



Crossrail Project Representative

Crossrail Joint Sponsor Team

Sponsor Summary

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Period 7 FY2019-20

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Note: This report relies on the information set out in CRL's Period 6 reports augmented by more current information received by PRep during the course of our routine discussions with CRL since the Period close on 15 September 2019. Note that information emerging after the close of Period 6 is subject to formal confirmation by CRL in its Period 6 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	1 November 2019	PSR 130 Period 07 FY 2019-20 Sponsor Summary v2.0	[REDACTED]		
1	14 November 2019	PSR 130 Period 07 FY 2019-20 Sponsor Summary v3.0 Final	[REDACTED]	[REDACTED]	[REDACTED]

Sponsor Summary

Health & Safety Performance

For the third consecutive period, the project has unfortunately suffered a RIDDOR, taking the yearly total to 15 (5 in the last 3 periods). An unsecure 65kg gas bottle, located in a storage cage, fell on an operative’s foot, resulting in 4 broken bones. CRL initiated a review of the gas storage facilities across C610 and has issued a programme wide notice. In addition to the RIDDOR, three HPNMs (2 construction, 1 dynamic testing) occurred in the period. This is disappointing performance, given the recent safety stand-down by the programme and the safety strategy re-launch.

The positive interventions being made by CRL to improve safety performance are currently not flowing through to an improvement in results. The LTI over the last 12 periods has remained static at the 0.08/0.09 mark (2 per period). We support CRL’s positive approach to H&S; however, as stated last period, CRL must not lose sight of the fact that the Tier 1 contractors are accountable for the safety of their workforce and supply chain, and we would have expected a more proactive approach from their perspective.

Programme Delivery

Predictable Performance

As reported previously, we have observed some CRL project teams are working to targets that are not fully underpinned with current performance levels; we have previously referred to this as ‘planning-to-targets’. While there is considerable effort being exhibited by the CRL teams to meet the programme targets, the consequences of this approach are increasing schedule compression and missed milestones, as can be seen in Figure 1 - 1. For example, Farringdon Station has again maintained its 28 November 2019 SC3 milestone, while the underpinning milestones have compressed up to this date.

Stations	Phase 2 T&C	Period 11	Period 12	Period 13	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
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	08-Nov-19	20-Nov-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	15-Nov-19	27-Nov-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	20-Nov-19	03-Dec-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	30-Sep-19	11-Oct-19
	Phase 2.2		11-Jul-19	07-Jun-19	12-Jul-19	12-Jul-19	09-Aug-19	25-Aug-19	NA	10-Oct-19	23-Oct-19
	Phase 2.3		22-Jul-19	14-Jun-19	15-Jul-19	15-Jul-19	16-Aug-19	02-Sep-19	NA	21-Oct-19	01-Nov-19
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	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	08-Aug-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	22-Nov-19	22-Nov-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	06-Sep-19	20-Sep-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	13-Jan-20	18-Nov-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	28-Feb-20	18-Dec-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	11-Jun-20	19-May-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	24-Jun-20	21-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	24-Jun-20	21-May-20

Figure 1 - 1 ~ Compression of Intermediate Milestones prior to SC3

CRL has acknowledged that another step-change in performance is required in some areas of the programme. The Visualisation Process details the interventions planned to recover the performance, but the adequacy of these interventions should be re-evaluated and forecasts re-profiled to provide robust delivery plans, where dates cannot be recovered.

It is not lost on CRL’s senior management, that the previous management team was focussed on meeting a date that was not achievable, with their previous rates of performance. As such the

CRL senior management, [REDACTED] is insistent the project teams report realistic and achievable dates. This needs to be reflected in the updated DCS next period. One example, previously highlighted, would be the resolution of Engineering Safety Justifications, as seen in Figure 2 below.

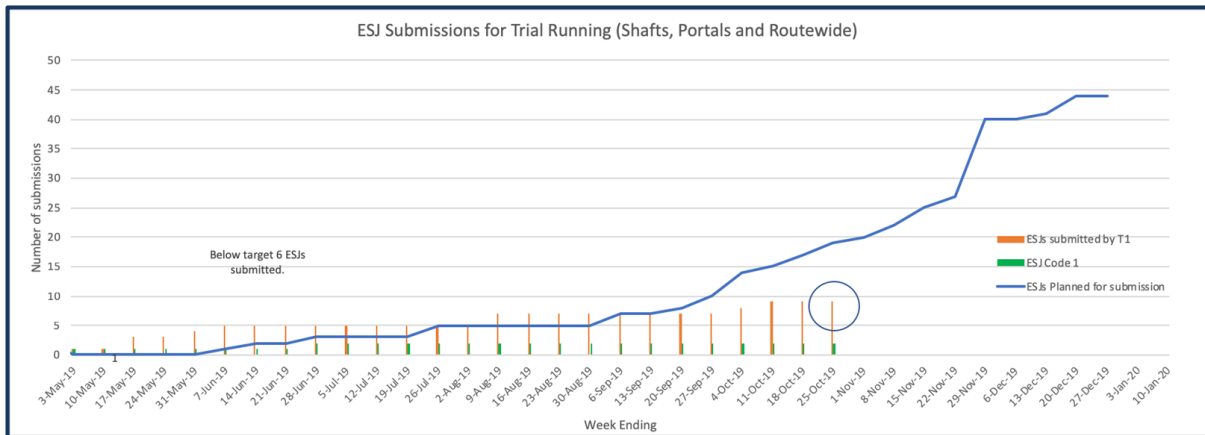


Figure 1 - 2 ~ ESJ Submissions for Trial Running (Shafts Portals and Routeway)

Forward Looking Approach

CRL delivery management teams are currently focussed on a large number of ‘near-term’ issues that need immediate resolution to ensure programme continues expediently. It must be noted, that once CRL identify an issue and place management focus on it, performance does improve. However, management bandwidth is limited and only a certain amount of issues can be resolved at once and so it is understandable that the issues that need resolving immediately are given priority.

However, whilst this approach will keep the programme moving forward, medium long term risks that are left unmitigated will eventually become critical. Also, opportunities such as the Tier 1 exit strategies and early integration of the IM’s into Crossrail will be missed. These risks and opportunities need immediate action to ensure they are either mitigated or realised.

As documented in the last period, CRL has been impacted by the need to replace Kentec fire panels, which had been identified a number of periods previously. If this risk had been escalated earlier, the impact of this delay on the overall project would have been minimal. The time CRL is currently taking to resolve binary risks is too long and a revised escalation process might be appropriate. CRL may want to consider a more proactive approach to highlight potential risks that could have significant impact on cost or schedule. One example could be an IM stand-down day, to invite the IMs that will operate the facilities going forward, well in advance of the handover date, in order to highlight potential issues/snags. This would give CRL teams sufficient time to resolve any issues raised, without impacting key handover dates.

T-Minus Process

The T-Minus process has successfully initiated a forward-looking approach, but for Custom House Station, the handover milestone slipped by over 1 month with only 72 hours before the milestone was due. This highlighted three key lessons/observations:

- 1) Due to project pressures, the Custom House project team passed through the T-Minus 11 gate with outstanding items that were promised to be delivered by T-Minus 4. Subsequent pressures elsewhere in the programme meant these items were not delivered in time for the T-Minus 4. An independent facilitator from the assurance team would remove the pressure

from members who attend the T-Minus review meeting (i.e. the participants from Engineering / Delivery / Operations) and give an accurate, independent reflection of progress.

- 2) The team was not aware it would not be possible to achieve the milestone, even though there were only hours remaining. CRL has identified a maturity assessment that visualises performance prior to the meeting, which should provide a forward looking measure; in our view this is a positive approach. Liverpool Street Station employs a forward-looking visualisation process, which CRL may want to replicate across the other projects. It would have been clear to the project team that Custom House was not ready in advance of the review.
- 3) The teams' philosophy of keeping pressure on, even while up against seemingly impossible challenges, as stated above, significantly increases the risk that planned milestones will not be met.

The above points can be observed this period, with Custom House Station handover and Tottenham Court Road handover. This ultimately results in a reduced ability to control cost (predominately time-related) and the schedule instability undermines CRL's ability to plan future milestones effectively. The lessons from this valuable experience need to be shared and implemented across all other projects as soon as possible.

Tier 2/3 Critical Resource Management

Last period, we highlighted the approach CRL had initiated to improve efficiency and manage the critical supply chain resources in a programmatic approach.

CRL identified Kone, Otis, Honeywell, AEG, Delmatic, Kilnbridge, Protech and Booths as the most critical of 24 key Tier 2/3 resources. The CRL supply-chain manager is planning 4 weeks ahead and reviewing performance and prioritisation to ensure the most efficient delivery plan is executed. The supply chain has welcomed this approach and it has given them an insight into the programme-wide perspective.

The re-allocation of resources is currently being managed in a collaborative manner, rather than through formal instruction, which we were initially concerned would initiate claims from the contractors. CRL has included a lawyer as part of its team, to ensure it is not compromising its commercial position. There are 5 members of the team, who have been assigned as key account managers.

We consider this programmatic approach a positive intervention. CRL should build on this and highlight other opportunities to deliver further efficiencies.

Internal CRL Communications

The speed and frequency at which the schedule is being updated is occurring at a time in which the programme is suffering from large period movements in the milestones. As a consequence of these two events, we have observed various levels of confusion across the CRL teams, as to which dates the programme are working to. This confusion can also be seen in our period report, as we quote various dates associated with the start of ROGS, which also forms the basis of our cost assessment. [REDACTED]

However, this does require skilled communication plans to be initiated across multiple levels of the programme, to ensure clarity is provided to CRL teams.

CRL Engagement with PRep

CRL’s current management team has been extremely open and welcoming of our presence on the project, inviting the PRep Team to meetings that were previously restricted. The recent publication of our PRep reports on the TfL website has seen the interest in our reports increase, not only in the public arena, but also within CRL.

As the PRep report is now available in the public domain and is reported on in the press, there has been a reduced level of engagement and access to documentation in some areas of CRL’s organisation. Due to the size of our team, it is essential that we maintain good relations and are provided with quick and clear access to data.

In response to this changing position, the CRL CEO stood up at the recent CRL Top 100 executives meeting to reiterate the importance of PRep, and to reinforce the need for PRep to have access to ‘all areas’. This was reiterated by the Programme Director at the period AFC meetings, both of which were well received by the PRep Team. We will monitor the current situation going forward.

High Level Schedule Summary

During Period 7, CRL undertook a substantial reassessment of the DCS and proposed the following changes to the [REDACTED] dates:

- Trial Running - [REDACTED]
- Stage 3 Opening date - [REDACTED];
- Stage 4 dates - [REDACTED]
- Stage 5 date - [REDACTED]

The movement is predominantly being driven by the following:

1. Software functionality and timing of availability;
2. Tunnel Ventilation System;
3. Routeway assurance;
4. SC1 complete at all stations;
5. “Physical work complete” at all SSP;
6. Trial Running and Trial Operations durations.

The schedule stability and rate of change on the programme is still causing difficulty in our ability to analyse the integrity of the schedule; constraints are being used, whilst mitigation plans are being developed for key risks. We are also still awaiting the supporting documentation that underpins the schedule, such as the basis of schedule, schedule management procedure, etc. Again, this limits our ability to make a judgement on DCS robustness. Further schedule development is also required post-ROGS.

In the period, there are 49 cardinal milestones that are late, 8 are early, with 63 milestones remaining static. There are 43 milestones with zero float (or less) remaining, compared to 31 milestones last period. As reported last period, this continues the schedule compression trend. There were 6 Cardinal Milestones achieved this period, as planned.

The weeks up to Christmas 2019 will prove critical to the successful achievement of the DCS dates by the SSPs. Headcount numbers continue to increase across the SSP sites, as CRL drives for increased productivity through 24/7 working and in support of assurance documentation production.

Assurance, Oversight & External Bodies Review

1st Line of Defence

CRL’s internally set deadline, of the end of October, has slipped in the period, particularly in the operations area. CRL has set itself a revised date of the end of November 2019 for the completion of all procedures. We are concerned the schedule and commercial procedures are still to be completed, as these are critical to ensure there is a consistency of approach. Whilst the key milestone of ‘processes updated’ is important, the roll-out/training and sign-off by the CRL teams is more important. An auditing of the CRL teams, to confirm their understanding of the processes, may be of benefit in ensuring a consistency and quality of output.

2nd Line of Defence

Targeted Assurance Reviews

The TARs for cost and schedule are progressing, with a verbal update to the CRL Board planned on 7 November 2019. Our initial review of the outputs suggests that the assessment, while providing a worthwhile exercise, does not provide an output-based assessment. To complete an output-based assessment at this stage of the programme, would cause significant disruption to its current delivery plan. CRL would not only require a stable scope of works to complete and schedule, but our initial assessment suggests it could take approximately 2 periods to complete. As such, due to the factors detailed in this section, together with the current level of CRL management bandwidth, it may not be possible to fully validate the schedule until the end of Quarter 2 in 2020.

Stage Gate Assurance Reviews

CRL has taken the approach to combine the stage gate reviews with the current T-Minus meetings. This would provide an independent ‘gate-keeper’ that is not influenced by the pressures faced by engineering/delivery/operations in the meeting. While the team will not be able to attend all T-Minus meetings, it is planning on taking a risk-based approach to ensure key meetings are attended. We see this as a positive step and approach by CRL. The recent slippage by Custom House station by over a month, was partly as a result of the project passing through T-Minus 11, when it was not ready. The above should help reduce this occurrence in the future.

Period Assurance Reviews

CRL’s Period assurance review has highlighted the following areas the CRL need to address.

Issue	CRL Response
Schedule Performance - CRL performance against the DCS programme continues to fall behind plan, particularly relating to assurance and completion readiness documentation.	TAR on the cost and schedule to highlight areas of improvement. Maturity assessments of handover to be completed to highlight status prior to the key milestone.
Delivery Quality - Gaps in delivered handover documentation, insufficient rigour in the handover process and high levels of documentation re-work.	Exemplar standard produced and shared across the programme.

Scope-To-Go Alignment between CRL and Supply Chain - risk that the supply chain is not yet fully aligned with CRL plans and therefore there is a risk the contractor programmes of work are out of step with CRL requirements.

Brief-out of the HEP documents which are recognised as being a pivotal step in bringing clarity to all parties about minimum acceptable definition of scope.

Figure 1 - 3 ~ Assurance Issue Raised vs CRL Responses

3rd Line of Defence

The following 3rd Line of Defence audits are still ongoing and were due at the end of October 2019:

- 1) **Tier 1 Suppliers** – To provide assurance that Tier 1 (T1) contractors are being managed effectively.
- 2) **Forecasting** - To provide assurance on the adequacy and effectiveness of controls over project cost forecasting for Anticipated Final Cost (AFC).

Cost, Commercial & Risk

The P50 AFDCDC has increased by £324m in Period 7 to £15,328m. [redacted] and represents an overspend of £365m above Sponsors Funding of £14,963m. This increase is primarily due to the delay of Trial Running from [redacted], increased scope of works and reassessment of the head and tail wind risks highlighted at Period 6.

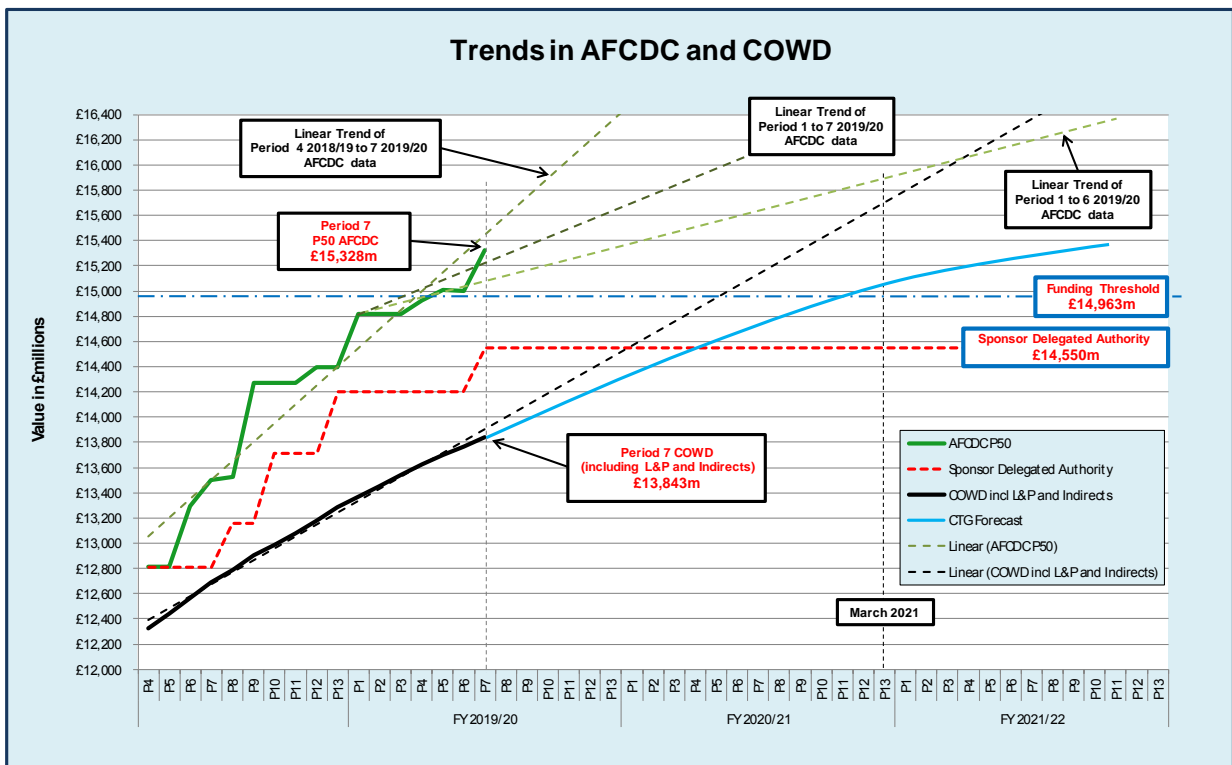


Figure 1 - 4 ~ AFDCDC Headroom to Sponsor Delegated Authority

CRL has confirmed that all projects are aligned to the revised [redacted] commencement date for Trial Running of [redacted]. These costs are built up of project AFCs' together with an overlay of cost, which has been applied centrally to accommodate this revised date. This overlay however has been based on what are 'achievable' productivity rates, rather than existing productivity rates. CRL has carried out a bottom-up QRA to align the AFDCDC to P50 and P80.

The new AFCDC is highly dependent on the achievement of key schedule dates, which do not appear to be fully underpinned by the current assurance document production rates, as displayed in the Vis-Board trends. The adequacy of the cost overlay that CRL have applied centrally to accommodate this date slippage, can only be confirmed, once a robust trend analysis has been completed. We are presently progressing with a review of the CRL QRA and its revised DCS cost model to comprehend and report next period our opinion on the adequacy of the AFCDC. In addition to the date slippages, we also consider the growing incumbent workforce and the lack of capacity for the schedule to account for emerging scope, to be key risks to the AFCDC.

The Risk Management process is still relatively immature, with a focus on risk accounting (i.e. the definition of QRA for AFCs), rather than on the identification and management of the risks themselves. However, CRL have initiated a number of areas of improvement in the period, which we believe will have a positive impact on the approach to risk management going forward;

- Segregation of risks, to align them with those people who are best placed to manage the risk. Previously, the PM's project risk register included a number of risks, which they had no ability to influence and were essentially used as a contingency to cover for other performance issues.
- Appointment of a delivery risk manager to drive mitigations
- New programme level risk owner at sector level to drive mitigations and support the PMs

Stage 2B

The date for approval of the software that enables driver training to start has been held since our Period 6 report. Assuming this situation continues, we could expect FLUs to be incrementally introduced into service, possibly from December 2019. However, the time required for driver training completion means that the earliest that full service is likely to be achieved is the end of March 2020, although this could be extended to May 2020¹.

Approvals, Assurance and Agreements

RAB(C) and subsidiary Sub-Groups have continued to meet in the period. Continued poor performance in site works completion and the production of key submissions highlighted throughout this report (e.g. ESJs and SJs), have delayed the anticipated bow-wave of Trial Running submissions. There is now insufficient time remaining for the necessary RAB(C) approvals to be made before the current Trial Running start date.

Consideration must be given to the arrangements for the management of change under ROGS, after the start of Trial Running, when safety and change review processes currently undertaken by CRL will transfer to RfL-I.

Trial Running & Reliability Growth

In our last report, we described RfL's initial view of what the baseline MTBSAF might be at Trial Running, assuming a Duane growth rate of 0.4, and how that affects MTBSAF values for Trial Operations, Stages 3, 4 & 5B.

The growth rate is a measure of how quickly and efficiently failures are being discovered and removed from the design. The growth rate for most projects averages between 0.25 and 0.4. The upper limit is 0.6, and growth rates above 0.5 are rare².

¹ Stage 2B Vis Board Gantt Chart 25 October 2019.

² Quanterion Solutions Inc.

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Recent work by the Reliability team suggests that P_D+11, whilst containing the necessary functionality to allow Trial Running to start, does not address faults that have disrupted reliability runs so far. A side benefit of a delay to the current February start date for Trial Running is that PD+12 can be introduced which aims to address these faults. Such action could avoid a disruptive start to Trial Running, which seems likely if starting with P_D+11.

The Reliability Group has been tasked to deliver its draft reliability growth curve by the end of November 2019, which will need to reflect the revised DCS.

Stage 4 & Stage 5a Summary

[REDACTED]

[REDACTED] the existing infrastructure and train systems related to Stage 4 are not now subjected to schedule pressure, but timely completion will minimise costs and free-up management resource.

The Stage 5A programme remains deliverable, with all major works on the NR network completed and DOO CCTV SATs submitted. The primary effort now is to successfully complete the DOO CCTV train integration tests before the introduction of the December 2019 timetable.

RfL continues to progress the introduction of FLUs for December 2019 by compiling performance and assurance evidence. However, with a decision point of 15 November 2019, we expect RLUs to start the service. FLUs could begin replacing RLUs from January/February 2020.

RLU – FLU Swap-Out

The MTIN for Period 7 was 427³ miles. As we stated in our last report, the figure is not expected to significantly improve until the Z0.100 software configuration is installed on the trains and approved for passenger service. The date for this has improved by circa one week⁴ since our Period 6 report.

Testing of this configuration is currently taking place at Melton. This will assist in providing evidence for the decision point of 15 November 2019 when MTR-C and RfL assess whether FLUs or RLUs should start the 5A service.

We remain of the opinion that the FLU option will be deemed as too high a risk on 15 November 2019, and that RLUs will be selected to start the service on 15 December 2019. However, the evidence being generated by the FLU should be the basis for developing a plan for their implementation at the earliest opportunity. This may be able to start from January/February 2020.

Stage 5B Opening

The handover milestones for both WP2 (Acton, Ealing Broadway, West Ealing) and WP3 (Hayes & Harlington, Southall, West Drayton) are being maintained. However, pressure upon those dates is increasing at Southall and Hayes & Harlington. This is due to programme resequencing at Hayes, and design interfaces at Southall.

³ RSD weekly service fleet performance_ 24-10-19.

⁴ Now forecast for 22 November 2019_ P8 wk 2 dashboard.

[REDACTED]

Stage 4 & Stage 5 Summary

CRL is reviewing a number of risk-based scenarios based upon the assumption that Trial Running starts in [REDACTED]. The scenarios are based upon Trial Running being prolonged from 7 to up to 12 months, and/or CRL being unable to bid the Stage 4 timetable until NR has some performance evidence from Stage 3 operations. [REDACTED]

[REDACTED] then CRL has made an assumption that Stage 4 opens 6 months later. To coincide with the National Timetable change would mean Stage 4 opens in [REDACTED].

Key Areas of Concern in the Period

We held a productive session with the CRL leadership team to discuss the points we had previously highlighted in our reports and expect CRL will provide a detailed response to these points in the next period.

I would like to take this opportunity to highlight the key issues from the Period Report, which are the same as the previous period. We consider these points require further action or explanation to Sponsors by the CRL Leadership Team:

- a) We note the increasingly large number of issues with respect to handover paperwork and engineering assurance documentation. Could CRL demonstrate the alignment of current levels of production, with the dates in the DCS?
- b) When does CRL believe it will have a detailed cost and schedule for the period of the project post-ROGS?

⁵ CRL Steering Group held on 28 October 2019 (EG 124/20).
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