

## Project Representative Report

**Item: Project Status Report 158 and Crossrail  
Response Period 9 FY2021-22**

**Date: Period 9 (13 November 2021 - 10 December 2021)**

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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

### 2 Contents

1	Crossrail response on the Project Representative Sponsor Summary Report Period 9 FY2021-22 .....	2
2	Project Status Report 158 Period 9 FY2021-22 .....	21



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

20 January 2022

Dear ██████████

**Re: Crossrail PRep Project Status Report 158 – Period 9**

I am writing in response to the PRep Sponsor Summary cover letter for Period 9.

As noted in your letter and as I stated in my last correspondence, we successfully completed all planned works over the festive period including the Tunnel Ventilation System upgrade, the commissioning of the latest Siemens signalling software (ELR110), the roll out of the updated Alstom Train software (v5.4), upgrade the SCADA communications system (v28) as well as the replacement and commissioning of all 36 Voltage Transformers. These completed works and upgrades move us closer to readiness for Trial Operations Phase 2 and subsequently Revenue Service.

The first phase of Trial Operations is well underway, and it is proving to be very beneficial. As you point out some exercises have been impacted by reliability. However, we anticipated these issues and built contingency into our Trial Operations schedule for that very reason. I am confident that we will complete all the planned exercises within the time allowed. Trial Operations Phase 2 is on target to commence on 29 January 2022 with a conditional 'GO' achieved at the latest review meeting that took place on 11 January 2022.

Clearly, we are managing the two parallel tasks of getting the railway ready to accept passengers and growing system reliability to a level that would be able to support the opening of the railway. I still believe this to be the correct agile approach to achieving the earliest possible opening.

I acknowledge your concern that Canary Wharf station did not achieve transfer to RFLI in 2021. As I mentioned in my last correspondence, the key issues have been the quality of electrical installations and completion of extensive safety critical upgrade work. Clearly safety comes first, and the rectification work is now nearing completion. We plan to complete the transfer of Canary Wharf station in January 2022.

We have also decided that Bond Street station will be delivered in a single phase with both the Eastern and Western Ticket Halls open to support Revenue Service by the ██████████ ██████████ at the earliest.

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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 9 PRep Report

Programme Response Category	PRep Period 9 Sponsor Summary Content	CRL Period 9 Response
<p><b>Headlines: Progress and Look Ahead</b></p>	<p>CRL has deferred the start of Trial Operations Phase 2 from 15 January 2022 to 29 January 2022. This delay provides a week of timetable train running opportunity following the completion of the December 2021/January 2022 blockades, to establish and demonstrate improved and consistent levels of railway reliability. The additional time will also be used to complete any failed or deferred staff exercises from Trial Operations Phase 1. A Go/No-Go review on 11 January 2022 will determine whether the reliability improvements are sufficient to support the Phase 2 mass evacuation exercises.</p> <p>Three blockades were planned for the end of 2021. The first started in mid-December 2021, assigned to the completion and final commissioning of the TVS. Subject to acceptance of safety assurance, this will allow progression into Trial Operations Phase 2 and facilitate the mass evacuation exercises. A further TVS software upgrade will take place during a planned Easter 2022 blockade; this is not required before entry into Passenger Service<sup>1</sup>.</p> <p>A second blockade took place over the Christmas 2021 period to allow the deployment of signalling software ELR110, and a third in early January 2022 for the replacement of failed Voltage Transformers. All blockades were</p>	<p>Conditional 'GO' status was achieved at the review meeting held on 11 January 2022 in readiness to commence Trial Operations Phase 2 on 29 January 2022. Management to close-out of the key conditions is set to de-risk achieving our desired improved and consistent reliability railway performance.</p> <p>Agree.</p> <p>Agree. All blockade works were completed as planned.</p>

## Appendix – CRL Response to Period 9 PRep Report

	<p>implemented against a backdrop of increasing Covid risk, and CRL and RfLI made specific resource arrangements to ensure cover throughout the works. Early indications are that all three blockades were completed successfully.</p> <p>There has been mixed railway performance in the first few weeks following entry into Trial Operations Phase 1, and a demonstration of a consistently reliable and sustainable infrastructure performance has not yet been achieved. Unresolved known faults, emerging new faults with the Timetable Processor and Wayside Cabinet Units, and the transient tripping of traction power supplies, have resulted in PPM levels which are below target and in excessive times to fix. Evidence of meaningful reliability improvement is not anticipated until mid-January 2022, following deployment of software ELR110, the roll-out of train software H5.3 and the completion of outstanding rail systems works.</p> <p>The remaining Auto-Reverse tests are scheduled for completion in January 2022, pending acceptance of the revised safety argument.</p> 	<p>Following the successful completion of the works planned over the festive period, the first week of post ELR110 operation shows a positive PPM increase (average 80.4%). Reliability of the railway has not yet achieved the criteria that was set for Trial Operations Phase 2, however, the initial days of data available since operations recommenced on 4 January 2022, show majority of the issues and delays appear to be related to start-ups and close. All reliability issues are driven and actioned through Critical Issues and key points discussed at Elizabeth Line Reliability Board (ELRB) and Passenger Service Steering Group (PSSG) that consider service impact, operability, and maintainability.</p> <p>A positive risk review meeting was held with Office of Rail and Road (ORR) on 11 January 2022 where ORR requested further evidence of controls implemented by Network Rail (NR) to support resumption of trials at Westbourne Park. The timetabled trials planned for 16 January 2022 to demonstrate the first 24TPH Auto-Reverse functionality was completed with 31 successful and four unsuccessful runs.</p>
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## Appendix – CRL Response to Period 9 PRep Report

	<p>Services under the C620 Signalling are being extended by CRL. C620 will be required to commit to the supply of specialist resources for the period of passenger service into 2022/23, to confirm the access windows for ongoing software drops into 2022 and the scope requirements for ELR 400 development. Both C610 Rail Systems and C660 have supported RfLI in addressing faults since entry into ROGS in late March 2021, and C660 still requires RfLI confirmation of the criticality and completion priority of approximately 300 EOWLs during passenger service. With C610 extended to May 2022, it is important that RfLI makes more effective supply chain arrangements for maintenance resilience after entry into Passenger Service.</p> <p>Canary Wharf Station has consistently missed target BIU dates since early November 2021 and issues with electrical certification and acceptance of works remain outstanding between CRL and RfLI. Additional resources and prolongation are necessary to modify lifts and close dilapidation surveys, with likely schedule impact. BIU must be achieved before Trial Operations Phase 2 to provide emergency evacuation functionality and the new target date is expected to be no later than 20 January 2022<sub>2</sub>. Further clarification is required between CRL and RfLI on the works to be completed for the station to be ready for start of Passenger Service.</p>	<p>C620 signalling contract has always been planned to continue until December 2022 with the delivery of ELR300 signalling software, followed by contract closeout by March 2023.</p> <p>Agree and noted.</p>
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## Appendix – CRL Response to Period 9 PRep Report

	<p>CRL has confirmed that Bond Street Station will not be ready for the start of Passenger Service in March 2022. The station will be delivered in a single stage, with both ticket halls expected to be available in [REDACTED] at the earliest. Consequently, there is an emerging substantial cost pressure associated with the extension of resources and design changes resulting in additional work. A firmer delivery date is expected early in January 2022, following schedule re-baselining and risk assessment.</p> <p>The deferral of the start of Trial Operations Phase 2 has directly impacted the deterministic date for the start of Stage 3 Passenger Service, which has moved from [REDACTED] March 2022 to [REDACTED] March 2022. While CRL has outlined the justification for this delay, it is unclear whether the additional time is sufficient for the completion of all necessary works and, critically, to allow sufficient railway reliability growth for entry into Passenger Service. CRL's P50 date for the start of Passenger Service is reported as [REDACTED] May 2022; given the risks described in this section, we believe it is more likely that passenger services will start closer to the P50 date rather than the deterministic date. The P80 date remains within the declared opening window of the first half of 2022.</p>	<p>Agree.</p> <p>The impact of the provisional 'GO' at the Trial Operations Phase 2 review and the decision to defer the first mass evacuation exercise to a contingency slot is being assessed as part of the DCS1.2 review. The results of this will be reported in Period 10.</p>
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## Appendix – CRL Response to Period 9 PRep Report

	<p>Minor change is indicated for the P50 date for Stage 5B opening, with a [REDACTED] improvement to [REDACTED], and a [REDACTED] deterioration of the Stage 5C P50 opening date, to [REDACTED] March 2023; these are due to increasing reliability risk and the potential for additional software updates. There is a growing risk that the achievement of a reliable 24 TPH service may not be aligned with the Go/No-Go and [REDACTED] for Stage 5C; Stage 5C opening might be driven back to May 2023 as a consequence.</p> <p>Sponsors' particular attention is drawn to the following:</p> <ul style="list-style-type: none"> <li>• Progress with the Trial Operations Phase 1 exercises has been impacted by poor overall railway reliability, and improved performance following blockade completion has yet to be demonstrated.</li> <li>• The case for safety for full Trial Operations remains outstanding, and there is limited time during Trial Operations Phase 2 for securing authority for entry into Passenger Service.</li> <li>• Railway reliability growth remains below expectation and there is limited schedule opportunity to meet readiness and entry targets for Stage 3 Passenger Service.</li> </ul>	<p>Agree.</p> <p>In response to the four issues for attention, CRL responds as follows:</p> <p>Improved performance has been observed following the blockade completion, however, other factors including train and depot performance are now affecting overall system reliability.</p> <p>The programme for achieving close out of safety assurance required for entry into Revenue Service remains on track.</p> <p>Agree.</p>
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## Appendix – CRL Response to Period 9 PRep Report

	<ul style="list-style-type: none"> <li>• Timeliness of acceptance of the remaining handover works for Canary Wharf Station readiness poses a threat to the start of Trial Operations Phase 2.</li> </ul> <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>Agree and noted.</p> <p>Agree.</p>
<p><b>Health &amp; Safety</b></p>	<p>Overall safety indicators remain within those set by the Programme. While there have been incidents of operational procedure non-compliance, these have generally not been safety related. The escalation of Covid during December 2021 poses a risk to the Programme in the coming periods, although past performance gives confidence that CRL and RfLI are able to manage this threat.</p>	<p>Agree.</p>
<p><b>Programme Overview:</b></p> <p><b>Schedule</b></p>	<p>The T-4 readiness review held on 14 December 2021 concluded that the deterministic dates for Trial Operations Phase 2 and the start of Passenger Service should be slipped by 2 weeks<sup>3</sup>. This has resulted in the start of Trial Operations Phase 2 moving from 15 January 2022 to 29 January 2022, and Passenger Service from ■ March 2022 to ■ March 2022. The decision was largely driven by issues with railway reliability, incident recovery times and</p>	<p>Agree and noted. As mentioned previously, Trial Operations Phase 2 review outcome is a conditional 'GO'.</p>

## Appendix – CRL Response to Period 9 PRep Report

<p><b>Commercial and Risk</b></p>	<p>the schedule slippages in the Trial Operations Phase 1 exercises.</p> <p>Achievements during the period<sup>4</sup> include the takeover of the Back-Up Control Facility (BU CF) by RfLI, the completion of the TVS upgrade and commissioning works during the first blockade, and approval of the H5.3 rolling stock software.</p> <p>The schedule critical path currently runs through the completion of the second and third blockades for ELR110 and the Voltage Transformer replacement, respectively, followed by one week of timetable train running prior to the re-scheduled Trial Operations Phase 2 Go/No-Go review on 11 January 2022. If commitment is made at this meeting, volunteers will be mobilised to start mass evacuation exercises from 29 January 2022. Completion of Trial Operations Phase 2 will lead into Shadow Running from █ March 2022, ahead of entry into Passenger Service on █ March 2022.</p> <p>CRL reported that the draft AF CDC has increased to █. This increase is a consequence of █ cost pressures across the Programme, principally at Bond Street Station. Although this overall increase has been partially offset by risk drawdowns, we would expect the residual █ increase to be further covered by risk or provision allowances, at this stage.</p>	<p>Agree.</p> <p>Agree. At the Trial Operations Phase 2 review held on 11 January 2022, it was agreed that in light of the risks, the first volunteer exercise scheduled for 29 January 2022 should be deferred, with the contingency slot on 12 March 2022 being the suggested alternative date. This will be confirmed at the next review meeting.</p> <p>The final Period 9 AF CDC is £15,939m, unchanged from Period 8. Following Executive review, it has been decided that there were sufficient opportunities not yet recorded in the AF CDC to justify the inclusion of an offset to the █ increase.</p>
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## Appendix – CRL Response to Period 9 PRep Report

	<p>CRL confirmed at the EPPR<sub>6</sub> that it would focus on rationalising its Scope Gap provisions, currently reported at [REDACTED]. CRL is proposing to report an unconfirmed Scope Gap reduction opportunity to the Period 9 ELDG to mitigate the AFCDC increase. Part of this proposal includes Scope Gap transfer to the COO reserve, but this will not reduce the AFCDC. The Scope Gap provision covers specific identified works awaiting decision on their respective implementation, including [REDACTED] for EHIP Power Upgrade works at Plumstead Depot. Consequently, available cost reductions from Scope Gap may be nominal and are subject to definitive decisions from CRL and RfLI.</p> <p>Despite pressures continuing to emerge from limited and identified cost centres, we continue to believe such increases can be covered by current risk and provision allowances; at Period 9, CRL reports these allowances to be [REDACTED], which represents [REDACTED] of total Cost-to-Go (CTG).</p> <p>The AFCDC increase appears to conflict with CRL’s objective to achieve an outturn as close as possible to the additional £825m funding package. There is [REDACTED] in Risk and Provision allowances to offset the [REDACTED] funding gap to the P50 AFCDC. We believe that the outturn AFCDC will be closer to the current P50 forecast.</p> <p>Notwithstanding that nearly a third of this risk and provision allowance is allocated, we expect</p>	<p>CRL agrees with the Project Representative’s comments regarding the Scope Gap reduction. However, the order of magnitude related to the items within the scope gap provision will also be reviewed with all relevant parties prior to any transfer to the COO reserve.</p> <p>CRL agrees with the Project Representative’s comments regarding the following amendments to figures: At Period 9, CRL reports these allowances to be [REDACTED], which represents [REDACTED] of total CTG.</p> <p>The Period 9 AFCDC is £15.939m, unchanged from Period 8. There is [REDACTED] in risk and provision allowances to offset the £150m funding gap to the P50 AFCDC. Whilst it is our objective to achieve an outturn as close as possible to the £825m, the Programme has always stated that the requirement could be up to £1.1bn.</p> <p>Central provisions are currently being managed to enable the offset of any emerging cost</p>
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## Appendix – CRL Response to Period 9 PRep Report

<b>Organisation</b>	<p>the CEO reserve is likely to offset the Period 9 AFCDC increase, and slippage to Canary Wharf and Bond Street Stations and to Trial Operations Phase 2 will draw on prolongation and risk allowances. CTG reduction opportunities achieved to date have been used to offset emerging cost pressures, and further cost reductions have yet to materialise. Milestone achievement continues to move towards P50 dates, and P50 risk provisions are likely to be drawn down.</p> <p>Demobilisation of the station Tier 1 contractors at Paddington and Whitechapel Stations is on schedule for completion by the end of 2021. That will only leave Tier 1 contractors engaged at Canary Wharf and Bond Street Stations. C610 Rail Systems has already been instructed to remain until the end of May 2022 to act in a Principal Contractor role, undertake final TVS upgrades and resolve issues associated with the stalling of fans. Arrangements for C620 Signalling support beyond the start of Stage 3 Passenger Service are being formalised by CRL.</p>	<p>pressures. CRL continues to keep risks and opportunities under review and ensure that there is full alignment to the schedule.</p> <p>Regarding the stations, this statement is not strictly correct. Work at Canary Wharf and Bond Street stations is being led by our delivery teams, therefore, CRL is effectively the principal contractor at both stations. Tier 1 contractors are still engaged to deliver assurance documentation and drawings as well as any late instruction for Back of House Safety Screens at Whitechapel station. There will be Tier 1 contractor engagement at Paddington and Whitechapel stations until mid-Feb 2022 and May 2022 respectively.</p> <p>The plan has always been for C620 to continue until December 2022 with the delivery of ELR300 signalling software followed by contract closeout by ██████████ 2023.</p> <p>C610 contract packages are on target to meet Trial Operations Phase 2 date of 29 January 2022. Tier 1 site demobilisation scheduled for 1 April 22 and Tier 1 works certified complete</p>
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## Appendix – CRL Response to Period 9 PRep Report

<p><b>Stage 3 Trial Running, Trial Operations and Passenger Service</b></p>	<p>CRL is concerned that RfLI is not yet in a position to undertake more work without assistance and be less reliant on the support of Tier 1 contractors. It is not unreasonable now for RfLI to correct faults with assets that have already been handed over, or alternatively make direct arrangements with the supply chain. The retention of Programme support to undertake these works is contributing to the prolongation of the Tier 1 Routeway contractors.</p>	<p>scheduled for 27 May 2022 are also on target as per the DCS1.2.</p>
	<p>While, in Period 9, CRL's full time equivalent resource is forecast to marginally reduce to 936, against a Period 8 total of 942<sub>7</sub>, the trend indicates that demobilisation will increase markedly from Period 10; this aligns with an agreed reduced CRL organisation structure in early 2022. The most significant drop-off in resources continues to be forecast for Periods 12 and 13; this remains aligned to the deterministic date for the start of Passenger Service.</p>	<p>Agree and noted.</p>
	<p>The railway has performed inconsistently since the start of Trial Operations Phase 1 on 20 November 2021. Once completed and fully operational, PPM levels of over 95% are expected, but weekly performance indicators from November 2021 show the achievement of PPM averages of between approximately 60%</p>	<p>Agree.</p> <p>Following the successful completion of the works planned over the festive period, the first week of post ELR110 operations shows a positive PPM increase (average 80.4%). Reliability of the railway has not yet achieved the criteria that was set for Trial Operations Phase 2, however, the five days of data available since operations</p>

## Appendix – CRL Response to Period 9 PRep Report

	<p>and 80%<sup>8</sup>. These figures are low for a railway undergoing Trial Operations. The underlying reason for the poor performance is the ongoing occurrence of a range of known and relatively low significance faults across the whole railway, which aggregate to become major performance disruptors. Some fixes are not yet allocated to future software builds.</p> <p>Delivery of the suite of staff exercises planned for Trial Operations Phase 1 has also been impacted by poor system performance. A total of 179 tests are planned in Phase 1, and 30% of those undertaken so far have had to be aborted due to system failure; of the 50 tests completed, 20% have failed<sup>9</sup>. We are concerned at this performance, given that these are the least complex of the Trial Operations exercises to be undertaken. Those not passed are being re-planned for January 2022.</p> <p>Despite the schedule slippage, CRL has implemented the December 2021/January 2022 blockades as planned. Reliability running will then take precedence for a week in lieu of Trial Operations exercises. A review on 11 January 2022 will consider if the levels of improvement necessary for entry into Trial Operations Phase 2 and Passenger Service have been achieved. If so, CRL and RfLI anticipate completing the deferred Phase 1 exercises before the end of January 2022 start to Phase 2. Canary Wharf</p>	<p>commenced on 4 January 2022 show majority of the issues and delays appear to be in relation to start-up and close mechanisms. All reliability issues are driven through Critical Issues and key points discussed at ELRB and PSSG.</p> <p>Following the decision to re-forecast Trial Operations Phase 2 for 29 January 2022, a comprehensive programme review was carried out on 20 December 2021. The review considered how to recover aborted Phase 1 exercises in the newly available space. As part of the Trial Operations review meeting held on 11 January 2022, it was considered practicable to schedule and manage large scale volunteer exercises to mitigate the reliability risks but that the first volunteer exercise should be deferred. A date for the deferment will be confirmed at the next review.</p> <p>As mentioned above, Trial Operations Phase 2 review considered aborted Phase 1 exercises and the requirement to defer first volunteer exercises. However, Canary Wharf station works continue apace leading to confirmation that bringing into use will be on the 21 January 2022.</p>
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## Appendix – CRL Response to Period 9 PRep Report

<p><b>Stations Commissioning and Handover</b></p>	<p>Station completion is also required for the start of Phase 2.</p> <p>While the configuration of the railway is now largely agreed between CRL and RfLI, there are around 70 areas that will not be complete for the start of Passenger Service. These might necessitate the application of operational mitigations or the relevant works to be completed. Completion may require additional access to be secured but, with little available, schedule dates might be threatened.</p> <p>A number of Traffic Managers have resigned from RfLI; this is an area that RfLI continues to monitor closely, as the period for recruitment and training could result in new staff not being secured in time.</p> <p>RfLI now considers that it has a way forward for the remaining three tests for confirming Auto-Reverse functionality. These are planned for early January 2022 but are not required for entry into Stage 3 Passenger Service.</p> <p>The Employer’s Completion Process (ECP) is complete and Works Completion Certificates</p>	<p>Configuration of the railway at Trial Operations Phase 2 and Revenue Service has been confirmed with all configuration deltas identified by RfLI and articulated against each phase; this has been accepted by RfLI with only five deltas contested. All five of the contested deltas are being resolved to RfLI's approval. The Programme is conducting a series of summit workshops to collect all inputs, assess options and recommend an intervention access schedule during Trial Operations as well as strategic choices to allow access during Revenue Service.</p> <p>Sourcing of competent staff and a revised Establishment Competency Plan is in place to build to 32 Traffic Managers by 31 May 2022. Recruitment interviews shall be completed by 18 January 2022. Workstations 1 and 2 courses and ATW(i) processes has also been reviewed to speed up performance and pass rates.</p> <p>The remaining three Auto-Reverse tests were completed on 16 January 2022.</p> <p>Agree.</p>
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## Appendix – CRL Response to Period 9 PRep Report

	<p>have been secured at Farringdon and Woolwich Stations; ECP was completed at five Shafts and Portals.</p> <p>Canary Wharf Station has struggled to meet target dates for BIU, having missed 4 November 2021 and 7 December 2021; the most recent target date of 17 December 2021 has also been deferred. This is in part because the volume and complexity of the assurance works has proved too challenging, but also because inconsistencies in the reporting of data has contributed to misunderstanding between CRL and RfLI of the true status of the quality and acceptance of the works. This has affected cable replacement works, fire certification activities, lighting and mechanical elements, LV distribution boards and the closure of Dependencies. Inspections and agreement between CRL and RfLI on the achievability of the remaining handover completions, will determine the new target date for BIU, which is expected to be no later than 20 January 2022<sup>10</sup>. CRL does not yet fully understand whether additional EOWs and assurance needs to be completed after BIU and prior to SC3 ROGS for Passenger Service. Any RfLI requirement for additional EOWs to be closed by CRL might threaten the start of Passenger Service.</p> <p>A Go/No-Go meeting held on 2 December 2021 concluded that it would not be possible to complete and open Bond Street Station in time to meet any March 2022 deterministic date for Passenger Service. Both ticket halls will now not</p>	<p>Canary Wharf station did not achieve BIU in 2021 due to ongoing electrical installation issues and the safety element of the critical upgrade works. However, works continue swiftly at the station resulting in confirmation that BIU is set for 21 January 2022.</p> <p>Agree and noted.</p>
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## Appendix – CRL Response to Period 9 PRep Report

	<p>be ready for SC3 ROGS until [REDACTED], and CRL will confirm a date in January 2022 following further assessment and schedule re-baselining. The main challenges are with completing additional commissioning testing and achieving a staged ticket hall opening with segregated fire systems that meet statutory requirements. [REDACTED]</p> <p>CRL’s delivery focus remains on Bond Street Station, with its highest number of resources (approximately 800) now engaged on completing this station.</p> <p>CRL is targeting completion of all physical and documentation work associated with outstanding EOWs at Paddington Station by the end of January 2022. This will allow a final contract close-out position to be established in [REDACTED] 2022. In the meantime, the MoBo has been extended, which has given rise to some cost increase.</p> <p>CRL is targeting to finish all physical works at Whitechapel Station by the end of December 2021, with contract close-out by [REDACTED] 2022. A risk associated with completion of station platform cages after March 2022 is expected to be addressed in early January 2022.</p>	<p>Agree.</p> <p>Completion of physical works at Paddington station is now targeted for mid-February 2022 due to access restraints. MoBo is complete as is demobilisation.</p> <p>Completion of physical works at Whitechapel station is targeted for end of January 2022 with exception of platform cages which will be covered by a small team forecast to complete in April 2022.</p>
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## Appendix – CRL Response to Period 9 PRep Report

<p><b>Assurance</b></p>	<p>Evidence of successful installation and testing from the December 2021 and January 2022 blockades will provide substantial support to the overall railway safety case; this is expected to be processed into formal document submissions in early January 2022. While CRL and RfLI remain positive, we believe the assurance workload is extremely challenging, despite the potential schedule relief offered by the slippage of the target start of Trial Operations Phase 2 to 29 January 2022.</p>	<p>Agree.</p>
<p><b>Future Stages</b></p>	<p>The December 2021 timetable has been successfully implemented. This already incorporates the train paths required under the May 2022 timetable application, agreed between NR and MTREL. Stage 5B services will operate from May 2022, with GE and GWML trains terminating at Liverpool Street and Paddington High Level Stations, respectively. Through-running of services via the Central Section is planned to start from [REDACTED].</p> <p>The decision to commit to through-running is expected to be made in [REDACTED]. All parties will need to be confident that the timetable can operate reliably at 24 TPH through the Central Section by [REDACTED], but current 12 TPH performance suggests this will be a significant challenge. A better understanding of 24 TPH performance capability is anticipated in late January 2022, following 24</p>	<p>The December 2021 timetable saw some additional peak services transferred from GWR to TfL Rail. The May 2022 timetable has been offered by NR to MTREL. This changes the times of trains but not frequencies and facilitates the implementation of Stage 5B at any point within the timetable period.</p> <p>The step up from 12TPH to 24TPH will be a considerable challenge and will require a significant improvement on current performance both in terms of the system and organisational response and management. The impact of upgrades made over the Christmas period are being evaluated and reinforcement initiatives are in place ahead of 12TPH operation in Stage 3</p>

Appendix – CRL Response to Period 9 PRep Report

	<p>TPH trials and software upgrades. However, there is unlikely to be any opportunity for 24 TPH reliability growth prior to the start of Stage 3 Passenger Service.</p> <p>Stage 5B also relies upon the ELR210 software upgrade which is not planned for implementation until [REDACTED]. The [REDACTED] decision will therefore have to be made before the improvements of the software upgrade have been fully assessed.</p> <p>[REDACTED]</p> <p>Mitigations are likely to be needed to support a Stage 5B opening, which may have additional cost implications. The Plumstead Depot Power Supply upgrade is now unlikely to be delivered until [REDACTED], and it is possible that operational mitigations will be required in Stage 5B.</p> <p>Similar issues affect the planned start of Stage 5C. To ensure services start in December 2022, RfLI will need to submit its [REDACTED] timetable bid in [REDACTED] at which time evidence of critical</p>	<p>Revenue Service. The immediate focus is to ensure a stable 12TPH operation. The decision to proceed with Stage 5B will require confidence that the Central Operating Section will be able to reliably support a 24TPH peak service, which includes the delivery of ELR210 and [REDACTED]. Stage 5B can be implemented at any point within the May 2022 timetable period, with a decision to proceed needed at T- sixteen weeks.</p> <p>As mentioned above, the decision to proceed with Stage 5B will require confidence that the Central Operating Section will be able to reliably support a 24TPH peak service, which includes the delivery of ELR210 and auto-reverse functionality. Stage 5B can be implemented at any point within the May 2022 timetable period, with a decision to proceed needed at T-16 weeks.</p> <p>As above.</p> <p>TfL's operator MTREL will need to submit a timetable bid for December 2022 at [REDACTED] in [REDACTED]. A bid for Stage 5C will require confidence</p>
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## Appendix – CRL Response to Period 9 PRep Report

	<p>systems is unlikely to be in place and the necessary reliability growth not completed. RfLI and NR will need to agree a process that accommodates these possibilities if Stage 5C is to start in December 2022.</p> <p>While Stage 3 opening remains problematic, the opening of Stages 5B and 5C will present unique challenges which may prove difficult to overcome in an operational environment.</p>	<p>that Stage 5B will have been implemented in advance of December.</p> <p>The graduated approach to Stage 5 (delivery of Stage 5B and subsequently Stage 5C) and the flexibility around the implementation date of Stage 5B recognises and mitigates this risk.</p>
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**Crossrail Project Representative**

**Crossrail Joint Sponsor Team**

**Sponsor Summary**

**Project Status Report 158**

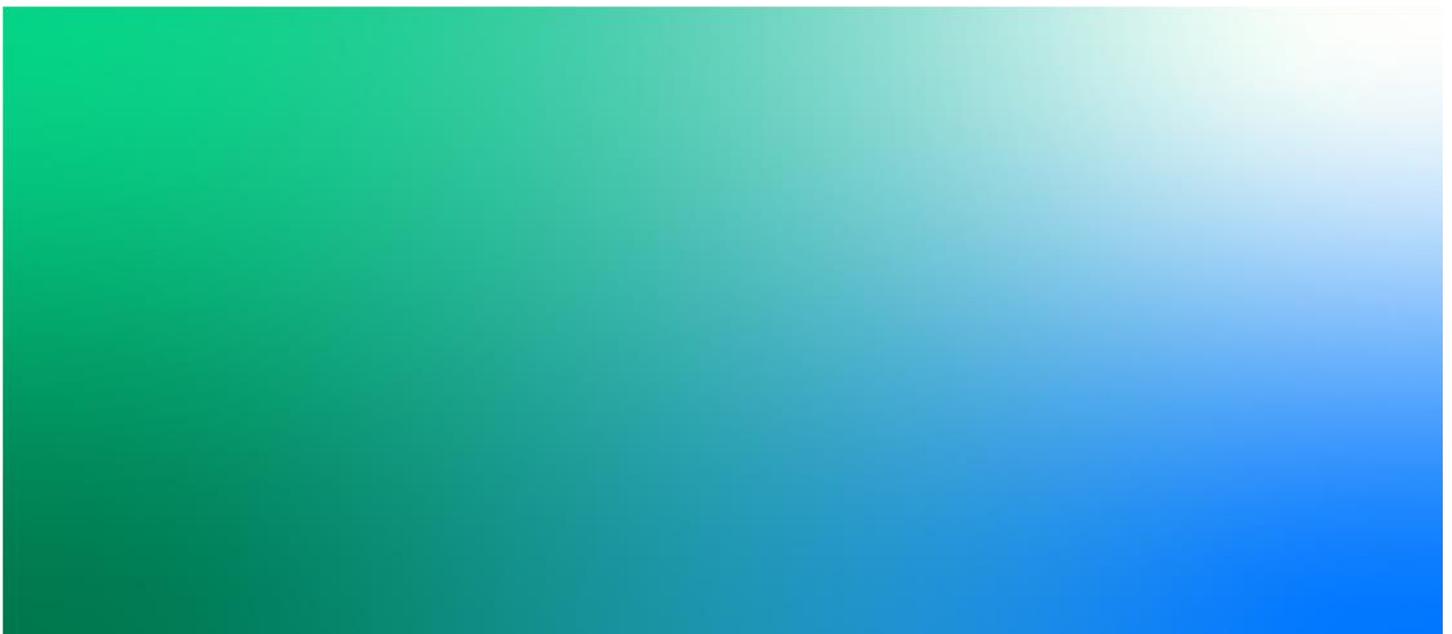
**Period 9 | FY2021/22**

**13 November 2021 – 10 December 2021**

**Official – Sensitive Commercial**

**Document No: B2387600/158/1.12**

**14 January 2022**



## Sponsor Summary PSR 158

**Project No:** B2387600  
**Document Title:** Sponsor Summary for PSR 158  
**Document No.:** B2387600/158/1.12  
**Date:** 14 January 2022  
**Client Name:** Crossrail Joint Sponsor Team  
**Client No:** RM 3730  
**Project Manager:** [REDACTED]  
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Note: This report relies on the information set out in CRL's Period 9 reports augmented by more current information received by PRep during the course of our routine discussions with CRL since the Period close on 10 December 2021. Note that information emerging after the close of Period 9 is subject to formal confirmation by CRL in its Period 9 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.	10 January 2022	PSR 158 Period 9 FY 2021-22 Sponsor Summary v1.10 ~ Draft	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2.	12 January 2022	PSR 158 Period 9 FY 2021-22 Sponsor Summary v1.11 ~ Final	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
3.	14 January 2022	PSR 158 Period 9 FY 2021-22 Sponsor Summary v1.12 ~ Final	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

## Sponsor Summary

### 1. Headlines

#### 1.1 Progress and Look Ahead

CRL has deferred the start of Trial Operations Phase 2 from 15 January 2022 to 29 January 2022. This delay provides a week of timetable train running opportunity following the completion of the December 2021/January 2022 blockades, to establish and demonstrate improved and consistent levels of railway reliability. The additional time will also be used to complete any failed or deferred staff exercises from Trial Operations Phase 1. A Go/No-Go review on 11 January 2022 will determine whether the reliability improvements are sufficient to support the Phase 2 mass evacuation exercises.

Three blockades were planned for the end of 2021. The first started in mid-December 2021, assigned to the completion and final commissioning of the TVS. Subject to acceptance of safety assurance, this will allow progression into Trial Operations Phase 2 and facilitate the mass evacuation exercises. A further TVS software upgrade will take place during a planned Easter 2022 blockade; this is not required before entry into Passenger Service<sup>1</sup>.

A second blockade took place over the Christmas 2021 period to allow the deployment of signalling software ELR110, and a third in early January 2022 for the replacement of failed Voltage Transformers. All blockades were implemented against a backdrop of increasing Covid risk, and CRL and RfLI made specific resource arrangements to ensure cover throughout the works. Early indications are that all three blockades were completed successfully.

There has been mixed railway performance in the first few weeks following entry into Trial Operations Phase 1, and a demonstration of a consistently reliable and sustainable infrastructure performance has not yet been achieved. Unresolved known faults, emerging new faults with the Timetable Processor and Wayside Cabinet Units, and the transient tripping of traction power supplies, have resulted in PPM levels which are below target and in excessive times to fix. Evidence of meaningful reliability improvement is not anticipated until mid-January 2022, following deployment of software ELR110, the roll-out of train software H5.3 and the completion of outstanding rail systems works.

The remaining Auto-Reverse tests are scheduled for completion in January 2022, pending acceptance of the revised safety argument. [REDACTED]

Services under the C620 Signalling are being extended by CRL. C620 will be required to commit to the supply of specialist resources for the period of passenger service into 2022/23, to confirm the access windows for ongoing software drops into 2022 and the scope requirements for ELR 400 development. Both C610 Rail Systems and C660 have supported RfLI in addressing faults since entry into ROGS in late March 2021, and C660 still requires RfLI confirmation of the criticality and completion priority of approximately 300 EOWs during passenger service. With C610 extended to May 2022, it is important that RfLI makes more effective supply chain arrangements for maintenance resilience after entry into Passenger Service.

<sup>1</sup> IPR Part A held on 21 December 2021.

Canary Wharf Station has consistently missed target BIU dates since early November 2021 and issues with electrical certification and acceptance of works remain outstanding between CRL and RfLI. Additional resources and prolongation are necessary to modify lifts and close dilapidation surveys, with likely schedule impact. BIU must be achieved before Trial Operations Phase 2 to provide emergency evacuation functionality and the new target date is expected to be no later than 20 January 2022<sup>2</sup>. Further clarification is required between CRL and RfLI on the works to be completed for the station to be ready for start of Passenger Service.

CRL has confirmed that Bond Street Station will not be ready for the start of Passenger Service in March 2022. The station will be delivered in a single stage, with both ticket halls expected to be available in [REDACTED] at the earliest. Consequently, there is an emerging substantial cost pressure associated with the extension of resources and design changes resulting in additional work. A firmer delivery date is expected early in January 2022, following schedule re-baselining and risk assessment.

The deferral of the start of Trial Operations Phase 2 has directly impacted the deterministic date for the start of Stage 3 Passenger Service, which has moved from [REDACTED] March 2022 to [REDACTED] March 2022. While CRL has outlined the justification for this delay, it is unclear whether the additional time is sufficient for the completion of all necessary works and, critically, to allow sufficient railway reliability growth for entry into Passenger Service. CRL's P50 date for the start of Passenger Service is reported as [REDACTED] May 2022; given the risks described in this section, we believe it is more likely that passenger services will start closer to the P50 date rather than the deterministic date. The P80 date remains within the declared opening window of the first half of 2022.

Minor change is indicated for the P50 date for Stage 5B opening, with a [REDACTED] improvement to [REDACTED], and a [REDACTED] deterioration of the Stage 5C P50 opening date, to [REDACTED] March 2023; these are due to increasing reliability risk and the potential for additional software updates. There is a growing risk that the achievement of a reliable 24 TPH service may not be aligned with the Go/No-Go and [REDACTED] for Stage 5C; Stage 5C opening might be driven back to May 2023 as a consequence.

The Sponsors' particular attention is drawn to the following:

- Progress with the Trial Operations Phase 1 exercises has been impacted by poor overall railway reliability, and improved performance following blockade completion has yet to be demonstrated.
- The case for safety for full Trial Operations remains outstanding, and there is limited time during Trial Operations Phase 2 for securing authority for entry into Passenger Service.
- Railway reliability growth remains below expectation and there is limited schedule opportunity to meet readiness and entry targets for Stage 3 Passenger Service.
- Timeliness of acceptance of the remaining handover works for Canary Wharf Station readiness poses a threat to the start of Trial Operations Phase 2.
- 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.

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<sup>2</sup> EPPR held on 5 January 2022.

## 1.2 Health and Safety

Overall safety indicators remain within those set by the Programme. While there have been incidents of operational procedure non-compliance, these have generally not been safety related. The escalation of Covid during December 2021 poses a risk to the Programme in the coming periods, although past performance gives confidence that CRL and RfLI are able to manage this threat.

## 2. Programme Overview

### 2.1 Schedule

The T-4 readiness review held on 14 December 2021 concluded that the deterministic dates for Trial Operations Phase 2 and the start of Passenger Service should be slipped by 2 weeks<sup>3</sup>. This has resulted in the start of Trial Operations Phase 2 moving from 15 January 2022 to 29 January 2022, and Passenger Service from ■ March 2022 to ■ March 2022. The decision was largely driven by issues with railway reliability, incident recovery times and the schedule slippages in the Trial Operations Phase 1 exercises.

Achievements during the period<sup>4</sup> include the takeover of the Back-Up Control Facility (BUCF) by RfLI, the completion of the TVS upgrade and commissioning works during the first blockade, and approval of the H5.3 rolling stock software.

The schedule critical path currently runs through the completion of the second and third blockades for ELR110 and the Voltage Transformer replacement, respectively, followed by one week of timetable train running prior to the re-scheduled Trial Operations Phase 2 Go/No-Go review on 11 January 2022. If commitment is made at this meeting, volunteers will be mobilised to start mass evacuation exercises from 29 January 2022. Completion of Trial Operations Phase 2 will lead into Shadow Running from ■ March 2022, ahead of entry into Passenger Service on ■ March 2022.

### 2.2 Commercial and Risk

CRL reported that the draft AFCDC has increased to ■■■■■<sup>5</sup>. This increase is a consequence of ■■■■■ cost pressures across the Programme, principally at Bond Street Station. Although this overall increase has been partially offset by risk drawdowns, we would expect the residual ■■■■■ increase to be further covered by risk or provision allowances, at this stage.

CRL confirmed at the EPPR<sup>6</sup> that it would focus on rationalising its Scope Gap provisions, currently reported at ■■■■■. CRL is proposing to report an unconfirmed Scope Gap reduction opportunity to the Period 9 ELDG to mitigate the AFCDC increase. Part of this proposal includes Scope Gap transfer to the COO reserve, but this will not reduce the AFCDC. The Scope Gap provision covers specific identified works awaiting decision on their respective implementation, including ■■■■■ for EHIP Power Upgrade works at Plumstead Depot. Consequently, available cost reductions from Scope Gap may be nominal and are subject to definitive decisions from CRL and RfLI.

<sup>3</sup> IPR Part B slides for meeting held on 22 December 2021.

<sup>4</sup> This report covers CRL reporting, progress, and decisions up to the end of Period 10 Week 1.

<sup>5</sup> IPR Part B meeting held on 22 December 2021.

<sup>6</sup> EPPR meeting held on 5 January 2022.

Despite pressures continuing to emerge from limited and identified cost centres, we continue to believe such increases can be covered by current risk and provision allowances; at Period 9, CRL reports these allowances to be ██████, which represents ██████ of total Cost-to-Go (CTG).

The AFCDC increase appears to conflict with CRL's objective to achieve an outturn as close as possible to the additional £825m funding package. There is ██████ in Risk and Provision allowances to offset the ██████ funding gap to the P50 AFCDC. We believe that the outturn AFCDC will be closer to the current P50 forecast.

Notwithstanding that nearly a third of this risk and provision allowance is allocated, we expect the CEO reserve is likely to offset the Period 9 AFCDC increase, and slippage to Canary Wharf and Bond Street Stations and to Trial Operations Phase 2 will draw on prolongation and risk allowances. CTG reduction opportunities achieved to date have been used to offset emerging cost pressures, and further cost reductions have yet to materialise. Milestone achievement continues to move towards P50 dates and P50 risk provisions are likely to be drawn-down.

### **2.3 Organisation**

Demobilisation of the station Tier 1 contractors at Paddington and Whitechapel Stations is on schedule for completion by the end of 2021. That will only leave Tier 1 contractors engaged at Canary Wharf and Bond Street Stations. C610 Rail Systems has already been instructed to remain until the end of May 2022 to act in a Principal Contractor role, undertake final TVS upgrades and resolve issues associated with the stalling of fans. Arrangements for C620 Signalling support beyond the start of Stage 3 Passenger Service are being formalised by CRL.

CRL is concerned that RfLI is not yet in a position to undertake more work without assistance, and be less reliant on the support of Tier 1 contractors. It is not unreasonable now for RfLI to correct faults with assets that have already been handed-over, or alternatively make direct arrangements with the supply chain. The retention of Programme support to undertake these works is contributing to the prolongation of the Tier 1 Routeway contractors.

While, in Period 9, CRL's full time equivalent resource is forecast to marginally reduce to 936, against a Period 8 total of 942<sup>7</sup>, the trend indicates that demobilisation will increase markedly from Period 10; this aligns with an agreed reduced CRL organisation structure in early 2022. The most significant drop-off in resources continues to be forecast for Periods 12 and 13; this remains aligned to the deterministic date for the start of Passenger Service.

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

The railway has performed inconsistently since the start of Trial Operations Phase 1 on 20 November 2021. Once completed and fully operational, PPM levels of over 95% are expected, but weekly performance indicators from November 2021 show the achievement of PPM averages of between approximately 60% and 80%<sup>8</sup>. These figures are low for a railway undergoing Trial Operations. The underlying reason for the poor performance is the ongoing occurrence of a range of known and relatively low significance faults across the whole railway, which aggregate to become major performance disruptors. Some fixes are not yet allocated to future software builds.

Delivery of the suite of staff exercises planned for Trial Operations Phase 1 has also been impacted by poor system performance. A total of 179 tests are planned in Phase 1, and 30% of those

<sup>7</sup> CRL Executive Group papers, 14 December 2021.

<sup>8</sup> Crossrail Weekly Dashboard, Week 4 Period FY2021/2022.

undertaken so far have had to be aborted due to system failure; of the 50 tests completed, 20% have failed<sup>9</sup>. We are concerned at this performance, given that these are the least complex of the Trial Operations exercises to be undertaken. Those not passed are being re-planned for January 2022.

Despite the schedule slippage, CRL has implemented the December 2021/January 2022 blockades as planned. Reliability running will then take precedence for a week in lieu of Trial Operations exercises. A review on 11 January 2022 will consider if the levels of improvement necessary for entry into Trial Operations Phase 2 and Passenger Service have been achieved. If so, CRL and RfLI anticipate completing the deferred Phase 1 exercises before the end of January 2022 start to Phase 2. Canary Wharf Station completion is also required for the start of Phase 2.

While the configuration of the railway is now largely agreed between CRL and RfLI, there are around 70 areas that will not be complete for the start of Passenger Service. These might necessitate the application of operational mitigations or the relevant works to be completed. Completion may require additional access to be secured but, with little available, schedule dates might be threatened.

A number of Traffic Managers have resigned from RfLI; this is an area that RfLI continues to monitor closely, as the period for recruitment and training could result in new staff not being secured in time.

RfLI now considers that it has a way forward for the remaining three tests for confirming Auto-Reverse functionality. These are planned for early January 2022 but are not required for entry into Stage 3 Passenger Service.

## 2.5 Stations Commissioning and Handover

The Employer's Completion Process (ECP) is complete and Works Completion Certificates have been secured at Farringdon and Woolwich Stations; ECP was completed at five Shafts and Portals.

Canary Wharf Station has struggled to meet target dates for BIU, having missed 4 November 2021 and 7 December 2021; the most recent target date of 17 December 2021 has also been deferred. This is in part because the volume and complexity of the assurance works has proved too challenging, but also because inconsistencies in the reporting of data has contributed to misunderstanding between CRL and RfLI of the true status of the quality and acceptance of the works. This has affected cable replacement works, fire certification activities, lighting and mechanical elements, LV distribution boards and the closure of Dependencies. Inspections and agreement between CRL and RfLI on the achievability of the remaining handover completions, will determine the new target date for BIU, which is expected to be no later than 20 January 2022<sup>10</sup>. CRL does not yet fully understand whether additional EOWs and assurance needs to be completed after BIU and prior to SC3 ROGS for Passenger Service. Any RfLI requirement for additional EOWs to be closed by CRL might threaten the start of Passenger Service.

A Go/No-Go meeting held on 2 December 2021 concluded that it would not be possible to complete and open Bond Street Station in time to meet any March 2022 deterministic date for Passenger Service. Both ticket halls will now not be ready for SC3 ROGS until [REDACTED] and CRL will confirm a date in January 2022 following further assessment and schedule re-baselining. The main challenges are with completing additional commissioning testing and achieving a staged ticket hall opening with segregated fire systems that meet statutory requirements. [REDACTED]

<sup>9</sup> Crossrail Weekly Dashboard, Week 4 Period FY2021/2022.

<sup>10</sup> EPPR held on 5 January 2022.

CRL's delivery focus remains on Bond Street Station, with its highest number of resources (approximately 800) now engaged on completing this station.

CRL is targeting completion of all physical and documentation work associated with outstanding EOWs at Paddington Station by the end of January 2022. This will allow a final contract close-out position to be established in [REDACTED] 2022. In the meantime, the MoBo has been extended, which has given rise to some cost increase.

CRL is targeting to finish all physical works at Whitechapel Station by the end of December 2021, with contract close-out by [REDACTED] 2022. A risk associated with completion of station platform cages after March 2022 is expected to be addressed in early January 2022.

## 2.6 Assurance

Evidence of successful installation and testing from the December 2021 and January 2022 blockades will provide substantial support to the overall railway safety case; this is expected to be processed into formal document submissions in early January 2022. While CRL and RfLI remain positive, we believe the assurance workload is extremely challenging, despite the potential schedule relief offered by the slippage of the target start of Trial Operations Phase 2 to 29 January 2022.

## 2.7 Future Stages

The December 2021 timetable has been successfully implemented. This already incorporates the train paths required under the May 2022 timetable application, agreed between NR and MTREL. Stage 5B services will operate from May 2022, with GE and GWML trains terminating at Liverpool Street and Paddington High Level Stations, respectively. Through-running of services via the Central Section is planned to start from [REDACTED].

The decision to commit to through-running is expected to be made in [REDACTED]. All parties will need to be confident that the timetable can operate reliably at 24 TPH through the Central Section by [REDACTED], but current 12 TPH performance suggests this will be a significant challenge. A better understanding of 24 TPH performance capability is anticipated in late January 2022, following 24 TPH trials and software upgrades. However, there is unlikely to be any opportunity for 24 TPH reliability growth prior to the start of Stage 3 Passenger Service.

Stage 5B also relies upon the ELR210 software upgrade which is not planned for implementation until [REDACTED]. The [REDACTED] decision will therefore have to be made before the improvements of the software upgrade have been fully assessed.

[REDACTED]  
[REDACTED]  
Mitigations are likely to be needed to support a Stage 5B opening, which may have additional cost implications. The Plumstead Depot Power Supply upgrade is now unlikely to be delivered until [REDACTED], and it is possible that operational mitigations will be required in Stage 5B.

Similar issues affect the planned start of Stage 5C. To ensure services start in December 2022, RfLI will need to submit its [REDACTED] timetable bid in [REDACTED], at which time evidence of critical systems is unlikely to be in place and the necessary reliability growth not completed. RfLI and NR will need to agree a process that accommodates these possibilities if Stage 5C is to start in December 2022.

While Stage 3 opening remains problematic, the opening of Stages 5B and 5C will present unique challenges which may prove difficult to overcome in an operational environment.