

NATIONAL PARKING MANAGEMENT GUIDANCE

This document provides guidance on best-practice management of public parking (on-street parking and publicly owned/managed off-street facilities) throughout New Zealand.

This guidance has been released as a draft for consultation and feedback. It has been designed help guide parking management decision-making.

The consultation period will run for four months to 12 March 2021, after which Waka Kotahi will review the feedback and refine the guidance, before being formally released.

If you would like to help improve this guidance by providing feedback, please email ParkingManagement@nzta.govt.nz.

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OVERVIEW

CITI FLORA

O'Connell Street Bistro

1. OVERVIEW



As our cities and towns grow there is increasing competition for space on our roads and streets. This results in a growing need to increase the use of public transport, walking and cycling, and for our streets to be inviting public spaces.

Well-managed public parking can positively contribute to the transformation of urban environments into safer, more vibrant, sustainable, and equitable places with better housing and travel choices. Equally, poor parking management can undermine these goals.

This guide promotes a consistent, best-practice guide for the management of public parking throughout New Zealand. Although public parking includes both parking managed by road controlling authorities and private parking operators this guidance is mostly applicable to road controlling authorities. It sets out a principles-based process for deciding where it may be appropriate to provide public parking, and how to manage public parking resources in a variety of circumstances.

- Section 1 provides a description of parking management, the purpose of the guide, and the benefits that can be achieved through good practice public parking management.
- Section 2 outlines the process for establishing a comprehensive framework of good public parking management.
- Section 3 provides guidance on the range of approaches to managing public parking. This section can be used to guide the development of a parking strategy or to respond to parking issues. There is also guidance on parking technology and successful public engagement approaches.

This guidance relates to motor vehicle parking, it does not cover bicycle or micro mobility parking. Guidance on bicycle parking supply, location and design can be found in the [Cycle Parking Planning and Design](#) guidance.

Throughout the document are case studies which provide some real examples from New Zealand and around the world that support the parking management concepts.

Image by Flickr/
Daniel Chodusov

1.1 WHAT IS PARKING MANAGEMENT

Parking management is a packaged approach that aligns with the objectives sought and can include a range of methods such as:

- limiting what space is available for parking
- restricting how long a vehicle can be parked for
- allocating specific space for types of parking (e.g. mobility parking, loading zones)
- requiring payment of a fee for parking.

The authority to make changes to public parking is enabled through a bylaw and then local authorities approve changes to parking through a parking resolution report. All parking changes must be in accordance with the Land Transport Rule Traffic Control Devices Rule 2004 (TCD Rule) including the types of signs and road markings used.

Relationship between the TCD Rule and Manual and this Guidance

The Land Transport Rule Traffic Control Devices Rule 2004 (TCD Rule):

- a) specifies requirements for the design, construction, installation, operation and maintenance of traffic control devices; and
- b) sets out the functions and responsibilities of local authorities in providing traffic control devices to give effect to their decisions on the control of traffic.

The Waka Kotahi [Traffic Control Devices Manual](#) (TCD Manual) supports the TCD Rule and provides guidance on industry best practice,

including, where necessary, practice mandated by law in relation to the use of traffic control devices. Guidance on traffic control devices related to parking control are covered in part 13 of the manual.

The figure below depicts the different roles of the present parking guidance versus the TCD Manual Part 13.

NATIONAL PARKING MANAGEMENT GUIDANCE

- (Public) parking management - what is it, potential benefits
- Process to develop parking management frameworks
- Parking management approaches

TCD MANUAL PART 13 (PARKING)

- Legal framework - implications and responsibilities
- Design considerations and elements
- Linear and zone parking treatments

1.2 STRATEGIC FIT OF THIS GUIDANCE

The planning and management of parking can make an important contribution to achieving the outcomes set out in several key national strategies:

- The Government's Urban Growth Agenda, which aims to remove barriers to the supply of land and infrastructure and make room for cities to grow up and out. A key component of this agenda is the National Policy Statement for Urban Development (NPS-UD). Policy 11 of the NPS-UD prevents local authorities from setting minimum car parking rate requirements, other than for accessible car parks, and strongly encourages local authorities to manage the effects of car parking through comprehensive parking management plans.
- Keeping Cities Moving released by Waka Kotahi NZ Transport Agency in September 2019, which aims to increase the well-being of NZ cities by growing the share of travel by public transport, walking and cycling.
- Government Policy Statement on land transport 2021/22–2030/31 (GPS) which includes strategic priorities to improve safety, provide better transport options, and reduce carbon emissions. The GPS guides investment in land transport.
- Road to Zero: A New Road Safety Strategy for NZ that has been developed by the Ministry of Transport and key partners, which aims to significantly reduce the number of people being killed or seriously injured on New Zealand roads.



- New Zealand Urban Design Protocol which provides a platform to make New Zealand towns and cities more successful through quality urban design. Minimum parking requirements and poorly managed parking can create poor urban design outcomes and uninviting public spaces.
- The Climate Change Response (Zero Carbon) Amendment Act 2019, and the need to transition the transport system to net zero carbon emissions, to meet our domestic and international commitments.

Keeping Cities Moving is the genesis of this document, identifying 'provide ongoing parking management guidance and leadership' as a key intervention for influencing mode shift (see excerpt below, p.27).

INTERVENTION	DESCRIPTION
20. Provide ongoing parking management guidance and leadership	We will provide leadership in public conversations about parking management, supported by robust research, data and guidance for parking management strategies. We will also make necessary regulatory changes to enable parking fines to be set to discourage inappropriate behaviour in residential areas.

Keeping Cities Moving recognises that good public parking management can contribute to achieving mode shift in several ways:

- Enabling higher densities and a more compact urban form by reducing the amount of space that is dedicated to parking.
- Freeing up street space for public transport, walking and cycling.
- Reducing price subsidies for parking, thus disincentivising car travel when other modes are available.

A good example of this in practice is in Queenstown where parking management was aligned with strategies to incentivise greater use of the bus service and reduce traffic congestion in the town centre. Refer to Case Study 1 for more information on this.

CASE STUDY 1

Queenstown Lakes integrated parking policy

The Queenstown Lakes area continues to experience significant growth pressure, resulting in concerns about road congestion, car parking, and reduced amenity within the town centre. Parking analysis from 2017 indicated that town centre car parking was at capacity and that approximately 30% of congestion was being generated by people searching for parking spaces.

In late 2017, the District and Regional Council responded to these issues by increasing, and in some cases doubling, parking fees, limiting the number of non-priced parking spaces, and removing all discounted long-term commuter parking from the town centre.¹

Critically, these changes were coordinated with the introduction of a new frequent bus network and the launch of a subsidised \$2.00 flat fare.

Since implementation, both bus ridership and parking revenue have shown a dramatic and sustained increase, while parking occupancy rates have dropped by around 17% between 2017 and 2019. Data from June 2019 show a 64% year to date increase in bus patronage compared to 2017/2018.²

A 2019 survey showed that peak occupancy intensity for the town centre was 79% at 1pm, within the typically recommended target occupancy rate of 70–90% to support effective parking turnover.³ This represents a 10% decrease from 2018 and a further 6% decrease from 2017 as shown in the figure below.

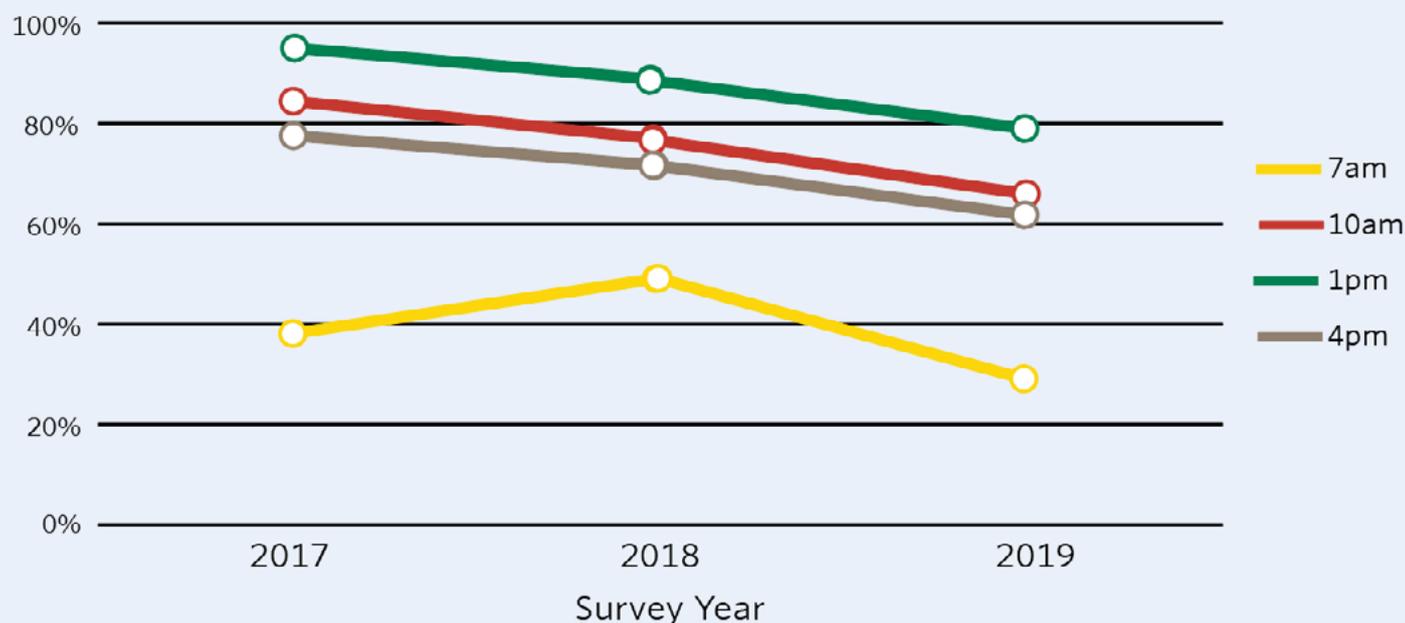
1 <https://www.qldc.govt.nz/assets/Uploads/News/QLDC-Parking-changes.pdf>

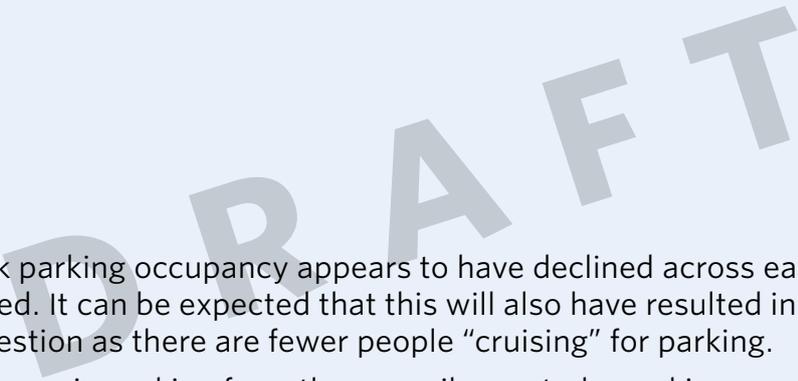
2 <https://www.orc.govt.nz/media/7088/appendix-2-queenstown-buses.pdf>

3 Stantec, Queenstown Parking Survey 2019, June 2019

Parking occupancy in central Queenstown

Town Centre Occupancy





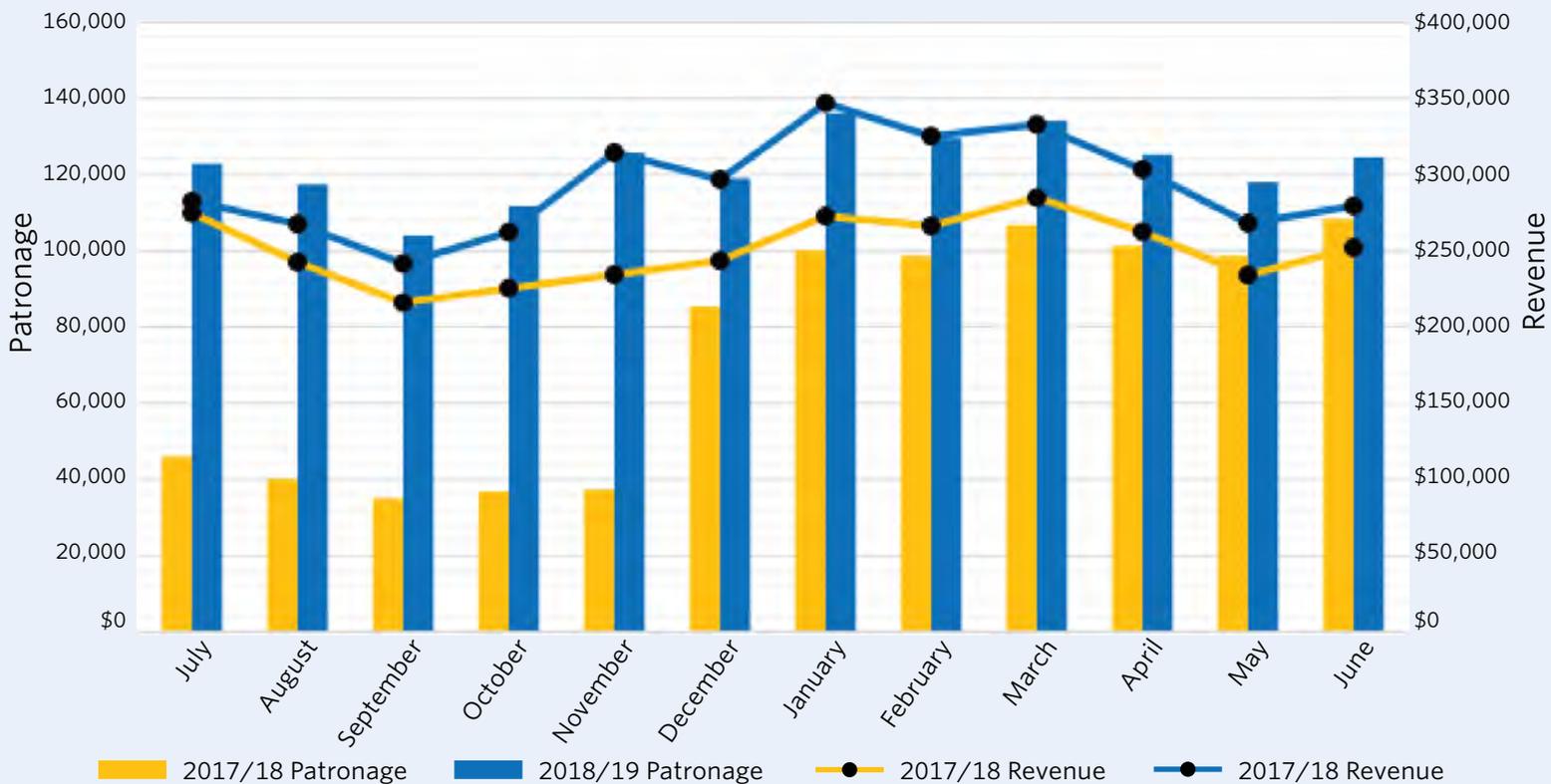
Furthermore, peak parking occupancy appears to have declined across each time point surveyed. It can be expected that this will also have resulted in a reduction in congestion as there are fewer people “cruising” for parking.

Following the increase in parking fees, the council reported a parking revenue surplus of approximately \$1.3 million for 2017-2018.⁴ This surplus was then invested into the bus service to improve bus stop infrastructure and wayfinding.

This is a good example on how parking management can be integrated with public transport management. The objective in Queenstown was to shift people to using public transport to relieve the congestion on the roads. This was achieved through increasing the cost of parking and reducing the cost of using the bus. The results to date demonstrate that this has been successful.

⁴ <https://www.odt.co.nz/regions/queenstown/surplus-target-getting-people-out-cars>

Wakatipu Patronage and Revenue



1.3 THE NEED FOR GOOD PARKING MANAGEMENT

Good management of public parking is a crucial component of the overall transport system, and essential for creating vibrant and well-functioning urban areas. It is especially important in areas experiencing growth pressure because:

- There will be a much stronger demand for public parking as urban areas experience intensification and consequential increases in travel activity.
- As minimum parking requirements⁵ are removed from district plans following the recently released National Policy Statement on Urban Development (August 2020), private parking stock may not increase as fast as it has historically, placing more demand on the public parking resource. Progressive parking management supports 'achieving more' with less parking supply by better utilising supply and managing demand.
- Parking takes up valuable land. Developing high-quality pedestrian, cycling and public transport infrastructure, or even increasing building stock to increase housing supply, is likely to involve reallocating areas currently used for parking. This reduction in parking will necessitate efficient management of the remaining parking supply.

- Parking availability and pricing is a key aspect of travel decision making and can fundamentally influence travel behaviour. Strategic parking management can support (or hinder) uptake in a range of travel modes, which can, in turn, impact on demand for the parking supply.

While parking can contribute towards the success of a place, poorly managed and designed parking can undermine efforts to create highly liveable urban areas by:

- Subsidising and encouraging excessive demand for car-based travel, leading to congestion, increased vehicle emissions and poorer public health, as well as undermining investment in public transport and walking and cycling infrastructure.
- Substituting parking for valuable floor space, thereby increasing development costs, and preventing higher value uses for land, (e.g. community facilities/social services or additional commercial and residential development that contribute more to broader urban objectives).
- Eroding the sense of place and character of a town centre and/or limiting potential streetscape enhancement. The location and design of parking can lead to poor urban design outcomes.
- Adding disproportionate costs to low income households, who may not own a car but pay directly or indirectly for the supply of car parking, either bundled with their housing or publicly subsidised via rates.

⁵ Minimum parking requirements are rules in District Plans which require at least a certain amount of off-street car parking to be provided on site as part of a development proposal.

- Increasing the direct financial costs to councils to provide and maintain car parking.⁶
- Creating safety issues for other users such as pedestrians (e.g. moving through off-street car parks) and cyclists (e.g. dooring and reversing).

Internationally there is a growing realisation that while many parking management initiatives are well-intentioned, they may have done more harm than good when their wider impacts are understood. In particular, efforts to increase parking supply to make it easy for people to find a parking space have had wide reaching (and often negative) impacts on urban form and the overall transport system. Generous parking supply is shown in the figure on the following page as a key part of the cycle of automobile dependency by inducing car-based travel demand, and thus parking demand.

This has led to a change in approach to parking management in many places around the world, which focuses on getting the balance right: providing the 'right' amount of parking, in the right place, at the right time, and at the right price.⁷

Image from Business Case for Walking, Auckland Council 2017.



⁶ Donald Shoup provides good general analysis on the negative outcomes conventional parking management can have in: Shoup, D. C. 2005. The high cost of free parking, Chicago, Planners Press, American Planning Association

⁷ Refer to 'The High Cost of Free Parking', American Planning Association, 2005 and 'Parking Management Best Practices', Routledge 2017

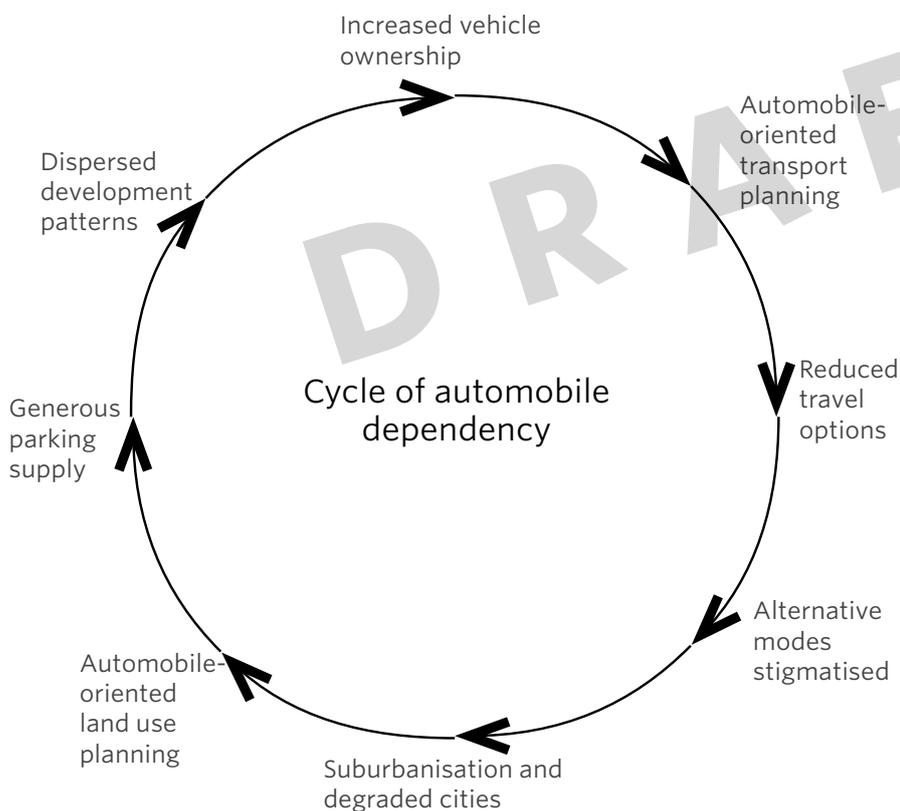


Figure of cycle of automobile dependency adapted from Litman T, Parking Management Strategies, Evaluation and Planning, Victoria Transport Policy Institute, 2016

1.4 OBJECTIVES AND PRINCIPLES

The overarching objective of good parking management is to:

enable an appropriate and efficiently used level of parking supply in a way that equitably supports wider transport and urban form outcomes.

Key considerations for achieving this overall objective are:

- What is an appropriate level of parking supply? How might it vary by location? What are the negative effects of too much or too little available parking?
- How can parking management help support wider transport outcomes? Is parking making congestion better or worse? Is parking supporting or undermining public transport, walking, and cycling?
- How can parking management help support a better-quality urban form? Is parking undermining a sense of place and character? Is it helping support higher density mixed-use developments?

- Is parking being supplied in an equitable way? Are those who benefit from it paying the true cost? Are those with the greatest need for parking being prioritised?

These considerations and questions help shape the key principles that should be applied to help deliver good parking management:

- prioritise public space to deliver the highest value
- efficiently use space dedicated to parking
- prioritise those with the greatest need for parking
- equitably pay for the costs of parking provision
- ensure parking supports wider transport outcomes
- ensure parking and its location supports a quality urban form
- make evidence-based decisions
- provide a high-quality user experience.

The way these principles can help guide parking management decision-making is outlined further in the document.

KEY PRINCIPLES OF PARKING MANAGEMENT

1. Prioritise public space to deliver the highest value.
2. Efficiently use space dedicated to parking.
3. Prioritise those with the greatest need for parking.
4. Equitably pay for the costs of parking provision.
5. Ensure parking supports wider transport outcomes.
6. Ensure parking supports a quality urban form.
7. Make evidence-based decisions.
8. Provide a high-quality user experience.

Image from Kate Battersby/MRCagney





THE PARKING MANAGEMENT FRAMEWORK

2. THE PARKING MANAGEMENT FRAMEWORK

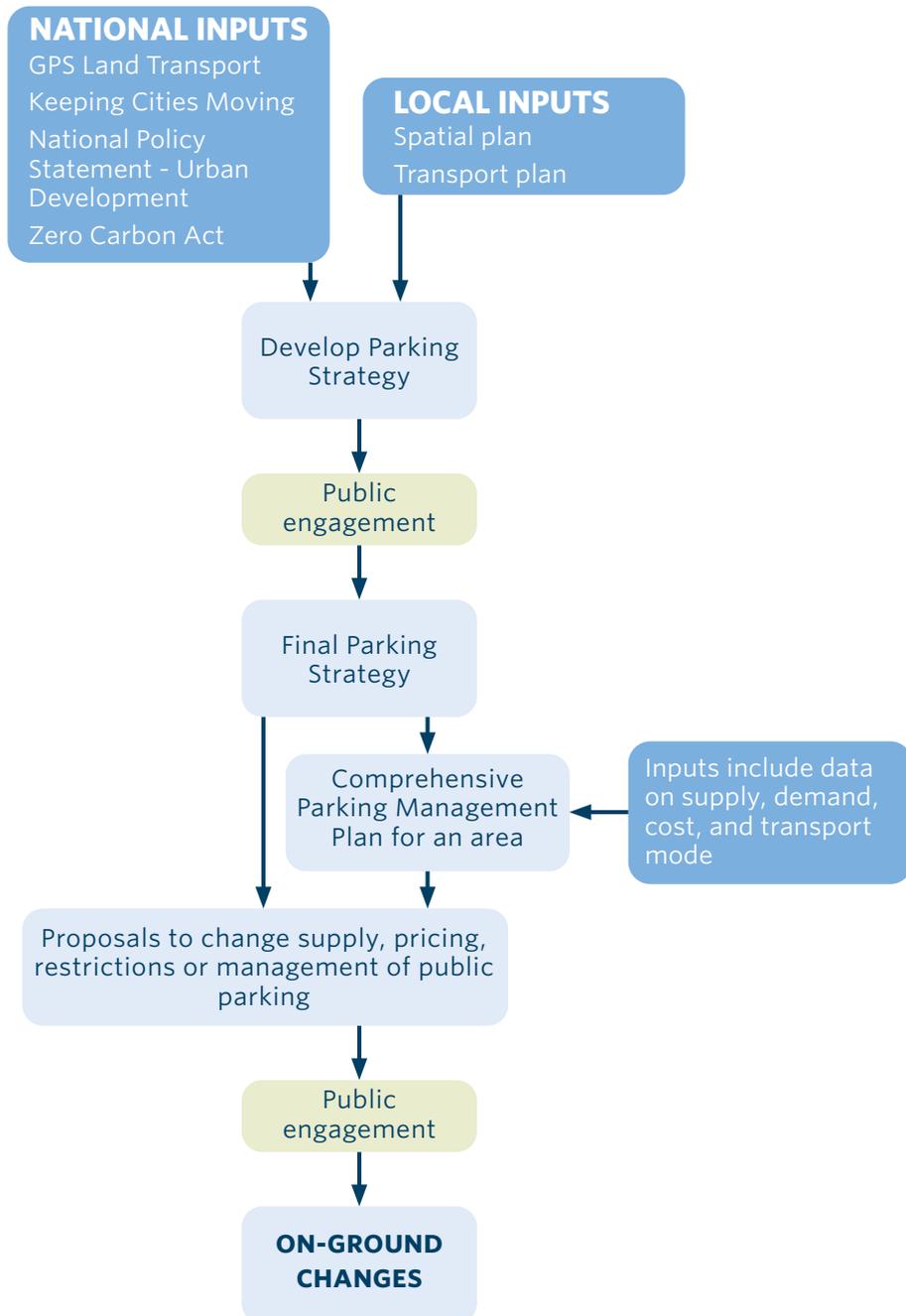
2.1 PARKING MANAGEMENT OVERVIEW

Good parking management achieves a situation where the right amount of parking is provided in the right location, at the right time, and at the right price. As discussed in Section 1, this means:

- providing an appropriate amount of parking, noting that there may be other higher value uses of public space
- efficiently using space that is dedicated to parking
- prioritising those with the greatest need for parking
- equitably paying for the costs of parking provision
- ensuring parking supports wider transport and urban form outcomes
- making evidence-based decisions
- providing a high-quality user experience.

The first step in approaching parking management is to develop a parking strategy. A parking strategy describes how parking will be managed in a way that is consistent with overarching national and local transport and land-use strategic direction. The parking strategy will include policies to support an overall vision and/or set of clear objectives. The adjacent figure shows the parking strategy in the context of local direction.

The next step is to develop area-based Parking Management Plans (PMP) to provide a specific plan to align with the parking strategy, address area specific parking issues or respond to proposed changes. A parking management plan can be prepared for a discrete area such as a city centre, a precinct of a city centre, a suburban commercial centre, or an area around a trip intensive land-use like a tertiary education or health facility.



2.2 PARKING STRATEGY

Having a parking strategy, is critical for any town or city where parking needs to be managed. A parking strategy will provide the guidance to operational teams and demonstrate to the public how parking will be managed. The principles outlined in Section 1, and the parking management approaches in Section 3 of this report should be used in the development of a parking strategy.

The parking strategy is a useful way to evaluate parking issues and plan for what parking interventions should apply and when. The parking strategy should contain parking management objectives that encourage more

efficient utilisation of parking resources, manage demand, and articulate when it may be appropriate to change public car parking supply. The strategy will provide analysis of the key issues, what is causing them, and the response to these issues. The strategy should be structured to help support project teams with reallocating road space.

Hastings District Council took an interesting approach in establishing the basis for its parking strategy. They asked the public whether parking should be paid for by everyone through rates or paid for by the users through metered parking. Refer to Case Study 2 for more information on this.

Image from
MRCagney



CASE STUDY 2

Hastings parking pricing decision

Parking has been a contentious issue in Hastings for many years. Under its Central City Strategy, the Hastings District Council adopted the Hastings Vibrancy Plan in October 2015, which supported trialling a free parking pilot for the city centre. Together with the direction of the Vibrancy Plan and pressure from retailers, Hastings District Council approved the trial of free parking, while retaining the existing time limit. The trial ran from November 2015 to February 2016 and was extended several times through to June 2017.

To determine the impact of the trial, parking occupancy surveys were conducted before and after the free parking was introduced. This data was used, along with other metrics, in an evaluation of the trial. The evaluation included analysis of parking occupancy and length of stay, parking revenue loss, retail spend, bus patronage, parking complaints and an attitudinal survey to see what the public thought of the free parking. There was also a comprehensive review into the effects of the free parking trial conducted by Marketview, a consumer spending research company, in May 2017.

The evaluation report about the free parking trial was inconclusive about any positive effect to Hastings' retail activity or vibrancy. Although there was some increased retail spend over the trial period, the review found it could not be directly linked to free parking and it could be argued that other macro-economic factors, such as lower interest rates and high levels of employment, had a greater influence.

The evaluation of the trial also showed the loss of \$805,000 of parking revenue created an affordability problem for Hastings District Council and would result in an increase in rates to offset the loss. The rates forecast for 2017/18 was 0.9% higher if free parking was retained.

Based on the evaluation, the council included a question in its 2017/18 Draft Annual Plan consultation. The council made it clear that providing parking in Hastings town centre has a financial cost which needs to be paid for by someone. The question was posed to residents like this:

2017/2018 Hastings District Council Draft Annual Plan consultation document on parking

BUDGETED OPTION

METERS

RATES SHOULD NOT BE USED TO PAY FOR CENTRAL CITY PARKING. A USER-PAYS SYSTEM IS FAIRER, BUT MORE CONVENIENT PAYMENT OPTIONS OTHER THAN CASH PAYMENT SHOULD BE INVESTIGATED.

This will mean investing in new technology which would be funded from revenue generated from parking meter charges.

RATES

NOT HAVING TO PUT CASH IN A PARKING METER IMPROVES THE VITALITY OF OUR CENTRAL CITY, IS MORE CONVENIENT AND IMPROVES THE SHOPPING EXPERIENCE.

I would be happy to pay via a charge on my rates. To cover the cost each ratepayer will be paying based on the property location. This will mean central commercial property owners paying \$65 per year, wider urban property owners \$22 a year, and rural property owners \$11 a year.

Question: How would you prefer to pay for Hastings city centre on-street parking?

Option A: Parking Meters.

This would be paid for via meters on the street as they are used, with some technological enhancements to provide additional payment options – i.e. credit cards. The charge for on-street parking would be increased to \$1.20 per hour (currently \$1) to future proof the system.

Option B: Rates

No on-street payment for on-street parking. Costs for parking in Hastings and Havelock North would be combined so everyone shares the cost. This would be paid via an additional charge on your rates.

The council received almost 3000 submissions on the parking question with 68% preferring the user-pays option (return to parking meters) and 32% preferring the targeted rate option.

Some themes arising from people preferring user-pays were:

- It is not the role of residents to subsidise parking to assist CBD retailers.
- Funding through rates would not be accurate or fair on those who do not go into town often, or rural ratepayers in the northern Hastings District who visit Napier as their nearest town.
- Out of towners, tourists and non-ratepayers will not be contributing, despite using the service.
- Do not believe argument that free parking has increased retail spend – trend happening nationwide.
- Free parking filled by businesses whose staff use it – policing of free parking is never enough to stop this, and businesses see it as their right.
- Having to put a coin in a meter does not make people drive elsewhere...it does make staff and businesses park elsewhere.
- Introduction of easier ways to pay would be good when paid parking reintroduced e.g. cell phone apps such as 'Park Mate'.

People preferring Option B thought the free parking had been successful and made Hastings an easier place to visit. There were also comments suggesting the brand of Hastings would be damaged by re-introducing parking meters.

The clear majority of those who responded felt the introduction of a targeted rate to fund the revenue shortfall was not a fair and equitable system for paying for parking, and that a user pays system was a fairer system. In June 2017, at the governing body meeting, the council supported the council officer's recommendation that user-pays charges through parking meters be reinstated in Hastings city centre. They also supported investigations into better electronic payment options and in-ground sensor technology.

Hastings District Council took an innovative approach to resolve the difficult decision around parking charges. By presenting the relevant information in a transparent manner to the public, it was easier for elected councillors to decide on what is normally a contentious topic.

Parking Strategy Contents

The content of a parking policy typically includes:

TOPIC	DESCRIPTION
Introduction and purpose	Explain the need for a parking strategy, how it fits within the local planning/strategic context, what it is aiming to achieve (best articulated through a 'vision') and what issues it is seeking to address.
Objectives and principles	Formulate a set of objectives that align with the vision, wider strategic direction and outcomes. The objectives for managing parking may differ for each location and need to describe the local outcomes being sought. Refer to Section 1.4 for principles that will help frame the objectives.
Strategic alignment and direction	This section will describe how the parking strategy aligns with and supports government and local strategies and plans. Explain how parking management supports other transport and land-use outcomes for the area.
How different parking uses are prioritised	This could include a parking hierarchy as shown in Section 3.2
Pricing parking	Explains the purpose of pricing parking. Include detail around how parking prices are set and adjusted, and how regularly they are reviewed. Refer to Section 3.4.
Parking management approach in centres	Outline the main issues associated with parking in commercial centres. Describe the approach to manage supply and demand in centres and how this aligns with policy objectives. This will include the use of pricing in areas of high demand. Refer to Section 3.4.
Parking management in residential areas	Outline the main issues associated with parking in residential areas. Explain the approach to manage these parking issues including where residential permit schemes will be used. Refer to Section 3.3.
Park and ride	Outline the approach taken to supply and manage demand for parking associated with public transport stations. This should explain how Park and Ride can support public transport and complements other access modes (e.g. feeder bus services, walking and cycling).
Electric vehicles, car share and autonomous vehicles	Outline the approach taken to support and cater for these vehicle categories. This will explain the benefit to the city of supporting, or not supporting, each of these and how it aligns with objectives and principles. Refer to Section 3.5.
Special events, sports, and other venues	Events and sporting fixtures have sporadic spikes in parking activity and can be difficult to manage. Some sporting venues have regular traffic management plans and parking restrictions that are used for each large event. Other considerations for these are how alternative forms of transport are supported and how Pick Up Drop Off is managed.
Parking technology	Clearly outline how technology will be used and the associated benefits to the customer or local authority. The public can be nervous about new technology and it is important to explain how it works and why it is being used. Refer to Section 3.7.
Parking Management Plans (PMP)	Explain the process for developing PMPs and a programme for their application. Refer to Section 2.4.

Application of the parking policy

Once the objectives or parking management policies and principles have been established via the parking strategy, it can be applied to areas of the city or town that have identified parking issues and pro-actively support wider transport and land-use plans. The strategy can also be used to support re-vitalisation initiatives for town and city centres, where alternative uses for areas of public parking may have net benefits for the success of the centres.

Whether responding or working proactively, useful first steps in devising a management response include scoping out an area of influence, gathering information on the parking stock and utilisation within the area, and applying the agreed parking policies to plan measures to manage the parking resource. This management response is often referred to as an area specific 'parking management plan' or a 'comprehensive parking management plan'.

2.3 PARKING MANAGEMENT PLAN

A Parking Management Plan (PMP) is a location specific plan that outlines parking management interventions for a centre, a neighbourhood, a particular land-use (such as residential) or an area that is influenced by a land-use (e.g. commercial parking spill over to a residential area). As explained above, a PMP may be used to respond to known problems, or to proactively contribute to wider transport and urban outcomes. PMPs should be informed by reliable survey data, and by an understanding of the resource cost of parking.

Parking supply and utilisation data

Undertaking parking occupancy surveys gathers the data essential for developing a parking management plan. Surveys should collect parking supply information and occupancy data for the on-street parking spaces and off-street car parks, which can be geocoded for subsequent spatial visualisation and analysis.

Surveys typically include the following attributes:

- Existing parking restrictions (e.g. P60, pay parking, residential parking, clearway, unrestricted).
- Parking occupancy.
- Parking turnover (number of new vehicles parked per hour or per day) – hourly counts are very useful for observing parking turnover and length of stay behaviour, but more frequent counts can be useful in busy areas or areas with a short parking restriction (e.g. P30), and less frequent counts in areas where interest is in long-stay parking.
- Average duration of stay.
- Surveys should cover different days of the week including weekends.

The survey should cover the opening hours of businesses on the street but will depend on the level of activity in the centre. Typically, a survey will cover 8am–6pm.

Origin-destination surveys of parked cars can also provide useful information when considering other means of accessing the centre.

Reviewing the survey data enables the council to determine current parking conditions, the level of demand for existing parking resources, whether existing parking management favours long-term commuter parking or short-stay

visitor parking, and the ease of finding a parking space at different times of the day.

Survey data can be converted into graphs, tables, static and online maps for easier communication.

Resource cost

The resource cost of parking is the value of investment that could be redeployed to other community projects if it were not invested in public parking, i.e. the resource cost equates to the opportunity cost.

The publication from the Australian Government, the *National Guidelines for Transportation System Management in Australia*,⁸ outlines the components that contribute to the resource cost of public parking. It states that, while the resource cost of parking varies widely depending on the value of the land and the type of parking involved (e.g. surface parking versus structure parking), the overall cost is comprised of:

- the capital value of the land
- the construction costs of the car parking
- the operation and maintenance costs of the facility.

Having extensive survey data alongside an accurate understanding of the resource cost of providing parking is necessary to properly understand:

- whether parking is being subsidised or under-supplied
- whether observed demand is for subsidised parking or market-priced parking.

⁸ Refer to 'National Guidelines for Transportation System Management in Australia,' <https://www.atap.gov.au/technical-support-library/ngtism/index>

Contents

A parking management plan should consider the following:

CONTENT TOPIC	DESCRIPTION
Introduction and background	<ul style="list-style-type: none"> ▪ information on area context ▪ current transport projects ▪ parking strategy ▪ public transport services ▪ user or visitor surveys ▪ parking utilisation surveys ▪ other relevant events and activities not covered by surveys.
Current parking patterns	<ul style="list-style-type: none"> ▪ current parking supply ▪ plans for car park divestment ▪ current utilisation of parking stock ▪ spatial variation in parking utilisation ▪ off-street car parks ▪ on-street car parking ▪ duration of stay and short-stay versus long-stay users ▪ origin of visitors ▪ mobility parking.
Vehicle traffic, walking and cycling	<ul style="list-style-type: none"> ▪ information on existing walking and cycling networks, walking, data on vehicle traffic on roads within the area ▪ information and cycling accessibility, future data on walking and cycling networks, and within the area ▪ information on any current walking and cycling or planned projects. that will change conditions for traffic, walking or cycling.
Planning and development implications	<ul style="list-style-type: none"> ▪ information on key planning and development observations ▪ future parking scenarios including impacts of car park divestment ▪ future parking demand ▪ implications of urban growth strategies, street design implications ▪ implications of parking trends and management strategies.
Recommended management measures/actions/interventions	<ul style="list-style-type: none"> ▪ short-term, medium-term, and long-term parking management measures.

KEY MESSAGES

1. Decisions on parking management and supply should be guided by a parking strategy that aligns with local and government policy direction.
2. Parking management plans can be used to respond to parking issues or to proactively guide urban improvement initiatives and should align with the parking strategy and include area-specific considerations and clarity on what interventions are needed.
3. Gathering information about parking supply, utilisation and resource costs is an essential part of developing a robust parking management plan.

Image from Flickr/
Kristina D.C.
Hoepfner





PARKING
MANAGEMENT
APPROACHES

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7-11
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3. PARKING MANAGEMENT APPROACHES

This section provides the key parking management approaches that can be used to manage public parking supply. For each management approach there is context, principles, and guidance on how to implement the approach.

The content covers the following:

- when to allocate street space to parking, including guidance to ensure other uses of this space are considered
- how parking is prioritised through use of different parking restrictions for different types of users, including a hierarchy for different types of on-street parking
- managing parking in residential areas
- parking management tools such as time restrictions and pricing
- emerging mobility trends and how parking could support these
- public engagement and implementation strategies
- a description of different parking technology options.

3.1 ALLOCATING STREET SPACE TO PARKING

Context

Car parking is one of the largest uses of land in cities. Studies typically find that about half of all land area in post-1950s towns or city centres is occupied by on-street or off-street car parking.⁹ While centres typically require some public car parking to accommodate visitors, successful centres are creating high-quality street environments and providing more space for people.

The concentration of activity in urban areas, particularly busy commercial or service centres, means that space is a limited and sought-after resource. This means allocating street space to parking needs to be done through a careful decision-making process that considers all potential users and uses, as well as how the benefits and costs of this allocation are distributed within the community.

Many towns and cities (see Case Study 3) are starting to allocate more kerbside space for pedestrian and streetscape improvements, including wider footpaths, parklets,¹⁰ bus and cycle lanes. Prioritising public transport, walking, and cycling supports wider transport outcomes, as well as supporting local businesses by making it safe and easy for people to access them.

⁹ Taylor, E and Clements, R (2018) Empty car parks everywhere, but nowhere to park. How cities can do better; Shoup D (2005), The High Cost of Free Parking

¹⁰ A parklet is the conversion of a small number of parking spaces to public space for people to use

CASE STUDY 3

Cities repurposing on-street parking

In the early 1990s, the city centre of Sheffield (UK) faced significant challenges with a decline in local steel and engineering industries and the opening of a new 'big box' shopping centre on the fringe of the town, redirecting economic activity away from the city centre. This challenge forced the local government to rethink its city centre strategy to ensure people would continue to visit the centre and business would have the confidence to invest. The city developed the Heart of the City project; a strategy aimed at attracting people back into the city. A suite of streetscape projects were implemented, including narrowing carriageways on key streets, and rationalising car parking to provide more space for pedestrian activity and events. An evaluation of the streetscape projects throughout the city centre reported a 35% increase in foot traffic, and a further estimation of a net increase in spending of £4.2 million (based on 7% attribution of additional spend of £12.20 per visitor).¹¹

San Francisco introduced the Pavement to Parks Programme in 2010. Developed by the San Francisco Mayor's Office, Planning Department, Department of Public Works, and Municipal Transportation Agency, the programme aims to revitalise the city's streets through inexpensive and non-permanent features. Pavement to Parks creates temporary 'parklets' by converting on-street car parking space into publicly useable space and expansion of floor space for adjacent cafés/restaurants. Parklets present a more valuable use of kerbside space, which can generate greater social and economic benefits than using the space exclusively for storing parked vehicles. Since 2015, more than 60 parklets have been built in the city.

¹¹ The Pedestrian Pound – The business case for better streets and places (<https://www.livingstreets.org.uk/media/3890/pedestrian-pound-2018.pdf>)

Wellington parklet - example of on-street parking being repurposed into extra cafe seating. Image from MRCagney.



The first trial parklet saw an increase in pedestrian traffic of 37% in the area during weeknights. Similar outcomes have been recorded in other areas across the city.¹²

Auckland has implemented a shared space programme in its city centre, transforming traditional city streets into shared spaces where pedestrians, cyclists and motor vehicles share a space with no defined carriageway, and where pedestrian movement is prioritised over vehicular movement.¹³ To date, eight shared space projects have been implemented in the Auckland city centre, resulting in the conversion of over 100 on-street parking spaces. In these locations, design speeds are as low as 10 km/h and the only parking available is for loading and unloading (6am-11am, seven days a week) and for motorcycles (time-restricted spaces). Through traffic is discouraged because of the slow speeds and busy pedestrian environment, although access to local buildings is still maintained. A post-implementation evaluation report was commissioned by Auckland Council for the Fort Street shared space project. The evaluation found that, when comparing pre-works in 2008 to post-works in 2011, Fort Street foot traffic increased by 50% during peak hours, consumer spending increased by 47%, vehicle traffic decreased by 25% and 80% of people felt safer in the street.¹⁴

In 2019, a similar pilot project in Auckland's High Street created additional footpath space by inserting temporary platforms into the parking bays on one side of the street. The remaining parking was reserved for deliveries and mobility users. The design was developed in collaboration with the business owners which has ensured their support. Compared to a full street redesign, this is a low-cost option and results in very little disruption to businesses.

¹² <http://www.greencitiescalifornia.org/urban-ecosystems/san-francisco-pavement-to-parks>

¹³ Davis, D (2015) A Tale of Two Cities (2): Auckland's Shared Space Programme Turns Streets into Places <https://www.viennacouver.com/2015/01/aucklands-city-centre-shared-space-programme/>

¹⁴ Case Study: Fort Street: Auckland New Zealand <https://globaldesigningcities.org/publication/global-street-design-guide/streets/shared-streets/commercial-shared-streets/case-study-fort-street-auckland-new-zealand/>

Principles

Street space allocation priorities will differ depending on the context of the streets involved. Therefore, this section sets out general principles, and principles for residential environments, commercial centre environments and industrial environments.

General principles:

- Safety is the foremost priority, because any use of street space should put the safety of all street users first. This could mean that street infrastructure is installed to improve safety (e.g. crossings and kerb buildouts), or infrastructure may need to be removed to improve safety (e.g. taking out parking or bus stops to improve sightlines).
- Existing property access is a high priority for all environments because of legal obligations to maintain existing access to vehicle crossings, which includes accommodating vehicle movements along a street to access properties.
- Footpaths are a high priority in all environments because they are required for people to move around the area safely and easily.
- Public transport and cycling are prioritised to provide safe and attractive facilities, supporting increase use of these modes.

In residential environments:

- On arterial roads, the efficient movement of people and goods (especially by public transport and active modes) are prioritised over vehicle parking.

- In non-arterial environments (e.g. local residential streets) pedestrian movement is prioritised, then car parking is prioritised over maximising vehicle movements. This is because after property access and pedestrian movement has been provided, these roads are not intended for the large through movement of vehicles, and parking provides more benefits to the community. Parking can be prioritised for short-stay and residents.
- Cycle parking and mobility parking are typically not provided on-street in residential environments because it is anticipated that these uses will be provided on private property.
- On-street parking can help keep traffic speeds low as road space reduced and creates side friction effect.
- The density of the housing can impact the level of on-street parking required, particularly if developments chose to not provide parking.

In commercial centre environments:

- On arterial roads, movement of people and goods (especially by public transport and active modes) is prioritised over vehicle parking.
- On non-arterial roads, vehicle movement is the lowest priority. Where there is a trade-off between movement and place, place should take precedence in commercial/ activity centre environments so that people can slow down, enjoy the environment, and spend time/ money. Also, providing high levels of amenity is critical to the success of the centre. Research shows that streetscape improvements create

a more attractive centre than high levels of through traffic.¹⁵

- As such, both car parking and streetscape improvements rank higher than vehicle movements on non-arterial roads in commercial/activity centre environments.
- Streetscape improvements are prioritised over parking because commercial/activity centres generally have higher footfall, better public spaces, and more 'people activity', so amenity is of a higher importance.
- Public transport stops and cycle parking are prioritised over vehicle parking in commercial centres because they take up relatively little space and are important to making these travel options safe and attractive.
- Small footprint commercial developments with street frontage may require loading to take place on-street.

In industrial environments:

- Movement of vehicles and goods along arterial roads is a high priority, to facilitate the flow and access of freight to/from industrial areas.¹⁶
- On arterial roads, parking can create safety issues. Guidance such as Austroads discourages on-street parking on arterial roads with speeds at or above 60 km/h.
- Vehicle parking and loading is a low priority on all roads because:
 - Parking and loading should be accommodated on site in the first instance. Even though there may

be no requirement for parking on site it is likely that it will be provided, along with loading, in industrial areas for practical reasons, however staff parking may spill over onto the street.

- It is more important to facilitate the tracking movements of heavy vehicles in an industrial environment.
- Where public transport and safe walking or safe biking options are available, it is important to encourage commuters to use these options (in accordance with national, regional, and local policies). An abundance of car parking incentivises private vehicle use for commuters.

Practice guidance for allocating street space to parking

Prioritisation framework

Street space allocation frameworks will help guide trade-offs that need to be made between competing uses for limited street space. A framework should contain a priority order for use of kerb-side space for each different environment using the principles listed above. Project teams can then refer to these frameworks when making decisions about use of the space. These frameworks need to be endorsed by elected members, so they are meaningful when projects are presented for approval and on-street parking supply has been reduced.

¹⁵ The Pedestrian Pound – The business case for better streets and places, Ellis Lawlor, 2014 edition, Updated by Moira Tasker for Living Streets 2018 Editing and additional case study material Rachel Lee and Stuart Hay (<https://www.livingstreets.org.uk/media/3890/pedestrian-pound-2018.pdf>)

¹⁶ Austroads Guide to Traffic Management Part 11, Parking Management Techniques

Removing existing car parking

The removal of existing on-street parking can be a controversial and challenging process. Where parking is removed there are several approaches to manage displaced demand from the loss of on-street parking in that location, including:

- optimisation of the space, for example marking individual spaces if currently a parking lane
- encouragement of other transport modes or car pooling
- better utilisation of parking on side streets by implementing additional time restrictions
- limitations on who can use parking spaces (e.g. resident parking schemes)
- better utilisation of off-street parking sites
- improving directional and information signage
- investigate additional parking opportunities in the road reserve, e.g. converting parallel parking to angle parking where there is enough road width.

Importance of data

When considering kerbside reallocation, it is important to get data to support your case. The collection of data before and after changes is important to validate proposed benefits and this can be used in subsequent projects. For example, the Fort Street shared space in Auckland recorded substantial benefits that were used to support the case for future shared space streets.¹⁷



Image from
MRCagney

¹⁷ Case Study: Fort Street: Auckland New Zealand
<https://globaldesigningcities.org/publication/global-street-design-guide/streets/shared-streets/commercial-shared-streets/case-study-fort-street-auckland-new-zealand/>

3.2 PRIORITISING THE ALLOCATION OF PARKING

Context

There are a variety of demands on public parking in urban areas, particularly in diverse commercial and service centres where residents, workers, visitors, public transport, and delivery activities may all be competing for the use of kerbside space and off-street public parking facilities.

New trends are increasing competition for kerbside space in cities. These trends include:

- an increase in e-commerce and delivery demands
- an ageing population and increasing mobility needs
- increasing use of on-demand transport apps and space for pick up and drop off
- the sharing economy and the increased popularity of car-share type activities
- electric vehicles and demand for charging infrastructure
- the increase in the popularity of micro-mobility transport options (including e-bikes and e-scooters).

Some of these trends are covered in more detail in Section 3.6.

The wide and growing variety of demands for kerb space means increasingly flexible management approaches are required, where the allocation of space for different uses changes by time or day. For example, there could be a need for goods delivery space in the morning, short-stay car parking in the afternoon, and taxis and Pick Up Drop Off in the evenings.

As an example, shown in Case Study 3, Auckland has a network of shared-space streets which allow loading between 6–11am.¹⁸ There is no parking after 11am, when the streets experience higher levels of pedestrian activity.

Principles for prioritising the allocation of parking

As parking demand increases, decisions will need to be made about how space is allocated between different types of parking. These decisions should consider the following principles:

- Inclusive access: public car parking should be allocated preferentially to serve different parking needs so that all members of the community are able to access amenities fairly.
- Variety and flexibility: Public car parking should provide for a range of parking types and restrictions on parking should be responsive to the dynamic nature of demands.

Allocating space for high priority users is important to ensure their needs are met first. Examples of high priority users and a justification is provided below:

- Adequate provision of mobility parking because well located, accessible and safe mobility parking is crucial for people with disabilities to access amenities.
- Cycle parking as it requires less space than cars, and cycling reduces traffic congestion, has a lower carbon footprint, and is good for people's health.
- Parking for car-sharing schemes because it contributes to lower car ownership and vehicle kilometres

¹⁸ Fort Street Shared Space http://www.aucklanddesign-manual.co.nz/resources/case-studies/street_fort_street_precinct

travelled, allows the flexibility for people to commute by public transport and active modes, and provides an equitable transport option for those who cannot afford to own a car.

- Parking for taxis and ride hail services because it serves more people and provides access for some people who are not able to drive, catch public transport, walk, or cycle.
- Loading zones serve an important function by facilitating the delivery of goods to centres, commercial areas, and industrial areas.
- Motorcycle parking because motorcycles require less space than cars, take up less space on the road and therefore impact less on traffic congestion and air pollution.

- Electric vehicle (EV) parking because electric vehicles have a lower carbon footprint than combustion vehicles and do not emit at point air pollution.

Practice guidance for prioritising the allocation of parking

A parking hierarchy provides direction on how parking space should be allocated and what uses have priority in certain areas. Uses with a high priority in the hierarchy would be accommodated first so long as there is demand for that use.

Image from
MRCagney



Example of Parking Preference Hierarchy

PRIORITY	COMMERCIAL/ ACTIVITY CENTRES	INDUSTRIAL AREAS	RESIDENTIAL
1	Loading zones	Loading zones	Car share parking
2	Mobility/accessible parking	Short-stay motorcycle parking	Mobility parking
3	Taxi & Pick Up Drop Off spaces	Short-stay general parking	Short-stay general parking
4	Car share parking	Long-stay motorcycle parking	Prioritised parking for residential permit holders but only in an approved Residential Parking Scheme area. Otherwise residential use is considered as long-stay general parking.
5	Short-stay motorcycle parking	Long-stay general parking	Long-stay general parking
6	Short-stay general parking	Mobility parking	
7	Long-stay motorcycle parking	Taxi & Pick Up Drop Off spaces	
8	Long-stay general parking	Car share parking	
9	Exclusive parking for residents		

Types of parking and loading restrictions

Below is some guidance for the use of different types of parking restrictions. This information could be used in the development of a parking policy.

Loading Zones

- Can be reserved for goods vehicles only or for any vehicle delivering goods. In busy commercial areas, goods vehicles should be prioritised.
- Should be located on main streets or immediate side streets and allow ability to pull in easily to parallel with the kerb. Angled parking should be avoided as longer vehicles may cause safety issues.
- Should be at least 12m in length to accommodate delivery trucks. Longer loading zones will also offer more certainty to delivery drivers and reduce congestion and illegal parking.
- A five or ten-minute time limit should be used to encourage turnover.
- In busy areas loading zones can be used during the morning and the space converted to another use in afternoon or evening.

Mobility parking

- Vehicles must display a valid mobility parking permit issued by a certified agency.
- There is no prescribed ratio for providing on-street mobility parking, but Local authorities should work with local advocacy groups to determine locations and numbers. Off-street mobility parking is required under the local district plan regulations and the Building Act.

- The New Zealand Standard NZS4121 provides dimensions and specifications for mobility parking.
- On-street mobility parking is unlikely to be required in residential areas as there is usually enough on-site parking or general on-street parking available.
- Generous time restrictions should be applied to mobility parking (e.g. P180, and one hour above the limit) to reflect the added time mobility parking users need to get to and from their parking spaces.
- Sophisticated wheelchair loading technology is becoming more commonplace, so when designing new mobility spaces, it is important to allow enough space for loading equipment.
- Mobility parking should be avoided on busy roads because of safety issues with accessing mobility devices. Side streets and level surfaces are best locations. There should be level kerbs provided.
- Local authorities should decide which exemptions mobility parking permit holders should receive in their area. Often permits holders are given additional time on top of posted time limit.

Pick Up Drop Off

- Two types of restriction can be used. A P5 restriction will allow anyone to park for five minutes to quickly pick something or someone up. A "No Parking" restriction with Pick Up Drop Off allows vehicles to stop quickly to pick up and drop off people, but the driver must remain with the vehicle.
- P5 restrictions can be used outside convenience businesses such as dairies or dry cleaners, especially if they are grouped together.

- The Pick Up Drop Off is best used near busy public spaces or venues but thought needs to be given to the location of the parking space. This restriction can attract a lot of vehicle movements, so it is sometimes best to locate away from busy pedestrian areas.
 - Pick Up Drop Off parking can be used to provide space for ride hailing in busy areas. In night-time areas, regular parking could be converted to Pick Up Drop Off in the evenings to provide a safer experience for customers.
 - Addressing car-based school pick-ups and drop offs with amendments to parking restrictions near schools is a reactionary or 'short-term' solution to the wider problem of the declining rate of students walking, cycling, or taking public transport to school. Looking at this issue alongside other interventions, such as school travel programmes, will be a more sustainable long-term solution.
- are all classed as small passenger services. All these vehicles can use dedicated taxi stands.
- In 2019 Waka Kotahi amended the TCD Rule to allow for Local authorities to use either Taxi Stand or Small Passenger Service Vehicle (SPSV) signs when allocating space for taxis and ride hail vehicles.
 - Taxi stands should not be located adjacent to bus stops, mobility parking or loading zones, to avoid spill over parking into these areas.
 - In busy night-time areas parking or loading zones should be converted to taxi stands in the evenings.

Electric vehicle parking

- Local authorities first need to decide where EV charging infrastructure should be located. There are safety implications with locating charging infrastructure on the street which need to be considered. Off-street parking is usually the most suitable location for charging sites.
- Another decision is whether to charge for the EV user to utilise the charger. This will depend on any policies supporting EV uptake.
- If EV charging infrastructure is being installed it is sensible to provide multiple spaces in a row to spread the costs of connecting the power source to the parking. This also makes it more legible for EV users.
- EV charging works best in angled or perpendicular parking rather than parallel parking as the EV charging points are either at the front or the back of vehicles.
- It is recommended that time limits and parking costs should remain the same for electric vehicles, as

Motorcycle parking

- Should be provided on a level surface.
- If provided in a parallel parking space, it should be at least 2.1m wide to avoid motorcycles protruding into the carriageway.
- Time limits should be used in busy commercial areas to ensure efficient use of the space. All-day motorcycle parking can be located in quieter streets.

Taxi and ride hail parking

- In 2017 the government introduced changes to passenger service regulations. Under these changes, taxi, shuttle, private hire vehicle and ride hail services (Uber etc)

they are still contributing towards car parking demand and congestion in and around busy town and city centres.

- The Land Transport Rule Traffic Control Devices Rule 2004 (TCD Rule) includes a sign for electric vehicle charging.

General public parking

- There are two types of parking restrictions that manage public parking: priced parking and time restrictions. Use of these are referred to as demand management, which is discussed in more detail in Section 3.4.

Image from Waka Kotahi



3.3 RESIDENTIAL STREETS

Context

Parking in residential streets is often an issue. Residents often feel they have preferential rights over the parking in their street. This can create tension when commuters and other non-residents use residential streets for all-day parking.

Residential streets adjacent to a successful commercial street or centre can experience parking spill over from the commercial area. This spill over can be exacerbated if the parking supply in the commercial area is reduced when on-street parking is reallocated for pedestrian, cycle or public transport priority, or divestment of off-street parking facilities.

A wide range of parking management tools are currently used in residential areas. These range from using a time restriction on sections of street within a residential area, to a residential parking zone with permit exemptions across a collection of streets. Different approaches have advantages and disadvantages, and this often depends on the location and surrounding land-use.

Principles for residential streets

In line with the general principles outlined in Section 1.4, principles for managing parking in residential streets include:

- Treat residential streets as a wider community resource, with the space in streets used to achieve the most public good benefits.
- Treat general parking demand pressures in residential streets in line with the demand management and pricing policies outlined in Section 3.4.

- Only consider prioritising on-street parking for residents where residents are unable to park on private property. Some older suburbs lack space for on-site vehicle parking.
- Residential parking schemes should be as fair and equitable as possible.
- When managing parking on adjacent residential streets, consult local retailers and business association to ensure the needs of the wider community are considered, not just those of the residents.

Practice guidance for residential streets

Firstly, local authorities should develop a residential parking policy that guides decision-making in a clear and consistent way. The policy should include public consultation, as public input at the policy stage will help successful implementation. The policy should carefully explain how the management of parking in residential streets will contribute to better outcomes for the community and align with local land-use and transport objectives.

The residential parking policy should decide how parking will be managed when demand increases, and which users should be prioritised. In Section 3.4 there are principles for managing the demand for parking using price adjustments to achieve optimal parking utilisation.

In many residential areas, a time limit (usually 2 or 3 hours) on one side of the street or small sections of streets can be enough to ensure turnover of parking and availability for visitors, while not inhibiting general residential use along the whole street.

Residential parking schemes

If parking permits are to be used the table below provides some guidance.

PARKING PERMIT APPROACH	DETAILS
Use tight eligibility criteria	This might involve only offering permits to properties with no ability to provide their own off-street parking.
Limit the number of permits	This can either be done on a per property basis or an overall limit on the number of permits issued in an area.
Limit the ability for residents of new developments to obtain permits	This encourages developers to provide parking to meet the needs of their development. It could be unsustainable to offer permits to every new apartment in dense residential areas.
Apply a reasonable time period	Permits are usually renewed annually. Make it clear in the parking strategy or permit conditions that the number of permits may be reduced if parking space is re-purposed for other uses such as cycleways. This manages the expectations of the parking permit holders and enables the local authority to redevelop street space for more beneficial community outcomes if the opportunity arises in the future.
Pricing permits	Parking permits should be priced to accurately reflect the value given to the permit holder. It is important to not price parking permits too cheaply as they allow unrestricted use of a valuable public asset. It is preferable to try and achieve a market price for parking permits. ^{19 + 20}

¹⁹ Professor Donald Shoup, a well-known expert on parking reform, suggests in his 2018 book 'Parking and the City' that a 'uniform price auction' is the best way to achieve this. A uniform price auction involves limiting the number of parking permits to fewer than the number of available parking spaces (e.g. 85% of the available space) and asking residents what price they would be prepared to pay for an annual permit. Then, all winning bidders pay the same price - the lowest accepted bid.

²⁰ The Land Transport Act 1998 22AB (c) has requirements for consideration when setting parking permits prices.

Other considerations for residential parking schemes are:

- Times and days of operation.
Often parking restrictions are only needed during the working week to manage the impact of commuter parking from nearby commercial areas. Therefore, Monday to Friday parking restrictions are often suitable. The period for which restrictions apply could be limited to minimal hours to deal with the commuter parking problem e.g. 9am to 5pm.
- Consider how to deal with streets just outside the residential parking zone area. Residential parking zones often shift the parking demand on to surrounding streets, but it might not be feasible for the council to keep extending the zone area. There could be some sections of parking restrictions on streets outside the zone area to help manage localised issues or a statement to residents that parking will only be reviewed every five years.
- An alternative to a residential parking scheme is to utilise priced parking in the residential streets. This will achieve more equitable outcomes providing a fair and transparent system and allowing residents and non-residents alike to pay for the parking they need. Pricing would only need to be applied when demand is high. Some periods, such as evenings and weekends, could be free and unrestricted, which would reduce the impact on local residents.

Image from Waka Kotahi



3.4 PARKING DEMAND MANAGEMENT TOOLS - TIME RESTRICTIONS AND PRICING

Context

In areas of high parking demand, encouraging vehicle turnover is important to making the most efficient use of dedicated car parking space. Methods to achieve turnover include:

- time restrictions
- pricing (with or without time restrictions).

In areas of lower parking demand, time limits may be sufficient to help make spaces available for short-stay parking. However, in places with high parking demand and high employment, pricing public parking will be more effective and efficient at managing this demand.

Time restrictions and pricing both have advantages and disadvantages, as shown in the table below.

A key goal of pricing and time restrictions is to help ensure parking spaces are well-used but not full. If prices are too low or time limits are too generous in areas of high parking demand, streets will have no vacant spaces and vehicles will need to cruise the streets searching for a space, adding to congestion and emissions. Conversely, if prices are too high or time limits too restrictive, then parking spaces will be under-utilised and will not be playing their role in enabling access to opportunities. Time restrictions and price should therefore be set with the goal of achieving around 85% utilisation in high demand areas, so that around 1 in every 7 spaces is available.

Technology, notably sensors, are enabling councils to better calibrate supply and demand of parking with demand responsive pricing, to better achieve the 85% utilisation target. Good examples of this type approach are shown in Case Study 4. Parking technology is discussed further in Section 3.7.

	PRICING	TIME RESTRICTIONS
ADVANTAGES	<ul style="list-style-type: none"> • Parking users cover more of their costs, reducing subsidies for driving and supporting a more mode neutral transport system. • Parking revenue can help support public investment in improved facilities and services. • Prices can be adjusted relatively quickly in response to changing demand while still allow people flexibility in how long they stay. 	<ul style="list-style-type: none"> • Relatively cheap and easy to implement compared to pricing. • Useful for encouraging very short-term parking outside convenience type retail.
DISADVANTAGES	<ul style="list-style-type: none"> • Requires capital investment in parking machines or a payment app (although payback period is usually relatively short). • Can be unpopular with local businesses and general public (see Section 3.6 for tips). • Requires more administration to handle faults and customer complaints. 	<ul style="list-style-type: none"> • Difficult to respond to increases in parking demand. One approach is to reduce time restriction, but this limits options for people wishing to park for longer. • In areas of high employment and parking scarcity time restrictions are often abused by staff who are looking to take advantage of free parking. • Leads to higher levels of parking infringement issuance. This negatively impacts peoples experience of visiting a place.

CASE STUDY 4

San Francisco demand responsive pricing

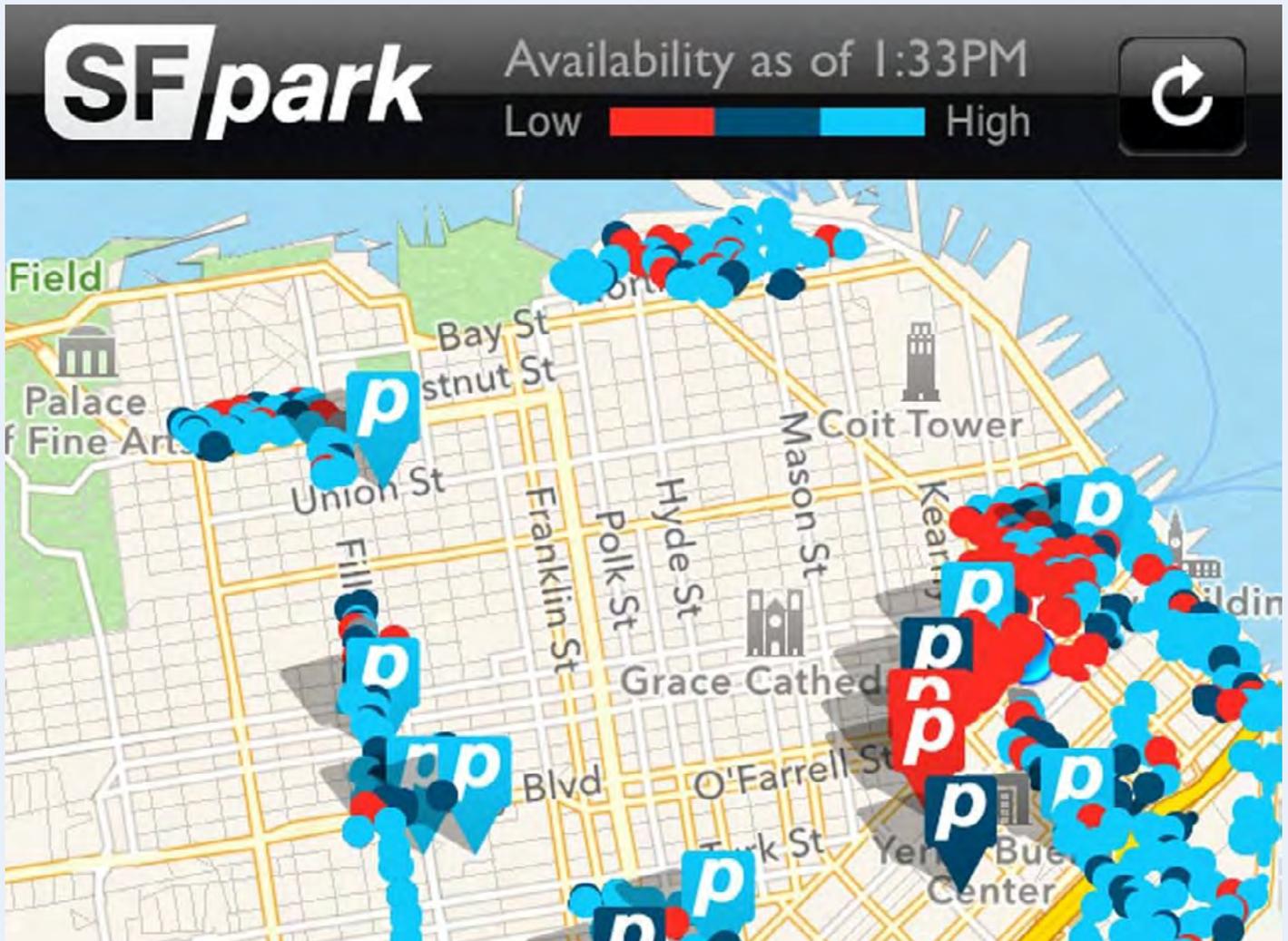
DEMAND RESPONSIVE PRICING

In 2011, the Municipal Transport Agency of San Francisco (SFMTA), launched SFPark, a pilot programme to test demand responsive parking technology. The goals of the pilot included making it easier for people to find a parking space, reducing congestion and improving reliability for buses.²¹ It was hoped that this would, in turn, reduce vehicle kilometres travelled, reduce emissions and improve safety.

The programme ran from 2011 to 2014 and used parking sensor data to develop a formula to allow the agency to adjust parking rates based on demand. Prices were increased in high-demand areas and decreased in low-demand areas. This was intended to encourage drivers to park in less congested areas or consider other modes. Pricing varied across both location and time of day to achieve occupancy targets of between 60 and 80 percent. The programme has been described as “the biggest price reform for on-street parking since the invention of the parking meter” (Pierce & Shoup, 2013).

²¹ http://sfpark.org/wp-content/uploads/2014/06/SFPark_Pilot_Summary.pdf

SFPark Pilot and Control area (pilot = orange, control = blue)



Within the pilot study areas, target occupancy was met 31% more often than in areas with no intervention. Surveys showed that drivers could find spaces three and a half minutes more quickly after the introduction of SFpark (SFMTA, 2014). In addition, greenhouse gas emissions were reduced by 30% after SFpark was introduced, as were vehicle kilometres travelled (SFMTA, 2014). Traffic volume was also estimated to have decreased in comparison to non-pilot areas, while traffic speeds increased (SFMTA, 2014). In early 2018, the policy was extended from the pilot areas to all 28,000 City-run on-street parking spaces, and 14 City-operated parking buildings, using smart meters rather than sensors. Despite these results, the programme's policy manager notes that putting a price on something that was previously free (the installation of meters in new locations) was much more effective than the time and expense associated with trying to get the price right through the SFPark programme.²²

When Auckland Transport introduced the "AT Parking Strategy" in 2015 it included a demand responsive pricing policy. Under this policy, parking prices are set to target 70–90% occupancy at peak times. If the parking utilisation is found to be above or below this range, the price is either increased or decreased. Prices are also applied in different locations for the hours of the day with the highest demand for parking. For example, in Kingsland, which has a night-time economy, the parking prices apply from 9am–9pm. In the Auckland City Centre prices are \$5 per hour but in Albany on the North Shore prices are \$1 per hour. The policy intends that parking occupancy is recorded every 3–12 months and prices are amended in line with measured utilisation levels.

²² Parking and the City, Donald Shoup, 2018

Principles for parking demand management tools

Time limits

The following principles apply to the use of parking time limits:

- The time limit should aim to achieve a parking occupancy of around 85%.
- Time limits do not reflect the full costs of driving and therefore drivers are subsidised by the community, which can encourage travel by private car over other transport modes.
- Use of different time limits can reflect the needs of the adjacent land-use.

Pricing

The pricing of parking should be guided by a policy, to help ensure clear and consistent decisions. Below are the recommended principles for a parking pricing policy:

- Introduce pricing when parking occupancy is regularly above 85% across a parking area.
- Link prices to demand or parking occupancy. If parking occupancy increases above a set threshold then prices should increase and conversely if parking occupancy decrease, then prices should decrease. Thresholds for when the price should go up and down should be agreed. A range is useful, say 80–90%, with prices remaining the same if measured parking occupancy is within the range.
- Prices should be reviewed regularly by measuring occupancy. Quarterly or half-yearly are appropriate time frames to allow for parking prices

to respond quickly to any changes in demand. The price may not change at every price review.

Practice guidance for parking demand management tools

The flowchart below is useful to demonstrate the parking management response to increasing demand for parking. Acknowledging that other wider transport and planning responses can also assist in reducing demand.



Measuring demand

The method of measuring demand is important. The best way to determine an accurate picture of parking occupancy is on-street sensors. Most sensor systems have an online reporting system where you can determine occupancy on any street or a selection of streets across any time period. However, sensors are expensive and have associated operating costs. Another method is to use manual occupancy surveys. This involves a team of people capturing the number of vehicles present on each street across the day. It is important to establish a framework for how the data will be captured and analysed. Vehicle counts should be done at least every hour across the day and across multiple days of the week.

In areas without pricing the parking utilisation levels will reflect the demand for free parking, and this distortion needs to be accounted for in any demand assessment so that it does not inadvertently cause an over-supply of car parking and an inefficient use of land. The best way to account for this is to apply pricing when demand for parking increases rather than increase supply.

Parking Management Plan

The following are considerations for the implementation of time limits on parking:

- The time restriction should initially be set to reflect the needs of the surrounding land-use. For example, if there are many convenience retail outlets such as bakeries or dairies, then a short time restriction such as P15 would be appropriate.
- Using two or three hour time restrictions is useful in residential

areas that experience spill over commuter parking. Managing commuter parking can help to reduce peak hour congestion and encourages people to switch to other forms of transport. This can also be considered with a residential parking permit scheme if many houses do not have off-street parking.

Pricing

Pricing parking can be contentious with the public and should be guided by a pricing policy. A pricing policy can be part of an overall parking strategy or a standalone policy. As with any policy development it is important to get public input. This is also an opportunity to explain the justification for pricing parking. A pricing policy should include:

- A clear goal for what the pricing of parking is trying to achieve (i.e. support the efficient and equitable use of public parking).
- The target occupancy range with trigger points for increasing or decreasing prices. It should also include the value or proportion of the increase, for example, prices could be increased by \$1 or by 20%.
- How often prices are reviewed. More frequent reviews respond quicker to changes in parking demand and will result in a more efficient system. However, it can be expensive and difficult to capture parking occupancy on a regular basis especially if manual process is used. Monthly price reviews would be a very responsive system however half yearly or annual reviews may be more practical.
- The process for changing the price. As price changes are based

on measured parking demand or utilisation it is useful to try and streamline the approval process for price changes and remove the need for public consultation and council approval. This will assist in moving towards a more demand responsive system.

- Establish the geographical area for setting the price. This could be at a street (or section of street) level or at a town centre level. Price areas should be small enough to be easily walkable and have a similar level of parking occupancy otherwise the price will not be effective in achieving the optimum availability.
- Ensure clear signage and customer information about the price and the times pricing applies.

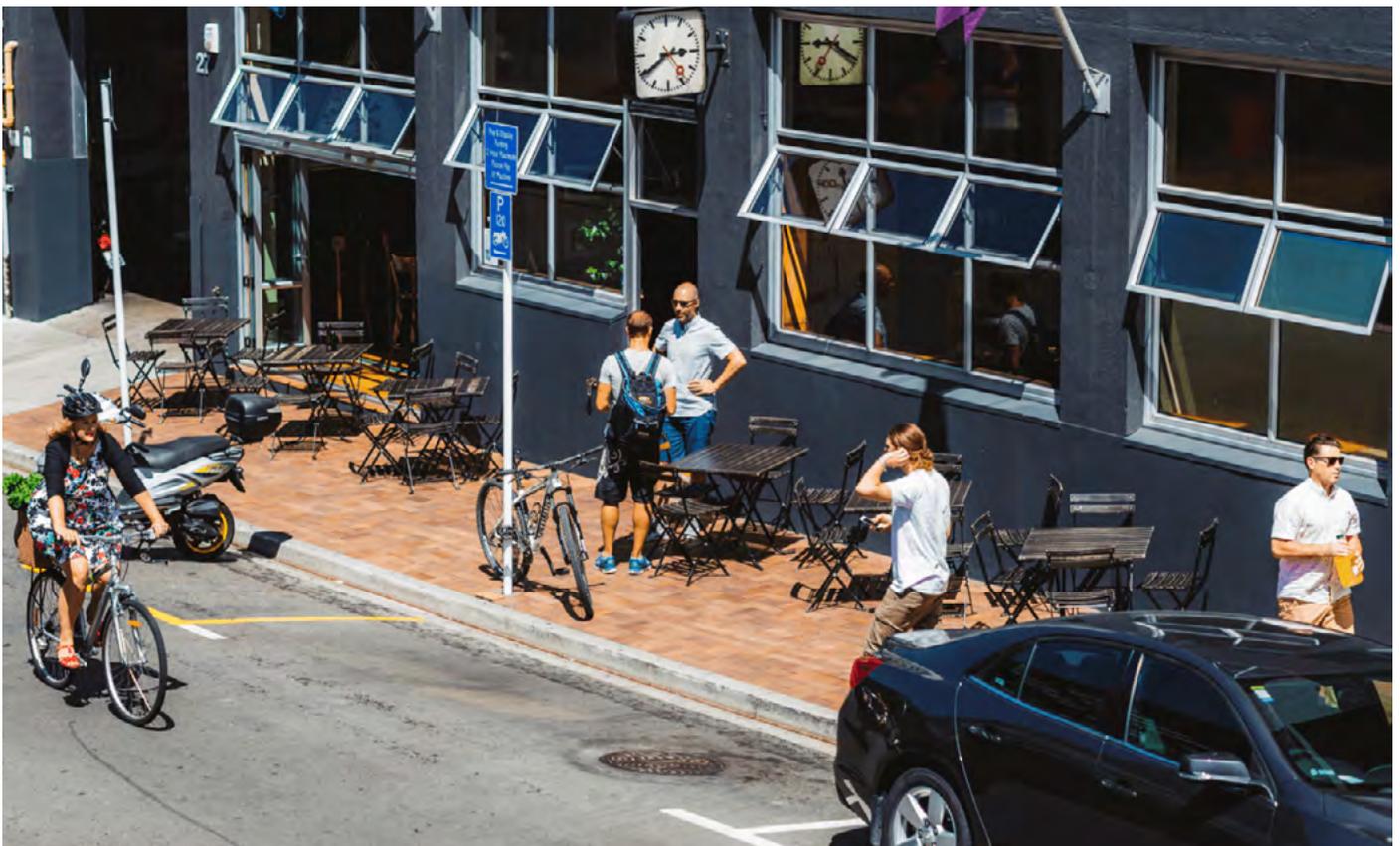
Where pricing is being introduced, it may be pragmatic to set the initial fees at a relatively low level. Once pricing is established, subsequent

occupancy surveys will reveal if the fee is set too low and can then be incrementally adjusted until the optimal level of parking utilisation has been achieved.

When pricing parking there is no need to apply a time restriction as the price will encourage turnover. If the price is set to achieve a vacancy rate of around 15% then people will usually be able to find a parking space nearby. This approach tends to reduce the number of parking infringements issued and offers greater flexibility for visitors. Charging for parking reduces the public subsidy to driving and makes people consider if walking, cycling, public transport or even carpooling are an alternative option for them.

See Section 3.6 for helpful tips about engaging with the public when introducing parking pricing.

Image from Waka Kotahi



3.5 PARKING AND EMERGING MOBILITY TRENDS

Context

New technology is driving significant change to how people travel around urban centres. These changes affect parking management, requiring increased flexibility to adjust quickly to new transport arrivals.

Key changes include:

- The rise of services such as ride-hailing apps, shared electric scooters and bicycles, electric cars, and car sharing.
- Real-time apps allow users to book or locate a range of transport options direct from their phone.
- Electric bike sales in New Zealand increased over 800% between 2015 and 2018.²³ The use of e-bikes for commuting to work is growing rapidly in New Zealand cities.
- Electric vehicle (EV) sales are starting to increase rapidly, and all car manufacturers are quickly converting their product lines to manufacture EVs.
- Car sharing has proved very popular in overseas cities. In Sydney, there are over 2000 car-share vehicles that members can book by the hour.²⁴ In Europe, there are multiple car share services with many companies offering electric only vehicles. There are two main types of car share operation: fixed location and free floating. With fixed location car share the vehicle has a dedicated parking space (either on-street or off-street) and the vehicle must be brought back to this location after each booking. With free floating car share the

vehicle can be parked in any legal parking space within a defined zone. Fixed location car share typically operates by users making bookings in advance whereas free floating car share is booked in real-time as someone needs to use the service.

- Increasing growth in online shopping from supermarket, other food delivery services and online consumer goods.

These changes create new parking management issues to consider, such as:

- Whether to provide dedicated or discounted parking for drivers of electric vehicles. On the one hand, this would encourage more people to use electric vehicles but on the other hand, it could encourage greater car use and benefit high income people (who least need subsidising) the most.
- Whether parking management can help encourage car sharing, by providing dedicated spaces to car sharing operators.
- Growing demand for very short stay 'Pick Up Drop Off' spaces to safely accommodate deliveries and passenger service vehicles. Refer to Case Study 5.

²³ Electric City: e-Bikes and the future of cycling in New Zealand, Dr K.Wild & Prof A.Woodward, 2018

²⁴ City of Sydney website: <https://www.cityofsydney.nsw.gov.au/live/residents/car-share>

CASE STUDY 5

Washington D.C. kerbside management

The Washington DC Department of Transportation (DDOT) has developed an innovative programme to address negative impacts associated with the growth of ride-hail services, such as Uber, in dense activity centres. Pick Up Drop Off (PUDO) zones have been established at several locations across the city with the following objectives:

- Safety: Facilitate safe and efficient movement of people and goods to and from the kerbside.
- Kerbside Efficiency and Utilisation: Reduce kerbside turnover time, decrease queue lengths, and increase trip completion.
- Traffic Control: Make space for all modes to interact with the kerbside while improving throughput.

The programme has grown out of an initial trial in the busy nightlife area of Dupont Circle. DDOT worked closely with the Business Improvement District (business association) to reallocate kerbside parking space to kerbside passenger loading. Previously, this space allowed parking free of charge between 10pm and 7am. The trial was so successful that 60 parking spaces have been removed along the major arterial of Connecticut Avenue to accommodate the PUDO zone, which now operates across the whole day.

As of March 2020, the programme has been expanded to create 25 PUDO locations and DDOT is hoping to double the number of PUDO locations soon.

PUDO locations are identified in collaboration with local businesses and residents. Business and public reaction to the creation of the zones has been positive, with little or no negative feedback to the loss of metered parking. Instead DDOT receives many requests for additional locations to be established.

DDOT has undertaken several measures to ensure the zones operate effectively. The penalty for parking in a PUDO zone is US\$75, in contrast to the \$30 penalty for a metered parking violation, which has been an effective deterrent to misuse of the zones. DDOT has also worked closely with agencies responsible for parking enforcement and the management of ride-hail companies in the District to establish a shared understanding of how these zones should be used. Finally, a public outreach campaign has been developed to ensure the concept of these new zones is well understood.

While the initial motivation for establishing the PUDO zones was to manage the negative impacts of ride-hail operations, the zones are also used for fast turn-around commercial kerbside loading by services such as Uber-eats or DoorDash. This complements the city's commercial kerbside loading management programme which includes metered loading zones. DDOT has also been exploring technology-based options to manage demand for loading zones by allowing commercial vehicles to reserve specific windows of time through a third-party app.

Principles for parking and emerging mobility trends

The first step in managing the parking demands of emerging mobility trends is to understand their contribution towards wider transport and urban outcomes. For example, e-scooter share systems may contribute towards shifting people from single occupant vehicles into an emission-free mode that reduces congestion but adds new safety risks and require space on streets and/or footpaths for their storage.

The following principles apply:

- Parking should serve multiple types of users so that it can accommodate variations in demands associated with different activities. For example, general parking could be converted to Pick

Up Drop Off in the evenings outside busy night-life areas.

- The most desirable spaces should be managed to favour higher priority uses as per Section 3.2.
- Collect and use data on emerging trends to understand how they contribute towards your organisation's goals and outcomes. Use data and analysis to fully understand the costs and benefits. Research how other cities are dealing with these issues.
- Parking needs to be adaptable in the face of uncertainty and change. To make the most use of valuable street space it is important to get acceptance, both internally and politically, that car parking can be repurposed to another use such as e-scooter parking.

Image from
MRCagney



Practice guidance for parking and emerging mobility trends

Ride-hailing on-demand services

- Create Pick Up Drop Off areas in busy locations to improve safety and reduce congestion caused by illegal parking. Refer to Case Study 5 to see a good example of this.
- Work with individual operators to control where they can pick up and drop off customers. In busy pedestrian areas it might be possible to prohibit pick up and drop off and require services to use a waiting area nearby.
- Convert some regular parking to taxi stands or Pick Up Drop Off areas in the evenings in busy night-time areas.

e-Commerce and deliveries

- Work with retailers in commercial areas to collectively develop delivery and servicing strategies.
- Collect data on where delivery hotspots are and allocate more loading zone space in these areas, as per the prioritisation framework discussed in Section 2.2.
- Investigate the use of off-street car parks for deliveries and reserved parking for service companies.

Electric vehicles

- Offer priority EV parking in off-street car parks.
- Work with EV charging companies to see if they would like to install chargers in off-street car parks.

Car-Share

- Develop a car-share policy to decide to what extent you want to support car-share. This policy should:
 - Enable different types of car-sharing e.g. Free floating and fixed location.

- Decide how car-share operators will pay for parking and what if any discount they get.
- For fixed location car-share, decide whether the spaces will be dedicated to one operator and how many locations to provide.
- Promote the use of EV car-share through discounted parking or preferential locations.
- Decide on the mix of on-street and off-street locations.
- Refer to Case Study 6 for an example of how car sharing can benefit a city.

General

- Track data from the new transport trends.
- Decide which of these new transport options is important and contributes most to the goals and outcomes of the city/town/region.
- Work collaboratively with operators and the public to get the best outcomes.

CASE STUDY 6

Christchurch car share

After the 2011 earthquake destroyed much of Christchurch city centre, Christchurch City Council looked at innovative ways to encourage businesses back to the city centre and to support sustainable transport initiatives. They decided to run a tender process for a car share company to provide a shared fleet of vehicles that the council and other businesses could use. The concept was that the vehicles would be managed by a separate car share company but would be available for registered members to use at any time of day and any day of the week. Instead of leasing a vehicle, businesses could book vehicles when they needed them, without the costs of leasing, parking, vehicle maintenance, registrations and warrant of fitness.

Christchurch City Council's analysis indicated that this approach offered significant financial benefits as the fleet of vehicles was used much more efficiently over a seven day and 24-hour period. The council also wanted the vehicles to be 100% electric, to meet Christchurch's green policy objectives. The tender was won by Yoogo (now called Zilch) and the scheme launched in 2018. In 2020, there are over 50 vehicles in operation, and they are shared by the council and several other businesses and residents. Vehicles are located in off-street parking across several hubs, including a library. The scheme has reduced the number of individual vehicles and parking spaces needed in the new city centre and has attracted businesses back into the city. The vehicles are all electric so there is no pollution or emissions created.

As of early 2020 there are over 1000 trips per month taken in Christchurch Yoogo vehicles. Yoogo have estimated that the car share service has resulted in 55 fewer vehicles in central Christchurch with an estimated reduction in carbon emissions of 200 tonnes since the scheme was implemented.



Image from Zilch
Zero Emission Car
Share

3.6 PUBLIC ENGAGEMENT TECHNIQUES FOR PARKING ISSUES

Parking is an emotive topic, because it sits at the heart of competition for limited space in urban areas. Undertaking effective public engagement can be challenging.

It is very important to effectively engage with the public when developing parking policies or planning transport projects that involve changes to parking. Many projects utilise a short explainer video as an effective communication approach. Examples of successful public engagement include Wellington Council's development of an updated parking policy in 2019–2020 and Auckland Transport's parking strategy in 2015.²⁵

Transport projects that involve the reallocation of parking space may become unstuck if the removal of parking is not well communicated or there is not a mitigation plan or clear justification explaining the change. The public focus immediately becomes the lost parking and not the benefits that the project is looking to deliver. Media is often quick to pick up on outspoken, disaffected stakeholders and this can quickly build into wave of opposition to the proposal.

Hastings District Council took an innovative approach to public engagement on priced parking in 2017 as part of their draft annual plan consultation. They decided to ask the public whether the costs of parking should be covered by everyone through an increase in rates or should

be paid for by the users of parking through metered parking. This made the public consider the actual costs of parking and the fairest way to pay for them. More information on this approach is shown in Case Study 2.

Case Study 7 demonstrates a successful communication campaign around summertime parking management in Mangawhai. The council worked collaboratively with the community in developing the proposals and so mostly avoided the risks of community backlash.

²⁵ Wellington City Council parking policy engagement <https://www.letstalk.wellington.govt.nz/41514/widgets/235013/documents/142728> ; Auckland Transport Parking Strategy video at <https://www.youtube.com/watch?v=Kojo6hDx-GTA>

CASE STUDY 7

Small town summer parking management

During the summer months, many of New Zealand's popular holiday towns swell in population, and local governments struggle to cope with increased congestion and parking demand. Several towns are implementing new strategies to manage congestion and safety issues generated by this increased demand.

Kaipara District Council implemented a 2019-20 summer trial of traffic and parking management strategies in Mangawhai Heads, a coastal town between Auckland and Whangarei. Within the town centre the main street was made one-way and a 60-minute time limit was introduced for on-street parking adjacent to the shops. Additional off-street parking capacity was created within a short walk from the main street and way-finding signage was installed. Bike racks were also installed on the main street to encourage people to cycle rather than drive to the shops.

To address community concerns that employees were occupying on-street parking during business hours, businesses were each provided with four parking permits for off-street parking behind the shops. The clear message from the council was that public parking was not for business staff. The Kaipara District Council policy does not currently allow on-street parking charges, but time restrictions are being considered to manage demand in constrained areas.

These trials were prompted by the Mangawhai Business Association, after concerns were raised about congestion and safety over summer. Kaipara District Council undertook a participatory design approach with the community to identify appropriate interventions that could be trialled for the peak summer period. This approach meant the community had a sense of ownership regarding the changes and resulted in widespread support for the trial.

After the summer trial, the council carried out some public consultation to get feedback on the changes. Most respondents indicated very strong support for the changes, particularly the one-way operation of the main street and the additional parking. After the success of the summer trial, a next phase of interventions has been proposed. Additional steps include the introduction of a pedestrian zone in the shopping centre. Two elements considered critical to the success of these trials are strong buy-in from the community (generated through the consultation and co-design process), and the trial approach, which allows the council to consider more permanent implementation of successful interventions while discarding others.

In addition to the traffic and parking management changes, a free summer shuttle between the town and surf beach, providing access to key destinations along the route was also trialled. There is limited parking at the surf beach and during busy summer periods the parking regularly fills up, leading to vehicles circulating and parking illegally on grass berms. The service was intended to provide a safe alternative to private vehicle use along this corridor, where there are constraints on walking and cycling. The service was co-funded by Kaipara District Council and Northland Regional Council and operated between December 27, 2019 and Feb 11, 2020. The shuttle, which was free of charge, carried a total of 963 passengers over this period, with the highest patronage recorded on the 30th and 31st of January. Key groups that utilised the shuttle included grandparents traveling with young children and unaccompanied older children accessing the activity centres along the route. The shuttle was so successful that operation was extended for several weekends beyond the initial trial period. While there is interest in establishing the shuttle as a commercial service, there are challenges around the initial financial viability. A mechanism that has been discussed for supporting the early operation of such a venture is “sunset” funding, an initial subsidy reducing over time as the service becomes commercially viable.

Consultation feedback form on the Mangawhai Heads summer trial changes:


Wood Street Summer Trial - Your Feedback



Looking at each initiative listed below - please indicate if they have had a positive or negative impact on your visit to Wood Street.

	Positive	Negative
 ONE WAY on Wood Street from Molesworth Drive to Ellen Street	<input type="checkbox"/>	<input type="checkbox"/>
 P Additional Parking off Fagan Place	<input type="checkbox"/>	<input type="checkbox"/>
 P 60 60 Minute Parking on Wood St	<input type="checkbox"/>	<input type="checkbox"/>
 Bike racks	<input type="checkbox"/>	<input type="checkbox"/>
 Walkway on Ellen Street	<input type="checkbox"/>	<input type="checkbox"/>
 Bus Stop on Wood Street 27/12/19 - 11/01/20	<input type="checkbox"/>	<input type="checkbox"/>

Please provide additional comments on the reverse of the flier.

Below are some useful tips achieving better outcomes for projects that involve changes to parking.

TIP	DETAIL
Link back to strategy	Clearly explain how the project aligns with relevant local, regional, and/or national strategies or policies and desired outcomes.
Collect data	Collect data to support the case for change. Data will help understand how different parking restrictions such as loading zones or mobility parking are used. It is often useful to include data to show how many get on and off public transport in the project area and how many cyclists use the corridor.
Understand your stakeholders	Demonstrate understanding of local issues and work closely with key stakeholders such as local boards and business associations. Gather any relevant data from public customer requests, social media, and surveys to understand existing issues or concerns that the public may have that can be addressed by the project.
Have a plan for lost parking	Have a mitigation plan for well utilised parking spaces that will be lost. Assess parking occupancy information and if possible, demonstrate that there will be minimal or no loss of customer parking if additional time restrictions are applied to surrounding streets.
Involve key stakeholders early	Groups representing the community become annoyed if they receive a proposal cold without prior notification or input. Involve key stakeholders early in the options development stage to improve the chance they will support the project later. This also improves the chance of approval. Refer to Case Study 7.
Sell the benefits	Clearly articulate the benefits of the project so that the public can consider the trade-offs of lost parking. Show them examples of other projects where a similar change has happened and how well that worked out.

3.7 PARKING TECHNOLOGY

Parking technology has advanced considerably in recent years and has made parking much easier to pay for and manage. However, it can be confusing for local councils and a rigorous process should be followed before investing in new technology. The table starting on the following page evaluates the main parking technology options. It is important to clearly understand the problems or challenges that are present before choosing parking technology.

To realise maximum benefits from the technology it is preferable to invest in systems that can easily be integrated with other systems. For example, when considering different suppliers for on-street parking machines, smartphone app for parking payments, and enforcement ticketing system, then these systems should integrate with each other in real-time. This needs to be a requirement when dealing with technology providers as it will improve the ability to efficiently manage and enforce parking.

Technology can overcome negative public sentiment towards parking management. For example, introducing priced parking is usually contentious but offering a smartphone app that shows how many spaces are available in real-time and lets the customer pay only for what they use may make priced parking more acceptable.

Before investing in parking technology, properly assess the costs and benefits using a robust business case process. Most technology has ongoing operational costs, and these should be offset by benefits in either increased efficiency or revenue.

Evaluation of parking technology options

The table below provides a summary of the pros and cons of each type of parking technology.

TECHNOLOGY	PROS	CONS
<p>Parking meters* – Pay and Display</p> <p>The customer gets a receipt from the machine to display in the car windscreen.</p>	<ul style="list-style-type: none"> ▪ Familiarity – public are familiar with the operation. ▪ Receipts – are available from the machine. 	<ul style="list-style-type: none"> ▪ Expensive to maintain – require regular servicing to replenish paper rolls, printer maintenance. ▪ Waste – paper creates waste and can result in littering.
<p>Parking meters – Pay by Plate</p> <p>The customer enters the licence plate of the vehicle into the machine.</p>	<ul style="list-style-type: none"> ▪ Integration – can be integrated with enforcement systems by using vehicle plate as identifier. ▪ Enforcement options – enforcement can be carried out by licence plate reading camera. ▪ Cheaper to maintain – than Pay and Display (no paper or printers). ▪ Convenience – customer does not need to return to vehicle once they have paid. 	<ul style="list-style-type: none"> ▪ Errors – customer can key in wrong plate. ▪ Privacy – some customers may have privacy concerns. ▪ Inconvenient – in high tourist areas can be inconvenient if meters too far from the vehicle as plate details not known by non-owners.

* Note: Most modern parking meters accept coins and credit cards. Some accept text payments or stored value cards. Cashless meters significantly reduce the cost of the meter and maintenance costs. A large part of the cost of a meter is the coin handling equipment and security features to deter vandalism. The parking meter can be up to 50% cheaper if cashless options are offered. Cash collection costs are also expensive as collection needs to be carried out over multiple small value sites. Coin jams are a common problem with parking meters and lead to higher operational costs. Many parking operators are encouraging parking app payments and reducing the number of parking meters.

TECHNOLOGY	PROS	CONS
<p>Parking meters – Pay by Space</p> <p>With Pay by Space meters the customer enters a unique parking space identifier into the machine. Pay by Space meters can be linked to parking sensors. The sensor confirms when the vehicle arrives, and the meter confirms if the vehicle has paid. The integrated systems then notify enforcement of vehicles that have parked and have not paid.</p>	<ul style="list-style-type: none"> Flexibility – ability to charge different rates for different parking spaces. Cheaper – no paper or printers. Convenience – customer does not need to return to vehicle once they have paid. 	<ul style="list-style-type: none"> Complexity – need to be programmed with each parking space and updated as parking changes. Maintenance – parking space numbers can be difficult to read or become vandalised. Integration – difficult to integrate with app payments via vehicle plate identifier.
<p>Parking payment apps</p> <p>Allow payment of parking through a smartphone app rather than using a meter. Most apps require the customer to pre-register and use a credit card. Apps can either be hosted and managed by the operator or a third party. Using a third-party app is usually more cost efficient for the local authority as the app provider will charge the customer a transaction fee for using the service. Parking apps can show other useful parking information such as prices, times of operation and live availability.</p>	<ul style="list-style-type: none"> Running costs – usually lower than installing meters. Convenience – customers who own a smartphone generally enjoy the convenience of paying through an app. Fair – customer only pays for the parking they use unlike a parking meter when an estimation of time required is needed at the start. Additional features: prices, times of operation and live availability. They also allow for instant updating of information and events like street closures. 	<ul style="list-style-type: none"> Flexibility – third-party apps limit the ability for the parking operator to influence the range of services offered through the app. Additional costs – this charge can disincentivise the public to switch from using cash at the machine to using an app.

TECHNOLOGY	PROS	CONS
<p>Ground parking sensors</p> <p>The sensors, installed on the road/in the middle of each parking bay, have a wireless connection to a server. Parking enforcement officers get a live feed from parking sensors to know how long a vehicle has been parked and whether it has overstayed a time limit.</p>	<ul style="list-style-type: none"> ▪ Parking enforcement efficiency – no need to chalk tyres or look for infringements. Parking sensors can increase the efficiency of parking enforcement officers or allow a reduction in staff numbers without a decrease in the number of infringements issued. ▪ Data – most sensor products provide a rich set of data and a backend reporting system that can be used to determine parking occupancy and turnover for any time period. This data can be used to set parking prices according to a demand responsive pricing policy. ▪ Live availability – parking occupancy information can be received in real-time and shared on websites, parking apps or electronic signage to inform the public of the number of vacant parking spaces. This can reduce congestion associated with people cruising for available parking. 	<ul style="list-style-type: none"> ▪ Cost – sensors can be expensive to purchase and maintain. They also have account monthly operating costs. Before road works, parking sensors need to be removed, stored, and reinstalled, usually by the contracted vendor. ▪ Accuracy – another factor to be aware of is parking infringements can only be issued when there is total confidence that the parking sensor system is working properly, and tickets can be defended.

TECHNOLOGY	PROS	CONS
<p>Licence Plate Recognition (LPR) Systems</p> <p>LPR is growing in popularity in the parking industry. Two typical uses are:</p> <p>Off-street car parks: cameras at the entrance and exit of the car park read the plates of vehicles entering and exiting. The customer pays at a pay machine using the licence plate as the identifier. There can be a barrier arm at the exit that only opens for vehicles that have been paid for, or non-paying customers can be sent a fine by mail.</p> <p>Enforcement: A vehicle fitted with LPR cameras can drive around detecting vehicles throughout the day, recording when a vehicle has overstayed a time limit. The footage can then be packaged up, confirmed by a parking officer and infringements issued in the mail. Alternatively, the vehicle can stop, and a parking officer issue the infringement on the spot. These systems can incorporate a list of vehicles with residential permits and exempt them from the time limit.</p>	<p>Off-street car parks</p> <p>Integration – can integrate with multiple payment systems that use licence plate as the payment identifier (smartphone apps or parking meters)</p> <p>No lost tickets – the time of entry is recorded by the camera, which removes the problem of lost tickets and associated customer conflict.</p> <p>Enforcement</p> <p>Coverage – larger coverage area for on-street enforcement than using parking officers on foot. This is good for covering large enforcement areas like residential parking zones.</p> <p>Compliance – for on-street parking, can lead to an increase in compliance as the customer cannot check for tyre chalk to know that a parking officer has viewed the vehicle.</p> <p>Infringements – license plate check means infringements for warrant of fitness and registration offences can be issued.</p> <p>Data – vehicle counting ability can be used to determine occupancy of streets covered by the vehicle. The system can also report the number of unique visitors to an area.</p>	<p>Cost – can be expensive to purchase.</p> <p>Accuracy – it is difficult to realistically achieve much higher than 99% accuracy. Therefore, in off-street car parks, there needs to be a backup process to assist customers when their vehicle plate is not read correctly. Likewise, on street parking enforcement still requires a manual check to ensure that the information collected by the system is accurate and the warranted parking officer needs to issue the infringement. This can erode the efficiencies of the system but usually will result in more infringements than a parking officer on foot.</p>

TECHNOLOGY	PROS	CONS
<p>Electronic permit systems</p> <p>The customer applies for a permit online. The electronic permit is linked the vehicle's licence plate. Electronic permit systems are sometimes called 'digital permit systems.'</p>	<p>Robust – physical permits were open to abuse by forgery or simply sharing the permit amongst other people which electronic permits are not.</p> <p>Real time – electronic permits can be amended or cancelled in real time.</p> <p>Integration – Electronic permits can be integrated with enforcement systems to allow for efficiency of enforcement without the need to check for a physical permit.</p> <p>Convenience – for most customers, an online system is much easier than a manual application process.</p> <p>Speed – the permit can be issued more quickly as no posting is required.</p>	<p>Cost – systems can be expensive, and cost may be prohibitive if only a small number of permits is issued.</p> <p>Electronic enforcement system required – because the permits are not visible, enforcement officers need to have an electronic enforcement system (e.g. a handheld enforcement device and software system) that can be uploaded with licence plate permit information.</p>



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AND GLOSSARY

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- Note: Images on pages 4, 5, 25, and 62 from MRCagney

GLOSSARY

Austrroads	Austrroads is the peak organisation of Australasian road transport and traffic agencies. Austrroads undertake leading-edge road and transport research which underpins our input to policy development and published guidance on the design, construction and management of the road network and its associated infrastructure.
District Plan	A District Plan is a requirement under the Resource Management Act, 1991, to assist local authorities in carrying out their functions in order to achieve the sustainable management purpose of the Act.
EV	Electric vehicle
GPS	Government Policy Statement on Land Transport (GPS) sets out the Government's strategic direction for the land transport system over the next 10 years and is updated every three years. It provides guidance on how we invest the National Land Transport Fund (NLTF), and how we assess and prioritise activities for Regional Land Transport Plans (RLTPs) and the National Land Transport Plan (NLTP).
Minimum Parking Requirements	Minimum Parking Requirements are district plan rules requiring new buildings and/or activities to include a fixed number of off-street parking spaces based on an assumed demand for parking generated by the buildings' use.
NPS-UD	National Policy Statement on Urban Development. This provides direction to local authorities about when and how cities should plan for growth and how to do this well. It aims to remove unnecessary restrictions on development, to allow for growth 'up' and 'out' in locations that have good access to existing services and infrastructure.
NZ	New Zealand
P180	An example of a time restriction on parking. The "P" denotes a parking restriction and the "180" refers to the time limit allowed in minutes.
Parklet	A parklet is the conversion of a small number of parking spaces to public space for people to use
PMP	Parking Management Plan

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Regional Land Transport Plan	Regional land transport plans (RLTPs) are six-year plans that document the regions' land transport objectives, policies, and measures as well as providing a statement of transport priorities for the region.
TCD Manual	This manual provides guidance on industry best practice, including, where necessary, practice mandated by law in relation to the use of traffic control devices. Part 13 Parking Control provides guidance on the use of traffic control devices related to stopping, standing and parking.
TCD Rule	Land Transport Rule Traffic Control Devices 2004. Traffic Control Devices Rule. This rule specifies requirements for the design, construction, installation, operation and maintenance of traffic control devices (including all parking restrictions), and sets out the functions and responsibilities of road controlling authorities in providing traffic control devices.
Waka Kotahi	Waka Kotahi is the New Zealand Transport Agency



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This publication is also available on the Waka Kotahi website.