



# City of Richmond

## Report to Committee

**To:** Public Works and Transportation Committee      **Date:** April 27, 2017  
**From:** John Irving, P .Eng., MPA      **File:** 10-6125-07-03/2017-  
 Director, Engineering      Vol 01  
**Re:** **2016 Climate Action Revenue Incentive Program and Carbon Neutral Progress Report**

### Staff Recommendation

1. That the 2016 Climate Action Revenue Incentive Program (CARIP) and Carbon Neutral Progress Report from the Director, Engineering dated April 27, 2017, be received for information.
2. That, in accordance with Provincial requirements, the CARIP Report and Carbon Neutral Progress Report be posted on the City's website for public access.

John Irving, P.Eng. MPA  
 Director, Engineering  
 (604-276-4140)

Att. 3

<b>REPORT CONCURRENCE</b>	
<b>CONCURRENCE OF GENERAL MANAGER</b> 	
<b>REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE</b>	<b>INITIALS:</b> 
<b>APPROVED BY CAO</b> 	

## Staff Report

### Origin

The City of Richmond is committed to maintaining carbon neutral corporate operations, first achieved in 2013. The purpose of this report is to update Council on the 2016 corporate greenhouse gas (GHG) emissions and on the City's carbon neutrality strategy and activities.

This report supports Council's 2014-2018 Term Goal #4 Leadership in Sustainability:

- 4.1. *Continued implementation of the Sustainability Framework.*
- 4.2. *Innovative projects and initiatives to advance sustainability.*

### Background

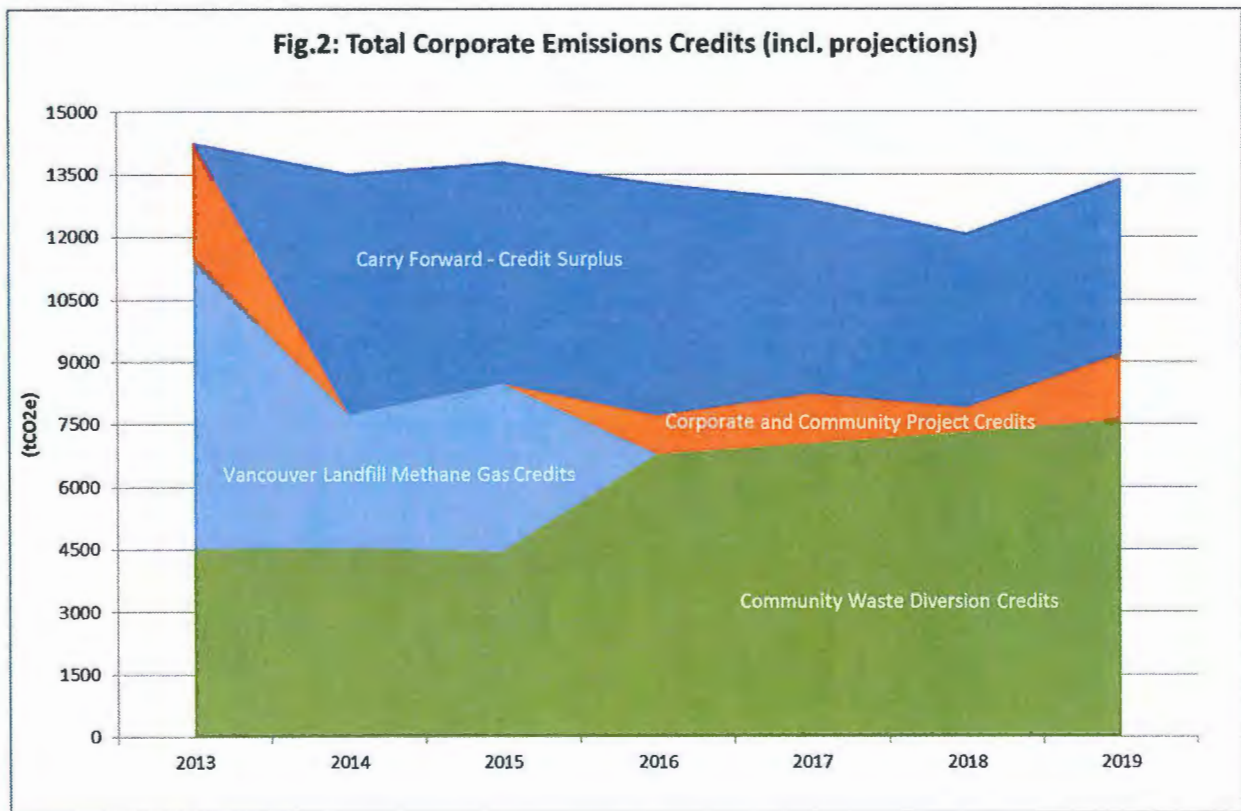
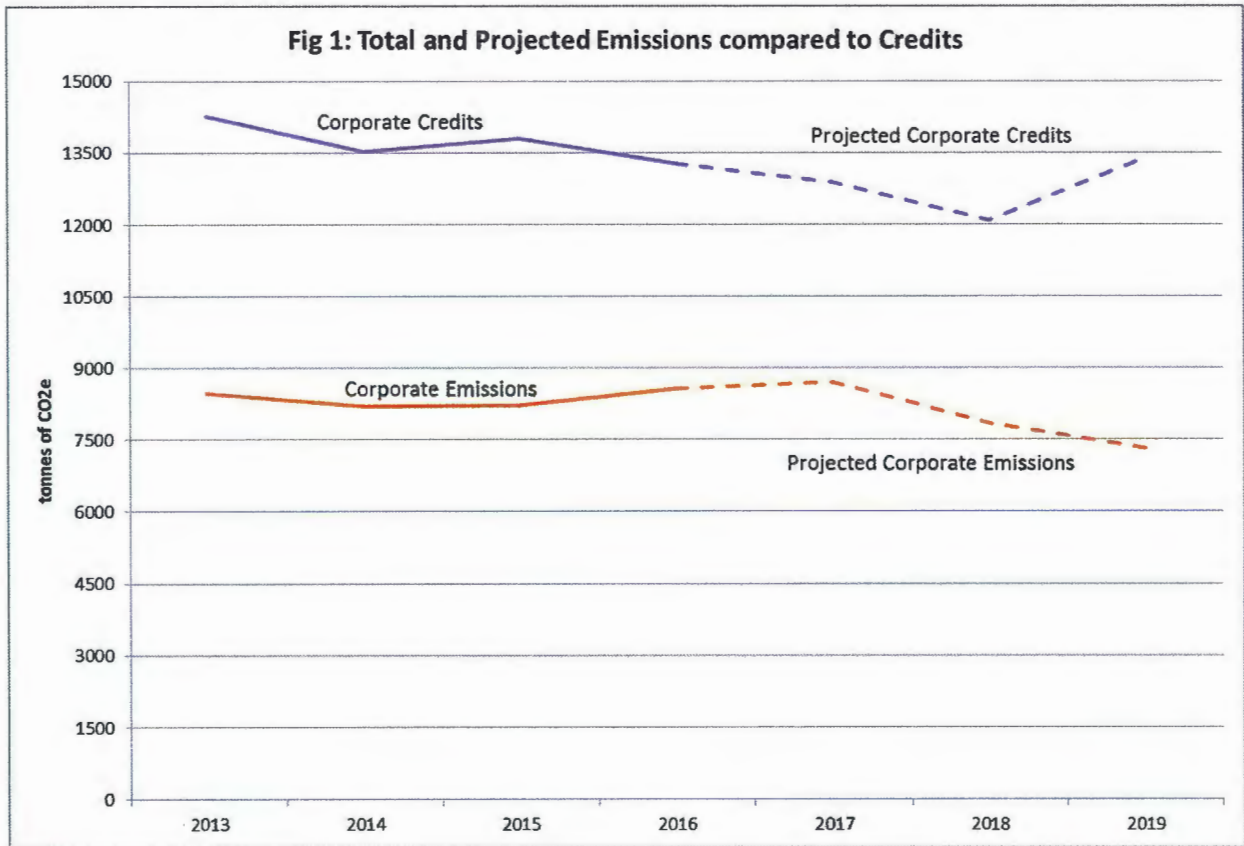
In September 2008, Council signed the BC Climate Action Charter, voluntarily committing the City to annual corporate GHG emissions reporting and to achieving carbon neutral operations. In 2013, Richmond City Council adopted the "*Towards Carbon Neutrality: Implementation Strategy*," which put in place an effective framework defined by four key steps for meeting carbon neutrality commitments: measure, reduce, compensate (or offset) and report.

Key mechanisms identified in the 2013 strategy to address the need for compensation included assessing and quantifying beyond "business as usual" corporate activities that reduce GHG emissions and the implementation of the Richmond Carbon Market pilot program to purchase offsets from Richmond-based projects.

Guided by the City's 2013 Green Fleet Action Plan and Energy Management Program for buildings and infrastructure, the City is constantly working on reducing its corporate GHG emissions footprint and energy use. To meet the City's community commitment of 33% reduction from 2007 levels by 2020, Council has endorsed a 20% GHG emissions reduction target for Fleet by 2020 from 2011 levels and a 65% reduction for corporate buildings by 2020 from 2007 levels.

### Analysis

The City has achieved carbon neutral operations for the past four reporting years, including 2016. Achieving carbon neutrality for corporate operations entails that the City reduces corporate emissions where possible and offsets corporate emissions as necessary. Due to the City's involvement in and completion of several emissions reduction projects since 2013, the City has been carrying forward a surplus of credits. The surplus has been allocated to following years as needed to achieve carbon neutrality. Based on the ongoing work to reduce corporate emissions and the ongoing accumulation of verified emission credits, the City is projecting that carbon neutrality will be maintained through to the 2019 reporting year, as shown below in Figure 1. The source of credits that the City has achieved and projects to achieve up to 2019 is shown below in Figure 2.



2016 Corporate Carbon Emissions and Offsets

Based on the figures in Table 1 and 2 below, outlining GHG emissions associated with corporate operations in City buildings, civic infrastructure and fleet activities for 2016 and the associated credits to offset these emissions, staff anticipate that the City will again be eligible for a “Level 3: Achievement of Carbon Neutrality” in 2016 through the Climate Action Recognition Program. A formal announcement is expected to be provided at the Union of British Columbia Municipalities’ annual conference. It is estimated that the City will carry forward approximately 4,669 tonnes of GHG (tCO<sub>2</sub>e) emission offsets for use in future years. Table 2 also includes future credits that are currently being quantified and will be used in future reporting years once completed.

The reported corporate figures adhere to the BC Ministry of Environment’s reporting methodology, and include GHG reductions resulting from the City’s purchase of renewable natural gas. The 2016 total includes GHG emissions associated with “traditional municipal services,” including those that are contracted out (community waste collection). Compared to the year prior to the City signing the BC Climate Action Charter, corporate emissions in 2016 were approximately 20% lower than in 2007. This reduction was achieved despite an increase in population of approximately 17% and corresponding increases in corporate services that are associated with this growth.

Table 1: 2016 Emission Sources

	<b>Tonnes CO<sub>2</sub>e</b>	<b>Quantification Method</b>
Emissions from services delivered directly by the City	6,688	Derived from metered energy consumption and associated GHG emissions from stationary sources (buildings, lighting, and pumps – except police services energy use) and corporate mobile sources (fleet – except construction related fuel use) used directly by the City
Emissions from contracted services delivering services on the City’s behalf	1,877	The BC government standard methodology and guidance for estimated contracted emissions. Fuel usage values and Option 3 (Vehicle/Equipment Type and Hours of Usage) were used to determine the contracted emissions value.
<b>TOTAL</b>	<b>8,565</b>	

Table 2: Anticipated Emission Credits (Offsets)

<b>Offsets</b>	<b>Tonnes CO<sub>2</sub>e</b>	<b>Quantification Method</b>
Household Organic Waste Composting – Municipally Collected	6,765	BC Government Option 1 GHG Reduction Projects reporting method.
Corporate concrete and asphalt recycling – Sidaway Yard	831	BC Government Option 2 GHG Reduction Projects reporting methods (for 2014-2016).
Richmond Carbon Market – Pacific Gateway Hotel energy efficiency credits	106	BC Government Option 1 GHG Reduction Projects reporting method.
Surplus GHG emission credits from 2015 Reporting Year	5,575 <sup>a</sup>	As per BC Government reporting protocol.
Alexandra District Energy Utility (2017)	500-700*	BC Government Option 2 GHG Reduction Projects reporting methods (for 2013-2016)
Northeast Bog (2018)	Over 1,000*	BC Government Option 2 GHG Reduction Projects reporting methods (for 2011-2016)
<b>Total projected credits</b>	<b>14,777-14,977*</b>	
Estimated surplus carry forward for 2017	4,712	
Anticipated additional surplus credits	1,500-1,700*	

<sup>a</sup>) In 2015, based on previous reporting years it was anticipated that the City's carry forward credit surplus would be 6,004 tCO<sub>2</sub>e. As a result of unexpected changes to Metro Vancouver conversion factors for waste diversion, the carry forward surplus dropped to 5,575 tCO<sub>2</sub>e. This change made no difference in the City's carbon neutrality status for 2015.

\*) current estimates, projects to still be quantified

### 2016 Corporate and Community Carbon Credits (Offset Projects)

As shown above in Table 2, emission credits from diverted household organic waste contributed significantly to offsetting the City's corporate emissions footprint. As compared to 2015, the total amount of diverted organic waste from the City's community collection program increased 16% to 21,477 tonnes in 2016. The total diverted organics for 2016 corresponds to avoided GHG emissions of 6,765 tonnes of CO<sub>2</sub>e, representing 79% of the City's 2016 total corporate emissions.

In accordance with BC Government Carbon Neutral reporting protocol, the City completed the necessary reporting, quantification and verification of two corporate projects outside of the City's traditional services boundary.

1. Concrete/Asphalt Recycling: Since 2014, the City has been periodically recycling concrete and asphalt at its Sidaway Yard, which is then used as road base material on City construction sites. This activity helps to displace the use of mined and processed virgin road base material. A third-party certifier reviewed the GHG emissions reductions associated with this recycling activity. Since the corporate recycling activity began in 2014, 831 tonnes of emissions have been avoided from the reduction of virgin road base use through to the end of 2016. As further recycling and reprocessing is conducted in the future, emissions reductions associated with this activity will continue to be used to offset corporate emissions.

2. Building Energy Efficiency Retrofit: Through the Richmond Carbon Market pilot program, the City worked with Pacific Gateway Hotels to assess and quantify the emissions reductions the facility achieved from various energy efficiency upgrades completed prior to 2015. By upgrading mechanical equipment and improving the building envelope, Pacific Gateway reduced its GHG emissions by 106 tonnes in 2015. This project was the first project the City completed through the Richmond Carbon Market program, with the credits being transferred to the City through a purchase and transfer agreement. The City is the first municipality in the Lower Mainland to utilize this method to support emissions reductions in the community while at the same time reducing its own emissions footprint. For future reporting years, the City will have the opportunity to continue purchasing these annual credits from Pacific Gateway through this program. Further detail on the Richmond Carbon Market pilot program is presented below.

“Non-Traditional” Corporate GHG Emissions Reduction Projects

The quantification and verification of two non-traditional municipal service projects that are “beyond business as usual” are on-going (described below in Table3), and it is expected that the associated credits from these projects will be used to offset corporate emissions in 2017 and 2018 respectively.

Table 3: Corporate GHG Emissions Reduction Quantification Projects

		<b>Status</b>	<b>Estimated GHG (tCO<sub>2</sub>e)</b>
1. Alexandra District Energy Utility	Renewable energy transfer for community housing, displacing natural gas and electricity	A verification consultant has engaged to complete the quantification of this project and final verification is expected to be completed in July 2017 – in time for 2017 reporting	500-700*
2. Northeast Bog	Conservation purchase and enhancement of a bog ecosystem to maintain its carbon storage capacity	Undergoing carbon assessment and hydrogeological study – quantification project is in initial stages and final verification is expected to be completed in May 2018 – in time for 2018 reporting	Over 1,000
*Estimated credits include reduction actions for 2016 and prior years			<b>Total 1,500-1,700</b>

Since operations and assets at Alexandra District Energy Utility (ADEU) were transferred to the City’s Lulu Island Energy Corporation (LIEC) on January 1, 2017, emission reduction credits from past ADEU operations (2014-2016) will be quantified and verified, and will be used to offset 2017 reported corporate emissions.

As the City works to shift its energy systems to use more sustainable sources, the City has identified district energy utilities (DEUs) as a key component of sustainable energy systems that can be implemented in neighbourhoods undergoing redevelopment. Some of the key benefits of implementing DEU systems include; using energy more wisely with less waste, increasing energy security and reliance, providing cost effective energy to the community, and reducing the associated GHG emissions. As the City’s DEU operations grow through LIEC, so too will the associated GHG emissions reductions that are derived from the displacement of conventional energy sources with renewable systems. Since LIEC is a separate corporation, it will have the

opportunity to continue to quantify and verify emissions reduction on a yearly basis for ADEU, as well as for other district utility systems. Based on Provincial reporting protocols, those reduction credits could be transferred back to the City through a purchase agreement or sold to a third party, if desired.

The GHG emission offsets associated with the Northeast Bog can be pursued since the City intends to conserve the land and maintain the carbon storage capacity of the bog. The carbon storage amount of the Northeast Bog is compared to the scenario where the land would have otherwise been developed for agricultural purposes. The conserving of the Northeast Bog is expected to result in significant GHG emission reduction credits. This quantification project is very unique, in terms of the type of ecosystem being assessed, the focus on carbon storage capacity of the Site, and the development of a carbon quantification methodology. It is believed that this work will help to inform the City and the region on the importance of conserving and enhancing this type of ecosystem.

### Richmond Carbon Market

Council endorsed the Richmond Carbon Market is a program designed to reduce GHG emissions and build community resilience by re-investing Climate Action Revenue Incentive Program funds in Richmond-based emissions reduction projects.

- Phase 1: Determine the Potential for Local GHG Reduction Projects (through outreach)
- Phase 2: Identify Potential Local GHG Reduction / Offset Projects, and complete pre-feasibility assessments
- Phase 3: Complete final assessments and quantify the RCM submissions, and enter into agreements with proponents to offset corporate GHG emissions
- Phase 4: Maintain corporate carbon neutrality
- Phase 5: Continue to help grow the City's low carbon economy

Staff have completed Phases 1 to 3 of this initial round of the pilot project, and finalized its first agreement with Pacific Gateway Hotels through this program. Unfortunately due to unexpected circumstances, three of the proponents identified in the original request for projects are not able to complete the quantification of their projects for inclusion in the RCM program. One original RCM project remains a potential source of future corporate credits, Ecowaste Industries' enhanced landfill re-vegetation and carbon sequestration project. Quantification of emissions reductions from the Ecowaste project has been delayed due to alterations to the original project parameters. The City remains committed to trying to reach an agreement with Ecowaste Industries if possible, although the project is not expected to be re-stabilized for another year or two. The funding for the RCM pilot program, allocated from the Provincial Climate Action Revenue Incentive Program grant, was previously approved in the 2014 operating budget process and remains in place to fulfill the completion of a potential Ecowaste purchase and funding agreement.

The City remains committed to identifying additional potential community partners with quantifiable GHG emissions reduction projects for inclusion in the program. Through an upcoming round of request for projects, Staff expects that further community projects can be brought forward for Council consideration, and further carbon credits can be accumulated to support the City's carbon neutral status.

Public Reporting

Another tool to build community awareness regarding the importance of GHG emissions reduction is through public reporting. The City will carry out public reporting on the City's website (Climate Action Charter related reports Attachments 1-3). Staff will continue to use the City's Richmond Carbon Market as a means to engage Richmond business to develop potential credits, and promote its general objectives to the business community to encourage greater awareness and focus on overall community GHG emissions reductions.

**Financial Impact**

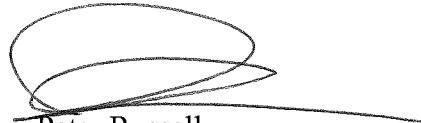
None at this time.

**Conclusion**

The City of Richmond is a leader amongst BC municipalities through its innovative corporate projects and programs to reduce community and corporate GHG emissions. Through the continued strategic implementation of the *Towards Carbon Neutrality – Implementation Strategy*, the City is well positioned to maximize corporate and community benefits of transitioning towards a low carbon community and maintain carbon neutral corporate operations in the long term.



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LH:lh

- Att. 1: Carbon Emissions Provincial Reporting Worksheet - 2016
- Att. 2: Climate Action Revenue Incentive Public Report - 2016
- Att. 3: Contracted Emissions Estimates (Hired Equipment and Cascade) - 2016



## 2016 Carbon Neutral Progress Report



Emissions/Offsets	Tonnes CO2e
<b>Annual City of Richmond corporate emissions (as per Provincial reporting protocol)</b>	<b>8,565</b>
<i>Emissions from services delivered directly by the local government</i>	6,688
<i>Emissions from contracted services</i>	1,877
<b>Less:</b> GHG reductions being claimed for this reporting year from Option 1 - GHG reduction project	<b>6,871</b>
<i>Household Organic Waste Composting</i>	6,765
<i>Solar Thermal</i>	
<i>Energy Efficient Building Retrofits and Fuel Switching (Pacific Gateway Hotels)</i>	106
<i>Low Emissions Vehicles</i>	
<i>Forest Conservation</i>	
<b>Less:</b> GHG reductions being claimed for this reporting year from Option 2 - GHG reduction projects	<b>6,406</b>
<i>Option 2 Project A –Corporate Concrete and Asphalt Recycling at Sidaway Yard</i>	831
<i>Option 2 Project B – Surplus Carbon Credits from 2015 Reporting Year</i>	5,575
<b>Less:</b> <i>Offsets purchased for this reporting year (Option 3). Please identify your offset provider in the offset provider information section below.</i>	n/a
<b>Total GHG emissions reductions claimed for 2016</b>	<b>13,277</b>
<b>Balance of corporate emissions for this reporting year.</b> <i>(If the corporate emissions balance is zero or negative, your local government is carbon neutral for this reporting year)</i>	<b>-4,712</b>

## Climate Action Revenue Incentive Program (CARIP) Public Report

# Climate Action Revenue Incentive (CARIP) Public Report for YEAR 2016

City of Richmond

Metro Vancouver



### Report Submitted by

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The City of Richmond has completed the 2016 Climate Action Revenue Incentive Program (CARIP) Public Report as required by the Province of BC. The CARIP report summarizes actions taken in 2016 and proposed for 2017 to reduce corporate and community-wide energy consumption and greenhouse gas emissions (GHG), as well as general sustainability related initiatives.

April 19, 2017

### General Information

<b>Name of Local Government</b>	City of Richmond
<b>Member of Regional District (RD)</b>	Metro Vancouver
<b>Regional Growth Strategy (RGS) in region</b>	Yes
<b>Population</b>	218,000

Page 1

## Table of Contents

1. GENERAL REPORT INFORMATION .....	3
2. BROAD PLANNING .....	3
2.1. Community Actions .....	4
2.2. Corporate Actions .....	5
3. BUILDINGS AND LIGHTING .....	5
3.1. Community Actions .....	6
3.2. Corporate Actions .....	7
4. ENERGY GENERATION .....	7
4.1. Community Actions .....	8
4.2. Corporate Actions .....	9
5. GREENSPACE/NATURAL RESOURCE PROTECTION.....	9
5.1. Community Actions.....	9
5.2. Corporate Actions .....	10
6. SOLID WASTE .....	11
6.1. Community Actions .....	11
6.2. Corporate Actions .....	12
7. TRANSPORTATION .....	13
7.1. Community Actions.....	14
7.2. Corporate Actions .....	15
8. WATER AND WASTEWATER .....	16
8.1. Community Actions.....	16
8.2. Corporate Actions .....	17
9. CLIMATE ADAPTION .....	17
9.1. Community Actions.....	18
10. INNOVATION .....	18
11. PROGRAMS, PARTNERSHIPS AND FUNDING OPPORTUNITIES .....	19
12. CONCLUSION.....	19



## 1. GENERAL REPORT INFORMATION

This 2016 Climate Action Revenue Incentive Program (CARIP) Public Report documents the actions that the City of Richmond has taken corporately and in the community to support the reduction of greenhouse gas (GHG) emissions and energy use, as well as other sustainability related initiatives. The actions are separated into seven main categories; Broad Planning, Buildings and Lighting, Energy Generation, Greenspace/Natural Resource Protection, Solid Waste, Transportation, Water and Wastewater, and Climate Adaptation. There are also is an Innovation category, which the City has inputted action items. The categories are further divided into corporate and community related actions, with general climate action questions at the beginning of each category.

This report encompasses a majority of the action items that the City is involved in to support GHG and energy reduction, but does not cover all sustainability related initiatives that the City conducts or supports. The report represents a “snapshot” of City activities over the past year, and proposed actions for 2017.

## 2. BROAD PLANNING

Broad planning refers to high level planning that sets the stage for GHG emissions reductions, including plans such as Official Community Plans, Integrated Community Sustainability Plans, Climate Action Plans or Community Energy Emissions Plans. Land use planning that focuses on Smart Growth principles (compact, complete, connected, and centred). Broad Planning plays an especially important role in energy and GHG reduction. Summarized below are the City of Richmond’s responses to the Provincial inquiries regarding broad planning issues, and summary of initiatives conducted in 2016 and planned in 2017.

General Climate Action Questions	
What is (are) your current GHG reduction target(s)?	GHG reduction targets of 33% by 2020, and 80% by 2050, below 2007 levels. Reduce energy use by 10%.
Has your local government used the Community Energy and Emissions Inventory (CEEI) to measure progress?	Yes
Which of the following does your local government use to guide climate action implementation? <ul style="list-style-type: none"> <li>• Community Energy and Emissions Plan</li> <li>• Integrated Community Sustainability Plan</li> <li>• Community-Wide Action Plan</li> </ul>	Yes Yes Yes
Does your local government have a corporate GHG reduction plan?	Yes
Does your local government have a climate reserve fund or something similar?	Yes

## 2.1. Community Actions

<b>Community-Wide Actions Taken in 2016</b>	
	The City's OCP was amended to incorporate the Arterial Road Land Use Policy, which identifies areas along the City's Arterial Roads that are appropriate for more energy efficient housing types such as duplex, triplex and row house development.
	Continued to implement the OCP and City Centre Area Plan (CCAP) directives as new development applications are processed. The plans direct the majority of Richmond's urban growth to the City Centre and near major transit stations.
	Continued to ensure new developments within the City Centre Area were "District Energy Utility (DEU) Ready" for future connection to a district energy system, as per the City by-law.
	Worked with Translink in developing the Southwest Area Transport Plan to define Richmond's long-term transportation network and priorities, which also encompasses, South Delta and Tsawwassen First Nation.
	Met regularly with Richmond's Small Home Builders and Urban Development Institute when preparing new community building related sustainability initiatives

<b>Community-Wide Actions Proposed for 2017</b>	
	Revise zoning regulations on the size of homes on agricultural land to ensure farmland is protected.
	Continue to implement OCP and CCAP policies as new development applications are processed.
	Continue to meet with Richmond's Small Home Builders and Urban Development Institute when preparing new community building related sustainability initiatives.
	Revise the Steveston Area Plan and include measures that promote a more compact, sustainable, energy efficient, and pedestrian friendly built environment
	Continue development of the Southwest Area Transport Plan.
	Implement and support the installation electric vehicle charging infrastructure in select new private developments.
	Continue to follow City by-law requirements and implement "DEU" ready development in the City Centre and West Cambie neighborhood areas



## 2.2. Corporate Actions

Corporate Wide Actions Taken in 2016	
	Continued to implement the corporate High Performance Building Sustainability Policy. This policy sets targets for the construction of energy efficient new corporate buildings and sets in place processes to ensure that energy and resources are used efficiently in existing buildings.
	Continued to implement action items from the City's Green Fleet Action Plan, to reduce GHG emissions associated with the City's vehicle and equipment use.
	Continued to adhere to the Corporate Building, Equipment, Monitoring, and Integration Requirements, which sets out guidelines for equipment energy efficiency, energy and GHG emissions monitoring requirements, and the integration of buildings and equipment into the City's network.

Corporate Wide Actions Proposed for 2017	
	Review the incorporation of a step code for new corporate buildings, with the goal of effectively improving building energy and sustainability performance
	Continue to implement the corporate High Performance Building Sustainability Policy.
	Continue to implement action items from the City's Green Fleet Action Plan
	Continue to implement Corporate Building, Equipment, Monitoring, and Integration Requirements

## 3. BUILDINGS AND LIGHTING

Low-carbon buildings use the minimum amount of energy needed to provide comfort and safety for their inhabitants and tap into renewable energy sources for heating, cooling and power. These buildings can save money, especially when calculated over the long term. This category also includes reductions realized from energy efficient street lights and lights in parks or other public spaces. Below are the City of Richmond's responses to the Provincial inquiries regarding building and lighting initiatives conducted in 2016 and planned for 2017.

General Climate Action Questions	
Does your local government have green building/construction policies, plans or programs?	Yes

### 3.1. Community Actions

<b>Community-Wide Actions Taken in 2016</b>	
	Continued to implement building and district energy policies. Secured commitments from new development in the City Centre to achieve LEED Silver, and townhome developments city-wide to build to EnerGuide 82 standard.
	Established a "Solar Friendly Richmond Framework", outlining actions to better enable solar energy system implementation in Richmond.
	Continued with the following EnergySave Richmond suite of programs. <ul style="list-style-type: none"> <li>• Building Energy Challenge, a friendly competition to save energy use over the course of the year, 2016 was the second year of the program that now has over 95 buildings involved and over 7.0 million square feet of property.</li> <li>• Richmond Carbon Marketplace pilot program, which supports community based GHG emissions reduction projects through facilitation and funding</li> <li>• Smart Thermostat Pilot Program involved 150 participants, providing a \$125 rebate on a smart thermostat.</li> <li>• Climate Smart program that provides coaching to Richmond-based businesses on cost-effective opportunities to reduce GHG emissions, energy use, and waste generation</li> </ul>
	Through a water and energy save program, installed efficient spray-valves and water fixture aerators, and conducted energy and water savings assessments at 99 food service facilities. The program is projected to save 73 million litres of water and over 500 tonnes CO <sub>2</sub> e annually.
	Supported implementation of the Climate Change Showdown in 20 Richmond Grades 4-7 classrooms.

<b>Community-Wide Actions Proposed for 2017</b>	
	Implement electric vehicle direct current fast charging stations in the City, to further encourage the use and development of electrical vehicles.
	Implement new BC Energy Step Code requirements for new developments through bylaw requirements and policies applied at rezoning.
	Implement a benchmarking, reporting and disclosure bylaw for buildings.
	Continue to implement EnergySave Richmond suite of programs. <ul style="list-style-type: none"> <li>• Host Year 3 of Building Energy Challenge.</li> <li>• Continue to provide the Smart Thermostat Program.</li> <li>• Continue to host Climate Smart program for businesses.</li> <li>• Continue to implement water and energy saving programs.</li> <li>• Continue to offer the Richmond Carbon Marketplace pilot program to Richmond businesses.</li> </ul>
	Continue to support climate change education in up to 20 Richmond classrooms.



### 3.2. Corporate Actions

<b>Corporate Wide Actions Taken in 2016</b>	
	Completed energy efficiency upgrades at City Hall, Steveston Community Centre, Fire Halls, and other corporate facilities that will reduce energy use by approximately 1.3 GWh, or equal to annual energy use of 30 single family homes in Richmond
	Completed Phase 1 of the City of Richmond street lighting conversion project, with the replacement of approximately 1,050 less energy efficient street light fixtures with new more efficient LED technology, for an estimated energy savings of over 240,000 kWh annually
	Initiated the internal Energy Statement reporting functionality to further engage City staff in corporate energy reduction initiatives.
	Initiated the upgrade of the mechanical building automation system at the Library Cultural Centre to help improve overall occupant comfort and equipment scheduling and monitoring

<b>Corporate Wide Actions Proposed for 2017</b>	
	Complete mechanical upgrades at Watermania, Richmond Ice Centre, and at Library Cultural Centre
	Complete the upgrade of the building automation systems at Fire Hall No.4 and No.5, and at the Community Safety Building to improve overall occupant comfort and equipment scheduling and monitoring
	Complete Phase 2 of the City of Richmond street lighting conversion project, with the replacement of approximately 1,000 less energy efficient street light fixtures with new more efficient LED technology
	Continue to work towards achieving key targets in the City's High Performance Building Policy for new and existing facilities, with focus on energy efficiency, reduced resource use, and environmental sustainability.

## 4. ENERGY GENERATION

A transition to renewable or low-emission energy sources for heating, cooling and power supports large, long-term GHG emissions reductions. Renewable energy including waste heat recovery, geo-exchange, micro hydroelectric, solar thermal and solar photovoltaic, heat pumps, tidal, wave, and wind energy can be implemented at different scales, e.g. in individual homes, or integrated across neighbourhoods through district energy or co-generation systems. Below are the City of Richmond's responses to the Provincial inquiries regarding energy generation, and summary of initiatives conducted in 2016 and planned in 2017.



<b>General Climate Action Questions</b>	
Is your local government currently developing or constructing new district energy projects?	Yes
Is your local government currently developing or constructing a new renewable energy system?	Yes
Is your local government operating a district energy centre?	Yes
Is your local government operating a renewable energy system?	Yes
Is your local government connected to a district energy system that is operated by another energy provider?	No
Are you aware of the integrated resource recovery (IRR) guidance page on the BC Climate Action Toolkit?	Yes

#### **4.1. Community Actions**

<b>Community-Wide Actions Taken in 2016</b>	
	Completed Phase 4 of the Alexandra District Energy Utility (ADEU), which included the construction of a new energy centre to service the ADEU's first commercial customers, new residential customers, and a connection to the new Fire Hall No.3. The expansion increased ADEU's service totals to 1,200,000 ft <sup>2</sup> of residential space and 335,000 ft <sup>2</sup> non-residential space.
	Increased the floor space serviced by the Oval Village District Energy Utility (OVDEU), in partnership with a private utility, to 1,413,000 ft <sup>2</sup> (a total of 1,343 units).
	Issued a request for proposals to find a partner to design, finance, build and operate City Centre North District Energy Utility (CCNDEU).

<b>Community-Wide Actions Proposed for 2017</b>	
	Continue to connect buildings and expand the ADEU distribution system as development requires. Currently, one new residential building (115,000 ft <sup>2</sup> ) is scheduled for connection.
	Continue OVDEU construction in partnership with private utility partner. Install additional distribution piping and connect two new developments with a total of 480,000 ft <sup>2</sup> of building gross floor area.
	Negotiate a partnership agreement to design, finance, build and operate CCNDEU with a private utility partner.
	Complete a feasibility study on the potential of micro sewer heat recovery infrastructure to be included as part of new multi-family and commercial development.

## 4.2. Corporate Actions

Corporate Wide Actions Taken in 2016	
	Completed a feasibility study on the installation of solar photovoltaic array at the new Minoru Complex and Fire Hall No.1
	Completed the connection of the new Fire Hall No.3 to the corporate Alexandra District Energy Utility Centre, which provides heating and cooling through a renewable geexchange system.

Corporate Wide Actions Proposed for 2017	
	Continue to target renewable energy integration, a key component of the City's High Performance Building Policy, during design development of new corporate facilities.
	Install solar photovoltaic array at Fire Hall No.1 to offset electrical demand.

## 5. GREENSPACE/NATURAL RESOURCE PROTECTION

Greenspace/Natural Resource Protection refers to the creation of parks and greenways, boulevards, community forests, urban agriculture, riparian areas, gardens, recreation/school sites, and other green spaces, such as remediated brownfield/contaminated sites as well as the protection of wetlands, waterways and other naturally occurring features. Greenspaces support climate change mitigation (reducing emissions by absorbing and sequestering GHG) and adaptation (providing shade, cooling, deflecting strong wind, and improving air quality). Below are the City of Richmond responses to the Provincial inquiry regarding "greenspace" management in the City, and summary of community initiatives conducted in 2016 and planned in 2017.

General Climate Action Questions	
Does your local government have urban forest policies, plans or programs?	Yes

### 5.1. Community Actions

Community-Wide Actions Taken in 2016	
	Adopted an Invasive Species Action Plan (ISAP), which is a strategic, risk based approach to guide and prioritized invasive species management in Richmond.
	Integrated the Ecological Network Management Strategy (ENMS) directives in over 15 projects, increasing native planting, connecting areas, and protecting sensitive habitat in the City.
	Planted 590 trees on City streets and parks, as per the City's Tree Management Plan
	In partnership with the David Suzuki Foundation and the Richmond School District, the City mentored the Richmond's Green Ambassadors who developed and delivered the 5 <sup>th</sup> annual ReaDY Summit – a youth led conference promoting environmental awareness and action. The theme for the 2016 summit was "Change Happens Now: The World is Rooted in our Backyard"
	Began development of the 136 acre Garden City Lands Conservation Area and Farm site that is within the ALR and is a remnant of the former Greater Lulu Island Bog.



### Community-Wide Actions Proposed for 2017

	Complete the Urban Forest Management Strategy and begin implementation of the Strategy's recommendations.
	Continue to advance the actions and initiatives identified in the City's ENMS to protect, restore and connect the City's Ecological Network in the following focus areas: <ul style="list-style-type: none"><li>- Green infrastructure and development;</li><li>- Vegetation, habitat and wildlife;</li><li>- Parks and public spaces; and stewardship and collaboration.</li></ul>
	At the Garden City Lands Conservation Area and Farm, complete the construction of the 900m seepage barrier to protect the bog, complete tree and shrub planting around the perimeter of the site including 935 trees and 55,224 shrubs, grasses, perennials, etc., and prepare a 5 acre farm area to facilitate Kwantlen Polytechnic University's Sustainable Agriculture degree program
	Continue to work in partnership with the David Suzuki Foundation and Richmond School District to mentor Richmond's Green Ambassadors to develop and deliver the 6 <sup>th</sup> annual Ready Summit –where the 2017 theme is "Going toward another 150."
	Host 29 free community workshops under the Enhanced Pesticide Management Program to reduce pesticide use and create a more sustainable community.

## 5.2. Corporate Actions

### Corporate-Wide Actions Taken in 2016

	Initiated a carbon assessment of the Northeast Bog Conservation Area, to model the carbon storage implications of the land as compared to agricultural development.
	Undertook a riparian compliance review to inform regulatory changes to protect and enhance the riparian area in accordance with the Riparian Area Regulation.
	Undertook a multi-year program to manage Japanese Knotweed infestations in and around City infrastructure and sensitive habitat.
	Developed a planting plan and completed site preparation for native species and shrubs planting along the City's new 5 km Railway corridor greenway, which is intended to function as an ecological corridor.
	At the City owned Terra Nova Rural Park Pollinator Pasture, planted 60 trees and 160 shrubs and forbes to enhance pollinator habitat and assist the agricultural production of the Sharing Farm's farming programs in the park.
	Established two demonstration lawns, one at City Hall, the other at Garden City to showcase alternative ground covers that utilize pollinator attracting/native grass species to mitigate infestations of European Chaffer Beetles.

<b>Corporate Wide Actions Proposed for 2017</b>	
	Complete a hydrological assessment of the City's Northeast Bog conservation area, to help finalize the City's carbon assessment.
	Complete the development of the Garden City Lands Water and Ecological Resource Management Strategy including recommendations for construction and management practices and long-term monitoring of the bog ecosystem.
	Complete the planned planting of native trees and shrubs along the Railway Greenway Corridor for Phase 2 of the project.
	Continue to detect and respond to invasive species encroachment on City property effectively

## 6. SOLID WASTE

Reducing, reusing, recycling, recovering and managing the disposal of solid waste minimizes environmental impacts and supports sustainable environmental management, greenhouse gas reductions, and improved air and water quality. Below are the City of Richmond responses to the Provincial inquiries regarding solid waste management in the City, and summary of initiatives conducted in 2016 and planned in 2017.

<b>General Climate Action Questions</b>	
Does your local government have construction and demolition waste reduction policies, plans or programs?	Yes
Does your local government have organics reduction/diversion policies, plans or programs?	Yes

### 6.1. Community Actions

<b>Community-Wide Actions Taken in 2016</b>	
	Introduced Bylaw 9516, which effective April 1, 2016, requires that 70% of waste from single-family home demolitions to be diverted from disposal – Contractors are assessed a \$2.00 per square foot refundable fee if they meet the 70% waste diversion requirement.
	Served approximately 145,000 customers at the Recycling Depot, using the facility to recycle material such as; large appliances, batteries, cell phones, and Styrofoam.



### Community-Wide Actions Taken in 2016

Conducted numerous community engagement and information on waste reduction, recycling and avoiding food wastage. <ul style="list-style-type: none"><li>• Delivered 38 recycling and waste reduction workshops with approximately 860 attendees</li><li>• Organized 10 DreamRider theatrical shows for Zero Heroes with more than 3,710 attendees</li><li>• Provided five Recycling Depot tours for 105 students/teachers</li><li>• Participated in in six community events to promote waste reduction and recycling initiatives.</li></ul>
Green Ambassadors contributed 2,327 hours to promote waste diversion at special events and participated in community outreach and invasive plant removals.
Introduced Donation Bin Regulation Bylaw No. 9502 that established approved locations for non-profit group to place bins for clothing or other household items throughout the community.
Supported recycling and waste reduction at over 50 community events.

### Community-Wide Actions Proposed for 2017

Review and report progress on Demolition and Recycling Material Bylaw.
Update the Multi-Family and Commercial Guidelines to ensure multi-family and commercial developments are designed with accessible and adequate space for garbage and recycling services.
Install in-ground containers in high traffic and/or remote public spaces to increase waste capacity concerns and reduce service frequency.
Continue public engagement through workshops, depot tours, community displays, and theatrical shows.
Continue to increase awareness of the expanded range of materials accepted in the Blue Box and Blue Cart recycling programs, including proper recycling practices under the MMBC partnership, to reduce contamination and increase recycling levels.

## 6.2. Corporate Actions

### Corporate Wide Actions Taken in 2016

Continued to expand in-house recycling to more City facilities through the City's WeRecycle program, which includes organics collection and expanded the range of materials accepted for recycling.
Supported Community Services department with their Annual Purge Event to properly recycle paper, large/small appliances, batteries, electronics and hazardous materials.
Assisted with the implementation of the Sustainable Food Service Quick Guide to ensure all facilities are using sustainable dinnerware that can be recycled/composted through Richmond recycling programs.

**Corporate Wide Actions Proposed for 2017**

Conduct corporate site and visual audits of the garbage and recycling stations to ensure that staff are disposing of materials in the correct receptacles and develop a renewed communication plan based on its results.
Conduct a waste reduction lunch and learn event for City staff to inform them of community and corporate opportunities to reduce waste
Continue promoting the corporate WeRecycle program, to encourage staff to increase corporate waste diversion

**7. TRANSPORTATION**

Transportation actions that increase transportation system efficiency, emphasize the movement of people and goods, and give priority to more efficient modes, e.g. walking, cycling, ridesharing, and public transit, can contribute to reductions in greenhouse gas emissions and more livable communities. Below are the City of Richmond responses to the Provincial inquiries regarding transportation system management in the City, and summary of initiatives conducted in 2016 and planned in 2017.

**General Climate Action Questions**

Does your local government have policies, plans or programs to support:	
• Walking	Yes
• Cycling	Yes
• Transit Use	Yes
• Electric Vehicle Use	Yes
• Other: car-sharing, carpooling	Yes
Does your local government have a transportation demand management (TDM) strategy (e.g. to reduce single-vehicle occupancy trips, increase travel options, provide incentives to encourage individuals to modify travel behavior)?	Yes
Does your local government have policies, plans or programs to support local food production (thus reducing transportation emissions)?	Yes



## 7.1. Community Actions

<b>Community-Wide Actions Taken in 2016</b>	
	<p>Completed multiple projects to improve transit, biking, and pedestrian accessibility including:</p> <ul style="list-style-type: none"> <li>• Upgraded two special crosswalks on arterial roads (No. 2 Road and Gilbert Road) to pedestrian signals to support the implementation of the Crosstown local street bikeway</li> <li>• Completed the Parkside local street bikeway along Ash Street (Williams Road-Granville Ave)</li> <li>• Upgraded special crosswalk on arterial road (Westminster Hwy) as part of northern extension of the Railway Greenway multi-use pathway to the Middle Arm Dyke Trail</li> <li>• Upgraded 24 bus stops to improve accessibility,</li> <li>• Initiated construction of off-street multi-use pathway on Dyke Road</li> <li>• Rehabilitated off-street multi-use pathway on Shell Road</li> <li>• Constructed sidewalk and pathways on 7<sup>th</sup> Avenue and Bridgeport Rd to support walking and access to nearby transit services.</li> <li>• Upgraded 27 signalized intersections to include accessible pedestrian signal features</li> </ul>
	Staged 16 <sup>th</sup> annual "Island City, by Bike" tour for the community to encourage cycling as a mode of transportation.
	Supported education and encouragement programs for cycling and walking (e.g., Bike to Work/School Week, cycling education courses for students and adults, Walk Richmond program, school travel planning partnership with TransLink)
	Continued partnership with TransLink to identify and encourage alternative travel modes to decrease single occupant vehicles trips to/from business parks and industrial areas in Richmond

<b>Community-Wide Actions Proposed for 2017</b>	
	<p>As part of the approved Transportation Capital Budget, the following improvements and enhancements are planned to be completed in 2017:</p> <ul style="list-style-type: none"> <li>• Construct or enhance eight new sidewalks/pathways to encourage alternative modes of transportation</li> <li>• Install 2 special crosswalks and 3 new pedestrian signals including one to support access to new Minoru Complex, which includes aquatic centre and older adult's centre</li> <li>• Complete the construction of road improvement projects on Lansdowne Road (Minoru Blvd-Alderbridge Way) and Westminster Hwy (Nelson Rd-McMillan Way), which will include off-street multi-use pathways.</li> <li>• Install new transit shelters</li> </ul>
	Continue to support expansion of car-share services in Richmond
	Stage 17 <sup>th</sup> annual "Island City, by Bike" tour for the community to encourage cycling as a mode of transportation.
	Continue to support education and encouragement programs for cycling and walking.

## 7.2. Corporate Actions

<b>Corporate Actions Taken in 2016</b>	
	Continued the City's vehicle replacement program to replace older, less fuel-efficient vehicles with newer, more fuel-efficient vehicles and with best in class fuel efficiency, where possible. In 2016, 37 units were replaced and 12 more units were ordered for 2017.
	Implemented a GPS system Fleet vehicle tracking project in 60 select vehicles to help with route planning and weather response, to improve fuel efficiency and reduce emissions.
	Developed and delivered a unique "Auntie"-idling and driver awareness campaign for staff, along with newsletters, t-shirts, key chains, message boards and posters
	Continued other operational improvements as described in the Green Fleet Action Plan, including reducing growth and downsizing the Fleet, incorporation of more electric and hybrid vehicles where possible, and right sizing of existing and new assets. The Green Fleet Action Plan target is to reduce the City's overall Fleet emissions by 20% in 2020 from 2011 levels.
	Implemented a car sharing pilot program for City Hall and City Center Community staff
	Completed a Fleet usage audit by the Finance department that reviewed the usage of the Fleet to see where reductions in the fleet size could be accomplished.
	Continued existing initiatives that encourage the use of alternative modes of transportation for commuting to and from work and corporate travel such as sponsorship and promotion of Bike to Work week, use of corporate bike fleet, pilot use of pedal-electric bike, and promotion of transit fare passes for work travel

<b>Corporate Actions Proposed for 2017</b>	
	Continue replacing older less efficient City fleet vehicles with newer, more fuel- efficient vehicles, where possible.
	Evaluate the results of the Fleet's GPS tracking project involving 60 select vehicles to and institute routing efficiency initiatives to reduce Fleet vehicle trip times and fuel use
	Continue corporate subsidy of City Employee Carpool Program
	Continue with the Auntie Idling Campaign and newsletter and focusing on what staff have done to reduce emissions and highlighting why they care
	Continue to support use of alternative modes of transportation for work related travel, including cycling, providing transit passes for work trips, and carpooling.
	Continue to explore alternative fuelling options for Fleet vehicles that will reduce emissions and operational issues



## 8. WATER AND WASTEWATER

Managing and reducing water consumption and wastewater is an important aspect of developing a sustainable built environment that supports healthy communities, protects ecological integrity, and reduces greenhouse gas emissions. Below are the City of Richmond responses to the Provincial inquiry regarding water and wastewater management in the City, and summary of initiatives conducted in 2016 and planned in 2017.

### General Climate Action Questions

Does your local government have water conservation policies, plans or programs?	Yes
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### 8.1. Community Actions

#### Community-Wide Actions Taken in 2016

	Installed 2,225 water meters at single-family residences (approximately 93% of single-family homes in the City of Richmond are now metered)
	Issued 748 toilet rebates to homeowners that replaced old toilets with a low-flush toilet to reduce residential water use. The total incentive paid to homeowners through this program in 2016 was \$74,800.
	Partnered with BC Hydro to provide a clothes washer rebate program to reduce home water and electricity use. In 2016, 294 rebates were issued to homeowners who replaced their less efficient (water and electricity) washer for a new efficient model at a total cost to the City of \$20,200. This program in 2016 is expected to result in an estimated annual savings in water and energy of 1,655,600 liters per year and 53,800 kilowatt hours per year, respectively.
	Installed meters for 141 existing multi-family residential complexes (comprising 8,585 dwelling units) through the volunteer water meter program. It is mandatory for new multi-family residences to have a water meter. A total of 40% of the multi-family units in Richmond now have a water meter.
	Provided 150 free water saving kits to Richmond households that included a low-flow showerhead, kitchen and bathroom tap aerators and a pop-flush device for toilets.

#### Community-Wide Actions Proposed for 2017

	Continue the single family and multi-family water meter installation programs
	Continue the toilet rebate program (\$100,000 in funding for 2017)
	Continue offering the water saving kits and free leak audits to homeowners with a newly installed water meter.
	Continue to participate in the clothes washer rebate joint program in May/June and October/November with BC Hydro in 2017.
	Continue the City's Rain Barrel Program and promote the use of rain water for gardening and irrigation purposes.

## 8.2. Corporate Actions

Corporate Actions Taken in 2016	
	Continued to participate in the Metro Vancouver Municipal Water Conservation Coordinator Committee. The meetings revolve around networking with other municipalities and discussing initiatives, progresses, updates in policies and results through group communication.
	The City of Richmond corporately supported Metro Vancouver's We Love Water campaign by utilizing their comprehensive assortment of Twitter and Facebook digital graphics, internally and in the community.
	Installed further recommended conservation measures at the ten previously water audited buildings

Corporate Actions Proposed for 2017	
	Continue to take part in the Metro Vancouver Municipal Water Conservation Coordinator Committee.
	Continue to follow the City's landscaping best practices, which emphasize planting grasses and plants at corporate facilities that require little or no irrigation water.
	Replace all domestic hot and water copper mains in the City Hall building with Aquatherm pipe to address pin hole leaks

## 9. CLIMATE ADAPTION

For local governments, adaptation to a changing climate can take the form of changes in policy, management, technology and behaviour that minimize negative impacts or exploit opportunities. It can involve both "hard" and "soft" solutions, including: changes in infrastructure engineering, planning, zoning, bylaws and public education. Below are the City of Richmond responses to the Provincial inquiries regarding climate change adaption, and summary of initiatives conducted in 2016 and planned in 2017.

General Climate Action Questions	
Are you familiar with the Plan2Adapt guidance located on the Climate Action Toolkit Website?	Yes
Are you familiar with "Preparing for Climate Change - An Implementation Guide for Local Governments in BC?"	Yes
Have you visited the climate change adaptation guidance page on the BC Climate Action Toolkit?	Yes



## 9.1. Community Actions

<b>Community-Wide Actions Taken in 2016</b>	
	Continued development of Dike Master Plan Phase 2, which is a blue print for dike improvements in advance of Climate Change Induced Sea Level Rise.
	Continued implementing the 2008-2031 Richmond Flood Protection Strategy
	Established the Integrated Rainwater Resource Management Strategy that aims to protect and enhance the City's stormwater conveyance infrastructure and ecological assets under more frequent rainfall events and considers rainwater as a resource to be utilized, by promoting its conservation and public re-use where possible.

<b>Community-Wide Actions Proposed for 2017</b>	
	Complete the design for Phase 3 of the Dike Master Plan, which includes raising the South Dike from Gilbert Rd to No.3 Rd to 4.7m geodetic
	Continue implementing the 2008-2031 Richmond Flood Protection Strategy
	Engage and communicate with locals about the tsunami risks in Richmond using the simulation model developed by DFO through the City's website and at public events.

## 10. INNOVATION

This section is intended to give the opportunity to describe any innovative Corporate and/or Community-Wide GHG reduction or climate change adaptation activity that have been undertaken over the past year(s) that your local government is particularly proud of and would like to share with other local governments. Below is summary of two of the innovated initiatives that the City implemented in 2016.

<b>Community-Wide Innovative Action</b>	
	Implemented and supported a free City workshop, entitled "An Introduction to Electric Vehicles", that was offered to residences to try to reduce any misconceptions about owning an electric car and to answer any questions residents might have. The course was delivered by a Richmond resident that owns an electric vehicle.

<b>Corporate Innovative Action</b>	
	Completed the Fraser Basin Councils Fleet certification program, called E3 Fleet, which awarded the City's Fleet Operations a Platinum rating, the highest rating that can be awarded. Through its efficient operation and detailed reporting the City has successfully implemented its Green Fleet Action Plan, to help reduce Fleet fuel use, improve driver training, down size and right size vehicles, and reduce idling.

## 11. PROGRAMS, PARTNERSHIPS AND FUNDING OPPORTUNITIES

Local governments often rely on programs, partnerships and funding opportunities to achieve their climate action goals. Please share the names of programs and organizations that have supported your local government’s climate actions by listing each entry in the box below.

Programs and Funding	
	Through BC Hydro’s Commercial and Community Energy Savings Programs, the City has partnered and received support from BC Hydro on numerous infrastructure and community engagement related projects, including, lighting upgrades, electrical vehicle infrastructure and engagement, and policy initiatives.
	In conjunction with Municipal programs and funding, TransLink provides funding to support a variety of alternative modes of transportation initiatives and community engagement activities towards cycling education and promotion initiatives including; <ul style="list-style-type: none"> <li>• Bike to Work/School Week</li> <li>• cycling education courses for elementary students and adults</li> <li>• construction of pedestrian and cycling-related infrastructure</li> </ul>
	Additional support for transportation related infrastructure was received by the City from BikeBC (BC Ministry of Transportation & Infrastructure) and ICBC.
	In conjunction with BC Hydro’s clothes washer rebate program, the City further increased the rebates received by local residents and promoted this program through City mailouts.
	The City was successful in securing support funding from the Federation of Canadian Municipalities to complete feasibility studies researching the cost and opportunity to install solar PV systems at two new facilities, and the cost and opportunity to extract energy from community wastewater during re-development.

## 12. CONCLUSION

This report highlights a wide range of initiatives that the City is undertaking to continue to advance sustainability corporately and in the community, with focus on reducing greenhouse gas emissions, and energy and resource use. This report does not encompass all of the sustainability related initiatives and actions that the City is involved in, but simply provides a “snapshot” of some of the key areas and work that the City has completed and is planning on completing. These efforts help to position the City as a leader in our region and beyond. The City has set aggressive sustainability targets on a range of fronts, including for greenhouse gas emissions reduction and waste diversion. The City will continue to pursue best practices and innovation to achieve its sustainability related goals, which are recognized as critical to Richmond’s Vision of “being the most appealing, liveable and well-managed community in Canada”.

## CARIP/Carbon Neutral Progress Report Reporting Year 2016

### Supporting Documentation Contracted Emissions Template

<p><b>LOCAL GOVERNMENT</b></p> <p>City of Richmond 6911 No. 3 Road Richmond, BC V6Y 2C1</p>
<p><b>PROJECT DESIGNATE</b></p> <p>Levi Higgs, Corporate Energy Manager, Sustainability &amp; District Energy Direct 604-244-1239 <a href="mailto:lhiggs@richmond.ca">lhiggs@richmond.ca</a></p>
<p><b>RATIONALE</b></p> <p>An estimation methodology for hired equipment contractor emissions is being utilized for 2016 since actual emissions for some contracts over \$25,000 have not provided fuel usage values.</p> <p>The City has identified four main contract areas that deliver traditional municipal services:</p> <ol style="list-style-type: none"> <li>1. Cascades Recovery Inc. and BFI provide recycling depot container collection and recycling services</li> <li>2. Sierra Waste Services provide residential solid waste and recycling services;</li> <li>3. Progressive Waste Solutions provides waste and recycling collection services at City facilities.</li> <li>4. Individual Hired Equipment.</li> </ol> <p>Contractor emissions associated with the delivery of traditional municipal services by Sierra Waste Services and Progressive Waste Solutions have been included in our mobile fleet emissions reporting spreadsheet, as fuel usage and vehicle type information was provided for 2016. Contractor emissions associated with the delivery of services by Cascades Recovery and Hired Equipment were estimated by from total kilometers and hours driven, respectively.</p> <p>The hired equipment contracted emissions, with the exception of equipment used outside of the defined traditional service boundaries or for construction rather than maintenance activities, is listed in the table below by traditional service area.</p> <p>Option 3 is the estimation methodology used:</p> <ol style="list-style-type: none"> <li>1. Hired equipment records sorted to exclude out of scope contracts;</li> <li>2. City equipment operating records assessed to determine average consumption factors in litres per charge hour or kilometers driven for each equipment family;</li> <li>3. Consumption factors used to estimated fuel consumption for contractor or hired equipment;</li> <li>4. BC GHG emissions factors applied to calculate GHG emissions.</li> </ol>

<b>CONTRACTED EMISSIONS</b>	
<b>Option 3: Vehicle/Equipment Type and Kilometers or Hours of Usage</b>	
<b>Traditional Service Area</b>	<b>Estimated Annual GHGs (tonnes)</b>
Drinking, Storm and Wastewater	331.6
Solid Waste Collection, Transportation and Diversion	10.3
Roads and Traffic Operations	83.4
Parks, Recreation, Arts, and Cultural Services	26.7
Corporate Operations	3.0
<b>Total</b>	<b>455.0</b>