1.0 INTRODUCTION

1.1 BACKGROUND

The City of Calgary requires a comprehensive set of guiding principles relating to the planning, design and management of its pathway and bikeway systems. IBI Group was retained to prepare the plan and associated strategies. Within the City of Calgary, a steering committee was established to oversee the development of the plan. The steering committee was composed of representatives of both the Transportation and Parks & Recreation Departments.

1.2 PURPOSE

The purpose of this study is nine-fold:

1. to develop guiding principles for the planning, design, implementation and management of pathways and bikeways;

2. to locate conceptual ties to regional and national pathway systems;

3. to produce a comprehensive and integrated pathway/bikeway plan for the study area (southeast and southwest Calgary);

4. to conduct ground-truthing of approved and proposed regional pathway routing;

5. to develop policy to support City negotiations with developers respecting pathway and bikeway construction;

6. to produce a lifecycle replacement strategy;

7. to identify high priority missing links and order of magnitude costing for same;

8. to illustrate where the guiding principles fit into the city planning process;

9. to provide data architecture for Pathway/Bikeway GIS mapping.

1.3 SCOPE

The study area for this report is the lands south of Memorial Drive, and south of The Trans-Canada Highway west of Shaganappi Trail. Essentially this comprises southeast and southwest Calgary. See Exhibit 1.1 for a map indicating the study area.

The guiding principles, system management process and implementation strategies are all applicable on a city-wide basis.

This plan was developed in the context of current approved city policy and departmental practice. It is generally not intended to supersede approved policy (except where in direct conflict with existing policy), but should be used as a supplement to it. In

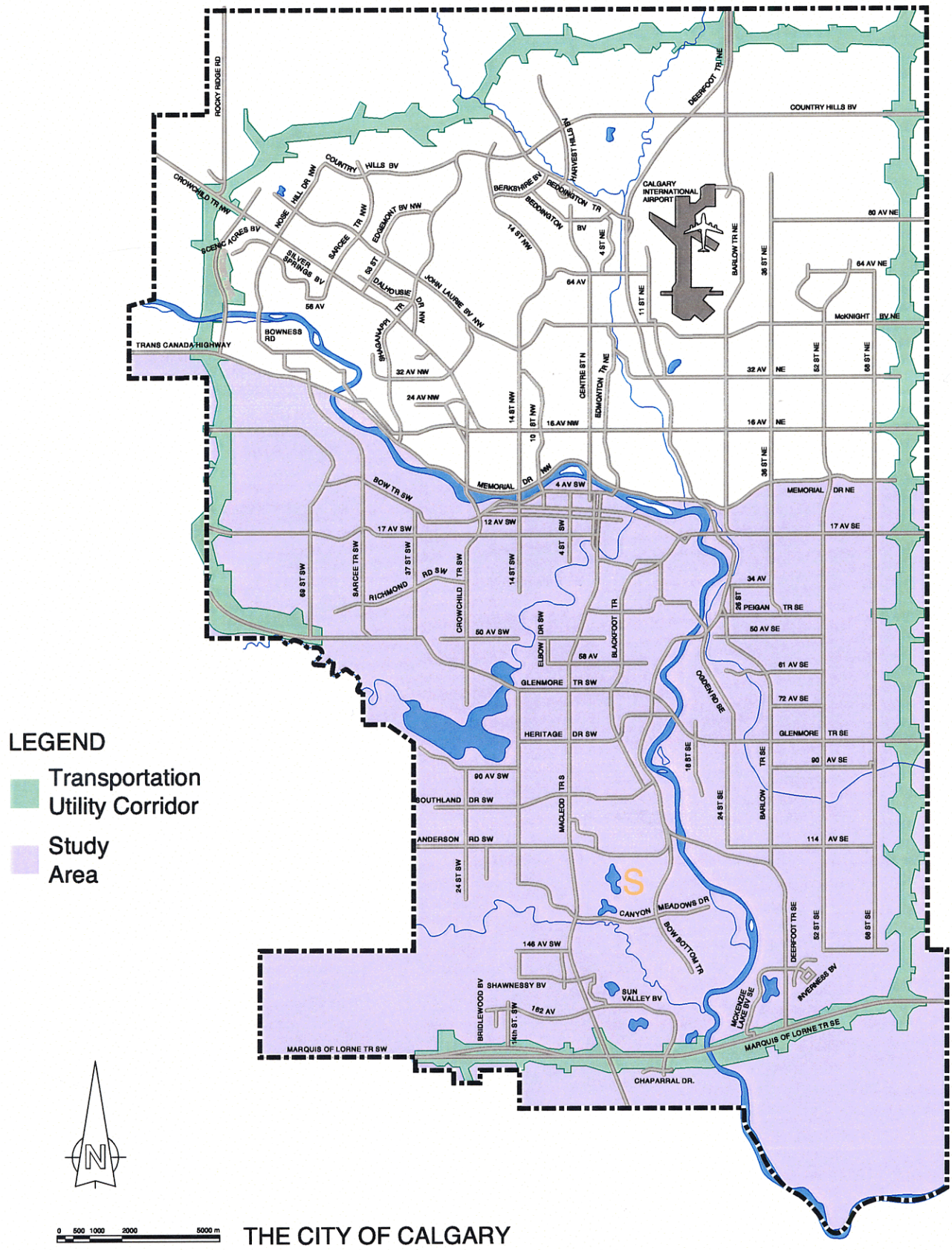


EXHIBIT 1.1: CONTEXT MAP

IBI GROUP

particular, this study should be read together with The Calgary Cycle Plan, the Parks By-law, the Linear Park Policy and the Calgary Plan.

1.4 PUBLIC PARTICIPATION

The study was conducted between August and November, 1999. During that time consultations were held with a group of 40 or so stakeholders, representing a variety of city departments and programs, as well as a cross-section of outside interest groups. Stakeholders consulted include:

- Calgary Parks and Recreation: Outdoor Nature Services, Pathway Maintenance, Parks Planning, By-law Enforcement, Natural Areas Management
- Calgary Transportation: Transit, Transportation Planning, Traffic Operations
- Calgary Engineering and Environmental Services: Streets Division
- Calgary Police Service
- City of Calgary Planning and Building Department
- Mount Royal College, University of Calgary
- Elbow Valley Cycle Club, Calgary Mountain Bike Alliance, bicycle messenger community
- National Skate Patrol, Alien In-Line Skate
- Fellowship of Calgary Skateboarders
- Calgary Alternative Transportation Co-op
- Calgary Roadrunners Club, Calgary Area Outdoor Council
- Architectural Barriers Committee, Calgary Pathways Advisory Committee (CPAC), River Valleys Committee
- Alberta TrailNet, Fish Creek Provincial Park
- Calgary Parks Foundation, Urban Development Institute.

Stakeholders were able to participate in the plan's development through issue identification, open houses and workshops. Ongoing liaison on particular issues was conducted with key stakeholders. In addition to the formal stakeholder consultation, members of the general public were able to contribute to the project through the open houses and a project hotline set up to collect public input through the duration of the study.

Many volunteer hours were contributed to this project, and the stakeholders are to be commended for their energy and dedication. The results of the public consultation are reflected throughout the plan.

1.5 LEGAL FRAMEWORK

The statutory framework for the use of roads and sidewalks is established by the Alberta Highway Traffic Act, R.S.A. 1980, c. H-7, as amended (the "HTA"). This Act is supplemented by municipal by-laws including the Traffic By-law (No. 26M96) which governs traffic regulations for roads and sidewalks in Calgary, and the Parks By-law (By-law 36/76, as amended), which sets out the rules for pathways.

1.6 GLOSSARY OF TERMS

In this report, a number of specialized terms are used. The terms "bicycle" and "pedestrian" are defined within the meaning of the *Highway Traffic Act* (HTA). At present, in-line skaters and skateboarders do not have any particular status under the HTA; they are considered "pedestrians", defined as "a person afoot". Currently in-line skaters and skateboarders are not legally permitted on roadways; they may only operate on sidewalks and pathways. A bicycle is a vehicle under the HTA, and may be operated on a road.

For the purpose of this report, unless stated otherwise, the following terms are used and defined as follows:

- **pedestrian:** includes a person walking or jogging, persons in wheelchairs or with mobility aids, people walking their dogs, people with children's strollers, in-line skaters, and skateboarders.

- **bicycle:** means any cycle propelled by human power on which a person may ride, regardless of the number of wheels it has.

- **cyclist:** a person operating a bicycle.

For further clarity, in this Plan, the terms "cycle", "cycling" and "cyclist" do not in any circumstances refer to a moped or motorcycle, or the use thereof.

This report focuses on the Regional Pathway System and the Bikeway System in Calgary. The following definitions are employed in this report:

The **Regional Pathway System** is a City-wide linear network that facilitates non-motorized movement for recreation and transportation purposes. The regional pathway is hard-surfaced, typically asphalt and located off-street. It is a multi-use facility and no one user or type of user is to be given elevated status.

Regional pathways can be broadly characterized into two categories:

Open Space Pathway: a pathway which runs through parks, open space, environmental reserves or along river banks;

Boulevard Pathway: an off-street pathway located in a road right-of-way; generally located where a sidewalk would be expected, i.e. in the boulevard, separated from the roadway by a grassy area. See Exhibit 1.2 for a cross-section diagram of a boulevard pathway.

In addition to the Regional Pathways, there are other facilities which are part of the circulation and recreational systems. These include:

Local Pathway: a pathway that provides secondary routes within communities, linking residential areas to facilities such as neighbourhood parks, schools and other local community destinations. Local pathways may also serve as linkages to the Regional Pathway system.

Trail: a constructed linear path with a granular surface generally located in natural areas. As a management tool they identify intended public routing and can formalize desire lines to minimize impact on the natural environment.

Sidewalk: concrete construction, pedestrian facility generally located in the road right-of-way.

Walkway: a path located between residential units to provide a connection through neighbourhood blocks; may be used by non-motorized users.

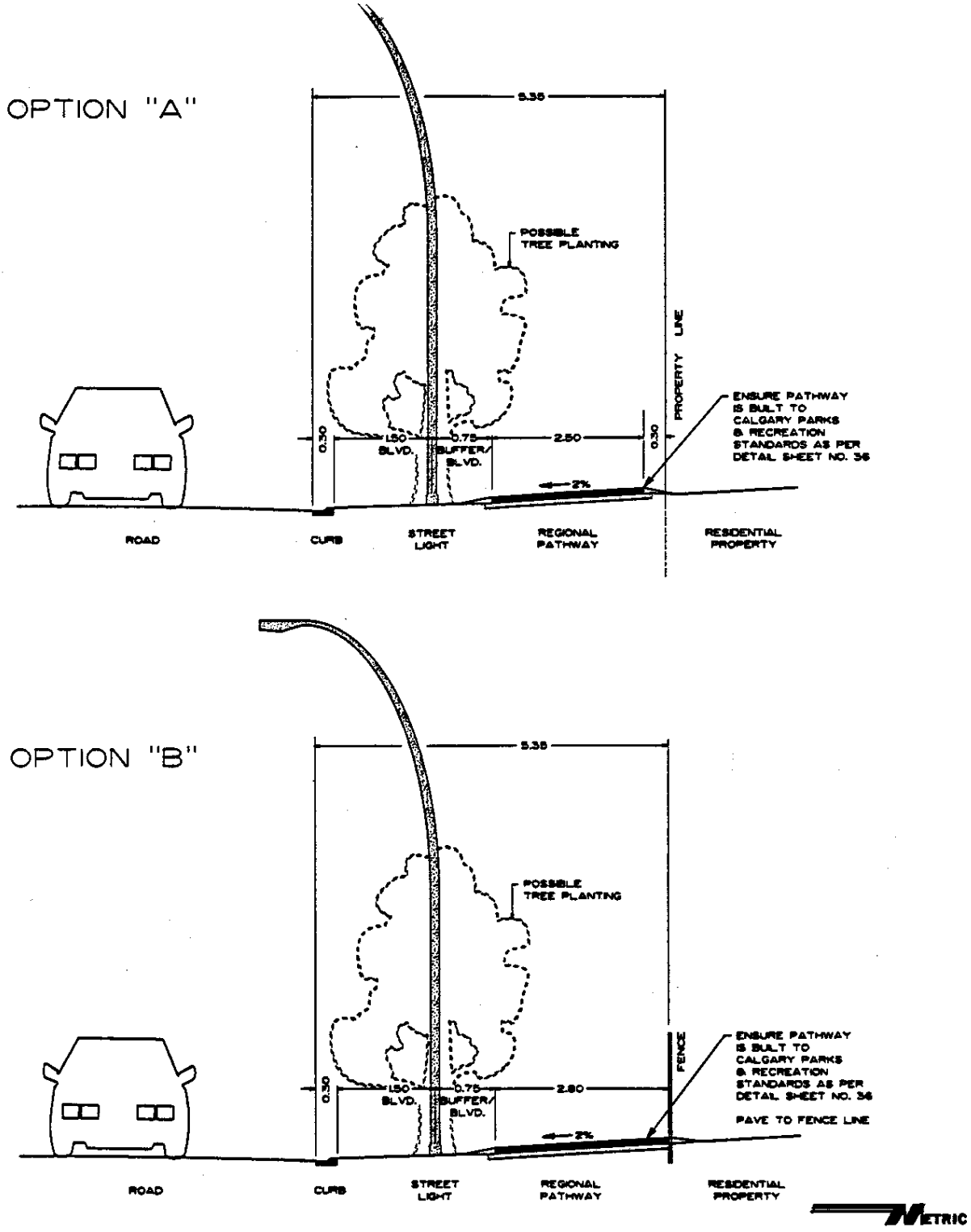
The Bikeway System: all roads in the City of Calgary that are legally open to bicycle travel.

A "bikeway" is defined by the Transportation Association of Canada (TAC) in *Bikeway Traffic Control Guidelines for Canada, December 1998*, and by the American Association of State Highway and Transportation Officials (AASHTO), as:

> Any road or path which is specifically designated as being open to bicycle travel, regardless of whether or not such facilities are designated for the exclusive use of bicycles, or are to be shared with other transportation modes.

While the TAC definition of "bikeway" includes paths, in Calgary, bikeways and pathways are different things. A "bikeway" in the Calgary context is any on-street area open to bicycle travel, while a pathway is off-street. Both bikeways and pathways may be open to cyclists as well as other users.

All roads in Calgary, with the exception of Deerfoot Trail south of 64 Avenue N. and roads specifically banning bicycles such as Stephen Avenue Mall, are bikeways. The term "bikeway" can be further broken down into the following types of facility:



Source: Calgary Parks & Recreation Development Guidelines and Standard Specifications

BOULEVARD PATHWAY CROSS-SECTION EXHIBIT 1.2

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- **signed bicycle route:** a street identified as a cycling route by signs and a map – see Exhibit 1.3;

- **wide curb lane:** a road where the curb travel lane is at least 4.3 m (excluding parking) such that motorists and cyclists can safely share the lane. A wide curb lane may be identified by a stencil, signage or other markings – see Exhibit 1.4;

- **marked bicycle lane:** a dedicated and marked on-street traffic lane for the exclusive use of cyclists (may be referred to as a "bike lane") - see Exhibit 1.5;

- **bike corridor:** a route identified and designed to give preference to bicycle traffic through the use of traffic calming devices, favourable stop sign orientation, partial road closures which permit through bicycle traffic, and other techniques - see Exhibit 1.6.

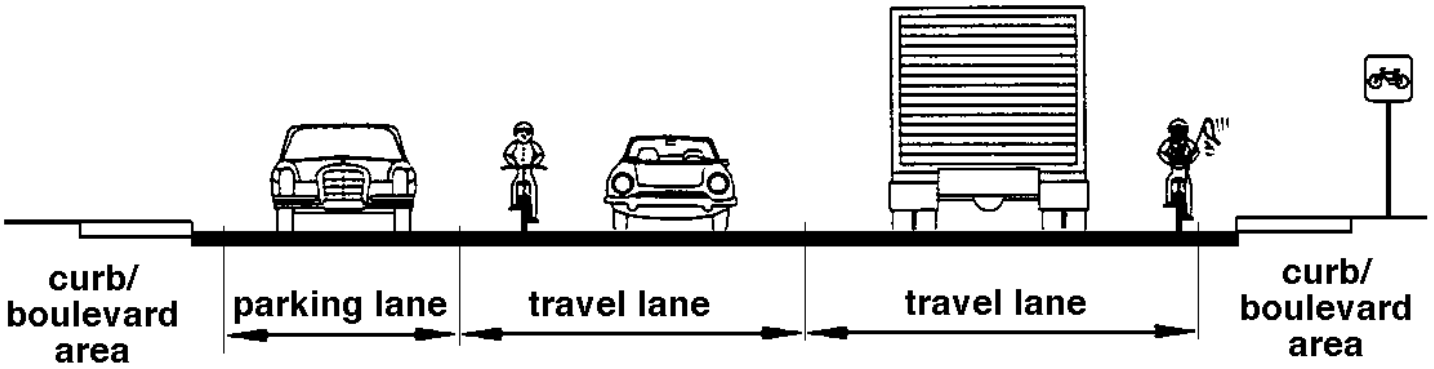
- **shared roadway:** any roadway upon which a bicycle lane is not designated and which may be legally used by bicycles regardless of whether such a facility is specifically designated as a bikeway.

Roadway classifications referred to in this report include local residential, collector, major, expressway and freeway. These terms are used as defined in *The City of Calgary Engineering & Environmental Services Department - Design Guideline for Subdivisions.*

1.7 DEPARTMENTAL NAMES

At the time this study was being prepared, an organizational review of the City of Calgary administration was underway. As a result, departments have been re-structured and re-named. The new structure has not yet been finalized. This study was commissioned by what were previously known as the "Transportation" and "Parks & Recreation" departments. As a result of the organization review, "Transportation" is now part of Land Use and Mobility, and falls under several sub-groups including Transportation Infrastructure, Public Transportation and Planning Policy. The former "Parks & Recreation" is now part of Community Vitality and Protection under various sub-groups including Recreation Programs & Facilities, and Park Development and Operations.

For simplicity, the administrative groups which commissioned this study will be referred to in the body of the report as the "Transportation" and "Parks" departments or divisions. These departmental names may need to be updated once the organizational review is complete.



Source: Adapted from TAC, Geometric Design Guide for Canadian Roads

SIGNED BICYCLE ROUTE - CROSS SECTION

EXHIBIT 1.3

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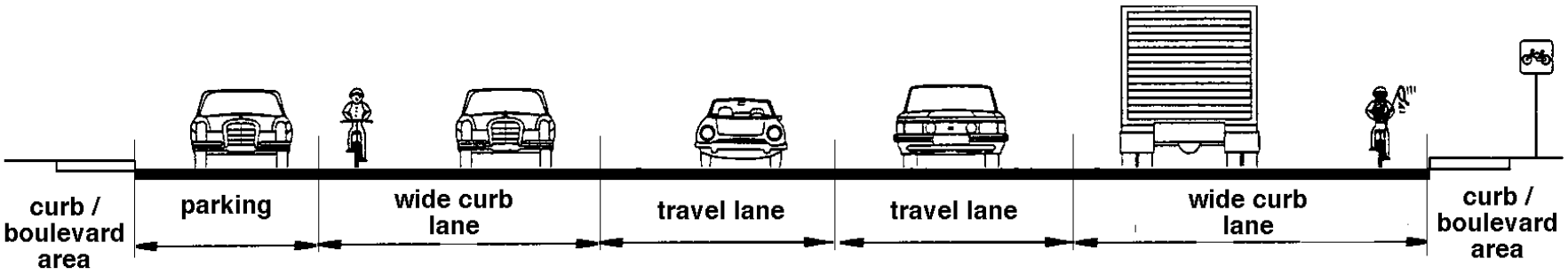

Source: Adapted from TAC, Geometric Design Guide for Canadian Roads

WIDE CURB LANE - CROSS SECTION

EXHIBIT 1.4

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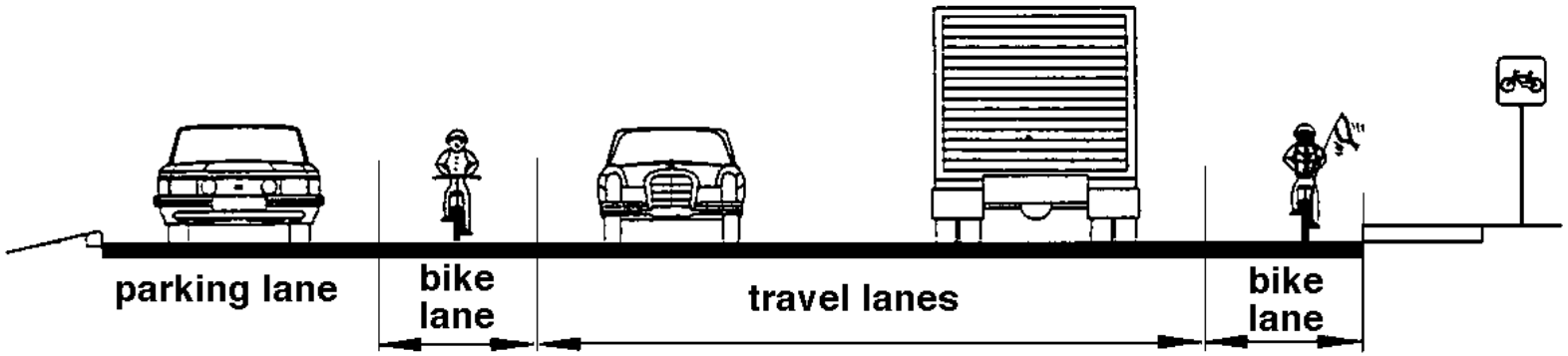

Source: Adapted from TAC, Geometric Design Guide for Canadian Roads

MARKED BICYCLE LANE - CROSS SECTION

EXHIBIT 1.5

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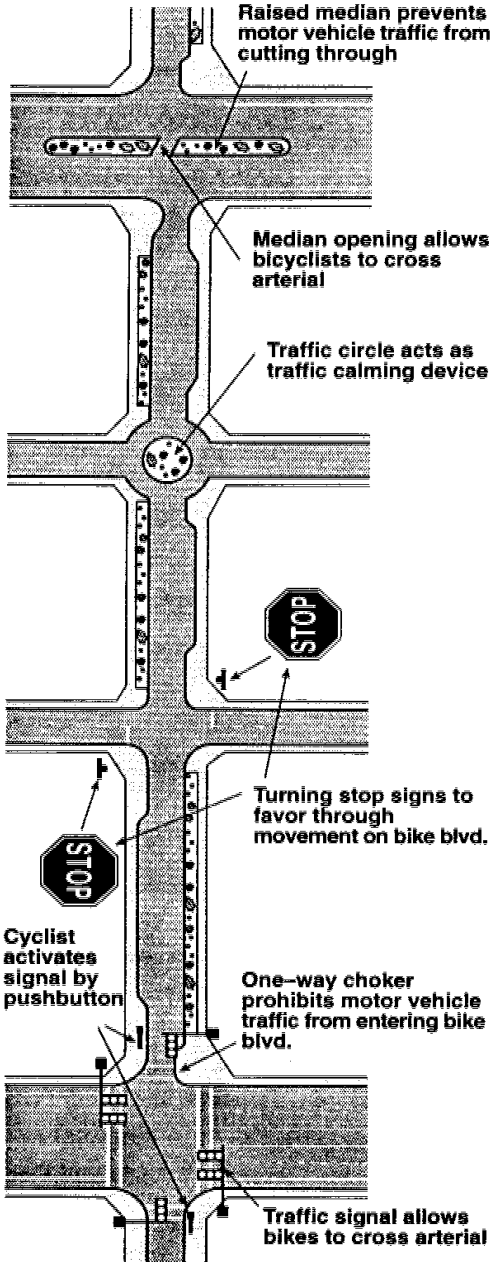

Source: Master Bicycle Plan, Portland, Oregon - Figure A1.18

BIKE CORRIDOR - CONCEPT

EXHIBIT 1.6

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2.0 GUIDING PRINCIPLES

2.1 INTRODUCTION

A key deliverable of the study is a set of guiding principles that will ensure that the Pathways and Bikeways are planned, developed, maintained and managed as a seamlessly integrated network for transportation and recreation. In this section, a series of principles for the design and development of the network are set out.

The principles were developed over the course of the study. The process entailed a literature review, consultations with other cities, review of comparables in other locations, and the public participation process. The initial results of the research were summarized in the Situational Analysis report presented to the City steering committee in September, 1999. At that time the proposed policy direction for the plan was determined and the principles presented.

2.2 VISION STATEMENT

The City of Calgary is committed to being a healthy place to work and live. It recognizes the importance of walking, running, cycling, wheelchair use, skateboarding, in-line skating and all other non-motorized modes of movement as positive contributors to the urban fabric. These non-polluting modes have inherent value as viable and efficient means of both transportation and recreation. They facilitate healthy and active living, and contribute to overall community vitality.

Calgary embraces the vision of a city of neighbourhoods which are interconnected by a friendly street and pathway network. The network is available to all Calgarians, regardless of age, gender, ability, income or culture. The Pathway and Bikeway Network offers a convenient alternative to the automobile, and provides year-round ability to enjoy linear recreational opportunities.

2.3 TRANSPORTATION AND RECREATION

The pathway and bikeway systems, operating together as a network, are envisioned as an urban system that can serve both transportation and recreation objectives.

This study is premised on the following concepts:

- the primary use of pathways is multi-use recreation
- the primary use of bikeways is bicycle travel
- many trips on pathways and bikeways are made for a combination of fitness, recreation and transportation purposes
- recreation and non-motorized movement have positive benefits for the health and wellness of participants

- recreation and non-motorized movement have positive benefits for the urban environment.

The non-motorized modes of travel, such as walking, jogging, skating and cycling, have inherent recreational and fitness components. Pathway users should be able to access the pathways to travel for whatever purpose they have in mind, whether purely for recreation, transportation, or both combined. When pathways are used for both recreation and transportation it is important is to ensure that the pathways are used **appropriately**, such that all users operate compatibly and with respect for each other.

Many recreational and sport cyclists use the roads not only to travel to a destination, but simply as a way to explore the city and get some exercise. It cannot be said that the bikeways are purely a transportation facility; any bike ride has an element of enjoyment, recreation or fitness to it. Indeed, choosing routes that have some esthetic qualities, where possible, is part and parcel of creating a bikeway network that serves recreational purposes. Again, it is important to ensure that bikeways are used appropriately.

Appropriate pathway use is determined by a number of factors, including:

- multi-use recreation
- volume of users
- limited speed
- pathway role in linking parks and natural areas.

Appropriate bikeway use is determined by:

- Highway Traffic Act provisions governing road users
- bikeway role in linking the main urban facilities.

The Pathway and Bikeway Plan seeks to encourage linear recreation and transportation activities as a means to incorporate exercise into daily life: this is the "active living" philosophy.

GUIDING PRINCIPLE

The pathways and the bikeways should be designed, operated and maintained as a system for moving people via non-motorized modes, whether the purpose of the trip is transportation, recreation, fitness or any combination thereof.

Co-ordinated planning of pathways and bikeways is required to accommodate this principle.

2.4 USER GROUPS

2.4.1 Pathway Users

The regional pathways are for multi-use. Users include:

- pedestrians, including walkers, joggers, runners and dog-walkers;
- people of all ages, from children to the elderly;
- persons with disabilities, e.g. the blind, wheelchair users;
- cyclists;
- skateboarders;
- in-line skaters.

While current design standards are intended to accommodate these users, many older pathway sections are missing elements critical to accessibility, such as curb cuts, a smooth surface, and signage. These older sections need to be brought up to the current standard.

GUIDING PRINCIPLE

Regional pathways should be designed and maintained, and retrofitted where necessary, to accommodate multi-use.

2.4.2 Roadway Users

Presently, the only legally permitted user groups for on-street bikeways are cyclists, and the motorists who share the roadways. In practice, in-line skaters and skateboarders are becoming more prevalent on roadways. The continuous and smooth asphalt surface is more attractive to skaters than the rougher concrete of sidewalks. Their use of the road can reduce conflicts with pedestrians using the sidewalk.

In other jurisdictions, in-line skaters are tolerated or even legally permitted in bike lanes or general roadways. To legally permit in-line skaters or skateboarders to operate on the roadway or any portion of it would require amendment of the provincial Highway Traffic Act. The Transportation Association of Canada (TAC) suggests that if skaters are permitted on roads, a by-law should be passed which would prohibit “reckless” or “endangering” activity by skaters.

GUIDING PRINCIPLES

Calgary should pursue the possibility of permitting in-line skaters and/or skateboarders to operate on low volume, low speed streets, and in bike lanes (should these be constructed).

Should in-line skaters and/or skateboarders be permitted on certain roads, an accompanying by-law should be passed prohibiting reckless or dangerous behaviour.

2.4.3 Sidewalk Users

Cyclists are not permitted to ride on sidewalks, with the exception of children and newspaper carriers. No change to this regulation is recommended, with certain exceptions which are presented to clarify the existing situation and to maintain continuity of the network.

At present, in-line skaters and skateboarders are permitted to operate on sidewalks outside of the "Central Traffic Zone" (essentially the downtown area). The ban on sidewalk skating in the downtown was enacted in 1998. This ban effectively prevents the use of in-line skates or skateboards for downtown transportation, thereby eliminating these pollution-free modes from operating in the most intensive employment district in the city. With proper education, enforcement and by-law provisions governing safety, skaters of all types should be able to safely share the sidewalk with other pedestrians in the downtown as well as the outer areas.

GUIDING PRINCIPLES

Where a sidewalk segment is designated a pathway, it should be signed as a pathway, and cyclists should be permitted to ride on it.

On roadway bridges, cyclists should be permitted to use the sidewalks where the roadway does not accommodate bikes.

In-line skaters and skateboarders should be permitted to operate on the sidewalks in the Central Traffic Zone, subject to by-law provisions regarding:

- *maximum speed,*
- *prohibition of reckless or dangerous behaviour,*
- *a requirement to share the sidewalk,*
- *a requirement to yield to slower moving pedestrians.*

2.5 NETWORK DEVELOPMENT: PRINCIPLES

2.5.1 The network

The pathways and bikeways are two components of a city-wide network. This plan seeks to better integrate the two, while ensuring appropriate use for each.

The pathways have grown in popularity. There has been a corresponding growth in the number of complaints regarding user conflicts. Cyclists and in-line skaters are frequently cited as a cause of conflict because of the speed differential between them and pedestrians. One reason for creating bikeways is to provide cyclists with an alternative to the pathways. If higher speed cyclists can feel comfortable on the roads, it will take pressure off the multi-use pathway system and reduce some user conflicts. As well, there may be an opportunity for in-line skaters to make greater use of roadways which could also reduce user conflicts on the pathways.

The overall network objective is to ensure that the pathways and bikeways are complementary to each other, providing seamless service to a variety of users, and a range of route options that are suitable for the diversity of users.

2.5.2 Relationship between user groups and the dual system network

The multi-use regional pathways serve a variety of users, including cyclists, who constitute a significant share of pathway users. The bikeways are not for multi-use; they serve only cyclists (although they may eventually accommodate in-line skaters). Hence cyclists are the common link for the two types of facility.

Regional pathways should be continuous, and avoid using streets for linkages. The multi-user recreational nature of the pathways necessitates this principle.

In order to provide continuity in the bikeway system, continuous road routes are preferred. However pathways or walkways (see Exhibit 2.1) may be used as links between bikeway segments to make a route more continuous and/or direct. This is particularly true in communities with curvilinear and discontinuous road patterns.

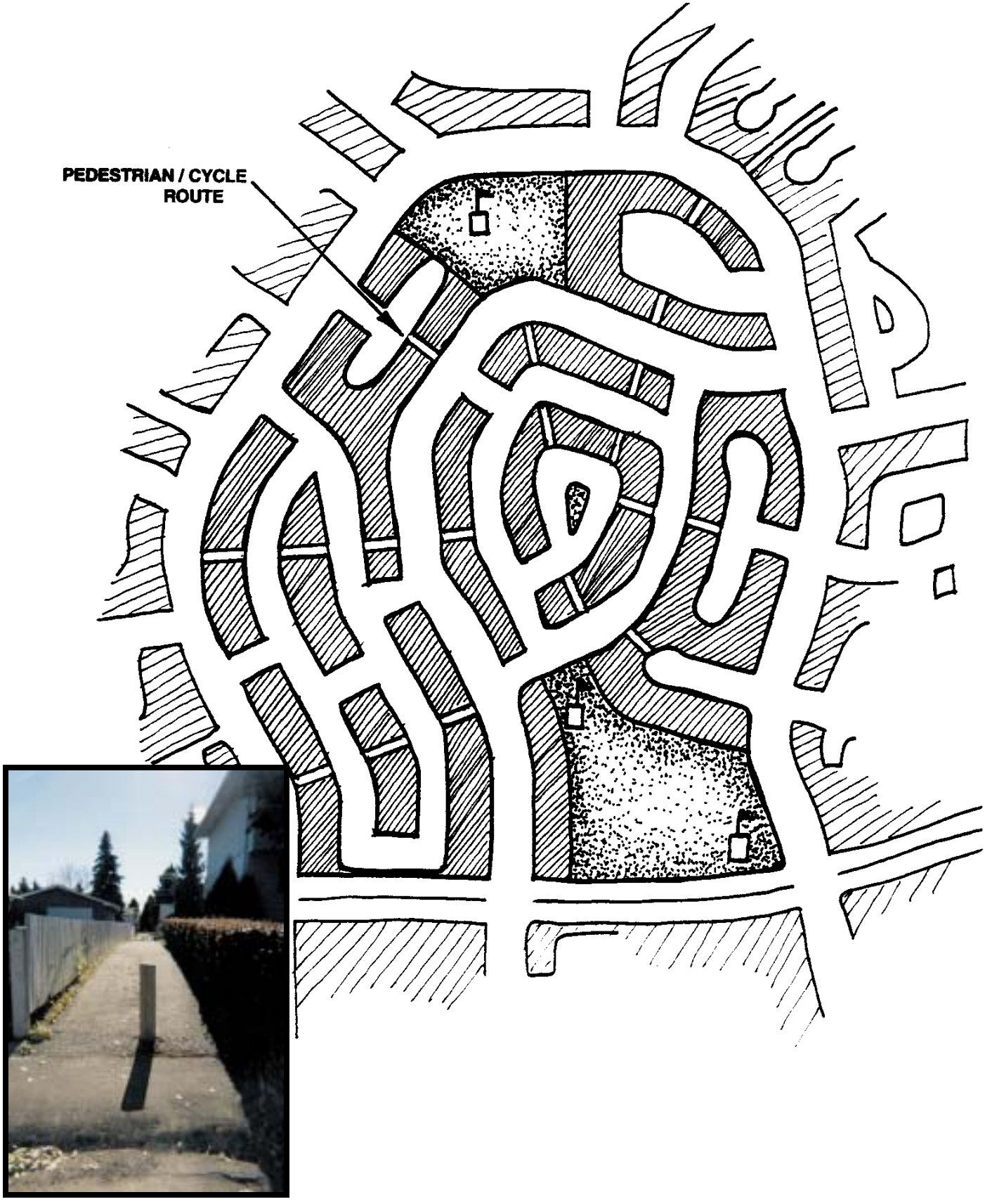
GUIDING PRINCIPLES

The pathways should be continuous to the greatest extent possible to accommodate recreation, and therefore should avoid on-street linkages.

Bikeways should form a continuous on-street network wherever possible.

For developments with indirect and discontinuous road patterns:

- *continuous and direct routes should be provided by a combination of bikeways, pathways and walkways;*



CYCLE/PEDESTRIAN CONNECTOR **EXHIBIT 2.1**

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- *bikeway, pathway and walkway linkages should be designed, lit and maintained to support safe operation.*

2.5.3 Planning for cyclists on the road network

Beyond the designated bikeways, cyclists are generally permitted to ride on every Calgary road with the main exception of Deerfoot Trail. The road network is a very extensive system, providing access to nearly every origin and destination in the city, and cyclists should be encouraged to use it.

The most functional and appropriate roads for cycling tend to be roads classified as major or lower (collector, local). However many Calgary collector and major roads are not presently hospitable to cyclists, although there are skilled and high-speed cyclists who are comfortable riding in almost any urban conditions. In order to ensure that cyclists have suitable access to the road network, the road network should be designed to accommodate them. In general, bikeways should provide alternate routes to higher speed, higher volume roads.

GUIDING PRINCIPLES

Major and primary collector roads should be designed for both motor vehicles and bicycles.

2.5.4 Network planning

The pathways and bikeways should be planned to form a complete network, without gaps, which serves both transportation and recreation purposes of non-motorized modes. Translating these overarching objectives into reality means creating routes that are:

- continuous
- reasonably direct
- functional, serving a variety of destinations
- part of a network.

In order for the pathways and bikeways to be fully and seamlessly integrated, the two types of facilities must be planned, routed, constructed and maintained as a network in a coordinated manner between the Transportation and Parks Departments.

Some general principles which should apply to designing and integrating the pathways and bikeways are as follows:

- priority for cycle/pedestrian facilities should be based on user information and needs assessments;
- pathways should be routed through parks and open space where possible;

- a regional pathway should be centrally located within a community and follow along a natural feature where possible;
- designated bikeway routes should generally be spaced at regular intervals of 1 to 1.5 km;
- convenient and safe pathway and bikeway access should be integrated with transit facilities;
- pathways should provide access points to streets at regular intervals.

2.6 PATHWAY ROUTE SELECTION AND DESIGN CRITERIA

2.6.1 General

Pathway routes are selected primarily to incorporate the pathways into the open space system. Pathways should connect recreational facilities, and be located within community parks, linear parks and natural areas. However within river valleys and natural areas, the protection of the resource will take precedence. Opportunities to use existing rail, utility rights-of-way and other corridors as part of the regional pathway system should be considered. As well, opportunities to connect the regional pathway system with pathway and trail initiatives of other agencies should be pursued (e.g. Alberta TrailNet, Rails to Trails programs).

Pathway routes are designed to provide visual amenity, variety and connectivity between communities as part of the city-wide open space system.

In general, pathways should be planned to provide two routes bisecting a community, and to cross the surrounding barriers to all neighbouring communities.

Where possible, pathways should be built parallel to new LRT routes.

A comprehensive list of pathway route selection criteria is set out in Exhibit 2.2.

2.6.2 High use areas

Where high-use is experienced or anticipated, pathway routing should accommodate a wider than standard pathway (e.g. 4.0 m or greater), or twinned pathways.

Twinning may be employed to alleviate congestion and improve the pathway experience for all. However, where possible, the separation of higher-speed cyclists from pathway traffic should primarily be accomplished by creating a parallel bikeway route.

Sufficient separation between the twinned portions should be provided to discourage crossover traffic between the two. The divergence of the twinned areas should be marked both at the beginning and the end of the twinned section, as well as along it. Marking should include both signs and stencils on the pathway indicating the permitted or

PATHWAYS: PROPOSED ROUTES - EVALUATION CRITERIA

I. Functional Criteria

- recreational potential
- connects to other pathways (regional, local)
- connects parks and natural areas to each other
- serves destinations - connects residential areas to:
    - schools/ college / university
    - places of employment (downtown, suburban, industrial)
    - shopping
    - cultural/arts facilities, etc.
    - other residential areas
- provides a pathway/bikeway function, when required

II. Location Criteria

- prefer locating on public property: parks, utility r.o.w.s, etc.
- personal security / informal surveillance and safety
- views, esthetic values
- vegetation – location of major trees
- topography:
    - desirable maximum longitudinal grade of 5%
    - transverse grades
    - water crossings
    - slope stability
    - drainage
- sufficient space to provide 4.5 to 5.5 m pathway corridor or twinned pathways
- can link to streets at regular intervals with safe street crossings

Pathway route should:

- be located adjacent to, but not through, environmentally sensitive areas/ important habitat
- avoid steep terrain
- avoid location in alleys, driveways, parking lots
- avoid location in boulevard of a major road with frequent intersections and driveways
- avoid creating a need for a pedestrian/cycle overpass or underpass
- avoid mid-block crossings

PATHWAY ROUTE SELECTION CRITERIA EXHIBIT 2.2

IBI GROUP

prohibited users. Note: winter snow clearing will result in a single pathway for multi-use due to reduced conflict during the lower use season.

2.6.3 Boulevard pathways

A boulevard pathway is an-off street pathway located in a road right-of-way, and is typically located where a sidewalk would be expected.

The boulevard pathway can create a difficult or confusing situation by placing cyclists and other users in the path of motorists when it crosses roadways, alleys and driveways, and generally creating bicycle traffic which goes against the normal flow of motor vehicle traffic.

However there are cases where a boulevard pathway is the only feasible alternative, such as roads with very high truck traffic, or high-volume roads with constrained widths which cannot safely accommodate cyclists on the roadway. With appropriate design, the boulevard pathway can be an acceptable solution. Where a boulevard pathway is proposed, the design criteria set out below should be employed.

GUIDING PRINCIPLE

Where a pathway is to be located adjacent to a road in a boulevard, the following route selection and design criteria should apply:

- *the pathway is generally separated from all motor vehicle traffic;*
- *there is a commitment to provide pathway continuity throughout the corridor;*
- *the pathway can be terminated at each end onto streets with good cycle/pedestrian facilities, or another well-designed pathway;*
- *there is adequate access to local cross-streets and other facilities along the route;*
- *avoid routing pathways along boulevards in front of residential development;*
- *avoid routing pathways on boulevards in non-residential areas where spacing of driveways, cross-streets and alleys is less than 200 m;*
- *consider the location of underground and above-ground utilities;*
- *consider plans for future road widening or interchanges;*
- *any needed grade separation structures should not add substantial out-of-direction travel distance;*
- *a minimum 2.25 m width should separate the pathway from the edge of the roadway;*

- *where a boulevard pathway intersects a roadway, signage or roadway design should alert motorists to the potential crossing by cyclists and pedestrians – e.g.,*
    - *coloured crosswalk or bike stencil in the pathway crosswalk area;*
    - *signage indicating pedestrian/cyclist crossing.*

2.6.4 Pedestrian/Cycle Overpasses

There are many existing pedestrian/cycle overpass structures in Calgary, and a long list of desired future projects of this type. These overpasses entail a major capital expenditure and can remain in the planning stage (i.e. unfunded) for a long time.

From a policy perspective, it is preferable to design roadway intersections from the outset (or as part of a re-design/retrofit) so that pedestrians and cyclists can safely and comfortably use the level intersection. This avoids the necessity of constructing a parallel, separate facility for pedestrians and cyclists. For example, where a major road is divided by a raised median, at intersections the median can be designed with curb cuts. The median thus provides a refuge, allowing pedestrians and cyclists to make the crossing in two stages - one for each break in opposing direction of traffic.

However, pedestrian/cycle overpasses may be necessary and/or desirable when it is unlikely that a retrofit project will occur in the foreseeable future, or where there is no road intersection planned but a pedestrian/cycle route is needed. Where a pedestrian/cycle overpass is planned, a set of design and location criteria are recommended for the overpass and its approaches.

GUIDING PRINCIPLES

Intersections should be designed so that pedestrians and cyclists may safely use them, to avoid the necessity of constructing a separate facility.

Pedestrian/cycle overpasses should be considered with and included in the budget of all major capital projects such as interchanges and LRT extensions.

Where a pedestrian/cycle overpass is necessary, the following design guidelines should be employed:

- *Approaches to the overpass on both sides should, where possible, connect to both the regional pathway system and a street which can connect to the bikeway network.*
- *Hairpin turn designs should be avoided.*
- *The overpass and its approaches should be designed using Crime Prevention Through Environmental Design (CPTED) principles. Specifically:*

- *the area should be well-lit,*
- *vegetation should be kept away from the immediate approach to ensure good visibility and avoid the creation of hiding places, and*
- *multiple exit routes should be available at either end of the bridge – e.g., travel should not be restricted to a single fenced corridor with only one escape route.*

- *Pedestrian/cycle overpasses should not terminate in an alley, unless the alley is well-lit, and signage is provided to direct overpass users to the closest streets, sidewalks and pathways.*

2.7 PATHWAY DESIGN GUIDELINES

Once the decision to build a regional pathway segment has been made, the design criteria set out in the current edition of Calgary Parks and Recreation's *Development Guidelines and Standard Specifications for Landscape Construction* should be applied. In addition, the following guidelines should be applied.

Surface

A smooth asphalt surface is the preferred material for pathways. While concrete is more durable, asphalt is less expensive and provides a smoother ride for cyclists, in-line skaters and persons in a wheelchair or motorized scooter. Motorists and pathway users often mistake concrete boulevard pathways for sidewalks. The use of asphalt for boulevard pathways provides an important visual cue and enables all users to clearly make the distinction between a multi use pathway and a sidewalk.

Markings

A yellow centre line is imperative for all regional pathways. The centre line is an important visual cue to distinguish a regional pathway from a sidewalk. It indicates the requirement to keep to the right and yield half the pathway to oncoming users. The centre line should be repainted as often as necessary to remain visible. This is especially important in high-use areas and areas of constrained width, such as cycle/pedestrian bridges.

Intersections

A series of guidelines are necessary for intersection design. These include the following:

- Pathway intersections should be marked with a sign from all directions, such as a stop, yield or warning sign. Visual clearance from all directions must be sufficient to allow pathway users to see each other.

- Pathways should intersect streets at a right angle. A curb cut making a smooth transition between the street and pathway is imperative.

- A pathway/street intersection should be marked on the pathway by a warning sign or bollard. Bollards must be positioned to allow a wheelchair or bike with trailer to easily pass on either side, with a minimum 1.0 m space, 1.5 m preferred.

- Either one or three bollards should be used, never two. The centre bollard must be removable. Using only two bollards will channel users into the centre of the pathway, setting up potential head-on collisions.

- Where a pathway crosses a roadway, whether at an intersection or a mid-block crossing, the roadway should be marked with signs warning of a pedestrian/cycle crossing. It may be desirable to use pavement markings, such as striping or coloured asphalt, to delineate the pathway route. The pathway should also be marked with a stop or yield control sign consistent with Transportation Association of Canada (TAC) Guidelines.

- A "right of way" rule should be developed for pathway/roadway interfaces. It is recommended that a pathway be treated the same as a driveway, such that persons exiting the pathway must look in all directions before entering the roadway. A full stop is not necessarily required. Where the road is a collector standard or higher or sightlines prevent an adequate view of approaching vehicles, pathway users should be required to make a full stop before entering the roadway, and such requirement should be marked with a sign. Cyclists should be permitted to ride across the roadway at pathway/roadway interfaces so long as they yield the right-of-way to pedestrians on the sidewalk and vehicles on the roadway.

- A standard street identification sign (e.g. "Signal Hill Drive") should be located wherever a pathway terminates at a street, as a guide for users.

Accessibility

The Barrier-Free Design Guide produced by the Alberta Safety Codes Council should be referred to for all pathway construction and reconstruction, as well as maintenance. Important considerations include:

- use ramps instead of or in addition to stairs;

- provide a smooth surface as much as possible – e.g. avoid the use of textured pavement or interlocking bricks;

- provide a smooth transition to roadways and sidewalks, through the use of curb cuts or wheelchair ramps;

- desirable maximum slope of 5%;

- changes in direction or grade, intersections and other changing features should be delineated with cane-detectable and tactile cues for the visually impaired.

GUIDING PRINCIPLES

The standards for pathways should be revised to incorporate the recommended design guidelines set out in section 2.7 of this report.

A right-of-way rule should be developed for pathway/roadway interfaces, consistent with the discussion in section 2.7 of this report.

2.8 BIKEWAY ROUTE SELECTION PROCESS AND CRITERIA

2.8.1 Introduction

The Calgary Cycle Plan sets out a proposed "Level of Service" model for selecting streets suitable for cycling (at p. 30). The model was tested by the Transportation Department for a number of proposed cycling routes. The model did not produce consistent results and as a result was found not to be a significant indicator of road suitability for bikeway selection. Consequently the following route selection process and design criteria were developed through this study.

2.8.2 Purpose of designated bikeways

As stated earlier, essentially every road in Calgary is open to cyclists except Deerfoot Trail; however many Calgary roads present an intimidating or hostile environment for cyclists. The purpose of designating particular roads as bikeways is four-fold:

- to provide a "wayfinding" tool for cyclists, to help them navigate the city;
- to identify streets that are lower volume or lower speed options;
- to identify or create routes with sufficient road width to make cycling reasonably comfortable;
- to encourage cyclists to use the street system for travel.

2.8.3 Cyclist skill level

A variety of streets may be suitable for cycling, depending on the ability of the rider. It should be borne in mind that the skill level among cyclists can vary greatly; a confident and skilled cyclist may be comfortable riding on a Calgary "expressway" class road, such as Shaganappi Trail. However, the more typical cyclist would prefer to be on a lower volume or lower speed road.

Ideally, the bikeway network should address the needs of cyclists of all skill levels. The most skilled cyclists do not really need identified routes; they will find their own

preferred routes. The designated routes identified through this study have been chosen as suitable for cyclists who fit into one or more of the following groups:

- a regular or occasional commuter;
- a regular or occasional recreational rider with an understanding of the rules of the road.

It should be made clear that a basic skill set is required of any urban cyclist. Anyone riding in the city on the road should be aware of the rules of the road, and have the ability to signal, brake and generally manoeuver in traffic. (The issue of cycling education is dealt with later in this report.) An urban cyclist should use his or her own best judgement as to whether he or she can safely and comfortably ride on a particular route.

2.8.4 Bikeway route selection process

The task of evaluating roads as potential bikeway routes is a complex process. Many variables are considered, and may carry different weights depending on the context. In general, selecting bikeway routes can be broken down into a five-step process as follows:

1. Identify a need or opportunity for a route in the network.
2. Identify one or more candidate routes.
3. Evaluate the candidate routes against the route selection criteria.
4. Select the route that best meets the desirable criteria.
5. Select the design treatment that best suits the route selected.

Route selection should involve community and public consultation at each stage of the process.

Identifying a need or opportunity for a route can occur through a number of processes. These include:

- a comprehensive network review;
- the community planning process – may apply to both new communities and redevelopment of existing communities;
- a local or community traffic study;
- opportunity: road or bridge construction or re-construction;
- requests or complaints;
- analysis of traffic counts or accident statistics.

The case for "opportunistic" bike route planning should not be overlooked. In the course of regular municipal maintenance roads are re-striped, re-surfaced, widened or upgraded. These occasions should provide an opportunity to make cyclist-friendly improvements.

Evaluating routes for overall suitability is not a scientific process but rather one that involves judgement and weighing the pros and cons of a particular location. This entails a consideration of many competing factors. For example, a route through an industrial area may not be considered a "safe" location for a sole female cyclist at night; however, that does not mean industrial areas should not be served by bikeways.

The competing factors should be carefully weighed against each other, in consultation with both city staff and the concerned public. By using a participatory route identification and selection process, optimal route selections will emerge. (The role of public consultation in route selection is discussed in more detail later in this report.)

2.8.5 Route selection criteria

A variety of bikeway route selection criteria were developed through the study. The criteria reflect the diversity of functions that the bikeways should serve. Hence bikeway routes should connect to a variety of land uses including residential, commercial, industrial, institutional and open space.

Bikeway routes should afford operational comfort and safety for cyclists. Bikeways should be operational 24 hours a day, all seasons. Personal safety is a consideration, especially for women and other potentially vulnerable groups. In communities where pathways do not or cannot exist, a bikeway should be provided.

A comprehensive list of bikeway route selection criteria is set out in Exhibit 2.3.

The criteria were used in this study to evaluate proposed routes in the study area, as well as alternative routes that were suggested through the public consultation process and through site visits.

GUIDING PRINCIPLE

The City of Calgary Transportation department, through the Pathway/Bikeway coordination team (as described in section 8 of the report), should employ the route selection process and criteria set out in sections 2.8.4 and 2.8.5 of this report.

2.9 BIKEWAYS: DESIGN OPTIONS AND CRITERIA

2.9.1 Introduction

Once routes have been selected as candidates for designated bikeways, a range of design treatments are available. The particular design chosen will depend on the nature of the existing road, as well as the future desired environment for a chosen road.

ON-STREET BICYCLE ROUTES: SELECTION CRITERIA

I. Functional Criteria

- continuous
- direct
- serves destinations - connects residential areas to:
  - schools/ college / university
  - places of employment (downtown, suburban, industrial)
  - shopping
  - cultural/arts facilities, etc.
  - other residential areas
  - pathway system or parks
- adds to the network: spaced 1.0 to 1.5 km from another on-street bikeway
- already used as a cycling route
- enables or improves crossing of a major/arterial road, rail line, green space, water

II. Roadway Criteria

- surface type (gravel, paved)
- width of curb lane
- traffic volume in curb lane
- percentage of trucks
- presence of parallel or angled parking - one side or both
- parking turnover rate
- frequency of driveways, alleys, cross-street intersections
- frequency of stop signs and stop lights
- awkward intersections
- presence of double or triple turning lanes
- posted speed limit
- actual speed of traffic
- frequency of transit
- incidence of railway/ LRT track crossings
- topography
- surface condition (potholes, rippling, raised or “unfriendly” sewer covers, erosion, etc.)
- lighting - one or both sides

III. General Criteria

- demand analysis
- adjacent land use
- opportunity: scheduled road resurfacing or widening
- personal security / informal surveillance
- views, esthetic value

The Calgary Cycle Plan discusses a number of potential design options to improve the roadway environment for cyclists. The Cycle Plan should continue to be used as a guide for the planning and design of on-street cycling facilities. This plan expands on the Cycle Plan and provides more detailed discussion of the options and how to select the most appropriate street treatment for a particular route.

2.9.2 On-street bikeway options

On-street bikeway options include a signed bike route, wide curb lane, dedicated bike lane, or a "bike boulevard" or "bike corridor". These terms are defined in s.1.4 of this plan. Each is discussed below.

Signed bike route

A signed bike route is the simplest facility to implement: it is marked by signs posted periodically on the street, and is indicated on Calgary's Pathway and Bicycle Route map. A signed bike route is most appropriate for a lower volume residential or collector road. Parking may be present.

A signed bike route requires less road width than some of the other bikeway design options because motor vehicle traffic volumes are low on residential and low volume collector roads. The chance of a vehicle overtaking a bicycle and encountering an oncoming vehicle is lower than on higher volume roads, and the operating speeds tend to be lower. The width of residential and collector standard roads, as defined by the city of Calgary Subdivision Design Standards, do not have to be increased for signed bike routes.

Care should be taken to ensure that creating a signed bike route does not imply that this route is "safer" than any other street for cycling. As stated earlier, urban street cyclists are expected to have a minimum skill set and to use their own best judgement in choosing a route. Nonetheless some minimum standards of road condition and lighting should be in place to ensure a measure of safety before designating a street as a signed bike route.

Wide curb lane

On multi-lane roads, it may be possible to re-stripe the lane configuration to make the curb lane wider.

A wide curb lane is a design option suitable for higher volume collector roads, major roads and some expressway standard roads. A wide curb lane can be implemented on roads with one, two or three lanes in each direction. The wide curb lane should be at least 4.3 m wide to accommodate motor vehicles and bicycles, but should not be wider than 4.6 m. Curb lanes wider than 4.6 m can encourage passing and speeding.

The extra road width can be achieved in a number of ways:

- on primary collector roads with two lanes in each direction:

  - reduce the width of the left lane;

- on major and expressway roads:

  - reduce the curb and gutter width from 0.5 m to 0.25 m (for new construction), and/or

  - reduce the width of the left lane(s).

Re-striping of existing roads can be achieved when existing lane markings fade and are scheduled for repainting.

A wide curb lane should be identified by 1.0 m wide bicycle stencils painted on the asphalt surface at 100 m intervals and "Share the Road" signage as shown in Exhibit 2.4.

Wide curb lanes can be an acceptable on-street bicycle facility for the following reasons:

1. road widening is generally not required;

2. inexpensive to implement and maintain;

3. the sweeping action of passing vehicles tends to keep the wide curb lane clear of sand, gravel, snow and debris. These obstructions have little impact on motorists but are a serious hazard for cyclists. Sand and gravel are used extensively on Calgary roads in the winter. These materials accumulate next to the gutter until spring cleanup is complete;

4. generally does not result in the loss of on-street parking. On-street parking is important to businesses and residents. Removal of parking on proposed bikeway routes should be avoided if possible;

5. promotes "share the road" operation by providing sufficient width for cyclists and motorists.

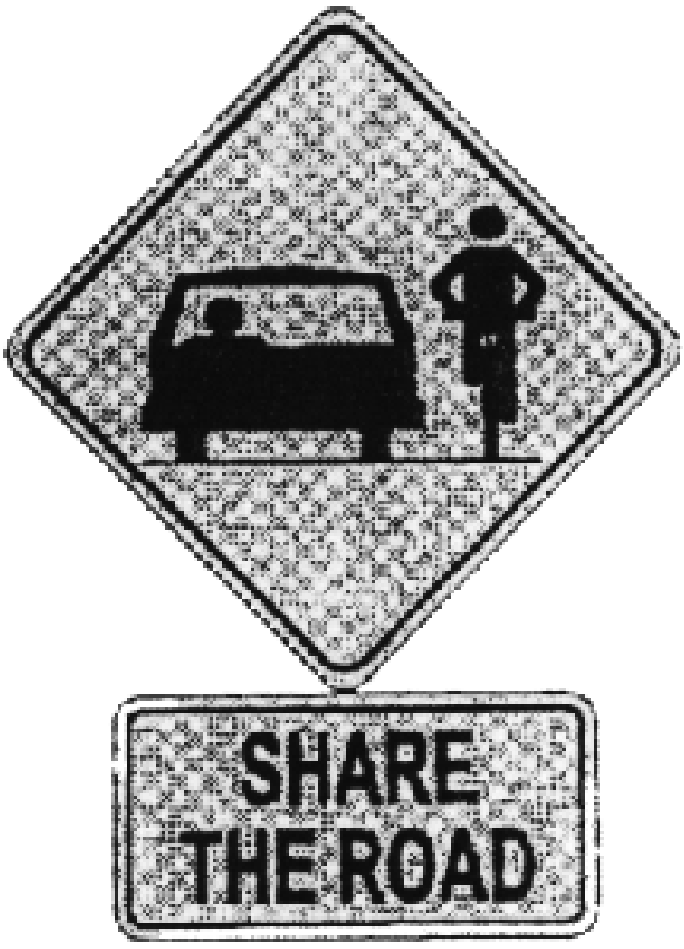
In addition, wide curb lanes offer some operational benefits for both cyclists and motorists, including the following:

- a wider lane for trucks, buses and other large vehicles which use the curb lane;

- provides room for vehicles overtaking cyclists without encroaching into the left lane or endangering cyclists;

- permits larger vehicles to make right turns with less encroachment on the left lane;

- improves access to right turn "cut off" lanes when traffic is queued at busy intersections.



Source: Bikeway Traffic Control Guidelines, TAC

WIDE CURB LANE - SAMPLE SIGN **EXHIBIT 2.4**

IBI GROUP

Marked bicycle lane

A marked bicycle lane, or "bike lane", is a dedicated traffic lane which is identified by pavement markings and signage consistent with the conventions set out in the Transportation Association of Canada's *Bikeway Traffic Control Guidelines for Canada* (1999). A sample bike lane is shown in Exhibit 1.5.

Guidelines and standards for bike lane construction and intersection design are set out in the current Transportation Association of Canada (TAC) Manual: *Geometric Design Guide for Canadian Roads, 1999* and the Calgary Cycle Plan.

A bike lane should be located in the curb lane, preferably immediately adjacent to the curb on a street with no parking. If parking is present the bike lane must be to the left of the parking lane. The parking lane must be identified using the current TAC-approved pavement markings.

Bike lane width should be a minimum of 1.2 m, 1.5 m desirable, where the bike lane is adjacent to the curb. Bike lanes adjacent to parking should allow for additional width to ensure that open car doors do not encroach on the path of the cyclist.

Bike lanes are intended for the exclusive use of cyclists. However, motor vehicle traffic can enter a bike lane to make turns or gain access to adjacent development.

Bike lanes and wide curb lanes are generally appropriate for the same classifications of road, that is, medium to high volume collector roads, major roads and some expressway standard roads. Bike lanes may be established by reducing the number and/or width of motor vehicle traffic lanes, removing on-street parking or widening the roadway.

A road that meets some or all of the following conditions is a candidate for a bike lane:

- collector road or higher classification;
- roads with medium to high traffic volumes;
- roads with moderate to higher speed traffic;
- few commercial or residential driveways;
- roads with heavy bicycle traffic;
- roads where frequent nighttime usage is expected, such as streets with nighttime entertainment / shopping/ educational/ recreational destinations;
- roads where width is constrained, e.g. bridges, underpasses;
- roads where cyclists require safe crossing at an interchange ramp.

Bike lanes should not be installed if there is/are:

- angled parking;
- high on-street parking turnover;
- steep downgrades;
- surface or pavement interruptions; and/or
- short blocks or many designated right turn lanes where the majority of the bike lane would be dashed or dropped.

The design and installation of a bike lane should entail a detailed design study which analyses the width of the road along the entire length of the proposed route; the need for parking, and parking turnover rate; and whether a possible reduction in motor vehicle capacity on that road is a desirable and/or acceptable outcome, weighed against the benefit of improving the environment for cyclists.

Bus/bike lane or HOV lane

As a result of recommendations from the Calgary Transportation Plan (1994), some city streets are being considered or re-designed for exclusive bus lanes during peak hours. In other jurisdictions HOV (high occupancy vehicle) lanes are reserved for buses, taxis, bikes and carpoolers during peak periods; HOV lanes may some day be adopted in Calgary. The curb lane is usually chosen for a bus or HOV lane on roads which are not free flow. Under the Highway Traffic Act, cyclists are generally required to keep right, which means riding in the curb lane in most circumstances.

The North American standard width for a shared bus/bike lane or HOV lane which permits cyclists is 4.5 m minimum, 4.8 m preferred.

Bike corridor

A bike corridor is an on-street route identified as a good cycling route which is provided with features to encourage and favour cyclist traffic over motor vehicle traffic. (The term "bike corridor" is preferred to "bike boulevard" here to avoid confusion with a pathway in the boulevard.) Refer to Exhibit 1.6 for a diagram illustrating the concept of a bike corridor.

The bike corridor may incorporate a variety of features to make it an attractive cycling route, including the following:

- bicycle-sensitive loop detectors in the roadway to trigger traffic signals;
- cyclist-accessible push-buttons to activate pedestrian crossings or general traffic signals;
- re-orienting stop signs to favour through movement along the corridor;

- cyclist median refuges to assist crossing major roads;
- adjusting signal timing to facilitate and favour cyclist movement through intersections;
- traffic calming to discourage motorists along the route.

A bike corridor is usually established on a grid road that is within a block or two of a major road which is an important shopping and/or employment street. The bike corridor thus serves as a close and convenient alternative to the major road, which is typically a busy street with high parking turnover, many intersections and driveways, or high speed traffic. A bike corridor is especially effective in the higher density urban areas, such as downtown and the inner city. It also works best where the grid system is complete, such that minor grid roads do not "dead-end" but cross major streets. Crossing the major streets can be facilitated by installing signalized crosswalks, or creating a median with a "refuge" area for cyclists to have a safe place to stop half-way across the major road.

Some discussion of traffic calming is warranted here. Traffic calming measures may include:

- curb bulbs or bump-outs;
- roundabouts;
- partial one-way entrances or partial closures;
- chicanes;
- speed tables;
- diverters.

Definitions and examples of these measures can be obtained from TAC's *Canadian Guide to Neighbourhood Traffic Calming* (December 1998).

Traffic calming can be beneficial to cyclists, if it has the effect of reducing motor vehicle speed and generally discouraging motorists from using a particular route (reducing volume). However if not designed properly, traffic calming devices can create hazards for cyclists. For example, a tree planter in the curb lane, if not marked with reflective materials, could be an unseen obstacle at night. Curb bulbs or bump outs which require cyclists to move left could force cyclists to swerve into the path of motor vehicles. All traffic calming devices should be designed so as not to create new hazards for cyclists.

Note that in the "Proposed Routes" section of this report, some routes have been identified as potential bike corridors. Installation of the bike corridor street treatment should be carried out in consultation with the local residents and communities.

GUIDING PRINCIPLES

The preferred street treatment for a selected on-street bikeway should be determined in accordance with the discussion set out in section 2.9.2 of this report.

A designated bikeway should meet the following minimum requirements:

- *road surface should be in average or better condition – particularly in the curb lane - with minimal cracking, potholes and other surface irregularities which could be hazardous to a cyclist;*
- *all drainage grates should be consistent with the City of Calgary's approved "bicycle friendly" design;*
- *lighting should be sufficient to provide a measure of safety and comfort for night cycling.*

A wide curb lane suitable for cycling should be 4.3 m wide, excluding parking.

Where a curb lane is widened to 4.3 m or more, roadway signs should be posted indicating "cars and bikes share the road", and or bicycle symbols painted on the asphalt at regular intervals.

Where a bus lane or HOV lane is located in the curb lane it should be investigated for the ability to safely accommodate cyclists. Where a bus-only or HOV lane is planned to exclude cyclists, a parallel alternative route must be provided for cyclists within a few blocks.

The Bike Corridor design option should be explored for existing and new on-street bikeways.

The needs and safety of cyclists should be accommodated in all traffic calming designs.

2.9.3 On-going issues

Once a designated bikeway has been created, no matter which design is chosen, it is important that the route be maintained at a standard to ensure that cycling on that route is a safe and positive experience. As recommended in part in the Calgary Cycle Plan (Recommendation #21), designated bikeways should have:

- traffic-actuated signals that detect bikes;
- priority spring street sweeping;
- priority winter snow clearing.

In addition to regular maintenance, the bikeways should be inspected on a regular basis to ensure that the curb-area roadway surface is in good condition, and any signs, stripes or stencils denoting the bikeway remain legible.

GUIDING PRINCIPLES

Calgary's Transportation and Roads Departments should coordinate a program to ensure designated bikeways have priority spring and winter maintenance, and are inspected regularly to ensure the roadway surface, line painting, stencils and signs are in good condition.

Bicycle-activated detector loops should be considered at selected intersections on bikeways.

RECOMMENDATION

1. **The Guiding Principles set out in section 2 of this report should be adopted for Pathways and Bikeways.**