



Water Management Plan  
University of Alberta

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# 1. Introduction

The University of Alberta is a globally recognized leader in post-secondary education and research, and a leader in sustainability<sup>1,2,3</sup>. The university develops strategies to conserve resources, decrease the production of waste, minimize ecological footprints, decrease greenhouse gas emissions, and build a culture of sustainability at the institution and in the greater community of which it is a part. The university has demonstrated its commitment to sustainability and has made progress in recent years to advance a broad campus sustainability initiative.

The Board of Governors endorsed the Office of Sustainability.	2008	The Board of Governors adopted the Sustainability Commitment and Guiding Principles.
	2009	
Integrating Sustainability into the Academic Experience, a companion document to the university's academic plan was approved.	2010	Establishment of the Sustainability Reserve and Sustainability Enhancement Fund grant program.
	2011	
Release of the first Sustainability Plan (2012-2016).	2012	The university achieved a silver rating on the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment, and Rating System (STARS).
	2013	
Alberta Emerald Award winner for waste diversion programming in residences.	2014	The university celebrated as it improved its STARS rating to Gold.
Release of the first Greenhouse Gas Emissions Inventory and Reduction Plan.	2015	Seventh consecutive year being recognized as one of Canada's Greenest Employers.
Launch of the new 2016-2020 Sustainability Plan.	2016	

**Figure 1.** Sustainability highlights timeline

The University of Alberta's Facilities and Operations (FO) department is committed to reducing its impact on the environment. Substantial contributions have been made to this effort for decades through the energy management program, which also includes reductions in water used for heating and cooling across campus. It is recognized that water, energy, and greenhouse gas emissions are

<sup>1</sup> Times Higher Education World University Rankings 2016. <https://www.timeshighereducation.com/world-university-rankings/university-of-alberta?ranking-dataset=133819>. Accessed January 15, 2017.

<sup>2</sup> Maclean's University Rankings 2016. <http://www.macleans.ca/education/best-of-the-best-introducing-the-2016-macleans-university-rankings/>. Accessed January 15, 2017.

<sup>3</sup> AASHE STARS Ratings. <https://stars.aashe.org/institutions/participants-and-reports/?sort=rating>. Accessed January 15, 2017.

intrinsically linked—the consumption of water drives up energy use and greenhouse gas production. The university is always looking for other opportunities to enhance its commitment to sustainability and considering the university’s water use is a natural step.

## **Regional Context**

The University of Alberta resides on the banks of the North Saskatchewan River, whose watershed is the sole supply of water for the university and the city of Edmonton. Water is clarified, filtered, and disinfected at EPCOR’S E.L. Smith and Rossdale Water Treatment Plants, then transferred to reservoirs that supply water to the city<sup>4</sup>. Wastewater is treated at EPCOR’s Gold Bar Wastewater Treatment Plant and then returned to the river where it continues to travel through Saskatchewan and is expelled into the Hudson Bay, via the Nelson River<sup>5</sup>.

In 2005, the North Saskatchewan Watershed Alliance studied the health of the watershed by investigating water quality, water quantity, biological indicators, and surrounding land use. On a scale of excellent, good, fair, and poor it was determined that the overall health of the watershed is generally “fair”, and the watershed’s health decreases in areas where land use is more intensive, more specifically downstream of Edmonton<sup>6</sup>.

## **Benefits of a Water Conservation Initiative**

As the population of the university grows, larger demands will be placed on water resources. Striving to decrease consumption will result in environmental, social, and economic benefits for the university and the Edmonton region. The University of Alberta is motivated to be a leader in resource conservation within the Edmonton region and across Canada. Implementing formal water management measures will demonstrate the university’s dedication to resource conservation and social responsibility.

### *Environmental Benefits*

- Less water drawn from lakes and rivers
- Less wastewater production and decreased demand for treatment of wastewater
- Reduced GHG emissions and energy use from wastewater treatment
- Less chemicals produced for treatment
- Less industrial waste because of treatment
- Lowered instances of land erosion due to agricultural and irrigation requirements
- Less habitat degradation due to fewer surface water withdrawals
- Preservation of wetlands which filter pollutants

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<sup>4</sup> EPCOR. (2014). *How Water Gets To Your Home*. <http://www.epcor.com/water/service-delivery/Pages/water-to-your-home.aspx>. Accessed January 30, 2017.

<sup>5</sup> City of Edmonton. (2010). *Edmonton’s Water Supply*. [http://www.edmonton.ca/city\\_government/documents/Discussion\\_Paper\\_3\\_Water\\_Supply.pdf](http://www.edmonton.ca/city_government/documents/Discussion_Paper_3_Water_Supply.pdf). Accessed January 30, 2017.

<sup>6</sup> North Saskatchewan Watershed Alliance. (2005). *The State of the North Saskatchewan Watershed Report*. <http://www.nswa.ab.ca/content/state-north-saskatchewan-river-watershed-report-0>. Accessed February 2, 2017.

- Lessened impacts on species at risk, and species in general, due to wastewater and treatment facilities
- Moving from bottled water consumption to treated tap water, reducing waste
- Improved carbon storage due to maintaining wetland health
- Less need for water to be transported over long distances
- Lower energy and GHGs because of decreased pumping and mechanical system operations required for the entire life cycle of the water

#### *Social Benefits*

- Establishes the university's commitment to sustainability of the surrounding community and region
- Less impact on livelihood of farmers/producers/related retailers during drought conditions
- Lessened likelihood of disputes over water distribution during extreme drought conditions
- Higher standard of living and health due to easier access to potable water
- Higher air quality due to mitigation of environmental degradation
- Healthy watersheds that aid in reduction of flood impacts
- Preservation of First Nations culture which is profoundly tied to water for both physical and spiritual health
- Greater community involvement in water initiatives and watershed protection
- Increased understanding about the benefits and savings associated with treated tap water

#### *Operational Efficiencies (Economic Benefits)*

- Reduced purchases of raw or finished water
- Reduced operations and maintenance costs
- Fewer/downsizing of new facilities in terms of water needs
- Cost-savings related to reduced energy use associated with water-related operations
- Less wear and tear on the municipal equipment that carries and filters water
- Reduce need for management of disposable beverage containers

#### *Cost of Not Conserving*

Beyond considering the benefits to water conservation, it is also important to take the costs of not conserving into consideration. At this time, water in the region is not a major issue. As population continues to expand—and with the increasing stress of climate change—it is important that we prepare ourselves to handle water scarcity. By implementing forward-thinking initiatives and adopting new practices and infrastructure now, we give ourselves a head start in responding to future issues.

By failing to be proactive on water conservation, we risk the University of Alberta losing its status as an institution which values sustainability and is committed to continuous improvement of sustainability practices.

## History of Water at UAlberta

Between the beginning of fiscal year 1975/1976 and 2012/2013, the University of Alberta's water consumption has decreased by 54 per cent, while building area has increased by 75 per cent. During the same period water use intensity, the amount of water used per square metre, has decreased by 74 per cent, indicating university processes have become more water efficient. Further investigation through water audits show evidence of opportunities for continued reduction that could be achieved through a program dedicated to water stewardship.

### *Setting the stage for continued water reductions at UAlberta*

Concerns about energy usage, environmental impacts, climate change, and increasing utility costs are increasingly adding pressure to establish significant resource reduction opportunities including water and its corresponding energy nexus.

At UAlberta specifically:

- Heavier energy demands are being placed on existing facilities with respect to occupancy and usage, and facilities are continually becoming more equipment intensive.
- Systems are required to run for longer hours including increased usage after normal hours to meet the increased demands being placed on facilities.
- Upgrading funds are not keeping pace with the decay of facilities. Facilities and systems are continually aging and decaying with subsequent loss of efficiency and increased water and overall energy consumption.
- Between 1990 and 2015, the university's building area increased by 56 per cent and its population by 54 per cent, with a substantial amount of building growth concentrated after the year 2005.

We are not immune to utility rate increases and have no control over the water available in the North Saskatchewan River that influences them. However, through vigilance in our water conservation efforts we can exercise control over our consumption, thereby increasing the security and decreasing the cost of our utility bill and reducing our impact on the environment. Water scarcity is not yet an issue in Northern Alberta, but UAlberta aims to proactively protect the water supply in the North Saskatchewan River Basin. Through the water management program, *Watego*, UAlberta can contribute to a secure water future for the campus and beyond.

## 2. Water Management Plan Overview

### **Watego: Proactive Water Protection**

The Energy Management and Sustainable Operations (EMSO) unit within Facilities and Operations (F&O) is responsible for planning and implementing water reductions. This contributes to EMSO's core objective of reducing the university's utility consumption and greenhouse gas (GHG) emissions. EMSO strives to ensure that:

- previous gains are built upon,
- water and energy bills are as low as practical,
- water and energy are used efficiently to reduce consumption of non-renewable resources,
- environmental impacts are reduced, and
- the university is developed and operated in a sustainable manner.

With much reflection on past initiatives and successes, EMSO broke water management out from under its long-standing energy management program in 2014 and launched *Watego: Proactive Water Protection*. This program is a university wide water stewardship is focused on contributing to a sustainable water future for Albertans and all those living in the North Saskatchewan River basin.

*Watego* initiatives include:

- Water use reductions
- Water closet fixture upgrades
- Lab upgrades
- Pilots of innovative technologies
- Behaviour change campaigns
- Support for campus community led water reduction projects

Through *Watego* EMSO will be working directly with other units within F&O to plan projects to align with the deferred maintenance schedule. Additionally, EMSO will collaborate with other university departments as necessary (e.g., lab updates, innovative projects)

### **Strategic Alignments**

#### *Greenhouse Gas Reduction Plan and Energy Reduction Master Plan*

The flow of water, whether through a forest, river ecosystems, or human built environments, creates complex interconnections among people, places and issues. This interconnectedness is often viewed as a major challenge in addressing environmental issues because of the many values, interests and actors at play. But this interconnectedness also provides opportunities. For water, the opportunities lie in the interconnections between water and energy, and the related climate change implications.

The story of these interconnections – often referred to as the “water–energy nexus” – has two sides. Huge amounts of water are required to generate energy - to power the turbines in hydro-electric facilities, for cooling in thermal or nuclear energy plants, and to extract oil from Alberta's oil sands.

Collectively, the energy sector is the single largest user of water in Canada<sup>7</sup>. At the same time, large amounts of energy are required to pump, treat and distribute water for urban, industrial and agricultural use and to deal with the resulting wastes. Together, the two sides of this story are generating new research, policy proposals and public dialogue that will be critical as societies struggle to address the intersecting challenges of climate change, energy security and water scarcity<sup>8</sup>.

This plan focuses on the energy used for water provision as it relates to urban water services. Specifically addressing the energy required to deliver water to, within and from our communities, to remove contaminants from water and wastewater, and to heat water to meet campus needs.

The water-energy nexus is deeply embedded within the context of climate change, a concern that is front and centre for many Canadians. Burning fossil fuels to generate electricity and heat for provision of water services creates GHG emissions. A discussion of the energy associated with water use and the potential for related efficiencies is therefore necessarily a discussion of climate change and the potential for mitigation of greenhouse gas emissions.

Thus by working to reduce water use, we are contributing to the objectives of UAlberta's Energy Master Plan and Greenhouse Gas Reduction Plan, and to the institution's goal of reducing its GHG emissions 17 per cent below 2005 levels by 2020.

*The University of Alberta's Institutional Strategic Plan "For the Public Good"*

In addition to the strategic approach of the program itself, *Watego* will help advance UAlberta towards the goals and missions set out in its institutional strategic planning.

- Objective 6/Strategy 2: "Engage and advocate strategically with all levels and orders of government and other key stakeholders, and identify and demonstrate how university activities intersect with their goals and their strategies."
- O6/S3: "Communicate, using both quantitative and qualitative evidence, how the University of Alberta serves as a cornerstone of the community bringing widespread economic and societal benefits to all Albertans, as well as to national and international partners and stakeholders."
- O16/S3: "Engage with government, community, industry, business and the post-secondary sector to address shared local, provincial, national and global challenges."
- O20/S2: "Embed social, economic, and environmental sustainability into the development and care of the university's natural and built environments."

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<sup>7</sup> Environment Canada. (2014). *Water Quantity*. Retrieved from <http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=2DE7B40F-1>

<sup>8</sup> Maas, C. (2009). *Greenhouse Gas and Energy Co-Benefits of Water Conservation*. POLIS Research Report, 09-01. Retrieved from [http://poliswaterproject.org/sites/default/files/maas\\_ghg\\_.pdf](http://poliswaterproject.org/sites/default/files/maas_ghg_.pdf)

- O21/S5: "Develop a set of equitable, meaningful and relevant measures to monitor our progress toward strategic goals and develop the tools required to report on them."
- O23/S1: "Secure and sustain funding to plan, operate, expand, renew and optimize the use of campus infrastructure to meet evolving teaching and research priorities."

### 2016-2020 Sustainability Plan

*Watego* will advance the greater campus sustainability initiative and aligns with strategies within the university's [Sustainability Plan](#) (2016-2020). The following goal and strategies are copied directly from the plan, for reference:

**Goal 3.1.** Embed social, economic and environmental sustainability into the development and care of the university's indoor and outdoor spaces.

**vi. Strategy.** Continue water use reduction plan informed by water audits that outlines baseline water use, and set reduction targets to be reached by the year 2025.

**ix. Strategy.** Develop programs to reduce energy use, increase waste diversion and decrease water use in lab environments.

## Scope of the Water Management Plan

The University of Alberta has five campuses and several research stations. This plan focuses mainly on North Campus and will eventually expand to other campuses and research stations that are directly operated and maintained by the university's Facilities and Operations (FO) department, as well as some Ancillary Services (AS) facilities.

### Campuses

North Campus  
 South Campus  
 Augustana Campus  
 Campus Saint-Jean

### Research Stations

Ellerslie Research Station  
 Kinsella Research Station  
 Devon Research Station

## Key Collaborations

The EMSO unit within FO is responsible for the implementation of *Watego* but EMSO does not work in isolation. The success of the *Watego* program and its strategic approach require constant and productive collaboration with other units within FO including:

- ✓ Operations and Maintenance
- ✓ Planning and Project Delivery
- ✓ Utilities
- ✓ Ancillary Services

### 3. Technology Selection and Implementation

Significant components of *Watego's* initiatives include water metering, water audits, and retrofitting buildings with water-efficient fixture and equipment alternatives.

All buildings on North Campus have water meters that are read monthly. Older buildings use a Rockwell turbine or compound meters for domestic water. Newer buildings and upgraded water meters use Rosemount Magflow meters. Eventually all domestic water meters on campus will be upgraded.

Throughout the implementation of the university's deferred maintenance program, innovative and low-flow fixtures will be retrofitted, and similarly specified and installed for new construction projects. Examples of fixtures that fit required standards for *Watego* include:

#### TOILETS

- Toto Flushometer Toilet CT705EN(G), 1.28 GPF when used with High Efficiency Flushometer Valve – commercial floor mounted toilet with elongated front bowl
- Toto Wall-Mounted Flushometer toilet, 1.28 GPF when used with High Efficiency Flushometer Valve – wall-mounted toilet with elongated front bowl
- Toto EcoPower® Toilet Flushometer Valve TET1GA32#CP, 1.6 gpf or less – hydropower self-generating system, sensor activated toilet flush valve.

#### URINALS

- Toto Low Consumption Washout Urinal UT447E(V), 0.5gpf – compact urinal with concealed integral trap
- Toto EcoPower® Urinal Flushometer Valve TUE1GA22#CP, 1 gpf or less – hydropower self-generating system, sensor activated urinal flush valve.

#### FAUCETS

- Sloan EAF-275, 0.5 gpm – light powered, sensor activated electric faucet pre-tempered for hot and cold water operation.
- Delta 22C151, 0.5 gpm

Fixture standards will be updated with availability of new technology. It is also understood that the plumbing at the university requires a certain amount of flow so it does not malfunction. Ultra-low flow fixtures may not be feasible at this time.

To date, the UAlberta Trades unit has been managing the implementation. The potential to hire external contractors to perform fixture upgrades is also a possibility.

## 4. Watego Projects

Building	Projected Annual Savings		
	Water (m <sup>3</sup> )	Cost (\$)	Steam (kg)
Agriculture Forestry	950	2,829	25,000
Biological Sciences	15,377	37,847	52,700
G/L Chemistry Centre	3,348	9,890	59,600
Clinical Sciences	2,326	6,162	18,100
Education Centre (N+S)	11,015	27,814	63,800
General Services Building	1,324	4,040	29,191
Humanities Centre	862	2,447	12,600
Medical Sciences	28,671	70,795	39,900
<b>TOTALS</b>	<b>63,873</b>	<b>161,824</b>	<b>300,891</b>

**Table 1:** Summary of potential savings projected for planned projects. Projection based on washroom water use audits performed on North Campus. This chart will expand as more audits are performed.

Water audits have been conducted in several North Campus washrooms, showing the potential for savings (Table 1). Additionally, an audit performed at Campus Saint-Jean (CSJ) suggests that fixture replacement in the residence building would also be beneficial (faucets, water closets and shower heads). There are also opportunities in Pavilion McMahon around fixture upgrades and rainwater capture. Conservation efforts at CSJ could save up to 2211 m<sup>3</sup> of water per year excluding a rainwater cistern, which could save an estimated additional 296 m<sup>3</sup>/yr.

A similar audit was performed for Augustana Campus. It was found that the most impactful savings would stem from fixture upgrades in the residences as well as classroom buildings. Conservation efforts at Augustana could save up to 6507 m<sup>3</sup> of water per year.

### Completed Projects:

- General Services Building – Complete 2016. Replaced all water fixtures in bathrooms on every floor of the General Services Building.
- Water Reduction in Large Scale Fluids Laboratory – Complete July 2017. Collaboration with Faculty of Engineering and the Sustainability Enhancement Fund. Funds granted were used to purchase a new, refrigerant-based cooling system for mechanical engineering pipeline experiments. This system eliminates the need for water to chill the pipeline contents, reducing water use, while resulting in more reliable and accurate experimental conditions. The project saves both water and associated utility costs, estimated at 4,000 cubic meters of water and \$9,000 annually.

### Projects in Progress:

- Biological Sciences Building – 15% complete (August 2017)
- Medical Sciences – 20% complete (August 2017)

As *Watego* continues, we will complete fixture upgrades in buildings as outlined in Table 1. Buildings slated for deferred maintenance by the Operations and Maintenance unit will be audited as well and added to the project list. Communications with Trades will be key to ensuring that all water savings projects are captured (e.g., switching reverse osmosis water to demineralized water, capitalizing on unplanned fixture upgrades). *Watego* will also be open to funding suggestions from Trades for water saving projects.

Moving forward, *Watego* projects will align with what has been planned out via Infrastructure Maintenance Program (IMP) funding. *Watego* will also seek out more collaborative projects to help fund lab upgrades, behaviour change initiatives and innovative water use reduction solutions.

## 6. Education and Behaviour Change

*Watego* is primarily a program based around facilities upgrades and operational components, however in order to increase awareness and promote sustainable behaviours, there is potential under *Watego* to incorporate elements of education and behaviour change.

Goals:

- Promote individual responsibility for resource use
- Use appropriate signage to raise awareness about the university's water use and opportunities to positively influence behaviour change
- Meter and display water demands
- Create programs to spark student/public involvement in water-related initiatives/funding opportunities, teaching and research
- Reach out to sustainability groups on campus to create partnerships
- Conduct research on water reuse technologies

## 7. Conclusion

The *Watego* program will continue its work to reduce the impact of the University of Alberta's facilities on the North Saskatchewan River Watershed and surrounding region. By enhancing the teaching, research and study spaces for its community members, and seeking opportunities to advance industry practices and research in the area of water management, the University of Alberta strives for the betterment of the entire campus and the communities in which it is a part.

## 8. Acknowledgements

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