



UNIVERSITY
OF WOLLONGONG
AUSTRALIA

Water Management Action Plan 2018-2020

University of Wollongong

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1 INTRODUCTION

UOW is committed to the principles of environmental sustainability and has developed the 2017-2020 Environmental Management Plan (EMP) and the Wollongong Campus Master Plan 2016-2036 in line with its Environment Policy.

The strategies required under the EMP 2017-2020 include the development and implementation of a Water Management Action Plan (WMAP). This WMAP defines strategic areas and specific actions to improve water performance and support the achievement of UOW's water management targets specified in the EMP 2017-2020.

2 OBJECTIVE

The objective of this WMAP is to define the strategies and actions to support the achievement of the following water management targets defined in the EMP 2017-2020:

- Continuously reduce potable water use to below 8.5 kL/EFTSL by 2020¹.
- Reduce potable water use by 5% by 2020 (kL/m²)².

UOW also has long term targets to achieve 20% water reduction by 2035.

3 BACKGROUND

The following graph illustrates UOW water performance KPI over the previous years:

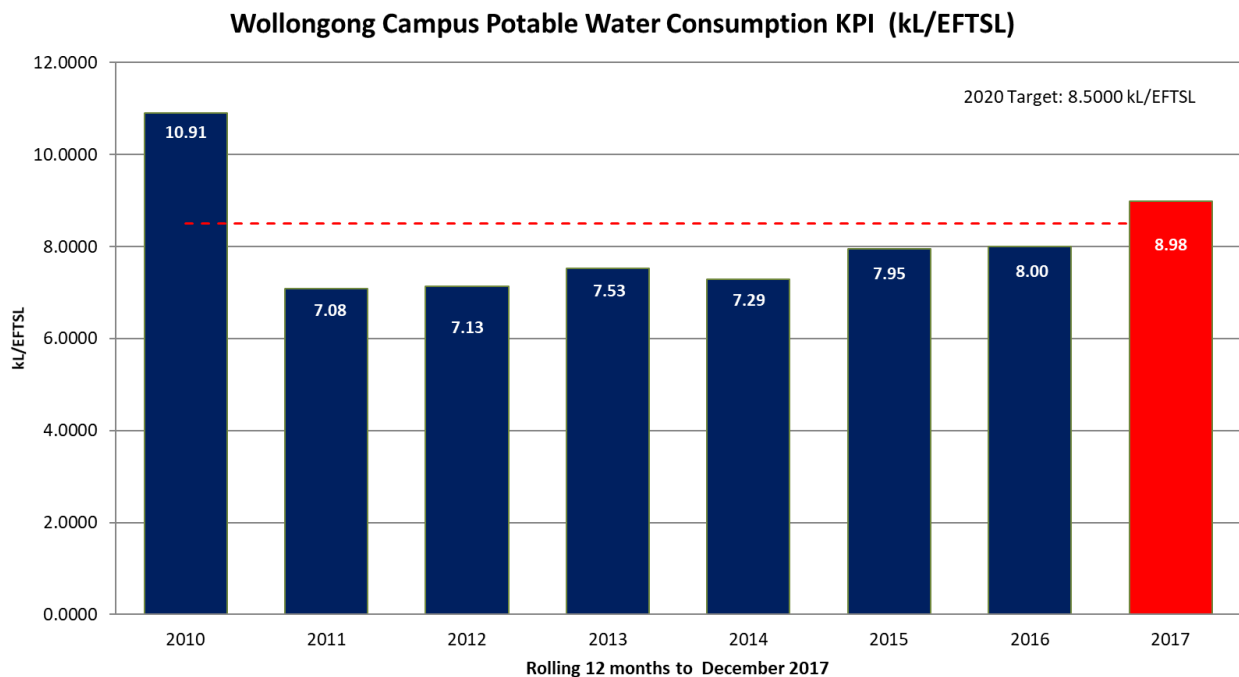


Figure 1: Wollongong Campus water consumption performance

¹ Based on annual TEFMA bench-marking, includes Wollongong Campus and excludes residential accommodation. This indicator may vary during periods of abnormally rainfall.

² Based on 2016 levels, includes Wollongong Campus and excludes residential accommodation.



Growth in operations, drier climatic conditions and ageing infrastructure pose a challenge to water consumption reduction. Rainfall has decreased over the last two years (see Figure 2) and water consumption at UOW has increased during this time. With an aging water infrastructure water leaks become more frequent, increasing water consumption. Therefore improvement in the management and detection of water leaks is a key strategy of this WMAP.

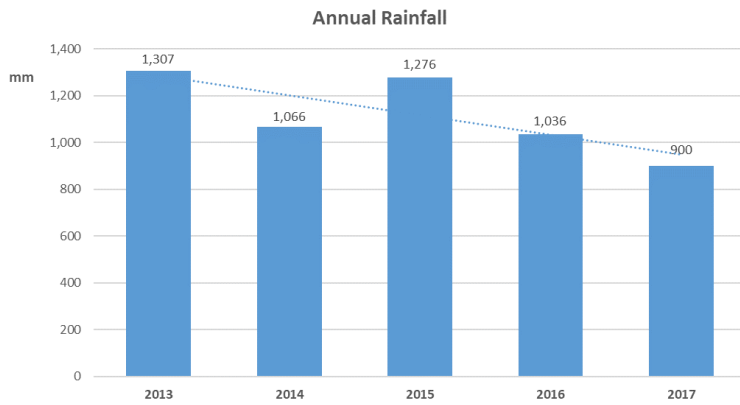


Figure 2: Annual rainfall (mm)

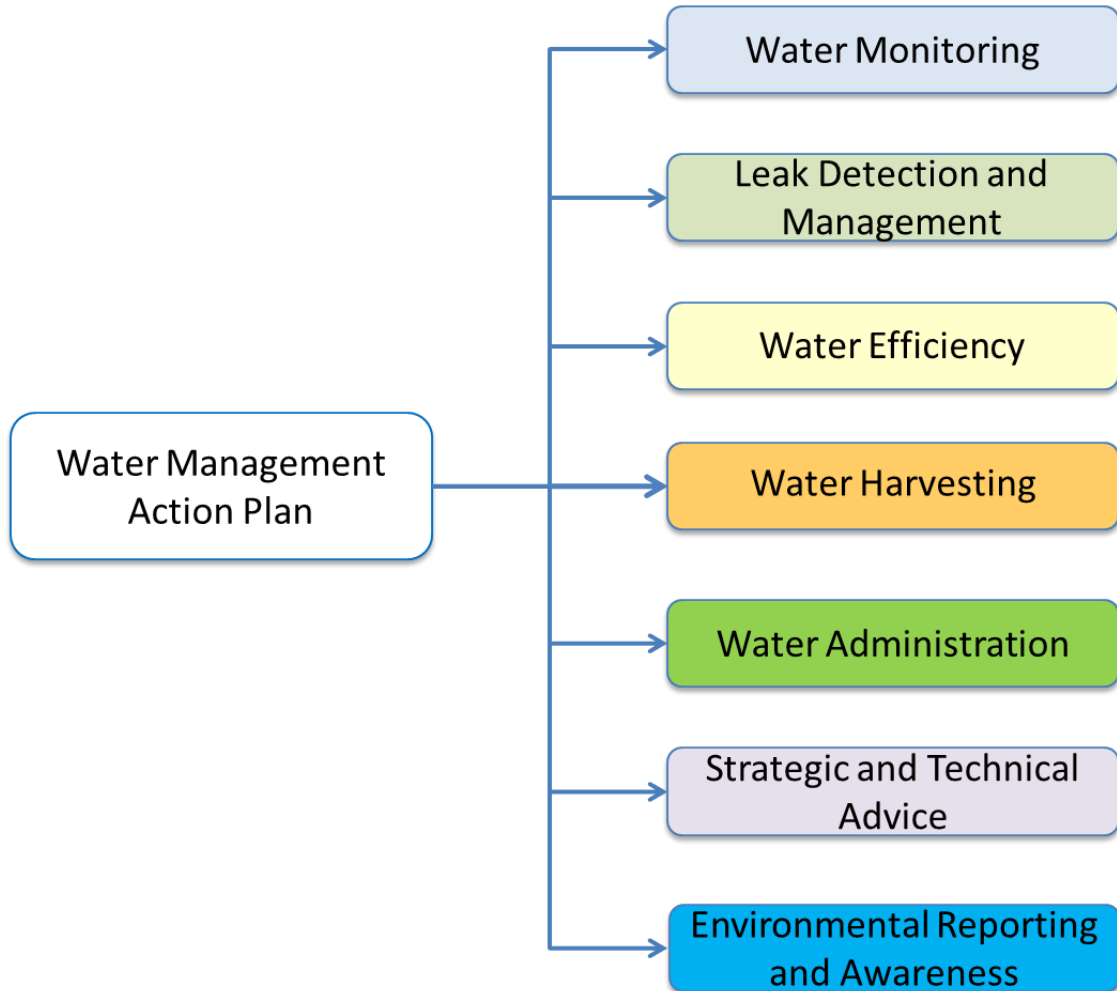


Figure 3: Water leak

In addition UOW operations will continue to grow with new buildings expected to be operative in the near future and with new water cooled air conditioning equipment being installed which will increase water demand onsite. This WMAP includes strategies and actions to monitor water consumption trends and patterns, improve leak detection and management, maximise the efficiency of water equipment, assess opportunities to harvest and reuse water, effectively manage the costs associated with water consumption, integrate water requirements into new building and project plans, increase awareness and report on water performance.

4 STRATEGIC AREAS

This WMAP focuses on the following strategic areas for the identification and implementation of improvements in water saving and performance management actions:



WATER MONITORING

Water monitoring consists of systems, tools and processes to meter and track water consumption and to understand where and when water is used across the campus. Water monitoring is the first step required to measure consumption, understand patterns, assess performance and identify opportunities.

LEAK DETECTION AND MANAGEMENT

Water leaks result in significant water wastage at UOW. Many leaks cannot be physically detected when they occur underground and when water does not flow to the surface. These leaks can result in significant water losses and even damage to campus infrastructure before they become noticeable.

Leak detection and management consists of actions to prevent water leaks, improve the capability to detect these at early stages and reduce the time between leak commencement through to detection and repair.

WATER EFFICIENCY

Water efficiency consists of projects and practices that reduce water consumption by using more efficient equipment and/or system controls to improve water performance without compromising service.

WATER HARVESTING

Water harvesting consists of systems that capture rainwater/stormwater and reuse it for suitable purposes such as irrigation, outdoor water features or toilet flushing which do not require potable water.



WATER ADMINISTRATION

Water administration strategies do not necessarily result in water savings however they are necessary to understand and track water expenditure, minimise costs and forecast budgets. Examples of these strategies include water invoice check and verification, monitoring and forecasting water expenditure, liaising with authorities to address billing issues and organise new water feeds.

STRATEGIC AND TECHNICAL ADVICE

Strategic and technical advice consists of the ongoing liaison with relevant stakeholders to ensure that projects and activities conducted at UOW such as new building developments and landscape/campus refurbishments incorporate the relevant sustainability and environmental features required to ensure adequate water performance.

ENVIRONMENTAL REPORTING AND AWARENESS

Environmental reporting initiatives aim to ensure that water performance, achievements and opportunities are effectively documented and communicated to provide relevant information and facilitate decision making. Environmental awareness initiatives also facilitate behavioural changes and enhance the understanding of sustainable practices and the positive impact of water conservation actions taken by staff and students.

5 WATER MANAGEMENT ACTIONS

The following actions have been identified as potential projects/initiatives to improve water performance according to the strategic actions defined in Section 4:

STRATEGIC AREA	ACTION	PRIORITY	INDICATIVE IMPLEMENTATION DATE
Water Monitoring	Upgrade Water Metering and Monitoring System	High	2018
	Monitor Water Consumption and Performance	High	Monthly
	Manage Water Metering and Monitoring System	High	As required
	Measurement and Verification of Actions/Events Impacting Water Consumption	Medium	Monthly
Leak Detection and Management	Implement Online Monitoring Process to Identify Potential Leaks at Early Stages	High	Daily
	Develop Processes to Reduce Time Required to Find Exact Location of Concealed Leaks	High	2019
	Reduce the Unmetered Water Feeds on Campus	Medium	2019
	Assess Opportunities to Monitor and Measure Sewage and Stormwater	Low	2019
	Restrict Water Supply to Selected Irrigation Systems	Low	2020
	Review Major Water Infrastructure	Medium	2020
Water Efficiency	Develop Strategies to Reduce Water Consumption for Outdoor Purposes	High	2019
	Assess the Installation of Additional Water Efficient Fittings, Toilets and Controls	Medium	2020
	Assess Strategies to Further Reduce Swimming Pool Water Losses	Low	2019
	Assess Opportunities To Reduce Consumption of Cooling Towers	Low	2020
	Conduct Water Saving Audits	Medium	As required



STRATEGIC AREA	ACTION	PRIORITY	INDICATIVE IMPLEMENTATION DATE
Water Harvesting	Assess Status of Existing Harvesting Systems	Medium	2020
	Develop Strategies to Monitor Ongoing Performance of Harvesting Systems	Medium	2020
	Maintain Existing Harvesting Systems	Low	After assessment of existing systems
	Assess Opportunities to Increase Water Harvesting Onsite	Low	After assessment of existing systems
Water Administration	Continuously Improve and Manage Water Billing Verification Process	High	Quarterly
	Track, Forecast and Plan Water Consumption and Expenditure	Medium	Quarterly and annually
Strategic and Technical Advice	Review UOW Ecologically Sustainable Design Standards	High	2019
	Integrate Water Management Requirements into UOW Hydraulic Design Standards	Medium	2019
	Provide Input and Liaise with Key Stakeholders	Medium	As required
Environmental Reporting and Awareness	Provide Water Performance Reports	High	Monthly and as required
	Develop and Implement Behavioural Change and Awareness Programs for Water Users	Medium	Quarterly

Water Monitoring

UPGRADE WATER METERING AND MONITORING SYSTEM

The water metering system at UOW consisted of a network of data loggers connected to water meters across the University Campus. These data loggers sent information to UOW Data and Analytics Self Service Hub (DASH) where the data could be analysed. The data loggers operated using 2G network technology which was phased out during 2017/2018 therefore this metering system became obsolete and needed to be upgraded.

In addition to adapting to the 2G network closure the aim of this upgrade was to:

- Improve data reliability and accuracy
- Outsource the system maintenance services and improve efficiency of UOW resources
- Have access to a software platform that allows to:
 - Visualise water consumption at different intervals and for different periods
 - Download data and reports
 - Create customised alarms and automatic notifications
 - Create virtual meters

MONITOR WATER CONSUMPTION AND PERFORMANCE

UOW has specific water performance targets as part of its EMP. Therefore actively monitoring water consumption is required to understand current performance and to ensure that UOW is on track to achieve these targets. Ongoing water monitoring is also required to ensure potential issues, leaks and opportunities are identified.

This will be achieved by regularly monitoring and recording all the relevant parameters (e.g. water consumption, EFTSL, Gross Floor Area, KPIs etc.) and taking the required actions to further investigate issues and opportunities for improvement when required.



DEVELOP AND MANAGE WATER METERING AND MONITORING SYSTEM

Development and management of the water metering and monitoring system includes all the ongoing tasks required to ensure that the system operates adequately and that it is maintained and tailored to UOW operations and requirements. This includes (but is not limited to):

- Define specific water consumption volume baselines and assess patterns for different areas and buildings
- Set up and adjust specific alarms/notification events (e.g. excessive consumption overnight)
- Manage the integration of new meters/loggers into the monitoring system (e.g. new buildings, unmetered areas etc.)
- Develop and maintain metering asset registers and location diagrams
- Develop and maintain water data record management processes and tools
- Manage water metering and monitoring system contract

MEASUREMENT AND VERIFICATION OF ACTIONS/EVENTS IMPACTING WATER CONSUMPTION

Measurement and verification (M&V) is the process of gathering information and conducting assessments to evaluate the impacts on water consumption resulting from projects or actions to reduce water usage. M&V is also used to evaluate the impact of activities or events that result in water consumption increases (e.g. extended operation hours, leaks, increased irrigation requirements, new buildings etc.).

M&V will allow developing a register of actions that have an impact on UOW water performance to keep a record of these action and their outcomes.

Leak Detection and Management

IMPLEMENT ONLINE MONITORING PROCESS TO IDENTIFY LEAKS AT EARLY STAGES

Water leaks in buildings can be identified by building users noticing water on the floor or flowing from water fittings, toilets or pipes at the time when the leak starts to develop. These leaks are usually reported by the building users to Facilities Management Division Service Centre and works are organised to fix the leak.

However underground leaks can develop overtime and it can take a long time before the leak becomes noticeable. The reason for this is that these leaks usually occur underneath the pavement or concrete slabs and leaking water finds its way underground before flowing to the surface (e.g. through storm water, sewage system or underground natural paths). Water can also flow to the surface without being noticed if this happens in secluded areas, if the volume of leaking water is low or if the ground is already wet (e.g. due to rainfall).

The implementation of an online monitoring processes to identify water leaks at early stages aims to minimise undetected leaks and to allow identifying potential leaks soon after they start developing, both inside and outside the buildings. This process includes:

- Assess overnight water consumption patterns of different buildings and establish expected overnight consumption levels for each building.
- Set up automatic alarms/notifications to identify building water usage exceeding expected levels. This will provide information about possible leaks or issues inside buildings.
- Regularly monitor and compare the combined overnight water usage of all the buildings and water features in the Campus with the total consumption from the mains supply. This will provide information about possible leaks outside the buildings (e.g. underground, in the water distribution infrastructure, etc.).

DEVELOP PROCESSES TO REDUCE TIME REQUIRED TO FIND EXACT LOCATION OF CONCEALED LEAKS

Underground water leaks occur frequently in sites with an extended and ageing water infrastructure such as the Wollongong Campus. This infrastructure consists of three main supply points feeding water across a complex interconnected network. When underground leaks occur this interconnection hinders the identification of the leak source due to the impossibility to determine the location of the leak. In these cases the leak cannot be addressed until water flows to the surface revealing the approximate location of the leak. By the time this happens the leak could be occurring for a long time causing significant water losses and even damage.

Developing processes to improve the capability to localise concealed water leaks will reduce the time required to address and fix these hence reducing water consumption, costs and minimising potential damage to UOW infrastructure.



REDUCE THE UNMETERED WATER FEEDS ON CAMPUS

Water meters are installed to measure water consumption of many buildings on Wollongong Campus. Water meters can be connected to a monitoring system which allows monitoring the water consumption at different times of the day. This provides very valuable information to understanding the water consumption patterns of each specific building and to identify potential issues.



Figure 4: Water meters at UOW

However not all the buildings on the Campus have a water meter and there are outside areas where water is used but consumption is not metered (e.g. external water feeds, taps etc.). The two main consequences of not having water meters for these feeds are:

- Water consumption in these areas cannot be metered or monitored
- Water leaks occurring in these areas cannot be detected or localised

In order to ensure that potential leaks in these areas are detected and localised it is required that the quantity of unmetered feeds on campus be reduced by installing new meters and integrating these into UOW water monitoring system.

ASSESS OPPORTUNITIES TO MONITOR AND MEASURE SEWAGE AND STORMWATER

Underground water leaks can result in water flowing to the sewage or to the storm water system. This has been the case for some previous significant leaks at UOW.

Identifying opportunities to monitor water flow through the sewage and storm water systems can result in valuable information to identify potential leaks across the campus. Opportunities to monitor water flow through storm water and/or sewage will be investigated. This includes collaborating with research teams at UOW SMART to investigate the possibilities of using sensors to monitor storm water and/or sewage lines.

RESTRICT WATER SUPPLY TO SELECTED IRRIGATION SYSTEMS

Irrigation lines have been previously installed in several areas across Wollongong Campus to facilitate the adequate growth of newly planted vegetation at the time when these areas were built or renovated. Once planted, this vegetation required regular irrigation during the first year to ensure their adequate establishment before becoming self-sufficient with rain water or with occasional irrigation.

Water and pressure in irrigation lines can cause damage of the pipes and result in water leaks. Some of the existing irrigation lines are not used in regular basis because the vegetation in those areas has been established and regular irrigation is no longer required.

Restricting water supply to specific water lines that are not used on a regular basis will minimise the risk of potential leaks in these pipe sections. This will be done by assessing how often these areas need to be irrigated, the technical requirements to shut down



water supply to the relevant water lines and the process required to manage the supply of water to these areas when irrigation is required.

REVIEW MAJOR WATER INFRASTRUCTURE

Wollongong Campus water infrastructure has been built many years ago and has been extended and modified overtime as part of new developments and maintenance works. Consequently the current water infrastructure consists of pipes, valves and other equipment of different age and condition.

The major water infrastructure will be reviewed to identify opportunities to improve water efficiency and develop recommendations for future capital improvements.

Water Efficiency

DEVELOP STRATEGIES TO REDUCE WATER CONSUMPTION FOR OUTDOOR PURPOSES

Water at UOW is required to maintain the grounds, vegetation, water features and biodiversity on the Campus. Some of these uses include irrigation of the lawns and ovals and maintaining the adequate water flow and level of the ponds.

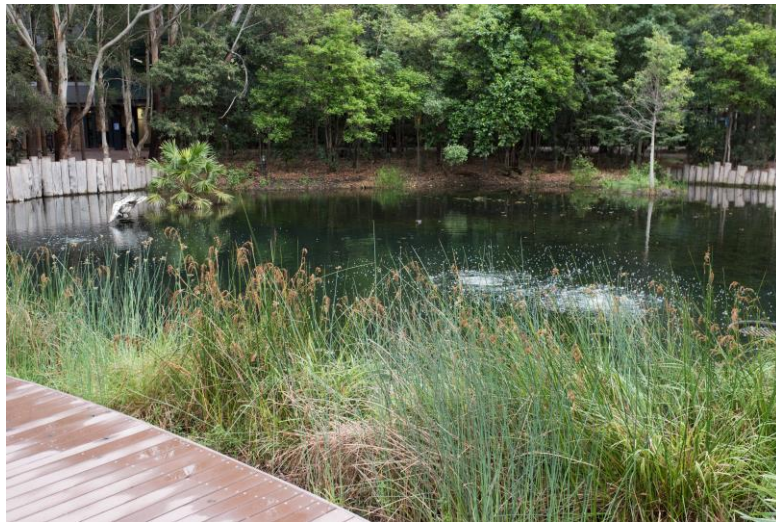


Figure 5: Duck pond

The use of water for these outdoors purposes represents a significant proportion of the total water consumption at UOW however these tasks are required to maintain the remarkable landscape and campus environment. Opportunities to minimise water consumption without compromising these requirements will be assessed. These potential strategies include the investigation of (but are not limited to):

- Reduce top up requirements for ponds and water features
- Adjust the water level of ponds
- Increase the amount of harvested water used for irrigation
- Monitor and minimise time of irrigation events and automate irrigation processes

ASSESS THE INSTALLATION OF ADDITIONAL WATER EFFICIENT FITTINGS, TOILETS AND CONTROLS

Water efficient fittings, toilets and controls have been previously installed in buildings on Wollongong Campus. Some of these systems include:

- Taps with flow aerators
- Automatic controls for taps (push button, infrared sensors etc.)
- Dual flush toilets
- Automatic controls for urinal flushing



These systems ensure that water usage is minimised by reducing the flow through taps and showers, reducing the volume of water used for toilet flushing, minimising the time that taps remain opened etc.



Figure 6: Automatic flushing system

The existing buildings will be assessed to identify further opportunities to install additional water efficient fittings, toilets and controls and to assess the condition and performance of the ones previously installed. These opportunities will be prioritised based on water consumption levels, age and maintenance requirements of each building. Water efficient fittings, toilets and controls will also be installed in new developments and as part of building refurbishments.

ASSESS STRATEGIES TO REDUCE SWIMMING POOL WATER LOSSES

Water losses occur in swimming pools due to evaporation, backwashing and leaks, in addition to the standard activities such as swimming, diving, splashing etc.



Figure 7: UOW swimming pool

The swimming pool in Building 13 is located outdoors which results in significant evaporation losses due to the following:

- Winds - The location of the swimming pool in an outdoor environment exposes the pool surface to winds which increases heat convection losses and water evaporation.
- Air/water temperature difference – The swimming pool is heated which causes additional evaporation losses due to the difference in temperature between the water and the surrounding air. This temperature difference becomes very relevant in outdoor pools especially during winter nights which increases evaporation losses.

These factors have an impact on the water consumption of the swimming pool. Therefore strategies to minimise evaporation and water losses in the swimming pool will be investigated.

ASSESS OPPORTUNITIES TO MINIMISE CONSUMPTION OF COOLING TOWERS

Cooling towers are a key component of air conditioning systems in many buildings at UOW. They use sprayed water to remove heat rejected from the buildings by water cooled air conditioning systems.



Figure 8: Cooling towers

Cooling towers can use significant amounts of water therefore opportunities to minimise water consumption of cooling towers will be assessed. These include (but are not limited to):

- Manage the operation of cooling towers
- Audit and address tower water balance and water consumption of cooling towers
- Optimise water management
- Consider cooling tower water efficiency in new developments and refurbishments

CONDUCT WATER SAVING AUDITS

The purpose of a water audit is to assess the water consumption of a site and to identify opportunities to reduce water usage.

Conducting detailed water audits to address specific needs and requirements will assist UOW identifying opportunities to improve water efficiency, minimise costs and improve water performance. These audits will be conducted as required to investigate specific areas and opportunities such as:

- Reduce water consumption of specific buildings and systems
- Improve efficiencies of water using processes
- Minimise water requirements usage for outdoor features
- Assess harvesting systems performance and improvement opportunities

Water Harvesting

ASSESS STATUS OF EXISTING HARVESTING SYSTEMS

Rainwater harvesting systems with a total capacity of 2,500 kilolitres have been installed on Wollongong Campus. These systems can be used to collect rainwater and reuse it for toilet flushing, irrigation and top up of the ponds. The use of rainwater for these purposes reduces the amount of potable water required from the mains water supply hence improving environmental impact and performance and reducing costs.



Figure 9: Rainwater Harvesting Tanks

The existing harvesting systems have been installed several years ago at different stages and some of them have not been operating as expected due to maintenance or operational issues. In addition, some of these systems are interconnected but the operation and management of these interconnections has not been clearly documented and there are no specific processes that define their operation.

Therefore the existing systems will be assessed to understand their condition, identify problems and opportunities, evaluate the feasibility of their operation and develop a strategy to maximise their performance.

DEVELOP STRATEGIES TO MONITOR ONGOING PERFORMANCE OF HARVESTING SYSTEMS

The amount of rainwater that is used onsite can be estimated based on the capacity of the existing harvesting systems and the rainfall events data (e.g. from the Bureau of Meteorology). While this approach allows developing estimations it does not provide an accurate measure of the harvested water used onsite and does not allow assessing the performance of the existing harvesting systems.

Strategies to monitor the performance of each harvesting system and to identify potential issues will result in a better understanding of the water usage at UOW and will provide valuable information about the feasibility of operating the existing systems and/or installing additional harvesting systems.

MAINTAIN EXISTING HARVESTING SYSTEMS

Once the condition and of existing harvesting systems is assessed and the strategies to maximise their performance are developed and implemented it is required that specific maintenance practices are developed and implemented to ensure the sustainable operation of these systems.

This includes practices may include:

- Check and clean catchments and gutters
- Check and clean filters, strainers etc.
- Service water pumps
- Conduct regular system inspections
- Clean tank and conduct water quality test if required
- Other

ASSESS OPPORTUNITIES TO INCREASE WATER HARVESTING ONSITE

A significant capacity of harvested water is already installed on Wollongong Campus (2,500 kilolitres). The existing systems need to be assessed to understand their condition and the feasibility of operating these systems effectively.

Following the assessment of the existing systems and the feasibility of their operation, opportunities to further increase the capacity of rainwater harvesting systems onsite or to develop a different approach towards water harvesting onsite will be assessed. Depending on the results of this assessment the installation of additional harvesting systems or alternative approaches to water reuse will be analysed.



Water Administration

CONTINUOUSLY IMPROVE AND MANAGE WATER BILLING VERIFICATION PROCESS

UOW receives a significant number of water bills which include charges for water usage, wastewater, service fees etc. Opportunities to reduce water costs by negotiating changes in the water billing processes have been previously identified and implemented resulting in significant savings for UOW.

Continuously improving and managing a process to check and verify water bills will ensure that UOW does not incur unnecessary expenses and may result in opportunities to further reduce costs.

TRACK, FORECAST AND PLAN WATER CONSUMPTION AND EXPENDITURE

This action consist of the tasks required to actively track and record the water consumption and expenses across UOW portfolio and to understand the impact that UOW plans (expansion, developments, projects, activities) may have on future water usage and costs.

This will provide valuable information to model and forecast water consumption and costs, which is required to understand water costs and establish budgets.

Strategic and Technical Advice

REVIEW UOW ECOLOGICALLY SUSTAINABLE DESIGN STANDARDS

UOW has an Ecologically Sustainable Design (ESD) Standard for all new construction and refurbishment works. This ESD Standard was created in 2012 and therefore needs to be reviewed and updated. The development of the new ESD Standard will be conducted in collaboration with UOW Sustainable Buildings Research Centre to ensure that design characteristics, technologies and resources are applied to minimise environmental impact, maintain ecological processes and increase the quality of life.

INTEGRATE WATER MANAGEMENT REQUIREMENTS INTO UOW HYDRAULIC DESIGN STANDARDS

Water management and sustainability requirements will be integrated into the review of UOW Hydraulic Design Standards to ensure that relevant and up to date water savings and metering considerations are integrated into new buildings and refurbishments. This will result in a better performance of the buildings and facilities, reducing water consumption and costs.

PROVIDE INPUT AND LIAISE WITH KEY STAKEHOLDERS

In order to successfully implement water saving actions it is required that other UOW needs and priorities are understood and considered and that the relevant communication and collaboration processes between the Environment Unit and key internal stakeholders be developed, implemented and sustained. This includes (but is not limited to):

- Maintenance Works – to collaborate on the development and implementation of water leak management actions, understand maintenance requirements of water fittings and infrastructure, provide input on requirements and performance of water saving devices and actions etc.
- Planning and Project Delivery – to integrate water management and saving requirements into capital works developments/projects (e.g. new buildings), integrate new buildings into UOW water metering and monitoring system, understand the impact of future developments in the expected water consumption and costs etc.
- Financial Operations – to manage and approve water bills, track and forecast water expenditure etc.
- Relevant building representatives – to understand water consumption patterns, inform about unexpected water consumption levels and potential leaks, understand possible causes and identify water reduction opportunities.
- UOW SBRC and SMART– to exchange information on sustainability and identify opportunities to collaborate on water saving projects and initiatives.
- All other units and departments whose activities may influence or be impacted by water management actions.



Environmental Reporting and Awareness

PROVIDE WATER PERFORMANCE REPORTS

Regular reports will be provided to inform relevant stakeholders on water consumption against targets and to facilitate required information related to UOW water performance. This includes reports to the Environment Unit, Facilities Management Division, Environment Advisory Committee, Finance and Resources Committee, TEFMA and all other reporting requirements.

Environmental reporting also includes actions required to provide specific information that may be required by UOW staff and students and to share relevant environmental information.

DEVELOP AND IMPLEMENT BEHAVIOURAL CHANGE AND AWARENESS PROGRAMS FOR WATER USERS

Water management awareness consists of initiatives to facilitate behavioural changes across the campus, enhance the understanding of water saving practices and their positive environmental impact and to increase accountability of all water users including staff and students. Some examples of these initiatives include facilitating communication to improve reporting of leaks and working with technical staff to reduce operational use of water.

6 DELIVERY

The prioritisation and implementation of specific actions defined in this WMAP will depend on the environmental and financial benefits of each action, technical feasibility, budget and resources available and interaction with other projects and works at UOW.

A strategic and structured approach will be taken to ensure the suitable assessment, development and implementation of relevant actions by:

- Identifying and prioritising actions based on environmental benefits, financial feasibility and onsite investigations.
- Liaise with the relevant stakeholders to assess technical, operational and financial requirements.
- Prepare detailed business cases for UOW approval including:
 - Recommendation
 - Objectives
 - Scope
 - Environmental, operational, financial and risk analysis
 - Delivery method
 - Program

The final evaluation, planning, funding and implementation of these actions are intended to be achieved utilising the resources of the Facilities Management Division and engaging relevant contractors when required.

This WMAP will be reviewed annually to monitor and record the status of the different strategies and actions.

