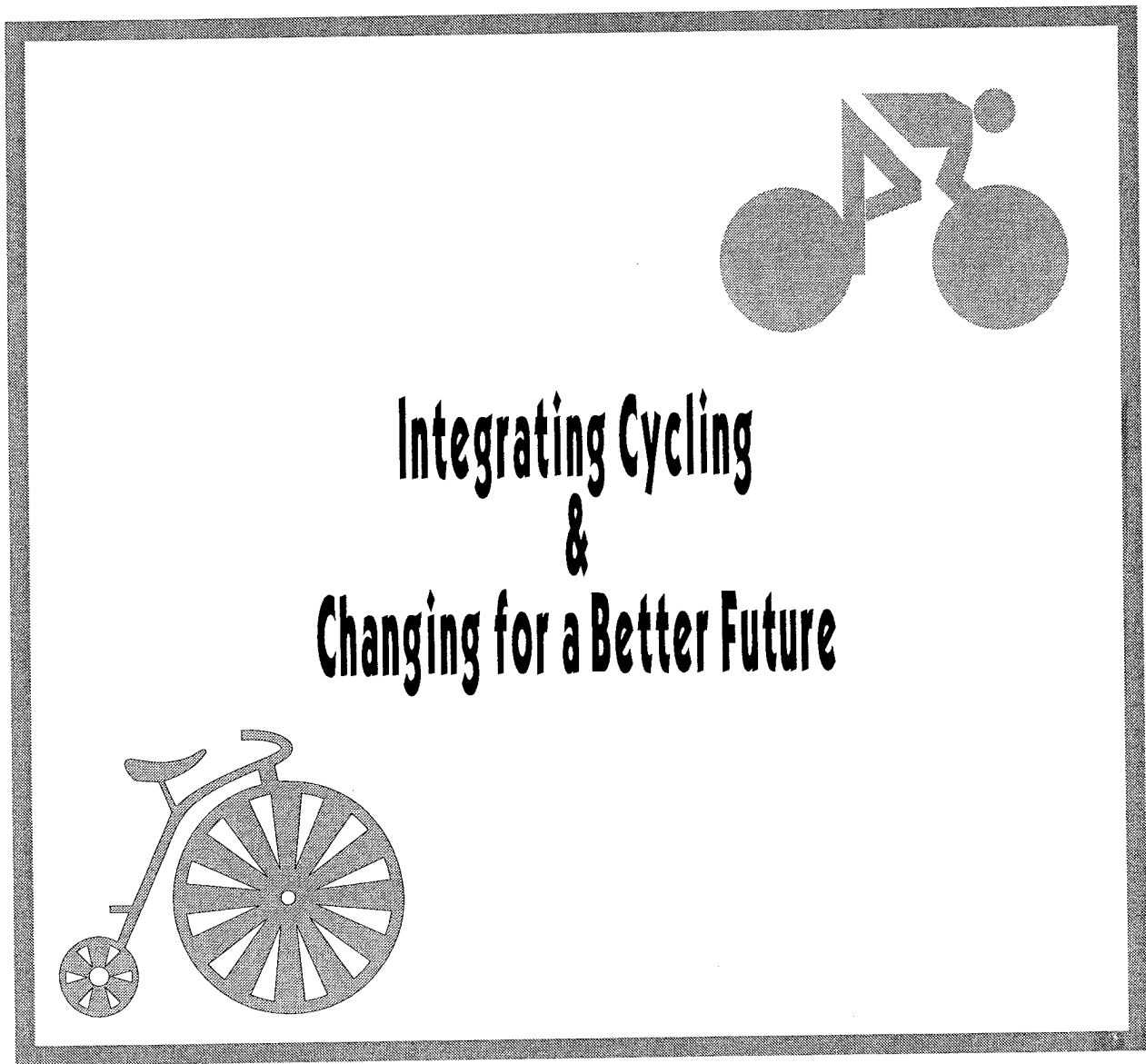




BICYCLE MASTER PLAN



Victoria's Bicycle Master Plan

February 1995

The Advisory Transportation Committee submitted this report to Council with the cooperation of the:

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- Capital Regional District,
- Westland Resource Group,
- Advisory Planning Commission,
- Downtown Advisory Committee,
- Community Planning Department,
- Parks and Recreation Advisory Committee,
- Environment and Public Works Advisory Committee,
- GMK Transportation, Planning, and Engineering Ltd.

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Executive Summary

Introduction

As the Capital City for the Province of British Columbia, Victoria has many geographic, environmental and urban features that could make it the "*Cycling Capital of Canada.*"

The climate is mild throughout most of the year, the topography is moderate, and the urban area is compact enough to make cycling feasible. For example, most of the population in the region is located within 6 km of the downtown which is an ideal range for attracting cyclists.

Despite the ideal cycling conditions, the City of Victoria has made few provisions for bicycles in its transportation system.

To correct this situation, and to recognize the value of encouraging cycling to the quality of life and efficiency of the transportation in the City, the terms of reference for Victoria's Integrated Transportation Strategy called for the preparation of a *Bicycle Master Plan* that:

Proposes policies, engineering standards, enforcement programs, cycling networks and other measures to actively encourage greater cycle use and ensure maximum safety.

The recommendations are linked to the City's stated goals of increasing the numbers of people riding bicycles (primarily for commuting, but also for recreation) and making cycling safer.

The *Bicycle Master Plan* supports the Capital Regional District's Cycling Strategy and many of the recommendations made over the past 3 years by the Greater Victoria Cycling Coalition.

Victoria's Mandate

In July 1991 City Council established a mission statement that said Victoria is "*Committed to a vision of a strong downtown and strong neighbourhoods, the City of Victoria, will have open responsive government enabling citizens to live in a socially responsible, environmentally responsible, artistically rich, and people-oriented city that is economically viable.*"

The City of Victoria commissioned the Bicycle Master Plan in response to the community involvement during the City's development of its' Integrated Transportation Strategy. The *Bicycle Master Plan* is part of the total strategy for transportation management and offers a framework to advance the goals outlined in the City's mission statement.

There is an increasing use of the automobile. To change this trend, we must increase the use of cycling, transit or walking; however, it will require a full commitment by the City of Victoria. Its leadership needs to include policies focusing on all alternative modes of travel and long range funding support to achieve the City's goals.

Cycling Activity

Today, there are over 5000 bicycle trips in the peak hour but further growth is hampered by the lack of facilities. For example, many employees showed a desire to cycle, even part-time, but they felt that it was not safe. This view was expressed by both recreational and commuter cyclists.

Major Findings & Priorities

The Bicycle Master Plan has focused on five key areas that should form the basis of future municipal efforts in promoting cycling. These areas are:

- ***Developing community acceptance:*** It is important the City involve the public and educate the community on the benefits of cycling if we are to fully integrate cycling as a viable transportation option.
- ***Improving the level of safety is a priority:*** Safety is a complex issue and there is a need to utilize all options to respond to improving cycling safety. Many options exist such as bicycle licencing and insurance programs, education programs, enforcement, legislation and developing cycling facilities.
- ***Providing facilities:*** There is lack of cycling facilities in the City and in the region. This includes the provision of safe cycling routes, bicycle lockers and other related amenities.
- ***Providing a funding level:*** Policies for cycling have existed since 1976 in the City. However, other than minor initiatives, ongoing cycling programs have not been realized due to funding. It is estimated that an annual funding program of \$50,000 to \$100,000 per annum will fulfill many of the Bicycle Master Plan objectives by the year 2010.
- ***Implement the Bicycle Master Plan:*** The most important priority is the implementation of the plan. If the City is to work towards a people friendly environment, cycling will be an major factor in achieving this goal. Action is necessary before opportunities are lost to the automobile. A goal of this plan is to see the *Bicycle Master Plan* implemented by the year 2010.

Goals, Objectives and Policies to Encourage Cycling

1.0 Cycling Goals

To make cycling in Victoria a safe, convenient, and economical transportation mode by identifying and eliminating obstacles to bicycle use, and

To increase cycling's share of the total City trips to 12% by the year 2010.

1.1 Bikeways

Objective: *To create a network of bikeways to safely serve major activity centres throughout the City, and*

To make all city streets safe and enjoyable for cycling.

If the goal of increasing bicycle use is to be achieved, then alternative facilities designed specifically for *non-expert* cyclists are necessary. Many cyclists are comfortable riding on highways and heavily-travelled arterial roads, and require no special facilities. However, through the public process, work groups and study by the Bicycle subcommittee, people that do not cycle or are part-time cyclists need a bicycle friendly environment. These facilities need to increase security, safety and increase the pleasure of bicycle travel. The following policies are recommended for adoption by the City:

1.1.1 *The City adopt a map of Bikeways along routes that link downtown to its neighbourhoods.*

The City should adopt a map for Bikeway routes throughout the City. Advisory Committees, the public and the Engineering Department have participated in the review of the routes outlined on Figure 1. Individual neighbourhood associations need to review these routings and any specific standards.

The recommended route network would offer over 40 km of Bikeways to the community and serve both recreational and commuter cyclists.

1.1.2 *The City encourages the participation of residents and business community in the decisions regarding bicycle facilities in their neighbourhoods.*

Local residents have an important role in bikeway planning. They provide key information about local conditions, review suggested plans, and provide support. Before finalizing decisions on major bicycle facilities; local residents and businesses should be invited to participate in any planned changes to a street as part of the *Bicycle Master Plan*. Ideally, this involvement would form part of the Neighbourhood Plan process.



Figure 1 - Recommended Bikeway Routes to the year 2010.

1.1.3 *By 1996, the City develops bikeway standards and establishes a priority list for the development of bikeways for the next five years.*

It is recommended that the City establish standards for the Bikeway routes and the standards follow the guidelines outlined in the Capital Regional Cycling Strategy (Class1, Class2 and Class 3 options). *For arterials, it is preferred that Class 2 standards (marked bike lanes) be used.* This classification was frequently requested during the two public meetings and the survey of City employees.

Marked bike lanes may be unnecessary for the Group A (experienced) cyclists who are comfortable riding in traffic. This standard is intended to encourage more bicycle use by Group B (intermediate and novice) riders. The public involvement in the report showed that bike lanes are important if we are to achieve the goal of increasing cycling trips.

The following streets contain key portions of the Bikeway routes as shown on Figure 1 and act as major connector routes to downtown from the neighbourhoods. It is recommended, these routes be enhanced beyond the City's existing policy of providing only wide curb lanes for bicycles on major streets.

- Fort Street
- Yates Street
- Blanshard Street

The use of class 2 standards (marked bike lanes) should maximize the safety of cyclists and increase the overall awareness of cycling in the City. The bike lane routes should be a minimum width of 1.5 m but could vary from 1.2 to 1.6 m wide. These lanes would be marked by a wide (15 cm) white line on the roadway and supplemented with bicycle stencils and signs.

This technique is used in other cities. For example, the Municipality of Saanich has introduced marked bike lanes next to traffic lanes. Figure 2 shows the kinds of improvements needed to accommodate the recommended cycling facilities on the Victoria bicycle route network. Typical cross sections are presented in Figure 3.

The effectiveness of bicycle lanes and any other facilities depends on diligent application of accepted standards that are appropriate for local conditions. Table 1 outlines a range of acceptable standards; each should be applied based on sound engineering practises. The Canadian Institute of Planners *Community Cycling Manual: A Planning and Design Guide* is recommended for adoption by the City. This guide will help the City in developing bike lanes.

Marked bike lanes may not always be the best or only option. To provide bicycle lanes, the City will need to consider street parking, transit routes, lane widths and adjacent land uses. Community goals, engineering practises, safety trends and public involvement should guide the use of bicycle lanes.

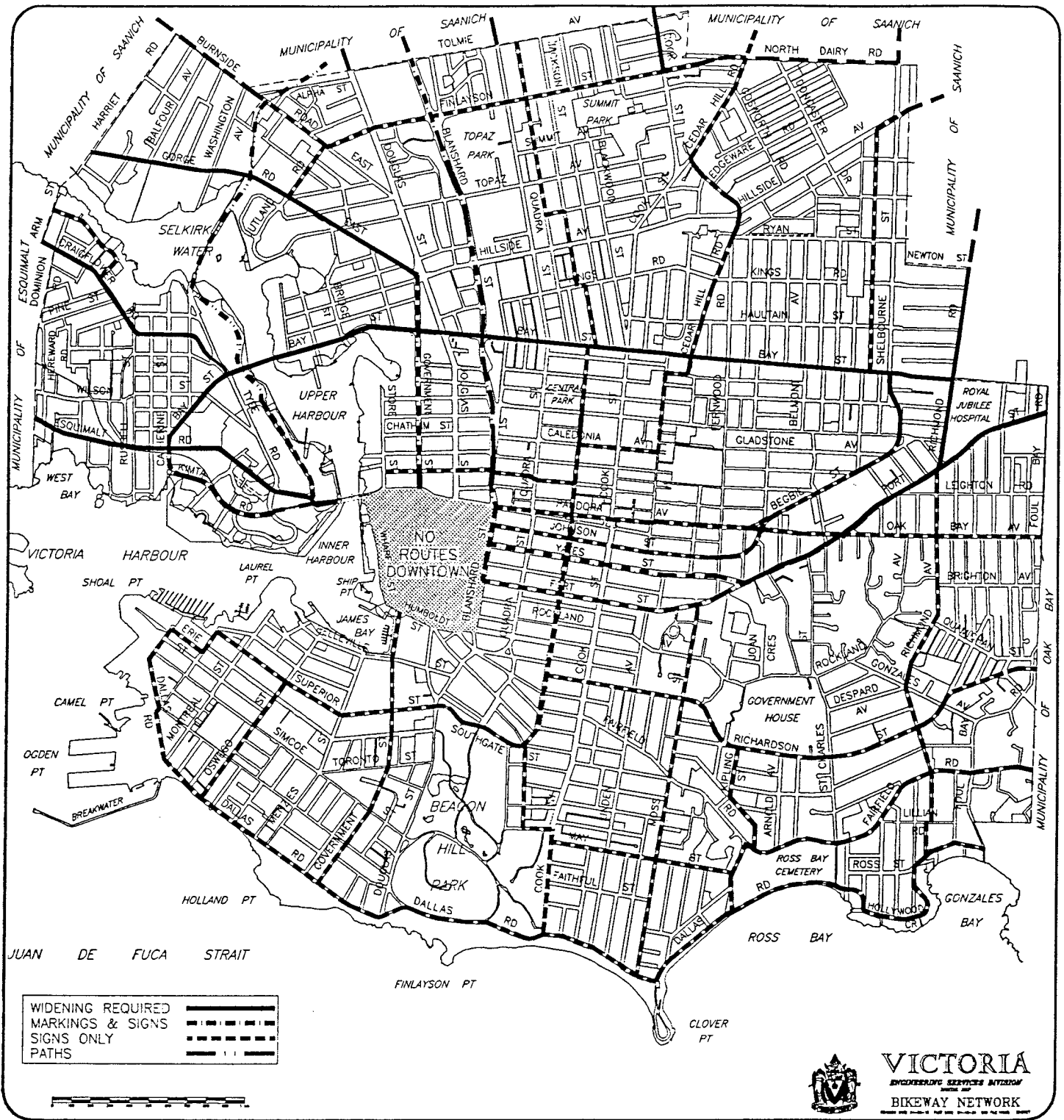
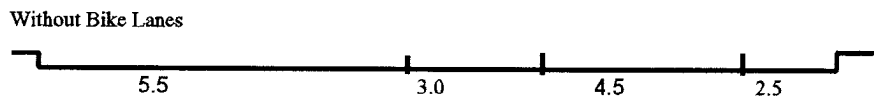
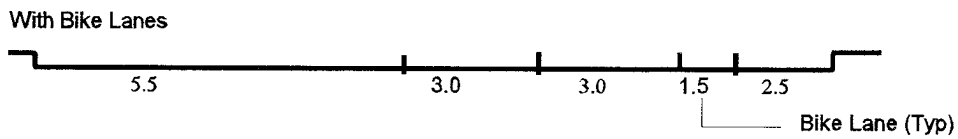


Figure 2 - Potential Improvements needed to Bicycle Routes

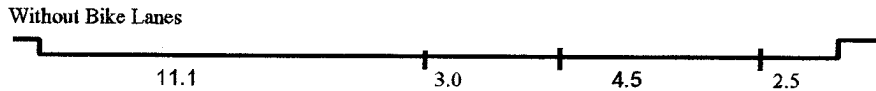
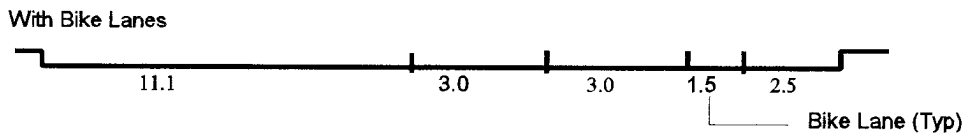
Blanshard Street (Tolmie to Pembroke)



Fort Street (Blanshard to Harrison)



Yates Street (Blanshard to Cook)



not to scale, all dimensions in metres

Figure 3 Cross Section Options for Proposed Bike Lane Routes

1.1.4 *The City develops criteria for safer cycling around schools.*

Schools are major bicycle destinations of Group C (child) cyclists throughout the City. To improve the safety of cycling near schools, the City should identify major bicycle routes to schools and meet with school administrators to decide the best method to improve safety.

1.1.5 *The City coordinate its bikeways with adjacent municipalities for continuity of the inter-municipal routes.*

Esquimalt and Saanich have developed bicycle plans with routes that are not always consistent with the Victoria network map. The basis of route selection in Saanich differed from the system used in Victoria, in part because of different provincial funding programs available to the municipalities.

The large volume of inter-municipal bicycle traffic requires that a contiguous system of bicycle routes, paths, and lanes be achieved throughout the region. The City should work with adjacent municipalities and encourage the development of a contiguous network of bicycle routes.

1.1.6 *Bikeways be developed based on accepted national practices and standards.*

Providing adequate curb lane width can be the single most valuable improvement for safe, low-stress, on-street bicycling (Mackay, J., in Boivin and Pronovost 1992). Whether striped or not, curb lanes need to be wide enough to be safely shared by cyclists, parked cars, and trucks and buses. *It is recommended the City adopt the lane width standards in Table 1.*

Many routes proposed for Bikeways are sufficiently wide to meet the criteria in Table 1, and require only restriping and signing. Other routes, however, require widening to reach the standards. For all road improvements that occur along the Bikeway routes should include designs to meet the standards recommended for safe cycling routes. It is recommended that any construction project on or near the street that restrict the ability to improve the road to the Safe Cycling standards be approved by City Council.

Feature	Width Range
Motor vehicle travel lane--50 km/h	3.0 to 3.65 m
Onstreet parking (car doors open)	2.5 to 2.6 m
Marked bicycle lane width (recommended 1.5 m)	1.2 to 1.6 m
Unmarked bikeway with parking, curb lane width	6.6 to 6.9 m
Unmarked bikeway and no parking, curb lane width	≥4.25 m

1.1.7 *Cycle paths be constructed based on accepted national practices and standards.*

Experience in other communities suggests that separated bicycle or joint bicycle-pedestrian paths can support commuting and recreational cycling by all age groups. Separated paths may be feasible where there is limited cross traffic (pedestrian and motor vehicle). Paths should ideally be 2.5 to 3.0 m wide, with a centre line and signs saying whether the path is for exclusive bicycle use or joint pedestrian use.

For joint use paths, special control measures are necessary. "Pedestrians Keep Right" signs should be posted and a *speed limit* should be considered. Whatever the design, complaints are expected. A review process should be available to evaluate the trends and to involve a committee such as the Bicycle Advisory Subcommittee, City staff and the public.

In Victoria, opportunities exist for bicycle paths in the following locations:

- Beacon Hill Park south of Dallas Road from Menzies Street in the west to Bushby Street in the east;
- Beacon Hill Park from the intersection of Cook Street and Dallas Road in the southeast to Southgate and Blanshard Streets in the northwest (with a spur to the Park Boulevard terminus of the Vancouver Street);
- Along the CNR right-of-way from Bayside to the Saanich boundary (including a bridge crossing of the Selkirk Water);
- From Bridge Street to the intersection Gorge Road and the CNR right-of-way (through a redeveloping property);
- Westsong Way, Songhees.

A path on the CNR right-of-way through Cecelia Ravine to the District of Saanich boundary has recently been completed. The City is actively pursuing providing the Selkirk Bridge crossing to extend the route. The CNR bicycle path can be expected to attract significant volumes of recreational and commuter traffic. This path should be designed to a high standard, paved, and lighted for night travel.

The existing Westsong Way path is 4 m wide. Cycling is banned along this path due to concerns raised about pedestrian safety. The conflicts between cyclists and pedestrians could be reduced by providing adequate control measures. It is suggested the City test signs informing users that it is a "Joint Use Path" and that "Cyclists must Yield to Pedestrians," in addition, posting a bicycle speed limit of 10 km/hr, and paint a centre line. In addition, during high use periods when conflicts would increase, the City should be prepared to assign Victoria Police bicycle patrols to the area.

In Beacon Hill Park, the City should review the provision of joint use of paths. This will require upgrading the standard of existing paths. The Parks Department and the Bicycle Advisory Subcommittee should collaborate on the amendments due to the safety concerns raised by the Parks Department.

1.1.8 *The City develops a program to improve the condition of all streets to make cycling safer.*

Low volume collector and local streets can be safe for Group B and C cyclists without special measures. This includes downtown streets where traffic volumes are very high, the speeds are generally low. There are logistical problems associated with designating bicycle lanes downtown and it may not be justified, especially because bicycle traffic is dispersed throughout the downtown. Therefore, on local and downtown streets, a program should be carried out to make the streets "bicycle friendly" by taking the following actions:

- Installing drain grates having slots perpendicular to traffic direction;
- Repairing damaged pavement or surface irregularities greater than 2.5 cm;
- Ensuring, curb lane widths comply with the guidelines in Table 1.

1.1.9 *The City amends road design, construction and maintenance policies to promote a safer environment for cycling.*

Road edges are frequently in worse condition than other parts of the roadway. Cracked and broken pavement and asphalt, road debris, broken glass, dirt and gravel, and drain grates characterize the portion of the roadway used by bicycles. Road and curb cuts for utility installation and servicing leave pavement irregularities that create unpleasant or unsafe riding surfaces.

The City should develop a set of design guidelines, a paving program, and maintenance procedures to create and maintain smooth, debris-free road edges throughout the city. Resurfacing contracts and utility installation and service procedures should pave to the road edges to the highest standard, leaving them in smooth condition. Street cleaning operations should focus on cleaning the 2 m of road closest to the curb or a marked bike lane.

1.1.10 *The City strives to eliminate the hazards to cycling caused by variable lane widths on major roads.*

A road that suddenly narrows can force cyclists into the path of passing motor vehicles. The curb lane of Cook Street, for example, narrows to 2.6 m midway between Johnson and Yates Streets. As part of the objective of making all streets safe for cycling, the City should identify where roads narrow and develop a program for improving these sections. The City recognizes that in some places, right-of-way acquisition may be necessary to create safe lane widths.

1.1.11 *The City establishes construction policy that reduces the hazards to cyclists.*

Construction materials, equipment, and vehicles of private and public operations are often stored on the road edge, either with or without advisory signs or barricades. This trend along with temporary road covers and patches can be dangerous to cyclists. As long as motor vehicles can pass, such practices have been accepted. In a bicycle friendly city, however, such practices are not acceptable, because they narrow the roadway and create cycling hazards at the road edge.

The City should develop, implement, and enforce new standards for construction on and around roadways that reflect the intent of this policy.

1.1.12 *The City petition the Capital Regional District to establish a "Spot Improvement Program" to identify unsafe cycling conditions; and further, the City establishes an annual maintenance program to respond to the unsafe cycling conditions reported.*

Spot Improvement Programs have proven successful in other jurisdictions for reporting unsafe road conditions. The CRD should create and advertise a "Hot Line" to accept cyclists' calls and direct them to the appropriate municipal or City department. Most calls could be expected to deal with road conditions. The City should include a funding and a policy to repair any identified road hazards for cyclists within 48 hours.

1.1.13 *The City includes with all traffic calming initiatives, facilities that encourage cycling.*

As part of new neighbourhood plans, traffic calming measures have become more important to the community. The City should assure that the traffic calming measures do not obstruct the movement of pedestrians or cyclists.

1.2 Ancillary Facilities

Objective: *To provide secure bicycle storage and other necessary supporting facilities at major destinations.*

1.2.1 *The City establishes policies, standards, guidelines and regulations for the redevelopment or rezoning of properties to ensure the provision of bicycle parking and other appropriate ancillary facilities.*

Class 1 parking protects the bicycle from inclement weather, provides for secure locking of wheels and frame, may include bicycle lockers, and is in a monitored location. Class 2 parking provides less protection from weather, provides for secure locking of wheels and frames, and is conveniently located at major entrances.

The City policies should be responsive to changing trends in cycling by employees, customers, or residents. As cycling volumes increase, the bicycle parking standards may also need to be raised. The standards should allow for the reduction of automobile parking requirements if bicycle parking is provided and proves to reduce automobile related demand. The Zoning Bylaw should include requirements for bicycle parking similar to the standards outlined in Table 2.

Predominant Use	Class 1 Parking	Class 2 Parking	Other
Retail	10% of auto spaces	1 / 1000 sq ft	1 locker /10 employees; showers if more than 75 employees
Office, Institutional	10% of auto spaces	1 / 1200 sq ft	1 locker /10 employees; showers if more than 75 employees
Hotel	1/20 rooms	1 / 1200 sq ft ¹	1 locker /10 employees; showers if more than 75 employees
Industrial	10% of auto spaces	1/3,000 sq ft	1 locker / 10 employees
Attached Housing	1 / unit	1 / 4 units	---
Reduce auto spaces	1 / 3 bike spaces	1 / 6 bike spaces	none

¹

Non-accommodation facilities

1.2.2 *The City establishes a program to increase the provision of bicycle parking in the City through a cost sharing policy and/or a program that is fully funded by the private sector.*

The City presently funds the cost of installing approved bicycle racks purchased by downtown businesses. The City should look for ways to expand the program to install bicycle racks and it will be necessary to expand the funding sources. In addition, options for economical bicycle racks (such as the combination parking meter-bicycle rack design used in Toronto, or providing advertising on the racks) should be investigated.

1.2.3 *The City encourages the provision of bicycle facilities at all downtown employment centres.*

To encourage cycling, all buildings should contain Class 1 and 2 bicycle parking, showers, and lockers. Along with bicycle facilities, employers should include incentives for cycling and disincentives for driving. The City has an opportunity to advance this goal. The Victoria Accord project proposes to construct large provincial office buildings and to reduce the dependence on the automobile. This policy should apply to all major employers' in the City.

1.2.4 *The City establishes funds to allow for the provision of secure and supervised bicycle parking in City owned parkades.*

Steps should be taken to increase the usage of bicycles and to support cycling with high quality bicycle parking services. This action could reduce the long term pressures to build additional parking for vehicles. Compared to \$10,000 per space for vehicle parking, the cost to provide bicycle services is very reasonable.

At present, the City provides 100 bicycle spaces in the five civic parkades. The City should develop Class 1 storage for bicycles and make the availability of bicycle parking equivalent to 10 percent of the total vehicle spaces (10% x 2000 = 200 bicycle spaces). This equivalency standard should be incorporated in the zoning bylaw and applied to all new parkades.

1.2.5 *The City develops bicycle parking guidelines for development permits and rezoning applications.*

The City should investigate and recommend measures for getting private parkades to install Class 1 and Class 2 bicycle parking. As illustrated in section 1.2.4, the private sector should be fully involved in this program.

1.3 Integration

Objective: *To integrate cycling into all City plans, decision-making processes, and operations.*

1.3.1 *The City includes all relevant policies and networks outlined in the Bicycle Master Plan in Victoria's Official Community Plan and Neighbourhood Plans.*

The Official Community Plan and Neighbourhood Plans already have policies that deal with cycling. Neighbourhood plans, however, are inconsistent in the designation of routes and other cycling elements. It is recommended that all relevant goals, objectives and policies from the *Bicycle Master Plan* be reflected in the Official Community Plan and Neighbourhood Plans.

At the Neighbourhood Plan level, the community should be included to review the impact of the *Bicycle Master Plan*. This is especially important as it will guide the standards for specific portions of the bikeways. Neighbourhood concerns need to be evaluated in context with the broader municipal and regional goals expressed through the *Bicycle Master Plan*. Based on the comments made in the neighbourhoods, the *Bicycle Master Plan* should be reviewed and, if necessary, amended.

1.3.2 *Council be advised of all road works on proposed bikeway routes that effects the curb and gutter and the options to coordinate any works to coincide with improvements that achieve the recommended standards for the bikeways.*

The City should ensure that the Planning, Parks and Engineering Departments prepare guidelines that identify opportunities to provide for cycling improvements with all road works, maintenance programs, and urban design projects. These guidelines should be reviewed by the appropriate advisory committees and submitted to Council for approval.

1.3.3 *The City establishes a program that promotes integrating cycling with all transit modes.*

The City should promote the integration of cycling with other modes of travel. This should include the examination of transit service, the ferry and float plane terminals to identify obstacles to safe bicycle access, egress, and storage.

The City should seek ways to provide bicycle lockers or other secure Class 1 storage facilities at the inter-municipal bus depot, float plane terminals, and ferry terminals. These facilities are expected to reduce the demand for automobile access to these departure points.

BC Transit is providing bicycle lockers at selected "Park and Ride" locations in the region. The City needs to encourage the expansion of this program to other regional bus transfer points and to major bus stops in the city.

- 1.3.4** *The City allocates resources to administer the bicycle program; and further, that the City recommends to the Capital Regional District to establish a position for a Bicycle Program Coordinator.*

A Bicycle Program Coordinator(s) is needed to motivate the implementation of the *Capital Regional Cycling Strategy, the City of Victoria Bicycle Master Plan and other cycling programs*. It would be more effective to have the CRD coordinate the cycling programs of various municipalities, along with meeting with representatives of the community and other jurisdictions and various committees. This coordination effort would help each municipality to have a broader understanding of cycling goals, priorities and improve joint inter-municipal routes.

Each municipality would remain responsible for the funding and implementation of its cycling initiatives. In the City, it would be necessary that staff coordinate budget and bicycle program priorities, advise Council and coordinate community involvement.

- 1.3.5** *The Engineering Department monitors the Bicycle Master Plan implementation and report on the progress annually to Council.*

The City should evaluate the progress and success of *Bicycle Master Plan* program elements, and recommend changes to the program as necessary. The Advisory Transportation Committee is the recommended group to review and recommend any changes of the *Bicycle Master Plan*. This committee is encouraged to use a specialized subcommittee such as the existing Bicycle subcommittee for the detail discussions of the annual report.

- 1.3.6** *The City monitor cycling trends and develop programs to enhance cycling in Victoria.*

The City needs to include bicycle counts as part of regular traffic counts to help in transportation planning. The City should conduct bicycle user surveys as necessary to find out cyclist needs and priorities and to learn the acceptance of the City's Bicycle Program.

- 1.3.7** *The City establishes programs to support and encourage all levels of government and the private sector to pursue cycling initiatives.*

The City should endorse most of the recommendations contained in the CRD Cycling Strategy and recognize the importance of taking a regional approach to planning for bicycles. It should provide support for the CRD initiatives through staff participation, letters of support, and financial assistance as appropriate. Along with the CRD, other municipalities and the province are also actively developing programs for cycling. It would be important that the City cooperates with programs that encourage more cycling.

1.4 Cycling Education

Objective: To foster mutual respect and understanding of the needs and responsibilities of cyclists, motorists, and pedestrians through an active program of education and training.

The cycling literature and results of the focus group activities highlight the need to improve the understanding of safe cycling techniques and to increase motorists' respect for the rights of cyclists. Education programs need to be expanded to solve existing safety problems and to prepare for expected increases in bicycle traffic on City streets. To be effective, cyclists and motorists throughout the region need to be involved in education programs.

1.4.1 *The City petition the Province and the Capital Regional District to establish programs that will encourage and support bicycle education for all age groups, and the City participates with such programs through the provision of facilities, funding and cooperation with other agencies.*

The road improvement elements of the City's bicycle program need to be complemented by cyclist and motorist education. Institutions, such as ICBC, the Motor Vehicle Branch, the B. C. Safety Council, the Canadian Cycling Association, and police departments have developed effective programs for reaching school-age cyclists. The City will provide annual financial support for these programs, recognizing their value to the goals of safe cycling. The Police Department and the Advisory Bicycle Subcommittee will advise Council regarding appropriate programs and levels of support.

The City will also support efforts by cycling education groups, the CRD Traffic Safety Commission, the Motor Vehicle Branch, and ICBC to reach motorists and adult cyclists through changes to the Safe Drivers Guide, motor vehicle examinations, and required cycling safety courses for cyclists and motorists involved in car-bicycle accidents.

Improving the Safe Drivers Guide and examinations will only reach new motorists. The Motor Vehicle Branch and ICBC should be encouraged to develop and set up a program to reach drivers already licensed in British Columbia and visitors to the City from other jurisdictions.

Cycling educational programs should, at a minimum, consider the use of the following elements presented in Table 3.

**Table 3
Cycling Education Program Elements**

Target Group	Elements
General Population	<ul style="list-style-type: none"> - wide use of media - community cycling events - designated bike days - bike route maps - pamphlets
School, Colleges & Universities	<ul style="list-style-type: none"> - slogans - leaflets - programs to develop motor skills and physical coordination - formal class instruction - assembly programs - play streets - Safe Cycling Route to School program - rodeos - hands-on cycling education
Adult Cyclists	<ul style="list-style-type: none"> - expanded cycling safety education courses - bicycle training courses for traffic violators - cycling incorporated in standard drivers' test - inclusion of cycling in Safe Drivers Guide - designated bike days - bike route maps
Motorists Awareness	<ul style="list-style-type: none"> - cycling incorporated in standard drivers' test - inclusion of cycling in Safe Drivers Guide - mailings and other methods of reaching licensed drivers - wide use of media

1.5 Encouraging Greater Bicycle Use

Objective: *To actively encourage cycling rather than driving to work, shopping, and for recreation by providing promotional materials, incentives for cycling, and disincentives for driving.*

1.5.1 *The City establishes a program to encourage all City employees to cycle to work.*

To encourage its employees to cycle to work, the following options will be considered:

- Identifying and overcoming impediments to cycling to work;
- Eliminating subsidized parking or pay cyclists an equivalent or greater amount;
- Paying employees the same rate per kilometre for travel on City business on bicycles as in a car;
- Purchasing a fleet of bicycles for use by employees during the day on City business (such as is done at the University of Victoria);
- Holding events to encourage cycling--lunchtime cycle tours, awards for most days or kilometres cycled, etc.
- using City employees to provide reviews of cycling facilities installed by the City and to suggest improvements to the *Bicycle Master Plan*.

1.5.2 *The City recommends that all employers in the City establish bicycle programs for their employees.*

The City should develop a program to encourage increased cycling to work throughout the City. Cycling programs should be coordinated with the Capital Regional District and provincial agency programs. These programs could include:

- Preparation of brochures and posters describing the advantages of cycling over driving to work;
- Meeting with employers, building managers, and employee groups to identify impediments to cycling to work, and then developing programs to remove those impediments;
- Providing incentives in the form of reduced parking requirements for new construction or publicity in City or CRD public mailings;
- Encouraging the elimination of subsidies to automobile parking;
- Seeking partnership and participation in staging bicycle events, creating cycling encouragement committees, or competitions (most cycling employees, greatest distance cycled, etc.).

1.6 Laws and Enforcement

Objective: *To encourage legislation and regulations that improve the safety of cycling without reducing its appeal to broad segments of society.*

Cyclists and motorists have equal responsibilities under the Motor Vehicle Act, even though bicycles clearly are not physically equal to motor vehicle. Laws and roads have been focused to response to the characteristics of cars, trucks, and buses. By comparison, bicycles can turn and stop faster than cars and trucks, but their speeds are much lower and depend on topography. Bicycles are more vulnerable to poor road conditions--water, ice, oil, debris, uneven surfaces--than motor vehicles, and are obligated to use the right-hand margin of the road where these problems are common.

The law favours motor vehicles and does not fully respond to changes in cycling technology or behaviour of cyclists. There is a need to examine the differences between bicycles and motor vehicles as related to the Motor Vehicle Act and include in the review the types of bicycles in the marketplace and the sociological differences between the operators.

Regulating the use of bicycles needs to be carefully considered because of the effects of regulation on bicycle-dependent segments of society, effects on efforts to increase bicycle use, how society would benefit from additional regulations, if incentives and education would be more cost-effective than regulation, and whether the regulations could be reasonably enforced.

For example, most adult cyclists are also motorists, but the cycling population differs from motorists in several ways:

- Children and teenagers operate bicycles on roads
- Bicycles are used by those who cannot afford to own and operate a car
- People ride bicycles who are forbidden from driving for legal or medical reasons
- Cyclists are usually untrained, unlicensed and uninsured.

1.6.1 *The Chief of Police review the enforcement policies as related to the Motor Vehicle Act to assure fairness, reasonableness and consistency exists in enforcing violations by either drivers or cyclists, and advise the City on the enforcement policies and practises.*

The City works closely with the community and the police to see that enforcement policy are appropriate in dealing with cyclist violations of the traffic laws. Although traffic laws were developed to be uniform for all modes of travel, rigid enforcement for cyclists may not be reasonable. *However, disregard of the rules of the road by cyclists cannot be tolerated.* Riding against traffic, running red lights, and failing to yield the right-of-way to pedestrians falls into this category. The Police Department should work with the community to explain its guidelines for enforcing traffic laws as they apply to cyclists. Close liaison with the Capital Regional District, the Motor Vehicle Branch, and police departments in neighbouring municipalities should be a priority, to ensure that enforcement policies are compatible.

1.6.2 *The City petition the Province of British Columbia to review and update section 185 (3) of the Motor Vehicle Act.*

This section of the Motor Vehicle Act requires cyclists to use a path if one exists adjacently to a public road. For cyclists that travel at high speeds on the roadway, it would not be reasonable to require them to abide by speed limits as recommended for separated bicycle paths. Requiring all cyclists to use bicycle paths rather than adjacent roads is inappropriate and could create hazards for other users of bicycle paths.

Section 185 (3) of the Motor Vehicle Act does not encourage safe cycling and should be deleted. The CRD Cycling Strategy outlines other sections of the Act that may be outdated such as having the bottom 22.5 cm of the rear mud guard painted white.

The City should support the revision of the Motor Vehicle Act as it pertains to cycling and encourage the province to consult with the City before adopting any new legislation.

1.6.3 *The City encourages the Province of British Columbia to include cycling as part of the driver training, education, and licensing process.*

The City endorses CRD actions to encourage the provincial government to include cycling in the *Safe Drivers Guide* and in written driver examinations and to require cycling training for driving instructors and Motor Vehicle Branch examiners.

The City should seek all opportunities to inform drivers about cyclists' rights on the road and how to share the road with bicycles.

2.0 Purpose of the Bicycle Master Plan

The *Bicycle Master Plan* provides a blueprint for creating a more bicycle-friendly Victoria. It summarizes present conditions, problems, and opportunities. It establishes goals to be attained and policies to be followed to reach the goals. The plan presents some priorities, a draft schedule, and estimated costs for implementing the plan. It includes a bikeway network that needs to be discussed with local residents prior to any implementation.

The plan is not a specific plan or local area bicycle plan. Details of the *Bicycle Master Plan* should be worked out by the City of Victoria and the community. Many of the City's Departments need to be involved in efforts to improve cycling: Engineering, Planning, Finance, Parks and Recreation, Public Works, and the Police Department. Some of the recommendations apply to the provincial government, and suggest that the City lobby for changes of legislation and funding formulas. Coordination with the Capital Regional District (CRD) Cycling Strategy and with bicycle planning groups in adjacent municipalities is encouraged.

The *Bicycle Master Plan* has been prepared as part of an Integrated Transportation Strategy for the City. The findings and recommendations are based on examination of plans and reports, review of information produced as part of the Capital Regional District's Regional Transportation Strategy, analysis of information from focus groups involving local residents, and participation in the City of Victoria's Advisory Bicycle Subcommittee and the CRD's Cycling Strategy Task Force. Bicycle planning experts and cycling program administrators across North America were contacted.

Information on cycling strategies in other places was obtained through a literature search using the Transportation Research Information System (TRIS), office files and libraries of the consultant team, and the University of Victoria library. Substantial information was obtained from the Conference Velo Mondiale - Pro Bike held in Montreal in 1992 that focused on integrating bicycles into transportation planning. Other sources of information were the *Community Cycling Manual* of the Canadian Institute of Planners and bicycle plans prepared by a variety of jurisdictions.

2.1 Effect on the Environment

Cycling improves the quality of the environment by replacing motor vehicle trips and by increasing the energy efficiency of transportation. The following benefits of cycling can be documented:

- *Reduced traffic congestion.* By reducing the vehicle miles travelled (VMT), the lower VMT results in many of the environmental benefits.
- *Reduced fuel consumption.* Bicycles are most effective at replacing short automobile trips, which have very poor fuel economy. For example, fuel consumption for a 3 km trip is twice as high as it is for a 10 km trip.
- *Cleaner air.* When bicycles replace motor vehicle trips, air pollution is reduced accordingly. The replacement of "dirty" short car trips makes the bicycle even more effective in reducing air pollution.
- *Lower noise levels.* Bicycles are virtually silent when compared to motor vehicles. However, adjacent property owners may not notice small reductions in traffic-generated noise because trucks (that are not replaced by bicycles) generate a large component of traffic noise.

- *Reduced cost of road improvements.* Lower levels of motor vehicle use reduce wear and tear on road surfaces, resulting in less need for road resurfacing, widening, and other improvements.

Bicycles may lead to some negative effects. Most of these negative effects can be mitigated through careful design, implementation, and education.

The impacts relate to cycle programs could include the following:

- increased travel delays for motorists
- reduced transit revenues
- intrusion of bicycle facilities into neighbourhoods
- increased conflicts with motor vehicles, pedestrians, and other cyclists
- the need to expend public funds to create a safe cycling environment.

2.2 Effects on the Retail Sector

A study in Holland found that shoppers consider the type of shopping and the weight and volume of purchases when choosing a mode of transportation. They also consider available time, service level of the mode of transport, convenience, reliability, cost, personal income, safety, and characteristics of the mode. In general, bicycles were seen as having advantages for expense, parking, reducing walking distance, and flexibility. Cars had advantages in speed, transport capacity, convenience, and safety. Transit had parking and safety advantages. The study of shopper spending produced the pattern shown in Table 4.

Transport Mode	Proportion of Average Retail Spending (Average =1.0)
On foot	0.8
Bicycle	0.8
Car	1.4
Public transit	1.0
Overall average	1.0

Source: Stienstra, S. in Boivin and Pronovost 1992

The high value of retail spending by car users could be attributed to purchase of big-ticket items that require automobile transport (stereos, furniture, appliances). The study did not indicate the relative numbers of shoppers using the various modes. From a business perspective, the total expenditures by all customers is more important than the amount spent by a single class of customer. No studies examined as part of this project indicated that retail sales had been harmed by the provision of cycling facilities.

Estimating the potential effects of cycling on downtown Victoria business would require tested models from other locations and baseline information on downtown shoppers. Neither models nor baseline data exist. Applying results of studies conducted elsewhere could provide misleading results. Determining the economic impact of changes to modal splits requires that shopper expenditure data be multiplied by the number of shoppers per transport mode.

A recent study identified the income and demographic profile of cyclists in Toronto. The study found that cyclists' modal income was significantly higher than the average (Table 5).

If cycling facilities and programs can increase the numbers of high-income people in commercial areas, the effects on business should be beneficial. In addition bicycles have been shown to reduce business expenses (commuting costs, parking fees, parking space requirements, health insurance rates and expenses) and increased worker productivity (Toronto Cycling Committee 1993).

The downtown business community is concerned that free automobile parking at suburban malls draws customers away. The actual competitive advantage of malls may result from ease of access rather than parking, so if improved customer access to downtown businesses can be provided--by cycling, pedestrian facilities, transit, or strategic provision of parking--business should benefit. Because most adult cyclists are also automobile owners, getting shoppers to leave their cars at home to shop downtown (or at a mall) could enhance the quality of the shopping experience. Because people, not cars, make purchases, initiatives that get more people into retail districts, by whatever means, should be encouraged as a way to stimulate economic activity. A shift from private cars to bicycles will result in a less congested, more pleasant city. This more attractive setting should appeal to shoppers and others involved in commercial activities in the city.

Household Income	Percent of Cyclists
\$70,000 and over	39%
\$50,000 to \$69,999	26%
\$30,000 to \$49,999	22%
\$29,999 and under	13%
Median age of cyclists	32 years

Source: Toronto City Cycling Committee

2.3 Community Plans

The *Bicycle Master Plan* reviews the cycling elements of adopted plans in the City of Victoria and adjacent municipalities, provides an inventory of cycling facilities, and examines some of the obstacles to safe cycling.

All of Victoria's community and neighbourhood plans stress the need for improved bicycle access and safety through a variety of changes to roadway design and provision for improved bicycle facilities.

However, only six plans contain specific proposals for bicycle routes. Because these plans are community-specific, continuity of routes between neighbourhoods is limited.

Communities with distinct proposals for the bicycling facilities are Harris Green, James Bay, Burnside-Oaklands, Vic West, Downtown, North Park, and Suburban Neighbourhoods.

2.3.1 Community Plans - Victoria and Adjacent Municipalities

City of Victoria.

A main objective of the *Official Community Plan* (1986) is the establishment of the Major Street Network system as indicated in the plan. This network would help define right-of-way widths and standards for roadways, sidewalks, and facility access.

The plan includes as an objective the provision of safe and direct alternatives to the private automobile. The plan places priority on the joint use of the road right-of-way space, supplemented by designed bicycle routes. Bicycles are to be accommodated by widening curb lanes and, where possible, providing separated systems for both recreational and commuter use. This objective has guided many of the recommendations in the *Bicycle Master Plan*.

The *Background Report - Official Community Plan* suggests that additional cycling opportunities be examined around the Victoria Harbour shoreline.

Oak Bay

The *Oak Bay Community Plan* (1981) does not designate bicycle routes. A recommendation is made, however, that signs be installed that clearly indicate the presence of cyclists along Beach Drive.

District of Saanich

The *Saanich General Plan* (1993) states that transportation policies should diversify modes of travel and link land use and transportation systems to reduce the number and length of trips. At the neighbourhood level, cycling and pedestrian networks will be essential for

greater traffic efficiency, improved safety, and reduction of road congestion and pollution. Future bikeways will be identified in local area plans and rights-of-way or easements will be acquired at the time of subdivision, to create high quality "bicycle friendly" neighbourhoods. The Plan also calls for the adoption and development of a bicycle network in consultation with residents as part of a regional network. Bike lanes are to be 1.5 m wide.

Commuter bikeways are proposed on all major streets throughout Saanich, with links to Esquimalt and the City of Victoria. Saanich Council has placed a priority on the McKenzie/Quadra and McKenzie/Gordon Head Road intersections.

Saanich has adopted a Bicycle Network plan that designates many arterial streets as bikeways. Provincial funding will be sought to upgrade these routes.

Township of Esquimalt

The Township of Esquimalt Official Community Plan does not contain references to bicycle routes or ancillary facilities. Esquimalt has recently established a Bicycle Committee to review cycling issues and to recommend actions to improve the safety of cycling and the creation of a bikeway network.

2.3.2 Victoria's Neighbourhood Plans

The City of Victoria has nine neighbourhood planning areas. These plans include the following information about planning for cycling:

Burnside

The *Burnside Community Plan* (1991) recommends the provision of safe cycling routes. The plan suggests that routes be developed in conjunction with major roadways if sufficient

width is available. The plan recognizes opportunities along the Gorge shoreline properties, and in the Songhees area across Selkirk Water.

Downtown Victoria

An objective of the *Downtown Victoria Neighbourhood Plan* (1990) is to promote cycling as a safe alternative to the automobile. The private sector is encouraged to provide facilities such as bicycle parking areas. Part of the program is to improve cyclist safety on the Johnson Street Bridge. The plan also recommends redesign of road rights-of-way to permit joint use by cyclists and motorists.

Harris Green

An objective of the *Harris Green Neighbourhood Plan* (1979) proposes safe and convenient access for bicycles. Improvements would include the narrowing of the View Street roadway to two lanes between Blanshard and Cook Streets to permit the establishment of tree planted boulevards, improved sidewalks, and bicycle lanes.

The Vancouver Street bicycle path shown in the *Harris Green Neighbourhood Plan* was built as part of the Model Bikeway initiative of the 1970s. The route was built as a pilot to test alternative bikeway designs. Its shortness and interruptions by cross traffic have been criticized by many cyclists.

Inner City Neighbourhoods

The only cycling recommendation included in the *Inner City Neighbourhoods Plan* (1976) is for the redesign of View Street to incorporate bicycle use.

James Bay

A policy of the Draft *James Bay Neighbourhood Plan* (1990) is to maintain, expand, and improve the waterfront access for pedestrians and cyclists. Two additional policies advocate the construction of wider curb lanes and the development of a continuous bicycle path through the community to accommodate commuter cyclists.

Although the Draft *James Bay Local Area Plan* does not show designated bicycle routes, city staff have indicated that routes are provided in the community. The route discussed in the James Bay plan begins at the Breakwater and continues to the Ross Bay Cemetery, along Dallas Road. It should be noted that signs along this route indicate that cyclists are not permitted on paths in Beacon Hill Park and other portions of the route.

North Park

The *North Park Neighbourhood Plan* (1981) mentions the importance of cycling paths. The plan suggests that where one-way streets are established, bicycling facilities should be considered.

Oaklands

One objective of the *Oaklands Neighbourhood Plan* (1991) is to establish a neighbourhood traffic management plan to accommodate the movement of various transportation modes and minimize the conflict between modes. While not discussed in the plan's text, a bikeway is shown in the traffic management plan along Kings Road from Belmont Avenue to Richmond Street.

Songhees Area; Vic West

In the *Songhees Area; Vic West Neighbourhood Plan* (1986), primary bicycle routes are proposed either as bicycle paths or bicycle lanes along Esquimalt Road, Kimta Road, Sitkum Road, Harbour Road and Bay Street. Consideration is also given to a bicycle path to Bayside under the Point Ellice Street Bridge. The Westsong Way, the City's first combined recreational bicycle and pedestrian path, was constructed in the 1980s along the Songhees waterfront, connecting the Johnson Street Bridge with the foot of Catherine Street. Due to perceived conflicts between cyclists and pedestrians, however, Council imposed a temporary ban on cyclists in 1990 pending the outcome of the Capital Regional District's bicycle strategy.

Suburban Neighbourhoods

One of the main suggestions pertaining to cycling in the *Suburban Neighbourhoods Plan* (1977) is that Kings Road should become a designated bicycle route.

2.4 Bicycle Parking and Ancillary Facilities

To establish an inventory of bicycle facilities in the City of Victoria, managers of several large office buildings, hotels, recreational facilities and tourist attractions were contacted. Respondents were asked questions pertaining to bicycle parking, shower facilities, usage, and accessibility.

Respondents were asked to estimate facility use during peak periods (summer months). They noted that where employment is seasonal (hotels and tourist attractions), bicycle use is most prevalent among students working part time during those months. Full time employees were far less likely to cycle on a regular basis. (See Table 6 for a summary of survey responses).

Office Buildings

Three of the largest property management companies were contacted: British Columbia Buildings Corporation (BCBC), Colliers Property Management, and Equitex Property Management.

BCBC manages provincial office buildings throughout the downtown core, including the Waddington Building, the Richard Blanshard Building, the Law Courts, the Parliament Buildings and the Robert Kerr Building. Colliers and Equitex Property Management companies administer several downtown office complexes such as the Weiler Building, the Royal Trust and Royal Bank Buildings. Only data pertaining to the larger buildings was requested.

Government Offices. In almost all cases, BCBC buildings are equipped with bicycle parking facilities, primarily bicycle racks, storage areas, or a combination of the two. These facilities were installed by BCBC. Usage varies widely among buildings. For instance, bicycle racks and storage areas at the Waddington Building are fully used, but at the Richard Blanshard and Robert Kerr Buildings use ranges from 5 to 15 percent. At most BCBC buildings, parking facilities are located in the parkade or within 50 feet of the main entrance. Additional facilities such as showers or changing rooms are not provided in most BCBC buildings, but they are provided at the Richard Blanshard Building and the Royal B.C. Museum. In most cases, tenants have expressed an interest in having new or expanded facilities for bicycle parking, showers, or change rooms. A lack of space and prohibitive costs are the main deterrents to additional facilities. The proportion of employees cycling to work varies considerably, with estimates ranging from 5 to 25 percent. Most cycling employees are seasonal or part time staff members. Approximately 5 to 10 percent of clients or customers arrive at the buildings on bicycle.

Private Offices. Facilities for bicycle parking vary greatly for buildings administered by Colliers Property Management. Bicycle racks and storage areas are usually provided at the sides of buildings or in a parkade. These parking facilities are fully used and requests have been made to double the storage capacity for bicycles. Many tenants have expressed an interest in having new or improved facilities for bicycle parking, showers, or change rooms, but such facilities are the responsibility of the tenant. Lack of space and prohibitive costs are cited as the main deterrents to additional facilities. Approximately 10 percent of employees and 5 to 10 percent of customers and clients arrive at the buildings on bicycle. Equitex Property Management provides no bicycle facilities at any of their buildings.

Question	Government Office	Private Office	Hotels	Recreation and Tourist Facilities
Bicycle Parking	yes	some	yes	yes
Type of Parking Facility	bike racks, storage area, or both	bike racks, storage area, or both	bike racks, storage area, or both	bike racks
Location of Parking Facility	parkade, or within 10-50 feet of building	parkade, or side of building	hotel parking lot, employee entrance, or near front entrance	near main entrances
Percentage of Use of Bike Parking Facilities	varied	100%	varied - use usually by employees	varied -during summer, usually 100%
Additional Facilities - Change Rooms/Showers	usually not	usually not	yes	yes
Percentage of Employees Who Bike To Work 20% of the Time	5-25%	10%	10%	10%
Percentage of Cycling Employees (Seasonal)	usually 100%	usually 50%	100%	usually 100%
Percentage of Customers/Clients Who Arrive on Bike	5-10%	5-10%	1%	2%
Impediments to Additional Facilities	lack of space	cost, lack of space	no perceived need	lack of space

Hotels

Ten of the larger hotels in the City of Victoria were contacted by telephone for information on the bicycling facilities they provide for their guests and employees. All hotels provide bicycle racks, storage areas, or both. Facilities at the Empress and the Grand Pacific are fully used, but not those at the Executive House and the Royal Scot. Employees of the Empress would like additional bicycle parking. Most of the parking facilities are in the hotel parking lots, near employee entrances or, for guests, near the front entrance. Almost all of the hotels have change areas or shower facilities for their staff members.

The proportion of employees who cycle to work varies due to the seasonality of hotel employees and the wide age range. The greatest number of employees that cycle to work is 30 percent, reported by the Chateau Victoria and the Empress Hotel, three times the estimated overall average of 10 percent for hotel employees. Only 1 percent of hotel guests arrive on bicycles, not including bicycle tours, in which guests typically arrive by car or bus. The Laurel Point Hotel reports approximately 2 bicycle tour groups per week during peak season. The parking facilities they provide in their underground parking area are considered adequate.

Because most cycling employees are seasonal workers, respondents feel that the expense of providing facilities would not be in the best interests of the hotels.

Recreation and Tourist Facilities

A variety of recreation facilities and tourist attractions were contacted, including the Butchart Gardens, the Royal British Columbia Museum, the YMCA, the Legislative Buildings and several other facilities. In all cases, bicycle parking facilities are provided, consisting primarily of bicycle racks located near the main

entrances. Although use varies, the Royal London Wax Museum, the Legislative Buildings and the Royal British Columbia Museum indicated that the racks are fully used and requests have been made for additional storage spaces. Almost all of the recreation and tourist facilities contacted have a change room or shower facility for their employees.

The proportion of employees who cycle to work ranges from a low of 1 percent for employees of the Maritime Museum to a high of 20 percent at the Butchart Gardens. The Royal British Columbia Museum, the Royal London Wax Museum and the Legislative Buildings reported that approximately 10 percent of their employees arrive on bicycle. The percentage of guests arriving on bicycle was estimated at 2 percent by most of the respondents.

2.5 Cycling Safety

The Victoria Police Department keeps records of serious accidents involving bicycles. According to one estimate (Forester 1984), only about 12 percent of bicycle accidents are reported. The City maps the locations of reported bicycle accidents. According based on information from the Capital Regional District and the Victoria Police Department, there have been 1,090 reported bicycle accidents in the City of Victoria between 1986 and 1992, for an average of 155 per year or one every other day.

In the past 3 years, two of the reported traffic accidents were fatalities and one was a pedestrian fatally injured when struck by a bicycle.

Bicycle accidents are not evenly distributed on Victoria's streets. Mapping the reported accidents for 1989-1992 revealed several dangerous intersections and sections of road.

The following locations display the locations with the greatest frequency of bicycle accidents:

- Quadra Street near Hillside Avenue
- Douglas Street between Hillside and Bay
- Douglas Street near Finlayson
- Douglas Street between View and Broughton
- Yates Street near Quadra
- Yates Street near Cook
- Oak Bay Avenue between Chamberlain and Morrison
- Cook Street between Faithful and Pendergast.

The four streets that have the highest frequency of bicycle related accidents are Douglas Street with 75 reported bicycle accidents between 1989 and 1992, Quadra Street with 40, Bay street with 37, and Yates street with 30 accidents.

Two other sites that are unsafe are the Johnson Street Bridge and Government Street in front of the Empress Hotel.

The reports indicate that nearly half of all accidents occurred on straight sections of road. Nationally, these accidents (often involving overtaking vehicles) are the most dangerous, accounting for 38 percent of all cyclist fatalities (Hope and Yachuk 1990).

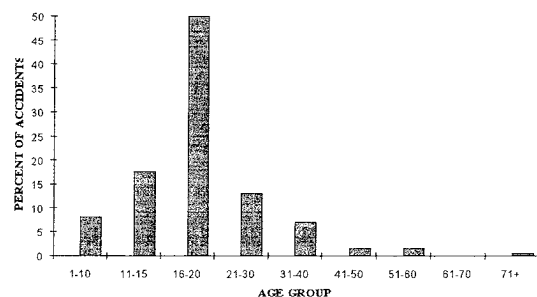
Intersections were the next most common location, with 37 percent of accidents. Sharp curves and crests of hills were occasionally the sites of bicycle accidents. Unsafe conditions discourage cycling, and improvements should be funded.

The highest priority for improvements should be on the routes with the highest frequency of bicycle accidents; by providing either safer roadways or alternative routes.

Accident characteristics

Accident reports characterize the circumstances and causes of bicycle accidents. Approximately half of the 239 reported cycling accidents involved people between 16 and 20 years of age (Figure 4). This age group relies on bicycles as a mode of transportation, and many tend to ignore traffic dangers.

Figure 4
Age of Cyclists involved in
Accidents in Victoria



The next largest group is the 11 to 15 year-olds, with 17 percent of all accidents. The frequency of bicycle accidents declines with age over 21 years, in part reflecting a decline in reliance on bicycles for transportation.

The proportion of employees who cycle to work ranges from a low of 1 percent for employees of the Maritime Museum to a high of 20 percent at the Butchart Gardens. The Royal British Columbia Museum, the Royal London Wax Museum and the Legislative Buildings reported that approximately 10 percent of their employees arrive on bicycle. The percentage of guests arriving on bicycle was estimated at 2 percent by most of the respondents. Butchart Gardens, however, serves a large number of bicycle tours. Their bicycle overflow area is considered adequate to meet the occasionally increased demand.

Most bicycles were going straight at the time of an accident (77 percent of accidents), and 14 percent were turning. More than one-quarter of automobiles were moving straight ahead at the time of accidents involving bicycles, and approximately the same percentage were turning left. Approximately 16 percent of cars were turning right. Notably, one-fifth of collisions involved cars that were parked legally and presumably opened their doors into the path of a cyclist.

Police reports identify the factors contributing to an accident. More than 27 percent of cars and 11 percent of cyclists were cited as failing to yield the right-of-way. Fifteen percent of cars were driving without due care and attention. Seven percent of cars and 20 percent of cyclists were involved in "no fault" accidents. Approximately 30 percent of all car infractions were due to "other causes" such as:

- opening car door into bike's path;
- turning across bike's path;
- backing into bike
- hitting bike from behind.

Cyclists were cited in 27 percent of cases under "other causes," including:

- riding at night without lights
- no brakes or poorly functioning brakes
- bikes swerving into path of car
- cycling on sidewalks when accident occurred.

Bicycle helmet use

Helmet legislation has been considered in the capital regional district and by the provincial government. Vigorous debate surrounds the merits of helmet laws.

The effects of the mandatory bicycle helmet-wearing law in Australia are well documented. From 1980, helmet use was promoted through bicycle education in primary and post-primary schools, mass media, professional organisations, community groups, and through

incentives such as rebates on helmet purchases. Prior to legislation, but aided by this strong promotion, helmet use among primary school children rose from 5 percent to 70 percent. Among secondary school children, rates rose from 2 percent to 20 percent, and the percentage of adults wearing a helmet rose from 27 percent to 40 percent. After the legislation was passed, helmet use by all groups grew from 73 percent to 92 percent. With the mandatory helmet law, hospitals reported that head injuries for cyclists fell 47 percent. Total bicycle use by children, however, decreased 36 percent since the introduction of legislation (44% in the 12-17 age group, and no data for adults) (Cameron and Heiman in Boivin and Pronovost 1992).

In Canada, "...it has been estimated that cranial trauma is the cause of approximately 80 percent of cycling deaths and 30 percent of serious injuries. Enforcing the use of protective helmets is thus essential..." (c. Dussault, 1992).

However, many bicycle experts argue that "...due to the practical constraints on helmet design, the protection afforded by bicycle helmets is very limited" (J. Carre, 1992). The number and severity of cycling accidents reported vary widely from study to study and the incidence and severity of head injuries has been shown to be no greater among cyclists than among pedestrians and automobile passengers.

2.6 Cycling Education

Engineering and regulations alone cannot eliminate bicycle conflicts with pedestrians and motor vehicles. Education plays a vital part in reducing bicycle accidents. Experience has shown that cycling education is most effective if it teaches:

- cyclists how to see through the motorists' eyes;
- motorists how to see through the cyclists' eyes;
- defensive cycling techniques;
- traffic regulations.

Safety awareness for young children

Young children lack the skills necessary to allow them to safely ride a bicycle in traffic. Studies have linked most accidents involving children with their lack of motor skills, suggesting that safety education should start before a child enters grade school.

Safety education at the most basic level can consist of simple information about rules-of-the-road, with slogans such as "ride right" and "at night wear a light". Leaflets about the "do's" and "don'ts" of cycling are also helpful.

School programs should be conducted by trained cycling safety personnel. School bicycle safety programs can include pamphlets, formal class instruction, and assembly programs. Video tapes for schools and community television broadcasts add variety to cycling education. Planners and traffic engineers can play an important part in education programs by preparing safe cycling strategies in consultation with school administrators.

Safety awareness components identified by cycling focus groups

Participants of focus groups assembled for the *Bicycle Master Plan* stressed the need to provide a public education program for both motorists and cyclists. Although many of the participants were avid cyclists, they recognized that cyclists and motorists share responsibility for safety. Participants suggested that traffic violators be required to attend a bicycle training course and that cyclists' rights and responsibilities should be incorporated into the standard driver's test to reach both adult cyclists and motorists. Some, but not all participants felt that training should be mandatory. All agreed that bicycle traffic rules should be included in the *safe drivers guide*, and that bicycle training programs should be included or expanded in the school curriculum.

To further promote public awareness of cycling safety issues, participants suggested a designated bike day, when several streets would be opened exclusively to bike traffic. Booths could be set up to provide information on bicycle safety training tips. Helmets would be mandatory.

Safety awareness programs available in Victoria

ICBC's traffic safety programs department has worked on many bicycle safety initiatives and campaigns with organizations such as the bicycling association of bc, the bc medical association, and community organizations. ICBC's bicycle safety programs focus on children because safety attitudes and habits established early in life will shape future traffic behaviour. Working with the ministry of education, ICBC has developed safety and accident prevention curricula for primary grades. In Victoria, ICBC traffic safety programs staff have developed a computer assisted traffic safety project for grades 4 to 7, and pamphlets such as "top gear" (promoting helmet use) and "cycle to be seen" (promoting visibility) have been widely distributed.

Many local cyclists have benefitted from the CRD traffic safety commission courses, the Canadian cycling association's "cycle right" course, and other provincial and local safety programs. Hands-on cycling education, as provided through the "cycle right" course for grade 5 students has been shown to be highly effective in reducing bicycle-related accidents. The Vancouver Island Safety Council also supports bicycle safety programs for schools.

2.7 Obstacles to Bicycle Use

Despite the benefits of cycling to the community, the City of Victoria has made relatively few provisions for cycling, and many potential cyclists are discouraged by assorted obstacles to bicycle use. The identified problems can be classified as physical and non-physical obstacles.

Physical obstacles:

- Narrow curb lanes, often with onstreet parking, leaving little room for cyclists;
- Dangers to cyclists posed by other transportation modes and facilities (storm drain grates, the Johnson Street Bridge, railroad tracks in roadways, debris on the road, designated turn lanes, vehicle-activated traffic signals, and competition for the road edge with buses and parked cars);
- Lack of designated bicycle paths or lanes;
- Few parking and storage facilities for bicycles downtown and at commercial and office nodes.

Non-Physical obstacles:

- Opposition to the provision of designated bike routes and lanes by property owners and traffic engineers;
- Failure of municipal and provincial agencies to appreciate and develop the transportation potential of bicycles;
- Misconceptions about cyclists and the potential of bicycles as a transportation mode in urban areas;
- The difficulty of providing facilities to suit the varying needs of beginning, recreational, commuting, and competitive cyclists;
- Fear of cyclists by pedestrians and poor understanding of cyclists' rights by vehicle drivers;
- Failure to improve cycling in other cities (in Canada, Europe and the United States) or to act on recommendations from local cycling organizations;

- Lack of funding for bicycle facilities by local or provincial agencies responsible for transportation;
- Subsidized parking for automobiles;
- Lack of a coordinated and vigorous implementation of cycling elements of official community plans, local area plans, and transportation plans.

2.8 Focus Group Responses

Two focus group sessions were held in February, 1993, to explore issues, problems, and priorities regarding cycling in Victoria. The participants represented avid cyclists, moderate or beginning cyclists, and non-cyclists. Nearly all of these people were also automobile drivers. The groups slightly overrepresented serious cyclists and underrepresented novices and young (children and teenaged) cyclists. A cycling behaviour and opinion survey was completed by the participants, and two hours of discussion was held with each group. Participants were asked "How many kilometres per week do you ride your bicycle during the following seasons and for what purpose?"

Table 7 shows that the largest seasonal change in cycling distance is for recreation. Commuting, shopping, and visiting trips changed only slightly. Whereas recreation generated the longest trips in summer, commuting trips were longest in winter.

Purpose	Winter		Summer	
	Range	Avg.	Range	Avg.
Trip to work	0 - 120	19	0 - 120	22
Shopping	0 - 20	5	0 - 20	7
Visiting	0 - 50	6	0 - 30	9
Recreation	0 - 75	10	0 - 150	32
Total	40		70	

Reason	Commuting to Work	Recreation	Shopping
Weather	33%	38%	31%
Safety	24	22	20
Habit	12	5	11
Distance of trip	9	14	14
Comfort	9	11	17
Ease of Access	12	11	6
Other	lack of facilities, need car for work, size of load		size of load

Bicycle use increased over the past few years for 70 percent of focus group attendees and decreased for 22 percent of those surveyed. When asked for reasons for the changes, increases were due to a desire for increased fitness, fun, to spend more time with the family, changes in attitude, social reasons, frustration over downtown parking, and concern for the environment. Decreases were explained by declining health, work habits, lack of road safety, and expense.

The focus groups enjoyed cycling because it is enjoyable, less stressful and cheaper than driving, quicker than driving for short trips, it is environmentally sound, and it is good exercise. Disadvantages of cycling include unsafe road and traffic conditions, the need to be constantly alert, hills, inability to carry groceries or work materials, bad weather, lack of parking facilities, and peer pressure (from the "car culture").

Poor weather was the biggest single reason for not cycling, especially for recreation (Table 8). Lack of safety was the next biggest concern, cited in 20-24 percent of responses.

"Habit" (presumably of driving rather than cycling) was the next most common reason for not commuting by bicycle. Distance was cited as discouraging recreational cycling and cycling to shop. Several people noted that the inability to carry large loads on a bicycle was a drawback to shopping and to commuting. Comfort and ease of access were sometimes mentioned as problems when shopping or commuting.

Even with these issues, the City can motivate cycling. Road improvements can improve safety (and sometimes the perceived distance of a trip), better maintenance can improve safety and comfort, building designs and facilities can improve access, and education can change people's habits. Specific identified dangers of cycling in Victoria include:

- one-way streets (car doors, angle parking, and lane changing);
- aggressive, arrogant, and discourteous drivers;
- narrow curb lanes; and trucks and buses;
- slippery crosswalk markings.

As motorists or pedestrians, focus group participants identified many annoying cyclist behaviours, that included the following:

- failure to obey traffic laws,
- riding without lights at night,
- swerving into traffic (even if avoiding road-edge debris),
- unsafe entry from side streets, and
- aggressive behaviour.

An active education program could help to address these shortcomings in cyclists and motorists. Cyclists and motorists were found to share some problem traits, specifically:

- ignorance of laws, rights, and responsibilities;
- "bad attitudes"--aggressiveness, arrogance;
- failure to signal intentions.

Focus groups identified several factors that would encourage more cycling (Table 9).

The most important single item was improving motorists' awareness of cyclists on the roads, awareness of cyclists' rights, and improved public attitudes (including drivers, the general public, and traffic engineers and managers). Close behind public awareness were improved travel safety facilities--improved road conditions, provision of bicycle lanes, and better intersection safety. Better bicycle storage and provision of bicycle paths are nearly tied in importance.

Showers and change rooms and improved law enforcement are important to substantial but smaller groups of residents.

Focus groups also criticized the City for prohibiting bicycles on paths intended for joint use by bicycles and pedestrians. They questioned why pedestrian's complaints seem to have more influence on policy than cyclists' complaints.

Factor	Importance (percentage of responses)			
	Very Important	Moderately Important	Not Important	Uncertain or Not Applicable
Improved public awareness	63%	20%	0%	4%
Improved road conditions	50	33	8	8
Creation of bicycle lanes	58	13	17	13
Improved intersection safety	46	38	8	8
Better bicycle parking facilities	42	33	17	17
Creation of bicycle paths	42	25	21	13
Better shower and change facilities	29	21	21	29
Improved law enforcement	21	50	13	17
Increased bicycle availability	8	0	67	21

2.9 Bicycle Activity

Several counts of cyclists in the City have been conducted in recent years. Two of these counts are timely and helpful in determining the general numbers of cyclists using City roads. The combined information from both surveys helps to define bicycle volumes and favoured routes in the City.

The CRD Transportation Strategy undertook an origin-destination survey that obtained information on automobile, transit, and bicycle trips from more than 9,000 residents in the region. Respondents were asked to describe their travel for a weekday in November, 1992. The survey results were presented for each of the 400 traffic zones in the region. Survey respondents were found to be representative of the total population.

The Greater Victoria Cycling Coalition (GVCC) conducted a survey of cyclists leaving the downtown core between 4:00 and 6:00 PM on 4 days between June 1 and 10, 1992. Numbers of cyclists with and without helmets were counted by GVCC volunteers at 18 locations on the margins of downtown.

Major traffic generators

The CRD Origin-Destination study has made significant strides in documenting the magnitude of bicycle use in the region. The November survey also provides a very conservative count of cyclists because cycling numbers typically decline during this cold, wet season. The latest calibration of the model (that extrapolates from the sample to the total population) indicates that during a typical afternoon peak period (4:00 to 6:00 PM), there are 2,500 bicycle trips originating in the City (and another 2,400 that end in the City). These 2,500 trips constitute 6 percent of total trips originating in Victoria, and compare favourably to the 4,200 trips (10 percent of total trips) ascribed to transit.

The figures shows that Victoria accounts for 60 percent of the 5,500 total bicycle trips in the region. However, with 83 percent of Victoria's afternoon trips involving automobiles, significant opportunities exists for improving the mode share of bicycles.

Figures 5 and 6 show the numbers of bicycle trips originating and ending in traffic "super-zones" in the core municipalities. These figures, summarized in Table 10. The major origins and destinations of cycling traffic are the downtown core, the University of Victoria, Camosun College, and the Royal Jubilee Hospital precinct. There are a string of moderate bicycle generators along Douglas Street to the Saanich boundary, presumably the retail and service commercial businesses there. The Oaklands-North Park superzone generates nearly one-fourth of all city bicycle trips, reflecting the proximity of the predominantly residential neighbourhoods to downtown and other bicycle traffic generators.

Figure 7 shows the destinations of cyclists leaving the downtown core in the afternoon. Of the total trips, 20 percent travel to the Oaklands-North Park neighbourhoods. Another 15 percent cycle to Fairfield, and 11 percent to James Bay. Burnside (8 percent), Harris Green 5 percent), and Vic West (4 percent) are the destinations of smaller numbers of the downtown cyclists. Two-thirds of downtown trips end within the City. Saanich receives 20 percent of the downtown cycle traffic, Esquimalt 8 percent, and Oak Bay 6 percent.

Not all bicycle trips leave downtown during the afternoon peak. Volumes of trips originating elsewhere and ending downtown are approximately 60 percent as large as the volumes leaving. Aside from the specific destinations revealed in the CRD data, all schools should be considered important generators of bicycle traffic. Providing safe cycling facilities near schools is especially important because the age and behaviour of younger cyclists puts them at risk (Figure 4).

The destinations of bicycle traffic in the City are fairly uniformly distributed among the residential neighbourhoods. The industrial and commercial districts of the city are the destinations of relatively few cyclists, as expected during the afternoon peak. An exception is the downtown core that receives a moderate amount of cycle traffic.

Superzone	Originating trips	Trip destinations	Total trips² (% of Victoria total)
Victoria Downtown	832	562	968 (30%)
Oaklands/North Park	525	674	778 (24%)
Burnside	381	346	515 (16%)
Fairfield	344	385	443 (14%)
James Bay	238	236	282 (9%)
Harris Green	123	126	154 (5%)
Vic West	80	112	123 (4%)
Subtotal	2528	2442	3263 (100%)
Esquimalt/View Royal	377	381	2227
Oak Bay (includes UVic)	532	303	
Saanich	1193	1482	
Saanich Peninsula	349	354	
West of Thetis Lake Interchange	511	537	
Regional Total	5490	5490	5490

Implications for Future Cycling Demand

The bicycle volumes in Victoria are higher than expected and well distributed throughout the City. Although population growth in neighbourhoods will have some effect on future demand, the increase is expected to be slight compared to the volume growth that could be achieved by implementing an effective bicycle program. Because a substantial portion of cyclists on Victoria streets come from other municipalities, growth outside of the City and other bicycle initiatives could strongly influence future bicycle volumes in Victoria.

² Total includes all trips originating in the superzone, plus destinations of trips originating outside of the City. These values do not include cycling trips passing through the City to and from other jurisdictions.

Figure 5
Total Originating Bicycle Trips, PM Peak, by Traffic Superzone
 (Source, City of Victoria Engineering Department, based on CRD EMME/2 Model)

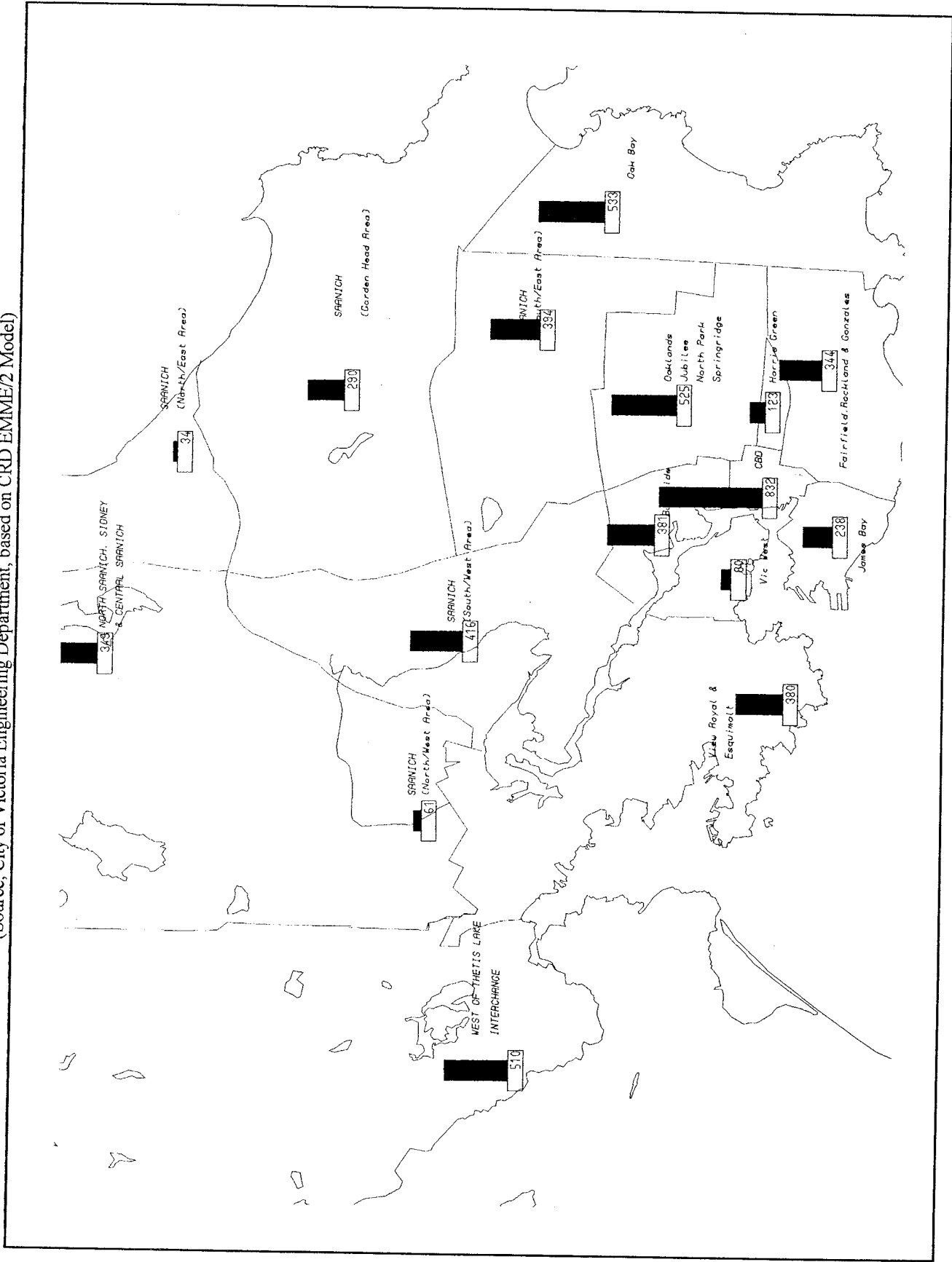
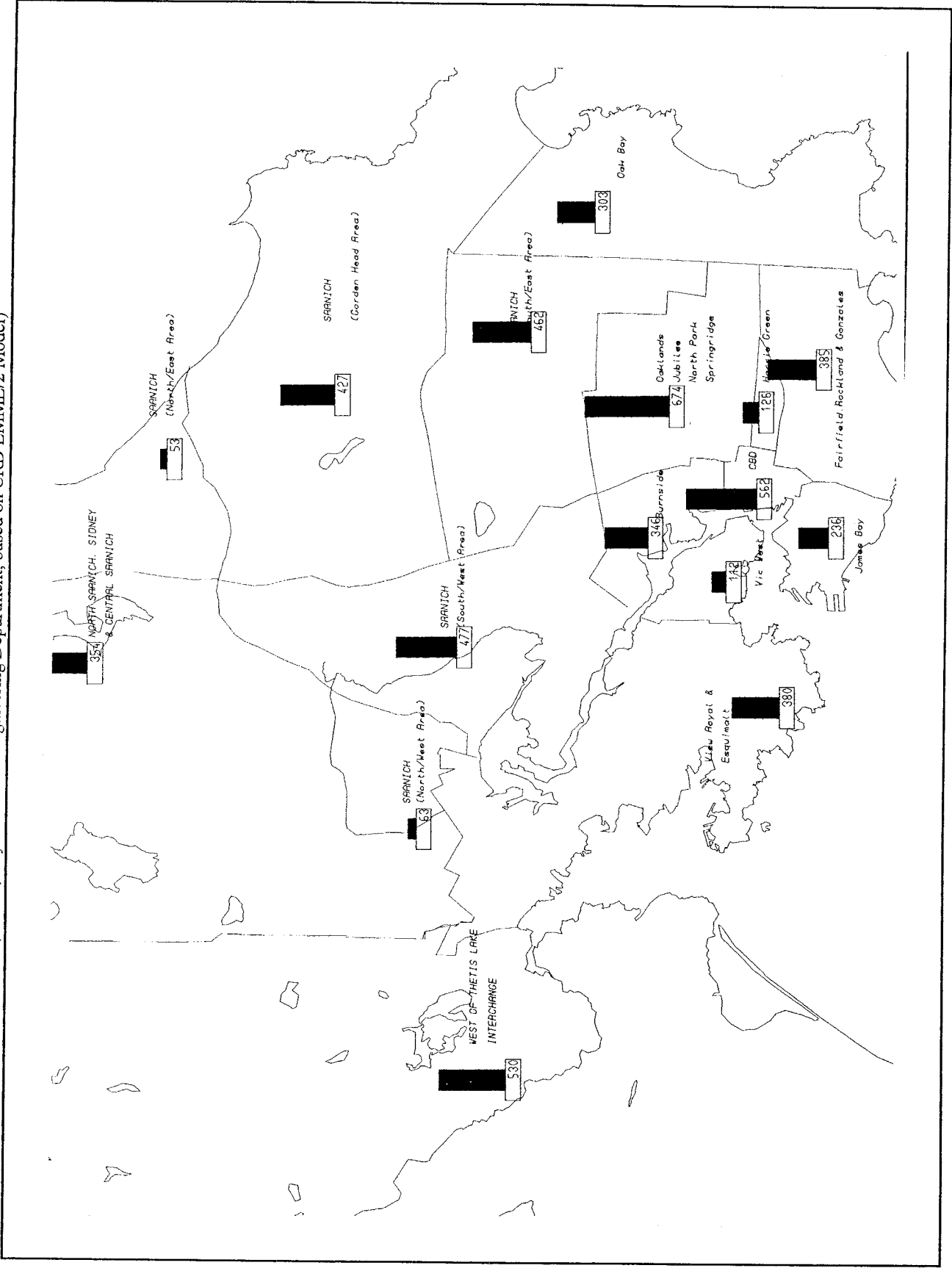


Figure 6
Total Bicycle Trip Destinations, PM Peak, by Traffic Superzone
 (Source, City of Victoria Engineering Department, based on CRD EMME/2 Model)



2.10 Favoured Downtown Core Exit Routes

The bicycle survey conducted by the Greater Victoria Cycling Coalition counted an average of 1,062 bicycles leaving the downtown core during the 4:00 to 6:00 PM period. The number of bicycles on the road segments monitored are shown in Table 11.

The GVCC data show that several streets carry most of the bicycle traffic out of the downtown. Johnson, Fort, Government, and Douglas account for 62 percent of all bicycle traffic. The second largest single count, 137, occurred at the eastern end of the Johnson Street Bridge, despite cyclists' common identification of the bridge as "unsafe." Its heavy use emphasizes the need to provide for safe cycling facilities on the bridge.

The GVCC data (and all similar volume counts) can be used to indicate the general directions taken by cyclists today, in the absence of any facilities. The data do not tell us what changes in route preferences or total numbers of cyclists would result from improving and designating specific roads as primary cycling routes. *The GVCC survey found that about half of all cyclists wore helmets.*

2.11 Experience from Elsewhere

Literally thousands of communities worldwide have cycling programs and facilities. Only a few will be highlighted here as providing examples for the City of Victoria. None of the examples cited are recommended for complete adoption by the City; a "made in Victoria" program will be most appropriate here.

In European cities, efforts to accommodate the cyclist in transportation planning have resulted in substantial bicycle modal shares (Table 12).

Victoria has similar characteristics to many European cities in terms of scale, road system, climate, and urban form. Unlike European cities, however, Victoria's residential and commercial areas are segregated, automobile ownership and use is much higher, and transit use is lower. Nonetheless, it should be possible to increase the bicycle's share of the modal split in Victoria significantly, to approach the characteristics of the European cities listed in Table 12.

The City of Vancouver adopted a Comprehensive Bicycle Plan in 1988. It includes design standards for three kinds of bikeways:

- commuter routes;
- recreational routes;
- local access routes.

The City of Vancouver has also adopted a set of Bicycle Parking Standards (1991) that establish the kind and number of bicycle parking facilities to be provided in residential, commercial, institutional, and industrial buildings. The standards were developed after an extensive public survey and review of conditions in downtown offices and other buildings. "Combined with education, new parking standards and other elements of the comprehensive Bicycle Plan, [the strategy] is expected to double the number of bicycle commuters in Vancouver" (I. Adam, 1992).

The Resort Municipality of Whistler has developed an excellent system of separated paths for joint use by pedestrians and bicycles. The program was instituted a decade ago when residents approved a bond issue to provide such paths. The Valley Trail paths (2 to 3 m wide) link the Whistler Village with most other facilities in the area (schools, parks, lakes, residential areas). The paths are constructed on road rights-of-way, sewer easements, and other lands obtained at the time of land development. Commuters make heavy use of the paths, as do cyclists, joggers, in-line roller skaters, and pedestrians.

Whistler staff report "common" complaints by all users about other user groups, but the path system is still enthusiastically supported by residents and visitors alike; 80 percent of residents and 42 percent of visitors report cycling on the Valley Trail system. The local Royal Canadian Mounted Police detachment reports no serious accidents involving cyclists on the path system, whereas bicycle-automobile accidents have occurred on roads. There is no enforcement of Motor Vehicle Act section 185 (3) regarding cycling on a road if an adjacent path is provided, and the law is considered a "non-issue." The paths are an attraction to visitors (mentioned by 52 percent as the "most important reason for visiting"), thereby contributing to Whistler's economic development.

Seattle has developed an extensive network of bicycle paths and routes, and continues to expand their system to serve commuter and utilitarian cyclists. Eugene, Oregon, has developed a system of bicycle lanes and paths that serve most of the city, especially the cycling-oriented university. Calgary and Edmonton have both developed a system of bicycle paths, primarily for recreational purposes.

Table 11 Average Bicycle Volumes on Selected Streets, PM Peak		
Location	Average Volume	Percent of Total
Store--Pandora to Johnson	60	6
Douglas--Pandora to Johnson	109	10
Blanshard--Pandora to Johnson	62	6
Broughton--Blanshard to Quadra	85	8
Courtney--Blanshard to Quadra	46	4
Blanshard--Courtney at Burdett	42	4
Fort--Blanshard to Quadra	127	12
View--Blanshard to Quadra	37	3
Johnson--Blanshard to Quadra	160	14
Douglas--Humboldt at Belleville	34	3
Government--Humboldt to Belleville	133	13
Johnson--Harbour to Wharf	132	13
Burdett--Douglas to Penwell	17	2
Humboldt--Douglas to Penwell	19	2
Total	1062	100

Source: Greater Victoria Cycling Coalition

City, Year	Population	Bicycle	Walking	Transit	Car
Amsterdam, 1989	700000	23%	23	23	31
Copenhagen, 1982	580000	20	27	20	33
Hannover, 1989	500000	16	23	22	39
Muenster, 1990	270000	34	21	7	38
Delft, 1986	85000	40	25	10	25

Source: Bracher, T. in Boivin and Pronovost 1992

Integration with Other Modes of Transportation

The goals of the Victoria Integrated Transportation Strategy require that cycling's links to transit be explored. Some examples of integrated bicycle planning from other jurisdictions contain lessons for Victoria.

The Bay Street Urban Clearway project in Toronto had a phenomenal effect on cycling while improving efficiency of other transportation modes. On heavily-used Bay Street, parking and stopping was prohibited in the curb lane, which was allocated for buses, taxis, and bicycles. Cars are restricted to the centre two lanes of a four lane roadway and may only enter the restricted lane to turn. The result was an increase in bicycle volumes of 173% and transit ridership by 25%, and reduced accident rates. The program is viewed favourably by cyclists, motorists, and businesses. "It also demonstrates that simple solutions, such as re-allocating the existing road space, can yield high returns at a fraction of the cost of more ambitious transit mega-projects" (D. Egan, 1992).

The establishment of mixed bus and bicycle corridors in Grenoble and Annecy, France, has also proven successful. The program to establish these corridors was well received and results indicate that the corridors do not pose safety risks.

In Groningen, Netherlands, the city centre has been closed to cars. The streets within the restricted zone were narrowed and public spaces were improved. A bicycle network was established that provided a number of bicycle facilities such as parking, pathways, increased bicycle availability (through renting and employee loans) and bike and ride programs. While the program is still being monitored, the results have indicated a positive response from the public.

In Victoria, B.C. Transit is starting to install bicycle lockers at major park and ride locations. B.C. Transit feels that providing bicycle racks on buses in Greater Victoria is not justified by existing demand.

2.12 Effective Bikeway Planning

In 1991, the University of North Carolina Highway Safety Research Center and HDR Engineering completed a *National Bicycling and Walking Study* for the U.S. Federal Highway Administration. The Interim Report found that 7 percent of all commuter trips were on foot or bicycle (less than 2 percent by bicycle), and improving cycling facilities could result in a ten-fold increase in adult bicyclists (from 3 to 35 million). In response to a tripling of the number of bicycle riders between 1985 and 1989, many communities integrated cycle facilities into transportation plans.

The study also found that compact land use patterns encourage bicycle riding; bicycle racks on public transit encourage multi-modal trips; and "disincentives to using motor vehicles, such as a lack of parking, can also promote bicycling and walking" (p. v). The report concluded that benefits of cycling initiatives are maximized and costs minimized if planning and implementation of programs are integrated with road and transit planning processes. This finding validates the approach taken by the City of Victoria in designing its transportation planning program.

In Canada, bicycles have been considered a marginal mode of transport, associated with children or recreationists. In other parts of the world, however, bicycles are often the transportation mode of choice. Worldwide, bicycles outnumber automobiles by two to one, and production exceeds auto manufacturing by three to one. In the Netherlands, nearly one-third of all urban trips are on bicycles. Many European countries and Japan have achieved a high level of integration of bicycles with other transport modes. Even in the auto-dominated United States, 23 communities have been identified in which at least 15 percent of the population walks or bicycles to work, including cities in northern, snowy climates.

In Madison, Wisconsin, a city with an integrated multi-modal transportation system, 11 percent of licensed drivers commute by bicycle each day. In New York City nearly 10 percent of all vehicles counted in a May 1990 survey were bicycles (University of North Carolina 1991).

Improving the level of bicycle use can be achieved through many complementary strategies. In addition to providing safe cycling facilities, the most effective actions needed to get commuters out of their cars and onto bicycles are:

- a compact pattern of land use
- fees for automobile use
- limited parking.

Additional fuel taxes can provide funding for alternative transportation facilities, but taxes were less effective than peak hour fees in causing a modal shift.

The United States Department of Transportation in 1980 recommended that programs to increase bicycle use should have the following components:

Goal 1: To improve the awareness and competence of cyclists and motorists by:

- increasing the levels of bicycle education and training available to adults;
- implementing awareness programs;
- focusing on motorist awareness;
- increasing the enforcement of traffic laws and
- providing incentives for cycling.

Goal 2: To improve institutional and professional response by:

- increasing funding for bicycle programs
- developing standards for cycle facilities
- integrating cycling with other activities
- coordinating bicycle activities
- increasing the acceptance of cycling
- increasing the knowledge of bicycle programs among transportation and related professionals.

Goal 3: To improve transportation system for cycling by:

- reducing roadway surface and design hazards
- improving cyclists access to destinations
- providing secure parking facilities.

Most of these goal items have been addressed in the *Bicycle Master Plan*.

2.13 Route Selection and Planning Process

The cycling surveys conducted in Greater Victoria indicate that cycle traffic is dispersed throughout the community. To create a safe cycling environment, all streets need to be made bicycle-friendly. In parallel with the goal of removing obstacles to safe cycling, creating a network of routes for carrying higher volumes of cyclists is an important element of the *Bicycle Master Plan*. This goal was repeatedly articulated by focus group participants and supports the goals of the CRD Cycling Strategy.

Many articles on cycling express the need for a more systematic approach to route selection, often focusing on the benefits and drawbacks of route optimization versus network realization. Although a hierarchial cycle network fits well

with traditional road patterns and the layout of most housing developments, it rarely serves the needs of special users. In addition, the grid layout lengthens bicycle routes and requires numerous potentially dangerous road crossings.

A network based on the location of cycle destinations, using a partial radial network was found to be more effective in promoting bicycle use.

Establishing a compact system of radial routes is more efficient than a widespread system that does not provide a coherent network of routes (B. Bach and J. Diepens, 1992). Unfortunately, the choice of a bicycle network design in established communities is usually determined by the pattern of development and roads.

Safe routes should be provided for all user groups (recreational, commuter, sport cyclists). A compact network can be based on the skill level and resultant vulnerability of the cyclist groups. Such a system features user-group based local routes, combined with the main local routes to form a network. A first step is to get a better understanding of the users, their varied motives and skill levels. How cyclist groups respond to traffic speed and volume must be considered.

Bach and Diepens suggest that cyclist groups be classified as follows:

- *Vulnerable to traffic* - 10-16 years of age, seniors, and the hearing impaired;
- *Mobile Adults* - over the age of 16, travelling at speeds less than 30 km/hr;
- *Sport or Training* - over the age of 16, travelling at speeds greater than 30 km/hr.

This classification can be used to identify user characteristics, routing requirements, and the measures required to ensure route suitability with regards to safety and directness. For the purposes of the *Bicycle Master Plan*, sport or training cyclist will not receive specific attention, although they would be expected to benefit from many of the recommendations in the plan.

The *Bicycle Master Plan* targets policies and recommendations at two categories:

- Group A (Advanced Bicyclists, experienced riders, comfortable in most traffic situations), and
- Groups B/C (Basic Adult and Child Bicyclists, casual or novice adult cyclists, and pre-teens, who are less confident in their ability to operate in traffic on collector and arterials without special provisions for bicycles).

Group A cyclists require few on-street facilities, but normally appreciate wider curb lanes. Group B/C cyclists "will be best served by identifying key travel corridors (typically served by arterial and collector streets) and by providing designated bicycles facilities for these bicyclists" (Wilkinson, W. in Boivin and Pronovost 1992).

The "supply driven" approach to providing cycling facilities will encourage increased use by Group B/C riders (e.g., "if you build them they will come"), but providing lanes and paths for this group is not a substitute for making the design and maintenance of all streets "bicycle friendly" (Wilkinson in Boivin and Pronovost 1992).

Location is important in designing a bikeway network, because "bicycle facilities are often not built where they are truly needed to create/complete a network or provide an alternative to congested traffic, but rather where

it is the easiest to install them" (Mackay, J., in Boivin and Pronovost 1992).

Routes versus Paths

A great deal of discussion has focused on the merits and drawbacks of *integrating or separating* bicycles from other modes of transportation. Integration through the use of on-street bicycle routes implies that automobile drivers must adapt their behaviour to avoid cyclists on the road. In many cases, traffic volume must be altered and speeds reduced.

Segregation provides incompatible modes with their "own territory". Segregation can lead to inconvenient or inefficient bicycle paths that miss the city's main attractions. While a strong case can be made for both sides of this issue, "...the right balance of separated (specialized) and integrated (mixed) bicycle facilities might be the answer..." (Mamoli, 1992).

Based on their extensive experience, the Dutch have developed criteria for segregation and integration of different modes of transport. As described by T. Godefrooij (1992), the decision to alter traffic conditions or segregate depends on the:

- function of the road for cars and bicycles
- space availability for lanes or paths
- scenic or urban characteristics of the road
- other restrictive circumstances
- continuity of the bicycle network.

Although segregation can be avoided by decreasing car speed and volume and changing parking zones and intersections, Godefrooij's method can be used to determine when segregation is advisable.

Large segments of the population may be intimidated by riding on arterial roads. Gender and age considerations may be important considerations in providing cycling facilities:

"...men should be given the freedom of the road and be allowed to commute with the cars. Their speed shouldn't be curbed, and their daring closeted....It's just that biking opportunities should also be provided for women, children, and older people" (Lusk in Boivin and Pronovost 1992).

Lusk (a woman) feels that the majority of women, children, and older people would choose slower, more sociable, separated bicycle paths rather than the speed of riding on roads. Work trips as well as recreation, shopping, and errands could be served by such facilities.

Route Selection in Victoria

Historically, motor vehicle and cycling traffic in Victoria was light enough that shared roadways, even arterials, could handle bicycles relatively safely. (Although bicycle accident numbers were as high in 1986 as 1992, accident rates cannot be estimated because there are no good bicycle volume statistics from 1986.) With the increase in motor traffic and the number of cyclists, the pleasure and safety of cycling has declined.

Cycling volumes in the City of Victoria are not measured on a regular, comparable basis, so the change in bicycle use over the years cannot be accurately determined. Many Group B cyclists in this project's focus groups, however, commonly said that they no longer cycle in or near downtown or on major arterials because they consider it unsafe.

The Advisory Bicycle Subcommittee proposed a bikeway network based on the following steps that:

- *Identified major trip generators.* Members identified information contained in maps and plans, and based on the experience of the subcommittee members;
- *Used of local streets.* These routes were generally discontinuous and required cyclists to cross busy streets frequently; it was decided to address these issues.
- *Choose direct routes.* Research confirmed that the most direct routes were needed between cyclist destinations;
- *Tested alternative routes.* Members cycled on optional routes to assess their desirability;
- *Established an evaluation process.* Committee members used an evaluation process based on an American formula using:
 - average daily traffic volume
 - number of travel lanes
 - width of the curb lane
 - a pavement factor (quality of road surface)
 - a location factor (parking, grades, land use).

A variety of streets having potential as bicycle routes were evaluated using this method. The result was a pattern of road suitability for bicycle use. The "excellent" segments should need little upgrading to serve as designated routes. The "fair to good" segments need varying degrees of improvement, and the "poor" segments require extensive upgrading.

This plan is available through the City of Victoria Engineering Department.

The network prepared by the Advisory Bicycle Committee formed the basis of the *Bicycle Master Plan* network. Some additions were made, to define:

- Bikeways that should include the use bicycle lanes,
- Bikeways that should be signed as routes and need not include bike lanes initially, and
- Bikeways that could be developed as paths and separated from roads.

Bikeways that include *marked bike lanes* are intended to serve major traffic generators and to provide a exclusive portion of the roadway for cyclists along key sections of the major street network. The use of bicycle lanes, as described later in this report, should be designed to comply with accepted standards applied to local conditions. The lanes should be 1.0-1.6 m wide, lined, signed, and have bicycle stencils on the roadway.

The bicycle-vehicle accident rates on streets *with bike lanes* has been shown to be about *half* of the rate on streets without bicycle lanes (Lott 1975). The biggest benefit is for mid-block, overtaking, and bicycle entry onto the roadway accidents. Because about half of all bicycle-motor vehicle accidents in Victoria occur on straight segments of road, lanes may improve safety on bike lane routes. With or without bicycle lanes, intersections are dangerous places for cyclists (and cars and pedestrians). The use of well-designed bicycle lanes can increase ridership (a major goal of the *Bicycle Master Plan*) and indicate that the City has responded to identified needs of the cycling and potential cycling community.

With wider curb lanes, bicycle lane markings and stencils will also discourage compact cars

from travelling two abreast, creating hazards for cyclists. Lane markings will show both cyclists and motorists that the City recognizes bicycles as a legitimate mode of transportation and an effort has been made to allocate a safe portion of the roadway for bicycles.

For Class 3 bikeways, road improvements need to be provided to accommodate both bicycles and motor vehicles. These provisions could include wider curb lanes but they would not include marked bicycle lane. These routes would be signed as bicycle routes.

The development of paths in the City of Victoria is feasible only in parks, railroad corridors, or redeveloping properties. Paths in most cases should be considered as joint-use facilities with pedestrians, and serve both commuters and recreational cyclists.

2.14 Integrating Cycling with Corporate Strategies

Institutionalization "...occurs when an entire organization is focused on looking out for the needs of cyclists and pedestrians. It means that bicycle and pedestrian safety and access are automatically given top priority when developing new policies and projects" (Lagerwey, 1992).

Corporate strategies needed to include cycling in:

- policy documents
- planning documents
- regulations
- design manuals and traffic control policies
- maintenance schedules and procedures
- environmental impact statements
- training
- boards, commissions, and interdepartmental and interagency cooperation.
- funding programs

Successful cycle programs should include three key elements:

- a full-time bicycle program coordinator;
- political and administrative support within government agencies;
- an active and organized citizenry, usually exemplified by the presence of a Advisory Bicycle Committee (Clarke in Boivin and Pronovost 1992).

"Make cycling part of your corporate philosophy."

Part of the institutionalization of cycling includes staff training. In 1990, only 1% of American university engineering programs offered courses in bicycle transportation. Even when this topic was covered in other courses, the average time spent was 1.5 hours (Clarke in Boivin and Pronovost 1992). The City of Victoria has taken steps to train their staff in bicycle issues. Training has included specialized work-shops and multi-day conferences on cycling. This training has contributed to their active support in the preparation of the plan.

In summary, it will be crucial that the corporate structure is fully knowledgeable and supportive of cycling issues. For the *Bicycle Master Plan* to be successful in the City full support is needed by both the political and administrative components. The administration will be responsible for providing bicycle friendly streets and the task of:

- encouraging Council to support and fund cycling programs,
- encouraging neighbourhoods and business to support cycling projects,
- preparing improvement plans, and
- improving maintenance programs.

Priorities, Cost and Implementation

3.0 Priorities

Objective: *To implement the Master Bicycle Plan in an order of priority that responds to user demand.*

The development of the infrastructure for cycling is important if this mode of travel is to succeed and if the objectives of the *Bicycle Master Plan* are to be achieved. Without this commitment by the City, bicycle use will remain marginal.

Moreover, bicycle facilities are more cost-effective in moving people than spending more on facilities for automobiles. The investment in cycling to the year 2010 represents only 2% of the dollars needed to achieve the same gain in transit ridership.

Additional benefits include tourism appeal, a more attractive community, improved environmental quality, a healthier population, and integration of this mode of travel into the community. The focus groups identified funding priorities for City to improve cycling conditions (Table 13).

Table 13 What Should the City do to Promote Safe Cycling?	
Recommended Action	Number of "Votes"
Build wider curb lanes during road reconstruction or new construction	23
Provide education for motorists and cyclists	20
Provided lined, marked bicycle lanes	11
Raise parking fees and use proceeds to encourage cycling; eliminate subsidies for cars	9
Build separated bicycle paths	8
Cover the full costs of bike racks/Provide secure and well-lighted storage (controlled access in parkades)	8
Use low volume streets for bicycle routes	6
Provide showers and lockers in new buildings or in hotels and recreation facilities	6
Integrate cycling and motoring facilities	5
Provide peak hour bus/taxi/bicycle lanes	5
Provide bicycle bikeway network signs with directions and maps	5
Implement testing and licensing for cyclists	3

Besides the items listed in Table 13, focus group participants also mentioned linking car insurance rates to kilometres driven, conducting a campaign to make cycling "fashionable," and adding cycling to motorists' driving tests. The City should establish some criteria for establishing funding programs for transportation programs. According to focus group members, the criteria should focus on:

- Safety
- getting people out of their cars
- providing value for tax dollars
- serving the greatest numbers of people, and
- improving bicycle security.

3.1 Implementation and Budgets

Objective: To implement the Master Bicycle Plan as quickly as possible, consistent with efficient expenditure of tax dollars and the need to improve cycling safety.

3.1.1 The City establish funding to implement the Bicycle Master Plan.

The final costs to implement the *Bicycle Master Plan* will depend on changes to the plan as it is reviewed with the local neighbourhood plans. The estimated costs of Bicycle Master Plan and its major elements are summarized in Table 14.

Costs of land acquisition, landscaping, and similar measures need to be estimated based on detailed site-specific studies of each cycle facility segment and design. It is important that the land needed for cycling facilities not reduce the quality of the pedestrian environment. Protection of street and boulevard trees also needs to be given a high priority in facility design.

It is expected that by providing an annual funding program for the implementation of the Bicycle Master Plan, the goals of the plan could be phased over the next 15 years. A large share of the program relate to non-construction projects or programs. With a funding program of \$50,000 to \$100,000 per year most of the plans policies could be introduced by the year 2010. The construction related projects should be coordinated with redevelopment or major upgrades of major streets. These changes may not be fully acheived by the target year.

Table 14 Estimated Cost of Bicycle Master Plan Elements		
Item	Description	Total Cost
Widen major routes	8.9 km, 3 m wide	\$5,481,300
Potential Cycle Paths	1.0 km, 3 m wide	\$240,000
Signing Routes	54 km	\$90,100
Marking Routes	8.8 km	\$31,500
Selkirk Bridge Crossing	see design details	\$300,000
Grates, Repairs & Maintenance	all routes	\$71,300
Parking	30 units	\$14,700
Education Campaigns (2 yr cycle)	Education: \$10,000 Encouragement: \$10,000,	\$200,000
Training (5 yr cycle)	Police:\$8,000, City staff:\$2,000	\$40,000
Cycling Coordinator	half-time to year 2010	\$560,000
Subcommittee costs:	\$5,000/yr to year 2010	\$100,000
CRD Cycling initiatives	\$10,000 (2 year cycle)	\$100,000
Total Funding Recommended to year 2010		\$7,228,900

The implementation costs could be significantly reduced by reevaluating standards as the community adjusts to cycling and through the coordination of road improvements with new developments. We expect a large share of the road widening costs could be coordinated with redevelopment and have private funds pay for the new standards.

Several program elements (education, encouraging changes in provincial revenue sharing and regulations, etc.) should be cost-shared with the Province, Capital Regional District and/or regional municipalities. This may require the use of referendums to fund cycling facilities and programs. This method separates cycling program costs from the normal annual budgets.

- *The City should seek funding from other sources such as cost-sharing with appropriate senior governments to maximize the development of the network.*

The City of Victoria may be eligible for Ministry of Municipal Affairs revenue sharing as part of approved highways road improvement projects. Revisions are now being considered that could allow direct funding of bicycle facility projects not associated with road improvements. These potential changes are to be reviewed by the Union of British Columbia Municipalities.

Even under existing conditions, however, the City may be eligible to receive 50/50 cost sharing for correcting unsafe conditions for bicycles on roads. Some eligibility guidelines may be relaxed if safety conditions would be substantially improved.

The City of Victoria does not presently qualify for Ministry of Transportation and Highways financial assistance under the *Highways Act*. As a "terminal city," Victoria is deemed to have no through traffic, so there is no opportunity for getting bicycle facilities on major roads funded by the Ministry of Transportation and Highways under this program. If Victoria had "external traffic" that passed through the City on designated roads, it could receive 50/50 cost sharing for construction of secondary roads, 100% for arterial roads, and 40% for maintenance. The opportunity exists for the City to use the CRD Transportation Model to assess the amount of through traffic on its roads. This information may change the policy of the province.

3.1.2 *The City implement the Bicycle Master Plan by the year 2010.*

It is the goal of the committees involved in the Bicycle Master Plan that all efforts are taken to influence existing modal trends. Integrating cycling into the community is important and should be fully carried out by the year 2010.

This goal is consistent with projected land-use patterns changes outlined in the Capital Regional District's Regional Development & Transportation Project. The CRD outlined in their "Summary Report" that "Without a bikeway program the market share for cycling is likely to decline to 1-2% found in other large cities that lack bikeways."

APPENDIX A COSTS FOR BICYCLE FACILITY CONSTRUCTION

The following cost estimates for constructing bicycle facilities have been obtained from various sources and were summarized by the University of North Carolina (1991). The City of Victoria Engineering Department has reviewed the unit costs and finds them appropriate for costs of construction here. Costs are provided in Canadian dollars.

Table A1. Construction Costs per 30 Linear Metres of Program Element		
Item	Description	Unit Cost³
Base and pavement	Per metre of width	\$630
Widening of roadway ³	Per metre of widening	3,850
Widening of roadway with curb sections involved	Per metre of widening	7,800
Widening of bridge	Per metre of widening	84,000
Striping		42
Barriers		224
Lighting		3,780
Landscaping	7 m wide	2,590

Table A2. Construction Costs Per Program Element		
Item	Description	Unit Cost
Grade-separated intersection	Concrete conduit underpass, m diameter	\$214,200
Pedestrian/cyclist bridge	60 m long, 2 m wide, \$14,175/m	\$850,500
Bicycle grates		434
Bicycle locker	Holds two bicycles	800
Signs		84/sign

3

Costs exclude any land acquisition.

Table A2 - Estimate of Proposed Improvements to Specific Sections (1994 Dollars)
Signing & Painting Only

Street	From	To	Length	Widening(\$)	Signing(\$)	Painting(\$)
Blackwood	Kings	Haultain	240		\$500	
Blanshard	Tolmie	Fisgard	4,475		\$8,950	\$17,900
Bridge	Bay	David	300		\$600	
Caledonia	Vancouver	Chambers	430		\$900	
Catherine	Harbour	Bay	300		\$600	
Chambers	Caledonia	Walnut	370		\$700	
Cook	Dallas	Park Blvd.	530		\$1,100	
Dallas	Menzies	Foul Bay	3,500		\$7,000	
Fairfield	Memorial	Foul Bay	1,500		\$3,000	
Fernwood	Haultain	Walnut	300		\$600	
Fifth	Tolmie	Topaz	760		\$1,500	
Finlayson	Gorge	Cedar Hill	2,600		\$5,200	
Fisgard	Government	Vancouver	980		\$2,000	
Government	Gorge	Fisgard	1,000		\$2,000	\$3,900
Government	Dallas	Humboldt	1,400		\$2,700	
Graham	Topaz	Bay	860		\$1,700	
Johnson	Blanshard	Begbie	1,500		\$3,000	\$6,000
May	Cook	Memorial	900		\$1,800	
Memorial	Dallas	Fairfield	300		\$600	
Oak Bay	Begbie	Foul Bay	1,500		\$3,100	
Oswego	Dallas	Superior	760		\$1,500	
Park Blvd	Vancouver	Cook	\$300		\$600	
Richardson	Vancouver	Foul Bay	2,800		\$5,500	
Richmond	Dallas	Fairfield	560		\$900	
Richmond	Fort	Fairfield	1,520		\$3,100	
Scott	Haultain	Hillside	1,200		\$2,400	
Selkirk	Arm	Styles	460		\$900	
Styles	Selkirk	Craigflower	150		\$300	
Superior	Erie	Vancouver	1,700		\$3,400	
Topaz	Fifth	Graham	150		\$300	
Vancouver	Park Blvd	Superior	380		\$760	
Vancouver	Bay	Pembroke	320		\$600	
Vancouver	Caledonia	Southgate	1,950		\$3,900	
Yates	Blanshard	Fort	900		\$1,800	\$3,700
			36,895	\$0	\$73,510	\$31,500

Section	From	To	Length (m)	Widening(\$)	Sign (\$)	Markings(\$)
Bay	Catherine	Dowler	1,900	\$1,382,600	\$3,900	
Burnside	Washington	Finlayson	600	\$438,900	\$1,200	
Craigflower	Catherine	Bay	300	\$260,000	\$2,100	
Esquimalt	Harriet	Russell	610	\$438,900	\$1,200	
Fort	Blanshard	Foul Bay	3,050	\$1,536,200	\$4,300	
Gorge	Harriet	Douglas	1,370	\$548,600	\$1,500	
Richmond	Newton	Fort	1,070	\$768,100	\$2,100	
Vancouver	Pembroke	Caledonia	150	\$108,000	\$300	
Sub-total (Road widenings, signs & markings)			9,050	\$5,481,300	\$16,600	\$0

- Estimates may vary once detailed designs and standards are coordinated with each neighbourhood plan.

Item	Description	Unit Cost ⁴
Landscaping	8/mo/yr, 7 m wide area	\$518
Snow removal	2 snowfalls/month	0.20
Sweeping	Once a month; 8 km/hr	\$53/hr
Repair: seal coat	2 m path, 5th and 15th year after construction	59
Resurfacing	2 m path, 10th year after construction	430

⁴Costs exclude any land acquisition.

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