Reimagining the Complete Street

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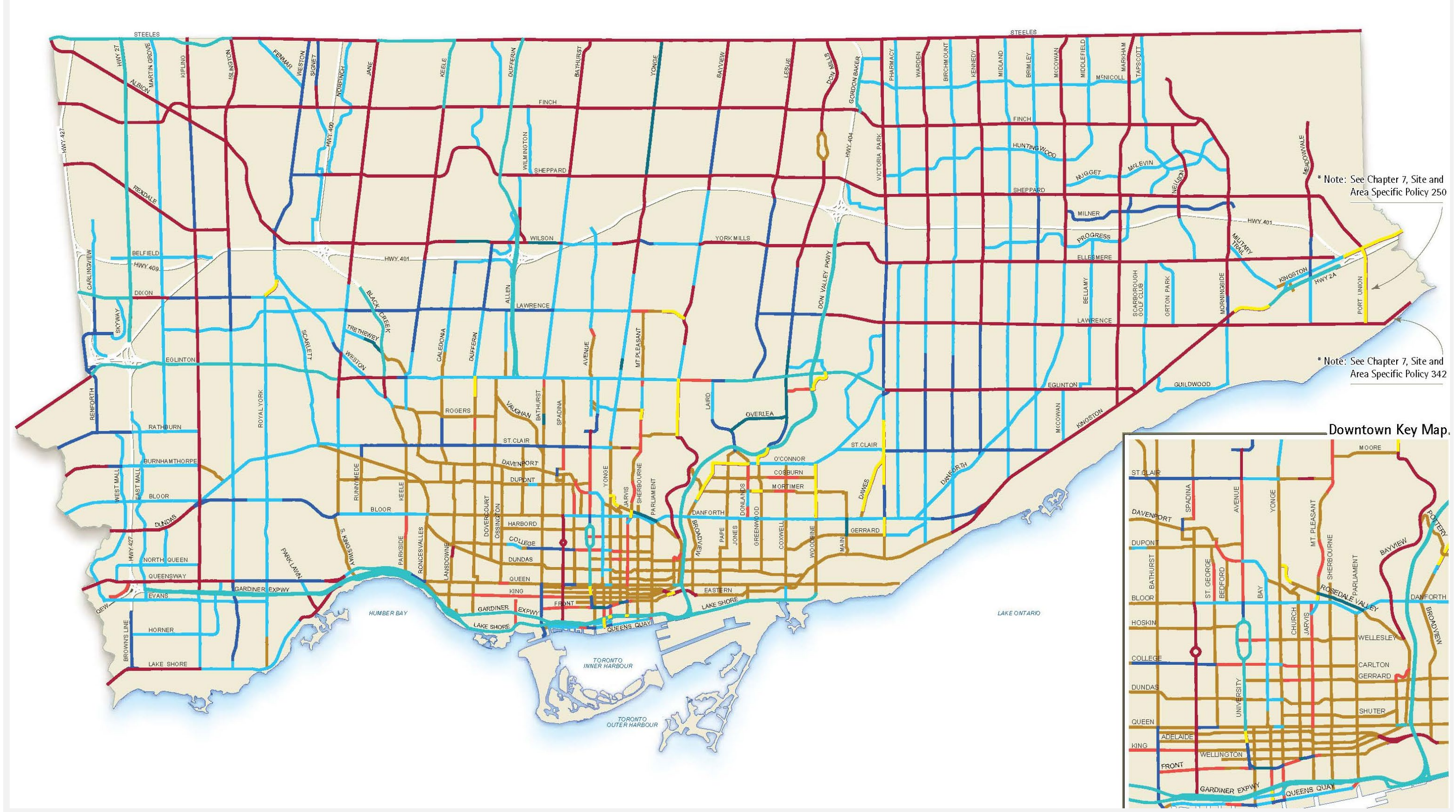
Streets in Toronto

Cities are filled with streets, and Toronto is no exception! Toronto has 5,600 km of streets. This is roughly equivalent to the distance from Toronto to Whitehorse. Streets take up approximately one-quarter of the land in Toronto.

Our streets vary in their use and size – from local neighbourhood roads, to wide, fast-moving arterials. The map on this page indicates the right-of-way widths of major streets in the city. Notice the large number of wide streets in certain parts of the city such as Etobicoke, North York and Scarborough, compared to the narrower roads in Old Toronto.

One thing many of our streets have in common is that they prioritize the movement of private automobiles. Through various design interventions, the opportunity exists to create *complete* and *green* streets that contribute to our city's ecological resilience and sustainability, and that help promote active transportation.



45 metres and over | 33 metres | 27 metres | 20 metres
36 metres | 30 metres | 23 metres | Non-uniform width

Right-of-way widths associated with existing major streets in Toronto (Toronto, 2010)

Complete Streets ≠ Green Streets

Complete Streets

Complete Streets are streets that are designed to be safe for everyone: people who walk, bicycle, take transit, or drive, and people of all ages and abilities. Instead of singularly prioritizing the movement of vehicles, they prioritize a multiplicity of street uses and modes of transportation (Complete Streets for Canada, n.d.).

Green Streets

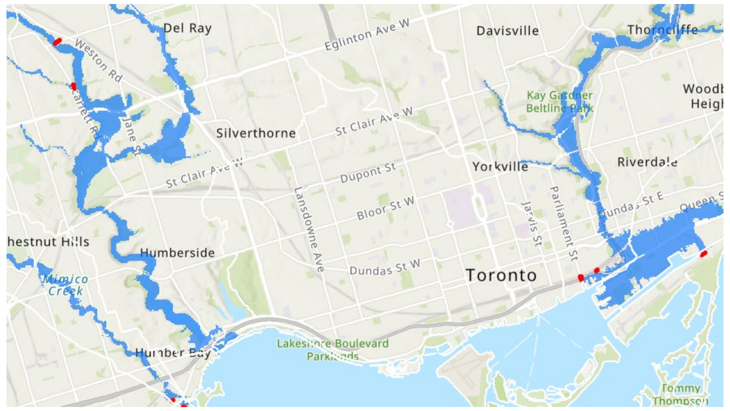
Green Streets are streets that incorporate green infrastructure, including natural and human-made elements such as trees, green walls, stormwater management systems and other low impact development (LID) interventions that provide ecological and hydrological functions (City of Toronto, n.d.).

Streets and Sustainability Issues

Toronto's streets are vital for moving people and goods through the City. However, most streets are designed at the expense of environmental sustainability, pedestrian safety and multi-modal transit. Let us take a closer look at the issues our streets present today.

Impermeable Surfaces

Runoff occurs when stormwater is unable to absorb into impervious surfaces, including pavement, shingled roofs, cement surfaces and more. This raises several environmental and safety concerns. Impervious surfaces facilitate stormwater runoff which increases the risk of flooding. Street users are often the first people affected by flooding when stormwater accumulates (NACTO, 2021). Furthermore, runoff often carries toxic chemicals which end up in our river systems, and eventually, Lake Ontario. This causes damaging effects on water quality and wildlife habitats (Environment and Climate Change Canada, 2013).

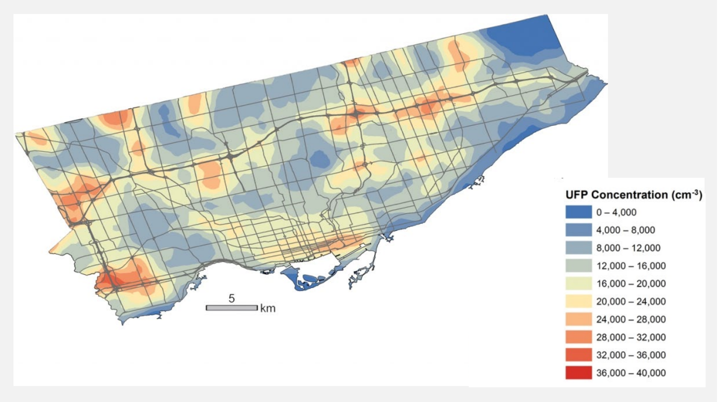


Floodplain map of Toronto (TRCA, n.d.)

Impervious surfaces cause stormwater to carry contaminants that affect local ecology (Glen, 2016)

Transportation Emissions

Transportation accounts for 36% of total greenhouse gas (GHG) emissions in our city, second only to emissions from buildings (City of Toronto, 2019). Transportation emissions are caused by personal and commercial vehicles, busses, commuter rail and some marine navigation. On-road vehicle emissions account for 97% of all transportation-related GHG emissions, and 73% of on-road vehicle emissions are caused by private cars and trucks. GHG emissions reduce air quality and are harmful to public and environmental health.

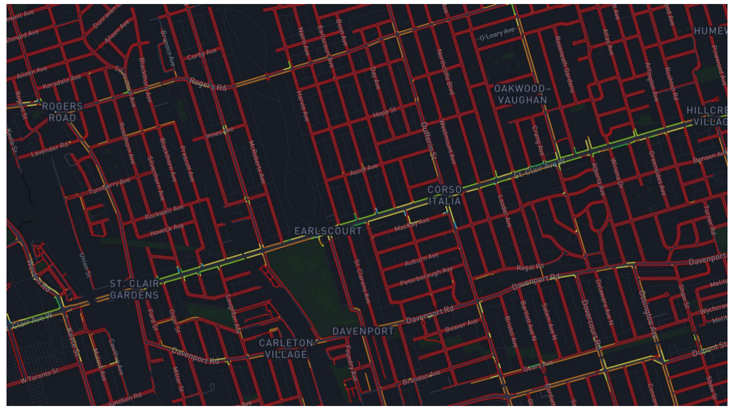


Heatmap of ultra-fine particles in Toronto (Evans, 2015)

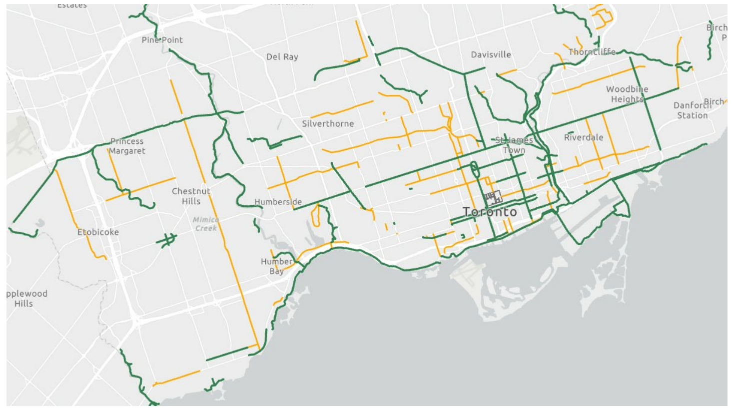
Traffic emissions may pollute 1 in 3 homes (Evans, 2015)

Pedestrian and Cyclist Safety

Increasing the portion of trips made by cycling or walking can help reduce carbon emissions and improve population health – and it can be more fun! However, these modes of transport are limited due to lack of safety. This includes missing or narrow sidewalks, a lack of protected cycling infrastructure, and the risk of being hit by dangerous motorists. As COVID-19 has made clear, sidewalks are also often too narrow to enable safe physical distancing. For more people to feel comfortable and safe walking or biking, streets need to be fundamentally redesigned.

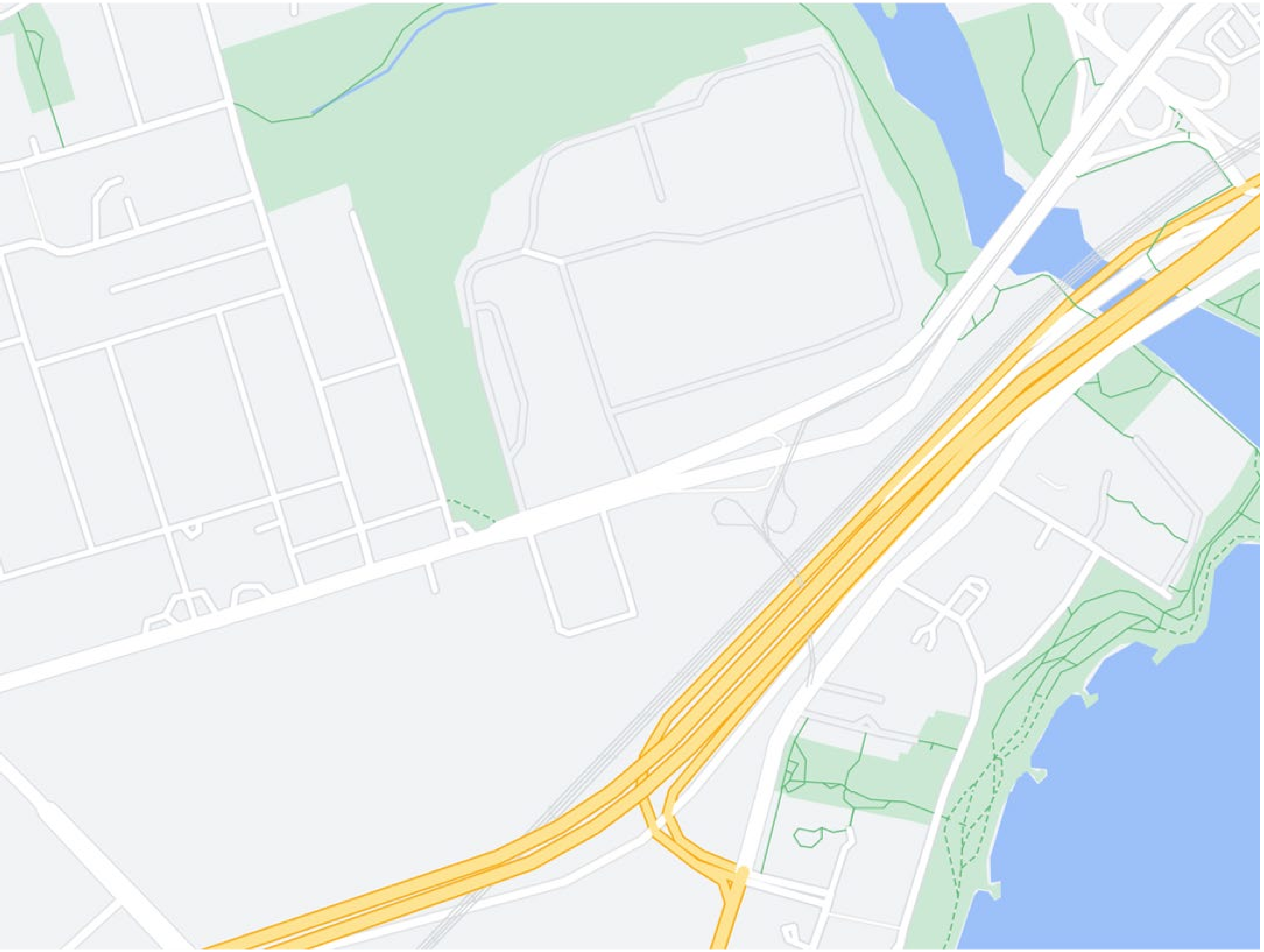


Sidewalk widths – red means sidewalks are too narrow for social distancing (Sidewalk Widths Toronto, n.d.)



Toronto cycling infrastructure: green is protected cycle tracks & multi-use trails; orange is unprotected bike lanes (City of Toronto, 2021)

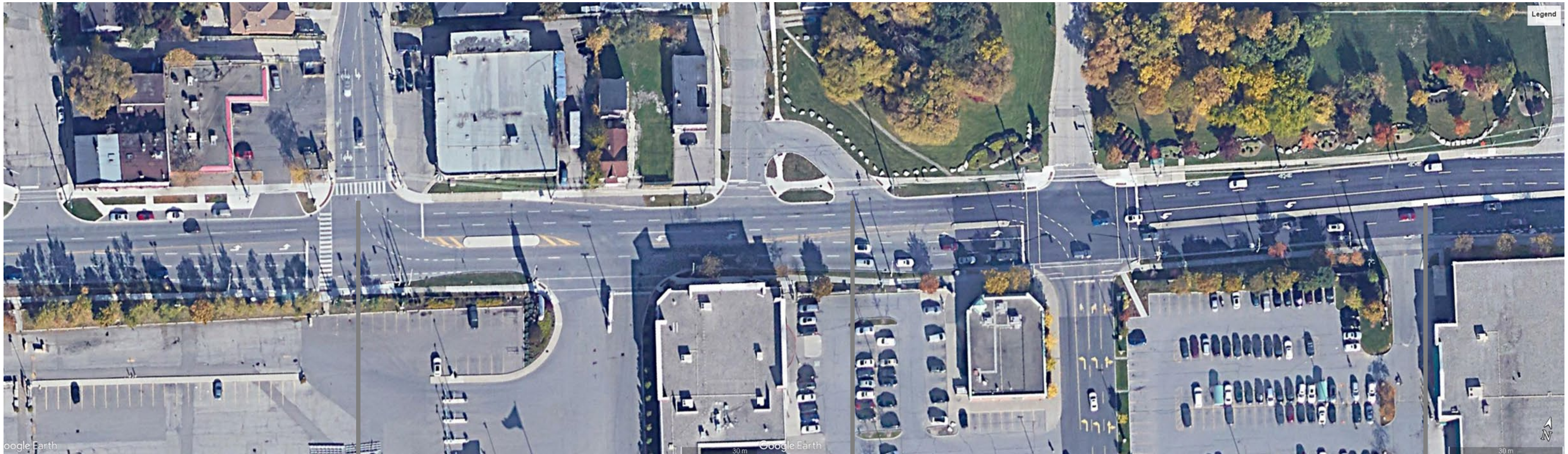
A Toronto Street in Action – The Queensway



Now let us examine how the outlined street-related sustainability issues manifest in our city. **The Queensway** is an approximately 18-kilometre east-west arterial road in the Cities of Toronto and Mississauga. It runs between Roncesvalles Avenue (Toronto) and Glengarry Road (Mississauga) and is the western extension of Toronto's Queen Street. It provides a useful case study, demonstrating where purposeful interventions have the opportunity to improve resilience, public realm, multi-modal transportation, advance United Nations Sustainable Development Goals, and provide an example for future interventions on other streets across the City. Our analysis focuses on an approximately 250 metre section of the roadway between the commercial plaza at 125 The Queensway and the intersection at Smithfield Drive.

The Queensway

Here is an aerial view of The Queensway between Smithfield Drive and 125 The Queensway. This site is west of the Humber River in Etobicoke. The streetscape and physical features vary slightly along the identified 250-metre stretch. The details below describe the roadway context in three segments.



Smithfield Drive to Stephen Drive (75 metres)

There are four vehicular lanes (two eastbound and two westbound). There is one dedicated left turning lane for Stephen Drive. There is one bus bay on the south side of the street at Stephen Drive. There are approximately eight parallel parking spaces on the north side of the street in a paved layby adjacent to the sidewalk. There are sidewalks on both sides of the street and a grass boulevard exists in some areas. The north side of the street is characterized by one- and two-storey commercial buildings and a parking lot. The south side of the street is lined by the Ontario Food Terminal.

Stephen Drive to High Street (100 metres)

Four vehicular lanes continue, with two lanes in each direction. An approximately 40 metre long median separates east and westbound traffic. Half of the median is painted on the road and half is a raised concrete slab. There are sidewalks on both sides of the street and a grass boulevard exists in some areas. The north side of the street is characterized by a single-storey car dealership and two commercial buildings. There is one dedicated left turning lane for the Ontario Food Terminal entrance on the south side of the street. There is a single-storey Shoppers Drug Mart east of the Ontario Food Terminal entrance lining the sidewalk.

High Street to 125 The Queensway (75 metres)

Four vehicular lanes continue, with two in each direction. There is one dedicated left turning lane for the Humber Wastewater Treatment Plant entrance. There are sidewalks on both sides of the street with a grass boulevard. There is a Toronto Bike Share station. At High Street, there is a traffic loop. The remainder of the north side is land adjacent to the Humber Wastewater Treatment Plant with grass and trees. The south side is characterized by a commercial plaza with a sprawling parking lot.

The Queensway Complete Street

This rendering displays what The Queensway could look like if the City's Complete Street proposal is adopted and constructed.

The Queensway Rendering (City of Toronto, n.d.)

The Queensway Complete Street Proposal

The City of Toronto is proposing improvements to the identified section of The Queensway for construction in 2023. Plans are at a preliminary stage; however, the City intends to widen sidewalks, improve bus stops, add raised and protected bike lanes, add bicycle signals at intersections, maintain current vehicle lanes, adjust signal timing to optimize efficiency for buses, trucks and cars, introduce new landscaping, trees and stormwater management features (features that are currently undefined) (City of Toronto, 2021).

Complete Streets do not equal Green Streets

While the City's proposed upgrades offer some improvements, the Complete Street idea falls short of integrating important Green Street features. In this case, the City fails to integrate resilient infrastructure designed to withstand changing weather, water, and climate conditions, and does not adequately aim to reduce the impacts of urban pollutants. The design continues to prioritize private vehicles – bike lanes are not well protected, and there are no bus lanes proposed.

Proposed Green Street Transformation

We propose a variety of interventions to advance streetscape resilience and sustainability. Our proposal enhances the City's plan and transforms the Complete Street idea into a Green Street. Let us take a look at how these interventions might manifest on The Queensway, and furthermore, let us consider how we can scale these solutions across a variety of urban and suburban environments in our city.

Proposed Interventions

This aerial rending highlights some of our proposed transformations for The Queensway.

The plan for this block incorporates bioswales, silva cells and street furniture.

The proposal includes a bus shelter and bike parking.

A protected bi-directional cycle track is also proposed.

A traffic loop is transformed into a rain garden to absorb stormwater runoff.

Our proposal includes planting an urban forest bordering the Toronto Food Terminal property.

Sidewalks on both sides of The Queensway are widened.

A left-turn lane is preserved for trucks turning into the Ontario Food Terminal.

Automobile lanes are narrowed, and 2 lanes are repurposed for priority transit lanes.

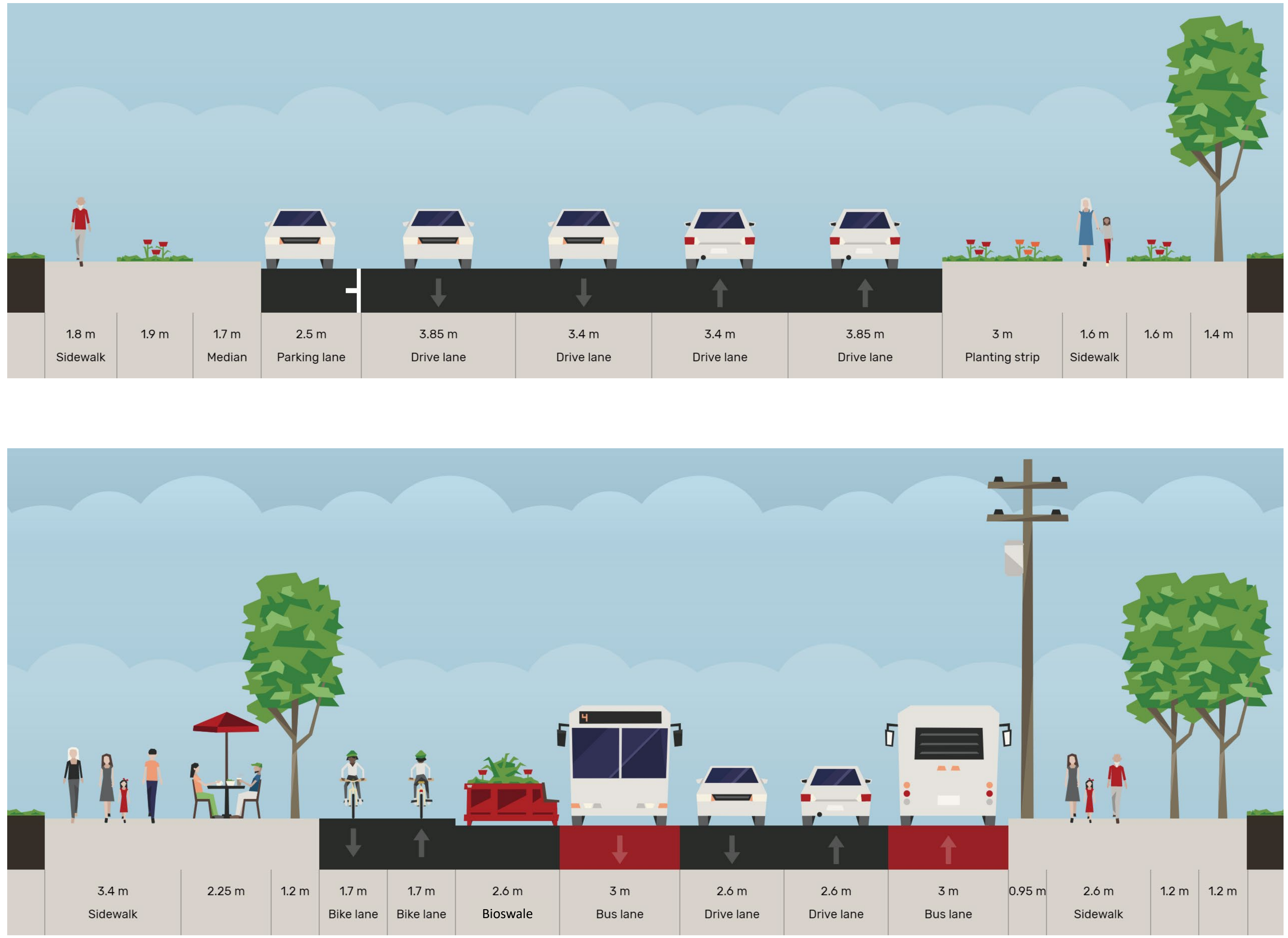
Sites for potential intensification and redevelopment are highlighted in pink.

Proposed Interventions

These before and after cross-section diagrams further demonstrate the proposed changes to The Queensway.

Currently, vehicular lanes are significantly wider than recommended by the City of Toronto. The City recommends that curb lanes be 3.3 metres wide, and through lanes be 3 metres wide (City of Toronto, 2017). This is significantly narrower than the current width. Our proposal includes even narrower lanes, as recommended by the National Association of City Transportation Officials (NACTO, n.d.). Narrower lanes help reduce vehicle speeds and thus result in safer streets for all road users.

The extra space generated by reducing lane widths and eliminating some parking and turning lanes is used to introduce bi-directional cycle tracks, wider sidewalks and sustainability features such as bioswales, silva cells and an urban forest. In addition, two vehicular lanes are repurposed as transit priority lanes.



Cross-section of The Queensway between Smithfield Drive and Stephen Drive. Top: Existing cross-section. Bottom: Proposed transformation

Rain Gardens

Rain garden (TRCA, n.d.)

Rain Gardens are landscaped gardens meant to collect stormwater runoff to limit its flow into drainage systems and waterways (TRCA, 2016). Rain gardens reduce the risk of drainage problems, flooding and erosion. They also reduce the number of contaminants carried by runoff, which prevents them from entering sewer and water systems. A rain garden can absorb about 30% more water than an equally sized patch of grass (TRCA, 2016). Costs to install a rain garden can vary from $10 to $15 per square foot. Maintenance in the first two years helps the rain garden to become established, however, the garden will require very little maintenance in the long term (Groundwater Foundation, n.d.).

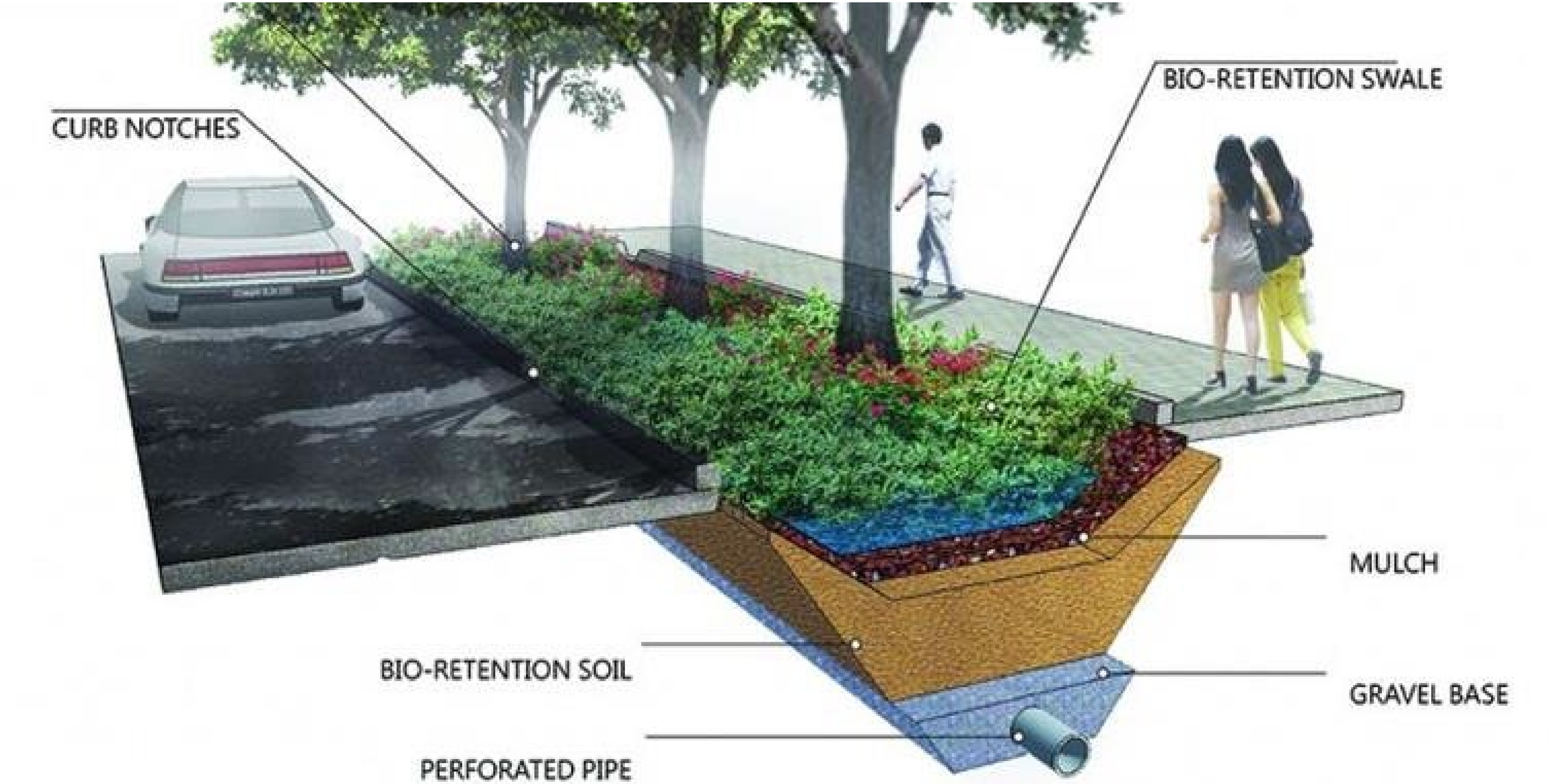
A rain garden is recommended in the High Street loop on The Queensway, as this space is situated close to a floodplain risk area by the Humber River (TRCA, n.d.). This rain garden will beautify the neighbourhood and enhance the public realm.

Rain Gardens: A Success Story

A rain garden was introduced in Toronto's Fairford Parkette at the intersection of Fairford and Coxwell Avenue. With a budget of $350,000, the City added the garden to handle stormwater runoff, which also created a safe public space for pedestrians and improved the aesthetics of the area. In the end, the project cost $320,000 (Sustainable Technologies, 2017).

Rain garden in Fairford Parkette (City of Toronto, n.d.)

Bioswales



Bioswale diagram (Jusić, Hadžić & Milišić, 2020)

Bioswales are shallow, narrow, landscaped depressions meant to capture stormwater runoff, filtering pollutants, and redirecting the runoff on a desired path (NACTO, n.d.). Bioswales can be implemented alongside rain gardens to help with stormwater capture, and to facilitate waterflow toward the garden. As one of the most effective types of green infrastructure, bioswale installation can be flexible, and in the case of The Queensway, can be built alongside the bike lane to act as a safety barrier and traffic calming measure. Installation cost can vary, and sometimes reach up to $4,000 for a 2,000 square foot bioswale (ASLA, 2008).

Bioswales: A Success Story

There are several cases of bioswale implementation throughout the Greater Toronto Area, including a 2021 addition on Haggert Avenue in Brampton (Sustainable Technologies, n.d.). Roughly 190m of the street was retrofitted for a landscaped bioswale including trees, grasses, and flowering plants to improve stormwater management. The bioswale captures stormwater before entering Fletcher’s Creek, and it slows and filters the rainwater before entering the natural water system. This project is especially important as it helps to keep Fletcher’s Creek clean and protects its endangered species, including the Redside Dace fish (Sustainable Technologies, n.d.). Although the system is new, early results have been positive.

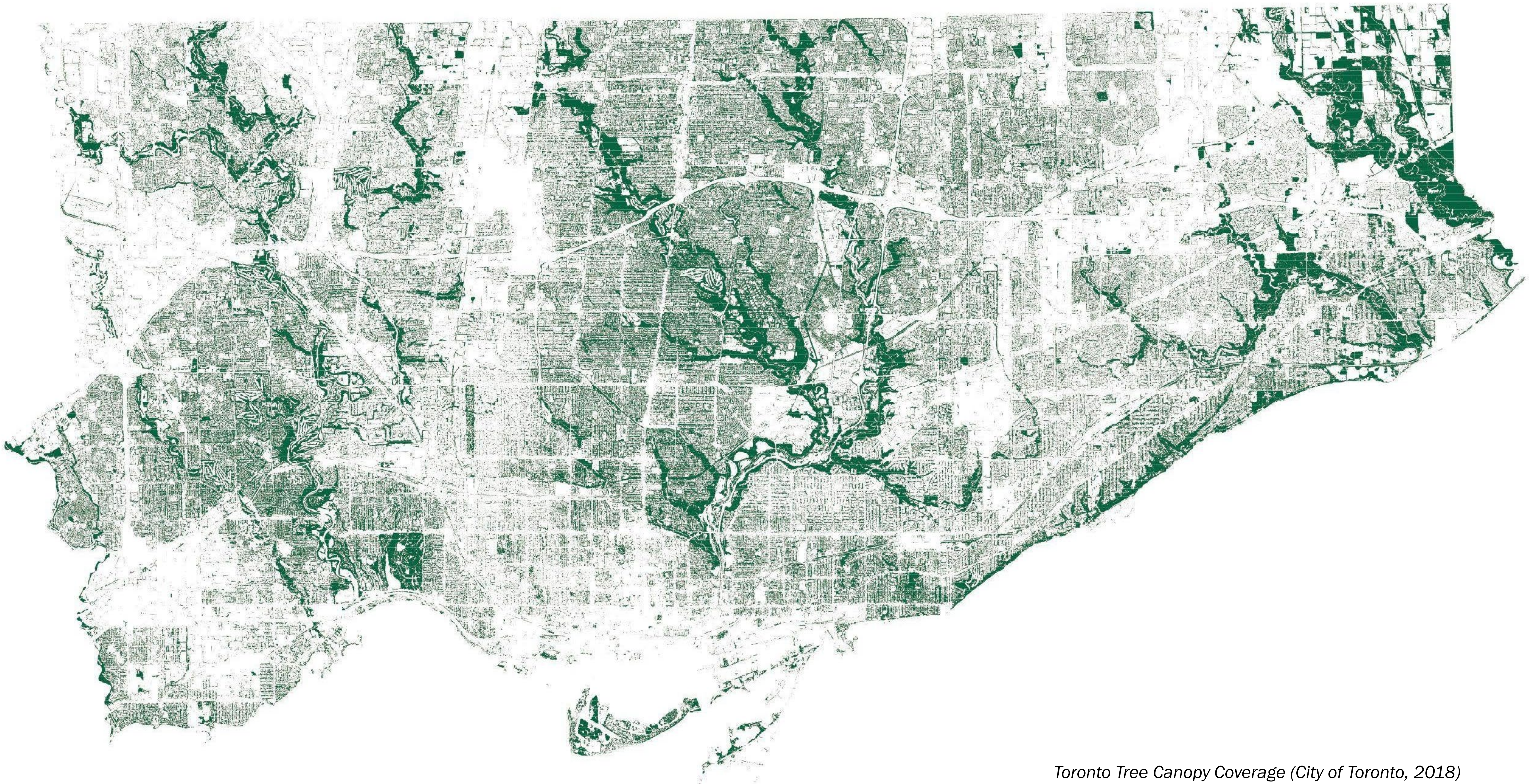
Haggert Ave in Brampton; Before and After (Credit Valley Conservation, 2021)

Urban Forest

Urban forest in Cabbagetown (Urbaneer, 2019)

Urban forests are exactly what they sound like: trees in cities. They can vary in size and location. Some urban forests are integrated in wetlands, natural areas, and parks. Others line streets, surround parking lots or complement commercial buildings. They offer a variety of benefits including GHG emission sequestration, air pollution filtration, stormwater management, and flood mitigation. They also introduce wildlife habitats into built environments, offer heat protection and cool the air. Resilient urban forests contain native species capable of withstanding local climate, soil and moisture conditions, and are constituted by a diversity of trees (Alvey, 2006). We propose the addition of a dense urban forest of native, diverse trees along the boulevard adjacent to the Ontario Food Terminal. This will improve air quality, enhance the public realm, and build towards the Toronto's plan for a resilient city through their Urban Forest Management Plan (City of Toronto, 2016).

Urban Forest: A Success Story



Toronto Tree Canopy Coverage (City of Toronto, 2018)

As of 2016, 26% of the City's land was occupied by tree canopy. The collective urban forest sequesters 2.7 million tonnes of carbon, removes $36.5-million worth of air pollution annually and provides energy-saving benefits worth $20-million (University of Toronto, 2016). The City plans to advance these benefits by increasing tree canopy to 40% as outlined in the Strategic Forest Management Plan (City of Toronto, 2016).

Silva Cells

Silva Cell cross-section diagram (Deeproot, n.d.)

Silva Cells enable trees to thrive in conditions unique to urban settings. Tree roots prosper in lightly compacted soil where they can grow, spread and access water with ease. In an urban landscape, soil beneath built features like roads and buildings is often highly compacted due to the weight of hard infrastructure above. This results in unsatisfactory soil conditions for tree life and growth. Silva Cells are flexible and modular soil containment systems that transfer the weight of heavy surface loads to a deeper layer belowground (Jusić, Hadžić & Milišić, 2019). This reduces pressure on soil close to the surface and allows it to remain lightly compacted, providing favourable conditions for urban trees. Silva Cells also serve as stormwater management systems because their technology allows for the absorption of significant water volumes (Deep Root, 2012). The cost of Silva Cell implementation is unique to the scale and setting. Excavating the site, filling the cells and then backfilling the area are the costliest tasks involved. Costs average between $14 and $18 per cubic foot (Deep Root, n.d.). We propose the addition of silva cells along the north side of The Queensway where we are concurrently proposing improvements to public space.

Silva Cells: A Success Story

Google Streetview comparing 2012 versus 2021 (Google Maps, 2012; Google Maps, 2021)

Silva Cells have already proven successful on The Queensway. They were introduced between Moynes and Berl Avenues on the north side as part of The Queensway Sustainable Sidewalk Project. The initiative increased tree canopy, improved stormwater management and maintained surface level space for pedestrian activity (Sustainable Technologies, n.d.).

Transportation Improvements

Multi-modal transportation allows street users to choose a variety of mobility types that are equally accessible and effective for moving through the City. The Queensway is wide enough for a protected, bi-direction cycle track, transit priority lanes and wider sidewalks, to increase the efficacy and safety of multi-modal transportation.

Bike Infrastructure

Introducing dedicated bike lanes separates bikes from vehicular traffic and enhances safety and efficiency for all road users. Physically protected cycling infrastructure can help encourage an uptake in cycling for mobility. The City of Toronto has already experienced success with adding protected cycling facilities. After adding protected lanes on Richmond and Adelaide streets between 2014 and 2016, there was a 1,095% increase in daily cyclist counts on these routes. After the 2016 and 2017 Bloor Street bike lane pilot, cycling increased by 49% on this route (Harris, 2020). Safe bicycle storage is also important to encourage cycling, and our proposal includes bicycle parking.

Before and after photos of a complete streets transformation in Lincoln, Nebraska (Schlossberg et al, 2019)

Transit Priority Lanes

Introducing dedicated bus lanes on existing bus routes separates them from personal vehicle congestion, improves the reliability and speed of service, and offers opportunities to enhance frequency. Consistent driving and less idling is better for fuel efficiency, air quality, and makes choosing bus transit more appealing to the public (Urban Mobility Solutions, n.d.). The Greater Toronto Area offers several recent examples of priority bus lanes that improve reliability and service for riders, including the transit-priority lane on Don Mills Road, the Mississauga Transitway, and Viva BRT in York Region (Mackenzie, 2021).

VIVA BRT system (Marshall, 2013)

Bus lanes on Eglinton Ave. East (Wanek-Libman, 2021)

Pedestrian Safety

Pedestrian safety is a significant challenge on Toronto's streets. In 2019, 39 pedestrians were killed as a result of traffic collisions (City of Toronto, 2021). In 2016, the City adopted a Vision Zero Road Safety Plan with the goal of eliminating traffic-related deaths and injuries. Our proposal advances these goals by widening sidewalks, introducing barriers between driving lanes and sidewalks, and narrowing traffic lanes in order to reduce speeding. Our proposal also includes tighter corner radii at intersections, forcing drivers to slow down when making right turns.

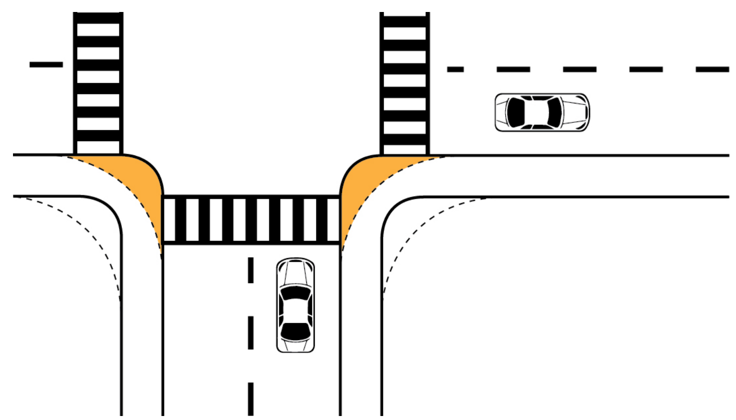


Illustration of tighter corner radius in yellow (City of Newmarket, n.d.)

An example of wide sidewalks (NACTO, n.d.)

Intensification

Properties identified for potential redevelopment are shown in pink. From left to right: A one-storey strip mall and parking lot; a one-storey car dealership; and a suburban-style big-box retail complex (Gordon, 2021)

The Provincial Policy Statement (PPS), Growth Plan for the Greater Golden Horseshoe (GGH), and the City of Toronto Official Plan (OP) call for compact urban growth and redevelopment of underutilized lands (Ministry of Municipal Affairs and Housing, 2020; City of Toronto, 2019). We have identified low-density lands adjacent to the proposed streetscape upgrades that could be redeveloped for enhanced use. As these lands are privately owned property, their redevelopment relies on private will and investment. Land-use intensification would advance both the notions of Complete and Green Streets and take better advantage of the proposed streetscape redesign on The Queensway.

Recommendation: LID (Low Impact Development) Approaches

Example of a LID practice (Calvet, 2014)

Traditionally, approaches to urban stormwater have aimed to direct water away from city streets quickly and efficiently, resulting in large volumes entering water systems and carrying pollutants along the way. LID practices deal with stormwater by mimicking natural water cycles, with a focus on stormwater absorption in soil to be filtered by plants (TRCA, n.d.). It is a low-cost alternative to conventional grey infrastructure and provides numerous ecological, economic, and social benefits. As the City is slowly implementing LID approaches to its stormwater infrastructure management, we propose LID practices along The Queensway in our defined area.

High Street Traffic Loop – Current

Photo of a traffic loop at the Intersection of High Street and The Queensway in Toronto (Lam, 2021)

High Street Traffic Loop – Reimagined

Rendering of Complete Street and Green Street interventions at the intersection of High Street and The Queensway in Toronto (Lam, 2021)

The Queensway Streetscape – Current

Photo capturing the streetscape on The Queensway looking east in front of Rocco's Plum Tomato restaurant in Toronto (McQuillan, 2021)

The Queensway Streetscape – Reimagined

Rendering of a redesigned streetscape for The Queensway in Toronto (Lam, 2021)

The Queensway Streetscape – Current

Photo of The Queensway with the Ontario Food Terminal visible behind the fence (McQuillan, 2021)

The Queensway Streetscape – Reimagined

An urban forest with diverse native trees improves stormwater management, sequesters carbon and air pollutants, and increases canopy coverage on the sidewalk.

Rendering of a redesigned streetscape for The Queensway in Toronto (Lam, 2021)

UN Sustainable Development Goals

As a major city on the international stage, the most populated city in Canada, and the nucleus of the Greater Golden Horseshoe Region, the City of Toronto has a responsibility to lead by example as it develops built environments for the future. Green and Complete streetscape redesign, as exemplified in The Queensway case study presented here, offers an example for how city streets across Toronto can be reimagined to integrate resilient infrastructure. These green, socially conscious interventions advance the United Nations Sustainable Development Goals of Clean Water and Sanitation, Sustainable Cities and Communities, Climate Action and Life Below Water.

UN, 2021

Considerations and Challenges

Culture Change

Transforming streets requires a cultural change among road users, particularly if it means removing any road space from drivers. Drivers may oppose such changes due to fears of increased traffic or reduced parking availability. Planners, decision makers and advocates must communicate to all stakeholders the importance of street transformation and the benefits they can provide. However, planners should also be cognizant that those who stand to gain most from street transformations are less likely to show up to community consultations or respond to surveys.

Cost

Transforming streets can be costly, particularly when including interventions such as bioswales, silva cells and rain gardens. Other improvements such as transit priority corridors and bike lanes can be piloted quickly using paint, bollards or planters. The City should provide significant, stable funding to enable progress in implementing Complete and Green streets.

Equity

There are hundreds of kilometers of streets in Toronto that need to be transformed. It is vital to ensure that street transformation is prioritized and sequenced in a way that is equitable and deliberate. A disproportionate number of street transformations in Toronto have been done closer to the downtown core and have tended to benefit wealthier residents. For example, six of nine bikeways that were introduced as part of the city's ActiveTO program in 2020 were located downtown (City of Toronto, 2020). There are opportunities to transform streets across the city's inner suburbs and particularly in Neighbourhood Improvement Areas.



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