



September 12, 2017

**TO:** Park Board Chair and Commissioners  
**FROM:** General Manager - Vancouver Board of Parks and Recreation  
**SUBJECT:** Water Conservation Action Plan

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## RECOMMENDATION

THAT the Vancouver Park Board endorse the Water Conservation Action Plan (2017 - 2020), as outlined in this report and attached as Appendix A, to guide the ongoing implementation of water conservation in Vancouver parks.

## POLICY / PREVIOUS DECISIONS

On November 2, 2015, the Board unanimously passed the [Water Conservation Strategy motion](#) directing staff to explore “the costs and benefits of various measures that can be taken to mitigate against future droughts by reducing water use and identifying opportunities to reuse or recycle grey water”.

The Park Board is also committed to meeting the Greenest City Action Plan target of reducing per capital water use by 33% compared to 2006 levels.

## BACKGROUND

### Regional Context

Despite the significant rainfall experienced by Vancouver during a typical fall and winter, drinking water storage capacity is limited in Metro Vancouver. In addition, increasingly frequent summer drought (July & August 2017 were the driest on record for Vancouver) and the resultant increased consumption means that water conservation will be increasingly important across all sectors in the years to come.

Water is supplied to 20 municipalities, including the City of Vancouver, by Metro Vancouver who manage, treat, and distribute drinking water. The reservoirs are fed by the melting snowpack that accumulates over the winter, as well as rain that falls within the watershed. Supply is a challenge during summer months when demand peaks and reservoir levels are at their lowest.

Both population growth and climate change are expected to put increasing strain on existing water resources in the region. By 2041, regional population is expected to grow by 885,000 and Vancouver’s population by 112,000<sup>1</sup>. In addition, climate change is expected to put further strain on existing water resources. Temperature, precipitation patterns, snowpack size, growing season length, and drought frequency and duration are all expected to negatively affect water supply and demand<sup>2</sup>.

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<sup>1</sup> [Metro Vancouver 2040 - Regional Growth Strategy; Government of BC - Population Estimates](#)

<sup>2</sup> [Metro Vancouver - Climate Projections for Metro Vancouver \(2016\)](#)

Metro Vancouver recently updated predictions for long-term water supply as part of a regional gap analysis. They found that without additional storage (raising dams or other large-scale projects) water supply challenges will develop over the next decades:

- storage gaps by mid 2030s (Stage 3 drought response required about every 5 years on average);
- increasing frequency of Stage 3 drought response measures (required almost every year by 2040s);
- significant gaps by mid-century under all demand scenarios that cannot be addressed with Stage 3 drought response measures.

### Park Board Water Use

Parks and Park Board facilities account for about 2% of total water consumed in the City of Vancouver, which was roughly 1.8 billion litres in 2016, or equivalent to the water use of 3,200 average single family homes. Park Board water uses are split into three categories:

- **Unbilled water use:** metered water use that is paid for by the city, includes irrigation, fieldhouses, water features, ponds, and other non-revenue facilities and end uses.
- **Billed water use:** metered water use that is paid for through an allocated budget and includes all revenue generating facilities such as community centres, golf courses, lawn bowling, and other destination parks with admission such as VanDusen Gardens.
- **Unmetered water use:** is all water use that is not measured by a meter.

In 2016, Park Board metered water use was at its lowest point since 2012, when water meters were installed for many of the sites. Figure 1 shows the decline in water use in 2016 compared to previous years, with the majority of that decrease seen in the unbilled uses. The 2016 metered consumption was 21% lower than the 2006 baseline, and 26% lower than the 2012-2014 average (2015 was omitted due to the drought conditions affecting water use).

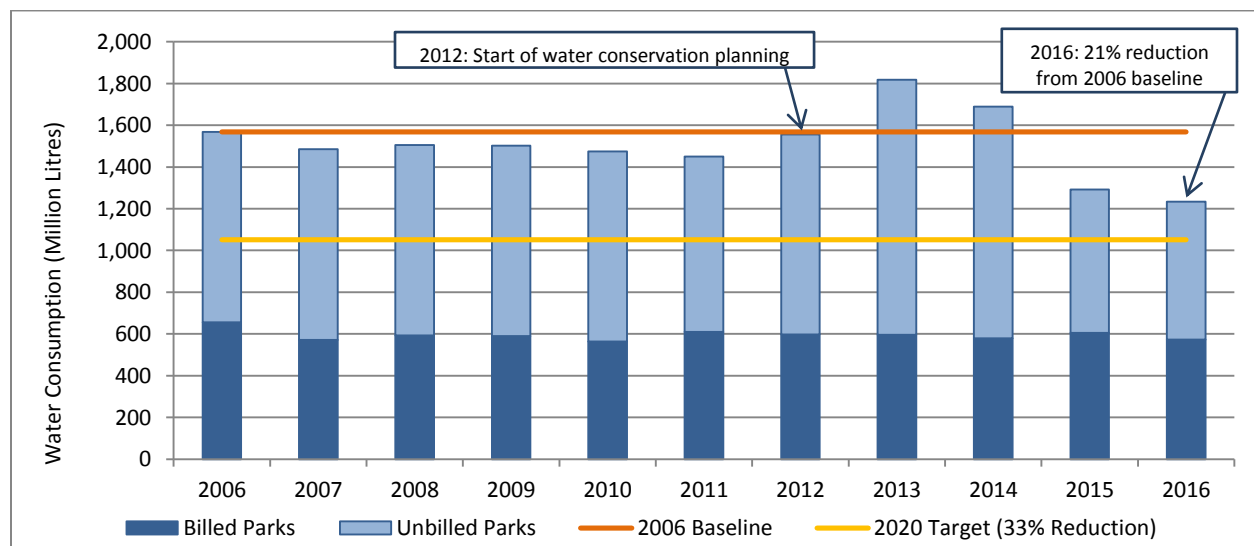


Figure 1: Annual extrapolated metered Park Board water consumption.

Note: In 2012 the majority of the parks water meters were installed and water conservation planning began in earnest; in 2015 the significant reduction in use was due primarily to the float valve installation at Trout Lake.

## DISCUSSION

The goal of the Water Conservation Action Plan (2017-2020), attached as Appendix A, is to reduce potable water use in parks by 33% from 2006 levels without compromising the importance of water in parks for irrigation, recreation, and aesthetics.

The priority actions listed in the following section are based on seven principles:

1. Initial prioritization of largest water users and actions that will facilitate the largest water savings.
2. Exploring and utilizing alternative water sources where possible, while assuring the sustainability of those alternative resources.
3. Compliance with existing by-laws and best practices.
4. Cost effective solutions for both implementation and construction, but also ongoing operation and maintenance.
5. Phased approach to retrofitting and upgrading existing water features.
6. Adaptive management that uses data monitoring and analysis, and responds to cultural and environmental values of water features in parks.
7. Ensure project development and implementation includes input from Park Board and City staff from relevant departments.

### Priority Water Conservation Actions

The Action Plan makes recommendations on six priority water conservation projects between 2017 and 2020:

1. Stanley Park - Lumberman's Arch Spray Park to Beaver Lake
  - Convey outflow water from spray park to train ponds, which flow to Beaver Lake.
2. Stanley Park - Miniature Train Waterfall and Waterwheel
  - Recirculate waterfall and waterwheel; discontinue potable water input (contingent on #1).
3. Charleson Park - Waterfall
  - Recirculate waterfall/ponds by upgrading the abandoned recirculation system.
4. VanDusen Botanical Garden
  - Recirculate pond system; identify and address losses; explore groundwater supply potential. Use of the older reservoir for water storage, as recommended in the May 2016 [Water Conservation Measure motion](#) referred to staff, is being considered as a second phase, however preliminary review highlighted several engineering, structural, seismic, drainage, and safety challenges. Surface water re-use for the visitor centre is also being considered for a second phase.
5. Irrigation
  - Explore various efficiency opportunities
6. Once-through Water Features
  - Address once-through water features while balancing by-law compliance, cost, water savings, and public sensitivities.

### **Water Conservation Planning Opportunities**

**Green Infrastructure:** Park Board staff will collaborate with the City's new Green Infrastructure Implementation (GI) team. The GI group has articulated their goals to include increasing resilience through sustainable water management, including the harvest and reuse of water. There exist many opportunities to incorporate green infrastructure components and principles into new and existing parks, as well as meet conservation goals by utilizing stormwater to offset potable water where possible. Next steps include a city-wide mapping of specific park's water needs and potential sources of rainwater or stormwater (including surface runoff, storm sewers, and roof capture). The objective is to identify and prioritize potential projects where rain or stormwater can be used to offset potable water use in parks.

**Park Design and Renovation:** Park Board Green Operations staff are collaborating with Park Development staff to review and provide input on proposed water features in new and upgraded parks, with additional input from Engineering (Water Design). For example:

- New park at Smithe & Richards will have a water feature that captures outflow water that will also be used for on-site irrigation and toilet flushing;
- Project looking to restore the Tatlow Park creek is currently underway and will be fed by stormwater, which will eliminate the potable water input;
- New park at NE False Creek to include a water feature & wetland; considering the capture and reuse of rain and stormwater to replace on-site potable water uses;

**Data Collection and Monitoring:** Both potable water and natural water systems (with ponds and lakes) are monitored on an ongoing basis to facilitate adaptive management of water system as conditions change. In addition, Park Board staff monitor lake and pond levels for various sites across the City, as well as track water quality as reported by Metro Vancouver and Vancouver Coastal Health. As part of the Corporate Water Reduction Plan, meters will be installed by Real Estate and Facilities Management (30 per year) to increase coverage. These meters are installed on civic facilities and include billed and unbilled park end uses.

### **SUMMARY**

Climate change is expected to have effects on the rainfall and snowfall patterns that supply Vancouver's watersheds. In addition, projected population growth is expected to increase regional water demand in the coming years. Through careful study of the Park Board's water use systems, and prudent interventions as outlined in this report, efficiency can be increased and water use can be reduced. This careful management of our water resources will demonstrate the Park Board's commitment to sustainability, as well as reduce the overall cost of potable water to the City of Vancouver.

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DRAFT

# WATER

Conservation Action Plan  
2017-2020

September 18, 2017



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# 1 Summary

The Park Board uses treated water across the park system for irrigation of fields, gardens and green spaces, as well as water features and facilities. However, despite the typical rainfall during winter months, drinking water resources are finite. Population growth, climate change, and urbanization are all expected to increase water demands in the years to come making water conservation of vital importance moving forward.

The Park Board is not a large water user in the context of the city as a whole (roughly 2% of City's overall use); however efficiency and conservation opportunities are available throughout its many facilities and parks, and contribute to meeting water conservation targets. Several municipal, as well as regional and provincial policies drive conservation, and through the Corporate Water Reduction strategy the Park Board has a goal of decreasing potable water use by 33% from 2006 levels. To date, significant progress has been made by focusing on the largest water users in the park system, and conservation work continues with several projects that are ongoing or planned for 2017-2020.

This Water Conservation Action Plan (2017-2020) provides background on water supply and use in the City and Park Board before outlining the potential opportunities and challenges pertinent to conservation actions for the parks system.

## Goal

**Reduce potable water use in parks by 33% from 2006 levels** without compromising the importance of water in parks for irrigation, recreation, and aesthetics.

## Priority Projects (2017-2020)

- Lumberman's Arch Spray Park to Beaver Lake (Stanley Park)
- Miniature Train Waterfall and Waterwheel (Stanley Park)
- Charleson Park – Waterfall
- VanDusen Botanical Garden
- Irrigation
- Once-Through Water Features

# 2 INTRODUCTION

## WHY IS WATER CONSERVATION IMPORTANT?

Despite the significant rainfall experienced in Vancouver during a typical fall and winter, drinking water storage capacity is limited and conservation will be increasingly important across all sectors in the years to come.

Water is supplied to 20 municipalities, including the City of Vancouver, by Metro Vancouver who manage, treat and distribute drinking water. The reservoirs are fed by the melting snowpack that accumulates over the winter, as well as rain that falls within the catchment. Supply is a challenge during summer months when demand peaks and supply levels are at their lowest.

Both population growth and climate change are expected to put increasing strain on existing water resources in the region. By 2041, regional population is expected to grow by 885,000 and CoV population by 112,000.<sup>1</sup> In addition, climate change is expected to put further strain on existing water resources. Temperature, precipitation patterns, snowpack size, growing season length, and drought frequency and duration are all expected to change in ways that will negatively affect water supply and demand.<sup>2</sup>

## A climate in flux

We rely on melting snow and rain to feed our water supply. With long hot summers and erratic periods of rain and snowfall, **how will our water supply support an increased demand?**



Capilano Reservoir

<sup>1</sup>Metro Vancouver 2040 – Regional Growth Strategy; Government of BC – Population Estimates

<sup>2</sup>Metro Vancouver – Climate Projections for Metro Vancouver (2016)



# INTRODUCTION

## PARK BOARD WATER USE

Parks and Park Board facilities account for an estimated 2% of total water consumed in the City of Vancouver, which was roughly 1.8 billion litres in 2016, or equivalent to the water use of 3,200 average single family homes (Figure 1). The water end uses are split into three categories:

- **Unbilled water use**, metered water use that is paid for by the city, includes irrigation, fieldhouses, water features, ponds, and other non-revenue facilities and end uses.
- **Billed water use**, metered water use that is paid for through an allocated budget, and includes all revenue generating facilities such as community centres, golf courses, lawn bowling, and destination parks with admission such as VanDusen Gardens.
- **Unmetered water use**, is all water use that is not measured by a meter.

The unbilled park water use payment structure is currently under review by City Finance and changes may be forthcoming.

The City of Vancouver buys water from Metro Vancouver at a bulk seasonal rate that covers the cost of the supply and treatment of drinking water. The City then charges its metered customers a higher retail rate to cover the cost of the distribution, operations and maintenance. It is a cost recovered service, meaning the revenue is returned to the water system operation.

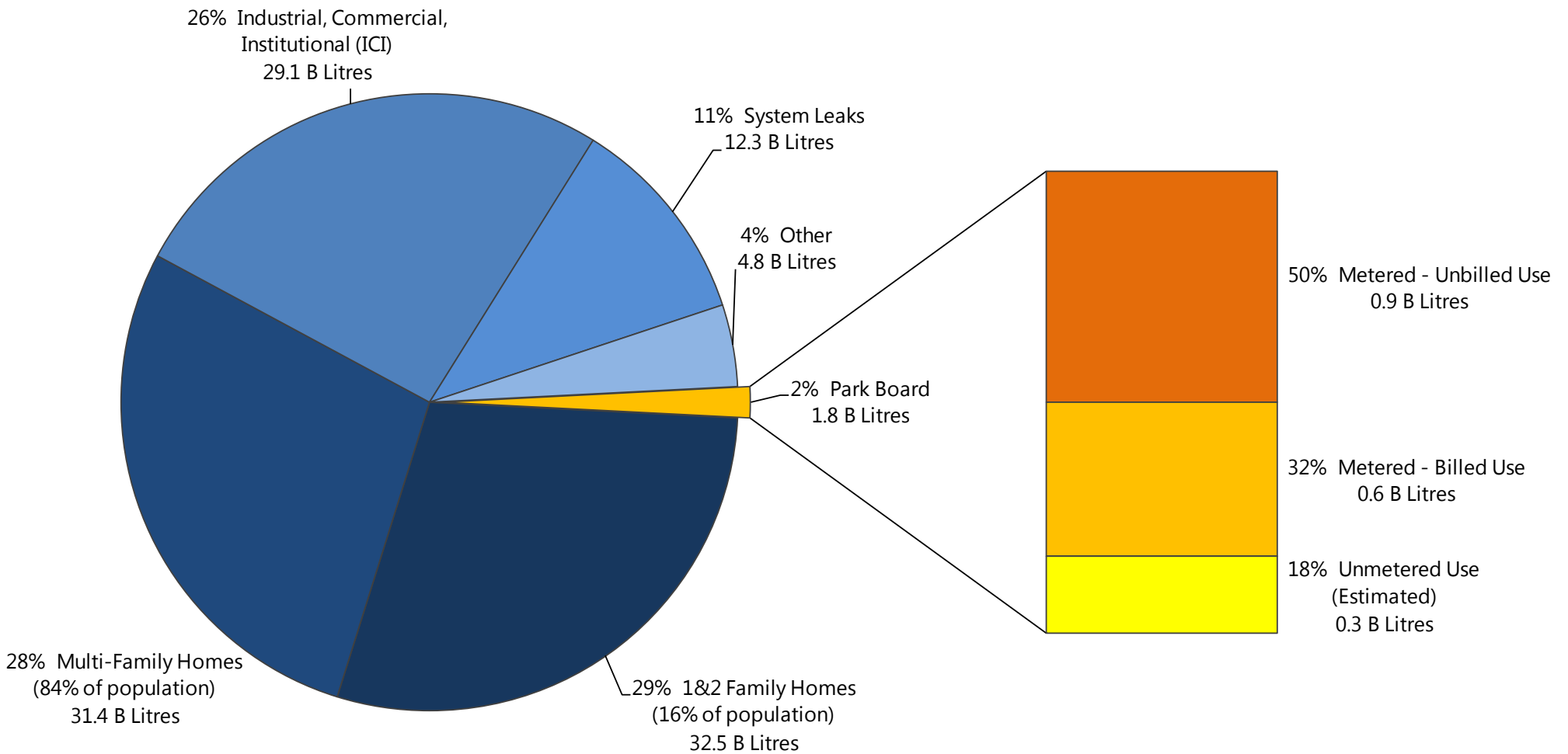
## How do we compare?

**2%** of total water use in the City of Vancouver is from Park Board usage. This is equal to the water use of 3, 200 homes.

See Figure 1 for a complete comparison of usage.

# INTRODUCTION

**Figure 1. City of Vancouver Water Use by Sector**



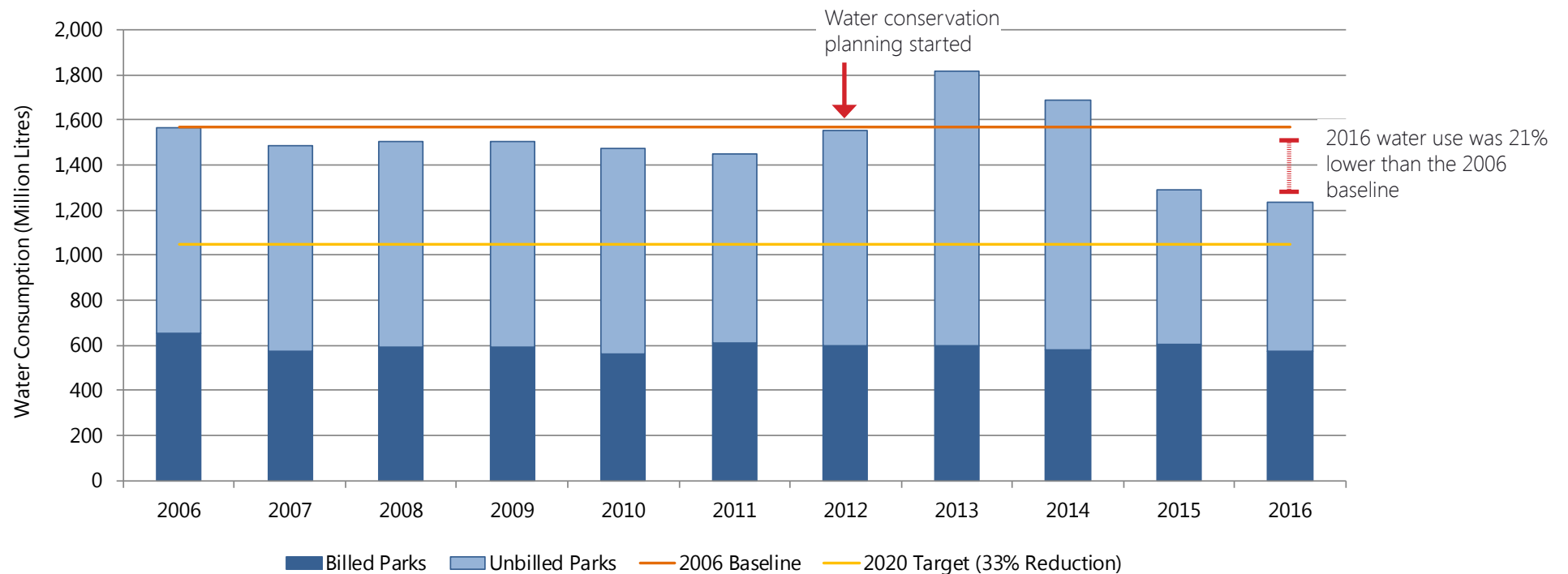
# INTRODUCTION

## WATER USE TRENDS

In 2016, Park Board metered water use was at its lowest point since 2012 when water meters were installed at many Park Board owned locations. Figure 2 shows the decline in water use in 2016 compared to previous years, with the majority of that decrease seen in the unbilled uses.

The 2016 metered consumption was 21% lower than the 2006 baseline and 26% lower than the 2012-2014 average (2015 was omitted due to the drought conditions affecting water use). The majority of those water savings came from the unbilled water use: 38% for unbilled accounts, versus a 3% savings for billed accounts.

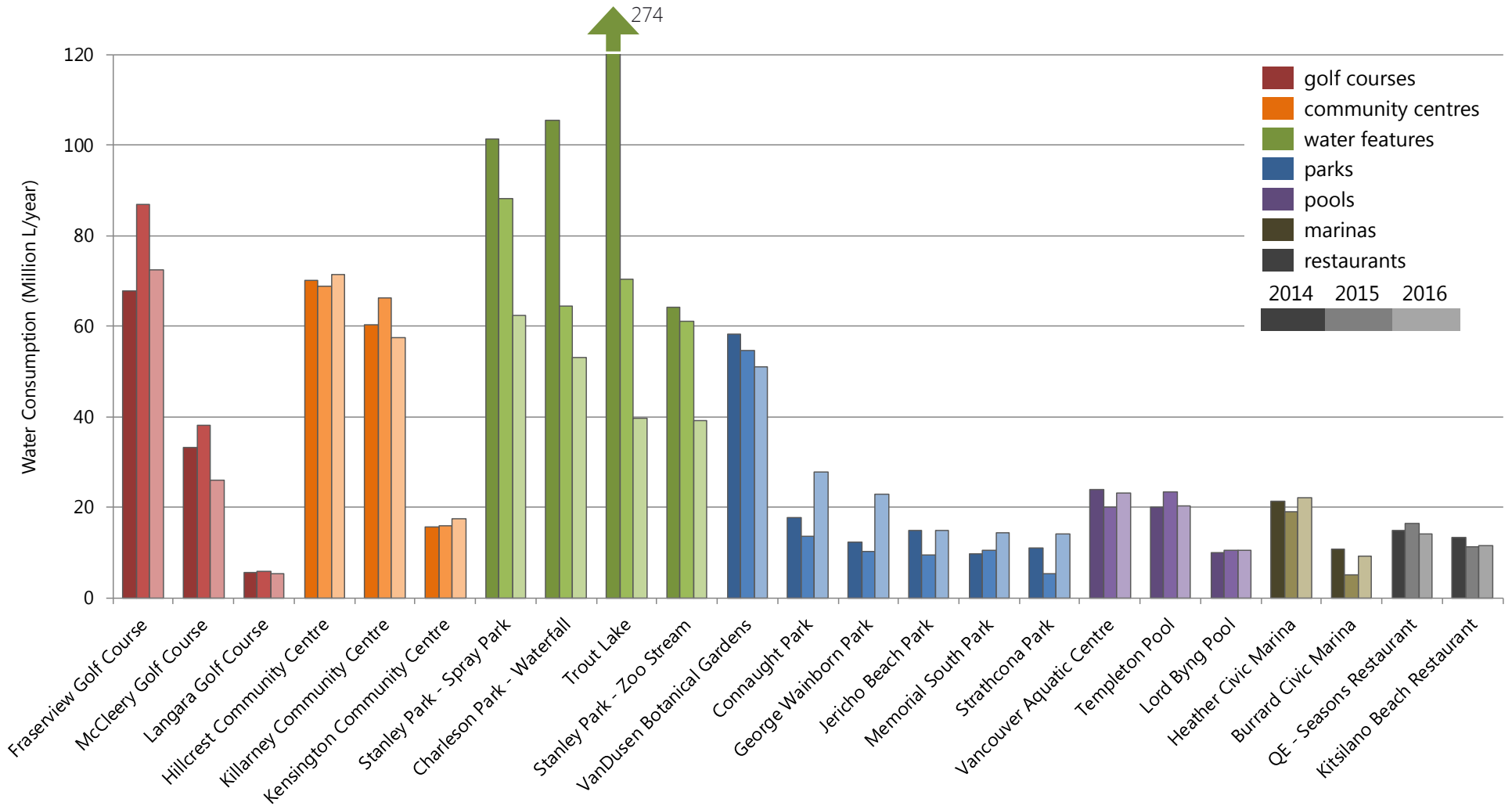
**Figure 2. Annual Park Board Water Consumption (metered)**



# INTRODUCTION

Figure 3 shows the 2016 water consumption for a selected group of top water-using parks or facilities in the system, by end use category.

### Figure 3. Park Board's Top Metered Water Users by Category (2014-2016)



# 3 SUCCESS STORIES

## TROUT LAKE



Trout Lake has historically been the largest potable water user in the Park Board system. Treated drinking water is added to the lake during summer months to help maintain the lake level. In 2012-2014, an average of 220 million litres of treated drinking water (at a retail water cost of \$240,000) was used to top-up the lake each year. In 2014, a float valve was installed to control potable water additions. This has led **to a water savings of 180 million litres (\$200,000) for 2016**, in comparison to the previous annual average.

## SPRAY PARKS



The Park Board operates fifteen spray parks across the City. Since the 2015 drought, all spray parks have been fitted with activation buttons. Prior to the button installation, the largest spray park – the Lumberman's Arch spray park in Stanley Park, used an average of 98 million litres of water per year (at a retail cost of \$114,000). In 2016, after the button was installed **the park used 35 million litres (\$41,000).**

## 5TH AND PINE



An innovative rainwater collection system at the 5th and Pine pop-up park has allowed the park to save potable water by using the collected water for irrigation. The on-site 10,000 litre cistern collects water from an adjacent roof, which then feeds a subsurface irrigation pipe serving the plants and trees on site.

# SUCCESS STORIES

## HILLCREST COMMUNITY CENTRE



Water for irrigation and toilet flushing at the Hillcrest Community Centre is provided from a system that utilizes alternatives to potable water. Rainwater and foundation drainage water are collected on site and conveyed to a cistern where it is stored before use in the toilets and irrigation system. When there is insufficient rain or foundation drainage water supply, an outdoor geyser/water feature fed by potable water is activated, and the outflow water is conveyed to the cistern.

## GOLF COURSES



Starting in 2016, the City of Vancouver entered into annual Water Use Agreements with each of the private and public golf courses. The Water Use Agreements provide a volume-based water allocation during the irrigation season (May to Oct) that the turf managers agree to work within. In 2016, all the golf courses were successful in keeping under their water budget.

# 4 POLICY CONTEXT

This Water in Park Conservation Action Plan aligns with existing plans at each level of government, as well as CoV and Park Board targets and strategic plans.

## PROVINCIAL POLICIES

### BC Living Water Smart

A provincial plan that “sets the direction for changes to water management and water use. These changes are crucial measures for adaptation to climate change impacts and the pressures placed on water resources from a growing population and economy.”

## METRO VANCOUVER

### Drinking Water Management Plan (2011)

Sets the direction to ensure our region’s water needs will be met affordably and sustainably through a number of demand side management strategies across all sectors.

### Water Shortage Response Plan

A regional plan that is enforced by the member municipalities through their independent Water Shortage Response bylaws. This bylaw sets out the seasonal watering restrictions that are automatically activated each spring, and run from May 15th – October 15th.<sup>3</sup> The restrictions have four stages tied to water supply levels, and cover a range of water end uses that are pertinent to park operations. The restriction details are currently undergoing review and update.



## Guidelines

Increase efficiency of water use in BC  
by **33% by 2020**

+

**50%** of new municipal demand will  
be met by conservation.

<sup>3</sup>Metro Vancouver Water Shortage Response Plan - Summary

# POLICY CONTEXT

## CITY OF VANCOUVER

### Vancouver Greenest City 2020 Action Plan (GCAP)

Sets a Clean Water Goal for Vancouver to have the best drinking water of any city in the world.

### Corporate Water Reduction Plan

Achieve Greenest City targets specifically aimed at civic facilities, parks, and engineering utility uses.

### Green Operations

#### *Department Action Plan for Engineering (2012) -*

Water conservation is recognized as an important target to ensure Vancouver and the region avoids or defers source expansion. Direction is provided to baseline civic water consumption and investigate opportunities to minimize operational potable water usage.

#### *Citywide Integrated Rainwater Management Plan (2016) -*

A central goal of the plan is to reduce potable water demand by encouraging beneficial use as well as reuse of rain and stormwater where it can replace drinking water.

### Water Works By-Law 4848

Section 3.7 'Prohibition Against Wasting Water' applies to water features and systems, including those in parks.<sup>4</sup> Among other components, the by-law prohibits the "use of ponds, waterways, water features, fountains or swimming pools, which do not have a recirculation device".

<sup>4</sup>City of Vancouver Water Works By-Law No. 4848

<sup>5</sup>Vancouver Board of Parks and Recreation - Motion on Notice - Water Conservation Strategy

Vancouver Park Board: Water Conservation Action Plan (2017-2020)



## GCAP Target

Reduce per capita water consumption by

**33% from 2006 levels**

## Park Board Motion

On November 2, 2015, the Park Board unanimously passed a motion directing "staff to report back to the Board on the costs and benefits of various measures that can be taken to mitigate against future droughts by reducing water use and identifying opportunities to reuse or recycle grey water".<sup>5</sup>



# 5 OPPORTUNITIES AND CHALLENGES

## OPPORTUNITIES

Park Board facilities have significant opportunities for water savings. As the water conservation strategy implementation moves forward there are several important considerations.

- **Fit for purpose water quality.** Many water end uses in the parks water system do not require potable water, presenting opportunities to utilize alternative water source for applications such as irrigation and toilet flushing.
- **Water reuse through a series of features.** There is significant potential for water reuse as many parks have multiple water using features.
- **Rainwater capture and reuse.** Park space can be leveraged to capture and potentially utilize rainwater for various end uses on site or nearby.
- There are **public education opportunities** associated with water projects in parks that can encourage conservation and highlight the value and scarcity of water resources.

## CHALLENGES

There are also some key challenges of note:

- Not all water use in the park system is metered.
- Only revenue generating facilities pay for water through their budget, meaning water savings for unbilled use are not reflected in Park Board operating budgets. This is currently under review.
- Water reuse and alternative supplies must be managed to reduce risk to public health. Avoiding inviting human contact, aerosolizing non-potable water and cross connections with the potable system are a few of the requirements.
- Many of the park water features and irrigation infrastructure are old, and efficiency retrofits can be complex and costly. However, assets nearing or at the end of life present an opportunity to upgrade during replacement.
- Changing water use in parks is a sensitive topic for park users and the public.

# 6 GOALS AND PRINCIPLES

## GOAL

**The goal of the Park Board is to reduce potable water use in parks by 33% from 2006 levels without compromising the importance of water in parks for irrigation, recreation, and aesthetics.**

## PRINCIPLES

As we address these components, we will follow seven principles:

1. Initial prioritization of largest water users and actions that will facilitate the largest water savings.
2. Exploring and utilizing alternative water sources where possible, while assuring the sustainability of those alternative resources.
3. Compliance with existing by-laws and best practices.
4. Cost effective solutions for both the implementation and construction, but also ongoing operation and maintenance.
5. Phased approach to retrofitting and upgrading existing water features.
6. Adaptive management approach that uses data monitoring and analysis, and responds to cultural and environmental values of water features in parks.
7. Ensure project development and implementation includes input from Park Board and City staff from relevant departments.



VanDusen Botanical Garden

# 7 PRIORITY PROJECTS: 2017-2020

## STANLEY PARK - LUMBERMAN'S ARCH SPRAY PARK TO BEAVER LAKE

Lumberman's Arch Spray Park – the third largest water user in the park system – is a once-through system that currently discharges directly into Burrard Inlet. Park Board staff are exploring the potential to connect the discharge from Lumberman's Arch Spray Park to top-up Beaver Lake via the miniature train ponds. The Beaver Lake enhancement project is currently underway and this project will provide a much needed water input to the lake and stream. It may also provide water for uses such as nearby washrooms. Early planning is underway.



## STANLEY PARK - MINIATURE TRAIN WATERFALL AND WATERWHEEL

The Stanley Park Miniature Train site includes a waterfall and waterwheel which are single pass features that currently use potable water. Funding has been provided to install a recirculation system for both features with an improved timer in order to improve operational control. In addition, the current water input to the train ponds are these features, which can be eliminated if the spray park water input is successful. Implementation is planned for spring 2018.



## CHARLESON PARK - WATERFALL

The Charleson Park waterfall, the fifth largest water user in the parks system, does not recirculate. The plan is to upgrade and re-activate the defunct recirculation system between the waterfall and ponds. Early planning is underway.



# PRIORITY PROJECTS: 2017-2020

## VANDUSEN BOTANICAL GARDEN

VanDusen Gardens requires significant water resources for irrigation and its extensive network of ponds and streams, and is the sixth largest water user in the parks system. A contractor has been retained to explore possible water conservation opportunities on site, including recirculating the pond system. Additional projects are being considered for future phases including utilizing groundwater on site and reusing surface water for greywater applications at the Visitor's Centre. Re-activating the abandoned reservoir at VanDusen for water storage is also being considered for a future phase (see Park Board Motion Water Conservation Measure - May 2, 2016)<sup>6</sup>, however preliminary review highlighted several engineering, structural, drainage, seismic, and safety challenges.

## IRRIGATION

Improvements to the large and complex irrigation systems across the park system are being explored in collaboration with operations staff. The nature of the system means that actions will be incremental; however even small changes applied across the entire system can have a large effect on water use. Possibilities for increasing irrigation efficiency include:

- Incorporating evapotranspiration and rainfall data into irrigation scheduling
- Installing automated irrigations systems where possible
- Training Staff
- Auditing and inspecting of irrigation systems
- Assessing water use of turf playing fields

<sup>6</sup>Vancouver Board of Parks and Recreation - Motion on Notice - Water Conservation Measure  
 Vancouver Park Board: Water Conservation Action Plan (2017-2020)

## ONCE-THROUGH WATER FEATURES

The parks system has several once-through water features. To conserve water, and bring these features into compliance with City of Vancouver By-Law 4848, these water features will be addressed with a focus on seeking opportunities that take into account the volume of water saved, the potential costs, and the value within the park context. A phased and adaptive approach to these small features will be undertaken, and some initial projects may include timer installation, seasonal scheduling, or recirculation.



VanDusen Botanical Garden

# 8 ONGOING CONSERVATION PLANNING

## GREEN INFRASTRUCTURE

Parks staff will collaborate with the new Green Infrastructure Implementation (GI) team to identify opportunities for incorporating green infrastructure into parks. The GI team has re-articulated their goals to include increasing resilience through sustainable water management, which involves the harvest and reuse of water. Many opportunities to incorporate green infrastructure components and principles into new and existing parks, as well as meet conservation goals by utilizing stormwater to offset potable water are possible. Next steps include a City-wide mapping of specific park water needs and potential sources of rainwater or stormwater (including surface runoff, storm sewers, and roof capture). The objective is to identify and prioritize potential projects where rain or stormwater can be used to offset potable water use in parks.

## DATA COLLECTION AND MONITORING

### Data Analysis and Monitoring

Both potable water and natural water systems (with ponds and lakes) are monitored on an ongoing basis to facilitate adaptive management as conditions change. In addition, Park Board staff monitor lake and pond levels for various sites across the City, as well as track water quality as reported by Metro Vancouver/Vancouver Coastal Health.

### Water Meter Coverage

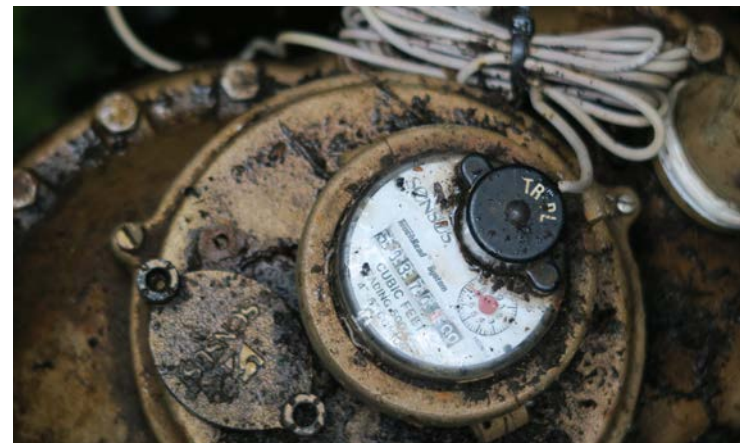
As part of the Corporate Water Reduction Plan, 30 meters will be installed by Real Estate and Facilities Management per year to increase coverage. These meters are installed on civic facilities, and include billed and unbilled park end uses.

Vancouver Park Board: Water Conservation Action Plan (2017-2020)

## PARK DESIGN AND RENOVATION

Park Board Green Operations staff is collaborating with Park Development to provide input on proposed water features in new and upgraded parks, with input from Engineering (Water Design).

- The new park at Smithe and Richards will have a water feature that captures outflow water that will be used for on-site irrigation and toilet flushing.
- A project looking to restore the Tatlow Park Creek is currently underway and will be fed by stormwater, which will eliminate the potable water input.
- The new park at North East False Creek may include a water feature and wetland. Current discussions involve the capture and reuse of rain and stormwater to reduce potable water uses on-site.



CoV Water Meter

