MOVING THE GVRD FORWARD: MAKING THE CASE FOR REGIONAL RAIL

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ABSTRACT

This research study makes the case for the development of a regional rail system south of the Fraser River in the Greater Vancouver Regional District, based upon current policy debate and public opinion.

The study establishes a case for regional rail based on the history of rail transportation planning in the GVRD, arguments of climate change, Peak Oil and fuel prices, traffic congestion and the Gateway Program and the current urban rail debate, all of which are apparent in the current policy debates. The study also tests to determine how well this awareness corresponds with the public opinions collected in an online survey, targeted at GVRD residents who travel within the region.

The results of this study were that, for the GVRD, a case can be made for the development of a regional rail system, with support from both policy debate and public opinion.

Keywords: Regional/Urban Rail; Greater Vancouver Regional District

Subject Terms: Greater Vancouver Regional District -- Regional/Urban Rail
Urban Transportation System -- Greater Vancouver Regional District

DEDICATION

To Nathan for his support and to my parents for providing the opportunity.

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GLOSSARY OF TERMS

Convenience Sample: Sample of data taken from the universe according to the researcher's convenience.

Cross-Sectional Sample: A description of a particular phenomenon at a particular point in time.

Gateway Program: A Provincial program composed of proposed transportation projects that will address the movement of people and goods through the Greater Vancouver region.

Geographic Information System (GIS): Integrated computer tool used for handling, processing and analysing geographic data that is explicitly referenced to the surface of the earth.

Greater Vancouver Regional District (GVRD): The GVRD is a partnership of 21 municipalities and 1 electoral area that make up the metropolitan area of Greater Vancouver, which is geographically divided by the Fraser River, in an East-West direction.

Greater Vancouver Transportation Authority: Regional organisation that plans, funds, implements and maintains GVRD transportation system. Administration of service contracts with subsidiary companies and contractors, the management of capital projects, financial management and planning public affairs and supporting business functions. See also: TransLink.

Hubbert, Marion King: Geophysicist, creator of Peak Oil Theory.

Light Rail Transit (LRT): Generally defined as an electric railway with a light volume traffic capacity compared to heavy rail. Light rail may use shared or exclusive rights-of-way, high or low platform loading and multi-car trains or single cars. However, not all light rail lines are electrically powered. While similar in operation, SkyTrain is not LRT, as it operates with a third rail, not overhead cables.

Listserv: An email distribution list, maintained by a group or organisation. Generally focused on a specific topic related to the group or organisation.

Livable Region Strategic Plan (LRSP): Greater Vancouver Regional District regional growth strategy, adopted by the GVRD Board with the formal support of member municipalities in 1996.

Non-Probabilistic Sample: A sample drawn arbitrarily without a specific probability structure in mind; individuals are selected because of their availability, geographical proximity or willingness to participate in the study.

North of Fraser (region): Greater Vancouver municipalities located north of the Fraser River. Includes all GVRD municipalities outside of Delta, Langley City, Langley Township, Surrey and White Rock.

Peak Oil: Concerns the long-term rate of conventional petroleum and other fossil fuel extraction and depletion. Created by American geophysicist Marion King Hubbert.

Pre-Test Survey: Survey conducted prior to the primary survey dissemination. Used to review and edit survey questions, and used to validate the final results.

Primary Data: Original, systematically collected elements of information about the world.

Port Mann Bridge: 5-Lane bridge that spans the Fraser River, connecting Surrey with New Westminster and Burnaby.

Regional Rail System: A rail system that provides service between a Central Business District (CBD) and suburbs or other locations that draw large numbers of people on a daily basis. Occasionally referred to as commuter trains, due to their use by commuters. Traditionally characterised by heavy rail. However, in the context of this research, refers to a regionally operated system of rail transit, using multiple modes of rail, including Light Rail and Medium Capacity Rail.

Sample Size: Number of people within the sampling frame that are solicited for participation in the study.

Sampling Frame: A method for identifying and locating eligible participants for a research study.

Sampling Method: Method in which members of the sampling frame are selected. See also: Non-Probabilistic Sampling.

Secondary Data: Pre-collected elements of information about the world.

SkyTrain: Medium Capacity Automated Rail transit system currently in use in the GVRD. SkyTrain runs on a separated, elevated grade, and is fully automated. Also referred to as Intermediate Capacity Transportation System.

Snowball Sample: Sampling method that relies on referrals from initial subjects to generate additional subjects. Technique can dramatically lower search costs, but comes at the expense of introducing bias because the technique itself reduces the likelihood that the sample will represent a good cross section from the population.

South of Fraser (region): Greater Vancouver municipalities located south of the Fraser River. Includes Delta, Langley City, Langley Township, Surrey and White Rock. While geographically located south of the Fraser River, Richmond is not included in the South of Fraser Region.

SPSS: Quantitative coding software, designed to analyse quantitative data.

Transport 2021: Medium- and long-term GVRD transportation planning document developed jointly by the GVRD and the BC Provincial Government. Focuses on three interlocking elements -- managing land use, managing transportation demand and managing transportation supply.

Target Population: The population a research study aims to approximate; population generally informed by the objectives of the study.

TransLink: British Columbia Provincial Government organisation involved with transportation planning, administration of service contracts with subsidiary companies and contractors, the management of capital projects, financial management and planning public affairs and supporting business functions. See also: Greater Vancouver Transportation Authority.

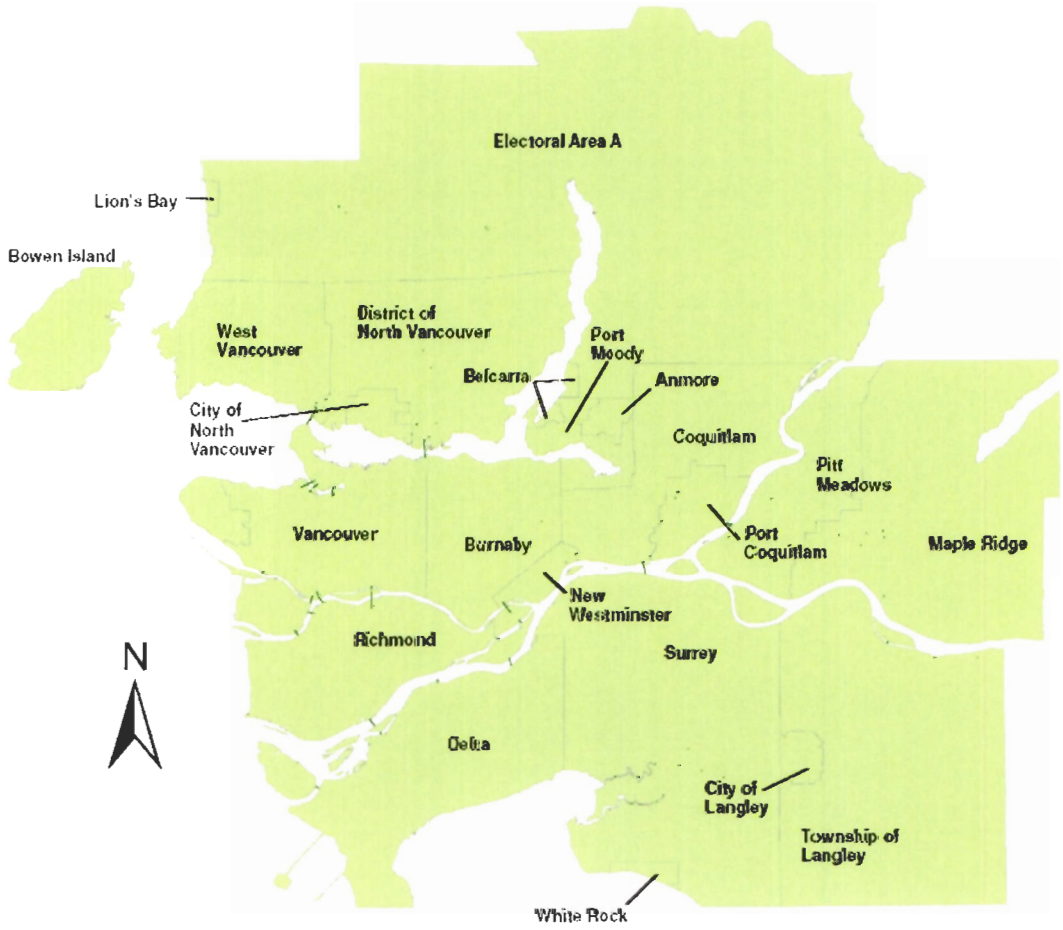
URL: Uniform Resource Locators. The global address of documents and other resources on the World Wide Web

Validation: The extent to which a research instrument measures what it is intended to measure.

1 INTRODUCTION

In the Southwest corner of British Columbia, the Greater Vancouver Regional District (GVRD) is home to over 2 million residents (BC Stats, 2006a). The region is bounded by the Pacific Ocean to the west, the USA border to the south and mountain ranges to the east and north (please see Figure 1.1). As a geographically restricted region, traffic congestion is a significant concern for residents who travel long distances within the region.

Figure 1.1: Greater Vancouver Regional District



Governing the GVRD is a board of elected officials from the member municipalities. The GVRD Board was established by the British Columbia (BC) provincial government in 1965 with the mandate to provide regional services throughout the region. One of the greatest contributions that the GVRD Board has made to regional planning is the Livable Region Strategic Plan (LRSP), which was ratified in 1996. This plan coordinated several previous regional plans to create a cohesive growth strategy for the region, including where and how the region's rail transit system should be developed. The regional transportation plans specifically were derived from the predecessors to the Transport 2021 plan, which outlines medium- to long-term regional transportation developments.

In 1985, the first line of the GVRD automated rail transit system, SkyTrain, opened for public use. SkyTrain is a medium capacity automated rail technology that is fully separated from traffic on its own guided right-of-way. While rail transit was outlined for development in the Transport 2021 plan, the SkyTrain system was essentially developed as a legacy project for the 1986 World's Fair, which was held in Vancouver. The original SkyTrain line ran from downtown Vancouver to New Westminster. In 1989, a bridge was built specifically for the SkyTrain across the Fraser River, bringing SkyTrain into Surrey, terminating at the newly built Scott Road Station. In 1994, the SkyTrain was further extended into Surrey, with three new stations: Gateway, Surrey Central and King George, for a total of 28.9 km of track (Gregg, 2003).

This first SkyTrain line, the Expo line, has been found to be successful based on many factors, including high ridership numbers, its cost-effectiveness and its overall promotion of the public transit system (Babalik-Sutcliffe, 2002). Regional governmental cooperation is also often cited as one of the main reasons for the Expo line's success (Mackett and Babalik-Sutcliffe, 2003). The four municipalities that the Expo line runs through (Vancouver, Burnaby, New Westminster and Surrey), agreed on the planning policies and techniques to help foster growth in the areas surrounding the SkyTrain stations and have been successful in their attempts (Schiller and Kenworthy, 1999). Densification efforts around the stations can be found in the form of high-rise residential condominium developments and Regional Town Centres[1]. However, there has been some debate regarding the impact that Regional Town Centres have had in the promotion of densification in those areas. This issue will be further discussed in Section 2.1.1.

[1] For a description of the regional town centres, please see Section 2.1.1

Due to rapidly expanding population growth, the BC Provincial Government decided to build a second SkyTrain line along the Broadway-Lougheed corridor. This corridor runs through East Vancouver, North Burnaby and New Westminster, and is represented by the yellow line in Figure 1.2 (Rapid Transit Project 2000, 2003). Because of the development timeline (the beginning of the 21st Century), the new SkyTrain line was christened the Millennium line. The majority of the Millennium line was completed in 2001, with the final station (VCC-Clark) completed in 2003 (Rapid Transit Project 2000, 2003). The new Millennium line, fully completed, is 20.3 km long, and connects at each end to the Expo line.

Whether because of its length of time in operation or the communities that it travels through, the Expo Line consistently recovers its operating expenses from fare traffic, while the Millennium Line is still well below the original projected ridership numbers (Luba, 2005). At the same time though, it has been shown that in conjunction with other TransLink programs[2], the Millennium Line has helped to increase ridership on the overall transit system by almost 12% (between 2002 and 2003) (City of Vancouver, 2004).

In 2003, the City of Vancouver won the bid for the 2010 Winter Olympic Games. As a part of the bid package, the Greater Vancouver Transportation Authority (TransLink) and the BC Government committed to build a rapid transit line which would run from downtown Vancouver to the Vancouver International Airport in Richmond. The construction of this rail line[3], officially known as the Canada Line, began in 2006 and is expected to be completed in 2009, in time for the Olympic Games. It is important to note that TransLink only agreed to the development of the Canada Line on the condition that the Provincial Government help to fund the Evergreen Light Rapid Transit (LRT) Line (in the Northeast sector) and that the Vancouver International Airport fund the airport section of the Canada Line (TransLink, 2007a).

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[2] Programs including the U-Pass program for university students and an increase in the bus fleet.

[3] While automated and operating on a third rail, the Canada Line will not be SkyTrain technology, and will not be integrated with the existing SkyTrain lines. However, it will connect with the Waterfront Station.

Figure 1.2: GVRD SkyTrain Route Map

However, with all of the rapid rail transit development in the GVRD, the majority of the stations are located north of the Fraser River, with the exception of four stations in North Surrey: Scott Road, Gateway, Surrey Central and King George. According to TransLink's South of Fraser Area Transit Plan, the South of Fraser Region (Delta, Langley City, Langley Township, Surrey and White Rock) contains approximately 600,000 people, which accounts for 30% of the GVRD population (BC Stats, 2006b; TransLink, 2006a). The GVRD forecasts that the population of the entire region will reach 2.7 million by 2021 (GVRD, 2005a). The same report shows that Surrey's population alone will increase to a forecasted 637,381 by 2031, a 62.0% increase over the current population count of 394,976 in 2006 (Census Canada, 2007).

With large population growth comes an increase in the number of registered vehicles in the GVRD and a corresponding increase in the infrastructural and service demands for mobility around the region. In 2000, there were approximately 1.1 million registered vehicles in the GVRD (GVRD and ICBC, 2006). At the beginning of 2006, this number had increased to 1.3 million registered vehicles, an increase of 20% (Ibid). The impact of the increase in registered vehicles can be seen in the congestion on major GVRD thoroughfares; a GVRD staff report indicates that a major GVRD arterial bridge, the Port

Mann Bridge, has rush hour level congestion for an average 13 hours each day (Leicester, 2006). As Mackett and Babalik-Sutcliffe (2003) rightly point out, the ability to create attractive transportation alternatives is fundamental to enticing drivers out of their cars.

1.1 Framing the Research

How do we go about determining what would entice drivers out of their cars? This research project is focused on determining whether a case can be made for a regional rail transit system development south of the Fraser River in the GVRD. In the context of this research, a regional rail system does not refer to the type of rail used, but on the fact that it is a rail system that spans the GVRD. With a lack of alternatives to the private automobile or bus transit in the south of Fraser region, what will help to convince drivers to leave their cars at home, and is rail a viable option to that end?

There are two components to making the case for regional rail. The first component to making the case is to determine if the policy documentation and literature review shows that alternatives to fossil fuel burning automobiles and the personal automobile are needed. The second component to making the case is to determine if the majority of respondents to an online survey agree that they would use regional rail if it were developed.

To help determine if these two components are true, the following research question was used to drive the research development:

> Based on current policy debate and public opinion, can a case be made for the development of a regional rail system south of the Fraser River in the Greater Vancouver Regional District?

This study establishes a case for regional rail based on the history of public rail transit development in the GVRD, as well as with arguments of climate change, Peak Oil and fuel prices, traffic congestion and the Gateway Program and the urban rail debate, all of which are present in the current policy debates. It then tests to determine how well this awareness corresponds with public opinion collected in an online survey. To help clarify and solidify the research question, the following two sub-questions were used:

- How do level of service concerns and preferences figure into GVRD residents' support of the development of regional rail and the use of public transit?

- How does the current state and location of rail infrastructure figure into GVRD residents' support of the development of regional rail?

The next section will cover the document analysis that was conducted. It will also discuss the methodology behind the design and dissemination of the online opinion survey. The third section will outline the results and analysis of the opinion survey that was distributed. The final section will conclude the research project and suggest possible topics for future research.

2 MAKING THE CASE – RESEARCH CASE DETAILS

To make the case for a regional rail system south of the Fraser River, two research methods were used. The first was a document analysis in which a significant amount of literature was reviewed, including scholarly journals, newspaper and magazine articles, published books, governmental memos and policy documents. The second method was an online survey, designed to collect the opinions of GVRD residents towards the development of a regional rail system south of the Fraser River. The document analysis provided the policy case for regional rail transit, looking at the history of transportation development within the GVRD, climate change and Peak Oil, traffic congestion and the BC Government Gateway Program and regional rail as a public transit option. The opinion survey provided the case for community agreement. Many arguments can be made for a regional rail system in the abstract; however, without popular support, it cannot succeed.

2.1 Planning, Policy and Changing Behaviours

With changing climate and fuel futures, policy makers must explore alternative transportation options that will help change automobile dependent behaviours. While building new transportation infrastructure for the automobile may build us out of traffic congestion, the increase in automobiles on the road will contribute to a decrease in regional air quality and accelerate climate change.

2.1.1 The GVRD Experience - Regional Context

The GVRD is a Provincial Regional District, composed of 21 member municipalities and one electoral district, which is governed by a board of appointed members who represent the member municipalities. The GVRD Board is a unique governance body, the only one of its kind in Canada. Established in 1965 by provincial legislation, the GVRD provides government services to unincorporated areas and a comprehensive, cooperative planning structure for municipalities in the region (Government of Canada,

2006a). In 1983, the BC Government amended the Municipal Act that gave the GVRD its power -- this amendment eliminated regional planning as a statutory function, essentially removing any power the GVRD Board had to implement regional changes (Ibid). However, many municipalities in the GVRD continued to work with the GVRD Board to achieve regional planning goals. Because of this, in 1995, the BC Government once again amended the Municipal Act, reinstating the GVRD powers for regional planning. The planning powers were granted in such a way as to encourage collaboration between the member municipalities and regional district (Government of Canada, 2006b). However, the GVRD Board's powers to enforce changes within the region were not fully restored.

One of the largest contributions of the GVRD Board to coordinated long-term regional planning is the Livable Region Strategic Plan (LRSP). The LRSP is a regional growth strategy that outlines where and how development in the region should occur[4]. The LRSP is organised into four main principles/goals: Protect the Green Zone, Built Complete Communities, Achieve a Compact Metropolitan Region and Increase Transportation Choice. Two major components of the LRSP discussed in this paper are the Regional Town Centres and the development of the GVRD rail transit system, SkyTrain[5].

In 1996, all of the GVRD member municipalities adopted the LRSP as the regional growth strategy and agreed to use the LRSP as a planning guideline (GVRD, 2004). In 2001, the GVRD Board decided to review the LRSP because of the perception that social and economic issues had been receiving inadequate attention under the LRSP, and that even some environmental issues had been addressed in a somewhat fragmented way (Government of Canada, 2006b). This review shows that the regional Board is actively concerned about both its residents and its environment.

While the LRSP outlines strategies for regional transit development, the GVRD Board has no legislated transit planning authority within the region. In 1980, the BC Government implemented the Urban Transportation Authority Act, which gave the GVRD taxation sources to fund regional transportation projects, as well as the authority to

[4] A copy of the 1996 LRSP can be found on the GVRD website: http://www.gvrd.bc.ca/growth/lrsp.htm
[5] For a map of the Regional Town Centres outlined in the LRSP, please see Appendix 3.

determine fares and service level targets on the regional transit system. However, just 2 years later, all planning and funding functions were given to the Urban Transit Authority, by then known as BC Transit (Meligrana, 1999). As such, the GVRD has a directive to plan for the region's transit system, but has limited authority over the enforcement of those plans. The GVRD does have some impact on transportation planning in the region, as the TransLink Board was created as a subset of the GVRD Board, giving the GVRD indirect control over transportation planning decisions. The GVTA Act also mandates that the TransLink medium- and long-term plan, Transport 2021, must support the LRSP (BC Government, 1998).

Today, all GVRD transit planning and operations are delivered by the Greater Vancouver Transportation Authority (GVTA). The GVTA was created in 1999 though an agreement between the GVRD and the BC Government. This organisational body is named TransLink, and in 2007 consists of an appointed board of 15 members: 12 regional members and 3 Provincial Government members. TransLink organises the contracts of subsidiary companies that operate transit services within the region, including Coast Mountain Bus Company (regional buses) and BC Rapid Transit Company (SkyTrain) (TransLink, 2007b).

When first developed, SkyTrain was a legacy project for the region, with some uncertainty as to its future success. However, the success of the Expo has been due in large part to the implementation of regional governmental cooperation, the development of planned mixed-use and residential development adjacent to SkyTrain stations and a strong downtown Central Business District (CBD) in Vancouver (where the Expo Line terminates).

The Regional Town Centres defined within the LRSP are locations designed to accommodate a large share of the region's future higher density commercial and residential growth with a high level of transit access and interconnection (GVRD, 1996). The Regional Town Centres outlined in the LRSP were put into place around three of the Expo Line SkyTrain stations (Metrotown in Burnaby, New Westminster Quay in New Westminster and Surrey Central in Surrey) (Babalik-Sutcliffe, 2002; Mackett and Babalik-Sutcliffe, 2003; Schiller and Kenworthy, 1999). However, there has been some debate regarding the effectiveness of the Regional Town Centre concept. When

reviewing the example of Metrotown, it can be seen that there is little residential development directly around the station, and there is poor access to the station itself (GVRD, 2005b).

As discussed above, the GVRD has no direct power to implement transportation plans within the region (Adler, 1988; Babalik-Sutcliffe, 2002). Although identified in the LRSP as a suitable corridor for rail transit development, when the Millennium Line was finished in 2003, its development was based more upon provincial political boundaries than on municipal and regional needs[6] (Cho and Rosta, 2001; ENR, 2001; Gregg, 2003). The final route of the Millennium Line was also not the exact identified route in the LRSP – the original route was planned to run from Broadway Station in Vancouver to Coquitlam Centre in Coquitlam. However, the final route, as shown in Figure 1.2, is from Broadway Station in a loop through North Burnaby to Columbia Station in New Westminster.

Showing the foresight of the LRSP, though, Municipal Town Centres have been developed around two Millennium Line stations. Similar to Regional Town Centres, Municipal Town Centres are intended to provide business and community facilities with medium- and high-density residential developments. The Municipal Town Centres have helped to densify the local neighbourhoods and increase ridership on the transit system; the Brentwood and Lougheed Town Centres, both in North Burnaby, saw increased densification as a result of the Millennium SkyTrain line (Babalik-Sutcliffe, 2002)[7].

The most recent GVRD rail transit line, the Canada Line, is being developed as a link to the Vancouver International Airport from the Vancouver CBD and its completion will coincide with the Vancouver 2010 Winter Olympics. The planned route can be seen in Figure 2.1. This new rail transit line will not be SkyTrain, as it will not use linear induction motor technology (as is the case with SkyTrain) (Canada Line, 2007). However, it may still be named SkyTrain to avoid confusion for riders.

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[6] The original plan for the Lougheed-Broadway corridor development was to be LRT, not SkyTrain, and was to run from Broadway Station to Coquitlam Town Centre as a single line.

[7] Municipal Town Centres are identified in the LRSP as locations intended to provide business and community facilities, together with opportunities for medium and higher density residential development in both ground-oriented housing and apartments.

Figure 2.1: Proposed Canada Line Route and Station Placement

The new rail line will run from Downtown Vancouver to Richmond, with a branch line running out to the airport. There has been much debate about the wisdom of the Canada line due to the very large cost it represents (estimates place the capital cost at $1.9 billion, in 2003 dollars), its ambiguous relationship with the 2010 Winter Olympics[8] and

[8] The BC Government has denied the Olympics as being a reason for development of the Canada Line.

the dubious nature of the decision making process among the regional, provincial and federal governments[9] (Canada Line, 2006; McGillivray, 2006).

Because of the Canada Line, there have been arguments made against the development of more SkyTrain lines (Cambie Boulevard Heritage Society, 2004a). The LRSP outlined that the Northeast Sector rail line should be built first (originally as a part of the Millennium Line), and the airport rail line be built after that. When the Canada Line was first proposed as a component to win the Olympic Games bid, many GVRD residents felt that the development was pushed forward without enough community input, and that the Olympics were dictating the development in the region (BEST, 2003; Cambie Boulevard Heritage Society, 2004b). The Canada Line (originally named RAV Line -- Richmond Airport Vancouver) has a planned route up the Cambie Street corridor, a heritage site. However, there is an existing rail right-of-way up the Arbutus Street corridor[10]. During the time of the debate, the Arbutus line was active, with 1-2 cars moving along the line per day.

Because the Arbutus corridor option received greater public resistance, the planning team chose the Cambie corridor. The Arbutus corridor was also considered to be the less attractive option as a rapid transit corridor[11]. Many felt that the Arbutus corridor was passed over because that neighbourhood is much more affluent than that surrounding the Cambie one (Cambie Boulevard Heritage Society, 2004a).

With the Canada Line development, the South of Fraser Region remains with only four rapid rail transit stations (all SkyTrain). The cities of Vancouver, Burnaby, Richmond and New Westminster have a history of urban densification and rail based urban transit, while the cities in the South of Fraser region have historically been rural and much less dense, creating a difficult situation for transit development. However, the municipalities in the South of Fraser area are among the fastest growing in the GVRD, and with proper city planning, they could see an increase in density.

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[9] TransLink Board voted twice to veto the development of the Canada Line, and only agreed to its development once the BC Government agreed to help fund the Evergreen Line and the Vancouver International Airport agreed to fund the airport portion of the line.

[10] Please see Appendix 4 for a map of the two corridors.

[11] The Arbutus corridor contains more residential development and lower commercial density.

Even with this lack of urban rail transit history in the South of Fraser region, it is often pointed out by residents in that area, there currently exists a rail right-of-way in the South of Fraser region, which originally carried public transit passenger and freight trains. This regional Interurban rail passenger and freight rail system was fully completed in 1910. At the peak of its service during the depression era, it ran from Vancouver to Chilliwack in the Fraser Valley. It was owned and operated by BC Electric (now BC Hydro), and was fully powered by electricity. However, due to competing interests with the automobile, it was completely removed from service in 1970 (Fraser Valley Guide, 2005; Wyatt, 2001).

Due to public interest in the Interurban right-of-way, TransLink commissioned a technical study to determine the feasibility of using the Interurban infrastructure. Since the completion of the online survey, the technical report was released by TransLink (DRL Solutions Inc., 2007). The technical report indicates that there is a long-term possibility of developing the old interurban infrastructure for public rail transit (within the next 25-50 years), but not in the short-term. The report also found that the corridor is not in a projected growth area for Surrey, rendering it less useful for transit development. However, the report also maintains that the corridor should be protected for possible future use (Ibid).

2.1.2 The Gateway Program & Traffic Congestion - Does One Solve the Other?

In the GVRD, traffic congestion is often a cause of frustration for commuters and politicians alike (Boei, 2006; Leung, 2007; Skelton, 2006). As noted above, one key example of this is the traffic condition on the Port Mann Bridge -- it is congested an average of 13 hours per day (Leicester, 2006). The BC Government has developed a proposal (the Gateway Program) to increase road capacity in the GVRD (BC Government, 2007b). The plan outlines two new highways (the North and South Perimeter Routes), widening Highway 1 and twinning the Port Mann Bridge[12]. A map of the proposed updates can be seen in Figure 2.2 and Appendix 2.

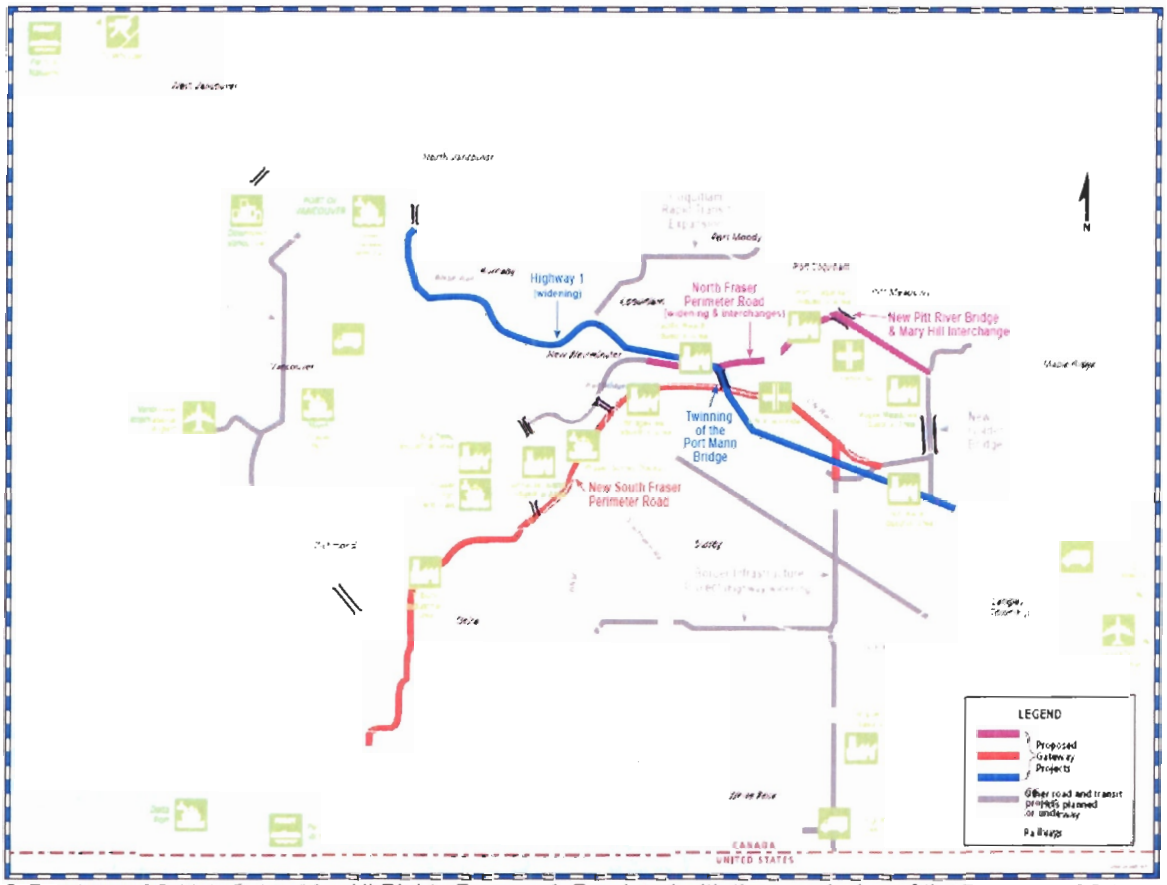
The BC Government's argument for increased road capacity is that BC needs more road capacity to open the province up as the Pacific Gateway to Asia. They argue that the

[12] For more information on the Gateway Program proposals, please see http://www.th.gov.bc.ca/gateway/index.htm

current cost of traffic congestion for the trucking industry is too great; with the increase in roads, goods movement will increase and improve. However, as evidenced in Braess' Paradox, increases to road capacity will only alleviate congestion in the short-term, creating opportunity for greater congestion in the future (Braess et al., 2005; Vuchic, 2000; Yang and Bell, 1998). This argument has also been applied to the Gateway Program by local critics (Boei, 2006; Democratic Reform BC, 2006; Leicester, 2006).

Other arguments have been raised against the Gateway Program, including that the issue with goods movement in the region actually stem from the Port Authority only allowing limited access to the Port during the day (i.e. there currently is no 24-hour access for loading and unloading cargo). One additional argument made is that the majority of goods caught in traffic congestion are simply being shipped out of the province, and that traffic delays are a small part of the much longer trip.

Figure 2.2: Proposed Gateway Program Projects



Braess' Paradox occurs because, under existing road pricing methodology in the GVRD (with no restrictions on use), users will attempt to minimise their own travel time while ignoring the effect of their decisions on other travelers. Because users of GVRD road infrastructure are not required to pay for use, it is possible for the total system travel time to increase following the introduction of new transportation links in the system; as travelers are better off using the new link, they will contribute to increasing congestion for other travelers (Pas and Principio, 1997; Braess et al., 2005).

In the case of the Gateway Program, because road pricing measures (which require the user to pay for infrastructure use) are not being implemented on the new roads, congestion may decrease in the short term, but as the user attempts to minimise his or her travel time, the overall congestion within the system will increase. The Gateway developments will also provide easier access across the Port Mann Bridge, making the Fraser Valley more accessible than it is currently. This could potentially lead to an increase in sprawl and an overall increase in traffic on the Highway 1 corridor.

While focused primarily on road infrastructure development, there have been some provisions for public transit in the Gateway Program. Those transit improvements are outlined as increased cycling lanes on the Port Mann Bridge, dedicated infrastructure for bus service (including a median busway and queue jumping access) over the Port Mann Bridge and expansion of HOV lanes to Langley on Highway 1 (BC Government, 2006). The development of a rail link in the areas with planned road capacity increases has been rejected as too expensive and not effective enough to relieve congestion in the corridor (Leicester, 2006; McGillivray, 2006). Arguments are also made that the LRSP outlines that bus infrastructure (and not rail) should be implemented in many areas of the GVRD, especially in the South of Fraser region (GVRD, 1996).

The BC Government also did an assessment on the possibility of implementing a transit only solution for reducing congestion in the Highway 1 corridor (as opposed to widening Highway 1 and twinning the Port Mann Bridge) (Krajczar, 2003). The assessment found that a transit only solution would only decrease the morning peak hour westbound traffic by less than 350 vehicles, making a transit only option unrealistic for reducing congestion in the corridor.

While correct in their argument that a 350 vehicle reduction is not significant enough to develop a transit only option in the Highway 1 corridor, the report's focus on peak hour travel may have prompted some questionable results. According to the 2004 Greater Vancouver Trip Diary Survey conducted by TransLink and the BC Ministry of Transportation, the majority of regional trips are made during off-peak hours, between 9:31 and 3:30 (TransLink, 2006b). Combined with the GVRD reports that the Port Mann Bridge experiences peak hour conditions for an average 13 hours per day, the Trip Diary results suggest that the BC Government should be reviewing how transit can help displace personal vehicle traffic throughout the entire day, and not just in peak hour periods.

As with all major transportation policy decisions, there need to be incentives and disincentives for new travel options. In the case of the Gateway Program, the BC Government should invest in multiple alternatives to the personal automobile alongside the investment in road infrastructure. Disincentives for travelling in a personal vehicle could be road tolls (specifically for personal automobiles), increased parking costs or increased insurance costs. Incentives for using transit could be increased income tax relief for transit users and the development of a convenient and reliable regional transit system. It is important to understand that neither roads nor transit alone can eliminate traffic congestion, but a combination of the two, with appropriate limitations on personal automobile use in place, may achieve that goal.

2.1.3 Climate Change & Peak Oil - Are They Real and do they Matter?

> *The understanding of anthropogenic warming and cooling influences on climate has improved since the Third Assessment Report (TAR), leading to very high confidence that the globally averaged net effect of human activities since 1750 has been one of warming.*
>
> (IPCC, 2007)

With the words "very high confidence", the Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report (FAR) on climate change gave serious weight to the fact that climate change is happening and that it is (very likely) caused by human activity (IPCC, 2007). The FAR indicates that there is a greater than 90% probability that climate

change is the direct result of human activity (Ibid). This is in contrast to the IPCC TAR released in 2001, which indicated there was a 66% degree of certainty that rising global temperatures were due to human activity (IPCC, 2001).

Prior to the release of the IPCC's FAR, public awareness of climate change and environmental issues had begun to increase. Both local and national media had increased their coverage of climate change, with arguments for and against the idea. As an example of this increased coverage, a media search conducted for the months December 2006 to February 2007 found 3434 results related to climate change in Canadian newspapers (search conducted within the ProQuest Canadian Newspaper database). A search in the same time frame in the previous year (December 2005 and February 2006) found 1218 results related to climate change.

The increase in media coverage has given the impression that a tipping point in climate change awareness has been reached. The Tipping Point is an idea made popular by Malcolm Gladwell (2000) in his book of the same name. The Tipping Point is essentially the point at which the rate of a particular process proceeds to increase dramatically[13]. This notion is hard to quantify, but the IPCC FAR has lent more weight to the argument that we have reached such a tipping point and that changes in human behaviour must happen.

Even though a tipping point in climate change awareness has been reached, one for personal behaviours has not. A survey of Canadians found that 68% of the respondents felt they were more worried about climate change than they were a year ago (Vancouver Sun, 2007). However, in contrast to this, the sale of large Sport Utility Vehicles (SUVs) in Canada increased in 2006 by 17% over 2005 levels (Keenan, 2007). According to a poll conducted by Maritz Research, Canadian automobile consumers indicated that the environmental friendliness of their new vehicle ranked 23rd among 26 reasons for the purchase (Ibid). Based on this, it appears that a change in personal choices may take much longer to occur than a change in opinion. This may also be a reflection of the fact that policy changes often take longer to come about; without a policy structure to govern the SUV buying behaviour (and other climate damaging behaviours), it will continue until the behaviour becomes socially unacceptable.

[13] For more information, please visit the following webpage: http://www.gladwell.com/tippingpoint/index.html

As outlined in the IPCC's FAR, one key factor in rising global temperatures is the increase in fossil fuel emissions from human sources. Colvile et al. (2001) point out that the first automotive emission controls were motivated by the infamous Los Angeles smog in the 1950s and 1960s. The photochemical smog that hovered over the Los Angeles region was produced by the action of sunlight reacting with oxides of nitrogen and hydrocarbons -- the very chemicals emitted from the growing automobile population. However, even with the implemented restrictive measures placed on automobiles (and the level of emissions from them), automotive transportation is a primary cause of the observed decline in global urban air quality because of the extreme rate of growth in the use of fossil fuel burning vehicles (Lyons et al., 2003).

Partially in response to growing concerns of climate change, the BC Government outlined a new climate action plan for the province in the February 13, 2007 Throne Speech. The climate action plan outlined very clear and exceptionally ambitious targets for the reduction of Greenhouse Gas (GHG) emissions. The BC Government has stated that they will "...aim to reduce greenhouse gas emissions by at least 33 percent below current levels by 2020" (BC Government, 2007a). This very bold plan was supplemented with interim targets (yet to be established) for 2012 and 2016, which will be measured and evaluated by a Climate Action Team that the BC Government will assemble for this purpose. This target for 2020, if achieved, will place BC's emissions of GHGs 10 percent below 1990 levels (Ibid). However, within the same Throne Speech, the BC Government outlined the importance of following through with the Gateway Program developments, which would see a dramatic increase of road capacity in the GVRD.

However, it was pointed out that the BC Government's new climate change reduction plan is in direct contravention to the Gateway Program developments, both of which were discussed in the February 13th, 2007 Throne Speech (Leyne, 2007). It is argued that the BC Government has discounted the fact that new roads will eventually lead to further congestion and greater impacts on the climate (in the form of increased emissions) (Ibid).

To help achieve their GHG target, the BC Government has outlined numerous programs and initiatives to help reduce the emissions from BC energy producers as well as from

personal automobiles. Among these programs and initiatives is a $25 million investment to encourage commercialisation of alternative energy sources. Additionally the BC Government will introduce new tailpipe emission standards by 2016 in order to reduce carbon dioxide emissions by 30%, extend the $2000 provincial sales tax exemption for the purchase of hybrid vehicles and introduce a low-carbon fuel standard by 2020 in order to reduce the carbon intensity of personal automobiles by 10% (BC Government, 2007a).

To counteract the argument that the Gateway Program will actually increase emissions over time, the BC Government Throne Speech outlined that $50 million of the $1.3 billion Gateway Program Budget will be spent on increasing the number and quality of bike paths in the GVRD (BC Government, 2007a). The Throne Speech also highlighted the fact that with greater road capacity comes less congestion and less idling. Therefore, even though there are GHG emissions being produced, by easing the gridlock the BC Government feels that there will be some productivity associated with the emissions (as goods movement would improve and cost less over time).

Again though, without viable alternatives to fossil fuel burning vehicles, it is unlikely that GVRD residents will choose to abandon their personal vehicles. Policy makers must provide an appropriate structure to discourage personal automobile use and to encourage alternative and less environmentally harmful transportation options. As evidenced by a study conducted by TransLink in 2006, 56% of regional travellers within the GVRD use a car or truck as their principal method of transportation (Ipsos Reid, 2006). While a regional rail system alone cannot remove gridlock, it would give regional travelers the option to leave their personal automobile at home. A regional rail system would help to ease the reliance on the personal automobile in the south of Fraser region by providing a convenient alternative for regional travel. It would also help to reduce the level of GHG emissions in the GVRD, regardless of the productivity associated with those emissions.

In conjunction with concerns of climate change is the argument of Peak Oil. Marion King Hubbert, an American geophysicist, created the Peak Oil theory in 1956. This theory outlines that global petroleum stocks are extracted at such a rate as to create a bell curve of production. Once the peak of extraction is reached, global petroleum production

will be greatly reduced, creating a severe shortage[14]. It is argued by some that Peak Oil has already been reached today, and that global production will soon start to slow (Spencer, 2007). This is a concern as the majority of our energy needs are based in fossil fuels and crude oil extraction. With the event of Peak Oil, demand for fossil fuels will result in an extreme increase in fuel and energy prices.

This situation would present as a mixed-blessing for the GVRD. With increased fossil fuel prices comes an increase in the real cost of fuel for personal automobiles. Once a (as of yet undetermined) fuel cost tipping point is reached, residents will likely opt to not drive anymore. While this helps to reduce the number of vehicles on the roads, it also decreases the revenue generated for TransLink (and therefore regional road and transit projects). A large share of TransLink's funding is generated from fuel taxes, which would be impacted if the cost of fuel rose so high as to become prohibitive.

If a Peak Oil crash is in the near future, alternative fuels (as well as alternative travel options) need to be discovered and/or developed in order to help alleviate the impact of declining petroleum stocks. But, as indicated above, it would seem that the current behaviour is only to consider the dangers of climate change, but not actually act on those considerations (Gordon, et al., 2007; GVRD and ICBC, 2006; Ipsos Reid, 2006; Keenan, 2007).

Peak Oil is of particular concern in the context of South of Fraser travel, as the 2004 Trip Diaries indicate that the percent of trips leaving the South of Fraser municipalities were on the rise, whereas trips originating from the North of Fraser municipalities were declining (with the exception of the Northeast Sector, which saw an increase) (TransLink, 2006b). When combined, the five South of Fraser municipalities saw a 5.3 percent increase in trips made from those cities. This suggests that travel is increasing within that region, and that a Peak Oil crash would require alternative travel options for residents traveling to (and from) the South of Fraser.

Peak Oil is somewhat of an enigma, as it cannot be pinpointed until after it has actually happened. Because of this, some researchers believe that Peak Oil has not (and may not) be reached. In his article, Illum (2002) indicates that new production methods and

[14] For more information, please see http://www.peakoil.com/

new sources of crude oil will be discovered using further adaptation in methods, lessening the impact of a Peak Oil crash. However, there are others who are adamant that the point of Peak Oil has already been reached (and passed), based on the cost of crude oil[15]. In 2000, the cost of a barrel of crude oil was trading at approximately $23.00 US (Williams, 2005). As of January 1st, 2007, crude oil was trading at $62.50 US per barrel, an increase of almost $40.00 US per barrel in 7 years. This increase in crude oil pricing has been reflected in the cost of fuel for average consumers. In 2004, fuel prices in the Greater Vancouver area were approximately $0.824 CDN per litre (Vancouvergasprices.com, 2007). As of January 1st, 2007, fuel prices in the Greater Vancouver area were approximately $1.072 CDN per litre, an increase of 23% in 3 years[16] (Ibid).

The rise in real fuel prices supports the argument that the point of Peak Oil has been reached, and that we are heading into a state of declining petroleum stocks. However, even with this dramatic increase in fuel costs, there has been no real impact to local travel patterns; GVRD residents continue to drive their cars suggesting that the tipping point in fuel costs is much higher than current levels.

As noted above, Peak Oil is of particular concern to the development of new regional transit services, as planning, funding and building of new transit infrastructure takes time. If the decision was made now to implement new transit infrastructure in the South of Fraser region, it would take 10-20 years for that decision to be realised. If we are indeed heading into a Peak Oil crash, the impact would be felt within the next 10-20 years, at which point the development of a new transit system would come too late. Additionally is the concern that a large portion of TransLink's funding is derived from fuel taxes; with a dramatic increase in fuel costs, residents may be less likely to drive, reducing the taxes collected and reducing the funding level for new regional transportation projects.

[15] For example, see websites such as http://www.lifeaftertheoilcrash.net/ and http://members.home.nl/peakoil/

[16] This number also includes all applicable GVRD fuel taxes.

2.2 Two Sides to Every Story – The Urban Rail Debate

But do these issues help to make the case for a regional rail system in the GVRD, south of the Fraser River? As is the case with all arguments, there are two sides to the rail debate. There are those researchers who feel that rail development should not even be considered when building a transit system (Bundy, 2006; Rubin et al., 1999). They feel that, among other things, rail is too expensive, removes passengers from other transit modes (such as buses) and is not supported in principle by those who have to pay for it (such as taxpayers).

It should be noted that two urban rail critics discussed here, Bundy (2006) and Rubin et al. (1999), draw heavily on examples from specific metropolitan areas in the United States (Rubin et al. focus upon the Los Angeles experience and Bundy reviews Sound Transit in Seattle). This opens up their arguments to critics who feel the research is too narrow, and that their arguments are funded from political sources (such as road-building lobbyists). However, even with this issue, the arguments provided make a good comparison for the GVRD, as both Los Angeles and Seattle are growing, Pacific coastal cities.

Each of the Bundy and Rubin et al. articles point out specific rail "myths" that are used to sell urban rail projects and to steer attention away from the fact that rail projects will never pay for themselves. It is recognised that there is an inherent danger in using US arguments concerning rail developments. It is often the case that urban rail projects are developed in the US because there is funding to do so, and no because there is a need for those projects (Adler, 1988). Rail projects also tend to be developed on existing rail infrastructure, which may cost less, but not be appropriate corridors for people movement.

Rubin et al. lay out ten myths that are used to justify the development of urban rail in large US cities, while Bundy uses five arguments (which are more specific to the Seattle context). However, in their article, Rubin et al. do point out that they do not judge whether or not rail is appropriate for other countries, although they do not mention Canada (they identify Western Europe and more affluent developing countries in their article). Among the myths that they use in their article, they cover arguments such as rail

is cost-effective, that it is the people's choice method of transit, it is fast and provides high capacity transit.

In their counter argument to these points, Rubin et al. provide some very insightful evidence to the contrary. For example, they argue that rail is not cost-effective, as it usually causes the overall ridership on the transit system to decline, due to the displacement of riders from bus to rail. They go on to reference Kain's 1990 article regarding the misuse of ridership forecasts by Dallas Area Rapid Transit, as evidence that rail is not the peoples' choice method of transit, but is made to appear so through a certain amount of data massaging. Rubin et al. also point out that rail is neither fast nor high capacity. They argue that rail, when mixed with traffic, will proceed at the same rate as traffic, making it a slow method of travel. Additionally, they argue that bus transit can carry the same amount of, or more, passengers than a rail system can, with more flexibility to change routing.

However, when these counter-arguments are applied to the existing GVRD SkyTrain system, it can be seen that the situation is somewhat different from the US experience. For example, the Expo line consistently recovers its operating expenses from fare traffic, and has been found to have increased ridership in the transit system overall, without taking ridership from the bus system. When planned, the SkyTrain system was coordinated with the bus system to ensure the two modes worked in cooperation, rather than in competition. The original Expo route was developed as a fast method to reach the Vancouver CBD, a heavily trafficked destination point, which helped to increase the overall success of the system.

The GVRD experience also shows that the rapid transit line was planned well in advance, under the LRSP, with agreement and support from all member municipalities (which helps to counteract the point that rail is not the people's choice). Finally, the SkyTrain system is fully separated from all vehicle traffic, on its own guided right-of-way. This ensures that trains consistently travel at the same speed, often at equal speeds to cars.

Bundy (2006) similarly argues against rail based on certain rail myths. Specifically, he points out that rail does not supplant the need for freeway development, that urban rail

does not foster transit oriented development and that it doesn't increase the overall economic activity near stations. Again, though, when applied to the GVRD context, it can be seen that the existing Expo and Millennium Lines help to dispel these arguments. For example, due to the LRSP and municipal zoning guidelines for increased development adjacent to SkyTrain stations, the economic and/or residential activity in those areas has increased, allowing for transit oriented development in those areas (Babalik-Sutcliffe, 2002).

Regarding the argument of freeway development, this does not necessarily apply to a Canadian context, as an equivalent to the federal highway fund in the US does not exist in Canada (Adler, 1988). Overall, the GVRD has generally attempted to move away from large highway development projects, and it can be argued that the current transit system has helped to support that decision. However, with the Gateway Program developments will come two new highways and the expansion of an existing highway, which may make the freeway argument more prevalent in the future.

On the other side of the rail debate are those who passionately believe rail is a key part of any successful transit system. There are many organisations dedicated solely to the pursuit of promoting the rail agenda[17] (Gray, 2006). These rail advocates generally are of the opinion that, despite the initial cost of rail, a rail transit system will ultimately provide a more economical, environmentally friendly travel option for commuters.

But how do these arguments help to determine whether a regional rail transit system should be developed? Between the pro- and anti-rail arguments are those researchers who fit into the middle -- they feel that rail transit development can work, but only in certain situations. For example, Babalik-Sutcliffe has written numerous articles related to the factors behind successful urban rail transit systems, in the USA, Canada and Europe (Babalik-Sutcliffe, 2002; Mackett and Babalik-Sutcliffe, 2003). She notes that a successful system is characterised by an appropriate urban format and a strong supportive policy structure. She also, interestingly, points out that urban rail transit does not necessarily lead to a decrease in traffic congestion, unless its development is coordinated with restrictions on personal automobile usage.

[17] For example, http://www.lightrailnow.org/ is dedicated to following urban rail success stories from the United States and globally.

Other authors, such as Kuby et al. (2004), Ryan (2005) and Handy (2005) have also written on the viability of urban rail, if used in the right context. In Babalik-Sutcliffe's writings are references to the GVRD SkyTrain system and its technology. Overall, she and her co-authors have found that the development of the original Expo SkyTrain line was successful due to multiple factors, including focused regional development, intergovernmental cooperation and a comprehensive development plan (Babalik-Sutcliffe, 2002; Mackett and Babalik-Sutcliffe, 2003). Schiller and Kenworthy (1999) have also pointed out this success in their research, in comparison with Seattle, Washington and Portland, Oregon.

A common theme among these researchers is that the most important component in the development of urban rail transit is a strong regional planning relationship. It has been shown that the success of the Expo line is due to the strength in planning relationship that the individual municipalities had and have with each other and with the GVRD regional government (Babalik-Sutcliffe, 2002; Mackett and Babalik-Sutcliffe, 2003; Schiller and Kenworthy, 1999). To build a successful urban rail transit system south of the Fraser River, the GVRD would need to duplicate the efforts made with the Expo line, ensuring a positive planning relationship with the municipalities affected.

How, though, do these arguments help make the case for a regional rail system south of the Fraser River? With a well-designed and planned regional rail system there is the opportunity to provide greater transportation options for those living in the South of Fraser region, an area that is currently under served by public transit. If the regional rail system were powered by electricity (much like the SkyTrain), the energy source could potentially be cleaner than fossil fuels, especially as the BC Government has pledged to require all electricity generated in BC have net zero GHG emissions by 2016. Electricity could also be obtained within the province of BC, as BC Hydro (the main electricity provider in BC) is the largest electric utility in Canada (Simpson, 2007). This would also help to mitigate the possible disruptions caused by a decline in global crude oil extraction. With a regional rail transit system in place, if (or when) a Peak Oil extraction decrease arrives, there would be less impact on those who travel within the region. Additionally, a regional rail transit system would provide an alternative travel option to fossil fuel burning personal automobiles. If fuel prices continue to increase at the rate

they have, by 2020, fuel in the GVRD could cost over $2.00 CDN per litre (a value which does not account for a possible Peak Oil crash and subsequent increase in fuel prices)[18].

2.3 Opinion Matters - GVRD Resident Rail Opinion Survey

Document analysis provided a base for building the case for a regional rail transit system south of the Fraser River. In the GRVD, TransLink often uses public opinion surveys and community focus groups to understand how they can improve the current transit system. To that end, an opinion survey was developed to determine the current opinions of GVRD residents and analyse the impact that those opinions may have on building the case for a regional system.

2.3.1 Primary Research Instrument - Online Survey Development

Two approaches, qualitative and quantitative, make up the analytical framework used to develop the survey. The research instrument (an online survey) was based on, and disseminated through, the Internet.

As this was an online research instrument, the sampling frame essentially defined the target population for the survey (Best and Krueger, 2004). The sampling method employed was non-probabilistic, as not everyone in the target population possesses the ability to access the online survey. Although this sampling method limits the ability to apply the results to the wider population, it does allow for testing and refining of applicable theories as well as reaching a large population quickly and easily. This was important for this study as the survey was only accessible for approximately one month. Because the sampling method for the survey is non-probabilistic, the sample size has no effect on the precision of population estimate generated (Ibid). However, to help generate a useful sample for comparison with other surveys conducted on GVRD residents, the minimum population target was 100.

The survey was developed on Simon Fraser University (SFU) WebSurvey Software, with the responses stored on SFU's secured servers. This particular software was chosen

[18] At the time of writing (April 2007), fuel costs in the GVRD had reached an average of $1.17/litre, representing a price increase of 9% in three months.

based on its availability and guaranteed security. The survey consisted of 14 questions, designed to ascertain the opinions of GVRD residents towards the current state of the regional transit system, and to determine their level of agreement with the development of a new regional rail transit system[19]. A third party, prior to the test survey being sent out, reviewed each opinion question to ensure they were suitable and addressed the research questions.

Additionally, prior to recruiting respondents for the survey, it was pre-tested on a small group of individuals, all of whom live in the GVRD, are over the age of 19 and travel within the region. This pre-test group consisted of eight individuals and allowed for review of the questions, as well as feedback regarding the possible ambiguity of the questions. It also allowed for a comparison with the final survey results, as a method of data verification.

In order to recruit respondents to the survey, a participation email was sent to various email distribution lists (listservs) in the GVRD, including those sponsored by Better Environmentally Sound Transportation (BEST), Smart Growth BC and the Livable Region Coalition. The bias of these listservs was recognised at the outset of the research, due to the nature of their individual foci. However, the informed character of those subscribing to the listservs as well as the varying opinions among those subscribers helps to offset some of the bias.

A letter to the editor was also submitted for possible publication to seven local newspapers in the GVRD, the majority of them in the south of Fraser region, to help broaden the sample frame.

The sampling frame for the survey included the listservs as well as numerous GVRD municipality newspapers. The target population for the survey was GVRD residents who are over the age of 19, and travel within the region. The target population needed access to a computer and the internet, needed to read and write in English and have access to either the newspapers that the letter to the editor was published in or the

[19] Please see Appendix 6 for a copy of the survey questions.

listserv to whom the survey was sent[20]. The listservs were chosen due to their target audience of those living within the GVRD. They also focused on specific regional issues, including local transportation issues, GVRD Smart Growth and livability in the region. A further discussion of the listservs can be found in Section 2.3.3.

Additionally, by sending letters to the editors of local newspapers, my intent was to offset the bias of the listservs. This would have allowed a more targeted approach to reach the South of Fraser region residents. However, as no contact was made from the newspapers regarding publication, and all follow-up attempts went unanswered, it is assumed that the letters were no published. As such, the bias of the listservs was not offset as expected, leaving the results likely to be skewed toward support for a new rail system.

2.3.1.1 Question Development

The survey consisted of three question types, including:

- Single option questions
- Likert scale questions
- Open-ended questions

There were two separate scales in the Likert scale questions; Questions 3, 4 and 5 contained five different time frames used to answer the time spent in each transportation mode choice over the previous seven days. Question 6 contained five opinion options ranging from strongly agree to strongly disagree with a not applicable option, which were used to quantitatively capture the respondent's opinion on the questions being posed[21]. The single option questions restricted the respondent to single responses where necessary (these were used when requesting demographic information). The open-ended questions, 7 and 8, provided a qualitative element that could not be captured in either of the previous two types of questions. The open-ended questions permitted the respondent the opportunity to voice any particular opinions or thoughts that they felt weren't addressed by the other questions. In total, the survey consisted of four Likert

[20] The respondents could also have been given access to the survey URL through those who are on the email distribution list.
[21] Please see Appendix 6 to review the Likert Scale questions. The first scale was applied to Questions 3, 4 and 5. The second scale was applied to Question 6.

Scales, seven single option questions and two open-ended questions, with a comment box to close the survey.

The first two questions asked for the residential and work or school locations for each respondent. This information was collected for two reasons. The first was to verify that the respondent did indeed live in the GVRD. The second reason was to allow for analysis of the North/South of Fraser division of respondents, as well as determine where many respondents live in relation to where they work or go to school. These issues are important to the question of interest in regional rail because they provide a basis of comparison for travel within the region. By determining where the respondents live and work/go to school, a better regional travel picture is painted. It also allows for greater depth of analysis when reviewing the opinions of the respondents towards a regional rail system.

The third, fourth and fifth questions were designed to capture the modal split of transportation types used by the respondents in the previous seven days. The seven-day time frame was selected based on its use in other transportation surveys, including those conducted by TransLink (Ipsos Reid, 2006). Question 3 asked for the total time spent in each mode over the previous seven days. Question 4 looked specifically at the work/school modal split, to help determine the modes used during typical peak hour travel. Finally, Question 5 asked for the modal split for all other trips in the previous seven days, determining the mode usage during off-peak travel patterns.

The five specific temporal options in the Likert Scales used in Questions 3, 4 and 5 were used to help reduce the amount of bias in a subjective scale of options, such as frequently, sometimes or occasionally[22]. Using a SkyTrain everyday for one person may constitute a "frequent" response. However, SkyTrain trips are quite short, and would not compare easily with a seven hour commute in a personal vehicle (which someone else may see as "frequent"). By creating specific time frames to respond in, there was less likelihood of subjectivity in the responses.

[22] The temporal categories for Questions 3, 4 and 5 were Never, <1 Hour, 1-4 Hours, 4-7 Hours and 7+ Hours, with an N/A option if it didn't apply to the respondent. To review the questions, please see Appendix 6.

Question 6 was designed to draw out the opinions of the respondents, helping to address and answer the research question and sub-questions. Each respondent was given an instruction screen outlining what municipalities are in the South of Fraser region and a definition of regional rail. They were then presented with 8 statements, with which they were asked to state their level of agreement. The options ranged from Strongly Agree to Strongly Disagree, with a Not Applicable (N/A) option for each statement. The questions were designed to answer the research question of whether or not a case can be made for regional rail based on public opinion.

Question 7 and Question 8 were the two open-ended questions provided in the survey. These questions were designed to help clarify the responses provided in Question 6, as well as expose any possible research discrepancies. These questions were also designed to help draw out any issues or ideas not conceived of prior to the survey development.

Questions 9 through 13 were demographic questions, used to test the degree to which attitude toward rail and use of public transit might depend on such issues as gender, age, home ownership and access to a household vehicle. The demographic data also provided a basis for comparison with other surveys and Canadian Census data.

Question 9 asked for the respondents' age, in the same category format as the Canadian Census (for easy comparison). Question 10 asked for the respondents' gender, Question 11 asked whether or not the respondent owns or rents their residence and Question 12 asked whether or not the respondent has access to a household vehicle. Question 13 asked for the respondents' postal codes, which were later used to visually map the respondents' locations, as well as to verify the responses provided in Question 1.

Finally, the respondents were given the opportunity to provide feedback on the survey in a closing comment box (identified in Section 3 as Question 14). They were asked to use the comment box if they had any concerns about the survey or if they wished to provide further clarification on their responses. This section was also provided for respondents to volunteer any further information on their thoughts of regional rail. These comments were later reviewed in order to help answer the research questions.

2.3.2 The Benefits and Drawbacks of the Internet Survey

Due to the nature of the medium the survey was delivered through (the Internet), it was created with brevity in mind; if it takes too long to complete, participants may be less likely to complete the survey (Best and Krueger 2004).

With an internet survey comes both opportunity and limitation. For the purposes of this specific survey, the opportunities are identified as:

- Able to reach a large demographic in the GVRD,
- Very inexpensive to disseminate to the population that lives in the GVRD,
- Allows for simple collection and data entry methods[23], and
- Less time intensive for collection.

However, while the online survey does provide for quick and efficient data entry and does not require large monetary investment, it does have weaknesses. Specifically for this survey, the weaknesses have been identified as:

- Difficult to quantify the universe as the GVRD, as the Internet is available to a global community of online users,
- Difficult to ensure that the respondents are being truthful of their location,
- Survey would not be random as only a proportion of the population can access the internet and who can read and write in English, and
- Response rate for online surveys is often lower than that of traditional surveys (telephone and postal survey).

Although these limitations pose validity issues, overall, the online survey was the most effective method of reaching the variety of opinions needed in the time frame allotted for the research.

The data was collected in a convenience sample fashion, due to the nature of internet. The information was also collected in a cross-sectional fashion, looking at the opinions

[23] Most survey systems will allow direct input into a spreadsheet software such as Excel or SPSS

of those who work and reside in the GVRD at a particular point in time. In effect, the survey looked at a horizontal 'slice' of these opinions (Johnston et al. 2000).

2.3.3 Distribution of the Online Survey

The survey was made available from October 25 to November 30, 2006 for a total of 34 days. As indicated above, to recruit respondents for the survey, a participation email was sent to various email listservs in the GVRD. This letter was then disseminated out to other groups in a snowball sample fashion through the original respondents who received the letter. A letter to the editor was also submitted for possible publication to seven local newspapers in the GVRD, the majority of them in the south of Fraser region. However, as no contact was made from the newspapers, and all follow-up attempts went unanswered, it is assumed that none of those letters were published.

Because the letter to the editor was not published in any of the seven newspapers, the bias of the sample is likely in favour of regional rail. The listservs contacted are all focused upon regional issues, with a politically left-leaning tendency. However, the informed nature of those subscribing to the listservs as well as the varying opinions among those subscribers possibly helped to offset some of the bias.

As noted in the previous section, to be eligible for the survey, each respondent had to be 19 years of age or older and live within the boundaries of the GVRD. To ensure eligibility, each respondent was required to agree to a consent form prior to filling out the survey. Please refer to Appendix 5 for a copy of the consent letter each respondent was presented with. Respondents were not asked for any personally identifying information, except for their residential postal code, which was used to map the location of respondents in Geographic Information System (GIS) software, as well as verify the information provided in Question 1 (residential municipality). To ensure that only GVRD residents took the survey, all non-GVRD postal codes and related responses were removed from the received data. In total, eight non-GVRD postal codes and related responses were removed.

Due to system limitations with the survey program, there was no way to ensure that respondents did not take the survey multiple times. In order to combat this issue, duplicate postal code data and substantially similar corresponding responses were

reviewed to determine if the data was identical. This was the case with one duplicated response. As such, the duplicated response was removed.

The data collected from the survey was downloaded into a text file and imported into SPSS. Once in SPSS, the data was coded to help with analysis. Each response was allocated a numerical value, with the text value recorded on the variable tab. For a list of the codes and corresponding text values, please see Appendix 7.

Upon review of the data received, a weakness in the survey software was discovered. The software did not require respondents to answer each option in the scale. Because of this, it was found that some respondents did not select a response for all of the options in the Likert Scale questions. In the cases of Questions 3, 4 and 5 and 6, if a blank response was found, the blank was coded with the numerical value of 99 (categorised as a no response), and analysed accordingly.

To help uncover hidden relationships in the data, additional variables were calculated in order to separate out the responses from respondents in the North and South of Fraser municipalities. With this divide, the responses from the opinion questions were compared in order to determine any correlation or interesting relationships. Additional variables related to mode usage and demographic characteristics were also created for analysis. Cross-tabulations were run on the data to uncover any interesting relationships, with an analysis of the significant results presented in the next section.

3 ONLINE SURVEY RESULTS AND ANALYSIS

3.1 Framework for Data Investigation

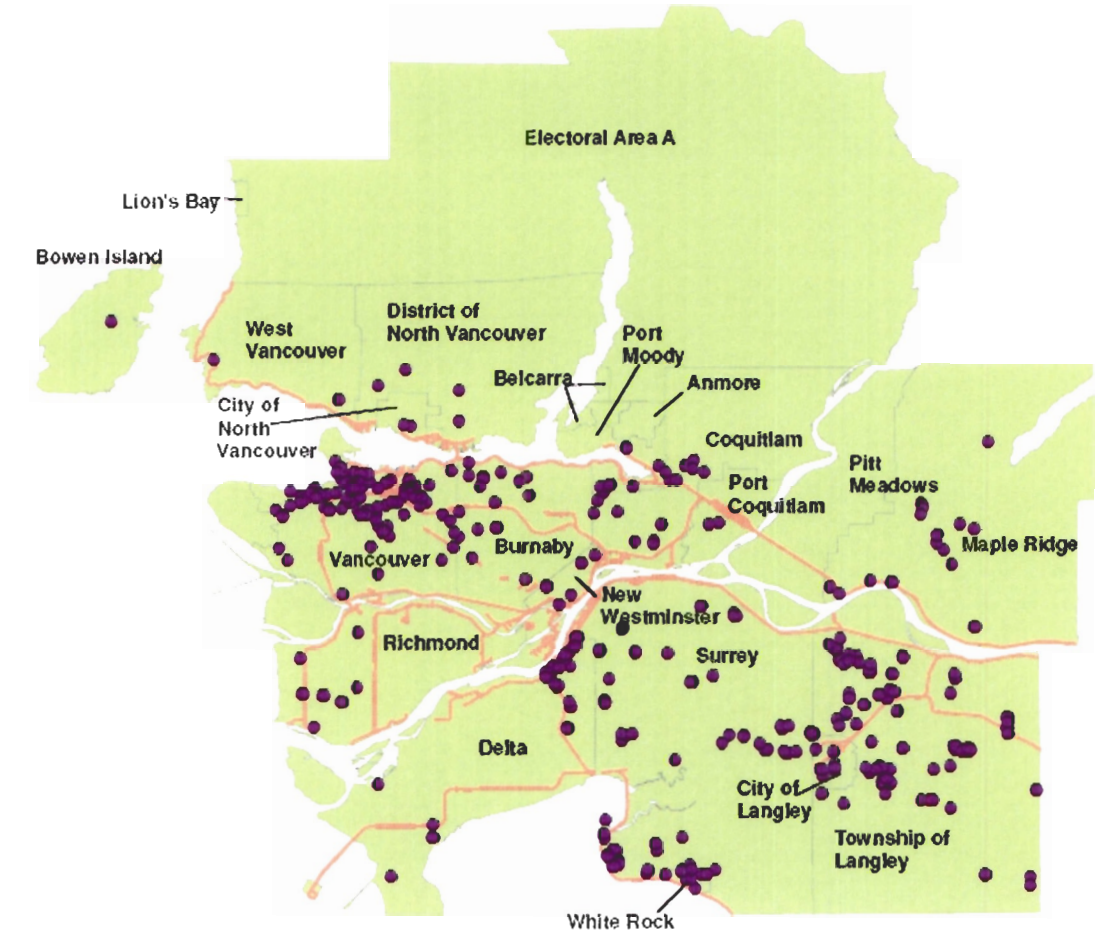
The data collected from the online survey was approached from a post-positivist point of view, and analysed accordingly. This particular framework was chosen due to its ability to recognise that reality is a social construction; the focus of post-positivism is on science's account of reality rather than on reality itself (Johnston et al. 2000). This framework allowed for an investigation into the *why* (why certain individuals provided the opinions that they did) as opposed to just the *what* (what the respondents provided as their opinion). The post-positivist approach also shifts the focus of the data analysis to the situational context, providing the ability to analyse the situation that affected each respondent's opinion.

3.2 Demographic Analysis

In total, 294 responses were received by the November 30th deadline. Of those responses, eight were found to belong to non-GVRD residents, and one was found to be a duplicate response. Additionally, one respondent elected not to enter his or her postal code. This respondent's data was removed, as it could not be verified. As such, the total responses used for analysis was 284.

These responses have been mapped in (GIS) software, for visual representation, and can be seen in Figure 3.1 and Appendix 8. It is important to point out that the Canada Post postal code data used for the GIS analysis is from 2005, and that since 2005, many new postal codes have been created within the GVRD. As such, not all of the respondents' postal codes have been mapped. However, there is enough data to provide an appropriate graphic representation of the respondents' locations.

Figure 3.1: Survey Respondent Locations



The clusters of respondents noted in the map above are interesting as they possibly indicate the different respondents interest in a regional rail transit system. For example, the cluster in Vancouver may indicate an interest due to the ability to move throughout the region in a rail system that they already enjoy (SkyTrain). Another cluster can be

seen in the Northeast Sector (Coquitlam, Port Coquitlam, Port Moody), where there is currently a planned LRT. However, this line (the Evergreen Line) has been delayed due to funding constraints, which has increased the interest level in rail in the Northeast Sector. Another cluster of respondents can be seen in Langley City and Township, where there is a strong interest in the revival of the Interurban line for transit use. Both Langley City and Township have very heavily car-oriented designs and very poor transit access, which makes residents captive personal automobile users, and potentially very interested in the development of regional rail transit. These clusters would, undoubtedly, skew the data in favour of a new regional rail transit system.

Four demographic indicators were collected in the survey: gender, age, access to a household vehicle and household tenure. The demographic information shows that the majority of the survey respondents are female, as shown in Table 3.1.

Table 3.1: Respondent Gender

Gender	Census Count (%)[24]	Survey Count (%)
Female	51.0	54.2
Male	49.0	45.2
Not Applicable	n/a	0.4

The gender percentages are slightly different from the Canada Census counts for the GVRD, as shown in the above Table. However, a chi-square test shows that the difference is not statistically significant.

The age categories of the respondents varied much more from the 2001 Census data, as shown in Table 3.2. The survey data shows that the majority of respondents are in the 25-34 age category, as opposed to the Census data, which shows that the average GVRD resident is in the 35-44 age category. This shows that the average age of those subscribing to the listservs contacted (and most likely more interested in regional transportation issues) are younger than the average GVRD resident. This could suggest that the younger age group may be more likely to favour regional rail transit, and respond to the survey with a favourable response.

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[24] BC Stats (2006b)

Table 3.2: Census Age Categories Comparison

Age Category	Census Count (%)[25]	Survey Count
19-24	6.8	9.5
25-34	19.8	32.0
35-44	23.1	19.4
45-54	20.2	16.2
55-64	11.9	14.1
65+	16.1	8.8

In comparing the vehicle access data, the numbers from the online survey were similar to a recent TransLink study, as shown in Table 3.3. While the online survey data shows a higher number of respondents not having access to a household vehicle, a chi-square test indicates that the difference between the two surveys is not statistically significant. This may also show that in addition to being younger than the average GVRD resident, the listserv subscribers are also more likely to be captive alternative transportation users, although the survey data does not provide information on whether this is by choice or by situation.

Table 3.3: TransLink Access to Household Vehicle Comparison

Access	TransLink Survey Count (%)	Survey Count (%)
Yes	88.0	82.4
No	11.0	16.5
Other	n/a	1.1

Finally, when the household ownership Census numbers are compared to the online survey numbers, it can be shown that the numbers for ownership are very similar (although it should be noted that the Census data does not include a Not Applicable category for alternative housing options). Housing values can be seen in Table 3.4.

Table 3.4: Census Household Ownership Comparison

Household Tenure	Census Data (%)[25]	Online Survey (%)
Own	61.0	62.7
Rent	39.0	31.0
Other	n/a	6.3

[25] BC Stats (2005)
[26] BC Stats (2005)

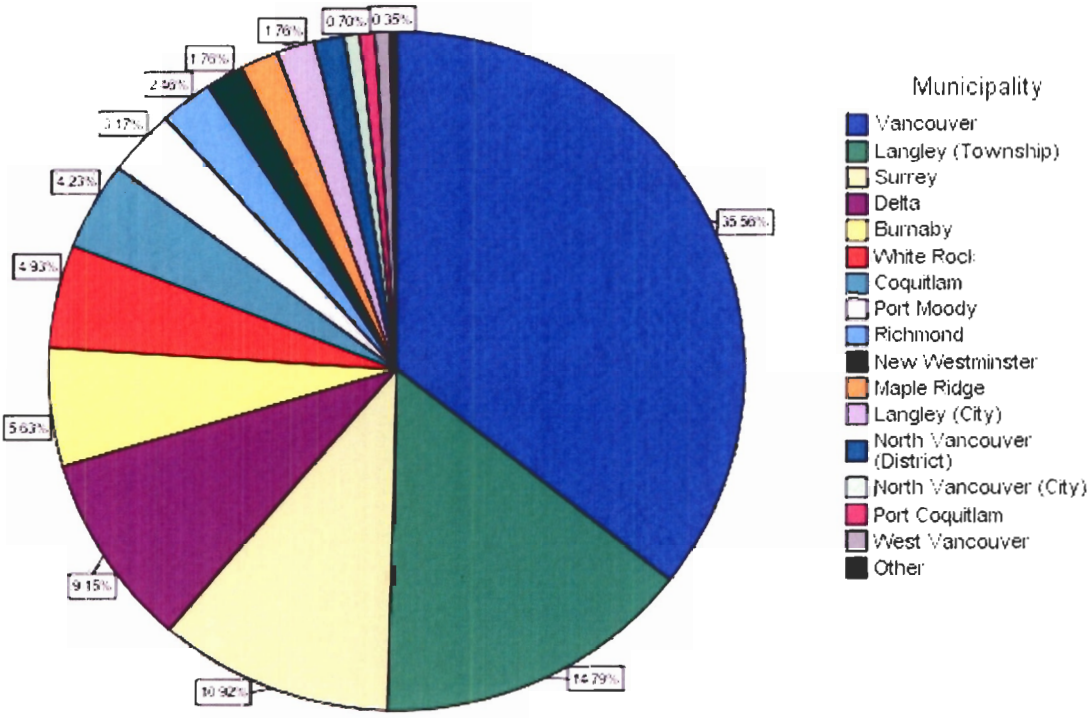
The results in Table 3.4 are interesting when compared with the young age composition of the survey respondents. While the majority of the respondents to the survey were under the age of 35, over 60% of them own their own home, suggesting perhaps that this group of respondents is more affluent than the average GVRD resident. However, as income data was not collected from the respondents, this assumption cannot be verified.

The respondents were asked to provide both their municipality of residence and municipality of work and/or school. As noted in the previous section, these questions were asked for three reasons: the first to ensure the respondent lives in the GVRD, the second was to allow for a North vs. South of Fraser analysis and finally to determine travel patterns within the region among the survey respondents.

As shown in Figure 3.2, the largest proportion of respondents (over one-third) lives in Vancouver, with the next highest number of respondents coming from Langley Township and Surrey, respectively. In terms of the North and South of Fraser divide, 58.1 percent are from North of Fraser municipalities, 41.5 percent from South of Fraser and 0.4 percent from Other[27]. Because of the high level of North of Fraser responses, analysis of the data was conducted both for the total and for a comparison of the two, with some analyses focusing specifically on the South of Fraser responses only.

[27] For the purposes of data analysis, the Other respondent (from Bowen Island) was separated out from the North of Fraser municipalities.

Figure 3.2: Municipality of Residence (%)



As shown in Table 3.5, the municipality of work or school also shows Vancouver with the greatest share of respondent employment or education, followed by Burnaby and Langley Township. In order to compare the North vs. South commuting patterns, a cross-tabulation was run on the municipality data (Questions 1 and 2). From Table 3.6, it can be seen that the reverse commute (living North of the Fraser and working South of the Fraser) is quite small overall, at 3.5% (10 total respondents). This value is much lower than one reported by the City of Vancouver in 2006. In their 2006 Census analysis, they found the reverse commute to be 31%[28] (City of Vancouver, 2006). However, the survey data is similar to the data found in the 2004 Trip Diaries, which shows that trips within the South of Fraser region are more likely to remain within the South of Fraser (TransLink, 2006b).

[28] It is important to point out, though, that this comparison is not direct, as the City of Vancouver numbers are only for Vancouver residents; the survey data is for the entire GVRD.

This result has very real impact on the development of a rail link in the South of Fraser. Rail generally works well where there is a common destination for the majority of travellers (such as a CBD or downtown location, much like downtown Vancouver). As there have been no specific locations identified in the South of Fraser region as a common destination, a rail link may not be immediately successful.

Table 3.5: Municipality of Work or School

Municipality	%
Vancouver	37.3
Burnaby	15.1
Langley (Township)	8.8
Not Applicable	8.1
Surrey	7.0
Delta	5.6
Richmond	4.6
White Rock	2.1
Langley (City)	1.8
New Westminster	1.8
Maple Ridge	1.4
Other	1.4
Coquitlam	1.1
North Vancouver (City)	1.1
North Vancouver (District)	1.1
West Vancouver	1.1
Port Moody	0.7
Anmore	0.0
Belcarra	0.0
Electoral Area A	0.0
Lion's Bay	0.0
Pitt Meadows	0.0
Port Coquitlam	0.0

Table 3.6: Cross-Tabulation for Residential vs. Work/School Municipalities (% of Total Respondents)

		Work/School Municipal Location			
		N/A	North	South	Other
Residential Municipal Location	North	1.7	51.8	3.5	1.1
	South	6.0	13.4	21.8	0.4
	Other	0.0	0.4	0.0	0.0

The demographic data also revealed certain characteristics that are inherent to specific groups. For example, the survey data shows that the two youngest age groups (19-24 and 25-34) are more likely to live in the North of Fraser region. A correlation test indicated a positive correlation between age and region of residence. This suggests that the older the respondents are, the more likely it is that they would live in a South of Fraser municipality. This characteristic could also be attributed to a historical trend in the region, which has seen as residents age, they are more likely to move to a suburban municipality to raise their family in a single family home.

The survey data also showed that there is a positive correlation between region of residence (North vs. South of Fraser) and home ownership. The data indicates that the rental rate is much higher in the North of Fraser municipalities, and home ownership much higher in the South of Fraser municipalities. Therefore, among the respondents, the older the age group, the more likely the respondent is to own their residence and live south of the Fraser River. Again, this fits into the historical socio-economic status of residents in the suburban municipalities with high car-ownership and high home-ownership.

3.3 Transportation Mode Usage

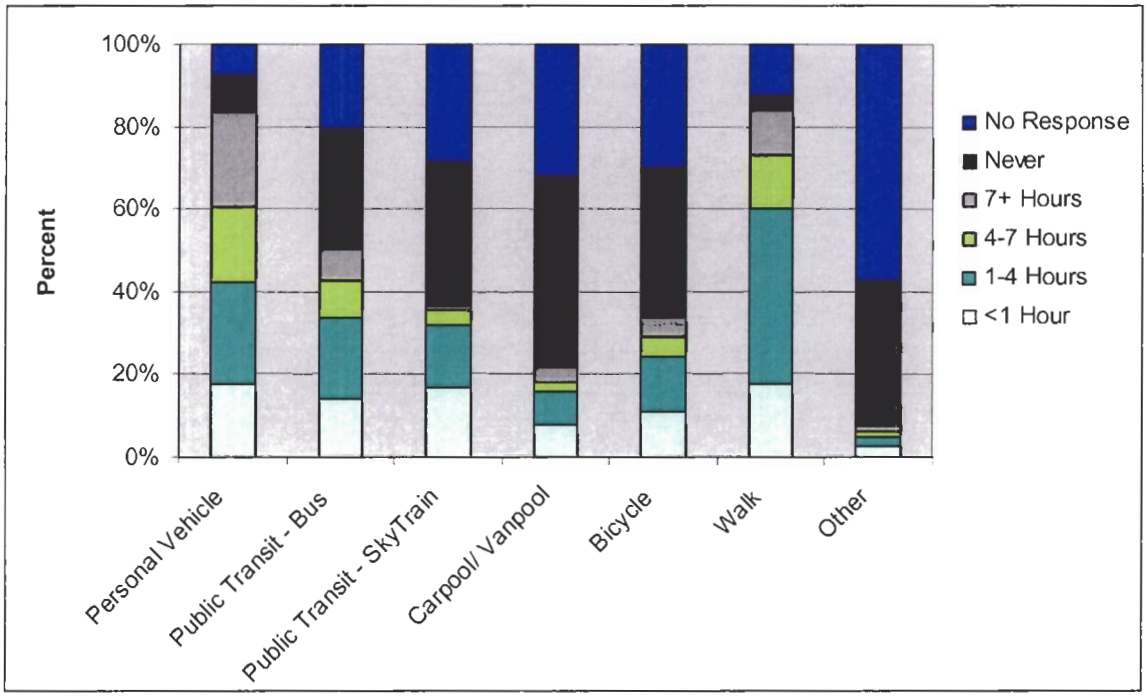
As outlined in Section 2.3.1.1, the transportation mode use questions were asked based on travel in the previous seven days. This option was chosen based on similar travel surveys using the same time frame. To uncover the transportation modes used for different trips, respondents were asked to provide their most used transportation mode overall, the mode they use most for work or school trips and the mode use most for other trips.

Upon review of the responses to the transportation mode-split questions (Questions 3, 4 and 5), it can be seen that the two heaviest used modes are the personal vehicle and walking. Interestingly enough, for total trips in the previous seven days, as shown in Table 3.7 and Figure 3.3, the personal vehicle and walking options also generated the lowest number of No Response responses.

Table 3.7: Transportation Mode Usage in the Past 7 Days (Total Trips, % of Mode Choice)

	Personal Vehicle	Public Transit – Bus	Public Transit – SkyTrain	Carpool/ Vanpool	Bicycle	Walk	Other
Never	8.8	29.2	35.2	46.1	36.6	3.5	35.2
<1 Hour	17.6	13.7	16.5	7.7	10.6	17.6	2.8
1-4 Hours	24.6	20.1	15.5	8.1	13.7	42.6	2.1
4-7 Hours	18.3	8.8	3.5	2.1	4.9	12.7	1.4
7+ Hours	22.9	7.7	0.7	3.5	4.2	10.9	1.1
No Response	7.7	20.4	28.5	32.4	29.9	12.7	57.4

Figure 3.3: Transportation Mode Usage in the Past 7 Days (Total Trips, % of Mode choice)



One possibility as to why the respondents felt more inclined to completely answer the personal vehicle and walk options is because they actually use each on a day-to-day basis, whereas they may not use transit, carpool/vanpool or ride a bike.

It is important to note that the amount of time spent on SkyTrain will be low by virtue of the modal choice -- it takes approximately 40 minutes to travel from King George Station

to Waterfront[29], leaving the two highest categories with usage as <1 Hour and 1-4 Hours in the past 7 days.

Upon review of the data provided, it was found that the two youngest age categories (19-24 and 25-34) are the heaviest users of transit for total trips (both bus and SkyTrain). It was also found that the most individuals who did not have access to a household vehicle were in this age group. This may suggest that the younger respondent age groups are more likely to utilise alternative transportation options, and rely less upon the use of a personal vehicle for overall travel. Other reasons for this data may be that the younger respondents may be working towards the ownership of a personal vehicle, or that there is perhaps a social (and/or cultural) shift in perception in the acceptability of using public transit.

It should be noted that TransLink has indicated that the North of Fraser municipalities are currently well serviced by bus and rail transit (TransLink, 2004). As the data has shown the majority of the younger age groups to live North of the Fraser, this use of transit may also be attributed to a greater access to transit services.

When the survey asked respondents to provide the time spent in each mode when travelling to work or school in the past seven days (that is, for commuting only, rather than all travel purposes), the numbers were much more evenly distributed across the different temporal categories. As shown in Figure 3.4 and Table 3.8, in the case of the personal vehicle, it can be seen that the split is generally even (with the exception of the Never category, which was higher than in the other temporal categories for that mode).

[29] TransLink (2006c)

Figure 3.4: Transportation Mode Usage in the Past 7 Days (Work/School Trips, % of Mode Choice)

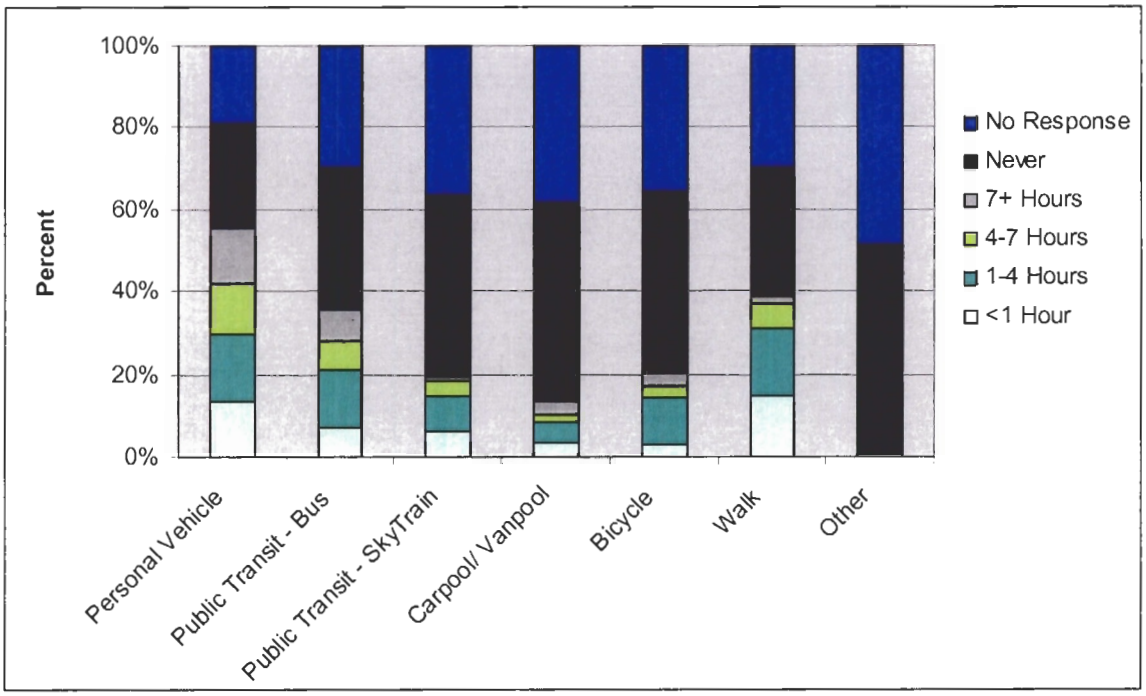


Table 3.8: Transportation Mode Usage in the Past 7 Days (Work/School Trips, % of Mode Choice)

	Personal Vehicle	Public Transit – Bus	Public Transit – SkyTrain	Carpool/ Vanpool	Bicycle	Walk	Other
Never	25.7	34.9	44.4	47.9	44.4	31.3	49.3
<1 Hour	13.4	7.0	6.3	3.5	3.2	14.8	0.7
1-4 Hours	16.2	14.1	8.5	4.9	11.3	16.2	0.7
4-7 Hours	12.3	6.7	3.9	1.8	2.8	6.0	0.4
7+ Hours	13.4	7.7	0.7	3.5	2.8	1.8	0.4
No Response	19.0	29.6	36.6	38.4	35.6	29.9	**48.6**

Interestingly enough, there is a much higher Never response for personal vehicle in the work/school trips than in the total trips, which indicates that residents use other transportation methods to get to work/school. However, there is no significant increase in the other categories to offset this decrease in personal vehicle usage. This could be explained by the overall increase in No Response responses for each of the categories,

or the possibility that respondents use a combination of methods for work/school commuting. Alternatively there may be an additional transportation option not provided in the survey categories. From the comments provided in Question 14, there is also the possibility that there are those who either do not work or go to school (retired, unemployed), or work from home, which could explain the numbers provided in Table 3.8.

It is also interesting to note that the category one might expect to see an increase in usage for work/school trips, Carpool/Vanpool, saw an overall decrease (except in the 7+ Hours category, which remained the same). However, the numbers seen in Table 3.7 and 3.8 are substantially similar enough to suggest that carpool/vanpool is a transportation option generally reserved for work/school trips.

Question 5 of the survey asked for respondents to provide the time spent in each mode for all other trips outside of those made to work/school. These trips were defined in the survey as representing trips to visit the grocery store, go to a coffee shop or to visit a friend's house (although not limited to those trip types). The results from Question 5 are displayed in Table 3.9 and Figure 3.5.

Table 3.9: Transportation Mode Usage in the Past 7 Days (Other Trips, % of Mode Choice)

	Personal Vehicle	Public Transit – Bus	Public Transit – SkyTrain	Carpool/ Vanpool	Bicycle	Walk	Other
Never	8.8	34.5	40.1	45.1	35.6	12.3	43.0
<1 Hour	21.5	13.7	12.3	6.3	12.3	17.3	1.1
1-4 Hours	34.9	15.8	10.9	4.9	10.9	41.9	1.1
4-7 Hours	16.2	1.4	0.4	1.1	2.5	8.5	0.7
7+ Hours	8.5	1.4	0.4	0.4	1.4	2.5	0.4
No Response	10.2	33.1	35.9	42.3	37.3	17.6	53.9

From the data provided, it appears that all other trips are short in length, with the majority of responses falling within the <1 Hour and 1-4 Hour categories. This may suggest that respondents generally travel within their municipality for other trips, with

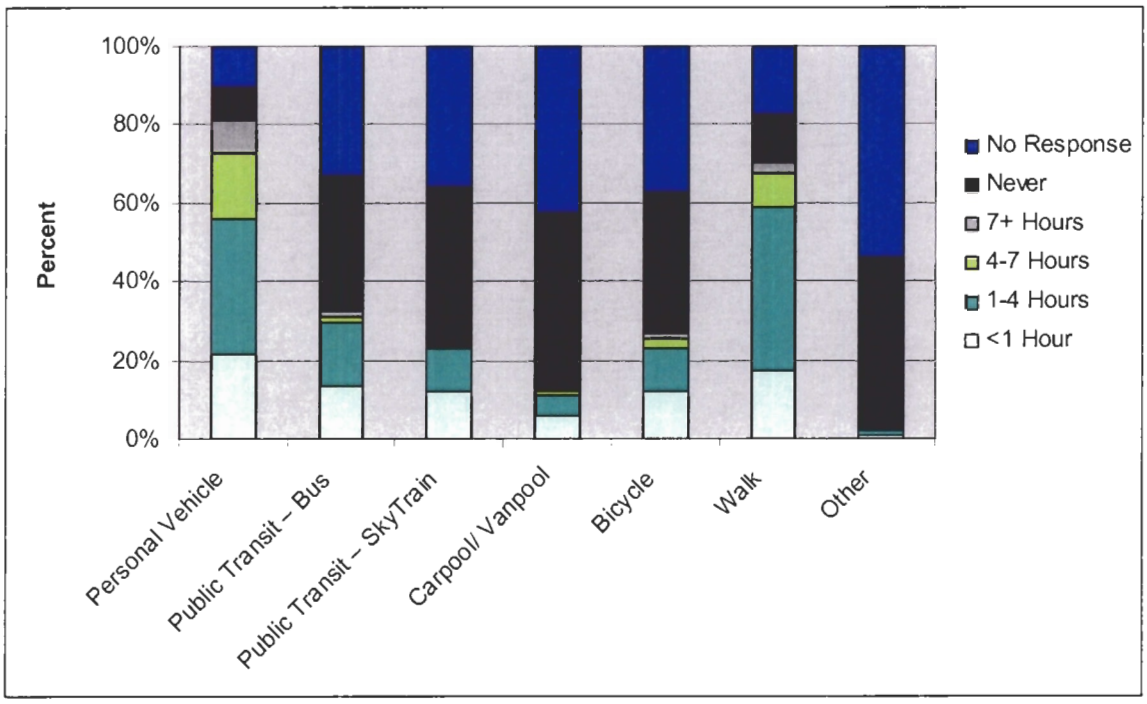
fewer regional trips. It may also suggest that the respondents' individual local built environment is conducive to shorter trips, with encouragement of walking or cycling.

SkyTrain usage also appears to be much greater for other trips than for work/school trips. This could potentially be explained by recreational trips -- for example, the survey was live during October and November, during which time both the BC Lions (Canadian Football League team) and the Vancouver Canucks (National Hockey League team) were playing. Both the BC Lions' stadium and the Canucks' arena are directly on the SkyTrain route (at Stadium Station in Downtown Vancouver). The month of November also saw an increase in holiday related activities taking place in the downtown core of Vancouver, which is heavily serviced by SkyTrain (activities including holiday shopping, increased theatre performances and the annual Roger's Santa Claus parade).

It is important to point out that the greatest amount of No Response responses can be seen in Question 5. There is the possibility that some respondents felt that a blank response equalled a Never. However, as this information cannot be determined without contacting the respondent directly, the blank responses were categorised as a No Response, with no further assumptions being made.

It is also important to point out the weather conditions during the survey period. In the month of November 2006, the Vancouver International Airport recorded 308mm of rain and a record setting 38.4cm of snow (Environment Canada, 2007). This may have resulted in a change in commuting behaviours, as well as general commuting patterns overall.

Figure 3.5: Transportation Mode Usage in the Past 7 Days (Other Trips, % of Mode Choice)



3.4 Personal Opinions Toward Regional Rail

Overall, the survey responses indicate that there is a general agreement for the development of a regional rail system south of the Fraser River. The positive results could also indicate that the survey respondents value rail as a regional transit option. The complete results from Question 6 can be seen in Table 3.10 and the corresponding text for each question in Table 3.11.

Table 3.10: Personal Opinions Toward the Development of Regional Rail (% of Total Respondents)

	Convenient	Effective	Reliable	Bus Service	Use Rail	Existing Rails	New Rails	Tax Burden
Strongly Agree	0.4	0.7	1.4	11.6	46.1	54.9	41.5	34.9
Agree	3.2	10.6	5.6	19.0	30.3	27.1	28.5	20.4
Neutral	6.0	20.1	4.2	24.3	8.8	5.3	14.4	26.4
Disagree	26.1	28.9	14.8	11.6	0.7	3.5	5.3	6.0
Strongly Disagree	47.5	16.9	36.3	6.0	1.8	2.1	3.2	5.3
N/A	16.9	22.9	37.7	26.8	12.3	7.0	6.7	7.0
No Response	0.0	0.0	0.0	0.7	0.0	0.0	0.4	0.0

The first interesting thing to note about the opinion data collected from the survey is that there are very few No Response responses (total of 3 No Response responses). Unlike those found in the transportation mode questions (Questions 3, 4 and 5), it appears that the survey respondents felt compelled to respond to each opinion question.

Table 3.11: Opinion Question Key

Question Code	Question Text
Convenient	Compared with other transportation options, current public transit service south of the Fraser River is convenient enough.
Effective	Overall, Current public transit south of the Fraser River is an effective way for me to get to work/school.
Reliable	Overall, Current public transit south of the Fraser River is a reliable way for me to get to work/school
Bus Service	If bus service were closer to my home, I would use it more often.
Use Rail	I would use a public transit rail service if it were available within my municipality.
Existing Rails	I would support the development of a regional rail system along existing rail lines in my municipality.
New Rails	I would support the development of a regional rail system along newly constructed rail lines within my municipality.
Tax Burden	I would support the development of a regional rail system if there were no additional burdens placed on the public tax system.

It is also clear from the data provided in Table 3.10 that there is a high level of dissatisfaction with South of Fraser transit as it operates today, and that the majority of respondents support the development of a regional rail transit system. Because the survey did not compare rail to other transit modes (such as Bus Rapid Transit), the respondents may have associated the idea of a regional system of rail transit with SkyTrain, but not necessarily the high density land-use requirements that come with it (which the South of Fraser does not currently have).

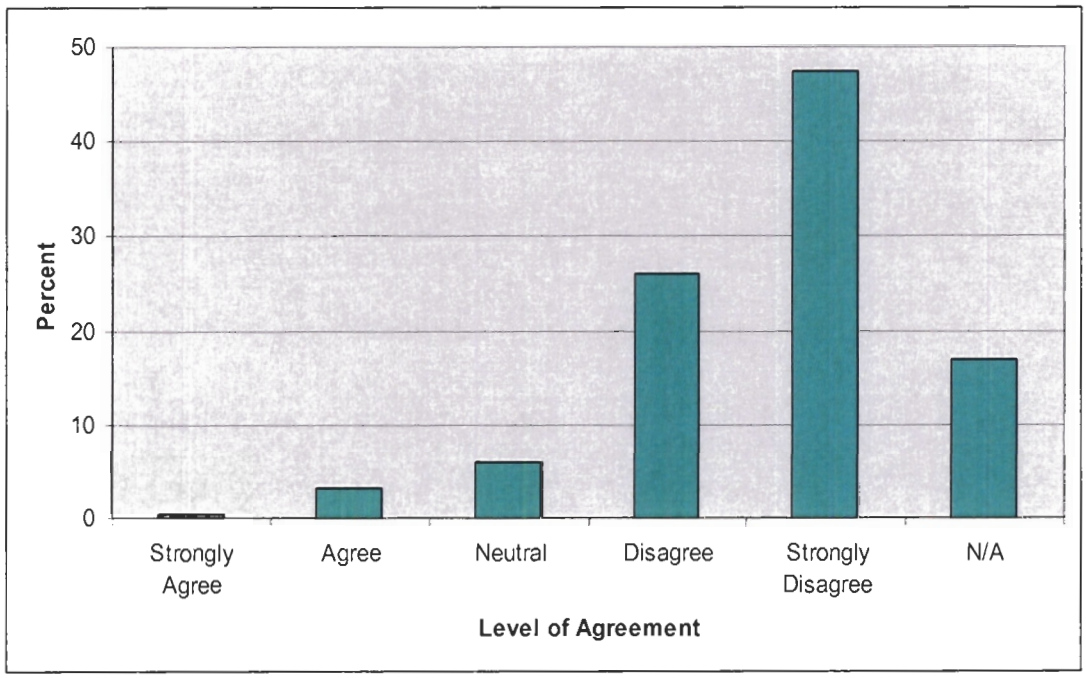
3.4.1 Research Sub-Question Analysis

In order to address the research sub-questions regarding support for a regional rail system, each opinion question was aimed at one of the two sub-questions. The first four opinion questions were designed to address GVRD residents' level of service concerns and preferences regarding regional rail. The remaining four opinion questions were designed to address how residents feel regarding the development of a regional rail system overall, as well as whether the development should be on existing or new infrastructure.

3.4.1.1 How do level of service concerns and preferences figure into GVRD residents' support of the development of regional rail and the use of public transit?

From the data in Table 3.10, the overwhelming majority of respondents (73.6%) feel that transit in the South of Fraser region is not a convenient enough travel option when compared to other modes of travel (Figure 3.6).

Figure 3.6: South of Fraser Transit Service Convenient Option When Compared with Other Travel Options (% of Total Respondents)



When asked if, overall, transit service south of the Fraser is effective for travel to work or school, 45.8% of respondents indicated that it is not (Figure 3.7). When asked if the transit service in the south of Fraser region is reliable way to get to work or school, 51.1% of respondents felt that it is not (Figure 3.8). These numbers suggest that the level of service in the South of Fraser region is inconvenient, ineffective and unreliable. Overall, the service level results indicate that it would require a large amount of investment in the current system to convince residents to use transit south of the Fraser River.

Figure 3.7: South of Fraser Transit as Effective Method of Transportation for Travel to Work or School (% of Total Respondents)

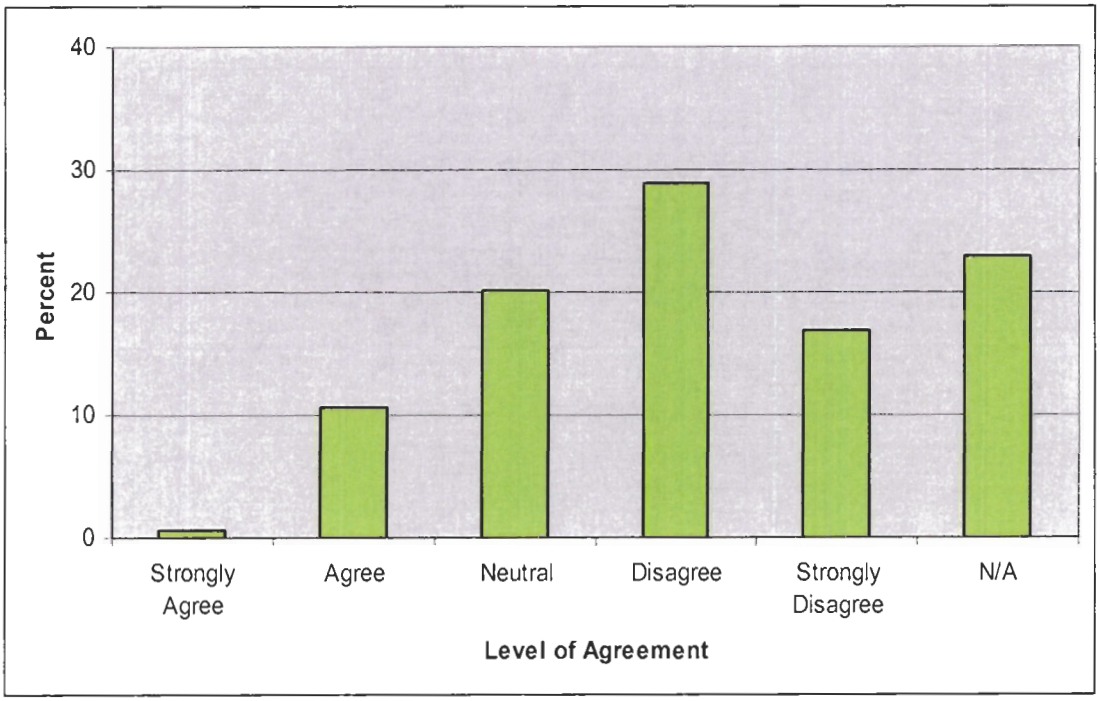
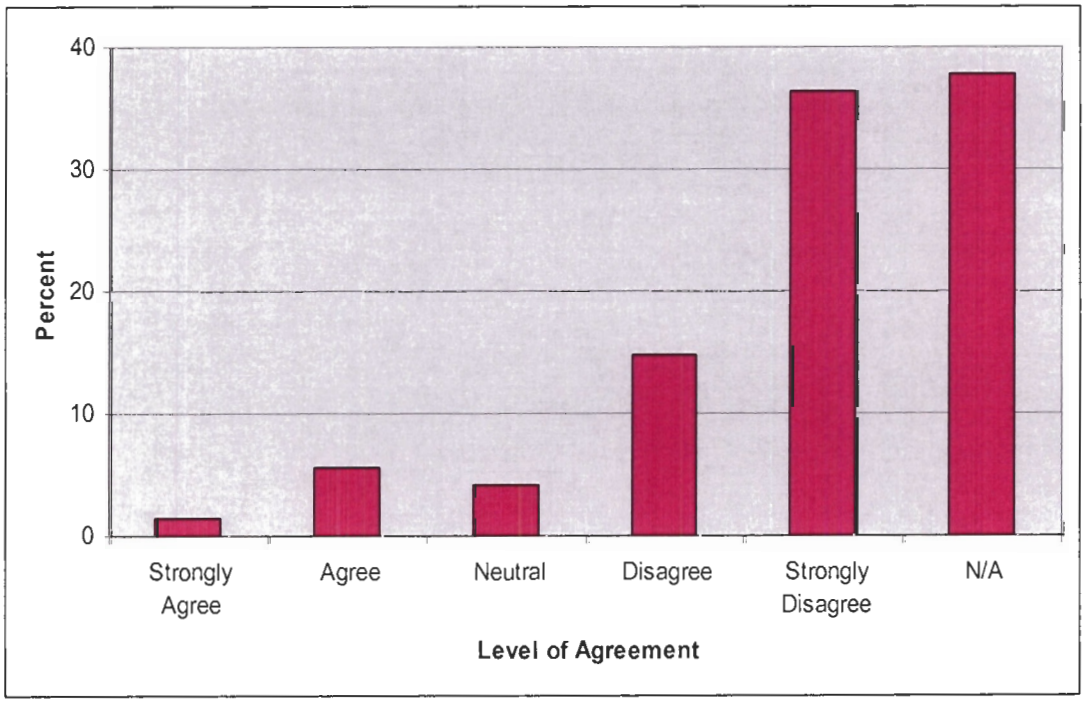


Figure 3.8: South of Fraser Transit as a Reliable Transportation Method for Travel to Work or School (% of Total Respondents)



It is important to point out the level of N/A responses received in the question regarding reliability. As shown in both Table 3.10 and Figure 3.8, it can be seen that the N/A response is highest in this question (when compared to the other opinion questions). This could indicate that the majority of respondents (from the municipalities north of the Fraser River) generally do not utilise the transit services south of the Fraser River.

When the question of effectiveness is compared with the question of reliability, it is interesting to see the difference in the N/A responses. Whereas 37.7% of respondents indicated N/A regarding the reliability of transit services south of the Fraser River, only 22.9% indicated the same response regarding the effectiveness of transit services south of the Fraser River. An even larger difference in the Neutral responses for the two questions can also be seen. For effectiveness, 20.1% of respondents indicated that they were neutral on the effectiveness of transit south of the Fraser River, whereas only 4.2% of respondents indicated the same response regarding reliability of transit service south of the Fraser River.

Assuming that these results are due to the North of Fraser respondents indicating N/A and/or Neutral in these questions, the South of Fraser responses were separated from the total results and analysed in order to determine overall opinions, with the results in Table 3.12, Figure 3.9 and Figure 3.10.

Table 3.12: South of Fraser Responses -- Effectiveness and Reliability (% of South of Fraser Respondents)

	Effective	Reliable
Strongly Agree	2.5	0.8
Agree	8.5	16.1
Neutral	5.9	28.0
Disagree	16.1	31.4
Strongly Disagree	50.9	18.6
N/A	16.1	5.1
Total	100	100

Figure 3.9: South of Fraser Responses -- Effectiveness of South of Fraser Transit Services (% of South of Fraser Respondents)

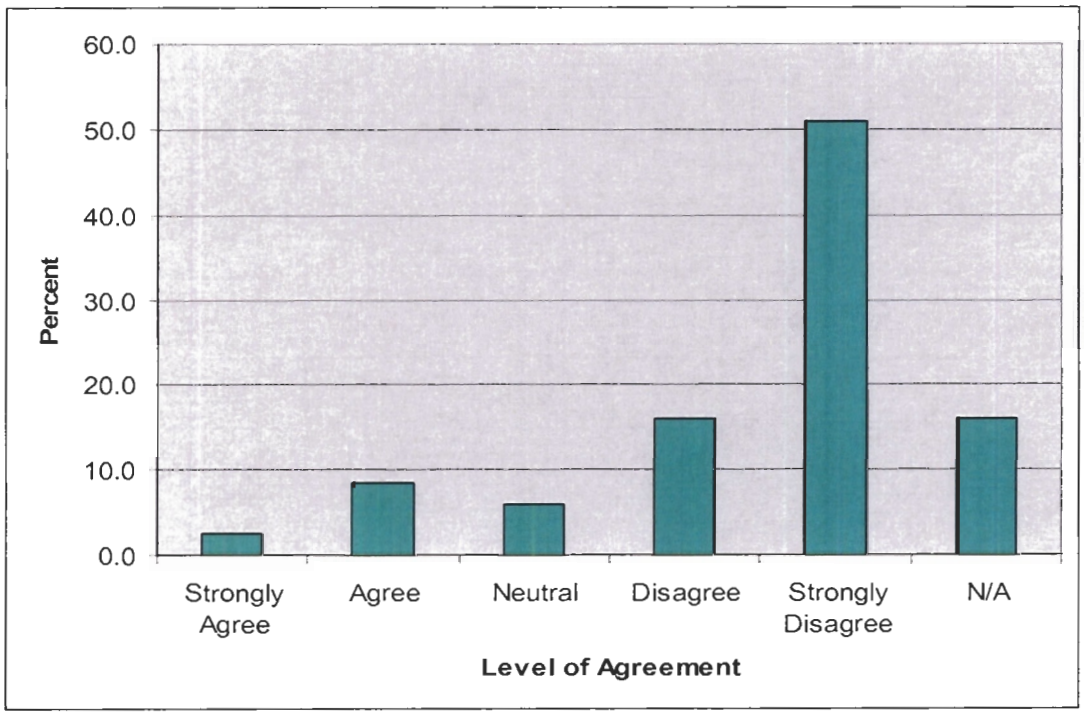
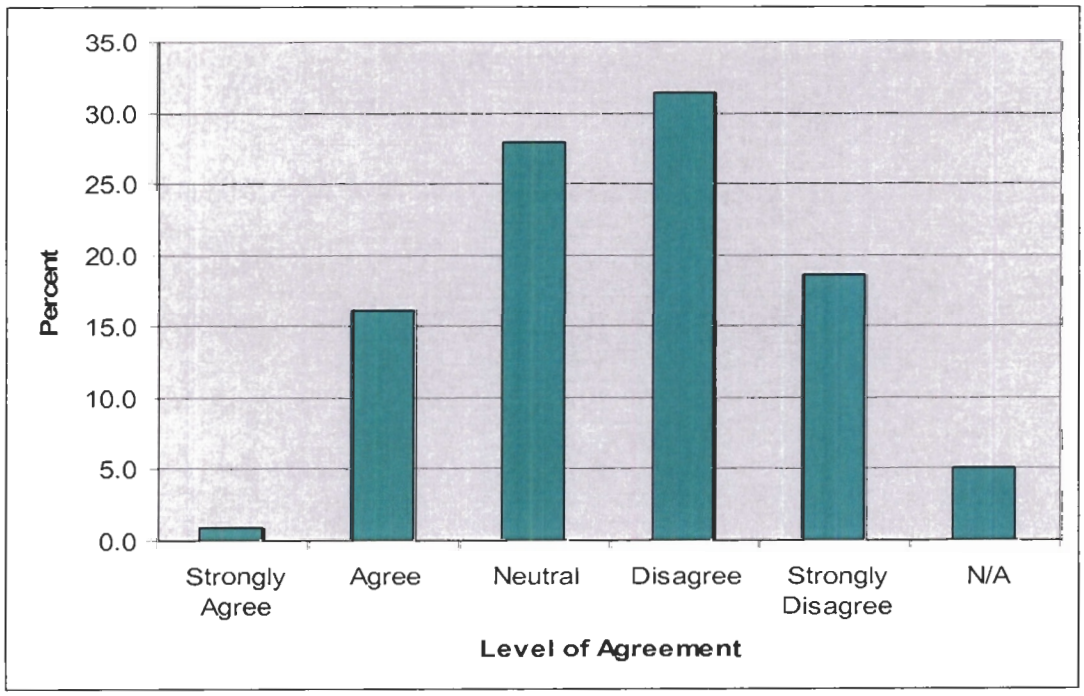


Figure 3.10: South of Fraser Responses -- Reliability of South of Fraser Transit Services (% of South of Fraser Respondents)



When only looking at the South of Fraser respondents, it can be seen that the high overall N/A values in Table 3.10 are driven by the majority of the survey respondents coming from the North of Fraser municipalities. It should be pointed out that the N/A value provided in Table 3.12 and Figure 3.9 for effectiveness is much greater than that for reliability, indicating that South of Fraser respondents feel much stronger about the unreliability of South of Fraser transit than they do about its ineffectiveness.

These results are also reflected in the responses to Question 7 (what changes to the transit system would convince you to make more trips via public transit?). Of the respondents who provided a response (241), 84 indicated that they would use the transit system more often if the service were faster and more frequent, with less waiting (a total of 34.9% of those who responded). Similarly, 63 respondents (26.1% of those who responded) indicated that they would use the system more often if there were better connections and more of them.

These results suggest that the overwhelming negative perception of current South of Fraser transit (based for the majority on bus service) makes respondents more likely to see rail as the solution to the current South of Fraser transit issues, exclusive of bus improvements alone. As noted above, South of Fraser respondents may also see the success of SkyTrain, and assume that a regional rail transit system could be implemented in the South of Fraser with similar results. However, the urban rail arguments provided in the previous section show that without existing density and strong land-use planning to increase densification, rail transit will be less likely to be successful.

When reviewing whether respondents would be more likely to use bus service if it were closer to their home, a large proportion responded Neutral (as shown in Table 3.13). This question was developed in part based on a survey commissioned by TransLink in the South of Fraser Area. That survey found that, among other reasons, personal automobile users would be more encouraged to use bus transit if it were closer to their home (McIntyre and Mustel, 1999).

Upon review of the comments provided in Questions 7 and 14, many respondents in the North of Fraser region indicated that they already have bus service close their home, and did not feel that it could be made any closer. This would fit with the residential

municipality information collected (with 58.1% of the respondents to the survey coming from North of Fraser municipalities), as TransLink indicates that the North of Fraser communities are generally well serviced by bus transit (TransLink, 2004).

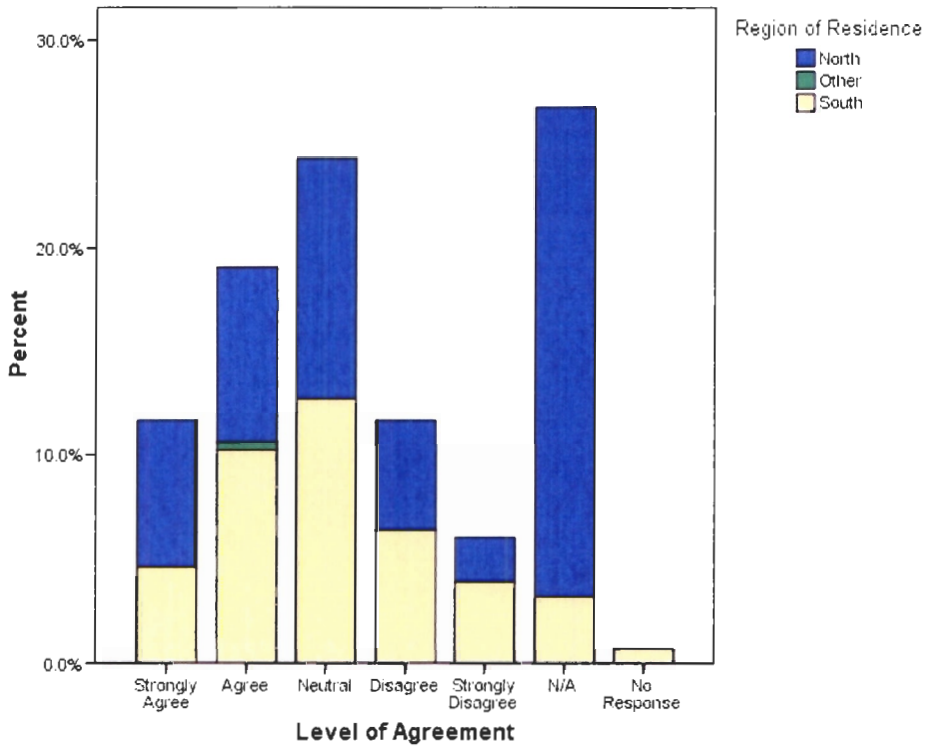
Table 3.13: Would Use Bus Service More Often if Closer to Home (% of Total Respondents)

	North	South	Other
Strongly Agree	7.0	4.6	0.0
Agree	8.5	10.2	0.4
Neutral	11.6	12.7	0.0
Disagree	5.3	6.3	0.0
Strongly Disagree	2.1	3.9	0.0
N/A	23.6	3.2	0.0
No Response	0.0	0.7	0.0
Total	58.1	41.6	0.4

When shown graphically in Figure 3.11, the data indicates that the portion of N/A responses from North of Fraser respondents provides evidence that there is already sufficient bus service in those municipalities.

From the responses in Question 7, there are those residents in the North of Fraser municipalities that indicated there are reasons why they do not use the bus service in their municipality (even though there is service close to their home). One of the key issues for these individuals is over-crowding on the existing buses. Because there is a current shortage of mechanics and operators in the GVRD, peak service on high capacity routes is reduced. This leads to buses that are over-crowded, further leading to "pass-ups" (buses passing by a stop that has passengers waiting), and therefore longer commute times. Alternatively, South of Fraser respondents indicated that transit is not frequent enough and that it requires too many transfers. With more frequent service and more direct routes, respondents would be more likely to use transit in the South of Fraser region.

Figure 3.11: Would Use Bus Service More Often if Closer to Home (% of Total Respondents)



To determine overall South of Fraser responses regarding use of bus if closer to home, these responses were separated out and can be found below in Table 3.14. From the information provided, it appears that South of Fraser respondents would be more likely to use bus transit if it were closer to their home (35.6% of respondents agreed). However, when compared with the level of neutral response provided (30.5%), it would appear that residents would probably be unlikely to use current South of Fraser transit service, even if it were closer to their home. Again, this result could be due to the current perception of service in the South of Fraser region, which even if brought closer to the respondent's home, still would not be a reliable, convenient or effective transportation option.

Table 3.14: South of Fraser Responses -- Use Bus Service if Closer to Home (% of South of Fraser Respondents)

	South
Strongly Agree	11.0
Agree	24.6
Neutral	30.5
Disagree	15.3
Strongly Disagree	9.3
N/A	7.6
No Response	1.7

The Neutral response shown in Figure 3.11 is similar for both North and South of Fraser respondents. While the Neutral for North of Fraser residents may be due to the current level of service in those municipalities, some South of Fraser respondents indicated in Question 7 that they would not take a bus, but that they would consider using a regional rail service if it were made available.

3.4.1.2 How does the current state and location of rail infrastructure figure into GVRD residents' support of the development of regional rail?

In reviewing the data regarding whether respondents would use a public transit rail service if it were available within their municipality, respondents would be overwhelmingly likely to use such a regional rail system; 76.5% of respondents agreed to the question. The agreement with the use of a regional rail transit system has been mapped in GIS software and can be found in Appendix 9 (Agreement) and Appendix 10 (Total Opinions).

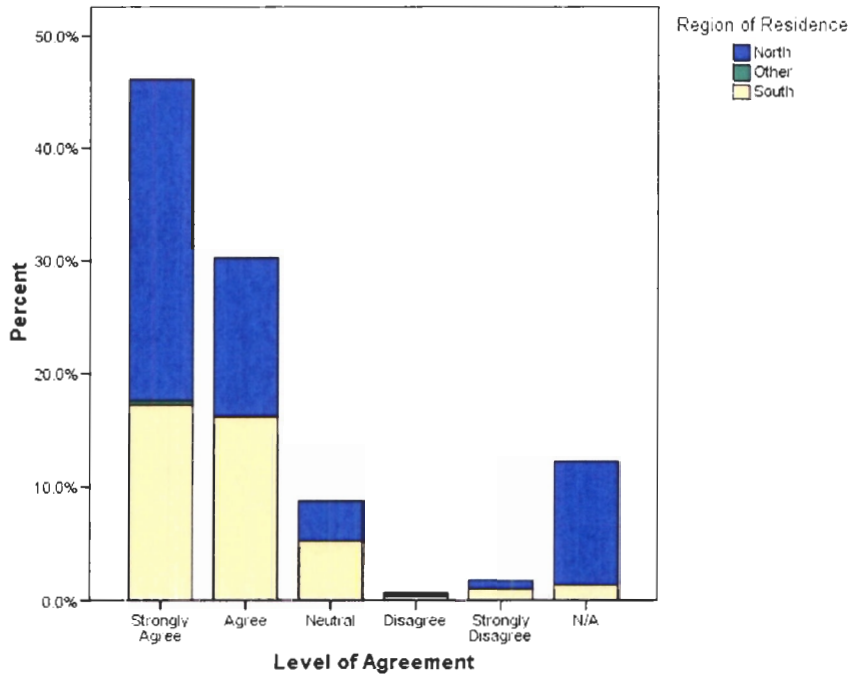
As can be seen in Table 3.15 below, the number of respondents who did not agree with the development was less than 3%, further strengthening the case for a regional rail system south of the Fraser River.

Table 3.15: North vs. South Level of Support for Development of a Regional Rail System (% of Total Respondents)

	North	South	Other
Strongly Agree	28.5	17.3	0.0
Agree	14.1	16.2	0.4
Neutral	3.5	5.3	0.0
Disagree	0.4	0.4	0.0
Strongly Disagree	0.7	1.1	0.0
N/A	10.9	1.4	0.0
Total	58.1	41.5	0.4

It should be noted that there were a number of respondents who indicated in Question 7 that they are opposed to a regional rail system in the South of Fraser region, as it would be inflexible and could not be moved to meet changing demands. Some of those who indicated their disagreement with rail pointed out that bus service is much less expensive than rail, and can be more easily adapted to changing travel patterns. However, as shown in Figure 3.12, these respondents were in the minority regarding a regional rail development south of the Fraser River. From Figure 3.12, it can be seen that both North and South of Fraser residents appear willing to support a regional rail system if it were proposed for development.

Figure 3.12: Level of Support for Development of a Regional Rail System (% of Total Respondents)



When asked about development on existing infrastructure, the respondents overall agreed with the statement (I would support the development of a regional rail system along existing rail lines in my municipality). As shown in Table 3.16 and Figure 3.13, the majority of respondents agreed that they would support a regional rail system if developed on existing rail infrastructure.

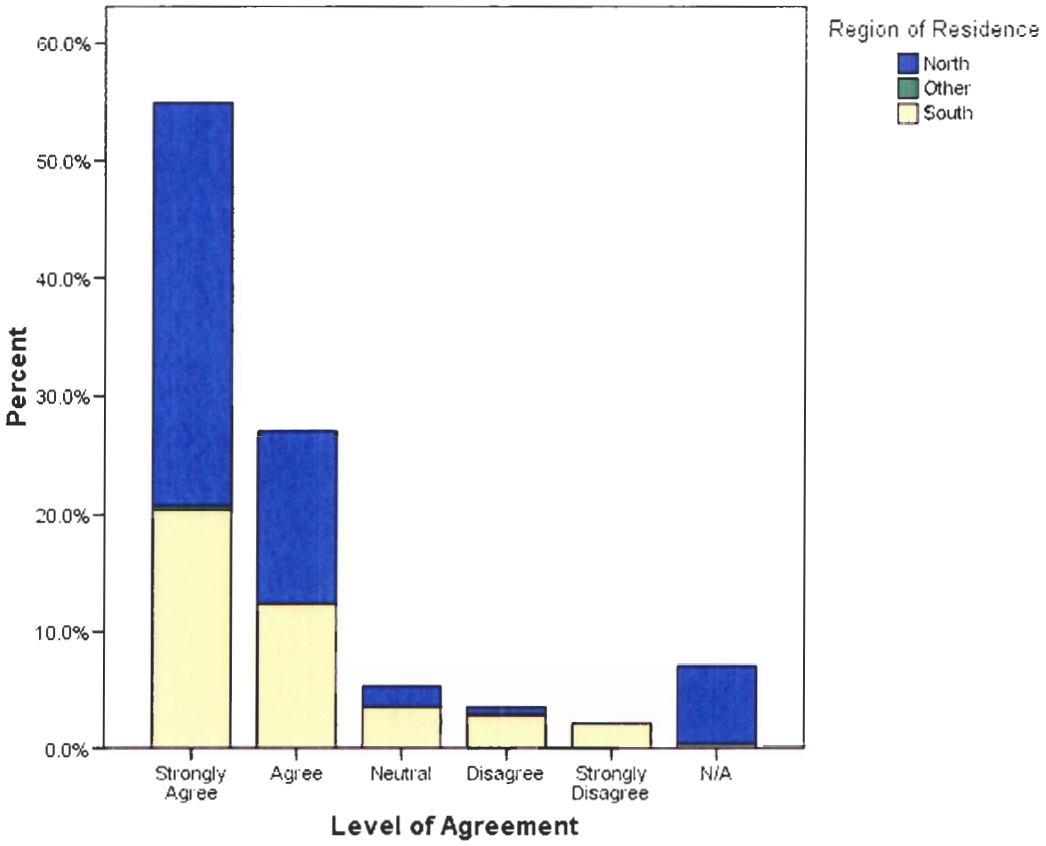
The question regarding development of rail on existing infrastructure was originally developed with the Interurban corridor in mind. This corridor is often pointed out as the logical choice for rail development south of the Fraser River. Upon review of the open ended questions (Questions 7, 8 and 14), many residents commented on the development of the Interurban tracks for an urban transit system in the South of Fraser region. However, as pointed out in Section 2.1.1, the development of this corridor for public transit is only being considered as a long term development option.

Table 3.16: North vs. South Level of Support for Development of a Regional Rail System on Existing Infrastructure (% of Total Respondents)

	North	South	Other
Strongly Agree	34.2	20.4	0.4
Agree	14.8	12.3	0.0
Neutral	1.8	3.5	0.0
Disagree	0.7	2.8	0.0
Strongly Disagree	0.0	2.1	0.0
N/A	6.7	0.4	0.0
Total	58.1	41.5	0.4

Overall, the support for regional rail development on existing infrastructure was 82.1%. As indicated in Table 3.16, the North vs. South of Fraser divide was interesting, as there was more support from the North of Fraser River residents than those in the South of Fraser region (49.0% vs. 32.7%, respectively). Upon reading the closing comments in Question 14, the lower agreement level from South of Fraser respondents may be due to the current use of heavy rail for goods movement in the South of Fraser municipalities. When goods trains travel through those municipalities, the trains are given the right-of-way over automobiles, which cause long waits at rail intersections. The perception may be that development on new infrastructure (on a grade separated or elevated right-of-way similar to SkyTrain) would keep the automobile wait times at rail intersections as they are today.

Figure 3.13: Level of Support for System if Developed on Existing Infrastructure (% of Total Respondents)



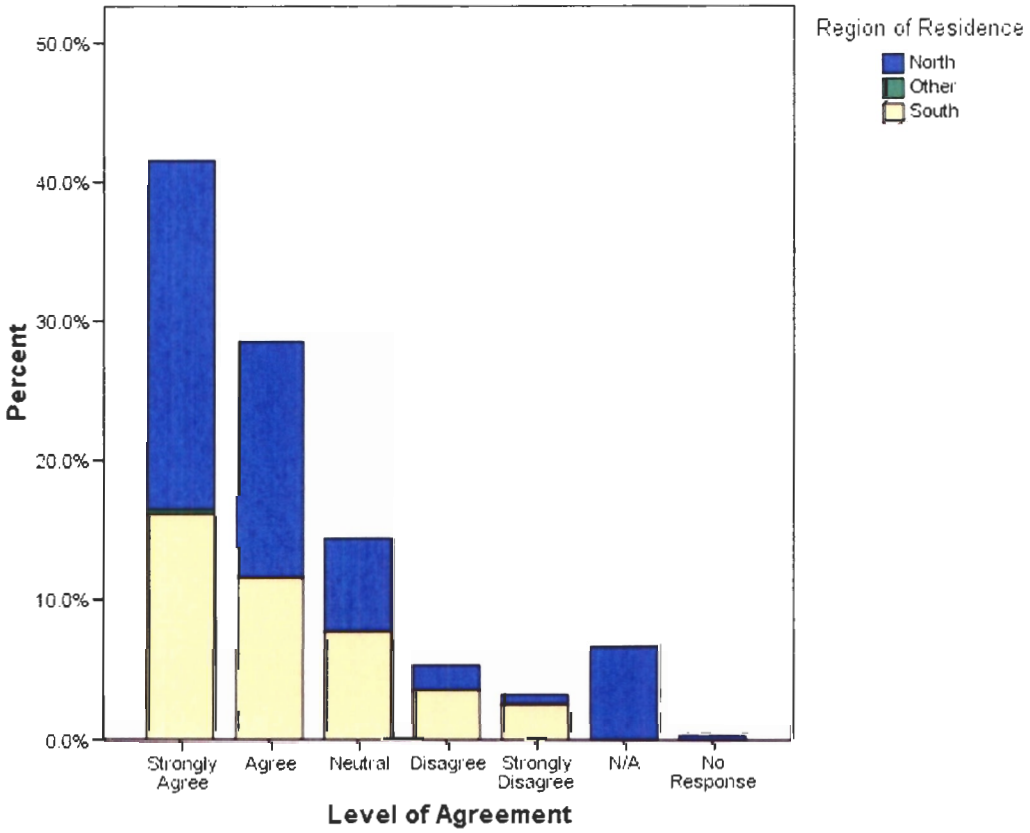
Upon review of the data for the question related to development of a regional rail line on new infrastructure, it is interesting to note that when compared with the results from the previous question, the numbers do not indicate that South of Fraser region residents are more favourable of new infrastructure. As shown in Table 3.17, only 27.8% of the total survey respondents who live in the South of Fraser region would support the development on new infrastructure, compared to 32.7% on existing infrastructure.

Overall, respondents felt that they would also support the development of a regional rail system on new infrastructure, as shown in Figure 3.14 (although there is a lower support level for new infrastructure development than on existing infrastructure, 70.1% vs. 82.1%, respectively).

Table 3.17: North vs. South Level of Support for Development of a Regional Rail System on New Infrastructure (% of Total Respondents)

	North	South	Other
Strongly Agree	25.0	16.2	0.4
Agree	16.9	11.6	0.0
Neutral	6.7	7.7	0.0
Disagree	1.8	3.5	0.0
Strongly Disagree	0.7	2.5	0.0
N/A	6.7	0.0	0.0
No Response	0.4	0.0	0.0
Total	58.1	41.5	0.4

Figure 3.14: Level of Support for System if Developed on New Infrastructure (% of Total Respondents)



In order to determine how respondents felt about development on existing vs. new infrastructure, a cross-tabulation of the two data sets was conducted, as shown in Table 3.18.

Table 3.18: Cross-Tabulation for Existing vs. New Infrastructure (% of Total Respondents)

		Develop on New Infrastructure						
		N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
Develop on Existing Infrastructure	N/A	6.3	0.0	0.7	0.0	0.0	0.0	0.0
	Strongly Agree	0.4	38.0	10.2	3.5	2.1	0.7	0.0
	Agree	0.0	1.4	15.8	7.7	1.8	0.4	0.0
	Neutral	0.0	0.4	1.1	2.8	0.4	0.4	0.4
	Disagree	0.0	1.4	0.4	0.4	1.1	0.4	0.0
	Strongly Disagree	0.0	0.4	0.4	0.0	0.0	1.4	0.0

From the existing vs. new infrastructure cross-tabulation, it appears that there is a broad support for either form of development. Only 5.9% of respondents disagreed with new infrastructure while agreeing with development on existing infrastructure. This may indicate that there is simply an overall perceived need for an enhanced transit system.

The final question among the opinion statements was whether or not the respondent would support the development of a regional rail system if there were no additional burdens placed on the public tax system. This question was designed to draw out the current attitude towards the tax implications of large capital projects (such as the Canada Line). The results from this question can be seen in Table 3.19.

Table 3.19: North vs. South Level of Support for Development of a Regional Rail System with No Further Tax Burdens (% of Total Respondents)

	North	South	Other
Strongly Agree	20.1	14.4	0.4
Agree	9.9	10.6	0.0
Neutral	15.5	10.9	0.0
Disagree	3.9	2.1	0.0
Strongly Disagree	2.1	3.2	0.0
N/A	6.7	0.4	0.0
Total	58.1	41.5	0.4

The results from this question are very obviously in favour of no additional public cost burdens. However, upon review of the results, it appears that the question may have

been worded improperly for the intended result. In the existing wording (I would support the development of a regional rail system if there were no additional burdens placed on the public tax system), it stands to reason the respondents would be more willing to support the development if there were no further costs to them. If the question had been worded in a way that asked respondents if they would support the development of such a system if there were additional tax burdens imposed, the results may have been more useful for the study. As such, the data collected for this question may be considered to be less useful due to the ambiguity of the question wording.

This conclusion regarding the ambiguity of the question is further supported by the responses provided in Question 14 (final comment box). Many indicated that they were unsure how to respond, as they felt by saying Agree, they were indicating that they did not support a further tax burden, which they stated in Question 14 was not actually the case. This would be a good opportunity in a future study; with rewording, the question could capture how residents feel regarding tax burdens for regional transit projects.

3.5 Making the Case - Is There Support?

The research outlined above has been used to develop a case for a regional rail development south of the Fraser River in the GVRD. In order to make this case, the research needed to show that alternatives to fossil fuels and the personal automobile are needed and that the majority of survey respondents agree that they would use a regional rail system if it were developed.

The public transit rail system in the GVRD, SkyTrain, has shown that the GVRD and its member municipalities have the ability to create a lasting, successful rail transit system. This success suggests that a strong regional/municipal land-use development relationship, in conjunction with a rail development, can help to increase the overall use of the public transit system.

Current traffic congestion on major GVRD arterial networks has led the BC Government to develop the Gateway Program, which will see two new major roads, the widening of Highway 1 and the twinning of the Port Mann Bridge. However, the BC Government's new climate change plans for the year 2020 suggest that the current number of vehicles

on GVRD roads will need to be decreased to reach the set targets. Based on the new climate change plans, the Gateway Program appears to be working towards an opposite goal. Braess' Paradox suggests that an increase in road capacity will lead to an increase in vehicles on the road, and, therefore, future congestion. The creation of new roads will also lead to easier access to the Fraser Valley along the Highway 1 corridor, therefore potentially increasing urban sprawl and increasing the overall vehicles in the Highway 1 corridor. New roads will reduce the short-term congestion and travel times, making the personal automobile appear to be the more attractive option for travel, decreasing in the current disincentive for drivers who are utilising alternative driving options (due to high traffic congestion levels). As outlined in Braess' Paradox, the attractiveness of the automobile will lead more people to choose it as an option, with the result of more cars on the road, and future congestion issues.

With the implementation of disincentives on personal automobile use to accompany the Gateway Program developments (tolling, increased insurance costs, etc...), the BC Government could implement both Gateway and the climate action plan without the current contradiction. The development of a regional rail system would also help to create alternative travel options, which, in conjunction with Gateway Program disincentives, could help to reduce congestion and impacts on the environment.

Evidence provided has shown that one of the greatest contributors to climate change is emissions from the automobile. The argument that climate change is happening and is (very likely) caused by human activities has been proven by the IPCC, and has led to a greater public awareness of climate change. Because of this, in order to help reduce the effects of the current climate change, personal automobile usage needs to be reduced, and possibly replaced with more climate friendly transportation alternatives (i.e. those that do not utilise fossil fuels).

The argument of Peak Oil suggests that any alternative to the automobile should be fuelled with a sustainable and climate friendly fuel source, with less reliance on crude oil extraction. If powered by an alternative energy source (such as electricity), the development of a regional rail transit system would help to mitigate the impact of increased use on climate change. It would also help to relieve any disruptions from a Peak Oil extraction rate being reached.

The rail debate outlined in Section 2.2 has also provided evidence to support the development of a regional rail system under the right circumstances. While some rail detractors feel that urban rail development should not be considered as a public transit option, it has been shown that with the right conditions, regional rail can be successful. It is important the rail system be developed under a structured and endorsed planning model, which helps to anchor the system and provide guidance for future growth and development. The rail system also must have the support of all affected municipalities, as well as the governing regional body (in this case, the GVRD). The success of the Expo line has shown that the GVRD and its member municipalities can create a successful regional rail system -- to create a similarly successful system south of the Fraser River, the GVRD and affected municipalities simply need to look to that model and adjust it for the situation.

Rail opponents may be correct in their argument that not all rail systems are cost effective. However, future issues such as climate change and Peak Oil may require new transit systems for people movement, regardless of their initial cost vs. benefit equation.

Based on the online survey data collected, there is overall support for the development of such a system, with the consensus being that South of Fraser public transit is currently not a convenient transportation option in comparison with other modes, and that it is both ineffective and unreliable as a transportation option for getting to work or school. The data indicates that, overall, both North and South of Fraser residents are in favour of a regional rail development. However, the characteristics of the North and South of Fraser groups were found to be quite different. North of Fraser residents were found to be younger, and use more alternative options for travel in the region. This may indicate that they would be more likely to use a regional rail system. In contrast, the South of Fraser respondents were found to be older, more likely to own their home and to have access to a household vehicle. Overall, the data shows that the overwhelming majority of respondents (both in the North and South of Fraser regions) are in favour of such a development.

4 CONCLUSION

The main objective of this research project was to determine if a case can be made for a regional rail transit development south of the Fraser River in the GVRD, based on current policy debate and public opinion. The research showed that the case for a regional system of rail transit in the South of Fraser region is supported by current policy debate, which suggests that there is a need to find alternatives to fossil fuel use and to the personal automobile. The online survey results indicated that the majority of the respondents agree that current South of Fraser transit needs to be improved and that they would utilise a regional rail transit system if developed in their community.

Due to increases in climate change concerns, alternative travel options need to be developed for those wishing to utilise them. Peak Oil and rising fuel costs have also helped to show that any new mass transportation alternatives should be fueled by sources other than fossil fuels, which could be achieved with a rail system. The BC Government's Gateway Program has planned for faster goods movement, but has made no apparent effort to reduce the possible increases in personal automobile usage as a result of the increase in road capacity. Finally, the rail debate has shown that with the appropriate planning tools and employment of cooperative policies, a regional rail system can be successful. If the GVRD and member municipalities can create a planning framework that all participants/affected parties agree upon, as well as ensure that each participant is receiving some benefit from the development, and that their concerns are being addressed, a regional rail development will likely succeed.

4.1 Future Study Opportunities

It is important to note that the survey used in this study was not random, and was responded to by those who were self-selecting and are already involved in issues related to regional transportation. The respondents to this survey are generally more politically left-leaning, more likely to use alternative transportation options and more vocal regarding regional transportation issues. Future studies of this nature can eliminate this

sampling bias by collecting the data in a more randomised fashion, ensuring that a greater range of opinions are collected for analysis.

It is also important that future studies collect opinions from all sides of the regional rail debate. For example, based on the listservs that the survey was sent to, it is very likely that individuals who are in favour of more roads, more capacity (i.e. the Gateway Program supporters) did not answer this survey. Special interest groups who favour roads and personal automobile use (such as automobile manufacturers, trucking industry, etc...) most likely did not respond to the survey. By developing a more random sampling frame, a future study can ensure that a greater range of opinions are gathered for assessment.

However, even with this obvious sampling bias, the responses provided in this study are important due to the fact that often, the vocal minority is the group that expresses the loudest opinion regarding regional change. The sampling frame for this research focused upon that group. There is a likelihood that the opinions collected in this survey would be the ones provided if a request for survey respondents was sent out to the GVRD as a whole.

It may also be interesting to conduct another study, similar to this one after the completion of the Canada Line. Another cross-sectional study for comparison would be very telling regarding the success of the expensive capital project, as well as if it had an impact on the opinions of those in the region.

Based on the comments received at the end of the survey, a study which reviews the viability of rail transit vs. bus transit in the South of Fraser region may be telling of the responses received in this survey. Respondents may have agreed to the development of a regional rail system only because there is no current feasible option for travel. It may be interesting to determine if rail is actually the public transit mode of choice for residents in the region, or if bus transit would be more favoured.

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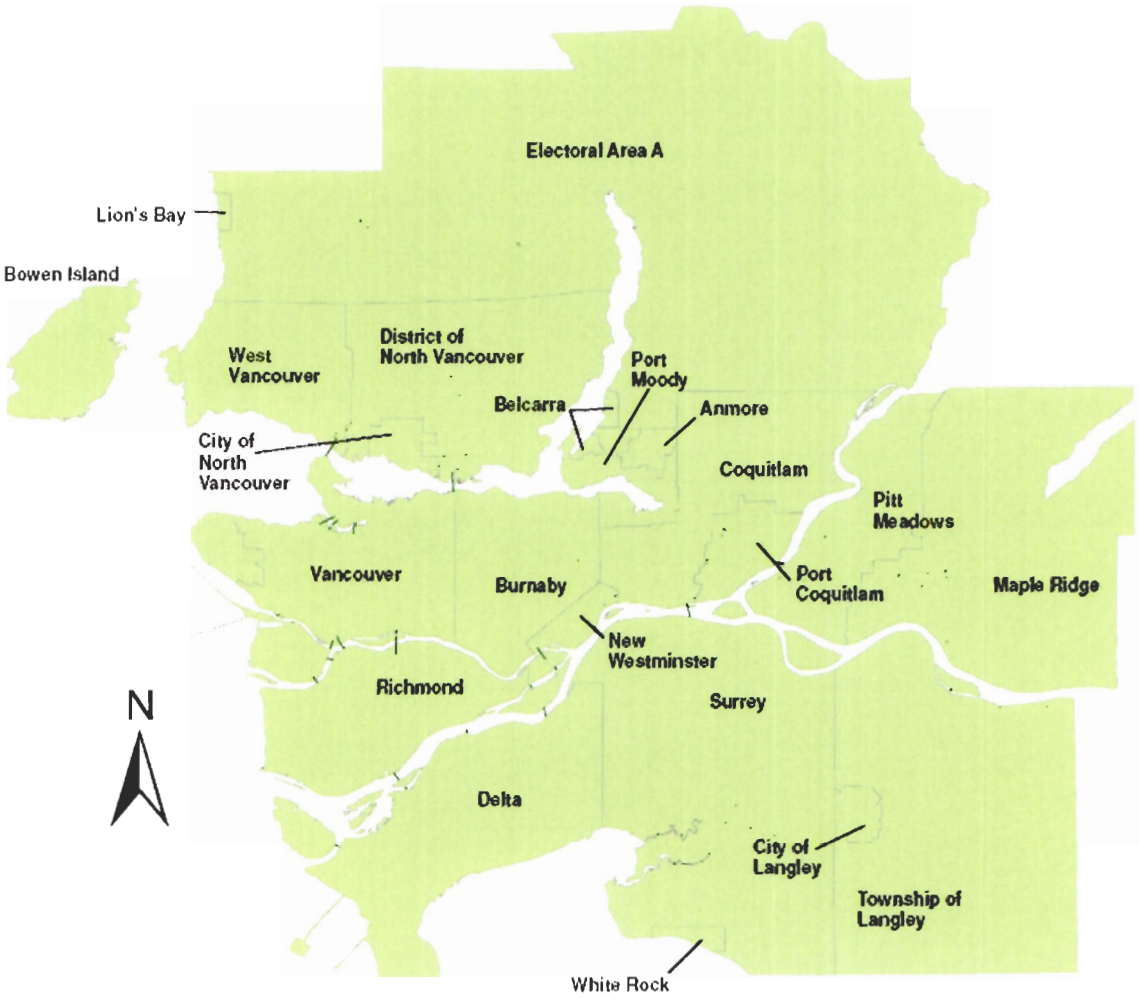
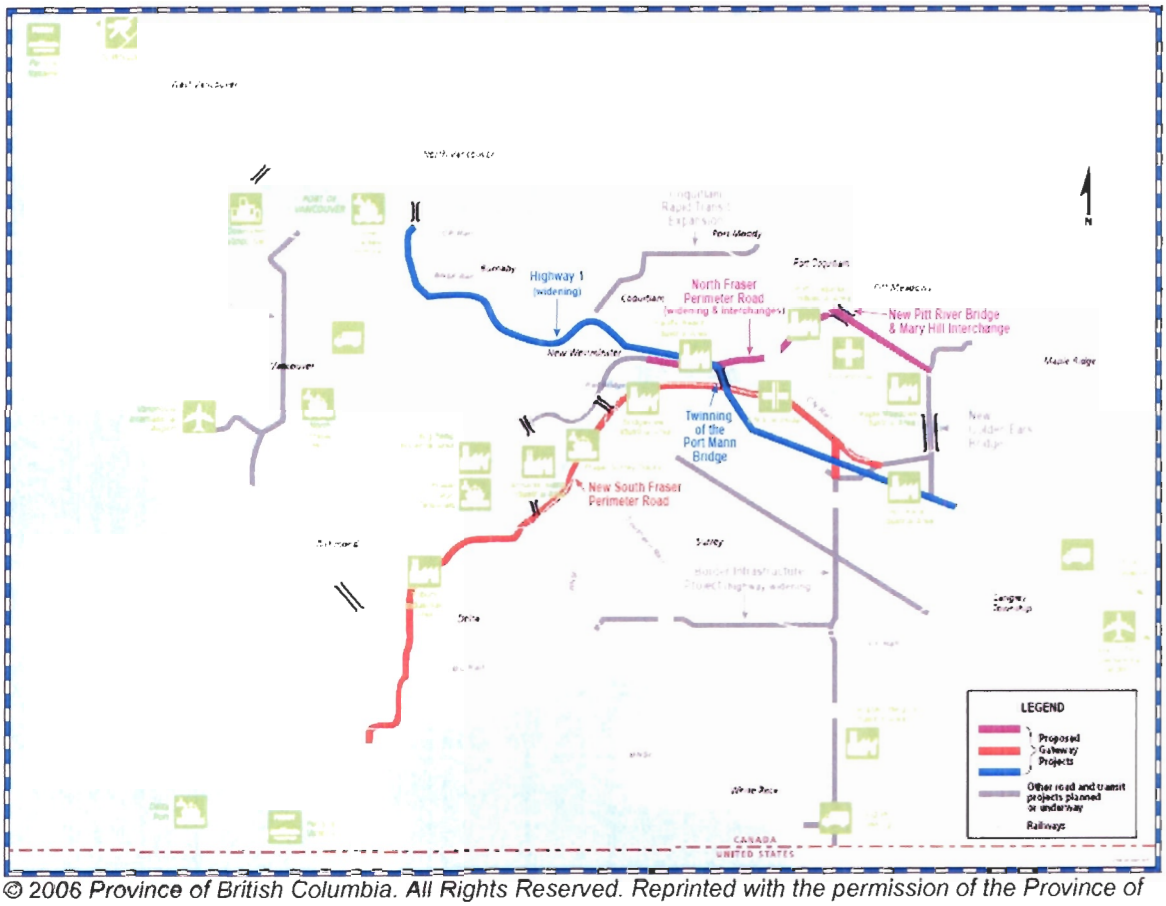
APPENDICES

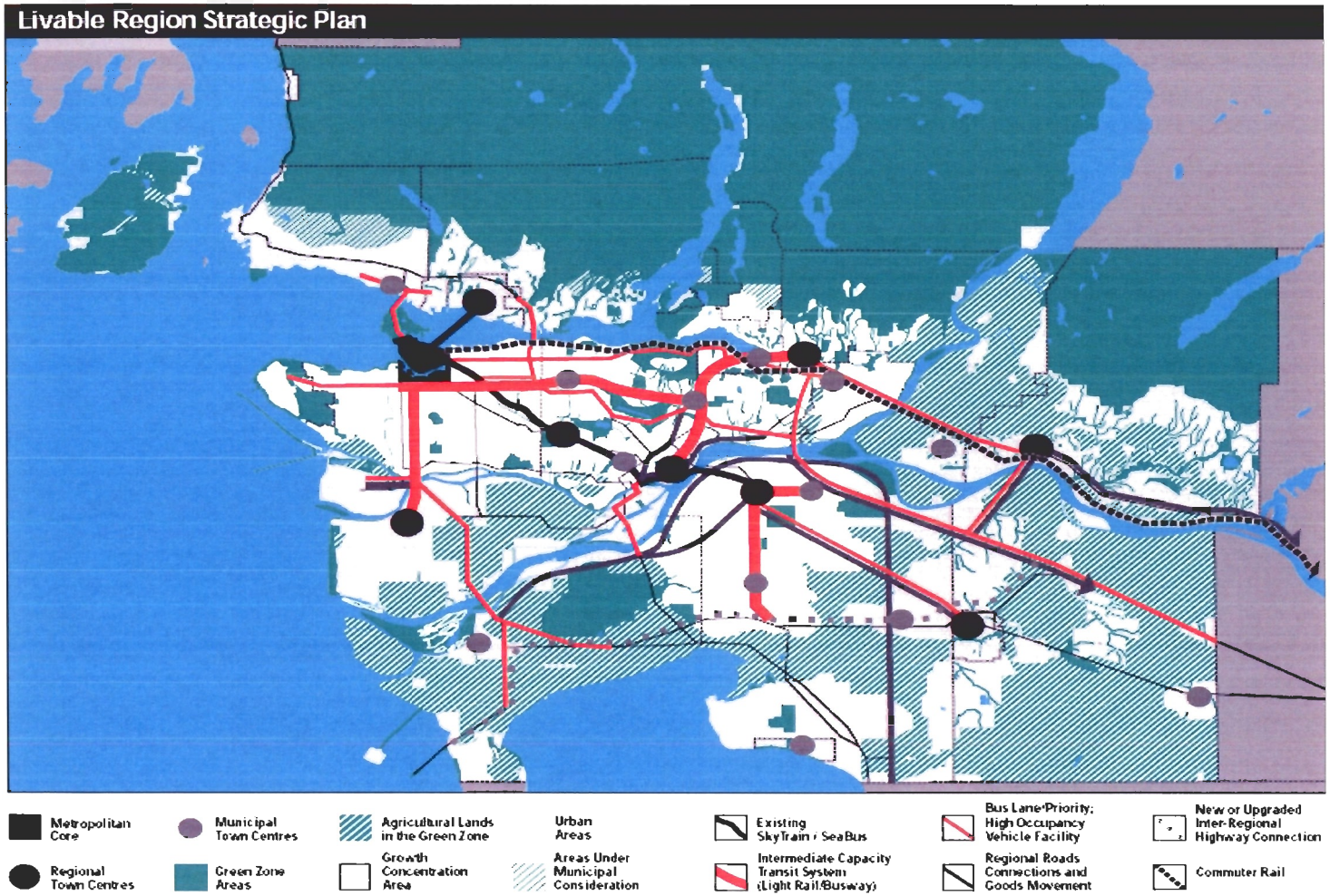
Appendix 1: Greater Vancouver Regional District



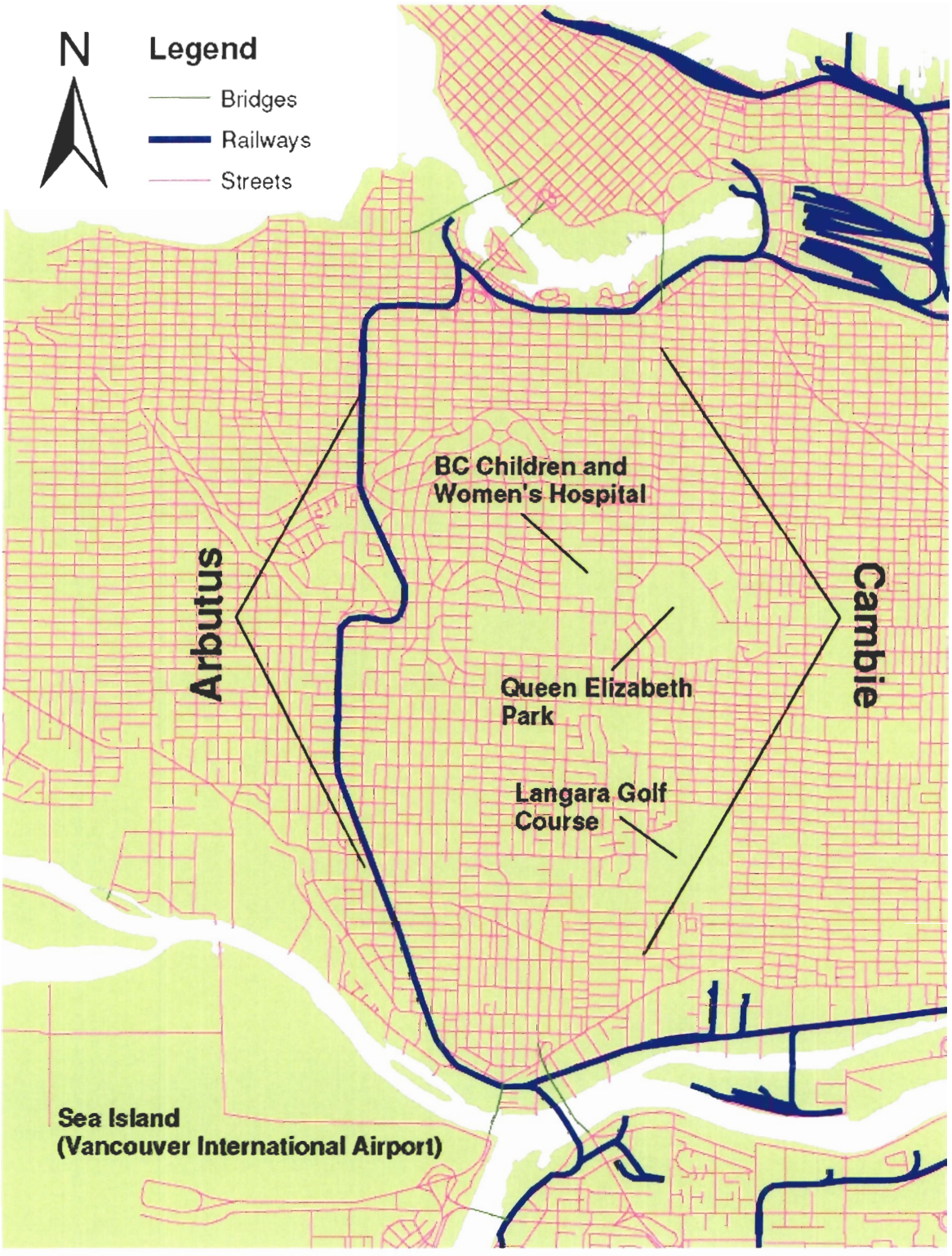
Appendix 2: Proposed Gateway Program Routes and Upgrades



Appendix 3: Livable Region Strategic Plan Map



Appendix 4: Arbutus and Cambie Street Corridor Map



Appendix 5: Survey Consent Letter

This survey has been designed to collect the opinions of GVRD residents towards the development of a regional rail system south of the Fraser River. The survey is 13 questions long, and will take approximately 10 minutes to complete. The responses that you provide should speak to your personal opinion, and not those of your household.

By clicking the "Next" button, you are consenting to participate in this research project, and you are consenting to the collection of the responses that you provide for the purposes of this research project. By clicking the "Next" button, you are also confirming that you are 19 years of age or older.

All information collected by this survey is securely stored in Simon Fraser University's on-site servers and completely controlled by the University's privacy policies regarding personal data. You will not be asked to provide any information of your individual identity. For the purposes of the study, you will be asked to provide your residential postal code, which will be used to help analyse the data. You have the option to opt out of the survey at anytime by closing your Web browser.

If you have any questions regarding the study or the use of the information that you provide, please feel free to contact me directly at jdeane@sfu.ca, or through the SFU Urban Studies Program using the contact information found on the Research Homepage.

If you have any concerns or complaints please contact Dr. Hal Weinberg, Director, Office of Research Ethics at hal_weinberg@sfu.ca or phone at: 604-268-6395.

Please click "Next" to continue.

Appendix 6: Survey Questionnaire

Q1. Which GVRD municipality do you live in?

Anmore
Belcarra
Burnaby
Coquitlam
Delta
Electoral Area A
Langley (City)
Langley (Township)
Lion's Bay
Maple Ridge
New Westminster
North Vancouver (City)
North Vancouver (District)
Pitt Meadows
Port Coquitlam
Port Moody
Richmond
Surrey
Vancouver
West Vancouver
White Rock
Other

Q2. Which GVRD municipality do you work/go to school in? If you both work and go to school, please select the municipality that you spend the most time in for work or school.

Anmore
Belcarra
Burnaby
Coquitlam
Delta
Electoral Area A
Langley (City)
Langley (Township)
Lion's Bay
Maple Ridge
New Westminster
North Vancouver (City)
North Vancouver (District)
Pitt Meadows

Port Coquitlam
Port Moody
Richmond
Surrey
Vancouver
West Vancouver
White Rock
Other
Not Applicable

Q3. Please select the amount time that you spent in each mode in the past 7 days.

	7+ Hours	4-7 Hours	1-4 Hours	<1 Hour	Never
Personal Vehicle					
Public Transit – Bus					
Public Transit - SkyTrain					
Carpool/Vanpool					
Bicycle					
Walk					
Other					

Q4. 4. Please select the amount time that you spent using each mode to travel to work/school in the past 7 days. If you both work and go to school, please provide answers for the one that you spend the most time traveling to and from.

	7+ Hours	4-7 Hours	1-4 Hours	<1 Hour	Never
Personal Vehicle					
Public Transit – Bus					
Public Transit - SkyTrain					
Carpool/Vanpool					
Bicycle					
Walk					
Other					

Q5. Please select the amount of time that you spent using each mode to travel for all other trips in the past 7 days. All other trips include small and large trips, such as going to the grocery store, the coffee shop, a friend's house, etc....

	7+ Hours	4-7 Hours	1-4 Hours	<1 Hour	Never
Personal Vehicle					
Public Transit – Bus					
Public Transit - SkyTrain					
Carpool/Vanpool					
Bicycle					
Walk					
Other					

Options for Regional Rail - Individual Opinions

The following questions are designed to determine your opinions on the current transit system in your municipality, as well as how you believe a regional rail system would or would not change your travel habits.

For the purposes of this study, regional rail is a system that operates to serve areas with high car ownership, such as suburban municipalities. A regional rail system spans multiple municipalities, allowing long range travel in an efficient amount of time. Regional rail operates on a right of way separated from vehicle traffic, allowing higher speeds and reliable service. For a more detailed description of Regional Rail, please visit Wikipedia.

A local example of a regional rail system is the West Coast Express, a commuter regional rail system that operates in peak periods, traveling from Mission to Downtown Vancouver in the morning and back in the afternoon.

For clarity, the south of Fraser region consists of the following municipalities:

- Delta
- Langley City
- Langley Township
- Surrey
- White Rock

Q6. The following statements are opinions held by different GVRD residents. Please indicate your level of agreement with each of the statements below. If you haven't traveled within the South of Fraser region, or if the statement doesn't apply to you, please mark the statement as N/A.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
Q6a	Compared with other transportation options, current public transit service						

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
	south of the Fraser River is convenient enough						
Q6b	Compared with other transportation options, current public transit service south of the Fraser River is reliable						
Q6c	Overall, Current public transit south of the Fraser River is an effective way for me to get to work/school						
Q6d	If bus service were closer to my home, I would use it more often						
Q6e	I would use a public transit rail service if it were available within my municipality						
Q6f	I would support the development of a regional rail system along existing rail lines in my municipality						
Q6g	I would support the development of a regional rail system along newly constructed rail lines within my municipality						
Q6h	I would support the development of a regional rail system if there were no additional burdens placed on the public tax system						

Q7. What changes to the transit system would convince you to make more trips via public transit? If there are no changes, or you would rather not answer, please type n/a.

Q8. How would the existence of a regional rail system with station(s) in your municipality impact how you travel within the region? If no impact, or you would rather not answer, please type n/a.

Respondent Information

The following questions will ask you for information about yourself. These questions are not designed to personally identify you, but to help identify trends in the collected data, as well as ensure that the responses represent all types of GVRD residents.

Q9. Age - Please select your age range.

19-24

25-34

35-44

45-54

55-64

65+

Q10. Gender - Please select you gender.

Female

Male

Not Applicable

Q11. Do you own or rent your residence?

Own

Rent

Not Applicable

Q12. Do you own of have access to a household vehicle?

Yes

No

Other

Q13. Please enter your residential Postal Code.

Closing Comments

If you have any feedback on the survey you just completed, or would like to provide more clarity on your responses/opinions regarding a regional rail system in the GVRD, please use the space below to do so.

Appendix 7: Data Codes

Data Codes for Questions 1 and 2

Municipality	Code
Anmore	1
Belcarra	2
Burnaby	3
Coquitlam	4
Delta	5
Electoral Area A	6
Langley (City)	7
Langley (Township)	8
Lion's Bay	9
Maple Ridge	10
New Westminster	11
North Vancouver (City)	12
North Vancouver (District)	13
Pitt Meadows	14
Port Coquitlam	15
Port Moody	16
Richmond	17
Surrey	18
Vancouver	19
West Vancouver	20
White Rock	21
Other	22
Not Applicable[30]	23

Data Codes for Questions 3, 4 and 5

Time Category	Code
Never	1
<1 Hour	2
1-4 Hours	3
4-7 Hours	4
7+ Hours	5
No Response	99

Data Codes for Question 6

Level of Agreement	Code
N/A	0
Strongly Agree	1
Agree	2

[30] Not Applicable code only used in Question 2.

Level of Agreement	Code
Neutral	3
Disagree	4
Strongly Disagree	5
No Response	99

Data Codes for Question 9

Age Category	Code
19-24	1
25-34	2
35-44	3
45-54	4
55-64	5
65+	6

Data Codes for Question 10

Gender	Code
Not Applicable	0
Female	1
Male	2

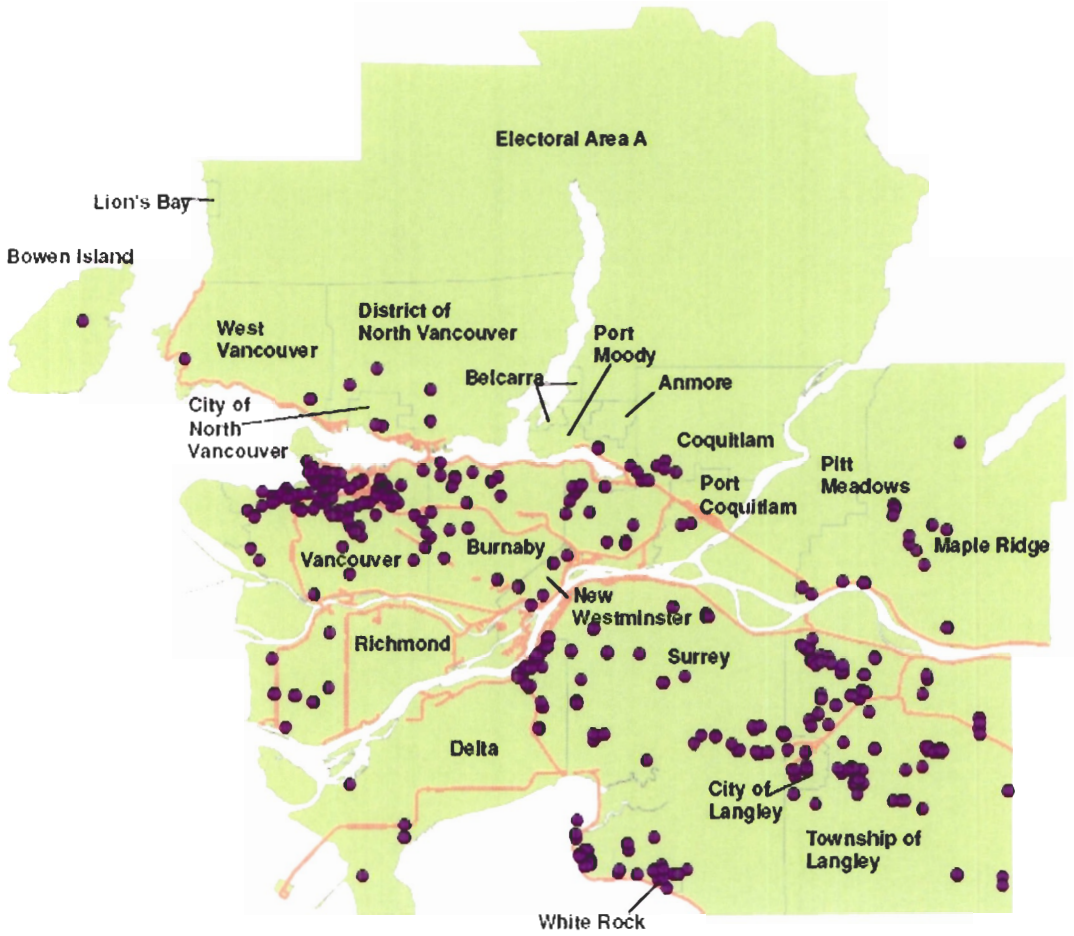
Data Codes for Question 11

Household Ownership	Code
Not Applicable	0
Own	1
Rent	2

Data Codes for Question 12

Access to Household Vehicle	Code
Other	0
Yes	1
No	2

Appendix 8: Map of Survey Respondent Municipality



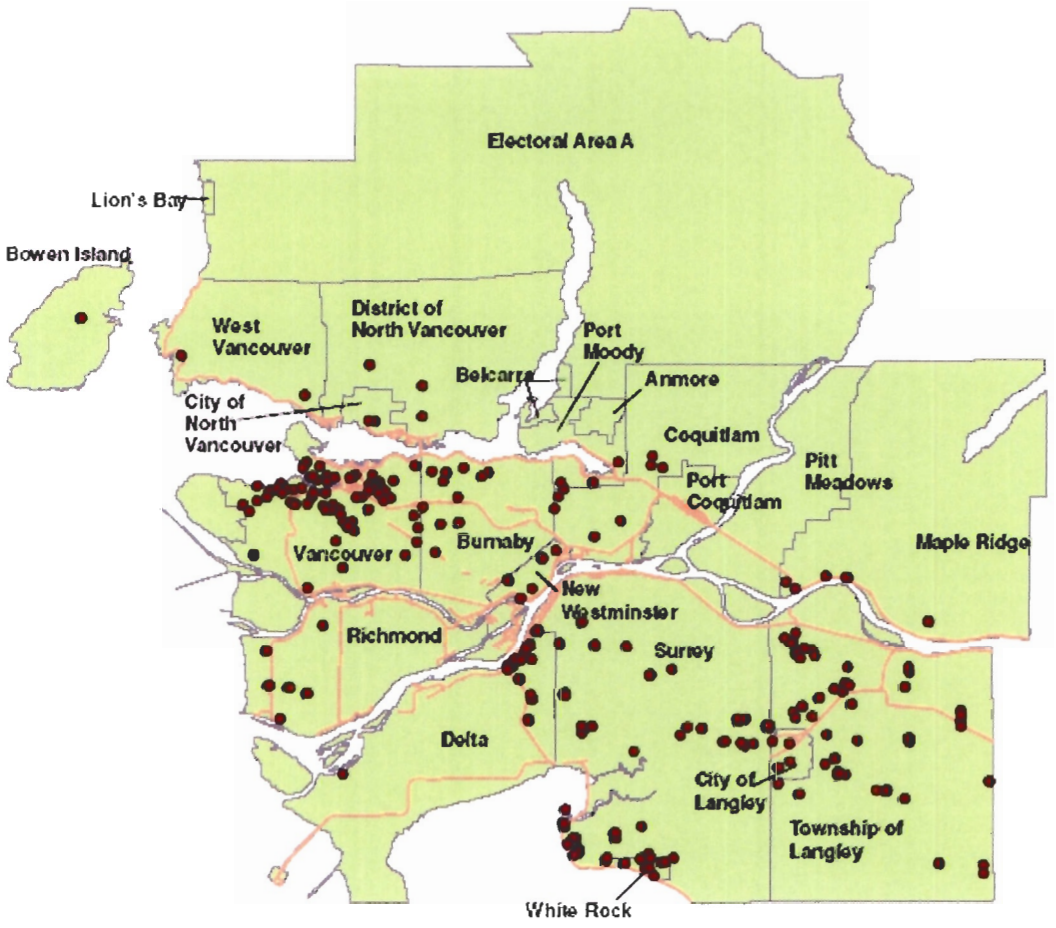
Legend

- Survey Postal Codes
- Railways

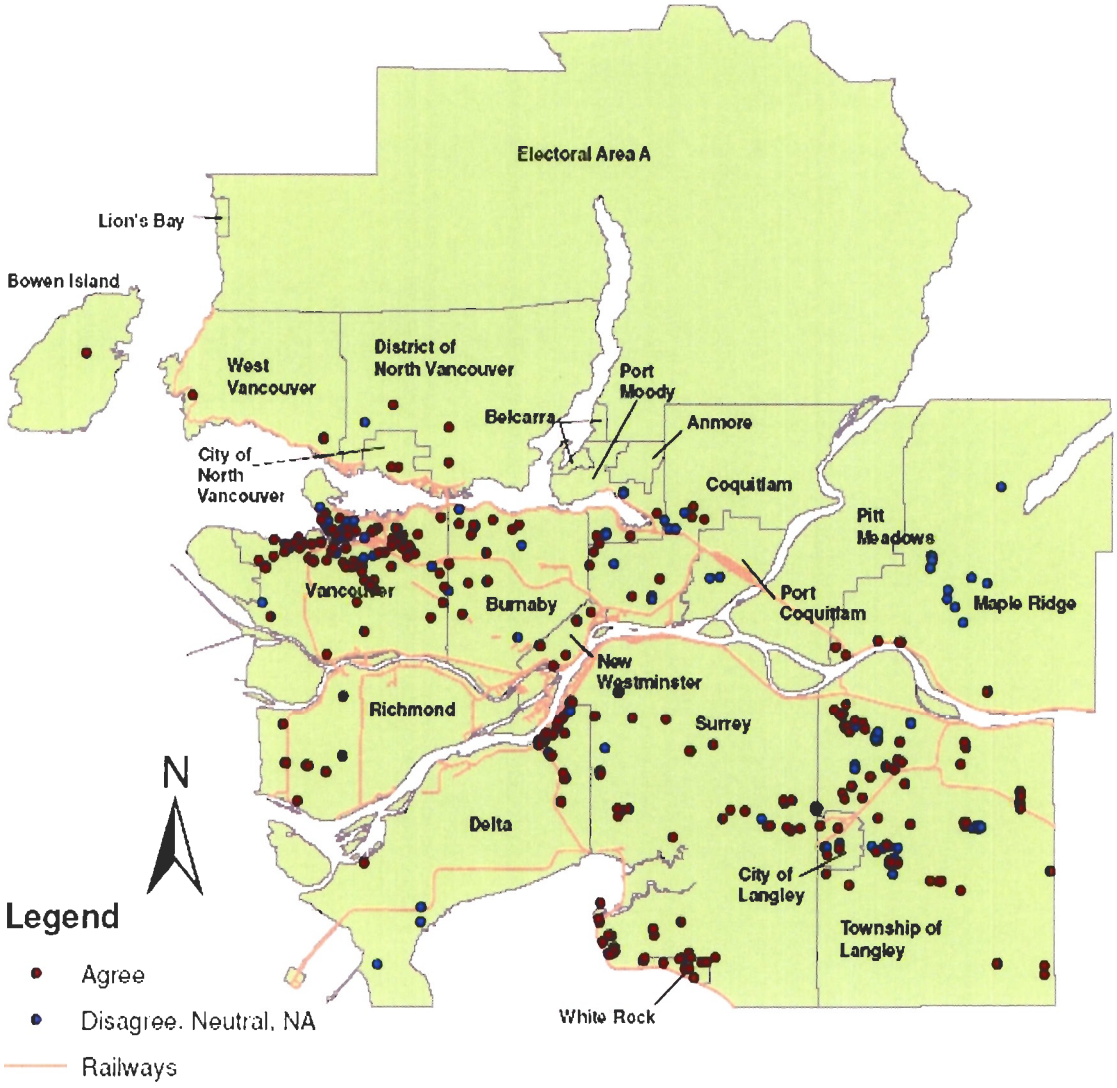
Kilometers
0 3 6 12 18 24

N

Appendix 9: Map of Survey Respondent Agreement with Rail Development (Agreement Only)

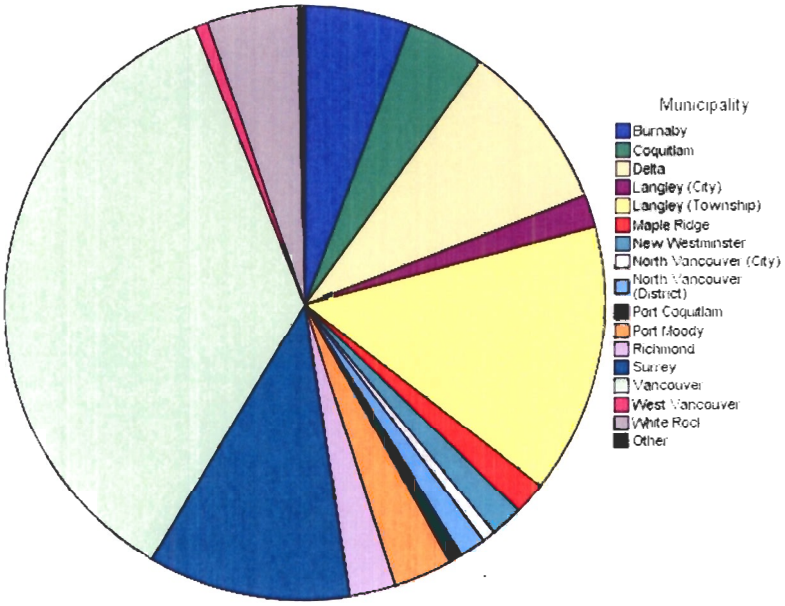


Appendix 10: Map of Survey Respondent Agreement with Rail Development (Total Opinions)

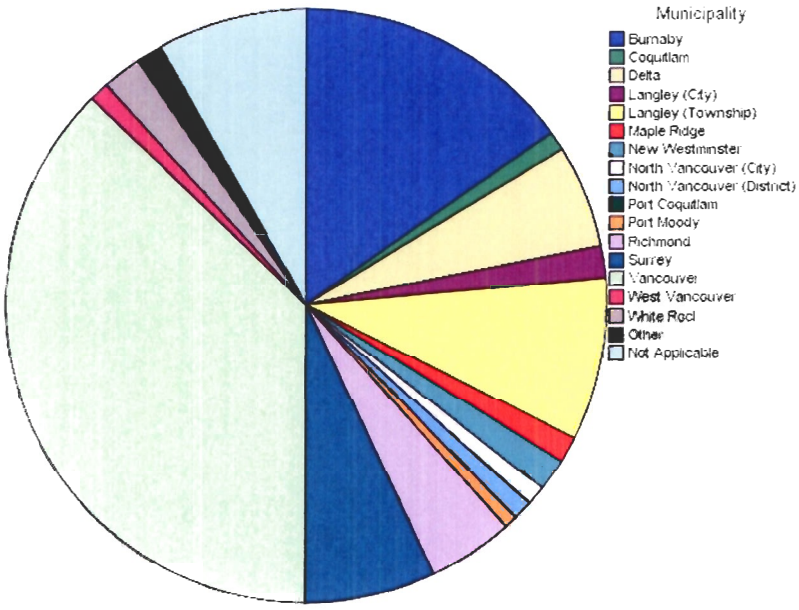


Appendix 11: Graphed Survey Data

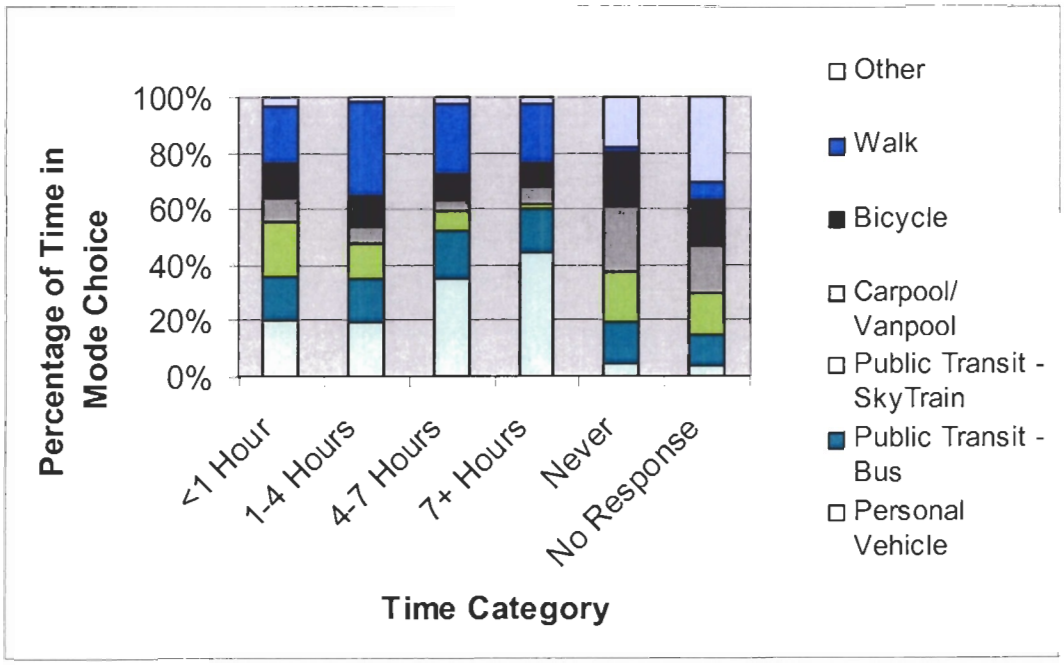
Question 1: Residential Municipality



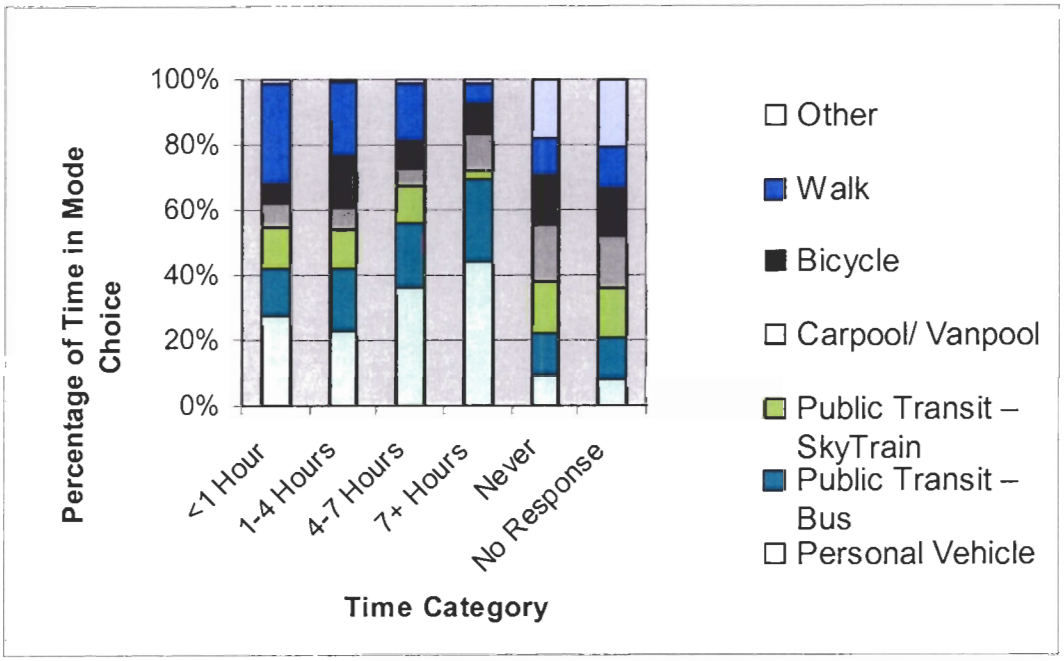
Question 2: Work/School Municipality



Question 3: Mode Usage in Past 7 days (Total Trips, %)



Question 4: Mode Usage in Past 7 Days (Work/School Trips, %)



Question 5: Mode Usage in Past 7 Days (Other Trips, %)