

## Project Representative Report

**Item: Project Status Report 157 and Crossrail  
Response Period 10 FY2021-22**

**Date: Period 0 (11 December 2021 - 7 January 2022)**

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### 1 Overview

- 1.1 The P-Rep is in place to provide the Sponsors, TfL and the Department for Transport, with oversight of project delivery, advise and raise points of challenge to the Sponsors and scrutinise progress.
- 1.2 The P-Rep observations are shared with Crossrail and are discussed in detail by Crossrail, P-Rep and the Commissioner. Crossrail then produces a written response to the P-Rep report.
- 1.3 In line with the commitments made by the Mayor for greater transparency of the Crossrail project, please find below the latest P-Rep Sponsor Summary and Crossrail's Management Response.
- 1.4 It has been necessary to make some redactions to the reports prior to publication to protect commercially sensitive material. We have sought to keep such redactions to a minimum

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██████████  
**Project Representative**  
**Jacobs**

22 February 2022

Dear ██████████

**Re: Crossrail PRep Project Status Report 159 – Period 10**

I am writing in response to the PRep Sponsor Summary cover letter for Period 10.

Trial Operations Phase 2 commenced on 29 January 2022. This is an important milestone for the Programme as it has moved the acceptable risk profile of the system into a position where we can accept an unlimited number of people on the railway instead of capped numbers per train. This enables the commencement of mass volunteer exercises which are crucial in the final testing of the whole railway system.

The first mass evacuation exercise took place on 13 February 2022 between Woolwich and Custom House stations. The exercise was one of the more challenging of those planned and involved a detrainment on the surface section and evacuation to Custom House station. Around 500 volunteers took part and the exercised was deemed a "pass" with comments and recommendations for improvement. Since then, a second exercise has been completed that entailed the evacuation of over 900 volunteers from the tunnel section through Farringdon station. Four exercises remain and they are proving to be an important step towards Revenue Service by ensuring processes are as optimal as possible.

In parallel with the mass volunteer exercises, we continue to complete the remaining Trial Operations scenarios and the necessary final safety assurance documentation. We aim to complete this phase of Trial Operations by the end of March 2022, delivering a fully assured customer ready railway. We acknowledge there is still a considerable amount of work to do in a limited time span. We remain focussed on having a Revenue Service assured railway in place by our scheduled deterministic date.

Reliability continues to build week by week and the railway's performance is often in the zone that would be acceptable for customer service. In parallel with the completion of Trial Operations, we are deploying a reliability growth campaign across the Programme to eliminate recurring defects and delays. Central to this will be the deployment of ELR200 signalling software and 5.7 train software at Easter. Our current projections indicate that, alongside many other interventions, this will provide a capability to support adequate Revenue Service.

**MOVING LONDON FORWARD**





I hope this response provides a useful summary of the measures in place to address the specific issues you have highlighted. A more comprehensive response focussed on the content of the Sponsor Summary report will be issued as an Appendix to this letter.

Kind regards,



**Mark Wild**  
CEO, Crossrail

## Appendix – CRL Response to Period 10 PRep Report

Programme Response Category	PRep Period 10 Sponsor Summary Content	CRL Period 10 Response
<p><b>Headlines: Progress and Look Ahead</b></p>	<p>CRL and RfLI agreed to proceed with entry into Trial Operations Phase 2<sub>1</sub> at the Go/No-Go review held on 11 January 2022. The review identified Canary Wharf Station BIU on 21 January 2022 and the resolution of an incorrect safety indication on train driver displays as conditions for entry. This means that the first mass evacuation exercise is now scheduled to take place in mid-February 2022, with the aborted or failed exercises from Phase 1 re-run beforehand.</p> <p>The Christmas/New Year blockades were implemented to plan, with signalling software ELR110 and train software H5.4 successfully deployed, and outstanding rail systems works completed. However, reliability running carried out in early January 2022 delivered mixed results. Unresolved known faults such as those affecting the Timetable Processor and train cab HMI (Human Machine Interface) persist, and new issues have arisen with the GEML signalling transition and yellow plant. PPM levels are significantly below target with excessive times to recover the service compounding the problems. Overall railway reliability still falls short of levels expected at this stage of Trial Operations. While the decision to proceed towards Trial Operations Phase 2 was not wholly predicated on railway performance levels, rapid improvements in reliability are now needed to</p>	<p>Following the Go/No Go review held on 11 January 2022, Trial Operations Phase 2 commenced as planned on 29 January 2022. Canary Wharf BIU was achieved on 21 January 2022 and the Great Eastern Transition demobilisation was achieved on 23 January 2022. The first mass evacuation exercise took place on 13 February 2022 between Woolwich station and Custom House and passed with comments.</p> <p>All planned blockades to complete works over the festive period were successfully achieved. To achieve the required criteria, the Reliability and Resilience Delivery Group (RRDG) monitors progress weekly, agrees interventions and mitigations as and when required. Siemens continue to resolve issues with the Signalling System. A temporary Timetable Processor (TTP) fix was installed on 28 January and no TTP issues have been observed since. A permanent fix is expected in April 2022 with the commissioning of ELR200 signalling software. Siemens continue to test fixes for the issues being experienced at the Stratford Great Eastern Fringe.</p>

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	<p>demonstrate that sustainable operations will be possible once passenger services have started.</p> <p>All railway infrastructure installation is effectively complete, and future performance gains will be achieved through major rail system software changes, process improvement and growing staff experience. The software changes include a TVS upgrade and ELR200 deployment for signalling; both are planned for Easter 2022, but neither is strictly necessary for entry into Passenger Service.</p> <p>RfLI continues to address Auto-Reverse with the ORR and plans to complete testing in the first quarter of 2022. Alternative arrangements to de-risk Stage 5B are being investigated, should this issue not be resolved prior to Stage 3 Passenger Service.</p> <p>Works carried out at Canary Wharf Station over the Christmas 2021 period resulted in better alignment and understanding between CRL and RfLI on the requirements for BIU; this contributed to BIU being achieved on 21 January 2022. Large amounts of asset data and documentation remain to be delivered before the planned contract completion date in ██████ 2022.</p> <p>CRL and RfLI have made progress with the delivery of safety assurance, but completion before the start of Passenger Service remains challenging, despite the deterministic date</p>	<p>Agree.</p> <p>A staged delivery programme has been proposed for the Auto-Reverse issues with a detailed implementation plan to deliver approval for Westbourne Park and for the tunnels under development. Close Headway testing was carried out on 30 January 2022 to demonstrate 24 TPH service, with Auto Reverse performing well during the tests.</p> <p>Processing of asset data and other documentation is being addressed and progressing well for the end of ██████ 2022 contract completion date.</p> <p>Revenue Service burndown assurance continues and is monitored daily. CRL and RfLI are in the process of aligning the assurance closeout plan for the remaining Safety Justifications (SJs) and</p>
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	<p>slipping to ■ March 2022 in the period; there is also unlikely to be sufficient time to build railway reliability before this date. Given that ELR200 is scheduled for deployment shortly afterwards, in mid-April 2022, deferral of Stage 3 opening until the benefits of the software upgrade have been demonstrated appears an attractive proposition. This would avoid disruptive impacts on a newly opened passenger railway, which have been experienced with previous software deployments. CRL's P50 date for the start of Passenger Service is reported as ■ May 2022 and we believe it is more likely that passenger services will start closer to this date than the deterministic date. The P80 date remains within the declared opening window of the first half of 2022.</p> <p>Minor change is indicated for the P50 date for Stage 5B opening, with a ■ deterioration to ■ and a ■ improvement to the Stage 5C P50 opening date, to ■ March 2023. The risk that the achievement of a reliable 24 TPH service may not be aligned with the Go/No-Go reviews and timetable bidding process for Stage 5C remains, and Stage 5C opening might be driven back to May 2023 as a consequence.</p> <p>Sponsors' particular attention is drawn to the following:</p> <p>CRL and RfLI committed to the start of full Trial Operations on 29 January 2022, with all</p>	<p>Dependencies. Once the plan is confirmed it will be discussed with ITAP. The DCS1.2 schedule is holding ■ March 2022 for an assured Stage 3 railway.</p> <p>Agree and noted.</p> <p>CRL responds to the Sponsors as follows:</p> <p>Trial Operations Phase 2 commenced as planned on the 29 January 2022. The programme is still</p>
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	<p>exercises planned to be completed before Shadow Running on █ March 2022.</p> <p>ITAP safety case acceptance for full Trial Operations is in progress, but the securing of authority for entry into Passenger Service against deterministic dates will be challenging.</p> <p>Railway reliability growth remains below expectation and there might be benefits in deferring Stage 3 Passenger Service until after ELR200 deployment in April 2022.</p> <p>Bond Street Station delivery completion remains uncertain, with baseline schedule, costs and risks to passenger opening yet to be finalised by CRL.</p> <p>The start dates for Passenger Service and Stages 5B and 5C are critically linked by reliability growth, and several technical issues remain beyond Stage 3 for resolution.</p>	<p>holding █ March 2022 as the Ready for Revenue Service target date.</p> <p>The full Trial Operations safety case was accepted on 28 January 2022. The aim is to get the Stage 3A safety case completed for Ready for Revenue Service by █ March 2022. The Programme will need both Authority to Place in Service and Sponsor 'Substantial Completion' prior to allowing fare paying passengers to use the railway.</p> <p>Agree.</p> <p>Bond Street station is assessing the integration of London Underground and CRL assurance to best optimise a total station opening for Passenger Service instead of partial opening as originally planned.</p> <p>Noted. The DCS will be revised over the period to the end April 2022 to develop DCS1.3. This will map out the schedule to achieve the agreed Staging Plan and deliver Stage 5B and 5C. Key components supporting this schedule will be plans that articulate amongst other things the signalling software and train software deployment to support the reliability growth required to deliver these stages.</p>
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## Appendix – CRL Response to Period 10 PRep Report

<p><b>Health &amp; Safety</b></p>	<p>Overall safety indicators remain within those set by the Programme. The escalation of Covid during December 2021 posed a risk to the Programme, but detailed planning and good management during the blockades meant this risk did not materialise.</p>	<p>Agree.</p>
<p><b>Programme Overview:</b></p> <p><b>Schedule</b></p>	<p>CRL has maintained progress towards the start of Trial Operations Phase 2 on 29 January 2022, but is reporting a [REDACTED] slippage in the deterministic date for the achievement of the Stage 3 Passenger Service cardinal milestone, moving from [REDACTED] March 2022 to the [REDACTED] March 2022. This is primarily driven by a resequencing of the Trial Operations Phase 2 mass evacuation exercises, with the last major trial taking place at Paddington Station.</p> <p>Achievements during the period include commissioning of CMS software version 28.0, GEML Auto-Transition commissioning and Tier 1 contractor demobilisation at Whitechapel Station.</p>	<p>As mentioned previously, Trial Operations Phase 2 commenced on 29 January 2022 as planned. The DCS1.2 schedule is still holding [REDACTED] March 2022 as Ready for Revenue Service.</p> <p>Agreed. Other key milestones achieved since last period's update include:</p> <ul style="list-style-type: none"> <li>• Bond Street station SC2 Enactment was achieved 17 January 2022</li> <li>• Close Headway (24 TPH proxy) testing performed on 30 January 2022</li> <li>• Canary Wharf BIU was achieved on 21 January 2022</li> <li>• Great Eastern Transition demobilisation was achieved on 23 January 2022</li> <li>• Entry into Trial Operations Phase 2 was achieved as planned on 29 January 2022 with the first mass evacuation trial on 13 February 2022.</li> </ul>

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<p><b>Commercial and Risk</b></p>	<p>The schedule critical path currently runs through the completion of Trial Operations Phase 2 leading into Shadow Running from █ March 2022, ahead of entry into Passenger Service on █ March 2022.</p> <p>For Period 10, CRL is reporting a draft P50 AFCDC █, which is an increase of █ from the final Period 9 AFCDC forecast. The total cost pressure at Period 10 was █, comprising █ at Bond Street Station, █ for Indirect Costs and █ at C660. These Project &amp; Indirect increases were partially offset by a █ drawdown from provision releases and transfers, resulting in the █ forecast increase. Rather than assume and commit to cost mitigation, as undertaken from the Scope Gap at Period 9, CRL is seeking an opportunity to offset the █ cost increase currently reported at Period 10. Under current circumstances, we view the Period 10 AFCDC to be cautiously overstated, but we have concerns regarding the apportionment of Risk and Provision allowances.</p> <p>At Period 9, CRL advised that an assessment had been conducted valuing the Scope Gap cost provision to be █ lower than included in</p>	<ul style="list-style-type: none"> <li>• Successful over and back testing for ELR200 signalling software and commissioning of CMS 4.28.1.</li> </ul> <p>The Critical Path currently passes through the completion of Trial Operations and relevant assurance leading to Ready for Revenue Service on █ March 2022 and in parallel will continue driving the reliability growth of the railway.</p> <p>The Period 10 AFCDC was finalised at £15,963m, an increase of █ on Period 9. This was fully related to Bond Street station for which the LOD1 and LOD2 reviews are still ongoing. A budget review exercise has commenced, including risk and provisions, to determine where the real cost mitigations can be found to offset the cost pressures reported.</p> <p>The scope gap provision is fully itemised. Items remain because they have not been formally transferred to the required delivery mechanism</p>
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	<p>previous cost forecasts. However, this reduction was reflected as an opportunity, pending validation by the CRL Programme team. The proposed revision is a combination of Orders of Magnitude items which are no longer required or are covered elsewhere. This approach would suggest that the Period 9 Scope Gap provision has reduced from █████ to █████, whereas CRL is reporting the Period 10 Scope Gap provision to be █████. It is unclear to us why scope gap provision is still being made at this late stage of the Programme. Consequently, we regard the cost forecast to be dynamic and not corroborated between the various exercises CRL is conducting.</p> <p>CRL has yet to show the complete elemental breakdown of its Period 10 AFCDC, particularly its provisional costs; however, we expect this will be presented to the Period 10 ELDG<sub>5</sub> and will show the reasoning and direction of travel of the provisional allowances.</p> <p>CRL continues to pursue delivery of the Programme against the £825m funding package, but it recognises that this is a significant challenge and that opportunities are diminishing. CRL has undertaken an alternative approach to its funding forecast, in which it utilises an itemised assessment for all identified works and scope, with the objective of assessing the feasibility of staying within the £825m funding package.</p>	<p>with an accurate Order of Magnitude through the Programme Change Panel. All items are aligned to the Scope Book which has been agreed with the Infrastructure Managers. CRL agrees with the Project Representative that potential reductions from the Scope Book are available, but this is yet to be validated. Without having done this exercise, it was not appropriate to formally reduce the scope gap provision. This review has now been superseded with the budget review exercise.</p> <p>This has been subsequently provided to the Project Representative.</p> <p>CRL agrees with the Project Representative, with the addendum that the Programme has always stated that the requirement could be up to £1.1bn in additional funding.</p>
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## Appendix – CRL Response to Period 10 PRep Report

<p><b>Organisation</b></p>	<p>We believe that, in order for CRL to remain within the approved funding, the majority of the residual Project, Programme and Prolongation Risk will need to be eliminated or retired; it unlikely that this will be achieved in full.</p> <p>The Paddington Station Tier 1 contractor has been frustrated by restricted access and late supply issues. Consequently, CRL is targeting the end of January 2022 for Tier 1 demobilisation, with contract completion by early [REDACTED] 2022. Canary Wharf Station BIU was achieved on 21 January 2022, and there is now a need for focus on assurance and contract close-out to enable the Tier 1 contractor to demobilise by the forecast date of the end of [REDACTED] 2022.</p> <p>CRL critical engineering and management resources have been focussed on the successful delivery of the Christmas/New Year blockades, and this has affected the transfer of management responsibilities between CRL and RfLI. As a result, completion of organisation transition might be slightly delayed to allow the</p>	<p>Agree. Periodic project reviews continue to focus on project performance in mitigating risk to control the spend of contingency. Programme and Prolongation Risk drivers are reviewed in periodic integrated programme reviews. However, experience would suggest that it is unlikely that these exposures will be mitigated in full. CRL agrees with the Project Representative with the addendum that the Programme has always stated that the requirement could be up to £1.1bn in additional funding.</p> <p>Demobilisation at Paddington station has taken place but continues to work through contract close out and completion of EOWs. The target remains to complete in February 2022. Canary Wharf station is on target for close out by the end of [REDACTED] 2022 with exception of the MOBO which will be carried on until the end of April 2022 with a small project team.</p> <p>Agree and noted.</p>
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## Appendix – CRL Response to Period 10 PRep Report

<p><b>Stage 3 Trial Running, Trial Operations and Passenger Service</b></p>	<p>final arrangements to be implemented, and this may have an impact on the demobilisation of some resources.</p> <p>Software upgrades ELR110 and H5.4 were installed during the Christmas/New Year blockades. These were generally effective in addressing the faults that they were designed to fix, but operating performance is still variable. Trial Operations exercises are generally being completed as planned.</p> <p>Despite an improvement in railway performance, the reliability criteria for entry into Trial Operations Phase 2 had not been achieved by the Go/No-Go review held on 11 January 2022. The continuing shortfall in performance is due to new issues arising since the software designs were completed, poor train reliability and the need for further staff learning. Nevertheless, CRL and RfLI decided to continue to target Trial Operations Phase 2 on 29 January 2022, on the basis that this was not a commitment to a specific passenger service start date, and it would allow statutory mass evacuation exercises to be completed; these start on 13 February 2022 and finish on 13 March 2022. This approach would also allow final assurance to be delivered by mid-March 2022, effectively freeing the Elizabeth Line to enter passenger service from the end of March 2022, subject to reliability targets being met. Entry into Passenger Service</p>	<p>Noted.</p> <p>As stated above, Trial Operations Phase 2 commenced on 29 January 2022 with the current target to have a Ready for Revenue Service railway by ■ March 2022. To achieve the required standards, the RRDG monitors progress weekly, agrees interventions and mitigations as and when required.</p>
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## Appendix – CRL Response to Period 10 PRep Report

<p><b>Stations Commissioning and Handover</b></p>	<p>is largely dependent upon when the railway is able to perform consistently at a reliable level, and it is appearing more likely that this will be after the Easter 2022 blockade and the deployment of ELR200.</p>	<p>Agree. However, lost time when establishing and removing night-time possessions also extends to isolations. Additionally, regarding resolution of the TVS - Station Mode Working restrictions pose a risk to the operational ability to run the Revenue Service timetable.</p>
	<p>RfLI is generally unable to complete all scheduled maintenance work because of time being lost when establishing and removing night-time possessions. Resolutions are being progressed, and these will need to be implemented soon because possessions are currently longer than provided for in passenger service. RCC workload has reduced following the deployment of ELR110, but further improvements, such as timetable loading, are required to enable staff to manage the railway effectively in service.</p>	
	<p>Following a period of intense activity and schedule mitigation, Canary Wharf Station BIU was achieved on 21 January 2022. Additional EOWs and assurance needs to be completed during Trial Operations Phase 2; these activities are on the schedule critical path for Passenger Service.</p>	<p>Agree.</p>
<p>Development of the baseline schedule, costs and risks to passenger opening has yet to be finalised at Bond Street Station; the earliest opening is still expected to be in Summer 2022.</p>	<p>Agree.</p>	



## Appendix – CRL Response to Period 10 PRep Report

<p><b>Future Stages</b></p>	<p>submit Technical Files to the ORR to receive an Authority to Place into Service (APIS) and RfLI must submit its safety assurance deliverables to ITAP. CRL and RfLI have [REDACTED] from the start of Trial Operations Phase 2 to complete these activities and meet the Stage 3 opening date of [REDACTED] March 2022. There is likely to be little contingency within these timescales, but both parties appear to be aligned in delivery.</p> <p>CRL and RfLI continue to target Stage 5B services starting from the deterministic date of [REDACTED]. Slow reliability growth and uncertainty as to when Auto-Reverse functionality will be available drive a P50 date of [REDACTED].</p> <p>Deployment of the Auto-Reverse continues to be delayed due to issues with technical functionality and safety approvals. Auto-Reverse is currently unable to reliably support the timetable and CRL believes it has identified a technical solution which will require a software change by both the rolling stock and signalling contractor. However, implementation by [REDACTED] will be challenging and it is more likely that the fix will be in place after late [REDACTED]. Site works such as additional CCTV installation are also required, which could extend beyond [REDACTED]. RfLI and MTREL are planning mitigations in case Auto-Reverse is not available (e.g. operating derogations such as reduction of services, increased journey times). A decision to</p>	<p>Agree.</p> <p>Agree.</p>
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	<p>build the timetable with or without full Auto-Reverse functionality will need to be made by late [REDACTED], and this will determine what Stage 5B services, if any, could be operated in [REDACTED].</p> <p>The decision to proceed with Stage 5B services in [REDACTED] needs to be made in [REDACTED], to enable driver rosters to be developed in time for implementation with the timetable change. Reliability growth of the 12 TPH service is behind plan and is likely to delay the start of Stage 3 towards the P50 date. There has also been no opportunity to carry out 24 TPH service demonstrations, with only one now scheduled before the planned start of Stage 3 on [REDACTED] March 2022; thereafter, opportunities for testing and reliability demonstrations will become more restricted once the railway enters passenger service. We are concerned that there may not be sufficient evidence that the railway will operate a reliable 24 TPH service by [REDACTED].</p> <p>Stage 5C is scheduled to start in [REDACTED] December 2022, with the primary risk to achievement being any delay to Stage 5B opening at 24 TPH. This means that there is little time to absorb any lessons before implementing the more complex Stage 5C service patterns. It also highlights that delivery dates of key functionality such as Auto-Reverse are close to Stage 5C opening. NR is likely to approach this situation with caution when it is considering whether the December national timetable change (incorporating Stage</p>	<p>The Project Representative's comment is not entirely accurate. The decision to proceed with Stage 5B services in [REDACTED] does not need to be made in [REDACTED] to enable driver rosters to be developed in time for implementation with the timetable change. However, the decision does need to be made within that timeframe to allow time for train planning work.</p> <p>Agree.</p>
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	<p>5C services) goes ahead as planned. This is because Stage 5C has a greater impact upon the national network, and NR will want to ensure that there is as little risk of disruption to GW and GEML services as possible. If Stage 5C is delayed, the next opportunity for implementation will be in May 2023.</p> <p>The start of Stage 3 Passenger Service is an important interim milestone towards Stage 5C opening. While it remains the current Programme focus, subsequent activities such as delivery completion, reliability growth and the progressive development of Elizabeth Line operating best-practice, will be the key to securing Stages 5B and 5C in the challenging timescales that remain.</p>	<p>Agree.</p>
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**Crossrail Project Representative**

**Crossrail Joint Sponsor Team**

**Sponsor Summary**

**Project Status Report 159**

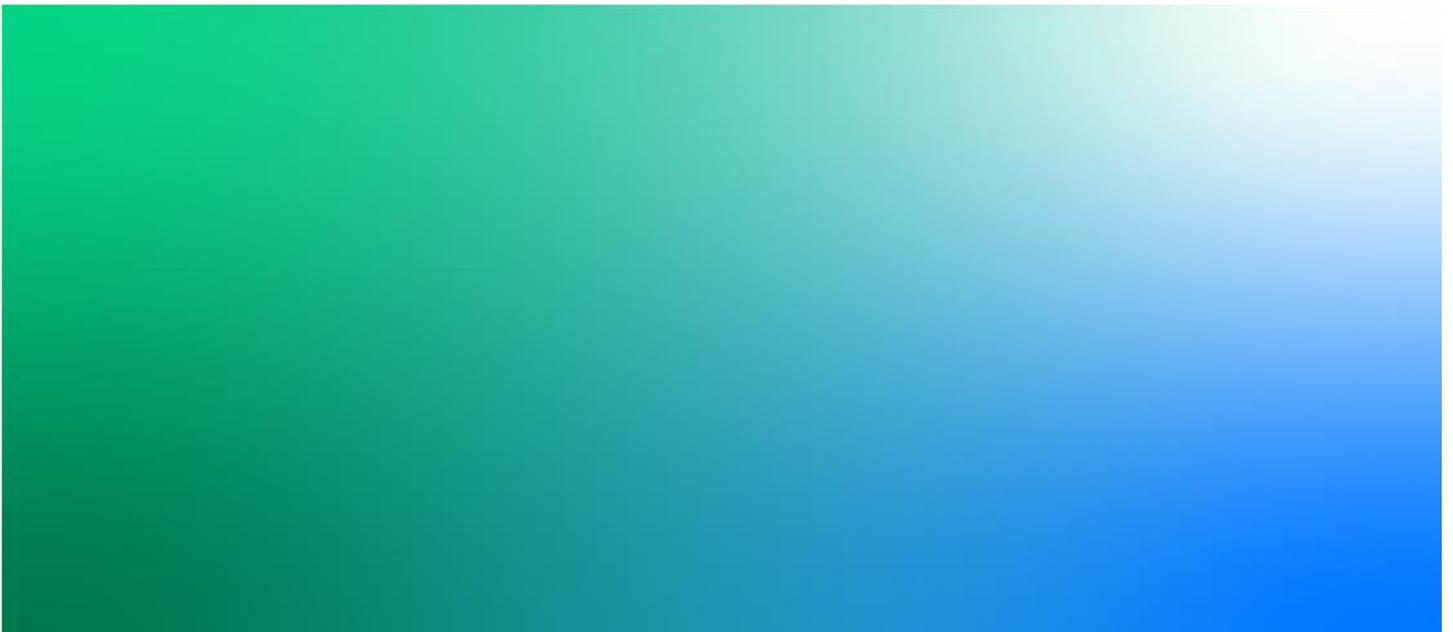
**Period 10 | FY2021/22**

**11 December 2021 – 7 January 2022**

**Official – Sensitive Commercial**

**Document No: B2387600/159/1.13**

**4 February 2022**



## Sponsor Summary PSR 159

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 Document No.: B2387600/159/1.13  
 Date: 4 February 2022  
 Client Name: Crossrail Joint Sponsor Team  
 Client No: RM 3730  
 Project Manager: [REDACTED]  
 Author: PRep Team

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Limitation: This report has been prepared by Jacobs UK Ltd (Jacobs) pursuant to its contract (the Contract) entitled "TTW00033 Crossrail Project: Crossrail Joint Sponsor Project Representative" and dated 30 March 2020 with the Department for Transport (DfT) and Transport for London (TfL), DfT and TfL being the Clients. This report is prepared on behalf of, and for the exclusive use of the Clients and is subject to, and issued in accordance with, the provisions of the Contract. Jacobs neither has nor accepts any liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Note: This report relies on the information set out in CRL's Period 10 reports augmented by more current information received by PRep during the course of our routine discussions with CRL since the Period close on 8 January 2022. Note that information emerging after the close of Period 10 is subject to formal confirmation by CRL in its Period 10 reports. This report is supplemented by our weekly reports to JST and regular meetings with JST staff.

### Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
1.	31 January 2022	PSR 159 Period 10 FY 2021-22 Sponsor Summary v1.11 ~ Draft	<span style="background-color: black; color: black;">[REDACTED]</span>			
2.	4 February 2022	PSR 159 Period 10 FY 2021-22 Sponsor Summary v1.13 ~ Final	<span style="background-color: black; color: black;">[REDACTED]</span>			

## Sponsor Summary

### 1. Headlines

#### 1.1 Progress and Look Ahead

CRL and RfLI agreed to proceed with entry into Trial Operations Phase 2<sup>1</sup> at the Go/No-Go review held on 11 January 2022. The review identified Canary Wharf Station BIU on 21 January 2022 and the resolution of an incorrect safety indication on train driver displays as conditions for entry. This means that the first mass evacuation exercise is now scheduled to take place in mid-February 2022, with the aborted or failed exercises from Phase 1 re-run beforehand.

The Christmas/New Year blockades were implemented to plan, with signalling software ELR110 and train software H5.4 successfully deployed, and outstanding rail systems works completed. However, reliability running carried out in early January 2022 delivered mixed results. Unresolved known faults such as those affecting the Timetable Processor and train cab HMI (Human Machine Interface) persist, and new issues have arisen with the GEML signalling transition and yellow plant. PPM levels are significantly below target with excessive times to recover the service compounding the problems. Overall railway reliability still falls short of levels expected at this stage of Trial Operations. While the decision to proceed towards Trial Operations Phase 2 was not wholly predicated on railway performance levels, rapid improvements in reliability are now needed to demonstrate that sustainable operations will be possible once passenger services have started.

All railway infrastructure installation is effectively complete, and future performance gains will be achieved through major rail system software changes, process improvement and growing staff experience. The software changes include a TVS upgrade and ELR200 deployment for signalling; both are planned for Easter 2022, but neither is strictly necessary for entry into Passenger Service.

RfLI continues to address Auto-Reverse with the ORR and plans to complete testing in the first quarter of 2022. Alternative arrangements to de-risk Stage 5B are being investigated, should this issue not be resolved prior to Stage 3 Passenger Service.

Works carried out at Canary Wharf Station over the Christmas 2021 period resulted in better alignment and understanding between CRL and RfLI on the requirements for BIU; this contributed to BIU being achieved on 21 January 2022. Large amounts of asset data and documentation remain to be delivered before the planned contract completion date in [REDACTED] 2022.

CRL and RfLI have made progress with the delivery of safety assurance, but completion before the start of Passenger Service remains challenging, despite the deterministic date slipping to [REDACTED] March 2022 in the period; there is also unlikely to be sufficient time to build railway reliability before this date. Given that ELR200 is scheduled for deployment shortly afterwards, in mid-April 2022, deferral of Stage 3 opening until the benefits of the software upgrade have been demonstrated appears an attractive proposition. This would avoid disruptive impacts on a newly-opened passenger railway, which have been experienced with previous software deployments. CRL's P50 date for the start of Passenger Service is reported as [REDACTED] May 2022 and we believe it is more likely that passenger services will start closer to this date than the deterministic date. The P80 date remains within the declared opening window of the first half of 2022.

<sup>1</sup> The safety case for entry into Trial Operations Phase 2 was accepted by ITAP on 28 January 2022.

Minor change is indicated for the P50 date for Stage 5B opening, with a [REDACTED] deterioration to [REDACTED], and a [REDACTED] improvement to the Stage 5C P50 opening date, to [REDACTED] March 2023. The risk that the achievement of a reliable 24 TPH service may not be aligned with the Go/No-Go reviews and timetable bidding process for Stage 5C remains, and Stage 5C opening might be driven back to May 2023 as a consequence.

The Sponsors' particular attention is drawn to the following:

- CRL and RfLI committed to the start of full Trial Operations on 29 January 2022, with all exercises planned to be completed before Shadow Running on [REDACTED] March 2022.
- ITAP safety case acceptance for full Trial Operations is in progress, but the securing of authority for entry into Passenger Service against deterministic dates will be challenging.
- Railway reliability growth remains below expectation and there might be benefits in deferring Stage 3 Passenger Service until after ELR200 deployment in April 2022.
- Bond Street Station delivery completion remains uncertain, with baseline schedule, costs and risks to passenger opening yet to be finalised by CRL.
- The start dates for Passenger Service and Stages 5B and 5C are critically linked by reliability growth, and several technical issues remain beyond Stage 3 for resolution.

## 1.2 Health and Safety

Overall safety indicators remain within those set by the Programme. The escalation of Covid during December 2021 posed a risk to the Programme, but detailed planning and good management during the blockades meant this risk did not materialise.

## 2. Programme Overview

### 2.1 Schedule

CRL has maintained progress towards the start of Trial Operations Phase 2 on 29 January 2022<sup>2</sup> but is reporting a [REDACTED] slippage in the deterministic date for the achievement of the Stage 3 Passenger Service cardinal milestone, moving from [REDACTED] March 2022 to the [REDACTED] March 2022. This is primarily driven by a resequencing of the Trial Operations Phase 2 mass evacuation exercises, with the last major trial taking place at Paddington Station.

Achievements during the period<sup>3</sup> include commissioning of CMS software version 28.0, GEML Auto-Transition commissioning and Tier 1 contractor demobilisation at Whitechapel Station.

The schedule critical path currently runs through the completion of Trial Operations Phase 2 leading into Shadow Running from [REDACTED] March 2022, ahead of entry into Passenger Service on [REDACTED] March 2022.

<sup>2</sup> The safety case for entry into Trial Operations Phase 2 was accepted by ITAP on 28 January 2022.

<sup>3</sup> Period 9 as regards schedule reporting includes progress and decisions up to the end of Period 10 Week 1.

## 2.2 Commercial and Risk

For Period 10, CRL is reporting a draft P50 AFDCD [REDACTED], which is an increase of [REDACTED] from the final Period 9 AFDCD forecast. The total cost pressure at Period 10 was [REDACTED]<sup>4</sup>, comprising [REDACTED] at Bond Street Station, [REDACTED] for Indirect Costs and [REDACTED] at C660. These Project & Indirect increases were partially offset by a [REDACTED] drawdown from provision releases and transfers, resulting in the [REDACTED] forecast increase. Rather than assume and commit to cost mitigation, as undertaken from the Scope Gap at Period 9, CRL is seeking an opportunity to offset the [REDACTED] cost increase currently reported at Period 10. Under current circumstances, we view the Period 10 AFDCD to be cautiously overstated, but we have concerns regarding the apportionment of Risk and Provision allowances.

At Period 9, CRL advised that an assessment had been conducted valuing the Scope Gap cost provision to be [REDACTED] lower than included in previous cost forecasts. However, this reduction was reflected as an opportunity, pending validation by the CRL Programme team. The proposed revision is a combination of Orders of Magnitude items which are no longer required, or are covered elsewhere. This approach would suggest that the Period 9 Scope Gap provision has reduced from [REDACTED] to [REDACTED], whereas CRL is reporting the Period 10 Scope Gap provision to be [REDACTED]. It is unclear to us why scope gap provision is still being made at this late stage of the Programme. Consequently, we regard the cost forecast to be dynamic and not corroborated between the various exercises CRL is conducting.

CRL has yet to show the complete elemental breakdown of its Period 10 AFDCD, particularly its provisional costs; however, we expect this will be presented to the Period 10 ELDG<sup>5</sup> and will show the reasoning and direction of travel of the provisional allowances.

CRL continues to pursue delivery of the Programme against the £825m funding package, but it recognises that this is a significant challenge and that opportunities are diminishing. CRL has undertaken an alternative approach to its funding forecast, in which it utilises an itemised assessment for all identified works and scope, with the objective of assessing the feasibility of staying within the £825m funding package.

We believe that, in order for CRL to remain within the approved funding, the majority of the residual Project, Programme and Prolongation Risk will need to be eliminated or retired; it is unlikely that this will be achieved in full.

## 2.3 Organisation

The Paddington Station Tier 1 contractor has been frustrated by restricted access and late supply issues. Consequently, CRL is targeting the end of January 2022<sup>6</sup> for Tier 1 demobilisation, with contract completion by early [REDACTED] 2022. Canary Wharf Station BIU was achieved on 21 January 2022, and there is now a need for focus on assurance and contract close-out to enable the Tier 1 contractor to demobilise by the forecast date of the end of [REDACTED] 2022.

CRL critical engineering and management resources have been focussed on the successful delivery of the Christmas/New Year blockades, and this has affected the transfer of management responsibilities between CRL and RfLI. As a result, completion of organisation transition might be slightly delayed to allow the final arrangements to be implemented, and this may have an impact on the demobilisation of some resources.

<sup>4</sup> CRL has reported a rounded total.

<sup>5</sup> Scheduled for 3 February 2022.

<sup>6</sup> CRL has yet confirm that this was achieved.

## 2.4 Stage 3 Trial Running, Trial Operations and Passenger Service

Software upgrades ELR110 and H5.4 were installed during the Christmas/New Year blockades. These were generally effective in addressing the faults that they were designed to fix, but operating performance is still variable. Trial Operations exercises are generally being completed as planned.

Despite an improvement in railway performance, the reliability criteria for entry into Trial Operations Phase 2 had not been achieved by the Go/No-Go review held on 11 January 2022. The continuing shortfall in performance is due to new issues arising since the software designs were completed, poor train reliability and the need for further staff learning. Nevertheless, CRL and RfLI decided to continue to target Trial Operations Phase 2 on 29 January 2022, on the basis that this was not a commitment to a specific passenger service start date, and it would allow statutory mass evacuation exercises to be completed; these start on 13 February 2022 and finish on 13 March 2022. This approach would also allow final assurance to be delivered by mid-March 2022, effectively freeing the Elizabeth Line to enter passenger service from the end of March 2022, subject to reliability targets being met. Entry into Passenger Service is largely dependent upon when the railway is able to perform consistently at a reliable level, and it is appearing more likely that this will be after the Easter 2022 blockade and the deployment of ELR200.

RfLI is generally unable to complete all scheduled maintenance work because of time being lost when establishing and removing night-time possessions. Resolutions are being progressed, and these will need to be implemented soon because possessions are currently longer than provided for in passenger service. RCC workload has reduced following the deployment of ELR110, but further improvements, such as timetable loading, are required to enable staff to manage the railway effectively in service.

## 2.5 Stations Commissioning and Handover

Following a period of intense activity and schedule mitigation, Canary Wharf Station BIU was achieved on 21 January 2022. Additional EOWs and assurance needs to be completed during Trial Operations Phase 2; these activities are on the schedule critical path for Passenger Service.

Development of the baseline schedule, costs and risks to passenger opening has yet to be finalised at Bond Street Station; the earliest opening is still expected to be in Summer 2022. [REDACTED]

[REDACTED]  
With physical works still to be completed to allow SC2 Enactment before the start of Trial Operations Phase 2, Bond Street Station remains CRL's delivery focus.

All physical works at Whitechapel Station were completed by the end of December 2021, with contract close-out planned by [REDACTED] 2022.

CRL is targeting completion of all physical and documentation work associated with outstanding EOWs at Paddington Station by the end of January 2022<sup>7</sup>. This will allow a final contract close-out position to be established in February 2022 and contract completion by early [REDACTED] 2022.

## 2.6 Assurance

While beyond the end date of Period 10, CRL and RfLI made sufficient progress with assurance delivery to secure ITAP acceptance of the safety case for Trial Operations Phase 2 on 28 January 2022.

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<sup>7</sup> It has yet to be confirmed that this was achieved.

The assurance workstreams will continue to work at full capacity throughout Trial Operations Phase 2. Twenty-five SJs will require updating for review and acceptance by RfLI and ITAP, following the closure of EOWs and Dependencies. CRL will need to complete and submit Technical Files to the ORR to receive an Authority to Place into Service (APIS) and RfLI must submit its safety assurance deliverables to ITAP. CRL and RfLI have [REDACTED] from the start of Trial Operations Phase 2 to complete these activities and meet the Stage 3 opening date of [REDACTED] March 2022. There is likely to be little contingency within these timescales, but both parties appear to be aligned in delivery.

## 2.7 Future Stages

CRL and RfLI continue to target Stage 5B services starting from the deterministic date of [REDACTED]. Slow reliability growth and uncertainty as to when Auto-Reverse functionality will be available drive a P50 date of [REDACTED].

Deployment of the Auto-Reverse continues to be delayed due to issues with technical functionality and safety approvals. Auto-Reverse is currently unable to reliably support the timetable and CRL believes it has identified a technical solution which will require a software change by both the rolling stock and signalling contractor. However, implementation by [REDACTED] will be challenging and it is more likely that the fix will be in place after late [REDACTED]. Site works such as additional CCTV installation are also required, which could extend beyond [REDACTED]. RfLI and MTREL are planning mitigations in case Auto-Reverse is not available (e.g. operating derogations such as reduction of services, increased journey times). A decision to build the timetable with or without full Auto-Reverse functionality will need to be made by late [REDACTED], and this will determine what Stage 5B services, if any, could be operated in [REDACTED].

The decision to proceed with Stage 5B services in [REDACTED] needs to be made in [REDACTED], to enable driver rosters to be developed in time for implementation with the timetable change. Reliability growth of the 12 TPH service is behind plan, and is likely to delay the start of Stage 3 towards the P50 date. There has also been no opportunity to carry out 24 TPH service demonstrations, with only one now scheduled before the planned start of Stage 3 on [REDACTED] March 2022; thereafter, opportunities for testing and reliability demonstrations will become more restricted once the railway enters passenger service. We are concerned that there may not be sufficient evidence that the railway will operate a reliable 24 TPH service by [REDACTED].

Stage 5C is scheduled to start in [REDACTED] December 2022, with the primary risk to achievement being any delay to Stage 5B opening at 24 TPH. This means that there is little time to absorb any lessons before implementing the more complex Stage 5C service patterns. It also highlights that delivery dates of key functionality such as Auto-Reverse are close to Stage 5C opening. NR is likely to approach this situation with caution when it is considering whether the December national timetable change (incorporating Stage 5C services) goes ahead as planned. This is because Stage 5C has a greater impact upon the national network, and NR will want to ensure that there is as little risk of disruption to GW and GEML services as possible. If Stage 5C is delayed, the next opportunity for implementation will be in May 2023.

The start of Stage 3 Passenger Service is an important interim milestone towards Stage 5C opening. While it remains the current Programme focus, subsequent activities such as delivery completion, reliability growth and the progressive development of Elizabeth Line operating best-practice, will be the key to securing Stages 5B and 5C in the challenging timescales that remain.