The Ottawa Hospital | L'Hôpital d'Ottawa

JULY 2023

Transportation Impact Assessment Addendum #2

New Campus Development for The Ottawa Hospital

Hospital and Central Utility Plant

PARSONS

New Campus Development for The Ottawa Hospital

Hospital and Central Utility Plant

Transportation Impact Assessment Addendum #2

Prepared for:
The Ottawa Hospital
1053 Carling Avenue,
Ottawa, ON
K1Y 4E9

Prepared by:
Parsons
1223 Michael Street North, Suite 100
Ottawa, ON K1J 7T2

27 July 2023

478340 - 03000

DOCUMENT CONTROL PAGE

CLIENT:	The Ottawa Hospital
PROJECT NAME:	New Campus Development
REPORT TITLE:	TIA Addendum #2 – Site Plan Application for the Main Hospital Building and Central Utility Plant
IN SUPPORT OF:	Site Plan Application (SPA)
PARSONS PROJECT NO:	478340 – 03000
VERSION:	Final
DIGITAL MASTER:	https://parsons365can.sharepoint.com/sites/OttawaHub/Projects/Projects/478340 - The Ottawa Hospital/3000/DOCS/80-Approvals/7 - Report Updates - July 2023/TIA Addendum 2/TOH-TIA Addendum 2 Main Building-July 2023-Finalv2.docx
ORIGINATOR	Juan Lavin, P. Eng.
REVIEWER:	Austin Shih, P.Eng.
AUTHORIZATION:	
CIRCULATION LIST:	Mike Giampa, P.Eng.
HISTORY:	1. TIA Step 1 Screening Form – Sept 29, 2020 2. TIA Step 2 Scoping Report – Sept 29, 2020 3. TIA Step 3 Forecasting Report – January 21, 2021 4. TIA Step 4 Strategy Report – March 31, 2021 5. TIA Step 5 Final Draft Report – July 30, 2021 6. Draft Addendum #1 – Phase 2: Parking Garage and Green Roof – Oct 8, 2021 7. Revised Addendum #1 – Phase 2: Parking Garage and Green Roof – Dec 3, 2021 8. Draft Addendum #2 – Site Plan Application for the Main Building – Nov. 29, 2022 9. Draft Addendum #2 – Site Plan Application for the Main Building – April 14, 2023 10. Final Addendum #2 - Site Plan Application for the Main Building – July 27, 2023

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

The following *TIA Addendum #2* has been prepared in support of the Site Plan Control Application (SPC) for the main Hospital building at the New Campus Development (NCD) of The Ottawa Hospital (TOH). In July 2021, a *TIA and Mobility Study* was prepared in support a Zoning By-law Amendment (ZBLA) for the Master Site Plan of the NCD and to lift the holding provision were approved by City Council in October 2021. Following the Master Site Plan approval, a *TIA Addendum #1* supporting the SPC for *Phase 2: Parking Garage and Green Roof*, was submitted in October 2021 and was approved by City Council in February 2022. A draft version of this report was circulated to stakeholders, including City of Ottawa and NCC staff on November 29th, 2022. This report represents the final version that incorporates City of Ottawa and NCC technical comments.

INTRODUCTION

The Ottawa Hospital (TOH) has initiated the development approval process with the City of Ottawa and the federal government to establish a New Campus Development (NCD) to replace the existing Civic Hospital Campus and become the major referral centre for Eastern Ontario, Western Quebec, and parts of Nunavut. It will be the home of the Eastern Ontario Trauma Centre with a range of specialized services, research, and education facilities, along with related ancillary uses such as resident care stay facilities, and retail service uses. The existing Civic Hospital Campus is located at 1053 Carling Avenue and the NCD will be located approximately 1km to the east on lands leased to The Ottawa Hospital from Public Services and Procurement Canada (PSPC) adjacent to the Dow's Lake Pavilion and Central Experimental Farm (CEF).

The new campus will be generally bound by Carling Avenue to the north, Preston Street and Prince of Wales Drive to the east, the Birch Drive to the south, and Maple Drive to the west. The overall Master Site Plan proposal, the existing transportation conditions, and the planned network conditions were described in detail within the *TIA and Mobility Study (July 2021).*

Since the Master Site Plan approval, TOH submitted a site plan control application for phase 2, the proposed parking garage, including a TIA Addendum #1 that was approved in 2022.

TOH is now proceeding with the site plan control application in support of Phases 3 and 4, the main hospital building and the central utility plant, which will be covered in this TIA Addendum #2.

The *TIA Addendum #2* will incorporate the latest information available, including the most recent development statistics for the NCD at Opening Day (2028) and Full Buildout (2048) have been provided in **Section 2.1**. The following list identifies the sections within this Addendum that have been refreshed from the original *TIA and Mobility Study (July 2021)* and the *TIA Addendum #1 (Oct 2021).*

- Overall, the NCD site statistics are generally similar to what was assumed in the *TIA and Mobility Study (July 2021)*. The overall footprint of the hospital remains comparable, with some redistribution of gross floor area for hospital uses, while the number of employees has decreased.
- A detailed breakdown of anticipated employee shift schedules and patient registrations at the NCD was provided by TOH. This data was used to update the trip generation forecast for the NCD based on first principles, using anticipated arrival and departure times by staff and different types of visitors. Existing Civic Campus staff and visitor parking activity/patterns were used to calibrate these projections. This methodology replaced the trip generation forecast based on the existing Civic Campus, completed within the original July 30th, 2021, submission. The comprehensive breakdown of future employee schedules at the NCD enabled more precise trip generation forecasts for the morning and afternoon "peak hour of the generator" (i.e., during shift changes at the hospital), in addition to the "peak hour of the adjacent street traffic" (i.e. typical commuter peak hours).
- Shift schedules were broken down for different programs at the future campus, which have been incorporated into this analysis. For example, the University of Ottawa Heart Institute will only transfer to the NCD in 2048 and the rehab program is now expected to remain at the existing Civic Campus location.

- Adjustments were made to the forecasted peak hour traffic volumes in background conditions from the *TIA and Mobility Study (July 2021)*. Specifically, a big data platform 'Streetlight' was used to provide a better understanding of baseline traffic volumes to/from the existing Civic Campus, which helped inform the process of removing some of these trips from the background network. Additionally, known development applications that were initiated since the Master Site Plan submission have been included in the analysis under "other area developments".
- Minor re-distribution of on-site trips based on the latest site plan (that has a more refined parking layout) and anticipated activities and vehicle destinations within the campus. Overall, an increase in forecasted vehicular traffic to the Prince of Wales/Road E intersection from the *TIA and Mobility Study (July 2021)* was forecasted.
- The proposed Road E/Prince of Wales Drive intersection design has evolved from an original proposal for an all movement unsignalized intersection in the Master Site Plan in 2021. A signalized protected intersection was briefly considered in response to refinements to the site plan and updated site generated traffic forecasts, however challenges with drainage, the required footprint that would have had significant impact to existing trees and greenspace on both sides of Prince of Wales Drive, and the associated costs steered the design to a modified unsignalized intersection that restricts the critical outbound left-turn movement from Road E to maintain adequate long-term intersection performance.
- The proposed Road B/Prince of Wales Drive intersection design has also evolved to no longer permit the through movement from the southbound curb-side lane, making it a right-turn lane only, which enables the proposed receiving lane to be removed. Providing two southbound through movements was not expected to notably improve anticipated queues since the limited storage and receiving lane length would hinder driver utilization. A sensitivity analysis and risk assessment were shared with the city traffic signals department, and they agreed with this conclusion. They confirmed they could manage the southbound queues through signal timing optimizations without the additional through movement and receiving lane, which also helps preserve trees at the southwest corner of the intersection.
- The Active Transportation Plan has been refined based on public and stakeholder feedback. As a result, this triggered refinements to the design of internal roadways (e.g., Road A and Road B) and adjacent intersections that balance mobility, capacity, and active transportation opportunities.

1.0 SCREENING FORM

Although the site statistics have changed, the screening form still meets the same criteria as outlined in the original *TIA and Mobility Study (July 2021).*

2.0 SCOPING REPORT

2.1 Existing and Planned Conditions

2.1.1 Proposed Development

The TIA Addendum #2 will focus on Phase 3 and 4 of the NCD, which represents the main hospital building as shown in **Figure 1**. This report will also update the long-term analysis at the anticipated full buildout horizon of 2048 using the latest information on ensuing development phases, which have been summarized in **Table 1**. The statistics assumed for future phases of the NCD may change over time and will only be confirmed at the time of their respective Site Plan Control application.

The conceptual plan of the NCD is shown in **Figure 1**. A more detailed site plan is provided later on in this report that incorporates comments from both City of Ottawa and NCC. However, it is expected that minor refinements to the overall site plan will continue as the process transitions to the Developed Design.

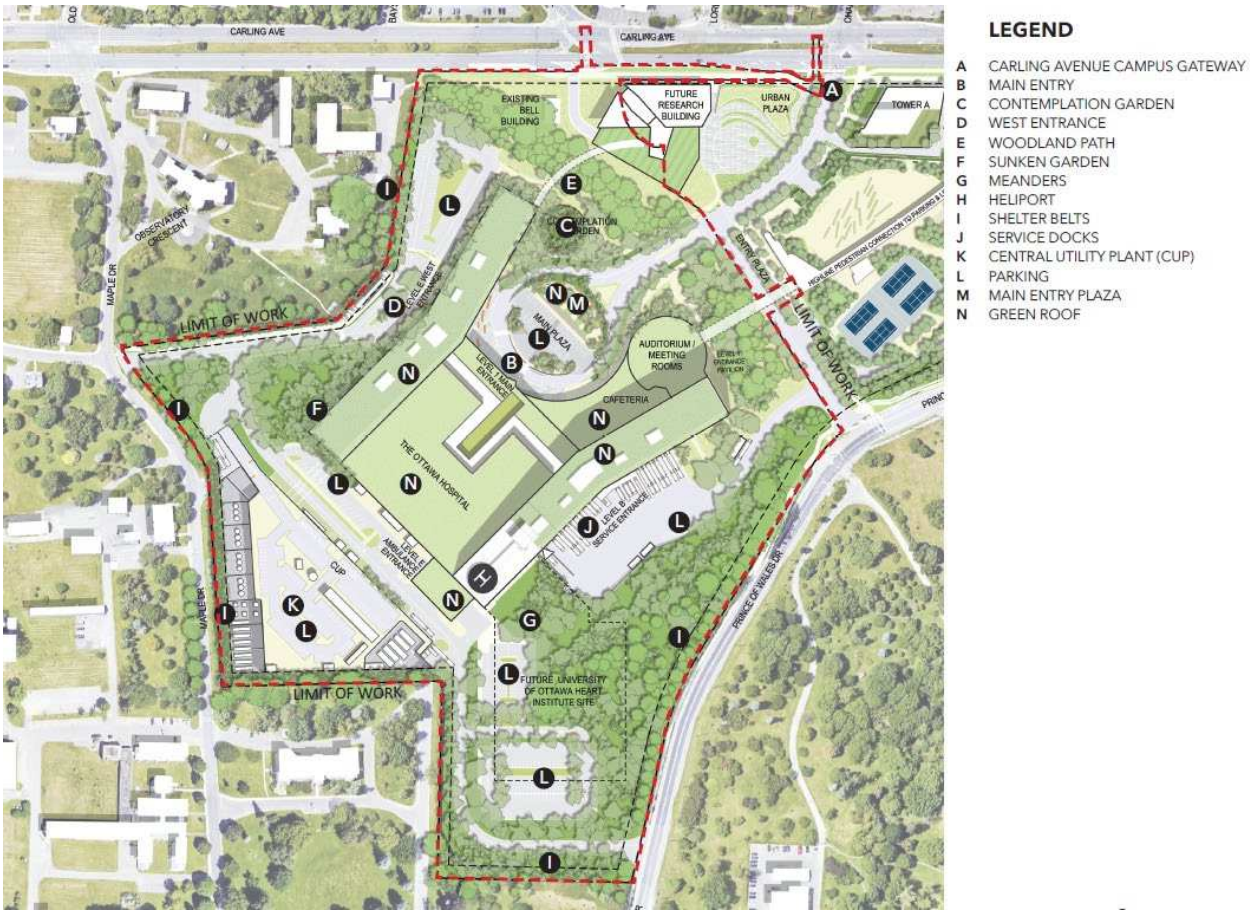
Table 1: Current and Anticipated Land Use Statistics for the NCD

Independent Variable	Existing Civic Campus	NCD 2028 Opening Day	NCD 2048 Full Buildout
General Statistics			
Total Number of Beds	559	641	1,136
Number of Employees	3,473	5,000	9,956
Number of Parking Spaces	2,500	3,292[1]	3,095
Development Gross Floor Area (GFA) x1,000 sq.ft.			
Hospital Land Uses	1,815	2,605	3,322
U. Ottawa Heart Institute	305	0	868
Other[2]	0	81	750

1. The 3,292-parking space allotment includes 172 spaces designated for snow storage and surge space during emergency events. The effective campus parking space supply during these "seasonal/peak" events is 3,120. This extra allotment will be lost in 2048 when the UOHI building is construction.
2. The 81,000 ft² will include ancillary retail services within the NCD main hospital structure. The Life Science Park proposed for 2048 has approximately 100,000 ft² Ground Floor Commercial, 162,500 ft² Hospital Appointments, 487,500 ft² Research and Development land uses.

Overall, the site statistics remain similar to the *TIA and Mobility Study (July 2021)*, with the most notable change being an overall reduction in anticipated number of staff by 2028 and 2048.

Figure 1: Components of the New Campus Development Hospital and Central Utility Plan Phases



2.1.2 Phasing Plan

There are no changes anticipated in the phasing plan, outlined in **Section 3.1.2** of the *TIA and Mobility Study (July 2021).*

2.1.3 Existing Conditions

The existing conditions as described in **Section 3.1.3** of the *TIA and Mobility Study (July 2021)* were still valid and used in this report.

Existing Transit Network

Minimal changes to existing transit network have occurred since the preparation of the *TIA and Mobility Study (July 2021)*. Overall, the same routes within the study area continue to operate, with the following minor changes noted and accounted for within the analyses:

- Frequent Route #53: was moved from former Parkdale Avenue to Holland Avenue (Scott Street to Carling Avenue).
- Local Route #56: was moved from former Holland Avenue to Parkdale Avenue (Scott Street to Carling Avenue).
- Local Route #55: no longer originates at Bayshore Mall, it now originates from Westgate Shopping Center.

Existing Peak Hour Volumes

It is noteworthy that the peak hour volumes used in the *TIA and Mobility Study (July 2021), TIA Addendum #1 (October 2021)*, and this report reflect pre-COVID-19 pandemic traffic conditions. The pandemic work from home orders have been removed at the time of this writing, however commuting trends for both drivers and transit users have not returned to pre-pandemic levels. While the future of remote work is unclear, there may be a need to revisit baseline traffic assumptions as future phases of the NCD proceed, to determine if City-wide travel behaviour settles into a 'new normal' and the corresponding implications on the future transportation network.

2.1.4 Planned Conditions

New Official Plan and Transportation Master Plan

Section 3.1.4 of the *TIA and Mobility Study (July 2021)* acknowledged the draft new Official Plan and the 2013 Transportation Master Plan. Since that time, the New Official Plan was approved by City Council (November 24th, 2021) and has received provincial approval as of November 4th, 2022. The City's Transportation Master Plan (TMP) Update is still ongoing. Preliminary policies and future project list have been released. None of the highlighted projects are within the study area for the hospital. Prince of Wales Drive has been identified as a crosstown bikeway.

Other Area Developments

New development applications within the study area have been accounted for in this report. **Figure 2** illustrates the previously captured developments in purple, and new developments to be added to background conditions in green. The new developments have also been described below:

A – 1081 Carling Avenue
The proposed development has a 22- and 28-storey residential towers. A total of 462 units are proposed. The Transportation Brief (prepared by Parsons) projects an increase in two-way traffic volumes of approximately 95 to 115 veh/h during peak hours. These volumes have been added to the background network.

B – 101, 105, 111, 115 Champagne Avenue
The 4 neighbouring high-rise towers, two for Envie and two for Soho will be treated as one lot.

- Envie Towers:
  - Phase 1 (105 Champagne): occupied prior to 2017 –captured in existing traffic counts
  - Phase 2 (101 Champagne): occupied in 2020 – not been captured in existing traffic counts

- Soho Towers:
  - Phase 1 (111 Champagne): occupied prior to 2017 –captured in existing traffic counts
  - Phase 2 (115 Champagne): under construction – not been captured in existing traffic counts

No TIA for the Soho development was found; however, a transportation brief by Parsons for Envie Phase 1 and 2 combined projected two-way traffic volumes of approximately 60 to 65 veh/h during peak hours. Since the Envie and Soho developments share a similar site context and development size, for the purpose of this TIA Addendum #2, the volumes forecasted for Envie Phase 1 and 2 have been layered to the background network to account for volumes not captured in existing counts for Envie Phase 2 and Soho Phase 2.

C – 829 Carling Avenue

The proposed development is a 61-storey residential building. A total of 459 units plus some ground floor commercial uses are proposed. The Transportation Brief (prepared by Novatech) projects an increase in two-way traffic volumes of approximately 150 to 100 veh/h during peak hours. These volumes have been added to the background network.

D – 299 Carling Avenue

The proposed development is envisioned as a mixed-use site which could include approximately 550 residential units and 55,000 ft^2 of commercial uses. This project is still in its infancy and no official Site Plan or Transportation Impact Study have been submitted, thus, no volumes have been added to the background network for this development.

E –275 Carling Avenue

The proposed development will host 168 senior/retirement units with a ground floor pharmacy. The Transportation Brief (prepared by Parsons) projects an increase in two-way traffic volumes of approximately 40 to 65 veh/h during peak hours. These volumes have been added to the background network.

F – 770 Bronson Avenue

The proposed development is a 26-storey residential building. A total of 153 apartment units and 71 student units are proposed. The Transportation Brief (prepared by CGH) projects an increase in two-way traffic volumes of approximately 70 to 80 veh/h during peak hours. These volumes have been added to the background network.

Figure 2: Updated Other Area Developments

2.2 Analysis Parameters

The timing of opening day and full buildout of the NCD, 2028 and 2048 respectively, have not changed for this study. The anticipated peak hour periods have been refined based on new information provided by TOH. The projected employee schedules were provided with corresponding start and end times, which paint a more accurate picture of arrival and departure windows for future employees.

Table 2 summarizes the different types of employee shifts anticipated at the NCD, including their range of start and end times. TOH provided the proportion of employees that would apply to each shift. It is acknowledged that some employees may arrive or depart earlier or later than the shown hours, however it was assumed the majority will adhere to the noted schedule.

Table 2: Types of Shift and Arrival/Departure Times

Type of Shift	General Arrival Time	General Departure Time	Proportion of Staff 2028 (2048)
Day Shift	06:00 – 08:00	15:00 – 18:00	68% (75%)
Evening Shift	14:00 – 15:00	23:00 – 00:00	11% (9%)
Night Shift	22:00 – 23:00	07:00 – 08:00	3% (3%)
12hr Day Shift	06:00 – 07:00	19:00 – 20:00	11% (8%)
12hr Night Shift	18:00 – 19:00	07:00 – 08:00	7% (5%)
		Total	100% (100%)

In general, the peak morning hour of the NCD ('generator') occurs at a similar time to the peak hour of the adjacent street, while in the afternoon, the peak hour of the NCD is expected to occur earlier than the adjacent street peak hour. For this study, three time periods were analyzed, including:

- Morning peak hour for the NCD and adjacent street: 07:00 – 08:00

- Afternoon peak departure hour for the NCD: 15:00 – 16:00
- Afternoon peak hour for the adjacent street: heaviest 60-minute period between 15:30 – 17:30

2.3 Exemption Review

Site Plan Control Applications (SPA) and Zoning By-Law Amendments (ZBLA) reports differ in their context according to the City's TIA Guidelines. The *TIA and Mobility Study (July 2021)* supported a ZBLA application. This TIA Addendum is supporting a SPC and as thus, different exemptions are permitted.

Additionally, there are four (4) separate transportation supporting studies that will accompany the SPC covering modules within the TIA in far greater detail. The following modules/elements of the TIA process will be exempted as listed in Table 3.

Table 3: Exemption Review Summary

Module	Element	Exemption Consideration
4.2 Parking	4.2.2 Spillover Parking	Parking spillover will be captured within a separate "Off-Street Parking Strategy" Report
4.5 Transportation Demand Management (TDM)	All Elements	TDM will be captured within a separate "Transportation Demand Management Strategy" Report
4.6 Neighbourhood Traffic Management (NTM)	All Elements	NTM will be captured within a separate "Neighbourhood Traffic Management Strategy" Report
4.8 Review of Network Concept	All Elements	Zoning has already been approved and NCD does not project any major deviations from original zoning

3.0 FORECASTING REPORT

3.1 Development-Generated Travel Demand

3.1.1 People Trip Generation

The *TIA and Mobility Study (July 2021)* developed a custom trip generation rate using the existing Civic Campus traffic data and calibrated based on research of similar institutions in North America. The three strongest independent variables; number of beds, number of employees and gross floor area (GFA) were blended together to produce a single local rate to derive person trips to/from the NCD.

At the time of the previous submission, TOH did not have any employee schedules or shifts available. Since that time, they have provided the project team with a comprehensive employee shift breakdown, which replaced the original trip generation approach and methodology. This new approach is expected to provide a more accurate estimate of the number and type of employee arriving and departing the NCD on each day of a week.

Note that approximately 81,000 ft^2 of commercial retail is proposed for Opening Day 2028; however, it is all assumed to be located inside of the main Hospital building and is meant to cater directly to people already within the NCD. All commercial retail trips for Opening Day 2028 are considered internal trips and will not generate any new people trips from the adjacent network.

Employee Person Trip Generation

TOH provided the estimated number of full-time equivalent (FTE) employees on a typical weekday based on their schedule and summarizes approximately how many employees work each type of position.

The project team then "adjusted" this number to reflect absenteeism and remote work. A 5% reduction was applied to account for absentees on vacation or sick leave. TOH also confirmed they anticipate approximately 25% of the "day-shift" workers will be administration roles, of which approximately 20% of them on average will be remote-workers and the remainder will travel to the NCD on a typical weekday. The final estimated employee breakdown by 2028 and 2048 is summarized in **Table 4**.

The anticipated shift schedule provided by TOH was broken down further to understand arrival and departure patterns throughout the day. The employee schedules only provided a range of shift start times and end times, but it was acknowledged there would /be variability in the actual arrival and departure times.

Therefore, the project team requested the existing hourly employee parking entry and exit time stamps from the Civic Campus employee satellite lots. This helped provide a baseline estimate of hourly arrival and departures throughout a typical weekday that was applied to the future adjusted employee shift breakdown in **Table 4**. The parking data has been provided in **Appendix A. Table 5** summarizes the resulting arrival and departure distribution by shift type.

Table 4: Full Time Employees Anticipated at the NCD in a Typical Weekday – 2028 and 2048

Type of Shift	Est. Arrival Window	Est. Departure Window	2028 FTE	2028 Adjusted	2048 FTE	2048 Adjusted
The Ottawa Hospital Core Staff (TOH)						
Day Shift	06:00 – 08:00	15:00 – 18:00	3,466	3,128	4,488	4,050
Evening Shift	14:00 – 15:00	23:00 – 00:00	524	498	679	645
Night Shift	22:00 – 23:00	07:00 – 08:00	160	152	208	198
12hr Day Shift	06:00 – 07:00	19:00 – 20:00	439	417	568	540
12hr Night Shift	18:00 – 19:00	07:00 – 08:00	310	295	401	381
University of Ottawa Heart Institute (UOHI)						
Day Shift	06:00 – 08:00	15:00 – 18:00	0	0	964	916
Evening Shift	14:00 – 15:00	23:00 – 00:00	0	0	146	139
Night Shift	22:00 – 23:00	07:00 – 08:00	0	0	45	43
12hr Day Shift	06:00 – 07:00	19:00 – 20:00	0	0	122	116
12hr Night Shift	18:00 – 19:00	07:00 – 08:00	0	0	86	82
Residents (Doctors)						
12hr Day Shift	06:00 – 07:00	19:00 – 20:00	75	71	97	92
12hr Night Shift	18:00 – 19:00	07:00 – 08:00	25	24	32	30
Research						
Day Shift	06:00 – 08:00	15:00 – 18:00	0	0	2,120	2,014
TOTAL			5,000	4,585	9,956	9,246

Note: FTE = 'Full Time Equivalent' employees

Table 5: Arrival and Departure Hourly Distribution to/from NCD by Staff – 2028 and 2048

Type of Shift	00:00 -01:00	01:00 - 02:00	02:00 - 03:00	03:00 - 04:00	04:00 - 05:00	05:00 - 06:00	06:00 - 07:00	07:00 - 08:00	08:00 - 09:00	09:00 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 13:00	13:00 - 14:00	14:00 - 15:00	15:00 - 16:00	16:00 - 17:00	17:00 - 18:00	18:00 - 19:00	19:00 - 20:00	20:00 - 21:00	21:00 - 22:00	22:00 - 23:00	23:00 - 24:00
Day Shift TOH						5%	32%	37%	14%	5%	3%	2%	2%	4%	10%	25%	22%	14%	8%	13%	4%			
Day Shift Other*							50%	30%	20%							50%	30%	20%						
Evening Shift	20%	20%													60%	20%	20%							60%
Night Shift								75%	25%														75%	25%
12hr Day Shift							75%	25%												75%	25%			
12hr Night Shift								75%	25%										75%	25%				

Green – Proportion of Arrivals to NCD, Blue – Proportion of Departures from NCD, Grey – Shift Group Working at NCD, *Day Shift Other refers to UOH and Research

The adjusted full time employee estimates from **Table 4** were then distributed hourly based on the distribution of arrival and departure times for each shift shown in **Table 5**. **Table 6** and **Table 7** show the estimated hourly employee arrival and departure volumes (i.e., employee person trips) at Opening Day 2028 and Full Buildout 2048, respectively. Note that only the heavier forecasted hours between 06:00-09:00 and 15:00-20:00 have been shown in the tables below. For a full 24-hour breakdown, please refer to **Appendix B.**

Table 6: Estimated Hourly Employee Arrival and Departure Volume at NCD – 2028

Type of Shift	Day Shift TOH	Day Shift Other*	Evening Shift	Night Shift	12hr Day Shift	12hr Night Shift	TOTAL IN	TOTAL OUT	TOTAL 2-WAY
06:00 - 07:00	1,000	n/a			366		1,366		1,366
07:00 - 08:00	1,152	n/a		114	122	239	1,274	353	1,627
08:00 - 09:00	448	n/a		38		80	448	118	566
15:00 - 16:00	786	n/a	100				100	786	886
16:00 - 17:00	669	n/a	100				100	669	769
17:00 - 18:00	435	n/a						435	435
18:00 - 19:00	251					239	239	251	490
19:00 - 20:00	418				365	80	80	783	863

Green – Proportion of Arrivals to NCD; Blue – Proportion of Departures from NCD; *Day Shift Other refers to UOHI and Research

Table 7: Estimated Hourly Employee Arrival and Departure Volume at NCD - 2048

Type of Shift	Day Shift TOH	Day Shift Other*	Evening Shift	Night Shift	12hr Day Shift	12hr Night Shift	TOTAL IN	TOTAL OUT	TOTAL 2-WAY
06:00 - 07:00	1,295	1,465			561		3,321		3,321
07:00 - 08:00	1,492	879		181	187	371	2,558	552	3,110
08:00 - 09:00	580	586		61		124	1,166	185	1,351
15:00 - 16:00	1,018	1,465	236				236	2,483	2,719
16:00 - 17:00	866	879	157				157	1,745	1,902
17:00 - 18:00	563	586						1,149	1,149
18:00 - 19:00	325					371	371	325	696
19:00 - 20:00	541				561	124	124	1,102	1,226

Green – Proportion of Arrivals to NCD; Blue – Proportion of Departures from NCD; *Day Shift Other refers to UOHI and Research

Visitor Person Trip Generation

The *TIA and Mobility Study (July 2021)* produced a blended trip generation rate that included employees, patients, and non-patient visitors. At the time, it was understood that approximately 1 in 4 person trips to the hospital was a visitor, while the remaining 3 in 4 people was an employee.

TOH has since provided more information regarding visitor trips, with historic numbers and future projections. The type of visit was split into two categories:

- Planned visits - includes patients with appointments and other non-emergency visitors
- Unplanned visits - emergency visits. Note that ambulances have been individually layered on top, which could cause a double counting of trips creating a slightly more conservative value.

TOH historic and forecasted visitation numbers were factored by an additional 20% to account for potential variability and to ensure a conservative approach. The resulting annual and daily visitor trips have been summarized in **Table 8**.

Table 8: Estimated Annual and Daily Planned and Unplanned Visits (Data Provided by TOH)

Type of Visitor	2018 Registered Visitor	2028 Estimated Visitor	2048 Estimated Visitor
Annual			
Planned Visitor	263,725	344,293	571,401
Unplanned/Emergency Visitor	86,275	112,632	186,928
TOTAL	350,000	456,925	758,329
Daily (Factored by 1.2)			
Planned Visitor	867	1,132	1,879
Unplanned/Emergency Visitor	284	370	615
TOTAL	1,151	1,502	2,493

Similar to the employee trip generation process, TOH also provided visitor parking activity within public lots at the existing Civic Campus, which provided arrival and departure times. Visitor arrivals and departures were generally consistent between 07:00 and 20:00, which coincided with typical visitor hours. During the time periods outside visitor hours, if the parking data showed no activity, a constant number was assumed to account for possible variability in emergency visits. It is noteworthy to mention that the total daily visitor numbers and growth factors for the future horizon years within this report are the same as the ones within the TDM Strategy Report; however, the number seen in the tables below varies to their peak visitor parking numbers within the heaviest parking demand hour. This is mostly to do with choosing the most conservative distribution for both reports. For this report, it was assumed there would be uniform visitor arrivals and departures each hour, while TDM Strategy Report had assumed some visitors/patients may arrive and stay for longer than an hour. Besides this nuance, the total number of patients and visitors expected per day remains consistent between the two reports.

The resulting visitor trips at Opening Day 2028 and Full Buildout 2048 are shown in **Table 9** and **Table 10** respectively.

Table 9: Estimated Hourly Visitor Arrival and Departure Volume – 2028

Type of Shift	Planned Visit Arrival	Planned Visit Departure	Unplanned Visit Arrival	Unplanned Visit Departure	TOTAL IN	TOTAL OUT	TOTAL 2-WAY
06:00 - 07:00			19	19	19	19	38
07:00 - 08:00	103		19	19	122	19	141
08:00 - 09:00	103	103	19	19	122	122	244
15:00 - 16:00	103	103	19	19	122	122	244
16:00 - 17:00	103	103	19	19	122	122	244
17:00 - 18:00	51	103	19	19	70	122	192
18:00 - 19:00	51	51	19	19	70	70	140
19:00 - 20:00		51	19	19	19	70	89
Green – Proportion of Arrivals to NCD; Blue – Proportion of Departures from NCD							

Table 10: Estimated Hourly Visitor Arrival and Departure Volume - 2048

Type of Shift	Planned Visit Arrival	Planned Visit Departure	Unplanned Visit Arrival	Unplanned Visit Departure	TOTAL IN	TOTAL OUT	TOTAL 2-WAY
06:00 - 07:00			31	31	31	31	62
07:00 - 08:00	171		31	31	202	31	233
08:00 - 09:00	171	171	31	31	202	202	404
15:00 - 16:00	171	171	31	31	202	202	404
16:00 - 17:00	171	171	31	31	202	202	404
17:00 - 18:00	85	171	31	31	116	202	318
18:00 - 19:00	85	85	31	31	116	116	232
19:00 - 20:00		85	31	31	31	116	147

Green – Proportion of Arrivals to NCD; Blue – Proportion of Departures from NCD

Life Sciences Park Person Trip Generation

The Life Sciences Park (formerly known as Carling Village) is a reserved parcel of land on the north-eastern quadrant of the site. No formal design has been submitted and only a very basic high-level vision for the site including approximately 750,000 ft^2 of development fronting Carling Avenue has been proposed.

The Life Science Park **will not be built by 2028 and is outside of the current SPC scope of work**. For completeness however, the trip generation analysis was updated to reflect potential land uses and incorporated into the 2048 horizon analysis. The former Carling Village trip generation within the original *TIA and Mobility Study (July 2021)*, now Life Science Park, were still considered be applicable, however, in order to produce a more conservative analysis, this TIA addendum has assumed 650,000 ft^2 of medical/research office uses and 100,000 ft^2 of commercial uses.

The ITE Trip Generation Manual 11th Ed. was used to estimate the person trips generated by the Life Sciences Park. For the purposes of this analysis, it was assumed that 75% of the 650,000 ft^2 of medical/research office use was considered “Research and Development”, while the remaining 25% were “Hospital Uses” under the ITE land use descriptions.

Additionally, the ground floor retail is intended to serve local foot traffic to/from the NCD and the local community already on the adjacent streets (i.e., Carling Avenue and Preston Street). Since these trips are already in the network, they are not creating a new trip and were subsequently treated as “internal” trips. An 80% internal reduction was used for the commercial retail component of the Life Sciences Park.

As previously mentioned, the Life Science Park (LSP) represents one of the final phases of the NCD, and the potential mix of uses and employee schedules will not be confirmed for many years. There are no reasonable estimate of staff and visitor schedules related to the LSP at this time. A high-level review of the surrounding network intersections showed a notable reduction in traffic volumes for the PM peak of the generator versus the PM peak of the street, suggesting the PM peak of the street would still represent the worse-case scenario. It is also noteworthy that LSP is forecasted to generate relatively few vehicle trips, which would then be dispersed through the adjacent street network with negligible effects on study area intersection performance. The trip generation assumptions and overall analysis will be revisited during the Site Plan Control application for the LSP. **Table 11** summarizes the estimated person trips generated by the Life Science Park.

Table 11: Life Science Park Trip Generation Rates

Land Uses in Life Sciences Park	Size	Reference	Peak Hour	Trip Generation Rate[1]	Person Trips Generated
Ground Floor Commercial (Shopping Center)	100,000 ft²	ITE 820	AM	1.20 (x)	24[2]
			PM	4.88 (x)	98[2]
Hospital Use	162,500 ft²	ITE 610	AM	0.82 (x)	133
			PM	0.86 (x)	139
Research and Development	487,500 ft²	ITE 760	AM	1.03 (x)	502
			PM	0.98 (x)	477

1. Trip Generation Rates include a 1.28 factor to account for typical North American auto occupancy, transit and non-motorized mode
2. Person trips for commercial were internally reduced by 80%.

Emergency Transports, Service Vehicles and Transport Trucks

Similar to **Section 4.1.4** in the *TIA and Mobility Study (July 2021)*, the NCD estimates approximately 100 emergency transports per day.

Contractor service vehicles and other specialized vehicles such as garbage trucks, small supply deliveries, electronic/ telecommunications technicians, police vehicles, etc. are expected to access the site in addition to employees and visitors. It was assumed 20 of these vehicles (10 vehicles entering and 10 vehicles exiting) would occur during the morning and afternoon peak hour in 2028 and increasing to 40 total vehicles (20 in and 20 out) by 2048. The majority of these vehicles were assumed to use Road E/Prince of Wales Drive or Maple Drive/Road D accesses. Note that Maple Drive/Road D will be strictly reserved for emergency vehicles only (i.e., active ambulances).

Large transport trucks were not expected to operate frequently during the peak hour periods, as they have different operating schedules than regular commuters. Conservative, it was assumed that 4 transport trucks (2 in and 2 out) would occur during the peak hours in 2028, increasing to 8 transport trucks (4 in and 4 out) by 2048. These trucks will be destined to the loading area off Road F, which will only be accessible via Prince of Wales and Road B.

Conceptual circulation diagrams for the emergency, non-urgent, supplementary vehicles and large transports have been provided in **Appendix C**.

3.1.2 Mode Shares and Trips Generated by Mode

Existing Mode Shares

In 2022, TOH distributed an employee commute survey to all Civic Campus staff that was prepared by Steer and Parsons to better understand current travel trends amongst different staff positions and levels. This survey helped refine the mode share assumptions and captured the widespread effect of COVID-19 (such as increased work from home opportunities) that was not accounted for in the initial estimate developed in the *TIA and Mobility Study (July 2021)*. For further details related to the employee survey, please refer to the Transportation Demand Management Strategy report.

A limitation of the 2022 employee survey was it did not include patients/visitor travel data that would be expected to have a higher auto-driver mode share. The survey results reflect a more optimistic view of travel behaviour for all campus users.

The reported mode share from the employee survey is shown in **Table 12**, and were lower than originally forecasted in the *TIA and Mobility Study (July 2021)*.

Table 12: Existing Employee Mode Shares at Civic Campus – 2022 Employee Survey

	Auto Driver	Passenger	Transit	Walk	Bike	Work from Home	Total
Staff Mode Share	62%	11%	7%	8%	6%	6%	100%

Future Mode Shares

The *TIA and Mobility Study (July 2021)* developed aggregate future mode share assumptions for all person-trips to/from the NCD, which had some limitations in not recognizing the discrete mode shares for different users (e.g. employees, planned visitors and emergency visitors), as this information was not clear or well defined at that time.

Since then, projected staff and visitor arrival and departure data have been provided by TOH, the project team was able to update future mode share assumptions to reflect each user-type noted above. Consideration was given for transit availability during different hours in day, the type of user, the trip context, and other factors which may influence someone from taking one mode of transportation versus another. At the end of this process, the updated mode share forecasts, when aggregated, was generally consistent with the original *TIA and Mobility Study (July 2021)* assumptions.

The mode share assumptions Opening Day 2028 and Full Buildout 2048 have been summarized in **Table 13** and **Table 14** respectively. It was assumed approximately 20% of administrative staff trips (approx. 25% of day shift employees are administrative staff) have been removed from people trips per time period for day shifts to reflect potential work-from-home opportunities separate from the traditional mode types, based on TOH guidance. These results mirror the future mode share assumptions made in the *Transportation Demand Management (TDM) Strategy* (within 0.5% related to rounding), which accounted for work-from-home as another mode share option based on the employee survey. Overall, the total number of trips and mode shares forecasted for 2028 and 2048 are consistent between both reports.

Table 13: Mode Share Assumptions by User Type at the NCD - 2028

Type of Shift / Patient	Auto Driver	Passenger	Transit	Walk	Bike	Total
Staff Shift Type						
Day Shift	40%	7%	44%	1%	8%	100%
Evening Shift	75%	14%	6%	1%	4%	100%
Night Shift	75%	15%	6%	1%	3%	100%
12hr Day Shift	50%	10%	35%	1%	4%	100%
12hr Night Shift	50%	11%	33%	1%	5%	100%
Patient Type						
Planned	60%	15%	20%	1%	4%	100%
Unplanned	80%	20%	0%	0%	0%	100%
SUBTOTAL WEIGHTED AVERAGE STAFF + PATIENTS						
Combined	**51.4%**	**10.5%**	**31.4%**	**1.0%**	**5.8%**	**100%**

Table 14: Mode Share Assumptions by User Type at the NCD - 2048

Type of Shift / Patient	Auto Driver	Passenger	Transit	Walk	Bike	Total
Staff Shift Type						
Day Shift	25%	11%	54%	2%	8%	100%
Evening Shift	70%	18%	7%	2%	3%	100%
Night Shift	70%	18%	7%	1%	4%	100%
12hr Day Shift	40%	15%	37%	2%	6%	100%
12hr Night Shift	40%	18%	34%	2%	6%	100%
Patient Type						
Planned	45%	25%	25%	2%	3%	100%
Unplanned	80%	20%	0%	0%	0%	100%
SUBTOTAL WEIGHTED AVERAGE STAFF + PATIENTS						
Combined	**36.3%**	**14.7%**	**40.6%**	**2.1%**	**6.3%**	**100%**
Life Sciences Park						
Commercial	12%	3%	5%	40%	40%	100%
Medical/Research	25%	8%	57%	5%	5%	100%

Trips by Mode

The future mode share assumptions were applied to person-trip volumes from each user type: employees and visitors, in 2028 and 2048. The assumptions were also applied to the person-trip results for the future Life Sciences Park, and layered onto the hospital peak hour volumes, but only accounted for the 2048 horizon. Additionally, the emergency, supplementary, and large transports were added separately to the peak hour traffic volumes at each horizon. The anticipated peak hour traffic volumes (including the PM peak hour of the generator) in 2028 and 2048 are shown in **Table 14** and **Table 15** respectively.

To reflect a worse-case scenario, the trip generation assumptions for the LSP were assigned only during the AM and PM peak hours for the adjacent street, not the PM peak of the generator. There is a likelihood of peak period spreading of LSP trips, which will be confirmed and applied accordingly during the site plan control application for the LSP, however the buildout date and data is too limited at this time to provide an accurate representation outside of peak hours of street. For a full breakdown of each hour, please refer to **Appendix D.**

Table 15: Trips Generated by NCD by Mode Shares – 2028

Mode Share		Auto Driver	Auto Passenger	Transit	Walk	Bike	TOTAL 2-WAY
AM Peak * 07:00 - 08:00	IN	611	112	570	14	101	1,408
	OUT	233	47	86	3	15	384
	TOTAL	844	159	656	17	116	1,792
PM Peak Generator 15:00 - 16:00	IN	164	33	27	2	8	234
	OUT	403	74	367	9	67	920
	TOTAL	567	107	394	11	75	1,154
PM Peak Adjacent Street 16:00 - 17:00	IN	164	33	27	2	8	234
	OUT	357	66	315	8	58	804
	TOTAL	521	99	342	10	66	1,038
*AM Peak is both of Adjacent Street and Generator Green – Proportion of Arrivals to NCD; Blue – Proportion of Departures from NCD							

Table 16: Trips Generated by NCD by Mode Shares – 2048

Mode Share		Auto Driver	Auto Passenger	Transit	Walk	Bike	TOTAL 2-WAY
AM Peak * 07:00 - 08:00	IN	842	353	1,495	69	219	2,978
	OUT	346	113	188	16	37	700
	TOTAL	1,188	466	1,683	85	256	3,678
PM Peak Generator 15:00 - 16:00	IN	291	92	60	8	12	463
	OUT	748	322	1,384	52	204	2,710
	TOTAL	1,039	414	1,444	60	216	3,173
PM Peak Adjacent Street 16:00 - 17:00	IN	266	86	111	30	33	527
	OUT	615	258	1,090	67	173	2,203
	TOTAL	881	344	1,202	97	206	2,730
*AM Peak is both of Adjacent Street and Generator Green – Proportion of Arrivals to NCD; Blue – Proportion of Departures from NCD							

3.1.3 Trip Distribution

The proposed number and location of site accesses has not changed from the original *TIA and Mobility Study (July 2021)*. Overall, the trip distribution will remain the same, with approximately 35% of trips going to and from the east and west and approximately 15% of trips going to and from the north and south.

3.1.4 Trip Assignment

The new site generated trips from **Section 3.1.2** were assigned to the road network based on the updated trip distribution, which have been shown in **Figure 3** and **Figure 4** for Opening Day 2028 and Full Buildout 2048 respectively. The proposed parking layout on the campus have evolved, which affected the trip assignment. Specifically, there was a minor increase in vehicular traffic at the Road E/Prince of Wales Drive intersection with a corresponding reduction at all other accesses when compared to the *TIA and Mobility Study (July 2021)*. Further details related to on-site parking can be found in **Section 4.2.**

Please note, as part of the design review of the Road E/Prince of Wales Drive intersection, both City staff and TOH agreed that there were too many constraints (e.g. environmental, tree and drainage impacts etc.) to develop a traditional protected intersection or roundabout design at this location. Therefore, an unsignalized intersection with a restricted outbound left-turn from Road E was agreed upon as the preferred design proposal. This collaborative choice has been reflected in the trip assignment, particularly shifting all outbound left-turns to the outbound right-turn, followed by an increase in U-turn traffic at The Scenic Driveway/Prince of Wales Drive roundabout to proceed north.

Further details related to the final design for Road E/Prince of Wales Drive intersection can be found in **Section 4.4**.

Figure 3: 2028 Opening Day Site Generated Volumes (Streets Adjacent to NCD)

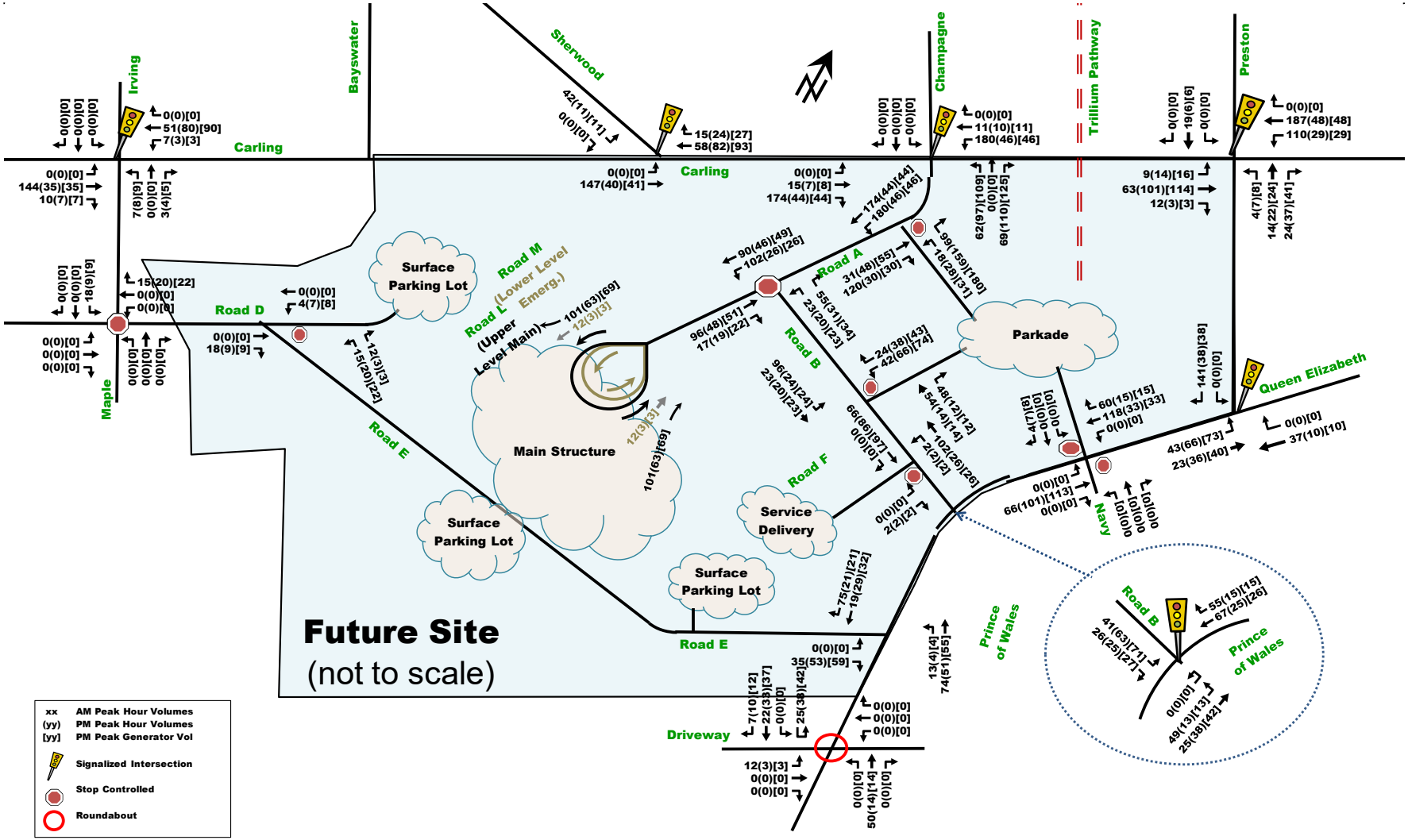
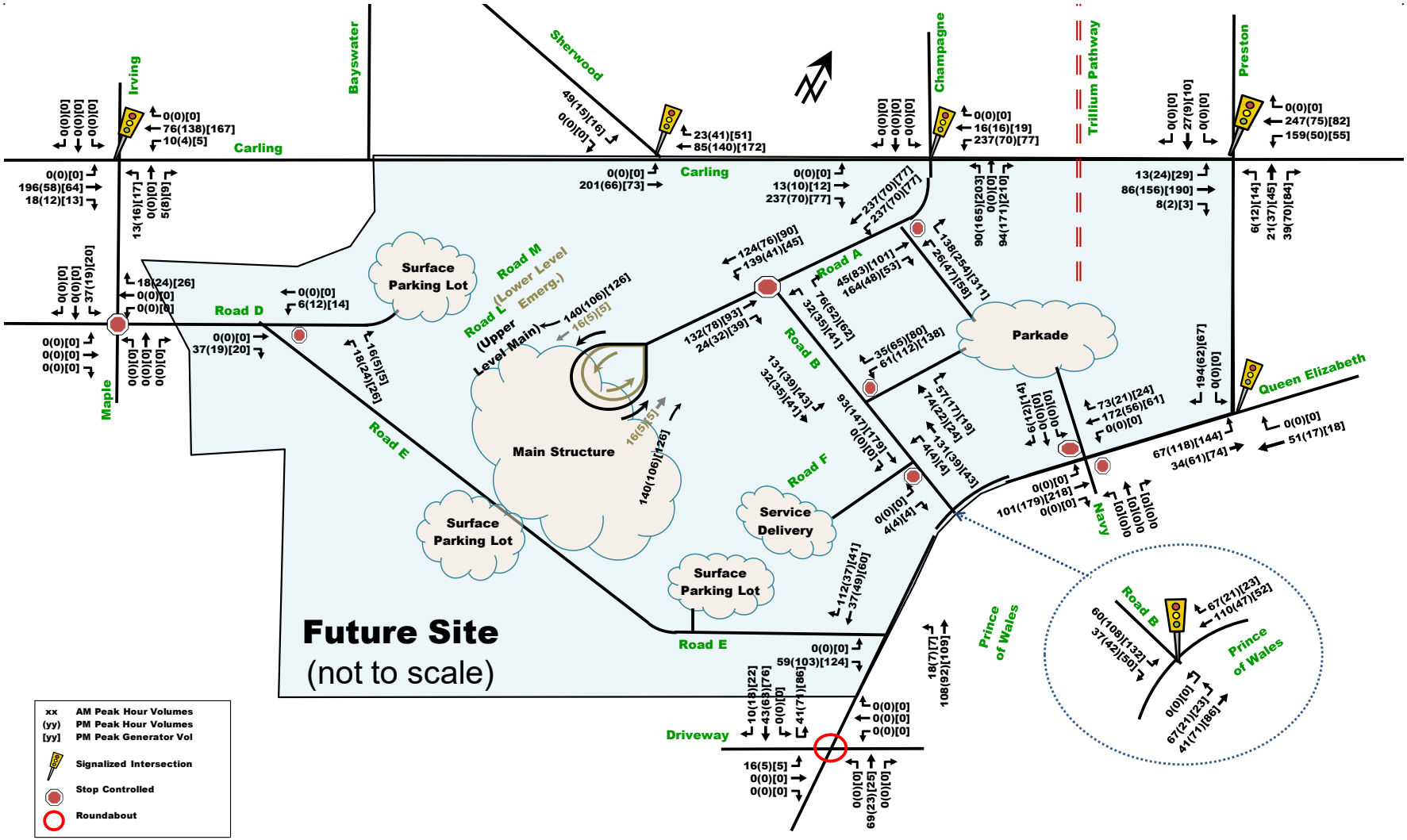


Figure 4: 2048 Full Buildout Site Generated Volumes (Streets Adjacent to NCD)



3.2 Background Network Travel Demands

Since the submission of the *TIA and Mobility Study (July 2021)*, TOH retained a 'Streetlight' software license which uses historic pings from location-based devices. Using this software tool in combination with existing peak hour traffic counts and TRANS data, Parsons was able to better estimate existing vehicle trips traveling to and from the existing Civic Campus.

For the 2028 background volume horizon, the hospital land use proportion of trips was removed from the network while the trips destined to the UOHI were maintained, estimated based on employee proportions provided by TOH. For the 2048 background volume horizon, the remaining trip generation from the UOHI were removed from the network.

In both horizon years, rehab vehicle trip generation were estimated and added separately following the same process as "Day Shift" staff in **Section 3.1.1.** As previously noted, the rehab program is expected to remain at the existing Civic Campus site.

Finally, some turning movements were balanced to the existing peak hour counts and TRANS data, to ensure the total volumes exiting and entering the greater network aligned better with the total vehicle volumes and directional splits as determined by Streetlight.

Other area development background volumes were updated to reflect the latest development applications within the study area, as discussed in **Section 2.1.4.** The new developments were added to the background volumes for all subsequent analyses. The combined other area development site generated traffic volumes have been provided in **Appendix E.**

Overall, the future background volumes in the TIA Addendum #2 were higher (more conservative) compared to the *TIA and Mobility Study (July 2021)* as they include additional other area developments and less conservative reduction factors related to the existing Civic Campus.

3.3 Demand Rationalization

Table 17 provides a comparison of the trip generation results from **Section 3.1** and the *TIA and Mobility Study (July 2021)*.

Table 17: TIA and Mobility Study Trip Generation (July 2021) vs Updated Trip Generation (2023)

Mode Share	Original (2021) TIA Peak Street		Updated (2023) Peak Street		% Change		New (2023) Peak Generator		New (2023) Peak 3h Total	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
2028										
Vehicle IN	764	456	611	164	-20%	-64%	611	164	1,466	629
Vehicle OUT	359	530	233	357	-35%	-33%	233	403	394	957
TOTAL 2-way	1,123	986	844	521	-25%	-47%	844	567	1,860	1,586
2048										
Vehicle IN	914	557	842	266	-8%	-52%	842	291	2,177	934
Vehicle OUT	434	646	346	615	-20%	-5%	346	748	565	1,563
TOTAL 2-way	1,348	1,203	1,188	881	-12%	-27%	1,188	1,039	2,742	2,497

The updated trip generation process resulted in notably lower peak hour vehicle traffic volume estimates in both 2028 and 2048 compared to the *TIA and Mobility Study (July 2021).* The key reasons the updated results were considered more reliable and acceptable for this study is as follows:

- The *TIA and Mobility Study (July 2021)* aggregated the trip generation process by developing a local trip generation rate based on the existing Civic Campus, which comprised of a single day traffic count

at each access to the existing campus. This approach, while a common practice in the industry, is less reliable as it represents a single sample and risks not being representative of a typical weekday. The first principles approach based on projected employee shift schedules and historical arrival/departure data for employees and visitors provides a much more comprehensive and accurate forecast of travel activity at the NCD.

- The *TIA and Mobility Study (July 2021)* developed a trip generation rate using existing Civic Campus traffic counts that blended three independent variables: the number of beds, number of employees and the gross floor area. This approach is acceptable if no other information is available about employee travel patterns, but is less reliable based on how different the building design of existing Civic Campus will be compared to the NCD.
- The estimated number of employees at the NCD in 2028 and 2048 has decreased 24.6% and 4.6% relatively since the original *TIA and Mobility Study (July 2021)*, as more information about future programs has come to light.
- The original *TIA and Mobility Study (July 2021)* did not factor in remote work potential, which has since been confirmed by TOH. The assumed peak hour activity in the *TIA and Mobility Study (July 2021)* was based on the existing Civic Campus traffic counts prior to COVID-19.

There have been no major changes to the planned transportation network surrounding the NCD. Projects such as the planned Carling Avenue Transit Priority project (introduced by year 2028 with median bus lanes from Bronson Avenue to Sherwood Drive and curb bus lanes from Sherwood Drive to Lincoln Fields), the city-wide active transportation and transit initiatives, and active connections to the adjacent pathway networks remain the same. It has been acknowledged that the City of Ottawa is in the process of prioritizing works on Bronson Avenue Renewal, which includes potential enhancements to active transportation and transit, in addition to the Carling Avenue Transit Priority project. The demand rationalizations developed in Section 4.3 in the original *TIA and Mobility Study (July 2021)* were still considered acceptable and were applied to peak hour traffic background volumes for 2028 and 2048 in this study.

The future background volumes were updated based on a new process discussed in **Section 3.2**. The demand rationalized background volumes and future forecasted volumes with the site generated trips, including updated other area developments have been provided in **Appendix F**

4.0 STRATEGY REPORT

4.1 Development Design

4.1.1 Design for Sustainable Modes

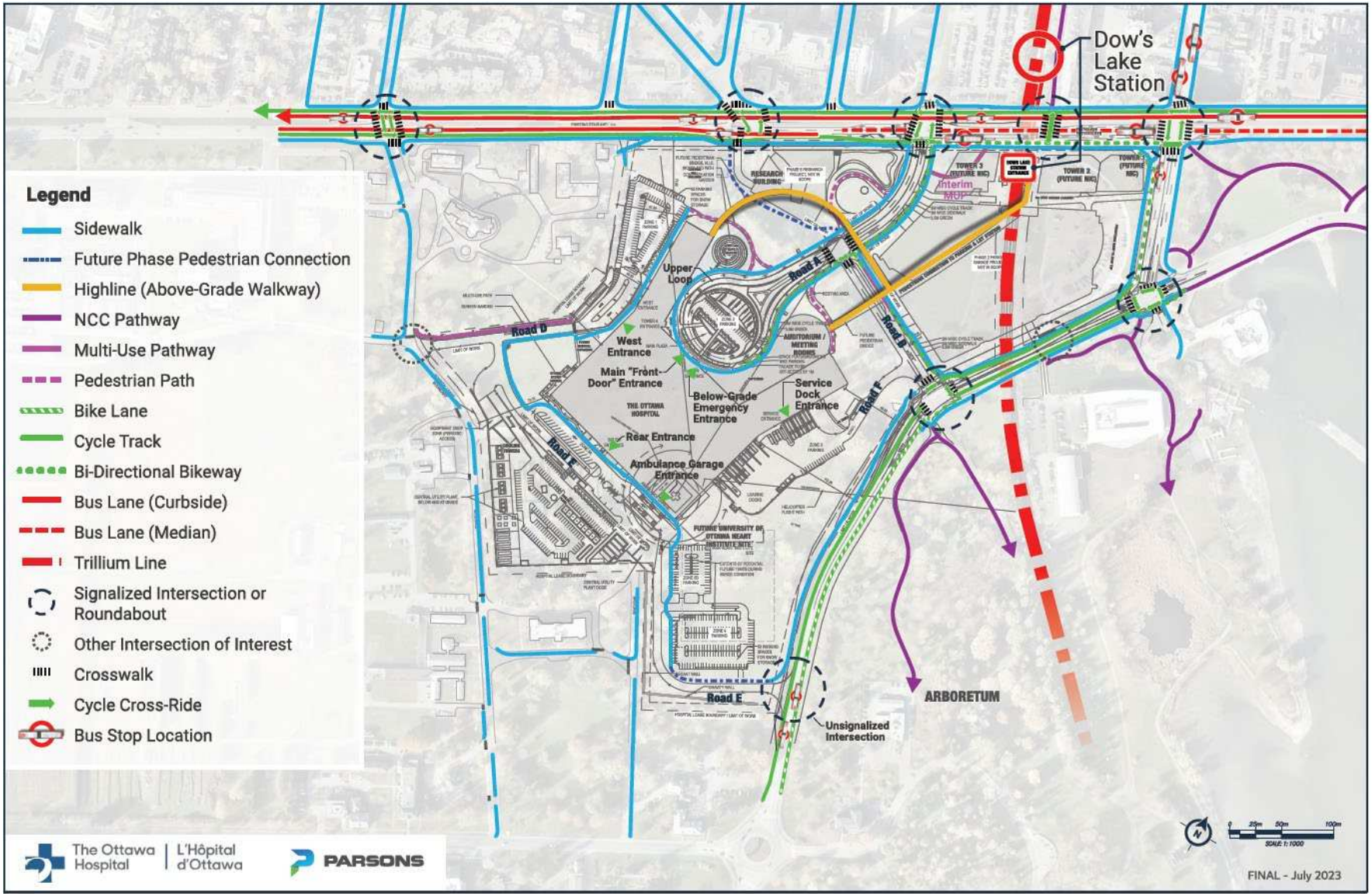
The overall NCD site plan has undergone various refinements since the *TIA and Mobility Study (July 2021)* was submitted, however, many of these changes had little to no effect on the conclusions and recommendations from the previous submission. The more notable changes are discussed below.

The original *TIA and Mobility Study (July 2021)* assumed entry to the parking garage via Road A was only open to the public, while the Road B and Navy Private parking garage accesses were open to staff only, for the purpose of balancing traffic distributions onsite and avoid congestion on the internal road network that risks spillback onto the municipal road network. These assumptions were reassessed in this study with updated development information, and it was determined that these entry restrictions for specific user groups were no longer required. The proposed parking garage can be accessed by all user groups with low risk of congestion spilling back to the municipal road network. The type of entry/egress control into the parking garage has not been finalized yet, but could include license plate readers or other evolving parking management technologies (further discussion on access is provided in Section 4.1.2).

The Active Transportation Plan for the NCD has been updated to reflect ongoing collaboration with City of Ottawa and the NCC, shown in **Figure 5**. The overall active transportation plan for the NCD in the original *TIA and Mobility Study (July 2021)* has undergone various refinements. A list of the key changes is as follows:

- All pathways on site will be winter maintained and lit, with rest areas proposed every 30m.
- The Prince of Wales intersections at Preston and Road B are currently proposed as protected intersections, as per the City's Protected Intersection Design Guidelines (PIDG).
- The proposed Road E/Prince of Wales Drive intersection design is ongoing. The *TIA and Mobility Study (July 2021)* proposed an unsignalized all movement intersection at this location. As previously discussed in this report, the latest direction from City of Ottawa staff and TOH is to develop an unsignalized intersection that restricts the outbound left-turn movement that would reduce various environmental impacts compared to a signalized protected intersection and maintain adequate long-term operational performance. An unsignalized intersection at this location would also eliminate active transportation facilities crossing Prince of Wales Drive, but a new southbound cycle track and a new 2m concrete sidewalk will be provided on the west side of Prince of Wales Drive between Road B and south of Road E, improving upon the existing pedestrian and cycling experience along Prince of Wales. The east side of Prince of Wales will maintain existing conditions through the intersection.
- In the *TIA and Mobility Study (July 2021),* there was a gap in active transportation facilities on the south side of Road A between the front door of the NCD and the Road A/Road B intersection. The *TIA Addendum #2 Draft (November 2022)* proposed a multi-use pathway (MUP) to fill this gap, along with new bike parking facilities near the front door of the hospital. This MUP has since been upgraded to separate pedestrian sidewalk and a bi-directional cycle track facilities to provide an even better active transportation experience and connectivity within the site.
- Due to AODA standards compliance, a short section of approximately 60m in length on Road B between the Road B Garage Access and Road A/Road B intersection bidirectional cycle-track will require a "mixing" zone for cyclists to mitigate conflict points between pedestrians crossing from the layby are to the adjacent sidewalk.
- A new 2m wide pedestrian path has been proposed that connects the sidewalk along the west building face around to the Road A sidewalk near the front of the main building, called "Woodland Path". This path is proposed as an 'experiential' pathway for health and wellness and is not meant as a commuter route for cyclists. A connection from Sherwood Drive to the front door via the Woodland Path has been identified for pedestrians and will be explored in future phases of the development, namely the Research Building. A cycling connection at this location is not anticipated due to grade issues, loss of tree canopy, anticipated user (Woodland Path) and future Research Building.
- The sidewalk on Road D has been relocated to the opposing side and has now been upgraded to a MUP between Maple Drive/Road D intersection and the proposed bike parking adjacent to the pedestrian crosswalk on Road D. Once on the southern side of Road D, a sidewalk will extend east towards the West Entrance and a series of smaller pedestrian desire lines and west towards the rear entrance.
- Temporary eastbound uni-directional cycle tracks are proposed along the Carling Avenue frontage between Sherwood Drive and Road A-Champagne Avenue to replace former Queen Juliana Park connection between Sherwood Drive and Prince of Wales Drive. In the following phase of construction, Phase 5 – Research Building, the potential for creating a connection from Sherwood Drive to Road A/Road B intersection will be explored. This connection will not be included within this phase of construction since the final design for the research building has not been completed and that area may be used as a staging zone during construction of the Research Building.

Figure 5: Future Active Transportation Network Map



- The designs for the Road A/Road B and Road E/Prince of Wales Drive intersections have been enhanced with additional active transportation facilities and treatments to meet AODA requirements.
- Sidewalk facilities along Road E near Prince of Wales Drive were purposely omitted for Phases 3 and 4 to prevent pedestrian activity near the emergency area. Zones 5B and 4 (where the future University of Ottawa Heart Institute is proposed) will function in the interim as an emergency staging area for surge emergency events in addition to its planned emergency access point for ambulances. TOH operations prefer walking traffic from non-emergency staff and the public be restricted until such time the University of Ottawa Heart Institute phase is implemented. At that time, when surge capacity may be considered elsewhere on the campus such as Zone 1 parking, the opportunity to expand the sidewalks facilities will be examined, along with the need for an east-west pedestrian crossings at the Road E/Prince of Wales Drive intersection.
- Some of the pedestrian and cycling facility widths have been increased, namely the Preston Street and Prince of Wales Drive segments fronting the site.
- As previously noted, new unidirectional cycle track and sidewalk has been proposed on the west side of Prince of Wales Drive between Preston Street to south of Road E. Similar facilities have also been provided on the east side of Prince of Wales between south of Road B and Preston Street. These modifications will greatly improve the pedestrian and cycling experience along Prince of Wales.
- An Environmental Assessment (EA) is currently underway for an improved connection between Dow's Lake Station and the NCD, along with a potential MUP bridge crossing over the Trillium Line Corridor which would connect the Trillium MUP to the Road A cycle and pedestrian facilities.

In general, sidewalks are now 2m or wider, Multi-Use Pathways (MUPs) are 3m wide, and uni-directional cycle tracks are 1.8m or wider, which meet or exceed minimum requirements. A detailed breakdown of active transportation facility widths has been provided in **Appendix G**.

Additional considerations that were ultimately ruled out include:

- The extension of a multi-use pathway between Road D (adjacent to the West Building entrance) to Carling Avenue was ultimately ruled out due to significant grade issues. In order to provide connectivity between the proposed Road D MUP and Carling Avenue, winding turns would need to be provided to obtain an AODA approved slope. These winding turns would utilize a larger footprint resulting in further tree canopy loss and would encroach on the landscaping between the NCD and the Dominion Observatory. The Road D MUP is currently proposed to end at the proposed bike storage facilities.

It is important to note that discussions are ongoing between TOH, NCC and City of Ottawa on the ultimate design of active transportation facilities on the campus, which may result in further refinements to the Active Transportation Plan as part of the Developed Design.

4.1.2 Circulation and Access

Circulation within the site remains consistent to what was shown in the *TIA and Mobility Study (July 2021)*. The design of the curb space in front of the main entrance of the hospital building has been revised to include 8 layby spaces required for short-term patient/visitor drop-offs. In addition, TOH has provided a dedicated space that accommodates an articulated bus that may be shared with ParaTranspo vehicles located within 30m of a main entrance. There will be opportunities to explore other refinements at the main entrance during the Developed Design stage.

Road D is still envisioned as an emergency access only. TOH is exploring the feasibility of adding a gate control at this access to prevent cut through traffic by non-emergency personnel. Similarly, parking lot access /egress control options for the entire campus are currently being explored as part of a wider parking management implementation plan, which includes exploring contemporary parking technology infrastructure to create a

frictionless experience for the user, such as license plate readers, online payment platforms, real-time wayfinding etc. Further details on parking access controls will emerge during the Developed Design.

The ultimate forms of Roads A and B, and Road A/Road B intersection are still being discussed between NCC and TOH, with the latest design provided in this report (referenced in Section 4.3). However, there is not expected to be fundamental changes to the design or location of internal streets and intersections. Only minor refinements may be expected over the course of the Developed Design.

4.2 Parking

4.2.1 Parking Supply

Vehicle Parking

Table 18 summarizes the minimum required and maximum permitted parking spaces based on the land uses and location of the NCD.

Table 18: Minimum Required and Maximum Permitted Vehicle Parking Spaces

Land Use		GFA x 1,000 m²	Min Rate	Min Required	Max Rate	Max Permitted
Opening Day 2028	Hospital	155	0.7/100 m²	1,085	1.6/100 m²	2,480
Full Buildout 2048	Hospital Expansions[1]	175	0.7/100 m²	1,225	1.6/100 m2	2,800
	Office	23.5	1/100 m²	235	2.2/100 m²	517
	Research and Dev.	6	0.4/100 m²	24	1/100 m²	60
	Medical Facility	22	2/100 m²	440	5/100 m²	1,100
	Retail	7	1.25/100 m²	88	3.6/100 m²	252
			Min Required	3,097	Max Permitted	7,209
			Total Provided[2]	By 2028: 3,292 By 2048: 3,095		
			Additional NCC Parking Spaces in Parking Garage	200		

1. This row pertains to the future expansion of the Hospital and Heart Institute, which are not included in Phases 3 and 4.
2. Total parking supply in 2028 includes 172 parking spaces designated for snow storage, emergency surge events, and temporary police parking. By 2048, these ancillary lots will be replaced by the new UOHI building.

The total number of vehicle parking spaces has changed with the redistribution of spaces in the parking garage and the surface lots within the campus. The parking garage has increased in capacity to roughly 2,870 spaces (including 200 designated for NCC parking), but the overall footprint and size of the previously proposed parking garage remains the same.

The current Site Plan now proposes 622 surface parking spaces, including 100 spaces that will function as snow storage space during winter and 72 flex spaces which function as additional space for surge capacity (i.e., emergency tents during disaster or medical events etc.), which raised the total parking spaces provided higher than quoted in the original *TIA and Mobility Study.* However, these additional spaces do not count towards the by-law requirement (not reflected in Table 18), but they have been considered in this report and the *TDM Strategy* when reviewing parking management; discussed further in **Section 4.2.2**. By 2048, roughly 197 spaces will be lost when the new University of Ottawa Heart Institute building is constructed, there are currently no plans to replace these lost spaces.

The number and location of parking spaces are expected to undergo refinements as TOH proceeds to developed design, but the overall recommendations from the *TIA Addendum #1 (October 2021)* in support of Phase 2 Site Plan Application for the Parking Garage and Green Roof are still valid.

Bicycle Parking

The number of bike parking spaces within or near the parking garage compared to **Section 4.1.2** of the *TIA Addendum #1 (October 2021)* has been reduced from approximately 540 bike parking spaces to 310. However, the total quantity of bike parking proposed, 630 on campus, is still consistent with the *TIA and Mobility Study*

(July 2021) and meets the minimum required bike parking. The reduction in bike parking spaces within the parking structure reflects an effort to redistribute bike parking closer to the front door of the hospital and reduce the walking distance for cyclists from the place that they park their bike to walk into the NCD structure. The new Site Plan proposes 48 new short-term outdoor bike parking spaces near the front door of the NCD, 168 long term covered/secured bike parking and 104 short term covered bike parking on the northwest wing of the NCD adjacent to the hospital structure, 184 long term covered/secured bike parking and 126 outdoor short term bike parking within the parking garage structure, for a combined total of 630 bike parking spaces. Bike parking will be provided as a Type C – classic bike inverted U rack. Future phases of the NCD will determine if additional bike parking is required and where it should be added.

NCD also proposes showers and storage lockers, located near the bike parking at the west entrance of the NCD within levels E1 and level 1. Another facility is also proposed near the main entrance and pavilion entrance, near to the public elevator core.

Similar to vehicle parking statistics, the distribution, type and final number of bike parking spaces are still under refinement and will continue to evolve into the Developed Design.

4.2.2 Parking Demand and Spillover

As previously noted, this section of the report has been exempted. TOH is preparing two separate studies that will discuss on-site and off-site parking management.

On-site parking management will be a central focus of the *TDM Strategy* (discussed further in Section 4.5), which aims to define policies, measures, and strategies to aid TOH in reducing single-occupant vehicle demand at the NCD. The *TDM Strategy* anticipates there will be surplus parking to accommodate projected parking demand by 2028 and only a minor shortfall by 2048 with recommended TDM measures in place.

Although a surplus parking supply is expected at Opening Day 2028, TOH can regulate the quantity of parking spaces available to drivers to support the TDM Strategy, via gate control, on-site enforcement, or simply restricting access to spaces. The surplus during 2028 is also an important redundancy in the event of significant snowfall or emergency event, as well as to ensure there is sufficient parking available to prevent community parking infiltration.

The off-site parking implications were discussed in detail within the *Off-Site Parking Strategy*, including potential mitigation options. An important element of the OPS report is the recommended regulatory changes to better protect neighbourhood streets from parking infiltration, and the process that is outlined, which provides the local communities the mechanism to initiate these changes with City staff at the appropriate time prior to opening day of the NCD.

It is important to recognize that the TDM and OPS are synergistic strategies to tackle a common issue, parking management. If supply constraints occur, the 1st option is always to revisit and adjust TDM measures to reduce parking demand, but implementation of some policies and the needed culture changes often take time. The OPS offers tools to stem community impacts until such time TDM is able to affect change. The hope is contingency measures are never needed. Any temporary increases in parking supply would be limited to use by staff only, and would be gradually reduced as more robust TDM measures are implemented.

4.3 Boundary Street Design

There have been some refinements made to the boundary streets since the original *TIA and Mobility Study* submission, the differences have been discussed below and their respective multi-modal level of service (MMLOS) for interim conditions has been summarized in **Table 19**:

- The full buildout segment of Carling Avenue between the Trillium Pathway and Preston Street is envisioned to have a 3.5m sidewalk with more than 2m boulevard separation and a 3m bi-

directional cycle-track. The interim design proposes a 3m bi-directional cycle track and a 2m sidewalk without a boulevard separation.

- The full buildout segment on Preston Street from Carling Avenue to Prince of Wales Drive was originally proposed as a 3m sidewalk with a 3m cycle-track and greater than 2m boulevard separation. The latest RMA proposes a 3m sidewalk with a 3.5m bi-directional cycle-track and greater than 2m boulevard separation to be built prior to Opening Day 2028. Although an improvement to cycling facilities, the MMLOS analysis will show the same results.
- The full buildout segment on Prince of Wales Drive from Preston Street to Road B was originally proposed as a 2m sidewalk with a 2m unidirectional cycle-track and greater than 2m boulevard separation. The latest RMA proposes a 2m sidewalk with a 1.8m unidirectional cycle-track and greater than 2m boulevard separation to be built prior to 2028 Opening Day. The MMLOS analysis will show the same results.
- No changes anticipated for Maple Drive.

Table 19: Future Interim 2028 Adjacent Road Network MMLoS

Road Segment	Multi-Modal Level of Service (MMLOS)								
	Pedestrian			Bicycle		Transit		Truck	
	Full Buildout PLoS	Interim PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Carling Ave.	C	E	A	No change from Table 36 in original TIA and Mobility Study (July 2021)					
Preston St.	C	C	A						
Prince of Wales Dr.	C	C	A						

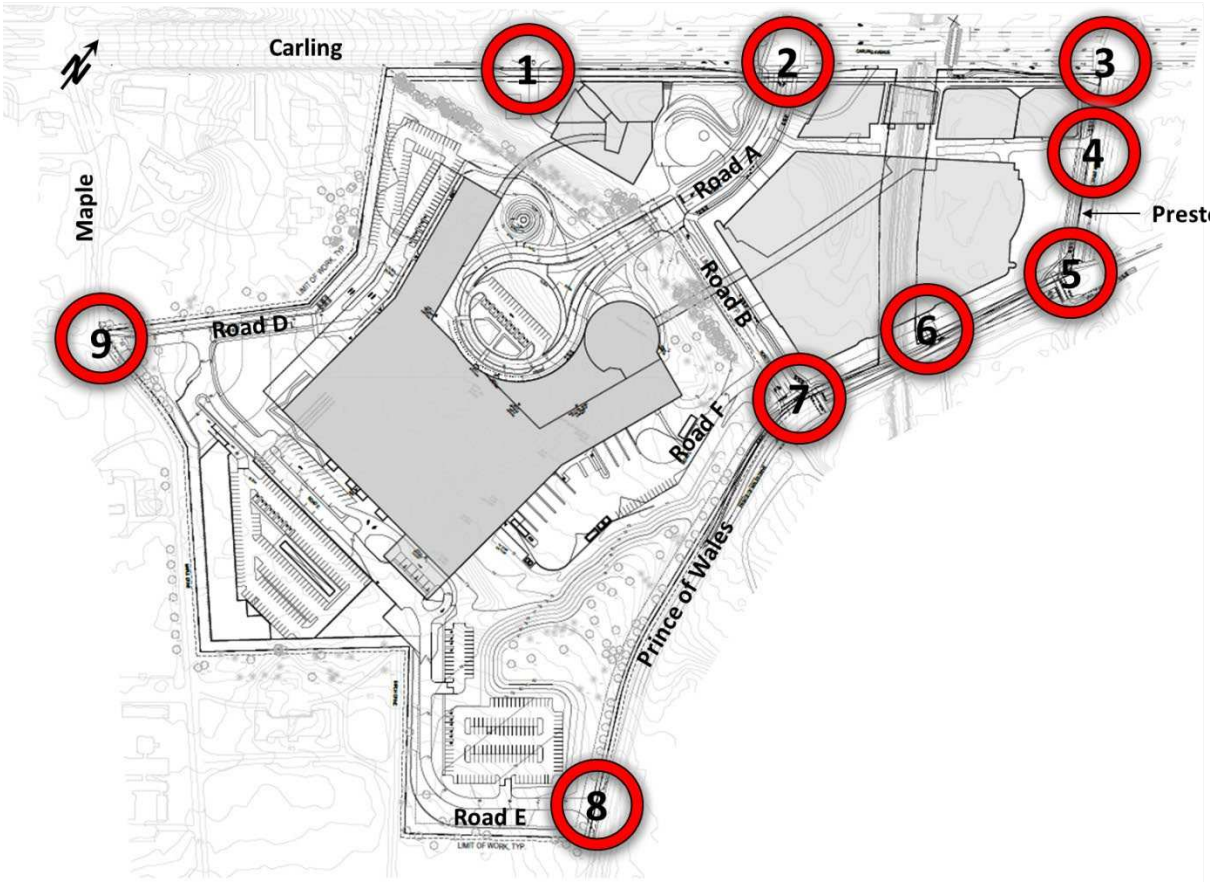
As shown in **Table 19**, Preston Street and Prince of Wales Drive segments are expected to be constructed to its ultimate design by Opening Day 2028 and show no changes in MMLoS performance. The Carling Avenue frontage will be redeveloped as part of the Carling Avenue Transit Priority Project and is expected to include pedestrian and segregated cycling facilities.

It is important to note while there has been general consensus on the proposed off-site roadway modifications proposed at the NCD, there may be further refinements made to these designs as part of the Developed Design process.

4.4 Access Intersection Design

Figure 6 below illustrates the study area intersections along the NCD frontage. Intersections 1, 2 and 3 (on Carling Avenue) will be built to interim conditions until the Carling Avenue Transit Priority project is implemented. The precise timing of Carling Avenue works is currently unknown but anticipated prior to 2029. All other intersections are expected to be constructed to their ultimate design before Opening Day 2028.

Figure 6: Study Area Intersections Fronting the NCD Site



A description of the key changes to the noted intersection is provided below. It is important to note that the intended function and expected users of each intersection has not fundamentally changed since the *TIA and Mobility Study (July 2021)* submission – only the designs of certain intersections have been refined.

At this time, two of the four designs have been approved by City staff, including Road A/Carling Avenue and Prince of Wales Drive/Preston Street. The Road B/Prince of Wales Drive intersection design had been approved, but a recent modification in the design will trigger a resubmission. The first design submission for the Road E/Prince of Wales Drive intersection has been initiated.

A composite plan showing the proposed off-site intersection designs, as well as vehicle turning templates have been provided in **Appendix H**.

1. **Carling Avenue/Sherwood Drive:** No changes are anticipated from the original *TIA and Mobility Study (July 2021)*.
2. **Carling Avenue/Champagne Avenue/Road A:** An interim new south leg will be built as part of the NCD, with a 75m-long westbound left-turn lane and a 30m-long eastbound right-turn lane are proposed. An extended concrete island on the west approach is proposed to provide a pedestrian shelter when crossing Carling Avenue. Once the Carling Avenue Transit Priority Project is implemented, it is anticipated that all approaches will have unidirectional cross-rides. The ensuing intersection performance analysis reflects a bi-directional cross-ride on the south approach, which represents a worst-case scenario (i.e., would require a time separated phase and an eastbound right-turn lane). The northbound through movement will be prohibited at this intersection to reduce traffic infiltration along Champagne Avenue and Beech Street.

3. **Carling Avenue/Preston Street:** No changes are anticipated from existing conditions until such time that the Carling Avenue Transit Priority Project is implemented. No changes are anticipated from the original *TIA and Mobility Study (July 2021)* for the full buildout design. Once the Carling Avenue Transit Priority Project is implemented, it is anticipated that all approaches will have uni-directional cross-rides. The ensuing intersection performance analysis reflects a bi-directional cross-ride on the south approach, which represents a worst-case scenario (i.e., would require a time separated phase and an eastbound right-turn lane).

4. **Life Science Park Laneway/Preston Street:** the original *TIA and Mobility Study (July 2021)* suggested a one-way laneway from Preston Street to Road A. This assumption is still valid for horizon year 2048, once the Life Science Park is built. Prior to construction of the Life Science Park, the laneway will not connect across the Trillium Line and will function as a two-way laneway reserved for service vehicles and snow removal. It is anticipated to have very limited traffic and during off-peak hours only.

5. **Prince of Wales Drive/Preston Street:** The design of this intersection has evolved considerably since the original *TIA and Mobility Study (July 2021)*. In consultation with City of Ottawa staff and the NCC, the design has been augmented to a fully protected intersection with a bi-directional cross-ride on the west side (to facilitate the realigned Trillium Pathway connection), north side, and south side, with a unidirectional cross-ride on the east side.

6. **Prince of Wales Drive/Navy Private/Parking Garage Access:** No changes are anticipated from the original *TIA and Mobility Study (July 2021)*.

7. **Road B/Prince of Wales Drive:** The design of this intersection has evolved considerably since the original *TIA and Mobility Study (July 2021)* and the *TIA Addendum #2 Draft (November 2022)* submission. The most notable change is the conversion of the shared through-right and through lane with two receiving lanes to a single right-turn lane and single through lane with a single receiving lane. This decision was made collaboratively with city staff to minimize environmental impacts along the Prince of Wales Drive frontage. City staff also confirmed they would be able to manage potential queues on Prince of Wales Drive through signal timing optimizations. Potential queuing implications and risks will be discussed in **Section 4.9**.

   A uni-directional cross ride is now proposed on the north approach and a bi-directional cross-ride is proposed on the east approach of the intersection, which connects the bi-directional cycle track on the northeast side of Road B to the NCC pathway network near the Arboretum.

8. **Road E/Prince of Wales Drive:** This intersection was originally proposed as an all-movement unsignalized intersection with a stop-control on the Road E approach within the *TIA and Mobility Study (July 2021)*. Since that time, anticipated site generated traffic has been refined based on the evolving site plan, which resulted in more traffic utilizing Road E than previously anticipated and the all-movement unsignalized intersection no longer being sufficient to accommodate future NCD traffic.

   At one point, either a signalized protected intersection or a roundabout was being contemplated, but both were ruled out due to significant environmental, drainage, and cost constraints. The latest direction with guidance from City of Ottawa, NCC and TOH has led back to an unsignalized intersection with a restricted outbound left-turn movement from Road E, which avoids the various constraints but still provides long-term operational capacity. A northbound left-turn lane and a southbound right-turn lane on Prince of Wales Drive will be provided and single through lanes north-south.

9. **Maple Drive/Winding Way/Road D:** No changes are anticipated from the original *TIA and Mobility Study (July 2021)*. TOH maintains their commitment to restrict access to Road D to emergency vehicles only, reducing traffic implications on Maple Drive.

Similar to the *TIA and Mobility Study (July 2021)*, traffic control signal warrants for Road B/Prince of Wales Drive and Road E/Prince of Wales Drive intersections were completed and in both cases, a signalized intersection was not warranted.

4.5 Transportation Demand Management

This section of the report has been exempted. TOH is preparing a comprehensive *Transportation Demand Management (TDM) Strategy* that will identify needs/opportunities, alternative solutions, and prepare a recommended plan that help TOH achieve the necessary mode share targets to limit single-occupant vehicle trips and ensure parking demand does not exceed supply at the NCD. This strategy also includes a long-term vision for TDM, through a framework that can be applied to all TOH hospitals and affiliates in the fullness of time. Key recommendations include, but not limited to:

- Continue work-from-home policies
- Virtual Care
- Travelling Doctors/Mobile Health Clinics
- TDM Coordinator
- TDM Platform
- Priority Carpool/Vanpool Parking
- Transit Subsidy
- Bike Room
- Bike Support Facilities
- Daily Parking Only (removing monthly passes if possible)

4.6 Neighbourhood Traffic Management

This section of the report has been exempted. TOH is preparing a comprehensive *Neighbourhood Traffic Management Strategy (NTMS)* that will identify needs/opportunities, develop a NTMS Toolkit, and prepare a recommended plan for area traffic management measures within the adjacent communities. Representatives from five adjacent community associations, Carlington Community Association, Civic Hospital Neighbourhood Association, Dalhousie Community Association, Dow's Lake Residents Association and Glebe Annex Community Association were engaged directly help identify community values, issues, and opportunities from varying perspectives, specific to each neighbourhood.

Various measures were recommended to help mitigate existing and potential future traffic implications related to the NCD in surrounding community associations, such as turn restrictions, speed humps, flex-posts etc. The strategy also included various community improvement measures for the City and/or NCC to consider that may not be directly related to area traffic management or the NCD, but were acknowledged as possessing intrinsic value and were of great importance to the local community associations.

The strategy also addressed the sensitivities of Maple Drive to the Central Experimental Farm (CEF) and Agriculture and Agri-food Canada (AAFC), and the recommended plan included measures to address potential concerns within the CEF.

4.7 Transit

The following transit discussion expands on the section provided in the *TIA and Mobility Study (July 2021)* now that more transit information has been provided by the City of Ottawa. The NCD will greatly benefit being located in close proximity to the Dow's Lake LRT Station (Line 2 – Trillium Line) and the future Carling Avenue Transit Priority Corridor – where bus rapid transit is envisioned within the next 10 years. As a result, there was a heavy focus on transit to move people to and from the site.

Transit Access

Although the site is predominantly within a 600m radius from the Dow's Lake LRT Station to the NCD, it is acknowledged this distance may be a challenge to some, predominantly those with mobility difficulties. The City is currently planning an Environmental Assessment (EA) process that would define possible grade separation solutions for pedestrians crossing Carling Avenue between Dow's Lake Station and the future Life Sciences Park.

Today, there are currently bus stops located on Preston Street between Carling Avenue and Prince of Wales Drive and on Prince of Wales Drive between Preston Street and The NCC Scenic Driveway. It is possible that in the future, OC Transpo may decide to bring these stops back in to regular weekday operation if demand exists. Similarly, buses may be routed via the front door of the hospital if there is such a demand; Roads A and B have been designed to accommodate this possibility as directed by City Council.

Future Transit Demand

For the purposes of this study, it was estimated that approximately two-thirds of transit trips will arrive or depart using the Trillium Line LRT, while the remaining one-third would use surface bus routes on Carling Avenue, Preston Street or Prince of Wales Drive in the future. This assumption was based on existing Civic Campus visitor origin-destination data and staff postal code information provided by TOH. In addition, factors such as how direct the route options to arrive to the NCD, how many transfers would be required, estimated transit travel time and available hours of service were all considered during this process.

Historic ridership data was requested from OC Transpo and has been provided in **Appendix I**. The data suggests low historic ridership, particularly the average load at departure for Line 2 LRT at Dow's Lake Station, which averages around 35 passengers on the train, on trains with capacity of approximately 500 passengers. It is important to note, however, that these average load departures are taken over a 3-hour period. Further communication with OC Transpo confirmed that the driving force for the Trillium Line ridership is Carleton University, specifically students. It is expected that loads will be much higher in the short periods prior to and after classes.

As previously shown in **Table 15** and **Table 16**, the NCD is forecasted to produce up to 650 new transit trips during the peak hour in 2028 and up to 1,700 new transit trips in 2048. For both 2028 and 2048, the peak transit activity for the NCD is forecasted between 06:00-07:00 based on projected staff schedules. In the PM peak, travel activity was found to be less focused to a single period. Once the Line 2 LRT returns to operation, it is forecasted that the line could provide capacity for approximately 2,500 passengers per direction per hour.

There is a potential risk of a very heavy transit demand hour, exceeding the Line 2 LRT capacity if NCD staff schedules were to coincide with class schedules. That said, current NCD staff daytime shifts (6am-7am) are expected to start earlier than typical University class schedules (8am-9am).

Transit Capacity

The Trillium Line is currently under construction as part of ongoing Stage 2 LRT expansion works by the City, which will increase the catchment area for the line and attract new users, namely: McDonald Cartier Airport; South Keys; Leitrim Park and Ride; and Riverside South. Line 1 LRT is also undergoing expansions, broadening its catchment area, and making the use of Line 1 to Line 2 connectivity more desirable. Based on the conservative estimate of 1,700 peak hour transit demand for the 2048 horizon year at the NCD, with a two thirds Trillium Line usage (approximately 1,200 LRT trips), combined with increased commuter ridership growth and continued Carleton University classes, it is possible that the Trillium Line may need additional capacity by 2048, which may include a full twinning of the Trillium Line, platform extensions to provide longer trains or increased train frequencies where available.

Recent data from OC Transpo suggests there has been a 50% decrease in transit usage post Covid-19 pandemic; however, these numbers are expected to return to normal in the fullness of time and likely grow as the transit network matures. Once the LRT line expansions are complete, and pending data from OC-Transpo regarding peak existing ridership arrives (Carleton University usage influence), then a more comprehensive understanding of route capacity can be completed.

4.8 Review of Network Concept

As shown in **Table 3**, this section of the report has been exempted as the Zoning By-Law Amendment (ZBLA) was approved in October 2021.

4.9 Intersection Design

As previously discussed, the anticipated peak hour of the NCD generator in the morning was found to coincide with the peak hour of the adjacent street. In the afternoon, the peak hour of the generator and of the adjacent street did not align, and both scenarios were analyzed in 2028 and 2048.

4.9.1 Intersection Performance

Similar to the *TIA and Mobility Study (July 2021)*, overall intersection performance in 2028 and 2048 did not change significantly, with 2048 normally performing only slightly worse than 2028. All signalized intersections were shown to operate within acceptable limits (LOS 'E' or better) overall, which was an improvement over the *TIA and Mobility Study (July 2021)*.

As for unsignalized intersections, Rochester Street/Carling Avenue intersection continued to perform at an LoS of 'F' for the critical southbound movement due to the proposed removal of through lanes on Carling Avenue and its heavy westbound through movement. If persistent delays are observed during peak hours at this intersection, drivers have the option of using adjacent signalized intersections instead such as Booth Street or Preston Street with Carling Avenue. The PM peak of the adjacent street almost always performed worse than the PM peak of the NCD.

A summary table of intersection performance for 2028 and 2048 has been provided in **Appendix J** and detailed Synchro outputs in **Appendix K.** All results in this study do not vary significantly from the *TIA and Mobility Study (July 2021)*.

Road B/Prince of Wales Drive

As discussed in **Section 4.4**, Road B/Prince of Wales Drive has evolved from a previously recommended westbound shared through-right and through lane with two receiving lanes to a single right-turn lane and single through lane with a single receiving lane. In discussions with city staff, their observations at other intersections with similar designs showed low utilization of the second through lane suggesting the additional through lane capacity is not necessary. Operationally, both intersection configurations were shown to operate within city standards, with comparable results. However, reducing the number of receiving lanes by one would avoid notable impacts to surrounding trees and environment. For these reasons, the decision to reduce the number of receiving lanes was agreed to by city staff. They also confirmed potential queues on Prince of Wales Drive could be managed through traffic signal optimizations. The potential queuing implications were evaluated in **Section 4.9.2**.

Road E/Prince of Wales Drive Options

As previously discussed in **Section 4.4**, at some point since the *TIA and Mobility Study (July 2021)* was approved, three alternative intersection options were considered at this location:

- A signalized protected intersection,
- A roundabout and,
- An unsignalized intersection with an outbound left-turn movement restriction from Road E.

The signalized protected intersection option was preferred over the roundabout option since it provided better active transportation accommodations than a roundabout and it had a smaller footprint, reducing the number of trees impacted.

The two remaining options were subsequently analyzed in Synchro and Sim Traffic; the intersection performance for these two options has been summarized in **Table 20**.

Table 20: Road E/Prince of Wales Drive Intersection Performance Comparison – 2048 Horizon

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'As a Whole'		
	LoS	Max Delay (s) or v/c	Movement	Delay (s)	LoS	Max v/c
Signalized Intersections						
Road E/Prince of Wales Signalized	B(C)[B]	0.63(0.73)[0.66]	NBT(SBT)[SBT]	9.8(13.6)[12.7]	B(B)[B]	0.61(0.69)[0.62]
Road E/Prince of Wales Unsignalized[1]	B(C)[C]	13(23)[20]	EB(EB)[EB]	0(1)[2]	A(A)[A]	-

1. The NCC Scenic Driveway/Prince of Wales Drive was also tested with the added southbound U-turn movements from deviated eastbound left-turners at Road E/Prince of Wales Drive. Performance was similar to the *TIA and Mobility Study (July 2021)* and operated within City Standards.

Both intersection configurations operate within city standards. However, the unsignalized intersection design has far fewer implications related to the surrounding environment (e.g., trees), drainage and costs.

It is acknowledged that the preferred unsignalized option does not provide active transportation facilities across Prince of Wales Drive; however, there is not expected to be a strong pedestrian or cyclist desire line prior to opening of the University of Ottawa Heart Institute, which is planned closer to 2048. Implementing new facilities may be considered at that time as part of the Heart Institute Site Plan Control application. In the interim, there will be alternative crossing opportunities at the new Road B/Prince of Wales Drive or the existing Scenic Driveway/Prince of Wales Drive intersections.

4.9.2 Queueing Analysis

Another important measure of the health of an intersection is determining if there will be queueing implications and if vehicles are likely to spillback to adjacent intersections with consistency. A detailed summary of all queueing analysis using SimTraffic software along with intersections deemed sensitive or at risk of queueing implications have been summarized within the table in **Appendix L**.

Overall, most study area intersections have experienced a reduction in queue lengths compared to the *TIA and Mobility Study (July 2021)* with the exception of Preston Street/Prince of Wales Drive intersection.

Preston Street/Prince of Wales Drive

The Preston Street/Prince of Wales Drive intersection has a few movements which at times, predominantly the peak hours only, exceed the storage capacity. These movements include the eastbound left-turn, the southbound right-turn, and the southbound through-left-lane. However, this vehicular congestion is a direct result of applying contemporary protected intersection design guidelines to this intersection, which improves pedestrian and cycling priority at the expense of vehicle capacity. Anticipated queues will only occur during the peak hour periods, predominantly the hour between 15:30-16:30 when vehicle traffic is highest, but outside of these hours, the intersection is expected to function adequately.

Preston Street/Carling Avenue

The Preston Street/Carling Avenue intersection shows possible queuing constraints during the peak hour periods, but was considered reasonable considering it was modelled with a time separated bi-directional crossing of the south leg that improves cycling prioritization through the intersection. The City is expected to redesign this intersection as part of the Carling Avenue Transit Priority project, and the intersection will be reassessed at that time.

Road E/Prince of Wales Drive

The proposed unsignalized intersection design with a restricted outbound left-turn movement has no expected queuing complications with NCD traffic, while the alternative signalized protected intersection design has greater risks of spillback to The Scenic Driveway roundabout.

Road B/Prince of Wales Drive

A queuing sensitivity analysis was completed for Road B/Prince of Wales Drive between the two noted design configurations confirmed the city's assertion that removing the additional through lane does not have a notable impact on queues; while the additional benefit of this scaled-back configuration is it reduces the crossing distance for pedestrians and cyclists, and avoids impacts to the adjacent trees and environment.

There is approximately 85m between Road B and the right-in right-out (RIRO) along Prince of Wales Drive, and approximately 190m between Road B and Preston Street. The 95th percentile queue ranges between 170m and 190m in Sim Traffic and Synchro respectively during the critical PM peak hour, which suggests there is only a nominal risk of queue spillback to Preston Street during the most congested hour of the day. Outside of that peak hour, the risk of queue spillback drops significantly.

4.10 Monitoring

This section of the report has been exempted. TOH has prepared a comprehensive *Transportation Monitoring Strategy* that will outline how TOH will monitor, process, and report future traffic conditions to enable them to make informed decision related to the long-term implementation plan for each transportation strategy.

5.0 CONCLUSIONS

As previously noted in the introduction of this report, there have been a number of refinements made to the NCD site plan since the submission of the *TIA and Mobility Study (July 2021)*. A summary of the key conclusions to the TIA Addendum #2 is as follows:

- The changes in the site plan and programming projections since the *TIA and Mobility Study (July 2021)* submission did not alter the overall conclusions and recommendations in that document.
- The main Hospital building can be accommodated by the adjacent road network with recommended modifications to the adjacent road network as included shown in the updated off-site roadway design plan attached in **Appendix H**. Note that new or updated RMA packages will be submitted for the Road E and Road B intersections with Prince of Wales Drive.
- The current Road E/Prince of Wales Drive intersection design will be an unsignalized intersection with eastbound left-turn movement prohibition.
- The Road B/Prince of Wales Drive intersection has been reduced in footprint by reducing the westbound movement from dual through lanes and dual receiving lanes to a single through lane with a single receiving lane. City of Ottawa staff accepted this adjustment and confirmed they could manage potential queues along Prince of Wales with signal timing optimizations.
- Discussions are ongoing between TOH, the City of Ottawa, NCC and federal departments on the design and implementation of adjacent road network modifications to support the main Hospital building and may be further refined prior to developed design.

For reference, the conclusions and recommendations from *TIA and Mobility Study (July 2021)* have been provided with corresponding commentary that relate to changes or implications stemming from the TIA Addendum #2, please refer to **Appendix M.**