Athletic Facilities: Water Sustainability Leadership

Roxanne Nesbitt

University of British Columbia

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Athletic Facilities: Water Sustainability Leadership

Roxanne Nesbitt, MArch Candidate

Working in collaboration with

Kavie Toor, Athletics and Recreation,

Dan Cooper, Athletics and Recreation,

Bud Fraser, Water and Zero Waste Engineer,

Liska Richer, SEEDS

Preface

This report is one of fifteen research projects completed for the 2014 UBC Sustainability Scholars program. It was preparded in collaboration with UBC Social, Ecological, Economic, Development Studies (SEEDS) and the Athletics and Recreation Department. Daniel Cooper, Facility Manager UBC Athletics, Liska Richer, SEEDS and Bud Fraser, UBC Water and Zero Waste Engineer, acted as mentors throughout the project. I also consulted frequently with Bradley Thomas, Thunderbird Stadium Facility Manager and Erin Kastner, UBC Utilities Geospatial Information Manager.

Thank you to everyone who has provided support in the compilation of this report.

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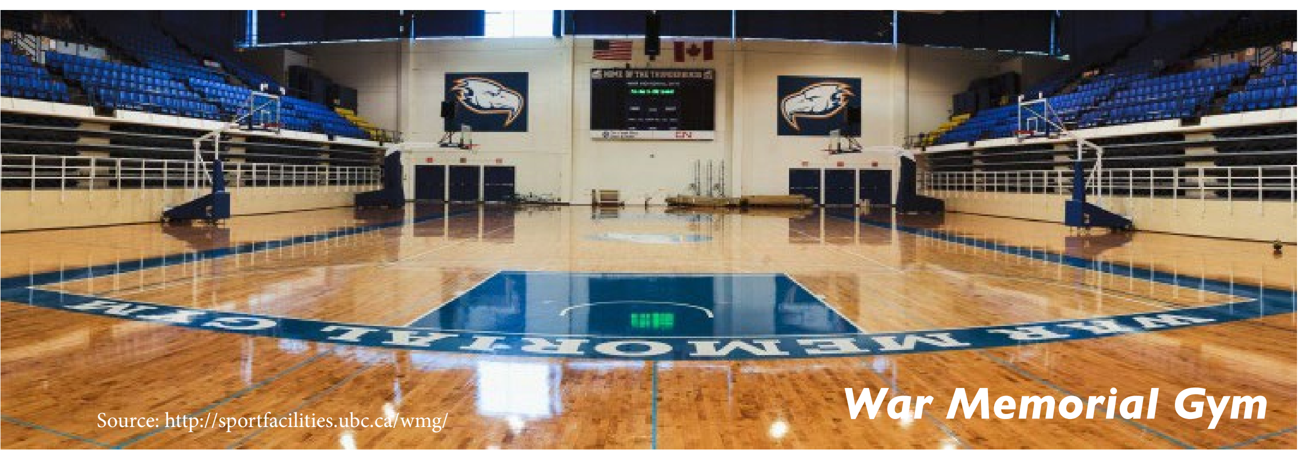
Source: http://sportfacilities.ubc.ca/src/

Source: http://www.centaurproducts.com/artificial-turf-track/artificial-turf-project-gallery



Source: http://sportfacilities.ubc.ca/wmg/

During 2013, a detailed water use profile and report titled *Athletics Ability To Conserve: Investigating A University Athletic Facility's Water Consumption*, was produced for the UBC athletics department by student intern Jennifer Bruce. This report included a water-use break down and suggested retrofits for the Student Recreation Centre, Thunderbird Stadium, and the War Memorial Gym.

In the Student Recreation Centre and Thunderbird Stadium several of the retrofit recommendations were realized. The following pages examine the cost benefits and water savings of the upgrades that were made and highlight changes that could drastically reduce water consumption in these facilities.

Summary Of Successful Retrofits And Target Areas

Facility	Toilets	Urinals	Sinks	Showers	Washing Machine
Thunderbird Stadium	18.9 litres/ flush	motion sensor installed in main Men's Washroom	aerators installed	30 showers-11.4 l/m 11showers-13.2 l/m	35lb (235L/load) 50lb (278L/load)
War Memorial Gym	13.2 litres/ flush	3.8 litres/ flush	8.3 litres/ min	21 showers-11.4 l/m 3 showers-13.2 l/m	GE Hydro Wave (170-150 L/load)
Student Recreation Centre	13.2 litres/ flush	3.8 litres/ flush	aerators installed	showers upgraded to 9.5 litres/min from 11.4 litres/min	
WaterSense Standards for Plumbing Fixtures	4.8 litres/ flush	1.9 litres/ flush	5.7 litres/ min	7.6 litres/ min	

Figure 1. Summary of Recent Upgrades and Target Areas

ATHLETICS ABILITY TO CONSERVE: Report Evaluation

Summary Of Successful Retrofits And Target Areas

Facility	Toilets	Urinals	Sinks	Showers
Student Recreation Centre	13.2 litres/ flush	3.8 litres/ flush	aerators installed	showers upgraded to 9.5 litres/min
WaterSense Standards for Plumbing Fixtures	4.8 litres/ flush	1.9 litres/ flush	5.7 litres/ min	7.6 litres/ min

Figure 2. Recent Upgrades and Target Areas for the Student Recreation Centre

Several water-conserving retrofits were recommended for the Student Recreation Centre. The suggested upgrades included sink faucet aerators, low flow shower heads, low flow urinals and low flow toilets. Faucet aerators were installed in the facility sinks and the shower heads were changed from 11.4 litres per minute to 9.5 litres per minute.

The effect of the aerators and low flow shower heads appear to be evident in the water consumption reports for the facility. The shower heads were upgraded for the beginning of September 2013. Figure 3 shows the water consumption for the facility in litres from September 2011- May 2014. When comparing the seasonal fluctuations in water demand, 1043985.5 litres were consumed in September 2012, compared to 794995.5 litres used in September 2013 following the installation of the low flow shower heads and faucet aerators. This resulted in a savings of approximately 248990 litres of water and a 24% reduction in water use from the previous year.

ATHLETICS ABILITY TO CONSERVE: Report Evaluation

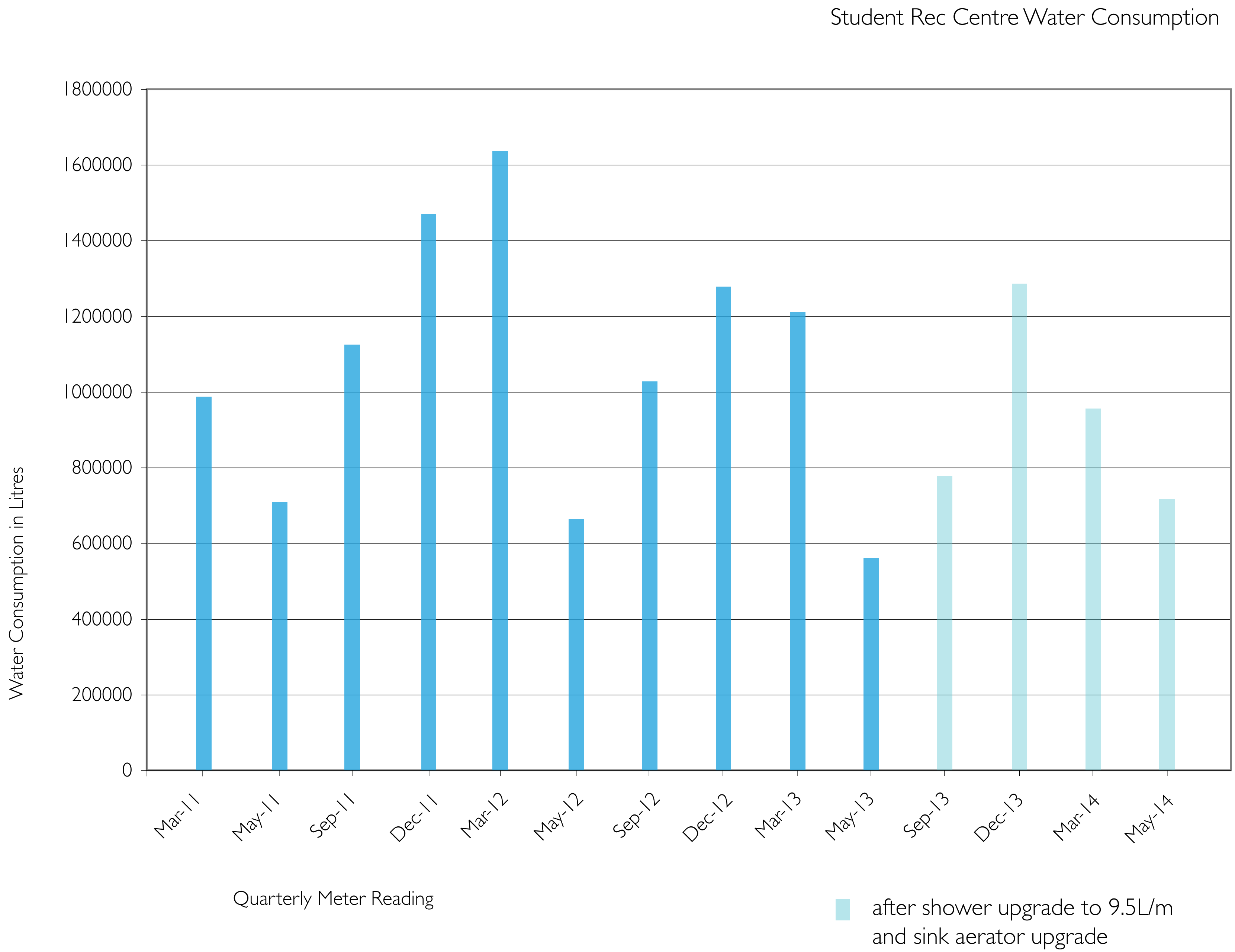


Figure 3. Water Consumption Student Recreation Centre 2011-2014 (Compiled using water meter data from UBC Utilities).

Student Recreation Centre Water Use

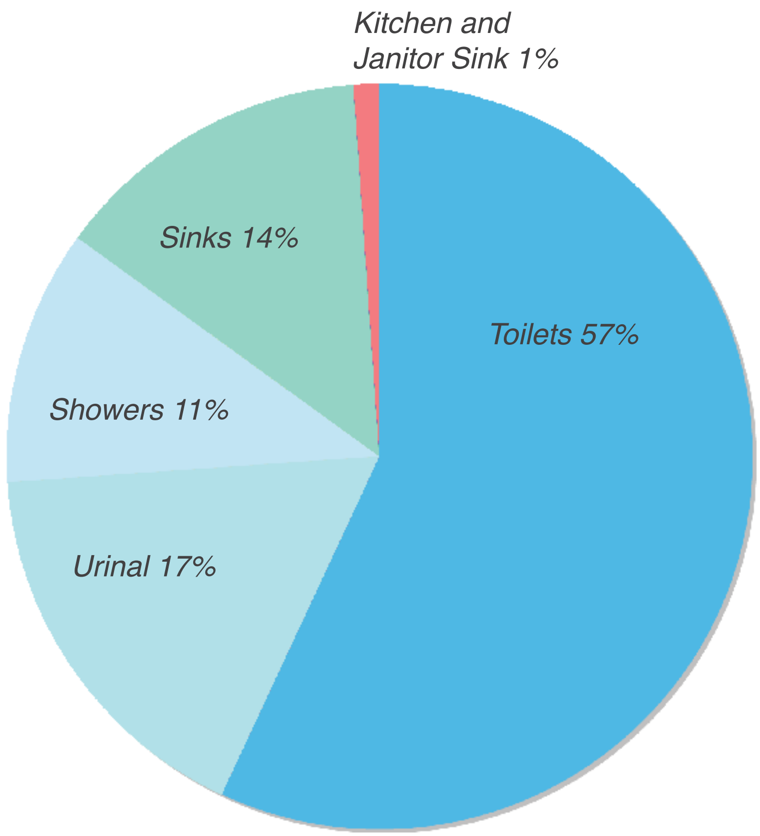


Figure 4. Water Use Student Recreation Centre Constructed using data from Bruce, Jennifer. *Athletics Ability To Conserve: Investigating A University Athletic Facility's Water Consumption.*

For the full 2013 academic term water consumption was reduced by approximately 10%. The retrofit had less of a financial benefit than Bruce estimated, likely because she used a 7.6 Lpm shower in her calculations and a 9.5 Lpm shower head was installed. A 10% reduction in water metered also reduces the quantity of waste water exiting the building. Athletics is billed approximately 90% of the cost of incoming water for waste water. Including the reduction in waste water charges, the department has saved approximate $858 since the implementation of the upgrades. It is worth noting that non-peak cost of water has increased by 58% from 2012 to 2014, which will continue to amplify the effect of these upgrades.

The implemented water saving upgrades have saved water, electricity, and money for the Student Recreation Centre. Continuing with retrofits could save the facility even more water and money in the long-term. The toilets and urinals have not been upgraded and present an opportunity for additional water savings. The facility was constructed in 1995 and will likely continue to serve the student body for another twenty years. The continued high use of the facility make further upgrades to the urinals and toilets financially and environmentally logical.

According to *Athletics Ability to Conserve*, toilets have the highest water consumption, using 57% of the facility's total (25). The current toilets use approximately 13.2 litres per flush, almost 3 times the WaterSense standard of 4.8 litres per flush. In *Athletics Ability to Conserve*, Bruce estimated that upgrading the toilets to a low flow alternative could save the athletics department $3,377 and 3.7 million litres of water annually (33). The urinals in the facility use 3.8 litres per flush, twice the volume of the WaterSense high-efficiency alternative, which uses 1.9 litres per flush.

ATHLETICS ABILITY TO CONSERVE: Report Evaluation

Summary Of Successful Retrofits And Target Areas

Facility	Toilets	Urinals	Sinks	Showers	Washing Machine
War Memorial Gym	13.2 litres/ flush	3.8 litres/ flush	8.3 litres/ min	21 showers-11.4 l/m 3 showers-13.2 l/m	GE Hydro Wave
WaterSense Standards for Plumbing Fixtures	4.8 litres/ flush	1.9 litres/ flush	5.7 litres/ min	7.6 litres/ min	

Figure 5. Recent Upgrades and Target Areas for the War Memorial Gym

Athletics Ability to Conserve contains several recommendations for retrofits to the War Memorial Gym. These upgrades include low flow toilets, urinals, shower heads and high efficiency sink faucet aerators. The easiest most effective upgrades were identified as installing low flow shower heads and sink faucet aerators. It was estimated that approximately 422,148 litres of water and $1 212 could be saved annually by switching to a shower head with a flow rate of 7.6 Lpm or less (Bruce, 33). Installing faucet aerators, produces very little disturbance for users, has low capital costs and features fast installation. It was estimated that faucet aerators could save the department up to 299,251 litres and $262.72 annually (34).

None of the water conservation recommendations made by Jennifer Bruce have been realized in War Memorial Gym. When investigating potential upgrades to the facility, it was revealed that the facility manager was not aware of the *Athletics Ability to Conserve* report and had not read it. The need for a department wide strategy for sustainable water use that engages all levels of staff and students is discussed further in the *Best Practices Study* on page 30.

The upgrades to the toilets and urinals are less practical due to the age of the building and likelihood that it will be replaced in the near future. However, installing sink aerators and low flow shower heads should still be considered. As demonstrated with the Student Recreation Center, these upgrades can significantly reduce the amount of water consumed by the facility.

ATHLETICS ABILITY TO CONSERVE: Report Evaluation

Image Source: http://www.centaurproducts.com/artificial-turf-track/artificial-turf-project-gallery

Thunderbird Stadium

For Thunderbird Stadium the *Athletics Ability To Conserve* report suggested water saving upgrades to the sinks, showers, urinals and toilets. As a result of the report, a urinal tank controller was installed in the buildings main men's washroom. The tank controller flushes the urinals when motion is detected by the sensor. Previously the urinals were flushing constantly when the lights in the facility were on for approximately 8 hrs per day regardless of frequency of use. The original report estimated that the tank controllers would conserve 4.2 million litres of water annually saving the department $3,907 per year (Bruce, 30). This estimate was based on the assumption that the controllers would be installed in all four urinal locations. Currently, the tank controller has only been installed in one location.

Faucet aerators were also installed in several of the facilities washroom sinks. The aerators have reduced the flow rate of the sinks in the women's main washroom from 7.6 Lpm to 4.8 Lpm. Aerators were also installed in the Visiting Team Locker Room and the Soccer Locker Room. The flow rates of these sinks have been reduced from 9.5 Lpm to approximately 4.8 Lpm. The *Athletics Ability To Conserve* report estimated that the Thunderbird stadium could save 262,000 litres of water and $240 annually (Bruce, 31).

ATHLETICS ABILITY TO CONSERVE: Report Evaluation

Summary Of Successful Retrofits And Target Areas

Facility	Toilets	Urinals	Sinks	Showers	Washing Machine
Thunderbird Stadium	18.9 litres/ flush	motion sensor installed in main Men's Washroom	aerators installed	30 showers-11.4 l/m 11showers-13.2 l/m	35lb (235L/load) 50lb (278L/load)
WaterSense Standards for Plumbing Fixtures	4.8 litres/ flush	1.9 litres/ flush	5.7 litres/ min	7.6 litres/ min	

Figure 6. Recent Upgrades and Target Areas for the Thunderbird Stadium

In *Athletics Ability to Conserve*, the installation of low flow toilets in the washroom facilities and low flow shower heads in the locker room facilities, were also recommend. These water saving retrofits have not been implemented. According to *Athletics Ability to Conserve*, the installation of low flow toilets could save 3.4 million litres of water annually resulting in a financial savings of $3,079 per year. The report highlighted higher capital costs a for toilet purchase and installation or approximately $7000 and a payback period that is longer than the other retrofits of 2.27 years (31).

The current washroom fixtures utilize 18.9 litres of water per flush, almost 4 times the volume of a low flow high efficiency fixture, which uses 4.8 litres per flush. In discussion with the facility manager, it seemed that this option was forgotten rather than being dismissed and should be re-explored. Since there is no continuous facility position, or campaign pushing sustainable strategies forward, it seems that it may be easy for facility managers who are busy, to prioritize other facility operations over water saving upgrades. The need for a cohesive athletics department sustainability strategy is further discussed on page 30 of the *Best Practices Study*.

ATHLETICS ABILITY TO CONSERVE: Reconsidering Thunderbird

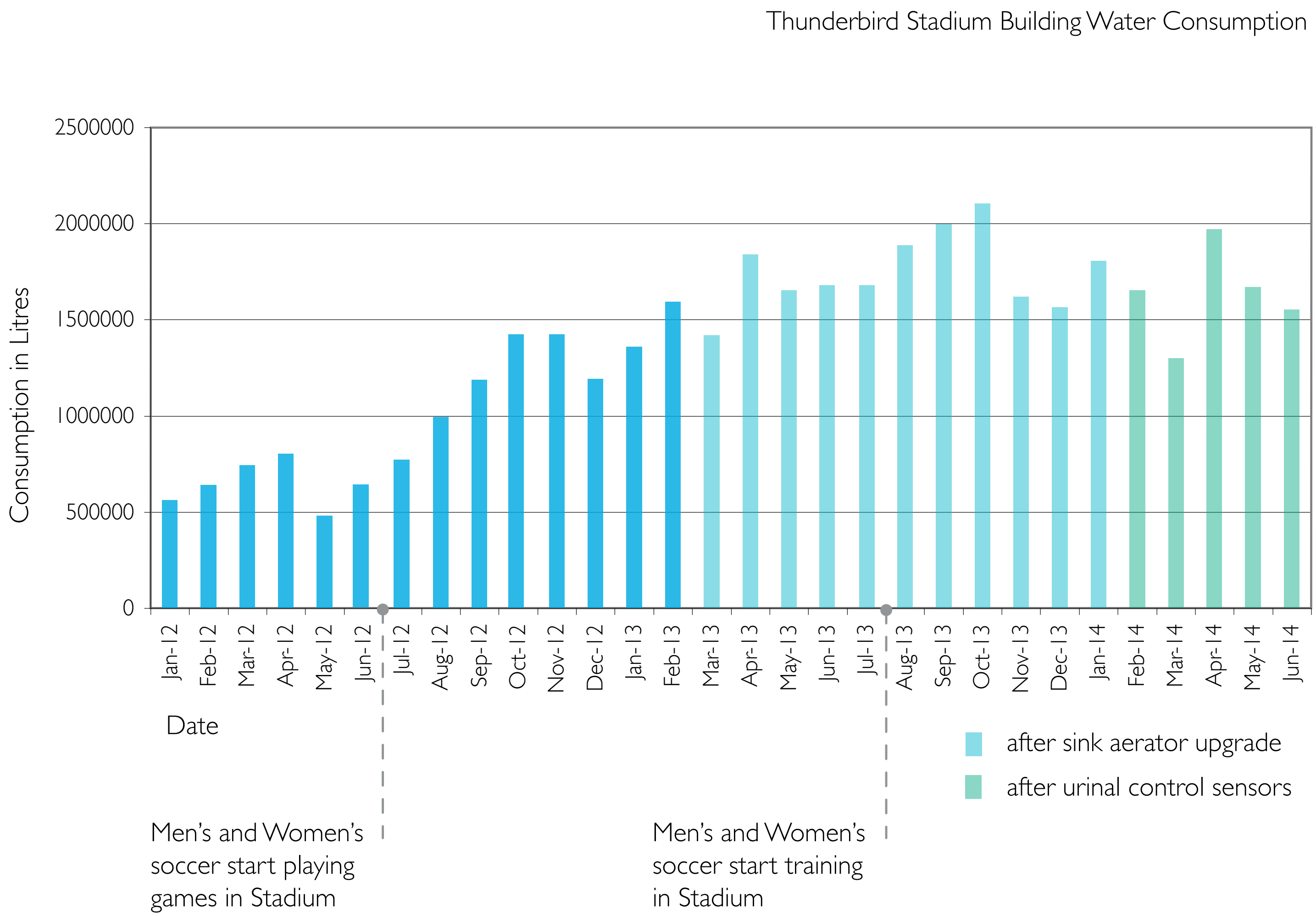


Figure 7. Water Consumption Thunderbird Stadium 2012-2014

The adjacent bar chart shows the water consumption of the building without the irrigation water use for January 2012 to June 2014. This chart was made from meter readings collected from UBC utilities. These readings indicate that the water consumption of the building has increased significantly from the 2012 athletic season to the present.

The rise in water consumption following upgrades that should have reduced it resulted in the need to re-examine water use in the Stadium.

Increased building usage can partially explain the rise in water consumption. The men's and women's soccer teams began having games in Thunderbird stadium during the summer of 2012 and started training in the facility during the summer of 2013. The soccer team's primarily use the washroom facilities, ice bath and washing machine. No members of the Women's Soccer team use the shower facilities. Approximately 33% of the Men's team shower after games and practice.

ATHLETICS ABILITY TO CONSERVE: Reconsidering Thunderbird

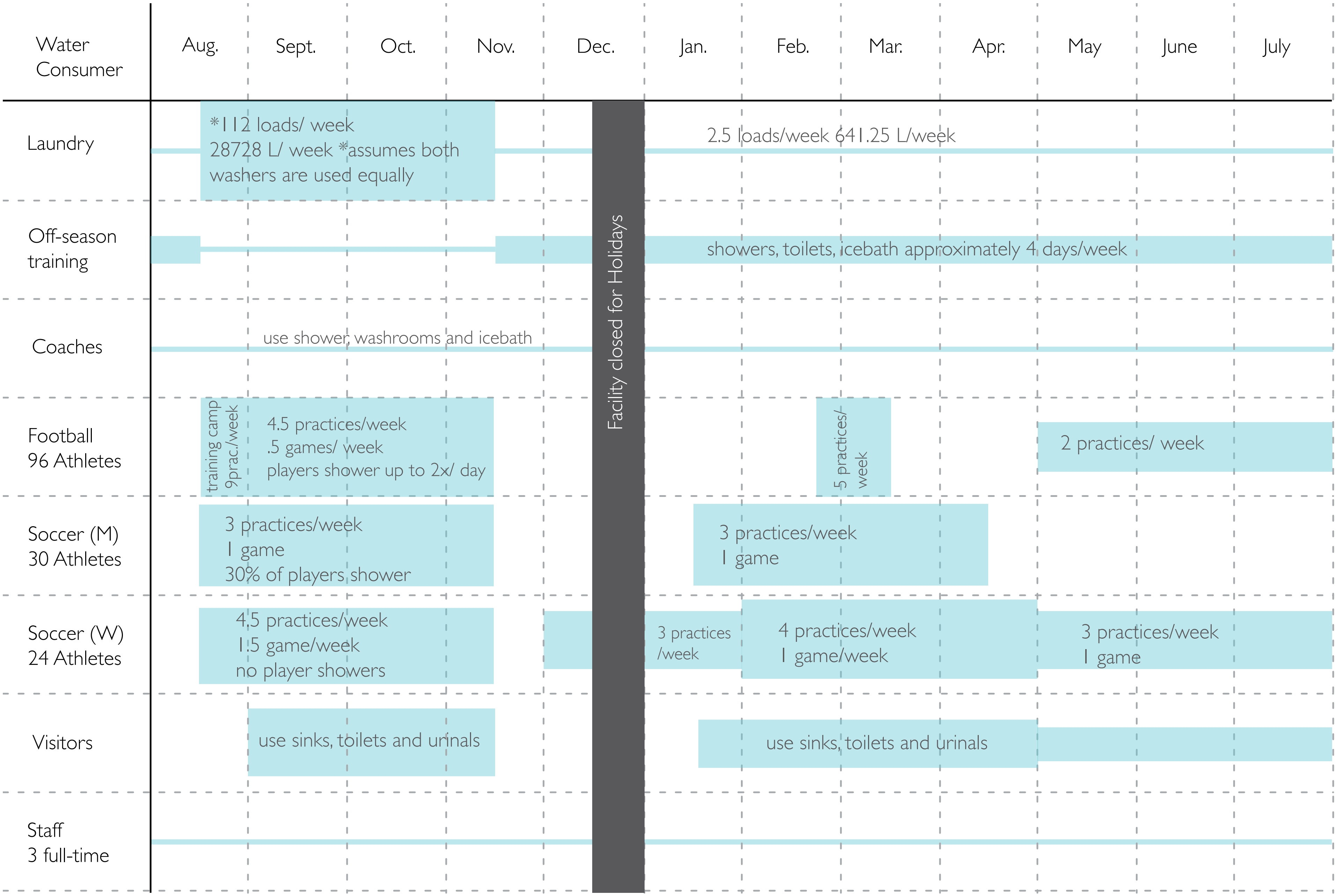


Figure 8. Thunderbird Occupation Schedule

ATHLETICS ABILITY TO CONSERVE: Reconsidering Thunderbird

Thunderbird Fixtures and Flow Rates

Area	Toilets	Urinals	Sinks	Showers	Washing Machine	Ice Bath
Men's Washroom	3 (18 Lpf)	4 (3.8 Lpf)	8 (2 Lpm)			
Women's Washroom	5 (18 Lpf)		8 (4.8 Lpm)			
Football Locker Room	3 (18 Lpf)	3 (3.8 Lpf)	4 (8.3 Lpm)	18 (11.4 Lpm)	* 35lb (235L/load) 50lb (278L/load)	(344L/use) (517L/use)
Soccer Locker Room	2 (18 Lpf)	3 (3.8 Lpf)	3 (5 Lpm)	11 (13.3 Lpm)		
Visitor Locker Room	2 (18 Lpf)	3 (3.8 Lpf)	3 (4.2 Lpm)	11 (11.4 Lpm)		
Referee Locker Room	1 (18 Lpf)		1 (9.5 Lpm)	1 (11.4 Lpm)		

* Based on estimates from "Assesment of Water Savings for Commercial Clothes Washers." (2006) produced by Water Management, Inc. Western Policy Research Koeller and Company

Figure 9. Thunderbird Fixtures and Flow Rates

ATHLETICS ABILITY TO CONSERVE: Reconsidering Thunderbird

Figure 10. Annual Building Water Consumption with Facility Schedule
August 2012- July 2013

According to Facility Manager, Bradley Thomas, the use of the building is increasing as players are now training in the facility during the off-season. The presence of football and soccer athletes during the off-season results in an increased use of laundry, showers, toilets and the ice bath. The facility also began doing laundry for the men's and women's soccer teams in 2013.

During a survey of the facility, the equipment manager noted that in the past year coaches started using the shower facilities and that some student athletes shower twice per day during training, which was not common in previous years.

Figure 10 shows the building water consumption in litres above the facility schedule for the 2012-2013 athletic season beginning in August 2012. The water meter readings taken by UBC Utilities are typically read in the middle of the month, therefore the consumption of the month will lag behind the activity of the month. For example the recorded water consumption for the month of August measures from July 20th to August 20th.

The metered water consumption reflects the changes in occupancy for the first half of the athletic season. The water consumption in January should show half of the volume of December as this time interval should include the two week period when the facility is closed for holidays and has no occupancy.

ATHLETICS ABILITY TO CONSERVE: Reconsidering Thunderbird

Figure 11. Annual Building Water Consumption with Facility Schedule August 2013- July 2014

The water consumption and schedule for the 2013/ 2014 athletic season also reflect the schedule. The recorded water use in December and January are similary high considering the holiday break and small amount of scheduled activities. This may indicate that there is a significant leak in the facility or that the urinals are left on when there are no occupants in the facility.

Although time constraints and scheduling did not allow for this investigation, it is highly recommended that the department test Thunderbird Stadium for leaks over the two week holiday period when there is no occupancy in the building. A leak test can be done by recording the high and low meter reading in the facility before the holiday and again after the facility re-opens before any activity has resumed. The building water consumption is calculated by subtracting the first high reading from the second high read and the first low reading from the second low reading and combining the difference (Kastner). Any change in the meter which records in cubic meters will confirm that there is a leak in the facility, or that a fixture has been left on.

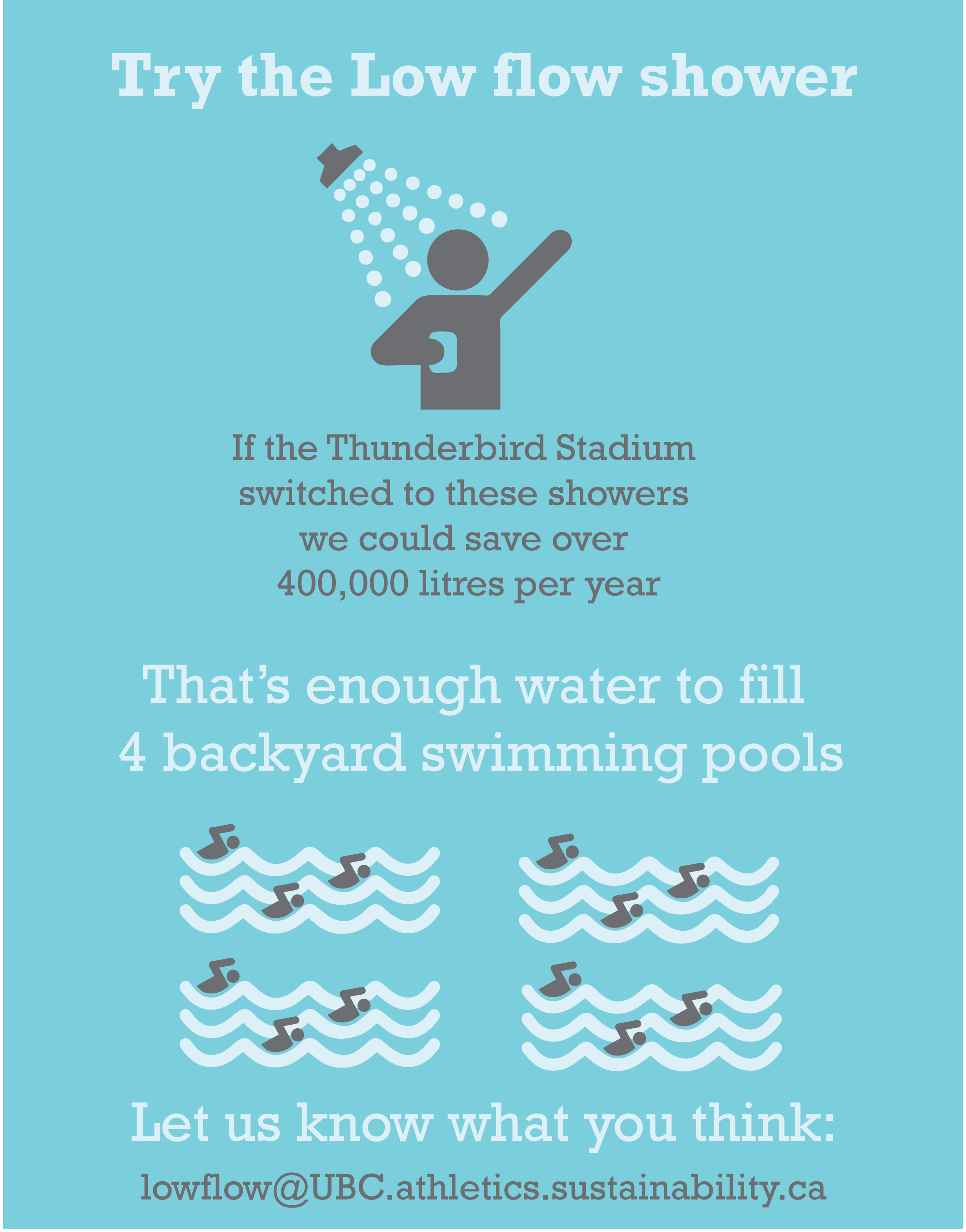
ATHLETICS ABILITY TO CONSERVE: Reconsidering Thunderbird

The lack of motion sensors on urinals could also be causing the high water consumption during periods of low occupancy. The urinals have three settings; they can be off, on (full flush every 5 minutes) regardless of occupancy and linked to the lights in the washroom meaning that the urinal flushes every 5 minutes when ever the lights in the washroom are on. Each urinal tank holds approximately 21 litres of water and the switches are accessible to users. If a urinal is left "on" it would waste 6048 litres in a 24 hour period. If all three urinals were left "on" from the time that the soccer and football teams stopped using the facility in mid-November until occupancy began again in mid -January they would waste over a million litres of water accounting for the high water consumption when the facility is unused.

If charged at the off-peak water rate, these urinals remaining on over the break in occupancy would cost the department approximately $1482.9 in water and $1334.78 in sewer fees, totaling over $2800.00 in completely unnecessary fees. This could be avoided by ensuring that staff switch the urinals "off" after the season has finished or installing motion sensors which would also ensure that the urinals are not flushing overnight or during the day when the space is unoccupied.

A motion sensor for each urinal station is the recommended option in this case. The current urinal switches can be accessed by students who may simply flick them to ensure that the urinals flush after use, without knowing what settings they are changing them to. It is currently the responsibilty of the coaches to make sure the urinals are switched "off" after facility use but according to the building manager this is rarely done. The motion sensor would result in the maximum water savings without relying on a behavior change from staff or students.

The savings of the upgrades may have also been offset by leaky fixtures in the facility. When I visited the Stadium on August 8th 2014 two toilets in the facility were constantly running. One of these toilets was also running when I first visited the facility on June 23rd 2014. The Environmental Protection Agency estimates that a constantly running toilet wastes approximately 72 800 litres of water annually (WaterSense). Using this estimate as a base point we can assume that two leaking toilets waste at least 145 600 litres of water annually. There is also a leaking hose in the facility storage room. Addressing plumbing problems will reduce water consumption for the building.



The recommended upgrade to low flow shower heads was also not implemented in the Thunderbird Stadium. According to the Facility Manager, Bradley Thomas, there is some concern over the quality of the low flow shower experience expressed by some student athletes.

This concern presents an interesting opportunity to engage students in sustainable water initiatives. The department could consider installing one low flow shower in each locker room with a poster describing the water savings associated with the shower and ask students for feed back. This could avoid costly installation of a product that does not deliver on the manufactures guarantees and create an opportunity to educate and engage students on water conservation. Hopefully students leave the building in support of a switch to a water saving shower and curious about the water consumption in their own homes.

Figure 12. Sample poster to accompany low flow show trial

Sustainable Athletics Water Use: Best Practices Study

Report Contents

Sustainable Athletics Water Use: Best Practices Study

Summary of Fixture Flow Rates

Organization	Toilets	Urinals	Bathroom Faucet	Showers
BC Plumbing Code 2012	6 litres/ flush	1.9 litres/ flush	8.3 litres/min	9.5 litres/min
LEED 2012 Standard *	4.8 litres/ flush	1.5 litres/ flush	6.6 litres/ min	7.6 litres/min
UBC Endorsed Standard	6 litres/ flush	1.9 litres/ flush	5.6 litres/ min	7.6 litres/min
WaterSense Standards for Plumbing Fixtures	4.8 litres/ flush	1.9 litres/ flush	5.7 litres/ min	7.6 litres/ min

*points awared for fixtures 20% more efficient than the baseline. In this case the baseline is considered the BC Plumbing Code

Figure 13. Summary of Relevant Fixture Flow Rates

The adjacent chart summarizes the maximum bathroom fixture flow rates for four organizations relevant to new construction and renovations on UBC campus. The Vancouver plumbing code has the highest water usage for fixtures compared to the UBC-endorsed and LEED standard for new construction. The organization WaterSense advocates for the highest level of conservation of the considered institutions. The WaterSense standard is set by the US Environmental Protection Agency and is commonly seen as a benchmark of water conservation. The WaterSense rating label is frequently seen on plumbing fixtures in both the Canadian and American market place.

Case Studies: Collegiate Sustainable Water-use Initiatives

Figure 14. Student Volunteers for Ralphie's Green Stampede
Source: http-_cuswimdive.com_images_Slideshow1.png

Figure 15. Ralphie's Green Stampede Logo
Source: ralphies-green-stampede-http-_silk.com_our-story_our-partners

Summary of Sustainable Activities:

-All new athletics facilities built to LEED standards

-Sports fields irrigated with non-potable water

-Fields fertilized with "compost tea"

-Soil moisture monitors used to reduce irrigation

-"Ralphie's Green Stampede" Zerowaste campaign

Several American collegiate departments have publicized efforts to create more sustainable athletics departments. The initiatives include, water conservation, and zero waste strategies, and LEED standard new construction and retrofits to existing facilities. The following case studies examine the sustainable water use campaigns and strategies employed by the University of Colorado and the University of Boston. The case studies also explore the elements of a successful sustainable athletics strategy with a focus on realizing projects through alternative funding sources.

University of Colorado Boulder Campus

The University of Colorado has a cohesive campus wide sustainable initiative, as well as several notable projects underway in the athletics department. The campus wide water conservation initiatives include retrofitting existing facilities with high efficiency, low flow fixtures and irrigating landscaping and sports fields with non-potable water.

University of Colorado –Boulder Campus

Figure 16. Anderson Ditch at the University of Colorado
source: http-_alumni.colorado.edu_wp-content_uploads_2011_06

Figure 17. Field fertilized with Compost Tea at the University of Colorado
Source: Ryan Heiland, http://www.cuoutdoorservices.blogspot.ca/search/label/Turfgrass

Irrigation

Approximately 95% of the University of Colorado irrigation needs are met using non-potable ditch water (Ryan Heiland, UC Facilities Management). The campus switched to the raw water irrigation system from potable irrigation in 1991. In an average year the University of Colorado uses 80,000,000 gallons of ditch water for irrigation. This system saves the university approximately $440,000 annually compared to the cost of using treated potable water (Blackheart).

Compost Tea Fertilizer

To fertilize the sports fields, compost tea is fed directly into the irrigation lines. Compost tea is a natural fertilizer made by steeping compost in water to transfer the nutrients of the compost to the irrigation water. According to David Newport, the director of the Campus Environmental Centre, the “fields have never looked better.”

University of Colorado –Boulder Campus

Figure 18. Inground Rain Sensor Utilized by the University of Colorado

Source: Soil monitors-http-_www.cuoutdoorservices.blogspot.ca_2012_10_turfgaurd-sensors.html.JPG

Figure 19. Sample Rain Sensor Reading

Source: Turfgaurd 1 http-_www.cuoutdoorservices.blogspot.ca_2012_10_turfgaurd-sensors.html.jpg

Rain Sensors

The athletics department also uses soil monitors to regulate the amount of water distributed to the sports fields. University of Colorado uses Turfguard soil monitors, which track moisture as well as temperature and salinity (Heiland, CU Outdoor Services).

University of Colorado –Boulder Campus

Figure 20. UC Boulder Poster for Recycling and Compost

Source: http://archive.constantcontact.com/fs143/1101127556183/archive/1112672309398.html

Several of the University of Colorado Athletics department's successful sustainable initiatives have resulted from collaborations with the campus Environmental Centre. Athletics has worked with the Environmental Centre on the sporting event, zero waste campaign "Ralphie's Green Stampede," since 2008. This ambitious on-going campaign attempts to create a zero waste stadium by providing ample recycling and composting stations around the stadium and switching all of the concession packaging to compostable and recyclable food ware. The "Green Stampede" is run by students employed through the Environmental Centre as well as student volunteers.

The campaign is financed through sponsorship deals with local and international businesses. The main sponsors include White Wave Foods and BASF the chemical company. Although "Ralphie's Green Stampede" does not have a water conservation agenda, the project successfully engages students, reduces and diverts landfill waste, and fosters collaboration between the athletics department and the Environmental Centre. The Centre had a large role in the acquisition of sponsors who make the project possible. Perhaps UBC could consider acquiring sponsors to fund a non-potable irrigation project or to supply facilities with upgraded compost, recycling stations.

University of Colorado – Boulder Campus

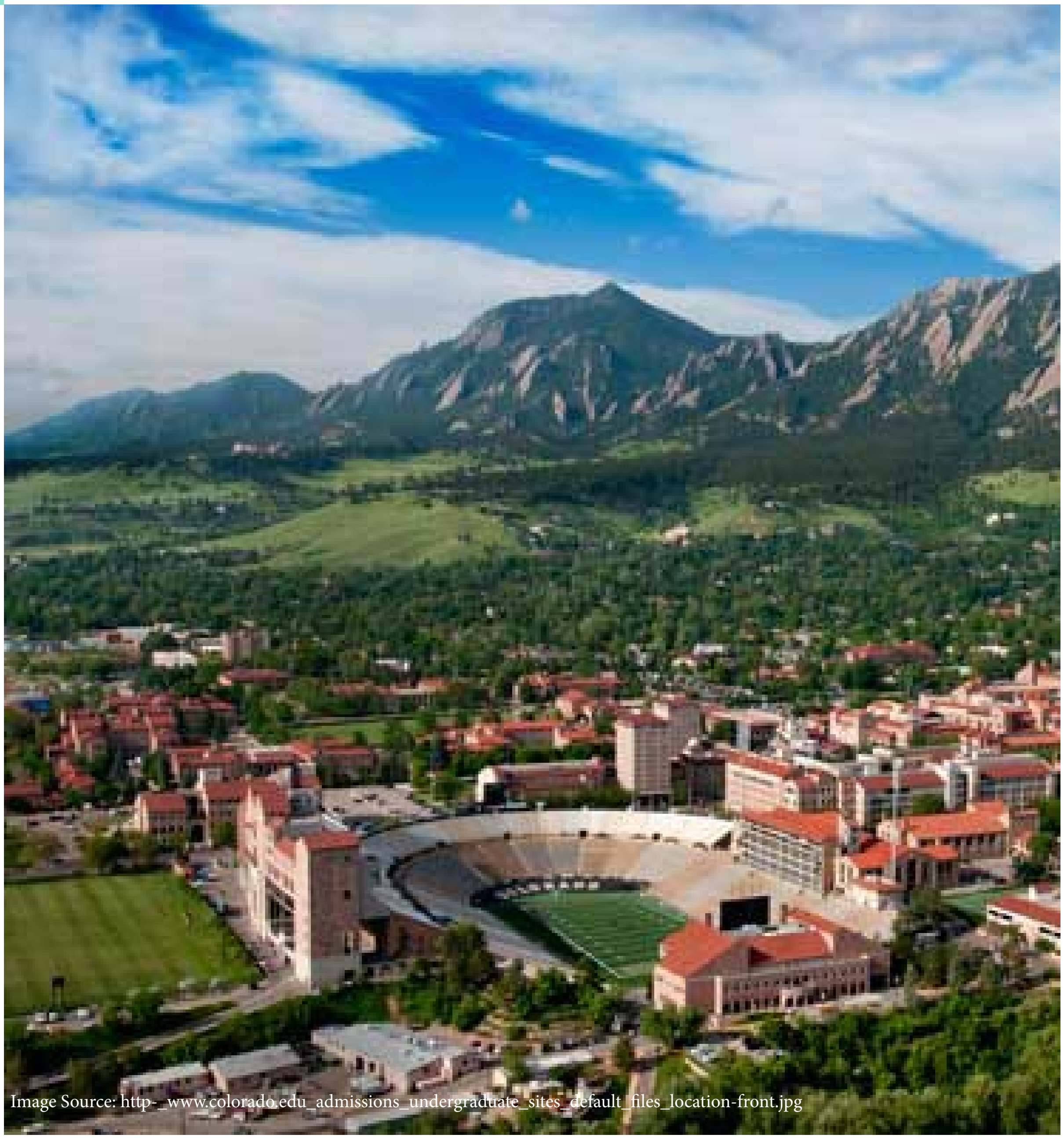


Figure 21. University of Colorado Boulder Campus

The success of Ralphie's Green Stampede has resulted in additional sustainable sports initiatives at the University of Colorado. The zero waste campaign was recently expanded to include the campus basket ball arena (Henly).

In an interview with David Newport, director of the Campus Environmental Centre, he discussed the importance of finding a "cultural compatibility" between environmentalists and athletes. Finding common ground between seemingly dichotomous groups is important when getting effective sustainable campaigns off the ground.

"Our goal is to use our 'zero waste' efforts and Sustainable Game-days brand platform to inspire fans to take bigger sustainability steps in their own lives. We recognize that sports is a uniquely powerful messenger for promoting sustainability..."

-David Newport, director of the University of Colorado Environmental Centre. Qtd in Henly, Alice. CU-Boulder basketball Launches "Sustainable Gamedays" (2014) Web. 16 August 2014.

University of Boston

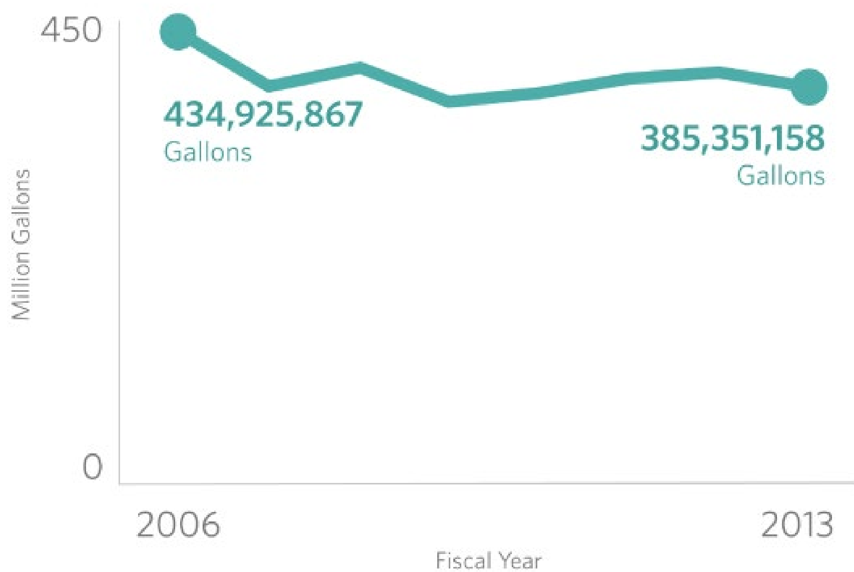


Figure 22. Water Usage University of Boston

Source: http://www.bu.edu/sustainability/what-were-doing/water/

Summary of Sustainable Water Initiatives:

-Piloting extreme low flow toilets and urinals

-Rain water harvesting for sports field irrigation

-Rain sensors installed on 140 irrigation systems

-Self-charging, hands-free sink faucets

The University of Boston has embarked on several campaigns to reduce their water consumption and create a more sustainable athletics department. These include rainwater harvesting for irrigation, the use of rain sensors on all irrigation systems and upgrades to washroom and locker room water fixtures. The University proudly advertises an 11% reduction in water consumption from the 2006 levels, along side a 14% increase in enrollment (What We're Doing: Water).

Low Flow Fixtures

The University of Boston is piloting extreme low flow fixtures, setting a new industry standard. The University has installed 5.6 Lpf/ 3Lpf dual flush toilets, compared to the 4.8 Lpf Water-Sense Standard. The campus is also using 0.9 Lpf urinals, using a litre less than the 1.9 Lpf Water Sense Standard (13, Sustainability Report 2013). As a University they are doing more than following the most efficient standards, they are setting them.

University of Boston

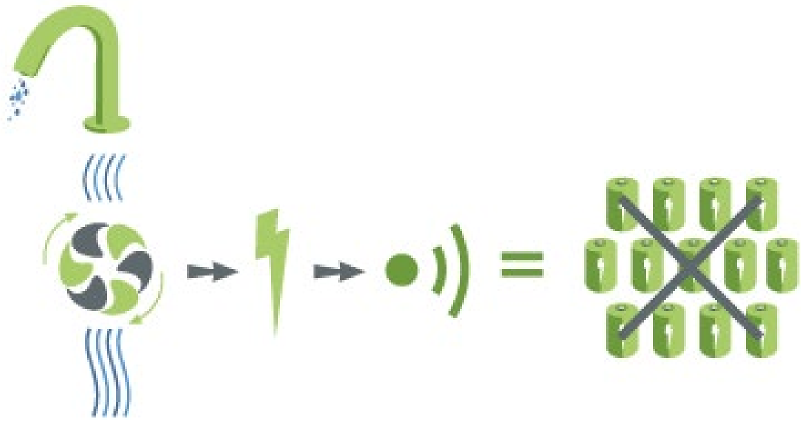


Figure 23. Self Charging Sink by EcoPower

Source: http://www.bu.edu/sustainability/what-were-doing/water/self-charging-hands-free/

Figure 24. 15,000 gallon tank being installed at the New Balance Field on The University of Boston Campus.

Self-Charging Sinks

This innovative new technology utilizes a small internal turbine that turns, charging when water runs through it. These fixtures designed by Eco-Power, are another example of U Boston piloting a sustainable new innovation.

Rainwater / Sports Field Irrigation

The University of Boston athletics department recently installed a 15,000 gallon (56781.2 Litre) rain water storage tank that is used to irrigate the new balance field hockey turf (Rainwater Harvesting at New Balance Field). The under ground cistern is expected to supply 80% of the grounds irrigation needs. The water storage tank also captures water used to wet the field hockey turf before practice and games. The area irrigated by the reclaimed water also use drip irrigation reducing the water loss to evaporation.

Innovative Financing Ideas for Sustainable Initiatives

Figure 25. Solar Canopy at the Softball Stadium at Arizona State University
Source: https-_asunews.asu.edu_files_0225-farrington-18-west_looking_east.jpg

The following projects are not directly related to water conservation but rather present an example of a University funding a sustainable initiative in a unique way. Considering alternative methods of funding allowed these schools to realize projects outside of the typical athletics department budget.

Arizona State University powers almost half of their operations using solar arrays. The athletics department employed a unique fee structure in order to finance the use of solar panels without investing a large amount of initial capital. The solar panels are managed by the university's solar team, who operate with in the university's facilities Development and Management department. The Solar Team contracted half of the panels from solar developers and the University owns the other half. (Henly, 45) The panel installation and maintenance also benefit from federal and state incentives, which further reduces any financial burden from the University (46).

Although UBC's Athletics department is not currently considering solar power on any facilities, the fee structure employed by Arizona State University could suggest an innovative way of financing sustainable initiatives without a high upfront cost. Perhaps cisterns for rainwater capture could be purchased by another department at UBC or sponsored by a private company.

University of Arizona also employs an innovative financing structure to fund sustainable projects. The University charges all enrolled students a $24 "Green Fund," which is used by a 10 student team to fund sustainable campaigns including greener sports events and research projects (59).

The New Zero Waste Standard

Figure 26. Zero Waste Campaign at the John Paul Jones Arena at the University of Virginia
Source: http-_news.virginia.edu_sites_default_files_zero_waste.jpg

Of the 10 Universities recognized for sustainability initiatives in the “Collegiate Gamchangers,” report released by the National Resource Defense Council, 8 had active zero waste event and stadium campaigns. Although there are costs associated with purchasing recycling and compost stations, the high visibility of this type of campaign creates a sponsorship opportunity that can generate income. The University of Colorado Athletics department in collaboration with the University Environmental Centre turned “Ralpie’s Green Stampede,” into a revenue generating event securing over $100,000 of annual sponsorship.

A waste diversion program would greatly benefit UBC Athletics. A Zero waste campaign would align athletics with the sustainability mandate of UBC and several progressive North American colleges and Universities.

Sustainable Athletics Water Use: Best Practices Study

Conclusion: Elements of a Sustainable Athletics Campaign

In order to implement a successful sustainable athletics campaign, the Universities studied employed a variety of tactics and resources. The most successful programs engaged the student body, sports fans, and university employees. These campaigns like University of Colorado's "Ralphie's Green Stampede" have a strong visual presence which allows them to secure sponsorship and create a dialogue about sustainable practice among participants.

To create a sustainable department, UBC requires a sustainability campaign that included students, athletes, sports fans and staff. Engaging all stakeholders starts a conversation about sustainability and meaningful change rather than simply plumbing upgrades or recycling stations. All participants need to contribute to prevent counter productive backlash from students or staff.

The athletics department has a lot to gain from interaction with other departments and campus resources. Continuing to work with SEEDS student researchers and the University Sustainability Initiative could help the athletics department achieve their sustainability goals. Having student interns investigate energy, waste or water consumption is an affordable way to make gradual sustainable upgrades. The energy and water saving upgrades resulting from student research should be publicized to encourage further student involvement.

The Athletics department should make their willingness to collaborate and interest in sustainability known to the campus. Perhaps the department could engage an Environmental Design class or engineering students to further explore energy retrofits for department facilities or reclaimed water re-use.

Hiring a full or part-time Athletics staff member to pursue sustainable oppurtunities and collaborations could also help the department to make a cohesive environmental campaign. Alternatively, the department could assign sustainability tasks to facility managers or develope a long term collaboration with the Campus Sustainability Initiave or the UBC Social, Ecological, Economic, Development Studies (SEEDS).

Elements of a Sustainable Athletics Campaign:

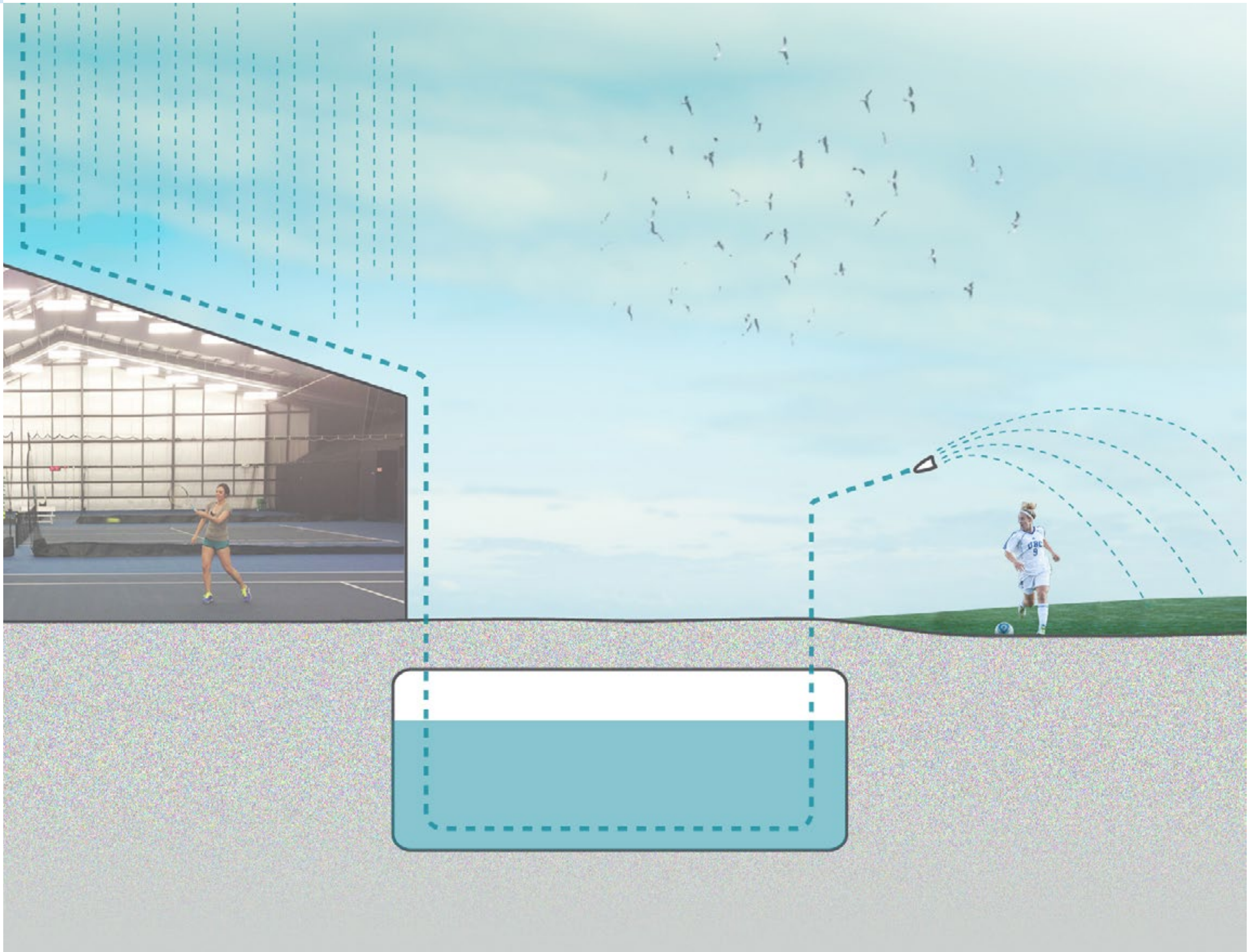
1) Engage all participants (students, athletes, staff sports fans)

2) Utilize all campus resources and potential interdepartmental collaboration

3) Capitalize on sponsorship to realize costly upgrades

4) Publicize successful upgrades and changes

Sports Field Irrigation Investigation



The following investigation explores the feasibility of utilizing storm water and excess irrigation recapture to reduce the amount of potable water used for irrigation. The cost of a reclaimed water system is a major barrier in the implementation and was therefore considered as the deciding factor in the feasibility of a new system.

Figure 27. Imaging Water Reuse in UBC Athletics

Considering Wright Field

Figure 28. Map of Thunderbird Park

Image Source: http://maps.ubc.ca/PROD/index.php

Harold Wright field is used primarily for field hockey. Artificial turf surfaces used for hockey must be irrigated to prevent injuries and regulate ball behavior. According to Athletics managerial staff, the turf surface has the highest water consumption of all of the fields in Thunderbird park.

The field is irrigated by water canons that shoot 100 gallons per minute for a 6 or 12 minute cycle. This wetting occurs between 5 and 10 times per day, 7 days per week during the summer. The field is also irrigated during the winter with less frequency. Using the assumption that Vancouver receives at least 197 days of sun, along with an average field usage, it can be estimated that Wright Field consumes approximately 1 430 550 gallons or 5415 cubic meters of water annually (Vancouver Weather Stats).

Much of the water used to wet the field before play simply runs through the field surface into the storm drainage bellow. The research that follows explores the feasibility of capturing and reusing this water.

Two properties adjacent to Wright Field are scheduled for renovations within the next two years creating an opportunity to construct an underground storm water and irrigation runoff storage system.

Harold Wright Field

Fields being renovated in 2015

Longwood University Storm Water / Irrigation Collection Chambers

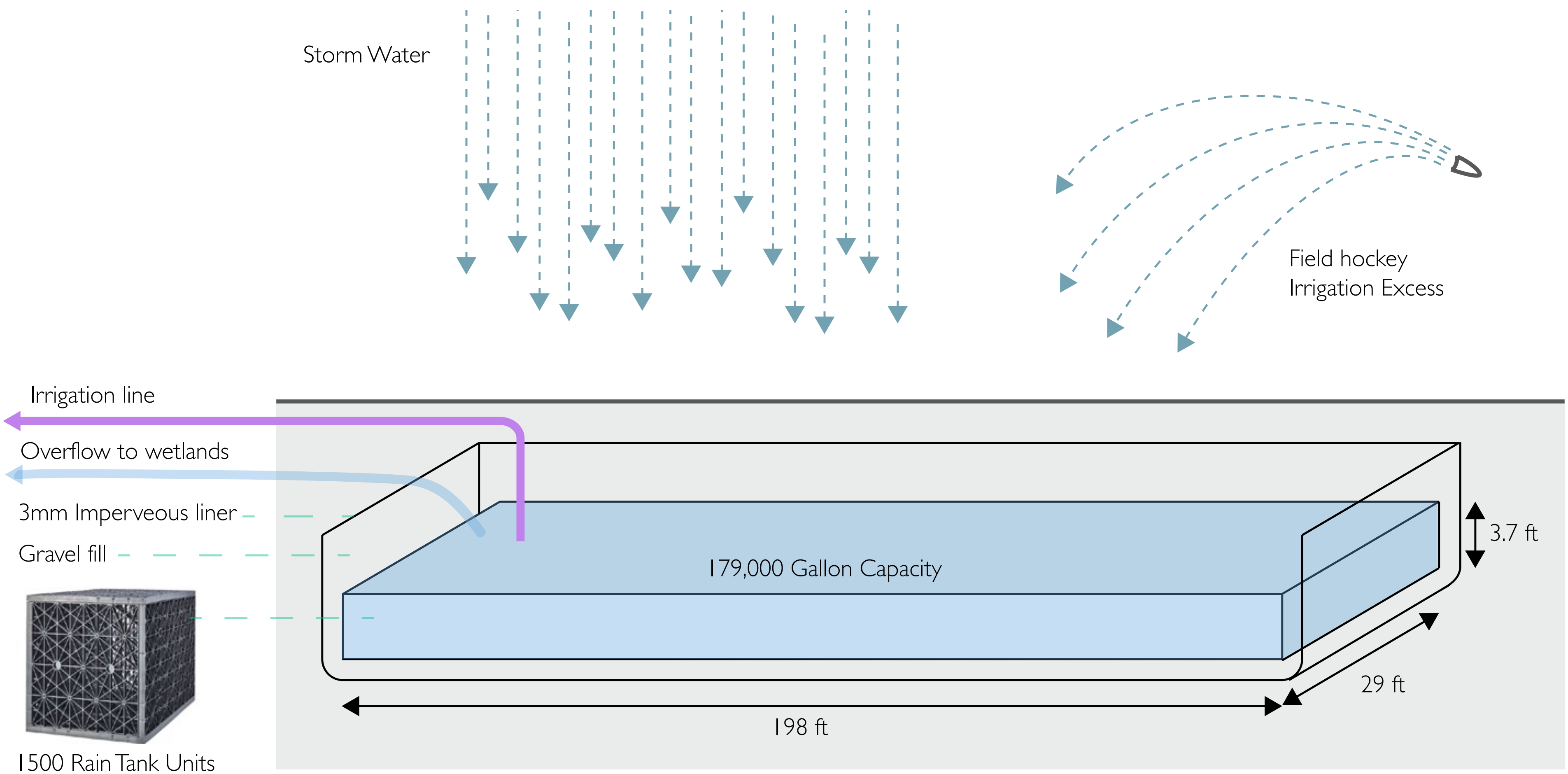


Figure 29. Diagram of Reclaimed Water System used at Longwood University in Lancer Park

compiled using information from: Goatley, Michael, James C. Puhalla, Jeffrey V. Krans Sports Fields: Design, Construction, and Maintenance. N.J: Wiley , 2010.

Several Collegiate athletics departments use reclaimed water systems that collect both storm water and excess irrigation from field hockey playing surfaces. The University of Boston and Longwood University in Farmville Virginia, both collect water from hockey fields and use it to irrigate surrounding landscaping or other sports fields.

Raintank Water Storage System

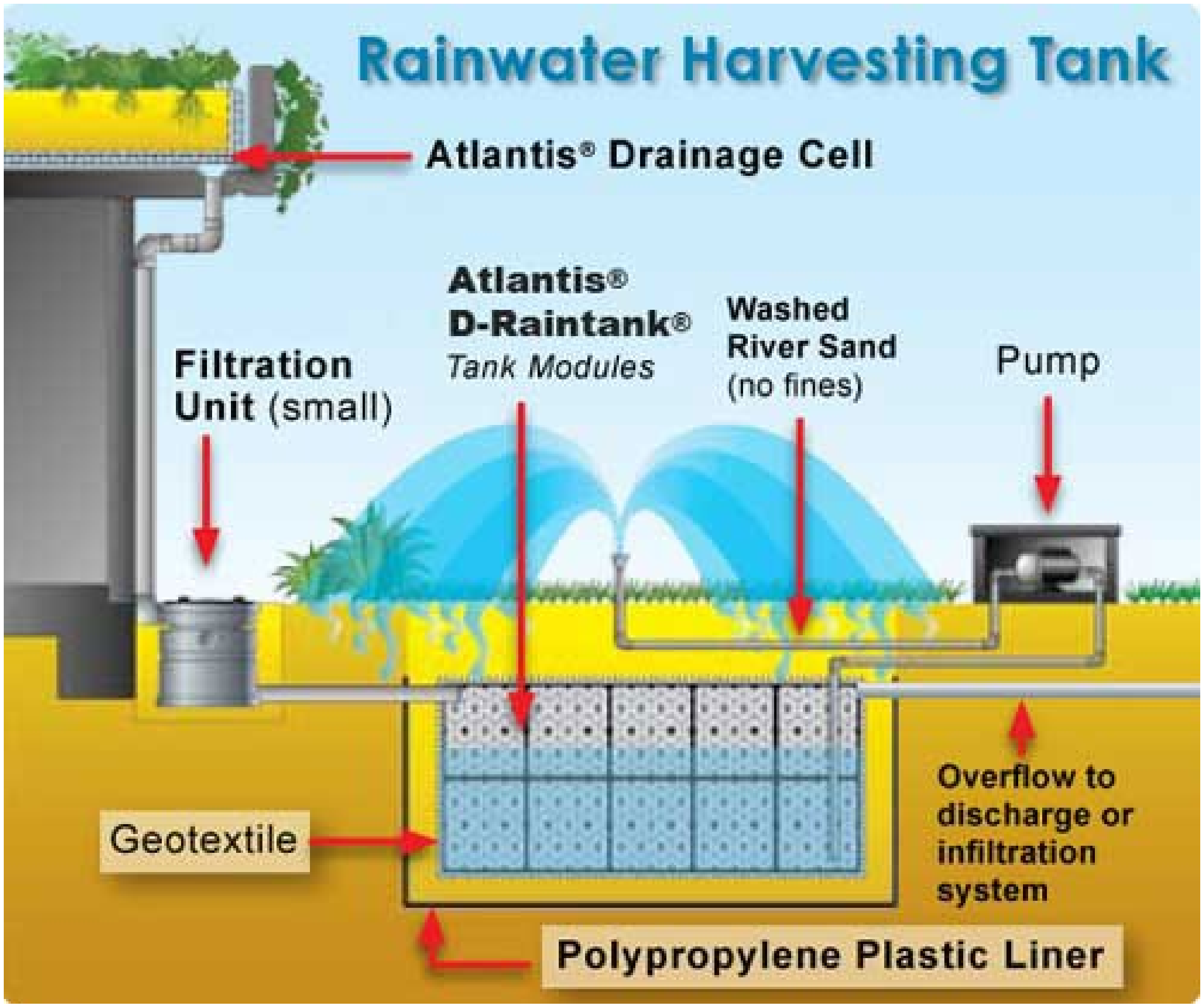


Figure 30. Diagram of the Raintank System From the Supplier
Image source: http-_www.rainharvest.com_atlantis-d-raintank-.jpg

These systems do not recycle water collected from the turf back onto the hockey surface. This may be because of concerns that the recycled tire rubber infill mat common to most hockey turf surfaces are releasing toxins and could be concentrated by reusing the water without extensive filtration. Instead the systems at Boston and Longwood University collect water to irrigate other fields and nearby landscaping.

Sized for the maximum amount of daily water capacity, Wright field would require a water retention chamber of approximately 12 000 gallons (45424.9 L). Using a triple module sold by Atlantis a chamber this size could be constructed by 194 modules with a capacity of 233.64 L at a cost of $83 per module. This would make the cost of the modules approximately $16 102 before shipping and installation.

Rain Tank modules and similar strategies for Storm Water Retention

Figure 31. Single Matrix One Module

Source: http-_www.layfieldenvironmental.com_Content_Files_Images_Product_MatrixOne3

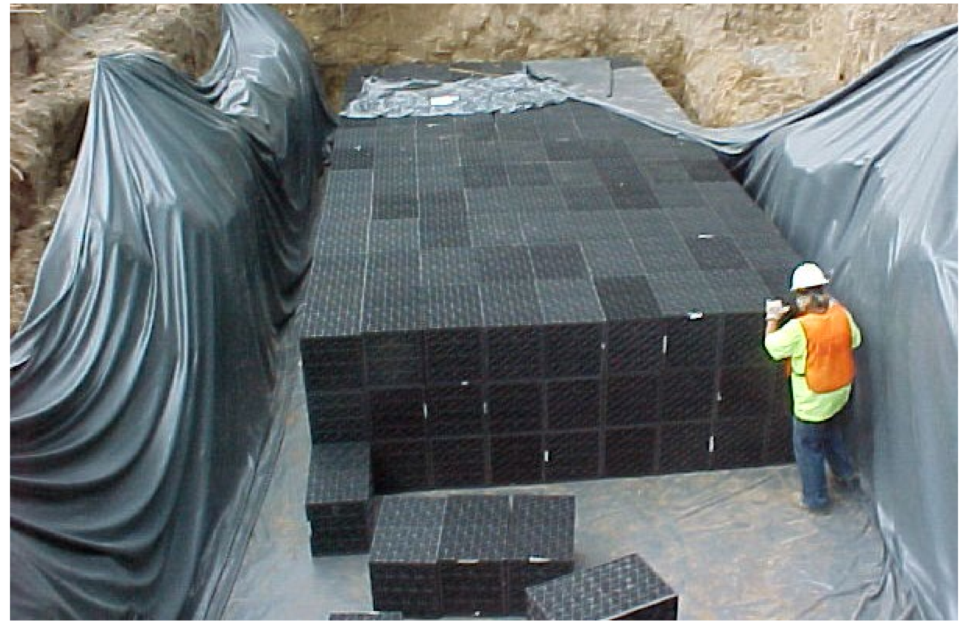


Figure 32. Installation of Rain Tank Modules

Source: http-_www.kanapipeline.com_images_Rain-Tank-

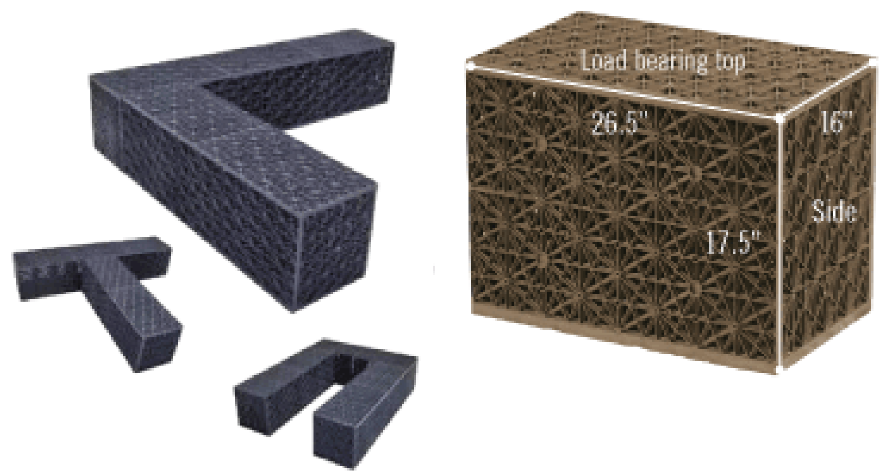


Figure 33. Various configurations of Aqua Blox Modules

Source: http-_www.rainxchange.com_products_images_aquablox.gif

Several modular system for storm water storage are available. These systems are made from recycled polypropylene and designed to the size required by each specific project. The modules are sold as a structural load bearing product that can support traffic or parking or a non load bearing version which supports pedestrian traffic.

Storm Water Retention Chambers - Structural Core Bundles

Figure 34. Installation of Storm Water Retention Chamber.

Source: raintechnologies.com/projects

Storm water retention chambers made from structural core bundles of recycled food grade high density polyethylene can be constructed to store large quantities of water.

These systems are sold by Rain Technologies for approximately $6.5 US ($7.06 CAD) per cubic foot of water storage space. This figure includes a filter system, impermeable liner, structural core, sump connections and input and output connections. For a 12 000 gallon water storage space this would cost approximately $10 426 US or $11 328 CAD (calculated at the August 25 2014 exchange rate).

If considering the waste-water costs associated with water exiting Wright Field and the cost to irrigate an adjacent field at the peak water rate, this system could pay for itself after approximately 69 days. This figure assumes a 12 000 gallon (1604 cu.ft.) water storage space, and 19,000 gallons per day to irrigate a sports field the size of Varsity. This figure does not include installation costs.

Reclaimed Water System for Wright Field

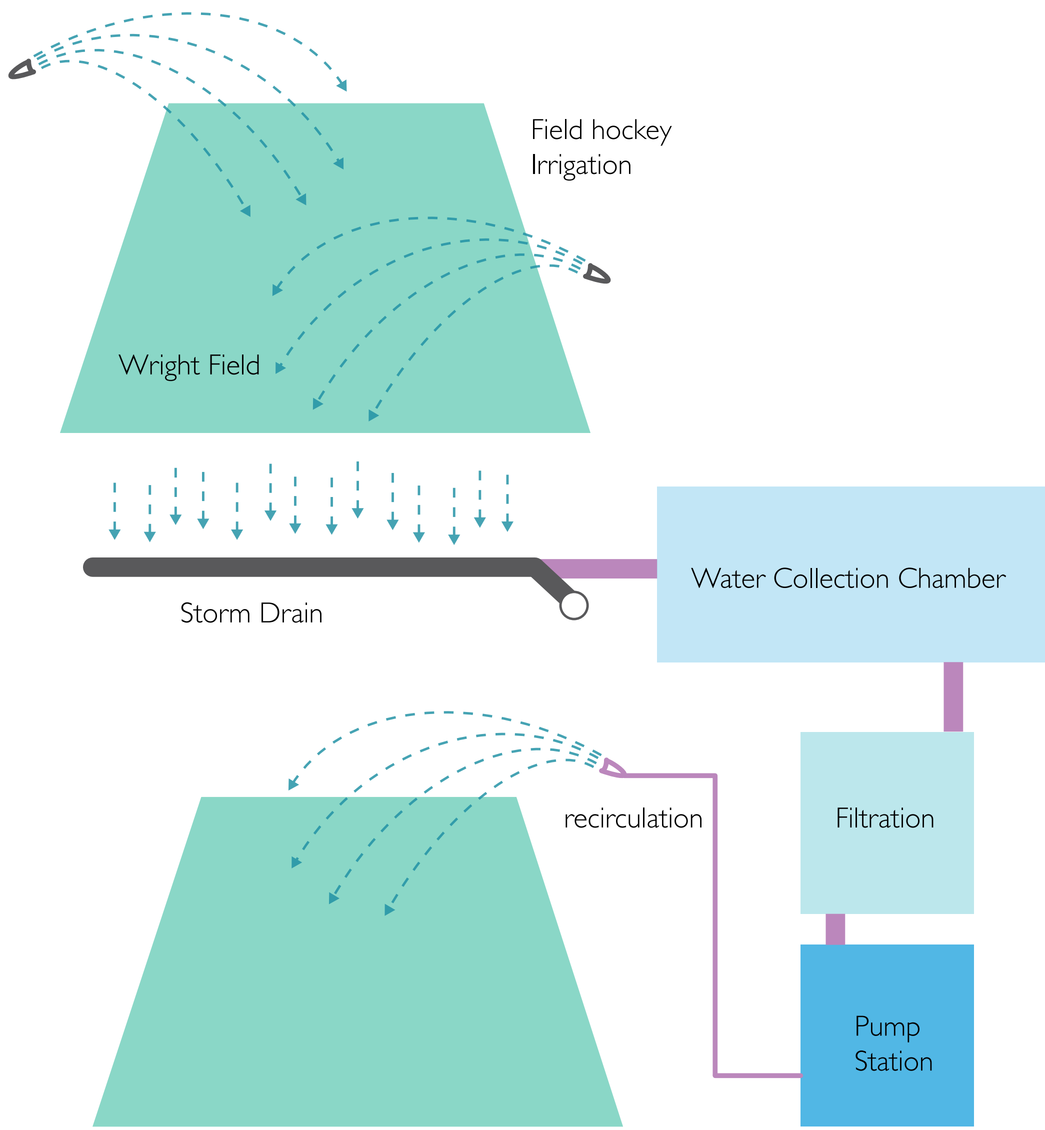


Figure 35. Schematic of Reclaimed Water System for Wright Field

According to the "UBC Wright Field Remediation Plan," Wright Field drains to a 200mm storm drain on the south east side of the turf. The fields being renovated in 2015 are on the south and east side of Wright Field creating an opportunity to embed a water collection tank or chamber in to the fields being renovated.

The reclaimed water system would require piping from the storm drain, a collection chamber, and a filtration unit before the water could be used to irrigate the adjacent fields. Because of regulations from the Vancouver Coastal Health Authority on the spraying of reclaimed water, the water would need to be filtered to the level of being potable.

The "Reclaimed Water Guide" published by the B.C. Ministry of Environment details the specifics of irrigating with reclaimed water. According to the guide, water collected from Wright Field could only be used for irrigation between 10PM and 6AM, because of the exposure of students and the public to reclaimed water (28).

Water Filtration specialists, Watertiger and Corix Water System provided quotes for a reclaimed water system for Wright Field. Both companies are based in greater Vancouver. Watertiger provided the estimate that the filtration system would cost $ 19,000 plus the cost of a pump which would be between $4000 and $7000. This quote does not include installation or excavation. Corix Water Systems provided the estimate that the system would cost $198,000 including installation, excavation and start-up.

Reclaimed Water System for Wright Field

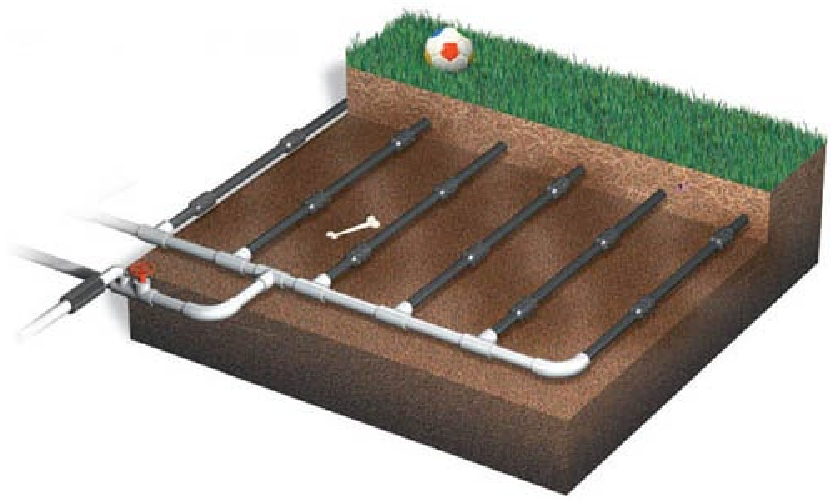


Figure 36. Illustration of Subsurface Drip Irrigation System
Source: http://www.slimfilms.com/graphics/12drip.Irrigation.jpg

The Athletics department could avoid treating the reclaimed water collected from Wright field to a potable level by utilizing it in a subsurface dripline irrigation system. Subsurface driplines are gaining popularity for sports field irrigation becuase of the increased water efficiency and absence of sprinkler heads to be damaged by or injure athletes (Goatley, 108). The largest draw back to these systems is the high initial installation cost as the dripline must be drenched approximately 6 inches into the field. This part of the installation cost could be avoided if the system is installed when the turf is replaced with grass on Varsity field in the upcoming athletic season.

Southern Drip Irrigation based in Chiliwack and Wes-Tech Irrigation based in Victoria supplied quotes for a sub-surface irrigation system.

Southern Irrigation estimated that the design, materials and installation would cost $81,000 (the installation cost has been factored to remove trenching and burrying the dripline). Considering the savings to sewage charges from reusing waste water from Wright Field and the cost to irrigate Varsity Field with a spray system at peak meter rates, this system could pay for itself in 1.35 years. This figure assumes peak water rates and maximum useage , therefore the system would realistically pay for itself after two summers. The subsurface drip system would also need to be combined with a water storage system like the water space retention chambers discussed on page 36, adding another 69 days to the pay back period.

Wes-Tech Irrigation provided the estimate that the whole system would cost $77 364.70. This quote includes a reclaimed water storage space, subsurface irrigation dripline, filtration, pump, irrigation controller and GST. The quote did not include the cost of installation, which the company could not provide. This system would pay for itself in approximately 1.29 years or two summer seasons.

LEED Points for Reclaimed Water Strategies

Sustainable Sites Credits

SS Credit 6.1
Storm water Design: Quantity Control
(1 Point)

SS Credit 6.2
Storm water Design: Quality Control
(1 Point)

SS Credit 7.1
Heat Island Effect: Non-roof
(1 Point)

Materials & Resources Credits

MR Credit 3
Materials Reuse
(1-2 Points)
5% = 1 Point; 10% = 2 Points
MR Credit 4
Recycled Content
(1-2 Points)
10% = 1 Point; 20% = 2 Points

Water Efficiency Credits

WE Credit 1
Water Efficient Landscaping
(2 Points)

WE Credit 2
Innovative Wastewater Technologies
(2 Points)

WE Credit 3
Water Use Reduction
(2-4 Points)

Innovation & Design Credits

ID Credit 1

Innovation & Design
(1-5 Points)

Storm water storage chambers and reclaimed water systems can contribute to LEED credits for new construction. It is possible that the athletics department could link a sub-surface dripline system and reclaimed water system to the new construction of the National Soccer Development Centre which may be located south of Varsity field. (Penny Martyn).

The recycled content and water efficiency inherent in these systems allows Storm water retention chambers to add up to 20 points to a project, helping a project achieve a higher LEED standard.

Sports Field Irrigation Investigation Conclusion

The need to filter reclaimed water to a potable level or employ a subsurface irrigation system to utilize water reclaimed from Wright field, make the project less financially feasible than originally anticipated. A reclaimed water irrigation system would be more feasible if external sponsorship or support from UBC was employed.

Although the payback periods discussed on page 38 for the subsurface irrigation system seem reasonable, it is recommended that the department consult with a local landscape design firm to confirm the costs and returns of a project of this scale.

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