



# Cycling Safety Review

April 2013

## Executive Summary

As a follow-up to Council discussions related to the Bicycle Master Plan, District staff have reviewed cycling safety issues in the District of North Vancouver, making use of ICBC collision data as well as RCMP expertise. The review looked closely at:

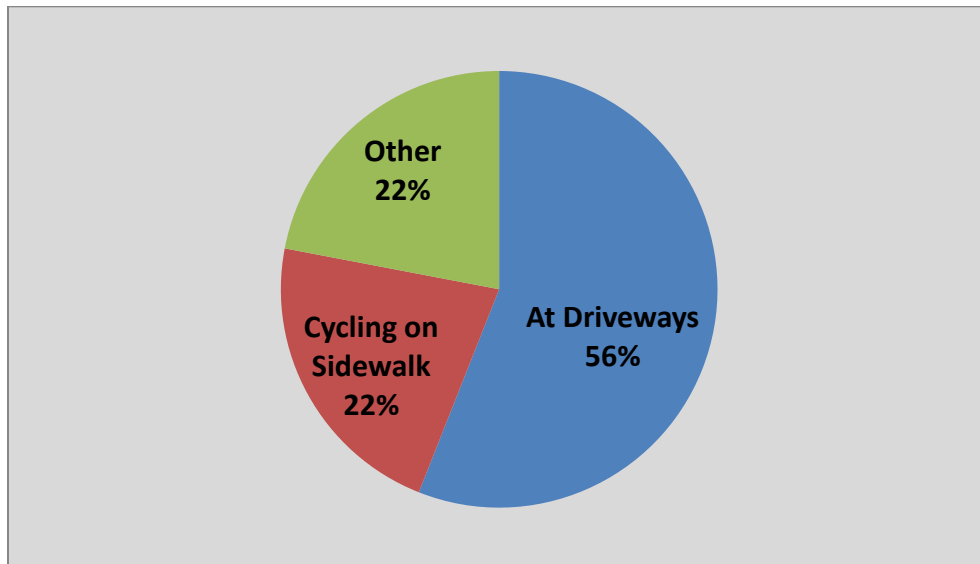
- **intersections** with two or more cyclist collisions; and
- **corridors** with five or more cyclist collisions per kilometre.

Recent research on cycling safety by UBC informed ideas for improvements at high cyclist crash locations. The review also assessed the potential to address gaps in the cycling network by allowing cycling on sidewalks.

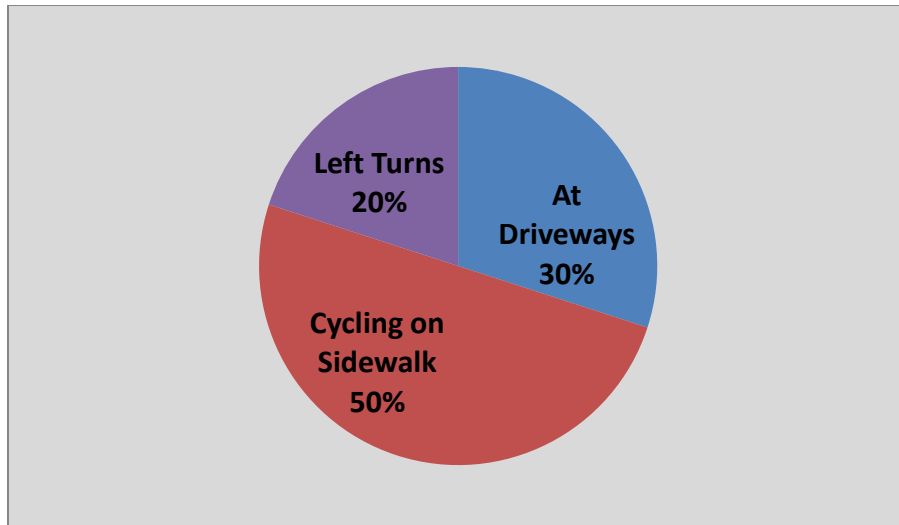
## Crashes involving Cyclists in the District

Between 2008 and 2011 (four years), there were 58 reported crashes involving cyclists. Bicycle traffic counts are unavailable for the crash locations and so, the rate of cycling collisions relative to the number of cycling trips cannot be calculated.

The two corridors with the most crashes were Main Street (nine) and Marine Drive (ten) - two of the most popular travel corridors in the District. The locations of crashes involving cyclists on Main Street and Marine Drive are summarized in the charts below.



Locations of Collisions on Main Street



**Locations of Collisions on Marine Drive**

On Main Street, most crashes occurred at driveways or were related to cycling on the sidewalk. On Marine Drive, crashes related cycling on the sidewalk formed a larger proportion, but crashes also occurred at driveways or when turning left at intersections.

The three intersection locations where there are the most crashes involving cyclists are:

- Lynn Valley Road at Mountain Highway (3),
- Mount Seymour Parkway at Plymouth Drive (2), and
- Mount Seymour Parkway at Berkley Road (2).

ICBC data attributed these collisions to vehicles trying to pass a cyclist, cyclists turning left, and visibility issues and a general lack of driver awareness of the presence of cyclists.

## **Cycling Network Improvements**

- ✓ Enhance bike lane markings and signage at problem intersections and driveways.
- ✓ Trim vegetation to improve sightlines.
- ✓ Improve parallel alternate routes such as Hope Road, 15<sup>th</sup> Street, and Barrow Street.
- ✓ Determine whether a crosswalk or signal is warranted on Mount Seymour Parkway at Plymouth Drive.

## Cycling on Sidewalks

This review also looked at whether cycling on sidewalks provides a feasible means of addressing gaps in the District's cycling network.

Studies have proven that **the risk of cycling on the sidewalk is between two and twenty-five times more than riding on the road**. Intersections and driveways are a major point of conflict between cyclists and motor vehicles, as drivers often do not expect cyclists on the sidewalk.

North American best practices recommend that cycling on sidewalks be permitted only at specific locations, where designated and directed by a sign. These locations should meet the following criteria:

- Up-hill travel (i.e. lower cycling speeds)
- Low pedestrian volumes (i.e. fewer than 10 per hour);
- Wide sidewalks (i.e. minimum 1.8 metres wide);
- Clear sightlines at intersections and driveways;
- One-way cyclist travel in the direction of traffic; and
- Cyclists yield to pedestrians.

Locations that could be considered in the District include:

- northbound **Mountain Highway** up-hill, east sidewalk between Highway 1 and Arborlynn Drive; and
- northbound **Capilano Road** up-hill, east sidewalk between Paisley Road and Ridgewood Drive.



Westbound East Keith Road uphill between Sutherland Avenue and Brooksbank Avenue is not considered suitable for cycling on sidewalks at this time because of potential sightline issues and conflicts given the intersection angles and driveways.

Subject to an evaluation of the first two sites, additional locations could be considered.

RCMP staff have indicated that they concur with this approach to permitting cycling at these two up-hill locations only at this time. They do not support universally allowing cycling on sidewalks.

## Education about Sharing the Road

Cycling safety can also be improved by educating cyclists and drivers about how to share the road.

To this end, it is advisable that District staff continue working with partners like TravelSmart, Preventable, and ICBC to encourage the development of information campaigns.

## Introduction

On November 5, 2012, District of North Vancouver Council articulated that a better understanding of cycling safety issues would help guide future cycling investments. Council members also expressed interest in exploring whether cycling could be permitted on sidewalks.

Staff have worked with the RCMP and reviewed data and literature from ICBC, UBC, and other North American research sources to better understand cycling safety issues in the District. The study identifies opportunities to improve the District's cycling network.

To help improve safety and raise awareness about cyclists and cars sharing the road, the District is also working with partners like TravelSmart, Preventable, and ICBC to encourage development of information campaigns.

## Cycling Network Improvements

### Study Method

For the safety review, 2008-2011 ICBC collision data was analyzed. Intersections with **two or more cyclist collisions or corridors with five or more cyclist collisions per kilometre** were selected for further analysis.

There is limited data regarding cycling in the District at this time. While we have information on the recorded collisions through ICBC data, limited bike counts for corridors and intersections is available. As such, the current study does not compare collisions against total number of bicycle trips.

On the morning of February 13, 2013, District of North Vancouver staff (A. Kim, E. Geddes, A. Milek) and Sergeant D. Jewers of the RCMP visited all of these locations together to obtain a better understanding of the physical characteristics that may be contributing the collisions.

Recent research on cycling safety by UBC is a key input into identifying opportunities to improve conditions at high cyclist crash locations.

## Summary of Data

Between 2008 and 2011 (four years), there were **58 reported crashes involving cyclists** in the District of North Vancouver (data from ICBC). A map showing the collision distribution across the District is shown in Attachment 1.

The analysis identified two major corridors and three intersections having a higher crash risk for cyclists, as shown in Table 1.

	Location	Total Cyclist Collisions (4 years)	Corridor Length	Cyclist Collisions/km
Corridors	Main Street Corridor	9	0.5 km	18.0
	Marine Drive Corridor (DNV)	10	1.6 km	6.3
Intersections	Lynn Valley Road and Mountain Highway	3		
	Mount Seymour Parkway and Plymouth Drive	2		
	Mount Seymour Parkway and Berkley Road	2		

**Table 1** Summary of High Crash Locations

## Recent UBC Cycling Safety Research

A study conducted in Vancouver and Toronto between May 2008 and November 2009 by UBC examined how route infrastructure influences the risk of cyclist injury in North America. The study looked at the relative safety of 15 different route types by interviewing 690 cyclists in Toronto and Vancouver that were injured in a collision while cycling.

The researchers also performed site observations at the injury site and at two randomly-selected “control sites” along the injured cyclist’s route. The figures below summarize relative safety of the different route types.



Figure 1: Route Preference vs. Route Safety (UBC, Cycling in Cities)

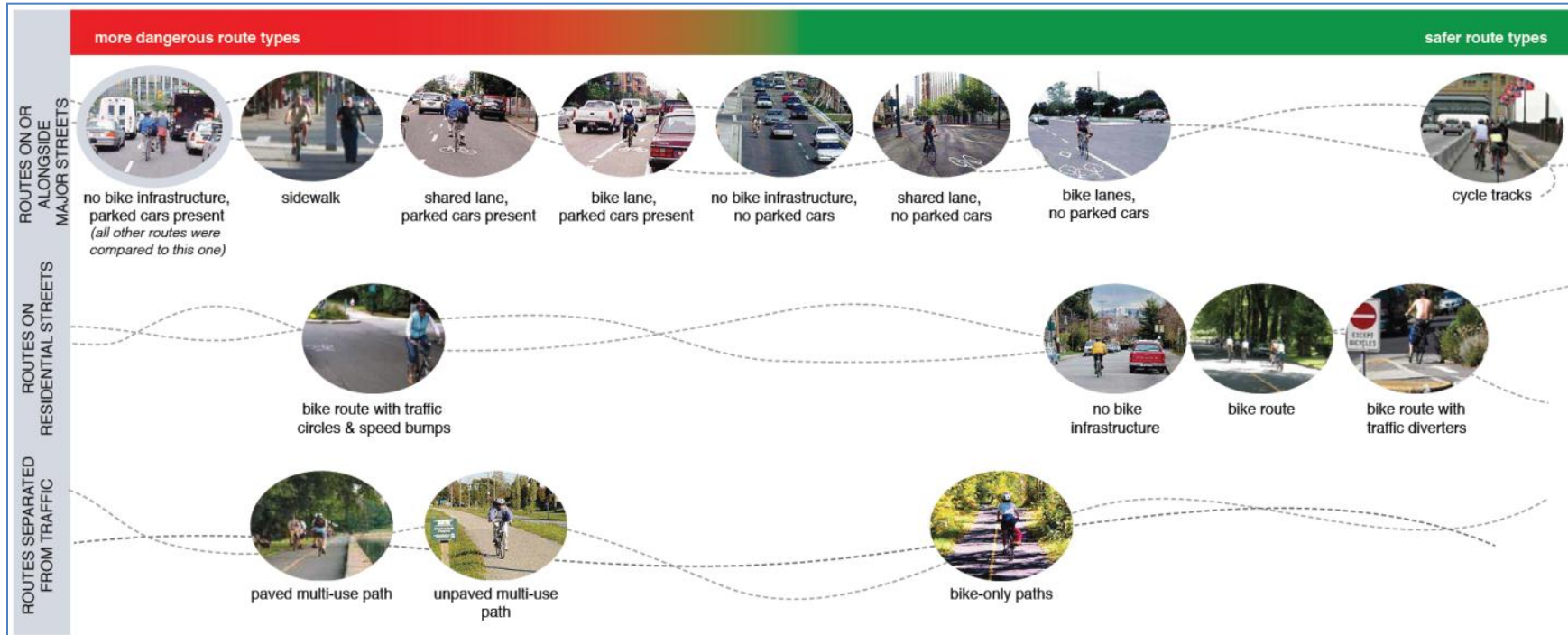


Figure 2: Relative Safety Comparison of Different Route Types (UBC, Cycling In Cities BICE Brochure)



## **Key Findings of UBC Research**

The most dangerous route types are:

- Major streets with parked cars and no cycling infrastructure;
- Sidewalks; and
- Paved multi-use paths.

The safest route types are:

- Cycle tracks on major streets separated by a physical barrier;
- Residential streets especially with traffic diversion; and
- Major street bike lanes with no parked cars.

On high cyclist-crash corridors like Main Street and Marine Drive, it would be beneficial for the District to continue to explore opportunities to provide separated bike lanes and/or parallel alternate routes using residential streets. The intent is to encourage new cyclists to use their bicycles more for everyday transportation needs.

## Analysis of Key Corridors

Corridors with five or more cyclist collisions per kilometre were selected for further analysis: Main Street/Dollarton Highway and Marine Drive.

### 1. Main Street (Mountain Highway to City of North Vancouver Border)

There were nine cyclist related collisions on Main Street, between Highway 1 and the City of North Vancouver boundary (including the intersection at Mountain Highway which is under Provincial jurisdiction).

What's in Place Now: Eastbound bike lane and westbound side-by-side shared lane, west of Harbour Avenue. No bike facilities east of Harbour Avenue.



**Left: Eastbound Main Street at Lynn Avenue;**  
**Right: Westbound Main Street, facing east near Mountain Highway**

### Collision Causes

Location	# of Collisions	Descriptions
Main Street at Mountain Highway	4	<ul style="list-style-type: none"> <li>• Westbound cyclist collided with westbound vehicle turning right into gas station</li> <li>• Eastbound cyclist on sidewalk collided with vehicle turning westbound out of gas station</li> <li>• Westbound cyclist collided with passenger side door opening</li> <li>• Westbound cyclist collided with westbound vehicle changing lanes</li> </ul>
Main Street at Lynn Avenue	3	<ul style="list-style-type: none"> <li>• Cyclist travelling on sidewalk in wrong direction collided with turning vehicle.</li> <li>• Eastbound cyclist collided with eastbound vehicle turning right into plaza.</li> <li>• Eastbound cyclist collided with westbound vehicle turning left into plaza</li> </ul>
Main Street at Harbour Avenue	2	<ul style="list-style-type: none"> <li>• Cyclist collided with vehicle changing lanes.</li> <li>• Westbound cyclist collided with vehicle exiting Canadian Tire parking lot</li> </ul>

## Summary

- 56% (5/9) at driveways.
- 22% (2/9) involved a cyclist travelling on the sidewalk.
- 50% (2/4) at the intersection of Main Street and Mountain Highway occurred at the gas station driveways.

## Potential Improvements

- ✓ Enhance bike lane marking through intersections and driveways
  - e.g. green paint, double dashed line, and additional bike stencils
- ✓ Provide clear sightlines to TAC standards at all driveways and intersections.
- ✓ Improve Barrow Street as an alternate route to the Ironworkers' Memorial Bridge.
- ✓ Provide separated bike lanes in the long-term, as land becomes available through re-development.



Example of Green Paint and Bike Stencils through Conflict Area

## **2. Marine Drive (Lloyd Avenue to Tatlow Avenue)**

There were a 10 cyclist related collisions on Marine Drive, between Lloyd Avenue and Tatlow Avenue.

What's in Place Now: 4.3m wide shared lane as of fall 2010.



Collision Causes

Location	# of Collisions	Descriptions
Marine Drive at Bridgeman Avenue	2	<ul style="list-style-type: none"> <li>• Cyclist going eastbound collided with westbound truck turning left (2011)</li> <li>• Westbound cyclist sideswiped by westbound bus pulling into bus stop (2010)</li> </ul>
Marine Drive at Pemberton Avenue	2	<ul style="list-style-type: none"> <li>• Eastbound cyclist collided with eastbound vehicle turning right into driveway (2011)</li> <li>• Eastbound cyclist cut-off by vehicle turning right (2011)</li> </ul>
Marine Drive at Tatlow Avenue	1	<ul style="list-style-type: none"> <li>• Eastbound cyclist collided with westbound vehicle turning left onto Tatlow Avenue (2011)</li> </ul>
1200 Marine Drive	1	<ul style="list-style-type: none"> <li>• Westbound cyclist travelling on sidewalk collided with vehicle exiting driveway (2011)</li> </ul>
1151 Marine Drive	1	<ul style="list-style-type: none"> <li>• Eastbound cyclist collided with eastbound vehicle turning right into driveway (2011)</li> </ul>
Marine Drive at MacGowan Avenue	1	<ul style="list-style-type: none"> <li>• Westbound cyclist travelling on sidewalk collided with westbound vehicle turning into driveway</li> </ul>
Marine Drive at Lloyd Avenue	1	<ul style="list-style-type: none"> <li>• Westbound cyclist collided with vehicle turning right from Lloyd Avenue onto Marine Drive (2008)</li> </ul>
1420 Marine Drive	1	<ul style="list-style-type: none"> <li>• Cyclist travelling on the sidewalk in wrong direction collided with vehicle exiting parking lot (2008)</li> </ul>

Summary

- 30% (3/10) involved a cyclist travelling on the sidewalk.
- 50% (5/10) occurred at driveways.
- 20% (2/10) involved left turns.

Potential Improvements:

- ✓ Enhance bike lane marking through intersections and driveways
  - e.g. green paint, double dashed line, and additional bike stencils
- ✓ Provide dedicated bike lanes on Marine Drive in the long-term
- ✓ Improve alternate parallel routes such as West 15<sup>th</sup> Street and Hope Road
- ✓ Remove trees or trim vegetation to improve sightlines (at Lloyd Avenue and other locations as needed)

## Analysis of Key Intersections

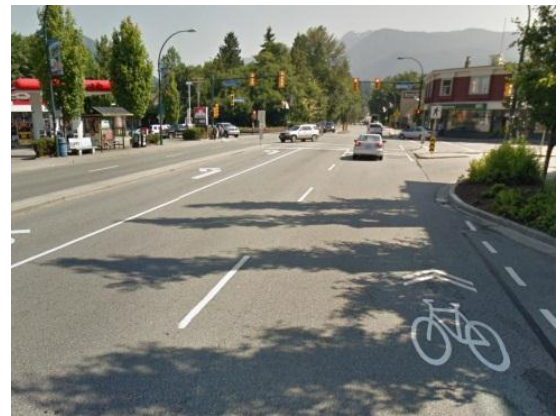
All of the cyclist collisions on Mount Seymour Parkway at Plymouth Drive and at Berkley Road involved left turns. Two of the three cyclist collisions on Lynn Valley Road at Mountain Highway involved a cyclist sideswipe with a vehicle.

### 1. Lynn Valley Road at Mountain Highway (3)

Facility Type: Shared bike lanes on Lynn Valley Road west of Mountain Highway

Collision Causes:

1. Eastbound cyclist collided with eastbound vehicle trying to pass.
2. Westbound cyclist struck by westbound vehicle trying to pass.
3. Eastbound cyclist on sidewalk collided with vehicle exiting parking lot driveway.



Potential Improvements:

- ✓ Provide dedicated bike lanes on all legs and consider enhanced bike lane markings (e.g. green paint) where appropriate.

### 2. Mount Seymour Parkway at Plymouth Drive (2)

Facility Type:

Bike lanes on Mount Seymour Parkway.

Collision Causes:

1. Westbound cyclist turning left onto Plymouth collided with northbound vehicle on Plymouth.
2. Westbound cyclist turning left onto Plymouth collided with westbound vehicle changing lanes.



Potential Improvements:

- ✓ Investigate whether a crosswalk or signal is warranted.
- ✓ Trim vegetation to improve sightlines.
- ✓ Provide dedicated bike lanes on all legs and consider enhanced bike lane markings (e.g. green paint) where appropriate.



### 3. Mount Seymour Parkway at Berkley Road (2)

Facility Type: Bike lanes on Mount Seymour Parkway.

Collision Causes:

1. Westbound cyclist collided with southbound vehicle turning left.
2. Westbound cyclist collided with eastbound vehicle turning left/northbound onto Berkley Road.

Potential Improvements:

- ✓ Enhance signage and bike lane marking through intersection (e.g. green paint, and/or double dashed line, and additional bike stencils).



## Cycling on Sidewalks

On November 5, 2012, District of North Vancouver Council expressed interest in exploring whether cycling could be permitted on sidewalks. One of the reasons why this is being considered is because there is often a competition amongst the different modes of transportation for scarce road space. Widening the road for bike lanes can involve construction costs and, in some cases, property requirements. Allowing cycling on sidewalks where appropriate could reduce gaps in the cycling network.

To **explore whether cycling is feasible on sidewalks**, staff reviewed current practice in other municipalities and existing research on the risk of cycling on sidewalk and engaged RCMP to obtain input.

This study provides an overview of the current practice in other municipalities, research on the risks of cycling on sidewalks, and recommendations for the District of North Vancouver. It is noted that RCMP staff have indicated that universally allowing cycling on sidewalks is not advisable because it is likely to be confusing and problematic from a safety standpoint.

Some cyclists choose to ride on the sidewalk because they are afraid to ride in traffic and have a perception that cycling away from traffic is safer.

Cycling on the sidewalk does not eliminate the risk of being involved in a car-bike collision. Several studies have shown that cycling on sidewalks involves a greater collision risk than cycling on roadways. This is often because cyclists on sidewalks are usually less visible to motorists than cyclists on roads.

Intersections and driveways are more prone to collisions involving cyclists on sidewalks, as motorists often do not expect cyclists to be travelling on the sidewalk and sometimes outside of a motorist's line of sight (Figure 3).



Figure 1 – Driveway Conflicts (Kavanagh, 2008)

Pedestrians, particularly vulnerable road users like people with visual or hearing impairments or children, are at a greater risk when cyclists are on the sidewalk. Cyclists can also be at risk of being hit by a passenger car door opening.

Nonetheless, permitting cycling on sidewalks in some areas where there are gaps in the cycling network and few intersections could help encourage more people to use their bikes for transportation, especially people that are not comfortable riding in traffic.

This section examines the current practice in other municipalities, provides a summary of the research on the risk of cycling on sidewalks, and provides recommendations for the DNV.

### Current Practice

Most municipal bylaws are concurrent with the British Columbia Motor Vehicle Act and do not permit cycling on a sidewalk or marked crosswalk unless directed by a sign (refer to Appendix 2). Current exceptions on the North Shore include the Lions Gate Bridge, the Ironworkers' 2<sup>nd</sup> Narrows Memorial Bridge, and their approaches.

Some examples of municipalities in Canada that have allowances for cycling on sidewalks are listed below in Table 1.

Municipality	Regulation
New Westminster	Allows cycling on all City sidewalks, except at specific locations listed in a Bylaw. Cyclists must not interfere with pedestrians using the same sidewalk.
Township of Langley	Cyclists permitted on sidewalks unless otherwise signed, but to a maximum speed of 7km/hour and must yield to pedestrians and equestrian traffic. However, cyclists riding on a sidewalk are not permitted to pass another cyclist while riding in the same direction.  Cyclists are not permitted on a roadway if there is a useable walkway or trail intended for the use of cycles adjacent to the roadway.
Brampton and Mississauga	Bikes with wheels greater than 50 cm (20 inches) in diameter are NOT permitted on city sidewalks unless: <ul style="list-style-type: none"> <li>•The sidewalk is part of a bicycle path, or</li> <li>•The rider is directly crossing a sidewalk.</li> </ul>
Toronto	Cyclists with tires that are 61cm (24 inches) or smaller are allowed on sidewalks.

**Table 2: Examples of Canadian Cities that Allow Cycling on Sidewalks**

While many municipalities are allowing cycling on sidewalks, the research shows clearly that this can increase risk.

### Safety Performance Research

Several researchers have studied the risk of riding on the sidewalk. These risks are often measured by the relative danger index (RDI). The RDI looks at the fraction of crashes reported for a particular facility by the fraction of kilometers ridden on that facility type. For example, an RDI of 1.0 means that crashes occur in proportion to the



distance travel. The research indicates that the risk of cycling on the sidewalk is between 2 and 25 times more than riding on the road.

### Key Findings

- Moritz (1997) determined that the RDI is almost 25 times higher for sidewalk riding when compared to riding on a major road without bike facilities.

Facility	Relative Danger Index Normalized to Major Road
Major road without bike facilities	1
Minor road without bike facilities	1.42
Signed bike route only	0.77
On-street bike lanes	0.62
Multi-use trail	2.1
Off-road/unpaved	6.8
Other (most often sidewalk)	24.8

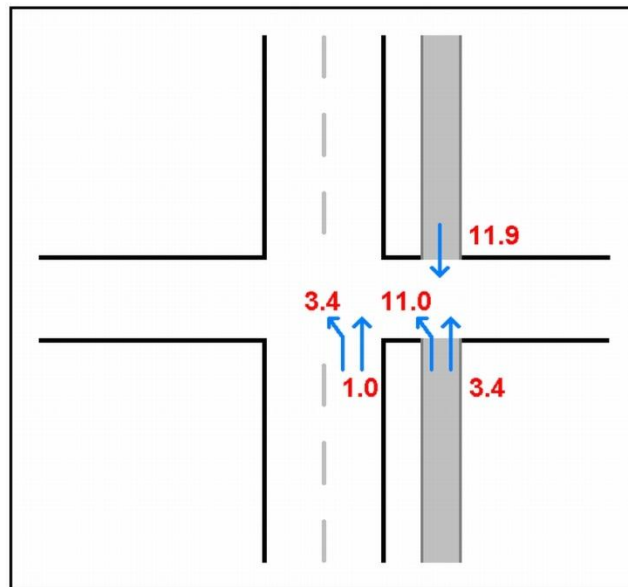
**Table 3: Relative Danger Index by Facility Type**

Source: Moritz, 1997, Table 5

- Rauh (1990) compared the crash risk for cyclists travelling through an intersection on the side path versus cyclists on the roadway. The risks are almost 12 times greater for cyclists on a side path travelling in the opposite direction of car traffic, and over 3 times greater for cyclists on a side path travelling in the same direction of car traffic (refer to Figure 4).

Movement	Crash Risk Factor
Through travel with a bike lane stripe	1.1 times
Left turn on the roadway	3.4 times
Through travel on a sidepath	3.4 times
Left turn from a sidepath	11.0 times
Through travel on a sidepath on the left side of the roadway	11.9 times

These findings are illustrated in Figure 4.



**Figure 2: Crash Risk of Side Paths**

- Wachtel and Alan (1994) found that cycling on a sidewalk or a path through intersections is associated with a 1.8 times greater risk than those on the roadways.
- Aultman-Hall and Adams found sidewalk cycling incidents occurred 1.93 to 12.5 times more frequently than on-road cycling incidents.
- Teschke et al (2012) of the University of British Columbia measured route safety by facility type using an odds ratio (OR). An OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in absence of that exposure. Their research found that the adjusted OR of cycling on a sidewalk or other pedestrian path is 0.87 and on a major street with no bike infrastructure and no parked cars is 0.63. This suggests that cycling on the sidewalk is less safe than cycling on a major road with no bike infrastructure and no parking.

## Comparison of Regulations

Table 4 summarizes the benefits and challenges of other jurisdictions' common approaches to regulating cycling on sidewalks. The restrictions commonly used are based on wheel size, age, speed, or location.

Restriction	Regulation	Benefits	Issues
Wheel size	Allow cycling on sidewalk if wheels are less than 50cm (20 inches)	<ul style="list-style-type: none"> <li>• Encourages children to cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Some adult bikes have small wheels (e.g. BMX, folding bikes)</li> <li>• Safety, especially at intersections</li> </ul>
Age	Allow cycling on sidewalk by persons under 16 years old	<ul style="list-style-type: none"> <li>• Encourages children to cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to enforce, many children do not carry ID.</li> <li>• Safety, especially at intersections</li> </ul>
Speed	Allow cycling on sidewalk if travelling under 7km/h	<ul style="list-style-type: none"> <li>• Encourage children and novice adult cyclists</li> <li>• Slow cycling could reduce risk of collisions and severity</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to enforce</li> <li>• Safety, especially at intersections</li> </ul>
Location	Allow sidewalk cycling only where designated and directed by a sign	<ul style="list-style-type: none"> <li>• Can manage risk by following guidelines as below.</li> <li>• Help reduce gaps in the cycling network</li> </ul>	

**Table 4: Examples of Sidewalk Cycling Restrictions**

There are advantages of the location-based restriction because it is easier to manage and regulate, while helping to reduce gaps in the cycling network.

Research has shown that cycling on a sidewalk or side path incurs a much greater risk than cycling on the road. Cycling on the sidewalk in the wrong direction presents an even greater risk. Intersections and driveways are a major point of conflict between cyclists and motor vehicles, as drivers often do not expect cyclists on the sidewalk.

To minimize the risk of cyclist collisions on sidewalks, it is recommended that the District permit cycling on sidewalks only where feasible and where designated and directed by a sign.

Areas with very few intersections and driveways that could be feasible for cycling on sidewalks could be determined by ensuring the following criteria are met.

- Up-hill travel (i.e. lower cycling speeds)
- Low pedestrian volumes (i.e. fewer than 10 per hour)
- Wide sidewalks (i.e. minimum 1.8 metres wide)
- Clear sightlines at intersections with streets and driveways
- One-way cyclist travel in the direction of traffic
- Cyclists yield to pedestrians

The evidence suggests that integrating bicycles and motor vehicles on the road is a safer approach than allowing cycling on sidewalks. Where there is a critical gap in the cycling network, allowing cycling on sidewalks in appropriate locations can be considered only as a temporary measure until standard cycling facilities can be implemented. Examples of locations that could be considered in the District include:

- ✓ Northbound Mountain Highway – east sidewalk between Highway 1 and Arborlynn Drive; and
- ✓ Northbound Capilano Road – east sidewalk between Paisley Road and Ridgewood Drive.

Westbound East Keith Road uphill between Sutherland Avenue and Brooksbank Avenue is not considered suitable for cycling on sidewalks at this time because of potential sightline issues and conflicts given the intersection angles and driveways.



East Keith Road intersection layouts

Subject to an evaluation of the first two sites, additional locations could be considered in the future.

**RCMP staff have indicated that they concur with this approach to permitting cycling at these two up-hill locations only at this time.** RCMP staff do not support universally allowing cycling on sidewalks.

## Education about Sharing the Road

To help improve safety and **raise awareness about cyclists and drivers sharing the road**, the District is also working with partners like TravelSmart, Preventable, and ICBC to encourage development of information campaigns. Some of the ways that staff can continue working with these partners is summarized in the table below.

Partner	Initiatives
TravelSmart	<ul style="list-style-type: none"> <li>✓ <a href="http://www.travelsmart.ca/northshore">www.travelsmart.ca/northshore</a> bicycle maps and safety information</li> <li>✓ TravelSmart for Schools cycling awareness programs</li> </ul>
ICBC	<ul style="list-style-type: none"> <li>✓ Continue to encourage ICBC to provide information about sharing the road as part of upcoming vulnerable road users campaigns</li> </ul>
Preventable	<ul style="list-style-type: none"> <li>✓ Identify opportunities for a catchy, nonconventional information campaign to be available in the District</li> </ul>

Cycling advocacy groups (like HUB) and private businesses offering cycling training (like Escape Adventures) also continue to provide cycling education programs to individuals, schools and other groups in the community.

**Before you think you won't need a helmet today, have a word with yourself.**

Example - Preventable Campaign

## Conclusion and Recommendations

District staff reviewed cycling safety issues in the District of North Vancouver, making use of ICBC collision data as well as RCMP expertise. Recent research on cycling safety by UBC informed ideas for improvements at high cyclist crash locations.

### Cycling Network Improvements

The study identified the following **improvements to improve conditions for cycling at key intersections and along key corridors in the District.**

Location	Improvement(s)	Cost	Timeline
Main Street Corridor	✓ Enhance bike lane marking through driveways and intersections	Medium	Short
	✓ Trim vegetation to improve sightlines	Low	Short
	✓ Improve Barrow Street (parallel alternate route)	Medium	Short
	✓ Bike lanes on all of Main Street	High	Long
Marine Drive Corridor	✓ Enhance bike lane marking through driveways and intersections	Medium	Short
	✓ Remove trees or trim vegetation to improve sightlines (at Lloyd Avenue and other locations as needed).	Low	Short
	✓ Install signs that state that cycling is prohibited on sidewalks	Low	Short
	✓ Improve Hope Road and 15th Street (parallel alternate routes)	Medium	Medium
	✓ Bike lanes on all of Marine Drive	High	Long
Lynn Valley Road at Mountain Highway	✓ Bike lanes on Lynn Valley Road and on Mountain Highway	High	Medium
	✓ Enhance bike lane marking through driveways and intersections	Medium	Short
Mount Seymour Parkway at Plymouth Drive	✓ Crossing treatment or signal	Medium	Medium
	✓ Trim vegetation to improve sightlines	Low	Short
	✓ Enhance signage and bike lane marking through intersection and conflict areas.	Medium	Short
Mount Seymour Parkway at Berkley Road	✓ Enhance signage and bike lane marking through intersection and conflict areas at slip lanes.	Low	Short
Sidewalks	✓ Implement signage enabling cycling on sidewalks at two locations.	Low	Short

## Cycling on Sidewalks

To minimize the risk of cyclist collisions on sidewalks, the study discerned that **permitting cycling on sidewalks is appropriate at two up-hill locations** (where designated and directed by a sign) and should not be implemented universally. The recommended locations are:

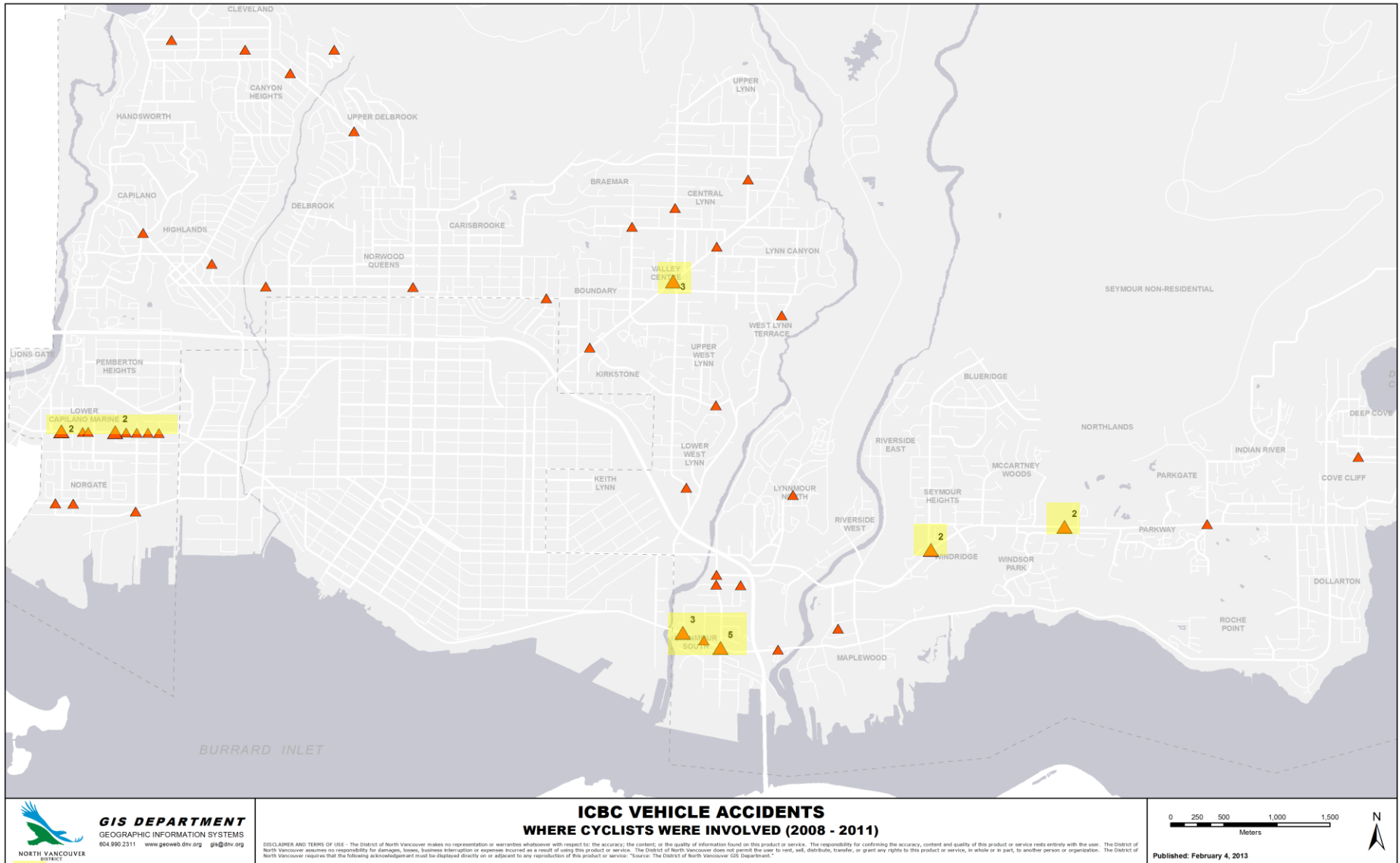
- ✓ Northbound Mountain Highway – east sidewalk between Highway 1 and Arborlynn Drive; and
- ✓ Northbound Capilano Road – east sidewalk between Paisley Road and Ridgewood Drive.

Subject to an evaluation of the first two sites, additional locations could be considered in the future.

## Education about Sharing the Road

To help improve safety and **raise awareness about cyclists and drivers sharing the road**, it is advisable that District staff continue working with partners like TravelSmart, Preventable, and ICBC to encourage development of information campaigns.

## Appendix 1 – Geographic Distribution of Cyclist Collisions in the District



**GIS DEPARTMENT**  
GEOGRAPHIC INFORMATION SYSTEMS  
604.990.2311 www.geoweb.dnv.org gis@dnv.org

DISCLAIMER AND TERMS OF USE - The District of North Vancouver makes no representation or warranties whatsoever with respect to the accuracy, content, or the quality of information found on this product or service. The responsibility for confirming the accuracy, content and quality of this product or service rests entirely with the user. The District of North Vancouver assumes no responsibility for damages, losses, business interruption or expenses incurred as a result of using this product or service. The District of North Vancouver does not permit the user to rent, sell, distribute, transfer, or grant any rights to this product or service, in whole or in part, to another person or organization. The District of North Vancouver requires that the following acknowledgment must be displayed directly on or adjacent to any reproduction of this product or service: "Source: The District of North Vancouver GIS Department."

High cyclist crash areas



## Appendix 2 – Regulations

### District of North Vancouver Street and Traffic Bylaw

#### *Duties of Operator of Cycle*

1101. A person operating a cycle:

- 1101.1 shall not ride upon the sidewalk of any Highway or bridge or upon any pedestrian path in any public Park, unless otherwise directed by a Traffic Control Device;
- 1101.2 shall not, for the purpose of crossing a Highway, ride on a marked crosswalk unless otherwise directed by a Traffic Control Device;
- 1101.3 shall not leave a cycle on a sidewalk so as to interfere with or obstruct the flow of pedestrian traffic;
- 1101.4 shall park such cycles on racks or stands placed on the Highway for that purpose, and shall not park a cycle other than on such rack or stand in areas where such rack or stand is located; and
- 1101.5 shall not ride a cycle on a Highway where a Traffic Control Device prohibits such use.

1102. In addition to the duties imposed by this Part, a person operating a cycle on a Highway has the same rights and duties as the driver of a vehicle.

## British Columbia Motor Vehicle Act

### *Rights and duties of operator of cycle*

- 183** (1) In addition to the duties imposed by this section, a person operating a cycle on a highway has the same rights and duties as a driver of a vehicle.
- (2) A person operating a cycle
- (a) must not ride on a sidewalk unless authorized by a bylaw made under section 124 or unless otherwise directed by a sign,
  - (b) must not, for the purpose of crossing a highway, ride on a crosswalk unless authorized to do so by a bylaw made under section 124 or unless otherwise directed by a sign,
  - (c) must, subject to paragraph (a), ride as near as practicable to the right side of the highway,
  - (d) must not ride abreast of another person operating a cycle on the roadway,
  - (e) must keep at least one hand on the handlebars,
  - (f) must not ride other than on or astride a regular seat of the cycle,
  - (g) must not use the cycle to carry more persons at one time than the number for which it is designed and equipped, and
  - (h) must not ride a cycle on a highway where signs prohibit their use.
- (3) Nothing in subsection (2) (c) requires a person to ride a cycle on any part of a highway that is not paved.
- (4) Despite section 165, a person operating a cycle who intends to turn it to the left at an intersection where there is more than one lane from which left turns are permitted must
- (a) cause the cycle to approach the intersection in the lane closest to the right side of the highway from which a left turn is permitted,
  - (b) keep the cycle to the right of the line that divides the lane referred to in paragraph (a) from the lane immediately to the left of that lane,
  - (c) after entering the intersection, turn the cycle to the left so that it will leave the intersection to the right of the line referred to in paragraph (b), and

(d) when practicable, turn the cycle in the portion of the intersection to the left of the centre of the intersection.

(5) A person must not ride a cycle, skate board, roller skates, in-line roller skates, sled, play vehicle or other similar means of conveyance when it is attached by the arm and hand of the rider or otherwise to a vehicle on a highway.

(6) A cycle operated on a highway between 1/2 hour after sunset and 1/2 hour before sunrise must have the following equipment:

(a) a lighted lamp mounted on the front and under normal atmospheric conditions capable of displaying a white light visible at least 150 m in the direction the cycle is pointed;

(b) a red reflector of a make or design approved by the Insurance Corporation of British Columbia for the purposes of this section;

(c) a lighted lamp, mounted and visible to the rear, displaying a red light.

(7) Despite any other provision of this Act or the regulations, a cycle may be equipped with a flashing red light that is of a make or design approved by the Insurance Corporation of British Columbia for the purposes of this section.

(8) A cycle operated on a highway must be equipped with a brake that will enable the person operating the cycle to make the braked wheels skid on dry, level and clean pavement.

(9) If an accident occurs by which a person or property is injured, directly or indirectly, owing to the presence or operation of a cycle on a highway or a sidewalk, the person in charge of the cycle must

(a) remain at or immediately return to the scene of the accident,

(b) render all possible assistance, and

(c) give to anyone sustaining loss or injury his or her name and address and the name and address of the owner of the cycle, and if the cycle has been licensed and registered, the licence or registration number of the cycle.

(10-13) [Repealed 2008-42-83.]

(14) A person must not operate a cycle

(a) on a highway without due care and attention or without reasonable consideration for other persons using the highway, or

(b) on a sidewalk without due care and attention or without reasonable consideration for other persons using the sidewalk.

(15) If a person is convicted of an offence under this Act in respect of his or her riding or operating a cycle, the court may, in addition to or in place of any penalty otherwise prescribed, order the cycle seized, and on the expiry of that period the person entitled to it may again have possession of the cycle.

(16) For the purpose of seizing and impounding a cycle under an order made under subsection (15), a peace officer may enter any place or building in which the cycle is located.

(17) A person operating a cycle on a highway must signify

(a) a left turn by extending the person's left hand and arm horizontally from the cycle,

(b) a right turn by doing either of the following:

(i) extending the person's left hand and arm out and upward from the cycle so that the upper and lower parts of the arm are at right angles;

(ii) extending the person's right hand and arm horizontally from the cycle, and

(c) a stop or decrease in speed by extending the person's left hand and arm out and down from the cycle.

## Appendix 3: Examples of Signage for Regulating Cycling on Sidewalks

### City of Surrey



### BC Ministry of Transportation – Catalogue of Standard Traffic Signs



## References

- Aultman-Hall, L. and Adams, M. (no date). Sidewalk Bicycling Safety Issues. *Transportation Research Record 1636, Paper No. 98-0645*. Retrieved February 27, 2013, from <http://www.enhancements.org/download/trb/1636-011.PDF>
- Kavanagh, G. "Driveway Hazard of Sidewalk Riding". 25 Aug 2008. Retrieved April 16, 2013, from <http://www.flickr.com/photos/garyseven/2799212338/>
- Moritz, W. (1997). Adult Bicyclists in the United States – Characteristics and Riding Experience in 1996. *Transportation Research Record 1636*. Retrieved February 27, 2013, from <http://www.enhancements.org/download/trb/1636-001.pdf>
- Rauh, W. (1990), Russian Roulette on Sidepaths – Sidepaths are the Target of Criticism. p.78 of the proceedings of the Velo Secur 90 conference, Issues of Bicycling Safety, Lund University. Retrieved February 27, 2013, from <http://www.bikexpert.com/bikepol/facil/sidepath/adfc173.htm>
- Teschke, K.; Harris, A; Reynolds, C.; Winters, M.; Babul, S.; Chipman, M...Cripton, P. (2012). Route Infrastructure and the Risk of Injuries to Bicyclists: A Case-Crossover Study. *American Journal of Public Health, December 2012, Vol 102, No.12*. Retrieved March 7, 2013 from <http://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.2012.300762>
- Wachtel, A. and Lewiston, D. (1994). Risk Factors for Bicycle-Motor Vehicle Collisions at Intersections. *ITE Journal*. Retrieved March 7, 2013 from <http://www.ite.org/membersonly/itejournal/pdf/JIA94A30.pdf>