# Cycling Infrastructure in the Township of Esquimalt

Jessica Shamek, Oliver Terry, Jane Patterson, Ashley Bronaugh, David Bronaugh

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# 1. Introduction

The Township of Esquimalt is a vibrant part of the CRD, with abundant parks, a colourful waterfront, and a focus on healthy living. Esquimalt supports healthy living in part by providing infrastructure for both recreational and commuter cycling, and also aims to reduce its greenhouse gas footprint in the same way. For these reasons, Esquimalt submitted a proposal to the CRD's Ready Set Solve program to map bicycle parking within the township of Esquimalt. Knowing where their current bicycle lockup stations are located would help determine where new infrastructure is needed to reach the CRD goal of having a commuter cycling rate of 15% by 2035. This increase in cycling will reduce both traffic congestion and local carbon emissions.

Many could qualitatively list the benefits of increased cycling for a city: increased community well-being, decreased congestion, safer roads, and a modest decrease in greenhouse gas emissions. Many studies have been conducted on the benefits and risks of cycling, using such measures as statistical analysis of life expectancy and financial quantification of socioeconomic factors among others. The results of several studies concerning the benefits, risks, and ratios between the two can be found in Table 1.1. The most notable findings were that cycling can add up to 14 months to your life expectancy, that cycling can decrease cardiovascular risk factors and provide wide-ranging fitness benefits, and that increased cycling infrastructure will generate savings in healthcare and transportation. Also, many of the studies examined did not fully take into account the broader benefit to society of decreased air pollution.

A measurement commonly used in public health studies and by such organizations as the WHO is the DALY, or "Disability-Adjusted Life Year". It quantifies the years of lifespan lost due to disease, early death, or disability. It is a summation of YLL, "Years of Life Lost", and YLD, "Years Lived with Disability".

The data we originally collected included bicycle rack locations, their security, and their weather protection; winter usage of bicycle racks was also recorded. The project was then expanded under the auspices of the CRD to include recording the locations of all of Esquimalt's cycling infrastructure, such as cycling lanes, sharrows and signs. The data collected from this project will help to inform the CRD and Esquimalt about existing cycling infrastructure, and will be used in determining areas of focus for future infrastructure improvement within the Township. This will assist in building a healthy community with a strong focus on cycling for both commuting and enjoyment.

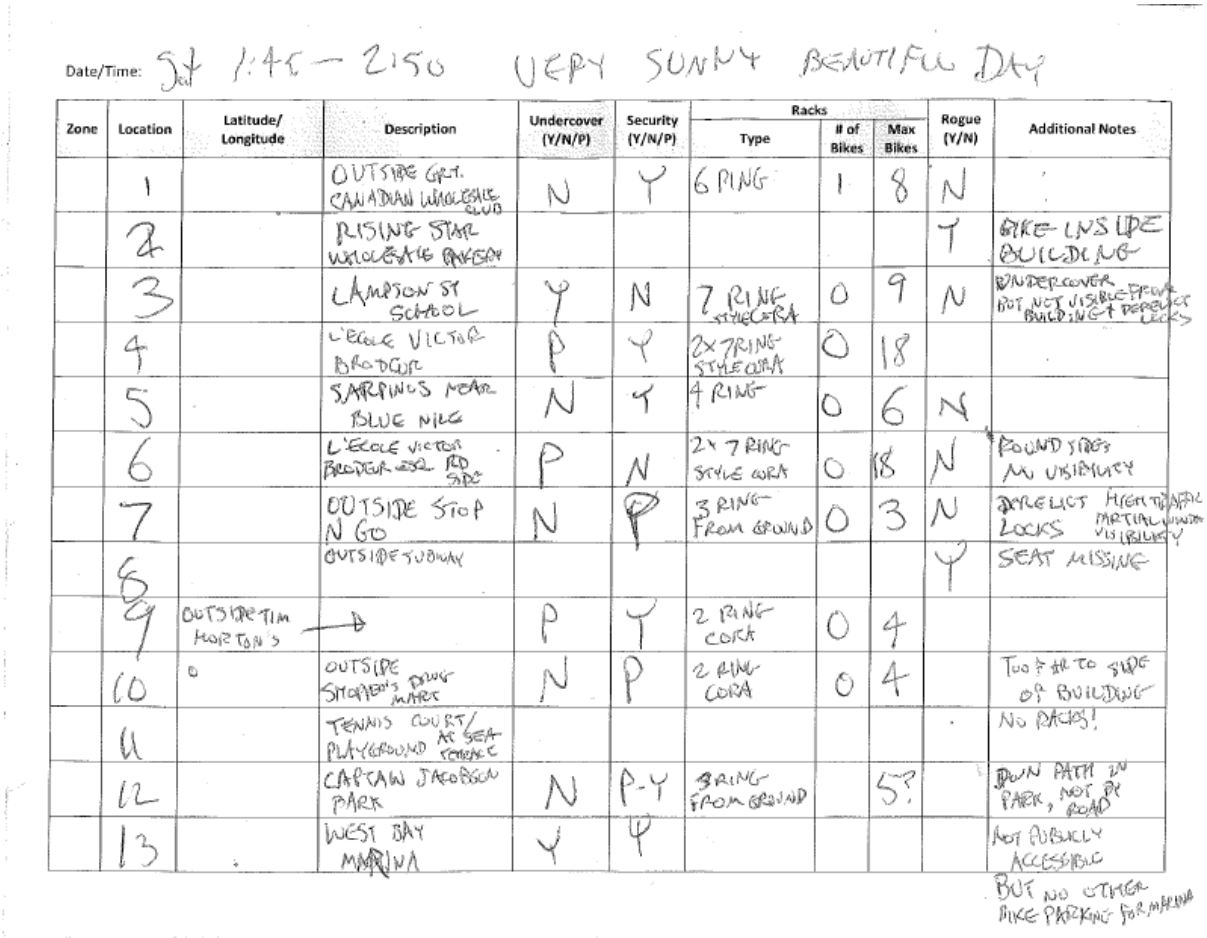
**Table 1-1: Benefits and Risks of Cycling**

| Authors | Location | Benefits and Risks | Ratio of Benefits to Risks |
|---|---|---|---|
| de Hartog et al, 2010 | Netherlands | Increased physical activity: 3-14 life months gained<br>Injury: 5-9 life days lost<br>Air pollution: 0.8-40 life days lost | 9:1<br>Note: this result omits the societal benefit of reduced air pollution |
| Woodcock et al, 2009 | United Kingdom | Increased physical activity: 528 deaths averted per million, 5496 years of life saved, 2245 years of healthy life saved; 7742 DALYs saved<br>Decreased air pollution: 21 deaths averted per million, 200 years of life saved; 200 DALYs saved<br>Increased traffic crashes: 11 lives lost per million, 418 years of life lost, 101 years of healthy life lost; 519 DALYs lost | 50:1 lives saved<br>14:1 years of life saved<br>22:1 years of healthy life saved<br>15:1 DALYs saved |
| Rabl and de Nazelle, 2011 | Europe | Increased physical activity: 1310 Euros saved per person per year<br>Public health gain: 33 Euros saved per person per year<br>Increased exposure to pollution: 19 Euros lost per person per year<br>Increased accidents: 53 Euros lost per person per year | 19:1 Euros gained<br>Note: this ratio may in reality be higher as it averages the traffic patterns and air pollution for many cities which may differ from Esquimalt |
| Rojas-Rueda et al, 2009 | Barcelona | Among the population of the BICING bike sharing program:<br>Increased physical activity: 12.46 deaths averted<br>Increased exposure to air particulates: 0.13 lives lost<br>Increased accidents: 0.03 lives lost<br>9,062,344 kg $CO_2$ emissions saved | 78:1 lives saved<br>Note: this result omits the societal benefit of reduced air pollution |
| Gotschi, 2011 | Portland, Oregon | Infrastructure investment: $138-605 million<br>Healthcare savings: $388-594 million<br>Fuel saving: $143-218 million<br>Value saved of statistical lives: $7-12 billion | 27:1 dollars saved per dollar spent on infrastructure |

# 2. Methodology

No standardized methodology for data collection exists regarding data collection for bicycle rack locations, cycling infrastructure, and bikeways. The following is a description of the data collection of bicycle racks, lanes, and cycling infrastructure for the Township of Esquimalt. The research team feels that the data collection and compilation efforts were sufficient for the quantity and type of data gathered.

Simple methods of surveying were used. The Township was first divided into three sections, with five group members, two larger sections were surveyed by pairs and one smaller section was surveyed by a single person. The survey was conducted on foot and by bike in order to get the most accurate and detailed survey possible and the data was recorded by hand onto collection sheets such as that found in Figure 2.1.



Date/Time: Sat 1:45 – 2:50 VERY SUNNY BEAUTIFUL DAY

| Zone | Location | Latitude/ Longitude | Description | Undercover (Y/N/P) | Security (Y/N/P) | Racks | | | Rogue (Y/N) | Additional Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Type | # of Bikes | Max Bikes | | |
| | 1 | | OUTSIDE GRT. CANADIAN WHOLESALE CLUB | N | Y | 6 RING | 1 | 8 | N | |
| | 2 | | RISING STAR WHOLESALE BAKERY | | | | | | Y | BIKE LNS UP BUILDING |
| | 3 | | LAMPSON ST SCHOOL | Y | N | 7 RING STYLE CORA | 0 | 9 | N | UNDERCOVER BUT NOT VISIBLE FROM BUILDING & DEPENDENT LOCKS |
| | 4 | | L'ECOLE VICTOR BRODEUR | P | Y | 2x 7 RING STYLE CORA | 0 | 18 | | |
| | 5 | | SARPINOS NEAR BLUE NILE | N | Y | 4 RING | 0 | 6 | N | |
| | 6 | | L'ECOLE VICTOR BRODEUR RD SIDE | P | N | 2 x 7 RING STYLE CORA | 0 | 18 | N | ROUND STICK NO USABILITY |
| | 7 | | OUTSIDE STOP N GO | N | P | 3 RING FROM GROUND | 0 | 3 | N | DERELICT HIGH TRAFFIC LOCKS MARTIAL ARTS VISIBILITY |
| | 8 | | OUTSIDE SUBWAY | | | | | | Y | SEAT MISSING |
| | 9 | OUTSIDE TIM HORTON'S | → | P | Y | 2 RING CORA | 0 | 4 | | |
| | 10 | | OUTSIDE SHOPPER'S DRUG MART | N | P | 2 RING CORA | 0 | 4 | | TOO FAR TO SIDE OF BUILDING |
| | 11 | | TENNIS COURT/ PLAYGROUND AT SEA TERRACE | | | | | | | NO RACKS! |
| | 12 | | CAPTAIN JACOBSEN PARK | N | P-Y | 3 RING FROM GROUND | | 5? | | PAVED PATH IN PARK, NOT BY ROAD |
| | 13 | | WEST BAY MARINA | Y | Y | | | | | NOT PUBLICLY ACCESSIBLE BUT NO OTHER BIKE PARKING FOR MARINA |

**Figure 2.1: Sample Data Collection Sheet**

To collect the locational data for bicycle racks, the GPS coordinates of every bike rack were gathered using cellphone GPS capabilities or Juno 3B handheld units, using the WGS 1984 datum. The racks were photographed and the photographs collected into a photo library with a reference number attached to each photograph for better referencing in the database. The type of each rack was noted along with nominal capacity listed by the manufacturer and the actual capacity was judged by the research team depending on placement of specific types of racks and how many bikes this allowed to be locked to the rack. Relative security was noted as judged by the research team; how safe and secure a bike would be locked to the specific rack was taken into account as well as how visible the rack was to the public. The racks were also categorized as covered if located completely under a building or structure, uncovered if exposed, or partially covered if they were near enough to a structure that some weather protection, such as an overhang, was provided. All of this data was gathered into a spreadsheet and collected with the other data gathered in the project into a database. The rack locations and attributes were mapped as XY data using ESRI Arc GIS and plotted as points with attribute tables over road and land boundary GIS layers provided to the group by the Township of Esquimalt, showing the nominal, ordinal, and integer data with attached photographs for every rack.

As well as the survey of bike racks, bikes locked to street furniture or other fixed objects that were not bike racks and not visibly located on residential private property, hereafter known as ‘Rogue Bikes’, were photographed and the GPS coordinates noted. This data was also mapped as XY data over the provided Arc GIS roads and land boundary layer.

Bicycle lanes and cycling routes as well as all cycling infrastructure associated with them were also surveyed in the same way. The GPS coordinates of the beginning and the end of every bike lane and route were collected and used with the main road layer shapefile provided by the Township of Esquimalt to draw a layer of all existing bikeways. The width of the lanes from the gutter edge of the roadway or inner lane striping to the inside of the outer lane striping in meters, the name of the road the bike lane was on, whether the bike lane existed on one or both sides of the road, and the associated signage or stencils were noted and catalogued into the database with each bikeway. All cycling associated signs and stencils were photographed and their GPS coordinates gathered. The photos were gathered into a photo library with a reference number associating them with a cycling lane, or if not located on a cycling lane the road name was noted. The signs and stencils were mapped in the same way as the bike racks, as XY data in Esri ArcGIS over the road and land boundary layer with the cycling lanes.

# 3. Policy Context

## 3.1 CRD Pedestrian and Cycling Master Plan

The Capital Regional District's (CRD's) Pedestrian and Cycling Master Plan is the strategic guide for a shift towards multi-modal transportation throughout the CRD [pp.1 para 1 of the Executive Summary]. With the assistance of the municipalities within the CRD, this shift is likely to be accomplished [pp.1 para.1]. The CRD's vision for cycling within Greater Victoria is summarized as follows:

> "The Capital Region will be a truly livable and environmentally sustainable community, where walking and cycling are key components of an innovative and integrated transportation system. Citizens of all ages in all parts of the region will find active travel irresistible on a seamless network of Class I on- and off-street facilities appropriate for users of all abilities. In 2038, the CRD will be lauded for its mode share for cycling of 25% in urban areas and 15% region wide and 15% mode share for pedestrian travel.
> Goal 1: More walking and cycling.
> Goal 2: Safer walking and cycling
> Goal 3: More places to walk or cycle" [pp.1]

The CRD has built a cycling network linking communities throughout the Greater Victoria area. These connector routes serve the entire cycling community with attractive signage and cycle ways for all ages and abilities [pp.2 para. 1-3]. Through education, encouragement, having safe cycling routes, improving facilities and rewards for sustainable living, the CRD will promote cycling as a method of commuting and recreation [pp.2 para 4]. To aid in achieving a more active, and sustainable way of living, the CRD has come together with planners, decision makers, and municipal and regional advocates to build a Pedestrian and Cyclist Master Plan. To accomplish the goals set in the Pedestrian and Cyclist Master Plan, Priority Actions have been developed to ensure the success of the plan.

The Priority Actions are (quoted directly from Pedestrian and Cycling Master Plan):

- Adopt the Primary Bikeway Network, Classifications and Typologies as a Regional Plan.
- Work with member municipalities to fund the priority projects.
- Work with municipalities and disability advocacy agencies to ensure good universal pedestrian design, particularly in areas identified as high pedestrian use.
- Make the Design Guideline document available to member municipalities; regularly update the document in cooperation with staff.
- Establish a Signage Committee to review and revise the Draft Sign Guidelines (Section 5 of the Design Guidelines) for a recommended regional standard.

- Work with BC Transit and member municipalities to install secure bike lockers at priority transit locations.
- Establish a task force that seeks to improve and amend existing provincial laws in support of safer cycling and walking conditions.
- Collaborate with partners in the development of a volunteer-driven manual count strategy for the Region.
- Convene a Pedestrian and Cycling Advisory Committee made up of CRD and municipal staff, as well as community representatives.

## 3.2 Cycling in Esquimalt: Official Community Plan

Esquimalt's Official Community plan states that the aim of the residents of Esquimalt is to "enhance our quality of life; enjoy health and safety; build upon our cultural heritage; revitalize our community; protect our natural environment and foster our diversity." Cycling options in Esquimalt are an integral part of achieving these objectives.

Esquimalt has one of the highest ratios of jobs to residents [pp.5 s1.4] within the CRD, which causes high traffic within Esquimalt. As of 2004, an estimated 17,100 people live in Esquimalt [pp.7 s1.4]. With the CRD's population expected to increase by 11.3% by 2015 [pp.5 s1.4], traffic within Esquimalt may also increase significantly. The Township of Esquimalt is therefore promoting the use of public transit [pp.25 s.3], employing multi modal street design, and making infrastructure more accessible [pp.33 s4.1.2c]. Promotion of public transit and multimodal transportation should help to minimize traffic through neighbourhoods, promote a more peaceful setting, reduce environmental impacts and create a safer cycling network. This cycling network will connect Esquimalt with adjacent communities within the CRD [pp.33 s4]. The CRD has set a target of having a minimum cycling population of 15% by 2026 [pp.36 s4.3.2]. Esquimalt's investment in infrastructure will assist in meeting this goal.

To assist in encouraging cycling as an option for commuting and pleasure, Esquimalt has taken into consideration the need of cyclists in road design. As Esquimalt rebuilds and redesigns its infrastructure, Esquimalt will eventually make all roads, including connector roads, accommodating of bicycles [pp.33 s4.1.2]. Using the CRD's Regional Transportation Strategy and UVic's Bicycling Strategy, and with the assistance of a cycling advisory task force, the Township of Esquimalt will make decisions regarding the expansion and improvement of its cycling infrastructure [pp.36 s4.3.2]. The six main goals of the task force are: to give cycling a presence and profile at city hall, to promote Bicycling as a viable transportation alternative, to incorporate bicycle friendly guidelines into road design guidelines, to focus on "core network" of on-street and off street routes, to improve end of trip facilities and to enhance the bicycle network and funding strategy [pp.36].

# 4. Results

## 4.1 Bike Parking Supply, Bike Ways, and Infrastructure

Figure 4.1 is the rider's map that will be made available to the public; it shows the existing bike parking supply for Esquimalt. Many businesses and most shopping plazas in Esquimalt provide bike parking. The same cannot be said for Esquimalt's parks: bike racks were not present in most parks, which would otherwise be perfect destinations for recreational cyclists.

## 4.2 Bike Ways and Infrastructure

Figure 4.2 shows the locations of infrastructure, both signs and stencils.

As shown in Figure 4.1, the bike route network, although it goes to most major destinations, remains rather fragmented, and the observed bike routes varied markedly from the bike routes as outlined in the CRD's provided GIS layers. Of particular concern was that CFB Esquimalt, the largest employer in the region, does not have a bike route linking it with any other destinations. Completing the bike lane running along Admirals Road would link CFB Esquimalt with the existing bike network, and would also link the bike routes along Esquimalt and Craigflower Roads. Figure 4.3 shows the recommended separation and planned bicycle routes as outlined in the CRD's PCMP.

Previously surveyed bikeways differed from what was found by the survey team for this report as seen in Figure 4.4. The 2011 Bikeways survey stated that there was a separated bike lane on Head street where the research team found no bike lane to exist. An existing bike lane not noted, however, was found on Admirals Rd from Naden St to Lockley Rd. The bike lane on Esquimalt Rd was found to extend from Dominion to Park Pl with sharrows effectively populating portions of the lane that were segmented by other infrastructure.

Several decommissioned bikeways existed, many of which had been incompletely removed. This included lanes on Admirals from Esquimalt Rd South, the entire length of Lyall St, and the southern tip of Head St as seen in Figure 4.5. Some had been painted over, but weathering of the paint had occurred and the bikeway was partially visible. This is confusing to both cyclists and drivers, and more thorough removal of decommissioned bikeways must be undertaken.

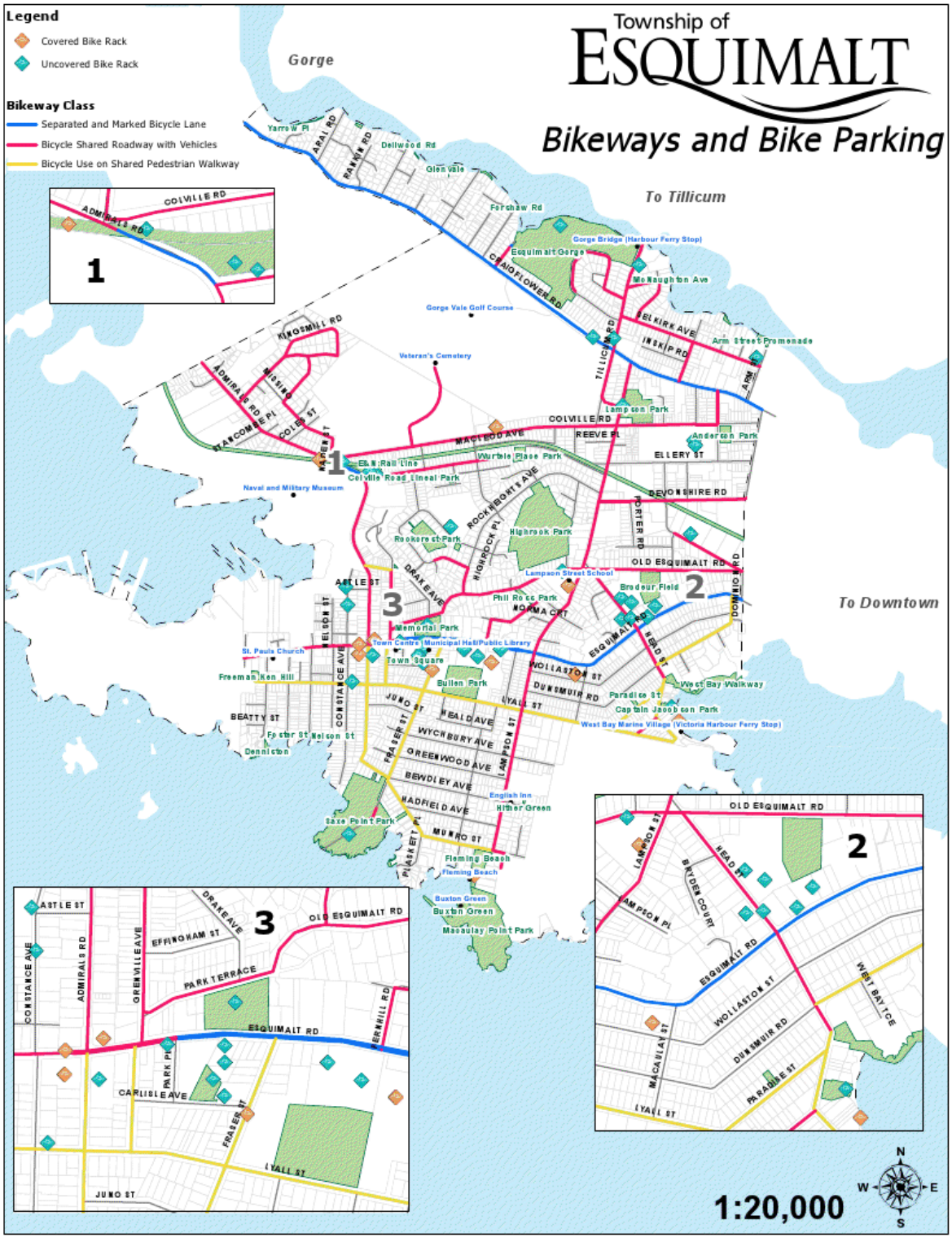



**Figure 4.1: Public Rider's Map with Existing Bikeways and Bike Parking**

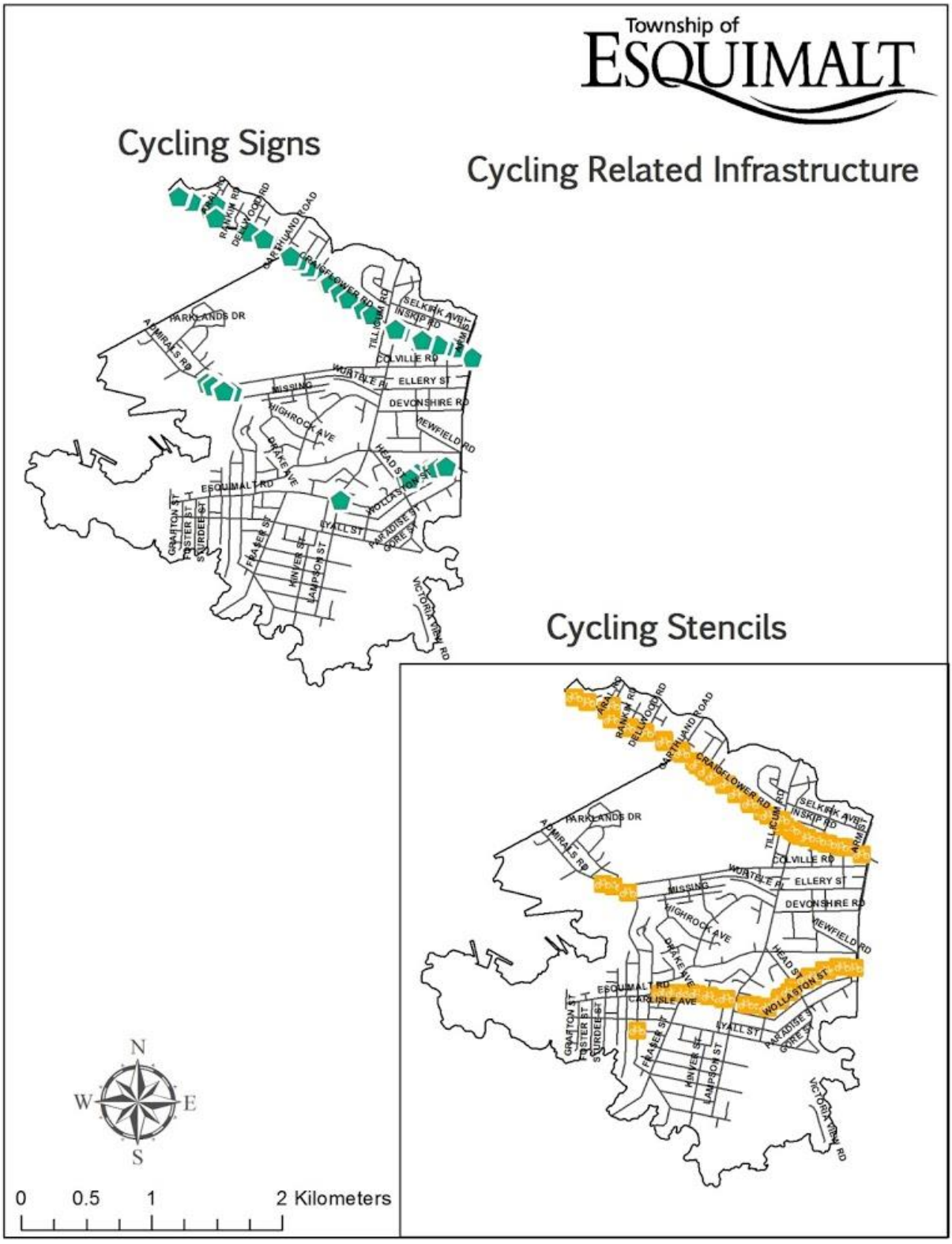



**Figure 4.2: Cycling Related Infrastructure**

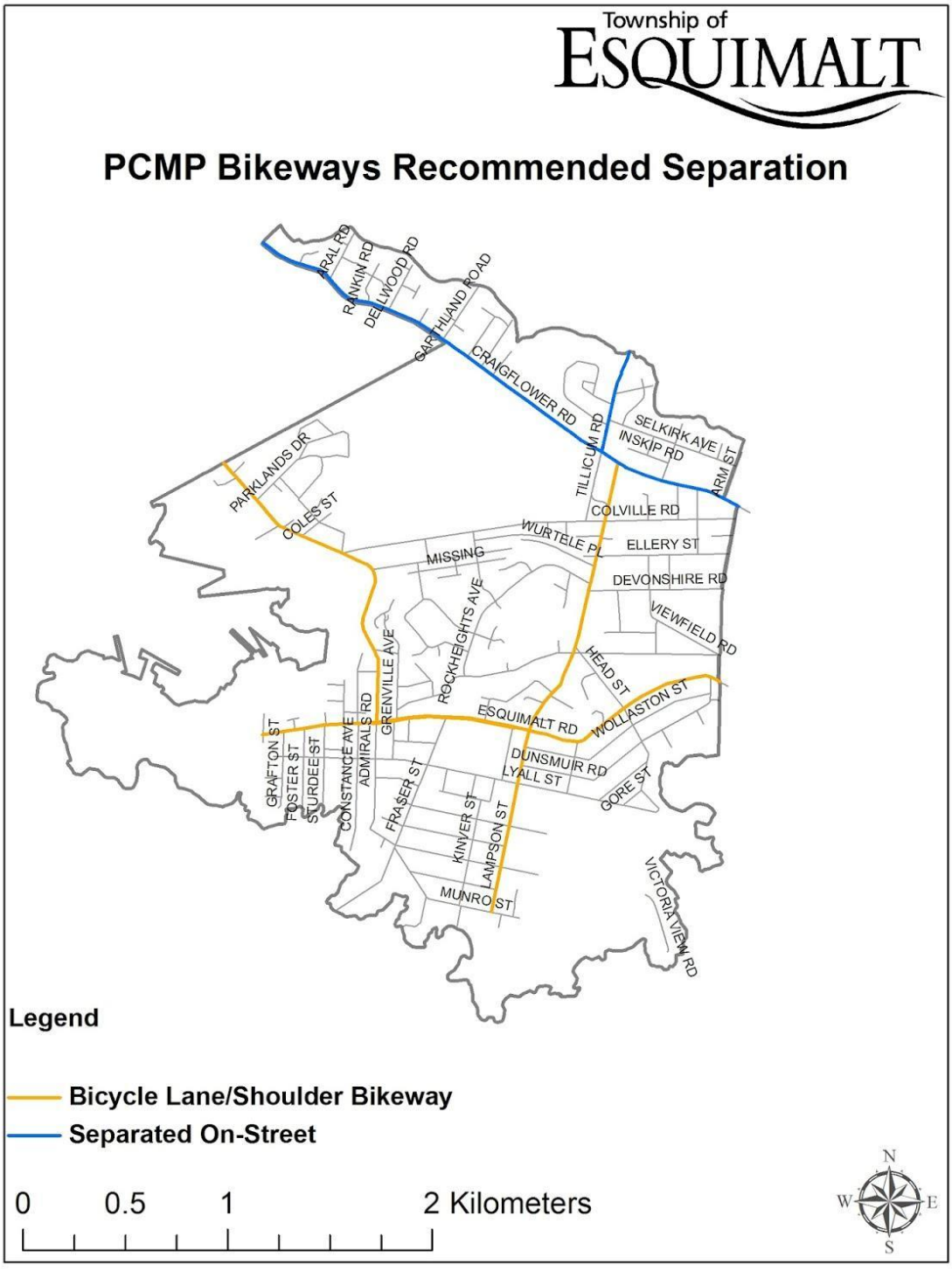



**Figure 4.3: PCMP Recommended Separation of Bikeways in Esquimalt**

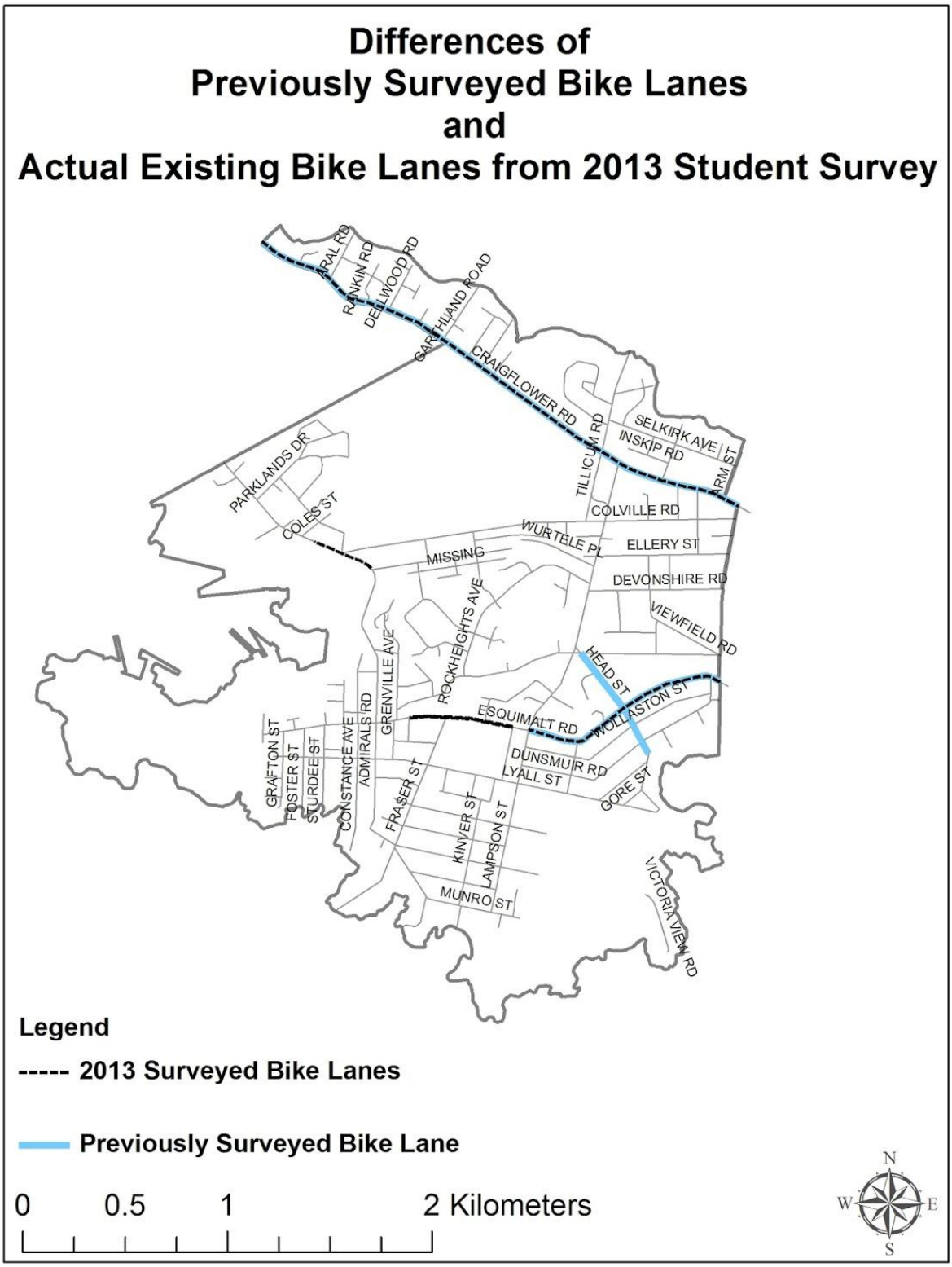



**Figure 4.4: Differences**


**Figure 4.5: Defunct Lanes**

# 5. Discussion

### 5.1 Bicycle Parking Best Practices

Many different types of rack were used to supply bike parking in Esquimalt. These ranged from concrete blocks to painted, welded steel racks. A summary of the rack styles encountered can be seen in Table 5.1, below. Sources for the pricing on these racks are cited in the references.

**Table 5.1: Rack Types Encountered in Esquimalt**

| Rack Type | Security | Maximum Capacity | Number of Racks | Percentage of Racks | Cost |
|---|---|---|---|---|---|
| Cora Style | Excellent | Varies | 26 | 61% | $495 and up |
| Inverted U | Excellent | 2 | 10 | 23% | Unknown |
| Post and Ring | Excellent | 2 | 2 | 5% | $250 |
| Ring | Excellent | Varies | 1 | 2% | up to $495 |
| Ribbon | Excellent | Varies | 1 | 2% | Unknown |
| Concrete Block | Poor | Varies | 3 | 7% | Unknown |

Security of a rack depends partly on the materials used in its construction and in its design. All of the racks deemed to be of excellent security have a solid metal construction, and offer multiple locking points to accommodate a variety of bikes. The concrete block type rack has the limitation of only accepting cable locks which, according to bikeoff.org, are especially vulnerable to cutting - a few minutes with a pair of wire cutters is all that is needed. U locks and armored cable locks offer a much higher degree of security; all new rack installations should accommodate these types of locks.

Another area of concern is how the rack itself is secured. Many racks are bolted to the ground and can be removed. This poses more of a problem for some rack types than others. A bike thief

is unlikely to steal a heavy Cora style bike rack along with the target bike; however, the inverted U type of rack used by the Township of Esquimalt can be unbolted, fed through the lock and removed entirely from the bike. As one might expect, cyclists are leery of locking their bicycles up to racks which are not bolted down or which are inadequately secured. This can be avoided by making good rack choices ahead of time, and mitigated by checking bicycle racks from time to time to ensure their security, by using tamper-proof bolts, or by embedding the rack into concrete.

Even if a rack is designed securely and fastened securely to the ground, it is essential that it be situated in a secure location. High-traffic locations or those visible from within the building they are associated with will also deter bike theft. According to John Luton's *Bicycles at Rest*, if a bike rack is located in a location deemed unsafe by cyclists, it may be ignored in favour of more visible fixed objects such as street signs. When this occurs, damage to the objects in question and congestion of sidewalks may occur. Figures 5.1 and 5.2 show examples of bike racks with excellent intrinsic securities, which are rendered less secure by their placement in less visible areas.

**Figure 5.1: Cora Style Rack at Macaulay Point Park**

**Figure 5.2: Cora Rack in Insecure Location**

Location also matters for weather protection, and is frequently not considered. In Esquimalt, only 19% of racks are fully protected from weather; 24% have some level of weather protection; and the remainder have no protection at all. People who cycle in rainy and wet conditions will favour covered bike racks over uncovered ones, and having bike parking such as this will encourage more cyclists to ride in bad weather.

Most racks will have a very long lifespan, especially if situated under cover. The Cora bike rack bike rack company's website states that their racks are subject to a twenty year guarantee against defects in workmanship and materials. The bicycle rack shown in Figure 5.1 shows the extreme durability of such styles of rack in hostile environments; this rack was situated very near open salt water, and although very rusty, was structurally sound.

Of course, many who commute to work will choose to put their bikes inside for greater security and less weather exposure. These same people are more likely to use their bicycles as transportation for recreational activities as well as commuting, and will likely use public cycling facilities.

## 5.2 Bicycle Way Best Practices

Bike lanes are an integral part of a healthy and well-used bicycle infrastructure network. In a comprehensive study covering the causes of hospital visits for cycling accidents, Teschke et al. observed that 49% of accidents were a result of direct contact with a vehicle. Other significant factors which reduced risk were, in the order of greatest to least reduction of risk; the presence of a separated bike lane, the presence of a bike lane with traffic diversion or slowing, and the presence of a bike lane. A downhill grade and streetcar or train tracks were also associated with a large increase in risk, as was construction.

A 2010 opinion survey by Winters and Teschke showed that the types of road most popular among cyclists are dedicated bike lanes or paths, multi-use paths, and finally, local street bike routes with traffic calming; the results of this study are summarized in Figure 5-3. According to a 2012 study by Winters, Teschke, et al, these route preferences correlate strongly with the most safe types of route for cyclists.

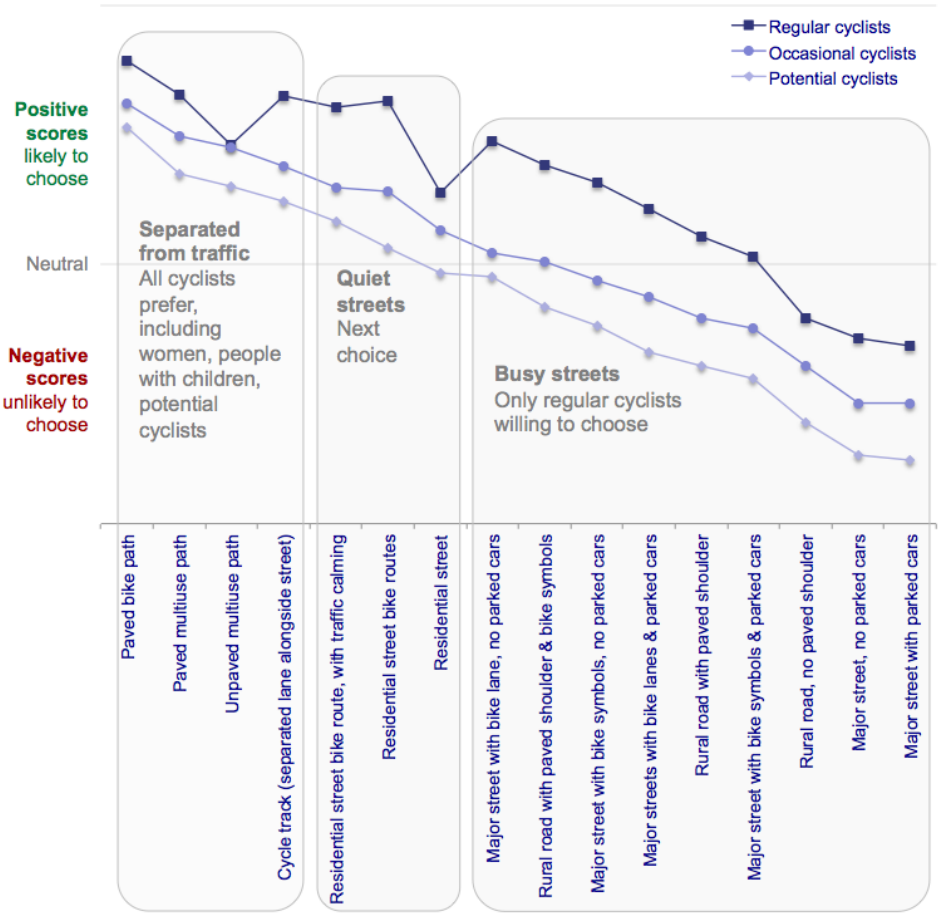



**Figure 5.3: Cyclist Route Preference**

In Esquimalt, we observed bicycle lanes on high traffic streets (notably on Esquimalt Road and Craigflower Road) bicycle sharrows on high traffic streets, and traffic calming devices on less-travelled local streets.

According to Figure 5.3, only regular cyclists are likely to use the bike routes such as those on Esquimalt and Craigflower, as the high amount of traffic, greater incidence of trucks and other large vehicles, and close proximity to cars can be intimidating to many cyclists. In the case of the bike lane on Esquimalt Road, the bike lane has numerous breaks, and at several points the bicycle lane is located between the roadway and bus stops or on-street parking. According to Teschke et al, a greater amount of potential interaction between cyclists and vehicles will lead to an increase in accidents.

The width of the bike lanes varied from approximately 1.0 to 1.4 m. Many sections of the bike lanes seemed to include the gutter at the extreme edge of the road as part of the bike lane. This section of the roadway tends to be rougher, to collect detritus and often contains storm drains, as shown in Figure 5.4. This decreases the usable width of bike lane by a significant margin. There were a few sites where manhole covers were situated in the bike lane. When metal surfaces such as these are wet, they become very slick. While this may pose little risk for cars and trucks, this is especially dangerous for cyclists, who have relatively thin tires and a small contact patch with the ground.

**Figure 5.4: Detritus and Storm Drain in Gutter**

All bicycle routes were bounded by striping, contained stencils, and were marked with signs. However, some parts of these routes contained a huge amount of signs and stencils; an example of this is the bike lane on Esquimalt Road between Dominion and Head. This is fantastic, but as this is a well-lit area, such a large amount of infrastructure may be unnecessary. The same bike lane, from Head to Lampson, contained almost no signs, and what few stencils there were, and some of the striping, had been worn by traffic and road resurfacing. This stretch of road, which contained a sharp curve and was less well-lit, would be much improved and safer for cyclists with more signs and stencils. To sum up, there are plenty of lane-marking infrastructures, but it would benefit cyclists to have them more evenly spaced. A good example of this is the intersection of Colville and Admirals; although a confusing intersection, containing train tracks and the intersection of half a dozen streets, the bike lanes are clearly marked, to the benefit of both cyclists and drivers.

The CRD's PCMP outlines recommended separation of cyclists from traffic for various road types. For arterial roads, the recommended separation is a separated and marked bicycle lane; for collector roads, a bicycle lane or "shoulder bikeway". In terms of cyclist safety, and especially on an arterial road, a separated bicycle lane is perfect. For separated bikeways, it is essential that adequate signage is provided to reassure cyclists of their safety, and to warn drivers of the presence of cyclists.

On some local streets, we observed traffic calming devices called "Speed Cushions". These were similar to a regular "Speed Hump", but with a gap in each lane, presumably to provide an unobstructed path for cyclists while forcing motorized vehicles to reduce their speed. Examples of these can be found in Figures 5.5 and 5.6. These measures on less-travelled local streets such as Old Esquimalt road, which often feature lower speed limits, result in the type of route that many cyclists prefer to use in the absence of a bike-only path. Of note is the fact that older traffic calming devices such as those on Wollaston, Dunsmuir, and Paradise roads were "Speed Humps"; those on Old Esquimalt Road were "Speed Cushions", and were likely more recently added due to their newer condition and the fact that they are not visible on Google Street View. This indicates that the Township of Esquimalt is adding new infrastructure with the aim of encouraging cycling, as outlined in its OCP.

**Figure 5.5: Example of a "Speed Cushion" on Old Esquimalt Road**

**Figure 5.6: Example of a "Speed Hump" on Dunsmuir Road**

In order to encourage cycling, it is essential to plan for the needs of the cyclist, and especially for the needs of the more tentative potential cyclist. Although special measures need to be taken, these will be offset by a decrease in traffic incidents and an increase in the number of cyclists, resulting in a variety of benefits for the community.

## 5.3 Other Cycling Infrastructure

Other cycling infrastructure which might encourage cycling in Esquimalt includes electric bicycle charging stations and public bicycle repair stations.

Electric bicycle charging stations, though of great use to owners of electric bicycles, are of limited use to the general cycling public. Furthermore, some difficulties exist in their implementation. Electric bikes of different brands use different power adapters for charging. To prevent theft, damage, or tampering, a purpose-built, secure and undercover facility would have to be built. This could possibly be combined with a more general-purpose electric vehicle charging station. Electric bike charging stations are of much more use in a bike-share program, as all of the bicycles in such a program would use the same charger, allowing them to be secured to the facility. Until such a program is available in Greater Victoria, electric bike charging stations are likely not financially feasible.

Public bicycle repair stations can be found in many cities in Europe, across America, and in several Canadian cities, including in Victoria. In Canada, these are often first introduced on university campuses; a bicycle repair station at Camosun College's Interurban Campus is shown in Figure 5.7.


**Figure 5.7: Public Bicycle Repair Station at Camosun College Interurban**

These stations feature the tools most commonly needed for simple bike repair, a pump, and a means to support the bike while it is being fixed. This bicycle repair station is manufactured by Dero, and features tools held using tamper-proof fasteners, and a variety of weather-proofing finishes including powder coating, thermoplastic, and galvanized or stainless steel. The Dero Fixit stand also features a QR code, which when scanned with a smartphone will direct the user to a website outlining how to perform various simple bike repairs. These stands are best situated in high-traffic areas, such as cycle route junctions or transport exchanges.

Bicycle repair stands can further encourage cycling in the presence of cycling routes and other cycling infrastructure. Public events such as Bike to Work week and courses at local businesses spread greater public knowledge on bike tool use and basic bicycle maintenance. Offering publicly available bicycle tube patch kits and maintenance tools on trailways would give riders more support, making cycling a more attractive option for commuting and recreation.

## 5.4 Barriers to Cycling Adoption

Cycling is very feasible for most Canadians; according to Teschke and Winters, more than 80% of us live relatively close to at least one common destination and over half of us already own bikes. This is especially true for Greater Victoria, which boasts a moderately mild climate year-round and has many excellent cycling routes.

In a 2008 survey of more than 1400 people deemed to be regular, frequent, occasional, or potential cyclists, Teschke et al found that the main motivators to cycling were

- the route has beautiful scenery
- the route has bicycle paths separated from traffic for the entire distance
- the route is flat
- cycling to the destination takes less time than travelling by other modes
- the distance to my destination is less than 5 km
- I can make the trip in daylight hours
- I can take my bike on the Skytrain at any time
- a 2-way off-street bike path has a reflective centre line for night and poor weather cycling
- secure indoor bike storage is available at my destination

The main deterrents were

- the route is snowy or icy
- the street has a lot of car, bus, or truck traffic
- the route has glass or debris
- vehicles drive faster than 50 km/h
- the risk from motorists who don't know how to drive safely near bicycles
- the risk of injury from car-bike collisions
- it is raining
- the route has surfaces that can be slick when wet or icy when cold
- the route is not well lit after dark
- I need to carry bulky or heavy items

Many of these are easily surmountable in Esquimalt. As a relatively small municipality near the water and graced with a public transit system accepting of bicycles, Esquimalt is a beautiful and convenient place to cycle. Of course, some deterrents to cycling adoption are uncontrollable, such as weather, the limited carrying capacity of bikes, and the physical exertion required, but by increasing the amenities available to potential cyclists in the form of more and better bike lanes, bicycle parking, and other bicycle infrastructure, more people can be encouraged to cycle.

# 6. Conclusion

Esquimalt is an excellent place to cycle, and in conjunction with the Capital Regional District is actively planning future infrastructure choices to accommodate pedestrians, cyclists, and other non-vehicular traffic on its roads.

To further improve Esquimalt as a place welcoming of cyclists of all skill and comfort levels, it is necessary to get the opinion of cyclists, and to look at case studies of successful cycling infrastructure in other cities. The results of studies such as these include

- Planning cycling-only routes, or cycling routes on less-travelled local roads with traffic-calming devices, which are proven to be the safest and most popular types of route for cyclists.
- Improving the continuity of the bike network by linking existing and future bikeways and trails, and completing the E&N Rail Trail.
- Increasing the amount and diversity of infrastructure available to cyclists, such as public bike racks and public repair stations.
- Placing public bike parking near recreation sites such as parks and beach access points, to encourage cycling and to increase the use of these facilities.

Measures such as these will increase the mode share of cycling, and will lead to fewer traffic incidents involving cyclists. Other benefits include a modest decrease in greenhouse gas emissions, less congestion, decreased road wear and thus lower roadway maintenance costs, and for those who take up cycling, greater health and statistically greater life expectancy.

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