

LONDON ASSEMBLY

Derailed: Getting Crossrail back on track



Photo Credit: Hugh Llewelyn

Transport Committee
April 2019

Holding the Mayor to account and investigating issues that matter to Londoners

LONDONASSEMBLY

Transport Committee Members



The Transport Committee holds the Mayor and Transport for London to account for their work delivering the capital's transport network. The committee examines all aspects of the transport network and presses for improvements on behalf of Londoners.

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Caroline Pidgeon MBE AM

Chair of the Transport Committee



The new Elizabeth Line is expected to be a welcome new addition to the transport system in London, promising passengers faster and more pleasant journeys.

That promise is now under threat. The announcement last August that the project is delayed is yet another example of a large catalogue of failed infrastructure projects – projects that are over time and over budget.

In light of it all, it is frustrating that top Crossrail executives have not taken responsibility for their mismanagement of the project in its later stages. This despite the fact that they were taking home eye-watering salaries and bonuses to deliver the project.

It is also difficult to accept why the independent reviewer, Jacobs, was ignored. Jacobs was paid to advise Transport for London (TfL) and the Department for Transport (DfT), and help them scrutinise progress on the project. However, the risks of delay it raised were not sufficiently acted upon. Instead, the positive messaging from the Crossrail Executive was listened to.

The evidence we have seen makes it clear that some officers at Crossrail and TfL attempted to warn about the risks to opening on time. It is unacceptable that these risks were being downplayed by TfL Commissioner, Mike Brown. The Mayor and the TfL Board have to have confidence in the Commissioner and his Executive team if they are to successfully deliver transport projects in the capital.

Once open, the Elizabeth Line will transform east west travel in London, contribute to reducing congestion and journey times, increase capacity on the network and support the economy. However, for now there are significant lessons to be learned. Our report provides clear advice to the Mayor and TfL so that they make sure Crossrail and future infrastructure projects have the right skills, the openness and transparency, and the appropriate systems of governance and accountability, to avoid going off track.

Summary

Crossrail is a major programme to provide new rail services for London and the south east, running from Reading and Heathrow in the west, through 42km of new tunnels under central London, to Shenfield and Abbey Wood in the east. Once open, Crossrail will be known as the Elizabeth Line.

It was announced in August 2018 that the central section of the line would be delayed and would not open in December 2018 as originally planned. This announcement came after another announcement in July 2018 of Crossrail requiring more funding to complete the project. The effect of these delays and increased costs will not only be felt by passengers and businesses, but by the city's overall economy.

Since the announcement of the delay, the London Assembly has been at the forefront of public scrutiny on Crossrail. The Assembly's Transport Committee has conducted an in-depth examination of the circumstances behind the programme's failure and implications of its delay and cost increase. We have dedicated five public meetings to the investigation, and summonsed a large number of documents from the Mayor's Office, Transport for London and Crossrail. This report brings together an extensive body of evidence, and makes strong recommendations to ensure future projects as large, complex and meaningful as Crossrail do not go off track.

Recommendations

Governance and risk

Recommendation 1 – The governance model

Sponsors should ensure governance systems are robust and remain fit-for-purpose throughout the lifetime of a project. Governance systems must involve key players from the start, and embed adequate financial and accountability processes to protect the public purse right from the outset. Reviews of governance systems should take place periodically, in particular when there is a clear shift in the nature of the project (e.g. from construction to fit-out, to operation).

Recommendation 2 – Skills profile in the project

Sponsors should ensure Crossrail has the right skillset now for successful programme completion. For future projects, Sponsors should review the skills needed throughout the lifetime of the project, to ensure the right technical capacity is present at each stage.

Recommendation 3 – The role of independent reviewers

The role of independent reviewers on Crossrail and other infrastructure projects needs to be clearly and fully built into the governance structure. Sponsors should strengthen the role of independent reviewers by clearly outlining from the outset the actions to be taken in response to their recommendations. This will not only provide assurance of deliverability, but will also protect the public purse.

Leadership and corporate culture

Recommendation 4 – Corporate culture

Crossrail and future infrastructure projects should have a system of governance and accountability that encourages a culture of transparency and openness, and offers mechanisms for these to be sustained at all levels of the organisation. This culture should balance optimism, to keep the project and staff motivated, against reliable communication of risk, productivity and project performance.

Recommendation 5 – Role of Sponsors

Sponsors need to keep an overly optimistic corporate culture in check by bolstering the role of independent reviewers, and encouraging consistent and strong scrutiny, informed by independent advice.

Recommendation 6 – Chief Executive remuneration

The remuneration packages for chief executives in large infrastructure projects should be benchmarked against those for other projects. Additionally, the process for setting and assessing performance bonuses should be revisited periodically, to ensure the remuneration of programme chief executives adequately reflects progress towards the successful delivery of a publicly-funded project.

Transparency and communication of risk

Recommendation 7 – Access to board meetings

Decision-making on major projects should occur in formal meetings. These meetings should be comprehensively minuted and recorded. Further, barring commercially-sensitive business, these meetings (e.g. Crossrail Board and Sponsor Board) should be public, in particular given that funding is coming from the public purse.

Recommendation 8 – The Mayor as Chair of TfL

The Mayor and TfL Board must strengthen control over TfL, and implement the necessary processes to allow them to remain fully informed and on top of progress on the projects they are ultimately accountable for.

Recommendation 9 – The Commissioner's role

Given the strong evidence presented in this report, we recommend that the Commissioner reflects on whether he is fit to fulfill his role in TfL.

Project design

Recommendation 10 – Complex infrastructure

Future infrastructure projects should strive to keep designs simple, incorporating standard rather than bespoke features, in order to reduce risks to budget and timelines, and protect the public purse against overspend.

Recommendation 11 – Complementary works

Future infrastructure projects should make plans to deliver complementary works—including step-free access—at the outset.

1. Background

Key facts

- Crossrail is a major programme to provide new rail services for London and the south east, running from Reading and Heathrow in the west, through central London, to Shenfield and Abbey Wood in the east. Once open, Crossrail will be known as the Elizabeth Line.
- The project has faced financial challenges. Prior to 2010, it had a budget of £15.9 billion, but this was reduced by £1.1 billion in the Government's 2010 Spending Review. On 24 July 2018 it was announced that the budget was being increased by £590 million, to £15.4 billion. This included funding for Crossrail Limited and Network Rail.
- On 10 December 2018, it was announced that there would be a new increase in Crossrail's budget, of up to £2.15 billion, in response to increasing costs. This included funding for Crossrail Limited only. This has brought the total funding envelope to £17.6 billion. This funding envelope does not include the cost of trains and depots, amounting to £1.1 billion.
- Crossrail has also faced major delays. On 31 August 2018, Crossrail announced its central section would not open until Autumn 2019, when the opening was originally planned for December 2018.
- In early 2019, Crossrail admitted it could not commit to an opening date and more work needed to be done to understand what was left on the project.
- Crossrail Limited is expected to announce a revised schedule and estimate of the programme's cost in late April 2019.

What is Crossrail?

- 1.1 Crossrail is a complex programme to provide new rail services for London and the south east, running from Reading and Heathrow in the west, through 42km of new tunnels under central London, to Shenfield and Abbey Wood in the east. When complete, the railway will be around 118km long and will become part of Transport for London's (TfL) rail and underground network. Once open, Crossrail will be known as the Elizabeth Line.¹
- 1.2 New trains will carry an estimated 200 million passengers a year. The new service will reduce journey times, increase the capital's rail capacity by ten per cent and bring an extra 1.5 million people to within 45 minutes of central London.²
- 1.3 The project will also increase accessibility to transport, through the creation of ten new stations with step-free access, and improvement works of 31 stations along the east and west sections.³
- 1.4 Crossrail is also expected to boost the economy by an estimated £42 billion. Crossrail's business case update in 2011 estimated that Crossrail would create up to 14,000 construction jobs and 1,000 jobs for the operation and maintenance of the line.⁴
- 1.5 The Department for Transport (DfT) and TfL are joint sponsors and funders of Crossrail. Crossrail Limited—a wholly owned subsidiary of TfL—is responsible for delivering the scheme. This includes everything from building the line and stations, to integrating the signalling systems and providing an operational railway. Once opened, the service will be run by the operator MTR Crossrail, whose contract is managed by TfL.

Figure 1: Crossrail route map



What are the issues?

- 1.6 On 24 July 2018 it was announced that the budget was being increased by £590 million, to £15.4 billion. This included funding for Crossrail Limited and Network Rail. It was announced on 10 December 2018 that there would be a new increase in Crossrail's budget, of up to £2.15 billion. This included funding for Crossrail Limited only, and no additional funding for Network Rail works.⁵
- 1.7 This new funding has brought the total envelope to £17.6 billion. This new funding package does not include trains and depots, procured at a cost of £1.1 billion.⁶
- 1.8 TfL's latest business plan states that revenues are forecast to be £600 million lower than expected as a result of the delays.⁷ The current cost of Crossrail is £30 million per week in contractor and supply chain resources.⁸
- 1.9 On 31 August 2018, Crossrail announced its central section would not open until Autumn 2019. Crossrail had originally planned for the central section of the railway to open in December 2018, while the full east-west service was to open in December 2019. In early 2019, however, Crossrail admitted it could not commit to an opening date and more work needed to be done to understand what was left on the project.⁹

How much will it cost?

- 1.10 The current estimated cost of the project is £18.7 billion. Table 1 outlines the changes in funding available since the start of the project.
- 1.11 Prior to 2010, the project had a budget of £15.9 billion, but this was reduced by £1.1 billion in the Government's 2010 Spending Review.¹⁰

Where will it run?

It will run from Reading and Heathrow (west), through central London, to Sheffield and Abbey Wood (east).

What are the benefits?

The new railway will help to reduce congestion and journey times, increase passenger capacity and support the economy.

Who is funding it?

Department for Transport (DfT), Transport for London (TfL), London residents and businesses.

Who is delivering it?

Crossrail Ltd, a wholly-owned subsidiary of TfL.

What funding is available?

The current funding package is of £17.6bn. This is £2.8bn more than the funding package agreed in the 2010 Spending Review, of £14.8bn.

What is the cost?

TfL estimates the cost in revenue losses will be £600 million. The operational cost is £30 million per week.

When will it open?

The central tunnel section was meant to open in December 2018. Crossrail has yet to announce a new delivery schedule for the central section.

1.12 The total budget for Crossrail following the review was £14.8 billion, with funding provided by central government, TfL, London residents and businesses. Crossrail’s rolling stock has been procured separately from Bombardier by TfL at a cost of around £1.1 billion. No additional funding is needed to cover trains and depots as these were arranged for a fixed price.¹¹

1.13 Although more funding was committed to the project in 2018, Chief Executive of Crossrail, Mark Wild, has suggested that the funding required to complete the scheme is still under review,¹² and highlighted cost increases:

“Our weekly cost spend has reduced, however, the Earliest Opening Programme will need to be examined for cost and commercial impact. As you would expect the staff associated costs previously budgeted has increased significantly as the project is re-resourced and strengthened.”
 Mark Wild, Crossrail Chief Executive, 4 April 2019

1.14 Crossrail Limited is expected to announce a revised estimate of the programme’s cost in late April.

Table 1: Crossrail's funding explained

Date	Funding	Details
Initial funding agreed	£15.9 billion	Funding to cover all infrastructure elements of the project, including Network Rail improvements to the existing network.
Funding following 2010 Spending Review	£14.8 billion	Sponsors reduced funding by £1.1 billion due to savings and revised cost estimates.
Additional funding committed in July 2018	£590 million Total: £15.4 billion	Additional funding to reflect cost pressures: £300 million for Crossrail Limited, with DfT and TfL contributing £150 million each; £290 million provided by DfT for Network Rail works.
Additional funding committed in December 2018	£2.15 billion Total: £17.6 billion	Additional funding for Crossrail Limited following delays and cost increase: £1.3 billion loan from DfT to GLA; £750 million contingency DfT loan facility; £100 million GLA cash contribution.
Other funding required/project costs	£1.1 billion	Procurement cost of trains and depots.
Total project cost (as of April 2019)	£18.7 billion	This includes all additional funding committed to the project since the 2010 Spending Review.

When will it open?

- 1.15 DfT and TfL decided to open the railway in sections, in order to reduce risks associated with opening the entire line at once. Table 2 shows the planned versus forecast delivery of each section of Crossrail, based on analysis from the National Audit Office (NAO).¹³
- 1.16 At the TfL Board on 27 March 2019, Chief Executive Mark Wild confirmed he would be able to announce a plan for the central opening at the end of April 2019. Crossrail Chairman, Tony Meggs, stressed that Crossrail would offer a window rather than a specific date for opening.¹⁴ This window is expected to close with time as Crossrail gets more data on progress to achieve project completion.

Table 2: Staged opening and current status

Stage	Description	Target Date	Forecast Delivery
1	Liverpool Street (main line) to Shenfield	May 2017	Delivered in June 2017
2	Heathrow to Paddington (main line)	May 2018	Stage 2 opening partially achieved in May 2018. There are plans to introduce some Crossrail services between the existing Paddington station and Reading from December 2019
3	Paddington (Crossrail) to Abbey Wood	December 2018	Unknown
4	Paddington (Crossrail) to Shenfield	May 2019	Unknown – Dependent on Stage 3
5	Full east-west service	December 2019	Unknown – Dependent on Stage 3

What has the impact of the delay been?

- 1.17 The knock-on effects of this delay are being felt by many businesses in London and passengers of other transport services. Property values along the Elizabeth Line route have increased, with one estimate that house prices have increased by 3.3 per cent above the underlying growth rate.¹⁵
- 1.18 Many businesses have also contributed directly to the cost of the Elizabeth Line, by paying the Crossrail Business Rate Supplement (BRS). Originally the contributions of the levy to Crossrail were meant to end in 2033-34, but the Mayor has agreed to extend these contributions until 2036-37, to support the Greater London Authority (GLA)'s additional funding commitment to Crossrail.¹⁶
- 1.19 The Elizabeth Line will interchange with other National Rail services and the London Underground at numerous points along the route. The absence of the Elizabeth Line is therefore likely to exacerbate existing pressures on the capacity of other services, such as the Central Line, which Crossrail was meant to relieve.
- 1.20 If it is approved, Crossrail 2 will also be affected by the delays as increased funding is required to complete Crossrail. Crossrail 2 is a proposed new railway line linking south-west and north-east London. The Mayor and TfL have developed plans for the line, with anticipated costs of around £30 billion.¹⁷ However, part of the funds from Crossrail 2, including those collected from the BRS, will be diverted to cover the increased cost of completing Crossrail. Details have yet to be provided on the total amount of funds that will be passed over onto Crossrail.¹⁸

Case Study: The real impact of the delays

"We bought a house in Abbey Wood in 2017 in anticipation of the soon-to-arrive Crossrail. I work in Euston full time so the journey time was very long at approximately 1hr 20mins door-to-desk each way...The supposed arrival of Crossrail made it bearable as it would cut the journey time by around 50 mins, especially as I became pregnant and found the journey absolutely exhausting.

Almost two years later and with the arrival of a child, my maternity leave is almost complete. I now have to try and navigate getting back to work with finding childcare that opens early enough and closes late enough for me to be able to drop my child off and still make it to work and back on time. This is highly stressful, not to mention expensive. It puts me in a position that makes it very difficult to be able to perform my job well and be a good mother. This is not a choice I should have to make!"

Submission from Resident of Abbey Wood, received on 3 April 2019

2. Governance and assessment of risk

Key findings

- The governance structure set up for Crossrail was innovative and allowed for various successes in the initial phases of the project. However, it was not fit-for-purpose to deliver such a complex infrastructure project, especially in its more mature stages.
- The Crossrail executive did not have the skills required at the later stages of the programme to adequately assess and understand risk as the project moved from construction to operations.
- The independent reviewer (Jacobs) reported significant risks to the December 2018 opening as early as January 2018. However, Sponsors did not sufficiently act upon these reports of risk. Instead, they accepted Crossrail's assurances that no threat existed to the planned opening of the central section.

- 2.1 Crossrail Limited is a company wholly-owned by TfL, in charge of managing and delivering the Crossrail programme. The company was set up to operate at arm's-length from government. This arrangement was intended to give autonomy to the project delivery team, protect Crossrail from political interference from the Sponsors, and allow the company to attract “the best and the brightest” from around the world. It was a promising governance model that aimed to do away with many of the shortcomings of entirely public service-run projects.¹⁹
- 2.2 In this governance model, Crossrail's main governing body is an independent Board. The Sponsors have oversight of the programme through non-executive members appointed to Crossrail's Board, and through Sponsor Board meetings where they discuss progress with the Crossrail executive. Other partners, such as Network Rail, have been until recently absent in the interface between the Sponsors and Crossrail, despite being key partners in the delivery of the line.²⁰
- 2.3 In 2009, the Sponsors contracted an independent auditor, known as the Project Representative team, Jacobs.²¹ The Project Representative team is made up of engineers and project management specialists, who are embedded in Crossrail Limited. Their role is to provide advice and regular reporting on the programme to Sponsors, with the aim of helping them to scrutinise Crossrail. The team's reporting is based on detailed reviews and analysis of Crossrail data.²²
- 2.4 With the advent of the delays, the adequacy of this governance model has been called into question. The autonomy given to Crossrail encouraged an over-reliance on the Crossrail executive's accounts of progress. Both Sponsors have referred to the fact that Crossrail had executive responsibility for delivering the programme to explain why they did not strongly challenge Crossrail's assurances that December 2018 was a deliverable date.²³ The Sponsors have also stated that the light-touch approach made it difficult for them to fully understand the programme and its risks. In turn, this prevented them from thoroughly scrutinising the Crossrail executive. The increase in the cost of the programme made this scrutiny role not only advisable but expected, if the Sponsors were to adequately hold Crossrail financially accountable and protect the public purse.

“There is a genuine question about whether the governance arrangements that have been put in place for this project are right and, if I was setting something up of this nature again, I am not sure I would choose the arrangements that we have.”

Heidi Alexander, Deputy Mayor for Transport, 9 January 2019

- 2.5 As we now know, the risk of relying too strongly on Crossrail was compounded by the fact that there were insufficient people at the later stages of the programme with the appropriate skills and experience with systems integration. While the skills profile of the team was appropriate for the initial stages—when Crossrail was essentially a large construction project—it was not

specialised enough to deliver on the more complex elements of the later stages of the programme.²⁴ This was reflected in the executive's failure to properly assess the cumulative effect of individual risks, which included major delays on station completion and testing of signalling systems.

"The management team did not understand the risk profile they were carrying and no matter who you are, if you are non-Executive attending a meeting one or two days a month or five times a month, you are relying on the Executive being competent to do it. I am not saying they are incompetent; I am just saying they clearly did not understand the massive risk that they had ratcheted up."

Mark Wild, Crossrail Chief Executive, 9 January 2019

- 2.6 In addition, the governance model did not give a prominent role to the independent reviewer. Although in theory Jacobs was contracted to help the Sponsors scrutinise Crossrail, in practice their advice was largely missed or ignored. Table 3 shows excerpts from Jacobs reports that flag serious risks to the December 2018 opening, as early as January 2018. As the table highlights, these risks were not reflected in communications to any of the major governance bodies and stakeholders. In fact, an opposite, and as we now know inaccurate, representation of risk was communicated. The question remains of the role the Project Representative was there to play, and why the Sponsors did not rely more strongly on their advice to steer how they managed Crossrail.

Table 3: Assessment of risk

When?	What did Jacobs Reports say? ²⁵	What did the Crossrail Board Minutes say? ²⁶	What did the Sponsor Board Minutes say? ²⁷	What did the TfL Board Minutes say? ²⁸	What did the weekly briefing to the Mayor say? ²⁹
January	" significant risk to formal Handover in July 2018 and possibly Stage 3 Opening in December 2018 " [10 January 2018]	"Overall the programme is now at 90.1% complete with progress slightly ahead of plan in period" [1 February 2018]	DfT asks "when sponsors should start to consider contingency options." [26 January 2018]	"There are some increasing cost and schedule pressures on the project that Crossrail Ltd will continue to manage. The overall programme for December 2018 remains on track. " [30 January 2018]	N/A - weekly briefings only started in February
March	"[The schedule] is ambitious, contains virtually no float, and relies upon right-first-time delivery at productivity rates that have not been sustained in the past. There is therefore a high risk that the start dates for Stage 3 Opening, Trial Running and Trial Operations will not be achieved. " [1 March 2018]	"Progress of 0.8% was achieved in the period against the plan of 0.8% reflecting good progress against nearly all contracts" [29 March 2018]	"DfT notes the starkness of [Jacobs'] assessment" "Crossrail Limited need to be clear on the criteria, timing and checkpoints for establishing the deliverability of Stage 3. This is important to ensure effective planning can occur in the event that the schedule becomes unachievable." [22 March 2018]	"Crossrail Ltd is continuing to actively manage the increased cost and schedule pressures and has developed a revised delivery schedule that sets out the programme to achieve opening of the Elizabeth Line in December 2018." [20 March 2018]	Stage 3 is "on target" " Further improvement is still required to meet the milestones that delivers the Elizabeth line on 9 December 2018." [26 March 2018]

When?	What did Jacobs Reports say?	What did the Crossrail Board Minutes say?	What did the Sponsor Board Minutes say?	What did the TfL Board Minutes say?	What did the weekly briefing to the Mayor say?
April	<p>"There is very little schedule float available and a high risk remains that that Stage 3 Opening will not be achieved"</p> <p>[26 April 2018]</p>	<p>"Schedule pressures continue to be felt across most contracts...Although many of these missed milestones did not affect the Master Operating Handover Schedule..., they still need to be addressed"</p> <p>[24 May 2018]</p>	<p>Simon Wright said that "Crossrail was absolutely focused on opening in December which was still achievable if everyone 'pulled their weight'"</p> <p>[18 May 2018]</p>	<p>"Crossrail Ltd...is resolutely focused on achieving the opening of the Elizabeth Line in December this year and completion of the full service in December 2019"</p> <p>[23 May 2018]</p>	<p>"A revised plan is under development...prior to commencement of Elizabeth Line services in December 2018"</p> <p>[21 May 2018]</p>
June	<p>"The time available to achieve Stage 3 Opening is reducing. There remains a high risk that Stage 3 Opening may be delayed or the opening will be sub-optimal"</p> <p>[21 June 2018]</p>	<p>"Schedule pressures continued to generate very considerable concern about the amount of time available for handover and testing"</p> <p>"It is becoming clear that as works were not physically completed on time, there is an accumulation of pressure"</p> <p>[19 July 2018]</p>	<p>"Sponsors noted the increasing schedule risks and agreed that they would discuss the need for alternative or contingency options"</p> <p>"Sponsors may wish to consider the possibility of delaying Stage 3 to ensure a reliable service in the context of learning lessons from the timetable challenges"</p> <p>[25 June 2018]</p>	<p>N/A - no meeting until July</p>	<p>"The combined results of these reviews...will be considered in July and an overall assessment of readiness for a December launch will be taken"</p> <p>[4 July 2018]</p>

Lessons learned

- 2.7 Crossrail's governance model has positive elements (e.g. the protection against political interference) that should not be lost. However, to withstand the complexity of the project, the governance model needs to adapt to become more fit-for-purpose. As already pointed out by the NAO in 2014,³⁰ the requirements of projects vary as they mature. With Crossrail, the maturity of the project was accompanied by an increase in risk that would have benefited from a more hands-on approach from Sponsors.

Recommendation 1 – The governance model

Sponsors should ensure governance systems are robust and remain fit-for-purpose throughout the lifetime of a project. Governance systems must involve key players from the start, and embed adequate financial and accountability processes to protect the public purse right from the outset. Reviews of governance systems should take place periodically, in particular when there is a clear shift in the nature of the project (e.g. from construction to fit-out, to operation).

- 2.8 Management teams for large, complex and high-risk infrastructure projects should not remain static. As Crossrail's experience has shown, project requirements change as programmes evolve. Management teams need to be ready to respond to these changing requirements. Ensuring this is the case may involve reviewing the skills profile of the team and making new appointments to support the adequate management and delivery of the project.

Recommendation 2 – Skills profile in the project

Sponsors should ensure Crossrail has the right skillset now for successful programme completion. For future projects, Sponsors should review the skills needed throughout the lifetime of the project, to ensure the right technical capacity is present at each stage.

- 2.9 The role of the independent reviewer is of utmost importance, especially in governance structures where the Sponsors have a hands-off approach. In Crossrail, the Project Representative fulfilled its role of providing advice and reporting on risks. However, it seems that the governance structure encouraged dynamics that led the Sponsors to prioritise Crossrail's view of risk over Jacobs'.

Recommendation 3 – The role of independent reviewers

The role of independent reviewers on Crossrail and other infrastructure projects needs to be clearly and fully built into the governance structure. Sponsors should strengthen the role of independent reviewers by clearly outlining from the outset the actions to be taken in response to their recommendations. This will not only provide assurance of deliverability, but will also protect the public purse.

3. Leadership and corporate culture

Key findings

- Crossrail leadership fostered an overly optimistic culture, where risks were largely overlooked instead of escalated, properly communicated, and addressed.
- Regardless of how the project was progressing, the importance of achieving the completion date overpowered any professional skepticism or critical assessment of risk.
- Former Crossrail executives have not accepted any responsibility for the inadequate management of the project in its later stages, and the impact this has had on the opening delay and increase in project costs.

- 3.1 In addition to criticisms of the governance system, stakeholders have also raised concerns about a corporate culture that has suffered from optimism bias. In other words, the executive team seems to have been so committed to the December 2018 deadline that they thought the unachievable was achievable despite the existence of clear red flags. We experienced this optimistic outlook first-hand. In June, during our visit to the Tottenham Court Road site, the then Chair of Crossrail, Sir Terry Morgan, confirmed that December 2018 was still achievable. This was supported by former Crossrail executive Simon Wright³¹:

“When you are in this situation you fight extraordinarily hard to maintain the schedule because everybody knows how important it is. Therefore, we were looking at all sorts of options through the early part of the year into May. In June we started to feel that we had a significant schedule challenge...Of course, with a programme – and I have been working in programmes all my life, for 40-plus years – you fight tooth and nail to retain your schedule right to the very last moment and look at all sorts of options and mitigations.”

Simon Wright, Former Crossrail Chief Executive, 6 September 2018

- 3.2 By fostering this overly optimistic culture, the Crossrail executive failed to encourage sufficient professional skepticism and the escalation of potential risks. As Table 3 shows, the Project Representative had been communicating serious risk to the opening date since early 2018. However, there was no recognition of the threats to the programme until August, four months before the planned opening date, despite the fact that 1) several crucial elements of the programme started falling behind schedule in 2016; and 2) the cost of delivering Crossrail had substantially increased.
- 3.3 Sponsors also failed to keep this culture in check by insufficiently scrutinising and challenging the Crossrail executive. The Commissioner of TfL told us that having a fighter mentality was characteristic of project managers of large infrastructure programmes:

“The way that...senior project directors and project programme managers are wired or their DNA, if you like, is about surmounting insurmountable problems.”

Mike Brown, Commissioner of TfL, 21 December 2018

- 3.4 Likewise, former Crossrail chief executives Andrew Wolstenholme and Simon Wright justified an optimistic business culture by suggesting it was needed to keep the workforce motivated.³² They defended this position despite the opening delay.
- 3.5 Crossrail executives have not recognised the negative impact undue optimism has had on the programme. This sheds light on a wider problem of Crossrail senior leadership not holding itself accountable for the delay, despite the steep remuneration packages they received to deliver the project on time.

- 3.6 The remuneration package for Crossrail executives included annual performance bonuses, which varied according to the position. As Chief Executive, Andrew Wolstenholme was entitled to 60 per cent of his base salary.³³ Simon Wright was entitled to 40 per cent of his base salary as Programme Director,³⁴ and 50 per cent in his dual role as chief executive and Programme Director³⁵ (after Andrew Wolstenholme's departure). As Finance Director, Matthew Duncan was entitled to 40 per cent of his base salary in performance bonuses.³⁶
- 3.7 Tables 4 and 5 show the performance bonuses received by Crossrail executives for their performance in 2015-16 and 2016-17. For 2017-18, the following bonuses were approved by Crossrail's Remuneration Committee: £102,976 for Andrew Wolstenholme, £54,055 for Simon Wright, and £38,924 for Matthew Duncan.³⁷
- 3.8 Additionally, Crossrail executives were eligible to participate in the company's Long Term Incentive Plan (LTIP). Unlike the annual performance bonuses, which are based on achievement of performance related objectives, the LTIP is focused on the retention of top talent and successful progress through key programme milestones. The LTIP is also meant to encourage the achievement of Crossrail's funding and financial targets, as well as the safe delivery of the project. The key milestones for 2018-19, as agreed by TfL and Crossrail in 2013, were the openings of Stages 2, 3, 4 and 5 of the line.³⁸
- 3.9 As a result of the delays, Crossrail's Remuneration Committee denied Andrew Wolstenholme, Simon Wright and Matthew Duncan access to their respective LTIP pots in 2018. The minutes note that this decision was based on the failure of these employees to meet their LTIP targets. The minutes also state that Crossrail executives "reluctantly accepted" non-payment of their retention bonuses.³⁹ In fact, Andrew Wolstenholme wrote a letter to the Remuneration Committee requesting a review of their decision not to release his LTIP payment.⁴⁰ This attitude is symptomatic of a culture that, while encouraging unchecked optimism, has also encouraged a denial of responsibility.

Table 4: Crossrail senior remuneration (2016-17, in £000)⁴¹

Employee	Salary	Performance related pay for 2015-16	Compensation for loss of employment	Benefits in kind	Total Remuneration (excluding pension contributions)
Sir Terry Morgan, Non-Executive Chairman	250	-	-	2	252
Andrew Wolstenholme, Chief Executive	463	481	-	2	946
Simon Wright, Programme Director	323	169	-	2	494
Matthew Duncan, Finance Director	242	27	-	2	270

Table 5: Crossrail senior remuneration (2017-18, in £000)⁴²

Employee	Salary	Performance related pay for 2016-17	Compensation for loss of employment	Benefits in kind	Total Remuneration (excluding pension contributions)
Sir Terry Morgan, Non-Executive Chairman	250	-	-	2	252
Andrew Wolstenholme, Chief Executive	477	160	98	2	736
Simon Wright, Programme Director	329	106	-	2	436
Matthew Duncan, Finance Director	247	112	-	2	361

Lessons learned

- 3.10 Unchecked optimism has been a problem within TfL in the past. A 2016 Budget and Performance Committee report on the now five-years-delayed Sub-Surface Upgrade Programme (SSUP) stated that TfL’s management was “only interested in presenting good news”.⁴³ The programme was meant to be completed in 2018. However, it is now expected to open in 2023. As the report notes:

“Regardless of how the project was progressing, the importance of achieving the 2018 completion date appeared to overpower any professional skepticism or suggestion that things were not going to plan.”

Transport for London’s Signal Failure, Budget and Performance Committee Report, March 2016

- 3.11 The findings from the SSUP on project management and corporate culture could be seamlessly applied to Crossrail. While it is understandable that project managers have a strong commitment to delivering programmes to timelines, it is important that Sponsors do not have the same type of tunnel vision. The fact that TfL has experienced this undue optimism—or as described in the 2016 SSUP report, “good news culture”—should provide a strong lesson for ensuring that checks and balances systems are in place in Crossrail and future projects.
- 3.12 Infrastructure projects need a culture that balances optimism to keep project and staff motivated against reliable communication of risk, productivity and project performance.

Recommendation 4 – Corporate culture

Crossrail and future infrastructure projects should have a system of governance and accountability that encourages a culture of transparency and openness, and offers mechanisms for these to be sustained at all levels of the organisation. This culture should balance optimism, to keep project and staff motivated, against reliable communication of risk, productivity and project performance.

Recommendation 5 – Role of sponsors

Sponsors need to keep an overly optimistic corporate culture in check by bolstering the role of independent reviewers, and encouraging consistent and strong scrutiny, informed by independent advice.

- 3.13 Remuneration of programme executives should be commensurate with the demands of the job and the level of risk and responsibility to deliver. In its latest report on Crossrail, the Public Accounts Committee stated that some of Crossrail’s executives are paid much more than senior executives in similar DfT’s arm’s-length bodies delivering programmes of equal weight. Steep remuneration packages are helpful to attract “the best and the brightest” in a highly competitive environment. However, in achieving this objective, programme stakeholders must not lose sight of the fact that remunerations are being paid with the public purse and must be assessed against delivery.
- 3.14 Robust leadership is characterised by critical reflection and assumptions of responsibility when things have not gone according to plan, or when they could have been done better. Former and current Crossrail executives have explained the delays as a “systems issue”. While it is true that there are significant shortcomings with the structural and cultural set-up of Crossrail, this should not prevent individual accountability, especially when the delays resulted in accrued costs for the taxpayer.

Recommendation 6 – Chief Executive remuneration

The remuneration packages for chief executives in large infrastructure projects should be benchmarked against those for other projects. Additionally, the process for setting and assessing performance bonuses should be revisited periodically, to ensure the remuneration of programme chief executives adequately reflects progress towards the successful delivery of a publicly-funded project.

4. Transparency and Communication of Risk

Key findings

- There were multiple communication channels between Crossrail Limited and key stakeholders. These channels were both in the private and public domains, they were written and oral, and formal and informal. The absence of sufficiently detailed record of these communications prevents adequate scrutiny and attribution of responsibility.
- Evidence from emails between Crossrail Limited and TfL suggests that communications to the Mayor were being managed by the TfL Commissioner, Mike Brown. Instead of communicating risks head on, these were downplayed in the weekly updates to the Mayor.
- Crossrail documents strongly suggest that Sponsors started collaborating on the communications strategy for the delay in mid-August. This, in addition to the known financial challenges, makes it difficult to understand how the Mayor claims he was not aware of the imminent risk of delay.

- 4.1 The seemingly sudden news of the delay to the December 2018 opening has called into question a) how risk is communicated within the organisation and to immediate stakeholders; and b) how risk and progress are communicated to the public.
- 4.2 There seem to be various channels for communicating and recording updates on progress and flagging risks. These channels include:
- a) Crossrail Board meetings
 - b) Sponsor Board meetings
 - c) TfL's Elizabeth Line Readiness Board meetings
 - d) TfL Board meetings (updates from Crossrail leadership)
 - e) Verbal briefings to the Mayor
 - f) Weekly written briefings to the Mayor
- 4.3 This abundance of opportunities for communication has not fully translated into transparency or clarity on the events leading to the announcement of the delay. For instance, Crossrail Board minutes fail to give a detailed account of the issues discussed and the decisions made. The minutes note that executives tend to provide Board Members with an informal briefing prior to a formal Board meeting. These informal sessions are not minuted and there is no explanation given publicly for why these discussions need to be held informally.
- 4.4 Concerns about the transparency of Crossrail have been raised by the London Assembly, with the 2016 GLA Oversight Committee report⁴⁴ on transparency stating:

"Despite being a wholly-owned subsidiary of TfL, Crossrail publishes far less information than its parent organisation. While the Crossrail website does include lists of contracts worth more than £5,000, it does not publish any of these contracts in full. It also does not publish papers from its Board meetings, which are held in private."

Transparency of the GLA Group and Family, GLA Oversight Committee Report, February 2016

- 4.5 TfL provided a lukewarm response to the report, saying they were working with Crossrail and Crossrail 2 "on further steps to ensure a consistent approach to transparency." However, papers from their meetings did not become public until after the announcement of the delay. In September 2018, the Deputy Mayor for Transport and Crossrail committed to publishing past and future board papers and minutes, with some redaction.⁴⁵
- 4.6 The Committee has also expressed concern at TfL's lack of transparency in its oversight of Crossrail. Discussions on the progress of the scheme at TfL Board meetings have tended to be short and vague, with little meaningful

information in covering papers. The Board has tended to go into private sessions to discuss the scheme, a practice which continued even after the delay announcement.

- 4.7 For instance, it is now clear that one of the key points at which the Crossrail scheme entered serious difficulty was the electrical explosion that occurred at Pudding Mill Lane in late 2017. The former Chair of Crossrail, Sir Terry Morgan, reported this to the TfL Board in public in January 2018, but the public discussion was curtailed and resumed only in private session. The minutes of that Board meeting make only a vague reference to this information, noting “issues with the energisation of the tunnel.”⁴⁶ As a response to the public request by the Chair of the Transport Committee, TfL Board has now started placing Crossrail as one of the first agenda items. It is in fact through TfL Board meetings and London Assembly Transport Committee meetings that Crossrail has been given a public hearing.
- 4.8 Clarity on what was communicated to the Mayor during verbal briefings is also missing. The conflicting accounts on what was flagged by Crossrail during the 26 July 2018 briefing to the Mayor provide a prime example. While the Mayor asserts that Crossrail remained committed to the December 2018 opening, former Crossrail chair Sir Terry Morgan has stressed to us that he communicated to the Mayor that the December 2018 deadline would not be met.
- 4.9 Information obtained under a Freedom of Information (FOI) request revealed that the communications team at Crossrail started planning for the announcement of the delay in mid-August. The Crossrail communications team prepared press release drafts that were shared with and amended by the TfL communications team earlier than the date of the delay announcement. In response to this, TfL has suggested their communications team was merely “prudent scenario planning” in case the delay materialised.⁴⁷ They have also suggested top leadership at TfL were not involved in this communications planning.
- 4.10 However, as Table 6 shows,⁴⁸ communications planning presentations suggest the Sponsors were actively involved in developing a communications strategy surrounding the delay. For instance, the presentations indicate that the Sponsors are aware of the “schedule issue” and that they have yet to agree on a timeline for the announcement, noting the different preferences by DfT, TfL and Crossrail. Here, it is difficult to believe that “Sponsors” refers to communications teams and not to top leadership at DfT and TfL, given the level of risk and importance of decisions made about the delay.

Table 6: Crossrail communications strategies

Document	Date (as noted in the document)	What does it say?
Communications Approach – Programme Schedule (PowerPoint Presentation)	16 August 2018	<p><u>Slide 2 – Introduction</u></p> <ul style="list-style-type: none"> • “No announcement will be made before the Crossrail Board meeting on 29 August – however news could enter into public domain at any time between now and the formal announcement date” <p><u>Slide 3 – Context</u></p> <ul style="list-style-type: none"> • “Sponsors are aware of the schedule issue” • “Given the close proximity to the WMS, questions are likely to be raised about timing and whether this information was known in July” • “Crossrail and Sponsors will need to align on the reasons for the delayed schedule” <p><u>Slide 4 – Risks Overview</u></p> <ul style="list-style-type: none"> • “Revised schedule is leaked – information becomes known before formal announcement”
Communications Approach – Programme Schedule (PowerPoint Presentation)	22 August 2018	<p><u>Slide 2 – Timeline</u></p> <ul style="list-style-type: none"> • “Following a decision by the Crossrail Board, an announcement would ideally be made in early September” • “Sponsors have not formally agreed on a timeline for the announcement. DfT’s preference is for an announcement following return of House of Commons on 3 Sep. TfL’s preference is likely to be for an announcement following Sponsor Board on 3 Sep. TfL also required to issue a market’s update.” <p><u>Slide 3 – Context</u></p> <ul style="list-style-type: none"> • “Key to the delivery of the communications output will be an agreed narrative that explains the contributory factors in a concise way.” • “This narrative is under discussion with Sponsors and outlines how the programme became compressed.” <p><u>Slide 4 – Risks Overview</u></p> <ul style="list-style-type: none"> • “Revised schedule is leaked – information becomes known before formal announcement” <p><u>Slide 6 – Outline timeline for announcement</u></p> <ul style="list-style-type: none"> • “DfT and TfL currently propose that no media interviews should be undertaken.”

4.11 The transparency of the weekly written updates to the Mayor has also been questioned. The weekly reports are composed of three sections: 1) a general section with highlights on the progress of the scheme; 2) a section on Bombardier updates; and 3) a table summary of the Master Operating Handover Schedule (MOHS) milestones. The MOHS table summary was only included in these briefings until 12 July 2018.

“Nothing ever went to the Mayor that first had to go through some degree of scrutiny... We did issue a weekly briefing note to the Mayor and I am looking at one dated 19 June [2018]. As I said earlier, this does not go to the Mayor without it being cleared by TfL first...that second paragraph in what went to the Mayor was deleted by TfL.”

Sir Terry Morgan, former Crossrail chair, 9 January 2019

4.12 These reports are written and reviewed by Crossrail and TfL staff, with continuous back-and-forth emails over the span of several days, before a draft is submitted to the TfL Commissioner for approval and then sent to the Mayor’s Office. As the images below show,⁴⁹ there have been several instances where the Commissioner has altered key messages of risk. For instance, in one of the February updates, the Commissioner deleted text on limited float and ambitious timelines, originally in the draft. The risk of limited float was highlighted by the Project Representative in their reports early in 2018 to indicate that the December 2018 opening was increasingly unfeasible. Likewise, the Commissioner deleted mention of a risk with the testing schedules, which were originally planned for early October 2018. Delays with the testing have been a major cause of the delay with the central opening. These are important omissions as they certainly change the view on risks on the programme.

Image 1: Email Thread - February Weekly Update to the Mayor

2 Weekly Mayor Update 22 February 2018

TfL
Head of Corporate Affairs, Andy Brown

“ FYI - attached tracked changes from Mike. We will get this over to City Hall now. ”

Tracked changes

All partners are being asked to sign up to the MOHS to affirm the commitment to achieving the dates which set out delivery of the Elizabeth Line Stage 3 in December 2018. ~~There is very limited float in the programme and a number of the key dates are aggressive and will require improvements in productivity and delivery.~~

Crossrail
Chief of Staff, Lucy Findlay

“ Thanks... I note the wording where Crossrail Limited made it clear that the MOHS remains challenging to achieve has been removed. We're trying to be transparent about the risks that exist so perhaps when we speak at 3 this afternoon we could discuss how this can be included in an acceptable way? ”

Image 2: Email Thread - March Weekly Update to the Mayor

2 Weekly Mayor Update 5 March 2018

Crossrail
TfL
Principal Sponsor, Richard Zavitz

“ Hi, find attached some comments and additional text for the briefing that would have been included from the Joint Sponsor Team if we were still doing period updates... ”

Additional text

2.1 Delivering the programme on-time remains a significant challenge for Crossrail Limited (CRL). The Master Operating Handover Schedule (MOHS) 2018 has been launched by CRL and has been signed up to by the majority of contractors. Whilst it identifies the key critical milestones for delivering Stage 3 Opening in December 2018, it is ambitious and contains limited float.

Crossrail
Chief of Staff, Lucy Findlay

“ Thanks, but 2.1 was in last time and Mike took out the wording I'd put in about MOHS being challenging, limited float, etc. ”

Image 3: Email Thread - May Weekly Update to the Mayor

3 Weekly Mayor Update 8 May 2018

TfL
Corporate Affairs Manager, Stephanie Doyne

Removed text

~~A MOHS review is held each period to review forecast dates and assess criticality and mitigations. There are a number of dates that are under pressure. Crossrail Limited is reviewing the RAG status for the period 1 report and "Amber" status will be introduced to identify milestones that are forecast on-time but are under pressure.~~

Crossrail Chief Operating Officer, Howard Smith

“ Obviously Mike's the boss so his call but I think that one of the deletions is the reference to the imminent MOHS review and the high likelihood that several of the CRL dates will go amber and/or red. Obviously this week is now done but both David H and I thought that we do need to flag the areas under pressure... ”

As you know we have, in the past, sometimes been thought not to have flagged risks sufficiently clearly in advance. When we produce next weeks report can we please give this some thought. I'm happy to provide further explanation if necessary - and or work with others to simplify whilst keeping the message clear

TfL Head of Corporate Affairs, Andy Brown

“ Thanks. Let's have another go for next week's note on the best way to phrase that point - I know what you mean but there is a difficult balance to be struck between getting that caution across, and just sounding like a description of MOHS and what Amber means now that we've added one to the schedule. I fear the drafting that got cut may not have leant heavily enough on the former. ”

Image 4: Email Thread - May Weekly Update to the Mayor

3 Weekly Mayor Update 15 May 2018

TfL
Corporate Affairs Manager, Stephanie Doyne

Tracked changes

2.2 Several tests were successfully completed, including further full speed automatic operation, ~~however due to equipment failures including signal, radio communications, platform screen doors and train software~~; This is to be expected at this stage in a project, but will require careful management of the remaining programme of tests. A number of tests were deferred or will need to be repeated in the next testing window which is in two week's time.

Crossrail Chief Operating Officer, Howard Smith

“ Thanks. Maybe too late to correct but looks to me like the sentences in 2.2 are the wrong way round. ”

TfL Corporate Affairs Manager, Stephanie Doyne

“ Hi, the wording was amended by Mike so that the setbacks appeared less serious. Reading it back it does appear to make sense so hopefully City Hall agrees. ”

Image 5: Email Thread - June Weekly Update to the Mayor

4 Weekly Mayor Update 19 June 2018

TfL Senior Advisor to the Managing Director, Sylvia Mannah: "Are you happy with the attached?"

Removed text

~~2.3 At the moment, there is insufficient time to complete the testing required ahead of the joint trial running and trial operations from 1 October 2018. This remains an area of serious attention and an improved plan that balances construction and testing time is being developed over the next fortnight.~~

Crossrail Chief Operating Officer, Howard Smith: "Not really! Removing the statement re insufficient testing time is wrong. We see it as a critical issue that we need to note. I'd remind them that we have been taken to task (on Stage 2) for not highlighting risks. If it's Mike I don't think it changes my view but he is the boss!"

TfL Senior Advisor to the Managing Director, Sylvia Mannah: "I spoke to Mike about this. He is not happy including this paragraph because there was no mention of it at last week's meeting with the Mayor. He feels strongly that we cannot spring things like this on him in a weekly note when there is ample opportunity to trail it in person."

Mike also doesn't want us to reference train availability and reliability issues as one of the causes of any problems with the big testing window. If these points are correct and need to be reported to the Mayor we will need to have a conversation (with Mike at some stage) about how we can best do that."

Crossrail Chief Operating Officer, Howard Smith: "Thanks. Not saying for a minute that Mike's wrong but my recollection varies a bit - either way he's in charge so I'll drop it."

Image 6: Email Thread - August Weekly Update to the Mayor

3 Weekly Mayor Update 6 August 2018

TfL Head of Corporate Affairs, Andy Brown: "Thanks for this. Only minor comments tracked in the attached - except one, in the milestone list at the end: are you sure you want the stage 3 opening date to be 'tbc'? That surprised me."

Original

Current forecast for start of Stage 3 = "to be confirmed"

Offline discussion between TfL and Crossrail

TfL Senior Advisor to the Managing Director, Sylvia Mannah: "Please find attached a slightly revised version of the note following our discussion yesterday. I've included some comments and would be grateful for your help on them."

Revised

Current forecast for start of Stage 3 = "December 9th"

Lessons learned

- 4.13 Transparency and open communication are indispensable for projects funded by the public purse. It is important that all stakeholders, including future passengers, have the opportunity to know and understand the decisions that are being made on large, expensive, high-risk projects. Likewise, thorough reporting of these decisions is necessary to ensure accountability and scrutiny.

Recommendation 7 – Access to board meetings

Decision-making on major projects should occur in formal meetings. These meetings should be comprehensively minuted and recorded. Further, barring commercially-sensitive business, these meetings (e.g. Crossrail Board and Sponsor Board) should be public, in particular given that funding is coming from the public purse.

- 4.14 Crossrail documents strongly suggest that Sponsors started collaborating on the communications strategy and press statements for the delay in mid-August. This, in addition to the known financial challenges, makes it difficult to understand how the Mayor was not aware of the imminent risk of delay at a point earlier than the official announcement. As Chair of TfL, the Mayor needs to keep hold of the organisation he is leading. The evidence seems to suggest that TfL did not fully communicate, and sometimes omitted, key pieces of information to the Chair, the Mayor of London.
- 4.15 Evidence from emails between Crossrail Limited and TfL suggests that communications to the Mayor were being managed by the TfL Commissioner, Mike Brown. Instead of communicating risks head on, these were downplayed in the weekly updates to the Mayor. This raises serious concerns about the role of the Commissioner and his ability to support the Mayor as Chair of TfL.

Recommendation 8 – The Mayor as Chair of TfL

The Mayor and TfL Board must strengthen control over TfL, and implement the necessary processes to allow them to remain fully informed and on top of progress on the projects they are ultimately accountable for.

Recommendation 9 – The Commissioner's Role

Given the strong evidence presented in this report, we recommend that the Commissioner reflects on whether he is fit to fulfill his role in TfL.

5. Project Design

Key findings

- While innovative, the project has also been complex, from the design of the stations to the number of signalling systems to be integrated into the programme. This level of complexity on various elements of the programme has posed a risk to budget and schedule pressures for delivering Crossrail.
- Complementary works are delayed and have not prioritised station enhancements, such as step-free access, which could bring immediate benefits to passengers.

- 5.1 Crossrail Limited is delivering a complex project. The complexity comes largely from the state-of-the-art elements of the programme that are meant to be integrated with one another to deliver an effective, safe and comfortable service.
- 5.2 Crossrail's new Class 345 trains involve new systems and software. They are 200 metres long—twice the length of a tube train—and have nine carriages with the capacity of carrying 1,500 passengers.⁵⁰
- 5.3 The programme also involves the construction of ten new stations and the enhancement of 31 existing stations. Station platforms are around 240 metres long each to be able to accommodate the long new trains.⁵¹ The stations require a range of complex IT systems, designed to help manage the stations and ensure passengers can move efficiently and safely through the stations. As reported by the NAO, the stations have been designed “to a high architectural specification.”⁵² The design features are complex and bespoke – for instance, in Paddington station a large steel and glass canopy will be used to bring in natural light.
- 5.4 There have been significant delays to the completion of the new stations and to complementary works to the existing stations. The plans for completing these works have re-prioritised the elements to focus on, and step-free access will not be delivered until much later in the programme.⁵³

“There are 60,000 individual items on Crossrail [stations] that need controlling and integrating. The task is huge.”

Mark Wild, Crossrail Chief Executive, 30 January 2019

- 5.5 The complexity of the programme is also related to the signalling systems being deployed for the Elizabeth Line. The line will use three different signalling systems, with the line running on Network Rail infrastructure in the east and west sections, and TfL infrastructure in the centre. As Box 1 suggests, this approach is highly complex. In fact, this type of transition between signalling systems has not been used in the UK before.^{54 55}

“One of the problems that we are dealing with here is the fact that we are trying to integrate three signalling systems. We need to find a way to simplify big infrastructure projects...With the nature of signalling arrangements for example, on Crossrail 2, whilst it might sound a bit geeky, that needs to be considered right at the outset.”

Heidi Alexander, Deputy Mayor of London for Transport, 12 September 2018

Box 1: Crossrail signalling explained

Crossrail will use three separate signalling systems: Train Protection Warning System (TPWS), Communication Based Train Control (CBTC) and European Train Control System (ETCS).

The CBTC will be used in the Central Operating Section. At the western end, Crossrail trains will operate under the ETCS and TPWS systems. ETCS signalling is being implemented on the whole line between Paddington and Heathrow. The responsibility for the implementation of signalling systems lies with the owners of the rail infrastructure, namely Network Rail between Paddington and the airport junction, and Heathrow Airport Limited between the junction and the airport terminal stations. For trains continuing to Maidenhead and Reading, the TPWS will be used. In the east, Crossrail will also use TPWS.

ETCS was supposed to be in place to the west of London, from Paddington, but has only been implemented in the Heathrow Tunnel. This has added to the complexity of signalling integration as there is an additional interface to account for between ETCS in the airport junction and the Network Rail legacy signalling system, TPWS, in the eastern line from Paddington.

The information from these three separate signalling systems will be integrated by the on-board software Train Control and Management System (TCMS). The ability of this software to switch between these three systems, as trains move along the various parts of the route, will guarantee the safe and efficient operation of Crossrail.

Lessons learned

- 5.6 While innovative, the project has also been complex, from the design of the stations to the number of signalling systems to be integrated into the programme. Although we welcome and strongly encourage innovations around passenger safety and accessibility, and ensuring stations, track and trains are brought up to modern standards, it is important to note that the more complex a project is, the higher the likelihood of having risks to safety, timelines and budget.

Recommendation 10 – Complex infrastructure

Future infrastructure projects should strive to keep designs simple, incorporating standard rather than bespoke features, in order to reduce risks to budget and timelines, and protect the public purse against overspend.

- 5.7 We understand that under a time crunch, re-prioritising works is necessary. However, there are certain station improvements, such as step-free access, that can be delivered at a lower cost than others, and which can bring immediate benefits to passengers. If these works are placed at the end of major infrastructure programmes, there is greater risk of slippage and cancellation.

Recommendation 11 – Complementary works

Future infrastructure projects should make plans to deliver complementary works—including step-free access—at the outset.

Our approach

At its five public evidence sessions, the committee took oral evidence from the following guests:

- Rupert Walker, Strategy and Planning Director (South), Network Rail
- Sadiq Khan, Mayor of London
- Mike Brown, Commissioner, Transport for London
- Sir Terry Morgan, former Chair, Crossrail Ltd
- Simon Wright, Chief Executive, Crossrail Ltd
- Meliha Duymaz, Route Managing Director (Anglia), Network Rail
- Howard Smith, Operations Director, Crossrail
- Simon Wright, former Chief Executive, Crossrail
- Andrew Wolstenholme, former Chief Executive, Crossrail
- Heidi Alexander, Deputy Mayor of London for Transport
- Tony Meggs, Chair, Crossrail Ltd
- Mark Wild, Chief Executive, Crossrail Ltd
- David Hughes, Director of Strategy and Network Development, London Underground, TfL

The committee also reviewed and analysed the following documents during the investigation:

- Adverse Event Notices
- Crossrail Limited Board minutes
- Crossrail Sponsor Board minutes
- Crossrail Remuneration Committee minutes
- Transport for London Board agenda papers and minutes

- Elizabeth Line Readiness Board agenda papers
- Weekly Updates to the Mayor
- Correspondence between Crossrail and Transport for London
- Jacobs reports
- Master Operational Handover Schedule and Crossrail Board Risk Register
- Crossrail communications strategy and planning documents
- Draft and final press releases from Crossrail

References

- ¹ Crossrail website, information retrieved from: <https://tfl.gov.uk/travel-information/improvements-and-projects/elizabeth-line>
- ² Crossrail website, information retrieved from: <https://tfl.gov.uk/travel-information/improvements-and-projects/elizabeth-line>
- ³ Crossrail website, information retrieved from: <https://tfl.gov.uk/travel-information/improvements-and-projects/elizabeth-line>
- ⁴ National Audit Office, A Memorandum of the Crossrail Programme, 28 February 2019
- ⁵ Written Statement, 10 December 2018, information retrieved from: <https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2018-12-10/HCWS1165/>
- ⁶ Crossrail website, information retrieved from: <http://www.crossrail.co.uk/news/articles/update-on-crossrail-rolling-stock-depot-procurement>
- ⁷ TfL Business Plan 2019-24
- ⁸ KPMG Independent Review of Crossrail – Financial and Commercial Report, 23 January 2019
- ⁹ TfL Board Meeting, 30 January 2019
- ¹⁰ KPMG Independent Review of Crossrail – Financial and Commercial Report, 23 January 2019
- ¹¹ KPMG Independent Review of Crossrail – Financial and Commercial Report, 23 January 2019
- ¹² Crossrail update to London Assembly’s Transport Committee, 4 April 2019, retrieved from: <http://content.tfl.gov.uk/caroline-pidgeon-monthly-update-apr-19.pdf>
- ¹³ National Audit Office, A Memorandum of the Crossrail Programme, 28 February 2019
- ¹⁴ TfL Board Meeting, 27 March 2019

- ¹⁵ Financial Times, "Crossrail reshaping property market along its route", 6 September 2016, retrieved from: <https://www.ft.com/content/c6dae4bc-1b87-11e6-b286-cddde55ca122>
- ¹⁶ Mayoral Decision, 12 February 2019, retrieved from: <https://www.london.gov.uk/decisions/md2430-crossrail-business-rates-supplement-2019-20>
- ¹⁷ Crossrail 2 website, information retrieved from: <https://crossrail2.co.uk/discover/funding/>
- ¹⁸ London Assembly Budget and Performance Committee Meeting, 7 January 2019
- ¹⁹ London Assembly Transport Committee Meeting, 21 December 2018
- ²⁰ KPMG Independent Review of Crossrail – Governance Report, 23 January 2019
- ²¹ Crossrail website, information retrieved from: <http://www.crossrail.co.uk/news/articles/jacobs-announced-as-crossrail-project-representative>
- ²² KPMG Independent Review of Crossrail – Governance Report, 23 January 2019
- ²³ London Assembly Transport Committee Meeting, 21 December 2018
- ²⁴ London Assembly Transport Committee Meeting, 21 December 2018; Public Accounts Committee Meeting, 6 March 2019
- ²⁵ Jacobs Project Representative Reports, retrieved from: <https://tfl.gov.uk/corporate/publications-and-reports/crossrail-project-updates#on-this-page-2>
- ²⁶ Crossrail Board minutes, retrieved from: <https://tfl.gov.uk/corporate/publications-and-reports/crossrail-board-minutes>
- ²⁷ Crossrail Sponsor Board minutes, retrieved from: <https://tfl.gov.uk/corporate/publications-and-reports/crossrail-sponsor-board-minutes>
- ²⁸ TfL Board papers, retrieved from: <https://tfl.gov.uk/corporate/publications-and-reports/board-papers>
- ²⁹ Weekly updates to the Mayor, retrieved from: <https://tfl.gov.uk/corporate/publications-and-reports/crossrail-project-updates#on-this-page-2>
- ³⁰ National Audit Office, Crossrail Report, 24 January 2014
- ³¹ London Assembly Plenary Meeting, 6 September 2018

- ³² Transport Committee Meeting, 14 March 2019
- ³³ Crossrail contract for Andrew Wolstenholme, 4 July 2011
- ³⁴ Crossrail contract for Simon Wright, 16 April 2014
- ³⁵ Crossrail letter for Simon Wright, 2 March 2018
- ³⁶ Crossrail contract for Matthew Duncan, 23 September 2015
- ³⁷ Crossrail Remuneration Committee minutes, 24 May 2018
- ³⁸ TfL Remuneration Committee, 3 July 2013, retrieved from: <http://content.tfl.gov.uk/Part-1-Item07-CRL-LTIP.pdf>
- ³⁹ Crossrail Remuneration Committee minutes, 8 November 2018
- ⁴⁰ Crossrail Remuneration Committee minutes, 1 March 2018
- ⁴¹ TFL Annual Report and Statement of Accounts 2016/17
<http://content.tfl.gov.uk/tfl-annual-report-and-statement-of-accounts-2016-17.pdf>
- ⁴² TFL Annual Report and Statement of Accounts 2017/18
<http://content.tfl.gov.uk/tfl-annual-report-and-statement-of-accounts-2017-18.pdf>
- ⁴³ London Assembly Budget and Performance Committee Report, “Transport for London’s Signal Failure,” March 2016
- ⁴⁴ GLA Oversight Committee Report, “Transparency of the GLA Group and Family,” February 2016
- ⁴⁵ London Assembly Transport Committee Meeting, 12 September 2018
- ⁴⁶ TfL Board meeting, 30 January 2018
- ⁴⁷ Cover e-mail to Evening Standard from TfL FOI Case Management Team
- ⁴⁸ FOI documents retrieved from: <http://content.tfl.gov.uk/draft-communications-plan.pdf>
- ⁴⁹ Images based on summonsed e-mails available at: <https://tfl.gov.uk/corporate/publications-and-reports/crossrail-project-updates>
- ⁵⁰ Crossrail website, information retrieved from: <http://www.crossrail.co.uk/route/new-trains/>
- ⁵¹ Crossrail website, information retrieved from: <http://www.crossrail.co.uk/construction/railway-systems/platform-screen-doors>

⁵² National Audit Office, A Memorandum of the Crossrail Programme, 28 February 2019

⁵³ London Assembly Transport Committee Meeting, 14 March 2019

⁵⁴ National Audit Office, A Memorandum of the Crossrail Programme, 28 February 2019 <https://www.railengineer.uk/2016/01/08/signalling-crossrail/>

⁵⁵ Rail Engineer, Signalling Crossrail, 8 January 2016, retrieved from: <https://www.railengineer.uk/2016/01/08/signalling-crossrail/>

Other formats and languages

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Chinese

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Vietnamese

Nếu ông (bà) muốn nội dung văn bản này được dịch sang tiếng Việt, xin vui lòng liên hệ với chúng tôi bằng điện thoại, thư hoặc thư điện tử theo địa chỉ ở trên.

Greek

Εάν επιθυμείτε περίληψη αυτού του κειμένου στην γλώσσα σας, παρακαλώ καλέστε τον αριθμό ή επικοινωνήστε μαζί μας στην ανωτέρω ταχυδρομική ή την ηλεκτρονική διεύθυνση.

Turkish

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Punjabi

ਜੇ ਤੁਸੀਂ ਇਸ ਦਸਤਾਵੇਜ਼ ਦਾ ਸੰਖੇਪ ਅਪਣੀ ਭਾਸ਼ਾ ਵਿਚ ਲੈਣਾ ਚਾਹੋ, ਤਾਂ ਕਿਰਪਾ ਕਰਕੇ ਇਸ ਨੰਬਰ 'ਤੇ ਫ਼ੋਨ ਕਰੋ ਜਾਂ ਉਪਰ ਦਿੱਤੇ ਡਾਕ ਜਾਂ ਈਮੇਲ ਪਤੇ 'ਤੇ ਸਾਨੂੰ ਸੰਪਰਕ ਕਰੋ।

Hindi

यदि आपको इस दस्तावेज का सारांश अपनी भाषा में चाहिए तो उपर दिये हुए नंबर पर फोन करें या उपर दिये गये डाक पते या ई मेल पते पर हम से संपर्क करें।

Bengali

আপনি যদি এই দলিলের একটি সারাংশ নিজের ভাষায় পেতে চান, তাহলে দয়া করে ফো করবেন অথবা উল্লিখিত ডাক ঠিকানায় বা ই-মেইল ঠিকানায় আমাদের সাথে যোগাযোগ করবেন।

Urdu

اگر آپ کو اس دستاویز کا خلاصہ اپنی زبان میں درکار ہو تو، براہ کرم نمبر پر فون کریں یا مذکورہ بالا ڈاک کے پتے یا ای میل پتے پر ہم سے رابطہ کریں۔

Arabic

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فارجاء الاتصال برقم الهاتف أو الاتصال على
العنوان البريدي العادي أو عنوان البريد
الإلكتروني أعلاه.

Gujarati

જો તમારે આ દસ્તાવેજનો સાર તમારી ભાષામાં જોઈતો હોય તો ઉપર આપેલ નંબર પર ફોન કરો અથવા ઉપર આપેલ ટપાલ અથવા ઇ-મેઇલ સરનામા પર અમારો સંપર્ક કરો.



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