WATER STRATEGY

RETHINKING WATER: CHANGE THE WAY WE THINK ABOUT WATER TO CHANGE THE WAY WE STEWARD OUR WATER

Prepared for Physical Resources
by Urban Equation

ALGONQUIN COLLEGE

KEY UPDATES

Strategy Document (Periodically updated with new info)	
v.2017.11.02	Minor edits and updates
v.2017.06.28	Reviewed by ACET
Project Vision & Principles (Changes to be reviewed by ACET)	
v.2017.06.28	Approved by ACET

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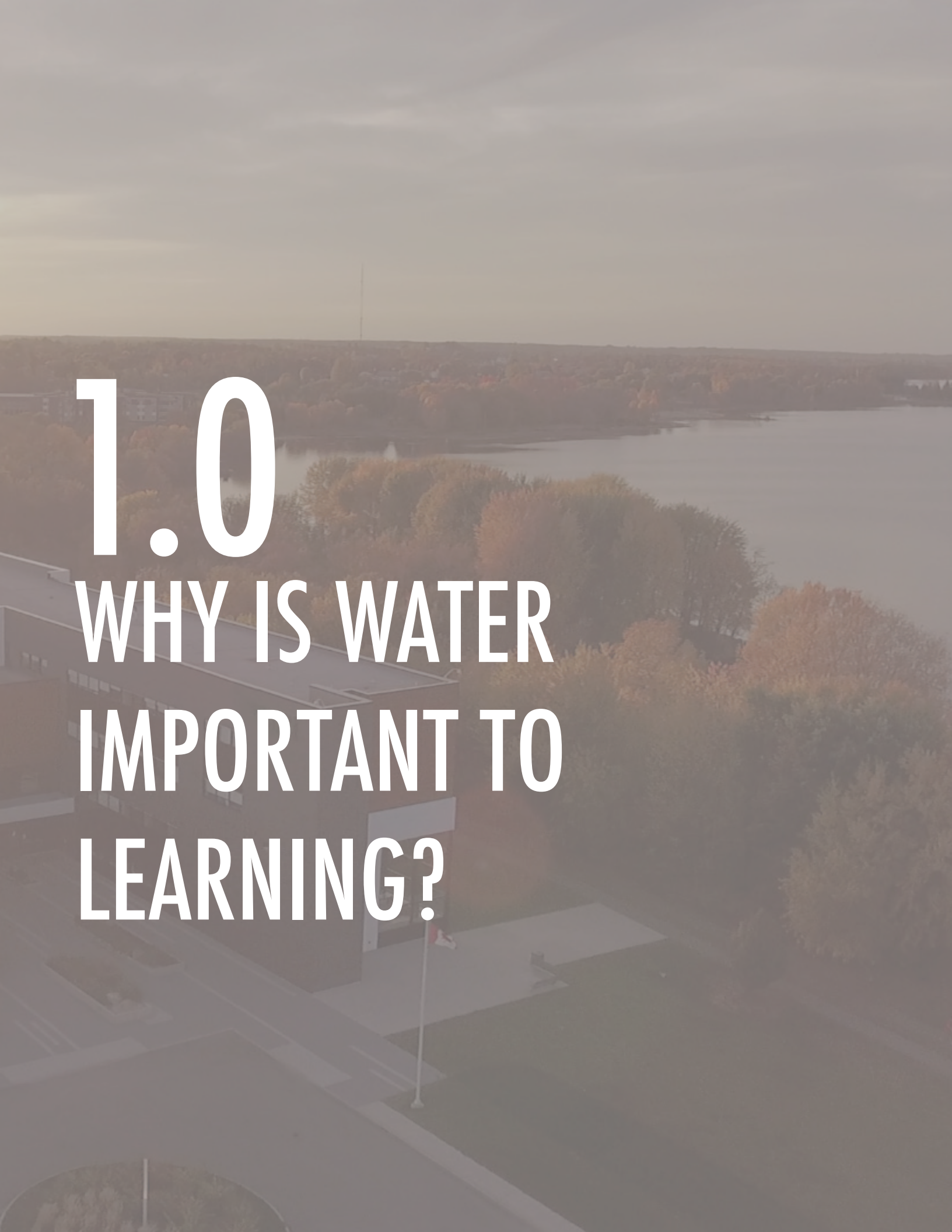


1.0 WHY IS WATER IMPORTANT TO LEARNING?

Water is a finite and irreplaceable resource. It sustains all life, and binds humans, animals and plants together through the water cycle. Water is a fundamental building block within our communities; across society it supports human development, provides recreation, and supports the production of goods and services.

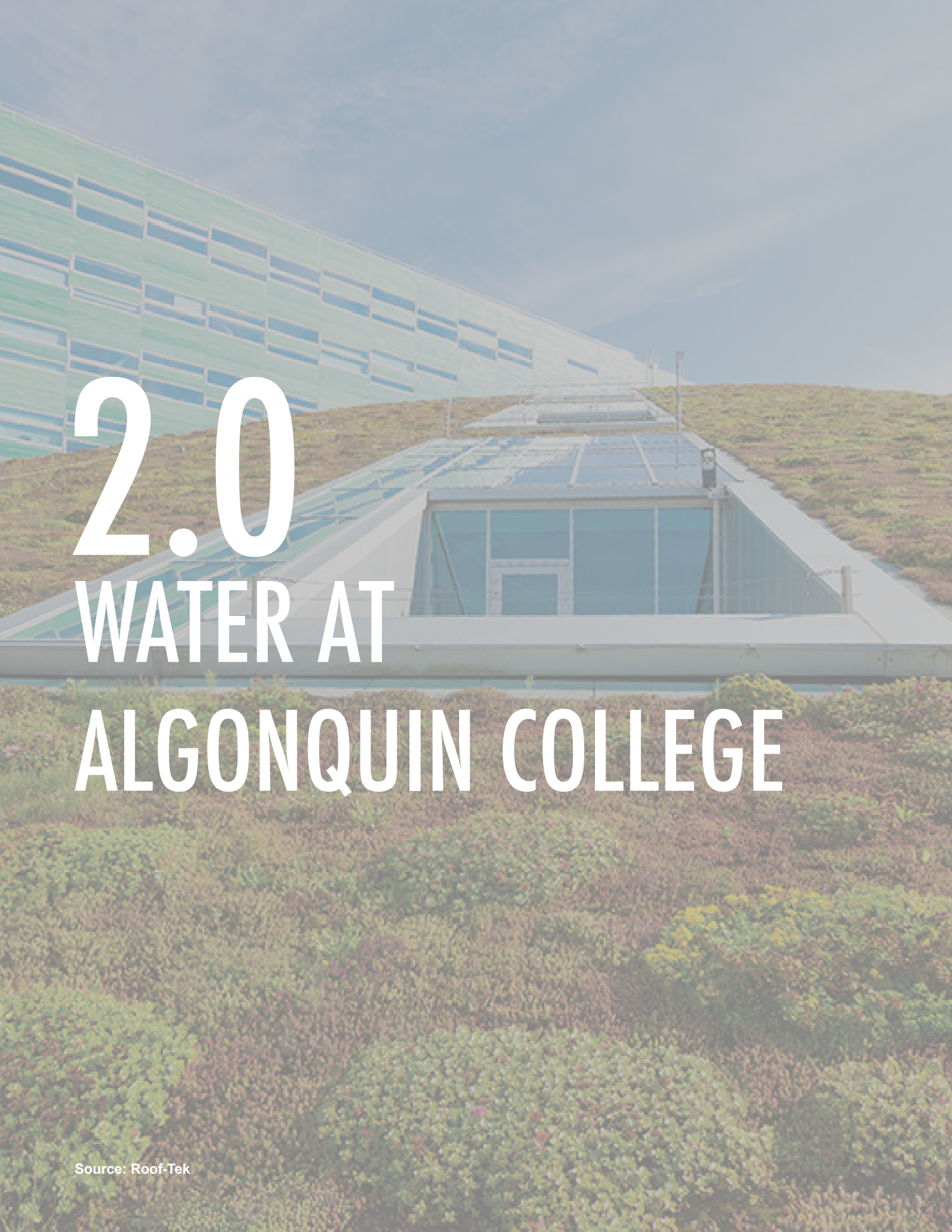
Water is also essential to our everyday campus activities; we use it for drinking, cooking, washing, irrigation, and sanitation.

Globally, water resources are under increasing pressure. Water security and access to clean water and sanitation are long standing issues, particularly within developing countries, that have drawn attention and support from the international community. In developed countries, the perceived abundance of water has led to overconsumption, and the rapid urbanization of our communities has led to a degradation of water supplies, and a decline of our riparian and aquatic habitats.

Traditionally, our cities, towns and campuses have responded to urbanization by offering centralized, large scale, engineered infrastructure solutions. These artificial solutions failed to mimic the natural water cycle, and as a result many of them have had unintended environmental and social consequences. As we learn from the past, the campus of the 21st century has the opportunity to introduce natural solutions; those that are local, smaller in scale, and community based. This approach can lead to wide ranging benefits, from reducing water costs to regenerating downstream watersheds; from compliance with municipal stormwater / rainwater requirements to creating amenities and beautifying campuses.

To get there, a shift in thinking is required. Learning to respect water as a finite and precious resource, perhaps looking to Indigenous communities for knowledge and inspiration, is imperative to create a culture of water awareness. By recognizing that water is part of a broader nexus, one that includes the energy, food and land-use sectors, we can begin to identify the interconnections and interdependencies between systems, and implement holistic solutions, such as low impact development strategies to manage rainwater. Finally, by seeing our watersheds and local rivers as amenities, rather than barriers to development, we can begin to embrace, and celebrate the value they bring to our communities. With this in mind Algonquin is rethinking water. Algonquin College's first Water Strategy provides a sustainable, and holistic framework that will enhance learning, deepen our connection to water, reduce our ecological footprint, and support the regeneration of our local watersheds.

The Green Roof on the ACCE Building (source: D&C Blog).



2.0 WATER AT ALGONQUIN COLLEGE

Source: Roof-Tek

2.1 STRATEGIC LINKAGES

The Water Strategy is aligned with the College's core strategic documents.

- *50+5: Algonquin College Strategic Plan 2017-2022*: The Strategic Plan calls upon the College to "Reduce [its] ecological footprint". The Water Strategy will contribute towards this goal by reducing College-wide potable water consumption and managing water as a resource;
- *Integrated College Development Planning (ICDP) Framework*: This innovative and agile approach to planning is used to plan, design, and implement physical and digital environments in a fluid academic environment. Water connects to various planning principles within the ICDP framework, from healthy living to sustainable physical infrastructure;
- *Sustainability Strategy Framework*: The Water Strategy supports the sustainability framework in several ways by advancing social, economic and environmental objectives. For example:
  - Socially – Drinking the right quantities of water on a daily basis provides many health benefits, and may in fact reduce the number of alternative, and less healthy, drinks often purchased by students and employees. In addition, water projects such as green roofs, can provide a community amenity, enhance the beauty of the campus, and offer student learning opportunities;
  - Environmentally – By introducing low impact development strategies our campuses can reverse the negative impacts of previous stormwater management practices, and begin to focus on rainwater as a resource. Improved watersheds will in turn enhance the overall health, and quality of life, of our community; and
  - Economically - Reducing unnecessary potable water use can save the College money.
- *5-Year Woodroffe Campus Master Development Plan*: The Water Strategy fulfills a key objective of the 5-Year Plan, that is advancing low impact development (green infrastructure) for water management, creating opportunities for learning and campus beautification; and
- *Algonquin College Transportation Strategy and Energy Strategy*: The water-energy-food-land nexus highlights the need to ensure the interconnections and interdependencies between the College's infrastructure strategies are recognized. The rate and volume of stormwater / rainwater discharged from College campuses is directly related to surface parking, and low impact development strategies in our parking lots can help regenerate our local watersheds. With respect to energy, by harvesting rainwater to flush toilets and irrigate landscaping, the College can reduce emissions generated from the energy required to clean, and distribute potable water to our campuses.

The Water Strategy also contributes to government, and non-government priorities.

- *Stormwater Management Guidelines for the Pinecrest Creek / Westboro Area*: The Ottawa Campus sits within the Pinecrest Creek watershed, which has suffered extensive degradation over the years due to the way in which the watershed was neglected and disrupted due urbanization. This strategy provides direction to ensure the College contributes towards the protection and regeneration of this community resource; and
- *Ontario Stormwater Management Planning and Design Manual (2003)*: The College's approach to SWM likely exceeds the requirements noted in this outdated manual, however it's important to note that new Provincial Guidance is in development, and should be evaluated once completed for compliance.

2.2 LOCAL PLANNING CONTEXT

All three College campuses are located close to important waterways.

The Pembroke Campus is located adjacent to the Ottawa River, the Perth Campus next to the Tay River, and the Ottawa Campus sits on top of the long-buried Pinecrest Creek, which reemerges in to the sunlight just north of the campus boundary. All three Campuses are part of the Ottawa River watershed.

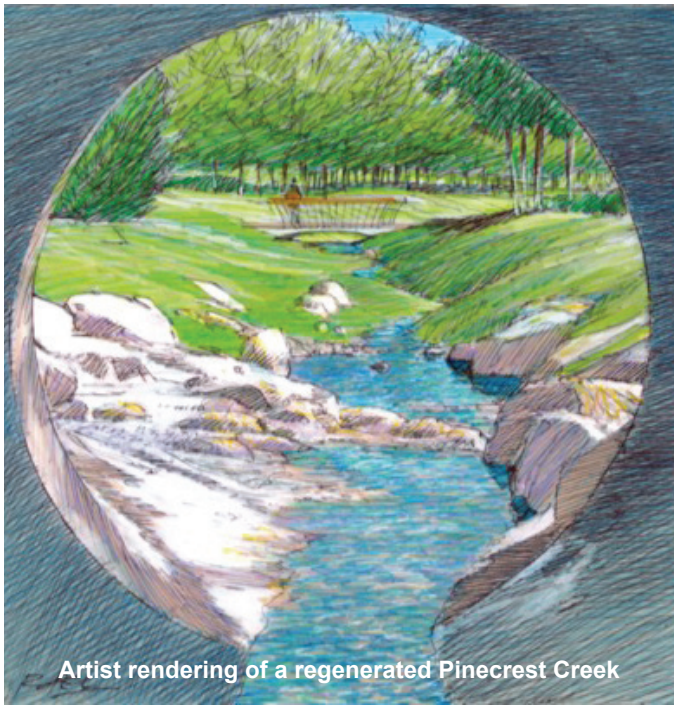
The College's approach to managing water is driven by meeting local rainwater/stormwater requirements, and the pursuit of Leadership in Energy and Environmental Design (LEED) Gold certification for its new buildings.

LEED breaks water in to related, but separate topics, including rainwater, indoor water, and outdoor water. These topics have informed how the College has approached water management on its new building projects for more than ten years.

By pursuing the rainwater, or stormwater, credit in LEED, the College will better manage the quantity and quality of water that leaves its sites, thereby reducing the potential for downstream issues.

The achievement of LEED Gold for New Construction at both the Perth and Pembroke campuses began a new approach to managing rainwater for Algonquin. Both campuses employed a variety of LID strategies that reduced the quantity and quality of rainwater / stormwater runoff leaving the campuses. These campus buildings have set a new benchmark for the College.

Both indoor and outdoor water use refer to how potable water resources are used on campus. LEED Building Design and Construction (BD+C) mandates that new construction and major renovation projects meet minimum water efficiency targets (currently 20% less than the published baseline). As LEED requirements evolve and become more stringent, this commitment will keep the College at the leading edge of efficient, and responsible, water use.



Artist rendering of a regenerated Pinecrest Creek

PURSUING LEED GOLD AT ALGONQUIN

As part of the College's approach to pursuing LEED Gold on all new construction projects, Algonquin will commit to the following water related credits:

- Indoor water use consumption. All projects will achieve a minimum 20% reduction in potable water consumption. Up to 6 points possible.
- Outdoor water consumption. All projects will either demonstrate that either no permanent irrigation is required, or that landscape water requirements will be reduced by at least 30%. Up to two points possible.
- Rainwater management. All projects will reduce runoff and improve water quality by replicating the natural hydrology and water balance of the site. Up to 3 points available.
- In all cases the College will strive to exceed the minimum thresholds, and optimize the points available for these credits.

OTTAWA CAMPUS: CURRENT STATE

Over the past ten years, the Ottawa Campus has benefitted from projects that have targeted both new and existing buildings.

All new buildings on campus have, and will continue, to pursue LEED certification. With respect to its existing buildings, the Ottawa Campus has retrofitted many of its plumbing fixtures through Energy Services Contracts (ESCOs) 1 and 2, which included provisions to reduce potable water consumption within the College's older buildings, including the student residence. (In 2013, approximately 37% of potable water consumed at the Ottawa Campus was by the resident buildings.) The College will continue to benefit from these strategies for years to come, both financially and environmentally.

With respect to rainwater / stormwater, the Ottawa Campus is under pressure from the City of Ottawa to reduce runoff rates from the campus to Pinecrest Creek. Over the years, as the campus has developed and the volume of impervious hardscape (surface parking and buildings) has increased, the College has developed a shortfall in the amount of runoff it is required to manage on-site (see box on right), which has made it more difficult to receive site plan approval for infrastructure projects. An Integrated Rain / Stormwater Management Plan is underway, and will recommend a stormwater management pond to resolve the issue.

PINECREST CREEK

The Ottawa campus is located within the heart of the Pinecrest Creek watershed. In 2012, the City of Ottawa released Stormwater Management Guidelines for the Pinecrest Creek / Westboro Area to address serious surface water runoff concerns and water quality issues within Pinecrest Creek. These Guidelines, the strictest in the City, establish mandatory rainwater / stormwater requirements for all new development and redevelopment projects within Pinecrest Creek's 1,920ha watershed.

To help regenerate the watershed, the City of Ottawa is in the preliminary stages of designing and building a stormwater management pond (SWM) in the NCC lands near the intersection of Woodroffe Ave and Baseline Road. The proposed city SWM pond will serve as a water quality and frequency flow control facility, and treat runoff from 450 ha of existing upstream area, including Algonquin College, and compensate for uncontrolled frequent flows from Baseline LRT/BRT Station. However, the College cannot rely on this facility to meet its obligations.

Until 2012, the Ottawa Campus met all rainwater/ stormwater requirements, however since the new Guidelines were launched, the campus has developed a shortfall in the amount of rainwater / stormwater it is required to manage onsite; in short, the College has completed several projects that have not meet the requirements.

The College's Water Strategy will provide the framework from which the College can begin to address this issue, and will lead to the development of an Integrated SWM Plan. This plan will explore and suggest solution to address requirements for flood control, and in-stream erosion control associated with rainwater / stormwater runoff.

For its part, Algonquin will control on-site peak flow rates and volumes in order to:

1. Contribute to reduced flooding and erosion, maintain base flows in Pinecrest Creek and contribute to the overall health of the watercourse;
2. Ensure future runoff can be managed by the existing trunk sewers that serve the campus.

Going forward, the College will continue to work with the City of Ottawa to develop integrated rainwater / stormwater management solutions that take a watershed approach.

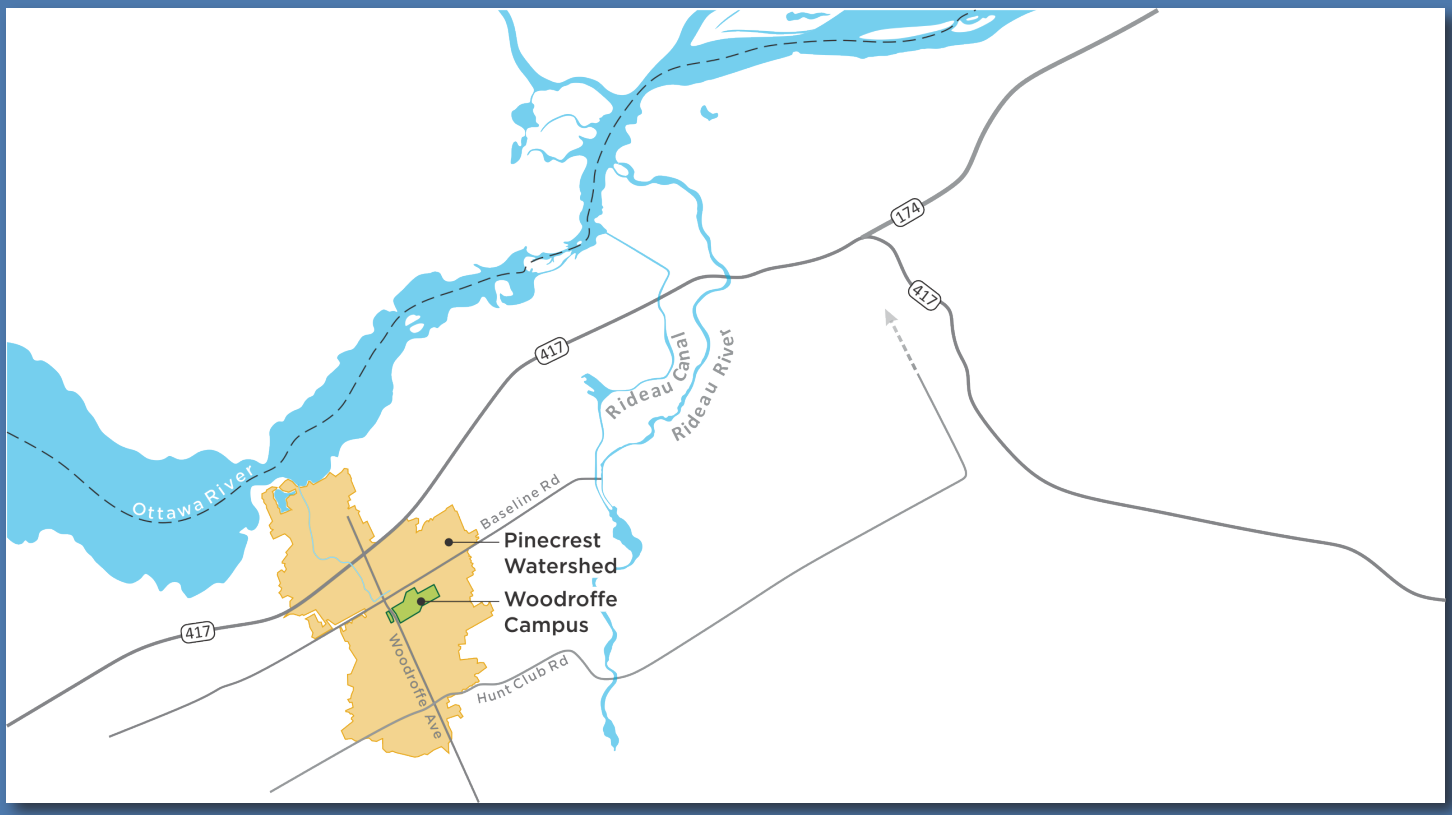


Figure 1. Pinecrest Watershed's location relative to Woodroffe Campus.

OTTAWA CAMPUS: ACHIEVEMENTS

The Ottawa Campus has implemented a number of water conserving strategies over the past ten years, including:

- ACCE:
  - Achieved LEED for New Construction (NC) Platinum (v1.0), and in doing so met all requirements for rainwater / stormwater management credits;
  - Installed a 61,300 L cistern to harvest rainwater for irrigation, to flush toilets and urinals, and reduce rainwater / stormwater runoff;
  - Incorporated low flow / flush plumbing fixtures;
  - Planted a 4,000 m2 green roof to absorb rainwater, and control the volume and quality of rainwater / stormwater runoff, protecting the downstream watershed of Pinecrest Creek.
  - Planted indigenous, drought tolerant landscaping to reduce irrigation requirements;
- Student Commons:
  - Achieved LEED NC Gold (v1.0), and in doing so met requirements related to the quantity and quality of rainwater / stormwater runoff;
  - Incorporated low flow / flush plumbing fixtures;
  - Planted indigenous, drought tolerant landscaping has reduced irrigation requirements around the new buildings;
- All plumbing fixtures across the campus, including the student residence buildings, were retrofitted;
- Water bottle refilling stations have been installed in ten buildings, making tap water more easily accessible, and reducing the number of plastic water bottles consumed and disposed of on campus; and
- As a result of the initiatives noted above, the Ottawa Campus has reduced water consumption by 33% since 2005, even though square footage has increased over the same time; water intensity was reduced from 91 liters per square foot (L/SF) in 2005 to 50 L/SF in 2016, representing a 45% reduction.

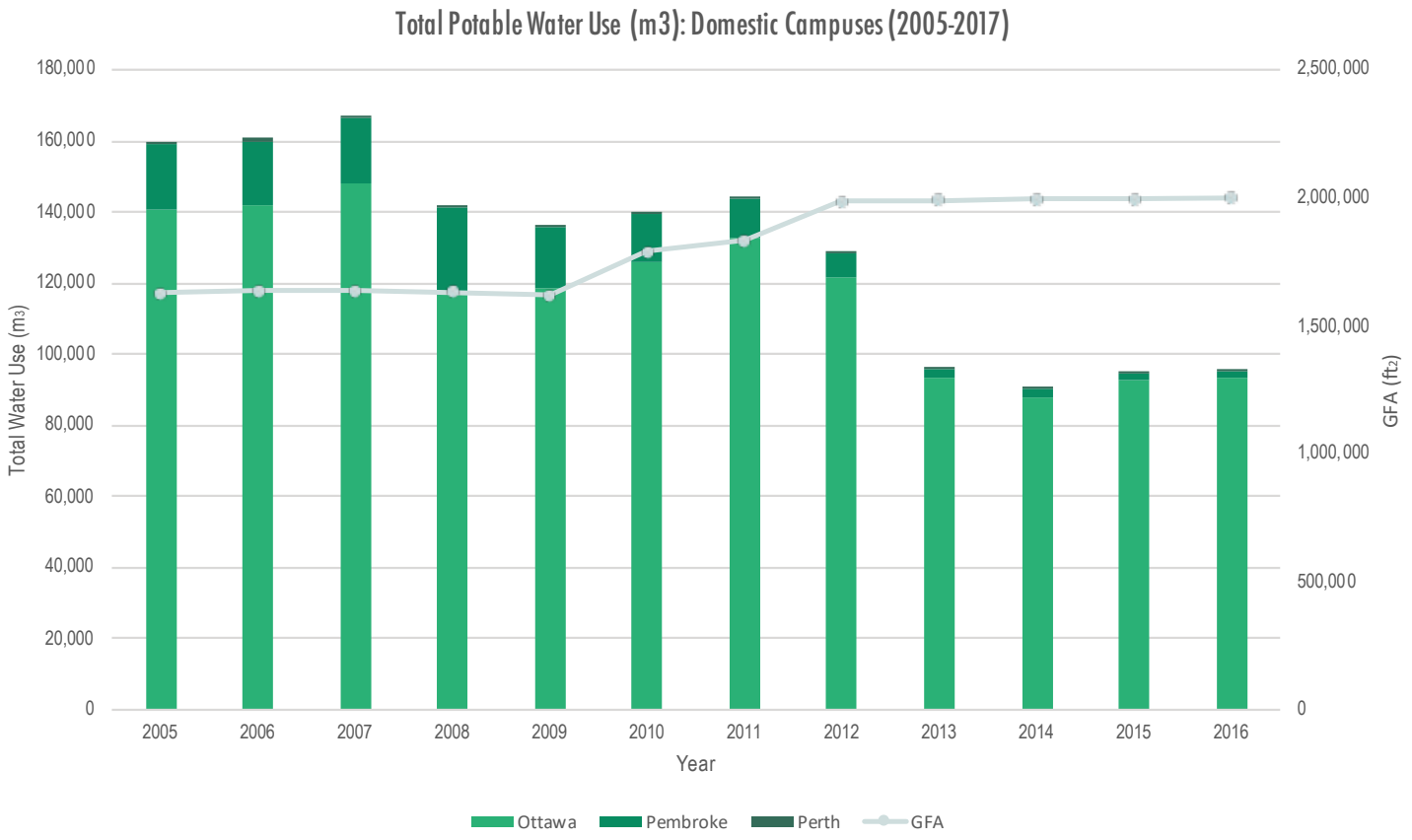


Figure 2. Total potable water use for all Algonquin College Campuses.

PERTH AND PEMBROKE CAMPUSES: CURRENT STATE

The redevelopment of the Perth and Pembroke Campuses provided the College with an opportunity to install new water infrastructure that would reduce the amount of potable water consumed at each campus, as well as introduce low impact development strategies that would meet both LEED and local rainwater / stormwater requirements.

Each building achieved LEED Gold for New Construction (NC), in part because of the commitment to reduce potable water consumption. Each building will continue to benefit from the strategies implemented.

With respect to rainwater / stormwater, each campus sits within a floodplain, and as a result both buildings required a variety of low impact development strategies to reduce the quality and quantity of runoff from the new buildings, and their sites. Both projects now provide best practice examples for low impact development that the Ottawa Campus can replicate.

PERTH AND PEMBROKE CAMPUSES: ACHIEVEMENTS

The redevelopment of the Perth and Pembroke Campuses led to the following specific initiatives:

- Water-efficient plumbing fixtures installed in each new building;
- Water bottle refilling stations have been installed at each building, making tap water easily accessible at all campuses, and reducing the number of plastic water bottles consumed and disposed of;
- Indigenous, drought tolerant landscaping has reduced irrigation requirements at each campus;
- A rainwater harvesting system at Perth captures water for flushing toilets, and meet irrigation needs; and
- Low Impact Development strategies:
    - Bioswales and on-site retention (by way of a stormwater management pond) help manage the quality and quantity of runoff; and
    - In Perth, the gravel parking lot helps treat the quality of rainwater / stormwater prior to it leaving the site.

As a result of the initiatives noted above, the Perth Campus has reduced overall water consumption by 55% since 2005, and Pembroke by 89%. In both cases, even though the new buildings added square footage, potable water use per square foot decreased at Perth from 35 L/SF to 8 L/SF (75%) and at Pembroke from 296 L/SF to 20 L/SF (93%). It should be noted that Pembroke numbers were validated with the utility company, and some exploration should be considered to better understand the reduction.


Robert C. Gillett
Student Commons
STOP
EXIT

3.0 WATER PLANNING VISION AND PRINCIPLES (PVP)

VISION

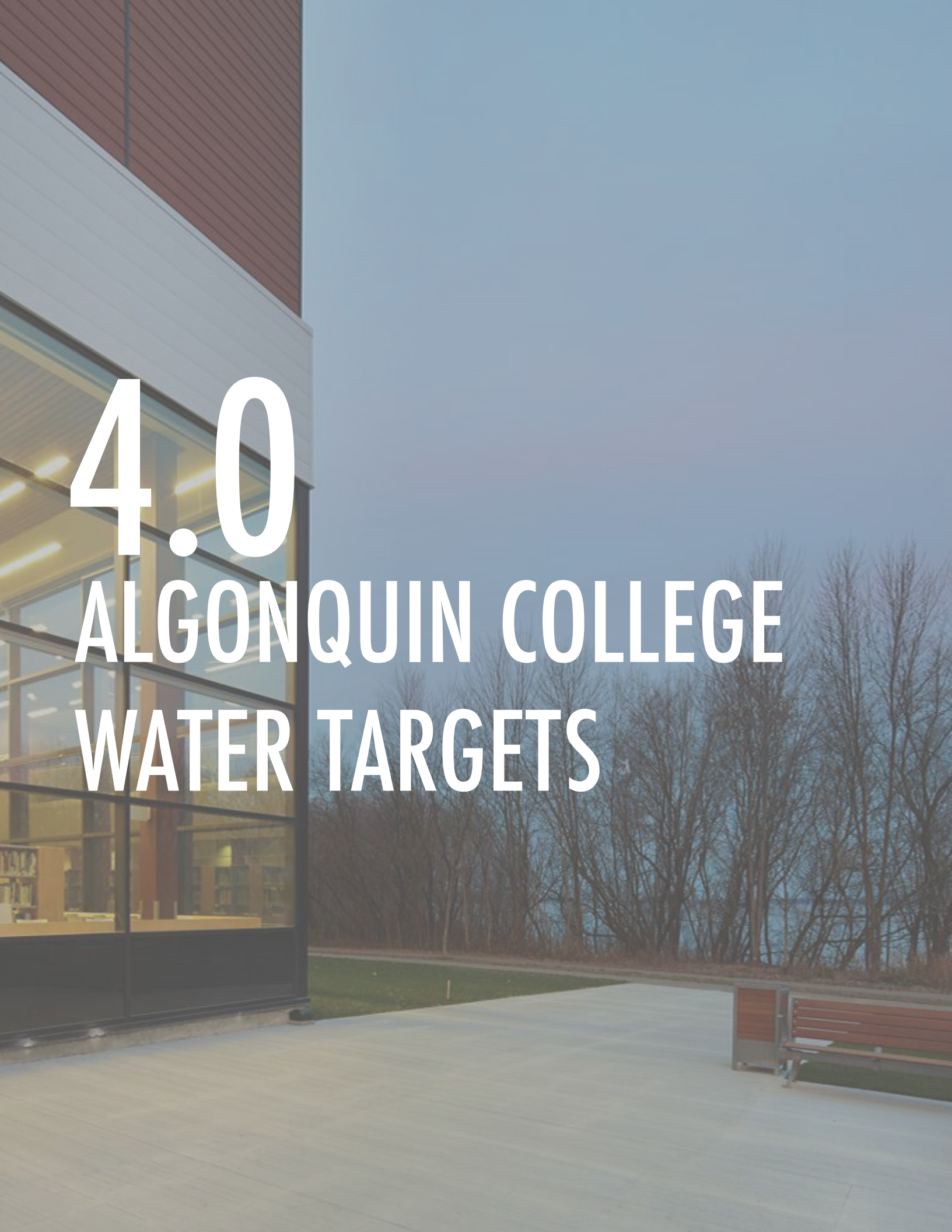
Rethink Water:
Change the way we think about water to change the way we steward our water

GUIDING PRINCIPLES

A. Build and Maintain Water Awareness	B. Practice Water Stewardship	C. Regenerate our Watersheds
Create a culture of water awareness that changes the way the College community thinks about water.	Steward our water resources efficiently to reduce our water footprint.	Embrace and regenerate our watersheds to provide our communities with lasting improvements to their local environments.

OBJECTIVES

Engage the College community to raise awareness, celebrate and appreciate our connection to water, and inspire action. Learn, share and embed traditional Indigenous Knowledge into the College's approach to managing its water resources. Evaluate water solutions through a sustainability lens that includes lifecycle costs, environmental impact, and community benefits. Facilitate opportunities to connect water projects and initiatives with academic programming, experiential learning opportunities, and applied research.	Reduce College-wide potable water consumption. Collaborate with the City of Ottawa to initiate a water infrastructure planning approach for the Ottawa Campus. Increase the volume of potable water consumed as drinking water, while reducing plastic water bottles sold at each campus.	Support the restoration of Pinecrest creek by reducing the quantity of rainwater / stormwater discharged at the Ottawa campus. Rebalance local hydrology by increasing green space and reducing impervious surfaces, while creating beautiful and sustainable campuses. Improve the quality of water discharged from all campuses by ensuring procurement policies and operational procedures consider products that will reduce the impact on the downstream water supply. Explore opportunities to "turn back the clock" and regenerate local watersheds at each campus.



4.0 ALGONQUIN COLLEGE WATER TARGETS

Table 1. Potable water targets.

INDICATOR	BASELINE (2005)	BY 2022	BY 2032
Decrease total potable water consumption (m^3) across all 3 campuses	160,000 m^3	45% reduction[1] to 88,000 m^3	50% reduction to 80,000m^3
Decrease potable water use intensity (L/SF)	98 L/SF	55% reduction[2] to 44 L/SF	60% reduction to 39 L/SF

Table 2. Rainwater/Stormwater Targets

INDICATOR	BY 2018
Meet the Stormwater Management Guidelines for Pinecrest Creek [3]	Improve water quality by removing 80% of on-site Total Suspended Solids (TSS);
	Reduce the risk of downstream flooding by controlling the 100-year discharge to 33.5L/s/ha (liters per second per hectare);
	Control downstream erosion by limiting runoff from the 25mm rainfall to 5.8L/s/ha.

[1] 2016/17 FY = 40% reduction
[2] 2016/17 FY = 51% reduction
[3] Achieving this target will ensure that all three of campuses comply with local rainwater / stormwater requirements. Once achieved, the College will maintain these standards by ensuring all future developments meet local rainwater / stormwater requirements.

5.0 INITIAL RECOMMENDED PRIORITY PROJECTS & INITIATIVES

The following table lists the recommended short-term projects to be completed within the next five years. Implementation details such as resource implications, timelines, possible stakeholder impact, and accountability will be determined at the implementation stage following ACET approval.

GUIDING PRINCIPLE	RECOMMENDED PRIORITY PROJECT
A. Build and Maintain Water Awareness Create a culture of water awareness that changes the way the College community thinks about water.	Develop an engagement plan to inform and create a culture of water awareness. For example: • Host at least one annual event related to water, such as a thought leader lecture or Water Celebration festival. • Profile College water projects and initiatives.
B. Practice Water Stewardship Steward our water resources efficiently to reduce our water footprint.	Track and report on water consumption at all domestic campuses.
	Complete a water inventory for all campuses; and develop specific targets and actions to reduce potable and outdoor potable water use, and greywater.
	Assess the College's total water footprint; and develop targets and actions to reduce it.
	Develop a Plan that will: • Increase the number of water stations (Ottawa campus); • Increase drinking water habits of students and employees; • Reduce the number of bottled water / drinks sold and disposed of at each campus.
C. Regenerate our Watersheds Embrace and regenerate our watersheds to provide our communities with lasting improvements to their local environments.	Develop an Integrated Rainwater / Stormwater Management Plan at the Ottawa Campus that provides sustainable, campus-wide, long-term solutions to manage stormwater.
	Develop guidelines that identify Low Impact Development (LID) measures that can be implemented to manage and reduce rainwater / stormwater.
	Pursue a LID pilot project with the City of Ottawa.
	Explore opportunities to 'daylight', or expose, Pinecrest Creek at the Ottawa campus.

APPENDICES

Source: GBPlusMag

APPENDIX A: GLOSSARY

Bioswale (or bioretention) – A Bioswale temporarily stores, treats and infiltrates runoff to remove silt and pollution.

Cistern –A tank for storing water.

Close Loop Water System – A system where waste water is recycled and reused.

End-of-Pipe Stormwater Management – Describes the more conventional and traditional approaches to large-scale stormwater management e.g. extended detention ponds (wet or dry) that serve larger catchment areas (i.e. drainage areas).

Green Infrastructure – Green infrastructure is any practice that uses or replicates natural systems to achieve a desired outcome. This includes green roofs, bioswales and rain gardens. Green infrastructure does not exclusively mean vegetation. Permeable surfaces are considered green infrastructure as well. Green infrastructure looks to nature for advice, restoring and replicating ecological systems to create human benefits.

Greywater – Used water from bathroom sinks, showers; excludes waste water from toilets.

Indoor Water – Similar to potable water, indoor water is the terminology used by the LEED Rating Systems to describe water use within buildings, including water supply and wastewater systems. By contrast outdoor water is used to describe potable water used by irrigation systems.

Low Impact Development (LID) – A stormwater management approach with a basic principle that is modeled after nature: manage rainfall at the source using on-site natural landscape features, such as rain gardens, green roofs, permeable pavers, etc. The goal is to mimic a site's predevelopment hydrology (water cycle) by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source.

Potable Water (or Drinking Water) – Water that is safe to drink, or use for food preparation, without risk of health problems. Non-potable water, on the other hand, is water not fit for human consumption.

Rainwater Harvesting – The collection, storage and distribution of recycled rainwater, generally used in landscaping or flushing toilets.

Stormwater – Surface water that results from rain or snow. When not infiltrated, stormwater is typically collected in ponds, culverts, ditches and pipes, to avoid flooding, and pollution / erosion of waterways. Stormwater is increasingly referred to as rainwater, particularly within LEED version 4.

Total Suspended Solids (TSS) – Solid materials, including organic and inorganic, suspended in water. It is a water quality parameter used to assess the quality of water, a higher value can lower water quality by absorbing light, in turn warming water and lessening the ability of a water supply to hold oxygen necessary for some aquatic life.

Water Footprint – A measure of humanity's appropriation of fresh water in volumes of water consumed and/or polluted." (Source: Water Footprint Network). The water footprint measures the amount of water we use each day, including water from the tap and water used to produce each of the goods and services we use. e.g. food we eat, products we buy, energy we use.

APPENDIX B: CURRENT INITIATIVES

As noted above, the initiatives undertaken by the College over the past 10 years have resulted in a significant reduction in total potable water use. When measured by intensity, or water use per square foot, we can see that the volume of water used has more than halved since 2005, representing enormous savings across the College, and putting Algonquin among the leaders in water conservation across the Province. This performance should be acknowledged within the context of physical growth at each campus, as well as continued growth in student enrolment.

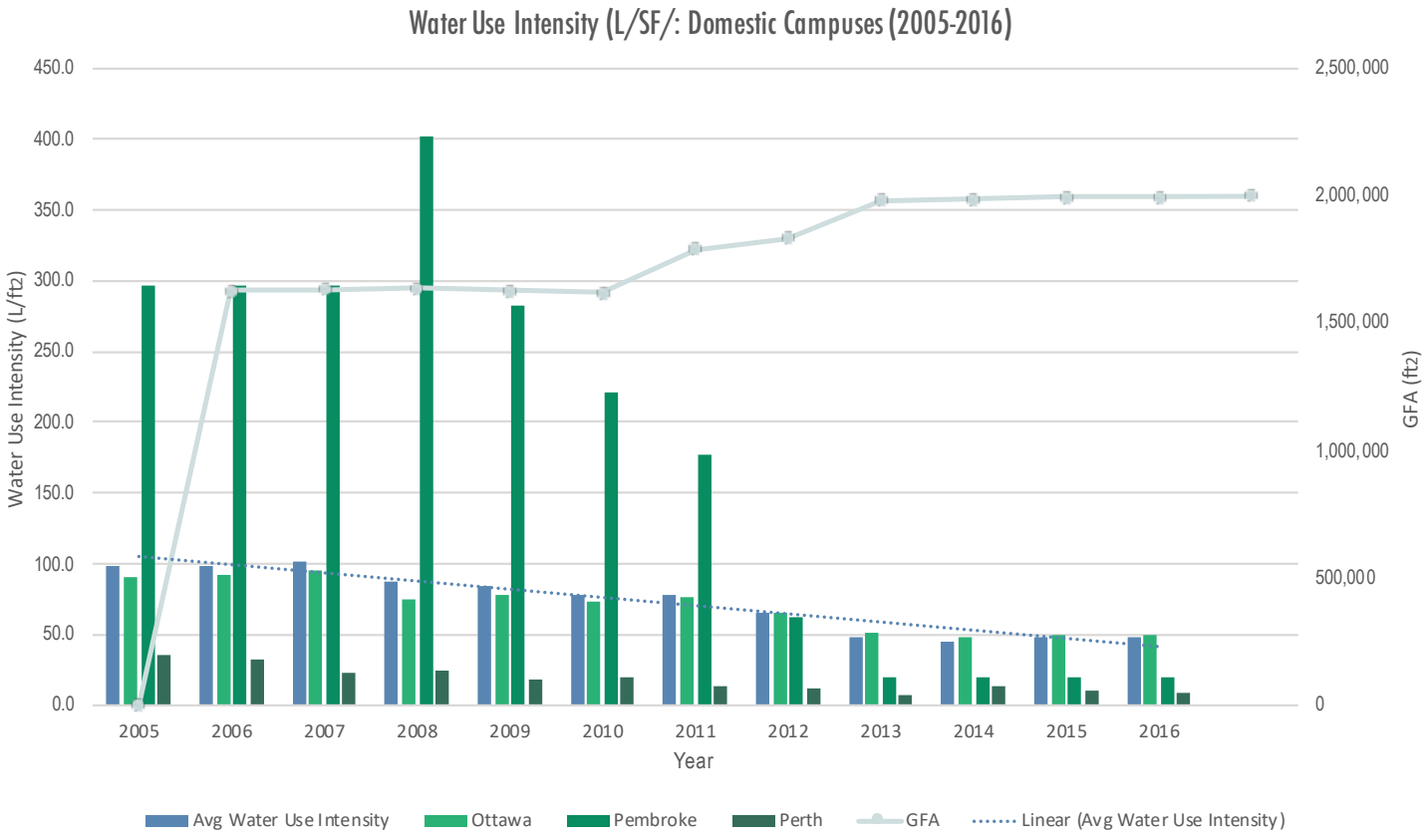


Figure 3. Water use intensity across all campuses (2005-2016).

OTTAWA CAMPUS

The following initiatives have been implemented at the Ottawa campus:

- All new buildings on campus have been designed to meet LEED Gold standards, as a minimum, which sets strict standards for water conservation and stormwater management;
- Several advanced water conservation strategies have been implemented at the Ottawa Campus as part of the ESCO (Energy Services Contract) initiatives, including:
  - Water-efficient plumbing fixtures: low flow faucets and showerheads, and low-flush toilets and urinals in ACCE, SC and the Residence buildings.`
- Rainwater Harvesting and Reuse: a rainwater harvesting system and greywater reuse system at ACCE collects rainwater from the roof in an underground cistern. This non-potable water is used to flush urinals and toilets in the building and to irrigate the green roof.;
- Student Commons uses filtration media under the front lawn to infiltrate rainwater / stormwater, and reduce runoff to Pinecrest Creek;
- Reduced Irrigation: Indigenous, drought tolerant plantings reduce the need for irrigation, and where irrigation is required 100% of the water is from reclaimed rainwater at ACCE;
- Green Roof: a ~4000 m2 green roof on the ACCE building absorbs rainwater to control runoff which allows rainwater to be infiltrated at the source and reduces flows to Pinecrest Creek; and
- A Stormwater Management Plan and Stormwater Management Pond are currently in development as of June 2017. The Pond is due to be constructed during the summer / autumn of 2017.

Water consumption at the Ottawa Campus has decreased by 33% compared since 2005, while total building area has increased over the same period.

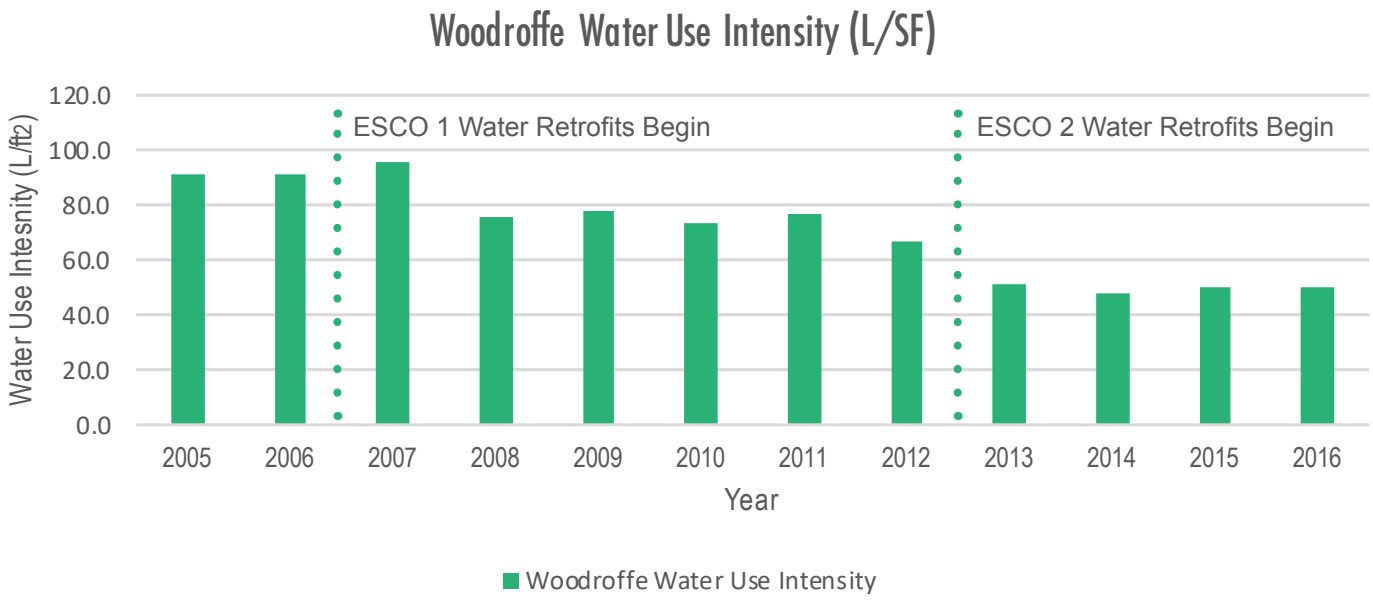


Figure 4. Water use intensity at Woodroffe Campus (2005-2016).

PEMBROKE CAMPUS

The Pembroke Waterfront campus, built in 2012, is a four-story 99,474 square foot LEED Gold building with a central common area, offices, and multi-purpose rooms, classrooms, library, nursing, science and computer labs, an automotive shop, and a large gymnasium. As part of the design of the new building, the following initiatives were implemented on campus:

- Water-efficient plumbing fixtures: the building has low flow / flush plumbing fixtures in all washrooms;
- Reduced Irrigation: Indigenous, drought tolerant plantings reduce the need for irrigation, and areas are designed to blend in with the natural parklands or environments that surround the campus. Irrigation for the trees is provided through a rainwater harvesting system that collects rain from the roof, and stores it in a cistern; and
- Low impact Development strategies: rainwater / stormwater overflows are managed through bioswales that surround the parking lot and an on-site rainwater / stormwater management pond.

Total water consumption at the Pembroke campus has decreased by 89%, water intensity has decreased by 93%.

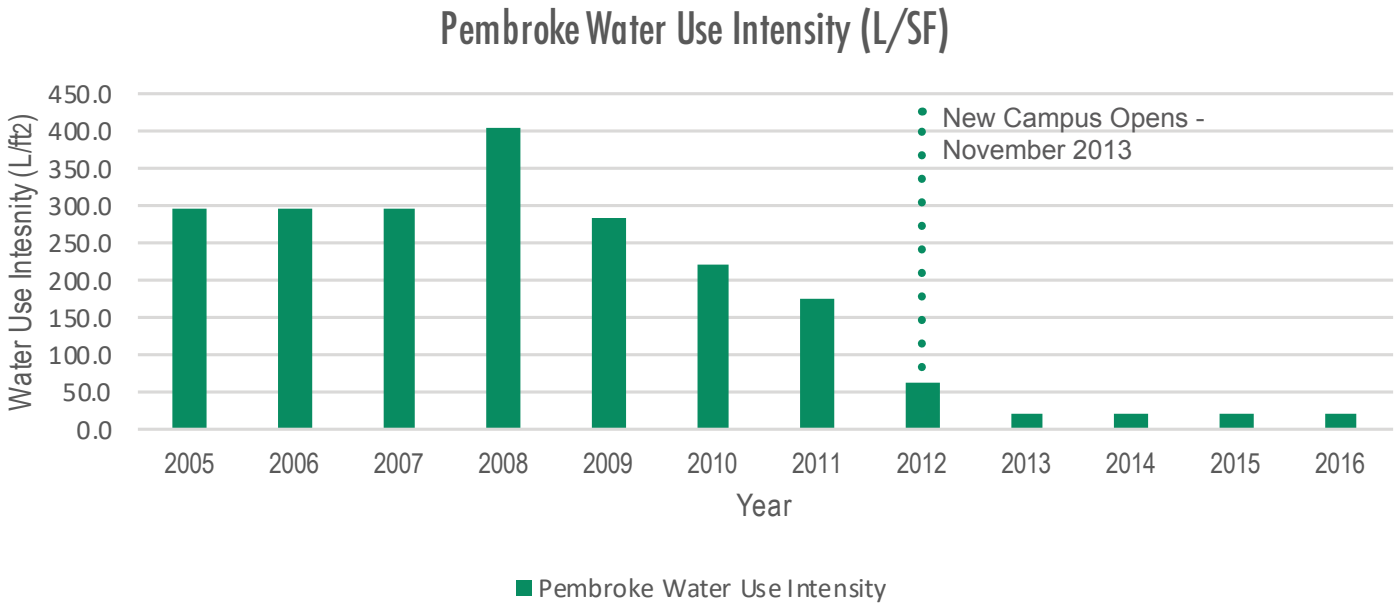


Figure 5. Water use intensity at Pembroke Campus (2005-2016).

PERTH CAMPUS

The Perth Campus building, built in 2011, is a 42,000-square foot facility that accommodates an academic hall and a construction wing with trades shops. The building was awarded LEED Gold for New Construction (1.0) certification. The Perth campus in on a five-hectare rural site, and is located within a floodplain. The following initiatives have been implemented on campus:

- Water-efficient plumbing fixtures: the new building has low flow faucets and showerheads, low-flush urinals, and dual-flush toilets in all washrooms;
- Water bottle refilling stations: to increase accessibility to safe and affordable water, and to reduce the number of water bottles sold on campus;
- Rainwater Harvesting and Reuse: a 2,000L rainwater harvesting system collects rainwater to flush toilets, supplying at least 50% of the water required to flush toilets;
- Indigenous, drought tolerant landscaping on-site eliminates the need for irrigation once plantings are established; and
- Low impact Development strategies: Stormwater Management: on-site retention, bioswales, rainwater harvesting system and a gravel parking lot all help infiltrate rainwater on campus in order to reduce stormwater flows.

Total water consumption at the Perth campus has decreased by 55%, while the building area increased. Water intensity has decreased by 75%.

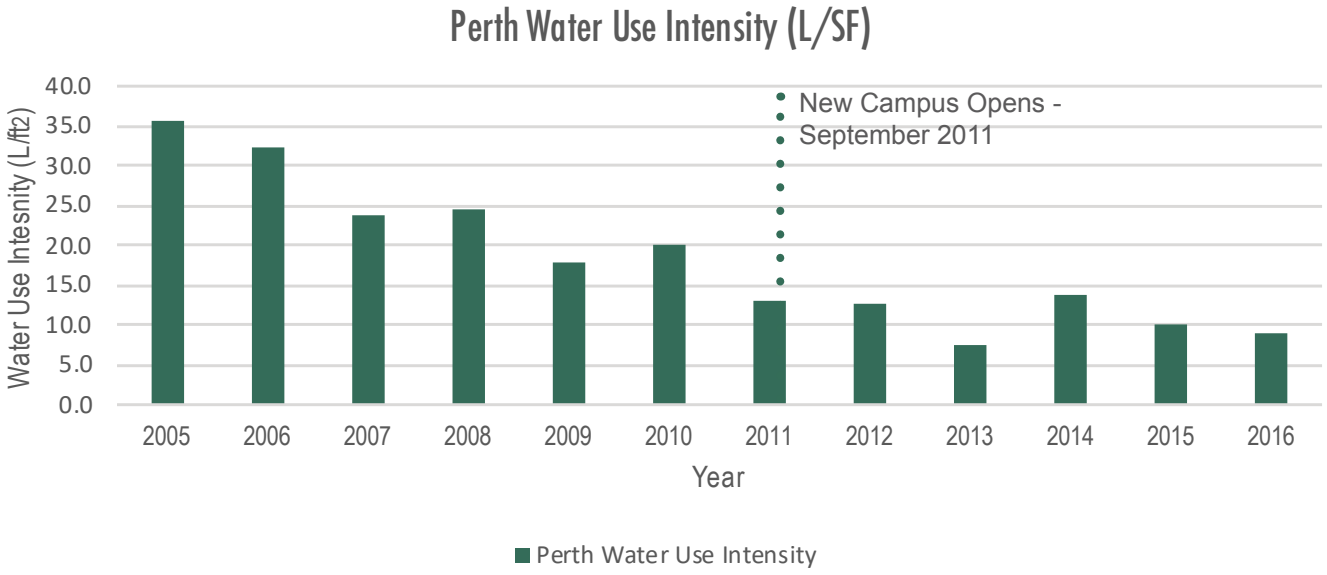


Figure 4. Water use intensity at Woodroffe Campus (2005-2016).

APPENDIX C: LOCAL CAMPUS ISSUES

OTTAWA CAMPUS

- Water bottle filling stations are available in nine buildings on campus, however there are many buildings where they have not been installed, limiting accessibility to drinking water;
- Drains near the SA Athletic Dome accumulate water and are an issue for the campus' neighbours;
- There are issues within the SA Athletic Dome including lack of hot water, drainage systems that freeze, and water low pressure in the showers;
- Without the appropriate control strategies, the parking lots will continue to create volumes of stormwater runoff to the detriment of Pinecrest Creek; and
- The campus currently has a shortfall in meeting the Pinecrest Creek Stormwater Management Guidelines, as a result the College has had problems receiving site plan control for recent projects.

PEMBROKE CAMPUS

- The Pembroke Campus is located next to the Ottawa River and has recreational pathways that connect the campus to the River. The flood plain extends into the Pembroke property, and is protected from the Ottawa River by a berm;
- The stormwater management pond was designed to be a wet pond, but the pond is normally dry; and
- Toilet flush valves have already failed and have been replaced in the new building.

PERTH CAMPUS

- Almost half the Perth Campus lies within a floodplain, which is protected by the Rideau Valley Conservation Authority. With poor infiltration conditions and no municipal storm sewers, stormwater flows must be managed on-site, and this is currently done with bioswales and a rainwater harvesting system. A gravel parking lot also helps infiltrate rainwater to reduce stormwater flows, and for this reason paving it is not permitted.

APPENDIX D: WATER TREND LOG

Water will increasingly become an issue for the College and society. Pressure on our water resources, increasing infrastructure costs, future campus development and changing social norms introduces uncertainty as it relates to planning future water infrastructure. This uncertainty introduces risk, making long-term decision-making challenging, reinforcing the need for an agile and flexible approach to planning. Imagining how the market will change within the context of the College's key planning horizons provides an important perspective on how the College may need to respond to water issues in the years to come. By considering potential scenarios, Algonquin can do its best to make decisions within the context of emerging trends, risks, and opportunities. The following table is not intended to predict the future, but rather is intended to provide a log to capture this context. Where appropriate, the College could explore any of these issues in further depth, as needed.

PLANNING HORIZON	TREND & POTENTIAL DRIVER OF CHANGE	RISK/OPPORTUNITY	SHORT-TERM RESPONSE
SHORT-TERM: 2017-2022	Increasing interest in sustainability by potential students. Water itself is vital to human development, and key sustainable development priority.	Without continued action, the College could be perceived to be falling behind other institutions, impacting the reputation of the College, and rendering the College less competitive as students pursue learning and research opportunities at institutions with strong performance / reputation in sustainability.	Reduce water consumption at each campus. Develop a stormwater management plan, and build the pond. Develop an engagement strategy to increase the amount of potable water consumed on campus, and reduce the plastic water bottle sold on campus.
	Cost of potable water and sanitation increases.	With aging water infrastructure across Ottawa, the cost of water could significantly increase, becoming a constraint for the College.	Reduce potable water consumption across the College.
	Cost of addressing stormwater increases.	The Environmental Commissioner of Ontario has found that only about 35% of rainwater / stormwater costs are currently recovered by municipalities, and has called on the province to require municipalities to recover the full costs of managing runoff.	Manage as much rainwater / stormwater on campus as possible.
	Lack of funding to complete Phase II (or enhanced) stormwater management pond.	The stormwater pond has an opportunity to become a College amenity, and provide the College with an outdoor space for students and employees.	Develop a compelling case to source funding to implement an enhanced landscaping plan.
	Provincial Stormwater Management Guidelines developed.	Provincial Stormwater Management guidance were last updated in 2003, and have since been superseded by guidelines developed by other organizations. New guidelines may put pressure on future buildings and infrastructure to accommodate stricter guidelines.	Develop a forward thinking SWM Plan that incorporates best practice, and leading edge technologies.

PLANNING HORIZON	TREND & POTENTIAL DRIVER OF CHANGE	RISK/OPPORTUNITY	SHORT-TERM RESPONSE
MID-TERM: 2023-2033	The health of Pinecrest Creek improves, but the Guidelines are updated to reflect stricter runoff requirements.	Future buildings and infrastructure may need to accommodate stricter rainwater / stormwater management guidelines.	Work with the City to monitor the volume and rate of stormwater discharged from the Ottawa Campus, and the ongoing health of Pinecrest Creek.
	College funding is constrained, and there are limited resources to implement source control measures at each campus.	The College is unable to meet current or future stormwater management guidelines at one or more of its campuses.	Work with the City to monitor the volume and rate of stormwater discharged from each campus, and the ongoing health of Pinecrest Creek.
	Increased focus on sustainability will likely continue to increase, putting pressure on organizations to reduce water footprint and restore watershed.	The College's reputation is at risk due to its water performance being perceived as out of synch with provincial trends, and student expectations.	Maintain a willingness to embrace new technologies, and pilot projects that would continue to reduce water consumption at each campus.
	Interest in naturalizing / beautification of the Ottawa campus increases.	Bringing Pinecrest Creek closer to its original state would help beautify the campus, and provide a new amenity.	Explore ways to daylight, or expose, Pinecrest Creek.
LONG-TERM: 2034-BEYOND	The frequency and intensity of storms increase.	The frequency and intensity of storms may increase as a result of climate change, potentially putting the Perth and Pembroke campuses at increased risk of flooding.	Develop an emergency response plan to deal with potential flooding at the Perth and Pembroke campus.
		Increased rainwater could render current stormwater strategies less effective.	Increased rainwater could render current stormwater strategies less effective. Monitor the stormwater runoff at each campus.

APPENDIX E: THE PROCESS AND ENGAGEMENT

PROJECT VISION AND PRINCIPLES (PVP)

The Project Vision and Principles (PVP) was the starting point for Algonquin's new Water Strategy. It was developed through consultation with stakeholders as part of the Integrated Design Process. The PVP provides succinct guidance to Design teams, Consultants, College staff and other Stakeholders to establish an understanding related to the College's ambitions for Water.

The PVP has three parts: A Vision statement for the project; Guiding Principles; and Objectives. Consultants will use this document as a decision-making framework that allows them to make informed choices between competing alternatives. The objectives are used to set direction, and inform the evaluation of the Strategy once in operation.

The PVP sessions were held during the Spring of 2016. Stakeholders that participated in the PVP process are listed below, and included a wide range of internal College staff, as well as external stakeholders. (Note: AC denotes Algonquin College staff).

We'd like to thank everyone who participated in the PVP sessions and in the development of this Water Strategy. A special thank you to Richard Briginshaw and his students from the Green Architecture program who participated in the PVP sessions and completed the best-practice research for the Water Strategy as part of their term project.

WATER STRATEGY WORKING GROUP

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- John Cook, GRC Architects
- Karyn Cornfield, Morrison Hershfield
- Eric Emery, Morrison Hershfield
- Phil Rouble, Associate Director of Facilities Planning and Sustainability, Algonquin College
- Sandra Sousa, Urban Equation (formerly BuildGreen Solutions)

PVP PARTICIPANTS/CORE STAKEHOLDERS

- Richard Briginshaw, Professor/Coordinator Green Architecture Program
- Brent Brownlee, Director of Ancillary Services
- John Dalziel, Associate Director, Physical Resources
- Sarah Dehler: Sustainability Coordinator
- Beverley Haselgrav, Coordinator of Grounds Maintenance and Operations
- Daniel Heffner, Student, Green Architecture Program
- Manon Levesque, Manager of Facilities and Operations, Physical Resources
- Ken MacLeod, Manager of Theatre Operations and Hospitality Services, Students' Association
- Martha Peak, Athletics Administrator, Students' Association
- Ian Pineau, Professor at Pembroke campus
- Rukma Ramdenee, Student, Green Architecture Program
- Sonali Srivastava, Student, Green Architecture Program
- Siwei Wang, Student, Green Architecture Program

EXTERNAL

- Richard Buchanan, Program Manager, Development Review, City of Ottawa
- Darlene Conway, Senior Project Manager, Infrastructure Planning, City of Ottawa
- Steve Dulmage, Urban Equation (formerly BuildGreen Solutions)
- Chris Rogers, Program Manager, Infrastructure Planning, City of Ottawa

APPENDIX F: WATER AND THE COLLEGE SUSTAINABILITY STRATEGY FRAMEWORK

Water has an important role to play in the College's Sustainability Strategy Framework. The following summary highlights some of the ways in which the Water Strategy will advance sustainability at the College.

Social

- Enhance student success: by taking care of our watersheds, we will improve the quality of our water supplies, and in turn our individual health, and the health of our broader community;
- Promote human development: by increasing accessibility to drinking water, and raising awareness, the College can promote water as a means towards encouraging healthier lifestyles for our students and employees; and
- Lead in community and corporate social responsibility: nurturing a connection, and appreciation to water at each of our campuses, will help our students and staff appreciate the role of water both globally, and locally, and its importance to intergenerational equity.

Economic:

- Institutionalize sustainability: by making smarter, and more balanced, procurement decisions we can begin to institutionalize sustainability; and
- Pursue Economic strength: by using water more efficiently, we can reduce the cost of water, enabling more resources to be reinvested in learning.

Environmental:

- Reduce our ecological footprint: By increasing awareness of water, we can influence people's behaviour both on and off campus, helping the College and its students and employees, reduce their water footprint;
- Facilitate Debate on Environmental Issues: raising awareness about water issues helps shift our mindset to see water as a precious resource and change our behaviours; and
- Restore and Regenerate our Environments: by taking a watershed approach to managing water, the College can support efforts to reduce the effects of rainwater / stormwater, and restore and regenerate our local environments.

The definition that inspires us
"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Brundtland Commission, 1987

The S-E-E Model of Sustainability reflects the notion that the world is an interconnected system of social, economic and environmental needs that must succeed over time and that Algonquin College will weigh in all its decisions.

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