



Investment programme report

22 August – 16 October 2021

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Introduction

We assess the progress of some of our biggest and most important projects



Purpose and scope

Purpose

TfL is part of the Greater London Authority (GLA) family led by Mayor Sadiq Khan. We are the integrated transport authority responsible for delivering the Mayor's aims for transport.

Our investment programme is the suite of projects comprising renewals and enhancements to maintain the reliability of our network and support growth in London. Renewing and replacing our assets is our baseline to maintain current performance levels in terms of safety, reliability, capacity and asset condition. Additional enhancements can unlock new capacity and enable us to use our existing network more intensively. This supports London's growing population and economy, enhances the quality of life for Londoners and creates jobs and improves skills across the UK.

We continue to adapt to the evolving situation as London emerges from the restrictions imposed by the coronavirus pandemic.

Scope

This report provides an update on a range of projects that will further enhance our world-class transport services. It covers Periods 6 and 7, which runs from 22 August to 16 October 2021.

For each key project or programme, the financial and milestone data represent the position at the end of Period 7 and includes commentary on key achievements, progress, and challenges. The report also contains updates on notable progress since the last report.

Financial records of spend to date, authority and estimated final cost (EFC) represent the duration of each separate project, programme or portfolio, except where stated. Where authority is significantly lower than EFC, it has been given for the current stage of works and further funding authority will be sought when appropriate.

Some financial information is commercially sensitive and is redacted.



Our projects cover all areas of London's transport network



Investment programme structure

Our investment programme is delivered by certain areas of our organisation, which is reflected in the structure of this report.

Major projects

This area is responsible for our largest and most complex projects. It comprises line upgrades, such as the Piccadilly line upgrade and the Four Lines Modernisation programme, as well as network extensions, major station upgrades, the Elizabeth line and Crossrail.

London Underground

This area covers stations, accessibility, track renewals, power, cooling and energy, rolling stock, and signalling and control.

Surface transport

This area comprises Healthy Streets, air quality, public transport and asset investment.

Professional services

Our professional services area comprises Technology and Data, Media and the TfL Growth Fund.

Our performance

We measure the safety and milestones progress of our investment programme schemes



Safety performance

During Quarter 2, we continued to keep our customers and workforce safe during the pandemic. Our priority was to provide reassurance that our services were safe. At the same time, we continue to make progress towards our longer-term safety, health and environmental objectives.

Capital delivery

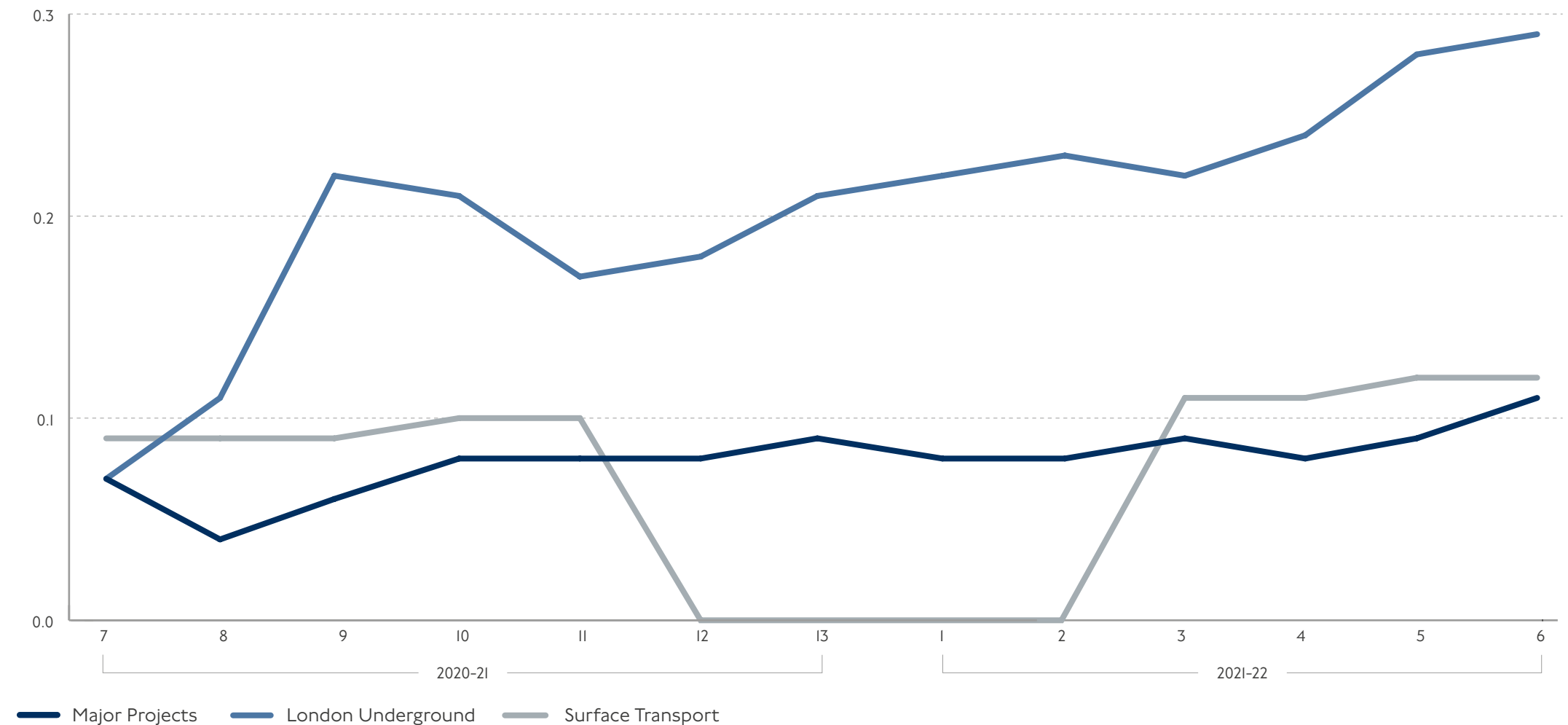
Data reported in this section comes from our Major projects directorate, the Surface transport project and programme delivery, and the London Underground renewals and enhancements. Data from other areas where construction and maintenance work is done is reported separately in our public transport workforce data.

Quarterly performance

To enable data to be accurately analysed, some of our key measurables are quoted as a frequency rate per 100,000 hours worked. Frequency rates are calculated using a moving annual average based on performance over the previous 13 periods.

In Quarter 2, there were seven accidents reported under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) in our Capital Delivery teams. Three of these were in London Underground, three in Major Projects and one in Surface Transport. The increase in RIDDOR reportable accidents resulted in the accident frequency rising within London Underground and Major Projects against their respective thresholds of 0.15 and 0.10. Within Surface Transport, the accident frequency rate remained below the threshold of 0.15.

RIDDOR accident frequency rate
(per 100,000 hours worked)

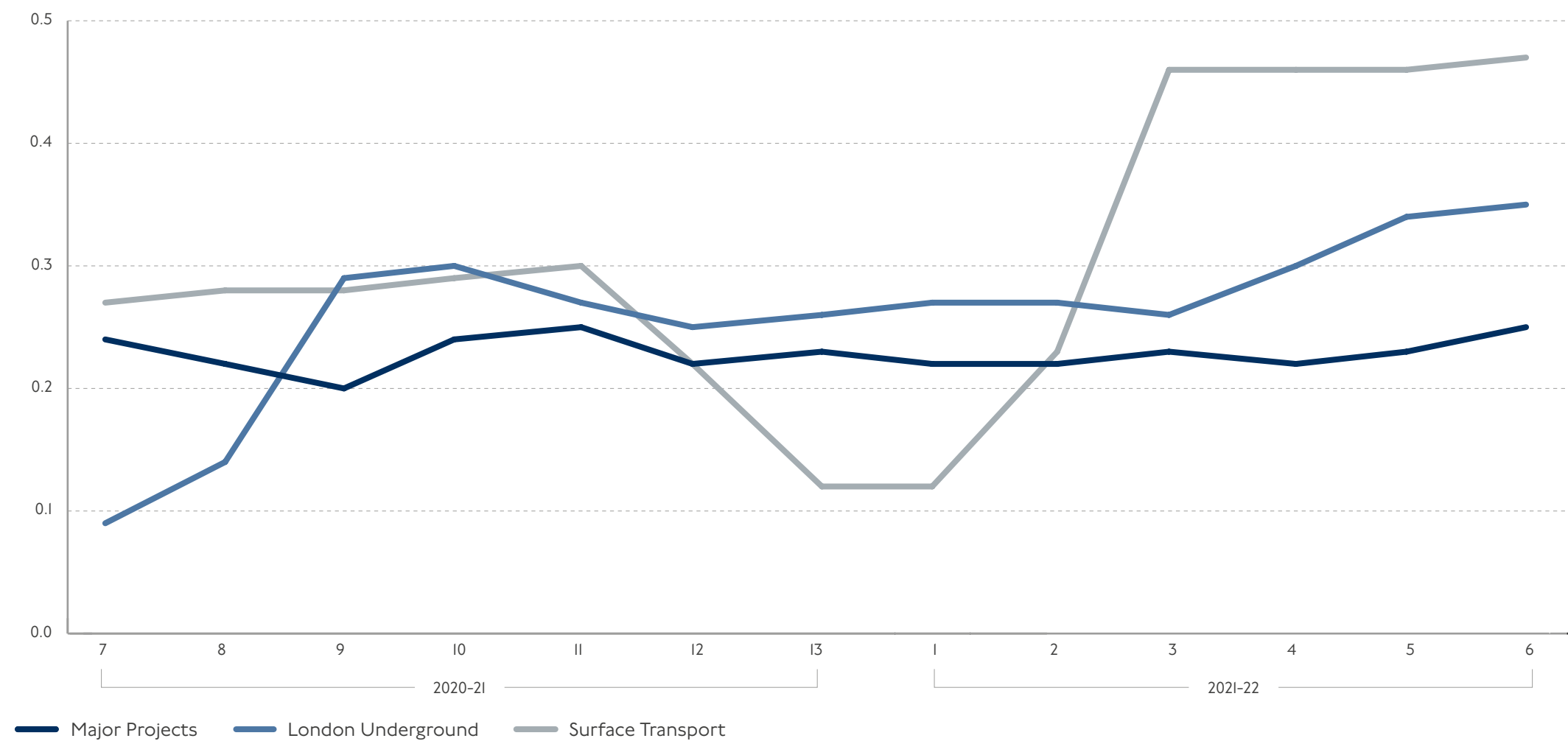


We are working to address the root causes and concerns arising from incidents during the quarter to prevent recurrence. A track operative injured their ankle while working at Embankment station. As a result, the team is working closely with the contractor to review the factors that affect workforce performance, including culture, chain of command and communications. After two RIDDOR reportable accidents at Barking Riverside, our Major Projects team has worked with the contractor to run a full site stand down, focused on safety behaviours, two-way communication and reinforcing the importance of conducting workplace risk assessments. As always, learning from incidents will be shared across capital teams to both prevent harm and drive performance improvements.

Lost time injuries are those that cause an employee to be absent for one or more shifts. There were nine lost time injuries in our Capital Delivery teams during Quarter 2, a slight increase on the previous quarter. As a result, there has been a rise in the lost time injury frequency rate in London Underground and Major Projects against a threshold of 0.20. No lost time injuries were recorded in Surface Transport during the quarter, but the rate remains high due to the number of injuries that occurred in the previous quarter.

Most of the lost time injuries were classified as minor, such as cuts and muscle strains. Where injuries were classified as RIDDOR reportable accidents, they have been reported to the Health & Safety Executive or Office of Rail and Road. All injuries have been investigated to understand root causes and put any possible mitigations in place to prevent them from happening again.

Lost time injury frequency rate
(per 100,000 hours worked)

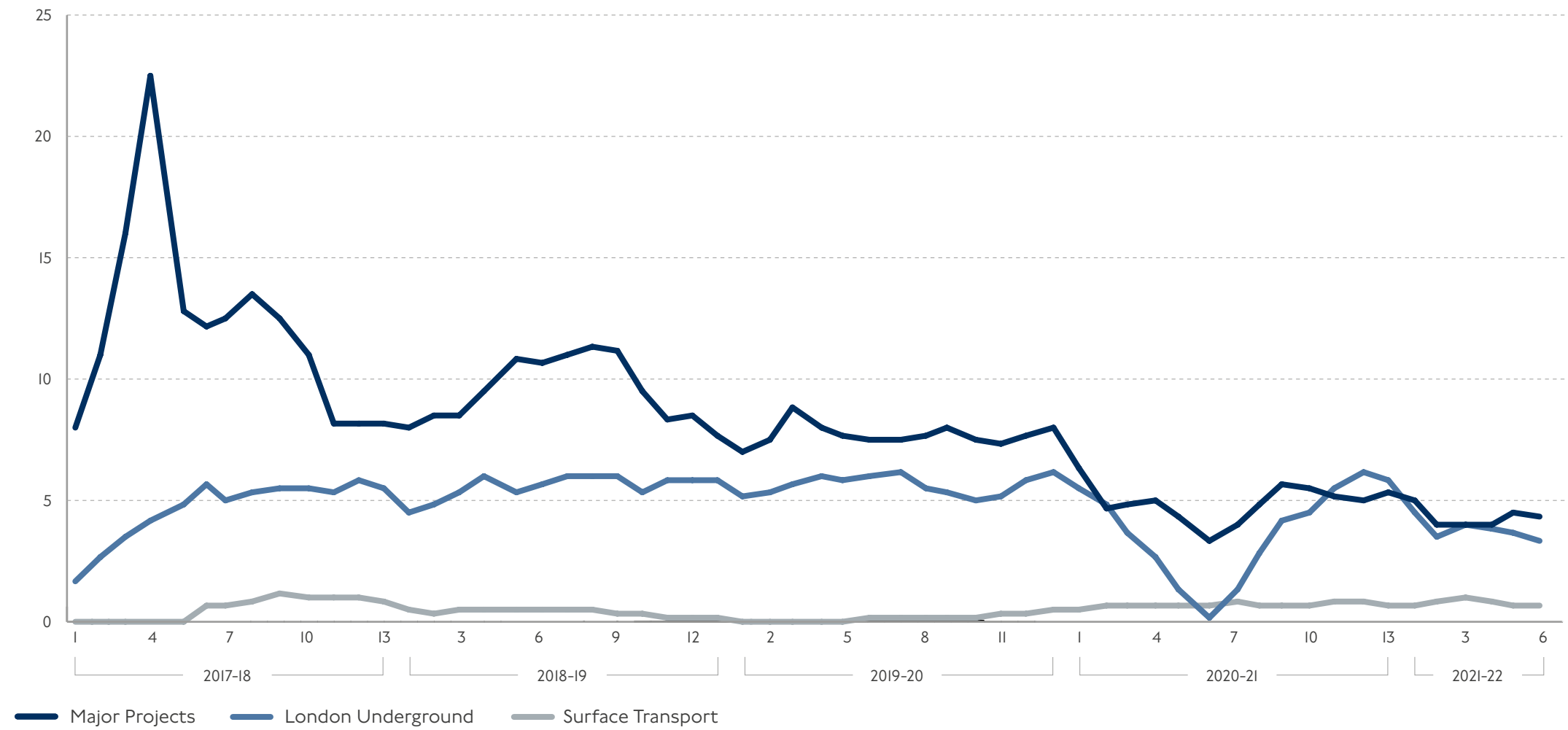


There were 26 injuries across our Capital Delivery teams during Quarter 2. While this is a small increase on the previous quarter, injuries across our Capital Delivery activities remain below pre-pandemic levels and continue the overall trend of long-term decline since 2017-18. This remains the case when hours worked are taken into context, which have seen a smaller decline over the same period.

The steady decline in injuries is positive and reflects the hard work that has gone in to improving safety, health and environment performance across our Capital Delivery programmes. However, data indicates that the number of injuries is beginning to stabilise. As such, it is more important than ever that we continue to investigate all incidents to understand their root causes and identify any improvements.

We are launching a data improvement programme across our Capital Delivery areas that aims to support better decision making and enable interventions. During the next quarter, our Major Projects team will use detailed analysis to inform future improvements and how our use of data aligns with our role as a construction client.

Total capital delivery physical workforce injuries
(Six-monthly average)





Some of our most significant projects reached major milestones

Schedule performance

We have achieved a number of significant milestones throughout the year

Northern Line Extension

On 20 September, two new stations on the Northern Line Extension at Nine Elms and Battersea Power Station welcomed their first customers. The two step-free Zone 1 stations are set to dramatically improve the connectivity of these vibrant south London neighbourhoods and contribute to London's recovery from the pandemic.

Piccadilly line upgrade

We have begun assembly of the new passenger trains.

DLR rolling stock replacement programme

The first train in the new fleet has been assembled in advance of testing.

Barking Riverside Extension

We have completed viaduct construction, including the works to enable rail systems to be installed.

Four Lines Modernisation

The passenger carrying revenue service has been implemented between Monument and Sloane Square.

London Underground

We have developed a decarbonisation strategy.

London Underground asset performance

The Victoria Line train overhaul programme has been completed.

London Underground asset renewals

We have completed our one-person operation camera work at 75 per cent of the planned platforms.

Surface technology

We have completed the Intelligent Transport System Release 2.0.

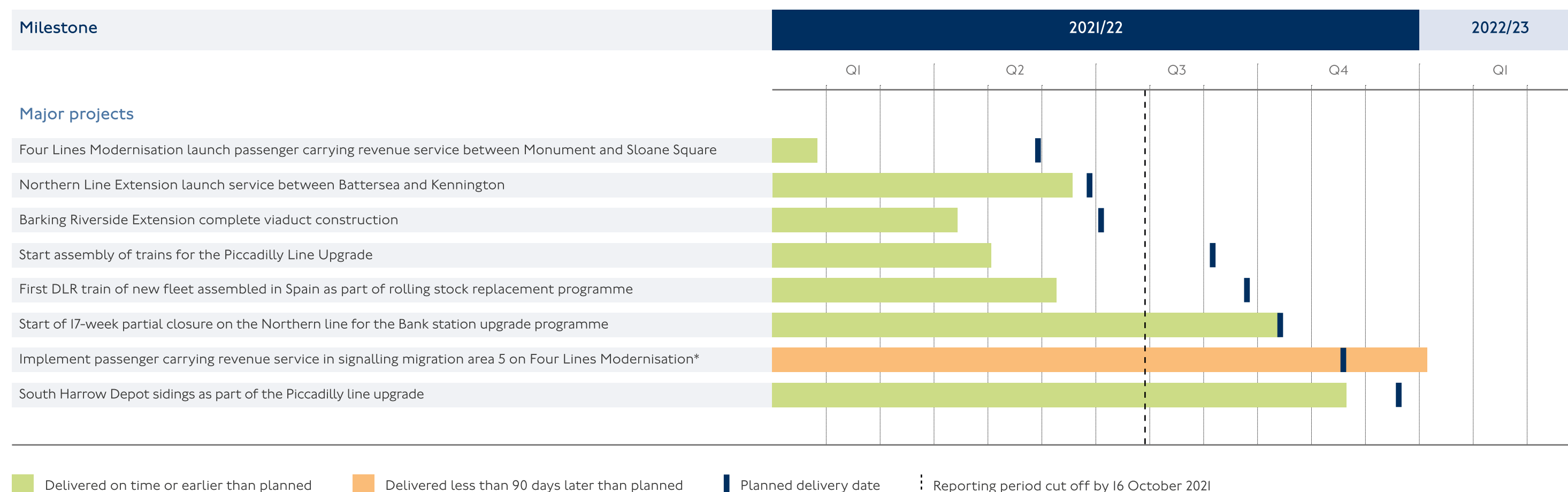
Surface assets

Construction work on the A40 Westway began on site.

Strategic milestone performance

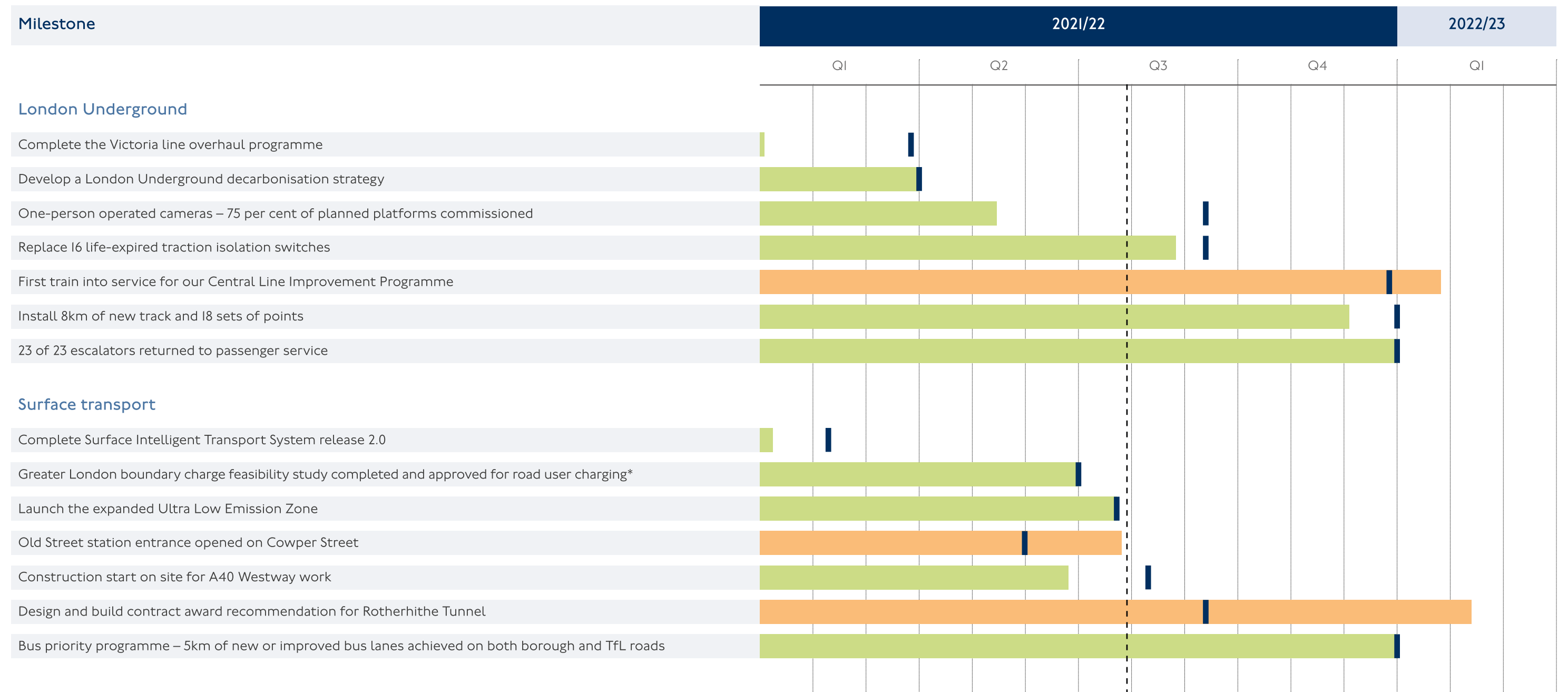
We are forecast to deliver 86 per cent of our strategic milestones on time or early for the full year

The graphic shows our 2021/22 strategic milestones. The blue line shows when the milestone was due to be met, while the coloured block shows when it was achieved or is forecast to be achieved.



* Between Sloane Square and Fulham Broadway, Barons Court, Kensington (Olympia) and Paddington

Strategic milestone performance 2021/22 (continued)



■ Delivered on time or earlier than planned
 ■ Delivered less than 90 days later than planned
 ■ Planned delivery date
 ⋮ Reporting period cut off by 16 October 2021

* Signed off by TfL Commissioner

Strategic milestones that are forecast later than planned

Rotherhithe Tunnel

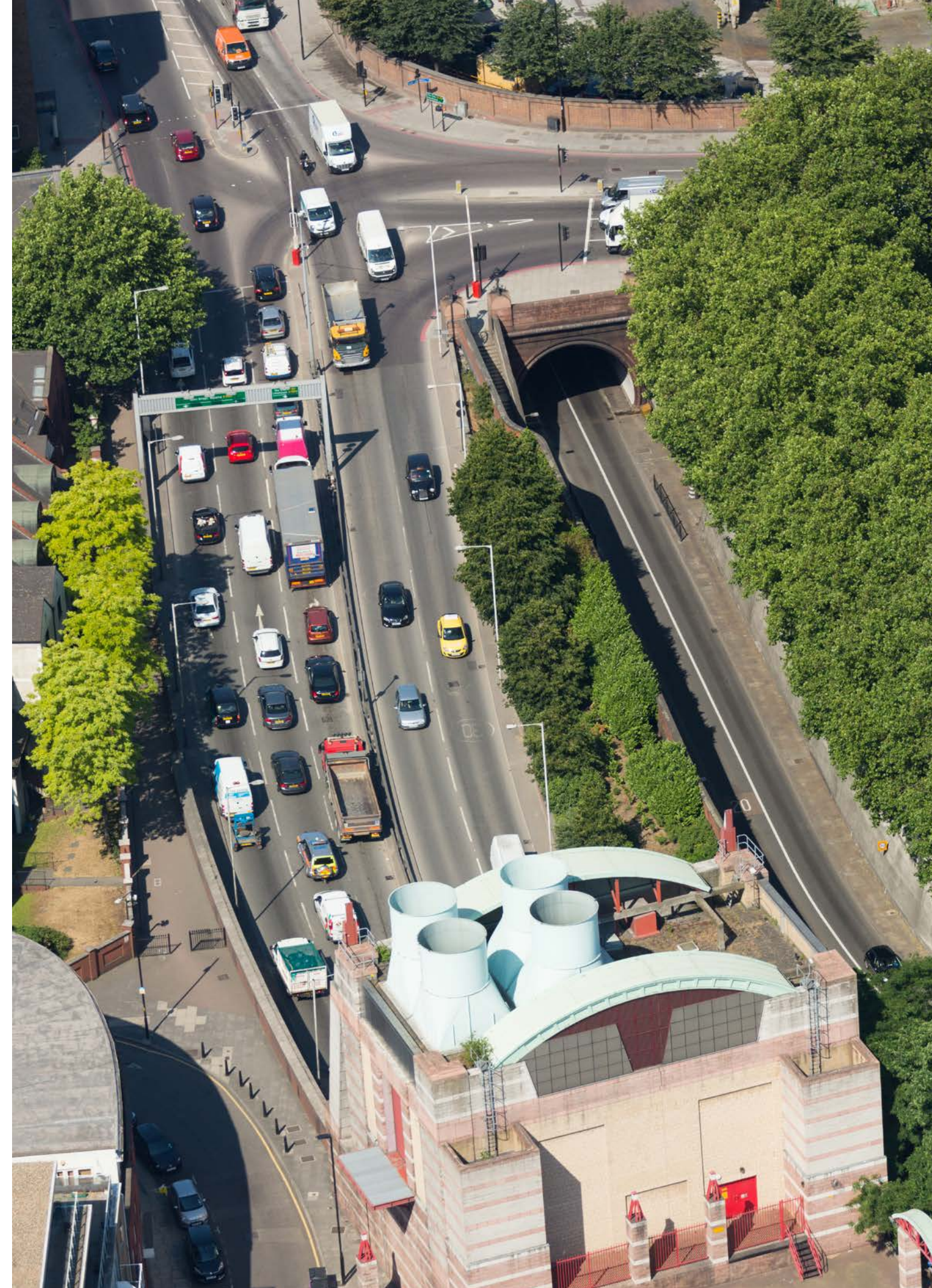
The milestone to make a recommendation for the award of the Design and Build Contract for the Rotherhithe Tunnel is running 153 days late. It was agreed in June with Surface directors that additional work should be undertaken to determine whether the refurbishment of Rotherhithe Tunnel could be deferred until after the Silvertown Tunnel opens. The outcomes are being reviewed with the options being presented in autumn.

Four Lines Modernisation signal migration area 5

This milestone is forecast to be 48 days later than planned, owing to ongoing software issues that are under review and to incorporate all functionality for the safety and reliability of the migration area.

London Underground Central Line Improvement Programme

The first train was expected to go into service in March 2022, but the current forecast shows a later delivery by 32 days. The programme has been delayed by a lack of resource and inability to recruit. The team is reviewing the plan to identify delivery dates based on the current available resources and validate the impact to delivery. Though there is a plan to try to recover some of this time, the current forecast shows the first train will be later than planned.



We are working to make the Rotherhithe Tunnel safer

Major projects

This portfolio contains our largest and most complex projects, such as the Piccadilly line upgrade, Four Lines Modernisation programme, network extensions, major station upgrades, the Elizabeth line and Crossrail



Elizabeth line

On-network stations improvement programme

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority deficit £m
2022	92	1	94	94	0
Change since last Investment programme report					
No change	-	-	No change	No change	

The on-network station improvement programme involves upgrading surface stations on what will form the Elizabeth line route.

The programme comprises step-free access work at seven stations and refurbishment work across all 22 TfL-operated surface stations.

We have completed the Great Western step-free access schemes. Further to this, the completion certificate has now been issued to the contractor and the 12-month defect liability period has begun.

On the completed eastern step-free access works at Maryland, Manor Park and Seven Kings, some progress has been made on the review and closeout of documentation to achieve handover, with only telecoms paperwork left to review. There have been significant delays in handover on both the east and west step-free access schemes as a result of the pandemic.

The station refurbishment half of the programme, delivered in partnership with our operator MTR Elizabeth Line, continues. Alongside a number of smaller interventions, the team is currently focused on two major projects – completing the new station building at Burnham, which is due to be brought into use in late December, and the installation of new platform canopies at Ealing Broadway and Hayes & Harlington, due to be completed during the Christmas period.

All numbers are shown as net of income and third-party contributions. Figures are rounded to the nearest £m.



We are providing accessible stations across the Elizabeth line

Elizabeth line

Rolling stock

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority surplus £m
2025	991	15	1,006	1,149	143
Change since last Investment programme report					
No change	I	(I)	No change	No change	

Programme update

Class 345 trains

Passenger services between Reading, Heathrow and Paddington continue to be operated by nine-car Class 345 trains.

There have been six nine-car Class 345 trains in passenger service between Shenfield and Liverpool Street since July 2021, supplementing seven-car Class 345 and eight-car 'legacy' Class 315 trains.

The transition of the Shenfield to Liverpool Street service to a full nine-car Class 345 operation, with up to 22 trains, began on 1 November 2021.

Up to 18 Class 345 trains, 12 trains per hour, have been operating timetabled trial running in the Elizabeth line central section since 13 July 2021 under the control of the new signalling system.

The upgrade of the train and signalling software for trial operations started on 15 October and was completed on 25 October.

Challenges

The current train control and signalling software has not delivered the predicted nine-car Class 345 reliability growth. Signalling system supplier Siemens completed the enhanced software update on schedule on 25 October, in time for the start of trial operations, which started on 20 November. Train manufacturer ALSTOM is on schedule to deliver the first of two reliability-focused train control software releases later in December, ready for installation on the fleet.



We are rolling out new trains ahead of Elizabeth line services

Crossrail

Forecast completion	Spend to date £m	Cost to go £m	EFC £m	Programme and project authority (£b)
2023	*	*	*	18.4

Programme update

Crossrail is the biggest railway infrastructure project in Europe and one of the largest single investments undertaken in the UK. It will deliver 42km of new rail tunnels under London, 50km of new, permanent track and 10 new stations.

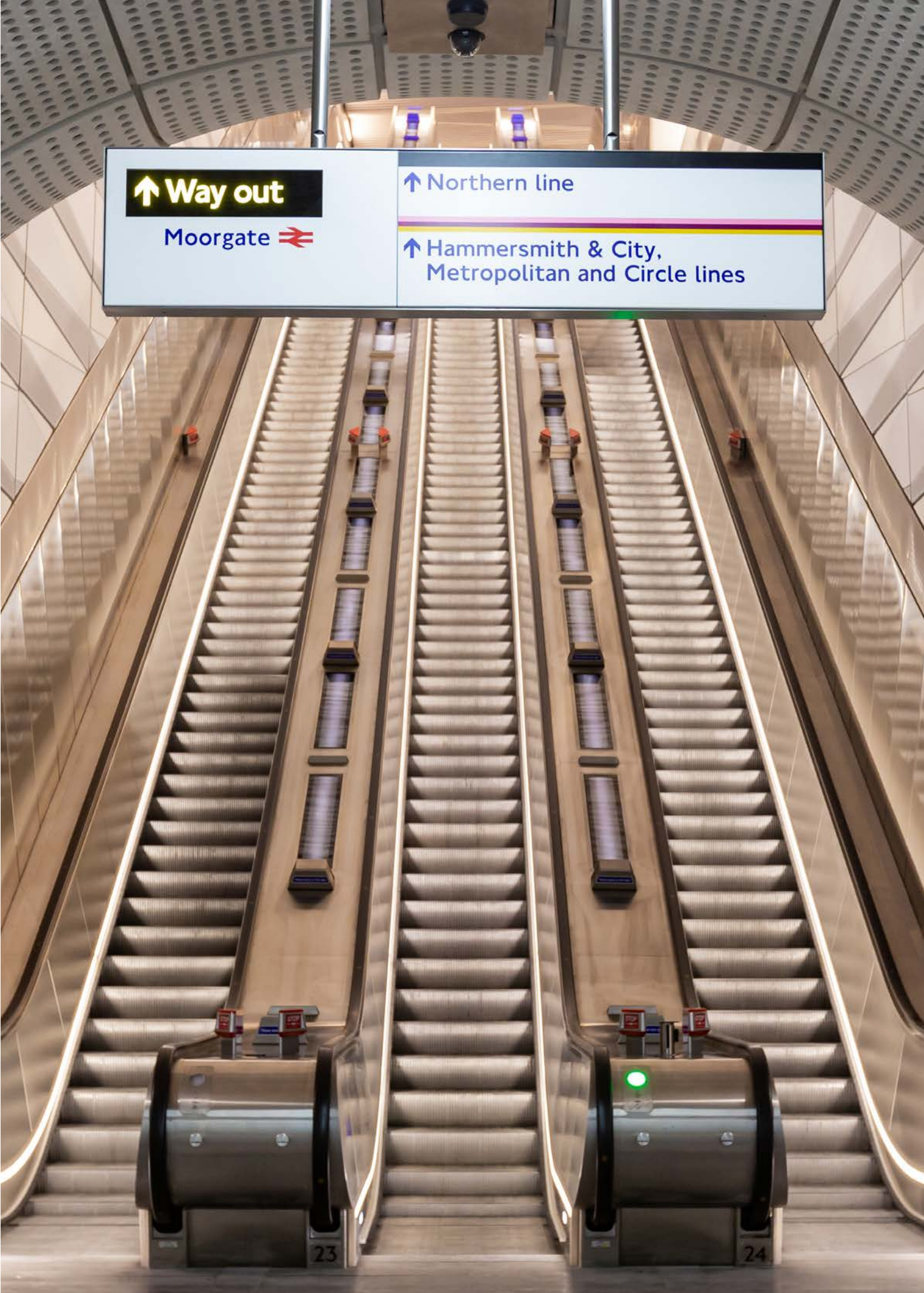
The project completed an 18-day blockade in July 2021 where trial running was suspended to enable work to proceed uninterrupted. The objective of the blockade was to reduce the number of intrusive activities in the tunnels and stations. A further closure took place in October 2021 to complete outstanding works in the tunnels and update the software configuration to ELRI00.

The final railway integration tests to the tunnel ventilation system, trains, software, signalling and power systems will be completed during the remaining trial running period. These can only be done at this stage now that the whole system railway is available. This testing has identified the final modifications needed to complete the railway and ensure reliability ahead of the Elizabeth line opening.

Data has been redacted due to commercial sensitivity

The next station to be handed over later in the year is Canary Wharf, where final safety system modifications are being carried out. Bond Street has met its requirements to support trial operations and Crossrail is continuing to work to get it ready for passenger service.

We have a countdown process to monitor progress ahead of Elizabeth line passenger services starting. The aim is to ensure that the configuration of the railway and the entry criteria for trial operations are defined, approved and achieved. It will also capture the collective readiness of infrastructure managers and operators.



We are developing 10 new stations as part of the Crossrail project

Four Lines Modernisation

Forecast completion	Cost to date (Gross) £m	Cost to go (Gross) £m	EFC (Gross) £m	Programme and project authority £m	Authority deficit £m
2025	5,081	376	5,457	5,447	(10)
Change since last Investment programme report					
No change	20	(8)	12	No change	

Financial commentary

Following the revised authority, which was granted by the Programmes and Investment Committee in July 2021, we have continued to further review the risks and opportunities for the remainder of the Four Lines Modernisation programme. Given the complexity of this programme and the extent of the review, we expect this to take some time, during which the estimated final costs will remain dynamic. We will update the Committee in spring 2022 following the review.

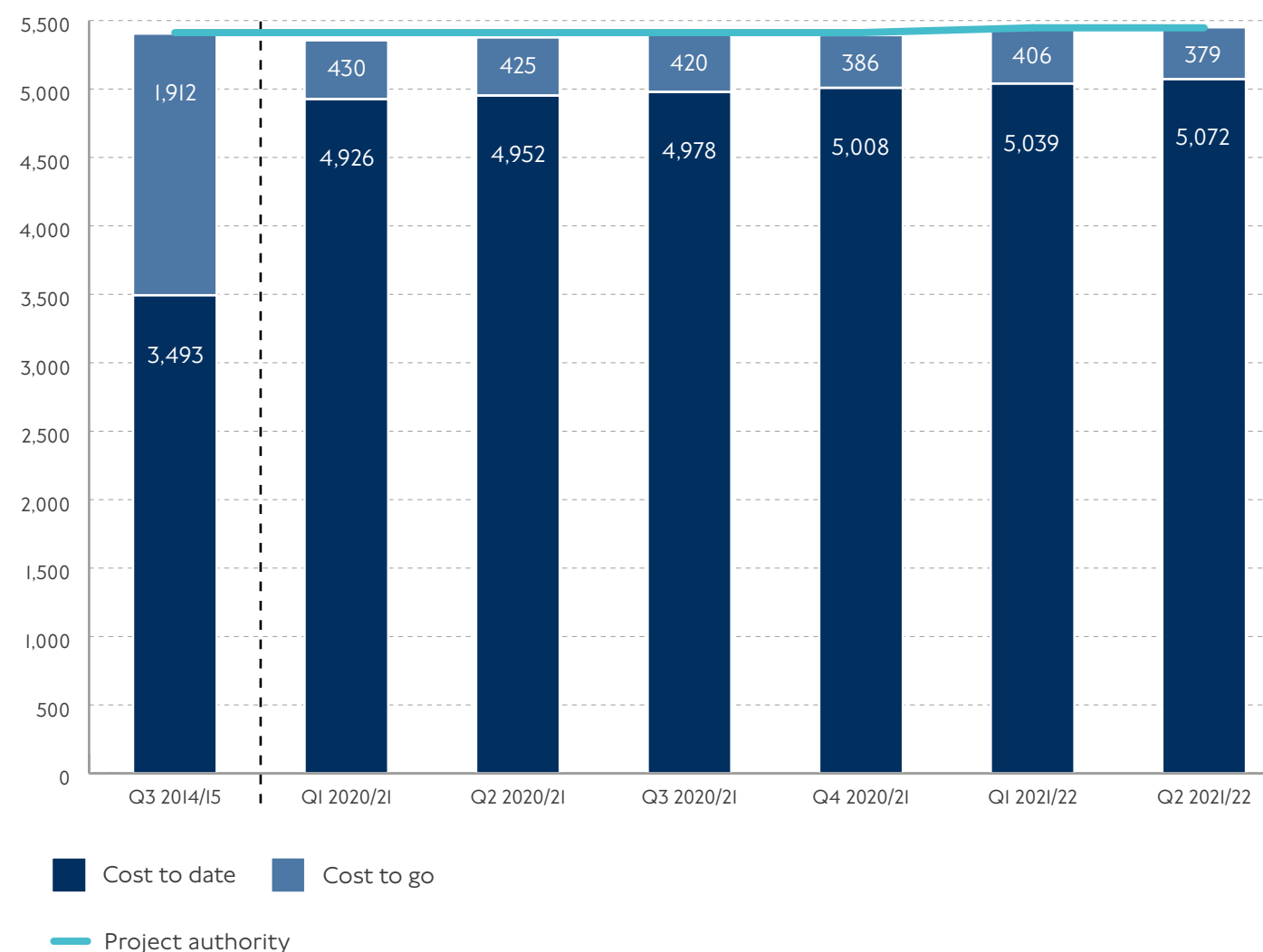
As part of the review, the software programme has been extensively analysed with our signalling contractor, Thales. This has focused on understanding of the risks and the granular metrics, which are essential to monitor the performance. This review has been fed into the latest programme to help ensure it is realistic and will be the catalyst to drive further collaboration and confidence in our plan.

Performance over time

The programme is currently forecasting an EFC of £10m over the authority granted in July 2021. The EFC is a dynamic forecast based on the current understanding of the cost to go in relation to the remaining scope of work and the associated risks, which considers the entire programme and currently has signalling migration area I4 forecast for October 2024. The financial budget is a more robust near-term view of costs to go and will retain a higher degree of maturity, while not entirely without uncertainty in the estimates, owing to the volatility of software development. While a reduction in EFC cannot be guaranteed, we continue to review the programme cost forecasts, with a strong focus on identifying opportunities for savings and risk mitigations. We are still awaiting an acceptable schedule from the signalling supplier, Thales, which will support the assessment for producing a robust EFC.

Performance over time – estimated financial cost (£m)

Forecast end date





We are upgrading some of the oldest parts of the Tube network

Programme update

We are transforming the Circle, District, Hammersmith & City and Metropolitan lines to reduce journey times and run a more frequent and reliable service. The next section of signalling, between Sloane Square, Paddington, Fulham Broadway and Barons Court, is due to go live in spring 2022. This phase, called signalling migration area 5, will involve upgrading the highly complex junction at Earl's Court and will mean the entire Circle line will have been upgraded to the new signalling system. This will be a significant milestone for the programme.

New timetable

The programme achieved a major milestone on 12 September 2021 when the first timetable change enabled by the new signalling system was introduced. Journey times have been reduced by 10 per cent on the north side of the Circle line and added one extra train during the morning and evening peaks. The reliability of the timetable has since improved.

Further improvements were planned after the new signalling goes live, but the importance of keeping the network open during the Christmas period mean we have decided to go live in spring 2022. This decision was taken in order to incorporate all functionality for the safety and reliability of the migration area.

Further testing has been done on signalling migration area 6 and we have completed our first test weekend on signalling migration area 8 between 11 and 12 September, which is the most technically complex of the sites.

DLR rolling stock and systems integration

Forecast completion	Cost to date (Gross) £m	Cost to go (Gross) £m	EFC (Gross) £m	Programme and Project Authority £m	Authority surplus £m
Spring 2026	127	461	588	603	15
Change since last Investment programme report					
No change	II	(II)	No change	No change	

Financial commentary

The EFC has remained stable since the last report and spend is in line with current forecasts.

Performance over time

Our forecast end date and programme and project authority have remained consistent since December 2018. We have reduced our EFC to reflect procurement savings and taking a proactive stance with the remaining risk exposure as the rolling stock design approaches completion.

Programme update

Our new DLR rolling stock programme will manufacture and supply 43 new trains – 33 to replace the expired B92 fleet and 10 to increase capacity. It will also include an expanded depot at Beckton to stable and service the new fleet, and signalling modifications to the Thales automatic train operation system to work with the new trains and functionality. There will also be a telecoms system modification to provide enhanced customer information and traction power capacity works.

Rolling stock delivery

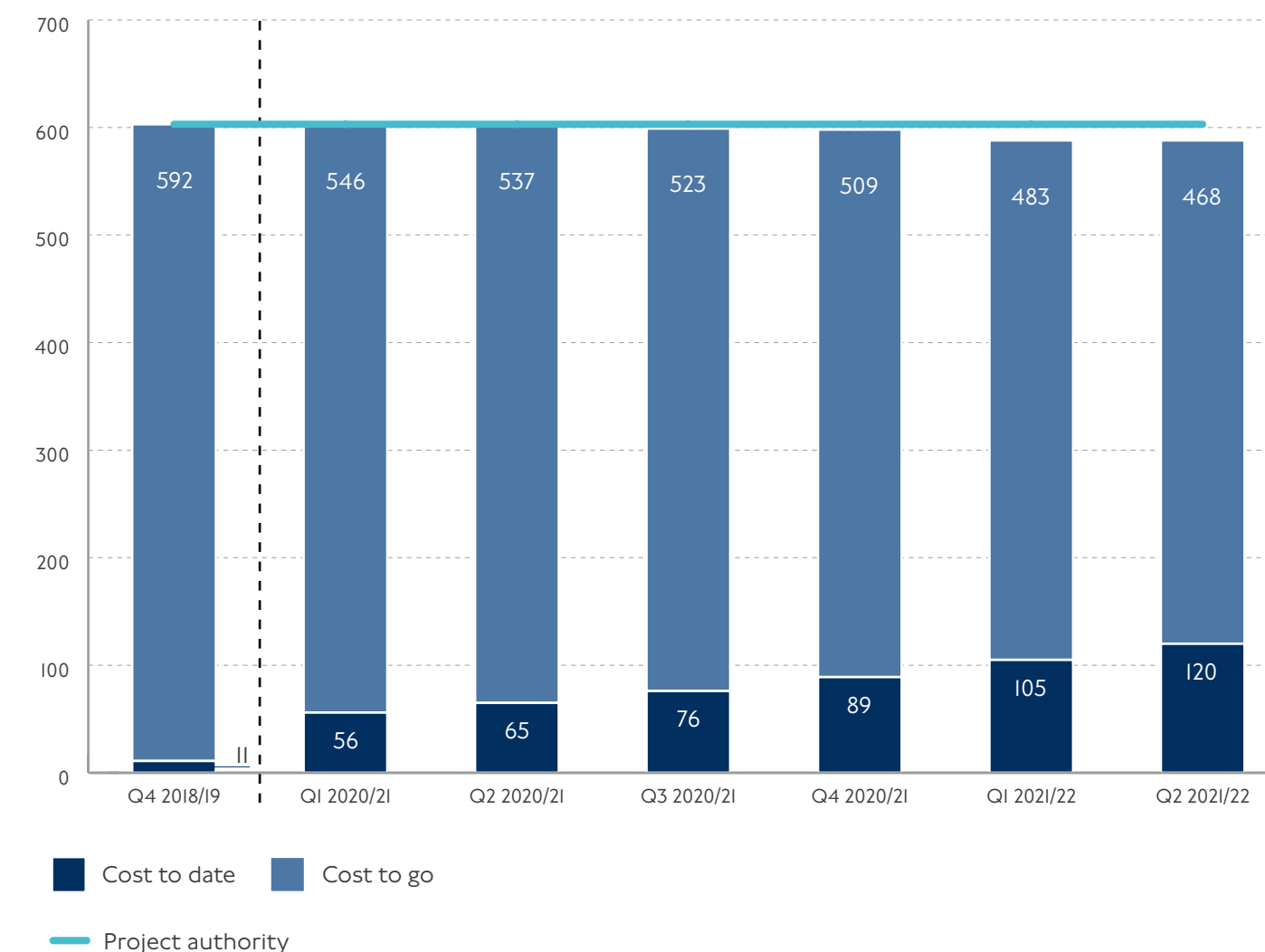
Manufacturing for our new rolling stock is under way, with the initial run of 20 car bodies for trains one to four now in production. The first train is now assembled and ready to begin static testing. This strategic milestone was achieved two months ahead of programme.

Beckton Depot and network infrastructure

At Beckton, work on the northern sidings continues in preparation for the decommissioning of sidings in January 2022. The main site compound is now operational and work on the sub-station began in November 2021. Meanwhile, signalling software development for the new trains continues to progress on time with the first software releases due in March 2022.

Performance over time – estimated financial cost (£m)

Forecast end date





Housing Infrastructure Funding

We have now finalised terms for the acquisition for the land at Beckton adjoining the current depot to accommodate a further 11 trains, in addition to the original order of 43 trains. This supports the development of 12,000 homes across 15 sites, comprising the Poplar site owned by us and 14 sites in third-party ownership, with the aim for all sites to provide a minimum of 35 per cent affordable housing.

Piccadilly line upgrade

Forecast completion	Cost to date (Gross) £m	Cost to go (Gross) £m	EFC (Gross) £m	Programme and Project Authority £m	Authority surplus £m
Spring 2027	346	2,498	2,844	2,994	150
Change since last Investment programme report					
No change	24	(22)	1	No change	

Financial commentary

Our EFC has increased by £1m since the last report. Risks and opportunities are actively managed each period, which results in dynamic changes to the EFC. The main driver for the increased risk this quarter comes from a review of legacy signalling works as scope has matured. Although the EFC has increased slightly this quarter, the overall EFC has reduced by £450m since initial programme and project authority was granted in 2018.

Performance over time

The 2020/21 emergency budget decision was to defer the start of third party spend where possible by six months. Due to this, and the delay to start infrastructure enabling works, the new trains are now expected to begin entering revenue service from spring 2025, as mentioned in the public announcement in March 2021.

We have reduced our overall EFC due to active risk management and an ongoing focus on value and efficiency generating an authority surplus. To reflect the progressive reductions in EFC for the stage one programme since authority in May 2018, a decision was endorsed by the Programmes and Investment Committee to reduce the programme's authority by £300m.

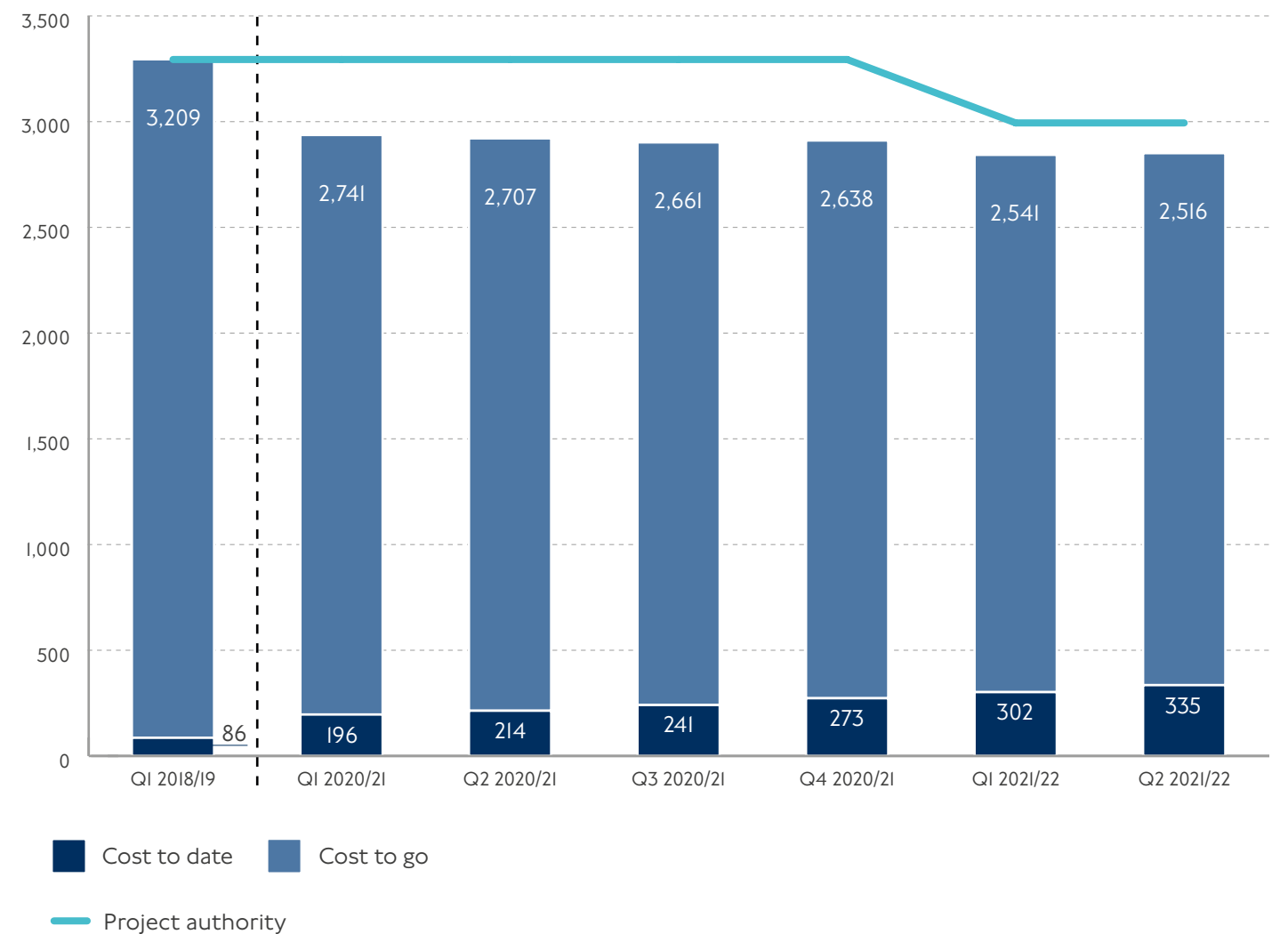
Programme update

Phase one of our upgrade of the Piccadilly line will introduce 94 new generation, high-capacity, walk-through, air-conditioned trains and supporting infrastructure.

These will replace some of the oldest trains on our transport network and enable a peak frequency increase from 24 to 27 trains per hour.

Performance over time – estimated financial cost (£m)

Forecast end date



Power and signalling

The supplier for the HV Power Immunisation Design and Build contract has been selected and the contract award is expected this quarter. Some existing elements of signalling equipment are not compatible with the new trains. This contract will deliver the power infrastructure to support the frequency conversion of this equipment, which will ensure it is compatible.

The HV Power Design and Build Tender returns, which will deliver the sub-station upgrades, were received and are being evaluated. We remain on target to achieve the key milestone of issuing the tender recommendation report in Quarter 4.

We completed the installation and commissioning of new signals at Earl's Court. Due to the trains being longer and having different sightlines to the existing stock, we need to install new signalling assets at all Piccadilly line sites.

At the end of Quarter 3, the depots and sidings team will award a contract for the Northfields Depot Works Stage One, which will include underground utility mapping, surveys and ground investigation works.



The Piccadilly line has some of the oldest trains on the network

Northern Line Extension

Forecast completion	Cost to date (Gross) £m	Cost to go (Gross) £m	EFC (Gross) £m	Programme and Project Authority £m	Authority surplus £m
Autumn 2021	1,088	19	1,107	1,260	153
Change since last Investment programme report					
No change	8	(7)	No change	No change	

Financial commentary

The EFC has remained stable since last quarter and the variance on spend to date and cost to go reflects the costs spent since last quarter.

The revenue service on the Northern Line Extension launched on 20 September 2021, with the two new stations at Nine Elms and Battersea Power Station welcoming their first customers.

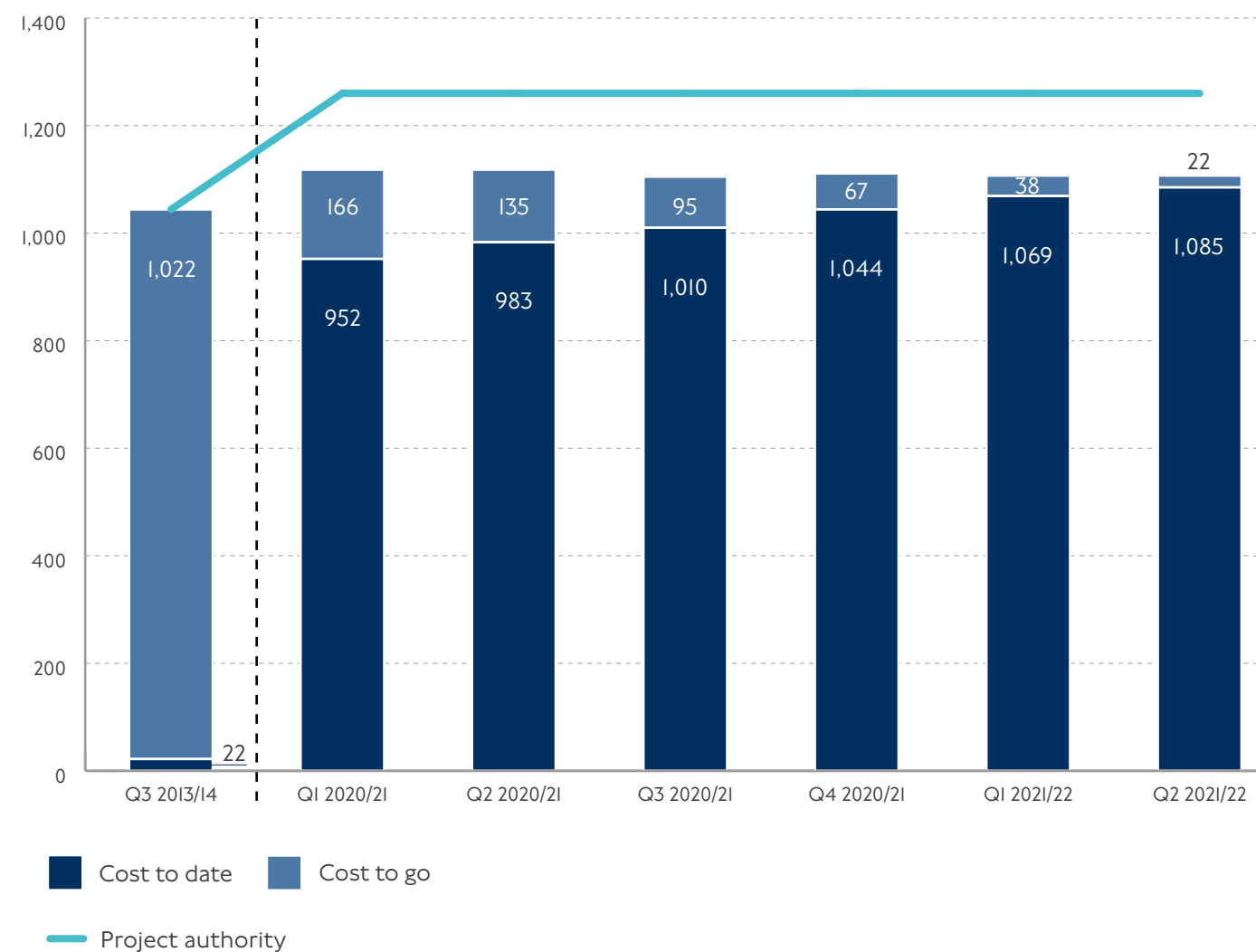
Performance over time

The project came in £160m under budget, bringing its estimated final total cost to £1.1bn, despite the cost pressures brought about by the pandemic.

The Northern Line Extension team is now focused on closing out snagging items, completing assurance documentation, achieving commercial closure and working towards project closure in 2022.

Performance over time – estimated financial cost (£m)

Forecast end date



Silvertown Tunnel

Forecast completion	Cost to date (Net) £m	Cost to go (Net) £m	EFC (Net) £m	Programme and project authority £m	Authority deficit £m
Winter 2025	62	113	175	173	(2)
Change since last Investment programme report					
No change	2	(1)	1	No change	

Financial commentary

The EFC is currently £2m over the delegated Programme and Project Authority of £173m. The project team is continuing to look for opportunities to bring this back in line with authority.

Performance over time

Our forecast end date has been stable since the Programme and Project Authority was approved in May 2019. Our Programme and Project Authority was granted net of third-party contributions. EFC increased over the last 18 months due to an increase in costs for implementation of road user charging infrastructure. It was then reduced in Quarter 1 2021/22 after the road user charging infrastructure scope and budget was transferred to Surface Project and Programme Delivery to achieve synergies with our other Road User Charging schemes. Sponsorship will remain with the Major Projects Directorate to ensure project objectives are met.

Programme update

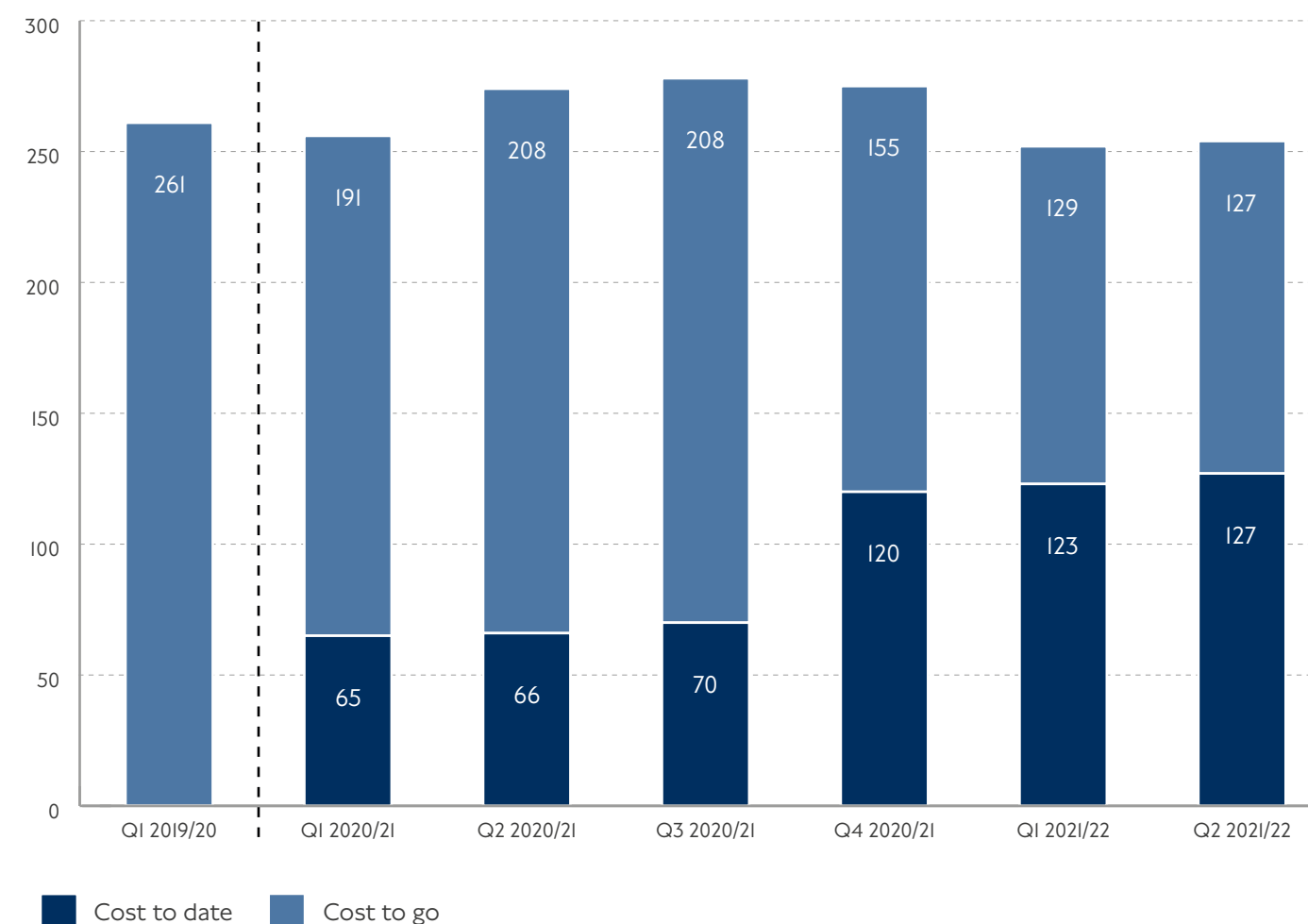
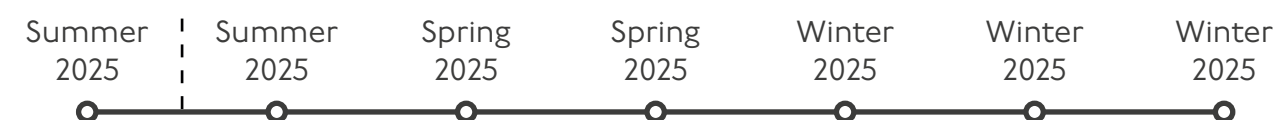
Site works continue at both Greenwich and Silvertown, including where the tunnel boring machine launch chamber will be constructed. Demolition of existing buildings and site clearance are under way.

The piling for the tunnel boring machine launch chamber is now complete, and excavation works in the first shaft have begun. Works continue on the river wall and on cabling and diversions to enable the power supply for the tunnel boring machine. The contract for the design and manufacture of the tunnel boring machine is progressing to plan, with delivery expected in spring 2022.

We have taken temporary possession of the required land from existing tenants to facilitate handover of 47 out of 63 sites to date to our contractor Riverlinx.

Performance over time – estimated financial cost (£m)

Forecast end date



All numbers shown as net of income and third-party contributions



The tunnel will link Silvertown with the Greenwich Peninsula

Contracts are now in place for transport and traffic, socio-economic and environmental monitoring, which are part of our Development Consent Order obligations.

Environmental monitoring continues, with other monitoring planned to start later this year. This will support our wider air quality monitoring and is in addition to that required under the Development Consent Order obligations.

A Supplementary Agreement incorporating Riverlinx revised car park design on the Greenwich Peninsula has now been executed. This has been raised in previous papers as approval was delayed due to ongoing requests from developer Knight Dragon. Resolution of this issue involved changes to a London Underground Framework Agreement, which allows Knight Dragon to call down on GLA and TfL land for development, the changes put in place by Commercial Development extend the deadline by which Knight Dragon need to take up this option.

Virtual exhibition

A virtual public exhibition on the Silvertown Tunnel is being hosted on the Riverlinx website and includes new CGI images showing what the fully accessible walking and cycling bridge across the A102 Blackwall Tunnel approach will look like.

Barking Riverside Extension

Forecast completion	Cost to date (Gross) £m	Cost to go (Gross) £m	EFC (Gross) £m	Programme and project authority £m	Authority deficit £m
Autumn 2022	300	31	331	329	(2)
Change since last Investment programme report					
No change	11	(11)	No change	No change	

Financial commentary

The EFC is unchanged from last forecast and still exceeds Programme and Project Authority granted by the Programmes and Investment Committee in December 2020 by £2m. The current authority was based on the minimum EFC of a range at that time and all risks and opportunities to delivering within this are being fully explored before seeking any further uplift.

Performance over time

Our forecast end date has been delayed since Programme and Project Authority was increased in December 2018, following the discovery of uncharted utilities and the Safe Stop as a result of the pandemic causing a replanning of rail systems works and requirement to secure revised Network Rail possessions.

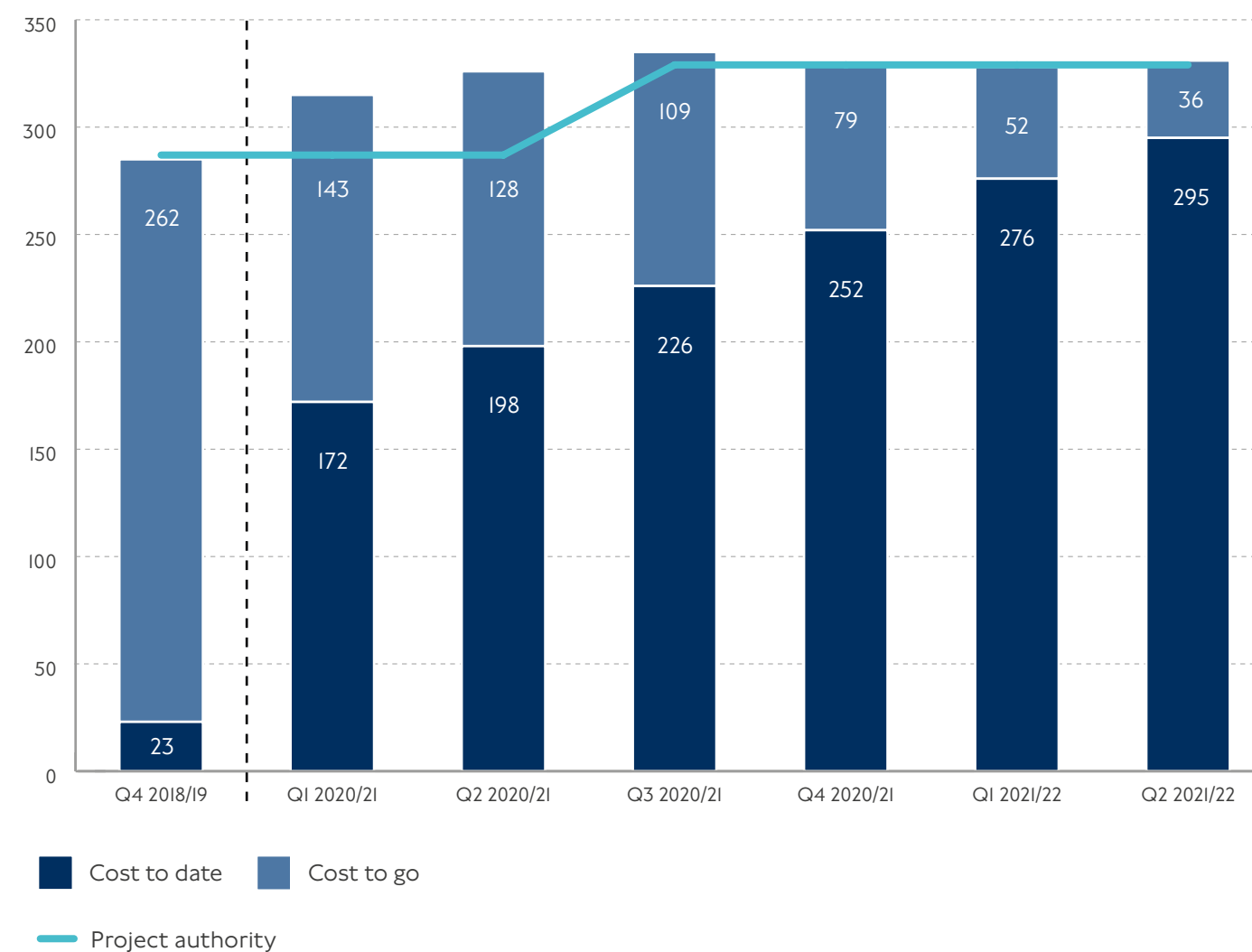
Programme update

Delivery of the physical works is well advanced with the installation of track on the viaduct completed as planned in October 2021. The focus is now on installing the remaining rail systems on the viaduct ahead of the final signalling stage commissioning planned for April 2022. At the station, the installation, testing and commissioning of systems continues ahead of completing the quality assurance activities that ramp up towards the end of this year.

Our most likely date to enter into service remains autumn 2022.

Performance over time – estimated financial cost (£m)

Forecast end date





Viaduct rail systems

In October, we completed the installation of the track running along the viaduct from the existing Network Rail lines to the new Barking Riverside station. The rail systems team's attention now turns to the installation of telecoms, signalling and overhead line equipment and preparations for the final signalling stage commissioning that is planned for a series of weekends in March and April 2022.

Station installation

The installation, testing and commissioning of mechanical and electrical equipment at the station has continued and there is an increasing focus on producing and reviewing assurance documentation. Plans for delivering the public realm areas around the station that interface with the Barking Riverside development are being finalised to ensure they are ready for when the station opens.

Bank station capacity upgrade

Forecast completion	Cost to date (Gross) £m	Cost to go (Gross) £m	EFC (Gross) £m	Programme and project authority £m	Authority deficit £m
Autumn 2022	601	101	702	701	(1)
Change since last Investment programme report					
No change	9	(8)	No change	No change	

Financial commentary

The EFC has remained stable since the last report and spend is in line with current forecasts.

Performance over time

Our forecast end date has remained consistent since January 2016. The EFC has increased since authority award in Quarter 4 2015/16 due to site works being disrupted by the impact of the terrorist attack at London Bridge, additional scope following the discovery of asbestos and the impact of the pandemic. Costs have remained relatively static over the last 18 months, with minor increases driven by the impact of the pandemic and the Safe Stop of all construction works, as well as the discovery of asbestos and the resultant programme delays.

Programme update

The works and preparation activities leading to the start of the 17-week closure of the Bank branch of the Northern line from Kennington to Moorgate are progressing to

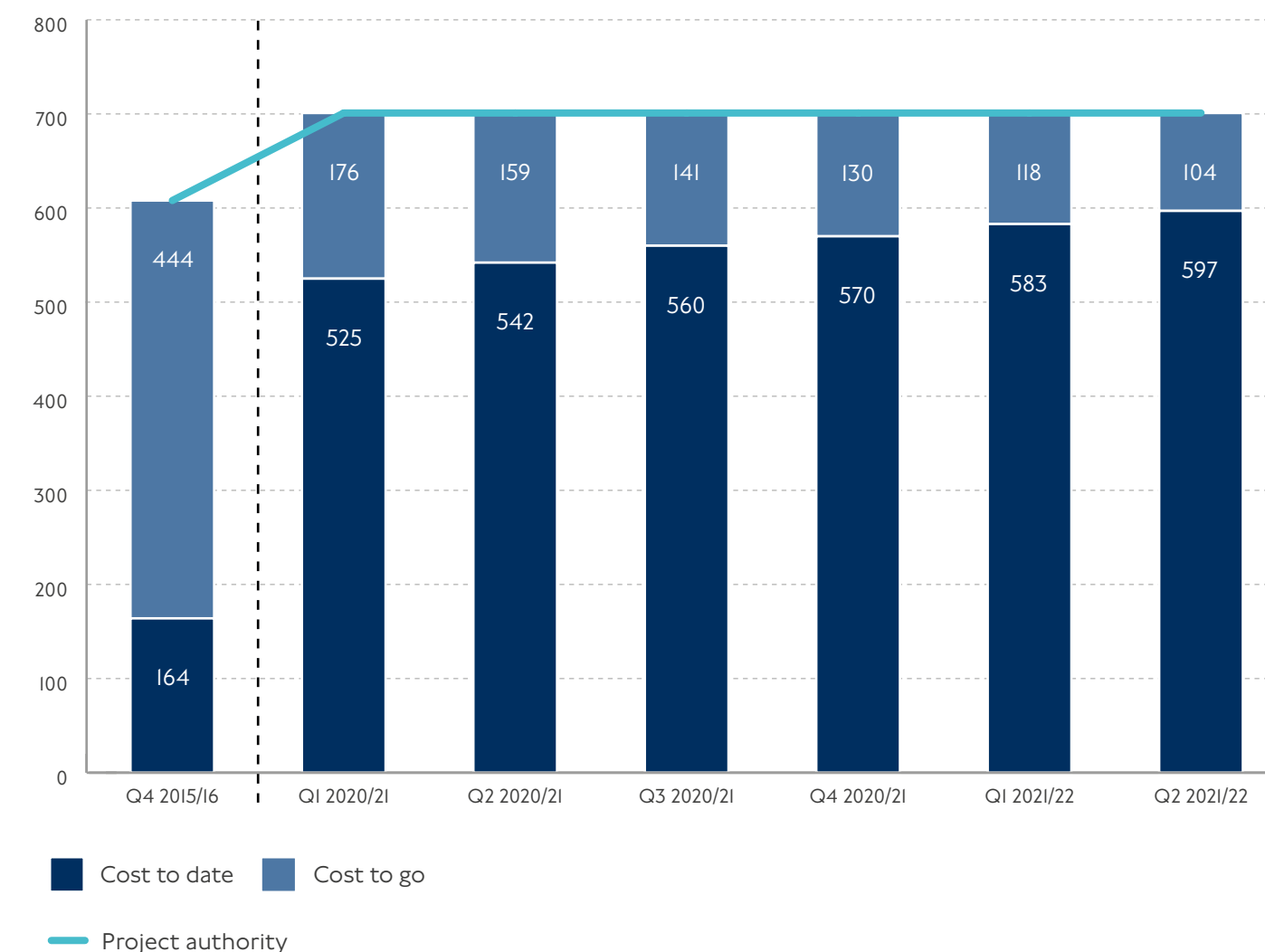
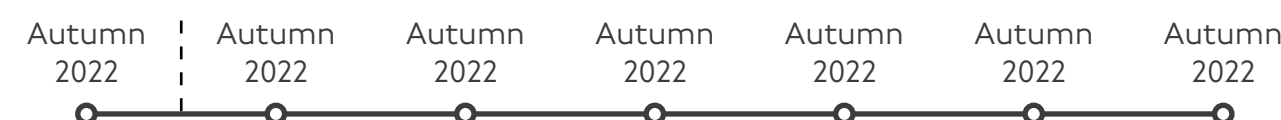
plan. The construction works have moved into the finishing phase in all public facing areas of the station. Installation of the 12 new escalators, moving walkways, lifts and preparation for integration testing of all the new electrical and mechanical systems asset are under way.

During the closure, due to start on 15 January, we will enhance services on the Charing Cross branch and deploy a new bus route between Oval and the city. Additional staff will be deployed to help customers, working with Network Rail and other train operators on alternative travel options. We have also launched a communications campaign to give customers journey planning tools and advice.

The closure will enable our contractors and us to complete the works needed to connect the new tunnel to the existing railway, fit out the station, install new track sections, complete the new tunnel work and the integrate the new systems installed in readiness for operations in 2022.

Performance over time – estimated financial cost (£m)

Forecast end date



Elephant & Castle

Forecast completion	Cost to date (Gross) £m	Cost to go (Gross) £m	EFC (Gross) £m	Programme and project authority £m	Authority deficit £m
Spring 2030	*	*	*	*	*
Change since last Investment programme report					
No change	0	0	No change	No change	

Financial commentary

The EFC has remained stable since the last report and spend is in line with current forecasts. Authority for tunnelling works and station box construction will be requested at this Programmes and Investment Committee meeting.

Developer negotiations

Our negotiations with the developer continue, with a few issues outstanding. The latest target date for concluding the fundamental components of the Development Agreement is late autumn 2021. Programmes and Investment Committee approval will be sought by Chair's Action for authority to enter into the Development Agreement.

Funding

Funding discussions with third parties, including the GLA and London Borough of Southwark, were successful, which means we have secured the funding for the first stage of works, including the station box, connecting tunnels and early works. A successful submission was made to the October Programme and Investment Committee to request full authority for the first stage of the works.

The contract in respect of the early works has been let. Station fit-out remains unfunded but we will seek to secure funding at a later date.

Current technical activity includes preparing the early works during the Bank closures, plus more detailed analysis of the requirements for the fit-out.

Data has been redacted due to commercial sensitivity



We are preparing for the next stage of works at Elephant & Castle

High Speed 2

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority deficit £m
2028	18	44	62	28	(34)
Change since last Investment programme report					
No change	-	-	No change	6	

Financial commentary

Programme and Project Authority is £34m lower than EFC as it is granted on an annual basis for the following year's spend. The £6m increase in authority is an adjustment in the quarter and was approved at both the Surface Investment Programmes Director Review and the Financial Commitment Oversight Group on 27 and 30 September respectively.

Programme update

Construction progress

HS2 Ltd's early construction activity continues across London. We have been working together to mitigate the impacts of construction traffic on our roads, including on Hampstead Road, where changes have been made to the site entrance after concerns by residents. We are working closely with HS2 Ltd as it constructs the new Euston London Underground facilities, including a new substation, ventilation building and tunnels connecting the station. Early enabling work has also started for the relocated taxi rank.

At Old Oak Common, we continue to ensure that the Elizabeth line depot is protected during the large-scale piling and excavation works, which are under way for the new high-speed station box.

Station designs

We are supporting HS2 Ltd on its designs for Euston and Old Oak Common stations. A high-level design for Euston was shared at the end of September and we have carried out a comprehensive review. We are actively and collaboratively working with HS2 Ltd, Network Rail, London Borough of Camden and Lendlease, under the umbrella of The Euston Partnership, to ensure it meets our requirements and any undertakings and agreements accommodate our requirements.



Early construction work for High Speed 2 continues across London

Railway systems enhancements

Forecast completion	Cost to date (Gross) £m	Cost to go (Gross) £m	EFC (Gross) £m	Programme and project authority £m	Authority surplus £m
2027	141	53	194	245	51
Change since last Investment programme report					
No change	1	1	2	No change	

Financial commentary

The EFC increased by £2m since the last report. This is because of increases in scope following delays to the Northern line speed uplift, Kennington works and Jubilee line rolling stock upgrades. EFC is £51m lower than the Programme and Project Authority, due to additional historical Jubilee and Northern line trains being taken out of scope, and scope transfer for high voltage works at Stockwell station to another project.

Programme update

Kennington works

The Kennington speed uplift works have been completed. These have improved the track condition in advance of the start of the Northern Line Extension revenue service.

Northern line power upgrade

The Northern line power supply enhancement work continues and is planned for completion in early 2022. This will provide system capacity for reliable services during planned or unplanned outages.

Rolling stock

Work continues on modifications to Jubilee line rolling stock to enable an increase in entry and exit speeds at Neasden Depot, with dynamic train testing completed as planned. This ensures compatibility with adjacent Metropolitan line services following the introduction of new signalling on the Circle, District, Hammersmith & City and Metropolitan lines, which will support the future timetable uplift.

Challenges

The planning for the delivery of the Northern line speed uplift and Northern Line Extension signalling defect software continues and we are targeting commissioning on the railway in mid-2022.

The Jubilee line enhanced signalling and fleet improvements, to enable a peak service of 32 trains per hour, remain paused until 2023/24 because of our ongoing funding discussions with the Department for Transport (DfT) and reduced passenger demand on the Jubilee line due to the coronavirus pandemic.



We need suitable infrastructure to support our rail systems

London Underground

Our programmes ensure safety and reliability, while also increasing the capacity of the network. This portfolio is made up of stations, accessibility, track renewals, power, cooling and energy, rolling stock, and signalling and control



Enhancements

Station developments

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority deficit £m
2023	406	132	538	532	(6)
Change since last Investment programme report					
No change	6	(6)	No change	No change	

Programme update

The enhancements programme covers a range of improvement projects, mainly on stations and depots. We improve stations primarily through enhancing accessibility, relieving congestion and carrying out large scale capacity upgrades.

Paddington

We continue to work with Great Western Developments on a co-funded scheme to improve customer access to the Bakerloo line. This includes an enlarged ticket hall and step-free access to the platforms. Civil and structural works continue. Tunnelling works to create a new cross-passage are due to start later in the year and continue into early 2022. The project is due for completion in late summer 2022.

Knightsbridge

Fit-out works within the new station entrance are ongoing. The fitout of the lower passageway connecting the lift shafts has also begun. Work has started to install three lifts, which will make the station step-free in 2022. Structural defects were found in work delivered by the developer,

Carraig Investments, which have delayed opening the Brompton Road entrance. The developer and its technical teams are exploring solutions and mitigation measures to ensure the entrance is opened as early as possible.

Waterloo

As part of a wider redevelopment that will see Elizabeth House demolished, we are evaluating a project to provide step-free access to the Northern line platforms. Discussions with the developer are ongoing and are expected to conclude later in 2022. Step-free access would be subject to affordability.

Tottenham Hale

We are creating an interchange with Network Rail, as well increasing capacity and creating a new ticket hall. The final works are progressing well and focused on completing the remaining station fitout scope and starting final testing and commissioning of the integrated systems. The newly constructed assets will be brought into use in late 2021.



Our stations are a gateway to London for our customers



We must ensure people can travel safely through our stations

King's Cross St Pancras

We are engaged in detailed negotiations over a developer-funded scheme to upgrade the station entrances on the south side of Euston Road as part of a wider redevelopment of the area. This project would improve the urban realm and provide additional step-free access. Negotiations are expected to conclude early in 2022 with project delivery timescales still to be confirmed.

South Kensington

With our joint venture partner Native Land, we are disappointed that the Royal Borough of Kensington and Chelsea did not grant permission for our plans to restore and enhance the station and surrounding streets. We will now review our options.

Colindale

Working with our key stakeholder, the London Borough of Barnet, we aim to relocate the ticket hall, increase capacity and provide step-free access. The detailed design phase was completed in July. We are finalising an optimised delivery schedule, making best use of working in engineering and traffic hours, weekend track possessions and a station closure. The decision on starting construction is expected by the end of 2021.

Stratford

A new south-western station entrance is forecast to open in 2023. It is a collaborative venture with London Legacy Development Corporation and the London Borough of Newham who are funding the capital works. Concept design is under way and scheduled to be completed by March 2022.

West Ham

We are working with developer Berkeley Homes on a new ticket hall from the Twelve Trees Park housing development. The developer's enabling works are ongoing, with piling activity set to begin later in 2021. We aim to start on the new station entrance in 2022.

Leyton

We continue to work closely with our key stakeholder, the London Borough of Waltham Forest, to create a new ticket hall, increase capacity and provide step-free access. This is at early development stage and will be subject to a commercial agreement with the borough in early 2022.

Walthamstow

The Walthamstow Central project will address existing capacity limits and supports the London Borough of Waltham Forest in its wider regeneration plans. The project plans to deliver step-free access and improved customer facilities. Current activity is focused on developing funding options and safeguarding the planned scheme.

Ladbroke Grove

We continue to work closely with our key stakeholder, the Royal Borough of Kensington & Chelsea to evaluate the merits of a scheme to provide increased capacity and step-free access at Ladbroke Grove. A feasibility study, funded by the borough, started this summer and has identified various options, which are being appraised. Dialogue continues on funding opportunities from the borough and exploration of other third-party contributions.

Enhancements

Depot construction

Programme update

Acton train modification unit

This project supports the ongoing London Underground fleet renewals programme, including the heavy overhauls and modernisation on the Central line trains. The delivery of the new train modification unit at Acton was completed in July 2021, with the first train moving into the facility in August. Two track roads are now available for full project use, with the remaining three expected to be available in late 2021.

Acton warehouse

Funding for the first phase of works for a new warehouse has been approved and contract award is expected in November. A detailed design phase will follow in tandem for the replacement storage facility. The future decision around transition into the construction of a new storage facility is expected in early 2022. This project will also complement the strategy for the future use of the Acton Depot and the relocation of business activity from Lillie Bridge Depot and Ruislip redevelopments.



Our depots are essential for maintaining our Tube assets

Enhancements

Energy and cooling

Programme update

Substation ventilation

As part of the enabling works for the Four Lines Modernisation programme, we are upgrading the cooling capacity within key substations. Critical improvements to the final seven substations are currently ongoing. Earl's Court and Shepherd's Bush have achieved practicable completion of the main installation and final commissioning is imminent. Onsite works are progressing at Acton and design is nearing completion for Embankment.

In the next quarter, Acton will be commissioned and handed over, with works starting at Embankment and recommencing at Victoria. Notting Hill Gate should also be nearing practical completion.

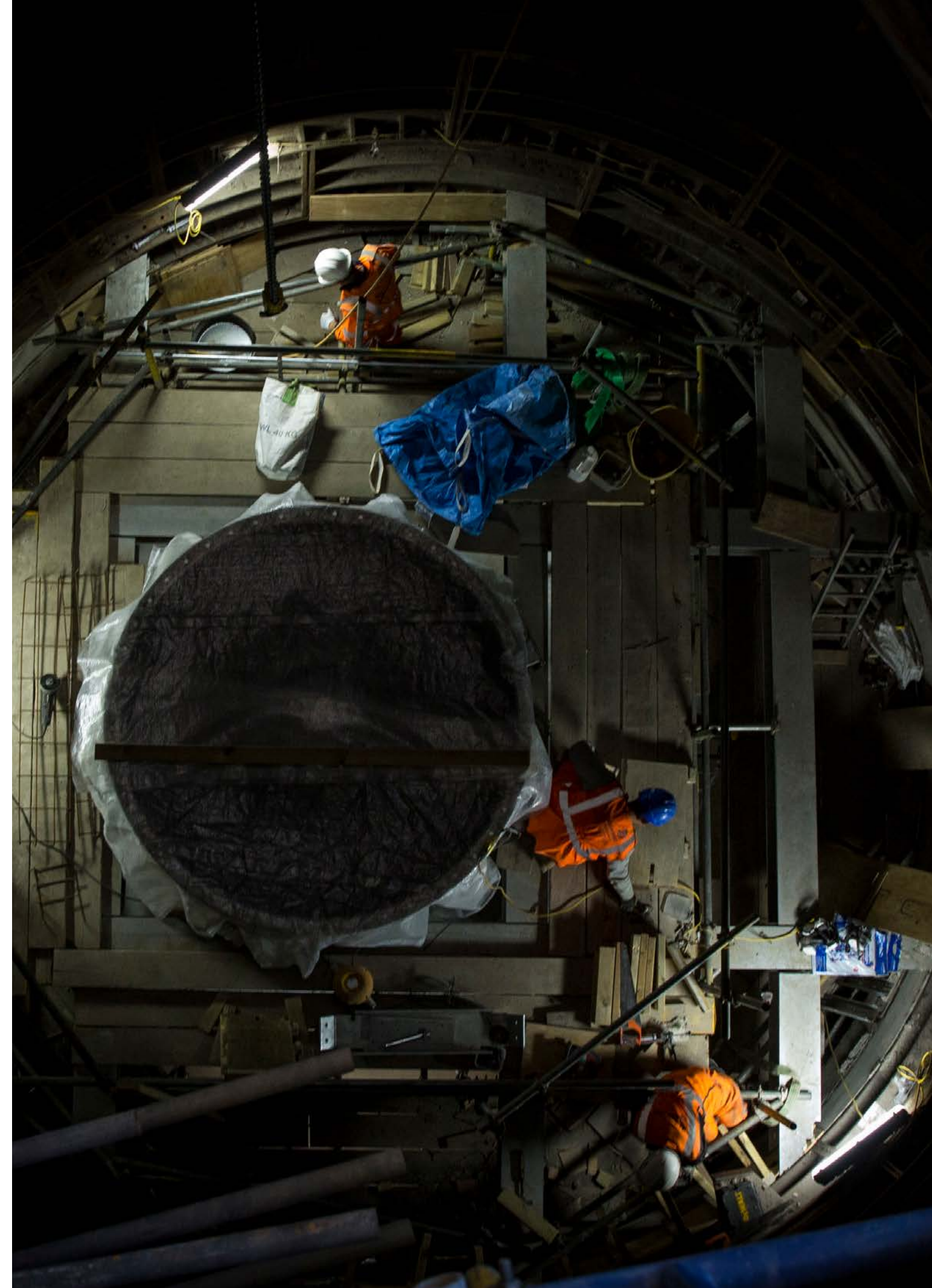
Waste heat and solar private wire

These are environmental projects that form part of our wider energy and carbon strategy. These are early-stage projects.

The waste heat project builds on our success with the London Borough of Islington in the Bunhill development. It aims to offer the market an opportunity to use currently uncaptured thermal energy from ventilated air on the Tube networks to power heating and hot water in buildings, with potential to serve more than 15,000 households.

Solar private wire will enable us to directly receive zero-carbon electricity from local solar assets, reducing our carbon emissions. The project is focused on direct connection to new-build solar photovoltaic generation. Based on a typical solar generation profile, the opportunity represents up to 64 megawatts of renewable generation, equivalent to five per cent of our annual energy load.

Works are progressing on both projects to establish the route to market and develop the contract strategy, specification documents and the production of a financial and carbon model.



Our energy projects will support environmental improvements

Accessibility

Step-free access

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority surplus £m
2023	103	17	120	120	0
Change since last Investment programme report					
No change	I	(I)	No change	No change	

Programme update

We are committed to improving accessibility across the Tube network and, as well as third-party funded work, we have 15 stations in our accessibility programme.

Since 2018, we have provided step-free access at Newbury Park, Buckhurst Hill, South Woodford, Mill Hill East, Cockfosters, Amersham, Debden, Ickenham, Wimbledon Park and, most recently, Osterley, which became the 89th step-free station on 6 October. Main works and lift installations continue at Harrow-on-the-Hill and Sudbury Hill, with both due to be made step-free by the end of 2021.

We are making steady progress across the accessibility programme, with Sudbury Hill due to be made step-free imminently. Work at Harrow-on-the Hill is now entering the final stages.

Discussions have restarted with our supply chain on the paused step-free

improvements at Burnt Oak, Hanger Lane and Northolt. We will have a two-stage approach to provide greater assurance on the deliverability of the projects. In collaboration with the supply chain, the first phase will focus on completing the detailed design and progressing value engineering opportunities, in addition to refining construction logistics, methodologies, planning and sequencing, ensuring a robust and deliverable schedule and cost estimate are in place. This initial phase will conclude in early 2022 ahead of the future decision on moving into full construction delivery.

On 2 November, we launched a public consultation on our future step-free access priorities and improvements. The consultation, which runs until 10 February 2022, will help us identify where we should prioritise future investment to bring the most far-reaching and beneficial impacts and help even more people use public transport independently.



Our accessibility work helps keep our services open to all

Enhancements

Lifts and escalators

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority surplus £m
2023	466	125	591	885	294
Change since last Investment programme report					
No change	4	(4)	No change	No change	

Programme update

There are 447 escalators, 259 lifts and four passenger conveyors on the London Underground network, which are essential to ensuring customers have safe, reliable and quick access to our services. These numbers will grow by 25 per cent by 2026 as a result of major station projects, the accessibility programme and the Elizabeth line. This programme provides the rolling asset renewals work to keep these assets in operation.

Maintaining and improving lift and escalator availability requires ongoing refurbishment and renewal. Typically, escalators need replacing every 40 years and lifts every 20 to 40 years, depending on the type. This means we need to replace around 2.5 per cent of our escalator assets and four per cent of our lift assets each year. This rate will need to increase as the number of assets grows. The interventions carried out are informed by the condition and performance of each asset.

Replacing an escalator or lift is a complex process. It must be fully dismantled and worked on in a very constrained space, while daily operations in the station continue. When we replace assets, we also try to standardise them where possible to reduce ongoing maintenance costs.

South Kensington

Works continue to replace five life-expired escalators at the station. This means Piccadilly line trains are not stopping at the station until spring 2022. However, the Circle and District line platforms remain open. The civils construction phase is now complete, with delivery and installation of the new escalators having begun on 7 November.



Our lifts and escalators need ongoing refurbishment and renewal



Marylebone

We have completed the installation of a third escalator, which will boost capacity and resilience at the station. We have started to replace one of the remaining two life-expired existing escalators. All works are due to complete in 2023.

Oxford Circus

Refurbishment work to improve the condition and reliability of the escalators began in May 2021 and the third escalator was completed and returned to service in October.

Borough and Tottenham Hale

Works to replace the obsolete lift at Tottenham Hale station are progressing well and are expected to be complete in January 2022. Works to replace the poorly performing lifts at Borough station will continue into 2022. They will coincide with the temporary Bank branch Northern line closure to minimise disruption.

Track renewals

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority surplus £m
2023	124	278	402	402	-
Change since last Investment programme report					
No change	19	(19)	No change	No change	

Programme update

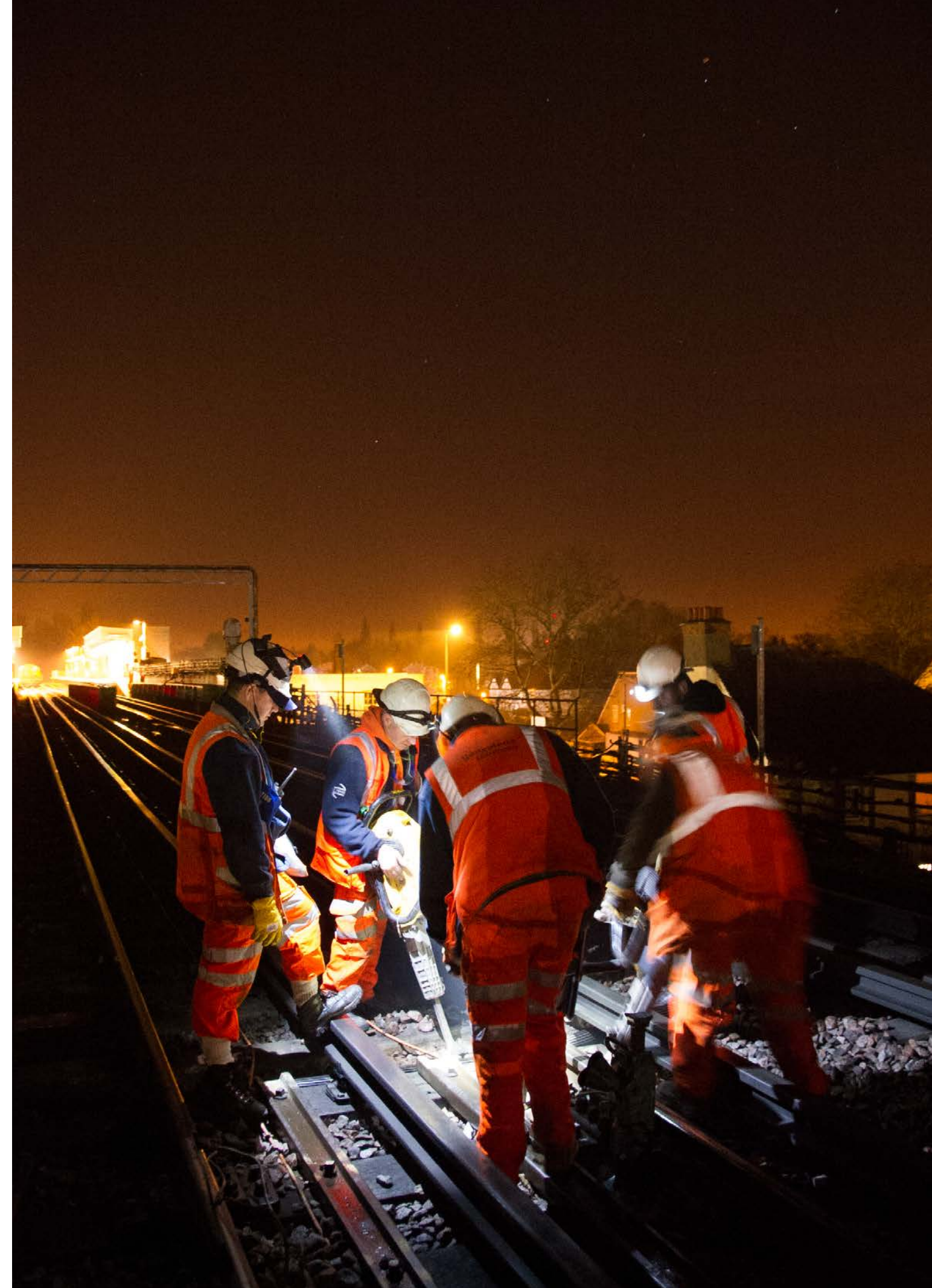
Our track assets are an essential component of a safe and reliable railway. Track is continually degrading and needs rolling maintenance and renewals to maintain it. Each section of track may have a residual life of between 40-60 years, meaning we must renew two to three per cent of our track every year, as well as making ongoing component replacements.

We aim to progressively install high-integrity, low-maintenance, flat-bottomed track on concrete sleepers, replacing bullhead rail on timber sleepers, some of which has been in service since the early 1900s. This new, modern track is more stable and reliable.

This quarter, we successfully delivered four planned weekend closures on the District, Central, Northern and Piccadilly lines, as well as extensive works during engineering hours. We delivered more than 1.1km of renewed track, which meant we achieved our mid-year target of 3.4km of new track installed in the financial year.

As usual, work was spread across the entire network, addressing the areas of track in greatest need of renewal to support safe operation. We renewed more than 600 metres of ballasted track, as well as 500 metres of concreted track in the deep Tube.

The programme remains on course to deliver the year-end target of installing 8km of new track across the network.



We must maintain our track to ensure safety and reliability

Rolling stock

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority deficit £m
2027	245	804	1,049	703	(346)
Change since last Investment programme report					
No change	4	(4)	No change	No change	

Programme update

We have more than 600 Tube trains operating across 11 lines, with the oldest trains entering service in the 1970s. We must ensure all trains remain safe and operational, which requires certain interventions. Some of these are maintenance activities and others are needed due to changes in regulations, arising safety issues, poor reliability and performance, unacceptable costs or system obsolescence.

To better predict interventions, we have a 25-year fleet cost model, which feeds into our long-term capital plan. The model has various scenarios that map out when each fleet may get replaced and the likely interventions required to enable them to reach this date.

We are purchasing a new fleet for the Piccadilly line. There are no other confirmed fleet replacements.

The engineering vehicle fleet supports the track renewal programme and comprises battery locomotives, various wagons for different activities and plant equipment, such as cranes and tampers. We aim to improve reliability of this non-passenger fleet, responding to component obsolescence problems and supporting our overarching strategy to mechanise track-based activities where possible. Our intention is to encourage enhanced productivity and an improved safety culture.

Accessibility

Our programme of works on the Bakerloo and Central line fleets is critical to improving accessibility. Both projects are progressing with detailed design validation through the installation and testing of prototype systems. A Bakerloo line train is currently at Acton maintenance shed, having the first wheelchair bays and new grab poles installed. We are progressing designs and prototype installation for the passenger information system.



We monitor the condition of our trains to ensure their safe running



The safety of our equipment is our number one priority

For the Central Line Improvement Programme, a train is currently at Ruislip maintenance shed, with all electrical systems installed, as well as wheelchair bays and trial fitments of new door entry tread plates and vinyl floors. We expect to meet our target of a successful dynamic test of the Central line saloon design by end of the year. A Waterloo & City line train has also been fitted out with wheelchair bay components and returned to service, with documentation under way.

Reliability

We are including critical reliability improvements in our Central Line Improvement Programme works, by converting them from the now obsolete direct current (DC) power traction to the much more reliable alternating current (AC) traction equipment. The AC traction prototype installation on the first train is complete, and we have made a back-to-back comparison on the London Underground network and have completed extensive offsite eight-car high-speed testing at the Rail Innovation & Development Centre in Old Dalby. We expect to meet our target of a dynamic train test by the year end.

As part of the Jubilee line reliability improvement programme, the feasibility study on reducing the risk of structural fatigue cracking in the carriage underframe has completed, with capital investment authority to proceed into concept design and delivery expected in Quarter 3.

Safety

We are working to improve customer safety on the Central and Bakerloo line fleets. The first Bakerloo train, with new LED lighting, was returned to service in Quarter 1. Our target of 10 trains by the end of the financial year is at risk due to trade union discussions, which prevented the project from starting onsite during the summer. These discussions have been resolved and a limited team of four installers have been permitted on site to deliver the installation on to the trains at a reduced rate while additional facilities are procured to enable full production in January 2022.

On the Central line, we have completed the installation and unit testing for all electrical systems, which includes passenger information system, CCTV, data transmission system, saloon design and LED installed and undergone static train testing and maintenance activities. We expect to meet our target of a successful dynamic test of the Central line saloon design by the end of the year.

We have restarted a programme of works to improve the train operator's cab security. In Quarter 3, we will instruct a security and behavioural assessment and revise the installation plan prioritising the Waterloo & City line to complete works started pre-March 2020.

Engineering vehicles

The mechanised renewal vehicle will change the way we replace track by mechanising concrete track renewal in the deep Tube. Made up of three wagons, the vehicle has been fitted with track renewal equipment, handrails and steps. It is ready for testing and familiarisation at Ruislip Depot. Once it is approved, we will trial the vehicle during engineering hours.

We are purchasing a new fleet of engineering wagons from the world's largest rolling stock manufacturer in China. The first four prototype wagons arrived in the UK in late 2020. With final engineering works now complete, dynamic testing is due to start. A fifth wagon is expected to arrive in January 2022. Once dynamic testing has passed, they will undergo infrastructure testing on the Underground network. The remaining 66 wagons will then enter production in China before being shipped to the UK in early 2023.

We purchased two rail-mounted cranes and eight tilting wagons from Kirow in Germany. The cranes have successfully completed dynamic brake testing on our test track. Consent to operate will first be granted in open sections and then in sub-surface tunnel environments. The cranes and tilting wagons enable us to transport wide track panels directly from the manufacturer's site to the track renewal location, giving time and quality benefits.

Track recording vehicle

Tender evaluation of the track geometry measuring equipment is under way with contract award scheduled for mid/early 2022. This project will mount this equipment to two sets of host wagons, which will be hauled by battery locomotives across the Tube network, replacing the single, life-expired track recording vehicle currently in operation.

Ruislip Depot

The first of three areas identified for track layout changes in Ruislip Depot to improve track condition is due to begin this quarter. Work on the remaining areas for increased stabling capacity will start next year.

Battery locomotive fleet replacement

We are exploring options, supported by a completed early market engagement exercise, to replace the existing battery locomotive fleet. These locomotives haul most of our engineering vehicles around the Underground network, but the fleet is close to its extended service life. Part of this project will ensure the existing fleet remains operational while the replacement fleet is being progressed.



We maintain and service a wide range of vehicles

Fleet heavy overhauls

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority deficit £m
2027	85	156	241	398	157
Change since last Investment programme report					
No change	6	(6)	No change	No change	

Programme update

To ensure train fleets remain safe and reliable, we conduct a planned programme of essential heavy maintenance. This ensures all core systems meet the required standards. This programme delivers large scale heavy maintenance activities on our existing fleet of passenger rolling stock and rail adhesion trains.

The work requires each train to be removed from service for several days or weeks and includes overhauling suspension, wheelsets, motors and brake systems, overhauling auxiliary equipment.

Victoria line

We ran a prototype of the pressurised ventilation fans, which provide air in place of air-conditioning, work has started to roll out this system to the whole fleet. This upgraded system will reduce maintenance.

Metropolitan line

Work has continued with the third train forecast to go back in service in early November.

Piccadilly line

On the Piccadilly line life extension works, we have completed the replacement of the saloon seats and 75 per cent of the floors. The second lift cycle has begun for the additional 59 units to take the fleet to end of life.



We have a programme of planned maintenance work



We must continually assess the status of our train fleets

Jubilee line

Mobilisation continues to progress at Stratford Market Depot, with a new bogie press installed and commissioned.

Procurement activities progressed to enable the start of some work in February 2022 and the main programme lift in summer 2022. As planned, we are working on the concession document, which lists the mitigations necessary to keep the trains in operation until the heavy overhaul takes place. Work Instructions have been drafted and are being reviewed. Recruitment is under way.

In the past year, our engineering team has used the latest iteration of its framework for finding suppliers to support the programme. Availability of principal engineers is slowing down delivery and remains an issue.

Adhesion train

We completed this year's work on one of our rail adhesion units. These are required to support operations on the Central line by applying a substance to the rails to manage adhesion levels during autumn when the leaves fall on the tracks.

Renewals

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority deficit £m
2025	134	207	341	285	(56)
Change since last Investment programme report					
No change	(0)	0	No change	No change	

Programme update

This programme covers a range of assets across buildings and stations, civils, power, electricals and cooling to ensure safety compliance and continued reliability.

Buildings and stations

We undertake rolling programmes of targeted interventions to building systems, communications, fire and mechanical assets, and the built environment in stations, buildings and other London Underground premises to improve asset condition.

We recently completed concept designs on the replacement of the ceiling at Pimlico station.

We have completed detailed design work to replace obsolete communications equipment at King's Cross St Pancras, including station management systems, local area networks, CCTV, the public address and alarm system, lift intercom system, visual information displays and ticket hall information displays, as well as passenger help points.

We have completed concept design work and detailed designs are now progressing to replace station information management systems, public address and voice alarm systems, as well as the passenger help point systems, at London Bridge, North Greenwich, Canary Wharf, Canada Water, Canning Town, West Ham, Southwark and Bermondsey.

In October, we completed works to renew the one-person operated CCTV cameras on the Bakerloo line platforms at Waterloo station, to improve passenger safety.

Staff welfare facilities

We are carrying out targeted renewals of staff welfare facilities at prioritised locations. The renewals will improve the condition of the facilities and the environment. We are doing procurement activities to support works starting on site from January 2022.



We are improving customer safety on platforms across the Underground



We have an extensive asset base that must be maintained

Civils

These account for 30,000 assets across the network, providing structural support, stability and protection to the railway. The asset base includes more than 16,000 bridges and structures and 235km of embankments and cuttings, as well as tunnels, lighting masks and flood protection assets.

We are assessing their condition to improve our understanding of our asset base, which will help us to plan future interventions.

Works are progressing onsite to stabilise the cutting between Grange Hill and Chigwell stations on the Central line to ensure the continued safe running of the railway.

Power and electrical

London Underground is the largest consumer of power in London. We operate our own high-voltage distribution network and backup power generation capability. Based on the state of good repair of the assets and the expected age, we deliver a rolling programme of renewals to maintain the integrity of power delivery to the railway.

Work is under way to replace 22 life-expired uninterruptable power supply units to ensure a continuous power supply to critical signalling assets on the railway. Detailed designs have been completed with site works planned for later this year.

Procurement has started for the replacement of 20 life-expired offline battery power inverter units supplying station emergency lighting systems. The project will include developing standardised modular equipment, which can be retrofitted into existing installations, and site trials to reduce the installation work and improve value for money.

The replacement of 16 traction isolation switches is in progress at Hainault Depot to address equipment non-compliances and remove operational restrictions. All units are now installed with five fully commissioned and the others planned for completion in 2021.

Civil works at Greenford substation are nearly complete in preparation for the replacement of the high-voltage switchboard. The impact of the pandemic on the overseas manufacture of the switchboard has been mitigated with completion of its factory acceptance test in October for delivery to site in late autumn this year.

We have started procurement for the replacement of the DC traction switchboard at Holborn station, starting in 2022/23.

Power control

We have nearly completed the installation of the network-wide power control system replacement project. This comprises control centres linking to circuit breakers across the network, which enable train traction control. The site acceptance testing began in September and, with the relaxation of coronavirus travel restrictions, plans have been put in place to train operational staff and commissioning towards the end of 2021/22.

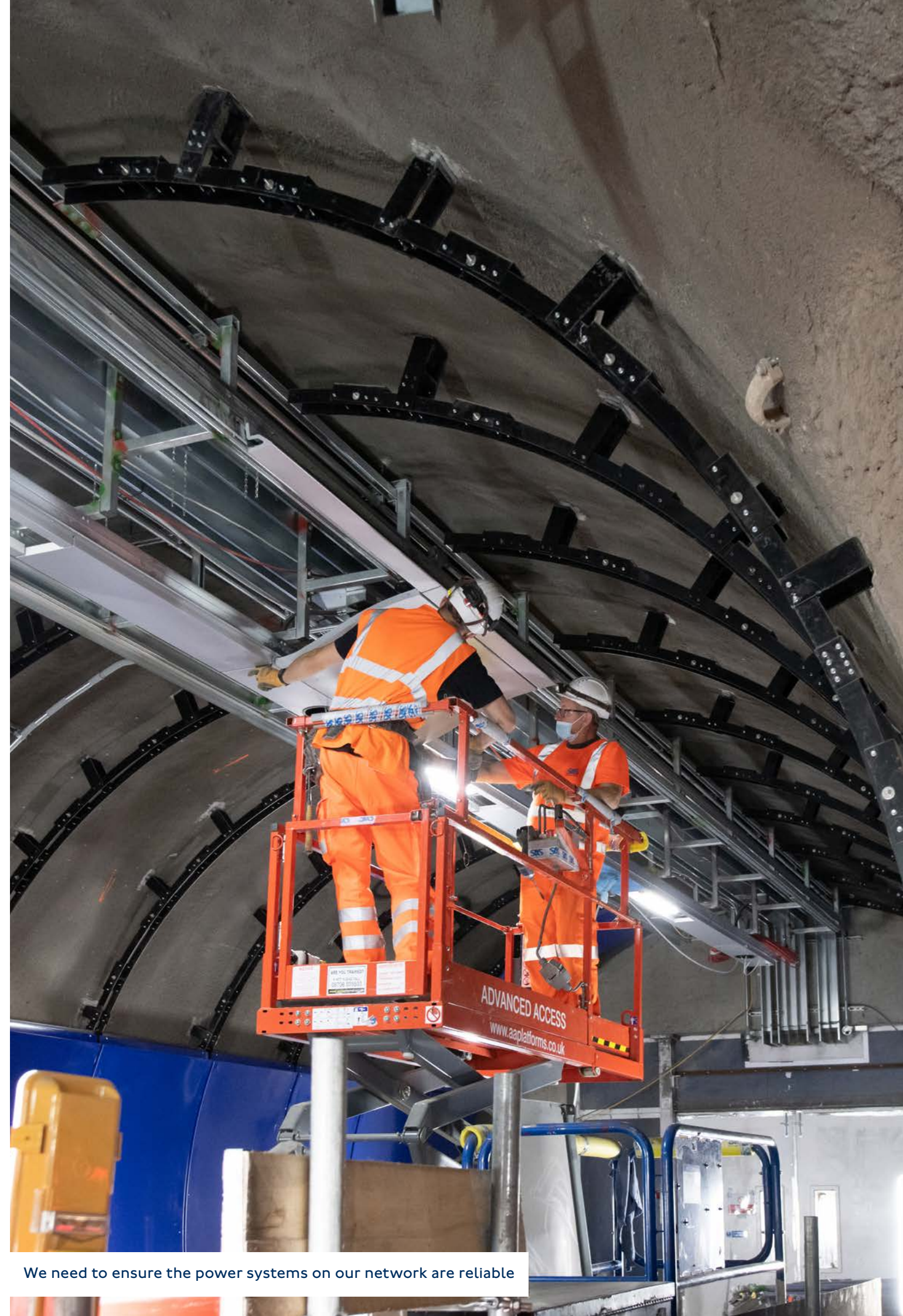
The first of the control system upgrades on the electricity generators at Greenwich Power Station was completed in October. The upgrades will continue in 2022/23 and remove obsolescence and improve the long-term reliability of the essential emergency generating plant.

LED lighting

We have continued with the planned conversion of traditional fluorescent lights to low energy LED lighting, improving efficiency and reducing ongoing maintenance costs. A new delivery programme for a further 26 stations to be completed during 2022/23 is in progress, with additional conversions also started in September at prioritised train depot locations.

Civils and accessibility

Meeting Rail Vehicle Accessibility Regulations (RVAR) requirements to provide level access between the train and platform for customers on the Bakerloo line will improve accessibility and safety. We have constructed platform humps at Oxford Circus and provided manual boarding ramps at Elephant & Castle in readiness for when the Bakerloo line trains are made RVAR-compliant. Final preparations are under way for construction of a hump and associated works at Paddington.



We need to ensure the power systems on our network are reliable

Signalling and control

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority deficit £m
2028	96	328	424	307	(117)
Change since last Investment programme report					
3 years	1	207	208	95	

Financial commentary

The EFC has increased by £208m since Quarter 2 and the cost to go has also increased by £207m for the next stage of works. This is due to maturing of estimated costs for the next tranche of signalling and control system upgrades on the Bakerloo and Central lines, and critical obsolescence works on the Jubilee and Northern lines. The recent stretch to the forecast completion covers the scope in the next tranche of system upgrades under the Central line incremental upgrade, which is forecast to complete in 2028. This was authorised at the Programmes and Investment Committee in October 2021. Additionally, new projects have been added that will resolve safety and legislative compliance issues across the network.

Programme update

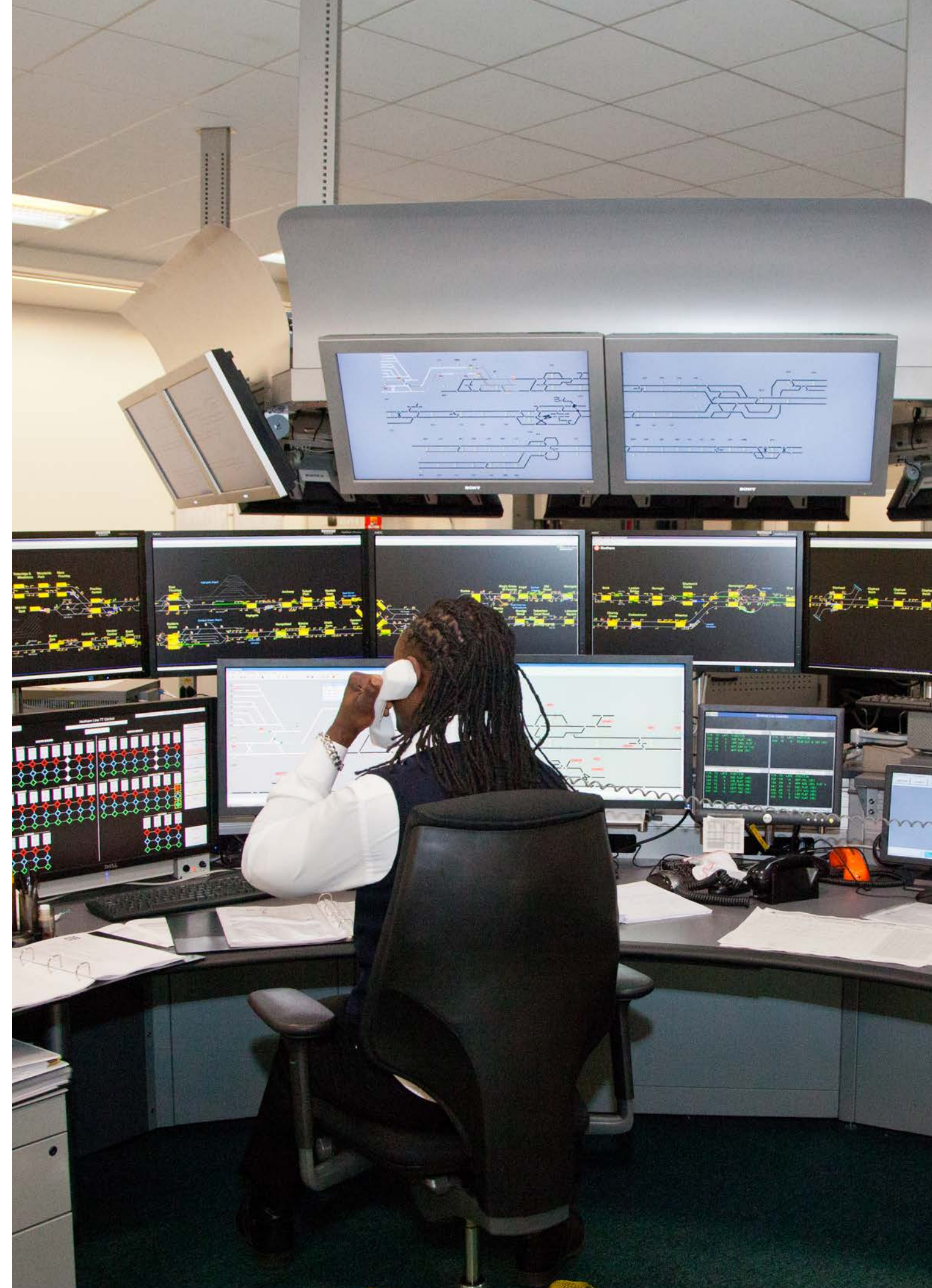
Signalling and control systems are essential for the safe and efficient operation of train services. Some date to the early 1960s and are now obsolete and increasingly hard to maintain. We continue to move towards more modern computer-based systems that provide greater service capacity. While these need less day-to-day

maintenance compared with traditional electro-mechanical signalling, they do need significant obsolescence-driven renewals during their life.

Large upgrades, such as the modernisation of the Circle, District, Hammersmith & City and Metropolitan lines, are replacing systems across the sub-surface lines. The Jubilee, Northern and Victoria lines have relatively modern, computer-based systems, however as computer technology is fast-paced, the availability of support and spares declines as systems age, and obsolescence risk increases.

On lines such as the Bakerloo, Central, Piccadilly and Waterloo & City, recent financial challenges have seen planned upgrades scaled back, and in response we have developed a targeted incremental approach to upgrading and life extension.

This programme has been established to extend the life of current systems and contain obsolescence risk.



Our signals and controls are essential for ensuring safe travel



Signalling and control

The Bakerloo line control system life extension project has successfully commissioned the replacement central computer servers into service. These are now controlling the Bakerloo line with the next phase of the project, which involves decommissioning and transferring the equipment to a museum, is under way.

We will start replacing the large file transfer system on the Jubilee line to enable data to be transferred automatically rather than doing it manually.

Assurance reviews and necessary governance steps have been completed to award the contract for life extension of the Central line signalling and control systems, which is expected in late autumn this year.

Incremental signalling upgrade

The first five-year tranche of the incremental signalling upgrade programme is progressing well, with design starting on updating the Bakerloo line control system. We are procuring a contractor to address replacement of obsolete signalling sub-systems on the Jubilee and Northern lines. We are also planning the first part of the upgrade for the Central line signalling system, limited in scope to part of the line.

Technology

Forecast completion	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority deficit £m
2025	89	116	205	95	(110)
Change since last Investment programme report					
No change	3	(3)	No change	No change	

Programme update

Our technology assets include a network-wide radio system and data network, as well as the software to manage our assets and deliver customer service. The fast-evolving IT market means we must keep software in manufacture support, as well as taking advantage of new technology to improve the way we deliver services.

Networks and connectivity

We continue to upgrade key components of London Underground's operationally critical Connect radio system and are now focusing on rolling out new radio hardware base-stations across the network. This second phase will continue through 2021/22 and is expected to be complete in mid-2023. As a result of this work, the Connect system will be able to function into the 2030s. We have installed new hardware at 44 of the required 293 locations and installation is progressing well.

We are also issuing replacement mobile devices to many of our operational staff. This will be complete in early 2022 and entails rolling out around 7,700 devices.

More than 5,000 replacement devices have been issued so far. Old devices will either be recycled or donated.

Asset management

To improve our approach to asset management and long-term investment planning, we are consolidating our asset management information systems into a single platform for London Underground and London Trams. We are now in the process of migrating London Underground assets onto this new single platform. This work will continue through 2021/22 and is anticipated to complete in early 2023. The project is part of an initiative to streamline our approach to asset management, which will involve migrating to the same single asset management platform over the coming years.

In addition, we are working to improve the quality of our asset condition data by running surveys across a wide range of assets on our network. This work will be complete by mid-2022 and help us improve the planning and co-ordination of essential maintenance works.



We are upgrading key connectivity elements on the network

Surface transport

This area comprises Healthy Streets, air quality, asset investment, public transport and surface technology



Healthy Streets

Reporting period	Cost to date £m	Cost to go £m	EFC £m	Programme and project authority £m	Authority deficit £m
2020/21 to 2024/25	220	516	736	309	(427)
Change since last Investment programme report					
No change	24	(39)	(15)	No change	

Financial commentary

Our Healthy Streets Investment Programme and Project Authority was increased at the July 2021 Programmes and Investment Committee. This includes all spend from 2020/21 to 2022/23.

The investment programme is currently reporting a £15m lower expenditure than the previous report. This mainly relates to slippage on committed spend, due to revised delivery plans on Old Street Roundabout, and the decision by the members of the Hammersmith Ferry Task Force to postpone the ferry service following the reopening of the bridge for people walking and cycling. The latest forecast also reflects lower borough expenditure based on current allocations and the run rate of spend to date.

Programme update

In March 2021, we largely concluded the rapid delivery of new temporary schemes under the Streetspace for London programme, in response to the challenges

of the pandemic. Further Government funding of £100m was allocated to the programme as part of the funding package agreed between the DfT and us for the period from 29 May to 11 December 2021.

We have now remobilised our longer-term Healthy Streets investment programme, while continuing with some temporary and experimental schemes on borough roads via the Government's Active Travel Fund.

A lot has changed since the programme was paused and we are now in a markedly different context. Our approach to Healthy Streets planning and delivery has adapted to reflect this, with a review of some historic schemes to test the best next steps, a new integrated pipeline of future schemes, and learning lessons from the Streetspace for London programme. We have also reviewed our strategies and policies, which has led to the programme and its priorities being reshaped to align with these commitments, which will span the next three years to May 2024.



We are working to make London's streets healthier for all



The continuing Healthy Streets programme will help reduce road danger in line with our Vision Zero action plan, and make it easier to walk, cycle and travel by bus across London. It will accelerate progress towards mode shift, decarbonisation, economic recovery and tackling health inequalities. Healthy Streets will also be an indispensable complement to our other initiatives, such as Vision Zero, Crossrail, the electrification of the bus fleet, and the ULEZ expansion, and help power London's wider recovery.

Old Street Roundabout

This scheme will substantially improve safety for pedestrians and cyclists at this major junction. Completion is scheduled for autumn 2022.

The next traffic management phase was completed during the August bank holiday weekend. This enabled construction to continue on the highways and drainage elements on all four arms of the junction, including roof strengthening works above the existing station in the peninsula area.

Construction of the new main station entrance continues with the substructure works now completed. Works have started on the above-ground superstructure and the installation of the precast concrete central column and stairs began on 15 November. This will be followed by the roof and glazing installation as planned from February 2022. Work on the new goods lift shaft continues in readiness to install the new lift car from January 2022.

Refurbishment of the existing stairs at the northwest entrance was substantially completed on 3 September 2021, which enabled the entrance to be reopened to the public and the green line to Moorfields Eye Hospital reinstated. This has enabled the adjacent ramp at the northwest entrance to be permanently closed, enabling new passenger lift works to start.

Construction of the new station entrance at Cowper Street was substantially completed on 31 August 2021 and opened for public use. This has enabled the permanent closure of the northeast entrance, which will be infilled over the coming months. The southwest entrance will remain open for customers until July 2022.

Installation of the new mechanical, electrical and new fire safety systems works in the below surface shopping arcade area continues as planned.

Cycleway 4

Construction works along Evelyn Street are now 35 per cent complete. The southbound diversion for traffic that was put in place from 31 August to accommodate the works was removed on 7 November 2021 as planned. The construction works are due to complete in summer 2022. The works on the Creek Road Bridge section, which will be carried out by the borough, are planned to start in January 2022.

Cycleway 9

Work to transform Hammersmith gyratory started on 29 November. This includes a protected two-way cycle track on the north side of Hammersmith gyratory and cyclist-specific signals at junctions to separate cyclists and motor vehicles. There will also be improvements for pedestrian safety at all junctions with side roads, including raised level crossings and more footway space, and new pedestrian crossing signals with 'countdowns' at King Street, Beadon Road, Shepherd's Bush Road, Queen Caroline Street, Hammersmith Road and Butterwick. There will also be a new parallel crossing at the Butterwick junction to enable westbound cyclists to join the two-way cycle track.

Work is set to be completed by spring 2022. We are advising people in the area to check their journeys before they travel, as the work will cause some travel disruption.

Responding to the pandemic

Borough delivery continues at pace, with more than 20km of cycling routes under construction. Hackney started construction of a new bus gate on Church Street in Stoke Newington, which closes the road to general traffic for part of the day and widens pavements for pedestrians. The London Legacy Development Corporation started construction of a new cycle crossing in The Queen Elizabeth Olympic Park. Ealing has recently completed construction of a 4.3km route between East Acton and Chiswick. Various improvements along the route make cycling more comfortable, with the major improvement seeing Fishers Lane, a previously highly

congested road, closed to general traffic. Further construction is planned to start and be completed over the coming months.

Work is ongoing to review each temporary Streetspace for London scheme that was delivered over the past 18 months, to consider whether schemes should be retained, altered, or removed from site. These decisions are based on extensive monitoring of the temporary schemes, stakeholder feedback, equalities considerations and alignment to our strategic priorities.

We successfully appealed the judgment in the judicial review challenge brought by two taxi groups, the Union Trade Action Group (UTAG) and the Licensed Taxi Drivers Association Limited (London) (LTDA), to challenge the Streetspace for London Plan, a temporary traffic scheme in Bishopsgate (A10) and the issuing of our interim Streetspace for London guidance to the boroughs.

On 16 June, the Court of Appeal allowed our appeal and overturned the order to quash the A10 scheme order, the Streetspace for London Plan and the interim guidance. UTAG and LTDA have made an application to the Supreme Court for permission to appeal, which we have objected to. A decision from the Supreme Court about whether any further appeal should have permission to proceed is currently awaited.



More people are cycling in London following the pandemic



Our roads must be safe to encourage more active travel options

Safer streets

We are working on more than 120 vital projects to address historical collision issues and reduce road danger on our roads. This contributes to the Mayor's Vision Zero ambition to eliminate deaths and serious injuries from London's roads by 2041. Measures include new and upgraded crossing points, improved pedestrian and cycle facilities, speed limit reductions and innovative pedestrian crossing technology. We are progressing these projects, but delivery will be subject to future funding.

Design work is progressing well on the latest projects to lower the speed limit to 20mph on more than 140km of our roads. We will introduce 20mph limits across 13km of our roads within Westminster, as well as 12.7km on the A13 in Tower Hamlets, the A23 London Road in Croydon, the A107 corridor in Hackney, the A10 to A503 corridors in Haringey and the A232 West Wickham and A205 Putney town centres. We will also introduce 2km of 30mph limits on the A10 Great Cambridge Road in Haringey, as well as A4180 Ruislip Road in Ealing.

Detailed design work is almost complete on five of these projects, which will be delivered by late January 2022. These are the A10 Great Cambridge Road, A13 Commercial Road, A23 London Road, A107 corridor and A10-A503 corridors. We engaged with local stakeholders on these projects during the summer. In addition, we met with key external stakeholders such as the Metropolitan Police Service, emergency services, 20s Plenty, London Cycling Campaign and boroughs in early September.

Detailed design work is also under way on proposals to introduce a new 20mph speed limit across our remaining roads in Westminster by March 2022. This follows successful public consultation, which concluded on 18 August.

We are working on a supplementary marketing campaign including posters and radio advertising. These are planned to take place in mid-December 2021 and March 2022, to coincide with the launch of the Lowering Speed Limits projects.

Safer Junctions

Safety measures have been introduced at 43 Safer Junction locations so far. Common measures include new and improved crossings, pedestrian countdowns at traffic signals, separation of signal phases or early release for cyclists,, improved cycle facilities, wider footways, separation or prohibition of dangerous turning manoeuvres, resurfacing, and lining improvements to encourage better lane discipline.

Detailed design work is complete on the new signal crossing on the north side of Battersea Bridge, after a pedestrian was tragically killed. Phase one of the project, delivering a new crossing and introducing a 20mph speed limit, commenced construction in October.

Air quality

Reporting period	Cost to date (Gross) £m	Cost to go (Gross) £m	Forecast £m	Programme and project authority £m	Authority deficit £m
2020/21 to 2024/25	194	501	695	255	(440)
Change since last Investment programme report					
No change	16	(13)	3	No change	

Financial commentary

Our Air Quality Programme and Project Authority was increased at the December 2020 Programmes and Investment Committee. This includes all spend, from 2017/18 to 2020/21, and expected contracted spend for 2021/22 and 2024/25 required before March 2023.

The Air Quality and Environment portfolio is forecasting an increase in expenditure of £3m from the previous report.

A further contribution of £5m has been received from the GLA to increase the number of polluting vehicles that are scrapped following the overwhelming demand for the scheme ahead of the launch of the expanded Ultra Low Emission Zone.

Programme update

Ultra Low Emission Zone expansion

In 2019, we introduced the world's first 24-hour Ultra Low Emission Zone (ULEZ) in central London. This has contributed to a 44 per cent reduction in roadside nitrogen dioxide levels within its boundary.

On 25 October 2021, the existing central London ULEZ was expanded to the North Circular Road (A406) and South Circular Road (A205), creating a zone 18 times larger than the central London ULEZ. This will improve air quality for millions of Londoners. Cars, motorcycles, minibuses (up to five tonnes), vans (up to 3.5 tonnes) and other specialist vehicles driving within the boundary must meet the required emissions standards or pay a daily charge.

A key element of this successful expansion, which was delivered on time and under budget, was to migrate the existing operational systems to a cloud-based platform. This enabled us to deal with the massively increased volumes of data and transactions from the larger zone. We successfully migrated all existing road user charging schemes to the new cloud platform in early October, which substantially de-risked the scheme launch.



Our projects are helping to clean up London's air

In addition to this major software project, a new camera data processing system was deployed, together with around 900 new cameras and more than 1,600 new or altered road signs. Our service provider Capita recruited, trained and deployed almost 800 new operational staff.

We ran a substantial marketing campaign to raise awareness of the ULEZ expansion and inform drivers how and where the scheme operates, encouraging them to check their vehicles and plan their options. This included posters, radio and television adverts, press and online advertising, leaflets for local residents, stakeholder and press activity. An intensive Mayoral launch day secured extensive and largely positive national and international media coverage. In the first week of operation, compliance rates were higher than anticipated.

Vehicle scrappage and support schemes

We have continued to operate the Mayor's scrappage schemes to help drivers scrap their older, more polluting vehicles to meet tightened emissions standards. A further contribution of £5m from the GLA was received in August 2021, to meet an increased demand for the scheme ahead of the launch of the expanded ULEZ. The schemes have supported the scrapping of more than 13,000 vehicles, with more than £48m of grant payments issued. The schemes have now closed for new applications as all available funds have been allocated.

Congestion Charge changes

Since its implementation in 2003, we have made changes to the Congestion Charge to ensure it remains effective, including changes to discounts and exemptions, charge levels, and days and times of operation. Last year, we made temporary changes to the charging days and hours in response to the transport challenges presented by the pandemic, including operating daily until 22:00.

We have developed proposals to change the Congestion Charge on a permanent basis. The public consultation on the proposed changes ended on 6 October 2021. A consultation report was prepared to inform the Mayor's decision at the TfL Board meeting on 8 December 2021 on whether some or all of these proposals are taken forward, with or without modifications. These proposed changes, if implemented, would take place later this year or early next year.

Electric Vehicle infrastructure strategy

On 15 October, the Mayor launched a summary of the London electric vehicle infrastructure strategy. This update report sets out our vision and key principles, captures recent trends and policy changes, forecasts the infrastructure needs to 2030 and sets out our roles and that of the wider public sector. The full document will be published in December 2021.



We are working to support the switch to electric vehicles



We already have one of the greenest bus fleets in Europe

The strategy targets the needs of key user groups, including those making high-mileage essential trips, while encouraging everyone to switch to zero-emission transport. We also set out our commitments to these user groups, including a need to address one of the main barriers – the availability of suitable land, through unlocking GLA group and other public sector sites. Finally, we summarise our key asks for Government, both in terms of support and funding, which has been vital in recent years in enabling London to meet the demand for electric vehicle charging and will be crucial to help maintain consumer confidence and accelerate the switch to these vehicles.

Electric vehicle infrastructure delivery

A keystone commitment of electric vehicle infrastructure strategy is for the Electric vehicle infrastructure delivery programme, which aims to provide specific mechanisms to help deliver the charge points needed to meet projected demand, while also generating revenue for the GLA. This includes creating flexible commercial and procurement models, tailored to individual requirements, as well as establishing guidance to help boroughs to consistently implement electric vehicle infrastructure.

Proposals for the programme, including a first tranche of delivery, were endorsed by the GLA Collaboration Board on 5 October 2021. This tranche seeks to deliver 100 charge points and will be a testbed for future, faster, delivery throughout the coming decade.

Greener fleet

All buses operating in our Dial-a-Ride fleet now comply with the Euro VI emission standard, which ensures they meet the requirements of the expanded ULEZ.

Zero-emission bus fleet

Since January 2021, the bus fleet has continued to meet or exceed the latest Euro VI emission standard. The number of zero-emission buses entering the fleet through competitive bus route tendering continues to rise. There are more than 560 zero-emission buses in service, including 20 hydrogen double-deck buses and we continue to invest in new greener technology. Around 10 per cent of London's bus network will be zero-emission by the end of 2022 and we will have 800 fully electric buses by March 2022.

Together with the Campaign for Better Transport, we organised a successful zero-emission bus summit on 17 September at City Hall, attended by the Mayor, local authorities, manufacturers, bus operators and other key industry stakeholders. The summit sought to find collaborative ways to bring transformational change faster to UK towns, cities and rural areas and speed up the procurement of and investment in zero-emission buses across the UK.

Two key announcements were made that all new buses procured into London's bus fleet will be zero-emission and a commitment to bring forward the delivery of a 100 per cent zero-emission bus fleet in London by three years, from 2037 to 2034.

Asset investment

Reporting period	Cost to date (Gross) £m	Cost to go (Gross) £m	Forecast £m	Programme and project authority £m	Authority deficit £m
2020/21 to 2024/25	194	139	977	494	(483)
Change since last Investment programme report					
No change	9	13	22	No change	

Financial commentary

The Asset Investment Programme and Project Authority was increased at the March 2021 Programmes and Investment Committee. This includes all spend from 2020/21 to 2022/23. Current authority remains the same as the previous quarter.

Five-year expenditure is forecast to increase by £22m from the previous report, which is primarily driven by increased investment into the portfolio's Major Asset Renewal projects. Examples include Blackwall Tunnel southbound refurbishment, Kingston Cromwell Road bus station refurbishment, as well as pier and tunnels renewals projects.

Programme update

Work is under way to ensure the safety and operability of our highest priority assets that need urgent renewals, including critical tunnels, such as Rotherhithe and Blackwall, and structures, such as the A40 Westway, Brent Cross, Croydon Flyover and Gallow's Corner.

Design work is nearing completion on the replacement of the bridge expansion joint scheme on the A40 Westway. Fabrication of the joint is progressing, the enabling works have started and the works on the top side of the structure began on 26 November 2021. The remaining joints, parapets and other planned works will start in 2022.

The detailed design for protective security measures at Westminster Bridge has now received consent from both local authorities plans and are progressing well, and the works began on site on 15 November 2021.

The design work and preparation of tender documents for the design and build procurement stages is complete. A series of short-term capital interventions will be progressed to ensure the tunnel remains safe and operable until the main project can be progressed. The installation of a height barrier to improve compliance of vehicles using the tunnel is currently in design, with implementation to take place in late January 2022.

Advance critical works to install a height barrier to reduce the number of non-compliant vehicles using the Rotherhithe Tunnel and replace the approach road lighting are progressing. The approach road lighting has been installed and was tested for completion on 19 October. The design work for the barrier is nearly complete and installation of the gantry is expected to complete by the end of January 2022.

Tender returns have been received on two key projects, Brent Cross structures and the renewal of Kingston Cromwell Road bus station and we have awarded the contracts for both.

Hammersmith Bridge

Hammersmith Bridge re-opened for pedestrians and cyclists to cross and for river traffic to pass beneath in July 2021. After a review, the Hammersmith Bridge Taskforce decided on 25 November that there is no longer a need for a ferry service. We will continue to work closely with the Government and the council to ensure people can continue to cross the river in this area.

Carriageway renewal

Work to renew 325,000m² of carriageway continues at pace, with 150,000m² delivered by 15 October. Many schemes have been delivered, with large schemes on the A24 Epsom Road and Great Cambridge Roundabout. Schemes in the next quarter include A3220 Warwick Road and A503 Camden Road. Design work to facilitate future renewals is progressing well.

Public transport

Reporting period	Cost to date (Gross) £m	Cost to go (Gross) £m	Forecast £m	Programme and project authority £m	Authority deficit £m
2020/21 to 2024/25	103	638	741	249	(492)
Change since last Investment programme report					
No change	9	(15)	(6)	No change	

Financial commentary

The Public Transport Investment Programme and Project Authority was increased at the July 2021 Programmes and Investment Committee. This includes all spend from 2020/21 to 2022/23.

The Public Transport portfolio is forecasting a decrease in gross expenditure of £6m from the previous report.

The five-year forecast reflects lower spend, mainly driven by Royal Docks, as approval for the programme scope originally planned for July was delayed until September 2021, resulting in activity for a work package relating to Pontoon Docks taking place in 2025/26.

There is increased effort following the transfer of Woolwich Ferry to improve the service on the south layby by increasing spend in 2022/23 by £2m. The overall forecast has been offset by over programming in the portfolio.

Programme update

Class 710 trains

A further six Class 710 trains will be delivered later in 2021. These will be used on the Barking Riverside Extension as operational spares and provide additional capacity to meet forecasted growth on the London Overground network.

We have continued to develop the concept designs for projects funded by the Housing Infrastructure Fund, which support the development of 14,000 new homes. The concept designs, which are forecast to be completed by January 2022, will inform programme cost estimating and scheduling. We will then return to the Programmes and Investment Committee in spring 2022 to look at proceeding with the programme into the next detailed design and construction stages.



We are delivering more new trains on the London Overground



Work continues on our renewal work for the DLR

We have installed a safety system on the eastern and western Network Rail sections of the Elizabeth line on behalf of London Underground to prevent incorrect side-opening of doors at stations. This will complement the automatic correct-side door control provided by Crossrail in the central section. The system uses new trackside equipment that verifies location so the train knows the next station and position of the platform. Installation has been in phases, with both the section between Liverpool Street and Shenfield and the section between Paddington and Heathrow and Reading now complete. The system is now in use with the Elizabeth line train operator.

DLR

In Quarter 3, both construction and procurement activities for the renewal portfolio continue to gather pace. The team, including our contractors, continue to assess the impact of the pandemic and mitigations, and ongoing testing has enabled us to see minimal impact.

The B92 replacement bogie frame project is progressing well with 67 out of 70 frames being delivered, and an additional 20 being ordered.

The Poplar Direct Current High Voltage project is in the final commissioning stage. Switchgear factory building has started, final designs are under way for key high voltage projects to replace the east route ring main units and other vital power substation equipment. New DC switchgear for Custom House is ready for factory acceptance testing.

Good progress has been made on the Poplar and West India Quay station lighting upgrade projects. Migration and final commissioning works are in progress.

We have replaced 90 per cent of the Beckton Depot shore supply equipment and commissioned it into service. Intrusive lighting and power surveys have been completed at several stations, which will enable us to progress with technical documentation for tender.

The lift system upgrade project continued to make good progress, with 10 lifts completed. Following a successful tender process, a contract has been awarded for escalator mid-life overhaul work across 20 DLR stations.

Coper and tactile installation have been completed at Bank station, completing our DfT obligation for Rail Vehicle Access Regulations compliance. Work has now started on London City Airport. Crossharbour station stair tread replacement has been finished. Waterproofing at Limehouse Arches works have been concluded and handed back to the local Council.

Switches and crossovers have been installed at Canary Wharf and Canning Town and commissioned successfully. We have completed 800 metres of rail, including eight new expansion switches between Canning Town and Blackwall, and Canary Wharf and Crossharbour stations. Track fixings continue to upgrade baseplates through critical sites during engineering hours.



We are working to modernise London's cycle hire options

The GLA-funded Royal Docks stations programme concept designs has now been approved for Royal Victoria and Beckton Park. GLA funding has been agreed for the next phase of works.

London Trams

The Tram Rolling Stock Replacement programme will replace the life expiring Bombardier CR4000 trams, which are experiencing declining reliability and have one of the lowest states of good repair categorisations across our fleets. The programme has been assessing the outputs from the Sandilands inquest and has fed these into the current tram market study to understand safety innovations available for modern fleets.

The market study, plus assessments of the current depot and infrastructure, will complete in the autumn ahead of starting the market engagement exercise in Quarter 4.

Installation work continued for both the wayside and on-tram upgrades to tram communication equipment, which is a precursor to enabling a correct-side door enable system on the Bombardier CR4000 trams. The next milestone is the completion of the wayside works in January 2022.

Our renewals programme continues across six asset groups, including rolling stock, power, civils, systems and permanent way infrastructure. The third phase of the Reeves Corner embedded track renewal

was completed during a 16-day part-closure of the tramway in August and the final phase is planned for completion during a nine-day closure in February 2022. Highway resurfacing work in the centre of Croydon and further repair works to the Addiscombe Road bridge were also completed during the possession.

Following contract award for Morden Road staircase civil renewals, site works started on 18 October 2021 and the tender evaluation for the Birkbeck retaining wall was progressed, with contract award now expected by mid-December 2021.

Tram 2547, which is a specific type, was transported to Alstom's depot in Ilford and the first phase of condition assessment and repair works is ongoing. The repeat trial-running for the first-in-class Stadler on the CCTV upgrade project was delayed by a technical issue following the installation of the new CCTV, which is being resolved and the roll-out is now forecast to complete by the end of December 2021.

Santander Cycles

The programme to modernise, electrify and expand our Santander Cycles scheme is continuing as planned. This initiative aims to broaden and increase Santander Cycles usage and support our financial sustainability plan by increasing revenue and to adapt to the requirements of the latest applicable regulations. It will include the introduction of 500 electric bikes (e-bikes) and enhanced app functionality.

The launch of the 500 e-bikes remains on track for summer 2022. The systems integration team has been formed and is working with suppliers to integrate the back-office payment system, e-bikes and the website and app. The detailed design for the entire solution has been received and is under review.

Options are being explored to expand the geographical footprint of Santander Cycles, with a business case in development to confirm the priority list of areas that would benefit from expansion. Third-party funding has been secured from the London Borough of Southwark for a small expansion within the borough and design work is under way for the potential sites.

Woolwich Ferry

Following the transfer of the Woolwich Ferry from the Assets portfolio to the Public Transport portfolio, the Woolwich Ferry resilience and renewals programme has been created. This will establish a prioritised work bank of projects, with the overarching aim of reducing operational expenditure costs, maximising the use of the assets, and exploiting opportunities to generate additional revenue. The programme absorbs the previous Woolwich Ferry Life Extension Phase 3 package, including needing an unrestricted vessel access to a lay-by berth, maintenance access ramp, fender deformation issues and a backup mooring plan.

The Woolwich Ferry is legally required to operate without charge to passengers. The strategic aim is therefore to reduce the net cost of operations, including by generating additional revenue where possible, improve safety, and to maximise the value of the assets and operating expenditure by carrying more passengers. To achieve the latter, the focus is on improving service reliability and resilience as well as attracting new users and winning old users back, particularly local people, through better awareness and improved customer experience.

Following the multiple safety critical work packages earlier this year, the programme has refocused its work on key priorities. This includes the feasibility of a new berth and fuelling system, highway's enhancements in the surrounding area and real-time information changes. These projects are all within feasibility and the berth and fuelling projects expecting early design work began on 2 and 9 September respectively.



We are looking to reduce operating costs for the Woolwich Ferry

Technology

Reporting period	Cost to date (Gross) £m	Cost to go (Gross) £m	Forecast £m	Programme and project authority £m	Authority deficit £m
2020/21 to 2024/25	35	325	360	130	(230)
Change since last Investment programme report					
No change	4	(4)	No change	No change	

Financial commentary

The Programme and Project Authority was increased at the March 2021 Programmes and Investment Committee. This included all spend from 2020/21 to 21/22 and expected contracted spend for 2022/23 to 2024/25 required before March 2022. A further authority request was submitted to the committee in October 2021.

The five-year expenditure has not changed since the previous report.

Programme update

Compliance, enforcement and safety technology

We are delivering a suite of projects, using technology to improve safety and security on our network. Projects include the enforcement and compliance operations system, which is upgrading the digital capability of our Compliance, Policing, Operations and Security directorate. This will ensure our 600 on-street compliance officers and back-office support staff can enforce the safety and security of our network efficiently and effectively.

Work is also continuing to deliver deployable enforcement cameras. Each year, more than 4,000 people are killed or seriously injured in collisions on London's roads, with 76 per cent of these collisions happening at junctions. These cameras can be flexibly deployed at locations not covered by existing CCTV cameras, which will greatly improve enforcement coverage, reduce collisions and support bus reliability. During a trial, the junctions where these cameras were deployed saw at least a 40 per cent improvement in compliance. A contract was awarded on 26 July 2021 to enable the new cameras to start being introduced from late 2021.

We are committed to preventing violence and aggression across our network. In February 2020, our Safety, Sustainability and HR Panel endorsed a Work-Related Violence and Aggression strategy in response to increasing concerns about the levels of violence faced by our staff. In 2020, we rolled out 4,500 body worn video cameras to colleagues in the highest risk roles.



Body-worn cameras are helping keep frontline staff safe



We are making it easier to book our Dial-a-Ride services

We are now looking across the business to provide further cameras to those who need them. We are also looking to invest in additional emergency alert devices that give staff priority access to the emergency services. As part of the strategy, we are also looking to improve the way incidents are reported, making it simpler. We will also introduce a new case management system, which will help better support victims.

Roads technology

We are leading the way in delivering innovative new road traffic management systems to make journeys by walking, cycling and bus, as well as essential emergency services and freight trips, as efficient as possible. Delivery of elements of the Surface Intelligent Transport Systems programme remains on track. The third release of our Common Operational View Incident Management System has now been deployed in our Network Management Control Centre, and the fourth release took place on 30 November 2021.

The latest release includes enhanced data on buses, including passenger counts and delay data, and information on Santander Cycles docking stations, enabling us to focus our response to incident management.

The element of the Surface Intelligent Transport Systems programme that aims to predict the impact of incidents on the network, is approaching the end of

feasibility. The predictive system will use innovative modelling technology, so we are working with experts to baseline the scope to ensure it can contribute to overall journey time benefits.

Public transport technology

We are maintaining and developing technology to improve our public transport networks and enhance customer experience. This includes replacing the booking and scheduling system for Dial-a-Ride, which will enable us to book and deliver more trips with the same number of vehicles. Procurement is progressing well, with virtual site visits with potential suppliers concluded earlier in the year.

We are also replacing the iBus system, which is vital to ensure buses continue to operate effectively. Replacing this critical system is a key priority, as it enables us to provide real-time information to customers, enable bus priority at more than 1,800 junctions and supports performance payments to bus operating companies. Refreshing it gives an opportunity to improve bus passenger experience, with targeted enhancements including providing real-time information when a bus cannot follow its normal route and linking virtually to traffic lights at more junctions to help buses travel more quickly. We have published the contract notice for the iBus2 replacement project on the Find a Tender service and expect to shortlist suppliers later this year.

Professional services

This comprises technology and data, media and the TfL Growth fund



Technology and data

Reporting period	Cost to date (Gross) £m	Cost to go (Gross) £m	Forecast £m	Programme and project authority £m	Authority deficit £m
2019/20 to 2022/23	169	158	327	320	(7)
Change since last Investment programme report					
No change	12	(13)	(1)	No change	

Financial commentary

The EFC movement is due to other telecoms income and technology development spend transferred to business-as-usual operating expenditure, and overprogramming transferred with iBus2 to the Surface Transport portfolio, as part of the revised budget.

Authority and EFC shown are for 2019/20 to 2022/23, as per the Programmes and Investment Committee paper that was approved on 6 March 2021.

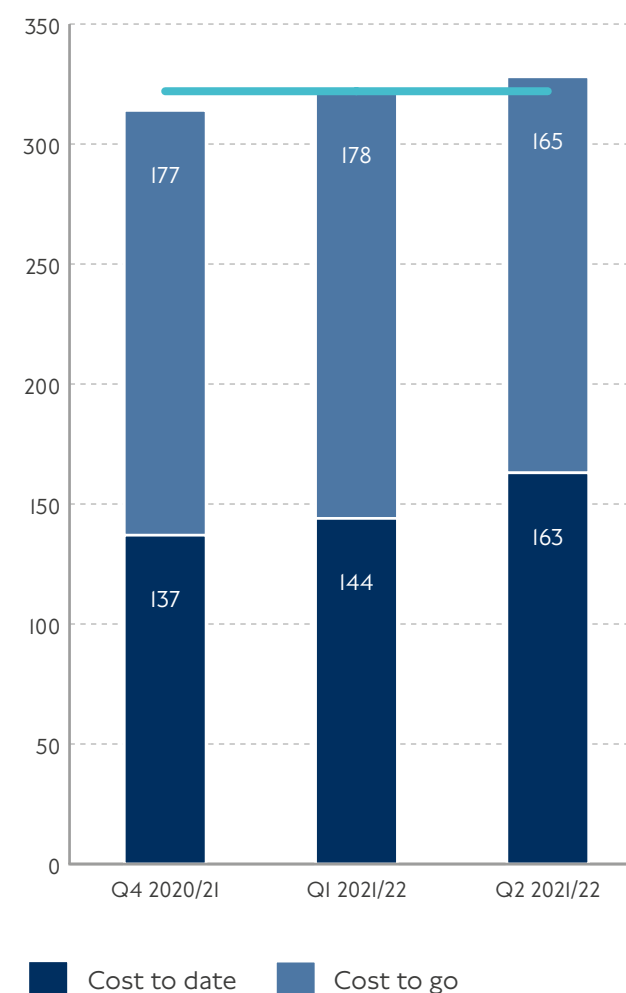
Values shown are for technology and data funded projects only and exclude the Emergency Services Network, the Public Cellular Network and Telecoms Commercialisation Projects.

Other telecoms spend is included from 2021/22 as it was included within the latest Programmes and Investment Committee approval. iBus2 spend is excluded from 2021/22 onwards, as it transferred to the Surface Transport part of the business from 1 April 2021.

Performance over time

Forecast spend for the three-year reporting period has increased above Programme and Project Authority, driven by transfers of other telecoms income to business as usual operating expenditure and Surface overprogramming transferred with iBus2 to the Surface Transport portfolio, as part of the revised budget. This will be regularised as part of our next submission to the Programmes and Investment Committee in March 2022.

Performance over time – estimated financial cost (£m)



Programme update

Payments

On 27 September, we introduced weekly capping on Oyster for rail customers. This involved complex negotiations with the Rail Delivery Group to gain acceptance on all rail services in London. The initial launch is for adult fare payers, with weekly caps for discounts and concessions expected to be introduced next summer.

This change provides the best price for both Oyster and contactless users over a seven-day period, improves best value calculations for Oyster customers in relation to daily cap, improves our ability to provide refunds, and automated refunds are able to be collected for six months.

Oyster and contactless charging outcomes are now more aligned as the same journey construction and forgiveness rules will be applied to both. This means that pay as you go is now more clearly the best value way to pay for travel.

Following the introduction, we will promote pay as you go weekly capping as an alternative to season tickets, helping to reduce demand for season tickets. This aligns with the increasing demand for flexible travel products.



We have introduced price capping for Oyster customers

Oyster journeys will also now be calculated in our back office using contactless logic, with any fare adjustment subsequently issued to the card reader if necessary. This is an important step towards upgrading the Oyster system, which is nearly 20 years old.

This also means we are also able to stop a number of analytics-run refund processes, by creating an automated credit to the customer's card.

Digital workplace

The consolidation of all legacy versions of Microsoft SharePoint sites onto SharePoint Online continues to progress ahead of schedule, with 1,087 of 1,225 sites now completed. This project provides a common, online data platform for all our SharePoint sites, giving improved accessibility, security and eliminating the cost and complexity of managing the obsolete infrastructure, and is planned to complete in March 2022.

Data centre rationalisation and Cloud migration

Work continues to refresh our hosting platforms, but we did not achieve any major milestone this quarter.

Networks

Start-up activities have completed successfully with our telecoms concessionaire BAI including the establishment of governance structures and the agreement of design and build processes with our engineering team. The initial designs have been delivered for approval. We supported the BAI

industry launch event, at which the Anne-Marie Trevelyan, International Trade Secretary, welcomed the launch of the new partnership, which aims to transform London into a smart city, boost connectivity and create 600 jobs. She was joined by Australian Minister Dan Tehan.

The Connect Programme continues to replace London Underground's operational radio base stations. We have now replaced 34 of 293 for this two-year project. This was running to plan, however, unfortunately there were delays to the work as the third-party technical engineers were unable to access the site owing to positive COVID-19 test results. It is now planned to update the core radio software by February 2022 to version 9.1, bringing the system in line with the current supportable version.

We continue to deliver infrastructure to support the Home Office's national Emergency Service Network communications system. In tunnels, we have pulled 418km (99 per cent) of the leaky feeder cable, with 391km fixed (93 per cent) and 363km tested from a total of 422km of tunnels. Fibre installation is unchanged at 411km (97 per cent). Much of the remaining work is dependent on removing existing legacy tunnel telephone assets to create space for our cables and we are now achieving a removal rate of two sections a week. We have completed 94 per cent (up two per cent) of the required station cabling works at the first 65 stations with the remaining stations that we had completed or partially completed, handed over to BAI. We have also installed more than 40 per cent of the required low-powered radios in the back of house areas of the 4G pilot stations, building on the existing front of house deployment.

Technical service operation

For the transition of IT infrastructure/ services the remaining resiliency improvements for business-critical services are progressing to plan for completion in this financial year. In the next quarter, we will also be initiating projects to replace on premise and cloud network infrastructure to protect our business-critical services. For the GLA head office move, there have been challenges with completing works by third party suppliers on providing network connectivity into the new building. These challenges are being overcome in collaboration between the GLA, the third parties and us, so that GLA's overall plan is supported.

The contract for the software asset management provider was awarded in September and the design of the service and implementation are now under way. We are also progressing an initiative to investigate how we optimise license usage

Enterprise resource planning

Our new people management solution, myJourney, for employee performance appraisals and succession management went live in early September for an early adopter group of around 3,000 employees. This proved a success and was followed up by the full roll-out to all our employees in early October. This supports the People Roadmap in our Vision and Values, promoting more frequent line manager and employee performance and development conversations in a digital mobile solution. This replaces the old paper forms.

The Procurement and Supply Chain improvement project supplier has been onboarded and work continues to implement the new SAP Ariba supply chain solution. Focus is on the delivery of the upstream sourcing and contract management capabilities first by Quarter 4 2021/22 as these govern and control purchasing, which is planned to be transformed by Quarter 3 2022/23.

We supported Business Services with the transition of our main NPL recruitment supplier from Hays to Reed. The new solution went live in October 2021 and will make significant savings in Business Services from better rates and has given our hiring managers a more user-friendly portal to review and approve timesheets.

Contact Centre operations

We continue to focus on maintaining the quality and efficiency of our Contact Centre services. Following our re-tender, transition and go live of our new consolidated Oyster customer support contracts in July, we have made increasing progress in carrying out the same activities for our Santander Cycles customer support. Following an evaluation of bids in October, the project will now focus on transitioning to the new contracts without disruption to the customer service being provided.

A milestone was also hit in our Concessions project, where the new Concessions Portal went live. Following challenges, several fixes have been prioritised.

Early market engagement on our future outsourcing framework was completed in November 2021. We remain ready and awaiting the appropriate technical resources to develop the automation of our customers' contactless payment card refund enquiries.

Replacing our main, legacy and business critical lost property system continues to make progress in line with forecast. Following supplier bids' evaluation being completed we have also gained appropriate governance signoff to award the contract and drafted a plan of the rollout of the tool including change management. Next steps will be taking these plans through a review and sign off cycle while joining up content with the supplier.

Data analytics

We have supported the 27 September launch of weekly capping on Oyster, updating our reporting tools that are used by our payment and finance teams for reporting and the allocation of revenue.

Digital tools

We continue to progress with the integration of account, journey history and payment card functionality in the TfL Go app. We are working towards a beta release to test the implementation with customers.

We now have an App Store rating of 4.7 and more than half a million customers have downloaded the app since launch. We have achieved a regular update cycle, releasing tangible app enhancements every two to four weeks. This includes real-time information to support the Northern Line Extension.

Growth Fund

Reporting period	Forecast £m
2020/21 to 2029/30	258
Change since last Investment programme report	
No change	No change

Programme update

As the Growth Fund schemes have developed, and costs and potential funding have become clearer, it has been possible to identify savings in required contributions.

The revised budget classifies all Growth Fund schemes as fully meeting the Mayoral objectives but are contingent on additional funding. This means that, although all projects have already secured a strong commitment and a significant degree of third-party funding, a further commitment by the Government or other third-party sources is needed to complete the funding packages.

We continue to identify additional funding streams, while supporting all Growth Fund projects with contractual obligations and other urgent milestones by providing case-making and programme-level support.

Challenges

The main challenges centre around continued funding uncertainty for Growth Fund projects, which are necessary to unlock new homes and jobs in areas of high need in London. Several projects with previously complete funding packages are currently at risk due to the programme being contingent on additional funding.

As a result, several projects have been delayed or paused in anticipation of funding certainty, while some critically urgent projects have tried to bid for and secure alternative funding contributions over the last couple of months.



Our Growth Fund schemes are contingent on extra funding

About TfL

Part of the Greater London Authority family led by Mayor of London Sadiq Khan, we are the integrated transport authority responsible for delivering the Mayor's aims for transport.

We have a key role in shaping what life is like in London, helping to realise the Mayor's vision for a 'City for All Londoners' and helping to create a safer, fairer, greener, healthier and more prosperous city. The Mayor's Transport Strategy sets a target for 80 per cent of all journeys to be made by walking, cycling or using public transport by 2041. To make this a reality, we prioritise sustainability, health and the quality of people's experience in everything we do.

We run most of London's public transport services, including the London Underground, London Buses, the DLR, London Overground, TfL Rail, London Trams, London River Services, London Dial-a-Ride, Victoria Coach Station, Santander Cycles and the Emirates Air Line. The quality and accessibility of these services is fundamental to Londoners' quality of life. By improving and expanding public transport and making more stations step

free, we can make people's lives easier and increase the appeal of sustainable travel over private car use.

We manage the city's red route strategic roads and, through collaboration with the London boroughs, we are helping to shape the character of all London's streets. These are the places where Londoners travel, work, shop and socialise. Making them places for people to walk, cycle and spend time will reduce car dependency, improve air quality, revitalise town centres, boost businesses and connect communities. As part of this, the Ultra Low Emission Zone scheme and more environmentally friendly bus fleets are helping to tackle London's toxic air.

During the coronavirus pandemic we have taken a huge range of measures to ensure the safety of the public. This includes enhanced cleaning using hospital-grade cleaning substances that kill viruses and bacteria on contact, alongside regular cleaning of touch points, such as poles and doors, and introducing more than 1,000 hand sanitiser points across the public transport network.

Working with London's boroughs we have also introduced Streetspace for London, a temporary infrastructure programme providing wider pavements and cycle lanes so people can walk and cycle safely and maintain social distancing.

At the same time, we are constructing many of London's most significant infrastructure projects, using transport to unlock much needed economic growth. We are working with partners on major projects like the extension of the Northern line to Battersea, Barking Riverside and the Bank station upgrade.

Working with Government, we are in the final phases of completing the Elizabeth line which, when open, will add 10 per cent to central London's rail capacity. Supporting the delivery of high-density, mixed-use developments that are planned around active and sustainable travel will ensure that London's growth is good growth. We also use our own land to provide thousands of new affordable homes and our own supply chain creates tens of thousands of jobs and apprenticeships across the country.

We are committed to being an employer that is fully representative of the community we serve, where everyone can realise their potential. Our aim is to be a fully inclusive employer, valuing and celebrating the diversity of our workforce to improve services for all Londoners.

We are constantly working to improve the city for everyone. This means using data and technology to make services intuitive and easy to use and doing all we can to make streets and transport services accessible to all. We reinvest every penny of our income to continually improve transport networks for the people who use them every day. None of this would be possible without the support of boroughs, communities and other partners who we work with to improve our services.

By working together, we can create a better city as London recovers from the pandemic and moves forward.

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