

## ***Purpose***

The purpose of this paper is to set up an analysis of crashes that have occurred over the past 10 years on Thorndon Quay and to analyse how converting the angle parking to parallel parking will affect the safety and parking usage on this street.

## ***Key Findings***

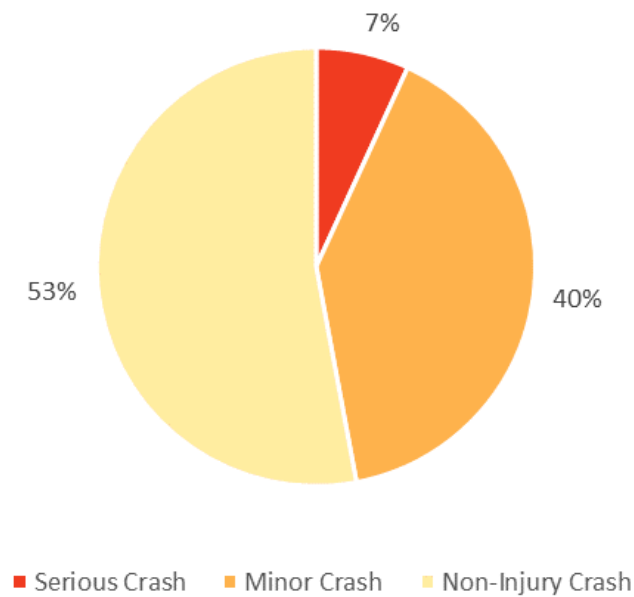
- More than half (57 of 102) of all recorded crashes on Thorndon Quay in the past 10 years relate to parking
- 42 percent of all parking related crashes are due to angle parking
- About a quarter (25 of 102) of all recorded crashes involve cyclists
- 80 percent of cycling crashes relate to parking, with 44 percent due to angle parking
- All Serious Injury crashes and 68 percent of Minor Injury crashes involve either cyclists or motorcyclists
- More than half (4 of 7) of Serious Injury crashes involve cyclists, 50 percent of which are due to angle parking
- 41 percent of Minor Injury crashes involve cyclists, 41 percent of which are due to angle parking
- More than half (12 of 22) of parallel parking crashes resulted in Minor or Serious Injury, with a third of these injury crashes due to a door opening into a cyclist
- Angle parking crashes cost approximately \$2.7 million over a 10-year period
- Converting angle parking to parallel parking can result in an estimated \$1.7 million in crash costs savings over a 10-year period
- 72 percent (274 of 380) of on street parking spaces on Thorndon Quay are angled
- 117 angled parking spaces allow for 9+ hour parking, while 154 have a 2 hour parking restriction; 3 have a 5 minute parking restriction
- The parking on Thorndon Quay is mostly underused with 53 percent of 2 hour parking spaces occupied and 70 percent of 9+ hour parking spaces occupied at peak occupancy (weekdays from 8 am to 6 pm)
- The average stay time is 37 minutes, with 41 percent of visitors parking for less than 10 minutes
- 40 percent of visitors overstay, by not paying or by exceeding either the time paid for or the time limit of the parking space
- Most overstays are short at 10 minutes or less
- The data indicate that converting angle parking to parallel parking on Thorndon Quay has the potential to improve both safety and parking usage without negatively affecting visitors to businesses

## Crashes Overview

There have been 102 recorded crashes at Thorndon Quay over the past 10 years (2011 to 2021)<sup>1</sup>. Of these crashes, 53 percent have been non-injury crashes, 40 percent have been minor injury crashes, and 7 percent have been serious injury crashes, as outlined in Figure 1 below.

Figure 1

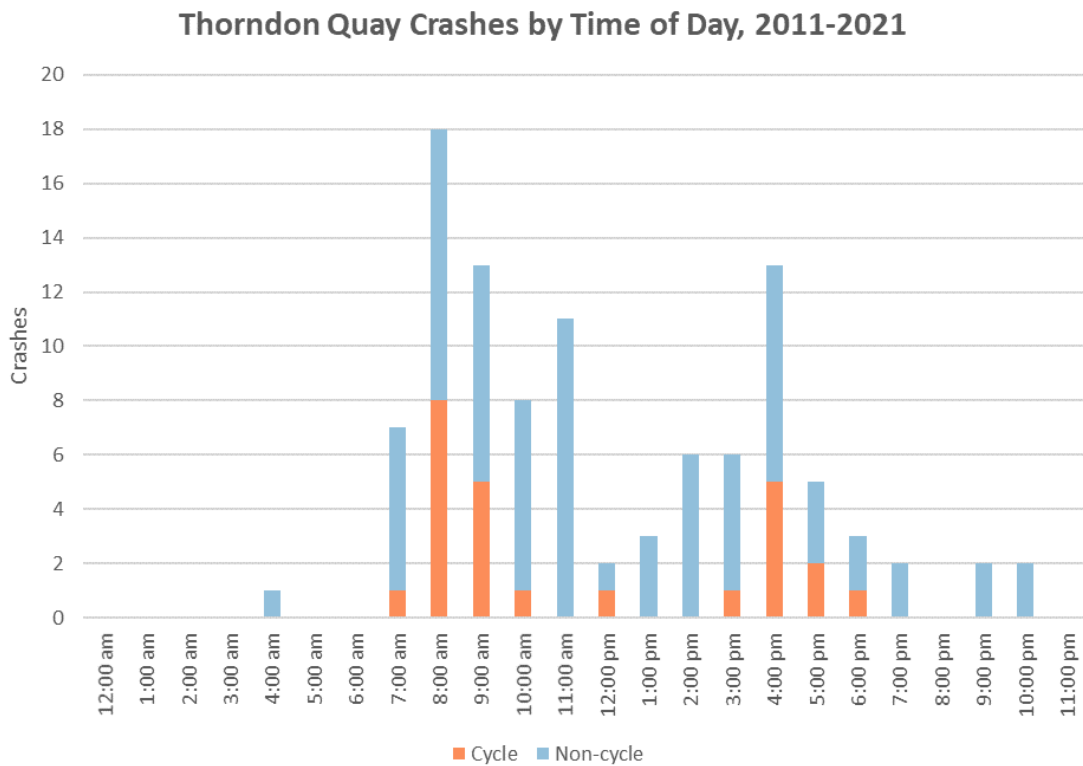
### All Crashes, Thorndon Quay 2011-2021



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<sup>1</sup> The 2021 data include crashes that occurred up to the query date of 09-02-2021, so it is only a partial year of data.

Figure 2



As Figure 2 shows, most of the crashes on Thorndon Quay occurred during peak commuting times.

More than half (56 percent) of all crashes on Thorndon Quay over the past 10 years have been related to parking, as illustrated in Figure 3 below.

Figure 3

### All Crashes, Thorndon Quay 2011-2021

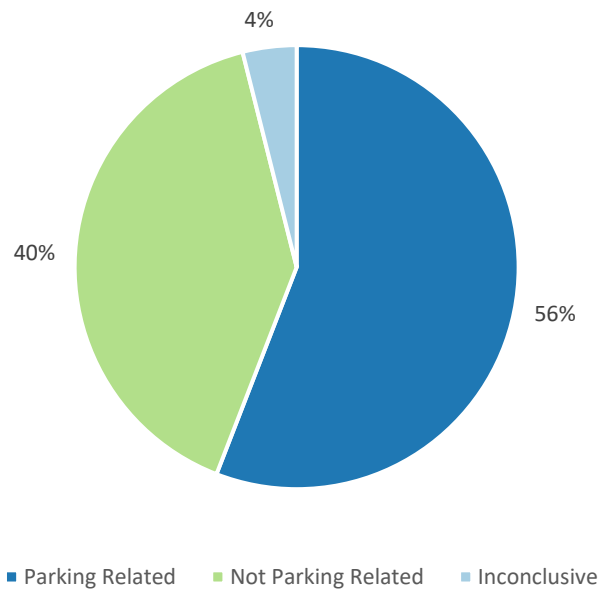


Table 1 shows details about crash severity and vehicles involved for each recorded crash from the past 10 years.

Table 1

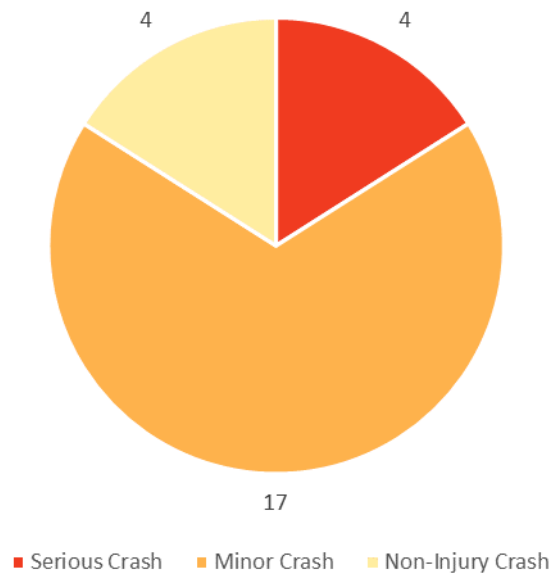
Vehicles Involved	Non-Injury Crash	Minor Crash	Serious Crash	Total
Cycle only	0	2	1	3
Cycle vs. heavy vehicle	0	1	0	1
Cycle vs. light vehicle	4	14	3	21
Heavy vehicle only	1	2	0	3
Light vehicle only	2	2	0	4
Light vehicle vs. heavy vehicle	19	4	0	23
Light vehicle vs. light vehicle	24	5	0	29
Motorcycle only	0	1	0	1
Motorcycle vs. heavy vehicle	0	1	0	1
Motorcycle vs. light vehicle	4	9	3	16
<b>Total</b>	<b>54</b>	<b>41</b>	<b>7</b>	<b>102</b>

The crash history indicates that cyclists are at particular risk at Thorndon Quay. Cyclists were involved in 25 percent of crashes and represent more than half of serious injury crashes in the area. In contrast, vehicle vs. vehicle or vehicle only crashes represent 58

percent of crashes and zero serious injuries. Figure 4 shows the crash severity for each recorded cycling crash.

Figure 4

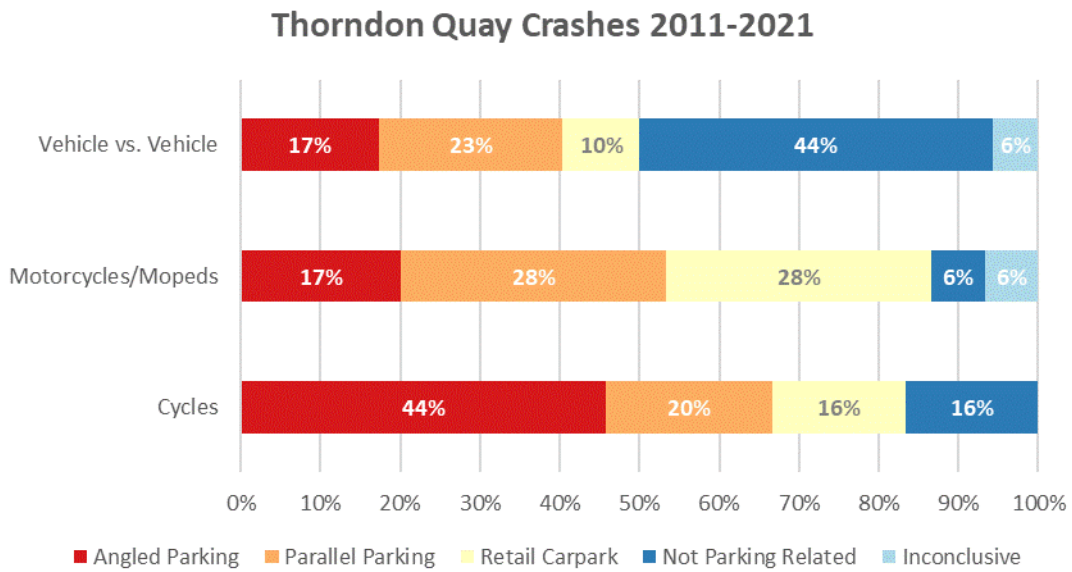
### Cycle Crashes, Thorndon Quay 2011-2021



The data indicate that the current parking configuration is likely the main contributor to the large number of cycle crashes in the area. Of the 25 reported crashes involving cyclists in the area, 20 were related to parking. Of the four serious injuries involving cyclists, three related to parking. There are two main types of parking crashes: vehicles manoeuvring into or out of parking spaces and colliding with cyclists, and drivers opening car doors and hitting cyclists.

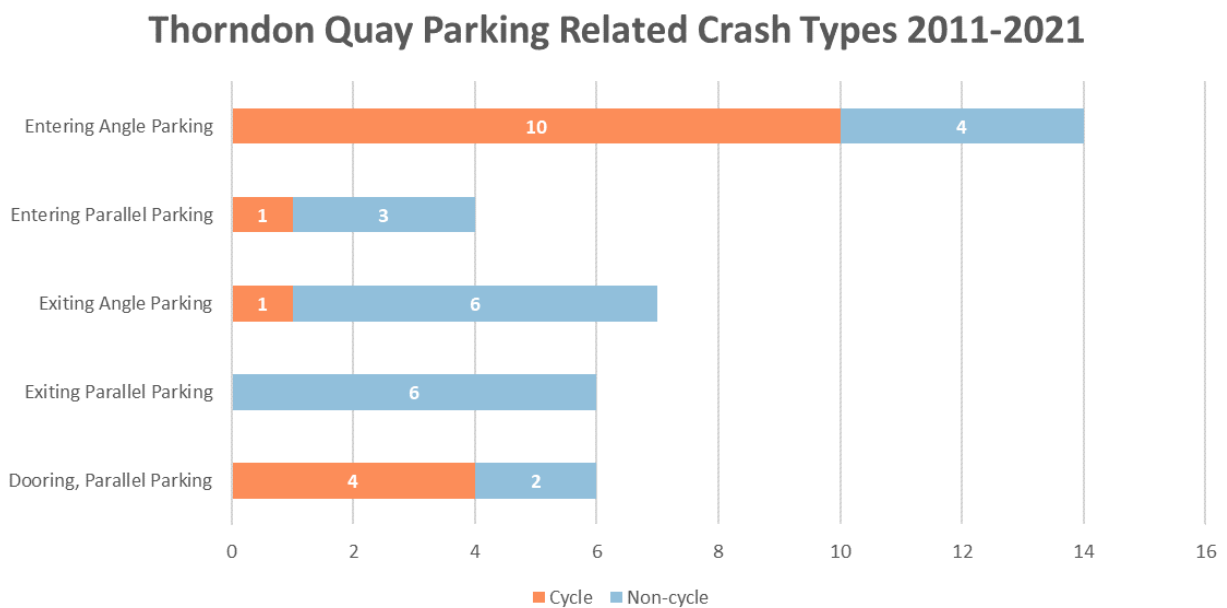
Figure 5 shows that parking, especially angle parking, is a proportionally greater factor in cycle crashes along Thorndon Quay than it is for vehicle vs. vehicle crashes or crashes involving motorcycles and mopeds.

Figure 5



As Figure 6 shows, the majority of parking related crashes on Thorndon Quay occur when a car is entering a parking space, especially an angled car park.

Figure 6



Angled parking accounts for 78 percent of the crashes that occur when a vehicle is entering a parking space and 54 percent of the crashes that occur when a vehicle is exiting a parking space. Overall, 24 percent of all crashes on Thorndon Quay relate to angled parking, and 42 percent of all parking related crashes are due to angled parking.

Of the parking related crashes, 24 of the 57 recorded crashes are due to angled parking. Half (12) of the angled crashes resulted in Non-Injury, while 10 resulted in Minor Injury, and 2 resulted in Serious Injury. By using cost figures from the NZTA and Ministry of Transport, we calculated the crash costs of the current design on Thorndon Quay, as well as the estimated crash cost savings achieved by converting the angled parking to parallel parking.<sup>2</sup> The calculations are based on the actual number of crashes related to angle parking on Thorndon Quay in the past 10 years. As shown in Table 2, after adjusting for severity, traffic trends, and underreporting, it is estimated that the angled parking crashes cost approximately \$2.7 million over a 10 year period. An estimated \$1.7 million in crash cost savings over a 10 year period can occur by converting angled parking to parallel parking.

*Table 2*

<b>Crash Costs</b>	<b>Fatal</b>	<b>Serious</b>	<b>Minor</b>	<b>Non-injury</b>	<b>Total</b>
Cost of crashes per 10 years	\$562,023	\$1,149,815	\$782,258	\$216,132	<b>\$2,710,228</b>
Crash cost savings per 10 years	\$354,075	\$724,383	\$492,823	\$136,163	<b>\$1,707,505</b>

## ***Parking Overview***

There are 380 on street parking spaces with sensors along Thorndon Quay. The majority (274 spaces) are angled parking, while the remainder (106 spaces) are parallel parking.

<sup>2</sup> A.) <https://nzta.govt.nz/assets/resources/monetised-benefits-and-costs-manual/Monetised-benefits-and-costs-manual.pdf>

B.) <https://www.nzta.govt.nz/assets/resources/monetised-benefits-and-costs-manual/crash-risk-factors-guidelines-compedium.pdf>

C.) <https://www.transport.govt.nz/assets/Uploads/Report/SocialCostof-RoadCrashesandInjuries2019.pdf>

Figure 7





Nearly two thirds (254) of the spaces have a 2 hour parking time restriction, while 117 spaces allow for 9+ hour parking, 6 spaces have a 5 minute parking limit, and 3 spaces have a 30 minute limit. Figure 8 shows the distribution of parking by time restriction, and Figure 9 shows where the 2 Hour and 9+ Hour parking is located on Thorndon Quay.

**Figure 8**

**Thorndon Quay Sensored Street Parking - Time Restrictions**

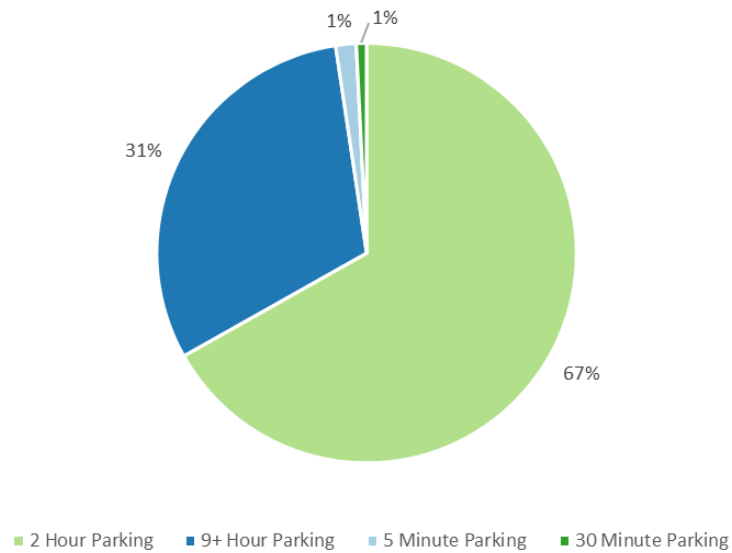


Figure 9



## ***Parking Usage and Revenue***

From 1 September 2020 to 31 October 2020, there were 142,000 recorded visits where visitors parked for at least 1 minute. This averages out to about 2,300 recorded parking visits per day.

When analysing the parking usage along Thorndon Quay, we divided the data into three sections: Bunny to Davis, Davis to Motorway, and Motorway to Tinakori. Within each of these sections we looked at the differences in usage between 2 Hour Parking and 9+ Hour Parking. Looking at the data at this level allowed us to derive more detailed insight.

Figure 10



The figures below show the parking occupancy throughout the day for the 2 Hour and 9+ Hour Parking spaces along Thorndon Quay. Each pair of figures shows data for a section identified in the map in Figure 10 above. Please note, a clearway causes the number of available parking spaces to drop between the hours of 7 am and 9 am.

Figure 11

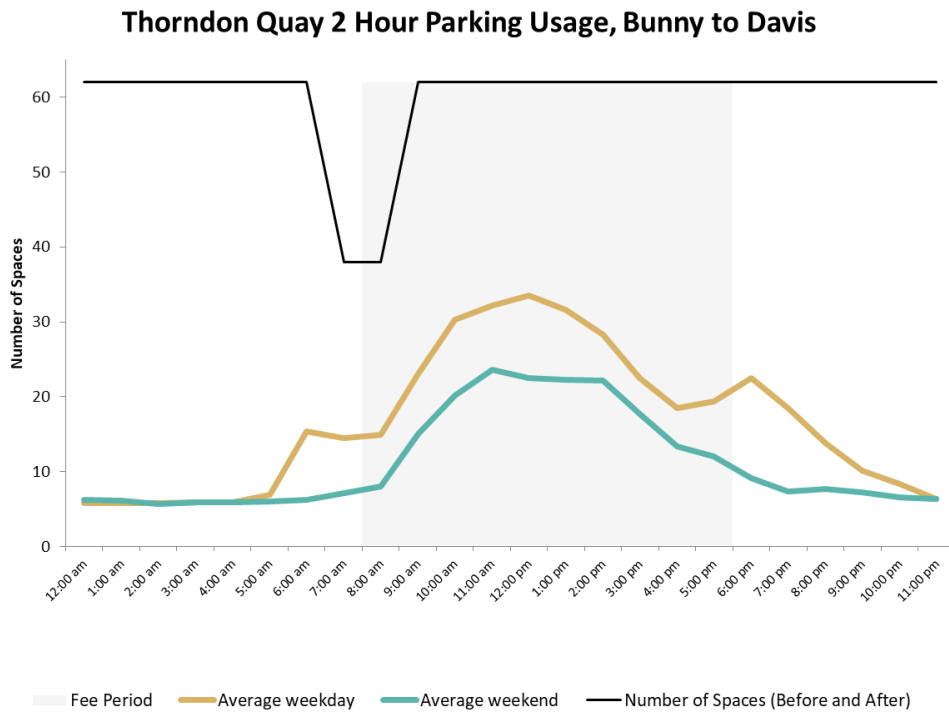


Figure 12

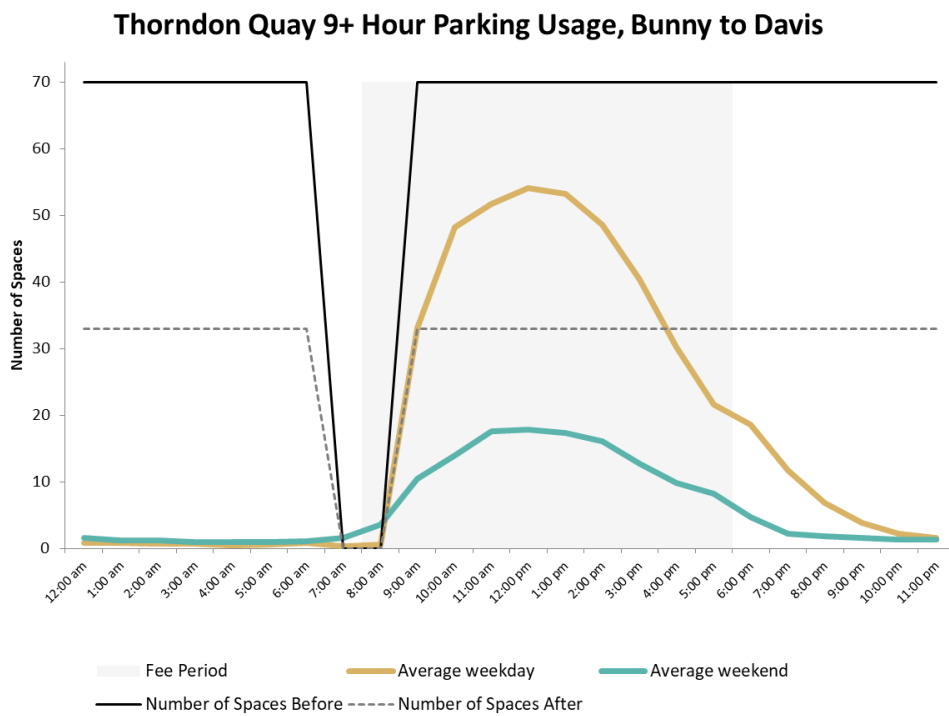


Figure 13

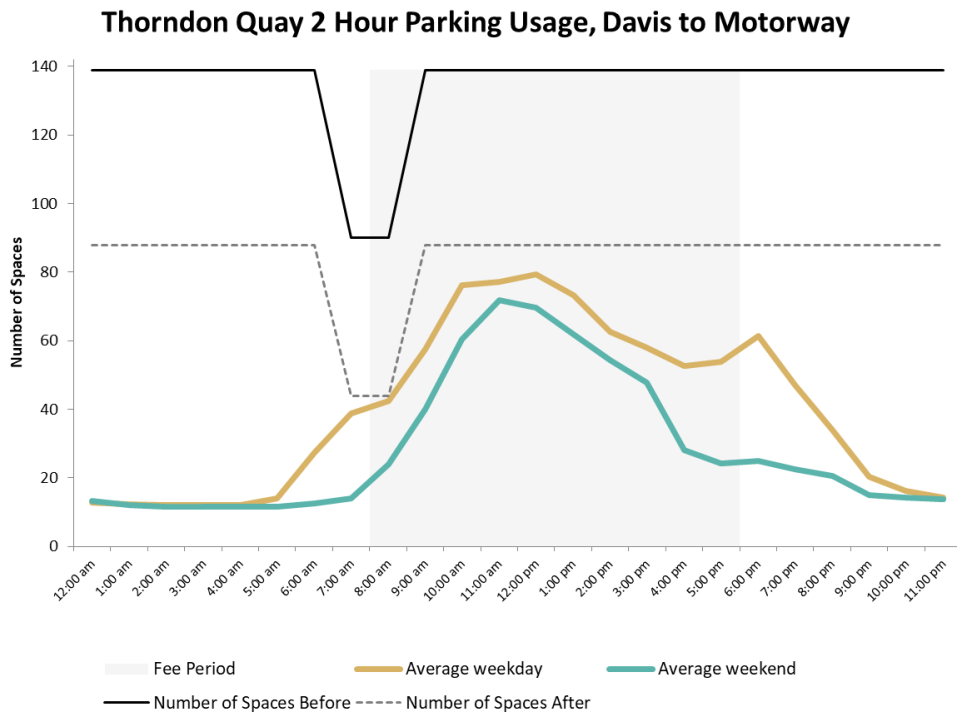


Figure 14

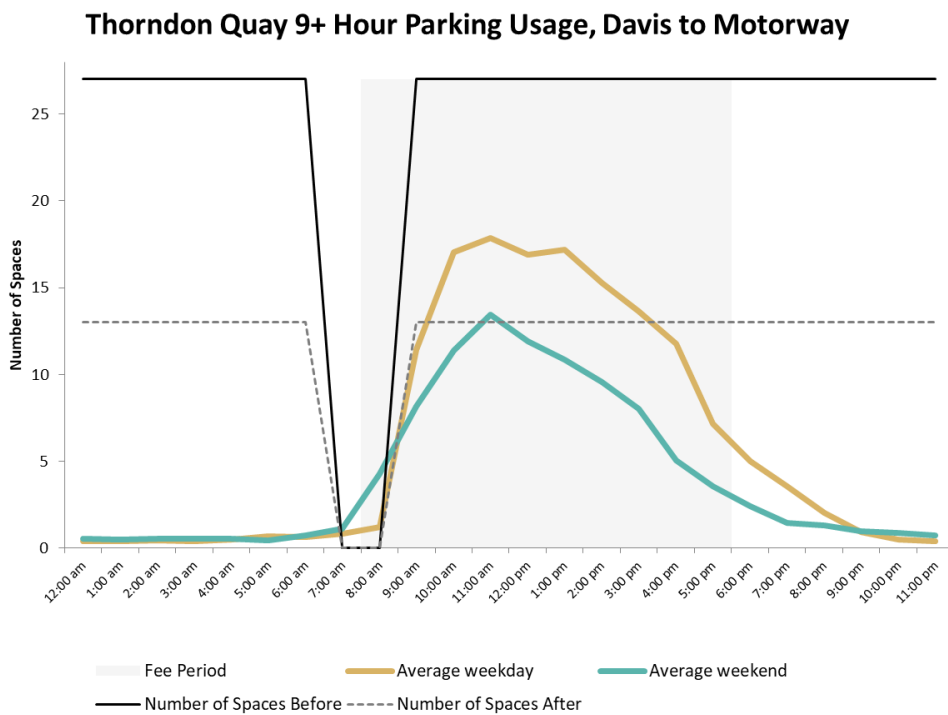


Figure 15

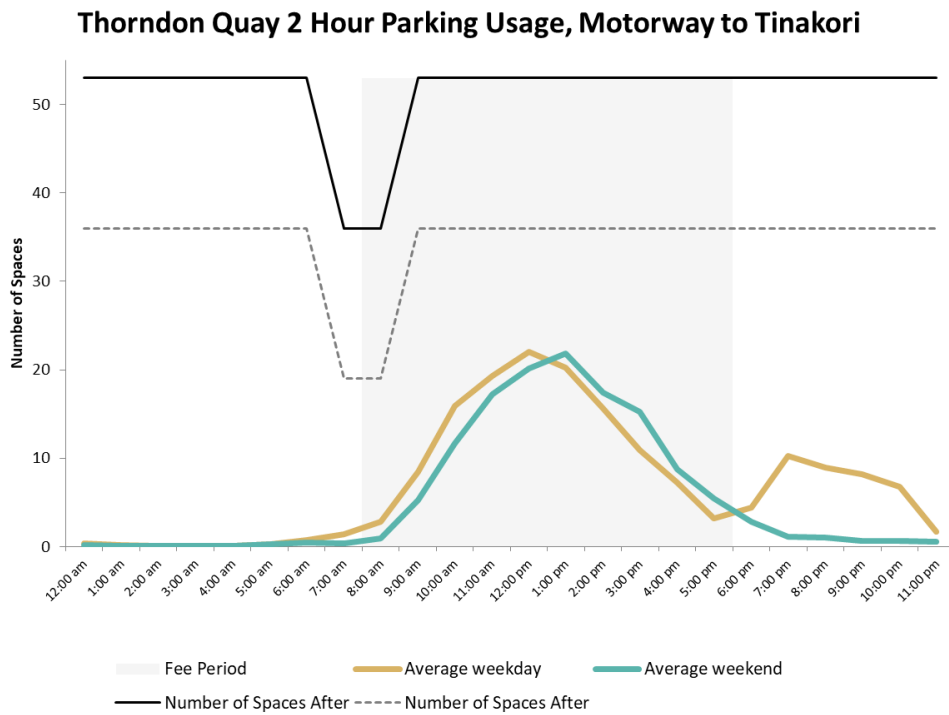
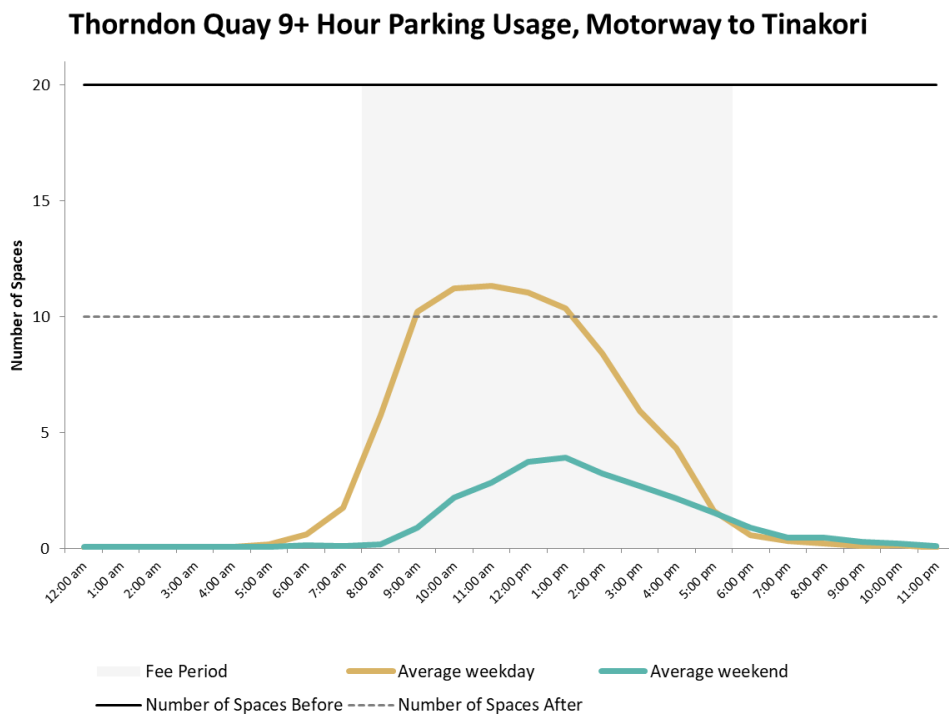


Figure 16



As illustrated by the figures above, parking on Thorndon Quay is most used during the fee period of 8 am to 6 pm. Peak occupancy occurs on weekdays during these hours. Overall, 53 percent of 2-hour parking spaces are occupied, while 70 percent of 9+ hour parking spaces are occupied. The highest occupancy occurs around noon, which makes sense given that people are likely having lunch or running errands in this time. The occupancy trends are fairly consistent whether the parking space is angled, parallel, inbound, or outbound. Even in the section where the majority of businesses are located, Davis to Motorway, most of the parking spaces are underused, with the highest occupancy rates occurring during business hours on the weekday and weekend. Table 3 summarises the occupancy trends for the 2-hour parking in the main commercial part of Thorndon Quay, Davis Street to the Motorway.

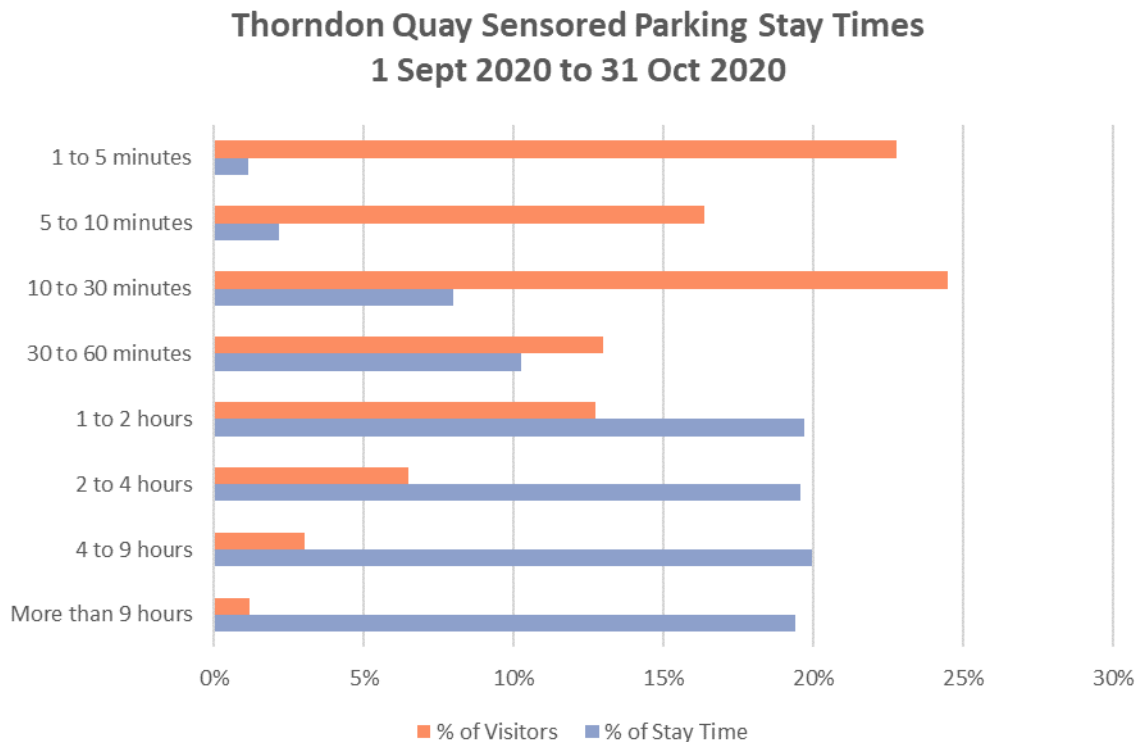
**Table 3**

<b>Usage</b>	<b>Under used &lt; 50%</b>	<b>Under used 50-70%</b>	<b>Optimal 70-85%</b>	<b>Over used 85-100%</b>
Weekday (8am - 6pm)		<b>X</b>		
Week Evening (6pm - 8pm)	<b>X</b>			
Week Overnight (8pm-8am)	<b>X</b>			
Weekend Day (8am - 6pm)		<b>X</b>		
Weekend Evening (6pm - 8pm)	<b>X</b>			
Weekend Overnight (8pm-8am)	<b>X</b>			
Peak Occupancy		<b>X</b>		

Most visitors park on Thorndon Quay for only a short amount of time (less than half an hour), with the majority of these visits lasting for 10 minutes or less. Figure 17 below shows the stay times.



Figure 17



Below are a few quick facts about the recorded parking stays during September and October 2020:

- 37 minute average stay time for same day visitors during the payment period of 8 am to 6 pm
  - 32 minute average stay time for 2 Hour Parking
  - 69 minute average stay time for 9+ Hour Parking
  - 13 minute average stay time for 5 Minute Parking
  - 22 minute average stay time for 30 Minute Parking
- 41% of visitors stay under 10 minutes and use 5% of time
- 2% of visitors stay over 4 hours and use 22% of time
- 40% of visitors overstay
  - 34% park without paying
  - 4% pay but overstay the time paid for
  - 2% overstay the parking time limit (P5, P30, P120, P9hr, P10hr)

Figure 18 shows that the majority of parking overstays are visitors who park without paying, while only a small percentage of visitors overstay the time paid for. Only 5 percent of total visitors who overstay exceed the time restrictions on the spaces they occupy. Figure 19 shows that most overstays are short at 10 minutes or less.

Figure 18

### Parking Overstays, Thorndon Quay 1 Sept 2020 to 31 Oct 2020

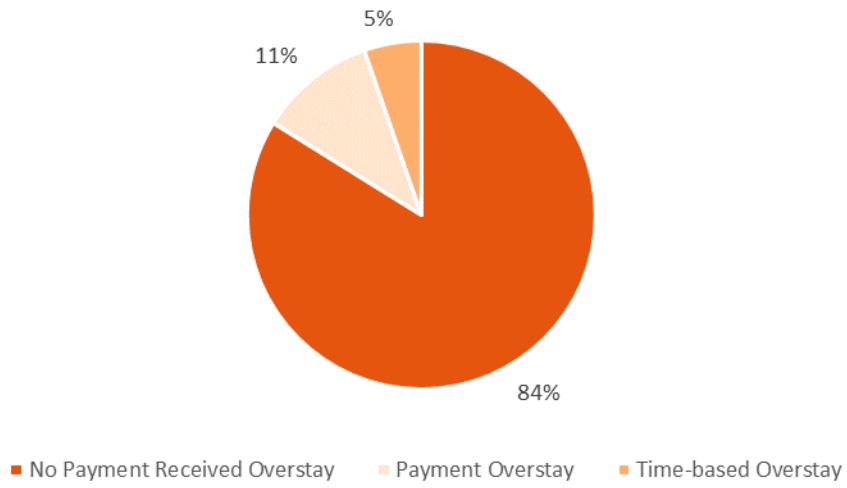
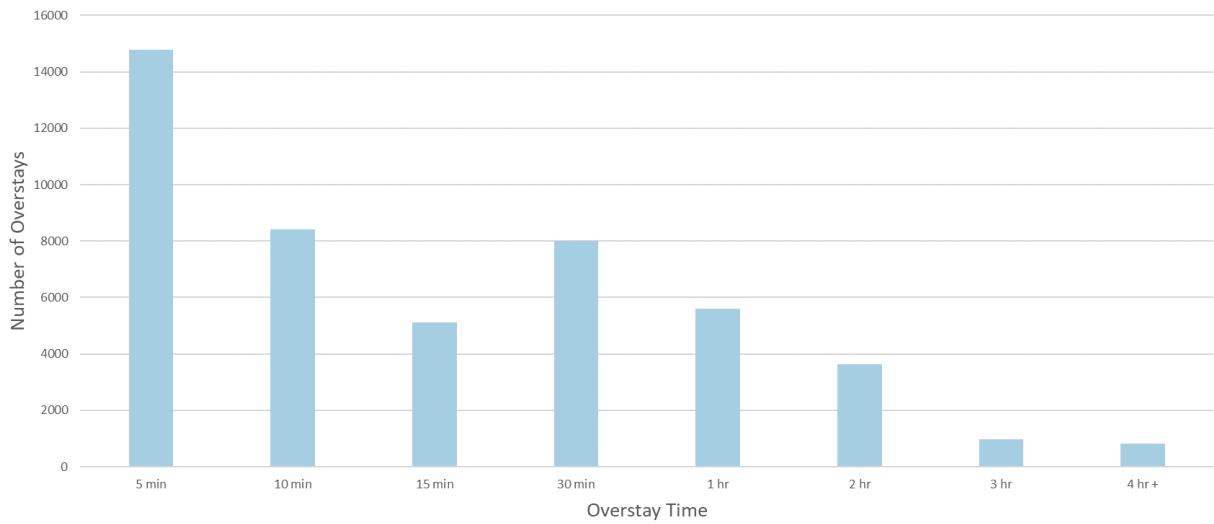


Figure 19

### Thorndon Quay Parking Overstays 1 Sept 2020 to 31 Oct 2020



The analysis so far has revealed that the parking on Thorndon Quay is underused, as well as being used incorrectly (i.e., visitors are parking without paying or overstaying the time limit or time paid for). The current configuration is not optimising the space nor the potential revenue for businesses and the city alike. During the analysis period of 1 September 2020 to 31 October 2020, the parking spaces on Thorndon Quay generated \$220,000 in parking revenue. This works out to approximately \$1.2 million a year when accounting for public holidays and periods of lower usage (such as summer holidays). Meter and PayMyPark app revenue accounted for 83 percent of the total revenue, while the remaining 17 percent of the revenue came from parking related infringements and tow revenue. Each space averaged about \$10 of revenue per day. Differences in parking orientation (angle vs. parallel) and parking direction (inbound vs. outbound) did not reveal a significant effect on average parking revenue per space.

### ***Parking Changes and Effects***

As stated in a previous section, converting angle parking to parallel parking will result in an estimated crash cost savings of \$1.7 million over a 10 year period. There will be approximately a 35 percent reduction of total spaces when all the existing angle parking on Thorndon Quay is converted to parallel parking. This change will result in an expected annual revenue loss of approximately \$74,000, or 6 percent, if no other interventions, such as changing some of the parking time restrictions or increased enforcement, are implemented. Specific figures are shown in Table 4 below.

The reduction in parking also means that approximately 4 percent of current visitor demand would not be met. All the unmet demand falls in the commuter or longer stay category, not the short-term visitors to businesses. Figures 12, 14, and 16 in the previous section show that commuter parking demand would exceed the supply most strongly at noon (the lunchtime rush), with the two hours on either side of this time as pressed for demand as well. However, current visitor patterns suggest that the current parking isn't being used optimally. More than 80 percent of visitors along Thorndon Quay are staying for less than an hour, with the majority of these visits lasting for less than 30 minutes. The data show that more than a third of visitors are parking without paying, especially visitors who stay for just a short duration. Should the parking demands increase on Thorndon Quay in the future, changing time restrictions in the busiest areas and increasing enforcement can help encourage turnover and mitigate both the unmet visitor demand and revenue losses.

Table 4

Location	Total Spaces Before (Angle and Parallel)	Total Spaces After Converting All Angle to Parallel	Current Average Daily Visitors Per Space	Current Average Daily Revenue Per Visitor Per Space	Current Total Yearly Revenue	Daily Visitors Not Served After, Weekday	Daily Visitors Not Served After, Weekend	Total Daily Revenue Loss Based on Visitors Not Served	Total Yearly Revenue Loss Based on Visitors Not Served
<b>Bunny To Davis</b>	<b>132</b>	<b>95</b>	<b>3</b>	<b>\$3</b>	<b>\$459,959</b>	<b>40</b>	<b>0</b>	<b>\$244</b>	<b>\$60,903</b>
2 Hour Parking	62	62	5	\$2	\$195,554	0	0	\$0	\$0
9+ Hour Parking	70	33	2	\$6	\$264,405	40	0	\$244	\$60,903
<b>Davis To Motorway</b>	<b>166</b>	<b>101</b>	<b>7</b>	<b>\$2</b>	<b>\$596,698</b>	<b>30</b>	<b>1</b>	<b>\$44</b>	<b>\$11,096</b>
2 Hour Parking	139	88	7	\$2	\$506,142	0	0	\$0	\$0
9+ Hour Parking	27	13	7	\$1	\$90,556	30	1	\$44	\$11,096
<b>Motorway To Tinakori</b>	<b>73</b>	<b>46</b>	<b>4</b>	<b>\$2</b>	<b>\$149,863</b>	<b>1</b>	<b>0</b>	<b>\$6</b>	<b>\$1,566</b>
2 Hour Parking	53	36	5	\$1	\$95,681	0	0	\$0	\$0
9+ Hour Parking	20	10	2	\$5	\$54,181	1	0	\$6	\$1,566
<b>Grand Total</b>	<b>371</b>	<b>242</b>	<b>5</b>	<b>\$2</b>	<b>\$1,206,520</b>	<b>71</b>	<b>1</b>	<b>\$294</b>	<b>\$73,564</b>