Appendix C. Active Transportation and Transit Integration Technical Appendix

Transit connections are an integral part of any non-motorized transportation system. Keeping in mind the common phrase that "every transit user is a pedestrian at some point," this master plan acknowledges transit's integral role in ensuring the success of an active transportation strategy. Quality integration between modes is mutually beneficial in extending the reach and catchment area of transit services (this is particularly beneficial in lower density areas) as well as increasing the distance that can be comfortably travelled by a pedestrian or cyclist.

Transit agencies have identified numerous reasons for providing active transportation connections to transit including[1]:

- Increasing the number of multimodal trips.
- Removing motor vehicles from roads and parking lots to better utilize that space.
- Enhancing quality of life in the community by reducing emissions, noise, and traffic congestion and supporting active living, improved public health, equity, and accessibility.
- Increasing the visibility of walking and bicycling as viable transportation options.
- Contributing to regional commuter assistance programs and extending low-cost transportation options.
- Providing an alternative for pedestrians and bicyclists so that they can bypass areas that are barriers, such as bridges, tunnels, steep hills, roads with traffic, and avoid walking or riding at night or during adverse weather conditions.

This appendix identifies typical issues involving active transportation and transit and summarizes existing best practices. The existing conditions gathered in Phase I of the PCMP process form the baseline of this analysis, along with interviews with transit staff.

Existing Conditions

Transit Providers

Several organizations provide transit throughout the CRD. This section briefly describes transit options that are currently available, as well as planned improvements or changes.

Victoria Regional Transit System - BC Transit

The Victoria Regional Transit System is operated by BC Transit under the management of the Victoria Regional Transit Commission. The Commission is responsible for approving route configurations, transit service levels, and setting fares. The Commission also reviews and makes recommendations for the annual operating budget and capital spending, as well as making recommendations about the municipal share of transit service costs.

Currently, all buses on the Victoria transit system have two-bike racks mounted on the front of the bus. They are available on a first-come, first-serve basis. Bicycles are not allowed within the bus when the rack is full; the cyclist must wait for the next bus. Folding bicycles are considered luggage and are allowed at the discretion of the operator. In addition, loading or unloading of bicycles along Douglas Street from

[1] Based on responses to a survey included in the TCRP Bicycle and Transit Integration study.

Pandora to Broughton or on Fort at Douglas is prohibited due to heavy passenger traffic. Community Buses only allow the racks to be used during daylight hours due to headlight interference.[2]

Access to Transit

BC Transit defines its service area as the "number of potential riders within walking distance (typically 400m for local service, 1 km+ for a rapid transit station) of a bus exchange or transit station." This corresponds to approximately a five-minute walk for local service and a 10-minute walk for a rapid transit station.

Connections to transit are also dictated by pedestrian and cycling barriers. Ideally, transit access is maximized with a grid-style network of facilities. However where discontinuous networks (such as cul-de-sacs) or other barriers exist, alternative connections such as pedestrian short-cuts, laneways, or dedicated crossings can help increase station accessibility. Transit Oriented Development (TOD) guidelines suggest transit exchanges should be located at the centre of major developments, such as the designated Regional Centres in the CRD.

For "average" commuter cyclists, the service area of a transit exchange is approximately three to four times the pedestrian service area, i.e., 1,200 – 1,600 metres. Cycling and transit can be integrated to extend the reach of transit services into lower density areas that cannot support a transit line within walking distance (i.e., 400 m) of all residents.

Park-and-Rides and Transit Exchanges

Transit stations are hubs where more bicyclists and pedestrians tend to travel to access transit. Features at the transit station and policies for carrying bicycles onto transit particularly impact cyclists' and pedestrians' abilities to utilize the transit system. The draft *Transportation Corridor Report* (2010) defined key locations in the region for interchange between modes.

Park-and-ride and transit exchanges include:

- Beacon Avenue - Patricia Bay Highway (Sidney Exchange)
- McTavish Road - Patricia Bay Highway (Airport Exchange)
- Mount Newton Cross Road - Patricia Bay Highway (Mount Newton Exchange)
- Keating Cross Road - Patricia Bay Highway (Central Saanich Exchange)
- View Royal Exchange
- Helmcken (Victoria General)
- Langford Transit exchanges include:
- Saanich Centre (Town and Country)
- Downtown
- University Heights
- Colwood

Note – this list of park-and-ride and transit exchanges is not complete. An updated list will be made available upon completion of the Victoria Transit Future Plan.

The PCMP is developing a regional active transportation network, which has incorporated existing and future Park and Ride facilities and transit exchanges to ensure good bicycle and pedestrian connections to transit throughout the region.

[2] http://www.transitbc.com/regions/vic/news/commission/pdf/cmtg-ri-602.pdf

In addition, BC Transit is currently developing guidelines for transit-oriented developments (TODs). The basis for TOD planning is the concept of 'mode hierarchy,' which recognizes transportation modes that have the least environmental impact and greatest contribution to liveability. Intended as a prioritization strategy, the hierarchy promotes funding and development of facilities for modes that affordably enhance access for the majority of residents, rather than using level of service standards focused on vehicle movement. The hierarchy gives precedence to pedestrians, then to bicyclists and public transit.

Rapid Transit

BC Transit is currently developing a *Rapid Transit Plan* which will provide links between the West Shore, Uptown, and downtown Victoria. The plan will consider whether, and how many, bicycles can be accommodated on the Rapid Transit vehicles. This plan will be augmented by the new *Victoria Transit Future Plan* which will offer rapid and frequent trips among the regional centres. (At the time of publication, the corridors have not been finalized nor has the transit technology, e.g., light rail, bus, etc.). These plans represent a significant shift in transit service in the region and will potentially have significant influence on land use (where people will ultimately choose to live and work) and ridership. Mandated by the Province's Climate Action legislation, BC Transit's goal is to double transit mode share to 12%. Success and uptake of the new service will require seamless multi-modal integration with cycling and walking facilities.

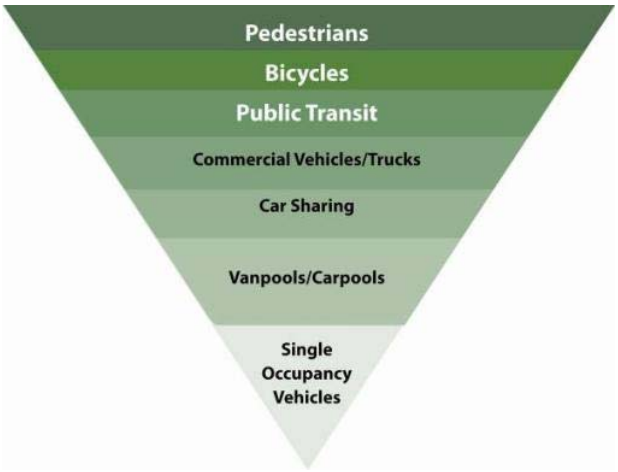

Figure 1. 'Green transportation' modal hierarchy chart, which promotes planning for pedestrian and bicycle travel prior to other modes.

VIA Rail

VIA Rail Canada runs a primarily tourist train between Victoria and Comox (departing at 8 am and returning at 6 pm). The train has been identified as lacking wheelchair accessibility and does not accommodate bicycles well.[3] The Island Corridor Foundation, owners of the rail corridor, and their rail operator, Southern Rail of Vancouver Island, are currently working with VIA Rail to identify an enhanced passenger service that could add additional train service into Victoria in the morning as well as outbound in the afternoon.

Private Busses

Several private companies provide bussing services throughout the region. Some of these include:

- Akal Airporter Bus: A private service provides buses from Victoria Airport to hotels in downtown Victoria and other locations as requested, including the University of Victoria, CFB Esquimalt, senior homes, and other destinations.
- West Coast Trail Express: This bus shuttles people between Victoria and Nanaimo and the trailheads of the West Coast Trail and the Juan de Fuca Trail.

[3] Source: Evaluation of the E & N Railway Corridor: Foundation Report

Victoria Harbour Ferry

The Victoria Harbour Ferry Company provides service around Victoria's Inner Harbour as well as the Selkirk and Gorge Waterways. Ferry boats are equipped to carry up to twelve passengers. Four exchanges provide connections to destinations including the Harbour Air Terminal, Fisherman's Wharf, and the Galloping Goose Regional Trail. This tourist oriented service currently does not allow bicycle transport.

Private Ferry Services

Several private ferry services provide bicycle transit from downtown Victoria to various locations in Washington State.

- The Black Ball Ferry Lines provide daily year-round service from Port Angeles, WA to downtown Victoria for cyclists and pedestrians. Bike transport costs approximately six dollars.
- The Victoria Express provides daily year-round transportation for pedestrians and cyclists between Port Angeles and downtown Victoria. Bike transport costs approximately five dollars.
- The Victoria Clipper provides daily year round service from Seattle. Bicycles are allowed, and advanced registration is recommended. Bike transport costs approximately ten dollars.

Washington State Ferries

A Washington State Ferry line provides daily service from Sidney to Anacortes. A six-dollar bicycle transport fee applies.

BC Ferries

BC Ferries provides regular service between Vancouver Island and the mainland. Cyclists pay a fee of approximately $2 to transport their bike. The main terminal is Swartz Bay, in North Saanich, which provides service to Tsawwassen, Saltspring Island, and the Southern Gulf Islands. A smaller ferry runs from Brentwood Bay across the Saanich Inlet to Mill Bay.

Existing Design Standards

BC Transit and the District of Saanich provide guidance for design of bus exchanges and roadways for accessibility. This section provides an overview of those guidelines, which will be integrated into the PCMP Bicycle and Pedestrian Design Guidelines.

BC Transit

BC Transit's Master Operating Agreement states that bus exchanges are the responsibility of the municipalities. BC Transit's Marketing Department provides signage for bus exchanges, such as wheelchair symbol decals to be used on designated accessible bus exchanges. While funding bus exchange improvements is typically the responsibility of individual municipalities, a potential new program could become available to fund upgrades to transit exchanges.

BC Transit provides guidelines for bus exchanges in the publication, *Design Guidelines for Accessible Bus Stops.* While the document does not provide hard and fast rules, it serves as general design guidelines and identifies minimum requirements for bus exchanges to be deemed accessible. Guidelines for accessible transit exchanges include consideration for shelters, seating, curb cuts, walkways, circulation, and ramps.

Saanich

The District of Saanich has developed access to transit Development Permit Guidelines (2008). These guidelines include considerations for handyDART pick-up and drop-off zones. Guidelines for drop-off locations on streets include:

- Where the drop-off area utilizes the public street, the curb cut should be located at the rear-loading area.
- The locations should be of sufficient length to accommodate the bus/van.
- The location should be signed appropriately for use only by the handyDART vehicle.

The travel path to the front door should be reviewed for continuous connectivity and accessibility. The Guidelines also recommend that speed-humps be designed to minimize impact on passengers - speed tables are preferred or speed buttons spaced to allow the wheels of the handyDART vehicle to pass between the humps.

Saanich also makes recommendations about bus exchange locations:

- Bus exchanges should be located as close to seniors' homes, hospitals, institutions and other high transit usage locations as practically possible to reduce walking distances. Developers of seniors' homes and high-density developments should consider locating their facilities close to transit routes/ exchanges.

Issue Identification

This section describes typical issues related to the integration of active transportation and transit. This includes:

- Appropriately planning for expected demands.
- Providing connections between active transportation and transit networks.
- Providing appropriate facilities at transit stations (e.g., bicycle parking).
- Creating convenient access at, to, and from transit stations.
- Developing policies for carrying bicycles onto transit vehicles.
- Accommodating pedestrians and cyclists in the physical design of the station.

Expected Demands

Estimates of potential ridership inform the type of station that should be provided as well as the level of pedestrian and cycling accommodation. Potential ridership forecasts consider a number of factors in the station area including population and employment, the level of transit service being proposed, parking provision (as an indicator of auto-use) and management, and the extent and walk- / bike-ability of the pedestrian / bicycle network (note: as an example, Table 1 presents possible bike-ability measures).

Table 1. Potential Bikeability Measures

Bikeability Measure	Unit of Measure	Reasoning
Road Network Density	Linear km per ha	Areas with a greater density of roads allow cyclists greater route choice and distribute traffic volumes.
Bike Network Density	Linear km per ha	The presence of facilities designed for cyclists increases their comfort and safety.
Connectivity	Connected node ratio	Areas with greater roadway connectivity enable cyclists to easily go more places and have greater route choice.
Slope	Average slope across the area	Topography can decrease the ease of cycling and is an issue that is difficult to change.
Land Use Mix	Average distance (m) along the road network between residential and retail/commercial	People are more likely to cycle in areas with many available activities.

San Francisco Bay Area Rapid Transit (BART) uses this method to determine bicycle parking needs and to estimate bicycle use in the future. Table 2 shows the assumptions behind developing the "Bicycle Access Growth Factor". In the future, BART is considering expanding the population and employment input to include a 2 km radius of the station. The variables in this analysis could be adapted to the BC Transit service area in the CRD.

Table 2. BART Bicycle Access Potential Growth Assumptions[4]

Variable	Rating Value	Source
Home-Based Ridership	Maximum of 10 points given to station based upon home-based weekday passenger entries.	Station Profile Study, August 1999.
Ridership Rate	Maximum of 15 points given to station based upon total weekday passenger entries.	Station Profile Study, August 1999.
Bicycle Mode Share in AM Peak	Maximum of 30 points given to station based upon percent bicycle mode share during AM peak period.	Station Access Evaluation System, 2002
2000 Population within 1 Mile of Station	Maximum of 15 points given to station based upon Year 2000 population within 1 mile of station.	Station Access Evaluation System, 2002.
Households with No Car within 1 Mile of Station	Maximum of 10 points given to station based upon number of households with no car available within 1 mile of station.	Station Access Evaluation System, 2002.
Topography/Traffic/ Barrier Factor	Maximum of (-)20 points given to station based upon factors affecting bicycle travel such as surrounding topography, traffic on roadways leading to station, and impediments to bicycle travel including railroad tracks and freeway ramps.	Based upon field data collection.

[4] Source: www.acta2002.com/thirdfunding/BART_Bicycle_Access_Parking_Plan_Table%20A-11.pdf

Bus Exchange and Station Planning

Transit exchange and station planning includes determining the appropriate spacing and type of bus exchanges and stations. The active transportation network plays a role in informing both of these factors.

Station Spacing

Station spacing will vary depending on whether an area is urban, suburban, or rural:

- **Suburban/Rural Areas:** Transit exchanges located in lower-density residential areas are generally served by less frequent local bus services often with considerable distances between exchanges. (Some suburban areas in the region however, have a high density of exchanges.) Given that distances between trip origins/destinations and larger transit exchanges are often prohibitive to walking, these situations may encourage transit patrons to cycle, if adequate and secure bicycle parking is provided (or if bicycles can be taken onto the transit vehicle), and as long as there is a safe and comfortable bicycle route to the station. The latter may include providing dedicated on- or off-street bicycle routes and traffic signals fitted with bicycle and pedestrian activation. Bicycle parking should be easily recognizable, located close to the boarding area, and be as secure as possible from theft.

- **Urban Areas:** Exchanges and stations in urban areas tend to be spaced closer together and service high levels of walking trips and short-distance bicycle trips. The higher level of pedestrian traffic means that consideration should be given to managing bicycle and pedestrian interactions through pavement markings, bicycle lanes, and other treatments.

Station Typology

Station typology is dictated by the transit planning process; however there are a number of design considerations for pedestrians and cyclists depending on the station type. Some common transit station types are described below.

- **Park-and-Rides:** Park-and-rides are located in out-lying areas with good auto access to facilitate auto-transit connections. These are also appropriate locations to link bicycle-transit connections. Bicycle parking at a park-and-ride should be plentiful, secure, signed, and located close to the boarding area. Specific consideration needs to be given to the interaction of bicycles and automobiles, especially to and from the park-and-ride and within the parking area. Park-and-rides are often located at stations where transit travels long distances quickly and so the cycling catchment could be further than the typical service area of a local transit exchange (i.e., further than 1,200 - 1,600m).

- **Bus:** Local bus exchanges will likely attract fewer bicyclists than other station types. While they may not merit expensive infrastructure improvements, well-marked and safe routes to the exchange should be provided. This includes sidewalks, bike lanes, or marked wide curb lanes on the road, signage and markings alerting drivers about the presence of bicyclists, and safe crossing facilities. Bicycle racks may be considered for higher use exchanges. Major and regional bus exchanges serviced by multiple lines, high ridership, or acting as a transfer point may require more sophisticated treatments, in particular more parking options, such as covered and/or more secure long-term parking.

- **Rapid Bus, Light Rail, and Commuter Rail Stations:** Rapid bus, light rail platforms, commuter rail stations, and transit exchanges will attract large numbers of bicyclists. These stations should have well-marked sidewalks and crossings as well as on-street or off-street bicycle facilities

leading to and from the station. Bicycle parking, both short- and long-term, should be provided and end-of-trip facilities considered. Pedestrian circulation is a major consideration and particular emphasis should be given to providing safe and convenient connections between modes and transit lines. In high-activity areas bicycle and pedestrian movements will need to be managed through signage or pavement markings (e.g., directing bicyclists to dismount on the sidewalk).

Facilities

Facilities that make the experience more comfortable for a pedestrian or a cyclist are critical in attracting and maintaining transit riders. Recommended provisions at transit exchanges, which will vary depending on the type and use of exchanges, include:

- **Seating:** Either benches or seats should be made available and can be attached to the bus exchange post. Seating should be placed so that waiting passengers are visible to the bus driver.
- **Shelter:** Shelter can be a dedicated bus shelter or make use of surrounding building elements such as awnings to provide adequate cover for rain and wind protection.
- **Trip information:** Essential information that should be provided at every exchange includes the route number and the exchange number. It is preferable to also provide a route map and timetable. Real-time arrival information may be appropriate where there are frequent bus arrivals and multiple lines at an exchange.
- **Bicycle parking:** Guidance is provided above and in Appendix B on the amount, design, and placement of bicycle parking at transit exchanges. In general, minor and local exchanges can make do with existing street furniture or simple bike racks. As station size and catchment area increases, more secure options need to be provided.*
- **Trip enhancement amenities:** Major transit hubs and stations may offer end-of-trip facilities beyond parking such as showers, washrooms, clothing lockers, etc.
- **Pedestrian scale lighting:** Lighting designed for pedestrians increases security and visibility for riders and transit operators.
- **A trash container.**

* The Transit Cooperative Research Program (TCRP) report, *Bicycle and Transit Integration* recommends that bicycle parking receive priority siting near the bus or train loading zone. Parking should also be located so that cyclists do not need to carry bicycles up or down stairs or through large crowds of travellers. The parking facility should be located in the clear view of the general public, vendors, or transit staff. Security is a particular concern if parking is provided in a garage and in these cases should be located in a central, frequently travelled part of the garage, ideally near an attendant. Most guidelines recommend against providing bicycle racks in unattended garages. Garages may also require treatments to manage conflicts between bicycles, automobiles, and pedestrians at entrances and within the garage.

Accessibility

Pedestrian Access to the Station

Difficult and unsafe routes to transit exchanges can discourage or prevent pedestrians and users in wheelchairs or with strollers from using the transit system. The District of Saanich has developed a set of Design Guidelines as part of its OCP Development Permit Guidelines

(http://www.saanich.ca/living/dpa.html). The standards provide direction that is suitable for a region-wide application. For example, sidewalk widths suggest the provision of a minimum 1.5 metre unobstructed pathway around the bus exchange or shelter and a pathway between the bus and the waiting area (e.g., across the boulevard).

Other factors that are typically used to evaluate the safety of pedestrian access to a transit exchange or station include:

- Traffic environment
- Crossing location distance/quality
- Posted speeds
- Sightlines and distances
- Number of travel lanes
- Curb-to-curb width
- Curb height
- Traffic volume
- Pedestrian collisions
- Existence/condition of sidewalks
- Slope

Sidewalks, ramps, and crossings are also essential parts of the pedestrian network and connect transit exchanges with nearby land uses. Routes near transit are priority locations in the PCMP regional pedestrian network, and the CRD should work with BC Transit, municipalities, and local developers to identify innovative opportunities to ensure that bus exchanges are accessible for all users. In addition, standards and guidelines for marked crossings and mid-block crosswalks are provided in the PCMP design guidelines.

Crossings are particularly important, and where possible these should be provided along the most direct path, as pedestrians are typically unwilling to walk out-of-direction to access a crosswalk. This includes mid-block crossings, which should be treated appropriately depending on the crossing opportunities afforded by traffic and prevailing conditions of the roadway. Treatments to improve pedestrian crossings include:

- Clearing visual obstructions – street trees, telephone poles, limiting on-street parking, etc.
- Moving the exchange to an existing marked or signalized crossing.
- Adding curb extensions or median refuges to shorten the crossing distance.
- Adding pedestrian signals.

Bicycle Access to the Station

The local bicycle network should connect to transit exchanges and stations, particularly higher-volume hubs that should also host ample secure bicycle parking. One noticeable example is San Francisco Bay Area Rapid Transit (BART), which works with local jurisdictions to provide safe, direct, and well-marked routes to and from BART stations. BART works to ensure that:

- All actuated traffic signals near the station can be activated by bicycles.
- Local jurisdictions provide bikeway links between BART stations and bikeway networks, and give streets leading to stations top priority for bicycle facilities.
- Local jurisdictions maintain streets leading to stations from adjoining streets and bikeways.

Ottawa has developed a system of off-street trails that provide direct connections from neighbourhoods to large transit hubs. These systems are most appropriate at regional transit hubs and park-and-rides. The TCRP report titled *Bicycle and Transit Integration* also encourages bicycle permeability and providing bicycle paths from neighbouring communities that are the same length as or shorter than roadway routes.

Permeability is particularly important in areas with a disconnected street pattern. Where feasible, bicycle lanes and bicycle-actuated signals should be provided within five kilometres of major transit stations.

The density of the area surrounding transit stations and the frequency of transit affects how far the average transit user travels to access transit. When planning for access management, BC Transit should take into account the distances users are likely to bicycle in order to encourage people who live further from transit stations to bike to them.

Pedestrian Access within the Station/Exchange

Accessible curb ramps and sidewalks should be provided, at a minimum, on the block of all bus exchanges (to the maximum extent possible). At the exchange, ADA guidelines require a "firm, stable boarding surface" and waiting areas should be large enough to accommodate both seated and standing passengers, extend or connect to the street, and meet any applicable disabled access regulations.

Where waiting areas are separated from the boarding zone, e.g., by a cycle track or similar facility, safe and convenient crossings should be provided. Accessibility requirements will also need to be met.

Bicycle Access within the Station

Once the bicyclist has entered the transit station area or the exchange's immediate surroundings, they should be able to readily locate bicycle parking and safely access it. Conflicts between bicyclists, pedestrians, automobiles, and buses should be managed. This may include reducing vehicle and bicycle speeds, providing safe crossing opportunities, maintaining visibility between users, and perhaps even separating movements. At many transit stations in Europe, bicycle paths are clearly marked by coloured pavement treatments (see Figure 2), which should be considered in locations where there is substantial interaction of bicycles and automobiles (as in the case of auto passenger drop-off zones, a.k.a. Kiss-and-Rides).

Figure 2. Separated Bicycle Lanes at a Transit Station in the City of York, UK

If bicycle parking is provided below or above grade, an elevator, escalator, ramp system, or wheel gutter (less desirable) should be provided. Elevators should accommodate several bicycles and preferably have opposing doors for "wheel through" entry and exit. Signage and marking should supplement other visual cues to locate these facilities. Wheel gutters are required inside BART stations where bikes will move up or down stairs, as bicycles are not allowed on escalators. Parking structures in the Netherlands provide escalators appropriate for bicycle use (Figure 3). Ramps should be at least 3 metres wide, with a maximum gradient of 6-7%.

Figure 3. Bicycle Escalator at a Bicycle Parking Garage in Amsterdam

The CROW Design manual for bicycle traffic designates 50 metres as the maximum walking distance from the parking facility to destinations within the station and the boarding area. These routes should also be safe and well-lit. In San Francisco, some sidewalks are used as bicycle routes in the station area, but only if they have been designed to safely accommodate the expected volumes of bicycle and pedestrian traffic. Bus exchanges and exchange platforms are often integrated into the general sidewalk.

As a result, cyclists sometimes ride on the sidewalk/platform and interfere with pedestrian travel. In locations where bicycling on the sidewalk is prohibited, signage may be warranted to emphasize this ordinance. In other locations, engineering solutions such as additional curb cuts can enable cyclists to stay on the street longer before accessing the exchange.

Bicycles on Transit

Determining whether cyclists can carry bikes onto transit is a significant decision. Carrying bicycles onto transit enables cyclists to avoid potentially difficult situations, including large hills, busy streets, long distances and inclement weather. It also reduces the fear of being stranded in the case of equipment failure, and pre-empts theft of bikes that would otherwise have to be locked up at the bus exchange.

At the moment, buses provide the only transit options in the CRD (with the exception of the VIA Rail service). In May 2010, the Victoria Regional Transit Commission published a report on the Bikes on Buses Pilot Project.[5] The project sought to increase bicycle capacity on Victoria's bus fleet, particularly on the long haul bus routes. The report concluded by recommending further work with the manufacturers of buses to reduce the headlamp exposure restriction to three-bike racks. The commission did not recommend the other alternatives.

If light rail is constructed in the future, allowing bicycles onto the train can take up significant amounts of passenger space, although some designs reduce space necessary for bicycle accommodation. Many transit agencies restrict bicycle-carrying times to outside peak commuter hours, limiting the utility of bike-transit trips for commuting and would significantly reduce potential mode split. Such policies need to be supported with options for secure bicycle parking such as full-service bicycle centres and other protected parking facilities.

Mechanisms for allowing bicycles on transit vehicles are described below as well as some other considerations.

Front–mounted Bike Racks

The majority of buses that allow bikes use a rack placed at the front of the bus; this is the case amongst the BC Transit fleet. When not in use, the bike rack folds up on the front of the bus. When a bicyclist wants to use the rack, they pull it down and lift their bicycle onto the unit. Some buses are capable of kneeling to help with mounting of the bicycle.

Most bike racks hold two bicycles, but some transit agencies have been testing racks with capacity for three to five bicycles. In BC, the regulations in the Motor Vehicle Act relating to headlight interference and load projections pose significant barriers to implementation. In 2005, TransLink piloted a three-rack installation, but the project failed due to concerns about bike loading on the street side (passenger collision danger) and the width of the rack affecting bus turning radius.

The two-bike front racks add six to nine inches of length to the bus (folded), requiring additional storage in the bus yard. For certain size buses, racks can interfere with windshield wiper, headlight, and turn signal operations. In hillier regions such as Seattle, buses have had problems with bottoming-out as they turn up large hills.

The primary capital costs of a bike-on-bus program include the purchase and installation of the rack units. In 2005, these cost between $500 and $1,000 each (including installation) for two-bicycle racks and more recently King County Metro paid $660 per rack for a three-rack design from Sportworks Northwest. Purchasing bike racks on new buses reduces the labour cost of retrofitting. It is recommended that at a

[5] http://www.transitbc.com/regions/vic/news/commission/pdf/cmtg-ri-602.pdf

minimum a visual inspection of the rack is performed each day along with a 30-day general maintenance inspection, which consists of tightening bolts and checking for wear and tear.[6] Maintenance of the bike racks costs about $50 to $100 per rack per year. They need to be replaced after 6-7 years, often due to rust or colliding with other objects.

Some transit agencies deploy bus bike racks (at least initially) on only specific routes and add indicator lights to show when a rack is down. Generally, all transit agencies offer the use of the rack free of charge and without a permit, although some agencies require you to attend a training session or state that you watched a training video on how to use the rack. Bicycle racks should not be left down when not in use as they may not be visible to drivers and other road users.

Certain types of bicycles are sometimes prohibited for clearance or visibility reasons, e.g. recumbents, tandems, tricycles, unicycles, electric bicycles, and other non-standard bicycles. Some agencies have a minimum age for using the racks, and others limit usage to people who can load their bikes themselves.

Rear-Mounted Bike Racks

Rear-mounted racks were experimented with by some transit agencies, but are problematic because of user safety concerns. They also block access to the engine and reduce driver visibility, as drivers cannot see the rack and monitor the safety and security of bicyclists as they load and unload their bicycles. Bicycles can also get dirtied by exhaust at the rear of the bus. These are not recommended.

Bikes-in-Buses

Another option is to allow the bicyclist to carry their bicycle onboard. Allowing bikes in buses is often cumbersome, requiring bicyclists to lift the bike up stairs, and is problematic for loading/unloading during busy periods. In these situations, bus drivers are usually given the authority to decide when to allow bicycles on the bus. In a few cases, where buses have additional space for luggage, bicycles are allowed to be stored in this compartment, often underneath the bus. Some policies allow bicycles to be located in the wheelchair securement station when not utilized by passengers with mobility challenges. In general, the policy of allowing bikes in buses is not recommended, except on longer routes on weekends and holidays for recreational and tourist traffic. The policy should be clearly stated and consistent to allow cyclists to plan their trips.

Figure 4. Bike rack on a MAX light rail train in Portland, OR.

Bikes-on-Rail

Train cars that allow bicycles may or may not provide dedicated space for bicycles. Many times the space is shared with seating dedicated for passengers with special needs (who receive priority). Passengers with bicycles then need to board a car with open space or wait for the next train. This is often communicated to passengers through signage on the train car and through information dissemination tools such as the transit agency website.

Some transit agencies have begun allocating specific areas for bicycles. Newer design light rail trains provide hooks to vertically hang bicycles. This reduces the footprint of the bicycle, but it can be difficult

[6] Sportsworks Northwest. Bike Racks for Buses: Service and Maintenance. http://www.bicycleracks.com/busrack_support_maintenance.asp Accessed 3/19/2009.

for some users to lift their bicycle onto the hook. Also, if the racks are full, the passenger may use the unoccupied priority seating or wait until the next train arrives that has hooks available.

Time Restrictions

Agencies can also establish policies regarding appropriate times of the day when bicycles are allowed on or in transit vehicles. These typically exclude bicycles being carried aboard during peak commuter times. This typically excludes folding bikes (in their folded position). These restrictions should be coupled with secure parking at transit stations to store bicycles rather than carry them aboard.

Education and Marketing

First-time and novice users are often concerned about how to load their bicycle on to the bus or train and have fears about the system being time-consuming or otherwise difficult to use. There are numerous examples where advertising, events, and targeted audience participation have successfully introduced users to bicycle loading. Information should be made available on the transit agency (and other) website. Videos are an effective means of instruction.

TriMet, the transit agency in Portland, OR, has a model bike rack which they bring to fairs and employment centres. This allows users to experiment with the system before having to depend on it. Similarly, in Chicago representatives of the mayor's bicycling education program have staged demonstrations of bike-on-bus racks at events for hands-on training.

Capacity Concerns

The TCRP report, *Integration of Bicycles and Transit* (2005) found anecdotally that young adults, students, and low-income commuters are the most frequent users of bike-on-bus systems. Bus routes serving populations that are more likely to bicycle, such as colleges and low-income areas, may have capacity issues.

If a rack is full, the bicyclist typically has to wait for the next bus. This problem has led several transit agencies to explore different options, such as three-bike racks, rear-mounted racks, secure bicycle parking options, and allowing bicycles onboard buses.

The increased frequency of service (when the Rapid Transit Plan and the Transit Future Plan are implemented) will alleviate some of the capacity concerns on the most popular routes.

Physical Design

Beyond the design considerations noted above, there are a number of physical design issues that need to be addressed. In particular, the bicycle/transit interface and bicycle rail line crossings are addressed below.

Figure 5. Pavement markings direct bicyclists onto the streetcar platform from the bicycle lane.

Bicycle/Transit Interface

In addition to providing safe routes to get to transit, it is important to minimize potential conflicts between bicyclists and transit vehicles and people waiting or boarding transit. Where bicycles and transit vehicles share lane space, buses frequently exchange to pick up or drop off passengers. This can delay cyclists or require them to pass the transit vehicle. The nature of the vehicle can make it difficult for drivers to see cyclists and crashes that do occur will likely be severe.

Where possible, it is recommended that bus routes and regional bicycle corridors not be located along the same roadway corridors. However, on longer regional routes, alternative parallel routes may not be available to accommodate bicycle traffic. Also, construction of new transit facilities can provide opportunities for developing longer bikeways, such as the proposed design for the Douglas Street corridor.

Where bikeways are provided alongside transit routes, recommendations for improving bicyclists' safety around buses include the following:

- Designate dedicated space for bicyclists through use of bike lanes or cycle tracks (although this introduces new conflicts between bicycles and pedestrians boarding the bus).
- Continue the bicycle facility on the inside of the boarding platform and clearly mark the pedestrian crossing (see Figure 5).
- Provide advance crossbars, a bike box, or a dedicated signal cycle to increase cyclists' visibility at intersections.
- Provide regular track crossings with sufficient angle for cyclists to safely cross (see below).

Some jurisdictions, including Vancouver, BC, have dedicated bus lanes where automobiles are prohibited. Bicyclists can share this space and 'leapfrog' buses as they exchange to load or unload passengers. Alternatively, a bicycle lane can be provided on the left side of the bus lane, to reduce conflicts with the merging bus.

Track Crossings

The E&N Rail corridor presents many rail crossings stretching from Vic West to Langford. Discussions are also underway, exploring the future installation of streetcars and/ or light rail as part of the Rapid Transit strategy. It is imperative that the new designs take into account bicycle movements, as bicyclists are uniquely susceptible to crashes with rail and/or streetcar infrastructure due to the width of the flange gap of streetcar tracks.

Figure 6. Signs alert cyclists that they are approaching tracks and direct them to approach the tracks at a near 90° angle.

Bicyclists attempting to cross tracks at a less than a 60-degree angle are likely to have their wheel caught in the flange gap, resulting in a crash. The severity of such crashes can be significant because the bicyclist is usually thrown from their bicycle. Figure 7 shows an area along the Interstate Avenue MAX light rail line in Portland, OR where the bicycle lane crosses the MAX tracks. There is a separated bicycle and pedestrian crossing, which are both well-marked and signed.

Figure 7. Fencing and pavement markings direct bicyclists to cross streetcar tracks at a 90° angle.

Conclusions

Integration of the active transportation network with transit facilities has a number of benefits, the least of which is extending the reach of the transit system. There are a number of considerations in developing a truly multi-modal system. These include:

- Appropriately planning for expected demands.
- Providing connections between active transportation and transit networks.

- Providing appropriate facilities at transit stations (e.g., bicycle parking, resting amenities for pedestrians).
- Creating convenient access at, to, and from transit stations.
- Maintaining existing policies that remove barriers to cyclists by allowing bicycles to be carried on racks fitted to the front of the bus.
- Accommodating pedestrians and cyclists in the physical design of the station and its environs.

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