Revitalizing Suburban Neighbourhoods with Smart Growth Design: A Case Study of Walkability in the Town Centre of Maple Ridge, BC

by

Amelia Bowden

B.A., Simon Fraser University, 2007

Project Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Urban Studies

in the
Urban Studies Program
Faculty of Arts and Social Sciences

Amelia Bowden 2016
SIMON FRASER UNIVERSITY
Summer 2016

Approval

Name:	**Amelia Bowden**
Degree:	**Master of Urban Studies**
Title:	***Revitalizing Suburban Neighbourhoods with Smart Growth Design: A Case Study of Walkability in the Town Centre of Maple Ridge, BC***
Examining Committee:	**Chair:** Anthony Perl, Professor, Urban Studies Program and Department of Political Science

Patrick J. Smith
Senior Supervisor
Professor
Urban Studies Program and
Department of Political Science

Karen Ferguson
Supervisor
Professor
Urban Studies Program and
Department of History

Joaquin Karakas MCIP RPP
External Examiner
Senior Urban Designer
Sustainable Planning and Community
Development Department
City of Victoria

Date Defended/Approved: July 21, 2016

Ethics Statement

The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

a. human research ethics approval from the Simon Fraser University Office of Research Ethics

or

b. advance approval of the animal care protocol from the University Animal Care Committee of Simon Fraser University

or has conducted the research

c. as a co-investigator, collaborator, or research assistant in a research project approved in advance.

A copy of the approval letter has been filed with the Theses Office of the University Library at the time of submission of this thesis or project.

The original application for approval and letter of approval are filed with the relevant offices. Inquiries may be directed to those authorities.

Simon Fraser University Library
Burnaby, British Columbia, Canada

Update Spring 2016

Abstract

The design of our communities shapes the transportation choices that we make. Transportation choices include active and inactive modes that contribute to recommended levels of physical activity to maintain physical health. Walking, as a form of transportation, is increasingly viewed as an important form of physical activity that contributes to physical health. Community design is an outcome of planning policies. These planning policies, such as Smart Growth, shape the built environment, which influences peoples' travel behaviour, and this in turn can affects health.

The impact of Smart Growth re-development strategies between 2009 and 2014 are explored through a case study of the Town Centre in Maple Ridge, BC. This study examined the relationship between built environment changes, informed by Smart Growth principles to encourage new residential density and sidewalk improvement projects, and walkability. Walkability in the Town Centre was also compared to overall city walkability, to understand the role of Smart Growth.

Through an analysis of WalkScore and *My Health My Community* health and lifestyle survey data, this study found that walkability was higher in the Town Centre compared to Maple Ridge as a whole due to the Smart Growth planning interventions. Smart Growth planning principles such as compact neighbourhoods, pedestrian friendly design, and mixed land uses, aligned with built environment objectives that are conducive to utilitarian walking, thus effectively promoting utilitarian walking in the Town Centre.

Keywords: walkability, urban design, urban planning, smart growth, Maple Ridge, BC.

To my fellow Urban Studies peers, working in partnership to shape our communities.

Acknowledgements

This thesis would not have come to fruition if not for my supervisor, Dr. Patrick Smith, my formidable Urban Studies colleagues, and all the SFU Urban Studies professors that I was fortunate enough to learn from during my graduate studies.

Sincere thanks to my family for their support.

Table of Contents

List of Tables

List of Figures

List of Acronyms

APA	American Planning Association
BMI	Body Mass Index
CMR	City of Maple Ridge
CPTED	Crime Prevention Through Environmental Design
CSP	Council Strategic Plan
DMR	District of Maple Ridge
DMRBIA	Downtown Maple Ridge Business Improvement Association
DRP	Downtown Rehabilitation Program
LRSP	Livable Region Strategic Plan
MHMC	My Health My Community
MOTI	Ministry of Transportation and Infrastructure
MRTP	Maple Ridge Transportation Plan
MV	Metro Vancouver
OCP	Official Community Plan
OSOT	Our Spirit Our Town
RCC	Regional City Centre
RTC	Regional Town Centre
SD	Sustainable Development
SG	Smart Growth
SGotG	Smart Growth on the Ground
STP	Strategic Transportation Plan
TCAP	Town Centre Area Plan
TCCP	Town Centre Concept Plan
TCIIP	Town Centre Investment Incentive Program
UBC	University of British Columbia

Glossary

Built Environment	"A term referring to the physical form and character of communities….[T]he built environment consists of three elements – transportation systems, land use patterns, and urban design characteristics" (Frank et al, 2003, p.337).
Smart Growth	"an approach to neighbourhood development that considers impacts on environmental quality, social interactions, population diversity, and transportation choices. Smart Growth is often contrasted with suburban sprawl that assumes automobile dependence. Smart Growth advocates development that is higher in density, built around public transit, contains a mixture of residential and commercial uses, and provides housing for a range of income levels. Smart Growth is the efficient usage of transportation infrastructure (e.g. roads and railways) and therefore encourages growth to be located in areas served by transportation investments" (Saelens, 2003, p.81).
Sustainable Development	"a dynamic process in which communities anticipate and accommodate the needs of current and future generations in ways that reproduce and balance local social, economic, and ecological systems, and link local actions to global concerns" (Berke & Conroy, 2000,p.23)
Walkability	"…the extent to which the built environment supports and encourages walking by providing pedestrians comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network" (Southworth, 2005, p.248).

Chapter 1.

Introduction

The Smart Growth planning model uses urban design principles that support walkability. The key design components of the Smart Growth planning model are tailored to pedestrians and promote communities that are walkable, due to the compact, mixed-use and pedestrian friendly focus. Communities that have more walking friendly urban design elements encourage walking as a form of transportation, and higher levels of walking contribute to healthier residents. The Smart Growth model is a different approach to suburban sprawl development, and can be viewed as a response to the issues that suburban sprawl creates, including physical inactivity and reliance on the automobile for transportation.

This study examines a Smart Growth revitalization plan that encouraged walkability in a characteristically suburban sprawl community. Specifically, this study seeks to identify the built environment changes guided by Smart Growth principles over a six-year period between 2009 and 2014. Walkability is then compared between the case study area, which was the subject of a Smart Growth revitalization, and the rest of the city, which was not.

The design of our communities, also known as the ***built environment***, is one factor that influences walkability. The built environment is defined as the man-made elements in our communities such as buildings, parks, and streets. It is the form and character of communities and includes transportation systems, land use patterns and urban design characteristics (Frank et al, 2003).

Figure 1 illustrates how the built environment influences walkability. Walking is both a method of transportation and a form of physical activity. Community design determines the convenience, safety, and enjoyment of walking; and community design is

an outcome of planning policies. These policies shape the built environment, which influences peoples' travel behaviour, and this in turn affects health. The built environment is the walkability consideration explored in this research through a case study of the City of Maple Ridge's[1] Town Centre Area Plan, which used a Smart Growth planning model.

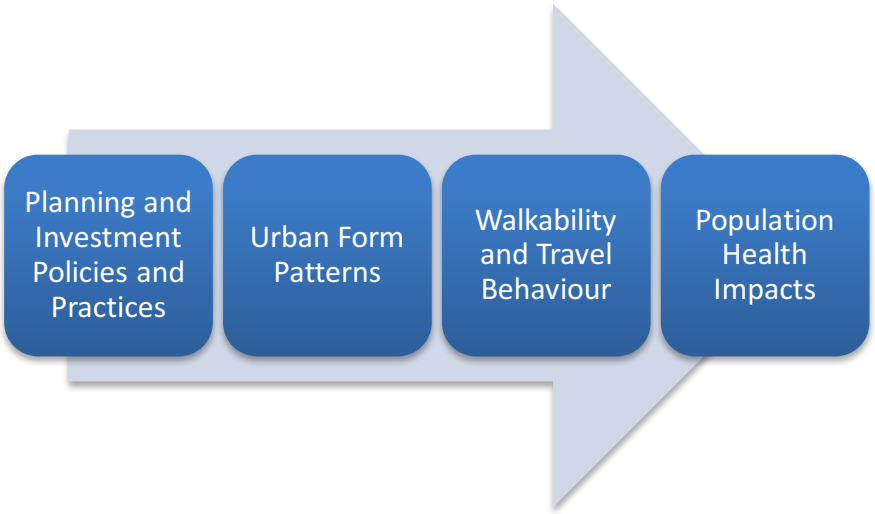


Figure 1: Connection between the built environment, walkability, and health
Source: Adapted from Provincial Health Services Authority (2009)

The influence of the built environment on transportation choice is a growing field of study with a more recent focus on physical health impact. As a result, there is a growing body of literature that examines how the built environment impacts physical health through walking correlates (Saelens & Handy, 2008). Across North American communities, public health and transportation planners alike have been studying how the built environment impacts walkability in connection with developing an urban form that promotes walking and encourages a higher level of physical activity (Saelens & Handy, 2008). One such example is a regional travel survey conducted in the Puget Sound, Washington region. This study involved surveying 6,000 households regarding travel behaviour. The results showed that the level of utilitarian walking[2] was related to the number of retail and commercial uses within the resident's neighbourhood (Frank, Engelke & Schmid, 2003). Another example is the SMARTRAQ research program, which examined over 12,000

[1] Formerly the District of Maple Ridge. Maple Ridge's status changed from District to City on September 12, 2014. All references to the jurisdiction are to the current name for consistency although most of the events discussed occurred prior to September 2014.

[2] Utilitarian walking is defined as walking for transportation, rather than recreational, purposes.

residents in Atlanta, Georgia (Frank, Engelke & Schmid, 2003). This research found that residents of more compact, high density, and pedestrian friendly areas had significantly lower obesity rates (Frank, Engelke & Schmid, 2003).

Longitudinal health data was not available for Maple Ridge. Instead, a small sample of cross-sectional self-report health data was available during the study period at the city and sub-city level. This data was not detailed enough to analyze the health profile of the study area before or after the Smart Growth revitalization program occurred. Therefore, the focus of this study is to understand the relationship between walkability and the built environment, rather than the impact of neighbourhood design on public health statistics.

A walkable built environment is closely related to the urban form created through Smart Growth principles. Southworth defines ***walkability*** as:

> "…the extent to which the built environment supports and encourages walking by providing pedestrians comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network" (Southworth, 2005, p.248).

Using a case study research design, this study examined the relationship between Smart Growth planning policies, built environment changes, and walkability over a six-year time period in one Maple Ridge, BC neighbourhood. A conceptual framework of three literature themes framed the analysis and understanding of the built environment's influence on walkability, and by extension, health, in the Maple Ridge Town Centre case study:

- Planning for walkability through three key development models;
- The connection between health and walkability; and
- The built environment influences on walkability

1.1. Context and Case Study Selection

1.1.1. Regional Context

Maple Ridge is located in the Metro Vancouver region of British Columbia (BC), approximately 100 kilometres east of the City of Vancouver. Maple Ridge is the furthest east within the regional district on the north side of the Fraser River.

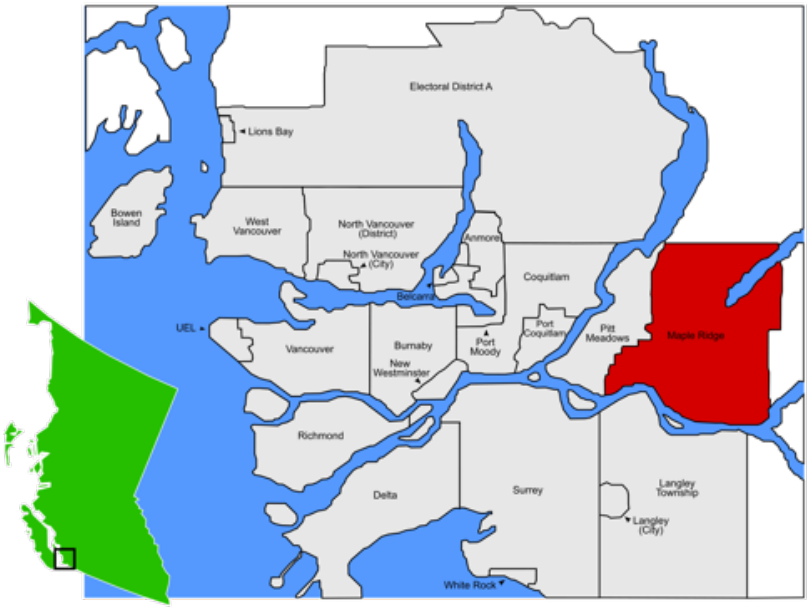


Figure 2: Maple Ridge's location in Metro Vancouver
Source: (Wikipedia, 2016)

The 2003 Maple Ridge Transportation Plan describes the population change, land use patterns, and transportation choices that characterise this suburban community:

> Maple Ridge is one the fastest growing municipalities in the Greater Vancouver area. Between 1996 and 2001, the District's population grew by 12.5% from 56,170 residents to 63,170 residents (Urban Systems, 2003, p.10)
>
> Because much of this growth is occurring in lower-density suburban developments, most of the travel generated by this growth will be made by car (Urban Systems, 2003, p.12).
>
> Maple Ridge is characterized by an urbanized area of predominantly single-family homes surrounded by rural landscape. Within the 'urban'

> area of Maple Ridge, residential and commercial land uses tend to be segregated and low density, such that longer trips are required for residents' everyday needs (such as grocery shopping or picking up dry-cleaning). Because trips are longer, they are typically made by automobile directly influencing travel patterns and putting greater pressure on the transportation system (Urban Systems, 2003, p.13).

Maple Ridge is also a member municipality of Translink BC, which provides public transportation services to the Metro Vancouver region. Due to Maple Ridge's location at the edge of the region and one of the furthest jurisdictions from the regional core, Maple Ridge has limited Frequent Transit Network (FTN) access. Translink defines a FTN as "a network of corridors that have transit service every 15 minutes or better during at least all of the following times: Monday to Friday 6:00-21:00, Saturdays 7:00-21:00, Sundays and holidays: 8:00-21:00" (Translink, 2013). Maple Ridge is serviced by one FTN only, which is comprised of a rapid bus that serves west Maple Ridge and terminates in the Town Centre.

1.1.2. City Context and Demographic Profile

The City of Maple Ridge is 266.78 square kilometres in size, and is bordered by the City of Pitt Meadows to the west, the Fraser Valley Regional District to the east and the Township of Langley to the south. The 2011 population was 76,052 (Statistics Canada, 2014b). The Maple Ridge demographics have been consistent over the 2006 and 2011 Census years. The median age is 40 years, with 22% of the population over the age of 55 years; and the median 2005 income for all census families before tax was significantly higher than the provincial average of $62,346 at $72,082 (Statistics Canada, 2014b). The predominant housing form is single-detached house, with approximately 59% of the dwelling unit share (Statistics Canada, 2014b).

Sustainability is an important city consideration that guides decision-making in Maple Ridge and aligns with the goals and principles of Smart Growth. This value is reflected in the city's vision statement. The City of Maple Ridge's Vision Statement for 2025 is to be among the most sustainable communities in the world. Sustainable development is a planning model that seeks to reduce the environmental impact of travel and land use. Transportation alternatives to the private vehicle, such as transit, walking

and cycling, are encouraged. The impact of this planning model in the Town Centre is explored in the data analysis section of this study.

1.1.3. Case Study Context and Demographic Profile

The case study neighbourhood is Maple Ridge's Town Centre, situated in the central-south area of the city. The Town Centre is 727 acres in size with a 2011 population of approximately 10,500 (Metro Vancouver, n.d.). The Maple Ridge Town Centre (see Appendix A) includes the historic Port Haney settlement, which dates back to the 1880's.

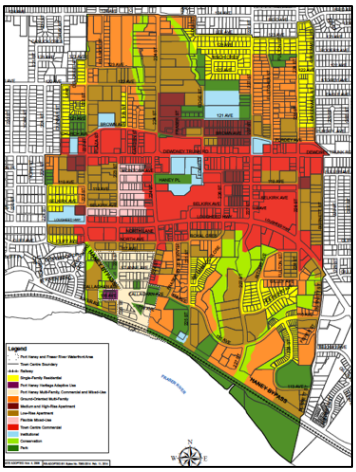


Figure 3: Town Centre Area Boundaries
Source: City of Maple Ridge

The Town Centre is bordered by the Fraser River on the southern boundary. All the basic services such as city hall, the library, police and fire headquarters, as well as several schools and the municipality's transit exchange are located in the Town Centre. The two main shopping malls, as well as smaller strip malls and local shops are also located in the Town Centre. The housing is diverse, and includes single family, townhouse, low-rise and high-rise apartment buildings. The Town Centre acts as a hub for Maple Ridge. This role has evolved over time compared to the current services and design. The agricultural grounds were located in the current location of Memorial Peace Park, and were a gathering space for community interaction and celebration (Personal Communication, 2016).

The Town Centre population has a different demographic profile to the demographic profile of the city as a whole. The average median family 2005 income of $51,720 is lower than Maple Ridge's city average as well as the provincial average (Statistics Canada, 2014a). The percentage of seniors aged 55 or older (27%) is also higher in the Town Centre compared to Maple Ridge as a whole in 2006 (Statistics Canada, 2014a).

City Planning Context

Maple Ridge's Town Centre has historically been an area of focus for city planning efforts. The Maple Ridge Town Centre was identified as a Regional Town Centre (RTC) in the 1996 Livable Region Strategic Plan (LRSP), which later became known as Regional City Centres (RCC) (Metro Vancouver, 2011). As one of the seven RCCs in the Metro Vancouver region, the Town Centre Area Plan states that "[b]y 2021 it is projected that the population will increase by over 13,000 resulting in a target population of 21,750 people by 2021" (District of Maple Ridge, 2008, p.11).

Over the past decade, the Town Centre has been the focus of Smart Growth revitalization strategies to increase population, jobs, and transit access (City of Maple Ridge, 2008). A significant city-led redevelopment project occurred in the Town Centre's downtown core in the late 1990s that set the tone for further area wide revitalization strategies. The redevelopment included construction of an underground municipal parking lot, an expanded Memorial Peace Park, a six storey office building, an arts centre theater, and an expanded Leisure Centre. Land was made available for these new buildings and expansions by moving the existing skating rink and curling club to a larger site outside of the Town Centre, and by moving the seniors centre to a new Town Centre location. These changes are illustrated in Figure 4 and 5 below.

Figure 4: Town Centre in 1999
Source: City of Maple Ridge

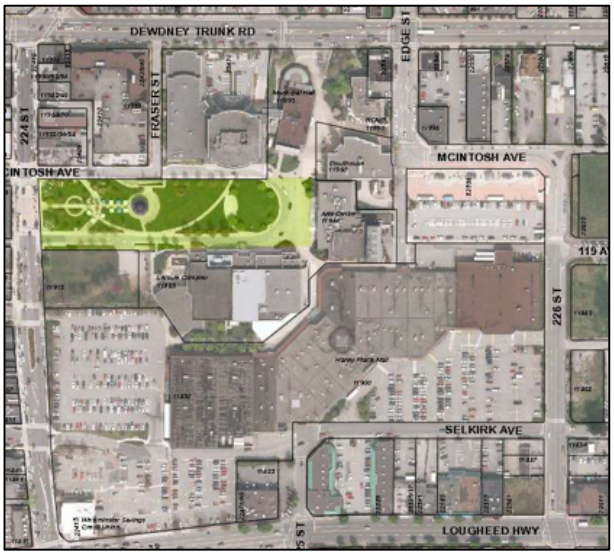


Figure 5: Town Centre in 2011
Source: City of Maple Ridge

More recent revitalization strategies have used a Smart Growth planning model, which seeks to address the negative impacts of urban sprawl (Frumkin, Frank & Jackson, 2004). The application of this planning approach in Maple Ridge includes prioritizing pedestrian needs over those of private vehicles, and using compact development and green infrastructure to both preserve environmentally sensitive land and improve air

quality. Frumkin et al (2004) identify the health issues created by a sprawling form of development and explain how the Smart Growth model attempts to reverse many of these issues. As a result, the Smart Growth model can be viewed as a public health intervention, as it seeks to increase active transportation, reduce distance between use, and preserve environmental features (Frumkin, Frank & Jackson, 2004).

In 2002, the District of Maple Ridge's Mayor became aware of the Smart Growth on the Ground (SGotG) project led by Patrick Condon and the Sustainable Communities Program at the University of British Columbia (UBC). The program provided significant expertise and funding towards long term planning in BC municipalities. Following further discussion with senior staff, Maple Ridge Council entered into a Memorandum of Understanding in July 2003 to partner with the SGotG project. Maple Ridge became the first municipality to become a Smart Growth of the Ground Partner Community. The SGotG initiative was:

> "…a partnership between the Real Estate Institute of B.C, Smart Growth B.C, and the Sustainable Communities Program at U.B.C. This initiative strives to create more options for housing and transportation and reduce the environmental impacts of growth, and can help create positive change in the Maple Ridge community by responding to the challenge of building a vibrant district in which to live and work" (Smart Growth on the Ground 2005, p.3).

The partnership began an area planning process to align with regional plans of densification in a compact and complete community manner. Following completion of the SGotG project, the city formalized the plan with the Town Centre Area Plan (TCAP), which forms part of the Official Community Plan (OCP). These planning documents created the foundation for implementing re-development in the Town Centre, and have guided the built environment changes during the 2009-2014 study period. The TCAP contains 8 Guiding Sustainability Principles:

- Each Neighbourhood is Complete
- Options to Our Cars Exist
- Work in Harmony with Natural Systems
- Buildings and Infrastructure are Greener and Smarter
- Housing Serves Many Needs

- Jobs are Close to Home
- The Centre is Attractive, Distinctive and Vibrant
- Everyone Has a Voice (City of Maple Ridge, 2008)

These guiding principles are modeled on the 10 Smart Growth Principles:

1. Mix land uses.
2. Take advantage of compact building design.
3. Create a range of housing opportunities and choices.
4. Create walkable neighborhoods.
5. Foster Distinctive, attractive communities with a strong sense of place.
6. Preserve open space, farmland, natural beauty, and critical environmental areas.
7. Strengthen and direct development toward existing communities.
8. Provide a range of transportation choices.
9. Make development decisions predictable, fair and cost effective.
10. Encourage community and stakeholder collaboration in development decisions (Frumkin, Frank & Jackson, 2004, p.351).

Both sets of principles speak to walkability, either directly through transportation principles, or indirectly, through built environment principles that facilitate a walkable environment. The SGotG program concluded in 2005 with the Council endorsement of the Town Centre Concept Plan (TCCP) in 2005. The TCCP formed the foundation of the Town Centre Area Plan. In November 2008, Maple Ridge Council adopted the TCAP and this plan has guided decision-making since that time.

Built Environment and Walkability Context

The Town Centre is comprised of historic Port Haney and much of downtown Maple Ridge, which was developed prior to the automobile. As a result, a significant portion of the study area is characterised by small blocks and a grid network of well-connected streets. The Maple Ridge Town Centre has been selected as the case study because the neighbourhood is located in a broader suburban sprawl community context. Sprawling development has been linked to higher levels of physical inactivity and the associated health risks that come along with physical inactivity. The study area is also located in a broader community that has a low WalkScore rating, which means that a range of destinations are generally more than 400 metres from residential addresses (WalkScore, n.d.). The focus of this study is the impact of Smart Growth policies on

walkability in the Maple Ridge Town Centre. While these policies do not overtly reference walkability, they were intended to create a walkable and pedestrian Town Centre.

WalkScore Metric

The WalkScore ranking evaluates neighbourhood walkability. This metric uses proximity of amenities like businesses, parks, schools and other common destinations to residential addresses to produce a numerical walkability score. Amenities within 400 m of the address are awarded a score of 100, and that number declines as the distance increases. A score of 0 is provided when the amenity is 1.6 km away from the address. WalkScore are available for all North American cities. Cities with high WalkScores include New York City (89) and San Francisco (86) (WalkScore, n.d.). More locally, the cities of Vancouver and Victoria have the same strong WalkScore of 78 points (WalkScore, n.d.). Within the Metro Vancouver region, cities such as North Vancouver and New Westminster are classified as 'very walkable' with WalkScores of 73 and 70, respectively (WalkScore, n.d.).

Table 1: WalkScore Summary

City	WalkScore
New York	89
San Francisco	86
Vancouver, BC	78
Victoria, BC	78
Maple Ridge, BC	36

The average WalkScore for Maple Ridge is the lowest in the region at 36 out of 100 possible points (WalkScore, n.d.). Based on this low ranking, people in Maple Ridge are possibly the least likely to be walking. The WalkScore values are the highest in the Town Centre, with WalkScores of 94. These higher WalkScores may indicate that something is different in the Town Centre compared to the rest of the municipality (WalkScore, n.d.). Maple Ridge's WalkScore indicates that walkability is not high compared to the rest of the Metro Vancouver region, therefore, walkability interventions

may have a larger impact on the community. Additionally, the Town Centre is selected as the case study due to the higher WalkScore, indicating that this area is more conducive for walkability than the community as a whole.

1.2. Significance of Research

This study examines the relationship between Smart Growth planning principles and walkability in a suburban context. At the broadest level, this research is useful because it seeks to understand how the suburban built environment may be revitalization to improve walkability and influence our physical health. The incidence of chronic diseases such as hypertension, heart disease, diabetes and obesity is increasing in Canada due to more sedentary lifestyles and an aging population, and this is taxing the health care system (Provincial Health Services Authority, 2009). The Public Health Services Authority reports that 34% of the BC population is dealing with a chronic condition, and this makes up 67% of the health care costs (Provincial Health Services Authority, 2009). Many chronic diseases are preventable, and research findings in this area of study may further prevention strategies. Moderate physical activity provides significant health benefits to mitigate chronic diseases (U.S. Department of Health and Human Services, 1996). There are many ways that a person can engage in physical activity to receive health benefits, but walking is the most accessible and frequent type of physical activity.

At the municipal level, the TCAP has been in implementation for seven years and an evaluation of its impact is timely. It is hoped that this research will establish a feedback loop which may inform future plan revisions, other area plans in Maple Ridge or elsewhere, and may potentially contribute to healthier communities. Lastly, the case study's urban form within a suburban community with the lowest WalkScore rating in the region makes it a relevant location to study.

Many academics have studied how the built environment influences walkability. This study provides a base line of information that has the ability to be part of a longitudinal study on walkability rather than a cross-sectional study, which is much more common in

the literature (Handy, 2005).[3] The research question seeks to contribute to the body of literature regarding the relationship between Smart Growth planning principles and walkability. More broadly, this study seeks to understand how urban planners can create healthy communities through urban design.

1.3. Research Question

The central research question of this study is: Have the Smart Growth built environment changes achieved between 2009-2014 supported walkability in the Maple Ridge Town Centre compared to Maple Ridge as a whole? I answered the central research question by unpacking it into the following sub-questions:

1. Do Smart Growth city plans and strategies promote walkability in the Town Centre?

2. What built environment changes occurred between 2009 to 2014 in the Maple Ridge Town Centre, and how does this relate to walking correlates identified in the Literature Review?

3. How do walkability metrics in Maple Ridge's Town Centre compare to Maple Ridge as a whole?

4. How were pedestrian considerations conceptualized by key stakeholders during various Town Centre area planning processes?

5. Did Maple Ridge seek to improve walkability for physical activity and public health reasons? What were the driving forces of these initiatives?

To answer each research sub-question, the relationship between the built environment and planning processes and policies was reviewed first, followed by the relationship between the built environment and walkability, and finally, the relationship between walkability and health. Chapter 2 contains a Literature Review of relevant research organized in a conceptual framework comprised of three themes: planning for walkability through three key development models; the connection between health and walkability; and built environment influences on walkability.

[3] Handy (2005) reviewed 28 travel behaviour and physical activity literature studies and found that all but one used a cross-sectional study design.

The conceptual framework provides the context for understanding the contributions, opinions and studies in the existing literature. Specific studies that measure walkability and the associated built environment components that support or hinder walkability are especially relevant to understand the Maple Ridge case study.

Chapter 3 outlines the research methodology, and describes the primary and secondary used. Chapter 4 provides an overview of Smart Growth city plans and strategies to identify walkability considerations. Chapter 5 details the built environment changes that have occurred in the Town Centre over the 2009 – 2014 study period. Walkability and related health data outcomes are then discussed in Chapter 6. In Chapter 7, the impetus for pedestrian consideration in Town Centre land use planning was explored through key informant findings. In Chapter 8, conclusion are presented, research findings are summarized, and the central research question is answered.

1.3.1. Research Scope and Limitations

The focus of this study is to understand the relationship between built environment changes and walkability in the study area, and also to understand how Smart Growth planning policies are created and implemented to improve neighbourhood walkability. While walkability encompasses all walking trips, the walkability scope of this study focuses on walking trips that are utilitarian rather than recreational. The reason for this distinction is found in the literature. Studies show that the built environment influences utilitarian walking but not recreational walking (Troped et al, 2003). As this study addresses the built environment's impact on walkability, the focus is on utilitarian walking.

Furthermore, walkability data obtained from the *My Health, My Community* (MHMC) survey is narrowly focused and it is important to identify the parameters of this walkability data. Survey questions are based on neighbourhood walkability, therefore it is assumed that the survey data does not capture longer walking trips, such as trips to work and school. This assumption is made based on the design of suburban Maple Ridge, where work and school trips are often inter-neighbourhood or inter-municipality. Trips to and from work and school are also less likely to be contained within one geographic area. As the distance is critical in travel mode selection, it is anticipated that the built

environment data under analysis in this study would not influence school or work trips significantly.

Additionally, the MHMC secondary data used in this study has limitations in terms of the population surveyed. MHMC surveys were conducted with participants 18 years of age or older, therefore no information on children's walkability in this survey. Additionally, special population groups such as seniors or adults with mobility disabilities that have specific needs and limitations for walking were not examined separately from the adult population. While it is valuable to consider walkability for children, seniors, and adults with mobility disabilities, this is beyond the scope and data availability for this research undertaking.

Lastly, neighbourhood level longitudinal data sets for mode of transportation does not exist, making it challenging to measure the impact of built environment changes over time. Despite this data shortage, the MHMC conducted a region-wide health and lifestyle survey in 2013-2014. The MHMC organization has released a health atlas that was publically available for municipal sub-areas. The sub-areas are larger than neighbourhoods but smaller than municipalities, and in Maple Ridge's case, MHMC has divided the municipality into four sub-areas. In Maple Ridge, 791 MHMC surveys were completed, which is a relatively small sample that was not representative of the Maple Ridge population. As a result, MHMC weighted and aggregated the data to create a representative sample. To offset MHMC survey data limitations, interviews were conducted with a Town Centre resident and a Town Centre business representative. Both of these individuals were involved in various Town Centre planning processes and initiatives. These interviews provide anecdotal evidence regarding changes in walkability in the Town Centre to support the limited MHMC survey data. To address the issue of lack of a longitudinal walking data, a comparison is made between the Town Centre and Maple Ridge as a whole to try and measure the impact of built environment changes on walkability in the study area.

Chapter 2.

Literature Review

To answer the central research question - *Have the Smart Growth built environment changes achieved between 2009-2014 supported walkability in the Maple Ridge Town Centre compared to Maple Ridge as a whole?*, I must first situate this research within the existing literature. Three literature themes, structured as a conceptual framework and illustrated in Figure 6, are discussed in this chapter to frame the analysis and understanding of the Maple Ridge Town Centre case study, as follows:

- Planning for walkability through three key development models;
- Built environment influences on walkability; and
- Connection between health and walkability.

The first theme examines three planning and development models commonly used over the past two decades in the Lower Mainland to understand how walking is discussed, conceptualized, and planned for. The goals and benefits of walking in each model are also studied. The three planning and development models are: Regional Town Centres (RTC), Sustainable Development (SD) and Smart Growth (SG). All three of the models were applied to the Maple Ridge Town Centre; therefore, this theme helped assess how walkability was planned for and implemented in the case study area during the first stage of data analysis.

The second theme examines the influence of the built environment on walkability. The theme illustrates how community design shapes transportation choice, and explores the built environment factors that promote and discourage walking. This theme also helps to analyze the research findings, to determine if the changes in the Town Centre align with walking correlates in the existing literature.

The third theme addresses walking as a form of transportation and as a form of physical activity. In this theme, I unpack the concepts of physical activity and potential health benefits in relation to walking. This theme connects the concept of walkability with

health, and supports the argument that highly walkable communities are healthier places than low walkability communities.

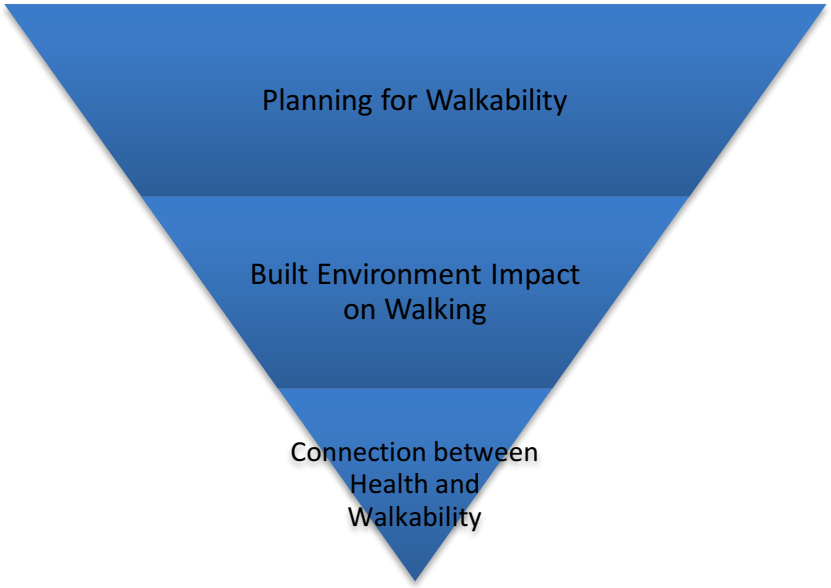


Figure 6: Conceptual Framework

2.1. How Walkability is Incorporated into Planning Models

This study contends that the design of the built environment can either support or hinder neighbourhood walkability, and by extension, the physical health of residents. Furthermore, the basis of this analysis is premised on the idea that planning policies - and the implementation of those policies by city planners – shape the built environment. Prior to conducting a document analysis of the plans and strategies that guided revitalization in the Maple Ridge Town Centre, it was necessary to understand prevailing urban planning models that guided policy development in the case study area. This section examines how planning and development models discuss walkability.

Several planning models have emerged in response to the urban sprawl development pattern. These models include Regional Town Centres, New Urbanism,

Sustainable Development, and Smart Growth. While there are common attributes for all of these models, each model is also unique.

The negative outcomes attributed to urban sprawl, including the chronic disease concerns discussed earlier, have resulted in planning and development models to create more walkable future communities. These planning and development models have influenced the revitalization of Maple Ridge's Town Centre, therefore it is important to understand the principles of these models and how they address walkability. Three models stand out: Regional Town Centres (RTC), Sustainable Development (SD), and Smart Growth (SG). This section situates the TCAP within these development models. Before exploring these three models, the history of urban sprawl and Maple Ridge context is reviewed first.

2.1.1. History and Impact of Urban Sprawl

Cheap land, inexpensive construction methods, favourable tax policies, and trolley line expansion facilitated rapid suburban growth in the United States during the late nineteenth century and early twentieth century (Frank, Engelke & Schmid, 2003). Oliver Gillham, author of *The Limitless City* defines urban sprawl as "a form of urbanization distinguished by leapfrog patterns of development, commercial strips, low density, separated land uses, automobile dominance, and a minimum of public open space" (Frumkin, Frank & Jackson, 2004, p.28).

In order for this literature to be relevant to my research question, I contend that Maple Ridge is a sprawling community. Based on Metro Vancouver's map showing population density by census tract using 2011 Census data, the population density per square kilometre for all but one census tract is 3,000 or less people. In comparison with census tracts in downtown Vancouver that have population densities of over 15,000 people per square kilometre, the population density in Maple Ridge is in the lowest density range (Metro Vancouver,n.d).

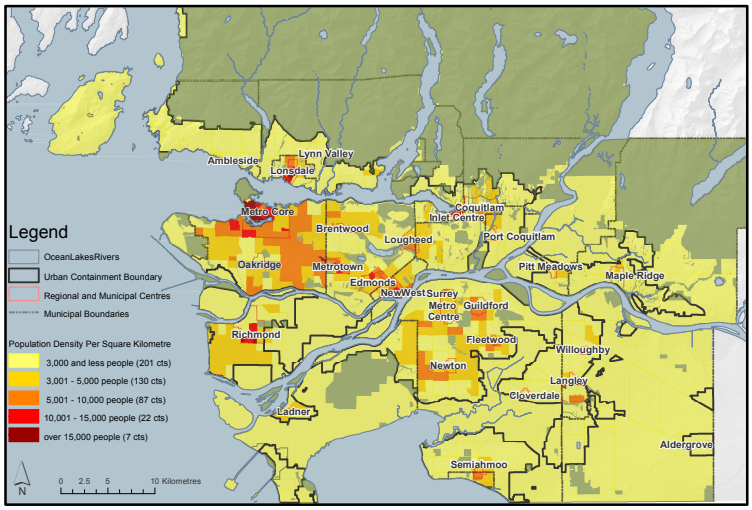


Figure 7: Metro Vancouver Population Density
Source: Metro Vancouver

In addition to low residential density that characterizes urban sprawl, another characteristic of sprawl is automobile dependence. Figure 8 below illustrates the percentage of commuters using automobile as mode of transportation to work in Metro Vancouver using Census 2011 data. In Maple Ridge, the majority of census tract have 80% of residents using private vehicles to commute to work, indicating a heavy reliance on automobiles (Metro Vancouver, n.d).

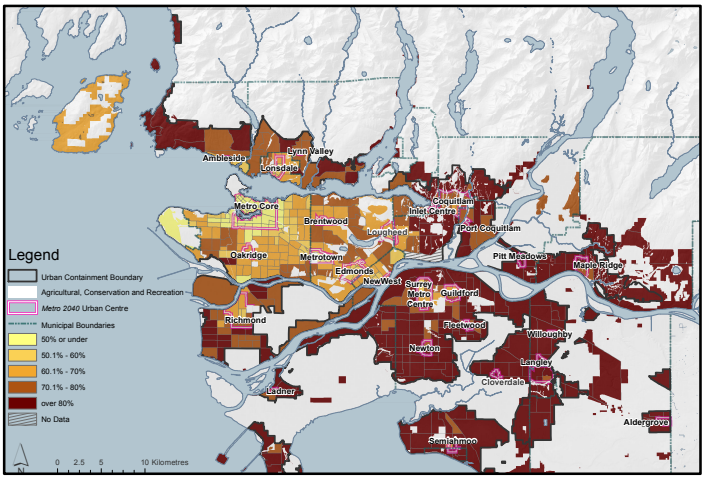


Figure 8: Car Usage in Metro Vancouver
Source: Metro Vancouver

Critics of urban sprawl cite a multitude of issues with this prevalent form of development, from the high infrastructure costs, to the inefficient use of land, to the loss of agricultural land. To understand why Maple Ridge used a Smart Growth planning paradigm in the Town Centre, and how this paradigm addresses walkability, we must first understand the problems that Smart Growth was designed to fix. As there are many issues that Smart Growth is in response to, this study focuses specifically on walkability.

2.1.2. Regional Town Centres

The Regional Town Centre development strategy dates back to the LRSP prepared by the Greater Vancouver Regional District (GVRD), now called Metro Vancouver (MV), in 1996. Located in the Metro Vancouver region, the City of Maple Ridge is governed by the long-term regional planning document titled *Metro Vancouver 2040: Shaping Our Future*, which states that:

> [s]ince 2002, Metro Vancouver has formally put sustainability at the core of its operation and planning philosophy and advanced its role as a leader in the attempt to make the region one which is explicitly committed to a sustainable future (Metro Vancouver, 2011, p.1).

Metro Vancouver's regional planning approach uses a hierarchy of nodes (Metropolitan Core, Surrey Metro Centre, Regional City Centres (7), Municipal Town Centre (16) and an urban containment boundary to guide growth in the region (Metro Vancouver, 2015). Filion defines nodes as "…high-density multifunctional developments featuring a pedestrian-conducive environment and good public-transit accessibility" (Filion, 2009, p.505) and further notes that "[a]t a time of rising concern over urban sprawl and its adverse financial, quality-of-life, and environmental consequences, nodes assume growing importance within urban (and especially metropolitan) planning strategies" (Filion, 2009, p.505). The Maple Ridge Town Centre is one of the seven Regional City Centres in the Metro Vancouver region.

Walking is closely tied with public transit, and the RTC model places a high importance on frequent transit networks. The provision of public transit means that walking will become more prevalent, as users need to reach transit stops by foot, as well as their final destination that may be a short walk from the transit stop. While walking is

not the highest priority for mode of transportation, walking is acknowledged as going hand in hand with public transit, and is therefore prioritized by association.

2.1.3. Sustainable Development

The notion of sustainability at the city level is premised on the concept of Sustainable Development, which was first presented in the United Nations' *Our Common Future* publication (Berke, 2002). Sustainable Development requires the equal consideration of the economic, social, and environmental aspects of growth. Berke and Conroy define sustainable development as:

> "a dynamic process in which communities anticipate and accommodate the needs of current and future generations in ways that reproduce and balance local social, economic, and ecological systems, and link local actions to global concerns" (Berke & Conroy, 2000,p.23)

At the city growth level, sustainability principles include reducing reliance on greenhouse gases and protecting the natural environment. Compact development that requires less land, and alternative forms of transportation that use less or no fossil fuels are two development approaches that support the goals of Sustainable Development.

Environmental consideration is top of mind in this planning and development model, and as a result, walking is discussed as an alternative form of transportation to the personal vehicle, because walking does not create pollution or create greenhouse gas emissions. In a broader sense, the SD model supports a form of development that make more environmentally sensitive options, such as walking, more viable. This includes compact neighbourhoods where walking trips are feasible.

2.1.4. Smart Growth

One of the simplest ways of explaining the Smart Growth planning model is to define it as an opposite approach to urban sprawl. In the post-war decades, the Smart Growth planning model began taking shape in response to the prevalent urban sprawl model. The Smart Growth planning model was created through growth management

programs during the 1970s and 1980s (Edwards & Haines, 2007). Burchell et al (2000) identifies five components of Smart Growth:

1. Control of outward movement/growth controls
2. Inner-area revitalization
3. Design innovations
4. Land and natural resource preservation
5. Transportation reorientation

Burchell et al (2000) argue that with the exception of the fifth and final component, the first four components have a history of preceding events which resulted in the contemporary notion of the Smart Growth planning model. The notion of Smart Growth as a planning concept was formalized in 1997 with the publication of two key documents by the American Planning Association (APA) and a collaboration between the Natural Resources Defense Council and the Surface Transportation Policy Project (Knaap & Talen, 2005).[4] In the same year, the Smart Growth and Neighborhood Conservation Act was passed in the state of Maryland. The goal of this Act was "to limit the sprawling patterns of low-density residential development and arterial strip commercial development, spilling outside of existing cities and villages" (Daniels, 2001, p.274).

Varying definitions and criteria exist in the literature for the Smart Growth planning model; therefore, it is useful to define the parameters of this model as it is referred to in this study. Saelens et al (2003) define Smart Growth as:

> an approach to neighbourhood development that considers impacts on environmental quality, social interactions, population diversity, and transportation choices. Smart Growth is often contrasted with suburban sprawl that assumes automobile dependence. Smart Growth advocates development that is higher in density, built around public transit, contains a mixture of residential and commercial uses, and provides housing for a range of income levels. Smart Growth is the efficient usage of transportation infrastructure (e.g. roads and railways) and therefore

[4] *Growing Smart Legislative Guidebook: Model Statutes for Planning and the Management of Change* and *The Tool Kit for Smart Growth*, respectively.

> encourages growth to be located in areas served by transportation investments (Saelens et al, 2003, p.81).

In addition to this definition, Smart Growth is also identified by ten guiding principles:

1. Mix land uses.
2. Take advantage of compact building design.
3. Create a range of housing opportunities and choices.
4. Create walkable neighborhoods.
5. Foster distinctive, attractive communities with a strong sense of place.
6. Preserve open space, farmland, natural beauty, and critical environmental areas.
7. Strengthen and direct development toward existing communities.
8. Provide a range of transportation choices.
9. Make development decisions predictable, fair and cost effective.
10. Encourage community and stakeholder collaboration in development decisions (Frumkin, Frank & Jackson, 2004, p.351).

Like Regional Town Centres and Sustainable Development, the Smart Growth planning and development model can be viewed as a response to urban sprawl, as it addresses many of the concerns raised with urban sprawl (Frumkin, Frank & Jackson, 2004). Similar to the Regional Town Centre development model, compact communities and alternative modes of transportation to automobiles are two Smart Growth principles. Smart Growth also aligns with sustainability in terms of limiting the impact on undeveloped green fields and natural features.

Frumkin (2004) makes the case that Smart Growth can be classified as a public health strategy. A key component of Smart Growth that relates to public health is the goal of reducing vehicle dependence by making other forms of transportation, such as transit, biking and walking more feasible and enjoyable. Walking is made more feasible by decreasing the distance between destinations, by increasing the number of destinations, and by making the built environment more attractive to pedestrians.

While many jurisdictions and planning documents have embraced Smart Growth principles, Filion and McSpurren (2007) outline the obstacles to fully implementing this strategy, namely due to the long-term, regional scale that is required for Smart Growth implementation; as well as the difficulty in shifting car use to other modes of transportation.

The SG model is similar to the SD model in that compact forms of development are supported to make walking a viable transportation choice. The concept of complete communities also makes walking a more viable transportation choice.

2.2. The Built Environment's Influence on Walkability

The previous section has outlined the three planning models and their walkability context. This section discusses the built environment elements that impact people's decision to walk as a mode of transportation. Several case studies in the existing literature are used to justify the variables that are studied in the Maple Ridge case study. First, it is important to define the built environment as it is applied in this case study. The built environment is defined as "a term referring to the physical form and character of communities….[T]he built environment consists of three elements – transportation systems, land use patterns, and urban design characteristics" (Frank et al, 2003, p.337).

Not all neighbourhoods are equally conducive to walking, and considerable research and studies have been conducted to identify the built environment factors that promote or discourage walking in order to create healthier communities. The metric of walkability is used to evaluate the built environment. Southworth (2005) defines walkability as:

> …the extent to which the built environment supports and encourages walking by providing pedestrians comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network (248).

The most common walking correlates are: density/proximity, land use mix/access, street connectivity, and pedestrian amenities (Handy et al, 2002). Saelens et al (2003) conclude that proximity and connectivity are the two primary land use factors that influence travel choice. The authors define proximity as the straight-line distance between trip origins and destinations. They further divide the concept of proximity into density and land use mix.

2.2.1. Density and Land Use Mix

Sallis and Frank (2003) define density as the compactness of land uses, and land use mix is the distance between land uses. In contrast, connectivity is defined as "the ease of moving between origins… and destinations… within the existing street and sidewalk pathway structure" (Saelens et al, 2003, p.82). These walking correlates are consistent with Smart Growth planning principles.

The walking correlate of density is reinforced by Newman and Kenworthy (Newman & Kenworthy, 1991), who examined 32 cities and found a correlation between population density and non-motorized forms of transportation such as walking. Academics including Ewing, 2003; Saelens & Handy, 2008; Saelens et al, 2003; and Ross & Dunning, 1997 have further supported this connection. "Clearly, increased density is highly correlated with decreased dependency on the single occupancy vehicle resulting in fewer annual miles driven" (Ross & Dunning, 1997, p.44) .

Similar to density, land use mix is identified as a walking correlate by Ewing, 2003; Saelens & Handy 2008; Saelens et al 2003; and Cervero, 1996. In his research, Cervero concluded that:

> Having grocery stores and other consumer services within 300 feet of one's residence is found to encourage commuting by mass transit, walking and bicycling, controlling for such factors as residential densities and vehicle ownership levels…For non-motorized commuting, the presence or absence of neighborhood shops is a better predictor of mode choice than residential densities (Cervero, 1996, p.361).

2.2.2. Street Connectivity and Pedestrian Amenities

Pedestrians move through space at a slower pace than vehicles, and they therefore experience their surroundings differently than vehicle drivers (Frank & Engelke 2001). Public space designed for pedestrian transportation must have interesting visual elements, landscaping, and furniture to make the journey enjoyable and safe for pedestrians. Southworth (2005) reviewed several studies that examine the built environment factors that contribute to highly walkable streets, and concludes that walking

desirability elements vary widely, and depend greatly on the culture and context of a city. Southworth (2005) concludes that:

> Nevertheless, a few attributes are likely to contribute to the quality of path context in most urban and suburban settings: scale of street space, presence of street trees and other landscape elements, views, visible activity and transparency, scale, and coherence of built form (Southworth 2005, p.254).

In addition to pedestrian amenities, such as street trees and pedestrian furniture, the pattern of the road network is also important for walkability (Southworth, 2005; Ewing, 2003; Saelens & Handy 2008; Saelens et al, 2003; Marshall et al, 2014). Marshall and Garrick (2010) studied the impact of street connectivity, network density and pattern in 24 Californian cities and concluded that:

> The results suggest that all three of the fundamental measures of a street network—street connectivity, street network density, and street patterns—are highly significant and associated with influencing the choice to drive, walk, bike, or take transit (Marshall & Garrick, 2010, p.114).

Marshall and Garrick (2010) define street connectivity as the ratio of road segments between intersections divided by the number of nodes; and network density as the number of intersections per square mile. The authors use Marshall's concept of macroscopic and microscopic street networks to classify various types of street patterns.

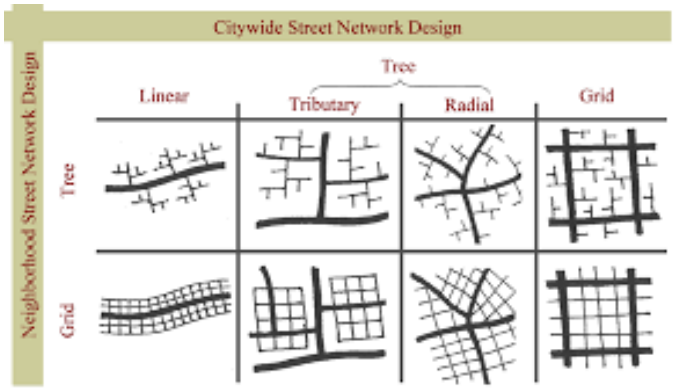


Figure 9: Street Networks
Source: http://jtlu.org

2.2.3. Challenges and Criticism of Walking Correlates and Critique of Built Environment Impact on Travel Behaviour

The correlation between built environment elements such as density, land use mix, pedestrian amenities, and street connectivity with utilitarian walkability is complicated by several limitations and issues. Saelens and Handy (2008) conclude after reviewing 29 studies published between 2005-2006 that "…the built environment is associated with walking, though….the specifics of this association is less clear" (Saelens & Handy, 2008, p.S558). Indeed, the presence of correlation and the degree of correlation across the literature is varied.

One of the main criticism of walk correlates is that urban form variables cannot be isolated from one another; therefore, this makes it difficult to distinguish which factors are affecting behaviour, and to what degree (Ewing & Cervero, 2001). Furthermore, these variables are defined differently from one study to another, and therefore cannot be compared systematically across the board (Frank & Engelke, 2001; Marshall et al, 2014). Marshall et al (2014) conclude that there has been a failure to quantify more concrete aspects of "suburban vs urban", "traditional vs modern", and "highly walkable vs low walkability" neighbourhoods. All of these inconsistencies have resulted in academics producing different results (Frank & Engelke 2001, p.211). Also, short non-motorized travel trips are commonly underreported (Frank & Engelke 2001), and these omissions further complicate the ability to measure the factors that influence these types of trips. Furthermore, the built environment can influence walkability to differing degrees depending on the population group (Frank & Engelke, 2001). Seniors and children have different thresholds for safety and comfort that will influence their walkability.

Some studies have even found negative correlations between walking, density, and land use mix. For example, Wineman et al's study of the built environment's influence on walking behaviour in three lower socioeconomic status Detroit neighbourhoods concluded that, in fact, higher density and land use mix deterred walking (Wineman et al, 2014). However, this was attributed to higher levels of social disorder, which caused fear and safety concerns.

Another criticism of the built environment's impact on travel behaviour is that the correlation does not factor in self-selection (Frumkin, 2004). Krizek's study of households in the Puget Sound region before and after they moved neighbourhoods indicated that travel behaviours was seldom altered despite changes to the built environment characteristics. This led Krizek to conclude that "attitudes toward travel are firmly entrenched and postmove travel provides little insight into how changes in urban form affect travel" (Krizek, 2000, p.48). To address the omission of travel attitudes and neighbourhood preferences in the correlation between walking behaviour and the built environment, Handy et al (2006) surveyed residents in eight American neighbourhoods and found that "…the built environment has an impact on walking behavior even after accounting for attitudes and preferences" (Handy et al, 2006, p.55).

2.3. Walkability, Health, and the Built Environment

> *"Many would be surprised to learn that the greatest contribution to the health of the nation over the past 150 years was made, not by doctors or hospitals, but by local government"* (Parfitt, 1987, p.12).

While the second theme illustrates the impact of the built environment on walkability, the third theme explores the relationship between walkability and physical health. Walking as a form of physical activity and as a form of transportation is also discussed in this theme.

The connection between the built environment and public health is intertwined with the history of city planning (Freestone & Wheeler, 2015). The health of city dwellers was an objective that was common to influential pioneers of the urban planning field, such as Ebenezer Howard and Frederick Law Olmsted (Frank & Engelke, 2005). Since the emergence of the urban planning profession, public health has been a consideration to varying degrees and in different capacities for the design and development of cities (Freestone & Wheeler, 2015; Frank et al, 2003).

The historic relationship of health and community design informs how urban planners shape the built environment today. This section explains the connection between walking, the built environment, and health. Many of the tools that planners and engineers'

use today for city building; such as city-wide sanitation, housing standards and zoning regulations, were created in response to public health concerns (Frank, Engelke & Schmid, 2003).

The concepts of the built environment and public health are connected through the nexus of physical activity (Frank & Engelke, 2001). While there are many forms of physical activity, walking is selected for the purposes of this research undertaking. The reasons for selecting walking are discussed in this section.

First, the concepts of public health, walking for physical activity, and the built environment have a historical connection. Second, walking is an important physical activity, and it is useful to identify different types of walking in the literature. The first concept explored in this section is public health.

2.3.1. Changing Physical Activity Perspectives

Two key shifts in thinking occurred in the 1990s which caused health practitioners and academics to look to community design changes as a public health intervention. The first important shift was the recognition of environmental factors as contributors to health. The second shift was increased support for the health benefits of moderate physical activity.

The World Health Organization defines health as “a state of complete physical, mental and social well-being, and not merely the absence of disease of infirmity” (World Health Organization, 2003) . The recognition that walking is a critical form of physical activity has resulted in a shift in public health models to focus on environments that promote health (Frank & Engelke, 2001). Sallis and Owen (1999) explain a model for studying physical activity that shifts the physical health promotion conversation from the individual level to the community level through their proposal of an ecological model, which includes the physical environment as a health determinant.

Along with the recognition that environmental factors affect health, the publication of *Physical Activity and Health* by the Surgeon General in 1996 marked a watershed

moment in public messaging for physical activity (Frank, Engelke & Schmid, 2003; Sallis, & Owen, 1999). The report states:

> Significant health benefits can be obtained by including a moderate amount of physical activity…on most, if not all, days of the week. Through a modest increase in daily activity, most Americans can improve their health and quality of life (U.S. Department of Health and Human Services, 1996, p.10).

Moderate physical activity is defined as "activities that use large muscle groups and are at least equivalent to brisk walking" (Frank & Engelke, 2001, p.205). Prior to the Surgeon General's report, public health officials had recommended vigorous sustained physical activity for twenty minutes, three days a week in order to reap any health benefit (Frank et al, 2003; U.S. Department of Health and Human Services, 1996). Vigorous activity appeals to a smaller section of the population that is at a proficient level of fitness and has access to equipment and facilities to participate in vigorous activity. Moderate physical activity is accessible to a larger amount of the population, and easier to adopt and maintain than vigorous activity (Frank & Engelke, 2001). Therefore, the Surgeon General's report highlighted the health benefits that could still be achieved with lower intensity physical activity.

The shift from vigorous intensity to moderate intensity was supported by new research on the health benefits of reduced intensity activity, and in response to low levels of activity amongst Americans. *Physical Activity and Health* reported that 60% of American adults do not achieve minimum physical activity thresholds, while another 25% are completely inactive (U.S. Department of Health and Human Services, 1996). These trends are similar for the Canadian context.

Health Importance of Walking

There are many ways that a person can engage in physical activity to receive health benefits, but walking is the most accessible and frequent type of physical activity. Frank et al (2003) identify that walking appeals to the majority of individuals, because it requires low levels of exertion to participate, can be utilitarian or recreational, and has few barriers to participation. Owen et al state that "[t]he public health policy has identified walking as the physical activity of adults that should be most amenable to influence."

(Owen et al, 2004, p.68). It is not surprising, then, that walking is the physical activity most commonly engaged in (Lee & Moudon, 2004; Owen et al, 2004).

2.3.2. Walking Types and Walking Correlates

The previous section has demonstrated that there is an historical connection between health and the built environment, and that walking as a form of moderate physical activity has recognized health benefits. This literature supports the contention that walkable communities are healthier environments for residents. This section reviews walking correlates as well as literature that differentiates walking types. These literatures will frame the research scope by illustrating how the built environment is more impactful on utilitarian walking than on recreational walking.

Walking Types

Two distinctive types of walking are identified in the literature, and these classifications are important in guiding the focus of the Maple Ridge case study. These are recreational, or leisure walking and utilitarian, or active transport walking. Frumkin et al (2004) explain the important distinction between recreational and utilitarian activity:

> Recreational physical activity – a jog in the park, a game of tennis – is carried out with the intention of getting exercise. In contrast, utilitarian physical activity is activity done for purpose, such as walking to the store, to the theater, or to work. The primary purpose of such a trip is to arrive at the destination, and the physical activity involved is incidental. … The distinction is important because the impetus for recreational physical activity is very different than the impetus for utilitarian physical activity. Recreational physical activity, or exercise, requires a high level of motivation, and even people who begin exercise programs often do not sustain them. Utilitarian physical activity, on the other hand, is secondary to other goals (2004, p.170).

Recreational activity may be conducted indoors or outdoors in facilities and spaces designed specifically for these activities, such as a playground, running track, fitness centre or basketball court. Recreational walking may take place on streets or on trails and in parks. On the other hand, utilitarian activity may also be conducted in private spaces such as gardening or house work, or in public spaces such a travel from one place to another. Therefore, the presence and quality of public infrastructure such as street

networks and sidewalks are much more relevant for people participating in utilitarian activity. Despite this, in their studies of recreational facilities' impact on physical activity, Giles–Corti and Donovan (2002) found that informal spaces including streets were the most popular locations for recreational walking (Giles-Corti & Donovan, 2002). The literature makes a distinction between recreational and utilitarian walking, but acknowledges that the built environment impacts both types of activity (Frumkin et al 2004; Frank et al 2003; Owen et al 2004).

While there is evidence that the built environment influences both recreational and utilitarian walking, the extent of influence is much more apparent for utilitarian travel. There are limited studies that compare the built environment's impact on recreational and utilitarian walking; however, Troped et al (2003) demonstrate that certain built environment factors such as streetlights, sidewalks and scenery have a statistically significant impact on utilitarian walking, but were not significant for recreational walking (Troped et al, 2003). Similarly, in Saelens et al's (2003) comparison study of physical activity behaviour in a high walkable and low walkable neighbourhood, the results indicated that:

> no observed difference was found between neighbourhoods regarding self-reported walking for exercise, self-reported leisure time physical activity, or objectively measured vigorous physical activity. There was, however, a difference between neighborhoods regarding walking for errands (Saelens et al, 2003, p.1556).

The same results were found in Handy's comparison of grid street network neighbourhoods and dendritic street networks[5]. While all neighbourhoods had similar strolling, or leisure walking percentages, the utilitarian walking trips were significantly higher in the grid street network neighbourhoods (Handy, 1992). These findings indicate that the built environment design has an impact on travel choice. The focus of the Maple Ridge case study is to examine built environment changes, such as sidewalk improvements over a six-year time period, from 2009 to 2014. The Maple Ridge case study focuses on utilitarian walkability.

[5] A grid street network has high intersection frequency and path redundancy to maximize route options. On the other hand, a dendritic network is a series of streets that branch off from one another in a hierarchical order. Dendritic networks have lower intersection frequency and connectivity.

2.3.3. Urban Sprawl and Physical Health

The impact of an urban sprawl built environment on physical health is well documented in the existing literature (Ewing & Schmidt, 2003; Lopez, 2004; Frank et al 2003). Ewing et al (2003) conclude from their study of over 200,000 participants in 83 U.S metropolitan areas that Americans "…living in sprawling counties were likely to walk less, weigh more, and have greater prevalence of hypertension than those living in compact counties" (2003, p. 54). The study further concluded that urban sprawl residents weighed an average of 6.3 pounds more than their compact neighbourhood counterparts (Ewing et al, 2003). The growing concerns surrounding sedentary lifestyle due to changes in transportation and mechanized work has led public health officials to identify several factors that can promote physical activity (Frumkin et al, 2004).

2.4. Conclusion

This literature review explored three themes in a conceptual framework to shape the analysis and understanding of the Maple Ridge Town Centre case study: planning for walkability through three key development models, how the built environment influences walkability, and the connection between walkability and health.

The first theme explained how planning policies address walkability. The second theme shed light on the relationship between specific built environment components and walkability, which allowed conclusions to be made between how walkability in the study area has changed based on the types and amounts of built environment changes. The third theme connected walkability and health, which illustrated that walkable communities are also healthier communities.

The main built environment elements that influence utilitarian walking, as discussed in the literature, have been summarized in this chapter. In the ensuing analysis chapters, these Smart Growth built environment elements are compared with both the overarching goals and objectives of the city's plans and strategies, and the built environment changes that have occurred during the 2009-2014 study period. This

analysis strategy explores the relationship between walkability and built environment changes in the Town Centre compared to Maple Ridge as a whole.

Chapter 3.

Methodology and Research Design

A mixed-methods approach combining qualitative and quantitative methods was used to answer the central research question – *Have the Smart Growth built environment changes achieved between 2009-2014 supported walkability in the Maple Ridge Town Centre compared to Maple Ridge as a whole?* Both primary and secondary data are drawn on for the purposes of this research. A case study research design is used, which Babbie and Benaquisto (2014) define as "a focused, detailed investigation of a single instance of some social phenomenon" (2014, p.302). This study focuses on the Maple Ridge Town Centre to gain a full understanding of changes that have occurred over a six-year time period in the area. There will likely be transferability of research design to other suburban communities, but the findings are not necessarily applicable to each and every one of those communities. The benefit of using a case study research design is that it serves as a baseline of information for future Town Centre investigation. The author disclosed that she is an employee of the City of Maple Ridge in the Planning Department, but was not directly involved in the creation of the TCCP or TCAP. Ethics approval was granted.

This chapter outlines the types of data used, and the data collection methodology. Four categories of data were examined to answer the central research question. The data used in this study included Maple Ridge city plans and strategies, building permit statistics, Census data, city policies and initiatives including capital works projects, and walkability data obtained from WalkScore and the My Health, My Community (MHMC) lifestyle survey. Key informant interviews were the final data set used. Each data set helps to unpack the issues at play in the Town Centre. The following sections describe each data set in more detailed. The final section provides a synopsis of the analysis strategy.

3.1. City Plans and Strategies

The first data set examined were City of Maple Ridge's plans and strategies, accessed online from the City of Maple Ridge website and from the Clerks Department for any documents dated 2008 or earlier. The City of Maple Ridge has a number of interrelated plans and strategies that reflect the development strategies of Regional Town Centres, Sustainable Development and Smart Growth principles. City plans and strategies were reviewed and systematically coded with NVivo Software using 26 themes including pedestrian realm, pedestrian, walkability, and health to identify relevant principles, policies, and objectives (see Appendix D). The following City of Maple Ridge plans and strategies were included in the content analysis:

- Council Strategic Plan and Vision Statement
- Official Community Plan (1996, 2006)
- Parks Master Plan 2010
- Sustainability Action Plan 2007
- Transportation Plan (2003, 2014)
- Town Centre Concept Plan
- Town Centre Area Plan

The plans and strategies most relevant to the Town Centre for the 2009-2014 study period – which covered the period from planning and design to implementation - are the TCAP and the TCCP. The document analysis was broadened beyond the key TCCP and TCAP documents to include city wide planning documents for land use, transportation, and parks in order to understand the full scope of the Town Centre and its historic planning context. The list of city plans and strategies was selected based on relevancy to the Town Centre study area.

3.2. Built Environment Data

In addition to a document analysis, built environment data for residential density and sidewalk improvements and other built environment improvements were also collected from various sources to understand the changes that have occurred in the study area during the 2009-2014 time period. In the analysis phase, these changes were compared to both the policy objectives and the Literature Review themes.

In the initial stage, I drew on my own knowledge and observation of built environment changes in the study area. Next, I reviewed past and current aerial photographs from the city website and Google maps to identify new residential construction. Historical aerial photography was available the years 2011, 2009, 2007, and 2004. I also noted other significant changes based on my own observations, such as new park developments, major commercial construction. New sidewalk construction and sidewalk improvements was identified through the building permit records as well as council reports awarding contracts for sidewalk improvements.

3.2.1. Density Data

Two data sources were used to measure change in density. Residential density was measured in 2006 and 2011 using Census data. It is noted that Census tract boundaries do not match up with the study area boundaries. In the 2001 Census, the study area was comprised of four census tracts that included additional lands, predominantly single family land use outside of the Town Centre. These applicable Census tracts are numbered: 401.01, 401.02, 402.01 and 402.02. In the 2011 Census, the number of Census tracts was increased to five, with 402.01 dividing into 402.03 and 402.04.

Two analysis scenarios were undertaken. The first scenario used all of the Census tracts with land in the study area; while the second scenario omitted some Census tracts that only had small areas within the study area. Both options were run to compare the impact of each. Census tracts 402.01 and 402.02 have only small potions within the study area, so these were omitted in the second scenario. It is noted that while these areas are small, new multi-family development has occurred in them.

Building and occupancy permit statistics were also used to identify new units that were constructed during the study period. New residential construction was defined in this study as vacant or single family properties that have had multi-family or mixed-use buildings constructed. Building permit addresses were used to specifically identify the location of density changes.

3.2.2. Sidewalk Data

In addition to density changes, capital works projects were reviewed in the study area to determine all of the sidewalk and related improvement projects during the 2009-2014 time period. Changes in sidewalk quality and connectivity were the result of two different processes: developer-led upgrades in connection with a building permit application, or a city-led upgrade as a result of a capital works project. Both projects which included a new sidewalk installation in an area that did not previously have a sidewalk, or a project that widened the sidewalk and added amenities such as benches, public art, lighting, and landscaping in a location that previously had a sidewalk, where included in this study. This data was obtained from Maple Ridge Council reports that award contracts for these projects, as well as development permit applications.

3.3. Walkability and Health Data

Secondary walkability data from two sources was used to understand the impact of built environment changes. The first data set used was secondary health and lifestyle quantitative data. In 2013, the non-profit organization “My Health, My Community” (MHMC) conducted an online questionnaire that generated 33,000 responses from across the Lower Mainland. I drew on data collected from the MHMC health survey, which was conducted by Fraser Health, Vancouver Coastal Health, and the eHealth Strategy Office at the University of British Columbia (UBC). This survey collected 791 responses in Maple Ridge between July 2013 and July 2014. The survey results were released at the municipal level publicly on the MHMC organization’s website.

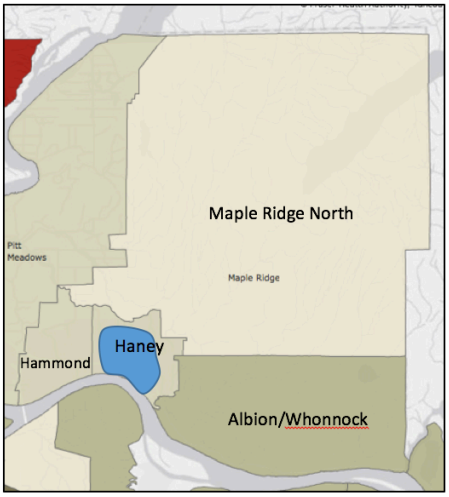


Figure 10: MHMC Maple Ridge Sub-Areas
Source: Fraser Health Authority and Vancouver Coastal Health Authority

Regional, municipal, and sub-municipal area data was publically available. Maple Ridge data is broken down into four large sub-areas, as shown in Figure 10 above. The survey has 83 questions in total. There are five Likert scale evaluations and one transportation question that are applicable to this study, as follows:

- What is your primary mode of traveling to do errands, like grocery shopping or other shopping? *If you use more than one mode, choose the one that you use for most trips.*

- Think about your neighbourhood as the area within a 20-minute walk or a distance of one mile (1.6 km) from your home. For each statement, indicate to what extent you agree or disagree (Likert Scale):

    - There are sidewalks in my neighbourhood that are well maintained (paved, with few cracks) and not obstructed.

    - Many shops, restaurants, services and facilities are within easy walking or cycling distance of my home.

    - There is so much traffic along the street I live on that it makes it difficult or unpleasant to walk in my neighbourhood.

    - I see a lot of people walking and biking in my neighbourhood.

    - I feel safe walking alone in my neighbourhood after dark.

These questions were selected because they related to walking for errands and built environment elements that influence walkability. The responses to these survey questions were used to understand if walkability is higher or lower in the Town Centre study area compared to Maple Ridge as a whole. Survey responses also provided an indication of built environment conditions that influence walkability.

In tandem with the MHMC survey response data on walkability, the second walkability data set was the WalkScore rating. WalkScore was used to understand differences in walkability between the Town Centre study area and Maple Ridge as a whole. The WalkScore tool is a ranking tool that evaluates the ease of walking in a neighbourhood. This metric uses proximity of amenities like businesses, parks, schools and other common destinations to residential addresses to produce a numerical walkability score. Amenities within 400 m of the address are awarded a score of 100 points, and that score declines as the distance increases. A score of 0 points is earned when the amenity is 1.6 km away from the address (WalkScore, n.d.).

The average WalkScore for Maple Ridge is the lowest in the Metro Vancouver region, at 36 out of 100 possible points. For comparison purposes, the average Vancouver walk score is 75. Based on this low ranking, people in Maple Ridge are possibly the least likely to choose walking as a method of transportation. The WalkScore values now are the highest in the Town Centre, which may indicate that something is different in the study area compared to the rest of the municipality.

3.4. Semi-Structured Interviews

A fourth data set was primary qualitative data collected through key informant interviews. A total of 10 key informant interviews were conducted between December 2015 and April 2016. Key informants included current and past city Planning, Engineering, and Administration staff and stakeholders on the project committee for the TCCP and TCAP planning process. All informants were involved in either the creation or implementation of the TCAP, or both. The author disclosed her job title and role at the City of Maple Ridge to all key informants. Stakeholders from the project committee included elected officials, business representatives, and resident representatives. The business

and resident representatives are important because they provide anecdotal walking evidence. Names and job titles of key informant were omitted to maintain confidentiality. Key informants were emailed through publicly available contact information, or using the snowball technique in some cases. Interviews were audio recorded, then transcribed. Transcribed interviews were then analyzed using the NVivo software tool using the same 26 theme codes that were used for the document analysis.

There were two purposes to the key informant interviews. First, the interviews provided additional context to the first stage of document analysis. Second, the interviews provide perspectives on how walkability was conceptualized during the land use planning processes in the Town Centre. Each key informant had a different role and experience on the walkability impact of the TCCP and the TCAP. The interview participants were involved in either the development or implementation of the TCCP and TCAP, therefore, they had individual opinions about the impacts of the programs and the success the implementation stage. Key informants were also asked to reflect on the built environment changes that have occurred over the 2009-2014 time period.

3.5. Analysis Strategy

The four categories of data described in this chapter are each analyzed separately. Each analysis stage is sequentially described in this chapter. In the first stage, city plans and strategies are systematically reviewed to identify overarching goals and objectives. The first sub-question - *do city plans and strategies support the creation of a walkable built environment in the Town Centre?* is answered in the first stage of analysis.

Once the city's Town Centre planning approach was understood from a policy perspective, the second stage of data analysis entails understanding the physical changes that have happened in the Town Centre during the study period, so that these changes can be compared to both the policy objectives and the Literature Review themes. Built environment changes are examined that have occurred in the Town Centre between 2009-2014 in terms of residential density and sidewalk improvement projects. I explored the second sub-question in this phase of analysis, which is: *What built environment changes*

occurred between 2009 to 2014 in the Maple Ridge Town Centre and how does this relate to walking correlates identified in the Literature Review?

The third stage of this study's analysis focused on measuring the influence that the previously examined built environment changes and policy implementations have had on actual walkability in the Town Centre. In this third analysis stage, I addressed the third sub-question, which was: *How do walkability metrics in Maple Ridge's Town Centre compared to Maple Ridge as a whole and is there a connection to overall health?* This stage of analysis examined how built environment changes have translated to health and walkability metrics in the Town Centre. Town Centre walkability and health metrics are then compared to the same metrics for Maple Ridge as a whole.

The fourth stage of analysis reflects on which policies, strategies or built environment interventions were most impactful on walkability. The final data set is comprised of semi-structured key informant interviews, which provided greater insight into the decision-making process and policy development rationale. I analyzed how walkability was considered in the area planning process and development permit stage by various stakeholders to understand if and how walkability was used as a goal in the Town Centre re-development approach. This chapter answers the final two research sub-questions, which are: *How were pedestrian considerations conceptualized by key stakeholders during various Town Centre area planning processes? and: Did Maple Ridge seek to improve walkability for physical activity and public health reasons?* What were the driving forces of these initiatives?

Each of these four phases of analysis builds on one another to ultimately answer the central research question.

Chapter 4.

Maple Ridge Pedestrian Planning Framework

The first stage of data analysis takes place in this chapter, and provides an overview of Maple Ridge's relevant city plans and strategies. These plans and strategies are reviewed to determine what overarching themes were present. Particular attention was given to policies that address walkability and pedestrian considerations. In this chapter, I answer the first sub-question, which is: do city plans and strategies promote walkability in the Town Centre?

In Chapter 2: Literature Review, three themes were explored in a conceptual framework to guide the analysis and understanding of the Maple Ridge Town Centre case study: planning for walkability through three key development models, the connection between walking and health, and how the built environment influences walking.

4.1. Overview of Maple Ridge's Plans and Strategies

The City of Maple Ridge has a number of inter-related plans and strategies that apply to the study area, as outlined in Figure 11 below. These plans and strategies speak to Smart Growth design, walking promotion and encouraging walking conducive environments. This section provides an overview of each of the city plans and strategies. These overviews help to understand the planning processes in Maple Ridge.

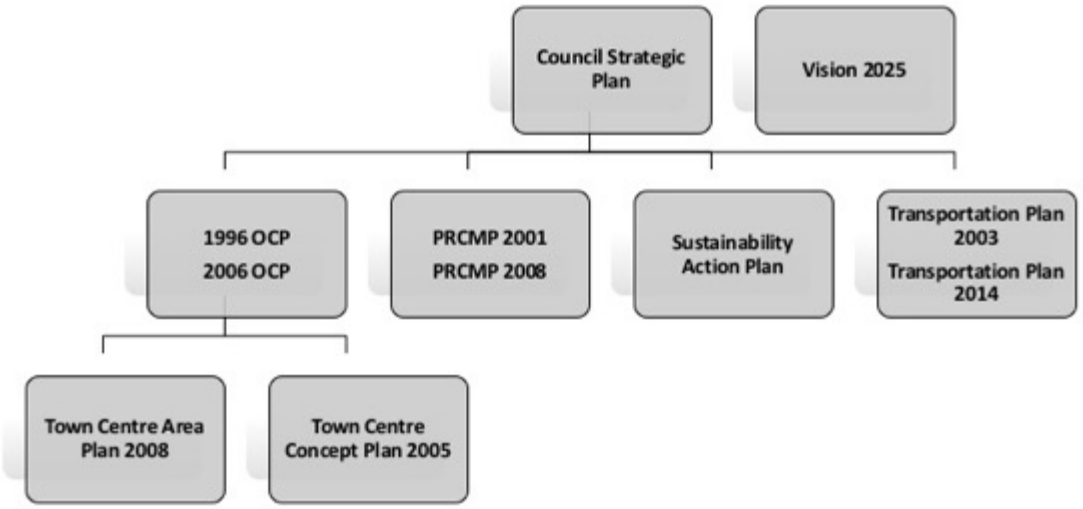


Figure 11: Content Analysis Hierarchy

4.2. Council Strategic Plan and Vision 2025

Vision 2025 is Maple Ridge's overarching values statement that informs the long term direction of city planning operation. This value statement makes up part of the Council Strategic Plan (CSP), which was last revised on May 27, 2007. The CSP was created by Council and provides a set of objectives aimed to realize the Vision Statement (District of Maple Ridge, 2008). The CSP contained nine strategic focus areas that guide the financial and operational decision-making through the business planning process of the entire organization. The concept of sustainability – a central aspect of Smart Growth - was an overarching theme in the CSP. The 'pedestrian friendly downtown' is referenced in three strategic focus areas: Transportation, Smart Managed Growth, and Economic Development. Walkability is also referenced in the following statement:

> • Continue to improve the walkability of the downtown, ensuring it is pedestrian friendly and accessible, particularly for those with impaired mobility (District of Maple Ridge, 2007, p.10).

The review of the CSP and the Vision 2025 statement show that at one of the broadest and high level policies, a walkable and pedestrian friendly downtown is desirable. As the over-arching objectives for the city, references to walkability at this level mean than this theme will be reflected in more detailed plans, as well as across the organization.

4.3. Sustainability Action Plan

The next document in the content analysis was the Sustainability Action Plan (SAP), which was created as a result of the Council Strategic Plan approval in 2007. The SAP was prepared by the Sheltair Group consultants as an implementation strategy for the nine strategic focus areas of the CSP, which are:

1.Environment
2. Transportation
3. Smart Managed Growth
4. Safe and Livable Community
5. Financial Management
6. Governance
7. Community Relations
8. Inter-government Relations/Networks
9. Economic Development

The SAP demonstrates current practices for each focus area, as well as new undertakings for 2008 and beyond to create a more sustainable community. The relevant strategic focus areas for this research are Transportation, Smart Managed Growth, and Safe and Livable Community. An accomplishment listed in the Safe and Livable Community focus area is the Walk Maple Ridge/Pitt Meadows Guide published in partnership with Fraser Health. This publication served to promote trail walking and hiking opportunities in Maple Ridge as well as Pitt Meadows.

4.4. Official Community Plan

Maple Ridge's current Official Community Plan (OCP) was adopted by Council in 2006 after a public consultation process. The current 2006 OCP replaced the previous 1996 OCP. The OCP is a high level document that outlines policies and objectives for the community over the long-term horizon. These policies and objectives apply across the municipality; however, more specific area plans such as the TCAP are contained with the OCP. The 1996 OCP explains that:

> In its simplest form the Official Community Plan is a set of policies or rules to guide future decision-making. The policies of an OCP express the local vision of what is important to a community and how certain issues will be dealt with. With good policy guidance, the direction the community wishes to follow is understood by all and is continued (District of Maple Ridge, 1996, p.1).

The 2006 OCP is a substantially larger and more detailed long-range document compared to the 1996 OCP. The 2006 OCP includes several area plans including sections for the Albion, Silver Valley, and the Town Centre neighbourhoods. General themes common to both documents include development permit guidelines for commercial and multi-family development that considers and prioritizes pedestrian access and circulation. Another theme is the need to support a multi-modal transportation system, which includes roads, transit, walking and cycling. Policies surrounding support for a grid pattern of streets are more established in the 1996 OCP, and fall away in the 2006 version. The 1996 OCP does include discussion about the Town Centre, and speaks to a higher level of design and pedestrian realm than in other parts of the municipality, but these themes are much more developed in the 2006 version, including photos and diagrams to reinforce design guidelines. The following sections address the 2006 OCP version, as this is the document that was current during the study period.

4.4.1. Multi-Modal Transportation Theme

The OCP contains a dedicated chapter on transportation in addition to other stand-alone city transportation strategies. In the OCP, transportation is considered as a multi-modal system that includes road systems for vehicles, buses, and bikes; and sidewalks for people. Walking is recognized in the OCP as a form of transportation, and furthermore,

the need to promote non-vehicular modes of transportation is also expressed in the following transportation policy:

> Policy 7 - 4 Maple Ridge will place an emphasis on increasing choice for non-automobile transportation modes (District of Maple Ridge, 2014a, Ch.7, p.13).

Furthermore, the following policy specifies a targeted approach to increasing the modal split in the community:

> Policy 7 - 11 Maple Ridge will support initiatives that reduce traffic demand and automobile trips such as:
>
> a) encouraging more compact development in the Town Centre and around village commercial centres and community commercial cores;
> b) supporting the Town Centre as the central node of the community linked to outlying areas;….(District of Maple Ridge, 2014a, Ch.7, p.7).

4.4.2. Pedestrian Amenities Theme

In addition to walking as a form of transportation that is part of a multi-modal transportation system, the OCP also contains policies that speak to pedestrian friendly environments and pedestrian amenities, which connects the form and character of the built environment with transportation mode choice. These policies and objectives are found specifically in the development permit guidelines, which guide the design of new multi-family, commercial, and industrial projects in the urban area. These guiding principles prioritize pedestrian environments by stating:

> Principle 8 Unique and enjoyable communities and places are created through community improvements, quality design, less obtrusive signage, pedestrian friendly environments, accessibility and viewscapes (District of Maple Ridge, 2014a, Ch.1, p.2).

> Principle 45 Citizens value a pedestrian friendly environment that includes a trail network for horses, walking and cycling for recreation and access to amenities, employment, and services (District of Maple Ridge, 2014a, Ch.1, p.6).

4.4.3. Health Theme

Another theme that is woven through the OCP that is of relevance to this study is the concept of health. There are two principles and four policies in the OCP that refer to health. In all of these cases, community, rather than individual health, is referenced. Health is conceptualized broadly in the OCP, both in terms of physical health, as well as social connectedness and mental well-being. Health is also referred to in terms of 'community health', alluding to less tangible goals and aspirations. Eco-system health is also mentioned. Elements that contribute to healthy communities based on the OCP include recreation and access to green space; social services for a diverse population including education and outreach; and culture. The principles state that:

> Principle 13 Culture and recreation are vital components of a **healthy community** (District of Maple Ridge, 2014a, Ch.1, p.2)**.**

> Principle 39 A **healthy community** depends on social services that meet the needs of a diverse population (District of Maple Ridge, 2014a, Ch.1, p.5).

The policies and objectives show that the connection between the built environment and health are not explicitly made; however, Smart Growth and Sustainable Development goals remained central to the broader vision of Town Centre planning for the City of Maple Ridge.

4.5. Parks, Recreation and Culture Master Plan

Two Parks, Recreation and Culture Master Plans (PRCMP) were reviewed for the purpose of this research. The first plan dates back to 2001, and the second plan was revised and approved by Council in June 2010. The Parks and Leisure Services Department in Maple Ridge is a joint department with the City of Pitt Meadows[6]. For the purposes of this research, the content analysis of the PRCMPs focused on overarching

[6] Established in 1994 and ending in 2016, the Parks and Leisure Services Department was jointly funded by the City of Pitt Meadows and the City of Maple Ridge. Operating costs were shared based on population and capital costs were funded by the jurisdiction that owned the asset (Maple Ridge Pitt Meadows Parks & Leisure Services, 2015).

goals and objectives that applied to both communities, as well as specific sections that related to Maple Ridge. Policies or strategies that related only to the City of Pitt Meadows were excluded. The current 2010 PRCMP's vision statement includes the following statements:

> The city cores are centres for arts and culture, each with a unique identity. The cores are places for people to connect, contribute and celebrate their sense of belonging. Neighbourhoods throughout the community are interconnected vibrant hubs, nurturing social interaction and leadership development, and helping everyone to feel welcome and connected.
>
> A wide variety of linked parks, trails and recreation facilities support diverse activities, resulting in a healthy, active community (Catherine Berris Associates Inc, 2010,p.II).

This vision statement reaffirms that vibrancy in the Town Centre is desirable, as a place for gathering and interacting. The connection between recreation and health is also made, reinforcing the idea that physical activity is important for Maple Ridge residents and city planners. Additionally, the overall goal of the 2010 PRCMP is to create a healthy and sustainable community that participates in recreational and cultural activities (2010 Parks Master Plan: ii). As this goal illustrates, a sustainable community is identified as desirable and important. The 2010 PRCMP is built on a framework that is centred on the idea of community, of which sustainability also plays a role. The PRCMP states that:

> The strongest interest is in fostering a sense of community. Within that "community", the values of importance for the Master Plan fall neatly into the categories of Connected, Energized and Collaborative….By living and functioning according to these values, we will contribute to achieving a **Sustainable Community** (Catherine Berris Associates Inc, 2010, p. i).

As this statement indicates, the framework above strengthens Maple Ridge's commitment to using the Sustainable Development planning model in its decision-making process. In the following sections, specific themes in the 2010 PRMCP are explored in further detail.

4.5.1. Health Theme

The 2010 PRCMP addresses several themes that were also reflected in the OCP, which flow from the PRCMP's vision of vibrant, active centres and a sustainable community. The 2010 PRCMP speaks to a healthy, active community in the document's vision statement, which recognizes the key role that the PRCMP plays in healthy lifestyles. There are two aspects of health that are discussed in the PRCMP document. The first relates to recreational infrastructure, such as trails and greenways that provide residents with sites to engage in physical activity, which supports physical and mental health (Catherine Berris Associates Inc, 2010, p.45). This notion was expressed similarly in the OCP. The second health aspect discussed in the PRCMP, which was also referenced in the OCP, is the preservation of the natural environment and the associated human health benefits (Catherine Berris Associates Inc, 2010, p.51).

4.5.2. Walking Theme

The 2010 PRCMP has several important connections to walkability in the Town Centre and also within the broader community. Trails and greenways are part of the overall pedestrian network, along with sidewalks and there are important considerations in terms of connectivity, signage, and safety. Both trails and parks are largely recreational amenities; however, trails can serve a utilitarian transportation function as well, and the quality of parks within a resident's walkshed will also influence neighbourhood walkability. A key walking connection made in the PRCMP was the proximity between parks and residential area. One of the goals of the PRCMP was to have a neighbourhood park within a five-minute walk of residents and a community park within a ten-minute walk. While walking distance to park destinations was identified, the use of those parks for walkers was also discussed. Additionally, the plan recognizes that trails can complement the sidewalk network and act as part of the connective transportation system for pedestrians with the following statements:

> to improve the infrastructure for more active transportation in order to increase the physical connectivity and accessibility of neighbourhoods, parks and facilities, and to help meet sustainability goals for the community (Catherine Berris Associates Inc, 2010, p.5).

> Increase the number of different types of trails to accommodate more use, provide transportation alternatives, and to increase interconnectivity (Catherine Berris Associates Inc, 2010, p.i).

In addition to general trail references as pedestrian infrastructure, and the importance of parks within walking distance of all Maple Ridge residents, a specific project in the Town Centre is included in the PRCMP for trail connectivity along the Fraser River. The PRCMP aims to "[a]cquire the riverfront log sort (Northview) as a critical trail linkage and key historic connection for the community" (Catherine Berris Associates Inc, 2010, p.xv). These themes illustrate that the Parks and Leisure Services Department, through the 2010 PRCMP, plays an important role in the walkability of the Town Centre.

4.5.3. Pedestrian Amenities Theme

The Parks and Leisure Services Department oversees a wide range of amenities and services in addition to parks and green space including the provision of trails, public art, street tree and boulevard maintenance. Elements such as public art, street trees, beautification projects including hanging baskets, and boulevards, all contribute to the richness of the pedestrian realm and increase the attractiveness of sidewalks and walking areas for users. Community beautification may seem like an insignificant contribution to walkability; however, these initiatives promote walking, as was discussed in the Chapter 2 Literature Review. These undertakings are reflected in the PRCMP in the following passages:

> Pursue beautification projects that build community pride and address sustainability (Catherine Berris Associates Inc, 2010, p.v).

> Support artistic expression related to Maple Ridge's and Pitt Meadows' cultural identity, particularly in the downtown areas (Catherine Berris Associates Inc, 2010, p.xiv).

4.6. Transportation Plans

The Maple Ridge Transportation Plan: *Moving Forward: Transportation Plan 2026* (MRTP) was completed in August 2003. The MRTP replaced the 1999 draft transportation study conducted jointly with the City of Pitt Meadows (Urban Systems, 2003). Many of the

MRTP policy statements formed the 2006 OCP's Transportation chapter. More recently, the Strategic Transportation Plan (STP) was adopted by Council in October 2014. While the policies of this current plan are not relevant to transportation projects during the study period of 2009-2014, a document analysis was conducted to determine if there were any difference in direction between the two plans. The 2003 MRTP was prepared in conjunction with the 2006 OCP review. The purpose of the MRTP was to recommend transportation improvements over a 25-year period. Since preparation of this plan, significant regional infrastructure projects have been completed that have an impact on transportation in Maple Ridge, most notably construction of a new Fraser River crossing at 200 Street (Golden Ears Bridge), and replacement of the dual two lane Pitt River Bridge with a larger seven lane bridge. The MRTP is reviewed first, followed by the STP.

4.6.1. 2003 Plan Overview

The 2003 MRTP contained five goals, each with a subset of objectives. These four goals are listed below, including related objectives:

- **Access and Mobility**
  - Develop Multi-modal network
- **Quality**
  - Support Urban Design Objectives
- **Choice**
  - Support Pedestrians
- **Community and Environment**
  - Support Healthy Lifestyles

The 2003 MRTP referred to a multi-modal transportation system that includes walking, cycling, transit, and vehicles. The MRTP is divided into four categories that reflect each of these modes of transportation: roads, transit, pedestrian, and cycling. While a multi-modal transportation system was outlined as a desirable goal, the plan does acknowledge obstacles to achieving a balanced modal split due to Maple Ridge's sprawling form of development and vehicle reliant urban design.

Built Environment Theme

The 2003 MRTP acknowledges that the built environment plays an important role in people's mode of transportation choice. Key issues identified in the plan are the rapid population growth, the prevalent pattern of development, and the resulting automobile use, as described in the following passages:

> Continued growth of traditional suburban developments (segregated, low-density land uses) will only intensify the demand for automobile trips on the road network by promoting a high level of auto ownership (Urban Systems, 2003, p.15).

> The challenge will be to develop a transportation network that supports and encourages travel by non-automobile modes through strategic improvements to alternative modes. At the same time, the District will want to develop a coordinated land use strategy that supports compact development and sustainable growth in the long term. A coordinated land use strategy will promote the population density needed to support enhanced networks for alternative modes, such as transit (Urban Systems, 2003, p.15).

These passages illustrate that population density and land use mix are recognized as important factors for transportation choice. In addition to these two factors, the plan also explains the importance of street network patterns in relation to walking:

> Grid systems generally provide a large amount of redundancy in the road network, which allows traffic to be distributed across several roadways and provides a larger number of routing options for road users. There are other benefits to grid systems, including easier provision of transit services and better pedestrian and cycling access because there are fewer dead-ends.

> Many suburban developments have moved away from grid systems because it is perceived that traffic volumes are higher along local roads, and because local roads can be used for short-cutting. However, the resulting development of circuitous road networks and cul-de-sacs has limited the ability to serve newer areas with transit service. In addition, without the provision of pathways throughout communities, walking becomes an unattractive option. Consequently, automobile dependency is these areas is quite high (Urban Systems, 2003, p.95).

The 2003 MRTP also discusses the built environment characteristics that are critical to supporting transit, which align with pedestrian needs as well. It is interesting to note that the transit section of the plan contains a lengthy section on 'Transit Supportive

Strategies', which include land use mixture, land use density, parking reductions, redundant road networks, and location of building siting.

Pedestrian Plan

The pedestrian component to the 2003 MRTP is the most relevant section of the transportation plan for this study. The plan recognizes that:

> Walking is a fundamental form of transportation….Although the pedestrian mode is so prevalent in our everyday life, policies and designs that facilitate walking as a mode of transportation with a community often take a back seat to the goal of maximizing automobile access (Urban Systems, 2003, p.46).
>
> If suitable conditions exist within a community, walking can be a convenient alternative to the automobile for almost all short trips….If proper pedestrian planning and design principles are applied to both new developments and retrofit projects in established areas, and accommodating pedestrian environments can be created in Maple Ridge (Urban Systems, 2003, p.46).

The pedestrian plan identifies a network of connected walking facility (i.e.: sidewalks) requirements based on road classification, road standard (i.e.: rural or urban), and related amenities (transportation, service area, etc.). The ultimate walking facility plan is to have higher traffic areas such as urban arterials, collectors, and through local roads require sidewalks on both sides of the street, and cul-de-sac local roads require sidewalks on one side of the street. The 2003 MRTP states that:

> The Pedestrian Plan is designed to augment the District's existing sidewalk program by defining key pedestrian areas of the District within which facilities are needed in the long term to support and encourage pedestrians of all levels of mobility (Urban Systems, 2003, p.5).

As an incremental step to move forward to the ultimate sidewalk plan, the 2003 MRTP identifies focus areas for sidewalk provision over a 20-year period. Six key pedestrian areas are determined in the plan, as shown in Figure 12. These areas require provision of sidewalks on all streets within the pedestrian zones. Two of the pedestrian areas are located in the study area: Port Haney and Town Centre. The highest level of sidewalk improvements were identified in these six areas, which are associated with key destinations such as major shopping destinations, the city's hospital, and transit exchanges. The second level of sidewalk provision is within 500 metres of the pedestrian

zones on arterial and collector streets. The third level of sidewalk improvements are identified along one side of all bus route streets, and the final level is along arterial and collector streets not captured in the first three categories.

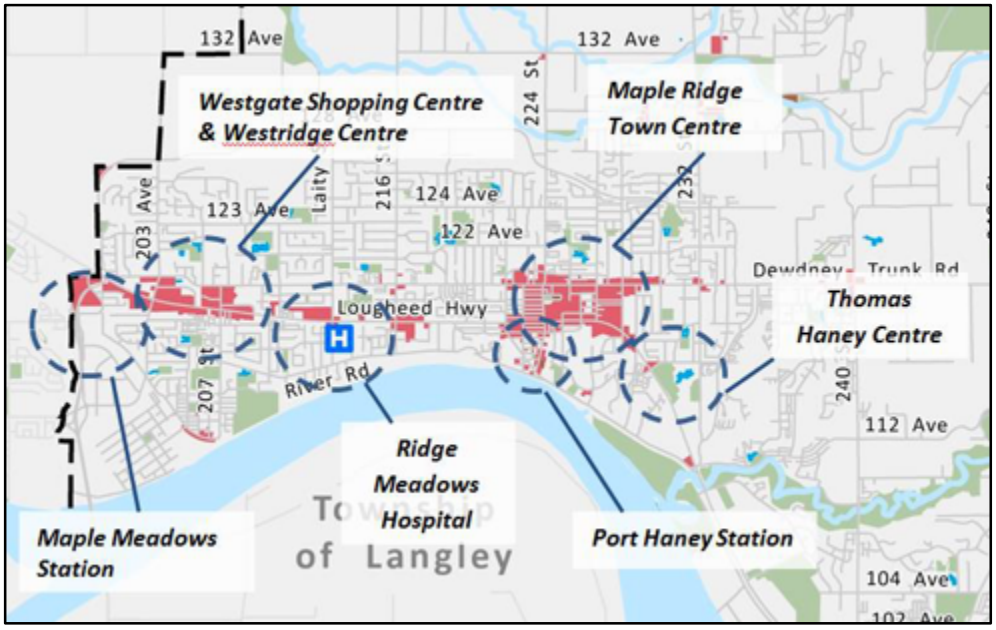


Figure 12: Maple Ridge Pedestrian Zones
Source: Urban Systems 2014

Street segments within the Port Haney and Town Centre pedestrian zones that currently do not have sidewalks were identified. In the Town Centre, there are 10 such street segments. Additionally, the need for a reinforced connection between the Town Centre and Port Haney neighbourhoods was noted. The report also identifies pedestrian crossing barriers as an obstacle to a functional walking network. The 2003 MRTP does not identify sidewalks that may need to be replaced due to poor condition or lack of pedestrian amenities. Significant barriers were noted in regards to access to the river waterfront beyond the train tracks, access between Port Haney and the Town Centre across the Haney Bypass.

While walking was identified as one of four modes in the transportation plan, the 2003 MRTP also recognized that pedestrian needs are highly integrated into the transit mode of transportation. This fact further bolsters the need to consider pedestrians in

transportation planning. The 2003 MRTP explains how walking is different from other transportation modes:

> Planning for pedestrians is much different than planning for automobile, transit, and bicycle transportation. All of these modes typically rely on designating specific networks, routes and rights-of-way for travel. Walking can and will occur almost everywhere in Maple Ridge – alongside the roadway, on sidewalks, along pathways, through trails, within parking lots, and on private lands (Urban Systems, 2003, p.152).

The Pedestrian Plan in the 2003 MRTP recognizes walking as a form of transportation and as one of four transportation modes that create a multi-modal transportation system. The pedestrian section of the 2003 MRTP identifies the challenges to walking in Maple Ridge, and addresses sidewalk infrastructure projects that can ameliorate facilities for pedestrians in the key walking nodes of the city. While there is acknowledgment that built environment factors such as land use density play a role in transportation choice, the pedestrian recommendations are limited to the city's road right-of-ways.

Health Theme

In addition to references to walking as a form of transportation and pedestrian needs, there were two connections made between health and walking in the 2003 MRTP that further support the health references in other city plans and strategies, such as the OCP. An objective of Goal 4 – *Community and Environment* is to: "[s]upport healthy lifestyles [and] promote transportation alternatives [cycling, walking] that are supportive of community desires for more healthy lifestyles" (Urban Systems, 2003, p.9). Cycling is also noted as having health and fitness benefits in the cycling plan section (Urban Systems, 2003, p.44).

4.6.2. 2014 Strategic Transportation Plan

The current STP was endorsed by Council in October 2014. Similar to the previous 2003 MRTP, a multi-modal approach was used, with plans for road, transit, cycling and pedestrians. The goals and objectives are also very similar. One key difference is the addition of expanded pedestrian facilities beyond just the sidewalk that were discussed in

the 2003 MRTP. The STP calls for an enhanced Town Centre treatment that builds on infrastructure projects and re-development projects over the past decade. The expanded pedestrian facilities include streetscape and pedestrian realm, boulevards, street furniture, enhanced wayfinding, lighting and Crime Prevention Through Environmental Design (CPTED) principles[7]. These additions indicate that pedestrian considerations are growing in scope and importance. The STP also acknowledged that progress has been made in the Town Centre pedestrian zone since 2003. The STP does identify 13 streets and street segments that do not include pedestrian facilities, seven of which were identified in 2003. Of note is that five of the deficient segments are identified as part of the pedestrian network in the Town Centre Area Plan.

4.7. Town Centre Concept Plan

The previous city plans and strategies discussed have had a city-wide scope, with particular sections dedicated to the Town Centre. The following plans and strategies are specific to the study area. The Town Centre Concept Plan (TCCP) was the outcome of the Smart Growth on the Ground (SGotG) planning project, which began in 2003. The SGotG program was a joint project by the Real Estate Institute of BC, Smart Growth BC, and the Sustainable Communities Program at UBC. There are five sections to the TCCP: *Project Background, Baseline Analysis, Elements of the Plan, detailed Design Guidelines and Performance Standards*, and *Implementation*. The *Project Background* and *Baseline Analysis* sections provide a description of existing conditions, an overview of the SGotG process, and a list of partnerships involved in the project. The *Elements of the Plan* and *Design Guidelines and Performance Standards* sections describe the Smart Growth principles and includes a conceptual land use plan. The TCCP also includes technical bulletins. The TCCP aligns itself with the policies and goals of the 1996 OCP and the 2003 MRTP, and builds on these goals to create a concept plan that is more strongly based in Sustainable Development and Smart Growth principles. The TCCP explains that:

[7] CPTED is a design approach that reduces criminal behaviour through careful consideration of site design to maximize safety.

> Although the Concept Plan does not depart significantly from the OCP, there are some important distinctions…. Overall, the proposed land use changes allow for more residential development, a greater mix of housing types and land uses, and ultimately a vibrant and revitalized downtown area.
>
> The Plan was designed according to aspects which the community felt were most important to Maple Ridge. These were translated into three overall guiding elements: transportation, green infrastructure, and energy and water….. (Smart Growth on the Ground, 2005: Section 5 p.3).

The TCCP included five technical bulletins and a substantial amount of baseline research in terms of population, transportation, environmental systems and sustainability practices. Maple Ridge was the first community to participate in this initiative, and several other communities followed suit, including the City of Prince George, the District of Squamish, and the Town of Oliver. The TCCP was endorsed by Council in 2005.

4.7.1. Sustainable Development Theme

Sustainable Development is an integral part of Smart Growth and the TCCP. The TCCP contains 8 Guiding Sustainability Principles, which are:

- Each Neighbourhood is Complete
- Options to Our Cars Exist
- Work in Harmony with Natural Systems
- Buildings and Infrastructure are Greener and Smarter
- Housing Serves Many Needs
- Jobs are Close to Home
- The Centre is Attractive, Distinctive and Vibrant
- Everyone Has a Voice (City of Maple Ridge, 2008)

Additionally, the TCCP approach is reflected in the following statement:

> Rooted in in principles of sustainability and open public and stakeholder workshops that guided the process from the outset, the Plan is intended as the guide for sustainable future development in Maple Ridge (Smart Growth on the Ground, 2005, p.3).

The SGotG program sought to overcome some of the key issues with Sustainable Development, by focusing on the implementation stage by reviewing construction projects, and by examining economic realities and costs to implementation. A design charrette involving stakeholders was undertaken as part of the program, to engage the community in the plan creation process. The charrette process is a defining component of the SGotG program. The TCCP states that "Smart Growth on the Ground is characterized by several critical components: an inclusive process, an integrated charrette event, practical research, and a focus on implementation" (Smart Growth on the Ground, 2005:Section 1, p.3).

The eight guiding principles in the TCCP are strongly rooted in Sustainable Development, and health and walkability are important components of the sustainability approach. For example, compact mixed-used development and increased residential density are goals of the TCCP that are also walking correlates reflected in the Chapter 2 Literature Review. However, the desirability of these elements in the TCCP is related to energy efficiency and reduced energy consumption (Smart Growth on the Ground, 2005: Section 2:19). The TCCP has five major elements, and two of these elements are relate to walkability:

> • A vibrant Centre where residents live within a five minute walk from shops, services, recreation and cultural events, and where local job opportunities are provided by potential mixed use, flexible, and live/work developments (Smart Growth on the Ground, 2005, Section 3, p.2).
>
> • Greater connectivity through an integrated transportation network that accommodates cars, pedestrians, bikes, transit and other modes (Smart Growth on the Ground, 2005, Section 3, p.2).

4.7.2. Walkability Theme

Walkability is reflected in several of the TCCP guiding principles. The dominant form of transportation in a suburban community is the personal automobile, so the goal of promoting walkability through the built environment in the eight guiding principles was in contrast to much of the development occurring in Maple Ridge at the time. The goal of the first principle, *Each neighbourhood is complete,* was to create a community that allows residents to live, work, shop and play in the same place (Smart Growth on the Ground,

2005). The mix of these different land uses in close proximity to one another makes walking a viable form of transportation. Complete communities are also viewed as less car dependent (Smart Growth on the Ground, 2005). The second principle, *Options to our car exists*, was more directly aligned with walkability. Similar to the first principle, the goal of the second principle was to create a built environment that encourages walking, by increasing public transit and implementing an interconnected street network (Smart Growth on the Ground, 2005). Lastly, principle seven, *[t]he centre is attractive, distinctive and vibrant*, also addresses walkability by placing emphasis on enjoyable public spaces for pedestrians to use.

The TCCP contains a review of transportation trends and statistics in the study area, reporting that the dominant transportation mode is the private vehicle and noting that non-vehicular transportation options should be improved. The low percentage of walking trips is attributed to the disconnected network of sidewalks and the barriers created by the three east-west highways. Since implementation of the area plan has taken place, the downtown sidewalk network has been improved both through capital works projects and new development upgrades. Opportunities for further improvement still exist, most notably with connectivity across the Haney Bypass. The TCCP explains that:

> The projected future condition of Maple Ridge Town Centre, which assumes the application of sustainability principles, suggests that with increased density, more local jobs, more accessible transportation, and walkable/bikeable destinations, there could be 40% less vehicle ownership per household, 52% less VKT [vehicle kilometres travelled] per household, and 20% more PKT (pedestrian kilometres travelled) per household (Smart Growth on the Ground, 2005, Section 2, p.16).
>
> The plan should aim to reduce VKT by 40-60% through an increase in density, increase and diversification of shops and services, increase in transportation options, increase in connectivity, and an increase in local jobs. Additionally, the plan for Maple Ridge Town Centre should aim for 40-60% of travel in the Centre to be by modes other than the single passenger vehicle (Smart Growth on the Ground, 2005, Section 2, p.16).
>
> Also, doubling the residential density in the Centre while adding necessary services at hand will lead naturally to a 40-60% reduction in per capita car trips, as residents are less dependent on their cars than those in low density suburban areas and more able to walk or take transit to satisfy daily needs (Smart Growth on the Ground, 2005, Section 2, p.19).

The TCCP focused on a multi-modal system that is accessible for all abilities. The plan proposed "Pedestrian Friendly Streets", which were two key north-south routes in the study area that featured a higher level of pedestrian amenities such as traffic calming, street trees and universal accessibility. The purpose of these streets was to connect residential and commercial land uses, and other service and major destinations to one another. Greenways along watercourse and high voltage power lines were also identified to complement sidewalks and further increase walking connectivity in the Town Centre. Design guidelines contained in the TCCP also speak to pedestrian considerations, such as siting building close to the sidewalk, and requiring parking underground or to the rear of the building to reduce conflicts between pedestrians and vehicles.

4.7.3. Health Theme

The theme of health plays an overarching role in the TCCP, with several references in policies and objectives. Two of the three references in the TCCP relate to green infrastructure, and how this promotes indoor health environments through reduced pollutants in building materials and better ventilation for improved air quality. These policies explain that:

> The whole "green building" concept captures many other factors, such as land use, water use, waste, **healthy indoor environments**, greener materials, low maintenance, etc. (Smart Growth on the Ground, 2005: Section 3, p.19).

> …[T]he most effective strategy for promoting energy and water efficiency is to promote green buildings as better quality investments, providing better comfort, **healthier environments** and lower future costs (Smart Growth on the Ground, 2005:Section 3, p.19).

The third health reference relates to physical activity and transportation choice, which is the focus of this study. The reduction of greenhouse gases, and as a result, improvements to air quality due to reduced vehicle usage, is commonly viewed as a benefit to health and a goal to strive towards in the Sustainable Development planning model. However, the physical activity incurred through non-vehicular forms of transportation is another health benefit. Both of these health benefits are referenced in the TCCP through the following statement:

> Communities that are designed to encourage these alternative forms of transportation can significantly reduce average household greenhouse gas emissions and can dramatically improve physical activity and public health levels (Smart Growth on the Ground 2004, Technical Bulletin, p.1).

The TCCP identifies the benefits of walkability in the Town Centre; however, the physical activity benefits are not the most prominently referenced. Nonetheless, the shift in transportation modes from vehicles to non-motorized forms such as walking was discussed as an environmentally friendly and sustainable mode of transportation that will not contribute to air pollution.

4.7.4. Residential Density Theme

Increasing residential density in the Town Centre was a key objective of the TCCP and the SGotG process, due to the study area's designation as a RTC in the LRSP and the goals of densification in that plan. The connection between residential density and walkability is made in the TCCP in the following statement:

> Compact neighbourhoods with an interconnected street network are convenient for walking and cycling, and can provide sufficient residential density and a mix of uses to provide a sustainable ridership base for transit (Smart Growth on the Ground, 2005, Section1, p.9).

Residential density was discussed in specific detail, including targets on number of residential units for 2021, and specifically that half of the population growth in Maple Ridge should be directed into the Town Centre. The exact population growth and the benefits to this growth, particularly the 'live, work, play' element, occurring in the Town Centre are described in the TCCP:

> By 2021, the [city] population is projected to increase by 27,400 to 93,700. The current population of the Centre is 8,050. For the purposes of this charrette, we proposed a target for the Centre that reflects an increase by approximately 50% of the total projected population for Maple Ridge. (50% of 27,400 = 13,700. 8050 + 13,700 =21,750). Focusing development within the town centre will offer a wider range of jobs, housing, transportation and other services, enabling people to live, work and play within Maple Ridge (Smart Growth on the Ground, 2005, Section 2, p.14).

Other benefits to residential densification are also described in the TCCP as follows:

> By 2021, the Maple Ridge Town Centre will accommodate nearly 7,000 new housing units. Directing this growth to Maple Ridge Town Centre will result in the revitalization of the downtown area, new and varied housing choices, a population base to support local businesses and transit, increased public safety owing to more "eyes on the street," and reduced development pressure in outlying areas of the municipality where rural character and natural areas are valued (Smart Growth on the Ground, 2005 Section 4, p.2).

The population density targets in the TCCP were ambitious and signaled a change in direction from a suburban sprawl community to a focus on a vibrant, urban Town Centre. The acceptance of Town Centre densification also went hand in hand with other urban changes, such as increased walkability, greater environmental protection, and job opportunities.

4.8. Town Centre Area Plan

The TCAP builds on the TCCP by formalizing many of the concepts into policies that inform city decision-making. The TCAP forms part of the 2006 OCP, and was approved by Council in 2008. In addition to the TCAP, the area has a dedicated design guideline chapter in the OCP, which is also discussed in this section. The TCAP is divided into five sections, plus the development permit chapter. The focus in this study's document analysis was on the transportation and land use sections of the TCAP in light of the study focus. The eight guiding principles presented in the TCCP form the foundation of the TCAP, and 16 goals and 90 objectives were prepared from the guiding principles (see Appendix C). The overarching theme of the plan is "Live Work Play in the Town Centre".

The TCAP includes eight sustainability guiding principles (see Appendix F). Of the eight principles of the TCAP, three principles relate to walkability. Each of these principles includes two goals and a list of objectives. The most relevant goals to this study are:

- Principle 1, Goal 1: Increase density and distribute a range of uses throughout the Centre
- Principle 2, Goal 1: Acknowledge and respect pedestrian needs

- Principle 7, Goal 2: Establish the Centre as a hub of activity (District of Maple Ridge, 2014b).

The list of TCAP goals and objectives, in its entirety, is included in Appendix C.

4.8.1. Walking and Pedestrian Theme

Planning for pedestrians is an important aspect of the TCAP, and these considerations are reflected in the transportation policies, design guidelines, and built environment objectives. Compared to the TCCP, the pedestrian network evolved from the identification of two main pedestrian corridors to a multi-modal network that includes walking and cycling routes. There is a strong realization that the built environment influences transportation behaviour, and specifically walking behaviour in the following policies and statements in the TCAP:

> Most of the Town Centre Central Business District is designated Town Centre Commercial with the intent to create a compact and vibrant commercial area that is pedestrian-oriented. Permitted uses include commercial, mixed-use, and multi-family residential (District of Maple Ridge, 2014b, p.107).

> One of the biggest challenges put forth as a community goal in the Town Centre Concept Plan is to reduce the dependence on private automobile use in the Town Centre neighbourhood and create a neighbourhood environment that is enjoyable to explore by foot, bicycle, wheelchair, scooter, etc. (District of Maple Ridge, 2014b, p.115).

> All roadways within the Town Centre will be required to accommodate pedestrians, but the Connective Pedestrian Network should be designed to enhance the pedestrian experience with separated sidewalks on both sides of street, street trees, and wayfinding signage (District of Maple Ridge, 2014b, p.120)

The TCAP's Multi-Modal Routes map classifies six categories that have specific route characteristics. These characteristics include a range of built environment elements that promote walking, as shown in Figure 13 below. The TCAP describes the purpose of the pedestrian network as having an enhanced pedestrian experience.

	Sidewalks on Both Sides of Street	Street Trees Along Sidewalk	Street Trees Along Separated Sidewalk	Wide Sidewalks	Wayfinding Signage	Bicycle Lanes/Shared-Use Arrows	Bicycle Storage Racks	Seating/Benches	Pedestrian Level Lighting (both sides)	Viewing/Seating Area	Public Art	Interpretive Signage	Hanging Baskets
Civic Area Ring Route	✔	✔		✔	✔		✔	✔	✔		✔		✔
Civic Area Pedestrian Network	✔	✔		✔	✔		✔	✔	✔		✔		✔
Connective Pedestrian Network	✔		✔	✔	✔		✔		✔				
Bicycle Network	✔		✔			✔	✔	✔	✔				
Secondary Ring Route	✔		✔		✔	✔	✔		✔	✔	✔	✔	
Greenway Trail					✔			✔		✔		✔	

Figure 13: Multi-Modal Route Classification
Source: City of Maple Ridge

4.8.2. Residential Density Theme

Increasing residential density is a key goal of the TCAP, which involves doubling the area population by 2021 with approximately 7,000 new residential units. This increase reflects the targets outlined in the TCCP. Walking and pedestrian references are directly related to the desired built environment form of residential density and land use mix, which are also discussed in the TCCP. The highest residential density is identified for the Central Business District:

> Accommodating this growth will require an increase in density throughout the Town Centre. The highest densities and greatest mix of uses can be expected primarily within the Central Business District (see Figure 2 for CBD boundaries), making this area the most pedestrian-oriented part of the neighbourhood (District of Maple Ridge, 2014b, p.98)

> More density in the Town Centre will result in the revitalization of the downtown area, provision of new and varied housing options, a population base of sufficient size to support more local businesses, and improved public transit. To enhance public safety and draw more “eyes on the street”, as the Town Centre neighbourhood grows, the design considerations involved in new development will play a major role in creating spaces that feel secure and attract pedestrian activity and social interaction (District of Maple Ridge, 2014b, p.98).

4.8.3. Health Theme

The health references in the TCAP are in line with the discussion of the TCCP, and relate to green building and infrastructure more so than physical activity and public health. The connections between green infrastructure and indoor environment health are in line with the principles of Sustainable Development. These policies state that:

> Managing energy for reduced consumption benefits the community by putting less strain on natural resources and contributing to a **healthier environment** (District of Maple Ridge, 2014b, p.96).

> Green Buildings make up an important part of Green Infrastructure, in that they are designed to consider the environmental impact of a building throughout its entire lifecycle. From site selection through design, construction, and use a Green Building consumes fewer resources and emits fewer pollutants than a similar building designed and constructed without any Green technology. These buildings also tend to be **healthier buildings** by providing better air quality through a higher rate of ventilation and by selecting environmentally responsible non-toxic materials (District of Maple Ridge, 2014b, p.97).

Similarly to the TCCP, although the health benefits of physical activity in relation to walking are not explicitly discussed in the TCAP, there is a multi-angle approach to improving walkability through design considerations.

4.9. Document Analysis Findings

The purpose of the document analysis was to answer the first sub-question, which was: do city plans and strategies support the creation of a walkable built environment in the Town Centre? The document analysis revealed that the plans and strategies did support the creation of a walkable Town Centre, through built environment policies that increased residential density, supported mixed-use development, recognized walking as a form of transportation, and placed importance on pedestrian amenities.

The two broad concepts that were common across all of the document analysis conducted were *pedestrian environments* and *healthy communities*. The first over-arching theme was *pedestrian environments*. P*edestrian environments* is a broad term that includes sidewalk infrastructure, pedestrian street design, on-site considerations that

reduce conflict between parking and pedestrians, and pedestrian scale elements such as canopies and public art. Pedestrian considerations were noted in development permit guidelines that guide new construction, in transportation policies as a mode of transportation, and in the TCAP policies that describe a built environment conducive to pedestrians. Other policies and goals that can be classified under the term of *pedestrian environments* were those that spoke to reducing dependence on automobiles and on greenhouse gases.

The second theme of *healthy communities* was also reflected in the Literature Review similar to the *pedestrian environments*. Health was conceptualized in several high level ways across the different plans and strategies. Ecological and natural feature health ties in with sustainability goals. There was also a connection made between environmental preservation and positive benefits to human health. Health was also conceptualized in terms of social connection and social sustainability. This includes supporting diverse populations, addressing mental health, and supporting marginal populations. Lastly, physical health was touched on in terms of recreation opportunities on trails.

The *healthy communities* theme connects to historic trends for planners to consider built environment interventions for public health purposes. In the Maple Ridge context, these interventions are sometimes building specific. For example, the building materials that are used and the low environmental impact technologies are seen as desirable because they contribute to health of the building occupants. Healthy communities are also considered in the recreational infrastructure of the community, to provide residents with public spaces to be active outdoors, such as in parks and along trails.

These concepts tie into the Literature Review in several ways. The Literature Review identified all of these components as walking correlates that make it easier, safer, and more enjoyable to walk. The *pedestrian environments* theme also ties into the Literature Review because it reinforces the fact that community design is shaped by transportation and vice versa, just like cities have been historically shaped by dominant forms of transportation. In Maple Ridge's case, the pedestrian theme represents a desire

to re-prioritize walking over vehicular forms of transportation, which is more reflective of historic times.

Despite the two themes of *pedestrian environments* and *healthy communities* reflected in the document analysis and being the outcome in the Literature Review, the two concepts are not interlinked in the city plans and strategies, although they should be. In very few circumstances was the connection between pedestrian considerations made to physical health outcomes. However, there is a strong relationship between pedestrian activity and the levels of physical health, which came to light through the Literature Review. Although the review of city plans and strategies revealed numerous high level principles and policies that promote walkability in the Town Centre, these principles and policies must be systematically implemented and constantly reinforced across all work areas.

4.10. Conclusion

The document analysis phase indicated that there are numerous Smart Growth and other city high level principles and policies that relate to promoting walkability in the Town Centre. Furthermore, the review of city plans and strategies revealed that all of the documents reflect in some way, policies and objectives that align with the walking correlates and development strategies discussed in the Chapter 2 Literature Review. Two themes emerged as overarching guiding principles: *pedestrian environments* and *healthy communities*. The next stage of analysis addresses the implementation and outcomes of the Smart Growth principles and policies identified in the document analysis that support a walkable community design.

Chapter 5

Built Environment Changes 2009-2014

The Chapter 4 document analysis provided an overview of Maple Ridge's related plans and strategies. The plans and strategies' overarching themes were analyzed to determine whether or not the principles and policies of these documents speak to creating walkability in the Town Centre. The themes from the city plans and strategies were also compared with the walking correlates and planning models discussed in Chapter 2, to determine if these goals and approaches were reflected in the documents and decision making process for the TCCP and the TCAP. The analysis found that there were many consistencies. The themes of transportation, health, pedestrian amenities, sustainability, and residential density were touched on as they related to each document. Two over-arching themes emerged as a result of the document analysis in Chapter 4. These were the concepts of *pedestrian environments* and *healthy communities*.

This chapter builds on the Chapter 4 analysis with the second stage of data analysis. In this chapter, the built environment changes that have occurred in the Town Centre between 2009-2014 are examined in terms of new residential units, sidewalk construction and improvement projects. Moving beyond the context of high level principles and policies, the actual built environment changes that have occurred in the Town Centre in terms of the walking correlates identified in the Literature Review are examined. The second sub-question is explored in this chapter, which is: what built environment changes occurred between 2009 to 2014 in the Maple Ridge Town Centre and how does this relate to walking correlates identified in the Literature Review?

Built environment changes that have occurred between 2009 and 2014 are reviewed in the first part of Chapter 5. These built environment changes are determined by analyzing census data; by reviewing building and occupancy permits; and by identifying sidewalk capital works projects. In addition to these tangible built environment changes that can be readily measured quantitatively, the analysis in this chapter is complemented

by a review of city policies and bylaws that influence positive walking correlates in the built environment in a more indirect way. While the influence of some of these policies and bylaws can be measured quantitatively, their impacts are more nuanced. A finer grain of city documents, including city policies, staff reports, and initiatives that arose from the higher level plans and strategies are drawn upon.

Throughout this chapter, the discussion is brought back to evaluating these built environment changes in terms of three goals in the TCAP that relate to walkability. The goals subject to my evaluation were:

- Principle 1, Goal 1: Increase density and distribute a range of uses throughout the Centre
- Principle 2, Goal 1: Acknowledge and respect pedestrian needs
- Principle 7, Goal 2: Establish the Centre as a hub of activity (District of Maple Ridge, 2014b).

The actions to increase density, respect pedestrian needs, create activity, and distribute a range of uses in the Town Centre are determined by measuring changes in the built environment and the policy initiatives that helped realize these changes.

4.11. Residential Density Changes 2009-2014

Census data, building and occupancy permit records were analyzed to understand the residential unit and density change over the course of the 2009-2014 six year study period. The census years which are most applicable for this research were 2006 and 2011. The first dataset from 2006 pre-dates built environment changes undertaken under the TCAP, and the second data set from 2011 was captured in the second year of the study period, when the TCAP had been in the implementation stage for three years. Ideally, this census data would be available for every year, to allow data analysis at the end of the study period that covered all of the built environment changes between 2009 and 2014. Although the census data is limited by the collection and reporting years, these two datasets are useful in examining residential density changes over time, and this data is supplemented with City of Maple Ridge building and occupancy permit data.

In addition to census data, building and occupancy permit data was collected. The permit dataset included multi-family and mixed-use buildings[8] that were issued a building permit or received a final occupancy permit between 2009 and 2014. The building permit data was used to confirm census data and provide geographical distribution information of new densification in the Town Centre.

4.11.1. Census Data

The first tool used to analyze change in residential density was Census data. Census data from 2006 and 2011 was drawn on to better understand both the demographic profile of Maple Ridge and the Town Centre study area, as well as residential density changes that have occurred over the 2009-2014 study period.

Before delving into the Town Centre Census data, it is useful to understand the city-wide population profile leading up to the TCAP and prior to the implementation of the area plan. In 2001, the population of Maple Ridge was 63,169 (BC Stats, 2012). This number increased to 68,949 in 2006, equivalent to a 9.2% population growth rate (BC Stats, 2012). The provincial population growth rate during the same time period was 5.3%, which indicates that Maple Ridge as a whole was a growing community with a faster growth rate than the BC provincial average.

The 2006 Census data indicates that there were 26,488 total private dwellings in the City of Maple Ridge (Statistics Canada, 2014a). Of this total, 61% of the dwelling were single-detached houses. This amount is higher than the provincial percentage of 49% (Statistics Canada, 2014a). The population density in the same year was 259 persons per square kilometre. In 2011, the population of Maple Ridge increased to 76,052 and experienced a higher population growth rate than the previous census period with a rate of 10.3% (Statistics Canada, 2014b). In comparison, the regional growth population growth rate over the same period was slightly lower at 9.3% (Statistics Canada, 2014b). The number of private dwellings also increased to 29,158 and the population density was 285 persons per square kilometre (Statistics Canada, 2014b).

[8] A building with commercial or office uses on the ground floor with residential units on the floors above.

City-wide census data for Maple Ridge was compared to census tract data for the Town Centre study area. Census tract boundaries do not match up exactly with the study area boundaries. In the 2006 Census, the study area was comprised of four census tracts that include additional lands, predominantly used for single family development. The relevant census tracts for 2006 are identified as: 401.01, 401.02, 402.01 and 402.02. In the 2011 Census, the number of census tracts was increased to five, with 402.01 dividing into 402.03 and 402.04, as shown in Figure 14 below.

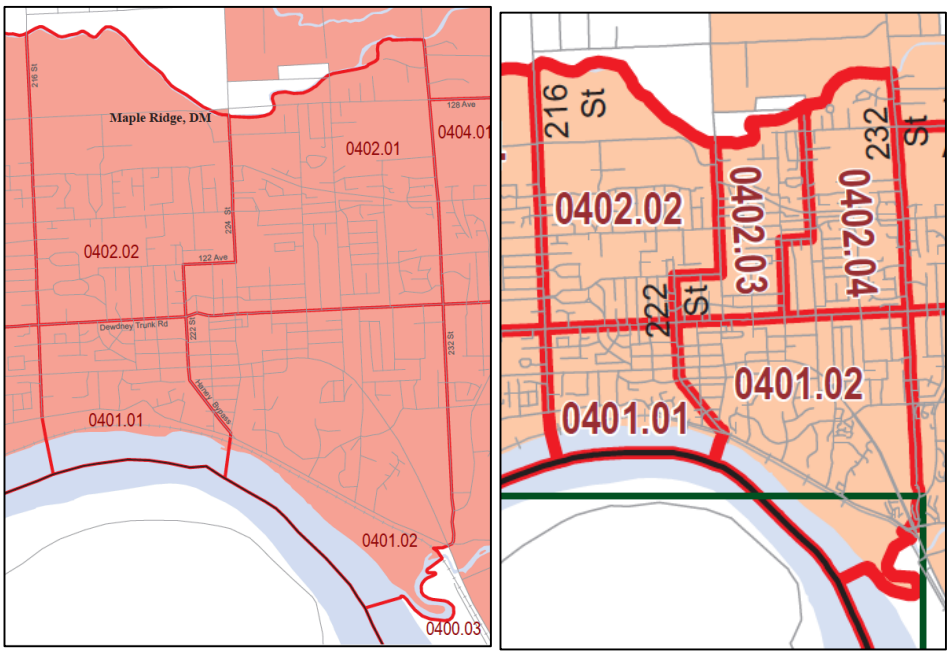


Figure 14: Town Centre Census Tract 'Area A' (L) 2006 (R) 2011
Source: Statistics Canada

Two options for census tract analysis were pursued: the first option was to use all of the census tracts with land in the study area, as shown in Figure 14 above. The second option was to omit some census tracts that only had portions of land within the study area, as shown in Figure 15 below. Census tracts 402.01 and 402.02 have only small potions within the study area, so these were omitted in the second option. It is noted that while these areas are small, new multi-family development has occurred in them.

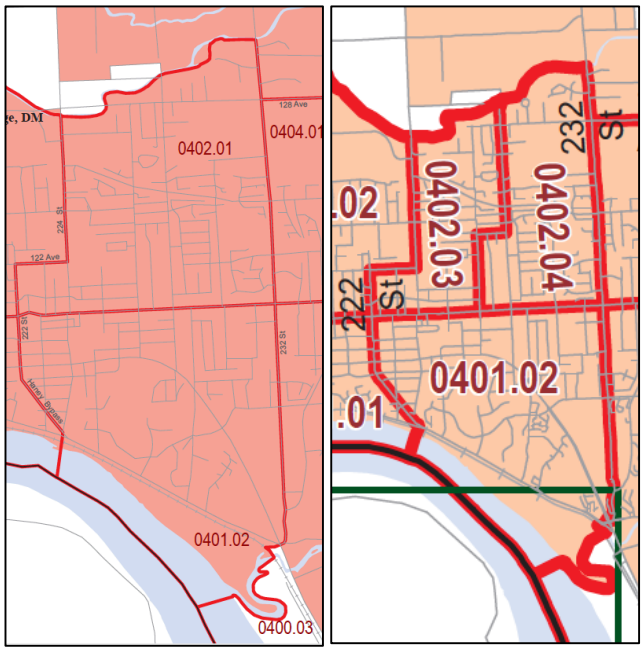


Figure 15: Town Centre Census Tracts 'Area B' (L) 2006 (R) 2011
Source: Statistics Canada

A total of four scenarios were compared: Area A – 2006, Area A – 2011, Area B - 2006 and Area B – 2011. In 2006, the total land area for Area A was 10.3 square kilometres (2,545 acres) and the population was 22,585 (Statistics Canada, 2014a). The resulting density was 2,192 people per square kilometres, approximately eight times denser than the city average (Statistics Canada, 2014a). The total number of occupied private dwellings was 9,290 (Statistics Canada, 2014a). In comparison, the 2006 total land area for the smaller Town Centre Area B was 6.2 square kilometres (1,532 acres) and the population was 15,095 (Statistics Canada, 2014a). The resulting density was 2,434 people per square kilometres, approximately nine times denser than the city average. (Statistics Canada, 2014a) The total number of occupied private dwellings was 6,465 (Statistics Canada, 2014a).

In 2011, the population increased to 24,092 in Area A (Statistics Canada, 2014b). This resulted in a density of 2,336 people per square kilometre (Statistics Canada, 2014b) The total number of occupied private dwellings was 10,335 (Statistics Canada, 2014b). When the 2011 numbers are compared to the 2006 data for Area A, the resulting percentage change is a 1.06% increase in population, a 1.11% increase in dwelling units,

and a 1.07% increase in residential density (Statistics Canada, 2014b). These findings are summarized in Table 2 below.

Similar changes took place in Area B between 2006 and 2011, with the population increasing to 16,215 (Statistics Canada, 2014b). This resulted in a density of 2,599 people per square kilometre. The total number of occupied private dwellings was 7,295 (Statistics Canada, 2014b). When the 2011 numbers are compared to the 2006 data for Area B, the resulting percentage change is very similar to the larger Town Centre area: 1.07% increase in population, 1.13% increase in dwelling units, and 1.07% increase in population density. These findings are summarized in Table 2 below.

Looking at the change in occupied private dwellings over the 2006-2011 time period in the smaller Town Centre census area, the units increased by 830. In the larger Town Centre census area over the same time period, the number of dwelling units increased by 1,045. These statistics are summarized in Table 2 below.

Table 2: Residential Density Changes

	Area A	Area B
2006 population	22,585	15,095
2006 dwelling units	9,290	6,465
2006 residential density	2,192 persons per sq. km	2,434 persons per sq. km
2011 population	24,092	16,215
2011 dwelling units	10,335	7,295
2011 residential density	2,336 persons per sq. km	2,599 persons per sq. km
Population % Change 2006-2011	1.06%	1.07%
Dwelling Unit % Change 2006-2011	1.11%	1.13%
Residential Density % Change 2006-2011	1.07%	1.07%

4.11.2. Building and Occupancy Permits

Census data analysis showed that population, dwelling units, and residential density increased in the Town Centre over the 2006-2011 time period. City of Maple Ridge building and occupancy permit data was used to complement the Census data analysis

and to further pinpoint the location of new residential construction. Residential building permit data including mixed-use buildings with a residential component that were issued between 2009 and 2014 were collected, as well as residential occupancy permit issuance during the same time period. The building permit data was then mapped by address to understand where new residential density occurred. Due to data availability, the time frame of issued building permits and occupancy permit issuance was more easily adjusted to the five-year study period than census data.

The building permit data is somewhat limited in assessing residential density, as it is a measure of units built rather than population. The assumption was made that the residential dwelling units were all occupied. Some errors in reporting may occur due to building permits that were issued during the study period, but never constructed or inhabited during the study period. As a way of mitigating this issue, occupancy permit issuances for multi-family projects were also considered. However, including these permits may inflate the actual number of units added during the study period, because construction and building permit application may have pre-dated the study period by one or more years. The larger building permit scope was used because the overall number of permits was relatively low, and because it was anticipated that any delays in occupying vacant units would be minimal.

In total, there were 20 residential building permits for new construction, which resulted in 803 new units. Of those 20 applications, six were for single family homes, and the remainder were multi-family, above a commercial unit, or for assisted living. A site visit to each of the listed properties was conducted, and all of the buildings were fully constructed with the exception of one property. As a result, the total number of residential units was reduced to 688. A review of the residential occupancy permits issued by the city between 2009-2014 indicated that 30 occupancy permits were issued for a total of 909 residential units. Building permits and occupancy permits were compared for overlap, and this analysis showed that 461 residential units overlapped, meaning that these units both received a building permit and occupancy during the study time period. The net number of new and occupied units is difficult to count accurately, as occupied units may not yet have an occupancy permit. The total number of residential units that received an occupancy permit during the study period, or received a building permit and were

confirmed to be constructed through site visits was 1,136 in the Town Centre. The City of Maple Ridge also reports that since the TCAP was implemented in 2008, 14 new apartment buildings have been constructed and the investment value is estimated at $88,926,200 (District of Maple Ridge, 2011). Figure 16 below shows the distribution of new residential dwellings in the study area, and how many units were constructed in each development (see Appendix E for larger map).

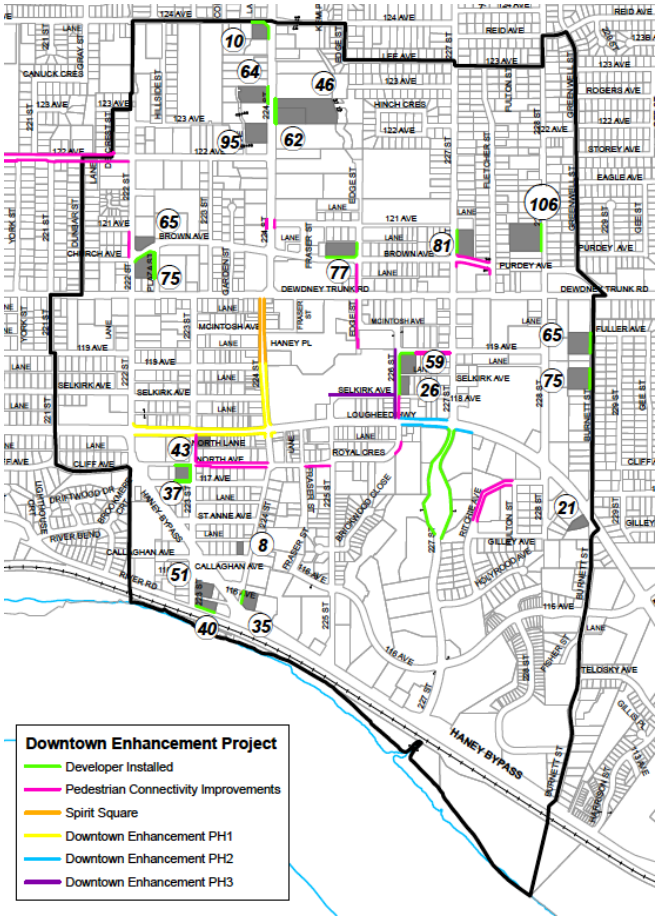


Figure 16: Built Environment Changes

In comparison to the Town Centre occupancy permits issued during the study period, Table 3 below summarizes residential occupancy by Maple Ridge neighbourhood. The largest number of residential occupancy permits were issued in the Town Centre; however, the share of permits is lower than the 50% target in the TCAP.

Table 3: Maple Ridge Occupancy Permits

Maple Ridge Neighbourhood	Number of New Residential Units 2009-2014	Percent of total
Albion	464	16%
Hammond	15	0.05%
Haney	733	26%
Silver Valley	705	25%
Thornhill	37	1%
Town Centre	915	32%
Total	2,869	100%

4.11.3. Mixed-Use Developments

Although the majority of new construction in the study area between 2009-2014 has been for multi-family residential, there have also been four new mixed-use buildings constructed in the Town Centre, with a total of 136 residential units. Having a variety of land uses within the same building including residential, retail, and services allows short trips that can be achieved on foot. Cervero's research indicates the presence of shops within 300 feet of residential units is a greater determinant for transportation choice than residential density (Cervero, 1996).

The built environment changes explored in this section relate to the following TCAP goal:

- Principle 1, Goal 1: Increase density and distribute a range of uses throughout the Centre (District of Maple Ridge, 2014b).

As this data has shown, the population and dwelling units have increased in the Town Centre between 2006 and 2011 based on census data. The average yearly increase is less than the targeted numbers in the TCCP and TCAP, but the built environment change for new residential units has been significant nonetheless.

4.12. Sidewalk-Related Pedestrian Improvements

In addition to residential unit increases, new sidewalk construction and upgrades in the Town Centre was reviewed between 2009 and 2014. New sidewalk installation in an area that did not have a sidewalk, and projects that widened the sidewalk and added amenities such as benches, public art, lighting, and landscaping in a location that had a sidewalk already were included in the analysis. Changes in sidewalk quality and connectivity could be the result of two different processes: developer-led upgrades in connection with a building permit application, or a city-led upgrades as a result of a capital works project. New sidewalk construction and improvements were identified through the building permit records as well as council reports awarding contracts for sidewalk improvements.

Figure 16 above shows areas where either new sidewalks have been constructed through the redevelopment process, or sidewalks have been substantially improved through city-led capital works projects. The length of combined capital works and development sidewalk improvements was approximately 5.1 km long.

4.12.1. Developer-led Sidewalk Improvements

The first scenario that results in sidewalk construction or improvement was through the building permit stage for re-development projects. Multi-family and commercial projects have larger frontages than single family homes, therefore significant sidewalk enhancements are generally not achieved through a building permit for a single family home. Building and occupancy permit records for the 2009-2014 time period indicated that there were 15 multi-family or commercial developments in the Town Centre that required sidewalk upgrades. The most significant developer-led sidewalk work to occur in the Town Centre during the six-year study time was for the Chances Gaming Facility at Lougheed Highway and 227 Street. For this project, not only was new sidewalk installed, but a new 227 Street road connection was built to connect the existing north and south stretches of 227 Street together. With this building permit application, 175 metres of sidewalk was constructed along the new portion of 227 Street. This work created a continuous north-south connection along 227 Street in the Town Centre.

In addition to the Chances Gaming Facility site improvements, all of the multi-family building permits were required to provide some sidewalk improvements or construction. Many of the buildings were constructed on properties that had no existing sidewalk, so the re-development of those sites provided a significant benefit to the sidewalk network in the Town Centre. The length of sidewalk improvement and construction through building permit applications was approximately 1.13 km, for a total length of 1.3 km of sidewalk.

4.12.2. Capital Works Projects

There were three critical capital works projects in the study area during the study time period. These were the Spirit Square/Memorial Peace Park project, completed in 2010 and the Downtown Enhancement project on Lougheed Highway, completed in phases starting in 2011. These larger capital projects were complemented by approximately 12 smaller pedestrian connectivity improvement projects. The total length of sidewalk construction and improvement under capital works projects was approximately 3.8 km. The cost of the first two projects was 7.6 million dollars (District of Maple Ridge, 2011).

Spirit Square

The Spirit Square capital works project took place along 224 Street in front of Memorial Peace Park. This project was part of the BC Spirit Squares program in conjunction with legacies projects for BC 150th Anniversary (District of Maple Ridge, 2009). The District received a $500,000 provincial grant. The portion of street in front of Memorial Peace Park was treated with a stamped concrete finish to slow traffic, and replaced an existed landscaped median. The project was completed in July 2009 (District of Maple Ridge, 2009). The Spirit Square capital works project has improved walkability in the study area and reflects the following two TCAP goals:

- Principle 2, Goal 1: Acknowledge and respect pedestrian needs
- Principle 7, Goal 2: Establish the Centre as a hub of activity (District of Maple Ridge, 2014b).

Goal 1: Acknowledge and respect pedestrian needs

The prioritization of pedestrian needs in the Spirit Square capital works projects was exemplified through the sidewalk design and new sidewalk amenities. Prior to the start of this capital works project, the sidewalks were narrow and included street trees. A landscaped median also divided the street in half. A key informant describes the project and the objective of the changes made on 224 Street:

> At the time, there were these big medians down the street and they were almost like barriers one side of the street to the other. There's a certain traffic calming that we got out of them, and beautification, but we had very narrow sidewalks. [B]y removing those medians in the middle, we were able to widen the sidewalks, so that was one of the goals…. That particular approach on 224 [Street] was to widen the sidewalk (Personal Communication, 2016).

The sidewalks were widened in most areas along 224 Street, and existing street trees were replaced with new ones. The previous sidewalks were heaving due to the method of installation for the street trees. Through the capital works project, a new way of installing the trees was implemented using a Silva Cell product that allowed tree roots to grow down rather than outwards under the surface of the sidewalk. A key informant explains how the street trees were installed:

> So when the sidewalks were redone there was a completely different way of planting the trees used, where they were put in a well and the tree roots are forced to grow down instead of up. So it's no longer pushing up the sidewalk, so that was a great improvement. The sidewalks are now in most places level. They are very nice and smooth. And they are widened so it gave us more space for, as you can see here, some plantings on the sidewalk, which makes it really friendly. But also … the cars can actually not go right to the sidewalk because there's planting. So there's a bit of a buffer and it creates an environment that's much more friendly and attractive for people to walk (Personal Communication, 2016).

The wider, level sidewalks promoted walkability by improving the safety of the sidewalk for all users by mitigating tripping hazards and creating enough width to reduce conflict. Before, the uneven sidewalk made it difficult for seniors to navigate the sidewalk with confidence, and the tree roots breaking through the concrete posed a tripping hazard. Furthermore, the narrow sidewalk width and the location of the street tree within the

sidewalk area made it difficult for users with wheelchairs and strollers to pass one another and roll down the sidewalk smoothly. The sidewalk was also not inviting due to the proximity of walkers to the vehicle travel lanes.

Town Centre businesses were involved in the design of the Spirit Square project, and provided feedback to improve the streetscape. In addition to the more functional street tree planting approach, infrastructure upgrades in conjunction with the new street trees provided increased pedestrian realm improvements and benefitted the appearance of local businesses. As one key informant describes:

> [T]he businesses brought… forward that they wanted flower baskets. That wasn't possible before because we didn't have any watering systems in our trees, so that was placed and even all the improvements that we did on the sidewalks, that's all underground stuff that had to be put in at the same time, right? So now, we have watering systems in all the trees so we can hang flower baskets. Now there is electricity in all the trees so we can put lights in the trees. That's what the businesses really wanted to see. So yes, there was lots of suggestions brought forward and all of those suggestions were adhered to (Personal Communication, 2016).

> There was also benches placed, a lot of benches were placed and they're facing the stores, not the traffic, the stores. So people sit there and just enjoy people as they walk by. We also have a bunch of mosaics placed in the sidewalk, which is interesting, and we organized through our organization, a tour that you can go on and look at these mosaics. So people are more aware of our history and there was also a bunch of markers placed on the lamp posts. Again, it's almost a historical tour of our downtown, which makes it interesting to walk again. Now the city is proposing to have poetry on the sidewalk again, really encouraging people to walk around. The public art has increased, our banners, our flower baskets, the lighting, it all encourages people to walk outside and people are outside [taking] pictures because it's a friendly and walkable environment (Personal Communication, 2016).

These changes to 224 Street significantly enhanced the pedestrian realm to encourage walkability. The Spirit Square capital works project represented a shift in thinking about the role of sidewalks. Whereas the original sidewalks were given little space and were only for the purpose of walking, the new sidewalks were designed for pedestrian enjoyment, where people could walk, sit, gather, visit, shop and eat. The

enhancement created through this capital works project had a minor impact for on-street parking spaces, as three spaces were lost through this process.

Goal 2: Establish the Centre as a hub of activity

The location of the Spirit Square project is in the heart of the Town Centre close to several civic buildings and adjacent to Memorial Peace Park, which is the venue for many community events including a weekly farmers' market. The improvements made to Spirit Square were designed to blend 224 Street in front of Memorial Peace Park with the park to enhance the existing area for events. A key informant describes the project and the objective of the changes made on 224 Street:

> But what our role in all of that in parks and recreation was to create public gathering space. Not only outdoor space, but indoor space as public gathering space. The arts centre is a public gathering space and so is the [Memorial Peace] park of course. But more than that when we did the Spirit Square project what we wanted to do with the street, is take the principles of the street development work (Personal Communication, 2016).

The Spirit Square capital works project did not only focus on physical infrastructure upgrades, but also aimed to facilitate public gatherings and events. One key informant describes the importance of reinforcing the downtown as the heart of the community by supporting active use of public spaces such as Spirit Square:

> I mean, you know one of the other strategies here wasn't physical, wasn't capital, but investing in making sure things happened here. Community events, for example. Investing in festivals. I had an experience when we were building this. [My wife] and I went on a road trip one summer and we drove down through Utah, and down into Arizona and New Mexico. And while we were there we went to a number of towns where they all basically had a town square, and these were town squares that were historic you know, they were like old Santa Fe....But they all are built around a centre square park in which they invest lots to make sure there is constant activity. Events and activity and people playing guitars on a bandstand and vendors, and all that kind of stuff going on. It really struck me. How important this area [Memorial Peace Park] was and could be to this community. And there aren't many communities that have that. The whole Spirit Square notion is one to try and recreate that in some cities. You know, that was kind of the purpose. And Spirit Square, if there's anything that speaks to community, and community development, it's that name. So I saw that throughout our travels and thought God, that's what we have, the

> opportunity of doing something here. And isn't it cool to be part of that (Personal Communication, 2016).

Details such as adding electricity at each street tree for event kiosks and using a different road surface in the square all supported the creation of a gathering space in the heart of the Town Centre.

Downtown Rehabilitation Project

The Downtown Rehabilitation Project (DRP) followed the success of the Spirit Square Project and built on the pedestrian amenities and improved sidewalks standards that were constructed on 224 Street. Lougheed Highway (Highway 7) is an arterial route through both the Town Centre and the entire City of Maple Ridge. The Ministry of Transportation and Infrastructure (MOTI) has jurisdiction over most of Highway 7, with the exception of the segment that runs through the Town Centre. This allows greater decision making autonomy for the City in the study area. The DRP took place over several phases and used Federal and Provincial Government grants for infrastructure upgrades, which were secured in 2008. The scope of work involved replacing water and sanitary lines, new wider sidewalks, and the addition of pedestrian amenities including benches, bike racks, garbage cans, streetlights, and decorative intersection markings. A City press release explained that:

> One of the most popular aspects of the first phase of the Downtown Enhancement Project was the intersection treatments. Citizens and local businesses continue to comment on how these treatments create a greater sense of safety and visibility for pedestrians (District of Maple Ridge, 2013a).

The first phase was completed in 2010. This phase included Lougheed Highway from 222 Street to 224 Street, and along 224 Street between Lougheed Highway and 119 Avenue. The second phase was completed in 2011. The third phase extended the improvements on Lougheed Highway, between 226 and 227 Street to coincide with the construction of 227 Street. This phase was completed in 2013. The fourth phase was on Selkirk Avenue and 226 Street, parallel to Lougheed Highway and an important pedestrian street in the study area. This phase was started after the study period, in the summer of 2015 and followed a similar pedestrian-friendly design. In addition to the Downtown

Enhancement Project, there were also numerous smaller scale capital works pedestrian projects to improve sidewalk connectivity in key Town Centre locations.

4.13. Examples of Built Environment Changes

The previous sections have outlined two key built environment changes in the Maple Ridge Town Centre: new residential units, sidewalk construction and improvements. This section provides two examples of both of these built environment changes occurring in partnership to improve walkability.

The first example is at the corner of Edge Street and Brown Avenue. The subject site was previously vacant and was redeveloped as an apartment building with 77 units. The perimeter of the site did not have sidewalks, and through the development process, new sidewalks and boulevards were constructed. These were further complemented by pedestrian capital works projects that extended the sidewalks in the area on the south side of Brown Avenue, at the intersection, and south on Edge Street.

Figure 17: Corner of Brown Avenue and Edge Street (L) 2011 and (R) 2015
Note: No sidewalks present on the north and west side in 2011. Low density single family lots prevalent. Sidewalks installed by developer and construction of a four storey apartment building. Intersection improvements included corner bulges and new crossing demarcation. Subsequently, the city installed sidewalks on both sides of Edge Street between Brown Avenue and Dewdney Trunk Road to create better pedestrian connectivity. Source: City of Maple Ridge, Google Maps

The second example is at the corner of 226 Street and 119 Avenue. Similar to the first example, this property was vacant with no existing sidewalks along the property frontage. The new building is a mixed-use building with commercial units on the ground floor and three storeys of apartments above, with a total of 59 units. During the study period, there was also a new tenant that went into the adjacent mall. New pedestrian walkways were constructed through the parking lot, and along Selkirk Avenue.

Figure 18: Corner of 226 Street and 119 Avenue (L) 2011 and (R) 2015
Note: This property lacked sidewalks in 2011 in a busy pedestrian area adjacent to the transit exchange. The property was re-developed with a mixed-use building and new sidewalks.
Source: City of Maple Ridge, Google Maps

4.14. Other Built Environment Changes 2009-2014

While new residential units, sidewalk construction and improvements, were the focus of this study's review for Town Centre built environment changes between 2009-2014, this section touches on other notable built environment changes that exemplify the Sustainable Development and Smart Growth planning models. These changes include transit improvements, and park upgrades.

A significant city investment in alternatives to the car was the construction of a new Translink Bus Exchange in the CBD. This was completed in 2009 with a cost of 1.68 million dollars (District of Maple Ridge, 2011). Several pedestrian crossings were also improved during the study period using lighting, traffic lights, and traffic calming measures to strengthen the pedestrian aspect of the multi-modal system. Corresponding

improvements to bike facilities and transit facilities also benefit pedestrians and the walking infrastructure in the study area. This investment illustrates that walkability was considered in broad terms and improvements were made to promote walkability beyond just sidewalk improvements. Furthermore, the Haney Nokai park was developed and opened during the five-year time period, in August 2012. The Haney Nokai park is located at the corner of Church Avenue and 222 Street.

4.15. Built Environment Change Analysis

An inventory of built environment changes that have occurred in the Town Centre between 2009 and 2014 has been outlined in this chapter. This data indicates that there have been substantial built environment changes that have occurred, and this is a result of the Smart Growth TCAP Smart Growth goals. Not only has this planning document guided private investment and redevelopment in the Town Centre, but it has also served as a road map for the City of Maple Ridge to focus engineering capital projects and large infrastructure projects in the Town Centre area during the six-year study period.

The TCCP and TCAP identify the population of the Town Centre at 8,050, based on the 2001 Census data. At the time of plan preparation, the population of Maple Ridge was anticipated to reach 93,700 by 2021, equivalent to an increase in 27,400 people (Smart Growth on the Ground, 2005). The density goal of the TCCP was to accommodate half of the 27,400 new residents in the Town Centre (Smart Growth on the Ground, 2005). Therefore, with a 2001 base population of 8,050 and an increase of 13,700 by 2021, the TCCP and TCAP modelled a 2021 future Town Centre population of 21,750. Furthermore, the estimated 2001 dwelling units in the Town Centre was 4,500 and the goal of the TCAP was to increase this number by 6,700.

One of the weaknesses that came through the built environment analysis was the lack of attention given to sidewalk connectivity. Although capital works projects were generally undertaken adjacent to significant re-development projects to complement developer-led improvements, the focus on overall pedestrian network connectivity did not always occur. As the amount of sidewalk improvements increases, this may allow the city to be more selective in its capital works projects. Furthermore, as residential and mixed-

use buildings continue to be developed in the Town Centre, the overall connectivity is anticipated to improve.

4.16. Implementation Policies

Sections 5.1 and 5.2 earlier in this chapter described the new residential units and sidewalks that were created or improved between 2009 and 2014. These built environment changes reflect significant investment made by both private developers and the City of Maple Ridge. The two separate streams of investment were often coupled together in the Town Centre to maximize improvements and reinforce new projects.

In this section, the previously described built environment changes are complemented with an analysis of specific city policies and bylaw amendments that promoted a walkable built environment in an indirect way. I drew on a finer grain of city documents, which include city policies, staff reports, and initiatives, that arose from higher level Maple Ridge plans and strategies covered in Chapter 4. These initiatives include the *Our Spirit… Our Town* (OSOT) program, the Façade Improvement Program, the Town Centre Investment Incentive Program and updates to the Off-Street Parking and Loading Bylaw. Two key policy changes that are discussed in this section are the Town Centre Investment Incentive Program (TCIIP) and the Off-Street Parking and Loading Bylaw changes in 2008.

4.16.1. Our Spirit…Our Town Initiative

The OSOT program was a project partnership between the District of Maple Ridge, the Downtown Maple Ridge Business Improvement Association (DMRBIA) and the Chamber of Commerce (District of Maple Ridge, 2009). The goal of this project was to make the Town Centre safe, clean, and lively through three key areas: safety and security, cleanliness, and helping those in need (District of Maple Ridge, 2009).

4.16.2. Town Centre Investment Incentive Program

The TCIIP was approved by Council on November 1, 2010 to encourage private sector residential and commercial development that would build on the significant city investment that had previously occurred in the Town Centre (District of Maple Ridge, 2010a). The area subject to incentives was the entire Town Centre area; however, two Town Centre sub-areas were identified to provide a higher level of development incentive in the CBD and Port Haney areas. The development incentives provided by the city include priority processing of development applications, reductions on city development cost charges, building permit fees, and other development fees, as well as three years of property tax exemptions (District of Maple Ridge, 2013b). An additional three years of property tax exemptions were triggered by Leader in Energy and Environmental Design (LEED) certified construction or use of a renewable energy system. Qualifying projects included four storey and greater residential and mixed-use construction in the CBD sub-area 1 and five storey and greater residential and mixed-use construction in the Port Haney sub-area 2. Incentives for new commercial development with construction values of $1,000,000 or greater, or renovations greater than $20,000 in value applied in both sub-areas. The desired outcomes of this program were to encourage residential and commercial investment in the Town Centre, communicate to investors that Maple Ridge supports development in the Town Centre, and provide a marketing strategy to raise the profile of investment in Maple Ridge (District of Maple Ridge, 2010b).

4.16.3. Off-Street Parking Bylaw Revisions

In addition to the TCIIP, another pro-active policy approach was the review of Town Centre parking standards. In conjunction with the TCAP, a parking study was commissioned by the City of Maple Ridge to determine if there was insufficient, adequate, or excessive parking supply in the Town Centre. The parking study concluded that there was an excessive amount of parking spaces in the Town Centre. As a result of this finding, the parking requirements were reduced for all future development projects in the CBD. Other opportunities for parking flexibility include payment in lieu of parking space provision, whereby developers in the CBD could chose to pay a flat fee for their customers and employees to use the downtown parkade. Small density bonuses were also provided

in Town Centre zones when all parking was provided underground, to reduce the amount of surface parking.

Parking availability is a common concern for businesses. During the Spirit Square capital works project, three on-street parking spaces were removed along 224 Street. This prompted the DMRBIA to conduct their own parking study, which came to the same conclusion as the city's review: there was an abundance of parking space in the Town Centre, and more specifically the downtown core. A key informant explained the parking review findings:

> When we had the renovations on 224 [Street] we lost three parking spots. It wasn't really major but we lost three parking spots on 224 [Street]. But it was a major point of discussion so what the BIA did was we did a total parking inventory of how many parking spots are there within the BIA area. There's actually 8,400 parking spots in that area. And so those are public, private, employee, mall… all the parking we have downtown Maple Ridge: 8,400. Which is very interesting but they're not necessarily in the place that people want it. So it's just, the problem is that people don't want to walk. There's actually lots of parking on 222 [Street] and 223 [Street], which is free, unlimited parking. No restrictions at all. But people don't want to walk there. So the problem is to re-educate the customers. Not only the customers but also the business owners, and their employees (Personal Communication, 2016).

Although concerns regarding the location and availability of on-street parking in the Town Centre are ongoing, the reduced parking standard acknowledges the existing parking stock and allows the opportunity for new developments to provide fewer parking spaces. This results in more pedestrian friendly development.

4.17. Conclusion

In this chapter, I addressed the second sub-question, which was: what built environment changes occurred between 2009 to 2014 in the Town Centre and how does this relate to walking correlates identified in the Literature Review? I began by documenting the built environment changes for residential density and sidewalk improvements during the 2009-2014 time frame. During the study time period, there has been an 1,136 increase in residential units, an increase in population of 1,120 residents,

and nearly four kilometres of new and improved sidewalk. Pedestrian needs have been addressed through these capital works projects, as well as through the form and character controls for new residential and commercial developments in the Town Centre. Furthermore, the Town Centre has been reinforced as a hub of activity with improved festival amenities in Memorial Peace Park and increased frequency of events in Memorial Peace Park with the weekly Farmers' Market.

The next stage of analysis seeks to understand how the built environment changes described in this chapter may have impacted walkability and overall health in the Town Centre compared to Maple Ridge as a whole using two secondary data sets comprised of MHMC survey data and WalkScore walkability data.

Chapter 5.

Measuring Walkability and Health Impact

In Chapter 5, I examined new residential units, sidewalk construction and improvement projects to illustrate built environment changes in the Town Centre during the 2009-2014 time period. That stage of analysis indicated that there has been a significant amount of built environment changes in the Town Centre during the study period, which can be attributed to the TCAP and Smart Growth planning principles.

The third stage of this study's analysis focuses on measuring preliminary walkability findings in the Town Centre and Maple Ridge as a whole. I used non-city data including WalkScore and MHMC lifestyle data to understand the relationship between built environment changes and walkability in the Town Centre. This data primarily measures walkability through built environment characteristics. A small amount of health data was available through the MHMC survey, and was drawn on briefly as well in this section. In this chapter, I address the third sub question, which is: How do walkability metrics in Maple Ridge's Town Centre compared to Maple Ridge as a whole? Available self-reported health data was also examined in this stage of analysis. The health survey questions, sample size, and snapshot nature of the data, were not conducive to explaining connections between the built environment and physical health.

In 2013, the non-profit organization "My Health, My Community" (MHMC) conducted an online questionnaire that generated 33,000 responses from across the Lower Mainland (My Health My Community, n.d.-a). For this section, I used data collected from the 'My Health My Community' health survey, which was conducted by Fraser Health, Vancouver Coastal Health, and the eHealth Strategy Office at UBC (My Health My Community, n.d.-a). This survey collected 791 responses in Maple Ridge between July 2013 and July 2014 (My Health My Community, 2015a).

The MHMC survey examined the modal split for trips to work and compared commuting modes to other health and lifestyle statistics such as weight, and daily and weekly recommended levels of physical health. The health region recommends a

minimum of 30 minutes of walking per day, and 150 minutes of physical activity per week. The survey has 83 questions in total. There were five Likert scale evaluations and one transportation question that were applicable to this study, as follows:

- What is your primary mode of traveling to do errands, like grocery shopping or other shopping? *If you use more than one mode, choose the one that you use for most trips.*

- Think about your neighbourhood as the area within a 20 minute walk or a distance of one mile (1.6 km) from your home. For each statement, indicate to what extent you agree or disagree (Likert Scale):

    - There are sidewalks in my neighbourhood that are well maintained (paved, with few cracks) and not obstructed.

    - Many shops, restaurants, services and facilities are within easy walking or cycling distance of my home.

    - There is so much traffic along the street I live on that it makes it difficult or unpleasant to walk in my neighbourhood.

    - I see a lot of people walking and biking in my neighbourhood.

    - I feel safe walking alone in my neighbourhood after dark (My Health My Community, n.d.-b).

These questions were selected because they related to walking for errands and built environment elements that influenced walkability. The responses to these survey questions were used to understand if walkability is higher or lower in the Town Centre study area compared to Maple Ridge as a whole. Survey responses also provided an indication of built environment conditions that influenced walkability.

The MHMC survey data is limited due to the sample of respondents that participated, the data collection time, and the relevance of the survey question with the specific research aims of this study. The survey was conducted once, and is therefore a snapshot of the health and lifestyle profile in the Metro Vancouver. For this reason, there was no ability to compare across time, which would be more helpful when evaluating the impact of Smart Growth design interventions. The data was also limited by a small sample of completed surveys that raises questions about the representativeness relative to the population. MHMC has mitigated this issue by aggregating the data and scaling the data

to reflect the actual demographics. Nonetheless, response rates for each of the Maple Ridge sub-areas did not exceed 2%, so with a small sample the results are not representative (My Health My Community, 2014). Despite these limitations, this data has been analyzed to assess if walkability trends differ between the Town Centre and Maple Ridge as a whole.

5.1. Metro Vancouver Results

Health and lifestyle data was analyzed at the regional and city level, and these findings are helpful when examining walkability in the Maple Ridge Town Centre. MHMC defines active transportation as walking, cycling, and public transit (My Health My Community, 2015b). The regional results showed that active transportation users were more likely to meet minimum activity requirements; and that biking and walking commuters have 48% lower odds of being overweight or obese compared to car commuters (My Health My Community, 2015b). Survey results indicated that active transportation commuters were twice as likely to meet the daily minimum requirement of 30 minutes of walking per day, and have 69% greater odds of participating in 150 minutes of moderate-intense physical activity per week (My Health My Community, 2015b). These findings indicate that choosing active forms of transportation supports meeting minimum physical activity targets, which supports physical health.

5.2. Maple Ridge Results

In addition to regional findings, statistics were also reported out at the city level. In Maple Ridge, 15% of respondents reported walking or cycling for errands compared to the regional response of 20% (My Health My Community, 2015a). Additionally, 70% of Maple Ridge respondents agreed that sidewalks in their neighbourhoods were well maintained compared to the regional response of 76% (My Health My Community, 2015a). While 70% of Metro Vancouver respondents agreed that amenities were within walking or cycling distance, only 49% of Maple Ridge respondents agreed with that statement (My Health My Community, 2015a). Finally, 33% of respondents are obese, meaning that they have a Body Mass Index (BMI) of 30 or greater (MHMC 2016) (My Health My Community,

2015a). This is a higher incidence that the regional rate of 22% (My Health My Community, 2015a).

In addition to city-wide results, MHMC also provided neighbourhood level lifestyle and health data. The City of Maple Ridge was classified further into four sub-areas: Maple Ridge North (MRN), Albion/Whonnock, Haney and Hammond (Fraser Health Authority, 2016). The first two sub-areas are a mix of rural low density development and traditional suburban low density development. The Hammond neighbourhood is an older suburban form of development which contains significant commercial land along the main corridors of Dewdney Trunk Road and Lougheed Highway. The Town Centre study area is completely contained within the Haney neighbourhood, with additional land to the north, east, and south.

The use of this data set in comparing the health and lifestyle indicators for Town Centre residents vis-a-vis the same indicators for Maple Ridge residents as a whole is limited due to the discrepancy in area boundaries between the Town Centre and the Haney MHMC neighbourhood. Nonetheless, the MHMC data provides valuable self-reported insight into variations in health and lifestyle indicators within the City of Maple Ridge. The MHMC created Maple Ridge neighbourhoods contain variable levels of urbanization, density, road patterns, and development approaches and therefore some conclusions can be drawn between the built environment in the Town Centre and the resulting health and lifestyle variables compared to the city's overall health and lifestyle results. All four of these sub-areas are shown in Figure 19 below.

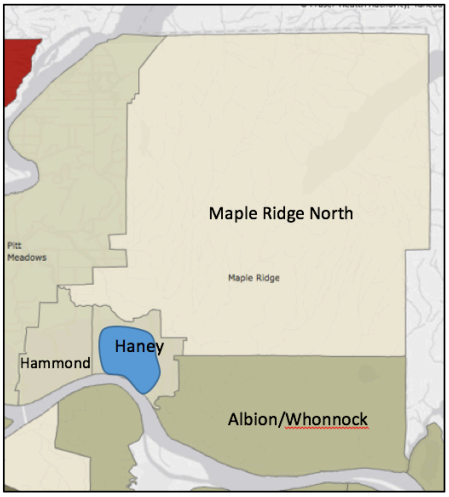


Figure 19: MHMC Maple Ridge Sub-Areas
Source: Fraser Health Authority and Vancouver Coastal Health Authority

5.3. Town Centre Results

In light of increased residential density and sidewalk improvements in the study area, the MHMC data categorized as the Haney sub-area was reviewed to compare if walkability results varied from city-wide results or not. In the Haney sub-area, respondents reported 33% were participating in 30 minutes or more of utilitarian walking per day (Fraser Health Authority, 2016). This was the highest percentage out of all the four Maple Ridge sub areas.

The MHMC data that showed the highest amount of variability between the Haney sub-area and the other three Maple Ridge sub-areas was the percentage of respondents who reported that there were many shops, restaurants, services, and facilities within an easy walking or cycling distance to their home. In the Haney sub-area, 65% of the MHMC survey respondents reported that amenities were within either a walking or cycling distance from their home. This percentage was substantially higher than the overall city percentage of 49%. The most striking variability was with the two low density sub-areas of MRN and Albion Whonnock, who had only 10.1% and 19.9% of respondents identify amenities within walking or cycling distance of their home (Fraser Health Authority, 2016).

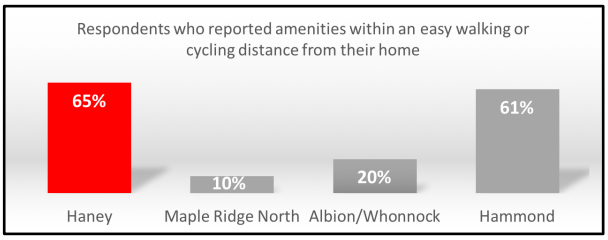


Figure 20 : Respondents with amenities within walking or cycling distance of home

Another MHMC survey question that provided insight into walkability differences across Maple Ridge sub-areas was the primary mode of transportation used to travel to do errands, such as shopping. Sub-area data was not available for respondents who reported that walking, cycling, or transit was their primary mode of transportation for errands; however, data for vehicle trips was provided and this data sheds light on the modal split for errand trips in Maple Ridge's different sub-areas. The two low density sub-areas of MRN and Albion/Whonnock reported that 98.8% and 96.4% of respondents, respectively, used a car as their primary mode of transportation for errands (Fraser Health Authority, 2016). The Haney sub-area had a much lower percentage, with 74.2% of respondents using a car (Fraser Health Authority, 2016).

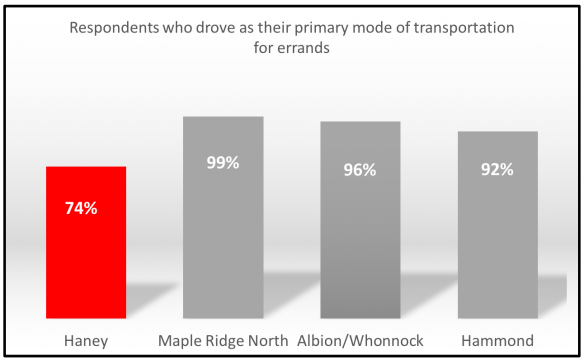


Figure 21: Respondents with vehicle as primary transport mode for errands

The wording of this question is problematic, as it does not capture the breakdown of people's daily and weekly transportation choices for errands, allowing respondents to only pick their most commonly used mode. However, when values are nearly at 100%, like in the case on the two eastern low density Maple Ridge sub-areas, there is some indication that there are no alternative transportation modes to the vehicle. In comparison,

the lowest regional values are in the City of Vancouver, with the areas of Strathcona and the West End reporting values of 17% and 14% respectively (Fraser Health Authority, 2016). This data indicates that there are alternative methods of transportation to the private vehicle in the MHMC Haney sub-area, which is not the case in the two low density sub-areas.

Other MHMC survey results for the Haney sub-area are that 60% of respondents reported that there were lanes and pathways for cyclists and walking, and 71% reported that sidewalks were well maintained (Fraser Health Authority, 2016). These values were not significantly different than the three other sub-areas or the city average, indicating that self-reported data does not identify a higher level of maintenance or incidence of sidewalks, lanes and pathways in the MHMC Haney sub-area.

5.3.1. Health Impact

The MHMC survey included health statistics such as self-reported Body Mass Index (BMI), high blood pressure, and presence of one or more chronic conditions. As the Literature Review indicates, making a correlation between areas of higher walkability and better health statistics is difficult, as there are many variables that impact health. The 2013-2014 health snapshot available through the MHMC survey shows some variability in health statistics across the four Maple Ridge sub-areas. Although the Haney sub-area reported the lowest rate of obesity (BMI over 30) compared to the other Maple Ridge sub-areas, the data does not consistently point to the Haney sub-area as having significantly better health statistics than lower density car dependent areas of Maple Ridge, such as the MRN sub-area. In fact, some health indicators are better in the MRN sub-area, such as a chronic disease incidence (Fraser Health Authority, 2016). This may be attributed to the demographic and socio-economic profile of the sub-area.

5.3.2. WalkScore

In addition to MHMC data, WalkScore was another secondary dataset used to understand Town Centre walkability. The WalkScore ranking evaluates the ease of walking in a neighbourhood. This metric uses proximity of amenities like businesses,

parks, schools and other common destinations to residential addresses to produce a numerical walkability score. Amenities within 400 metres of the address are awarded a score of 100 points, and that score declines as the distance increases. A score of 0 points is earned when the amenity is 1.6 km away from the address.

The average WalkScore for Maple Ridge as a whole is the lowest in the region at 36 out of 100 possible points (WalkScore, n.d.). Based on this low ranking, people in Maple Ridge are possibly the least likely to be walking. In addition to the MHMC survey results, WalkScore also ranked the core of the Town Centre at 94 and the outer periphery of the study area at 62 (WalkScore, n.d.). The WalkScore rating for the Town Centre core is shown in Figure 22 below. Maple Ridge's WalkScore indicates that walkability is not high compared to the rest of the Metro Vancouver region, therefore, walkability interventions may have a larger impact on the community.

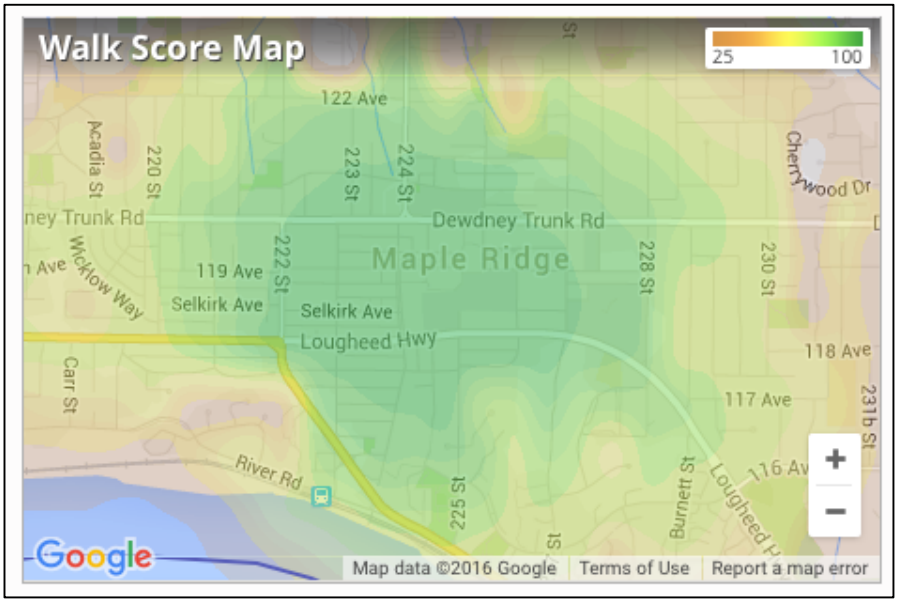


Figure 22: Town Centre WalkScore Map
Source: www.walkscore.com

5.4. Conclusion

The third stage of analysis was conducted in this chapter. WalkScore and MHMC lifestyle data was used to understand the impact that built environment changes, such as

increased residential density and sidewalk improvements, have had on walkability in the Town Centre compared to Maple Ridge as a whole. In this chapter, I addressed the third sub question, which was: How do walkability metrics in Maple Ridge's Town Centre compared to Maple Ridge as a whole?

The analysis of MHMC walkability and limited health data resulted in mixed results. The key finding was that there is greater proximity of shops, services, and other destinations within walking or cycling distance in the MHMC Haney neighbourhood than in the low density sub-areas as well the overall City of Maple Ridge average. This finding was reinforced by the WalkScore values, which are a measure of proximity to destinations to residential addresses. In conclusion, a range of daily services and destinations are located within the Town Centre in close enough proximity to residential areas that residents can reach these destinations on foot if they so choose. Based on the MHMC survey data and WalkScore, the ability to do this is much more limited in the rest of Maple Ridge, and particularly so in the lowest density eastern neighbourhoods.

The limited self-reported MHMC health data did not uncover any relevant patterns of differentiating health patterns between the MHMC Haney sub-area, the remaining sub-areas, and Maple Ridge as a whole. The lack of health findings reinforces the notion that health is influenced by many factors, and the correlation between physical health and walkable neighbourhoods is confounded by many other variables, such as population demographics. Additionally, longitudinal health data is required to better understand how changes in the built environment may influence physical health.

Chapter 6.

Key Informant Interviews

In the first stage of analysis, city plans and strategies were reviewed to answer the first of three sub-questions, which was – do Smart Growth city plans and strategies support the creation of a walkable built environment in the Town Centre? The first stage of analysis yielded two overarching themes: *healthy communities* and *pedestrian-friendly environments.*

The second stage of analysis involved measuring two key built environment changes in the Town Centre between 2009 and 2014: new residential units, sidewalk construction and improvement projects. The built environment changes were juxtaposed with two relatively current datasets in the third stage of analysis: MHMC health and lifestyle survey responses and WalkScores for the study area. This connection was made to ascertain whether or not the built environment changes resulted in different MHMC and WalkScore results for the Town Centre than for Maple Ridge as a whole, to attempt to build a case for the relationship between walkability and the built environment.

The fourth and final stage of analysis takes place in this chapter, followed by a return to the central research question and closing remarks in Chapter 8. In Chapter 7, the Chapter 4 document analysis and the Chapter 5 built environment outcomes are complemented by key informant interviews. These interviews provided additional context and information to the processes that occurred in the Town Centre between 2009 and 2014. Key informants included current and past staff; as well as politician, citizen and business representation that were involved in either the development or implementation of the TCAP.

The area planning experience was reported as a positive undertaking by all stakeholders. The TCAP began with the creation of the TCCP and the Smart Growth of the Ground program that was first championed by the community's elected officials. Due to the project's significant public consultation and engagement, the final area plan was

widely supported by city staff and officials, and the area residents. This chapter seeks to answer the final two research sub-questions, which are:

How were pedestrian considerations conceptualized by key stakeholders during the creation and implementation of the TCCP and TCAP?

Did Maple Ridge seek to improve walkability for physical activity and public health reasons? What were the driving forces of these initiatives?

Although the intent to create a pedestrian friendly design with a multi-modal transportation system was clear in Maple Ridge's plans and strategies, this does not mean that walkability was a central consideration in the Town Centre area planning process through the SGotG program that created the TCCP and the TCAP. In this section, I analyzed how walking was considered by various stakeholders in the area planning process and development permit stage to understand if and how walking was used as a goal in the Town Centre revitalization plan. Three main themes came out of the interviews and are discussed below. These themes are: the role of existing conditions in the Town Centre, city investment in the Town Centre, and the success of the Town Centre Investment Incentive Program.

6.1. Walkability and Health Considerations

As the Chapter 2 Literature Review showed, the built environment influences transportation choice, and the built environment has historically been shaped by public health concerns. Interviews with key informants that were involved with the preparation and implementation of the TCAP, were asked the following two questions:

1. How were pedestrian considerations conceptualized in the creation and implementation of the TCCP and TCAP?

2. Did physical activity and public health considerations factor into walkability policies and goals during the planning and implementation process of the TCCP and TCAP? What were the driving forces of these initiatives?

Regarding the first question noted above, the responses back from key informants were that pedestrian considerations were conceptualized primarily through built environment considerations that relate back to Smart Growth principles. These included a complete community, alternative transportation methods, and a vibrant Town Centre. While increasing walkability was not a goal in its own right during the TCAP planning process, creating a walkable environment and promoting walkability through design certainly was. Because the notion of walkability was embedded and layered in numerous policies and objectives, there were multiples initiatives that changed the built environment and strengthened the walkability of the Town Centre. Some of these initiatives include reduced reliance on vehicles, Smart Growth principles, urban design guidelines, and revised parking standards, which all relate back to the concept of walkability. One key informant explained that:

> … [i]n terms of the walkability, that was kind of a natural outcome of the downtown because the downtown is fairly compact, it is a lovely grid system it's easy to get around in and if you could make space for people to live downtown, it would be very easy for them to walk around. So it wasn't like it was a huge accomplishment….We did a whole parking study around that. We have [fewer] cars parked downtown since so that would allow them to…well force them perhaps, to have [fewer] cars and more walking. So the plan was pretty much premised on that without it being necessarily one of the big forefront things about it. And it wasn't necessarily one of the goals, well it was one of the goals….but it was not the foremost goal but it was going to be an outcome of it (Personal Communication, 2015).

This position was supported by another key informant, who stated that:

> So I don't believe, and at the time of the [Smart Growth on the Ground] study, that never showed up on the radar as a goal. We never sat in this building [the ACT] up in those rooms up there and said well, we have to get the population of the downtown out and walking. That was never said once. It might be a spin off, been a consequence, but not an intended consequence. And it wasn't an intended consequence, it wasn't said at the time. The real motivator, or driver, was densification. Densify, densify, densify (Personal Communication, 2016).

Regarding the second question posed to key informants, promoting physical activity and healthy lifestyles through walkable urban design was recognized during the planning and implementation stages of the area plan. The driving forces behind this

approach were Sustainable Development and Smart Growth principles. A key informant explained that:

> There was discussion around urban trail systems, stewardship even comes in there, but in terms of health and that potentially that people living in the Town Centre would potentially be making fewer trips to the doctor's office and the hospital, less obesity, a little bit thinner, all those kinds of those things, we didn't talk about it. We honestly talked around it. With all the other topics that the talked about, we talked around it. But we didn't zone in on that and I have to wonder if we were trying to think about the kinds of things that would generate interest in developing a complete community we were thinking of the hot topics at the time that we could get some traction with (Personal Communication 2015).

Nonetheless, despite walkability not being a stand-alone goal or discussion topic during the TCAP planning process at the staff level, or the health benefits of walking coming to the forefront either, the importance of pedestrians and pedestrian-scale development were results of the TCAP and its Smart Growth principles. A key informant explains how walkability was conceptualized, and how walkability policies were created despite not being termed 'walkability':

> [Walkability is] woven through some of the principles. And it wasn't really termed walkability. It was the principles about each neighbourhood is complete, options to the car exist, jobs are close to home…those kind of things give the sense that you should be able to walk in the downtown, in that environment. Now, it was woven through the whole plan: pedestrian experience, multi-modal transportation, pedestrian experience being one of the significant ones. Types of modes that just had a part of the conversation, it was never set aside to talk about being disconnected, or something special, it was just woven into the principles and I think as a result it makes some of those principles easy to understand, certainly easier for the community to accept. It's hard to argue with walkability in the Town Centre and the need to make some pedestrian improvements over time without having to do everything at once" (Personal Communication, 2015).

Another key informant explains that:

> All the stakeholders were brought into this building here actually [the ACT] and we had the charrettes, and it was quite a long process, and what did not stand out to me at the time was the notion of walking other than live work play. So live work play was the walk to the mill kind of

> philosophy, that was what was behind it (Personal Communication, 2016).

These comments from key informants indicate that while three of the goals in the TCAP relate to walkability and align with the walking correlates identified in the Chapter 2 Literature Review, the connection between walkability and the built environment were seldom explicitly made. There was an understanding that pedestrian friendly neighbourhoods were desirable; however, the connection between certain built environment aspects and higher levels of walking were not an outright stated goal. These findings exemplify that increased walkability is just one outcome of Smart Growth built environment changes.

6.2. The Role of Existing Conditions in Plan Outcomes

The first theme that arose out of the key informant interviews that was not obvious in the city plans and strategies was the conducive existing conditions of the study area for walking. The Town Centre contains short blocks, and a grid pattern of streets. This is the most conducive road network for walking, as there are many redundant pathways. The built environment changes that occurred between 2009 and 2014 were significant and included increased residential density, mixed-use developments, improved sidewalk quality, and enhanced pedestrian amenities. A built environment change that did not occur during the study time was any alteration to the street network, with the exception of the 227 Street connection that was made. Nonetheless, the street network design plays a key role in supporting walkability. Marshall and Garrick (2010) determined that street connectivity, street network density, and street patterns all influence people's transportation choice. For the Town Centre, a grid street network with short blocks that was conducive to walking already existed, and this worked in favour of walkability. The built environment changes that occurred during the study period further improved walkability in the Town Centre. A key informant explains that:

> [T]he Town Centre itself it's got this bones if you want to say for creating a walkable community; you know, the grid street and short blocks and laneways. So it was really important and we had discussions around that policies were developed to create short blocks and laneways (Personal Communication, 2015).

6.3. City Investment in the Town Centre

In addition to the existing grid street network, what became apparent when speaking with the key informants was that the Town Centre is an important location for city investment to create a vibrant hub of activity. This view pre-dates the TCAP, and reflects the historic roots of the area. Creating a vibrant centre full of varied activity supports safety in the neighbourhood, makes it an attractive destination for both residents and visitors, and activates public spaces. All of these things encourage walkability. In this section, I highlight the historic investment that was made in the Town Centre to reinforce and enhance the downtown as the heart of the community. I also touch on how the city played an active role in creating vibrancy and activity in the Town Centre, through the creation and enhancement of public parks and other public spaces, and support for events and festivals in the Town Centre.

In the early 1990s, the Town Centre experienced a decline in investment as large commercial tenants left for newer larger spaces in western Maple Ridge. The construction of Highway 1 also increased mobility in the region and allowed residents to shop in other communities more easily. One key informant reflects that:

> I think if you go back through the records, [19]86 or [19]87 was our biggest housing start year. 700 or 800 [units], it was crazy numbers and it was people moving out from Vancouver and Burnaby cause it was, you could buy a brand new house here for 30 or 40 thousand dollars and across the river it would be 70 or 80 [thousand dollars], and then you just started commuting. And that was I think the demise, or the start of the demise of the [Maple Ridge] downtown (Personal Communication,2015).

In the late 1990's, the downtown core was the subject of a high profile multi-million-dollar re-development project that laid the ground work for built environment changes that occurred in the following decades. The downtown re-development involved the construction of a six storey high rise office building, an arts theater and gallery, an addition to the Leisure Centre including a youth centre, an underground parkade and an expanded Memorial Peace Park. This re-development resulted in the seniors' centre moving further north out of the Central Business District (CBD) to an expanded space and residential tower, and the ice rinks and curling club moving outside of the Town Centre to allow for

expansion of these facilities to include additional ice sheets. A key informant recollects that:

> 60 million dollars to build the office tower, the library, the underground parking, doubling the size of the leisure centre, and complete the park, well, the square footage of that and for 60 million dollars is an amazing, amazing deal (Personal Communication, 2016).

The SGotG project began immediately following the completion of the downtown re-development. In addition to the city investment in the Town Centre infrastructure, there was also city investment in city events and celebrations to create a vibrant gathering space. A key informant explains that:

> Always through that time, there's been a focus by the planning department, parks and recreation department, city councils, to create strong downtown heart to the community. It started in 1981 actually, when the city acquired the land that the Haney Place Mall now sits on and sold that to a developer but in addition to that built the now city hall and the Maple Ridge Leisure Centre (Personal Communication, 2015).

> The notion of the downtown being a gathering place was as far back as 1981, if not before then, because the historic roots of the community were that this was the old agricultural grounds, where people got together for fairs and stuff (Personal Communication, 2015).

The combined effort of new infrastructure projects and festivals in the Town Centre served to kick-off revitalization from private investment, and set the tone for creating a walkable neighbourhood.

6.4. Incentive Program Success

The third and final theme that resulted from the key informant interviews was the success of the TCIIP. While increasing walkability in the Town Centre was not an overt goal during the land use planning process and implementation of the SGotG, TCCP, or TCAP; the main goal of these plans certainly was to increase density in the Town Centre. As Chapter 4 indicated, the city was successful at increasing the number of residential

dwelling units during the 2009 to 2014-time period, and that number continues to grow as new developments are completed.

Several key informants referenced the TCIIP as a successful tool in achieving the increase in residential units during the study period. A key informant states that:

> I think the fact that we got 100 million dollars of investment in here from 2011 to 2014 says that we are on the right track (Personal Communication, 2015).

The same informant goes on to say:

> I think in 2011, with that revised downtown incentive program I think the developers went "Oh wow, I think we can make this work" and then we had all these applications come in (Personal Communication, 2015).

This sentiment is echoed by two other key information with the following comments:

> I personally think that Jim Rule [Maple Ridge CAO] in doing the Town Centre Investment Incentives Program really helped. I'm not sure if we would be this far along if that hadn't been undertaken (Personal Communication, 2015).

> With the incentive plan, we did see an increase in the downtown area. I think that the years that I've been here it's been really consistent. I think the incentive program pretty much started when I got here so I haven't experienced a reduction in [development] (Personal Communication, 2015).

It is challenging for suburban communities such as Maple Ridge to attract higher density development in downtown areas due to market demands for single family homes and land prices that facilitate low density development. The TCIIP was able to capture interest in Town Centre revitalization, and was a driving force behind the addition of over 1,100 new residential units between 2009 and 2014.

6.5. Conclusion

This chapter covered the fourth and final stage of data analysis, involving 10 key informant interviews and their perspectives on this study's two remaining sub-questions:

How were pedestrian considerations conceptualized by key stakeholders during various Town Centre area planning processes?

Did Maple Ridge seek to improve walkability for physical activity and public health reasons? What were the driving forces of these initiatives?

The answers to these two final sub-questions from key informants was that walkability considerations were incorporated into a number of policies and approaches. While walkability itself was not an outright goal, many of the Smart Growth principles supported walkability through land use, design, and infrastructure. The impetus for improving walkability was based in sustainability concepts of reduced air pollution and reduced reliance on private vehicles rather than the physical health benefits of walking.

Several themes emerged from the key informant's responses. These themes were that existing built environment conditions were conducive to walkability even before the TCAP was implemented; that city investment in the Town Centre created a hub of activity that was important for walkability; and that the TCIIP was a key tool in achieving many new residential units in the area.

Chapter 7.

Return to Central Research Question and Conclusion

The purpose of this study was to answer the following central research question - Have built environment changes between 2009-2014 influenced walkability in the Maple Ridge Town Centre compared to Maple Ridge as a whole? This study involved four stages of data analysis to answer the central research question. Each stage of analysis included one or more research sub-question that provided insight for answering the central research question. The analysis included a content analysis of city plans and strategies, an inventory of built environment changes, review of walkability and health data, and key stakeholder interviews.

7.1. Key Findings

In Chapter 4, the document analysis phase indicated that there are numerous Smart Growth plans and strategies that include policies which support walkability in the Town Centre. Furthermore, the review of city plans and strategies revealed that all of the documents reflect in some way, policies and objectives that align with the walking correlates and development strategies discussed in the Chapter 2 Literature Review. Two themes emerged as overarching guiding principles: pedestrian environments and healthy communities. While these themes related to the Literature Review themes, they are not connected to one another in the same way as the Literature Review.

In Chapter 5, built environment changes for new residential units, sidewalk construction and improvements during the 2009-2014 time period were assessed. During the study time period, there was an 1,136 increase in residential units, an increase in population of 1,120 residents, and over five kilometres of new and improved sidewalk. Pedestrian needs were addressed through these capital works projects, as well as through the form and character controls for new residential and commercial developments in the Town Centre. Furthermore, the Town Centre has been reinforced as a hub of activity with improved festival amenities in Memorial Peace Park and increased frequency of events in

Memorial Peace Park with the weekly Farmers' Market. This study focused on assessing three relevant walkability goals in the TCAP, which were:

- Principle 1, Goal 1: Increase density and distribute a range of uses throughout the Centre

- Principle 2, Goal 1: Acknowledge and respect pedestrian needs

- Principle 7, Goal 2: Establish the Centre as a hub of activity (District of Maple Ridge, 2014b).

Despite the built environment changes noted in Chapter 5 that aligned with the above noted goals, the increase in population and residential dwelling units has not matched the forecasted growth goals in the TCAP. The built environment change assessment during the 2009-2014 time period also indicated that sidewalk connectivity was not dealt with by addressing key gaps in the identified pedestrian zones. While capital works for sidewalk improvements did occur in pedestrian zones, they were located in conjunction with private re-development throughout the Town Centre.

In Chapter 6, walkability and limited self-reported health data was compared between the Town Centre and the City of Maple Ridge using WalkScore and MHMC survey data. This analysis indicated that respondents in the Haney sub-area were more likely to agree that amenities were within an easy walking or cycling distance from their home compared to respondents in low density sub-areas, such as MRN and Albion/Whonnock, as well as the city average. Furthermore, respondents in the Haney sub-area also reported a lower primary reliance on their vehicle for errand trips, compared to MRN and Albion/Whonnock sub-areas, whose respondents were almost exclusively reliant on their vehicle as the primary mode of errand transportation.

Finally, in Chapter 7, key informants reported that walkability considerations were incorporated into a number of policies and approaches. While walkability itself was not an outright goal, many of the Sustainable Development and Smart Growth principles supported walkability through land use, design, and infrastructure. The impetus for

improving walkability was based in sustainability concepts of reduced air pollution and reduced reliance on private vehicles rather than the physical health benefits of walking.

Several themes emerged from the key informant's responses. These themes were that existing built environment conditions were conducive to walkability even before the TCAP was implemented; that city investment to make the Town Centre a hub of activity was important for walkability; and that the TCIIP was a key tool in achieving built environment changes that support walkability.

7.2. Recommendations

Several recommendations have been identified for the City of Maple Ridge to continue creating walkable neighbourhoods in both the Town Centre and elsewhere in Maple Ridge. The first recommendation relates to the Multi-Modal Transportation Network map in the TCAP (see Appendix B). The map identifies key pedestrian and cycling routes in the study area, but there are no formally adopted road design drawings for the routes identified on the map. To create consistency between re-development and capital works project, a formalized design standard should be adopted. This would also allow further refinement and re-evaluation of the pedestrian network. More detailed work is required to determine if sufficient road width can be achievable along the routes to ensure that the improved facilities are in fact feasible. This review process may require relocation of some of the pedestrian or cycling routes.

In addition to formalized pedestrian route design, it is also recommended that the pedestrian routes and the existing sidewalk inventory in the study area be systematically coordinated with capital works projects. Some of the pedestrian routes identified in the TCAP have gaps in sidewalk connectivity. These gaps should be prioritized for capital works projects over missing sidewalk areas that are not identified as pedestrian routes.

Another recommendation is to make an effort to collect walking data in the Town Centre, as well as in the City of Maple Ridge to provide longitudinal data that can assist with measuring built environment impacts. There is very little data collected regarding mode of transportation for trips other than to and from work, or about what encourages or

discourages residents to walk in their neighbourhoods. In order to properly understand the local context and alter the built environment accordingly, more data is required. This could be initiated by the City of Maple Ridge in conjunction with other customer surveys, or in partnership with other organizations such as Fraser Health or Translink. These potential partnerships with Fraser Health and Translink will also help strengthen Maple Ridge's understanding of the connection between health, land use patterns, and transportation. Additionally, comprehensive planning between all three organizations will support healthier neighbourhoods overall.

Furthermore, it is noted in several city plans and strategies that there is a need for large scale pedestrian projects, such as a pedestrian overpass across the Haney Bypass to connect the waterfront with the rest of the Town Centre. This will strengthen recreational use of the waterfront for residents of the Town Centre, and will increase safe access for residents using the West Coast Express Port Haney station. It is recommended that federal infrastructure funding be pursued for this type of large scale project.

Several city-wide recommendations that have implications for the study area were also identified. The first recommendation involves the comprehensive mapping of walking routes in both the study area and beyond. Unlike transit and cycling routes, there is a lack of pedestrian route mapping. Pedestrian routes are somewhat unique to other transportation routes because they include sidewalks, walkways, trails, and even informal pathways through large properties such as a mall property. The creation of a comprehensive pedestrian map would assist the Engineering, Planning, and Parks Departments identify gaps and consider walking connectivity in a more holistic, global sense. This mapping would also be a helpful resource for residents.

Lastly, there are many best practices that were used in the Town Centre, as well as existing conditions that support walking. The final recommendation is to use these best practices and existing condition design considerations in other areas of the city, particularly in greenfield developments at the outer periphery of the city.

While there are many approaches to retrofitting suburban neighbourhoods, some built environment elements are easier than others to retrofit. One of the more challenging elements to retrofit is the street network. As a result, developing greenfield areas on a

connected grid pattern will maximize pedestrian routes. Another best practice that can be taken from the Town Centre to create more walkable neighbourhoods throughout Maple Ridge involves creating neighbourhood serving commercial businesses that are within an easy walking distance of homes. Commercial businesses in these outlying areas should be focused on serving the local residents only, rather than drawing customers away from the Town Centre. The number and size of each business would need to be carefully regulated through neighbourhood planning.

7.3. Smart Growth and Suburban Development: Zero Sum or Opportunity for Synergy?

The Maple Ridge Town Centre case study has demonstrated that Smart Growth policies and pedestrian-minded built environments can be successfully implemented in suburban communities characterised by urban sprawl, to encourage walking as a form of transportation for basic service trips. Despite these positive findings, outlying neighbourhoods in Maple Ridge are still heavily dependent on cars as a primary form of transportation for errands. Lessons learned from the Town Centre need to be applied in these outlying neighbourhoods, both in Maple Ridge, and in other similar suburban municipalities in the region. By locating neighbourhood-serving amenities within low density neighbourhoods, providing pedestrian-scale elements along walking routes, and creating connected grids of sidewalks, walking will emerge as a feasible method of transportation. In turn, this will contribute to more livable neighbourhoods and healthier residents.

References

BC Stats. (2012). *Maple Ridge Community Facts*. Retrieved from https://www.mapleridge.ca/DocumentCenter/Home/View/1101

Berke, P. R. (2002). Does Sustainable Development Offer a New Direction for Planning? Challenges for the Twenty-First Century. *Journal of Planning Literature*, *17*(1), 21–36. http://doi.org/10.1177/088122017001002

Berke, P. R., & Conroy, M. M. (2000). Are we planning for sustainable development? *American Planning Association.Journal of the American Planning Association*, *66*(1), 21. http://doi.org/10.1080/01944360008976081

Burchell, R. W., Listokin, D., Galley, C. C., Burchell, R. W., Listokin, D., Smart, C. C. G., … Galley, C. C. (2000). Smart growth : More than a ghost of urban policy past , less than a bold new horizon Smart Growth : More Than a Ghost of Urban Policy Past , Less Than a Bold New Horizon. *Housing Policy Debate*, *1482*(11), 821–879. http://doi.org/10.1080/10511482.2000.9521390

Catherine Berris Associates Inc. (2010). *Maple Ridge and Pitt Meadows Parks, Recreation and Culture Master Plan*.

Cervero, R. (1996). Mixed land-uses and commuting: Evidence from the American housing survey. *Transportation Research Part A: Policy and Practice*, *30*(5 PART A), 361–377. http://doi.org/10.1016/0965-8564(95)00033-X

Daniels, T. (2001). Smart Growth : A New American Approach to Regional Planning Smart Growth : A New American Approach to Regional Planning. *Planning Practice & Research*, *16*, 271–279. http://doi.org/10.1080/02697450120107880

District of Maple Ridge. (1996). *Official Community Plan - District of Maple Ridge*.

District of Maple Ridge. (2007). *Corporate Strategic Plan*.

District of Maple Ridge. (2008). *2008 Annual Report*.

District of Maple Ridge. (2009). *2009 Citizens Report*.

District of Maple Ridge. (2010a). *Town Centre Investment Incentives Program*.

District of Maple Ridge. (2010b). *Town Centre Investment Incentives Program - Implementation Schedule*.

District of Maple Ridge. (2011). *Maple Ridge Investment Report January 2005 - December 2010*.

District of Maple Ridge. (2013a). Construction Schedule Set for East Section of Downtown Enhancement Project.

District of Maple Ridge. (2013b). *Town Centre Investment Incentive Program 2013*.

District of Maple Ridge. (2014a). *Maple Ridge Official Community Plan*.

District of Maple Ridge. (2014b). *Town Centre Area Plan*.

Edwards, M. M., & Haines, A. (2007). Evaluating Smart Growth Implications for Small Communities. *Journal of Planning Education and Research*, *27*, 49–64. http://doi.org/10.1177/0739456X07305792

Ewing, R., & Cervero, R. (2001). Travel and the Built Environment: A Synthesis. *Transportation Research Record*, *1780*(1), 87–114. http://doi.org/10.3141/1780-10

Ewing, R. T., & Schmidt, R. (2003). Relationship between Urban Sprawl and Physical Activity, Sedentary Beahviour, and BMI. *American Journal of Health Promotion*, *15*(1), 430–445.

Filion, P. (2009). The mixed success of nodes as a smart growth planning policy. *Environment and Planning B: Planning and Design*, *36*(3), 505–521.

http://doi.org/10.1068/b33145

Filion, P., & Mcspurren, K. (2007). Smart Growth and Development Reality: The Difficult Co-ordination of Land Use and Transport Objectives. *Urban Studies*, *44*(3), 501–524. http://doi.org/10.1080/00420980601176055

Frank, L; Engelke, P; Schmid, T. (2003). *Health and Community Design: The Impact of the Built Environment on Physical Activity*. Island Press.

Frank, L., & Engelke, P. (2001). The Built Environment and Human Activity Patterns: Exploring the Impacts of Urban Form on Public Health. *Journal of Planning Literature*, *16*(2), 202–218. http://doi.org/10.1177/08854120122093339

Frank, L., & Engelke, P. (2005). Multiple Impacts of the Built Environment on Public Health: Walkable Places and the Exposure to Air Pollution. *International Regional Science Review*, *28*(2), 193–216. http://doi.org/10.1177/0160017604273853

Fraser Health Authority. (2016). My Health My Community Atlas. Retrieved from http://www.fraserhealth.ca/MHMCAtlas/index.html

Freestone, R., & Wheeler, A. (2015). Integrating Health Into Town Planning: A History. In M. Barton, Hugh; Thompson, Susan; Burgess, Sarah; Grant (Ed.), *The Routledge Handbook of Planning for Health and Well-Being*.

Frumkin, H; Frank, L; Jackson, R. (2004). *Urban Sprawl and Public Health:Designing, Planning, Building for Healthy Communities*. Island Press.

Giles-Corti, B., & Donovan, R. (2002). The relative influence of individual, social and physical environment determinants of physical activity. *Social Science & Medicine*, *54*(12), 1793–1812. http://doi.org/10.1016/S0277-9536(01)00150-2

Handy, S. (1992). Regional versus local accessibility: Neo-traditional development and its implications for non-work travel. *Built Environment*, *18*(4), 253–267.

Handy, S. (2005). *Critical Assessment of the Literature on the Relationships Among*

Transportation , Land Use , and Physical Activity.

Handy, S., Boarnet, M., Ewing, R., & Killingsworth, R. (2002). How the built environment affects physical activity: Views from urban planning. *American Journal of Preventive Medicine*, *23*(2 SUPPL. 1), 64–73. http://doi.org/10.1016/S0749-3797(02)00475-0

Handy, S., Cao, X., & Mokhtarian, P. (2006). Self-Selection in the Relationship between the Built Environment and Walking: Empirical Evidence from Northern California. *Journal of the American Planning Association*, *72*(1), 55–74. http://doi.org/10.1080/01944360608976724

Knaap, G; Talen, E. (2005). New Urbanism and Smart Growth: A Few Words From the Academy. *International Regional Science Review*, *118*(April), 107–118. http://doi.org/10.1177/0160017604273621

Krizek, K. J. (2000). Pretest-Posttest Strategy for Researching Neighborhood-Scale Urban Form and Travel Behavior. *Transportation Research Record 1722*, (00), 48–55.

Lee, C; Moudon, A. (2004). Physical Activity and Environment Research in the Health Field: Implications for Urban and Transportation Planning Practice and Research. *Journal of Planning Literature*, *19*(2), 147–181. http://doi.org/10.1177/0885412204267680

Lopez, R. (2004). Urban sprawl and risk for being overweight or obese. *American Journal of Public Health*, *94*(9), 1574–1579. http://doi.org/10.2105/AJPH.94.9.1574

Maple Ridge Pitt Meadows Parks & Leisure Services. (2015). *Joint Parks and Leisure Services Model Review*. Retrieved from http://www.mapleridge.ca/DocumentCenter/View/4820

Marshall, W. E., & Garrick, N. W. (2010). Effect of Street Network Design on Walking and Biking. *Transportation Research Record: Journal of the Transportation Research Board*, 103–115. http://doi.org/10.3141/2198-12

Metro Vancouver. (n.d.). *Metro Vancouver Urban Centre Network*. Retrieved from http://www.metrovancouver.org/services/regional-planning/PlanningPublications/MetroVancouverRegionalCityCentreProfiles.pdf

Metro Vancouver. (2011). *Metro Vancouver 2040*.

My Health My Community. (n.d.-a). About the Project. Retrieved September 27, 2015, from https://www.myhealthmycommunity.org/About/AboutTheProject.aspx

My Health My Community. (n.d.-b). *Survey*. Retrieved from https://www.myhealthmycommunity.org/Portals/0/Documents/MHMC_Survey_2013_ FINAL-EXAMPLE_FOR_WEB.pdf

My Health My Community. (2014). *My Health My Community Survey Progress*. Retrieved from https://www.myhealthmycommunity.org/Portals/0/Documents/MHMC Survey - target progress 08AUG14_2014 (FH web).pdf

My Health My Community. (2015a). *Maple Ridge Community Health Profile*. Retrieved from https://www.myhealthmycommunity.org/Portals/0/Documents/Community Profiles/MapleRidge_final.pdf

My Health My Community. (2015b). *Transportation and Health in Metro Vancouver*. Retrieved from http://www.myhealthmycommunity.org/Portals/0/Documents/MHMC Transportation and Health vPUBLIC 12MAR2015.pdf

Newman, P.W.G; Kenworthy, J. (1991). Transport and urban form in thirty-two of the world's principal cities. *Transport Reviews*, *11*(3), 249–272.

Owen, N., Humpel, N., Leslie, E., Bauman, A., & Sallis, J. F. (2004). Understanding environmental influences on walking: Review and research agenda. *American Journal of Preventive Medicine*, *27*(1), 67–76. http://doi.org/10.1016/j.amepre.2004.03.006

Parfitt, J. (1987). *The Health of a City: Oxford, 1770-1974*. Oxford: Amate Press.

Provincial Health Services Authority. (2009). Foundations for a Healthier Built Environment, (January 2009), 1–19.

Ross, C. L., & Dunning, A. E. (1997). *Land Use Transportation Interaction: An Examination of the 1995 NPTS Data*.

Saelens, B. E., Sallis, J. F., Black, J. B., & Chen, D. (2003). Neighborhood-Based Differences in Physical Activity: An Environmental Scale Evaluation. *Research and Practice*, *93*(9), 1552–1558. http://doi.org/10.2105/ajph.93.9.1552

Saelens, B., & Handy, S. (2008). Built Environment Correlates of Walking. *Medicine & Science in Sports & Exercise*, *40*(Supplement), S550–S566. http://doi.org/10.1249/MSS.0b013e31817c67a4

Saelens, B., Sallis, J., & Frank, L. (2003). Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. *Annals of Behavioral Medicine : A Publication of the Society of Behavioral Medicine*, *25*(2), 80–91. http://doi.org/10.1207/S15324796ABM2502_03

Sallis, J; Owen, N. (1999). *Physical Activity & Behavioral Medecine*. Thousand Oaks, CA: Sage.

Smart Growth on the Ground. (2005). *The Maple Ridge Town Centre Concept Plan*.

Southworth, M. (2005). Designing the Walkable City. *Journal of Urban Planning and Development*, *131*(4), 246–257. http://doi.org/10.1061/(ASCE)0733-9488(2005)131:4(246)

Statistics Canada. (2014a). 2006 Profile of Census Tracts. Retrieved February 2, 2015, from http://datacentre.chass.utoronto.ca.proxy.lib.sfu.ca/census/

Statistics Canada. (2014b). 2011 Profile of Census Tracts. Retrieved February 2, 2015, from http://datacentre.chass.utoronto.ca.proxy.lib.sfu.ca/census/2011/index.html

Translink. (2013). *Frequent Transit Network in Metro Vancouver*.

Troped, P. J., Saunders, R. P., Pate, R. R., Reininger, B., & Addy, C. L. (2003). Correlates of recreational and transportation physical activity among adults in a New England community. *Preventive Medicine*, *37*(4), 304–310. http://doi.org/10.1016/S0091-7435(03)00137-3

U.S. Department of Health and Human Services. (1996). Physical activity and health: a report of the Surgeon General, 1–18. http://doi.org/10.1006/pmed.2000.0686

Urban Systems. (2003). *Maple Ridge Transportation Plan*.

WalkScore. (n.d.). WalkScore. Retrieved September 9, 2015, from https://www.walkscore.com

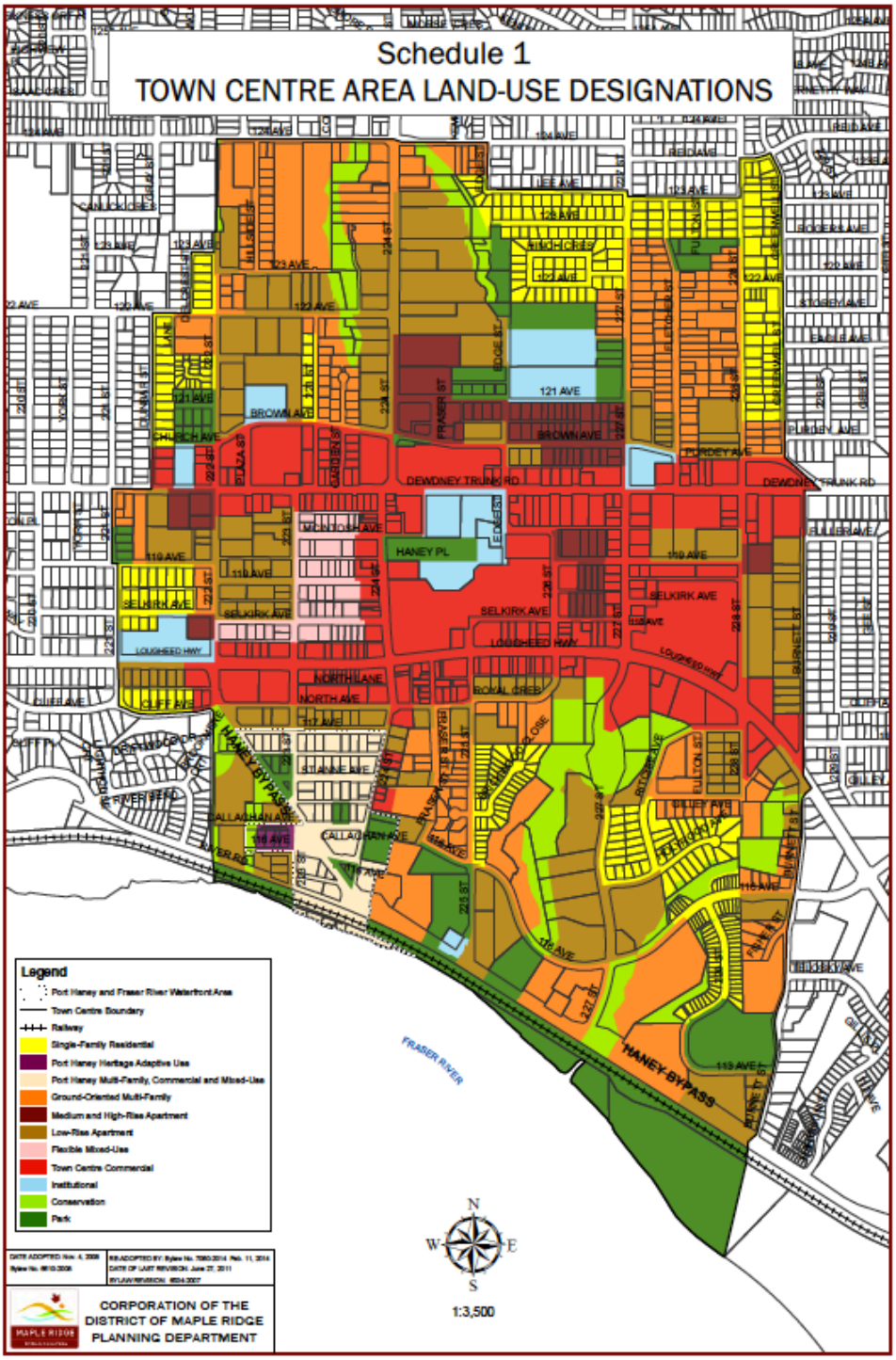
Wikipedia. (2016). Maple Ridge, BC. Retrieved November 29, 2015, from https://en.wikipedia.org/wiki/Maple_Ridge,_British_Columbia

Wineman, J. D., Marans, R. W., Schulz, A. J., van der Westhuizen, D. L., Mentz, G. B., & Max, P. (2014). Designing healthy neighborhoods: Contributions of the built environment to physical activity in Detroit. *Journal of Planning Education and Research*, *34*(2), 180–189. http://doi.org/10.1177/0739456X14531829

World Health Organization. (2003). WHO definition of Health. Retrieved November 17, 2015, from http://www.who.int/about/definition/en/print.html

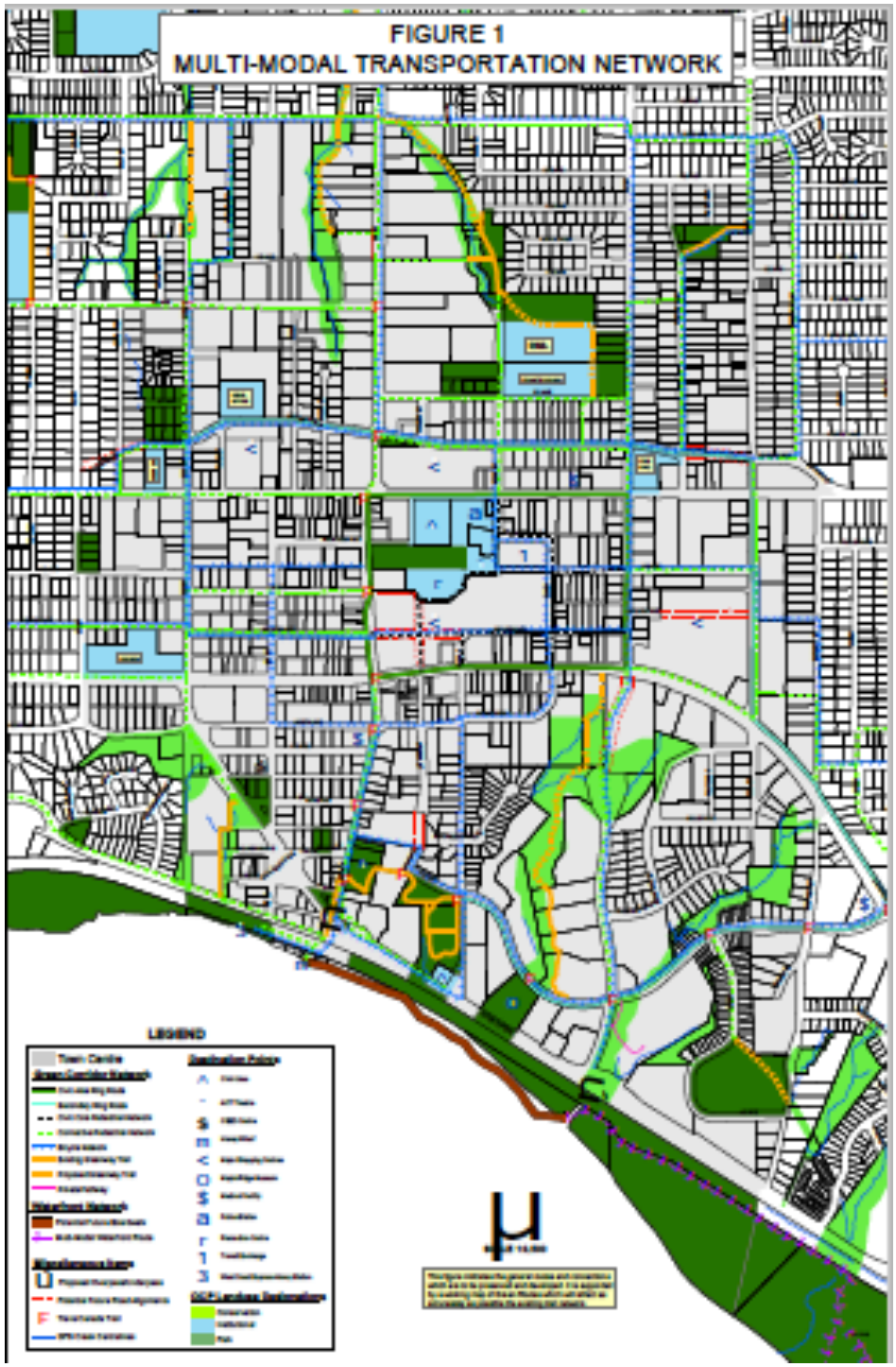
Appendix A.

Town Centre Study Area Boundaries



Appendix B.

Multi-Modal Transportation Network



Appendix C.

TCAP Goals and Objectives

1. Principle 1 Goal 1: Increase density and distribute a range of uses throughout the Centre

Objectives:

- Increase density for residential and non-residential land uses
- Incorporate a range of densities
- Incorporate mixed use development opportunities
- Ensure opportunities for living, working, shopping, and service provision
- Integrate waterfront development into the Centre
- Develop on currently undeveloped lots
- Create links between the Centre and other hubs within Maple Ridge

2. Principle 1 Goal 2: Enhance opportunities for personal development and recreation

Objectives:

- Provide educational/training facilities
- Enhance technological capabilities so people can take advantage of world opportunities
- Develop cultural facilities
- Improve recreation opportunities, particularly for youth
- Improve and secure public access to natural places, including streams and waterfront
- Provide more public green space within the core
- Promote the social integration of all ages and groups through shared or adjacent facilities and spaces
- Design easily accessed public spaces
- Ensure public safety and security, and accessibility throughout the Centre

3. Principle 2 Goal 1: Acknowledge and respect pedestrian needs

Objectives:

- Prioritize the safety of pedestrians
- Enhance pedestrian experience
- Designate pedestrian-only areas/no-car zones
- Enhance connectivity of pedestrian and other non-vehicular routes
- Utilize and upgrade laneways, sidewalks and other existing paths for pedestrians, bikes
- Design for short walking distances to reach daily needs
- Goal: Increase transit modes, availability and destinations

4. Principle 2 Goal 2: Increase transit modes, availability and destinations

Objectives:

- Establish an internal transit system for the Centre
- Increase the frequency of transit service both internally and to out-lying areas
- Consider other transit modes
- Link new Abernethy crossing to transit
- Increase and improve access from river to Centre
- Provide water transportation options
- Ensure public safety for all transportation modes

5. Principle 3 Goal 1: Preserve, enhance and capitalize on natural amenities and create new ones

Objectives:

- Respect and enhance riparian areas and water resources
- Maintain views of mountains
- Maintain access and views to Fraser River
- Protect and enhance a range of wildlife habitats
- Reinstate historical streams

6. Principle 3 Goal 2: Protect natural systems from the impacts of development

Objectives:

- Increase quality and amount of green space in the Centre
- Establish a green system that is linked throughout the Centre and beyond
- Reduce the generation of water pollution, air pollution and waste
- Manage pollution and waste with Best Management Practices (BMPs)

7. Principle: 4 Goal 1: Make it easier to be environmentally friendly

Objectives:

- Identify and act on appropriate urban ecology opportunities
- Provide incentives for the development of environmentally friendly buildings
- Have municipality adopt green building and infrastructure standards
- Educate on environmental benefits of growing smarter
- Increase quality, function and amount of mandatory public/open/green space built by developers

8. Principle 4 Goal 2: Combine new technologies with rediscovered approaches

Objectives:

- Incorporate alternative methods of power generation
- Require sustainable buildings and building systems
- Design buildings to adapt to future technologies and uses
- Minimize environmental impact of erosion and waste disposal during construction
- Adaptively reuse existing buildings, including heritage buildings
- Manage urban stormwater with green infrastructure methods
- Develop green infrastructure that provides for multiple land uses

9. Principle: 5 Goal 1: Increase housing options to provide for all ages, economic status, and life stages

Objectives:

- Integrate housing for all demographics

- Ensure a variety of housing types and tenures that are fully accessible and accommodate special needs
- Integrate affordable housing/low-cost housing with market housing
- Improve rental housing stock and options
- Improve housing quality and range of housing types
- Design housing for flexibility of use over its lifetime
- Design housing to strengthen social relationships
- Provide housing for people in transition

10. Principle 5 Goal 2: Increase density in the Centre by integrating housing with other uses

Objectives:

- Increase residential density and identify density limits
- Integrate housing with other uses at the scale of both building and block
- Establish attractive form and character and mitigate noise to make housing in the centre desirable

11. Principle 6 Goal 1: Encourage all types of jobs, including new and non-traditional businesses and workplaces

Objectives:

- Provide an educational centre to train for jobs and to provide teaching and other jobs
- Increase civic development and retail development for job creation
- Incorporate high tech, internet, home businesses
- Incorporate live/work and work/live developments
- Welcome unique industries/business opportunities
- Make zoning and bylaws less restrictive for location and form of business premises, while retaining a positive sense of community
- Promote the film industry
- Promote the tourism industry

12. Principle 6 Goal 2: Attract investment by supporting business needs

Objectives:

- Attract investment in housing and business ventures
- Densify the Centre to provide a customer base for businesses
- Identify and promote niche markets for business
- Develop the industry potential already present in Maple Ridge and support local businesses
- Pre-install technological infrastructure in buildings to attract businesses
- Streamline development approval processes and provide incentives
- Provide venues to support arts and crafts businesses

13. Principle 7 Goal 1: Cultivate an identity that grows from the heart of the community

Objectives:

- Develop the “caring” identity of Maple Ridge
- Ensure that historical and cultural assets are respected and celebrated
- Feature the natural beauty and amenities of the place
- Establish development guidelines that respect local heritage, natural settings and attributes
- Support the arts in the community
- Encourage art in public and private spaces
- Enhance the urban public environment

14. Principle 7 Goal 2: Establish the Centre as a hub of activity

Objectives:

- Increase tourism
- Provide opportunities for festivals and community events
- Provide more entertainment and education venues
- Encourage evening activities that cater to a broad demographic while benefitting the community
- Utilize park space for daily activities as well as special events

- Create easily accessible routes to key destinations
- Encourage symbiotic relationships among and between lands and land users
- Support and encourage the vitality of small business

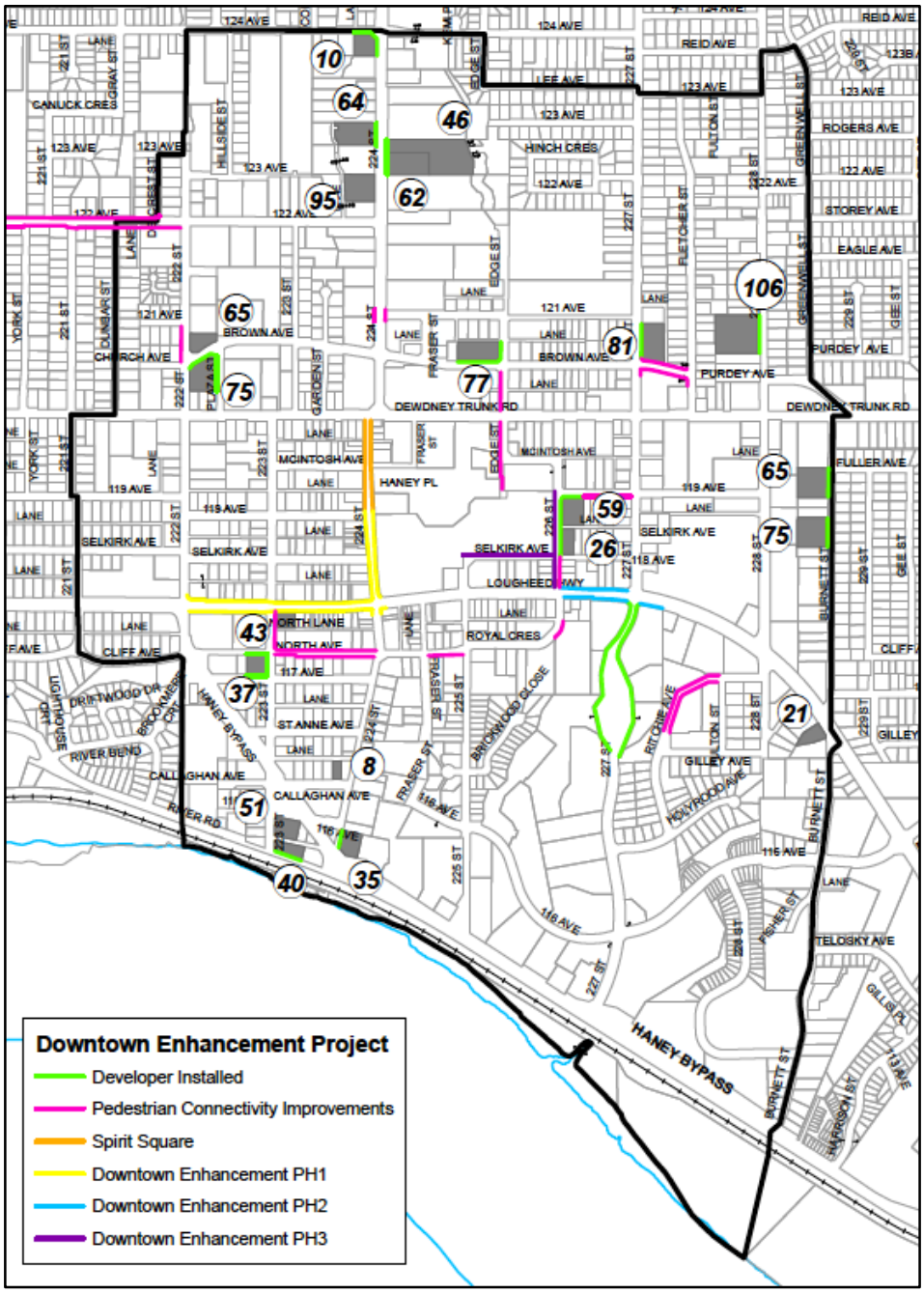
Appendix D.

NVivo Themes

Alternatives to the car	Long Term Process
Area Plan influence	Mixed Use
Capital Works	Multi-modal transportation
City Investment	Open space
Complete Community	Parking
Existing Context	Pedestrian
Gathering Space	Pedestrian Realm
Green Space	Regional Plan
Health	Residential Density
History	Sidewalks
Implementation	Smart Growth
Incentive Program	Sustainability
Influences on Walking	Trails
	Walkability

Appendix E.

Building Permits and Sidewalk Improvements



Appendix F.

TCAP 8 Guiding Sustainability Principles

The Smart Growth on the Ground Project resulted in 8 Guiding Sustainability Principles that are reflected in the Town Centre Area Plan. Those Principles are:

1. Each Neighbourhood is Complete

Smart Growth on the Ground communities allow residents to have the option to live, work, shop and play in the same local area. Compact, complete communities use land and infrastructure more efficiently, while providing more living choices for residents and local employees. Complete communities can reduce per capita expenditure on cars and per capita production of air pollution by over 40%. This means more money in our pockets and less congestion on our streets.

2. Options to Our Cars Exist

Smart Growth on the Ground Communities reduce the emphasis on automobiles, and provide for other transportation choices. Compact neighbourhoods with an interconnected street network are convenient for walking and cycling, and can provide enough residential density and mix of uses to create a large ridership base for transit. Transportation choices reduce congestion and pollution, and allow residents who cannot drive (such as children, seniors, and people with disabilities) to access daily activities on their own.

3. Work in Harmony with Natural Systems

Smart Growth on the Ground Communities respect, maintain, and restore the natural functioning of the landscape. Communities can be more environmentally friendly, energy efficient, and cost effective, by respecting natural eco-systems -- particularly river and stream systems and their associated aquatic habitat.

4. Buildings and Infrastructure are Greener and Smarter

Smart Growth in the Ground Communities optimize the economic, social and ecological impact of buildings and infrastructure. Innovative development standards, such as “green”

infrastructure and buildings or natural drainage systems, can result in lower impact solutions that cost municipalities, residents and businesses much less over the long term.

5. Housing Serves Many Needs

Smart Growth on the Ground communities incorporate a variety of housing in the same neighbourhood and even on the same street. A mix of housing types (both owner and for rent) allows residents to live in the same community throughout their life, and recognizes the increase in non-traditional households such as empty nesters, single parent families, and childless couples. A range of housing also allows lower income residents (such as seniors on fixed income or recent university graduates) equal access to community amenities and local employment opportunities.

6. Jobs are Close to Home

Smart Growth on the Ground Communities foster sustainable economic growth. Local economic growth allows many residents to find employment close to home and supports local businesses, while making the best use of existing infrastructure.

7. The Centre is Attractive, Distinctive and Vibrant

Smart Growth on the Ground communities are animated, diverse, and have a strong local identity. The cultural heritage of the community is celebrated in functional and meaningful ways, and are incorporated into the vibrant neighbourhood and town centres as focal points for community interaction.

8. Everyone Has a Voice

Smart Growth on the Ground Communities belong to those who live, work and play there. Meaningful participation includes an early and on-going role for community members by engaging them in planning, design and development processes. This ensures that new development is accepted by existing stakeholders and responds to local needs