



PERFORMANCE AUDIT

30 APRIL 2020

Train station crowding

NEW SOUTH WALES AUDITOR-GENERAL'S REPORT

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In accordance with section 38E of the *Public Finance and Audit Act 1983*, I present a report titled '**Train station crowding**'.

A handwritten signature in black ink, appearing to read 'Margaret Crawford'.

Margaret Crawford
Auditor-General
30 April 2020

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Section one

Train station crowding

Executive summary

Sydney Trains patronage has increased by close to 34 per cent over the last five years, and Transport for NSW (TfNSW) expects the growth in patronage to continue over the next 30 years. As patronage increases there are more passengers entering and exiting stations, moving within stations to change services, and waiting on platforms. As a result, some Sydney metropolitan train stations are becoming increasingly crowded.

There are three main causes of station crowding:

- patronage growth exceeding the current capacity limits of the rail network
- service disruptions
- special events.

Crowds can inhibit movement, cause discomfort and can lead to increased health and safety risks to customers. In the context of a train service, unmanaged crowds can affect service operation as trains spend longer at platforms waiting for customers to alight and board services which can cause service delays. Crowding can also prevent customers from accessing services.

Our 2017 performance audit, 'Passenger Rail Punctuality', found that rail agencies would find it hard to maintain train punctuality after 2019 unless they significantly increased the capacity of the network to carry trains and people. TfNSW and Sydney Trains have plans to improve the network to move more passengers. These plans are set out in strategies such as More Trains, More Services and in the continued implementation of new infrastructure such as the Sydney Metro. Since 2017, TfNSW and Sydney Trains have introduced 1,500 more weekly services to increase capacity. Additional network capacity improvements are in progress for delivery from 2022 onwards.

In the meantime, TfNSW and Sydney Trains need to use other ways of managing crowding at train stations until increased capacity comes on line.

This audit examined how effectively TfNSW and Sydney Trains are managing crowding at selected metropolitan train stations in the short and medium term. In doing so, the audit examined how TfNSW and Sydney Trains know whether there is a crowding problem at stations and how they manage that crowding.

TfNSW is the lead agency for transport in NSW. TfNSW is responsible for setting the standard working timetable that Sydney Trains must implement. Sydney Trains is responsible for operating and maintaining the Sydney metropolitan heavy rail passenger service. This includes operating, staffing and maintaining most metropolitan stations. Sydney Trains' overall responsibility is to run a safe rail network to timetable.

Conclusion

Sydney Trains has identified platform crowding as a key strategic risk, but does not have an overarching strategy to manage crowding in the short to medium term. TfNSW and Sydney Trains devolve responsibility for managing crowding at stations to Customer Area Managers, but do not have sufficient oversight to know if crowding is being effectively managed. TfNSW is delivering a program to influence demand for transport in key precincts but the effectiveness of this program and its impact on station crowding is unclear as Transport for NSW has not evaluated the outcomes of the program.

TfNSW and Sydney Trains do not directly measure or collect data on station crowding. Data and observation on dwell time, which is the time a train waits at a platform for customers to get on and off trains, inform the development of operational approaches to manage crowding at stations. Sydney Trains has KPIs on reliability, punctuality and customer experience and use these to indirectly assess the impact of station crowding. TfNSW and Sydney Trains only formally assess station crowding as part of planning for major projects, developments or events.

Sydney Trains devolve responsibility for crowd management to Customer Area Managers, who rely on frontline Sydney Trains staff to understand how crowding affects individual stations. Station staff at identified key metropolitan train stations have developed customer management plans (also known as crowd management plans). However, Sydney Trains does not have policies to support the creation, monitoring and evaluation of these plans and does not systematically collect data on when station staff activate crowding interventions under these plans.

Sydney Trains stated focus is on providing a safe and reliable rail service. As such, management of station crowding is a by-product of its strategies to manage customer safety and ensure on-time running of services. Sydney Trains' operational response to crowding involves restricting customer access to platforms or stations before crowding reaches unsafe levels, or when it impacts on-time running. As rail patronage increases, it is likely that Sydney Trains will need to increase its use of interventions to manage crowding. As Sydney Trains restrict more customers from accessing platforms or station entries, it is likely these customers will experience delays caused by these interventions.

Since 2015, TfNSW has been delivering the 'Travel Choices' program which aims to influence customer behaviour and to manage the demand for public transport services in key precincts. TfNSW is unable to provide data demonstrating the overall effectiveness of this program and the impact the program has on distributing public transport usage out of peak AM and PM times. TfNSW and Sydney Trains continue to explore initiatives to specifically address crowd management.

1. Key findings

Sydney Trains has identified crowding on platforms as a key strategic risk but does not have a specific strategy to manage crowding

Sydney Trains has identified overcrowding on platforms as a high rated strategic risk. Sydney Trains risk rating acknowledges that overcrowding can impact the safety and health of staff and customers by causing illness, injuries or fatalities. Sydney Trains has developed some mitigating controls to manage the risks of crowding such as restricting access to platforms or station entries but does not have an overarching strategy to manage crowding.

Sydney Trains response to crowding is to restrict customers from accessing platforms or stations which will likely result in deteriorating satisfaction and increased travel times for those customers directly affected

Sydney Trains operational approach to manage crowding is to restrict access to platforms or station entries before crowding reaches unsafe levels or when it impacts on-time running. We found that these actions are a regular and direct response to expected patterns of crowding at busy metropolitan stations like Wynyard and Town Hall. However, restricting customers access to platforms or stations entries is not a sustainable approach to manage station crowding. As rail patronage increases, it is likely that Sydney Trains will increase its use of interventions to manage crowding. As Sydney Trains restrict more customers from accessing platforms or station entries, it is likely these customers will experience delays caused by these interventions. Increased delays are likely to result in a decrease in customer satisfaction for those customers directly affected and increased crowding. Sydney Trains customer satisfaction data shows an overall increase in customer satisfaction between 2014 to 2019.

Sydney Trains does not directly assess the effect of its management of station crowding on customer experience and travel times

TfNSW and Sydney Trains advise they will continue using existing approaches to manage station crowding before the delivery of network capacity increases. However, Sydney Trains does not directly assess the effect of these actions on passengers. Sydney Trains' Customer Experience Management Program, a customer survey, asks questions about comfort at stations which is used as an indicator of crowding. Sydney Trains customer delay metrics do not account for the time that passengers might wait before reaching the platform. As such, Sydney Trains may not have a full picture of the customer's experience of crowding.

Sydney Trains devolves responsibility for the management of station crowding to local station managers but does not have sufficient oversight of crowd management plans at stations

Sydney Trains' Customer Area Managers (CAMs) lead a group of front line station teams. CAMs are accountable for performance at their stations including dwell time management. Sydney Trains expects CAMs to understand local conditions that affect the day-to-day operation of the stations for which they are responsible. At the stations we visited, we observed that CAMs and their staff could describe patterns of customer behaviour over the course of the day.

Identified busy stations on the network have developed Crowd Management Plans (CMPs). Stations currently with CMPs are Central, North Sydney, Parramatta, Redfern, Strathfield, Town Hall, Wynyard, Chatswood, Epping and St Leonards stations. The objective of CMPs is to establish crowding interventions to minimise the risk of injury and to keep rail services running to timetable.

Sydney Trains does not have a policy or directive that requires Customer Area Managers to draft these plans, nor anything that sets out what such a plan should contain. There is considerable variation in CMPs. Sydney Trains advises that this is partly due to variations and complexity in station environments. Sydney Trains does not have a centralised view or collect data on how often crowding interventions occur; and whether they are increasingly prevalent and at what times.

Sydney Trains does not directly measure crowding at stations

Sydney Trains does not directly measure crowding but uses other operational data on dwell time to assess the impact of crowding. Sydney Trains has an operational focus on managing dwell times - which is the time that trains wait at platforms for passengers to get on or off trains. Sydney Trains uses dwell time information to identify where crowding is impacting on-time running or creating risks to customer safety. Sydney Trains is trialling the use of CCTV and cellular signal detection at Wynyard and Redfern stations to identify and monitor crowding in real time.

Sydney Trains does not have key performance indicators (KPIs) directly related to the management of crowding. Crowding at stations impacts KPIs for train punctuality, reliability and customer satisfaction. Reliability means that trains run to timetable and passengers get to their destination without unnecessary delay. Sydney Trains reports annually on these KPIs.

Airport Link is responsible for the management of crowding at stations on the airport line, however the procedures it uses are limited in comparison to Sydney Trains' customer management plans

The Airport Link Company (Airport Link), a privately-run business, is responsible for the operation of four stations on the T8 line. These stations are Domestic Airport, International Airport, Mascot and Green Square. Airport Link is responsible for developing and following a Station Operation Manual which details procedures for the operation and management of stations, which includes station crowding. In response to increasing patronage at Airport Line stations, Sydney Trains has deployed FastTrack teams to manage dwell time on some platforms at Airport Link stations during peak periods.

For day to day operations, Airport Link uses an operational checklist to manage routine crowding at Green Square and Mascot stations particularly during peak times. Airport Link's Incident and Emergency Manual describes the roles and responsibilities for managing crowd congestion during service disruption, but these procedures are not station specific and contain limited detail compared to CMPs developed for other stations.

For example, CMPs developed for other stations contain clear objectives, provide information on the number of customers entering and exiting a station in peak periods and contain diagrams to show how station staff position themselves to manage customer flow or crowding. Crowding procedures for Airport Link stations only cover the management of crowding at the platform level, and do not consider station concourses or surrounding areas. Sydney Trains does not regularly collect data on how often Airport Link uses crowd management procedures at Airport Link stations.

TfNSW and Sydney Trains consider crowding when planning for major projects or developments

Sydney Trains and TfNSW collect data and conduct modelling on station crowding when planning for significant infrastructure or network capacity projects such as the Sydney Metro project and More Trains, More Services enhancements. Approaching 2024, pedestrian modelling commissioned by Sydney Trains and TfNSW shows that Town Hall and Redfern stations will come under increasing pressure during normal operations. TfNSW consults with Sydney Trains when development is likely to affect the heavy rail network and maintains a record of development around precincts to assist with future transport planning over the short to long term.

Sydney Trains does not have a routine process for identifying whether crowding contributed to minor safety incidents

Under the Rail Safety National Law (NSW) 2012, Sydney Trains must have a safety management system. The safety management system must identify safety risks, provide a systematic assessment of those risks and specify controls used to manage and monitor those risks.

Sydney Trains does not routinely prompt staff to consider whether crowding is a contributing factor when reporting safety incidents or near misses. As a result, Sydney Trains may not always identify locations where crowd management practices are not sufficiently managing the risk to customers or staff. This risk intensifies as Sydney Trains expects patronage, and therefore crowding, to increase in the short to medium term.

Sydney Trains advises that it investigates all serious safety incidents which includes determining contributing factors such as crowding. Sydney Trains staff who record safety incidents will refer to crowding as a cause of an incident if they deem crowding was the direct cause. Sydney Trains advised that it follows the requirements of the Office of the National Rail Safety Regulator to report safety data.

Between January 2016 and October 2019, there were 9,097 customer incidents, of various severity recorded across the network. Sydney Trains reported that crowding at a station was the cause of 31 of these incidents, with 14 of these resulting in an injury.

TfNSW is delivering a program to influence transport demand in key precincts, but the overall impact of this program on crowding is not clear

TfNSW and Sydney Trains acknowledge that crowding will increasingly become part of the experience of travel on the Sydney rail network. Since 2015, TfNSW and Sydney Trains have been delivering the 'Travel Choices' program to manage the demand for public transport services in key precincts such as Sydney CBD and Macquarie Park. Some of the aims of the program are to help distribute public transport usage out of peak AM and PM periods and to reduce private vehicle use in peak AM and PM periods by offering alternative travel choices. TfNSW is unable to provide data to demonstrate the overall impact this program has on managing station crowding, distributing travel out of peak periods and changing customer behaviours, as it has not evaluated it.

While not directly related to station crowding, TfNSW has also invested \$170 million on a 'Wayfinding' program that involves the roll out of uniform visual signs across all modes of transport. Effective wayfinding is intended to improve the customer experience and improve the flow of customers moving through a train station and reduce travel time. TfNSW has not conducted an evaluation of the Wayfinding program and the overall impact of the program on customer journey time or crowding is unclear at this time.

TfNSW and Sydney Trains have trialled and evaluated other interventions aimed at influencing customer behaviour, but these interventions are not yet in widespread use across the network.

2. Recommendations

By December 2020, Sydney Trains should:

1. systematically collect information on the use of crowd management interventions at stations and assess the impact of these interventions
2. enhance existing procedures to require staff to make an assessment on whether crowding was a contributing factor in safety incidents and near-misses and code these incidents for crowding
3. develop a policy for customer management plans. The policy should include:
 - a process for identifying stations requiring a customer management plan
 - essential elements of a customer management plan
 - requirements for the review and approval of customer management plans
 - the requirement to centrally store all customer management plans.

By December 2020, Transport for NSW should:

4. evaluate Travel Choices to determine the overall impact the program has on distributing public transport use out of peak AM and PM periods and its impact on station crowding
5. evaluate the Wayfinding strategy to determine the impact of the program and to identify any lessons learnt for future wayfinding strategies.

By December 2020, Transport for NSW and Sydney Trains should:

6. develop a direct performance measure for station crowding and collect data to measure performance
7. work with the Airport Link Company to develop a more comprehensive crowd management strategy for Airport Link Stations that includes:
 - a crowd management plan for each station, with clearly described roles and responsibilities
 - a service level indicator or KPI relating to station crowding at Airport Link Stations.

1. Introduction

1.1 Background

Station crowding refers to the concentration of people in a train station. The station includes the platforms and station concourse areas. Station crowding is distinct from crowding in train carriages. Crowds can inhibit movement (including alighting and boarding of carriages), cause discomfort and lead to increased health and safety risks to customers. In the context of a train service, crowding can cause delays to train services or prevent customers from accessing these services.

Major work on station infrastructure to relieve crowding is expensive and often challenging due to heritage and other physical constraints. TfNSW and Sydney Trains are working to deliver network capacity improvements, intended to increase the capacity of the network to move more passengers (such as More Trains, More Services and the Sydney Metro). However, network capacity improvements are long term solutions and don't address crowding at train stations in the short and medium-term.

Exhibit 1: Crowding at a Sydney train station



Source: Sydney Trains.

TfNSW and Sydney Trains

TfNSW is the lead agency for transport in NSW. TfNSW is responsible for:

- establishing the long term strategic direction for transport in NSW
- developing and managing whole of transport strategies
- identifying and planning infrastructure upgrades
- setting the standard working timetable that Sydney Trains must implement.

Sydney Trains is responsible for operating and maintaining the Sydney metropolitan heavy rail passenger service. This includes:

- operating, staffing and maintaining most metropolitan stations
- maintaining large sections of train track and track signalling infrastructure
- maintaining most rolling stock
- train crewing.

Sydney Trains' overall responsibility is to run a safe rail network to timetable.

See Appendix two for a diagram of the Sydney rail network.

The relationship between Sydney Trains and TfNSW is formalised in the 2013 Rail Services Contract. TfNSW sets Sydney Train's performance targets and service standards outlined in the Rail Services Contract. See Appendix three for a high-level summary of the Rail Services Contract and the key performance indicators.

The Airport Link Company (Airport Link), a privately-run business, is responsible for the operation of four stations on the T8 line. These stations are Domestic Airport, International Airport, Mascot and Green Square. RailCorp, the NSW Government entity that holds rail property assets, maintains the contract with Airport Link.

1.2 Crowding

There are three main causes of station crowding

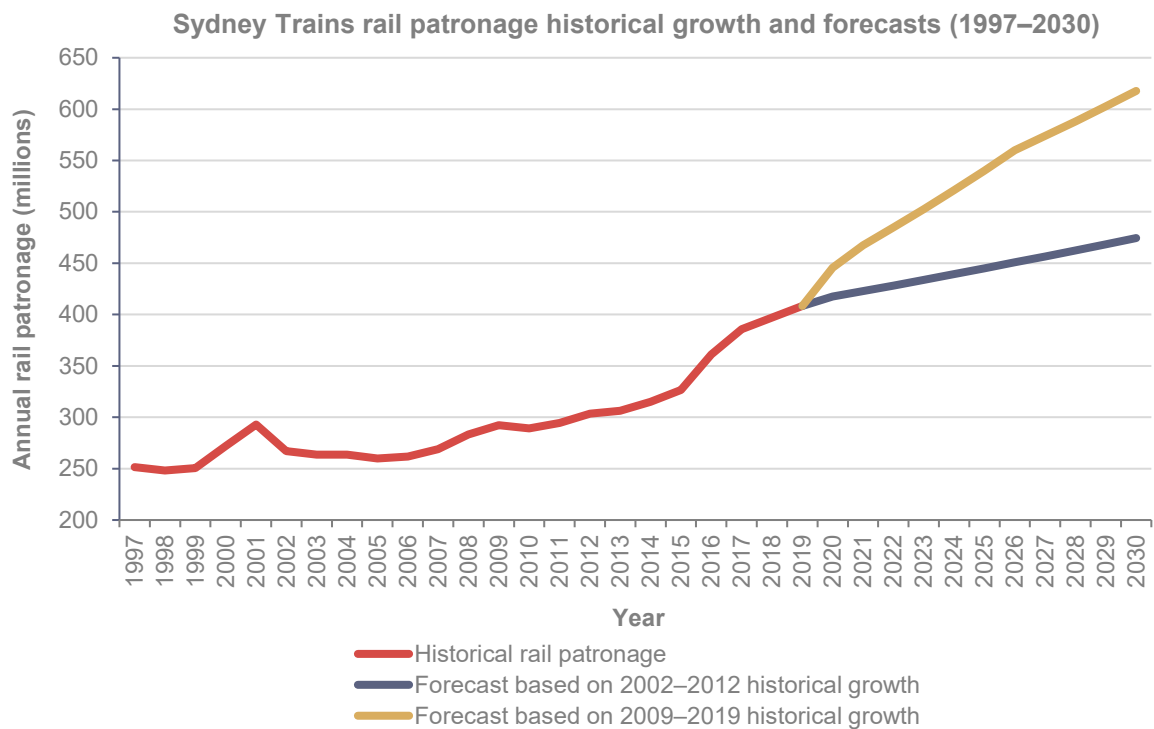
Growth in patronage

Growing customer demand is a cause of station crowding. In the five years to 2019, Sydney Trains reported a 34 per cent increase in patronage. Sydney Trains and TfNSW expect that patronage growth will continue to grow over the next 30 years.

TfNSW predicts that by 2056 there will be more than ten million people in the Sydney greater metropolitan area. There will be an increasing number of customers travelling on trains, particularly during the weekday AM and PM peak.

As patronage increases there will be more passengers entering and exiting stations, moving within stations to change services and waiting on platforms. As a result, train stations will become increasingly crowded. Exhibit 2 demonstrates the growth in Sydney Trains patronage, alongside growth forecasts.

Exhibit 2: Rail patronage growth and forecasts



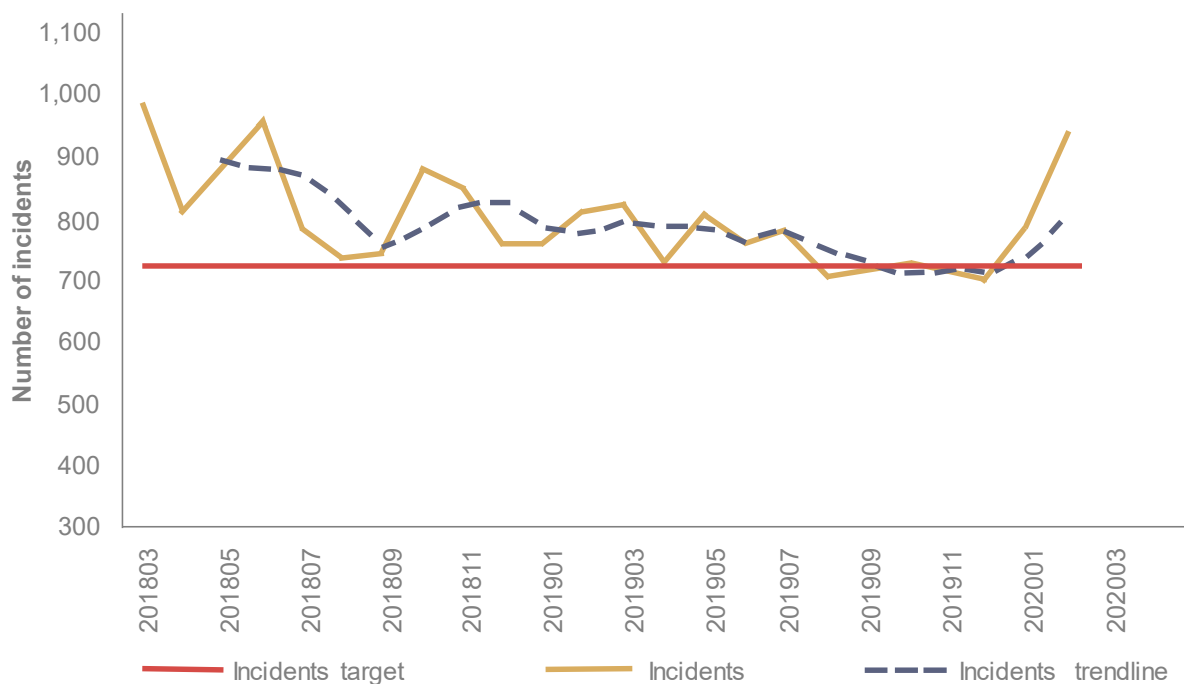
Source: Transport for NSW.

Service disruptions

Disruptions to services can cause station crowding. Service disruptions involve delays and cancellations of trains and can occur for many reasons such as signalling failures. Crowding can occur when services are delayed or cancelled as there are additional customers waiting to board trains.

Sydney Trains reports monthly to its Board on its performance including service disruptions. Exhibit 3 shows the number of monthly service incidents which caused delays from March 2018 to February 2020. Sydney Trains advised that the number of service incidents was stable over the last year. However, in February 2020, Sydney Trains recorded an increase in the number of incidents which it attributes to extreme weather. The number of service incidents (932) in February 2020 represented a 19 per cent increase in incidents from January 2020. The length of delays caused by these incidents has fluctuated.

Exhibit 3: Monthly service incidents causing delays on the Sydney Trains network - March 2018 to February 2020



Source: Sydney Trains 2020 unaudited data.

Crowding can also be a contributing factor leading to service disruptions. In February 2020, Sydney Trains attributed eight per cent of all train delay minutes to incidents within its Customer Service Division. This includes incidents with boarding or alighting trains. Alongside crowding, incidents with boarding and alighting trains can be caused by slow boarding due to wet weather or customers falling over. Sydney Trains acknowledges that boarding and alighting continues to be an area of improvement and focus.

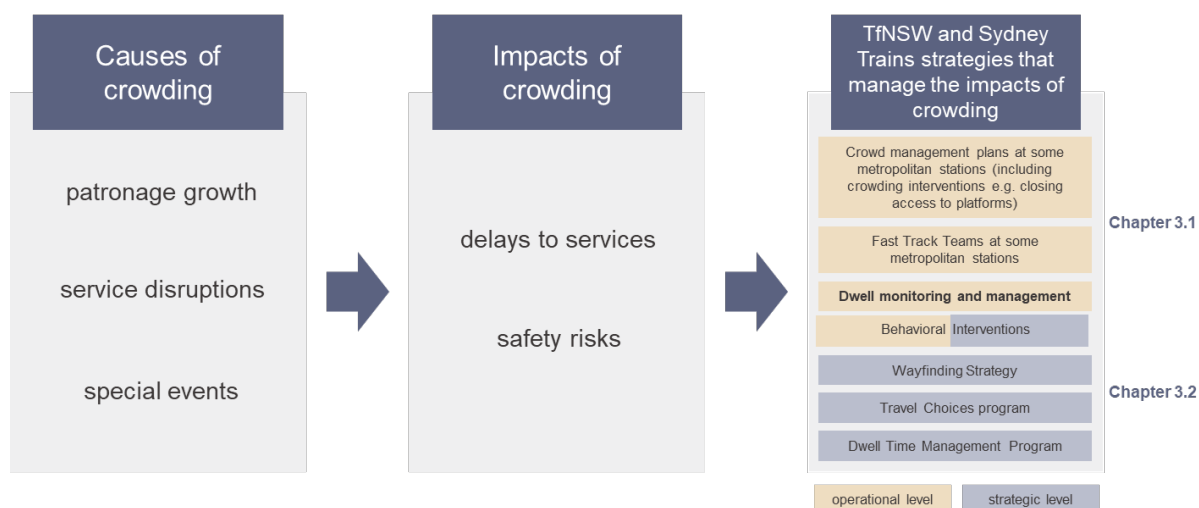
Special events

Special events in the Sydney metropolitan area can also cause station crowding. For example, major sporting or entertainment events in Homebush creates crowding at Sydney Olympic Park train station and major interchange stations such as Lidcombe and Central.

1.3 Management of crowding

TfNSW and Sydney Trains focus is on providing a safe and reliable service. Their management of crowding is a by-product of their management of safety and on-time running. Exhibit 4 shows the strategies TfNSW and Sydney Trains use to manage the impacts of crowding.

Exhibit 4: TfNSW and Sydney Trains strategies that manage the impacts of crowding



Source: Audit Office analysis.

1.4 About the audit

This audit examined how effectively TfNSW and Sydney Trains manage crowding at selected metropolitan train stations in the short and medium term. In doing so, this audit examined how TfNSW and Sydney Trains know whether there is a crowding problem at individual stations and how TfNSW and Sydney Trains act to manage that crowding.

Stations in scope for this audit included:

- Central
- Chatswood
- Green Square
- North Sydney
- Parramatta
- Redfern
- Town Hall
- Wynyard.

This audit looked at station crowding at Sydney metropolitan heavy rail stations which does not include Sydney Metro stations. The Sydney Metro is a public transport project which involves the delivery of new metro railway stations. Long-term strategies to manage crowding were out of scope for this audit. Long-term strategies include major signalling infrastructure upgrades and new services such as the next stage of the Sydney Metro.

Lessons from previous audits

Our 2017 performance audit, 'Passenger Rail Punctuality', found that rail agencies would find it hard to maintain train punctuality after 2019 unless they significantly increased the capacity of the network to carry trains and people. The report found that there was a significant risk that rail agencies would not make investments soon enough to handle future patronage levels. The report made six recommendations including that TfNSW provide business cases for Cabinet consideration as soon as possible for programs to address rail patronage growth over the next five to ten years (from 2017 to 2027).

We note that TfNSW and Sydney Trains are now investing in long term network capacity improvements. These network capacity improvements will not be available until 2022 and this audit does not seek to assess the likely effectiveness of these investments.

2. Measuring and understanding crowding at train stations

Conclusion

TfNSW and Sydney Trains do not directly measure or collect data on station crowding. There are no key performance indicators directly related to station crowding. Sydney Trains uses performance indicators on reliability, punctuality and customer experience to indirectly assess the impact of station crowding. Sydney Trains does not have a routine process for identifying whether crowding contributed to minor safety incidents. TfNSW and Sydney Trains formally assess station crowding as part of planning for major projects, developments or events.

2.1 Measuring the impact of crowding

TfNSW and Sydney Trains do not have a performance measure for crowding at stations

The Rail Services Contract includes key performance indicators for punctuality, reliability and customer satisfaction. Reliability measures whether trains run to timetable and passengers get to their destination without unnecessary delay. There are no KPIs directly related to the management of crowding. However, station crowding can impact punctuality and reliability measures as crowding can cause dwell times to rise and prevent customers from reaching their service. Crowding may impact the customer satisfaction measure as it can be a cause of customer dissatisfaction. In 2018–19, Sydney Trains achieved its KPI for customer satisfaction but it did not meet its headline KPIs for train punctuality and reliability.

See Appendix three for a summary of Sydney Trains KPIs relevant to station crowding.

Sydney Trains does not directly measure crowding at stations

Sydney Trains does not directly measure station crowding and uses other operational data to assess the impact of crowding. Sydney Trains has an operational focus on managing dwell times - which is the time that trains wait at platforms for passengers to get on or off trains. Crowding can prevent Sydney Trains from achieving dwell time targets, especially at busy stations.

Currently, the maximum number of trains Sydney Trains can operate on some, but not all, lines is 20 trains per hour. Trains only run at this frequency during peak AM and PM periods. If average dwell time during a peak period is overrun by ten seconds, then Sydney Trains can only run at 19 trains per hour and risks having to cancel a service to keep the network operating.

Sydney Trains is trialling the use of CCTV and cellular signal detection to identify and monitor crowding in certain locations with a view to better manage dwell time. This followed an earlier trial of a WIFI detection technology at Redfern station that tested whether this technology could provide accurate data on how customers interchange between platforms, how long they take and which sections of the platforms are the busiest.

Crowding has increased in importance to rail passengers

Sydney Trains runs a passenger survey, the Customer Experience Management Program (CXMP), which acts as a lead indicator for the biannual Transport-wide customer survey, the Customer Satisfaction Index. The CXMP, like the Customer Satisfaction Index, asks questions about comfort at stations.

Between 2017 and 2019, data from the CXMP indicates that comfort has increased in importance for passengers. Sydney Trains' analysis of passenger verbatim comments on the CXMP survey records that 'overcrowding and lack of seats on trains and stations' is the dominant reason for dissatisfaction with comfort. However, the Sydney Trains analysis attributes this in part to improvements in hygiene factors such as station cleanliness and station facilities. Between 2014 to 2019, Sydney Trains Customer Satisfaction Index showed an overall increase in customer satisfaction.

Sydney Trains does not have a routine process for identifying whether crowding contributed to minor safety incidents

Under the Rail Safety National Law (NSW) 2012, Sydney Trains must have a safety management system. The safety management system must identify safety risks, provide a systematic assessment of those risks and specify controls used to manage and monitor those risks. Sydney Trains has identified overcrowding at platforms as a key strategic risk.

Sydney Trains does not have a routine process to identify whether crowding contributed to an incident at the time a staff member records an incident. Sydney Trains advises that it investigates all serious safety incidents which includes a determination of contributing factors such as crowding. Sydney Trains staff who record safety incidents will refer to crowding as a cause of an incident if they deem crowding was the direct cause. Sydney Trains advises that it follows the requirements of the regulator to report safety data.

Between January 2016 and October 2019, there were 9,097 customer incidents, including NSW Trains and the Airport line, of various severity recorded across the network. Thirty-four incidents were reported within the incident description to have been caused by crowding in that time. Of those 34 incidents, 31 occurred on the station itself. The remaining three occurred on trains. There were 14 reported incidents involving crowding that resulted in an injury during this period.

As Sydney Trains does not routinely prompt staff to consider whether crowding is a contributing factor to incidents, or near misses, Sydney Trains may be at risk of not identifying locations where crowd management practices are not sufficiently managing the risk to customers or staff. This risk intensifies as Sydney Trains expects patronage, and therefore crowding, to increase in the short to medium term.

2.2 Understanding, and planning for, crowding

TfNSW and Sydney Trains formally address crowding as part of major infrastructure, network capacity upgrades and new timetables

Both Sydney Trains and TfNSW collect data and conduct modelling on station crowding when planning for significant infrastructure or network capacity projects such as:

- the Sydney Metro project
- More Trains, More Services enhancements
- major timetable changes occurring every few years
- other major infrastructure projects including large station enhancements and precinct development.

TfNSW and Sydney Trains use patronage models to identify stations that are most likely to be affected by major changes.

Approaching 2024, pedestrian modelling commissioned by Sydney Trains and TfNSW shows that Town Hall and Redfern stations will come under increasing pressure during normal operations. TfNSW and Sydney Trains do not expect to deliver network capacity upgrades to relieve pressure on these stations until 2022. If service delays occur at Town Hall and Redfern stations in 2022, without intervention by Sydney Trains, models show that customers will experience highly uncomfortable conditions and severely restricted movement.

Further information on pedestrian modelling is presented in Appendix four.

TfNSW and Sydney Trains have a collaborative approach when planning for developments that will increase station demand

TfNSW is responsible for coordinating with planning agencies its consideration of development applications and precinct plans. Where this affects the heavy rail network, TfNSW consults Sydney Trains. Exhibit 5 provides an example of work done by TfNSW and Sydney Trains to plan for increased customers at Redfern station following a major development of an office building near Redfern.

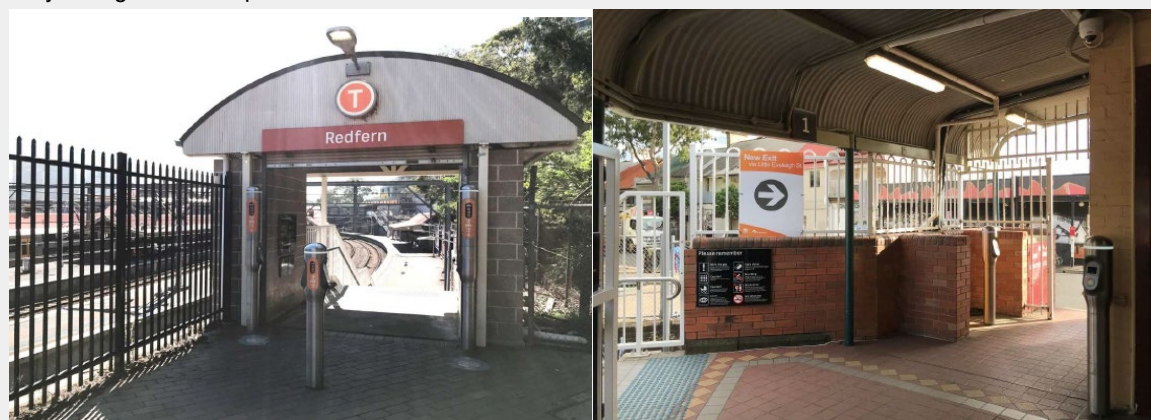
Exhibit 5: Planning for increased customers at Redfern station

In 2019, Commonwealth Bank of Australia (CBA) began relocating staff to South Eveleigh (formerly known as Australian Technology Park). CBA expects to move around 10,000 CBA employees to South Eveleigh over a two-year period from 2019 to 2020.

Sydney Trains determined it was necessary to implement mitigation measures to cope with the increase in patronage at Redfern Station. In response, it developed a Crowd Management Plan (CMP) for the AM and PM peak periods. The CMP details how staff manage customers while on platforms, use of barricades to guide customer movement or prevent access to platforms and configuration of opal gate lines. It also commissioned pedestrian modelling to highlight pinch points on platforms.

In addition to the CMP, Sydney Trains and TfNSW conducted minor building works including the installation of additional opal card readers on the Platform 10 and Little Eveleigh Street entrances/exits to ease congestion on the stairs and concourse. Sydney Trains installed temporary wayfinding signs to direct customers to South Eveleigh. In addition, during peak AM and PM travel periods, Sydney Trains use announcements to direct customers traveling to South Eveleigh to exit the station via Platform 10.

Wayfinding and new opal readers at Redfern Station.



Source: Sydney Trains and Transport for NSW 2019.

TfNSW maintains a record of development around precincts to assist with future transport planning over the short to long term. The audit team has observed examples of this planning for the Sydney Central Business District, Macquarie Park and Parramatta. TfNSW used this information to inform the rollout of the Travel Choices program. Section 3.2 of this report covers the Travel Choices program is covered in more detail.

3. Strategies to manage station crowding in the short and medium term

Conclusion

Sydney Trains has identified platform crowding as a strategic risk but does not have an overarching strategy to manage station crowding. Sydney Trains' stated focus is on providing a safe and reliable rail service. As such, management of station crowding is a by-product of its strategies to manage customer safety and ensure on-time running of services.

Sydney Trains devolve responsibility for managing crowding at stations to Customer Area Managers but does not have sufficient oversight to know that station crowding is effectively managed. Sydney Trains does not have policies to support the creation, monitoring or evaluation of crowd management plans at key metropolitan train stations. The use of crowding interventions is likely to increase due to increasing patronage, causing more customers to experience delays directly caused by these activities.

TfNSW and Sydney Trains have developed interventions to influence customer behaviour and to manage the demand for public transport services but are yet to evaluate these interventions. As such, their impact on managing station crowding is unclear.

3.1 Crowd management strategies

Sydney Trains has identified crowding at platforms as a key strategic risk but does not have an overarching strategy to manage crowding

Sydney Trains has identified overcrowding on platforms as a high rated strategic risk. Sydney Trains risk rating acknowledges that overcrowding can impact on the safety and health of staff and customers by causing illness, injuries or fatalities. Sydney Trains has also identified the risk of crowds at Wynyard, Town Hall, Chatswood, Central and Epping Stations as part of the introduction of the Sydney Metro. Sydney Trains has developed some mitigating controls to manage the risks of crowding such as restricting access to platforms or station entries but does not have an overarching strategy to manage crowding.

Sydney Trains is developing an organisation wide program that will include crowd management initiatives, but it is too early to conclude on its likely effectiveness

Sydney Trains has identified dwell time as a strategic priority in its 2019–20 corporate business plan. As a result, Sydney Trains is developing an organisation wide Dwell Management Program.

Sydney Trains has endorsed the following as being in scope for the program:

- crowd management initiatives
- customer education and behavioural change initiatives
- dwell specific construction, technology and data initiatives
- operational initiatives including procedure optimisation
- extended dwell scenarios – for example, medical emergencies and security alerts
- KPI and business performance metrics to support delivery of the Corporate Business Plan.

A project manager was appointed to the program in August 2019. At the time of writing this report, we were unable to determine whether this approach is likely to be effective at managing station crowding before the delivery of additional network capacity in 2022.

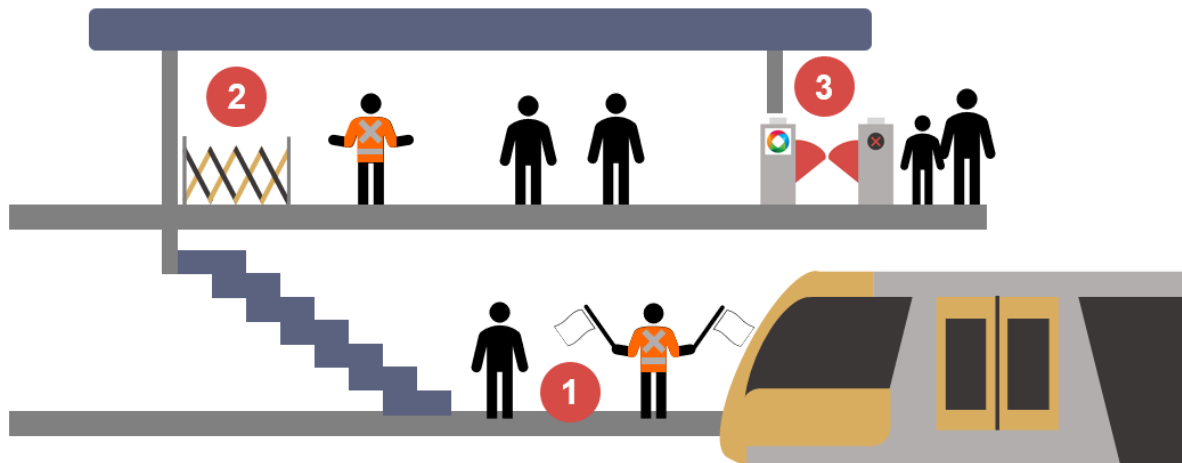
Sydney Trains management of station crowding is often a by-product of its strategies to manage customer safety and ensure on-time running of services

TfNSW and Sydney Trains focus is on providing a safe and reliable rail service. As such, Sydney Trains management of station crowding is a by-product of its strategies to manage customer safety and ensure on-time running of services. Sydney Trains strategies to manage on-time running includes the management of dwell time. Sydney Trains staff describe its operational strategies to manage dwell time at stations as 'lines of defence'. The objective of these lines of defence is to ultimately defend the Platform-Train Interface (PTI) so that trains can arrive and depart as timetabled and to minimise the risk of injury.

Some common features to manage dwell time at many Sydney central business district stations:

- **1st line of defence:**
 - Station staff positioned on platforms who signal to the station guard that passengers have left or boarded the train successfully. This is a key safety measure and allows the guard to authorise the train to leave the station and resume its journey.
 - Fast Track staff at key doors to protect passengers getting off trains, coordinate passengers getting on trains and defend doors against last minute, rushing passengers. The composition of Fast Track Teams differs across designated fast track platforms. There is a Fast Track dwell manager coordinating platform activity and over nine other staff positioned on the platform to ensure that train dwell time is within target dwell. During reoccupation, which is the time between trains, the fast track team will guide passengers evenly along the platform or to areas where passengers are likely to be able to board more easily.
- **2nd line of defence:**
 - Stair barriers: the dwell manager can determine that it is necessary to close access to the platform until crowds have cleared. Station Duty Managers coordinate this and station staff restrict access to the stairs rather than the Fast Track Team.
 - Corraling is an option at some stations across the network. For example, Chatswood station has a large paid concourse area, the area between the gate or ticket line and the stairs to the platform. In the event of any delay with Metro services in the AM peak for instance, staff can direct all escalators to the paid concourse, close stair access to Platform 1 and 2 and corral passengers in the paid concourse to access Platform 3 for alternate services to the city. Sydney Train advises that corraling has only been used once as part of the opening day event.
 - Placement of staff in paid concourse to direct passengers to platform access.
- **3rd line of defence:**
 - The gate line configuration is routinely altered during AM and PM peak and non-peak periods to affect how passengers access the station. For example, at Wynyard station in the AM peak, most gate lines are configured to exit passengers from the station as quickly as possible. In the PM peak, in contrast, access to the station is more restricted and designed to slow passenger flow onto platforms, reducing levels of congestion. At Town Hall station in the PM peak, gate-lines are configured to divert passengers towards the southern end of the concourse as the bulk of passengers seek to access the station from the northern or Queen Victoria Building end.

Exhibit 6: 'Lines of defence' at a station



Source: Audit Office.

Appendix five provides a case study of how Sydney Trains identified and managed a dwell time issue caused by crowding.

Sydney Trains' data suggests its strategies to manage customer safety and on-time running are effective at some stations

Sydney Trains deploy staff to manage dwell time during AM and PM peak periods at high volume metropolitan stations. These staff are known as Fast Track teams. Fast Track teams operate on selected platforms at Central, Town Hall, Wynyard and Chatswood Stations. Sydney Trains is also using variations of Fast Track teams at Airport Link stations as described in Appendix five. Sydney Trains data demonstrates that Fast Track teams have resulted in decreased dwell times.

Each Fast Track team is developed to meet the specific needs of the station, as each station has a unique platform layout and service features. On platforms, Fast Track teams position themselves to ensure customers are standing behind the yellow tactile lines prior to a train arrival. When a train arrives, teams help to clear pathways towards exits for customers alighting the train and encourage boarding passengers to move into the train carriage utilising the upstairs and downstairs train compartments. When a train is ready to depart, teams position themselves in a stance to restrict access to the train. Teams communicate with flags and whistles to ensure the train is ready to depart.

The Fast Track team is labour intensive with up to ten additional staff required at platforms during AM or PM peak times. Sydney Trains is exploring the use of moveable mechanical screen doors at stations across the network.

Sydney Trains devolves responsibility for managing crowding at stations to Customer Area Managers and relies on the experience and insight of its staff

Sydney Trains Customer Area Managers (CAMs) are responsible for station operations and are accountable for station performance including dwell time management. Sydney Trains expects CAMs to understand local conditions that affect the day-to-day operation of the stations for which they are responsible. At Wynyard and Town Hall, we observed that CAMs and their staff could describe patterns of customer behaviour over the course of the day.

Sydney Trains and TfNSW consult with CAMs when considering the effect of large changes on stations. These meetings present the opportunity to discuss if there are any concerns with the level of patronage, congestion points or the layout of the station. TfNSW advises that these meetings, together with site visits, enables it to assess the scale of congestion and the capacity of a station. Sydney Trains Customer Service Division and CAMs have meetings to discuss issues at train stations including issues related to station crowding. Sydney Trains advises that these meetings occur on a needs basis or as an event arises i.e. More Trains More Services planning.

TfNSW maintains a register of major and minor events which assist Sydney Trains to develop event specific timetables to manage the impact of special events. In addition, Sydney Trains has an established protocol for managing the impact of planned service disruptions due to maintenance or infrastructure upgrades.

Identified busy stations on the network develop crowd management plans which include crowd management interventions

Some identified busy stations on the network develop Crowd Management Plans (CMPs). Stations currently with CMPs are Central, North Sydney, Parramatta, Redfern, Strathfield, Town Hall, Wynyard, Chatswood, Epping and St Leonards. Station staff implement crowd management interventions that use the previously described lines of defence as stations become increasingly crowded or after identifying dwell time issues.

The experience of station staff and their observations inform the day-to-day use of CMPs. At stations we visited, we observed that staff have a good understanding of passenger dynamics at their station. For example, station staff know under what conditions to deploy staff to manage crowds on stairs, or to close the stairs. Sydney Trains advises that only the most experienced Duty Managers work at the busiest stations on the network.

Airport Link is responsible for the management of crowding at stations on the airport line, however the procedures it uses are limited in comparison to Sydney Trains' customer management plans

The Airport Link Company (Airport Link), a privately-run business, is responsible for the operation of four stations on the T8 line. These stations are Domestic Airport, International Airport, Mascot and Green Square. RailCorp, the NSW Government entity that holds rail property assets, maintains the contract with Airport Link. Under the contract, Airport Link is responsible for developing and following a Station Operation Manual which details procedures for the operation and management of stations, which includes station crowding.

For day to day operations, Airport Link uses an operational checklist to manage routine crowding at Green Square and Mascot stations particularly during peak times. In response to increasing patronage at Airport Link stations, Sydney Trains has deployed FastTrack teams to manage dwell time on some platforms at Airport Link stations during peak periods.

Airport Link's Incident and Emergency Manual describes the roles and responsibilities for managing crowd congestion during service disruption, but these procedures are not station specific and contain limited detail compared to CMPs developed for other stations. For example, CMPs developed for other stations contain clear objectives, provide information on the number of customers entering and exiting a station in peak periods and contain diagrams to show how station staff position themselves to manage customer flow or crowding. In addition, crowding procedures for Airport Link stations only cover the management of crowding at the platform level and do not consider station concourses or surrounding areas. Sydney Trains does not regularly collect data on how often crowd management procedures are used at Airport Link stations.

In 2018, as part of preparation for More Trains, More Services Phase 2, TfNSW engaged a consultant to conduct crowding modelling for some stations on the T8 line. The crowding modelling report details that Green Square and Mascot stations experience crowding in peak periods, with extensive queuing at Mascot Station during the morning peak. Between 2016 to 2018, the number of customers entering Green Square and Mascot stations grew 31 per cent and 36 per cent respectively. Given the increase in customers entering these stations, TfNSW and Sydney Trains should continue to work with Airport Link to strengthen procedures to manage crowding.

Sydney Trains does not have policies to support the creation, monitoring or evaluation of crowd management plans at metropolitan stations

Customer Management Plans vary considerably. Some are a few pages, while others such as the Central station CMP, are much more detailed. The Central Station CMP has three levels of escalating action clearly articulated. Other plans provide less guidance on when station staff should implement crowd management procedures. Only two out of the ten stations currently with a CMP have established crowding interventions in the unpaid concourse, which is the area of the station directly outside the ticket gate lines. Establishing crowding interventions in the unpaid concourse is important if Sydney Trains restrict access to platforms or station entries, as it can cause crowding near station entries and exits. Sydney Trains advises that the detail within the CMP varies in part due to the complexity and particular environment of the individual stations.

Sydney Trains does not have a policy or directive that requires Customer Area Managers to draft these plans, nor anything that sets out what such a plan should contain. The revision of CMPs is tied to project cycles rather than periodic review or any other threshold test. There is no documented procedure or requirement for CMPs to be revised over time. Sydney Trains advise that its Customer Readiness Team review these plans and store them centrally. However, we found that the Customer Readiness Team has not centrally stored CMPs for three stations and we found no evidence that the Customer Readiness Team reviews CMPs.

Sydney Trains does not have a policy that details when a CMP should be created, this leads to a risk that some stations may not develop a CMP as soon as desirable. Customer Area Managers reported that they sometimes implement ad hoc interventions when dwell time issues arise. If, due to repeated dwell issues, station staff identify that a problem is emerging, then they might develop a CMP. Also, Sydney Trains prepare CMPs for significant events such as New Year's Eve, City to Surf, Vivid and major events at Olympic Park.

Sydney Trains does not regularly collect data on how often crowd management interventions occur

Sydney Trains does not regularly collect centralised data on how often crowd management interventions occur; and whether they are increasingly prevalent, for longer durations and at what times. Customer Area Managers told us that they regularly use the interventions described in their crowd management plans at large city stations. Sydney Trains advised us that some stations locally record how many times they need to take these actions.

Increasing use of crowd management activities will likely result in deteriorating customer satisfaction and increased travel times for those customers directly affected

TfNSW and Sydney Trains advise they will continue using existing approaches to manage station crowding before the delivery of network capacity increases. However, Sydney Trains does not directly assess the effect of these actions on passengers. Sydney Trains customer delay metrics do not account for the time that passengers might wait before reaching the platform. As such, Sydney Trains may not have a full picture of the customer's experience of crowding.

Between 2014 to 2019, Sydney Trains customer satisfaction index showed an overall increase in customer satisfaction. However, Sydney Trains use of crowding interventions is likely to increase due to increasing patronage, which will cause more customers to experience delays directly caused by these activities (for example, those customers prevented from freely accessing station concourses due to crowding). Increased delays are likely to result in a decrease in customer satisfaction for those customers directly affected and increased crowding.

3.2 Behavioural interventions and service

TfNSW and Sydney Trains are exploring different ways of influencing customer behaviour to manage station crowding. There are two main 'moments' for influencing customer behaviour:

- Before a customer decides to travel – influencing customers here can directly impact on the demand for public transport by encouraging customers to consider whether they need to travel at all, to consider another mode of transport or to travel outside the AM or PM peak.
- While a customer is on their journey – influencing customer's behaviour once they arrive at a train station to manage crowds, improve pedestrian flows, and reduce the impact of crowding on dwell time.

TfNSW is delivering a program to influence transport demand in key precincts, but the overall impact of this program on crowding is not clear

Since 2015, TfNSW has been delivering 'Travel Choices', a program that aims to influence demand on transport in key precincts. Travel choices has three broad behavioural outcomes:

- help reduce private vehicle traffic volumes in AM and PM peak times by offering alternative travel choices
- help distribute public transport usage out of AM and PM peak times
- help reduce customers overall travel.

The available evaluation data for Travel Choices indicates that the program may be both a cause, and a solution, for station crowding in Sydney. TfNSW reports that since 2015, the Travel Choices program has contributed to a 13 per cent decrease in vehicles entering the Sydney CBD and a 14.7 per cent increase in public transport use in the AM peak. As the number of private vehicles entering the CBD has decreased, more people are traveling on other modes of transport including trains. TfNSW is unable to provide data demonstrating the overall impact of the program on helping distribute public transport usage out of AM and PM peak times. However, a recent campaign evaluation for the implementation of Travel Choices in Macquarie Park demonstrated an increase in the number of customers moving or intending to move their travel times out of peak AM and PM periods. See Exhibit 7 for more information on the Macquarie Park implementation of Travel Choices.

As part of a work plan for 2019–20, TfNSW is targeting stations including Green Square, Parramatta and Westmead with the aim of managing travel demand by encouraging customers to re-time trips out of AM peaks.

Exhibit 7: Macquarie Park travel choices advertising campaign

In 2018, TfNSW worked with businesses in Macquarie park during the metro upgrade of the Epping to Chatswood rail line. Part of this work through the Greater Sydney Commission involved an advertising campaign to encourage alternative travel patterns for commuters including train passengers. TfNSW designed a radio and digital advertising campaign to distribute public transport usage out of AM and PM peak times and to reduce customer travel at Macquarie Park station. An example of advertisements is shown below.

Evaluations of the campaign showed an increased instance of customers who recognised the campaign changing their travel out of peak times. Evaluations show that 57 per cent of regular customers in the evening peak have changed their evening travel time and 57 per cent of regular customers in the morning peak say that they intend to change their morning travel time. The evaluations also show that the campaign has increased customers intention to work from home from 34 per cent to 43 per cent.



TfNSW and Sydney Trains are delivering a wayfinding program to improve customer flow at stations and reduce travel times

TfNSW is responsible for NSW's wayfinding strategy to ensure consistency across all modes of public transport. The wayfinding program includes the roll out of uniform visual signs for all modes of public transport. This includes signs at train stations to direct customers to platforms, exits and interchanges with other modes of transport. TfNSW and Sydney Trains are expecting several benefits to the program including improved customer experience and reduced travel times. Effective wayfinding can increase the speed at which customers move through a train station and may reduce the number of confused customers who inefficiently navigate a train station. TfNSW has not conducted an evaluation of the Wayfinding program and the overall impact of the program is unclear.

Sydney Trains and TfNSW have also developed a standalone wayfinding strategy for Central station. TfNSW conducted user testing at Central station that included asking 60 participants about their experience before and after introducing new signage. The results showed that the new signage made six out of seven user journeys easier and showed a reduction in participants' journey times.

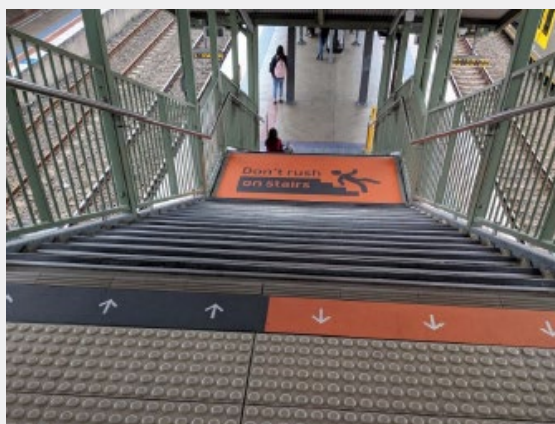
TfNSW and Sydney Trains trialled new decals, signs and announcements at stations to encourage desired behaviours and are planning to use the results of these trials across the network

As part of the introduction of Sydney Metro Services, TfNSW and Sydney Trains investigated the impact of inexpensive behavioural interventions. In 2019, TfNSW research identified 19 interventions to test including:

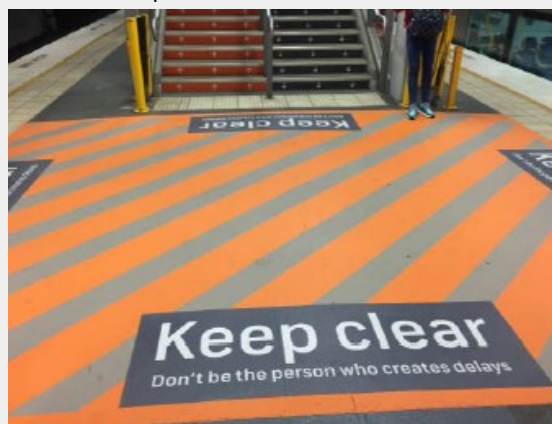
- decal and signage refinement for greater message clarity and prominence
- messaging to encourage passengers to pre-plan trips as much as possible
- stair decals to encourage walking on the left-hand side and discourage rushing down stairs
- platform decals to indicate desired behaviour for passengers waiting to board a train
- showing load capacities on indicator screens (SPI screens) to encourage spread along the length of the platform
- designated no-standing zones to encourage circulation around station crowding hotspots such as stairs and escalators.

Exhibit 8: Sample of behavioural interventions trialled along the T1 and T9 lines

Panel A: Do not run on stairs decal



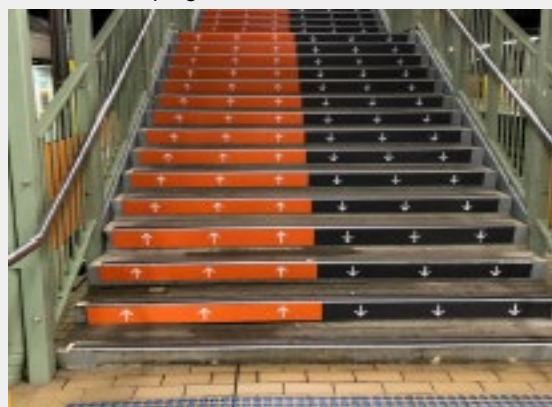
Panel B: Keep clear areas at bottom of stairs



Panel C: Keep clear of doors markings on platform



Panel D: Keeping left on stairs decals on stairs



Source: Transport for NSW.

TfNSW and Sydney Trains commissioned an external evaluation of the trialled interventions. Successful interventions identified in that evaluation included the interventions shown in Panels A, B and D of Exhibit 8. The evaluation found that the intervention in Panel C did not achieve the desired effect as, unlike the Sydney Metro, Sydney Trains operates different types of trains with slightly different door positions. Platform markings can therefore only be approximate. The evaluation found that the markers increase the number of people blocking train doors and require Fast Track team intervention to ensure on-time running of trains. Sydney Trains advised that it is assessing how and when to deliver the successful interventions more widely across the rail network.

Section two

Appendices

Appendix one – Response from agency



Your ref: D2005059/PA0024
Our ref: GSD20/01955

Ms Margaret Crawford
Auditor-General
Audit Office of NSW
GPO Box 12
SYDNEY NSW 2001

Dear Ms Crawford

Thankyou for the opportunity to consider and respond to the Performance Audit Report on Train Station Crowding.

Prior to the impact of Covid-19, the Transport Cluster had seen ever increasing patronage on public transport within Greater Sydney, increases that were predicted to continue in the coming years. This includes an increase in Sydney Trains patronage over the last 5 years. Regardless of patronage increases, customer experience continues to be a key measure for service delivery. It is therefore critical for us to ensure our services are meeting customer and community needs.

The real opportunity and challenge for us is to work together to deliver a joined-up transport network across Greater Sydney, taking our customer service excellence to the next level at a time of ever increasing demand.

Customer journeys rarely involve a single trip or mode. Under the new Greater Sydney division, we are focused on giving our customers a consistently great transport journey and experience, regardless of what part of the network they are using or who is delivering it.

Transport for NSW welcomes the opportunity that the Performance Audit provides to enhance our approaches to managing station crowding, raising our customer experience and keeping our customers safe.

Transport for NSW accepts the recommendations and will implement these to improve the approaches we have in place to manage station crowding across key stations in our network, improving the experience for our customers.

We will work together as a cluster and with the Airport Link Company to improve our crowd management and reporting processes. In addition, in relation to recommendations 4 and 5, whilst the Travel Choices and Wayfinding programs were not specifically intended as tools used in the management of crowding, we recognise that reviewing the opportunity to leverage lessons learnt for future considerations is important in identifying opportunities to further improve our management of station crowding.

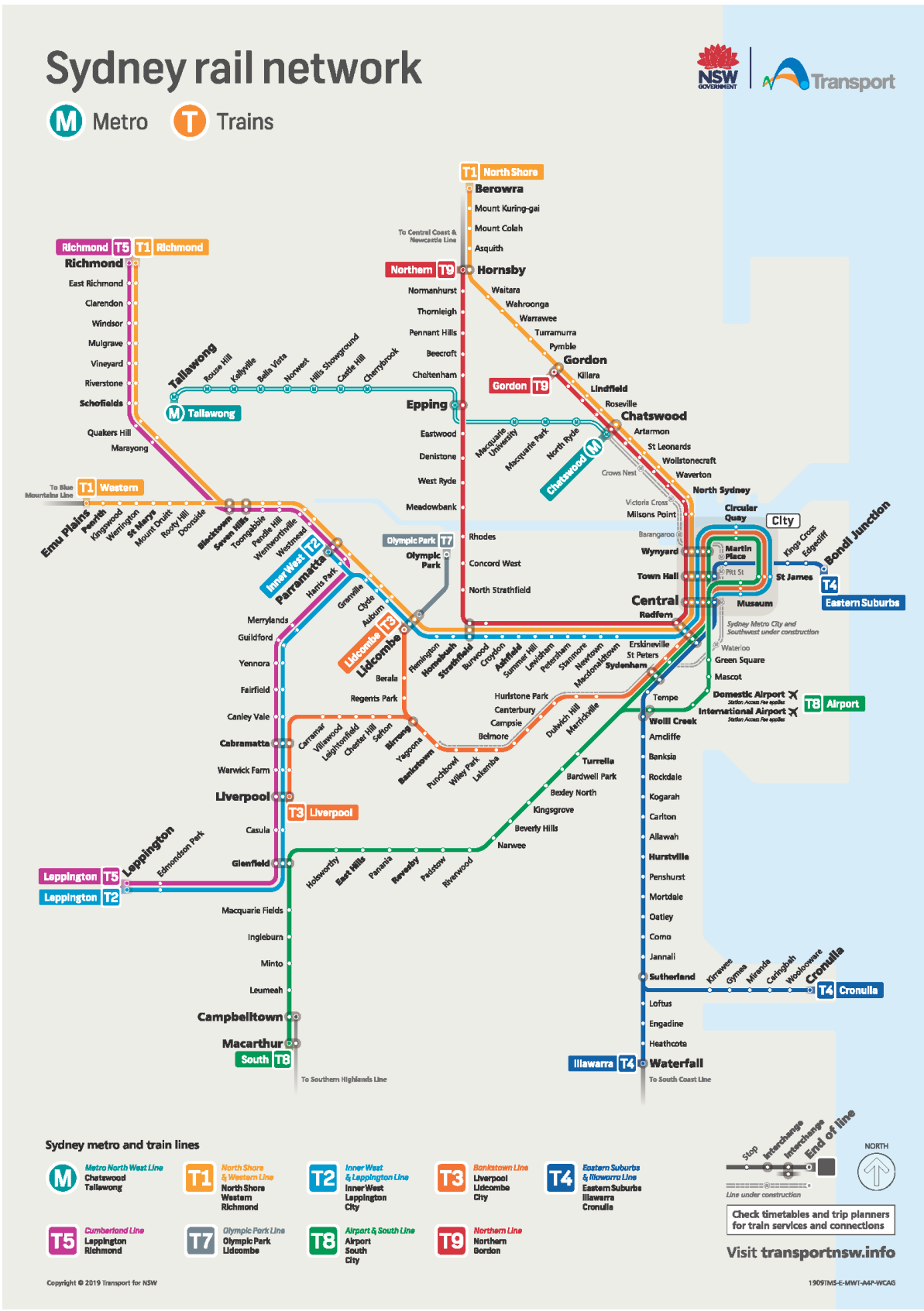
Yours sincerely

A handwritten signature in black ink, appearing to read 'Elizabeth Mildwater', written over a horizontal line.

Elizabeth Mildwater
A/Secretary 21 April 2020

Transport for NSW
18 Lee Street, Chippendale NSW 2008 | PO Box K659, Haymarket NSW 1240
T 02 8202 2200 | F 02 8202 2209 | W transport.nsw.gov.au | ABN 18 804 239 602

Appendix two – Sydney rail network



Appendix three – Rail services contract

TfNSW is the lead agency for transport in NSW. It has entered into a service contract with Sydney Trains to deliver train services. Both TfNSW and Sydney Trains have roles and responsibilities relevant to this audit which are summarised in Exhibit 9 below.

Exhibit 9: Summary of relevant responsibilities under the rail services contract

Responsibility	Transport for NSW	Sydney Trains
Delivery of services		<p>Use reasonable endeavours to deliver rail passenger services in accordance with the Standard Working Timetable and Daily Working Timetable.</p> <p>Develop systems and processes for recording and reporting network performance including: information on punctuality, delays, cancellations, customer delay and incidents.</p>
Customer satisfaction surveys	Undertake Customer Satisfaction Surveys quarterly (or periods otherwise agreed) and provide the results to Sydney Trains.	<p>Use the results of the Customer Satisfaction Surveys to inform decisions and actions on the development of service delivery and service improvement plans.</p> <p>Sydney Trains runs its own Customer Satisfaction Survey (CXMP) daily, with results provided every two hours.</p>
Customer complaints	Establish a policy framework and service standard for the management of complaints and feedback from customers.	<p>Establish and maintain its own internal systems and processes for managing customer complains in accordance with standards set by TfNSW.</p> <p>Provide TfNSW with reports and analysis of customer feedback to TfNSW quarterly (or periods otherwise agreed).</p>
Customer information	Develop information standards, protocols and templates (in consultation with Sydney Trains) and supply them to Sydney Trains.	Maintain customer information displays in good condition and update and replace customer information signage as necessary.
Wayfinding	Develop and design a system for wayfinding and signage and provide Sydney Trains with the wayfinding strategy.	Maintain all wayfinding and signage installed on stations, precincts and other customer facing areas it manages in good condition and install new signage as required.

Source: Sydney Trains.

TfNSW developed KPIs to measure Sydney Trains' performance under the contract. Exhibit 10 shows the Key Performance Indicators (KPIs) and corporate measures relevant to the audit.

Exhibit 10: Summary of relevant KPIs under the rail services contract

KPI	Definition	Target
Customer satisfaction	The percentage of customers partly satisfied to very satisfied with overall service	Overall customer satisfaction >78% as per the Customer Satisfaction Surveys undertaken by TfNSW.
Customer delay	The difference between customer arrival time and the customer planned arrival time at the customer destination station.	≤ current baseline performance for the Sydney Trains Services
Punctuality	The percentage of timetabled peak services arriving on time without skipping stops or being cancelled.	≥ 92% (each business centre), by line, by am/pm peak period.
Service provision	The percentage of passenger services which are operated and configured in compliance with the timetable specifications.	Target to be set prior to full implementation.
Customer information	A service quality audit measure of customer information (including day-to-day information as well as information during disruptions).	SQA Overall Announcement Index (AI) > current baseline performance
Customer service staff	A measure of customer satisfaction with the standard of customer service provided by staff; willingness of rail staff to help, knowledge of staff and presentation of staff. Representative sample collected on each train line.	Customer Service/Staff Index (CSI) > 0.74
Customer complaints	A measure of customer complaint resolution.	% resolved within 5 working days ≥ 90%
Operational Safety Index (OSI)	The number of specified safety incidents representing significant risk to passengers per million passenger train journeys.	≤ current baseline performance for the Sydney Trains Services

Source: Sydney Trains.

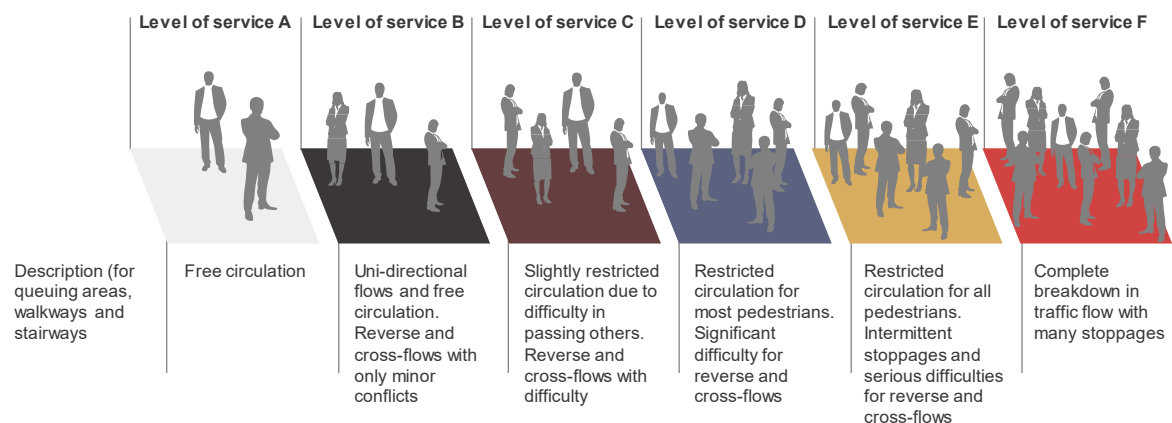
Appendix four – Crowding pedestrian modelling

Both Sydney Trains and TfNSW collect data and conduct modelling on station crowding when planning for significant infrastructure or network capacity projects. The models consider information from a range of sources including:

- population and patronage information generated by the Strategic Travel Model (STM)
- qualitative assessments of crowding and customer behaviour provided by station staff
- dwell time data
- OPAL data including boarding and terminations
- interchanges (based on a TfNSW algorithm which predicts where customers are likely to interchange based on origin and destination)
- data on numbers of passengers requiring boarding assistance.

TfNSW and Sydney Trains use global industry standard Fruin Levels of Service to assess estimated crowding density. Exhibit 11 shows Fruin Levels of Service and the quality of passenger's space.

Exhibit 11: Fruin Levels of Service and the quality of passengers' space



Source: Transport for NSW.

For short periods of time or in emergency situations it is considered reasonable for people to experience Level of Service E or F. There is a trade-off between maximising the use of space and passenger comfort.

Results of pedestrian modelling at Town Hall and Redfern stations

Approaching 2024, pedestrian modelling commissioned by Sydney Trains and TfNSW shows that Town Hall and Redfern stations will come under increasing pressure during normal operations. TfNSW and Sydney Trains do not expect to deliver network capacity upgrades (which will relieve pressure on these stations) until 2022.

Pedestrian modelling for Town Hall station shows that without intervention from Sydney Trains, the station may not perform satisfactorily in the 2024 PM peak interval (the busiest 15-minute period during the PM peak). The model shows excessive levels of congestion and a complete breakdown of passenger flow at OPAL gate lines at the entry to the station causing gridlock. Exhibit 12 shows a density heat map for Town Hall Station concourse in 2017 PM and projected for 2024 PM.

With some interventions, the model shows improvements in passenger flow however multiple platforms will operate at Fruin 'Level of Service D-E'. This level of congestion indicates uncomfortable crowding and restricted movement.

Exhibit 12: Town Hall 2017 v 2024 PM (5.15–5.30pm) station concourse density heat map

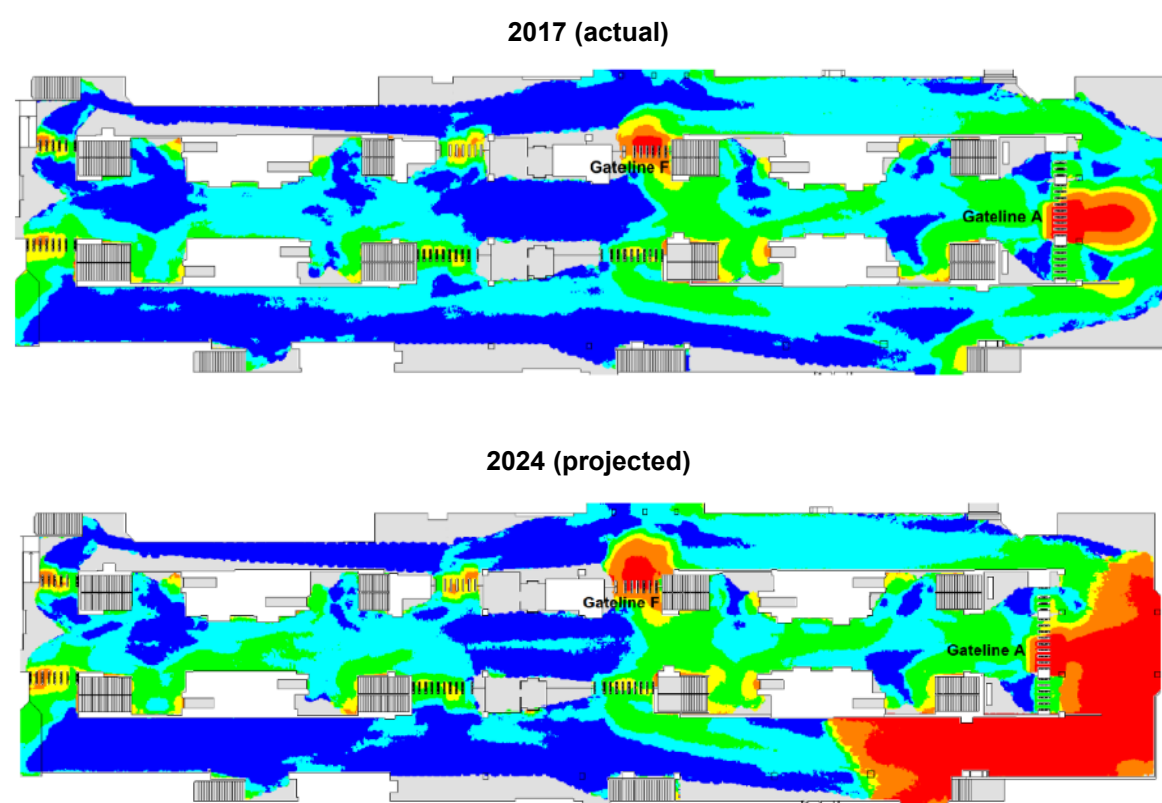


Figure 9: Density Heat Map Scale

Fruin LoS Criteria for Walkways					
A	B	C	D	E	F
∞	3.25	2.32	1.39	0.93	0.46
m ² per passenger					

Source: Transport for NSW 2017. Unaudited.

Pedestrian modelling for Redfern station shows that in the 2024 AM peak interval, the platform clearance time at platform four is longer than the train headway. This means that there is not enough time for alighting customers to leave the platform before the next train arrives, this leads to a risk of train delays. Some areas of platform four will operate at Fruin 'Level of Service E-F', indicating uncomfortable crowding and restricted movement.

If service delays occur at Town Hall and Redfern stations in 2024, with no intervention by Sydney Trains, it is likely to result in highly uncomfortable conditions and severely restricted movement, and a high risk of unsafe levels of congestion and gridlock.

Appendix five – Airport Link stations case study

In 2018, Sydney Trains identified persistent delays on a section of the T8 line between Wolli Creek and Central stations heading towards the city. This section incorporates the following stations shown in Exhibit 13:

- International Airport
- Domestic Airport
- Mascot
- Green Square.

Exhibit 13: Airport Link stations on the T8 train line



Source: Transport for NSW.

These stations are operated by the Airport Link Corporation, a privately run business. RailCorp, the NSW Government entity that holds rail property assets, maintains the contract to run these stations with Airport Link Corporation.

The Standard Working Timetable requires trains to complete this section of track in 588 seconds, or just under ten minutes. Sydney Trains analysis shows that before this trial, trains normally complete this section of track in around 672 seconds (around one minute longer than required in the timetable). In investigating this discrepancy, Sydney Trains identified increased dwell times at the Airport Link stations, and especially Green Square. Sydney Trains determined that additional dwell time management strategies might help improve punctuality performance on this section.

In February 2019, Sydney Trains commenced a four-week trial aiming to improve dwell times at these stations. Sydney Trains placed a Fast Track team (which includes 8–10 staff members trained in dwell time management) at Green Square and between 2–3 trained staff members at International Airport, Domestic Airport and Mascot stations during the AM peak. Fast Track staff guide passengers along the platform, make sure passengers are able to get off trains easily, ensure that passengers are able to get on trains within the timetabled stop and close of access to platforms in the event of excess crowds. Chapter 3 discusses the Fast Track program.

Sydney Trains analysis of the trial shows that the dwell time management strategies were successful in improving the on-time running of trains. Sydney Trains recorded a median 30 second improvement in the overall journey time between Wolli Creek and Central during the trial period. Sydney Trains extended the trial before formalising the arrangement with Airport Link Corporation in July 2019 for both AM and PM peak. Sydney Trains assumes the cost of this initiative.

Appendix six – About the audit

Audit objective

This audit will examine how effectively transport agencies manage crowding at selected metropolitan train stations.

Audit criteria

We addressed the audit objective by assessing performance against the following criteria:

1. Transport agencies regularly collect sufficient data on train station crowding to inform decision making:
 - a) Transport agencies understand local factors that affect train station crowding.
 - b) Transport agencies have well defined crowding measurement methodologies or principles.
 - c) Sufficient data is used in developing and evaluating strategies.
 - d) Transport agencies understand risks related to train station crowding.
2. Transport agencies implement short and medium-term strategies to manage train station crowding:
 - a) Transport agencies have clear objectives for managing crowding at metropolitan train stations.
 - b) Transport agencies consider different ways of understanding and influencing commuter behaviour to manage train station crowding.
 - c) Strategies are designed and implemented to effectively manage train station crowding.
 - d) Strategies are evaluated or regularly reviewed.

Audit scope and focus

This audit focused on short and medium term strategies deployed by Sydney Trains and Transport for NSW. The audit did not look at the Sydney Metro.

Audit exclusions

The audit did not seek to:

- examine network capacity issues, including the effect on train station and on-train crowding because of projects intended to increase capacity across the network
- examine railway and building technical standards (e.g. platform length and width; and compliance with building codes)
- question the merits of government policy objectives.

Audit approach

Our procedures included:

1. interviews with relevant staff from Transport for NSW and Sydney Trains
2. examination of relevant documents, including legislation, policies, strategies, guidelines, procedures, reports and reviews
3. observing strategies to manage crowding on platforms
4. consultation with stakeholders
5. research into international practice.

The audit approach was complemented by quality assurance processes within the Audit Office to ensure compliance with professional standards.

We selected eight stations for inclusion in our audit scope. Our selection methodology aimed to identify stations where there may be crowding. We used data on customer entries and exits to stations to identify stations that experienced high customer demand over the last three years. We also considered advice from Sydney Trains on what stations experience crowding. In addition, we conducted a survey of our staff and a media review to identify any other stations not identified through our review of data or advice obtained. We ranked stations with a weighted score to determine their inclusion in scope.

Audit methodology

Our performance audit methodology is designed to satisfy Australian Audit Standard ASAE 3500 Performance Engagements and other professional standards. The standards require the audit team to comply with relevant ethical requirements and plan and perform the audit to obtain reasonable assurance and draw a conclusion on the audit objective. Our processes have also been designed to comply with requirements specified in the *Public Finance and Audit Act 1983* and the *Local Government Act 1993*.

Acknowledgements

We gratefully acknowledge the co-operation and assistance provided by staff at Sydney Trains and Transport for NSW.

Audit cost

The estimated cost for the audit is \$285,000.

Appendix seven – Performance auditing

What are performance audits?

Performance audits determine whether State or local government entities carry out their activities effectively, and do so economically and efficiently and in compliance with all relevant laws.

The activities examined by a performance audit may include a government program, all or part of an audited entity, or more than one entity. They can also consider particular issues which affect the whole public sector and/or the whole local government sector. They cannot question the merits of government policy objectives.

The Auditor-General's mandate to undertake performance audits is set out in section 38B of the *Public Finance and Audit Act 1983* for State government entities, and in section 421D of the *Local Government Act 1993* for local government entities.

Why do we conduct performance audits?

Performance audits provide independent assurance to the NSW Parliament and the public.

Through their recommendations, performance audits seek to improve the value for money the community receives from government services.

Performance audits are selected at the discretion of the Auditor-General who seeks input from parliamentarians, State and local government entities, other interested stakeholders and Audit Office research.

How are performance audits selected?

When selecting and scoping topics, we aim to choose topics that reflect the interests of parliament in holding the government to account. Performance audits are selected at the discretion of the Auditor-General based on our own research, suggestions from the public, and consultation with parliamentarians, agency heads and key government stakeholders. Our three-year performance audit program is published on the website and is reviewed annually to ensure it continues to address significant issues of interest to parliament, aligns with government priorities, and reflects contemporary thinking on public sector management. Our program is sufficiently flexible to allow us to respond readily to any emerging issues.

What happens during the phases of a performance audit?

Performance audits have three key phases: planning, fieldwork and report writing.

During the planning phase, the audit team develops an understanding of the audit topic and responsible entities and defines the objective and scope of the audit.

The planning phase also identifies the audit criteria. These are standards of performance against which the audited entity, program or activities are assessed. Criteria may be based on relevant legislation, internal policies and procedures, industry standards, best practice, government targets, benchmarks or published guidelines.

At the completion of fieldwork, the audit team meets with management representatives to discuss all significant matters arising out of the audit. Following this, a draft performance audit report is prepared.

The audit team then meets with management representatives to check that facts presented in the draft report are accurate and to seek input in developing practical recommendations on areas of improvement.

A final report is then provided to the head of the audited entity who is invited to formally respond to the report. The report presented to the NSW Parliament includes any response from the head of the audited entity. The relevant minister and the Treasurer are also provided with a copy of the final report. In performance audits that involve multiple entities, there may be responses from more than one audited entity or from a nominated coordinating entity.

Who checks to see if recommendations have been implemented?

After the report is presented to the NSW Parliament, it is usual for the entity's audit committee to monitor progress with the implementation of recommendations.

In addition, it is the practice of Parliament's Public Accounts Committee to conduct reviews or hold inquiries into matters raised in performance audit reports. The reviews and inquiries are usually held 12 months after the report received by the NSW Parliament. These reports are available on the NSW Parliament website.

Who audits the auditors?

Our performance audits are subject to internal and external quality reviews against relevant Australian and international standards.

The Public Accounts Committee appoints an independent reviewer to report on compliance with auditing practices and standards every four years. The reviewer's report is presented to the NSW Parliament and available on its website.

Periodic peer reviews by other Audit Offices test our activities against relevant standards and better practice.

Each audit is subject to internal review prior to its release.

Who pays for performance audits?

No fee is charged for performance audits. Our performance audit services are funded by the NSW Parliament.

Further information and copies of reports

For further information, including copies of performance audit reports and a list of audits currently in-progress, please see our website www.audit.nsw.gov.au or contact us on 9275 7100.

OUR VISION

Our insights inform and challenge government to improve outcomes for citizens.

OUR PURPOSE

To help parliament hold government accountable for its use of public resources.

OUR VALUES

Pride in purpose
Curious and open-minded
Valuing people
Contagious integrity
Courage (even when it's uncomfortable)

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