

Date: 28 February 2018

Item: TfL Health, Safety and Environment Quarter 3 2017/18
Report

This paper will be considered in public

1 Purpose

- 1.1 This report provides an overview of the health, safety and environment (HSE) performance for London Underground (LU) , TfL Rail, Surface Transport (including London Rail) and Crossrail.
- 1.2 Generally, this report covers 17 September – 9 December 2017 inclusive, referred to as Quarter 3. The road safety data for Greater London and the Transport for London Road Network (TLRN) is based on the calendar year and covers July to September 2017, also referred to as Quarter 3.

2 Recommendation

- 2.1 The Panel is asked to note the report.

List of appendices to this report:

Appendix 1: Health, Safety and Environmental Performance – Quarter 3 - 2017/18

List of Background Papers:

None

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TfL Health, Safety and Environment Quarter 3 2017/18 Report

In this report:

- Executive summary
- Performance at a glance
- Significant incidents
- Customer safety
- Road danger reduction
- Workforce safety and wellbeing
- Internal audit
- Resilience
- Environmental management

Executive Summary

This report provides an overview of the health, safety and environment (HSE) performance for London Underground (LU) & TfL Rail, Surface Transport (including London Rail) and Crossrail. Generally, this report covers 17 September – 9 December 2017 inclusive, referred to as Quarter 3. However, the road safety data for Greater London and the Transport for London Road Network (TLRN) is based on the calendar year and covers July to September 2017, also referred to as Quarter 3.

During the period covered by this report, 14 people lost their lives following incidents on our transport network. There were also 27 people fatally injured on London's roads in Quarter 3. The Coroner issued two Prevention of Future Deaths reports to us, both relating to historic fatalities in previous quarters. We have sent a response to the Coroner in both cases.

The draft Mayor's Transport Strategy (MTS) sets out the Mayor's policies and proposals to reshape transport in London. We continue to develop our strategy and delivery plan to support the commitment to Vision Zero, within the draft MTS. The plan is expected for publication in Spring 2018 and will include our commitment to the expansion of the Vision Zero approach to cover all of our public transport operations.

Making the tram service safer remains one of our priorities. In December 2017, the Rail Accident Investigation Branch (RAIB) published their report of recommendations. In January 2018, SNC-Lavalin, the company we commissioned to undertake an independent

investigation, published our report¹. We will ensure all the recommendations outlined in the RAIB report and our own report are met, and continue to implement improved safety measures on the tram network.

In October 2017, we formally responded to the 'Driven to distraction: making London's buses safer' report, outlining action taken to date, and proposed future action against each of the recommendations.

There were 2,558 customers injured while travelling on our transport network in the quarter, a one per cent decrease compared to the same period last year. We have continued to deliver our customer safety improvement plans, the Bus Safety Programme and Bus Safety Innovation Fund, as well as supply chain safety initiatives. All these plans are contributing to reducing injuries and to the Mayor's Vision Zero.

There were 498 injuries to our workforce in the quarter, a 12 per cent decrease on the same period last year. We are committed to creating the safest possible working conditions for all our direct and supplier employees, and have continued with the delivery of targeted improvement programmes that address work related injuries and causes of sickness absence.

We run a programme of audits across our businesses to ensure our strategic risks are being monitored and adequately controlled. We conducted 10 HSE and Technical audits in the quarter. There was one 'poorly controlled' conclusion arising from an audit of LU Transplant vehicle maintenance. Three other audits identified opportunities for improvement; fatigue management, signals maintenance and premises inspections.

Five of our employees failed drug and alcohol monitoring tests. This included three failures from our unannounced testing regime, one post incident and one 'for cause' result. Appropriate disciplinary action, up to and including dismissal, is taken against anyone who is found to be in breach of our drug and alcohol policy.

Our resilience activities aim to reduce the impact of any event or incident on our network. We have deployed operational winter preparedness measures to minimise the impact of severe winter weather.

On 15 September 2017, LU station staff responded quickly to an incident involving an explosive device on a train at Parsons Green Station. Nineteen people were injured, however, the prompt action of our employees helped reduce further risk to our customers and minimise disruption to the network.

The London Environment Strategy (LES) and draft MTS set out the actions required to achieve the Mayor's vision of making London the world's greenest global city.

We remain on course to deliver the Mayor's air quality objectives. In November, the Mayor announced that the Ultra Low Emission Zone (ULEZ) will replace the T-Charge in Central London from April 2019, and we started our consultation for expansion of the ULEZ standards. We are proposing that all buses, coaches and HGVs within London will need to meet the European Union emissions standard (Euro VI) for NO_x² and PM₁₀³ from October 2020.

We are making our bus fleet cleaner and more environmentally friendly by making sure older vehicles are updated to meet the European emissions standards. To date, we have delivered

just over 1,500 ULEZ-compliant buses into service.

We are installing rapid charging infrastructure to support the decommissioning of the oldest, most polluting taxis and achieve the goal of having 9,000 zero emission capable taxis on the roads by 2020. We are continuing to make progress towards our target of delivering 100 rapid charge sites by the end of March 2018. At the end of December 2017, 40 rapid charge points had been installed on the network.

In 2017, the Mayor commissioned a review of air pollution on LU with the aim of introducing measures to minimise dust levels. A review of our dust monitoring and cleaning procedures has confirmed we are well within regulatory limits set by the Health and Safety Executive (HSE), and within the more stringent guidelines set by the Institute of Occupational Medicine (IOM).

Footnotes

1 SNC-Lavalin Independent investigation into the tram overturning at Sandilands Junction:

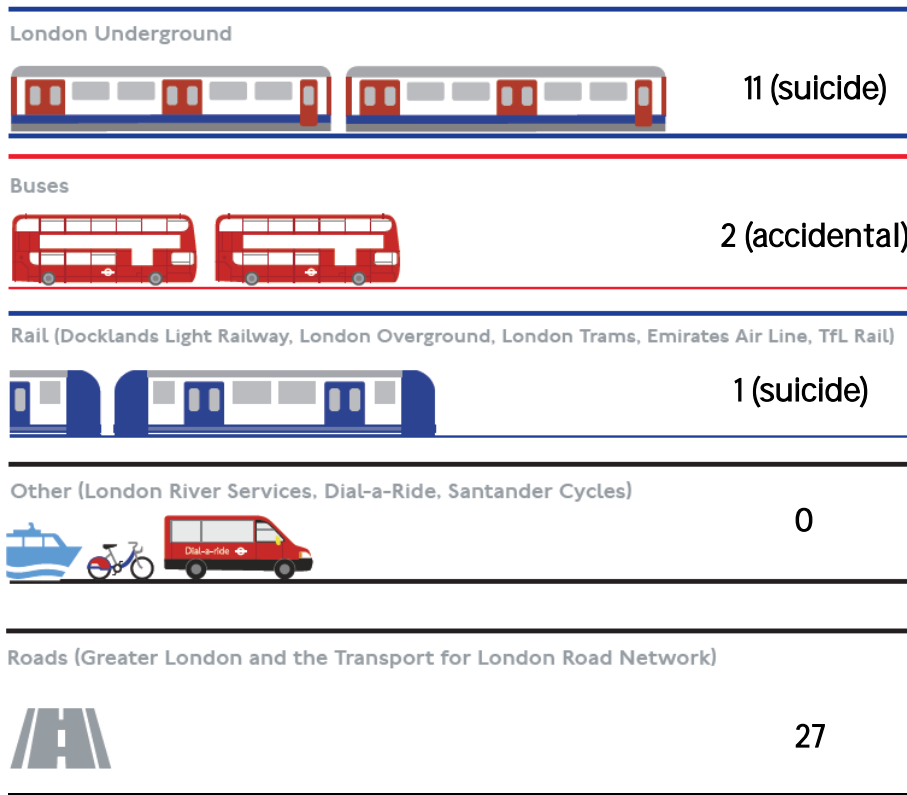
<http://content.tfl.gov.uk/sshrp-20180122-item03-tram-overturning-at-sandilands-investigations-update.pdf>

2 Nitric oxide (NO) and nitrogen dioxide (NO₂) are together referred to as oxides of nitrogen (NO_x).

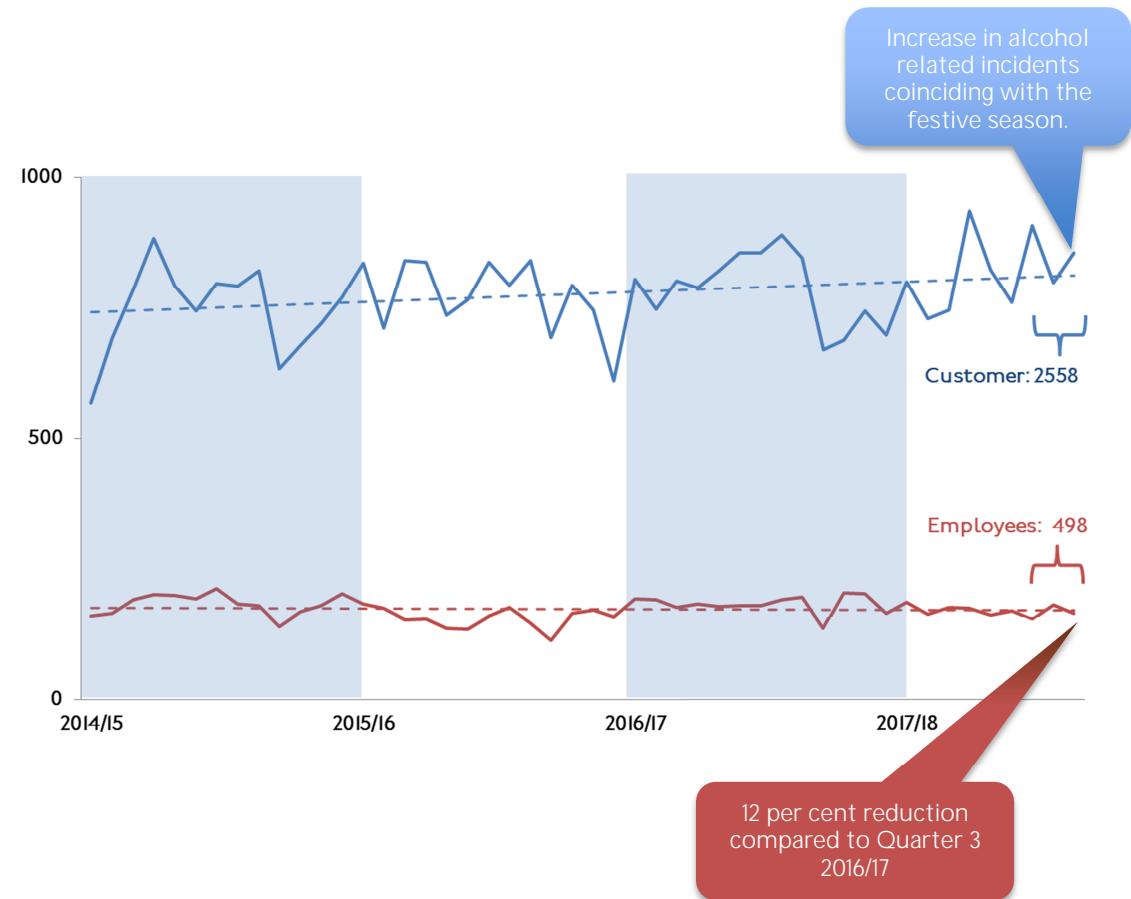
3 PM₁₀ is particulate matter up to 10 micrometres in size.

Performance at a glance

Fatalities



Injuries



Above: Figure 1. TfL fatalities and injuries at a glance for Quarter 3 2017/18 and road fatalities for Quarter 3 2017.

Significant incidents

This section of the report covers significant incidents that occurred across our businesses in Quarter 3 2017/18.

On 6 November, a South Western Railway (SWR) train derailed on the LU District line between Wimbledon and Wimbledon Park. Four SWR customers sustained minor injury and the LU Wimbledon branch line remained closed until 8 November. The RAIB published important safety findings into the derailment¹ (7 February 2018), concluding that the accident demonstrates the importance of maintaining and marking precise maintenance boundaries with neighbouring infrastructure owners. Since the incident, we have carried out site checks with Network Rail at all 19 of our shared boundaries and have installed marker plates to show where these boundaries are. We have also reviewed and updated our asset management system and are undertaking checks on other shared assets (traction current rails, embankments, bridges, and signals) to ensure boundaries and maintenance arrangements are clear.

On 15 September, LU station staff responded quickly to an incident involving an explosive device on a train at Parsons Green Station. Prompt action helped reduce the risk to our customers. There were 19 persons taken from the scene to hospital. The majority of injuries were sustained from slips, trips and falls as customers tried to leave the station.

There have been four incidents of buses colliding with bridges. An in service rail

replacement bus collided with a low bridge on Scarborough Road (24 September). The agency driver was following directions from a customer after becoming lost and ignored warning signs. The driver has been banned from the operating company and the incident has been reported to the Traffic Commissioner. A route N205 bus collided with an elevated section of the Bow Flyover bridge (7 October). The driver failed to follow the approved route and ignored warning signs. We are working with the Local Authority to improve visibility of advanced warning signs. On 10 November, a driver under tuition collided with a part of a Network Rail bridge at Old Oak Common. The investigation concluded the driver failed to obey advanced warning signs and did not follow the approved route. Disciplinary proceedings concluded in dismissal of the instructor and the driver. An in service route 75 bus collided with a bridge on Parish Lane when a new driver became lost and took a wrong turn (28 September). Initial investigations identified the driver was following passenger directions which could have contributed to the bridge strike. The full report is expected in Quarter 4 2017/18.

On 24 September, a bus driver was arrested for driving under the influence of alcohol. The driver failed a roadside breath test after colliding with a cyclist on route N26. The cyclist sustained minor injuries. Disciplinary proceedings concluded in dismissal of the bus driver. The operator is supporting the Police with their investigation and the incident has been reported to the Traffic Commissioner.

There was one incident resulting in a route 38 bus catching fire (22 September). There were no reported injuries. The investigation identified incorrect installation of the headlamp unit as the cause of the fire. The

technician has undergone corrective training.

On London Overground, customers were detrained at Peckham Rye (07 November) due to a fault with the train. Customers were guided along the trackside without any track power isolations in place. The operator investigation is underway. The results of the investigation are expected in Quarter 4 2017/18.

Other high potential incidents

An important part of our HSE management strategy is the analysis of incidents with high potential to cause harm. Our quarterly review of safety incidents has highlighted several key themes.

There have been several incidents of objects falling or at risk of falling from overhead within our premises and infrastructure. Within LU, incidents include: falling concrete at Moorgate (16 November); a falling ceiling panel at Cannon Street (25 November); a falling cable conduit cover at Vauxhall (14 December); a loose panel at Victoria station (6 November); and a loose fire exit sign at Bond Street (11 December). On the bus network, a glass roof panel fell at Canada Water bus station (18 October). Temporary measures have been implemented at Canada Water to prevent customer injury whilst a long term solution is considered. On the road network, cladding fell from a gantry at Euston Underpass (27 October) and landed on the central reservation. In some of the incidents, customers sustained minor injuries. Investigations have identified opportunities for improvements to be made to the risk assessment, inspection, and maintenance hand-back procedures. Corrective actions will be implemented throughout 2018.

There have been two incidents where customers have responded to disturbances in or near LU stations. Customers and members of public responded by instigating an evacuation at Oxford Circus (24 November) and attempted to exit the station by accessing the track at South Kensington (7 October). Minor injuries were sustained during the attempts made to exit stations. The initial investigation has identified opportunity for improvements to be made in the familiarisation of evacuation plans at smaller stations. Further measures under review include the control of gate line access and public address announcements to be coordinated centrally from the LU operations command centre. Results of the investigation are expected in Quarter 4 2017/18.

There were two incidents within areas of restricted access (track possessions), where failures in the planning process led to an increased scope of works. A group of workers strayed beyond their possession into an area of live track whilst working at Gloucester Road LU station (20 September), and track protection was given up whilst a group of workers were on the track at Shepherds Bush (9 November). Our TfL-wide investigation into track access has concluded and a programme to modernise employee track access will be launched in Quarter 4 2017/18.

There were four incidences of unintended vehicle movement or acceleration on our transport network. On DLR, a broken down train became separated from a recovery vehicle whilst being moved to a depot (30 October). The faulty train remained coupled to the trailing vehicle. Initial investigations identified a mechanical failure of the coupler as the cause of the separation. Results of the coupler testing are expected in Quarter 4 2017/18. On the

bus network, three incidents resulted in collisions with pedestrians and other vehicles from unintended bus acceleration. Investigations in all cases identify pedal confusion as the cause. The driver of a route 254 bus (9 November) has resigned, and the operator is supporting Police with their investigation. Disciplinary procedures concluded in the dismissal of the driver of a route 8 bus (25 September) and the outcome of disciplinary proceedings to the driver of a route 16 bus (21 September) are expected in Quarter 4 2017/18.

There were six incidences of buried utility service (water, gas, electricity or telecommunications) strikes. On LU, a contracted worker drilled through a cable conduit at Moorgate (22 November), and another was narrowly missed during work at Bank (15 November). On the road network: a communications cable was disturbed during the removal of kerb stones (09 October); water pipes were severed during excavation works (27 and 30 October); and an electricity cable was cut during re-surfacing works (06 December). The investigations identified opportunities to improve accuracy of utility information on site, effective buried services detection, and enhanced training and supervision of those working around utilities. Recommended improvement actions have been put in place.

Where any incident occurs on our network, the party accountable for the activity conducts an investigation to identify the causes and contributory factors, and identify action to prevent re-occurrence. This may include reinforcing safe behaviours through on-site briefings to workers, revising risk assessments and implementing new controls, or increasing safety messages to our customers. We communicate

lessons learned from significant incidents across our businesses.

Footnotes:

1 The RAIB publication of important safety findings from the Wimbledon derailment (6 November 2017) can be found here:

<https://www.gov.uk/government/publications/safety-digest-012018-wimbledon/derailment-of-a-passenger-train-near-wimbledon-south-west-london-6-november-2017>

Customer Safety

TfL customer injuries

There were a total of 2558 injuries to our customers in Quarter 3 2017/18 (Fig. 1). This is a decrease of one per cent on the same quarter in 2016/17. The majority of incidents on our transport network are recorded by London Buses (50 per cent) and LU (45 per cent).

Customer safety: LU and TfL Rail

Fatalities

Eleven customer fatalities occurred on the LU network in Quarter 3 2017/18. A Coroner's inquest concluded one fatality as suicide. The remaining 10 fatalities await the outcome of inquest, although LU and British Transport Police (BTP) initial investigations suggest suspected suicide in all cases. There were zero fatalities on the TfL Rail network.

Coroner Inquests in the period have concluded 11 historic fatalities that occurred on the LU network. The Coroner recorded verdicts of: suicide (7); narrative¹ (2); open² (1); and accident (1). The accidental conclusion referred to a person who was struck by a train whilst walking in a tunnel at Old Street Station (21 May 2017). There were no historic fatalities concluded on the TfL Rail network.

In November 2017, an inquest hearing took place concerning the death of a customer who fell down emergency stairs at Canning Town, which are not normally accessible by the public (22 January 2017). The Coroner issued us a Prevention of Future Deaths report. The report related to the checks of the

emergency exit at Canning Town station by staff (particularly those working alone) and access to playback of CCTV in the control room. A response was sent to the Coroner on 13 January. The ORR issued an Improvement Notice on LU in July 2017 (related to lone working at Canning Town and West Ham stations). LU responded to this notice in October 2017 and the ORR have confirmed the notice is now closed. The ORR concluded that no further action will be taken against LU or any individuals.

Customer injuries

A total of 1163 customer accidental injuries were recorded on the LU and TfL Rail network in Quarter 3 2017/18 (Fig. 2). There were two fewer injuries in the quarter when compared to the same period of the 2016/17 year. There is a seven per cent reduction in total injuries for the 2017/18 year to date when comparing total injuries for the 2016/17 year equivalent period.

Incidents on LU occur in three main areas: on escalators (40 per cent), stairs (20 per cent) and at the Platform Train Interface (20 per cent). Causes of incidents include; being under the influence of alcohol; being encumbered with luggage; rushing for services; and distraction from hand held devices such as mobile phones and music devices. The peak in incidents observed in the final period within the quarter coincides with the lead up to the festive season, when we traditionally observe an increase in the number of alcohol-related incidents.

We observed a significant reduction in injuries that met criteria for a statutory report under RIDDOR³ (2013). At the end of Quarter 3 2017/18 there were 29 RIDDOR injuries recorded for the year, compared with 50 at the same point in the 2016/17 year.

Customer safety improvements

Our customer safety improvement initiatives are focused on changing customer behaviour (through direct messages and 'nudge' messages) and on making infrastructure changes which will eliminate or reduce the risk. The 2017/18 LU customer safety improvement plan focuses on all customer accidental injuries and aims to reduce the total by 17 per cent compared to 2016/17.

As part of our plan to reduce the 40 per cent of incidents that take place on LU escalators, we have rolled out enhanced escalator safety measures throughout the 2017/18 year. Measures include highlighting escalator entry and exit points, positional footprints indicating recommended safe standing areas, and a 'hold the handrail' safety message. We have identified further opportunity to 'nudge' customers towards safer behaviour at the top 10 stations where most escalator incidents occur. We will be promoting the use of station lifts through improved signage and increased announcements over public address systems. We will also replace existing handrail messages with our 'hold the handrail' safety message. We expect to complete this by the end of Quarter 4 2017/18.

Seven percent of all incidents on the rail based modes of the TfL transport network identify alcohol as a contributory factor leading to the incident. Our historic incident data shows a significant increase in alcohol-related customer incidents from November to early January. The most common incidents involve people falling down stairs or escalators, or falling over on the platform, often resulting in injury. From the start of December 2017, we displayed awareness posters at stations and in pubs around Zone 1

encouraging customers to take care after drinking. We also increased announcements made over public address systems and made social media posts to send timely messages to our customers.

Similar to LU, TfL Rail customer safety improvements focus on influencing customer behaviour. The rebuilt Abbey Wood station became a TfL Rail station on the 22 October 2017, with the new booking office and concourse being brought into public use on that date. Key safety improvement activities include the management of busy platforms in winter conditions and advising customers under the influence of alcohol.

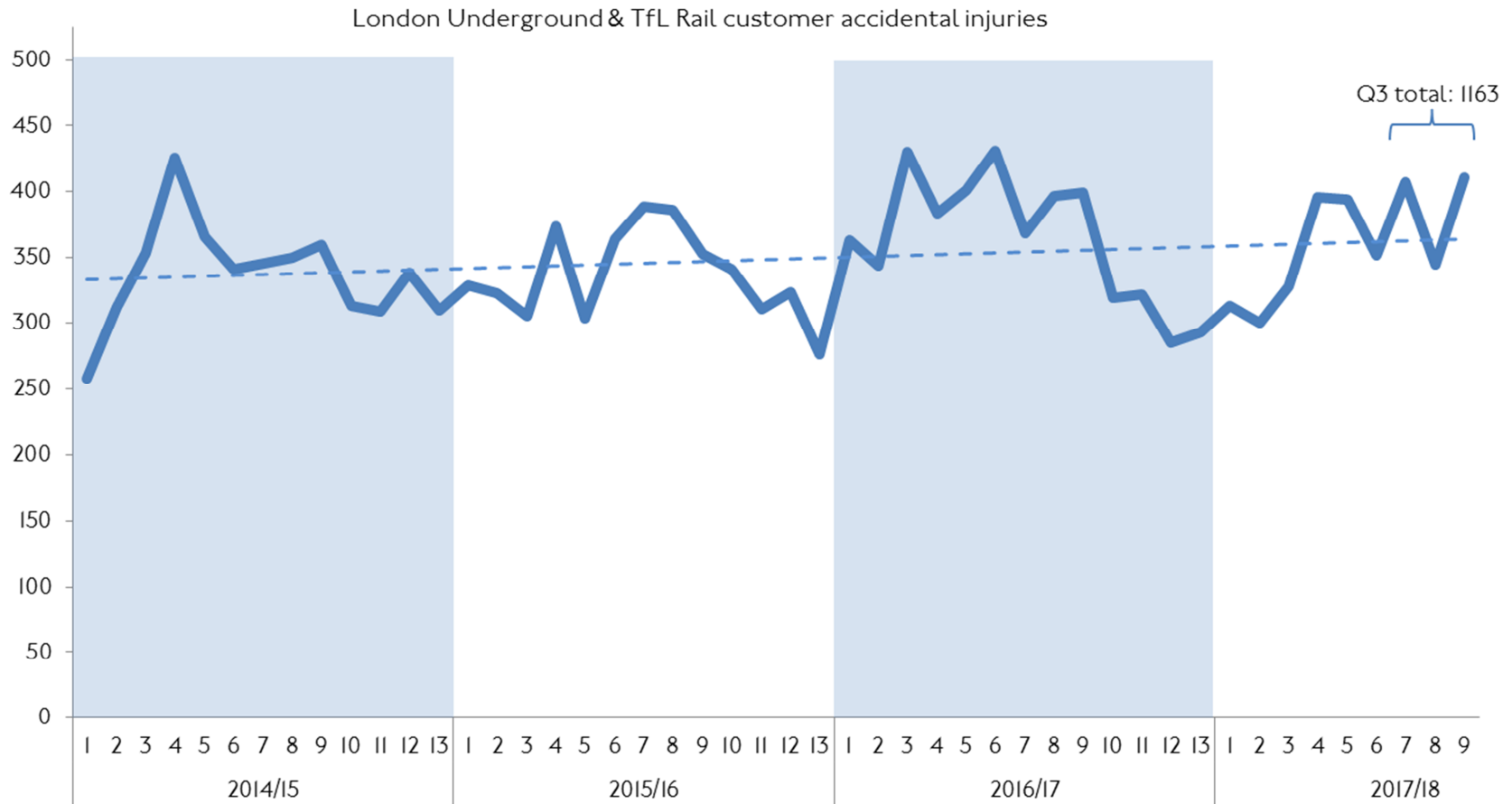
Rail for London Infrastructure (RFLI), our organisation that operates and maintains the Elizabeth line, continue to build the safety case supporting the application for authorisation from the ORR to become an Infrastructure Manager.

Footnotes:

1 A narrative conclusion records the coroner's detailed conclusions on the important issues arising in the circumstances by which the deceased came by his or her death.

2 An open conclusion arises where there is insufficient evidence to meet the criteria required for any other conclusion.

3 Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013.



Above: Figure 2. London Underground and TfL Rail customer accidental injuries 2014/15 – Period 9 2017/18.

Customer safety: Buses

Fatalities

Two accidental fatalities occurred on our bus network in Quarter 3 2017/18. A route 220 bus collided with a pedestrian on Hammersmith Gyration (8 October), and a route 19 bus collided with a pedestrian on Bloomsbury Way at the junction between Museum Street and New Oxford Street (26 November). Both fatalities are under investigation by the Operators and Police. As a follow up to any bus collision fatality, we work closely with bus operators to conduct a joint site visit as part of the investigation. This improves understanding of the circumstances leading to the incident and enables thorough identification of causal factors to inform potential improvement opportunities. The findings of these investigations, along with the outcome of Coroner Inquests will inform the corrective actions to be implemented.

Coroner Inquests in the period have concluded one historic fatality that involved the operation of a bus. In November 2017, an inquest hearing took place concerning the death of a pedestrian who walked off the pavement and collided with a bus (24 May 2016). The Coroner concluded death by road traffic collision. There were no arising actions for the bus operator.

Customer injuries

A total of 1283 injuries were recorded on our bus network in Quarter 3 2017/18 (Fig. 3). This is a two per cent increase on the same quarter in the 2016/17 year. Twenty-two per cent of these injuries required hospital attendance.

Seventy-six per cent of all injuries were caused by falls on buses, striking an object, or being struck by an object within the bus. In a majority of the

cases, including the 78 multi-casualty events resulting in 193 injuries, the bus drivers were forced to take action to avoid collisions which resulted in passengers sustaining injuries through falls or striking against objects. To further mitigate against falls, we have trialled a new on-board announcement, advising customers to hold on to hand rails. We are currently evaluating the outcomes of the trial and will take next steps in collaboration with our passenger groups in Quarter 4 2017/18.

Smoothness of bus ride is a key risk control for falls on buses. We have continued our work with bus operators to conduct covert and overt bus driver monitoring of driving standards. In the quarter, we covertly monitored 1,857 bus drivers. So far this year 5,308 drivers have been observed. This is providing valuable information on driving standards and areas where corrective actions are required.

Bus collisions

A total of 6,611 collisions involving buses were recorded in Quarter 3 2017/18, a one per cent decrease on the same quarter in the 2016/17 year (Fig. 4). Fewer than four per cent of the collisions resulted in injuries to bus customers or other road users, including two collisions that resulted in the fatality of two pedestrians. We have observed a reduction in bus collisions which result in injury. In the quarter there were 239 of these incidents, compared with 275 in the same period of the 2016/17 year.

Seventy-eight per cent of all the collisions involved another vehicle, with the actions of the bus driver stated as potentially contributory in 31 per cent of the incidents. To reduce these types of incident, we have continued to enhance our major incident investigation process. Improvements include: revised incident

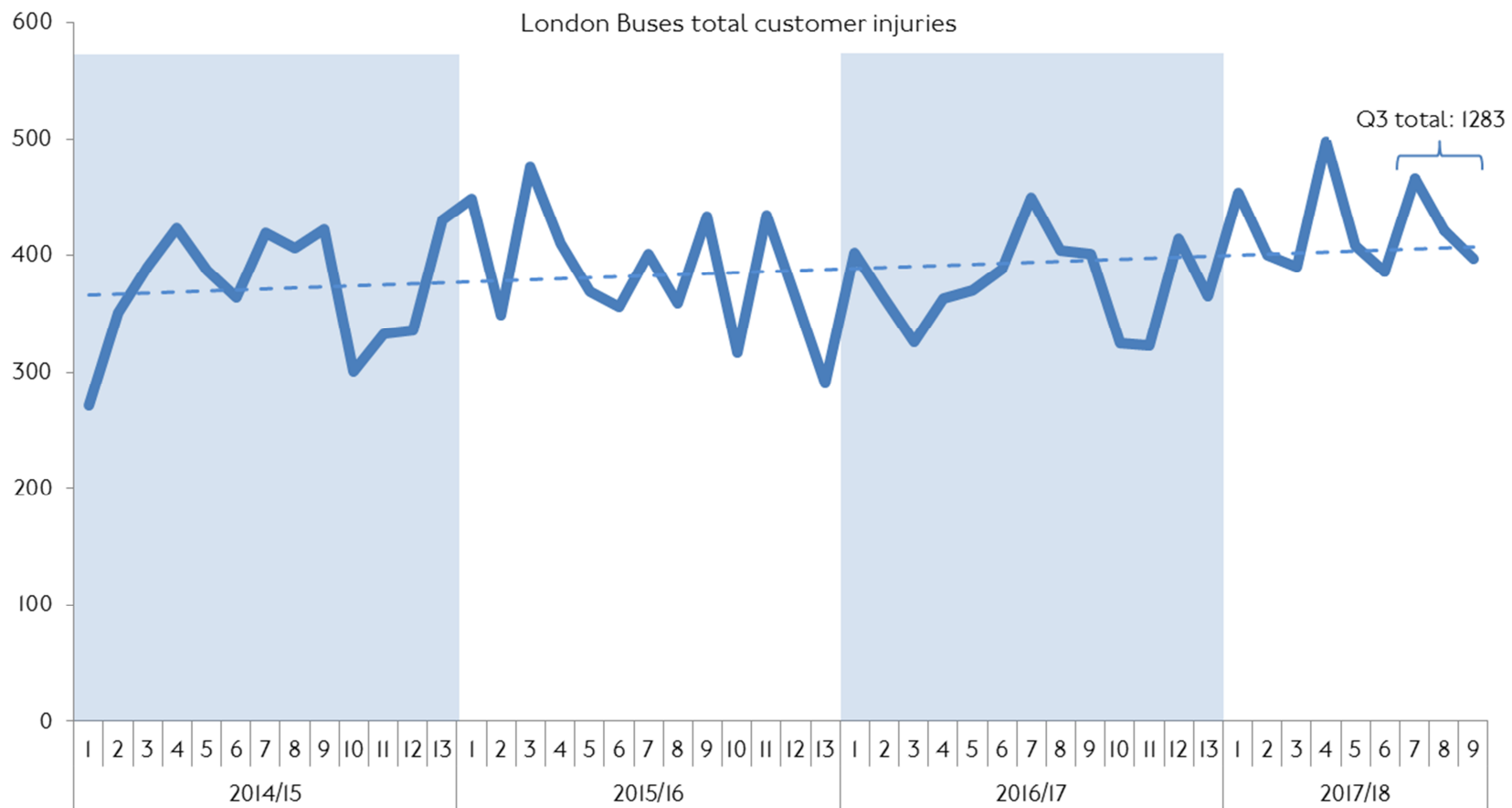
investigation forms; increased engagement with bus operators; and dedicated support from TfL safety managers to support bus operators with investigations. This has resulted: in a standardised approach to incident investigations; improved identification of causal factors; and improvement actions that focus on minimising incident re-occurrence.

Analysis of our investigations into collisions has identified pedestrians stepping into the road without looking and failing to obey red signals as significant contributory factors. Our work to influence pedestrian behaviour has included a review of signage and road markings, and the use of audible and visual cues to improve pedestrian awareness of buses. Our analysis also identified poor driving standards and bus driver hazard perception as areas for improvement in a number of cases. This will be improved through our ongoing work to further enhance driver training.

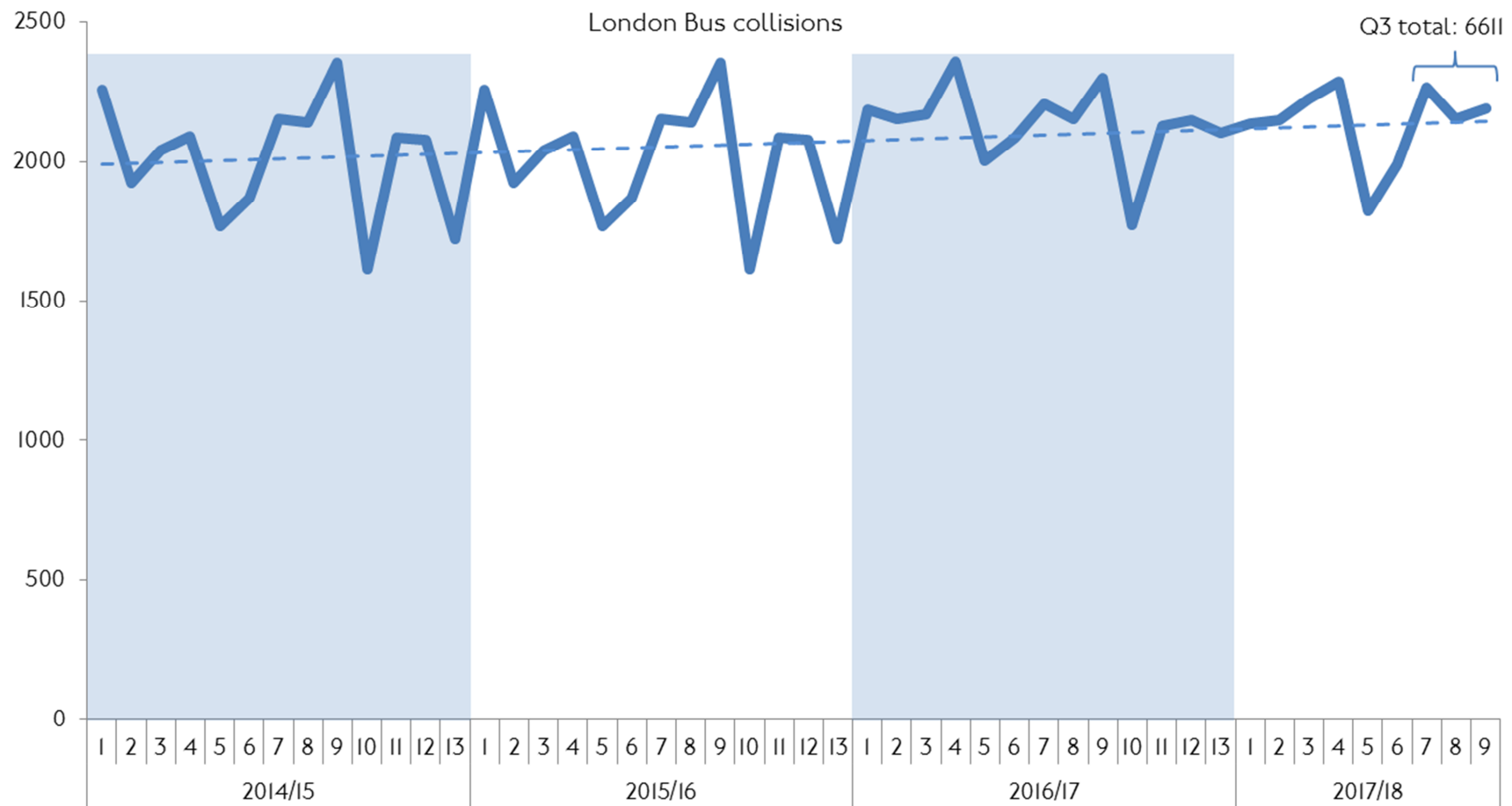
Falls on buses

A total of 1,166 customers fell on buses in Quarter 3 2017/18 (Fig. 5). This is a 4 per cent increase on the same quarter in 2016/17. Sixty-one per cent of the slips, trips and falls resulted in injury to 708 customers in the quarter. Falls within the bus isles and on stairs accounted for 58 per cent of the incidents.

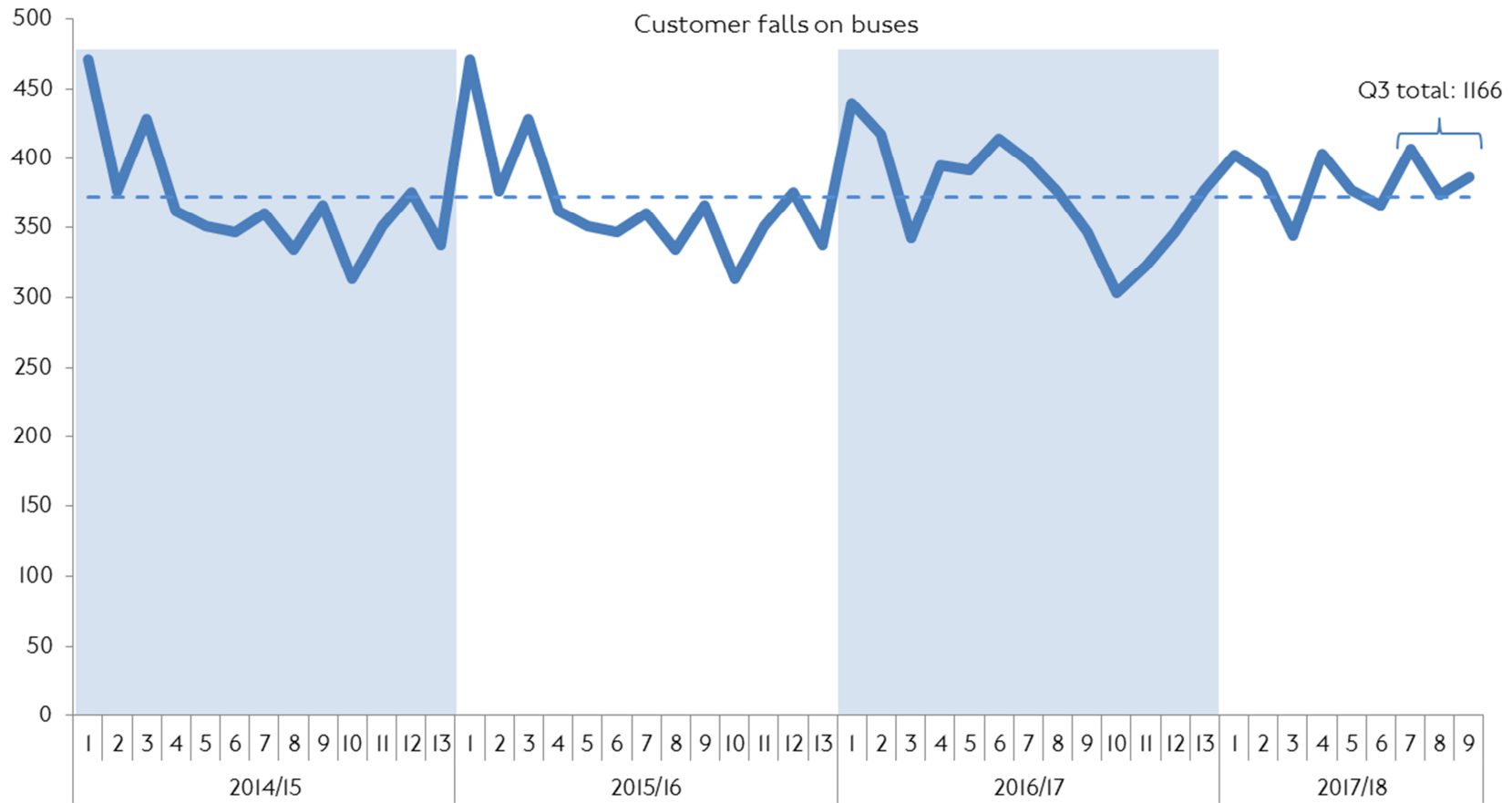
Boarding and alighting related incidents accounted for 22 per cent of the falls recorded in the period. Through our customer experience survey, we review the way in which bus drivers serve bus stops. This has revealed that on 97 per cent of the observations, the stops were served to the required standard.



Above: Figure 3. London Buses total customer injuries 2014/15 – Period 9 2017/18.



Above: Figure 4. London Buses total collisions 2014/15 – Period 9 2017/18.



Above: Figure 5. Customer falls on buses 2014/15 – Period 9 2017/18.

London buses customer safety improvements

Response to the 'Driven to distraction: making London's buses safer' report

In July 2017, the London Assembly Transport Committee published the findings of its review of bus safety. The report, 'Driven to distraction: making London's buses safer' suggests a number of recommendations to improve the safety when travelling by bus in London.

At the end of October 2017, we formally responded to each of the recommendations outlining action taken to date, and proposed future action. This included:

- development of a new bus safety standard;
- use of technology to avoid or reduce the severity of incidents;
- a review of the design of buses;
- improved transparency of bus collision and investigation information;
- and, completion of the installation of bus driver welfare facilities on the network through installation of temporary toilet facilities.

The Bus Safety Programme

The Bus Safety Programme is contributing to the Vision Zero approach to reducing road danger set out in the Mayor's draft transport strategy. It aims for no one to be killed or seriously injured in or by a London bus by 2030, and for deaths and serious injuries from road collisions to be eliminated from London's streets by 2041. The following sections outline key achievements and progress updates we have made in Quarter 3 2017/18.

A new approach to measuring bus safety performance

We have developed two new safety measures; a bus operator safety performance index (SPI), and a safety maturity measure which examines the supplier's safety arrangements in the same way that we use a risk maturity model internally. The method allows us to monitor our supplier's performance and to identify long-term actions that address root cause barriers to safety improvement. The SPI, which is already in place in our contracted London Rail businesses, uses several indicators to measure HSE performance and allows us to further analyse incidents on buses. We will use both measures in our performance monitoring of bus operators from the end of Quarter 1 2018/19.

Safety training for bus drivers

In 2017 we delivered the 'Hello London' bus driver customer experience training programme to 25,000 London bus drivers. Following the success of the course, we are now procuring a bus driver safety training module. We are seeking a standardised and innovative approach that will ensure all our bus operators receive the same high level of safety training.

On our approval of the course content, all bus company driving instructors will be trained to deliver the course to their bus drivers. In December, we started the procurement process which we aim to complete by March 2018. We intend for drivers to receive the new safety training course from Summer 2018.

Bus Safety Innovation Fund

In November 2017, we announced the winners of our Bus Safety Innovation fund. Bus operators were invited to bid for up to £500,000 of funding to develop and trial new safety interventions that will improve safety across London's bus network.

Successful bids included: a fatigue management system; a collision avoidance system; an interactive mobile safety app; a psychometric testing regime to be included as part of driver recruitment; and technology to control bus acceleration. Results from trials of the new technologies are expected in Summer 2018. If the trials are successful, they will be considered for introduction across the bus network.

Bus Safety Standard

The new bus safety standard will feature thirteen safety countermeasures that seek to reduce or eliminate deaths and serious injuries that arise as a result of bus collisions.

In November 2017, we produced a draft road map that sets out an indicative timetable for testing of countermeasures, and when we anticipate these to be ready for market use. The road map will help operators and manufacturers to plan for their future products and fleet vehicles.

Bus Safety Summit

In November 2017, we held the first Bus Safety Summit, bringing together representatives from TfL, Bus Operators and other transport industry stakeholders. The summit reflected on the personal impacts of the November 2016 Sandilands tram overturning, a year after the tragedy which claimed the lives of seven people.

The summit also explored industry improvements in safety culture and the practical management of fatigue by drawing lessons from the civil aviation industry and the use of innovative technology used in the mining and commercial coach sectors.

Customer safety: London Rail (Docklands Light Railway, London Trams, Emirates Airline, London Overground)

Fatalities

There was one fatality to a member of the public on the London Overground network (4 October). The BTP initial investigation identifies causal factors that indicate suspected suicide. This fatality is awaiting the outcome of Coroner inquest.

Customer injuries

A total of 91 customer injuries were recorded on the London Rail network in Quarter 3 2017/18 (Fig. 6). This is a 32 per cent decrease on the same quarter in 2016/17, when we recorded a high number of injuries due to the Sandilands tram over turning incident in November 2016.

Sixty-two per cent of the customer injuries were recorded on the London Overground network, even though they carry just over half of all London Rail network customers. Similar to LU, being encumbered with luggage, travelling under the influence of alcohol, or rushing for services are the key contributory factors in causing injury to customers.

London Rail customer safety improvements

London Trams (LT)

Making the tram service safer remains one of our priorities. In December 2017, the Rail Accident Investigation Branch (RAIB) published their report of recommendations. In January 2018, SNC-Lavalin, the company we commissioned to undertake an independent investigation, published our report. We

will ensure all the recommendations outlined in the RAIB report, and our own report, are met. We continue to work with the UK tram industry to ensure lessons are learned and that we are collectively able to introduce any further measures that could improve the safety of trams across the UK. A summary of our progress against RAIB and our own report recommendations can be seen in Table 1 (overleaf).

We continue to implement safety measures identified from our investigations. These include: additional speed restrictions; improved speed monitoring; new signs for drivers; an upgrade of the CCTV recording system; and an in-cab driver monitoring system. This means that drivers will be immediately alerted if any signs of distraction or fatigue are detected.

We have also started to explore options to make further improvements to the containment provided by tram windows and doors, automatic speed reduction systems, and the initiation of emergency lighting if required. We continue to work with the tram operator to revise risk assessments to ensure they fully consider all pragmatic scenarios.

We have reviewed our customer complaints procedure and implemented improvements to ensure that any safety issue raised by a customer is dealt with efficiently and thoroughly.

Additionally, and not related to the tram over turning at Sandilands, publicity campaigns and school liaison activities are raising awareness of the tram network for those living and working nearby. Messages focus on moving tram awareness whilst travelling on, or nearby, the network.

Sandilands investigation recommendations applicable to TfL and its subsidiaries

Recommendation	Progress to Date
<p>UK tram operators, owners and infrastructure managers should conduct a systematic review of operational risks and control measures associated with the design, maintenance and operation of tramways.</p> <p>[RAIB recommendation 2. Links with RAIB Recommendation 1, 10, and TfL Recommendation 5]</p>	<p>TfL and London Trams (LT) are represented on the UK Tram Industry Sandilands Sub Committee, established to consider the RAIB findings and take action on behalf of the UK tram industry.</p> <p>LT and Tram Operations Ltd (TOL) review of route risk assessments and the network risk model has commenced and will be shared with the wider industry.</p>
<p>UK tram operators, owners and infrastructure managers should work together to review, develop, and install suitable measures to automatically reduce tram speeds if they approach higher risk locations at speeds which could result in derailment or overturning.</p> <p>[RAIB recommendation 3. Link with TfL recommendation 2]</p>	<p>LT has investigated potential automatic speed reduction solutions and have developed a specification for an over speed control solution appropriate to its vehicles. LT is in the process of assessing the impact and technical requirements of the system before entering the procurement market. LT has shared its work to date with UK tram industry.</p>
<p>UK tram operators, owners and infrastructure managers should work together to research and evaluate systems capable of reliably detecting driver attention state and initiating appropriate automatic responses if a low level of alertness is identified.</p> <p>[RAIB recommendation 4]</p>	<p>LT has procured and commissioned the 'Seeing Machine Guardian' driver protection system fleet wide. This system uses proven facial movement technology to monitor driver fatigue and distraction. The system has been installed across the LT fleet.</p>
<p>UK tram operators, owners and infrastructure managers, in consultation with the DfT, should work together to review signage, lighting and other visual information cues available on segregated and off-track areas required by drivers on the approach to high risk locations.</p> <p>[RAIB recommendation 5. Links to TfL Recommendation 1]</p>	<p>A TfL review has resulted in the following changes: reduction in maximum network speed from 80kph to 70 kph; introduction of step down speeds and associated signage on approach to high risk locations; and provision of additional high visibility outlines to relevant speed signage.</p>

Recommendation	Progress to Date
<p>UK tram operators and owners should, in consultation with appropriate tram manufacturers and other European tramways, review existing research and, if necessary, undertake further research to identify means of improving the passenger containment provided by tram windows and doors.</p> <p style="text-align: center;">[RAIB recommendation 6. Links to TfL Recommendation 8]</p>	<p>LT has commissioned the manufacture and testing of several prototype windows that may provide an appropriate level of additional containment. These prototypes have been assessed against the conditions likely to have been encountered during the Sandilands incident, and will take into account any affect they may have on ease of access for the emergency services.</p> <p>LT is investigating the practicalities of modifying tram doors and we will consider the recommendations made by the RAIB when designing new vehicles in the future.</p>
<p>UK tram operators and owners should install (or modify existing) emergency lighting so that the lighting cannot be unintentionally switched off or disconnected during an emergency.</p> <p style="text-align: center;">[RAIB recommendation 7]</p>	<p>LT has commissioned a study into emergency lighting on its trams, and is preparing to procure an industry approved system.</p>
<p>UK tram operators and owners should review options for enabling the rapid evacuation of a tram which is lying on its side after an accident.</p> <p style="text-align: center;">[RAIB recommendation 8]</p>	<p>We will work with tram operators and tram manufacturers to identify and evaluate options to achieve this objective.</p>
<p>TOL and LT should commission an independent review of its process for assessing risk associated with the operation of trams.</p> <p style="text-align: center;">[RAIB recommendation 10. Links with RAIB recommendation 2]</p>	<p>Route risk assessments and risk model have been reviewed and updated.</p>
<p>TOL should review and, where necessary, improve the management of fatigue risk affecting its tram drivers with reference to the ORR's good practice guidance.</p> <p style="text-align: center;">[RAIB recommendation 11]</p>	<p>TOL are implementing a safety improvement plan designed to address the intent of this recommendation through their own internal safety governance arrangements.</p>

Recommendation	Progress to Date
<p>TOL should commission an external organisation to review, the way that it learns from operational experience.</p> <p style="text-align: right;">[RAIB recommendation 12]</p>	<p>TOL are implementing a safety improvement plan designed to address the intent of this recommendation through their own internal safety governance arrangements.</p>
<p>TOL and LT should review and improve the process for managing public and employee comments that indicate a possible safety risk.</p> <p style="text-align: right;">[RAIB recommendation 13]</p>	<p>We have reviewed our customer complaints procedure and implemented improvements to ensure that any safety issue raised by a customer is dealt with efficiently and thoroughly across the TfL network.</p>
<p>TOL and LT should review and improve their processes for inspecting and maintaining on-tram CCTV equipment to greatly reduce the likelihood of recorded images being unavailable for accident and incident investigation. This recommendation may apply to other UK tram operators.</p> <p style="text-align: right;">[RAIB recommendation 14]</p>	<p>All LT fleet has been fitted with new CCTV image recorders. CCTV health checkers which actively monitor the status of recording units and identify faults.</p>
<p>TOL and LT should review and revise where required existing tram maintenance and testing documentation to take account of experienced gained, and modifications made, since the trams were brought into operational service.</p> <p style="text-align: right;">[RAIB recommendation 15]</p>	<p>LT has undertaken a comprehensive review of its written standards, maintenance processes and identified quality deficiencies. LT is in the process of appointing an independent entity who will author new written standards, maintenance processes and forms addressing all quality gaps. This process will be in two phases, with sixteen critically prioritised standards and associated documents being delivered in the first phase.</p>
<p>Review available driver cues in relation to braking points on a approaching a curved section of the tramway.</p> <p style="text-align: right;">[TfL recommendation 1. Links to RAIB recommendation 5]</p>	<p>Overall network top speed has been reduced from 80kph to 70kph. Additional 70kph signs have been provided to aid driver awareness of the permitted maximum speed.</p> <p>A design and signal sighting exercise has been concluded and the provision of additional step down speed signage to aid driver speed awareness and visual cuing is complete. Additional visibility signs have also provided, which will heighten driver speed awareness in high risk areas.</p>

Recommendation	Progress to Date
Review of arrangements for the monitoring and management of speeding. [TfL recommendation 2. Links to RAIB recommendation 3]	LT has commissioned the installation and commissioning of the 'iTram' system, which will provide driver over-speed alerts network wide. iTram will also provide oncoming hazard awareness to drivers of high risk areas.
Review of traction brake controller (TBC) driver's safety device design. [TfL recommendation 3]	LT has procured and commissioned the 'Seeing Machine Guardian' driver protection system fleet wide. This system provides proven driver fatigue and distraction management via facial recognition technology.

TfL recommendations 4, 5, 6, 7, and 8 have all been closed as they replicate RAIB recommendations.

Above: Table 1. Sandilands investigation recommendations applicable to TfL and its subsidiaries.

London Overground (LO)

In December 2017, the Night Overground service was launched. Services will run all night on Fridays and Saturdays on the East London route between New Cross Gate and Dalston Junction initially, before being extended to Highbury & Islington. The East London section of the Overground route serves an area popular for museums, restaurants, bars and night spots. It will connect with the Night Tube at Canada Water on the Jubilee line, and Highbury & Islington on the Victoria line, with Whitechapel station added next summer following completion of Elizabeth line works.

To ensure we offer a safe service, there will be additional BTP officers and Travel Safe Officers patrolling trains and stations, to deter antisocial behaviour. We will continue to monitor incident and crime statistics to evaluate the effect of this mitigation.

Rollout of the wrong side door opening protection system for the Barking to Gospel Oak and Romford to Upminster West Anglia routes has now been completed, in anticipation of the introduction of new Class 710 trains entering passenger service in 2018. The system provides additional mitigation against doors being opened on the wrong side of the train by providing a visual and audible warning to drivers. Once commissioned after the current testing period, all London Overground routes will be operating with the wrong side door opening protection technology in place.

The operator of LO services, Arriva Rail London (ARL), has concluded a detailed analysis of customer incidents in 2017. The analysis revealed a sustained reduction in the number of slip, trip and fall incidents on stations, and also identified a slight increase in boarding and alighting injuries. Improvement

actions planned for implementation throughout 2018 include: use of CCTV to assist in crowd control measures, development of a platform train interface (PTI) risk reduction strategy, and customer awareness campaign promoting safe boarding and alighting. The analysis also revealed ARL recorded the fewest public and customer injuries per million train miles of any UK Train Operating Company for 2017.

ARL have progressed the implementation of their operational safety improvement plan. The focus of the plan addresses the underlying causes of: signals passed at danger; incorrect door operations; station overruns; and persons being over-carried past the final destination of the train. The plan includes: an assessment or driver training and competence management programmes; improving the quality of incident investigations; and ensuring local leadership teams are more visible in communicating key safety messages. A series of employee awareness campaigns have been delivered to raise the importance of personal vigilance and risk awareness.

Docklands Light Railway (DLR)

Analysis of DLR customer injuries in the 2016/17 year concluded that 79 per cent of injuries are caused by slips, trips and falls on escalators and platform areas. We continue to focus our customer safety improvement activities to influence customer behaviour and making infrastructure changes which will eliminate or reduce the risk.

To further understand customer incidents on escalators and at the PTI, we engage with customers through a series of roadshow events. The roadshows are being delivered across the network by Docklands Light Railway Limited (DLRL) and KAD staff, and used

to inform our understanding of customer behaviours that lead to injury. We use this information to develop customer safety improvement strategies.

Escalator safety

In Quarter 2 2017/18 KAD installed enhanced escalator safety measures (similar to those identified by LU in their escalator safety research) at locations where most incidents occur (Cutty Sark, Tower Gateway and London City Airport). KAD have since identified further opportunity to improve escalator safety at London City Airport. A 60 per cent reduction in escalator incidents has been achieved at London City Airport through the introduction of a poster campaign and onsite Travel Safe Officers promoting the use of lifts to customers carrying luggage.

Reducing PTI incidents at DLR

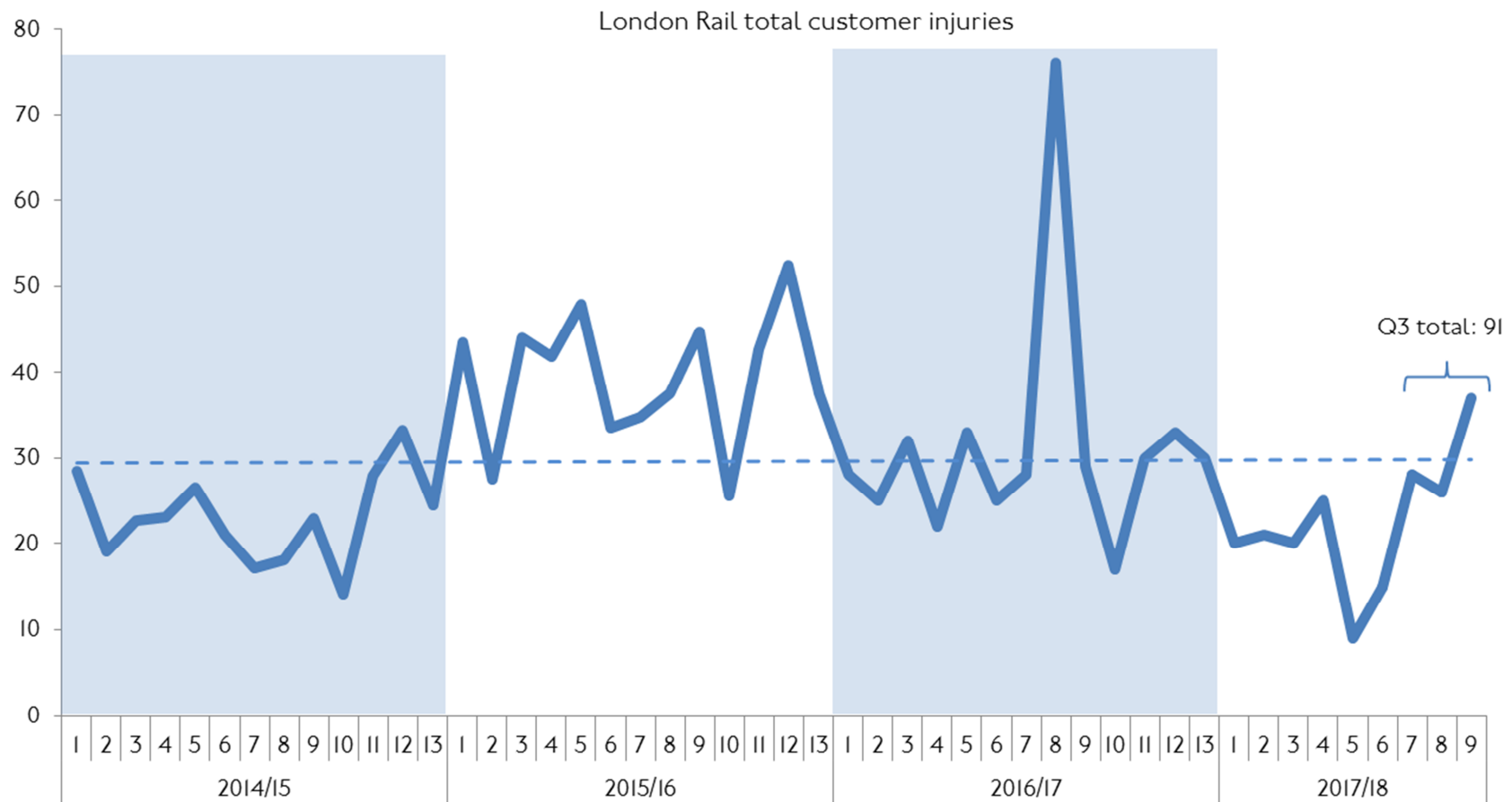
Following the approval of a PTI incident reduction strategy in Quarter One 2017/18, we have further progressed the delivery of planned safety improvements that target a reduction in PTI incidents.

KAD have launched a revised train dispatch procedure which focusses on safe door closing operations. Passenger Service Assistants (PSAs) have received refresher training and are supported with reminder posters at station rest areas.

PSAs use platform mirrors to aid dispatch of trains. A joint working group of DLRL and KAD staff proposed adjustments to the position of platform mirrors on network platforms. Planned improvements will be delivered in Quarter 4 2017/18.

DLRL have started to explore the use of platform edge lighting systems to

illuminate the gap between the train and platform. DLRL are sharing lessons learned from trials conducted by LU, the impact of lights recently installed at Paddington Station, and the experiences of international operators.



Above: Figure 6. London Rail total customer injuries 2014/15 – Period 9 2017/18.

Customer safety: Other Operational Services (London River Services, Cycle Hire, Licensed Operations, Victoria Coach Station, Dial-a-Ride)

Customer injuries

There were no customer fatalities, or conclusions to historic Coroner inquests in Quarter 3 2017/18.

A total of 21 customer injuries were recorded on our Other Operational Services within Surface Transport in Quarter 3 2017/18 (Fig. 7). This is a decrease of 40 per cent on the same quarter in 2016/17, continuing the improving trend. Fifty-two per cent of the customer injuries were Dial-a-Ride customers and 29 per cent were Cycle Hire users.

Dial-a-Ride service users are the group most affected within the Other Operational Services customer profile. During the quarter, five service users were injured after falling while boarding or alighting a bus. Within Cycle Hire, five users were injured in road traffic collisions, and one received injuries after falling off their hire cycle. In Victoria Coach Station (VCS), one customer was injured after falling while boarding a coach. London River Services recorded two incidences of falls when a customer tripped on one of our piers during boarding a boat, and another customer suffered an injury while on a concession boat service. The predominant cause of injuries in the quarter was slips, trips, and falls.

New compliance officers

The Capital's private hire industry has grown dramatically, from 65,000 licensed drivers in 2013/14, to more than 116,000 today. The number of vehicles has increased from 50,000 to 88,000

over the same period. With this growth, there has been a substantial increase in the cost of ensuring private hire operators fulfil their licensing obligations and in tackling illegal activity to keep passengers safe. Under the Private Hire Vehicles (London) Act 1998 we may suspend or revoke a licence if we are no longer satisfied that the licence holder is fit to hold a licence, or the licence holder has failed to comply with any condition of the licence. In 2017 we revoked 148 licenses.

As set out in the Mayor's Taxi and Private Hire Action Plan, income from operator licensing fees will be used to contribute to funding an extra 250 compliance officers, who are all now in post. The team plays a pivotal role in keeping Londoners safe. It also provides reassurance to those travelling at night, by means of a highly visible, uniformed presence in the West End, City and other areas across London.

Safer Travel at Night

As part of our work to improve the safety of travelling by taxi and private hire vehicles in London, officers from TfL and the Metropolitan Police Roads and Transport Policing Command were mobilised over Quarter 3 2017/18. This was part of Operation Safer Travel at Night (STAN) to deter and disrupt illegal taxi and private hire activity and get people home safely over the festive period.

The operation coincided with the beginning of the new academic term when there is an influx of new students to London, who are often unfamiliar with the rules for using taxis and minicabs. Officers were out engaging with members of the public to raise awareness of the ways to get home safely using a taxi or a minicab and the dangers of using unbooked minicabs. This included engagement both with

students at university events across London and with venue door staff in priority locations.

Officers talked to members of the public about the importance of reporting any sexual offences or driver conduct that made them feel uncomfortable so that it can be investigated and action taken against any drivers found to be behaving in a criminal or inappropriate manner.

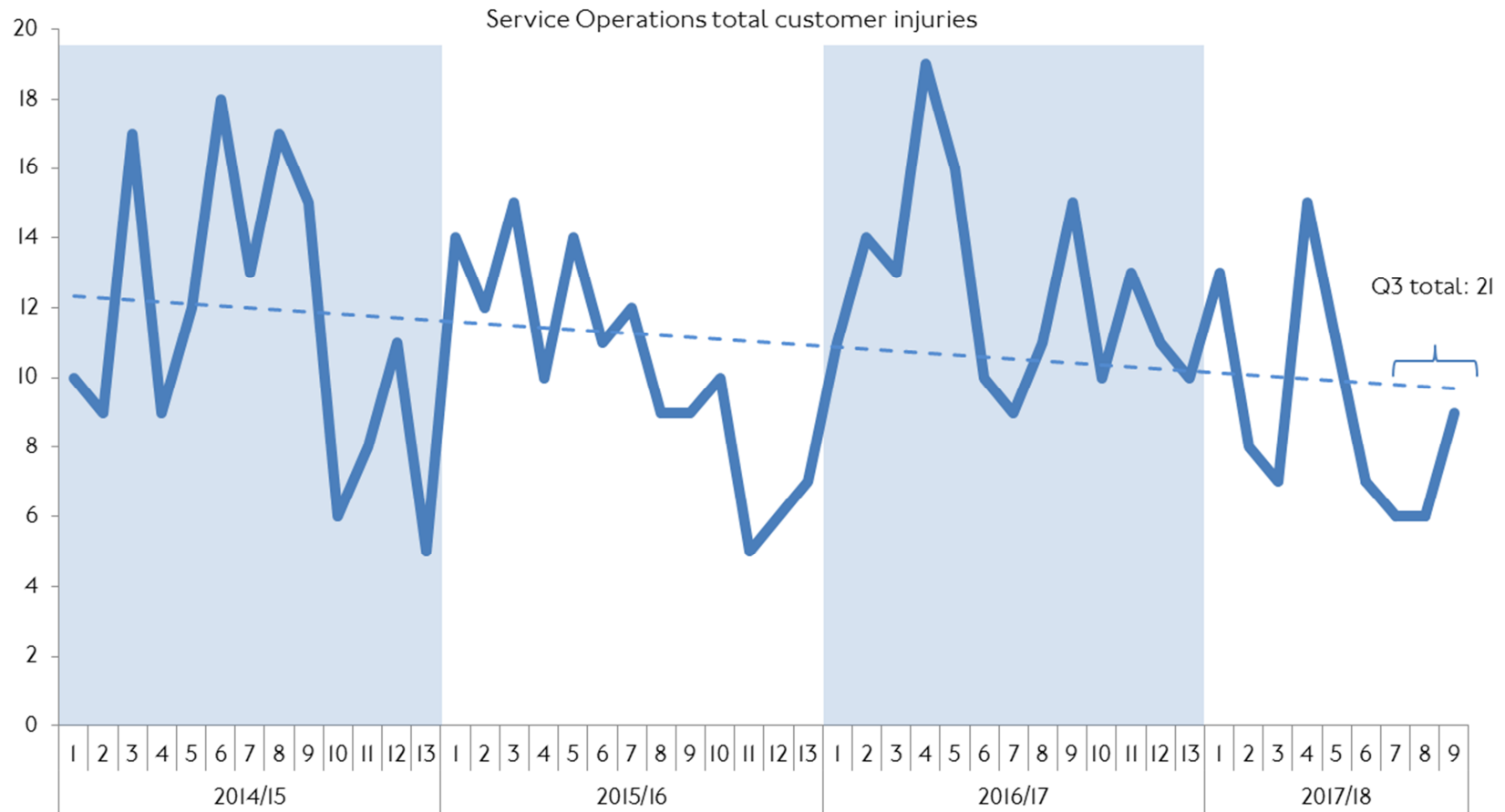
The operation also involved high-visibility patrols in priority areas to deter illegal activity as well as plain clothes patrols, roadside taxi and private hire vehicle and driver checks, private hire operator visits, crime prevention advice and the following up of intelligence leads linked to taxi and private hire journey-related sexual offences.

Uber private hire licensing decision

On 22 September 2017, we informed Uber London Limited (ULL) that it will not be issued with a private hire operator licence after expiry of its current licence on 30 September.

Our regulation of London's taxi and private hire trades is designed to ensure passenger safety. Private hire operators must meet rigorous regulations, and demonstrate that they do so, in order to operate. We consider that Uber's approach and conduct demonstrate a lack of corporate responsibility which have potential public safety and security implications.

The Private Hire Vehicles (London) Act 1998 includes provision to appeal a licensing decision, allowing ULL to continue to operate until their appeal process has taken place, scheduled for 25 June 2018.



Above: Figure 7. Service Operations total customer injuries 2014/15 – Period 9 2017/18.

Road danger reduction

In June 2017, the Mayor of London published a draft Transport Strategy. The document sets out the Mayor's policies and proposals to reshape transport in London over the next 25 years. We are currently drafting a strategy and delivery plan to support the commitment to Vision Zero, within the MTS. The plan is expected for publication in Spring 2018, following the anticipated publication of the final MTS. This will include our commitment to the expansion of the Vision Zero approach to cover all TfL public transport operations.

Prevention of Future Deaths Order

In November 2017, a Coroner inquest took place concerning the death of a pedestrian who was struck by a route 476 bus at the junction between Pentonville Road and Kings Cross Road (10 July). The Coroner concluded death by road traffic collision and issued us a Prevention of Future Deaths (PFD) report concerning the road traffic layout, marking, and signalling. We have reviewed the Coroner's concerns and are implementing some changes, including lane markings showing pedestrians which way to look at the crossing and installing louvres on green man signals. We have sent our response to the PFD report to the Coroner.

Road casualties

The Metropolitan Police Service (MPS) introduced a new system for recording road casualties in September 2016. This has led to far more accurate and detailed data being available to inform

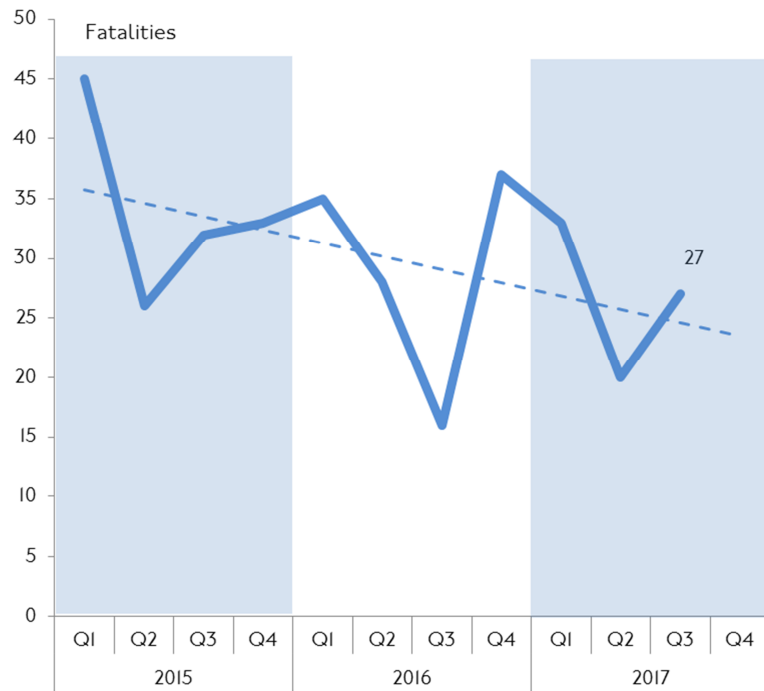
how we and our partners improve road danger reduction in London. It has also resulted in an increase in the number of injuries being classified as 'serious' rather than 'slight', as the previously system relied on the professional judgement of police officers regarding the severity of injury.

Data for slight and serious injuries reported by the police since September 2016 uses injury-defined systems. Therefore this data is not directly comparable with data collected using previous systems and should not be used to interpret year on year or quarterly trends.

Provisionally, a total of 1,251 Killed or Seriously Injured (KSI) casualties were reported by the police during Quarter 3 2017 (01 July - 31 September), using the new methodology of reporting serious injury severity. In Quarter 3 2016, based on the previous methodology, 566 KSI casualties were reported. We are working with the Department for Transport (DfT) to back-estimate numbers of killed and seriously injured casualties that would have been reported to allow more accurate comparisons to be made.

The provisional data presented below is for fatalities and all casualties occurring on the public highway, involving personal injury in London. These figures are subject to change.

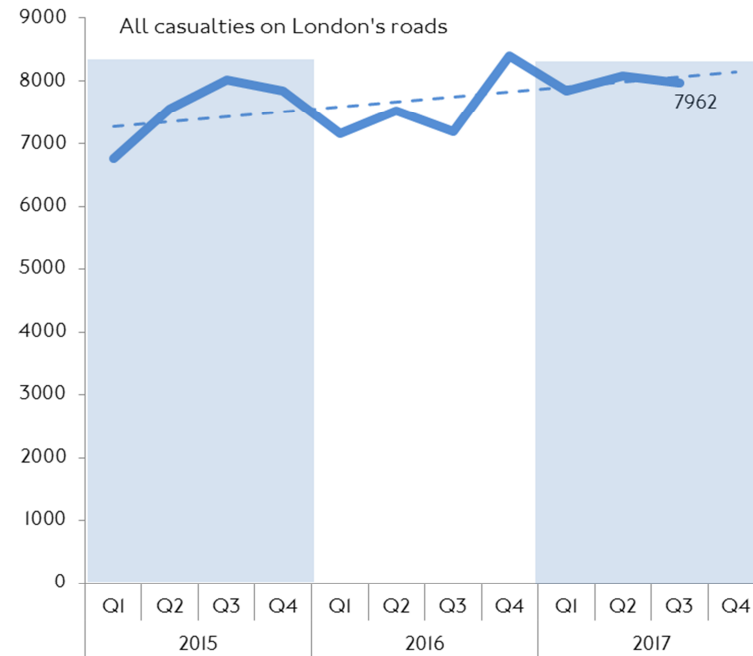
Road safety fact sheets, reports, and data extracts can be found on our website¹.



Above: Figure 8. All fatalities on London Roads.

There were 27 (provisional) fatalities on London's roads. This is an increase from 16 during Quarter Three of 2016.

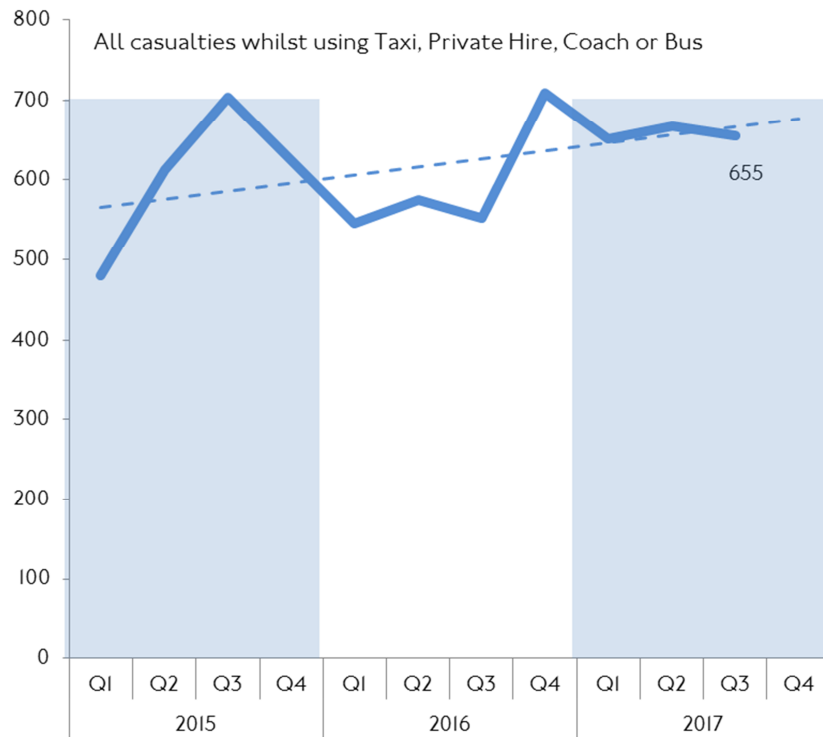
When compared to Quarter Three of 2016: pedestrian fatalities increased from 10 to 15; car occupant fatalities increased from 1 to 5; motorcyclist fatalities increased from 4 to 5; and cyclist fatalities from 1 to 2. There were no bus, coach, or private hire occupant fatalities.



Above: Figure 9. All casualties on London's roads.

There were 7,962 (provisional) casualties on London's roads. This is an 11 percent increase compared to the same quarter of 2016, partly reflecting self-reporting of collisions using the MPS Road Safe London tool².

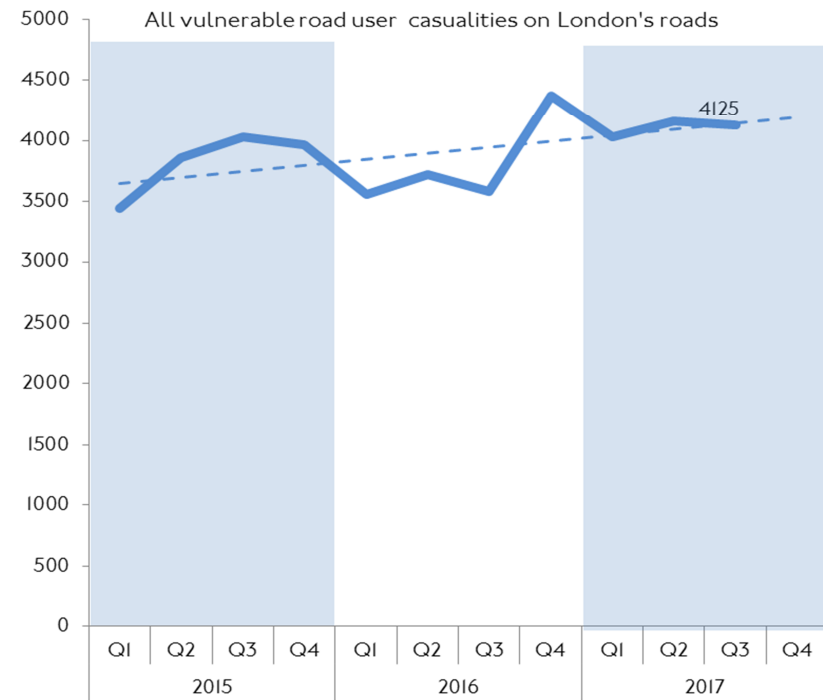
The increase in pedestrian casualties (1,102 during Quarter Three 2016 to 1,565 during the same period of 2017) is of particular concern and we are undertaking further analysis of this trend.



Above: Figure 10. All casualties from taxi, private hire, coach or bus services on London's roads.

There were 655 (provisional) bus, coach, taxi or private hire vehicle occupant casualties on London's roads. This is a 19 per cent increase compared with the same quarter in 2016.

The number of private hire drivers has more than doubled by the end of 2016/17³. The highest number on record.



Above: Figure 11. Vulnerable road user casualties on London's roads.

There were 4,125 (provisional) vulnerable road user (cyclist, pedestrian and motorcyclist) casualties on London's roads. This is a 15 per cent increase when compared with the same quarter in 2016.

When compared to Quarter Three of 2016: total pedestrian casualties increased by 42 per cent and motorcyclist casualties increased by 17 per cent. Cyclist casualties fell by 11 per cent - the lowest number since 2009.

Vision Zero

In October 2017, we hosted a workshop with senior officers from London boroughs to improve awareness and understanding of the Vision Zero approach. The workshop enabled discussion and contributions to the proposed strategy and delivery plan and the sharing of knowledge, views and ideas on how they can be achieved. The workshop provided an opportunity to propose and discuss new opportunities for road danger reduction and how we can work better together in partnership.

Improving motorcycle riding standards

We want to increase and improve motorcyclist training, and raise the standard of motorcycle delivery company operations. In October 2017, we launched a new package of motorcycle safety initiatives: developing a new Fleet Operator Recognition Scheme standard for motorcycle delivery companies, and offering a range of rider training schemes aimed at different riding audiences. These initiatives will contribute to delivering the MTS proposals to improve the safety of vulnerable road users.

Direct Vision Standard

We are developing a Direct Vision Standard to ensure that Heavy Goods Vehicles (HGVs) on London's roads are as safe as possible by providing drivers with direct vision of vulnerable road users around them.

In September 2017, we published the interim star ratings for the Direct Vision Standard for Euro VI HGVs. We also set out how an HGV permit scheme, combining the standard with current, recognised safety measures, would be the best way to improve the safety of lorries on our roads. This was the result of intensive consultation and discussion

with the freight industry, vehicle manufacturers and vulnerable road user groups. We will continue to work with these stakeholders during the next phase of consultation, which started in November 2017.

Road danger reduction improvement schemes

We have made a number of safety improvements across the London road network. A full list of works that we have completed so far is on our website⁴.

Waterloo roundabout

In December 2017, we published our response to the recent public consultation on our proposals to transform the Waterloo area⁵. Our proposals are designed to improve safety for vulnerable road users by introducing signalised pedestrian crossings, new cycle lanes, and separate cycle signals.

Oxford Street

A second public consultation on the proposals to transform Oxford Street, recently closed. The transformation will tackle a range of issues, including: road danger reduction; overcrowding; air quality; and traffic.

Works will begin in 2018 to install or upgrade new pedestrian crossing facilities at six junctions along Wigmore Street. Additional transformations include: pedestrian improvements at another 20 junctions; footway widening; and development of an alternative cycle route strategy, which we aim to consult on in Summer 2018.

Pedestrian Town Centres

We presented the finalised feasibility designs for the Tooting town centre to key stakeholders in November 2017. Proposals include continuous footways to reduce traffic dominance, and reduced risks for cyclists against turning vehicles. There will also be a new public space on Totterdown Street, and widened footways. Further design work will start in early 2018 with a public consultation expected in May 2018.

Brixton Hill Junction

A consultation has been undertaken for a safety scheme at Brixton Hill Junction with Dumbarton Road and Upper Tulse Hill Road. The scheme aims to address collisions involving cyclists and powered-two-wheelers with turning vehicles.

Clapham High Street

We continue to engage with the London Borough of Lambeth to develop proposals to improve Clapham High Street. This joint project will include urban realm enhancements as well as road safety improvements.

Kidbrooke Park Road

The road layout of Kidbrooke Park Road, between the junctions with Old Post Office Lane and Weigall Road, was changed within the quarter. The changes, which form part of the Berkeley Homes' Kidbrooke Village development, include a replacement pedestrian subway under Kidbrooke Park Road with a surface-level signalised crossing, a new signalised crossing at the junction of Kidbrooke Park Road and Weigall Road, new footways, street furniture, street lighting and drainage systems. Kidbrooke Park Road is now fully open to traffic and all bus services have returned to their original line of

route. Until the Kidbrooke Village development is finished, temporary traffic management will remain on site although this should not affect journey times on Kidbrooke Park Road.

Central London Cycling Grid

A network of Quietways and Cycle Superhighways makes up 100km of safer cycle routes known as the Central London Grid. Quietways are sign posted cycle routes which run on quieter back streets to provide for those cyclists who want to travel at a more relaxed pace. Cycle Superhighways are on main roads and often segregate cyclists from other traffic.

Construction of the 85km of core Grid network continues, with 59 per cent (50km) complete or underway. Construction is underway in the City of Westminster and the boroughs of Hackney, Islington, Lambeth and Southwark. 37km of wayfinding has been introduced in the City of London, Hyde Park and St. James Park. As part of the future Grid programme, 62km of additional Grid routes are being prioritised for delivery.

Cycle Superhighways

We completed a public consultation for Cycle Superhighway 9 (Kensington Olympia to Brentford) working closely with our partners (the London Boroughs of Hounslow, and Hammersmith & Fulham). We are now reviewing the responses and we plan to publish the consultation report in early 2018. Cycle Superhighways continue to offer all road users and communities a clear and safe route for people to cycle.

Enfield Mini Holland

The Mini Holland programme is part of the Mayor's Healthy Streets agenda to promote walking, cycling and the use of

public transport. Mini Hollands have features that make cycling feel safer and more convenient.

In Enfield, the town centre will be redesigned, with new segregated cycle routes linking key destinations and corridors. The A105 Green Lanes segregated cycle route is currently under construction.

Streetworks prosecutions

BT has been fined after we successfully prosecuted the company for serious lapses in safety that put the public at significant risk in Lambeth. It is the second time in 12 months we have taken BT to court for unsafe working practices as part of our commitment to tackle poorly managed or unsafe roadworks. The prosecution follows unsafe work carried out on Streatham Hill at the junction of Leigham Court Road, Lambeth on 1 March 2017. BT failed to properly sign and guard the working area, enabling pedestrians to walk dangerously close to heavy plant and machinery.

On 4 October 2017, BT pleaded guilty at Westminster Magistrates' Court to the unsafe execution of streetworks with significant risk to public safety and was fined £25,000 – the highest fine imposed to date in London for safety breaches – and ordered to pay a further £2,764 in costs.

Cadent Gas Ltd (formerly National Grid Gas) was also prosecuted for unsafe execution of streetworks and a failure to cooperate with us in mitigating the risk to public safety. The two offences were committed between 17 and 22 March 2017 when Cadent Gas Ltd failed to comply with safety regulations in the course of carrying out works in Burdett Road, by the junction of Thomas Road, on our road network in Tower Hamlets. The company did not properly sign and

guard the work area and forced vehicles into the opposite lane which could have caused a serious collision. It also failed to address the management of traffic in relation to the works, despite our repeated demands for it to do so.

Cadent Gas Ltd pleaded guilty to both offences and was fined £10,000 and ordered to pay our prosecution costs of £3,004.

Foot notes:

1 tfl.gov.uk/corporate/publications-and-reports/road-safety

2 met.police.uk/roadsafelondon/

3 tfl.gov.uk/corporate/publications-and-reports/travel-in-london-reports

4 tfl.gov.uk/campaign/our-plan-for-londons-roads/what-weve-done

5 consultations.tfl.gov.uk/roads/waterloo-roundabout/?cid=waterloo-roundabout

TfL Workforce safety and wellbeing

There were no workforce fatalities in Quarter 3 2017/18.

There were a total of 498 injuries to our workforce in the quarter (Fig. 12). This is a 12 per cent decrease on the same quarter in 2016/17. Fifty-eight per cent of the injuries involved our direct employees.

TfL direct employee safety

There were a total of 288 injuries to direct employees in the quarter (Fig. 12). This is a 12 per cent decrease on the same quarter in 2016/17. Eighty-seven per cent of these injuries were recorded by LU employees, who account for 70 per cent of our direct employee workforce.

TfL supplier employee safety

There were a total of 210 injuries to supplier employees in the quarter (Fig. 12). This is a 13 per cent decrease on the same quarter in 2016/17. The majority of these incidents were recorded by employees of Bus Operators (62 per cent) and London Underground suppliers within the major project directorate (16 per cent).

Reducing accidental injuries to direct employees

We are committed to creating the safest possible working conditions for our employees. Safety risks are continually reviewed and control measures are put in place to ensure our employees work in a safe environment.

Our 'Go Look See' programme is one of a number of initiatives aimed at preventing incident reoccurrence. It involves senior managers going to the incident site, discussing the causes with the injured person and the local manager, and agreeing preventative actions.

As part of our strategy to improve safety, particularly for those working on the frontline, employee injury working groups continue to provide a forum for managers in operational areas to discuss local challenges and interventions. The initiative is helping to foster the sharing of lessons learned and provide opportunities for peer reviews.

Common themes of employee accidents include slips, trips and falls, workplace violence, and manual handling, often resulting in minor injury. In more than 60 per cent of workforce incidents, lack of personal awareness and behaviours are the main cause.

Workforce safety improvements within LU

The LU People Safety Plan is focused on reducing the number of accidents to our workforce by changing our safety culture through two key messages: 'Showing We Care' and 'Make Safety Personal'.

We plan to change our safety culture by ensuring that the leadership team are visible and having safety conversations with the front line teams. During the quarter, LU Directors and Senior Managers have shared experiences from their safety tours through internal social media (Yammer). There has been a significant increase in the number of safety tours being shared, and this has allowed for wider engagement with the front line teams.

We have continued to roll out manual handling training for maintenance staff, install new equipment to protect staff from the risk of electrical shocks, and changed working practices to reduce risks from working at height.

LU Senior Managers and Directors have launched personal safety charters. These set out the individuals' commitment to safety, their reasons for this commitment and the actions that they will take to improve safety performance. The safety charters are now being shared with the network teams.

Workforce safety improvements within Surface Transport

Manual handling is the predominant cause of injury to employees within Dial-A-Ride. To help mitigate against these injuries, we have implemented a new physical capability testing procedure as part of our fitness standard. To support employees, on-line manual handling refresher training is provided to upskill drivers. At the end of the quarter, 25 new drivers have attended the course. We aim to complete the programme to train existing drivers by 2019.

We are considering how to use this approach across all our businesses where employees undertake manual handling activities as part of their daily tasks. Training in the movement of wheelchairs has been developed for VCS employees, and will be implemented during Quarter 4.

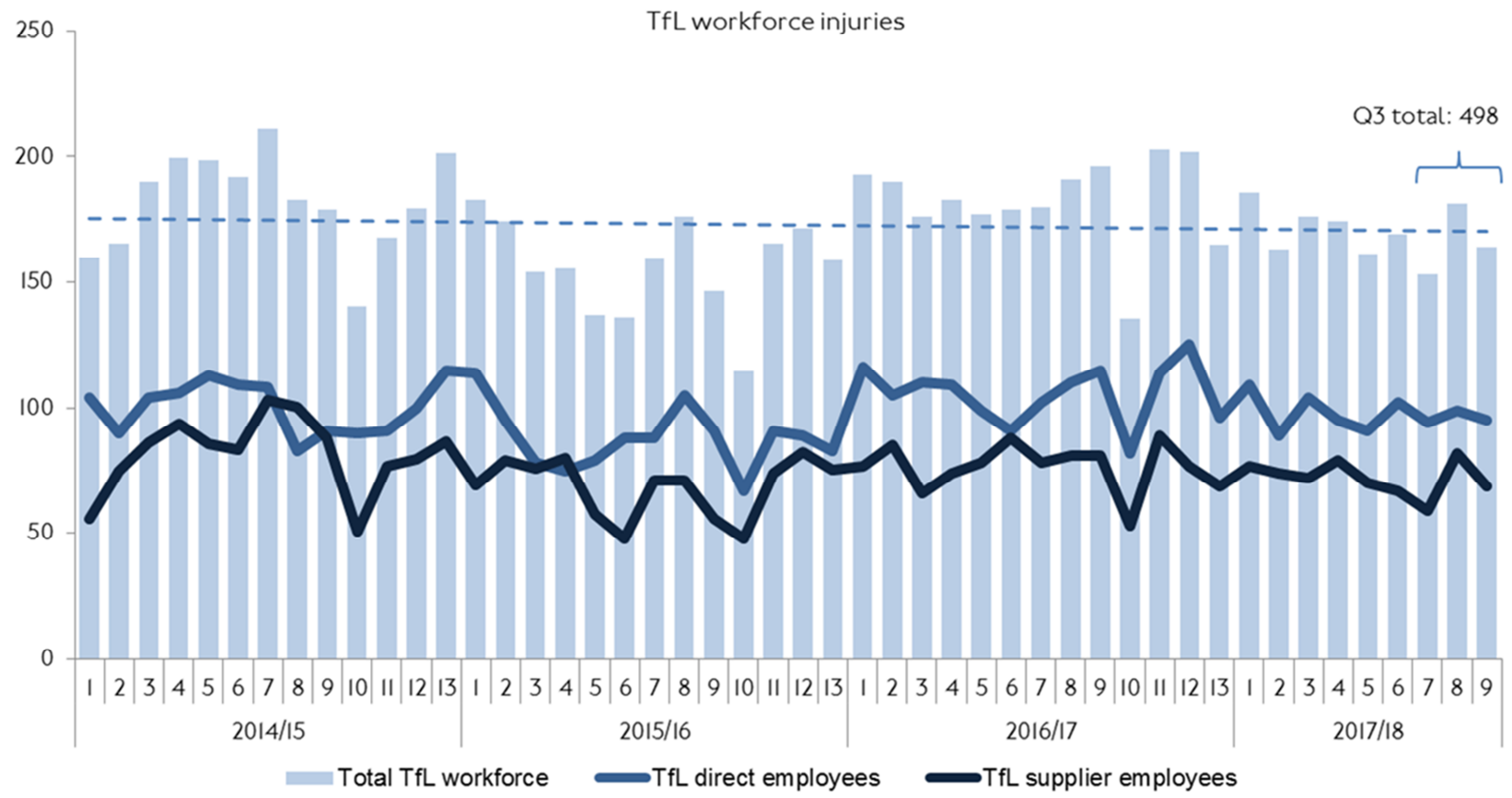
To protect those working in proximity to vehicles at VCS, a new safe system of work has been established for coach departures. The berthing of coaches at alternate, rather than adjacent bays, reduces the risk of employees coming into contact with moving vehicles.

Adjacent berths are only used where all alternate bays are full, under additional staff supervision. The new system is also being trialled in the arrivals area, which is more challenging a greater number of vehicles seeking to access the coach station.

An important part of our approach to safety management, is effective employee reporting of incidents, regardless of severity and outcome. At London Trams, we have introduced new safety observation cards, which are already use in other part of our business. They are a quick and easy way for employees to report low level incidents and observed hazards in the workplace. The will facilitate improvements in reporting and promote employee engagement.

Operational supplier safety

Our operational suppliers are central to our London Rail and Surface Transport networks. We work with our supplier organisations to support their measures for improving safety of their workforce. This will include our contribution to addressing the staff safety and welfare findings of the Greater London Authority (GLA) 'Driven to Distraction' report published in July 2017.



Above: Figure 12. TfL workforce injuries 2014/15 – Period 9 2017/18

TfL major projects directorate (MPD) employee safety

There were a total of 29 accidental injuries to workers across MPD. This is a 17 per cent decrease on the previous quarter. Eighty-six per cent of these injuries were recorded by supplier employees, who account for 75 per cent of the MPD workforce. Figure 13 shows the RIDDOR¹ accident frequency rate (AFR) safety performance of our construction supplier teams for MPD, Crossrail, and the LU Renewals and Enhancements² (LU R&E) team.

Workforce safety improvements within MPD

To keep London moving, working and growing, we engage a wide range of companies from across the UK. As part of our approach, we utilise a supplier 'Zero Harm' forum, and Safety Improvement Groups, to bring construction supplier representatives together. The sessions promote collaboration across the client and contractor boundary on key HSE issues to improve performance.

Based on accident and trend analysis focus has been upon the catalysts to improving our accidental injury performance. Our 'making HSE personal' campaign is helping individuals to enhance their commitment through self motivation. Our efforts so far have resulted in a 45 per cent reduction in lost time injuries compared with last year, but crucially this approach has made 'safety' a genuine conversation between colleagues.

Through analysis of recent incident trends we identified that scaffold towers, in some cases, are not being erected to manufacturer's assembly instructions. We have raised this with our supply chain as a safety

conversation topic and have undertaken a review of sites that have towers and podiums erected. The purpose of the exercise was to raise awareness of the issue with our supplier project teams, ensuring that information is recorded, communicated and awareness raised across all levels our business' for a collaborative approach to corrective actions and to reduce risk of injury.

At a tactical level our dedicated night HSE team and construction teams are working on the front line with our suppliers to further understand cultural barriers and / or unsafe behaviours.

MPD Supplier Assessments

Our Supplier Assessment Tool (SAT) is a newly developed assurance tool, that we use to review our MPD supplier performance on a quarterly basis. The tool assess quality criteria that help to identify both good practices and areas for improvement. The assessment process facilitates the sharing of good practices and where improvement is required, is used to track the effectiveness of improvement plans and risk mitigations. The tool is in early stages of development but our aim is to expand its application across all TfL capital works.

This quarter has highlighted that our supplier base has holistically demonstrated good practice in their approach to safe site management (supplier assessment objective five) (Fig. 14). However, approximately 60 per cent of our supplier base requires improvement in their approach to undertaking HSE performance reviews and continuous improvement (supplier assessment objective seven). A key area of focus is their management of audits and response to managing improvements associated with the SAT process.

TfL Supplier awards

In November, we held our first Supplier Awards to recognise the contribution that our suppliers make to running and improving transport in the Capital.

Conway Aecom won the best safety initiative award in recognition of the initiatives they have implemented in to improve the safety of their fleet. This supports the reduction of work related road risk, which is a key aspect of our Road Danger Reduction programme.

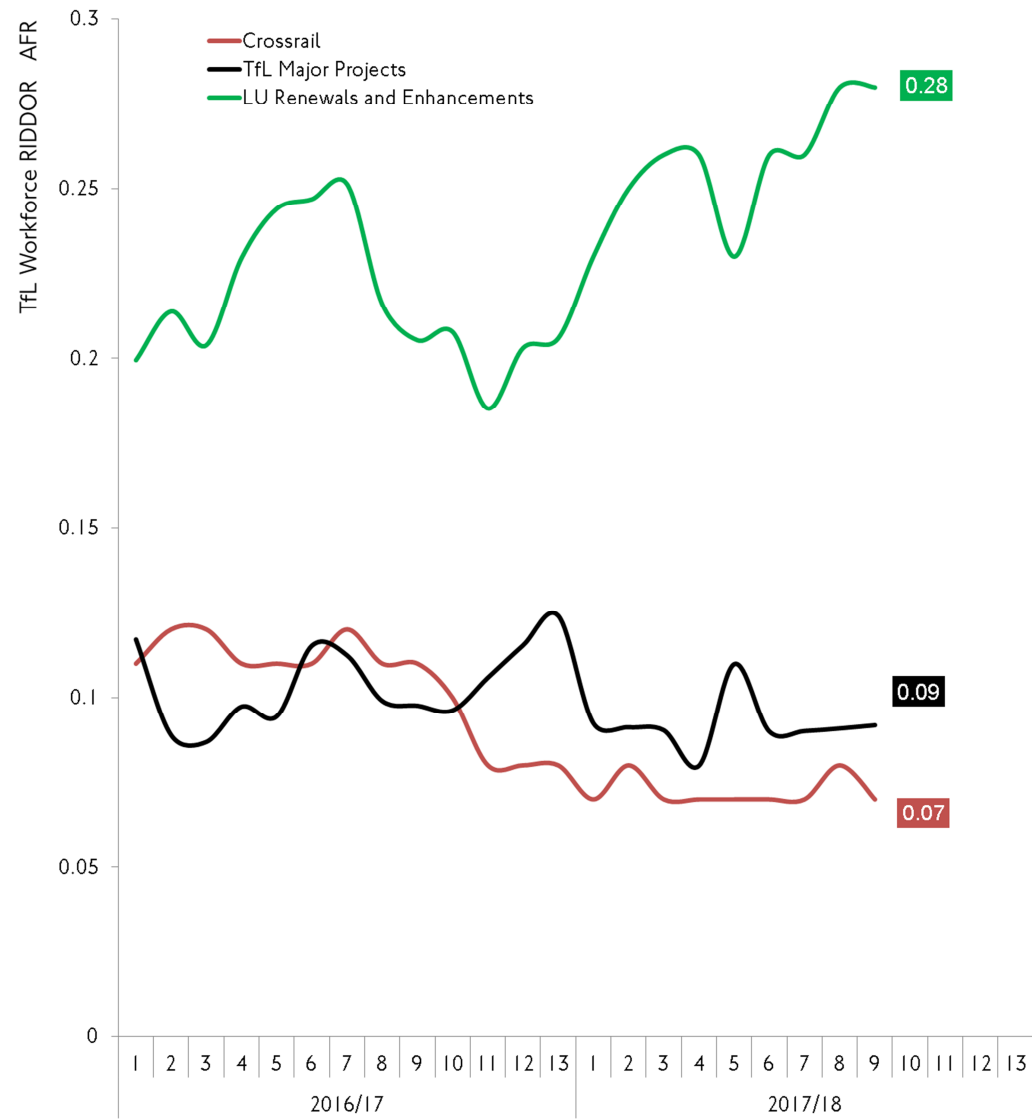
To reduce the risk posed by driver distraction by mobile devices, while recognising the value of these devices as a business tool and assistance in emergency situations; Conway Aecom worked with their IT experts, and suppliers, to develop an in-cab solution that stops use of mobile phones and all other dangerous behaviours while driving.

Our 'Beacon Awards' scheme recognises exemplary site safety practice on TfL sites. In December, Power Road Bridge became the first Surface Transport construction site to be successfully assessed for a beacon award. We are replacing the Power Road Bridge which carries the A406 North Circular Road (Gunnersbury Avenue) over the railway. The works are due for completion by summer 2019.

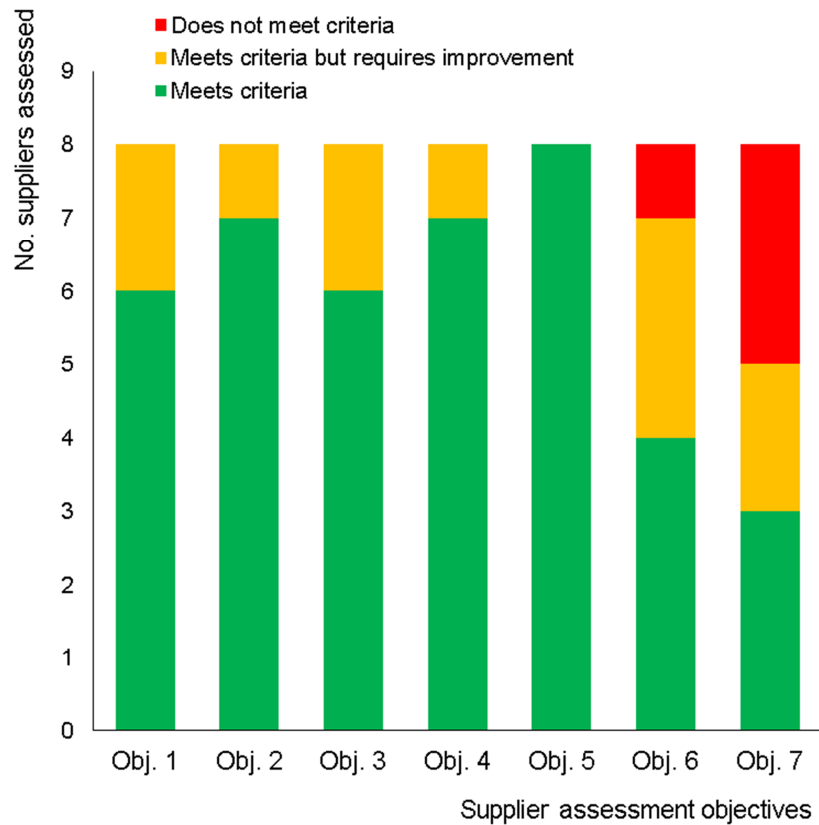
Foot notes:

1 Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013.

2 The work of LU R&E includes the replacement of assets to prevent safety and reliability concerns, and delivery of programmes that improve facilities on the railway.



Above: Figure 13. TfL construction workforce RIDDOR accident frequency rate comparison 2016/17 – Period 9 2017/18



Supplier assessment objectives key

- Objective 1: HSE Leadership & Culture
- Objective 2: Communication, Cooperation, Coordination
- Objective 3: Competence
- Objective 4: Managing HSE Risk Assessments, Documentation and Surveys
- Objective 5: HSE Site Management
- Objective 6: Managing Incidents
- Objective 7: HSE Performance Review & Continuous Improvement

Above: Figure 14. MPD supplier assessment results for Quarter 3 2017/18.

TfL workplace violence

We take workplace violence extremely seriously and we always encourage staff to report any instance of abuse whether physical or non physical so that preventative measures can be taken, and the strongest penalties brought against offenders.

Across TfL, the main cause of injury is from work related violence incidents involving direct and supplier employees in frontline customer service. In Surface Transport the main customer-facing service is provided by private sector suppliers. Incidents tend to be connected with revenue collection and temporary LU station closures as part of our congestion control plans, mainly resulting in verbal abuse.

TfL direct employees affected by work place violence

There were a total of 531 TfL direct employees affected by work place violence in the quarter (Fig. 15). This is a 12 per cent increase on the same quarter in 2016/17. Eighty-four per cent of these injuries were recorded by London Underground employees.

TfL supplier employees affected by work place

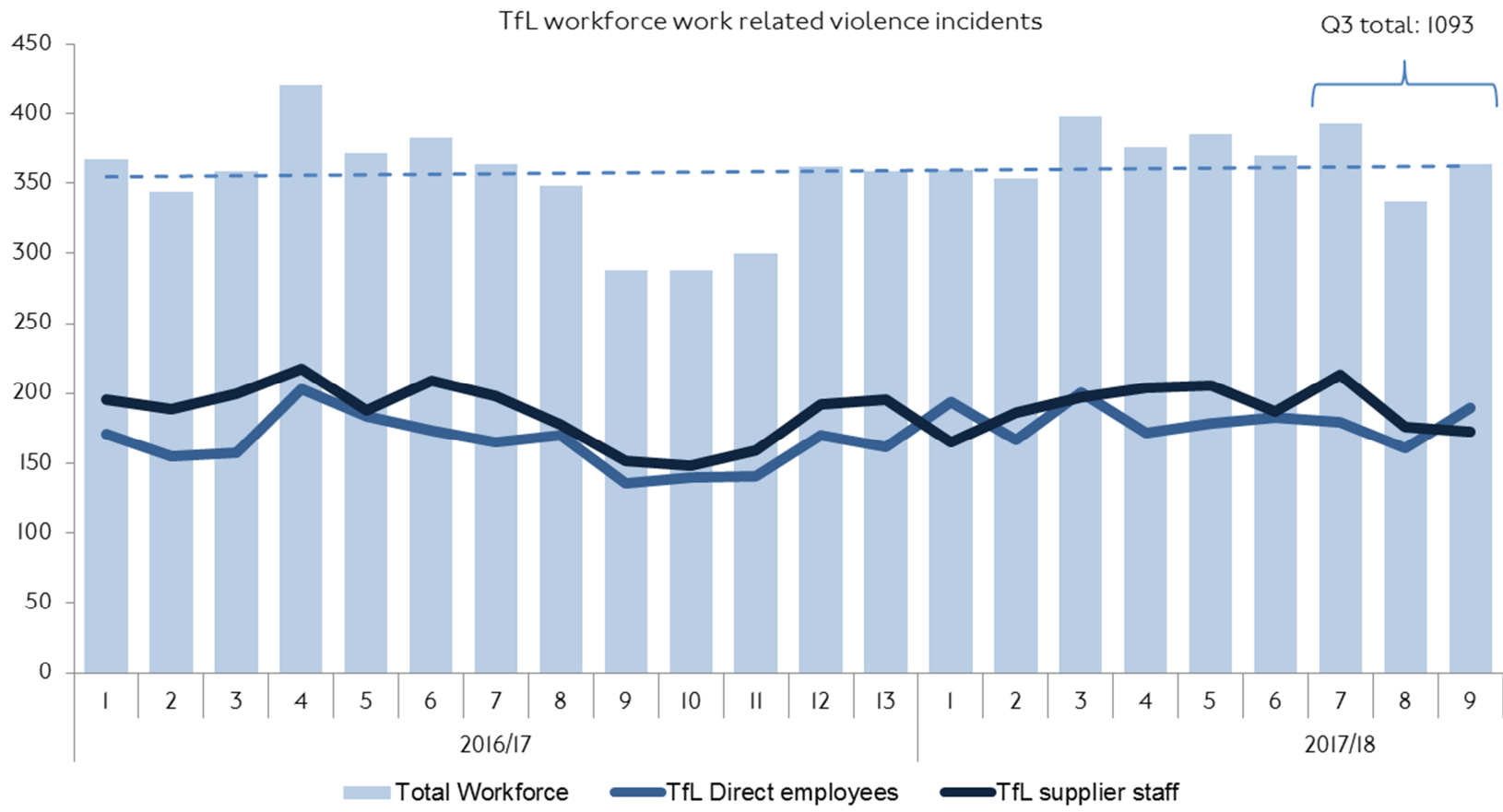
There were a total of 562 TfL supplier employees affected by work place violence in the quarter (Fig. 15). This is a six per cent increase on the same quarter in 2016/17. Seventy per cent of these were recorded on the bus network. DLR and London Overground recorded 14 per cent and 9 per cent respectively.

Managing workplace violence

Our partnerships with the BTP and MPS continued to focus on targeting

hotspots, supporting investigations and court proceedings.

Our Workplace Support Team continues to work in partnership with the MPS and BTP in tackling staff assaults. We continue to deliver Operation Spearhead, an early intervention tactic to prevent low level antisocial incidents escalating to staff assaults. To further support our workforce, we have continued to provide conflict avoidance training to both new recruits and existing employees, and provide strong management support to enable them to deal with such issues effectively.



Above: Figure 15. TfL workforce work related violence incidents 2016/17 – Period 9 2017/18.

Workforce health and wellbeing

We aim to end occupational illness, and to create workplaces that protect employees' health and promote wellbeing. We identify occupational health risks and introduce practices to control exposure.

Our Occupational Health team continue with the delivery of our five-year Health and Wellbeing Improvement Programme, focussing on lifestyle health factors by engaging with employees to improve musculoskeletal, mental health and general health. In Quarter 3 employees participated in physical and mental health challenges for Health and Wellbeing week; diabetes awareness workshops; and the inaugural forum for Health and Wellbeing Champions. During Quarter 4 we will start the delivery of a series of 25 Health Fair events that further support our employees with advice on a range of health topics.

Workforce attendance

At the end of Quarter 3 2017/18, the TfL annual average days sickness absence is 11 days per employee. The UK annual average days sickness absence is 4.3 days per year (Office of National Statistics, Sickness absence in the labour market: 2016).

Musculoskeletal injury and mental health are the main causes, as declared through self-certification and doctors' certificates.

Early referral to our physiotherapy support services for a musculoskeletal injury results in less time off. The average sickness duration is three times less for those employees who are referred within the first month of absence, compared with those who are referred later. We work with line managers to ensure early referral for

employees that need physiotherapy support services.

In Quarter 3 we ran a series of mental health awareness workshops to educate employees on a range of practices, including getting better sleep, overcoming stress and building resilience. Our team of mental health first aiders are also available to offer peer-to-peer support across the organisation.

At the end of Quarter 3, 177 employees received trauma counselling for; work place violence (22 per cent); observing suicide incidents (24 per cent); and near miss / other (54 per cent). There were 293 persons who received non-trauma related counselling for; stress (29 per cent); anxiety (26 per cent); depression (19 per cent); and other (26 per cent). The causations for non-trauma counselling are not conclusive whether caused by personal or work related issues.

Drug and alcohol testing

Across LU and our Major Projects Directorate, 13,969 employees were within scope for drug and alcohol testing. In Quarter 3, the number of employees tested on each monitoring code was: unannounced (180); for cause (3); monitoring (30); and post incident (15). There were two positive alcohol test results: unannounced (1) and for cause (1). There were three positive drug test results: unannounced (2) and post incident (1). All positive test results remain under investigation.

In Surface Transport, 1141 operational employees were within scope for drug and alcohol testing in Quarter Three. The number of employees tested on each monitoring code was: unannounced (0), monitoring (28), for cause (2) and post incident (0). There were no positive results, however, a bus

driver a bus driver was arrested for driving under the influence of alcohol on 24 September 2017 (see page 5).

In the event of a failure, appropriate disciplinary action up to and including dismissal is taken against anyone who is found to be in breach of the drugs and alcohol policy.

Internal Audit

We run a programme of audits across our businesses to ensure our strategic risks are being monitored and adequately controlled. Ten HSE and Technical audits were completed in Quarter 3 2017/18 (Fig. 16). There was one poorly controlled conclusion arising from an audit of LU Transplant vehicle maintenance. Three audits concluded where improvement was required; fatigue management within LU and from two audits of a TfL franchisee, KeolisAmeyDocklands (KAD), where improvements are required within signals maintenance and premises inspections.

Maintenance of Transplant engineering vehicles

LU operate a fleet of engineers trains, and plant equipment (known as Transplant) to support maintenance and modernisation activities. The audit identified: inadequate management of vehicle overhauls; incomplete maintenance records, inconsistent application of maintenance instructions across some of the vehicles audited, and inadequate long term budget planning for maintenance of vehicles.

Whilst corrective actions are implemented, operational use of some equipment has been restricted and speed limits for affected trains put in place. Corrective actions are due for completion by April 2018.

Areas requiring improvement

An audit of fatigue management within LU revealed arrangements do not include all the controls recommended

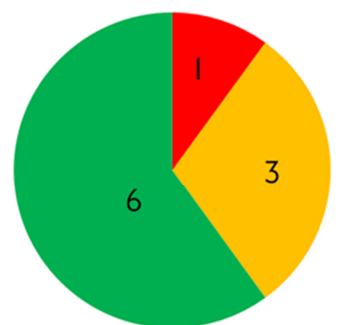
by regulatory guidance. Additional controls, including a new monitoring regime, will be implemented in 2018.

An audit of signals maintenance at KAD, a TfL franchisee, identified a requirement to improve: signal inspections, arising actions, and certification of completed works. The audit of premises inspections at KAD identified incomplete historic inspections, use of localised systems for recording, and issues with the planning process.

Where any risk is identified to be deficient of the required standard, a corrective action plan is implemented to ensure improvements are made.

Audit memorandums

Audit memorandums are distributed to highlight deficiencies identified outside the scope of the audit programme. Recommendations have been issued to further improve the management of safety and security complaints, and improve the quality of London Trams asset information within the enterprise system.



- Poorly Controlled
- Requires Improvement
- Adequately Controlled

Above: Figure 16. TfL HSE audit results Quarter 3 2017/18.

Resilience

Our resilience and preparedness activities aim to reduce the impact of any event or incident on our customers, minimise cost of failures, and recover services to customer expectations following an incident.

Multiagency resilience exercise

We maintain close working relationships with all emergency services and continue to engage resilience stakeholders through the London Resilience Forum (LRF).

In October, we took part in a multiagency resilience exercise at Dalston Junction. The simulated multi-casualty incident tested emergency response protocols of London Buses staff and the emergency services. Improvements have been made to our internal communication procedures within bus operations.

Winter Preparedness

In the event of severe winter weather, we will keep the rail and strategic road networks open and running. This includes key arterial roads, cycle routes and footways around bus and railway stations, hospitals and police, fire and ambulance stations across London.

We work closely with London Councils, to ensure salt is stored at key locations across the Capital for quick and easy access. We are responsible for the treatment of all of London's Red Routes, a network of 580km of key roads. We have a fleet of low emission road gritters, as well as gritting quad-bikes and flatbed trucks to keep the roads and

pavements clear. Working with our partners in London's Boroughs we will also ensure that the Cycle Superhighways and other cycling routes remain safe to use during the winter months.

On LU, we rehearse plans that include running overnight de-icing trains, keeping tracks as clear as possible, gritting platforms to keep them safe for customers, and key sets of points (the mechanical parts that operate junctions on the network) are heated and regularly checked.

On the DLR, points heaters are in operation and teams of staff are ready to grit station platforms.

On London Overground, trains in passenger service fitted with de-icing tanks will be operating across the network to ensure conductor rails are free of ice. Stations will also be gritted and conductor rail heating has been installed at key parts of the network.

We briefed members of the LRF on our winter readiness plans in November.

See It, Say It, Sorted security campaign

The 'See It, Say it, Sorted' campaign, designed and commissioned by the Department for Transport (DfT), encourages customers to report security concerns to police or our staff.

Originally focussing on railway activity, the campaign message has been used nationally by police to encourage engagement around seasonal celebrations and high profile events. We have adapted the campaign to cover all our services and promote it across the network through posters and announcements on public address systems.

Analysis of data supports previous experience that we observe an increase in reports of unattended items and suspicious behaviour immediately after terrorist events. This makes it difficult to analyse the impact of the campaign. We will participate in a DfT review of the effectiveness of the campaign message and evaluation of the impact on public behaviours and expect that a report will be available by Summer 2018.

Environmental management

The Mayor's environmental vision was published in the draft London Environment Strategy (LES) in August 2017. It set out his vision for London to be the world's greenest global city by making London greener, cleaner and fit for the future. The LES and draft MTS set out the actions to support this vision, covering environmental aspects including air quality, carbon and energy, climate resilience, noise and green infrastructure. We are committed to supporting these measures through the operation of our transport services.

Air Quality

On 6 November the Mayor announced that the Ultra Low Emission Zone (ULEZ) will replace the T-Charge (also known as the Emissions Surcharge) in the Central London Congestion Charging zone from April 2019. The ULEZ will apply 24 hours per day and all vehicles will need to meet the minimum emissions standard or pay a daily charge.

On 30 November, consultation for expansion of the ULEZ standards commenced. We are proposing that all buses, coaches and HGVs within London will need to meet the European Union emissions standard (Euro VI) for NO_x¹ and PM₁₀² from October 2020. Vehicles that do not meet the standard will pay a daily charge. We are also proposing all cars, vans and motorcycles will need to meet ULEZ standards inside the North and South Circular roads or pay a daily charge, from October 2021. The consultation runs until 28 February 2018.

Low Emission Buses

We remain on course to deliver the Mayor's air quality objectives by making the bus fleet cleaner, with zero-tailpipe-emission technologies. Route RV1 between Covent Garden and Tower Gateway is now predominantly hydrogen-fuelled as two additional vehicles, manufactured by Van Hool, have entered service.

With these new vehicles we now have 10 fuel-cell buses in our fleet. Our pure electric fleet will increase to 120 vehicles by early 2018, then to 170 in 2019, following the award of contracts to convert routes C1, 46, 70, 153, 214 and 360.

To date, we have delivered just over 1,500 ULEZ-compliant buses into service as part of a retrofit programme of conventional diesel vehicles to bring them up to the Euro VI emission standard.

Airborne dust monitoring on the Tube

The Mayor has already introduced new measures to lower emissions from cars and buses, and is now also focused on wider sources of pollution, including the Tube, river transport and construction sites. In 2017, the Mayor commissioned a review of air pollution on the Tube with the aim of introducing measures to minimise dust levels, and ensure employees and customers breathe the cleanest air possible.

Airborne dust is composed of fine particulate matter that can be inhaled and absorbed into the human body. Dust can be generated from a variety of sources on the Tube: the interface between the train wheels and the track; brake pad wear; construction works; foot trodden dust from customers; and emissions from nearby traffic. We operate a comprehensive and regular

cleaning programme to minimise any health risks associated with the presence of dust, including: litter picking; sweeping of dust and fluff from cables and track; wet mopping of walls and floors; and vacuum cleaning.

Our dust monitoring programme conducted over the last 13 years has confirmed we are well within regulatory limits set by the Health and Safety Executive (HSE). In May 2017, we undertook an additional dust monitoring programme. Following recognised industry best practice, dust samples were collected and analysed to determine if an increase in the frequency of cleaning would be beneficial in areas where our previous results have shown higher dust concentrations, even though these areas were still within regulatory limits.

Analysis identified dust samples to be predominantly Iron and Oxygen, likely to be from train wheel and track wear. A small proportion of samples had a comparatively higher Calcium, Silicon and Oxygen content indicating nearby construction work as a potential source of dust.

The samples taken after cleaning show a reduction in average concentration of dust for all samples taken. On the Northern Line, cleaning resulted in a 44 per cent reduction in respirable dust levels. All airborne concentrations of inhalable and respirable dusts, measured at the sampling points, were well within the regulatory limits set by the HSE. We observe higher standards than regulatory limits, and all our post cleaning samples met the recommended guidelines for inhalable and respirable dust concentrations set by the Institute of Occupational Medicine (IOM).

Next steps include further monitoring activity and planning for a whole line

clean to measure the rate of dust accumulation.

Rapid Charging Infrastructure

We are installing rapid charging infrastructure to support the decommissioning of the oldest, most polluting taxis and achieve the goal of having 9,000 zero emission capable taxis on the roads by 2020. The move will also encourage vehicle owners to switch to electric vehicles. The first sites became operational in October. Individual operators are responsible for operating the points, servicing and accepting payment. Some may offer membership schemes too and most offer pay as you go mechanisms.

We are continuing to make progress towards the target of delivering 100 rapid charge sites by the end of March 2018. At 9 December 2017, 40 rapid charge points had been installed with TfL funding, including 31 dedicated for use by London licensed taxis. Over the next two years, 300 new rapid charging points will be installed on borough and private land, as well as our own land.

Go Ultra Low City Scheme

The Go Ultra Low City Scheme (GULCS) is a joint project between TfL, Local Authorities, and The Greater London Authority (GLA) aiming to increase the provision of on-street electric vehicle charging infrastructure across London. We expect to procure a charging infrastructure service provider(s) to by Spring 2018.

There are six Neighbourhoods of the Future (NoF) currently trialling innovative electric vehicle charging technologies, policies and initiatives that support the growth of clean vehicles in London. On 15 November, the GULCS project team advertised up to £1.5M of funding for London Boroughs to

implement additional NoF projects. Project proposals will be assessed and funding allocated to new projects during Quarter 4 2017/18.

Solar Energy

As part of our continuing work to reduce carbon emissions we will be installing solar panels at a prospective 24 buildings across the TfL estate. The new installations will complement existing solar panels at head offices, train crew accommodation buildings and stations. They currently provide approximately 245kW of installed capacity. We expect the new installations to generate an additional 1.1MW of low carbon electricity to support our operations, with installation beginning in early 2019. Energy efficiency upgrades completed in 2017, including the retrofitting of older buildings with more modern heating and lighting, are anticipated to help reduce energy consumption in some of our buildings by approximately 20 per cent.

Proposed enforcement action

There remains an issue of proposed enforcement action from the Environment Agency (EA) for non-compliant London Underground assets containing Polychlorinated Biphenyls (PCB). High voltage power transformer assets have all been decontaminated or registered with the EA. Removal of other assets found in signal equipment rooms and on some of our older train fleet is under way. All asset types and locations have been subject to a comprehensive safety and environmental risk assessment and all were found to be very low risk

Energy consumption within our managed sites

Our energy consumption for LU, Surface Transport and Head Offices is shown in figures 17 – 19. This includes Surface

Transport infrastructure, London Underground stations, depots and other assets, and head office buildings. Charts also show the CO₂ emissions associated with our energy consumption.

The total amount of CO₂ emissions associated with energy consumption at our managed sites (LU, Surface Transport and Head Office buildings) was 9,759 tonnes at the end of Quarter 3 2017/18. This represents a two per cent reduction compared with 9,955 tonnes at the end of the same period in 2016/17. Period 09 2017/18 gas and electricity data for head offices is a forecast only due to availability from the supplier.

Periodic consumption of traction electricity (energy used to power trains) for London Underground and London Overground, and the CO₂ emissions associated with this, is shown in figure 19. As traction electricity represents approximately 75 per cent of our total energy consumption, this is shown separately from other energy use.

TfL waste management

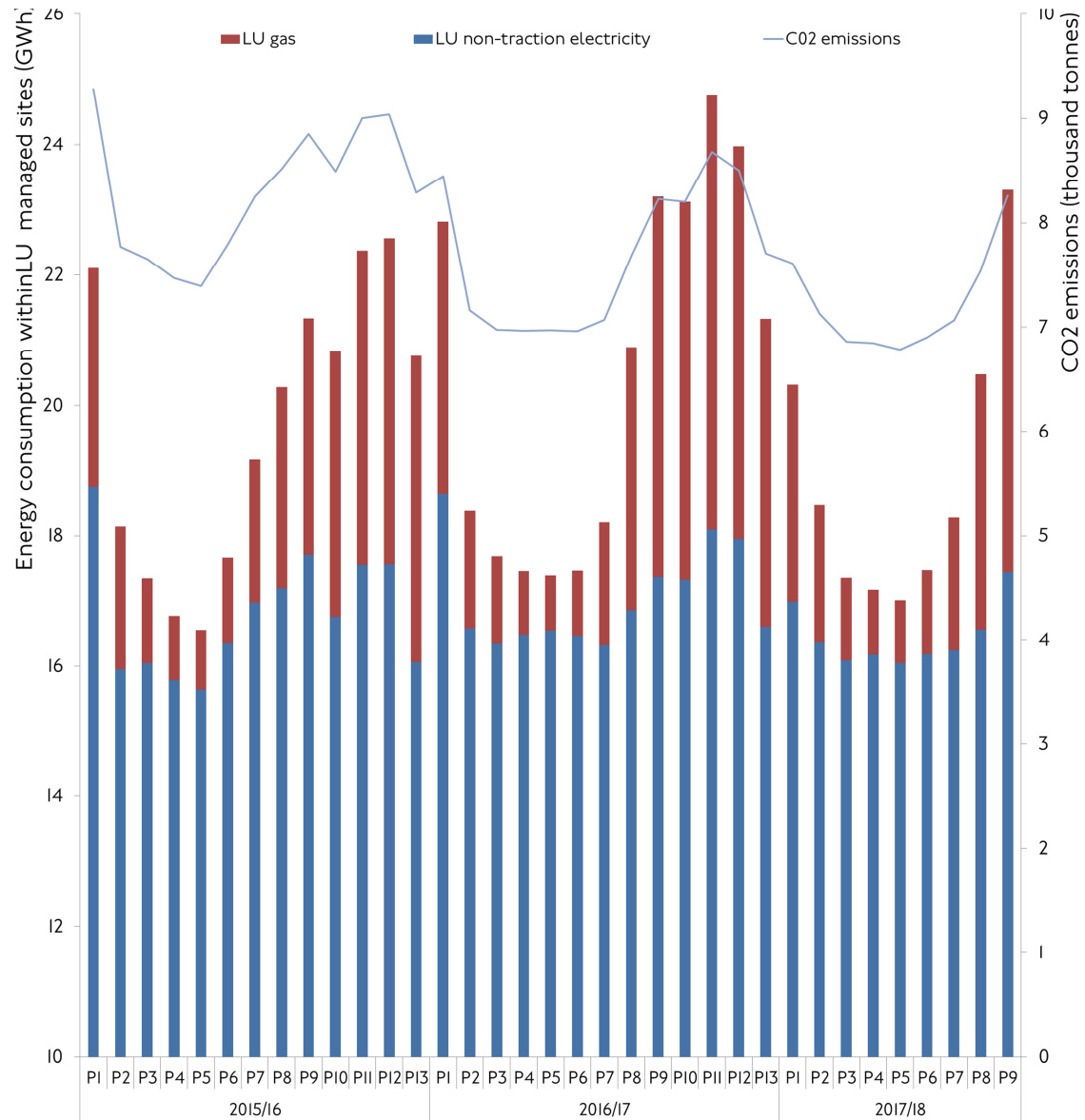
Quarterly waste and recycling / recovery volumes are shown in figures 20 – 23 inclusive (below). Data is provided quarterly in arrears due to availability from contracted service suppliers.

Footnotes

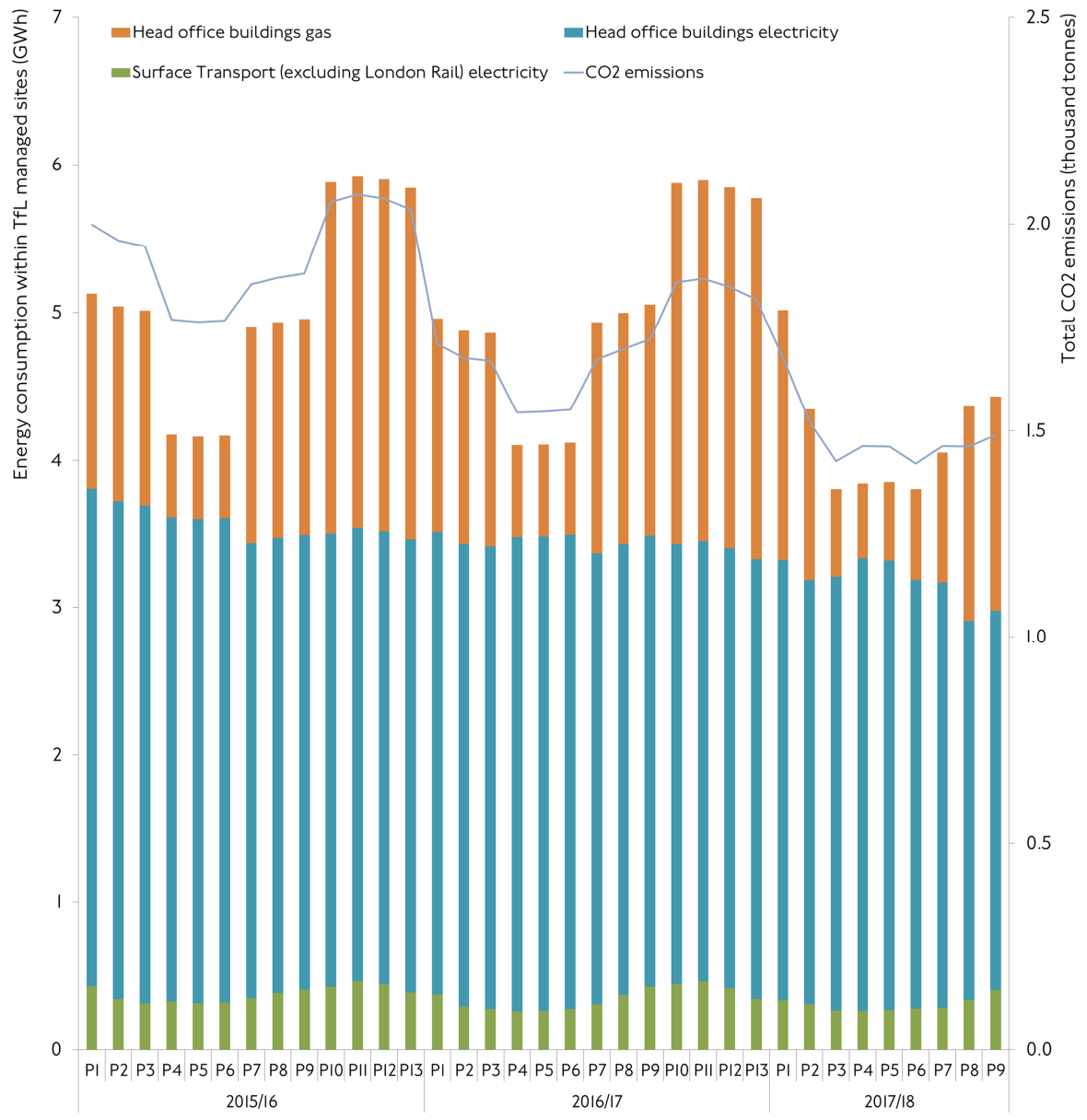
1 Nitric oxide (NO) and nitrogen dioxide (NO₂) are together referred to as oxides of nitrogen (NO_x).

2 PM₁₀ is particulate matter up to 10 micrometres in size.

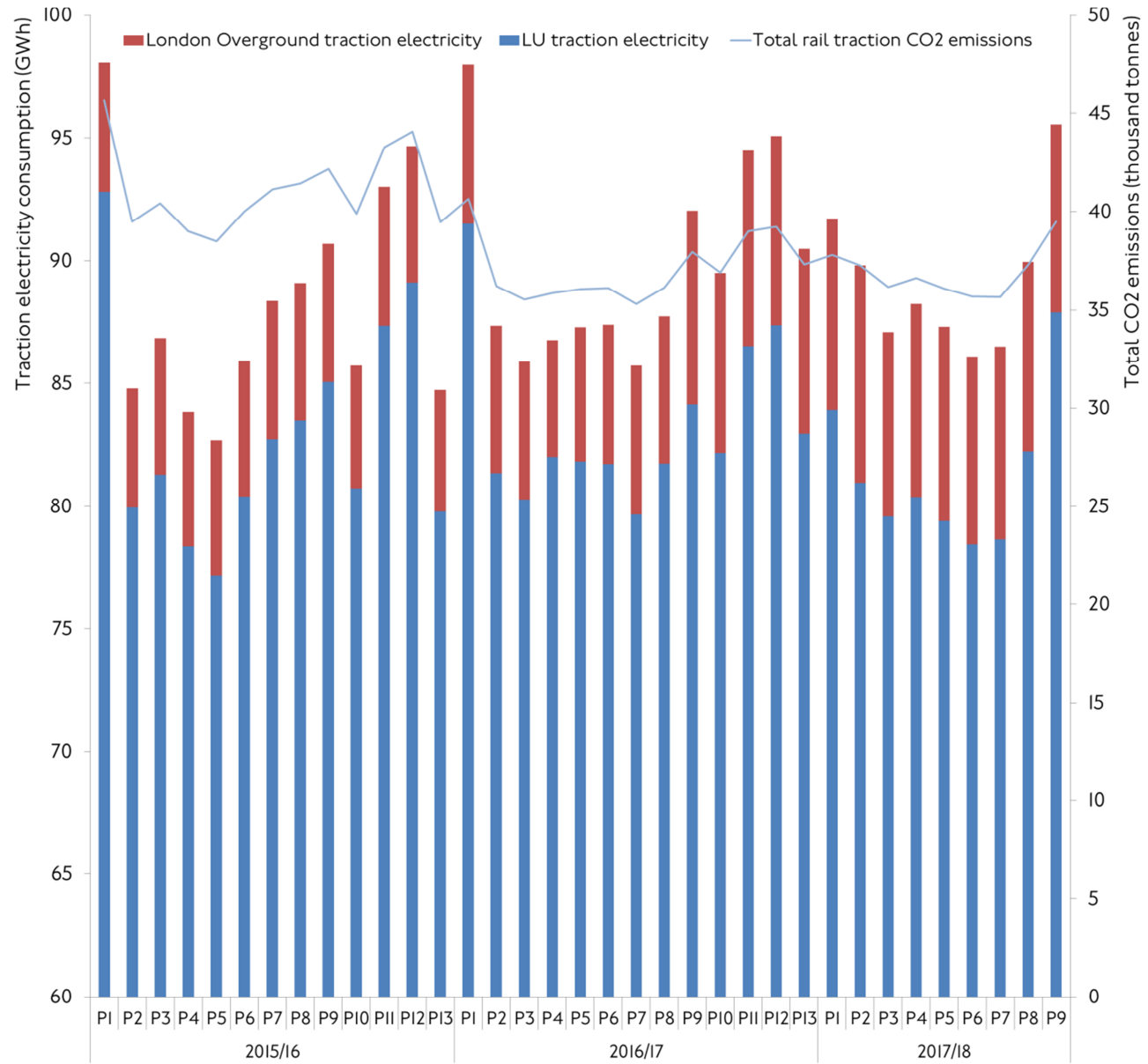
Energy consumption within our managed sites



Above: Figure 17. London Underground gas and non traction electricity consumption P1 2015/16 – P9 2017/18



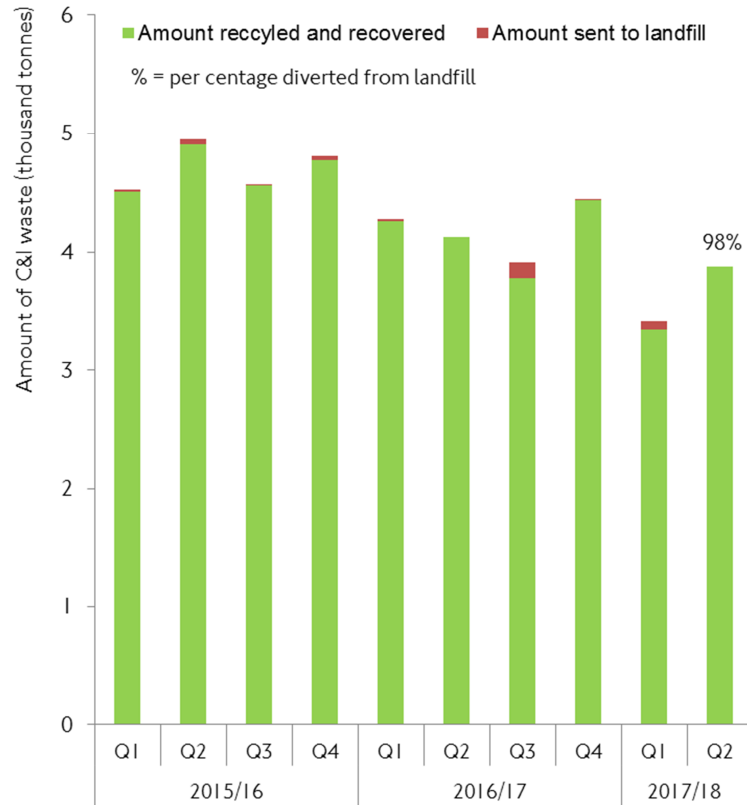
Above: Figure 18. Surface Transport and Head Office gas and electricity consumption P1 2015/16 – P9 2017/18



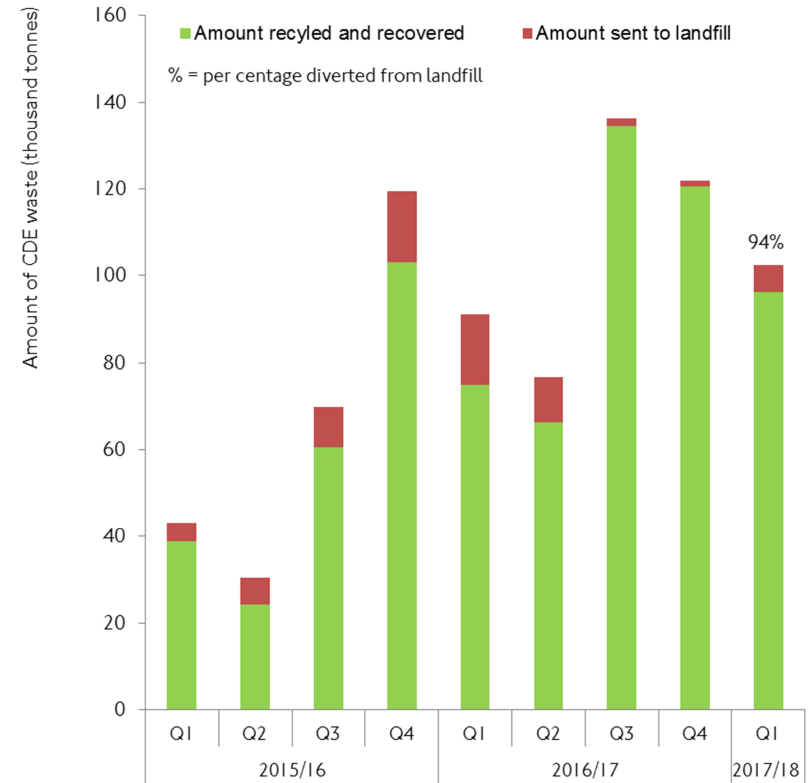
Above: Figure 19. London Rail and London Underground traction electricity consumption P1 2015/16 – P9 2017/18

Waste management within London Underground and London Rail

Data provided quarterly in arrears due to availability from contracted service suppliers.



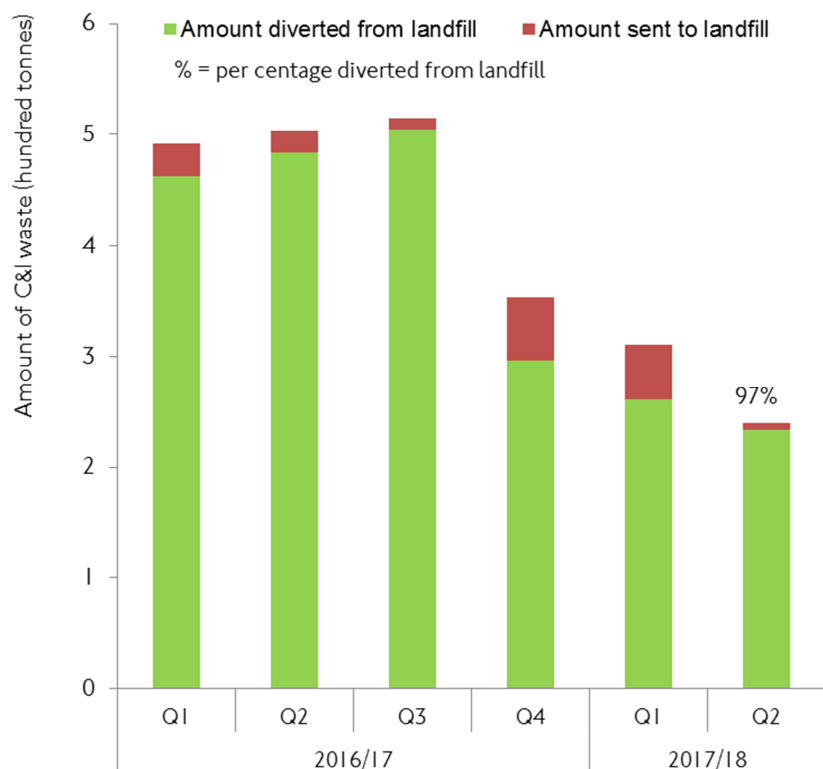
Above: Figure 20. London Underground commercial and industrial waste Q1 2015/16 – Q2 2017/18.



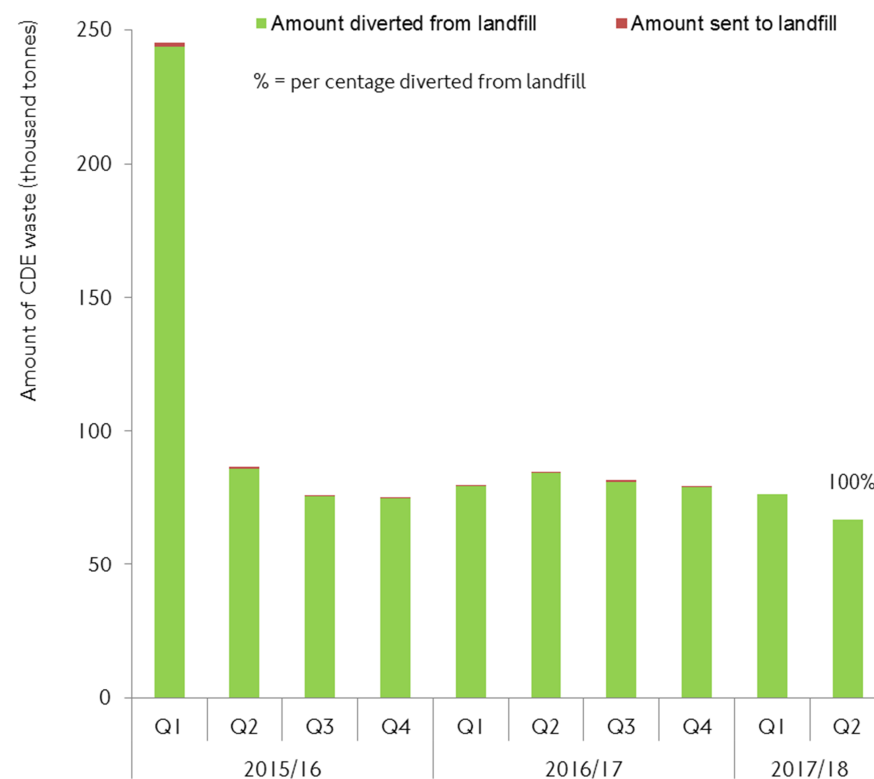
Above: Figure 21. London Underground construction, demolition and excavation waste Q1 2015/16 – Q1 2017/18.

Waste management within Surface Transport

Surface Transport commercial and industrial waste data for Q1 2016/17 to Q2 2017/18 year is shown. Historic data is not available.



Above: Figure 22. Surface Transport commercial and industrial waste Q1 2016/17 – Q2 2017/18.



Above: Figure 23. Surface Transport construction, demolition and excavation waste Q1 2015/16 – Q2 2017/18

