Water Management Group, NWC, Australia** KEYNOTE ADDRESS: NATIONAL GROUNDWATER ACTION PLAN **Rick Evans, Sinclair Knight Merz, Australia** MANAGING CONNECTED GROUNDWATER RESOURCES **Mike Williams, NSW Office of Water, NSW** A STATE GROUNDWATER MANAGEMENT PERSPECTIVE **Neil Power, Chair, National Groundwater Working Group, Australia** RECENT IMPROVEMENTS IN GROUNDWATER MANAGEMENT PANEL DISCUSSION / Q&A	This workshop will explore the urban water governance, collaboration, engagement, decision making and master planning strategies that have been used in cities that have implemented these principles. Workshop participants will hear from panel speakers and be actively involved in: 1. Bringing together examples of what has, and has not, worked in implementing integrated water management in Australian and international cities, and 2. Using these examples to benchmark best practice. The workshop outcomes will contribute to best practice guidelines for urban planners and water managers that will be presented at the 2012 IWA World Water Congress in Korea as a part of the IWA's Cities of the Future program. This workshop is hosted by the IWA Cities of the Future working group and is supported by Melbourne Water and GHD
1120 - 1145	**Michelle Colwell, Gippsland Water, VIC** JUST LIKE A CHOCOLATE MILKSHAKE AND IT'S CRUNCHY - MAINTAINING WATER SUPPLY AFTER CONSECUTIVE FIRE AND FLOOD **Abstract No. 142**	**Jenny Tibbitts, Sydney Catchment Authority, NSW** CAPTURING KNOWLEDGE, GROWING OUR FUTURE **Abstract No. 145**	**Angela Ganley, City West Water, VIC** WATER AND ENERGY EFFICIENCY THROUGH STEAM SYSTEMS **Abstract No. 148**	**Graeme Anderson, Black & Veatch Australia, QLD** PHOSPHORUS FOOTPRINTING FOR SUSTAINABLE DECISION MAKING **Abstract No. 151**	**Ross Phillips, John Holland Water & Enviro, NSW** EPDM SEAL DEGRADATION AT THE MURRUMBA DOWNS ADVANCED WATER TREATMENT PLANT **Abstract No. 154**	**Franz Jacobsen, engys, QLD** CFD MODELLING OF A MESOPHILIC SLUDGE DIGESTER **Abstract No. 157**	**Andrew Downing, Melbourne Water and Neil Moody, Urban Water Solutions, VIC** QUANTIFYING SEWER POLLUTANT LOADS FROM GROUNDWATER INFILTRATION VIA CONTINUOUS SEWAGE QUALITY MONITORING **Abstract No. 160**			
1150 - 1215	**Mark Newland, Tenix Australia Pty Ltd, WA** FLOOD RECOVERY OF THE FAIRFIELD WATER RECYCLING FACILITY **Abstract No. 143**	**Michelle Hill, qldwater - Queensland Water Directorate, QLD** THE WATER WORKFORCE OF THE FUTURE: WHAT IT LOOKS LIKE AND HOW WE GET THERE **Abstract No. 146**	**Yingyu Law, Advanced Water Management Centre, The University of Queensland, QLD** FULL SCALE MONITORING OF FUGITIVE NITROUS OXIDE AND METHANE EMISSIONS FROM A WASTEWATER TREATMENT PLANT IN AUSTRALIA **Abstract No. 149**	**Robert Humphries, Water Corporation, WA** IDENTIFYING EMERGING AND PROSPECTIVE ENERGY HARVESTING AND EFFICIENCY TECHNOLOGIES FROM WASTEWATER **Abstract No. 152**	**Hilary Nath, University of Waikato, NEW ZEALAND** ELECTROCHEMICAL DEGRADATION OF SYNTHETIC INDIGO CARMINE DYE USING A PERFORATED ELECTRODE FLOW THROUGH CELL **Abstract No. 155**	**Yuanmei Sha, RMIT University, VIC** EFFECT OF INOCULUM/SUBSTRATE RATIO ON MESOPHILIC ANAEROBIC DIGESTION OF WASTE-ACTIVATED SLUDGE IN BATCH MODE **Abstract No. 158**	**Ray Rootsey, The University of Queensland, QLD** TAKING CONTROL OF ODOURS AND CORROSION IN SEWERS **Abstract No. 161**			

1215 - 1315 — Lunch

1315 - 1515	**Non Conventional Systems** **Chair:** Darryl Day, Power and Water Corporation, NT **Assistant Chair:** Matthew Renshaw, AECOM, NSW **Session Code: 50**	**Sustainable Decision Making** **Chair:** Cilla deLacy, Water Services Association of Australia, **Assistant Chair:** Assistant Chair: Lauren Dragicevich, AECOM, NSW **Session Code: 51**	**Climate Change - Impacts and Adaptation** **Chair:** Liz Floyd, Bayside Personnel, NSW **Assistant Chair:** Mukhlis Mah, University of New South Wales, NSW **Session Code: 52**	**Water for Irrigation / Water Markets** **Chair:** Barry Sanders, AWA Past President, WA **Assistant Chair:** Zenah Bradford-Hartke, University of New South Wales, NSW **Session Code: 53**	**Wastewater Treatment** **Chair:** Grahame Simpson, Queensland Urban Utilities, QLD Assistant Chair: Juan Pablo Alvarez, University of New South Wales, NSW **Session Code: 54**	**Stormwater Management** **Chair:** Tim Summers, AECOM, NSW **Assistant Chair:** Bei Wang, University of New South Wales, NSW **Session Code: 55**	**Reticulation and Collective Systems** **Chair:** Mark Trembath, Xylem - Water Solutions, NSW **Assistant Chair:** Chitwan Jawanda, Sydney Water, NSW **Session Code: 56**	**Water Quality Research Australia presents:** What's bugging you? – The emergence of Pathogen X **Facilitator:** Jan Bowman, Principal, Janette Bowman Consultancy, Melbourne,VIC **Session Code: WS16**	**National Water Commission presents:** Australia's Groundwater Challenge – past, present, future **Facilitator:** Adam Sincock, Senior Manager Groundwater, National Water Commission, ACT, Australia **Session Code: WS14**	**IWA Cities of the Future Working Group presents:** Cities of the Future: From principles to best practice **Session Code: WS15**
1320 - 1345	**Rob Salisbury, Manidis Roberts, NSW** COMPLEX, SMART, SUSTAINABLE: THE GOOGONG TOWNSHIP INTEGRATED WATER CYCLE **Abstract No. 162**	**Kate Miles, AECOM, NSW and Clint Cantrell, AECOM, NEW ZEALAND** AN EFFICIENT AND EFFECTIVE WASTEWATER OVERFLOW FRAMEWORK FOR THE AUSTRALIAN WATER SECTOR **Abstract No. 166**	**Greg Greene, Sydney Catchment Authority, NSW** CLIMATE CHANGE IMPACT ASSESSMENT - THE SYDNEY CATCHMENT AUTHORITY'S APPROACH **Abstract No. 170**	**Bronwyn Puttyfoot, ALS, VIC** THE IMPACT OF WASTEWATER IRRIGATION ON SOILS IN THE ACT **Abstract No. 174**	**Alice Connell, TRILITY, SA** CONTROLLING AN ENVIRONMENTAL NUISANCE: ODOUR **Abstract No. 178**	**Alexa McAuley, Equatica, NSW** ARE WASTEWATER OVERFLOWS A SIGNIFICANT CONTRIBUTOR TO URBAN WATERWAY POLLUTANT LOADS? **Abstract No. 182**	**Bei Wang, University of New South Wales, NSW** VOLATILE ORGANIC COMPOUND (VOC) EMISSIONS FROM SEWER NETWORKS IN SYDNEY **Abstract No. 186**	**Jan Bowman, Principal, Janette Bowman Consultancy, Australia** WELCOME AND RULES OF ENGAGEMENT • **Dr Joan Rose, Homer Nowlin Chair of Water Research, Michigan State University, Michigan, USA** • **Dr Mark O'Donohue, CEO, Australian Water Recycling Centre of Excellence, Brisbane, Queensland, Australia** • **Dr David Cunliffe, Principal Water Quality Advisor, SA Health, Adelaide, SA, Australia** • **Dr Martha Sindair, Senior Research Fellow, Monash University, Melbourne, Victoria, Australia** • **Dr Andrew Bath, Manager, Water Quality Operations, Water Corporation, Leederville, WA, Australia** • **Mr Phil Callan, Principal Executive Officer, NHMRC, Canberra, ACT, Australia** PANEL DEBATE AUDIENCE Q&A	**SESSION 2: RISING TO THE GROUNDWATER CHALLENGE – EMERGING PRIORITIES AND FUTURE DIRECTIONS** **Craig Simmons, National Centre for Groundwater Research and Training (NCGRT), SA** BUILDING GROUNDWATER CAPACITY **Peter Baker, Chief Scientist, DSEWPAC, Australia** MINING AND COAL SEAM GAS **Tony Boston, Bureau of Meteorology, ACT** NATIONAL GROUNDWATER INFORMATION SYSTEM **Peter Hyde, Murray-Darling Basin Authority (MDBA), Australia** GROUNDWATER UNDER THE MURRAY-DARLING BASIN PLAN PANEL DISCUSSION/ Q&A **Chris Davis, Commissioner, NWC, Australia** SUMMARY AND CONCLUDING REMARKS	This workshop will explore the urban water governance, collaboration, engagement, decision making and master planning strategies that have been used in cities that have implemented these principles. Workshop participants will hear from panel speakers and be actively involved in: 1. Bringing together examples of what has, and has not, worked in implementing integrated water management in Australian and international cities, and 2. Using these examples to benchmark best practice. The workshop outcomes will contribute to best practice guidelines for urban planners and water managers that will be presented at the 2012 IWA World Water Congress in Korea as a part of the IWA's Cities of the Future program. This workshop is hosted by the IWA Cities of the Future working group and is supported by Melbourne Water and GHD.
1350 - 1415	**Liz Pattison, Parsons Brinckerhoff , WA** WATER QUALITY MANAGEMENT FOR REMOTE INDIGENOUS COMMUNITIES **Abstract No. 163**	**Toby McGrath, KBR, QLD** NATURAL ASSET MANAGEMENT PLANS: A NEW APPROACH TO PROTECT DRINKING WATER QUALITY **Abstract No. 167**	**Sabir Hussain, University of South Austalia, SA** QUANTIFYING THE IMPACT OF CLIMATE CHANGE ON WATER QUALITY IN THE LOWER RIVER MURRAY, SOUTH AUSTRALIA: A CASE STUDY (1997-2010) **Abstract No. 171**	**Robran Cock, TRILITY Pty Ltd, SA** WASTEWATER REUSE SCHEMES: A CASE FOR A HORSES FOR COURSES APPROACH TO TECHNOLOGY AND CONTRACTING **Abstract No. 175**	**Michael Short, The University of NSW, NSW** APPLICATION OF A NEW MICROARRAY TOOL FOR OPTIMISING PROCESS PERFORMANCE OF ACTIVATED SLUDGE **Abstract No. 179**	**John Tetteroo and Vijesh Chandra, GHD Limited, NEW ZEALAND** WORKING TOWARDS A BEST PRACTICE MODEL FOR AUCKLAND TRANSPORT'S ROAD STORMWATER NETWORK **Abstract No. 183**	**Vincent Pilot, Parsons Brinckerhoff Australia, WA** THE USE OF CAISSON TANKS FOR WASTEWATER EMERGENCY STORAGE AT CONSTRAINED SITES **Abstract No. 187**			
1420 - 1445	**Sean Tucker, GHD Pty Ltd, VIC** SEWAGE PRESSURE PUMP OPTIMISATION: THE GENESIS OF AN INTEGRATED DECENTRALISED PRESSURE SERVICING SYSTEM **Abstract No. 164**	**Glenn Wilson, Yarra Valley Water, VIC** INTEGRATED WATER MANAGEMENT PLANNING IN MELBOURNE, AUSTRALIA - MANAGING COMPETING OBJECTIVES **Abstract No. 168**	**Shane Ruschiensky, SKM, NSW** BATHURST CLIMATE CHANGE AND WATER SECURITY PLAN - CONSULTATIVE INTEGRATED RESOURCE PLANNING **Abstract No. 172**	**Scott Lawson, GHD, ACT** GROUNDWATER TRADING - WHAT'S THE BIG DEA ? **Abstract No. 176**	**Anub Nair, RMIT, VIC** INHIBITION OF ANIONIC AND NONIONIC SURFACTANTS TO ACTIVATED SLUDGE OXYGEN UPTAKE RATE **Abstract No. 180**	**Lan Dinh, City West Water, VIC** STORMWATER QUALITY SAMPLING FOR EFFECTIVE SCHEME MANAGEMENT **Abstract No. 184**	**Paul Edwards, Urban Water Solutions, VIC** DESIGNING MORE EFFICIENT PRESSURE SEWERS **Abstract No. 188**			
1450 - 1515		**Lee Forbes, KBR, USA** NATURAL CHANNEL DESIGN - A CASE FOR A NEW PARADIGM IN OPEN CHANNEL MANAGEMENT STRATEGIES FOR AUSTRALIA **Abstract No. 169**	**Stuart Khan, University of New South Wales, NSW** WATER QUALITY IMPACTS OF EXTREME WEATHER-RELATED EVENTS: FINDINGS FROM AUSTRALIA **Abstract No. 173**	**Joel Byrnes, AECOM, VIC** WATER OPTIONS CONTRACTS - BRINGING IRRIGATORS AND ENVIRONMENTAL MANAGERS TOGETHER **Abstract No. 177**		**Faisal Ahammed, University of South Australia, SA** APPLYING WSUD PRINCIPLES TO MANAGE STORMWATER IN DHAKA, BANGLADESH **Abstract No. 185**	**Ali Torbaty, Parsons Brinckerhoff, NSW** MODELLING OF AIR TRANSPORT VIA SEWER DROP SHAFTS **Abstract No. 189**			

1515 - 1630 — Closing Session, Bayside Auditorium B

1515 - 1600 — **Mary Ann Dickinson, President and CEO, Alliance for Water Efficiency, USA**
WATER EFFICIENCY IN NORTH AMERICA: THE GOOD, THE BAD AND THE UGLY. **Abstract No. KEY08**

1600 - 1630 — CLOSING CEREMONY

1630 — Farewell Drinks, Bayside Foyer, Level 1

PROGRAM – THURSDAY