water ACTION PLAN

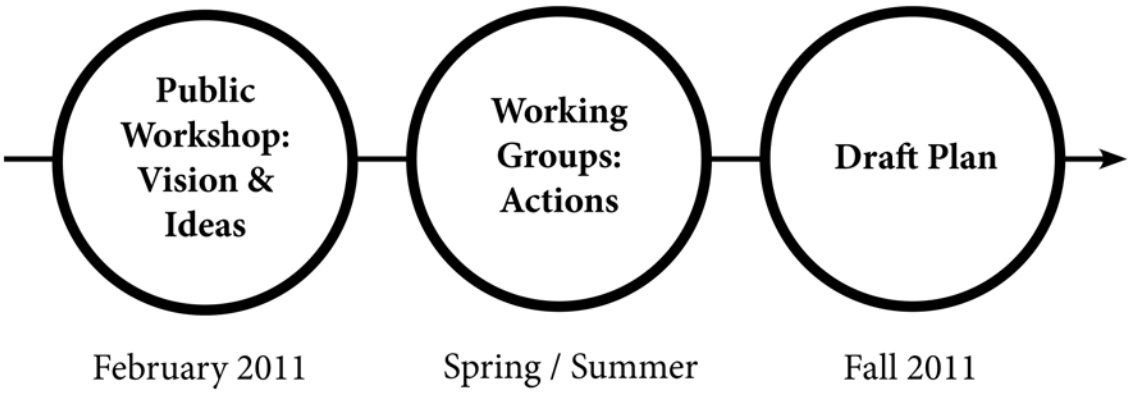
DISCUSSION PAPER

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

At UBC we are building a sustainable community where each of us is committed to innovation and action that keeps the University at the forefront of best practices in sustainability, including water management.

The University of British Columbia (UBC) is embarking on the development of a Water Action Plan (the "Plan") that will set water conservation targets for UBC's Vancouver campus. The Campus Sustainability Office wants to engage the UBC community in the development of this Plan.

A public workshop was held on February 8, 2011 to help establish a long-range vision for water and the types of actions required to achieve this vision (visit www.sustain.ubc.ca/campus-water for more information). The input received at this session will be reviewed and considered by Working Groups in preparation of a draft Water Action Plan.



The following Discussion Paper provides background information to help initiate an informed discussion about water at UBC. Although UBC is also conducting a separate, comprehensive Stormwater Management Plan process, opportunities to use rainwater as a resource will be considered in this planning process (e.g. harnessing rainwater to offset potable water requirements).

1. Background

LOCAL / REGIONAL CONTEXT

UBC's Vancouver campus is embraced on three sides by ocean and river, and bound on the other by a temperate forest. The university also sits on a natural aquifer – porous, layered beds of sands and gravels that hold water.

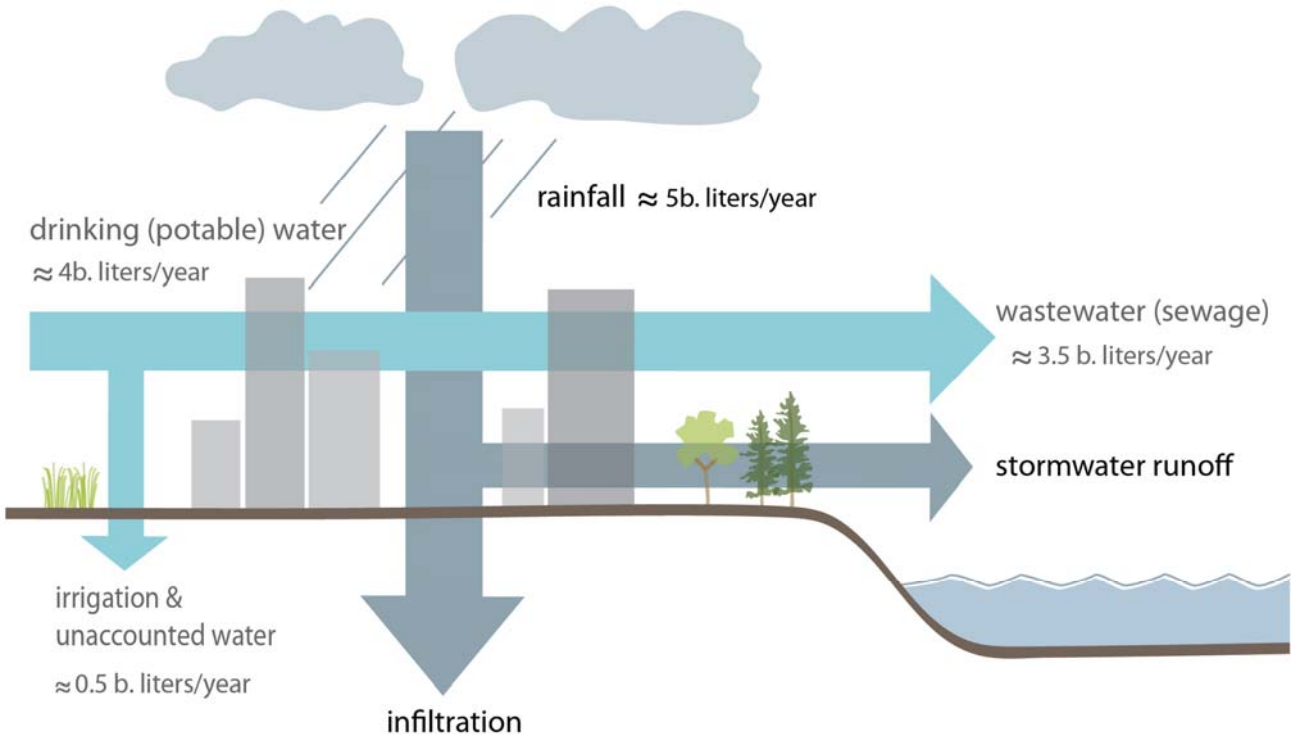
As with most of Metro Vancouver, UBC's drinking water comes from creek-fed reservoirs (lakes) in three watersheds: Capilano, Seymour and Coquitlam. The majority of water consumed at UBC comes from the Seymour and Capilano Reservoirs. Water from the Seymour Reservoir is treated in the newly constructed Seymour-Capilano Filtration Plant, while water from the Capilano Reservoir is treated via chlorination. By 2013, water from the Capilano Reservoir will also be treated at the Seymour-Capilano Filtration Plant.

DESCRIPTION OF UBC WATER SYSTEMS

UBC Utilities purchases drinking water (also known as potable water) from Metro Vancouver for distribution to institutional and commercial customers at UBC's Vancouver campus. Water is piped over 20km from the Capilano or Seymour watersheds before being stored in the Sasamat Reservoir, an underground concrete storage tank. Water then passes through one of two connection points before arriving on campus. At UBC, potable water is used for drinking, cleaning, toilet-flushing, irrigation, steam production, equipment cooling and research applications. After water is used on campus, wastewater (also known as sewage) is collected in pipes and conveyed to the Iona Wastewater Treatment Plant in Richmond, BC.

At UBC, rainwater (also known as stormwater) is collected in pipes that lead to one of four outfalls. An outfall, which represents the end-point of a catchment area, discharges rainwater to the natural environment. The four stormwater catchment areas at UBC are: North, West, 16th Avenue and South. The North catchment discharges directly into the marine environment at Spanish Banks via the Spiral Drain, a vertical cork-screw pipe. The other three catchment areas enter small streams that flow through steep ravines in Pacific Spirit Regional Park and eventually into the brackish waters at the north arm of the Fraser River.

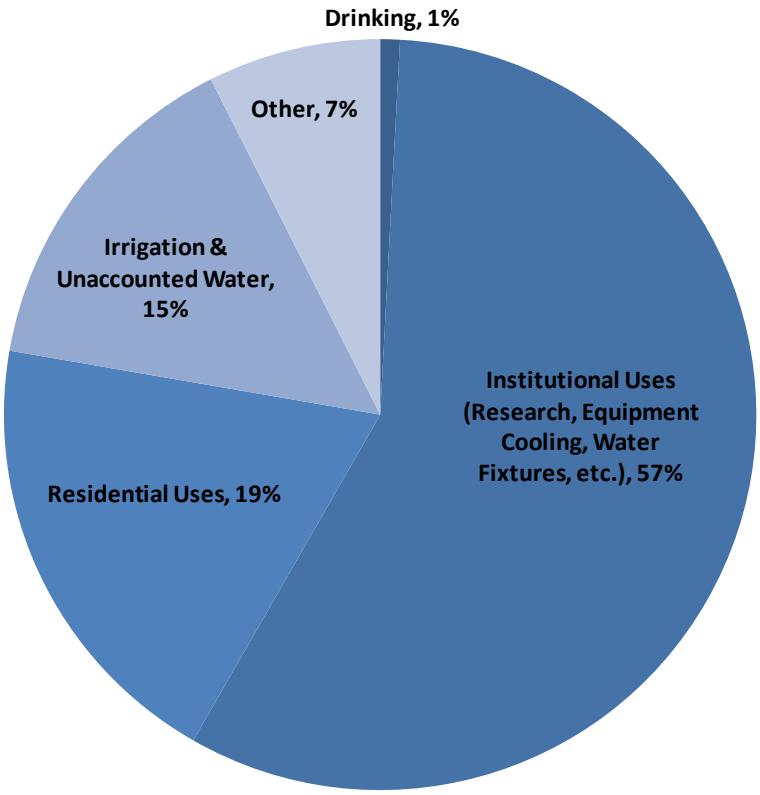
Flow of Water at UBC



INVENTORY OF WATER CONSUMPTION

In 2009, UBC's Vancouver Campus consumed over 4.3 billion liters of water, or an average of 137 liters of water per second (L/s). This is enough water to fill over 1,700 Olympic-sized swimming pools! It is estimated that approximately 57% of UBC's water consumption can be attributed to institutional uses (research, equipment cooling, water fixtures, etc.) while 19% of water consumption is attributed to residential uses. It is also estimated that nearly half of UBC's water consumption is attributable to a ***base flow***, which is the result of processes that have constant demands for water, day and night. Water consumed for drinking purposes only represents approximately 1% of UBC's overall consumption. The following graph illustrates the composition of water use at UBC's Vancouver campus.

Estimated Composition of UBC's Average Water Demand (137 L/s) by Use



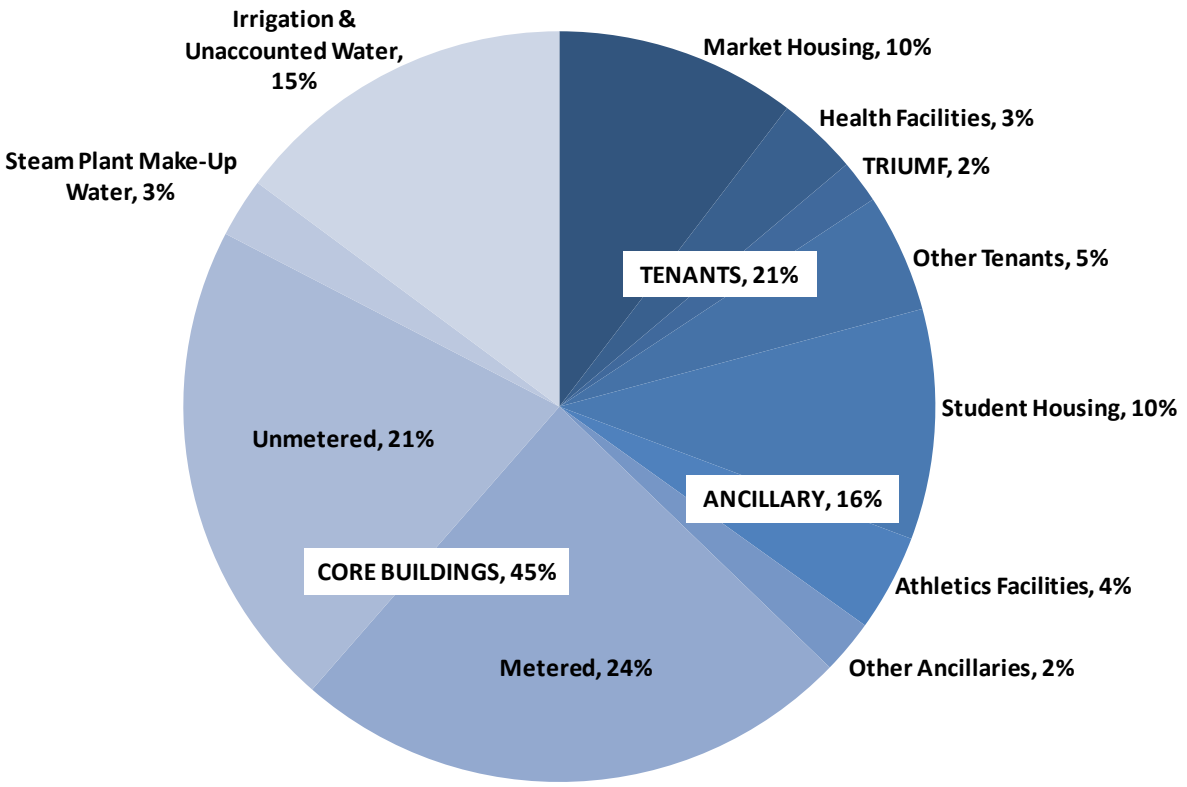
Total water consumption and sewage generation are metered at UBC. Furthermore, Ancillaries[1] (Student Housing, Athletics & Recreation, etc.) and Tenants[2] (Market Housing, Health Care, TRIUMF, etc.) are metered for water consumption at the building-level and pay UBC Utilities for water and sewer service. The remainder of water is used in Core[3] academic buildings and for irrigation purposes and is paid for through core university funds. Over 60 core buildings are metered for water consumption even though this data is not used for billing purposes. Core buildings are metered to monitor water consumption over time and to identify conservation opportunities. The following graph illustrates the breakdown of water consumption at UBC's Vancouver campus by user group.

[1] *Ancillaries: UBC owned and operated buildings that are billed for water consumption*

[2] *Tenants: not UBC operated or owned but occupy UBC land (also billed for water consumption)*

[3] *Core: UBC owned and operated buildings that do not receive individual billings for water*

Estimated Composition of UBC's Average Water Demand (137 L/s) by User Group



Water rates are continually increasing. UBC's water rate in the 2010 peak season (June – September) was $0.74/m^3 while the rate in the off-season was $0.59/m^3. UBC currently spends approximately $2.5 million on water per year.

2. Successes at UBC

NEW CONSTRUCTION

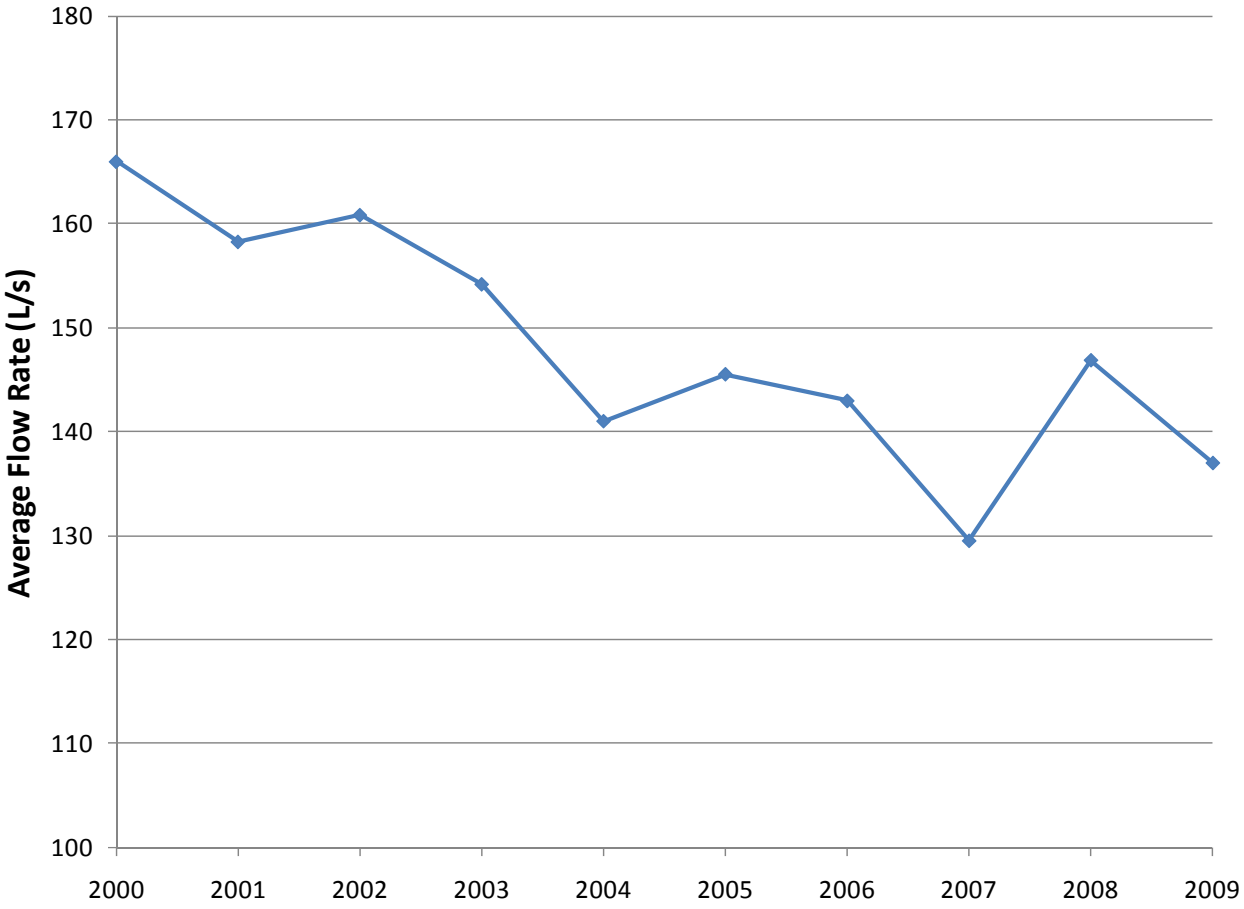
UTown@UBC family housing neighbourhoods are model green communities built to UBC's stringent Residential Environmental Assessment Program (REAP) guidelines. REAP ensures that residential buildings will perform better than similar buildings throughout the region in all environmental impact categories, including water management. For all new UTown@UBC residences, low-flow fixtures, efficient irrigation and ecologically sound planting are mandatory under REAP guidelines.

For all new institutional buildings on campus, new construction must achieve a minimum Leadership in Energy and Environmental Design (LEED®) Gold or equivalent rating. LEED points are awarded to projects that implement water efficiency measures.

EXISTING BUILDINGS - ECOTREK ENERGY AND WATER RETROFIT PROJECT

In 2001, UBC launched the ECOTrek project to upgrade and retrofit energy and water infrastructure in over 200 Core academic buildings. At that time, ECOTrek was the largest energy and water retrofit project ever to have taken place on a Canadian campus. With respect to water, the focus of ECOTrek was to repair leaks and install low-flow fixtures in Core academic buildings. Total water consumption at UBC has decreased by 20% between 2000 and 2007, despite an increase in floor space and population. The following graph shows overall water consumption at UBC since 2000.

Total Water Consumption at UBC



WATER MANAGEMENT INNOVATION

State-of-the-art academic buildings at UBC demonstrate water management innovations. The C.K. Choi Building, completed in 1996, is not connected to the sewer system. Instead, composting toilets are used to save potable water and provide nutrients for landscaping. Water from hand sinks and liquid from the compost system are pumped into a landscaped trench along the front of the building, and processed by a plant-based greywater recycling system.

UBC also seeks new ways to harvest rainwater, reuse water and work more closely with natural systems. At Wesbrook Place, a UTown@UBC neighbourhood in the South Campus area, sustainable land use strategies include stormwater flood control techniques such as rainwater retention, green roofs, rain gardens and sediment control to improve water quality. Rather than whisking stormwater away through underground storm sewers, surface water is captured in attractive pools to provide irrigation for landscaped areas. Landscape features at Michael Smith Park demonstrate how stormwater run-off is treated in Wesbrook Place as a resource to be managed, rather than wasted.

CENTRE FOR INTERACTIVE RESEARCH ON SUSTAINABILITY (CIRS)

The Centre for Interactive Research on Sustainability (CIRS) building, scheduled to open in the fall 2011, will be water self-sufficient, harvesting rainwater and purifying it to meet 100% of its potable water needs. Wastewater will be treated to tertiary treatment quality and recycled to flush toilets and for irrigation purposes. Stormwater runoff will also be redirected into the local aquifer, making CIRS water net positive. A schematic of system flows at CIRS is provided in Attachment 1.

3. Best Practices

A review of water management best practices at other municipalities and institutions provides lessons for consideration in developing UBC's Water Action Plan.

Australian universities boast some of the lowest water consumption rates of post-secondary institutions. On average, Australian universities consume less than 1 m^3 of water per m^2 floor area (m^3/m^2). In comparison, UBC consumes approximately 3 m^3/m^2.

There are also many best practices close to home. As part of their Greenest City initiative, the ***City of Vancouver*** has recognized the need to increase conservation and efficiency, reduce pollution and raise the price of municipal water. To this end, Vancouver has adopted BC's Living

Water Smart target of using water 33% more efficiently by 2020. They have also begun to develop a Water Conservation and Stewardship Strategy, which would include the following key elements:

- Universal water metering and volume-based pricing;
- Strengthening water efficiency requirements in the Vancouver Building Code including purple pipes (a second set of plumbing that uses rainwater and recycles water from dishes, washing and showers) in all new buildings;
- Rebates for the purchase of water-efficient fixtures;
- Increased social marketing and public education;
- Greater use of rainwater;
- Water efficiency audits, including a proactive leak detection program; and
- Increased enforcement of water conservation bylaws, including sprinkler restrictions.

At ***UBC's Okanagan campus***, smart irrigation control systems measure ground moisture content, calculate wind direction and speed, and monitor the weather forecast. As a result, the systems are used only when conditions require it.

4. Opportunities

At the Vancouver campus, there are opportunities to consume water more efficiently, harvest rainwater and use technologies to reuse and recycle water. There is also potential to work with natural systems, such as the aquifer below the campus, to store and exchange clean water. Furthermore, there are opportunities to build on UBC's current water-related research.

UBC's high ***base flow*** means that water is consumed 24 hours a day. There are opportunities to reduce or improve processes, such as equipment cooling and research processes, which use water on a constant basis.

Since drinking water is used for ***irrigation*** on campus, opportunities exist to reduce potable water consumption by considering other water sources for irrigation (e.g. rainwater, groundwater).

Potable water conservation can result in ***cost savings*** to the university community by reducing the amount of water purchased from Metro Vancouver. Infrastructure upgrades can also be deferred or avoided through conservation. A recent study estimated that nearly 50%, or $2.6 million, of water and sewer pipe upgrades could be avoided by reducing water consumption at UBC by 25%.

5. Discussion Topics

As UBC develops its Water Action Plan, there are many areas of potential discussion.

1. What is UBC's vision for water?
2. What lessons can be learned from CIRS?
3. What are the costs of not conserving water?
4. Are there opportunities to further reduce water consumption on campus through retrofits and upgrades to infrastructure?
5. How can UBC reduce its high base flow (i.e. water consumed 24 hours per day for process cooling, research, etc.)?
6. How can UBC reduce its reliance on potable water for irrigation?

These are just some of the questions that need to be explored and answered as UBC develops a Water Action Plan to keep at the forefront of best practices in sustainability. Join the discussion and get involved! For more information, please visit www.sustain.ubc.ca/campus-water.

Attachment 1: Schematic Diagram of Proposed System Flows at CIRS