



RESPONSE TO THE CROSSRAIL SPONSORS ON THE PROJECT REPRESENTATIVE SPONSOR SUMMARY REPORT

Date of Issue: 04 October 2019

Issued to: Simon Adams, Head of Crossrail Joint Sponsor Team

Author: Liam Hewitt, Advisor to Deputy CEO, Crossrail Ltd

Approved by: Mark Wild, Chief Executive Officer, Crossrail Ltd

1. Purpose

- 1.1. The purpose of this paper is to provide the Crossrail Sponsors with Crossrail's response to the Project Representative's ("**PRep**") Sponsor Summary report. It has been produced in consultation with Crossrail subject matter experts. A list of consultees is attached as Appendix 1.
- 1.2. The report responded to in this paper is for Period 05 FY2019-20 (21 July 2019 – 17 August 2019), issued and received on 12 September 2019.
- 1.3. To ensure Crossrail's comments can be mapped accurately to the PRep's comments, each header (typed in **bold**) has the relevant PRep paragraph reference number in brackets. For this Period, Crossrail has annotated the PRep's report to include paragraph references. This annotated report is attached as Appendix 2.

2. Opening Statement from the Chief Executive Officer of Crossrail Ltd

- 2.1. Crossrail was deeply saddened to hear about the tragic incident at Waterloo Underground station in which Christian Tuvi lost his life on Wednesday 18 September 2019. Our thoughts remain with his wife and three young children as well as the rest of his family and friends. Incidents such as this are a reminder of how dangerous our industry can be and how vital it is that everybody follows all safety procedures in place, regardless of the pressures we face in delivering the Elizabeth line.
- 2.2. The openness and transparency of Crossrail extends past health and safety, and the detail in this report highlights the constructive relationships that the organisation has developed with the PRep with this mindset. Good progress is being made and, while the PRep rightly raises numerous comments, it is positive that the people delivering the Elizabeth line are proactively recognising and managing these.

3. PRep key areas of concern – closed matters

3.1. Crossrail has closed 1 of the 2 key areas of concern highlighted in this period's report, and 1 of 4 key areas highlighted by the PRep in the "Key Areas of Concern in the Period" section since the PRep Sponsor Summary report for Period 4 FY2019-20¹.

3.2. The details for the closed matter are: (*Period 5 1920 Reference: 16.2*)

PRep Concern: "b. Given the various influences and challenges from across the Crossrail Programme upon readiness to enter Trial Running, when does CRL believe it will be in a position to declare a firm date, to enable key interfacing parties to make robust plans?"

Crossrail Response: A firm date for commencement of Trial Running will be declared 12 weeks in advance of the start, so as to provide industry partners with sufficient notice for mobilisation. Determination of readiness to progress into Trial Running will be subject to a formal T-minus review process, accountability for which is with the Crossrail Chief Operations Officer.

4. PRep key areas of concern – updates on live matters

4.1. There are 3 open key areas of concern highlighted by the PRep in the "Key Areas of Concern in the Period" section since the PRep Sponsor Summary report for Period 4 FY2019-20¹. Updates to these are summarised below.

TIER 1 RESOURCE DEMOBILISATION (*Period 5 1920 Reference: 16.1*)

4.2. Crossrail has a well-defined and structured governance framework that (a) provides a full hierarchy of decision making / 'challenge' forums (with information escalation), and (b) ensures no competing governance requirements for key attendees at these forums. This structure is accessible to all Crossrail resource. In practice this translates as a defined process for the challenge, allocation/tracking of actions, and decision making of matters including Tier 1 resource.

4.3. Project managers determine the appropriate level of T1 resources in consultation with the contractor based on their period submissions (clause 32 programme). Project-specific reviews are held by the project managers, feeding into Sector-level reviews, that in turn feed into Programme-level AFC and Schedule Reviews. All projects, in their "basis of estimate"

¹ Crossrail changed how it responds to the PRep reports from, and including, the Period 4 FY2019-20 report. Crossrail now responds to the Sponsor Summary report and not the covering letter to Sponsors. This represents a significant increase in detail and effort, and it would not be practicable to retrospectively apply the same level of detail to all previous PRep reports.

documentation, provide forecast resource analysis covering Tier 1s, FTEs and costs by period through to completion (including run-rate and productivity) and this is considered at the AFC and Schedule reviews, in comparison to: the baseline and previous forecast. Actions are recorded and tracked from these reviews.

- 4.4. The Programme Integration Review is a forum led by the Programme Controls Director to ensure activities for delivering all components of Crossrail are integrated and aligned, including (but not limited to) contractor schedules, and potential programme change implications. The outputs of these reviews inform the AFC and Delivery Basis of Estimations on a period basis.
- 4.5. Crossrail has improved the integration of Schedule, Cost, Risk, Change and Reporting functions, including a new Programme Controls Director. A new match-fit programme controls workstream commenced on 15 July 2019 under the Director's leadership. The relevant focuses of this workstream are: Schedule Change Control; and aligning contractor, project, sector, and programme updates of the schedule (feeding into the Sector reviews, Programme reviews, and Programme Integration Reviews).
- 4.6. The Programme Assurance team and Integrated Assurance Framework provide a means to undertake activity to assure the Crossrail Executive Group of performance against the plan. The Third Line of Defence (Internal Audit) has three related audits planned: 19 500 Tier 1 suppliers; 19 501 Supply Chain; and 19 505 Workforce Planning.
- 4.7. The implementation of Crossrail's requirements of the contractor will continue to be managed through the proper contractual mechanisms.
- 4.8. Crossrail has taken significant steps to increase its capability in identifying, escalating and managing key programme priorities, such as Tier 1 resource demobilisation. However, Crossrail also appreciates that efficacy of process will need to be demonstrated to inspire full confidence, and will continue to be transparent through its involvement of the PRep in all activities.

SAFETY AND TECHNICAL ASSURANCE DOCUMENTATION (*Period 4 1920*
Reference: 18.1)

- 4.9. The RABC plan has been updated this period to reflect the addition of SC3 ROGS definition and the timing of these milestones. In addition, a forecast has been added to reflect the latest project dates (unmitigated) that were reported via the DCS.
- 4.10. A resource plan is under development within the Technical Directorate to understand what levels of resource would be required to deal with more concurrent submissions from contractors in a larger peak in Q4 2019 and Q1 2020. Other responses being considered include the formation of a dedicated assurance "tiger team" to move from Element to

Element to process the contractor's submissions, although this needs to be balanced against the need to progress lots of fronts in parallel.

- 4.11. A "structured engineering judgement" approach has been agreed to deal with parts of the railway where the full "end state" evidence will not be available for Trial Running.

RISK FOR FUTURE PHASES (*Period 4 1920 Reference: 18.2*)

- 4.12. Crossrail continues to increase its focus on Stages 4 and 5 risks, but recognises that this matter should remain live until this reaches a more developed level.

5. Matters necessitating Crossrail comment

- 5.1. Crossrail has the following comments on the PRep report, in a repeated order to the PRep's Sponsor Summary report.

HEALTH AND SAFETY PERFORMANCE (*Reference: 1.0*)

- 5.2. For accuracy, the accident referenced was at Bond Street not Paddington. All comments are correct, agreed with and reflect the focus and way forward being taken for performance stabilisation and improvements.

UNDERPINNING THE DCS (Delivery Control Schedule) (*Reference: 2.0*)

- 5.3. As the DCS was deterministic, the majority of project dates were by nature demanding, however in places the unmitigated forecasts are beyond the Programme and [REDACTED]. When considering these forecasts as part of the integrated programme, this forecasts a ROGS transition date in [REDACTED], against the deterministic date of February 2020. Extensive work is underway in Period 7 to provide additional clarity within the DCS to include major updates to logic since DCSv1.0, including:

- Handover strategy (including SC3 / SC3R);
- Optimising trial running;
- Routeway chapters integration;
- Applying lessons learned from initial handovers; and
- PD+10 functionality for Trial Running.

- 5.4. Collectively the updates to the DCS will increase confidence in the schedule. The updated forecast position relative to the ROGS window resulting from this work will be presented to the Crossrail Board in November.

ASSURANCE, OVERSIGHT & EXTERNAL BODIES REVIEW (*Reference: 3.0*)

- 5.5. Since June 2019, the key features of the Second and Third Line of Defence assurance functions has been underway. This includes the establishment of the Crossrail Programme Assurance Group (of which PRep is a member); and the execution of Targeted Assurance Reviews (TARs), Stage Gate Reviews (SGRs) and Internal Audit reviews. Crossrail would acknowledge that there has been some re-sequencing of planned activities to reflect broader programme activity.
- 5.6. The new Crossrail Advisory Panel (referred to in the PRep report as the 'expert panel') was established in June 2019. It brings together leading experts in major programme delivery, signalling, testing and commissioning and railway operations. The Panel is undertaking structured work on 7 focus areas (integrated into the Independent Audit and Assurance Plan) and has been reporting on these to the Crossrail Board on a 4-weekly basis since inception. The Panel also meet via teleconference on a 4-weekly basis, and the Panel Coordinator attends the Crossrail Programme Assurance Group meetings. Panel Members provide advisory services through a number of forums, including: attending: the weekly Executive Visualisation meetings; Crossrail Steering Group; site visits; and both structured governance and ad hoc meetings.

PROGRAMME EXECUTION (*Reference: 4.0*)

- 5.7. Crossrail is ensuring lessons learned during the handover of Victoria Dock Portal are communicated clearly across the programme with sessions planned from October 2019. Crossrail's Handover team is working with the element project management teams to optimise the delivery of key handover documentation, in recognition of the future needs of the IM. Crossrail is executing the commercial, delivery and handover strategies that have been approved through governance.
- 5.8. The reference to the Farringdon paper focuses on dates in that paper only and not the vast source of consistent data being reported weekly and periodically on project status and forecast. Crossrail has been clear about the status of progress consistently and openly with all, including the PRep. The dates in the referenced paper are Period 04 forecast dates (as of the 6th July), and this is stated in the date table in the paper.
- 5.9. It is correct that since Period 01 the 'planned' Staged Completion has remained unchanged at 28 November 2019 for 6 periods. There has been some movement on intermediate ('interim') milestones but it is important to consider the critical path and not just milestone movement. In addition, there are only a few Partial Acceptance Certificates (PACs) now remaining and Crossrail currently has 98% of IRNs/PCCs/PACs signed. Crossrail has deliberately targeted the critical path requirements, rather than PAC Part 2s as a whole (which in themselves are of lower priority than the identified critical components within them). Therefore, Crossrail continue to show stability in the SC3 date driven by critical deliverables.

- 5.10. It should also be noted that the introduction of SC3Rogs at Programme Level results in some deferring of deliverables from SC3 to SC3Rogs.

COST AND COMMERCIAL (Reference: 5.0)

- 5.11. The statement that an artificial impression of cost escalation has been given does not recognise the detailed analysis provided to the Crossrail Board and PRep in the paper on DCS 1.0, presented and discussed in detail at the Crossrail Board meeting on 15 August 2019. The escalation in cost was identified on page 3 and analysed in detail in Appendix 9. The Period 5 Board report referenced this 15 August 2019 Crossrail Board paper to ensure there was complete audit trail.
- 5.12. The movements on risk were also clearly analysed in the above paper, being referred to on Page 4 and analysed in detail in Appendix 6. The movements included recognition of [REDACTED] risk as cost, as the likelihood was >80%. The movement was discussed expressly and transparently.

RISK (Reference: 6.0)

- 5.13. Crossrail agrees with all of the points raised. Crossrail would, however, express caution in the independent analysis of data in ARM without involving the Crossrail Risk team.

STAGE 2 PHASE 2 (Reference: 7.0)

- 5.14. The temporary solution has been agreed with Heathrow Airport Limited, and approval from operators is anticipated shortly. The permanent solution is solution to be implemented by end November 2019.

STAGE 3 – STATIONS, SHAFTS AND PORTALS (Reference: 8.0)

- 5.15. A revised assurance approach has been devised based on "structured engineering judgement" approach. This has been agreed to deal with parts of the railway where the full "end state" evidence will not be available for Trial Running and is references in Crossrail's response to the Assurance heading in this report. All HEPs have been drafted and are in the process of being approved, and work is underway to incorporate the revised approach to assurance within them. Following, the key leadership figures will be briefed in person on the revised assurance approach to ensure consistency of understanding.
- 5.16. The Delivery Control Schedule is being developed and is to be submitted to the Crossrail Board in November. This, alongside work underway to strengthen Programme

Controls (the 'match fit' workstream) and the updated Sector/Programme/Programme Integrations Review governance structure, will provide Crossrail with the information base required to make decisions on supply chain resourcing and the means to escalate actions for resolution (see 'Key Areas of Concern in the Period' section a. for further information).

DYNAMIC TESTING (*Reference: 9.0*)

- 5.17. In response to the Plateau action to investigate reducing time for software download, the existing software load process map has been produced and process improvements have been identified. The time to load P_D+10 is planned as 3 days (2 + 1 day contingency) and has been reduced from 7 days. The improved process on the central operating section for PD+10 will be implemented, with a forecast closure 06 October 2019. Crossrail will continue to identify process improvements for future software releases.
- 5.18. In response to the GEML and GWML interface possessions, GEML access has been agreed between week 30 and 46, which amounts to double the quantum of access previously allocated. GWML transition routes and criteria have been agreed and sent to NR for acceptance. MTR and NR are to review and agree GWML routes (forecast closure 11 October 2019) - these will be used to go into Trial Running.

APPROVALS, ASSURANCE AND AGREEMENTS (*Reference: 10.0*)

- 5.19. The Crossrail agrees with the PRep's commentary. Delays to testing and commissioning and the subsequent evidence of completion will impact on the timely production of assurance documentation. This is a growing risk against the 14 February 2020 Trial Running date.
- 5.20. The RABC plan has been updated this period to reflect the addition of SC3 ROGS definition and the timing of these milestones. In addition, a forecast has been added to reflect the latest project dates (unmitigated) that were reported via the DCS.
- 5.21. A resource plan is under development within the Technical Directorate to understand what levels of resource would be required to deal with more concurrent submissions from contractors in a larger peak in Q4 2019 and Q1 2020. Other responses being considered include the formation of a dedicated assurance "tiger team" to move from Element to Element to process the contractors' submissions, although this needs to be balanced against the need to progress multiple work packages in parallel.
- 5.22. A "structured engineering judgement" approach has been agreed to deal with parts of the railway where the full "end state" evidence will not be available for Trial Running.

STAGE 4 SUMMARY (*References: 11.0*)

- 5.23. A paper describing the status, risks and short-term actions was discussed at the Crossrail Board on 12 September 2019. A further paper is in preparation for the Crossrail Board for October 2019, describing the key options and progress on short term actions. There are a number of constraints as there is limited scope for a 'soft' start in terms of feasible timetables.

STAGE 5 SUMMARY (*References: 12.0*)

- 5.24. Crossrail remains vigilant but has confidence that the programme will be ready for December 2019. There are a number of constraints as there is limited scope for a 'soft' start in terms of feasible timetables.

RLU-FLU SWAP-OUT (*References: 13.0*)

- 5.25. The PRep's comments are noted.

STAGE 5A OPENING – NR (*References: 14.0*)

- 5.26. Regarding the DOO, some of the works require white and grey period possessions. These have been secured through to the end of November, allowing additional contingency should there be a loss of possession.

STAGE 5B OPENING (*References: 15.0*)

- 5.27. Independent cost and risk assurance reviews have been agreed with Network Rail and scheduled to commence at the start October 2019. The focuses will be on cost to go and risk allowances.

END

APPENDIX 1 – LIST OF CONTRIBUTORS

RESPONSE TO THE CROSSRAIL SPONSORS ON THE PROJECT REPRESENTATIVE SPONSOR SUMMARY REPORT

Period 05 FY2019-20 (21 July 2019 – 17 August 2019), issued and received on 12 September 2019.

Advisor to the CEO
Advisor to the Deputy CEO
Chief of Staff
Chief Finance Officer
Cost Engineer (Project Delivery)
Crossrail Operations Business Manager
Deputy Chief Executive Officer
Deputy Programme Controls Director
Head of Assurance
Head of Programme Delivery Strategy
Head of Project and Programme Assurance
Head of Risk
Head of Systems Integration
Health and Safety Director
Programme Delivery Business Manager



APPENDIX 2 – ANNOTATED PREP REPORT

RESPONSE TO THE CROSSRAIL SPONSORS ON THE PROJECT REPRESENTATIVE SPONSOR SUMMARY REPORT

Period 05 FY2019-20 (21 July 2019 – 17 August 2019), issued and received on 12 September 2019.



Crossrail Project Representative

Crossrail Joint Sponsor Team

Sponsor Summary

Project Status Report 128

Period 5 FY2019-20

21 July 2019 – 17 August 2019

Document No. B2111500/128/1.2

12 September 2019



Sponsor Summary PSR 128

Project no: B2111500
Document title: Sponsor Summary
Document No.: B2111500/128/1.2
Date: 12 September 2019
Client name: Crossrail Joint Sponsor Team
Client no: RM 3730
Author: [REDACTED]
File name: PSR 128 Period 05 FY 2019-20 Sponsor Summary v1.2

Jacobs U.K. Limited
2nd Floor Cottons Centre
Cottons Lane
London SE1 2QG
England
Phone: +44 (0)203 980 2000
www.jacobs.com

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Note: This report relies on the information set out in CRL's Period 5 reports augmented by more current information received by PRep during the course of our routine discussions with CRL since the Period close on 18 August 2019. Note that information emerging after the close of Period 5 is subject to formal confirmation by CRL in its Period 5 reports. This report is supplemented by our weekly reports to JST and regular meetings with JST staff

Document history and status

Revision	Date	Description	By	Review	Approved
1	11 September 2019	PSR 128 Period 05 FY 2019-20 Sponsor Summary v1.0 ~ Draft	[REDACTED]	[REDACTED]	
2	12 September 2019	PSR 128 Period 05 FY 2019-20 Sponsor Summary v1.2	[REDACTED]	[REDACTED]	[REDACTED]

Sponsor Summary

1.0 Health & Safety Performance

Following 4 periods of no RIDDORs, there were 2 RIDDORs in the period. Both RIDDORs were at Paddington, due to the collapse of a carpenters-made bench. CRL has checked all fabricated benches to ensure there are no other failures.

CRL is rolling-out its new H&S strategy to reinvigorate the programme through to its completion. An updated re-induction process is close to completion, and CRL hopes to initiate a step change in performance going forward.

High Potential Near Misses (HPNM) increased to a programme high of 0.37, mainly due to a reduced number of worked hours; we anticipate this increasing trend will continue. CRL has carried out an extensive assessment of the 53 HPNM over the last 13 periods. Assessment has shown there are three key root causes:

1. Procedural irregularities;
2. Energised systems; and
3. Materials falling from height.

CRL has developed a targeted improvement plan to arrest the continued raising of HPNMs, which is centred upon the three main causes. This proactive approach is supported by PRep, and the speed of implementation will be key.

Programme Delivery

2.0 Underpinning the DCS (Cost & Schedule)

For the last 4 periods, the DCS v1.0 has been relatively stable, especially compared to the old MOHS. However, this trend is coming under increasing pressure and dates are now slipping, to various degrees, all of which has an impact on the opening date window. This compression of key dates has resulted in the key date of ROGS transition moving from February to May 2020 (although this still keeps CRL within the approved opening window). This is mainly due to the assurance paperwork and the number of documents required for handover. CRL's decision to declare a slippage must be encouraged as part of the transparency process, although they should not give up yet on this key milestone.

Of 120 Cardinal Milestones, 8 have been achieved in the period (which is on target) and 24 are forecast to be delayed. CRL is planning to mitigate the delay; however, the underpinning mitigation plans are still awaited.

3.0 Assurance, Oversight & External Bodies Review

CRL has initiated an update of its CMS processes to align with the current methods of working, and to provide the necessary consistency in approach across the programme. CRL has set itself a target of the end of September 2019 for all process to be updated, and this work is currently on plan. The level 2 & 3 lines of defence are still to be implemented and the output from the 'expert panel' is awaited.

4.0 Programme Execution

CRL has initiated the programmatic process for managing the Tier 2/3/4 contractors and has appointed a Head of Supply Chain Delivery to co-ordinate its approach. The management of the scarce resource of the lower tiers is a major opportunity to improve productivity across the programme. CRL has also initiated a ‘bench’ of additional critical resources from its supply chain to ensure it is not constrained in the completion of the Stations.

While CRL has identified the scale of the opportunity, it needs to initiate interventions as soon as possible and co-ordinate resources to support the critical stations. CRL may want to consider allocating a key account manager for each of the critical companies such as [REDACTED], who would ensure that the station workloads were co-ordinated for efficient delivery.

CRL has used the handover of Victoria Dock Portal as a test case, or ‘learning centre’, to flush-out lessons that can be applied to the larger stations; for example, Tottenham Court Road is of a much larger scale, and is scheduled for handover in November 2019. We suggest CRL ensures that lessons are shared with all Teams, so past failures are not repeated. Initial observations indicate this has not happened yet.

Following a review of the handover readiness of one of the most advanced stations, it appears that the Tier 1 contractors are not being driven to completion by CRL as much as they could. CRL may want to consider these ‘exit strategies’ are challenged to ensure they are the most efficient execution methodology possible. Where possible, the opportunity should be taken to replace the Tier 1 contractor resources with IM resources, in order to secure the anticipated, but as yet unrealised, post-TOSD cost savings as soon as possible.

This period, we have witnessed a difference in the reported dates and costs presented by CRL. An example of this can be seen in CRL’s [REDACTED], which indicates all PCCs were completed on 12 August 2019; however, the CRL Delivery Teams state that this will take place in October 2019. CRL should consider carrying out a data analysis of its reports, to ensure consistency.

We have observed this period that the intermediate milestones have continued to slip, whilst the cardinal milestones are not impacted. Farringdon SC3, for example, has maintained its date of 28 November for over 6 periods. However, the intermediate milestones that contribute to this key milestone have slipped by over 7 months during this period. This slippage cannot be maintained and, at some point in the near future, the key milestones will be missed.

Stations	Phase 2 T&C	Period 11	Period 12	Period 13	Period 1	Period 2	Period 3	Period 4	Period 5
Paddington	Phase 2.1	13-Jun-19	01-Jul-19	02-Jul-19	05-Jul-19	19-Jul-19	01-Aug-19	30-Aug-19	23-Sep-19
	Phase 2.2	15-Apr-19	10-Jun-19	11-Jun-19	03-Jul-19	16-Jul-19	30-Jul-19	17-Sep-19	01-Oct-19
	Phase 2.3	12-Jun-19	01-Jul-19	09-Jul-19	24-Jul-19	13-Aug-19	29-Aug-19	01-Nov-19	07-Oct-19
Tottenham Court Road	Phase 2.1		20-Jun-19	17-May-19	07-Jun-19	07-Jun-19	30-Jul-19	16-Aug-19	NA
	Phase 2.2		11-Jul-19	07-Jun-19	12-Jul-19	12-Jul-19	09-Aug-19	25-Aug-19	NA
	Phase 2.3		22-Jul-19	14-Jun-19	15-Jul-19	15-Jul-19	16-Aug-19	02-Sep-19	NA
Farringdon	Phase 2.1	15-Mar-19	12-Apr-19	05-Apr-19	05-Apr-19	13-May-19	14-Jun-19	12-Apr-19	12-Apr-19
	Phase 2.2	12-Jun-19	05-Apr-19	26-Apr-19	26-Apr-19	03-Jun-19	14-Jun-19	18-Jul-19	08-Aug-19
	Phase 2.3	12-Jun-19	05-Apr-19	28-Jun-19	28-Jun-19	28-Jun-19	01-Jul-19	25-Jul-19	16-Oct-19
Liverpool Street	Phase 2.1		25-Jun-19	14-Jun-19	17-Jun-19	08-Jul-19	17-Jul-19	02-Aug-19	30-Aug-19
	Phase 2.2		07-Aug-19	24-Jun-19	15-Jul-19	23-Sep-19	23-Sep-19	23-Sep-19	30-Oct-19
	Phase 2.3		20-Aug-19	21-Aug-19	21-Aug-19	09-Oct-19	09-Oct-19	21-Oct-19	06-Nov-19
Whitechapel	Phase 2.1	28-May-19	15-Aug-19	19-Aug-19	17-Sep-19	23-Sep-19	30-Sep-19	04-Nov-19	04-Apr-20
	Phase 2.2	04-Jun-19	20-Sep-19	11-Oct-19	17-Oct-19	24-Oct-19	12-Nov-19	18-Nov-19	08-May-20
	Phase 2.3	11-Jun-19	04-Feb-20	18-Nov-19	18-Nov-19	13-Jan-20	17-Dec-19	14-Jan-20	08-May-20

Figure 1: Movement of IRN/PCC/PAC milestones over the last 6 periods

5.0 Cost & Commercial

CRL has concluded its bottom up estimate of DCS v1.0 and reports a corresponding P50 Baseline Budget of [REDACTED] at Period 5 [REDACTED]. The Baseline Budget was presented to the CRL Board and approved on 15 August 2019 and CRL presented its plan for cost control and management to its Investment Committee on 28 August 2019. CRL further reports that it is subject to change control and will be used each period forthwith to benchmark the latest AFDCD and in-period performance. The Period 5 CRL Board Report uses the new Baseline Budget for comparative purposes, which differs from the Period 4 Board Report AFDCD.

The AFDCD at Period 5 has increased by £79m from Period 4 to £15,005m. We consider it inappropriate to report the Period 5 AFDCD as a reduction from the Baseline Budget, as CRL states in its Period 5 report, as this gives an artificial impression of cost escalation. At Period 5, the AFDCD is currently [REDACTED] below the Baseline Budget. We note again that Costs to Go (CTG), excluding risk, is reported as increasing by [REDACTED] having been spent in the period. However, CRL is reporting a reduction in risk of [REDACTED] in Period 5. This implies that circa [REDACTED] Period 4 Risk allowances have been confirmed as CTG. CTG, inclusive of Risk, has increased by [REDACTED] in Period 4 to [REDACTED] in Period 5.

The DCS dates reported by CRL are under increasing pressure each period and are less likely to be achieved. The financial impact of not meeting these dates is not immediately picked-up with the AFCs, as these can take a period to manifest in revised forecasts. The lack of a schedule which is integrated with cost and risk will continue to hamper the development of robust AFDCD figures.

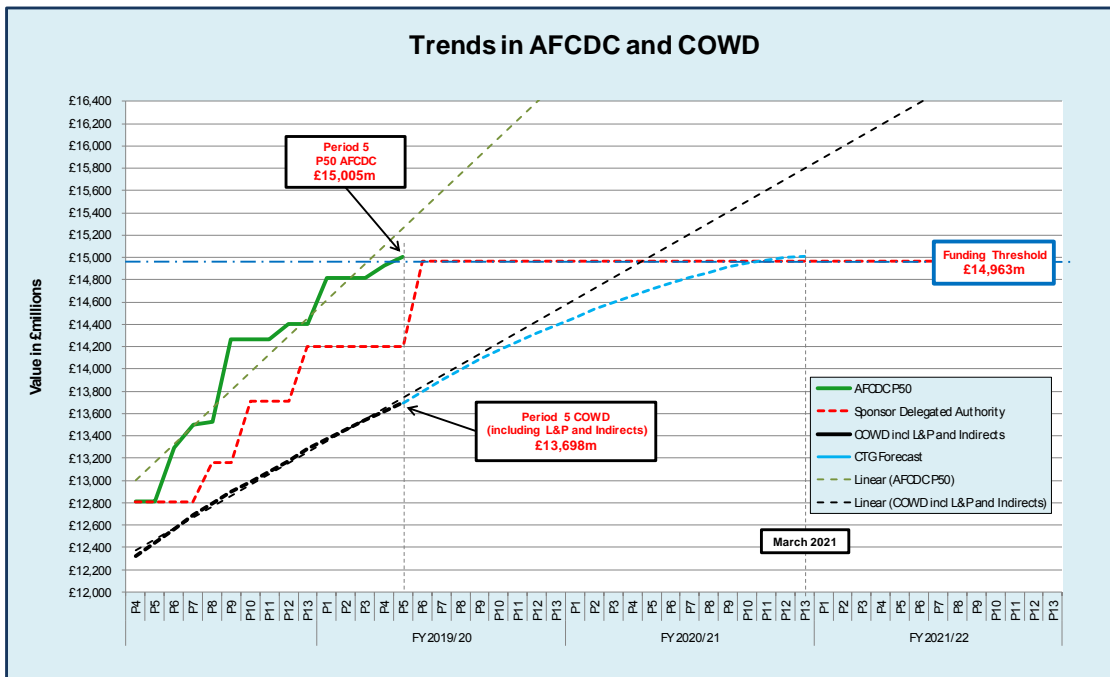


Figure 2: AFDCD Headroom to Sponsor Delegated Authority

From Period 5 onwards, CRL is reporting and comparing its AFDCD to the DCS v1.0 based Baseline Budget. This approach aligns with its commercial strategy and its plan for cost control and management of the AFDCD. We are encouraged that the CRL commercial strategy focuses on risk management as the principal area of cost escalation mitigation. We believe the revised reporting approach CRL is adopting from Period 5 onwards is positive and proactive.

However, the threats of cost escalation persist, and CRL continues to develop and implement its commercial strategy around the key areas of:

- Programme Risk, which requires further input and review, particularly around the 6 key tightening areas;
- Buy-in into the DCS at [REDACTED] to avert the risk of commercially aggressive behaviours from the Tier 1 Contractors; and
- Engagement of the Tier 2 and 3 supply chain partners to improve resource efficiencies across the programme.

6.0 Risk

The Risks that have increased in the programme are not technical but contractual, and by their nature, are harder to mitigate. Therefore, it is more likely that a larger portion of the remaining risk exposure will eventually make its way into CTG.

A total of 69 risks were closed in the period, likely due to due to the completion of works in the SSPs, but none were in the C6xx series of contracts. There has been a rise in risk throughout [REDACTED], and many of these lie on the Critical Path, with the ability to force additional delays into preparations for ROGS and the start of Trial Running. Emerging and unforeseen complexity in the integration of software and systems will compound resource shortages and assurance problems, and increase pressure on the transition to ROGS.

Since last period, we note the following changes:

Category	Period 4	Period 5
CRL Risk Value	[REDACTED]	[REDACTED]
Risk Value Already Occurring	[REDACTED]	[REDACTED]
Number of Risks Raised / (Emerging)	613/(76)	569/(58)
Number of Risks Closed	50	69
Mitigations Actions Raised	45	42
Mitigation Actions Implemented	1	49
Ave Probability 'Unmitigated' Risk	42%	43%
Ave Probability 'Mitigated' Risk	38%	37%

Figure 3: Periodic Changes to Key Risk Indicators

7.0 Stage 2 Phase 2

The principal risks of train software development and safety authorisation remain unchanged, with forecast dates slipping by 2 weeks in the period¹. However, in this period the train has successfully completed the majority of the '39' formal integration tests with the wayside ETCS. The remaining tests do not present major technical challenges and are expected to pass. Once completed, this will signify an important step for the programme.

The issues with the GSM-R system on Heathrow Terminal 4 Platform 1 remain. NR has produced a draft programme that shows completion in December 2019, but this still presents a risk to the proposed early passenger service start date. Mitigation for passenger service, in the form of the already-implemented temporary solution may be possible. This needs to be agreed between NR and MTR-C in the near future, and MTR-C is likely to be wary of taking such a course of action.

¹ RSD Period 5 Dashboard.
PSR 128 Period 05 FY 2019-20 Sponsor Summary v1.2

The CRL Period 5 Stage 2B dashboard has a 'red' RAG status.

8.0 Stage 3

Stations, Shafts and Portals (SSP)

Delays to intermediate milestones and low productivity have continued, with some further slippage beyond the DCS milestone dates. The production and sign-off of Phase 2 T&C assurance documentation (IRNs², PCCs & PACs³) has proven to be far more time consuming and challenging than originally anticipated by CRL, the implications of which put the agreed handover dates at greater jeopardy.

The full extent of the effort and the standard of assurance paperwork necessary, has been underestimated in terms of time and the level of resource required. There is also a growing realisation by CRL that the remaining Phase 2 T&C will require a considerable effort to achieve and will prove difficult to close-out and sign-off as accepted.

The lower-than-planned levels of productivity have led to an increase and prolongation of the Tier 1 Contractor's staff, and some of the pass-through Tier 2 subcontractors involved in document production. As a result, staff levels that were expected to substantially reduce post-TOSD, have remained high. This has kept the associated costs higher than forecast. When trended forward, CRL's productivity suggests continued delays in achieving certification documentation sign-off and the likelihood of meeting the required dates is significantly reduced due to increasing schedule compression. We remain concerned that forecast SC3/HO dates for most of the SSP assets are now either coincident with, or later than, their Cardinal Milestone dates, and that further delays continue to be reported.

We remain concerned that the required 'run rates' for the completion and sign-off of the remaining certification are, in some cases, more than has been achieved in the past, and that further delays to the forecast SC dates will occur as a result.

Some success has been achieved in the sign-off and closure of outstanding IRNs by converting any remaining issues without sign-off into snag-list (punch-work) items for resolution post SC3. These snag-lists, and the progress made in their closure, must be carefully tracked by CRL to ensure that the necessary works are completed.

The IMs have been concerned that CRL's reported project forecast dates are 'unreliable'. LU believed that the introduction of a T-Minus process would provide a better gauge of where the programme and each of the SSPs are, as they advance towards HO. In response to this concern, CRL has introduced its (i.e. effectively LU's) T-Minus process. This has already impacted on CRL's schedule, adding delays of up to 2 months to SSP forecast dates for SC3 (Trial Operations). The successful achievement of the EOP may consequently be under threat.

The T-Minus process identifies what assurance documentation is required, by when, if SC3 is to be achieved, and Handover/Ownership of the new SSP asset to be passed from CRL to the IM. The process, and an illustrative flow chart, has been issued to each Delivery Team. Definition of the exact requirements and timings has been left to each site, to agree with their respective IMs. There does not appear to have been any centralised 'pushback' by CRL to negotiate either alternative compromise proposals or phased submission, as elements become available; particularly in the anticipation of the schedule impacts and the associated cost escalations that will be incurred.

² Installation Release Notes (Phase 2.1).

³ Pre-Commissioning Certificates Phase 2.2 and Partial Acceptance Certificates Phase 2.3.
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Unless CRL can agree a reduction in the requirements of the IMs (LUL and RfL) for SC and HO, it remains unlikely that any mitigation measures (beyond increased resourcing and work hours with associated additional cost) will be able to recover the dates. We wait to see if CRL can mitigate these delays, by seeking the IM's agreement to minimum practical requirements, or whether the delays will be accepted, in part to accommodate the contractors' continued slow rate of document submission. We have not seen any evidence, as yet, of any IM flexibility in their requirements. The T-Minus process will have to be refined by CRL if it is to fully understand and mitigate the impact on the schedule, and any new requirements⁴ which may further delay SC3.

Each site now has to prepare a new HEP (Handover Execution Plan) that will define the list of key deliverables (e.g. documents, certificates, manuals and drawings etc.) to be submitted to the IM by specified dates; if the T-minus process is to proceed. The production of the HEPs is critical for defining and agreeing the scope and deliverables for Handover. This level of clarity has evaded CRL since the T-Minus process was announced.

Failure to achieve the agreed submission dates for what will effectively become Gate Reviews, will result in a pause/stop in the process; this will incur further potential delay, until the process can be re-started. We believe this will introduce an indeterminate schedule and cost risk to CRL. Previous performance suggests that achieving such dates will be a serious challenge for CRL to overcome. There is also a risk that additional work or requirements on CRL may result, as each of the sites negotiates its HEPs with the IMs. There are 29 HEPs planned, which provides detail of what the IM's are going to get at ROGS. CRL anticipates that 21 of the HEPs will be complete and ready for submission to the respective IMs by the end of August 2019. Production of HEPs is being delayed due to contractor and CRL resource shortages, compounded by the summer holiday period.

Consideration has been given by CRL to establishing documentation 'factories' for producing O&M Manuals and Hazard Closures for Safety Justifications and other documentation; but it may now be too late to provide meaningful benefit. Difficulties in identifying and sourcing suitable available resources will make it hard to get this initiative underway. Meanwhile, agreement has been given to reinforce resource on a case-by-case basis at each site, to try to relieve the production bottleneck. While action is necessary, it is not clear which option provides the best value for money.

CRL is considering a sequential handover of sections of the new stations, rather than waiting for a full Handover. It is not yet clear whether this would add an additional burden to the already stretched documentation production process; requiring documentation packs for each separate Station, Portal and Shaft element, followed by a further re-consolidation for full and final Handover. However, it remains to be seen whether or not any station can achieve SC3, until the Routeway/Systemwide contractor has achieved its own Staged Completion (forecast April 2020), and RfL is able to sign-off its rooms within the stations.

9.0 Dynamic Testing

The strategic plan Dynamic Testing remains as previously reported, with the schedule 'footprint' extending nominally to MDT 37⁵, starting on 10 December 2019. CRL's processes for works planning consider scope in detail in the next four weeks, with content refined until 'locked-down' a week ahead of execution.

A significant change in the period has been the adjustment of Dynamic Testing plans in MDT 26, 27 and 28, in order to accommodate the completion of footbridge works at Silvertown Way. A

⁴ For example, LU's requirements for "self-contained" Red-Line Drawings will result in a further potential impact on the T-Minus process and the forecast SC3 dates.

⁵ T&C Visualisation Room, 2 September 2019.
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long-planned and significant event is the use of MDT 29 for construction; this will allow Siemens to download software P_D+10 to Central Section signalling equipment. CRL continues to assess the benefits of possible earlier introduction of P_D+10 to the Central Section, but agreement with Siemens has yet to be reached.

Separately, the Plateau Team is also investigating whether the period of Dynamic Testing 'downtime' currently considered by Siemens necessary for software downloads, can be reduced; if achievable, this would provide significant schedule benefit, but must be exploited as soon as possible to have maximum effect.

CRL has yet to formally secure enough GEML interface possessions from NR in late 2019, which would allow Siemens to demonstrate the correct functioning of the interface prior to Trial Running; possessions have been booked through the first quarter of 2020. There is still a lack of agreement that this proof is a pre-requisite⁶, with MTR-C insistent that access from the East is necessary to support Trial Running. While some GWML interface possessions have been secured by CRL, the final number required is subject to Siemens confirmation of transition testing scope. This is considered a priority interface, because of its critical role in the transfer of Rolling Stock between OOC Depot and the Central Section, and the uncertainty around commissioning requirements represents a significant risk to the start of Trial Running.

10.0 Approvals, Assurance and Agreements

The submission schedule for RAB(C) approvals continues to be updated and aligned with the DCS. The size of the predicted peak workloads (both for submission preparation and availability of Board members for approval) remains a significant concern. However, CRL's proposal to move away from incremental safety submissions which, we have suggested in past reports, will provide some relief.

As stated in our last report, it is clear there are substantial challenges to producing the required assurance evidence in time for Trial Running in February 2020. This is primarily because the evidence in most cases can only be completed once testing and commissioning is completed, which, as described in earlier sections, is still in progress. The evidence should also be produced before February in a staggered manner, considering the different scheduled Handover (in some cases SC1) dates for the Elements and the requirements of the 12-week T-Minus process. Delays to individual Elements will have consequences for others following them in the schedule.

11.0 Stage 4 Summary

Last period, we reported that reliability risk was the key challenge facing Stage 4 Opening. This is because the Stage 3 service will be increased by 100%, and staff will be managing the transition of services between the Central Section and the GEML. This is planned to occur circa 6 months from Stage 3 Opening. The submission for the Stage 4 timetable is likely, by necessity, to be submitted prior to Stage 3 Opening; the Stage 4 timetable may be required to be ready for the May 2021

If the Trial Running data is poor during the timetable submission period, it will increase the need for a 'soft' start. Options as to what that might comprise should be considered now.

12.0 Stage 5 Summary

CRL has given an overall rating of 'amber' for Stage 5A Opening in its Period 5 PDB Dashboard. This is because there has been another period of stable performance from the DOO CCTV

⁶ Dynamic Testing Vis-Board Review held on 2 September 2019.
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element of the project. We appreciate the progress that is being made, but remain cautious due to the late (but scheduled) dates of two of the eight stations.

Stage 5A services are likely to start with RLUs, before being swapped out with FLUs. This is due to further slippage in delivery of the Y0.100 software configuration.

Our comments concerning Stage 4 reliability equally apply to Stage 5B. The need for, and nature of, a 'soft' start must be given consideration in time for the NR timetable process.

13.0 RLU – FLU Swap-Out

The FLU fleet has been providing limited service on the Paddington to Hayes & Harlington route, with its roll-out being held back by the poor performance of the trains. The trains are currently operating with an MTIN of circa 500⁷. The faults have generally been software related.

This provides valuable learning experience, but indicates that full deployment of FLUs on the route will take some time to achieve.

The Z0.100 software upgrade that is necessary to allow FLUs to operate Stage 5A services has slipped by 2 weeks to the end of November 2019. This latest delay means that the Stage 5A service on 15 December 2019 will likely consist of RLUs using R 4.2⁸ software. The process of delivering the necessary RLUs is reported to be going well⁹.

As we said in our last report, if the service begins with RLUs, RfL can start replacing these with FLUs as soon as the software is ready

14.0 Stage 5A Opening - NR

The DOO CCTV remains on programme, with no change to the critical path. The SATs for the first 3 of the 8 stations have been submitted to RfL and it is reported that there are no major issues with them. MTR-C will carry out its operational proving runs at these stations to complete the assurance process.

Nevertheless, DOO CCTV remains the most critical part of Stage 5A. A loss in possessions, or clash with other projects cannot be ruled out, and Twyford and Maidenhead remain scheduled to be completed close to the start of Stage 5A.

15.0 Stage 5B Opening

As we have described in our previous report, all West Inner Station enhancements works should be completed by December 2020¹⁰. Assuming Stage 5B will start at the earliest in December 2021, there should be little risk of the works being delayed for opening. The primary focus at this point should therefore be to contain costs.



⁷ For comparison, the requirement to exit Stage 3 Trial Operations is 10,000 MTIN. (CRL Reliability report).

⁸ The train are currently in use on the GEML.

⁹ Stage 5A Vis-Board review on 2 September 2019.

¹⁰ Period 5 Stage 5B Dashboard.

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16.0 Key Areas of Concern in the Period

While acknowledging last period the great strides CRL has made in recent months, evident by the 'green-shoots' that are starting to occur across the Programme, these still need to translate through to the ultimate performance metrics of cost and schedule. We believe CRL has yet to fully address the following: root cause of the optimism bias; the IM's detailed integration plan; the mitigation plans for limiting the increasing AFCDC, the timely completion of the safety and technical assurance documentation, definition of the post-ROGS phase of the Programme and the culture of 'planning to targets' in some areas of the Programme.

I would also like to take this opportunity to highlight the key issues from the Period Report that we consider require further action or explanation to Sponsors by the CRL Leadership Team:

- 16.1 a. As the Programme enters its final stages and noting the challenge ahead to reduce the Tier 1 contractors current head-count as soon as possible. What are CRL's plans to ensure that a 'drift' in re-allocation of Tier 1 resources does not occur, which would impact the AFCDC, and that the resources are removed in the most efficient manner possible?
- 16.2 b. Given the various influences and challenges from across the Crossrail Programme upon readiness to enter Trial Running, when does CRL believe it will be in a position to declare a firm date, to enable key interfacing parties to make robust plans?