North East Victoria Adapting to a low water future phase 3:

Social response skills gaps and training needs analysis

FINAL REPORT

Wodonga Institute of TAFE

Centre for Sustainable Skills

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Prepared for the North East Greenhouse Alliance

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EXECUTIVE SUMMARY

The North East Greenhouse Alliance (NEGHA) has identified the development of a climate change adaptation strategy as one of its key priority areas. The NEGHA recognises that the region requires careful planning and risk assessment to ensure Local Government and Water Authorities are resilient and have the capabilities to deal with climate change with respect to strategic planning and management of our water resources.

This report is part of the broader project "North East Victoria – Adapting to a Low Water Future" and aims to provide a skills gap and training needs analysis for the NEGHA partners within North East Victoria - Local Government (Alpine Shire, Indigo Shire, Towong Shire, City of Wodonga), Water Authorities (Goulburn-Murray Water (G-MW), North East Water (NEW)) and the North East Catchment Management Authority (NECMA). The overarching objective of this project is to provide the NEGHA partners with strategies and recommendations in terms of skills, knowledge, capacity and training that address the changing capability requirements to meet the effects of climate change on our water resources

The NEGHA partners charged with implementing Federal and State Government policy and legislation for strategic planning and management of our water resources are the Water Authorities and, to a lesser extent, the Catchment Management Authority. Local Government also play an important role (e.g. Water Sensitive Urban Design (WSUD)), though their scope for influencing strategic planning and management of our water resources is far less prescribed than the other NEGHA partners. All NEGHA partners respond to the impacts of climate change on our water resources and this is a significant issue as it diverts resources away from other organisational activities.

Our research identified a number of external and internal factors that will have an impact on knowledge, skills, capabilities and training requirements for the NEGHA partners. However, the impact of these factors varies for the NEGHA partners in keeping with the varying roles and responsibilities of these organisations with respect to strategic planning and management of our water resources. The NEGHA partners will need to consider macro environmental factors and emerging trends in their respective industries to ensure their capacity is maintained and enhanced. These include:

- Climate change;
- Water shortages;
- Extreme weather events;
- Projected future shortages of skills and capabilities within the water sector;
- Changing legislative and policy environments and continuous improvement;
- Workforce planning issues; and
- Recruitment and retentions issues.

Recruitment and retention issues were expressed as a particular concern for the NEGHA partners with respect to attracting people with specialised skills to regional areas.

Major challenges and trends affecting skills and training needs include workforce decline, emerging skills gaps, fragmentation of training gaps and impending retirement of large cohort of the workforce. A number of current and emerging skills gaps identified include technical skills, broad multi-disciplinary environmental/sustainability/natural resource management skills, keeping abreast of developments in science and technology, and WSUD.

An extensive training scan revealed that North East Victoria is serviced well by the education sector offering a wide scope of flexible delivery modes. Some training opportunities the NEGHA partners may consider are now available fully online to limit the impact of that training barrier. Cost as a training barrier may be overcome if NEGHA partners seek relevant funding either individually or as a cohort.

Generally, the NEGHA partners for this project are managing their current knowledge, skills and trainings needs adequately with respect to the impact of climate change on our water resources and their strategic planning and management. However, the findings of our research indicate that the NEGHA partners should consider building knowledge and skills to ensure they are prepared for the challenges in a changing water future.

We recommend the following strategies for the NEGHA partners to respond to the changing climatic environment with respect to the strategic planning and management of our water resources:

- Add broad skills in natural resource or environmental management and/or sustainability throughout the organisation, but particularly at higher levels within the organisation;
- Working more closely with the tertiary sector to address the reported lack of development in appropriate training and education opportunities; and
- Regular interaction within Departments and between the NEGHA partners to ensure additional continuity and resilience in the North East Victoria region i.e. sharing knowledge and skills.

These strategies will ensure the NEGHA partners have the capacity to:

- Identify the knowledge and skills needed within their organisation for both staff and contractors;
- Keep abreast of new developments, knowledge and technology; and
- Think critically and responsively with respect to water resource management and planning.

Given these findings, there is strong merit in the NEGHA partners instigating a collaborative mechanism that might be known as ‘Water Skills Training Centre’ to effectively coordinate and/or deliver training for skills in strategic planning and management of our water resources in a changing climatic environment.

In lieu of a Water Skills Training Centre, we recommend the creation of a training co-ordinator role for water planning and management in the North East. This role would be located centrally in the North East and perform the following functions:

- Collaborate with local government natural resource managers/strategic planners/human resource staff to identify training needs and opportunities;
- Work alongside NEGHA partners to address training gaps and barriers;
- Liaise with the education sector to deliver relevant and accessible training programs;
- Coordinate combined training/skills and knowledge sharing activities;
- Identify emerging technological trends in water management and plot strategies to assess relevance for the region;
- Coordinate water or sustainability training/workshops as deemed necessary; and
- Seek funding to support the above.

The existence of a Water Skills Training Centre and/or a coordinator may also enhance the capacity of the region to attract and retain staff. Funds to assist the NEGHA partners to establish either a Water Skills Training Centre or coordinator role may available through Federal (e.g. Water for the Future) or State (e.g. Victorian Water Trust) programs. These funding opportunities may also be considered by the NEGHA partners as an opportunity to work more closely with the tertiary education sector by applying for funds in partnership.

INTRODUCTION

Project background:

The North East Greenhouse Alliance (NEGHA) has identified the development of a climate change adaptation strategy as one of its key priority areas. The project "North East Victoria – Adapting to a Low Water Future" aims to investigate the potential impacts of climate change in North East Victoria, inform the community of expected impacts on the region, and provide strategies and solutions towards climate change adaptation. The three phases of the project are:

Phase 1: Project Context Setting – Understanding Climate Change Impacts

Phase 2: Climate Change Risk Assessment and Adaptation Planning

Phase 3: Development and Delivery of Practical Solutions

This report forms part of Phase 3, a skills gap and training needs analysis for the NEGHA partners: Local Government (Alpine Shire, Indigo Shire, Towong Shire, City of Wodonga), Water Authorities (Goulburn-Murray Water (G-MW), North East Water (NEW)) and Catchment Management Authorities (North East Catchment Management Authority (NECMA)) within the region. It should be noted that Rural City of Wangaratta declined to participate in this project. The need for an analysis of skills gaps and training needs within North East Victoria in response to climate change arises from the recognition that climate change is likely to have a significant impact on the local economy, community health and viability, and the natural environment. (See Appendix 8 for an overview of expected climate change impacts for North East Victoria).

The key stakeholders addressed in this report are:

- Local Government staff and executives in the area of strategic and statutory planning, human resource planning, economic development, community development; sustainability & environment, infrastructure & engineering, and risk management;
- Relevant Authorities (G-MW, NEW and NECMA) staff who have a direct role in planning and managing water resources or in dealing with planning and emergencies in relation to storms and flooding; and
- Staff dealing with urban and/or rural water resource issues as well as on-ground water managers including environmental water managers.

The skills considered in this report are those focuses upon addressing climate change adaptation for strategic water resource planning and management.

Project objectives:

The NEGHA recognises that the region requires careful planning and risk assessment to ensure Local Government and Water authorities are resilient and have the capabilities to deal with climate change with respect to strategic planning and management of our water resources. The National Water Skills Audit (ICEWRM, 2008) states that one of the issues affecting the water industry today is "Changing capability requirements to meet the emerging demands of climate change...". Climate change and associated water shortages, water quality issues and extreme weather events are likely to have a significant impact on the role of these organisations in land use planning, maintaining biodiversity, maintaining local infrastructure, emergency response and community services and health. Municipalities are ideally located to respond to regional challenges and develop a tailored plan for adapting to climate change. By developing an adaptation plan, Local Government and Water Authorities will be actively contributing toward creating resilient and sustainable communities in North East Victoria. A key requirement of developing adaptation plans is the identification of skills gaps within organisations for strategic planning and management. This will enable effective responses in dealing with climate change impacts on our water resources in the region. The availability of appropriate and responsive training within the region to address these skills shortages is critical in developing strategies and recommendations for building local capacity.

The overarching objective of this report is to provide the basis, in terms of skills, knowledge, capacity and training, to implementing a holistic/whole of system approach to strategic water resource planning management. That is, in the context of policies and processes for the NEGHA partners, this report holds a clear focus on planning for sustainable outcomes. The report aims to provide the NEGHA partners with strategies and recommendations to address the changing capability requirements needed to meet the challenges of climate change on our water resources.

Project methods:

As prescribed by the tender document, the content, methodologies and conclusions of the *Government Skills Australia Environmental Scan (2011)* were considered in developing the proposed work plan and methodologies for this project. These are outlined as:

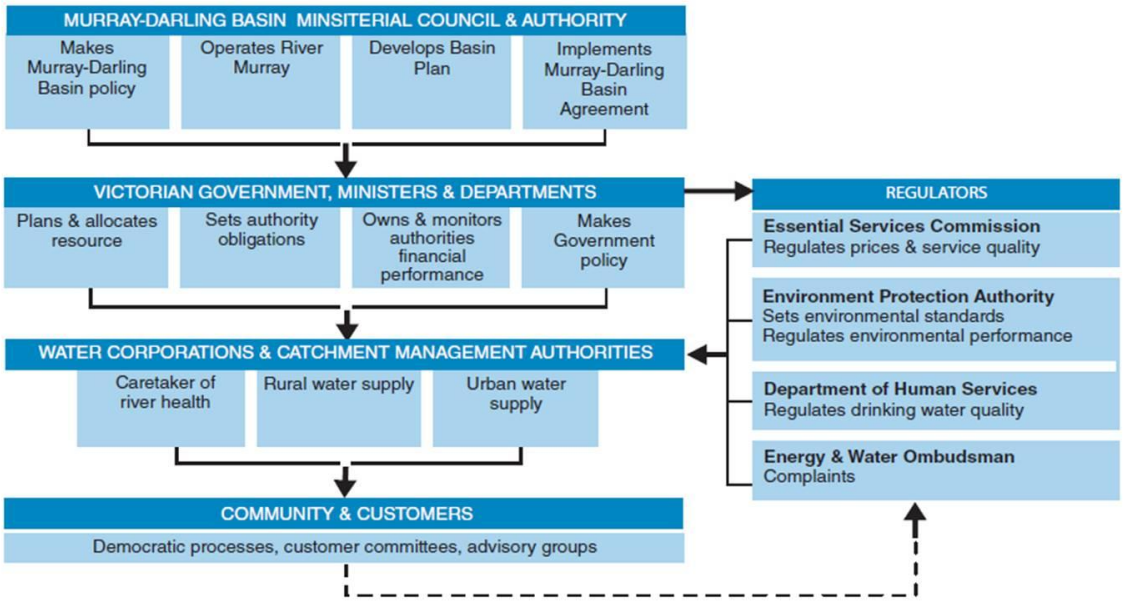
1. **Research and data collection** to ensure current knowledge and understanding of the NEGHA partners with respect to their roles and responsibilities in strategic water resource management and planning. This included the consideration of macro-environmental factors and drivers of change, which impacts skills and training both internal and external to the agencies.
2. **Identify the current, short-term** (up to 3 years) and **medium-term** (up to 10 years) skills and workforce development needs of the NEGHA partners with respect to their capacity to address the impacts of climate change on our water resources for strategic planning and management roles
3. **Identify the availability of training and gaps** in training packages and accredited courses (including their delivery and assessment mode), barriers to the uptake of currently available training and strategies to address these as well as additional opportunities for training
4. **Recommend improvements and strategies** that will allow NEGHA partners to achieve a workforce with high-level skills and capacity to respond appropriately and effectively to the impacts of climatic change and water shortages on strategic planning and management of our water resources.

Consultation methods included one-on-one interviews, an online survey (see appendix) and a workshop with the NEGHA partners. While there were few respondents to the online survey and few attendees at the workshop, one-on-one conversations with the NEGHA partners proved fruitful and were increased to allow sufficient data to be collected to achieve the outcomes of this project. Comments on the draft report also allowed additional data collection and contributed to final recommendations.

ROLES AND RESONSIBILITIES OF THE NEGHA PARTNERS

The statutory implications of Federal and State Government Department policy and the broad roles and responsibilities of the NEGHA partners in this project charged with strategic planning and management of our water resources may be summarised in the flow chart from the Victorian Department of Sustainability and Environment's (DSE) 2009 publication *Northern Region Sustainable Water Strategy*, below:

Figure 10.1 Roles and responsibilities in water resource management



Clearly, the key NEGHA partners charged with implementing Federal and State Government policy and legislation for strategic planning and management of our water resources are G-MW, NEW and NECMA. Local Government also play an important role, though their scope for influencing strategic planning and management of our water resources is far less than the other NEGHA partners in this project. However, Local Government do have some strategic planning and management roles with respect to water resources in their planning role e.g. Water Sensitive Urban Design (WSUD). The report *North East Victoria – Adapting to a low water future: Review of municipal documents* (Martin, 2011) and Appendix 2 provide more detail on the roles and responsibilities of the NEGHA partners.

INFLUENCE OF MACRO ENVIRONMENTAL FACTORS ON KNOWLEDGE AND SKILLS REQUIREMENTS

Research undertaken by the Water Services Association of Australia (WSAA, 2008) identified the following macro environmental factors and drivers of change as potentially having an impact on skills, capabilities and training requirements:

- Climate change;
- Alternative approach to water supply;
- Infrastructure renewal;
- Possible institutional reform; and
- Potential fiscal constraints for increased capital expenditure

This is consistent with our finding with respect to the NEGHA partners' responses to the survey for this report that rated water shortages and extreme weather events only as being either "important" or "extremely important" in their impact on skills and training requirements. Infrastructure issues, institutional reform and fiscal constraints particularly with respect to responding to extreme weather events were also raised by the NEGHA partners in the course of our research.

While it is difficult to separate these drivers of change given they are inherently linked, we will discuss our research findings with respect to skills issues for climate change, water shortages and extreme weather events, below.

Climate change

Climate change and its associated impacts will increasingly impact on the function of all NEGHA partners. For example, legislation and policy which drives the activities of the Water Authorities is undergoing major changes to take into account future challenges of climate change. Furthermore, the broader impacts of climate change such as drought, heatwaves, floods and bushfires, have direct implications for all NEGHA partners given their roles in responding to emergencies and infrastructure issues.

The Department of the Environment, Water, Heritage and the Arts (DEWHA) *National Water Skills Strategy* (DEWHA, 2009) is based on an audit of national skills shortages within the water sector undertaken by the International Centre of Excellence in Water Resources Management (ICEWRM, 2008). This report notes the challenge in addressing future skills needs within the water sector as a result of the "emerging demands of climate change,

environmental management, new technologies and the multidisciplinary nature of sustainable water management" (DEWHA, 2009, p 4). Similarly, Government Skills Australia (GSA) (the Industry Skills Council (ISC) that covers the NEGHA partners' industry skills i.e. the water industry and local councils) note in their *Environmental Scan* that "Local councils increasingly seek workers skilled in environment management and sustainability in order to deliver sustainable services, such as waste and recycling management, public works maintenance and construction, and management of water resources" (GSA, 2011; p 6). The *Environmental Scan* goes on to state that the new focus on climate change in government policy and guidelines and green skills will lead to an increased need for knowledge, skills and experience in addressing environmental issues, and to "introduce a stronger culture of sustainability" (GSA, 2011, p 6).

Water shortages

There is widespread recognition amongst the NEGHA partners that issues with water shortages affect organisations as a whole and are not the sole responsibility of one employee. The implications of water shortages are far-reaching and need to be considered when the NEGHA partners strategically plan for and manage our water resources within their jurisdiction.

The Northern Region Sustainable Water Strategy identifies climate change and variability as the biggest threats to water availability in our region (DSE, 2009). It is not surprising then that the largest single influencing factor on the development of procedures and management plans in Water Authorities has been the recent drought. This has led to a greater interest and reliance on groundwater as a source of irrigation and stock and domestic supply for communities within the North East Victorian region, which may have implications for surface water supply and the available knowledge and skills to address these hydrological interactions. Our research found that the responsible authorities had the capacity to address the impacts of groundwater extraction on surface water supply within the bounds of the current knowledge. However, it will be important to keep abreast of emerging knowledge in order to ensure decisions lead to the best outcomes for the region.

Extreme weather events

The NEGHA partners are concerned about the operational impact of extreme weather events such as recent floods in the region. Extreme weather events are often overlooked in planning and existing infrastructure is currently unable to cope with these extreme weather

events. In some areas, heritage listings make it difficult to update infrastructure. Mention was made during the workshop that councils may be able to more effectively harvest water during extreme weather events with revised water catchment infrastructure. Extreme weather events need to be considered in planning since emergency management and other responses to these events often take resources away from other aspects of the operations of the NEGHA partners. These findings suggest that skills and knowledge in risk management and best-practice with respect to planning and renovation of existing infrastructure will be required by the NEGHA partners to address these issues effectively.

IMPACT OF INDUSTRY FACTORS ON SKILLS AND KNOWLEDGE REQUIREMENTS

The following emerging industry sector trends will have a direct bearing on the skills and knowledge requirements and workforce development for the NEGHA partners. These issues have been identified through research and consultation with the NEGHA partners and include recruitment issues and retention issues. Other factors noted by the NEGHA partners as industry influences were changing environments, continuous improvement and workforce planning issues. However, not all agencies agreed on the degree of these influences within their organisations. A number of reports also discuss these issues. While these issues are inherently interrelated, the findings of our research are outlined below in sections related to water sector growth and projected demands, changing environments and continuous improvement, workforce planning issues, recruitment and retention issues.

Water sector growth and projected demands

Future shortages of skills and capabilities within the water sector are predicted to arise from the anticipated retirements of an ageing workforce and increased demand for skilled workers in this sector, according to the *National Water Initiative* (ICEWRM, 2008). The *National Water Skills Audit* (NWSA) estimates that the whole Water Sector will employ up to 100,000 by 2018, an increase of 40,000 from 2008 numbers potentially leading to workforce shortages (ICEWRM, 2008). The WSAA projects similar workforce shortages for the urban water industry, estimating a gap of 44 % of the existing workforce by 2017 (a shortfall of 8,600 employees) (WSAA, 2008). This large increase in demand for skilled water industry professionals including those involved in strategic planning and management is likely to put pressure on tertiary education providers. However, ICEWRM (2008) also notes that the tertiary education sector is currently not well equipped to deal with the anticipated increase in demand somewhat as a result of altered public policy that has led to low investment in curriculum development recently (ICEWRM, 2008). This has impacted on the ability of the water sector to replace skills possessed by the retiring cohort of workers as well as the development of skills needed across a broad range of disciplines (ICEWRM, 2008). This concern was not explicitly expressed by the NEGHA partners, although projected workforce demands with respect to strategic planning and management of our water resources in a changing climatic and institutional environment was expressed more generally and was considered a workforce planning issue. However, given the potential impact of this issue,

NEGHA partners could consider working more closely with the tertiary sector to address the reported lack of development in appropriate training and education opportunities.

Changing environments and continuous improvement

Changing environments and continuous improvement, such as new policy and legislation, Local Government reform, organisational change, and proposed mergers all have an impact on an organisation's ability to develop the skills and capacity needed to adapt to climate change. The GSA *Environmental Scan* indicates that high levels of change within the management of organisations as part of their continuous improvement strategies can lead to uncertainty, fear and low morale (GSA, 2011). It identified a number of organisations within Local Government and the Water Industry that were proposing mergers or restructuring. Such changes can divert resources among the NEGHA partners and limit their capacity to respond to climate change issues and impacts. Given these impacts are generally imposed on an organisation, knowledge and skills in critical analysis and risk management may enhance the capacity of the NEGHA partners to respond to these challenges.

Workforce planning issues

Organisations need to be able to meet future human resource demands based on forecast workforce gaps in skills and capacity (guided by an organisation's strategic objectives). While many organisations may be able to adequately determine future human resource requirements, these forecasts are usually quantitative and lack detailed knowledge of the types of skills and knowledge required to meet future strategic objectives (GSA, 2011). Organisations therefore need the skills and knowledge, preferably at senior management level, to be able to identify their future skills and knowledge requirements. These would then drive the training needs of the organisation. The NEGHA partners expressed confidence in their capacity in workforce planning generally. However, as noted above, skills and knowledge in critical analysis and risk management may assist organisations to respond rapidly to changing industry environments.

Recruitment issues

The process of attracting, selecting and contracting an appropriately skilled workforce is critical for an organisation's ability to meet forecast human resource needs and adapt to the challenges of climate change. Recruitment of professionals with highly specialised skills such as strategic water planning and management are particularly difficult to attract to regional areas. Furthermore, the WSAA reports that there are issues with recruiting people into the urban water industry because of a lack of people with generic degrees (e.g. science and engineering) and specialised skills relevant to the management of water utilities (WSAA, 2008). Furthermore, many organisations have difficulty in striking a balance between recruiting people who already have the required skills and developing a current employee's skill-base within the organisation (WSAA, 2008). However, whether organisations are recruiting or choosing to upskill their staff they may have difficulty finding the appropriate person or education opportunity as a result of the decline in popularity of science and mathematics at school and the lack of water-specific units within generic qualifications to meet skills gaps within the water sector (ICEWRM, 2008). The NEGHA partners noted that this is particularly relevant to them in a regional area where the availability of appropriately skilled staff can be limited, particularly in the smaller towns.

Retention issues

The retention of employees due to an ageing workforce within the water sector is broadly seen as a critical issue in meeting future skills and capacity needs. In addition to this, the NEGHA partners mentioned staff movements to different roles within their own organisation and also between organisations; however this was seen to be a benefit because of the shared knowledge, skills and network creation.

The GSA *Environmental Scan* notes that the Water Skills Taskforce predicted higher than average retirement rates in the near future due to one third of the water industry being aged over 50 (GSA, 2011). Furthermore, retention of young professionals in the public sector was difficult, as they were often 'poached' by the private sector (WSAA, 2008).

Other issues in retaining employees include flexible management and human resource systems, career opportunities and movement within the industry. Employees may leave organisations due to low morale, based on; feeling under-valued, a lack of task variety, sense of poor workplace connectivity and concerns over career development (GSA, 2011).

Organisations generally perform exit interviews poorly, whereas they should be seen as opportunities to seek information about potential organisational improvements (GSA, 2011).

There is little doubt there is a strong connection between each of these factors affecting workforce planning and development. The changing climate and its effect on water availability (and extreme weather events) places extra demand on the skills of staff to plan and respond. Therefore, it is evident that organisations must continue to incorporate creative strategies that address the drivers for people leaving the organisation. Additionally, NEGHA partners must further explore ways to both incorporate mechanisms to upskill staff and engage in the broader development of education and training. Strategies include working more closely with the tertiary education sector and knowledge and skills in critical analysis and risk management.

TRAINING OVERVIEW AND BARRIERS TO TRAINING

Strategic planning and management of water resources in the face of the predicted changes that will occur with climate change may require higher-level knowledge and skills. Census data from 2006 on the qualifications of those within the water supply industry suggests that 67 % of professionals, 55 % of managers, and less than 10 % of technicians and tradespeople within the industry had a Bachelor Degree (ICEWRM, 2008). This report goes on to suggest there will be a need for some 11,404 additional water sector workers with at least Bachelor level degrees – 6632 of whom will need to be engineer professionals (see Appendix 12).

This sets a significant challenge for the NEGHA partners. There is a clear need to ensure the new employees to the strategic water planning and management roles are adequately skilled to meet the emerging water challenges associated with climate change. An overview of our research findings on the existing situation within the NEGHA partner organisations with respect to current skills and knowledge to address these challenges is given, below.

Training overview

Water Authorities

Water Authorities in the North East region (NEW and G-MW) are the lead agencies charged with strategic planning and management of our water resources as directed by Victorian State Government policy and legislation (e.g. *Our Water Our Future* (DSE, 2004)*, Northern Region Sustainable Water Strategy* (DSE, 2009)). Thus, these agencies along with DSE are the responsible authorities to accommodate the impacts of climate change on strategic water resource planning and management.

In light of their statutory role, it is not surprising that these organisations have knowledge and skills within to address the impacts of climate change on strategic planning and management for ground and surface water resources. For example, the required formal qualifications for a Water Resource Officer whose role is delivering sustainable water resource planning and management outcomes may include a Bachelor Degree in disciplines such as hydrogeology, natural resource management, environmental engineering or geology. Applicants for a Water Resource Officer position must also be able to demonstrate

knowledge and a technical understanding of water resource management principles. In addition to State Government policy and legislation these Authorities have developed their own internal approaches to adapting to the new and emerging environment including the impacts of climate change. For example, groundwater appraisals in G-MW now take into account the impacts of climate change. Furthermore, these organisations are providing technical advice and using management planning tools such as restrictions and trading to assist their internal and external stakeholders to meet the predicted future challenges. These functions include community consultation and skills to adequately address this activity will also be needed within these roles.

North East Catchment Management Authority

The NECMA has statutory responsibility to look after river health, which impacts on water quality so they have a significant role to play with respect to strategic planning and management of water resources, although more indirect than direct as is the case for the Water Authorities. For this reason, NECMA do not have extensive knowledge and skills specific to the strategic planning and management of water resources with respect to the impacts of climate change in-house with the exception of the Environmental Water Resources Officer. NECMA report that they contract additional skills in if required and where funds allow.

Given the organisation's broader role of looking after the region's natural resource base, the formal knowledge and skills within the organisation tend to Bachelor Degrees in Environmental Science and Natural Resource Management. These undergraduate degrees ensure a number of staff in the organisation have a good conceptual understanding of the biophysical world including the water and carbon cycles, environmental protection, weather influences, disturbance and resilience theories, natural resource condition assessment and monitoring.

There are other knowledge domains and skills within the NEGHA partners that could be considered relevant to the capacity to plan and manage for the impacts resulting from climate change. These include risk assessment, scenario planning, adaptation planning and implementation and there are some position descriptions within the organisation that are prescriptive with respect to these skills. However, others are more general in nature, for example, the tertiary qualifications as outlined, above. Communication, education and capacity building are other skills that could be considered important for assisting stakeholders to meet the predicted future challenges.

Local Government

Strategic planning and management of water resources within Local Government is largely restricted to strategies such as incorporating Water Sensitive Urban Design into planning. The Melbourne Water website (2011) suggests Water Sensitive Urban Design is an integrated approach to stormwater management and includes strategies that will:

- Protect natural river systems within urban developments;
- Integrate stormwater treatment into the landscape;
- Protect the water quality of receiving waterways and bays by removing pollution close to its source;
- Locally manage rainwater as it flows from the land to reduce the need for big infrastructure projects downstream; and
- Reduce the overall cost of drainage infrastructure (Melbourne Water, 2011).

In general, Local Government in our region do not have these skills in-house and prefer to contract any skills requirements with respect to planning and management of water resources. This is not surprising given that Local Government do not play a lead role in the strategic planning and management of our water resources and they are unlikely to be able to employ a person solely for this role. However, this then raises the question of whether or not the organisation possesses the skills and knowledge in-house to know what skills and knowledge are required in contractors to achieve the organisation's goals with respect to strategic planning and management of water resources. Some Local Governments in our region feel they do possess these skills, for example the natural resource management knowledge, but certainly not all the Local Government bodies involved in this study expressed such confidence. Indeed some expressed an awareness that where those skills do exist in-house, they may sit with only one person, leaving the organisation vulnerable to a skills and knowledge deficit should that person leave.

Various local government representatives also reflected on the challenge of integrating strategic water planning and management across departments. If various departments in the organisation are adequately integrated during the planning process then the required skills and knowledge within the organisation for water planning and management are more likely to be accessible at the time when they have the most to contribute, which will, in turn, lead to improved outcomes.

There is a general view that whilst formal qualifications were an important consideration during recruitment, Local Government agencies are more interested in skill sets. To augment the existing skills sets and qualifications there was a preference to select only relevant units for training rather than completing an entire qualification. This is in agreement with the NWSA, which found that water-specific qualifications are seen as an

important requirement for new professional employees within the water sector, with more than half of survey respondents citing this to be a requirement. Water specific experience, on the other hand, is seen by the majority of survey respondents (92 %) to be required by new professional employees.

Finally, Local Government agencies in our region were concerned that lack of resources limited their capacity to plan and manage water resources. Resources that were considered lacking include human resources (i.e. people to do the work) and financial. Resource limitations commonly arose because of the need to move existing resources to emerging priorities such as flood response.

Training barriers

The survey conducted for this report asked respondents to choose which barriers there may be within their organisation to undertaking training. Respondents noted cost of training, no time and availability of training as barriers to training within their organisations. It was also noted that there is a significant organisational cost to backfill roles whilst staff take leave to attend training. Our research also recognised the challenge of the NEGHA partners that are largely dependent upon external funding sources. Cost of training is particularly a barrier for these organisations since it involves diverting financial resources to training - a complex and lengthy process.

The NEGHA partners involved in the workshop also noted the lack of awareness of training opportunities and Recognition of Prior Learning (RPL) as barriers to undertaking training or ensuring skills are formally recognised. It was noted that the NEGHA partners are unclear what options exist for up-skilling in skills related to water operations, and strategic planning and management. At various stages during the workshop it was suggested that it was critical for senior management and others within the NEGHA partner organisations to hold or seek broad natural resource management and sustainability skills. Such an eventuality would help drive organisational up skilling to address the strategic planning and management of our water resources in a changing climatic environment.

Preferred training methods

The survey conducted for this report asked respondents to choose which training methods they prefer within their organisations. Respondents suggested classroom/workshop activities and on-the-job training as preferred methods of training within their organisations. Participants in the workshop also expressed a preference for flexible approaches to training. To effectively meet the different requirements of individual organisation, the unique requirements of the content and compliance issues we recommend that training should be a combination or selection of the following delivery modes:

- Face-to-face;
- On-the-job;
- Workshops; and
- Fully online (distance education).

IDENTIFIED WORKFORCE TRAINING NEEDS - CHALLENGES, SKILLS GAPS AND OPPORTUNITIES

Overview

As part of the NEGHA's Understanding Climate Change Impacts project, URS Corporation conducted research with focus groups on the understanding and awareness of climate change of key stakeholders (including tourism, business, agriculture and communities) in North East Victoria (URS, 2007). Stakeholders generally agreed that the skills currently exist to successfully adapt to climate change. However, our findings and those of the NWSA (ICEWRM, 2008) and WSAA (WSAA, 2008) surveys do not fully support the finding of URS Corporation (URS, 2007). In terms of workforce capacity, these surveys both project an additional 26,000 employees are needed by the water sector over the ten years from the time of publication of the reports (i.e. to 2018). Of those, more than 11,000 water industry sector professionals are projected to require a Bachelor Degree, while the remainder would require a Certificate III, Certificate IV (CIII and CIV, respectively) or Diploma qualification (see Appendix 12). These workforce issues may have significant implications for the NEGHA partners in their strategic planning and management activities generally, but moreso in the face of changing climatic trends. We outline these challenges and trends and their associated knowledge and skills gaps, below.

Major challenges and trends

As noted above, the NWSA (ICEWRM, 2008) outlines a number of overarching challenges in addressing the labour and skills needs of the water industry, including:

- The overall decline in numbers in the workforce over the last 10 years
- Rapidly emerging skills gaps
- Fragmentation of training gaps
- Impending retirement of a large cohort of workforce

In addition to these, *the Preliminary Report: Gaps in skills, training and education in water management* (ICEWRM, 2005, unpublished) identified low investment in curriculum development for training, a general shortage of technical skills in the workforce and competition from other industries for employees in the infrastructure utilities sector as major challenges in addressing the labour and skills needs of the industry.

Similarly, the WSAA also reports that the following emerging challenges have resulted in skills gaps and training needs:

- major capital works development over next five years would require increased project/contract management, engineering and asset management skills
- impending retirements contribute to shortages of current skills
- emerging technology (greater automation, complexity, diversity) contribute to shortages of new skills (WSAA, 2008)

In keeping with our findings, many organisations surveyed for the ICEWRM report (2005) address skills shortages by contracting out skills to contractors or consultants. Larger organisations used a combination of training for staff, using exiting skills within the organisation and external consultants to cover the broad mix of capabilities needed. However, our research identified concern that external consultants lacked the specialised skills required and were often learning on the job. Furthermore, and as noted above, we suggest that a skills gap may be the 'knowledge and skill' required to accurately determine the requisite 'knowledge and skills' required in a consultant. Broader knowledge and skills in disciplines such as Natural Resource Management, Environmental Science and/or Sustainability may overcome these important knowledge and skills gaps.

Current and emerging labour shortages and skills gaps

Following on from the projected skills and capabilities gaps for the water industry noted above, the GSA *Environmental Scan* (GSA, 2011) predicts the following labour role shortages:

- Engineers and asset engineers;
- Operations and maintenance personnel;
- Technical officers;
- Water and waste water treatment personnel;
- Environmental officers;
- Managers;
- Process and water quality specialists;
- Skilled trade workers; and
- Information technology personnel.

For local government, the following labour shortages are predicted:

- Planning and building;
- Environmental health;

- Engineering and civil construction;
- Finance;
- Surveying; and
- Environmental services.

The WSAA reports that the urban water industry's current (2008) and emerging skills gaps are:

- Keeping abreast of developments in science and technology;
- Environmental sustainability;
- Technical skills such as environmental engineering and process technology, water quality, wastewater and bio-solids;
- Leadership and a range of 'people skills' (Managers and Professional Engineers);
- Strategic thinking, business planning and risk management;
- Asset management;
- Project management;
- Commercial acumen; and
- Cost management.

Participants at the workshop for this report acknowledged that there are many available water technologies, but they are not being adopted due to the difficulty of maintaining knowledge in a rapidly developing market. This observation confirms the finding in the WSAA report related to urban water skills shortage, i.e. the challenge of keeping abreast of development in science and technology (WSAA, 2008).

The WSAA report (WSAA, 2008) is also in keeping with the GSA *Environmental Scan* (GSA, 2011), which suggests that the current and emerging skill gaps for the water industry are:

- Operating groundwater source systems;
- Maintaining assets, water quality treatment;
- Maintaining water and wastewater systems;
- Inspecting and maintaining catchments;
- Dams and reservoirs;
- Installing and maintaining hydrometric systems;
- Policy development;
- Frontline management & leadership;
- Financial/budget management;
- Project management; and
- Training and assessment.

And the current and emerging skills gaps for local government are:

- Planning and building;
- Environmental health;
- Engineering and civil construction;
- Finance;
- Management & leadership;
- Project management;
- Training and assessment;
- Occupational, Health and Safety awareness;
- Customer service; and
- Report writing (GSA, 2011).

These findings are in agreement with our own findings, including one local government workshop participant who mentioned that while they had received funding to develop a 'Water Management Plan, they felt they lacked the skills, knowledge and time to develop it so the task has been delayed.

The unpublished ICEWRM report (ICEWRM, 2005) identified a number of new skills and capabilities that the water management sector were lacking in 2005. These included:

- Rivers management;
- Wetland design;
- Water sensitive urban design; and
- Water trading.

Consistent with these findings, workshop participants for this report also believed that those dealing with water sensitive urban design need engineering up-skilling.

The ICEWRM (2005) report identified the need for broad ranging, multi-disciplinary skills for training in these skills and capabilities gaps. More specifically, the authors of that report identified the following capabilities and areas of knowledge as lacking in water management at the time of publication:

- Integrating water management into a broader management agenda;
- Linkages between groundwater/floodplains/biology;
- Groundwater/surface-water/river-water interactions;
- Engaging communities in the issues and solutions;
- Hydrogeology; and
- Systems thinking (ICEWRM, 2005).

Bachelor Degrees in Natural Resource management and/or Environmental Science would also largely address these skills, capabilities and training needs.

Although not mentioned by the NEGHA partners, the opportunities for indigenous people to take an active role in the water sector, particularly strategic water planning should be noted. Traditional indigenous 'ways of knowing' offer a special knowledge and an affinity for the natural environment which places them in an ideal position to take an active role within water authorities, catchment management authorities and local government. The NWSA (2008) notes that uptake of water-related training programs by indigenous candidates is limited; however this could change through government and other incentives to make training and education of water-related skills attractive and relevant to indigenous candidates. Given these findings, NEGHA partners may like to consider offering incentives and incorporating indigenous knowledge and skills into their strategic planning and management of our water resources. This could be done by individual organisations or in partnership, that is, one employee working with the partners, which would also enhance strategic planning and management outcomes within the partnership.

TRAINING AVAILABILITY

The NWSA (ICEWRM, 2008) projected approximately 26,500 additional employees will be required within the water industry by 2018, and half of these will need Vocational Education and Training (VET) qualifications across three levels of certification – Certificates III and IV (CIII and CIV, respectively) and Diploma. Furthermore, these authors estimate that 42% of the approximately 100,000 employees in the water industry in 2018 will require Bachelor level qualifications (see Appendix 12) (ICEWRM, 2008). These higher level qualifications would be predominantly needed for managers, professional engineers and scientists. The expected learning and capacity outcomes of different Australian Qualifications Framework (AQF) levels is given in Appendix 4. In general, level 5 qualifications and above (i.e. Diploma and above) would relate to roles that may be considered appropriate for the strategic planning and management of our water resources in a changing climatic environment.

Of the tertiary education sector (VET and University), the VET sector works most closely with industry and is more responsive to current and future skills needs (ICEWRM, 2008). The VET sector not only trains within industry, but also works closely with Industry Skills Councils (ISC) such as the Government Skills Australia (GSA) ISC . GSA ISC covers a number of the industry skills requirements of the NEGHA partners including Water and Local Government. It is worth noting that the decline in interest for studying science and engineering-related disciplines was thought to be due to, among other things, competition from well-paid industries with lower entrance qualifications (e.g. mining), and the lack of availability of water-specific training programs (ICEWRM, 2008). While this is not an issue the NEGHA partners can address directly, ensuring they are attractive to employees and conduct appropriate exit strategies may assist in overcoming this barrier to having the necessary knowledge and skills within their organisations to address strategic planning and management of water resources in the changing climatic environment.

Availability of training is determined by a number of factors within the education sector. The NWSA listed a number of issues facing the tertiary education sector which may affect its ability to meet the demands of the growing water sector. These include:

- Low levels of entrants in general courses such as science and engineering;
- Resource constraints;
- The need to develop training and education specific to industry needs; and
- Institutional restructuring (ICEWRM, 2008).

As part of the National Water Commission's *Raising National Water Standards* Program, the Australian Government has committed to a number of strategies to meet future skills shortages including funding trial programs for training remote and indigenous communities in water management skills, developing skills and training standards for operators of potable water treatment facilities and support for the H2Oz water industry marketing campaign. However, the ICEWRM unpublished report suggests past efforts from the government to invest in training and education for the water sector were seen to have had little impact on the sector (ICEWRM, 2005). "There have been a number of attempts to implement national training/education frameworks in water resource management at the vocational level (industry training package) and university level (rivers). Neither has had a significant impact on subject availability to date. The reasons for this should be identified before similar approaches are recommended for water resource management more generally." (ICEWRM, 2005, p 17).

Training Scan Background

Research done to prepare an overview of training options and gaps involved a general internet scan. Given our findings thus far, a focus was kept on courses related to water, environmental science/management, sustainability and conservation and land management. The results of the training scans can be found in the appendices, including an overview of the contents of the Water Training Package (see Appendices 6 – 11).

At the registered training organisation (RTO) level this involved a search using the 'Training.Gov' website which is the central store house for all accredited training in Australia. For the scans of University courses, searches mainly focused on New South Wales, Victoria and the Australian Capital Territory. There appears no single reliable tool to search across Australian universities, though a variety of commercial search engines are available and were used. University scans were, therefore, conducted institute by institute. The Skills Victoria website has also provided a useful tool in identifying both training provider and universities. Refer to the appendices for more details of scan methodology and detailed findings (see Appendices 5 – 10).

There is an awareness that many others in the North East provide informal training and information sessions that may be relevant for the NEGHA partners, but it proved difficult to easily locate these programs and they appear ad hoc and developed and delivered on demand. Of course the complexity of natural systems reminds us to not manage water in isolation from people and the land. We have therefore included in the appendix a record of a scan made across a number of land managers, including for example; DSE, Department of Primary Industries and the Municipal Association of Victoria (see Appendix 11).

North East Training and Education

North East Victoria is well serviced by training (TAFE and independent RTOs) and Higher Education (Universities and some TAFE Institutes).

Key Training Providers in the region are:

- Go TAFE
- Riverina TAFE
- Wodonga Institute of TAFE
- Victorian Employer Chamber of Commerce and Industry

There are also many smaller RTOs delivering accredited training that is often delivered directly with those requiring training in the work place.

Key Higher Education Providers in the region are:

- Latrobe University, Albury /Wodonga Campus
- Charles Sturt University Albury /Wodonga Campus.

Within both these forms of education there is also wide scope for flexible delivery modes that enable people to receive education and training without attending a campus. This includes workplace based learning, localised seminars and distance education programs. There has also been a rapid uptake of online classes with the reliable use of 'Cloud' information technologies and operating systems like; 'Audacity (audio editing software), 'BigBlueButton' (webinar software), 'Camtasia,' 'Easi Speak' microphones, 'Facebook,' Moodle, MS Move Maker, MS Photo Story PowerPoint, and WordPress (teacher/student blogs). These software tools enable effective and flexible online learning environments.

Given this expansion of training modes it is therefore theoretically possible to complete training in a near endless number of curriculums from programs within Australia and internationally. Moreover this training can be delivered in work places at quiet times or out of hours to suit personal and organisational needs.

Local Specialisations

The two North East universities provide a wide range of general programs in Environmental Science and Environmental Management. Latrobe Department of Environmental Management and Ecology offers a wide range of environment focused programs. Additionally, Latrobe is home of the Murray Darling Freshwater Research Centre, which is an accomplished water research agency.

Charles Sturt offers a wide range of Environment related programs through the School of Environmental Sciences and is home of the Institute of Land, Water and Society.

Given the emerging need for many water related engineers it is very significant that there are no on-campus environmental engineering courses evident in the North East.

Equally the main TAFE providers offer courses of relevance to those working in the natural resources, water planning and sustainability realms, including; Catchment and Land Management and Diploma of Sustainability. These courses are available in a variety of formats so could well fit in to a local government or water agency training program.

Training within the NEGHA partners

The NEGHA partners for this report noted variable degrees of in-house training related to water planning and management and these ranged from on-the-job development to external specialist training. Support for training was varied and ranged from some support to very little.

STRATEGIES AND RECOMENDATIONS

Training gaps and future needs

The predicted impacts of climate change on water supply and quality present real environmental, economic and social challenges for organisations and individuals within those organisations charged with the strategic planning and management of our water resources. Not only do these challenges appear to be presenting themselves currently (e.g. recent unprecedented drought and floods), but the predicted impacts are varied and within relatively broad ranges. Perhaps the uncertainty in predicting natural systems has exacerbated the skills gap in efforts to protect and manage of water resources.

The NEGHA partners each have some roles and responsibilities with respect to the strategic planning and management of our water resources. These range from statutory obligations to guiding principles such as encouraging developers to implement Water Sensitive Urban Design in new residential and industrial developments. In general, the NEGHA partners are managing their current knowledge, skills and trainings needs adequately with respect to the impact of climate change on our water resources and their strategic planning and management. However, the findings of our research suggest that this could not only be improved in the short-term, but that organisations should consider building knowledge and skills in certain disciplines order to ensure they are prepared for the future skills and knowledge requirements to address a changing water future. This recommendation may also overcome any potential problems that might occur if integrated/cross-departmental dialogue for water resource planning and management is lacking within the NEGHA partners. Given the outcomes of the workshop discussions, we would also recommend regular interaction between the NEGHA partners to ensure additional continuity and resilience in the North East Victoria region. This dialogue must address the integrated strategic planning and management of our water resources in the face of challenges presented by climate change.

Given the wider research on skills gaps and trainings needs in the water industry and the findings of this project, we recommend that the NEGHA partners consider adding broad skills in natural resource or environmental management and/or sustainability throughout their organisation i.e. within each department and level of the organisation relevant to strategic planning and management of our water resources. This will ensure that trained staff are capable of identifying the knowledge and skills needed within their organisation (either in-house or a consultant) and to keep abreast of new developments, knowledge and

technology related to planning and management of our water resources in the face of relatively uncertain impacts of climate change. Furthermore, the knowledge and skills gained in these broader qualifications will enable staff to think critically with respect to natural resource planning and management as well as identify risks and plan for environmental, economic and social adaptation within the North East Victorian region. Given the emphasis on triple bottom line accounting and reporting and the environmental learning gained within education about and for sustainability, we strongly recommend training in sustainability as a first step in improving the knowledge and skills within the NEGHA partner organisations. This will provide a relevant and strong foundation to base ongoing assessments of needs and promote more effective future forecasting.

As previously described, workshop participants highlighted the possibility of senior management receiving a general up-skilling in the natural resource management and sustainability areas. Such an eventuality would promote a more nuanced understanding and interpretation of the complex issues associated with water management and sustainability. The broad threat posed by serious climate change is a strong motivation for people in organisational leadership positions to have an educated understanding of the environment and sustainability. This knowledge would have the added advantage of better informing organisational strategic and operational decisions more broadly.

Given the findings of the research referred to in this report that points to significant workforce and skills shortages in the Water Industry, our own findings and the available training in the education sector regionally there is strong merit in instigating a collaborative body that might be known as 'Water Skills Training Centre.' Such a centre could effectively coordinate and/or deliver training for skills in strategic planning, water resource management and even water operations. It is recognised that such a Water Skills Training Centre is a significant financial and logistical undertaking. Therefore, another recommendation is that an active mechanism should be enacted to allow effective and ongoing collaboration between the NEGHA partners to share training and resources. The mechanism to achieve this could be a skills and training website but a more engaging and active process such as regular meetings either face-to-face or via the internet in strongly encouraged.

With respect to water planning for the NEGHA partners, and in lieu of a Water Skills Training Centre, we recommend the creation of a training co-ordinator role for water management in the North East. This role would be located centrally in the North East and perform the following functions:

- Collaborate with local government natural resource managers/strategic planners/human resource staff to identify training needs and opportunities;
- Work alongside NEGHA partners to address training gaps and barriers;

- Liaise with Registered Training Providers/Universities to deliver relevant and accessible training programs;
- Coordinate combined training/skills and knowledge sharing activities;
- Identify emerging technological trends in water management and plot strategies to assess relevance for the region; and
- Deliver water or sustainability training/workshops as deemed necessary

The existence of a Water Skills Training Centre and/or a coordinator may also enhance the capacity of the region to attract and retain staff. Funds to assist the NEGHA partners to establish either a Water Skills Training Centre or coordinator role may available through Federal (e.g. Water for the Future) or State (e.g. Victorian Water Trust) programs. These funding opportunities may also be considered by the NEGHA partners as an opportunity to work more closely with the tertiary education sector by applying for funds in partnership.

During the training scan it became evident that many TAFE institutes were ready to deliver training, but were awaiting sufficient numbers to deliver the qualifications. Effective courses in sustainability, water management and environmental science, and the mechanisms to quickly adopt new ones upon demand, are available. The need for training has been well articulated in other parts of this report; thus reinforcing the need for more effective communication between the training providers delivering the training, and individuals/organisations seeking the training.

Therefore, we recommend again an 'active, ongoing and specialist process' to connect training and education providers and programs with the NEGHA partners. This connection process could effectively be achieved with the introduction of the previously described Water Training Centre /Training Coordinator role. The importance of reliable water supply and quality in the face of climate change further supports our recommendation of the efficacy of a Water Skills Training Centre in the North East Victoria.

Recognition of prior learning

Recognition of Prior Learning (RPL) is a cost-effective way for organisations to recognise the skills, knowledge and experience of their staff. The GSA *Environmental Scan* notes that while many staff within organisations lack relevant VET qualifications, many existing staff possess the relevant skills, knowledge and experience (GSA, 2011). Such an approach should be encouraged as it reduces training costs and recognises employees' skills and knowledge base. This also enables organisations to more effectively map the status of skills and knowledge with-in the organisation and to accurately project future and more complex training requirements.

Workforce and industry planning

As experienced water resource workers near retirement, definite steps must be either in place or implemented to ensure corporate and specific knowledge is captured and interpreted. Such strategies are highly relevant for the NEGHA partners and would see these organisations carefully planning succession measures and ensuring they adequately contain the knowledge and wisdom held by experienced staff.

The recommendations above are further supported by the GSA *Environmental Scan* that notes the following as strategies to address skills and labour shortages identified nationally for the water industry:

- Development of recruitment planning, including liaison with schools, universities and local training providers;
- Development of a human resource strategy providing a framework to ensure that they have the people, capability and capacity to meet both current and future needs;
- Exploring different recruitment and advertising methods to promote its flexible work practices;
- Provision of traineeships and cadetships;
- Addressing image problems through targeted recruitment drives;
- Offering above award rates to specialists in regional areas;
- Work/life balance initiatives;
- Evolving development of partnerships between industry and RTOs; and H2OZ Website (GSA, 2011).

The GSA *Environmental Scan* also notes the following as employee retention strategies to address skill and labour shortages identified nationally for local government that are also relevant for the NEGHA partners:

- Provide counter offers to employees;
- Pay above award rates;
- Offer other reward systems;
- Implement succession planning;
- Initiate recruitment campaigns;
- Contract training providers for graduates;
- Redesign job roles;
- Offer flexible working arrangements; and
- Address image problems through targeted recruitment drives (GSA, 2011).

While we recognise that fiscal constraints may not allow implementation of any of these strategies, we strongly recommend they at least be considered by the NEGHA partners in order to best address the skills and knowledge gaps that may arise for strategic planning and management of our water resources in a changing climatic environment.

APPENDIX 1: CSIRO climate change predictions for North East Victoria

The impact of greenhouse gas emissions has seen an increase in daily global temperatures and a rise in sea levels. Extreme weather events such as heat waves and high rainfall events are becoming more common. In Australia, higher temperatures have been accompanied by changes in the pattern of rainfall – higher annual rainfall in the northwest of Australia has occurred at the same time as a decrease in rainfall in the south and east. Commonwealth Scientific and Industrial Research Organisation's (CSIRO) predictions for future emissions and resulting climate change forecast further global warming, sea level rises and increasing intensity of extreme weather events.

In North East Victoria, annual rainfall is predicted to decrease by up to 10 % by 2030 and 25 % by 2070. Reductions in snow cover in alpine areas are expected, including a decline in peak snow depth on Mt Hotham of 10 – 50 % by 2020 and 25 – 95 % by 2050. In addition to reduced rainfall, annual average flows in North East Victoria's rivers are likely to fall by up to 25 % by 2030 and up to 50 % by 2070. Droughts in North East Victoria are likely to become more common, longer in duration, and more intense. These predictions would make the climate in Wangaratta in 2030 more like the current climate of Corowa in NSW. Cropping and grazing in the region, while possibly benefiting from higher CO_2 in the atmosphere, are likely to be severely impacted by higher temperatures and drought (Hennessy, 2006).

Other industries such as horticulture, fruit cropping, forestry, ski tourism, and vineyards are also likely to be negatively impacted, having a major impact on the economy and livelihood of the region. Infrastructure is at risk from increased extreme weather events, and temperature increases and heatwaves are likely to have implications for community health. The environmental impacts of climate change in North East Victoria include; widespread effects on habitat (particularly alpine and aquatic ecosystems) and local extinctions. Given the changes likely in north east Victoria, climate change adaptation is critical to ensure the community is able to minimise the impacts of climate change. Prudent action would also encourage continued efforts to reduce the human-related causes of climate change (Hennessy, 2006).

The Garnaut Climate Change Review commissioned by the Australian Government in 2008 and updated in 2010 and 2011 provides an excellent discussion of the broader economic implications of adapting to Climate Change for our community. This includes a section of the report discussing the implications for water. The implications of failing to address gaps in skills, training and capabilities are potentially significant and include; community disappointment, greater reliance on external consultants, loss of skills; potential for conflict

between water users because of a lack of information; and conservatively designed infrastructure and engineering projects (Garnaut, 2008).

APPENDIX 2: Overview of the NEGHA partners

The material in Appendix 2 has been captured from a wide examination of the relevant Water Authority and council websites and the work by Martin (2011) - *North East Victoria – Adapting to a low water future: Review of municipal documents*..

Water authorities

Goulburn-Murray Water

Goulburn-Murray Water (G-MW) is a statutory corporation under the *Water Act 1989* responsible for the storage, delivery and drainage of water to customers within the Goulburn-Murray region. G-MW has powers under the *Water Act 1989* to manage areas of water delivery, and service areas bordered by the Great Dividing Range, the Murray River, Corryong and downstream to Nyah. G-MW works closely with the Murray Darling Basin Authority to determine irrigation entitlements for Victorian Murray River entitlement holders. G-MW is bound by the *Water Industry Act 1994 Statement of Obligations*, and is governed by a board of eight Directors, appointed by the Minister administering the W*ater Act 1989*.

GM-W states as one of its corporate values, the "Sustainability of the environment, business, and communities", and the *Water Industry Act 1994* specifically states one of the core functions of G-MW to "manage water resources in a sustainable manner". The government has set a target to reduce losses in rural distribution systems by 25% by 2020, and GM-W is obliged to set targets to meet this. Works carried out from now until 2018 to modernise irrigation infrastructure under the 'Northern Victoria Irrigation Renewal Project' meet this obligation. They also have an obligation to develop a drought response strategy to ensure they meet their obligations to supply to customers under the relevant policies and to inform customers of the availability of entitlements. Under the *Water Industry Act 1994,* G-M Water is obliged to develop programs for responding to climate change within its *Water Plan*.

The *Environmental Policy Statement* outlines G-MW's commitment to preventing and minimising any impact of its activities on the environment. The promotion of best practice in terms of land use and development aims to reduce impacts on water quality and biodiversity. G-MW is responsible for managing blue-green algae in its storages, and undertakes regular water quality monitoring in its storages and drainage systems. *Storage Management Plan*s have been developed for all of the storages managed by G-MW, which

aim to prioritise works required to meet water quality and biodiversity issues. Future threats are identified and prioritised.

G-MW is directly involved in the *Northern Region Sustainable Water Strategy* (a strategy to develop long term sustainable management of water resources within the region), through its membership of the Consultative Committee. Research and Development is carried out by G-MW aim to improve the knowledge and sustainability of water resource management.

Currently, adaptation to new environment (climate change) is being done through increasing GM-W's knowledge of our resources and then using management planning to help license holders meet the possible future challenges through; restrictions, trading, carryover and monitoring.

North East Water

North East Water (NEW) provides water and sewerage services to communities within North East Victoria, acting as a retailer for G-MW, (who is effectively the wholesaler). NEW is responsible for delivering safe drinking water to households, and monitors water quality under the Safe Drinking Water Act. NEW is governed by a board of directors.

NEW's Strategic Intent 2018 outlines future needs of customers, and what is required to meet those needs. The mission statement within states ,"To provide sustainable water services to our customers and community". Strategic initiatives developed within the Strategic Intent 2018 outline NEW's commitment to adapting to climate change, particularly in business planning and operations. The One Resource project is part of this initiative, providing a holistic approach to water management to respond to future changes in water availability.

NEW have developed a Drought Response Plan which guides operational aspects of water shortages to inform customers and minimise disruptions. Water restrictions are administered under the Water Restrictions By-Law and the Permanent Water Saving Plan.

Reclaimed Water Reuse schemes have been developed by NEW under the State Environmental Protection Policy and approved by the Environmental Protection Authority. Currently, eight towns within NEW's jurisdiction reuse 100% of reclaimed water, while five towns reuse up to 50 % of reclaimed water. The schemes vary from lawn irrigation at schools, parks and golf courses, to irrigated cropping in Benalla and Yarrawonga. NEW also have a trade waste by-law which regulates commercial and industry waste, and the 'Developers Handbook' outlines the role of NEW in setting water and sewerage conditions under the Planning and Environment Act 1987.

NEW has an Environmental Management System (externally accredited to ISO 14001:2004) which aims to reduce the impact of their operations, products and services on the environment.

North East Catchment Management Authority

The North East Catchment Management Authority (NECMA) is one of ten CMA's developed by the Victorian Government in 1997 to manage water, land and biodiversity resources together with communities, government and funding organisations. The NECMA's organisational structure includes a Water Programs section, which includes managers, team leaders, officers and facilitators responsible for river health, water quality, water resources, floodplain management and the Waterwatch program.

The NECMA is responsible for coordinating integrated catchment management and sustainable land and water use within North East Victoria, as guided by the *North East Regional Catchment Strategy*. The strategy specifically outlines the following areas of responsibility:

- Managing river health;
- Managing floodplains;
- Coordinating water quality management;
- Supporting Landcare groups and other community based natural resource management groups;
- Administering regional funding and grants; and
- Facilitating access to external grant programs.

Annual reporting ensures targets set out by the Strategy are publicised. The Strategy specifically states climate change as a threat to the catchment, and mentions decreased snow cover and habitat loss in Alpine areas as a specific threat to the region. Other associated threats identified include flooding, drought, and water quality changes. The CMA has developed Action Plans targeted at water quality in the region including the *Ovens Basin Water Quality Strategy* and the *Upper North East Water Quality Strategy*.

The NECMA is required to produce a Corporate Plan under the *Catchment and Land Protection Act 1994* to inform the Victorian government of natural resource management issues pertinent to North East Victoria, and to ensure transparency to the wider community and stakeholders. The CMA also has responsibilities under the *Water Act 1989*.

A role of the NECMA is to work with the community, landholders and government to adapt to climate change. After the 2010 \ 2011 flooding in north-east Victoria, the NECMA was

involved in flood response and recovery. This response included; assisting emergency services, carrying out emergency river health works and mapping out priority areas for restoration works in partnership and consultation with the other organisations targeted in this project. The NECMA has committed to their Flood Recovery program until December 2012, with works being prioritised and carried out according to criteria set out by the Victorian Government's Flood Recovery funding. The Floodplain Management vision of the NECMA also encompasses flood risk minimisation.

'River health' works are an integral part of the NECMA's role, and are guided by the *Waterway Action Plan*, which documents the strategic direction of river health. 'Fire Recovery' projects are also included in River Health works. The NECMA also recognises the impact of altered hydrology, which will be exacerbated by climate change, on wetland health and viability. They are actively involved in education and awareness around wetland health, including World Wetlands Day and Biodiversity Week, and have developed a *Wetland Management Strategy* for north-east Victoria, which directs strategic management of wetland in the region. The *Wetland Management Strategy* identifies climate change as a threat to wetlands through altered temperature, precipitation rates, and via associated changes in hydrology. Wetlands in alpine areas are identified as being under considerable threat, particularly those confined to the montane/sub-alpine transition zone. The NECMA are also working on a number of Environmental Water Reserve (water which has been set aside for the environment) priorities. *North East Vegetation Plan* identifies climate change as a threat to native vegetation management, suggesting increasing carbon sinks through revegetation and regeneration as part of the overall goal to reverse long-term decline in native vegetation health.

Local government

Local governments are responsible for encouraging and demonstrating sustainable water use within their jurisdictions. This could include for example; planting low water gardens or community education programs.

Council operations are directly affected by water restrictions under the Uniform Drought Water Restriction Guidelines put in place by state water authorities (e.g. irrigation of playing fields, filling swimming pools), but can be exempt from some restrictions by demonstrating efficient water use management. Councils develop a Sustainable Water Use Plan, as guided by the Intergovernmental Agreement on a National Water Initiative, driven by the State Governments Sustainable Water Use Plan Program for Regional Local Government, which acts to outline actions and set a target for reducing the council's water usage. It is in the council's interest to act on as many actions outlined in their Sustainable Water Use Plan as possible to be eligible for these exemptions.

Strategic planning and management of water resources within Local Government is largely restricted to approaches such as incorporating Water Sensitive Urban Design into planning. Water Sensitive Urban Design is an integrated approach to stormwater management and includes strategies that will: (i) protect natural water systems and water quality; (ii) integrate stormwater treatment into the landscape; (iii) reduce runoff and peak flows; and (iv) add social, economic and environmental benefits to communities while minimising development costs.

Council's are also required to develop Council 2030 plans, which outline their vision for key directions and future visions.

Alpine Shire Council

The Alpine Shire encompasses the townships of Bright, Mt Beauty and Myrtleford, and covers the Buffalo, Ovens and Kiewa Rivers and their tributaries. Over 90 % of the Shire is public land, including national parks, the rest farming land and townships. It includes Victoria's major ski resorts, and tourism is a major part of economy. Buffalo Dam (Lake Buffalo) is a major storage supplying water, however apart from the Kiewa Hydro Electric Scheme; rivers within the Shire are largely unregulated.

One of the key directions identified in the 2030 Community Vision is an "Unspoilt natural environment". The council has developed a Rural Land Strategy, as outlined by the Council Plan and the Alpine Liveability Plan, which aims to address the competing demands of productivity versus development on rural land. The plan includes addressing the impacts of climate change and other environmental issues on development opportunities. The Alpine Region Tourism Strategic Plan recognises the importance of water and its natural resources (rivers, Lake Buffalo) as important in attracting tourists to the area for recreation. Water quality and supply are identified as threats to tourism in the Plan.

The Alpine Shire is a key stakeholder in the Victorian State Emergency Service FloodSafe education program, aimed at informing and empowering the community to take a proactive role in preventing damage and personal injury from flooding. This includes the development of a flood warning system.

The Alpine Shire together with the Country Fire Authority and the DSE have developed Township Protection Plans for Bogong Village, Bright, Wandiligong, Harrietville and Porepunkah which contain information about neighbourhood safer places and together collated information designed to assist emergency services.

The Alpine Shire's Greenhouse Local Action Plan, which outlines actions the council will take and encourage the community to take to reduce greenhouse gas emissions, including

energy audits, investing in green power, and various community education programs. The Plan sets a target of 20 % reduction in both corporate emissions and community emissions by 2010 (on 2003 levels). The Sustainable Water Use Plan for the Alpine Shire aims to reduce water consumption by 40% by 2015 (from 2000/2001 levels). The objectives of the Plan also include increasing awareness in the community about sustainable water use.

The major uses of water by the council within the shire are; irrigation of open spaces, irrigation of playing fields, and caravan parks. Steps already undertaken to meet this target include repairing infrastructure (e.g. plumbing and leaking swimming pools), and further actions are outlined in the Water Consumption Action Plan.

Indigo Shire Council

The Indigo Shire includes the townships of Beechworth, Chiltern, Rutherglen, Tangambalanga, Yackandandah and Wahgunyah. The Shire's major industries include tourism, and many sites and buildings within the shire have heritage listing. Primary industry is an important feature of the shire, particularly milk, Cereal and grapes.

The Shire's Council Plan 2010 – 2013 identifies climate change as a key area of concern. Under objective 4.7, a commitment is made to "Recognise and plan for the effects of changing environmental conditions" (page 36). Other areas of focus within the Plan are implementing the Stormwater Management Strategy, storm water master plans, and the Water Use Plan. The Council plan emphasises the Shire's commitment to sustainable growth, sustainable council activities, and sustainable building design and lifestyle practises. The Shire has a detailed Environment Strategy, and notes a change in focus from the role of local government in infrastructure and social functions to a focus on community education, greenhouse gas abatement, climate change adaptation and incorporating natural resource management into planning. Climate change adaptation is specifically stated in the Strategy with a series of actions, including the implementation of sustainable building design beyond minimum requirements. The Indigo Shire Council Greenhouse Action Plan outlines a target of a 20 % reduction in corporate and community greenhouse gas emissions from 2005/2009 levels by 2016. The Plan also mentions support for the Cities for Climate Change Program.

The Shire established an Environmental Advisory Committee (a section 86 committee) comprised of Councillors, Council staff, community, Landcare, and NRM government representatives. The Committee ensures that environmental programs carried out within the Shire are done so in a strategic manner and meet community concerns.

The Shire's planning scheme mentions a commitment to environmentally and ecologically sustainable land use practices and the Shire's commitment to "….principles of ecologically sustainable development.." Water issues are considered within the Scheme, particularly in

relation to infrastructure, flooding and inundation, and issues with flooding, drainage and maintaining water quality are mentioned. In the Shire's Recreation Plan, commitment was made to minimising the use of potable water and energy in relation to recreating facilities and infrastructure. The Indigo Sustainable Water Use Plan outlines a targeted corporate water consumption of 20 % by 2015.

Recently, the Shire successfully lobbied Victorian Deputy Premier Peter Ryan for the early release of $1.6 million in Natural Disaster Financial Assistance funding for flood damage repair work. The Indigo Shire also received funding from Regional Development Victoria to develop programs to assist businesses which were experiencing a loss of incoming as a result of the recent fires.

Towong Shire Council

The Towong Shire is located in the Upper Murray and covers the townships of Tallangatta and Corryong. Tourism plays a major role in the region's economy, with the Murray and Mitta Mitta Rivers and Lake Hume major drawcards to the area. Agricultural development (grazing, dairying, horticulture and irrigated agriculture) is also important to the economy of the region. The Council promotes itself as having a "pure, clean, environmental" image with its "Pure" marketing campaign.

The Council Plan outlines one of its strategic objectives as *"To ensure that the Shire is a place of Pure attraction by integrating sustainable natural resource management into all of our business activities".* Strategies and priorities outlined under this objective include infrastructure development, review of waste management and reduction in landfill, weed management, the promotion of renewable energy and sustainable development

The Towong Shire Planning Scheme explicitly mentions the need to balance economic growth with environmental issues and sustainable development. It also mentions water as an issue for towns and villages and the need to upgrade infrastructure. Specifically, Corryong has water quality issues from Nariel Creek, Bellbridge is in need of infrastructure upgrades, and pollution issues from a lack of infrastructure arise periodically in Lake Hume and the Murray and Mitta Mitta Rivers. The plan also recognises the need for careful land use planning in flood-prone areas to ensure development is compatible with natural and storage functions of floodplains. The Planning Scheme specifically states the challenges with agricultural development in the face of climatic conditions, drought and bushfires.

The Towong Tourism Strategy 2010-2013 makes some mention of climate change, recognising the impact it may have on natural attractions in the region. The Towong Shire Council Healthy Communities Plan mentions the need for planning to ensure the health of

communities in relation to the social, economic and physical environment. There is explicit mention of climate change in the Plan. The Shire also has a Heatwave Plan which is reviewed annually, which was developed with the recognition of the impact of climate change on the local community. The Shire has also developed a Zero Energy Estate Feasibility Study with the aim of developing a carbon neutral development, addressing water consumption, waste management, and infrastructure.

City of Wodonga

The City of Wodonga is the largest city in North East Victoria with a population of 37,000. It includes natural features such as the Murray River, parkland reserves and hillsides, and many parks and gardens throughout the City. Recreation facilities include a number of sports grounds, an 18-hole golf course and water sports at Lake Hume. Strong population growth is forecast for the area, with the development of two major sub-divisions. Manufacturing is the primary area of employment, however other industries are also important in the region, including public administration and safety, retail, health care and social assistance.

The Wodonga Planning Scheme outlines as a strategic issue "There is recognition that future growth in Wodonga needs to respond to the challenges of climate change, scarcity of water, energy consumption and the building of a cohesive community" (P. 3). The Scheme aims to monitor to ensure the "implementation of sustainable development principles and protection of waterways" by analysing energy and resource use. The Plan emphasises the need to protect natural assets such as Lake Hume, the Murray and Kiewa Rivers and associated floodplains and waterways. This involves the restriction of development on floodplains, and buffer zones to ensure urban development does not encroach on waterways. The Planning Scheme further emphasises the need for sustainable water development and infrastructure through the following statement: "The council supports North East Water in the implementation of initiatives for the better use and reuse of water. This includes additional infrastructure in existing areas and in new developments for the future supply of reclaimed water for non-potable reuse." (P. 5). The Wodonga Council Plan further emphasises the need for sustainable development, including a focus on renewable energy, energy efficiency, stormwater reuse and wastewater reuse. In addition, the City of Wodonga Economic Development Strategy 2011-2013 includes a key focus on "growing, creating and maintaining Wodonga's Economic base in a sustainable manner" (P. 1).

The Soil and Water Management Policy and Urban Storm Water Management Plan aim to protect and maintain water quality, and include initiatives involving upgrading infrastructure, and minimising water use. Stormwater is being harvested from White Box Rise estate and

used to irrigate recreation areas within the city including Wodonga Racecourse. Wodonga Council has adopted principles of Water Sensitive Urban Design into the White Box Rise and Leneva developments. The Council's Sustainable Water Use Plan outlines a number of initiatives including a 10 % reduction in water use for recreation, at the request of NEW.

The Council's Greenhouse Action Plan (developed in 2006) aimed to reduce corporate and community energy consumption by 10 % on 2000 and 1996 levels respectively.

APPENDIX 3: Glossary of Abbreviations and Acronyms.

Acronym	Name
CERT I, II, III, IV	Certificate 1 to Certificate IV, VET Qualifications
CFA	Country Fire Authority
CMA	Catchment Management Authority
CSIRO	Commonwealth Scientific and Industry Research Organisation
DPI	Department of Primary Industries, Victorian
DSE	Department of Sustainability - Victorian
G-MW	Goulburn Murray Water
GSA	Government Skills Australia
ICEWRM	International Centre of Excellence in Water Resources Management
LGA	Local Government Authority
NECMA	North East Catchment Management Authority
NEGHA	North East Green House Alliance
NEW	North East Water
NRM	Natural Resource Management
NWSa	National Water Skills Audit, Australian Water Association (2008)
RPL	Recognised Prior Learning
RTO	Recognised Training Organisation
TAFE	Technical and Further Education
URS	URS Australia "…engineering, environmental, construction and technical services organization." http://www.urscorp.com.au accessed 14 – 12 -11
VET	Vocational Education and Training
WSAA	Water Services Association of Australia

APPENDIX 4: Australian Education and Training Level Overview.

Qualifications levels at the tertiary level in Australia are described by the Australian Qualifications Framework.

> "The Australian Qualifications Framework (AQF) is the national policy for regulated qualifications in Australian education and training. It incorporates the qualifications from each education and training sector into a single comprehensive national qualifications framework." http://www.aqf.edu.au/ accessed 14 – 12 – 11

The tertiary sector is a complex gathering of institutions, organizations, courses and programs. The Australian Qualifications Framework website, (http://www.aqf.edu.au) provides a very detailed examination of the Australian tertiary environment. However, we have below provided a general overview of key aspects in the tertiary sector.

General Descriptions:

Registered Training Organisation
"A registered training organisation is a vocational education and training organisation registered by a state or territory registering body in accordance with the Australian Quality Training Framework (AQTF) Essential Standards for Registration within a defined scope of registration (National Quality Council Training Packages glossary)" http://www.aqf.edu.au/ accessed 14 – 12 – 11

National Training Package
"Training Packages underpin skill formation and recognition processes, assisting to ensure that the outcomes for individuals and industry meet contemporary requirements." http://www.deewr.gov.au accessed 14 – 12 -11

RTO's prepare all accredited courses based on information prescribed in the National Training Package or state based organisations, (in Victoria this organisation is the Training Support Network). Across Australia there are 11 'Industry Skills Council's' who represent industry (including training providers) to inform and guide the production of National Training Packages.

TAFE
Technical and Further Education. These institutes typically offer post secondary education usually with a vocational focus and generally (though not exclusively), at a level lower than those offered at a University or College. There is an increasingly unclear line between which qualifications are being delivered by which type of organization.

All TAFE institutes will be Registered Training Providers. Not all RTO's are TAFE's, they can be private training providers, not for profit organizations, Government Agencies and other businesses who need accredited training in their organisation.

University

"A university is a Higher Education institution that is established by the Commonwealth or a state or territory government as a university"
http://www.aqf.edu.au/ accessed 14 – 12 - 11

VET

"Vocational education and training (VET) is 'education and training for work' and part of a broader educational network in Australia that includes schools, universities and adult and community education."

http://www.training.com.au accessed 14 – 12 - 11

Qualification types explanatory table overleaf:

Australia Qualifications Framework – Qualification Types in the Levels Structure.				
Qualification Type	Certificate I	Certificate II	Certificate III	Certificate IV
Level	Level 1	Level 2	Level 3	Level 4
Summary	Graduates at this level will have knowledge and skills for initial work, community involvement and/or further learning.	Graduates at this level will have knowledge and skills for work in a defined context and/or further learning.	Graduates at this level will have theoretical and practical knowledge and skills for work and/or further learning.	Graduates at this level will have theoretical and practical knowledge and skills for specialized and /or skilled work and /or further learning.

Qualification Type	Diploma	Advanced Diploma / Associate Diploma	Bachelor Degree	Bachelor Honours Degree Graduate and Vocational Graduate Certificate
Level	Level 5	Level 6	Level 7	Level 8
Summary	Graduates at this level will have specialized knowledge and skills for skilled/paraprofessional work and/or further learning.	Graduates at this level will have broad knowledge and skills for paraprofessional/highly skilled work and/or further learning.	Graduates at this level will have broad and coherent knowledge and skills for professional highly skilled work and/or further learning.	Graduates at this level will have advanced knowledge and skills for professional highly skilled work and/or further learning.

Qualification Type	Masters Degree	Doctoral Degree
Level	Level 9	Level 10
Summary	Graduates at this level will have specialised knowledge and skills for research, and/or professional practice and/or further learning.	Graduates at this level will have systematic and critical understandings of complex field of learning and specialized research skills for advancement of learning and/or for professional practice.

Source: P18. Australian Qualifications Framework, July 2011. Website: http://www.aqf.edu.au accessed 14 December. 2011

APPENDIX 5: National Training, Water Training Package

NWP10110 Certificate I in Water Sustainability

Description

"The Certificate I in Environmental Sustainability provides pathways into the water industry for, in particular, young people who are seeking an opportunity to gain experience of the industry while developing a set of valuable employability skills.

To achieve this qualification the candidate must demonstrate competency in seven units of competency, comprising:

- Four core units;
- Two industry project units;
- Two pathways units specifically incorporating employability skills; and
- Three elective units."

Downloaded from National Training Package (www.training.gov.au) accessed 23 – 11 -11

NWP20107 Certificate II in Water Operations

Description

This is an introductory program for people entering employment in the water sector.

"To achieve this qualification the candidate must demonstrate competency in 11 units of competency, comprising three core and eight elective units."

Downloaded from National Training Package (www.training.gov.au) accessed 23 – 11 -11

NWP30107 Certificate III in Water Operations

Description

A program which is designed to support individuals working in the water industry and wishing to adopt more responsibility in their positions. Course extends to; site management of potable and waste water, installation of meters, monitoring dams, cleaning infrastructure and responding to contaminations.

"To achieve this qualification the candidate must demonstrate competency in 11 units of competency, comprising three core and eight elective units."

Downloaded from National Training Package (www.training.gov.au) accessed 23 – 11 -11

NWP40107 Certificate IV in Water Operations

Description

Students successfully completing this training will be able to coordinate filtration systems, drainage, oversee infrastructure projects and contribute to continuous improvement programs.

"The Certificate IV in Water Operations supports candidates seeking competency and requiring increasingly specialised technical skills or those who require a broad range of skills."

"To achieve this qualification the candidate must demonstrate competency in nine units, comprising two core and seven elective units of competency."

Downloaded from National Training Package (www.training.gov.au) accessed 23 – 11 -11

NWP50107 Diploma of Water Operations

Description

This qualification provides knowledge and skills for those working in the water industry to adopt more strategic approaches to working including the oversight of quality assurance systems, Occupational Health and Safety programs, environmental management programs/systems, water systems management and budgets.

"The Diploma of Water Operations supports candidates seeking competency and requiring increasingly specialised technical skills or those who require a broad range of skills. To achieve this qualification the candidate must demonstrate competency in seven units, comprising two core and five elective units of competency."

Downloaded from National Training Package (www.training.gov.au) accessed 23 – 11 -11

NWP70107 Vocational Graduate Certificate in Water Industry Leadership

Description

"The Vocational Graduate Certificate in Water Industry Leadership supports graduate entrants to the water industry who require industry-specific context to add to their broad academic education gained in, for example, engineering, applied science or chemistry. It also supports experienced existing workers seeking to extend their career opportunities."

Downloaded from National Training Package (www.training.gov.au) accessed 23 – 11 -11

APPENDIX 6: National Training, Agriculture, Horticulture and Conservation and Land Management Package (AHC10)

AHC51110 Diploma of Conservation and Land Management

Description

"The Diploma of Conservation and Land Management reflects the role of personnel working in management positions with technical level skill in land management roles."

Downloaded from National Training Package (www.training.gov.au) accessed 29 – 11 -11

This course, due to the ability to select from a very wide range of units across the Agriculture, Horticulture and Conservation and Land Management Package allows a high degree of specialisation. This specialisation does include water unit options.

AHC60410 Advanced Diploma of Conservation and Land Management

Description

"This qualification reflects the roles of individuals working in management roles in conservation and land management."

Downloaded from National Training Package (www.training.gov.au) accessed 29 – 11 -11

APPENDIX 7: National Training, Water Training Package NWP07

Overview:
The completed scan involved a desktop web-based research approach. This has provided a broad overview of the course availability in the described field of study; Water Training Package.

Parameters:
The parameters of this research are;

1. Qualifications and Courses provided by training.gov.au,
2. All searches conducted by internet,
3. All courses with water in the title,
4. Does not include Catchment, Land or Resource Management Programs.

Limitations:
In providing an overview, it is understood that we have not attempted a comprehensive examination of each individual institution or Registered Training Institute, nor made contact with individual institutions. Where possible, reference has been included to online study options. The scan relied on information that is publically and easily accessible on a website. We make no claim on the currency of data available on individual training body websites.

Certificate 1 in Water Sustainability, NWP10110				
Course Consists of 4 Core Units and 3 Elective Units				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Canberra Institute of TAFE	Not Listed	Expression of Interest	Not Listed	
Simmonds and Bristow	On Campus	Taking Enrolments	Not Listed	
Wide Bay Institute of TAFE	Flexible	Expression of Interest	4 Weeks	
Skills Tech Australia	Not Listed	Expression of Interest	Not listed	
Note: Institutes Listed as eligible to deliver but with no public information on website; Canberra Institute of TAFE, Challenger Institute.				

Certificate II in Water Operations, NWP20107				
Course Consists of 2 Core Units and 8 Elective Units				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Riverina Institute of TAFE	Flexible	Taking Enrolment	1 Semester	10 hours per day for 18weeks
Wide Bay Institute of TAFE	Flexible	Taking Enrolment	1 Semester	Queensland off campus
Water Industry Train Centre	Flexible	Taking Enrolment	Varied	Geelong Based
Water Training Australia	On campus	Taking Enrolment	Varied	2 core nine electives??
Hunter Institute of TAFE	Traineeship	Not Listed	Not Listed	Newcastle Campus
Hunter Institute TAFE	Traineeship	Not Listed	360 hrs	Newcastle Campus
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Goulburn Murray Water, Central Institute.				

Certificate III in Water Operations, NWP30107				
3 Core units and 8 Electives				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Skills Tech Australia	Flexible	Taking Enrolment	Varied	6 months/unit
Riverina Institute of TAFE	Flexible	Taking Enrolment	Varied	10hrs/week 18 weeks
Wide Bay institute of TAFE	Flexible	Taking Enrolment	Varied	Also traineeship
Water Industry Train Centre	Flexible	Taking Enrolment	Varied	
Water Train Australia	On campus	Taking Enrolment	Not Listed	
Chisholm Institute	On campus	Taking Enrolment	1 Year	
Hunter Institute of TAFE	Traineeship	Taking Enrolment	640 hrs	Newcastle Campus
Simmonds and Bristow	On Campus	Taking Enrolment	Not Listed	Independent
Wide Bay Institute of TAFE	Unknown	Taking Enrolment	Varied	
Skills Tech Australia	Unknown	Taking Enrolment	Varied	
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Canberra Institute, Goulburn-Murray Water, Central Institute, Central Institute, Enviro-Check, Queensland Urban Utility, Adelaide North TAFE and Adelaide South TAFE.				

Certificate IV Water Operations, NWP40107				
2 Core units and 5 Electives				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Riverina	Flexible	Taking Enrolment	1 Semester	10hrs/18 weeks
Water Train Australia	On Campus	Taking Enrolment	Varied	Torumbarry, Vic
Hunter TAFE	Traineeship	Taking Enrolment	600 hrs	Newcastle Campus

Certificate IV Water Operations, NWP40107 (continued)				
2 Core units and 5 Electives				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Simmonds and Bristow	On Campus	Taking Enrolment	Not Listed	Independent Provider
Skills Tech	Not Listed	Taking Enrolment	Varied	
Wide Bay	Flexible	Taking Enrolment	Varied	RPL, Traineeship
Victoria Uni	On Campus	Taking Enrolment	2 Years	
Chisholm	Combined	Taking Enrolment	1 Year	Traineeship avail
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Central West TAFE, Chisholm Institute, South West Sydney TAFE.				

Certificate IV, Domestic Water and Environmental Plumbing, 39275QLD				
2 Core units and 5 Electives				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Nil Listed				
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Sunshine Coast TAFE and Skills Tech Australia				

Certificate IV Irrigation, RTE 40203				
0 Core units and 12 Electives				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Challenger Institute TAFE (WA)	On Campus/ Traineeship	Not Listed	2 Semesters	Full time or Part time
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Sunshine Coast TAFE and Skills Tech Australia				
Diploma of Water Operations, NPW50107				
2 Core Units and 8 Electives				

Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Simmonds and Bristow	On Campus	Not Listed	Not Listed	Independent Provider
Wide Bay Institute of TAFE	Online	Taking Enrolments	12 months	
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Canberra Institute, Chisholm Institute, Goulburn Murray Water., West Sydney TAFE and South West Sydney TAFE.				

Diploma of Sustainable Water and Catchment Management, 21781VIC				
10 Units				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Swinburne TAFE / Lilydale	On Campus	Taking Enrolment	2 years full time	Day and evening study options, part time possible
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Ballarat University.				

Vocational Graduate Certificate in Water Industry Leadership, NWP70107				
4 Units				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Simmonds and Bristow	On Campus	Taking Enrolment	Not Listed	
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Chisholm, Wide Bay Institute				

Course in Sustainable Management of Water, 21552VIC				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Bendigo Regional Instit. of TAFE	On Campus	Taking Enrolment	3 Days	No Pre-requisites
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Chisholm				

APPENDIX 8: National Training, Conservation and Land Management Training Package, AHC10

Overview:

The completed scan involved a desktop web-based research approach. This has provided a broad overview of the course availability in the described field of study; Conservation and Land Management.

Parameters:

The parameters of this research are;

1. Qualifications and Courses provided by training.gov.au,
2. All searches conducted by internet,
3. Courses with Conservation and Land Management in the title, and where they are **Cert IV or higher level.**
4. Does not include Water Programs, though package does include water units of competency

Limitations:

In providing an overview, it is understood that we have not attempted a comprehensive examination of each individual institution or Registered Training Institute, nor made contact with individual institutions. Where possible, reference has been included to online study options. The scan relied on information that is publically and easily accessible on a website. We make no claim on the currency of data available on individual training body websites.

Certificate IV in Conservation and Land Management, AHC31410				
10 Units plus 4 other units from relevant Cert II or above course from Training Package AHC10				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Burnham and Associates	Not Listed	Expressions of Interest	Not Listed	
Mareeba Centre for Sustainable Agriculture	Face to Face	Taking Enrolments	12 months	
BCA Training Group	Face to face	Taking Enrolments	6 - 9 months	Includes field trips
Challenger Institute	On Campus	Taking Enrolments	1 Semester	
CY O'Connor Institute (WA)	Flexible	Taking Enrolments	Variable	
Farm Gate Training and Consult	Not Listed	Not listed	Not Listed	No course shown for 2012
Great Southern Institute	On Campus	Taking Enrolments	Not Listed	Albany Campus
Tocal College (Central NSW)	External	Taking Enrolments	Self Paced	Normally completed as part of Diploma in CLM
North Sydney Institute	On Campus	Taking Enrolments	1 Year	Evening Classes (10 hr/week)
Riverina TAFE	On Campus	Taking Enrolments	1 Year	National Environment Centre
Western Institute	Not Listed	Expression Of Interest	Not Listed	Difficult to determine courses
Maxima Training Services	Face to Face	Expressions of Interest	Not Listed	Group courses possible
West Coast Institute	Flexible	Taking Enrolments	Not Listed	
Goulburn Ovens TAFE	Face to Face	Taking Enrolments	1.5 years	Part time
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Booroongen Djugun Aboriginal Corporation, Fairbridge Western Australia, Farm Information Services, Auswide Projects, Hunther Institute, Illawara Institute, North Coast TAFE (do offer a course in land restoration - (on campus)), University of Queensland (Gratton Campus)				

Diploma of Conservation and Land Management, AHC41110				
8 Units plus two other units from other AHC10 Units				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Burnham and Associates	Not Listed	Expressions of Interest	Not Listed	
BCA Training Group	Face to face/ field trips	Taking Enrolments	6 - 9 months	
Farm Gate Training	Face to Face	Expressions of Interest	Not Listed	
Great Southern Institute	Face to Face	Taking Enrolments	1 Year	Albany Campus
Tocal College	External	Taking Enrolments	2 Years	
Hunter Institute	Face to Face	Taking Enrolments	36 or 72 weeks	
Illawara Institute	Face to Face	Taking Enrolments	1 or 2 years	Goulburn or Yallah campus
Northern Sydney Institute	On Campus	Taking enrolments	1.5 Years	Or equiv part time
Riverina TAFE	Flexible	Taking Enrolments	18 Weeks	National Environment Centre
West Coast Institute of Technology	Flexible	Taking enrolments	No Listed	Full or Part Time
Go TAFE	On Campus	Taking Enrolments	2.5 Years	Part time
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Challenger Institute, Farm Information Services, North Coast TAFE, Maxima Training Services, University of Queensland (Gatton Campus)				

Advanced Diploma of Conservation and Land Management, AHC60410				
Completion of 8 Units				
Institute / Location	**Delivery Method**	**Status**	**Length**	**Notes**
Burnham and Associates	Flexible	Expressions of Interest	Not Listed	Traineeship possible
BCA National Training Group	Not Listed	Expressions of Interest	Not Listed	
Farm Gate Training	Not Listed	Taking Enrolments	Not Listed	
Note: Institutes/ Agencies listed as eligible to deliver but with no public information on website; Australian Agricultural College Corporation, Tocal College, Maxima Training Group, University of Queensland (Gatton Campus)				

APPENDIX 9: University 'Water' Study Programs, Australia Wide.

Overview:
The completed scan involved a desktop web-based research approach. This has provided a broad overview of the course availability in the described field of study – Water Focused Programs.

Parameters:
The parameters of this research are;

1. Undergraduate Degree and Above,
2. Does include some PhD level studies but challenging to capture broad overview since they are frequently directed by student interest, staff availability and funding opportunities,
3. Australia-Wide Universities,
4. Courses with reference to Water.
5. Scan does not include general Environmental Engineering, Natural Resource or Conservation study programs.

Limitations:
In providing an overview it is understood that we have not attempted a comprehensive examination of each individual institution, nor made contact with individual institutions. It has been challenging to ascertain the institutes that are providing Online programs, though reference to online study options have been included where possible. The scan relied on information that is publically and easily accessible on a website. We make no claim as to the currency of data available on individual University websites.

Under Graduate Degrees

	Course	Institute	Study Type	Status	Length
1	Water Engineering	University of Newcastle	Full Time On Campus	Taking Enrolment	3 Years
2	Engineering (Civil and Water Management)	University of South Australia	Full time On Campus	Taking Enrolment	4 Years
3	Water Engineering (Civil and Structural)	University of Adelaide	Full time On Campus	Taking Enrolment	4 Years
4	Water Engineering (Civil and Environment)	University of Adelaide	Full time On Campus	Taking Enrolment	4 Years
5	Engineering in Water (Architectural)	University of Adelaide	Full time On Campus	Taking Enrolment	4 Years
6	Science Water Major	Australian National University	Full time On Campus	Taking Enrolment	3 Years
7	Environmental Science (Freshwater Biology)	Deakin University	On Campus	Taking Enrolment	3 Years Full time or part time

Honours

	Course	Institute	Study Type	Status	Length
1	Honours in Science (Chemistry)	Monash University Water Studies Centre	Negotiated	Taking Enrolment	

Engineering Graduate Certificate

	Course	Institute	Study Type	Status	Length
1	Engineering (Water Engineering)	Sydney University of Technology	On Campus	Taking Enrolment	0.5 yrs
2	Engineering Science (Water, Wastewater, Water waste and waste engineering)	University of New South Wales	On Campus	Taking Enrolment	.5Yrs
3	Engineering Science (Water Resources)	University of New South Wales	On Campus	Taking Enrolment	.5Yrs
4	Engineering Science (Groundwater Resources)	University of New South Wales	On Campus	Taking Enrolment	.5Yrs

Post/Graduate Certificate

	Course	Institute	Study Type	Status	Length
1	River Restoration and Management	Charles Sturt University Wagga Campus	Distance	Taking Enrolment	
2	Applied Science (Sustainable Water Management)	Deakin University	On Campus Or online	Taking Enrolment	.5 yrs full time or part time
3	Water Resource Management	Deakin university	On Campus	Taking Enrolment	.5 yrs
4	Science (Groundwater Hydrology)	Flinders	On Campus	Taking Enrolment	
5	Science (Land and Water Management)	University of Western Australia	On Campus	Taking Enrolment	.5 yrs
6	Integrated Water Management	University of Queensland	On Campus	Taking Enrolment	.5Yrs
7	Water Resource Management	Charles Sturt University	Off Campus	Taking Enrol	

Post / Graduate Diploma

	Course	Institute	Study Type	Status	Length
1	Engineering (Water Resources Management)	Melbourne University	On Campus	Taking Enrolment	1 Year
2	Integrated Water Management	University of Queensland	On Campus	Taking Enrolment	1 Year
3	Water Resource Management	Charles Sturt University	Off Campus	Taking Enrolment	
4	River Restoration and Management	Charles Sturt University Wagga Campus	Off Campus	Taking Enrolment	
5	Applied Science (Sustainable Water Management)	Deakin University	On Campus	Taking Enrolment	.5 yrs
8	Science (Groundwater Hydrology)	Flinders University	On Campus	Taking Enrolment	
9	Science (Land and Water Management	University of Western Australia	On Campus	Taking Enrolment	.5 yrs
10	Water Management	University of Canberra	On Campus	Taking Enrolment	1 Year

Graduate Diploma - Continued					
	Course	**Institute**	**Study Type**	**Status**	**Length**
1	Water Resources Management	Central Queensland University Rockhampton Campus	On Campus Online	Taking Enrolment	
	Water Resources Management	Flinders University Bedford Campus	On Campus	Taking Enrolment	
	Water Resources Management	Chisolm Insititute	On Campus	Taking Enrolment	
	Water Resource Management	Flinders University	On Campus	Taking Enrolment	
	Science (Groundwater Hydrology)	Flinders University	On Campus	Taking Enrolment	
	Science (Land and Water Management)	University of Western Australia	On Campus	Taking Enrolment	.5 yrs

Masters

	Course	Institute	Study Type	Status	Length
1	Integrated water management	Uni of Queensland	On Campus	Taking Enrolment	1.5 years
2	Applied Science Sustainable Water Management	Deakin University	On Campus	Taking Enrolment	1.5 yrs
3	Water Resource Management ICE WaRM	Deakin University	On Campus	Taking Enrolment	
4	Water Sustainability	Charles Sturt University Wagga	On Campus and Online	Taking Enrolment	
5	Applied Science (Water Resource Management)	Melbourne University	On Campus	Taking Enrolment	
6	Philosophy - Irrigation	Charles Sturt University	On Campus	Taking Enrolment	2 Years
7	Philosophy - Integrated Water Management	Monash Node South Africa		Taking Enrollment	
8	Master of Science (Water)	Monash University Water Studies Centre	Negotiated	Taking Enrolment	

PhD Program in Water

1	Water Planning	Edith Cowan	On Campus	Scholarship	3 Years
2	Water	University of New South Wales Freshwater Research Centre	On and Off Campus	Scholarship	

3	Doctor of Science	Monash University Water Studies Centre	Negotiated	Taking Enrolment	

APPENDIX 10: University Environmental Study Programs – Vic, NSW and ACT

Overview:
The completed scan involved a desktop web-based research approach. This has provided a broad overview of the course availability in the described field of study.

Parameters:
The parameters of this research are;

6. Undergraduate Degree and Above,
7. Does not include PhD level studies since they are frequently by student interest, staff availability and funding opportunities,
8. Victorian, New South Wales and ACT Universities,
9. Courses with reference to Environment, Environmental Science, Environmental Studies or similar.
10. Scan does not include Environmental Engineering, Natural Resource or Conservation study programs.

Limitations:
In providing an overview, it is understood that we have not attempted a comprehensive examination of each individual institution, nor made contact with individual institutions. It has been challenging to ascertain the institutes that are providing Online programs, though reference to online study options have been included where possible. The scan relied on information that is publically and easily accessible on a website. We make no claim on the currency of data available on individual University websites.

Under Graduate Degrees

	Course	Institute	Study Type	Status	Length
1	Bachelor of Environmental Science	Charles Sturt University	Off Campus	Taking Enrollment	6 Year Part-time
2	Bachelor of Environmental Science and Management	Charles Sturt University	On Campus	Taking Enrollment	4 Year Full-time
3	Bachelor of Environment	Macquarie	On Campus	Taking Enrollment	3 Year Full time
4	Bachelor of Conservation and Bio-diversity	Macquarie	On Campus	Taking Enrollment	3 Year Full time
5	Bachelor of Environmental Science	Southern Cross University Lismore	On Campus	Taking Enrollment	3 Year Full time
6	Bachelor of Environmental Science	University of New England	On Campus	Taking Enrollment	3 Years Full time and < 10 Years Part time
7	Bachelor of Environmental Science	University of New South Wales	On Campus	Taking Enrollment	4 Years Full time
8	Bachelor of Environmental Science	University of Newcastle	On Campus	Taking Enrollment	3 Years Full time
9	Bachelor of Environmental Systems	University of Sydney	On Campus	Taking Enrollment	3 Years full time or part time option
10	Bachelor of Environmental Biology	University of Technology, Sydney	On Campus	Taking Enrollment	3 Years Full time or part time
11	Bachelor of Environmental Science	University of Western Sydney	On Campus	Taking Enrollment	3 Years Fulltime or part time option

Under Graduate Degrees, Continued					
12	Bachelor of Environmental Science	University of Wollongong	On Campus	Taking Enrollment	3 Years or part time
13	Bachelor of Science (Environment)	University of Wollongong	On Campus	Taking Enrollment	3 Years or part time
14	Bachelor of Environmental Studies	Australian National University	On Campus	Taking Enrollment	3 Years Full time /equiv part time
15	Bachelor of Environmental Studies	Australian National University	On Campus	Taking Enrollment	3 Years Full time /equiv part time
16	Bachelor of Science (Resources and Environmental Management)	Australian National University	On Campus	Taking Enrollment	3 Years Full time /equiv part time
17	Bachelor of Science(Environment)	University of Canberra	On Campus	Taking Enrollment	3 Years Full time /equiv part time
18	Environmental Science (Freshwater Biology and Management)	Deakin University	On Campus	Taking Enrollment	3 Years Full time /equiv part time
19	Environmental Science (Environmental Management)	Deakin University	On Campus and Online	Taking Enrollment	3 Years Full time /equiv part time
20	Bachelor of Science (Environmental Science)	Latrobe (Including Albury / Wodonga for first year)	On Campus	Taking Enrollment	3 Years Full time /equiv part time
21	Bachelor of Science Environmental Management and Ecology	Latrobe University (Albury Wodonga)	On Campus	Taking Enrollment	3 Years Full time /equiv part time
22	Bachelor of Environmental Science	Monash University	On Campus and Online	Taking Enrollment	4 Years Full time /equiv part time

Under Graduate Degrees, Continued					
23	Bachelor of Social Science (Environment)	Royal Melbourne Institute of Technology	On Campus	Taking Enrollment	3 Years Full time /equiv part time
24	Bachelor of Environmental Science	Royal Melbourne Institute of Technology	On Campus	Taking Enrollment	3 Years Full time /equiv part time
25	Bachelor of Environmental Science / Environment	Royal Melbourne Institute of Technology	On Campus	Taking Enrollment	4 Years Full time /equiv part time
26	Bachelor of Social Science (Environment)	Royal Melbourne Institute of Technology	On Campus	Taking Enrollment	3 Years Full time /equiv part time
27	Bachelor of Environmental Science / Management	Royal Melbourne Institute of Technology	On Campus	Taking Enrollment	4 Years Full time /equiv part time
28	Bachelor of Science Sustainability / Environmental Science	Swinburne University	On Campus	Taking Enrollment	3 Years Full time /equiv part time
29	Bachelor of Environmental Management	University of Ballarat	On Campus	Taking Enrollments	3 Years Full time
30	Bachelor of Science (Environmental Studies)	University of Ballarat	Flexible	Taking Enrollments	3 Years Full time
31	Bachelor of Science (Environmental Science)	University of Melbourne	On Campus	Taking Enrollments	3 Years Full time
32	Bachelor of Environments	University of Melbourne	On Campus	Taking Enrollments	3 Year Full time

Under Graduate Degrees, Continued					
33	Bachelor of Science Ecology and Environmental Management	Victoria University	On Campus	Taking Enrollments	3 Years Full time
34	Environmental Science	Australian Catholic University (Sydney)	On Campus	Taking Enrollments	3 Years Full time

Honours Level					
	Course	**Institute**	**Study Type**	**Status**	**Length**
1	Environmental Science and Management (Honours)	Charles Sturt University	On Campus	Taking Enrollment	1 Year Full-time 4 Years P/T
2	Environmental Science	Southern Cross University Lismore	On Campus	Taking Enrollment	1 Year Full time
3	Environmental Science	University of New England	On Campus	Taking Enrollment	1 Year Full time or 2 Years Part Time
4	Environmental Science	University of Newcastle	On Campus	Taking Enrollment	3 Years Full time
5	Environmental Science and Management	University of Newcastle	On Campus	Taking Enrollment	1 Year Full time
6	Environmental Science	University of Technology, Sydney	On Campus	Taking Enrollment	1 Year or part time equiv
7	Environmental Science	University of Wollongong	On Campus	Taking Enrollment	1 Year or part time equiv
8	Bachelor of Science (Resources and Environmental Management)	Australian National University	On Campus	Taking Enrollment	1 Year Full time /equiv part time

Honours Level Continued					
9	Applied Science(Environment)	University of Canberra	On Campus	Taking Enrollment	1 Year Full time /equiv part time
10	Science Environmental Management and Ecology	Latrobe University (Albury Wodonga)	On Campus	Taking Enrollment	1 Year Full time /equiv part time
11	Bachelor of Environmental Science	Monash University	On Campus	Taking Enrollment	1 Year Full time /equiv part time
12	Bachelor of Social Science (Environment)	Royal Melbourne Institute of Technology	On Campus	Taking Enrollment	1 Year Full time /equiv part time
13	Bachelor of Environmental Science	Royal Melbourne Institute of Technology	On Campus	Taking Enrollment	1 Year Full time /equiv part time
14	Bachelor of Science (Environmental Science)	University of Melbourne	3 Years	Taking Enrollments	1 Year Full time /equiv part time
15	Environmental Science	Australian Catholic University (Sydney)	On Campus	Taking Enrollments	1 Year Full time /equiv part time

Post/Graduate Certificate

	Course	Institute	Study Type	Status	Length
1	Environmental Management	Charles Sturt University	Off Campus	Talking Enrollment	
2	Environmental Studies	Macquarie	On Campus	Taking Enrollment	1 Year Full time
3	Environmental Management	Macquarie	On Campus	Taking Enrollment	1 Year Full time
4	Environmental Management	University Of New South Wales	On Campus	Taking Enrollment	.5 Years
5	Environment	Australian National University	On Campus	Taking Enrollment	.5 Years Full time /equiv part time
6	Environmental Science	Australian National University	On Campus	Taking Enrollment	.5 Years Full time /equiv part time
7	Applied Science (Environmental Management)	Deakin University	On Campus	Taking Enrollment	.5 Years Full time /equiv part time
8	Environment and Planning	Royal Melbourne Institute	On Campus	Taking Enrollment	.5 Years Full time /equiv part time
9	Bachelor of Environments	University of Melbourne	On Campus	Taking Enrollments	.5 Full time

Post/Graduate Diploma					
	Course	**Institute**	**Study Type**	**Status**	**Length**
1	Environmental Management	Charles Sturt University	Off Campus	Talking Enrollment	1 Year Full time 3 Year Part time
2	Environmental Studies	Macquarie	On Campus	Taking Enrollment	1 Year Full time
3	Environmental Management	University Of New South Wales	On Campus	Taking Enrollment	1 Year
4	Environmental Management and Ecology	Latrobe (Including Albury /Wodonga)	On Campus	Taking Enrolment	1 Year or equivalent Part Time
5	Environment and Planning	Royal Melbourne Institute	On Campus	Taking Enrollment	1 Years Full time /equiv part time

Post/Graduate Diploma					
8	Environment	University of Melbourne	On Campus	Taking Enrollments	1 Year Full time

Masters

	Course	Institute	Study Type	Status	Length
1	Environmental Management	Charles Sturt University	Off Campus	Talking Enrollment	1 Year Full time 3 Year Part time
2	Environmental Science	Macquarie	On Campus	Taking Enrollment	1.5 Year Full time
3	Environmental Management	Macquarie	On Campus	Taking Enrollment	1.5 Year Full time
4	Environmental Planning	Macquarie	On Campus	Taking Enrollment	1.5 Year Full time
5	Environmental Studies	Macquarie	On Campus	Taking Enrollment	1.5 Year Full time
6	Bachelor of Environmental Science	Southern Cross University Lismore	On Campus	Taking Enrollment	1.5 Year Full time or 3 year P Time
7	Master of Resource Science	University of New England	On Campus	Taking Enrollment	2 years Full time or , 4 years P/T
8	Environmental Management	University Of New South Wales	On Campus	Taking Enrollment	1.5 Years Full time or equiv. Part time
9	Environmental Biology	University of Technology, Sydney	On Campus	Taking Enrollment	1.5 Years Full time or part time
10	Environmental Change Management	University of Technology, Sydney	On Campus	Taking Enrollment	1.5 Years Full time or part time
11	Climate Change and Environmental Management	University of Western Sydney	On Campus	Taking Enrollment	1 Year Full time or 2 part time

Masters, Continued					
12	Environmental Science Environmental Science (research) Environmental Science (advanced)	University of Western Sydney	On Campus	Taking Enrollment	1 Year Full time
13	Environmental Science (research)	University of Western Sydney	On Campus	Taking Enrollment	1.5 Years Full time
14	Environmental Science (advanced) (designed for International Students)	University of Western Sydney	On Campus	Taking Enrollment	2 Years Full time
15	Master of Science (Resources and Environmental Management)	Australian National University	On Campus	Taking Enrollment	1 Years Full time /equiv part time
16	Master of Applied Science (Freshwater Ecology)	University of Canberra	On Campus	Taking Enrollment	2 Years
17	Master of Applied Science (Environmental Management)	University of Canberra	On Campus	Taking Enrollment	2 Years
18	Master of Applied Science (Resource and Environmental Management)	University of Canberra	On Campus	Taking Enrollment	2 Years
19	Master of Applied Science (Environmental Management)	Deakin University	On Campus	Taking Enrollment	1.5 Years
20	Environmental Management	Latrobe University (Albury /Wodonga)	On Campus	Taking Enrollment	1 - 2 Years Full time /equiv part time
21	Environment and Planning	Royal Melbourne Institute	On Campus	Taking Enrollment	1.5 Years Full time equiv p time
22	Environment	University of Melbourne	On Campus	Taking Enrollments	1 or 2 Years Full time or Part time equivalent.

APPENDIX 11: North East Agencies Training SCAN

Overview:
The completed scan involved a desktop web-based research approach. This has provided a broad overview of the course availability in the described field of study; Conservation and Land Management.

Parameters:
The parameters of this research are;

1. General overview or training programs identified on organisational website
2. No focus on accredited course,
3. Focused on agencies with strategic planning and management of natural resources and communities in North East Victoria
4. Search was conducted for training that may be of relevance to staff working in the water management sector,

Limitations:
In providing an overview, it is understood that we have not attempted a comprehensive examination of each individual agency, nor made contact with individual agencies. Where possible, reference has been included to online study options. The scan relied on information that is publically and easily accessible on a website. Whilst care has been taken, we make no claim on the currency of data available on individual agency websites.

Agency	Training Tab on website?	Course/ Workshops Available	Description
Goulburn Murray Water	No	No training publically viewable on website	Excellent general information on water resources
North East Water	Yes, has an 'Education' icon	Information primarily for community use and school resources	No training publically viewable on website Excellent resource information
North East Catchment Management Authority	No	Information available for community and Industry programs	No training publically visible Links available for the SEED educational resources program. Excellent information on water resources
Municipal Association of Victoria	Yes	Yes Floods, Fire, Droughts, What's next?	Mainly focused on governance, search options allows environment training as an option Workshop conducted around Victoria
Australian local Government Association	No	Not evident	Does not have training role
Rural Councils Victoria	No	Not evident	Rural Councils Victoria includes in their goals training and it may be possible to view training workshops on either the events or initiatives website.

Agency	Training Tab on website	Course/ Workshops Available	Description
Clearwater	Yes	Focused on Sustainable Urban Water Management: • Stormwater harvest and reuse • Raingardens • Stormwater modeling and WSUD	Training , technical tours and knowledge sharing events www.clearwater.asn.au
Department of Sustainability and Environment	No	Not evident	Access to many water related resources through www.water.vic.gov.au This includes access to Northern Region water strategy. Also provides good access to data via the Victorian Water Resources Data Warehouse.
Department of Primary Industries	Yes	General education and training available in the following areas; 1. Agriculture 2. Earth resources 3. Energy 4. Fisheries 5. Forestry, and 6. Pets	Show diversity of training and training Centres managed by Department of Primary Industries
Victorian Employers Chamber of Commerce and Industry	Yes	Mainly focused on business skills, one short course that was offered in Business Sustainability in Melbourne	Regional training offered, including training centre in Wodonga.
Sustainability Victoria	Indirectly held with 'Programs' Tab	Includes reference to; • 'Energy and Water Taskforce' and • 'Working with Local Government'	Contains vast amount of information about programs, reports and events within Victoria though less focused upon water in the environment. Excellent resources for general sustainability

Agency	Training Tab on website	Course/ Workshops Available	Description
Regional Development Victoria	Listed as 'Programs'	Information on programs including; Sustainable Small Town Development Fund, Landcare, Local Action for Sustainability	Focused on building business and community in Regional Victoria.

APPENDIX 12: Australian Projected Water Sector Employee Requirements

Table 5.4: Projected total additional water sector employees required by 2018

Australian Qualifications Framework	Cert II	Cert III	Cert IV	Diploma	Adv Diploma		Voc Grad Cert	Voc Grad Dip		
					Associate Degree	Bachelor	Grad Cert	Grad Dip	Masters	Doctorate
Managers						1,847				
Engineer Professionals						6,632				
Science/Technical Professionals						1,104				
Engineer Paraprofessionals				2,332						
Science/technology Paraprofessionals				380						
Trades and Related Workers			2,909							
Operators		5,783								
Business support				2,830		1,821				
Total		**5,783**	**2,909**	**5,542**		**11,404**				

Source: National WaterSkills Audit (IECWRM, 2008, p 63).

APPENDIX 13: Online survey

A copy of the online survey can be found at: Online Survey

INTRODUCTION

The North East Greenhouse Alliance (NEGHA) has identified the development of a climate change adaptation strategy as one of its key priority areas. The project "North East Victoria – Adapting to a Low Water Future" aims to investigate the potential impacts of climate change in north east Victoria, inform the community of expected impacts on the region, and provide strategies and solutions towards climate change adaptation. This survey forms part of Phase 3, a Skills Gap and Training Needs analysis for target agencies within the region (local government, water authorities and catchment management authorities).

This survey is designed to be easy to fill out and should not take more than 20 minutes of your time. Please answer the questions as well as you are able based on your current knowledge of your organisations practices. If you are unable to answer a question, leave it blank or provide your best estimate (or select "Don't Know" where applicable). We will send you a copy of the final report when we have completed our analysis of the results. The final report will provide statistical analysis of the survey results and will not identify individuals, companies, or organisations responding to the survey. Thank you in advance for taking the time to complete our survey.

Thank you

Centre for Sustainable Skills Team

Wodonga Institute of TAFE

1. Your details...

2. What industry sector is your organisation?

3. What is your role within your organisation?

4. How do you rate skills, knowledge and training requirements of your organisation with respect to strategic water planning and management?

	Extremely important	Important	Indifferent	Unimportant	Extremely Unimportant	N/A
Climate change	*How do you rate skills, knowledge and training requirements of your organisation with respect to strategic water planning and management? Climate change	Climate change Important	Climate change Indifferent	Climate change Unimportant	Climate change Extremely Unimportant	Climate change N/A
Water shortages	Water shortages Extremely important	Water shortages Important	Water shortages Indifferent	Water shortages Unimportant	Water shortages Extremely Unimportant	Water shortages N/A
Extreme weather events	Extreme weather events Extremely important	Extreme weather events Important	Extreme weather events Indifferent	Extreme weather events Unimportant	Extreme weather events Extremely	Extreme weather events N/A

	Extremely important	Important	Indifferent	Unimportant	Extremely Unimportant	N/A
Community values	.Community values Extremely important	.Community values Important	.Community values Indifferent	.Community values Unimportant	.Community values Extremely Unimportant	.Community values N/A
Alternative approach to water supply	.Alternative approach to water supply Extremely important	.Alternative approach to water supply Important	.Alternative approach to water supply Indifferent	.Alternative approach to water supply Unimportant	.Alternative approach to water supply Extremely Unimportant	.Alternative approach to water supply N/A
Infrastructure renewal	.Infrastructure renewal Extremely important	.Infrastructure renewal Important	.Infrastructure renewal Indifferent	.Infrastructure renewal Unimportant	.Infrastructure renewal Extremely Unimportant	.Infrastructure renewal N/A
Possible institutional reform	.Possible institutional reform Extremely important	.Possible institutional reform Important	.Possible institutional reform Indifferent	.Possible institutional reform Unimportant	.Possible institutional reform Extremely Unimportant	.Possible institutional reform N/A
Potential fiscal constraints for increased capital expenditure	.Potential fiscal constraints for increased capital expenditure Extremely important	.Potential fiscal constraints for increased capital expenditure Important	.Potential fiscal constraints for increased capital expenditure Indifferent	.Potential fiscal constraints for increased capital expenditure Unimportant	.Potential fiscal constraints for increased capital expenditure Extremely Unimportant	.Potential fiscal constraints for increased capital expenditure N/A

Other (please specify)

5. In what way do the factors you ranked as most important in impact on required skills and training within your organisation with respect to strategic water planning and management? (e.g. increased emphasis on emergency management)

6. Do any of the following industry factors have a bearing on skills and workforce development within your organisation?

	Yes	No	N/A
Changing environments and continuous improvement e.g. local government reform, organisational change, proposed mergers	.*Do any of the following industry factors have a bearing on skills and workforce development within your organisation? Changing environments and continuous improvement e.g. local government reform, organisational change, proposed mergers Yes	.Changing environments and continuous improvement e.g. local government reform, organisational change, proposed mergers No	.Changing environments and continuous improvement e.g. local government reform, organisational change, proposed mergers N/A
Workforce planning issues e.g. an organisations ability to determine future human resource needs (based on forecast workforce gaps)	.Workforce planning issues e.g. an organisations ability to determine future human resource needs (based on forecast workforce gaps) Yes	.Workforce planning issues e.g. an organisations ability to determine future human resource needs (based on forecast workforce gaps) No	.Workforce planning issues e.g. an organisations ability to determine future human resource needs (based on forecast workforce gaps) N/A
Recruitment issues	.Recruitment issues Yes	.Recruitment issues No	.Recruitment issues N/A
Retention issues e.g. unable to offer long-	.Retention issues e.g. unable to offer	.Retention issues e.g. unable to offer	.Retention issues e.g. unable to offer

	Yes	No	N/A
term contract	long-term contract Yes	long-term contract No	long-term contract N/A

Other (please specify)

7. Currently within your organisation, related to water planning and management, what do you offer in terms of in-house training?

8. What training support (e.g. paid study leave) are staff offered?

9. In addition to formal training and qualifications, what "soft skills" (e.g. leadership skills, OH&S) do you think your organisation requires to adapt to climate change and associated water shortages?

10. What barriers are there within your organisation to undertaking training? (choose as many as applicable)

- cost of release (backfilling)
- no time
- availability of training
- no request for training
- no awareness of types of training available
- no relevant training available

Other (please specify)

11. What are your preferred training methods? (choose as many as applicable)

- Classroom/workshop
- On-site
- On-the-job
- E-learning
- Distance
- Depends on the position

Other (please specify)

12. What would be of most use to your organisation in terms of gaining the skills required to adapt to climate change, and more specifically, a low water future?

- ☐ . No change / no training required.
- ☐ .No training, but outsourcing of skills as required.
- ☐ .Training in fundamental skills in environmental management/sustainability at many levels in your organisation.
- ☐ .Training in fundamental skills in environmental management/sustainability at higher levels in your organisation.
- ☐ .Training in higher-level skills in environmental management/sustainability at many levels in your organisation.
- ☐ .Training in higher-level skills in environmental management/sustainability at higher levels in your organisation.
- ☐ .Specific training for staff involved in strategic water planning and management within the organisation (please specify, below)

Other (please specify)

13. We thank you and appreciate your time and consultation in completing this survey; it is important information in accessing our region's ability to adapting to a low water future. If you have any further comments please submit here or contact us on 02 6055 6334 or email

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