



**City of Kingston
Environment, Infrastructure & Transportation Policies Committee
Meeting Number 06-2024
Agenda**

**Tuesday, May 28, 2024, at 6:00 p.m.
Hosted at City Hall in Council Chamber**

Please provide regrets to Allison Hannah, Committee Clerk at 613-546-4291, extension 1209 or ahannah1@cityofkingston.ca

Committee Composition

Councillor Cinanni, Chair
Councillor Amos
Councillor Chaves
Councillor Hassan
Councillor Stephen
Councillor Tozzo

- 1. Meeting to Order**
- 2. Approval of the Agenda**
- 3. Confirmation of Minutes**
- 4. Disclosure of Pecuniary Interest**
- 5. Delegations**
- 6. Briefings**
 - a) Ian Semple Director, Transportation & Transit will be present and speak to the Committee regarding Williamsville Transportation Study Conclusions.

7. Business

a) Williamsville Transportation Study Conclusions

The Report of the Commissioner of Infrastructure, Transportation & Emergency Services (EITP-24-018) is attached.

Schedule Pages 1 – 307

Recommendation:

That the Environment, Infrastructure and Transportation Policies Committee recommend to Council on June 4, 2024:

That the conclusions of the Williamsville Transportation Study presented in Report Number EITP-24-018 be adopted by Council; and

That the preferred concept for Princess Street that prioritizes cycle tracks and pedestrian infrastructure, identified as Alternative 2B in Report Number EITP-24-018, be incorporated into the detailed design and reconstruction of Princess Street as part of future capital projects and redevelopment opportunities; and

That the identified neighbourhood cycling network and facilities, as identified in Exhibit A and Exhibit G in Report Number EITP-24-018, be incorporated into future capital projects and development opportunities planned for identified streets; and

That the green street principles and concepts, as identified in Exhibit A in Report Number EITP-24-018, be established as options that can be integrated into neighbourhood streets slated for reconstruction in approved and future capital budgets; and

That Council direct staff to develop plans for operations, maintenance, enforcement, and other ongoing actions to support new infrastructure on Princess Street, the neighbourhood cycling network, and local streets where green street elements are added to be incorporated into future capital and operating budgets.

8. Motions

9. Notices of Motion

10. Other Business

11. Correspondence

- a) Correspondence received from Stuart McPherson, dated Sunday May 19, 2024, regarding Williamsville Transportation Study Conclusions.

Schedule Pages 308 - 308

12. Date of Next Meeting

The next meeting of the Environment, Infrastructure and Transportation Policies Committee is scheduled for Tuesday, June 11, at 6:00 p.m.

13. Adjournment



City of Kingston
Report to Environment, Infrastructure & Transportation Policies Committee
Report Number EITP-24-018

To: Chair and Members of the Environment, Infrastructure & Transportation Policies Committee

From: Brad Joyce, Commissioner, Infrastructure, Transportation & Emergency Services

Resource Staff: Ian Semple Director, Transportation & Transit

Date of Meeting: May 28, 2024

Subject: Williamsville Transportation Study Conclusions

Council Strategic Plan Alignment:

Theme: 3. Build an Active and Connected Community

Goal: 3.3 Improve public transit and active transportation options.

Executive Summary:

In the spring of 2022, the Williamsville Transportation Study (WTS) began to develop the preferred design of Princess Street from Regent Street to Division Street in support of land use adopted in the Updated Williamsville Main Street Study (WMSS). The scope of the WTS was expanded in 2023 to develop neighbourhood cycling options and define green street elements that could be incorporated onto residential streets.

This report presents the conclusions of the WTS which includes: a new conceptual design for Princess Street that incorporates cycle tracks, a neighbourhood cycling network, and establishes principles and implementing elements for green streets. The full analysis including conceptual designs, renderings, and transportation analysis can be found in Exhibits A through G attached to this report.

The main deliverable of the WTS was to define the future conceptual design of Princess Street in this area. As part of the initial analysis, six alternative concepts for Princess Street were developed to reflect the transportation priorities adopted in the WMSS which included a pedestrian-supportive realm, maximum opportunities for green elements, and improved transit

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operation. A concept that prioritizes these elements, referred to as Alternate 1 in this report, was developed with the relatively limited right-of-way space on Princess Street in this area requiring the removal of on-street parking and existing on-street cycling lanes. Alternative 1 was shared with the public in spring 2023 and there were strong concerns that the removal of the cycling elements would be detrimental to the long-term needs of the community.

An additional option that reintroduced the on-road cycling lanes while maintaining the road elements to best support transit priority, referred to as Alternate 5 in this report, was developed for review in fall 2023. Alternate 5 addressed some of the concerns raised but potential issues related to operation and maintenance, illegal parking by vehicles within the cycling lanes, and the reduced accessibility of the pedestrian areas were identified in technical review and in engagement with the community.

To respond to the continuing concerns, staff undertook another design exercise that reflected a concept that would prioritize cycling infrastructure while accommodating an accessible pedestrian realm. This concept, referred to as Alternative 2B in this report, creates a continuous, grade separated, cycle track with adjacent accessible sidewalks on both sides of Princess Street. To accommodate the new cycling infrastructure, several left turn lanes in the corridor and a transit priority queue jump planned for Drayton Street are removed from the concept that were present in Alternative 1. The space for green elements, benches, and other aspects of the pedestrian realm is reduced in Alternative 2B.

As expected with the prioritization of space to cycling, transportation modeling completed for this option, outlined in Exhibit E, show an increase in delays for transit and vehicle efficiency and overall vehicle trip capacity for this section of Princess Street. Mitigation measures can be employed in the future as needed that makes this concept viable however neighbourhood shortcutting by vehicles from Princess Street or vehicles shifting to other roadways is expected. Similar to Alternative 1, on-street parking is removed throughout the area with parking and loading being accommodated on side streets.

Alternative 2B was well received in stakeholder consultation with the Kingston Coalition for Active Transportation (KCAT), Williamsville Community Association, and Municipal Accessibility Advisory Committee (MAAC) completed in early May. Technical review with Engineering, Public Works, and Transportation resources concluded that both Alternative 1 and 2B were constructible and could be maintained with resourcing similar to lower Princess Street from Division to Ontario Streets.

Based on the technical review, updated transportation modeling that provides future mitigation options for vehicle delays, and approximating the closest reflection of the priorities expressed during WTS engagement by the public staff are recommending Alternative 2B be confirmed as the preferred design. With this confirmation, the concepts included in Alternative 2B will be incorporated into the detailed design and reconstruction of Princess Street as part of future capital projects and redevelopment opportunities. Confirmation of the preferred design for

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Princess Street is time sensitive as detailed design must begin this summer on the committed reconstruction area from Alfred to Division Streets.

The neighbourhood cycling network and associated cycling facilities identified developed in fall 2023, the second major deliverable of the WTS, remains the same as presented to the Committee and the public in February 2023. The network identifies a number of key north-south and east-west streets, in addition to Princess Street, that can include cycling supporting facilities such as advisory bike lanes and shared on-road bikeways. It is recommended that the neighbourhood cycling network developed through the WTS be incorporated into future capital projects and development opportunities planned for identified streets.

The third deliverable of the WTS developed five principles to define a “green street” in the City of Kingston and included conceptual elements that can be used on neighbourhood streets, both in Williamsville and elsewhere, to incorporate more vegetation, enhance walkability and reduce travel speeds by motorists. The principles and concepts included in this report are the same as presented to the Committee and public in February 2023. It is recommended that green street principles and concepts be established as options that can be integrated into neighbourhood streets slated for reconstruction in approved and future capital budgets.

In anticipation of new operating and maintenance requirements, it is also recommended that plans for operations, maintenance, enforcement, and other ongoing actions to support new infrastructure on Princess Street, the neighbourhood cycling network, and local streets where green street elements are added be incorporated into future capital and operating budgets. All elements developed through the WTS will require some modification or increase to existing service levels to maintain new infrastructure and ensure it is being used properly.

Recommendation:

That the Environment, Infrastructure and Transportation Policies Committee recommend to Council on June 4, 2024:

That the conclusions of the Williamsville Transportation Study presented in Report Number EITP-24-018 be adopted by Council; and

That the preferred concept for Princess Street that prioritizes cycle tracks and pedestrian infrastructure, identified as Alternative 2B in Report Number EITP-24-018, be incorporated into the detailed design and reconstruction of Princess Street as part of future capital projects and redevelopment opportunities; and

That the identified neighbourhood cycling network and facilities, as identified in Exhibit A and Exhibit G in Report Number EITP-24-018, be incorporated into future capital projects and development opportunities planned for identified streets; and

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That the green street principles and concepts, as identified in Exhibit A in Report Number EITP-24-018, be established as options that can be integrated into neighbourhood streets slated for reconstruction in approved and future capital budgets; and

That Council direct staff to develop plans for operations, maintenance, enforcement, and other ongoing actions to support new infrastructure on Princess Street, the neighbourhood cycling network, and local streets where green street elements are added to be incorporated into future capital and operating budgets.

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Authorizing Signatures:

p.p. ORIGINAL SIGNED BY DIRECTOR

**Brad Joyce, Commissioner,
Infrastructure, Transportation &
Emergency Services**

ORIGINAL SIGNED BY CHIEF ADMINISTRATIVE OFFICER

**Lanie Hurdle, Chief
Administrative Officer**

Consultation with the following Members of the Corporate Management Team:

Paige Agnew, Commissioner, Growth & Development Services	Not required
Jennifer Campbell, Commissioner, Community Services	Not required
Neil Carbone, Commissioner, Corporate Services	Not required
David Fell, President & CEO, Utilities Kingston	Not required
Peter Huigenbos, Commissioner, Major Projects & Strategic Initiatives	Not required
Desirée Kennedy, Chief Financial Officer & City Treasurer	Not required

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Options/Discussion:

This report provides a summary of the analysis, engagement, technical considerations, and next steps of the transportation study for the Princess Street corridor in Williamsville, along with the associated neighbourhood cycling network and Green Street concept development that was completed in addition to the original scope of the study. These three elements form the deliverables for Williamsville Transportation Study (WTS).

The report builds on the information presented at a public open house and the Environment, Infrastructure & Transportation Policies (EITP) Committee meeting on February 13, 2024, and includes a recommendation on a new alternative for Princess Street that incorporates raised cycle tracks. Feedback received on the neighbourhood cycling network and green street concepts in February has been incorporated into the information provided and associated recommendations on those elements are also included in this report to finalize the full scope of the WTS.

Detailed information is contained within the WTS technical memo included in Exhibit A and associated appendices contained in Exhibits B, C, D, and G. Details on the new alternative for Princess Street that includes cycle tracks is outlined in Exhibits E and F.

Background

The Princess Street corridor within the Williamsville neighbourhood is identified as an important area for population and housing growth through intensification and redevelopment. The land use and growth planned for this area was updated through a comprehensive review and adopted by Council in December 2020. In support of this work, a transportation operational needs assessment was completed to understand how the transportation network would perform in the short and long term with this anticipated growth.

The transportation operations analysis concluded that the increased transportation demand could be accommodated and recommended the prioritization of pedestrian and transit modes within the area. The analysis also noted that the limited width of the right-of-way would limit the street from simultaneously prioritizing all modes of travel with a recommendation to look at reducing travel lanes for vehicles, removing on-street parking, and exploring alternate routes for cyclists through the area if required. Full details of the 2020 study can be found in [Report Number PC-20-065](#) and the transportation operations analysis is included in this report as Exhibit B.

The adoption of the land use changes in 2020 also included a recommendation to complete a more detailed transportation study of Princess Street within this area to develop a conceptual design of what the street and intersections would look like to support this growth and prioritize these transportation modes. This second more detailed transportation study, referred to as the Williamsville Transportation Study (WTS), was commissioned to deliver on these objectives.

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Analysis

The WTS began in spring 2022 with technical and design work that identified alternative design concepts for review that were analyzed against the transportation goals and priorities adopted in the 2020 update to the Williamsville Main Street Study (WMSS).

From this work, a concept aligned with the transportation priorities adopted was shared with the public and stakeholders for comment in February 2023. The analysis also considered how to best accommodate the goals within the known constraints that exist along this section of Princess Street including:

- Relatively narrow public right-of-way that varies from 18 metres to 22 metres along the length of the study area.
- Short block lengths with 13 intersections that increase the complexity of incorporating continuous features.
- Limited opportunities to acquire additional right-of-way in the short term to provide space for all desired elements.

This conceptual design, referred to as Alternative 1 for the remainder of this report, included the following elements: widened pedestrian sidewalks to a minimum of 2 metres, transit priority areas at two locations, and expanded areas for benches, street trees and other landscaping or amenities. To accommodate these elements, vehicle travel lanes are minimized, on-street parking is removed, and the existing on-street cycling lanes are removed and shifted to other streets in Williamsville. Details of this technical analysis are included in Exhibit C – Princess Street Cross Section Study.

Engagement on Alternative 1 showed a strong desire from the Williamsville community and active transportation groups to retain the cycling infrastructure on Princess Street and to better understand the other alternatives considered and technical analysis completed. There was also a strong desire to understand how the neighbourhood cycling network could be developed further and how green street concepts could be included.

Based on this input the project team modified the deliverables of the project to provide the following:

- Sharing of additional technical information related to the alternatives considered for Princess Street, presentation of this information at a public information session, and further developing an alternative concept that included cycling infrastructure to allow direct comparison.
- Expanded bicycle network scope to further develop the neighbourhood cycling concepts that could be implemented within Williamsville.

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- Development and public engagement on Green Streets concepts that can be used in Williamsville and other areas of the city as part of the reconstruction of neighbourhood streets.

A summary of these three deliverables is provided below with full details found in Exhibit A through D and Exhibit G.

Princess Street Corridor Alternatives

The Princess Street Cross-Section Study (Exhibit C) developed concepts that could provide an improved environment for pedestrians, cyclists, and transit users along the Williamsville section of Princess Street.

The alternative concepts developed considered the following features as most desirable based on the conclusions reached in the 2020 study:

- Maximize areas for street trees and furniture to create a more welcoming streetscape,
- Sidewalks at least 2 metres wide to recognize the growing pedestrian trips and to ensure accessibility for all users.
- Transit priority measures to allow Kingston Transit to operate with headways of five minutes.
- Two-way cycling facilities to enhance cycling access.
- Reduced lane width for vehicles to encourage traffic calming and maximize space available for other amenities.

Six alternatives were developed for review based on these desirable features with all alternatives prioritizing spaces for active and transit modes by removing parking and reducing travel lane width to the minimum possible. A summary of the alternatives is as follows:

- **Alternative 1 (Widened Pedestrian Realm):** Prioritized the pedestrian realm by removing bike lanes and adding street trees and rest areas where possible to maximum extent of available space. Widened sidewalks to 2.0 metre minimum where possible.
- **Alternative 2 (Cycle Tracks):** Substituted existing street-level bike lanes with grade separated cycle tracks. Cycle tracks would be a minimum of 2.0 metre wide on both sides of the street. Sidewalks would be designed to 2.0 metre widths where possible.
- **Alternative 3 (Bi-Directional Cycle Track):** Replaced the existing street-level bike lanes with a bi-directional cycle track on the north side of Princess Street. Bidirectional cycle track would be a minimum of 3.5 metre wide. Sidewalks would be designed to 2.0 metre widths where possible.
- **Alternative 4 (One-Way Cycle Track):** Replaced existing street-level bike lanes with a one-way cycle track on the north side of Princess Street. Cycle track would be a minimum of 2.0 metre wide, with additional space between cycle tracks and sidewalks. Sidewalks would be designed to 2.0 metre widths where possible.

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- **Alternative 5 (On-Road Cycle Lanes):** Provide conventional street-level cycling lanes, similar to the current condition. Cycle lanes would be a minimum of 1.5 metre wide plus a 0.3-metre wide gutter to provide extra width for maneuvering. Sidewalks would be designed to 2.0 metre where possible.
- **Alternative 6 (Continuous Transit Lane):** Created a dedicated westbound transit lane throughout Princess Street to improve transit travel times. Sidewalks would be designed to 1.5 metre widths where possible.

Alternative 1 was identified to best address the pedestrian and transit objectives set forward in the adopted plan for Williamsville and was determined to be feasible with the public space available in the right-of-way. However, this option did not include on-street dedicated cycling infrastructure. This alternative was advanced to more detailed review and comment from the public in spring 2023 and is carried through as feasible in the final report. This is discussed in more detail in later sections of the report.

Alternate 2 and 3 could not fit continuously through the corridor and Alternative 4 only provided one-way cycling infrastructure so all three were not advanced further. Alternative 6 would create unacceptable delays for eastbound transit service, removed all cycling infrastructure, and required sidewalk widths of 1.5 metres so was similarly not advanced further.

Alternative 5 was determined to be feasible within the right-of-way while maintaining two-way cycling facilities and allowing transit to be prioritized. However, this alternative cannot meet the minimum pedestrian infrastructure design throughout the corridor and the on-road cycling lanes are not a preferred type of infrastructure unless part of existing conditions. This alternative was advanced to more detailed design following feedback received from the public engagement held in spring 2023 that indicated a desire to better understand if cycling lanes could be maintained and presented in October 2023 and February 2024 for public comment. Based on operations and stakeholder concerns related to accessibility, illegal parking, and operations, Alternative 5 is not being advanced in the final report as viable.

Public, stakeholder, and EITP Committee feedback received in February 2024 sought additional information on options that could include a grade separated cycling facility even if some elements related to transit priority, vehicle movement, and green space could not be accommodated. Staff undertook an additional review, design, and modeling with this input to develop an updated alternative for consideration summarized as follows and detailed in Exhibit E and F:

- **Alternative 2B (Cycle Tracks):** Replace on-road cycling lanes with grade separated cycle tracks that would be a minimum of 1.8 metre wide on both sides of the street with a 0.6 metre curb separating the cycle tracks from the road. Sidewalks would be designed to 2.0 metre widths where possible. Transit priority and turn lane capacity for vehicles reduced where required. On-street parking removed.

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A more detailed description of the existing conditions on Princess Street and the changes that would be created by Alternative 1 and new Alternative 2B is provided below.

Existing Conditions on Princess Street in Williamsville

The Princess Street corridor within Williamsville study area extends from the intersection of Bath Road/Concession Street in the west to Division Street in the east. The right-of-way exists for transportation is constrained in width ranging from 18 metres to 22 metres and is vehicle centric.

Existing sidewalk areas are generally narrow and cannot meet accessibility requirements. The on-road cycling lanes are unbuffered and vary in width to accommodate vehicle parking in some sections. Transit amenities such as shelters, benches, and accessible infrastructure is limited. The relatively short block lengths with numerous intersections add additional complexity to the change envisioned for the area.



Figure 1 – Example of Existing Conditions on Princess Street

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Alternative 1 – Widened Pedestrian Realm

Alternative 1 prioritizes the pedestrian experience along Princess Street while allowing for transit priority to be included to the highest degree. A rendering of this alternative is shown below in Figure 2. Details of this alternative including concept drawings of the full corridor, additional renderings, and transportation modeling details can be found in Exhibit A and D.



Figure 2 – Rendering of Alternative 1 (Widened Pedestrian Realm)

This alternative provides a 2.0 metre sidewalk along the corridor and protects an additional minimum 1.85 metre area for benches, street trees, and other amenities along more than 60%

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of the corridor. Cyclists and vehicles will share the travel lanes and the design can include infrastructure at intersections where possible to assist cyclists in making turns.

Vehicle travel lanes are reduced to between 3.3 metres and 3.5 metres and parking lanes are removed, which creates a maximum vehicle area of 7.0 metres in mid-block sections. This configuration is expected to lead to slower traffic speeds creating safer shared spaces for cyclists and drivers compared to existing conditions.

No on-street parking is included in this alternative with the expectation that these needs are accommodated on the side streets or within the private developments. It is expected that some motorists may attempt to park or stop illegally by pulling up onto the curb, blocking the travel lane. However, the narrow, single lane of travel in each direction is expected to discourage this behaviour to a much greater degree than other alternatives where at-grade cycling lanes, cycle tracks, or transit priority lanes may be improperly used for this purpose. Appropriate side street loading and parking areas along with enforcement will be necessary to minimize illegal parking and stopping. Some parking to address accessible or loading concerns may be able to be included in the eastern sections of Princess Street close to Division Street if the pedestrian realm is reduced.

Alternative 1 is most consistent with the vision adopted as part of the update to the WMSS in December 2020 and best addresses accessibility requirements for pedestrian areas. This alternative is most supportive of increased pedestrian use for trips within the neighbourhood and to comfortably access transit. It also allows greening elements to be provided more consistently along the entire corridor. Transit priority needs are protected where warranted and vehicle operation is slowed to allow shared use with cyclists but this is achieved only by removing dedicated cycling facilities.

Alternative 2B – Cycle Tracks

Alternative 2B provides grade separated cycle tracks in both directions as a priority and encourages cycling as a sustainable option of transportation along Princess Street. A rendering of this alternative is shown below in Figure 3. Details of this alternative including concept drawings of the full corridor, additional renderings, and transportation modeling details can be found in Appendix E and F. Note that the measurements provided in Figure 3 are for reference purposes and may change during detailed design.

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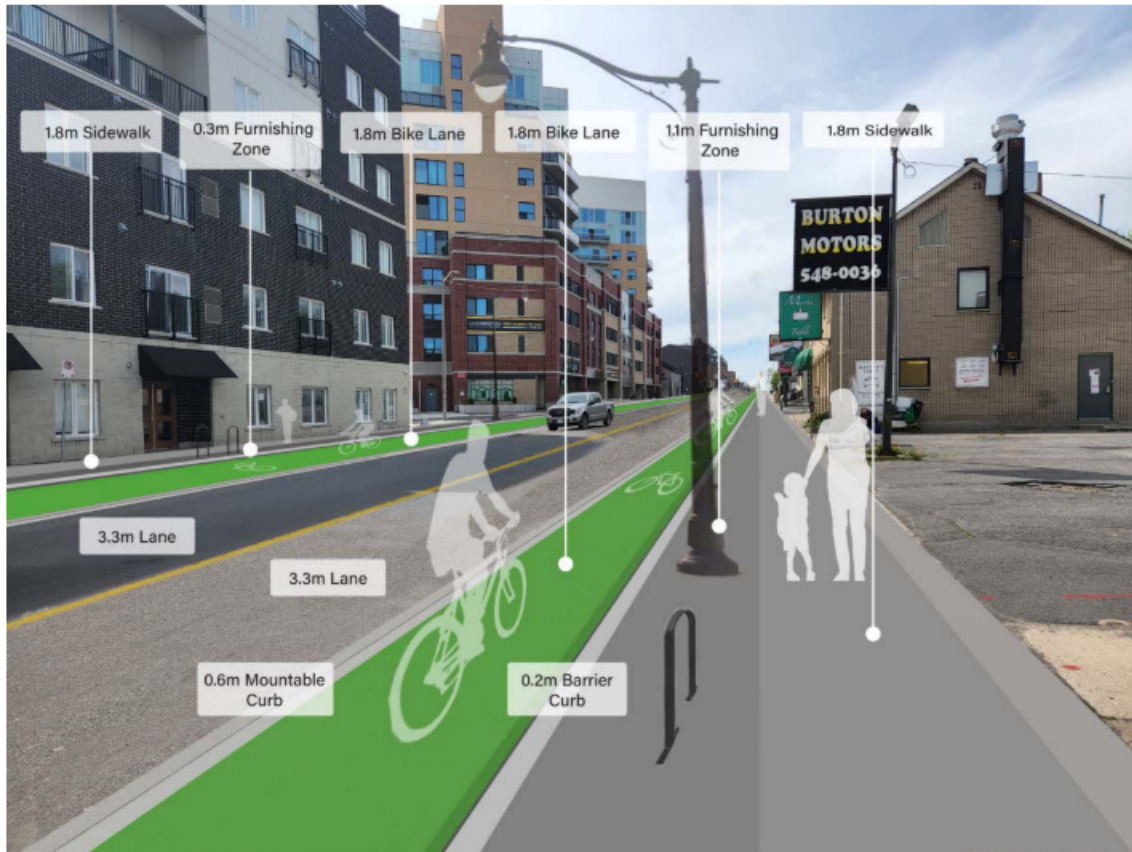


Figure 3 – Rendering of Alternative 2B

The narrowing of vehicles lanes to 3.3 metres, removal of left turn lanes at several locations, and removal of on-street parking allows for continuous on-road, grade separated cycle tracks. The cycle track enhances the current level of infrastructure for cyclists and replaces the on-road cycling lane configuration that is no longer recommended in the updated Ontario Traffic Manual guidelines unless part of an existing condition.

The remaining area is allocated to the pedestrian realm with minimum 1.8 metre sidewalk provided in the corridor. There are some areas at intersections where accessible ramp requirements cannot be fully met without additional property acquisition however this may be mitigated during detailed design. Some areas, largely in the eastern section of Princess Street closest to Division Street will allow for some pedestrian amenities such as benches and street trees.

The overall asphalt width of the roadway will be approximately 6.6 metres to 7.0 metres wide in mid-block areas, similar to Alternative 1. Although the cycle tracks are buffered and grade separated from the vehicle travel lanes, there is expected to be increased instances of vehicles stopping or parking within the cycle tracks compared to Alternative 1. Appropriate side street

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loading and parking areas along with enforcement of correct use of the cycle tracks will be necessary to minimize these occurrences.

This alternative provides the best option to enhance cycling infrastructure in this section of Princess Street and best encourages neighbourhood and city-wide cycling trips while ensuring the minimum sidewalk widths are maintained for accessibility. Alternative 2B has less opportunity for greening opportunities, including planters, particularly in the western half of the study area.

To fully accommodate the cycle tracks and maintain required sidewalk widths, some left turn lanes and a transit priority element planned for Drayton Street have been removed. As transit vehicles travel in the same lanes as other vehicles in this section of Princess Street the removal of the left turn lanes will add delay to the bus trip compared to Alternative 1 however the expected delay can be managed in the operation based on the modeling completed for Alternative 2B. The removal of the left turn lanes is expected to create additional delays for all vehicles on Princess Street which could lead to motorists shortcutting on neighbourhood streets or shifting to a separate roadway altogether such as Concession, Johnson, and Brock Streets.

Updated transportation modeling, as outlined in Exhibit E, quantifies the impact expected to transit and motorists in this alternative and details strategies to be deployed in the operation of the corridor in the future.

Engagement on Alternatives 1 and 2B

Following completion of the initial Princess Street Cross-Section study (Exhibit C), Alternative 1 was shared on the City's Get Involved platform to allow questions and feedback from the public and interested stakeholders. Public feedback through the Get Involved platform and at a townhall meeting organized by the Williamsville Community Association indicated a strong concern over the lack of cycling lanes in the design and a strong desire to better understand the alternatives that were considered that could allow cycling to be included in the final design.

To address these concerns and increase transparency for the design process, the Princess Street Cross-Section study was revised to add more details about the alternatives considered and the technical analysis completed. The design concept for Alternative 5 was advanced to a similar stage as Alternative 1 to be shared with the public. This expanded information, including updated concepts for Alternative 1 and 5, was presented at a public information session on October 26, 2023, and made available on the Get Involved platform through late November 2023 for comment. These concepts were then included in [Report Number EITP-24-008](#) to the EITP Committee for the February 13, 2024 meeting. As noted above, based on feedback received following the Committee meeting, Alternative 2B was developed and made available in early May to stakeholder groups and on the [Get Involved project page](#) on May 13, 2024.

Comments and survey results from this engagement indicated a preference for keeping and/or enhancing the existing cycling infrastructure along Princess Street. Strong support for cycling

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infrastructure was shown at the February EITP meeting and cycling lanes were ranked as the most important feature to include in the design, followed by wider sidewalks, street trees and furniture, and transit priority lanes. Residents noted that the existing Princess Street cycling lanes do not feel safe to ride on and preferred physically separated cycling lanes. This prioritization is best reflected in the Alternative 2B concept although the physically separated cycling lanes limit the space available for a wider pedestrian realm and transit priority features.

Participants also noted that the existing Princess Street corridor in Williamsville does not feel inviting from a pedestrian standpoint and should be enhanced particularly for persons with accessibility needs. It was noted that some existing intersections along Princess Street do not have accessible elements such as tactile plates or audible cues. Other concerns raised pertained to short crossing times at intersections, which are not suitable for individuals with accessibility concerns. Pedestrian enhancements, including crossing areas at the intersections, sidewalks that meet accessibility requirements, and space for rest areas is best addressed by the Alternative 1 concept, however both concepts can meet accessibility requirements.

Participants also noted that the removal of on-street parking on Princess Street would make it harder to find accessible parking. In addition, participants noted concern that the lack of parking on Princess Street would cause vehicle infiltration onto surrounding neighbourhood streets. Given the limited right-of-way in this area, it is not possible to accommodate parking while supporting the other desired elements. As such, an operations, maintenance, parking policy and enforcement plan, similar to the requirements for Princess Street from Division to Ontario Streets, would need to be developed to support any new infrastructure.

Consultation with Municipal Accessibility Committee on Alternatives 1 and 2B

Consultation with the MAAC was completed with a three-person project team. The MAAC project team noted that there is a requirement to comply with the *Access for Ontario Disabilities Act (AODA)* and legislative required minimums for exterior paths of travel must be prioritized. It was also noted that maintaining and improving transit service in the Williamsville area is critical for ensuring the Williamsville area remains accessible to residents who rely on the service. It was noted that for many individuals, transit serves as the gateway to the rest of the city, particularly for those who do not drive as their primary mode of travel.

During previous consultation, the MAAC project team expressed concerns with the sidewalk widths proposed for Alternative 5 along with other accessibility concerns. The team also stressed that the success of accessible infrastructure relies on its continuity with gaps or barriers being a significant concern for the accessibility of users. It was noted that the final design for Princess Street must emphasize accessibility at intersections so that they do not become a barrier themselves with suggestions to include raised intersections, scramble crossing signals, and shortening the crossing distance for larger intersections during detailed design. The MAAC representatives noted challenges with the existing cycling lanes on Princess Street and concern that the cycling lanes proposed in Alternative 5 would not address these

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issues. The lack of physical barriers may not prevent vehicles from encroaching on the cycling lanes and cyclists may be forced into the roadway if there are stopped vehicles blocking the cycling lanes.

The raised cycle tracks in Alternative 2B addresses many of the above-noted concerns and the removal of turning lanes and a queue jump lane in the design provides additional space for accessible infrastructure. Conflict points between cyclists, pedestrians, and transit users will be considered during detailed design of the cycle tracks. There were safety concerns noted regarding transit vehicles entering the cycling space for loading/unloading. There is a preference for completely separating vehicles from the cycle tracks and instead have cyclists sharing the transit loading zone with pedestrians and yielding to transit users while the bus is stopped.

The MAAC project team expressed a desire for the City to consider removing additional turning lanes or installing additional vehicle restrictions to provide space for more accessible infrastructure at intersections. It was also noted that there are currently a number of medical institutions that require accessibility accommodation within the corridor and it is important to provide accessible infrastructure where possible.

In the discussions about Alternative 1, it was noted that unintended impacts to accessibility can also occur with the removal of the existing on-street cycling lanes as the likelihood of non-confident cyclists riding on the sidewalk may increase, posing a hazard for pedestrians. It was also noted that some residents are unable to use any type of vehicle, including taking transit. For these residents, mobility devices such as rollators and adapted bicycles are the most accessible form of travel and preferable to walking longer distances. As such, designated active transportation facilities are vital. The expanded pedestrian space included in Alternative 1 would be available for these residents, however the lack of cycling facilities may constitute a barrier and limit travel for these residents. There is also concern that cyclists that are not comfortable cycling on shared facilities would need to alter their traveling routes, potentially increasing the total distance travelled significantly.

Constructability and Operations Review on Alternatives 1 and 2B

Technical staff from Public Works, Engineering, Transportation, and Transit completed a preliminary constructability review of Alternative 1 and Alternative 2B to compare the impacts for multiple areas including: utility conflicts, maintenance, snow removal, intersections, traffic signals, emergency services, operating costs, and safety. Previous comments received from Utilities Kingston review of Alternative 1 and 5 were incorporated into this review as well.

The technical group noted that the constrained right-of-way in this section of Princess Street is expected to create reconstruction challenges in any scenario, particularly as it relates to unknown or unexpected historic infrastructure. Staff noted that Alternative 1 best addresses accessibility requirements under the AODA and there is an identified need to reduce barriers for pedestrian and transit riders in this area. Alternative 2B can be fully AODA compliant, but space would be more limited.

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For both alternatives, it is expected that a high volume of pedestrian traffic would require accommodation during construction, particularly during school months. Both alternatives have a similar level of construction complexity.

It was noted that both Alternative 1 and Alternative 2B have narrowed roadways that would limit the available space for utilities and increases the cost of repairs and maintenance if needed. It was also noted that there is a significant amount of telecommunications utility infrastructure throughout the corridor, creating challenges for locating remaining utilities. With that said, space available to install traffic signals and street lighting, particularly in the study area west of Alfred Street is more constrained in Alternative 2B. Single poles could be used to reduce pole pollution and free up space while turning movements to and from constrained intersections may need to be limited or removed. Similarly, street trees and the associated Silva Cells may be difficult to implement and maintain in either alternative due to the depth needed for the soil and drainage interfering with utilities. These issues are mitigated if raised planters or plants with shallow roots are used but space to accommodate these elements in Alternative 2B is very limited.

The transition between cycle tracks and sidewalk for Alternative 2B was discussed. Several factors such as the type of curb, visual/tactile delineation, and treatment at bus stop location would need to be considered during detailed design which may differ from the conceptual design as shown. It was noted that similar cycle track designs in Ontario have prompted litigation related to accessibility delineation. Lessons from those examples would be considered during detailed design in addition to further consultation with the MAAC Project Team.

From an operational perspective, both alternatives pose challenges for snow removal as the elimination of the parking lanes restricts the snow storage capacity for the initial clearing of vehicle travel lanes. To meet City minimum maintenance standards, snow removal is most challenging in Alternative 2B due to snow clearance standards for winter bikeways. Alternative 1 has some snow storage capacity and would allow Public Works to return to clear snow from the boulevard and sidewalk. The narrow roadway in both alternatives may cause traffic delays during snow removal operation however this can be mitigated by completing this work overnight or in off-peak hours. Snow removal costs would likely increase to levels similar to existing costs for lower Princess Street in both alternatives. It was noted that the mountable and barrier curb design as shown for Alternative 2B may increase the difficulty of snow removal due to the grade separation between the cycle tracks and the sidewalk. This could be mitigated by using visual and tactile delineation for the design rather than grade separation.

Removal of accessible parking is a concern for both alternatives, however, with Alternative 1 there is more space available to include accessible parking in the eastern section in the final design at the expense of some of the pedestrian realm or greening space. Alternative 2B does not include space within the right-of-way to accommodate temporary on-street parking or passenger loading. Lack of loading zones is a concern for both alternatives and there may be traffic delays if vehicles stop in the middle of the road to load/unload. There is a concern that the cycle tracks proposed in Alternative 2B will attract illegally parked vehicles to a greater degree

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than Alternative 1. Staff noted that the side streets will need to accommodate all parking and loading in both alternatives as there is limited rear lane access to buildings along Princess Street.

Waste collection is currently done on-street with curbside placement. Solid Waste staff noted concerns that collection vehicles could block traffic movement when collecting waste under both alternatives. Off-peak waste collection and vehicle assignment similar to that used within other areas of the downtown core may be required to minimize disruption.

There is concern that the narrow roadway in Alternative 1 could impact emergency response time as there is less space for vehicles to maneuver to make way for emergency vehicles. Using mountable curb instead of barrier curb may alleviate this issue although this may lead to undesirable parking behaviours by motorists who can more easily mount the curb area. Alternative 2B can address this concern by implementing mountable curb between the raised cycle tracks and the roadway, allowing vehicles to pull over onto the cycle tracks for emergency vehicles and for cyclists to pull over onto the sidewalk if needed. Staff also note that the relatively short block length of Princess Street in this area can also allow motorists to turn off Princess Street relatively easily to allow emergency vehicles to pass.

Recommended Approach for Princess Street Design

Based on the updated technical modeling, constructability reviews, and stakeholder engagement, the design for Princess Street that incorporates cycle tracks and accessibility pedestrian walkways, Alternative 2B, is recommended as the preferred concept to proceed into detailed design.

Neighbourhood Cycling Network

In addition to developing a future concept for Princess Street, there is a need to develop supporting infrastructure within the Williamsville neighbourhood to further encourage active travel and shift trips away from vehicles. As part of the transportation study, a network of potential neighbourhood cycling routes was developed for public engagement in spring 2023.

The network developed through this process is shown in Figure 4 with the green lines representing the corridors most preferred.

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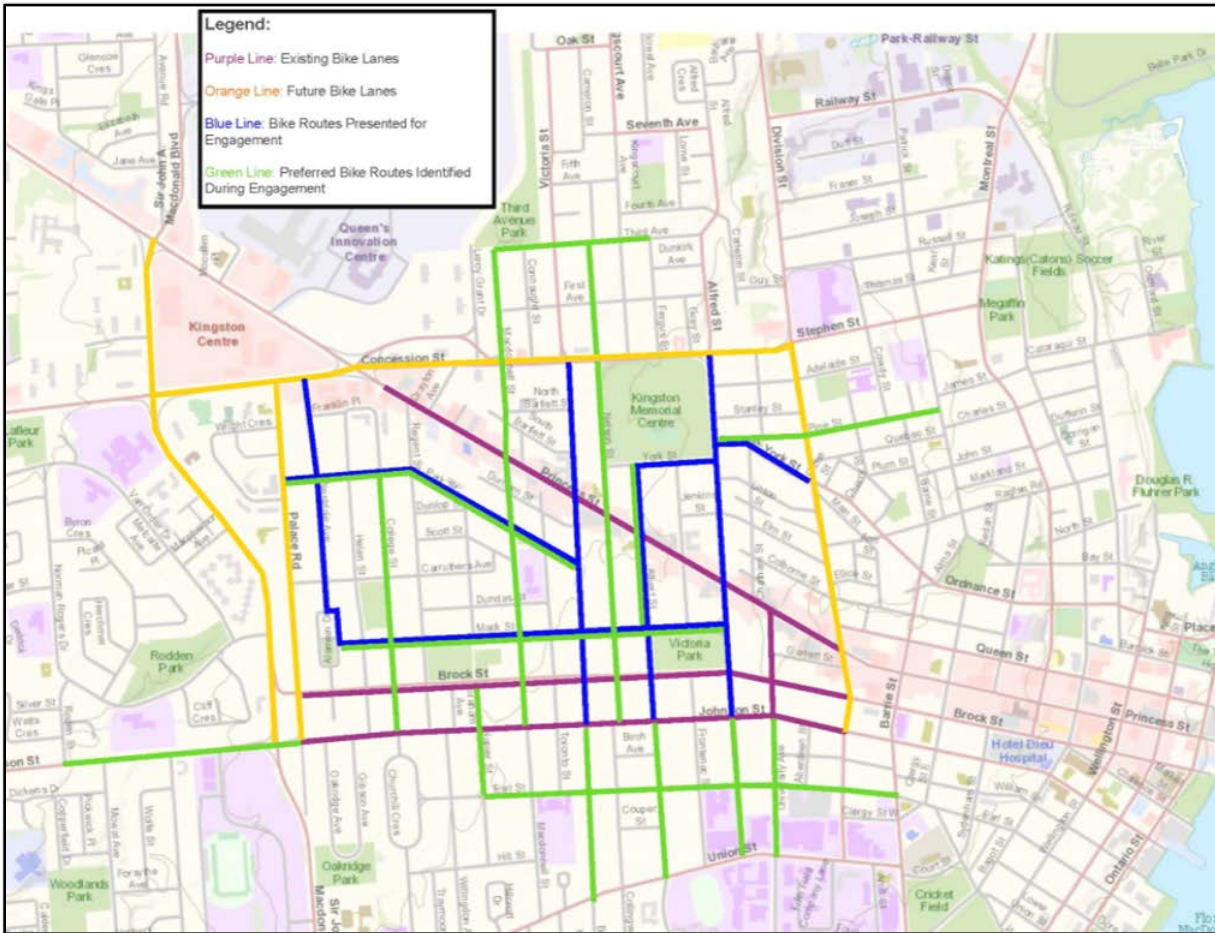


Figure 4 – Cycling Network Options Developed for Williamsville

Using these network options, the study developed a recommended facility type for the proposed network. These facility types were determined using the Cycling Facilities guidelines of the Ontario Traffic Manual (OTM Book 18). Based on this review and technical analysis, there are three facility types recommended for the Williamsville neighbourhood streets – shared streets, neighbourhood bikeways, and advisory bike lanes. Details of each of these facility types are presented in the WTS (Exhibit A) and further in Exhibit G. The resulting network and recommended facility type is captured in Figure 5.

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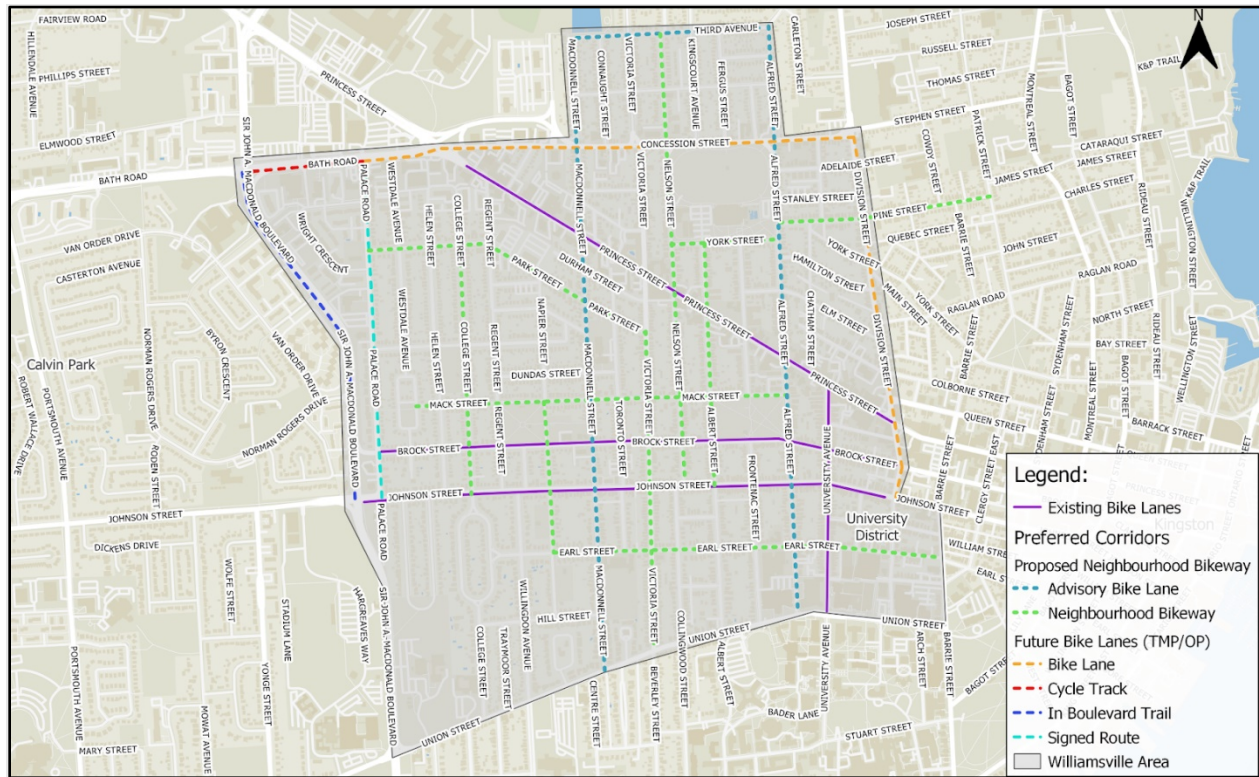


Figure 5 – Recommended Cycling Network and Facility Type

This neighbourhood network can be developed in conjunction with the recommended alternative for Princess Street.

Public engagement on the neighbourhood cycling network was completed in spring 2023, with additional comments gathered on the facility types at an in-person open house and online through the Get Involved platform in October and November 2023 and at the February 13, 2024 EITP meeting. Participants in the engagement were generally supportive of the network that was being developed and the proposed locations for the advisory cycling lanes.

Participants in the engagement expressed a desire for more robust vehicle restrictions on local roads, including modal filters, traffic diverters and bollards. There were mixed responses to using bump-outs as a traffic-calming measure, with concerns related to diverting cyclists to the centre of the road and visibility of the bump-outs, especially during winter.

Consultation with the MAAC project team noted strong support for additional cycling infrastructure in the surrounding area for residents with accessibility needs. It was noted that the importance of a holistic approach to the overall design should be a priority so that the additions to the neighbourhood cycling network are included as part of the design of the Princess Street areas. The MAAC project team noted a concern that the options proposed consisted primarily of

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painted cycling lanes and stated a preference for more robust infrastructure that included physical barriers between cyclists and vehicles, particularly if the cycling lanes along Princess Street are removed.

The MAAC project team also noted a concern that vehicles may not respect advisory cycling lanes and that a public education campaign would not be sufficient for maintaining the safety of cyclists, particularly with larger vehicles that are commonly used in the city. There was concern with the use of bump-outs and the possibility that they would force cyclists into the centre of the road. The MAAC project team expressed a general desire for physically separated cycling facilities and directional restriction for vehicles.

Green Street Concept Development

The Green Street concept was developed at a high level within the original Williamsville Main Street Study and carried through in the 2020 update as a concept that the community strongly desired to see on neighbourhood streets in the future. This concept was further supported in Council's Strategic Plan directing staff to "explore other options to support 'greening' the city, such as green infrastructure in municipal rights-of-way".

Five Principles

Based on this direction and the interest expressed by the Williamsville residents, the study scope was expanded to develop Green Street concepts that could be used on neighbourhood and local roadways. The work developed five principles that would define the Green Street approach as follows:

1. Intersections should be designed with a focus on vulnerable road user (VRU) safety. Techniques to consider should include intersection narrowing, reduced curb radii, raised crossings/intersections, conspicuous pavement marking, intersection channelization, and improved lighting.
2. Vehicular lane widths should be minimized to encourage reduced travel speeds and reduce impermeable surface area within the road right-of-way.
3. Traffic calming techniques should be considered for local roadways where speed or volume is a demonstrated concern to improve multi-modal safety and discourage the use of private vehicles within the Williamsville area.
4. Planting of street trees and landscaped boulevards/islands should be considered to provide shade and visual interest. If required, existing on-street parking should be considered for removal to provide additional space. Where parking cannot be removed, parking lane widths will be minimized.

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- 5. Where feasible, based on space and soil conditions, low-impact development features, including rain gardens and permeable pavements, should be used to improve the quality and decrease the volume of stormwater entering waterways.

From these principles, three preliminary concepts – lite, medium, and heavy – were developed for public engagement. These concepts can all be implemented with the recommended Princess Street design however there could be conflicts with some of the features considered for the neighbourhood cycling network that would be reviewed at a detailed design stage. A summary of these concepts is as follows:

Green Lite Concept

As the name suggests, the Green Lite concept requires the fewest infrastructure changes on the street and can be implemented at the lowest cost. The concept focuses on adding bump-outs at the intersections, seasonal centreline bollards, and minimizes the loss of on-street parking and opportunities for green elements to be added. A rendering of this cross-section concept and the layout on a block of Frontenac Street is shown in Figure 6 and 7.



Figure 6 – Green Lite Cross-Section Rendering

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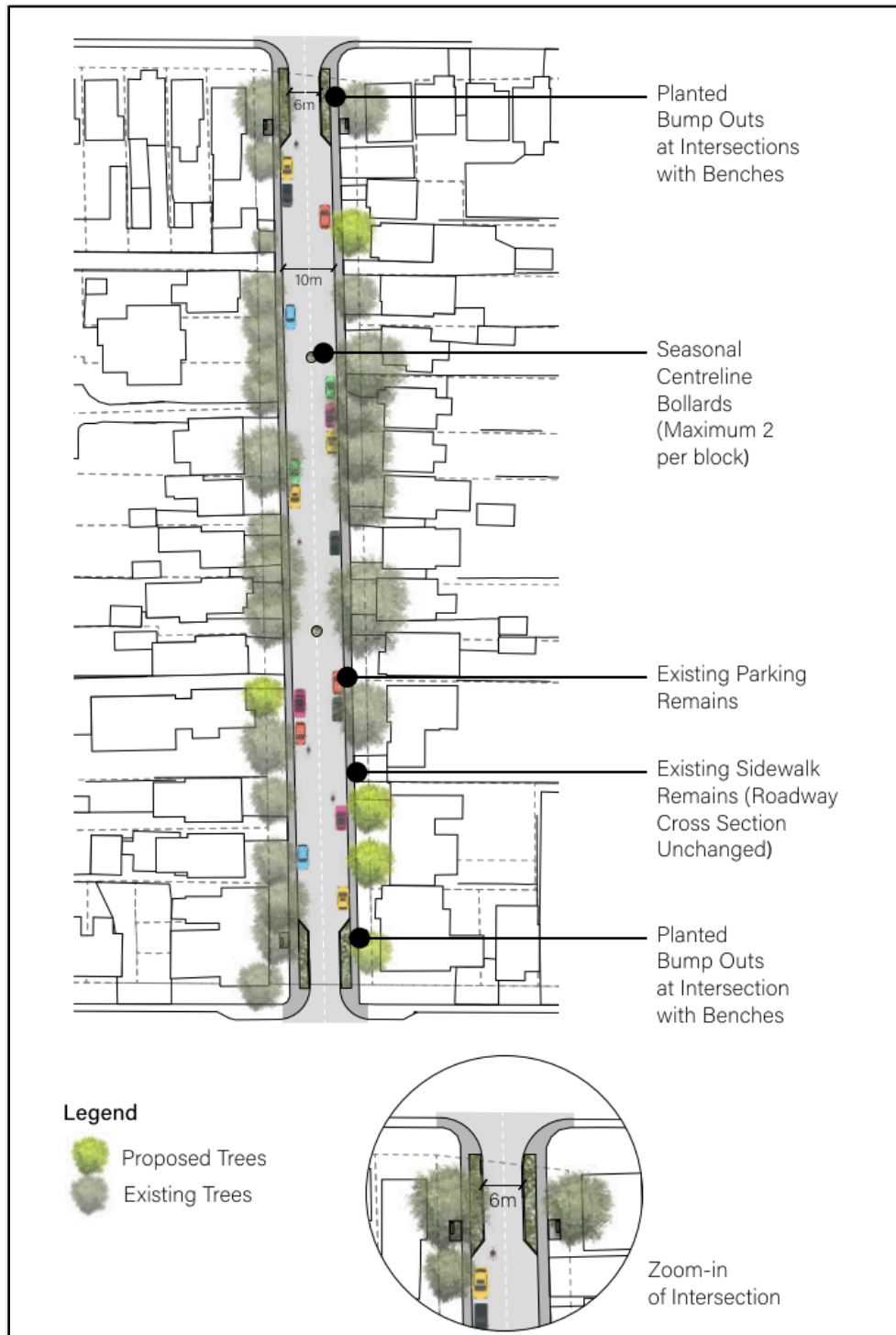


Figure 7 – Green Lite Concept Layout

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Green Mid Concept

The Green Mid concept expands on the features developed for the Lite concept and includes some additional mid-block bump-outs that would provide opportunities for additional traffic calming and greening elements. This concept requires removal of existing on-street parking areas to a greater degree than the lite concept.

A rendering of this cross-section concept and the layout on a block of Frontenac Street is shown in Figure 8 and 9.



Figure 8 – Green Mid Cross-Section Rendering

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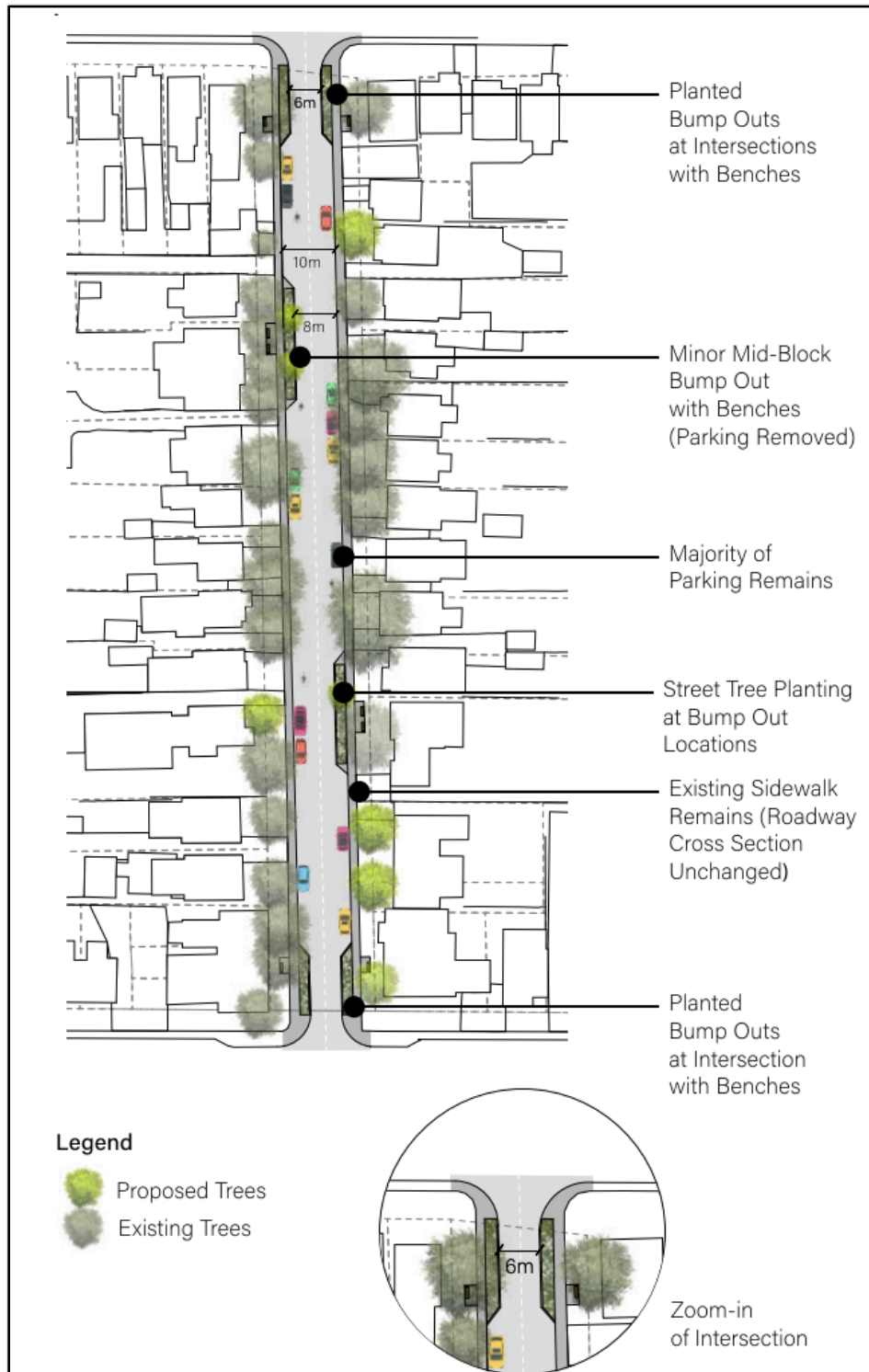


Figure 9 – Green Mid Concept Layout

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Green Heavy Concept

The final concept, Green Heavy, represents the greatest degree of change to the streetscape with a focus on bumped-out areas at along the entire street length and at the intersections. This concept maximizes the traffic-calming elements and provides the greatest space for additional trees and other greening elements to be added. Raised crosswalks are also introduced at the intersections to further enhance the pedestrian elements.

A rendering of this cross-section concept and the layout on a block of Frontenac Street is shown in Figure 10 and 11.

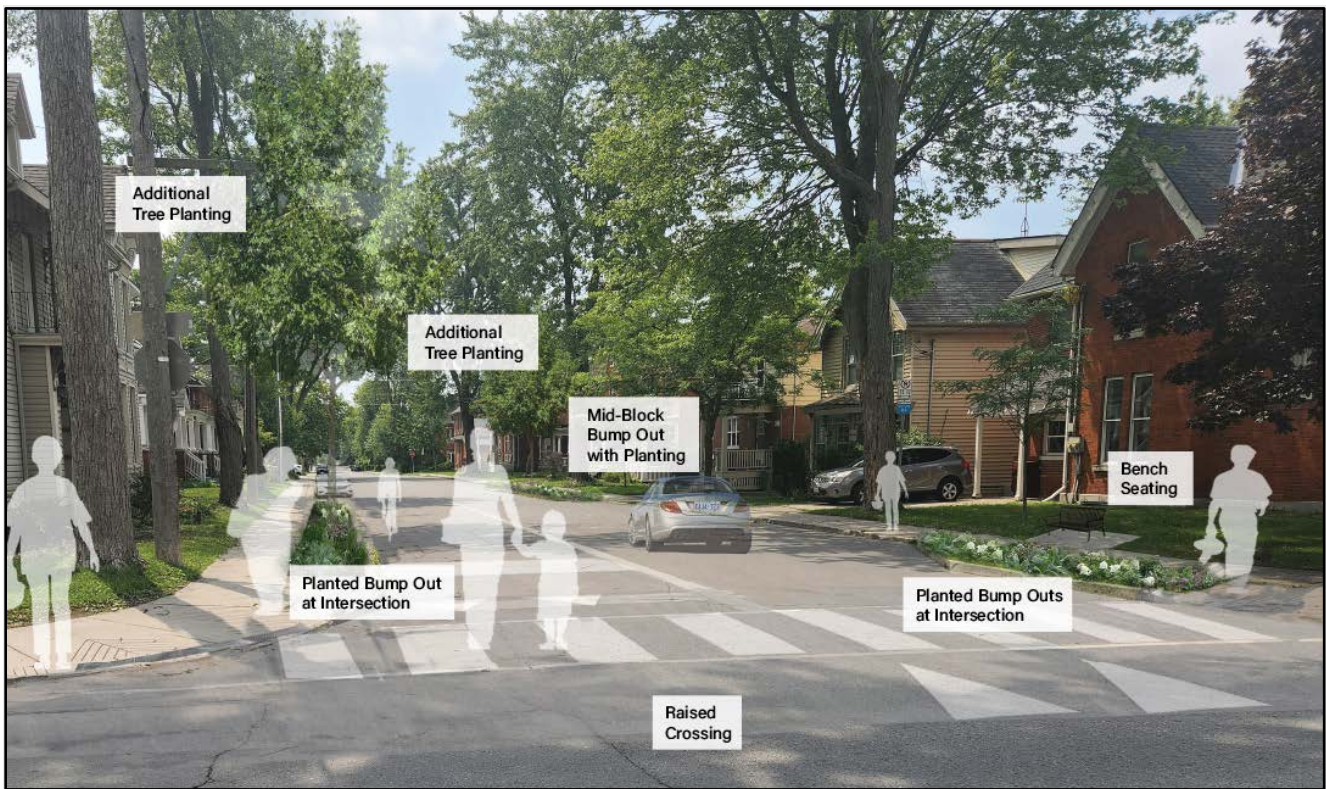


Figure 10 – Green Heavy Cross Section Rendering

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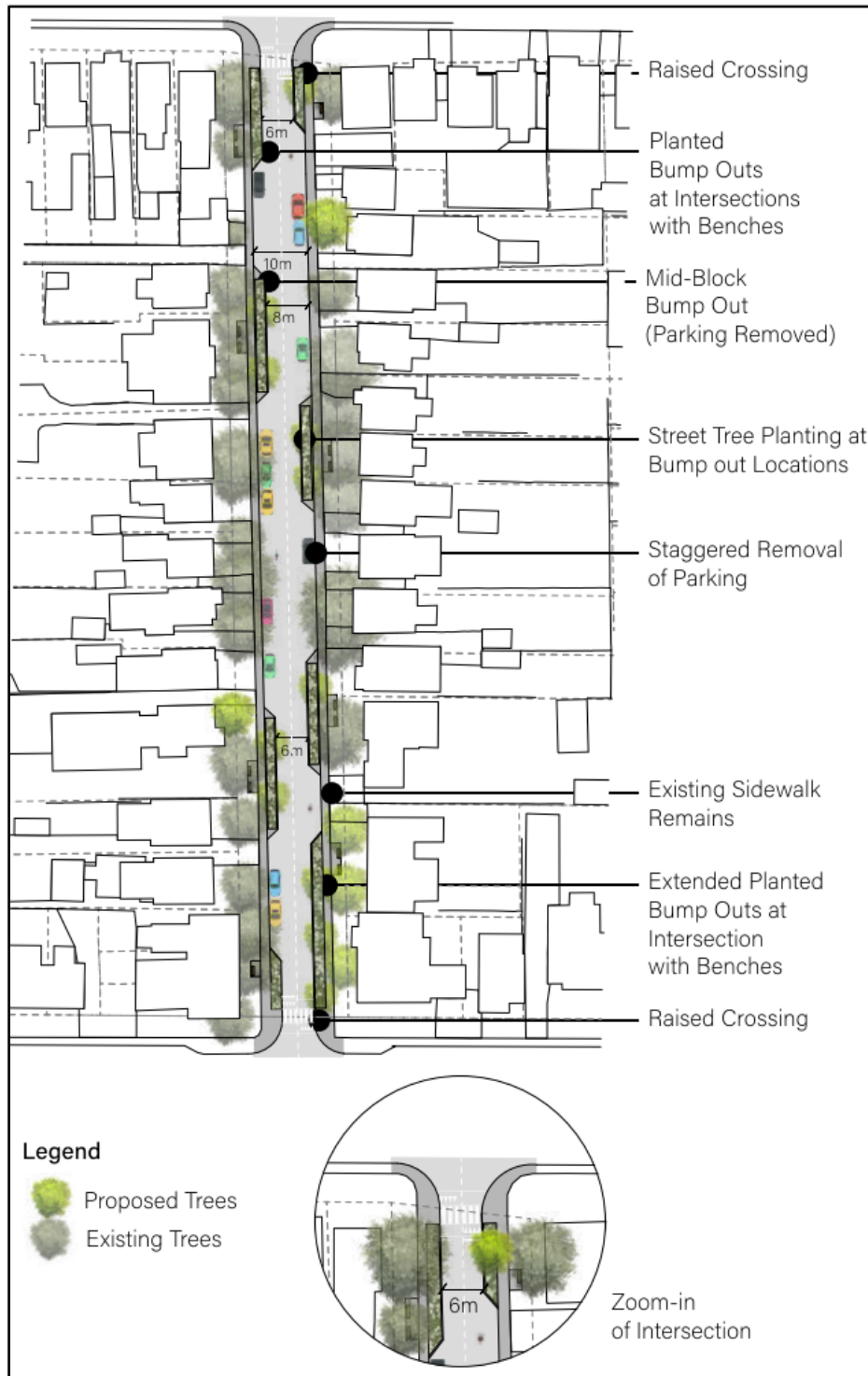


Figure 11 – Green Heavy Concept Layout

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Public engagement on the Green Streets concepts was undertaken in October and November 2023 as part of an in-person information session and through the Get Involved platform as well as the February 13, 2024 EITP meeting. Participants were asked to rank their preferred alternative for the Green Streets concepts with strong preference shown for the Heavy concept and the Lite concept being the least preferred.

Participants were receptive to the idea of Green Streets and when asked about the Green Street elements that were most important the responses indicated that the preferred design should involve wide sidewalks and tree planting where possible. Support was mixed regarding the use of bump-outs and removal of on-street parking suggesting that support for the implementation of the Heavy option may not be as broadly supported as it is at the conceptual level. Adding Green Street elements would require reduction of on-street parking. Overall support for Green Streets concepts was positive, but the sensitivity regarding parking should be considered further for individual projects.

Consultation with the MAAC project team noted broad support for the Green Street concepts, particularly as it pertains to the added rest areas and greenery including comments supporting maintaining and enhancing access for crossings, especially on major arterials such as Johnson and Brock Streets, was noted as being vital in reducing a major barrier to access.

Next Steps for the Williamsville Transportation Study

The information presented in this report and exhibits provides a recommended design concept for Princess Street that can be supported by formalizing a neighbourhood cycling network and incorporating green street design into local roadway reconstruction.

Based on the updated analysis, modeling, and comprehensive engagement staff are recommending that the following next steps to conclude the overall project be taken:

- Adopt the Princess Street concept that prioritizes cycle tracks and the pedestrian realm, Alternative 2B, as preferred and direct staff to proceed into detailed design on the segment from Alfred Street to Division Street.
- Use the preferred design of Princess Street to inform future capital projects and requirements for development opportunities.
- Develop detailed plans for operations, maintenance, enforcement, and other ongoing actions and incorporate requirements into future operating and capital budgets.
- Adopt the neighbourhood cycling network and facilities and incorporate direction on the cycling network into future capital projects and development opportunities planned for identified streets.
- Adopt the Green Street definition and concepts and further integrate design details into neighbourhood streets slated for reconstruction in approved and future capital budgets.

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Public Engagement

Public engagement for the project has been an iterative process with initial review of Alternative 1 and the neighbourhood cycling network completed through the Get Involved platform in February and March 2023, followed by participation at a townhall organized by the Williamsville Community Association in April 2023.

Subsequent engagement was completed at public information sessions in October 2023 and February 2023 ahead of an information report presented at the February EITP meeting. All information, including the cycle track alternative outlined in Alternative 2B, has been shared as developed directly to stakeholders and through the [City's Get Involved project page](#) to allow for comment and questions.

Following development of Alternative 2B, City staff engaged with the KCAT and the Williamsville Community Association as part of a neighbourhood walk to receive feedback and address questions about implementation of the project on Princess Street.

Climate Risk Considerations

The recommendations in this report for the Princess Street design concept, neighbourhood cycling networks, and green streets would all contribute to increased active transportation and opportunities for lower green house gas emissions.

Indigenization, Inclusion, Diversity, Equity & Accessibility (IIDEA) Considerations

The recommendations in this report consider how to prioritize access and use of a section of Princess Street and the surrounding neighbourhood by those who may walk, roll, cycle, use transit, or drive a vehicle. The work completed to date is informed by Council direction, public engagement, and work with members of the Municipal Accessibility Advisory Committee on the project team.

The findings in this report were reviewed with the MAAC project team in detail, with comments incorporated into this report summary based on the section presented.

Existing Policy/By-Law

None

Notice Provisions

None

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Financial Considerations

There are no direct financial considerations associated with the recommendation provided in this report however the concepts for Princess Street, neighbourhood bikeways, and Green Streets will provide direction for future capital projects and incur additional operating costs when implemented.

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Other City of Kingston Staff Consulted:

Henk Brilliams, Project Manager, Engineering Services

Luke Follwell, Director, Engineering Services

Karen Santucci, Director, Public Works

Exhibits Attached:

Exhibit A – Williamsville Transportation Study, January 2024

Exhibit B – Appendix - Operational Needs Analysis

Exhibit C – Appendix - Princess Street Cross Section Study

Exhibit D – Appendix – Conceptual Design Drawings – Alternative 1 (Widened Pedestrian Area), January 2024

Exhibit E – Williamsville Transportation Study Addendum for Alternative 2B (Cycle Tracks), April 2024

Exhibit F – Conceptual Design Drawings – Alternative 2B (Cycle Tracks), April 2024

Exhibit G – Appendix - Neighbourhood Bikeway Design Toolbox



City of Kingston

Williamsville Transportation Study

January 2024 - 23-6663



January 08, 2023

City of Kingston
Henk Brilliams, P.Eng
Project Manager, Transportation Infrastructure
1211 John Counter Blvd
Kingston, ON K7L 2Z3

Williamsville Transportation Study Report - Draft

Dear Henk Brilliams:

Dillon Consulting Limited (Dillon) is pleased to provide you with an initial draft of the Williamsville Transportation Study Report. We trust that the report covers the topics request by the City in a way that is logical and presented in plain language.

Please let us know if you have any questions or concerns as we work towards preparation of a final report.

Sincerely,

DILLON CONSULTING LIMITED

A handwritten signature in blue ink that reads "Maria King P.Eng." The signature is fluid and cursive.

Maria King, P.Eng.
Project Manager, Associate

cc: Ian Semple

Our file: 23-6663

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Executive Summary

Dillon Consulting Limited (Dillon) was retained by the City of Kingston (City) to conduct a transportation study of the Princess Street corridor, specifically within the Williamsville neighbourhood between Bath Road/Concession Street and Division Street. This study aims to support the planned growth of the Williamsville area and prioritize sustainable modes of transportation to mitigate potential traffic impacts. To this end, the study has been divided into three parts, which all relate to each other and support the overall vision for a sustainable and accessible Williamsville area.

Part one of the study focuses on Princess Street and the work which has been completed to date related to the traffic operations analysis, proposed cross-section alternatives, and previous engagement. The two shortlisted alternatives are the widened pedestrian realm and cycle lane alternatives. These alternatives most closely aligned with the priorities of the Williamsville area and it is recommended that these alternatives be presented to City council for further consideration. The responses received from the public engagement indicated that the public has a strong preference for keeping bike lanes on Princess Street.

Part two of the study relates to Neighbourhood Bikeways concepts for the surrounding Williamsville neighbourhood area. These bikeways were introduced as supportive infrastructure to enhance the cycling experience and provide additional signed connections to other cycling routes. Based on previous engagement, a list of preferred corridors was selected for neighbourhood bikeway treatments. These corridors were then further analyzed to determine which neighbourhood bikeway treatments would be most appropriate for them. Both advisory bike lanes and neighbourhood bikeways were selected as appropriate facilities for the area and sample renderings and designs were developed. MacDonnell Street, Alfred Street, Mack Street, and Park Street were selected as the key north-south and east-west corridors to prioritize. Additional studies should be conducted to explore the transition between these shared facilities and dedicated facilities at major intersections.

Part three of the study involves implementation of 'green streets' within the broader Williamsville area. These design concepts refer to streets that are intentionally designed to reduce impacts on the social and natural environments. These types of streets are

being considered for multiple local roads in the Williamsville area. The green street concepts included traffic calming measures, increased greenery, and reduced on-street parking. Public engagement revealed that the top priorities for green streets were tree plantings, wide sidewalks, and curb bump-outs. Participants ranked the “Green Heavy” alternative as the most preferred. It is recommended that the next steps for this part of the study are the identification of candidate sites within the Williamsville area and development of a prioritization plan for implementation.

It is recommended that the following additional steps are taken:

- Investigate opportunities to maximize accessibility of the short-listed alternative options presented for Princess Street and select a preferred design option.
- Develop an implementation plan and identify preferred traffic calming measures for the neighbourhood bikeways. Determine a timeline for implementing the proposed network with a focus on the priority corridors.
- Identify and screen candidate corridors for implementing the green streets concepts. Determine a preferred green-street design given the public feedback and preferred alternative.

1.0 Introduction

Dillon Consulting Limited (Dillon) was retained by the City of Kingston (City) to conduct a transportation study of the Princess Street corridor, specifically within the Williamsville neighbourhood between Bath Road/Concession Street and Division Street. Princess Street is identified in the Official Plan as an area for intensification in the City and as an important transportation corridor. Similarly, the Williamsville neighbourhood serves as a major destination and connection to Downtown Kingston, characterised by its high use and continued growth of active and sustainable modes of travel, including walking, cycling, and transit. More recently, the City has explored options for defining success in Williamsville, including aspirations for strategic and timely infill development to meet smart growth goals by updating the area secondary plan. As smart growth becomes more embedded in the principles and mandates of the City, there is an emphasis on ensuring the transportation network is refined to meet the changing needs of the community, primarily through a multimodal lens. This multimodal lens prioritizes active

and sustainable modes of travel throughout Williamsville, providing safer and more equitable access for all users.

1.1 Scope

One of the overarching transportation goals for Williamsville is supporting growth in walking, cycling, and transit mode share as they relate to the significant development and evolution of character the area is experiencing. The scope of this transportation study has three main parts that support Kingston in creating an implementation strategy that is well-suited to accommodate priority transit and active transportation in Williamsville. Part One looks at multi-mobility options along the Princess Street corridor between Bath Road/Concession Street and Division Street. This includes exploring alternative design solutions that emphasize shifting mode share in favour of transit and active transportation. While the intention is not to eliminate vehicular use along Princess Street, there is a great need to explore ways to minimize auto-dependency. The redesign of Princess Street will provide a strong foundation for establishing a more comprehensive multimodal network within Williamsville. Part Two explores implementation of a more comprehensive cycling network throughout the Williamsville neighbourhood, accomplished through the principles of “Green Streets”, which are explored in Part Three of this report. The goal of Parts Two and Three is to determine the most feasible approach to increase the desirability of cycling at all ability levels. This includes layering concepts such as Neighbourhood Bikeways and Advisory Bike Lanes on top of the facilities already proposed through the City’s Active Transportation Master Plan. The outcomes of Parts Two and Three will complement the redevelopment of Princess Street by improving transportation options and implementing design changes that encourage reduced auto dependency.

1.2 Background

The 2012 *Williamsville Main Street Study* was originally completed to examine existing land uses and redevelopment potential in the Williamsville area. It provided recommendations about transportation, servicing, and cultural heritage in the area. The *Study* was approved by City Council on February 21, 2012 and included a provision for cycling infrastructure on Princess Street.

As per the direction of City Council, an updated Williamsville Main Street Study began in 2019 and included the *Williamsville Transportation Plan Operational Needs Assessment*. On December 1, 2020 City Council passed amendments to implement the update to the Williamsville Main Street Study including adopting the conclusions from the Operational Needs Assessment. This resulted in an update to the Official Plan and Zoning By-law for the Williamsville Main Street Secondary Plan. Further direction was given to undertake a more detailed second phase to develop a design concept for the Princess Street corridor.

In the 2020 transportation study, the City confirmed that Princess Street is theoretically capable of accommodating additional growth and related transportation demand, inclusive of walking, cycling, and transit use. The physical constraints of the Princess Street right-of-way (ROW) could, however, limit the street's actual ability to meet the demands of all modes. This means that it may not be feasible for Princess Street to simultaneously serve as a transit priority corridor, cycling spine route, pedestrian-friendly corridor, and a primary vehicular connection to the Downtown core.

The current study is an extension of the *Williamsville Transportation Plan Operational Needs Assessment Study* completed in 2020 and explores how all modes can be accommodated on Princess Street, and within Williamsville as a whole. This study and report have been prepared in three parts:

- Part 1: Princess Street Study,
- Part 2: Neighbourhood Bikeways, and
- Part 3: Green Streets Concepts.

2.0 Existing Policy Context

The City of Kingston is the largest municipality in southeastern Ontario, with considerable opportunity to continue to grow. To promote growth, while simultaneously meeting the community's unique and evolving needs, the City of Kingston requires policy frameworks that guide its development into the future.

The following section speaks to the policies in several overarching planning documents and guidelines that are related to sustainable transportation and community development. The policies are augmented by the City's studies and guidelines, which guide towards establishing more inclusive and accessible rights-of-way that promote compatibility between mobility and land use.

2.1 City of Kingston Official Plan

The City of Kingston Official Plan (OP), consolidated in December 2022, provides direction on how the City will grow to the year 2036. The OP outlines goals, objectives, and policies that manage and direct the physical changes of the City and its effect on the social, economic, built, and natural environments. The policies that are contained in the OP guide how development will evolve over the prescribed planning horizon and how initiatives must be adapted to support the forecasted growth.

The OP's Vision strives to attain sustainability of development to become the most sustainable municipality in Canada. To successfully achieve this Vision, the OP details a set of policies that are focused on implementing green infrastructure, managing growth through sustainable planning principles, and promoting compact development within the Urban Boundary. All of these will reduce the need for automobile-dependent travel.

The OP recognizes:

- The importance of intensification and redevelopment along major corridors, continuing to grow within the City's existing urban boundary.
- The need to utilize existing City infrastructure more efficiently to address climate change resiliency, including mitigation and adaptation strategies.
- The need to carry out expansion of the transportation system in a systematic and timely fashion to maximize use of facilities and minimize associated costs and disruption.

- The importance of implementing an integrated and diverse transportation system through land use patterns and a multi-modal network that supports walking, cycling, and transit, fostering sustainable community development.

More specific to the role of transportation planning, the OP acknowledges the important role long-term transportation planning plays in readying the City for future travel needs, while meeting its goals for fostering sustainability. To this end, the **City's OP has included policies that are supportive of transit, active transportation, and pedestrian-friendly facilities that will increase usage, safety, and access for all.** Part of the OP's strategic direction is to reduce reliance on the automobile by satisfying travel demand through the efficient use of existing infrastructure, providing facilities and services that prioritize walking, cycling and transit as universal modes.

2.2 City of Kingston Official Plan - Princess Street Corridor Specific Policy Area (2022)

The Princess Street Corridor Specific Policy Area is a detailed policy directive that provides a cohesive plan for future development along the Princess Street Corridor. It includes consideration for principles such as sustainability, active transportation, and economic development. The Specific Policy Area extends from Ontario Street to Midland Avenue, including the Williamsville Main Street Study, which extends between the westerly limits of the Central Business District at Division Street and the Bath Road/Concession Street Intersection. The Williamsville Main Street policies focus on development in a pedestrian-oriented form that will provide support for the Princess Street transit corridors and more sustainable means of growth. **The primary vision for the Williamsville Main Street is to establish a corridor that is vibrant and active, inclusive of improved, pedestrian-oriented streetscape.** Additionally, the Williamsville Main Street policies denotes a set of directives for Green Streets. Policy 10E.1.43 states that "Green streets are defined as tree-lined corridors that establish important visual links and enhance active transportation connections between areas within and surrounding the Williamsville Main Street." This policy directive is directly linked to Part 3 of this report, where the City explores options for green street treatments along specific streets within the broader Williamsville area.

2.3

City of Kingston Transportation Master Plan (2015)

The City of Kingston Transportation Master Plan (TMP) provides the long-term direction for the development of transportation networks, supporting policies, programs, and services for the next 20 years. The TMP, originally received by Council in 2015, intended to support the City of Kingston with achieving its Official Plan and overall strategic vision of sustainability. **It established mode share goals, based on afternoon peak period travel, for the purposes of identifying policies, programs, and initiatives that put the City on the trajectory of change.** Council ultimately adopted aspirational mode share goals for the TMP to reduce reliance on the automobile and instead support mobility needs through sustainable modes of travel. The mode share goals are as follows:

- Active Transportation (Walking and Cycling): 20%
- Transit: 15%
- Auto: 65%

These mode share goals are increased for the Williamsville neighbourhood to further prioritize active transportation and transit as follows:

- Active Transportation (Walking and Cycling): 50%
- Transit: 15%
- Auto: 35%

The mode share goals noted above are critical to the design and operation of Princess Street. They serve as rationale for why potential trade-offs may be required if the City is to meet its objectives and strategic policy directions highlighted in both the Official Plan and the policies adopted specifically for Williamsville.

2.4

City of Kingston Active Transportation Master Plan (2018)

The City's Active Transportation Master Plan (ATMP) is a strategic document that builds upon the Official Plan and further develops the active transportation elements included at a high level in the TMP. The goal of the ATMP is to achieve the long-term city-wide active transportation mode share target of 20%. It encompasses a series of tools and strategies that are specific to neighbourhood transportation planning, including: traffic calming, expanded pedestrian crossings, cycle routes, and neighbourhood programs. The Williamsville neighbourhood falls within "Area K" of Kingston's Transportation

Focus Area in the ATMP. Through the ATMP, it was identified that a more detailed multi-modal transportation study is required to guide future decision-making and support the City with identifying improved conditions and facilities for pedestrians, cyclists, and transit users.

3.0 Part 1: Princess Street Study

Part 1, the Princess Street Study, reviews the operational needs and design options of the Princess Street Corridor in Williamsville, aiming to support the growth and intensification projected along the Corridor. This Princess Street Study is a continuation of the *Williamsville Transportation Plan Operational Needs Analysis (2020)* and the *Princess Street Corridor Cross-Section Study (2023)*.

It is important to note that as per the City's Official Plan, Princess Street is identified as the corridor meant to accommodate significant infill and intensification. The City's Transportation Master Plan (2015) and the Active Transportation Master Plan (2018) consider Princess Street as a corridor that would be at once pedestrian friendly and serve as an arterial for vehicular movement, a transit priority corridor, and a cycling-spine. The feasibility of simultaneously achieving all of these objectives is challenged by Princess Street's narrow right-of-way, which has sections that are less than 20 metres between Bath Road/Concession Street and Division Street. It is not possible to provide ideal facility widths for all modes (automobiles, transit, cycling, and walking) within the constrained 20 m right-of-way. Compromises must be made, with a focus on meeting both City of Kingston and Accessibility for Ontarians with Disabilities Act requirements.

3.1 Previous Studies

Background context from previous studies is required to establish an underlying understanding of existing conditions and to arrive at the proposed alternative designs for this Study. The following sections summarize the key findings and recommendations from the previous studies that have informed the development of this present study. More details are provided in the following sections.

- Princess Street Operational Needs Analysis (2020) recommended that a specific strategy be developed to reduce single occupancy vehicle dependence and improve the safety and desirability of transit and active modes; and
- Princess Street Cross-Section Study (2023) looked at alternative design solutions that could provide an improved environment for pedestrians, cyclists and transit users along Princess Street between Bath Road and Division Street.

- These studies were recommendation of the OP and Zoning updates for the Williamsville Main Street Study in December 2020.

3.1.1

Williamsville Transportation Plan - Operational Needs Analysis (2020)

The *Williamsville Transportation Plan - Operational Needs Analysis (2020)* study was completed by Dillon to review the road network's existing performance and assess how the network may perform under two future land use/development scenarios. This study focused on performing traffic modelling for the following primary transportation corridors in Williamsville:

- Princess Street between Bath Road/Concession Street and Division Street.
- Concession Street between Princess Street and Division Street.
- Division Street between Concession Street / Stephen Street and Princess Street.

The ultimate development conditions considered a total of 3,265 person trips in the PM peak period by the 2036 planning horizon. The analysis of transportation network impacts resulting from the planned growth was completed for two mode share scenarios:

- Auto mode share of 22% (based on previous studies of existing residential developments within the Princess Street Corridor), and
- Auto mode share of 35% (based on the preliminary mode share results for Williamsville from the City's 2019 household travel survey).

Travel times were predicted to increase along Princess Street and Division Street under both mode share scenarios. This outcome was anticipated based on the approved growth and the city's desire to avoid widening of roadways. The analysis indicated that intersections will only operate at satisfactory levels to 2036 if aggressive modal split targets are achieved within Williamsville. **The study recommended that a specific strategy be developed to reduce single occupancy vehicle dependence and improve the safety and desirability of transit and active modes.** The current study is a component of this strategy.

Further details on the land use scenarios and operational analysis can be found in **Appendix A.**

Princess Street Cross-Section Study (2023)

In 2023, Dillon conducted the *Princess Street Cross-Section Study* to identify alternative design solutions that could provide an improved environment for pedestrians, cyclists and transit users along Princess Street between Bath Road and Division Street. The study included a review of transit operations and transit travel time for Princess Street needed to achieve the City’s goal of providing transit headways of 5 minutes or less.

The features identified as most desirable for Princess Street included the following:

- Street trees and furniture,
- 2 metre sidewalks,
- Transit priority measures (queue jump lanes), and
- Two-way cycle facilities.

Traffic modelling identified that without any mitigation measures, one-way peak hour transit travel time on Princess Street will increase by approximately one to two minutes by the year 2036. In combination with increased transit frequency, this could result in up to 20 minutes of transit delay per hour compared to existing travel times.

Design alternatives such as queue jump lanes, left turn lanes, and transit signal priority were considered as potential mitigation measures for Princess Street. Queue jump lanes act as a transit priority measure that allow transit vehicles to “jump” the queue of vehicles by introducing a “transit only lane” at intersections that buses may pull into. The following recommended operational improvements were made based on the traffic modelling analysis:

- Signalize the intersection and implement a westbound queue jump lane and transit signal priority at Princess Street and Drayton Avenue.
- Provide an eastbound left turn lane at Princess Street and MacDonnell Avenue.
- Provide an eastbound left turn lane at Princess Street and Victoria Street.
- Implement a curbside queue jump lane in the westbound direction and implement transit signal priority at Princess Street and Albert Street.

More detail regarding the recommendations and the results of the traffic and transit analysis can be found in **Appendix B**.

Six alternative design concepts were developed for Princess Street, each of which prioritized combinations of transit amenities, widening pedestrian realm, cycling amenities, and landscaping. Compromises were made as necessary. Two lanes of vehicular traffic were maintained in every alternative to facilitate bi-directional transit movements and minimize the risk of traffic bypassing using local streets. **However, vehicular lanes were reduced to minimum widths of 3.3 m in all alternatives to prioritize space for alternative modes. Parking was recommended for removal in all alternatives to make space for improved active transportation facilities and discourage auto trips to the area.** The six alternative cross-sections developed as part of the *Princess Street Cross-Section Study* included the following list. Minimum cross-section dimensions are provided for each alternative for comparative purposes only. The Princess Street right-of-way ranges between 18 to 20 m wide.

- Alternative 1 (Wide Sidewalks): Prioritized the pedestrian realm by removing bike lanes and adding street trees and rest areas where possible. Widened sidewalks to 2.0 m minimum where possible. Minimum cross-section width: 13.2 m mid-block, 16.5 m at intersections.
- Alternative 2 (Cycle Tracks): Substituted existing street-level bike lanes with grade separated cycle tracks. Cycle tracks would be a minimum of 2.0 m wide on both sides of the roadway. Sidewalks would be designed to 2.0 m widths where possible. Design did not include desirable separation between cyclists and pedestrians. Minimum cross-section width: 17.2 m mid-block, 20.5 m at intersections.
- Alternative 3 (Bi-directional cycle track): Replaced the existing street-level bike lanes with a bi-directional cycle track on the north side of Princess Street. Bi-directional cycle track would be a minimum of 3.5 m wide. Design did not include desirable separation between cyclists and pedestrians. Sidewalks would be designed to 2.0 m widths where possible. Minimum cross-section width: 16.7 m mid-block, 20 m at intersections.
- Alternative 4 (One-way Cycle Track): Replaced existing street-level bike lanes with a one-way cycle track on the north side of Princess Street. Cycle track would be a minimum of 2.0 m wide, with additional space between cycle tracks and sidewalks. Sidewalks would be designed to 2.0 m widths where possible. Minimum cross-section width: 15.2 m mid-block, 18.5 m at intersections.

- Alternative 5 (On-road cycle lanes): Provide conventional street-level cycling lanes, similar to the current condition. Cycle lanes would be a minimum of 1.5 m wide, making use of the 0.3 m wide gutter to provide extra width for maneuvering. No buffer would be provided between cycling and vehicular lanes. Sidewalks would be designed to 2.0 m where possible. Minimum cross-section width: 16.2 m mid-block, 19.5 m at intersections.
- Alternative 6 (Continuous Transit Lane): Created a dedicated westbound transit lane throughout Princess Street to improve transit travel times. Required the removal of bike lanes and left turn lanes. Sidewalks would be designed to 1.5 m widths where possible. Minimum cross-section width: 16.5 m, continuous.

A high-level overview of the evaluation of the six long-listed design alternatives is provided in **Table 1**. Note that this evaluation considered application of the six alternative cross-sections along the length of Princess Street and therefore included the impact of the varying right-of-way width. Additional details are provided in **Appendix B**. Two of the design alternatives were identified as being ‘feasible’ and were carried forward to the current study. These short-listed design alternatives are explored in greater detail in **Section 3.2**.

Table 1 Rationale

Alternative 1 was carried forward because it provides many of the desired elements except for two-way cycling facilities. Alternative 2 does not provide desired elements except for cycle tracks, while Alternative 3 does not provide street trees or left turn lanes or queue jump lanes, which would result in delays to buses and cars as noted by traffic analysis. Alternative 4 does not provide the two-way cycling facilities that are preferred, such as in Alternative 5. **Alternative 5 was carried forward because it maintains Princess Street as spine cycling route, although cycle tracks would be preferred.** Traffic analysis revealed that the removal of all left turn lanes in Alternative 6 would cause significant delay for general traffic and non-prioritized transit service direction.

Table 1: Long-List Cross-Section Alternatives - Ability to Provide Desired Elements

Features Generally Accommodated	Street Trees	Minimum 2 metre sidewalks	Left turn lanes or transit queue jumps	Two-way Cycle Facilities	Carried forward
Alternative 1: Wide Pedestrian Realm	Yes	Yes	Yes	No	Yes
Alternative 2: Cycle Tracks (Both Sides)	No	No	No	Yes	No
Alternative 3: Bi-Directional Cycle Track	No	Yes	No	Yes	No
Alternative 4: One-way (northwest) cycle track	Yes, in most blocks	Yes	Yes, in most blocks	No	No
Alternative 5: On-road cycle lanes	No	Yes	Yes, in most blocks	Yes	Yes
Alternative 6: Continuous transit lane	Yes, in most blocks	Yes	No	No	No

3.2 Alternative Designs

The Princess Street Cross-Section Study shortlisted two alternatives for further analysis. These were Alternative 1 (Wide Pedestrian Realm) and Alternative 5 (On-Road Cycle Lanes). The two short-listed alternatives are detailed in Section 3.2.1 and Section 3.2.2.

A set of design criteria were developed which indicate minimum facility widths to be applied when designing the shortlisted alternatives for further review. **Table 2** explains the design criteria established for Princess Street, as well as the rationale behind them.

Table 2 Rationale

The furnishing zone width ensures that the placement of furniture does not obstruct the walkway zone by providing space for access, use and maintenance of furniture elements. 1.5 m is the absolute minimum width for a walkway zone indicated by AODA, while 2.0 metres is the recommended width for areas with a peak pedestrian flow rate greater than 400 pedestrians per 15 minutes. Additionally, a minimum width of 3.5m is preferred for the bus lane.

Table 2: Design Criteria for Princess Street

Right of Way Component	Minimum Dimensions	Factors and Guidelines References
Frontage Zone	0.5 metres	Transportation Association of Canada Geometric Design Guidelines (TAC GDG) Chapter 6 Section 6.3.1.1.
Walkway Zone	1.5 metres to 2.0 metres	AODA standards for Accessible Exterior Paths of Travel (2019) TAC GDG Chapter 6 Table 6.3.1.
Furnishing Zone	1.85 metres	TAC GDG Chapter 6 Section 6.3.1.3.
Transit Shelter:	Landing Pad: 9 m x 2.5 m min Ramp Deployment: 1.5 m x 2.5 m min Clearway: 1.5 m min width	City of Hamilton HSR Stop Accessibility Guidelines.
Cycle Track	2.0 metres (One way) 3.5 metres (Two way)	OTM Book 18 Table 4.4.
Curb/Gutter	0.5 metres	City of Kingston Technical Standards and Specifications. References OPSD 600.100
Cycle Lane	1.5 metres + 0.3 m buffer	OTM Book 18 Table 4.7.
Bus Lane	3.3 metres	Minimum width indicated by City staff and supported by TAC GDG Table 4.2.3.
Through Lane/Turn Lane	3.3 metres	TAC GDG Table 4.2.3.

3.2.1

Alternative 1 - Widened Pedestrian Realm with Transit Priority

Alternative 1 prioritizes enhancing the pedestrian experience along Princess Street while providing additional transit amenities.

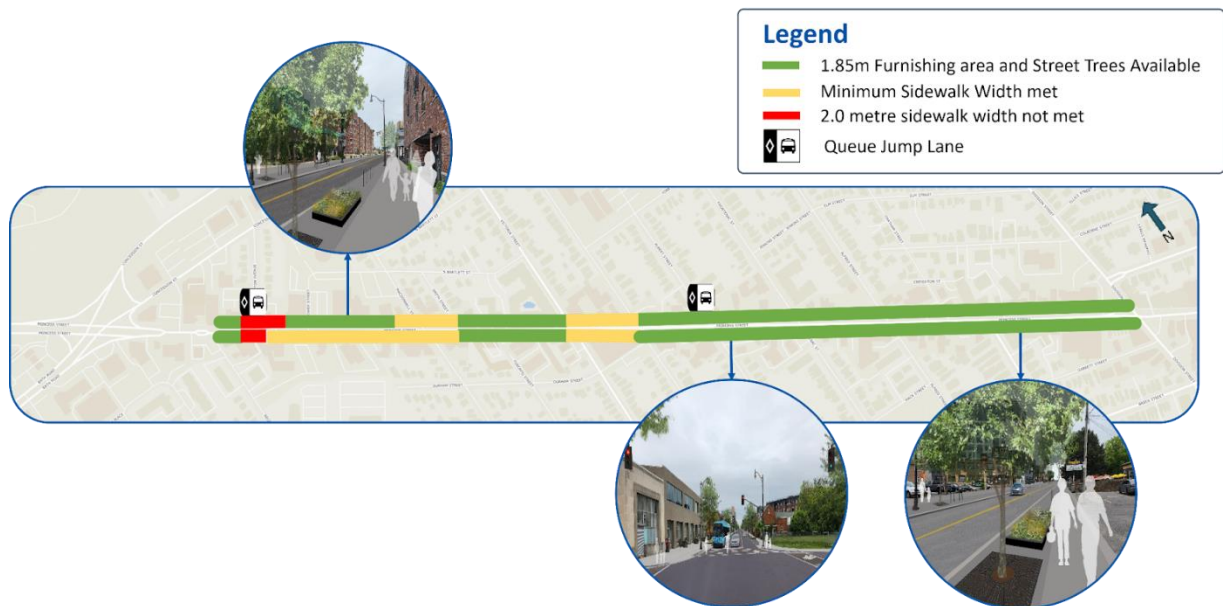
As discussed in **Section 3.1.2**, transit expansion and pedestrian experience are key priorities for Princess Street. First, Princess Street is identified as a priority transit corridor within the City. Second, for transit corridors to serve their purpose, users must also feel that the area is walkable. As a result, this alternative considers reducing vehicle travel lane widths and turning lanes, removing on-street parking, removing on-street cycling lanes, and widening the pedestrian walkways to a minimum of 2.0 metres where possible. The remaining space within the right-of-way would be allocated for street furniture, street trees, and amenities as a means of livening the corridor. A sample rendering of this alternative can be seen below in **Figure 1**.

Figure 1: Alternative 1 Rendering



Based on preliminary drawings, high level constraints were mapped out in **Figure 2**.

Figure 2: Alternative 1 Constraints



Referring to **Figure 2**, two metre desirable sidewalk widths are met throughout 98% of the corridor, with an additional 1.85 metres for furnishing and street trees available on both sides of Princess Street for 60% of the corridor. These improvements have been made possible by reducing the vehicle travel lanes to 3.3 metres, as explained in **Section 3.1.2**, removing on-street parking, and the removal of on-street bike lanes. It is expected that these improvements would encourage increased pedestrian traffic on Princess Street, which in turn has the potential to increase transit use. Additionally, this would improve Williamsville from an accessibility perspective as there are many existing locations where there are narrow sidewalks or physical barriers in the sidewalk as shown in **Figure 3**. Wider sidewalks would allow for two people with mobility devices to comfortably travel side-by-side or pass each other with no issues compared to existing conditions. Additionally, wider sidewalks allow for groups of pedestrians to walk side-by-side and encourages a social space. A wider pathway and fewer physical barriers also improve mobility in these areas as there are fewer obstacles to maneuver around. Cyclists would continue to be allowed to use Princess Street as a shared facility as explored in **Section 4.3.1**. The narrower travel lanes and the removal of on-street parking is expected to slow down vehicle traffic which results in safer shared spaces for cyclists and drivers.

Figure 3: Comparison of Existing (Left) and Proposed (Right) Sidewalk Conditions

(Source: Google Maps, 2020)



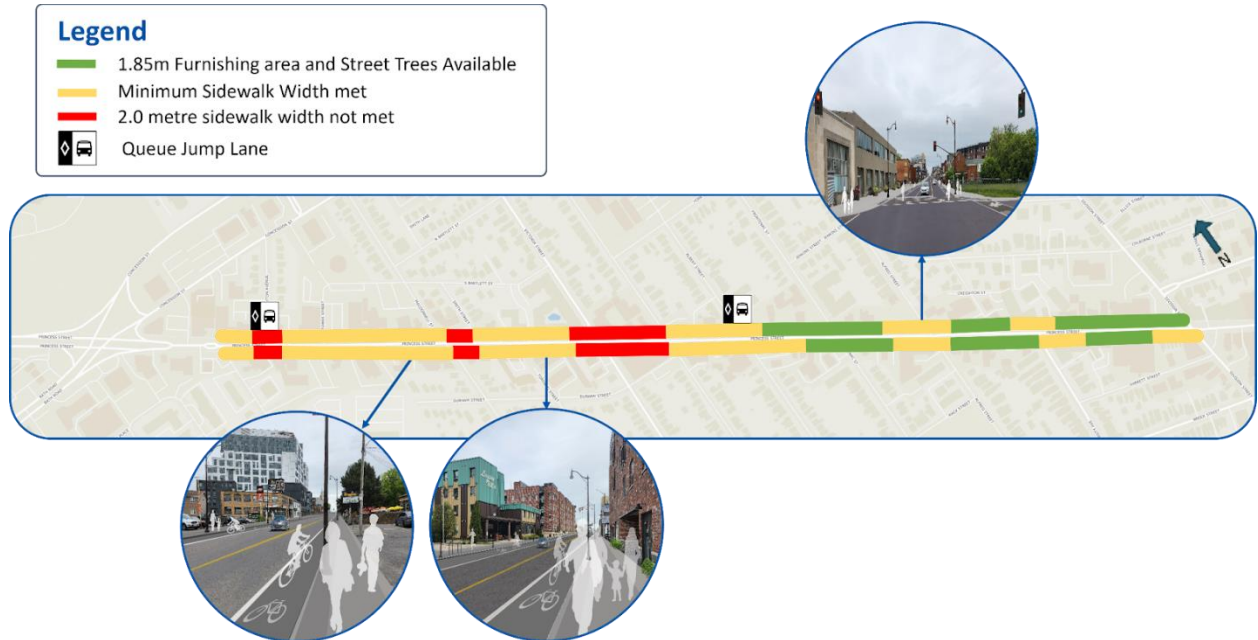
Conceptual drawings have been prepared for Alternative 1 which highlight the areas of concern along Princess Street. The drawings have been provided in **Appendix C**. The plans also identify the locations of proposed transit queue jump lanes.

3.2.2 Alternative 5 - Cycle Lanes with Transit Priority

Alternative 5 maintains cycling infrastructure as a priority and encourages cycling as a sustainable mode of transportation on Princess Street. This alternative would take advantage of the removal of on-street parking and narrowing of vehicle travel lanes to realign the bike lanes creating a continuous network along Princess Street as well as expanding the existing sidewalks, where possible. Transit queue jump lanes would be provided at key intersections to continue to promote and grow transit usage in Williamsville.

A sample rendering of the alternative is shown below in **Figure 5**. Based on preliminary drawings, rough constraints were mapped out in **Figure 4**.

Figure 4: Alternative 5 Constraints



Compared to **Alternative 1**, a 2.0 metre sidewalk is only feasible for 86% of the length of the corridor. In some cases, sidewalks may be narrowed to approximately 1.4 metres to accommodate the proposed elements in this alternative. However, wider sidewalks are possible in many locations with some areas, primarily in the section closest to Division Street, having sufficient space for some furnishings and street trees.

In addition, the preservation of the bike lanes in conjunction with the removal of on-street parking is expected to encourage cyclists to continue to use Princess Street and the opportunity of drawing cyclists back who were previously concerned about being “doored” by parked cars. **Figure 5** below is an image of existing conditions along Princess Street, where on-street parking conflicts with the bike lane. One of the concerns brought up at previous engagement sessions (**Section 3.3**) was that drivers tend to park illegally and block bike lanes. It is expected that this may still be a concern with on-street bike lanes although on-street parking is removed. It is recommended that parking enforcement is reviewed upon removal of on-street parking along Princess Street.

Figure 5: Comparison of Existing (Left) and Proposed (Right) Bike Lane Conditions

(Source: Google Maps, 2020)



Conceptual drawings have been prepared for Alternative 2 which highlight the areas of concern along Princess Street. The drawings have been provided in **Appendix C**. The plans also identify the locations of proposed transit queue jump lanes.

3.3 Engagement

The cross-sections for the two shortlisted alternatives were presented to residents at a Town Hall in April 2023 and an Open House in October 2023. During the April 2023 Town Hall, only Alternative 1 (Wide sidewalks) was presented. During the October 2023 Open House, the preliminary design drawings for both shortlisted alternatives (Alternative 1 and Alternative 5) were presented. An online survey was also posted on Kingston's Get Involved website to collect feedback about the presented cross-sections. The following section outlines each stage of engagement and what we heard. Additional information on the engagement sessions and the feedback received can be found in **Appendix D**.

3.3.1

April 2023 Town Hall

The purpose of the April 2023 Town Hall was to collect feedback on a potential re-design of Princess Street which included a focus on wider pedestrian realms and transit priority measures. Attendees also provided feedback on key local roads that could be used to provide connections for a potential neighbourhood bikeway network.

Three main topic areas of feedback were received at this session.

1. There was a strong preference towards keeping bike lanes on Princess Street as well as support for the neighbourhood bikeway network. On the topic of neighbourhood bikeway networks specifically, attendees requested that additional traffic calming measures be introduced alongside them to encourage vehicles to drive slowly and share the roadway with cyclists.
2. There was support for a widened pedestrian realm and “greening” of the corridor.
3. There were concerns about the removal of on-street parking along Princess Street, suggesting it may result in additional vehicles parking on local roads adjacent to Princess Street with already limited spaces.

Attendees expressed a lack of clarity in the design selection process, noting missed opportunities for additional engagement sessions, which could have provided more options and considerations. Although the City of Kingston staff noted multiple alternatives had been considered, attendees expressed transparency of design and limitations of the alternatives would have been beneficial to understand the decision-making process to date.

3.3.2

October 2023 Open House

An Open House was hosted on October 26, 2023, at St. Luke’s Anglican Church. The purpose of the Open House was to present additional details for the long list of six alternative designs for Princess Street. Details on the trade-offs and restrictions present in each alternative were explained further. Additional information was also provided about the required widths of the facilities.

Preliminary roll plans for the two short-listed alternatives were brought to the Open House to show attendees the restrictions they would have on the pedestrian realm and what trade-offs would be required between the two short-listed alternatives:

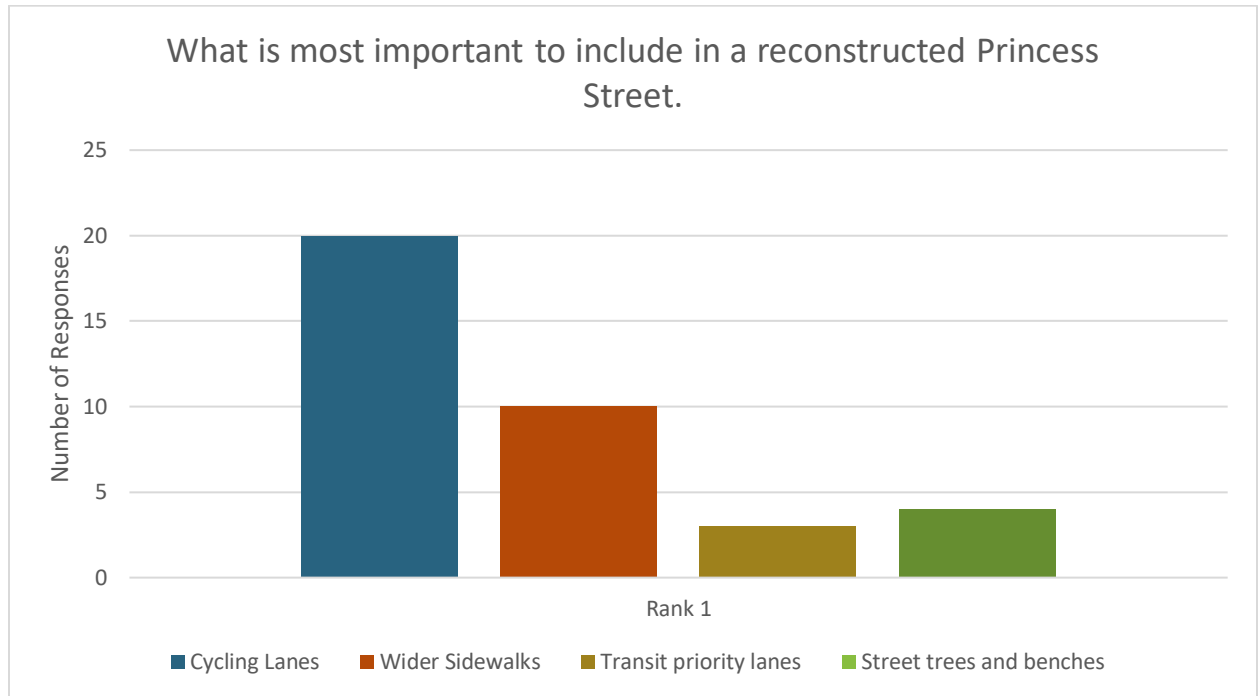
- Wider sidewalks and transit priority; and
- Bike lane and transit priority.

Attendees continued to support bike lanes on Princess Street. Potential advisory bike lanes and neighbourhood bikeways were also introduced as a potential alternative for the local bike network and are explored further in **Section 4.0**. Attendees were able to provide comments on both the panels and sheets that were presented.

3.3.3 What We Heard

Based on feedback received from both public engagement events, the cycling alternatives were most preferred by the attendees. Many attendees indicated they would strongly prefer to keep bike lanes on Princess Street even though it would impose restrictions on the pedestrian realm (See **Figure 6** below). Feedback from both the Open House and online feedback forms also emphasized the need for separated cycling infrastructure to improve safety for cyclists. In terms of the pedestrian realm itself, there were some concerns about cross-sections where the sidewalks were less than 1.5 m wide. Concerns about accessibility were also voiced for the alternative with bike lanes since narrow sidewalks would make it difficult for individuals with disabilities to travel. Additionally, it was noted that many of the existing intersections along Princess Street do not have accessible features (tactile walking surface indicators, accessible push buttons, etc.). Attendees also voiced safety concerns with existing right turn lanes along Princess Street, indicating that it's dangerous for both cyclists and pedestrians.

Figure 6: Ranked Features for Princess Street Based on Open House Surveys



3.4

Next Steps

It is recommended that Alternatives 1 and 5 be presented to City Council for further consideration along with supporting information from **Section 4.0** and **Section 5.0**.

Based on the technical design and policy analysis that was undertaken for the Princess Street Corridor, Alternative 1 provides a design that is most consistent with the direction adopted by Council as part of the Williamsville Main Street Study update in December 2020 as well the Official Plan strategic directions. It can prioritize pedestrians, greening opportunities, and transit priority within the available space. Moreover, Alternative 1 also best addresses accessibility concerns raised as part of this study by community members and the Municipal Accessibility Advisory Committee.

As mentioned in **Section 3.3.3**, many of the community members are supportive of maintaining bike lanes along Princess Street, represented by Alternative 5, even after understanding the potential trade-offs of narrower sidewalks reduced accessibility, greening opportunities, and street furniture.

It is recommended that the City investigate opportunities to maximize accessibility during the detailed design phase with whichever design is selected. A feasibility study should be conducted for the preferred design which should focus on the ability to widen sidewalks and the benefit and feasibility of the proposed transit queue jump lanes.

Additional studies will be required as part of the detailed design process including, but not limited to, a full topographic survey of Princess Street.

Part 2: Neighbourhood Bikeways

The concept of ‘supportive infrastructure’ was first formally introduced to the City of Kingston through the City’s 2018 Active Transportation Master Plan. Supportive infrastructure is an approach that improves cycling network connectivity using quiet, low volume, low speed streets within the existing transportation network. Streets can either be selected based on their existing characteristics, or they can be modified through signage and physical changes to meet the low speed/volume requirements.

Implementation of supportive infrastructure within Williamsville will not only improve cycling connectivity throughout the area, but also reduce vehicle dependency. Reduced private vehicle dependency is required to accomplish the target modal splits noted in **Section 2.0** of this report as well as to address directives of the City’s *Climate Leadership Plan*.

In Part 2 of this report, preferred cycling corridors and facility types are identified and analyzed for the purposes of establishing “Neighbourhood Bikeways” within the Williamsville neighbourhood, with opportunities for extending into the City’s broader cycling network.

Policy Background

Section 2.0 of this report discussed the policy documents that were reviewed as part of the Williamsville Transportation Study. By extension of the Official Plan (OP), the Transportation Master Plan (TMP), and the Active Transportation Master Plan (ATMP), and the overall vision for shaping the Princess Street Corridor, this report explores infrastructure opportunities that can support cycling along commonly used routes in the Williamsville neighbourhood. The ATMP is a direct response to Council approved directions focusing on sustainable development and transportation network prioritization in favour of active transportation. Building off the mode share goals noted in **Section 2.0**, the ATMP identifies a city-wide transportation network that provides key north-south and east-west connections, split into focus areas that inform context-specific solutions for implementing the appropriate infrastructure. The Williamsville neighbourhood falls within Focus Area “K” – bordered by Concession Street to the north, Division Street to the east, Johnson Street to the south and Sir John A.

MacDonald Boulevard to the west. This neighbourhood-level information is an important component for ongoing land use, development planning, and policy initiatives tied to the OP and other growth and development-related planning initiatives.

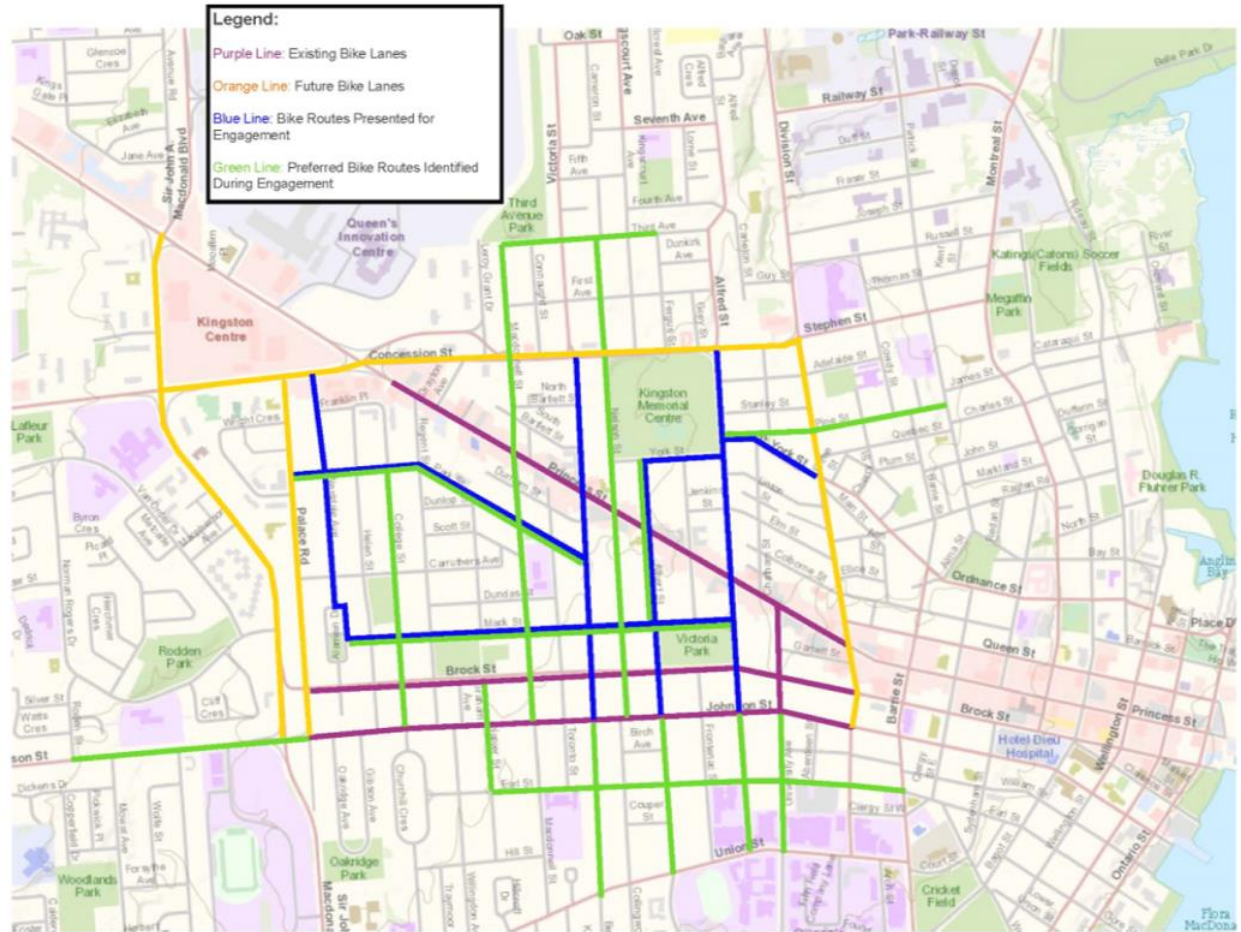
The following sections discuss candidate neighbourhood streets that would both benefit from and contribute to a multimodal shift in Williamsville, and the City more broadly, focusing on cycling as a viable mobility option for meeting growing travel demands.

4.2 Preferred Corridors

The addition of designated neighbourhood bikeways in the Williamsville area will improve cyclist wayfinding and access throughout the neighborhood. These new east-to-west and north-to-south signed and traffic calmed connections will link the bicycle routes identified in the ATMP and the existing cycling routes on Brock Street and Johnson Street. They will also improve access to key destination throughout, and adjacent to, the Williamsville area. This includes improved connections to the Leroy Grant Trail, the various parks in the area (Victoria Park, Compton Park, Third Avenue Park, etc.), and destinations along Princess Street.

The concept of a Williamsville local street bike network was presented to the public for comment during the April 2023 Town Hall meeting. The public was also encouraged to provide feedback through an online survey hosted on Get Involved Kingston between October 13, 2023 and November 17, 2023. Public input, together with technical analysis completed by the City, resulted in identification of the list of preferred local street cycling corridors listed below and illustrated in **Figure 7**.

Figure 7: Preferred Neighbourhood Corridors Identified

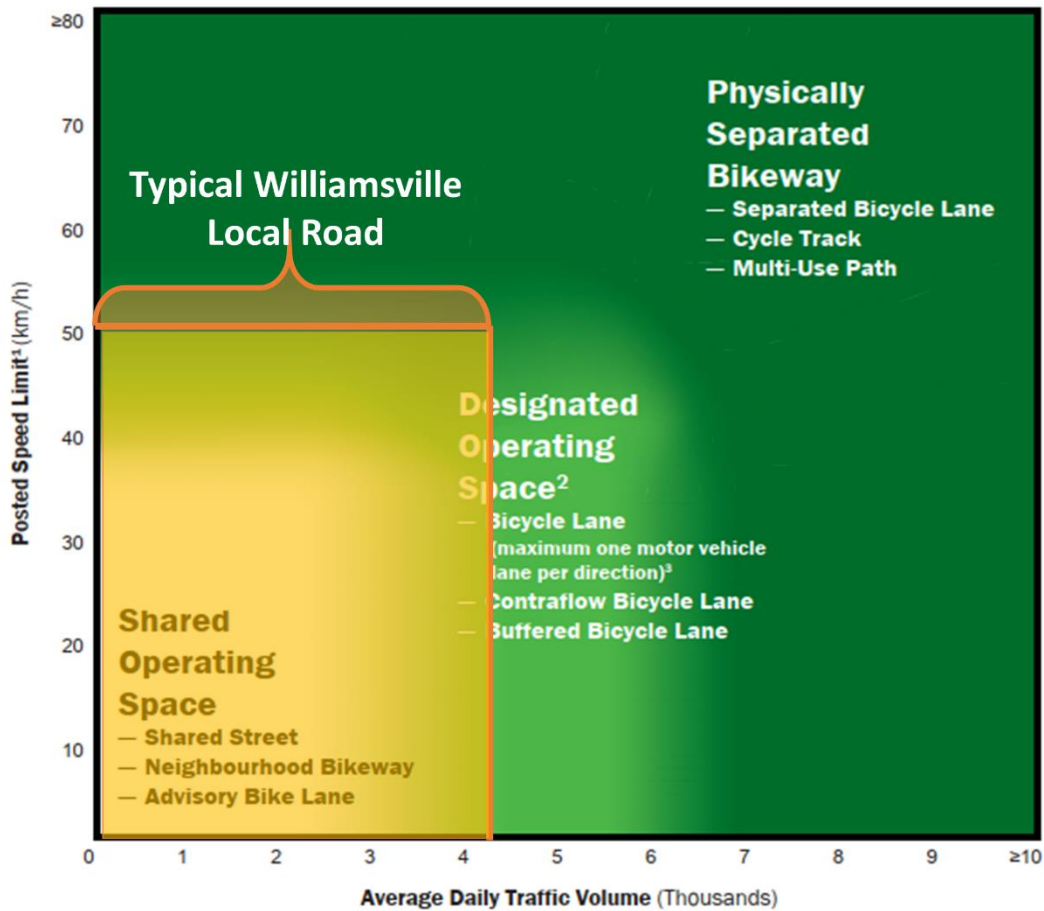


College Street	Park Street	MacDonnell Street
Park Street	Nelson Street	Mack Street
Albert Street	Napier Street	Earl Street
Pine Street	Victoria Street	

4.3 Alternative Facility Types

Appropriate facility types for the preferred neighborhood bikeway corridors identified in **Section 4.2** were determined using guidance from Ontario Traffic Manual (OTM) Book 18: Cycling Facilities. OTM Book 18 recommends three alternative cycle facility types for streets with the speed and volume profiles measured along local streets within the Williamsville area. Recommended facility types include, shared streets, neighborhood bikeways, and advisory bike lanes. Each of these facility types is explained in more detail below the nomograph shown in **Figure 8**.

Figure 8: Typical Williamsville Road Nomograph



4.3.1 Shared Street

Shared street operations represent the least protected option for cyclists. Cyclists are expected to ride on the right side of the travel lane where there is space for side-by-side operation; otherwise, they have the right to travel in the centre of the lane.

Shared streets are most appropriate on roads with the following features:

- Low volume <3000 Average Daily Traffic,
- Low posted speed <40 km/h,
- Lane widths of 4.5 m or less,
- Local streets, and
- Streets with low volume driveways or unsignalized intersections.

No provisions are required for shared streets other than signage to indicate to drivers that cyclists share the lane. Optional sharrow pavement markings can be used to further denote that the lane is shared by cyclists and drivers. A sample shared street facility is shown in **Figure 9**.

Figure 9: Shared Street Facility (Source: OTM Book 18, 2021)



4.3.2

Neighborhood Bikeway

Neighbourhood bikeways, also referred to as bicycle boulevards, build on the concepts introduced in shared street facilities by prioritizing through movements for people riding on bikes while discouraging through trips by motorized traffic¹. This treatment is most appropriate on roads with the following features:

- Low volume <3000 Average Daily Traffic,
- Low posted speed <40 km/h,
- No heavy vehicle traffic,
- Local streets,
- One travel lane in each direction,
- Limited on-street parking,
- Lane widths of 4.0 m or less, and
- Streets with low volume driveways or unsignalized intersections.

¹ OTM Book 18 Section 4.5.2

Neighbourhood bikeways utilize the same signage and sharrow pavement markings as shared street facilities, but further encourage cyclist activity by introducing additional restrictions on motorized vehicle traffic. These restrictions are explored further in **Section 4.5** and include measures to reduce traffic volumes and traffic speeds to encourage cycling on local roads. A sample neighbourhood bikeway is shown below in **Figure 10**.

Figure 10: Sample Neighbourhood Bikeway

(Source: BC Active Transportation Guide, 2019)



4.3.3 Advisory Bike Lane

Advisory bike lanes are a relatively new facility in Canada but have begun to see application in a handful of cities across the country. It is originally a European approach to delineate space for cyclists on narrow roadways and clarify operating positions for

cyclists and motorists and increase comfort for cyclists². This treatment is most appropriate on roads with the following features:

- Low volume <4000 Average Daily Traffic,
- Low posted speed <50 km/h,
- Restricted heavy vehicle traffic,
- Local streets,
- Geometry is straight and level,
- 6.6 m to 8 m roadway width without parking lane,
- 10 m to 11.5 m roadway width with parking lane, and
- Streets with low volume driveways or unsignalized intersections.

Advisory bike lanes contain no centreline and motorists are expected to travel in both directions in a shared centre travel lane which is typically between 3.0 and 4.0 m wide, or 5.0 to 5.7 m wide. The bike lanes are distinct in that they are temporarily shared spaces with motor vehicles during turning, approaching, and passing manoeuvres. A sample advisory bike lane facility is shown in **Figure 11** below.

² OTM Book 18 Section 4.5.1

Figure 11: Sample Advisory Bike Lane Facility in Ottawa, Ontario.

(Source: CBC News)



4.4

Recommended Facility Types

The screening criteria touched on in **Section 4.3** was used to identify appropriate cycle facility types for each of the preferred local street cycling corridors. **Table 3** below outlines the existing facilities on they key corridors considered and the recommended facility type on each corridor.

Table 3: Recommended Local Cycling Infrastructure

Corridor	Roadway Width (m)	Posted Speed Limit (km/h)	Max Annual Average Daily Traffic (AADT)	Existing On-Street Parking	Recommended Facility
College Street	9	50	238 ³	Both	Neighbourhood Bikeway
Alfred Street	11	50	4661 ⁴	Both	Advisory Bike Lane/Neighbourhood Bikeway
Park Street	9	50	1549 ⁵	One	Neighbourhood Bikeway
Mack Street	8/9	50	885 ⁶	Both	Neighbourhood Bikeway
MacDonnell Street	9	40	2141 ⁷	Both	Advisory Bike Lane/Neighbourhood Bikeway
Nelson Street	7/8	50	621 ⁸	One	Neighbourhood Bikeway
Albert Street	9/10	50	1771 ⁹	One	Neighbourhood Bikeway

The addition of these local street facilities will create a more comprehensive 'Neighbourhood Bikeway Network' within the Williamsville area. The location of all existing and proposed cycling facilities within the study area are illustrated on the map provided as **Figure 12**.

³ College Street @ Carruthers Avenue Traffic Count (2023)

⁴ Alfred Street @ Johnson Street (2017)

⁵ Park Street @ MacDonnell Street (2017)

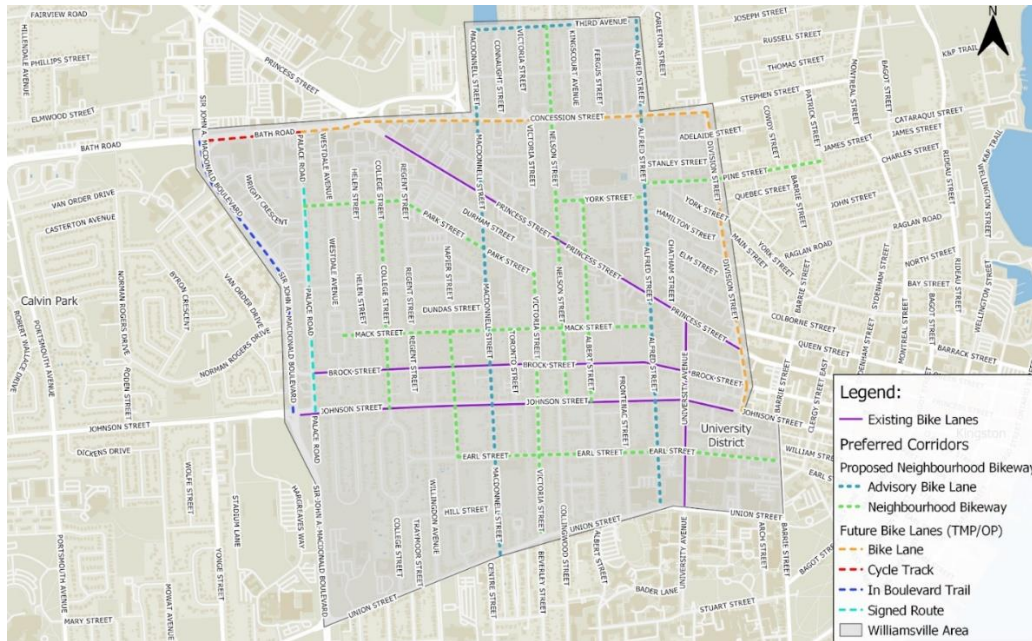
⁶ Mack Street @ MacDonnell Street (2017)

⁷ MacDonnell Street @ Princess Street (2017)

⁸ Nelson Street @ Concession Street (2016)

⁹ Albert Street @ Johnson Street (2018)

Figure 12: Proposed Neighbourhood Bikeway Network



4.5 Neighborhood Bikeway Facility Treatments

The following sections provide guidance on the types of treatments that could be considered to reduce vehicular volumes and speeds, as well as improve wayfinding, along the local street cycling corridors.

4.5.1 Applicable Guidelines

The following guidelines were referenced when identifying appropriate treatments for the streets within the proposed Williamsville neighborhood bikeway network:

- Ontario Traffic Manual (OTM) Book 18: Cycling Facilities (2021)
- Transportation Association of Canada (TAC) Chapter 5 - Bicycle Integrated Design (2017)
- City of Kingston’s Active Transportation Master Plan (ATMP) (2018)
- British Columbia Active Transportation Design Guide (2019)¹⁰
- National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide (2014)

¹⁰ Used as a reference for the design and application of advisory bike lanes through case studies.

4.5.2 Design Toolbox

The successful implementation of cycling supportive infrastructure requires that affected streets have low operating speeds (<40km/h) and low average daily traffic volumes (<3,000 ADT). Streets are often selected for inclusion in a cycling supportive network because they exhibit these characteristics in their existing condition. Streets that don't exhibit these characteristics will often be added to the network to provide improved north-south and east-west connectivity. These streets may require additional pavement markings and signage, as well as physical modification to reduce vehicular speeds and volumes to suitable levels. The City of Kingston's Traffic Calming Guidelines were referenced for approved traffic calming measures in the City.

Design techniques can be used to reduce vehicular speeds and volumes, as well as to help prioritize cycling over cars all into the following five categories^{11 12}:

- Traffic Reduction Design Measures
- Major Intersection Treatments
- Minor intersection treatments
- Speed Management
- Signs and Pavement Markings

The following sections provided additional detail regarding how each of the techniques can be applied within the City of Kingston context. Additional information about the expected cost for implementation of the each of the alternative techniques can be found in **Appendix E**.

4.5.3 Traffic Reduction Design Measures

Traffic reduction, commonly referred to as traffic calming, design measures are typically applied at intersections to restrict vehicle movements at intersections while permitting cyclists. The *City of Kingston Traffic Calming Guidelines* is developed in accordance with standards set out in the Transportation Association of Canada (TAC) Canadian Guide to Traffic Calming. It encompasses two main approaches. Type I approaches are classified as minor adjustments such as pavement markings, speed-display devices, vertical centreline treatments. Type II approaches are classified as engineered-based which are

¹¹ Ontario Traffic Manual Book 18 (2021)

¹² National Association of City Transportation Officials (2014)

more permanent in nature and involve planning, designing, and constructing. Type II approaches can include horizontal deflections such as curb extensions, vertical deflections such as speed cushions, intersection treatments and/or cross-sectional treatments.

Traffic reduction measures may not be applicable in all cases; however, they do provide the greatest benefit for cyclists, pedestrians, and residents through reduced exposure to collision risks, traffic noise and emissions (OTM Book 18, 2021).

4.5.4 Major Intersection Treatments

Major intersection treatments improve cyclists' ability to cross a major roadway with higher vehicle volumes and speeds. These treatments improve driver awareness of cyclists, help with cyclist navigation, minimize crossing distances, and reduce vehicle/bicycle conflicts. Examples of intersection treatments are provided in the list below. The City of Kingston's ATMP recommends the use of bike boxes and cross-rides as potential intersection treatments at major intersections as they have lower implementation costs and are familiar to both drivers and cyclists. Local and International Examples of Major Intersection Treatment include:

1. **Bike Boxes** (Image source: Google Maps, Kingston, ON, Princess Street and Division Street)
2. **Advanced Stop Bars** (Image source: NACTO, Portland, OR)
3. **Bicycle actuated signals** (Image source: Google Maps, Kingston, ON, Highway 15 and Gore Road)
4. **Crossrides/Intersection Crossing Markings** (Image source: Google Maps, Kingston, ON, John Counter Boulevard and Portsmouth Avenue)
5. **Refuge Islands** (Image source: NACTO, Portland, OR)
6. **Curb Extension (Bump Outs)** (Image source: NACTO, Portland, OR)



The preferred corridors identified in **Section 4.4** intersect with major roads such as Princess Street, Concession Street and Johnson Street. The following major intersections should be analyzed in more detail and could benefit from one of the major intersection treatments listed above:

- MacDonnell Street & Princess Street,
- Albert Street & Princess Street,
- Nelson Street & Princess Street,
- MacDonnell Street & Concession Street, and
- Victoria Street & Johnson Street.

4.5.5 Minor Intersection Treatments

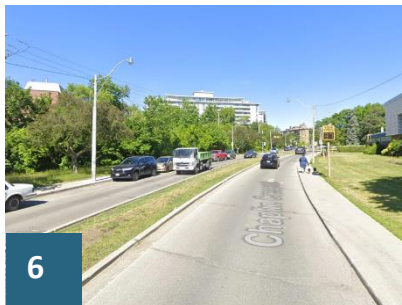
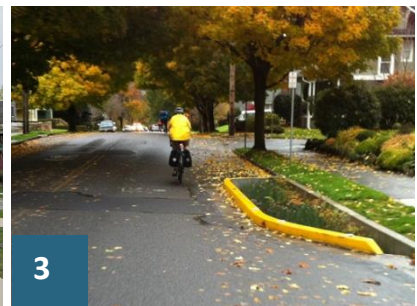
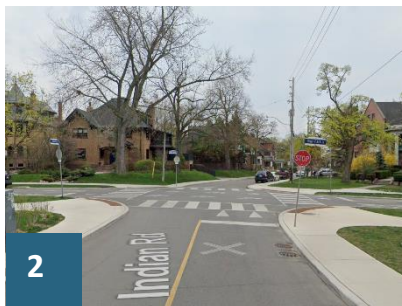
Fewer treatments are necessary where a neighbourhood bikeway intersects with a minor road due to lower speeds and vehicle volumes. It is desirable, however, to minimize stop controls on cycling corridors and slow vehicle speeds through intersections. For the preferred corridors, it is recommended that stop signs, where not warranted, be removed in the direction of cyclist travel at minor intersection.

4.5.6 Speed Management

Speed management on neighbourhood bikeways is one of the best ways to improve safety for cyclists and thereby encourage the use of bicycles. Reducing posted speed limits is generally not effective at reducing operating speeds below 40km/h, and typically requires the use of physical speed management tools. Reduced vehicle operating speeds can improve the perception time of both motorists and cyclists and further improve safety for both users.

Some examples of speed management measures, including traffic calming devices and minor road design changes, are listed, and illustrated below:

1. **Speed humps** (Image source: NACTO, Portland, OR)
2. **Raised crosswalks** (Image source: Google Maps, Toronto, ON)
3. **Curb extensions/ Bump Outs** (Image source: NACTO, Portland, OR)
4. **Chicanes** (Image source: NACTO, Seattle, WA)
5. **Narrowing of motor vehicle lanes**
6. **Dynamic “watch your speed” signs** (Image source: Google Maps, Toronto, ON)



4.5.7 Signs and Pavement Markings

Providing appropriate signage and pavement markings along neighbourhood bikeways and advisory bicycle lanes has the following benefits:

- Brings attention to the existence of the facility, encouraging use;
- Heightens driver awareness that the space is to be shared with cyclists; and
- Improves cyclist navigation through intersections and towards key destinations and network connections.

The most common signs used to denote shared cycling facilities on Ontario streets are signs Wc-19 OTM (Share the Road) and Wc-24 OTM (Single File), which are illustrated in **Figure 13**. These signs indicate the intended relative position of vehicles and cyclists within the roadway. The green bike route sign, Rb-69, should also be used to identify designated cycling corridors. This sign is illustrated in **Figure 14**.

Figure 13: Shared Facility Signs

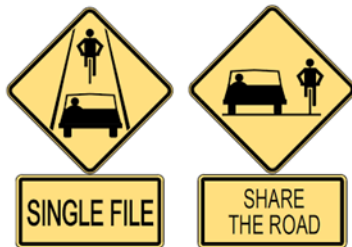


Figure 14: Rb-69.



Shared facility pavement markings such as “sharrows” can be used to improve the visibility of cyclists and to clarify that the roadway is a shared-use lane. Bicycle lane markings should be used for advisory bike lanes with a buffer between bicycle lanes and parking lanes. Examples of sharrows and advisory bike lane pavement markings are provided in **Figure 15**. At the time of writing, neither OTM Book 18, or TAC GDG have a standard advisory bicycle lane sign to inform drivers how to operate with these facilities. Both Gibbons, BC and Ottawa, ON have created custom signs to inform both cyclists and drivers.

Figure 15: Example pavement markings for shared cycling facilities



Sharrow pavement marking in London, ON Advisory bike lane, Ottawa, ON

4.5.8

Sample Designs

A variety of sample drawings and renderings were created to illustrate what neighbourhood bikeways and advisory cycling lanes could look like in Williamsville. These are shown in **Figure 16** to **Figure 18**. Note that local roads in the Williamsville area have narrow road right-of-way widths that vary between 15 m and 20 m and provide limited space for additional landscaping.

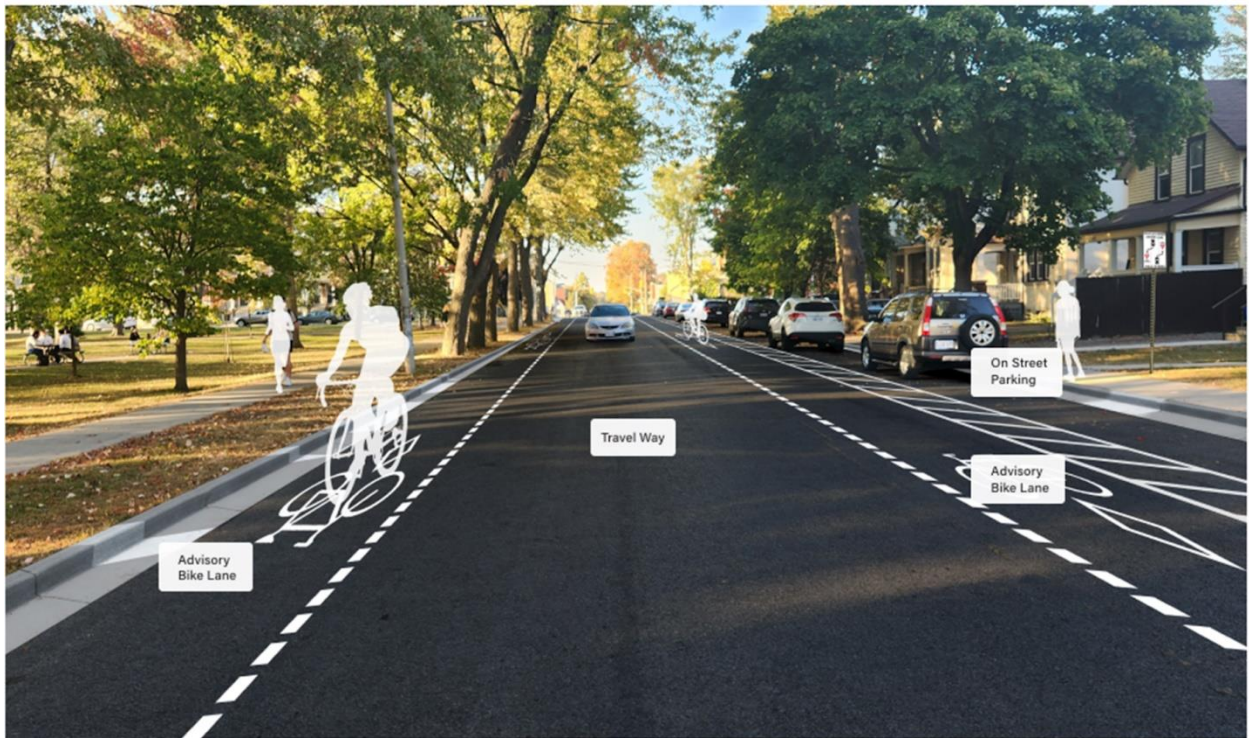
Figure 16: Typical 15 Metre Right-of-way Neighbourhood Bikeway



Figure 17: Typical 20 Metre Right-of-way Neighbourhood Bikeway



Figure 18: Typical 20 Metre Right-of-way Advisory Bike Lane



Detailed cross section drawings can be found in **Appendix E**.

4.6 Engagement

Alternative design concepts for the local street cycling facilities were presented during the October 26, 2023 Open House. Information and imagery were also provided on the 'Williamsville Bikeway' page of Get Involved Kingston. During the Open House attendees were asked to provide comments on the routes, facilities and traffic calming measures that were proposed. The Get Involved page included a survey where the public could provide comments between October 13 and November 17th, 2023.

The attendees at the Open House were generally supportive of the proposed designs for the neighbourhood bikeways and the proposed locations for advisory bike lanes. Feedback from the online survey was similarly supportive of the potential changes – including the recommended streets.

Traffic calming and speed control measures were included as part of the recommended design for the neighbourhood bikeways. Speed control measures such as lowering the posted speed limit were appreciated by attendees, who felt that it would make the streets feel safer to bike on. There were mixed reactions to traffic calming measures, including the use of bump outs. Bump outs were positively viewed by some who noted a benefit to people with disabilities through reduced crossing distances. Some attendees, however, were concerned that snowplows would not be able to clear them properly during the winter.

Attendees also recommended additional bike routes to consider for neighbourhood bikeways. One of the routes that was recommended was to add bike infrastructure on York Street between Alfred Street and Barrie Street as an alternative to Princess Street. After further discussions with attendees and City staff, it was also noted that Concession Street, Division Street, and York Street may also serve as appropriate alternative routes for cyclists.

Feedback collected through Get Involved Kingston also suggested that dedicated bike lanes should be added on Pine Street, Albert Street, Mark Street, Bath Road as well as on Brock Street and Johnson Street. Respondents who recommended these routes expressed that they should be used for pass-by trips and that the bike lanes on Princess Street should not be removed.

4.7 Next Steps

It is recommended that a detailed implementation plan be developed to introduce and construct the local cycling facilities. This plan should include confirmation of preferred cycle facility type, recommended traffic management techniques, identification of project budgets, and specific timeframes for implementation. Key north-south corridors and east-west corridors that should be developed first to provide the most significant improvements for cyclists through Williamsville include the following:

North-South	East-West
MacDonnell Street	Mack Street
Alfred Street	Park Street

These corridors provide the longest continuous local routes within Williamsville and connections to the existing cycling routes. Immediate, low cost, changes to these corridors could include the addition of pavement markings, signage and temporary intersection narrowing that uses of flexible bollards. Construction of planted bump outs and the addition of street trees can progress as budget becomes available. Other immediate actions could include strategic removal of some on-street parking to begin encouraging mobility behaviour change amongst residents.

Facility transitions and connections should also be explored further once the preferred facilities have been confirmed for each cycling corridor. A feasibility study for the removal of stop signs, removal of on-street parking, introduction of traffic circles, and traffic calming measures including modal filters and diverters, should be conducted. The effectiveness of traffic calming, and speed management measures should be monitored following implementation to inform the design of additional corridors.

There was an overall positive response to the advisory bike lane concepts, and as such it is recommended that these relatively new cycling facilities be piloted in Williamsville and monitored to understand impacts. There were some requests from the attendees to introduce advisory bike lanes on additional corridors which may be explored after a pilot program has been completed. This pilot program should review conflicts, operating speeds of vehicles, and vehicle compliance with the lane markings and signage. By prioritizing the routes listed above, it would also be possible to pilot an advisory bike lane on either MacDonnell Street or Alfred Street, or both.

5.0

Part 3: Green Streets

The City of Kingston is exploring opportunities to implement ‘Green Streets’ within the broader Williamsville area. Discussed more fully in **Section 5.2**, the ‘Green Streets’ concept generally refers to streets that are intentionally designed to reduce impact on the social and natural environments. The desire to implement green streets within the Williamsville area was one of the key themes that was part of the Williamsville Main Street Study and showed up in consultation on the Princess Street and neighborhood bikeway concepts. Within the Williamsville area, ‘greening’ of streets can be used to discourage auto traffic, promote sustainable transportation options, improve treatment of stormwater, and beautify the area. It is necessary to have a more fulsome understanding of what this means to the City of Kingston, and particularly the residents of Williamsville, before moving forward with any roadway modifications within the neighborhood.

The following content is intended to provide the reader with a baseline understanding of the design elements and benefits associated with the proposed changes. This includes visualization of alternative green streets concepts that could be applied to corridors with sections of Frontenac Street used to represent the concepts.

5.1

Policy Background

The concept of Green Streets is embedded in the City’s Official Plan Section 10E.1.43 as “Green Streets”, as previously detailed in **Section 2.0** of this report. Green Streets for the City of Kingston are intended to be pedestrian-focused with added greenery, rest areas, and space to increase pedestrian comfort, supporting active travel along commonly used neighbourhood routes. Green streets also include traffic calming measures as a mechanism for slowing traffic down along local roadways.

Green Streets also support the City of Kingston with its Official Plan vision for sustainability. In December 2021, the City of Kingston adopted a *Climate Leadership Plan* which sets out a strategy to reach carbon neutrality by 2040. The Plan sets out short- and long-term objectives across the sectors of buildings and energy, waste, transportation, and food and forestry. Within the transportation sector, Council identified the objective of “[Developing] active transportation connections and

foster[ing] transit-oriented development to encourage a shift to sustainable modes and a reduced reliance on personal vehicle use.”¹³ Specific actions recommended under the plan include:

- Continued implementation of the Active Transportation Master Plan, which is focussed on improving connectivity and safety for pedestrians and cyclists,
- Increasing transit ridership through such things as the addition of express routes (like what is planned on Princess Street), and
- Implementation of parking, car-share, and micro-mobility sharing solutions that reduce reliance on single occupancy automobile trips.

The priorities of the Climate Leadership Plan are also reflected in the City’s OP, TMP and ATMP, as discussed in **Section 2.0**. All of these put sustainable transportation at the forefront of their policy directives and recommended approaches, with a goal of reducing dependency on the automobile and single-occupant use. Implementation of green streets concepts will help advance policy objectives by making active transportation more inviting and reducing the environmental impact of vehicle operations.

5.2 Kingston’s Definition of ‘Green Street’

It is important to define what ‘Green Streets’ mean to the City of Kingston before rolling out the concept in Williamsville and the rest of the city. As previously mentioned, the term is generally used to describe the transformation of streets to more resilient and sustainable designs. How this definition is realized in terms of actual implementation, however, differs significantly between municipalities.

Two distinct definitions are provided by the cities of Toronto and Seattle. The City of Toronto defines Green Streets as “roads that include green infrastructure – natural and human-made – that capture rainwater and direct it to plants and trees, acting as a natural filter that cleans the water before it makes its way into local waterways.” On the other hand, the City of Seattle, Washington defines a Green Street as “a street right-of-way that, through a variety of design and operational treatments, gives priority to pedestrian circulation and open space over other transportation uses. The treatments

¹³ City of Kingston (2021). Climate Leadership Plan. Pg. 86.

may include sidewalk widening, landscaping, traffic calming, and other pedestrian-oriented features.” While the two definitions seem divergent, designing road right-of-way according to either definition would result in roads that accomplish the following objectives:

- Protection and restoration of natural resources,
- Promotion of a healthy and equitable human habitat,
- Climate change resiliency, and
- Performance optimization.

The City of Kingston has used the combination of the definitions above to develop its own green street design principles for the Williamsville area. These principles should be considered when working on transformational roads projects through the study area, including work on Princess Street:

- Intersections should be designed with a focus on vulnerable user safety. Techniques to consider should include intersection narrowing, reduced curb radii, raised crossings/intersections, conspicuous pavement marking, and improved lighting,
- Vehicular lane widths will be minimized to encourage reduced travel speeds and reduce impermeable surface area within the road right-of-way (ROW),
- Traffic calming techniques should be considered for local roadways where speed or volume is a demonstrated concern in order to improve multi-modal safety and discourage use of private vehicles within the Williamsville area,
- Planting of street trees and landscaped boulevards / islands should be considered to provide shade and visual interest. If required, existing on-street parking should be considered for removal to provide additional space. Where parking cannot be removed, parking lane widths will be minimized, and
- Where feasible, based on space and soil conditions, Low Impact Development (LID) features, including rain gardens and permeable pavements, should be used to improve the quality, and decrease the volume, of stormwater entering waterways.

5.3 Green Street Concept

Frontenac Street was used as a preliminary sample for developing concepts of how green streets could be implemented in Williamsville and other areas of the city. Before moving forward, the City wanted to be able to gauge public interest in green streets, as well as the degree of transformation. To assist with this, three alternative green streets designs were developed for Frontenac Street as a sample segment.

The three alternatives include the following, which are detailed in the following subsections:

1. Green 'Lite',
2. Green 'Mid-Level', and
3. Green 'Heavy'

The three alternatives have increasing levels of changes to the local streets, with the Green 'Lite' alternative retaining the most amount of on-street parking and existing number of street trees, while the Green 'Heavy' option resulted in the greatest reduction of on-street parking and the largest increase in number of street trees.

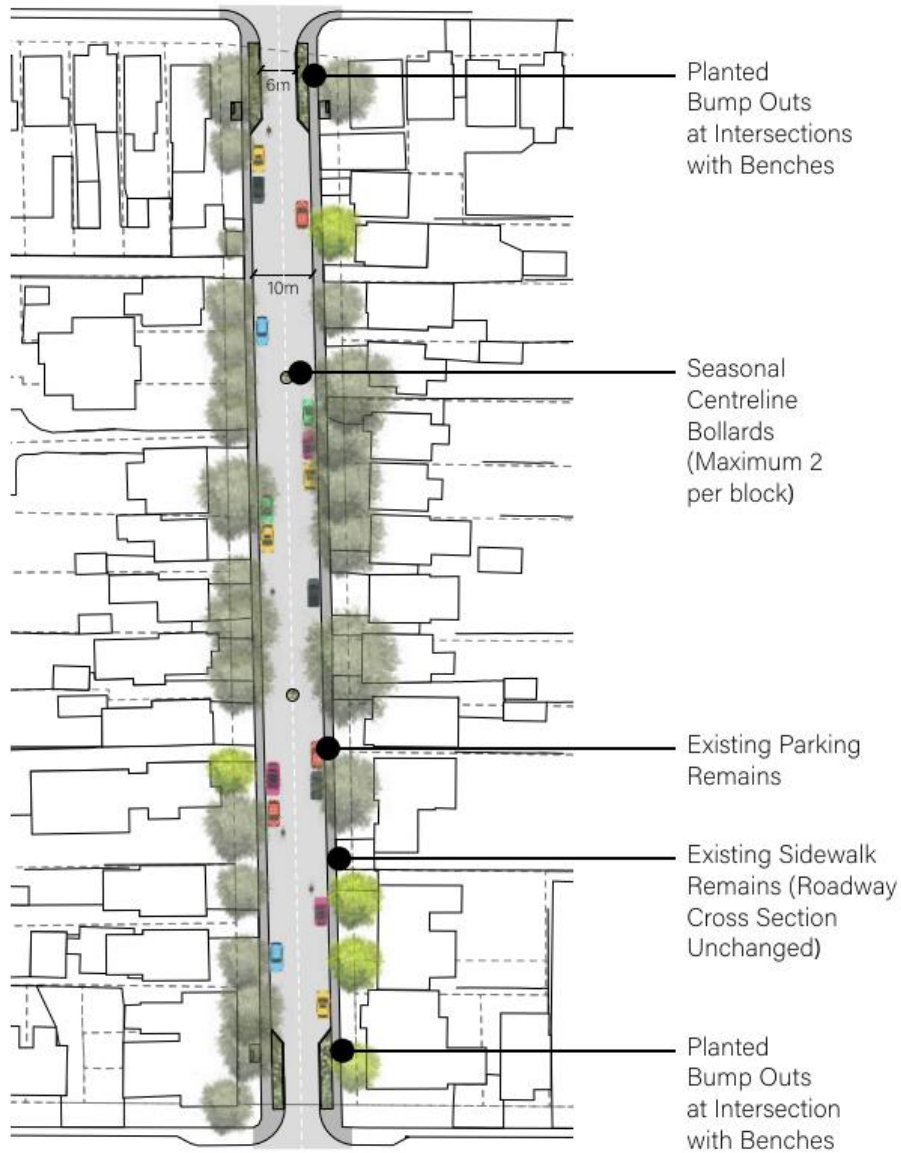
5.3.1 Green Lite

The Green 'Lite' concept was designed as the lowest cost alternative for implementation, requiring the fewest infrastructure changes. In this alternative, bump-outs are only included at intersections, with no additional bump-outs or traffic calming mid-block. On the sample Frontenac Street corridor (**Figure 19** and **Figure 20**), the Green 'Lite' alternative would result in a total of five additional trees (20% increase), and a reduction of two on-street parking spaces (3% reduction).



Figure 19: Green 'Lite' Cross-Section Rendering



Figure 20: Green 'Lite' Alternative Concept Layout



Legend

-  Proposed Trees
-  Existing Trees



Zoom-in of Intersection

5.3.2

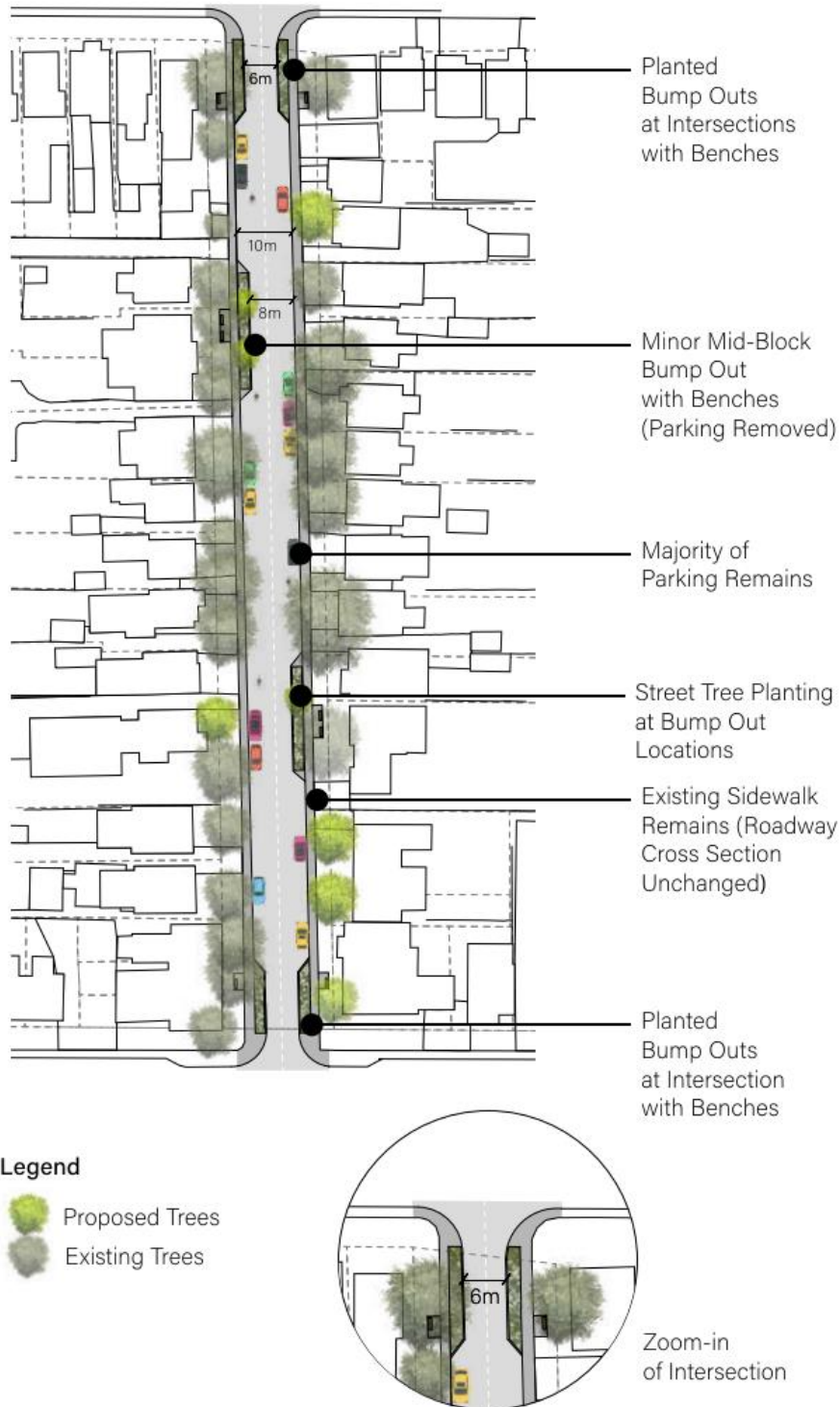
Green Mid-Level

The Green 'Mid-Level' concept was designed as the "additional improvement" alternative compared to the Green 'Lite' alternative. The mid-level alternative provides some additional bump-outs throughout the street as well as the bump-outs at the intersections. These bump-outs are intended to provide additional space for trees and benches throughout the street. On the sample Frontenac Street corridor (**Figure 21** and **Figure 22**), the Green 'Mid-Level' alternative would result in a total of eight additional trees (32% increase), and a reduction of thirty on-street parking spaces (53% reduction).

Figure 21: Green 'Mid-Level' Cross-Section Rendering



Figure 22: Green 'Mid-Level' Alternative Concept Layout



5.3.3

Green Heavy

The Green 'Heavy' was designed as the "greatest change" alternative, when compared to existing conditions. The heavy-level alternative provides mid-block bump-outs in addition to the bump-outs at the intersections and has limited space for on-street parking. These bump-outs are intended to provide additional space for trees and benches throughout the street, while slowing vehicles down as they navigate around them. On the sample Frontenac Street corridor (**Figure 23** and **Figure 24**), the Green 'Heavy' alternative would result in a total of 16 additional trees (64% increase), and a reduction of 36 on-street parking spaces (63% reduction).

Figure 23: Green 'Heavy' Cross-Section Rendering

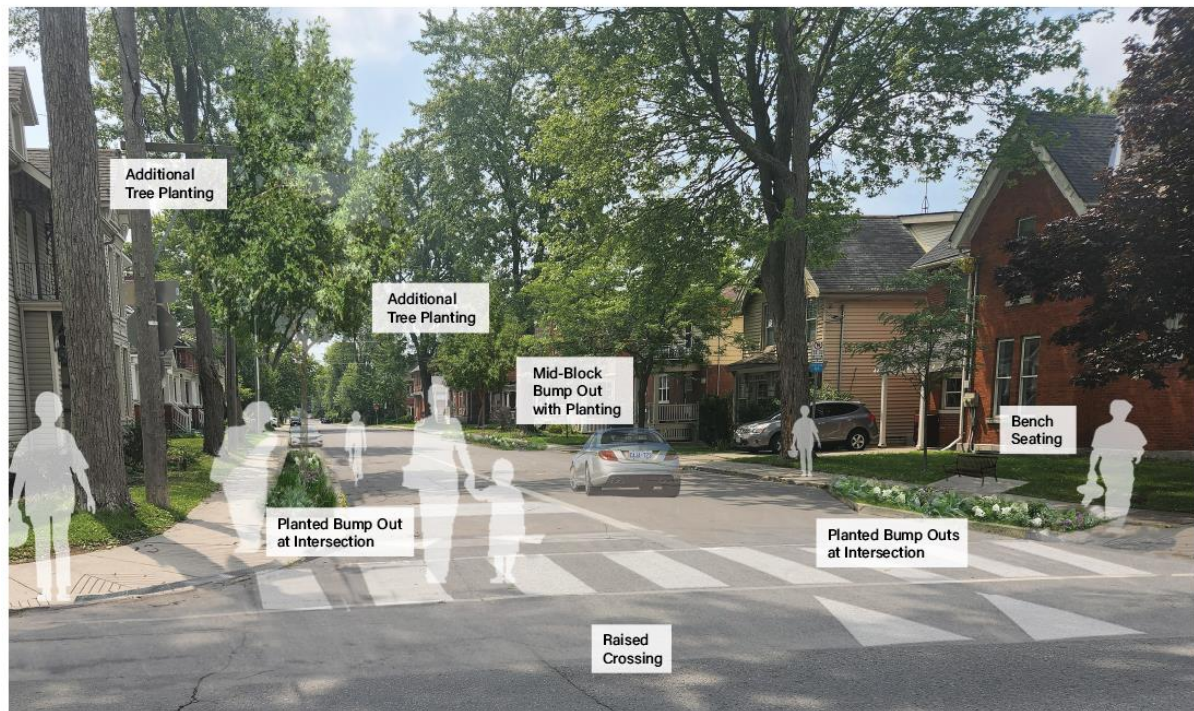
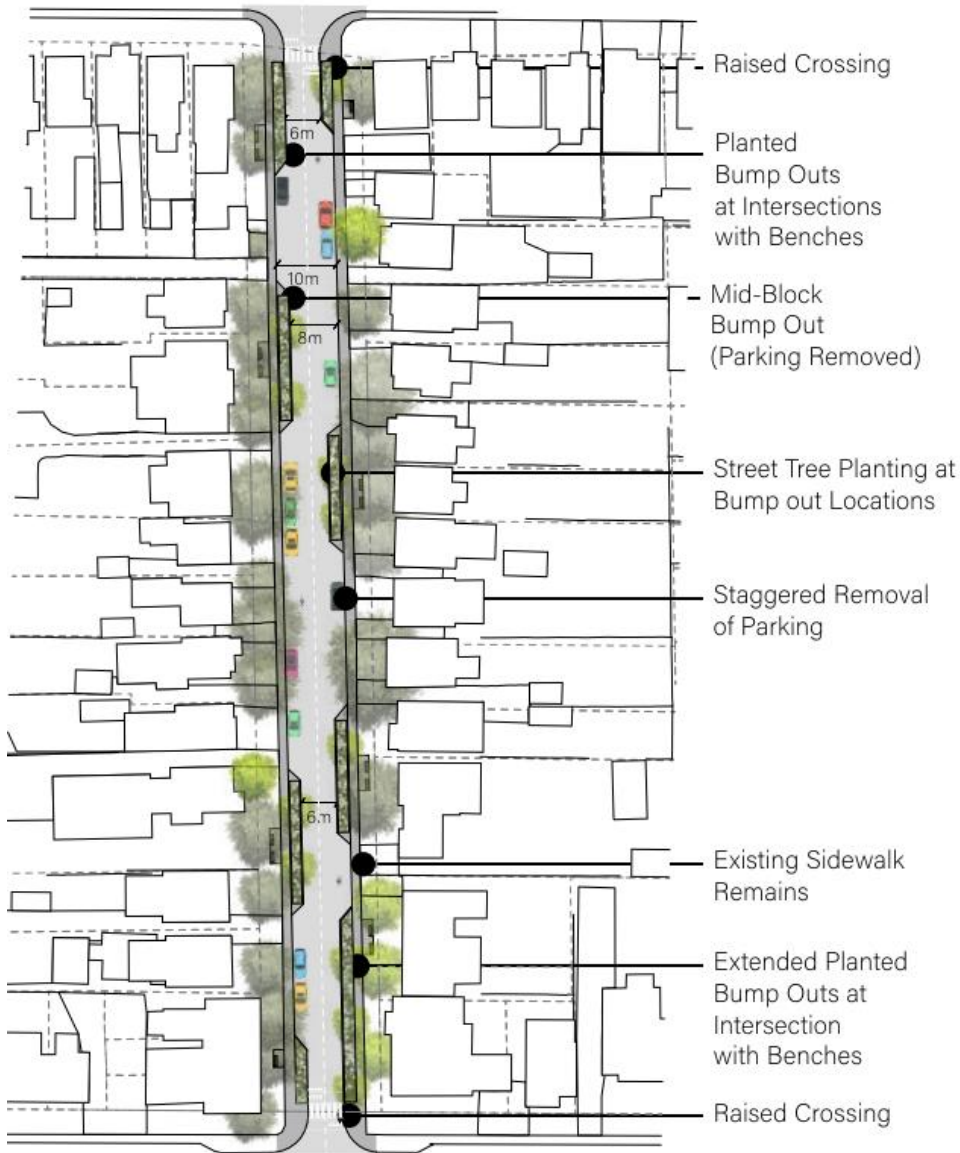


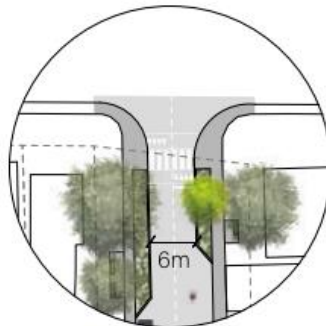


Figure 24: Green 'Heavy' Alternative Concept Layout



Legend

-  Proposed Trees
-  Existing Trees

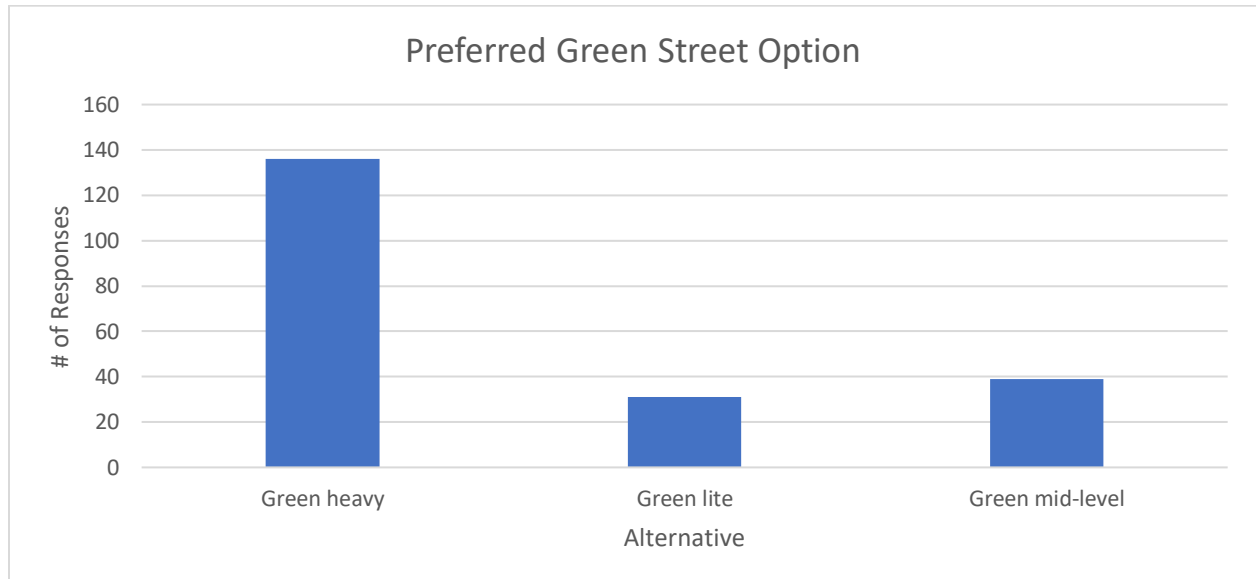


Zoom-in of Intersection

5.4 Engagement

The concept of green streets and the alternative designs for Frontenac Street were presented October 5th at the Councillor’s Town Hall. The public was also invited to provide feedback through completion of an online survey on the ‘Frontenac Green Streets Concepts’ page of *Get Involved Kingston* between October 2 and November 17, 2023. Additionally, printed copies of the cross-sections and renderings were available for attendees of the October 26, 2023, Open House to collect additional feedback. A total of 213 survey responses were received either at the in-person events or through the online survey. The following sections provide an overview of the feedback collected through those two methods.

The results of the webpage survey found that walking and biking were the most used modes of active transportation in Williamsville. In terms of barriers to using active transportation, participants were most concerned with sharing the road with vehicle traffic and the speed of traffic. The survey found that most participants were familiar with green street concepts. When asked to rank the three green streets concepts for use within Williamsville, participants ranked the “green heavy” option as the most preferred with “green lite” rated as the least preferred. A breakdown of participant preferences is illustrated in **Figure 25**.

Figure 25: Green Street Ranking

Additionally, participants noted that the following features are most desired on green streets:

- Tree planting (ranked most important),
- Wide sidewalks (ranked second most important), and
- Curb bump-outs and reduced parking (tied for third most important).

5.5 Next Steps

There is strong support for implementation of green street concepts within the Williamsville area based on community feedback. Most survey responses indicated that the green 'heavy' option was the most preferred. However, there was some discrepancy between the most preferred option and the most desired features on green streets. Curb bump-outs and reduction of on-street parking were the least preferred design feature; however, those are the most prominent features in the Green 'Heavy' alternative. Based on the overall support for green streets, it is recommended that the City move forward with identification and screening of additional candidate sites within the Williamsville area and throughout the City.

Looking Forward

Building off the Williamsville Transportation Plan Operational Needs Assessment Study that was completed in 2020, the intent of this present study was to explore alternative options for how to best accommodate all modes of travel on Princess Street, and more widely within the Williamsville neighbourhood. The alternatives were explored through three distinct sections: Princess Street Study, Neighbourhood Bikeways, and Green Street Concepts. The intent of the three parts was to allow for the City to pursue one or more of the initiatives independent of one another.

Part 1: Princess Street

Looking forward to next steps, the City will investigate opportunities to maximize the accessibility of the short-listed alternative options presented in this report. Recognizing the right-of-way constraints, a feasibility study will need to be undertaken for the preferred design option, focusing on the need to widen sidewalks and the feasibility of the proposed transit queue jump lanes. Considering recent subsurface initiatives along the corridor, there is an opportunity to maximize City resources and combine this with the Princess Street alternative approach as a means to minimize community disruption and financial constraints.

It is important to note that additional studies will be required as part of the detailed design process in support of implementation, including but not limited to a full topographic survey of Princess Street.

Part 2: Neighbourhood Bikeways

The City of Kingston's Official Plan policy directives focus on sustainable community development, favouring mechanisms that advance active transportation and reduce vehicle dependency. Implementation of supportive infrastructure is an approach that can allow the city to improve cycling network connectivity through quiet, low volume, and low speed streets within the existing Williamsville neighbourhood. The recommendations that are proposed are intended to guide the City with the development of a detailed Implementation Plan. The Implementation Plan should confirm the preferred cycling facility type for constructability and continuity purposes, recommended traffic management techniques, as well as budgeting and scheduling.

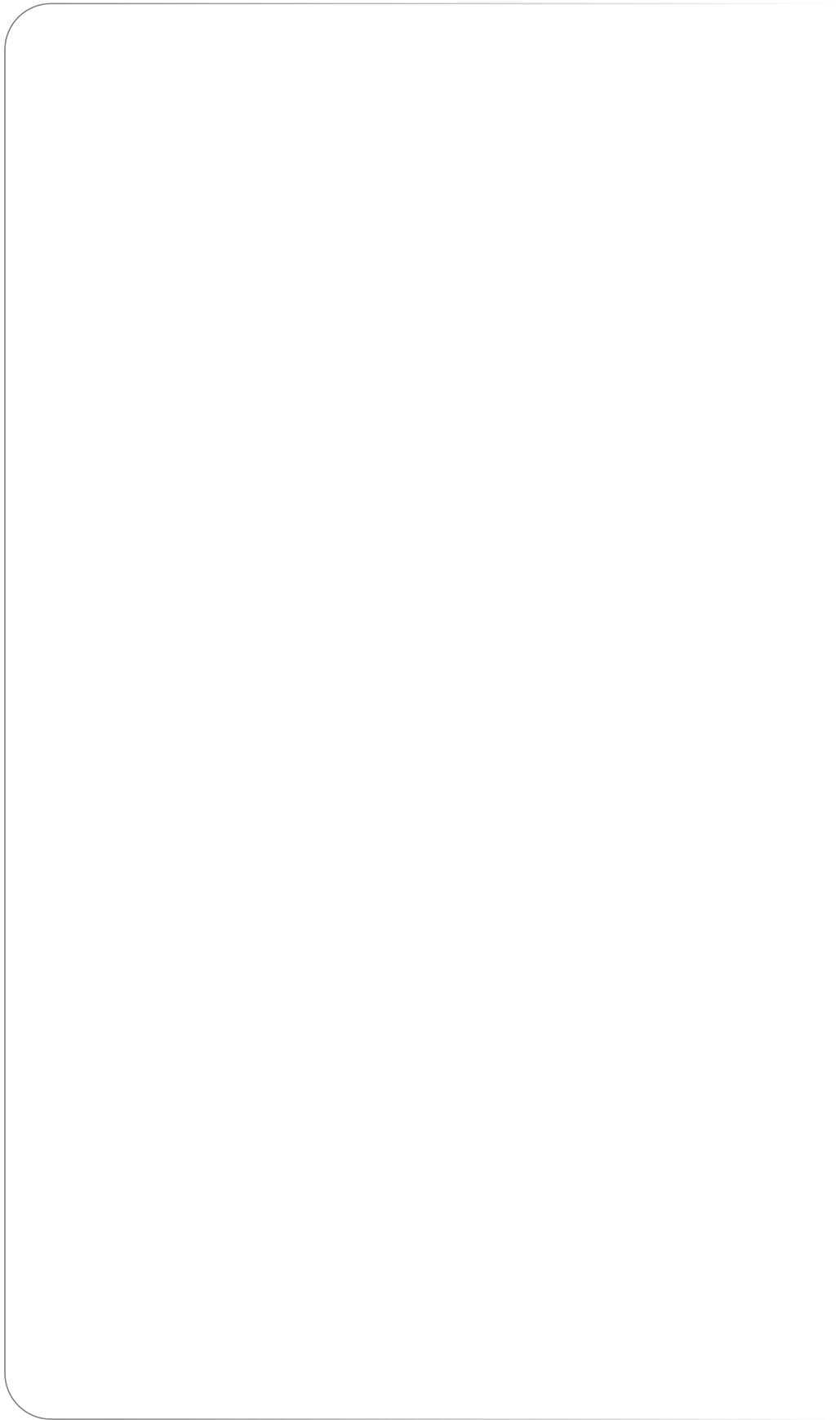
Prioritization of corridors should provide the most significant improvements for cyclists through Williamsville, and into the City's broader cycling network.

Part 3: Green Streets

In the City's Official Plan, more specifically the Princess Street Corridor Specific Policy Area, there is a vision for Kingston to establish corridors that are vibrant and active, inclusive of improved pedestrian-oriented streetscapes. Green Streets will help achieve this goal. As a newer concept for the City, a series of recommendations are explored in this report with the intent of guiding implementation of a comprehensive Green Street Concept. Looking forward from this report, the City can identify and screen candidate corridors to further explore implementing Green Street concepts as part of planned capital projects. A Green Streets Guideline can be developed which would further define desirable design elements, decision-making processes, and steps for implementation.

The City of Kingston will be required to undertake additional detailed analysis, focusing on design and constructability to identify the preferred alternative for the Princess Street Corridor. The preferred alternative has the potential to both inform and compliment the efforts put into analyzing the benefits of Neighbourhood Bikeways and Green Streets as a mechanism for achieving reduced dependency on private automobiles and increase in multimodality throughout both the Williamsville neighbourhood and the broader city. It is critical for the City to develop a transportation network that supports the growth in Williamsville and the City of Kingston, while improving multi-modal facilities that promote sustainable community development.

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Appendix A

Princess Street Operational Needs Analysis (2020)

Appendix B

Princess Street Cross-Section Study (2023)

Appendix C

Preliminary Design Drawings

Appendix D

Princess Street Study Engagement Results

Appendix E

Neighbourhood Bikeway Design Toolbox

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City of Kingston

Williamsville Transportation Plan

Operational Needs Analysis

April 2020 - 19-9291



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1.0 Introduction

The purpose of this memorandum is to document the results of the operational transportation network assessment undertaken for the Williamsville area.

Dillon Consulting Limited (Dillon) was retained by the City of Kingston to undertake an operational assessment of the Williamsville area for the 2036 horizon. The goal of the assessment was to review the road network's existing performance and assess how the road network may perform under two future land use/development scenarios. This also included consideration of alternate mode share scenarios for trip generations of future new development within the neighbourhood. The future land use scenarios are discussed further in Section 4.0.

The following sections describe the study area, analysis parameters, results, conclusions, and next steps.

2.0 Study Area

The focus of the study was on the main transportation corridors in Williamsville:

- Princess Street between Bath Road / Concession Street and Division Street;
- Concession Street between Princess Street and Division Street; and,
- Division Street between Concession Street / Stephen Street and Princess Street.

Williamsville contains a mix of residential, commercial and office land uses. The majority of the commercial land uses and high density residential land uses are located on Princess Street.

3.0 Methodology

3.1 Transportation Demands

City staff provided 2036 population and employment forecasts for the C.M.A. and for Williamsville specifically, based on two potential development scenarios within the Princess Street corridor: approved and active development, and ultimate development.

These population and employment forecasts were added to the C.M.A.¹ transportation demand model (VISUM) and used to estimate the future traffic volumes through Williamsville at the transportation corridor level.

The C.M.A.¹ transportation model is intended for strategic corridor-level analysis. To provide for more detailed intersection-level analysis, traffic generated by the proposed Williamsville developments was distributed to the road network manually outside of the C.M.A. model¹.

3.2 Operational Assessment

The operational analysis applied PTV Group's VISSIM microsimulation software, which is the industry-leading software for transportation microsimulation. Microsimulation involves simulating the behaviour of individual cars, buses, and pedestrians on a simulated transportation network. The model is used to assess the impact to motor vehicles in terms of delays, queuing, and travel time.

Cars in the model are given an origin and destination and are allowed to find their own routes through the simulated road network. The route finding process is iterative and allows vehicles to react and adapt to congestion in the model. This iterative route finding process allows the model to accurately assess future conditions.

Before testing future conditions, it was necessary to construct a model that replicated existing conditions. This step allows the model to better assess future conditions. Calibration involves adjustments to the transportation demands in the model and other parameters to match the travel patterns, travel times, and vehicle behaviour.

¹ Formerly referred to as the 'City-Wide model'

4.0 Study Foundations

The following sections document the population, employment, road network, and public transit assumptions that were used for the analysis.

4.1 Williamsville Growth

City staff provided population and employment projections for various ‘blocks’ in the study area for the 2036 horizon.

Figure 1 illustrates the location of the development blocks and the assumed location of vehicle driveways for each block.

4.1.1 Williamsville Population and Employment

Table 1 summarizes the population and employment for each block in the study area. There are two development levels that are being evaluated:

1. Approved & active development level; and,
2. Ultimate development level.

The following abbreviations are used for the table below and the rest of the document:

- Ex. for existing
- Units for residential dwelling units
- Appr. for approved and active development scenario
- Ult. for ultimate development scenario.

Figure 1: Williamsville Blocks and Assumed Vehicle Driveway Locations

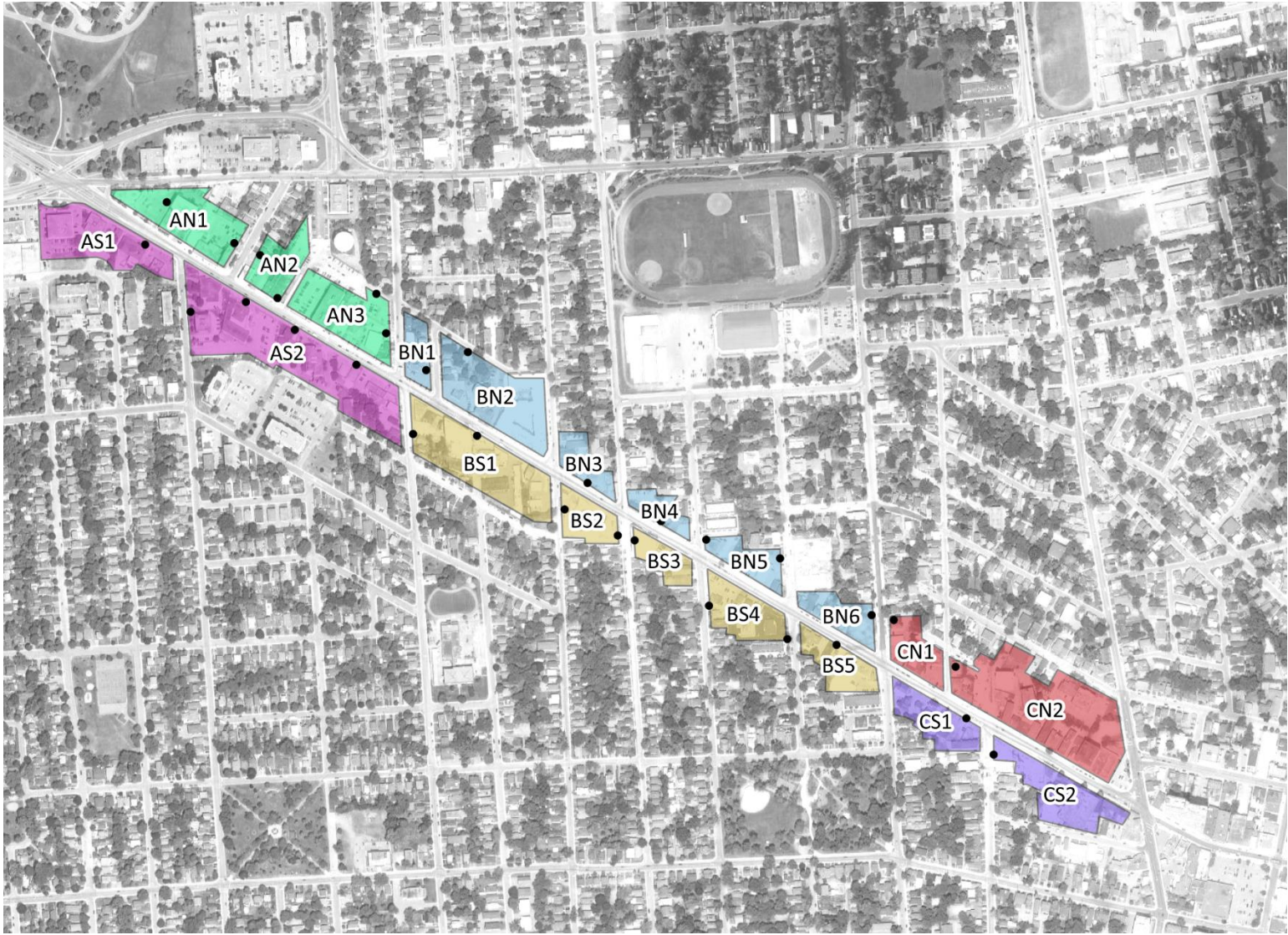


Table 1: Residential Dwellings, Population, and Employment by Block

Block	Ex. Units	Ex. People	Ex. Jobs	Appr. Units	Appr. People	Appr. Jobs	Ult. Units	Ult. People	Ult. Jobs
AN1	0	0	12	0	0	12	300	690	107
AN2	2	5	78	2	5	78	52	120	94
AN3	7	16	156	7	16	156	207	476	219
AS1	1	2	71	1	2	71	901	2,072	356
AS2	59	136	109	174	400	139	264	607	168
BN1	12	28	18	12	28	18	72	166	37
BN2	88	202	15	233	536	41	273	628	54
BN3	1	2	26	1	2	26	131	301	66
BN4	5	12	33	5	12	33	115	265	68
BN5	6	14	4	608	1,398	53	608	1,398	53
BN6	13	30	33	184	423	62	234	538	78
BS1	83	191	35	177	407	35	227	522	51
BS2	7	16	0	332	764	34	332	764	34
BS3	0	0	7	31	71	26	91	209	45
BS4	18	41	27	18	41	27	118	271	59
BS5	7	16	21	7	16	21	47	108	34
CN1	11	25	18	312	718	66	372	856	85
CN2	104	239	81	299	688	101	949	2,183	306
CS1	14	32	31	14	32	31	94	216	56
CS2	18	41	56	222	511	108	252	580	118
Growth				+2,183	+5,021	+307	+5,183	+11,921	+1,257
Total	456	1,049	831	2,639	6,070	1,138	5,639	12,970	2,088

Growth in the above table is compared to existing.

4.1.2 Trip Generation - Person

Table 2 lists the person trip generation rate, number of people and jobs, and the total person trip generation for the future development scenarios. The residential trip generation rate is consistent with the observed trip generation rates at 117 Park Street². It is worth noting that the P.M. rate is 2.6x the A.M. rate and therefore the P.M. peak hour is very likely to govern the analysis.

Given the uncertainty with the type of employment, the employment trip generation rate was set to 0.6 trips per job, which assumes that 60% of employees will travel during the peak hour. This is reasonable and conservative for this analysis.

Table 2: Williamsville Trip Generation - Persons

	A.M. Peak Outbound	A.M. Peak Inbound	P.M. Peak Outbound	P.M. Peak Inbound
Trip generation rate per residential dwelling unit	0.24			0.63
Trip generation rate per job		0.6	0.6	
Person Trips - Approved +2,183 dwelling units +307 jobs	524	184	184	1,375
Person Trips - Ultimate +5,183 dwelling units +1,257 jobs	1,244	754	754	3,265

4.1.3 Trip Generation - Vehicles

The Williamsville area is very close to downtown Kingston and Queen's University and therefore the number of vehicle trips generated by the proposed residential developments is anticipated to be relatively low. It should be noted that a lower vehicle mode share means the new development within Williamsville will have less impact on the road network than may be expected.

² City of Kingston Princess Street Corridor and Residential Area of Williamsville Neighbour Traffic Impact Study (September 12, 2018), Table 3.3.

Two mode share scenarios were developed to assess the impact of the mode share assumption on the study area road network:

1. The first mode share scenario was based on previous studies of existing residential developments within the Princess Street corridor which showed an auto mode share of 22%; and,
2. The second mode share scenario was 35% auto mode share, which was based on the preliminary mode share results for Williamsville from the City's 2019 household travel survey.

It should be noted that these residential auto mode shares, including observations from existing residential land uses along the Princess Street corridor, are significantly lower than the City-wide 2034 target of 65% auto mode share. The employment auto mode share was held constant at 60%. The proximity to downtown is anticipated to influence the employment auto mode share slightly but not to the same extent to which it influences the residential auto mode share.

Table 3 summarizes the vehicle trip generation for the Approved and Ultimate land uses for the two auto mode share scenarios. The following abbreviations are used:

- M.S. for mode share
- Res. for residential and Emp. for Employment
- I.B. for inbound and O.B. for outbound

Table 3: Williamsville Trip Generation - Vehicles

Trip Type	Land Use	Res. M.S.	Emp. M.S.	A.M. Peak O.B.	A.M. Peak I.B.	P.M. Peak O.B.	P.M. Peak I.B.
Person	Appr.	N/A	N/A	524	184	184	1,375
Person	Ult.	N/A	N/A	1,244	754	754	3,265
Auto	Appr.	22%	60%	115	111	111	303
Auto	Appr.	35%	60%	183	111	111	481
Auto	Ult.	22%	60%	274	453	453	718
Auto	Ult.	35%	60%	435	453	453	1,143

Table 4 and **Table 5** summarize the trip generation by block for the two mode share scenarios. The 22%/35% values designate the applied auto mode share.

Table 4: Williamsville Trip Generation by Block - Vehicles – AM Peak Hour

Block	Appr.	Appr.	Appr.	Appr.	Ult.	Ult.	Ult.	Ult.
	22% O.B.	22% I.B.	35% O.B.	35% I.B.	22% O.B.	22% I.B.	35% O.B.	35% I.B.
AN1	0	0	0	0	16	34	25	34
AN2	0	0	0	0	3	6	4	6
AN3	0	0	0	0	11	23	17	23
AS1	0	0	0	0	48	103	76	103
AS2	6	11	10	11	11	21	17	21
BN1	0	0	0	0	3	7	5	7
BN2	8	9	12	9	10	14	16	14
BN3	0	0	0	0	7	14	11	14
BN4	0	0	0	0	6	13	9	13
BN5	32	18	51	18	32	18	51	18
BN6	9	10	14	10	12	16	19	16
BS1	5	0	8	0	8	6	12	6
BS2	17	12	27	12	17	12	27	12
BS3	2	7	3	7	5	14	8	14
BS4	0	0	0	0	5	12	8	12
BS5	0	0	0	0	2	5	3	5
CN1	16	17	25	17	19	24	30	24
CN2	10	7	16	7	45	81	71	81
CS1	0	0	0	0	4	9	7	9
CS2	11	19	17	19	12	22	20	22
Total	115	111	183	111	274	453	435	453

Table 5: Williamsville Trip Generation by Block - Vehicles – PM Peak Hour

Block	Appr.	Appr.	Appr.	Appr.	Ult.	Ult.	Ult.	Ult.
	22% O.B.	22% I.B.	35% O.B.	35% I.B.	22% O.B.	22% I.B.	35% O.B.	35% I.B.
AN1	0	0	0	0	34	42	34	66
AN2	0	0	0	0	6	7	6	11
AN3	0	0	0	0	23	28	23	44
AS1	0	0	0	0	103	125	103	198
AS2	11	16	11	25	21	28	21	45
BN1	0	0	0	0	7	8	7	13
BN2	9	20	9	32	14	26	14	41
BN3	0	0	0	0	14	18	14	29
BN4	0	0	0	0	13	15	13	24
BN5	18	83	18	133	18	83	18	133
BN6	10	24	10	38	16	31	16	49
BS1	0	13	0	21	6	20	6	32
BS2	12	45	12	72	12	45	12	72
BS3	7	4	7	7	14	13	14	20
BS4	0	0	0	0	12	14	12	22
BS5	0	0	0	0	5	6	5	9
CN1	17	42	17	66	24	50	24	80
CN2	7	27	7	43	81	117	81	186
CS1	0	0	0	0	9	11	9	18
CS2	19	28	19	45	22	32	22	52
Total	111	303	111	481	453	718	453	1,143

4.1.4 Trip Distribution - Vehicles

Traffic generated by the Williamsville development was manually distributed to the local road network using a cardinal distribution.

Table 6 summarizes the trip distribution used for the analysis. The distribution was based on the location of employment and residential land uses relative to the Williamsville area.

City of Kingston

Williamsville Transportation Plan - Operational Needs Analysis

April 2020 - 19-9291

Table 6: Williamsville Trip Distribution - Vehicles

Cardinal Direction	Percent	Gateways in Study Area
North	30%	Division Street N, Princess Street N/W
East	20%	Stephen Street, Princess Street S/E
South	20%	Division Street S, Princess Street S/E
West	30%	Concession Street W, Princess Street N/W
Total	100%	

4.1.5

Trip Assignment - Vehicles

Traffic generated by the Williamsville development was added to the microsimulation model and the model was used to assign traffic to the transportation network. The microsimulation model uses an iterative process to determine the quickest path from the origin to the destination for each vehicle trip.

This assignment method was used because it allows vehicles to adapt to changing conditions and avoid congestion, as drivers do in real life. Williamsville has a grid-like road network and therefore it is anticipated that vehicles will use Collector and Local roads to avoid congestion on Arterial roads such as Princess Street, Division Street, and Concession Street. The amount to which this occurs will be quantified during the operational assessment.

4.2

Other Growth in Kingston

The growth occurring in Williamsville is anticipated to represent approximately 20% of the total population growth in Kingston between 2020 and 2036. The C.M.A. transportation demand model³ was used to estimate the transportation impact of the other 80% of population growth outside Williamsville.

The transportation demand model uses population and employment data and mode share assumptions to estimate the number of vehicle trips generated in the future.

³ Formerly called the 'City-Wide' model

C.M.A. Population and Employment

Table 7 summarizes the C.M.A. population and employment assumptions for four (4) land use scenarios. All scenarios include the student population.

The first land use scenario is the existing conditions scenario which was calibrated to existing traffic volumes. The second land use scenario is the forecasted population and employment based on the approved and active developments; this matches the C.M.A. population and employment projections⁴.

The third land use scenario is the “Ultimate Williamsville Land Use scenario” which exceeds the City’s population and employment projections. The additional growth is all located in Williamsville for this scenario.

The fourth land use scenario includes all approved C.M.A. growth except for growth in Williamsville. The growth in Williamsville was accounted for explicitly (as described in the previous section) and therefore the growth in Williamsville was removed from the C.M.A. model⁵ to avoid double-counting for the operational assessment.

This fourth scenario shows that **without the Williamsville growth**, vehicle trips within and **through Williamsville itself** are only anticipated to increase by 2% total between 2020 and 2036. This shows that growth in other areas of Kingston do not significantly increase traffic volumes on Princess Street, Concession Street, or Division Street. This is likely due to a combination of factors such as:

- the three largest projected population growth areas are located northwest of Williamsville (along Princess Street) and east of Williamsville (North King’s Town);
- these growth areas are anticipated to have good transit, walking, and cycling facilities and therefore the auto mode share will be lower and the vehicle trips generated by these developments will be lower;
- a large portion of the employment growth occurs north and west of Williamsville and therefore it does not travel through Williamsville; and,

⁴ Figure 4-3 and Figure 6-1 from the *Population, Housing, and Employment Growth Forecast, 2016 to 2046, City of Kingston, Final Report (Watson & Associates Economists Ltd., March 5, 2019)*

⁵ Formerly called the ‘City-Wide’ model

- the grid network in near the study area, which allows vehicles to use other routes if there is congestion on major roadways.

Table 7: C.M.A Population and Employment, and Williamsville Vehicle Trips

Land Use Scenario	C.M.A. Population	C.M.A. Employment	Williamsville Vehicle Trips
1.2016 Model Base	194,500	83,315	7,873
2.2036 Approved	220,208	92,201	8,410
3.2036 Approved + 'Ultimate' W.M.V. Growth	227,108	93,151	9,056
4.2036 Approved without any W.M.V. Growth	215,187	91,816	7,993

Table 8 summarizes the population change that was assumed for this analysis. **Figure 2** and **Figure 3**, respectively, illustrate the location of population and employment change areas and the amount of change for the Approved scenario.

Table 8: C.M.A. Population Change

Area	Approved Pop. Change	Approved Pop. Change	Ult. Pop Change
N.K.T.	15.0%	3,585	3,585
Williamsville	20.9%	5,020	11,921 (+6,901)
1	1.2%	286	286
2	0.6%	143	143
3	15.0%	3,579	3,579
4	3.3%	787	787
5	12.3%	2,935	2,935
6	14.8%	3,531	3,531
7	2.7%	644	644
8	5.2%	1,241	1,241
9	0.5%	119	119
10	1.5%	358	358
11	0.6%	143	143
12	5.0%	1,193	1,193
13	1.4%	334	334
Total	100%	23,900	30,801

Figure 2: C.M.A. Population Change (Approved Scenario)

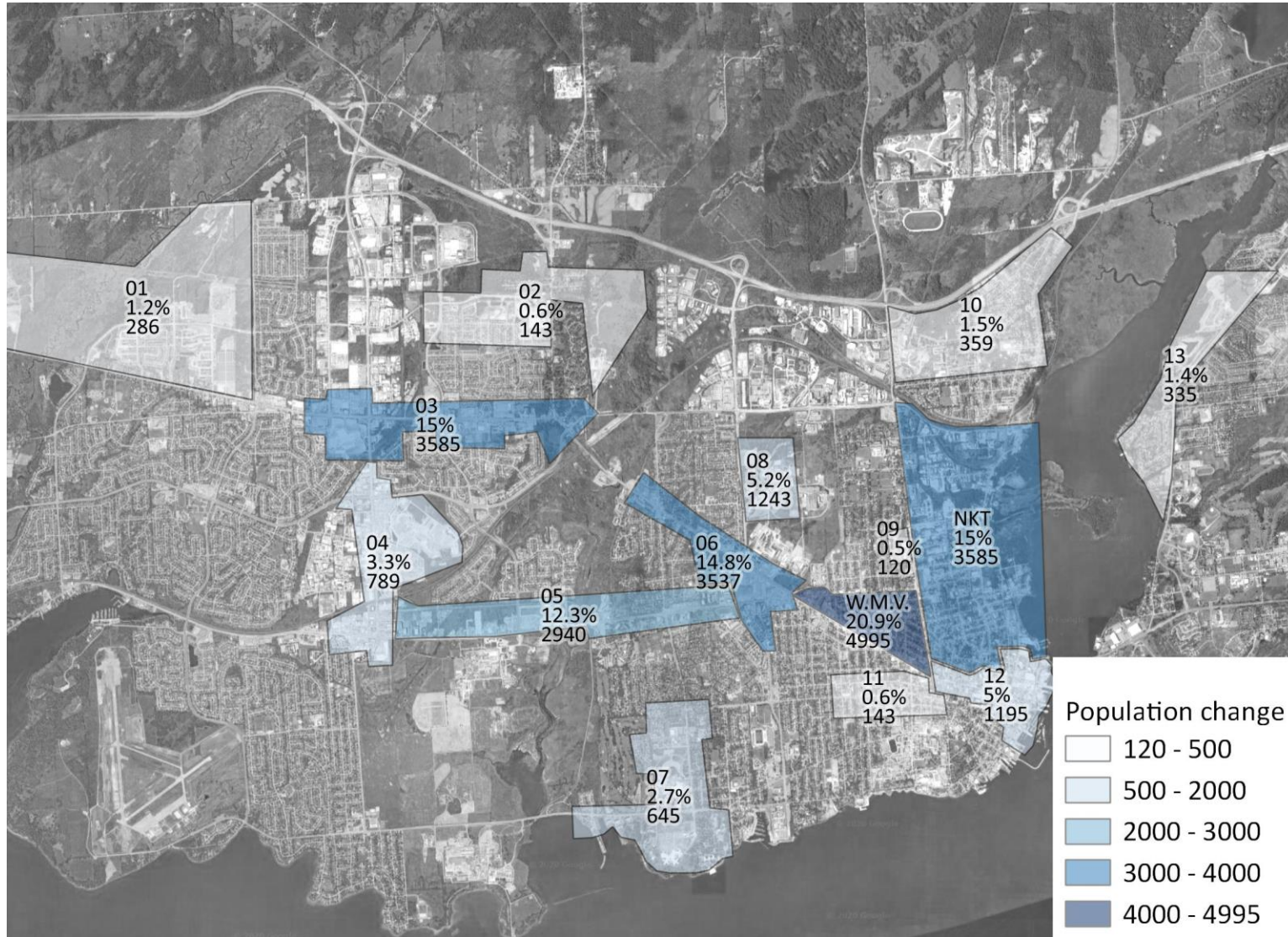
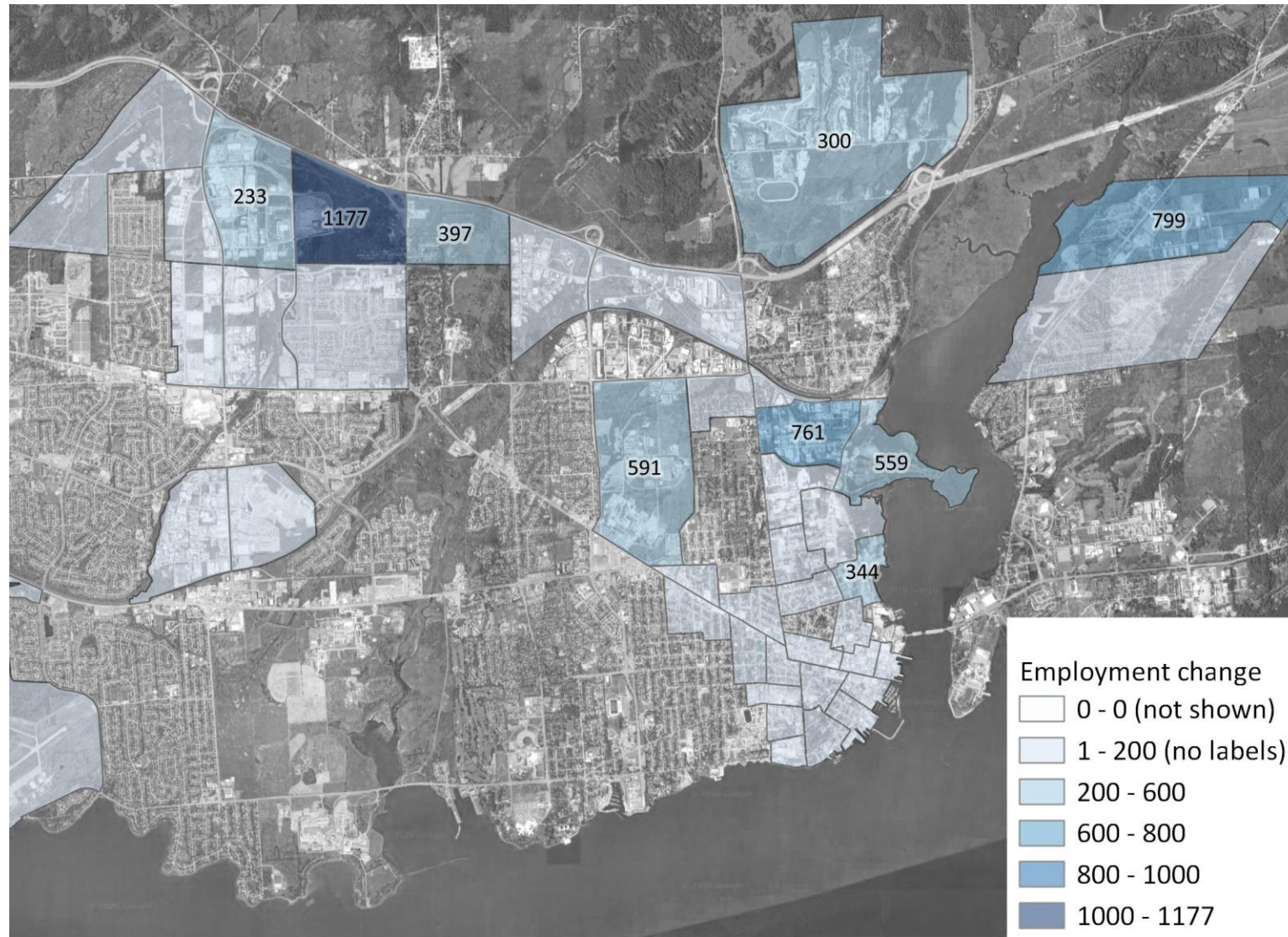


Figure 3: C.M.A. Employment Change (Approved Scenario)



4.2.2 Mode Share

The C.M.A. model⁶ includes assumptions from the City of Kingston *Transportation Master Plan* (2015), which recommended a 2034 target of 9% transit trips, 17% active transportation, and 5% reduction from Transportation Demand Management (T.D.M.) for the 2034 horizon. These targets were referred to as the “Base” mode share.

For the analysis in this report, more aggressive targets were applied, as directed by City of Kingston council on December 1, 2015. These are referred to as the “Reduced” demand scenario and targeted 15% transit usage, 20% active transportation, and 5% T.D.M. “Reduced” refers to the reduction of auto trips on the network through increased use of sustainable travel modes.

Table 9 lists the C.M.A. model⁶ mode share targets. The reduced mode share results in transit trips increasing from 9% to 15%, and an increase in active transportation trips from 17% to 20%, when compared to the base demand mode share.

Table 9: C.M.A. Model Mode Share Targets

Mode	2008 Household Travel Survey	2036 Base Mode Share	2036 Reduced Mode Share
Auto	81%	74%	65%
Transit	5%	9%	15%
Active Transportation	14%	17%	20%
Total	100%	100%	100%

4.2.3 Trip Distribution and Assignment

The vehicle trips resulting from population and employment growth were distributed to different areas within the model based on the location of new residential developments and employment locations. The model assigned these new vehicle trips to the road

⁶ Formerly called the ‘City-Wide’ model

network through an iterative process of trial and error to reduce the overall delay to all road users. This is similar to how people select routes in reality.

4.3 Transportation Network Changes

4.3.1 Road Network

Within the study area itself, Division Street and Princess Street are identified for corridor optimization.

The assessment assumed that the following transportation projects would be implemented by the 2036 horizon, as per the K.T.M.P.:

1. Third Crossing bridge across the Cataraqui River;
2. J.C.B. widening between Division Street and Elliott Avenue;
3. J.C.B. widening between Portsmouth Avenue and Princess Street; and,
4. Leroy Grant Drive extension from Concession Street to Elliott Avenue / J.C.B.

The importance of these transportation projects as they relate to the Approved and Ultimate land uses will be considered in future modelling.

4.3.2 Public Transit

Princess Street is the main transit corridor in the City and there has been some consideration for transit priority lanes on Princess Street. This may prove a challenge in the future since Princess Street has a relatively narrow right-of-way of approximately 20 metres.

4.3.3 Active Transportation

Figure 4 illustrates the existing and planned active transportation network within the study area.

Princess Street is currently a designated spine cycling route. Concession Street and Division Street are identified as proposed spine cycling routes.

MacDonnell Street, Albert Street, Alfred Street, University Avenue, and York Street are identified as proposed neighbourhood cycling routes.

Figure 4: Planned Active Transportation Network



Source: City of Kingston Active Transportation Master Plan, “Walk ‘n’ Roll Kingston” – Technical Appendix G – Neighbourhood Focus - Area G (June 2018)

5.0 Operational Assessment

An operational assessment was completed using transportation microsimulation software to evaluate:

1. the capacity of the Williamsville transportation network;
2. the impact on travel times through the study area;
3. the potential for vehicles to infiltrate residential areas; and,
4. the impact on intersection operations.

Before conducting the operational assessment it was necessary to calibrate the microsimulation model.

5.1 Calibration

Model calibration was performed to ensure the transportation demands are correct and that the model accurately represents the travel patterns and traveller behaviours that occur in reality.

A set of calibration standards were employed to measure the accuracy of the model. The standards used in this analysis are based on FHWA's *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Models*, and include a set of statistical tests to verify the validity of the model results in comparison to observed field data.

Table 10 presents the FHWA Calibration standards.

The model was also calibrated for travel time through the major corridors. The Google Distance Matrix Application Programming Interface (API) was queried to determine real-world travel times; it is crowd-sourced from mobile phones running Google Maps and uses historical averages which represent hundreds of measurements. It was used as it allowed a much larger sample size than would otherwise be possible.

Table 11 compares the target observed travel time against the modelled travel times. All modelled travel times are within 15% or within 60 seconds otherwise. This demonstrates that the model is well calibrated in terms of travel times.

Table 10: FHWA Calibration Standards

Criteria and Measures	Calibration Acceptance Targets
Hourly Flows, Model Versus Observed	
Individual Link Flows	
Within 15%, for 700 veh/h < Flow < 2700 veh/h	> 85% of cases
Within 100 veh/h, for Flow < 700 veh/h	> 85% of cases
Within 400 veh/h, for Flow > 2700 veh/h	> 85% of cases
Sum of All Link Flows	Within 5% of sum of all link counts
GEH Statistic < 5 for Individual Link Flows*	> 85% of cases
GEH Statistic for Sum of All Link Flows	GEH < 4 for sum of all link counts
Travel Times, Model Versus Observed	
Journey Times, Network	
Within 15% (or 1 min, if higher)	> 85% of cases
Visual Audits	
Individual Link Speeds	
Visually Acceptable Speed-Flow Relationship	To analyst’s satisfaction
Bottlenecks	
Visually Acceptable Queuing	To analyst’s satisfaction

*The GEH statistic is computed as follows:

$$GEH = \sqrt{\frac{(E - V)^2}{(E + V)/2}} \tag{4}$$

where:

E = model estimated volume

V = field count

Source: “Freeway System Operational Assessment,” *Paramics Calibration and Validation Guidelines* (Draft), Technical Report I-33, Wisconsin DOT, District 2, June 2002.

Table 11: Model Calibration – Travel Times

Scenario	Princess St. E.B.	Princess St. W.B.	Concession St. E.B.	Concession St. W.B.	Division St.	Division St. S.B.
A.M. Obs.	5:30	4:30	3:15	3:15	2:30	2:45
A.M. Model	5:00	5:15	4:00	3:45	2:45	2:30
A.M. Diff.	30s	45s	45s	30s	15s	15s
A.M. Diff. %	9%	17%	23%	15%	10%	9%
P.M. Obs.	6:30	5:30	3:45	4:00	3:15	3:00
P.M. Model	5:45	5:00	4:45	5:00	2:45	3:00
P.M. Diff.	45s	30s	60s	60s	30s	0s
P.M. Diff. %	12%	9%	27%	25%	15%	0%

Table 12 and **Table 13** summarize the model calibration results for intersection volumes. The calibration was checked for turns (at intersections) and links (between intersections). The results show the model is within a reasonable calibration range.

In many cases there are only one or two turns or links for a particular criteria which are below the targets (e.g. 14/17 or 4/5). The overall volumes during the AM peak hour are higher than the counted volumes; however, this is conservative and therefore it is not considered an issue.

Overall, the model is suitably calibrated for assessing the impacts of the proposed Williamsville developments.

Table 12: Model Calibration – Turns and Link Volumes - Weekday AM Peak

Turns		Passed 4 of 6							
Criteria	Flow Range		Criteria		Goal	Current	Count	Model	Pass
Within 75 veh/h, for Flow < 400 veh/h > 85% of cases	0	400	75	veh	85%	97%	144	139	✓
Within 0.2%, for 400 veh/h < Flow < 1200 > 85% of cases	400	1,200	20%	%	85%	82%	17	14	✗
Within 300 veh/h, for Flow > 1200 veh/h > 85% of cases	1,200		300	veh	85%	--	0	0	
Sum of all flows within 0.05% of sum of all counts	Overall		5%	%	5%	4%	19,200	20,021	✓
GEH < 5 for individual flows > 85% of cases	Overall		5	GEH	85%	89%	161	144	✓
GEH < 10 for individual flows, 95% of cases	Overall		10	GEH	95%	100%	161	161	✓
GEH < 4 for sum of all counts	Overall		4	GEH	4.0	5.9	19,200	20,021	✗

Links		Passed 4 of 6							
Criteria	Flow Range		Criteria		Goal	Current	Count	Model	Pass
Within 100 veh/h, for Flow < 700 veh/h > 85% of cases	0	700	100	veh	85%	95%	56	53	✓
Within 0.15%, for 700 veh/h < Flow < 2700 > 85% of cases	700	2,700	15%	%	85%	80%	5	4	✗
Within 400 veh/h, for Flow > 2700 veh/h > 85% of cases	2,700		400	veh	85%	--	0	0	
Sum of all flows within 5% of sum of all counts	Overall		5	%	5%	4%	19,200	20,021	✓
GEH < 5 for individual flows > 85% of cases	Overall		5	GEH	85%	85%	61	52	✓
GEH < 10 for individual flows, 95% of cases	Overall		10	GEH	95%	97%	61	59	✓
GEH < 4 for sum of all counts	Overall		4	GEH	4.0	5.9	19,200	20,021	✗

Table 13: Model Calibration – Turns and Link Volumes - Weekday PM Peak

Turns		Passed 5 of 6							
Criteria	Flow Range		Criteria		Goal	Current	Count	Model	Pass
Within 75 veh/h, for Flow < 400 veh/h > 85% of cases	0	400	75	veh	85%	96%	135	129	✓
Within 0.2%, for 400 veh/h < Flow < 1200 > 85% of cases	400	1,200	20%	%	85%	83%	29	24	✗
Within 300 veh/h, for Flow > 1200 veh/h > 85% of cases	1,200		300	veh	85%	--	0	0	
Sum of all flows within 0.05% of sum of all counts	Overall		5%	%	5%	1%	25,959	25,804	✓
GEH < 5 for individual flows > 85% of cases	Overall		5	GEH	85%	86%	164	141	✓
GEH < 10 for individual flows, 95% of cases	Overall		10	GEH	95%	98%	164	161	✓
GEH < 4 for sum of all counts	Overall		4	GEH	4.0	1.0	25,959	25,804	✓

Links		Passed 5 of 6							
Criteria	Flow Range		Criteria		Goal	Current	Count	Model	Pass
Within 100 veh/h, for Flow < 700 veh/h > 85% of cases	0	700	100	veh	85%	90%	50	45	✓
Within 0.15%, for 700 veh/h < Flow < 2700 > 85% of cases	700	2,700	15%	%	85%	73%	11	8	✗
Within 400 veh/h, for Flow > 2700 veh/h > 85% of cases	2,700		400	veh	85%	--	0	0	
Sum of all flows within 5% of sum of all counts	Overall		5	%	5%	1%	25,959	25,804	✓
GEH < 5 for individual flows > 85% of cases	Overall		5	GEH	85%	85%	61	52	✓
GEH < 10 for individual flows, 95% of cases	Overall		10	GEH	95%	98%	61	60	✓
GEH < 4 for sum of all counts	Overall		4	GEH	4.0	1.0	25,959	25,804	✓

5.2 Results

The analysis was performed using a combination of performance metrics including: overall network capacity, travel time measurements, vehicle-kilometers travelled (VKT), and intersection-level delay, queues, and level-of-service (LOS). The use of multiple performance metrics allows for a better understanding of what is happening and why it is happening.



5.2.1

Network Capacity

Table 14 summarizes the overall network capacity results for the ‘no mitigation’ scenario. The operational model is for a relatively small area. Unmet demand refers to vehicles that could not “enter” the model due to congestion in the model.

These results show that the Williamsville transportation network is able to accommodate the future demands for all scenarios except the Ultimate development PM peak hour scenario. This scenario shows a reduction in the percentage of trips completed (93-95%), a reduction in the average speed (16-18 km/h), and an increase of the trips in progress (426-539).

Table 14: Network Capacity - No Mitigation

Scenario	Total Demand	Trips Completed	Trips in Progress	Unmet Demand	Average Speed	Trips Completed
AM 2019 Ex.	6,151	5,990	161	0	28	97%
AM 2036 No WMV Growth	6,274	6,084	162	0	28	97%
AM 2036 Appr. Auto 22%	6,387	6,220	167	0	28	97%
AM 2036 Appr. Auto 35%	6,489	6,318	171	0	27	97%
AM 2036 Ult. Auto 22%	7,071	6,881	190	0	27	97%
AM 2036 Ult. Auto 35%	7,484	7,285	199	0	26	97%
PM 2019 Ex.	9,015	8,775	240	0	25	97%
PM 2036 No WMV Growth	9,124	8,884	240	0	24	97%
PM 2036 Appr. Auto 22%	9,250	8,981	260	9	24	97%
PM 2036 Appr. Auto 35%	9,352	9,044	269	39	23	97%
PM 2036 Ult. Auto 22%	10,295	9,790	426	79	18	95%
PM 2036 Ult. Auto 35%	10,843	10,122	539	182	16	93%

5.2.2 Travel Times

Travel times provide an easy to understand measure which takes into account the combined impacts of several intersections and the impact on traffic progression through the corridor.

Table 15 summarizes the travel time results for the 'no mitigation' scenario.

For the Approved land use, travel times are anticipated to increase by 30 seconds or less during both the AM and PM peak hours which is not significant.

For the Ultimate land use, travel times are anticipated to increase significantly during the PM peak hour for Princess Street eastbound, Concession Street eastbound, Concession Street westbound, and Division Street southbound.

The increases are from 6:45 to 8:15, 4:45 to 9:45, 5:00 to 8:30, and 3:00 to 6:30. These are increases of 3-5 minutes over a relatively short distance (2 km for Princess Street, 1.5 km for Concession Street, and 1 km for Division Street).

Table 15: Travel Time Results – No Mitigation

Scenario	Princess St. E.B.	Princess St. W.B.	Concession St. E.B.	Concession St. W.B.	Division St. N.B.	Division St. S.B.
AM 2019 Ex.	5:00	5:15	4:00	3:45	2:45	2:30
AM 2036 No WMV Growth	5:00	5:15	4:15	4:00	2:45	2:45
AM 2036 Appr. Auto 22%	5:00	5:15	4:00	3:45	2:45	2:45
AM 2036 Appr. Auto 35%	5:15	5:15	4:00	3:45	2:45	2:45
AM 2036 Ult. Auto 22%	5:15	5:30	4:15	4:15	2:45	2:45
AM 2036 Ult. Auto 35%	5:30	5:30	4:30	4:15	2:45	2:45
PM 2019 Ex.	5:45	5:00	4:45	5:00	2:45	3:00
PM 2036 No WMV Growth	6:15	5:00	5:00	4:45	2:45	2:45
PM 2036 Appr. Auto 22%	6:15	5:00	5:45	5:30	3:00	3:00
PM 2036 Appr. Auto 35%	6:15	5:00	5:45	5:30	3:00	3:00
PM 2036 Ult. Auto 22%	7:30	5:15	8:30	7:00	3:15	6:00
PM 2036 Ult. Auto 35%	8:15	5:45	9:45	8:30	3:30	6:30

5.2.3 Vehicle-Kilometres Travelled by Road Class

Table 16 summarizes thousand-vehicle-kilometers-travelled (k.V.K.T.) by road class for the for the ‘no mitigation’ scenario.

The Arterials include Princess Street, Concession Street, Division Street, Leroy Grant Drive, Stephen Street; the Collectors include Alfred Street and Victoria Street, and the Local roads are all other roadways.

All scenarios and time periods show an increase in the amount of traffic on local roads. This is particularly true during the Ultimate PM peak hour scenario which shows Local traffic has increased 75% compared to Existing and 30% compared to the Approved scenario.

Some of this is due to the development being located on a local roadway, but some is due to traffic infiltration through residential areas to avoid congestion elsewhere. This is not surprising given that Williamsville has a grid network. Mitigating this will likely require a combination of turn prohibitions, traffic calming, and traffic signal optimization.

Table 16: Results - V.K.T. by Road Class – No Mitigation

Scenario	k.V.K.T. Arterial	k.V.K.T. Collector	k.V.K.T. Local	k.V.K.T. Total	% Art.	% Coll.	% Local
AM 2019 Ex.	3,800	400	400	4,600	83%	9%	9%
AM 2036 No WMV Growth	3,800	400	400	4,600	83%	9%	9%
AM 2036 Appr. Auto 22%	3,950	400	450	4,800	82%	8%	9%
AM 2036 Appr. Auto 35%	4,000	450	450	4,900	82%	9%	9%
AM 2036 Ult. Auto 22%	4,300	400	550	5,250	82%	8%	10%
AM 2036 Ult. Auto 35%	4,500	450	600	5,550	81%	8%	11%
PM 2019 Ex.	5,450	450	600	6,500	84%	7%	9%
PM 2036 No WMV Growth	5,500	450	600	6,550	84%	7%	9%
PM 2036 Appr. Auto 22%	5,500	450	800	6,750	81%	7%	12%
PM 2036 Appr. Auto 35%	5,550	450	800	6,800	82%	7%	12%
PM 2036 Ult. Auto 22%	5,850	550	1,050	7,450	79%	7%	14%
PM 2036 Ult. Auto 35%	6,000	600	1,100	7,700	78%	8%	14%

5.2.4 Intersection Performance

The scenarios were also compared in terms of intersection performance (delay, queues, and level of service) for study area intersections.

The Approved land use shows all intersections operating at LOS C or better. There are several turning movements operating at a LOS E or F, which shows there is room for improvement.

The Ultimate land use shows four intersections operating at LOS D or worse and the sum of the delays for all study area intersections is 100% higher than existing conditions and 50% higher than the approved land use during the PM peak hour.

This reinforces the findings from the previous sections which demonstrate that the Approved land use can be accommodated without significant issues, but without mitigation there is a lack of capacity for vehicle trips to accommodate the Ultimate land use during the PM peak hour.

Appendix A contains the detailed intersection performance worksheets, which list the number of vehicles, delay, level-of-service (LOS), 50th and 95th percentile queues for each turning movement and the overall intersection for study area intersections.

6.0 Conclusion

Overall the study area roads appear capable of accommodating the additional traffic fairly well except for the Ultimate land use during the weekday PM peak hour. This conclusion is based on analysis without any optimization or mitigation in the Williamsville study area.

The ability of Williamsville to accommodate this growth is due largely to the low auto mode share that was assumed for the residential growth; the low auto mode share means the growth will result in relatively “few” vehicle trips.

“Few” in this case is still 400-600 vehicles per hour for the Approved land use and 900-1,500 vehicles per hour for the Ultimate land use. This vehicle trip generation has an impact on the road network and results in increased travel times, delays, queuing, etc., as well as traffic infiltration through the residential areas.

The growth in Williamsville will have relatively high walking, cycling, and transit mode shares and therefore it is important to have adequate facilities to accommodate the additional demands for these modes.

Improvements to walking, cycling, and transit facilities are key to maintaining the low auto mode share, which is critical to maintaining the viability of the Williamsville growth. The issue, however, is the narrow right-of-way for the Princess Street corridor (20 metres) which is an important Arterial road through the study area.

Due to the limited right-of-way, it is likely not possible for Princess Street to simultaneously be a transit priority corridor, a cycling spine route, a pedestrian-friendly corridor, and an Arterial class roadway leading to the downtown core. Therefore, compromises will need to be made in a way that improves multi-modal mobility, but recognizes the limited space to accommodate all modes of travel in a narrow corridor.

It is critical to develop a vision for the study area transportation network. This operational assessment should be revisited once this vision has been developed to determine how the needs of transportation modes can be balanced to support the growth in Williamsville and the City of Kingston.

7.0 Next Steps

The next steps for the analysis are to identify the preferred role, function, and cross-section for the Princess Street, Concession Street, and Division Street transportation corridors.

We suggest additional analysis using optimized traffic control signal timings to improve throughput in the corridors based on their identified role and function. We also suggest investigating turn prohibitions and other traffic calming measures and the impact they may have on traffic infiltration and network operations.

Appendix A

Intersection Performance Worksheets

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ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LOS
10	Princess St / Concession St	Signalized	2,606	43.3	65.8	26.9	21.4	C
20	Princess St / Regent St	TWSC	1,009	0.2	36.7	2.3	0.1	-
30	Princess St / Drayton Av	TWSC	957	0.0	50.8	1.9	0.1	-
40	Princess St / Macdonnell Av	Signalized	887	51.0	94.4	16.1	9.5	B
50	Princess St / Smith St	TWSC	733	28.8	33.0	1.6	0.0	-
60	Princess St / Victoria St	Signalized	879	8.4	52.7	7.0	3.5	A
70	Princess St / Nelson St	TWSC	786	0.3	3.8	1.6	0.1	-
80	Princess St / Albert St	Signalized	828	30.4	80.4	13.1	9.0	B
90	Princess St / Frontenac St	TWSC	775	0.0	0.1	1.0	0.1	-
100	Princess St / Alfred St	Signalized	1,109	44.4	74.2	23.7	16.7	C
110	Princess St / Chatham St	TWSC	747	0.0	25.8	1.5	0.0	-
120	Princess St / University Av	Signalized	723	15.0	56.2	5.4	2.4	A
130	Princess St / Division St	Signalized	950	18.2	45.8	16.9	12.3	B
140	Concession St / Drayton Av	TWSC	954	0.2	140.2	7.0	2.8	-
150	Concession St / Leroy Grant Dr (S)	TWSC	912	44.8	74.7	6.9	2.9	-
155	Concession St / Leroy Grant Drive (N)	TWSC	750	0.2	1.0	0.6	0.2	-
160	Concession St / Macdonnell St	Signalized	1,559	50.3	72.6	9.8	6.1	A
170	Concession St / Connaught St	TWSC	1,346	0.0	52.4	1.7	0.6	-
180	Concession St / Victoria St	Signalized	1,426	38.9	88.3	11.3	7.0	B
190	Concession St / Nelson St	TWSC	1,303	0.1	60.4	1.3	0.1	-
200	Concession St / Kingscourt Av	TWSC	1,283	0.2	40.4	1.3	0.4	-
210	Concession St / Fergus St	TWSC	1,315	0.2	40.3	2.7	1.4	-
220	Concession St / Grey St	TWSC	1,351	10.2	53.2	7.5	4.1	-
230	Concession St / Alfred St	Signalized	1,416	41.6	62.2	13.1	8.0	B
240	Concession St / Lansdowne St	TWSC	968	0.0	19.3	1.1	0.0	-
250	Concession St / Division St	Signalized	1,635	39.8	97.4	21.4	15.5	C
260	Adelaide St / Division St	TWSC	692	0.0	25.4	0.7	0.1	-
270	Stanley St / Division St	TWSC	777	0.5	20.8	2.6	0.9	-
280	Pine St / Division St	Signalized	837	18.4	48.2	8.7	5.1	A
290	Quebec St / Division St	TWSC	718	0.0	29.9	0.8	0.0	-
300	York St / Division St	Signalized	787	15.7	35.7	6.6	4.1	A
310	Main St / Division St	TWSC	644	21.3	30.1	0.9	0.4	-
320	Hamilton St / Division St	TWSC	622	0.0	0.0	0.0	0.0	-
330	Raglan St / Division St	TWSC	625	0.0	0.0	0.1	0.0	-
340	Elm St / Division St	TWSC	614	0.0	0.0	0.1	0.0	-
350	Ellice St / Division St	TWSC	617	0.0	0.1	0.2	0.0	-
360	Colborne St / Division St	TWSC	612	0.0	13.5	1.0	0.0	-
370	Queen St / Division St	Signalized	836	25.8	47.6	13.8	7.8	B
Total			37,588	548	1,673	241	143	

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Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	141	25	40	42	50	D	50.0	D	26.9	C
10	Princess St / Concession St	Signalized	NBT	110	25	40	38	45	D				
10	Princess St / Concession St	Signalized	NBR	37	25	40	0	3	A				
10	Princess St / Concession St	Signalized	SBL	490	70	95	29	37	D				
10	Princess St / Concession St	Signalized	SBT	481	70	95	29	37	D				
10	Princess St / Concession St	Signalized	SBR	31	70	95	14	18	B				
10	Princess St / Concession St	Signalized	EBT	418	35	60	26	32	C				
10	Princess St / Concession St	Signalized	EBR	190	35	60	0	2	A				
10	Princess St / Concession St	Signalized	WBT	236	20	40	26	31	C				
10	Princess St / Concession St	Signalized	WBR	343	20	40	0	0	A				
10	Princess St / Concession St	Signalized	WBL	129	20	40	1	4	A				
20	Princess St / Regent St	TWSC	NBL	3	5	10	1	9	A	11.0	B	2.3	A
20	Princess St / Regent St	TWSC	NBR	29	5	10	3	11	B				
20	Princess St / Regent St	TWSC	EBT	618	0	55	0	3	A				
20	Princess St / Regent St	TWSC	EBR	49	0	55	0	2	A				
20	Princess St / Regent St	TWSC	WBL	7	0	0	6	9	A				
20	Princess St / Regent St	TWSC	WBT	303	0	0	0	0	A				
30	Princess St / Drayton Av	TWSC	SBL	0	0	5	0	0	A	8.0	A	1.9	A
30	Princess St / Drayton Av	TWSC	SBR	12	0	5	2	8	A				
30	Princess St / Drayton Av	TWSC	EBL	100	0	75	1	3	A				
30	Princess St / Drayton Av	TWSC	EBT	548	0	75	0	2	A				
30	Princess St / Drayton Av	TWSC	WBT	295	0	0	0	1	A				
30	Princess St / Drayton Av	TWSC	WBR	2	0	0	0	1	A				
40	Princess St / Macdonnell Av	Signalized	NBL	41	5	20	12	18	B	20.0	B	16.1	B
40	Princess St / Macdonnell Av	Signalized	NBT	18	5	20	15	20	B				
40	Princess St / Macdonnell Av	Signalized	NBR	27	5	20	3	9	A				
40	Princess St / Macdonnell Av	Signalized	SBL	11	40	40	13	19	B				
40	Princess St / Macdonnell Av	Signalized	SBT	19	40	40	14	19	B				
40	Princess St / Macdonnell Av	Signalized	SBR	42	40	40	3	12	B				
40	Princess St / Macdonnell Av	Signalized	EBL	7	70	135	12	18	B				
40	Princess St / Macdonnell Av	Signalized	EBT	467	70	135	10	17	B				
40	Princess St / Macdonnell Av	Signalized	EBR	28	70	135	9	16	B				
40	Princess St / Macdonnell Av	Signalized	WBL	0	30	50	0	0	A				
40	Princess St / Macdonnell Av	Signalized	WBT	219	30	50	9	15	B				
40	Princess St / Macdonnell Av	Signalized	WBR	8	30	50	5	12	B				
50	Princess St / Smith St	TWSC	SBL	1	40	40	0	0	A	12.0	B	1.6	A
50	Princess St / Smith St	TWSC	SBR	22	40	40	1	12	B				
50	Princess St / Smith St	TWSC	EBL	2	40	40	0	0	A				
50	Princess St / Smith St	TWSC	EBT	503	40	40	0	1	A				
50	Princess St / Smith St	TWSC	WBT	205	0	15	0	2	A				
50	Princess St / Smith St	TWSC	WBR	0	0	15	0	0	A				
60	Princess St / Victoria St	Signalized	NBL	19	10	25	14	21	C	30.0	C	7.0	A
60	Princess St / Victoria St	Signalized	NBT	33	10	25	18	25	C				
60	Princess St / Victoria St	Signalized	NBR	45	10	25	6	13	B				
60	Princess St / Victoria St	Signalized	SBL	4	5	20	20	30	C				
60	Princess St / Victoria St	Signalized	SBT	57	5	20	16	21	C				
60	Princess St / Victoria St	Signalized	SBR	3	5	20	0	0	A				
60	Princess St / Victoria St	Signalized	EBL	1	10	70	0	0	A				
60	Princess St / Victoria St	Signalized	EBT	491	10	70	1	4	A				
60	Princess St / Victoria St	Signalized	EBR	7	10	70	1	4	A				
60	Princess St / Victoria St	Signalized	WBL	24	5	35	5	10	A				
60	Princess St / Victoria St	Signalized	WBT	180	5	35	2	4	A				
60	Princess St / Victoria St	Signalized	WBR	15	5	35	0	4	A				
70	Princess St / Nelson St	TWSC	NBL	2	0	5	0	0	A	17.0	C	1.6	A
70	Princess St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	NBR	7	0	5	1	8	A				
70	Princess St / Nelson St	TWSC	SBL	8	5	5	3	17	C				
70	Princess St / Nelson St	TWSC	SBT	4	5	5	5	15	B				
70	Princess St / Nelson St	TWSC	SBR	29	5	5	1	8	A				
70	Princess St / Nelson St	TWSC	EBL	13	0	5	0	2	A				
70	Princess St / Nelson St	TWSC	EBT	532	0	5	0	1	A				
70	Princess St / Nelson St	TWSC	EBR	3	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	WBL	1	0	0	5	9	A				
70	Princess St / Nelson St	TWSC	WBT	187	0	0	0	1	A				
70	Princess St / Nelson St	TWSC	WBR	0	0	0	0	0	A				

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Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
80	Princess St / Albert St	Signalized	NBL	13	5	15	15	21	C	26.0	C	13.1	B
80	Princess St / Albert St	Signalized	NBT	16	5	15	13	18	B				
80	Princess St / Albert St	Signalized	NBR	25	5	15	1	6	A				
80	Princess St / Albert St	Signalized	SBL	2	0	10	5	9	A				
80	Princess St / Albert St	Signalized	SBT	30	0	10	10	13	B				
80	Princess St / Albert St	Signalized	SBR	3	0	10	0	5	A				
80	Princess St / Albert St	Signalized	EBL	0	40	100	0	0	A				
80	Princess St / Albert St	Signalized	EBT	535	40	100	10	14	B				
80	Princess St / Albert St	Signalized	EBR	16	40	100	8	12	B				
80	Princess St / Albert St	Signalized	WBL	8	15	55	22	26	C				
80	Princess St / Albert St	Signalized	WBT	180	15	55	6	10	A				
80	Princess St / Albert St	Signalized	WBR	0	15	55	0	0	A				
90	Princess St / Frontenac St	TWSC	NBL	1	0	5	0	0	A	11.0	B	1.0	A
90	Princess St / Frontenac St	TWSC	NBT	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	NBR	1	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	8	0	5	3	11	B				
90	Princess St / Frontenac St	TWSC	SBR	13	0	5	1	7	A				
90	Princess St / Frontenac St	TWSC	EBL	9	0	0	1	5	A				
90	Princess St / Frontenac St	TWSC	EBT	544	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	EBR	5	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	WBL	4	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	WBT	189	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBR	1	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	25	15	45	15	22	C	35.0	C	23.7	C
100	Princess St / Alfred St	Signalized	NBT	103	15	45	12	18	B				
100	Princess St / Alfred St	Signalized	NBR	68	15	45	6	12	B				
100	Princess St / Alfred St	Signalized	SBL	27	25	45	14	22	C				
100	Princess St / Alfred St	Signalized	SBT	129	25	45	14	21	C				
100	Princess St / Alfred St	Signalized	SBR	51	25	45	7	13	B				
100	Princess St / Alfred St	Signalized	EBL	48	70	105	18	25	C				
100	Princess St / Alfred St	Signalized	EBT	484	70	105	21	29	C				
100	Princess St / Alfred St	Signalized	EBR	7	70	105	18	25	C				
100	Princess St / Alfred St	Signalized	WBL	7	20	45	26	35	C				
100	Princess St / Alfred St	Signalized	WBT	137	20	45	19	25	C				
100	Princess St / Alfred St	Signalized	WBR	23	20	45	0	3	A				
110	Princess St / Chatham St	TWSC	SBL	0	0	0	0	0	A	2.0	A	1.5	A
110	Princess St / Chatham St	TWSC	SBR	0	0	0	0	0	A				
110	Princess St / Chatham St	TWSC	EBL	12	0	20	0	2	A				
110	Princess St / Chatham St	TWSC	EBT	563	0	20	0	2	A				
110	Princess St / Chatham St	TWSC	WBT	169	0	45	0	0	A				
110	Princess St / Chatham St	TWSC	WBR	3	0	45	0	0	A				
120	Princess St / University Av	Signalized	NBL	21	5	10	19	24	C	24.0	C	5.4	A
120	Princess St / University Av	Signalized	NBR	20	5	10	2	7	A				
120	Princess St / University Av	Signalized	EBT	482	20	70	2	5	A				
120	Princess St / University Av	Signalized	EBR	49	20	70	1	5	A				
120	Princess St / University Av	Signalized	WBL	2	0	20	0	3	A				
120	Princess St / University Av	Signalized	WBT	149	0	20	2	4	A				
120	Princess St / University Av	Signalized	NBT	0	5	10	0	0	A				
120	Princess St / University Av	Signalized	SBL	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	SBT	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	SBR	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	EBL	0	20	70	0	0	A				
120	Princess St / University Av	Signalized	WBR	0	0	20	0	0	A				
130	Princess St / Division St	Signalized	NBL	16	5	20	12	24	C	28.0	C	16.9	B
130	Princess St / Division St	Signalized	NBT	53	5	20	11	17	B				
130	Princess St / Division St	Signalized	NBR	1	5	20	0	0	A				
130	Princess St / Division St	Signalized	SBL	142	5	45	4	6	A				
130	Princess St / Division St	Signalized	SBT	96	5	45	3	4	A				
130	Princess St / Division St	Signalized	SBR	141	5	45	0	0	A				
130	Princess St / Division St	Signalized	EBL	134	30	50	21	28	C				
130	Princess St / Division St	Signalized	EBT	355	30	50	20	27	C				
130	Princess St / Division St	Signalized	EBR	12	30	50	8	16	B				

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Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	34	5	10	23	32	D	32.0	D	7.0	A
140	Concession St / Drayton Av	TWSC	EBT	908	0	145	2	6	A				
140	Concession St / Drayton Av	TWSC	EBR	12	0	145	8	15	B				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	4	0	5	8	20	C	20.0	C	6.9	A
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	33	45	75	1	4	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	875	45	75	3	7	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	22	5	10	2	10	A	15.0	B	0.6	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	11	5	10	6	15	B				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	4	0	5	2	14	B				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	79	0	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	608	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	26	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	0	0	5	0	0	A	34.0	C	9.8	A
160	Concession St / Macdonnell St	Signalized	NBT	0	0	5	0	0	A				
160	Concession St / Macdonnell St	Signalized	NBR	7	0	5	1	6	A				
160	Concession St / Macdonnell St	Signalized	SBR	46	0	5	1	3	A				
160	Concession St / Macdonnell St	Signalized	EBL	36	75	75	14	21	C				
160	Concession St / Macdonnell St	Signalized	EBT	702	75	75	7	11	B				
160	Concession St / Macdonnell St	Signalized	EBR	141	75	75	5	9	A				
160	Concession St / Macdonnell St	Signalized	WBL	37	20	75	26	34	C				
160	Concession St / Macdonnell St	Signalized	WBT	590	20	75	4	7	A				
160	Concession St / Macdonnell St	Signalized	WBR	0	20	75	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	9	0	5	6	16	C	16.0	C	1.7	A
170	Concession St / Connaught St	TWSC	SBR	7	0	5	4	11	B				
170	Concession St / Connaught St	TWSC	EBL	15	0	95	4	8	A				
170	Concession St / Connaught St	TWSC	EBT	694	0	95	1	2	A				
170	Concession St / Connaught St	TWSC	WBT	618	0	5	0	1	A				
170	Concession St / Connaught St	TWSC	WBR	3	0	5	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	12	5	15	23	29	C	33.0	C	11.3	B
180	Concession St / Victoria St	Signalized	NBT	17	5	15	15	19	B				
180	Concession St / Victoria St	Signalized	NBR	13	5	15	8	14	B				
180	Concession St / Victoria St	Signalized	SBL	7	5	15	26	33	C				
180	Concession St / Victoria St	Signalized	SBT	27	5	15	21	26	C				
180	Concession St / Victoria St	Signalized	SBR	47	5	15	1	9	A				
180	Concession St / Victoria St	Signalized	EBL	21	35	100	10	15	B				
180	Concession St / Victoria St	Signalized	EBT	658	35	100	6	9	A				
180	Concession St / Victoria St	Signalized	EBR	7	35	100	8	15	B				
180	Concession St / Victoria St	Signalized	WBL	47	50	90	19	27	C				
180	Concession St / Victoria St	Signalized	WBT	569	50	90	6	11	B				
180	Concession St / Victoria St	Signalized	WBR	1	50	90	0	0	A				
190	Concession St / Nelson St	TWSC	NBL	11	0	5	10	19	C	19.0	C	1.3	A
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBL	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	23	5	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	43	0	85	1	3	A				
190	Concession St / Nelson St	TWSC	EBT	640	0	85	0	1	A				
190	Concession St / Nelson St	TWSC	EBR	0	0	85	0	0	A				
190	Concession St / Nelson St	TWSC	WBL	8	0	35	3	6	A				
190	Concession St / Nelson St	TWSC	WBT	578	0	35	0	1	A				
190	Concession St / Nelson St	TWSC	WBR	0	0	35	0	0	A				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	39	5	15	10	20	C	20.0	C	1.3	A
200	Concession St / Kingscourt Av	TWSC	SBR	5	5	15	5	19	C				
200	Concession St / Kingscourt Av	TWSC	EBL	24	0	80	2	6	A				
200	Concession St / Kingscourt Av	TWSC	EBT	616	0	80	0	1	A				
200	Concession St / Kingscourt Av	TWSC	WBT	578	0	0	0	0	A				
200	Concession St / Kingscourt Av	TWSC	WBR	21	0	0	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	44	5	15	11	20	C	20.0	C	2.7	A
210	Concession St / Fergus St	TWSC	SBR	2	5	15	2	10	A				
210	Concession St / Fergus St	TWSC	EBL	23	0	80	3	6	A				
210	Concession St / Fergus St	TWSC	EBT	630	0	80	2	4	A				
210	Concession St / Fergus St	TWSC	WBT	595	0	0	0	0	A				
210	Concession St / Fergus St	TWSC	WBR	21	0	0	0	0	A				
220	Concession St / Grey St	TWSC	SBL	41	5	15	32	43	E	43.0	E	7.5	A
220	Concession St / Grey St	TWSC	SBR	11	5	15	19	28	D				
220	Concession St / Grey St	TWSC	EBL	21	20	105	6	12	B				
220	Concession St / Grey St	TWSC	EBT	656	20	105	6	12	B				
220	Concession St / Grey St	TWSC	WBT	601	0	0	0	0	A				
220	Concession St / Grey St	TWSC	WBR	21	0	0	0	0	A				
230	Concession St / Alfred St	Signalized	NBL	174	25	50	17	28	C	31.0	C	13.1	B
230	Concession St / Alfred St	Signalized	NBT	10	25	50	22	31	C				
230	Concession St / Alfred St	Signalized	NBR	29	25	50	11	19	B				
230	Concession St / Alfred St	Signalized	SBL	2	5	15	21	30	C				
230	Concession St / Alfred St	Signalized	SBT	37	5	15	14	19	B				
230	Concession St / Alfred St	Signalized	SBR	38	5	15	3	8	A				
230	Concession St / Alfred St	Signalized	EBL	33	55	60	12	18	B				
230	Concession St / Alfred St	Signalized	EBT	488	55	60	7	11	B				
230	Concession St / Alfred St	Signalized	EBR	170	55	60	2	3	A				
230	Concession St / Alfred St	Signalized	WBL	22	35	80	9	16	B				
230	Concession St / Alfred St	Signalized	WBT	411	35	80	7	12	B				
230	Concession St / Alfred St	Signalized	WBR	2	35	80	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	5.0	A	1.1	A
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBT	519	0	10	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	10	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	13	0	30	2	5	A				
240	Concession St / Lansdowne St	TWSC	WBT	436	0	30	0	1	A				
250	Concession St / Division St	Signalized	NBL	16	25	60	19	27	C	43.0	D	21.4	C
250	Concession St / Division St	Signalized	NBT	222	25	60	16	21	C				
250	Concession St / Division St	Signalized	NBR	13	25	60	11	17	B				
250	Concession St / Division St	Signalized	SBL	32	50	110	18	26	C				
250	Concession St / Division St	Signalized	SBT	362	50	110	16	22	C				
250	Concession St / Division St	Signalized	SBR	201	50	110	2	6	A				
250	Concession St / Division St	Signalized	EBL	160	35	110	16	22	C				
250	Concession St / Division St	Signalized	EBT	345	35	110	12	17	B				
250	Concession St / Division St	Signalized	EBR	13	35	110	4	8	A				
250	Concession St / Division St	Signalized	WBL	22	40	80	33	43	D				
250	Concession St / Division St	Signalized	WBT	234	40	80	29	38	D				
250	Concession St / Division St	Signalized	WBR	15	40	80	20	27	C				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	39	0	20	1	3	A	12.0	B	0.7	A
260	Adelaide St / Division St	TWSC	NBT	239	0	20	0	1	A				
260	Adelaide St / Division St	TWSC	NBR	3	0	20	0	1	A				
260	Adelaide St / Division St	TWSC	SBL	11	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	SBT	374	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	SBR	11	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	EBL	4	0	10	2	9	A				
260	Adelaide St / Division St	TWSC	EBT	2	0	10	3	11	B				
260	Adelaide St / Division St	TWSC	EBR	0	0	10	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBT	2	0	5	2	12	B				
260	Adelaide St / Division St	TWSC	WBR	7	0	5	1	8	A				
270	Stanley St / Division St	TWSC	NBL	51	0	20	1	4	A	10.0	A	2.6	A
270	Stanley St / Division St	TWSC	NBT	268	0	20	0	1	A				
270	Stanley St / Division St	TWSC	SBT	373	0	25	1	2	A				
270	Stanley St / Division St	TWSC	SBR	0	0	25	0	0	A				
270	Stanley St / Division St	TWSC	EBL	15	5	5	2	9	A				
270	Stanley St / Division St	TWSC	EBR	70	5	5	3	10	A				
280	Pine St / Division St	Signalized	NBL	0	5	25	0	0	A	34.0	C	8.7	A
280	Pine St / Division St	Signalized	NBT	269	5	25	3	5	A				
280	Pine St / Division St	Signalized	NBR	6	5	25	0	0	A				
280	Pine St / Division St	Signalized	SBL	43	30	70	5	9	A				
280	Pine St / Division St	Signalized	SBT	406	30	70	4	8	A				
280	Pine St / Division St	Signalized	SBR	0	30	70	0	0	A				
280	Pine St / Division St	Signalized	EBL	0	5	10	0	0	A				
280	Pine St / Division St	Signalized	EBT	23	5	10	24	29	C				
280	Pine St / Division St	Signalized	EBR	3	5	10	0	7	A				
280	Pine St / Division St	Signalized	WBL	20	5	20	26	34	C				
280	Pine St / Division St	Signalized	WBT	16	5	20	18	25	C				
280	Pine St / Division St	Signalized	WBR	51	5	20	5	11	B				
290	Quebec St / Division St	TWSC	NBT	268	0	0	0	0	A	10.0	A	0.8	A
290	Quebec St / Division St	TWSC	NBR	3	0	0	0	0	A				
290	Quebec St / Division St	TWSC	SBL	3	0	50	0	2	A				
290	Quebec St / Division St	TWSC	SBT	425	0	50	0	1	A				
290	Quebec St / Division St	TWSC	WBL	13	0	5	2	10	A				
290	Quebec St / Division St	TWSC	WBR	6	0	5	1	7	A				
300	York St / Division St	Signalized	NBL	1	30	35	0	0	A	29.0	C	6.6	A
300	York St / Division St	Signalized	NBT	240	30	35	3	5	A				
300	York St / Division St	Signalized	NBR	9	30	35	1	4	A				
300	York St / Division St	Signalized	SBL	54	10	40	2	4	A				
300	York St / Division St	Signalized	SBT	385	10	40	2	4	A				
300	York St / Division St	Signalized	SBR	0	10	40	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	15	0	0	A				
300	York St / Division St	Signalized	EBT	32	5	15	24	29	C				
300	York St / Division St	Signalized	EBR	3	5	15	18	22	C				
300	York St / Division St	Signalized	WBL	2	5	20	0	0	A				
300	York St / Division St	Signalized	WBT	31	5	20	22	28	C				
300	York St / Division St	Signalized	WBR	30	5	20	5	11	B				
310	Main St / Division St	TWSC	NBT	245	0	15	1	2	A	13.0	B	0.9	A
310	Main St / Division St	TWSC	NBR	0	0	15	0	0	A				
310	Main St / Division St	TWSC	SBL	15	35	40	0	2	A				
310	Main St / Division St	TWSC	SBT	377	35	40	0	0	A				
310	Main St / Division St	TWSC	WBL	0	0	5	0	0	A				
310	Main St / Division St	TWSC	WBR	7	0	5	4	13	B				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
320	Hamilton St / Division St	TWSC	NBL	0	0	0	0	0	A	9.0	A	0.0	A
320	Hamilton St / Division St	TWSC	NBT	242	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBT	377	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	0	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	3	0	5	2	9	A				
320	Hamilton St / Division St	TWSC	EBR	0	0	5	0	0	A				
330	Raglan St / Division St	TWSC	NBT	236	0	0	0	0	A	8.0	A	0.1	A
330	Raglan St / Division St	TWSC	NBR	6	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	8	0	0	0	1	A				
330	Raglan St / Division St	TWSC	SBT	369	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	2	0	5	0	8	A				
330	Raglan St / Division St	TWSC	WBR	4	0	5	1	8	A				
340	Elm St / Division St	TWSC	NBL	0	0	0	0	0	A	8.0	A	0.1	A
340	Elm St / Division St	TWSC	NBT	238	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBT	368	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	2	0	0	0	0	A				
340	Elm St / Division St	TWSC	EBL	6	0	5	1	8	A				
340	Elm St / Division St	TWSC	EBR	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	NBT	229	0	0	0	0	A	8.0	A	0.2	A
350	Ellice St / Division St	TWSC	NBR	8	0	0	0	0	A				
350	Ellice St / Division St	TWSC	SBL	9	0	0	0	2	A				
350	Ellice St / Division St	TWSC	SBT	359	0	0	0	0	A				
350	Ellice St / Division St	TWSC	WBL	3	0	5	0	8	A				
350	Ellice St / Division St	TWSC	WBR	9	0	5	0	7	A				
360	Colborne St / Division St	TWSC	NBL	0	0	20	0	0	A	11.0	B	1.0	A
360	Colborne St / Division St	TWSC	NBT	226	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	0	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	10	0	10	0	1	A				
360	Colborne St / Division St	TWSC	SBT	352	0	10	0	1	A				
360	Colborne St / Division St	TWSC	SBR	0	0	10	0	0	A				
360	Colborne St / Division St	TWSC	EBL	8	0	5	2	9	A				
360	Colborne St / Division St	TWSC	EBT	4	0	5	1	9	A				
360	Colborne St / Division St	TWSC	EBR	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBL	5	0	5	2	11	B				
360	Colborne St / Division St	TWSC	WBT	4	0	5	0	9	A				
360	Colborne St / Division St	TWSC	WBR	3	0	5	0	7	A				
370	Queen St / Division St	Signalized	NBT	64	15	30	7	10	A	21.0	C	13.8	B
370	Queen St / Division St	Signalized	NBR	121	15	30	1	10	A				
370	Queen St / Division St	Signalized	SBL	111	40	75	14	21	C				
370	Queen St / Division St	Signalized	SBT	249	40	75	13	19	B				
370	Queen St / Division St	Signalized	WBL	129	15	25	9	14	B				
370	Queen St / Division St	Signalized	WBR	162	15	25	0	5	A				

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ID	Intersection Name	Control Type	Number of Vehicles	50th %ile Queue (m)	95th %ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LOS
10	Princess St / Concession St	Signalized	3,218	46.8	80.8	28.8	23.5	C
20	Princess St / Regent St	TWSC	1,458	0.1	60.7	2.9	1.1	-
30	Princess St / Drayton Av	TWSC	1,374	15.3	50.1	2.4	0.4	-
40	Princess St / Macdonnell Av	Signalized	1,353	70.6	146.5	19.5	12.9	B
50	Princess St / Smith St	TWSC	1,116	36.2	65.2	5.1	2.6	-
60	Princess St / Victoria St	Signalized	1,323	23.4	72.9	10.6	6.4	B
70	Princess St / Nelson St	TWSC	1,127	5.6	61.4	3.3	0.9	-
80	Princess St / Albert St	Signalized	1,117	43.8	90.8	16.4	11.6	B
90	Princess St / Frontenac St	TWSC	1,108	2.7	72.4	3.8	1.4	-
100	Princess St / Alfred St	Signalized	1,443	68.8	97.4	26.5	18.8	C
110	Princess St / Chatham St	TWSC	1,210	20.5	92.7	6.9	3.6	-
120	Princess St / University Av	Signalized	1,166	30.1	47.3	7.2	4.3	A
130	Princess St / Division St	Signalized	1,457	18.7	57.5	14.3	9.4	B
140	Concession St / Drayton Av	TWSC	1,014	24.4	166.5	21.4	12.9	-
150	Concession St / Leroy Grant Dr (S)	TWSC	1,084	68.7	73.6	22.4	14.5	-
155	Concession St / Leroy Grant Drive (N)	TWSC	1,202	2.4	7.7	4.1	1.9	-
160	Concession St / Macdonnell St	Signalized	2,016	72.6	77.1	15.0	9.3	B
170	Concession St / Connaught St	TWSC	1,751	30.0	104.3	6.7	3.1	-
180	Concession St / Victoria St	Signalized	1,956	90.0	95.1	15.9	9.9	B
190	Concession St / Nelson St	TWSC	1,730	0.0	89.3	3.5	1.5	-
200	Concession St / Kingscourt Av	TWSC	1,667	0.0	94.2	3.6	1.6	-
210	Concession St / Fergus St	TWSC	1,659	0.0	69.4	4.2	2.2	-
220	Concession St / Grey St	TWSC	1,659	22.3	52.1	7.5	4.5	-
230	Concession St / Alfred St	Signalized	1,796	53.8	86.2	16.5	11.2	B
240	Concession St / Lansdowne St	TWSC	1,182	0.0	32.5	1.7	0.6	-
250	Concession St / Division St	Signalized	2,160	68.0	136.9	29.2	22.3	C
260	Adelaide St / Division St	TWSC	1,097	0.0	71.6	4.0	1.8	-
270	Stanley St / Division St	TWSC	1,064	0.0	24.0	1.5	0.4	-
280	Pine St / Division St	Signalized	1,134	18.3	65.7	9.3	5.4	A
290	Quebec St / Division St	TWSC	976	0.0	48.1	1.6	0.5	-
300	York St / Division St	Signalized	1,056	24.6	42.5	7.2	4.6	A
310	Main St / Division St	TWSC	938	25.9	49.2	3.7	1.8	-
320	Hamilton St / Division St	TWSC	936	0.0	20.4	0.6	0.0	-
330	Raglan St / Division St	TWSC	931	0.0	0.1	0.1	0.0	-
340	Elm St / Division St	TWSC	962	0.0	9.1	0.2	0.0	-
350	Ellice St / Division St	TWSC	927	0.0	27.6	0.2	0.0	-
360	Colborne St / Division St	TWSC	911	0.0	23.3	0.7	0.5	-
370	Queen St / Division St	Signalized	1,429	41.2	81.8	17.6	9.7	B
Total			51,707	925	2,544	346	217	

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	307	45	115	33	40	D	44.0	D	28.8	C
10	Princess St / Concession St	Signalized	NBT	333	45	115	33	40	D				
10	Princess St / Concession St	Signalized	NBR	19	45	115	8	14	B				
10	Princess St / Concession St	Signalized	SBL	517	70	105	36	44	D				
10	Princess St / Concession St	Signalized	SBT	463	70	105	35	44	D				
10	Princess St / Concession St	Signalized	SBR	0	70	105	0	0	A				
10	Princess St / Concession St	Signalized	EBT	228	20	35	30	35	C				
10	Princess St / Concession St	Signalized	EBR	313	20	35	0	1	A				
10	Princess St / Concession St	Signalized	WBT	400	40	60	32	38	D				
10	Princess St / Concession St	Signalized	WBR	610	40	60	0	0	A				
10	Princess St / Concession St	Signalized	WBL	28	40	60	1	4	A				
20	Princess St / Regent St	TWSC	NBL	18	5	10	8	17	C	17.0	C	2.9	A
20	Princess St / Regent St	TWSC	NBR	17	5	10	2	10	A				
20	Princess St / Regent St	TWSC	EBT	689	0	55	1	3	A				
20	Princess St / Regent St	TWSC	EBR	71	0	55	0	2	A				
20	Princess St / Regent St	TWSC	WBL	33	0	70	5	8	A				
20	Princess St / Regent St	TWSC	WBT	630	0	70	1	2	A				
30	Princess St / Drayton Av	TWSC	SBL	4	5	45	9	22	C	22.0	C	2.4	A
30	Princess St / Drayton Av	TWSC	SBR	73	5	45	5	15	B				
30	Princess St / Drayton Av	TWSC	EBL	42	0	55	2	5	A				
30	Princess St / Drayton Av	TWSC	EBT	664	0	55	0	1	A				
30	Princess St / Drayton Av	TWSC	WBT	591	35	45	0	2	A				
30	Princess St / Drayton Av	TWSC	WBR	0	35	45	0	0	A				
40	Princess St / Macdonnell Av	Signalized	NBL	69	40	55	14	20	B	29.0	C	19.5	B
40	Princess St / Macdonnell Av	Signalized	NBT	28	40	55	12	21	C				
40	Princess St / Macdonnell Av	Signalized	NBR	67	40	55	6	15	B				
40	Princess St / Macdonnell Av	Signalized	SBL	2	10	40	15	23	C				
40	Princess St / Macdonnell Av	Signalized	SBT	39	10	40	13	18	B				
40	Princess St / Macdonnell Av	Signalized	SBR	43	10	40	4	13	B				
40	Princess St / Macdonnell Av	Signalized	EBL	41	100	245	21	29	C				
40	Princess St / Macdonnell Av	Signalized	EBT	590	100	245	16	24	C				
40	Princess St / Macdonnell Av	Signalized	EBR	27	100	245	9	16	B				
40	Princess St / Macdonnell Av	Signalized	WBL	6	50	55	19	28	C				
40	Princess St / Macdonnell Av	Signalized	WBT	437	50	55	10	14	B				
40	Princess St / Macdonnell Av	Signalized	WBR	4	50	55	5	9	A				
50	Princess St / Smith St	TWSC	SBL	0	40	40	0	0	A	23.0	C	5.1	A
50	Princess St / Smith St	TWSC	SBR	29	40	40	10	23	C				
50	Princess St / Smith St	TWSC	EBL	27	40	60	2	4	A				
50	Princess St / Smith St	TWSC	EBT	632	40	60	0	1	A				
50	Princess St / Smith St	TWSC	WBT	428	30	75	6	10	A				
50	Princess St / Smith St	TWSC	WBR	0	30	75	0	0	A				
60	Princess St / Victoria St	Signalized	NBL	15	10	35	19	26	C	28.0	C	10.6	B
60	Princess St / Victoria St	Signalized	NBT	76	10	35	17	24	C				
60	Princess St / Victoria St	Signalized	NBR	57	10	35	6	12	B				
60	Princess St / Victoria St	Signalized	SBL	14	5	20	20	28	C				
60	Princess St / Victoria St	Signalized	SBT	38	5	20	15	21	C				
60	Princess St / Victoria St	Signalized	SBR	14	5	20	3	6	A				
60	Princess St / Victoria St	Signalized	EBL	94	20	100	9	16	B				
60	Princess St / Victoria St	Signalized	EBT	534	20	100	2	5	A				
60	Princess St / Victoria St	Signalized	EBR	14	20	100	2	6	A				
60	Princess St / Victoria St	Signalized	WBL	17	35	55	13	17	B				
60	Princess St / Victoria St	Signalized	WBT	388	35	55	8	12	B				
60	Princess St / Victoria St	Signalized	WBR	62	35	55	6	10	A				
70	Princess St / Nelson St	TWSC	NBL	14	0	5	11	20	C	20.0	C	3.3	A
70	Princess St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	NBR	0	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	SBL	2	0	5	0	6	A				
70	Princess St / Nelson St	TWSC	SBT	1	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	SBR	0	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	EBL	95	10	110	3	8	A				
70	Princess St / Nelson St	TWSC	EBT	527	10	110	1	5	A				
70	Princess St / Nelson St	TWSC	EBR	6	10	110	0	1	A				
70	Princess St / Nelson St	TWSC	WBL	0	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	WBT	468	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	WBR	14	0	0	0	0	A				

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Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
80	Princess St / Albert St	Signalized	NBL	49	10	20	13	18	B	39.0	D	16.4	B
80	Princess St / Albert St	Signalized	NBT	18	10	20	11	16	B				
80	Princess St / Albert St	Signalized	NBR	39	10	20	3	8	A				
80	Princess St / Albert St	Signalized	SBL	0	0	0	0	0	A				
80	Princess St / Albert St	Signalized	SBT	0	0	0	0	0	A				
80	Princess St / Albert St	Signalized	SBR	7	0	0	0	3	A				
80	Princess St / Albert St	Signalized	EBL	21	50	115	23	33	C				
80	Princess St / Albert St	Signalized	EBT	500	50	115	13	18	B				
80	Princess St / Albert St	Signalized	EBR	21	50	115	13	18	B				
80	Princess St / Albert St	Signalized	WBL	28	45	80	31	39	D				
80	Princess St / Albert St	Signalized	WBT	434	45	80	9	13	B				
80	Princess St / Albert St	Signalized	WBR	0	45	80	0	0	A				
90	Princess St / Frontenac St	TWSC	NBL	4	0	5	14	23	C	23.0	C	3.8	A
90	Princess St / Frontenac St	TWSC	NBT	8	0	5	10	21	C				
90	Princess St / Frontenac St	TWSC	NBR	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	3	0	5	0	7	A				
90	Princess St / Frontenac St	TWSC	EBL	63	5	135	5	11	B				
90	Princess St / Frontenac St	TWSC	EBT	531	5	135	2	6	A				
90	Princess St / Frontenac St	TWSC	EBR	0	5	135	0	0	A				
90	Princess St / Frontenac St	TWSC	WBL	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBT	490	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBR	9	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	31	25	50	15	22	C	35.0	C	26.5	C
100	Princess St / Alfred St	Signalized	NBT	115	25	50	13	20	B				
100	Princess St / Alfred St	Signalized	NBR	104	25	50	6	12	B				
100	Princess St / Alfred St	Signalized	SBL	36	10	30	15	22	C				
100	Princess St / Alfred St	Signalized	SBT	49	10	30	12	18	B				
100	Princess St / Alfred St	Signalized	SBR	26	10	30	5	11	B				
100	Princess St / Alfred St	Signalized	EBL	5	80	140	26	34	C				
100	Princess St / Alfred St	Signalized	EBT	529	80	140	23	33	C				
100	Princess St / Alfred St	Signalized	EBR	14	80	140	24	35	C				
100	Princess St / Alfred St	Signalized	WBL	33	90	90	12	19	B				
100	Princess St / Alfred St	Signalized	WBT	445	90	90	21	27	C				
100	Princess St / Alfred St	Signalized	WBR	56	90	90	16	22	C				
110	Princess St / Chatham St	TWSC	SBL	0	0	0	0	0	A	22.0	C	6.9	A
110	Princess St / Chatham St	TWSC	SBR	0	0	0	0	0	A				
110	Princess St / Chatham St	TWSC	EBL	69	25	115	5	11	B				
110	Princess St / Chatham St	TWSC	EBT	601	25	115	3	8	A				
110	Princess St / Chatham St	TWSC	WBT	533	15	65	4	5	A				
110	Princess St / Chatham St	TWSC	WBR	7	15	65	14	22	C				
120	Princess St / University Av	Signalized	NBL	55	5	20	16	21	C	21.0	C	7.2	A
120	Princess St / University Av	Signalized	NBR	28	5	20	3	9	A				
120	Princess St / University Av	Signalized	EBT	528	55	70	5	9	A				
120	Princess St / University Av	Signalized	EBR	21	55	70	3	7	A				
120	Princess St / University Av	Signalized	WBL	15	5	25	7	12	B				
120	Princess St / University Av	Signalized	WBT	482	5	25	2	3	A				
120	Princess St / University Av	Signalized	NBT	0	5	20	0	0	A				
120	Princess St / University Av	Signalized	SBL	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	SBT	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	SBR	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	EBL	37	55	70	7	14	B				
120	Princess St / University Av	Signalized	WBR	0	5	25	0	0	A				
130	Princess St / Division St	Signalized	NBL	53	20	40	14	22	C	27.0	C	14.3	B
130	Princess St / Division St	Signalized	NBT	152	20	40	13	20	B				
130	Princess St / Division St	Signalized	NBR	11	20	40	9	15	B				
130	Princess St / Division St	Signalized	SBL	134	5	65	5	8	A				
130	Princess St / Division St	Signalized	SBT	109	5	65	3	4	A				
130	Princess St / Division St	Signalized	SBR	440	5	65	0	1	A				
130	Princess St / Division St	Signalized	EBL	153	35	55	16	25	C				
130	Princess St / Division St	Signalized	EBT	381	35	55	19	27	C				
130	Princess St / Division St	Signalized	EBR	24	35	55	9	16	B				

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Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	28	5	45	213	231	F	231.0	F	21.4	C
140	Concession St / Drayton Av	TWSC	EBT	942	25	170	7	15	B				
140	Concession St / Drayton Av	TWSC	EBR	44	25	170	13	26	D				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	22	5	5	7	19	C	25.0	C	22.4	C
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	184	70	75	18	25	C				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	878	70	75	14	22	C				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	95	15	50	11	24	C	24.0	C	4.1	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	88	15	50	12	24	C				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	22	5	5	9	20	C				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	5	5	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	951	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	41	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	31	10	35	23	30	C	45.0	D	15.0	B
160	Concession St / Macdonnell St	Signalized	NBT	26	10	35	26	35	C				
160	Concession St / Macdonnell St	Signalized	NBR	83	10	35	7	14	B				
160	Concession St / Macdonnell St	Signalized	SBR	68	5	20	5	9	A				
160	Concession St / Macdonnell St	Signalized	EBL	58	75	80	36	45	D				
160	Concession St / Macdonnell St	Signalized	EBT	783	75	80	8	14	B				
160	Concession St / Macdonnell St	Signalized	EBR	64	75	80	7	12	B				
160	Concession St / Macdonnell St	Signalized	WBL	17	85	85	35	44	D				
160	Concession St / Macdonnell St	Signalized	WBT	886	85	85	8	13	B				
160	Concession St / Macdonnell St	Signalized	WBR	0	85	85	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	0	0	5	0	0	A	28.0	D	6.7	A
170	Concession St / Connaught St	TWSC	SBR	14	0	5	18	28	D				
170	Concession St / Connaught St	TWSC	EBL	0	10	95	0	0	A				
170	Concession St / Connaught St	TWSC	EBT	860	10	95	2	5	A				
170	Concession St / Connaught St	TWSC	WBT	877	50	115	4	8	A				
170	Concession St / Connaught St	TWSC	WBR	0	50	115	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	54	20	50	29	38	D	38.0	D	15.9	B
180	Concession St / Victoria St	Signalized	NBT	31	20	50	28	36	D				
180	Concession St / Victoria St	Signalized	NBR	81	20	50	20	29	C				
180	Concession St / Victoria St	Signalized	SBL	9	5	15	27	35	C				
180	Concession St / Victoria St	Signalized	SBT	24	5	15	27	33	C				
180	Concession St / Victoria St	Signalized	SBR	35	5	15	2	12	B				
180	Concession St / Victoria St	Signalized	EBL	56	115	115	24	32	C				
180	Concession St / Victoria St	Signalized	EBT	793	115	115	8	14	B				
180	Concession St / Victoria St	Signalized	EBR	20	115	115	11	20	B				
180	Concession St / Victoria St	Signalized	WBL	48	85	90	21	28	C				
180	Concession St / Victoria St	Signalized	WBT	790	85	90	7	12	B				
180	Concession St / Victoria St	Signalized	WBR	15	85	90	0	1	A				
190	Concession St / Nelson St	TWSC	NBL	0	0	0	0	0	A	6.0	A	3.5	A
190	Concession St / Nelson St	TWSC	NBT	0	0	0	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	0	0	0	0	0	A				
190	Concession St / Nelson St	TWSC	SBL	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	12	0	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	1	0	85	1	6	A				
190	Concession St / Nelson St	TWSC	EBT	824	0	85	1	2	A				
190	Concession St / Nelson St	TWSC	EBR	50	0	85	1	2	A				
190	Concession St / Nelson St	TWSC	WBL	4	0	95	0	5	A				
190	Concession St / Nelson St	TWSC	WBT	839	0	95	2	5	A				
190	Concession St / Nelson St	TWSC	WBR	0	0	95	0	0	A				

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Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	0	0	15	0	0	A	15.0	B	3.6	A
200	Concession St / Kingscourt Av	TWSC	SBR	16	0	15	6	15	B				
200	Concession St / Kingscourt Av	TWSC	EBL	4	0	95	6	13	B				
200	Concession St / Kingscourt Av	TWSC	EBT	819	0	95	2	4	A				
200	Concession St / Kingscourt Av	TWSC	WBT	828	0	95	1	3	A				
200	Concession St / Kingscourt Av	TWSC	WBR	0	0	95	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	11	0	5	23	35	D	35.0	D	4.2	A
210	Concession St / Fergus St	TWSC	SBR	0	0	5	0	0	A				
210	Concession St / Fergus St	TWSC	EBL	5	0	100	10	14	B				
210	Concession St / Fergus St	TWSC	EBT	813	0	100	3	6	A				
210	Concession St / Fergus St	TWSC	WBT	827	0	40	1	2	A				
210	Concession St / Fergus St	TWSC	WBR	3	0	40	0	0	A				
220	Concession St / Grey St	TWSC	SBL	0	0	5	0	0	A	15.0	B	7.5	A
220	Concession St / Grey St	TWSC	SBR	15	0	5	4	11	B				
220	Concession St / Grey St	TWSC	EBL	4	45	105	9	15	B				
220	Concession St / Grey St	TWSC	EBT	819	45	105	9	15	B				
220	Concession St / Grey St	TWSC	WBT	816	0	0	0	0	A				
220	Concession St / Grey St	TWSC	WBR	5	0	0	0	0	A				
230	Concession St / Alfred St	Signalized	NBL	213	35	90	20	31	C	31.0	C	16.5	B
230	Concession St / Alfred St	Signalized	NBT	37	35	90	19	29	C				
230	Concession St / Alfred St	Signalized	NBR	38	35	90	11	19	B				
230	Concession St / Alfred St	Signalized	SBL	0	5	15	0	0	A				
230	Concession St / Alfred St	Signalized	SBT	34	5	15	18	25	C				
230	Concession St / Alfred St	Signalized	SBR	21	5	15	5	10	A				
230	Concession St / Alfred St	Signalized	EBL	27	55	60	17	23	C				
230	Concession St / Alfred St	Signalized	EBT	545	55	60	10	13	B				
230	Concession St / Alfred St	Signalized	EBR	251	55	60	2	4	A				
230	Concession St / Alfred St	Signalized	WBL	39	65	125	12	19	B				
230	Concession St / Alfred St	Signalized	WBT	591	65	125	12	18	B				
230	Concession St / Alfred St	Signalized	WBR	0	65	125	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	7.0	A	1.7	A
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBT	532	0	5	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	5	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	40	0	55	3	7	A				
240	Concession St / Lansdowne St	TWSC	WBT	610	0	55	1	2	A				
250	Concession St / Division St	Signalized	NBL	64	90	110	28	37	D	57.0	E	29.2	C
250	Concession St / Division St	Signalized	NBT	552	90	110	19	25	C				
250	Concession St / Division St	Signalized	NBR	0	90	110	0	0	A				
250	Concession St / Division St	Signalized	SBL	26	50	140	33	44	D				
250	Concession St / Division St	Signalized	SBT	399	50	140	17	23	C				
250	Concession St / Division St	Signalized	SBR	187	50	140	4	9	A				
250	Concession St / Division St	Signalized	EBL	219	45	105	23	32	C				
250	Concession St / Division St	Signalized	EBT	228	45	105	12	17	B				
250	Concession St / Division St	Signalized	EBR	63	45	105	3	6	A				
250	Concession St / Division St	Signalized	WBL	11	90	210	42	52	D				
250	Concession St / Division St	Signalized	WBT	379	90	210	47	57	E				
250	Concession St / Division St	Signalized	WBR	32	90	210	38	48	D				

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Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	0	0	105	0	0	A	23.0	C	4.0	A
260	Adelaide St / Division St	TWSC	NBT	613	0	105	3	6	A				
260	Adelaide St / Division St	TWSC	NBR	0	0	105	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	6	0	30	2	5	A				
260	Adelaide St / Division St	TWSC	SBT	441	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	SBR	25	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	EBL	3	0	5	10	23	C				
260	Adelaide St / Division St	TWSC	EBT	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	3	0	5	8	18	C				
260	Adelaide St / Division St	TWSC	WBT	6	0	5	6	16	C				
260	Adelaide St / Division St	TWSC	WBR	0	0	5	0	0	A				
270	Stanley St / Division St	TWSC	NBL	3	0	20	0	1	A	19.0	C	1.5	A
270	Stanley St / Division St	TWSC	NBT	602	0	20	0	1	A				
270	Stanley St / Division St	TWSC	SBT	376	0	30	1	2	A				
270	Stanley St / Division St	TWSC	SBR	69	0	30	0	1	A				
270	Stanley St / Division St	TWSC	EBL	8	0	5	4	19	C				
270	Stanley St / Division St	TWSC	EBR	6	0	5	1	7	A				
280	Pine St / Division St	Signalized	NBL	30	20	75	8	14	B	32.0	C	9.3	A
280	Pine St / Division St	Signalized	NBT	539	20	75	3	6	A				
280	Pine St / Division St	Signalized	NBR	14	20	75	4	6	A				
280	Pine St / Division St	Signalized	SBL	32	20	70	7	14	B				
280	Pine St / Division St	Signalized	SBT	345	20	70	5	9	A				
280	Pine St / Division St	Signalized	SBR	6	20	70	2	6	A				
280	Pine St / Division St	Signalized	EBL	0	5	20	0	0	A				
280	Pine St / Division St	Signalized	EBT	28	5	20	25	30	C				
280	Pine St / Division St	Signalized	EBR	26	5	20	4	10	A				
280	Pine St / Division St	Signalized	WBL	5	10	25	24	32	C				
280	Pine St / Division St	Signalized	WBT	43	10	25	22	28	C				
280	Pine St / Division St	Signalized	WBR	66	10	25	6	12	B				
290	Quebec St / Division St	TWSC	NBT	586	0	35	0	1	A	12.0	B	1.6	A
290	Quebec St / Division St	TWSC	NBR	0	0	35	0	0	A				
290	Quebec St / Division St	TWSC	SBL	8	0	70	3	6	A				
290	Quebec St / Division St	TWSC	SBT	368	0	70	1	2	A				
290	Quebec St / Division St	TWSC	WBL	14	0	5	4	12	B				
290	Quebec St / Division St	TWSC	WBR	0	0	5	0	0	A				
300	York St / Division St	Signalized	NBL	7	35	35	6	8	A	32.0	C	7.2	A
300	York St / Division St	Signalized	NBT	526	35	35	2	4	A				
300	York St / Division St	Signalized	NBR	12	35	35	2	3	A				
300	York St / Division St	Signalized	SBL	32	15	60	10	15	B				
300	York St / Division St	Signalized	SBT	349	15	60	4	6	A				
300	York St / Division St	Signalized	SBR	0	15	60	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	15	0	0	A				
300	York St / Division St	Signalized	EBT	28	5	15	23	28	C				
300	York St / Division St	Signalized	EBR	1	5	15	0	0	A				
300	York St / Division St	Signalized	WBL	32	10	25	25	31	C				
300	York St / Division St	Signalized	WBT	11	10	25	25	32	C				
300	York St / Division St	Signalized	WBR	58	10	25	6	13	B				
310	Main St / Division St	TWSC	NBT	545	20	60	3	6	A	13.0	B	3.7	A
310	Main St / Division St	TWSC	NBR	0	20	60	0	0	A				
310	Main St / Division St	TWSC	SBL	7	35	35	4	6	A				
310	Main St / Division St	TWSC	SBT	377	35	35	0	0	A				
310	Main St / Division St	TWSC	WBL	9	0	5	4	13	B				
310	Main St / Division St	TWSC	WBR	0	0	5	0	0	A				

Williamsville Operational Analysis

2019 PM Peak Hour

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
320	Hamilton St / Division St	TWSC	NBL	1	0	35	0	0	A	6.0	A	0.6	A
320	Hamilton St / Division St	TWSC	NBT	544	0	35	0	1	A				
320	Hamilton St / Division St	TWSC	SBT	362	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	24	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	0	0	5	0	0	A				
320	Hamilton St / Division St	TWSC	EBR	5	0	5	0	6	A				
330	Raglan St / Division St	TWSC	NBT	542	0	0	0	0	A	13.0	B	0.1	A
330	Raglan St / Division St	TWSC	NBR	8	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	0	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBT	368	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	11	0	5	3	10	A				
330	Raglan St / Division St	TWSC	WBR	2	0	5	5	13	B				
340	Elm St / Division St	TWSC	NBL	32	0	15	1	3	A	10.0	A	0.2	A
340	Elm St / Division St	TWSC	NBT	547	0	15	0	0	A				
340	Elm St / Division St	TWSC	SBT	347	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	31	0	0	0	1	A				
340	Elm St / Division St	TWSC	EBL	5	0	5	3	10	A				
340	Elm St / Division St	TWSC	EBR	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	NBT	565	0	45	0	0	A	9.0	A	0.2	A
350	Ellice St / Division St	TWSC	NBR	2	0	45	0	0	A				
350	Ellice St / Division St	TWSC	SBL	6	0	0	3	6	A				
350	Ellice St / Division St	TWSC	SBT	341	0	0	0	0	A				
350	Ellice St / Division St	TWSC	WBL	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	WBR	13	0	5	1	9	A				
360	Colborne St / Division St	TWSC	NBL	1	0	20	0	1	A	11.0	B	0.7	A
360	Colborne St / Division St	TWSC	NBT	540	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	0	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	6	0	30	2	5	A				
360	Colborne St / Division St	TWSC	SBT	335	0	30	1	1	A				
360	Colborne St / Division St	TWSC	SBR	0	0	30	0	0	A				
360	Colborne St / Division St	TWSC	EBL	15	0	5	3	11	B				
360	Colborne St / Division St	TWSC	EBT	1	0	5	0	0	A				
360	Colborne St / Division St	TWSC	EBR	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBL	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBT	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBR	13	0	5	3	11	B				
370	Queen St / Division St	Signalized	NBT	199	20	50	8	11	B	29.0	C	17.6	B
370	Queen St / Division St	Signalized	NBR	108	20	50	1	10	A				
370	Queen St / Division St	Signalized	SBL	93	40	80	19	29	C				
370	Queen St / Division St	Signalized	SBT	245	40	80	14	20	B				
370	Queen St / Division St	Signalized	WBL	440	50	95	15	27	C				
370	Queen St / Division St	Signalized	WBR	344	50	95	1	7	A				

Williamsville Operational Analysis

2036 No Mitigation - No Williamsville Growth - AM Peak

Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LOS
10	Princess St / Concession St	Signalized	2,554	39.9	64.5	27.5	21.9	C
20	Princess St / Regent St	TWSC	986	0.1	41.0	2.3	0.1	-
30	Princess St / Drayton Av	TWSC	931	0.0	51.4	1.8	0.1	-
40	Princess St / Macdonnell Av	Signalized	861	50.4	101.8	15.3	9.1	B
50	Princess St / Smith St	TWSC	712	29.0	31.7	0.9	0.3	-
60	Princess St / Victoria St	Signalized	852	8.5	49.5	6.7	3.6	A
70	Princess St / Nelson St	TWSC	767	0.3	0.3	2.1	0.2	-
80	Princess St / Albert St	Signalized	806	36.4	73.1	13.6	9.6	B
90	Princess St / Frontenac St	TWSC	747	0.0	0.1	0.9	0.0	-
100	Princess St / Alfred St	Signalized	1,071	45.3	68.6	23.4	17.0	C
110	Princess St / Chatham St	TWSC	736	0.0	21.6	1.6	0.0	-
120	Princess St / University Av	Signalized	719	11.4	56.4	5.1	2.1	A
130	Princess St / Division St	Signalized	938	18.4	46.0	17.2	12.2	B
140	Concession St / Drayton Av	TWSC	940	0.1	166.6	10.9	5.8	-
150	Concession St / Leroy Grant Dr (S)	TWSC	908	44.9	74.8	8.0	4.0	-
155	Concession St / Leroy Grant Drive (N)	TWSC	706	0.2	1.0	0.5	0.1	-
160	Concession St / Macdonnell St	Signalized	1,528	50.9	71.6	10.5	6.7	B
170	Concession St / Connaught St	TWSC	1,320	0.0	51.2	1.7	0.6	-
180	Concession St / Victoria St	Signalized	1,389	36.8	83.6	11.7	7.5	B
190	Concession St / Nelson St	TWSC	1,274	0.1	55.1	1.9	0.7	-
200	Concession St / Kingscourt Av	TWSC	1,256	0.2	30.9	1.2	0.4	-
210	Concession St / Fergus St	TWSC	1,286	0.2	33.2	2.0	1.2	-
220	Concession St / Grey St	TWSC	1,327	12.8	53.8	6.4	3.5	-
230	Concession St / Alfred St	Signalized	1,386	39.8	67.3	13.0	8.1	B
240	Concession St / Lansdowne St	TWSC	966	0.0	10.4	0.6	0.0	-
250	Concession St / Division St	Signalized	1,638	41.4	102.4	21.2	15.4	C
260	Adelaide St / Division St	TWSC	698	0.0	29.6	0.8	0.2	-
270	Stanley St / Division St	TWSC	762	0.5	17.4	2.0	0.8	-
280	Pine St / Division St	Signalized	812	15.9	46.9	7.8	4.7	A
290	Quebec St / Division St	TWSC	711	0.0	29.9	0.8	0.0	-
300	York St / Division St	Signalized	781	14.2	38.5	7.5	5.0	A
310	Main St / Division St	TWSC	634	21.2	28.9	1.3	0.4	-
320	Hamilton St / Division St	TWSC	613	0.0	0.0	0.1	0.0	-
330	Raglan St / Division St	TWSC	617	0.0	0.0	0.1	0.0	-
340	Elm St / Division St	TWSC	607	0.0	0.1	0.1	0.0	-
350	Ellice St / Division St	TWSC	609	0.0	0.1	0.8	0.0	-
360	Colborne St / Division St	TWSC	605	0.0	22.5	1.5	0.6	-
370	Queen St / Division St	Signalized	833	25.7	48.4	13.8	8.0	B
Total			36,886	544	1,671	245	150	

Williamsville Operational Analysis

2036 No Mitigation - No Williamsville Growth - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt		Intersection	
					50th	95th					Delay	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	143	25	40	39	46	D	46.0	D	27.5	C	
10	Princess St / Concession St	Signalized	NBT	103	25	40	36	43	D					
10	Princess St / Concession St	Signalized	NBR	31	25	40	0	2	A					
10	Princess St / Concession St	Signalized	SBL	494	60	90	30	38	D					
10	Princess St / Concession St	Signalized	SBT	485	60	90	29	37	D					
10	Princess St / Concession St	Signalized	SBR	29	60	90	17	22	C					
10	Princess St / Concession St	Signalized	EBT	422	35	60	26	32	C					
10	Princess St / Concession St	Signalized	EBR	184	35	60	1	2	A					
10	Princess St / Concession St	Signalized	WBT	232	20	40	26	32	C					
10	Princess St / Concession St	Signalized	WBR	334	20	40	0	0	A					
10	Princess St / Concession St	Signalized	WBL	97	20	40	2	5	A					
20	Princess St / Regent St	TWSC	NBL	2	5	10	3	10	A	13.0	B	2.3	A	
20	Princess St / Regent St	TWSC	NBR	22	5	10	4	13	B					
20	Princess St / Regent St	TWSC	EBT	620	0	60	0	3	A					
20	Princess St / Regent St	TWSC	EBR	50	0	60	0	1	A					
20	Princess St / Regent St	TWSC	WBL	2	0	0	0	5	A					
20	Princess St / Regent St	TWSC	WBT	290	0	0	0	0	A					
30	Princess St / Drayton Av	TWSC	SBL	0	0	5	0	0	A	7.0	A	1.8	A	
30	Princess St / Drayton Av	TWSC	SBR	8	0	5	1	7	A					
30	Princess St / Drayton Av	TWSC	EBL	90	0	75	1	3	A					
30	Princess St / Drayton Av	TWSC	EBT	547	0	75	0	2	A					
30	Princess St / Drayton Av	TWSC	WBT	286	0	0	0	1	A					
30	Princess St / Drayton Av	TWSC	WBR	0	0	0	0	0	A					
40	Princess St / Macdonnell Av	Signalized	NBL	44	5	20	12	18	B	18.0	B	15.3	B	
40	Princess St / Macdonnell Av	Signalized	NBT	21	5	20	9	14	B					
40	Princess St / Macdonnell Av	Signalized	NBR	17	5	20	5	10	A					
40	Princess St / Macdonnell Av	Signalized	SBL	11	40	40	11	15	B					
40	Princess St / Macdonnell Av	Signalized	SBT	18	40	40	11	14	B					
40	Princess St / Macdonnell Av	Signalized	SBR	34	40	40	2	10	A					
40	Princess St / Macdonnell Av	Signalized	EBL	8	70	145	8	13	B					
40	Princess St / Macdonnell Av	Signalized	EBT	467	70	145	10	17	B					
40	Princess St / Macdonnell Av	Signalized	EBR	27	70	145	9	15	B					
40	Princess St / Macdonnell Av	Signalized	WBL	0	25	50	0	0	A					
40	Princess St / Macdonnell Av	Signalized	WBT	210	25	50	8	13	B					
40	Princess St / Macdonnell Av	Signalized	WBR	4	25	50	1	5	A					
50	Princess St / Smith St	TWSC	SBL	0	40	40	0	0	A	12.0	B	0.9	A	
50	Princess St / Smith St	TWSC	SBR	20	40	40	1	12	B					
50	Princess St / Smith St	TWSC	EBL	0	40	40	0	0	A					
50	Princess St / Smith St	TWSC	EBT	496	40	40	0	0	A					
50	Princess St / Smith St	TWSC	WBT	196	0	10	1	2	A					
50	Princess St / Smith St	TWSC	WBR	0	0	10	0	0	A					
60	Princess St / Victoria St	Signalized	NBL	20	10	20	13	20	B	26.0	C	6.7	A	
60	Princess St / Victoria St	Signalized	NBT	33	10	20	19	26	C					
60	Princess St / Victoria St	Signalized	NBR	43	10	20	7	13	B					
60	Princess St / Victoria St	Signalized	SBL	2	5	20	18	22	C					
60	Princess St / Victoria St	Signalized	SBT	61	5	20	14	19	B					
60	Princess St / Victoria St	Signalized	SBR	0	5	20	0	0	A					
60	Princess St / Victoria St	Signalized	EBL	0	10	65	0	0	A					
60	Princess St / Victoria St	Signalized	EBT	486	10	65	1	4	A					
60	Princess St / Victoria St	Signalized	EBR	6	10	65	0	5	A					
60	Princess St / Victoria St	Signalized	WBL	20	5	35	7	10	A					
60	Princess St / Victoria St	Signalized	WBT	169	5	35	2	3	A					
60	Princess St / Victoria St	Signalized	WBR	12	5	35	0	2	A					
70	Princess St / Nelson St	TWSC	NBL	0	0	5	0	0	A	16.0	C	2.1	A	
70	Princess St / Nelson St	TWSC	NBT	0	0	5	0	0	A					
70	Princess St / Nelson St	TWSC	NBR	8	0	5	2	9	A					
70	Princess St / Nelson St	TWSC	SBL	13	5	5	4	16	C					
70	Princess St / Nelson St	TWSC	SBT	4	5	5	8	16	C					
70	Princess St / Nelson St	TWSC	SBR	25	5	5	1	9	A					
70	Princess St / Nelson St	TWSC	EBL	11	0	0	0	2	A					
70	Princess St / Nelson St	TWSC	EBT	522	0	0	0	2	A					
70	Princess St / Nelson St	TWSC	EBR	2	0	0	0	1	A					
70	Princess St / Nelson St	TWSC	WBL	0	0	0	0	0	A					
70	Princess St / Nelson St	TWSC	WBT	182	0	0	0	0	A					
70	Princess St / Nelson St	TWSC	WBR	0	0	0	0	0	A					

Williamsville Operational Analysis

2036 No Mitigation - No Williamsville Growth - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	12	5	10	12	16	B	23.0	C	13.6	B
80	Princess St / Albert St	Signalized	NBT	16	5	10	14	19	B				
80	Princess St / Albert St	Signalized	NBR	25	5	10	1	6	A				
80	Princess St / Albert St	Signalized	SBL	0	0	10	0	0	A				
80	Princess St / Albert St	Signalized	SBT	29	0	10	10	12	B				
80	Princess St / Albert St	Signalized	SBR	0	0	10	0	0	A				
80	Princess St / Albert St	Signalized	EBL	0	50	95	0	0	A				
80	Princess St / Albert St	Signalized	EBT	532	50	95	11	15	B				
80	Princess St / Albert St	Signalized	EBR	14	50	95	13	17	B				
80	Princess St / Albert St	Signalized	WBL	8	10	35	17	23	C				
80	Princess St / Albert St	Signalized	WBT	170	10	35	5	9	A				
80	Princess St / Albert St	Signalized	WBR	0	10	35	0	0	A				
90	Princess St / Frontenac St	TWSC	NBL	0	0	0	0	0	A	11.0	B	0.9	A
90	Princess St / Frontenac St	TWSC	NBT	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	NBR	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	5	0	5	1	11	B				
90	Princess St / Frontenac St	TWSC	SBR	12	0	5	0	6	A				
90	Princess St / Frontenac St	TWSC	EBL	8	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	EBT	539	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	EBR	4	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBL	3	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBT	176	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBR	0	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	20	20	40	12	18	B	33.0	C	23.4	C
100	Princess St / Alfred St	Signalized	NBT	106	20	40	12	17	B				
100	Princess St / Alfred St	Signalized	NBR	70	20	40	4	10	A				
100	Princess St / Alfred St	Signalized	SBL	27	20	45	17	26	C				
100	Princess St / Alfred St	Signalized	SBT	129	20	45	14	20	B				
100	Princess St / Alfred St	Signalized	SBR	34	20	45	6	11	B				
100	Princess St / Alfred St	Signalized	EBL	42	70	95	17	23	C				
100	Princess St / Alfred St	Signalized	EBT	477	70	95	22	29	C				
100	Princess St / Alfred St	Signalized	EBR	6	70	95	19	27	C				
100	Princess St / Alfred St	Signalized	WBL	6	25	45	26	33	C				
100	Princess St / Alfred St	Signalized	WBT	138	25	45	18	24	C				
100	Princess St / Alfred St	Signalized	WBR	16	25	45	1	3	A				
110	Princess St / Chatham St	TWSC	SBL	0	0	0	0	0	A	3.0	A	1.6	A
110	Princess St / Chatham St	TWSC	SBR	0	0	0	0	0	A				
110	Princess St / Chatham St	TWSC	EBL	8	0	15	0	3	A				
110	Princess St / Chatham St	TWSC	EBT	565	0	15	0	2	A				
110	Princess St / Chatham St	TWSC	WBT	159	0	45	0	0	A				
110	Princess St / Chatham St	TWSC	WBR	4	0	45	0	0	A				
120	Princess St / University Av	Signalized	NBL	22	5	10	15	20	B	20.0	B	5.1	A
120	Princess St / University Av	Signalized	NBR	23	5	10	2	7	A				
120	Princess St / University Av	Signalized	EBT	481	15	70	2	5	A				
120	Princess St / University Av	Signalized	EBR	52	15	70	1	4	A				
120	Princess St / University Av	Signalized	WBL	0	0	20	0	0	A				
120	Princess St / University Av	Signalized	WBT	141	0	20	1	3	A				
120	Princess St / University Av	Signalized	NBT	0	5	10	0	0	A				
120	Princess St / University Av	Signalized	SBL	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	SBT	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	SBR	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	EBL	0	15	70	0	0	A				
120	Princess St / University Av	Signalized	WBR	0	0	20	0	0	A				
130	Princess St / Division St	Signalized	NBL	12	5	20	14	27	C	27.0	C	17.2	B
130	Princess St / Division St	Signalized	NBT	50	5	20	11	17	B				
130	Princess St / Division St	Signalized	NBR	0	5	20	0	0	A				
130	Princess St / Division St	Signalized	SBL	143	5	45	4	6	A				
130	Princess St / Division St	Signalized	SBT	99	5	45	3	4	A				
130	Princess St / Division St	Signalized	SBR	131	5	45	0	1	A				
130	Princess St / Division St	Signalized	EBL	138	30	50	19	27	C				
130	Princess St / Division St	Signalized	EBT	357	30	50	20	27	C				
130	Princess St / Division St	Signalized	EBR	8	30	50	13	22	C				

Williamsville Operational Analysis

2036 No Mitigation - No Williamsville Growth - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	21	5	20	77	88	F	88.0	F	10.9	B
140	Concession St / Drayton Av	TWSC	EBT	911	0	170	4	9	A				
140	Concession St / Drayton Av	TWSC	EBR	8	0	170	19	28	D				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	2	0	5	18	30	D	30.0	D	8.0	A
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	32	45	75	2	6	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	874	45	75	4	8	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	20	5	10	2	10	A	11.0	B	0.5	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	12	5	10	3	11	B				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	2	0	5	0	8	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	71	0	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	576	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	25	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	0	0	5	0	0	A	38.0	D	10.5	B
160	Concession St / Macdonnell St	Signalized	NBT	0	0	5	0	0	A				
160	Concession St / Macdonnell St	Signalized	NBR	9	0	5	7	12	B				
160	Concession St / Macdonnell St	Signalized	SBR	41	0	5	1	4	A				
160	Concession St / Macdonnell St	Signalized	EBL	36	75	80	11	17	B				
160	Concession St / Macdonnell St	Signalized	EBT	701	75	80	7	12	B				
160	Concession St / Macdonnell St	Signalized	EBR	140	75	80	6	10	A				
160	Concession St / Macdonnell St	Signalized	WBL	39	20	65	30	38	D				
160	Concession St / Macdonnell St	Signalized	WBT	562	20	65	5	7	A				
160	Concession St / Macdonnell St	Signalized	WBR	0	20	65	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	8	0	5	6	14	B	14.0	B	1.7	A
170	Concession St / Connaught St	TWSC	SBR	7	0	5	3	9	A				
170	Concession St / Connaught St	TWSC	EBL	17	0	95	5	9	A				
170	Concession St / Connaught St	TWSC	EBT	694	0	95	1	2	A				
170	Concession St / Connaught St	TWSC	WBT	590	0	0	0	1	A				
170	Concession St / Connaught St	TWSC	WBR	4	0	0	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	12	5	15	26	32	C	32.0	C	11.7	B
180	Concession St / Victoria St	Signalized	NBT	15	5	15	24	31	C				
180	Concession St / Victoria St	Signalized	NBR	11	5	15	3	9	A				
180	Concession St / Victoria St	Signalized	SBL	8	5	10	24	30	C				
180	Concession St / Victoria St	Signalized	SBT	26	5	10	23	28	C				
180	Concession St / Victoria St	Signalized	SBR	42	5	10	2	10	A				
180	Concession St / Victoria St	Signalized	EBL	20	35	90	9	13	B				
180	Concession St / Victoria St	Signalized	EBT	660	35	90	7	10	A				
180	Concession St / Victoria St	Signalized	EBR	6	35	90	11	17	B				
180	Concession St / Victoria St	Signalized	WBL	40	45	90	17	24	C				
180	Concession St / Victoria St	Signalized	WBT	548	45	90	6	11	B				
180	Concession St / Victoria St	Signalized	WBR	1	45	90	0	0	A				
190	Concession St / Nelson St	TWSC	NBL	11	0	5	15	25	C	25.0	C	1.9	A
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBL	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	19	5	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	41	0	70	2	4	A				
190	Concession St / Nelson St	TWSC	EBT	636	0	70	0	1	A				
190	Concession St / Nelson St	TWSC	EBR	0	0	70	0	0	A				
190	Concession St / Nelson St	TWSC	WBL	11	0	40	3	6	A				
190	Concession St / Nelson St	TWSC	WBT	556	0	40	1	2	A				
190	Concession St / Nelson St	TWSC	WBR	0	0	40	0	0	A				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	36	5	15	11	19	C	19.0	C	1.2	A
200	Concession St / Kingscourt Av	TWSC	SBR	7	5	15	2	13	B				
200	Concession St / Kingscourt Av	TWSC	EBL	24	0	60	2	6	A				
200	Concession St / Kingscourt Av	TWSC	EBT	612	0	60	0	1	A				
200	Concession St / Kingscourt Av	TWSC	WBT	557	0	0	0	0	A				
200	Concession St / Kingscourt Av	TWSC	WBR	20	0	0	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	44	5	15	18	28	D	28.0	D	2.0	A
210	Concession St / Fergus St	TWSC	SBR	0	5	15	0	0	A				
210	Concession St / Fergus St	TWSC	EBL	20	0	65	3	6	A				
210	Concession St / Fergus St	TWSC	EBT	627	0	65	1	2	A				
210	Concession St / Fergus St	TWSC	WBT	575	0	0	0	0	A				
210	Concession St / Fergus St	TWSC	WBR	20	0	0	0	0	A				
220	Concession St / Grey St	TWSC	SBL	42	5	20	43	54	F	54.0	F	6.4	A
220	Concession St / Grey St	TWSC	SBR	8	5	20	16	28	D				
220	Concession St / Grey St	TWSC	EBL	20	25	105	4	9	A				
220	Concession St / Grey St	TWSC	EBT	650	25	105	4	9	A				
220	Concession St / Grey St	TWSC	WBT	588	0	0	0	0	A				
220	Concession St / Grey St	TWSC	WBR	19	0	0	0	0	A				
230	Concession St / Alfred St	Signalized	NBL	155	20	50	20	30	C	30.0	C	13.0	B
230	Concession St / Alfred St	Signalized	NBT	8	20	50	21	27	C				
230	Concession St / Alfred St	Signalized	NBR	29	20	50	13	19	B				
230	Concession St / Alfred St	Signalized	SBL	0	5	15	0	0	A				
230	Concession St / Alfred St	Signalized	SBT	33	5	15	16	22	C				
230	Concession St / Alfred St	Signalized	SBR	37	5	15	3	10	A				
230	Concession St / Alfred St	Signalized	EBL	30	55	60	9	15	B				
230	Concession St / Alfred St	Signalized	EBT	492	55	60	6	10	A				
230	Concession St / Alfred St	Signalized	EBR	168	55	60	1	2	A				
230	Concession St / Alfred St	Signalized	WBL	22	30	95	12	18	B				
230	Concession St / Alfred St	Signalized	WBT	412	30	95	8	13	B				
230	Concession St / Alfred St	Signalized	WBR	0	30	95	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	4.0	A	0.6	A
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBT	523	0	15	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	15	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	8	0	5	1	4	A				
240	Concession St / Lansdowne St	TWSC	WBT	435	0	5	0	0	A				
250	Concession St / Division St	Signalized	NBL	14	25	60	20	28	C	35.0	C	21.2	C
250	Concession St / Division St	Signalized	NBT	221	25	60	17	23	C				
250	Concession St / Division St	Signalized	NBR	8	25	60	11	16	B				
250	Concession St / Division St	Signalized	SBL	30	50	130	18	26	C				
250	Concession St / Division St	Signalized	SBT	367	50	130	16	22	C				
250	Concession St / Division St	Signalized	SBR	199	50	130	2	6	A				
250	Concession St / Division St	Signalized	EBL	164	40	105	15	22	C				
250	Concession St / Division St	Signalized	EBT	350	40	105	13	18	B				
250	Concession St / Division St	Signalized	EBR	12	40	105	6	10	A				
250	Concession St / Division St	Signalized	WBL	21	40	75	27	35	C				
250	Concession St / Division St	Signalized	WBT	236	40	75	27	34	C				
250	Concession St / Division St	Signalized	WBR	16	40	75	15	22	C				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	50	0	30	2	4	A	15.0	B	0.8	A
260	Adelaide St / Division St	TWSC	NBT	235	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	NBR	4	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	13	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	SBT	379	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	SBR	7	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	EBL	4	0	5	1	9	A				
260	Adelaide St / Division St	TWSC	EBT	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBT	2	0	5	3	15	B				
260	Adelaide St / Division St	TWSC	WBR	4	0	5	0	6	A				
270	Stanley St / Division St	TWSC	NBL	31	0	5	1	2	A	10.0	A	2.0	A
270	Stanley St / Division St	TWSC	NBT	282	0	5	0	0	A				
270	Stanley St / Division St	TWSC	SBT	377	0	30	1	2	A				
270	Stanley St / Division St	TWSC	SBR	0	0	30	0	0	A				
270	Stanley St / Division St	TWSC	EBL	7	5	5	1	8	A				
270	Stanley St / Division St	TWSC	EBR	65	5	5	3	10	A				
280	Pine St / Division St	Signalized	NBL	0	5	20	0	0	A	31.0	C	7.8	A
280	Pine St / Division St	Signalized	NBT	266	5	20	3	4	A				
280	Pine St / Division St	Signalized	NBR	6	5	20	4	5	A				
280	Pine St / Division St	Signalized	SBL	38	25	70	4	7	A				
280	Pine St / Division St	Signalized	SBT	404	25	70	4	8	A				
280	Pine St / Division St	Signalized	SBR	0	25	70	0	0	A				
280	Pine St / Division St	Signalized	EBL	0	5	10	0	0	A				
280	Pine St / Division St	Signalized	EBT	20	5	10	20	26	C				
280	Pine St / Division St	Signalized	EBR	4	5	10	4	9	A				
280	Pine St / Division St	Signalized	WBL	17	5	20	25	31	C				
280	Pine St / Division St	Signalized	WBT	8	5	20	19	26	C				
280	Pine St / Division St	Signalized	WBR	49	5	20	5	10	A				
290	Quebec St / Division St	TWSC	NBT	267	0	0	0	0	A	10.0	A	0.8	A
290	Quebec St / Division St	TWSC	NBR	2	0	0	0	0	A				
290	Quebec St / Division St	TWSC	SBL	4	0	50	0	0	A				
290	Quebec St / Division St	TWSC	SBT	420	0	50	0	1	A				
290	Quebec St / Division St	TWSC	WBL	14	0	5	2	10	A				
290	Quebec St / Division St	TWSC	WBR	4	0	5	1	7	A				
300	York St / Division St	Signalized	NBL	0	25	35	0	0	A	35.0	C	7.5	A
300	York St / Division St	Signalized	NBT	241	25	35	3	5	A				
300	York St / Division St	Signalized	NBR	10	25	35	0	2	A				
300	York St / Division St	Signalized	SBL	57	10	45	3	5	A				
300	York St / Division St	Signalized	SBT	378	10	45	3	5	A				
300	York St / Division St	Signalized	SBR	0	10	45	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	15	0	0	A				
300	York St / Division St	Signalized	EBT	30	5	15	23	27	C				
300	York St / Division St	Signalized	EBR	6	5	15	20	28	C				
300	York St / Division St	Signalized	WBL	0	5	20	0	0	A				
300	York St / Division St	Signalized	WBT	31	5	20	28	35	C				
300	York St / Division St	Signalized	WBR	28	5	20	7	14	B				
310	Main St / Division St	TWSC	NBT	244	0	20	1	3	A	8.0	A	1.3	A
310	Main St / Division St	TWSC	NBR	0	0	20	0	0	A				
310	Main St / Division St	TWSC	SBL	16	35	35	0	2	A				
310	Main St / Division St	TWSC	SBT	368	35	35	0	0	A				
310	Main St / Division St	TWSC	WBL	0	0	5	0	0	A				
310	Main St / Division St	TWSC	WBR	6	0	5	1	8	A				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
320	Hamilton St / Division St	TWSC	NBL	0	0	0	0	0	A	8.0	A	0.1	A
320	Hamilton St / Division St	TWSC	NBT	241	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBT	368	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	0	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	4	0	5	1	8	A				
320	Hamilton St / Division St	TWSC	EBR	0	0	5	0	0	A				
330	Raglan St / Division St	TWSC	NBT	237	0	0	0	0	A	7.0	A	0.1	A
330	Raglan St / Division St	TWSC	NBR	8	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	6	0	0	0	1	A				
330	Raglan St / Division St	TWSC	SBT	362	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	0	0	5	0	0	A				
330	Raglan St / Division St	TWSC	WBR	4	0	5	0	7	A				
340	Elm St / Division St	TWSC	NBL	0	0	0	0	0	A	8.0	A	0.1	A
340	Elm St / Division St	TWSC	NBT	237	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBT	362	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	0	0	0	0	0	A				
340	Elm St / Division St	TWSC	EBL	8	0	5	1	8	A				
340	Elm St / Division St	TWSC	EBR	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	NBT	229	0	0	0	0	A	9.0	A	0.8	A
350	Ellice St / Division St	TWSC	NBR	6	0	0	0	0	A				
350	Ellice St / Division St	TWSC	SBL	6	0	0	0	2	A				
350	Ellice St / Division St	TWSC	SBT	356	0	0	0	1	A				
350	Ellice St / Division St	TWSC	WBL	4	0	5	1	9	A				
350	Ellice St / Division St	TWSC	WBR	8	0	5	0	7	A				
360	Colborne St / Division St	TWSC	NBL	0	0	20	0	0	A	14.0	B	1.5	A
360	Colborne St / Division St	TWSC	NBT	225	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	0	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	11	0	25	1	2	A				
360	Colborne St / Division St	TWSC	SBT	349	0	25	1	2	A				
360	Colborne St / Division St	TWSC	SBR	0	0	25	0	0	A				
360	Colborne St / Division St	TWSC	EBL	6	0	5	1	8	A				
360	Colborne St / Division St	TWSC	EBT	2	0	5	3	14	B				
360	Colborne St / Division St	TWSC	EBR	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBL	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBT	8	0	5	2	11	B				
360	Colborne St / Division St	TWSC	WBR	4	0	5	0	8	A				
370	Queen St / Division St	Signalized	NBT	64	15	25	8	10	A	20.0	B	13.8	B
370	Queen St / Division St	Signalized	NBR	125	15	25	1	10	A				
370	Queen St / Division St	Signalized	SBL	109	40	80	13	20	B				
370	Queen St / Division St	Signalized	SBT	246	40	80	14	20	B				
370	Queen St / Division St	Signalized	WBL	126	15	25	9	15	B				
370	Queen St / Division St	Signalized	WBR	163	15	25	0	4	A				

Williamsville Operational Analysis

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Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LO S
10	Princess St / Concession St	Signalized	3,254	46.7	85.9	29.2	23.9	C
20	Princess St / Regent St	TWSC	1,502	0.1	76.1	2.9	1.2	-
30	Princess St / Drayton Av	TWSC	1,417	15.3	69.0	2.4	0.8	-
40	Princess St / Macdonnell Av	Signalized	1,409	79.4	157.1	19.5	12.8	B
50	Princess St / Smith St	TWSC	1,168	36.3	70.0	5.3	3.1	-
60	Princess St / Victoria St	Signalized	1,383	28.7	107.9	13.6	7.9	B
70	Princess St / Nelson St	TWSC	1,178	14.3	66.1	5.1	2.6	-
80	Princess St / Albert St	Signalized	1,170	58.2	99.9	21.4	15.4	C
90	Princess St / Frontenac St	TWSC	1,153	18.9	97.4	7.4	3.5	-
100	Princess St / Alfred St	Signalized	1,473	90.8	100.4	32.0	22.8	C
110	Princess St / Chatham St	TWSC	1,235	36.7	99.5	9.1	4.8	-
120	Princess St / University Av	Signalized	1,190	37.6	53.8	8.2	4.4	A
130	Princess St / Division St	Signalized	1,480	23.4	61.7	14.3	9.5	B
140	Concession St / Drayton Av	TWSC	1,009	4.9	158.2	13.0	6.6	-
150	Concession St / Leroy Grant Dr (S)	TWSC	1,069	63.9	73.8	20.5	14.0	-
155	Concession St / Leroy Grant Drive (N)	TWSC	1,174	2.3	7.9	4.1	1.9	-
160	Concession St / Macdonnell St	Signalized	1,981	72.9	77.1	14.8	9.5	B
170	Concession St / Connaught St	TWSC	1,737	32.9	104.3	7.2	4.1	-
180	Concession St / Victoria St	Signalized	1,930	87.8	97.4	17.0	11.3	B
190	Concession St / Nelson St	TWSC	1,699	0.0	89.3	4.4	2.5	-
200	Concession St / Kingscourt Av	TWSC	1,643	0.0	96.7	5.2	2.6	-
210	Concession St / Fergus St	TWSC	1,636	0.0	59.5	6.0	2.9	-
220	Concession St / Grey St	TWSC	1,636	27.5	52.5	7.6	5.0	-
230	Concession St / Alfred St	Signalized	1,762	55.0	88.7	16.9	11.2	B
240	Concession St / Lansdowne St	TWSC	1,159	0.0	32.8	1.6	0.6	-
250	Concession St / Division St	Signalized	2,185	67.1	128.2	28.6	21.6	C
260	Adelaide St / Division St	TWSC	1,126	0.0	51.7	2.7	1.2	-
270	Stanley St / Division St	TWSC	1,089	0.0	13.3	1.1	0.1	-
280	Pine St / Division St	Signalized	1,162	22.5	67.7	9.2	5.6	A
290	Quebec St / Division St	TWSC	991	0.0	39.3	1.6	0.5	-
300	York St / Division St	Signalized	1,067	22.7	44.9	7.0	4.4	A
310	Main St / Division St	TWSC	941	23.1	46.5	3.0	1.2	-
320	Hamilton St / Division St	TWSC	942	0.0	8.8	0.6	0.0	-
330	Raglan St / Division St	TWSC	938	0.0	0.1	0.1	0.0	-
340	Elm St / Division St	TWSC	974	0.0	15.3	0.1	0.0	-
350	Ellice St / Division St	TWSC	947	0.0	27.8	0.2	0.0	-
360	Colborne St / Division St	TWSC	929	0.0	17.7	0.7	0.5	-
370	Queen St / Division St	Signalized	1,447	39.9	99.6	18.4	10.6	B
Total			52,185	1,009	2,644	362	230	

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	309	45	135	34	41	D	45.0	D	29.2	C
10	Princess St / Concession St	Signalized	NBT	354	45	135	33	40	D				
10	Princess St / Concession St	Signalized	NBR	18	45	135	7	11	B				
10	Princess St / Concession St	Signalized	SBL	501	75	105	36	44	D				
10	Princess St / Concession St	Signalized	SBT	488	75	105	36	45	D				
10	Princess St / Concession St	Signalized	SBR	0	75	105	0	0	A				
10	Princess St / Concession St	Signalized	EBT	245	20	40	30	36	D				
10	Princess St / Concession St	Signalized	EBR	314	20	40	0	1	A				
10	Princess St / Concession St	Signalized	WBT	399	35	60	31	37	D				
10	Princess St / Concession St	Signalized	WBR	596	35	60	0	0	A				
10	Princess St / Concession St	Signalized	WBL	30	35	60	1	3	A				
20	Princess St / Regent St	TWSC	NBL	18	5	10	7	17	C	17.0	C	2.9	A
20	Princess St / Regent St	TWSC	NBR	16	5	10	4	12	B				
20	Princess St / Regent St	TWSC	EBT	717	0	80	1	3	A				
20	Princess St / Regent St	TWSC	EBR	70	0	80	1	2	A				
20	Princess St / Regent St	TWSC	WBL	34	0	75	5	8	A				
20	Princess St / Regent St	TWSC	WBT	647	0	75	1	2	A				
30	Princess St / Drayton Av	TWSC	SBL	4	5	45	22	39	E	39.0	E	2.4	A
30	Princess St / Drayton Av	TWSC	SBR	76	5	45	4	15	B				
30	Princess St / Drayton Av	TWSC	EBL	29	0	75	3	6	A				
30	Princess St / Drayton Av	TWSC	EBT	702	0	75	0	1	A				
30	Princess St / Drayton Av	TWSC	WBT	606	35	65	1	2	A				
30	Princess St / Drayton Av	TWSC	WBR	0	35	65	0	0	A				
40	Princess St / Macdonnell Av	Signalized	NBL	69	45	55	13	21	C	48.0	D	19.5	B
40	Princess St / Macdonnell Av	Signalized	NBT	24	45	55	11	20	B				
40	Princess St / Macdonnell Av	Signalized	NBR	68	45	55	9	18	B				
40	Princess St / Macdonnell Av	Signalized	SBL	2	15	40	3	13	B				
40	Princess St / Macdonnell Av	Signalized	SBT	41	15	40	14	20	B				
40	Princess St / Macdonnell Av	Signalized	SBR	44	15	40	4	12	B				
40	Princess St / Macdonnell Av	Signalized	EBL	37	115	260	22	30	C				
40	Princess St / Macdonnell Av	Signalized	EBT	633	115	260	15	23	C				
40	Princess St / Macdonnell Av	Signalized	EBR	27	115	260	12	20	B				
40	Princess St / Macdonnell Av	Signalized	WBL	8	50	60	38	48	D				
40	Princess St / Macdonnell Av	Signalized	WBT	456	50	60	10	14	B				
40	Princess St / Macdonnell Av	Signalized	WBR	0	50	60	0	0	A				
50	Princess St / Smith St	TWSC	SBL	0	40	40	0	0	A	23.0	C	5.3	A
50	Princess St / Smith St	TWSC	SBR	29	40	40	11	23	C				
50	Princess St / Smith St	TWSC	EBL	27	40	65	2	4	A				
50	Princess St / Smith St	TWSC	EBT	677	40	65	1	1	A				
50	Princess St / Smith St	TWSC	WBT	435	30	80	6	11	B				
50	Princess St / Smith St	TWSC	WBR	0	30	80	0	0	A				
60	Princess St / Victoria St	Signalized	NBL	14	15	35	19	27	C	27.0	C	13.6	B
60	Princess St / Victoria St	Signalized	NBT	80	15	35	18	25	C				
60	Princess St / Victoria St	Signalized	NBR	58	15	35	11	18	B				
60	Princess St / Victoria St	Signalized	SBL	22	5	15	18	24	C				
60	Princess St / Victoria St	Signalized	SBT	37	5	15	18	26	C				
60	Princess St / Victoria St	Signalized	SBR	14	5	15	2	5	A				
60	Princess St / Victoria St	Signalized	EBL	95	30	170	13	22	C				
60	Princess St / Victoria St	Signalized	EBT	579	30	170	5	11	B				
60	Princess St / Victoria St	Signalized	EBR	14	30	170	4	9	A				
60	Princess St / Victoria St	Signalized	WBL	14	35	55	18	23	C				
60	Princess St / Victoria St	Signalized	WBT	394	35	55	7	11	B				
60	Princess St / Victoria St	Signalized	WBR	62	35	55	5	9	A				
70	Princess St / Nelson St	TWSC	NBL	14	0	5	11	19	C	19.0	C	5.1	A
70	Princess St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	NBR	0	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	SBL	0	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	SBT	0	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	SBR	0	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	EBL	97	25	115	6	12	B				
70	Princess St / Nelson St	TWSC	EBT	569	25	115	4	8	A				
70	Princess St / Nelson St	TWSC	EBR	10	25	115	1	2	A				
70	Princess St / Nelson St	TWSC	WBL	0	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	WBT	475	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	WBR	13	0	0	0	0	A				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	50	10	20	13	18	B	34.0	C	21.4	C
80	Princess St / Albert St	Signalized	NBT	19	10	20	13	18	B				
80	Princess St / Albert St	Signalized	NBR	38	10	20	2	7	A				
80	Princess St / Albert St	Signalized	SBL	0	0	0	0	0	A				
80	Princess St / Albert St	Signalized	SBT	0	0	0	0	0	A				
80	Princess St / Albert St	Signalized	SBR	3	0	0	0	5	A				
80	Princess St / Albert St	Signalized	EBL	25	70	115	21	31	C				
80	Princess St / Albert St	Signalized	EBT	538	70	115	18	24	C				
80	Princess St / Albert St	Signalized	EBR	21	70	115	11	16	B				
80	Princess St / Albert St	Signalized	WBL	27	55	100	27	34	C				
80	Princess St / Albert St	Signalized	WBT	449	55	100	13	19	B				
80	Princess St / Albert St	Signalized	WBR	0	55	100	0	0	A				
90	Princess St / Frontenac St	TWSC	NBL	4	0	5	4	11	B	24.0	C	7.4	A
90	Princess St / Frontenac St	TWSC	NBT	8	0	5	12	24	C				
90	Princess St / Frontenac St	TWSC	NBR	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	EBL	61	35	155	8	16	C				
90	Princess St / Frontenac St	TWSC	EBT	563	35	155	6	12	B				
90	Princess St / Frontenac St	TWSC	EBR	0	35	155	0	0	A				
90	Princess St / Frontenac St	TWSC	WBL	0	0	30	0	0	A				
90	Princess St / Frontenac St	TWSC	WBT	510	0	30	0	1	A				
90	Princess St / Frontenac St	TWSC	WBR	7	0	30	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	31	25	50	12	19	B	51.0	D	32.0	C
100	Princess St / Alfred St	Signalized	NBT	113	25	50	15	23	C				
100	Princess St / Alfred St	Signalized	NBR	99	25	50	10	18	B				
100	Princess St / Alfred St	Signalized	SBL	36	10	30	21	31	C				
100	Princess St / Alfred St	Signalized	SBT	50	10	30	14	21	C				
100	Princess St / Alfred St	Signalized	SBR	26	10	30	5	11	B				
100	Princess St / Alfred St	Signalized	EBL	2	135	145	34	51	D				
100	Princess St / Alfred St	Signalized	EBT	560	135	145	30	43	D				
100	Princess St / Alfred St	Signalized	EBR	15	135	145	28	40	D				
100	Princess St / Alfred St	Signalized	WBL	37	90	90	24	32	C				
100	Princess St / Alfred St	Signalized	WBT	461	90	90	22	28	C				
100	Princess St / Alfred St	Signalized	WBR	43	90	90	13	19	B				
110	Princess St / Chatham St	TWSC	SBL	0	0	0	0	0	A	33.0	D	9.1	A
110	Princess St / Chatham St	TWSC	SBR	0	0	0	0	0	A				
110	Princess St / Chatham St	TWSC	EBL	75	50	115	6	13	B				
110	Princess St / Chatham St	TWSC	EBT	614	50	115	5	11	B				
110	Princess St / Chatham St	TWSC	WBT	538	20	80	4	6	A				
110	Princess St / Chatham St	TWSC	WBR	8	20	80	25	33	D				
120	Princess St / University Av	Signalized	NBL	54	5	20	17	22	C	22.0	C	8.2	A
120	Princess St / University Av	Signalized	NBR	32	5	20	5	10	A				
120	Princess St / University Av	Signalized	EBT	544	65	70	5	10	A				
120	Princess St / University Av	Signalized	EBR	23	65	70	5	10	A				
120	Princess St / University Av	Signalized	WBL	16	10	40	2	6	A				
120	Princess St / University Av	Signalized	WBT	483	10	40	2	4	A				
120	Princess St / University Av	Signalized	NBT	0	5	20	0	0	A				
120	Princess St / University Av	Signalized	SBL	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	SBT	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	SBR	0	0	0	0	0	A				
120	Princess St / University Av	Signalized	EBL	38	65	70	8	16	B				
120	Princess St / University Av	Signalized	WBR	0	10	40	0	0	A				
130	Princess St / Division St	Signalized	NBL	55	20	40	12	22	C	27.0	C	14.3	B
130	Princess St / Division St	Signalized	NBT	155	20	40	12	18	B				
130	Princess St / Division St	Signalized	NBR	10	20	40	3	8	A				
130	Princess St / Division St	Signalized	SBL	138	15	70	6	10	A				
130	Princess St / Division St	Signalized	SBT	111	15	70	3	4	A				
130	Princess St / Division St	Signalized	SBR	441	15	70	0	1	A				
130	Princess St / Division St	Signalized	EBL	163	35	60	17	25	C				
130	Princess St / Division St	Signalized	EBT	384	35	60	19	27	C				
130	Princess St / Division St	Signalized	EBR	23	35	60	10	19	B				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	12	0	5	38	47	E	47.0	E	13.0	B
140	Concession St / Drayton Av	TWSC	EBT	952	5	160	6	12	B				
140	Concession St / Drayton Av	TWSC	EBR	45	5	160	12	24	C				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	18	0	5	13	25	C	27.0	D	20.5	C
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	183	65	75	19	27	D				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	868	65	75	13	19	C				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	92	15	50	9	21	C	27.0	D	4.1	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	90	15	50	13	27	D				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	18	0	5	10	20	C				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	8	0	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	926	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	40	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	31	10	35	19	26	C	50.0	D	14.8	B
160	Concession St / Macdonnell St	Signalized	NBT	26	10	35	19	27	C				
160	Concession St / Macdonnell St	Signalized	NBR	73	10	35	10	17	B				
160	Concession St / Macdonnell St	Signalized	SBR	67	5	15	4	7	A				
160	Concession St / Macdonnell St	Signalized	EBL	58	75	80	41	50	D				
160	Concession St / Macdonnell St	Signalized	EBT	762	75	80	8	13	B				
160	Concession St / Macdonnell St	Signalized	EBR	67	75	80	7	11	B				
160	Concession St / Macdonnell St	Signalized	WBL	26	85	85	35	46	D				
160	Concession St / Macdonnell St	Signalized	WBT	871	85	85	8	13	B				
160	Concession St / Macdonnell St	Signalized	WBR	0	85	85	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	0	0	5	0	0	A	27.0	D	7.2	A
170	Concession St / Connaught St	TWSC	SBR	16	0	5	17	27	D				
170	Concession St / Connaught St	TWSC	EBL	0	5	95	0	0	A				
170	Concession St / Connaught St	TWSC	EBT	838	5	95	3	6	A				
170	Concession St / Connaught St	TWSC	WBT	883	60	115	5	8	A				
170	Concession St / Connaught St	TWSC	WBR	0	60	115	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	55	25	80	40	52	D	52.0	D	17.0	B
180	Concession St / Victoria St	Signalized	NBT	33	25	80	30	38	D				
180	Concession St / Victoria St	Signalized	NBR	80	25	80	27	37	D				
180	Concession St / Victoria St	Signalized	SBL	12	5	15	27	36	D				
180	Concession St / Victoria St	Signalized	SBT	22	5	15	23	29	C				
180	Concession St / Victoria St	Signalized	SBR	36	5	15	3	13	B				
180	Concession St / Victoria St	Signalized	EBL	54	110	115	19	27	C				
180	Concession St / Victoria St	Signalized	EBT	770	110	115	9	14	B				
180	Concession St / Victoria St	Signalized	EBR	22	110	115	10	20	B				
180	Concession St / Victoria St	Signalized	WBL	44	85	90	23	30	C				
180	Concession St / Victoria St	Signalized	WBT	790	85	90	8	13	B				
180	Concession St / Victoria St	Signalized	WBR	12	85	90	0	1	A				
190	Concession St / Nelson St	TWSC	NBL	0	0	0	0	0	A	6.0	A	4.4	A
190	Concession St / Nelson St	TWSC	NBT	0	0	0	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	0	0	0	0	0	A				
190	Concession St / Nelson St	TWSC	SBL	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	12	0	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	0	0	85	0	0	A				
190	Concession St / Nelson St	TWSC	EBT	813	0	85	2	4	A				
190	Concession St / Nelson St	TWSC	EBR	46	0	85	2	2	A				
190	Concession St / Nelson St	TWSC	WBL	0	0	95	0	0	A				
190	Concession St / Nelson St	TWSC	WBT	828	0	95	3	5	A				
190	Concession St / Nelson St	TWSC	WBR	0	0	95	0	0	A				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	0	0	15	0	0	A	20.0	C	5.2	A
200	Concession St / Kingscourt Av	TWSC	SBR	17	0	15	10	20	C				
200	Concession St / Kingscourt Av	TWSC	EBL	2	0	100	0	3	A				
200	Concession St / Kingscourt Av	TWSC	EBT	813	0	100	4	8	A				
200	Concession St / Kingscourt Av	TWSC	WBT	811	0	95	1	2	A				
200	Concession St / Kingscourt Av	TWSC	WBR	0	0	95	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	12	0	5	59	70	F	70.0	F	6.0	A
210	Concession St / Fergus St	TWSC	SBR	0	0	5	0	0	A				
210	Concession St / Fergus St	TWSC	EBL	4	0	100	19	32	D				
210	Concession St / Fergus St	TWSC	EBT	806	0	100	5	10	A				
210	Concession St / Fergus St	TWSC	WBT	810	0	20	0	1	A				
210	Concession St / Fergus St	TWSC	WBR	4	0	20	0	0	A				
220	Concession St / Grey St	TWSC	SBL	0	0	5	0	0	A	19.0	C	7.6	A
220	Concession St / Grey St	TWSC	SBR	16	0	5	4	12	B				
220	Concession St / Grey St	TWSC	EBL	4	55	105	14	19	C				
220	Concession St / Grey St	TWSC	EBT	813	55	105	10	15	B				
220	Concession St / Grey St	TWSC	WBT	799	0	0	0	0	A				
220	Concession St / Grey St	TWSC	WBR	4	0	0	0	0	A				
230	Concession St / Alfred St	Signalized	NBL	191	30	95	20	30	C	31.0	C	16.9	B
230	Concession St / Alfred St	Signalized	NBT	35	30	95	22	31	C				
230	Concession St / Alfred St	Signalized	NBR	34	30	95	16	23	C				
230	Concession St / Alfred St	Signalized	SBL	0	5	15	0	0	A				
230	Concession St / Alfred St	Signalized	SBT	34	5	15	18	23	C				
230	Concession St / Alfred St	Signalized	SBR	24	5	15	4	8	A				
230	Concession St / Alfred St	Signalized	EBL	29	55	60	18	25	C				
230	Concession St / Alfred St	Signalized	EBT	541	55	60	10	14	B				
230	Concession St / Alfred St	Signalized	EBR	245	55	60	2	4	A				
230	Concession St / Alfred St	Signalized	WBL	41	70	130	12	20	B				
230	Concession St / Alfred St	Signalized	WBT	588	70	130	12	19	B				
230	Concession St / Alfred St	Signalized	WBR	0	70	130	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	6.0	A	1.6	A
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBT	526	0	0	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	26	0	60	3	6	A				
240	Concession St / Lansdowne St	TWSC	WBT	607	0	60	1	2	A				
250	Concession St / Division St	Signalized	NBL	57	80	110	27	39	D	65.0	E	28.6	C
250	Concession St / Division St	Signalized	NBT	562	80	110	19	25	C				
250	Concession St / Division St	Signalized	NBR	0	80	110	0	0	A				
250	Concession St / Division St	Signalized	SBL	28	65	140	31	42	D				
250	Concession St / Division St	Signalized	SBT	421	65	140	17	23	C				
250	Concession St / Division St	Signalized	SBR	177	65	140	4	9	A				
250	Concession St / Division St	Signalized	EBL	221	35	105	21	29	C				
250	Concession St / Division St	Signalized	EBT	228	35	105	13	18	B				
250	Concession St / Division St	Signalized	EBR	64	35	105	5	8	A				
250	Concession St / Division St	Signalized	WBL	12	90	165	54	65	E				
250	Concession St / Division St	Signalized	WBT	381	90	165	43	53	D				
250	Concession St / Division St	Signalized	WBR	34	90	165	39	50	D				

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Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	0	0	70	0	0	A	16.0	C	2.7	A
260	Adelaide St / Division St	TWSC	NBT	617	0	70	2	4	A				
260	Adelaide St / Division St	TWSC	NBR	0	0	70	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	8	0	30	2	4	A				
260	Adelaide St / Division St	TWSC	SBT	450	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	SBR	40	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	EBL	1	0	0	0	0	A				
260	Adelaide St / Division St	TWSC	EBT	0	0	0	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	0	0	0	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	7	0	5	5	14	B				
260	Adelaide St / Division St	TWSC	WBT	3	0	5	6	16	C				
260	Adelaide St / Division St	TWSC	WBR	0	0	5	0	0	A				
270	Stanley St / Division St	TWSC	NBL	11	0	5	3	5	A	21.0	C	1.1	A
270	Stanley St / Division St	TWSC	NBT	606	0	5	0	0	A				
270	Stanley St / Division St	TWSC	SBT	383	0	25	0	2	A				
270	Stanley St / Division St	TWSC	SBR	71	0	25	0	1	A				
270	Stanley St / Division St	TWSC	EBL	12	0	5	6	21	C				
270	Stanley St / Division St	TWSC	EBR	6	0	5	2	10	A				
280	Pine St / Division St	Signalized	NBL	39	25	80	8	14	B	28.0	C	9.2	A
280	Pine St / Division St	Signalized	NBT	542	25	80	4	7	A				
280	Pine St / Division St	Signalized	NBR	14	25	80	3	5	A				
280	Pine St / Division St	Signalized	SBL	36	25	70	9	15	B				
280	Pine St / Division St	Signalized	SBT	353	25	70	5	8	A				
280	Pine St / Division St	Signalized	SBR	6	25	70	2	6	A				
280	Pine St / Division St	Signalized	EBL	0	5	20	0	0	A				
280	Pine St / Division St	Signalized	EBT	26	5	20	22	28	C				
280	Pine St / Division St	Signalized	EBR	34	5	20	4	9	A				
280	Pine St / Division St	Signalized	WBL	2	10	20	14	18	B				
280	Pine St / Division St	Signalized	WBT	33	10	20	21	27	C				
280	Pine St / Division St	Signalized	WBR	77	10	20	6	12	B				
290	Quebec St / Division St	TWSC	NBT	593	0	30	0	1	A	13.0	B	1.6	A
290	Quebec St / Division St	TWSC	NBR	0	0	30	0	0	A				
290	Quebec St / Division St	TWSC	SBL	9	0	55	3	7	A				
290	Quebec St / Division St	TWSC	SBT	375	0	55	1	2	A				
290	Quebec St / Division St	TWSC	WBL	14	0	5	5	13	B				
290	Quebec St / Division St	TWSC	WBR	0	0	5	0	0	A				
300	York St / Division St	Signalized	NBL	6	35	35	5	7	A	32.0	C	7.0	A
300	York St / Division St	Signalized	NBT	532	35	35	2	4	A				
300	York St / Division St	Signalized	NBR	12	35	35	0	0	A				
300	York St / Division St	Signalized	SBL	38	10	65	11	17	B				
300	York St / Division St	Signalized	SBT	352	10	65	3	5	A				
300	York St / Division St	Signalized	SBR	0	10	65	0	0	A				
300	York St / Division St	Signalized	EBL	0	0	10	0	0	A				
300	York St / Division St	Signalized	EBT	23	0	10	24	28	C				
300	York St / Division St	Signalized	EBR	0	0	10	0	0	A				
300	York St / Division St	Signalized	WBL	33	10	30	25	32	C				
300	York St / Division St	Signalized	WBT	10	10	30	21	28	C				
300	York St / Division St	Signalized	WBR	61	10	30	8	15	B				
310	Main St / Division St	TWSC	NBT	550	15	55	2	5	A	12.0	B	3.0	A
310	Main St / Division St	TWSC	NBR	0	15	55	0	0	A				
310	Main St / Division St	TWSC	SBL	6	35	35	2	5	A				
310	Main St / Division St	TWSC	SBT	379	35	35	0	0	A				
310	Main St / Division St	TWSC	WBL	6	0	5	3	12	B				
310	Main St / Division St	TWSC	WBR	0	0	5	0	0	A				

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2036 No Mitigation - No Williamsville Growth - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
320	Hamilton St / Division St	TWSC	NBL	0	0	15	0	0	A	6.0	A	0.6	A
320	Hamilton St / Division St	TWSC	NBT	549	0	15	0	1	A				
320	Hamilton St / Division St	TWSC	SBT	362	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	24	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	0	0	5	0	0	A				
320	Hamilton St / Division St	TWSC	EBR	7	0	5	0	6	A				
330	Raglan St / Division St	TWSC	NBT	549	0	0	0	0	A	12.0	B	0.1	A
330	Raglan St / Division St	TWSC	NBR	10	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	0	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBT	369	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	10	0	5	3	12	B				
330	Raglan St / Division St	TWSC	WBR	0	0	5	0	0	A				
340	Elm St / Division St	TWSC	NBL	36	0	25	1	3	A	3.0	A	0.1	A
340	Elm St / Division St	TWSC	NBT	560	0	25	0	0	A				
340	Elm St / Division St	TWSC	SBT	348	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	30	0	0	0	1	A				
340	Elm St / Division St	TWSC	EBL	0	0	0	0	0	A				
340	Elm St / Division St	TWSC	EBR	0	0	0	0	0	A				
350	Ellice St / Division St	TWSC	NBT	582	0	45	0	0	A	9.0	A	0.2	A
350	Ellice St / Division St	TWSC	NBR	2	0	45	0	0	A				
350	Ellice St / Division St	TWSC	SBL	6	0	0	2	4	A				
350	Ellice St / Division St	TWSC	SBT	343	0	0	0	0	A				
350	Ellice St / Division St	TWSC	WBL	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	WBR	14	0	5	2	9	A				
360	Colborne St / Division St	TWSC	NBL	0	0	20	0	0	A	12.0	B	0.7	A
360	Colborne St / Division St	TWSC	NBT	556	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	0	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	6	0	15	0	1	A				
360	Colborne St / Division St	TWSC	SBT	337	0	15	1	1	A				
360	Colborne St / Division St	TWSC	SBR	0	0	15	0	0	A				
360	Colborne St / Division St	TWSC	EBL	14	0	5	4	12	B				
360	Colborne St / Division St	TWSC	EBT	2	0	5	0	9	A				
360	Colborne St / Division St	TWSC	EBR	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBL	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBT	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBR	14	0	5	2	9	A				
370	Queen St / Division St	Signalized	NBT	209	20	70	8	11	B	30.0	C	18.4	B
370	Queen St / Division St	Signalized	NBR	111	20	70	1	9	A				
370	Queen St / Division St	Signalized	SBL	92	35	80	20	30	C				
370	Queen St / Division St	Signalized	SBT	247	35	80	14	20	B				
370	Queen St / Division St	Signalized	WBL	442	50	120	18	30	C				
370	Queen St / Division St	Signalized	WBR	346	50	120	1	7	A				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 22% Auto M.S. - AM Peak

Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LOS
10	Princess St / Concession St	Signalized	2,644	40.4	61.9	26.2	21.1	C
20	Princess St / Regent St	TWSC	1,035	0.2	52.6	2.4	0.2	-
30	Princess St / Drayton Av	TWSC	986	0.0	53.5	1.9	0.1	-
40	Princess St / Macdonnell Av	Signalized	926	51.1	113.6	16.1	10.3	B
50	Princess St / Smith St	TWSC	770	28.6	32.9	0.8	0.3	-
60	Princess St / Victoria St	Signalized	993	11.1	59.6	7.5	3.9	A
70	Princess St / Nelson St	TWSC	902	0.1	7.6	1.8	0.3	-
80	Princess St / Albert St	Signalized	930	22.6	57.6	12.3	8.7	B
90	Princess St / Frontenac St	TWSC	832	0.0	27.3	0.8	0.0	-
100	Princess St / Alfred St	Signalized	1,172	43.9	65.8	23.7	17.2	C
110	Princess St / Chatham St	TWSC	828	0.0	23.2	1.4	0.0	-
120	Princess St / University Av	Signalized	804	15.2	53.2	5.4	2.7	A
130	Princess St / Division St	Signalized	1,001	17.6	54.0	16.6	11.5	B
140	Concession St / Drayton Av	TWSC	941	0.2	131.0	11.3	7.0	-
150	Concession St / Leroy Grant Dr (S)	TWSC	913	49.9	74.9	7.8	3.9	-
155	Concession St / Leroy Grant Drive (N)	TWSC	768	0.3	0.8	0.6	0.1	-
160	Concession St / Macdonnell St	Signalized	1,555	49.7	61.5	9.9	6.5	A
170	Concession St / Connaught St	TWSC	1,298	0.0	46.9	0.8	0.1	-
180	Concession St / Victoria St	Signalized	1,384	31.1	79.4	10.8	7.4	B
190	Concession St / Nelson St	TWSC	1,235	0.1	52.2	1.8	0.6	-
200	Concession St / Kingscourt Av	TWSC	1,224	0.2	37.7	1.8	0.4	-
210	Concession St / Fergus St	TWSC	1,257	0.2	43.0	3.0	1.1	-
220	Concession St / Grey St	TWSC	1,288	16.4	57.3	6.9	3.9	-
230	Concession St / Alfred St	Signalized	1,362	41.4	61.5	12.0	7.7	B
240	Concession St / Lansdowne St	TWSC	997	0.0	0.0	0.6	0.0	-
250	Concession St / Division St	Signalized	1,661	39.8	91.6	20.9	15.0	C
260	Adelaide St / Division St	TWSC	658	0.0	25.8	0.2	0.1	-
270	Stanley St / Division St	TWSC	678	0.3	14.2	1.8	0.8	-
280	Pine St / Division St	Signalized	752	13.2	49.9	8.8	5.1	A
290	Quebec St / Division St	TWSC	650	0.0	31.8	0.9	0.1	-
300	York St / Division St	Signalized	741	12.0	32.7	7.5	5.4	A
310	Main St / Division St	TWSC	610	23.2	26.6	0.8	0.3	-
320	Hamilton St / Division St	TWSC	591	0.0	0.1	0.1	0.0	-
330	Raglan St / Division St	TWSC	585	0.0	0.1	0.1	0.0	-
340	Elm St / Division St	TWSC	568	0.0	0.0	0.1	0.0	-
350	Ellice St / Division St	TWSC	575	0.0	0.1	0.2	0.0	-
360	Colborne St / Division St	TWSC	576	0.0	16.1	1.8	0.7	-
370	Queen St / Division St	Signalized	837	27.7	48.6	14.7	8.7	B
Total			37,527	536	1,647	242	151	

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 22% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	142	25	35	39	46	D	46.0	D	26.2	C
10	Princess St / Concession St	Signalized	NBT	91	25	35	35	42	D				
10	Princess St / Concession St	Signalized	NBR	32	25	35	0	1	A				
10	Princess St / Concession St	Signalized	SBL	505	65	95	29	36	D				
10	Princess St / Concession St	Signalized	SBT	497	65	95	29	37	D				
10	Princess St / Concession St	Signalized	SBR	30	65	95	14	18	B				
10	Princess St / Concession St	Signalized	EBT	398	30	50	28	33	C				
10	Princess St / Concession St	Signalized	EBR	224	30	50	0	2	A				
10	Princess St / Concession St	Signalized	WBT	243	20	35	26	32	C				
10	Princess St / Concession St	Signalized	WBR	394	20	35	0	0	A				
10	Princess St / Concession St	Signalized	WBL	88	20	35	2	5	A				
20	Princess St / Regent St	TWSC	NBL	0	5	10	0	0	A	11.0	B	2.4	A
20	Princess St / Regent St	TWSC	NBR	33	5	10	4	11	B				
20	Princess St / Regent St	TWSC	EBT	669	0	75	0	3	A				
20	Princess St / Regent St	TWSC	EBR	52	0	75	0	1	A				
20	Princess St / Regent St	TWSC	WBL	7	0	0	7	9	A				
20	Princess St / Regent St	TWSC	WBT	274	0	0	0	0	A				
30	Princess St / Drayton Av	TWSC	SBL	0	0	0	0	0	A	3.0	A	1.9	A
30	Princess St / Drayton Av	TWSC	SBR	0	0	0	0	0	A				
30	Princess St / Drayton Av	TWSC	EBL	137	0	75	1	3	A				
30	Princess St / Drayton Av	TWSC	EBT	567	0	75	0	2	A				
30	Princess St / Drayton Av	TWSC	WBT	280	0	0	0	1	A				
30	Princess St / Drayton Av	TWSC	WBR	2	0	0	0	0	A				
40	Princess St / Macdonnell Av	Signalized	NBL	43	5	25	13	19	B	28.0	C	16.1	B
40	Princess St / Macdonnell Av	Signalized	NBT	17	5	25	12	17	B				
40	Princess St / Macdonnell Av	Signalized	NBR	26	5	25	6	12	B				
40	Princess St / Macdonnell Av	Signalized	SBL	9	40	40	14	18	B				
40	Princess St / Macdonnell Av	Signalized	SBT	14	40	40	12	16	B				
40	Princess St / Macdonnell Av	Signalized	SBR	26	40	40	2	10	A				
40	Princess St / Macdonnell Av	Signalized	EBL	33	70	160	14	20	B				
40	Princess St / Macdonnell Av	Signalized	EBT	499	70	160	11	17	B				
40	Princess St / Macdonnell Av	Signalized	EBR	27	70	160	8	13	B				
40	Princess St / Macdonnell Av	Signalized	WBL	7	25	50	19	28	C				
40	Princess St / Macdonnell Av	Signalized	WBT	215	25	50	9	14	B				
40	Princess St / Macdonnell Av	Signalized	WBR	10	25	50	6	11	B				
50	Princess St / Smith St	TWSC	SBL	2	40	40	0	10	A	12.0	B	0.8	A
50	Princess St / Smith St	TWSC	SBR	12	40	40	1	12	B				
50	Princess St / Smith St	TWSC	EBL	4	40	40	0	2	A				
50	Princess St / Smith St	TWSC	EBT	532	40	40	0	0	A				
50	Princess St / Smith St	TWSC	WBT	220	0	15	1	2	A				
50	Princess St / Smith St	TWSC	WBR	0	0	15	0	0	A				
60	Princess St / Victoria St	Signalized	NBL	24	10	35	16	23	C	26.0	C	7.5	A
60	Princess St / Victoria St	Signalized	NBT	29	10	35	18	26	C				
60	Princess St / Victoria St	Signalized	NBR	44	10	35	6	11	B				
60	Princess St / Victoria St	Signalized	SBL	7	5	20	18	23	C				
60	Princess St / Victoria St	Signalized	SBT	61	5	20	15	21	C				
60	Princess St / Victoria St	Signalized	SBR	2	5	20	0	0	A				
60	Princess St / Victoria St	Signalized	EBL	10	10	80	10	15	B				
60	Princess St / Victoria St	Signalized	EBT	516	10	80	1	4	A				
60	Princess St / Victoria St	Signalized	EBR	8	10	80	1	4	A				
60	Princess St / Victoria St	Signalized	WBL	22	15	40	13	17	B				
60	Princess St / Victoria St	Signalized	WBT	192	15	40	3	6	A				
60	Princess St / Victoria St	Signalized	WBR	78	15	40	2	6	A				
70	Princess St / Nelson St	TWSC	NBL	5	5	45	6	17	C	18.0	C	1.8	A
70	Princess St / Nelson St	TWSC	NBT	8	5	45	6	18	C				
70	Princess St / Nelson St	TWSC	NBR	7	5	45	5	14	B				
70	Princess St / Nelson St	TWSC	SBL	8	0	5	5	18	C				
70	Princess St / Nelson St	TWSC	SBT	0	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	SBR	8	0	5	1	13	B				
70	Princess St / Nelson St	TWSC	EBL	31	0	0	1	3	A				
70	Princess St / Nelson St	TWSC	EBT	533	0	0	0	1	A				
70	Princess St / Nelson St	TWSC	EBR	7	0	0	0	1	A				
70	Princess St / Nelson St	TWSC	WBL	14	0	20	4	7	A				
70	Princess St / Nelson St	TWSC	WBT	281	0	20	0	1	A				
70	Princess St / Nelson St	TWSC	WBR	0	0	20	0	0	A				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 22% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	13	5	15	13	18	B	29.0	C	12.3	B
80	Princess St / Albert St	Signalized	NBT	17	5	15	12	16	B				
80	Princess St / Albert St	Signalized	NBR	27	5	15	3	8	A				
80	Princess St / Albert St	Signalized	SBL	3	5	15	17	29	C				
80	Princess St / Albert St	Signalized	SBT	31	5	15	12	15	B				
80	Princess St / Albert St	Signalized	SBR	29	5	15	3	9	A				
80	Princess St / Albert St	Signalized	EBL	2	30	80	18	21	C				
80	Princess St / Albert St	Signalized	EBT	533	30	80	11	14	B				
80	Princess St / Albert St	Signalized	EBR	15	30	80	8	11	B				
80	Princess St / Albert St	Signalized	WBL	8	15	30	18	25	C				
80	Princess St / Albert St	Signalized	WBT	251	15	30	4	8	A				
80	Princess St / Albert St	Signalized	WBR	1	15	30	0	0	A				
90	Princess St / Frontenac St	TWSC	NBL	2	0	5	2	11	B	11.0	B	0.8	A
90	Princess St / Frontenac St	TWSC	NBT	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	NBR	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	8	0	5	0	7	A				
90	Princess St / Frontenac St	TWSC	EBL	29	0	40	0	2	A				
90	Princess St / Frontenac St	TWSC	EBT	529	0	40	0	1	A				
90	Princess St / Frontenac St	TWSC	EBR	8	0	40	0	2	A				
90	Princess St / Frontenac St	TWSC	WBL	4	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	WBT	251	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBR	1	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	27	20	40	14	21	C	36.0	D	23.7	C
100	Princess St / Alfred St	Signalized	NBT	109	20	40	13	19	B				
100	Princess St / Alfred St	Signalized	NBR	75	20	40	6	11	B				
100	Princess St / Alfred St	Signalized	SBL	26	20	50	15	24	C				
100	Princess St / Alfred St	Signalized	SBT	133	20	50	13	20	B				
100	Princess St / Alfred St	Signalized	SBR	60	20	50	6	11	B				
100	Princess St / Alfred St	Signalized	EBL	12	70	90	29	36	D				
100	Princess St / Alfred St	Signalized	EBT	497	70	90	22	29	C				
100	Princess St / Alfred St	Signalized	EBR	7	70	90	18	25	C				
100	Princess St / Alfred St	Signalized	WBL	8	30	50	21	29	C				
100	Princess St / Alfred St	Signalized	WBT	192	30	50	20	26	C				
100	Princess St / Alfred St	Signalized	WBR	26	30	50	2	6	A				
110	Princess St / Chatham St	TWSC	SBL	0	0	0	0	0	A	2.0	A	1.4	A
110	Princess St / Chatham St	TWSC	SBR	1	0	0	0	0	A				
110	Princess St / Chatham St	TWSC	EBL	15	0	15	0	2	A				
110	Princess St / Chatham St	TWSC	EBT	584	0	15	0	2	A				
110	Princess St / Chatham St	TWSC	WBT	224	0	45	0	0	A				
110	Princess St / Chatham St	TWSC	WBR	4	0	45	0	0	A				
120	Princess St / University Av	Signalized	NBL	33	5	10	18	23	C	24.0	C	5.4	A
120	Princess St / University Av	Signalized	NBR	21	5	10	3	8	A				
120	Princess St / University Av	Signalized	EBT	484	20	70	2	5	A				
120	Princess St / University Av	Signalized	EBR	61	20	70	1	4	A				
120	Princess St / University Av	Signalized	WBL	8	5	20	16	24	C				
120	Princess St / University Av	Signalized	WBT	197	5	20	2	3	A				
130	Princess St / Division St	Signalized	NBL	23	5	20	15	26	C	28.0	C	16.6	B
130	Princess St / Division St	Signalized	NBT	52	5	20	11	17	B				
130	Princess St / Division St	Signalized	NBR	1	5	20	0	0	A				
130	Princess St / Division St	Signalized	SBL	142	5	65	3	6	A				
130	Princess St / Division St	Signalized	SBT	97	5	65	3	4	A				
130	Princess St / Division St	Signalized	SBR	182	5	65	0	0	A				
130	Princess St / Division St	Signalized	EBL	127	30	50	20	28	C				
130	Princess St / Division St	Signalized	EBT	359	30	50	20	28	C				
130	Princess St / Division St	Signalized	EBR	18	30	50	7	15	B				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	36	5	30	83	95	F	95.0	F	11.3	B
140	Concession St / Drayton Av	TWSC	EBT	905	0	135	4	8	A				
140	Concession St / Drayton Av	TWSC	EBR	0	0	135	0	0	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	1	0	0	25	36	E	36.0	E	7.8	A
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	42	50	75	1	4	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	870	50	75	4	8	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	31	5	15	2	10	A	11.0	B	0.6	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	12	5	15	2	11	B				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	1	0	0	0	8	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	76	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	622	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	26	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	60	5	20	21	27	C	27.0	C	9.9	A
160	Concession St / Macdonnell St	Signalized	NBT	0	5	20	0	0	A				
160	Concession St / Macdonnell St	Signalized	NBR	4	5	20	13	22	C				
160	Concession St / Macdonnell St	Signalized	SBR	45	0	5	1	3	A				
160	Concession St / Macdonnell St	Signalized	EBL	36	75	75	10	17	B				
160	Concession St / Macdonnell St	Signalized	EBT	714	75	75	7	11	B				
160	Concession St / Macdonnell St	Signalized	EBR	123	75	75	5	9	A				
160	Concession St / Macdonnell St	Signalized	WBL	28	20	50	19	26	C				
160	Concession St / Macdonnell St	Signalized	WBT	545	20	50	4	6	A				
160	Concession St / Macdonnell St	Signalized	WBR	0	20	50	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	8	0	5	8	16	C	16.0	C	0.8	A
170	Concession St / Connaught St	TWSC	SBR	8	0	5	3	10	A				
170	Concession St / Connaught St	TWSC	EBL	17	0	85	3	6	A				
170	Concession St / Connaught St	TWSC	EBT	698	0	85	0	1	A				
170	Concession St / Connaught St	TWSC	WBT	563	0	0	0	0	A				
170	Concession St / Connaught St	TWSC	WBR	4	0	0	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	40	5	20	20	26	C	35.0	C	10.8	B
180	Concession St / Victoria St	Signalized	NBT	14	5	20	22	27	C				
180	Concession St / Victoria St	Signalized	NBR	19	5	20	10	16	B				
180	Concession St / Victoria St	Signalized	SBL	7	5	15	30	35	C				
180	Concession St / Victoria St	Signalized	SBT	30	5	15	25	30	C				
180	Concession St / Victoria St	Signalized	SBR	45	5	15	2	9	A				
180	Concession St / Victoria St	Signalized	EBL	20	30	85	7	10	A				
180	Concession St / Victoria St	Signalized	EBT	663	30	85	6	8	A				
180	Concession St / Victoria St	Signalized	EBR	8	30	85	7	13	B				
180	Concession St / Victoria St	Signalized	WBL	48	40	90	18	25	C				
180	Concession St / Victoria St	Signalized	WBT	486	40	90	6	10	A				
180	Concession St / Victoria St	Signalized	WBR	4	40	90	0	1	A				
190	Concession St / Nelson St	TWSC	NBL	7	0	5	8	17	C	17.0	C	1.8	A
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	3	0	5	1	7	A				
190	Concession St / Nelson St	TWSC	SBL	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	25	5	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	39	0	60	2	5	A				
190	Concession St / Nelson St	TWSC	EBT	647	0	60	0	1	A				
190	Concession St / Nelson St	TWSC	EBR	0	0	60	0	0	A				
190	Concession St / Nelson St	TWSC	WBL	10	0	45	5	8	A				
190	Concession St / Nelson St	TWSC	WBT	504	0	45	1	2	A				
190	Concession St / Nelson St	TWSC	WBR	0	0	45	0	0	A				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 22% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	43	5	15	9	18	C	21.0	C	1.8	A
200	Concession St / Kingscourt Av	TWSC	SBR	4	5	15	5	21	C				
200	Concession St / Kingscourt Av	TWSC	EBL	24	0	70	2	5	A				
200	Concession St / Kingscourt Av	TWSC	EBT	625	0	70	0	2	A				
200	Concession St / Kingscourt Av	TWSC	WBT	508	0	0	0	0	A				
200	Concession St / Kingscourt Av	TWSC	WBR	20	0	0	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	43	5	15	15	25	C	25.0	C	3.0	A
210	Concession St / Fergus St	TWSC	SBR	1	5	15	0	6	A				
210	Concession St / Fergus St	TWSC	EBL	21	0	80	2	5	A				
210	Concession St / Fergus St	TWSC	EBT	647	0	80	1	4	A				
210	Concession St / Fergus St	TWSC	WBT	525	0	0	0	0	A				
210	Concession St / Fergus St	TWSC	WBR	20	0	0	0	0	A				
220	Concession St / Grey St	TWSC	SBL	29	5	20	44	54	F	54.0	F	6.9	A
220	Concession St / Grey St	TWSC	SBR	14	5	20	16	24	C				
220	Concession St / Grey St	TWSC	EBL	21	30	105	8	14	B				
220	Concession St / Grey St	TWSC	EBT	674	30	105	5	10	A				
220	Concession St / Grey St	TWSC	WBT	529	0	0	0	0	A				
220	Concession St / Grey St	TWSC	WBR	21	0	0	0	0	A				
230	Concession St / Alfred St	Signalized	NBL	109	15	35	17	24	C	27.0	C	12.0	B
230	Concession St / Alfred St	Signalized	NBT	10	15	35	20	27	C				
230	Concession St / Alfred St	Signalized	NBR	41	15	35	9	15	B				
230	Concession St / Alfred St	Signalized	SBL	2	5	20	14	22	C				
230	Concession St / Alfred St	Signalized	SBT	32	5	20	13	17	B				
230	Concession St / Alfred St	Signalized	SBR	34	5	20	4	9	A				
230	Concession St / Alfred St	Signalized	EBL	34	55	60	9	14	B				
230	Concession St / Alfred St	Signalized	EBT	500	55	60	7	11	B				
230	Concession St / Alfred St	Signalized	EBR	163	55	60	1	3	A				
230	Concession St / Alfred St	Signalized	WBL	33	35	80	10	18	B				
230	Concession St / Alfred St	Signalized	WBT	404	35	80	8	12	B				
230	Concession St / Alfred St	Signalized	WBR	0	35	80	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	5.0	A	0.6	A
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBT	545	0	0	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	12	0	0	3	5	A				
240	Concession St / Lansdowne St	TWSC	WBT	440	0	0	0	0	A				
250	Concession St / Division St	Signalized	NBL	15	25	50	22	31	C	38.0	D	20.9	C
250	Concession St / Division St	Signalized	NBT	213	25	50	15	20	B				
250	Concession St / Division St	Signalized	NBR	7	25	50	15	22	C				
250	Concession St / Division St	Signalized	SBL	32	50	105	18	26	C				
250	Concession St / Division St	Signalized	SBT	368	50	105	16	22	C				
250	Concession St / Division St	Signalized	SBR	202	50	105	2	6	A				
250	Concession St / Division St	Signalized	EBL	184	35	105	14	21	C				
250	Concession St / Division St	Signalized	EBT	359	35	105	12	17	B				
250	Concession St / Division St	Signalized	EBR	13	35	105	6	8	A				
250	Concession St / Division St	Signalized	WBL	19	40	70	29	38	D				
250	Concession St / Division St	Signalized	WBT	232	40	70	28	36	D				
250	Concession St / Division St	Signalized	WBR	17	40	70	21	29	C				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 22% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	19	0	20	2	3	A	8.0	A	0.2	A
260	Adelaide St / Division St	TWSC	NBT	232	0	20	0	0	A				
260	Adelaide St / Division St	TWSC	NBR	0	0	20	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	14	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	SBT	375	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	SBR	9	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	EBL	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	EBT	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	2	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBT	2	0	5	0	8	A				
260	Adelaide St / Division St	TWSC	WBR	5	0	5	0	7	A				
270	Stanley St / Division St	TWSC	NBL	16	0	0	1	3	A	10.0	A	1.8	A
270	Stanley St / Division St	TWSC	NBT	245	0	0	0	0	A				
270	Stanley St / Division St	TWSC	SBT	375	0	25	1	2	A				
270	Stanley St / Division St	TWSC	SBR	1	0	25	0	0	A				
270	Stanley St / Division St	TWSC	EBL	5	5	5	2	9	A				
270	Stanley St / Division St	TWSC	EBR	36	5	5	3	10	A				
280	Pine St / Division St	Signalized	NBL	9	5	30	10	17	B	30.0	C	8.8	A
280	Pine St / Division St	Signalized	NBT	203	5	30	3	5	A				
280	Pine St / Division St	Signalized	NBR	4	5	30	3	4	A				
280	Pine St / Division St	Signalized	SBL	33	20	70	4	7	A				
280	Pine St / Division St	Signalized	SBT	378	20	70	4	8	A				
280	Pine St / Division St	Signalized	SBR	0	20	70	0	0	A				
280	Pine St / Division St	Signalized	EBL	0	5	15	0	0	A				
280	Pine St / Division St	Signalized	EBT	32	5	15	24	30	C				
280	Pine St / Division St	Signalized	EBR	13	5	15	4	9	A				
280	Pine St / Division St	Signalized	WBL	18	5	20	20	26	C				
280	Pine St / Division St	Signalized	WBT	5	5	20	17	23	C				
280	Pine St / Division St	Signalized	WBR	57	5	20	4	9	A				
290	Quebec St / Division St	TWSC	NBT	218	0	0	0	0	A	10.0	A	0.9	A
290	Quebec St / Division St	TWSC	NBR	3	0	0	0	0	A				
290	Quebec St / Division St	TWSC	SBL	4	0	50	1	3	A				
290	Quebec St / Division St	TWSC	SBT	407	0	50	0	1	A				
290	Quebec St / Division St	TWSC	WBL	17	0	5	2	10	A				
290	Quebec St / Division St	TWSC	WBR	1	0	5	0	6	A				
300	York St / Division St	Signalized	NBL	0	20	35	0	0	A	30.0	C	7.5	A
300	York St / Division St	Signalized	NBT	191	20	35	3	5	A				
300	York St / Division St	Signalized	NBR	12	20	35	2	4	A				
300	York St / Division St	Signalized	SBL	38	10	35	4	8	A				
300	York St / Division St	Signalized	SBT	388	10	35	3	4	A				
300	York St / Division St	Signalized	SBR	0	10	35	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	20	0	0	A				
300	York St / Division St	Signalized	EBT	46	5	20	24	28	C				
300	York St / Division St	Signalized	EBR	7	5	20	21	27	C				
300	York St / Division St	Signalized	WBL	9	5	20	22	26	C				
300	York St / Division St	Signalized	WBT	23	5	20	22	30	C				
300	York St / Division St	Signalized	WBR	27	5	20	4	11	B				
310	Main St / Division St	TWSC	NBT	200	0	10	1	2	A	9.0	A	0.8	A
310	Main St / Division St	TWSC	NBR	0	0	10	0	0	A				
310	Main St / Division St	TWSC	SBL	15	35	35	0	2	A				
310	Main St / Division St	TWSC	SBT	390	35	35	0	0	A				
310	Main St / Division St	TWSC	WBL	0	0	5	0	0	A				
310	Main St / Division St	TWSC	WBR	5	0	5	1	9	A				
320	Hamilton St / Division St	TWSC	NBL	0	0	0	0	0	A	9.0	A	0.1	A
320	Hamilton St / Division St	TWSC	NBT	192	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBT	383	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	6	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	8	0	5	1	9	A				
320	Hamilton St / Division St	TWSC	EBR	2	0	5	0	6	A				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 22% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
330	Raglan St / Division St	TWSC	NBT	186	0	0	0	0	A	11.0	B	0.1	A
330	Raglan St / Division St	TWSC	NBR	6	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	15	0	0	0	1	A				
330	Raglan St / Division St	TWSC	SBT	371	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	2	0	5	3	11	B				
330	Raglan St / Division St	TWSC	WBR	5	0	5	0	7	A				
340	Elm St / Division St	TWSC	NBL	2	0	0	0	1	A	6.0	A	0.1	A
340	Elm St / Division St	TWSC	NBT	188	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBT	371	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	2	0	0	0	0	A				
340	Elm St / Division St	TWSC	EBL	4	0	5	1	6	A				
340	Elm St / Division St	TWSC	EBR	1	0	5	0	6	A				
350	Ellice St / Division St	TWSC	NBT	182	0	0	0	0	A	8.0	A	0.2	A
350	Ellice St / Division St	TWSC	NBR	8	0	0	0	0	A				
350	Ellice St / Division St	TWSC	SBL	8	0	0	0	1	A				
350	Ellice St / Division St	TWSC	SBT	366	0	0	0	0	A				
350	Ellice St / Division St	TWSC	WBL	4	0	5	1	8	A				
350	Ellice St / Division St	TWSC	WBR	7	0	5	0	7	A				
360	Colborne St / Division St	TWSC	NBL	0	0	20	0	0	A	12.0	B	1.8	A
360	Colborne St / Division St	TWSC	NBT	177	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	0	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	11	0	15	0	2	A				
360	Colborne St / Division St	TWSC	SBT	360	0	15	1	2	A				
360	Colborne St / Division St	TWSC	SBR	0	0	15	0	0	A				
360	Colborne St / Division St	TWSC	EBL	10	0	5	2	9	A				
360	Colborne St / Division St	TWSC	EBT	4	0	5	3	10	A				
360	Colborne St / Division St	TWSC	EBR	2	0	5	0	11	B				
360	Colborne St / Division St	TWSC	WBL	4	0	5	1	10	A				
360	Colborne St / Division St	TWSC	WBT	4	0	5	2	12	B				
360	Colborne St / Division St	TWSC	WBR	4	0	5	0	7	A				
370	Queen St / Division St	Signalized	NBT	56	15	25	7	9	A	20.0	B	14.7	B
370	Queen St / Division St	Signalized	NBR	123	15	25	1	10	A				
370	Queen St / Division St	Signalized	SBL	115	40	75	13	20	B				
370	Queen St / Division St	Signalized	SBT	250	40	75	14	20	B				
370	Queen St / Division St	Signalized	WBL	174	20	30	10	16	B				
370	Queen St / Division St	Signalized	WBR	119	20	30	0	4	A				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 22% Auto M.S. - PM Peak

Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LOS
10	Princess St / Concession St	Signalized	3,314	51.1	84.9	31.2	25.5	C
20	Princess St / Regent St	TWSC	1,376	0.1	42.1	2.3	0.6	-
30	Princess St / Drayton Av	TWSC	1,305	3.6	32.6	2.4	0.4	-
40	Princess St / Macdonnell Av	Signalized	1,302	71.0	123.8	17.9	12.5	B
50	Princess St / Smith St	TWSC	1,063	35.6	66.3	5.2	3.2	-
60	Princess St / Victoria St	Signalized	1,362	27.3	71.9	11.2	6.3	B
70	Princess St / Nelson St	TWSC	1,298	10.6	85.7	4.9	2.0	-
80	Princess St / Albert St	Signalized	1,206	35.5	67.5	15.7	11.0	B
90	Princess St / Frontenac St	TWSC	1,063	0.0	32.7	2.2	0.7	-
100	Princess St / Alfred St	Signalized	1,422	58.6	77.3	25.1	17.9	C
110	Princess St / Chatham St	TWSC	1,168	12.4	78.2	5.8	2.2	-
120	Princess St / University Av	Signalized	1,095	25.2	49.7	7.3	4.0	A
130	Princess St / Division St	Signalized	1,454	20.7	57.0	13.7	9.1	B
140	Concession St / Drayton Av	TWSC	1,128	123.0	296.4	48.1	29.8	-
150	Concession St / Leroy Grant Dr (S)	TWSC	1,187	73.6	73.7	34.4	21.8	-
155	Concession St / Leroy Grant Drive (N)	TWSC	1,263	3.1	7.6	4.3	2.0	-
160	Concession St / Macdonnell St	Signalized	2,163	72.9	78.9	17.0	11.6	B
170	Concession St / Connaught St	TWSC	1,808	35.1	104.3	7.2	3.6	-
180	Concession St / Victoria St	Signalized	1,917	91.9	97.5	16.6	10.7	B
190	Concession St / Nelson St	TWSC	1,694	4.9	46.3	3.9	2.2	-
200	Concession St / Kingscourt Av	TWSC	1,637	0.0	79.4	2.2	1.1	-
210	Concession St / Fergus St	TWSC	1,636	0.0	66.9	2.2	0.6	-
220	Concession St / Grey St	TWSC	1,645	12.4	54.6	5.3	3.8	-
230	Concession St / Alfred St	Signalized	1,807	58.4	88.6	16.8	11.0	B
240	Concession St / Lansdowne St	TWSC	1,121	0.0	8.7	0.7	0.0	-
250	Concession St / Division St	Signalized	2,167	70.4	145.3	29.7	23.0	C
260	Adelaide St / Division St	TWSC	1,107	0.0	51.3	2.3	1.2	-
270	Stanley St / Division St	TWSC	1,092	0.3	12.2	1.6	0.5	-
280	Pine St / Division St	Signalized	1,157	22.2	66.5	9.2	5.7	A
290	Quebec St / Division St	TWSC	988	0.0	60.9	1.2	0.1	-
300	York St / Division St	Signalized	1,118	21.7	38.7	7.4	4.8	A
310	Main St / Division St	TWSC	971	26.4	47.9	3.4	1.7	-
320	Hamilton St / Division St	TWSC	981	0.0	11.0	1.2	0.6	-
330	Raglan St / Division St	TWSC	993	0.1	0.1	0.3	0.1	-
340	Elm St / Division St	TWSC	1,043	0.0	11.3	0.8	0.1	-
350	Ellice St / Division St	TWSC	1,005	0.0	14.3	0.5	0.0	-
360	Colborne St / Division St	TWSC	991	0.0	28.0	1.0	0.5	-
370	Queen St / Division St	Signalized	1,507	45.2	85.2	17.0	9.5	B
Total			52,554	1,013	2,445	379	241	

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 22% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt		Intersection	
					50th	95th					Delay	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	317	40	80	33	40	D	51.0	D	31.2	C	
10	Princess St / Concession St	Signalized	NBT	258	40	80	34	41	D					
10	Princess St / Concession St	Signalized	NBR	0	40	80	0	0	A					
10	Princess St / Concession St	Signalized	SBL	606	80	135	42	51	D					
10	Princess St / Concession St	Signalized	SBT	453	80	135	39	48	D					
10	Princess St / Concession St	Signalized	SBR	0	80	135	0	0	A					
10	Princess St / Concession St	Signalized	EBT	310	30	55	30	36	D					
10	Princess St / Concession St	Signalized	EBR	264	30	55	0	2	A					
10	Princess St / Concession St	Signalized	WBT	396	40	55	32	39	D					
10	Princess St / Concession St	Signalized	WBR	686	40	55	0	0	A					
10	Princess St / Concession St	Signalized	WBL	24	40	55	13	17	B					
20	Princess St / Regent St	TWSC	NBL	1	5	10	0	0	A	10.0	A	2.3	A	
20	Princess St / Regent St	TWSC	NBR	33	5	10	3	10	A					
20	Princess St / Regent St	TWSC	EBT	646	0	15	0	2	A					
20	Princess St / Regent St	TWSC	EBR	72	0	15	0	1	A					
20	Princess St / Regent St	TWSC	WBL	34	0	75	5	8	A					
20	Princess St / Regent St	TWSC	WBT	590	0	75	1	2	A					
30	Princess St / Drayton Av	TWSC	SBL	4	45	55	17	35	D	35.0	D	2.4	A	
30	Princess St / Drayton Av	TWSC	SBR	101	45	55	4	17	C					
30	Princess St / Drayton Av	TWSC	EBL	31	0	35	3	5	A					
30	Princess St / Drayton Av	TWSC	EBT	647	0	35	0	1	A					
30	Princess St / Drayton Av	TWSC	WBT	522	0	25	0	1	A					
30	Princess St / Drayton Av	TWSC	WBR	0	0	25	0	0	A					
40	Princess St / Macdonnell Av	Signalized	NBL	26	10	25	14	20	B	33.0	C	17.9	B	
40	Princess St / Macdonnell Av	Signalized	NBT	84	10	25	12	17	B					
40	Princess St / Macdonnell Av	Signalized	NBR	14	10	25	5	10	A					
40	Princess St / Macdonnell Av	Signalized	SBL	0	15	40	0	0	A					
40	Princess St / Macdonnell Av	Signalized	SBT	39	15	40	12	17	B					
40	Princess St / Macdonnell Av	Signalized	SBR	35	15	40	4	11	B					
40	Princess St / Macdonnell Av	Signalized	EBL	29	105	200	25	33	C					
40	Princess St / Macdonnell Av	Signalized	EBT	573	105	200	14	21	C					
40	Princess St / Macdonnell Av	Signalized	EBR	33	105	200	9	15	B					
40	Princess St / Macdonnell Av	Signalized	WBL	8	50	60	20	29	C					
40	Princess St / Macdonnell Av	Signalized	WBT	461	50	60	11	14	B					
40	Princess St / Macdonnell Av	Signalized	WBR	0	50	60	0	0	A					
50	Princess St / Smith St	TWSC	SBL	4	40	40	8	16	C	25.0	C	5.2	A	
50	Princess St / Smith St	TWSC	SBR	10	40	40	13	25	C					
50	Princess St / Smith St	TWSC	EBL	9	40	60	2	3	A					
50	Princess St / Smith St	TWSC	EBT	577	40	60	0	1	A					
50	Princess St / Smith St	TWSC	WBT	463	30	75	7	10	A					
50	Princess St / Smith St	TWSC	WBR	0	30	75	0	0	A					
60	Princess St / Victoria St	Signalized	NBL	15	20	50	20	31	C	31.0	C	11.2	B	
60	Princess St / Victoria St	Signalized	NBT	44	20	50	18	26	C					
60	Princess St / Victoria St	Signalized	NBR	100	20	50	9	16	B					
60	Princess St / Victoria St	Signalized	SBL	9	5	20	15	22	C					
60	Princess St / Victoria St	Signalized	SBT	43	5	20	17	23	C					
60	Princess St / Victoria St	Signalized	SBR	12	5	20	2	5	A					
60	Princess St / Victoria St	Signalized	EBL	14	15	90	13	18	B					
60	Princess St / Victoria St	Signalized	EBT	546	15	90	2	6	A					
60	Princess St / Victoria St	Signalized	EBR	25	15	90	3	7	A					
60	Princess St / Victoria St	Signalized	WBL	18	45	65	15	19	B					
60	Princess St / Victoria St	Signalized	WBT	447	45	65	8	13	B					
60	Princess St / Victoria St	Signalized	WBR	89	45	65	6	11	B					
70	Princess St / Nelson St	TWSC	NBL	16	5	45	15	25	C	25.0	C	4.9	A	
70	Princess St / Nelson St	TWSC	NBT	5	5	45	6	20	C					
70	Princess St / Nelson St	TWSC	NBR	2	5	45	7	19	C					
70	Princess St / Nelson St	TWSC	SBL	0	0	0	0	0	A					
70	Princess St / Nelson St	TWSC	SBT	0	0	0	0	0	A					
70	Princess St / Nelson St	TWSC	SBR	0	0	0	0	0	A					
70	Princess St / Nelson St	TWSC	EBL	198	20	105	3	8	A					
70	Princess St / Nelson St	TWSC	EBT	481	20	105	2	6	A					
70	Princess St / Nelson St	TWSC	EBR	3	20	105	0	5	A					
70	Princess St / Nelson St	TWSC	WBL	29	0	65	5	8	A					
70	Princess St / Nelson St	TWSC	WBT	550	0	65	1	2	A					
70	Princess St / Nelson St	TWSC	WBR	14	0	65	2	3	A					

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	50	10	25	17	23	C	35.0	C	15.7	B
80	Princess St / Albert St	Signalized	NBT	13	10	25	13	19	B				
80	Princess St / Albert St	Signalized	NBR	43	10	25	4	9	A				
80	Princess St / Albert St	Signalized	SBL	1	5	15	0	0	A				
80	Princess St / Albert St	Signalized	SBT	27	5	15	16	20	B				
80	Princess St / Albert St	Signalized	SBR	30	5	15	3	7	A				
80	Princess St / Albert St	Signalized	EBL	37	45	80	26	35	C				
80	Princess St / Albert St	Signalized	EBT	447	45	80	12	17	B				
80	Princess St / Albert St	Signalized	EBR	13	45	80	12	17	B				
80	Princess St / Albert St	Signalized	WBL	8	35	70	17	21	C				
80	Princess St / Albert St	Signalized	WBT	525	35	70	9	13	B				
80	Princess St / Albert St	Signalized	WBR	12	35	70	14	20	B				
90	Princess St / Frontenac St	TWSC	NBL	2	0	5	2	9	A	13.0	B	2.2	A
90	Princess St / Frontenac St	TWSC	NBT	10	0	5	4	13	B				
90	Princess St / Frontenac St	TWSC	NBR	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	EBL	58	0	70	4	7	A				
90	Princess St / Frontenac St	TWSC	EBT	437	0	70	1	4	A				
90	Princess St / Frontenac St	TWSC	EBR	0	0	70	0	0	A				
90	Princess St / Frontenac St	TWSC	WBL	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBT	544	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBR	12	0	0	0	1	A				
100	Princess St / Alfred St	Signalized	NBL	47	25	55	13	21	C	49.0	D	25.1	C
100	Princess St / Alfred St	Signalized	NBT	116	25	55	13	19	B				
100	Princess St / Alfred St	Signalized	NBR	116	25	55	7	14	B				
100	Princess St / Alfred St	Signalized	SBL	61	10	25	19	27	C				
100	Princess St / Alfred St	Signalized	SBT	51	10	25	16	22	C				
100	Princess St / Alfred St	Signalized	SBR	15	10	25	10	17	B				
100	Princess St / Alfred St	Signalized	EBL	12	60	90	41	49	D				
100	Princess St / Alfred St	Signalized	EBT	426	60	90	19	27	C				
100	Princess St / Alfred St	Signalized	EBR	15	60	90	18	26	C				
100	Princess St / Alfred St	Signalized	WBL	34	85	90	13	20	B				
100	Princess St / Alfred St	Signalized	WBT	492	85	90	22	29	C				
100	Princess St / Alfred St	Signalized	WBR	37	85	90	6	10	A				
110	Princess St / Chatham St	TWSC	SBL	0	0	5	0	0	A	31.0	D	5.8	A
110	Princess St / Chatham St	TWSC	SBR	3	0	5	14	31	D				
110	Princess St / Chatham St	TWSC	EBL	110	10	105	4	9	A				
110	Princess St / Chatham St	TWSC	EBT	491	10	105	2	7	A				
110	Princess St / Chatham St	TWSC	WBT	557	15	50	2	4	A				
110	Princess St / Chatham St	TWSC	WBR	7	15	50	1	3	A				
120	Princess St / University Av	Signalized	NBL	73	5	25	16	22	C	22.0	C	7.3	A
120	Princess St / University Av	Signalized	NBR	23	5	25	4	9	A				
120	Princess St / University Av	Signalized	EBT	448	45	70	4	8	A				
120	Princess St / University Av	Signalized	EBR	40	45	70	3	7	A				
120	Princess St / University Av	Signalized	WBL	25	10	35	8	13	B				
120	Princess St / University Av	Signalized	WBT	486	10	35	2	4	A				
130	Princess St / Division St	Signalized	NBL	72	20	40	13	23	C	27.0	C	13.7	B
130	Princess St / Division St	Signalized	NBT	156	20	40	14	20	B				
130	Princess St / Division St	Signalized	NBR	10	20	40	8	13	B				
130	Princess St / Division St	Signalized	SBL	195	15	70	6	10	A				
130	Princess St / Division St	Signalized	SBT	108	15	70	3	4	A				
130	Princess St / Division St	Signalized	SBR	443	15	70	0	1	A				
130	Princess St / Division St	Signalized	EBL	127	30	45	19	26	C				
130	Princess St / Division St	Signalized	EBT	309	30	45	19	27	C				
130	Princess St / Division St	Signalized	EBR	34	30	45	7	14	B				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	22	20	115	665	695	F	695.0	F	48.1	E
140	Concession St / Drayton Av	TWSC	EBT	1,066	125	300	17	35	D				
140	Concession St / Drayton Av	TWSC	EBR	40	125	300	21	42	E				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	22	0	5	12	26	D	48.0	E	34.4	D
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	190	75	75	37	48	E				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	975	75	75	19	32	D				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	101	20	50	12	25	C	28.0	D	4.3	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	89	20	50	13	28	D				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	22	5	5	6	17	C				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	6	5	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	1,007	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	38	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	101	20	35	22	28	C	71.0	E	17.0	B
160	Concession St / Macdonnell St	Signalized	NBT	26	20	35	21	27	C				
160	Concession St / Macdonnell St	Signalized	NBR	36	20	35	20	27	C				
160	Concession St / Macdonnell St	Signalized	SBR	68	5	15	5	9	A				
160	Concession St / Macdonnell St	Signalized	EBL	60	75	80	49	60	E				
160	Concession St / Macdonnell St	Signalized	EBT	848	75	80	8	13	B				
160	Concession St / Macdonnell St	Signalized	EBR	97	75	80	7	12	B				
160	Concession St / Macdonnell St	Signalized	WBL	50	85	90	58	71	E				
160	Concession St / Macdonnell St	Signalized	WBT	877	85	90	9	14	B				
160	Concession St / Macdonnell St	Signalized	WBR	0	85	90	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	0	0	5	0	0	A	23.0	C	7.2	A
170	Concession St / Connaught St	TWSC	SBR	15	0	5	14	23	C				
170	Concession St / Connaught St	TWSC	EBL	0	10	95	0	0	A				
170	Concession St / Connaught St	TWSC	EBT	883	10	95	2	5	A				
170	Concession St / Connaught St	TWSC	WBT	910	60	115	5	9	A				
170	Concession St / Connaught St	TWSC	WBR	0	60	115	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	69	20	65	38	48	D	54.0	D	16.6	B
180	Concession St / Victoria St	Signalized	NBT	45	20	65	45	54	D				
180	Concession St / Victoria St	Signalized	NBR	23	20	65	39	50	D				
180	Concession St / Victoria St	Signalized	SBL	0	0	10	0	0	A				
180	Concession St / Victoria St	Signalized	SBT	20	0	10	21	26	C				
180	Concession St / Victoria St	Signalized	SBR	34	0	10	7	17	B				
180	Concession St / Victoria St	Signalized	EBL	31	115	115	15	22	C				
180	Concession St / Victoria St	Signalized	EBT	793	115	115	7	13	B				
180	Concession St / Victoria St	Signalized	EBR	64	115	115	8	15	B				
180	Concession St / Victoria St	Signalized	WBL	22	85	90	24	32	C				
180	Concession St / Victoria St	Signalized	WBT	802	85	90	9	14	B				
180	Concession St / Victoria St	Signalized	WBR	14	85	90	0	1	A				
190	Concession St / Nelson St	TWSC	NBL	7	0	5	25	36	E	36.0	E	3.9	A
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	39	0	5	7	15	B				
190	Concession St / Nelson St	TWSC	SBL	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	11	0	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	0	0	0	0	0	A				
190	Concession St / Nelson St	TWSC	EBT	765	0	0	0	0	A				
190	Concession St / Nelson St	TWSC	EBR	50	0	0	0	0	A				
190	Concession St / Nelson St	TWSC	WBL	7	10	95	5	10	A				
190	Concession St / Nelson St	TWSC	WBT	815	10	95	4	7	A				
190	Concession St / Nelson St	TWSC	WBR	0	10	95	0	0	A				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	0	0	15	0	0	A	23.0	C	2.2	A
200	Concession St / Kingscourt Av	TWSC	SBR	16	0	15	11	23	C				
200	Concession St / Kingscourt Av	TWSC	EBL	2	0	65	1	9	A				
200	Concession St / Kingscourt Av	TWSC	EBT	808	0	65	1	1	A				
200	Concession St / Kingscourt Av	TWSC	WBT	811	0	95	1	3	A				
200	Concession St / Kingscourt Av	TWSC	WBR	0	0	95	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	11	0	5	20	30	D	30.0	D	2.2	A
210	Concession St / Fergus St	TWSC	SBR	0	0	5	0	0	A				
210	Concession St / Fergus St	TWSC	EBL	0	0	95	0	0	A				
210	Concession St / Fergus St	TWSC	EBT	807	0	95	1	3	A				
210	Concession St / Fergus St	TWSC	WBT	813	0	40	0	1	A				
210	Concession St / Fergus St	TWSC	WBR	5	0	40	0	0	A				
220	Concession St / Grey St	TWSC	SBL	6	0	5	57	68	F	68.0	F	5.3	A
220	Concession St / Grey St	TWSC	SBR	10	0	5	14	22	C				
220	Concession St / Grey St	TWSC	EBL	0	25	100	0	0	A				
220	Concession St / Grey St	TWSC	EBT	816	25	100	7	10	A				
220	Concession St / Grey St	TWSC	WBT	808	0	10	0	0	A				
220	Concession St / Grey St	TWSC	WBR	5	0	10	0	0	A				
230	Concession St / Alfred St	Signalized	NBL	214	40	90	18	28	C	33.0	C	16.8	B
230	Concession St / Alfred St	Signalized	NBT	32	40	90	24	33	C				
230	Concession St / Alfred St	Signalized	NBR	34	40	90	13	22	C				
230	Concession St / Alfred St	Signalized	SBL	0	5	20	0	0	A				
230	Concession St / Alfred St	Signalized	SBT	34	5	20	15	21	C				
230	Concession St / Alfred St	Signalized	SBR	20	5	20	4	9	A				
230	Concession St / Alfred St	Signalized	EBL	23	55	60	18	24	C				
230	Concession St / Alfred St	Signalized	EBT	480	55	60	11	15	B				
230	Concession St / Alfred St	Signalized	EBR	322	55	60	2	4	A				
230	Concession St / Alfred St	Signalized	WBL	68	75	130	13	23	C				
230	Concession St / Alfred St	Signalized	WBT	580	75	130	12	19	B				
230	Concession St / Alfred St	Signalized	WBR	0	75	130	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	5.0	A	0.7	A
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBT	468	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	27	0	15	2	5	A				
240	Concession St / Lansdowne St	TWSC	WBT	626	0	15	0	1	A				
250	Concession St / Division St	Signalized	NBL	37	85	115	25	34	C	58.0	E	29.7	C
250	Concession St / Division St	Signalized	NBT	547	85	115	19	25	C				
250	Concession St / Division St	Signalized	NBR	13	85	115	14	19	B				
250	Concession St / Division St	Signalized	SBL	29	65	180	28	38	D				
250	Concession St / Division St	Signalized	SBT	449	65	180	19	25	C				
250	Concession St / Division St	Signalized	SBR	195	65	180	5	10	A				
250	Concession St / Division St	Signalized	EBL	210	30	75	20	27	C				
250	Concession St / Division St	Signalized	EBT	209	30	75	12	17	B				
250	Concession St / Division St	Signalized	EBR	33	30	75	3	6	A				
250	Concession St / Division St	Signalized	WBL	11	100	205	44	53	D				
250	Concession St / Division St	Signalized	WBT	402	100	205	48	58	E				
250	Concession St / Division St	Signalized	WBR	32	100	205	42	51	D				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	0	0	70	0	0	A	26.0	D	2.3	A
260	Adelaide St / Division St	TWSC	NBT	599	0	70	2	3	A				
260	Adelaide St / Division St	TWSC	NBR	0	0	70	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	0	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	SBT	434	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	SBR	59	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	EBL	3	0	5	16	26	D				
260	Adelaide St / Division St	TWSC	EBT	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBT	12	0	5	6	16	C				
260	Adelaide St / Division St	TWSC	WBR	0	0	5	0	0	A				
270	Stanley St / Division St	TWSC	NBL	0	0	0	0	0	A	14.0	B	1.6	A
270	Stanley St / Division St	TWSC	NBT	592	0	0	0	0	A				
270	Stanley St / Division St	TWSC	SBT	367	0	30	1	3	A				
270	Stanley St / Division St	TWSC	SBR	68	0	30	1	1	A				
270	Stanley St / Division St	TWSC	EBL	8	5	5	5	14	B				
270	Stanley St / Division St	TWSC	EBR	57	5	5	2	9	A				
280	Pine St / Division St	Signalized	NBL	37	20	75	9	16	B	39.0	D	9.2	A
280	Pine St / Division St	Signalized	NBT	521	20	75	4	6	A				
280	Pine St / Division St	Signalized	NBR	14	20	75	4	5	A				
280	Pine St / Division St	Signalized	SBL	32	30	70	10	17	B				
280	Pine St / Division St	Signalized	SBT	389	30	70	4	8	A				
280	Pine St / Division St	Signalized	SBR	7	30	70	2	6	A				
280	Pine St / Division St	Signalized	EBL	7	5	15	29	37	D				
280	Pine St / Division St	Signalized	EBT	25	5	15	23	28	C				
280	Pine St / Division St	Signalized	EBR	12	5	15	4	9	A				
280	Pine St / Division St	Signalized	WBL	5	10	30	30	39	D				
280	Pine St / Division St	Signalized	WBT	44	10	30	20	26	C				
280	Pine St / Division St	Signalized	WBR	64	10	30	5	11	B				
290	Quebec St / Division St	TWSC	NBT	570	0	70	0	1	A	14.0	B	1.2	A
290	Quebec St / Division St	TWSC	NBR	0	0	70	0	0	A				
290	Quebec St / Division St	TWSC	SBL	0	0	50	0	0	A				
290	Quebec St / Division St	TWSC	SBT	405	0	50	0	1	A				
290	Quebec St / Division St	TWSC	WBL	13	0	5	6	14	B				
290	Quebec St / Division St	TWSC	WBR	0	0	5	0	0	A				
300	York St / Division St	Signalized	NBL	0	35	35	0	0	A	34.0	C	7.4	A
300	York St / Division St	Signalized	NBT	521	35	35	2	4	A				
300	York St / Division St	Signalized	NBR	12	35	35	2	3	A				
300	York St / Division St	Signalized	SBL	15	10	50	12	16	B				
300	York St / Division St	Signalized	SBT	408	10	50	3	5	A				
300	York St / Division St	Signalized	SBR	0	10	50	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	15	0	0	A				
300	York St / Division St	Signalized	EBT	51	5	15	24	29	C				
300	York St / Division St	Signalized	EBR	6	5	15	16	20	B				
300	York St / Division St	Signalized	WBL	14	10	25	27	34	C				
300	York St / Division St	Signalized	WBT	41	10	25	23	30	C				
300	York St / Division St	Signalized	WBR	50	10	25	6	12	B				
310	Main St / Division St	TWSC	NBT	533	20	55	3	6	A	11.0	B	3.4	A
310	Main St / Division St	TWSC	NBR	0	20	55	0	0	A				
310	Main St / Division St	TWSC	SBL	0	35	40	0	0	A				
310	Main St / Division St	TWSC	SBT	429	35	40	0	0	A				
310	Main St / Division St	TWSC	WBL	9	0	5	4	11	B				
310	Main St / Division St	TWSC	WBR	0	0	5	0	0	A				
320	Hamilton St / Division St	TWSC	NBL	12	0	20	2	4	A	10.0	A	1.2	A
320	Hamilton St / Division St	TWSC	NBT	527	0	20	1	2	A				
320	Hamilton St / Division St	TWSC	SBT	435	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	2	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	4	0	5	3	10	A				
320	Hamilton St / Division St	TWSC	EBR	1	0	5	0	6	A				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
330	Raglan St / Division St	TWSC	NBT	528	0	0	0	0	A	12.0	B	0.3	A
330	Raglan St / Division St	TWSC	NBR	2	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	0	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBT	436	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	15	5	5	3	12	B				
330	Raglan St / Division St	TWSC	WBR	12	5	5	3	11	B				
340	Elm St / Division St	TWSC	NBL	58	0	20	1	3	A	8.0	A	0.8	A
340	Elm St / Division St	TWSC	NBT	527	0	20	0	1	A				
340	Elm St / Division St	TWSC	SBT	413	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	38	0	0	0	1	A				
340	Elm St / Division St	TWSC	EBL	3	0	5	1	8	A				
340	Elm St / Division St	TWSC	EBR	4	0	5	0	7	A				
350	Ellice St / Division St	TWSC	NBT	572	0	25	0	0	A	8.0	A	0.5	A
350	Ellice St / Division St	TWSC	NBR	2	0	25	0	0	A				
350	Ellice St / Division St	TWSC	SBL	6	0	0	2	4	A				
350	Ellice St / Division St	TWSC	SBT	412	0	0	0	1	A				
350	Ellice St / Division St	TWSC	WBL	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	WBR	13	0	5	1	8	A				
360	Colborne St / Division St	TWSC	NBL	2	0	20	0	3	A	14.0	B	1.0	A
360	Colborne St / Division St	TWSC	NBT	559	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	0	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	3	0	40	2	8	A				
360	Colborne St / Division St	TWSC	SBT	405	0	40	1	2	A				
360	Colborne St / Division St	TWSC	SBR	2	0	40	0	1	A				
360	Colborne St / Division St	TWSC	EBL	2	0	5	6	14	B				
360	Colborne St / Division St	TWSC	EBT	5	0	5	3	13	B				
360	Colborne St / Division St	TWSC	EBR	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBL	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBT	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBR	13	0	5	1	8	A				
370	Queen St / Division St	Signalized	NBT	182	10	50	6	8	A	28.0	C	17.0	B
370	Queen St / Division St	Signalized	NBR	100	10	50	1	9	A				
370	Queen St / Division St	Signalized	SBL	95	50	80	17	26	C				
370	Queen St / Division St	Signalized	SBT	313	50	80	13	19	B				
370	Queen St / Division St	Signalized	WBL	437	55	100	16	28	C				
370	Queen St / Division St	Signalized	WBR	380	55	100	1	7	A				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LOS
10	Princess St / Concession St	Signalized	2,667	40.2	62.2	26.6	21.3	C
20	Princess St / Regent St	TWSC	1,052	0.2	55.1	3.1	0.2	-
30	Princess St / Drayton Av	TWSC	1,005	0.0	58.5	1.8	0.1	-
40	Princess St / Macdonnell Av	Signalized	942	49.4	106.5	15.9	10.2	B
50	Princess St / Smith St	TWSC	782	28.2	35.6	0.9	0.3	-
60	Princess St / Victoria St	Signalized	1,012	12.7	59.2	7.9	4.1	A
70	Princess St / Nelson St	TWSC	930	1.4	16.3	2.0	0.4	-
80	Princess St / Albert St	Signalized	959	25.1	62.8	13.0	9.1	B
90	Princess St / Frontenac St	TWSC	856	0.0	27.1	0.9	0.0	-
100	Princess St / Alfred St	Signalized	1,205	44.8	69.9	23.6	16.6	C
110	Princess St / Chatham St	TWSC	845	0.0	30.5	1.5	0.0	-
120	Princess St / University Av	Signalized	824	15.2	53.1	5.6	2.8	A
130	Princess St / Division St	Signalized	1,015	17.7	54.0	16.7	11.7	B
140	Concession St / Drayton Av	TWSC	939	0.2	120.6	7.2	3.9	-
150	Concession St / Leroy Grant Dr (S)	TWSC	913	45.0	74.9	6.9	2.9	-
155	Concession St / Leroy Grant Drive (N)	TWSC	775	0.3	0.6	0.6	0.2	-
160	Concession St / Macdonnell St	Signalized	1,568	49.4	63.3	9.6	6.2	A
170	Concession St / Connaught St	TWSC	1,303	0.0	52.2	1.3	0.6	-
180	Concession St / Victoria St	Signalized	1,391	33.8	74.5	11.8	7.5	B
190	Concession St / Nelson St	TWSC	1,240	0.1	56.3	1.9	0.2	-
200	Concession St / Kingscourt Av	TWSC	1,231	0.2	43.1	2.7	1.2	-
210	Concession St / Fergus St	TWSC	1,261	0.2	53.8	4.4	2.3	-
220	Concession St / Grey St	TWSC	1,290	19.0	57.6	9.9	6.7	-
230	Concession St / Alfred St	Signalized	1,382	43.3	62.8	13.0	8.3	B
240	Concession St / Lansdowne St	TWSC	1,010	0.0	12.8	1.1	0.0	-
250	Concession St / Division St	Signalized	1,673	39.8	93.2	20.4	14.8	C
260	Adelaide St / Division St	TWSC	658	0.0	25.8	0.2	0.1	-
270	Stanley St / Division St	TWSC	679	0.3	11.3	1.8	0.7	-
280	Pine St / Division St	Signalized	751	17.4	49.9	8.3	5.1	A
290	Quebec St / Division St	TWSC	649	0.0	31.7	0.9	0.0	-
300	York St / Division St	Signalized	739	12.0	32.7	7.4	4.8	A
310	Main St / Division St	TWSC	605	23.3	26.6	0.8	0.3	-
320	Hamilton St / Division St	TWSC	592	0.0	0.1	0.1	0.0	-
330	Raglan St / Division St	TWSC	590	0.0	9.9	0.8	0.0	-
340	Elm St / Division St	TWSC	571	0.0	0.1	0.1	0.0	-
350	Ellice St / Division St	TWSC	576	0.0	0.1	0.2	0.0	-
360	Colborne St / Division St	TWSC	576	0.1	16.2	1.1	0.7	-
370	Queen St / Division St	Signalized	837	28.7	48.5	14.8	8.7	B
Total			37,893	548	1,710	247	152	

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	149	25	40	41	48	D	48.0	D	26.6	C
10	Princess St / Concession St	Signalized	NBT	100	25	40	35	42	D				
10	Princess St / Concession St	Signalized	NBR	32	25	40	0	2	A				
10	Princess St / Concession St	Signalized	SBL	505	65	95	29	37	D				
10	Princess St / Concession St	Signalized	SBT	495	65	95	29	38	D				
10	Princess St / Concession St	Signalized	SBR	30	65	95	14	18	B				
10	Princess St / Concession St	Signalized	EBT	398	30	50	28	33	C				
10	Princess St / Concession St	Signalized	EBR	224	30	50	0	2	A				
10	Princess St / Concession St	Signalized	WBT	244	20	35	26	31	C				
10	Princess St / Concession St	Signalized	WBR	402	20	35	0	0	A				
10	Princess St / Concession St	Signalized	WBL	88	20	35	2	4	A				
20	Princess St / Regent St	TWSC	NBL	0	5	10	0	0	A	12.0	B	3.1	A
20	Princess St / Regent St	TWSC	NBR	33	5	10	4	12	B				
20	Princess St / Regent St	TWSC	EBT	669	0	80	0	4	A				
20	Princess St / Regent St	TWSC	EBR	52	0	80	1	2	A				
20	Princess St / Regent St	TWSC	WBL	7	0	0	3	6	A				
20	Princess St / Regent St	TWSC	WBT	291	0	0	0	0	A				
30	Princess St / Drayton Av	TWSC	SBL	0	0	0	0	0	A	3.0	A	1.8	A
30	Princess St / Drayton Av	TWSC	SBR	0	0	0	0	0	A				
30	Princess St / Drayton Av	TWSC	EBL	137	0	75	1	3	A				
30	Princess St / Drayton Av	TWSC	EBT	567	0	75	0	2	A				
30	Princess St / Drayton Av	TWSC	WBT	299	0	20	0	1	A				
30	Princess St / Drayton Av	TWSC	WBR	2	0	20	0	0	A				
40	Princess St / Macdonnell Av	Signalized	NBL	43	5	25	12	18	B	27.0	C	15.9	B
40	Princess St / Macdonnell Av	Signalized	NBT	17	5	25	12	17	B				
40	Princess St / Macdonnell Av	Signalized	NBR	26	5	25	6	12	B				
40	Princess St / Macdonnell Av	Signalized	SBL	10	40	40	14	18	B				
40	Princess St / Macdonnell Av	Signalized	SBT	16	40	40	7	10	A				
40	Princess St / Macdonnell Av	Signalized	SBR	27	40	40	3	11	B				
40	Princess St / Macdonnell Av	Signalized	EBL	33	70	150	14	21	C				
40	Princess St / Macdonnell Av	Signalized	EBT	499	70	150	11	17	B				
40	Princess St / Macdonnell Av	Signalized	EBR	27	70	150	8	13	B				
40	Princess St / Macdonnell Av	Signalized	WBL	7	20	50	18	27	C				
40	Princess St / Macdonnell Av	Signalized	WBT	227	20	50	9	14	B				
40	Princess St / Macdonnell Av	Signalized	WBR	10	20	50	6	10	A				
50	Princess St / Smith St	TWSC	SBL	2	40	40	0	9	A	14.0	B	0.9	A
50	Princess St / Smith St	TWSC	SBR	15	40	40	2	14	B				
50	Princess St / Smith St	TWSC	EBL	4	40	40	0	1	A				
50	Princess St / Smith St	TWSC	EBT	531	40	40	0	0	A				
50	Princess St / Smith St	TWSC	WBT	230	0	25	1	2	A				
50	Princess St / Smith St	TWSC	WBR	0	0	25	0	0	A				
60	Princess St / Victoria St	Signalized	NBL	27	10	35	16	25	C	26.0	C	7.9	A
60	Princess St / Victoria St	Signalized	NBT	29	10	35	19	26	C				
60	Princess St / Victoria St	Signalized	NBR	44	10	35	6	12	B				
60	Princess St / Victoria St	Signalized	SBL	7	5	20	18	25	C				
60	Princess St / Victoria St	Signalized	SBT	61	5	20	15	20	B				
60	Princess St / Victoria St	Signalized	SBR	2	5	20	0	0	A				
60	Princess St / Victoria St	Signalized	EBL	10	10	80	10	16	B				
60	Princess St / Victoria St	Signalized	EBT	515	10	80	1	4	A				
60	Princess St / Victoria St	Signalized	EBR	8	10	80	1	3	A				
60	Princess St / Victoria St	Signalized	WBL	22	20	40	10	16	B				
60	Princess St / Victoria St	Signalized	WBT	202	20	40	4	7	A				
60	Princess St / Victoria St	Signalized	WBR	85	20	40	3	7	A				
70	Princess St / Nelson St	TWSC	NBL	9	40	45	4	17	C	21.0	C	2.0	A
70	Princess St / Nelson St	TWSC	NBT	12	40	45	8	20	C				
70	Princess St / Nelson St	TWSC	NBR	11	40	45	6	16	C				
70	Princess St / Nelson St	TWSC	SBL	8	0	5	7	21	C				
70	Princess St / Nelson St	TWSC	SBT	0	0	5	0	0	A				
70	Princess St / Nelson St	TWSC	SBR	9	0	5	2	16	C				
70	Princess St / Nelson St	TWSC	EBL	31	0	5	0	2	A				
70	Princess St / Nelson St	TWSC	EBT	534	0	5	0	1	A				
70	Princess St / Nelson St	TWSC	EBR	7	0	5	0	1	A				
70	Princess St / Nelson St	TWSC	WBL	14	0	35	5	8	A				
70	Princess St / Nelson St	TWSC	WBT	295	0	35	0	1	A				
70	Princess St / Nelson St	TWSC	WBR	0	0	35	0	0	A				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	13	5	15	13	18	B	31.0	C	13.0	B
80	Princess St / Albert St	Signalized	NBT	17	5	15	12	16	B				
80	Princess St / Albert St	Signalized	NBR	27	5	15	3	8	A				
80	Princess St / Albert St	Signalized	SBL	11	5	20	14	24	C				
80	Princess St / Albert St	Signalized	SBT	31	5	20	12	15	B				
80	Princess St / Albert St	Signalized	SBR	35	5	20	3	10	A				
80	Princess St / Albert St	Signalized	EBL	2	35	90	17	21	C				
80	Princess St / Albert St	Signalized	EBT	535	35	90	11	15	B				
80	Princess St / Albert St	Signalized	EBR	15	35	90	12	15	B				
80	Princess St / Albert St	Signalized	WBL	8	15	30	25	31	C				
80	Princess St / Albert St	Signalized	WBT	264	15	30	5	8	A				
80	Princess St / Albert St	Signalized	WBR	1	15	30	0	0	A				
90	Princess St / Frontenac St	TWSC	NBL	2	0	5	2	9	A	9.0	A	0.9	A
90	Princess St / Frontenac St	TWSC	NBT	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	NBR	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	12	0	5	0	7	A				
90	Princess St / Frontenac St	TWSC	EBL	29	0	40	0	3	A				
90	Princess St / Frontenac St	TWSC	EBT	541	0	40	0	1	A				
90	Princess St / Frontenac St	TWSC	EBR	8	0	40	0	1	A				
90	Princess St / Frontenac St	TWSC	WBL	4	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	WBT	259	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBR	1	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	27	20	40	16	22	C	40.0	D	23.6	C
100	Princess St / Alfred St	Signalized	NBT	109	20	40	12	18	B				
100	Princess St / Alfred St	Signalized	NBR	75	20	40	5	11	B				
100	Princess St / Alfred St	Signalized	SBL	32	25	60	16	25	C				
100	Princess St / Alfred St	Signalized	SBT	139	25	60	12	19	B				
100	Princess St / Alfred St	Signalized	SBR	63	25	60	6	12	B				
100	Princess St / Alfred St	Signalized	EBL	12	70	95	32	40	D				
100	Princess St / Alfred St	Signalized	EBT	506	70	95	21	29	C				
100	Princess St / Alfred St	Signalized	EBR	11	70	95	17	26	C				
100	Princess St / Alfred St	Signalized	WBL	9	30	50	22	29	C				
100	Princess St / Alfred St	Signalized	WBT	194	30	50	20	26	C				
100	Princess St / Alfred St	Signalized	WBR	28	30	50	2	6	A				
110	Princess St / Chatham St	TWSC	SBL	0	0	0	0	0	A	12.0	B	1.5	A
110	Princess St / Chatham St	TWSC	SBR	1	0	0	1	12	B				
110	Princess St / Chatham St	TWSC	EBL	15	0	25	0	2	A				
110	Princess St / Chatham St	TWSC	EBT	595	0	25	0	2	A				
110	Princess St / Chatham St	TWSC	WBT	230	0	45	0	0	A				
110	Princess St / Chatham St	TWSC	WBR	4	0	45	0	0	A				
120	Princess St / University Av	Signalized	NBL	38	5	10	17	23	C	25.0	C	5.6	A
120	Princess St / University Av	Signalized	NBR	23	5	10	4	9	A				
120	Princess St / University Av	Signalized	EBT	497	20	70	2	5	A				
120	Princess St / University Av	Signalized	EBR	61	20	70	1	4	A				
120	Princess St / University Av	Signalized	WBL	8	5	20	17	25	C				
120	Princess St / University Av	Signalized	WBT	197	5	20	2	3	A				
130	Princess St / Division St	Signalized	NBL	23	5	20	14	25	C	28.0	C	16.7	B
130	Princess St / Division St	Signalized	NBT	52	5	20	11	17	B				
130	Princess St / Division St	Signalized	NBR	1	5	20	0	0	A				
130	Princess St / Division St	Signalized	SBL	142	5	65	5	7	A				
130	Princess St / Division St	Signalized	SBT	98	5	65	3	4	A				
130	Princess St / Division St	Signalized	SBR	182	5	65	0	0	A				
130	Princess St / Division St	Signalized	EBL	128	30	50	20	28	C				
130	Princess St / Division St	Signalized	EBT	363	30	50	20	28	C				
130	Princess St / Division St	Signalized	EBR	26	30	50	7	14	B				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	36	5	10	27	38	E	38.0	E	7.2	A
140	Concession St / Drayton Av	TWSC	EBT	903	0	125	3	6	A				
140	Concession St / Drayton Av	TWSC	EBR	0	0	125	0	0	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	1	0	0	8	19	C	19.0	C	6.9	A
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	41	45	75	1	4	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	871	45	75	3	7	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	31	5	10	3	10	A	11.0	B	0.6	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	12	5	10	2	11	B				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	1	0	0	0	9	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	76	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	629	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	26	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	69	5	25	22	27	C	28.0	C	9.6	A
160	Concession St / Macdonnell St	Signalized	NBT	0	5	25	0	0	A				
160	Concession St / Macdonnell St	Signalized	NBR	4	5	25	15	25	C				
160	Concession St / Macdonnell St	Signalized	SBR	45	0	5	1	3	A				
160	Concession St / Macdonnell St	Signalized	EBL	36	75	75	14	22	C				
160	Concession St / Macdonnell St	Signalized	EBT	714	75	75	6	10	A				
160	Concession St / Macdonnell St	Signalized	EBR	124	75	75	4	8	A				
160	Concession St / Macdonnell St	Signalized	WBL	28	20	55	21	28	C				
160	Concession St / Macdonnell St	Signalized	WBT	548	20	55	4	6	A				
160	Concession St / Macdonnell St	Signalized	WBR	0	20	55	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	8	0	5	7	15	B	15.0	B	1.3	A
170	Concession St / Connaught St	TWSC	SBR	8	0	5	2	9	A				
170	Concession St / Connaught St	TWSC	EBL	17	0	95	4	7	A				
170	Concession St / Connaught St	TWSC	EBT	698	0	95	1	2	A				
170	Concession St / Connaught St	TWSC	WBT	568	0	0	0	0	A				
170	Concession St / Connaught St	TWSC	WBR	4	0	0	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	42	10	25	24	30	C	34.0	C	11.8	B
180	Concession St / Victoria St	Signalized	NBT	14	10	25	25	30	C				
180	Concession St / Victoria St	Signalized	NBR	21	10	25	9	15	B				
180	Concession St / Victoria St	Signalized	SBL	7	5	15	29	34	C				
180	Concession St / Victoria St	Signalized	SBT	30	5	15	24	29	C				
180	Concession St / Victoria St	Signalized	SBR	45	5	15	2	9	A				
180	Concession St / Victoria St	Signalized	EBL	20	35	75	9	14	B				
180	Concession St / Victoria St	Signalized	EBT	664	35	75	6	9	A				
180	Concession St / Victoria St	Signalized	EBR	8	35	75	7	11	B				
180	Concession St / Victoria St	Signalized	WBL	48	40	90	16	24	C				
180	Concession St / Victoria St	Signalized	WBT	488	40	90	6	11	B				
180	Concession St / Victoria St	Signalized	WBR	4	40	90	0	1	A				
190	Concession St / Nelson St	TWSC	NBL	6	0	5	14	22	C	22.0	C	1.9	A
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	5	0	5	1	8	A				
190	Concession St / Nelson St	TWSC	SBL	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	25	5	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	39	0	75	2	4	A				
190	Concession St / Nelson St	TWSC	EBT	649	0	75	0	2	A				
190	Concession St / Nelson St	TWSC	EBR	0	0	75	0	0	A				
190	Concession St / Nelson St	TWSC	WBL	10	0	35	2	5	A				
190	Concession St / Nelson St	TWSC	WBT	506	0	35	0	1	A				
190	Concession St / Nelson St	TWSC	WBR	0	0	35	0	0	A				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt		Intersection	
					50th	95th					LOS	Delay	LOS	
200	Concession St / Kingscourt Av	TWSC	SBL	43	5	15	19	29	D	29.0	D	2.7	A	
200	Concession St / Kingscourt Av	TWSC	SBR	4	5	15	6	20	C					
200	Concession St / Kingscourt Av	TWSC	EBL	24	0	80	2	5	A					
200	Concession St / Kingscourt Av	TWSC	EBT	630	0	80	1	3	A					
200	Concession St / Kingscourt Av	TWSC	WBT	510	0	0	0	0	A					
200	Concession St / Kingscourt Av	TWSC	WBR	20	0	0	0	0	A					
210	Concession St / Fergus St	TWSC	SBL	43	5	20	37	49	E	49.0	E	4.4	A	
210	Concession St / Fergus St	TWSC	SBR	1	5	20	1	10	A					
210	Concession St / Fergus St	TWSC	EBL	21	0	100	3	7	A					
210	Concession St / Fergus St	TWSC	EBT	649	0	100	2	5	A					
210	Concession St / Fergus St	TWSC	WBT	527	0	0	0	0	A					
210	Concession St / Fergus St	TWSC	WBR	20	0	0	0	0	A					
220	Concession St / Grey St	TWSC	SBL	29	5	30	100	115	F	115.0	F	9.9	A	
220	Concession St / Grey St	TWSC	SBR	14	5	30	60	70	F					
220	Concession St / Grey St	TWSC	EBL	21	35	105	10	17	C					
220	Concession St / Grey St	TWSC	EBT	674	35	105	7	12	B					
220	Concession St / Grey St	TWSC	WBT	531	0	0	0	0	A					
220	Concession St / Grey St	TWSC	WBR	21	0	0	0	0	A					
230	Concession St / Alfred St	Signalized	NBL	114	20	35	17	25	C	26.0	C	13.0	B	
230	Concession St / Alfred St	Signalized	NBT	10	20	35	19	26	C					
230	Concession St / Alfred St	Signalized	NBR	52	20	35	11	18	B					
230	Concession St / Alfred St	Signalized	SBL	2	5	20	14	22	C					
230	Concession St / Alfred St	Signalized	SBT	32	5	20	13	17	B					
230	Concession St / Alfred St	Signalized	SBR	34	5	20	4	9	A					
230	Concession St / Alfred St	Signalized	EBL	34	55	60	14	20	B					
230	Concession St / Alfred St	Signalized	EBT	504	55	60	8	12	B					
230	Concession St / Alfred St	Signalized	EBR	163	55	60	1	3	A					
230	Concession St / Alfred St	Signalized	WBL	33	40	85	10	17	B					
230	Concession St / Alfred St	Signalized	WBT	404	40	85	8	13	B					
230	Concession St / Alfred St	Signalized	WBR	0	40	85	0	0	A					
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	7.0	A	1.1	A	
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A					
240	Concession St / Lansdowne St	TWSC	EBT	558	0	15	0	1	A					
240	Concession St / Lansdowne St	TWSC	EBR	0	0	15	0	0	A					
240	Concession St / Lansdowne St	TWSC	WBL	12	0	10	4	7	A					
240	Concession St / Lansdowne St	TWSC	WBT	440	0	10	0	1	A					
250	Concession St / Division St	Signalized	NBL	15	25	50	22	31	C	35.0	C	20.4	C	
250	Concession St / Division St	Signalized	NBT	214	25	50	15	20	B					
250	Concession St / Division St	Signalized	NBR	10	25	50	10	16	B					
250	Concession St / Division St	Signalized	SBL	31	50	105	18	26	C					
250	Concession St / Division St	Signalized	SBT	367	50	105	16	22	C					
250	Concession St / Division St	Signalized	SBR	202	50	105	2	6	A					
250	Concession St / Division St	Signalized	EBL	193	35	110	13	19	B					
250	Concession St / Division St	Signalized	EBT	359	35	110	12	17	B					
250	Concession St / Division St	Signalized	EBR	13	35	110	6	8	A					
250	Concession St / Division St	Signalized	WBL	19	40	70	27	35	C					
250	Concession St / Division St	Signalized	WBT	233	40	70	28	35	C					
250	Concession St / Division St	Signalized	WBR	17	40	70	21	28	C					

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	19	0	20	2	3	A	8.0	A	0.2	A
260	Adelaide St / Division St	TWSC	NBT	232	0	20	0	0	A				
260	Adelaide St / Division St	TWSC	NBR	0	0	20	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	14	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	SBT	375	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	SBR	9	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	EBL	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	EBT	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	2	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBT	2	0	5	0	8	A				
260	Adelaide St / Division St	TWSC	WBR	5	0	5	0	8	A				
270	Stanley St / Division St	TWSC	NBL	16	0	0	1	3	A	10.0	A	1.8	A
270	Stanley St / Division St	TWSC	NBT	245	0	0	0	0	A				
270	Stanley St / Division St	TWSC	SBT	373	0	20	1	2	A				
270	Stanley St / Division St	TWSC	SBR	1	0	20	0	0	A				
270	Stanley St / Division St	TWSC	EBL	8	5	5	3	10	A				
270	Stanley St / Division St	TWSC	EBR	36	5	5	2	10	A				
280	Pine St / Division St	Signalized	NBL	9	10	30	10	17	B	29.0	C	8.3	A
280	Pine St / Division St	Signalized	NBT	203	10	30	3	5	A				
280	Pine St / Division St	Signalized	NBR	4	10	30	3	4	A				
280	Pine St / Division St	Signalized	SBL	33	25	70	4	8	A				
280	Pine St / Division St	Signalized	SBT	378	25	70	4	7	A				
280	Pine St / Division St	Signalized	SBR	0	25	70	0	0	A				
280	Pine St / Division St	Signalized	EBL	0	5	15	0	0	A				
280	Pine St / Division St	Signalized	EBT	31	5	15	24	29	C				
280	Pine St / Division St	Signalized	EBR	13	5	15	5	11	B				
280	Pine St / Division St	Signalized	WBL	18	5	20	20	26	C				
280	Pine St / Division St	Signalized	WBT	5	5	20	17	23	C				
280	Pine St / Division St	Signalized	WBR	57	5	20	4	9	A				
290	Quebec St / Division St	TWSC	NBT	218	0	0	0	0	A	9.0	A	0.9	A
290	Quebec St / Division St	TWSC	NBR	3	0	0	0	0	A				
290	Quebec St / Division St	TWSC	SBL	4	0	50	0	3	A				
290	Quebec St / Division St	TWSC	SBT	406	0	50	0	1	A				
290	Quebec St / Division St	TWSC	WBL	17	0	5	1	9	A				
290	Quebec St / Division St	TWSC	WBR	1	0	5	0	6	A				
300	York St / Division St	Signalized	NBL	0	20	35	0	0	A	30.0	C	7.4	A
300	York St / Division St	Signalized	NBT	191	20	35	3	5	A				
300	York St / Division St	Signalized	NBR	10	20	35	2	4	A				
300	York St / Division St	Signalized	SBL	38	10	35	5	8	A				
300	York St / Division St	Signalized	SBT	387	10	35	2	4	A				
300	York St / Division St	Signalized	SBR	0	10	35	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	20	0	0	A				
300	York St / Division St	Signalized	EBT	47	5	20	23	27	C				
300	York St / Division St	Signalized	EBR	7	5	20	13	19	B				
300	York St / Division St	Signalized	WBL	9	5	20	22	27	C				
300	York St / Division St	Signalized	WBT	23	5	20	22	30	C				
300	York St / Division St	Signalized	WBR	27	5	20	4	11	B				
310	Main St / Division St	TWSC	NBT	197	0	10	1	2	A	8.0	A	0.8	A
310	Main St / Division St	TWSC	NBR	0	0	10	0	0	A				
310	Main St / Division St	TWSC	SBL	15	35	35	0	2	A				
310	Main St / Division St	TWSC	SBT	388	35	35	0	0	A				
310	Main St / Division St	TWSC	WBL	0	0	5	0	0	A				
310	Main St / Division St	TWSC	WBR	5	0	5	0	8	A				
320	Hamilton St / Division St	TWSC	NBL	0	0	0	0	0	A	8.0	A	0.1	A
320	Hamilton St / Division St	TWSC	NBT	192	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBT	383	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	6	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	6	0	5	1	8	A				
320	Hamilton St / Division St	TWSC	EBR	5	0	5	1	7	A				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
330	Raglan St / Division St	TWSC	NBT	186	0	0	0	0	A	11.0	B	0.8	A
330	Raglan St / Division St	TWSC	NBR	9	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	17	0	15	0	2	A				
330	Raglan St / Division St	TWSC	SBT	371	0	15	0	1	A				
330	Raglan St / Division St	TWSC	WBL	2	0	5	3	11	B				
330	Raglan St / Division St	TWSC	WBR	5	0	5	0	7	A				
340	Elm St / Division St	TWSC	NBL	2	0	0	0	1	A	7.0	A	0.1	A
340	Elm St / Division St	TWSC	NBT	189	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBT	371	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	2	0	0	0	0	A				
340	Elm St / Division St	TWSC	EBL	6	0	5	1	7	A				
340	Elm St / Division St	TWSC	EBR	1	0	5	0	6	A				
350	Ellice St / Division St	TWSC	NBT	183	0	0	0	0	A	9.0	A	0.2	A
350	Ellice St / Division St	TWSC	NBR	8	0	0	0	0	A				
350	Ellice St / Division St	TWSC	SBL	8	0	0	0	1	A				
350	Ellice St / Division St	TWSC	SBT	366	0	0	0	0	A				
350	Ellice St / Division St	TWSC	WBL	4	0	5	1	9	A				
350	Ellice St / Division St	TWSC	WBR	7	0	5	0	7	A				
360	Colborne St / Division St	TWSC	NBL	0	0	20	0	0	A	10.0	A	1.1	A
360	Colborne St / Division St	TWSC	NBT	178	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	0	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	11	0	15	1	2	A				
360	Colborne St / Division St	TWSC	SBT	359	0	15	1	1	A				
360	Colborne St / Division St	TWSC	SBR	0	0	15	0	0	A				
360	Colborne St / Division St	TWSC	EBL	10	5	10	2	9	A				
360	Colborne St / Division St	TWSC	EBT	3	5	10	1	9	A				
360	Colborne St / Division St	TWSC	EBR	3	5	10	1	10	A				
360	Colborne St / Division St	TWSC	WBL	4	0	5	1	10	A				
360	Colborne St / Division St	TWSC	WBT	4	0	5	0	9	A				
360	Colborne St / Division St	TWSC	WBR	4	0	5	0	7	A				
370	Queen St / Division St	Signalized	NBT	57	10	25	7	9	A	21.0	C	14.8	B
370	Queen St / Division St	Signalized	NBR	123	10	25	1	10	A				
370	Queen St / Division St	Signalized	SBL	115	45	75	13	21	C				
370	Queen St / Division St	Signalized	SBT	249	45	75	14	20	B				
370	Queen St / Division St	Signalized	WBL	174	20	30	10	16	B				
370	Queen St / Division St	Signalized	WBR	119	20	30	0	4	A				

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 35% Auto M.S. - PM Peak

Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LOS
10	Princess St / Concession St	Signalized	3,351	53.9	94.3	32.0	26.2	C
20	Princess St / Regent St	TWSC	1,432	0.1	45.7	2.4	0.2	-
30	Princess St / Drayton Av	TWSC	1,359	3.4	42.6	2.6	0.6	-
40	Princess St / Macdonnell Av	Signalized	1,358	76.7	160.8	19.2	13.7	B
50	Princess St / Smith St	TWSC	1,105	35.6	70.7	5.2	2.8	-
60	Princess St / Victoria St	Signalized	1,373	28.8	74.8	10.7	5.8	B
70	Princess St / Nelson St	TWSC	1,308	10.6	115.5	5.5	2.5	-
80	Princess St / Albert St	Signalized	1,216	31.3	67.3	16.2	10.7	B
90	Princess St / Frontenac St	TWSC	1,068	2.3	39.4	2.6	0.7	-
100	Princess St / Alfred St	Signalized	1,431	56.9	87.1	25.9	18.6	C
110	Princess St / Chatham St	TWSC	1,174	12.5	87.9	5.4	2.6	-
120	Princess St / University Av	Signalized	1,111	25.2	51.3	7.5	4.3	A
130	Princess St / Division St	Signalized	1,469	29.3	57.0	13.5	9.1	B
140	Concession St / Drayton Av	TWSC	1,170	196.9	316.4	56.8	37.7	-
150	Concession St / Leroy Grant Dr (S)	TWSC	1,195	73.7	73.9	37.0	22.4	-
155	Concession St / Leroy Grant Drive (N)	TWSC	1,191	2.9	7.4	3.9	1.6	-
160	Concession St / Macdonnell St	Signalized	2,109	72.8	76.9	17.7	12.7	B
170	Concession St / Connaught St	TWSC	1,761	53.8	103.9	8.1	5.0	-
180	Concession St / Victoria St	Signalized	1,882	92.4	103.1	18.5	12.9	B
190	Concession St / Nelson St	TWSC	1,690	14.3	77.1	6.5	4.3	-
200	Concession St / Kingscourt Av	TWSC	1,621	0.0	94.2	6.7	3.6	-
210	Concession St / Fergus St	TWSC	1,616	0.0	99.3	6.4	3.8	-
220	Concession St / Grey St	TWSC	1,629	15.2	82.3	8.1	5.5	-
230	Concession St / Alfred St	Signalized	1,811	59.9	92.8	19.8	12.8	B
240	Concession St / Lansdowne St	TWSC	1,127	0.0	32.9	1.6	0.6	-
250	Concession St / Division St	Signalized	2,173	80.7	155.4	32.0	24.7	C
260	Adelaide St / Division St	TWSC	1,106	0.0	67.6	2.7	1.2	-
270	Stanley St / Division St	TWSC	1,091	0.3	12.2	2.3	0.6	-
280	Pine St / Division St	Signalized	1,163	22.2	66.0	9.8	6.2	A
290	Quebec St / Division St	TWSC	997	0.0	58.0	1.2	0.1	-
300	York St / Division St	Signalized	1,110	21.7	37.1	6.6	4.3	A
310	Main St / Division St	TWSC	964	26.6	48.5	3.3	1.7	-
320	Hamilton St / Division St	TWSC	976	0.0	13.8	1.2	0.0	-
330	Raglan St / Division St	TWSC	993	0.2	0.2	0.4	0.1	-
340	Elm St / Division St	TWSC	1,048	0.0	25.2	0.9	0.1	-
350	Ellice St / Division St	TWSC	1,007	0.0	25.7	0.6	0.0	-
360	Colborne St / Division St	TWSC	996	0.0	28.0	1.5	0.5	-
370	Queen St / Division St	Signalized	1,514	43.4	83.1	17.5	9.7	B
Total			52,695	1,144	2,775	420	270	

Williamsville Operational Analysis

2036 No Mitigation - Approved Growth, 35% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	305	45	105	34	41	D	50.0	D	32.0	C
10	Princess St / Concession St	Signalized	NBT	294	45	105	33	40	D				
10	Princess St / Concession St	Signalized	NBR	0	45	105	0	0	A				
10	Princess St / Concession St	Signalized	SBL	621	85	145	41	50	D				
10	Princess St / Concession St	Signalized	SBT	486	85	145	39	48	D				
10	Princess St / Concession St	Signalized	SBR	0	85	145	0	0	A				
10	Princess St / Concession St	Signalized	EBT	329	30	50	33	40	D				
10	Princess St / Concession St	Signalized	EBR	279	30	50	0	2	A				
10	Princess St / Concession St	Signalized	WBT	388	40	60	32	38	D				
10	Princess St / Concession St	Signalized	WBR	627	40	60	0	0	A				
10	Princess St / Concession St	Signalized	WBL	22	40	60	6	10	A				
20	Princess St / Regent St	TWSC	NBL	0	5	10	0	0	A	12.0	B	2.4	A
20	Princess St / Regent St	TWSC	NBR	33	5	10	3	12	B				
20	Princess St / Regent St	TWSC	EBT	683	0	65	0	3	A				
20	Princess St / Regent St	TWSC	EBR	72	0	65	0	1	A				
20	Princess St / Regent St	TWSC	WBL	34	0	25	6	8	A				
20	Princess St / Regent St	TWSC	WBT	610	0	25	0	1	A				
30	Princess St / Drayton Av	TWSC	SBL	4	45	50	22	44	E	44.0	E	2.6	A
30	Princess St / Drayton Av	TWSC	SBR	100	45	50	6	19	C				
30	Princess St / Drayton Av	TWSC	EBL	31	0	55	4	6	A				
30	Princess St / Drayton Av	TWSC	EBT	681	0	55	0	1	A				
30	Princess St / Drayton Av	TWSC	WBT	543	0	25	0	1	A				
30	Princess St / Drayton Av	TWSC	WBR	0	0	25	0	0	A				
40	Princess St / Macdonnell Av	Signalized	NBL	25	10	25	13	19	B	32.0	C	19.2	B
40	Princess St / Macdonnell Av	Signalized	NBT	86	10	25	12	17	B				
40	Princess St / Macdonnell Av	Signalized	NBR	9	10	25	7	14	B				
40	Princess St / Macdonnell Av	Signalized	SBL	0	10	40	0	0	A				
40	Princess St / Macdonnell Av	Signalized	SBT	38	10	40	14	21	C				
40	Princess St / Macdonnell Av	Signalized	SBR	32	10	40	4	12	B				
40	Princess St / Macdonnell Av	Signalized	EBL	30	115	275	24	31	C				
40	Princess St / Macdonnell Av	Signalized	EBT	606	115	275	16	23	C				
40	Princess St / Macdonnell Av	Signalized	EBR	38	115	275	15	22	C				
40	Princess St / Macdonnell Av	Signalized	WBL	10	50	55	24	32	C				
40	Princess St / Macdonnell Av	Signalized	WBT	484	50	55	11	14	B				
40	Princess St / Macdonnell Av	Signalized	WBR	0	50	55	0	0	A				
50	Princess St / Smith St	TWSC	SBL	3	40	40	5	14	B	27.0	D	5.2	A
50	Princess St / Smith St	TWSC	SBR	10	40	40	15	27	D				
50	Princess St / Smith St	TWSC	EBL	14	40	60	2	4	A				
50	Princess St / Smith St	TWSC	EBT	595	40	60	0	1	A				
50	Princess St / Smith St	TWSC	WBT	483	30	85	6	10	A				
50	Princess St / Smith St	TWSC	WBR	0	30	85	0	0	A				
60	Princess St / Victoria St	Signalized	NBL	16	20	45	19	28	C	30.0	C	10.7	B
60	Princess St / Victoria St	Signalized	NBT	41	20	45	17	23	C				
60	Princess St / Victoria St	Signalized	NBR	100	20	45	9	17	B				
60	Princess St / Victoria St	Signalized	SBL	12	5	20	22	30	C				
60	Princess St / Victoria St	Signalized	SBT	46	5	20	17	23	C				
60	Princess St / Victoria St	Signalized	SBR	15	5	20	0	3	A				
60	Princess St / Victoria St	Signalized	EBL	9	15	80	12	18	B				
60	Princess St / Victoria St	Signalized	EBT	562	15	80	1	5	A				
60	Princess St / Victoria St	Signalized	EBR	33	15	80	1	5	A				
60	Princess St / Victoria St	Signalized	WBL	14	50	85	19	25	C				
60	Princess St / Victoria St	Signalized	WBT	462	50	85	8	13	B				
60	Princess St / Victoria St	Signalized	WBR	63	50	85	6	11	B				
70	Princess St / Nelson St	TWSC	NBL	15	0	40	18	29	D	29.0	D	5.5	A
70	Princess St / Nelson St	TWSC	NBT	3	0	40	15	29	D				
70	Princess St / Nelson St	TWSC	NBR	0	0	40	0	0	A				
70	Princess St / Nelson St	TWSC	SBL	0	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	SBT	0	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	SBR	0	0	0	0	0	A				
70	Princess St / Nelson St	TWSC	EBL	188	20	105	4	9	A				
70	Princess St / Nelson St	TWSC	EBT	499	20	105	2	6	A				
70	Princess St / Nelson St	TWSC	EBR	6	20	105	1	4	A				
70	Princess St / Nelson St	TWSC	WBL	39	0	130	4	8	A				
70	Princess St / Nelson St	TWSC	WBT	544	0	130	2	3	A				
70	Princess St / Nelson St	TWSC	WBR	14	0	130	1	3	A				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	47	10	20	13	19	B	32.0	C	16.2	B
80	Princess St / Albert St	Signalized	NBT	12	10	20	11	16	B				
80	Princess St / Albert St	Signalized	NBR	42	10	20	3	8	A				
80	Princess St / Albert St	Signalized	SBL	0	5	15	0	0	A				
80	Princess St / Albert St	Signalized	SBT	26	5	15	16	20	B				
80	Princess St / Albert St	Signalized	SBR	34	5	15	1	6	A				
80	Princess St / Albert St	Signalized	EBL	49	40	80	23	32	C				
80	Princess St / Albert St	Signalized	EBT	452	40	80	12	18	B				
80	Princess St / Albert St	Signalized	EBR	10	40	80	10	15	B				
80	Princess St / Albert St	Signalized	WBL	8	30	70	16	21	C				
80	Princess St / Albert St	Signalized	WBT	521	30	70	9	14	B				
80	Princess St / Albert St	Signalized	WBR	15	30	70	13	19	B				
90	Princess St / Frontenac St	TWSC	NBL	4	0	5	7	13	B	13.0	B	2.6	A
90	Princess St / Frontenac St	TWSC	NBT	8	0	5	4	13	B				
90	Princess St / Frontenac St	TWSC	NBR	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	EBL	56	5	85	4	8	A				
90	Princess St / Frontenac St	TWSC	EBT	438	5	85	1	5	A				
90	Princess St / Frontenac St	TWSC	EBR	0	5	85	0	0	A				
90	Princess St / Frontenac St	TWSC	WBL	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBT	544	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBR	18	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	48	25	55	14	23	C	51.0	D	25.9	C
100	Princess St / Alfred St	Signalized	NBT	120	25	55	16	23	C				
100	Princess St / Alfred St	Signalized	NBR	113	25	55	8	14	B				
100	Princess St / Alfred St	Signalized	SBL	70	15	30	17	25	C				
100	Princess St / Alfred St	Signalized	SBT	51	15	30	16	25	C				
100	Princess St / Alfred St	Signalized	SBR	11	15	30	8	15	B				
100	Princess St / Alfred St	Signalized	EBL	18	60	120	41	51	D				
100	Princess St / Alfred St	Signalized	EBT	419	60	120	20	29	C				
100	Princess St / Alfred St	Signalized	EBR	15	60	120	20	28	C				
100	Princess St / Alfred St	Signalized	WBL	37	80	90	12	18	B				
100	Princess St / Alfred St	Signalized	WBT	498	80	90	22	28	C				
100	Princess St / Alfred St	Signalized	WBR	31	80	90	7	11	B				
110	Princess St / Chatham St	TWSC	SBL	0	0	5	0	0	A	19.0	C	5.4	A
110	Princess St / Chatham St	TWSC	SBR	2	0	5	3	19	C				
110	Princess St / Chatham St	TWSC	EBL	111	15	110	4	10	A				
110	Princess St / Chatham St	TWSC	EBT	488	15	110	3	7	A				
110	Princess St / Chatham St	TWSC	WBT	564	10	65	2	3	A				
110	Princess St / Chatham St	TWSC	WBR	9	10	65	2	3	A				
120	Princess St / University Av	Signalized	NBL	71	10	20	14	20	B	20.0	B	7.5	A
120	Princess St / University Av	Signalized	NBR	25	10	20	2	8	A				
120	Princess St / University Av	Signalized	EBT	434	45	70	5	9	A				
120	Princess St / University Av	Signalized	EBR	49	45	70	5	9	A				
120	Princess St / University Av	Signalized	WBL	30	10	40	9	13	B				
120	Princess St / University Av	Signalized	WBT	502	10	40	2	4	A				
130	Princess St / Division St	Signalized	NBL	86	20	40	14	24	C	26.0	C	13.5	B
130	Princess St / Division St	Signalized	NBT	156	20	40	13	19	B				
130	Princess St / Division St	Signalized	NBR	10	20	40	7	11	B				
130	Princess St / Division St	Signalized	SBL	204	35	70	7	11	B				
130	Princess St / Division St	Signalized	SBT	105	35	70	4	5	A				
130	Princess St / Division St	Signalized	SBR	445	35	70	0	1	A				
130	Princess St / Division St	Signalized	EBL	130	25	45	17	25	C				
130	Princess St / Division St	Signalized	EBT	301	25	45	19	26	C				
130	Princess St / Division St	Signalized	EBR	32	25	45	7	14	B				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	21	30	120	832	858	F	858.0	F	56.8	F
140	Concession St / Drayton Av	TWSC	EBT	1,110	200	320	23	42	E				
140	Concession St / Drayton Av	TWSC	EBR	39	200	320	28	48	E				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	20	0	10	19	32	D	49.0	E	37.0	E
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	177	75	75	36	49	E				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	998	75	75	20	35	D				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	85	20	50	10	24	C	25.0	C	3.9	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	89	20	50	10	25	C				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	20	0	5	9	18	C				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	8	0	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	950	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	39	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	97	20	40	23	29	C	84.0	F	17.7	B
160	Concession St / Macdonnell St	Signalized	NBT	25	20	40	21	30	C				
160	Concession St / Macdonnell St	Signalized	NBR	34	20	40	17	24	C				
160	Concession St / Macdonnell St	Signalized	SBR	67	5	10	6	10	A				
160	Concession St / Macdonnell St	Signalized	EBL	58	75	80	51	61	E				
160	Concession St / Macdonnell St	Signalized	EBT	865	75	80	9	14	B				
160	Concession St / Macdonnell St	Signalized	EBR	94	75	80	8	12	B				
160	Concession St / Macdonnell St	Signalized	WBL	48	85	85	71	84	F				
160	Concession St / Macdonnell St	Signalized	WBT	821	85	85	10	14	B				
160	Concession St / Macdonnell St	Signalized	WBR	0	85	85	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	0	0	5	0	0	A	27.0	D	8.1	A
170	Concession St / Connaught St	TWSC	SBR	16	0	5	16	27	D				
170	Concession St / Connaught St	TWSC	EBL	0	25	95	0	0	A				
170	Concession St / Connaught St	TWSC	EBT	893	25	95	2	5	A				
170	Concession St / Connaught St	TWSC	WBT	852	85	115	8	11	B				
170	Concession St / Connaught St	TWSC	WBR	0	85	115	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	41	10	115	68	82	F	82.0	F	18.5	B
180	Concession St / Victoria St	Signalized	NBT	48	10	115	50	61	E				
180	Concession St / Victoria St	Signalized	NBR	19	10	115	42	51	D				
180	Concession St / Victoria St	Signalized	SBL	0	0	10	0	0	A				
180	Concession St / Victoria St	Signalized	SBT	22	0	10	19	24	C				
180	Concession St / Victoria St	Signalized	SBR	35	0	10	12	21	C				
180	Concession St / Victoria St	Signalized	EBL	30	115	115	19	26	C				
180	Concession St / Victoria St	Signalized	EBT	801	115	115	8	13	B				
180	Concession St / Victoria St	Signalized	EBR	67	115	115	9	15	B				
180	Concession St / Victoria St	Signalized	WBL	25	85	95	22	30	C				
180	Concession St / Victoria St	Signalized	WBT	781	85	95	12	17	B				
180	Concession St / Victoria St	Signalized	WBR	13	85	95	0	1	A				
190	Concession St / Nelson St	TWSC	NBL	7	0	5	64	77	F	77.0	F	6.5	A
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	43	0	5	9	16	C				
190	Concession St / Nelson St	TWSC	SBL	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	12	0	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	0	0	65	0	0	A				
190	Concession St / Nelson St	TWSC	EBT	775	0	65	1	1	A				
190	Concession St / Nelson St	TWSC	EBR	50	0	65	0	1	A				
190	Concession St / Nelson St	TWSC	WBL	7	30	95	8	12	B				
190	Concession St / Nelson St	TWSC	WBT	796	30	95	7	11	B				
190	Concession St / Nelson St	TWSC	WBR	0	30	95	0	0	A				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	0	0	15	0	0	A	27.0	D	6.7	A
200	Concession St / Kingscourt Av	TWSC	SBR	17	0	15	16	27	D				
200	Concession St / Kingscourt Av	TWSC	EBL	2	0	95	2	10	A				
200	Concession St / Kingscourt Av	TWSC	EBT	815	0	95	2	5	A				
200	Concession St / Kingscourt Av	TWSC	WBT	787	0	95	5	8	A				
200	Concession St / Kingscourt Av	TWSC	WBR	0	0	95	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	12	0	5	49	59	F	59.0	F	6.4	A
210	Concession St / Fergus St	TWSC	SBR	0	0	5	0	0	A				
210	Concession St / Fergus St	TWSC	EBL	0	0	100	0	0	A				
210	Concession St / Fergus St	TWSC	EBT	814	0	100	4	7	A				
210	Concession St / Fergus St	TWSC	WBT	786	0	100	3	5	A				
210	Concession St / Fergus St	TWSC	WBR	4	0	100	0	0	A				
220	Concession St / Grey St	TWSC	SBL	6	0	5	91	101	F	101.0	F	8.1	A
220	Concession St / Grey St	TWSC	SBR	10	0	5	14	22	C				
220	Concession St / Grey St	TWSC	EBL	0	30	105	0	0	A				
220	Concession St / Grey St	TWSC	EBT	826	30	105	9	14	B				
220	Concession St / Grey St	TWSC	WBT	783	0	60	1	1	A				
220	Concession St / Grey St	TWSC	WBR	4	0	60	0	0	A				
230	Concession St / Alfred St	Signalized	NBL	182	35	95	21	32	C	32.0	C	19.8	B
230	Concession St / Alfred St	Signalized	NBT	30	35	95	22	30	C				
230	Concession St / Alfred St	Signalized	NBR	32	35	95	16	26	C				
230	Concession St / Alfred St	Signalized	SBL	1	5	15	0	0	A				
230	Concession St / Alfred St	Signalized	SBT	35	5	15	18	23	C				
230	Concession St / Alfred St	Signalized	SBR	24	5	15	6	12	B				
230	Concession St / Alfred St	Signalized	EBL	27	55	60	21	27	C				
230	Concession St / Alfred St	Signalized	EBT	468	55	60	12	16	B				
230	Concession St / Alfred St	Signalized	EBR	342	55	60	2	5	A				
230	Concession St / Alfred St	Signalized	WBL	88	80	140	14	24	C				
230	Concession St / Alfred St	Signalized	WBT	582	80	140	16	26	C				
230	Concession St / Alfred St	Signalized	WBR	0	80	140	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	4.0	A	1.6	A
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBT	453	0	0	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	29	0	55	1	4	A				
240	Concession St / Lansdowne St	TWSC	WBT	645	0	55	1	2	A				
250	Concession St / Division St	Signalized	NBL	40	85	110	21	30	C	69.0	E	32.0	C
250	Concession St / Division St	Signalized	NBT	550	85	110	19	26	C				
250	Concession St / Division St	Signalized	NBR	10	85	110	17	23	C				
250	Concession St / Division St	Signalized	SBL	27	70	210	31	41	D				
250	Concession St / Division St	Signalized	SBT	452	70	210	19	25	C				
250	Concession St / Division St	Signalized	SBR	207	70	210	5	10	A				
250	Concession St / Division St	Signalized	EBL	198	30	75	18	24	C				
250	Concession St / Division St	Signalized	EBT	199	30	75	13	17	B				
250	Concession St / Division St	Signalized	EBR	37	30	75	3	6	A				
250	Concession St / Division St	Signalized	WBL	11	140	210	55	67	E				
250	Concession St / Division St	Signalized	WBT	410	140	210	57	69	E				
250	Concession St / Division St	Signalized	WBR	32	140	210	49	60	E				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	0	0	100	0	0	A	19.0	C	2.7	A
260	Adelaide St / Division St	TWSC	NBT	598	0	100	2	4	A				
260	Adelaide St / Division St	TWSC	NBR	0	0	100	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	0	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	SBT	432	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	SBR	66	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	EBL	0	0	0	0	0	A				
260	Adelaide St / Division St	TWSC	EBT	0	0	0	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	0	0	0	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBT	10	0	5	9	19	C				
260	Adelaide St / Division St	TWSC	WBR	0	0	5	0	0	A				
270	Stanley St / Division St	TWSC	NBL	0	0	0	0	0	A	16.0	C	2.3	A
270	Stanley St / Division St	TWSC	NBT	595	0	0	0	1	A				
270	Stanley St / Division St	TWSC	SBT	365	0	30	1	3	A				
270	Stanley St / Division St	TWSC	SBR	67	0	30	1	2	A				
270	Stanley St / Division St	TWSC	EBL	4	5	5	8	16	C				
270	Stanley St / Division St	TWSC	EBR	60	5	5	3	10	A				
280	Pine St / Division St	Signalized	NBL	38	20	75	9	15	B	35.0	C	9.8	A
280	Pine St / Division St	Signalized	NBT	522	20	75	4	7	A				
280	Pine St / Division St	Signalized	NBR	14	20	75	5	8	A				
280	Pine St / Division St	Signalized	SBL	30	30	70	12	19	B				
280	Pine St / Division St	Signalized	SBT	395	30	70	5	8	A				
280	Pine St / Division St	Signalized	SBR	6	30	70	4	6	A				
280	Pine St / Division St	Signalized	EBL	7	5	15	29	35	C				
280	Pine St / Division St	Signalized	EBT	28	5	15	24	29	C				
280	Pine St / Division St	Signalized	EBR	10	5	15	5	10	A				
280	Pine St / Division St	Signalized	WBL	4	10	25	24	32	C				
280	Pine St / Division St	Signalized	WBT	44	10	25	22	29	C				
280	Pine St / Division St	Signalized	WBR	65	10	25	6	12	B				
290	Quebec St / Division St	TWSC	NBT	574	0	65	0	1	A	12.0	B	1.2	A
290	Quebec St / Division St	TWSC	NBR	0	0	65	0	0	A				
290	Quebec St / Division St	TWSC	SBL	0	0	50	0	0	A				
290	Quebec St / Division St	TWSC	SBT	409	0	50	0	1	A				
290	Quebec St / Division St	TWSC	WBL	14	0	5	4	12	B				
290	Quebec St / Division St	TWSC	WBR	0	0	5	0	0	A				
300	York St / Division St	Signalized	NBL	0	35	35	0	0	A	32.0	C	6.6	A
300	York St / Division St	Signalized	NBT	519	35	35	2	4	A				
300	York St / Division St	Signalized	NBR	12	35	35	0	2	A				
300	York St / Division St	Signalized	SBL	12	10	45	8	12	B				
300	York St / Division St	Signalized	SBT	409	10	45	2	3	A				
300	York St / Division St	Signalized	SBR	0	10	45	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	20	0	0	A				
300	York St / Division St	Signalized	EBT	50	5	20	27	32	C				
300	York St / Division St	Signalized	EBR	6	5	20	25	29	C				
300	York St / Division St	Signalized	WBL	14	10	25	19	25	C				
300	York St / Division St	Signalized	WBT	32	10	25	22	29	C				
300	York St / Division St	Signalized	WBR	56	10	25	6	14	B				
310	Main St / Division St	TWSC	NBT	529	20	60	3	6	A	8.0	A	3.3	A
310	Main St / Division St	TWSC	NBR	0	20	60	0	0	A				
310	Main St / Division St	TWSC	SBL	0	35	35	0	0	A				
310	Main St / Division St	TWSC	SBT	429	35	35	0	0	A				
310	Main St / Division St	TWSC	WBL	6	0	5	1	8	A				
310	Main St / Division St	TWSC	WBR	0	0	5	0	0	A				
320	Hamilton St / Division St	TWSC	NBL	12	0	25	1	4	A	14.0	B	1.2	A
320	Hamilton St / Division St	TWSC	NBT	524	0	25	0	2	A				
320	Hamilton St / Division St	TWSC	SBT	436	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	0	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	4	0	5	6	14	B				
320	Hamilton St / Division St	TWSC	EBR	0	0	5	0	0	A				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
330	Raglan St / Division St	TWSC	NBT	525	0	0	0	0	A	12.0	B	0.4	A
330	Raglan St / Division St	TWSC	NBR	0	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	0	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBT	435	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	21	5	5	3	12	B				
330	Raglan St / Division St	TWSC	WBR	12	5	5	2	10	A				
340	Elm St / Division St	TWSC	NBL	62	0	45	2	4	A	10.0	A	0.9	A
340	Elm St / Division St	TWSC	NBT	524	0	45	0	1	A				
340	Elm St / Division St	TWSC	SBT	415	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	41	0	0	0	2	A				
340	Elm St / Division St	TWSC	EBL	2	0	5	3	10	A				
340	Elm St / Division St	TWSC	EBR	4	0	5	1	8	A				
350	Ellice St / Division St	TWSC	NBT	571	0	45	0	0	A	10.0	A	0.6	A
350	Ellice St / Division St	TWSC	NBR	2	0	45	0	0	A				
350	Ellice St / Division St	TWSC	SBL	6	0	0	1	4	A				
350	Ellice St / Division St	TWSC	SBT	414	0	0	0	1	A				
350	Ellice St / Division St	TWSC	WBL	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	WBR	14	0	5	2	10	A				
360	Colborne St / Division St	TWSC	NBL	4	0	20	0	1	A	11.0	B	1.5	A
360	Colborne St / Division St	TWSC	NBT	558	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	0	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	4	0	40	5	9	A				
360	Colborne St / Division St	TWSC	SBT	406	0	40	1	3	A				
360	Colborne St / Division St	TWSC	SBR	4	0	40	0	1	A				
360	Colborne St / Division St	TWSC	EBL	2	0	5	2	9	A				
360	Colborne St / Division St	TWSC	EBT	4	0	5	3	11	B				
360	Colborne St / Division St	TWSC	EBR	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBL	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBT	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBR	14	0	5	2	10	A				
370	Queen St / Division St	Signalized	NBT	184	15	25	6	8	A	28.0	C	17.5	B
370	Queen St / Division St	Signalized	NBR	102	15	25	1	9	A				
370	Queen St / Division St	Signalized	SBL	96	50	80	17	26	C				
370	Queen St / Division St	Signalized	SBT	315	50	80	14	20	B				
370	Queen St / Division St	Signalized	WBL	440	50	105	16	28	C				
370	Queen St / Division St	Signalized	WBR	377	50	105	1	8	A				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - AM Peak

Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LOS
10	Princess St / Concession St	Signalized	2,869	46.1	72.9	27.8	22.2	C
20	Princess St / Regent St	TWSC	1,297	6.4	62.4	4.4	0.8	-
30	Princess St / Drayton Av	TWSC	1,260	12.6	47.4	2.5	0.7	-
40	Princess St / Macdonnell Av	Signalized	1,200	68.6	112.4	15.9	10.0	B
50	Princess St / Smith St	TWSC	1,012	25.5	45.4	2.6	1.1	-
60	Princess St / Victoria St	Signalized	1,247	23.8	70.2	8.7	4.7	A
70	Princess St / Nelson St	TWSC	1,170	5.7	74.1	3.8	1.2	-
80	Princess St / Albert St	Signalized	1,139	38.1	83.0	15.1	9.7	B
90	Princess St / Frontenac St	TWSC	1,034	0.0	35.8	1.7	0.0	-
100	Princess St / Alfred St	Signalized	1,356	43.7	74.1	23.5	16.4	C
110	Princess St / Chatham St	TWSC	953	0.1	44.0	2.1	0.1	-
120	Princess St / University Av	Signalized	882	15.7	54.4	6.0	2.8	A
130	Princess St / Division St	Signalized	1,096	19.4	49.2	15.7	10.7	B
140	Concession St / Drayton Av	TWSC	944	0.0	119.0	7.3	3.2	-
150	Concession St / Leroy Grant Dr (S)	TWSC	915	54.6	74.5	7.9	3.9	-
155	Concession St / Leroy Grant Drive (N)	TWSC	705	0.3	0.9	0.7	0.1	-
160	Concession St / Macdonnell St	Signalized	1,550	50.1	76.9	13.8	9.5	B
170	Concession St / Connaught St	TWSC	1,273	0.0	89.7	3.5	2.0	-
180	Concession St / Victoria St	Signalized	1,355	37.7	84.6	11.9	7.7	B
190	Concession St / Nelson St	TWSC	1,229	0.1	64.7	1.8	1.1	-
200	Concession St / Kingscourt Av	TWSC	1,204	0.2	47.9	2.7	1.1	-
210	Concession St / Fergus St	TWSC	1,213	0.2	55.3	4.9	2.9	-
220	Concession St / Grey St	TWSC	1,246	13.8	61.1	10.5	7.2	-
230	Concession St / Alfred St	Signalized	1,330	43.6	64.1	11.9	7.2	B
240	Concession St / Lansdowne St	TWSC	1,010	0.0	0.0	0.5	0.0	-
250	Concession St / Division St	Signalized	1,769	40.7	103.2	22.6	16.3	C
260	Adelaide St / Division St	TWSC	757	0.0	22.1	0.7	0.0	-
270	Stanley St / Division St	TWSC	702	0.4	19.4	2.0	0.8	-
280	Pine St / Division St	Signalized	785	12.9	47.0	8.6	4.8	A
290	Quebec St / Division St	TWSC	677	0.0	32.8	0.9	0.0	-
300	York St / Division St	Signalized	761	15.2	42.2	7.4	4.9	A
310	Main St / Division St	TWSC	646	23.6	28.6	0.8	0.0	-
320	Hamilton St / Division St	TWSC	629	0.0	0.1	0.1	0.0	-
330	Raglan St / Division St	TWSC	627	0.2	0.2	0.4	0.1	-
340	Elm St / Division St	TWSC	614	0.0	0.1	0.2	0.0	-
350	Ellice St / Division St	TWSC	595	0.0	0.1	0.2	0.1	-
360	Colborne St / Division St	TWSC	601	0.2	19.1	1.2	0.1	-
370	Queen St / Division St	Signalized	879	28.9	50.4	15.4	9.4	B
Total			40,531	629	1,929	268	163	

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt		Intersection	
					50th	95th					Delay	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	163	35	50	37	45	D	47.0	D	27.8	C	
10	Princess St / Concession St	Signalized	NBT	198	35	50	40	47	D					
10	Princess St / Concession St	Signalized	NBR	42	35	50	2	4	A					
10	Princess St / Concession St	Signalized	SBL	526	75	105	30	38	D					
10	Princess St / Concession St	Signalized	SBT	570	75	105	30	38	D					
10	Princess St / Concession St	Signalized	SBR	32	75	105	19	24	C					
10	Princess St / Concession St	Signalized	EBT	402	30	65	25	31	C					
10	Princess St / Concession St	Signalized	EBR	277	30	65	0	2	A					
10	Princess St / Concession St	Signalized	WBT	241	20	40	25	30	C					
10	Princess St / Concession St	Signalized	WBR	334	20	40	0	0	A					
10	Princess St / Concession St	Signalized	WBL	84	20	40	1	4	A					
20	Princess St / Regent St	TWSC	NBL	0	5	10	0	0	A	16.0	C	4.4	A	
20	Princess St / Regent St	TWSC	NBR	29	5	10	7	16	C					
20	Princess St / Regent St	TWSC	EBT	765	10	85	1	6	A					
20	Princess St / Regent St	TWSC	EBR	50	10	85	1	3	A					
20	Princess St / Regent St	TWSC	WBL	8	0	25	4	8	A					
20	Princess St / Regent St	TWSC	WBT	445	0	25	0	1	A					
30	Princess St / Drayton Av	TWSC	SBL	0	0	45	0	0	A	14.0	B	2.5	A	
30	Princess St / Drayton Av	TWSC	SBR	5	0	45	1	14	B					
30	Princess St / Drayton Av	TWSC	EBL	117	20	75	2	5	A					
30	Princess St / Drayton Av	TWSC	EBT	677	20	75	1	3	A					
30	Princess St / Drayton Av	TWSC	WBT	450	0	0	0	1	A					
30	Princess St / Drayton Av	TWSC	WBR	11	0	0	0	1	A					
40	Princess St / Macdonnell Av	Signalized	NBL	44	10	40	12	19	B	23.0	C	15.9	B	
40	Princess St / Macdonnell Av	Signalized	NBT	26	10	40	11	17	B					
40	Princess St / Macdonnell Av	Signalized	NBR	17	10	40	7	12	B					
40	Princess St / Macdonnell Av	Signalized	SBL	7	40	40	15	22	C					
40	Princess St / Macdonnell Av	Signalized	SBT	14	40	40	9	13	B					
40	Princess St / Macdonnell Av	Signalized	SBR	56	40	40	2	9	A					
40	Princess St / Macdonnell Av	Signalized	EBL	29	90	165	15	23	C					
40	Princess St / Macdonnell Av	Signalized	EBT	606	90	165	11	18	B					
40	Princess St / Macdonnell Av	Signalized	EBR	30	90	165	8	14	B					
40	Princess St / Macdonnell Av	Signalized	WBL	0	50	50	0	0	A					
40	Princess St / Macdonnell Av	Signalized	WBT	366	50	50	9	13	B					
40	Princess St / Macdonnell Av	Signalized	WBR	5	50	50	7	9	A					
50	Princess St / Smith St	TWSC	SBL	2	40	40	0	0	A	17.0	C	2.6	A	
50	Princess St / Smith St	TWSC	SBR	14	40	40	5	17	C					
50	Princess St / Smith St	TWSC	EBL	7	40	40	1	4	A					
50	Princess St / Smith St	TWSC	EBT	623	40	40	0	1	A					
50	Princess St / Smith St	TWSC	WBT	353	0	55	3	5	A					
50	Princess St / Smith St	TWSC	WBR	13	0	55	1	2	A					
60	Princess St / Victoria St	Signalized	NBL	35	10	35	19	26	C	26.0	C	8.7	A	
60	Princess St / Victoria St	Signalized	NBT	25	10	35	17	23	C					
60	Princess St / Victoria St	Signalized	NBR	45	10	35	8	15	B					
60	Princess St / Victoria St	Signalized	SBL	13	5	20	16	23	C					
60	Princess St / Victoria St	Signalized	SBT	52	5	20	15	20	B					
60	Princess St / Victoria St	Signalized	SBR	0	5	20	0	0	A					
60	Princess St / Victoria St	Signalized	EBL	2	20	85	0	3	A					
60	Princess St / Victoria St	Signalized	EBT	612	20	85	2	6	A					
60	Princess St / Victoria St	Signalized	EBR	12	20	85	3	7	A					
60	Princess St / Victoria St	Signalized	WBL	34	35	65	10	14	B					
60	Princess St / Victoria St	Signalized	WBT	331	35	65	5	8	A					
60	Princess St / Victoria St	Signalized	WBR	86	35	65	2	5	A					
70	Princess St / Nelson St	TWSC	NBL	1	0	45	0	0	A	18.0	C	3.8	A	
70	Princess St / Nelson St	TWSC	NBT	7	0	45	6	18	C					
70	Princess St / Nelson St	TWSC	NBR	7	0	45	3	14	B					
70	Princess St / Nelson St	TWSC	SBL	8	0	5	5	16	C					
70	Princess St / Nelson St	TWSC	SBT	0	0	5	0	0	A					
70	Princess St / Nelson St	TWSC	SBR	12	0	5	2	16	C					
70	Princess St / Nelson St	TWSC	EBL	77	10	90	2	7	A					
70	Princess St / Nelson St	TWSC	EBT	586	10	90	1	4	A					
70	Princess St / Nelson St	TWSC	EBR	9	10	90	2	5	A					
70	Princess St / Nelson St	TWSC	WBL	15	0	55	5	9	A					
70	Princess St / Nelson St	TWSC	WBT	448	0	55	1	2	A					
70	Princess St / Nelson St	TWSC	WBR	0	0	55	0	0	A					

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	15	5	15	17	23	C	37.0	D	15.1	B
80	Princess St / Albert St	Signalized	NBT	4	5	15	13	19	B				
80	Princess St / Albert St	Signalized	NBR	36	5	15	2	5	A				
80	Princess St / Albert St	Signalized	SBL	4	5	15	4	14	B				
80	Princess St / Albert St	Signalized	SBT	30	5	15	8	11	B				
80	Princess St / Albert St	Signalized	SBR	53	5	15	2	6	A				
80	Princess St / Albert St	Signalized	EBL	1	55	115	29	37	D				
80	Princess St / Albert St	Signalized	EBT	572	55	115	13	19	B				
80	Princess St / Albert St	Signalized	EBR	20	55	115	13	18	B				
80	Princess St / Albert St	Signalized	WBL	7	25	60	23	32	C				
80	Princess St / Albert St	Signalized	WBT	396	25	60	6	11	B				
80	Princess St / Albert St	Signalized	WBR	1	25	60	0	0	A				
90	Princess St / Frontenac St	TWSC	NBL	1	0	5	0	6	A	9.0	A	1.7	A
90	Princess St / Frontenac St	TWSC	NBT	1	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	NBR	1	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	3	0	5	2	9	A				
90	Princess St / Frontenac St	TWSC	EBL	43	0	60	1	3	A				
90	Princess St / Frontenac St	TWSC	EBT	568	0	60	0	2	A				
90	Princess St / Frontenac St	TWSC	EBR	5	0	60	0	3	A				
90	Princess St / Frontenac St	TWSC	WBL	12	0	0	0	3	A				
90	Princess St / Frontenac St	TWSC	WBT	398	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	WBR	2	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	68	25	45	17	25	C	28.0	C	23.5	C
100	Princess St / Alfred St	Signalized	NBT	89	25	45	15	22	C				
100	Princess St / Alfred St	Signalized	NBR	84	25	45	9	16	B				
100	Princess St / Alfred St	Signalized	SBL	26	25	50	17	27	C				
100	Princess St / Alfred St	Signalized	SBT	133	25	50	13	19	B				
100	Princess St / Alfred St	Signalized	SBR	98	25	50	6	12	B				
100	Princess St / Alfred St	Signalized	EBL	11	65	105	18	25	C				
100	Princess St / Alfred St	Signalized	EBT	534	65	105	20	28	C				
100	Princess St / Alfred St	Signalized	EBR	16	65	105	15	21	C				
100	Princess St / Alfred St	Signalized	WBL	12	35	60	21	27	C				
100	Princess St / Alfred St	Signalized	WBT	266	35	60	18	24	C				
100	Princess St / Alfred St	Signalized	WBR	19	35	60	3	8	A				
110	Princess St / Chatham St	TWSC	SBL	0	5	5	0	0	A	14.0	B	2.1	A
110	Princess St / Chatham St	TWSC	SBR	24	5	5	1	14	B				
110	Princess St / Chatham St	TWSC	EBL	45	0	45	1	4	A				
110	Princess St / Chatham St	TWSC	EBT	595	0	45	0	2	A				
110	Princess St / Chatham St	TWSC	WBT	275	0	45	0	1	A				
110	Princess St / Chatham St	TWSC	WBR	14	0	45	0	0	A				
120	Princess St / University Av	Signalized	NBL	25	0	15	17	22	C	26.0	C	6.0	A
120	Princess St / University Av	Signalized	NBR	26	0	15	2	7	A				
120	Princess St / University Av	Signalized	EBT	500	20	70	2	5	A				
120	Princess St / University Av	Signalized	EBR	58	20	70	1	4	A				
120	Princess St / University Av	Signalized	WBL	8	10	30	18	26	C				
120	Princess St / University Av	Signalized	WBT	265	10	30	3	6	A				
130	Princess St / Division St	Signalized	NBL	55	5	20	13	22	C	27.0	C	15.7	B
130	Princess St / Division St	Signalized	NBT	51	5	20	11	16	B				
130	Princess St / Division St	Signalized	NBR	1	5	20	0	0	A				
130	Princess St / Division St	Signalized	SBL	143	5	55	3	5	A				
130	Princess St / Division St	Signalized	SBT	102	5	55	3	4	A				
130	Princess St / Division St	Signalized	SBR	219	5	55	0	1	A				
130	Princess St / Division St	Signalized	EBL	132	35	50	19	27	C				
130	Princess St / Division St	Signalized	EBT	367	35	50	19	27	C				
130	Princess St / Division St	Signalized	EBR	26	35	50	8	16	B				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	8	0	5	31	42	E	42.0	E	7.3	A
140	Concession St / Drayton Av	TWSC	EBT	936	0	120	3	7	A				
140	Concession St / Drayton Av	TWSC	EBR	0	0	120	0	0	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	7	0	5	10	21	C	21.0	C	7.9	A
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	39	55	75	1	4	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	869	55	75	4	8	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	28	5	5	2	9	A	11.0	B	0.7	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	11	5	5	2	10	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	7	0	5	1	11	B				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	76	0	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	557	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	26	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	64	10	25	20	26	C	48.0	D	13.8	B
160	Concession St / Macdonnell St	Signalized	NBT	0	10	25	0	0	A				
160	Concession St / Macdonnell St	Signalized	NBR	17	10	25	13	18	B				
160	Concession St / Macdonnell St	Signalized	SBR	41	0	5	1	3	A				
160	Concession St / Macdonnell St	Signalized	EBL	37	75	80	13	19	B				
160	Concession St / Macdonnell St	Signalized	EBT	701	75	80	7	11	B				
160	Concession St / Macdonnell St	Signalized	EBR	141	75	80	5	9	A				
160	Concession St / Macdonnell St	Signalized	WBL	71	20	85	39	48	D				
160	Concession St / Macdonnell St	Signalized	WBT	477	20	85	9	13	B				
160	Concession St / Macdonnell St	Signalized	WBR	1	20	85	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	9	0	5	10	20	C	20.0	C	3.5	A
170	Concession St / Connaught St	TWSC	SBR	6	0	5	8	18	C				
170	Concession St / Connaught St	TWSC	EBL	20	0	95	3	6	A				
170	Concession St / Connaught St	TWSC	EBT	696	0	95	1	2	A				
170	Concession St / Connaught St	TWSC	WBT	542	0	85	3	5	A				
170	Concession St / Connaught St	TWSC	WBR	0	0	85	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	6	5	15	26	33	C	33.0	C	11.9	B
180	Concession St / Victoria St	Signalized	NBT	19	5	15	22	28	C				
180	Concession St / Victoria St	Signalized	NBR	38	5	15	5	11	B				
180	Concession St / Victoria St	Signalized	SBL	3	5	10	13	20	B				
180	Concession St / Victoria St	Signalized	SBT	33	5	10	22	27	C				
180	Concession St / Victoria St	Signalized	SBR	40	5	10	2	10	A				
180	Concession St / Victoria St	Signalized	EBL	19	35	95	10	15	B				
180	Concession St / Victoria St	Signalized	EBT	662	35	95	7	10	A				
180	Concession St / Victoria St	Signalized	EBR	9	35	95	6	11	B				
180	Concession St / Victoria St	Signalized	WBL	25	50	90	17	25	C				
180	Concession St / Victoria St	Signalized	WBT	501	50	90	7	12	B				
180	Concession St / Victoria St	Signalized	WBR	0	50	90	0	0	A				
190	Concession St / Nelson St	TWSC	NBL	7	0	5	18	26	D	26.0	D	1.8	A
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	3	0	5	2	10	A				
190	Concession St / Nelson St	TWSC	SBL	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	25	5	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	38	0	85	2	5	A				
190	Concession St / Nelson St	TWSC	EBT	664	0	85	1	1	A				
190	Concession St / Nelson St	TWSC	EBR	0	0	85	0	0	A				
190	Concession St / Nelson St	TWSC	WBL	0	0	40	0	0	A				
190	Concession St / Nelson St	TWSC	WBT	492	0	40	1	2	A				
190	Concession St / Nelson St	TWSC	WBR	0	0	40	0	0	A				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	44	5	20	14	24	C	24.0	C	2.7	A
200	Concession St / Kingscourt Av	TWSC	SBR	3	5	20	4	20	C				
200	Concession St / Kingscourt Av	TWSC	EBL	41	0	85	3	7	A				
200	Concession St / Kingscourt Av	TWSC	EBT	626	0	85	1	3	A				
200	Concession St / Kingscourt Av	TWSC	WBT	486	0	0	0	0	A				
200	Concession St / Kingscourt Av	TWSC	WBR	4	0	0	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	44	5	15	33	43	E	43.0	E	4.9	A
210	Concession St / Fergus St	TWSC	SBR	3	5	15	0	8	A				
210	Concession St / Fergus St	TWSC	EBL	30	0	100	5	8	A				
210	Concession St / Fergus St	TWSC	EBT	634	0	100	3	6	A				
210	Concession St / Fergus St	TWSC	WBT	489	0	0	0	0	A				
210	Concession St / Fergus St	TWSC	WBR	13	0	0	0	0	A				
220	Concession St / Grey St	TWSC	SBL	43	5	45	90	104	F	141.0	F	10.5	B
220	Concession St / Grey St	TWSC	SBR	3	5	45	118	141	F				
220	Concession St / Grey St	TWSC	EBL	20	25	105	7	13	B				
220	Concession St / Grey St	TWSC	EBT	661	25	105	7	12	B				
220	Concession St / Grey St	TWSC	WBT	497	0	5	0	0	A				
220	Concession St / Grey St	TWSC	WBR	22	0	5	0	0	A				
230	Concession St / Alfred St	Signalized	NBL	44	5	25	16	22	C	22.0	C	11.9	B
230	Concession St / Alfred St	Signalized	NBT	10	5	25	16	20	B				
230	Concession St / Alfred St	Signalized	NBR	36	5	25	4	10	A				
230	Concession St / Alfred St	Signalized	SBL	2	5	20	1	7	A				
230	Concession St / Alfred St	Signalized	SBT	33	5	20	14	19	B				
230	Concession St / Alfred St	Signalized	SBR	39	5	20	5	10	A				
230	Concession St / Alfred St	Signalized	EBL	34	55	60	12	18	B				
230	Concession St / Alfred St	Signalized	EBT	495	55	60	7	12	B				
230	Concession St / Alfred St	Signalized	EBR	174	55	60	1	3	A				
230	Concession St / Alfred St	Signalized	WBL	28	40	85	13	20	B				
230	Concession St / Alfred St	Signalized	WBT	435	40	85	8	13	B				
230	Concession St / Alfred St	Signalized	WBR	0	40	85	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	1.0	A	0.5	A
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBT	538	0	0	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	3	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBT	469	0	0	0	0	A				
250	Concession St / Division St	Signalized	NBL	17	30	70	19	26	C	49.0	D	22.6	C
250	Concession St / Division St	Signalized	NBT	235	30	70	16	22	C				
250	Concession St / Division St	Signalized	NBR	40	30	70	11	17	B				
250	Concession St / Division St	Signalized	SBL	32	50	120	20	29	C				
250	Concession St / Division St	Signalized	SBT	394	50	120	17	23	C				
250	Concession St / Division St	Signalized	SBR	226	50	120	2	6	A				
250	Concession St / Division St	Signalized	EBL	179	30	100	14	20	B				
250	Concession St / Division St	Signalized	EBT	335	30	100	11	16	B				
250	Concession St / Division St	Signalized	EBR	19	30	100	3	5	A				
250	Concession St / Division St	Signalized	WBL	47	50	105	37	49	D				
250	Concession St / Division St	Signalized	WBT	230	50	105	35	45	D				
250	Concession St / Division St	Signalized	WBR	15	50	105	31	41	D				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt		Intersection	
					50th	95th					LOS	LOS		
260	Adelaide St / Division St	TWSC	NBL	0	0	10	0	0	A	12.0	B	0.7	A	
260	Adelaide St / Division St	TWSC	NBT	278	0	10	0	0	A					
260	Adelaide St / Division St	TWSC	NBR	3	0	10	0	0	A					
260	Adelaide St / Division St	TWSC	SBL	11	0	30	0	1	A					
260	Adelaide St / Division St	TWSC	SBT	393	0	30	0	1	A					
260	Adelaide St / Division St	TWSC	SBR	58	0	30	0	0	A					
260	Adelaide St / Division St	TWSC	EBL	5	0	5	5	12	B					
260	Adelaide St / Division St	TWSC	EBT	0	0	5	0	0	A					
260	Adelaide St / Division St	TWSC	EBR	0	0	5	0	0	A					
260	Adelaide St / Division St	TWSC	WBL	0	0	5	0	0	A					
260	Adelaide St / Division St	TWSC	WBT	0	0	5	0	0	A					
260	Adelaide St / Division St	TWSC	WBR	9	0	5	0	7	A					
270	Stanley St / Division St	TWSC	NBL	12	0	5	1	3	A	10.0	A	2.0	A	
270	Stanley St / Division St	TWSC	NBT	236	0	5	0	0	A					
270	Stanley St / Division St	TWSC	SBT	393	0	30	1	2	A					
270	Stanley St / Division St	TWSC	SBR	0	0	30	0	0	A					
270	Stanley St / Division St	TWSC	EBL	45	5	10	2	10	A					
270	Stanley St / Division St	TWSC	EBR	16	5	10	2	9	A					
280	Pine St / Division St	Signalized	NBL	7	5	20	10	15	B	30.0	C	8.6	A	
280	Pine St / Division St	Signalized	NBT	201	5	20	2	4	A					
280	Pine St / Division St	Signalized	NBR	7	5	20	0	1	A					
280	Pine St / Division St	Signalized	SBL	34	20	70	4	6	A					
280	Pine St / Division St	Signalized	SBT	382	20	70	4	8	A					
280	Pine St / Division St	Signalized	SBR	0	20	70	0	0	A					
280	Pine St / Division St	Signalized	EBL	2	5	20	0	0	A					
280	Pine St / Division St	Signalized	EBT	27	5	20	19	24	C					
280	Pine St / Division St	Signalized	EBR	45	5	20	6	11	B					
280	Pine St / Division St	Signalized	WBL	19	5	25	22	28	C					
280	Pine St / Division St	Signalized	WBT	15	5	25	22	30	C					
280	Pine St / Division St	Signalized	WBR	46	5	25	3	9	A					
290	Quebec St / Division St	TWSC	NBT	214	0	0	0	0	A	9.0	A	0.9	A	
290	Quebec St / Division St	TWSC	NBR	3	0	0	0	0	A					
290	Quebec St / Division St	TWSC	SBL	3	0	50	0	0	A					
290	Quebec St / Division St	TWSC	SBT	439	0	50	0	1	A					
290	Quebec St / Division St	TWSC	WBL	16	0	5	2	9	A					
290	Quebec St / Division St	TWSC	WBR	2	0	5	0	0	A					
300	York St / Division St	Signalized	NBL	0	20	35	0	0	A	34.0	C	7.4	A	
300	York St / Division St	Signalized	NBT	195	20	35	3	5	A					
300	York St / Division St	Signalized	NBR	15	20	35	0	2	A					
300	York St / Division St	Signalized	SBL	53	15	50	5	8	A					
300	York St / Division St	Signalized	SBT	410	15	50	3	5	A					
300	York St / Division St	Signalized	SBR	0	15	50	0	0	A					
300	York St / Division St	Signalized	EBL	0	5	15	0	0	A					
300	York St / Division St	Signalized	EBT	28	5	15	25	30	C					
300	York St / Division St	Signalized	EBR	3	5	15	28	34	C					
300	York St / Division St	Signalized	WBL	23	5	20	21	27	C					
300	York St / Division St	Signalized	WBT	12	5	20	21	28	C					
300	York St / Division St	Signalized	WBR	22	5	20	6	13	B					
310	Main St / Division St	TWSC	NBT	203	0	5	0	2	A	8.0	A	0.8	A	
310	Main St / Division St	TWSC	NBR	0	0	5	0	0	A					
310	Main St / Division St	TWSC	SBL	17	35	40	0	1	A					
310	Main St / Division St	TWSC	SBT	418	35	40	0	0	A					
310	Main St / Division St	TWSC	WBL	2	0	5	0	8	A					
310	Main St / Division St	TWSC	WBR	6	0	5	1	8	A					
320	Hamilton St / Division St	TWSC	NBL	2	0	0	0	0	A	7.0	A	0.1	A	
320	Hamilton St / Division St	TWSC	NBT	192	0	0	0	0	A					
320	Hamilton St / Division St	TWSC	SBT	397	0	0	0	0	A					
320	Hamilton St / Division St	TWSC	SBR	25	0	0	0	0	A					
320	Hamilton St / Division St	TWSC	EBL	11	0	5	1	7	A					
320	Hamilton St / Division St	TWSC	EBR	2	0	5	0	6	A					

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
330	Raglan St / Division St	TWSC	NBT	190	0	0	0	0	A	10.0	A	0.4	A
330	Raglan St / Division St	TWSC	NBR	15	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	9	0	0	0	1	A				
330	Raglan St / Division St	TWSC	SBT	387	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	22	5	5	2	10	A				
330	Raglan St / Division St	TWSC	WBR	4	5	5	0	7	A				
340	Elm St / Division St	TWSC	NBL	1	0	0	0	1	A	8.0	A	0.2	A
340	Elm St / Division St	TWSC	NBT	192	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBT	391	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	18	0	0	0	1	A				
340	Elm St / Division St	TWSC	EBL	12	0	5	1	8	A				
340	Elm St / Division St	TWSC	EBR	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	NBT	190	0	0	0	0	A	13.0	B	0.2	A
350	Ellice St / Division St	TWSC	NBR	2	0	0	0	0	A				
350	Ellice St / Division St	TWSC	SBL	12	0	0	0	1	A				
350	Ellice St / Division St	TWSC	SBT	379	0	0	0	0	A				
350	Ellice St / Division St	TWSC	WBL	8	0	5	4	13	B				
350	Ellice St / Division St	TWSC	WBR	4	0	5	0	7	A				
360	Colborne St / Division St	TWSC	NBL	0	0	20	0	0	A	12.0	B	1.2	A
360	Colborne St / Division St	TWSC	NBT	181	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	1	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	7	0	20	1	3	A				
360	Colborne St / Division St	TWSC	SBT	372	0	20	0	1	A				
360	Colborne St / Division St	TWSC	SBR	5	0	20	0	0	A				
360	Colborne St / Division St	TWSC	EBL	9	5	5	1	9	A				
360	Colborne St / Division St	TWSC	EBT	9	5	5	2	10	A				
360	Colborne St / Division St	TWSC	EBR	7	5	5	1	9	A				
360	Colborne St / Division St	TWSC	WBL	7	0	5	4	12	B				
360	Colborne St / Division St	TWSC	WBT	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBR	3	0	5	0	7	A				
370	Queen St / Division St	Signalized	NBT	66	10	25	7	10	A	23.0	C	15.4	B
370	Queen St / Division St	Signalized	NBR	116	10	25	1	9	A				
370	Queen St / Division St	Signalized	SBL	120	45	75	15	23	C				
370	Queen St / Division St	Signalized	SBT	265	45	75	14	20	B				
370	Queen St / Division St	Signalized	WBL	196	20	35	11	17	B				
370	Queen St / Division St	Signalized	WBR	116	20	35	0	4	A				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - PM Peak

Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LO S
10	Princess St / Concession St	Signalized	3,641	157.4	218.3	55.8	45.5	E
20	Princess St / Regent St	TWSC	1,245	0.1	28.5	1.9	0.5	-
30	Princess St / Drayton Av	TWSC	1,188	4.4	26.6	2.4	0.3	-
40	Princess St / Macdonnell Av	Signalized	1,226	64.2	125.2	18.8	12.6	B
50	Princess St / Smith St	TWSC	977	27.9	54.7	3.2	1.4	-
60	Princess St / Victoria St	Signalized	1,398	27.1	81.9	11.7	6.7	B
70	Princess St / Nelson St	TWSC	1,272	10.7	69.2	3.9	1.4	-
80	Princess St / Albert St	Signalized	1,284	32.1	66.8	14.2	9.3	B
90	Princess St / Frontenac St	TWSC	1,062	3.0	50.9	2.1	0.7	-
100	Princess St / Alfred St	Signalized	1,426	52.1	80.5	24.4	17.3	C
110	Princess St / Chatham St	TWSC	1,141	12.9	70.3	3.2	0.7	-
120	Princess St / University Av	Signalized	1,007	23.7	56.7	8.4	4.5	A
130	Princess St / Division St	Signalized	1,324	22.8	57.2	15.9	10.8	B
140	Concession St / Drayton Av	TWSC	1,232	318.8	318.9	58.0	28.2	-
150	Concession St / Leroy Grant Dr (S)	TWSC	1,209	73.7	73.9	33.2	18.1	-
155	Concession St / Leroy Grant Drive (N)	TWSC	1,555	4.8	5.3	5.2	3.1	-
160	Concession St / Macdonnell St	Signalized	2,511	73.7	82.6	16.8	11.6	B
170	Concession St / Connaught St	TWSC	1,991	77.6	105.0	8.4	4.8	-
180	Concession St / Victoria St	Signalized	2,189	93.1	97.5	17.0	10.6	B
190	Concession St / Nelson St	TWSC	1,950	50.8	91.9	9.8	6.0	-
200	Concession St / Kingscourt Av	TWSC	1,852	52.7	94.3	9.4	5.6	-
210	Concession St / Fergus St	TWSC	1,848	56.0	99.5	10.8	6.1	-
220	Concession St / Grey St	TWSC	1,855	50.7	79.4	9.3	6.1	-
230	Concession St / Alfred St	Signalized	1,990	79.9	117.7	28.0	19.8	C
240	Concession St / Lansdowne St	TWSC	1,289	0.0	75.0	3.8	1.3	-
250	Concession St / Division St	Signalized	2,390	104.4	162.4	41.9	32.8	D
260	Adelaide St / Division St	TWSC	1,271	60.8	91.4	24.6	19.1	-
270	Stanley St / Division St	TWSC	1,139	45.6	55.1	13.1	8.0	-
280	Pine St / Division St	Signalized	1,242	49.7	70.3	21.4	15.1	C
290	Quebec St / Division St	TWSC	1,054	40.9	82.2	7.9	4.9	-
300	York St / Division St	Signalized	1,164	26.8	44.1	9.8	7.1	A
310	Main St / Division St	TWSC	1,032	46.8	51.8	11.1	7.4	-
320	Hamilton St / Division St	TWSC	1,066	66.1	66.2	18.0	11.9	-
330	Raglan St / Division St	TWSC	1,078	23.9	35.9	6.2	4.6	-
340	Elm St / Division St	TWSC	1,192	15.8	50.2	7.2	4.7	-
350	Ellice St / Division St	TWSC	1,134	9.8	36.0	3.9	2.1	-
360	Colborne St / Division St	TWSC	1,174	13.0	179.0	6.9	4.3	-
370	Queen St / Division St	Signalized	1,490	42.8	133.4	23.6	13.2	C
Total			56,088	1,917	3,286	571	368	

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt		Intersection	
					50th	95th					LOS	Delay	LOS	
10	Princess St / Concession St	Signalized	NBL	221	30	60	32	40	D	117.0	F	55.8	E	
10	Princess St / Concession St	Signalized	NBT	200	30	60	34	41	D					
10	Princess St / Concession St	Signalized	NBR	12	30	60	29	38	D					
10	Princess St / Concession St	Signalized	SBL	706	390	430	88	106	F					
10	Princess St / Concession St	Signalized	SBT	470	390	430	76	92	F					
10	Princess St / Concession St	Signalized	SBR	0	390	430	0	0	A					
10	Princess St / Concession St	Signalized	EBT	351	50	250	93	117	F					
10	Princess St / Concession St	Signalized	EBR	283	50	250	10	16	B					
10	Princess St / Concession St	Signalized	WBT	521	50	75	31	38	D					
10	Princess St / Concession St	Signalized	WBR	843	50	75	0	0	A					
10	Princess St / Concession St	Signalized	WBL	34	50	75	60	70	E					
20	Princess St / Regent St	TWSC	NBL	0	5	5	0	0	A	10.0	A	1.9	A	
20	Princess St / Regent St	TWSC	NBR	33	5	5	2	10	A					
20	Princess St / Regent St	TWSC	EBT	665	0	35	0	2	A					
20	Princess St / Regent St	TWSC	EBR	75	0	35	0	1	A					
20	Princess St / Regent St	TWSC	WBL	34	0	20	4	7	A					
20	Princess St / Regent St	TWSC	WBT	438	0	20	1	1	A					
30	Princess St / Drayton Av	TWSC	SBL	8	45	50	9	24	C	24.0	C	2.4	A	
30	Princess St / Drayton Av	TWSC	SBR	108	45	50	2	14	B					
30	Princess St / Drayton Av	TWSC	EBL	20	0	10	1	2	A					
30	Princess St / Drayton Av	TWSC	EBT	676	0	10	0	1	A					
30	Princess St / Drayton Av	TWSC	WBT	365	0	50	0	1	A					
30	Princess St / Drayton Av	TWSC	WBR	11	0	50	0	1	A					
40	Princess St / Macdonnell Av	Signalized	NBL	12	10	35	13	21	C	26.0	C	18.8	B	
40	Princess St / Macdonnell Av	Signalized	NBT	90	10	35	12	17	B					
40	Princess St / Macdonnell Av	Signalized	NBR	22	10	35	7	12	B					
40	Princess St / Macdonnell Av	Signalized	SBL	5	40	40	17	26	C					
40	Princess St / Macdonnell Av	Signalized	SBT	59	40	40	14	20	B					
40	Princess St / Macdonnell Av	Signalized	SBR	35	40	40	4	8	A					
40	Princess St / Macdonnell Av	Signalized	EBL	32	85	190	18	25	C					
40	Princess St / Macdonnell Av	Signalized	EBT	606	85	190	14	21	C					
40	Princess St / Macdonnell Av	Signalized	EBR	29	85	190	11	17	B					
40	Princess St / Macdonnell Av	Signalized	WBL	0	50	55	0	0	A					
40	Princess St / Macdonnell Av	Signalized	WBT	329	50	55	11	16	B					
40	Princess St / Macdonnell Av	Signalized	WBR	7	50	55	8	13	B					
50	Princess St / Smith St	TWSC	SBL	1	40	40	1	13	B	17.0	C	3.2	A	
50	Princess St / Smith St	TWSC	SBR	5	40	40	6	17	C					
50	Princess St / Smith St	TWSC	EBL	40	40	60	1	2	A					
50	Princess St / Smith St	TWSC	EBT	594	40	60	0	1	A					
50	Princess St / Smith St	TWSC	WBT	334	5	45	4	7	A					
50	Princess St / Smith St	TWSC	WBR	3	5	45	0	0	A					
60	Princess St / Victoria St	Signalized	NBL	7	20	45	20	28	C	31.0	C	11.7	B	
60	Princess St / Victoria St	Signalized	NBT	93	20	45	17	23	C					
60	Princess St / Victoria St	Signalized	NBR	56	20	45	10	17	B					
60	Princess St / Victoria St	Signalized	SBL	75	20	35	22	31	C					
60	Princess St / Victoria St	Signalized	SBT	49	20	35	20	29	C					
60	Princess St / Victoria St	Signalized	SBR	1	20	35	0	0	A					
60	Princess St / Victoria St	Signalized	EBL	23	15	90	11	16	B					
60	Princess St / Victoria St	Signalized	EBT	554	15	90	1	5	A					
60	Princess St / Victoria St	Signalized	EBR	21	15	90	1	5	A					
60	Princess St / Victoria St	Signalized	WBL	16	45	95	15	20	B					
60	Princess St / Victoria St	Signalized	WBT	339	45	95	7	11	B					
60	Princess St / Victoria St	Signalized	WBR	164	45	95	6	12	B					
70	Princess St / Nelson St	TWSC	NBL	19	5	45	8	20	C	20.0	C	3.9	A	
70	Princess St / Nelson St	TWSC	NBT	2	5	45	1	12	B					
70	Princess St / Nelson St	TWSC	NBR	6	5	45	1	13	B					
70	Princess St / Nelson St	TWSC	SBL	0	0	5	0	0	A					
70	Princess St / Nelson St	TWSC	SBT	5	0	5	9	19	C					
70	Princess St / Nelson St	TWSC	SBR	0	0	5	0	0	A					
70	Princess St / Nelson St	TWSC	EBL	82	0	70	4	9	A					
70	Princess St / Nelson St	TWSC	EBT	609	0	70	1	3	A					
70	Princess St / Nelson St	TWSC	EBR	9	0	70	1	3	A					
70	Princess St / Nelson St	TWSC	WBL	27	25	70	6	10	A					
70	Princess St / Nelson St	TWSC	WBT	511	25	70	1	3	A					
70	Princess St / Nelson St	TWSC	WBR	2	25	70	0	7	A					

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	57	10	35	14	20	B	33.0	C	14.2	B
80	Princess St / Albert St	Signalized	NBT	11	10	35	12	18	B				
80	Princess St / Albert St	Signalized	NBR	49	10	35	5	10	A				
80	Princess St / Albert St	Signalized	SBL	3	5	30	15	27	C				
80	Princess St / Albert St	Signalized	SBT	30	5	30	14	18	B				
80	Princess St / Albert St	Signalized	SBR	101	5	30	2	7	A				
80	Princess St / Albert St	Signalized	EBL	32	50	95	23	33	C				
80	Princess St / Albert St	Signalized	EBT	578	50	95	11	16	B				
80	Princess St / Albert St	Signalized	EBR	13	50	95	6	13	B				
80	Princess St / Albert St	Signalized	WBL	8	20	45	18	23	C				
80	Princess St / Albert St	Signalized	WBT	391	20	45	7	11	B				
80	Princess St / Albert St	Signalized	WBR	11	20	45	9	15	B				
90	Princess St / Frontenac St	TWSC	NBL	1	0	20	0	0	A	19.0	C	2.1	A
90	Princess St / Frontenac St	TWSC	NBT	12	0	20	9	19	C				
90	Princess St / Frontenac St	TWSC	NBR	2	0	20	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	1	0	0	0	8	A				
90	Princess St / Frontenac St	TWSC	EBL	84	5	85	1	4	A				
90	Princess St / Frontenac St	TWSC	EBT	547	5	85	1	3	A				
90	Princess St / Frontenac St	TWSC	EBR	1	5	85	0	0	A				
90	Princess St / Frontenac St	TWSC	WBL	5	0	0	1	3	A				
90	Princess St / Frontenac St	TWSC	WBT	407	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	WBR	2	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	58	30	55	13	20	B	36.0	D	24.4	C
100	Princess St / Alfred St	Signalized	NBT	132	30	55	12	19	B				
100	Princess St / Alfred St	Signalized	NBR	118	30	55	9	14	B				
100	Princess St / Alfred St	Signalized	SBL	73	15	30	17	25	C				
100	Princess St / Alfred St	Signalized	SBT	44	15	30	15	24	C				
100	Princess St / Alfred St	Signalized	SBR	23	15	30	8	14	B				
100	Princess St / Alfred St	Signalized	EBL	40	75	100	26	36	D				
100	Princess St / Alfred St	Signalized	EBT	495	75	100	20	28	C				
100	Princess St / Alfred St	Signalized	EBR	28	75	100	16	24	C				
100	Princess St / Alfred St	Signalized	WBL	59	50	90	13	20	B				
100	Princess St / Alfred St	Signalized	WBT	333	50	90	20	26	C				
100	Princess St / Alfred St	Signalized	WBR	23	50	90	15	22	C				
110	Princess St / Chatham St	TWSC	SBL	1	0	5	0	0	A	19.0	C	3.2	A
110	Princess St / Chatham St	TWSC	SBR	12	0	5	3	19	C				
110	Princess St / Chatham St	TWSC	EBL	119	15	75	1	5	A				
110	Princess St / Chatham St	TWSC	EBT	567	15	75	1	4	A				
110	Princess St / Chatham St	TWSC	WBT	399	10	65	0	1	A				
110	Princess St / Chatham St	TWSC	WBR	43	10	65	1	3	A				
120	Princess St / University Av	Signalized	NBL	95	10	25	18	24	C	24.0	C	8.4	A
120	Princess St / University Av	Signalized	NBR	5	10	25	5	10	A				
120	Princess St / University Av	Signalized	EBT	501	35	70	3	7	A				
120	Princess St / University Av	Signalized	EBR	49	35	70	2	5	A				
120	Princess St / University Av	Signalized	WBL	21	10	45	10	15	B				
120	Princess St / University Av	Signalized	WBT	336	10	45	3	6	A				
130	Princess St / Division St	Signalized	NBL	74	25	45	14	23	C	27.0	C	15.9	B
130	Princess St / Division St	Signalized	NBT	185	25	45	13	19	B				
130	Princess St / Division St	Signalized	NBR	11	25	45	6	11	B				
130	Princess St / Division St	Signalized	SBL	145	15	70	9	14	B				
130	Princess St / Division St	Signalized	SBT	117	15	70	4	6	A				
130	Princess St / Division St	Signalized	SBR	283	15	70	0	1	A				
130	Princess St / Division St	Signalized	EBL	85	30	50	19	27	C				
130	Princess St / Division St	Signalized	EBT	366	30	50	19	26	C				
130	Princess St / Division St	Signalized	EBR	58	30	50	7	15	B				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	5	35	60	1040	1061	F	1061.0	F	58.0	F
140	Concession St / Drayton Av	TWSC	EBT	1,176	320	320	24	54	F				
140	Concession St / Drayton Av	TWSC	EBR	51	320	320	27	51	F				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	21	0	10	15	28	D	48.0	E	33.2	D
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	162	75	75	32	48	E				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	1,026	75	75	16	31	D				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	78	45	50	26	44	E	49.0	E	5.2	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	84	45	50	30	49	E				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	21	5	5	15	26	D				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	5	5	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	1,326	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	41	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	249	45	80	27	36	D	60.0	E	16.8	B
160	Concession St / Macdonnell St	Signalized	NBT	24	45	80	29	36	D				
160	Concession St / Macdonnell St	Signalized	NBR	29	45	80	24	32	C				
160	Concession St / Macdonnell St	Signalized	SBR	71	5	20	10	15	B				
160	Concession St / Macdonnell St	Signalized	EBL	55	75	80	49	60	E				
160	Concession St / Macdonnell St	Signalized	EBT	885	75	80	8	13	B				
160	Concession St / Macdonnell St	Signalized	EBR	116	75	80	7	12	B				
160	Concession St / Macdonnell St	Signalized	WBL	29	85	90	42	52	D				
160	Concession St / Macdonnell St	Signalized	WBT	1,053	85	90	8	12	B				
160	Concession St / Macdonnell St	Signalized	WBR	0	85	90	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	0	0	5	0	0	A	33.0	D	8.4	A
170	Concession St / Connaught St	TWSC	SBR	15	0	5	21	33	D				
170	Concession St / Connaught St	TWSC	EBL	0	35	95	0	0	A				
170	Concession St / Connaught St	TWSC	EBT	909	35	95	2	5	A				
170	Concession St / Connaught St	TWSC	WBT	1,067	115	115	7	11	B				
170	Concession St / Connaught St	TWSC	WBR	0	115	115	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	29	20	45	34	46	D	46.0	D	17.0	B
180	Concession St / Victoria St	Signalized	NBT	49	20	45	26	34	C				
180	Concession St / Victoria St	Signalized	NBR	75	20	45	18	27	C				
180	Concession St / Victoria St	Signalized	SBL	3	0	10	24	32	C				
180	Concession St / Victoria St	Signalized	SBT	22	0	10	24	29	C				
180	Concession St / Victoria St	Signalized	SBR	36	0	10	9	22	C				
180	Concession St / Victoria St	Signalized	EBL	21	115	115	30	39	D				
180	Concession St / Victoria St	Signalized	EBT	806	115	115	8	14	B				
180	Concession St / Victoria St	Signalized	EBR	92	115	115	7	13	B				
180	Concession St / Victoria St	Signalized	WBL	40	90	95	25	33	C				
180	Concession St / Victoria St	Signalized	WBT	1,000	90	95	10	16	B				
180	Concession St / Victoria St	Signalized	WBR	16	90	95	0	1	A				
190	Concession St / Nelson St	TWSC	NBL	7	0	5	202	221	F	221.0	F	9.8	A
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	7	0	5	3	9	A				
190	Concession St / Nelson St	TWSC	SBL	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	12	0	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	0	0	85	0	0	A				
190	Concession St / Nelson St	TWSC	EBT	813	0	85	1	2	A				
190	Concession St / Nelson St	TWSC	EBR	69	0	85	1	3	A				
190	Concession St / Nelson St	TWSC	WBL	13	95	100	5	12	B				
190	Concession St / Nelson St	TWSC	WBT	1,029	95	100	9	15	B				
190	Concession St / Nelson St	TWSC	WBR	0	95	100	0	0	A				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	0	0	15	0	0	A	46.0	E	9.4	A
200	Concession St / Kingscourt Av	TWSC	SBR	16	0	15	31	46	E				
200	Concession St / Kingscourt Av	TWSC	EBL	2	0	95	33	41	E				
200	Concession St / Kingscourt Av	TWSC	EBT	807	0	95	2	4	A				
200	Concession St / Kingscourt Av	TWSC	WBT	1,027	95	95	8	13	B				
200	Concession St / Kingscourt Av	TWSC	WBR	0	95	95	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	11	0	10	76	89	F	89.0	F	10.8	B
210	Concession St / Fergus St	TWSC	SBR	0	0	10	0	0	A				
210	Concession St / Fergus St	TWSC	EBL	0	0	100	0	0	A				
210	Concession St / Fergus St	TWSC	EBT	803	0	100	4	7	A				
210	Concession St / Fergus St	TWSC	WBT	1,030	100	100	7	13	B				
210	Concession St / Fergus St	TWSC	WBR	4	100	100	0	2	A				
220	Concession St / Grey St	TWSC	SBL	0	0	5	0	0	A	25.0	C	9.3	A
220	Concession St / Grey St	TWSC	SBR	15	0	5	14	25	C				
220	Concession St / Grey St	TWSC	EBL	0	65	105	0	0	A				
220	Concession St / Grey St	TWSC	EBT	816	65	105	11	17	C				
220	Concession St / Grey St	TWSC	WBT	1,019	40	60	2	3	A				
220	Concession St / Grey St	TWSC	WBR	5	40	60	1	4	A				
230	Concession St / Alfred St	Signalized	NBL	266	95	215	60	79	E	84.0	F	28.0	C
230	Concession St / Alfred St	Signalized	NBT	34	95	215	65	84	F				
230	Concession St / Alfred St	Signalized	NBR	26	95	215	52	72	E				
230	Concession St / Alfred St	Signalized	SBL	0	5	15	0	0	A				
230	Concession St / Alfred St	Signalized	SBT	36	5	15	16	21	C				
230	Concession St / Alfred St	Signalized	SBR	21	5	15	8	13	B				
230	Concession St / Alfred St	Signalized	EBL	22	55	60	25	33	C				
230	Concession St / Alfred St	Signalized	EBT	482	55	60	12	16	B				
230	Concession St / Alfred St	Signalized	EBR	316	55	60	3	5	A				
230	Concession St / Alfred St	Signalized	WBL	47	105	145	16	26	C				
230	Concession St / Alfred St	Signalized	WBT	740	105	145	15	24	C				
230	Concession St / Alfred St	Signalized	WBR	0	105	145	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	3	0	5	13	21	C	21.0	C	3.8	A
240	Concession St / Lansdowne St	TWSC	NBR	17	0	5	2	15	B				
240	Concession St / Lansdowne St	TWSC	EBT	464	0	0	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	43	0	120	3	6	A				
240	Concession St / Lansdowne St	TWSC	WBT	762	0	120	2	5	A				
250	Concession St / Division St	Signalized	NBL	149	115	115	48	62	E	88.0	F	41.9	D
250	Concession St / Division St	Signalized	NBT	560	115	115	34	42	D				
250	Concession St / Division St	Signalized	NBR	13	115	115	31	39	D				
250	Concession St / Division St	Signalized	SBL	27	70	225	33	44	D				
250	Concession St / Division St	Signalized	SBT	465	70	225	18	25	C				
250	Concession St / Division St	Signalized	SBR	237	70	225	6	14	B				
250	Concession St / Division St	Signalized	EBL	225	40	90	22	30	C				
250	Concession St / Division St	Signalized	EBT	207	40	90	12	17	B				
250	Concession St / Division St	Signalized	EBR	35	40	90	4	6	A				
250	Concession St / Division St	Signalized	WBL	43	205	210	73	88	F				
250	Concession St / Division St	Signalized	WBT	396	205	210	71	85	F				
250	Concession St / Division St	Signalized	WBR	33	205	210	70	86	F				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	0	110	110	0	0	A	475.0	F	24.6	C
260	Adelaide St / Division St	TWSC	NBT	702	110	110	24	32	D				
260	Adelaide St / Division St	TWSC	NBR	0	110	110	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	0	0	70	0	0	A				
260	Adelaide St / Division St	TWSC	SBT	427	0	70	0	2	A				
260	Adelaide St / Division St	TWSC	SBR	115	0	70	0	1	A				
260	Adelaide St / Division St	TWSC	EBL	16	5	60	458	475	F				
260	Adelaide St / Division St	TWSC	EBT	0	5	60	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	0	5	60	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	8	0	5	19	29	D				
260	Adelaide St / Division St	TWSC	WBT	3	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBR	0	0	5	0	0	A				
270	Stanley St / Division St	TWSC	NBL	0	75	75	0	0	A	40.0	E	13.1	B
270	Stanley St / Division St	TWSC	NBT	692	75	75	12	19	C				
270	Stanley St / Division St	TWSC	SBT	377	0	25	1	3	A				
270	Stanley St / Division St	TWSC	SBR	56	0	25	1	2	A				
270	Stanley St / Division St	TWSC	EBL	14	0	5	30	40	E				
270	Stanley St / Division St	TWSC	EBR	0	0	5	0	0	A				
280	Pine St / Division St	Signalized	NBL	40	75	80	15	22	C	45.0	D	21.4	C
280	Pine St / Division St	Signalized	NBT	622	75	80	17	24	C				
280	Pine St / Division St	Signalized	NBR	0	75	80	0	0	A				
280	Pine St / Division St	Signalized	SBL	28	25	70	19	25	C				
280	Pine St / Division St	Signalized	SBT	339	25	70	6	10	A				
280	Pine St / Division St	Signalized	SBR	13	25	70	4	7	A				
280	Pine St / Division St	Signalized	EBL	5	10	30	16	24	C				
280	Pine St / Division St	Signalized	EBT	43	10	30	25	31	C				
280	Pine St / Division St	Signalized	EBR	35	10	30	7	13	B				
280	Pine St / Division St	Signalized	WBL	6	15	45	34	43	D				
280	Pine St / Division St	Signalized	WBT	46	15	45	35	45	D				
280	Pine St / Division St	Signalized	WBR	65	15	45	27	37	D				
290	Quebec St / Division St	TWSC	NBT	664	65	85	7	11	B	20.0	C	7.9	A
290	Quebec St / Division St	TWSC	NBR	0	65	85	0	0	A				
290	Quebec St / Division St	TWSC	SBL	0	0	80	0	0	A				
290	Quebec St / Division St	TWSC	SBT	376	0	80	1	2	A				
290	Quebec St / Division St	TWSC	WBL	14	0	5	13	20	C				
290	Quebec St / Division St	TWSC	WBR	0	0	5	0	0	A				
300	York St / Division St	Signalized	NBL	1	35	35	0	2	A	31.0	C	9.8	A
300	York St / Division St	Signalized	NBT	625	35	35	5	7	A				
300	York St / Division St	Signalized	NBR	6	35	35	0	0	A				
300	York St / Division St	Signalized	SBL	36	20	65	16	22	C				
300	York St / Division St	Signalized	SBT	358	20	65	5	7	A				
300	York St / Division St	Signalized	SBR	0	20	65	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	15	0	0	A				
300	York St / Division St	Signalized	EBT	33	5	15	25	29	C				
300	York St / Division St	Signalized	EBR	1	5	15	0	0	A				
300	York St / Division St	Signalized	WBL	38	10	30	21	27	C				
300	York St / Division St	Signalized	WBT	26	10	30	23	31	C				
300	York St / Division St	Signalized	WBR	40	10	30	13	23	C				
310	Main St / Division St	TWSC	NBT	628	55	60	12	18	C	31.0	D	11.1	B
310	Main St / Division St	TWSC	NBR	0	55	60	0	0	A				
310	Main St / Division St	TWSC	SBL	0	35	40	0	0	A				
310	Main St / Division St	TWSC	SBT	394	35	40	0	0	A				
310	Main St / Division St	TWSC	WBL	8	0	5	5	13	B				
310	Main St / Division St	TWSC	WBR	2	0	5	19	31	D				
320	Hamilton St / Division St	TWSC	NBL	14	110	110	12	20	C	30.0	D	18.0	C
320	Hamilton St / Division St	TWSC	NBT	627	110	110	20	30	D				
320	Hamilton St / Division St	TWSC	SBT	378	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	29	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	0	0	5	0	0	A				
320	Hamilton St / Division St	TWSC	EBR	18	0	5	1	8	A				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 22% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
330	Raglan St / Division St	TWSC	NBT	624	40	60	7	9	A	26.0	D	6.2	A
330	Raglan St / Division St	TWSC	NBR	14	40	60	7	12	B				
330	Raglan St / Division St	TWSC	SBL	5	0	0	2	7	A				
330	Raglan St / Division St	TWSC	SBT	391	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	29	5	10	7	16	C				
330	Raglan St / Division St	TWSC	WBR	15	5	10	16	26	D				
340	Elm St / Division St	TWSC	NBL	124	25	60	6	10	A	37.0	E	7.2	A
340	Elm St / Division St	TWSC	NBT	625	25	60	7	10	A				
340	Elm St / Division St	TWSC	SBT	370	0	35	0	1	A				
340	Elm St / Division St	TWSC	SBR	49	0	35	1	2	A				
340	Elm St / Division St	TWSC	EBL	13	5	10	26	37	E				
340	Elm St / Division St	TWSC	EBR	11	5	10	8	16	C				
350	Ellice St / Division St	TWSC	NBT	737	15	55	3	5	A	22.0	C	3.9	A
350	Ellice St / Division St	TWSC	NBR	5	15	55	4	5	A				
350	Ellice St / Division St	TWSC	SBL	2	0	0	5	8	A				
350	Ellice St / Division St	TWSC	SBT	377	0	0	0	1	A				
350	Ellice St / Division St	TWSC	WBL	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	WBR	13	0	5	12	22	C				
360	Colborne St / Division St	TWSC	NBL	44	20	260	5	9	A	33.0	D	6.9	A
360	Colborne St / Division St	TWSC	NBT	712	20	260	5	8	A				
360	Colborne St / Division St	TWSC	NBR	0	20	260	0	0	A				
360	Colborne St / Division St	TWSC	SBL	5	0	35	5	7	A				
360	Colborne St / Division St	TWSC	SBT	372	0	35	2	3	A				
360	Colborne St / Division St	TWSC	SBR	0	0	35	0	0	A				
360	Colborne St / Division St	TWSC	EBL	11	5	10	23	33	D				
360	Colborne St / Division St	TWSC	EBT	2	5	10	12	22	C				
360	Colborne St / Division St	TWSC	EBR	14	5	10	5	14	B				
360	Colborne St / Division St	TWSC	WBL	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBT	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBR	14	0	5	7	16	C				
370	Queen St / Division St	Signalized	NBT	185	10	65	12	16	B	30.0	C	23.6	C
370	Queen St / Division St	Signalized	NBR	83	10	65	4	11	B				
370	Queen St / Division St	Signalized	SBL	107	50	80	17	25	C				
370	Queen St / Division St	Signalized	SBT	279	50	80	15	22	C				
370	Queen St / Division St	Signalized	WBL	265	50	180	12	20	B				
370	Queen St / Division St	Signalized	WBR	571	50	180	14	30	C				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LOS
10	Princess St / Concession St	Signalized	2,976	46.6	73.8	28.3	22.7	C
20	Princess St / Regent St	TWSC	1,395	12.2	74.2	5.3	1.8	-
30	Princess St / Drayton Av	TWSC	1,349	18.1	64.2	3.2	0.8	-
40	Princess St / Macdonnell Av	Signalized	1,294	72.9	136.0	16.5	11.0	B
50	Princess St / Smith St	TWSC	1,091	30.5	60.2	3.6	1.6	-
60	Princess St / Victoria St	Signalized	1,345	29.4	104.5	11.1	6.5	B
70	Princess St / Nelson St	TWSC	1,266	6.3	92.0	4.8	1.5	-
80	Princess St / Albert St	Signalized	1,232	39.5	84.7	15.7	10.5	B
90	Princess St / Frontenac St	TWSC	1,117	0.0	56.2	2.9	0.1	-
100	Princess St / Alfred St	Signalized	1,461	50.0	101.0	24.0	16.6	C
110	Princess St / Chatham St	TWSC	1,026	0.2	46.0	2.2	0.1	-
120	Princess St / University Av	Signalized	930	22.3	58.9	6.1	2.9	A
130	Princess St / Division St	Signalized	1,145	19.6	52.1	16.3	11.1	B
140	Concession St / Drayton Av	TWSC	961	0.0	158.1	9.0	4.9	-
150	Concession St / Leroy Grant Dr (S)	TWSC	937	69.4	74.4	8.9	4.8	-
155	Concession St / Leroy Grant Drive (N)	TWSC	715	0.3	0.9	0.8	0.2	-
160	Concession St / Macdonnell St	Signalized	1,582	53.6	76.5	15.6	10.9	B
170	Concession St / Connaught St	TWSC	1,298	0.0	102.3	4.9	3.3	-
180	Concession St / Victoria St	Signalized	1,390	35.6	81.8	12.9	8.4	B
190	Concession St / Nelson St	TWSC	1,272	0.1	86.2	3.9	2.3	-
200	Concession St / Kingscourt Av	TWSC	1,237	0.2	56.9	4.5	2.4	-
210	Concession St / Fergus St	TWSC	1,247	0.2	66.7	7.0	3.8	-
220	Concession St / Grey St	TWSC	1,280	27.8	59.5	12.1	7.7	-
230	Concession St / Alfred St	Signalized	1,378	43.4	69.0	12.1	7.6	B
240	Concession St / Lansdowne St	TWSC	1,048	0.0	8.2	0.6	0.0	-
250	Concession St / Division St	Signalized	1,830	46.5	107.1	23.4	16.9	C
260	Adelaide St / Division St	TWSC	772	0.0	21.9	0.2	0.0	-
270	Stanley St / Division St	TWSC	709	0.5	14.8	2.0	0.2	-
280	Pine St / Division St	Signalized	787	13.0	47.1	8.8	5.1	A
290	Quebec St / Division St	TWSC	682	0.0	32.6	0.9	0.0	-
300	York St / Division St	Signalized	770	15.2	41.8	7.4	4.7	A
310	Main St / Division St	TWSC	652	23.1	29.7	0.8	0.3	-
320	Hamilton St / Division St	TWSC	640	0.1	0.1	0.2	0.0	-
330	Raglan St / Division St	TWSC	645	0.2	0.2	0.4	0.0	-
340	Elm St / Division St	TWSC	628	0.0	0.1	0.2	0.1	-
350	Ellice St / Division St	TWSC	610	0.0	0.1	0.2	0.1	-
360	Colborne St / Division St	TWSC	628	0.3	22.2	1.4	0.7	-
370	Queen St / Division St	Signalized	906	31.0	52.5	15.8	9.6	B
Total			42,231	708	2,215	294	181	

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt		Intersection	
					50th	95th					LOS	Delay	LOS	
10	Princess St / Concession St	Signalized	NBL	191	40	60	37	44	D	45.0	D	28.3	C	
10	Princess St / Concession St	Signalized	NBT	242	40	60	37	45	D					
10	Princess St / Concession St	Signalized	NBR	50	40	60	3	5	A					
10	Princess St / Concession St	Signalized	SBL	528	75	105	31	38	D					
10	Princess St / Concession St	Signalized	SBT	577	75	105	31	40	D					
10	Princess St / Concession St	Signalized	SBR	32	75	105	17	22	C					
10	Princess St / Concession St	Signalized	EBT	408	30	65	25	31	C					
10	Princess St / Concession St	Signalized	EBR	277	30	65	1	2	A					
10	Princess St / Concession St	Signalized	WBT	245	20	40	24	30	C					
10	Princess St / Concession St	Signalized	WBR	341	20	40	0	0	A					
10	Princess St / Concession St	Signalized	WBL	85	20	40	1	4	A					
20	Princess St / Regent St	TWSC	NBL	1	5	10	0	0	A	17.0	C	5.3	A	
20	Princess St / Regent St	TWSC	NBR	34	5	10	8	17	C					
20	Princess St / Regent St	TWSC	EBT	788	20	95	2	7	A					
20	Princess St / Regent St	TWSC	EBR	51	20	95	1	3	A					
20	Princess St / Regent St	TWSC	WBL	9	0	45	8	11	B					
20	Princess St / Regent St	TWSC	WBT	512	0	45	1	2	A					
30	Princess St / Drayton Av	TWSC	SBL	2	0	45	11	28	D	28.0	D	3.2	A	
30	Princess St / Drayton Av	TWSC	SBR	6	0	45	3	16	C					
30	Princess St / Drayton Av	TWSC	EBL	118	30	80	3	7	A					
30	Princess St / Drayton Av	TWSC	EBT	696	30	80	1	4	A					
30	Princess St / Drayton Av	TWSC	WBT	516	0	40	0	1	A					
30	Princess St / Drayton Av	TWSC	WBR	11	0	40	0	1	A					
40	Princess St / Macdonnell Av	Signalized	NBL	46	5	40	12	18	B	32.0	C	16.5	B	
40	Princess St / Macdonnell Av	Signalized	NBT	25	5	40	13	18	B					
40	Princess St / Macdonnell Av	Signalized	NBR	22	5	40	7	13	B					
40	Princess St / Macdonnell Av	Signalized	SBL	8	40	40	9	15	B					
40	Princess St / Macdonnell Av	Signalized	SBT	18	40	40	12	16	B					
40	Princess St / Macdonnell Av	Signalized	SBR	63	40	40	3	8	A					
40	Princess St / Macdonnell Av	Signalized	EBL	29	100	210	25	32	C					
40	Princess St / Macdonnell Av	Signalized	EBT	633	100	210	12	19	B					
40	Princess St / Macdonnell Av	Signalized	EBR	32	100	210	9	15	B					
40	Princess St / Macdonnell Av	Signalized	WBL	0	50	55	0	0	A					
40	Princess St / Macdonnell Av	Signalized	WBT	413	50	55	10	13	B					
40	Princess St / Macdonnell Av	Signalized	WBR	5	50	55	10	14	B					
50	Princess St / Smith St	TWSC	SBL	2	40	40	3	17	C	19.0	C	3.6	A	
50	Princess St / Smith St	TWSC	SBR	17	40	40	6	19	C					
50	Princess St / Smith St	TWSC	EBL	7	40	45	0	2	A					
50	Princess St / Smith St	TWSC	EBT	649	40	45	0	1	A					
50	Princess St / Smith St	TWSC	WBT	402	15	85	4	7	A					
50	Princess St / Smith St	TWSC	WBR	14	15	85	2	3	A					
60	Princess St / Victoria St	Signalized	NBL	38	15	40	22	31	C	31.0	C	11.1	B	
60	Princess St / Victoria St	Signalized	NBT	29	15	40	16	23	C					
60	Princess St / Victoria St	Signalized	NBR	47	15	40	10	18	B					
60	Princess St / Victoria St	Signalized	SBL	16	5	20	19	26	C					
60	Princess St / Victoria St	Signalized	SBT	49	5	20	20	25	C					
60	Princess St / Victoria St	Signalized	SBR	0	5	20	0	0	A					
60	Princess St / Victoria St	Signalized	EBL	5	30	135	9	17	B					
60	Princess St / Victoria St	Signalized	EBT	643	30	135	4	9	A					
60	Princess St / Victoria St	Signalized	EBR	12	30	135	3	9	A					
60	Princess St / Victoria St	Signalized	WBL	38	35	90	12	17	B					
60	Princess St / Victoria St	Signalized	WBT	380	35	90	6	9	A					
60	Princess St / Victoria St	Signalized	WBR	88	35	90	3	7	A					
70	Princess St / Nelson St	TWSC	NBL	4	35	45	13	25	C	27.0	D	4.8	A	
70	Princess St / Nelson St	TWSC	NBT	11	35	45	11	27	D					
70	Princess St / Nelson St	TWSC	NBR	11	35	45	5	16	C					
70	Princess St / Nelson St	TWSC	SBL	10	0	5	13	25	C					
70	Princess St / Nelson St	TWSC	SBT	0	0	5	0	0	A					
70	Princess St / Nelson St	TWSC	SBR	11	0	5	3	17	C					
70	Princess St / Nelson St	TWSC	EBL	82	10	105	3	8	A					
70	Princess St / Nelson St	TWSC	EBT	617	10	105	1	5	A					
70	Princess St / Nelson St	TWSC	EBR	9	10	105	2	7	A					
70	Princess St / Nelson St	TWSC	WBL	16	0	80	8	13	B					
70	Princess St / Nelson St	TWSC	WBT	492	0	80	1	2	A					
70	Princess St / Nelson St	TWSC	WBR	3	0	80	0	3	A					

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	20	5	15	16	23	C	32.0	C	15.7	B
80	Princess St / Albert St	Signalized	NBT	7	5	15	14	20	B				
80	Princess St / Albert St	Signalized	NBR	36	5	15	2	7	A				
80	Princess St / Albert St	Signalized	SBL	10	5	35	9	19	B				
80	Princess St / Albert St	Signalized	SBT	31	5	35	7	9	A				
80	Princess St / Albert St	Signalized	SBR	58	5	35	1	8	A				
80	Princess St / Albert St	Signalized	EBL	2	55	120	23	32	C				
80	Princess St / Albert St	Signalized	EBT	609	55	120	14	20	B				
80	Princess St / Albert St	Signalized	EBR	21	55	120	16	22	C				
80	Princess St / Albert St	Signalized	WBL	5	30	55	18	26	C				
80	Princess St / Albert St	Signalized	WBT	432	30	55	7	11	B				
80	Princess St / Albert St	Signalized	WBR	1	30	55	0	0	A				
90	Princess St / Frontenac St	TWSC	NBL	1	0	20	1	7	A	25.0	C	2.9	A
90	Princess St / Frontenac St	TWSC	NBT	1	0	20	15	25	C				
90	Princess St / Frontenac St	TWSC	NBR	2	0	20	3	10	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	5	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	7	0	5	1	8	A				
90	Princess St / Frontenac St	TWSC	EBL	44	0	95	1	4	A				
90	Princess St / Frontenac St	TWSC	EBT	611	0	95	0	4	A				
90	Princess St / Frontenac St	TWSC	EBR	5	0	95	0	3	A				
90	Princess St / Frontenac St	TWSC	WBL	13	0	0	2	4	A				
90	Princess St / Frontenac St	TWSC	WBT	431	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	WBR	2	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	66	25	50	17	24	C	29.0	C	24.0	C
100	Princess St / Alfred St	Signalized	NBT	95	25	50	16	23	C				
100	Princess St / Alfred St	Signalized	NBR	86	25	50	8	16	B				
100	Princess St / Alfred St	Signalized	SBL	33	30	75	18	27	C				
100	Princess St / Alfred St	Signalized	SBT	143	30	75	14	21	C				
100	Princess St / Alfred St	Signalized	SBR	103	30	75	7	13	B				
100	Princess St / Alfred St	Signalized	EBL	14	75	140	22	29	C				
100	Princess St / Alfred St	Signalized	EBT	563	75	140	20	28	C				
100	Princess St / Alfred St	Signalized	EBR	27	75	140	13	20	B				
100	Princess St / Alfred St	Signalized	WBL	17	40	90	21	29	C				
100	Princess St / Alfred St	Signalized	WBT	295	40	90	18	25	C				
100	Princess St / Alfred St	Signalized	WBR	19	40	90	4	8	A				
110	Princess St / Chatham St	TWSC	SBL	0	5	5	0	0	A	15.0	B	2.2	A
110	Princess St / Chatham St	TWSC	SBR	40	5	5	1	15	B				
110	Princess St / Chatham St	TWSC	EBL	52	0	40	1	3	A				
110	Princess St / Chatham St	TWSC	EBT	630	0	40	0	2	A				
110	Princess St / Chatham St	TWSC	WBT	288	0	65	0	1	A				
110	Princess St / Chatham St	TWSC	WBR	16	0	65	0	0	A				
120	Princess St / University Av	Signalized	NBL	31	5	15	16	22	C	24.0	C	6.1	A
120	Princess St / University Av	Signalized	NBR	30	5	15	2	8	A				
120	Princess St / University Av	Signalized	EBT	528	30	75	2	5	A				
120	Princess St / University Av	Signalized	EBR	59	30	75	1	4	A				
120	Princess St / University Av	Signalized	WBL	10	10	35	17	24	C				
120	Princess St / University Av	Signalized	WBT	272	10	35	3	6	A				
130	Princess St / Division St	Signalized	NBL	58	5	25	11	21	C	28.0	C	16.3	B
130	Princess St / Division St	Signalized	NBT	52	5	25	11	17	B				
130	Princess St / Division St	Signalized	NBR	1	5	25	0	0	A				
130	Princess St / Division St	Signalized	SBL	149	5	55	4	6	A				
130	Princess St / Division St	Signalized	SBT	104	5	55	4	5	A				
130	Princess St / Division St	Signalized	SBR	224	5	55	0	1	A				
130	Princess St / Division St	Signalized	EBL	138	35	55	19	27	C				
130	Princess St / Division St	Signalized	EBT	377	35	55	20	28	C				
130	Princess St / Division St	Signalized	EBR	42	35	55	9	16	B				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	12	0	10	74	87	F	87.0	F	9.0	A
140	Concession St / Drayton Av	TWSC	EBT	949	0	160	4	8	A				
140	Concession St / Drayton Av	TWSC	EBR	0	0	160	0	0	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	8	0	5	7	17	C	17.0	C	8.9	A
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	40	70	75	1	4	A				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	889	70	75	5	9	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	29	5	5	3	11	B	11.0	B	0.8	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	11	5	5	1	11	B				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	8	0	5	2	11	B				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	77	0	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	564	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	26	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	72	10	25	22	28	C	60.0	E	15.6	B
160	Concession St / Macdonnell St	Signalized	NBT	0	10	25	0	0	A				
160	Concession St / Macdonnell St	Signalized	NBR	19	10	25	10	15	B				
160	Concession St / Macdonnell St	Signalized	SBR	43	0	5	2	3	A				
160	Concession St / Macdonnell St	Signalized	EBL	37	75	80	11	17	B				
160	Concession St / Macdonnell St	Signalized	EBT	715	75	80	7	11	B				
160	Concession St / Macdonnell St	Signalized	EBR	148	75	80	5	9	A				
160	Concession St / Macdonnell St	Signalized	WBL	73	30	85	49	60	E				
160	Concession St / Macdonnell St	Signalized	WBT	474	30	85	12	17	B				
160	Concession St / Macdonnell St	Signalized	WBR	1	30	85	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	9	0	5	10	18	C	26.0	D	4.9	A
170	Concession St / Connaught St	TWSC	SBR	8	0	5	17	26	D				
170	Concession St / Connaught St	TWSC	EBL	20	0	95	4	7	A				
170	Concession St / Connaught St	TWSC	EBT	713	0	95	1	2	A				
170	Concession St / Connaught St	TWSC	WBT	548	0	115	6	8	A				
170	Concession St / Connaught St	TWSC	WBR	0	0	115	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	5	5	20	34	41	D	41.0	D	12.9	B
180	Concession St / Victoria St	Signalized	NBT	20	5	20	25	31	C				
180	Concession St / Victoria St	Signalized	NBR	46	5	20	4	9	A				
180	Concession St / Victoria St	Signalized	SBL	3	5	10	19	27	C				
180	Concession St / Victoria St	Signalized	SBT	35	5	10	21	25	C				
180	Concession St / Victoria St	Signalized	SBR	42	5	10	4	12	B				
180	Concession St / Victoria St	Signalized	EBL	20	35	90	9	14	B				
180	Concession St / Victoria St	Signalized	EBT	680	35	90	6	9	A				
180	Concession St / Victoria St	Signalized	EBR	9	35	90	6	12	B				
180	Concession St / Victoria St	Signalized	WBL	24	45	90	18	27	C				
180	Concession St / Victoria St	Signalized	WBT	506	45	90	10	16	B				
180	Concession St / Victoria St	Signalized	WBR	0	45	90	0	0	A				
190	Concession St / Nelson St	TWSC	NBL	8	0	5	12	22	C	22.0	C	3.9	A
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	9	0	5	7	13	B				
190	Concession St / Nelson St	TWSC	SBL	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	5	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	26	5	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	40	0	85	1	4	A				
190	Concession St / Nelson St	TWSC	EBT	689	0	85	1	2	A				
190	Concession St / Nelson St	TWSC	EBR	0	0	85	0	0	A				
190	Concession St / Nelson St	TWSC	WBL	0	0	95	0	0	A				
190	Concession St / Nelson St	TWSC	WBT	500	0	95	4	6	A				
190	Concession St / Nelson St	TWSC	WBR	0	0	95	0	0	A				

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	44	5	25	26	39	E	39.0	E	4.5	A
200	Concession St / Kingscourt Av	TWSC	SBR	5	5	25	16	32	D				
200	Concession St / Kingscourt Av	TWSC	EBL	40	0	75	3	6	A				
200	Concession St / Kingscourt Av	TWSC	EBT	649	0	75	1	3	A				
200	Concession St / Kingscourt Av	TWSC	WBT	492	0	35	2	3	A				
200	Concession St / Kingscourt Av	TWSC	WBR	7	0	35	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	45	5	25	58	73	F	73.0	F	7.0	A
210	Concession St / Fergus St	TWSC	SBR	3	5	25	12	21	C				
210	Concession St / Fergus St	TWSC	EBL	30	0	100	2	7	A				
210	Concession St / Fergus St	TWSC	EBT	663	0	100	3	7	A				
210	Concession St / Fergus St	TWSC	WBT	490	0	25	0	1	A				
210	Concession St / Fergus St	TWSC	WBR	16	0	25	0	0	A				
220	Concession St / Grey St	TWSC	SBL	43	5	45	95	111	F	111.0	F	12.1	B
220	Concession St / Grey St	TWSC	SBR	3	5	45	46	78	F				
220	Concession St / Grey St	TWSC	EBL	21	50	105	5	11	B				
220	Concession St / Grey St	TWSC	EBT	685	50	105	8	15	B				
220	Concession St / Grey St	TWSC	WBT	504	0	0	0	0	A				
220	Concession St / Grey St	TWSC	WBR	24	0	0	0	0	A				
230	Concession St / Alfred St	Signalized	NBL	46	5	25	17	23	C	23.0	C	12.1	B
230	Concession St / Alfred St	Signalized	NBT	11	5	25	11	17	B				
230	Concession St / Alfred St	Signalized	NBR	46	5	25	6	13	B				
230	Concession St / Alfred St	Signalized	SBL	2	5	20	0	7	A				
230	Concession St / Alfred St	Signalized	SBT	35	5	20	13	19	B				
230	Concession St / Alfred St	Signalized	SBR	37	5	20	4	9	A				
230	Concession St / Alfred St	Signalized	EBL	34	55	60	12	18	B				
230	Concession St / Alfred St	Signalized	EBT	522	55	60	8	12	B				
230	Concession St / Alfred St	Signalized	EBR	172	55	60	1	3	A				
230	Concession St / Alfred St	Signalized	WBL	31	40	100	12	21	C				
230	Concession St / Alfred St	Signalized	WBT	441	40	100	8	13	B				
230	Concession St / Alfred St	Signalized	WBR	1	40	100	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	0	0	0	0	0	A	5.0	A	0.6	A
240	Concession St / Lansdowne St	TWSC	NBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	EBT	572	0	15	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	15	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	4	0	0	1	5	A				
240	Concession St / Lansdowne St	TWSC	WBT	472	0	0	0	0	A				
250	Concession St / Division St	Signalized	NBL	13	35	80	17	26	C	48.0	D	23.4	C
250	Concession St / Division St	Signalized	NBT	247	35	80	16	22	C				
250	Concession St / Division St	Signalized	NBR	45	35	80	13	18	B				
250	Concession St / Division St	Signalized	SBL	32	60	120	21	29	C				
250	Concession St / Division St	Signalized	SBT	396	60	120	17	23	C				
250	Concession St / Division St	Signalized	SBR	232	60	120	2	6	A				
250	Concession St / Division St	Signalized	EBL	202	35	105	16	23	C				
250	Concession St / Division St	Signalized	EBT	344	35	105	13	18	B				
250	Concession St / Division St	Signalized	EBR	20	35	105	7	10	A				
250	Concession St / Division St	Signalized	WBL	46	50	110	37	48	D				
250	Concession St / Division St	Signalized	WBT	237	50	110	35	46	D				
250	Concession St / Division St	Signalized	WBR	16	50	110	30	39	D				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	0	0	10	0	0	A	10.0	A	0.2	A
260	Adelaide St / Division St	TWSC	NBT	285	0	10	0	0	A				
260	Adelaide St / Division St	TWSC	NBR	2	0	10	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	13	0	30	0	1	A				
260	Adelaide St / Division St	TWSC	SBT	397	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	SBR	53	0	30	0	0	A				
260	Adelaide St / Division St	TWSC	EBL	11	0	5	2	10	A				
260	Adelaide St / Division St	TWSC	EBT	1	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	1	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	0	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBT	1	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBR	8	0	5	0	7	A				
270	Stanley St / Division St	TWSC	NBL	13	0	0	0	2	A	10.0	A	2.0	A
270	Stanley St / Division St	TWSC	NBT	236	0	0	0	0	A				
270	Stanley St / Division St	TWSC	SBT	395	0	25	0	2	A				
270	Stanley St / Division St	TWSC	SBR	0	0	25	0	0	A				
270	Stanley St / Division St	TWSC	EBL	49	5	10	2	10	A				
270	Stanley St / Division St	TWSC	EBR	16	5	10	2	8	A				
280	Pine St / Division St	Signalized	NBL	7	5	20	10	14	B	32.0	C	8.8	A
280	Pine St / Division St	Signalized	NBT	204	5	20	2	4	A				
280	Pine St / Division St	Signalized	NBR	7	5	20	0	2	A				
280	Pine St / Division St	Signalized	SBL	34	20	70	4	7	A				
280	Pine St / Division St	Signalized	SBT	385	20	70	4	8	A				
280	Pine St / Division St	Signalized	SBR	0	20	70	0	0	A				
280	Pine St / Division St	Signalized	EBL	2	5	20	0	0	A				
280	Pine St / Division St	Signalized	EBT	29	5	20	24	28	C				
280	Pine St / Division St	Signalized	EBR	39	5	20	6	11	B				
280	Pine St / Division St	Signalized	WBL	19	5	25	22	29	C				
280	Pine St / Division St	Signalized	WBT	16	5	25	24	32	C				
280	Pine St / Division St	Signalized	WBR	45	5	25	3	9	A				
290	Quebec St / Division St	TWSC	NBT	217	0	0	0	0	A	9.0	A	0.9	A
290	Quebec St / Division St	TWSC	NBR	4	0	0	0	0	A				
290	Quebec St / Division St	TWSC	SBL	3	0	50	0	0	A				
290	Quebec St / Division St	TWSC	SBT	440	0	50	0	1	A				
290	Quebec St / Division St	TWSC	WBL	16	0	5	1	9	A				
290	Quebec St / Division St	TWSC	WBR	2	0	5	0	0	A				
300	York St / Division St	Signalized	NBL	0	20	35	0	0	A	30.0	C	7.4	A
300	York St / Division St	Signalized	NBT	199	20	35	3	5	A				
300	York St / Division St	Signalized	NBR	21	20	35	1	3	A				
300	York St / Division St	Signalized	SBL	46	15	50	4	8	A				
300	York St / Division St	Signalized	SBT	408	15	50	3	5	A				
300	York St / Division St	Signalized	SBR	0	15	50	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	15	0	0	A				
300	York St / Division St	Signalized	EBT	32	5	15	19	24	C				
300	York St / Division St	Signalized	EBR	2	5	15	10	17	B				
300	York St / Division St	Signalized	WBL	29	5	20	21	28	C				
300	York St / Division St	Signalized	WBT	12	5	20	23	30	C				
300	York St / Division St	Signalized	WBR	21	5	20	4	11	B				
310	Main St / Division St	TWSC	NBT	213	0	10	1	2	A	10.0	A	0.8	A
310	Main St / Division St	TWSC	NBR	0	0	10	0	0	A				
310	Main St / Division St	TWSC	SBL	15	35	40	0	1	A				
310	Main St / Division St	TWSC	SBT	415	35	40	0	0	A				
310	Main St / Division St	TWSC	WBL	2	0	5	2	10	A				
310	Main St / Division St	TWSC	WBR	7	0	5	1	8	A				
320	Hamilton St / Division St	TWSC	NBL	3	0	0	0	0	A	8.0	A	0.2	A
320	Hamilton St / Division St	TWSC	NBT	198	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBT	394	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	27	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	15	5	5	1	8	A				
320	Hamilton St / Division St	TWSC	EBR	3	5	5	0	6	A				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 35% Auto M.S. - AM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
330	Raglan St / Division St	TWSC	NBT	195	0	0	0	0	A	9.0	A	0.4	A
330	Raglan St / Division St	TWSC	NBR	25	0	0	0	0	A				
330	Raglan St / Division St	TWSC	SBL	12	0	0	0	2	A				
330	Raglan St / Division St	TWSC	SBT	384	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	24	5	5	1	8	A				
330	Raglan St / Division St	TWSC	WBR	5	5	5	1	9	A				
340	Elm St / Division St	TWSC	NBL	1	0	0	0	0	A	8.0	A	0.2	A
340	Elm St / Division St	TWSC	NBT	201	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBT	390	0	0	0	0	A				
340	Elm St / Division St	TWSC	SBR	19	0	0	0	1	A				
340	Elm St / Division St	TWSC	EBL	17	0	5	2	8	A				
340	Elm St / Division St	TWSC	EBR	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	NBT	201	0	0	0	0	A	13.0	B	0.2	A
350	Ellice St / Division St	TWSC	NBR	8	0	0	0	0	A				
350	Ellice St / Division St	TWSC	SBL	9	0	0	0	1	A				
350	Ellice St / Division St	TWSC	SBT	380	0	0	0	0	A				
350	Ellice St / Division St	TWSC	WBL	8	0	5	4	13	B				
350	Ellice St / Division St	TWSC	WBR	4	0	5	0	7	A				
360	Colborne St / Division St	TWSC	NBL	0	0	20	0	0	A	11.0	B	1.4	A
360	Colborne St / Division St	TWSC	NBT	185	0	20	0	0	A				
360	Colborne St / Division St	TWSC	NBR	2	0	20	0	0	A				
360	Colborne St / Division St	TWSC	SBL	7	0	25	0	3	A				
360	Colborne St / Division St	TWSC	SBT	375	0	25	1	1	A				
360	Colborne St / Division St	TWSC	SBR	7	0	25	0	0	A				
360	Colborne St / Division St	TWSC	EBL	22	5	10	1	9	A				
360	Colborne St / Division St	TWSC	EBT	8	5	10	2	11	B				
360	Colborne St / Division St	TWSC	EBR	12	5	10	2	10	A				
360	Colborne St / Division St	TWSC	WBL	7	0	5	2	11	B				
360	Colborne St / Division St	TWSC	WBT	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBR	3	0	5	0	7	A				
370	Queen St / Division St	Signalized	NBT	71	10	25	8	11	B	24.0	C	15.8	B
370	Queen St / Division St	Signalized	NBR	121	10	25	1	10	A				
370	Queen St / Division St	Signalized	SBL	119	50	80	16	24	C				
370	Queen St / Division St	Signalized	SBT	277	50	80	14	20	B				
370	Queen St / Division St	Signalized	WBL	201	20	35	11	17	B				
370	Queen St / Division St	Signalized	WBR	117	20	35	0	4	A				

Williamsville Operational Analysis

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Measures of Effectiveness Details



ID	Intersection Name	Control Type	Number of Vehicles	50th %'ile Queue (m)	95th %'ile Queue (m)	Avg. Vehicle Delay (sec)	Avg. Stop Delay (sec)	LO S
10	Princess St / Concession St	Signalized	3,728	185.8	229.9	59.2	48.7	E
20	Princess St / Regent St	TWSC	1,346	0.1	50.9	2.6	1.0	-
30	Princess St / Drayton Av	TWSC	1,304	4.1	36.4	2.5	0.3	-
40	Princess St / Macdonnell Av	Signalized	1,319	90.2	174.8	20.9	14.4	C
50	Princess St / Smith St	TWSC	1,042	28.2	61.5	3.5	1.8	-
60	Princess St / Victoria St	Signalized	1,477	28.4	96.5	12.2	7.0	B
70	Princess St / Nelson St	TWSC	1,367	17.5	103.4	5.4	2.0	-
80	Princess St / Albert St	Signalized	1,394	40.4	88.0	16.6	10.8	B
90	Princess St / Frontenac St	TWSC	1,138	8.7	55.1	3.2	0.7	-
100	Princess St / Alfred St	Signalized	1,524	56.2	90.1	26.3	18.0	C
110	Princess St / Chatham St	TWSC	1,210	24.8	88.3	4.9	1.8	-
120	Princess St / University Av	Signalized	1,041	30.4	59.0	9.1	5.3	A
130	Princess St / Division St	Signalized	1,370	20.6	58.2	16.2	10.8	B
140	Concession St / Drayton Av	TWSC	1,245	314.0	319.2	57.8	30.0	-
150	Concession St / Leroy Grant Dr (S)	TWSC	1,223	73.7	73.7	31.1	16.2	-
155	Concession St / Leroy Grant Drive (N)	TWSC	1,526	4.8	5.3	5.2	3.1	-
160	Concession St / Macdonnell St	Signalized	2,490	73.6	80.3	17.3	12.1	B
170	Concession St / Connaught St	TWSC	1,975	74.4	104.9	8.9	4.8	-
180	Concession St / Victoria St	Signalized	2,186	92.8	99.2	17.8	11.5	B
190	Concession St / Nelson St	TWSC	1,940	50.4	91.9	11.7	7.9	-
200	Concession St / Kingscourt Av	TWSC	1,854	52.0	94.3	12.0	7.2	-
210	Concession St / Fergus St	TWSC	1,854	55.3	99.4	13.4	8.5	-
220	Concession St / Grey St	TWSC	1,871	57.3	79.5	10.1	6.6	-
230	Concession St / Alfred St	Signalized	1,998	121.4	135.5	41.6	30.1	D
240	Concession St / Lansdowne St	TWSC	1,308	63.0	258.2	10.6	5.6	-
250	Concession St / Division St	Signalized	2,417	131.3	195.9	48.7	38.2	D
260	Adelaide St / Division St	TWSC	1,276	59.7	102.1	24.3	18.7	-
270	Stanley St / Division St	TWSC	1,144	44.9	70.3	15.9	10.8	-
280	Pine St / Division St	Signalized	1,232	49.6	70.4	23.9	16.9	C
290	Quebec St / Division St	TWSC	1,051	43.4	78.4	9.0	6.1	-
300	York St / Division St	Signalized	1,162	26.8	47.1	10.8	7.8	B
310	Main St / Division St	TWSC	1,044	46.6	49.7	12.8	8.5	-
320	Hamilton St / Division St	TWSC	1,070	65.6	68.6	23.5	15.0	-
330	Raglan St / Division St	TWSC	1,091	35.0	35.3	9.3	5.9	-
340	Elm St / Division St	TWSC	1,219	37.5	43.0	9.2	5.8	-
350	Ellice St / Division St	TWSC	1,148	32.8	39.5	5.2	3.8	-
360	Colborne St / Division St	TWSC	1,207	90.7	233.0	9.9	5.7	-
370	Queen St / Division St	Signalized	1,528	56.3	179.0	35.3	20.1	D
Total			57,319	2,288	3,846	658	430	

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt		Intersection	
					50th	95th					LOS	LOS	Delay	LOS
10	Princess St / Concession St	Signalized	NBL	212	35	45	31	39	D	137.0	F	59.2	E	
10	Princess St / Concession St	Signalized	NBT	190	35	45	28	35	C					
10	Princess St / Concession St	Signalized	NBR	14	35	45	21	28	C					
10	Princess St / Concession St	Signalized	SBL	693	420	435	85	101	F					
10	Princess St / Concession St	Signalized	SBT	552	420	435	82	99	F					
10	Princess St / Concession St	Signalized	SBR	0	420	435	0	0	A					
10	Princess St / Concession St	Signalized	EBT	370	125	290	111	137	F					
10	Princess St / Concession St	Signalized	EBR	322	125	290	15	21	C					
10	Princess St / Concession St	Signalized	WBT	516	50	70	33	40	D					
10	Princess St / Concession St	Signalized	WBR	822	50	70	0	0	A					
10	Princess St / Concession St	Signalized	WBL	37	50	70	64	74	E					
20	Princess St / Regent St	TWSC	NBL	0	5	10	0	0	A	10.0	A	2.6	A	
20	Princess St / Regent St	TWSC	NBR	33	5	10	3	10	A					
20	Princess St / Regent St	TWSC	EBT	747	0	50	1	2	A					
20	Princess St / Regent St	TWSC	EBR	71	0	50	0	2	A					
20	Princess St / Regent St	TWSC	WBL	34	0	55	3	5	A					
20	Princess St / Regent St	TWSC	WBT	461	0	55	1	3	A					
30	Princess St / Drayton Av	TWSC	SBL	9	45	50	10	25	C	25.0	C	2.5	A	
30	Princess St / Drayton Av	TWSC	SBR	109	45	50	3	16	C					
30	Princess St / Drayton Av	TWSC	EBL	22	0	35	1	4	A					
30	Princess St / Drayton Av	TWSC	EBT	759	0	35	0	1	A					
30	Princess St / Drayton Av	TWSC	WBT	387	0	35	0	1	A					
30	Princess St / Drayton Av	TWSC	WBR	18	0	35	0	1	A					
40	Princess St / Macdonnell Av	Signalized	NBL	9	10	35	10	16	B	31.0	C	20.9	C	
40	Princess St / Macdonnell Av	Signalized	NBT	96	10	35	12	17	B					
40	Princess St / Macdonnell Av	Signalized	NBR	18	10	35	9	13	B					
40	Princess St / Macdonnell Av	Signalized	SBL	3	40	40	2	11	B					
40	Princess St / Macdonnell Av	Signalized	SBT	54	40	40	13	20	B					
40	Princess St / Macdonnell Av	Signalized	SBR	51	40	40	5	10	A					
40	Princess St / Macdonnell Av	Signalized	EBL	44	130	275	24	31	C					
40	Princess St / Macdonnell Av	Signalized	EBT	658	130	275	17	25	C					
40	Princess St / Macdonnell Av	Signalized	EBR	35	130	275	16	24	C					
40	Princess St / Macdonnell Av	Signalized	WBL	0	50	55	0	0	A					
40	Princess St / Macdonnell Av	Signalized	WBT	345	50	55	11	15	B					
40	Princess St / Macdonnell Av	Signalized	WBR	6	50	55	9	12	B					
50	Princess St / Smith St	TWSC	SBL	1	40	40	1	11	B	19.0	C	3.5	A	
50	Princess St / Smith St	TWSC	SBR	6	40	40	8	19	C					
50	Princess St / Smith St	TWSC	EBL	43	40	65	1	2	A					
50	Princess St / Smith St	TWSC	EBT	640	40	65	0	1	A					
50	Princess St / Smith St	TWSC	WBT	346	5	55	5	8	A					
50	Princess St / Smith St	TWSC	WBR	6	5	55	4	6	A					
60	Princess St / Victoria St	Signalized	NBL	8	20	45	16	21	C	30.0	C	12.2	B	
60	Princess St / Victoria St	Signalized	NBT	93	20	45	18	25	C					
60	Princess St / Victoria St	Signalized	NBR	55	20	45	11	17	B					
60	Princess St / Victoria St	Signalized	SBL	81	15	30	22	30	C					
60	Princess St / Victoria St	Signalized	SBT	47	15	30	18	27	C					
60	Princess St / Victoria St	Signalized	SBR	1	15	30	3	8	A					
60	Princess St / Victoria St	Signalized	EBL	20	15	115	11	17	B					
60	Princess St / Victoria St	Signalized	EBT	597	15	115	2	6	A					
60	Princess St / Victoria St	Signalized	EBR	30	15	115	1	5	A					
60	Princess St / Victoria St	Signalized	WBL	15	50	105	14	20	B					
60	Princess St / Victoria St	Signalized	WBT	358	50	105	7	12	B					
60	Princess St / Victoria St	Signalized	WBR	172	50	105	7	13	B					
70	Princess St / Nelson St	TWSC	NBL	19	5	45	16	27	D	27.0	D	5.4	A	
70	Princess St / Nelson St	TWSC	NBT	2	5	45	12	25	C					
70	Princess St / Nelson St	TWSC	NBR	6	5	45	3	16	C					
70	Princess St / Nelson St	TWSC	SBL	0	0	5	0	0	A					
70	Princess St / Nelson St	TWSC	SBT	6	0	5	9	20	C					
70	Princess St / Nelson St	TWSC	SBR	0	0	5	0	0	A					
70	Princess St / Nelson St	TWSC	EBL	74	0	105	5	11	B					
70	Princess St / Nelson St	TWSC	EBT	656	0	105	1	4	A					
70	Princess St / Nelson St	TWSC	EBR	11	0	105	0	3	A					
70	Princess St / Nelson St	TWSC	WBL	45	40	105	5	9	A					
70	Princess St / Nelson St	TWSC	WBT	546	40	105	2	5	A					
70	Princess St / Nelson St	TWSC	WBR	2	40	105	0	10	A					

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
80	Princess St / Albert St	Signalized	NBL	57	10	50	18	26	C	40.0	D	16.6	B
80	Princess St / Albert St	Signalized	NBT	11	10	50	17	24	C				
80	Princess St / Albert St	Signalized	NBR	51	10	50	6	11	B				
80	Princess St / Albert St	Signalized	SBL	4	10	25	12	23	C				
80	Princess St / Albert St	Signalized	SBT	32	10	25	13	18	B				
80	Princess St / Albert St	Signalized	SBR	118	10	25	2	8	A				
80	Princess St / Albert St	Signalized	EBL	42	60	115	23	32	C				
80	Princess St / Albert St	Signalized	EBT	607	60	115	12	18	B				
80	Princess St / Albert St	Signalized	EBR	14	60	115	8	15	B				
80	Princess St / Albert St	Signalized	WBL	8	30	80	32	40	D				
80	Princess St / Albert St	Signalized	WBT	430	30	80	9	14	B				
80	Princess St / Albert St	Signalized	WBR	20	30	80	14	21	C				
90	Princess St / Frontenac St	TWSC	NBL	1	0	20	0	0	A	15.0	B	3.2	A
90	Princess St / Frontenac St	TWSC	NBT	14	0	20	6	15	B				
90	Princess St / Frontenac St	TWSC	NBR	1	0	20	0	0	A				
90	Princess St / Frontenac St	TWSC	SBL	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBT	0	0	0	0	0	A				
90	Princess St / Frontenac St	TWSC	SBR	1	0	0	0	7	A				
90	Princess St / Frontenac St	TWSC	EBL	90	15	95	2	7	A				
90	Princess St / Frontenac St	TWSC	EBT	566	15	95	1	4	A				
90	Princess St / Frontenac St	TWSC	EBR	1	15	95	0	0	A				
90	Princess St / Frontenac St	TWSC	WBL	9	0	0	1	4	A				
90	Princess St / Frontenac St	TWSC	WBT	455	0	0	0	1	A				
90	Princess St / Frontenac St	TWSC	WBR	0	0	0	0	0	A				
100	Princess St / Alfred St	Signalized	NBL	75	35	70	18	27	C	35.0	C	26.3	C
100	Princess St / Alfred St	Signalized	NBT	138	35	70	16	24	C				
100	Princess St / Alfred St	Signalized	NBR	127	35	70	11	19	B				
100	Princess St / Alfred St	Signalized	SBL	83	20	40	24	35	C				
100	Princess St / Alfred St	Signalized	SBT	45	20	40	20	29	C				
100	Princess St / Alfred St	Signalized	SBR	25	20	40	10	17	B				
100	Princess St / Alfred St	Signalized	EBL	45	75	115	27	35	C				
100	Princess St / Alfred St	Signalized	EBT	512	75	115	19	28	C				
100	Princess St / Alfred St	Signalized	EBR	28	75	115	14	22	C				
100	Princess St / Alfred St	Signalized	WBL	55	60	90	16	24	C				
100	Princess St / Alfred St	Signalized	WBT	361	60	90	19	26	C				
100	Princess St / Alfred St	Signalized	WBR	30	60	90	9	15	B				
110	Princess St / Chatham St	TWSC	SBL	0	0	5	0	0	A	20.0	C	4.9	A
110	Princess St / Chatham St	TWSC	SBR	12	0	5	4	20	C				
110	Princess St / Chatham St	TWSC	EBL	152	25	105	3	8	A				
110	Princess St / Chatham St	TWSC	EBT	570	25	105	2	6	A				
110	Princess St / Chatham St	TWSC	WBT	434	25	65	1	2	A				
110	Princess St / Chatham St	TWSC	WBR	42	25	65	2	4	A				
120	Princess St / University Av	Signalized	NBL	96	10	25	17	22	C	22.0	C	9.1	A
120	Princess St / University Av	Signalized	NBR	5	10	25	10	14	B				
120	Princess St / University Av	Signalized	EBT	491	45	75	4	8	A				
120	Princess St / University Av	Signalized	EBR	61	45	75	3	6	A				
120	Princess St / University Av	Signalized	WBL	21	15	45	12	18	B				
120	Princess St / University Av	Signalized	WBT	367	15	45	4	7	A				
130	Princess St / Division St	Signalized	NBL	103	25	50	14	25	C	28.0	C	16.2	B
130	Princess St / Division St	Signalized	NBT	195	25	50	15	21	C				
130	Princess St / Division St	Signalized	NBR	11	25	50	10	16	B				
130	Princess St / Division St	Signalized	SBL	145	10	70	6	11	B				
130	Princess St / Division St	Signalized	SBT	131	10	70	5	6	A				
130	Princess St / Division St	Signalized	SBR	288	10	70	0	1	A				
130	Princess St / Division St	Signalized	EBL	83	30	50	21	28	C				
130	Princess St / Division St	Signalized	EBT	368	30	50	18	26	C				
130	Princess St / Division St	Signalized	EBR	46	30	50	9	17	B				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 35% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
140	Concession St / Drayton Av	TWSC	NBR	5	65	125	1202	1217	F	1217.0	F	57.8	F
140	Concession St / Drayton Av	TWSC	EBT	1,187	315	320	25	53	F				
140	Concession St / Drayton Av	TWSC	EBR	53	315	320	31	55	F				
150	Concession St / Leroy Grant Dr (S)	TWSC	SBL	22	5	5	18	31	D	32.0	D	31.1	D
150	Concession St / Leroy Grant Dr (S)	TWSC	EBL	160	75	75	17	32	D				
150	Concession St / Leroy Grant Dr (S)	TWSC	EBT	1,041	75	75	16	31	D				
155	Concession St / Leroy Grant Drive (N)	TWSC	NBL	76	45	50	28	46	E	46.0	E	5.2	A
155	Concession St / Leroy Grant Drive (N)	TWSC	NBT	84	45	50	27	45	E				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBT	21	5	5	18	28	D				
155	Concession St / Leroy Grant Drive (N)	TWSC	SBR	5	5	5	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBT	1,300	0	0	0	0	A				
155	Concession St / Leroy Grant Drive (N)	TWSC	WBR	40	0	0	0	1	A				
160	Concession St / Macdonnell St	Signalized	NBL	250	45	80	26	34	C	73.0	E	17.3	B
160	Concession St / Macdonnell St	Signalized	NBT	25	45	80	26	32	C				
160	Concession St / Macdonnell St	Signalized	NBR	27	45	80	27	35	C				
160	Concession St / Macdonnell St	Signalized	SBR	71	5	15	9	15	B				
160	Concession St / Macdonnell St	Signalized	EBL	58	75	80	47	58	E				
160	Concession St / Macdonnell St	Signalized	EBT	892	75	80	8	13	B				
160	Concession St / Macdonnell St	Signalized	EBR	111	75	80	7	11	B				
160	Concession St / Macdonnell St	Signalized	WBL	31	85	85	60	73	E				
160	Concession St / Macdonnell St	Signalized	WBT	1,025	85	85	9	13	B				
160	Concession St / Macdonnell St	Signalized	WBR	0	85	85	0	0	A				
170	Concession St / Connaught St	TWSC	SBL	0	0	5	0	0	A	28.0	D	8.9	A
170	Concession St / Connaught St	TWSC	SBR	16	0	5	18	28	D				
170	Concession St / Connaught St	TWSC	EBL	0	35	95	0	0	A				
170	Concession St / Connaught St	TWSC	EBT	913	35	95	2	5	A				
170	Concession St / Connaught St	TWSC	WBT	1,046	110	115	7	12	B				
170	Concession St / Connaught St	TWSC	WBR	0	110	115	0	0	A				
180	Concession St / Victoria St	Signalized	NBL	34	20	70	35	47	D	47.0	D	17.8	B
180	Concession St / Victoria St	Signalized	NBT	49	20	70	34	42	D				
180	Concession St / Victoria St	Signalized	NBR	78	20	70	23	32	C				
180	Concession St / Victoria St	Signalized	SBL	3	0	10	28	36	D				
180	Concession St / Victoria St	Signalized	SBT	23	0	10	19	23	C				
180	Concession St / Victoria St	Signalized	SBR	36	0	10	6	17	B				
180	Concession St / Victoria St	Signalized	EBL	16	115	115	24	33	C				
180	Concession St / Victoria St	Signalized	EBT	806	115	115	8	14	B				
180	Concession St / Victoria St	Signalized	EBR	98	115	115	8	14	B				
180	Concession St / Victoria St	Signalized	WBL	52	90	95	26	34	C				
180	Concession St / Victoria St	Signalized	WBT	975	90	95	11	17	B				
180	Concession St / Victoria St	Signalized	WBR	16	90	95	0	1	A				
190	Concession St / Nelson St	TWSC	NBL	8	0	5	358	376	F	376.0	F	11.7	B
190	Concession St / Nelson St	TWSC	NBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	NBR	7	0	5	17	23	C				
190	Concession St / Nelson St	TWSC	SBL	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBT	0	0	5	0	0	A				
190	Concession St / Nelson St	TWSC	SBR	12	0	5	0	6	A				
190	Concession St / Nelson St	TWSC	EBL	0	0	85	0	0	A				
190	Concession St / Nelson St	TWSC	EBT	813	0	85	1	2	A				
190	Concession St / Nelson St	TWSC	EBR	70	0	85	2	3	A				
190	Concession St / Nelson St	TWSC	WBL	13	95	100	10	19	C				
190	Concession St / Nelson St	TWSC	WBT	1,017	95	100	11	17	C				
190	Concession St / Nelson St	TWSC	WBR	0	95	100	0	0	A				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 35% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
200	Concession St / Kingscourt Av	TWSC	SBL	0	0	15	0	0	A	57.0	F	12.0	B
200	Concession St / Kingscourt Av	TWSC	SBR	16	0	15	41	57	F				
200	Concession St / Kingscourt Av	TWSC	EBL	2	0	95	20	33	D				
200	Concession St / Kingscourt Av	TWSC	EBT	821	0	95	3	5	A				
200	Concession St / Kingscourt Av	TWSC	WBT	1,015	95	95	10	17	C				
200	Concession St / Kingscourt Av	TWSC	WBR	0	95	95	0	0	A				
210	Concession St / Fergus St	TWSC	SBL	12	0	5	128	139	F	139.0	F	13.4	B
210	Concession St / Fergus St	TWSC	SBR	0	0	5	0	0	A				
210	Concession St / Fergus St	TWSC	EBL	0	0	100	0	0	A				
210	Concession St / Fergus St	TWSC	EBT	816	0	100	5	7	A				
210	Concession St / Fergus St	TWSC	WBT	1,022	100	100	10	17	C				
210	Concession St / Fergus St	TWSC	WBR	4	100	100	0	2	A				
220	Concession St / Grey St	TWSC	SBL	0	0	5	0	0	A	26.0	D	10.1	B
220	Concession St / Grey St	TWSC	SBR	15	0	5	15	26	D				
220	Concession St / Grey St	TWSC	EBL	0	55	105	0	0	A				
220	Concession St / Grey St	TWSC	EBT	830	55	105	11	16	C				
220	Concession St / Grey St	TWSC	WBT	1,021	60	60	3	5	A				
220	Concession St / Grey St	TWSC	WBR	5	60	60	2	6	A				
230	Concession St / Alfred St	Signalized	NBL	260	265	325	103	132	F	132.0	F	41.6	D
230	Concession St / Alfred St	Signalized	NBT	33	265	325	94	122	F				
230	Concession St / Alfred St	Signalized	NBR	27	265	325	80	104	F				
230	Concession St / Alfred St	Signalized	SBL	0	5	20	0	0	A				
230	Concession St / Alfred St	Signalized	SBT	35	5	20	16	21	C				
230	Concession St / Alfred St	Signalized	SBR	22	5	20	17	24	C				
230	Concession St / Alfred St	Signalized	EBL	22	55	60	25	31	C				
230	Concession St / Alfred St	Signalized	EBT	478	55	60	13	18	B				
230	Concession St / Alfred St	Signalized	EBR	317	55	60	3	5	A				
230	Concession St / Alfred St	Signalized	WBL	58	140	145	25	38	D				
230	Concession St / Alfred St	Signalized	WBT	746	140	145	24	37	D				
230	Concession St / Alfred St	Signalized	WBR	0	140	145	0	0	A				
240	Concession St / Lansdowne St	TWSC	NBL	5	5	10	79	91	F	91.0	F	10.6	B
240	Concession St / Lansdowne St	TWSC	NBR	20	5	10	19	32	D				
240	Concession St / Lansdowne St	TWSC	EBT	460	0	0	0	1	A				
240	Concession St / Lansdowne St	TWSC	EBR	0	0	0	0	0	A				
240	Concession St / Lansdowne St	TWSC	WBL	56	100	410	8	14	B				
240	Concession St / Lansdowne St	TWSC	WBT	767	100	410	8	15	B				
250	Concession St / Division St	Signalized	NBL	144	115	115	61	76	E	103.0	F	48.7	D
250	Concession St / Division St	Signalized	NBT	546	115	115	37	46	D				
250	Concession St / Division St	Signalized	NBR	12	115	115	28	34	C				
250	Concession St / Division St	Signalized	SBL	28	160	315	38	51	D				
250	Concession St / Division St	Signalized	SBT	486	160	315	25	33	C				
250	Concession St / Division St	Signalized	SBR	284	160	315	16	27	C				
250	Concession St / Division St	Signalized	EBL	227	35	100	18	26	C				
250	Concession St / Division St	Signalized	EBT	202	35	100	12	18	B				
250	Concession St / Division St	Signalized	EBR	36	35	100	2	5	A				
250	Concession St / Division St	Signalized	WBL	45	205	210	86	103	F				
250	Concession St / Division St	Signalized	WBT	375	205	210	86	103	F				
250	Concession St / Division St	Signalized	WBR	32	205	210	80	95	F				

Williamsville Operational Analysis

2036 No Mitigation - Ultimate Growth, 35% Auto M.S. - PM Peak

Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Delay	Mvmt LOS	Intersection	
					50th	95th						Delay	LOS
260	Adelaide St / Division St	TWSC	NBL	0	110	110	0	0	A	486.0	F	24.3	C
260	Adelaide St / Division St	TWSC	NBT	692	110	110	27	36	E				
260	Adelaide St / Division St	TWSC	NBR	0	110	110	0	0	A				
260	Adelaide St / Division St	TWSC	SBL	0	0	95	0	0	A				
260	Adelaide St / Division St	TWSC	SBT	438	0	95	1	2	A				
260	Adelaide St / Division St	TWSC	SBR	125	0	95	0	1	A				
260	Adelaide St / Division St	TWSC	EBL	10	5	60	469	486	F				
260	Adelaide St / Division St	TWSC	EBT	0	5	60	0	0	A				
260	Adelaide St / Division St	TWSC	EBR	0	5	60	0	0	A				
260	Adelaide St / Division St	TWSC	WBL	10	0	5	11	20	C				
260	Adelaide St / Division St	TWSC	WBT	1	0	5	0	0	A				
260	Adelaide St / Division St	TWSC	WBR	0	0	5	0	0	A				
270	Stanley St / Division St	TWSC	NBL	0	75	75	0	0	A	80.0	F	15.9	C
270	Stanley St / Division St	TWSC	NBT	685	75	75	16	23	C				
270	Stanley St / Division St	TWSC	SBT	384	0	65	1	3	A				
270	Stanley St / Division St	TWSC	SBR	61	0	65	1	2	A				
270	Stanley St / Division St	TWSC	EBL	14	0	10	68	80	F				
270	Stanley St / Division St	TWSC	EBR	0	0	10	0	0	A				
280	Pine St / Division St	Signalized	NBL	33	75	80	15	25	C	63.0	E	23.9	C
280	Pine St / Division St	Signalized	NBT	618	75	80	20	28	C				
280	Pine St / Division St	Signalized	NBR	0	75	80	0	0	A				
280	Pine St / Division St	Signalized	SBL	25	25	70	14	20	B				
280	Pine St / Division St	Signalized	SBT	344	25	70	5	9	A				
280	Pine St / Division St	Signalized	SBR	16	25	70	5	10	A				
280	Pine St / Division St	Signalized	EBL	3	5	25	31	39	D				
280	Pine St / Division St	Signalized	EBT	42	5	25	20	24	C				
280	Pine St / Division St	Signalized	EBR	37	5	25	7	12	B				
280	Pine St / Division St	Signalized	WBL	5	20	50	52	63	E				
280	Pine St / Division St	Signalized	WBT	45	20	50	38	48	D				
280	Pine St / Division St	Signalized	WBR	64	20	50	42	55	D				
290	Quebec St / Division St	TWSC	NBT	651	70	85	9	13	B	17.0	C	9.0	A
290	Quebec St / Division St	TWSC	NBR	0	70	85	0	0	A				
290	Quebec St / Division St	TWSC	SBL	0	0	70	0	0	A				
290	Quebec St / Division St	TWSC	SBT	386	0	70	1	2	A				
290	Quebec St / Division St	TWSC	WBL	14	0	5	9	17	C				
290	Quebec St / Division St	TWSC	WBR	0	0	5	0	0	A				
300	York St / Division St	Signalized	NBL	1	35	40	0	0	A	31.0	C	10.8	B
300	York St / Division St	Signalized	NBT	619	35	40	6	8	A				
300	York St / Division St	Signalized	NBR	6	35	40	2	3	A				
300	York St / Division St	Signalized	SBL	38	20	65	19	26	C				
300	York St / Division St	Signalized	SBT	363	20	65	4	7	A				
300	York St / Division St	Signalized	SBR	0	20	65	0	0	A				
300	York St / Division St	Signalized	EBL	0	5	15	0	0	A				
300	York St / Division St	Signalized	EBT	31	5	15	26	30	C				
300	York St / Division St	Signalized	EBR	1	5	15	0	0	A				
300	York St / Division St	Signalized	WBL	45	10	30	24	31	C				
300	York St / Division St	Signalized	WBT	24	10	30	24	31	C				
300	York St / Division St	Signalized	WBR	34	10	30	19	29	C				
310	Main St / Division St	TWSC	NBT	624	55	60	14	21	C	47.0	E	12.8	B
310	Main St / Division St	TWSC	NBR	0	55	60	0	0	A				
310	Main St / Division St	TWSC	SBL	0	35	35	0	0	A				
310	Main St / Division St	TWSC	SBT	410	35	35	0	0	A				
310	Main St / Division St	TWSC	WBL	8	0	5	11	19	C				
310	Main St / Division St	TWSC	WBR	2	0	5	36	47	E				
320	Hamilton St / Division St	TWSC	NBL	17	110	115	32	49	E	49.0	E	23.5	C
320	Hamilton St / Division St	TWSC	NBT	621	110	115	25	39	E				
320	Hamilton St / Division St	TWSC	SBT	382	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	SBR	34	0	0	0	0	A				
320	Hamilton St / Division St	TWSC	EBL	0	0	5	0	0	A				
320	Hamilton St / Division St	TWSC	EBR	16	0	5	1	8	A				

Williamsville Operational Analysis

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Measures of Effectiveness Details



Node	Location	Control	Mvmt.	Volume (All)	Queue (m)		Stop Delay (s)	Delay (s)	LOS	Critical Mvmt		Intersection	
					50th	95th				Delay	LOS	Delay	LOS
330	Raglan St / Division St	TWSC	NBT	618	60	60	9	14	B	32.0	D	9.3	A
330	Raglan St / Division St	TWSC	NBR	13	60	60	10	11	B				
330	Raglan St / Division St	TWSC	SBL	6	0	0	2	4	A				
330	Raglan St / Division St	TWSC	SBT	393	0	0	0	0	A				
330	Raglan St / Division St	TWSC	WBL	43	5	10	8	18	C				
330	Raglan St / Division St	TWSC	WBR	18	5	10	20	32	D				
340	Elm St / Division St	TWSC	NBL	142	60	60	7	10	A	38.0	E	9.2	A
340	Elm St / Division St	TWSC	NBT	618	60	60	9	14	B				
340	Elm St / Division St	TWSC	SBT	372	0	15	0	1	A				
340	Elm St / Division St	TWSC	SBR	63	0	15	1	3	A				
340	Elm St / Division St	TWSC	EBL	13	5	10	26	38	E				
340	Elm St / Division St	TWSC	EBR	11	5	10	6	13	B				
350	Ellice St / Division St	TWSC	NBT	747	50	55	5	7	A	22.0	C	5.2	A
350	Ellice St / Division St	TWSC	NBR	6	50	55	7	8	A				
350	Ellice St / Division St	TWSC	SBL	2	0	10	4	10	A				
350	Ellice St / Division St	TWSC	SBT	380	0	10	1	1	A				
350	Ellice St / Division St	TWSC	WBL	0	0	5	0	0	A				
350	Ellice St / Division St	TWSC	WBR	13	0	5	11	22	C				
360	Colborne St / Division St	TWSC	NBL	54	140	335	7	11	B	64.0	F	9.9	A
360	Colborne St / Division St	TWSC	NBT	727	140	335	7	12	B				
360	Colborne St / Division St	TWSC	NBR	0	140	335	0	0	A				
360	Colborne St / Division St	TWSC	SBL	6	0	50	2	6	A				
360	Colborne St / Division St	TWSC	SBT	375	0	50	1	3	A				
360	Colborne St / Division St	TWSC	SBR	0	0	50	0	0	A				
360	Colborne St / Division St	TWSC	EBL	14	5	15	52	64	F				
360	Colborne St / Division St	TWSC	EBT	2	5	15	13	22	C				
360	Colborne St / Division St	TWSC	EBR	16	5	15	7	15	B				
360	Colborne St / Division St	TWSC	WBL	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBT	0	0	5	0	0	A				
360	Colborne St / Division St	TWSC	WBR	13	0	5	12	23	C				
370	Queen St / Division St	Signalized	NBT	195	15	70	17	21	C	48.0	D	35.3	D
370	Queen St / Division St	Signalized	NBR	83	15	70	7	16	B				
370	Queen St / Division St	Signalized	SBL	108	45	80	21	31	C				
370	Queen St / Division St	Signalized	SBT	286	45	80	17	24	C				
370	Queen St / Division St	Signalized	WBL	273	75	260	23	38	D				
370	Queen St / Division St	Signalized	WBR	583	75	260	23	48	D				



CITY OF KINGSTON

Williamsville Main Street Study



April 2023 – 22-3399

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1.0 Introduction

Dillon Consulting Limited (Dillon) was retained by the City of Kingston (City) to investigate cross-section alternatives that could be accommodated with the Princess Street right-of-way (ROW) between Bath Road and Division Street. This report documents the review of existing corridor amenities and constraints, the development of alternative corridor cross-sections, the identification of impacts associated with operational changes, and the evaluation of alternative solutions.

Dillon has short-listed two alternative cross-sections in this report. The preferred cross-section will be identified with input from City staff, the public, and Council.

1.1 Background

Dillon previously completed the *Williamsville Transportation Plan – Operational Needs Analysis* in 2020. The study was a general assessment of future traffic operations in the Williamsville neighbourhood. The requirement for analysis was triggered by a need to identify the transportation mode shares required to enable intensification.

Two development/intensification levels were considered: “Approved” and “Ultimate”. The “Approved” scenario was the council-approved amount of development, whereas the “Ultimate” scenario included higher density for Williamsville.

The 2020 analysis also considered two mode share scenarios: “Base” and “Reduced” auto mode shares. The “Base” auto mode share was the same mode share used for the Transportation Master Plan (2015), whereas the “Reduced” auto mode share lower auto mode shares and higher active and transit mode shares, as per direction from council on December 1, 2015.

The Williamsville Transportation Plan – Operational Needs Analysis study concluded that Williamsville was able to accommodate the majority of growth largely by assuming the majority of trips to and from the new development in Williamsville would use walking, cycling, and/or transit (consistent with the “Reduced” auto mode share direction from council in 2015 and the existing auto mode share in Williamsville).

The 2020 study suggested improvements to walking, cycling, and transit facilities on Princess Street to support a low auto mode share and support the Williamsville growth. The previous study noted that Princess Street had a narrow right of way through Williamsville (generally 20 metres or less) which likely precluded Princess Street’s ability to simultaneously be a transit priority corridor, a cycling spine route, a pedestrian-friendly corridor, and an arterial class roadway leading to the downtown core. Additional study was recommended to review the Princess Street cross-section.

Approach

The 2020 *Operational Needs Analysis* identified the need to specifically investigate the feasibility for Princess Street to support the increased pedestrian, transit and cycling volumes associated with intensification. The previous study used traffic modelling to assess if the existing road network could potentially support the additional traffic demand from the proposed development. This study focussed on assessing whether adequate space exists in the Princess Street's right-of-way to provide facilities that encourage walking, cycling and transit while discouraging use of private vehicles. Alternative means of accommodating modes that cannot be adequately accommodated on Princess Street were also explored.

Traffic analysis was performed to assess intersection operations and identify the need and benefit of congestion mitigation measures such as queue jump lanes, left turn lanes, and transit priority signals. Removal of two-way vehicular access was not considered given Princess Street is a primary arterial roadway that supports a major transit route. The mitigation measures helped inform the development and analysis of vehicular and transit cross-section design elements. More information on the traffic analysis performed as a component of the current study is provide in Section 0.

Several alternatives were developed to understand how the space between the property lines and the edge of vehicular travel lanes could be used to provide a visually appealing and accessible place for pedestrians and cyclists. The limited available right-of-way on Princess Street made successful implementation of infeasible for several desirable options. Compromises of ideal facility widths are required in nearly every alternative. More information on the cross-section alternatives can be found in Section 4.0.

2.0 Traffic Analysis

Traffic operations were assessed using the PTV Vissim microsimulation software, which is the industry-leading microsimulation platform. Microsimulation was used to model vehicles, buses, pedestrians, and cyclists in a mixed environment. The analysis assumed a basic cross section; one lane in each direction along Princess Street throughout the study area. Consistent with existing conditions, transit was assumed to operate in mixed traffic.

The traffic analysis was completed using forecasted 2036 traffic volumes as per the previous work completed by Dillon in 2020. In 2020, the 2036 horizon was a +15-year horizon and was assumed to be a reasonable period for build out of the area. Note that actual timing for full build-out of the area is dependent on market conditions.

2.1 2036 Do-Nothing Scenario

2.1.1 Intersection Performance

Traffic operations for the 2036 Do-Nothing scenario were assessed to identify any capacity constraints or major delays resulting from future demand assuming no changes have been made to the existing lanes on Princess Street.

Table 1 summarizes the Level of Service (LOS) for intersections within the study area for the 2036 Do-Nothing scenario. Appendix A contains detailed traffic analysis results. For the Do-Nothing scenario, all intersections operate with an overall LOS D or better. Intersection LOS D represents a poor but acceptable average vehicular delay 36-55 seconds.

Table 1: Intersection Level of Service – 2036 Do Nothing

Intersection	Intersection Control	LOS – AM	LOS – PM
Princess St./Concession St.	Signalized	D	D
Princess St./Regent St.	T W S C	A	B
Princess St./Drayton Ave.	T W S C	A	B
Princess St./MacDonnell Ave.	Signalized	B	B
Princess St./Smith St.	T W S C	A	A
Princess St./Victoria St.	Signalized	B	C
Princess St./Nelson St.	T W S C	A	B
Princess St./Albert St.	Signalized	B	B
Princess St./Frontenac St.	T W S C	A	A
Princess St./Alfred St.	Signalized	B	B
Princess St./Chatham St.	T W S C	A	B
Princess St./University Ave.	Signalized	A	B
Princess St./Division St.	Signalized	B	B

Delays are anticipated for traffic exiting from two-way stop controlled minor side streets onto Princess Street. High traffic volumes on Princess Street can inhibit side street traffic from finding gaps to enter the corridor. During the PM peak hour, the southbound approach on Drayton Avenue, Nelson Street, Frontenac Street, and Chatham Street experience LOS F (i.e., delay in excess of 80 seconds). Traffic volumes observed for these movements are minor; generally, less than 30 vehicles per hour. No mitigation is recommended as Princess Street is the primary transportation corridor and would be negatively impacted by changes that would prioritize minor side streets.

2.1.2 Corridor Performance

Due to the close spacing of intersections and interaction between traffic signals, it was important to consider the overall corridor performance by reviewing travel time impacts.

Table 2 summarizes the transit travel times for 2019 existing conditions and the 2036 Do Nothing scenario. The existing transit travel time was provided by Kingston Transit.

The following observations were noted:

- During the weekday AM peak hour, there is a small increase in travel times between 2019 existing conditions and 2036 Do Nothing conditions; and
- During the PM peak hour, eastbound travel time along Princess Street is expected to increase by approximately 1 minute and westbound travel time is anticipated to increase by approximately 2.5 minutes.

Table 2: Travel Times – 2019 and 2036 Do Nothing – Transit

Direction	Time Period	2019 Existing Travel Time	2036 Do Nothing Travel Time
Eastbound	AM Peak	8 minutes	8.1 minutes
	PM Peak	8 minutes	9.0 minutes
Westbound	AM Peak	7 minutes	7.4 minutes
	PM Peak	9 minutes	11.4 minutes

Of note, a key objective of the future Princess Street corridor is to provide express transit service with headways of 5 minutes or less. Based on these travel time results, reducing delays for the westbound direction during the PM peak hour is critical. Mitigation measures should be implemented to reduce the westbound travel times.

One potential method to improve transit travel times is to implement transit queue jump lanes. This is discussed in Section 2.3.

2.2

2036 Mitigated Scenario

The 2036 Mitigated *Scenario* was modelled to identify and assess operational improvements that could result from potential mitigation measures. The proposed mitigation measures include the following:

Princess Street & Drayton Avenue:

- Implement traffic control signals;
- Implement curbside queue jump lane for westbound buses;
- Remove existing eastbound left turn lane to make space for the westbound curbside queue jump lane; and
- Implement transit signal priority.

Princess Street & Albert Street:

- Implement curbside queue jump lane for westbound buses;
- Remove existing eastbound left turn lane to make space for the westbound curbside queue jump lane; and
- Implement transit signal priority.

Princess Street & Nelson Street

- Implement left turn lanes in both directions to compensate for the removal of left turn lanes at Albert Street.

Westbound queue jump lanes have been proposed at two locations: Princess Street / Drayton Avenue and Princess Street / Albert Street. Queue jump lanes at these intersections will provide opportunities for express buses to “jump” ahead of queued vehicles in the adjacent lane. Given that express transit stops are present at both locations, mitigation at these locations will improve transit operations. For the queue jump lane, it should be noted that vehicles making a right turn at an intersection would be permitted to enter the curbside queue jump lane a short distance in advance of the intersection.

2.2.1

Intersection Performance

Traffic operations for the *2036 Mitigated Scenario* were assessed to demonstrate projected operations under the proposed design. Table 3 summarizes the intersection operations level of service for each intersection within the study area.

Under the *Mitigated Scenario*, all intersections operate with LOS D or better. Compared to *Do Nothing* conditions, level of service is relatively unchanged during the AM peak hour. However, intersection performance has improved slightly during the PM peak hour at most intersections. Only one movement operates with LOS F (delays of more than 80 seconds/vehicle) during the PM peak hour: the southbound

left turn at the intersection of Princess Street and Nelson Street. The introduction of dedicated left turn lanes on Nelson Street to help mitigate the delay were not investigated due to right-of-way constraints.

Table 3: Intersection Level of Service - 2036 Recommended

Intersection	Intersection Control	LOS – A M	LOS – P M
Princess St./Concession St.	Signalized	D	D
Princess St./Regent St.	Two Way Stop Controlled	A	A
Princess St./Drayton Ave.	Signalized	A	A
Princess St./MacDonnell Ave.	Signalized	B	B
Princess St./Smith St.	Two Way Stop Controlled	A	A
Princess St./Victoria St.	Signalized	B	B
Princess St./Nelson St.	Two Way Stop Controlled	A	B
Princess St./Albert St.	Signalized	B	B
Princess St./Frontenac St.	Two Way Stop Controlled	A	A
Princess St./Alfred St.	Signalized	B	B
Princess St./Chatham St.	Two Way Stop Controlled	A	A
Princess St./University Ave.	Signalized	A	B
Princess St./Division St.	Signalized	B	B

2.2.2 Corridor Performance

Table 4 summarizes the transit travel times for the Do-Nothing scenario and the 2036 Mitigated Scenario, which shows that:

- During the AM peak hour, transit travel times increased slightly (~0.5 minutes) in the mitigated scenario due to the introduction of the traffic signal at Drayton Avenue; and
- During the PM peak hour, travel time remained identical in the eastbound direction and improved by approximately 2.5 minutes in the westbound direction. This improvement can be attributed to the introduction of the westbound transit queue jump lanes at the Drayton Avenue and Albert Street intersections.

Kingston Transit has indicated the intent for future express transit routes to operate with 5-minute headways. Proposed mitigation measures are focused on improving transit travel time. The implementation of westbound queue jump lanes prioritizes transit and provides the opportunity for express buses to “jump” ahead of queued vehicles in the adjacent lane. The desired 5-minute headways can be achieved through consistent travel times along the Princess Street corridor throughout the peak hours.

Table 4: Travel Times - 2036 Do Nothing and 2036 Recommended - Transit

Direction	Time Period	2036 Do-Nothing Travel Time	2036 Recommended Design Travel Time
Eastbound	AM Peak	8.1 minutes	8.4 minutes
	PM Peak	9.0 minutes	9.2 minutes
Westbound	AM Peak	7.4 minutes	8.0 minutes
	PM Peak	11.4 minutes	9.1 minutes

Figure 1 illustrates a conceptual transit queue jump lane at the Princess Street/Drayton Avenue intersection.

Figure 1: Conceptual Transit Queue Jump Lane



Table 5 summarizes the auto travel time impacts. Minimal changes to auto travel time are seen in the eastbound direction (~0.5 minutes). However, improvements are evident in the westbound direction during both peaks.

Of note, the auto travel time decreases by approximately 2.5 minutes during the PM peak hour. Again, this improvement can be attributed to the queue jump lanes which prevent buses from backing up traffic while picking up passengers at high volume express stops.

Auto travel times are shorter than transit travel times since buses service multiple stops along the corridor.

Table 5: Travel Times - 2036 Do Nothing and 2036 Recommended - Auto

Direction	Time Period	2036 Do Nothing Travel Time	2036 Recommended Design Travel Time
Eastbound	AM Peak	5.3 minutes	5.6 minutes
	PM Peak	6.2 minutes	6.6 minutes
Westbound	AM Peak	4.6 minutes	4.5 minutes
	PM Peak	8.8 minutes	6.0 minutes

2.3 Corridor Design Recommendations

The following geometric changes are recommended based on results of the traffic analysis:

Princess Street/Drayton Avenue:

- Implement curbside queue jump lane for westbound direction to provide opportunity for express buses to “jump” ahead of queued vehicles in the adjacent lane;
- Remove eastbound left turn lane to provide adequate space to accommodate introduction of westbound curbside queue jump lane;
- The implementation of a traffic control signal at Princess Street/Drayton Avenue will:
 - Enable the implementation of a westbound queue jump lane;
 - Improve pedestrian connectivity across Princess Street;
 - Provide a gap for eastbound left turning traffic at the end of each cycle to offset the impact of the removal of the eastbound left turn lane; and
- Implement transit signal priority (TSP) to reduce delays for buses.

Princess Street/Albert Street:

- Implement curbside queue jump lane for westbound direction to provide opportunity for express buses to “jump” ahead of queued vehicles in the adjacent lane;
- Remove eastbound left turn lane to accommodate introduction of westbound curbside queue jump lane; and
- Implement transit signal priority (TSP) to reduce delays for buses.

Princess Street & Nelson Street

- Implement left turn lanes in both directions to compensate for the removal of left turn lanes at Albert Street.

In addition to the above, right-in/right-out treatments were also considered to reduce the number of mid-block left turns, which should reduce the delays in the corridor for auto and transit vehicles. Select locations along the corridor were identified as potential future candidates for right-in/right-out

treatment. These movement restrictions could be introduced in the future as necessary. The impact of implementing right-in/right-out treatments were not assessed in the modelling exercise.

Princess Street/Smith Street: Recommended conversion of north leg to right-in/right-out. Under existing conditions, the eastbound left and southbound left traffic will encroach on the MacDonnell Street westbound left turn storage when waiting for a gap in traffic. With right-in/right-out treatment, vehicles can use the traffic control signal at the Princess Street/MacDonnell Street intersection. Of note, the right-in/right-out option does not impact pedestrian connectivity since it is a three-leg intersection and free flow along Princess Street.

Princess Street/Chatham Street: Recommended conversion of north leg (Chatham Street) to right-in/right-out. Chatham Street is located 70 metres east of the Alfred Street intersection. With RIRO treatment in place, vehicles can alternatively use the signalized intersection at Alfred Street. Of note, the RIRO option does not impact pedestrian connectivity since it is a 3-leg intersection and free flow along Princess Street.

3.0 Cross-Section Design

The following sections provide an overview of the existing, and potential future, spatial allocations of the Princess Street road right-of-way. This right-of-way is particularly constrained through much its length between Bath Road and Division Street. This makes accommodation of all required and desired design elements challenging.

3.1 Existing Cross Section Allocation

The existing cross-section was reviewed to understand how the space is currently allocated and to identify areas for improvement. Within the tight urban environment of Princess Street, the right-of-way (distance between property lines) must not only include roadway elements to accommodate cyclists and vehicles, but also the various uses beyond the curb. This includes elements such as the swing of shop doors, streetlights, signs, bus stops, and garbage cans. The location and minimum required widths of key ROW elements are illustrated in Figure 2.

Figure 2: Elements of an Urban Road Right-of-Way.

Vehicular Lanes (Required)	Cycle Lanes (Optional – Not Shown)	Pedestrian Clearway (Required)
<ul style="list-style-type: none"> • Located between the curbs. • Minimum lane width of 3.3 m where lanes are used by trucks or buses due to width of these vehicles. • Required to provide access for vehicles on arterial transportation corridors. 	<ul style="list-style-type: none"> • Dedicated space for travel by bicycle. • Located beside vehicular lanes or behind the curb. • Minimum clear width of 1.5 m for accessibility. • Width to be adjusted based on anticipated user volumes and street context. 	<ul style="list-style-type: none"> • Most critical zone within the pedestrian realm. • Minimum clear width of 1.8 m for accessibility. • Width to be adjusted based on anticipated user volumes and street context. • Should be clearly delineated, direct and continuous.



Edge Zone (Required)	Furnishing/Planting (Optional)	Frontage Zone (Required)
<ul style="list-style-type: none"> • Space directly behind the curb that acts as a buffer between vehicles and other sidewalk/boulevard functions. • May include signs, parking meters, and snow storage. • Recommended minimum snow storage width for the City of Kingston is 2.0 m. This width may be provided across the edge and furnishing zones. 	<ul style="list-style-type: none"> • Located between the pedestrian clearway and edge, this zone provides space for streetscaping, streetlights, and storage for bikes and scooters. • Recommended minimum snow storage width for the City of Kingston is 2.0 m. This width may be provided across the edge and furnishing zones. 	<ul style="list-style-type: none"> • Space adjacent to elements of the private realm, including building entrances and stoops. • Width of this zone must consider requirements of doors or gates that open towards the sidewalk, leg room required for users of benches and café seating, and ventilation grates.

Table 6 provides an overview of the median right-of-way (ROW) width within key blocks along Princess Street. Note that due to the historic nature of this roadway, there are several locations in each block where existing buildings encroach on the ROW. Table 6 also identifies the types and widths of transportation facilities that are currently provided there. The following list provides an overview of key takeaways from review of the existing Princess Steet design:

- a) The current sidewalk width is less than required to meet Accessibility for Ontarians with Disabilities Act (AODA) requirements for two-way travel within two blocks. Only in one block does the sidewalk width exceed the minimum significantly (3 metres);
- b) The cycling lanes are consistently 1.5 metres were provided but are discontinuous in some locations. Due to the lack of a buffer between the cycle lanes parked cars, cyclists are at risk of being ‘doored’ by vehicle doors opening unexpectedly into the bike lane;
- c) The parking lanes consume a significant portion of the available section width, at 4 metres on each of two sides;
- d) The through lanes are generally 3.5 metres, which is preferred by transit operators but can encourage increased vehicular travel speeds;
- e) There are relatively few street trees, and there is minimal setback from buildings in some cases; and
- f) Left turn lanes are provided at all signalized intersections.

Table 6: Existing Right-of-Way and Transportation Facility Widths^a

Princess Street Segments	Average Mid-Block Right-of-Way Width	Average Widths of Existing Facilities			
		Sidewalk (m)	Cycle Lane (m)	Parking Lanes (m)	Through Lanes (m)
Concession St. to Regent St.	22	2.0	1.5	N/A	3.5
Regent St. to MacDonnell St.	18	3.0	1.5	N/A	3.5
MacDonnell St. to Frontenac St.	18	1.5	1.5	4.0	3.5
Frontenac St. to University Ave.	19.6	2.0	1.5	4.0	4.0
University Ave. to Division St.	19.5	1.5	1.5	4.0	3.5

^a Note that the widths provided do not account for curb and gutter (0.5 m each side), the edge zone (0.3 m minimum) and frontage zones (0.5 m minimum). Widths are average and may be wider or narrower in certain sections.

3.1.1 Transit Stops

Table 7 summarizes the existing transit stops in the study area which service Route 4, Route 501 Express (eastbound), and Route 502 Express (westbound). The existing express bus routes operate every 15 minutes or less during weekday daytime hours, although the intent is to increase frequency to every 5 minutes by 2034.

For the purpose of considering the future design of Princess Street, Kinston Transit provided specific direction on the placement of two stops along the corridor:

- Princess Street / Albert Street: Stop placement has been finalized. The stop will be integrated into the façade of the buildings to be constructed on the southwest and northeast corners of the intersection; and
- Princess Street / Alfred Street: Westbound stop will be integrated into the north-east corner in similar fashion.

Table 7: Existing Transit Stops

Direction	Eastbound Stops	Stop Type	Route(s)
Eastbound	800 Princess Street	Midblock	4, 501 Express
	MacDonnell Street	Far Side	4
	Victoria Street	Near Side	4
	Albert Street	Near Side	4, 501 Express
	Alfred Street	Near Side	4
	University Avenue	Far Side	4
Westbound	University Street	Far Side	4
	Alfred Street	Far Side	4
	Albert Street	Near Side	4, 502 Express
	Legion Villa	Midblock	4
	Tower Street	Midblock	4, 502 Express

3.2 Alternative Princess Street Cross-Sections

3.2.1 Long List of Alternatives

Cross-section alternatives were developed by identifying alternative priorities for Princess Street and combining various desirable elements to determine what could potentially fit within the limited ROW. All alternatives included AODA-compliant sidewalks, minimum frontage and edge zones, and one minimum width vehicular lane in each direction to accommodate transit and limit vehicular infiltration into the adjacent neighborhoods. Removal of on-street parking was also considered in all alternatives.

Table 8 summarizes the recommended widths for various elements of the cross-section such as: frontage, walkways, furnishing zone, cycle tracks, cycle lanes, curb and gutter, and bus lanes. and the factors and guidelines used to identify these minimums. The factors and guidelines used to identify the minimum component dimensions include:

- City of Kingston Technical Standards and Specifications;
- Transportation Association of Canada (TAC)'s Geometric Design Guide (2019);
- Ontario Traffic Manual Book 18: Cycling Facilities, and
- City of Hamilton's *Street Furniture Guidelines*.

Discussion with City staff identified the following desired elements based on the direction adopted by Council in December 2020 that are above and beyond the minimum requirements summarized in Table 8:

- a) Minimum 2.0-metre sidewalks, to enhance the pedestrian realm and exceed the requirements with Accessibility for Ontarians with Disabilities Act (AODA);
- b) Inclusion of street trees, to enhance the pedestrian realm. Note that providing street trees on Princess Street will require the use of soil cells, which necessitate a minimum 1.5 m wide furnishing zone;
- c) Provision of left turn lanes/transit queue jump lanes at key intersections to reduce travel delays for buses and general traffic. Reduced delay is important to support the use of Princess Street as a transit priority corridor; and
- d) Accommodations for cyclists, since the Princess Street corridor is identified as a part of the spine cycling network.

Table 8: Minimum Right-of-Way Component Dimensions

Right of Way Component	Minimum Dimensions	Factors/Guidelines
Frontage Zone	0.5 metres	Based on the Transportation Association of Canada Geometric Design Guidelines (TAC GDG) Chapter 6 Section 6.3.1.1.
Walkway Zone	1.8 metres – 2.0 metres	Based on AODA standards for Accessible Exterior Paths of Travel (2019) and TAC GDG Chapter 6 Table 6.3.1, a 1.8 m minimum width is recommended to provide space for two wheelchairs or pedestrians to pass each other, and for wheelchairs to be able to turn around. 2.0 metres is the recommended width for areas with a peak pedestrian flow rate greater than 400 pedestrians per 15 minutes.
Furnishing Zone	1.85 metres	The width ensures that the placement of furniture does not obstruct the walkway zone by providing space for access, use and maintenance of furniture elements. Values were based on TAC GDG Chapter 6 Section 6.3.1.3.
Transit Shelter	Landing Pad: 9m x 2.5m min Ramp Deployment: 1.5m x 2.5m min Clearway: 1.5m min width	Transit shelter width based on the City of Hamilton HSR Stop Accessibility Guidelines.
Cycle Track	2.0 metres (One way) 3.5 metres (Two way)	Based on OTM Book 18 Table 4.4.
Curb/Gutter	0.5 metres	Based on City of Kingston Technical Standards and Specifications. Reference to City of Kingston Technical Standards and Specifications. References OPSD 600.100

Right of Way Component	Minimum Dimensions	Factors/Guidelines
Cycle Lane	1.5 metres + 0.3m buffer	Based on OTM Book 18 Table 4.7. Note that an additional 0.3 m can be provided by having cyclists use the gutter.
Bus Lane	3.3 metres	3.5 m preferred. Minimum width indicated by City staff and supported by TAC GDG Table 4.2.3.
Through Lane/Turn Lane	3.3 metres	3.3m preferred. Minimum width indicated by City staff and supported by TAC GDG Table 4.2.3.

It is a significant challenge for Princess Street to simultaneously be a transit priority corridor, a cycling spine route, a pedestrian-friendly corridor, and an arterial class roadway due to the limited right-of-way. Therefore, compromises need to be made in a way that improves multi-modal mobility while recognizing the limited space to accommodate all modes of travel in a narrow corridor. To this end, provisions for transit priority and improved pedestrian realm were prioritized over maintaining on-street parking on Princess Street. There is parking available on side streets and within off-street parking areas to accommodate business needs.

The following sub-sections provide more detail on each of the six alternatives that were developed for use on Princess Street between Bath Road and Division Street. Table 9 summarizes the alternatives which were developed and their ability to provide desired elements, as identified through discussion with City staff.

3.2.2 Alternative 1: Prioritize Pedestrian Realm

Alternative 1 prioritized widening of the pedestrian realm through removal of on-street parking, existing cycling lanes, and most left turn lanes. This alternative included implementation of transit priority lanes at Albert Street and Drayton Avenue as recommended in Section 2.3. Cyclists could be accommodated on shared lanes on Princess Street or could use alternative routes on adjacent streets. This alternative was the only one that provides the city with the space required for continuous >2.0m sidewalks and street trees on both sides of the roadway.

3.2.3 Alternative 2: Implement Cycle Tracks (Both Sides)

Alternative 2 contemplated implementation of unidirectional cycle tracks (each 2.0 m wide) on both sides of Princess Street. Cycle tracks are typically located beyond the curb and constructed at sidewalk height. They are considered the most appropriate facility type for the broadest range of cyclist experience levels.

Spatial requirements for the cycle tracks would negate the potential to provide left turn lanes or transit priority features within the corridor. This would lead to significant delays and compromise the City's ability to provide express transit service on the corridor. Reduction of the ideal sidewalk width would be required between Regent Street and Frontenac Street. Provision of AODA-compliant sidewalks would not be feasible at intersections between MacDonnell Street and Frontenac Street. The feasibility of implementing street trees would be severely limited with this alternative.

3.2.4 Alternative 3: Implement Bi-Directional Cycle Track (One Side)

Alternative 3 contemplated implementation of bidirectional cycle tracks on one side of Princess Street. Bidirectional cycle tracks require less width to accommodate travel in two directions than separate unidirectional facilities. The primary challenge associated with bi-directional cycling facilities results from an increase in the number of vehicle – cyclist conflict points at intersections and the challenge of driver expectations.

This alternative would provide adequate additional width in the ROW to accommodate sidewalks with widths of at least 2.0 m throughout the corridor. This would, however, require removal of all on-street parking and left turn lanes. The limited space would also negate the potential to provide left turn lanes or transit priority features through much of the corridor without compromising sidewalk width.

3.2.5 Alternative 4: Implement Westbound Cycle Track Only

Alternative 4 contemplated implementation of a unidirectional cycle track on one side of Princess Street to further reduce spatial requirements. Cyclist traveling in the opposite direction could share lanes with vehicles on Princess Street or use alternative routes. Alternative 4 would provide adequate additional space in the ROW to accommodate sidewalks with widths of at least 2.0 m throughout the corridor, as well as accommodate left turn lanes at key intersections. The limited space would, however, negate the potential to provide the transit priority features recommended in Section 2.3.

3.2.6 Alternative 5: Implement On-Street Cycle Lanes

Alternative 5 is similar to the existing condition on Princess Street with the exception of removal of all on-street parking and the reallocation of space for wider pedestrian facilities and limited landscaping. Cycling lanes are assumed to be 1.5 m wide with no buffer between vehicular traffic and the cycling lane. This alternative included implementation of transit priority lanes at Albert Street and Drayton Avenue as recommended in Section 2.3. With Alternative 5, 2.0 m sidewalks can generally be provided on Princess Street with exception of the blocks between Regent Street and MacDonnell Street. Landscaping could feasibly be implemented west of Regent Street and east of Frontenac Street. Transit priority features and left turn lanes could be implemented for this alternative but would require further compromises to sidewalk width.

3.2.7 Alternative 6: Prioritize Transit Operations

Alternative 6 contemplated inclusion of a continuous westbound transit lane to improve transit reliability in the most congested direction. Alternative 6 prioritized widening of the pedestrian realm and the addition of the transit lane through removal of on-street parking, existing cycling lanes, and all left turn lanes. Cyclists could be accommodated on shared lanes on Princess Street or could use alternative routes on adjacent streets. Landscaping could feasibly be implemented west of Regent Street and east of Frontenac Street. While transit travel times would be greatly enhanced in the westbound direction, the removal of all left turn lanes would result in significant backups in the general use lanes in both directions. This would have significant negative impacts on eastbound transit vehicles travelling these lanes.

Table 9: Overview of High-Level Analysis of Cross-Section Alternatives

- Xs are used to identify segments where elements are expected to fit based with some minor compromises.
- Compromise solutions consider reducing the furnishing zone to 0.5 m before reducing sidewalk widths below 2 m.

Alternative	Alternative 1: Wide Pedestrian Realm						Alternative 2: Cycle Tracks						Alternative 3: Bidirectional Cycle Track						Alternative 4: One-Way Cycle Track						Alternative 5: On-Road Cycling Lanes						Alternative 6: Continuous Bus Lane						
	Design elements	Trees	Sidewalk < 1.5 m	Sidewalk 1.5 m-2.0 m	Sidewalk > 2.0m	Uni-directional cycle lanes	Bidirectional cycle facilities	Continuous 3rd Lane/Left turn lane	Trees	Sidewalk < 1.5 m	Sidewalk 1.5 m-2.0 m	Sidewalk > 2.0m	Uni-directional cycle lanes	Bidirectional cycle facilities	Continuous 3rd Lane/Left turn lane	Trees	Sidewalk < 1.5 m	Sidewalk 1.5 m-2.0 m	Sidewalk > 2.0m	Uni-directional cycle lanes	Bidirectional cycle facilities	Continuous 3rd Lane/Left turn lane	Trees	Sidewalk < 1.5 m	Sidewalk 1.5 m-2.0 m	Sidewalk > 2.0m	Uni-directional cycle lanes	Bidirectional cycle facilities	Continuous 3rd Lane/Left turn lane	Trees	Sidewalk < 1.5 m	Sidewalk 1.5 m-2.0 m	Sidewalk > 2.0m	Uni-directional cycle lanes	Bidirectional cycle facilities	Continuous 3rd Lane/Left turn lane	
Mid-block	Concession St. to Regent St.	X			X			X			X		X		X			X	X			X			X		X		X			X			X		X
	Regent St. to MacDonnell St.	X			X					X			X		X			X	X					X			X				X			X		X	
	MacDonnell St. to Frontenac St.	X			X					X			X		X			X	X							X			X			X			X		X
	Frontenac St. to University Ave.	X			X			X			X		X		X			X	X				X			X		X		X			X		X		X
	University Ave. to Division St.	X			X			X			X		X		X			X	X				X			X		X		X			X		X		X
Intersection	Concession St. to Regent St.	X			X		X	X		X		X		X			X	X		X		X		X		X		X		X		X		X		X	
	Regent St. to MacDonnell St.	X			X		X			X		X		X		X		X	X				X		X		X		X		X		X		X		X
	MacDonnell St. to Frontenac St.				X		X		X				X		X			X	X						X		X				X			X			X
	Frontenac St. to University Ave.	X			X		X	X			X		X		X			X	X				X		X		X		X		X		X		X		X
	University Ave. to Division St.	X			X		X	X			X		X		X			X	X				X		X		X		X		X		X		X		X
Notes	Wider sidewalks and left turn /queue jump lanes can be provided throughout the entire study corridor. With exception of intersections between MacDonnell and Frontenac, street trees can also be accommodated on both sides of the corridor.						Alternative cannot be used in combination with left turn lanes or queue jump lanes. Only three sections can accommodate the proposed design. Implementation in other sections would result in sub-standard sidewalk widths.						Alternative cannot be used in combination with left turn lanes or queue jump lanes. 2 m minimum sidewalk widths can be maintained throughout. the ability to accommodate street trees/furniture between Regent and Frontenac may be compromised.						Wider sidewalks can be accommodated throughout, with left turn or queue jump lanes feasible in three sections if the furnishing zone is reduced.						Alternative cannot be used in combination with left turn lanes or queue jump lanes without compromising the sidewalk.						Wider sidewalks and a continuous transit lane can be provided throughout. Street trees can also generally be accommodated. Left turn lanes will need to be removed.						
	CARRY FORWARD						SCREEN OUT						SCREEN OUT						SCREEN OUT						CARRY FORWARD						SCREEN OUT						

3.2.8

Short List of Alternatives

Alternatives 1 and 5 were recommended to be carried forward for further analysis based on their ability to provide for the majority of the desired elements.

- Figure 3 illustrates the short list of cross section alternatives, which include:
- Alternative 1: “Two Through Lanes & Wide Pedestrian Realm”; and,
- Alternative 5: “Two Through Lanes & On-Road Cycle Lanes”.

Plan view conceptual design drawings for both alternatives have been included in Appendix A.

Both of these alternatives support the priorities of the corridor with dedicated facilities for transit, improved pedestrian realm, and promoting cycling. While Alternative 1 does not provide dedicated cycling facilities, traffic is anticipated to move quite slowly through the corridor making it suitable for more confident riders. Unfortunately, due to the ROW constraints of Princess Street, it was not possible to provide improvements to all modes simultaneously. The key trade off between Alternative 1 and Alternative 5 is the support for either the wide pedestrian realm or on-road cycling lanes.

Both alternatives are expected to have transit queue jump lanes at critical intersections. As noted earlier, transit queue jump lanes are important to reduce delays and maintain transit priority in the Princess Street corridor, particularly with buses running as frequently as every 5 minutes in the future. Both alternatives will be carried forward for further analysis and consultation with the public.

Figure 3: Renderings for Short List of Alternatives

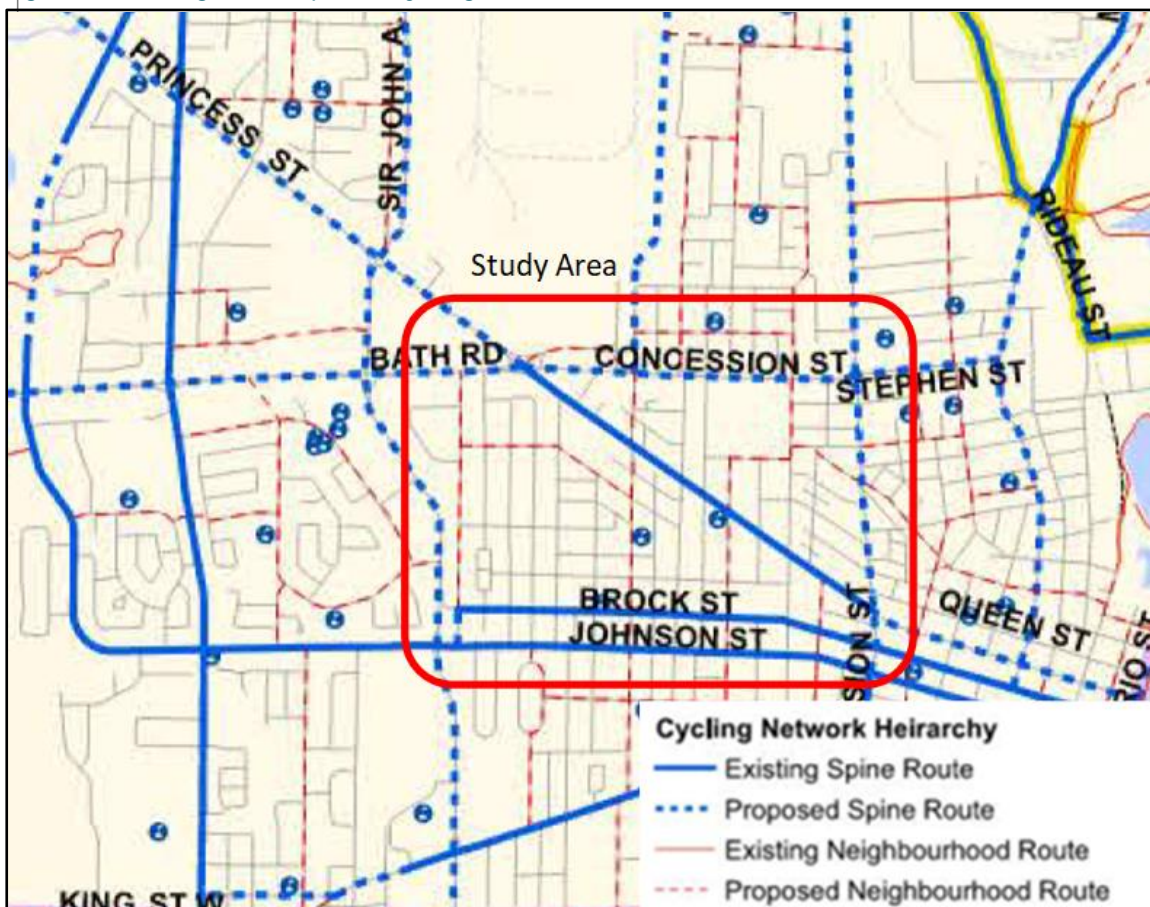


3.3 Cycle Network Impacts

As part of the 2012 Main Street Study, it was recommended that the surrounding local streets in the Williamsville area be improved with neighbourhood bikeway options to promote cycling. The existing and proposed cycling routes in the Active Transportation Master Plan (ATMP) were reviewed to understand cycling connectivity.

Figure 4 illustrates the Existing and Proposed Cycling Routes from the *Walk 'n' Roll Kingston Final Report* (ATMP). This shows that Princess Street, Brock Street and Johnson Street are existing Spine Routes with on-road cycling lanes, and Division Street, Concession Street, and Sir John A. Macdonald Boulevard are proposed Spine Routes. There are also proposed Neighbourhood Routes running north-south through the Williamsville area.

Figure 4: Existing and Proposed Cycling Routes



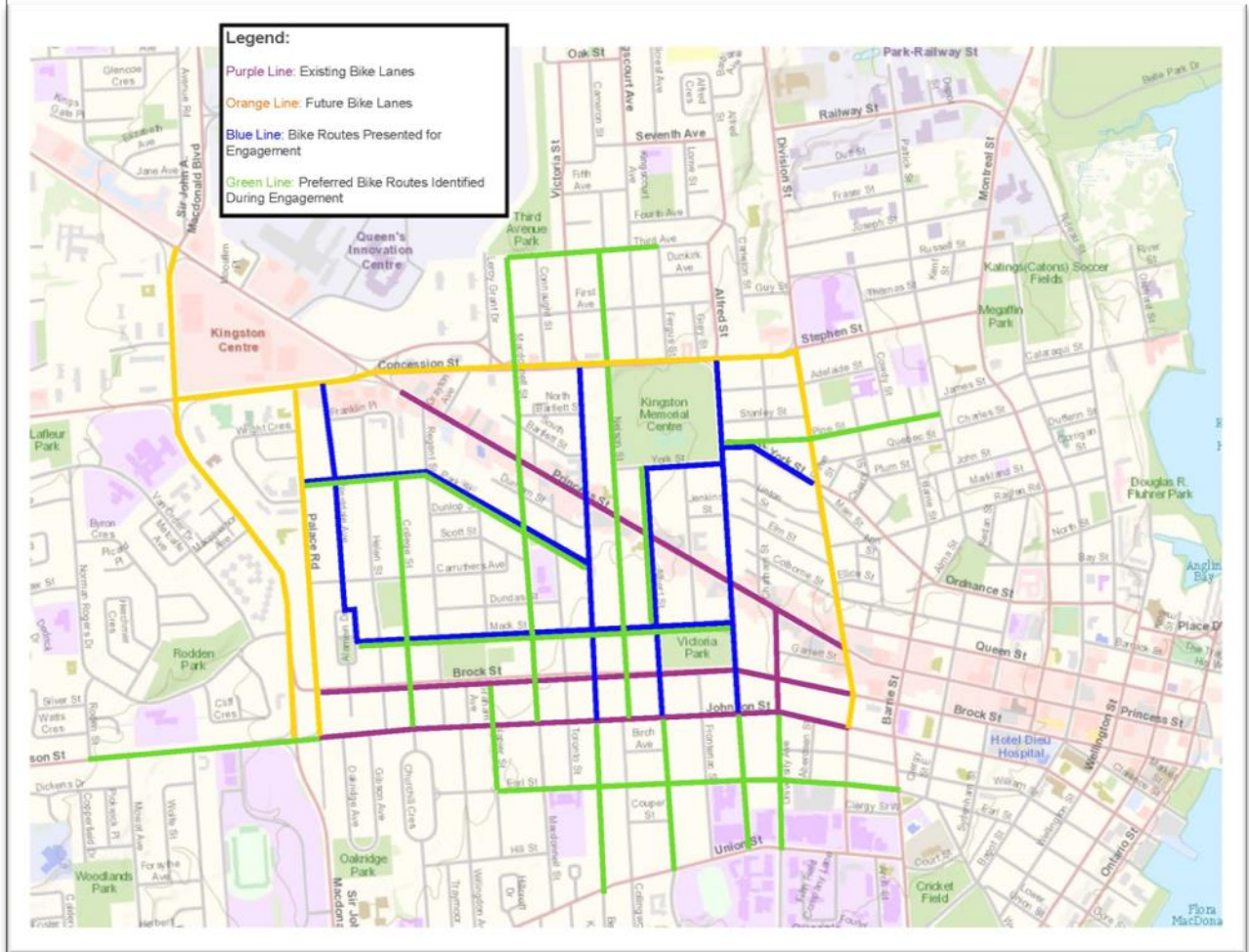
Source: Walk 'n' Roll Final Report, Map 2B, Cycling Network Hierarchy

In general, there are cycling facilities in the surrounding areas of Williamsville. The removal of cycling facilities from Princess Street eliminates a direct connection for through trips on Princess Street; however, alternative routes and options exist. If dedicated cycling facilities are removed from Princess Street, then the following should be considered:

- Promoting the use of Brock and Johnson Streets as part of the spine cycling network. Connections could be provided along Palace Road or Sir John A. Macdonald Boulevard up to Bath Road;
- Developing Concession Street as part of the spine cycling network alternative to connect into future bike facilities along Princess Street, west of Bath Road, and connect into existing and proposed bike facilities along Division Street;
- Developing neighbourhood bike routes – these routes would be formalized with wayfinding and could potentially include traffic calming and other measures to promote cycling along these areas.
- Confident cyclists can also continue to bike along Princess Street.

Figure 5 illustrates the neighbourhood bike routes which were considered to provide access to and from Princess Street if dedicated facilities are removed from the Main Street. For locations crossing Princess Street without a traffic control signal, a pedestrian/cycling crossover could be considered if the crossover is required for system connectivity. In general, it is recommended that additional neighbourhood bike routes are considered to provide connections throughout Williamsville and to existing and proposed bike routes to the south. These neighbourhood bike routes will be carried forward and brought to the public for consultation.

Figure 5: Proposed Neighborhood Cycling Network



4.0 Recommendations

Detailed traffic microsimulation and cross-section investigations have resulted in recommendations for the design of Princess Street and the need for a neighborhood bikeway network. The following geometric changes are recommended to support vehicular movement, prioritize transit, and reduce the proportion of the right-of-way allocated to vehicular traffic regardless of what alternative is carried forward:

- Removal of all existing on-street parking between Bath Road and Division Street,
- Add traffic signals and a westbound right turn / transit priority lane at Drayton Avenue,
- Widen the eastbound lane to 5 m on approach to the eastbound express stop at Tower Street to allow vehicles to slip past buses which are servicing the stop,
- Add traffic signals and east/westbound left turn lanes at Nelson Street,
- Remove existing left turn lanes at Albert Street and add a westbound right turn / transit priority lane, and
- Narrow vehicular lanes to 3.3 m.

Additional analysis is recommended prior to identifying a preferred cross-section for Princess Street. The following additional tasks are recommended:

- Undertake consultation with agencies, advocacy groups and the public to understand priorities and concerns;
- Conduct parking occupancy and requirement studies to identify locations where on -street parking can be removed and where accessible parking needs to be maintained;
- Explore the feasibility and potential design alternative for implementation of an expanded neighborhood bikeway network within Williamsville;
- Implement traffic calming throughout Williamsville, and particularly on local roadways adjacent to Princess Street, to minimize vehicular detouring and speeding and encourage cycling;
- Consider the use of 'green streets' concepts to improve walkability, improve cycling desirability, provide additional tree canopy, and reduce vehicular traffic; and
- Complete topographical surveys and advance the conceptual designs proposed through this study to confirm feasibility of implementation.

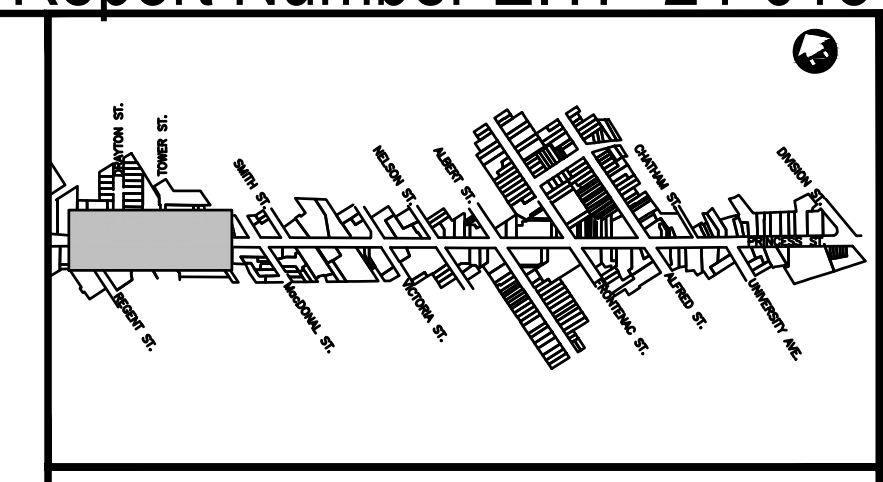
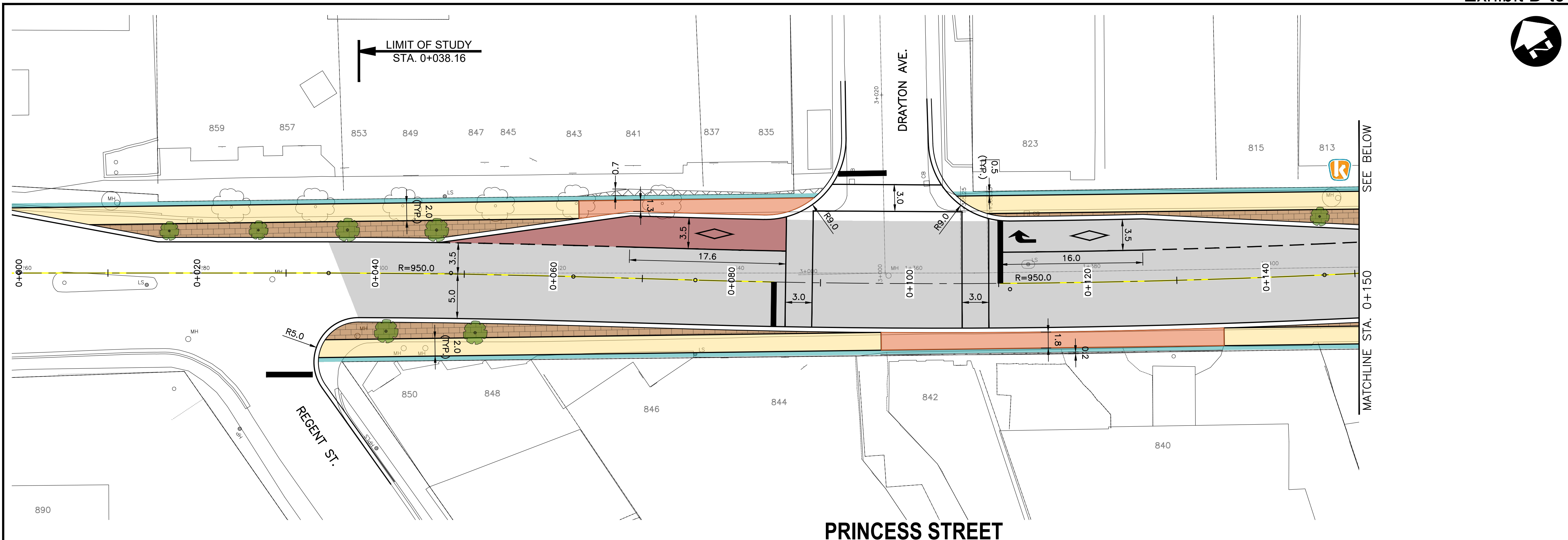
Completion of this study is an early step towards improving multi-modal mobility within the Williamsville Area.

Appendix A

Traffic Analysis Results

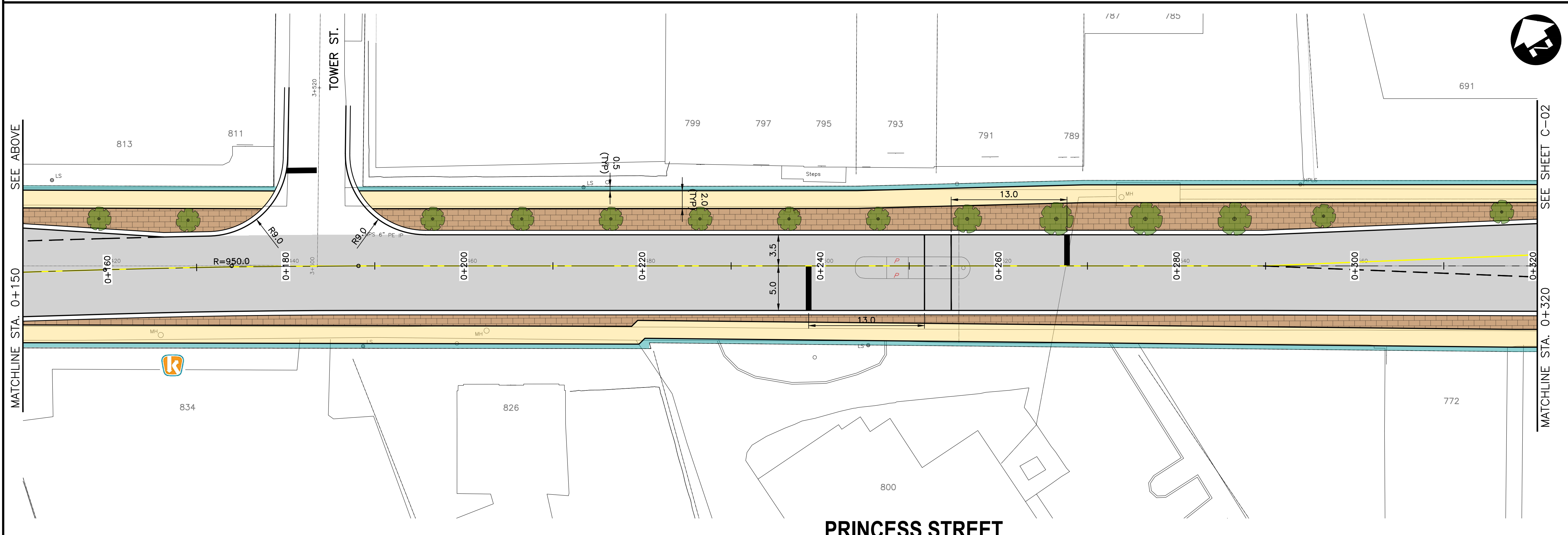
Appendix B

Plan View Conceptual Design Drawing



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- FRONTAGE ZONE
- K KINGSTON TRANSIT STOP
- POTENTIAL FOR STREET TREES (EXACT LOCATIONS TO BE DETERMINED THROUGH DETAILED DESIGN)
- REQUIRED SPACE FOR 2M SIDEWALK AND 0.5M FRONTAGE



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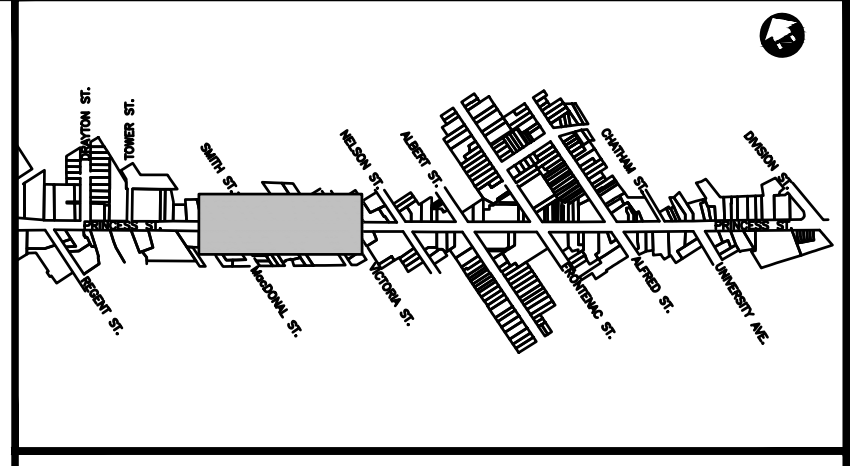
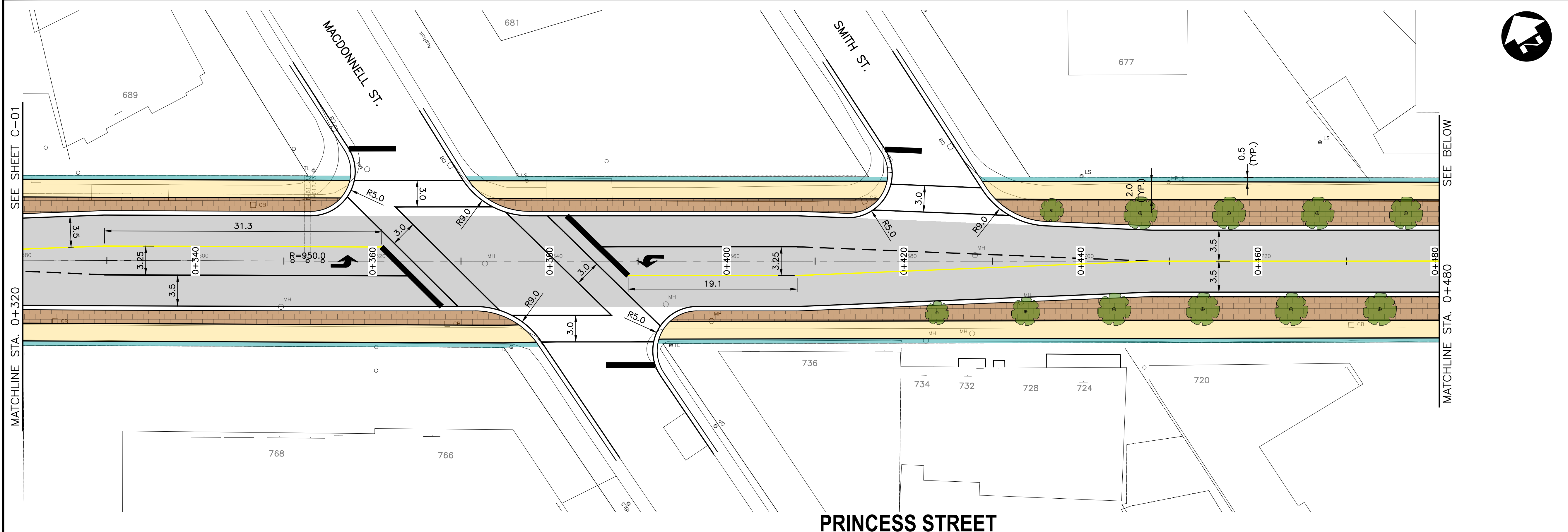


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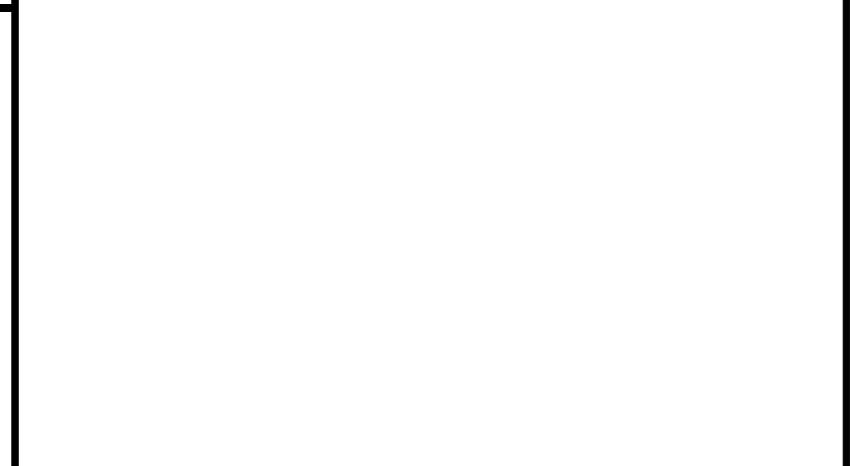
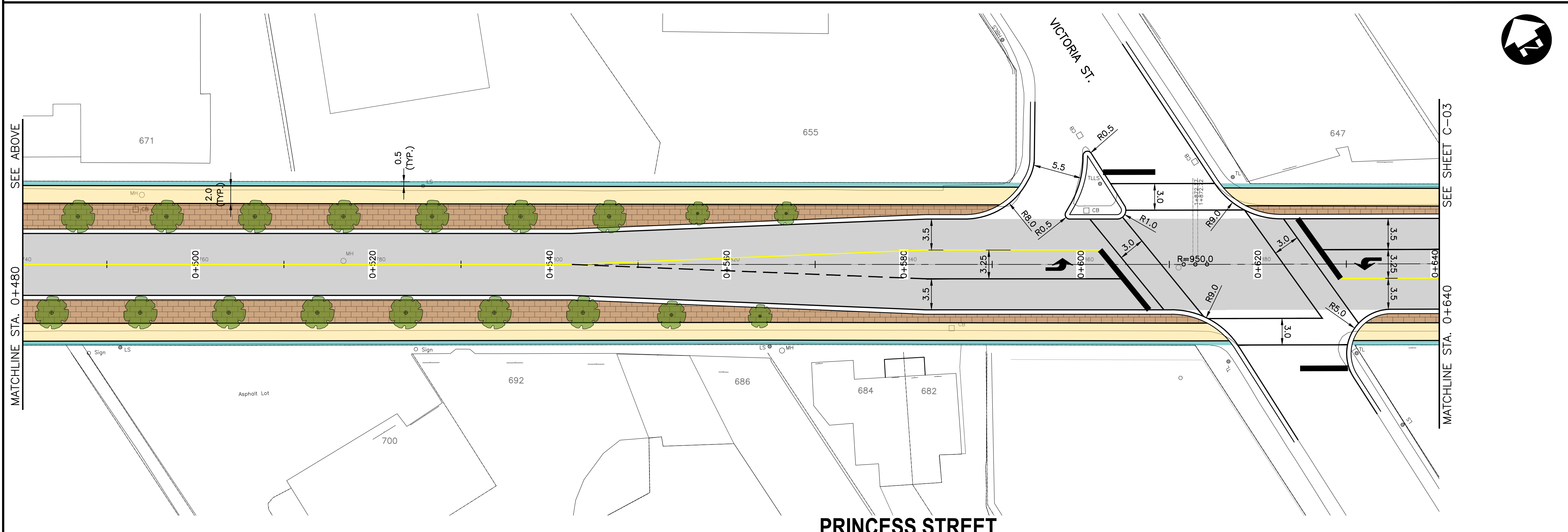
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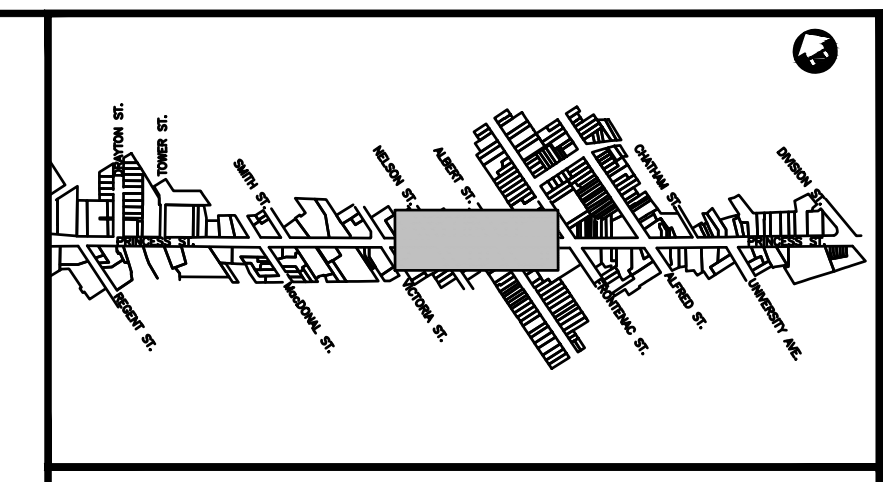
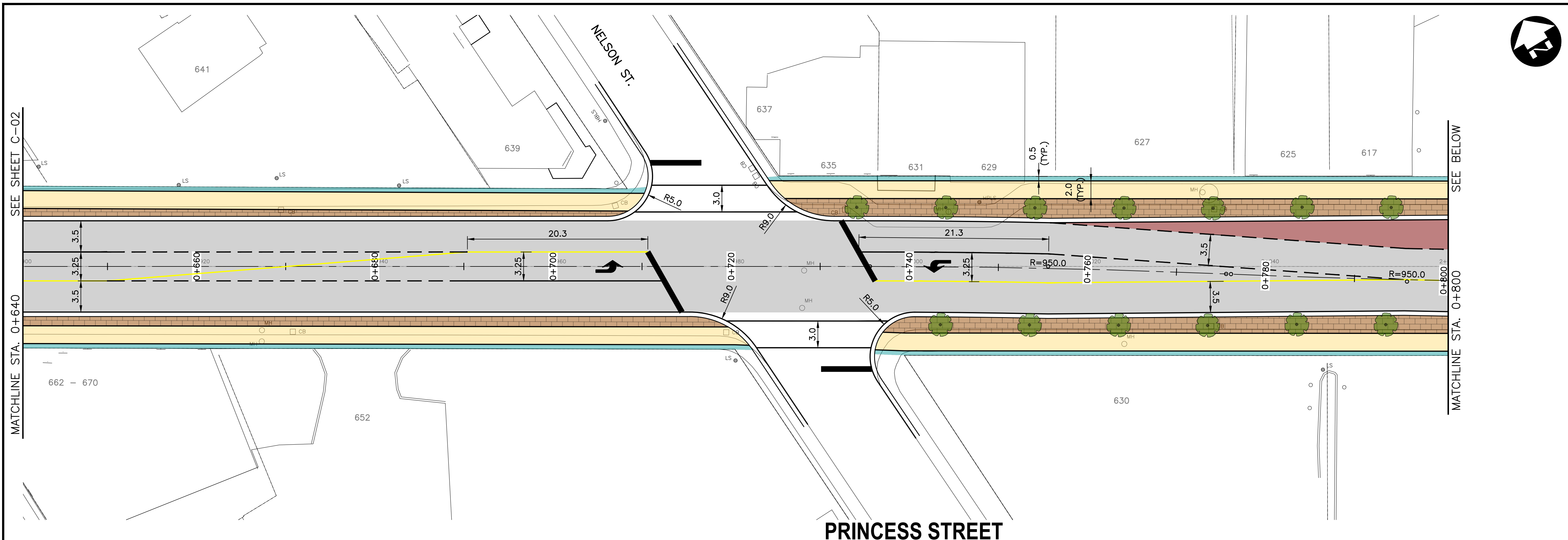
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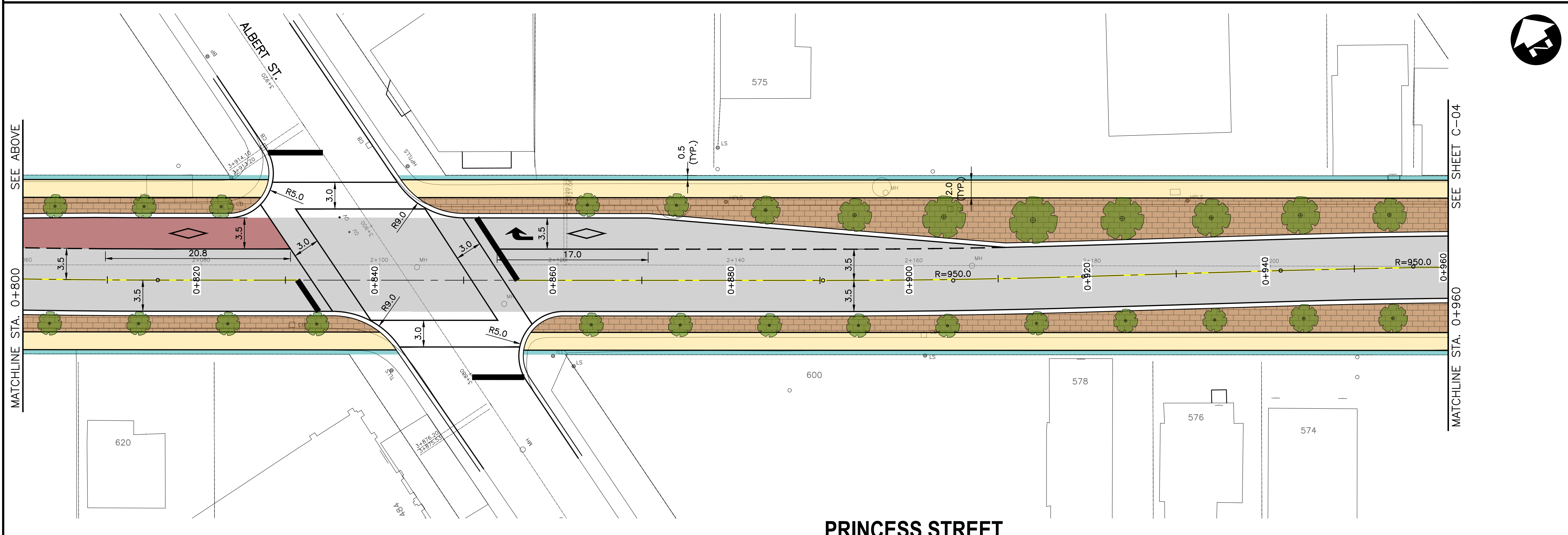
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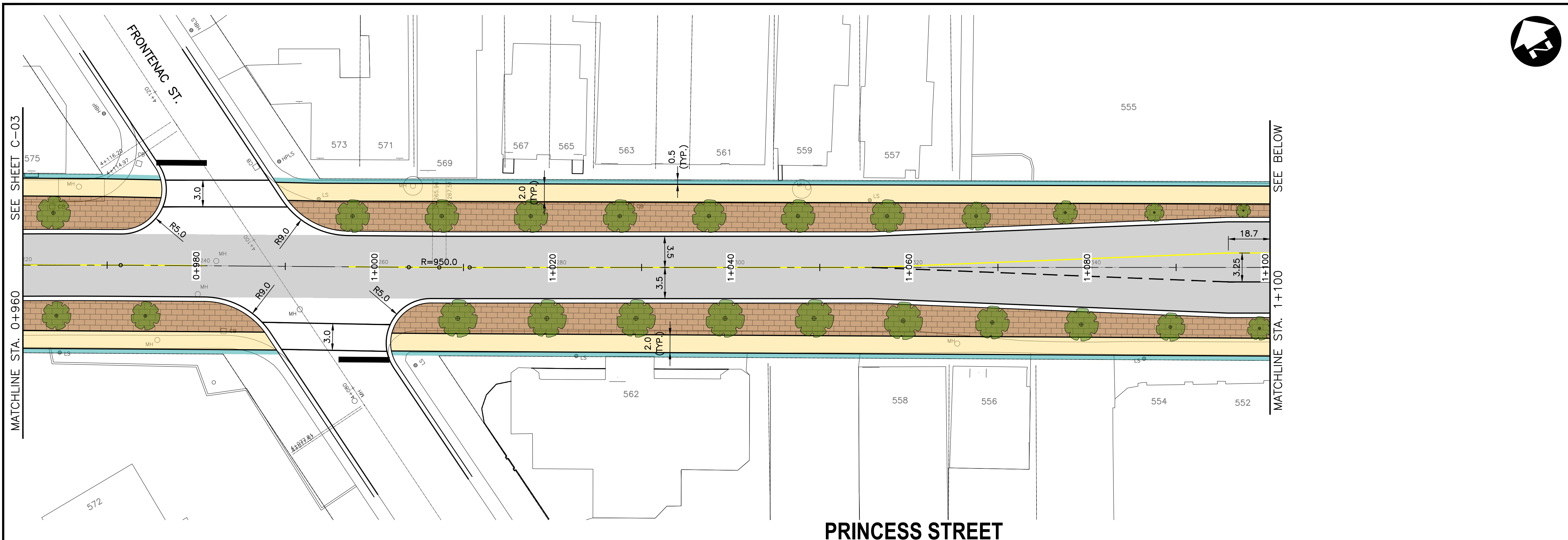


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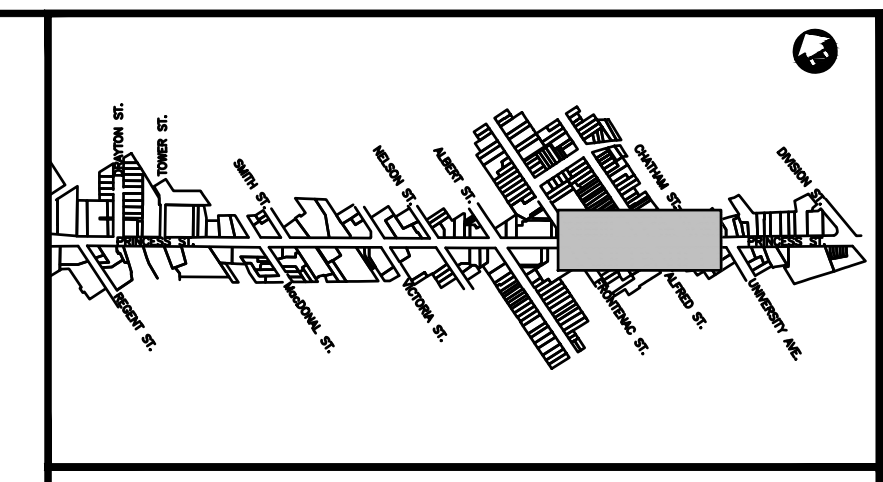
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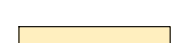



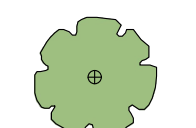
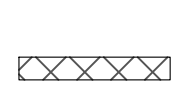
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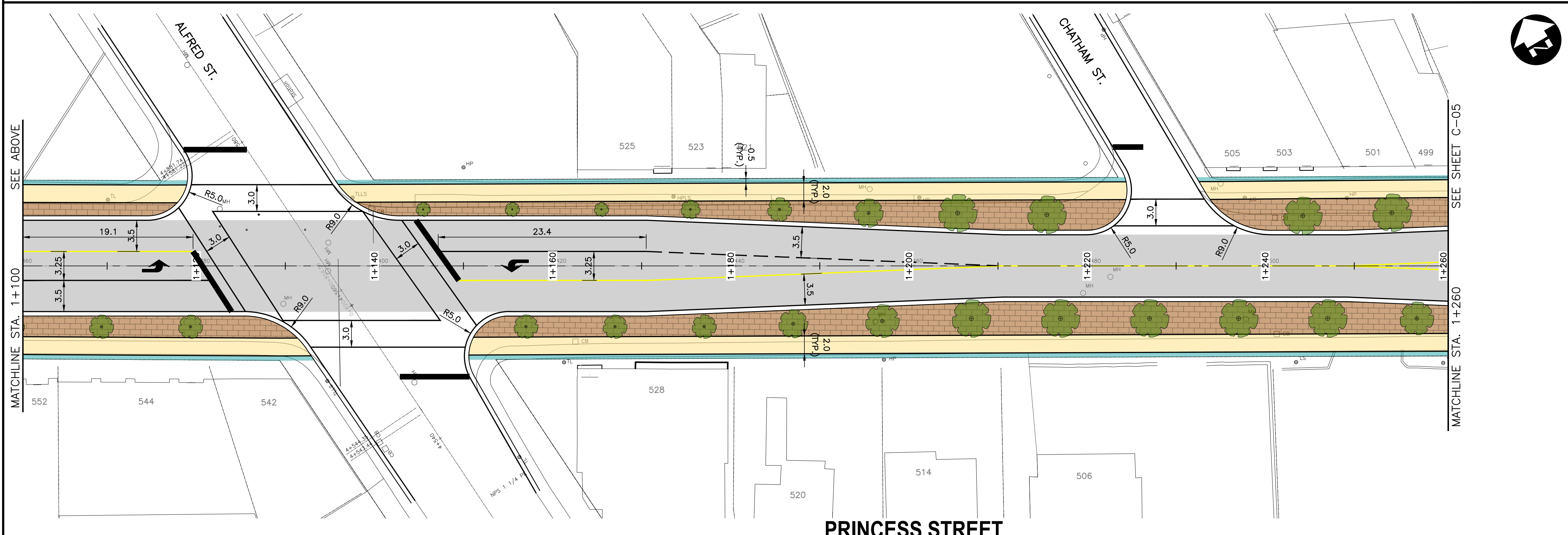
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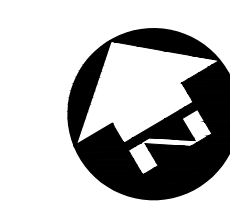
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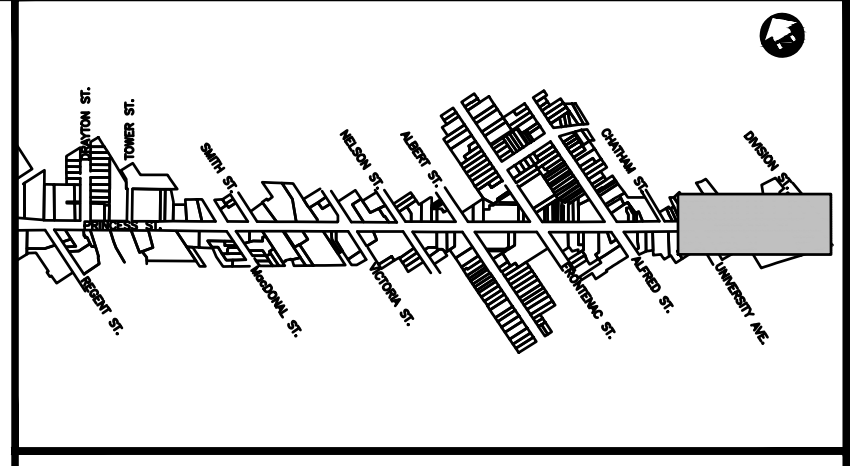
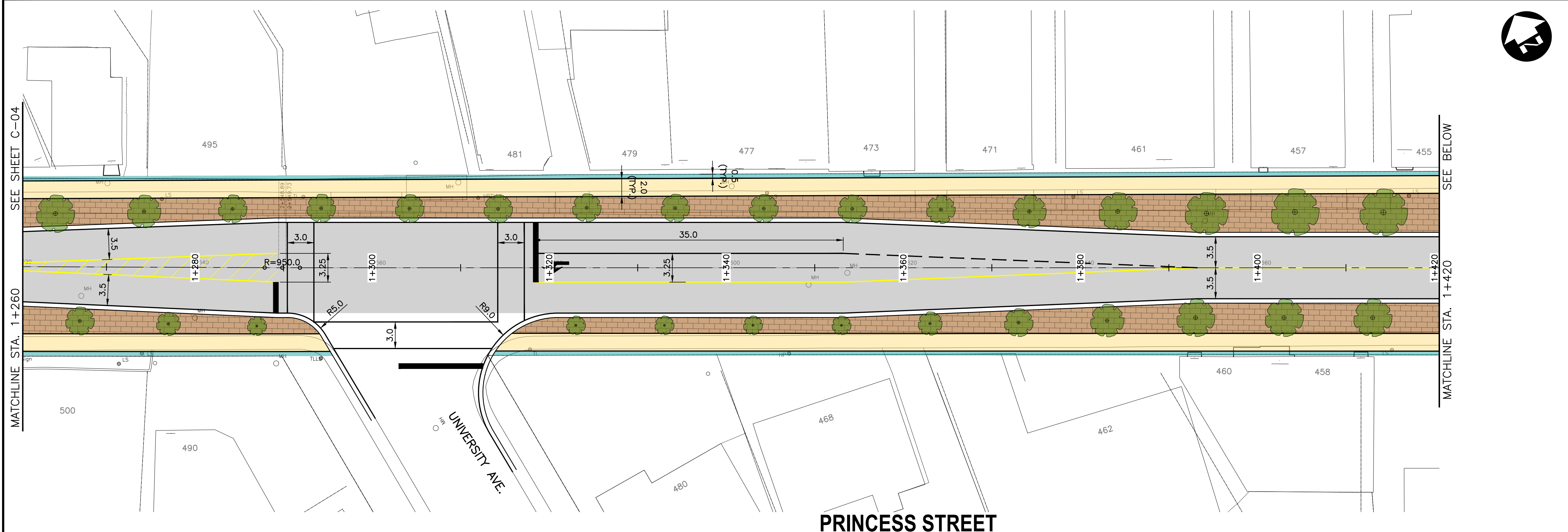
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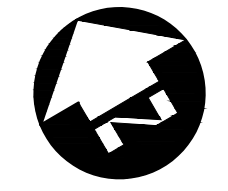
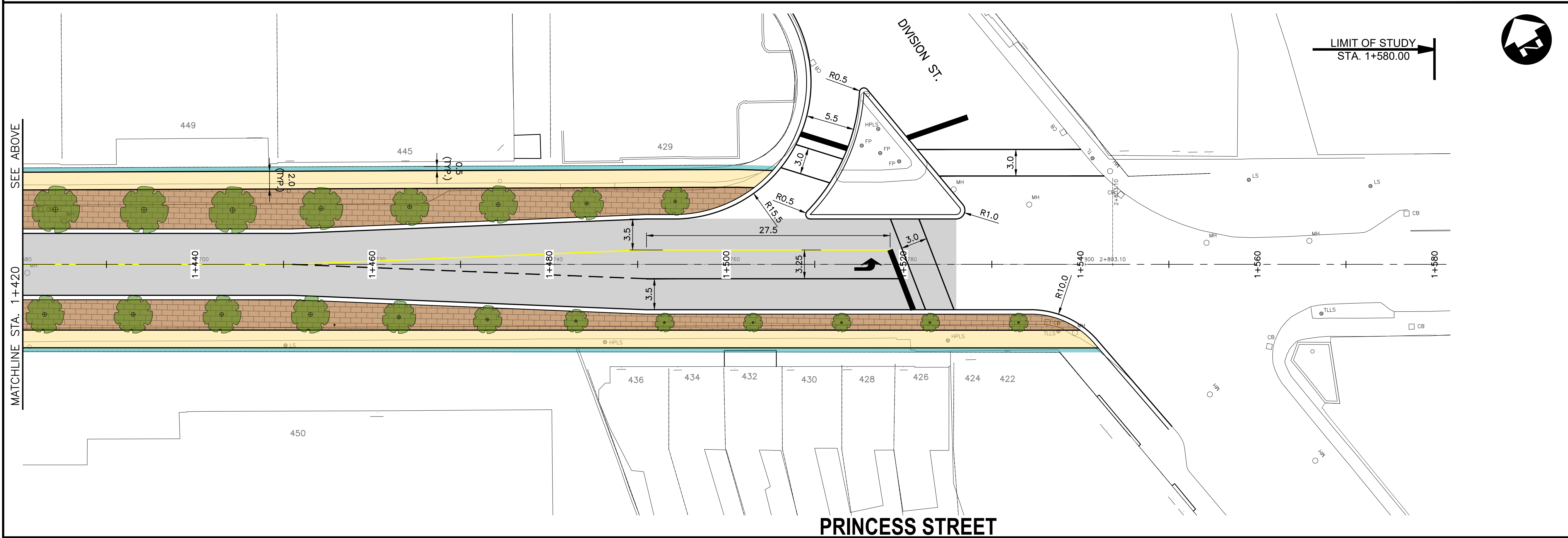


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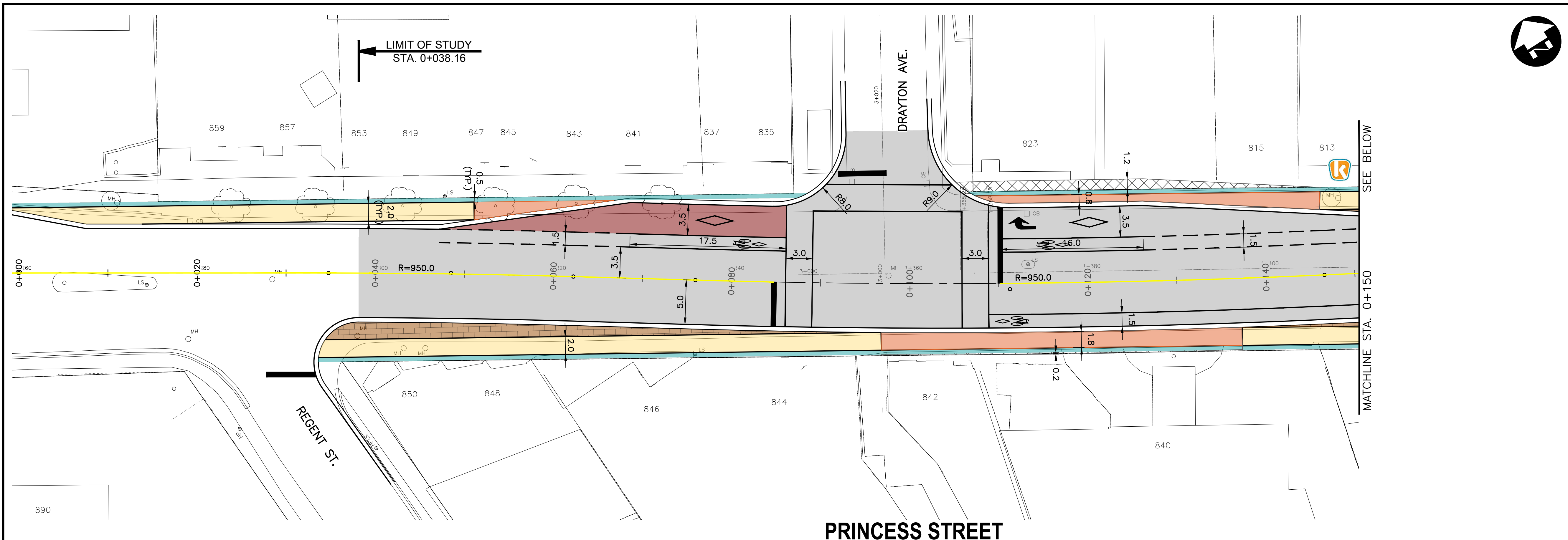
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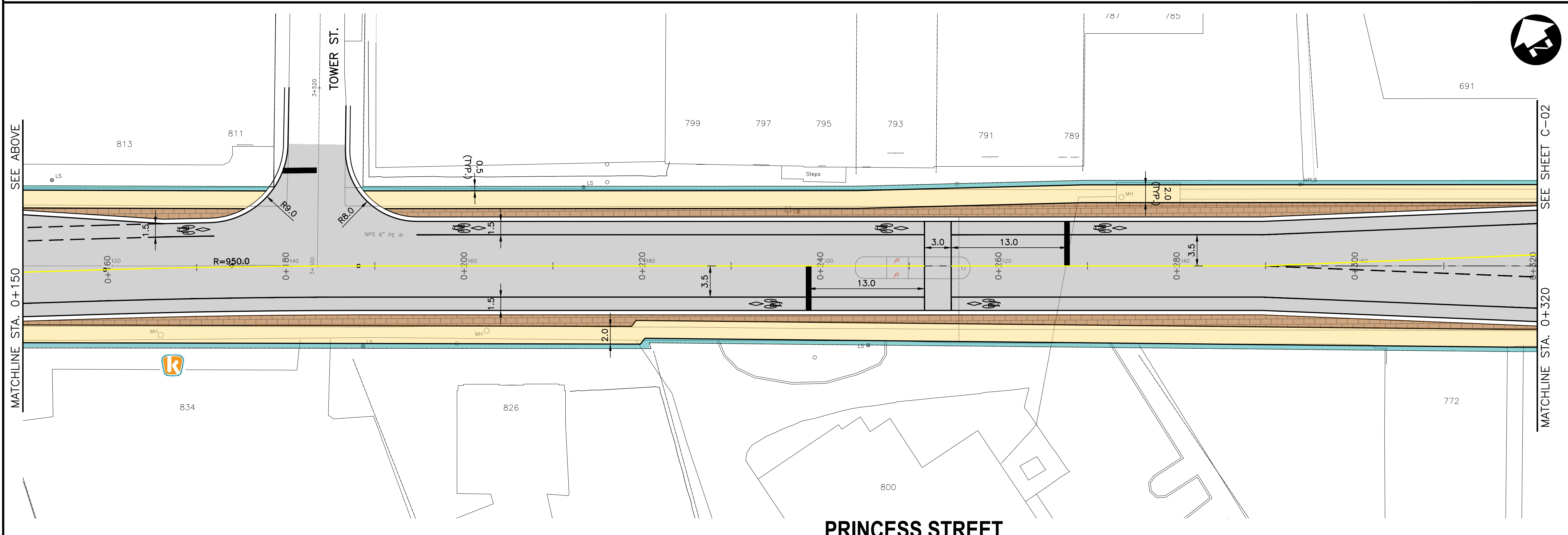


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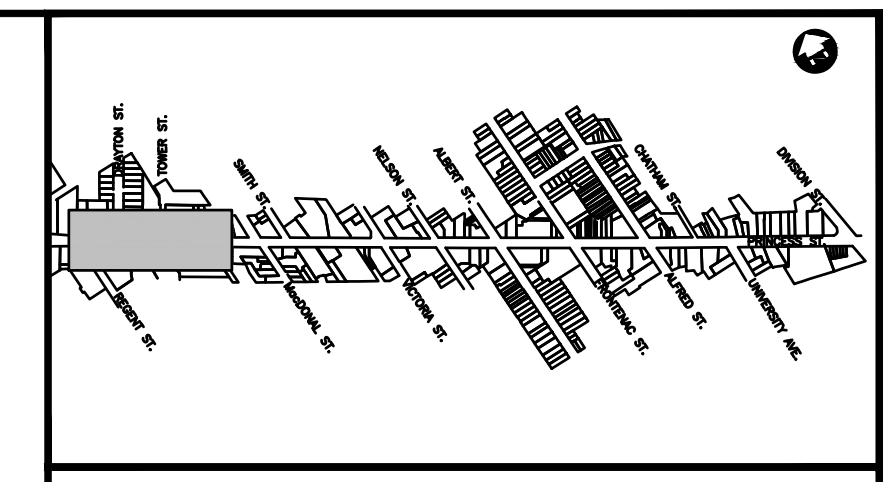
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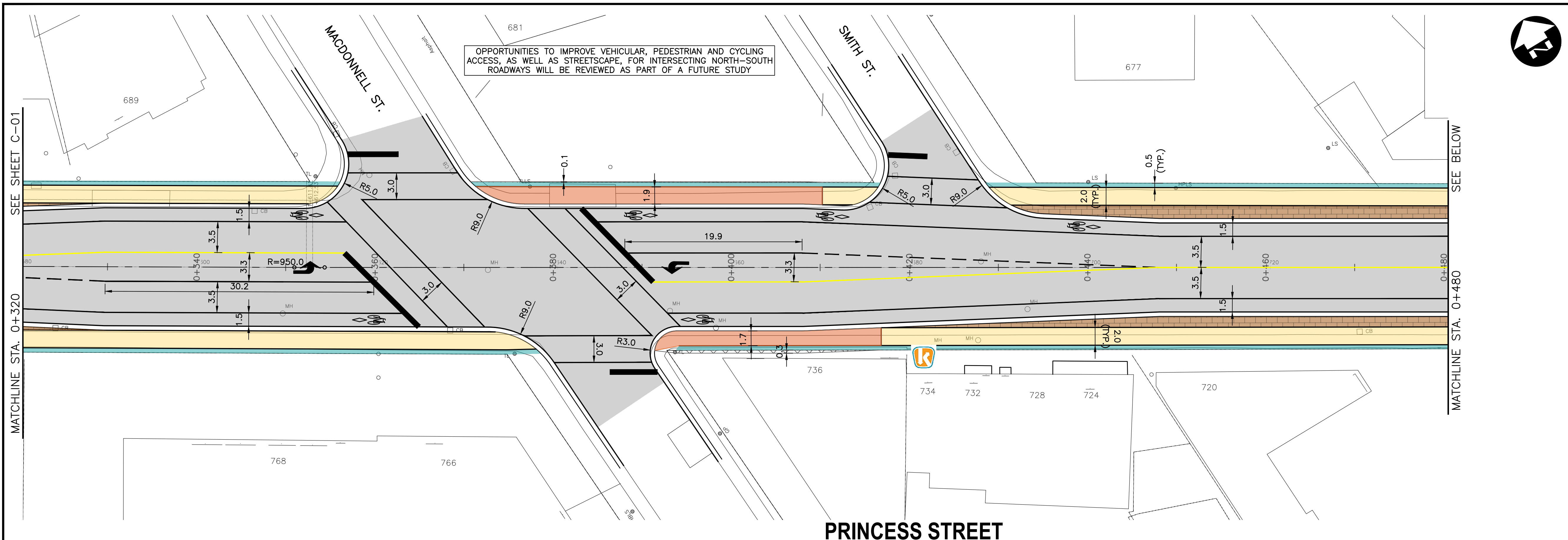
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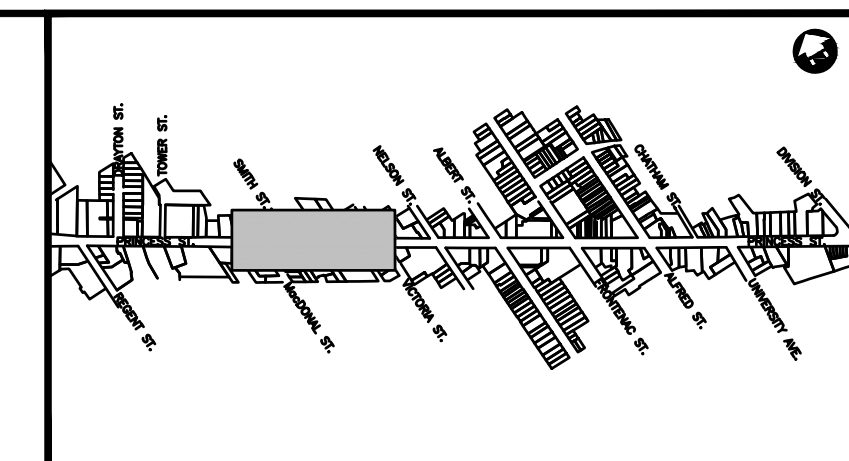
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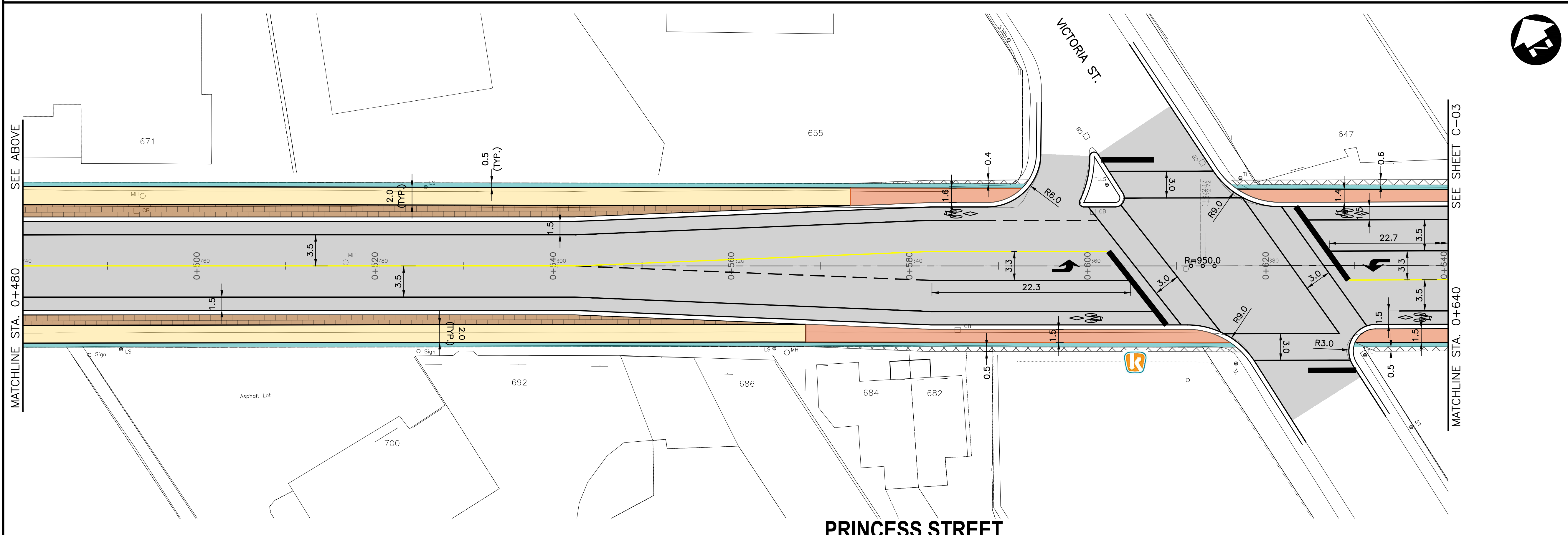
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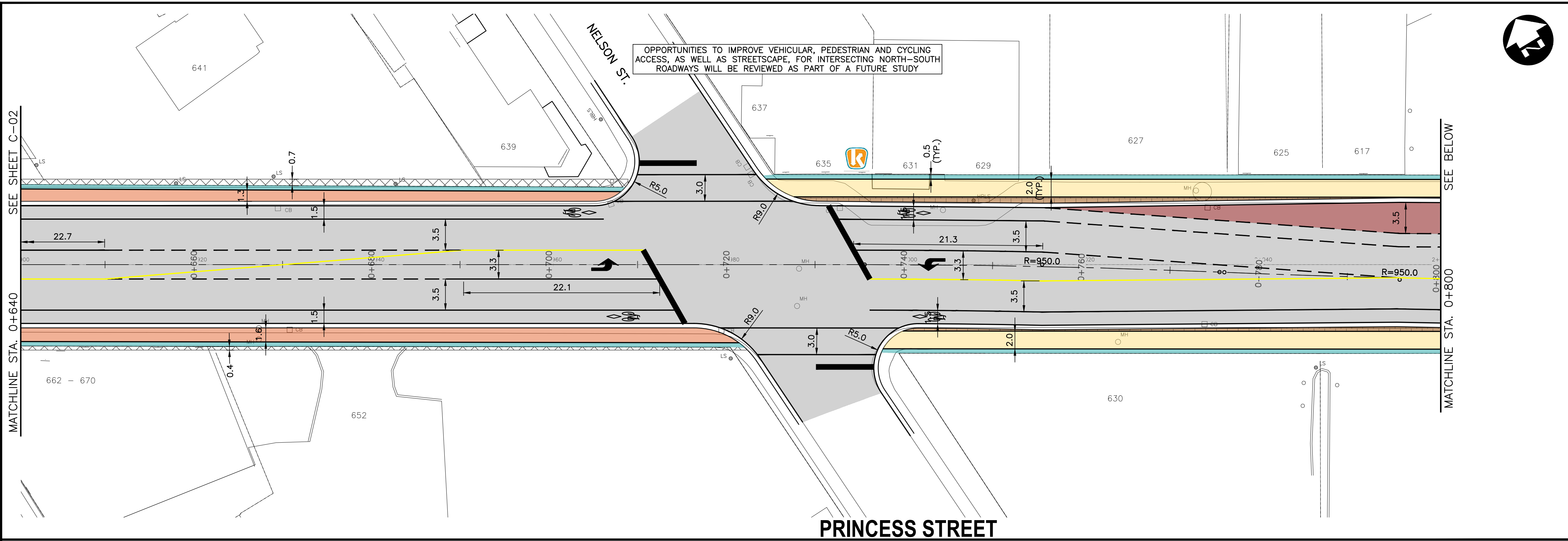


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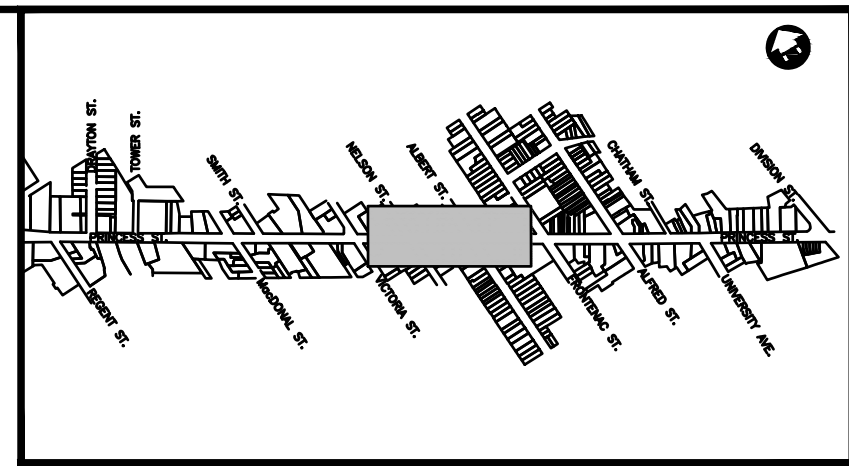


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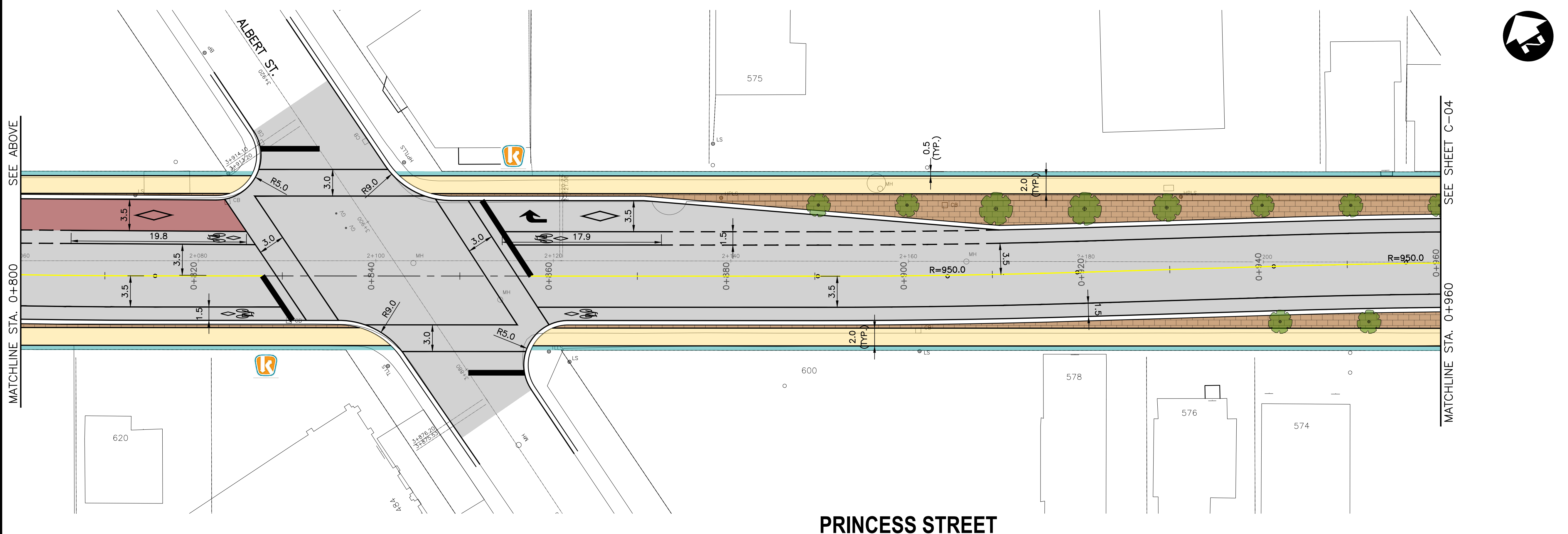
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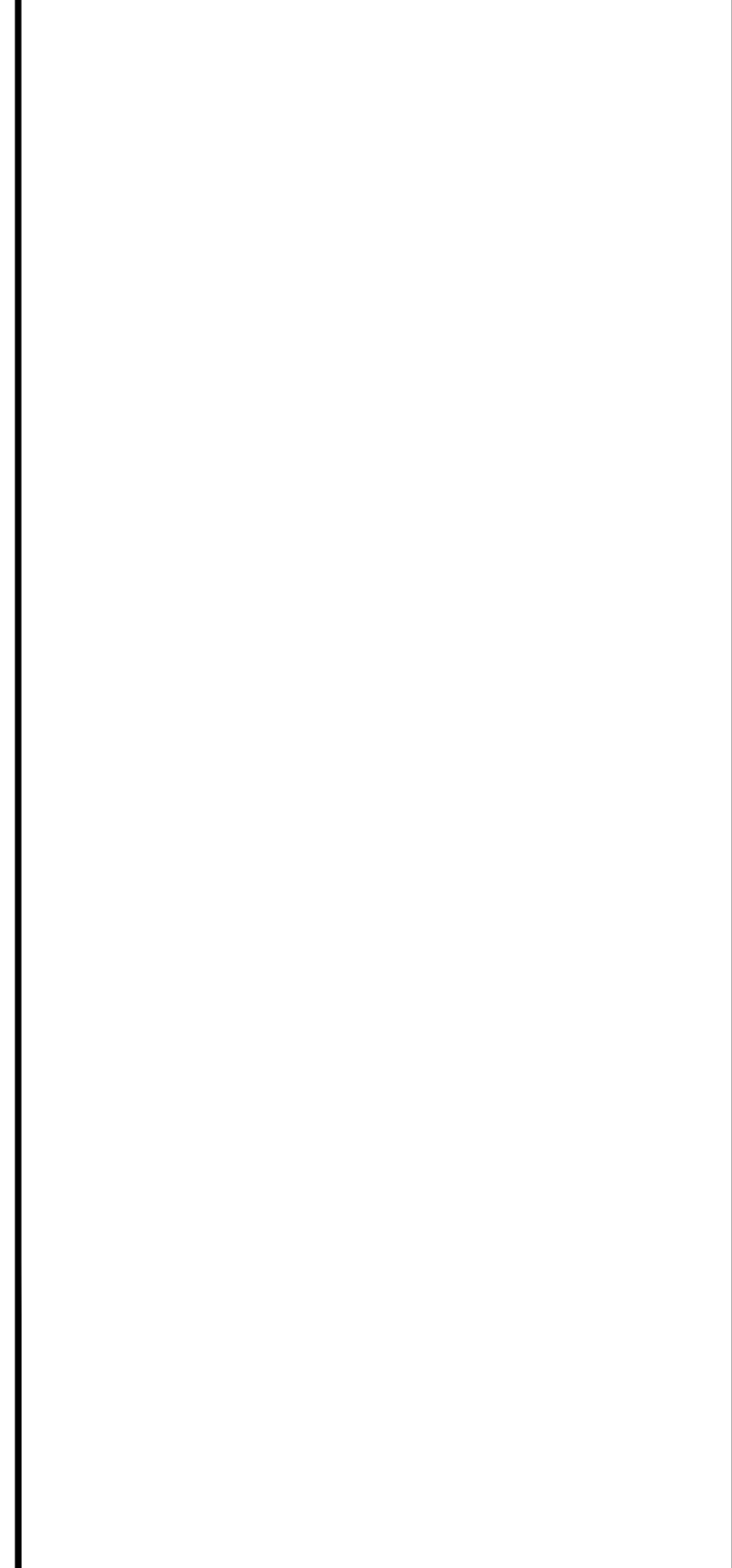
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 - ADDITIONAL SPACE FOR PEDESTRIAN REALM, AMENITIES AND STREET TREES
 - FRONTAGE ZONE
 - KINGSTON TRANSIT STOP
 - POTENTIAL FOR STREET TREES (EXACT LOCATIONS TO BE DETERMINED THROUGH DETAILED DESIGN)
 - <2M WIDE PEDESTRIAN THROUGHWAY
 - REQUIRED SPACE FOR 2M SIDEWALK AND 0.5M FRONTAGE



PRINCESS STREET



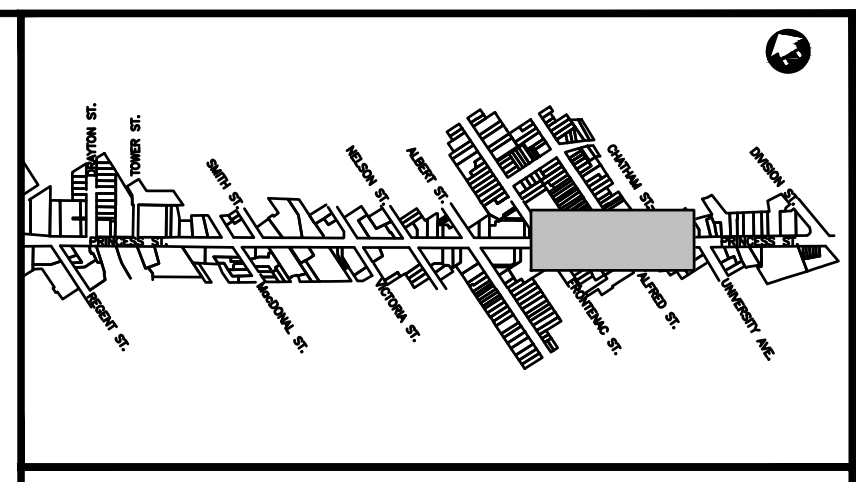
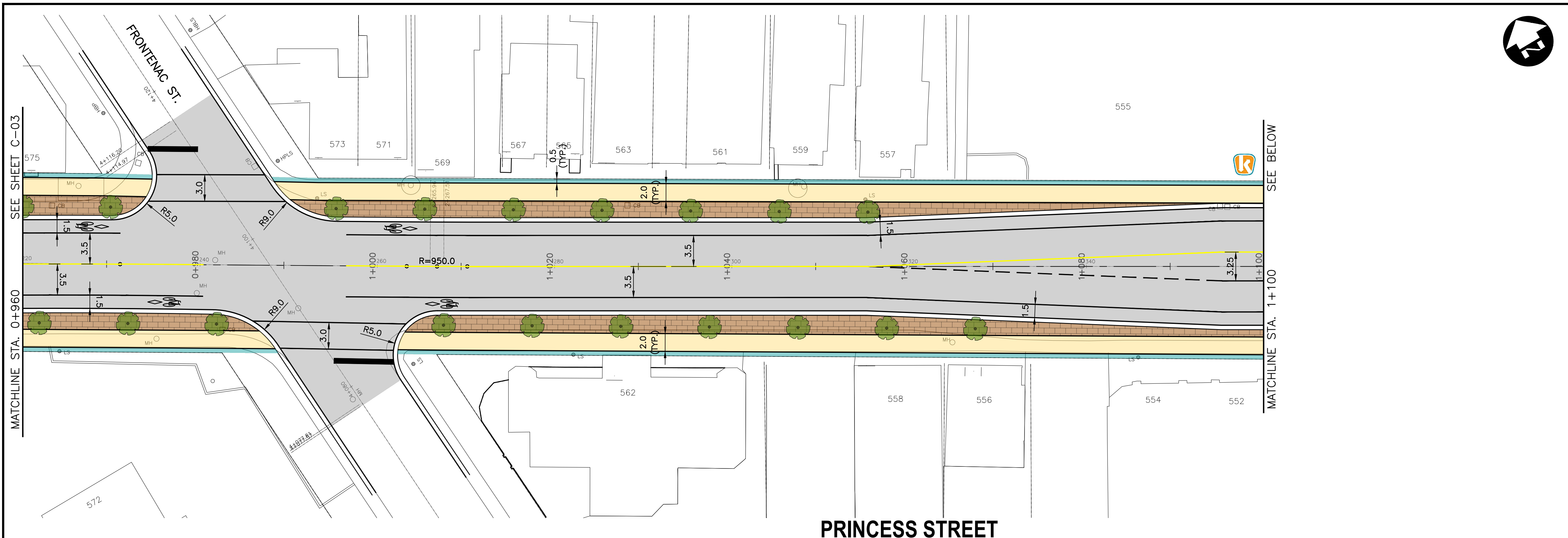
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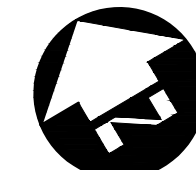
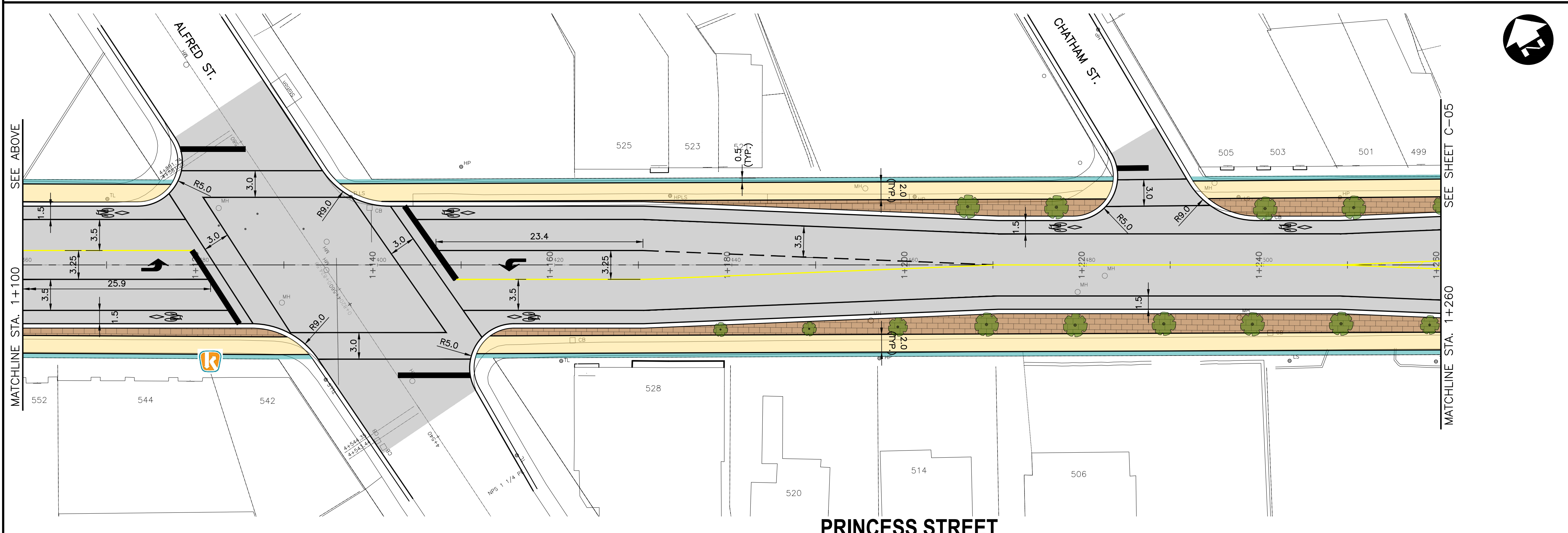
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ALTERNATIVE 5 ON-STREET CYCLE LANES WITH TRANSIT PRIORITY FEATURES		SHEET NO. C-03



- LEGEND:**
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 - ADDITIONAL SPACE FOR PEDESTRIAN REALM, AMENITIES AND STREET TREES
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 - K KINGSTON TRANSIT STOP
 - POTENTIAL FOR STREET TREES (EXACT LOCATIONS TO BE DETERMINED THROUGH DETAILED DESIGN)
 - <2M WIDE PEDESTRIAN THROUGHWAY
 - REQUIRED SPACE FOR 2M SIDEWALK AND 0.5M FRONTAGE

PRINCESS STREET



PRINCESS STREET

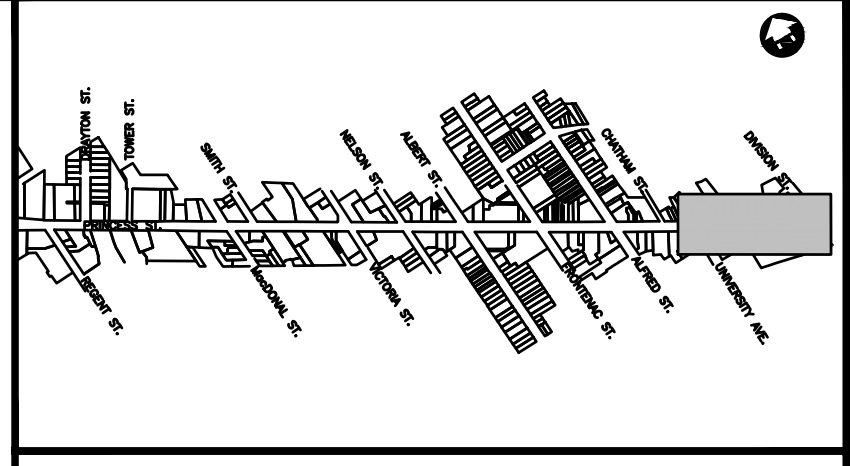
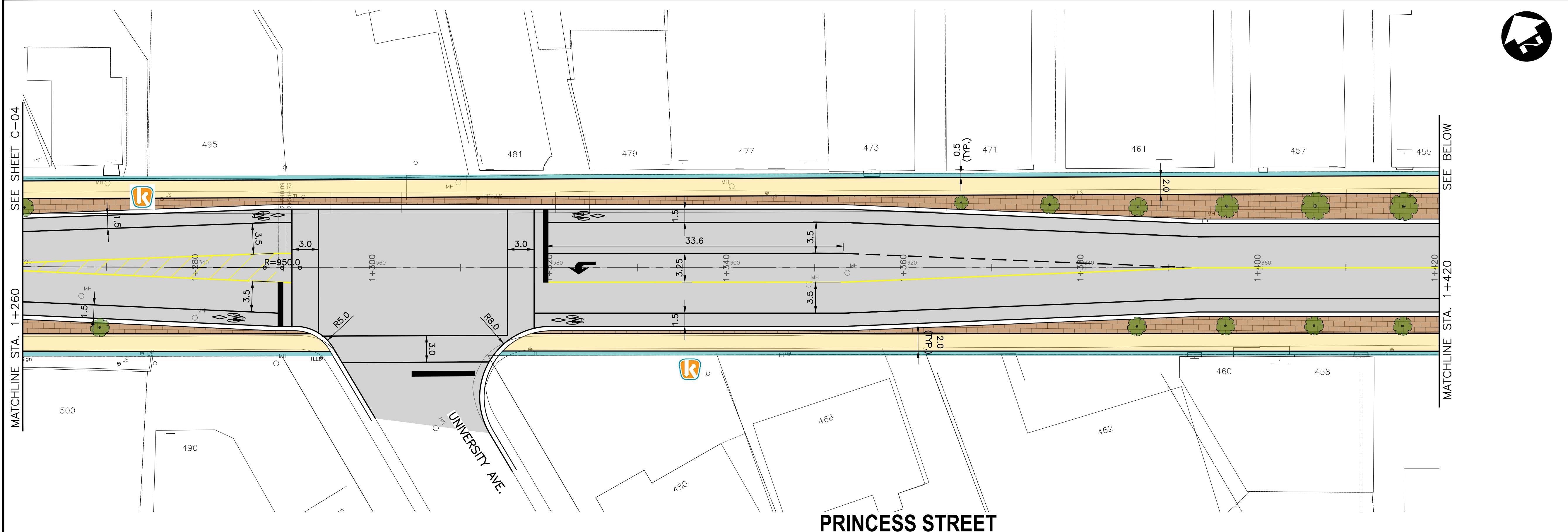
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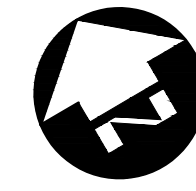
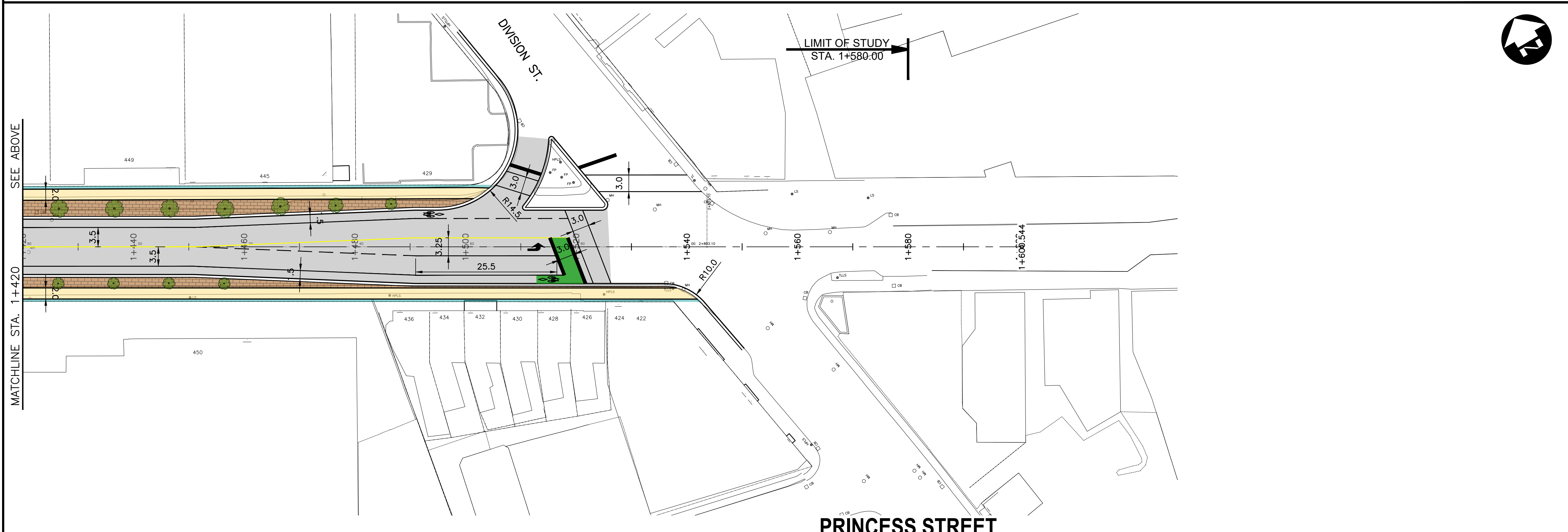


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ALTERNATIVE 5 ON-STREET CYCLE LANES WITH TRANSIT PRIORITY FEATURES		SHEET NO. C-04



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 - ADDITIONAL SPACE FOR PEDESTRIAN REALM, AMENITIES AND STREET TREES
 - FRONTAGE ZONE
 - K KINGSTON TRANSIT STOP
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 - REQUIRED SPACE FOR 2M SIDEWALK AND 0.5M FRONTAGE



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ALTERNATIVE 5 ON-STREET CYCLE LANES WITH TRANSIT PRIORITY FEATURES		SHEET NO. C-05



Williamsville Transportation Study Alternative Design Memo

To: Henk Brilliams, City of Kingston
From: Maria King, P.Eng.
cc: Ian Semple, Mark Dickson
Date: April 18, 2024 (Updated April 30, 2024)
Subject: Rationale and Outcomes of Review of Additional Alternatives
Our File: 23-6663

1.0 Introduction

The following technical memo provides the rationale for examining a third alternative design for Princess Street in more detail. It also explores the details of this new alternative, including design elements, design challenges and opportunities, and anticipated operational changes relative to the previously considered design alternatives.

2.0 Rationale for Introducing a New Alternative

There is an increasing need to reduce private automobile dependence within Williamsville as traffic congestion associated with redevelopment intensifies within the area. Reducing auto dependence will require reconfiguration of the limited Princess Street right-of-way to prioritize sustainable modes. This need to revise the Princess Street cross-section is the focus of the Williamsville Transportation Study.

The initial shortlisted designs presented in February 2024 aimed to optimize pedestrian and transit operations. Transit was prioritized due to its high carrying capacity; each standard transit vehicle can theoretically remove up to 50 private autos from the road when at capacity. This could theoretically result in up to 1,200 vehicles being removed from the network per hour when the City moves towards planned 5-minute headways on Express Routes¹.

In February 2024, one of the initially short-listed design alternatives for Princess Street included both vehicular lane improvements to optimize transit operations and on-street cycling lanes. The feasibility of this alternative was dependent on the City's ability to acquire additional property at intersections along the corridor. Additional property is required to both provide transit priority

¹ Number is based on 12 vehicles per hour per direction, each carrying 50 passengers. Headway refers to the anticipated time lapse between buses arriving at a particular stop.

and adequate space for cycling facilities. Adequate property at intersections is unlikely to be acquired and there are continuing concerns that the on-road, unbuffered cycling lanes may create safety issues with parked/stopped vehicles. Given these concerns it was determined that the alternative that both prioritizes transit and provides space for cycling was deemed infeasible.

Feedback from two open house events has made it clear that there is substantial public demand to provide cycling facilities on Princess Street. As a result, the decision was made to investigate a new alternative that prioritizes cycling and pedestrians as much as possible while maintaining reasonable transit operations. Providing cycle facilities within the available right-of-way will necessitate the removal of some left-turn lanes, which is anticipated to result in longer transit delays than predicted under the two initial design alternatives where all existing left turn lanes were maintained. Increased transit delay may impact ridership potential and the City's ability to increase service to a 5-minute headway in the future.

A strategy that maximizes cycling uptake will be essential to achieve modal shift targets in a scenario where transit is deprioritized to a certain extent. This strategy should include the installation of "All Ages and Abilities" (AAA) cycle track on Princess Street paired with the previously identified cycling and green streets improvements within Williamsville. Strong cycling connections to the east and west of the study area will also be required to reduce the number of personal vehicles travelling along Princess Street.

The following technical memo:

- Presents the proposed "cycling forward" design (Alternative 2 from the 2023 *Princess Street Cross-Section Study*),
- Explores the design and operational and opportunities and challenges of this new alternative, and
- Identifies additional consideration to be explored as portions of Princess Street proceed towards implementation.

3.0 Overview of Design Alternative 2b: Cycle Tracks with Fewer Turn Lanes

Alternative 2b prioritizes pedestrian and cycling facilities. It includes 1.8 m wide cycle tracks on both sides of Princess Street accompanied by sidewalks and curb ramps that are compliant with the Accessibility for Ontarians with Disabilities Act (AODA). Additional details on the proposed cross-section design are provided in **Section 3.1**. Functional design drawings are included in **Appendix A**.

Alternative 2b differs from the cycle track alternative that was considered earlier in the Williamsville Transportation Study in that it removes a few of the existing left turn lanes to make space for the desired All-Ages-and-Abilities (AAA) cycling facilities. Left turn lanes were maintained where they have the most significant impact on transit travel times. These include the intersections of Bath Road, MacDonnell Street, Alfred Street, University Avenue, and Division Street. A single westbound queue jump lane has been recommended at the intersection of Albert Street. Signalization and addition of a westbound queue jump lane at Drayton Street, which was recommended in the *Princess Street Cross-Section Study*, has been removed due to a lack of available property and significant constraints for traffic light placement.

Property acquisition and/or easement agreements will be required at locations where left turn lanes and queue jumps are recommended to accommodate the desired infrastructure. We have assumed that the required property acquisition and/or easements can be successfully negotiated for the purposes of this memo. If the City is unable to negotiate additional property then additional left turn lanes will need to be removed from the design. This will further degrade transit travel times.

The width of the cycle track and sidewalks were reduced in some cases to accommodate left turn or queue jump lanes. In these areas cycle tracks and/or sidewalks were reduced to 1.5m widths following minimums set out by the AODA and OTM Book 18. Any space left over in the right-of-way was used as boulevard space to fit streetscaping elements such as planters, benches, or street trees. Additionally, the current functional design drawings do not assume locations for electrical elements such as traffic lights or street lighting which may further reduce the width of available pedestrian and cycling elements in some locations.

3.1 Typical Cross-Section

Figure 1 illustrates the proposed typical cross-section for Princess Street between Bath Road and Division Street, which will include:

- 3.3 m vehicular lanes, one in each direction;
- 1.8 m (1.5 m in constrained sections) partially elevated unidirectional cycle tracks on both sides;
- 0.5 m minimum furnishing zone behind the curb to accommodate signs and streetlights;
- 1.8 – 2.0 m (1.5 m in constrained sections) sidewalks on both sides; and
- 0.5 m frontage zone, where feasible, along the property line to enable adjacent doorways to swing open without impacting pedestrian flow on the sidewalk.

It should be noted that this alternative includes very limited space for installation of street furnishings (including street trees, benches, and bike parking) west of Alfred Street.

Figure 1: Proposed Typical Cross-Section for Princess Street



The design currently considers that the cycle track will be constructed a minimum of 0.15 m higher than the adjacent vehicular lanes and 0.15 m lower than the adjacent sidewalk. The cycle tracks will be physically separated from the vehicle lanes by a 0.6 m wide mountable curb and gutter except at intersections.

Installing the cycle track behind a mountable curb, rather than a full height barrier curb, will deter vehicles from entering the cycling lane yet provide space for vehicles to pull over and allow emergency vehicles to pass. A barrier curb will be constructed between the sidewalk and cycle track to maintain physical separation between pedestrians and cyclists. The cycle track will be raised to sidewalk level at transit stops for pedestrian accessibility and improved cyclist safety.

Figure 22 illustrates similar treatments. The relative heights of the cycle track and sidewalk can be revisited during detailed design.

Figure 2: Cycle Track Treatments



Cycle track raised to sidewalk height at transit stop, Toronto, Ontario
(Source: Google Maps)
Cycle Track Separated by



Mountable Curb, East Gwillimbury, Ontario
(Source: OTM Book 18 *Cycling Facilities*)
Raised cycle track on Bloor



Street West at Kipling Avenue, Toronto, Ontario
(Source: Google Map)

3.2 Intersection Treatments

The segment of Princess Street between Bath Road and Division Street currently includes seven signalized intersections, all of which have dedicated left turn lanes. The following intersections are expected to retain left turn lanes: Bath Road, MacDonnell Street, Alfred Street, University Avenue, and Division Street. Dedicated left turn lanes will be removed from Victoria Street and Albert Street. A westbound queue jump lane will be installed at Albert Street in lieu of the existing left turn lane. Traffic control signals will neither be added nor removed in this alternative.

Widths of both the sidewalks and cycle tracks will be reduced to 1.5 m at each signalized intersection due to significant property constraints. These widths meet AODA requirements and Ontario Traffic Manual Book 18 *Cycling Facilities* (June 2021) recommendations. Several intersections currently have pedestrian facilities constructed on private property to provide both AODA-compliant curb ramps and sidewalks. It has been assumed that this will continue to be the case at several locations along the corridor. These locations are noted in the functional design drawings included in **Appendix A**.

Cycle tracks will be dropped to the same level as vehicle lanes through intersections. Bold green pavement markings will be used to identify the presence of cycle lanes through intersections and across driveways. Right-of-way space constraints will preclude provision of protected intersections; however in-lane two stage bike turning boxes (illustrated in **Figure 3**) will be

installed where space permits. It is not anticipated that bike turning boxes can be feasibly installed at University Avenue and Albert Street due to property and visibility constraints. These intersections should include bike boxes on Princess Street to allow left turning cyclists to be prioritized at intersections.

Figure 3: In-Lane Two-Stage Bike Turn Box



Source: oaksandspokes.com

4.0 Assessment of Design Related Opportunities and Impacts

Alternative 2b presents some unique design opportunities and challenges relative to the two alternatives that were previously investigated as part of the Williamsville Study. This section provides a high-level comparison of the three shortlisted alternatives which is summarized in **Table 1**. Note that operational differences are not identified, They are highlighted in **Section 5.0**.

4.1 Design/Maintenance Aspect Being Assessed - Property Impacts

Widest Pedestrian Realm, Transit Priority

Minor property required at select intersections.

2b - AODA-Compliant Sidewalks and Cycle Track

Property required at five intersections where a third lane is added to the cross-section to provide accessible crossings.

5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority

Property required at seven signalized intersections to provide accessible crossings.

4.2 Design/Maintenance Aspect Being Assessed - Accommodation of Pedestrians

Widest Pedestrian Realm, Transit Priority

Wide pedestrian spaces with significant space for street furniture. AODA-compliant crossings can be accommodated within the existing ROW at most intersections.

2b - AODA-Compliant Sidewalks and Cycle Track

AODA-compliant sidewalks can be provided mid-block within the existing right-of-way in all locations. Intersections with additional lanes will require property acquisition and/or easements to provide accessible crossings.

5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority

AODA-compliant sidewalks can be provided mid-block within the existing right-of-way in all locations. Intersections with additional lanes will require property acquisition and/or easements to provide accessible crossings.

4.3 Design/Maintenance Aspect Being Assessed - Accommodation of Cyclists

Widest Pedestrian Realm, Transit Priority

Cyclists accommodated in lanes shared with vehicles.

2b - AODA-Compliant Sidewalks and Cycle Track

Cyclists accommodated in dedicated space with physical separation from vehicles and pedestrians.

5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority

Cyclists accommodated in dedicated space. No physical separation from vehicles.

4.4 **Design/Maintenance Aspect Being Assessed - Accommodation of Transit System**

Widest Pedestrian Realm, Transit Priority

Westbound queue jump lane provided at Albert Street. All signalized intersections include left turn lanes, reducing transit vehicle delay.

2b - AODA-Compliant Sidewalks and Cycle Track

Westbound queue jump lane provided at Albert Street. Two left turn lanes removed from signalized intersections, will result in increased transit delay relative to alternatives 1 and 5.

5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority

Westbound queue jump lane provided at Albert Street. All signalized intersections include left turn lanes, reducing transit vehicle delay.

4.5 **Design/Maintenance Aspect Being Assessed - Accommodation of private Automobiles**

Widest Pedestrian Realm, Transit Priority

All signalized intersections, with exception of Albert Street, will include left turn lanes, reducing travel delay.

2b - AODA-Compliant Sidewalks and Cycle Track

Left turn lanes removed from two signalized intersections. Will impact travel times.

5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority

All signalized intersections, with exception of Albert Street, will include left turn lanes, reducing travel delay.

4.6 **Design/Maintenance Aspect Being Assessed - Design And Maintenance Of Sub-Surface Utilities**

Widest Pedestrian Realm, Transit Priority

Installation of trees within the boulevard would reduce portions of the right-of-way where utilities can be accommodated. Where trees are not planted, this option provides width where utilities can be installed and maintained without impacting pedestrians, cyclists, or vehicles.

2b - AODA-Compliant Sidewalks and Cycle Track

Majority of right-of-way is used to provide pedestrian, cyclist, and vehicle facilities. Utilities will need to be installed underneath. Maintenance operations, though infrequent, will necessitate the closure of one or more sidewalk, cycle track and/or vehicle lane.

5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority

Majority of right-of-way is used to provide pedestrian, cyclist, and vehicle facilities. Utilities will need to be installed underneath. Maintenance operations, though infrequent, will necessitate the closure of one or more sidewalk, cycle track and/or vehicle lane.

4.7 Design/Maintenance Aspect Being Assessed - Ability to Include Street Furnishings

Widest Pedestrian Realm, Transit Priority

Street furnishings can be provided throughout the corridor.

2b - AODA-Compliant Sidewalks and Cycle Track

Limited west of Alfred Street.

5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority

Limited west of Alfred Street.

4.8 Design/Maintenance Aspect Being Assessed - Emergency Vehicle Access

Widest Pedestrian Realm, Transit Priority

Limited curb-to-curb width would negatively impact emergency vehicle ability to navigate between vehicles, particularly during high traffic periods.

2b - AODA-Compliant Sidewalks and Cycle Track

Vehicles could pull onto the cycle track to allow emergency vehicles to pass.

5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority

Vehicles could pull into the cycle lane to allow emergency vehicles to pass.

Design/Maintenance Aspect Being Assessed - Winter Maintenance

Widest Pedestrian Realm, Transit Priority

Simplified winter maintenance relative to the other alternatives. Single passes for each of road and sidewalk. Adequate boulevard space for snow storage.

2b - AODA-Compliant Sidewalks and Cycle Track

Separate passes would be required for each of the roadway, sidewalk, and cycle track. Snow would need to be collected from the right-of-way west of Alfred Street due to lack of boulevards space.

5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority

Separate passes would be required for each of the roadway, sidewalk, and cycle lane. Snow would need to be collected from the right-of-way west of Alfred Street due to lack of boulevards space.

Table 1: Comparison of Design Alternatives

Design/Maintenance Aspect Being Assessed	1 - Widest Pedestrian Realm, Transit Priority	2b - AODA-Compliant Sidewalks and Cycle Track	5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority
Property Impacts	Minor property required at select intersections.	Property required at five intersections where a third lane is added to the cross-section to provide accessible crossings.	Property required at seven signalized intersections to provide accessible crossings.
Accommodation of pedestrians	Wide pedestrian spaces with significant space for street furniture. AODA-compliant crossings can be accommodated within the existing ROW at most intersections.	AODA-compliant sidewalks can be provided mid-block within the existing right-of-way in all locations. Intersections with additional lanes will require property acquisition and/or easements to provide accessible crossings.	AODA-compliant sidewalks can be provided mid-block within the existing right-of-way in all locations. Intersections with additional lanes will require property acquisition and/or easements to provide accessible crossings.
Accommodation of cyclists	Cyclists accommodated in lanes shared with vehicles.	Cyclists accommodated in dedicated space with physical separation from vehicles and pedestrians.	Cyclists accommodated in dedicated space. No physical separation from vehicles.
Accommodation of transit vehicles	Westbound queue jump lane provided at Albert Street. All signalized	Westbound queue jump lane provided at Albert Street. Two left turn	Westbound queue jump lane provided at Albert Street. All signalized

Design/Maintenance Aspect Being Assessed	1 - Widest Pedestrian Realm, Transit Priority	2b - AODA-Compliant Sidewalks and Cycle Track	5 - AODA-Compliant Sidewalks, Cycle Lanes, Transit Priority
	intersections include left turn lanes, reducing transit vehicle delay.	lanes removed from signalized intersections, will result in increased transit delay relative to alternatives 1 and 5.	intersections include left turn lanes, reducing transit vehicle delay.
Accommodation of private automobiles	All signalized intersections, with exception of Albert Street, will include left turn lanes, reducing travel delay.	Left turn lanes removed from two signalized intersections. Will impact travel times.	All signalized intersections, with exception of Albert Street, will include left turn lanes, reducing travel delay.
Design and maintenance of sub-surface utilities	Installation of trees within the boulevard would reduce portions of the right-of-way where utilities can be accommodated. Where trees are not planted, this option provides width where utilities can be installed and maintained without impacting pedestrians, cyclists, or vehicles.	Majority of right-of-way is used to provide pedestrian, cyclist, and vehicle facilities. Utilities will need to be installed underneath. Maintenance operations, though infrequent, will necessitate the closure of one or more sidewalk, cycle track and/or vehicle lane.	Majority of right-of-way is used to provide pedestrian, cyclist, and vehicle facilities. Utilities will need to be installed underneath. Maintenance operations, though infrequent, will necessitate the closure of one or more sidewalk, cycle track and/or vehicle lane.
Ability to Include Street Furnishings	Street furnishings can be provided throughout the corridor.	Limited west of Alfred Street.	Limited west of Alfred Street.
Emergency Vehicle Access	Limited curb-to-curb width would negatively impact emergency vehicle ability to navigate between vehicles, particularly during high traffic periods.	Vehicles could pull onto the cycle track to allow emergency vehicles to pass.	Vehicles could pull into the cycle lane to allow emergency vehicles to pass.
Winter Maintenance	Simplified winter maintenance relative to the other alternatives. Single passes for each of road and sidewalk. Adequate boulevard space for snow storage.	Separate passes would be required for each of the roadway, sidewalk, and cycle track. Snow would need to be collected from the right-of-way west of Alfred Street due to lack of boulevard space.	Separate passes would be required for each of the roadway, sidewalk, and cycle lane. Snow would need to be collected from the right-of-way west of Alfred Street due to lack of boulevard space.

5.0

Overview of Operations Associated with Design Alternative 2b

5.1

Alternative Operational Scenarios

As discussed in **Section 2.0**, the previously shortlisted alternatives were selected assuming availability of additional property at intersections and the preference of prioritizing transit and pedestrian mobility. By maintaining the existing intersection configurations, it was believed that those alternatives would have the fewest impacts on traffic operations and transit and vehicle travel times. Left turn lanes also allow left-turning vehicles to turn without backing up vehicle traffic or being stopped by transit vehicles.

As noted previously, based on public input, design of the right-of-way was re-evaluated to prioritize cycling infrastructure. As a result, previously proposed transit improvements such as transit queue jump lanes were reconsidered and only maintained if cycling lanes could also be accommodated. Left turn lanes were handled similarly where they were only maintained and considered in locations where cycling infrastructure could also be provided. Alternative 2b includes fewer left turn lanes throughout the corridor and one potential location for a queue jump lane.

To quantify the potential impacts to the corridor, a total of 7 scenarios were modelled for an alternative which includes cycle track using traffic microsimulation software:

1. Existing (Base) Conditions modelled using existing 2024 conditions,
2. All previously recommended Queue Jump Lanes and Left Turn Lanes,
3. No Left Turn Lanes and No Queue Jump Lanes,
4. Queue Jump Lane at Albert Street,
5. Queue Jump Lane at Albert Street & Left Turn Lane at MacDonnell Street,
6. Queue Jump Lane at Albert Street & Left Turn Lane at University Avenue, and
7. Queue Jump Lane at Albert Street & Left Turn Lanes at MacDonnell Street, University Avenue and Alfred Street.

The traffic microsimulation models were used to determine where left turn lanes would yield the greatest benefit to transit and vehicle travel times based on where left turn lanes can be physically accommodated. It is expected that some left turn lanes will be removed as a result of prioritizing cycling infrastructure. The models were analyzed to determine the capacity of the corridor in each scenario which dictates how many vehicles are expected to be processed by Princess Street in the peak periods. The scenarios were evaluated on a combination of the travel time results and the capacity of the corridor.

Private and emergency vehicle operations may also be impacted due to the narrower overall width of the roadway and less turning maneuver space. Curb radii were maintained where possible to mitigate the impact to heavy vehicles such as snowplows, maintenance vehicles, and emergency vehicles.

5.2 Traffic Operational Impacts

Traffic operations were assessed using the PTV Vissim microsimulation software, which is the industry-leading transportation microsimulation platform. Microsimulation was used to model vehicles, buses, pedestrians, and cyclists in a mixed environment.

The model was calibrated to match observed traffic volumes and travel times, and then updated to reflect the anticipated 2036 horizon future traffic demands, bus headways, bus dwell times, and lane geometry and traffic control for each scenario. The updates to traffic demands included forecasting future traffic demands due to new development in Williamsville as well as general growth throughout Kingston, in consideration of the anticipated reduction to the City-wide auto mode share. Bus headways through the study area were also updated to reflect planned 5-minute express route headways, as opposed to the existing 10-minute headways.

Travel times and the number of vehicles processed were compared for each scenario. Travel time measurements were collected for both eastbound and westbound directions between Bath Road/Concession Street and Division Street. The analysis focused on the weekday PM peak hour since this is typically the critical time period due to the combination of commuter and commercial activity.

5.3 Impact to Auto Drivers

Table 2 below shows the number of vehicles processed through the study area, the number of vehicles actively being processed through the study area, and number of vehicles unable to enter the study area.

The results were as expected: maintaining as many left turn lanes and queue jump lanes as possible was shown to positively impact the capacity of the corridor. Scenario 1, which was previously recommended, had the second highest capacity and the second highest number of processed vehicles.

Scenario 2, which has no left turn lanes and no queue jump lanes, performed poorly with over 1,000 vehicles unable to enter the study area, and over 3,000 vehicles left in the study area when the model run terminates (higher than other scenarios).

Scenario 6 operated well and processed the majority of vehicles through the study area. Approximately 190 vehicles were not processed through the study area and would likely choose

to travel a different route or travel slightly earlier or later during the peak period. The vehicles not processed by this scenario amounts to 3 vehicles per minute, which can likely be accommodated by other routes without significant impacts.

The following notes are made regarding the headings for the table:

- ‘Vehicles processed through the study area’ refers to vehicles that have entered and then exited the microsimulation model, which was a section of Princess Street between Division Street and Concession Street, including side streets.
- ‘Vehicles actively progressing through the study area’ refers to the number of vehicles on the road network within the study area at the end of the microsimulation model run, i.e. precisely at 5:30 PM. Lower numbers indicate that more vehicles have successfully entered and existed the study area during the modelled time period; and,
- ‘Vehicles unable to enter the study area’ refers to the number of vehicles not able to enter the microsimulation model. Vehicles unable to enter the study area would be queued on roads outside of the study area.
- Modelled Auto Travel Time EB (WB) provides the predicted average time for vehicles travelling between Bath Road and Division Street. EB refers to eastbound trips, while WB refers to westbound trips. Time is identified in seconds.
- Auto Travel Time Standard Deviation EB (WB) is used to identify the level of certainty associated with the predicted average travel time. A lower number indicates less variability in travel time, which is particularly important for transit operations. EB refers to eastbound trips, while WB refers to westbound trips. Time is identified in seconds.

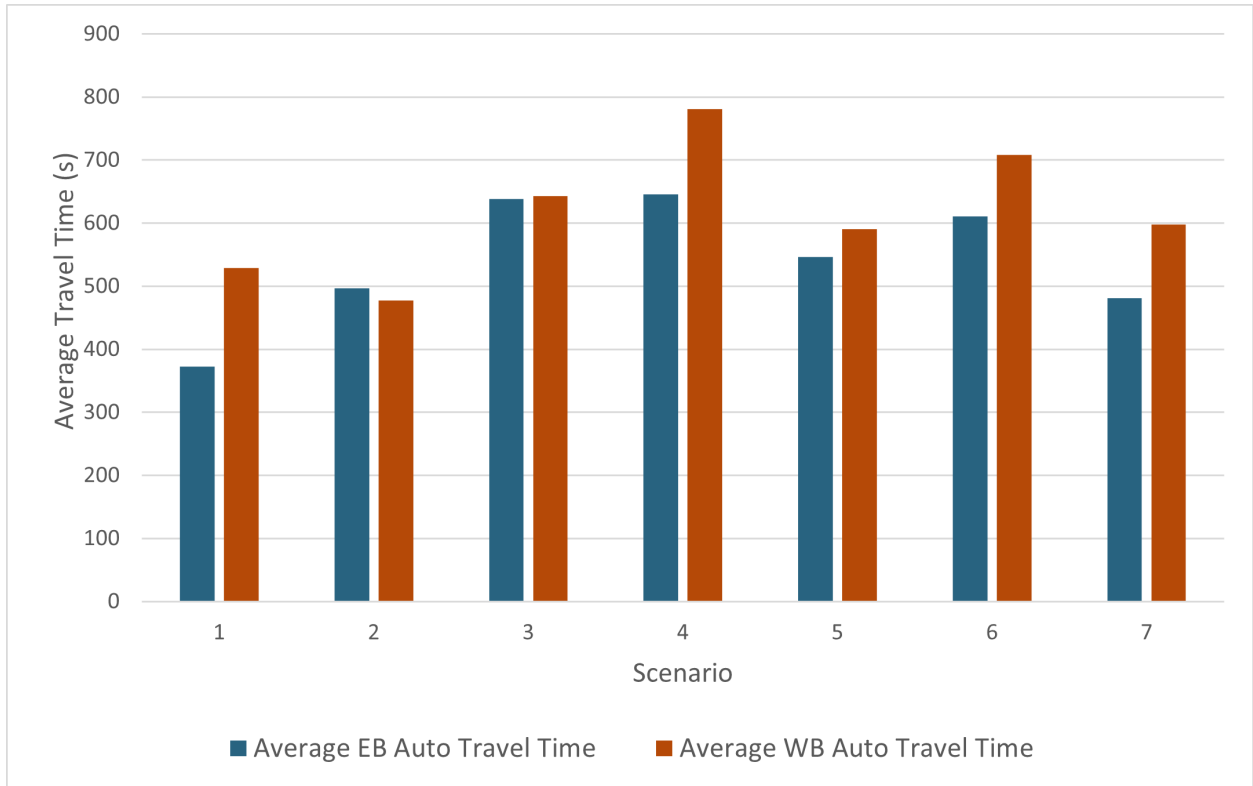
Table 2: Auto Vehicles Processed and Travel Time Per Scenario

Scenario	Vehicles Processed Through the Study Area	Vehicles Actively Progressing Through the Study Area	Vehicles Unable to Enter the Study Area	Modelled Auto Travel Time EB (WB) [in seconds]	Auto Travel Time Standard Deviation EB (WB) [in seconds]
1 Base	14,500	2,057	85	373 (529)	63 (133)
2 (Previously Recommended Queue Jump Lanes and Left Turn Lanes)	14,477	2,274	105	497 (477)	117 (154)
3 (No Left Turn Lanes and No	13,547	3,067	1,320	638 (642)	139 (180)

Scenario	Vehicles Processed Through the Study Area	Vehicles Actively Progressing Through the Study Area	Vehicles Unable to Enter the Study Area	Modelled Auto Travel Time EB (WB) [in seconds]	Auto Travel Time Standard Deviation EB (WB) [in seconds]
Queue Jump Lanes)					
4 (Queue Jump Lane at Albert)	14,118	2,742	645	646 (781)	137 (221)
5 (Queue Jump Lane at Albert & Left Turn Lane at MacDonnell)	14,399	2,459	164	547 (590)	136 (141)
6 (Queue Jump Lane at Albert & Left Turn Lane at University)	13,815	2,914	845	611 (708)	143 (194)
7 (Queue Jump Lane at Albert & Left Turn Lanes at MacDonnell, University, and Alfred)	14,357	2,464	188	481 (598)	128 (119)

As discussed in **Section 5.2**, the PM peak period was selected as the worst-case scenario to compare travel times between scenarios for both private vehicles and public transit. **Figure 4** illustrates the average corridor travel time between Bath Street and Division Street for base conditions and the six scenarios. This shows that Scenario 6 had the third lowest travel times, showing travel time increases of approximately 100 seconds (1 minute 40 seconds) in both directions compared to the base scenario. This increase is only slightly more than the travel time expected in Scenario 1 which reflects the outcomes associated with the modelling of design Alternative 1 (Wide Pedestrian Realm, No Cycling Lanes).

Figure 4: Average Corridor Travel Time – Auto



The queue lengths at each intersection were also monitored between the various scenarios. In every scenario it is expected that queues will extend to adjacent intersections in the weekday PM peak period with queues expected to extend onto Bath Road in some cases. The queue results are not discussed in detail since the impact of the queues is accounted for by the reporting of travel times.

5.4 Impact to Transit Operations

The removal of left turn lanes is expected to negatively impact transit vehicles as they may be stuck behind vehicles waiting to turn left. Transit queue jump lanes were previously proposed to improve the overall speed of transit in the corridor and support the future improvements to transit in the corridor.

Transit travel times are expected to increase by approximately 90 seconds in Scenario 6 (1 minute 30 seconds) in each direction compared to the base condition. Although transit vehicles were shown to get stuck behind left-turning vehicles, transit vehicles also created gaps in front of them after servicing a bus stop, which often allowed them to ‘make up’ for lost time.

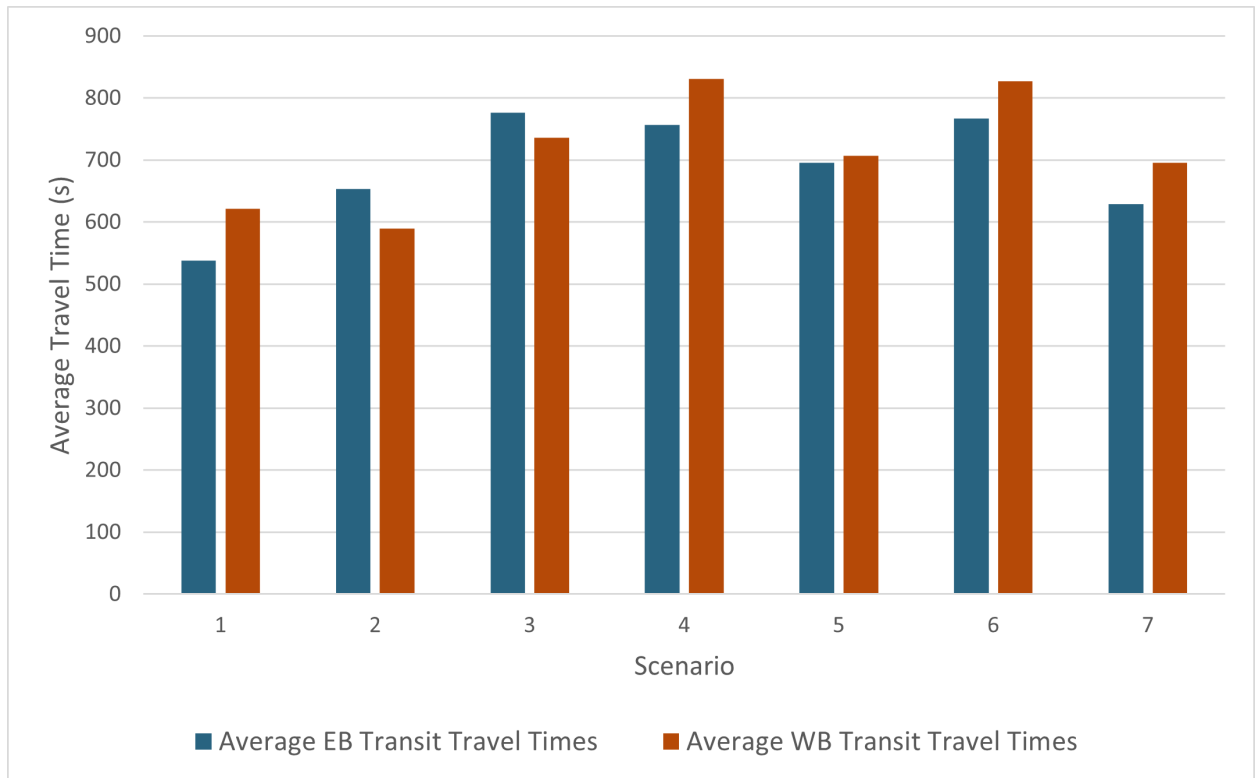
Table 3 summarizes the modelled transit travel time and standard deviation of those travel times. This shows that Scenario 7 has the third lowest travel time and standard deviation (Scenario 1 “Base” and 2 “Previously recommended”) have lower travel times and less deviation.

Table 3: Transit Vehicles Travel Time Per Scenario

Scenario	Modelled Transit Travel Time EB (WB) (seconds)	Modelled Transit Travel Time Standard Deviation EB (WB) (seconds)
1 Base	538 (621)	69 (131)
2 (Previously Recommended Queue Jump Lanes and Left Turn Lanes)	654 (590)	113 (145)
3 (No Left Turn Lanes and No Queue Jump Lanes)	776 (737)	125 (159)
4 (Queue Jump Lane at Albert)	757 (831)	126 (196)
5 (Queue Jump Lane at Albert & Left Turn Lane at MacDonnell)	695 (707)	136 (136)
6 (Queue Jump Lane at Albert & Left Turn Lane at University)	767 (827)	140 (182)
7 (Queue Jump Lane at Albert & Left Turn Lanes at MacDonnell, University, and Alfred)	628 (695)	114 (114)

Figure 5 illustrates the transit travel times for each scenario. As shown below, transit travel times were negatively impacted and it is recommended that the queue jump lane at Albert Street be implemented to help mitigate impacts to westbound transit travel times.

Figure 5: Average Corridor Travel Time – Transit



5.5 Summary of Outcomes

It is recommended that left turn lanes be maintained at Bath Road, University Street, MacDonnell Street, Alfred Street, and Division Street. Left turn lanes can be removed at Victoria Street and Albert Street without significantly impacting the capacity or travel time through the study area. It is also recommended that a westbound queue jump lane be provided at Albert Street to improve corridor traffic and transit operations.

Following these recommendations, the Princess Street corridor is anticipated to maintain most of its capacity although travel times are likely to increase by approximately 100 seconds for passenger vehicles and 90 seconds for buses, for both directions, during the weekday PM peak hour. There are also nearly 190 vehicles, or 3 vehicles per minute, which would likely choose to travel a different route or travel slightly earlier or later during the peak period. Potential mitigation measures are discussed in the next section, although these were not assessed as part of this analysis.

5.6

Potential Traffic Operations Mitigation Measures

This section discusses potential mitigation measures to address concerns about vehicular capacity and travel times. These mitigation measures have not been assessed and are for discussion only.

- 1. Prohibit problematic left turn movements** during the weekday PM peak hour. The turn prohibitions would result in a relatively small amount of traffic diverting to other routes during the peak hours.
- 2. Improve Traffic Operations on Alternate Corridors** such as Division Street, Concession Road, Brock Street, and Johnson Street, to provide alternate routes for vehicle traffic. If this is considered, it is important to minimize the impact of additional traffic on these other routes.
- 3. Review/Optimize transit stop locations** to reduce the impact of transit boarding/alighting activity on the corridor vehicle capacity. This could include the introduction of transit signal priority such as 'green extensions' or 'red truncations' which may result in more efficient flow for passenger vehicle and transit.
- 4. Maintain the existing bus headways at approximately 10 minutes** as opposed to reducing headways to 5 minutes as is planned by the 2036 horizon. This is undesirable since it would reduce the transit frequency; however, this would reduce the impact of bus boarding and alighting on corridor vehicle capacity.

6.0

Consideration for Future Work

The following sections provide a preliminary list of considerations for future phases of design of the Princess Street corridor. Most recommendations apply regardless of which Alternative is carried forward.

6.1

Recommended Technical Studies

The following additional technical studies should be completed prior to proceeding to later phases of the design process. It should be noted that the assessments provided as part of the Williamsville Transportation Study were completed in absence of this information. This may impact future decisions.

- Complete a detailed topographical survey of the study corridor, including completion of a Legal Survey to confirm property boundaries;
- Complete a Subsurface Utility Engineering investigation with Quality Level B reporting (use of geophysical methods to determine existence and approximate horizontal position of subsurface utilities);

- Undertake basement surveys of older adjacent properties to confirm that basements, coal chutes, etc. do not extend into the public right-of-way;
- Complete a geotechnical investigation of the corridor, including chemical testing to determine the presence of materials which may necessitate specialized off-site disposal;
- Using information collected through the above tasks, complete at least a preliminary (30%) design of the corridor to confirm the recommended future locations of property lines, easements, and utilities ahead of redevelopment of additional adjacent properties.

6.2 Connection to Adjacent Cycling Network

Building cycling ridership along the Princess Street corridor will require strong cycling connections to the east and west of the study limits, as well as the adjacent neighborhoods.

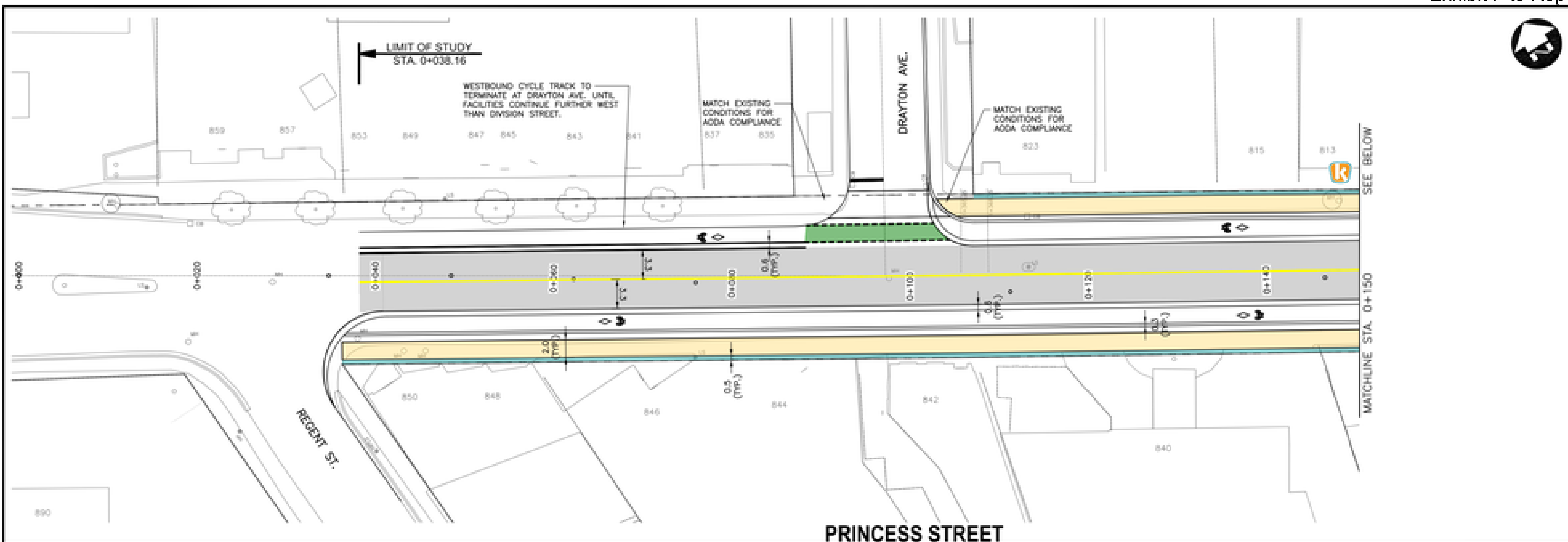
Consideration should be given to reducing the number of lanes on Princess Street at Bath Road/Concession Street to create space for physically separated cycling facilities through the intersection. West of the intersection, the existing north sidewalk could be converted to a multi-use pathway. Access to amenities on the south side of Princess Street could be provided via the various signalized intersections.

Consideration should also be given to continuing the cycle tracks east of Division Street to at least Barrie Street. This will avoid forcing cyclists to transition to shared lanes within the complex Division Street intersection. The width and proximity of Queen Street to the eastern portion of Princess Street may provide a suitable parallel route for riders traveling between Barrie Street and Ontario Street. Installation of cycle tracks should be considered for Queen Street if it is pursued as an alternative cycling route to Lower Princess Street.

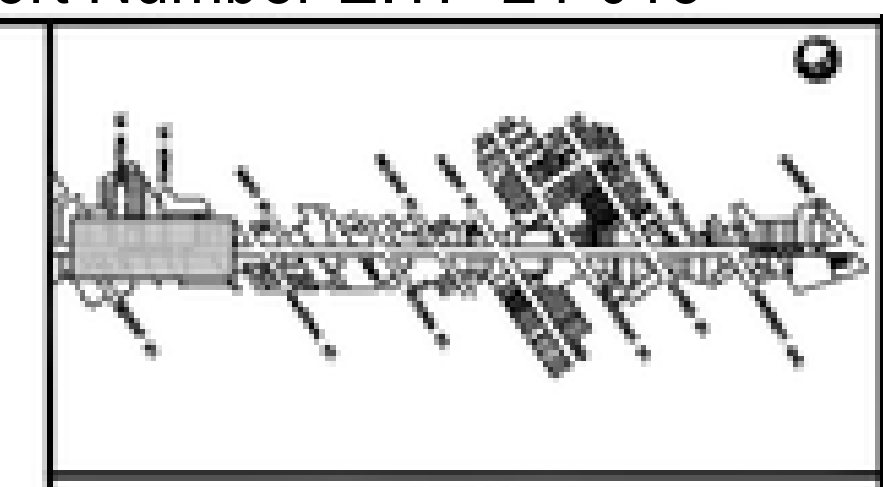
Implementation of green street concepts and neighborhood bikeways within Williamsville will also be critical to the success of the Princess Street cycle track. Implementation of the Alfred Street advisory bike lanes should be prioritized given the initial portion of cycle track would be constructed between Alfred Street and Division Street.

6.3 Monitoring Program

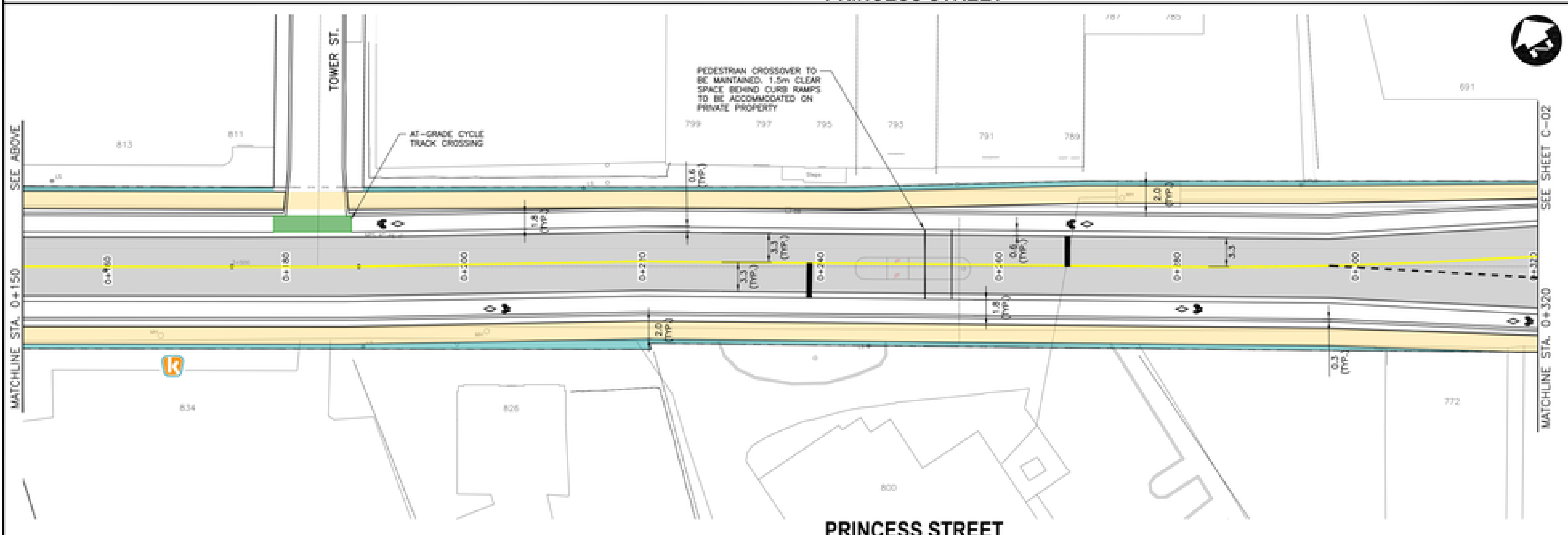
Traffic and collision volumes and patterns should be monitored along Princess Street and adjacent roadways as infrastructure and operational changes are made. The City should be prepared to modify signal timing, reprioritize projects, and adjust transit headways based on observed patterns. Predictive traffic modelling work has indicated that most vehicular traffic should remain on Princess Street following the proposed modifications. Modelling tools, however, are never completely accurate. City staff should also collect cycle track use data as the facility extends from east to west. This information can be used to inform decisions regarding the implementation of cycle tracks in other parts of the City.



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 - FRONTAGE ZONE
 - K KINGSTON TRANSIT STOP
 - POTENTIAL FOR GREENERY (EXACT LOCATIONS TO BE DETERMINED THROUGH DETAILED DESIGN)
 - EXISTING RIGHT-OF-WAY LIMITS
 - REQUIRED PROPERTY/EASEMENTS



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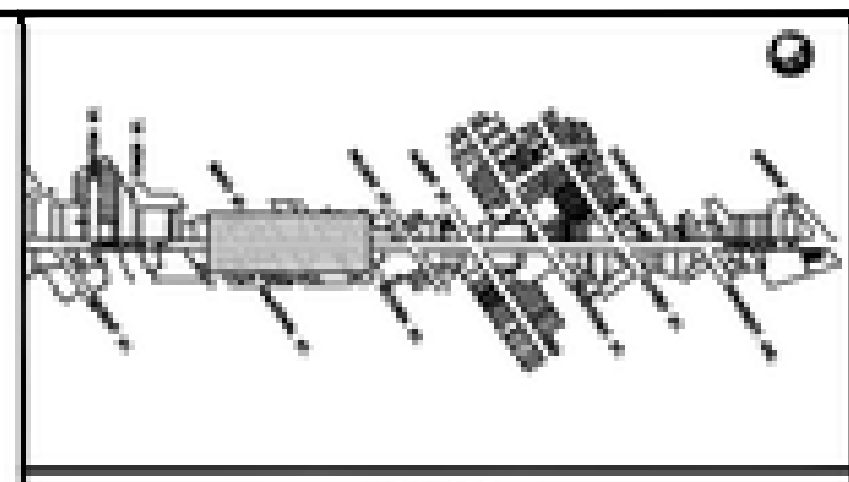
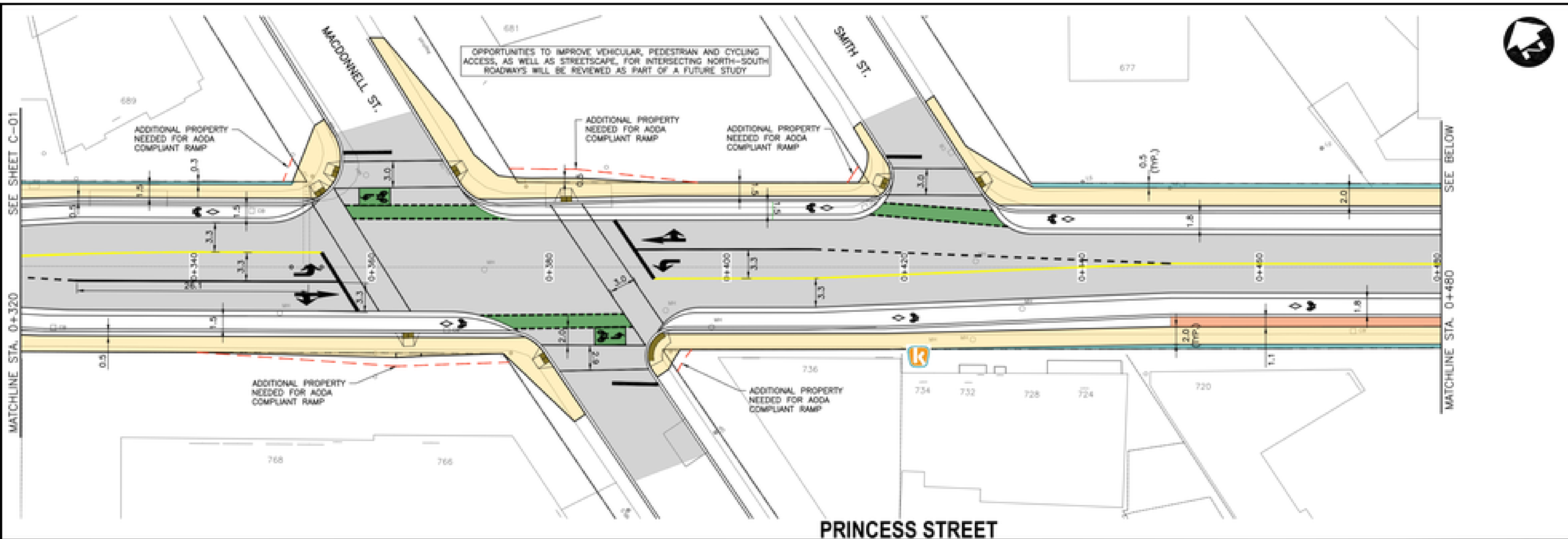
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CITY	City of Kingston
PROJECT NO.	22-3399
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City of Kingston

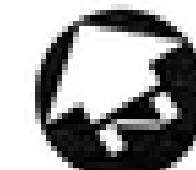
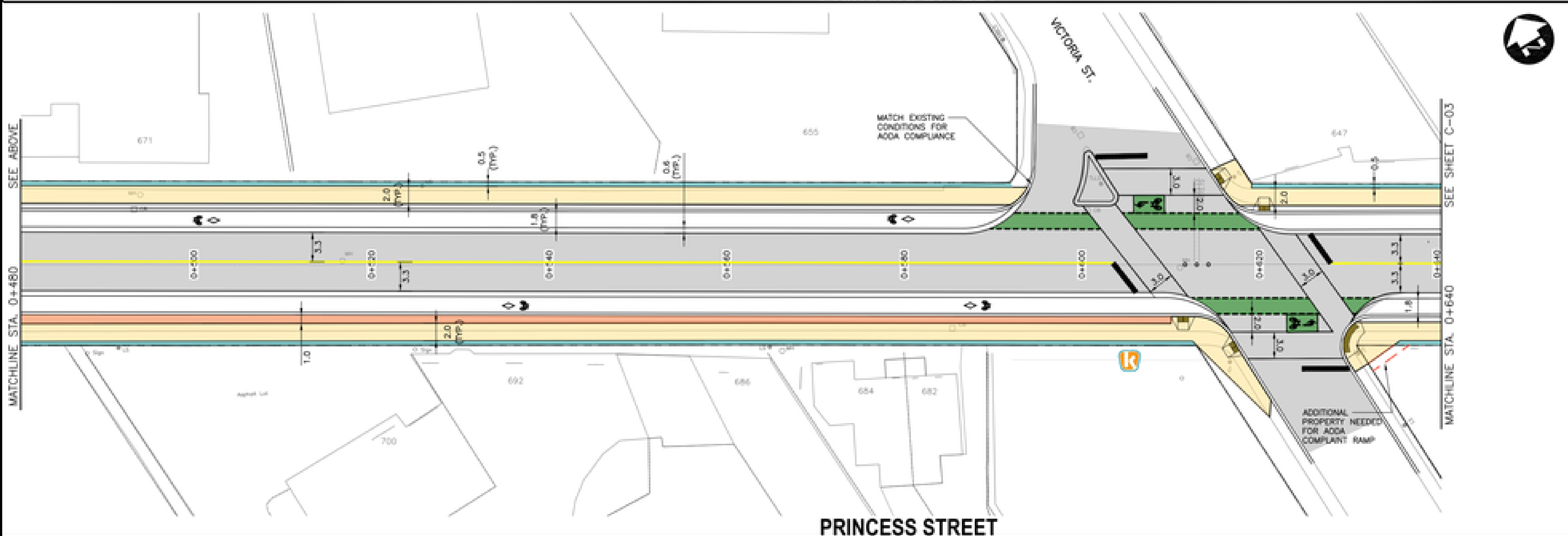
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WITH TRANSIT PRIORITY**

C-01

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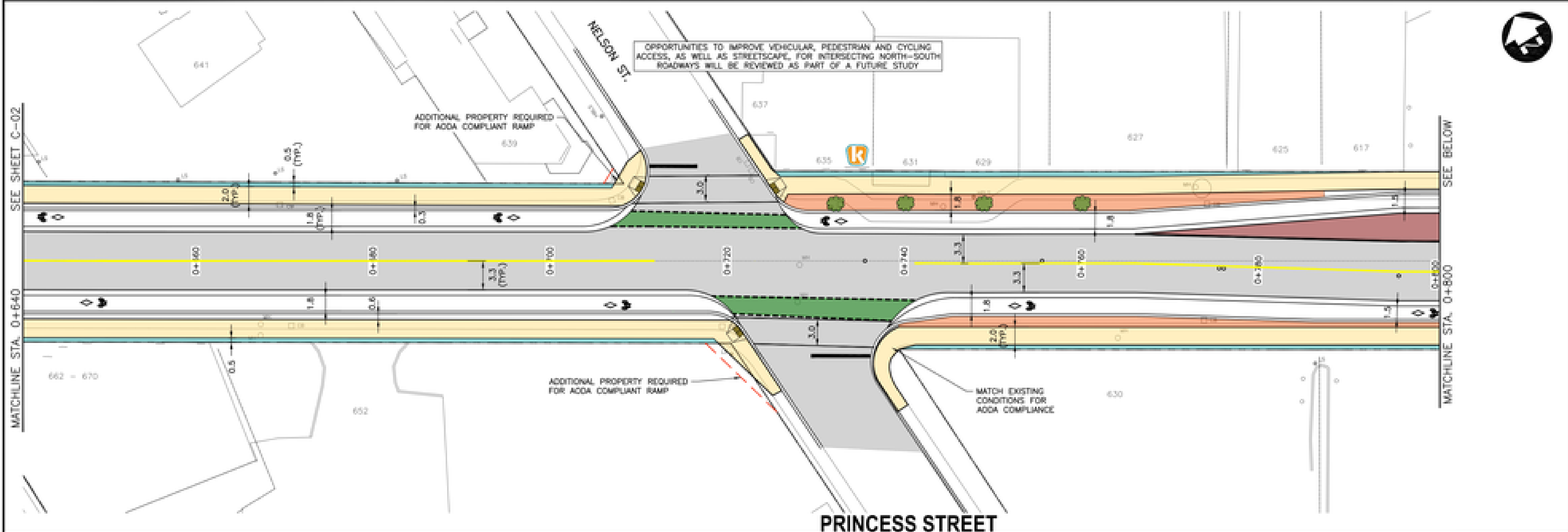
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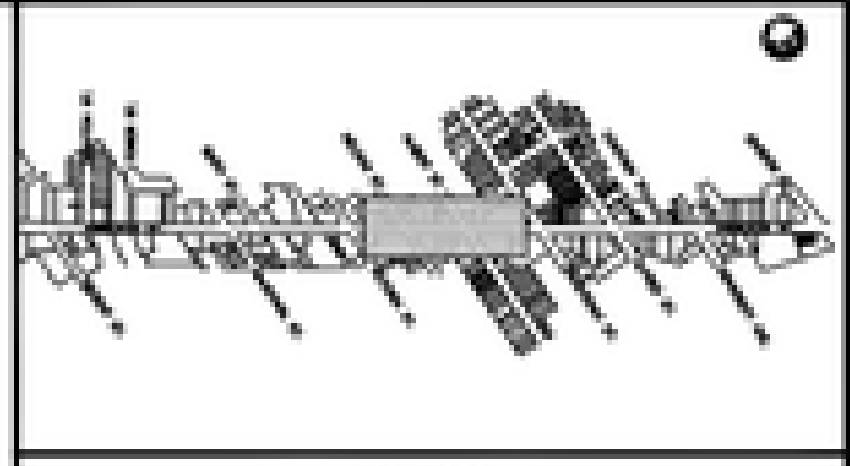
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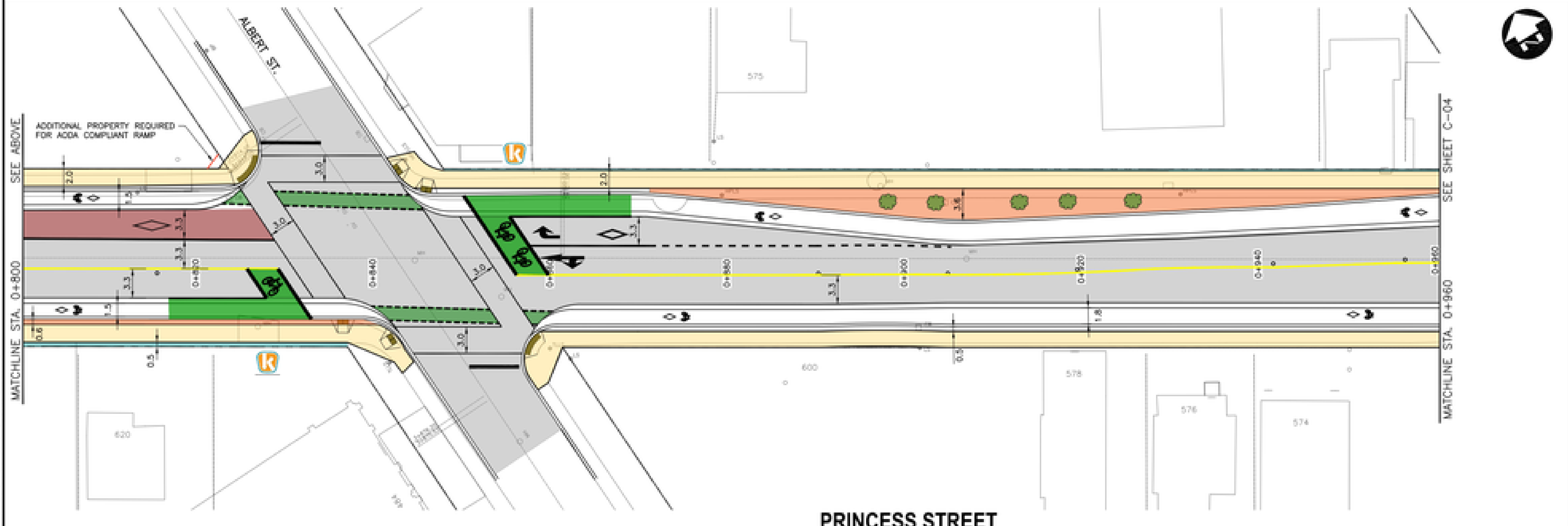
OPPORTUNITIES TO IMPROVE VEHICULAR, PEDESTRIAN AND CYCLING ACCESS, AS WELL AS STREETSCAPE, FOR INTERSECTING NORTH-SOUTH ROADWAYS WILL BE REVIEWED AS PART OF A FUTURE STUDY



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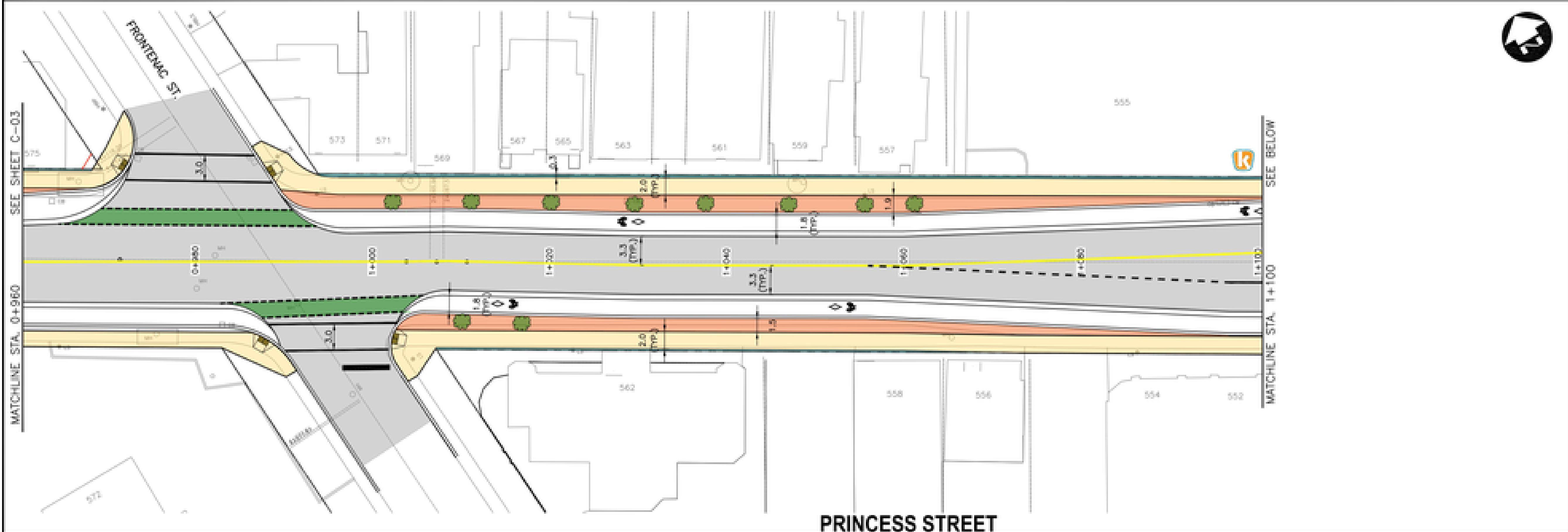
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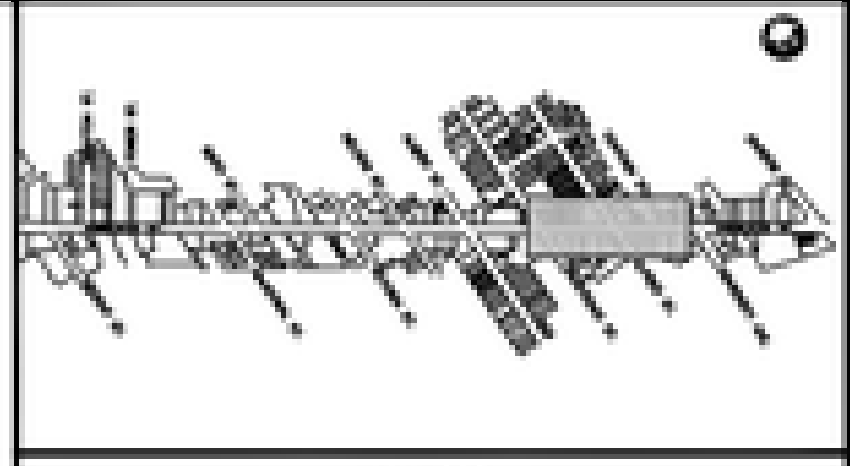


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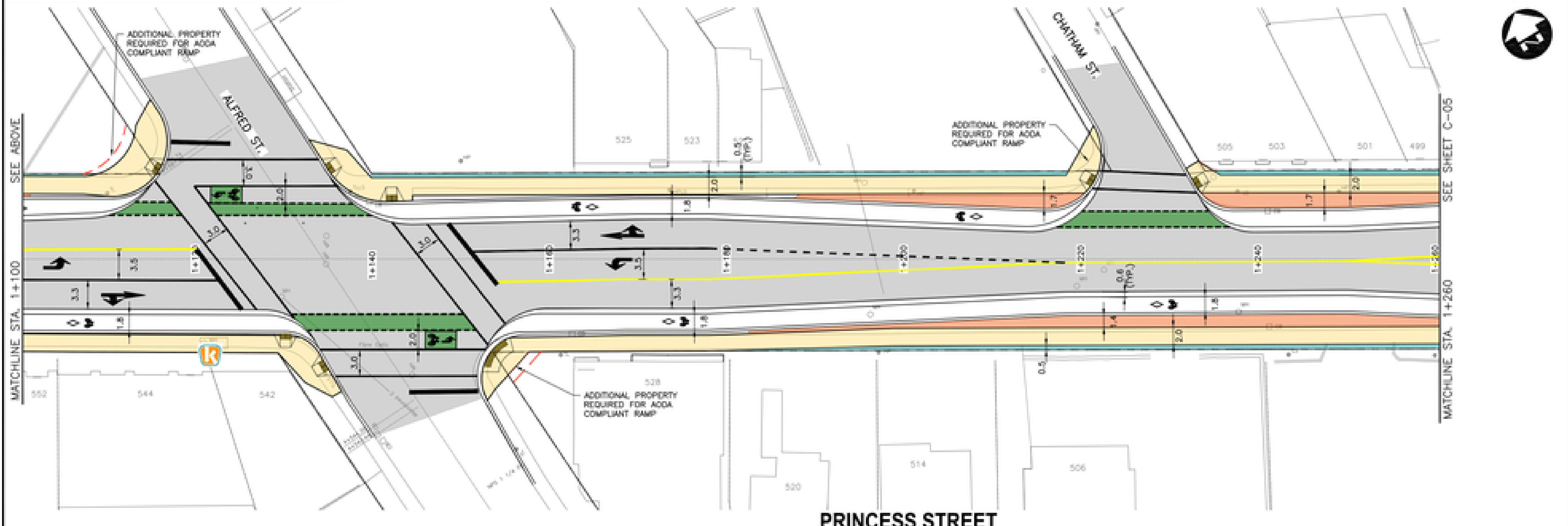
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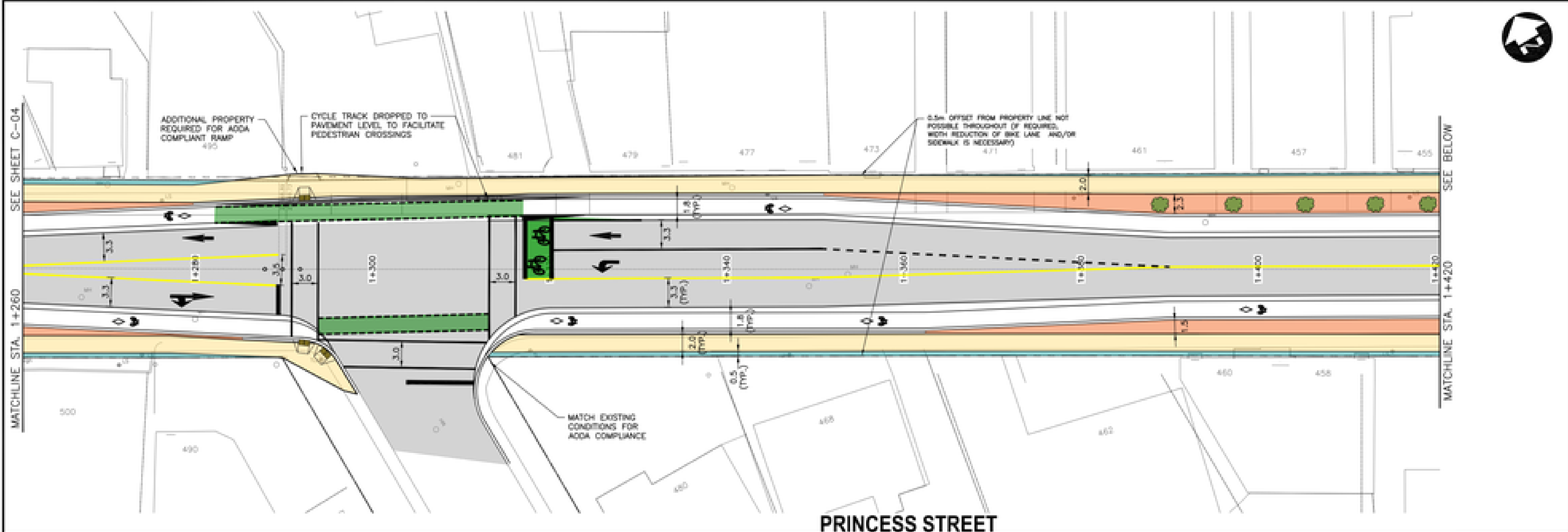
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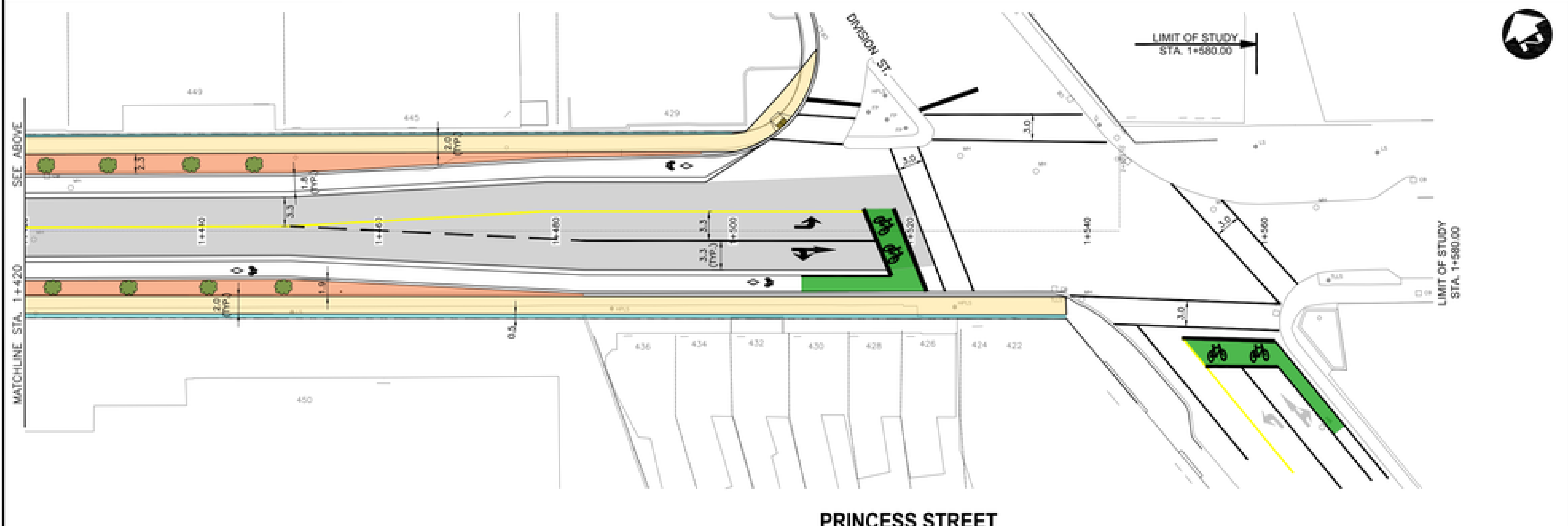


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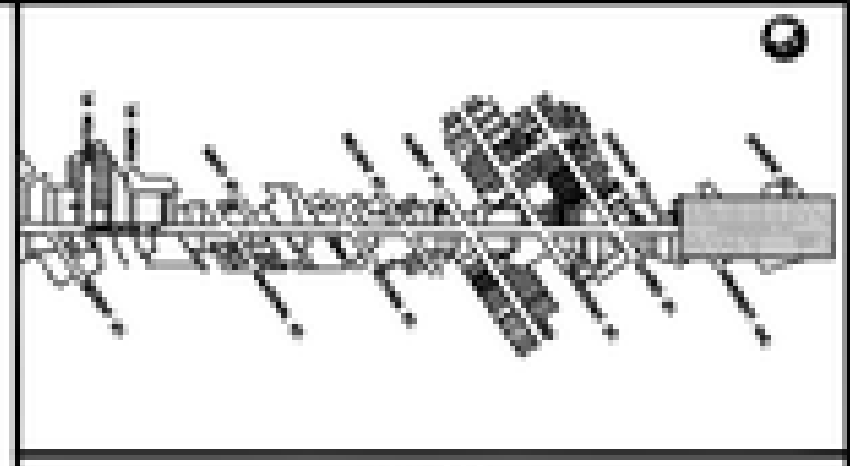
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Memo

To: Henk Brilliams
From: Rudi Rendel
cc: Ian Semple, Maria King, Pegah Tootoonchian
Date: January 15, 2023
Subject: Neighbourhood Bikeway Toolbox
Our File: 23-6663

1.0

Background

To enhance the cycling experience throughout Williamsville it is recommended that the local road network implements cycling supportive infrastructure. This includes converting local roads to either neighbourhood bikeways or other appropriate shared cycling facilities such as advisory bicycle lanes. When designing shared cycling facilities, a balance must be struck between permitting vehicle travel and improving cyclist safety throughout the corridor. While these corridors are shared between motor vehicles and cyclists, they are meant to prioritize through movements for cyclists while discouraging fast-moving vehicles on these corridors. Neighbourhood bikeways should only be implemented on roadways with low operating speeds (<40km/h) and low average daily traffic (<3,000 ADT). Bicycle use is typically prioritized through the use of traffic calming treatments that discourage or slow motorized traffic. Advisory bicycle lanes are typically implemented on streets with low motor vehicle traffic volumes (<4,000 ADT) and where it is relatively rare for two motor vehicles will meet each other at the same time. Advisory bicycle lanes are also appropriate to use in situations with on-street parking as designated on-street parking zones can be provided alongside bicycle lanes.

The following technical guides were used as primary resources:

1. Transportation Association of Canada Chapter 5 – *Bicycle Integrated Design (2017)*
2. Development, Construction, and Operations of a New Traffic Calming Tool, City of Calgary – *Transportation Association of Canada (2017)*
3. City of Kingston's Active Transportation Master Plan (ATMP) – *Walk n' Roll Kingston (2018)*
4. British Columbia Active Transportation Design Guideline (2019)
5. Bicycle Boulevards Feasibility Study – City of Hamilton (2021)
6. Ontario Traffic Manual (OTM) Book 18 – *Cycling Facilities (2021)*

A list of typical and recommended design criteria for the Williamsville area were created using these technical guides.

Typical Design Toolbox

Neighbourhood bikeways are designed to operate in mixed traffic conditions on roadways that encourage and prioritize bicycle travel.

These design elements can be summarized into four main categories¹²:

1. Traffic Reduction;
2. Intersection Treatments;
3. Speed Management/ Priority; and
4. Signs and Pavement Markings.

Traffic Reduction

Traffic reduction design measures are typically applied at intersections to restrict vehicle movements at intersections while allowing them for cyclists. These can include the following:

- Median islands/diverters: Restrict the through movement of motor vehicles at major crossings, while providing a refuge for cyclists to complete a two-stage crossing;
- Choker entrances: Allow only one direction of motor vehicle traffic either entering or exiting a side street, while allowing cyclists to pass through;
- Full diverters: Convert a four-way intersection into a “T” intersection by closing one of the legs to motor vehicles, while allowing cyclists to pass through.

Although traffic reduction measures may not be applicable in all cases, they do provide the greatest benefit for cyclists, pedestrians and residents as it reduces exposure to traffic noise and emissions (OTM Book 18, 2021). In the context of Williamsville, the preferred corridors provide necessary connections for two-way vehicle traffic and limiting a road to one-way circulation or preventing vehicles from entering a roadway in one direction are not recommended. If the local road network is changed substantially in the future to accommodate one-way roads, these measures may be applicable.

Major Intersection Treatments

Intersection treatments improve cyclists' ability to cross a major roadway with higher vehicle volumes and speeds. These intersection treatments should provide clear and safe navigation for people riding bikes. Examples of intersection treatments include:

- Bike Boxes;

¹ Ontario Traffic Manual Book 18 (2021)

² National Association of City Transportation Officials

- Advanced Stop Bars;
- Bicycle actuated signals;
- Crossrides/Intersection Crossing Markings;
- Refuge Islands; and
- Curb Extensions.

Based on the corridors identified, the following major intersections should be analyzed in more detail and could benefit from one of the major intersection treatments listed above:

- MacDonnell Street & Princess Street;
- Albert Street & Princess Street;
- Nelson Street & Princess Street;
- MacDonnell Street & Concession Street; and,
- Victoria Street & Johnson Street;

The City of Kingston's Active Transportation Master Plan outlines the use of bike boxes and crossrides as potential intersection treatments at major intersections to improve a user's ability to cross a roadway or intersection.

For the relatively low volume and speed roads selected as preferred corridors in the Williamsville area, it is recommended that bike boxes and crossrides or intersection crossing markings are explored further as potential major intersection treatments. Sample images of the above intersection treatments are provided below in Figure 1 to Figure 2.



Figure 1: Bike Boxes (Portland, OR)



Figure 2: Crossride (Chicago, IL)

2.3

Minor Street Intersection Treatments

In general, where a neighbourhood bikeway intersects with a minor road, fewer treatments are necessary due to lower speeds and vehicle volumes. It is desirable to provide a continuous bikeway without stop control for cyclists while also providing vehicle speed and volume control measures for motor vehicles.

These types of treatments range from simple stop signs on cross-streets to traffic circles to slow vehicle traffic while maintaining a continuous path for cyclists. For the preferred corridors, it is recommended that stop signs are removed in the direction of travel for the corridors when a preferred corridor intersects with another minor road. Where two preferred corridors intersect, it is worth considering a solution such as a traffic circle to prevent cyclists in both directions from coming to a complete stop. Implementation of a traffic circle would be appropriate at intersections with low volumes to ensure that large vehicle queues or frequent vehicle conflicts would not be present.

Sample minor street treatments are presented below in Figure 3 to Figure 4.



Figure 3: Minor Street Stop Sign (Google Maps (2020))



Figure 4: Neighbourhood traffic circle (Baltimore, MD)

2.4

Speed Management

Speed management on neighbourhood bikeways presents the greatest way to improve safety for cyclists and thereby encourage the use of bicycles. Reducing posted speed limits is generally not effective at reducing operating speeds below 40km/h, requiring the use of physical speed management tools. Reduced vehicle operating speeds can improve the perception time of both motorists and cyclists and further improve safety for both users.

Some examples of speed management designs include:

- Speed tables;
- Speed humps;
- Raised crosswalks;
- Curb extensions;
- Chicanes;
- Narrowing of motor vehicle lanes; and
- Dynamic “watch your speed” signs;

Potential speed management solutions for the Williamsville area have been summarized below in Table 1.

Table 1: Speed Management Solutions



Enhanced Pavement Markings



On-Street Messaging



Speed Hump



Signage



Curb Bump Out



Curb Radius Reduction



Traffic Circle



Raised Intersection





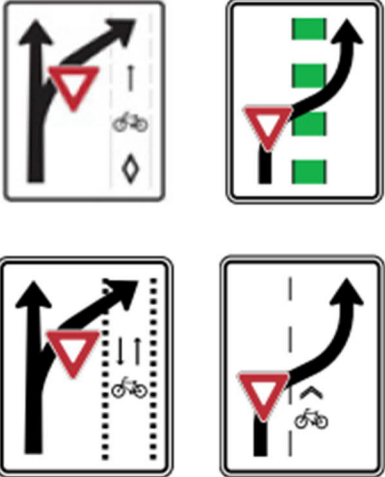

2.5 Signs and Pavement Markings

Providing appropriate signage and pavement markings encourages the use of neighbourhood bikeways and advisory bicycle lanes by communicating the intended travel path, and connections to the local cycling network, and promoting the visibility of cyclists to motorists.

In Ontario, the most common signs used to denote shared cycling facilities are signs Wc-19 OTM or Wc-24 OTM. The City of Kingston's ATMP outlines the use of the Green Bike Route Sign and the Share the Road sign. . In addition to signage, shared facility pavement markings are also encouraged to promote the visibility of cyclists and to clarify that the roadway is a shared-use lane. These pavement markings include "sharrow" (shared lane). In addition to these pavement markings and signage, bicycle lane markings should be used for advisory bike lanes with a buffer between bicycle lanes and parking lanes.

At the time of writing, neither OTM Book 18, or TAC GDG have a standard advisory bicycle lane sign to inform drivers how to operate with these facilities. Both Gibbons, BC and Ottawa, ON have created custom signs to inform both cyclists and drivers. Relevant signage and pavement markings are shown below in Table 2.

Table 2: Signage and Pavement Markings

	
<p>Share the Road Wc-19 Sign</p>	<p>"Green Bike Route Sign" Bicycle Route Marker M511 Sign</p>
	
<p>Shared Use Lane Wc-24 Sign</p>	<p>Sharrow Lane Pavement Marking</p>
	
<p>Turning Vehicles Yield to Bicycles Ra-18 Sign</p>	<p>Advisory Bicycle Lane Custom Signage</p>

Implementation Considerations

Based on the selected corridors, a list of potential design measures have been identified for implementation. Table 3 defines the design element, any relevant measures of efficacy, and a high-level estimated cost per unit.

Table 3: Recommended Design Measures

Design Element	Description	Purpose	Efficacy ³	Implementation Considerations	Estimated Cost ⁴	Design Category
Painted Cycle Symbols	On-street pavement markings designating a portion of the road way as an exclusive or shared space for cyclists.	Improve route finding for cyclists, and raise awareness for vehicular traffic that the facility is designated for cyclists	<ul style="list-style-type: none"> Efficacy information unavailable/non-applicable. 	<ul style="list-style-type: none"> Pavement markings have a relatively low installation cost but require repainting. Messaging intended for drivers is directly within the driver's/cyclist's field of vision. Not visible when snow cover is present 	\$2,000/km – single side of the roadway	Signs and Pavement Markings
Cycle Facility Signs	Roadside signage designating a corridor as a roadway as an exclusive or shared space for cyclists.	Improve route finding for cyclists, and raise awareness for vehicular traffic that the facility is designated for cyclists	<ul style="list-style-type: none"> Efficacy information unavailable/non-applicable. 	<ul style="list-style-type: none"> Minimal ongoing maintenance requirements Messaging intended for drivers is located outside the roadway edge. Requires space outside of the roadway for sign installation Visible in all weather conditions 	\$2,000/km – single side of the roadway	Signs and Pavement Markings
Painted Bike Lane	On-street painted space for cyclists to travel. Typically located along the curb. May include a buffer. Cyclist travel way and optional buffer delineated by pavement markings.	Provide on-street horizontal separation between cyclists and vehicle travel lanes.	<ul style="list-style-type: none"> Driver-cyclist collision rate decreased by 39%. (CMF = 0.61) (painted bike lanes through signalized intersection)⁵ 	<ul style="list-style-type: none"> Improved safety is due to visual cues, not physical protection or separation Not visible during snowy conditions Ongoing maintenance required for repainting 	\$49/m	Signs and Pavement Markings

³ Note that a Crash Modification Factor (CMF) indicates that this design element has been proven to reduce the number of crashes to X% of the original values. Where available, the change in condition used to arrive at the stated efficacy level has been identified.

⁴ Costs estimates obtained from historical studies, may not reflect current prices.

⁵ "Crash Modification Clearinghouse", Federal Highway Administration (2021)

On-Road Messaging	Provide information that is typically messaged to drivers as signage but are instead painted on the roadway to provide a larger image directly in the driver's line of sight (e.g. "SLOW")	Improve compliance with reduced speed limit, notify drivers of a change of context in the transportation network (e.g. neighbourhood bikeway vs. collector street)	<ul style="list-style-type: none"> • Vehicle speed reduction in 85th percentile speed up to 14 km/h⁶ • Driver-cyclist collision rate decreased by 30% (CMF = 0.7)⁵ 	<ul style="list-style-type: none"> • Ongoing maintenance required for repainting 	\$49/m2	Signs and Pavement Markings
Speed Humps	Raised area of a roadway that causes vertical deflections to travelling vehicles. Localized vertical deflection requires that drivers slow down to mitigate damage to their vehicles.	Reduce vehicle operating speeds on local and collector streets with posted speed limits <50 km/h	<ul style="list-style-type: none"> • Vehicle speed reduction in 85th percentile speed up to 13 km/h⁶ • Driver-cyclist collision rate decreased by 45%. (CMF = 0.55)⁵ • Traffic volume reduction up to 27%⁶ 	<ul style="list-style-type: none"> • Potential increase in delay to EMS, transit travel time • Negative effects on snow plowing operations 	\$5,000 each	Speed Management
Curb Bump Outs	A horizontal intrusion of the curb into the roadway resulting in the narrowing of a localized section of the road. Typically implemented at intersections, but can be used mid-block.	Reduce vehicle speeds and volume, reduce pedestrian and cyclist crossing distances, increase the visibility of pedestrians, prevent parking close to intersections	<ul style="list-style-type: none"> • Vehicle speed reduction in 85th percentile speed up to 8 km/h⁶ • Effectiveness improved when used in conjunction with other measures (e.g. speed humps) 	<ul style="list-style-type: none"> • Forces cyclists closer to vehicle traffic at the intersection • Loss of on-street parking • Impact on EMS, truck, and transit turning movements • May require drainage adjustments • Range in construction costs driven by surface type (interlocking brick, asphalt, concrete), landscaping, and if utility improvements are required (relocating/installing and connecting catch basins, signals) 	\$5,000 – 15,000 per corner	Speed Management
Curb Radius Reduction	Modification of an intersection corner to a smaller Can be	Slow down right-turning vehicle traffic, reduce crossing distances for	<ul style="list-style-type: none"> • Particularly effective where vehicles are turning 	<ul style="list-style-type: none"> • Range in construction costs for physical reductions driven 	\$10-000 - 20,000 per each corner (physical)	Major Intersection Treatment

⁶ Canadian Guide to Traffic Calming (Second Edition) *Transportation Association of Canada (2017)*

	implemented with pavement markings and bollards, or by reconstructing the curb, sidewalk, and boulevard.	vulnerable road users, and improve the visibility of pedestrians.	to/from a bike boulevard to higher volume/speed streets	by surface type (interlocking brick, asphalt, concrete), landscaping, and if utility improvements are required (relocating/installing and connecting catch basins, signals) <ul style="list-style-type: none"> Consider transit/EMS turning movements 	\$2,000 each (painted w/ Bollards)	Major Intersection Treatment
Mini Traffic Circle	A circular island located at the centre of an intersection, which requires vehicles to travel through the intersection in a counter clockwise direction, typically constructed with a raised centre and surrounded by a mountable apron.	Reduce travel speeds, volumes, and collisions points for vehicle traffic	<ul style="list-style-type: none"> Vehicle speed reduction in 85th percentile speed up to 14 km/h⁶ Vehicle traffic volume reduction up to 20%⁶ Driver-cyclist collision rate decreased by 30%. (CMF = 0.7) 	<ul style="list-style-type: none"> Minor delay to EMS, transit travel speed and snow clearing operations Range in construction costs for physical reductions driven by surface type (interlocking brick, asphalt, concrete), landscaping, and if utility improvements are required (relocating/installing and connecting catch basins) 	\$10,000 - 20,000 each	Minor Street Intersection Treatment
Raised Intersection	An intersection that may include crosswalks, constructed at a higher elevation than the adjacent approach roadways.	Reduce vehicle speeds, better define crosswalk areas, reduce frequency and severity of pedestrian/cyclist-vehicle conflicts	<ul style="list-style-type: none"> Vehicle speed reduction in 85th percentile speed up to 10 km/h⁶ Improved driver to pedestrian yield rate from 18% to 54%⁶ Driver-cyclist collision rate increased by 9%. (CMF = 1.09) (slight increase in crash frequency)⁴ 	<ul style="list-style-type: none"> Potential increase in delays to EMS, and maintenance (Transportation Association of Canada, Institute of Transportation Engineers, 2017) Cyclist speeds are reduced at raised intersections where cyclists are not required to stop. (Transportation Association of Canada, Institute of Transportation Engineers, 2017) Potential impact on local drainage (Transportation Association of Canada, Institute of Transportation Engineers, 2017) 	\$10,000 - \$50,000 each	Major Intersection Treatment/Minor Street Intersection Treatment

Modular Pedestrian Traffic Diverter	150mm high pre-cast concrete blocks, 1m by 2.75m in size, which can be arranged to simulate various traffic calming measures such as curb and median extensions, mini-roundabouts or chicanes.	Act as a low-cost temporary or permanent option for implementing traffic calming.	<ul style="list-style-type: none"> • Average speed and 85th percentile speed reduction up to 3 km/h⁷ • Speeding compliance improvement of 11% • Yielding compliance improvement of 47%⁷ 	<ul style="list-style-type: none"> • Ability to maintain existing drainage patterns • Can be used for permanent or temporary applications • Allows for planners/engineers to adjust the geometry after implementation 	\$1,000 per unit	Speed Management/Major Intersection Treatments
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⁶ Canadian Guide to Traffic Calming (Second Edition) *Transportation Association of Canada (2017)*

⁷ Development, Construction and Operations of a New Traffic Calming Tool, City of Calgary, *Transportation Association of Canada (2017)*

**Comments on
Williamsville Transportation Study Conclusions**
Stuart McPherson, Kingston, ON
May 19, 2024

Regarding the proposed redevelopment of Williamsville, I would like to voice my support for option 2b.

I live in the west end and work at Queen's. I either take transit or cycle to work. As such, I strongly support the separated cycle track proposed in option 2b. As anyone who has tackled Princess Street on a bicycle with the current cycle lanes could attest, they are not fit for purpose in their current form:

- cars regularly park in the lanes forcing cyclists out into the traffic - and risking being 'doored'
- cars regularly drive over the painted lanes, rendering the paint worn and hard to discern, resulting in more cars driving into the lanes.
- when not grade-separated, the road surface in the cycle lane gathers all debris from the main road - stones, glass, screws, etc. creating hazards and making punctures likely. It also risks damaging passing cars as bicycle tires kick up the stones.

Moreover, strong cycling infrastructure as encompassed by option 2b should encourage more cyclists thereby reducing the volume of car traffic.

Thanks for your consideration.

Stuart McPherson