



# City of Richmond

## Report to Committee

**To:** General Purposes Committee

**Date:** June 27, 2013

**From:** John Irving, P.Eng, MPA  
Director, Engineering

**File:** 10-6000-01/2013-Vol  
01

**Re:** Community Energy and Emissions Plan – Phase 2 Consultation Process

### Staff Recommendation

That the Community Energy and Emissions Plan, as described in the report from the Director, Engineering, titled "Community Energy and Emissions Plan – Phase 2 Consultation Process" dated June 27, 2013, be endorsed for the purposes of public consultation.

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

Att. 1

REPORT CONCURRENCE			
<b>ROUTED TO:</b>	<b>CONCURRENCE</b>	<b>CONCURRENCE OF GENERAL MANAGER</b>	
Transportation Policy Planning Development	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		
<b>REVIEWED BY DIRECTORS</b>	<b>INITIALS:</b> DW	<b>REVIEWED BY CAO</b>	<b>INITIALS:</b> 

## Staff Report

### Origin

Richmond is currently undertaking the second and final phase of the Community Energy and Emissions Plan (CEEP). This initiative supports Council's commitments under the BC Climate Action Charter (signed in 2008) and is in line with Council Term Goal 8.1:

*Continued implementation and significant progress towards achieving the City's Sustainability Framework, and associated targets.*

In 2010, Council endorsed Phase 1 of the CEEP and amended the City's Official Community Plan to include community-wide energy and greenhouse gas (GHG) emissions reduction targets. The purpose of the CEEP Phase 2 is to:

- Define actions towards the 2041 Official Community Plan (2041 OCP) GHG emissions reduction targets and implement related policies and strategies
- Identify additional opportunities to reduce community-wide energy use
- Quantify the impact of actions and determine the resulting energy and GHG emissions reductions over the 2041 OCP timeframe

The purpose of this report is to present the Draft CEEP Phase 2 and the recommended public consultation process.

### Background

Council adopted a comprehensive Climate Change Response Agenda in 2007 that identified priority focus areas. In 2008, the Province of BC enacted Bill 27 requiring each local government to include GHG emissions targets, policies and actions in its Official Community Plan. In response, the City completed CEEP Phase I and adopted the following community-wide energy and emissions targets:

- GHG emissions reduction targets of 33% below 2007 levels by 2020, and 80% below 2007 levels by 2050
- Energy use reduction target of 10% below 2007 levels by 2020

Public consultation on community energy and emissions has been undertaken during CEEP Phase 1 as well as during the extensive 2041 OCP consultation.

### Analysis

#### *Baseline and Projected Growth*

The Province of BC establishes the methodology for measuring community-wide energy consumption and GHG emissions and provides data inventory baselines, monitoring and reports to each local government in the form of a Community Energy and Emissions Inventory (CEEI). The CEEI baseline year was 2007, and the first update was recently completed for the year 2010. The Province has committed to future inventories to facilitate municipal monitoring of their community energy use and emissions.

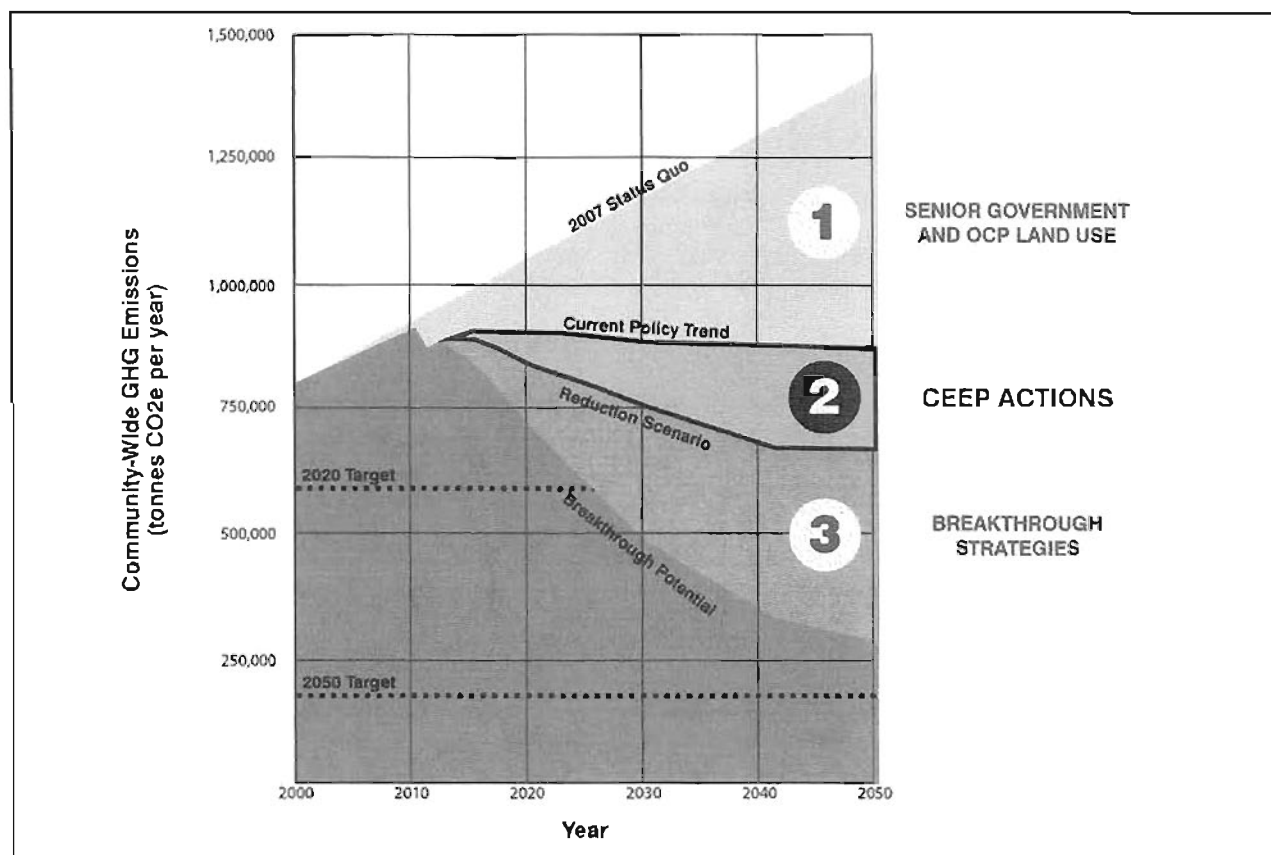
The City has completed population projections for the 2041 OCP estimating the City's 2041 population at 280,000 people, an increase of 40% from 2011. Growth provides the opportunity to build a more energy efficient community, but also makes reaching absolute targets more challenging than achieving per capita reductions.

### *Reduction Strategies*

The draft CEEP Phase 2 (**Attachment 1**) identifies the following three general groups of community-wide GHG emissions reduction strategies shown in Figure 1:

1. **Senior Government and 2041 OCP Land Use:** building standards and codes, tail pipe standards and 2041 OCP densification policies
2. **Community Energy and Emissions Plan (CEEP) Actions:** specific actions within the City's jurisdiction, deemed feasible to implement and modeled to reduce energy and emissions during the 2041 OCP timeframe
3. **Breakthrough Strategies:** possible—but not currently feasible—changes that demonstrate the scope of action required to address the remaining emissions; the CEEP does not identify actions to achieve these reductions

**Figure 1: Three Groups of Community-Wide GHG Reduction Impacts**



### **1. Senior Government and 2041 OCP Land Use**

The first group of reductions is already committed or anticipated today through Federal or Provincial actions (e.g. BC Building Code changes and improved tailpipe emissions standards) or through the City's 2041 OCP land use designations (e.g. more efficient forms of housing and reduced per capita driving distance achieved through densification).

These commitments reduce emissions from the 2007 projection to what is termed the "Current Policy Trend" (CPT) scenario and represents the expected outcome should none of the proposed actions in the CEEP be undertaken. It does, however, reflect the significant benefits from Federal and Provincial commitments and Richmond's 2041 OCP since these reductions are assumed to occur with or without the CEEP.

### **2. Community Energy and Emissions Plan (CEEP) Actions**

The second group of reductions is that expected from CEEP implementation. Many of the reductions identified are implementation actions for 2041 OCP objectives or are actions related to existing City policies and programs. However, the City is not currently committed to this suite of actions, and some actions would require more detailed assessment or a change in policy to implement.

The analysis reveals that the CEEP reductions in energy and emissions do not achieve the City's 2041 OCP targets. This is a common finding of CEEPs undertaken in the Lower Mainland that highlights the significance of the challenge.

### **3. Breakthrough Strategies**

For the above reason, a third group of reductions is assessed to better understand the impact of very aggressive measures. These are the significant changes beyond the CEEP that do not have identified implementation actions at this time. This is based on an assumption that developing technologies, changes in policy and/or regulatory powers, variable energy costs and shifting behaviours may cause these strategies—beyond the CEEP consideration today—to become implementable during the CEEP timeframe.

#### *Energy & Emissions Reductions – Result Summary*

Richmond's 2007 community-wide annual GHG emission baseline was 886,000 tonnes, or 4.7 tonnes per person. The estimated community-wide per capita GHG impacts for each general group of reductions are shown in Table 1 below.

**Table 1: Scenario Community-Wide Per Capita GHG Impacts**

Scenario	GHG emissions (tonnes per capita)		Percent change
	2007	2050	
2007 Status Quo	4.7	4.7	0%
Current Policy Trend		2.9	- 38%
CEEP Actions (Reduction Scenario)		2.2	- 53%
Breakthrough Strategies (Breakthrough Potential)		1.0	- 79%

CEEP implementation would result in an absolute 25% reduction from 2007 by 2050 with a per capita reduction of 53%. These results demonstrate progress towards the adopted reduction targets and are similar to the findings of other leading BC municipalities. They also indicate that further opportunities to reduce community-wide GHG emissions need to be identified during the 2041 OCP timeframe.

### Summary of Strategies

Strategies and actions in the CEEP are aligned with the Richmond 2041 OCP chapter headings (e.g. Neighbourhood and Buildings). The strategies are listed below and a consolidated list of actions is included in the CEEP Phase 2 Draft (**Attachment 1: page vii**):

#### Theme 1: Neighbourhoods and Buildings

- Strategy 1: Integrate Future Neighbourhood Centre Planning with Transit Planning
- Strategy 2: Increase Energy Efficiency in New Developments
- Strategy 3: Improve the Performance of Existing Building Stock

#### Theme 2: Mobility and Access

- Strategy 4: Prioritize and Fund Walking, Rolling and Cycling
- Strategy 5: Enhance Alternative Transportation Connectivity
- Strategy 6: Facilitate Changes in Transportation Behaviour and Mode Choice
- Strategy 7: Promote Low Carbon Personal Vehicles

#### Theme 3: Resilient Economy

- Strategy 8: Encourage Energy Efficient Businesses

#### Theme 4: Sustainable Infrastructure and Resources

- Strategy 9: Continue Advancement of Neighbourhood District Energy Systems
- Strategy 10: Utilize Local Energy Sources
- Strategy 11: Maximize Waste Diversion

#### Theme 5: Climate Change Leadership

- Strategy 12: Encourage Sustained Action by Senior Levels of Government
- Strategy 13: "Lead by example" with City Operations Energy Management
- Strategy 14: Engage the Community on Climate Action

## Public and Stakeholder Consultation

A staff working group met bimonthly between November 2012 and March 2013 to guide the development of the plan. Staff also provided comments on two interim drafts. Finally, as a funding partner, BC Hydro completed a critical review of the analysis and provided feedback. Staff and BC Hydro feedback is included in the draft plan with this report (**Attachment 1**).

At this stage, staff is ready to proceed with public consultation on the Draft CEEP Phase 2. The consultation plan would include the following three engagement techniques:

- **Digital Engagement:** Let's Talk Richmond interactive discussion forum and survey (July to September)
- **Stakeholder Engagement:** Presentation to Urban Development Institute Liaison Committee, Small Home Builders Group and interested Advisory Groups (July to October)
- **Public Engagement:** A major, multi-day public engagement event in the atrium of Richmond Centre mall organized to gain public feedback on priority actions in the plan. Staff would invite other community partners such as Richmond School District No. 38, BC Hydro, Fortis BC and Cadillac Fairview to share information about their activities and programs as well. (September)

## Financial Impact


None. Potential costs to implement CEEP actions would be analyzed for future reports.

## Conclusion

Richmond's 2041 OCP has provided a strong framework to pursue the City's community-wide energy and GHG reduction targets. Although progress is being made, additional actions are required. The draft CEEP Phase 2 has identified 14 strategies and related actions as well as illustrated the potential impact of future breakthrough strategies. Public consultation would provide the opportunity to present the City's existing and proposed actions and to identify further means to continue Richmond's progress towards its community-wide energy and GHG reduction targets.



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**Attachment 1 – Draft Community Energy and Emissions Plan (CEEP) Phase 2**





# **City of Richmond Community Energy and Emissions Plan Phase 2 Draft**

June 27, 2013





## Summary

### Introduction

A Community Energy and Emissions Plan (CEEP) is a strategic plan to assist Richmond with managing energy use and reducing carbon emissions within the community. It defines the role of the municipal government – working in partnership with others – to facilitate energy efficiency in the community, develop local energy sources, and to reduce greenhouse gas (GHG) emissions that form our “carbon footprint”. An energy strategy will assist Richmond in achieving the sustainable community vision it has defined in its recent Official Community Plan (OCP) update.

The objectives of this Community Energy and Emissions Plan are to:

- Define actions to implement some of the key energy-related strategies and outcomes defined in the OCP document;
- Define opportunities to reduce energy in areas not addressed by the OCP;
- Quantify the impact of these actions and determine the energy consumption and carbon emissions for the OCP period to 2041.

### Context

Scientific evidence increasingly indicates that emissions of GHGs are contributing to global climate change and that the level of these emissions must be reduced in order to forestall dramatic changes to our climate systems. In BC, the Province has required all local governments to set a target for reducing GHG emissions within their OCPs and then define policies and actions to achieve these targets. The City of Richmond previously undertook a CEEP “Phase 1” project to understand potential energy and GHG emissions reductions for the community and set a target for GHG reduction in its OCP.

### Where are we now?

While Richmond's current population is estimated to be 205,000, this plan is based on estimates from 2010, the date of both the adoption of the CEEP Phase 1 community-wide adoption targets and the most recent Community Energy and Emissions Inventory completed by the Province. This plan will be updated from time to time.

Richmond's population was approximately 195,000<sup>1</sup> in 2010, and the total amount of non-residential floor space was approximately 66 million square feet in 2009<sup>2</sup>. In 2010 the

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<sup>1</sup> BC Stats Population Estimates, September 2012.

<sup>2</sup> City of Richmond 2041 OCP Update – Employment Lands Strategy, 2011.

residents and businesses in the community consumed about 20 million GJ of energy – with a value in the range of \$440,000,000 – or about \$2,200 per resident. The "carbon footprint" of the community was just over 900,000 tonnes of CO<sub>2</sub> equivalents – or 4.5 tonnes per person annually (see Figures S-1 and S-2).

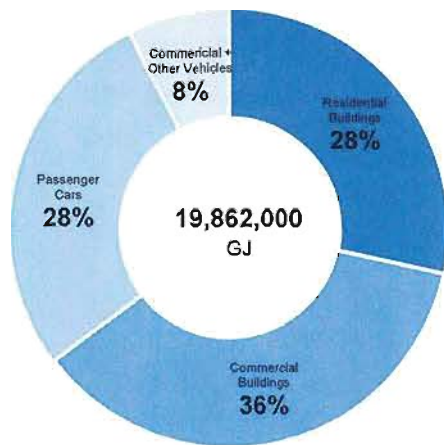


Figure S-1: Richmond 2010 Energy Consumption

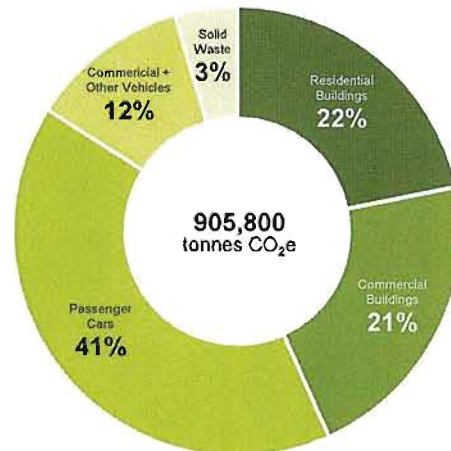


Figure S-2: Richmond 2010 GHG Emissions

### Where are we headed?

Between now and 2041 (the OCP horizon date), the population of Richmond will grow substantially – forecasted to be more than 80,000 new residents, reaching a total population of almost 280,000<sup>3</sup>. The non-residential floor space is also projected to grow, reaching approximately 88 million square feet by 2041<sup>4</sup>. Fortunately there are a number of initiatives to make our community more energy efficient and these will prevent our energy and GHG emissions from growing as fast as our population. These initiatives include increased Federal vehicle fuel efficiency standards, improved energy requirements of the BC Building Code, and the densification identified in the 2041 OCP document. These efficiencies will help to stabilize GHG emissions near their current level but will not make substantive progress towards reductions. Under a current policy trend scenario, energy use and emissions will remain at current levels.

### Where do we want to be?

In the 2041 OCP, Richmond incorporated community-wide GHG emissions reduction targets of:

<sup>3</sup> City of Richmond 2041 OCP Update: Demographics, Housing and Employment Projections Study, 2010.

<sup>4</sup> City of Richmond 2041 OCP Update: Employment Lands Strategy, 2011.

- Reduce GHG emissions by 33% from 2007 levels by 2020, and
- Reduce GHG emissions by 80% from 2007 levels by 2050.

As well, Phase 1 of the CEEP identified a community energy vision for Richmond to be:

*"an energy-wise and low-carbon community that supports a robust local economy, a healthy environment, and a safe, equitable, diverse, and resilient community."*

### How do we get there?

This plan defines 14 strategies and 33 implementation actions (note, a list of the strategies and actions is provided at the end of this summary). These actions have been developed to align with policies and objectives defined in the 2041 OCP. The actions identified are estimated to achieve reductions in GHG emissions (see Table S-1) but are not sufficient to reach the long-term targets in the OCP; however, they represent substantial reductions from taking no action at all. The estimated emissions and energy consumption reductions per capita are provided in Table S-2.

**Table S-1: Current Policy Trend (CPT) and Energy Plan Reduction Scenario: Total Community Impact**

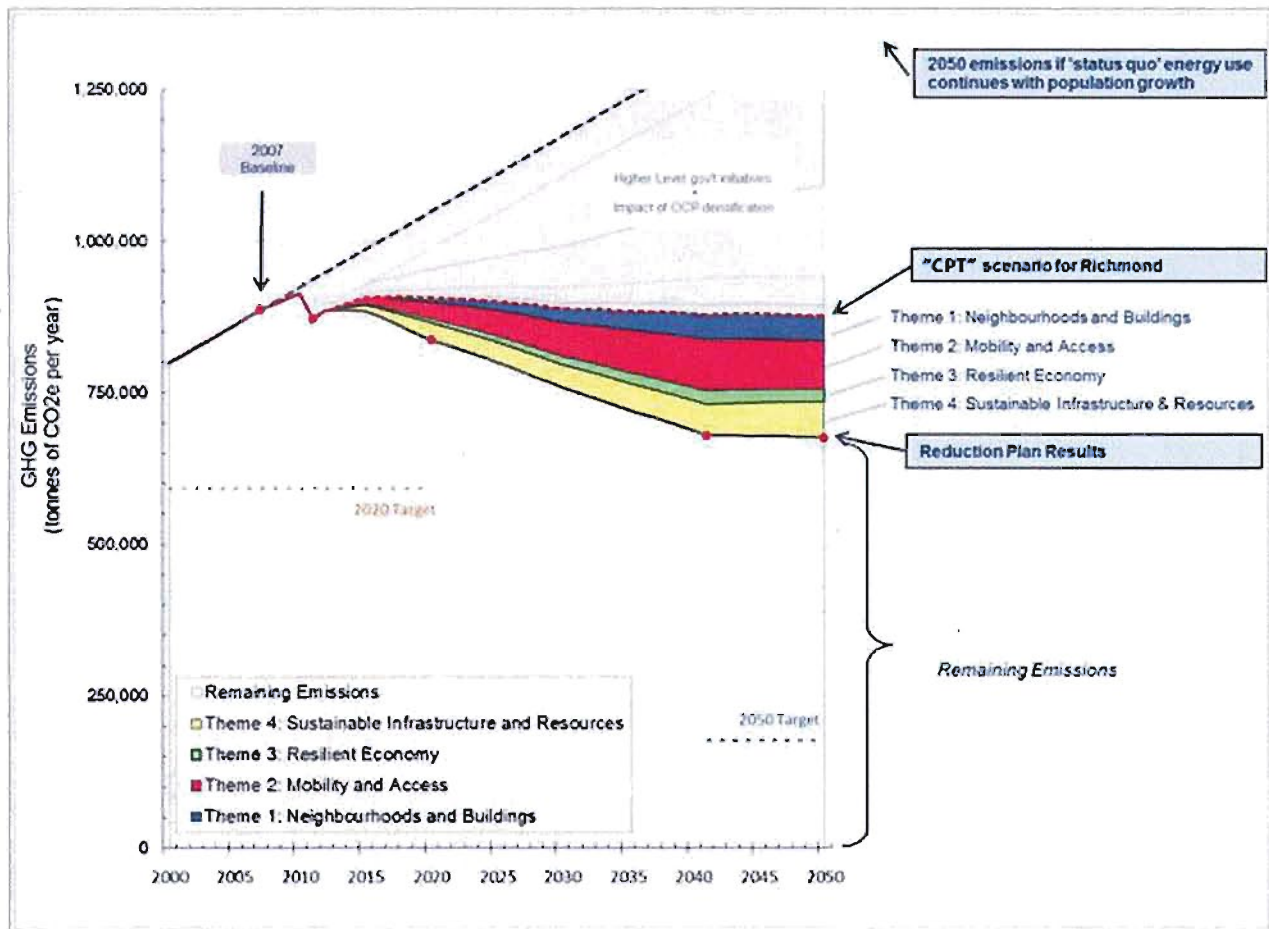
Item (% compared to 2007 baseline)	CPT	Reduction Scenario	OCP Target
2020 GHG Emissions	+ 2 %	- 6 %	- 33 %
2050 GHG Emissions	- 1 %	- 25 %	- 80 %
2020 Energy Consumption	+ 2 %	- 3 %	- 10 %

**Table S-2: Current Policy Trend (CPT) and Energy Plan Reduction Scenario: Per Capita Impact**

Item (% compared to 2007 baseline)	CPT	Reduction Scenario
2020 GHG Emissions	- 14 %	- 21 %
2050 GHG Emissions	- 38 %	- 53 %
2020 Energy Consumption	-14 %	-18 %

A graphical presentation of the impact of the reduction plan is presented as a 'carbon wedge' (Figure S-3).

Figure S-3: Carbon Reduction Wedge for the Reduction Scenario



### “Breakthrough” Opportunities

The plan actions alone will not be sufficient to reach the target levels. To explore further opportunities extending “beyond the plan”, estimates were made of the impact of “breakthrough opportunities”. The strategies selected are: (i) complete conversion of passenger vehicles to electric, (ii) Carbon Zero new buildings, and (iii) massive renovation of the existing building stock.

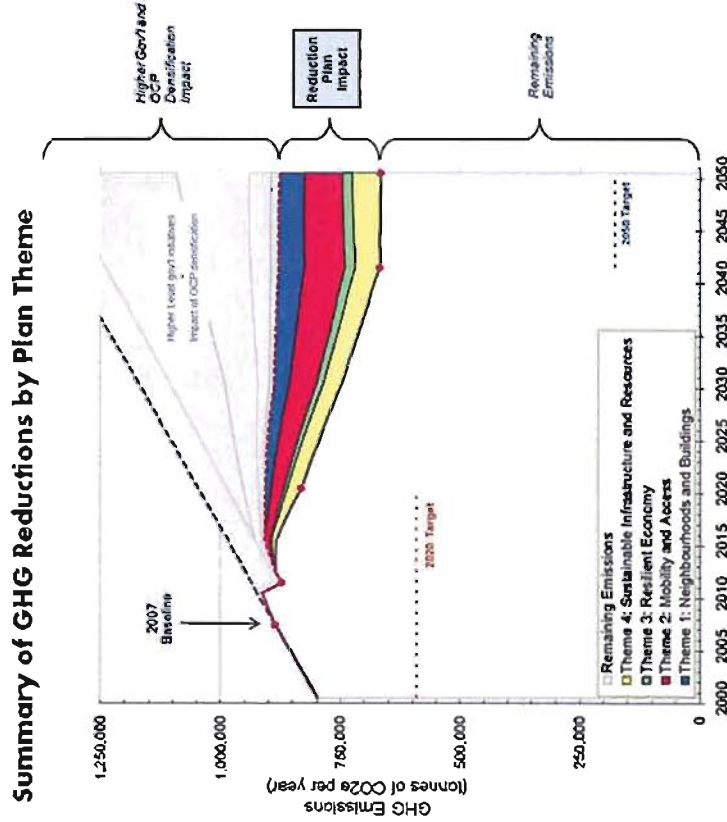
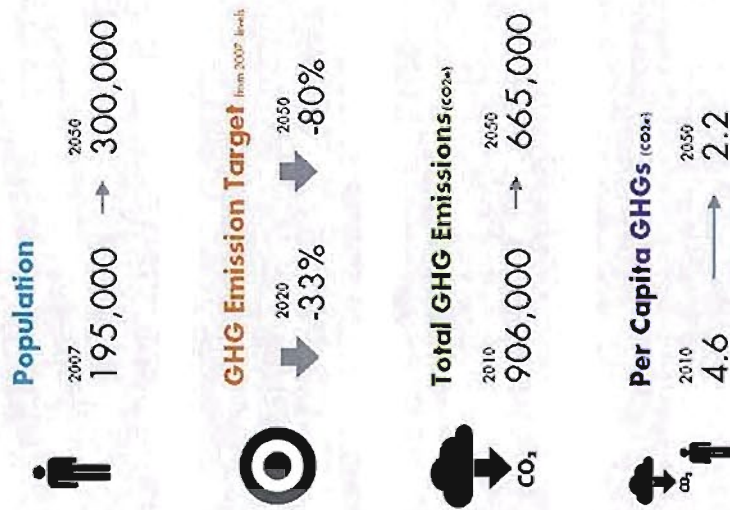
These breakthrough reductions are not achievable by the City alone – they would be the result of larger factors such as additional Federal and Provincial regulatory changes, aggressive industry development, or global pricing changes for energy or carbon. However, they do highlight that opportunities that exist today could achieve the dramatic reductions that would put the community on track to meet the OCP targets. Implementation of the plan is measured in decades, and the widespread application of these “big breakthroughs” may be plausible during this timeframe.

## **Implementation**

Implementing this plan will require a combination of existing staff resources and new effort. The 2041 OCP sets the foundation for this plan and many of the activities defined are well aligned with the existing planning skills and resources. Some items may require specific one-off or special project resources for information or policy development, and these will be budgeted for annually. It is proposed that a review of this plan be conducted about 5 to 7 years after adoption.

## Richmond Community Energy & Emissions Plan Summary At A Glance

## 2050 FORECAST



### Key Strategies in Richmond's Reduction Plan:

- Integrating Neighbourhood Centre planning with transit planning
- Promoting and incentivizing energy efficiency and alternative energy in new and existing buildings
- Prioritizing and funding walking, rolling and cycling infrastructure and connectivity
- Continuing advancement of District Energy systems
- Maximizing waste diversion



## Summary List of Actions

### Theme 1: Neighbourhoods and Buildings

#### Strategy 1: Integrate Future Neighbourhood Centre Planning with Transit Planning

- Action 1 Review Neighbourhood Centre development sequencing for flexibility
- Action 2 Collaborate with TransLink to update the Area Transit Plan (ATP)

#### Strategy 2: Increase Energy Efficiency in New Developments

- Action 3 Include energy efficiency in Neighbourhood Centre planning
- Action 4 Promote energy efficiency in all rezoning
- Action 5 Develop incentives for new development to exceed the building code energy requirements
- Action 6 Ensure that existing building code requirements are attained

#### Strategy 3: Improve the Performance of Existing Building Stock

- Action 7 Promote building efficiency through outreach and education
- Action 8 Provide Incentives for building retrofit action
- Action 9 Develop a residential energy conservation program to support housing affordability

### Theme 2: Mobility and Access

#### Strategy 4: Prioritize and Fund Walking, Rolling and Cycling

- Action 10 Prioritize walking, rolling and cycling infrastructure
- Action 11 Continue a "Complete Streets" approach in all new street construction and rehabilitation projects

#### Strategy 5: Enhance Alternative Transportation Connectivity

- Action 12 Improve pedestrian links throughout the city as the top transportation priority
- Action 13 Focus on providing safe school routes

#### Strategy 6: Facilitate Changes in Transportation Behaviour and Mode Choice

- Action 14 Implement TDM projects that incentivize non-vehicle mode choice and disincentive vehicle use
- Action 15 Reduce supply of unrestricted City-owned parking spaces
- Action 16 Provide infrastructure improvements to support increased transit service
- Action 17 Improve bike facilities and consider implementing a bike share system

#### Strategy 7: Promote Low Carbon Personal Vehicles

- Action 18 Set minimum requirements for EV infrastructure in new developments
- Action 19 Continue expanding the City-owned network of EV charging stations

### Theme 3: Resilient Economy

#### Strategy 8: Encourage Energy Efficient Businesses

- Action 20 Promote energy efficient business operations

### Theme 4: Sustainable Infrastructure and Resources

#### Strategy 9: Continue Advancement of Neighbourhood District Energy Systems

- Action 21 Reserve district energy rights of ways in new developments and road reconstruction
- Action 22 Develop a City Centre DE Right of Way Master Plan
- Action 23 Explore opportunities to connect existing buildings to DE system
- Action 24 Explore options for electricity generation from utility scale renewable sources
- Action 25 Integrate energy infrastructure into community planning

#### Strategy 10: Utilize Local Energy Sources

- Action 26 Promote building scale renewable energy

#### Strategy 11: Maximize Waste Diversion

- Action 27 Continue to implement activities to support the ISWRMP



**Theme 5: Climate Change Leadership**

**Strategy 12: Encourage Sustained Action by Senior Levels of Government**

Action 28 Continue to advocate for support from senior levels of governments

**Strategy 13: “Lead by example” with City Operations Energy Management**

Action 29 Develop long-term funding for climate activities in the city

Action 30 Integrate climate change into other municipal activities

Action 31 Provide incentives to encourage alternative transportation use by staff

Action 32 Define a climate change portfolio / staff person

**Strategy 14: Engage the Community on Climate Action**

Action 33 Develop an outreach program to residents and businesses on climate action

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## Acronyms and Abbreviations

ADEU	Alexandra District Energy Utility
CPT	Current policy trend
Bill 27	Local Government (Green Communities) Statutes Amendment Act (Bill 27, 2008)
CARIP	Climate Action Revenue Incentive Program (CARIP), a grant program to reimburse the carbon tax paid by municipalities that have signed the Climate Action Charter.
CAS	Climate Action Secretariat (of the BC Ministry of Environment)
Charter	Climate Action Charter
CEEI	Community Energy and Emissions Inventory
CEEP	Community Energy and Emissions Plan
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalents are a measure for how strong a greenhouse gas is relative to the emission of carbon dioxide. For example, emitting 1 tonne of methane gas has the equivalent impact of emitting 25 tonnes of carbon dioxide.
DA	Dissemination Area. A statistics Canada subdivision of a community. Richmond is divided into about 250 DAs
FCM	Federation of Canadian Municipalities
GHG	Greenhouse gases are gases that trap heat in the earth's atmosphere. The dominant greenhouse gas resulting from human activity is carbon dioxide (from fossil fuel combustion), followed by methane (from solid waste and agriculture).
GJ	A unit of energy – equivalent to about the energy in a tank of gasoline
LGA	Local Government Act
OCP	Official Community Plans are developed by municipalities in BC and provide a longer-term vision for the community. It guides decisions about land use, planning, and general purposes of local government. OCPs are usually developed with significant public consultation.
PCP	Partners for Climate Protection (PCP) an initiative of the FCM
RGS	Metro Vancouver Regional Growth Strategy
t	tonne – a metric tonne is equal to 1,000 kilograms
vkt	vehicle kilometres travelled

# 1 Introduction

## 1.1 What is a Community Energy and Emissions Plan?

A Community Energy and Emissions Plan (CEEP) is a strategic plan to assist Richmond to manage energy use and reduce carbon emissions within the community. It identifies objectives, policies and actions, and defines the City's role – working in partnership with others – to facilitate energy efficiency in the community, develop local energy sources, and to reduce carbon (i.e. GHG) emissions.<sup>5</sup>

## 1.2 Why have an Energy Plan?

Although it is not a legislated requirement for each local government to complete a CEEP, a plan supports the municipality in addressing the legislated requirements related to the reduction of community-wide GHG emissions. An energy strategy can also assist Richmond in achieving the sustainable community vision it defined in the 2041 OCP. Benefits of strategically planning for energy use include:

- Reducing energy costs to residents and businesses by helping them to realize more efficient energy use;
- Reducing local GHG emissions reduce the community's contribution to global climate change;
- Improve air quality – reducing the use of fossil fuels, especially in transportation, reduces the amount of air pollutants released into the air we breathe;
- Reduce vulnerability to energy markets – having a variety of energy sources and alternatives enhances resiliency to fluctuating energy prices;
- Create new jobs and business opportunities – promoting a green economy can open up new job and business opportunities;
- Sustainable communities – the activities that support energy conservation are aligned with other sustainable community objectives in the Official Community Plan such as

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<sup>5</sup> A number of terms are commonly used to describe the emissions that create climate change including: greenhouse gases –abbreviated as GHGs, carbon emissions, and the carbon 'footprint' of our energy use. For the purposes here, these all refer to the greenhouse gas emissions of the community and can be used interchangeably. While the term GHG is more technically accurate, carbon emissions and carbon footprint are more commonly used in popular communication.

building compact, complete communities, efficient infrastructure, walkable neighbourhoods, and protecting farmland and natural areas.

## **1.3 Plan Objectives**

For the past several years, Richmond has taken action to develop a more sustainable urban environment. A number of initiatives have been taken including more compact and complete neighbourhoods, incorporation of rapid transit, development of low carbon building energy sources through district energy initiatives, and promotion of alternative transportation.

A number of recent planning and policy initiatives include the development of a sustainability framework, the City Centre Area Plan (CCAP), and an updated 2041 OCP defining a direction for a more sustainable community.

Building on these initiatives, this Community Energy and Emissions Plan seeks to:

- Define actions to implement some of the key energy–related strategies and outcomes defined in the OCP document;
- Define opportunities to reduce energy in areas not addressed by the OCP;
- Quantify the impact of these actions and determine energy consumption and carbon emissions for the OCP period to 2041.

## 2 Context for Action

### 2.1 Global Climate Change

There is increasing evidence that global climate change resulting from emissions of carbon dioxide and other greenhouse gases is having an impact on the climate system of the planet. The Fourth Assessment Report (2007) of the Intergovernmental Panel on Climate Change (IPCC), states the consensus of scientific opinion that:

- Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level;
- Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in human-caused GHG concentrations, and;

In addition, climate change impacts are expected to have serious negative effects on global economic growth and development. In 2005, the UK government commissioned an independent economic review called The Stern Review, which concludes that "the benefits of strong and early action far outweigh the economic costs of not acting."<sup>6</sup> Using results from economic models, the Review estimated that if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global Gross Domestic Product (GDP) annually – potentially as much as 20% of GDP. In contrast, the costs of implementing actions to reduce GHG emissions and mitigate the impacts of climate change may be limited to around 1% of global GDP annually.

### 2.2 Action by Senior Levels of Government

#### 2.2.1 Global Action

On a global scale, the United Nations General Assembly endorsed action on climate change by establishing the United Nations Intergovernmental Panel on Climate Change (IPCC) in 1988. Since this time, there have been a number of international protocols and accords (the best known is the "Kyoto Protocol") that define each country's commitment to make reductions in greenhouse gas emissions. Subsequent policy commitments have been made at a number of IPCC meetings.

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<sup>6</sup> Nicholas Stern. *The Economics of Climate Change: The Stern Review*. Cambridge University Press, January 2007.  
[http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/independent\\_reviews/stern\\_review\\_economics\\_climate\\_change/stern\\_review\\_report.cfm](http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm)



## 2.2.2 Federal Initiatives

In Canada, senior levels of government have made commitments to reducing GHG emissions, and have developed policies, programs and initiatives to meet those commitments. New legislation, targets and actions that affect community emissions in Richmond include:

- In January 2010, the federal government set a national target to reduce GHG emissions by 17 percent, relative to 2005 levels, by 2020.
- In 2010, the federal government published the Passenger Vehicle and Light Truck Greenhouse Gas Emission Regulations under the Canadian Environmental Protection Act (CEPA) to create national vehicle efficiency standards that harmonize with the US standards. New vehicles sold in 2016 are projected to be an average of 25% more efficient than vehicles sold in 2008.<sup>7</sup>
- Currently the federal government is consulting on regulations for 2017 to 2025 that are expected to see up to a 50% reduction in GHGs from cars and light trucks by 2025 compared to 2008.
- In February 2013, details of the Heavy-Duty Vehicle and Engine Greenhouse Gas Emissions Regulations were announced to harmonize with the US standards. Emission standards will be progressively established between the 2014 and 2018 model years. Vehicles sold in 2018 will be up to 23% more efficient than vehicles sold in 2008.<sup>8</sup>

## 2.2.3 Provincial Initiatives

Since 2007 a number of provincial initiatives have been made to reduce GHG emissions in BC. These include:

- **Greenhouse Gas Reduction Targets Act (Bill 44, 2007):** establishes a province wide reduction of GHG emissions of 33% by 2020, and 80% by 2050 below 2007 levels.
- **BC Climate Action Plan:** Developed to support Bill 44, the plan's actions are estimated to achieve 73% of the reductions required to meet the reduction target. The plan and subsequent legislation included the BC carbon tax that in 2012 will reach \$30 per each tonne of GHG emissions.
- **Clean Energy Act:** In 2010 BC adopted the Clean Energy Act defining several energy objectives for BC, including achieving electricity self-sufficiency, reducing greenhouse gas emissions, meeting 66% of the increase in demand by 2020 through conservation and demand management, and investing in clean and renewable energy.
- **Local Government (Green Communities) Statutes Amendment Act (Bill 27, 2008):** which amends the Local Government Act to read:

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<sup>7</sup> Government of Canada Gazette "Regulations Amending the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations", accessed March 2013 at <http://www.gazette.gc.ca/rp-pr/p1/2012/2012-12-08/html/reg1-eng.html>.

<sup>8</sup> Environment Canada News Release "Canada Continues to Align Greenhouse Gas Emissions Measures with the United States", accessed March 2013 at <http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=3FC39747-ABF2-470A-A99E-48CA2B881E97>.

"LGA 877 (3) - An official community plan must include targets for the reduction of greenhouse gas emissions in the area covered by the plan, and policies and actions of the local government proposed with respect to achieving those targets (by May 31, 2010)"

- **BC Climate Action Charter:** A provincial initiative introduced in September 2007 to encourage local governments to become carbon neutral in their local government operations beginning in 2012.<sup>9</sup>

## 2.2.4 Regional Context

Richmond is the fourth most populated city in the Metro Vancouver region, after Vancouver, Surrey and Burnaby. Metro Vancouver<sup>10</sup> adopted a new 2040 Regional Growth Strategy (RGS) that provides guidance for land use policies and development across the region to 2040. The key energy related component of the RGS is to delineate urban growth boundaries to focus residential and commercial growth, so that agricultural, industrial, and natural areas may be preserved. The RGS identifies Richmond's City Centre as a "Regional City Centre" that is expected to see significant residential and commercial growth. Following adoption of the RGS, the City of Richmond developed a Regional Context Statement to demonstrate how its 2041 Official Community Plan (OCP) supports the RGS vision, goals and strategies.

Metro Vancouver also is a key facilitator of regional waste management and in 2010 completed an Integrated Solid Waste and Resource Management Plan (ISWRMP). The primary goal of the ISWRMP is to reduce waste by way of further diversion and energy recovery. The ISWRMP has set a target to increase the quantity of waste diverted from disposal to 80% by 2020. This target will only be achieved through a commitment to waste reduction by Richmond and other member municipalities in cooperation with Metro Vancouver.

TransLink, the regional transportation authority, plans and manages the regional transportation system – including major roads, transit and regional pathways. TransLink's Transport 2040 Goals include reducing GHG emissions from transportation, making non-auto trips the primary mode of transportation, aligning new housing and jobs with areas serviced by the frequent transit network, and facilitating efficient goods movement. In 2010 TransLink completed the Canada Line, providing Richmond with a rapid transit line connecting the airport, the City Centre, and Vancouver. Richmond's other transit service routes are defined through an Area Transit Plan (last updated in 2000). TransLink plans to update this Area Transit Plan in 2014. During the 2041 OCP process, the City envisioned a long term concept for transit network in 2041 that links future neighbourhood centres with frequent transit routes to support the goal of reducing automobile reliance and emissions.

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<sup>9</sup> Carbon neutrality means that efforts are made to reduce emissions, and that any emissions that cannot be reduced are 'neutralized' through purchase of carbon offsets.

<sup>10</sup> Metro Vancouver is a Regional District (RD) under the Local Government Act. RDs provide services to municipalities and unincorporated areas within the geographic boundary. RDs are not specifically "higher levels of government", however, they do perform functions that span across several municipalities – thus operating with a perspective beyond the city's boundaries.

## 2.3 Previous Action by Richmond

The City has recognized that it can play a role in mitigating the impacts of climate change for a number of years. This is evident in recent initiatives undertaken by the City described below.

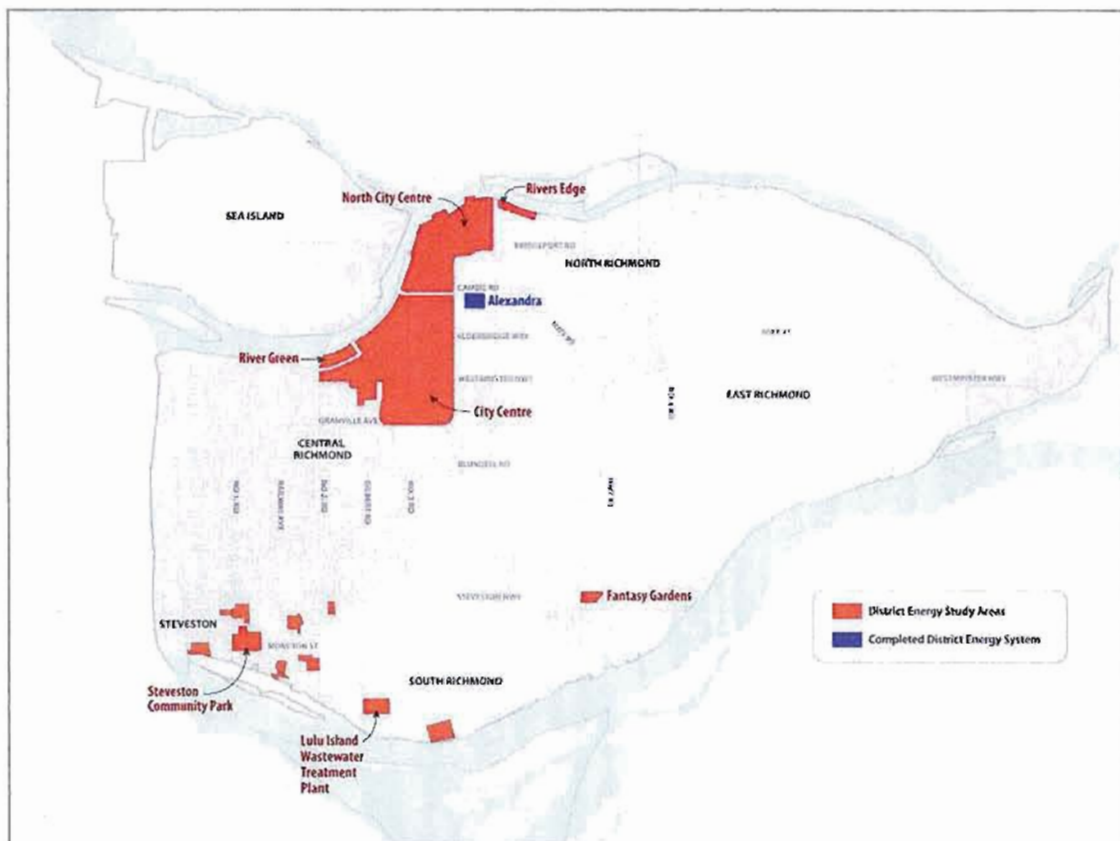
- **City Centre Area Plan:** In 2009 the City adopted a plan that prepares the City Centre area for significant levels of new growth in a manner that provides opportunities for people to live, work, play and learn in a sustainable, high-amenity environment while reducing sprawl and pressure on the suburban neighbourhoods, industrial areas and farmland (City Centre Area Plan, section 1.1). Supportive policies also include transit-oriented development, transit infrastructure and pass incentives, improved pedestrian and cycling links, and reduced parking in new developments, especially where transit accessible. Policy 2.5.2(a) requires LEED Silver equivalent for private developments over 2,000 m<sup>2</sup>.
- **Official Community Plan Update:** In 2012 the City adopted an updated OCP "Moving Towards Sustainability" that will guide community land use planning and policies for the next decade based on a long-term vision of where Richmond wants to be in 2041. The OCP provides clear direction that the majority of growth will be focused on the City Centre (55%), and that remaining growth will be accommodated as re-development along designated arterial roads and in close proximity to Neighbourhood Centres (shopping mall sites). Further to this, policies identify a need to shift the transportation priorities to pedestrians, cyclists and transit users, and away from vehicles.

The 2041 OCP update included targets for reducing GHG emissions. As directed by Council, the reduction targets were set at the level of the Provincial target – 33% by 2020 and 80% by 2050 – both from 2007 levels.

- **CEEP "Phase 1":** In response to the Bill 27 requirement to set a target for GHG reduction in an OCP, the city executed a high-level analysis of the potential for energy conservation and GHG reductions within the City. The analysis estimated that energy reductions of 7-12% by 2020 and 15-21% by 2050 were potentially achievable. Associated with this would be reductions of GHG emissions of 20-26% by 2020 and 33-41% by 2050 (all from 2007 levels).
- **Corporate Energy Management:** The City signed the Climate Action Charter and made a voluntary commitment to the Province to become carbon neutral in its operations from 2012 onwards. On the path to carbon neutrality, the City has undertaken significant efforts to reduce energy consumption in its facilities and operations.
- **District Energy (DE):** The City is actively pursuing opportunities to develop district energy systems. They have conducted several feasibility studies and have developed the Alexandra District Energy Utility (ADEU). The system in the West Cambie neighbourhood (see Figure 1) currently serves the Remy and Mayfair development through a geoexchange system. At full build out, the system will serve over 3,000 residents and a total of 3.9 million square feet of residential, commercial and office and institutional space.
- Other District Energy feasibility studies and activities included (see Figure 1):
  - The River's Edge neighbourhood (over 850,000 square feet of mixed use space)
  - The Fantasy Gardens site (approximately 560,000 square feet of mixed use space)

- Several areas in the City Centre area including North City Centre (over 6 million square feet of potentially connected space), River Green (2.7 million square feet), and City Centre main (potentially over 6.3 million square feet).
- Lulu Island heat recovery from WWTP effluent to provide heating the WWTP processes and buildings, and/or development in the Steveston area.
- City Centre redevelopment practice is to require new developments to be "DE ready" meaning that they employ hydronic heating systems that can in the future be connected to a centralized DE system.
- City Centre energy mapping. Staff developed mapping to identify the total potential heat load from the City Centre area. This process looked at each major site and identified whether it was potentially re-developable, and then estimated the thermal load if it developed to maximum potential.
- Richmond currently accesses support funding from BC Hydro for an energy manager to help provide district energy evaluation and implementation.

Figure 1. District Energy study areas in Richmond

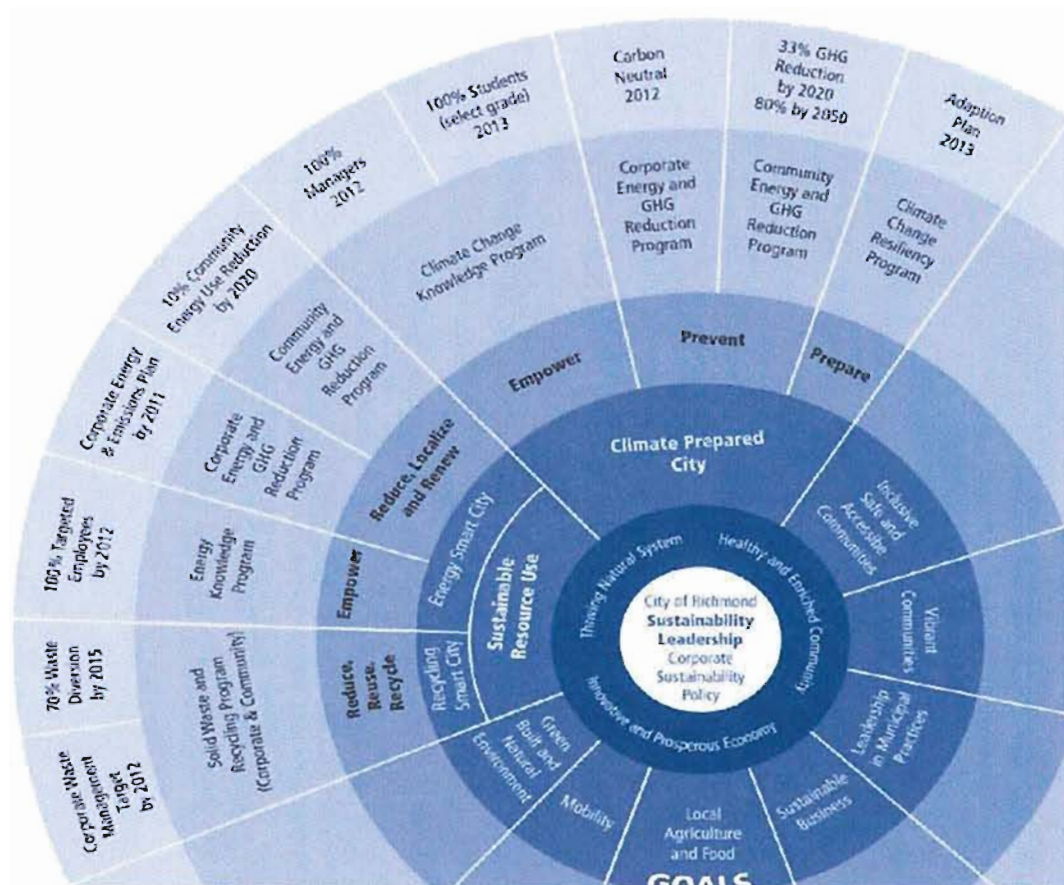


Note: The figure indicates the areas where District Energy has been studied. Not all of these areas have been determined to be promising candidates for district energy evaluation.

- **Electric Vehicle Charging Stations:** In 2013 the City is installing 10 EV charging stations in five civic locations for public and fleet use, supported by a provincial grant.
- **Active Transportation Dedicated Budget:** For 2013, Council consolidated existing funding programs to create a dedicated budget for active transportation improvements.
- **Transportation Demand Management (TDM) Measures:** TDM measures are sought from developers in exchange for relaxing parking requirements. These include providing EV charging outlets, bicycle parking and storage, end-of-trip facilities and dedicated parking stalls for car-share vehicles.
- **Solid Waste Strategic Program:** The City has set a target to divert 70% of waste by 2015 and 80% by 2020, and has developed a set of strategies and actions to get there. These targets match the regional goals set by Metro Vancouver. The City's actions include a Green Cart Pilot program to increase the uptake of food scraps composting in single-family areas, and expansion of the food scraps program to townhouses.
- **Climate Change and Energy Efficiency Awareness Programs:** The City has supported a number of awareness initiatives, including the Climate Action Showdown (an awareness program in schools), BC Hydro and Fortis energy efficiency program promotions, and the Climate Smart Initiative (support for 10 to 12 businesses in undertaking training to complete GHG emission inventories and business case analyses for energy and GHG reduction actions in their businesses).
- **Sustainability Framework:** In 2010 Council adopted a framework that will serve to guide decisions in a manner that considers the opportunities and impacts in relation to multiple community goals in nine theme areas (see Figure 2). The City is continuing efforts to complete the actions, strategies and targets in the remaining goal areas.



Figure 2. Richmond Sustainability Framework Schematic (2010)



## 2.4 BC Hydro Promotion of Energy Planning

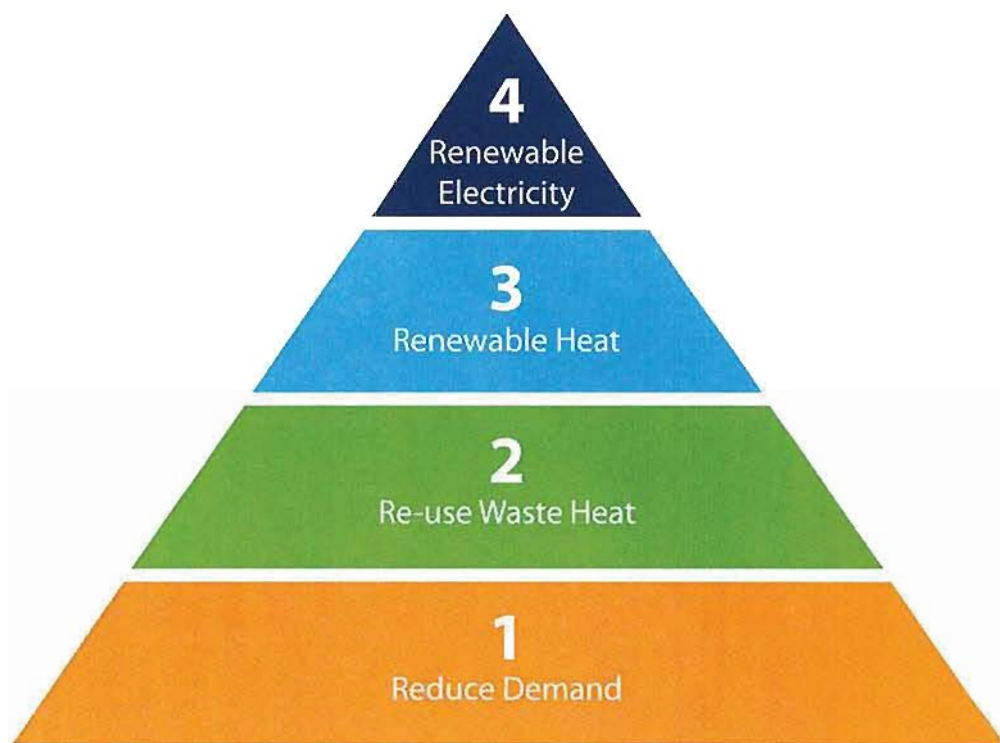
BC Hydro's Sustainable Communities Program has been supporting the development and implementation of energy efficiency and renewable energy initiatives in communities for a number of years. This program recognizes the importance of first identifying opportunities for conservation before moving into investigation of renewable energy alternatives. Figure 3, developed by BC Hydro, presents a hierarchy of priorities for energy and electricity planning as follows:

1. Reduce demand: Identify opportunities to reduce the amount of energy we need to undertake our daily activities. This requires us to be smarter about our energy use (e.g. turning down the heat) and to use more efficient technologies (better insulation, passive solar design, etc.).
2. Re-use waste heat: Find places that currently release heat into the air that could be recovered and used elsewhere. This involves building-scale technologies (e.g. heat and

drain water recovery ventilators) and also planning communities to encourage recovery of waste heat (e.g. locating a pool next to an ice rink and exchanging the heat).

3. Renewable heat: After undertaking initiatives to reduce demand and capture existing heat, next opportunities are sought to replace fossil fuels with renewable sources of heat (e.g. solar hot water heaters, heat pumps that extract heat from ground, water or air).
4. Renewable electricity: Finally, opportunities to supplement or replace electricity with local renewable sources are identified. This could entail photovoltaic solar panels, small wind turbines, or micro-hydro for generating electricity.

**Figure 3. BC Hydro's Hierarchy for Community Energy Planning**





## 2.5 Richmond 2011: Context and Recent Trends

Richmond is an island municipality situated at the west end of the Fraser River delta. The geography is flat with limited natural drainages. The island is largely agricultural in the east, and urbanized in the west. The municipality covers 130 square kilometres of land, of which approximately 50 square kilometres are within the Agricultural Land Reserve. The following sections outline key context and trends in Richmond in relation to energy and climate considerations.

### 2.5.1 Population

Richmond Context and Trends	In 2011, Richmond's Census population was approximately 190,000, an increase of almost 10% from the previous Census in 2006. <sup>11</sup> Over the same period, the population in Metro Vancouver increased approximately 9% and the population in BC increased 7%.
Energy and Climate Implications	Energy consumption and GHG emissions are strongly linked to population growth. Continued growth will lead to increasing energy consumption and GHG emissions unless our practices change.

### 2.5.2 Demographics

Richmond Context and Trends	The proportion of people under the age of 15 is declining, and the proportion of people aged 55 to 64 has grown the most.
Energy and Climate Implications	Improving infrastructure for walking and rolling is aligned with the objectives to reduce GHG emissions and improve accessibility for an aging population. Supplying more diverse housing options, such as apartments and ground-oriented townhouses, near frequent transit with amenities close by also supports both demographic trends and reduced energy consumption.

### 2.5.3 Homes

Richmond Context and Trends	<p>The City Centre has seen significant growth in low and high-rise apartments in recent years. Since 1996, the number of detached dwellings has remained about the same with detached dwellings becoming a smaller share of the total dwellings (see Figure 4).</p> <p>Almost 58% of all housing across the city is over 20 years old (built before 1990), and a large percentage of these were built during the 1970s (40 years ago). Figure 5 demonstrates the period of construction for Richmond's housing stock.</p>
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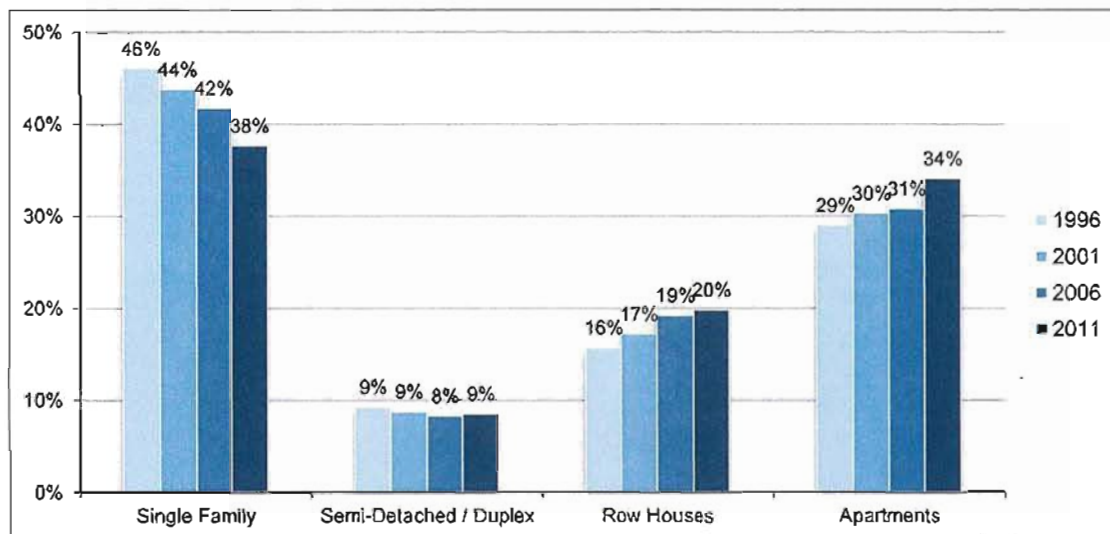
<sup>11</sup> Statistics Canada Census 2011 Profile, accessed March 2013.

## Energy and Climate Implications

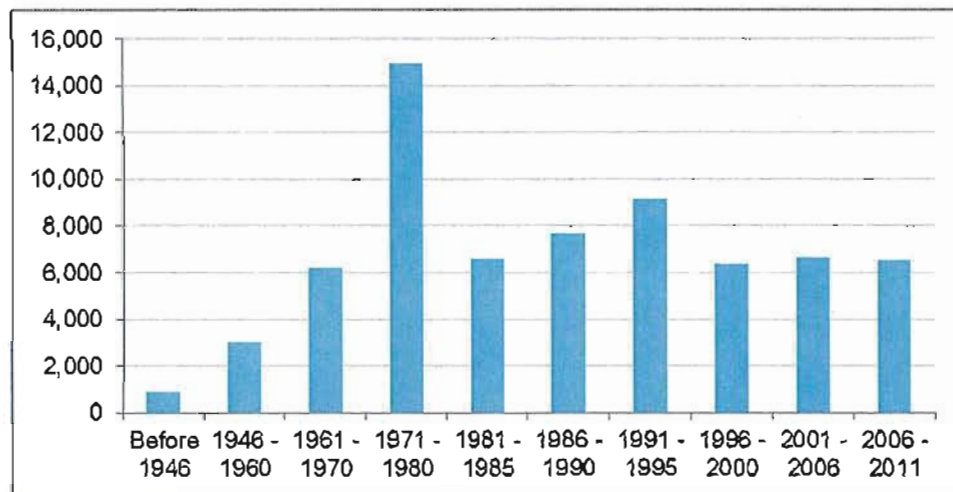
Apartments and townhouses are more energy efficient than detached homes because they tend to be smaller, and because they have less external wall space (where heat is lost). These types of homes are on average 50-80% more efficient than if built as detached homes. Smaller homes can also supply more affordable housing opportunities.

Upgrading older homes for energy efficiency can reduce energy use, heating costs and carbon emissions.

**Figure 4. Richmond Housing Types 1996-2011**



**Figure 5. Period of Construction for Homes in Richmond, 2011**



## 2.5.4 Mobility

### Richmond Context and Trends

Almost 80% of trips in Richmond are by automobile (see Figure 6). Since the Canada Line opened in 2010, residents in Richmond have reduced automobile trips by 3% and increased use of transit by 4%.

Walking and cycling trips remain roughly the same between 2008 and 2011 (8% and 1% respectively, see Figure 7). Richmond's topography and trip profile is supportive of walking and cycling: most trips originating in Richmond are within the City (67%) and one-half of all trips are 4 km or less in length.

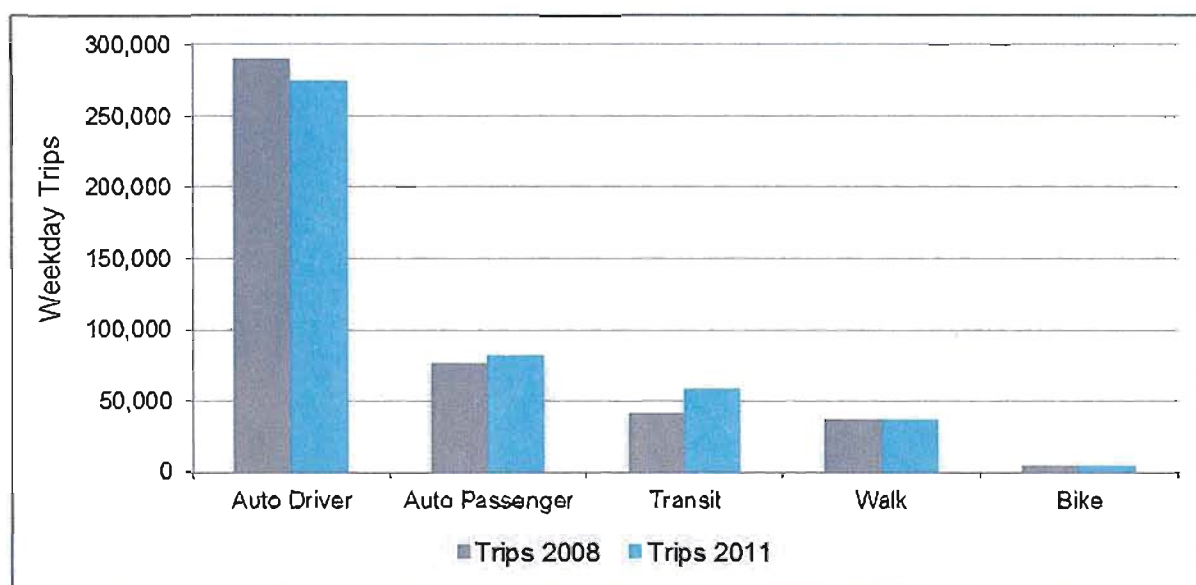
Over half of grade school children walk, cycle or take transit to school with the average length of all school trips of 2.8 km.

### Energy and Climate Implications

Land use planning that fills housing into areas with local shopping, amenities and transit leads to more walking, cycling and transit use. Safe, accessible walking, rolling and cycling pathways with direct and connected links will also support this shift.

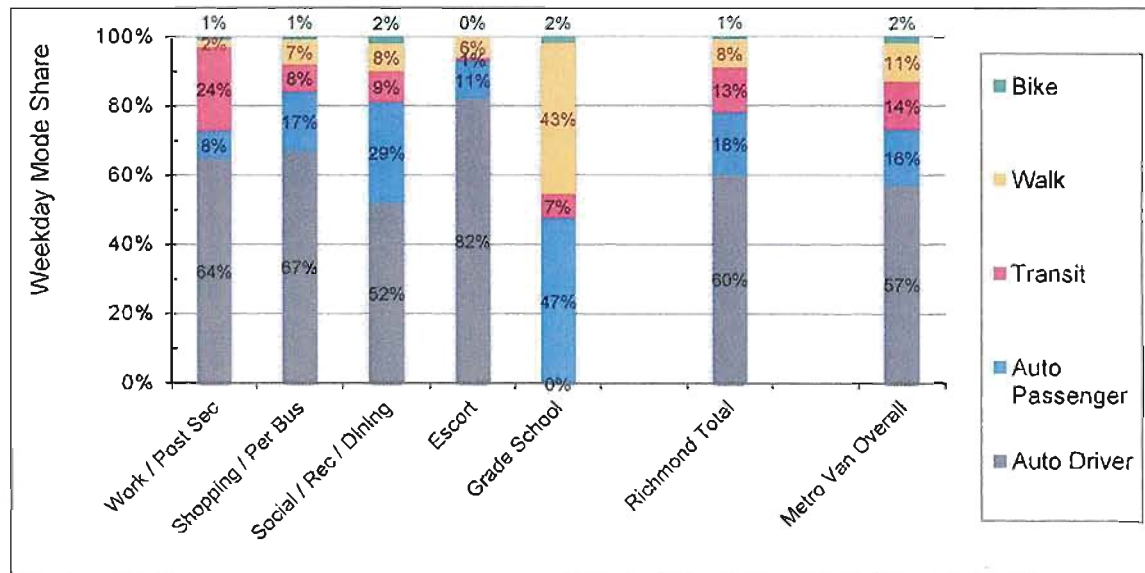
Focusing improved infrastructure and safety programs along school routes can encourage healthy active transportation choices among both children and parents.

Figure 6. Trips by mode and mode share for Richmond, 2008 and 2011



Source: 2011 Metro Vancouver Regional Trip Diary Survey Analysis Report, TransLink, 2013

Figure 7. Weekday mode share (Richmond), 2011



Source: 2011 Metro Vancouver Regional Trip Diary Survey Analysis Report, TransLink, 2013

Note: Escort trips occur when a driver assists someone else in their travel needs. This includes all parent trips with a reported purpose of "to school" where the parent (driver) is undertaking the trip for the purpose of transporting the child (passenger) to school.

## 2.5.5 Job Location

### Richmond Context and Trends

Richmond has the highest jobs-to-labour force ratio in Metro Vancouver (1.24 in 2006), meaning that there are more jobs in Richmond than there are Richmond residents in the labour force.<sup>12</sup> Richmond's top employment industries include retail trade (12%), food services & accommodation (9%), professional, scientific & technical services (9%), and health care (8%).

### Energy and Climate Implications

Retail and office space located near transit, cycling and pedestrian opportunities in City Centre are appropriate for many Richmond businesses. Surveys show that commercial office space located near rapid transit stations has lower vacancy rates and attracts higher rents<sup>13</sup>.

Many industries are located in less accessible parts of the Richmond and have different transportation opportunities and challenges.

<sup>12</sup> Statistics Canada Census 2006 Profile, accessed March 2013 at <http://www.richmond.ca/discover/about/demographics/Census2006.htm>. At the time of this report, 2011 statistics are not yet available for these categories.

<sup>13</sup> "Rapid Transit Office Index for Metro Vancouver", Jones Lang LaSalle, 2011.

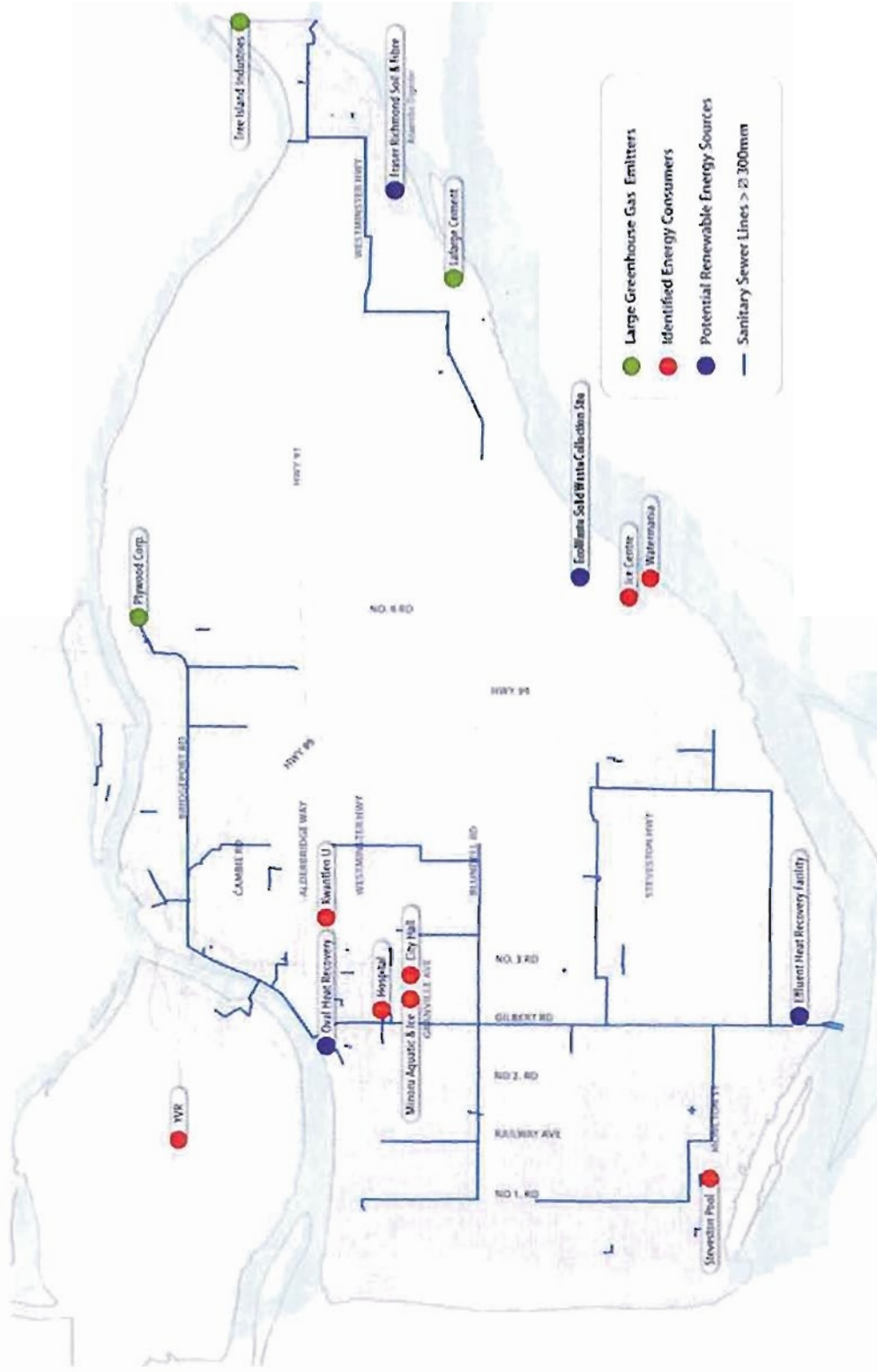
## 2.5.6 Industry

Richmond Context and Trends	<p>Additional important industries in Richmond include transportation &amp; warehousing, manufacturing and wholesale trade.</p> <p>Three industries in Richmond have GHG emissions large enough to report to Provincial agencies, indicate they are significant users of fossil fuels are Lafarge Cement, Plywood Corp and Tree Island Industries (see Figure 8 for locations).</p>
Energy and Climate Implications	<p>Industries may have different input and output materials and there may be opportunities to share resources and/or energy. Eco-industrial networking takes advantage of co-located industries that can share resources.</p> <p>Opportunities for reducing emissions from goods movement include buying new fuel-efficient vehicles, right-sizing, ensuring trucks are loaded for all trips, and route planning.</p>

## 2.5.7 Local Energy Sources

Richmond Context and Trends	<p>Richmond has one District Energy system – the Alexandra DEU, and all new buildings within the service area are required to connect to it. This system uses a ground source heat pump to extract geothermal energy from the ground.</p>
Energy and Climate Implications	<p>Local sources of renewable energy can achieve many objectives, including reduced GHG emissions, less reliance on global energy price fluctuations and availability, more resilient community. Other opportunities may include capturing waste heat from the city sewer system, capturing waste heat from buildings such as ice rinks and hospitals, heat exchange from the river water, and other site-level opportunities (solar hot water, heat pumps, etc.).</p>

Figure 8. Locations of industrial GHG emitters, large institutional facilities, and potential renewable energy sources in Richmond



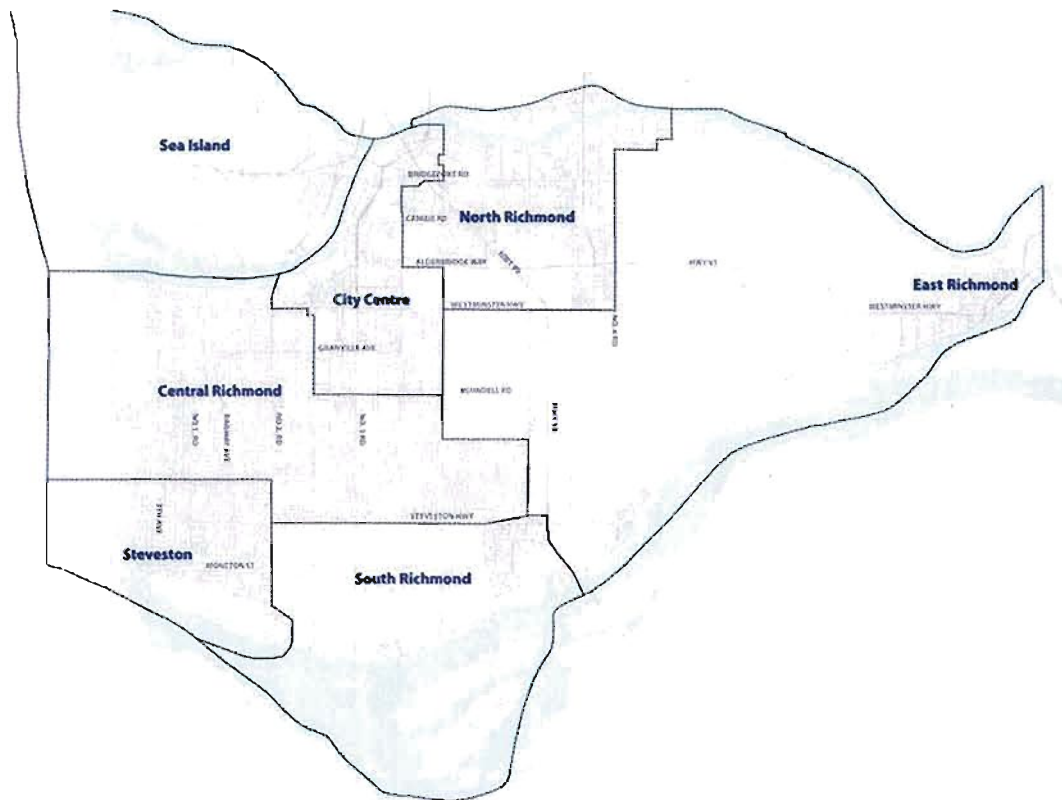


## 2.6 Richmond 2041: OCP Population, Housing and Employment Projections

In November 2012, the City adopted an updated OCP to guide growth and development that aligns with a 2041 vision and gets the city "Moving Towards Sustainability". In preparation for the update, the City undertook significant amounts of analysis and consultation to understand how much the population is anticipated to grow, how much employment is anticipated to grow, where there is potential to accommodate the new growth, and where particular uses need to be preserved. Based on all this, the City developed the following projections for each neighbourhood for the year 2041 (see Table 1).

Figure 10 and Figure 11 provide a visual representation of the size of projected population and employment growth, respectively, in each neighbourhood. From these it is evident that much of the residential and employment growth is forecast for the City Centre area.

Figure 9. Locations of Richmond Neighbourhood Areas





**Table 1. 2041 OCP Population, housing and employment projections by neighbourhood**

Neighbourhood	Population (number)			Housing (number of dwelling units)			Employment (number of jobs)		
	Existing (2009)	New (2010-2041)	Total Future (2041)	Existing (2009)	New (2010-2041)	Total Future (2041)	Existing (2009)	New (2010-2041)	Total Future (2041)
City Centre	46,000	54,000	100,000	21,000	26,000 Ground oriented: 25% Apartment: 75%	47,000	41,000	19,000	60,000
Central Richmond	87,000	20,000	107,000	28,000	12,000 Ground oriented: 90% Apartment: 10%	40,000	11,000	2,500	13,500
East Richmond	9,000	3,000	12,000	3,000	2,000 Ground oriented: 95% Apartment: 5%	5,000	14,000	3,000	17,000
North Richmond	22,000	9,000	31,000	7,000	4,000 Ground oriented: 45% Apartment: 55%	11,000	34,500	6,500	41,000
Sea Island	830	50	880	300	0	300	24,000	11,000	35,000
South Richmond	570	150	720	300	300 Apartment: 100%	600	6,500	1,500	8,000
Steveston	25,000	3,000	28,000	9,500	2,000 Ground oriented: 40% Apartment: 60%	11,500	4,000	1,000	5,000
<b>TOTAL (all of Richmond)</b>	<b>190,000</b>	<b>88,000</b>	<b>280,000</b>	<b>69,000</b>	<b>46,000</b>	<b>115,000</b>	<b>135,000</b>	<b>45,000</b>	<b>180,000</b>

Figure 10. Projected population growth in Richmond by neighbourhood (2011-2041)

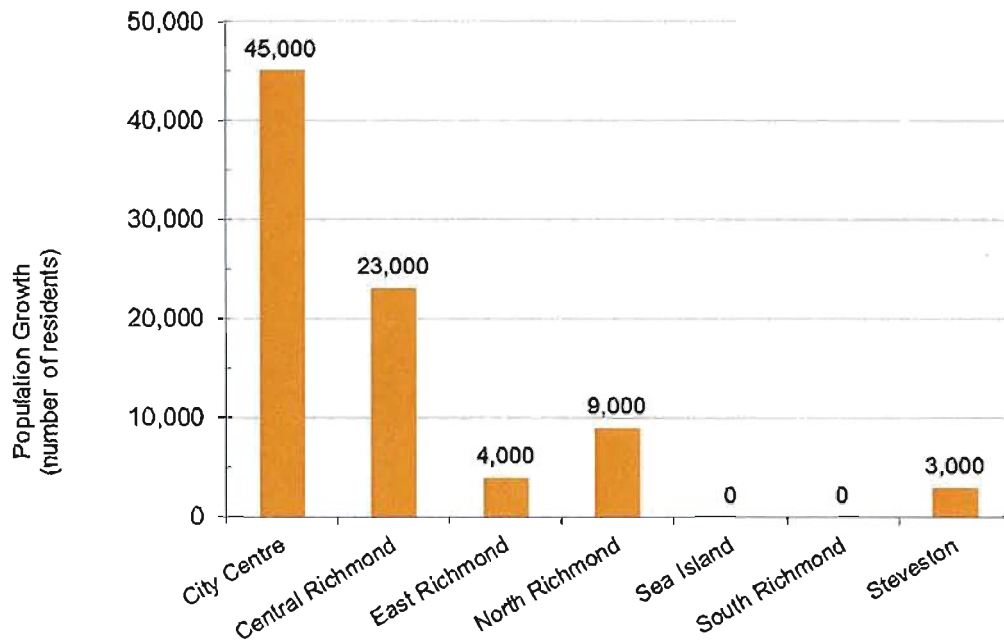
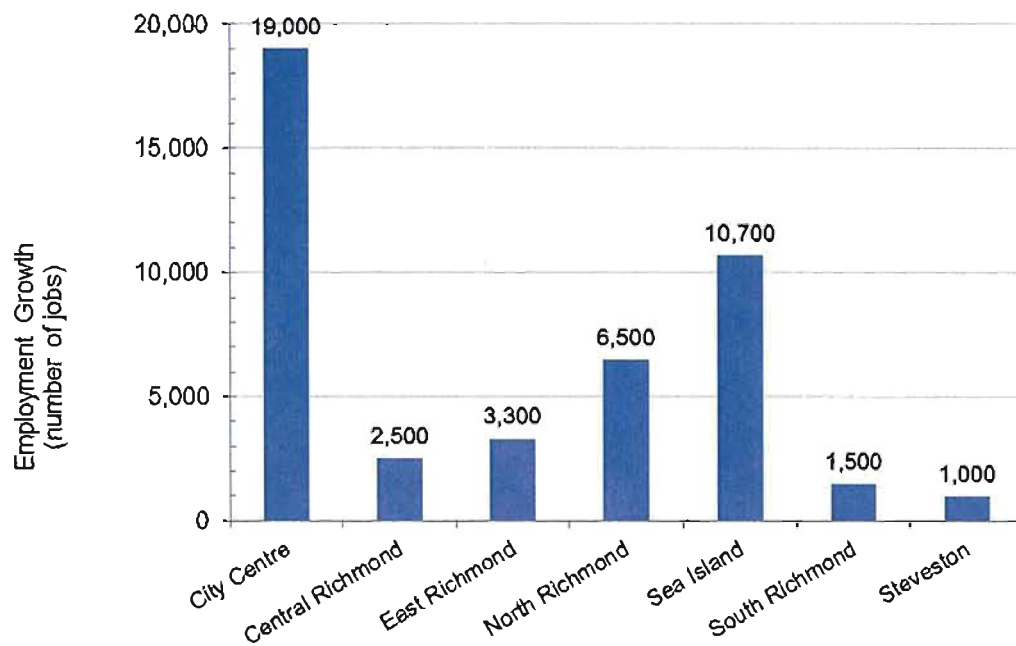


Figure 11. Projected employment growth in Richmond by neighbourhood (2011-2041)



# 3 Where are we now?

## 3.1 Energy Use and Carbon Emissions Baseline

Emissions of greenhouse gases (GHGs) or “carbon emissions” or our “carbon footprint” are emissions to the atmosphere from human activities. Most GHG emissions are a direct result of our use of fossil fuel energy – coal, oil, natural gas. This energy is used to heat and power our buildings, and drive our vehicles. Additionally a small amount of GHG emissions arise from the decomposition of the solid waste we generate.

### 3.1.1 Community Energy Use Baseline (2010)

We use energy to heat and power our buildings, drive our transportation and to run our businesses. Key energy uses in our community are (see also Figure 12):<sup>14</sup>

- **Buildings:** Energy is consumed to heat, cool and power our buildings and provide a range of services. Key energy sources for our buildings are natural gas – to provide space heating and hot water heating, and electricity – which provides energy to all sorts of process or “plug loads” and some heating and cooling.
- **Transportation:** Energy is consumed by vehicles to move people and goods. This energy primarily comes from burning gasoline, diesel and propane. Passenger vehicles account for the majority of the community’s estimated transportation fuel use.

#### What is a gigajoule?

A gigajoule (GJ) is a metric term used for measuring energy use. 1 GJ is equivalent to the amount of energy available in a vehicle tank of gas, or 2 barbeque propane tanks. It’s also the amount of electricity a typical homes uses in 10 days.

Energy consumption is an expenditure to the community. The

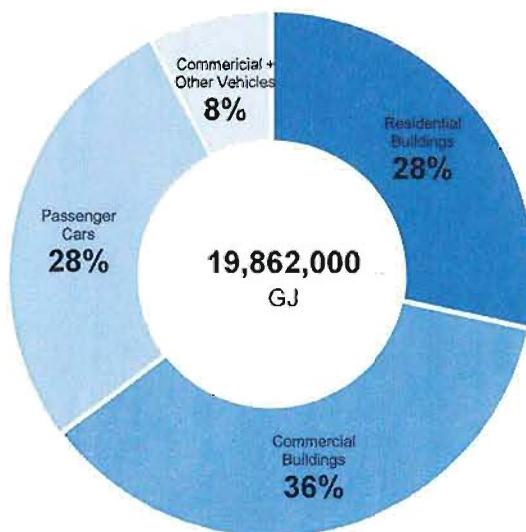
<sup>14</sup> The Province of BC has developed the Community Energy and Emissions Inventory (CEEI) initiative to provide inventories of community-wide energy consumption and GHG emissions for all municipalities and regional districts in BC. The CEEI reports provide the total amount of building energy consumed (electricity, natural gas) as well as modeled estimates of consumed propane, heating oil, and wood. Transportation emissions are modelled for vehicle fuels using statistics of vehicle travel and fuel economy ratings. The associated GHG emissions are calculated from energy consumed as well as from disposed waste. Inventories have been developed for the calendar years 2007 and 2010, and are expected to be produced biannually. (see [www.env.gov.bc.ca/epd/climate/ceei/index.htm](http://www.env.gov.bc.ca/epd/climate/ceei/index.htm)).

This report presents the most recent CEEI report for Richmond. The targets in Richmond’s OCP were developed from the 2007 baseline, using the first CEEI report available for Richmond.

Generally large industries are excluded from the CEEI inventories – usually for privacy reasons. For example, this inventory does not include emission from the Lafarge cement plant. However, this facility does report its emissions to senior government regulators.

most recent inventory indicates that **\$440,000,000 annually** is spent in Richmond for energy consumption (based on 2010 inventory) – about **\$2,200 each** year for every resident. The vast majority of this spending leaves Richmond. This level of consumption is on par with other communities in the Metro Vancouver region.

Figure 12. Breakdown of Energy Use in Richmond (2010)



### 3.1.2 Community GHG Emissions Baseline (2010)

Each energy source – burning a fuel, consuming electricity results in a release of carbon.<sup>15</sup> As well, waste disposal through a landfill or a waste to energy facility results in carbon emissions. Our sources of GHG emissions (see Figure 13) are:

- **Buildings:** Using electricity and natural gas to heat and cool buildings leads to 43% of the community's GHG emissions. Most of the GHGs result from natural gas use since electricity in BC is a relatively "low carbon" energy source.

#### What is a carbon dioxide equivalent?

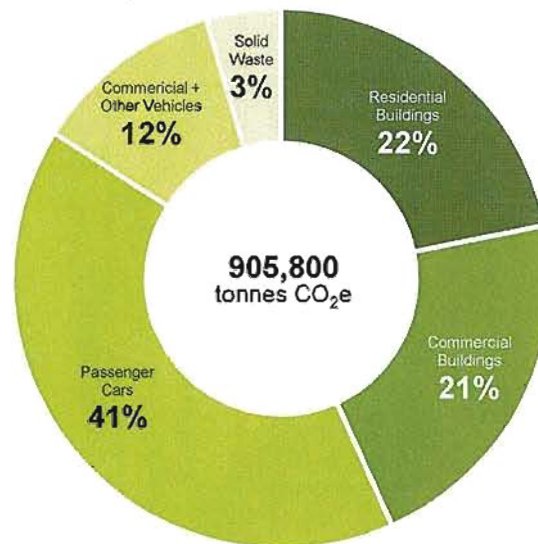
Greenhouse gas emissions are measured in tonnes of carbon dioxide equivalents or tonnes CO<sub>2</sub>e. A carbon dioxide equivalent is a way of expressing any given greenhouse gas as a functionally equivalent amount of carbon dioxide (CO<sub>2</sub>). 1 tonne CO<sub>2</sub>e is created when you consume 10 tanks of gasoline in a car.

<sup>15</sup> For fossil fuel consumption the release of carbon occurs at the 'tailpipe' – the point of consumption. For electricity consumption the release of carbon occurs elsewhere in the electricity 'grid' and not at the point of electricity use.

- **Transportation:** Using gasoline, diesel and propane for transportation leads to approximately 53% of the community's GHG emissions. This community inventory includes only vehicles registered in Richmond.
- **Solid waste:** Richmond's waste that is not diverted through recycling and composting programs goes to landfills where it decomposes and releases methane gas, a potent GHG.

These emissions equate to about 4.5 tonnes of CO<sub>2</sub> equivalents per person each year. This is a typical level of emissions for residents in the Metro Vancouver area.

**Figure 13. Breakdown of Greenhouse Gas Emissions in Richmond**



## 3.2 Electricity: A Unique Energy Service

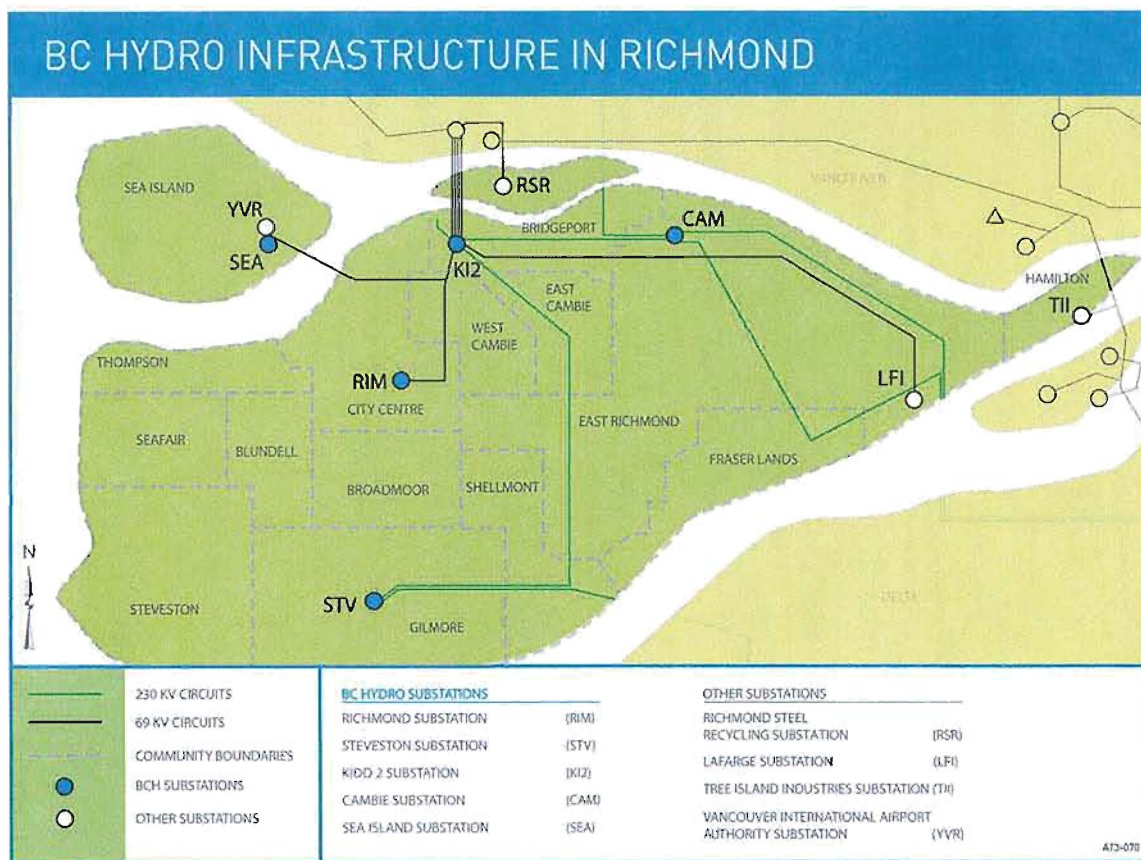
Electricity is a unique fuel. It is versatile and can be used for any number of applications – running machinery – heating buildings – driving vehicles. However, electricity is also transient in nature and cannot be stored.

Part of this energy plan process is to determine specific actions for reducing electricity use, and / or generating electricity within the community. These actions will help support BC Hydro's mandate to encourage conservation, and develop local alternative electricity sources to reduce the burden on the Provincial generation and transmission system.

Our electricity infrastructure also requires rights of ways and facilities, each occupying valuable land in the community (see Figure 14). Historically this (and other utility infrastructure) has been addressed separately by each utility. Growth in the community will drive new investments in infrastructure.



Figure 14. Electricity Infrastructure Schematic for Richmond



# 4 Where are we heading?

## 4.1 Current Policy Trend: Forecast without an Action Plan

Energy consumption and GHG emissions increase as the population and economy expand. In the future, they will continue to increase as Richmond grows. However, the growth will be tempered by efficiencies driven by other levels of government.

The forecast is initially driven by population growth.<sup>16</sup> In theory, from the 2007 baseline, our energy use and GHG emissions would grow directly proportional to the growth in population. In fact this will not happen because other initiatives are already underway. Specific activities that will reduce the growth of the GHG emissions compared to population growth are:

- Inclusion of a mandatory biofuel content in gasoline and diesel fuels
- Increases in vehicle fuel efficiency standards implemented by the Federal government.
- Improvements to the BC Building Code
- Impacts of densification of the community resulting in decreased building energy consumption (more efficient building forms) and decreased vehicle kilometers travelled (shorter travel distances and less reliance on automobiles).

These impacts will be explained by an example of a GHG emissions forecast called a "carbon wedge" diagram (see Figure 15). The figure will be examined from the top lines downward.

The top line represents the theoretical increase of GHG emissions if the energy use and GHG emissions continue to grow in the fashion of the 'status quo' energy use (the way that energy was consumed at the time of the 2007 baseline. That is each new person uses the same energy and same housing stock as the existing residents.<sup>17</sup> Beneath this status quo growth curve are four "wedges" representing different components of reductions caused by established activities. From top to bottom these reduction wedges are due to:

- **Biofuel Content of transportation fuels:** The Federal government has mandated a biofuel content for gasoline and diesel fuels. These are modeled through a reduction of the emission factors for these fuels (consistent with the methodology used for BC public sector organization in the SmartTool reporting system).

<sup>16</sup> A more complete description of the calculation methodology is provided in appendix A.

<sup>17</sup> This status quo development forecast is something of a theoretical construct because it implies that the new residents will be housed in the same types of dwellings as the existing residents (i.e. split between single family and multi-family etc.). In practice there is not sufficient land available to do this.



- **Improved Federal fuel efficiency standards for vehicles.** The Federal government has announced requirements for average fuel efficiency to increase between the 2010 and 2016 model year (called LDV1) and further targets are under development for further improvements for model years 2017 to 2025 (LDV2). GHG reductions may be greater than 50% of passenger vehicle emissions by 2025. As well, there are processes underway that would see (more modest) improvements in commercial vehicle efficiency as well.
- **BC Building Code improvements.** The BC government in 2007 established targets to improve the energy efficiency of commercial and residential buildings. These changes have been initiated with improvements to the building code and to energy standards for equipment.
- **"Base OCP" densification impacts: vehicles:** The new OCP defines a more densely developed City Centre to accommodate the increases in population. Data shows that as density increases, the amount of vehicle kilometers travelled decreases. This is regardless of whether transit service and other amenities are developed.<sup>18</sup> This wedge has been shown as a "given" or input assumption because it is established
- **"Base OCP" densification impacts: buildings:** The increased densification will result in lower residential building energy consumption due to the greater share of multi-family units compared to single family units, and the fact that townhomes and apartments tend to be smaller than detached dwellings. An improvement in residential building energy is shown – commercial buildings were not assumed to be affected.

The resulting emissions that remain after these wedges collectively are called the current policy trend (CPT) scenario, sometimes referred to in energy and emissions plans as business as usual (BAU) (Figure 15).

The impact of the densification resulting from the development of the 2041 OCP (including the 2009 CCAP) is shown here because it is a "given" or assumption going into the CEEP.

The reductions that are shown are an attempt to quantify the impact solely of the densification. As a concept it may be called the reductions that are achieved if the densification defined in the OCP is achieved – but little else is achieved (e.g. not transit improvements, no greener buildings, etc.). As such these have been called the "Base OCP" reductions.

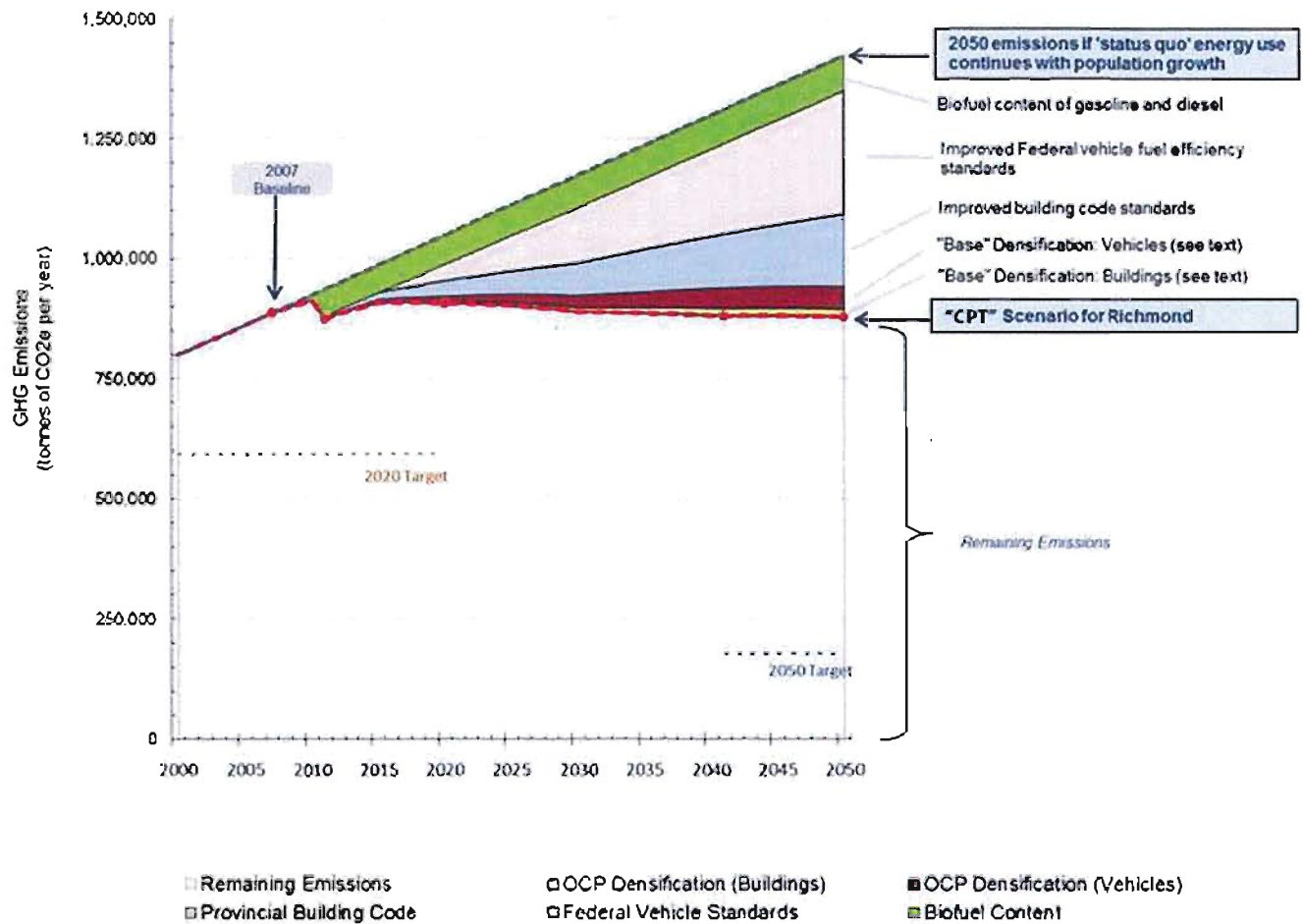
In practice this density will be achieved in combination with better transit, better non-vehicle transportation amenities, "above-code" building standards etc. Those activities though may be implemented to a greater or lesser degree. As a result they are considered actions for the energy plan.

The resulting CPT scenario results for energy, electricity and GHG emissions are estimated and shown in Table 2, and presented graphically in Figure 16, Figure 17, and Figure 18.

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<sup>18</sup> A description is provided in Appendix A. Transit service and amenities will enhance the reduction in vkt in addition to this base amount.

Figure 15. Carbon Wedge for the Current Policy Trend Scenario

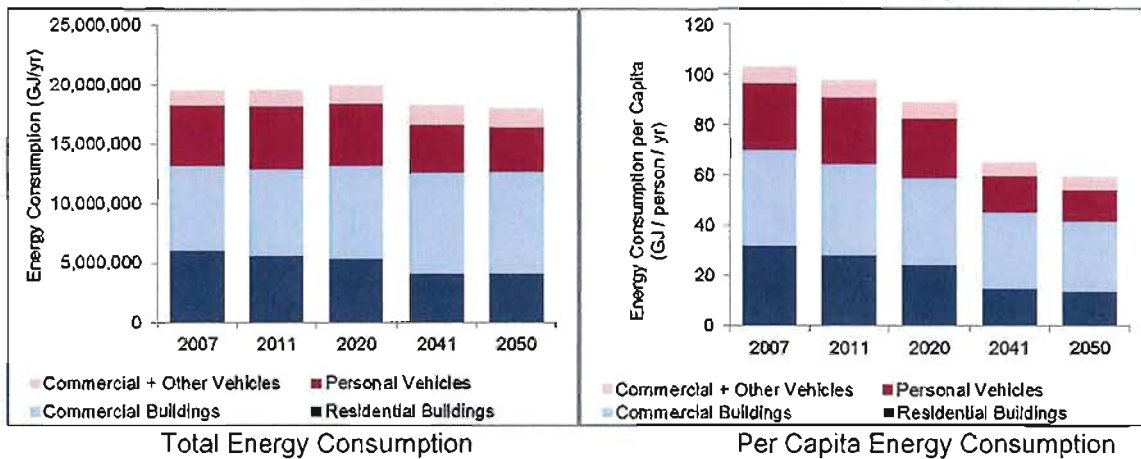


**Table 2: Current Policy Trend Scenario**

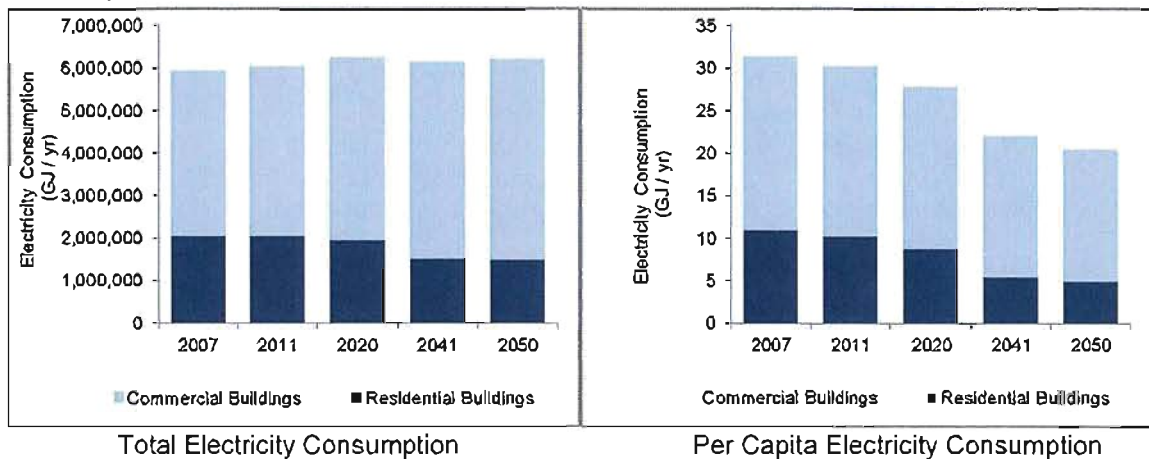
Year	2007	2010	2020	2041	2050
<b>Population</b>					
Residents	189,333	200,000	224,000	280,000	304,000
% change from Baseline (2007)	-	4%	18%	48%	61%
<b>GHG Emissions (tonnes of CO<sub>2</sub>e)</b>					
Total GHG Emissions	886,000	910,000	906,000	880,000	877,000
% change from Baseline (2007)	-	3%	2%	-1%	-1%
Per Capita Emissions (t/person)	4.7	4.6	4.0	3.1	2.9
<b>Electricity Consumption (GJ)</b>					
Total Electricity Consumption (GJ)	5,927,000	5,994,000	6,226,000	6,136,000	6,196,000
% change from Baseline (2007)	-	1%	5%	4%	5%
Per Capita Electricity Consumption (GJ/person)	31.3	30.4	27.8	21.9	20.4
<b>Total Energy Consumption (GJ)</b>					
Total Energy Consumption (GJ)	19,549,000	19,862,000	19,940,000	18,295,000	18,062,000
% change from Baseline (2007)	-	0%	2%	-6%	-8%
Per Capita Energy Consumption (GJ/person)	103.3	100.7	89.0	65.3	59.4

Notes: [1] Values shown in red can be compared to the council approved targets: GHGs: -33% by 2020, -80% by 2050; Energy -10% by 2020, all from 2007 levels.  
[2] Values may not add precisely due to rounding.

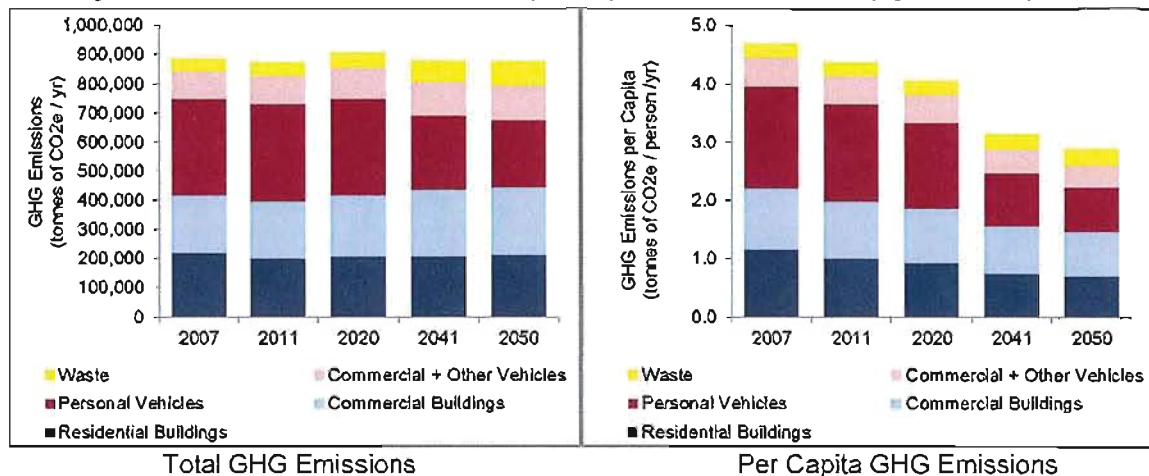
**Figure 16. CPT forecast total and per capita ENERGY consumption (by end user)**



**Figure 17. CPT forecast for total and per capita ELECTRICITY consumption**



**Figure 18. CPT forecast for total and per capita GHG emissions (by end user)**



## **4.2 Thermal Energy Load Growth: 2011 to 2041**

As part of this project an analysis was undertaken to estimate the current (2011) energy load needed for heating throughout the community, and also to estimate where the future (2041) energy load for heating will be based on the City's projected residential and employment growth.

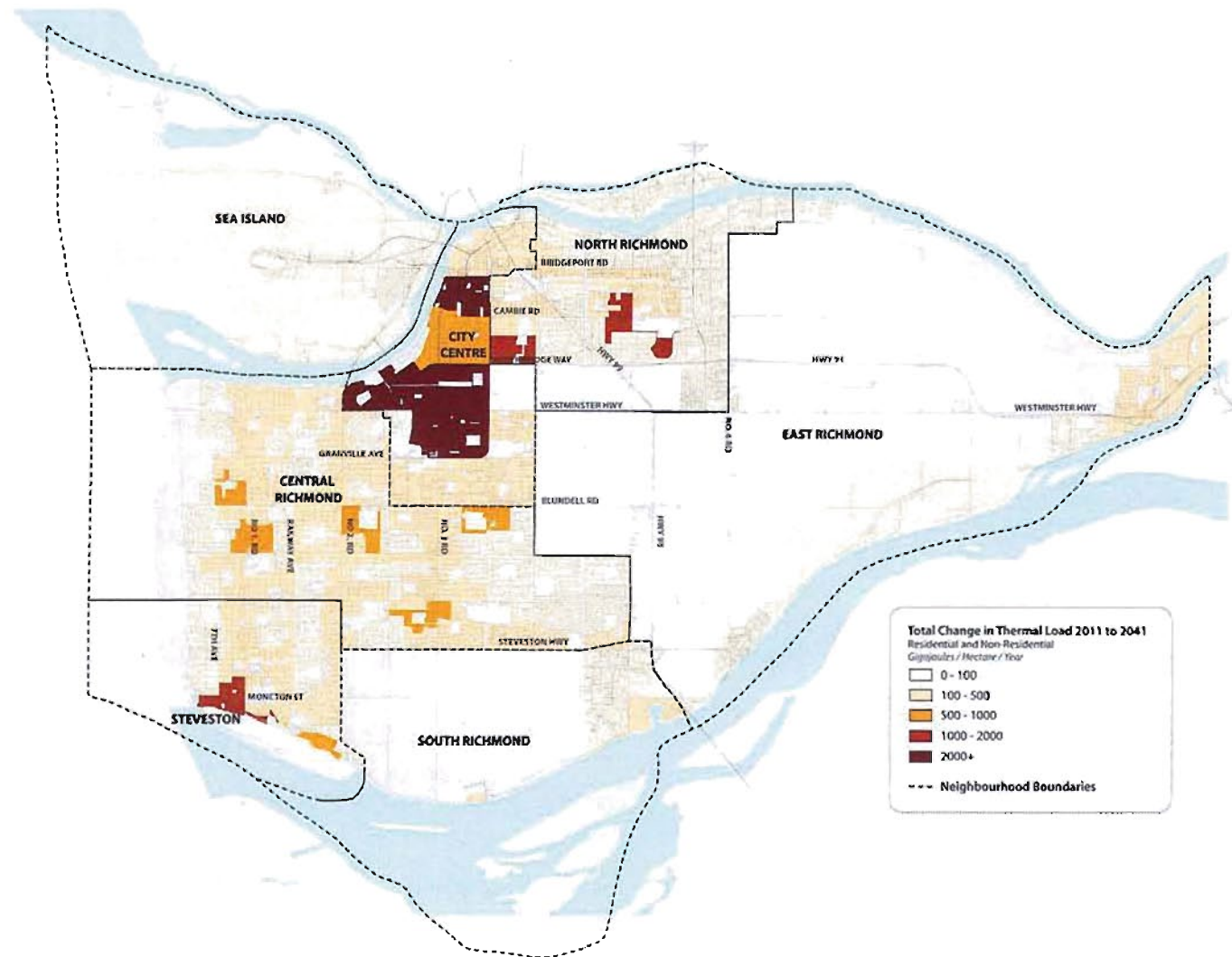
Thermal energy mapping (space and hot water heating) serves a number of purposes. First it serves as a composite measure for overall development – combining residential and commercial development. As well it can be useful to provide direction for potential future district energy opportunities. District energy feasibility is typically driven by the amount of new development – rather than the total developed area – simply because existing buildings are most often not compatible with DE systems.

As an example, Figure 19 shows the change in anticipated thermal energy for new buildings projected to be built in Richmond between 2011 and 2041. Features that are visually apparent include:

- Large increases in heating requirements in the City Centre area – consistent with the expected redevelopment of the City Centre area,
- Lesser intensive increases along the arterial road network, and
- Limited increases in existing single-family dwelling neighbourhoods.



Figure 19. Projected change in annual thermal energy requirements: 2011 to 2041 (GJ/ha)





# 5 Framing the Action Plan

## 5.1 CEEP Vision (2010)

During the first phase of the Community Energy and Emissions Plan, the City created a vision for the CEEP as follows:

*The development of a Community Energy and Emissions Plan (CEEP) for Richmond supports the vision of the city as the most appealing, liveable and well managed community in Canada. A community where development strengthens social institutions and values, enables a vibrant, innovative and resource efficient economy, and protects and enhances ecological resources to ensure that these continue to provide valuable services for all, now and in the future. Richmond recognizes the challenges that climate change and changing global energy dynamics present and aims to act now to be prosperous later.*

*Consistent with the City's sustainable community vision is the goal of achieving an energy-wise and low-carbon society, and enables a robust local economy, a healthy environment, and a safe, equitable, diverse, and resilient community. This vision of Richmond is predicated on a move away from fossil fuels and increasing greenhouse gas (GHG) emissions, and toward an energy future where demand for energy is reduced, more waste heat energy is recovered, renewable sources of heat are fully exploited, renewable energy for electricity generation become mainstream, and GHG emissions are lowered to the greatest extent possible.*

## 5.2 Richmond's GHG Reduction Targets

In the 2041 OCP, Richmond incorporated community-wide GHG emissions reductions and energy use targets as follows (OCP section 2.2, Objective 1):

*Reduce GHG emissions from City operations and services, and support broad-base community GHG emission reduction to achieve a 33% reduction from 2007 levels by 2020 and 80% below 2007 levels by 2050.*

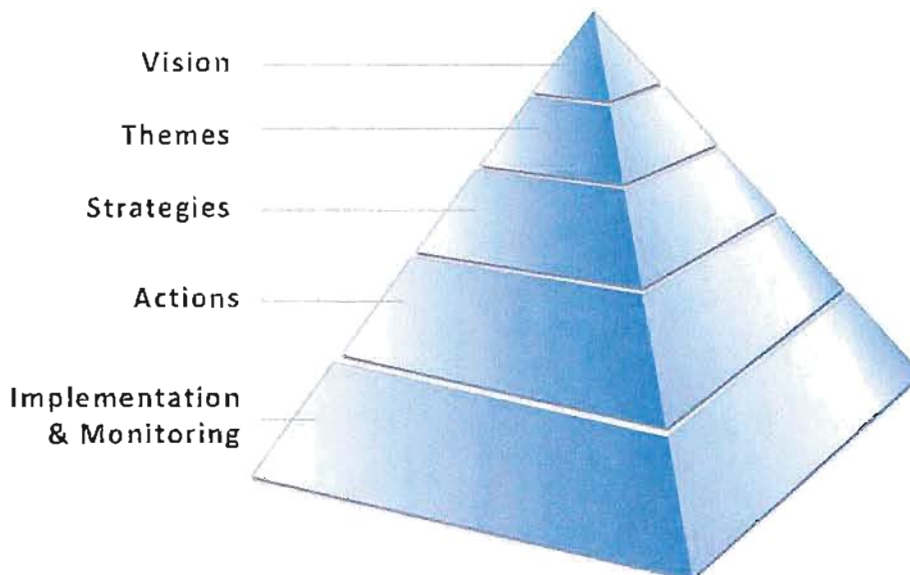
These targets align with the province-wide targets, which support the scientific consensus around the need to dramatically reduce global GHG emissions, and demonstrate a strong commitment to climate change mitigation. The targets also align with the provincial targets outlined in Bill 44, Greenhouse Gas Emission Reduction Targets Act, and also with the Metro Vancouver GHG emission targets in the Regional Growth Strategy.

During the CEEP Phase 1 project, the City also defined a target to reduce total energy use in the community by 10% from 2007 levels by 2020.

## 5.3 Plan Structure

A pyramid structure (see Figure 20) can be a useful structure to visualize the framework of the plan. From a singular vision at the top, the framework increases in detail, and number of items through each level. The long-term vision remains at the top, supported by several themes and strategies, each with a set of shorter-term actions that aim to achieve the strategies. The vision should remain relevant well into the future, while the actions are subject to more frequent revisions and review over time to ensure they are helping to achieve the vision. The base of the pyramid represents the numerous activities that are undertaken in executing the actions, as well as the need to measure the impacts of those activities and inform which areas need review and revision over time.

Figure 20. Plan Structure Pyramid



## 5.4 Plan Themes

In recognition of the importance of the OCP as a guiding document for Richmond, the CEEP is organized into five themes that also align with the OCP chapters that are most relevant to community energy consumption, energy efficiency and greenhouse gas emissions: Neighbourhoods & Buildings, Mobility & Access, Resilient Economy, Sustainable Infrastructure & Resources, and Climate Change Leadership. A comparison of these themes and relevant OCP chapters is provided in Table 3. This highlights how the OCP document already is aligned with energy management and GHG reductions, and where the different activities are addressed by OCP policy.

**Table 3. Alignment of CEEP, OCP and Key Issues**

CEEP Theme	OCP Chapter	Key Issues
1. Neighbourhoods and Buildings	Ch 3: Connected Neighbourhoods with Special Places	<ul style="list-style-type: none"> <li>• Land use to develop and maintain compact, complete communities</li> <li>• Promote New green homes</li> <li>• Building scale alternative and innovative energy supply</li> <li>• Make existing buildings more efficient</li> </ul>
2. Mobility and Access	Ch 8: Mobility and Access	<ul style="list-style-type: none"> <li>• Non-auto mode shift</li> <li>• Transit</li> <li>• Low carbon vehicles</li> </ul>
3. Resilient Economy	Ch 6: Resilient Economy Ch 7: Agriculture and Food	<ul style="list-style-type: none"> <li>• Goods movement &amp; commercial vehicles</li> <li>• Green jobs and low impact industrial development</li> <li>• Local jobs</li> <li>• Preservation of commercial &amp; industrial land</li> <li>• Commercial buildings – retrofits &amp; new green bldgs.</li> <li>• Alternative energy / biomass</li> </ul>
4. Sustainable Infrastructure and Resources	Ch 12: Sustainable Infrastructure and Resources	<ul style="list-style-type: none"> <li>• Solid waste</li> <li>• Use local energy sources</li> <li>• Build efficient infrastructure</li> </ul>
5. Climate Change Leadership	Ch 2: Climate Change Response	<ul style="list-style-type: none"> <li>• Education and engagement</li> <li>• Corporate operations will “lead by example”</li> </ul>

Note that other OCP sections may also have some connection to the energy plan. This table highlights the key considerations.

## 6 Reduction Scenario

This section first presents the results of a developed "reduction scenario" and then defines the detail of the strategies and actions used to develop the scenario.

### 6.1 The Municipal "Toolkit"

The range of actions available to a local government is broad, but they typically are one or a combination of a four key types of activity (see Table 4). Some strategies can be implemented individually, and some may require a combination of measures.

Table 4. Municipal Tools for Encouraging Action

Action	Types of Activities	Comments
Outreach and Education	Increase awareness through promotions (e.g. brochures and information), Facilitate self-motivated individuals to take action through information sharing, guidance, or seminars and workshops. Provide education and training through workshops and community events.	Generally simpler activities (some one-off, and some on-going). Many can be done in partnership with other funders or delivery agents. Generally low cost, but uptake is typically very low.
Non-financial Incentives	"Build it and they will come." Provide the infrastructure and facilities and residents will use it – connected sidewalks, neighbourhood access to amenities, bus shelters.	Aligns with municipal infrastructure activities and is part of existing activities. Strong push might require more budget capital projects.
Financial Incentives	Provide a financial incentive to take action. Examples may be a permit or fee discount, a tax break, a rebate or some other incentive for a resident / homeowner / developer to take action.	These generally become program activities requiring some ongoing maintenance or staff support – analogous to a water conservation program. Some examples exist for energy but this is generally a new area for local governments. <sup>19</sup>
Regulation	Require an activity through a policy statement, a bylaw, or a rezoning requirement to define an action that must be taken.	Strongest compliance since it is a requirement. However, it requires that the City be willing to enforce compliance and the activities must be pursued with consultation and communication with the affected stakeholders.

<sup>19</sup> An example is the Saanich Built-Green incentive that provides a building permit rebate for single family construction built to the "Built Green standard. Concerns are often cited about the cost of these programs but experiences have shown that they are not typically well subscribed initially and so require some promotion.



## 6.2 Reduction Scenario – Summary

### 6.2.1 Quantifying the Reductions

Creating a reduction scenario provides an opportunity to consider how the community will achieve its target. This involves:

- Identifying potential strategies and actions that are within the City's realm of authority, influence or ability to deliver,
- Considering what level of impact these activities may potentially have on the amount of energy consumed and/or the type of energy consumed and/or the amount of GHG emissions produced, and
- Estimating the uptake of the actions – i.e. how many people / buildings will change as a result of the action. Many factors influence the uptake of various actions, though general estimates can be made based on the tool selected (as outlined in the table above).
- Estimating the implementation time for an action. Each activity will start and at some point reach full implementation. (For example, an initiative to retrofit X % of homes, might target this to be achieved by a certain date).

Based on the actions identified, the desired goals of the OCP, literature review and input from the staff workshop, a reduction scenario has been developed. The assumptions, estimated levels of update and potential level of impact for the strategies identified in this plan are shown in Table 5.

Although specific actions have been defined in this plan as a starting point for moving forward with community energy and emissions management, it is anticipated that other actions may be identified in the future based on opportunities that present themselves during implementation (e.g. new funding becomes available for an activity that is not yet identified, but aligns with the intentions of the plan).

**Table 5: Reduction Scenario Assumptions and Outcomes**

Theme	Strategy	Description	Emissions Sector	Change Energy Use at 2041 (GJ)	Change in Electricity Use at 2041 (GJ)	Change in GHG Emissions at 2041 (tonnes CO <sub>2</sub> e)
Neighbourhoods and Buildings	Strategy 1	Neighbourhood planning	Personal Vehicles	-1,176,100	-254,900	-54,400
	Strategy 2	New development efficiency	NEW Residential Buildings			
	Strategy 3	Existing buildings	NEW Residential Buildings			
Mobility and Access	Strategy 4	Alternative transportation Connectivity Transport behavior and mode choice	Personal Vehicles	-1,299,400	41,600	-85,000
	Strategy 5					
	Strategy 6	Low carbon personal vehicles	Personal Vehicles			
Resilient Economy	Strategy 7	Energy efficient industries	Existing Commercial Buildings	-806,400	-440,800	-21,800
Sustainable Infrastructure and Resources	Strategy 8	District energy	NEW Residential and Commercial Buildings in the City Center area	-455,800	-201,100	-51,900
	Strategy 9	Local energy sources	NEW Residential and Commercial Buildings			
	Strategy 10	Waste	Waste			



## 6.2.2 Scenario Reductions

The results are tabulated in Table 6. For each of electricity, total energy and GHG emissions three comparisons are made:

- **Comparison to the Baseline:** This compares the value to the 2007 level. In these terms reductions are modest in percentage terms – and sometime even increasing in the early years. This result from the fact that the community is growing and reductions and efficiencies made can be overwhelmed by continued growth.
- **Comparison to the Current Policy Trend (CPT):** This compares the results to where the City might otherwise have been – and here the results are promising. Any reductions made help to divert away from the growth trajectory.
- **Comparison on a per capita basis:** The reductions appear most dramatic when presented on a per capita basis. This shows the substantial reductions required of each resident, if the impacts of growth are to be met, and overcome. That is, a small reduction in total energy use, given the population growth, requires a substantial reduction in per capita energy use.

Table 6. Reduction Scenario Results

Year	2007	2010	2020	2041	2050
<b>Population</b>					
Population	189,333	200,000	224,000	280,000	304,000
% change from Baseline (2007)	-	4%	18%	48%	61%
<b>GHG Emissions (tonnes of CO<sub>2</sub>e) (baseline)</b>					
Total GHG Emissions	886,103	913,000	831,500	666,500	664,700
Change from Baseline (2007)	-	26,900	-54,600	-220,000	-221,400
% change from Baseline (2007)	-	3%	-6%	-25%	-25%
Change from CPT	0	0	-74,600	-213,100	-212,500
% change from CPT	0%	0%	-8%	-23%	-23%
Per Capita Emissions (t/person)	4.7	4.6	3.7	2.4	2.2
% change per capita from Baseline (2007)	-	-1%	-21%	-49%	-53%
<b>Electricity Consumption (GJ)</b>					
Total Electricity Consumption (GJ)	5,926,916	5,994,400	6,027,000	5,280,700	5,317,200
Change from Baseline (2007)	-	67,400	100,100	-646,200	-609,700
% change from Baseline (2007)	-	1%	2%	-11%	-10%
Change from CPT	0	0	-198,900	-855,200	-878,400
% change from CPT	0%	0%	-3%	-14%	-14%
Per Capita Electricity Consumption (GJ/person)	31.3	30.4	26.9	18.9	17.5
% change per capita from Baseline (2007)	-	-3%	-14%	-40%	-44%
<b>Total Energy Consumption (GJ)</b>					
Total Energy Consumption (GJ)	19,548,808	19,862,000	18,975,000	14,557,200	14,389,500
Change from Baseline (2007)	-	313,200	-573,800	-4,991,600	-5,159,300
% change from Baseline (2007)	-	2%	-3%	-26%	-26%
Change from CPT	0	0	-966,300	-3,737,700	-3,672,300
% change from CPT	0%	0%	-5%	-20%	-20%
Per Capita Energy Consumption (GJ/person)	103.3	100.7	84.7	52.0	47.3
% change per capita from Baseline (2007)	-	-3%	-18%	-50%	-54%

Notes: [1] Values shown in red can be compared to the council approved targets:  
GHGs: -33% by 2020 & -80% by 2050;  
Energy -10% by 2020.

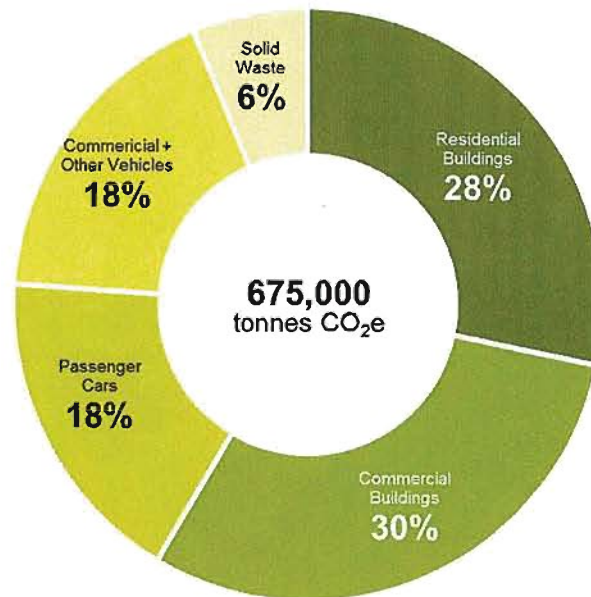
[2] Values may not add precisely due to rounding.

### 6.2.3 Emissions after the Action Plan

The remaining emissions following the action plan activities to 2050 is estimated at 675,000 tonnes of CO<sub>2</sub>e – a 25% reduction from the 2007 baseline level. The distribution of these remaining emissions is shown in Figure 21.

What can be noted is that all components of the carbon “pie” have been reduced each to a different degree.

Figure 21. Emissions Distribution Following Action Plan Reductions (2050)



### 6.2.4 Carbon Wedge

The overall impact on carbon emissions is presented as a carbon wedge in Figure 22. As in the earlier presentation, the effects of growth are tempered by the higher government initiatives, and the impact of the OCP densification – an established policy.

Shown in the figure are the additional measures that form the basis for the plan – these are shown by each of the themes<sup>20</sup>. The important point to note, is that without the actions in the plan, these reductions are not certain to be achieved through the implementation of the OCP by itself.

It is also worth noting that the action plan is not sufficient to meet the reduction targets established in the OCP (which match the Provincial targets). The Provincial and City targets are

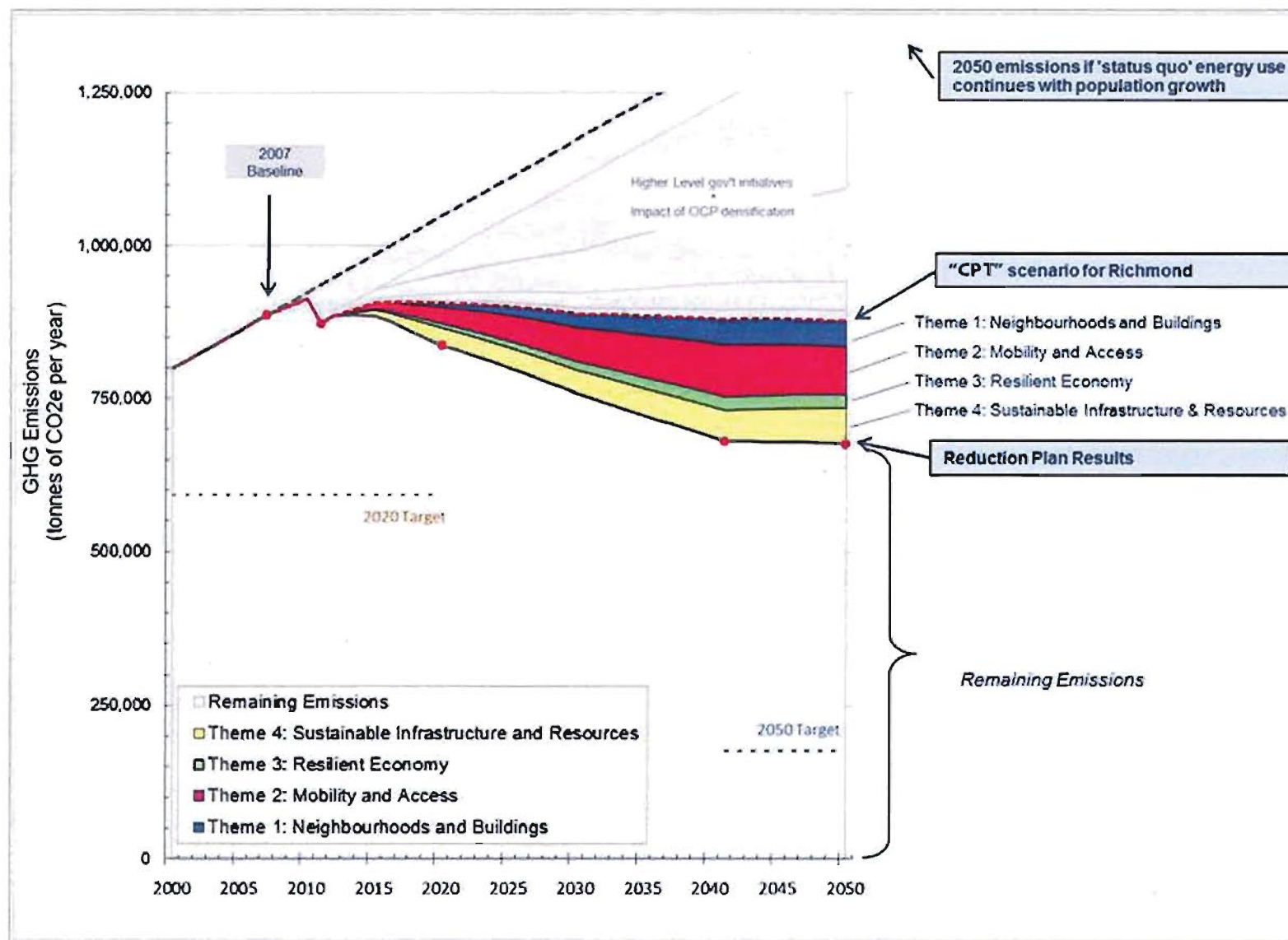
<sup>20</sup> The fifth theme Climate Change Leadership is a foundational activity which provides support and encouragement for the other actions. In general the reductions will be achieved in the other four themes – acknowledging that reduction are achieved through the corporate operations plan, but these are not quantified in a separate action plan.

extremely aggressive, and as yet few – if any – communities in BC have defined, and committed to implementing a set of actions sufficient to meet these levels of reductions.

This is not a cause for inaction – rather the impetus is to begin implementation, and then to continue developing actions over time. Future opportunities, technologies, price signals and so forth may make other actions more attractive in the future.

Finally – the next section (6.3) describes in detail the actions contained within the reductions scenario.

Figure 22. Reduction Scenario GHG Wedge



## 6.3 Detailed Descriptions of Strategies and Actions

Many of the actions described below are implementation actions for OCP objectives or are related to existing City policies and programs. However, the City is not currently committed to this suite of actions and some actions may require more detailed assessment, a change in policy or additional resources to implement.

### THEME 1: NEIGHBOURHOODS AND BUILDINGS

This section describes strategies to address the energy and carbon aspects of:

- Neighbourhood Centre Planning
- New buildings
- Existing buildings

The way cities are planned and built has an impact on the amount of energy residents consume to get around and to heat homes and other buildings. Historically, Richmond largely accommodated new residents through single family dwellings on greenfields (land not previously developed). The city is now close to reaching its developable land capacity, but has a continued need to accommodate a growing population. Over the next 30 years, the city's population is projected to grow by 80,000 requiring approximately 45,000 new dwelling units. By concentrating new development in City Centre and Neighbourhood Centres, Richmond can preserve its natural areas and agricultural land while creating communities with recreation, shopping and employment opportunities.

The City's recent OCP update supports this form of development but also recognizes that significant growth will need to be accommodated outside the City Centre (approximately 40,000 people), and that this growth should be carefully managed to enhance existing and create new Neighbourhood Centres.

#### Strategy 1: Integrate Future Neighbourhood Centre Planning with Transit Planning

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*"Richmond is a place where people live, work, and prosper in a welcoming, connected, accessible and vibrant community."*

This statement from the core of the Vision of a Sustainable Richmond that guided the 2041 OCP demonstrates the importance of growing in a manner that enables residents, employees and visitors to have access to their homes, work, recreation, and amenities. Through land use and development planning, the City aims to guide growth in a manner that supports an improvement in access to all of these needs.



The OCP identifies the City's plan "to undertake, over time, separate Neighbourhood Shopping Centre planning processes to enable a wider variety of housing, stores, services, and amenities which support more jobs, effective transit, walking, rolling and cycling."<sup>21</sup> Increasing density is needed to support expansion of the frequent transit network. However, new dwellings must be accompanied by services, amenities, and destinations, so that the new services are of value to the residents.<sup>22</sup>

This CEEP strategy highlights the importance of guiding growth in a phased manner that works in concert with improved transit service. In 2014, TransLink is expected to initiate a major area plan review, and this, combined with the new OCP mandate is an opportunity to coordinate neighbourhood planning with long range transit planning.

**Action 1    Review Neighbourhood Centre development sequencing for flexibility**

The OCP 2041 defines a vision for the future – with several developable neighbourhood centres evolving from current shopping mall sites, and a frequent transit network serving the majority of the urban area. The OCP has established a starting set of priorities for neighbourhood planning.<sup>23</sup> As well the OCP requires any large development proposals in the East Cambie, Blundell, and Garden City areas over 1 hectare (2.5 acres), to engage in a neighbourhood master planning process. This provides an exceptional opportunity to ensure that transit and land-use planning are developed in concert.

Through this action the City will:

- Define a sequencing strategy for the East Cambie, Blundell, and Garden City neighbourhood master planning
- Develop measures to stimulate neighbourhood development according to the transit area plan.<sup>24</sup>

*The 6 "Ds" of Transit-Oriented Communities:*

*D1: Destinations: Land use planning to make destinations sites*

*D2: Distance: Create a well-connected street network*

*D3: Design: Create places for people*

*D4: Density: Concentrate and intensify activities near frequent transit*

*D5: Diversity: Encourage a mix of uses*

*D6: Demand Management: Discourage unnecessary driving*

*From: Design Guidelines for Transit-Oriented Communities, TransLink,*

<sup>21</sup> City of Richmond Official Community Plan, 2041 OCP – Moving Towards a Sustainable Future; Section 3, Objective 2; 2012.

<sup>22</sup> Density is not the only element needed to create a Transit-Oriented Community. TransLink has identified the 6 "Ds" of Transit-Oriented Communities (Destinations, Distance, Design, Density, Diversity, and Demand Management). In combination these elements combine to shift mobility patterns towards transit, walking and cycling and away from automobiles.

<sup>23</sup> The OCP does identify general planning priorities. For example it defines the Broadmoor Neighbourhood Master Plan now completed for the shopping centre itself) and Hamilton Shopping Centre (underway) to continue, identifies East Cambie, Blundell, and Garden City as future planning areas, and defers planning for Terra Nova, Ironwood, and Seafair shopping malls into the far future. (OCP pg 3-4)

<sup>24</sup> Stimulus measures are not currently defined but may include packages of services, school and recreation facility planning, etc. Discussion with developers, or market studies may be required to define which measures are most suitable for each neighbourhood.



- Work to include the "Six D's" of transit oriented development into the neighbourhood plans (see sidebar)

#### Action 2 **Collaborate with TransLink to update the Area Transit Plan (ATP)**

Seeing the OCP defined future 'play out' will occur through the implementation of the OCP *and* the development and implementation of TransLink's next Area Transit Plan (ATP) – anticipated to initiate an update in 2014. The transit area planning will be aided by clear guidance to TransLink on the priority areas of growth and development (see Action 1).

It is important that the participation in the ATP capture the planning and land use issues and not be simply viewed as an infrastructure and engineering issue.

The City will:

- Partner with TransLink to align improvements to the transit network with land use plans and the defined FTN sequencing and routes.<sup>25</sup>
- Promote the 6 "Ds" of transit planning by developing new commercial and mixed-use spaces (Destinations and Diversity); improved links for pedestrian and cycling access (Distances); street furnishings, plantings, public art (Design), and decreased focus on automobile through reduced or priced parking (Demand Management) – see Mobility strategies for more ideas
- Identify new infrastructure needs to assist capital and road works planning.

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### **Strategy 2: Increase Energy Efficiency in New Developments**

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#### Action 3 **Include energy efficiency in Neighbourhood Centre planning**

Current and future neighbourhood plans can define objectives for energy efficiency. The 2008 "Bill 27" amendments to the Local Government Act (LGA) and the Community Charter allowed for local governments to include energy and water efficiency and reduced GHG emissions as objectives in development permit guidelines. Defining these has not been easy but includes issues such as building orientation, solar exposure and shading, ventilation, high albedo roofing materials, maximum glazing, or on-site renewable energy production

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<sup>25</sup> A common benchmark objective to achieve is service of a level of a Frequent Transit Network (FTN) – loosely defined as 15 min or better service, 12-15 hours per day – every day. FTN service provides a frequency that is generally regarded as the level at which customers will switch to transit over other transportation because it can be relied upon. The FTN defined in the mobility section of the OCP is an illustrative example to show the intent, and the impact of the arterial development strategy defined for the non-City Centre areas of the City. It is expected that it would be refined through the ATP process.

Specific actions to explore in future planning include:

- Incentivizing high efficiency requirements for new developments
- Requiring provisions for (current or future) alternative energy and district energy-ready systems.
- Include increased energy requirements for rezoned developments in neighbourhood centre rezoning similar to CCAP requirements

#### **Action 4 Promote energy efficiency in all rezoning**

The City Centre Area Plan requires that rezonings greater than 2,000 m<sup>2</sup> achieve LEED Silver equivalent. Action 3 (above) promotes this standard to each of the future shopping centre neighbourhood plans. This action suggests that higher energy efficiency requirements may eventually become a standard for all significant rezonings citywide.

The City will:

- Explore options to make high-energy efficiency a requirement for all significant rezoning applications.
- Identify energy efficiency requirements and application criteria in consultation with stakeholders

#### **Action 5 Develop incentives for new development to exceed the building code energy requirements**

Incentives may help to overcome the additional cost of building a more energy efficient building. This barrier is often cited as a reason for not building to higher standards. There are a variety of possible incentives including building permit fee discounts, (possibly) reduced DDC charges, or revitalization tax exemptions (RTEs).

The City will:

- Evaluate the options for an energy efficiency incentive program to encourage new developments to pursue greater efficiency. Tools may include fee reductions, rebates, revitalization tax exemptions, or other financial incentives.

#### **Action 6 Ensure that existing building code requirements are attained**

In 2008, the energy provisions of the building code were updated to be more stringent. There has been data accumulating recently (for example by BC Hydro) that indicates that the intended energy efficiencies are not always achieved. The reasons for this are not well understood but will become more evident over time. Working to achieve better attainment of the existing building standards may have a large impact on the energy use of new development – irrespective of efforts to achieve “better than code” performance.

The City will:

- work with BC Hydro, the BC Office of Housing and Construction Standards, and other agencies to evaluate the performance of new buildings within the City and to identify causes of underperformance
- review internal City processes to improve energy performance of new construction.

### **Strategy 3: Improve the Performance of Existing Building Stock**

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Almost 2/3 of the current energy use in the City, and over 40% of the GHG emissions are due to the existing building stock. Development actions (strategy #2) provides an opportunity to improve the sustainability of new buildings – which will replace some of the existing buildings, however the majority of the structures standing today will still be in place in 2041. Since OCP land use policies and development controls do not directly impact the existing building stock, this strategy is of particular importance to the scenario reductions.

The City currently has limited interaction with residents and businesses on energy issues and will need to expand its role if it is to achieve substantial reductions. At the local level, there are limited regulatory options to increase energy efficiency of existing buildings.<sup>26</sup> The opportunities for the City are primarily to pursue outreach and incentive activities.

#### **Action 7 Promote building efficiency through outreach and education**

The city can use its "points of contact" with residents to promote and encourage residents and businesses to take action. These include tax mailings, newspaper advertisements, utility distributions, the City website, the reception desk at City Hall, and the building permit desk.

The City will:

- Review and update its communication of energy efficiency and of available incentive programs for residents and businesses.
- Provide training and education (where appropriate) to city staff to help them understand the issues and communicate these to residents.
- Support appropriate regional initiatives to identify cost-effective improvements to increase energy efficiency of the existing building stock

#### **Action 8 Provide Incentives for building retrofit action**

Cost burdens are often cited as a reason for not taking action on energy efficiency. Providing some form of incentive can help mobilize action. Possibilities include:

- Building permit fee discounts for major renovations that include an energy upgrade (or perhaps simply an energy evaluation)

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<sup>26</sup> The City has signaled its support for alternative energy by signing on to the "solar energy ready" provisions of the BC Building Code.

- Rebates for residents that conduct an energy audit
- Revitalization tax exemptions for energy efficiency (traditionally connected to historic preservation but energy conservation is allowed for an RTE bylaw).

The City will:

- Develop a program of incentive measures for existing buildings. Most likely this will start as a pilot project and may be centred on a building audit incentive program.

While typically directed towards owner occupants, these incentives – particularly may be structured to provide an incentive for non-occupant owners (e.g. a tax reduction for the rental stock may be developed).<sup>27</sup>

#### **Action 9     Develop a residential energy conservation program to support housing affordability**

An area that is traditionally hard to reach with energy conservation incentives is low income residents, and in particular low income renters. Renters in particular are not able to make improvements to structures they don't own, and landlords are sometimes not motivated to make conservation measures if they do not receive the costs savings.

The city does have a strong interest in affordable housing, and there is a segment of aging rental housing. This action would target energy conservation through a small number of easy to install measures (shower heads, water fixtures, etc.) that may be installed by a resident, or by a resident with some assistance. The City may then use its access points (social services, program delivery agents, etc.) to get these installed in resident dwellings. This action may also be connected to water conservation, which is more familiar to municipal governments.

The City will:

- Support awareness of and access to energy conservation programs for low income residents
- Explore opportunities to retrofit units owned and/or operated by non-market housing providers

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<sup>27</sup> Rental stock can be a challenge to incentivize since the person paying for the upgrade (owner) does not benefit directly from the reduced energy costs or the improvement in living conditions.

## THEME 2: MOBILITY AND ACCESS

The OCP clearly identifies the need to make significant shifts in the way we get around. By 2041, the City aims to have more than half of all trips in Richmond by non-vehicle modes – walking, cycling and transit. In 2008, that vast majority of trips in Richmond were automobile trips (83%), so shifting to 51% of trips by walking, cycling and transit will require a concerted shift in priorities during land use planning (see Connected Neighbourhoods), infrastructure planning and design, as well as a shift in people's behaviours and attitudes towards using alternative forms of transportation.

The City recognizes that achieving this significant shift is necessary to reach the community's GHG emission reduction targets, but also necessary to achieve numerous other community objectives, including providing mobility and accessibility options to all residents, maintaining the affordability of getting around, providing safe public spaces, maintaining good air quality, and avoiding costly road expansions to accommodate growing populations.

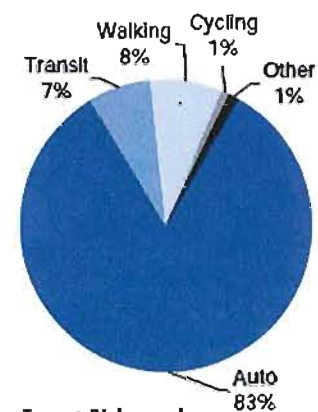
Prior to updating the OCP, the City undertook a Richmond Transportation Plan, including modeling of the current transportation system and opportunities for reducing reliance on vehicles. This study noted that the current street network does not have capacity problems within Richmond (though some were identified at connection points to other cities), and that with previously identified improvements for the City Centre, no further increases in capacity are needed to 2041. This provides an opportunity to shift financing priorities towards non-vehicular transportation improvements.

An important element of Richmond's transportation system is to understand where people travel to and from. Based on TransLink's Trip Diary analysis for trips taken in the fall of 2011, a very high percentage of trips that start in Richmond stay in Richmond (67% - the highest of any sub-region in the TransLink's service area). That means people are staying within the city to do many of their errands, go to restaurants, etc. The second most popular destination is Vancouver (16% of trips), which is well supported by the Canada Line. Therefore, a key focus for this plan is how to transition those trips within Richmond away from automobile trips to walking, cycling and transit trips. The weekday trips within Richmond are currently over 80% by automobile, while transit is only used for 5% of trips.

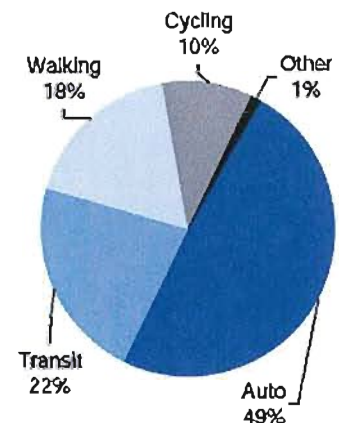
The City's increased commitment to non-vehicular transportation over recent years is demonstrated through several initiatives:

- Transportation Demand Management (TDM) measures are sought through development and have included: electrical outlets for vehicles and bikes, improved transit, pedestrian and cycling infrastructure, provision of car-share parking space and/or vehicle (primarily in proximity to Canada Line stations) and provision of transit passes
- Consolidated existing funding programs to create the Active Transportation Improvement Program in the 2013 budget
- Annual funding for Bike to Work Week (twice per year) and for Streetwise Cycling courses (learn to ride in traffic for adults)

Richmond Mode Share (2008)



Target Richmond Mode Share (2041)





- Planned funding in 2013 for Bike to School (learn to ride for elementary and secondary school students)
- Annual "Island City, by Bike" Tour for the community
- Biennial publication and distribution of cycling and trails map
- Currently designing a new recreation greenway along Railway Avenue (3.7 km trail for pedestrians and cyclists)

#### **Strategy 4: Prioritize and Fund Walking, Rolling and Cycling**

Supplying safe, direct, high-quality paths to and from homes, work, transit stops and other destinations is essential to reach Richmond's target to get residents, workers and visitors out of their vehicles for half of all trips. Safe routes ensure each mode is separated (i.e. pedestrians are separated from cyclists and vehicles; cyclists are separated from pedestrians and vehicles). Direct paths provide links directly to destinations; as opposed to traditional (vehicle-focused) roadway planning that has created circuitous paths that are a major deterrent to walking for errands and access.

Through the recent OCP update, the City has adopted policies that demonstrate a significant shift in priority towards the redesign of streets to incorporate quality infrastructure and allocation of street capacity to walking, rolling, cycling and transit uses. To realize this, it will be imperative to adopt this shift in priorities into infrastructure planning and design guidelines, and to ensure the City's annual capital budgets also reflect this shift in priorities.

##### **Action 10 Prioritize walking, rolling and cycling infrastructure**

Over several decades Richmond's transportation network has developed with a primary focus on streets for vehicles, and limited focus on other modes of transportation until recently. The City is now facing the challenge of maintaining the current street network, while significantly enhancing the non-vehicle transport network. This will require dedicated investment and integrated planning.

Non-vehicle infrastructure typically improves with dedicated budgets for each separate mode. Richmond has made significant investments in walking, rolling and cycling infrastructure and walkways through a variety of capital improvement programs: Active Transportation, Crosswalk, Neighbourhood Walkways and Pedestrian and Roadway. Additional investment is made through the Parks Division and special transportation projects. As a result, it is difficult to isolate the total funding for the non-vehicle transport network.

There is a correlation between cycling infrastructure funding and cycling mode share observed internationally. For example, it is estimated that dedicated investment of

*Freiburg, Germany (pop 218,000) dedicated \$1.3 million USD annually since 1976 and has 70% local trips made by bike, foot or public transit.*

*Source: Share the Road: Investment in Walking and Cycling Road Infrastructure, UNEP*

approximately 5 to 10 USD per capita in cycling infrastructure is required to yield a modal share of 5 to 10 percent<sup>28</sup>. Over the long term, the pedestrian and cycling network is less expensive to maintain than the vehicle network and is one of the least expensive elements of changing land use and transportation patterns.

The City will:

- Assess capital budgets to dedicate funds for pedestrian, rolling and cycling infrastructure that is supportive of reaching the community's mode shift targets
- Seek senior government grants to assist with funding larger dedicated pathways for walking, rolling and cycling.
- Target to dedicate a minimum of 10% of every roadway budget toward pedestrian safety features<sup>29</sup>.
- Prioritize linkages to existing and future planned Neighbourhood Centres and Frequent Transit Network corridors.

**Action 11 Continue a "Complete Streets" approach in all new street construction and rehabilitation projects**

"Complete Streets" refer to streets that are designed to accommodate many different modes, including walking, rolling, cycling, public transit and vehicles. Complete Streets typically incorporate the following design features as appropriate<sup>30</sup>:

- Wider and better sidewalks
- Universal design features (curbcuts and ramps)
- Crosswalks with pedestrian refuge islands
- Bike lanes
- Bus shelters and bus lanes where justified
- Centre left turn lanes
- Lower traffic speeds
- Landscaping

In addition to identifying a sustained, increased level of investment in and prioritization of non-vehicle infrastructure, the City will also need to ensure any new construction meets standards that support these new priorities.

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<sup>28</sup> Transport, Energy and CO2: Moving towards Sustainability, International Energy Agency IEA, 2009

<sup>29</sup> The Commission for Global Road Safety recommends that a minimum 10% of total project costs be allocated to safety.

<sup>30</sup> "Evaluating Complete Streets The Value of Designing Roads For Diverse Modes, Users and Activities", T. Litman, Victoria Transport Policy Institute, January 2013

For this action the City will:

- Review subdivision and development control bylaws to ensure designs provide safe, separated pathways for walking and cycling. To fully support non-vehicle mobility, the key will be to provide separated pathways for each mode (walking and cycling) to improve safety and comfort for all users<sup>31</sup>.
- Identify opportunities to reduce traffic speeds on urban streets.
- Identify schedules of street improvement projects based on the prioritized list of non-vehicle infrastructure needs.
- Where street improvements are prioritized to support goods movement, ensure non-vehicle infrastructure is fully integrated into all rehabilitation projects.

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### **Strategy 5: Enhance Alternative Transportation Connectivity**

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Ensuring residents have direct, safe routes to local shopping, amenities and transit will enable an increase in the number of walking, rolling, cycling and transit trips. This supports the community's goals to provide a transportation system that supports accessibility, safety and health of all its residents and visitors. The OCP identifies existing and future greenways, and neighbourhood links for each area of Richmond (section 3.5), and also identifies a list of criteria to use for prioritizing the identified projects (within 400 m radius of a neighbourhood centre, provides direct access to local destination, etc.).

#### **Action 12 Improve pedestrian links throughout the city as the top transportation priority**

Walking and rolling are the most accessible, equitable, healthy forms of transportation that can be used by all residents in Richmond. But the City must ensure pathways, sidewalks and other pedestrian links are in place throughout the community.

The City will:

- Identify streets to reduce vehicle speeds, increasing pedestrian safety. Various mechanisms may be employed, including reducing vehicles to one lane each way and converting additional space into separated paths.
- Prioritize all links identified within 400 m of Neighbourhood Centres that are on a current or planned Frequent Transit route and incorporate targets into Area Planning and Transit Planning processes.
- Prioritize Parks planning and budgets for Greenways to complete citywide links between Neighbourhood Centres in tandem with neighbourhood development sequencing.

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<sup>31</sup> For guidance on cycling infrastructure refer to the BC Ministry of Transportation and Infrastructure Bicycle Facilities Design, Course Manual, 2011.

- Seek out opportunities to improve links in neighbourhoods not being redeveloped and eliminate circuitous pedestrian routes (may require land acquisition where City land is not available).
- Fix sidewalks that limit accessibility for people that are rolling (e.g. reduce bumps at driveways).
- Provide funding to citizen groups that are promoting walking programs.
- Consider the creation of car-free zones.

#### Action 13 Focus on providing safe school routes

The City will prioritize pedestrian and cycling connections along school routes. This includes:

- Formalize the improvement of routes to school by funding or coordinating a citywide Safe Routes to School program<sup>32</sup> in conjunction with the School District, and with Parent Advisory Councils at each school.
- Working with the health authority to support a campaign for parents that links active transportation with healthier, more alert school children.
- Create vehicle-free zones in front of schools and designate vehicle drop-off areas further away to improve safety and improve pedestrian access.

### Strategy 6: Facilitate Changes in Transportation Behaviour and Mode Choice

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In addition to providing improved pedestrian, rolling and cycling infrastructure, incentives and disincentives may be required to ensure significant changes in the transportation choices made by Richmond residents. These can broadly be labelled Transportation Demand Management (TDM) measures. To increase the uptake of residents choosing transit, the City can also improve the built environment around transit stops by making it an attractive, comfortable, safe place to be while waiting for transit service. Although TransLink controls transit service routes and levels, however, the transit infrastructure improvements discussed here are within the City's realm.<sup>33</sup>

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<sup>32</sup> As an example, HASTe is a local non-profit organization that works with municipalities or other groups taking action on reducing school transportation emissions in BC.

<sup>33</sup> In the context of this report, "transit infrastructure" refers to street-level elements that support a transit system, but not the service itself, as the service is the responsibility of TransLink. The City takes responsibility for transit infrastructure such as: benches, shelters, public art, pedestrian and rolling access, and dedicated bus lanes which all increase the comfort and accessibility of transit and are important elements of a successful transit system.

**Action 14 Implement TDM projects that incentivize non-vehicle mode choice and disincentive vehicle use**

Municipalities are in the position to undertake a wide variety of TDM projects that support this transition in transportation choices ranging from raising awareness to implementing parking fees and addressing parking supply.

The City will work to implement the following TDM projects:

- Work with TransLink's Travelsmart program to raise awareness about the benefits of non-vehicle travel among residents, employees and employers, and school children.
- Reduce parking supply in transit accessible areas. Currently the City currently allows developers to build fewer spaces in exchange for various alternative transportation amenities. However, to apply more direct disincentives for automobiles, the City could consider establishing maximum parking allowances for developments in close proximity to transit facilities.
- Support Translink in coordinating employee discount transit passes across a number of firms in a related location (e.g. a business park) where individual employers are unable to meet the minimum requirement for discounted passes. Encourage companies to fund a "top-up" on the transit pass discount to bring it to 25% (from 15%).
- Continue encouraging car share organizations to locate vehicles in Richmond at key Neighbourhood Centres and throughout the City Centre. Provide dedicated parking spaces for minimal costs and promote car share programs with residents and businesses. Encourage employers to subsidize memberships for employees.
- Support regional road pricing policies.

**Action 15 Reduce supply of unrestricted City-owned parking spaces**

To discourage automobile use where other alternatives are available, the City can reduce the supply of unrestricted parking spaces both on- and off-street. This aligns with the City policy of reducing parking spaces in new developments where alternatives are available. The City will investigate the potential for:

- Implementing parking fees and/or time limits throughout the day in the City Centre.
- Over time consider implementing fees and/or time limits in Neighbourhood Centres where stores and amenities can be widely accessed by walking, rolling or cycling.

**Action 16 Provide infrastructure improvements to support increased transit service**

To get more people riding transit, the City will need to provide improvements to the public spaces where people access and wait for transit, as well as providing dedicated bus lanes and other transit priority measures that support a more frequent service level. TransLink, in consultation with the City and other stakeholders, will define a new



Richmond Area Transit Plan within the next year. Once the new plan is determined, the City will:

- Evaluate all current and future planned transit corridors for opportunities to improve the public space to make it attractive for transit users. Incorporate public art, greenery, lighting and other design elements to ensure transit users feel safe and comfortable.
- Commit funding to provide bus shelters and/or benches along all Frequent Transit routes.
- Implement transit priority measures (dedicated lanes, priority traffic lights, etc.) to support new service levels.

#### Action 17 **Improve bike facilities and consider implementing a bike share system**

Facilities dedicated to cyclists are currently in place but can be expanded further over time in Richmond. In addition to separated pathways, cyclists also need bike racks and other convenient and safe storage options at all destinations. Other facilities may include cyclist-controlled traffic lights. The City will:

- Provide ample and secure bicycle parking at all City facilities.
- Actively encourage other community amenities to put bicycle infrastructure in place – e.g. schools, clubs, businesses / business associations.
- Require cycling amenities with new developments.

Convenient access to Canada Line stations and other key FTN exchanges can be enhanced through provision of a public bicycle sharing system. There are over 300 cities around the world using public bike share systems with great success at reducing the use of personal vehicles for short trips, and for extending the reach of transit trips. Cities in Canada with existing systems include Montreal and Ottawa. The City of Vancouver is currently in the process of launching the first privately run and operated public bike share system in BC (target launch is summer 2013), and it is expected that this program will be expanded to Richmond if it is found to be successful.

In coordination with TransLink, the City will:

- Assess the feasibility of launching a public bike share system with a focus on connecting areas of high density and high employment with transit and community amenities. The system can start with a focus on the City Centre area and consider expansion to link Neighbourhood Centres over time.

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### **Strategy 7: Promote Low Carbon Personal Vehicles**

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There are many areas of Richmond, including single-family oriented neighbourhoods outside the current and potential future Neighbourhood Centres, and those in agricultural areas that are not expected to see any significant change in density over the next 30 years. Provision of a Frequent Transit service in close proximity to these residents is not viable.

Residents in these areas must also find alternatives that significantly reduce the distances they travel by vehicle and/or significantly increase the efficiency of their vehicles. Action can still be defined for these areas to improve the efficiency from vehicles for those trips that are still made

This strategy focuses on encouraging the use of smaller, more efficient and electric vehicles (EVs) that can achieve further reductions in the community's GHG emissions. The City has received funding and is currently installing EV charging stations across the community – 10 stations in 5 civic locations for public and City fleet use. The City also has new developments include EV charging stations as part of rezoning applications.

#### **Action 18 Set minimum requirements for EV infrastructure in new developments**

The OCP has identified private development EV infrastructure policy aligned with forecasted BC market penetration rates:

- A minimum of 20% parking stalls provided with a suitable receptacle for electric vehicle charging, and
- An additional 25% parking stalls pre-ducted for future wiring.

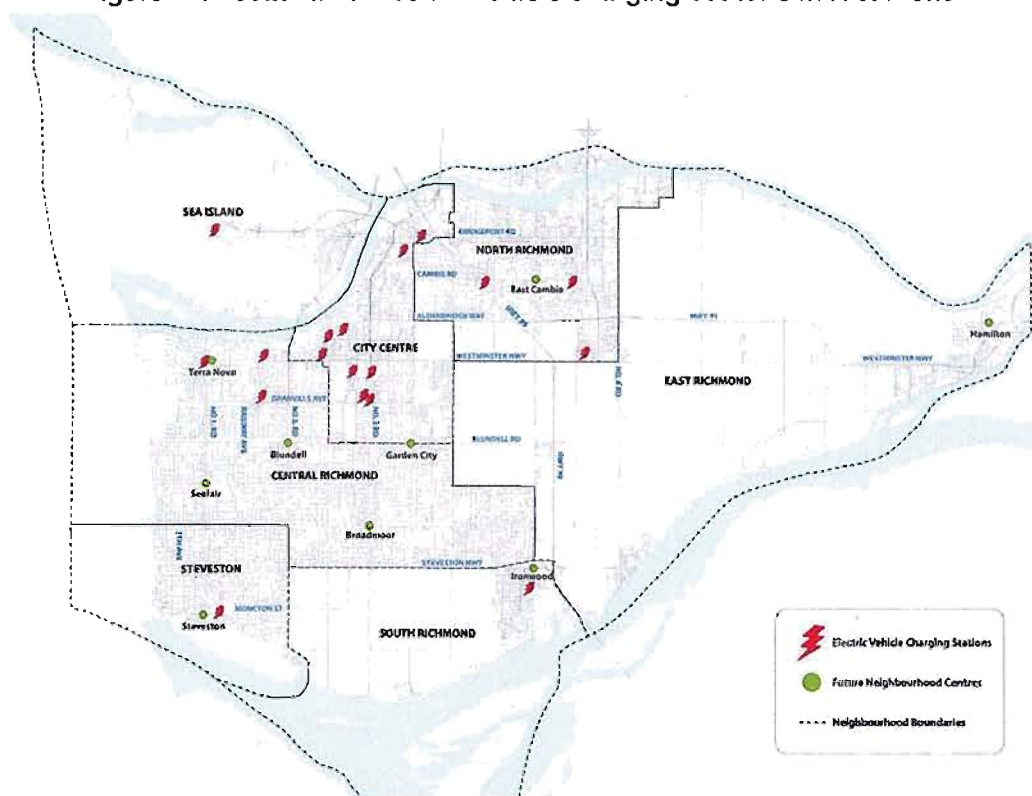
Detailed implementation will be done in consultation with stakeholders to address challenges associated with mixed use and/or strata developments.

#### **Action 19 Continue expanding the City-owned network of EV charging stations**

The existing EV charging network is largely focused in the City Centre (Figure 23), however, provision of this infrastructure in Neighbourhood Centres and at community facilities throughout the city is needed. The City will:

- Continue to install EV charging stations at key locations across the city.
- Consider providing premium parking in the City Centre to electric or small (e.g. smart car) vehicles.

Figure 23. Location of Electric Vehicle charging stations in Richmond



## THEME 3: RESILIENT ECONOMY

From an energy and carbon perspective, the economy sector refers to light industrial and commercial buildings and commercial vehicles and goods movement. Commercial buildings consume 36 % of the energy in the community and produce 21% of the GHG emissions. Commercial vehicles use 8% of the energy and produce 12% of the GHG emissions.

Municipalities interact with their commercial businesses through new development projects, property tax and business licensing issues, the Chamber of Commerce, and potentially for occasional bylaw enforcement issues. The City has an Economic Development office, whose role is to encourage and facilitate economic expansion within the City of Richmond. It acts as a catalyst to bring together people, ideas and capital, ultimately leading to economic development and diversification.

### Strategy 8: Encourage Energy Efficient Businesses

The City can encourage a greater awareness of energy efficiency and GHG reduction in the local business community. In many ways the City is already doing activities of this nature - e.g. supporting businesses to receive training from the Climate Smart Initiative. This role is generally one of facilitation, information sharing, and encouragement. Specifically the economic development office does not play a regulatory role. As a result, actions directed towards a more energy efficient economy will be supportive in nature and likely aided by partners in the community.

#### Action 20 Promote energy efficient business operations

In this action the City through its economic development activities will work to promote energy efficiency – through incentives or planning activities (e.g. eco-industrial networks) to engage and enable the business community to use energy more wisely and therefore reduce operating costs and increase business resiliency.

The City will:

- Increase engagement with businesses with respect to energy efficiency through support of established programs (e.g. ClimateSmart, LiveSmart, utility conservation programs),
- Encourage creation of green jobs during local economic development planning,
- Create liaison groups for Building Energy Managers and Fleet Managers to increase opportunities for capacity building and knowledge sharing across organizations with these roles (e.g. YVR, School District, Kwantlen),
- Continue to improve the City's corporate sustainability practices, including updating the corporate sustainable procurement policy, and
- Raise awareness amongst the business community of the City's sustainability initiatives.

## THEME 4: SUSTAINABLE INFRASTRUCTURE AND RESOURCES

This section describes strategies to address the energy and carbon aspects of sustainable infrastructure and resources. The city is the owner and operators of a vast network of infrastructure – roads, sewers, drainage pumping and sewage lift stations.

The City of Richmond became an energy utility operator with the establishment of the Alexandra District Energy Utility in July 2012. The OCP directs that the City will specifically look to utilize local energy sources as a way to be more resilient and self-sufficient in energy.

Waste is also recognized more as a resource than as a disposal product. The City is aligned with Metro Vancouver's waste strategy to increase diversion from disposal to 70%.

### **Strategy 9: Continue Advancement of Neighbourhood District Energy Systems**

The City has been experiencing significant population growth with the associated demand for new housing, additional infrastructure and amenities. It is anticipated that the population in Richmond City Centre will grow from approximately 50,000 today to 100,000 by 2040 and to 120,000 by 2100. A thermal energy demand map, developed by City staff identified this growth as a great opportunity for development of neighbourhood district energy systems.

Sustainable energy systems such as district energy provide a number of benefits for the community including environmental performance, local energy security, improved energy efficiency, fuel flexibility, and economic benefits to community. They also provide new employment opportunities during the construction and operation.

The City has shown leadership in pursuing district energy opportunities – completing a number of pre-feasibility studies, developing Richmond's first DE system utilizing ground source heat pump technology in West Cambie area, implementing Alexandra District Energy Utility service area bylaw, developing thermal energy demand map for the City Centre area, procuring detailed feasibility study for the River Green Development, defining a policy for new developments in the City Centre to be DEU-ready

#### **Action 21 Reserve district energy rights of ways in new developments and road reconstruction**

During development reviews, City staff work with proponents and developers to ensure that suitable right of ways are preserved in the roads to allow for future district energy services – but these are not codified or reserved from future use.

In this action the City will:

- Identify DE building connection standards for access across properties.
- Determine a mechanism to formalize the right-of-ways being reserved for future DE services



**Action 22 Develop a City Centre DE Right of Way Master Plan**

Develop a long term plan to maintain the future capability for District energy systems, by developing a plan for and preserving within the City Centre area suitable rights of ways and space under the streets for District Energy piping and other infrastructure.

**Action 23 Explore opportunities to connect existing buildings to DE system**

Almost 2/3 of the current energy use in the City, and over 40% of the GHG emissions are due to the existing building stock. Connecting the new buildings to district energy system provides an opportunity to improve the sustainability of new buildings; however the majority of the structures standing today will still be in place in 2041. Majority of these existing buildings use gas fired make-up-air units (MUA) for common space conditioning and gas fired boilers for domestic hot water heating.

The City will:

- Conduct a screening level analysis to identify multi-unit residential buildings located close to high density development to connect to district energy systems.

**Action 24 Explore options for electricity generation from utility scale renewable sources**

There are potential energy sources that may be explored. These would need to address site-specific issues of the geography, location, and available energy sources in Richmond. The City has already explored heat capture from the Lulu Island wastewater treatment plant. Other examples might include waste heat capture from industrial facilities that may generate electricity if properly deployed.<sup>34</sup>

The City will:

- Conduct a screening level analysis – in partnership with BC Hydro – to identify possibilities for renewable electricity generation within the City.

**Action 25 Integrate energy infrastructure into community planning**

Utilities – including BC Hydro have traditionally executed their infrastructure planning independently of municipal infrastructure. Interactions would typically be for permits and rights of way reviews. More recently there is an interest for infrastructure and utility planning to be better coordinated – and this may be specifically valuable in Richmond where the scale of new electricity demand is requiring BC Hydro to plan for upgrades to their infrastructure.<sup>35</sup>

The City will:

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<sup>34</sup> Each community has different opportunities for renewable energy. Specific factors in Richmond energy source may

<sup>35</sup> A description of BC Hydro's infrastructure system within Richmond and planned infrastructure upgrades is provided in Appendix B.

- Work more proactively with BC Hydro and other utilities to coordinate civil engineering work with energy utility work.

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### Strategy 10: Utilize Local Energy Sources

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Most community energy systems (vehicles, electricity, natural gas, etc.) bring energy from far away and deliver it to a community. This system has in the past been very successful, and as a result cities are intensive energy consumers, but not effective at energy generation. As new sources of energy become more expensive, or their reliability more uncertain, it is valuable to look again for energy sources within the community.

Local energy sources can be developed to provide a portion of the community's energy supply. This can have many benefits – most notable are the potential to defer major infrastructure upgrades, and to have a more resilient and varied energy supply system. There may also be potential to create jobs in the community through the development of energy sources.

#### Action 26 **Promote building scale renewable energy**

Innovative technologies can be applied at the building scale to reduce conventional energy consumption. At present the most common application is rooftop solar panels to provide water heat.<sup>36</sup> Other applications may include photo-voltaic (PV) systems for electricity, small wind generation systems, and a range of innovative heat pump applications.

Barriers to implementation of new technologies include cost, lack of proven examples or certification, uncertainty with permitting, unfamiliarity to approving officers and industry, and concerns over system impacts such as noise, reliability, servicing, etc.

To improve the uptake of these technologies, the City will:

- Explicitly define considerations for renewable energy technologies (rooftop solar, small scale wind, heat pump locations and operation) when developing or updating neighbourhood plans and development permit area guidelines<sup>37</sup>
- Invest in training and education of City staff regarding new innovative energy technologies
- Perform community level study for the effectiveness of the solar thermal systems for single family dwellings
- Actively promote the use of solar thermal heating in new dwelling construction

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<sup>36</sup> Richmond has signed-on to the solar ready building code amendment which requires that new detached dwellings provide suitable rooftop, conduit, and utility room space for the future installation of solar hot water systems.

<sup>37</sup> For example, the corporation of Delta has developed a rooftop thermal energy bylaw that states that the height of rooftop solar panels is not included in the building height calculation.

- Explore the practicality to develop a Policy requiring solar air heating and ventilation (solar walls) for commercial/industrial buildings

### **Strategy 11: Maximize Waste Diversion**

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The City has set aggressive diversion targets as part of the regional Integrated Solid Waste and Resource Management Plan (ISWRMP). Waste diversion can create energy recovery opportunities (e.g. through biogas creation from separated organics).

#### **Action 27 Continue to implement activities to support the ISWRMP**

The OCP commitment and the ISWRMP have set enthusiastic targets for waste diversion and the City is a proactive player in this area.

The City will:

- Continue to implement waste diversion activities in support of a 70% diversion target
- Encourage waste to be used as a resource

## THEME 5: CLIMATE CHANGE LEADERSHIP

The OCP defines climate action as an important consideration for the City in its planning and development. Part of that response will be to demonstrate that the City is committed to action, and will support all sectors of the community.

Although these strategies do not directly achieve community reductions, they are foundational and are part of a consolidated approach to building support for energy conservation and efficiency.

### **Strategy 12: Encourage Sustained Action by Senior Levels of Government**

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#### **Action 28 Continue to advocate for support from senior levels of governments**

The Federal and Provincial governments have a crucial role to play to reduce GHG emissions – through their roles as regulators (e.g. setting vehicle fuel efficiency standards, building code requirements, equipment efficiency standards), and as funders (through incentive measures, grant programs, and tax policy).

For this action the City will:

- Advocate for more aggressive action by Federal and Provincial agencies, independently and through the Union of BC Municipalities (UBCM), and the Federation of Canadian Municipalities (FCM).
- Support the achievement of GHG reduction targets at the Federal and Provincial level.

### **Strategy 13: “Lead by example” with City Operations Energy Management**

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Richmond has been a leader in “walking the talk” of conservation in its own operations. Several years ago it first established fleet management initiatives directed specifically to energy conservation and was among the first municipalities to define a policy for green building requirements in municipal facilities.<sup>38</sup> It has a dedicated staff role as an operations energy manager. As well it has signed the BC Climate Action Charter and reports annually on its operations and carbon footprint.

Pursuing the council approved energy and GHG reduction targets will mean that the City is going to ask its residents and businesses to take action. To be perceived as credible, the City will need to demonstrate that it has made a similar commitment to what it is asking residents and businesses to make.

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<sup>38</sup> Using the green building standards Leadership in energy and environmental Design (LEED<sup>TM</sup>), the City established a policy in 2007 (?) that all municipal buildings be designed to LEED Silver level.

**Action 29 Develop long-term funding for climate activities in the city**

Energy and emissions management are new areas that are largely unfunded, or are funded for short term, or project based activities through grants and partnerships. Recognizing that these issues are new, they will require incremental funding beyond existing resources. This funding will require a combination of staff time, and disbursements. Possible sources of this funding are general revenues, and the Carbon tax rebate (CARIP grant), which some communities have dedicated to be used to fund sustainability initiatives. Note, however, that grant funding is only certain on a year-to-year basis.

The City will:

- Secure long term budget funding for community climate change action.<sup>39</sup>

**Action 30 Integrate climate change into other municipal activities**

Taking action cannot be seen as an isolated activity. Rather it needs to align well with other initiatives. The 2041 OCP document includes many initiatives that have multiple community benefits, one of which is energy efficiency. Those benefits may not be explicitly identified as being climate driven.

The City will:

- Include considerations for energy conservation in other planning and infrastructure activities
- Continue developing the Sustainability Framework and expanding to other municipal activity areas.
- Continue its efforts to reduce energy use and carbon emissions in its building, fleet, and infrastructure operations.

**Action 31 Provide incentives to encourage alternative transportation use by staff**

Promoting alternative transportation with staff is a highly visible way to demonstrate leadership to the community. Opportunities to take action include fostering car-pooling, providing facilities at municipal facilities for staff to use alternative transportation, and providing incentives for transit. Many staff already use alternative transportation or transit for their commute.

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<sup>39</sup> In 2012 the city received Climate Action Revenue Incentive Program (CARIP) grant of \$232,000. This is essentially a reimbursement of the carbon tax paid by the City. Richmond dedicates these funds to the Carbon Provisional Account. The purpose of the fund is to reduce corporate emissions, support community-based GHG reduction action and protect the City from financial exposure should purchase of external offsets be required.



The City will:

- Review its major workplaces facilities for any gaps in provision of cycling, walking or transit opportunities.
- Consider providing top-up incentives (e.g. perhaps a matching 15% or something similar) to encourage employees to join the program.<sup>40</sup>

**Action 32 Define a climate change portfolio / staff person**

Experiences throughout the province have shown that without defined roles and responsibilities to specific staff, climate action is slow to start and the results are rarely fully realized.

The City will:

- Create clearly defined roles and responsibilities for the implementation of specific activities among existing departments (where appropriate) and provide job responsibilities for proper administration of this initiative.<sup>41</sup>

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**Strategy 14: Engage the Community on Climate Action**

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The OCP encourages the City to be an active player in moving forward resident and business action on energy conservation.

**Action 33 Develop an outreach program to residents and businesses on climate action**

Motivating and enabling residents and businesses to take their own action have been identified as key areas where the City can take action. The City is a contact point between residents, businesses and government in so many areas – utilities, services, development, recreation, culture, and more – that it is a natural place for the City to play a role.

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<sup>40</sup> TransLink offers a program whereby employers can arrange for their staff to receive a discount (typically 15%) on monthly bus pass purchases. This is a voluntary program but has some restrictions – including that employees must sign up for a year at a time for the program. The one-year sign-up has been seen as a barrier to join the program as the 15% discount is neutralized by unused transit days (vacation, other modes of commuting).

<sup>41</sup> See Chapter 7, for a description of the expected implementation requirements.

Opportunities for the City to take action include:

- Promoting existing senior government incentives for homeowners and business owners
- Dedicating City webpage space to helping homeowners and businesses learn about energy conservation
- Using City "contact points" more aggressively to promote energy efficiency – e.g. the building permit desk, etc.
- Supporting NGO events related to climate change and energy through use of City land and facilities
- Developing a small grant program (possible via Grants in Aid, or using the Climate Provisional Account)

## 7 Beyond the Plan: “Breakthrough” Actions

It is acknowledged that the plan-defined actions are not likely to be sufficient to achieve the desired GHG reductions. This is not a unique situation; in fact, few if any communities have defined and committed to implement the types and strength of actions that would be required to meet reductions in the range of 80% in 40 years. If it were easy, we would already be done!

The future though is wildly uncertain, and 40 years is a sufficient time for many unpredictable things to occur: oil prices could spike, new technologies could make new buildings highly efficient and rising costs for electricity of other fuels could inspire a level of conservation that we can't anticipate at the present.

This section explores the potential impact of three major breakthroughs and uses the wedge presentation format to highlight the magnitude of impact of these measures.

These are presented to help us appreciate the impact of these large game changers. Rather than work to discern whether some or all or many or most residents would take an action these are presented as "What if we all did this?" statements.

Three "big breakthroughs" are selected:

- **Complete conversion of passenger vehicles to electric:** the electric car has reached commercialized status. At present the cost and charging infrastructure make it a niche product. At the same time, global oil forecasts vary widely from a future of shortage, to one of new found cheap oil. However, those supplies could be vulnerable, or volatile, or perhaps a future with a price on carbon makes them expensive. For this breakthrough, some combination of price changes and broader acceptance of electric vehicles results in near complete conversion of the passenger vehicles fleet to electric cars by 2041.<sup>42</sup>
- **Carbon Zero Buildings:** Architectural and engineering visioning has placed the idea of a net zero (energy) building as the norm. The new CIRS building at UBC is designed to be a net generator of energy. Even within the more modest realm of the building code, the continual updating of the ASHRAE 90.1 energy performance standard is driving more and more efficient building design and operation with a targets for dramatic improvements in energy performance over the coming 20 years. For this "big

<sup>42</sup> The average age of a vehicle in the lower mainland is about 10 years. Achieving this break through does not mean that everyone must buy an electric car for their next purchase, rather that by the time they buy their third vehicle, it is an electric one.

breakthrough" we have assumed that by 2025 all new buildings are "net zero" carbon emitters.<sup>43</sup>

- **Massive building stock renovation:** The energy elephant in the room in many communities is the stock of existing buildings. While new dwellings are built by the hundreds each year, and each one becoming more efficient than the last as the building code evolves, there are thousands of existing buildings in the community. These are unaffected generally by municipal activity, and are only affected by the owners, at their discretion. However, energy price swings, owner awareness, demographic turnover of housing stock etc. could drive a desire for residents to retrofit and upgrade the energy efficiency of their homes and businesses. For the big breakthrough it is assumed that by 2050 all existing buildings have had a major renovation that dramatically reduces their external energy needs and carbon emissions. Many of these buildings obtain a portion of their energy from on-site renewables and have deployed low carbon energy sources.

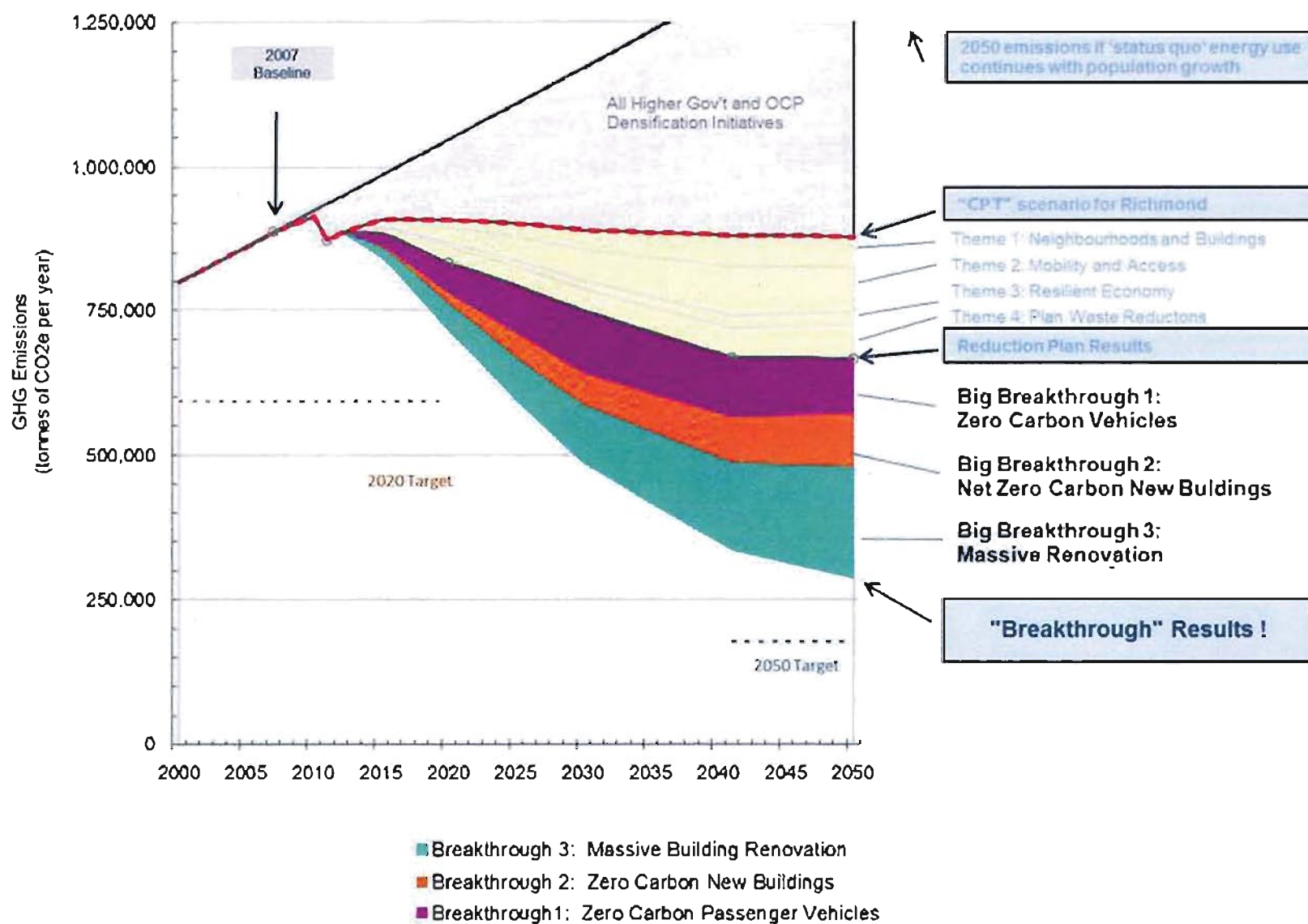
The results of these "Big Breakthroughs" are shown Figure 24. From this it is evident that more dramatic reductions are possible. To occur there will be a number of drivers beyond the municipal actions in this plan.

The wedge also shows us that no one action will be a silver bullet. To make large scale reductions will require action on each activity.

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<sup>43</sup> Net zero implies that while they may consume some carbon fuel at some times, they also export energy to displace a similar amount of carbon fuel elsewhere.

Figure 24. Carbon Wedge Results of the “Big Breakthrough” Actions





# 8 Implementation

## 8.1 Governance and Management

Preparation of the plan required staff resources from Sustainability and District Energy. It also required smaller allocations of time from departmental representatives participating in a staff working group to review drafts of the plan. The BC Hydro Sustainable Communities Program contributed to City funding for external expertise.

The plan presents a set of strategies and actions that will assist the City in taking steps to achieve its long-term energy vision and emission reduction targets.

## 8.2 5-Year Action-Level Implementation

Effective implementation of this plan requires some level of dedicated resources to ensure that actions are implemented and coordinated among departments and that progress is tracked. Sustainability and District Energy will be primarily responsible for the overall plan implementation with individual actions the responsibility of the relevant departments as deemed appropriate by their respective Directors. Additionally, some actions may require new resources not currently allocated in the City budget. As a starting point in understanding the level of resources that may be needed to create a Community Energy and Emissions Program, each action was assessed for its potential resource needs and costs.

The required staff, disbursements and capital costs are identified for resource planning purposes. Although much of the implementation requirements will rely on existing resources, there may be elements of the implementation plan that cannot be covered without additional resources or expertise. Similar to the preparation of the plan, the City will seek external funding as available.

The following table provides an action-level estimation with high-level costing estimate to implement the plan. As well, it identifies a number of considerations and co-benefits of the plan activity including:

- Approximate start year for implementing each action (between 2013 and 2018)
- Lead department – there may be a need to coordinate across departments, however this identifies the likely department to coordinate and lead the action
- Scale of City resources that may be needed to implement each action – considers potential additional staff resources that go beyond the existing staff roles, also provides very broad estimates for potential disbursements for studies, and notes where potential additional capital costs may be necessary
- Qualitative assessment of the potential cost to the community of the action – considers whether implementation of the action will result in reduced, neutral, or increased costs for

affected parties. Note, this does not consider changes in municipal taxes – as these can be represented in the cost to the City.

At the same time as taking action to mitigate climate change and improve energy efficiency, the City is also undertaking numerous other activities to obtain other key community goals and objectives (e.g. increasing supply of affordable housing, protecting natural areas, creating vibrant arts, heritage and cultural communities, preserving clean air, etc.). Although these are not directly listed as the vision or key objectives of the Community Energy and Emissions Plan, it is important to recognize how the actions identified may have a positive or negative impact on these community objectives. The last seven columns of the table present areas where the CEEP actions may provide co-benefits or positive impacts. The seven criteria were selected based on the City's Sustainability Framework and other priority areas identified during discussions with staff:

- Inclusive, Safe, Accessible Communities
- Vibrant Communities
- Sustainable Business
- Natural Environment
- Affordable Living
- Clean Air
- Resilient Infrastructure

**Table 7. Action Level Implementation Guide**

Resources and costs are rough estimates based on the findings of other municipalities completing CEEPs in the Lower Mainland. These may vary for the City of Richmond and require further review. The required staff, disbursements and/or capital costs are identified for resource planning purposes and it is anticipated that much of the implementation requirements will utilize existing resources.

Strategy / Action		Estimated year to start implementation	Lead department	Resource planning (estimated staff, disbursements and/or capital costs)	Cost to community (reduce, neutral, increase)	Inclusive, Safe, Accessible Communities	Vibrant Communities	Sustainable Business	Natural Environment	Affordable Living	Clean Air	Resilient Infrastructure
Theme 1: Neighbourhoods and Buildings						Sustainability framework goals and co-benefits						
Strategy 1: Integrate Future Neighbourhood Centre Planning with Transit Planning												
1	Review Neighbourhood Centre development sequencing for flexibility	2013	Policy Planning (Planning & Development)	existing resources	neutral	X	X		X		X	
2	Collaborate with TransLink to update the Area Transit Plan (ATP)	2014	Transportation (Planning & Development)	existing resources	neutral	X				X	X	
Strategy 2: Increase Energy Efficiency in New Developments												
3	Include energy efficiency in Neighbourhood Centre planning	align with area planning	Sustainability (Engineering & Public Works) AND Policy Planning (Planning & Development)	20k\$ to 40k\$ disbursement for technical studies (potential BC Hydro funding)	possible increased development cost; reduce occupant energy costs					X		X
4	Promote energy efficiency in all rezoning	2013	Sustainability (Engineering & Public Works)	existing resources	increase development cost; reduce occupant energy costs					X		X
5	Develop incentives for new development to exceed the building code energy requirements	2013; align with area planning	Sustainability (Engineering & Public Works)	0.5 PY for 2 years to develop program; 25k\$ disbursement for economic analysis.	neutral or increase development cost; reduce occupant energy costs					X		X
6	Ensure that existing building code requirements are attained	2013	Building Approvals (Planning & Development)	0.5 PY ongoing to review plans and ensure compliance	reduce occupant energy costs							X



Strategy 3: Improve the Performance of Existing Building Stock												
7	Promote building efficiency through outreach and education	2013	Sustainability (Engineering & Public Works)	0.25 PY for 3 years	neutral							X
8	Provide incentives for building retrofit action	2015	Sustainability (Engineering & Public Works)	0.5 PY for 2 years; 10k\$ disbursement marketing materials; pilot \$300k\$ incentives (\$300 x 1,000)	neutral					X		X
9	Develop a residential energy conservation program to support housing affordability	2014	Sustainability (Engineering & Public Works) AND Community Social Development (Community Services)	0.25 PY for 2 years	decrease energy costs for participants					X		X
Theme 2: Mobility and Access												
Strategy 4: Prioritize and Fund Walking, Rolling, Cycling Infrastructure												
10	Prioritize walking, rolling and cycling infrastructure	2014	Transportation (Planning & Development) AND Parks (Community Services)	capital budget shift or increase estimated at \$1M per yr	neutral; may reduce travel costs	X	X			X		X
11	Continue "Complete Streets" for street construction and rehabilitation projects	2014	Transportation (Planning & Development)	existing staff	neutral; may reduce travel costs	X	X			X		X
Strategy 5: Enhance Alternative Transportation Connectivity												
12	Improve pedestrian links throughout the city as the top transportation priority	2013	Transportation (Planning & Development) AND Parks (Community Services)	existing staff; capital budget (Action 10)	neutral; may reduce travel costs	X	X		X	X	X	X
13	Focus on providing safe school routes	2014	Transportation (Planning & Development)	0.5 PY for 3 years (share with TDM coordinator)	neutral; may reduce travel costs	X	X			X	X	
Strategy 6: Facilitate Changes in Transportation Behaviour and Mode Choice												
14	Implement TDM projects that incentivize non-vehicle mode choice and disincentive vehicle use	2014	Transportation (Planning & Development)	0.5 PY for 3 years (share with safe school routes)	reduce costs for alternatives; increase vehicle costs			X			X	

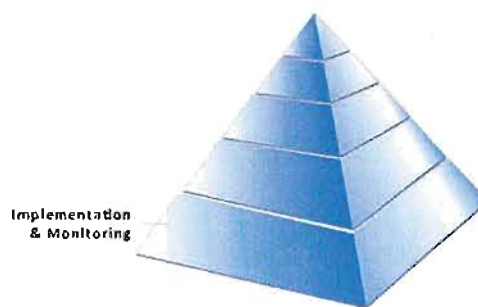
15	Reduce supply of unrestricted City-owned parking spaces	2018	Transportation (Planning & Development) AND Parks (Community Services)	existing staff	increase parking costs						X	
16	Provide infrastructure improvements to support increased transit service	2016 to align with service	Transportation (Planning & Development)	capital budget shift or increase estimated at 200k\$ per year	reduce travel costs	X				X	X	X
17	Improve bike facilities and consider implementing a bike share system	2015	Transportation (Planning & Development)	capital budget shift or increase (Action 10)	neutral; may reduce travel costs	X	X			X	X	X
<b>Strategy 7: Promote Low Carbon Personal Vehicles</b>												
18	Set minimum requirements for EV charging stations in new developments	2013	Transportation (Planning & Development)	existing resources	neutral						X	
19	Continue expanding the City-owned network of EV charging stations	2015	Engineering & Public Works	estimated 5k\$ per station x 20 stations	neutral						X	
<b>Theme 3: Resilient Economy</b>												
<b>Strategy 8: Encourage Energy Efficient Businesses</b>												
20	Promote energy efficient business operations	2015	Sustainability (Engineering & Public Works)	0.3 PY for 2 years; 20k\$ disbursement for study	reduce business operating costs			X				X
<b>Theme 4: Sustainable Infrastructure and Resources</b>												
<b>Strategy 9: Continue Advancement of Neighbourhood District Energy Systems</b>												
21	Reserve district energy rights of ways in new developments and road construction	2013	Engineering (Engineering & Public Works)	0.5 PY for 6 months to define standards and mechanism	neutral							X
22	Develop a City Centre DE Right of Way Master Plan	2015	District Energy (Engineering & Public Works)	0.5 PY for 6 months; 80k\$ disbursement for study	neutral							X
23	Explore opportunities to connect existing buildings to DE system	2015	District Energy (Engineering & Public Works)	0.3 PY for 6 months; 50k\$ disbursement for study	neutral							X
24	Explore options for electricity generation from utility scale renewable sources	2015	District Energy (Engineering & Public Works)	0.3 PY for 6 months; 50k\$ disbursement for study	neutral							X



25	Integrate energy infrastructure into community planning	2013	District Energy & Engineering (Engineering & Public Works)	existing staff	neutral												X
<b>Strategy 10: Utilize Local Energy Sources</b>																	
26	Promote building scale renewable energy	2015	Sustainability (Engineering & Public Works)	0.3 PY for 2 years; 50k\$ for study	neutral				X								X
<b>Strategy 11: Maximize Waste Diversion</b>																	
27	Continue to implement activities to support the ISWRMP	2013	Engineering (Engineering & Public Works)	existing staff	neutral												
<b>Theme 5: Climate Change Leadership</b>																	
<b>Strategy 12: Encourage Sustained Action by Higher Levels of Government</b>																	
28	Continue to advocate for support from higher governments	2013	Sustainability (Engineering & Public Works)	existing staff	neutral												
<b>Strategy 13: "Lead by example" with City Operations Energy Management</b>																	
29	Develop long-term funding for climate activities in the city	2015	Sustainability (Engineering & Public Works)	existing staff (corporate energy manager)	neutral												X
30	Integrate climate change into other municipal activities	2014	Sustainability (Engineering & Public Works)	existing staff	neutral	X	X										X
31	Provide incentives for alternative transportation by staff	2014	Sustainability (Engineering & Public Works)	incentive program 5k\$ per year	neutral								X	X			
32	Define a climate change portfolio / staff person	2014	Sustainability (Engineering & Public Works)	0.25 PY for 5 years (management of plan - other time is in other Actions)	neutral												X
<b>Strategy 14: Engage the Community on Climate Action</b>																	
33	Develop an outreach program to residents and businesses on climate action	2014	Sustainability (Engineering & Public Works)	0.25 PY for 2 years	neutral	X	X										

## 8.3 Monitoring Framework

As described earlier in section 5, the base of the plan pyramid represents the numerous activities involved in implementation and tracking the progress of that implementation. A monitoring framework provides a list of items to track that will help re-assess the effectiveness of the plan over time. The framework should assist with answering:



1. Direct progress towards the vision and targets:
  - Primary indicators:
    - How much progress have we made towards the community GHG reduction targets?
    - How much progress have we made towards the community energy use reduction target?
2. Progress on other indicators that provide indirect measures of energy and GHG impacts:
  - Secondary indicators: How much progress have we made towards related targets (e.g. change in mode split) that are linked to achieving the overall targets?
3. Progress on plan implementation:
  - How many actions are complete, how many are in progress, and how many did not start?

### 8.3.1 Primary Indicators: CEEI Reports

In BC, the provincial Climate Action Secretariat (Ministry of Environment) has undertaken efforts to quantify these primary indicators for every municipality on a biannual basis through the Community Energy and Emissions Inventory initiative. The City can continue to monitor these reports, understanding that they are likely useful to demonstrate general trends across numerous years, but are not refined enough to provide a precise measure of progress towards GHG targets. Indicators include:

- Total GHG emissions from community sources (tonnes CO<sub>2</sub>e)
- Total GHG emissions from buildings (tonnes CO<sub>2</sub>e)
- Total GHG emissions from transportation (tonnes CO<sub>2</sub>e)
- Total GHG emission from waste (tonnes CO<sub>2</sub>e)
- Total energy consumption (GJ)
- Total electricity consumption (kWh)

### 8.3.2 Secondary Indicators

Secondary indicators provide an additional method of understanding whether progress is being made towards the overall targets, and are particularly useful when the overall targets are challenging to measure with much certainty. They also provide clarity on whether identified strategies and actions are resulting in the desired outcomes. Possible tracking indicators include:

#### Neighbourhoods:

- Percent of new dwellings located within 400m of a frequent transit route, or 800m of a Canada Line station
- Percent of population living within 400m of a frequent transit route, or 800m of a Canada Line station
- Percent of population within walking distance of a grocery store and park

#### Buildings:

- Percent of new buildings exceeding energy performance standards in the current building code
- Percent of existing buildings renovated to high energy performance standards

#### Mobility and Access:

- Mode split for all trips (walking/rolling, cycling, transit, vehicle) \*
- Percent of completed pedestrian links within 400m of current or planned Frequent Transit route \*\*
- Percent of completed cycling links identified in the OCP
- Percent bus stops on frequent transit routes with shelters; Percent with benches

#### Resilient Economy:

- Percent of employees working within 400m of a frequent transit route, or 800m of a Canada Line station [may be challenging to track], alternatively:
- Mode split of commuters travelling to Richmond for work

#### Sustainable Infrastructure and Resources:

- Number of building scale renewable energy systems installed
- Percent of road construction projects with reserved DE right of ways (in areas identified for future DE)
- Number of new buildings connected to DE system
- Number of existing buildings connected to DE system
- Percent of waste diversion\*

#### Climate Change Leadership:

- Total GHG emissions from City facilities (tonnes CO<sub>2</sub>e)
- Mode split for staff commute trips to work

*\* Richmond target exists already for these indicators.*

*\*\* This plan has identified the need to conduct analysis and set specific targets for these secondary indicators.*

### **8.3.3 Plan Implementation Indicators**

The following indicators are suggested as mechanisms for tracking the overall progress of implementing the action plan:

- Number of actions underway
- Number of actions completed

Actions that are primarily outreach or incentive-based may benefit from understanding the level of uptake in the community, for example:

- Action 8: Number of energy audits completed (incentives distributed)
- Action 9: Number of residential energy conservation kits distributed
- Action 13: Number of schools participating in the safe routes to school program
- Action 14: Number of employers providing incentives for employee transit passes
- Action 21: Number of City staff completed building scale renewable energy awareness training program (in building permit department)
- Action 30: Number of City staff using the transit incentive program
- Action 32: Number of residents and businesses participating in the outreach program

## 9 Conclusion

The climate is changing...we need to act. There is consensus amongst scientists that carbon emissions are affecting the climate and must be reduced. There is an evolving public opinion – not as certain as the scientific consensus but becoming stronger – that action should be taken.

Energy consumption and GHG emissions have traditionally been closely tied to population growth. Over the next 30 years, Richmond is expected to grow by 80,000 people. Managing that growth while reducing carbon emissions is a challenge for all communities. In order to achieve a more sustainable future, communities will have to both conserve energy and to develop new energy sources that do not create more carbon emissions.

The availability of new energy efficient technologies, combined with stronger senior government regulations for efficiency in vehicle standards and building code standards will help Richmond reduce overall GHG emissions. But action from senior governments alone will not be enough and finding substantial reductions will require actions by all players in the economy.

The City has already taken steps to set the community on a more sustainable path through compact, mixed-use development and improved options for getting around without a vehicle. This plan defines further strategies and actions the City can take to realize more substantial reductions in GHG emissions from the community.

Residents and businesses in the community will also need to make choices that support the community's energy vision, identified through Phase 1 of the CEEP:

*"an energy-wise and low-carbon society that enables a robust local economy, a healthy environment, and a safe, equitable, diverse and resilient community."*

The actions defined in this plan represent an enthusiastic effort by the City. Implementing these will require determined effort and will make substantial reductions in the City's carbon footprint. However, these actions alone will not fully meet the targets defined in the OCP. This challenge is not cause for inaction however, as all parts of society must contribute to finding solutions to climate change.

To reach the defined targets larger actions will be required. The magnitude of the reductions required will require major breakthroughs in how we develop our communities – though no substantive technology breakthroughs are required (i.e. these breakthroughs can be achieved with current technologies but will require efforts larger than the City alone can implement). Given the long-term time frame (40 years) for the plan's vision, it is not unthinkable that these may well come to pass.



## Appendices

**Appendix A: Calculation Methodology**

**Appendix B: Overview of the Electricity Network in Richmond**

## Appendix A: Calculation Methodology

### A.1: GHG reduction “Wedge”

The data inputs for E2 include freely available data. Minimizing specialized data sets is a feature of the tool. Key data requirements for the base model predictions include:

- Statistics Canada population and housing data,
- Community Energy and Emissions Inventory (CEEI) or equivalent community-scale energy and emissions inventory data
- Estimates from staff, or other sources of the possible population growth.

The tool accounts for both the impacts of population growth and other initiatives by higher levels of government. Population growth results in increased energy consumption and GHG emissions. Provincial and Federal initiatives accounted for include increased fuel efficiency standards for passenger and commercial vehicles, and proposed building code and equipment improvements.

### A.2: Energy and GHG reductions from Actions

Reductions from the implementation of a measure are defined by the savings for each person (or dwelling) implementing the measure, multiplied by the uptake of the measure. For example:

- Reduction potential: If a new commercial building meets the Leadership in Energy and Environmental Design (LEED) Gold standard, it is expected that the building will consume approximately 30% less energy than a new commercial building that meets current building code.
- Level of uptake: If the local government provides a financial incentive to encourage commercial developers to meet the standard it may be estimated that modest level of uptake might occur. Defining the uptake is a subjective activity though it is usually informed by the strength of the measure that the community wishes to deploy (e.g. information/outreach, non-financial incentive, financial incentive, and regulation). For example, an outreach campaign may result in a small portion of the population (e.g. <1% to 10%) adopting a particular action or behaviour, whereas providing a financial incentive may result in a larger uptake rate. Regulation has the greatest uptake, though it is not always permitted as a tool.

### **A.3: Population and Housing Allocation**

The current location of population and housing is available from the Statistics Canada 2011 Census at the Dissemination Area (DA) level. The current dwelling densities (dwellings per hectare) by DA are shown in the figure below.

The projections developed by Urban Futures for the City as a background to the 2041 OCP update helped identify where new population, housing and employment will be located. These projections were done at the planning area scale. For this analysis, these were further refined spatially by allocating the dwellings in Neighbourhood Centres and along the Future Transit Network that is outlined in the OCP. This scenario provides one potential growth scenario based on the available information prior to completion. The 2041 dwelling density figure demonstrates the results of this allocation – clear density increases in the City Centre in residential areas, increases in density near Neighbourhood Centres, and along the frequent transit network.

Figure A-1: Dwelling Unit Density 2011

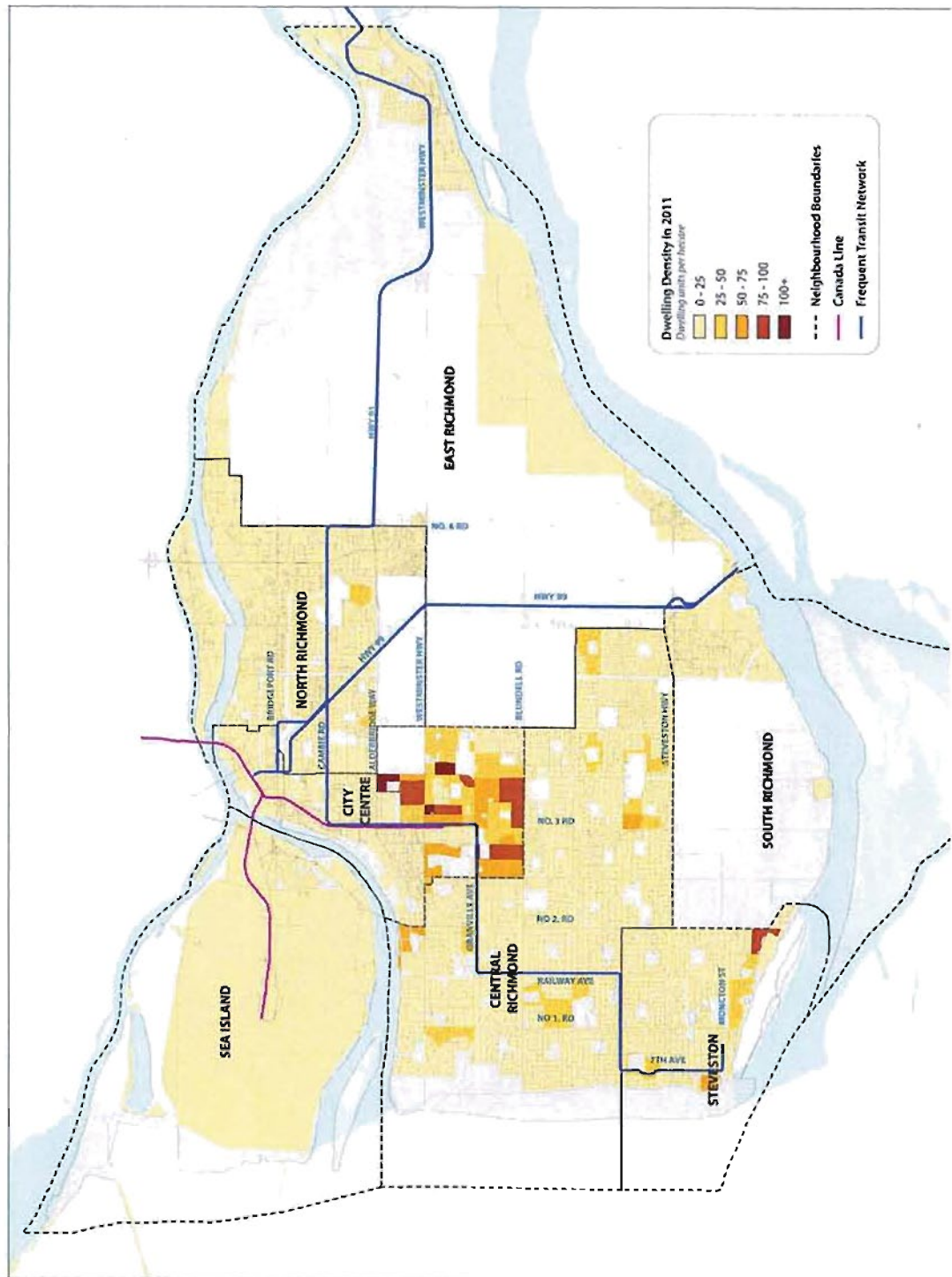
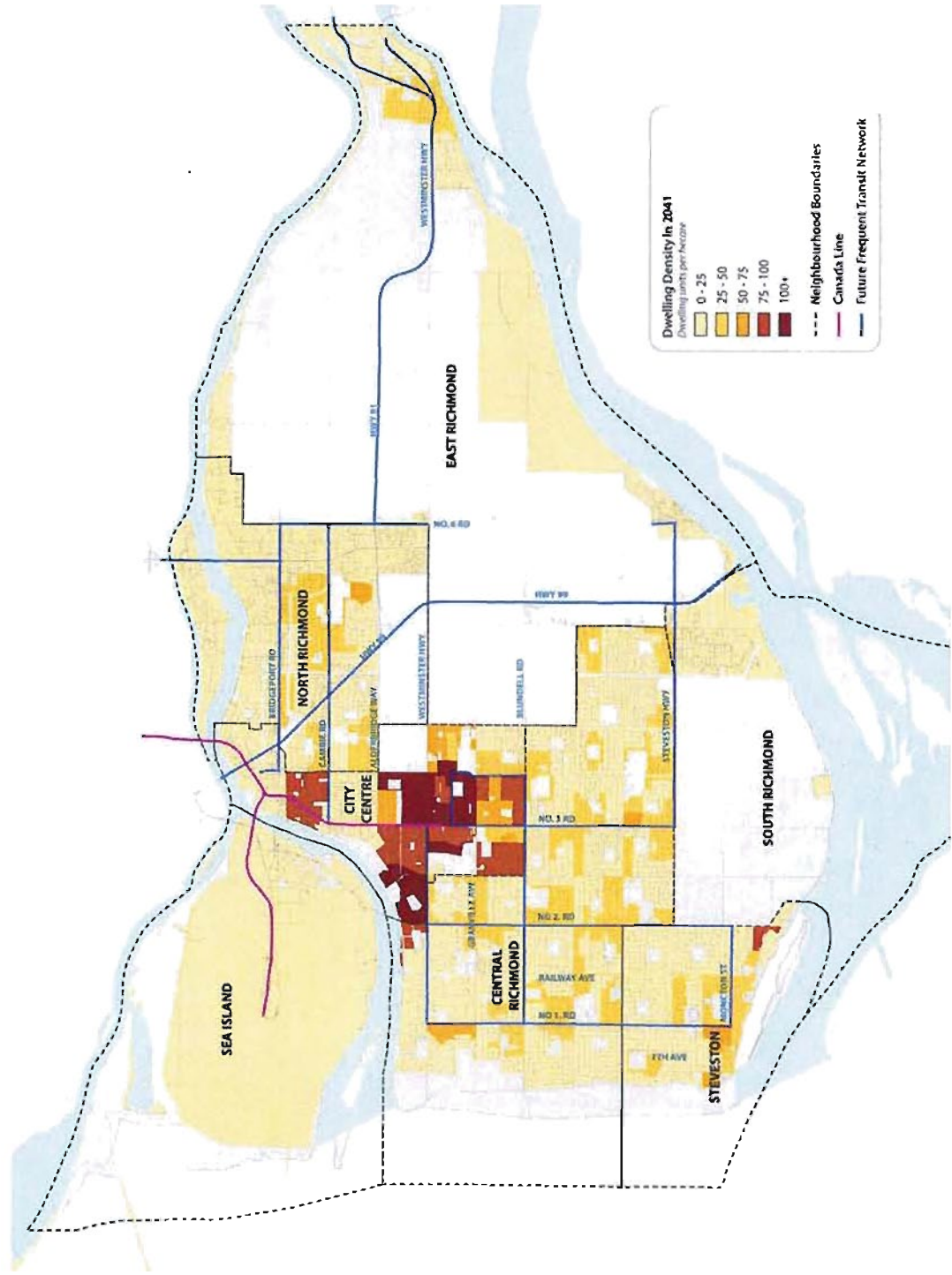


Figure A-2: Projected Dwelling Unit Density 2041





#### **A.4: Density Impacts on Residential and passenger Vehicle energy consumption**

Vehicle reductions are based on estimated changes in vkt due to densification. Each DA was identified as either in or out of the current FTN network. Then the percentages changes in Vehicle Kilometres Travelled (VKT) for each DA were estimated.<sup>44</sup>

#### **A.5: Thermal Energy density mapping:**

An analysis was undertaken to estimate the current (2011) energy load needed for heating throughout the community, and also to estimate where the future (2041) energy load for heating will be based on the City's projected residential and employment growth.

This involved:

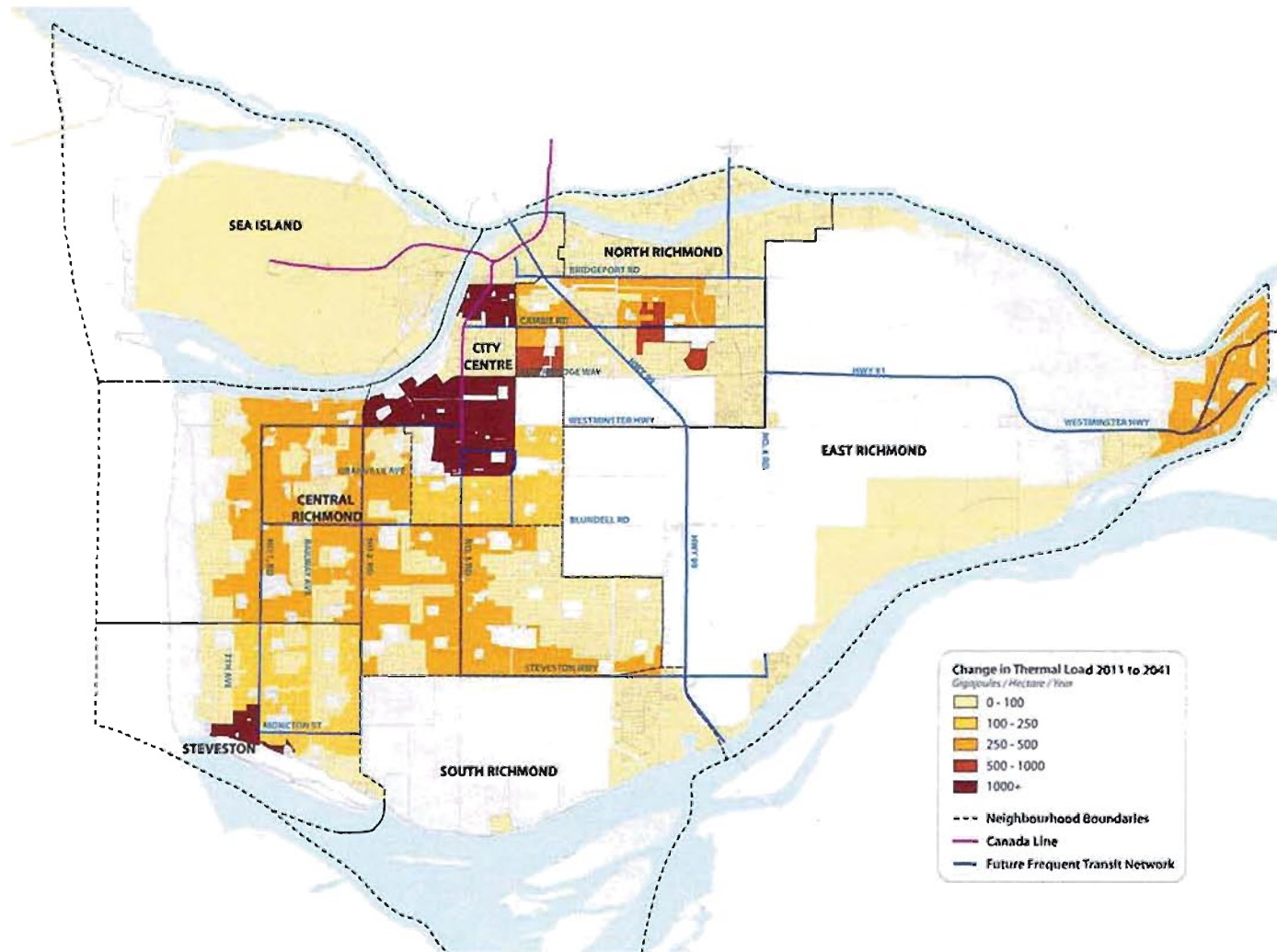
- Determining the location and types of housing based on Statistics Canada Census data. (shown above)
- Determining the location and types of non-residential floor space area from the BC Assessment Authority.
- Applying expected heating load requirements to those baselines based on the type of dwelling / type of non-residential use (for example, a single family home located in the Lower Mainland is expected to use almost 80 GJ of energy per year for space heating and hot water)<sup>45</sup>.
- Applying expected building efficiency improvements for all new growth due to improvements in the BC Building Code, as well as efficiency improvements to the existing building stock for expected changes in technology (e.g. furnace upgrades) and other renovations over time.
- Representing the projected changes in thermal load resulting from population and employment growth as a Change in Thermal Energy Density map of Richmond (see below).

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<sup>44</sup> Estimates based on methodology outlined in "Using Residential Patterns and Transit to Decrease Auto Dependence and Costs", John Holzclaw, 1994

<sup>45</sup> BC Hydro Conservation Potential Review, Marbek Resource Consultants Ltd., 2007

Figure A-3: Estimated New Incremental Thermal Heat Load 2011 - 2041





Richmond



## Appendix B: Overview of the Electricity Network in Richmond

BC Hydro is committed to supporting electricity conservation. Through its PowerSmart programs, BC Hydro has encouraged the conservation of substantial amounts of power capability. These are typically directed directly to customers for specific energy saving actions.

As part of its Sustainable Communities initiative BC Hydro is working with communities to identify long-range planning and policy actions that will result in lasting reductions in energy use.

Communities commonly plan for their own infrastructure – roads, sewers, water – but may not be aware of other infrastructure components in the community. Future energy systems that will result in a low-carbon community will require that all energy systems are better integrated.

The section below (developed by BC Hydro) provides an overview of the electricity infrastructure in Richmond.

### **B.1: ELECTRICITY SUPPLY AND DEMAND IN THE PROVINCE**

A reliable supply of electricity is key to BC's economic prosperity and our quality of life. Electricity is indispensable in running our homes, offices, industries, schools and hospitals. BC Hydro is committed to reliably meeting the electricity needs of our customers through integrated planning, new technology, innovative solutions and the safe operation and maintenance of our system. Local government partners are a critical part of these solutions.

BC Hydro serves 95% of BC's population, delivering electricity to approximately 1.9 million residential, commercial and industrial customers. Over 80% of that electricity comes from hydro-electric generation in the Peace and Columbia regions while 70% to 80% of it is used in the Lower Mainland and on Vancouver Island. This means that the electricity produced has to be moved over long distances. The 500 kilovolt (kV) bulk transmission system connects the major generators in the north and southern interior regions of the province, with the major load centres in heavily populated southwest BC.

BC's increasing population and new technology – such as tablets and smartphones – contribute to our growing electricity needs.

Energy conservation and efficiency are the best and most cost-effective ways to meet these growing electricity needs and BC Hydro is working to meet at least 66% of new demand through these means by 2020.

Even with conservation though, the province's electricity needs are expected to increase by approximately 20% to 40% over the next 20 years.

### **B.2: HOW ELECTRICITY REACHES Communities**

BC Hydro's electrical system crosses over five thousand hectares of land and is made up of over 75,000 kilometres of transmission and distribution lines. There are more than 900,000 utility poles and over 300 electrical substations in the province.



### **B.2.1: Generating Stations**

Most of our power is generated at hydroelectric generating stations. Water flows through the dam's penstocks (tunnels that bring water from the reservoir through the generating station) and causes the turbine's blades to spin. This drives a generator that converts the mechanical rotational energy into electric energy. The energy is then increased at a transformer, getting it ready to travel long distances through transmission lines.

### **B.2.1: Transmission Lines**

Transmission lines (those large metal towers and wood poles) move the power across the long distance between where electricity is generated, and where it is used. One of the big differences between transmission lines and distribution lines is voltage. To move power from the generating site to customers, voltage is increased to ensure power is delivered efficiently, minimizing the energy losses which occur over long distances.

### **B.2.3: Substations**

Transformers in substations are used to "step-up" or "step-down" the voltage of power once it's generated, increasing it for transmission lines, or decreasing it for distribution lines. Substations are usually located in open-air sites, but are sometimes housed within buildings.

### **B.2.4: Distribution Lines**

Distribution lines - the smaller power lines - take power from local substations to customers. The voltage of a distribution line is lower than transmission lines.

### **B.2.5: Distribution Step-Down Transformers**

Before the power reaches customers, it must be stepped down again. For overhead distribution lines, this is done in pole-top step-down transformers, and for underground distribution lines, this is done in enclosed step-down transformers.

Substations, transmission towers and poles, and distribution poles and the lines they support are the most visible components of BC Hydro's infrastructure in the Lower Mainland.

## **B.3: ELECTRICAL DEMAND AND INFRASTRUCTURE IN RICHMOND**

### **B.3.1: Electrical Demand in Richmond**

Once the electricity reaches the Lower Mainland, it is delivered to customers via an extensive system of regional transmission lines, substations and distribution lines.

Richmond is projected to have a continued population increase and as the number of people living in the community grows, so does the need for electricity. Richmond's electrical load growth is forecast to continue at about 2.4% per year over the next 10 years. This includes requirements from both residential growth in Richmond and new business development on Sea Island.

As of early 2013, there are five BC Hydro substations in Richmond (see figure B-1):

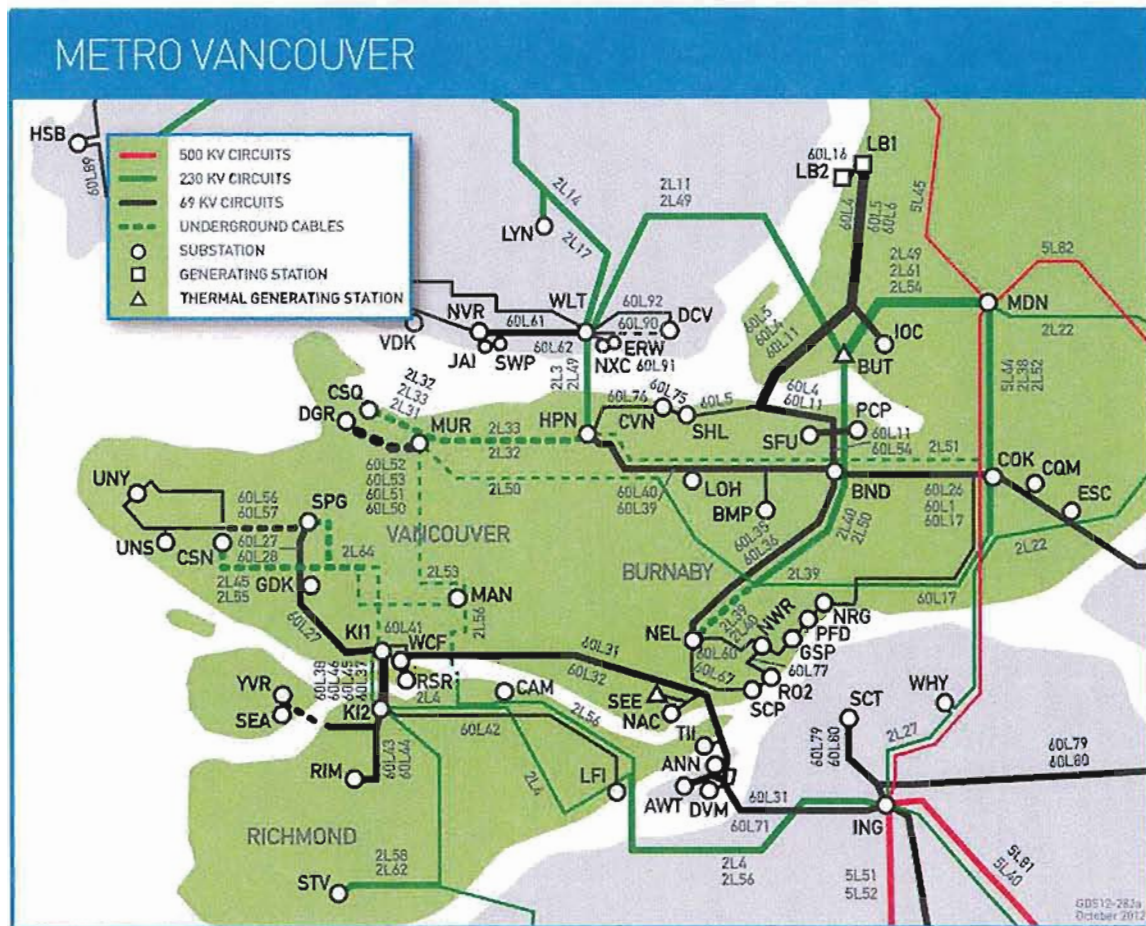
- Kidd 2 Substation (KI-2) – built in 1950's and currently being upgraded
- Sea Island Substation (SEA) – built in 1970's
- Richmond Substation (RIM) – built in 1950's and to be decommissioned
- Steveston Substation (STV) – built in 1970's
- Cambie Substation (CAM) – built in 1970's



The Vancouver International Airport Authority has its own substation.

- YVR Substation (see map)

Figure B-1: Schematic of Electricity Infrastructure in Richmond



### B.3.2: Electrical Infrastructure in Richmond

It is estimated that \$50 to \$70 million in transmission and distribution capital investment, including new infrastructure and system maintenance, will be required in Richmond over the next three years.

To meet the growing demand for electricity in Richmond, Kidd 2 Substation is currently being upgraded and the work is expected to be completed in 2014. This will facilitate having the Richmond Substation, a smaller, older substation, decommissioned within 5 years. Even after a substation is decommissioned, the property still belongs to BC Hydro. While there are no plans for the Richmond Substation property at this time, the land may be reused by BC Hydro in the future.

The Sea Island and Vancouver International Airport Authority area is currently being studied by BC Hydro to ascertain what electrical system reinforcements will be required in the next 10 years. The existing Sea Island Substation, which provides power to residences and businesses, including the airport, may need to be upgraded or a new substation may have to be built. If a new substation is built, the existing one on Sea Island would be decommissioned.

As well, a number of other station and distribution projects are planned over the next 10 years. These include:

- upgrades to existing substations;
- building new distribution underground duct banks; and
- distribution voltage conversion from 12 to 25 kilovolt (kV).

#### **B.4: MANAGING RIGHTS-OF-WAY**

BC Hydro maintains more than 18,000 kilometres of transmission lines, nearly enough to travel two and a half times across Canada. The ground under these lines must be kept clear at all times in order to ensure British Columbians enjoy a safe, secure and reliable source of electricity.

As the system asset owner, BC Hydro acquires certain rights from landowners (including private property owners, First Nations, municipalities and the provincial and federal Crown) to install, replace, maintain and access works (e.g. transmission towers and lines) related to the electrical delivery system.

Lands under transmission lines are usually owned by private landowners, while BC Hydro maintains specific rights governing their use. These lands are called rights-of-way (ROW). The ROW agreements restrict owners' rights to activities that do not impact public safety; interfere with the operation of the lines; cause a safety hazard; or interfere with the rights granted. These agreements generally allow BC Hydro to construct, maintain and replace existing works, as well as reserve space for future works.

By working with landowners, local governments, public agencies and interest groups to use ROW, BC Hydro has developed a network of ROW that are compatible with public safety and security of the transmission system. BC Hydro-maintained ROW can be used for a variety of compatible uses such as tree farms; parking; recreational activities such as walking trails; and wildlife habitat.

BC Hydro has prepared guidelines which provide advice to local government planners, developers, property owners and designers on how to plan development near overhead transmission lines considering aesthetics, vegetation and scale, as well as public safety and system security needs. There are also guidelines for accessing and using the ROW, including the compatible uses allowed. These guidelines are available at:  
[http://www.bchydro.com/energy\\_in\\_bc/our\\_system/right\\_of\\_way\\_management.html](http://www.bchydro.com/energy_in_bc/our_system/right_of_way_management.html)

##### **B.4.1: Safety and Vegetation Management**

Trees growing around power-lines represent a significant safety and outage management issue. BC has three times the number of trees per line kilometre of any other utility in North America and trees account for the most customer outages. Safety of BC Hydro's crews during the restoration of outages is a critical priority.

BC Hydro spends approximately \$50 million annually to control and maintain vegetation, removing weak or hazardous trees, and regularly maintaining trees under and adjacent to transmission and distribution lines.

## **B.5: INTEGRATED INFRASTRUCTURE PLANNING**

### **B.5.1: The Challenge – a Growing Province and Aging Infrastructure**

Most of BC Hydro's infrastructure, although well maintained, was built in the 1950s, 60s and 70s and some of our facilities are 80 to 100 years old. To meet BC's future electricity needs, BC Hydro must invest in our generation, transmission and distribution assets and adopt new technologies that prepare us for the future. BC Hydro is investing over \$2 billion per year between 2013 and 2015 on infrastructure upgrades and renewal.

As communities in the Lower Mainland densify to accommodate population growth, it affects the space required for the critical electrical infrastructure. Close coordination between BC Hydro and municipalities is therefore very important to plan and deploy electrical and other utility infrastructure.

New approaches to planning will improve the efficiency of generation, delivery and use of electricity. These approaches can also support other community goals such as preserving green space, carbon management, and providing opportunities for economic growth and development. Achieving these benefits, however, requires better integration of electricity planning with regional and community planning.

Communities have choices about how they grow and develop, which in turn influence electricity requirements and the options available to meet those requirements. If communities are aware of the energy implications of their decisions, they can make informed choices about growth and development. In turn, if BC Hydro understands community goals, we can make informed choices about the options to pursue for delivering electricity services in the region.

In providing electricity to the Lower Mainland, BC Hydro is inextricably linked with the region's economy, environment and landscape.