Freight and Servicing Last Mile Toolkit

A guide to planning the urban freight task

NSW GOVERNMENT

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This document is the main document of the Freight and Servicing Last Mile Toolkit Master Document. Freight and Servicing Last Mile Toolkit Master Document is accompanied by a summary document. Both documents are available at **www.mysydney.nsw.gov.au/lastmilefreight**

For further information, please contact **freight@transport.nsw.gov.au**

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1. Toolkit Introduction

1.1 The last mile freight task

Cities offer diverse options for living, working, shopping and socialising. This diversity makes cities the vibrant, cosmopolitan locales they are, for residents as well as visitors.

Today's cities are changing in many ways. Across the world, urban planners increasingly design cities around people, communities and amenity – not motor vehicles. In fact, planners are beginning to discourage motor vehicle access altogether. When designing urban spaces, there is less focus on short-term commercial goals, and more on liveability. Good transport plays a key role in placemaking, transforming the public domain, activating centres and unlocking new development.

The NSW Government and its agencies apply placemaking principles to transport planning to ensure places are accessible, attractive, comfortable and safe. By broadening the emphasis from just the mode of transport to encompass considerations of how transport networks support placemaking objectives, transport planning can help create connected places which promote people's health, happiness and economic well-being.

In this context, the serviceability of a location is important. Serviceability refers to how a building, precinct or place receives goods, how its waste is removed and how its amenity is maintained. The question of deliveries is particularly important for urban places, given that the diversity of goods and services they offer is one of their defining characteristics. The greater the diversity of choices in a city, the more attractive it is likely to be as a place and the greater the freight and servicing task necessary to support it.

Freight and servicing movements are a derived demand – they are necessary because of people's demand for goods and services. The demands of people living in and visiting cities generate a substantial freight task. As such, freight is an essential transport activity for a cosmopolitan city.

Urban freight logistics directly contribute to a city's wealth, competitiveness and efficiency. But the movement of freight, particularly along the congested 'last mile' into and within the city centre, can also have negative impacts on urban places. The freight industry generates some of these impacts itself, but others result from the way planners, developers and other stakeholders have traditionally designed cities and the buildings within them.

Serviceability is often overlooked when designing new places. When planners and developers do not incorporate serviceability into a building or precinct's design, building managers, tenants and freight operators have to rely on suboptimal approaches. These approaches can compromise the amenity of the surrounding area as cars, vans and trucks compete for parking spaces, and kerbsides become congested. As well as affecting amenity, the outcome is often inefficient, unattractive and costly for commercial and retail tenants such as coffee shops and clothes stores.

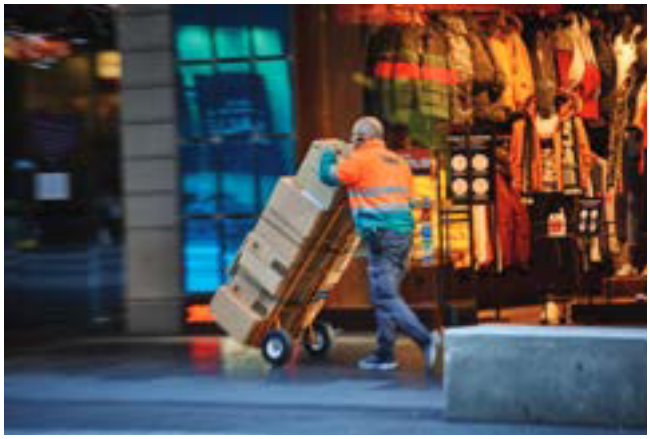
If building serviceability is incorporated into the planning process, onsite businesses receive goods and dispose of waste efficiently and reliably. It also enables essential servicing to be conducted with minimal fuss and disturbance. This enhances a building or precinct's amenity.

The Last Mile Freight and Servicing Toolkit (the Toolkit) is designed to help planners and developers to deliver good place outcomes in cities and urban centres by building serviceability into their designs from the ground up.

1.2 Supplying today's city

The sheer diversity of consumer choice, the ubiquity of online shopping and customers' growing service expectations are increasing the size and complexity of the urban freight task at a phenomenal rate. Driving into the city and competing for road and kerbside space is the standard approach to complete the task. But in modern cities that are orienting more around people and active transport, and less around motor vehicles, this is becoming more difficult to do. However, the task is unavoidable: freight and servicing vehicles enter urban centres because of consumer demand. Their journeys into the city are not discretionary.

Until recently, people shopped by visiting stores stocked with a variety of goods. These stores were supported by distribution systems that made a few large consolidated deliveries on a daily, weekly or monthly basis. Today's markets operate very differently. They are often online, and open 24 hours a day, seven days a week. Shoppers can go online to purchase an increasing variety of goods and services whenever they want, from wherever they want. Their purchases can now be delivered to their homes, workplaces or other convenient locations. While physical shops still exist and generate their own freight task, more and more items of all sizes are being delivered to the customer from online stores. The windows for these deliveries are getting shorter as competition grows and customer expectations increase. The result is more and smaller delivery vehicles on the roads.



Deliveries being made in George Street, Sydney

For the businesses delivering goods and services to these customers, the key challenge is how to develop supply chains to move goods in the most efficient way possible while meeting customer expectations of on-demand delivery. These commercial focuses can conflict with broader placemaking objectives, especially in locations where planners have not given due consideration to the freight task.

Whether it is our online shopping or the various supply chain activities that come together to enable people to get a coffee each morning, there is no escaping the size of the freight task. We cannot ignore it but must responsibly incorporate it into urban planning to ensure successful place outcomes and minimise network impacts as consumer expectations evolve and expand.

The Toolkit sets out best practices for incorporating freight and servicing activity into transport and land use planning and development and demonstrates how stakeholders can align urban planning priorities with freight planning priorities. Better planning is the responsibility of both the public and private sectors. The iterative approach to planning set out in this Toolkit is a foundation for securing better place outcomes for the city while meeting the evolving liveability needs of its people.

1.3 Purpose of the Toolkit

The Toolkit aims to support users incorporate freight and servicing activity into urban planning frameworks. It applies to major centres in both urban and regional areas where land use density is higher, competition for road and kerb space is greater and place outcomes are a priority. The Toolkit provides:

- an overview of the changing freight task and evolving design priorities for major centres
- profiles of different types of freight and servicing activity
- key principles in planning for freight movements and forecasting demand
- a comprehensive approach to freight forecasting and demand management
- guidance for managing off-street freight and servicing activity
- guidance for managing on-street freight and servicing activity
- an overview of the precinct approach to managing freight and servicing activity
- a summary of future challenges and approaches to the transport task
- an in-depth look at the micro hub solution.

An improved understanding of the freight and servicing task can help users of the Toolkit make better planning, development and management decisions that enhance place outcomes and provide more efficient business solutions.

Regional centres must also accommodate frequent freight and service vehicle movements

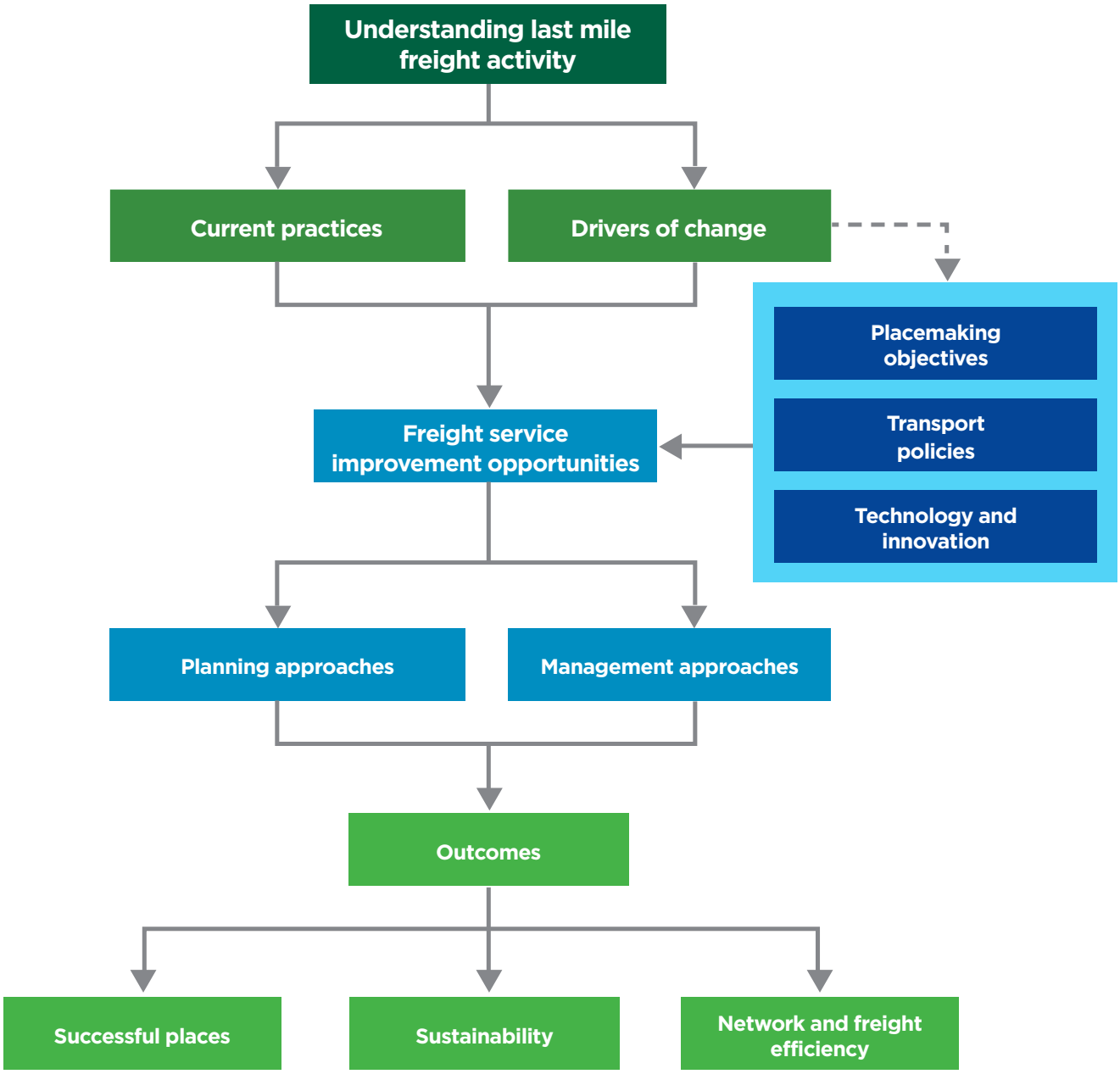


Figure 1 Approach and aims of the Last Mile Freight and Servicing Toolkit

Planners and other stakeholders can use the Toolkit proactively to improve their management of the freight and servicing task – in new and established developments alike.

The Toolkit advocates that planners:

- ensure all buildings have loading facilities that can accommodate the growing freight task for residents and tenants
- ensure that these loading facilities provide access for the largest practical vehicle size relevant to the task that the building will generate
- leverage future commercial opportunities by providing space for logistics service providers to establish facilities for last mile deliveries in the local area
- consider sustainable and space-efficient options for improving the efficiency of the urban freight and servicing task.

1.4 Toolkit stakeholders

The Toolkit is based on Transport for NSW's (TfNSW) strategic transport planning objectives, which support the Department of Planning, Industry and Environment's (DPIE) overarching strategic urban planning objectives. TfNSW developed the Toolkit by assessing individual developments and commercial freight management systems.

The Toolkit aims to support state government agencies, local government and the private sector to deliver economically viable, socially acceptable, commercially efficient and environmentally sustainable place outcomes. It is also intended to guide government agencies responsible for developing planning approaches, creating strategic future visions for the city and the state, and assessing developments and infrastructure.

Planning authorities and local councils

Local councils are most commonly responsible for planning places through their precinct and master-planning functions. As the approving authorities for most developments, they also have a significant influence over the impact developments have on local transport networks.

For many councils, it is difficult to support specialised freight and servicing expertise within their planning teams. Acknowledging this challenge, this guide can support councils by providing expert insights into the freight and servicing task and guidance on planning for the task to achieve successful place outcomes.

Councils and other planning authorities can use this Toolkit to enhance their precinct- and master-planning activities, and as a resource to guide their engagement with developers on freight and servicing requirements in new developments.

Developers

Developers provide the capital to transform planning visions into reality through the construction of new buildings and precincts. The extent to which developers can deliver against the vision set out by local and state authorities depends on the vision's clarity and commercial viability.

The Toolkit provides a clear, commercially sound case for prioritising freight and servicing considerations when planning for new developments, and guides developers in incorporating these considerations. It aims to embed a greater awareness of the economic benefits of good place outcomes and the necessity of planning for the transport task to achieve these outcomes.

Traffic consultants

Planning authorities and developers use traffic consultants to assess the traffic generated by buildings and precincts. The Toolkit provides traffic consultants with context on the relationship between planning outcomes and the freight and servicing task to guide how consultants design and conduct their traffic studies. In particular, it is intended to provide direction for the preparation of Traffic Impact Assessments (TIA) for new development applications and aims to encourage traffic consultants to adopt a comprehensive approach to planning for freight and servicing activity.

Building managers

Building managers operationalise planning and place outcomes, although the day-to-day management of loading facilities can often evolve into a task quite different to the one set out in master plans and development applications.

The Toolkit provides managers with a set of best practices they can apply to existing and newly constructed buildings to ensure that freight and servicing activity is managed effectively and in a way that supports the building and surrounding area's place outcomes.

A successfully managed freight and servicing task supported by a Loading Dock Management Plan (LDMP) tailored to the building or precinct facilities and the vehicle movements generated, can improve the commercial appeal of a building or precinct to residential and business tenants. Poor facilities and inadequate access, on the other hand, can result in dissatisfaction, potentially affecting desirability and viability.

Freight and logistics operators

The Toolkit contains contemporary perspectives on urban planning and freight management, drawing on local and international insights. It aims to assist freight and logistics operators by providing an overview of current urban planning priorities, and encouraging the uptake of up-to-date, best practice approaches to city servicing.

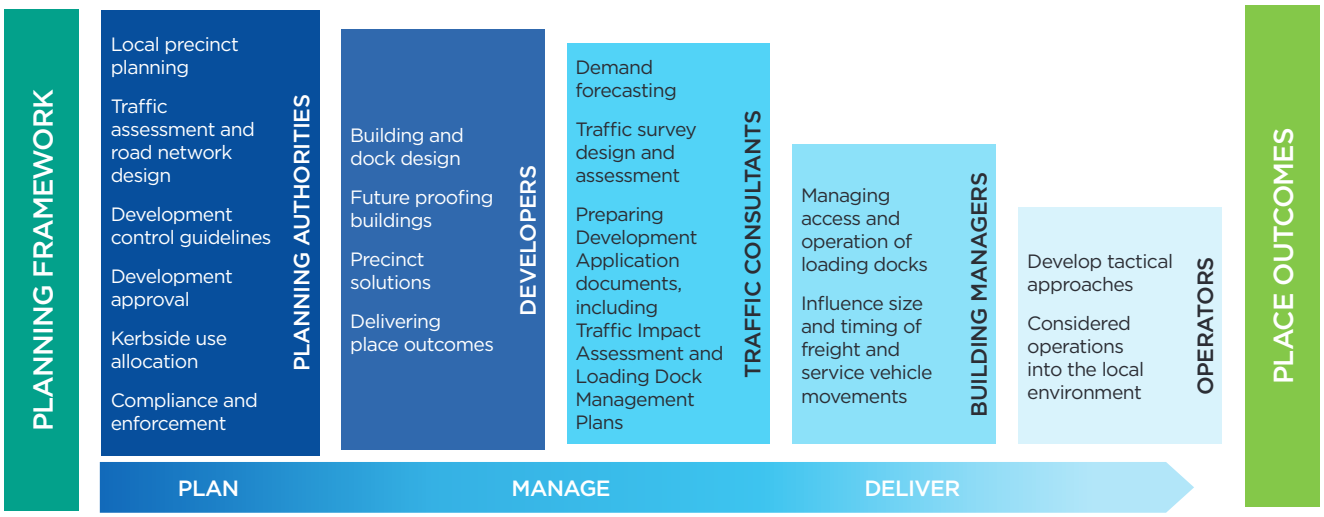


Figure 2 The roles of different stakeholders in a successful freight planning process

1.5 Guiding strategies and plans

The Toolkit has been developed in support of the **NSW Freight and Ports Plan 2018–2023**. The Plan is a pillar of TfNSW's **Future Transport 2056** and it aligns with other key NSW Government plans, including the Greater Sydney Commission's (GSC) District Plans and the State Infrastructure Strategy. The Toolkit is also intended to be used alongside the **Guide to Transport Impact Assessment** which covers all transport requirements in various environments.

The vision set out in **Future Transport 2056** is that "transport is an enabler of economic and social activity and contributes to long term economic, social and environmental outcomes" (TfNSW 2018, p.14).

Future Transport 2056 identifies the key concepts to deliver this vision.

A new conceptual framework for planning transport in NSW and Sydney

The strategy aims to enable people to have a better quality of life and find jobs closer to where they live. To achieve this, TfNSW will connect NSW's people to three cities instead of a single CBD. In regional NSW, this means creating more connections between towns and regional centres, rather than focusing on connecting regional areas back to Sydney.

Creating successful places

In a major shift, TfNSW is considering the whole place that transport systems impact, rather than just the systems themselves. TfNSW is working together with partners to help create functional, vibrant and beautiful places for the state's communities.

Embracing technology

TfNSW is harnessing new and emerging technologies and remaining open to new ideas and innovations to keep improving the customer experience.

Putting people at the heart

TfNSW is continuing to put the customer at the centre of everything it does. To deliver even better customer and community outcomes, TfNSW relies on its people. TfNSW will be successful if its people are able to make a difference for their customers.

Retail activity at Chatswood transport interchange

To achieve the vision set out in **Future Transport 2056**, TfNSW has developed a set of priorities for the transport cluster and identified the outcomes that need to be achieved in the next 40 years in **Service and Infrastructure Plans for both Greater Sydney and Regional NSW**. Within this plan, freight access, efficiency and reliability are recognised as vital components to further the complementary priorities of placemaking, and economic and social utility.

At the same time, the Toolkit supports the **Guide to Transport Impact Assessment** by focusing on freight movements in urban centres and is specifically designed to improve users' understandings of the freight task generated by cities, precincts and individual developments.

In partnership with Government Architect NSW, TfNSW has developed the **Practitioner's Guide to Movement and Place** for use on NSW Government projects. The framework delivers on NSW policy and strategy directions to create successful streets and roads by balancing the movement of people and goods with the amenity and quality of places.

2. How the freight task is changing

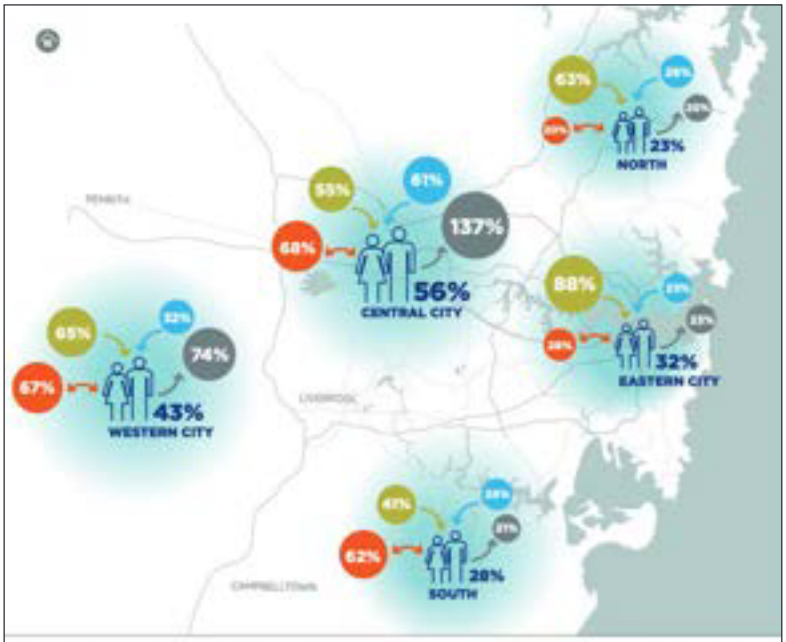
This section looks at how the freight task is growing and changing, and how this relates to current urban planning objectives. It sets out the challenges that urban planners will need to resolve to accommodate the freight task and outlines how the freight industry can respond to the shifting urban environment.

2.1 The increasing freight task

Between 1993 and 2018, the city of Sydney's population grew by 1.3 million people. Now sitting at 4.7 million, the city is expected to welcome another 1.3 million residents by 2036 (Greater Sydney Commission [GSC] 2018, p.27). While the effects of the COViD pandemic on population growth are not yet fully understood, based on this estimate, Sydney's freight task is forecast to increase by approximately 50 per cent by 2036.

Over the last decade, freight forecasts for the years ahead have been regularly revised upwards. The World Economic Forum predicted a 78 per cent increase in last mile deliveries between 2020 and 2030 (World Economic Forum [WEF] 2020, p.6), with the main drivers being increasing urbanisation, growth in eCommerce and an increase in "same day" and "instant" deliveries. This is likely to result in 36 per cent more delivery vehicles on the road.

It is not just that the freight task is growing – the service expectations associated with changing consumer demand and behaviour and the evolving nature of the built environment are also contributing to an increasingly complex logistics environment.



Source: *Transport Performance and Analytics, TfNSW*

Figure 3 Greater Sydney changes in population and freight demand, 2018 to 2036 (TfNSW 2018b, p.27)

2.2 Why the freight task is growing

The major trends shaping the freight task are outlined in the following sections.

2.2.1 Transformation in CBDs

Sydney, for example, is undergoing a major infrastructure renewal. New developments in urban centres are designed as places for people. Increasingly, urban planners are designing places around active transport and mass transport solutions such as light rail and metro. But for the businesses thriving in these new developments, getting the deliveries and services they need can be a challenge.

2.2.2 Population growth

By 2056, NSW will be home to 12 million people, an increase of four million from 2019. As the population increases, so will the freight task however the biggest challenges are likely to occur in last mile deliveries to urban centres and high-density residential areas. To cater for these densely packed, high-demand areas, a new approach to freight may be necessary.

2.2.3 Land rezoning and urban encroachment

As population growth generates demand for housing, former inner city industrial and logistics lands are being rezoned to accommodate high-density housing. These new residential areas will generate a new freight and servicing task, putting more vehicles – travelling greater distances from the relocated freight depots – on the road.

Pitt Street, Sydney: Growth in demand has increased the number of freight vehicles (in particular vans) on city streets.

2.2.4 Creating vibrant places

Many factors go into making cities attractive to residents and visitors. A key attraction of many cities is the wide variety of goods and services they offer. Unlike less urbanised areas, cities can cater to a wide range of consumer tastes. To ensure cities can maintain the diversity of choices people want, planners, developers and logicians must consider how to facilitate the expanded freight task.

2.2.5 Changing consumer preferences

People are increasingly doing more of their shopping online. It is now possible to buy goods from around the world in a 24-hour economy. While buying online is easy, purchases need to be delivered, and people often expect them immediately. This not only increases the freight task – it also makes the task more complex, as on-demand goods and services are delivered on an *ad hoc* basis rather than consolidated into set delivery schedules.

Delivery patterns could also change as highly urbanised centres develop a 24 hour economy, generating demand outside of traditional business hours. Currently, the peak time for deliveries into the Sydney CBD is between 9am and 12pm, but the demands generated by online shopping and the 24-hour economy could change this.

2.2.6 Increased environmental awareness

As concerns about the environment grow, city-dwellers are becoming more sensitive to air and noise pollution. At present, the growing number of freight deliveries in urban centres contributes to raising CO2 emission levels. Increasingly, consumers prefer environmentally friendly alternatives to petrol–powered freight vehicles. However, it is worth noting that introducing quieter electric vehicles would not solve Sydney's congestion problems.

2.2.7 Short-term impacts of construction

Major construction projects add to congestion by creating additional supply chains and increasing the freight task in urban areas. Large trucks deliver construction materials and equipment, while light commercial vehicles bring smaller deliveries and tradespeople. The time-sensitive nature of these deliveries can compel drivers to allow extra time for travelling into the city. If they arrive at the construction site early, drivers may queue along the street or circle the block waiting for their turn to unload. This can cause significant congestion, especially in narrow city streets.

In addition, work zones are often established around construction sites. These can take up kerbside space, potentially for years, which other delivery and service vehicles previously relied upon.

2.2.8 Increasing imports

Australia's manufacturing industry has shrunk in recent decades, while import volume has increased. This has caused an increase in supply chain activity branching out from trade gateways.

In Sydney, the major trade gateways are within the inner metropolitan area. However, the industrial zones that once supported freight and logistics facilities are being moved further away from these gateways to make room for residential developments. As a result, truck drivers are travelling greater distances between gateways, logistics facilities and final destinations, increasing congestion as they spend more time on the road.

2.2.9 Changing transport trends – connected and automated vehicles

The emergence of connected and automated vehicles, in particular driverless vehicles, presents urban planners with several challenges, including managing the movements of zero-occupancy vehicles and providing space to pick up and drop off passengers and goods. However, the current consensus is that the total demand for parking spaces (on- and off-street) in the Sydney CBD will be lower once driverless vehicles are in common use. If so, one of the key challenges facing urban planners may be partially solved.

CASE STUDY

New York steps up efforts to manage its massive freight task

Whatever the impact on roadways, the public loves internet shopping.

"We've entered an entirely new way of buying goods and services, but our infrastructure is only adapting incrementally," said Sarah Kaufman, Associate Director of the Rudin Center for Transportation Policy and Management of New York University. "We need to completely rethink how we use our streets if we want to maintain our current shopping and delivery habits." (Haag & Hu 2019)

New York is battling to manage its freight task, with an estimated 1.5 million online orders being delivered to its residents each day. What is more, the city's freight task is expected to grow 40 per cent by 2050.

The city faces significant traffic congestion on key gateway routes. An ever-increasing number of delivery vehicles has slowed average speeds by 23 per cent in the last five years. At the same time, record levels of illegal parking are causing problems kerbside, while the practice of sorting parcels on the footpath is irritating pedestrians.

The city's authorities are taking steps to manage these challenges. In 2019, they increased the number of kerbside loading zones to accommodate parcel deliveries. They also incentivised night-time loading and are developing a scheme mandating that deliveries must be received overnight in city-owned buildings. However, authorities are aware that this scheme will not work for all tenants. A trial is also taking place to promote the use of e-cargo bikes.

The city is investing US$100 million in developing better water and rail line terminals to encourage the use of alternative modes of transport. For their part, private sector stakeholders are trying to locate warehouses as close to their customers as possible to reduce their dependence on trucks and vans in the city centre.

"It became apparent that if New York City is going to be a competitive city in the world economy, it's going to need logistics fulfilment centres as close to the consumer as possible," said Dov Hertz of DH Property Holdings, a real estate development company with plans for three last mile warehouses in Brooklyn. (Haag & Hu 2019)

2.3 Movement and Place

TfNSW is not just focused on planning transport assets and services: a key emphasis is on how these assets and services will work to support successful cities. The Movement and Place Continuum provides a tool to manage the network in a way that supports safe, efficient and reliable journeys for people and freight while enhancing the liveability and amenity of places (TfNSW 2018, p.17). It is important to recognise, however, that places for people will still generate a freight and servicing task, and often a significant one.

The key focus of the Toolkit is how to manage these freight and service vehicle movements to leverage liveability and amenity outcomes on parts of the transport network that are focussed on place functions.

It is easy to imagine the large vehicles on main roads moving big quantities of freight as efficiently as possible between trade gateways and warehouses to end customers. However, these large vehicles are unsuitable for navigating narrow city streets and making multiple deliveries in dense urban centres. As a result, lots of small vehicles leave warehouses on the urban fringe to make last mile deliveries to customers in the city, contributing to congestion on motorways and movement corridors.

Ideally the most efficient transport approach would be large trucks moving freight to the edge of CBDs and then transhipping goods to smaller vehicles to complete the last mile delivery to the customers in the urban centre. Organising this transhipment is not easy hence this approach is not often taken currently. However, changing market dynamics mean this transhipment is becoming an efficient and commercially sustainable method.

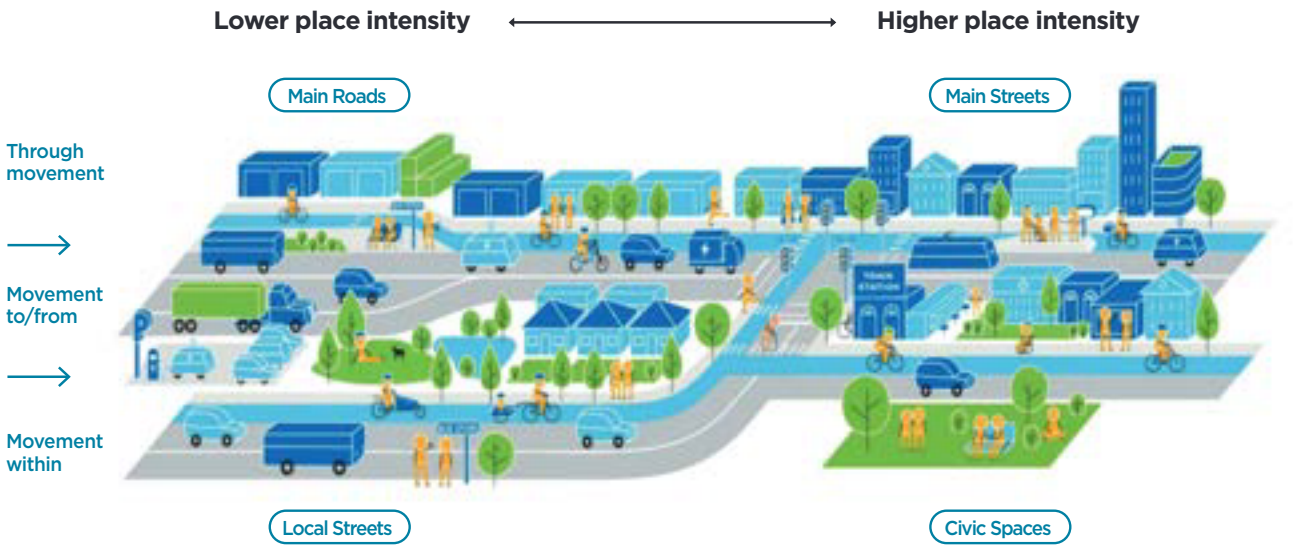


Figure 4 TfNSW's Movement and Place Continuum

2.4 Understanding the economic, social and environmental externalities generated in the last mile

Different stakeholders have different sets of objectives when they plan and manage the freight task. Logistics operators focus on generating revenue, minimising costs and fulfilling customers' service expectations. According to some estimates, this last mile currently accounts for over 50 per cent of the overall supply chain and logistics costs of delivering goods into a city (Spector 2020).

State and local governments focus on developing and implementing policy and planning reforms to improve the broader economic performance and development of cities. This means fulfilling social and environmental objectives to make localities attractive from safety, health and liveability perspectives. These objectives influence the day-to-day management and the long-term planning and development of cities.

As well as creating places for people and improving amenity, state and local governments need to manage the transport network so that it meets the needs of all users, including passengers and those moving freight. Government's priorities in managing the transport network change according to the time of day and the day of the week. For example:

- on weekday AM and PM peaks, priorities focus on public transport and moving commuters
- in the evening, attention may switch to supporting a city's 24 hour economy by providing more space for public transport, active transport, on demand transport, parking or activation to support local business activity, depending on the location
- between AM and PM peaks, the focus is on utilising kerbside space to support business activity
- overnight, the priority in residential and commercial areas may be cleaning, maintenance and waste removal. Some areas, particularly residential, have noise restrictions that can limit overnight delivery or servicing activity.

While the broader social, economic and environmental objectives of government and the commercial objectives of the private sector may not always align, congestion has a detrimental effect on both. As such, both sets of stakeholders have an interest in managing it effectively.

2.5 Freight task growth case studies

CASE STUDY

Cosmopolitan urban environments and consumer choice drives an increasing freight task

On one side of a street in the Sydney CBD, there are 230 different types of bread for sale from 35 different suppliers, displayed in 21 different shops. Every day, the street sees 80 bread deliveries, most of which occur in time for breakfast.

The selection of bread on this street is just one example of the wide range of choices modern cities provide. The same is true of any other product category: copy paper, types of cleaning products, noodles or craft beer, for example. But the choice and diversity on which global, cosmopolitan cities thrive lead to a substantial growth in the freight task.

The diverse range of products available to consumers are sold by an equally diverse range of businesses. According to the Australian Bureau of Statistics (ABS), the City of Sydney had 71,841 registered businesses in 2019, a 14.7 per cent increase since 2015 (ABS 2020; ABS 2018).

CASE STUDY

Previously unseen levels of construction activity and traffic

In recent years, Sydney has benefited from significant levels of public and private sector investment. This has spurred unprecedented construction activity in the Sydney CBD, as well as other major urban centres such as Parramatta and Macquarie Park.

This construction activity has generated a substantial transport task, with large commercial vehicles bringing materials to sites and smaller commercial vehicles ferrying tradespeople. For instance, the construction of the International Convention Centre Sydney at Darling Harbour generated over 16,000 concrete truck movements. Similarly, the AMP tower at Circular Quay required more than 900 trucks to deliver scaffolding to the site. The same number will be required to remove the scaffolding.

View of construction activity at Parramatta Square in 2019

3. Guiding principles in planning for freight and servicing activity

This section sets out the key guiding principles in planning for freight and servicing activity in urban centres. These principles apply to new and existing developments as well as existing precincts, greenfield sites and any other locations where planners need to balance the needs of freight and servicing movements against placemaking objectives.

Primary principles, which relate directly to the place outcomes sought from a building or precinct, and secondary principles, which help to ensure the broader benefits of an efficient freight and servicing task are considered.

3.1 Freight and servicing as a derived demand

Freight transport is a commercial activity and a derived demand. This means there is no direct demand for the transport service itself. Rather, the demand is for the good or service being transported. For example, customers at a coffee shop initiate demand in the supply chain for milk, coffee, cups and ultimately waste collection. The supply chain therefore generates several transport movements to deliver to the coffee shop. Transport movements – specifically freight and servicing vehicle movements – are also a direct function of land use (for example, retail land use which permits the coffee shop) and broader placemaking objectives at work in different areas.

Consequently, planners designing buildings and precincts must be aware of the demand for freight vehicle movements that these developments are likely to generate. In the past, plans for new developments and precincts have not always taken this demand into account. Often, there is a disconnect between the placemaking objectives of new proposals and the servicing facilities that are proposed to support them.

When onsite loading and servicing facilities proposed to support new developments are inadequate or poorly managed, the building will be unable to accommodate its logistics task, particularly at peak times. Instead, freight and servicing vehicles visiting the building will need to rely on kerbside parking, causing congestion in the surrounding area. In the case of waste servicing, reliance on kerbside collection and the associated loss of valuable kerbside space for this activity further affects a building's serviceability.

The Toolkit is intended to help developers and other stakeholders plan for the freight and servicing task in the design of buildings and precincts to secure a shared vision for place. Key to this is understanding the building's demand profile and designing loading facilities that are self-sufficient and able to accommodate the vehicle movements this demand will generate. By shifting from providing the minimum compliant facilities to adopting a best practice approach to planning for freight and servicing, stakeholders can help to ensure that land use and placemaking objectives are met.

Key Planning Principle

The design and management of loading facilities should directly reflect the land use and shared vision for place in a building or precinct.

3.2 Freight and servicing as enablers of placemaking objectives

Freight and servicing movements are often viewed as a risk to amenity and placemaking objectives, largely due to the visual, noise and air pollution these movements tend to create. This tension, which may be exacerbated by planning and management approaches to freight and servicing, tends to become apparent only after the key design parameters of buildings and precincts have been decided. Another source of tension is the fact that many people are unlikely to perceive a direct responsibility for or personal benefit from freight and servicing movements. Therefore, they are less likely to tolerate the negative impacts of these movements.

As a result, common planning responses to freight and servicing challenges include restrictions on when and where these movements can occur, and limitations on the size and type of vehicles as well as the times of day they can be used (e.g. curfews). These responses can inadvertently undermine placemaking objectives by making it more difficult to deliver goods and services to businesses and residents alike, ultimately resulting in practices that are detrimental to local amenity.

Freight and servicing movements are inextricably linked to the demand generated by a building or precinct. By fulfilling this demand, they help to ensure placemaking objectives are met. These movements allow restaurants and cafés to receive products, retail outlets to receive stock, public areas to be maintained and waste to be removed, among a range of other activities.

Stakeholders can improve place outcomes with an integrated and proactive approach to planning for the logistics task. Incorporating freight and servicing into initial designs and plans creates opportunities to separate freight access points from public spaces; optimise loading spaces to accommodate the most efficient vehicle types; minimise total movements; and provide ancillary facilities to support freight consolidation and after-hours servicing. It also enables a range of other initiatives that can increase the efficiency and reduce the overall impact of the freight and servicing task.

Properly understanding and actively planning for the transport task is the most effective way to minimise its negative effects – such as congestion, air, noise and visual pollution – on a building or precinct. An efficient and discrete freight and servicing function is a foundation for successful placemaking.

Key Planning Principle

Loading facilities and freight and servicing management strategies should be prioritised in the initial design of a building or precinct to align with and support the shared vision for place.

3.3 Promoting self-sufficient buildings and precincts

Nearly every building or precinct will generate private and commercial vehicle movements. The number and type of these trips will depend on the land use and placemaking objectives at work. As vehicles travel to and from buildings or precincts and dwell at kerbsides, they generate direct costs due to road wear, and externality costs due to congestion and pollution.

Road use charges (such as registration and fuel excise) go some way to helping governments recover these direct costs. However, there are fewer mechanisms in place to recover externality costs – in particular, the broader economic costs incurred when vehicle demand exceeds kerbside capacity. While many local authorities charge private vehicles for parking in busy areas with kerbside capacity constraints, loading zones across NSW are provided free of charge.

In economic terms, an efficient market is one in which the costs of a transaction are borne by the parties engaged in that transaction. Where freight and servicing vehicles cannot park in off-street docks at their destination and must rely on the kerbside, the full costs of delivery are not borne by the market participants: the site's owners, the suppliers and purchasers of the good or service, and the transport operator. Instead, some of these costs are shifted to third parties: taxpayers, who fund the provision, maintenance and policing of kerbsides; other road users, who are unable to access scarce kerbside capacity or are delayed by freight vehicles searching for kerbside space; and other businesses and visitors in the precinct, due to the visual, air and noise pollution caused by these movements.

The obvious solution is to ensure buildings and precincts have enough onsite, off-street capacity to accommodate the freight and servicing vehicle movements their demand generates – in other words, that they are self-sufficient. The feasibility of this solution may vary according to the size of the building or precinct, and the land use. In areas with lower-density land uses, externality costs may be negligible while the cost of providing off-street parking and unloading capacity may be prohibitively high relative to the overall cost of the development. As density increases, such as in urban centres, externality costs and the costs of remedial treatments to address them will increase, while the relative cost per movement of providing adequate off-street capacity will decrease.

It is important to note that best practice management of the freight and servicing task does not simply involve providing a sufficient loading space in a building or precinct. It also means ensuring that this space is accessible to appropriate sizes and types of vehicles, managing vehicle arrivals, encouraging consolidation between tenants and customers and aligning with the place vision. These concepts are explored in greater detail in **Section 6.5**.

Key Planning Principle

The design of buildings and precincts should enable them to be self-sufficient and not rely on kerbside space to support their freight and servicing demand.

3.4 Balancing amenity, transport and building efficiency

Early morning deliveries via Pitt Street Mall, Sydney CBD

An effective planning framework balances the needs of a place's different users appropriately. It is key that planners and developers incorporate freight and servicing considerations into their designs for both new and existing buildings and precincts. However, it is equally important they ensure that the design of freight and servicing facilities is not done in isolation or in a way that detracts from amenity or place outcomes. Particularly in dense urban centres, architects and developers are challenged to fit all the necessary features into a building. Loading facilities, including loading access within a building, can be difficult to accommodate yet they are essential for the building to operate efficiently.

TfNSW's **Future Transport 2056** includes a Movement and Place Framework. This Framework is intended as a tool for managing the road network in a way that supports safe, efficient and reliable journeys for people and freight while enhancing the liveability and amenity of places (TfNSW 2018, p.17). It provides a template for balancing the needs of different users across different parts of the road network, and applies equally to individual developments and precincts. By starting with an understanding of a road network's functions, planners can ensure that loading facilities, access points and place functions are appropriately orientated to the relevant parts of the transport network. The Framework also demonstrates how good planning and management of freight and servicing activity can enable good place outcomes, as discussed in **Section 3.2**.

Supporting Planning Principle

TfNSW's Movement and Place Continuum should be used as an enabling tool to plan and manage freight and servicing movements to and from buildings and within precincts.

3.5 Leveraging freight and servicing to deliver economic, social and environmental benefits

Vehicle movements generated by buildings and precincts affect the efficiency of the greater transport network. While an individual building or precinct's impact may be modest, the cumulative impact of the buildings and precincts in an urban centre is more significant, both on the streets surrounding individual sites and on the broader network.

Planning and approving authorities in particular have an opportunity to improve customer outcomes by ensuring that freight and servicing is well-planned and well-managed. Good planning and management means enabling the use of the most efficient vehicle types, minimising vehicle movements, facilitating consolidation to minimise total journeys, encouraging out-of-peak movements and providing alternative last mile delivery options. These actions can secure broader economic outcomes by improving network efficiency, and can unlock social and environmental benefits by reducing congestion and emissions.

Supporting Planning Principle

Good planning for freight and servicing movements can deliver broad economic, social and environmental benefits.

Figure 5 Key principles to guide planning for freight and servicing activity

4. Characteristics of different freight and service movements

This section provides an insight into the key characteristics of the most common types of freight and service vehicle movements that occur each day. It is essential to understand the characteristics of key movement types to plan better for the freight and servicing task and minimise the need for kerbside loading.

4.1 Freight activity timing

Mid-morning is the busiest time for freight activity in the Sydney CBD. It is when businesses open and expect deliveries from couriers and parcel companies, when retail stores receive stock for the day's trade and when restaurants and cafés receive the bulk of their supplies for the busy lunch and dinner periods.

While some goods can be delivered overnight, there are a variety of reasons why other goods cannot be delivered outside business hours including:

- goods are shipped overnight from regional areas or interstate and do not arrive in Sydney until the early morning, including items such as fresh produce and seafood
- the Sydney Airport curfew means many international items arrive after 6am
- most businesses are only open during normal trading hours and are not prepared to accept the costs of overnight labour to receive and unpack deliveries
- many retail businesses still operate using a 'just-in-time' inventory model and only carry minimal stock onsite. These businesses rely on quick and reliable supply chains with frequent deliveries to meet customer demand
- cold supply chain items need to be received and stored immediately.

4.2 Freight profiles

Each type of freight movement has different operating characteristics. These characteristics should be considered when planning loading facilities in buildings and precincts. Some movements are time-critical, with narrow delivery windows. Others require the use of larger vehicles or involve longer dwell times such as removalist trucks.

It is important that, as far as possible, loading facilities are designed to accommodate the characteristics of the different freight and service vehicle movements a building or precinct will generate. This will help optimise operational efficiencies and, by doing so, minimise potential road network and kerbside impacts. **Table 1** provides a summary of each vehicle movement type.

Table 1 Summary of the key types of freight and service vehicle movements

Movement	Preferred vehicle	Dwell time	Time-of-day criticality
Parcel/courier	Van to small rigid vehicle (SRV)	Short	High
Office supplies	SRV	Short to medium	Medium
Food* – provedore and supplies	Van to medium rigid vehicle (MRV)	Medium	Medium to high
Food* – beverages	MRV to heavy rigid vehicle (HRV)	Long	Low
Fashion and retail	MRV to heavy combination vehicle (HCV)	Long	Low
Cash-in-transit	SRV	Medium	High
Waste collection	HRV	Short	Low
Removalist	MRV	Long	Low
Trade and service	Van to SRV	Long	Low

*** More detail on types of food and beverage movements is provided in Section 4.2.3**

4.2.1 Parcels and couriers

Courier movements are numerous and service nearly all building types in urban centres.

Couriers typically handle business-to-business (B2B) freight so movements in urban centres are generally concentrated around commercial buildings. However, the growing eCommerce sector is changing this profile. Now, many traditional courier or parcel delivery companies are key providers in the business-to-consumer (B2C) market, and increasingly service residential buildings as well.

Couriers traditionally operate on a pickup-and-delivery (PUD) model, with drivers concentrating on deliveries in the morning and pickups in the afternoon. This approach, however, is also evolving. As online retailers increasingly focus on achieving quicker delivery times to differentiate themselves from competitors, they are generating more urgent freight movements throughout the day.

In general, couriers handle small, lightweight parcels and complete a large number of deliveries and pickups each day. As a result, they tend to use smaller vehicles, in particular vans, and dwell at drop-off points for short periods. Couriers often prefer kerbside parking to avoid spending additional time accessing existing off-street facilities. It also enables them to service multiple delivery points from one parking location. As vans may be loaded with 80–100 deliveries for customers in one day, couriers can save time by delivering goods from the minimum number of parking stops.

Couriers also tend to operate to tight delivery windows. While there may be some flexibility to shift delivery or pickup times for some clients, couriers are generally limited by the trading hours of their customers and the urgency of the consignments they are handling.

To plan for couriers and encourage them to use off-street facilities, planners must make them easily accessible and convenient to ensure couriers can speedily access and exit the facilities and also reach their customers quickly from these facilities.

4.2.2 Office supplies

Office supply movements are very similar to courier movements. They are common in urban centres and typically concentrated around commercial buildings. The goods are often heavier and bulkier than most courier consignments. As a result, office supply movements often involve large vans or small trucks, and deliveries require longer dwell times than those of couriers.

Offices supply movements are generally constrained to delivering during business hours, although the time of day at which deliveries are completed is typically flexible.

4.2.3 Food, including packaging supplies

Delivering seafood at Macquarie Centre using a van

Food and beverage deliveries are common in urban centres, with the bulk generated by demand from retail businesses such as cafés, restaurants, bars and supermarkets. Offices providing basic kitchen supplies for staff such as tea, coffee and milk, as well as catering for events, also attract some vehicle movements. In addition, the growth of online grocery shopping is increasing the number of food and beverage movements to residential buildings.

These movements vary considerably depending on the goods being transported and the customers being serviced. Most daily food and beverage movements are completed by small trucks, but some larger, heavier consignments, such as beer kegs, require bigger vehicles. **Table 2** summarises the typical characteristics of food and beverage movements.

4.2.4 Fashion and large retail

Vehicle movements to and from fashion and large retail businesses are generally concentrated around locations such as key shopping centres and department stores. The key difference between this type of movement and regular courier movements is the scale and concentration of demand.

Delivering supplies to a fast food restaurant in the Sydney CBD using an articulated truck

Typically, fashion and large retail consignments are large but relatively lightweight. The type of vehicle in which they are delivered is often determined by the accessibility of the delivery point, with suppliers preferring to use the largest, most efficient vehicle that each delivery point can accommodate (including semi-trailers). Delivery times are largely determined by retailers, with most deliveries occurring within contractually agreed windows. While some in-store factors dictate when deliveries need to be made, the timing of retail deliveries is generally more flexible than for courier or perishable movements.

Planning for fashion and large retail movements needs to be pragmatic. They are essentially bulk freight movements, so every effort should be made to maximise the accessibility of loading facilities in the developments and precincts in which they occur. Planners should consider the long dwell time of delivery vehicles and provide adequate space for unloading goods. Dock restrictions on vehicle size and loading space worsen congestion by increasing the total movements necessary to complete the delivery.

Table 2 Typical characteristics of food and beverage delivery vehicle movements

Type of movement	Freight	Indicative vehicle	Timing	Vehicle turnaround	Size of goods
Provedores	Fresh produce including bread, milk, smallgoods	SRV	Time-sensitive – generally before business hours	Short – often less than 15 minutes	Smaller consignments – often reasonably light
Supplies and consumables	Coffee, cups, packaging	SRV	Varied	Short – often less than 15 minutes	Smaller consignments – often reasonably light
Boutique alcohol suppliers	Beer, wine, spirits	Van – SRV	Varied	Medium – generally between 15 and 30 minutes depending on order size	Smaller cartons, some kegs – generally heavy consignments
Beverage suppliers	Soft drinks, water	MRV – HRV	Varied	Long – often 30 minutes or more	Pallets and cartons – heavy
Major alcohol suppliers	Beer, wine, spirits	MRV – HRV	Generally weekly morning deliveries	Long – often 30 minutes or more	Kegs, pallets and cartons – heavy
Meat suppliers	Beef, lamb, pork, poultry	MRV – HRV	Varied	Long – often 30 minutes or more	Cartons and carcasses – heavy
Supermarkets	Bulk goods including groceries, fresh produce, dairy, meats	HRV – HCV	Customer-driven delivery windows	Long – often 30 minutes or more	Pallets and cages – heavy
Home grocery delivery	Mixed groceries	SRV	Time-sensitive determined by customer – often outside business hours	Varies depends on reception arrangements and order size	Cartons/bags or equivalent

4.2.5 Cash-in-transit

Cash-in-transit refers to the movement of currency and other high-value items to and from banks, financial institutions and other major points of exchange. Generally, armoured vehicles the size of small trucks are used to complete this task, though larger trucks are often used for coin collection. Due to the value of the cargo, neither the timing nor the parking locations of cash-in-transit movements can be fixed. In addition, drivers of cash-in-transit vehicles are subject to a range of risk-related exemptions under the road rules that allow them to stop as close as possible to their delivery and collection points.

Although off-street facilities are generally not preferred by drivers of cash-in-transit vehicles, planning for cash-in-transit is still an important consideration where a building or precinct is likely to attract these movements. Building and precinct planners and developers should consider providing practical on- and off-street parking for these movements to minimise their associated risks.

4.2.6 Waste collection

Waste collection is a ubiquitous task demanded by every building and precinct. Waste operators prefer large trucks as these are generally the most efficient vehicles for the task. This type of vehicle not only maximises operational efficiencies, but also minimises the total number of vehicle movements. However, vehicle selection is often determined by external constraints such as street accessibility and the size of off-street facilities, particularly height restrictions.

Collecting secure waste in Parramatta using a rigid truck

The timing of waste collection is largely determined by land use. In commercial and retail areas, collection is often required multiple times each week and is generally feasible at any hour. In residential areas, collection is generally weekly and timed to minimise disruption to occupants.

Dwell time for waste collection vehicles tends to be reasonably short but is greatly influenced by accessibility considerations and bin arrangements at collection points.

Waste collection should be planned as an off-street activity in larger buildings and precincts. By moving the task off-street, planners and developers can reduce footpath clutter on collection days, minimise impacts on place outcomes and amenity and reduce vehicles' reliance on kerbside loading. This principle applies to commercial, retail and medium to high density residential waste collection. Loading facilities should be designed to accommodate the largest vehicles possible and to give drivers direct access to bin rooms.

Public street bins may need to be emptied multiple times per day, typically after lunch and once again at the end of the day. Some councils have trialled "smart bins" that send a message electronically when they are full as a means of minimising waste collection movements.

4.2.7 Removalists

Removalist movements are generated by occupants of residential, retail and commercial buildings. They require long dwell times and almost always involve small to medium-sized trucks (most commonly MRV size). Commercial and retail relocations are often completed outside business hours to minimise the impact on business operations, but residential relocations tend to occur during business hours.

While removalist movements are less common than other movements such as courier deliveries, good planning is still essential to accommodate them, particularly in residential sites. Failure to plan for removalist movements can result in inconvenience, reduced rental appeal, loss of amenity, network impacts and, in some circumstances, safety risks. As with waste collections movements, in larger buildings and precincts removalists should be accommodated off-street to mitigate these potential impacts.

4.2.8 Trade and service vehicles

Every building and precinct will create a demand for trades and services such as plumbing, electrical work, lock smithing, indoor plant maintenance, cleaning and general maintenance. In urban centres, most buildings will generate a daily demand for these activities. The demand generated by older buildings, which typically have no or limited loading dock space, will create more kerbside congestion. On nearly all occasions, tradespeople will require a vehicle to carry tools and equipment to site, and longer dwell times. Typically, tradespeople operate smaller vehicles like utes or vans.

Collecting restaurant air filters for cleaning in Chatswood, Sydney using a ute

Figure 6 Examples of the types of servicing activity generated by large buildings

While the same type of vehicle may be used for both delivery and servicing tasks, it is generally best to consider trade and service vehicle movements independently of freight movements, and plan for them as such. There are two reasons for this:

- dwell time – trade and servicing vehicles' dwell times are typically longer than most freight vehicles and subject to greater variability depending on the nature of the work being performed. As a result, these vehicle movements can have a disproportionate effect on loading bay capacity and the ability of other freight and servicing vehicles to plan and schedule their movements.
- vehicle size – as trade and servicing vehicles are typically smaller than freight vehicles, they can more easily access general parking areas with lower clearances and restricted manoeuvrability. While there are benefits in ensuring trade and service personnel can access loading facilities such as goods lifts, their vehicles can be more efficiently accommodated in lower-cost parking areas than larger freight vehicles.

5. Freight forecasting and demand management

This section provides guidance to assist planners, developers and other stakeholders measure freight activity in a building or precinct. It outlines several methods TfNSW and other authorities have used in recent years to measure and assess on- and off-street freight activity.

5.1 Understanding what to measure

Every type of building generates a freight task. Every weekday, approximately one commercial vehicle travels into the Sydney CBD for every 20 people living or working inside the city. Of course, not everyone requires one-twentieth of a truck or van on a typical day, however morning coffees, lunches, stationery and office supplies, business documents, groceries, maintenance activities and waste removal requirements all add up.

There are several ways to measure the activity of freight and servicing vehicles. Each measurement tells its own story about the task. **Table 3** outlines these different measurements.

According to a 2014 TfNSW CBD cordon count, approximately 35,000 commercial vehicles come into the Sydney CBD each weekday. Drivers of these vehicles park in loading docks or at the kerb to complete their tasks. For this reason, loading dock driveway counts are not a definitive record of all freight activity.

To assess total activity accurately, measurements of a building's freight task need to include both on-street activity and off-street loading dock activity. TfNSW's assessments show that between 10 and 25 per cent of a building's servicing activity is conducted on the adjacent street, for a variety of reasons that are outlined in **Table 4**.

Assessment of on-street activity should not focus only on compliant behaviour in loading zones. In congested areas, delivery and service vehicle drivers may parking in other zones, at times illegally. All this traffic, however, is generated by the survey building and hence needs to be captured to develop a comprehensive understanding of demand.
It is also important to capture smaller movements as well such as bicycle couriers deliveries and walking couriers. These movements also form part of the freight demand generated by a building.

Consider

Whether a driver uses a loading dock or kerbside parking to complete their freight or servicing task, planners need to record both activities as attributable to the building.

Table 3 Ways of measuring freight and servicing activity

Freight activity measurement	Explanation
Vehicles approaching and entering the CBD	This has been measured previously via cordon counts at 15 CBD entry points, with the help of the Sydney Coordinated Adaptive Traffic System (SCATS). SCATS uses sensors that enable general traffic counts. Additional surveillance of specific vehicle types is required to support this measurement.
Circulation of traffic in the CBD	Using a method similar to the one described above, this is measured by assessing how vehicles move in the CBD, often as they search for parking to complete deliveries.
Vehicles using kerbside loading zones	Data from parking ticket machines provides an indication of kerbside loading zone activity in the Sydney CBD. TfNSW has also undertaken video assessments to measure this activity.
Vehicles using off-street loading facilities	This is measured by carpark data and driveway counts capturing loading dock activity.

Table 4 Reasons delivery drivers use on-street parking

Reasons for on-street servicing	Explanation
Loading dock accessibility	• Driveway is difficult to navigate • Dock entrance height is too low • Dock is not open when needed e.g. security restrictions • The street location of the dock entrance: it may be in a congested location, in a one-way system or all of the above.
The availability of loading zones adjacent to the building	If a loading zone is available adjacent to a building, then a driver may use it for speedier delivery.
Amount of dwell time required	If the delivery is simple – a courier consignment of one small and light parcel, for instance – the driver may try to find a space on the street near the building rather than spending time entering a loading dock.
Making deliveries to several neighbouring buildings	If a driver has multiple deliveries for different buildings in the same vicinity, they may elect to park on a street within walking distance of all destinations, rather than going in and out of multiple docks.
A booking is required	If the delivery company is required to make a booking to access the loading dock but has not, the driver may need to park on a nearby street.

5.2 Measuring on-street activity

This section profiles some common on-street loading zone activities and discusses ways to compile and use information about these activities for better planning.

5.2.1 A day in the life of an on-street loading zone

Figure 7 illustrates the typical weekday profile of freight activity in an on-street loading zone in the Sydney CBD. The pattern it displays is consistent with other centres in Sydney and other cities around the world that have no access restrictions on freight and servicing vehicles. **Figure 7** does not include overnight activity, which can account for as much as 10-12 per cent of total activity.

A noticeable trend between 2016 and 2019 is the growth in early morning activity, particularly between 6am and 7am. Loading zone activities in this hour increased by 72 per cent over the three year period. The earlier start probably translates into an earlier finish, with less loading zone activity occurring in the afternoon by 2019.

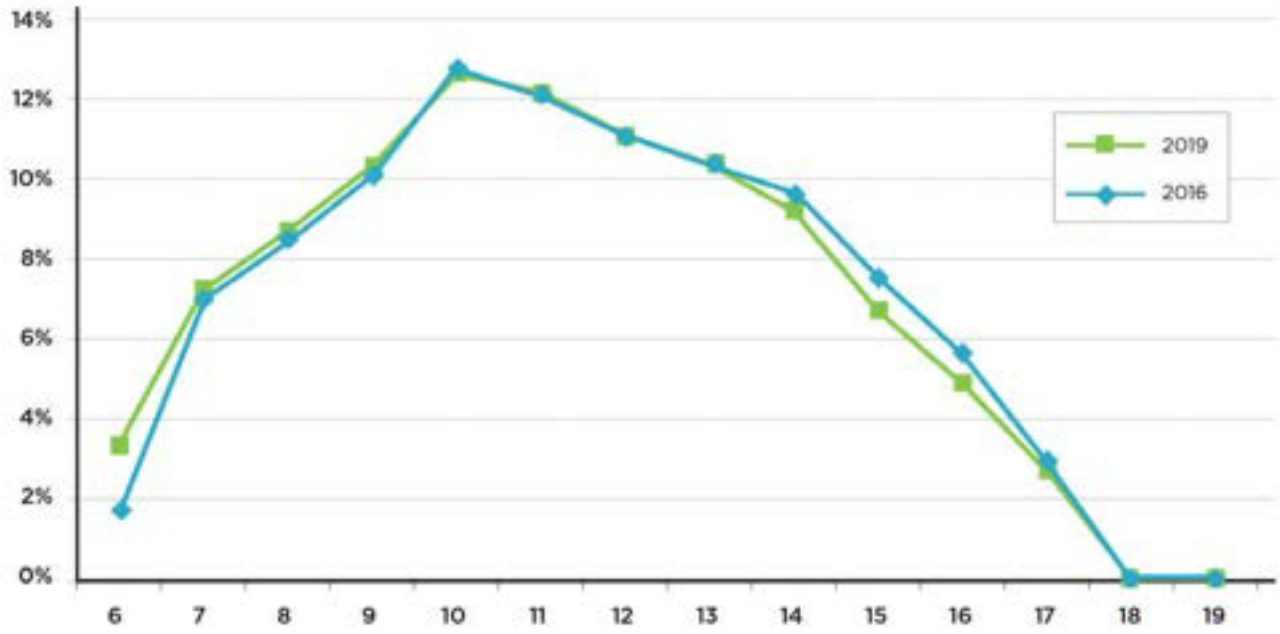


Figure 7 Loading zone activity in the Sydney CBD (City of Sydney)

In the Sydney CBD, loading zones are provided to freight and servicing operators throughout the day. The availability of these zones changes throughout the day depending on public transport, general traffic and commercial vehicle demand. It is easier to provide most loading zone capacity between the AM and PM peak periods. In peak periods, public transport movements take priority in kerbside lanes.

As **Figure 7** shows, loading zone demand decreases in the afternoon. After 3pm, the main freight and servicing activity in loading zones is typically couriers collecting consignments from businesses.

Figure 8 illustrates the provision of and demand for loading zone space in the Sydney CBD. It suggests there is still spare capacity in the early mornings prior to the AM peak, and in the early afternoons prior to the PM peak. In the middle of the day, however, the demand for loading zones exceeds operational capacity.

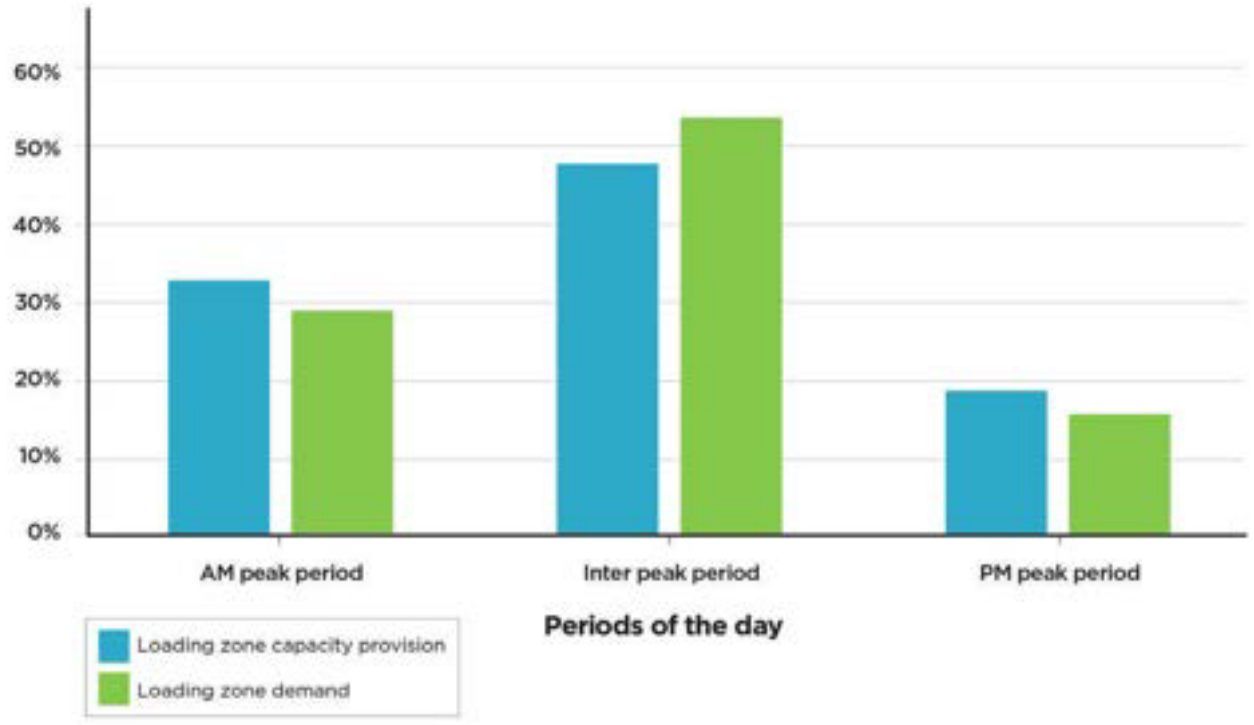


Figure 8 Weekday loading zone provision and demand by period of the day

CASE STUDY

A tale of two CBDs

Sydney and Parramatta CBDs are at different stages of evolution. Sydney is continuing its evolution as a global CBD, while Parramatta is transforming from a district centre into a major CBD. As a result, parking provision and freight and servicing behaviour is markedly different in each city.

Parramatta is already a significant city in metropolitan Sydney, supporting 257,000 residents and 185,000 jobs in 2020 (City of Parramatta [CoP] 2020). It is expected to grow considerably in the next 20 years as part of a three-city strategy for Greater Sydney, in which it is referred to as the Central River City. The population is expected to increase by 79.5 per cent between 2020 and 2041 (CoP 2020). The city will also grow as an employment centre. TfNSW expects its corresponding freight task to grow substantially each year, matching residential and jobs growth.

Figure 9 illustrates the differences in loading zone use in the two cities across the day. These graphs are based on assessments conducted by TfNSW in the Sydney and Parramatta CBDs in March 2016 and October 2017 respectively. The most noticeable difference is that private vehicles account for an average of 43 per cent of loading zone use in Parramatta, compared to an average of 26 per cent in Sydney.

However, what this graph does not show is that in Parramatta, only 49 per cent of commercial vehicles using on-street parking are completing their activities in signposted loading zones. The majority of commercial vehicles use other types of kerbside parking.

In the past, the Sydney CBD provided similar levels of on-street parking to Parramatta. Today, however, the Sydney CBD has virtually no general on-street parking, meaning most freight activity is conducted from loading zones.

In this and other assessments, it is important to remember that loading zones are not always the sole location of freight activity.

Deliveries in George Street, Parramatta

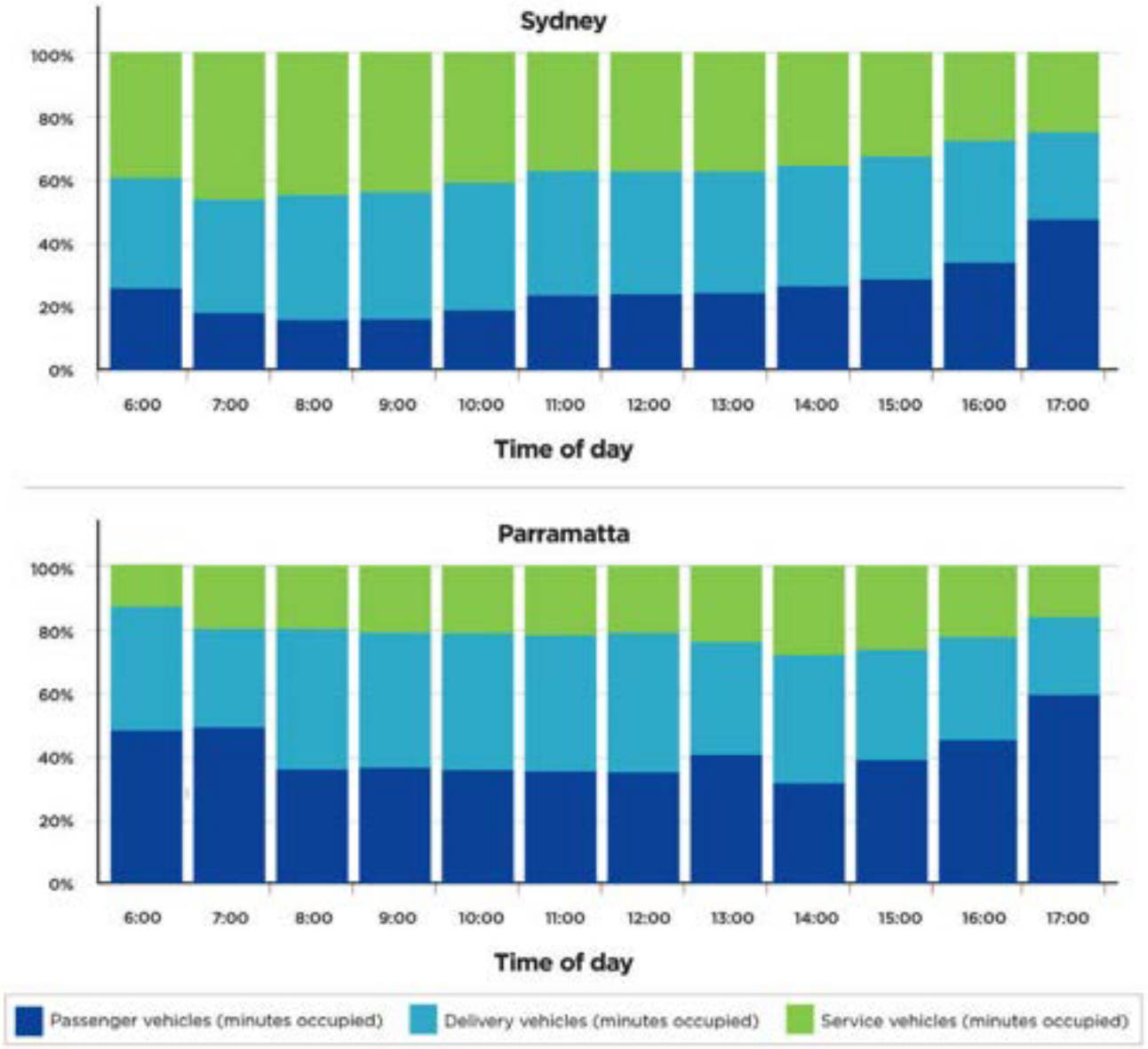


Figure 9 Comparison of loading zone use in Parramatta and Sydney CBDs

5.2.2 Methods to assess on-street activity

This section sets out a methodology for analysing on-street freight demand and kerbside activity. It is based on TfNSW's own work surveying Sydney streets for delivery and servicing activity. It aims to help planners and developers understand why this activity occurs as it does, measure its scale and plan for it appropriately.

This method involves collecting both quantitative and qualitative data. This combination enhances the evaluation of street activity by ensuring the limitations of certain types of data are balanced by the strengths of others.

The following sections list ways for planners, developers and other stakeholders to collect data about on-street freight and servicing activity.

5.2.2.1 Loading zone ticket or sensor data

In the Sydney CBD, many loading zones are managed using kerbside ticket machines. In these zones, drivers are required to display a ticket on their vehicle to park and make deliveries. These tickets contain the event date, time, meter number and street or area in which the parking activity occurs. With such infrastructure in place, the machines can be a consistent source of ongoing data. The data from these ticket machine transactions can provide insights into the geographical distribution of freight and servicing volume, as demonstrated in **Figure 10**. It can also help stakeholders build an hourly or even monthly profile of loading zones (if the dataset has sufficient historical data). This is useful for understanding the impacts of wide scale initiatives.

Although ticketing data is helpful for measuring actual vehicle volumes in loading zones, it does not directly identify types of vehicles, driver behaviours, or departure and dwell times. To get a complete picture, it is crucial to complement ticketing data with other forms of quantitative data, such as kerbside surveys. Solutions that capture vehicle registration and/or use in-ground sensors can provide more information.

Example of a ticket machine used to issue loading zone tickets in the Sydney CBD

Consider

Loading zones with high volumes of activity are likely to be frequented by service vehicles, which typically dwell for longer periods of time but obtain multiple tickets to reduce the risk of incurring an infringement notice.

As illustrated in **Figure 10**, a public tableau website provides a multi-year profile of loading zone use in the Sydney CBD based on ticketing data.

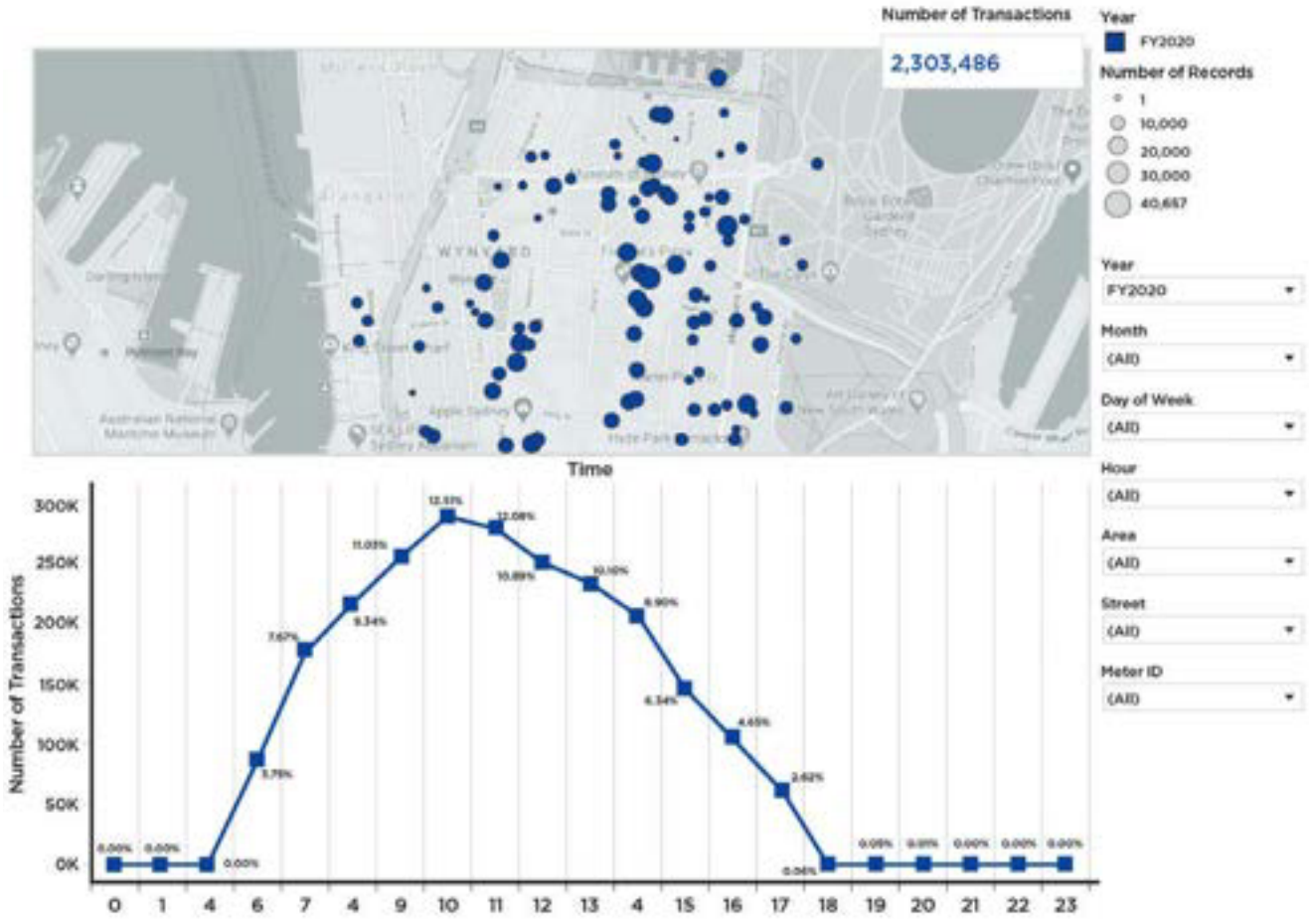


Figure 10 Geographic distribution of Sydney CBD loading zone demand from the TfNSW online tool

5.2.2.2 Kerbside video assessment

Video surveys can generate large amounts of data and provide researchers with valuable insights into kerbside behaviours in their study area. They can provide not only data on the number and type of movements, but also insights into driver behaviours and compliance levels.

Example of video footage captured over a three hour period as part of a kerbside survey conducted by TfNSW showing the driver of a ute parking for longer than the permitted time.

A video survey should ideally cover an entire study area, preferably for a full 24-hour, seven-day week – 168 hours in total. It should be conducted at a time of year with representative traffic flows, pedestrian footfall, and delivery and servicing conditions. Wherever possible, surveys should not be undertaken during public holidays, school holidays or other major events.

When defining the study area for the video survey, researchers should identify all potential parking locations – including private parking and rear accesses – to ensure they capture all kerbside activity. Other factors to consider include the nature of the land uses, such as any nearby events or construction projects, which may reduce the accuracy or reproducibility of the video survey results.

Camera location and resolution are particularly important to the success of video surveys. Camera angles should be reviewed before an assessment is commenced to ensure, as far as possible, that the entire kerb is visible and there are no obstacles obstructing the view. The best results are captured when a camera is pointing diagonally across a street. Reviewers should be able to clearly identify the type of vehicle on camera, the time of its arrival and departure, and the driver's activity – for instance, whether they are delivering parcels to an office or tools for a construction site.

The video survey should record the following information for all vehicles stopping at the kerbside in a study area:

- location
- date and time of arrival
- date and time of departure
- length of stay
- vehicle type
- trip purpose and/or movement type
- kerbside zone used
- where possible, some commentary on what delivery and servicing vehicle drivers were doing – for example, waste collection or material delivery.

Researchers should also ensure they comply with their obligations under the *NSW Privacy and Personal Information Protection Act 1998* in the design of the survey and collection of data.

An example of a camera used for data capture mounted on a light pole

5.2.2.3 Manual survey of freight vehicle parking

The purpose of a manual survey is twofold: to capture the number and type of movements; and to develop a broader understanding of the variables that affect kerbside delivery and servicing activity. A manual survey should be conducted across a large enough area to ensure data is representative. While it may not be possible to conduct a manual survey for 24 hours each day over seven consecutive days, at a minimum, surveys should focus on peak days and peak times (see the profile in **Figure 7** for guidance).

As with a video survey, for each movement a manual survey should capture:

- location
- date and time of arrival
- date and time of departure
- length of stay
- vehicle type
- trip purpose and/or movement type
  - kerbside zone used
  - where possible, some commentary on what delivery and servicing vehicle drivers were doing – for example, waste collection or material delivery.

The availability of nearby parking at a destination can influence the behaviour of drivers and should therefore be captured in the survey where possible. Researchers should also identify illegal behaviours such as overstaying.

5.2.2.4 Ethnographic research

Ethnographic research refers to any kind of research where researchers observe and/or interact with subjects in the subjects' real-life environments. The most useful form of ethnographic research to help understand the last mile freight and servicing task is a motion study or "ride along".

In a motion study, researchers shadow a courier driver for a day to capture quantitative data about their movements. To ensure that their presence does not affect the driver's ability to carry out their normal tasks or affect the results of the study in any other way, researchers can use geo-tracking devices (see **Figure 11**), audio-recording devices and dashboard cameras. The type of data that should be captured includes:

- stop number and type (loading zone, dock)
- location (nearest address or latitude and longitude)
- parcel information, including:
  - number of customers serviced at stop
  - number of B2C/B2B parcels
  - number of parcel pickups
  - number of failed deliveries
- time information, including:
  - arrival time
  - departure time
  - parking duration/dwell time
  - time spent driving in city
  - time spent driving to/from city
  - unproductive driving time, e.g. circling the block, looking for a space
- distance information, including:
  - driving distance
  - unproductive driving distance, e.g. circling the block, looking for a space
  - walking distance.

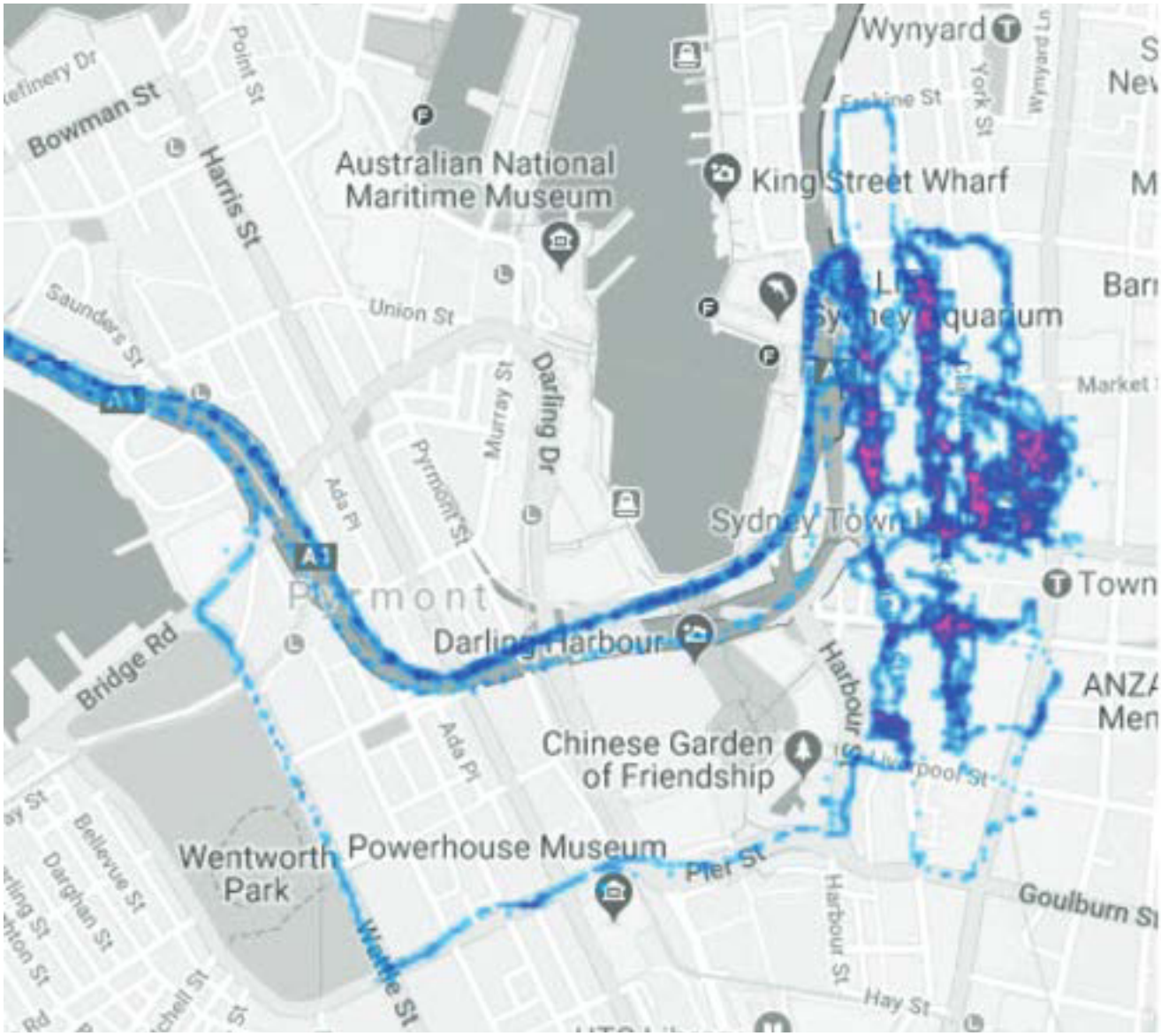


Figure 11 An example of delivery activity captured using a geo-tracking tool

5.2.2.5 Interviews and surveys for businesses

Before conducting face-to-face interviews and undertaking surveys, it is important to evaluate how qualitative feedback will capture attitudes, behaviours and perspectives in relation to kerbside assessment.

In designing questions, it is vital to convey the purpose of the interview or survey and ensure the questions clearly identify what is being asked. For example, some participants may not be familiar with delivery and servicing activity and kerbside behaviours. Relevant terms and concepts should be explained in order for participants to provide informed responses. This may include explaining the configuration of the kerbside in the immediate vicinity of the focus area so that participants think about that space and how it is used.

Interviewers should consider whether to conduct interviews and surveys with those who are generating freight (procuring goods and services) as well as the freight and servicing providers servicing the building.

For larger surveys and those focussing on behavioural insights and other more subjective measures, it is recommended that a professional research provider is engaged to ensure that the information gathered is consistent and robust.

5.2.3 Summary of assessment techniques

Table 5 provides a summary of the kerbside assessment techniques outlined in this section. Each technique can provide a different insight into the same activity. For example, location-specific kerbside analysis provides a perspective into how multiple operators arrive at and use the kerbside space. Motion studies and discussions with operators, on the other hand, provide alternative perspectives on how drivers complete their tasks. These latter perspectives, for instance, could show that a driver made several trips around the block before finding a park, or that the driver had to park some distance away from their delivery point. This data could not be captured just by assessing the kerbside.

Table 5 Summary of quantitative and qualitative kerbside assessment techniques

Method	Benefits	Limitations
Loading zone ticket/ sensor data	• Large volumes of data can be collected automatically • Historical and geographic data allows trend and mapping analysis • Inexpensive to obtain if infrastructure is already set up	• Will not provide dwell time • Will not identify vehicle type • Filtering and making sense of the raw data may take some initial effort • Data storage can be an issue
Manual survey of freight vehicle parking	Allows for first-hand observation of driver behaviours and patterns	Location-specific Can require significant levels of time and effort, depending on the duration and geographic spread of survey
Ethnographic research (e.g. motion study, ride-along)	• Allows for first-hand observation of driver's demands and tasks • Allows for the capture of highly granular data such as parcel types and driving distances	• Vehicle-specific • 'Observer effect' can impact results if it is not managed • May require significant time and effort
Interviews/surveys of business	• Inexpensive • Quick	High probability of response bias
Video assessment	• Can be a very accurate way to obtain qualitative and quantitative data (if set up properly)	• Location-specific • Expensive • Cleaning data and extracting meaningful insights are time-intensive tasks

CASE STUDY

Assessing behaviours of different loading zone user types

While arduous to process accurately, the data generated by one week of kerbside video surveillance can provide a wealth of helpful insights. Results from a 2018 video assessment of the Sydney CBD show:

- delivery vehicles dwelled for an average of 27 minutes, with 75 per cent of parking events being less than the 30 minute limit
- service vehicles dwelled for an average of 63 minutes, with more than 50 per cent of parking events taking more than 30 minutes. Approximately 15 per cent of parking events took more than two hours
- private vehicles, which can use loading zones for dropping off and picking up passengers, dwelled for an average of 15 minutes. Approximately 50 per cent of parking events took less than five minutes.

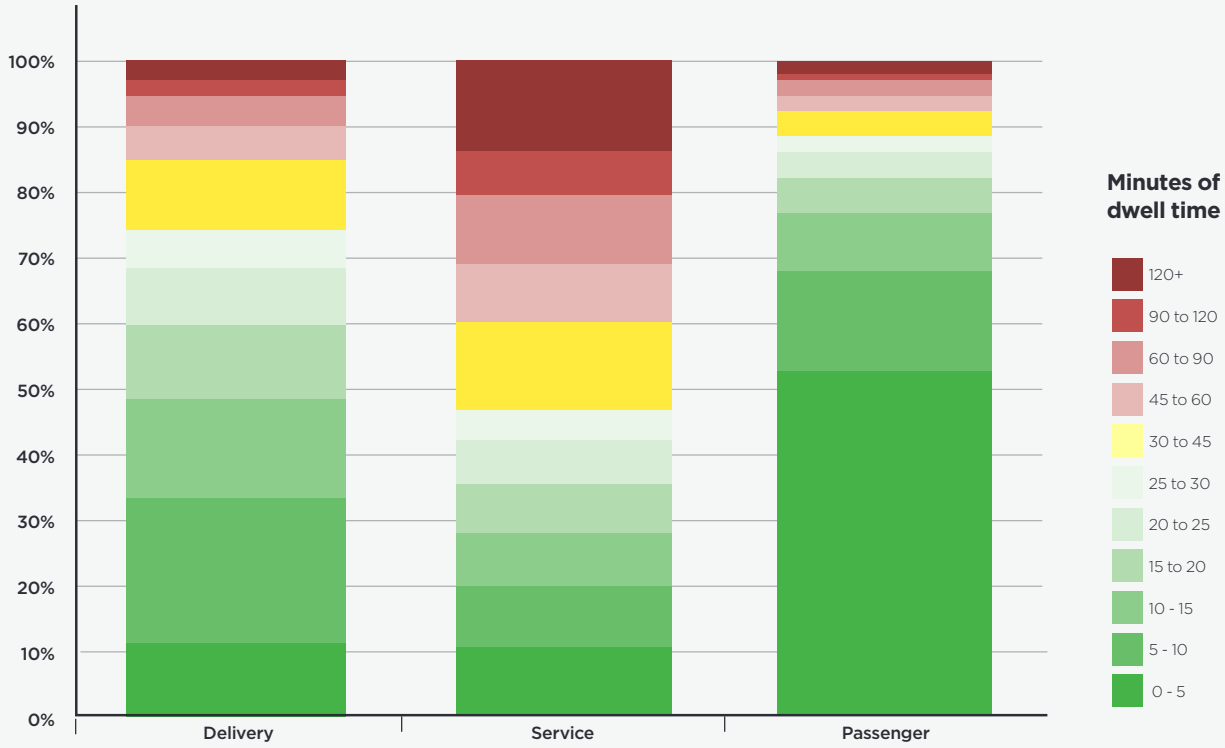


Figure 12 Dwell time results from 2018 TfNSW video assessment in the Sydney CBD

5.3 Measuring off-street activity

Evaluating the freight and servicing tasks of existing buildings can provide valuable insights to help planners and developers design new developments. This section profiles common loading dock characteristics and activities, and discusses ways stakeholders can compile and use data about these activities to improve planning.

The daily loading dock profile illustrated in **Figure 13** is typical of many commercial buildings in the CBD, and shows that loading docks and kerbside loading zones share a similar daily profile. In this graph, movements are grouped into three-hour periods with activity typically peaking in the morning in response to customer requirements. In most cases, the customer must be present to receive a delivery. Delivery times often vary, being influenced by traffic conditions as well as drivers' delivery schedules. However, it is reasonable to conclude that most deliveries to businesses in the city are completed between 6am and 12pm.

5.3.1 A typical day in the loading dock of a commercial building

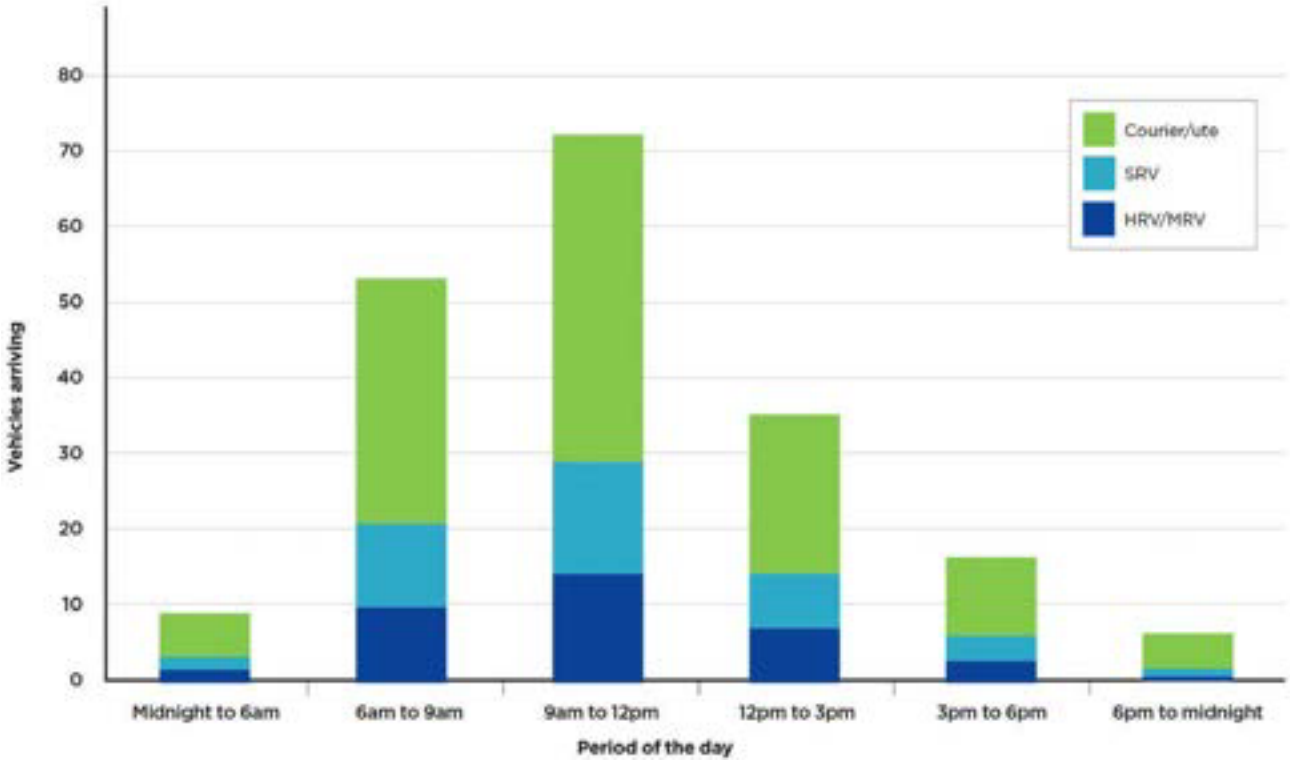


Figure 13 Profile of deliveries into a large CBD commercial development

Building daily profiles for loading docks

Table 6 profiles the daily movements to a typical commercial building. Analysis of the activity across different time periods indicates that there may be day-to-day flexibility in freight and servicing movements at commercial sites, and hence some potential to change activity within these periods.

Table 7 provides a more comprehensive guide to freight and servicing activity for different building types across the day.

Table 6 Profile of movements to a commercial building by time of day*

Time of day	12am–3am	3–6am	6–9am	9am–12pm	12–3pm	3–6pm	6pm–12am
Percentage of movements	**4%**	**14%**	**25%**	**34%**	**17%**	**8%**	**3%**

Table 7 Profile of movements by building type by time of day

Hour	Commercial building	Hotel	Residential %		Retail
			Deliveries	Trades and servicing	
0	2%	1%	1%	0%	0%
1	0%	1%	1%	0%	1%
2	0%	0%	1%	0%	0%
3	1%	1%	2%	0%	1%
4	1%	1%	2%	0%	1%
5	3%	2%	2%	4%	3%
6	7%	2%	2%	13%	7%
7	9%	4%	0%	15%	9%
8	9%	7%	7%	8%	9%
9	11%	6%	3%	11%	12%
10	12%	5%	6%	6%	13%
11	10%	4%	14%	9%	10%
12	8%	6%	5%	8%	8%
13	6%	5%	6%	6%	6%
14	5%	6%	8%	9%	5%
15	4%	8%	7%	4%	4%
16	3%	7%	5%	4%	3%
17	2%	7%	2%	2%	2%
18	2%	7%	1%	0%	2%
19	1%	5%	4%	2%	1%
20	0%	4%	9%	0%	1%
21	0%	4%	4%	0%	1%
22	0%	4%	3%	0%	0%
23	0%	0%	3%	0%	0%

***Based on TfNSW research in and around Sydney CBD 2016–2019.**

5.3.2 Loading dock assessment

By profiling multiple buildings in Sydney, TfNSW has developed a good understanding of how to assess different buildings' freight and servicing tasks. Together with TfNSW traffic generation rates, and traffic generation rates included in some Development Control Plans (DCPs), the assessment methods described in the following sections aim to give planners and developers a good indication of a building's likely freight and servicing profile.

The loading dock in any new building needs to be large enough to manage the freight and servicing task the building is likely to generate over its lifecycle. This includes variations in its level of occupancy over time, and the type and number of its tenants. Accordingly, when assessing a loading dock to build its freight and servicing profile, it is important to account for:

- potential land use types (commercial, retail, residential, hotel or mixed-use)
- total building size – the space used (or gross floor area) for each land use type
- the number of tenancies in a building – multiple tenants are likely to generate more demand than one tenant occupying the same floor space
- types of businesses in a building – a three-star hotel without a restaurant will generate less freight demand than a five-star hotel with multiple restaurants.

Table 8 sets out the key characteristics to consider when profiling a loading dock and its accessibility.

Table 8 Information to capture to develop an accurate loading dock profile

Reasons for on-street servicing	Explanation
Vehicle timing	Document the arrival time, total dwell time and departure time of freight and servicing vehicles coming to the building.
Vehicle frequency	Count vehicle arrivals to determine the frequency of activity, remembering that constraints on dock size can generate more deliveries by smaller vehicles than would be necessary if larger vehicles could be accommodated.
Vehicle type	Profile the vehicles used for different types of deliveries, including their length and height.
Vehicle purpose	While this is less straightforward to assess, an understanding of vehicles' purposes will assist planners. For example, one trade vehicle parked on a renovation site all day could take up the same amount of space as 20 or more delivery vehicles making short stops throughout the day.
Daily profiles	Account for minor day-to-day fluctuations in freight and servicing volume. Ideally, at least two days' worth of data should be captured to build a profile.

The following sections outline specific ways to collect data on loading dock activity. It should be noted that these methods primarily record the number of vehicles servicing a building. It is important to keep in mind that one vehicle, especially a courier vehicle, entering a large commercial tower could be making deliveries to a number of different tenants in the same building.

5.3.2.1 Driveway count

A video count of vehicles entering a driveway provides an accurate record of off-street activity and enables a 24 hour, multi-day count. Depending on the angle and resolution of the camera, it may also be possible to establish the dwell time of each vehicle, which gives an indication of dock utilisation.

There are a number of ambiguities that can arise when undertaking a video driveway count:

- it is not always clear whether a vehicle is a freight, servicing or private vehicle. Signage, dwell time and any visible equipment carried on a vehicle may give an indication of its purpose
- some commercial vehicles such as utes and vans may also be used as private vehicles. Arrival and departure time, as well as any equipment being carried, may give a clearer indication of the vehicle's purpose
- some private vehicles may also be used as freight and service vehicles. For example, a cleaner may use a car to travel to a customer's location. Dwell time may give an indication of the vehicle's purpose.

If a manual driveway count is undertaken, it should focus on the busiest period between 8am and 1pm, as the constraints that planners and developers need to consider will arise during this time.

In addition, it should not be assumed that because a building has a loading dock, all its freight and servicing activity is accommodated in the dock. In most cases, a portion of freight and servicing movements will still use on-street parking. As such, stakeholders should consider using the on-street assessment techniques set out in the previous section to supplement their off-street assessment.

5.3.2.2 Loading dock manager log

In some buildings, loading docks managers and attendants may log vehicle activity. However, where such logs exist, they may be handwritten or incomplete.

5.3.2.3 Loading dock booking records

Some large buildings have management systems that record booked and actual vehicle movements. These systems are designed for managing delivery activities, but they can also provide planners with details about what vehicle or company is making deliveries to which tenant. This information is particularly useful if it includes both booked and actual arrival times, as some companies may have block bookings that they do not always use.

5.3.2.4 Building tenants' surveys

In commercial buildings, tenants can be asked to keep a record of their deliveries. This approach works well with smaller businesses but is more challenging in buildings with multiple tenants or large corporations, where many people may be placing orders. A differentiating factor of this approach is that it can provide information on multiple orders arriving by the same delivery vehicle. A driveway count of vehicles does not identify this. Particularly with eCommerce orders, coincidental drops of multiple orders going to the same destination can be common. Where possible, courier companies plan for coincidental drops to improve efficiency.

Table 9 Summary of quantitative and qualitative loading dock assessment techniques

Method	Benefits	Limitations
Driveway count	• For off-street facilities, it provides a full record of arriving and departing vehicles and allows for assessment of dwell time and vehicle type. • When using video, it enables a 24-hour understanding of activity, although manual assessment across a 4–5-hour peak period can also provide a good understanding.	• The quantity of items and number of consignments will not be captured. • It needs a supporting, ideally concurrent, on-street assessment. • It may be difficult to distinguish the purpose of vehicles where they are unmarked. • Assessing individual dwell time is a time-consuming process. • Driveways shared between the carparks and docks can complicate assessments.
Loading dock manager log	• An accurate log will provide a record of activity.	• The quality of the records might be inconsistent.
Loading dock booking system record	• It may provide a ready and accurate record. • It is likely to record information about the purpose of the delivery. • If recorded, bookings and actual arrivals can be compared.	• It might only be available for a small number of large, busy docks, offering no insight into the profiles of smaller buildings.
Building residents' questionnaires	• It can provide insight into the type of freight and servicing movements as well as the number. • It can link delivery details with annualised procurement records and help planners and managers design operational improvements.	• It requires consistent record-keeping by people who are already busy servicing their customers. • It is better applied in a discrete building with a small number of interfaces than in a large commercial development.

5.3.3 Dock design standards

Australian Standard AS 2890.2 (Standards Australia 2018) sets out the design and engineering standards for loading docks, including height and bay size. While it is a good resource for planners and developers, the standard does not provide trip generation rates or guidance on the number of spaces to allocate in a new dock.

TfNSW's **Guide to Traffic Impact Assessments** includes figures for provision of loading docks based on assessed trip generation rates. Some councils also include trip generation rates within their DCPs. These rates are based on a reasonable number of vehicles likely to arrive in a given area and the space that should be provided for them. However, they offer no insight into the type of vehicle arriving, when it will arrive or for how long it will dwell.

5.3.4 Example: assessment of activity to support a loading dock design

The following approach describes a methodology for assessing loading dock activity. It is based on the assumption that the assessor has collated evidence from the sources described in **Sections 5.2** and **5.3**, and prorated this data to the size and profile of the building being planned.

Whether a driver uses a loading dock or kerbside parking to complete their freight or servicing task, planners need to record both activities as attributable to the building.

The steps below describe the process.

5.3.4.1 Dwell time demand

Table 10 shows a profile generated using data from the busiest hour of activity at a large CBD commercial development (**Figure 13**). In this example, the dock needs to accommodate approximately 23 vehicles every hour between 9am and 12pm. The profile also includes a supplementary estimate of on-street freight and servicing vehicle movements the building is likely to generate in the same period.

Table 10 Example of the loading dock profile at a large commercial building in the CBD

	Number of vehicles in the busiest hour	Average dwell time	Total demand
Small – item deliveries from vans or SRVs	11	15 minutes	165 minutes
Large – item deliveries from MRVs	9	30 minutes	270 minutes
Trade/ service providers	3	120 minutes	360 minutes*
Total	**23**		**795 minutes**

***This assessment only considers movements during the busiest hour. However, it is assumed that some other vehicles, which arrived before this period, may still be parked.**

The example profile demonstrates that:

- nine of the 23 vehicles are MRVs requiring larger parking spaces and adequate room to manoeuvre. Deliveries from these vehicles are typically larger and take an average of 30 minutes to complete
- 11 vehicles are delivery vans or SRVs. These require smaller parking spaces and swept paths, and have shorter dwell times of 15 minutes on average
- the other three vehicles are service vehicles. These have an average dwell time of two hours. However, this time can vary significantly: an emergency locksmith may be onsite for 30 minutes; a plumber may stay several hours; workers completing a fit-out may park all day, every day for several weeks. The assessment assumes that some vehicles are still there from the previous hour and their presence reduces dock capacity.

5.3.4.2 Number of dock spaces required

Table 10 indicates a total dwell time demand of 795 minutes for the hour-long period. If vehicles were to arrive at precise intervals and dwell for the estimated average time, the example loading dock would require 13–14 spaces to accommodate the 23 movements forecast for the busiest hour. The dock would also need to provide large parking spaces and enough manoeuvring room to accommodate bigger vehicles.

5.3.4.3 Operational efficiency during the busiest period

In reality, vehicles do not arrive at precise intervals or dwell for a uniform time. The 23 vehicles forecast to arrive during the busiest hour will arrive somewhat randomly and their dwell time will vary. This randomness and variation mean the maximum practical capacity of the loading dock is likely to be less than its theoretical capacity.

Generally, operational capacity is estimated to be 75 to 80 per cent of designed capacity. Thus, the example loading dock, while theoretically requiring 14 spaces to accommodate demand during the busiest hour, would in fact require 18 spaces to operate efficiently, including bays large enough to accommodate the bigger vehicles.

5.3.4.4 Implications of constrained space

In the building used as an example in **Figure 13** and in this section, the loading dock contains just 12 spaces. This means it will become congested during busiest periods, causing drivers to either queue or seek alternative parking, for instance in kerbside loading zones.

In the long term, this dock will develop a poor reputation, and freight and servicing vehicle drivers will be more likely to seek out on-street parking instead of using it. In more extreme circumstances, suppliers may be reluctant to deliver to the location at all, or negotiate special terms for a delivery to be made.

5.3.4.5 Evaluation of proposed dock

To avoid negative outcomes and provide adequate capacity, a proposal for a new loading dock should address the questions set out in **Table 11.**

Table 11 Loading dock assessment criteria

Proposed dock spaces: Number of HRV, MRV, SRV, and vans/utes spaces	For HRVs, MRVs and SRVs (larger vehicles)	For total vehicle movements
Is demand in the busiest hour likely to be manageable with these spaces?	Yes/No/Maybe Utilisation of space = %	Yes/No/Maybe Utilisation of space = %
Is peak period demand (9am to 12pm) likely to be manageable with these spaces?	Yes/No/Maybe Utilisation of space = %	Yes/No/Maybe Utilisation of space = %
Is total daily demand (12 hours per day) likely to be manageable?	Yes/No/Maybe Utilisation of space = %	Yes/No/Maybe Utilisation of space = %

5.3.4.6 Example dock evaluations

Table 12 and **Table 13** show worked examples of how a planner or developer might respond to these questions. In the example in **Table 12,** the dock has two HRV/MRV spaces, two SRV spaces and seven spaces for smaller vehicles. In the example in **Table 13**, the dock has one MRV space, two SRV spaces and six spaces for smaller vehicles.

In the tables:

- green indicates utilisation is less than 75 per cent and the dock can function effectively
- amber indicates utilisation is between 75–100 per cent and additional management strategies are needed to enable the dock to function efficiently
- red indicates utilisation is over 100 per cent and the dock cannot meet demand, even with additional management strategies in place.

In the **Table 12** example, high utilisation in the busiest hour overall and the peak period for MRVs and SRVs could limit deliveries and result in vehicles queueing. While the dock may be able to accommodate short-term spikes in demand, longer periods in which demand exceeds capacity are far more challenging. The example in **Table 12** is deemed 'acceptable' on the basis that additional management strategies can be implemented to manage the dock during peak demand periods. These mitigation measures are detailed in **Section 6**.

The example in **Table 13** is deemed unacceptable. This facility does not have the capacity to accommodate the MRV and SRV movements the building generates. It is likely that drivers will either be forced to queue or find on-street parking to make deliveries to the building.

Table 12 Example of operationally acceptable results for dock planning by vehicle types

Proposed dock spaces: 2 HRVs/MRVs, 2 SRVs, 7 vans/utes	For HRVs, MRVs and SRVs	For total vehicle movements
Is peak hour demand likely to be manageable?	(Potentially) Utilisation of space = 95%	(Potentially) Utilisation of space = 80%
Is peak period demand (9am to 12pm) likely to be manageable?	(Potentially) Utilisation of space = 80%	(Yes) Utilisation of space = 75%
Is total daily demand (12 hours per day) likely to be manageable?	(Yes) Utilisation of space = 55%	(Yes) Utilisation of space = 50%

Table 13 Example of operationally unacceptable results for dock planning by vehicle types

Proposed dock spaces 1 MRV, 2 SRV, 6 vans/utes	For HRVs, MRVs and SRVs	For total vehicle movements
Is peak hour demand likely to be manageable?	(No) Utilisation of space = 120%	(Potentially) Utilisation of space = 100%
Is peak period demand (9am to 12pm) likely to be manageable?	(Potentially) Utilisation of space = 95%	(Potentially) Utilisation of space = 90%
Is total daily demand (12 hours per day) likely to be manageable?	(Yes) Utilisation of space = 70%	(Yes) Utilisation of space = 65%

5.3.4.7 Mitigation measures

Mitigation measures can be employed where it is not practical or feasible to build more dock space to meet the demand from freight and servicing vehicles. **Sections 6** and **8** of this document outline some of these measures. It is important to note that such measures, while saving in the capital outlay involved in expanding or building new docks, do increase operational costs.

5.3.4.8 Profiling demand by usage type

As well as building the assessments shown above, planners can create profiles by plotting the demands of each type of user in a building's loading dock. Where **Figure 13** focuses on vehicle types, **Figure 14** shows the profile of a loading dock by user type. The dock in this example requires eight spaces to operate effectively during the peak period (8am–11am). Profiling a loading dock's activities by its user types can help planners and developers understand how much space each user needs, where there are constraints and potential mitigation measures. It also highlights the impact that longer dwell times can have on dock capacity and management of available spaces.

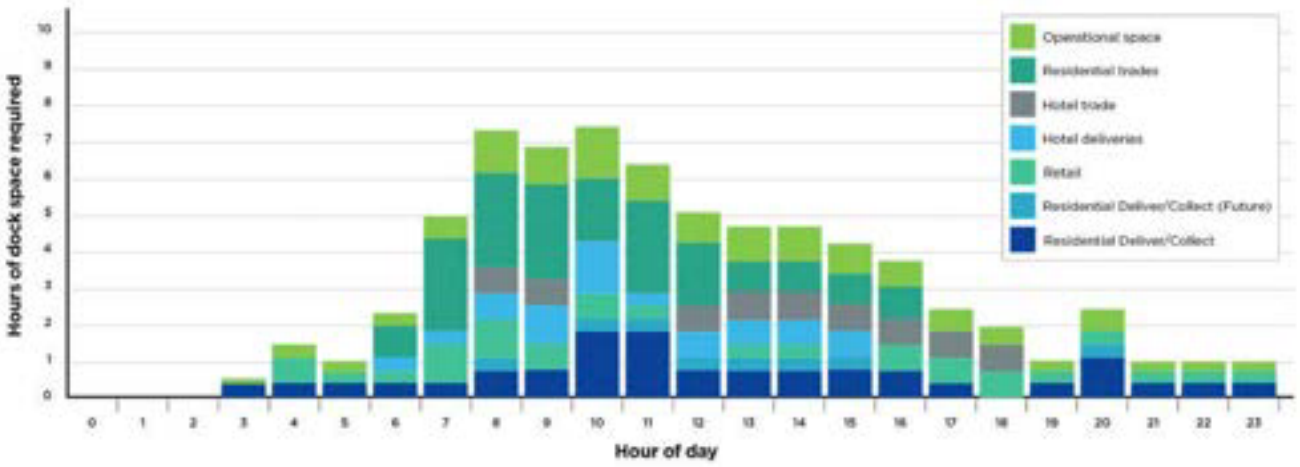
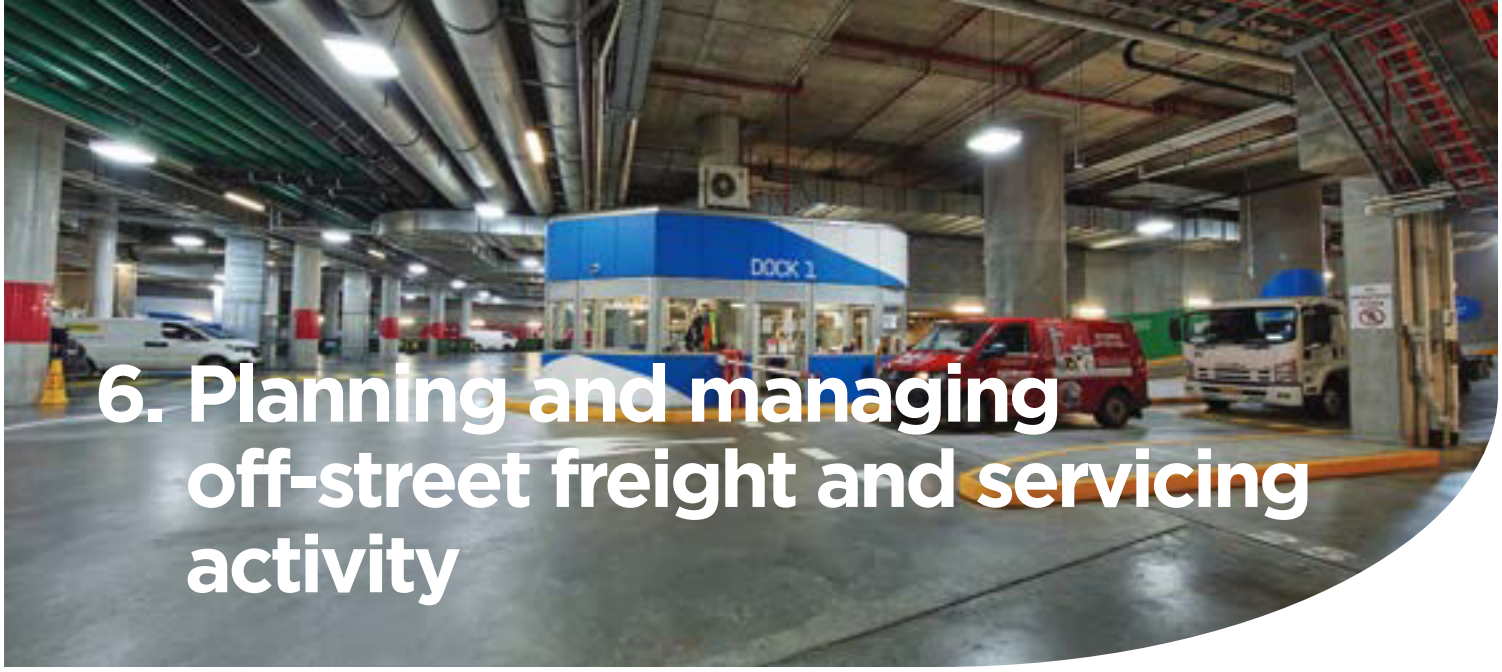


Figure 14 Profile of loading dock activity by user type in a mixed use development



6. Planning and managing off-street freight and servicing activity

This section provides planners, developers, building managers and other stakeholders with the tools they need to effectively manage off-street freight and logistics activity. The approaches outlined here can apply both to existing and planned loading docks.

6.1 What is the challenge?

Urban planning authorities typically require new developments to provide adequate loading dock space to accommodate the freight and servicing tasks they will generate. These requirements for self-sufficiency are generally set out in DCPs for urban centres.

Consider

The kerbside is part of a road and a public road space. It cannot be reserved or guaranteed for one particular use or user. Today's loading zones may be designated differently next year – they may be required as traffic lanes, for public transport or a number of other uses other than parking or loading.

Self-sufficient developments are buildings or precincts capable of accommodating the freight and servicing tasks they generate without needing to use kerbside parking. By building self-sufficiency into a building's or precinct's design, developers can minimise their impact on the surrounding environment, leading to better place and amenity outcomes.

Architects and developers design most buildings to have a lifespan of 50 years or more. Their designs assume that the facilities a building has when it is completed will be sufficient to service it over future decades. If facilities are insufficient when a building is first completed, the problem is only likely to intensify in future years. For these reasons, architects and developers need to provide facilities that will be suitable for the lifetime of a development, not just for when it is completed.

When developers do not build self-sufficiency into their proposals, their developments will likely cause congestion in surrounding areas, as freight and servicing vehicles will need to rely on and compete for kerbside loading zones. It is not sustainable, however, for new developments to rely on kerbside parking: this approach is likely to compromise placemaking objectives, and road authorities cannot guarantee the availability of kerb space for servicing a building.

Development Control Plans, Development Approvals and Traffic Impact Assessments that support them typically provide sound trip generation data for car and pedestrian movements, and account for parking needs and bicycle use. It is important that developers and approving authorities account for the non-discretionary freight and servicing task when designing new developments.

Consider

Poor loading dock design can force freight and servicing vehicles to rely on kerbside parking adding to congestion and detracting from the amenity of an area. A key objective of the Toolkit is to assist planning authorities, developers and consultants to plan off-street freight facilities and deliver better place outcomes.

6.2 Developing off-street loading docks

Local councils can pave the way for a more efficient transport task and improved place outcomes by setting out comprehensive loading dock requirements for new developments in DCPs. Developers can ensure the amenity of a building or precinct by meeting these requirements.

Although most large buildings will operate for 50 years or more, the cities, landscapes, equipment, work methods and access agreements surrounding them can change over much shorter periods.

Figure 15 compares delivery access and traffic in the Sydney CBD in 1965 and 2020. As might be expected, the city has made significant advances in traffic solutions since 1965.

Figure 15 Screenshot from a Department of Main Roads video showing a delivery vehicle reversing into the dock of the Anthony Horden & Sons department store in Sydney in 1965 (DMR 1965); a delivery vehicle accessing a loading dock in George Street, Sydney in 2020

CASE STUDY

"Suicide of a city: story of Sydney's traffic" (Department of Main Roads film)

In 1965, the then Department of Main Roads released a film exploring some of the causes of traffic congestion facing the CBD at the time. Many of the freight and servicing challenges identified in the film still exist today:

"The main cause of this congestion appears to be the number of commercial vehicles using the streets ... These commercial vehicles are using not only loading zones but are double-parked at various places. These vehicles cannot be classed as through traffic as they are delivering or collecting goods in the heart of the city ... Again, how many of the buildings in the city have provided proper loading facilities? That is, docks that allow trucks to drive in, turn around inside the building and drive out."

(DMR 1965)

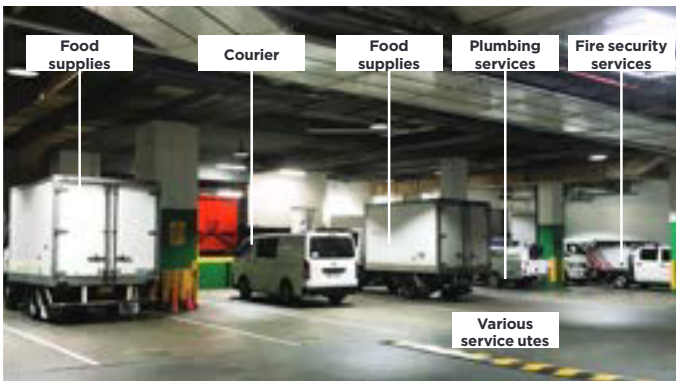
6.3 Freight profiles for different land uses

Every building generates its own freight and servicing task. A variety of commercial vehicle types are used to fulfil these tasks throughout the day, forming distinct patterns of activity. The first step to planning a better loading dock is to understand these patterns – the typical number and type of daily movements to and from a given building or precinct.

6.3.1 Profile of a typical commercial building in the Sydney CBD

Today, a large commercial building measuring 50,000m^2 and containing multiple tenants is likely to generate 130–180 commercial vehicle movements a day. Its typical freight and servicing activity will include:

- postal deliveries
- courier deliveries and collections
- stationery deliveries
- equipment deliveries and collections
- routine and emergency maintenance services
- office fit-out services
- food and beverage deliveries
- deliveries to co-located retail spaces
- eCommerce deliveries
- flower deliveries
- different types of waste collection
- removalist services.



The World Square loading dock in the Sydney CBD at 11:30am on a weekday morning

6.3.2 Profile of a typical high-density residential building in inner Sydney

With the growth of eCommerce, more people moving to the inner city and fewer residents owning cars, the freight task generated by urban residential developments is likely to continue growing. This task includes:

- grocery deliveries
- courier deliveries
- food deliveries
- maintenance activity
- renovation services
- bulky item deliveries and removals (for example, furniture and white goods)
- removalist services
- different types of waste collection
- commercial deliveries where ground floor retail is included.

Planners of residential developments face a particular challenge: unlike tenants in commercial buildings, the decisions residential tenants make about the deliveries and services they need are uncoordinated and often unpredictable. For example, a 400-unit development is likely to see at least 400 individuals making separate decisions every day about what will be delivered to the building.

6.3.3 Profile of a typical large hotel

Deliveries to large hotels are likely to be consolidated and coordinated. Typically, activity will include:

- linen collections and deliveries
- food and drink deliveries
- courier activity
- routine and emergency maintenance services
- different types of waste collection.

6.3.4 Mixed-use developments

The freight and servicing profile of a mixed-use development that includes commercial, residential and hotel tenants will involve elements of all three profiles.

While the transport task will peak at different times of a day in a mixed-use development, some overlaps and conflicts will occur.

6.4 Logistics solutions to loading dock constraints

Ideally, planners and developers will design self-sufficient buildings and precincts capable of accommodating their own freight and servicing tasks. An optimum loading dock design will allow access for HRVs, which in an urban centre such as the CBD, allows for the most efficient transport movements.

As smaller vehicles carry fewer goods, docks that can only receive smaller vehicles may end up generating more trips into the CBD for the same number of deliveries. The **TfNSW Guide to Traffic Impact Assessment** recommends that at least 50 per cent, and in some cases 100 per cent, of spaces in a dock should be able to accommodate larger trucks. Such a provision would ensure more efficient delivery of goods. A larger, better configured dock allows transport operators to use the most efficient vehicles at their disposal.

However, there are many of examples of docks that do not have sufficient capacity or that can only accommodate smaller vehicles. Expanding or reconfiguring these existing loading docks is not always feasible, as it is typically a high-cost solution. Where they are unable to be expanded, these constrained docks can force freight and servicing operators to rely on kerbside loading zones, the provision of which is not guaranteed. Reliance on an unpredictable shared kerbside resource can lead to poor service and delivery reliability and create hidden costs for customers. In the worst case, it could lower a building's rent, drive away tenants, or necessitate disruptive upgrades to improve access.

This section outlines various solutions building managers can use in this case, to help mitigate the impacts of constrained loading docks without relying on kerbside loading zones.

The solutions outlined in the following **Section 6.5** fall into four categories: Retime, Remode, Reroute, Reduce (the 4Rs). Further description is provided in **Figure 16**.

Retime	Shift freight and servicing activities outside peak times to create opportunities for greater efficiency.
Remode	Use modes of transport that are more efficient than trucks for CBD movements, where feasible.
Reroute	Avoid using the CBD for through traffic, where feasible. Be aware of alternatives that can improve efficiency.
Reduce	Consolidate deliveries, improve vehicle utilisation, reduce trip numbers, procure sustainably and develop buildings' delivery and servicing plans.

Figure 16 Finding solutions: the 4Rs approach to last mile freight management

6.5 Logistics management strategies

Where sufficient dock space cannot be provided, building managers may need to design and implement management strategies to accommodate their freight and servicing task. This section identifies some of these solutions, but it is not an exhaustive list.

Deliveries such as milk are often made outside of business opening hours

	Impact							
	Relative cost to implement	Low			Medium			High
Extended hours of operations	$							
Scheduling/booking systems	$$							
Smart locker system	$$							
Loading dock receiving personnel	$$$							
Preferred logistics partner/sublet space	$							
Freight consolidation – building	$$							
Freight consolidation – multiple buildings	$$$							
Group procurement	$$							
Revised loading dock design	$$$$							
Building partnership	$$							
Precinct approach	$$$							

Figure 17 Freight and servicing management strategies to improve loading dock capacity

6.5.1 Providing alternative loading dock space

Alternative parking spaces such as off-site car parks are one option to accommodate vehicles with long dwell times. Alternatives to standard loading dock spaces can be utilised to park smaller vehicles where:

- the height of the vehicle allows it
- the items being delivered into the building are easy to handle and transport
- there is a dedicated courier bay to facilitate quick deliveries or parcel handover to a concierge.

These alternative spaces may also require the cooperation of property owners and building managers, which can be complicated to secure. In addition, it is not always feasible for larger vehicles with bulky deliveries to use alternative spaces which may be located far from the destination building's loading dock. Where alternative parking spaces are used, it is typically only a short-term solution.

6.5.2 Shared dock space

Building managers can make agreements within a local area for sharing parking facilities. Ultimately, with this approach less parking is required and the local environment is improved as a result.

Schemes such as this depend on some buildings with surplus capacity being willing to share. Some shared dock schemes have emerged in Sydney where there is at least some partial common ownership across buildings in the same vicinity.

CASE STUDY **Ginza scheme, Tokyo**

The Ginza dock-sharing scheme was developed to combat drivers' use of illegal on-street parking for loading and unloading. Owners of buildings that are part of the scheme support it by contributing to a fund for improving local transport provisions. The scheme also provides additional capacity for multi-tenanted buildings.

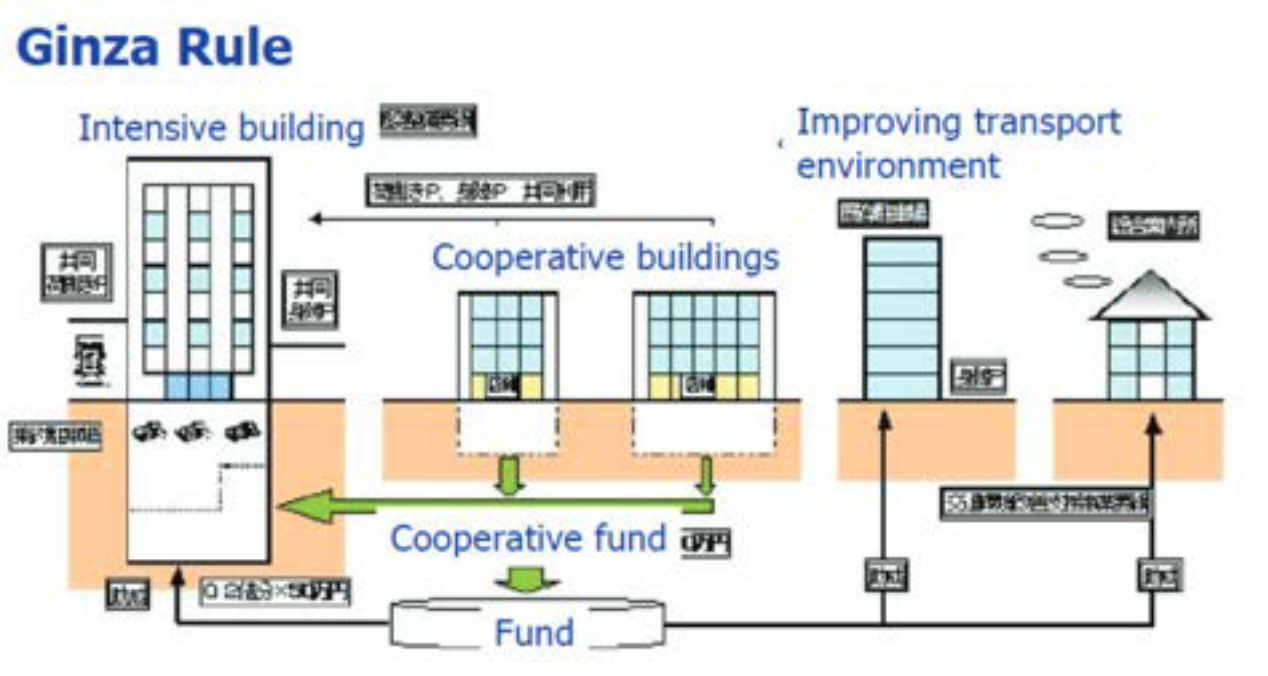


Figure 18 A shared parking scheme in Ginza, Tokyo (Matsumoto 2009)

Docks shared between several buildings are most commonly found in precinct developments, usually where a development is owned by one corporation or conglomerate. Other shared docks would need to rely on a body corporate (and potentially a local authority) to take a leading role in negotiations between two or more buildings.

6.5.3 Extended operating hours

For the most part, managed loading docks around the Sydney CBD have restricted operating hours. However, managed loading docks with 24-hour access give suppliers an opportunity to avoid congestion and inefficiency by moving their delivery and servicing movements to out of peak periods. Building managers can also schedule non-critical building services and fit-out works to occur outside business hours, reassigning the longest dwelling vehicles to non-peak periods.

By retiming deliveries and service movements into underutilised periods, the demand placed on loading dock facilities and surrounding networks during business hours is alleviated.

Facilitating access and allowing suppliers to make overnight deliveries can reduce daytime dock demand and ease broader traffic and congestion on the network. While businesses will generally need to pay their employees a higher rate of pay for working a night-time shift to make deliveries, this cost is likely to be offset by shorter delivery completion times.

Not all deliveries can occur out of hours, however. Even in a 24-hour loading dock, activity is still likely to peak in the morning.

CASE STUDY

Shred-it – overnight servicing activity

Freight operations in the CBD during peak daytime hours can be especially challenging and inefficient for operators of large vehicles, who cannot always easily access loading dock spaces and must sometimes rely on kerbside loading zones instead. The task is particularly difficult if the vehicle is delivering or collecting bulky items that are cumbersome to move over long distances.

TfNSW's former 12 Castlereagh Street office (now demolished) faced this problem when the secure document disposal service, Shred-It, was collecting wastepaper bins – each bin could weigh upwards of 100kg. To assist Shred-it's operations, TfNSW provided its staff with overnight access. This allowed Shred-it's drivers to reduce the time they spent looking for a loading zone and accessing the building's lifts, boosting their overall productivity (TfNSW 2016).

6.5.4 Scheduling and booking

Several loading docks around the Sydney CBD now require all suppliers and receivers to book their deliveries using the dock's booking system. These systems enable dock managers to schedule deliveries based on the space available, and to avoid the congestion and inefficiency that arises when peak demand exceeds dock capacity.

A booking system also lets building managers designate particular periods when they would prefer not to receive any deliveries, or to restrict deliveries to off-peak hours.

A number of market providers are offering advanced scheduling software for loading docks. These systems allocate unique barcodes or pin numbers to each appointment, which drivers validate at security gates to gain access to the loading dock.

Scheduled deliveries to retailers at Macquarie Centre

CASE STUDY

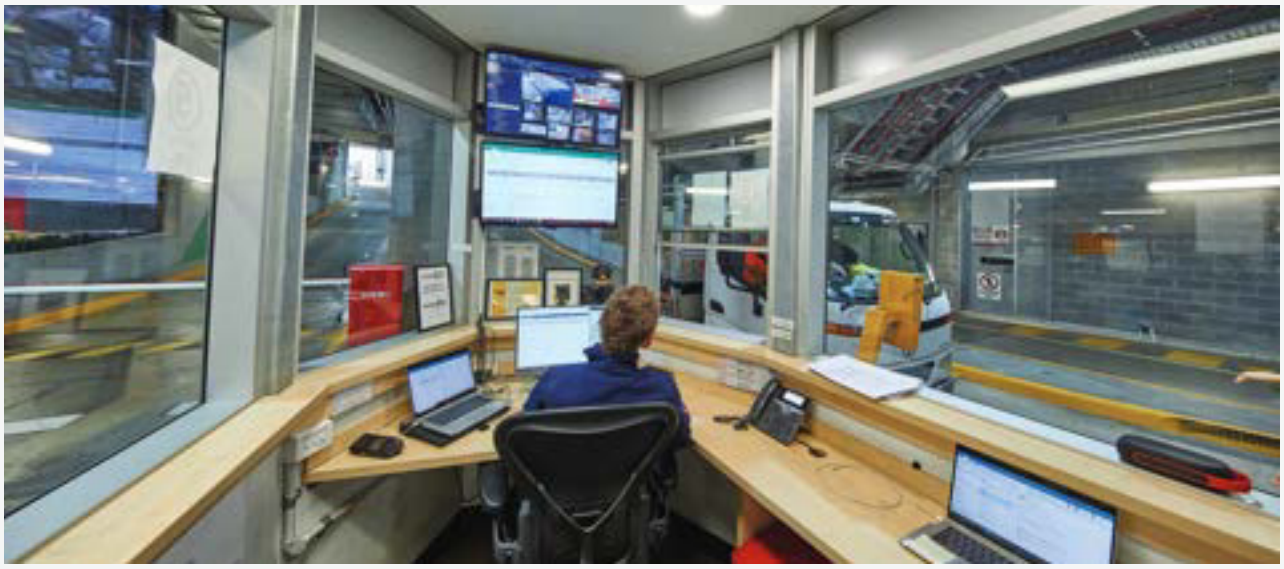
Loading Dock booking systems

Westfield Sydney was an early adopter of a loading dock booking system. Before the system's 2010 implementation, the congested dock caused delivery and servicing delays as well as safety risks. These problems would spill over into King Street, worsening traffic congestion in the surrounding area.

Following the implementation:

- average vehicle dwell time dropped from 44 to 25 minutes
- congestion in the dock has been eliminated and King Street congestion has eased
- demand is no longer concentrated in peak periods but distributed more evenly across the day.

(Sanders 2018, p.23)



6.5.5 Loading dock personnel

Managed logistics approaches can make loading docks more efficient, reduce the dwell time of delivery vehicles and unlock additional capacity during peak periods.

One option is to employ additional loading dock staff or provide a freight concierge service to receive deliveries for all tenants. These personnel can either store goods for collection by tenants or deliver goods directly to the tenants throughout the building.

This approach substantially reduces dwell time for delivery vehicles and improves peak hour throughput. Reducing a loading dock's average dwell time from 20 minutes to 15 minutes equates to a 33 per cent increase in capacity. However, this also requires space to be allocated for storage so that deliveries can be received and managed reliably and securely. In addition, building staff need to take responsibility for deliveries until they reach the customer.

This approach is often used in securely managed buildings where delivery drivers are not permitted access beyond the dock. It represents a high standard of service and logistics management for building tenants, sometimes referred to as a 'white glove' service.

6.5.6 Smart locker system

With a smart locker system, drivers can deposit multiple deliveries into dedicated onsite lockers, public off-site lockers or other secure spaces. Customers are then informed of their delivery and provided with the instructions they need to collect it, which they can generally do at any time that is convenient for them. Today, this approach is most commonly targeted at eCommerce consumers. It is significantly less common for deliveries to businesses, although businesses can provide keys to at least part of their building when they have a trusted relationship with a logistics provider or supplier.

Lockers can improve vehicle turnaround within loading docks as multiple deliveries can be made to a single locker bank rather than to multiple customers. Lockers can also enable secure out of hours deliveries by removing the need for a customer to be present to receive the goods, which is one of the key barriers to overnight servicing.

6.5.7 Building and office policies on personal deliveries

Some commercial buildings ban workers from receiving personal eCommerce deliveries. This measure is typically adopted due to concerns about the reception desk becoming an overloaded storage point for peoples' personal deliveries rather than loading dock constraints.

Banning individuals from receiving personal eCommerce deliveries at their office altogether may not alleviate pressure on the dock, as couriers making these deliveries may well have other items to deliver to that building anyway.

6.5.8 Appointing preferred logistics partners

One approach to improving loading dock efficiency is to appoint a specialist third-party logistics provider (3PL) to manage deliveries into the building. 3PLs can employ a wide range of measures to make the dock function more efficiently, depending on the size of the dock and the nature of the freight and servicing task at the building. They might, for example, consolidate all deliveries to the building in a logistics facility outside of the CBD. From there, the consolidated deliveries can be moved more efficiently using one vehicle (instead of many) to the loading dock, reducing overall vehicle movements and reducing pressure on the dock.

Whichever solution a 3PL adopts, their expertise could help a building manager to reduce traffic, reduce dwell time and increase throughput in the dock.

6.5.9 Group or coordinated procurement

Building managers can limit the number of deliveries to their docks by limiting the number of suppliers tenants use or coordinating delivery times.

A number of building managers, organisations and neighbourhoods are exploring group procurement solutions to reduce vehicle movements to their docks. Coordination can occur between tenants in individual buildings, or between tenants in several buildings in a precinct who share the same owner.

Group procurement reduces the likelihood of different suppliers – and different vehicles – providing the same product or service to neighbouring tenants. Coordinating procurement can significantly reduce the number of movements to loading docks. Well-coordinated approaches can also reduce costs through participants' bulk purchasing power and efficiencies for the supplier.

For waste in particular, it is common to incorporate a coordinated procurement solution into the early design of a building's loading dock operations. **Section 8.3** highlights examples of precinct approaches that have resulted in less vehicle movements and savings for participating businesses.

CASE STUDY

A tale of two buildings

Two 12-storey buildings accommodated multiple teams within the same organisation. In building A, the various teams cooperate to order stationery on the same weekday. In building B, seven teams order individually.

In both buildings, the personnel managing the stationery order kept the virtual shopping basket open for several days before submitting it. The items being bought could therefore not be considered as urgent. However, the terms of procurement stipulated that the orders be fulfilled the next working day after they were submitted.

In building A, one stationery delivery was made per week. In building B, three were made each week.

CASE STUDY

London Boroughs Consolidation Centre scheme

In 2012, the London Boroughs of Camden, Enfield and Waltham Forest agreed to trial a new method of managing and coordinating deliveries to council addresses using a consolidation facility. The trial commenced in 2014 for a period of nine months using a facility in North London, the London Boroughs Consolidation Centre (LBCC).

By the 2015, the scheme had been expanded to include additional partners. The LBCC was being used by over 80 suppliers, and was generating significant benefits including:

- 46 per cent reduction in vehicle trips to council sites
- 45 per cent reduction in vehicle kilometres travelled
- 41 per cent reduction in CO^2 emissions from the freight task of participating councils.

Although the project initially received public sector funding, it has generated procurement savings from reduced supply distances and fewer suppliers (Transport for London [TfL] 2015).

6.5.10 Freight consolidation

By consolidating deliveries, freight operators can reduce the number of vehicle movements to a given building. This can reduce peak demand and the congestion it generates. This strategy can be especially effective where loading docks can accommodate larger vehicles. It is also used where loading dock capacity at a destination is constrained. Deliveries to most supermarkets, for instance, work in this manner. It is not always possible, however, to build docks that can accommodate larger vehicles. Where this is the case, it is necessary to provide enough space and have processes in place that support the higher number of smaller vehicles needed to deliver the same volume of freight.

Consolidated delivery is a more attractive option when multiple businesses share the same supplier. Multiple trips by the same carrier can also be detrimental to loading dock efficiency. Encouraging consolidation is a method of reducing vehicle movements to individual loading docks, but it requires docks with enough space and access to accommodate large vehicles.

6.5.11 Consolidation centre models

6.5.11.1 Individual building consolidation

A building manager may commission a 3PL to direct all deliveries bound for their building to a consolidation facility outside the city centre. Moving dock space to a freight facility outside the CBD is cheaper than developing dock space within the CBD. However, lower capital development costs at the final CBD destination are replaced by higher ongoing operational costs.

Ideally, the consolidation centre should not be too far from the final destination – a shorter distance improves delivery options and reliability.

6.5.11.2 Multiple building consolidation services

A multi-building consolidation approach can improve efficiencies, reduce the number of deliveries to a given development, and allow for non-urgent activity to be conducted outside peak hours. Consolidating deliveries will also reduce vehicle traffic and congestion across the entire CBD network.

CASE STUDY

Freight consolidation in Soramachi, Tokyo

The Skytree precinct in Tokyo is home to 230,000m² of mixed-use commercial, educational, entertainment and retail space. To make the precinct's freight and servicing task more efficient, logistics specialists provide consolidation services to the precinct. With 800 consignments every day destined for the location, 420 are delivered directly while 380 are sent to consolidation centres, where they are organised into just five vehicles (Taniguchi & Quershii 2014).

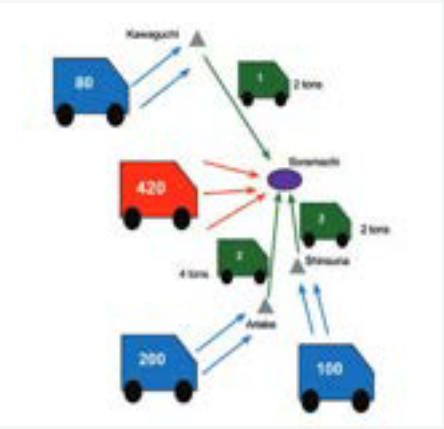
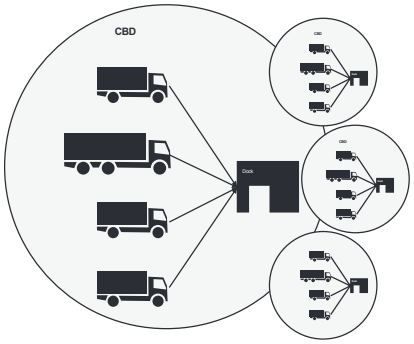


Table 14 Comparison of different approaches to completing deliveries in urban centres

Facility type

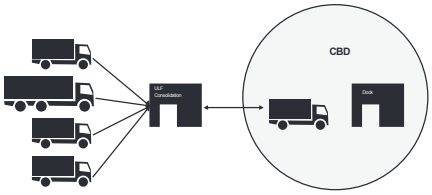
Standard approach

Loading docks typically service individual buildings in the CBD. All deliveries for customers in the building would be required to come to this destination and utilise the dock. From a space and access perspective, developing one loading dock for every building to meet its freight and servicing requirements can be costly and difficult.

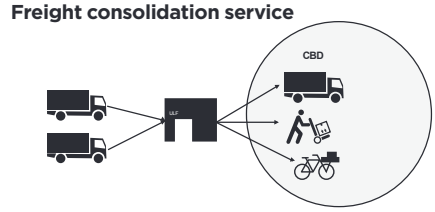


Consolidation/urban logistics facility

Directing deliveries to a consolidation centre on the fringes of the CBD may be a cheaper option for city-based businesses than operating a full-sized loading dock onsite. Several CBD buildings can cooperate to use a consolidation facility as their loading dock. Depending on distance, logistics personnel can use alternative transport modes such as bikes to deliver goods to their final CBD destinations. This can help to reduce congestion and therefore emissions in loading docks and on CBD roads.



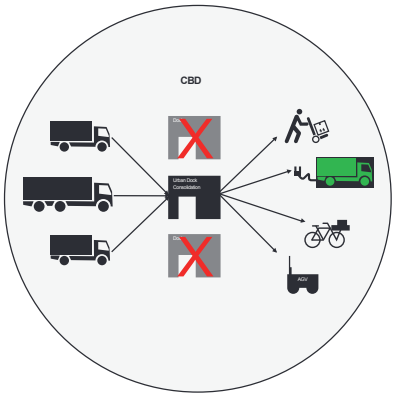
Freight consolidation service



Urban logistics facility (using consolidation)

Precinct facilities

A precinct loading dock reduces overall vehicle movements by consolidating movements into a single dock. All vehicles enter the single dock to deliver or provide a service to customers in the precinct, including using alternative transport modes such as bikes or trolleys.



6.6 Enabling alternative urban logistics facilities

Section 6.5 focused on logistics solutions available to building managers in urban centres. Local authorities also have an important role to play in enabling these logistics facilities and networks to develop.

Today, logistics facilities typically operate in industrial zones on the fringes of cities. In metropolitan areas around the world, inner-city areas that formerly housed these facilities are being rezoned, often for high-density residential use. Ironically, the demands of inner-city residents increase the local logistics task and generate more freight vehicle movements to the area.

Consider

Local Environmental Plans, prepared by councils and other local planning authorities, do not always permit the development of freight facilities in urban commercial and residential areas. Deliveries to these areas, however are the most expensive part of supply chain – the last mile. These urban commercial and residential areas also generate the most demand, being where many customers work and live. Enabling the development of appropriate freight facilities in these areas can reduce congestion, improve local amenity, and free up kerbside space for other uses.

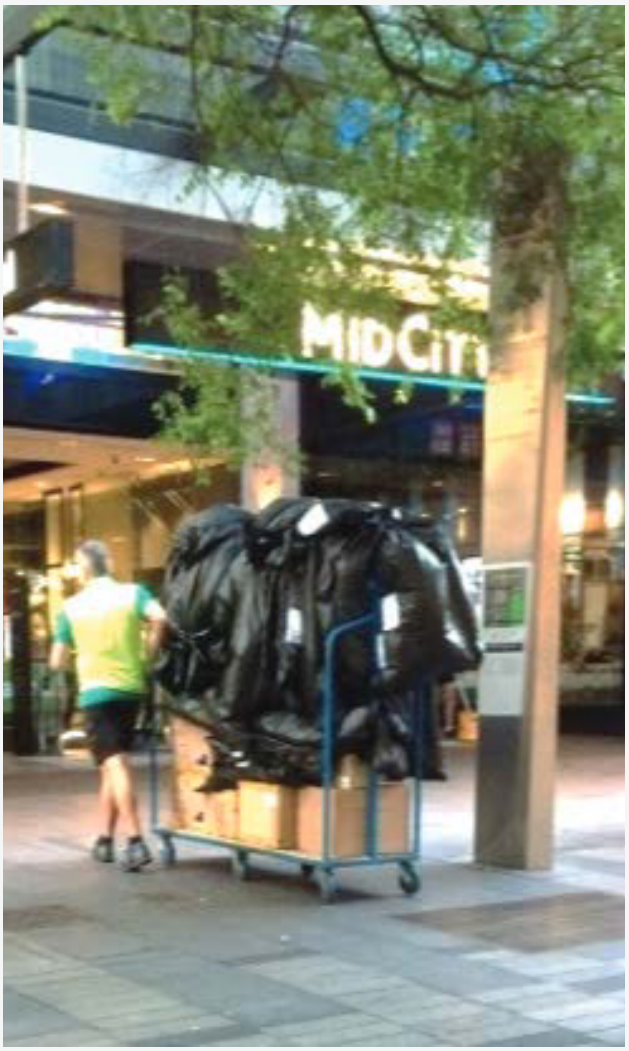
Logistics activity has changed substantially in recent years. The facilities that support last mile eCommerce deliveries are very different to traditional warehousing and logistics facilities. If planners recognise these differences and permit urban logistics facilities to open closer to the centres of customer demand, they can reduce the impact of freight movements on city traffic in urban areas. This can lead to better place outcomes for urban centres.

For the last mile, alternative modes for delivering goods, such as bikes, can become more efficient than traditional delivery vans. These alternative modes also have a smaller environmental impact, in terms of noise and air pollution, than larger vehicles.

CASE STUDY

Examples of urban logistics facilities

- In Paris – "Logistics Hotels" are small mixed use developments located in residential neighbourhoods instead of the industrial urban fringe used to manage last mile deliveries. One example is Chapelle International, which commenced operations in 2018. The project was developed by Sogaris, owned by the City of Paris and operated as a private company. By its final completion in 2023, the multi-use development will have 900 homes, a crèche, a school, a university campus, sports facilities offices, a place for amateur artists to practice and a logistics hotel connected to rail and clean urban vehicles. It is expected to reduce truck movements to the inner city by 50,000 each year (Beaulieu 2018).
- The rise of same day (or shorter) delivery models has made urban distribution, logistics and warehousing space popular and more lucrative. Paris has launched plans to convert abandoned parking facilities and gas stations into distribution warehouses (Marshall 2020).
- **Section 6.7** of the Toolkit discusses remoding deliveries using the example of a New York–based online store. To achieve a one-hour delivery service in New York, the business needed a logistics facility closer to customers. In 2015, it set one up on the fifth floor of a midtown Manhattan commercial tower – not a place commonly associated with warehousing facilities (Lumb 2015).
- Similarly, a UK logistics provider has established a 500m^2 facility it calls a 'micro depot' in Westminster, London – just 400 metres from Buckingham Palace. The provider plans to develop more micro depots across other parts of London (Pink 2018).
- In Sydney and other Australian cities, some logistics companies have developed facilities within or near major shopping centres. These companies consolidate customer orders in logistics centres on city fringes, reducing the number of vehicle trips to the city centre. From city centre facilities, CBD-based logistics personnel walk around the precinct making deliveries to customers. This significantly reduces drivers' trips to – and parking challenges within – CBD areas.



A delivery being made by a walker from an urban freight facility in the Sydney CBD

6.7 Remoding

The major logistics facilities from where goods are despatched, such as distribution centres, warehouses and trade gateways, are often located far from the urban centres. Larger trucks are the most efficient of moving these goods from the major logistics facilities to areas of high consumer demand, such as CBDs and regional town centres. Larger vehicles carry more freight and generate fewer trips than smaller trucks and vans, easing congestion and reducing emissions.

Courier bike deliveries in the Sydney CBD

Once in urban centres, however, larger vehicles quickly become less efficient. These vehicles are less suited to making multiple deliveries than smaller vehicles. They are also more more difficult to drive around narrow CBD streets or some town centres with roundabouts and traffic calming measures. Large vehicles are also often too high or long to access many loading docks or to park easily in on-street loading zones. It is often more efficient and practical to remode to smaller vehicles, bicycles or walking couriers with trolleys or other equipment to complete this urban last mile delivery task.

To enable remoding for last mile deliveries, an intermediate point on the fringes of the CBD, such as a consolidation centre or urban logistics facility, is required. These facilities allow:

- larger trucks to move consolidated loads more efficiently on the "trunk" journeys from the warehouse to an urban centre logistics facility
- goods to be transhipped to alternative modes, such as vans, bicycles and walking couriers for the last mile delivery in CBDs and town centres.

It is also important for councils to support remoding through the provision of appropriate street infrastructure and access, such as good quality footpaths, widened kerb ramps and bicycle lanes and facilities.

CASE STUDY

Remoding – biking, walking and public transport

As demand grows, congestion on the roads becomes a point of failure in supply chains. But there are various alternatives to the traditional freight approach of dispatching trucks.

Since Amazon launched its Prime Now one-hour delivery service, its employees in New York, USA, make most of their one-hour deliveries to Manhattan using the subway. An Amazon spokesperson noted that

"In Manhattan, our folks bike, walk or use public transportation. They only drive if the item is large like a flat-screen TV." (Lumb 2015)

In late 2019, in response to the high volumes of parcels being delivered each day into New York, the city's Mayor announced a program to encourage the use of cargo bikes as an alternative to trucks. The program allows cargo bikes to use commercial loading areas typically reserved for trucks free of charge (Haag & Hu 2019b).

(IMAGE: Sturla 2019)

In Sydney, there are thousands of electric bikes used to makes deliveries each day, mostly food deliveries. In the niche market these bikes serve, they are a more versatile and sustainable mode of transport than fossil fuel powered commercial vehicles.

There is a growing expectation that connected and automated vehicles will play a greater role in urban centre deliveries in the future. A great deal of research and media attention is focused on aerial drone deliveries in particular, however busy urban environments present substantial safety and infrastructure challenges for their use. These challenges may eventually be overcome, or terrestrial drones, which are already commonly found within some warehouses and hospitals, may be adopted instead.

For last mile deliveries over short distances, alternative modes of transport can be a more efficient method of delivery than sending vehicles into the CBD.

6.7.1 Sydney Courier Hub

In 2016, TfNSW and the City of Sydney developed a micro-distribution hub (the Courier Hub) by repurposing a disused wash bay in the Goulburn Street car park, Sydney. Today, a number of couriers making deliveries on foot or by bike into the city use the Courier Hub as a central distribution and collection point. In mid-2019, seven operators were working from the hub.

It is a small space but it is unique in Australia as an open-access, multi-user facility aimed at delivering urban environmental benefits and time savings (by easing pressure on couriers driving into a challenging road and parking environment), and reducing congestion in a small but significant way.

The Courier Hub demonstrates an easy alternative way to deliver goods into congested CBD areas.

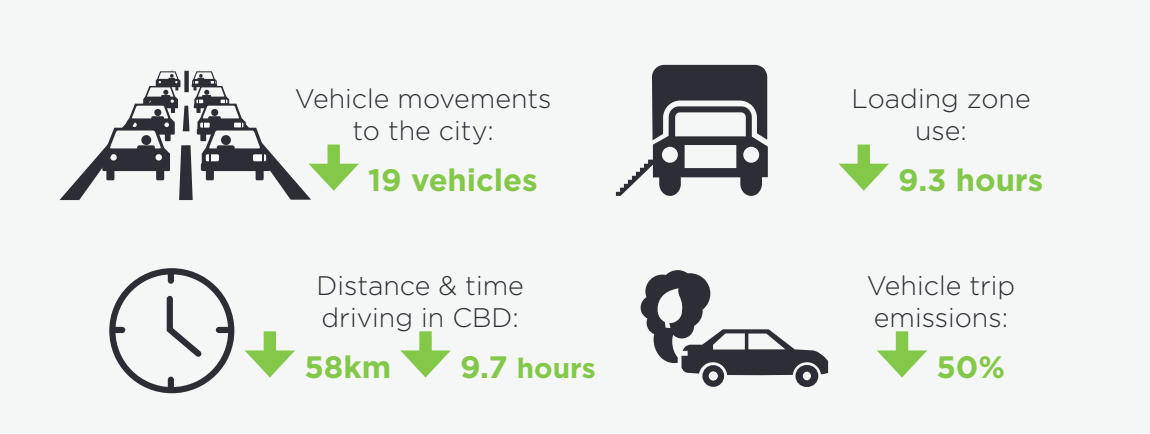


Figure 19 Daily benefits of seven carriers using the Courier Hub in 2019

In a 2016 assessment, two couriers were given the same 10 orders to deliver in the CBD. One took the orders to the Courier Hub, then delivered them by bike. The other used a van. The assessment found:

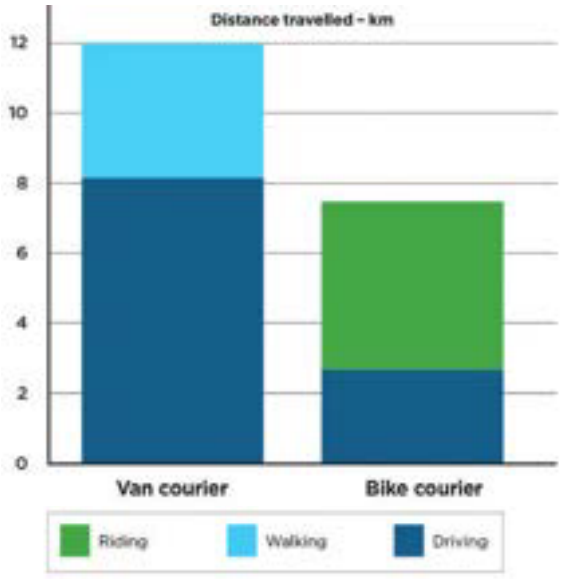
- the bike courier travelled 4.7 kilometres to complete the task
- the van courier drove 5.5 kilometres then walked 3.9 kilometres to complete the task – travelling a total of 9.4 kilometres.

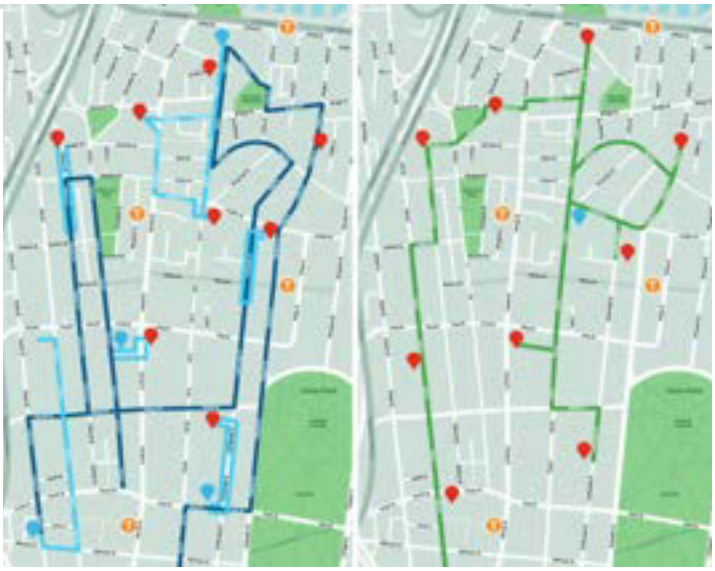
The assessment also found that:

- an experienced bike courier could make deliveries to the same 10 locations in half the time it took an experienced van courier to complete the same task
- the main challenge for the van courier was finding on-street parking close to the delivery point
- during the AM peak, the van driver spent approximately 30 per cent of their time searching for a suitable parking location, and 70 per cent of their time walking to the delivery point.

Bike couriers delivering to a CBD office building

Figure 20 Learnings from the 2016 assessment of the Goulburn Street Courier Hub





6.8 Delivery and Servicing Plans

Delivery and Servicing Plans (DSPs) are a methodology to help manage the freight and servicing activities of a building or precinct. They can improve the efficiency of freight and servicing activities, as well as reducing their impact on the surrounding precinct and transport network. While DSPs focus primarily on the impacts on the local precinct, they can also have broader benefits for traffic coming into an urban area.

DSPs can incorporate a wide range of measures that achieve beneficial outcomes by reducing freight activity and minimising the impact of this activity. The measures incorporated into DSPs can be flexible and include procurement strategies, limitations on (personal) deliveries, freight consolidation schemes, use of alternative modes, off-peak deliveries, waste management schemes and the use of low emissions vehicles.

The goals of a DSP are to:

- **Minimise freight and servicing trips.** This can be achieved by methods such as promoting efficiency in the procurement process, use of consolidation centres or micro-depots, limiting personal deliveries to offices, investigating alternative modes for last mile deliveries, and providing onsite storage to reduce the frequency of deliveries.
- **Match demand to network capacity.** This can include encouraging more deliveries outside of peak times (including overnight where possible), considering alternative routes to a destination, implementing a booking system for loading dock access.
- **Mitigate the impact of freight trips.** This can be achieved by planning appropriately for the types of vehicles to be used. It could include considering alternative modes where feasible and also ensuring, through good design, that the most efficient and clean vehicles can be used for a task. It can also mean working with suppliers to ensure they are using vehicles that support these goals.
- **Monitoring freight activity**. Capturing metrics for freight and servicing activity such as of air quality, noise, road safety and traffic impacts.

CASE STUDY

Shared service providers can reduce the number of vehicle movements to a building

The City of London identifies DSPs as "the single most effective way of proactively managing delivery and service arrangements." To achieve outcomes beneficial to the local area, the City of London's freight plan for the "Square Mile" mandates that a DSP accompanies any development with floor space over 1000m^2 where the development is likely to "have a significant impact on the transport network."

The approach encourages:

- all new developments to receive deliveries outside the peak hours
- all major developments to use a consolidation centre to reduce the number of vehicles required to fulfil the delivery requirements.

(City of London 2018, pp.16-18)

7. Planning for freight activity at the kerbside

This section provides guidance for councils and other local authorities on managing kerbside freight activity. Kerbside management is a complex task involving road design, safety and regulatory considerations. However, the Toolkit focuses on capacity considerations for kerbside areas, and the allocation of space for freight and servicing activities. The logistics management practices outlined in the Toolkit need to be incorporated into broader approaches to kerbside management.

7.1 Introduction

Kerbside spaces in busy urban centres need to meet the demands of many different users, including pedestrians, cyclists, public transport, private vehicles, and freight and servicing movements. All of these different users have their own requirements. Commercial freight vehicle operators are mainly focused on maximising their revenue by completing as many deliveries as they can, as efficiently as possible. Their drivers will take the path of least resistance to complete their deliveries quickly and safely. Often, this means parking at the kerbside.

While freight and servicing drivers may use similar vehicles, their behaviours can be very different:

- delivery drivers will arrive at a location, aim to complete one or more pick-ups and deliveries, and then move to another area to repeat the same task. They tend to park for short periods and generally comply with loading zone time restrictions.
- service providers and tradespeople may need to stay in a location for a longer period – often a number of hours, and at times over more than one day. These drivers tend to park for longer periods and demonstrate lower levels of compliance with loading zone time restrictions. Loading zones in the Sydney CBD are designed to support both freight and servicing activity, but they are not designed to provide long-term parking.

Kerbside management policies, enforcement approaches and land use planning all influence drivers' behaviours.

7.2 Planning to manage kerbside space

A number of factors are putting pressure on traditional approaches to kerbside management.

Cities around the world are increasingly becoming less motor vehicle-centric and more people-centric. Planners are creating spaces focused on public amenity and active transport solutions with walking making up the majority of trips within urban centres. In many cities, planners may repurpose kerbside space – which was previously used for parking – to support these changing priorities. These transformations can have a major impact on the freight and servicing task across a wide area and in a short period of time.

Construction activity creates an additional demand on kerbside capacity, particularly in Sydney's urban centres. Work zones supporting new developments can take up large amounts of kerbside space for the duration of the construction project.

Many major cities are facing the challenge of increasing road and kerbside congestion. However, a reduced supply of kerbside space can stimulate innovation and encourage vehicles to use off-street facilities. With no reason to change, it is unlikely people will. **Figure 21** highlights some of the ways that capacity constraints make it difficult for logistics operators to deliver to customers in busy urban areas and indicates how this may work as a force for change. The subsequent sections aim to equip local authorities with the tools to manage these constraints in a way that mitigates their impact and supports improved place outcomes.

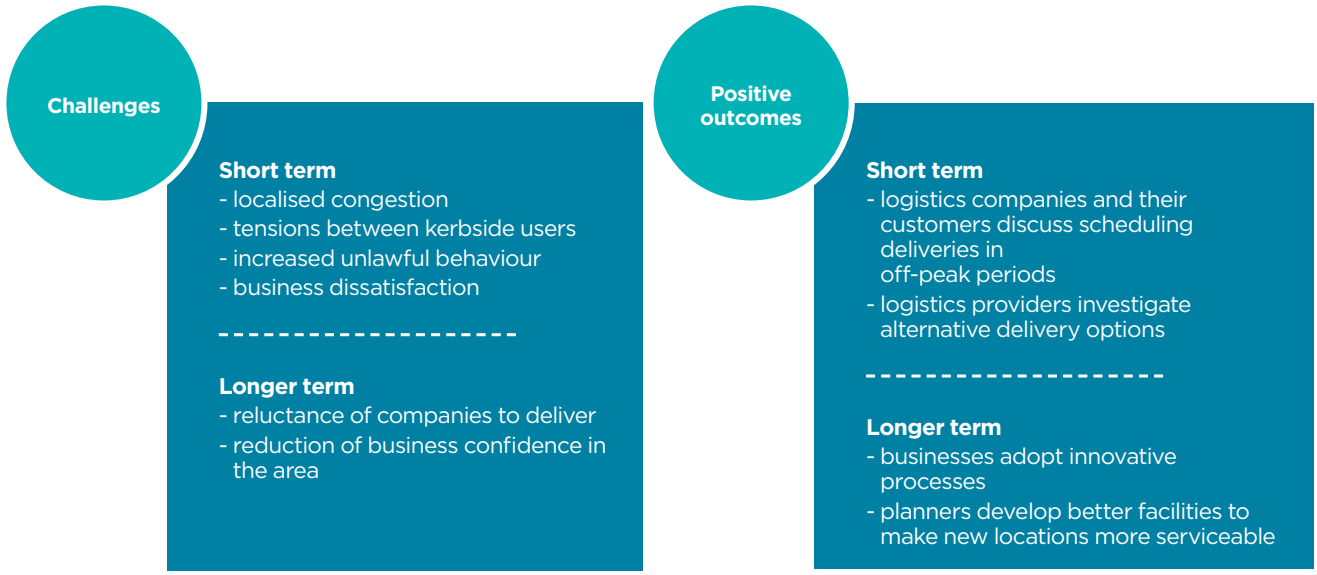


Figure 21 Implications of demand for kerbside loading exceeding supply

7.3 Maximising kerbside use

There are a range of potential responses to increasing pressure on kerbside capacity and the impact on the freight and servicing task. This section looks at some of the current challenges and discusses opportunities for unlocking additional kerbside space.

7.3.1 Kerbside challenges

Table 15 Summary of kerbside management challenges

Challenge	Description	
Suitability of the space	Various factors determine the suitability of a space for loading, including:	
	• width of bay • length of bay • camber • manoeuvrability • obstruction from surrounding trees and kerbside furniture	• distance to intersections • likely impact on nearby activities • possibility of noise disturbance • traffic flow timings • street lighting • urban planning objectives
Risks to vulnerable road users	A vehicle manoeuvring into and out of a space can be a risk to pedestrians and cyclists, and to other vehicles when it merges back into traffic. Larger delivery vehicles often have significant blind spots and limited rear visibility when manoeuvring. Equally, drivers alighting and unloading from freight and servicing vehicles can be at risk from surrounding traffic.	
Types of business to service	Some products require special handling. Beer kegs, for instance, are difficult to move over longer distances. For socio-historical reasons, pubs and hotels typically sit on street corners, which are now often busy traffic intersections.	
Minimising distance to delivery points	Where freight and servicing personnel cannot access loading zones, goods need to be moved longer distances. This increases the time and effort involved in making deliveries, congests footpaths and makes the overall process more complex and less efficient. Planners allocating loading zones must consider how deliveries will reach their final destination before implementing any changes.	
Understanding non compliance and the effect of penalty notices	Understanding driver behaviour in a given area can improve the planning process. Kerbside restrictions, for instance, will not automatically increase the use of alternative spaces – they may instead result in more illegal parking. Planners can learn more about an area's freight and servicing problems – and drivers' responses – by consulting rangers, drivers and local business managers, by analysing data, and by observing parking and traffic movements. They may also use infringement data to help them plan for more efficient, safer outcomes.	
Construction impacts	Construction projects often require a work zone at the adjacent kerbside or in the nearby area. This typically impacts pedestrian thoroughfares. Although these changes can be temporary, a work zone around a large construction project could be in place for a number of years.	

Delivery personnel using trolleys and other equipment are facing increasing challenges navigating congested footpaths

7.3.2 Management approaches for local authorities to maximise kerbside capacity

Although new developments should be self-sufficient, there will always be a need to provide some kerbside capacity to support businesses in older and heritage listed buildings that do not have off-street facilities. **Table 16** and the following subsections identify different ways to maximise kerbside capacity.

Table 16 Opportunities to maximise kerbside capacity

Opportunity	Description
Kerbside hierarchies	By prioritising different types of kerbside use, authorities can utilise the space in the most effective and efficient way.
Time-of-day demand and kerbside designations	Authorities can reserve kerbsides for traffic flows during peak periods (for example, bus lanes), and provide parking for other uses during off-peak periods.
Time-of-day access in pedestrianised areas	Freight and servicing vehicles can be given access to pedestrian areas during periods of low foot traffic, such as early morning or overnight.
Short-term parking	Short-term parking zones can flexibly accommodate both general parking and loading zone activity. Turnover in these zones can be higher than in 30-minute loading zones.
Evening and overnight loading zones	Extending loading zone operating hours into the evening or keeping them open overnight can help meet customers' needs and encourage off-peak freight and servicing activity.
Parking management systems	Effective management of kerbside loading and parking areas can improve compliance and efficiency.
Role of side roads	Prioritising freight and servicing activity on side roads can help support business activity on main thoroughfares.
Provision of different types of space	Planners and other authorities can influence freight and servicing as well as customer behaviour by altering the type of space provided and the permitted length of stay.

7.3.2.1 Kerbside hierarchies

Where overall parking demand exceeds supply, local authorities may develop a kerbside hierarchy to guide how to allocate parking spaces. The City of Sydney has taken this approach. **Figure 22**, which shows the City's kerbside hierarchy for parking (public transport uses, such as bus lanes, have the highest priority during hours of operation), is an example of the priorities of a mature CBD with a large commercial and employment focus.

As described in **Section 4.2**, major CBDs need to support multiple supply chains: commerce, retail, leisure and residential, as well as goods travelling to construction sites. The timing of these tasks often overlaps, with many movements concentrated into peak daytime hours.

Priority	Kerbside use	Service Objective
Highest	**Taxis**	To provide taxi ranks within 150m of any location in central Sydney. To provide pick up and drop off locations at or near key accommodation, tourism, commercial and residential facilities. To maximise safe pick up or set down opportunities, while minimising congestion impacts.
	Delivery and service vehicles	To provide loading zones within 100m of any location without on-site paring or loading.
	Mobility parking	To provide dedicated mobility parking spaces within 100m of a concentration of specialist medical or human services facilities. To provide dedicated mobility parking or ticket parking that can be used by mobility permit holders within 150m of any location in central Sydney.
	Authorised vehicle zones – essential services	Spaces to be provided as required to facilitate postal collection, policing and parking of dedicated emergency services or incident response vehicles.
	Authorised vehicle zones – coach parking	To provide short term coach parking for group pick up and drop off near to major destinations or accommodation. To encourage turnover of on-street coach parking and use of off-street facilities for long-stay coach layover.
	Authorised vehicle zones – passenger vehicles	To provide parking for government agencies or consular parking only where alternative off-street is not available within reasonable distance, or where on-street parking is required for exceptional circumstance.
	General kerbside parking	To provide time limited ticket parking and parking wherever or whenever space is not required for higher priority uses. To provide ticket parking with resident permit-holder exemptions in locations appropriate for long-stay kerbside parking.
Lowest		To provide dedicated long-stay motorcycle parking for use by commuters.

Figure 22 The City of Sydney's kerbside hierarchy (CoS 2015, p.4)

7.3.2.2 Time-of-day demand and kerbside designations

Table 17 provides an example of how kerbside space can be used for different purposes throughout the day, noting that the best use of the space may change multiple times each day. Ideal kerbside use may also depend on the type of road. Local shopping strips, for example, will have different requirements and priorities to major corridors.

Table 17 Examples of how the kerbside space in urban centres can be used for different purposes throughout the day

Changes in use throughout the day can lead to complex signage, but this approach can improve the efficiency of the kerbside and improve traffic flows. Changing uses also mean no single user can occupy the space for an entire day; this type of user can park in off-street carparks instead.

Example of kerbside that is used for different purposes according to different needs across the day

7.3.2.3 Time-of-day access in pedestrianised areas and bus lanes

Time-of-day restrictions can influence local delivery activity. Local authorities implement these restrictions in some pedestrian-centred areas or areas given over to public transport by permitting overnight or early-morning access for freight vehicles and restricting deliveries during peak pedestrian and commuter periods. **Figure 23** shows an example of this approach in Pitt Street Mall in Sydney. The Mall sees a high level of delivery activity early in the morning before transforming into a vibrant pedestrian boulevard for the rest of the day.

Other examples of this approach include Swanston Street and Bourke Street Malls in Melbourne, where vehicles are permitted access outside the peak pedestrian periods to minimise conflict between vehicle and pedestrian movements.

3am–8am

Vehicle access is permitted for deliveries, tradespeople and services.

8am

All vehicles exit and the bollards are raised.

12:30pm

Pedestrians at weekday lunchtime.

Figure 23 Changing uses in Pitt Street Mall across the day

7.3.2.4 Short-term parking

Under NSW road rules, loading zones are provided for use by drivers of commercial vehicles for up to 30 minutes, depending on the type of vehicle. Truck zones are reserved for larger vehicles with longer dwell times, and generate different vehicle and driver behaviours to loading zones.

Short-term parking zones – which may be used by drivers of both private and commercial vehicles – are an effective way to maximise kerbside capacity. **Table 18** shows an assessment of short-term parking activity and driver behaviour on Church Street in Parramatta undertaken by TfNSW in 2017. In this example, freight and servicing vehicles accounted for 19 per cent of all activity. Although Church Street had some loading zones at the time of the assessment, 51 per cent of freight and servicing activity was in 15-minute parking areas.

The assessment also demonstrated a lower average dwell time for commercial vehicles in short-term parking than in loading zones. Observations of different types of vehicles in different parking zones indicated that 15-minute parking areas were better suited to delivery vehicles than trade and service vehicles. Delivery vehicles made up 59 per cent of the commercial vehicles in 15 minute parking spots, but only 47 per cent in one-hour parking and loading zones.

As the Parramatta CBD grows and pressures on its kerbside capacity increase, its kerbside zoning is likely to become more segregated, as in the Sydney CBD. In the long term however, an increased demand for kerbside drop-off and pick-up from driverless vehicles could mean that the ideal model of kerbside zoning in the Sydney CBD may be similar to the current arrangement of short term parking spaces in Parramatta and other similar centres.

Timed parking provided for delivery vehicles at Chatswood Interchange

Table 18 Parking events in a mixed zone in Church Street, Parramatta, in 2017

Parking type	Number of spaces	Number of passenger vehicle events (Mon–Fri, 6am–6pm)	Passenger vehicle average dwell time	Number of commercial vehicle events (Mon–Fri, 6am–6pm)	Commercial vehicle average dwell time
15-minute parking zone	12	816	0:20:21	206	0:18:37
One-hour parking zone	6	764	0:36:49	107	0:25:55
Loading zone	3	153	0:27:17	93	0:28:01
Total	21	1,733	0:28:21	406	0:22:36

7.3.2.5 Evening and overnight loading zones

In recent years, the Sydney CBD has seen an increase in freight and servicing activity between 6pm and 6am. Some businesses find it more efficient to deliver overnight, as journey times to and from the CBD are shorter given the lighter traffic, and parking is easier to find. Some deliveries such as milk, bread and newspapers are invariably made overnight to prepare the city for early-morning activity. In addition, eCommerce could lead to further growth of evening deliveries as people arrive home after work.

Loading zones are currently uncommon in the evening. Most kerbside capacity at this time is dedicated to general kerbside parking. TfNSW has worked with a number of businesses to extended loading zone hours to facilitate efficient evening deliveries.

An example of a loading zone with extended hours in the Sydney CBD

7.3.2.6 Parking management systems

As technology improves, parking management systems are becoming increasingly sophisticated. In recent years, some councils have installed sensors in the ground to monitor the time vehicles park, while others keep track of parking time using machines that require drivers to key in and register. Increasingly, smartphone apps are being used both for booking spaces and for tracking parking use.

Many councils in Australia and overseas are also investigating 'virtual parking' management systems. These systems allow the dynamic control of the kerbside by only permitting drivers who have registered and reserved kerbside space to stop and park.

7.3.2.7 Side roads

Although it is often not practical to provide loading zones or other parking on main roads, businesses on these corridors still require goods and services. Side roads typically play a major role in supporting freight and servicing movements along main corridors.

7.3.2.8 Environmental conditions

Noise is the main cause of environmental complaints. It can be an important consideration when organising timing of kerbside use in a location. In areas where noise is an issue, such as residential areas, kerbside access could be limited to vehicles that meet certain environmental criteria – for example, quiet electric vehicles. It is worth noting that in acoustic tests TfNSW conducted with waste operators in 2016, combustion engines and hydraulic devices on trucks were not the loudest source of noise. The noise from operators moving waste bins, closing bin lids and emptying items (particularly glass) into waste trucks consistently exceeded the noise emitted from the truck itself.

Even when drivers and operators are using a diesel truck, improved practices such as switching off radios and not slamming vehicle doors can reduce the noise they create to an acceptable level.

7.4 Managing kerbside provision in different types of centres

Different types of urban centres have distinct business demands and freight and servicing characteristics. **Table 19** describes variations in how freight and servicing vehicles use kerbsides in different types of urban centres, and outlines the developments likely to impact the logistics tasks in urban centres in the future.

Table 19 Profile of kerbside management challenges by size of urban centre

Centre size	Parking, loading and delivery characteristics
Local centre	• businesses value kerbside parking to support their customers • a group of local shops may occasionally be supported by a loading zone • local supermarkets and shopping centres typically have a rear door or dock for deliveries and servicing • parking is flexible (shoppers and commercial vehicles both use short-term parking) • residential developments may have limited access to docks and rely on the kerbside for deliveries and waste collection • newer mixed-use developments (commercial and residential) have off-street facilities to support delivery and servicing access • provision of off-street surface-level parking adjacent to developments is more cost-effective than developing integrated docks.
District centres and CBDs	• businesses commonly have access to a rear laneway for deliveries and servicing • businesses value kerbside parking to support delivery and servicing activity, but local workers tend to use it more • loading docks provide off-street servicing access • incorporating loading docks into buildings is more cost-effective than using surface-level land adjacent to buildings • parking is flexible; shoppers and commercial vehicles both use short-term parking • capacity for bicycle couriers and hubs is increasing • delivery drivers often park and walk for multi-drop deliveries to several businesses within the area.
Major CBDs	• an increasing variety of goods and services sees supply chains supporting commerce, retail, residential, tourism and leisure businesses • supplying CBDs is a 24-hour task • parking spaces to support businesses' customers are less essential – customers arrive via public transport or park off-street • kerbsides are managed formally through kerbside hierarchies • few or no on-street parking spaces for private vehicles • activating laneways previously used for servicing constrains some access • loading docks support off-street delivery and servicing activity • major opportunities are emerging for centralised hubs with walkers and bike couriers becoming more prevalent • out-of-hours and overnight servicing and deliveries are promoted to encourage more efficient use of kerbside capacity • time-of-day priorities apply to kerbside use, to ease congestion and take advantage of different opportunities in the daytime and night-time economies • CBD transport network provides limited opportunities to increase the number of loading zones • traffic growth and urban remodelling will lead to a decline in kerbside parking spaces.
All sizes of urban centres in the future	• 'micro-mobility' lanes will provide opportunities for more space-efficient delivery vehicles, such as terrestrial drones • areas will be remodelled with an increasing focus on pedestrian amenity and placemaking priorities • less kerbside space will be available • access to pedestrian areas will be provided outside of peak periods for freight and servicing • space-efficient logistics methods will be necessary for servicing urban areas • driverless vehicle pick-ups and drop-offs are likely to place further demands on diminishing kerbside space, while the use of off-street carparks for private vehicles will fall • advanced supply chain methods will be developed for consolidated servicing in larger precincts • urban logistics facilities will be developed or incorporated into mixed-use developments • an increase in business-to-customer deliveries will support the growth of lockers and drop-off centres for storing and collecting goods.

8. Precinct approaches to freight activity

A precinct approach is a centralised and planned infrastructure approach to logistics between multiple customers in the same precinct. By coordinating their service and supply needs, cooperating customers aim to improve the place outcomes for the local environment. This approach can improve delivery efficiency to the precinct and within the local transport network.

8.1 Precinct approach

A precinct approach, where multiple buildings in the same precinct share common dock facilities, can significantly reduce the total number of vehicle movements to an area while still meeting customer demand. Allowing suppliers to deliver to multiple customers in a precinct from a single loading dock improves logistics efficiency and reduces local traffic congestion. The precinct dock effectively becomes a consolidation centre to drive more efficient last mile deliveries.

This collaborative approach is more logical and achievable when a precinct is planned and built by one developer, such as Barangaroo in Sydney. Where this is not the case, challenges may arise over ownership, organisational structures and security concerns. However, the benefits of a precinct approach are likely to outweigh the costs of navigating these challenges. Either way, the ability to develop a precinct dock or common approach depends on cooperation between developers, owners, managers, tenant businesses and local authorities.

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CASE STUDY

Precinct servicing at Barangaroo

In 2018, 57 outlets sold coffee in Barangaroo. When asked about freight and servicing in the precinct, a common response from people working in the area was, *"You know, I've never seen a delivery vehicle here."* Little did they realise that the precinct dock below their feet was handling approximately 10,000 vehicles per month.

The facilities that were planned and developed to enable the seamless and discrete management of this large transport task have contributed significantly to the placemaking outcomes in Barangaroo. Because the transport task goes unnoticed, its contribution to the area's amenity can be easily overlooked.

Logistics activity occurs behind the scenes (underground) at Barangaroo

For developers, one key benefit of a precinct dock is that its total size and capacity is likely to be less than the sum of the individual loading docks that would otherwise be required for each building. In addition to being cost-effective, well-managed precinct docks can significantly enhance place outcomes and improve the amenity of a precinct, as in Barangaroo.

Figure 24 illustrates the transport and logistics efficiency of precinct loading docks. In the traditional approach (shown in scenarios 1 and 2), a driver delivering goods to the precinct needs to enter four separate docks in four different buildings. In these scenarios, a driver is likely to look for on-street parking to complete deliveries so that they do not have to move their vehicle multiple times. By providing a combined dock, a precinct approach limits the number of trips drivers need to make, reducing kerbside congestion, increasing operational efficiency and reliability, and improving the precinct's place outcomes.

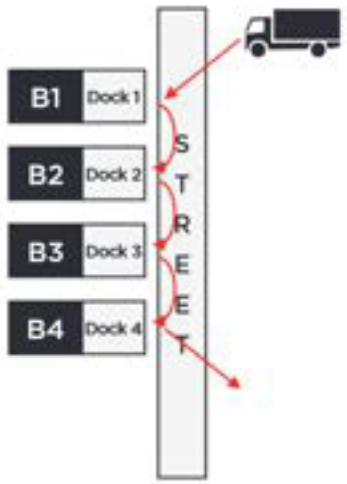
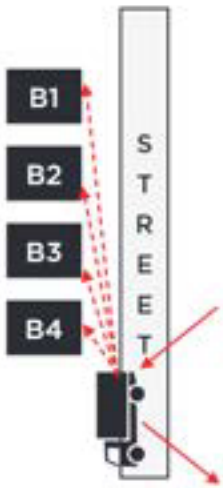
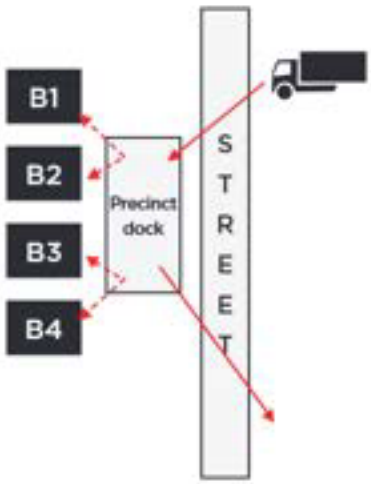
1. Individual loading docks	2. Street parking: common reaction to individual docks	3. Precinct dock approach
		
One truck needs to move five times to service four buildings, increasing traffic in the area.	The truck only needs to move twice, but it is relying on unpredictable kerbside space and causing congestion on the street.	The truck only moves twice, and it is off the road, reducing traffic and congestion.

Figure 24 How precinct docks can reduce the number of freight and servicing vehicle movements

8.2 Precinct approach assessment

The general objective of a precinct dock facility is to accommodate all the freight and servicing needs of the buildings it supports. Precinct docks allow logistics operators to consolidate deliveries, reducing the number of freight and servicing movements that need to be made to the precinct. Compared to single-building loading docks, the precinct approach can reduce the space a loading dock requires and increase the efficiency of the logistics task.

Table 20 compares the two approaches, using the example of a precinct comprising five buildings with a total gross floor area of approximately 220,000m^2. As it demonstrates, the precinct approach results in fewer vehicle movements and requires 30 fewer dock spaces – saving participating businesses money and space.

Table 20 Number of movements generated by a precinct dock compared to individual docks

Measure	Precinct dock movements	Movement to five individual docks
Freight vehicles (arrivals only) per day	378	617
Vehicles in busiest hour	50	82
Number of dock spaces required	46	76

8.3 Precinct procurement led by Business Improvement Districts (BIDs)

A precinct-based group procurement solution is an extension of the freight consolidation strategies explored in **Section 6.5.11**. Precinct partnerships, such as BIDs, have been implemented in London, UK, and elsewhere to help improve environments with local stakeholder input. Through joint procurement, buildings benefit from cost and delivery efficiencies. These partnerships also lead to transport efficiencies, and improved local environmental and placemaking outcomes.

One example is the New West End Company in London. A group procurement trial for waste collection conducted in Bond Street in 2018 resulted in:

- 94 per cent reduction in daily waste and recycling vehicle movements
- 67 per cent reduction in waste bags left on pavements
- 17 per cent reduction in kerbside vehicle stops.

(New West End Company 2019)

Australia currently has no regulatory framework for BIDs, but local chambers of commerce or groups of neighbouring businesses with common interests can still pursue similar joint procurement approaches.

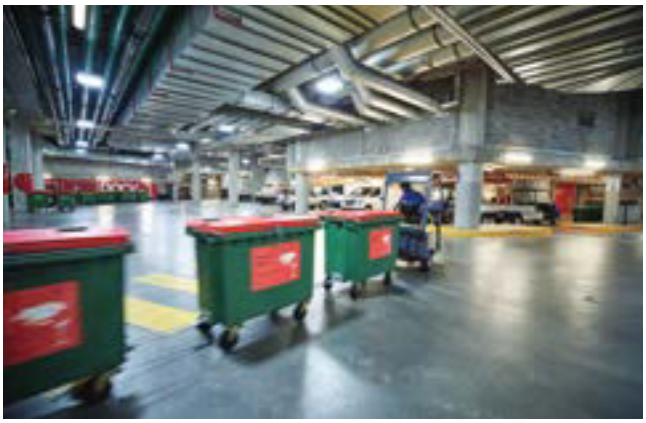
8.4 Best practices in precinct planning: a summary

This section summarises the key principles for planning freight and servicing activity in order to deliver successful place and amenity outcomes in a precinct.

8.4.1 Designing self-sufficient precincts

For a precinct approach to be successful, it must efficiently accommodate the freight and servicing task it generates. This will involve providing space for large vehicles to enter the precinct and considering the most efficient way to deliver goods to the customers. Planners, developers and other stakeholders can do this by designing loading docks that can accommodate heavy vehicles (such as large waste or removal trucks), either within or at the fringe of the precinct. They can also use space-efficient, low-carbon vehicles to make travel between the dock and the final customer more efficient.

8.4.2 Enhancing the precinct's amenity



Waste management in the Barangaroo loading dock

Both design and management of off-street facilities, and supply chain plans for a precinct, must aim to secure successful place and amenity outcomes. To ensure the logistics task helps to secure these outcomes, dock design and management plans need to address how vehicles enter, exit and are managed in the dock in a manner that is discrete and minimises their impact on the surrounding area. They may also need to address supply chain practices that extend beyond the precinct's geographic boundary.

This may require planning at early stages and potentially incorporating conditions into development approvals. Precinct managers should consider the placemaking goals of a precinct and the non-discretionary nature of freight. Organisational approaches such as a freight consolidation schemes to reduce vehicle traffic, may need to be incorporated into planning approaches and implemented as the precinct is developed.

8.4.3 Harnessing innovation to drive efficiency

The precinct plan should enable logistics operators to adopt emerging technologies that can unlock greater efficiencies, such as small electric vehicles, driverless vehicles and terrestrial and aerial drones. Stakeholders need to plan ahead by considering the infrastructure needs of the different types of larger vehicles that operate to and from the precinct as well as the space efficient ones that may operate within the precinct.

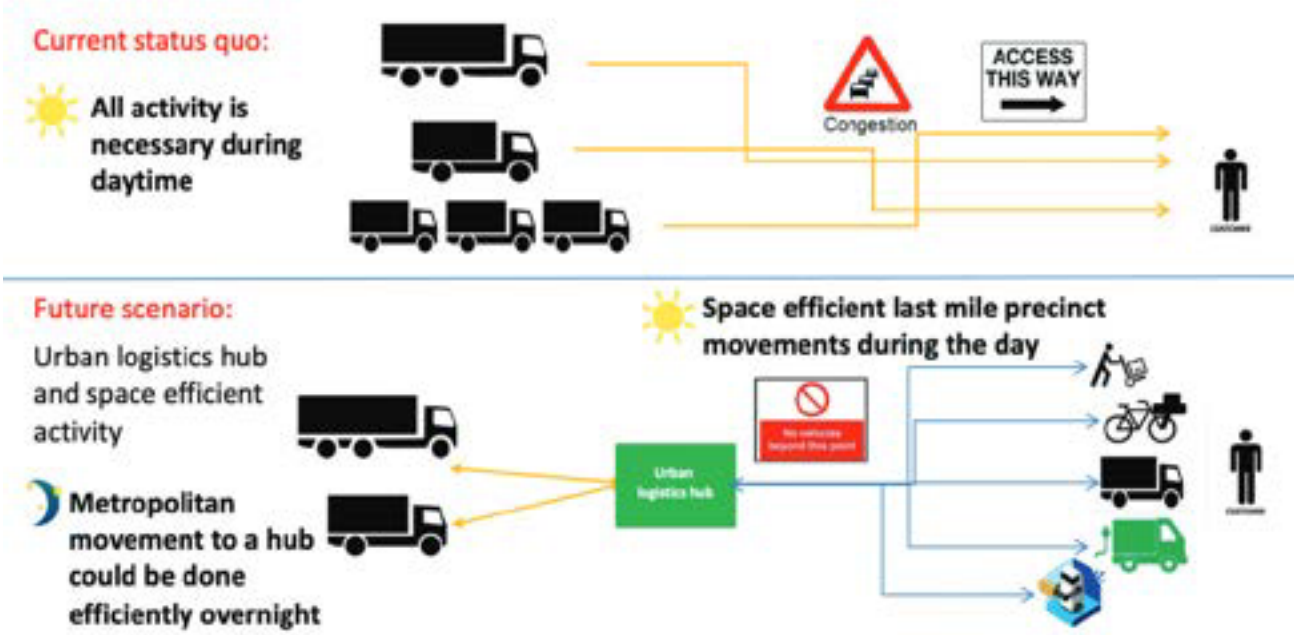


Figure 25 Using a precinct approach to improve urban delivery efficiency

9. Future approaches

Drawing on best practices from urban centres around the world, this section outlines some emerging approaches that could be applied to urban centres' transport task.

9.1 Placemaking

Placemaking refers to the development and management of the built environment to influence the character and experience of places. Successful placemaking either preserves or enhances the character of public spaces, making them more accessible, attractive, comfortable and safe. Good place outcomes can directly benefit local businesses. An attractive, high-amenity shopping area which prioritises pedestrians and cyclists, for instance, is likely to attract more customers than a dilapidated or otherwise unappealing shopping strip dominated by through traffic.

Successful placemaking typically encourages space-efficient transport modes such as walking and cycling and discourages the use of motor vehicles, which create congestion and detract from amenity. However, shops, cafes and restaurants that help create places for people inevitably generate a freight and servicing task, for which planners need to cater.

How well planners cater for this task can influence the ultimate success of a location's vision for place. A well planned, discreet freight and servicing task can enhance the liveability and amenity of a place, while making it efficient to service. A poorly planned task, on the other hand, can lead to inefficient, untidy, unsightly and unsafe practices, all of which detract from local amenity.

Consider

A substantial local freight task is a sign of vibrant economy and social activity. An inconspicuous freight task operating around a vibrant, busy area is proof of good urban planning.

9.2 Improved transport planning in urban areas

TfNSW's **Future Transport 2056** sets out a vision for transport as an enabler of economic and social activity and a contributor to long term economic, social and environmental outcomes. This represents a fundamental step forward in transport planning, including for freight and servicing activity.

A key objective of the Toolkit is to support **Future Transport 2056** and improve freight planning in urban areas by educating planners, developers and other stakeholders about the relationship between the **Future Transport 2056** vision and planning for the movement of goods and services.

NSW is not alone in pursuing these objectives. Progressive organisations throughout the world are improving their approaches to freight and servicing planning.

CASE STUDY

A Swedish arena for transport efficiency

The CLOSER Organisation in Sweden is working with several cities, business organisations and industries to develop sustainable freight transport and urban logistics solutions that will improve living conditions in Swedish cities. It has developed several methods to meet the urban transport challenge, such as:

- integrating freight transport considerations into urban planning
- creating smart solutions for more efficient use of infrastructure
- developing and testing new types of services and business models
- developing and testing new vehicle solutions
- identifying challenges in existing rules and regulations, and working to standardise approaches to transport management.

(CLOSER 2020)

9.3 Precinct approaches

Precinct approaches such as that developed in Barangaroo, Sydney, generate successful place outcomes. Although Barangaroo has a significant level of freight and servicing activity, with approximately 10,000 vehicle movements per month as of 2019, its coordinated off-street facilities keep this activity inconspicuous, enhancing Barangaroo's amenity. The same task would require approximately 230 metres of kerbside space per day, leading to congestion and reducing the precinct's amenity.

The approach set out in **Figure 26** summarises international best practices for an end-to-end precinct design and management.

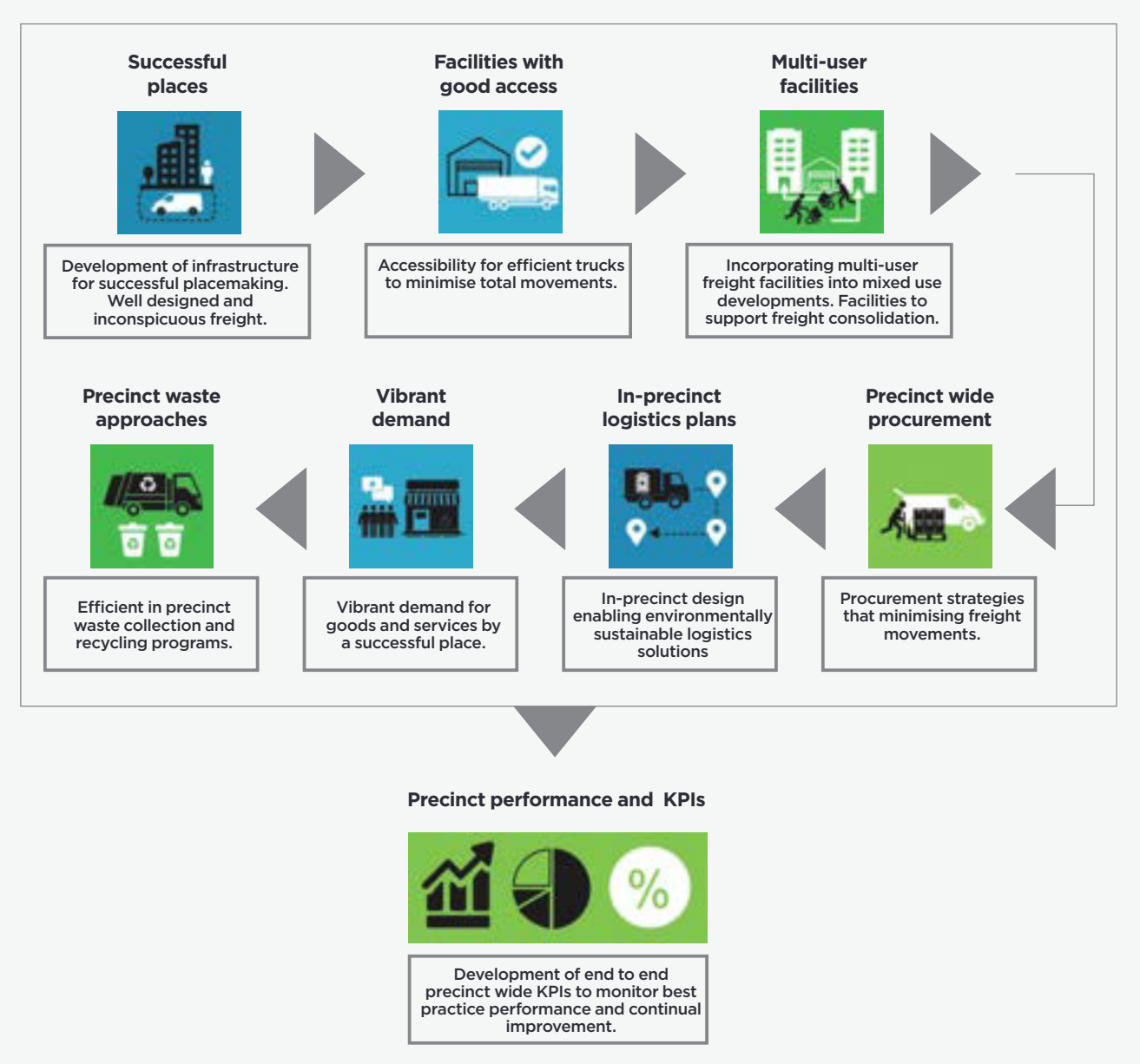


Figure 26 Planning a best practice precinct-based freight and servicing approach

9.4 Last mile freight and Connected and Automated Vehicles

Today, almost all available daytime kerbside space in the Sydney CBD is allocated to loading zones to support freight and servicing activity. In the future, more of this space may be needed to support other uses, such as active transport and autonomous vehicles.

The broad adoption of Connected and Automated Vehicles (CAVs) could bring substantial changes to Sydney's transport network. Although driverless vehicles may be useful to the freight industry as a whole, their benefit to the last mile freight task is less clear. In the last mile, delivery personnel are still needed for tasks such as unloading items, obtaining proof of delivery and resolving any delivery issues.

Driverless vehicles may also affect the last mile task in a different way. Traffic levels are forecast to increase when driverless vehicles join our roads as a result of zero-occupancy trips and increased car travel for non-drivers (Ellis 2019). These vehicles will also need kerbside space to pick up and drop off their passengers – this new kerbside demand could significantly impact space available for loading zones.

Driverless vehicles are likely to reduce demand for car parking spaces, but more space opening up in carparks would not necessarily benefit the freight task. Some 54 per cent of public car parking space in the Sydney CBD does not have sufficient height clearance to allow access for even small freight and servicing vehicles. The 46 per cent of parking space that can support these vehicles is approximately 10 times greater in capacity than the current amount of kerbside loading zone space, yet it is typically privately owned and is not evenly distributed across the city.

9.5 Dynamic kerbside management

Evolving technology and the adoption of driverless vehicles will also create opportunities to improve kerbside management practices. Developments such as intelligent sensors, vehicle to infrastructure systems, digital signs and dynamic pricing solutions may support the roll-out of "smart kerbs" that streamline existing kerbside management approaches and improve responsiveness to customer demand. A number of cities around the world are already trialling smart kerbs.

9.6 Improved logistics management

Bigger challenges require more creativity. Bigger logistics challenges, therefore, will demand more innovative logistics strategies. Proposals for new buildings may require significant managerial and operational logistics expertise. Logistics providers can propose efficient consolidation solutions for buildings, such as by managing deliveries from outer-city consolidation centres into the dock and using onsite personnel to distribute deliveries to customers within the building.

Logistics planning systems and kerbside management systems are improving. Previous systems produced static plans that did not adapt to daily, let alone hourly, changes in a city's transport networks. New systems are more adaptive, incorporating real-time traffic data, real-time changes to order schedules, customer booking systems, and information from vehicle management and guidance systems. They can also link to kerbside parking management systems to generate parking requests and permissions. In addition, they can learn from past approaches. There is also likely to be improved vehicle to vehicle and vehicle to infrastructure connectivity supporting better adaptive transport planning.

9.7 Crowd-sourced logistics

New business models have emerged in logistics, disrupting existing approaches and offering novel crowd-sourced solutions. These new ways of operating can have both positive and negative impacts on traffic. For example:

- if a driver collects an item and the delivery point is on the driver's route, the crowd-sourced solution may reduce traffic.
- if orders that would otherwise have been consolidated into a single vehicle are picked up by multiple drivers who deviate from their route to reach the delivery point, then the crowd-sourced solution may increase traffic.

Because crowd-sourced logistics activity is less conspicuous due to the variety of vehicles used, it is difficult to monitor and coordinate. Current NSW road rules do not permit passenger vehicles to park in loading zones, limiting the reach of crowd-sourced logistics solutions.

CASE STUDY

Smart Loading Zone pilot – Omaha, Nebraska

The city of Omaha, Nebraska, is piloting the use of smart loading zones. The pilot will allow drivers to reserve a loading zone, and will include dynamic pricing and integration with enforcement systems.

The pilot is intended to reduce illegal parking, congestion and conflicts between road users.

Ken Smith, Omaha's parking and mobility manager, said of the pilot that "there's an obvious benefit for drivers that also benefits non-drivers; there's less circling the block, which means less conflicts with other road users ... if cities don't do this, we're just going to see more and more of these vehicles blocking the way" (Wilson 2020).

9.8 Rethinking the transport task and redesigning vehicles

In Tokyo, (Japan) low vehicles transport soft drinks to vending machines and reload empty bottles onto their roofs to be taken back to the depot for recycling.

As well as redesigning buildings, planners can support the development of versatile vehicles for urban freight and servicing activities.

(IMAGE: Ringman 2018)

Couriers in Dublin (Ireland), Seattle (United States), Hamburg (Germany) and other cities use cargo bikes to complete some freight tasks. Sydney already has a reasonably sized courier bike fleet operating from some small depots in and around the CBD. This fleet is likely to expand as logistics businesses become more interested in bikes with greater cargo capacity. However, parking for cargo bikes is less flexible than for two-wheeled courier bikes.

(IMAGE: Adams 2018)

In Utrecht (Netherlands) and Gothenburg (Sweden) small electric vehicles are used to deliver consolidated freight into the heart of the densely populated CBDs, which have limited capacity to support traditional large freight vehicles.

These cities' use of these vehicles has led to reductions in emissions, noise and freight traffic, and has increased residents' safety and quality of life.

(IMAGE: Ericsson 2020)

CAVs that connect directly to transport infrastructure, traffic management systems and parking management systems are likely to become a reality in the future.

Their technology is well-proven inside industrial plants and warehouses. They could become a fixture of the urban delivery landscape, carrying goods within a limited geographic range.

(IMAGE: Starship 2020)

Applications of CAVs technology may capitalise on innovations such as vehicle electrification and be coupled with emerging service models by new market entrants.

CAVs may further reinforce the already growing trend of on-demand or express deliveries. More widespread adoption of freight and passenger automated vehicles has the potential to place further pressure on local road networks.

(IMAGE: WEF 2020, p.15)

Without question, drones have the potential to be used in the freight task. But in the short term, the use of drones for deliveries in high-density urban centres is likely to be challenging. So far, drone delivery tests have only been carried out in sparsely populated areas. The roll-out of 5G mobile networks may resolve some of the issues surrounding the urban use of drones, but security risks could remain.

Until 100 drones can be dispatched autonomously, replacing a full vehicle worth of goods with a single controller, drones are unlikely to join the urban freight task.

(IMAGE: SmartCitiesWorld 2019)

Vehicle management systems and routing optimisation systems are likely to connect to kerbside management systems in the future. These systems will work together to automatically make decisions throughout the day that continually re-optimise vehicles' delivery and collection operations.

9.9 Freight task growth

The growth of the last mile freight task can be understood through three main lenses:

- growth driven by location
- growth driven by societal change
- growth driven by new services.

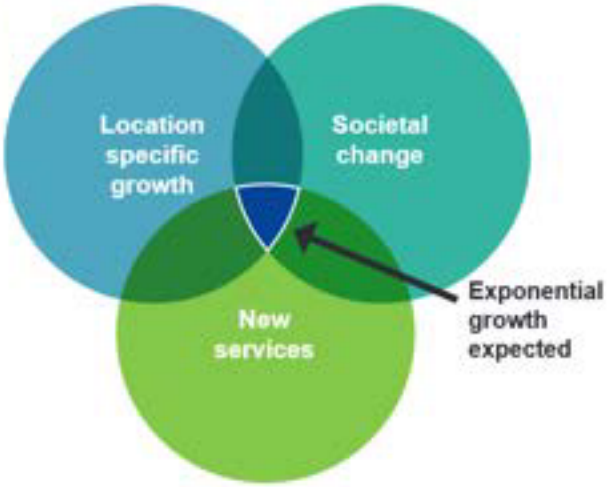


Figure 27 Key factors driving growth in the freight task

9.9.1 Location-specific growth

CASE STUDY

Greater Sydney Region Plan, A Metropolis of Three Cities

The Greater Sydney Commission's **Greater Sydney Region Plan, A Metropolis of Three Cities** is built on a vision of three cities where most residents live within 30 minutes of their jobs, education and health facilities, services and great places. To meet the needs of a growing and changing population the vision seeks to transform Greater Sydney into a metropolis of three cities:

- the Western Parkland City
- the Central River City
- the Eastern Harbour City.

The vision brings new thinking to land use and transport patterns to boost Greater Sydney's liveability, productivity and sustainability by spreading the benefits of growth. (GSC 2020, p.6)

New centres will inevitably experience significant growth in their freight and servicing tasks. Rapid increases in the amount and density of office and residential floor space in Parramatta, for example, will attract further retail and hospitality uses leading to significant year-on-year growth of the freight task. Planners need to accommodate this by developing more off-street facilities and loading docks.

New developments are also creating extra traffic. As of 2019, Barangaroo, for example, receives approximately 10,000 freight delivery vehicles each month. However, not all of this traffic is new. It is reasonable to assume that a substantial portion of Barangaroo's deliveries once went to areas around the Sydney CBD before businesses relocated to the new precinct. As a result, vehicle movements to these businesses may be more efficient and consolidated now.

Green Square in the inner east of Sydney has 35,700 dwellings under development as of 2019 and is likely to generate more than 5,000 freight movements per day to residential properties alone. On top of this volume will be deliveries to the new businesses, cafes and retail destinations that will develop in the area.

9.9.2 Societal change

In 2018, more than 73 per cent of Australians shopped online, accounting for approximately 10 per cent of all retail sales (Australia Post 2019, pp.6-7). This figure is forecast to grow, and as a result so too will the number of parcel deliveries. With online shopping growing, bricks-and-mortar retail sales are declining. Thus, although the number of items being sold in the whole retail market may remain stable, the number of freight vehicle movements these sales generate is likely to increase.

As the number of people living in dense urban centres increases and car ownership decreases, more people are likely to order groceries online. One large van delivering groceries is more efficient than many small cars completing the same task. This trend should result in less private vehicle movements.

9.9.3 New services

In response to these societal changes and to differentiate themselves from competitors, companies are developing new service offerings. Often, these offerings centre on faster delivery times. For retailers, the main constraint on continued growth is their ability to provide cost-effective deliveries in short timeframes.

Freight movements are likely to grow faster than online sales, partly as a result of the faster delivery times companies are promising customers. Typically, more vehicles are required to meet two- or three-hour delivery times compared to next day deliveries, which can be consolidated more effectively. These faster delivery times may even require delivery personnel to visit the same address more than once in a day.

Thousands of electric courier bikes operate across Sydney every day, the vast majority making food deliveries. These were virtually non-existent just a few years earlier. In 2018, the Australian food delivery market was valued at $2.6 billion, with approximately 7,000 orders placed every hour (Banney 2018). For this reason, the market is experiencing double-digit year-on-year growth.

9.10 New logistics structures

Minimising the distance between origin and destination points for last mile deliveries can change the urban freight transport task significantly, and improve place outcomes and amenity.

Over the last 30 years, logistics providers have moved their facilities from inner to outer metropolitan areas. This has reduced property costs, but increased transport costs for last mile deliveries as vehicles must travel further to reach urban centres.

As the sizes of consignments get smaller and consumers expect their deliveries sooner, logistics providers' outer metropolitan locations are constraining their ability to meet customer demand. To provide the service customers want, some logistics facilities are moving back into urban centres. In 2018, one European leader in eCommerce deliveries, for instance, established a small depot to operate a fleet of variously sized electric vehicles in central London, UK, less than 400 metres from Buckingham Palace. More micro depots are planned elsewhere in central London and in other cities.

Micro depots help reduce transport costs and increase the feasibility of expedited deliveries. However, they also increase property and land use costs for logistics providers.

9.11 Global predictions

In 2020, the WEF released a report on "The Future of the Last-Mile Ecosystem" (WEF 2020). The report explores the challenges facing urban freight due to the growth in eCommerce, more demanding customer expectations, changing technology and the increasing impact of supply chain disruptors. It identifies 24 prioritised interventions to respond to these challenges and mitigate the impacts of last mile freight on traffic volumes, congestion and pollution. These interventions are summarised into three "transition roadmaps": sustainability; economic; and a multiplayer or integrated ecosystem (**Figure 28**). The report argues that the integrated ecosystem approach, based on close collaboration between public and private sector stakeholders, "would optimise the last mile ... while minimising customer disruption" (WEF 2020, p.5) to produce beneficial results for all ecosystem players.

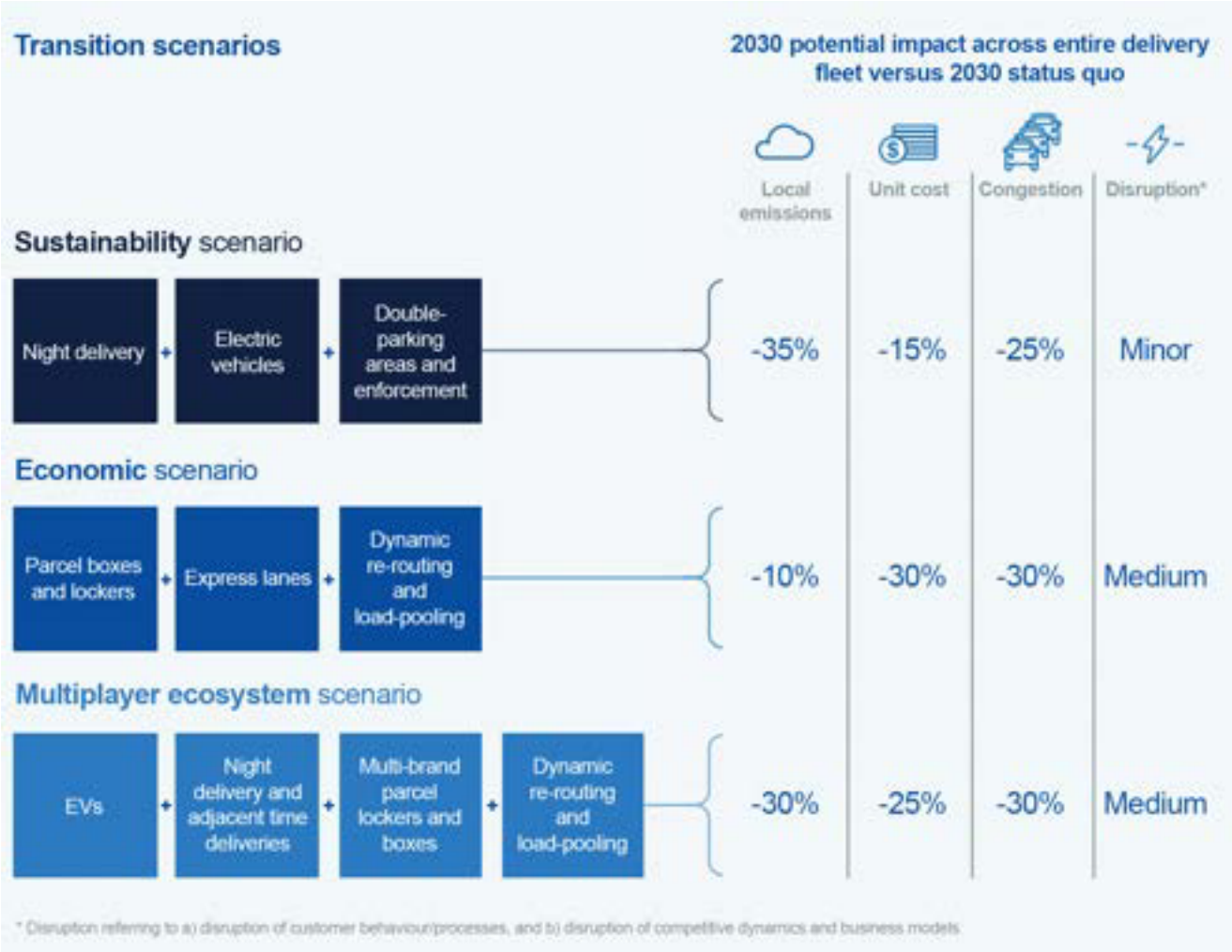


Figure 28 The future of the last mile ecosystem – scenario modelling undertaken by the World Economic Forum (WEF 2020, p.21)

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11. Glossary

30 minute city	A planning concept for a city in which people can easily access the places they need to visit on a daily basis within 30 minutes travel from where they live. In the Greater Sydney context the focus is on access to the nearest centre within 30 minutes by public transport, walking or cycling.
Accessibility (location)	Ability to access a place, building or precinct for the purposes of delivering and collecting goods and providing services.
Accessibility (Loading Dock)	The capacity to accommodate the required size and number of vehicles with ease of access.
Activation	The provision of improved features, facilities or services in a place to increase amenity.
Active transport	Transport that is human powered, such as walking or cycling.
Aerial mobility technology	The use of aerial technology such as drones for transport. They may be used to deliver emergency transport services, disaster responses or last mile freight deliveries.
Alternative fuels	Fuels derived from sources other than petroleum (e.g. petrol or diesel). Examples include ethanol, electricity, hydrogen, biodiesel and natural gas.
Alternative modes	Refers to modes that use fuels derived from sources other than petroleum (e.g. petrol or diesel), and includes walking and cycling.
AM peak	7am to 9am weekdays.
Amenity	The extent to which a place, experience or service is pleasant, attractive or comfortable. Improved features, facilities or services may contribute to increased amenity.
Automation	Use of control systems, such as computers, robots or artificial intelligence to undertake processes previously done by humans. Transport technology may be fully or partially automated, with the latter involving some form of human input to or management of the technology.
Business Improvement District	A framework in which a group of businesses within a defined geographic area pay a financial levy to procure shared services and contribute to community activities and programs for the district. In most jurisdictions, BID frameworks are established by legislation.
Business to business (B2B)	The sale and movement of goods between businesses for on-sale to customers.
Business to customer (B2C)	The sale and movement of goods directly from a business to the customer.
CBD	Commercial Business District. Examples used in the Last Mile Toolkit resources are Sydney City, North Sydney, Parramatta, Macquarie Park and Chatswood .
Central River City	One of the three cities of the Greater Sydney metropolis, anchored by Greater Parramatta in the Central City District.
Commercial vehicle	A type of private vehicle (not a public passenger vehicle) used for either delivery or service purposes.
Commercial building	Building primarily used for commercial activity such as business enterprise and office space
Congestion	Refers to traffic congestion on road networks resulting in longer trip times, slower speeds and increased vehicular queueing.
Congestion	When demand for a part of the transport network during a particular time nears its capacity, resulting in lower average speed, increased delay and unreliable journeys.
Connected and automated vehicle (CAV)	A connected vehicle is able to communicate wirelessly with other vehicles, infrastructure and/or devices. An automated vehicle has one or more element of the driving task that is automated and therefore does not require a human driver for at least part of the driving task. Levels of automation range from assisting the human driver with the driving task, through to fully and highly automated vehicles that can drive themselves. “Connected and automated vehicle” is widely used as a collective term to refer to the full range of different vehicles equipped with varying ranges and capabilities of connected and/or automated vehicle technologies.
Connected place	Refers to places between which goods transport infrastructure always people to move quickly and seamlessly.
Consolidation	The process of combining multiple smaller consignments into a single unit, either in the purchasing or the delivery of goods and services.

Corridor	A broad, linear geographic area between places.
Customer	Everyone who uses transport services or infrastructure is a customer of the NSW transport system. Whenever a person drives, travels by train, bus or light rail, or walks or cycles they become a customer of the transport system. TfNSW customers also use transport networks for business purposes, to deliver goods and services, and to move freight across the State and beyond.
Customer interface	The point at which transport services interact with their customers.
Customer outcomes	The economic, social and environmental benefits which customers can expect from the transport system. Used by planners to guide investment, policy and service provision.
Delivery and Servicing Plans (DSPs)	A formal and actionable plan for how a development or precinct will manage the freight and servicing task it generates in an efficient, sustainable and safe way.
Delivery vehicle	Vehicle used for the purpose of picking up or delivering goods.
Demand management	Systems, processes and activities that are aimed at efficiently allocating available capacity to meet demand including by influencing customers' choices about when, where and how they travel.
Derived demand	The demand for an intermediate good or service that is created as a result of demand for final goods or services.
Developer contributions	Where transport infrastructure is required, the associated development opportunities can be leveraged to contribute towards the costs for that infrastructure.
Development Application (DA)	A formal application for development that requires consent under the NSW Environmental Planning and Assessment Act 1979 (EP&A Act).
Development Control Plan (DCP)	A planning instrument under the EPA that sets out non-statutory guidance on objectives for land use and development standards.
Driverless Vehicles	Commonly referred to as a "self-driving vehicle" or "fully automated vehicle" is a vehicle with an automated system that can perform all driving tasks, under all conditions, that a human driver could perform.
Drones	A terrestrial or aerial vehicle that can be remotely controlled or can operate autonomously.
Dwell time	The length of time for which a vehicle is stationary (generally parked) at a given location.
Eastern Harbour City	One of the three cities of the Greater Sydney metropolis, anchored by the Harbour CBD in the Eastern City District.
E-bike	An electric bicycle, a standard pedal-powered bicycle with an electric motor built-in to assist the rider with additional propulsion.
eCommerce	Refers to the purchasing of consumer goods using online platforms rather than traditional "bricks and mortar" retailers.
Emissions	Chemicals in vehicle exhaust gases that are harmful to air quality, mainly carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NO).
Externality cost	A cost generated as a result of a market transaction which is borne by a party which is not a participant in the transaction.
First-mile and last-mile	A term applied to the first and final stage of the journey in which people or goods travel to a broad range of origins or destinations. An example of a last mile journey is the trip made between a train station and the final destination of a shopping centre or place of work.
Fleet	A collection of vehicles. This may describe all vehicles within NSW or the vehicles of an organisation transport company or service.
Freight	Goods or cargo transported by truck, light commercial vehicles (eg. vans and utes), cycle and walking couriers, rail, aircraft or ship.
Freight and servicing movements	Transport journeys from point of origin to the delivery location.
Freight and servicing vehicles	See commercial vehicle.

Freight as a Service	Similar to Mobility as a Service, this is a business model whereby on demand and ridesharing concepts formulate different procedures for the supply of goods to customers which is accessed through a single account and booking interface.
Global city	City that services and supports the complex and specialised economic activities of global markets.
Greater Parramatta	Greater Parramatta is at the core of the Central River City, encompassing Parramatta CBD, North Parramatta and Westmead, connected via Parramatta Park.
Greater Sydney	The 33 local government areas of Bayside, Blacktown, Blue Mountains, Burwood, Camden, Campbelltown, Canada Bay, Canterbury-Bankstown, Cumberland, Fairfield, Georges River, Hawkesbury, Hornsby, Hunters Hill, Inner West, Ku-ring-gai, Lane Cove, Liverpool, Mosman, Northern Beaches, North Sydney, Parramatta, Penrith, Randwick, Ryde, Strathfield, Sutherland, The City of Sydney, The Hills, Waverley, Willoughby, Wollondilly and Woollahra.
Greater Sydney Commission	An independent cross-governmental agency responsible for leading the metropolitan planning for the Greater Sydney Region.
Greenfield	A site which has not previously been used for development.
Hub and spoke	A transport network model that provides connections (spokes) to and from key centres (hubs). The spokes link to different hubs across an area, rather than focussing on one key hub.
Intelligent Transport System (ITS)	The application of computing, electronics, information technology and communications to solve transport problems. An example of an Intelligent Transport System is Cooperative Intelligent Transport Systems (CITS). CITS allow vehicles to communicate with other vehicles and infrastructure. They enable greater safety and can optimise the management of pedestrian movement and vehicle traffic.
Inter peak	The period between the AM peak and the PM peak.
Intermodal terminal	An intermodal terminal is an area of land used to transfer freight between at least two modes of transport. It is typically used to describe the transfer of international shipping containers from road to rail and vice versa.
Journey	For the purposes of this document, the term journey refers to the door-to-door movements of a customer through the transport system. A journey may include several sections, or trips, and use more than one mode of transport.
Kerbside	The lane or space on a public road adjacent to the kerb, often used for parking vehicles.
Kerbside management	Strategies to manage access to the kerbside.
Land use planning	The organisation of land, resources, facilities and services with a view to securing physical and economic efficiency, social inclusion, the protection of environmental values, amenity, and health and wellbeing outcomes for urban and rural communities.
Liveability	The term 'liveability' is used in land use planning to focus on quality of life within a given area considering social, economic and environmental factors. It encompasses the impact of the built environment on human health and community well-being.
Loading Dock Management Plan (LDMP)	A plan that provides guidance and outlines procedures and conditions for the operation of a loading dock to ensure safe and efficient movement of vehicles and personnel.
Loading facilities	Refers to facilities provided in a building or precinct to support the efficient movement of goods and services, and includes a loading dock.
Loading zone	An on-street parking zone defined under Rule 179 of the NSW Road Rules 2014, the primary purpose of which is to facilitate the loading and unloading of goods.
Local streets	Places that are part of the fabric of suburban neighbourhoods where we live our lives and facilitate local community access.
Logistics facility	A storage and distribution facility used in the provision of logistics services.
Metro	An urban railway transportation system that is associated with high capacity, high frequencies (typically turn-up-and-go, rather than timetabled) and greater automation.

Micro-hub	A small transport hub typically in an urban centre used to facilitate last mile deliveries (and pick-ups).
Micro-mobility	Refers to transport solutions that utilise smaller, lighter vehicles, such as bikes, to address last mile network congestion issues.
Mode	The type of vehicle or method used for a trip. For example train, bus, light rail, car, motorbike, bicycle, ferry or walking.
Mode share	The proportion of overall trips that are taken on a particular mode.
Motorways	Strategically significant, multi-lane roads that move people and goods rapidly over long distances.
Movement	The movement of people and goods on the transport network.
Movement and Place Framework	A framework for planning, designing and operating our road network based on a 'one road network' approach. It considers how different parts of the network perform different functions – moving people and goods and being places for people, particularly in centres.
Movement corridors	Places that provide safe, reliable and efficient movement of people and goods between regions and strategic centres.
Net-zero	The aspirational greenhouse gas emission level which the NSW Government has targeted to achieve by the year 2050. 'Net' means emissions, less capture and storage. 'Net-zero' means that no emissions occur at all or that any emissions that do occur must be captured and stored.
NSW Long Term Transport Master Plan	NSW's first integrated transport plan, which brought together planning for freight and passenger movements across all modes of transport. Future Transport 2056 builds upon the 2012 Long Term Transport Master Plan and the commitments it has delivered.
Off-street	Refers to facilities for the parking of vehicles that are not located on a public road, such as loading docks.
On demand	Transport services that are response to the demands of individual customer, rather than a fixed schedule.
On-street	Refers to the provision of space at the kerb of a public road for the parking of vehicles.
Pick up and delivery (PUD)	Traditional logistics model in which companies typically pick up items in one movement and deliver them in another, with goods moved via a sorting facility.
Place Plan	Plan to deliver an integrated transport network to improve access to/from/within key places or centres by all modes across regional NSW. It is the application of the Movement and Place Framework to improve the function of transport corridors to enhance the amenity of places. It will include the development of an active transport network, identifying the missing links and initiatives for behaviour change to support more sustainable travel options. Place plans will also include travel demand management policies and tools to support travel such as car sharing and to assist workers and employers better manage travel demand.
Placemaking	Refers to the development and management of the built environment to influence the character or experience of places. Successful placemaking either preserves or enhances the character of our public spaces, making them more accessible, attractive, comfortable and safe.
Places for people	Streets with a high demand for activities and lower levels of vehicle movement. They create places people enjoy, attract visitors and are places communities value.
PM peak	4pm to 630pm weekdays.
Point-to-point	Transport services that go directly from a passenger's origin to their destination. Outside of the private car, taxis and ridesharing services (Uber, Lyft) are the most common point to point transport modes. Also refers to the movement of goods directly from the point of sale to the customer, rather than via a warehouse or sorting facility.

Precinct	A geographical area with boundaries determined by land use. For example, an area where there is an agglomeration of warehouses may be termed a freight precinct.
Private vehicles	Passenger vehicles, motorcycles and trucks, owned and operated by those with a driving license and appropriate registration. Private vehicles includes both those registered for private use as well as those used for commercial use, excluding public passenger vehicles.
Residential building	A building with the primary purpose of housing people.
Resilience	The ability of infrastructure systems and services to withstand unexpected climate, weather and catastrophic events.
Ridesharing	Business models similar to Uber and Lyft which provide point-to-point transport services in private vehicles.
Safe system approach	Planning services and designing infrastructure to integrate with human behaviour to prevent trauma. A safe system approach aims to improve the safety of all parts of the system, so that if one part fails, the other parts will protect people from being killed or seriously injured.
Self sufficient buildings	Buildings that provide a loading dock and other facilities for all freight and servicing activities to be conducted on site rather than on the street.
Service vehicle	Vehicle used in the provision of a trade or service.
Serviceability	The ease with which goods and services can be delivered to a building or precinct, waste removed and amenity maintained.
Supply chain	Refers to the movement of goods and their component parts from the points of production through to the final customer.
Third party logistics provider (3PL)	A company that offers additional outsourced logistics services to the market in addition to traditional pick up and delivery activities. These services may include warehousing, inventory management and IT systems.
Three cities of Greater Sydney	The three cities envisaged by the Greater Sydney Commission are the established Eastern Harbour City, the developing Central River City and emerging Western Parkland City in and around the new airport. Each of these three cities will have their own unique identity and each must be planned to maximise liveability, productivity and sustainability.
Trade gateways	Trade gateways are locations with major ports or airports, and their surrounding precincts. They perform an essential and ongoing role to connect Sydney with locations across Australia and the world. Trade gateways are vital to NSW's prosperity and often support large concentrations of complementary business activity and employment.
Traffic Impact Assessment (TIA)	A document accompanying a development proposal that quantifies the impact of a proposed development on traffic and the transport network.
Transhipment	The passing of goods through an intermediary handling facility.
Transport for NSW	The statutory authority of the New South Wales Government responsible for managing transport services in New South Wales.
Triple bottom line	Refers to economic, social and environmental factors.
Urban centres	Locations with high density concentrations of commercial, retail and/or residential land uses.
Urban freight/logistics	The movement of goods and service to and from commercial, retail and residential centres in urban areas.
Urban renewal	A planned approach to the improvement and rehabilitation of city areas with new infrastructure, improved services and renovation or reconstruction of housing and public works.
Vibrant streets/places	Places that have a high demand for movement as well as place with a need to balance different demands within available road space.
Whole-of-life costs	The total cost of a particular item or service, from initial conceptualisation through to disposal.

Freight and Servicing Last Mile Toolkit
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