



Region of Waterloo

Final Report

Parking Impact Assessment Study for Arthur Street Reconstruction Project



Prepared for Region of Waterloo
by Arcadis Professional Services (Canada)
October 22, 2024

Document Control Page

CLIENT:	Region of Waterloo
PROJECT NAME:	Change Order No. 4 - Parking Impact Assessment Study for Arthur Street Reconstruction Project
REPORT TITLE:	Parking Impact Assessment Study for Arthur Street Reconstruction Project
IBI REFERENCE:	134579
VERSION:	Draft Report # 2.0
DIGITAL MASTER:	
ORIGINATOR:	Amjad Dehman, Yolanda Fu
REVIEWER:	Mike Campbell
AUTHORIZATION:	Mike Campbell
CIRCULATION LIST:	Region of Waterloo
HISTORY:	1.0 Draft Report #1 (December 2022) 2.0 Draft Report #2 (March 2022) 3.0 Draft Report #3 (October 2024) 4.0 Final Report (April 2025)

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1 Introduction

Arthur Street between South Street and William Street forms the core downtown area for the Community of Elmira, Ontario, in Woolwich Township. The existing cross-section of Arthur Street includes a single traffic lane in each direction with on-street parallel parking on both sides of the street. As per the Region of Waterloo's Transportation Master Plan, bike lanes are planned along the full extent of Arthur Street, and because of the high average annual daily traffic (AADT), designated or dedicated bike lanes are recommended. Due to the limited right-of-way (ROW) width along the subject segment of the street, the proposed dedicated bike lanes can only be accommodated if they occupied and replaced the existing on-street parking. This Parking Impact Assessment is intended to evaluate the feasibility of removing the on-street parking along Arthur Street between South Street and Riverside Drive which presently includes 86 parking spaces.

The viability of redirecting the parking demand along Arthur Street to other nearby parking facilities will be assessed based on the resulting walking distance and parking utilization in the area. Field surveys were conducted to collect up-to-date parking data in the area. The study intends to provide a parking analysis that can further inform the decision of removing on-street parking along Arthur Street.

This report is organized into the following sections:

1. **Introduction:** summarizes the purpose of this study and outlines the structure of the report and its sections.
2. **Parking Demand and Utilization Analysis:** provides all the analysis steps to quantitatively assess parking demand and utilization measures in the study area, including study area definition, details about the conducted parking surveys, peak hour analysis, and the parking utilization ratios in the study area.
3. **Parking Demand Redistribution Plan:** outlines the parking demand redistribution plan resulting from the removal of the parking spaces along Arthur Street, where the parkers can be relocated, and the resulting impact on the walking distance.
4. **Study Conclusions:** summarizes the outcomes and key findings of the study.

2 Parking Demand and Utilization Analysis

This section provides all the analysis steps aiming to quantitatively assess parking demand and utilization measures in the study area, including study area definition, details about the conducted parking surveys, peak hour analysis, and the parking demand that needs to be distributed.

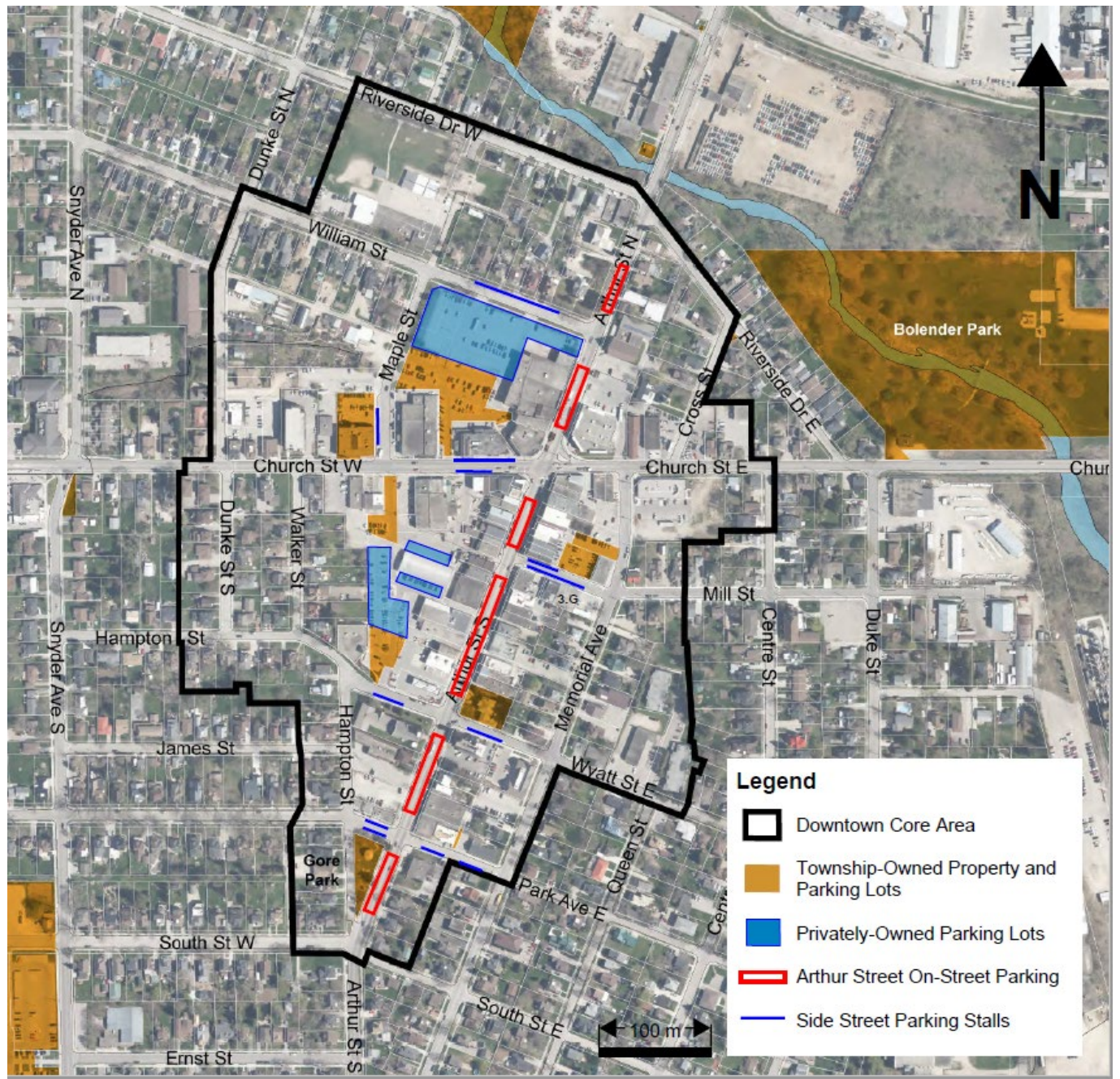
2.1 Study Area Definition

This study focuses on the Elmira downtown core area surrounding Arthur Street. As illustrated in **Exhibit 2.1**, the study area is delimited by the black boundary line, and it includes several types of parking facilities as outlined below:

- (1) Arthur Street on-street parking on both sides, as delineated by the red lines;
- (2) Side street parking, as delineated by the purple lines;
- (3) Municipal owned parking lots, as delineated by the bronze/brown polygons inside the downtown core area; and
- (4) Privately owned parking lots, as delineated by the blue polygons inside the downtown core area.

There are different types of developments and businesses that are located along Arthur Street, including restaurants, banks, churches, clinics, drug stores, etc.

Exhibit 2.1: Elmira Downtown Core Area



2.2 Parking Surveys

Field Parking Survey

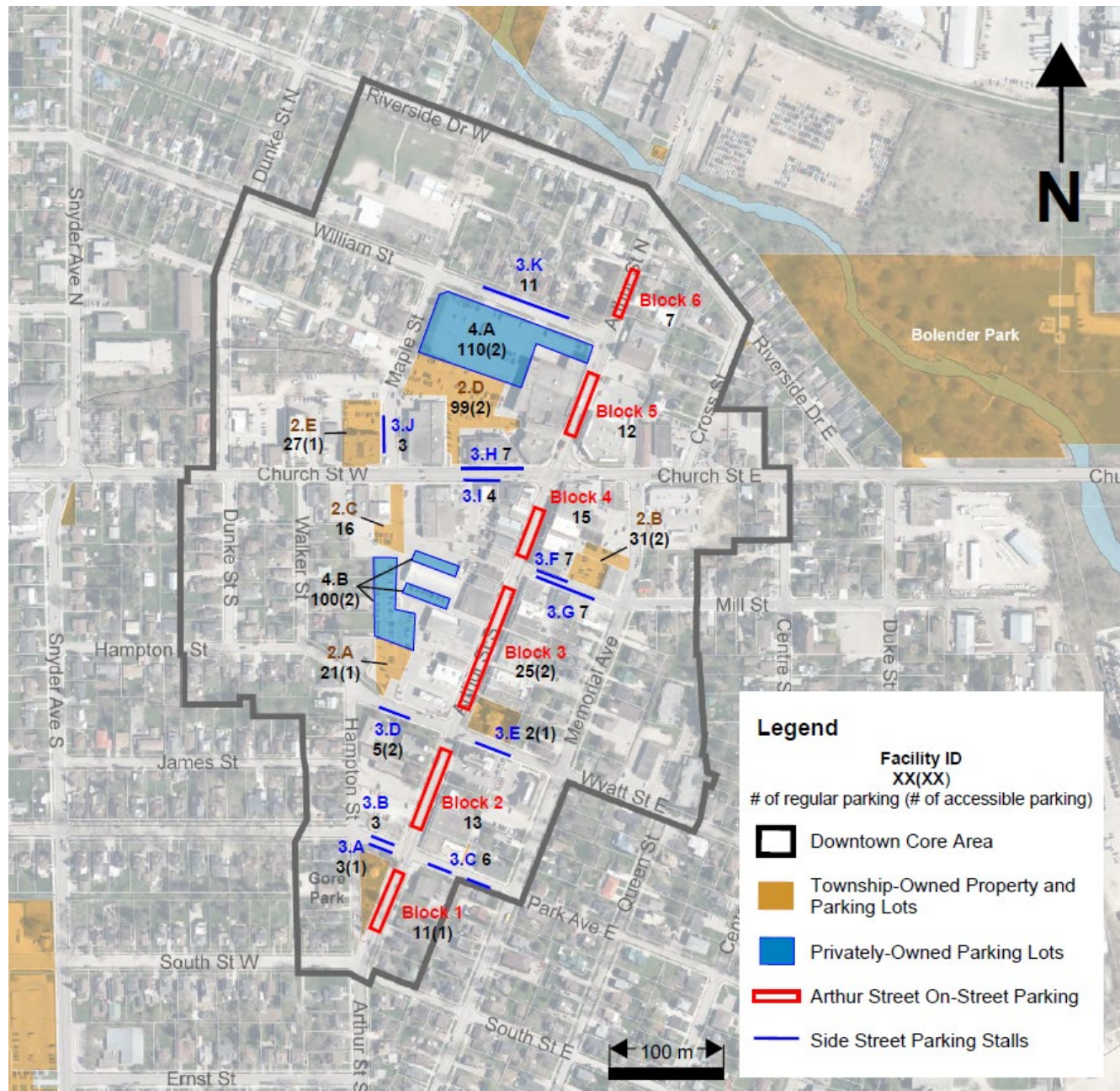
Field parking surveys were carried out to measure the existing parking supply and demand, as well as utilization of all the parking facilities shown in **Exhibit 2.1**. For a higher accuracy, parking surveys were conducted such that:

- Each street block and each parking lot in the study area was surveyed individually;
- The surveys were performed on two days: one weekday and a Saturday; and
- The surveys were repeated on an hourly basis (i.e., at one point of time during each hour) and extended from 9:00 AM to 8:00 PM on the weekday and from 10:00 AM to 7:00 PM on Saturday.

The surveys were carried out on Wednesday, August 24, 2022, for the weekday and on Saturday, August 27, 2022, for the Weekend.

To organize the parking demand analysis, each parking facility was assigned a unique ID as highlighted in **Exhibit 2.2**, which also provides the available parking supply for each individual facility.

Exhibit 2.2: Identification symbols of the parking facilities and their parking supply



Note: Brackets "(XX)" are not shown if the facility has no accessible spaces.

The total number of parking spaces available area-wide is 562 spaces. **Exhibit 2.3** further breaks down the parking supply by type (on-street vs. off-street) and into regular and accessible parking spaces. The area-wide parking system presently includes 148 on-street parking spaces and 414 off-street parking spaces. The 86 on-street spaces shown for Arthur Street blocks are what would be removed should bike lanes be implemented.

Exhibit 2.3: Summary area-wide available parking supply

PARKING FACILITY	TYPE OF PARKING	NUMBER OF PARKING SPACES		TOTAL
		Regular	Accessible	
Arthur Street blocks	On-street	83	3	86
Side Streets Parking	On-street	58	4	62
On-Street Subtotal		141	7	148
Municipal owned parking lot	Off-street	194	6	200
Privately owned parking lot	Off-street	210	4	214
Off-Street Subtotal		404	10	414
Total		545	17	562

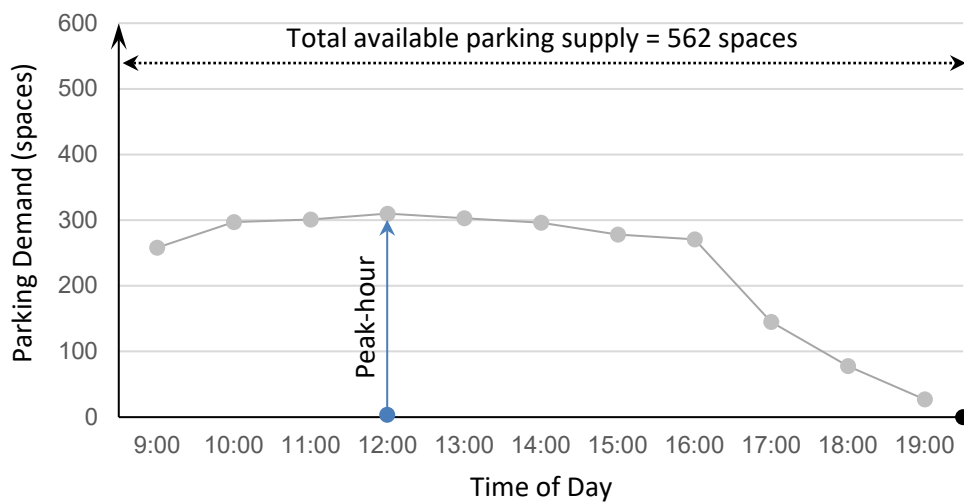
2.3 Peak Hour Analysis

The next step after carrying out the parking demand surveys was to analyse the data and identify the peak day, period, and hour and assess when parking demand reached its highest level. The peaking trend of parking demand was analysed using the area-wide parking demand data. This ensures having a holistic understanding of parking operations in the area and it avoids any misleading results caused by facility-specific momentary parking demand fluctuation. However, parking peaking trends for the Arthur Street blocks were also generally considered and checked because the purpose of the study is to redistribute their parking demand.

Exhibit 2.4 illustrates both the area-wide parking demand and utilization by different times of day for the weekday conditions (on Wednesday, August 24, 2022) whereas **Exhibit 2.5** illustrates the same but for the weekend conditions (on Saturday, August 27, 2022). Exhibits Exhibit 2.6 and Exhibit 2.7 also show the weekday and weekend parking patterns but only for the Arthur Street blocks.

Exhibit 2.4: Area-wide weekday (Wednesday, August 24, 2022) parking demand and utilization by time-of-day

(a) Parking demand by time of day



(b) Parking utilization by time of day

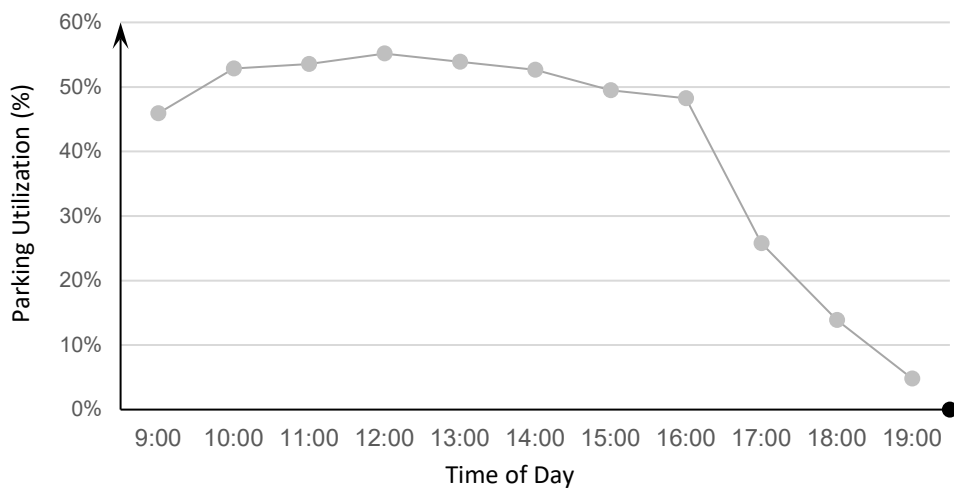
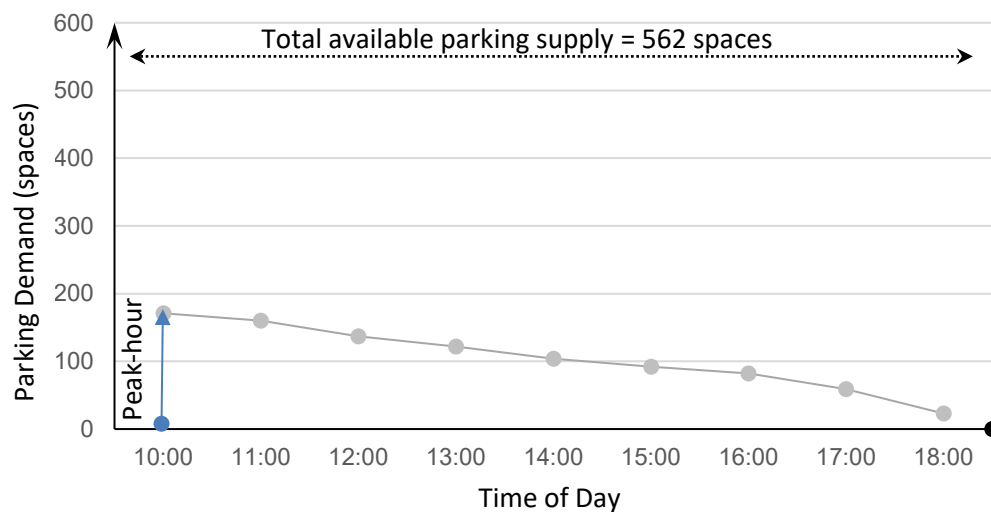


Exhibit 2.5: Area-wide weekend (Saturday, August 27, 2022) parking demand and utilization by time-of-day

(a) Parking demand by time of day



(b) Parking utilization by time of day

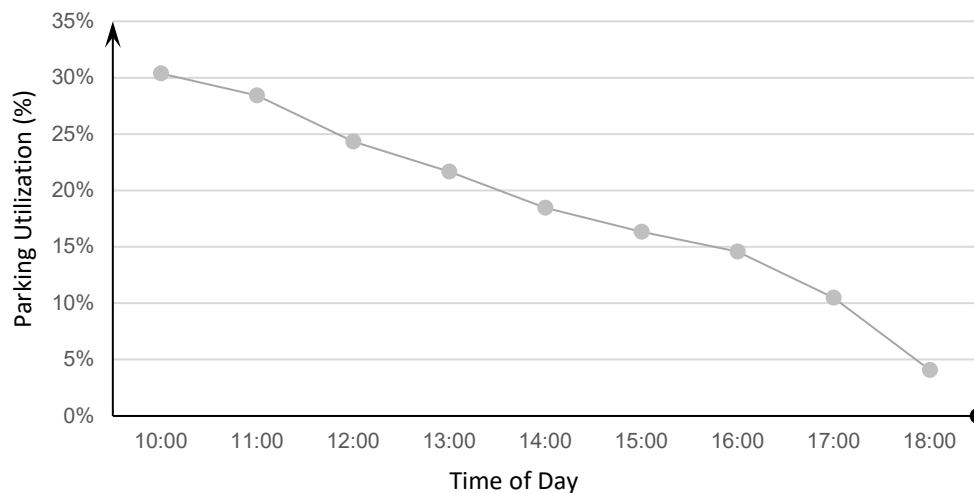
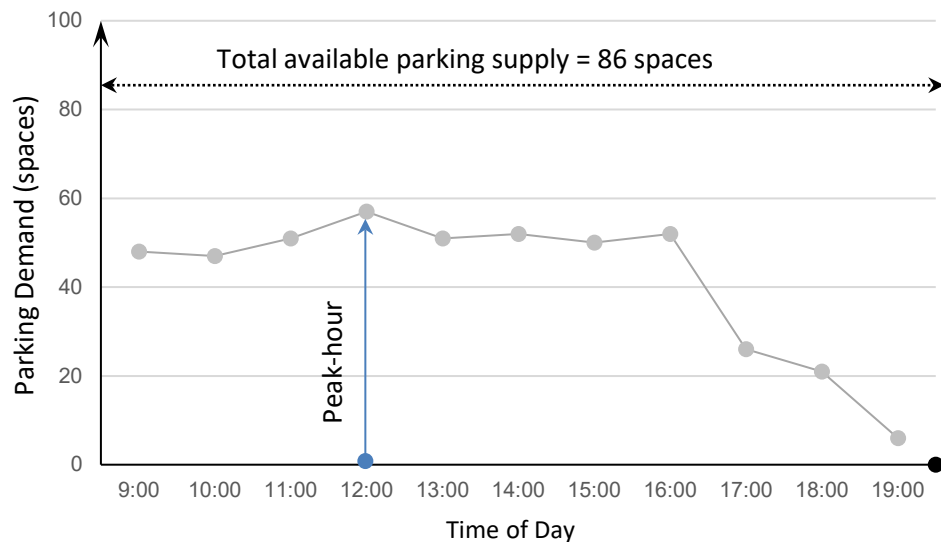


Exhibit 2.6: Arthur Street weekday (Wednesday, August 24, 2022) parking demand and utilization by time-of-day

(a) Parking demand by time of day



(b) Parking utilization by time of day

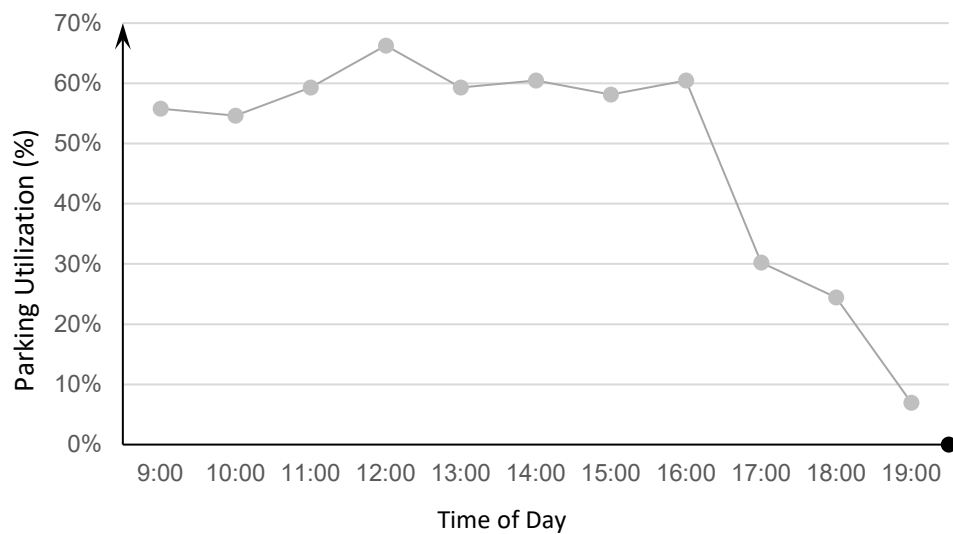
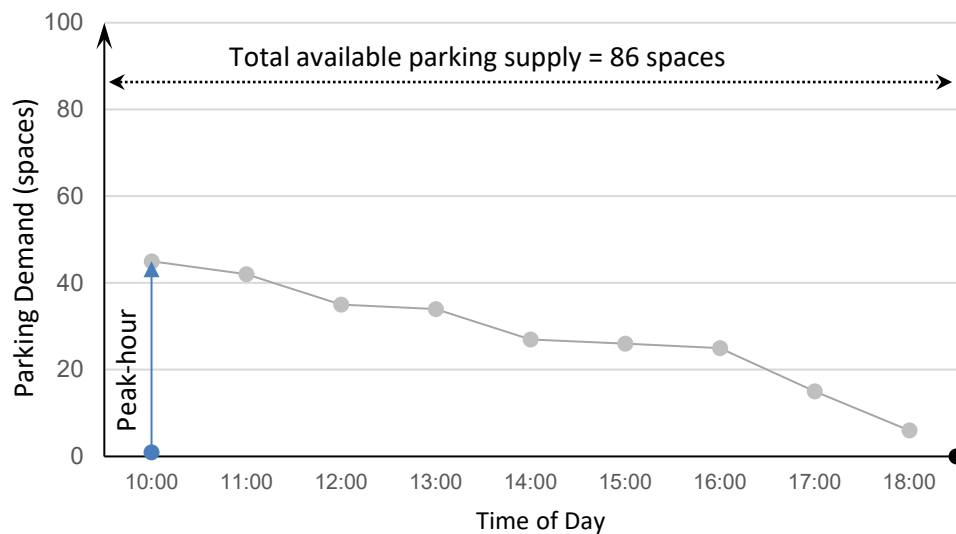
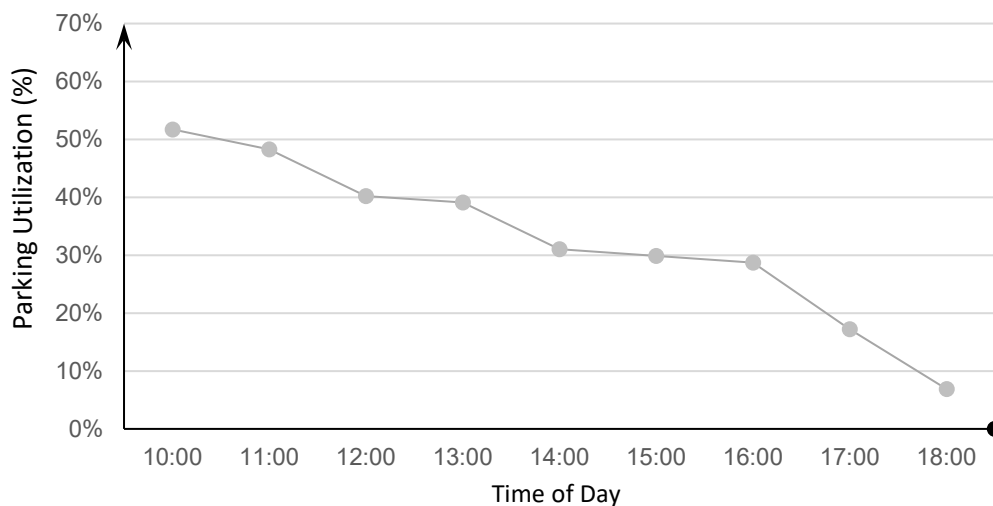


Exhibit 2.7: Arthur Street weekend (Saturday, August 27, 2022) parking demand and utilization by time-of-day

(a) Parking demand by time of day



(b) Parking utilization by time of day



By examining exhibits **Exhibit 2.4** through **Exhibit 2.7**: Arthur Street weekend (Saturday, August 27, 2022) parking demand and utilization by time-of-day

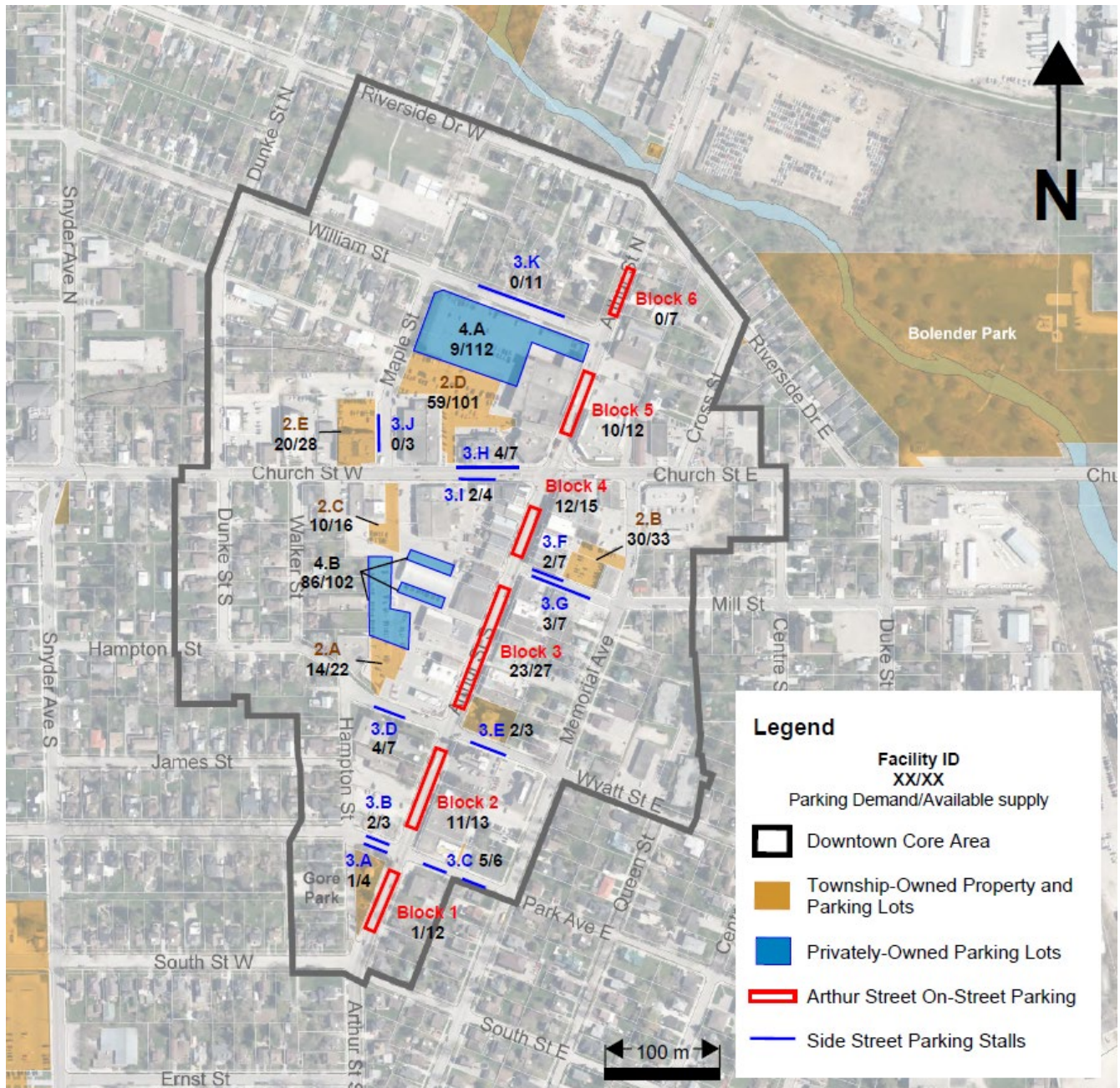
, several trends can be identified as outlined below:

- During the weekday, the area-wide parking demand increases gradually during the morning hours, peaks around noon, and then starts to decrease gradually. The peak-hour occurred between 12:00 PM to 1:00 PM. However, the shoulders of the peak hour carry only slightly less parking demand indicating that parking demand maintains a high-level during the late-morning, noon, and after-noon period. After 4:00 PM, parking demand starts to decline sharply releasing the pressure on the parking system. When analyzing Arthur Street blocks alone, their peak-hour coincided with the area-wide peak-hour, i.e., 12:00 PM to 1:00 PM, and they observed the same peaking patterns.
- During the weekend, area-wide parking demand reaches its highest level in the morning and declines consistently thereafter. The observed peak-hour was between 10:00 AM to 11:00 AM. The area-wide weekend peaking patterns were similarly observed on Arthur Street.
- The weekday peak-hour had an area-wide parking utilization of 55% whereas the weekend peak-hour had a 30% peak utilization. On Arthur Street, the peak-hour parking utilization was equal to 66% and 52% on weekday and weekend, respectively. These results indicate that the parking system is more occupied during the weekdays as compared to the weekends.
- Based on these findings, the weekday hour between 12:00 PM to 1:00 PM will be selected for further analysis because it represents the most critical case for both Arthur Street and the area-wide parking system. This is the most accurate and conservative assessment.
- The observed area-wide parking utilization ratio during the peak-hour, which is 55%, is well below capacity and this means that redistributing the parking demand of Arthur Street to nearby parking facilities merits further investigation.

Exhibit 2.8 demonstrates the parking utilization during the observed peak-hour and for each individual parking facility expressed as “demand/supply.” Parking utilization along Arthur Street is high in the heart of the downtown area, Blocks 2 to 5. Away from the centre, Blocks 1 and 6 of Arthur Street have low parking utilizations. Similar trend can also be noticed across the side streets and the surface lots, i.e., heavier utilization ratios are generally observed in the central area.

The overall (aggregated) peak-hour parking utilization ratio by facility type was also calculated and can be summarized as follows: 66% along Arthur Street blocks, 40% along the side streets, 67% at the township-owned lots, and 44% at the privately-owned lots. Therefore, drivers show more tendency to park their vehicles along Arthur Street and at the township-owned lots as compared to the other facilities.

Exhibit 2.8: Peak-hour (12:00 PM to 1:00 PM) parking utilization per parking facility (demand over supply)



The analysis of this section revealed that the peak hour is observed between 12:00 PM to 1:00 PM on the analyzed weekday. Area-wide parking utilization during the peak-hour was equal to 55% which means that redistributing the parking demand of Arthur Street to nearby parking facilities is plausible, and this merits further investigation. The next section elaborates on redistributing Arthur Street's parking to nearby facilities and the resulting impact.

Dwell Time Survey

The Region of Waterloo engaged the services of Pyramid Traffic to carry out a dwell time survey to determine the patterns of on street parking utilisation. The study was done as follows:

- Two surveys were carried out, one on a weekday and one on a Saturday, and
- The time was broken down into 15 minute intervals and individual vehicles were identified by their license plates.

The weekday survey was carried out on Wednesday September 18, 2024 and the weekend survey was carried out on Saturday September 21, 2024. The data was not separated by block, but rather aggregated for the entirety of the on street parking. The results are summarised in Exhibit 2.9.

Exhibit 2.9: Parking Dwell Times

		Total Number of Vehicles by Duration	
Duration	No. of Intervals	Weekday	Saturday
1 hour or less	up to 4	444	369
1 - 2 hrs	5 to 8	55	40
2 - 3 hrs	9 to 12	8	10
3+ hrs	13 +	9	3
		516	422

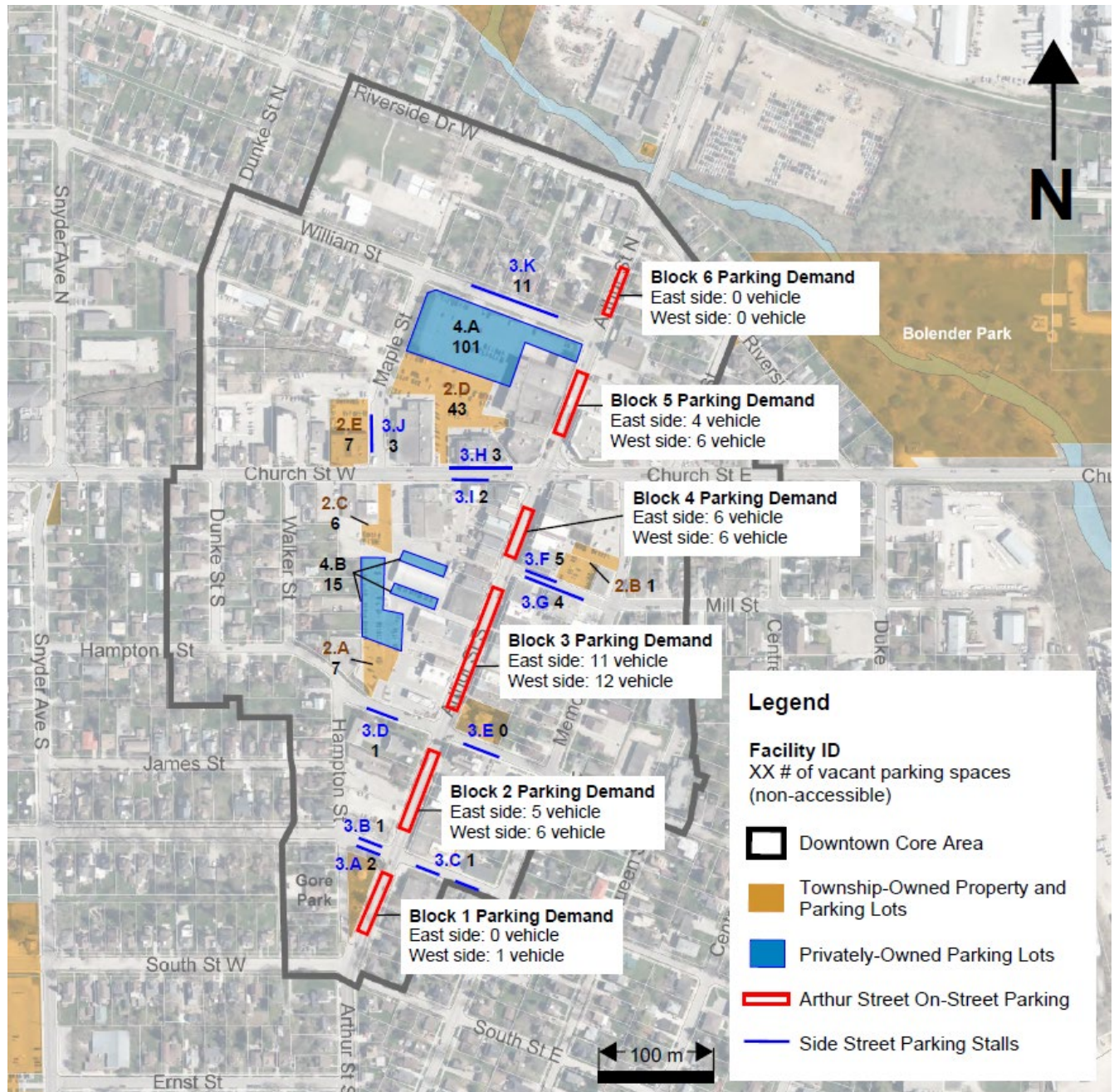
		Percentage of Vehicles by Duration	
Duration	No. of Intervals	Weekday	Saturday
1 hour or less	up to 4	86%	72%
1 - 2 hrs	5 to 8	11%	8%
2 - 3 hrs	9 to 12	2%	2%
3+ hrs	13 +	2%	1%

Out of 80 parking spots surveyed, only 9 (or 11%) were occupied for over three hours on the weekday count. The concern that this study addresses is that some parking may be all day use by owners or employees of downtown businesses. While the study didn't identify parking beyond 3 hours, if some or all of the 9 vehicles are there all day it isn't necessarily an issue because the peak parking usage is 67% on a weekday, so spots are still available.

3 Parking Demand Redistribution Plan

The plan to accommodate Arthur Street's existing peak parking is to be developed based on the peak-hour of 12:00 PM to 1:00 PM in weekdays, i.e., the most critical case found in the parking survey. In total, 57 vehicles were observed to park along (the 86 parking spaces on) Arthur Street blocks during the peak hour. These are further highlighted in **Exhibit 3.1**, which also shows the available parking spaces that were vacant during the peak hour and able to accommodate Arthur Street's parking demand. When redistributing the parking demand to nearby facilities, a holistic approach must be followed such that the vehicles need to be redistributed to the nearest facilities to reduce the needed walking distance. Research by Mary S. Smith, Thomas A. Butcher, and the Victoria Transport Policy Institute suggests that a walking distance less than 350 - 400 m is usually considered adequate for most land uses. In addition, the utilization of the parking system should remain at a healthy level, i.e., less than 85% and preferably between 60% to 80%.

Exhibit 3.1: Arthur Street's peak-hour parking demand versus available nearby parking supply surplus



The figures and numbers in **Exhibit 3.1** lead to several remarks as outlined below:

- Parking demand intensifies in the heart of the core area. For example, Blocks 1 and 6 of Arthur Street have low parking demand, whereas the middle blocks (i.e., Blocks 2 to 5) have the highest demand level. Similarly, limited to moderate parking supply surplus is available in the nearby facilities towards the center (0 to 15 surplus spaces are available per facility). Only the northern facilities have a large surplus (e.g., 101 spaces in Lot 4A and 43 spaces in Lot 2D).
- The total number of parked vehicles along Arthur Street observed in the peak-hour was equal to 57 vehicles. Among these vehicles, only one accessible vehicle was observed, and this can be easily relocated to several

nearby accessible parking spaces (requires 105 m walking distance). Therefore, the analysis will focus on redistributing the non-accessible vehicles.

- The observed available parking supply surplus in the peak-hour was 33 spaces along the side streets and 180 spaces inside the surface lots. That is, the observed area-wide total parking supply surplus is 213 spaces. The available parking supply surplus on the west side is larger as compared to the east side.
- The available parking supply surplus is well above the Arthur Street's parking demand, i.e., $213 > 57$ vehicles. However, it is to be noted that the largest proportion of the parking supply surplus is in the northern facilities which may require considerable walking distance for some drivers of the relocated vehicles so they can reach their final destinations. These northern facilities were used as a last resort to accommodate the redistributed vehicles.

The above remark calls for a detailed analysis that aims to redistribute Arthur Street's parked vehicles to the nearest possible facility and calculate the resulting average walking distance needed by each individual block and for the entire study area. Research by Mary S. Smith, Thomas A. Butcher, and the Victoria Transport Policy Institute¹ suggests the maximum walking distances presented in **Exhibit 3.2**.

Exhibit 3.2: Walking distance by level-of-service

WALKING ENVIRONMENT	LOS A	LOS B	LOS C	LOS D
Climate Controlled	300 m	730 m	1,150 m	1,580 m
Outdoor/covered	150 m	300 m	450 m	600 m
Outdoor/uncovered	120 m	240 m	360 m	480 m
Through Surface Lot	100 m	210 m	320 m	420 m
Inside Parking facility	90 m	180 m	270 m	360 m

Distances are provided by levels-of-service (LOS) as follows: LOS A is the best or ideal; LOS B is good; LOS C is average; and LOS D is below average and minimally acceptable. According to Victoria Transport Policy Institute Standards, LOS B and C can suit land uses such as general retail, restaurants, religious institutes whereas LOS A or B can suit land uses such as medical clinics and professional services. For the analysis presented in this study, the aim is to achieve the highest LOS and LOS C, which corresponds to 360 m, is considered the minimum acceptable LOS. Note that it should be recognized that this is not a strict criteria, but more of a research-based and industry best practice. If a LOS of D is present, it does not mean that conclusion should be the parking area is unsuitable, but rather pause should be given and other options be reviewed or considered, if possible.

Exhibit 3.3 outlines how the parking demand at all Arthur Street blocks was distributed to the nearby facilities and the resulting walking distance. The weighted average walking distances per block and for the entire street were also provided.

¹ https://www.vtpi.org/tdm/tdm73.htm#_Toc18599176

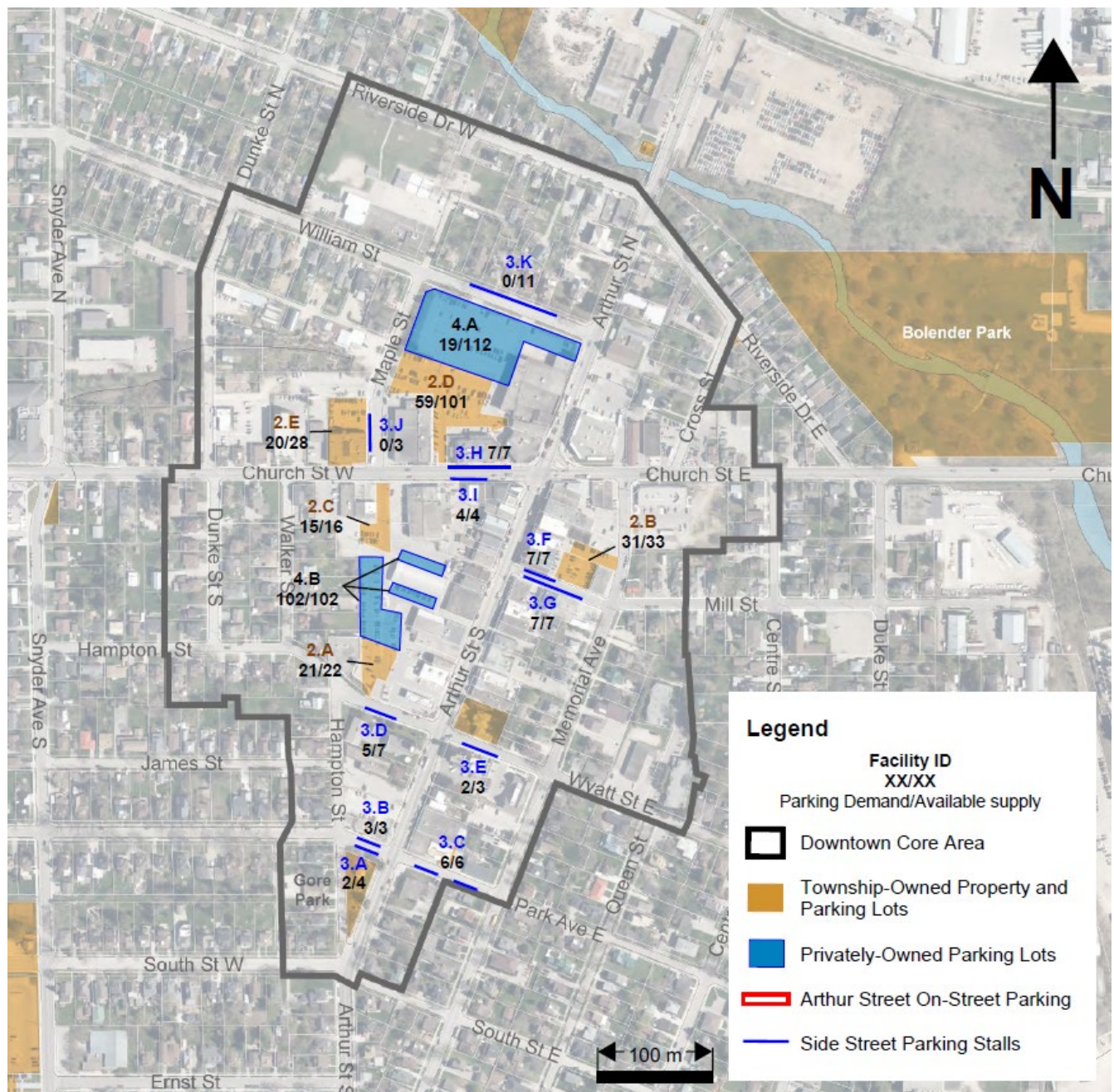
Exhibit 3.3: Outline of Arthur Street parking demand distribution

Block	Parking Demand	Parking Demand Distribution and (Walking Distance)	Weighted Average Walking Distance
1	1 vehicle	1 to side street 3.A (60m)	60 m
2	11 vehicles	1 to side street 3.B (82m) 1 to side street 3.C (109m) 1 to side street 3.D (110m) 7 to Parking Lot 2.A (160m) 1 to Parking Lot 4.B (225m) 4 users need to cross the street	150 m
3	23 vehicles	4 to side street 3.G (110m) 4 to side street 3.F (97m) 15 to Parking Lot 4.B (12 users are associated with 105m, and 3 users will cross the street requiring 233m total walking distance)	121 m
4	12 vehicles	1 to side street 3.F (49m) 2 to side street 3.I (97m) 3 to side street 3.H (100m) 1 to Parking Lot 2.B (100m) 5 to Parking Lot 2.C (230m) 4 users need to cross the street	149 m
5	10 vehicles	10 to Parking Lot 4.A (157m) 4 users need to cross the street	157 m
6	0 vehicle	N/A	N/A
Overall (57 vehicles)			137.7 m

Redistributing Arthur Street's parking demand to nearby facilities resulted in the following metrics:

- Parking redistribution will require an additional walking distance that ranges between 60 m (Block 1) and 157 m (Block 5). This corresponds to LOS between A and B as per **Exhibit 3.2** for an outdoor vicinity. Some travellers may park on the other side of the street and need to cross an intersection to reach their final destinations which may add some additional waiting time at the intersection.
- The resulting average walking distance area-wide, for the relocated Arthur Street's parking, is estimated at 137.7 m. This corresponds to LOS B and is considered to be acceptable.
- The system-wide parking utilization remains below capacity at 65%, which is an acceptable range within industry standards.
- Exhibit 3.4 provides the updated parking utilization ratios as a result of removing Arthur Street parking and redistributing its demand. Most of the nearby parking facilities in the central area reached their capacity with a parking utilization approaching 90-100%. This may instigate competition for space in the central area. Only the northern facilities still maintain comfortable levels of parking utilization. Therefore, searching or circulating for vacant parking spaces in the central area is likely and some vehicles may have to travel to the northern lots which may add extra walking distance. For example, redistributing vehicles from Block 3 and Block 4 to Parking Lot 2D will result in a walking distance of 310 m (LOS C) and 200 m (LOS B), respectively.
- After removing Arthur Street parking, 14 accessible parking spaces remain available in nearby facilities. The demand for accessible vehicles was low in the analysed peak-hour. Only one accessible vehicle was recorded in the peak-hour at Block 3 and this was relocated to Lot 4B.

Exhibit 3.4: Parking utilization per parking facility after redistributing Arthur Street's parking



4 Study Findings and Conclusions

Exhibit 4.1 provides a summary analysis of the strengths and weaknesses of the parking redistribution plan. Based on the previous sections in the report and **Exhibit 4.1**, the following remarks are made.

The study analysis indicates that redistributing the parking of Arthur Street to nearby facilities is possible. However, this redistribution has some disadvantages. It adds additional walking distance and circulating time to find a vacant parking space and some travellers will need to cross an intersection to reach their final destinations. This is to be expected and is within generally acceptable parking best practices.

Travelers can avoid circulating before finding a vacant parking space by parking in the northern facilities at the expense of adding extra walking distance.

The system-wide parking utilization remains at an acceptable level (65%) after the parking redistribution. However, the utilization ratios at the central parking facilities reach capacity during the peak hour and its shoulders (i.e., the weekday peak period extends over an approximate 5-hour period).

In summary, the area-wide analysis indicates that from an analytical perspective there are no major concerns with the removal of Arthur Street's parking to accommodate bike lanes. The resulting average additional walking distance (137.7 m) corresponds to LOS B which is deemed acceptable for most typical land uses. The parking utilization ratio (65%) was also found to be at an acceptable level area-wide, i.e., this ratio is well below the 85% effective capacity of parking systems.

Parking demand is expected to increase in the long run as a result of population and employment growth. In addition, the added improvements to the active transportation network and cycling infrastructure should reduce auto-dependence. However, it is recommended to keep monitoring the parking demand and supply profiles frequently in the future. Adding a small parking facility or entering into shared parking partnerships can be considered in the future should parking demand increase significantly in the area and if the utilization ratio approaches the capacity.

Exhibit 4.1: Strengths and weaknesses of the parking redistribution plan

STRENGTHS	WEAKNESSES
The resulting average additional walking distance area-wide is 137.7 m, which corresponds to LOS B. This is deemed acceptable for most typical land uses.	Some travellers will have to park on the other side of the street and cross a nearby intersection to reach their destination.
The system-wide parking utilization remains below capacity at a healthy level equal to 65%. If the northern most facilities, 4.A and 3.K, are removed from the overall capacity, utilisation is still only 70%.	Most of the nearby parking facilities, in the central area, reached their capacity with a parking utilization approaching 90-100%. Searching and circulating for vacant parking spaces is likely in the central area for many travellers during the peak periods. Vehicles who wish not to circulate will need to park in the northern underutilized lots, but this requires additional walking distance.
The demand for accessible vehicles was not notable in the analysed peak-hour, when 14 accessible parking spaces remain available in nearby facilities.	Future growth in population and employment activities will increase the parking demand and the area-wide parking utilization will increase.