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Memorandum

To/Attention	Loy Cheah, City of Markham Fion Ho, City of Markham	Date	April 29, 2022
From	Zibby Petch, IBI Group Lisa Ma, IBI Group	Project No	119478 / 137183
cc	Project Team		
Subject	Summary of ATMP Cycling Facility Selection Process		

Introduction

IBI Group was retained to develop an Active Transportation Master Plan for the City of Markham. As part of the development of the active transportation master plan, an ultimate cycling network was identified. Through the development of the cycling network, preliminary facility type recommendations were developed for each corridor.

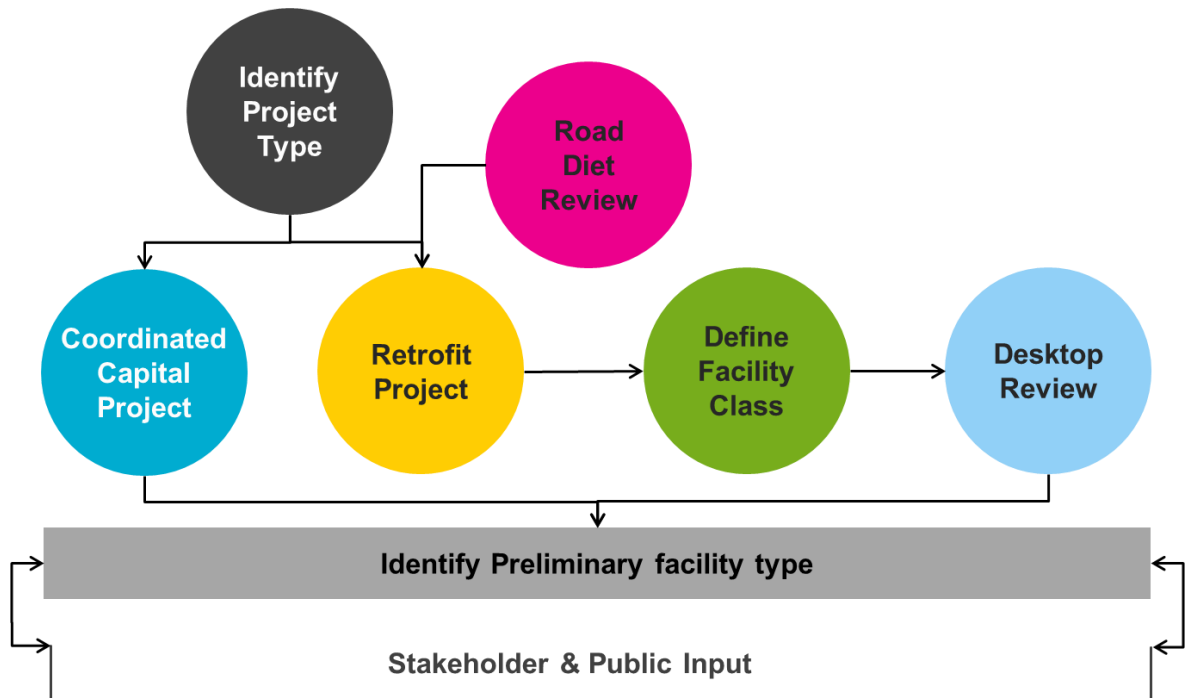
This memo summarizes the process for identifying a preliminary facility type during the ATMP development.

Overview of Facility Selection Process

The high-level process for defining a preliminary facility type for each corridor in the cycling network is illustrated in Exhibit 1. Each project is classified as either a capital project (cycling facility will be coordinated with a larger road capital project or as part of new development) or retrofit (cycling facility will be constructed as a standalone improvement), based on available information from City & Regional capital programs and secondary plans.

For capital projects, previously-identified/planned or designed facility types are rolled up into the ATMP for consistency. For retrofit projects, a multi-step review process is completed including defining the appropriate facility class, considering road diet opportunities, and a desktop review to identify a preliminary facility type.

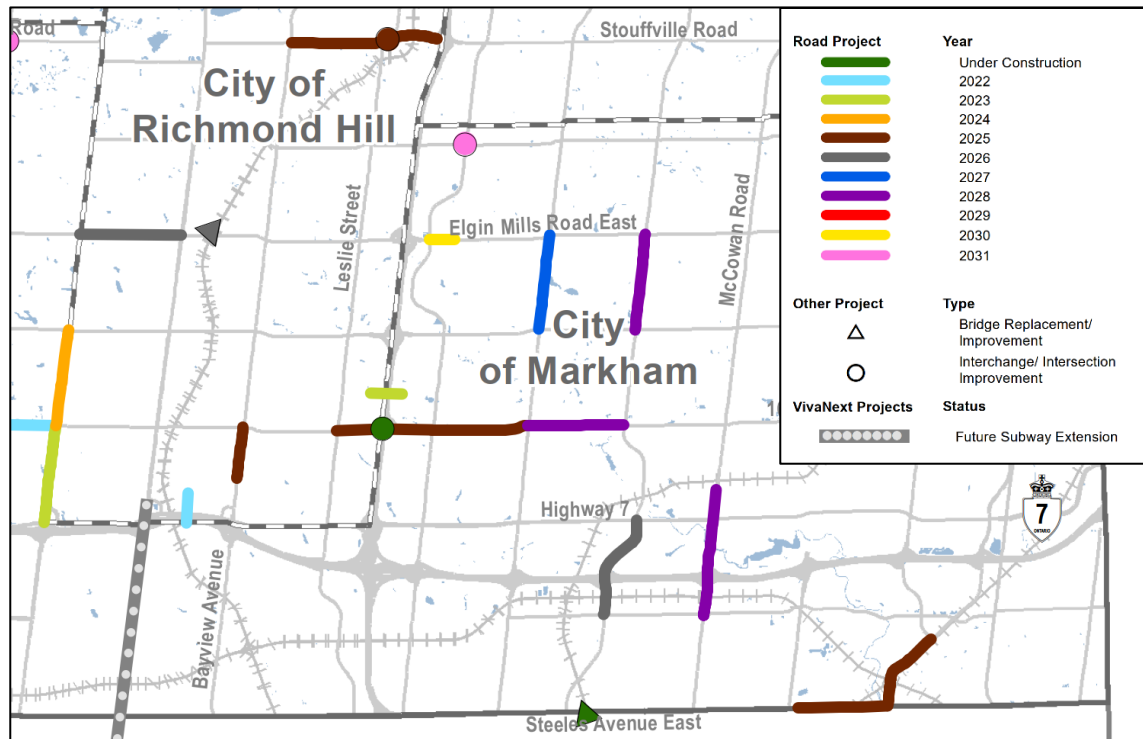
For all project types, public and stakeholder input is a key input and was used throughout the ATMP process to iteratively refine facility type selections. The following sections in the memo provide more information about each element of the facility selection review.

Exhibit 1: Overview of Facility Selection Process**Coordinated Capital Projects**

The latest City of Markham secondary plans and York Region 10-year capital plan (Exhibit 2) were reviewed to identify proposed cycling corridors where capital road and transit projects are being planned in the short-to-medium term. This exercise helps coordinate the implementation of proposed cycling facilities with planned capital projects, effectively reducing cost and minimizing the need for retrofit interventions. Cycling facility types from committed works and from the City's secondary plans were adopted directly into cycling network.

A recognition that each capital project can be leveraged to incrementally improve the network over time is important to advance the development of cycling facilities. On-going coordination will be needed with the Region as the capital plan is subject to change on an annual basis. The ATMP originally considered the 2022 capital plan (refer to Exhibit 2).

Exhibit 2: York Region 10-Year Roads and Transit Construction Program (2022)



Retrofit Cycling Projects

For retrofit projects, a multi-step review process includes defining the appropriate facility class, considering road diet opportunities, and a desktop review to identify a preliminary facility type.

Step 1: Facility Class Review

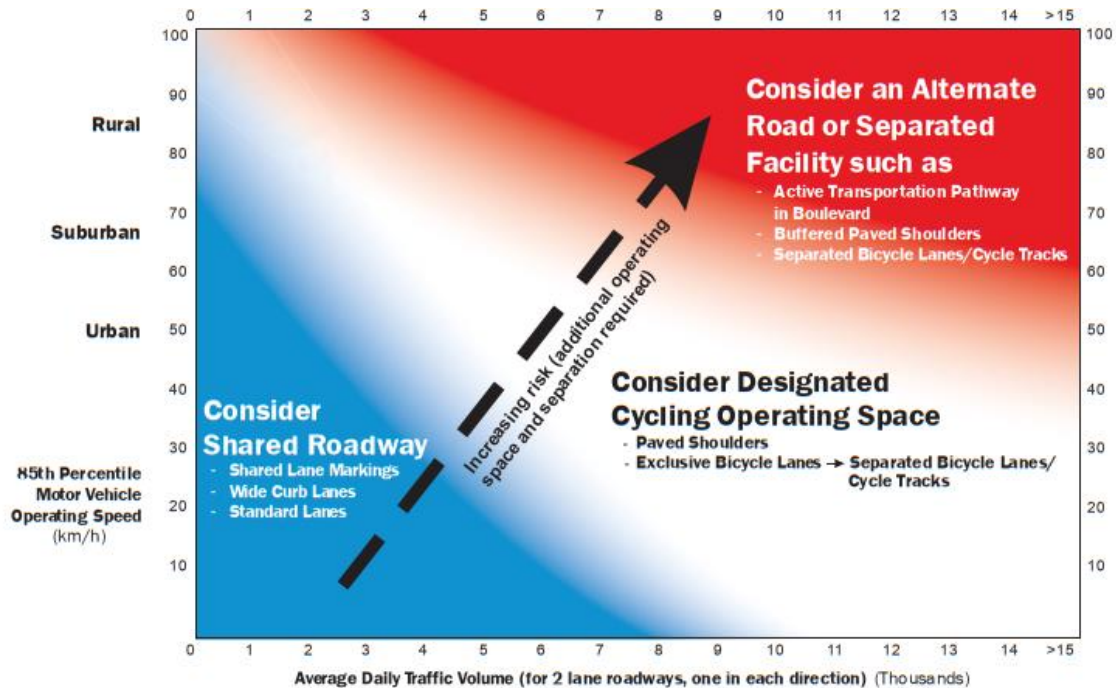
A high-level facility selection review was carried out for retrofit corridors to determine the most appropriate **cycling facility class** to implement. The review was completed using the OTM Book 18 (2013) Bicycle Facility Type Selection Process.

As the cycling network was reviewed over the course of ATMP development, primarily between 2019 & 2020, OTM Book 18 (2013) was the primary reference. In November 2021, an updated OTM Book 18 version was released. While the methodology is similar, the updated Book 18 reduces the thresholds for designated and separated facilities, so it is likely that as each project moves ahead to implementation there may be more corridors requiring these higher order facility classes. As part of the planning work prior to project implementation, all facilities will need to be confirmed against the updated guidance in OTM Book 18 (2021).

OTM Book 18 outlines a process for identifying the **minimum class of facility (shared, designated or separated)**. Facility class is defined in the first step in the process, Step 1: Facility Pre-Selection. The pre-selection process uses a nomograph based on road

and land use typologies to identify the preferred level of separation (“facility class”) along the corridor. The facility pre-selection nomograph is shown in Exhibit 3.

Exhibit 3: OTM Book 18 Desirable Cycling Facility Pre-Selection Nomograph



1. The nomograph has been adapted for the North American context and is based on international examples and research for two lane roadways. It is, however, still applicable for multi-lane roadways. For these situations, designers should consider the operating speed, total combined traffic volume and traffic mix of the vehicles traveling in the lanes immediately adjacent to the cycling facilities.
2. Consider a Separated Facility or an Alternate Road for roadways with an AADT greater than 15,000 vehicles and an operating speed of greater than 50 km/h.
3. For rural and suburban locations this nomograph assumes good sightlines are provided for all road users. In urban areas, there are typically more frequent conflict points at driveways, midblock crossings and intersections (especially on multi-lane roads), as well as on road segments with on-street parking. This needs to be considered when assessing risk exposure in urban environments since it will influence the selection of a suitable facility type.

The facility class was reviewed for each retrofit corridor based on available traffic volumes and speed data. The corresponding class represents the minimum facility class for the subsequent facility type review.

Step 2: Desktop Review & Select Preliminary Facility Type

Once the preferred level of separation is identified through the facility class review, a facility type is selected based on numerous factors including vehicle operating speeds, volumes, lane configurations and the roadway context. A desktop review of each corridor is completed to identify key feasibility elements such as approximate pavement width, boulevard space and constraints and corridor context.

The following section describes the various shared, designated and separated cycling facility types and key factors favouring the implementation of each facility types.

Shared Facility Types

Shared spaces are appropriate on local roads with low volumes and speeds. Shared cycling facilities include:

- **Signed routes** – These facilities are shared roadways designated as a cycling route via signage and pavement markings. They can be implemented on low volume and low speed roadways as a standalone or retrofit application. Often, signed routes can provide cycling connections through neighbourhoods between higher-order cycling facilities. These connections may consist of long routes along a continuous local roadway that provide alternatives to busier roadways, or short routes along shorter sections of local roadways that provide connections between other cycling facilities
- **Bicycle boulevards** – These facilities are signed routes that are optimized for bicycles and incorporate a variety of traffic calming features to control speeds and volumes to optimize the roadway for cyclists. Similar to signed routes, bicycle boulevards can provide cycling connections through neighbourhoods between higher-order cycling facilities and can provide an alternative routes to a major corridor. Bicycle boulevards may be favoured over signed routes where there are safety or operational concerns from the community that would benefit from traffic management features. They also represent an all ages and abilities (AAA) facility type and can help make connections between separated facilities while providing a high-comfort cycling facilities.
- **Advisory bike lanes** –Advisory bicycle lanes are shared roadways with bicycle-priority areas that provide an option to enhance treatments where there is insufficient space to provide conventional bicycle lanes. Unlike conventional bike lanes, advisory bike lanes require drivers to pull into the advisory bike lanes to pass on-coming traffic. The cycling space is visually delineated by dashed lane lines. There is no centreline and motor vehicles are expected to share the centre roadway lane for two-way travel. Advisory bike lanes provide greatest benefit where they connect between designated or separated facilities, since they can provide a similar experience for cyclists along narrow corridors. Like all shared facilities, they are only appropriate along lower speed and volume corridors.

Designated Facility Types

Designated facility types provide dedicated space for cyclists without providing physical protection from vehicular traffic. Designated cycling facilities include:

- **Bike lanes** –A bicycle lane provides designated space for cyclists through the application of pavement. Bike lanes are travel lanes dedicated exclusively for use by cyclists through a combination of pavement markings and signage. Parking is not permitted in bike lanes. This facility type can be implemented through retrofit applications and may require narrowing of the vehicular travel lanes and/or removal of on-street parking lanes.
- **Buffered bike lanes** –Buffered bike lanes are similar to conventional bike lanes but are upgraded by incorporating a painted buffer. Similar to conventional bicycle lanes, this facility type can be implemented through

retrofit or standalone projects. Narrowing of the vehicular travel lanes and/or removal of on-street parking lanes may be required to accommodate the buffered bike lanes depending on the corridor context. The removal of vehicular travel lanes, i.e. road diets, was considered based on the criteria outlined in the *Road Diet Review* section of the memo.

Separated Facility Types

Separated spaces are appropriate along higher-speed, higher-volume roadways or through off-road corridors. They provide physical protection or separation from motorized vehicles. These facility types are widely favoured by the interested but concerned segment of the cycling population and are growing in adoption across Ontario. Separated cycling facilities include:

- **Protected bike lanes** – Protected bike lanes may be applied on a variety of roadway types but are most appropriate on collector and arterial roadways. Most protected bike lanes will be most likely applied in retrofit scenarios within Markham, along corridors where it is feasible to either remove or reduce parking capacity or travel lanes. Protected bike lanes are a preferred retrofit facility type since they provide the benefit of separated cycling space but are much less costly to implement than cycle tracks.
- **Cycle tracks** – These facilities provide space for cyclists behind the roadway curb, typically at sidewalk level or mid-height between sidewalk and road level. Cycle tracks may be implemented as retrofit facilities through boulevard reconstruction. Cycle tracks are the preferred facility type in urbanized areas with high demand for active transportation since cyclists and pedestrians do not compete for space. Where there are street-oriented uses and numerous driveways, cycle tracks provide better safety outcomes and comfort for cyclists compared to multi-use paths as they eliminate wrong-way riding. However, they also require more overall space to implement.
- **Boulevard multi-use paths** – Multi-use paths are facilities shared between cyclists, pedestrians and other users such as rollerbladers, skateboarders etc. Multi-use paths appeal to a wide range of users, including a variety of cyclists with different skill levels. They are most likely to be implemented along collector or arterial roadways. They are most appropriate along lower demand corridors where there are likely to be fewer conflicts between cyclists and pedestrians.
- **Off-road multi-use trails** – These trails are located outside of road rights-of-way, often through parks, open space or greenways.

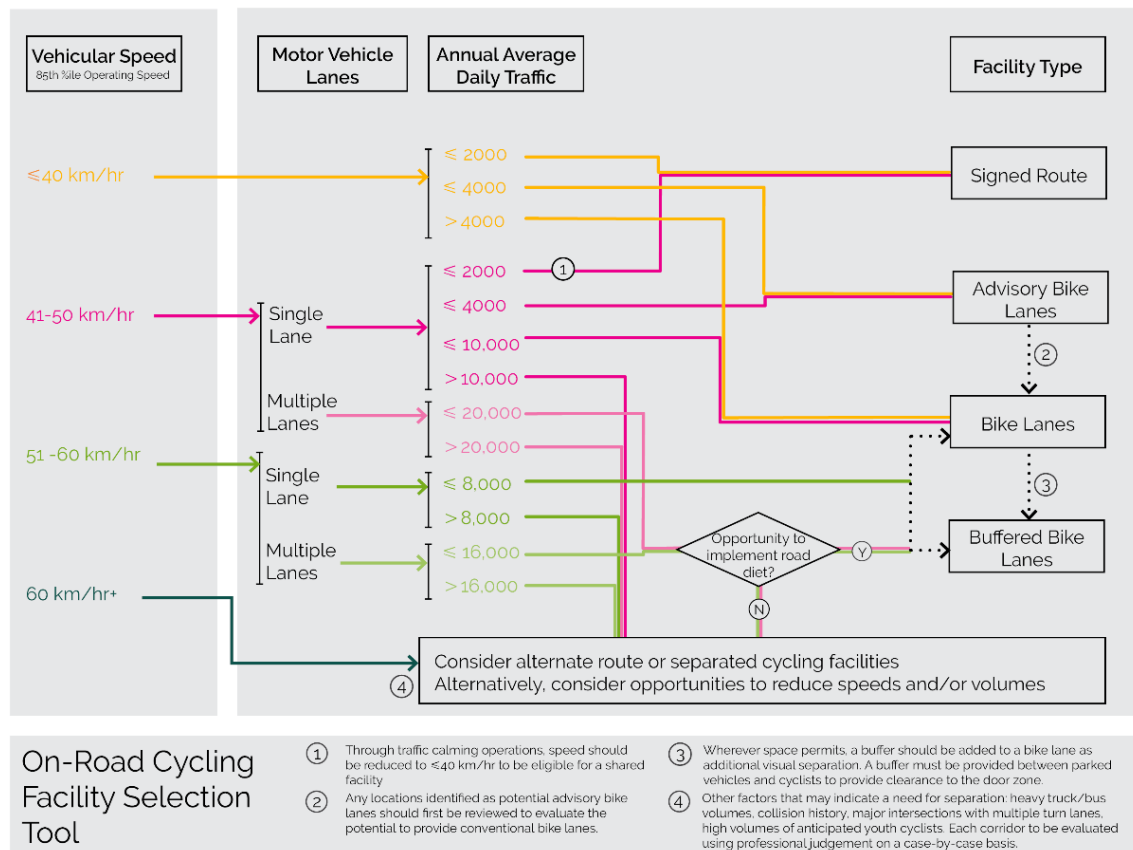
To assist with selecting a facility type within a particular facility class has been identified, the City's cycling facility selection tools, developed through the ATMP, were also considered in facility selection along with the desktop review of feasibility and context.

On-Road (Shared & Designated) Facility Selection Tool

As part of a previous project, a standalone facility selection tool was developed for on-road facilities within the City of Markham, as shown in Exhibit 4. The 85th percentile

vehicular speed, the number of motor vehicle lanes in the direction of the cycling facility, and the average annual daily traffic (AADT) volumes are used to guide the selection of the cycling facility. These criteria are generally available for City streets and affect the comfort and safety of cyclists. As motorists' speeds, the number of lanes and traffic volumes increase, there is a need to move from providing shared cycling facilities such as signed routes to separate cycling facilities such as bicycle lanes.

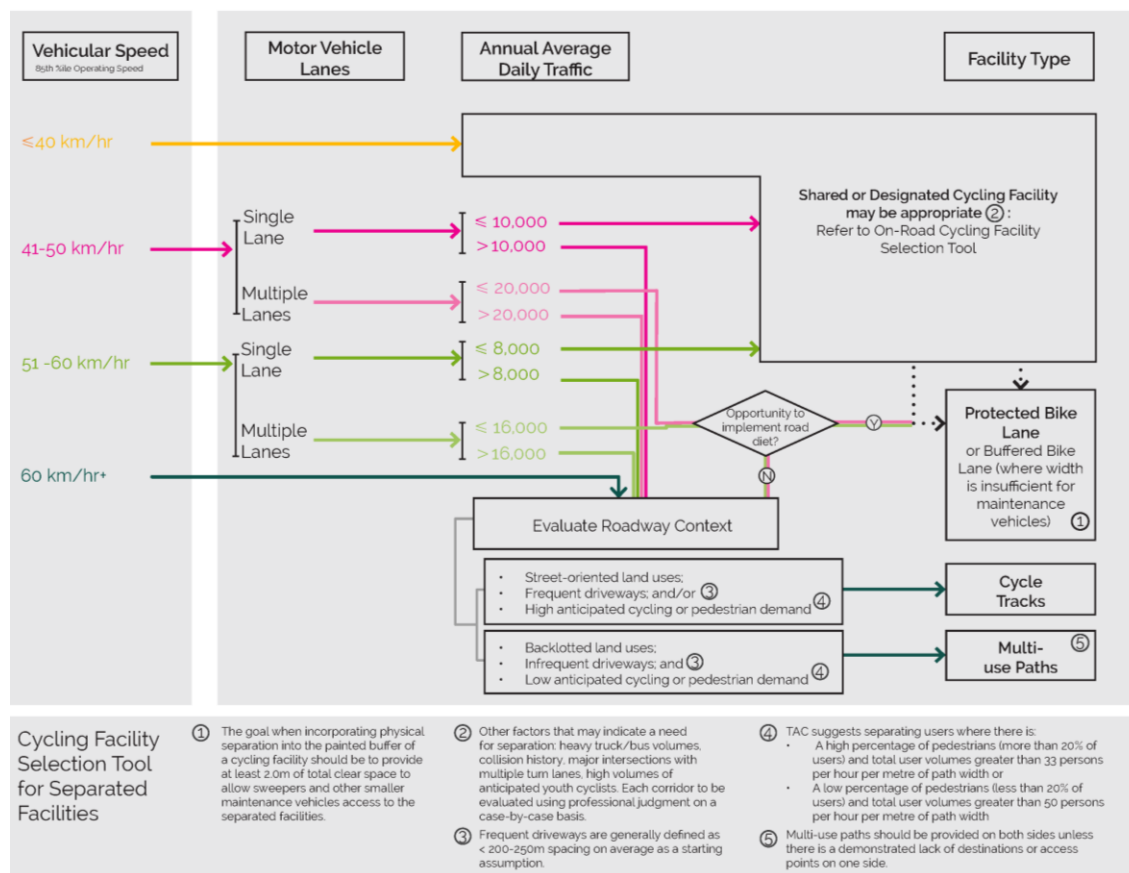
Exhibit 4: On-Road Cycling Facility Selection Tool



Separated Facility Selection Tool

During the development of the ATMP, a facility selection tool was developed for separated facilities in a City of Markham context, as shown in Exhibit 5. This tool follows the higher-level guidance of OTM Book 18, specifically the Facility Pre-Selection Nomograph, and incorporates relevant detailed characteristics from Step 2 of the selection process as applicable/possible.

Exhibit 5: Cycling facility selection tool for separated facilities



Road Diet Review

Road diets are an important implementation strategy in improving multi-modal community benefits and are broadly defined as a re-organization of the existing road space without significant civil works, which reduces the overall cost and schedule needed to implement cycling facilities. Road diets can include narrowing lanes or reducing the number of travel lanes to promote complete streets which prioritize active modes of transportation like cycling and ensure safer roadways for all users.

The most common road diet is the transformation of a four-lane street (with two vehicular lanes in each direction) to a three-lane street (with one vehicular lane in each direction and a shared centre two-way left turning lane). It is also possible to maintain the existing number of lanes on a street through a narrowing of the driving lanes in order to add other uses and increase the multi-mobility of the street.

All four lane City roads within the City of Markham were reviewed to determine the feasibility of removing a travel lane to create a more attractive and comfortable cycling environment. The review was largely based on established guidance in the FWH Road Diet Informational Guide, which provides the following quantitative criteria for consider road diets:

- **Daily Volume** - Roadways with ADTs of 20,000 vpd or less may be good candidates for a road diet;
- **Peak Hour Volume** - Implementation of a road diet is probably feasible at or below 750 vehicles per hour per direction (vphpd) during the peak hour. More caution is required if the corridor carries between 750 – 875 vphpd while feasibility is less likely above 875 vphpd during the peak hour.

Other considerations related to a possible road diet implementation included:

- **Presence & frequency of transit** – Road diets generally not preferred along corridor with high-frequency transit.
- **Driveway usage** – Corridors with high-volume or frequent driveways may be good candidates for road diets as a two-way left turn lane would provide significant safety benefits.
- **Operating speeds** – Corridors with motor vehicle speed concerns are considered candidates for a removal of a travel lane to help support desired operating speeds.
- **Proximity of schools** – Schools in close proximity to a corridor may indicate a need for a more comfortable cycling facility with a higher degree of separation.
- **Curb-face sidewalk** – Roads with a curb-face sidewalk would benefit from a road diet and the introduction of cycling facilities to buffer the sidewalk from adjacent traffic lanes.

A preliminary review was completed of all four-lane Markham roads and the potential road diets under consideration were reviewed with City staff to confirm the overall appropriateness of considering a road diet at the master plan level. If a corridor was identified as part of the cycling network and was a candidate for a road diet, a buffered or protected bike lane was identified based on the facility class review.

Public & Stakeholder Input

Public and stakeholder engagement was a major component throughout the development of the ATMP process. Public engagement activities included two rounds of Public Information Centres (PICs), various pop-up events, presentations and panel discussions, online consultation and an external technical advisory group. These opportunities for two-way conversation provided an overview of the ATMP, gather feedback on draft networks and other recommendations.

Interactive components of the activities included voting on active transportation priorities, identifying whether concrete or asphalt paths are preferred, and placing dots on the existing active transportation network map denoting where attendees like to walk or cycle or where they would want to walk or cycle but improvements are needed. Comments from the public on specific corridors, such as preferred facility types, were taken into consideration during the facility selection process and led to iterative changes to facility types throughout network development. Throughout the development of the ATMP, comments on facility types focused on preferences for protected bike lanes, cycle tracks, multi-use paths and bicycle boulevards to expand the City's AAA network.