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Crossrail

February 2021

DELIVERY STRATEGY

TO DELIVER A WORLD-CLASS RAILWAY THAT FAST-TRACKS THE PROGRESS OF LONDON

MOVING LONDON FORWARD

Crossrail

DELIVERY STRATEGY

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9.0	April 2016	[redacted]	[redacted]	[redacted]	Updated to reflect Project stage and organisation changes
10.0	January 2021	[redacted]	[redacted]	[redacted]	Updated to reflect new strategy to complete and close Crossrail

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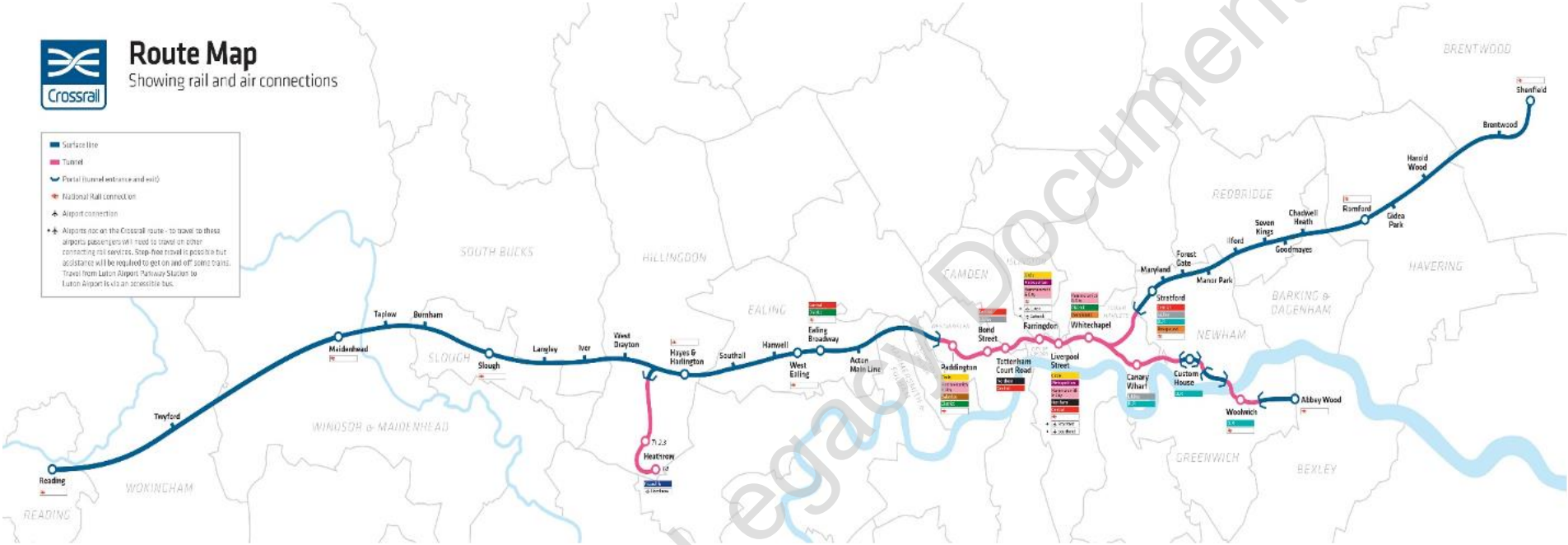

Section 1: Introduction

1 Introduction

The Project Development Agreement (PDA) between Crossrail Limited (CRL) and its Sponsors (the Secretary of State and Transport for London) appoints CRL as the legal entity accountable for the management and implementation of the Crossrail Project (Crossrail).

This Delivery Strategy sets out the manner in which CRL intends to deliver Crossrail. It provides the common definition of the Crossrail Project, its purpose and structure for everyone; particularly CRL's staff and its Industry and Delivery Partners, involved in the delivery of Crossrail. It sets out Crossrail's scope, its overall objectives, what has to be achieved and the main risks to those objectives. It demonstrates that CRL has in place the organisation, strategies, controls and resources to manage Crossrail as a whole to successfully achieve Substantial Completion, Final Completion and Handover to the Operators. It is Crossrail's primary management document, underpinned by the Crossrail Management System (CMS).

The Delivery Strategy was originally developed by CRL in order to demonstrate to the Sponsors that the requirements of the PDA had been understood and that the Crossrail Project had achieved sufficient maturity to proceed to implementation. Two formal Sponsor reviews were undertaken, Review Point 3b in 2010 and Review Point 4 in 2011, with the Delivery Strategy being updated in advance of each. There were subsequent updates in 2012, 2015 and 2016 to reflect various changes to the Crossrail Project and the CRL organisation.

It was intended that the 2016 version of the Delivery Strategy would be the final version in advance of Stage 3 opening in December 2018. However, following the announcement of the delays in 2018, the Earliest Opening Programme (EOP) was introduced. This initiative examined a revised opening strategy to allow opening of the Central Operating Section (COS) of the Elizabeth line (i.e. Stage 3 opening) at the earliest date possible and support subsequent staged opening of the end-to-end railway (through Stage 4 and 5) as soon as possible thereafter.

A COVID-19 Recovery Execution Plan was developed in response to the pandemic and its affects on the programme. The scenarios within this plan and the option selected for development into a Delivery Control Schedule (Baseline DCS1.1) [**39**] align with the overarching strategy set out in the EOP.

This revision of the Delivery Strategy supports the EOP and takes account of the COVID-19 Recovery Execution Plan[**32**]. The operating model and governance arrangements captured in the strategy were updated in December 2020 to reflect the transition to TfL.

Section 2: Vision, mission, objectives, and values

2 The Vision for Crossrail

The Elizabeth line has a key role to play in the future of London and the South East and delivers significant benefits including new journey opportunities and increased transport capacity. Now it is needed more than ever and we are focused on delivering the fully operational railway as soon as we possibly can.

The ambition of the Government and the Mayor of London for Crossrail is to create the world-class transport infrastructure needed to support the economic growth of London and its regeneration areas and facilitate London's continued development as a World City.

CRL's vision statement for all parties involved in the delivery of Crossrail is *"Moving London Forward".*

2.1 The mission for Crossrail

The mission for Crossrail embodies the ambition that is to be shared by all those people involved in the delivery of the Elizabeth line and has been defined as *"'To deliver a world-class railway that fast-tracks the progress of London"*

We must deliver a safe and reliable railway that our future passengers will need. It is absolutely vital that we don't spend any more money than we need to. Crossrail needs to be creative, solution driven, committed and focused on delivering the Elizabeth line as safely and effectively as we can, together as one team.

2.2 The Objectives for Crossrail

The Sponsors Requirements [**26**] sets out the following high-level objectives for the Crossrail Project:

1. The planning, construction, commissioning and implementation of service shall be consistent with the Government's overall approach to the provision of major transport infrastructure and the Mayor's plans for the development of the capital's infrastructure.
2. The Project shall support the Secretary of State's plans for public transport provision, in particular in relation to the manner in which it interfaces with other existing and future transport schemes and shall be integrated with the Mayor's transport and sustainability strategies.
3. Value for money shall be provided at every stage of the Project.
4. Robust cost control mechanisms shall be in place throughout the lifetime of the Project.
5. Subject to other requirements in these Sponsors Requirements, CRL shall ensure that the design and delivery of the Project shall be such as to achieve a service capacity of 24 trains per hour (TPH) utilising 200m Trains in the Normal State of Operation in the Central Section at the Final Delivery Date.
6. The Project shall be developed, designed and constructed in a way that optimises whole life cost on the basis of an appraisal period of 50 years from the Target Final Delivery Date and using TfL Business Case Development Manual assumptions as to methodology and discount rates, except that such analysis in respect of On-Network Works shall be undertaken with reference to Network Rail's equivalent procedures and parameters.

7. Quality assurance, environmental assurance, safety and security regimes shall be established to be implemented during the phases of design, construction, commissioning and service operation.
8. In all circumstances the design of the Crossrail Project shall comply with all Applicable Laws and Applicable Standards including, but not limited to, those pertaining to safety, security, interoperability, the environment and provision for those with disability.
9. World-class levels of performance and reliability shall be delivered.
10. CRL shall co-ordinate the activities of parties to the Crossrail Project to deliver pro-active and consistent communications and relations with stakeholders, the media and local communities; and
11. All outputs shall be achieved for a minimum of 50 years from the Target Final Delivery Date and allowing for increased use of the system and the requirements for maintenance and renewal of Crossrail Assets over this time period.

The statement of objectives for the Crossrail Project set out in Appendix 1 of the Sponsors Requirements is included in Appendix A.

2.3 The values of Crossrail

Crossrail's Executive Team has set out the values which they wish its people and partners to adopt in order to support the successful delivery of Crossrail. These are:

- Safety
- Inspiration
- Collaboration
- Integrity
- Respect

CRL have set their corporate objectives in line with these values which are further described in section 4

Section 3: The Crossrail Project

3 The Crossrail Project

3.1 Definition of the Crossrail Project

Crossrail is one of the largest infrastructure projects in the UK and the largest single addition to the London transport network for over 50 years.

The PDA defines the **Crossrail Project** as: 'the project for the development, design, procurement, construction, commissioning, integration and completion of a railway transport system that is capable of operating services from Reading in the County of Berkshire and from Heathrow Airport in the London Borough of Hillingdon through central London to Shenfield in the County of Essex and Abbey Wood in the London Borough of Greenwich in accordance with the Sponsors Requirements' *(Figure 3-1)*.

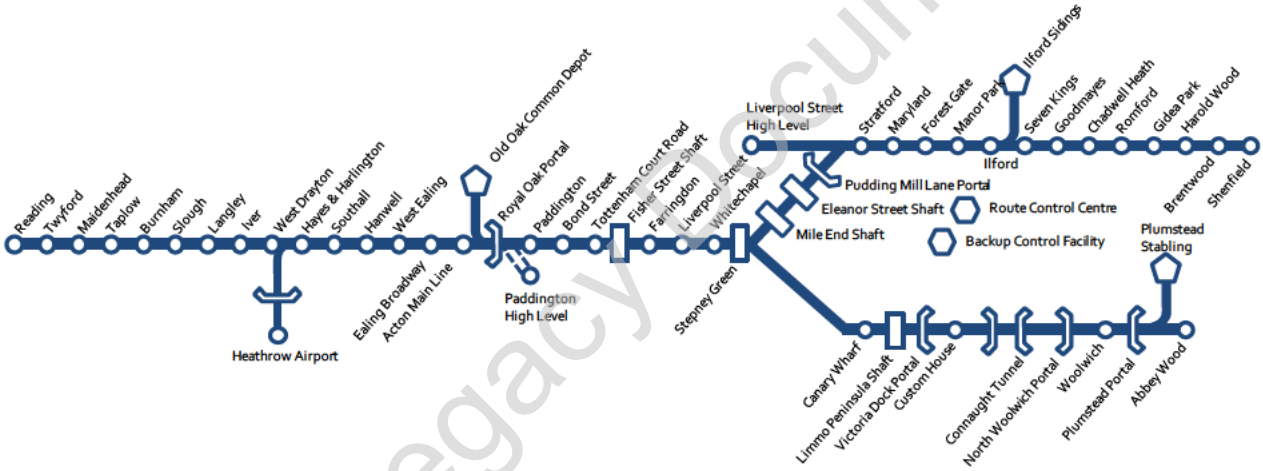

Figure 3-1 Crossrail Route Map

This definition is supplemented by the obligations and requirements set out in the following documents:

- Crossrail Act 2008 **[24]**
- Crossrail Environmental Minimum Requirements (including the Crossrail Register of Undertakings and Assurances) **[33]**
- Crossrail Project Development Agreement and associated Sponsors Requirements**[25]**
- Crossrail Programme Functional Requirements (CRL's detailed interpretation of the Sponsors Requirements) **[36]**, and
- Industry Partner and other Agreements.

This definition is broken down into sub sections which are used to describe the various component parts of the project:

1. Crossrail Network
2. Central Operating Section
3. Central Core Area
4. On-Network Sections
5. Depot and Rolling Stock
6. Other Works

1. Crossrail Network

Crossrail Network means the railway routes, depots and stations forming part of the Crossrail Project *(Figure 3-2).*

Figure 3-2 Crossrail Network

2. Central Operating Section

Central Operating Section (*Figure 3-3****)*** means the part of the Crossrail Network

(i) between Royal Oak (in the City of Westminster) and Pudding Mill Lane (in the London Borough of Newham) and

(ii) between Royal Oak (in the City of Westminster) and Abbey Wood (in the London Borough of Greenwich), the exact parameters of which shall be determined pursuant to the Sponsors Requirements.

Central Operating Section Stations means:

(a) the new sub-surface stations at Paddington, Bond Street, Tottenham Court Road, Farringdon, Liverpool Street, Whitechapel, and Canary Wharf (the Isle of Dogs) referred to in the Sponsors Requirements

(b) the existing station at Custom House that is to be upgraded and that is referred to in the Sponsors Requirements and

(c) the station at Woolwich for which the Woolwich Station Box was constructed by Berkeley Homes.

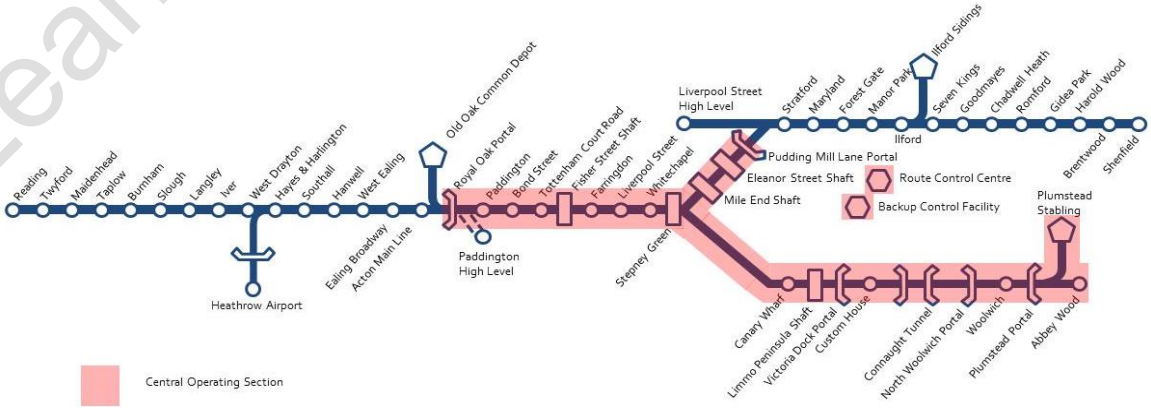

Figure 3-3 Central Operating Section

3. Central Core Area

Central Core Area ***(****Figure 3-4****)*** means that part of the Central Operating Section between (i) Royal Oak (in the City of Westminster) and Pudding Mill Lane (in the London Borough of Newham) and (ii) Royal Oak (in the City of Westminster) and Plumstead (in the London Borough of Greenwich).

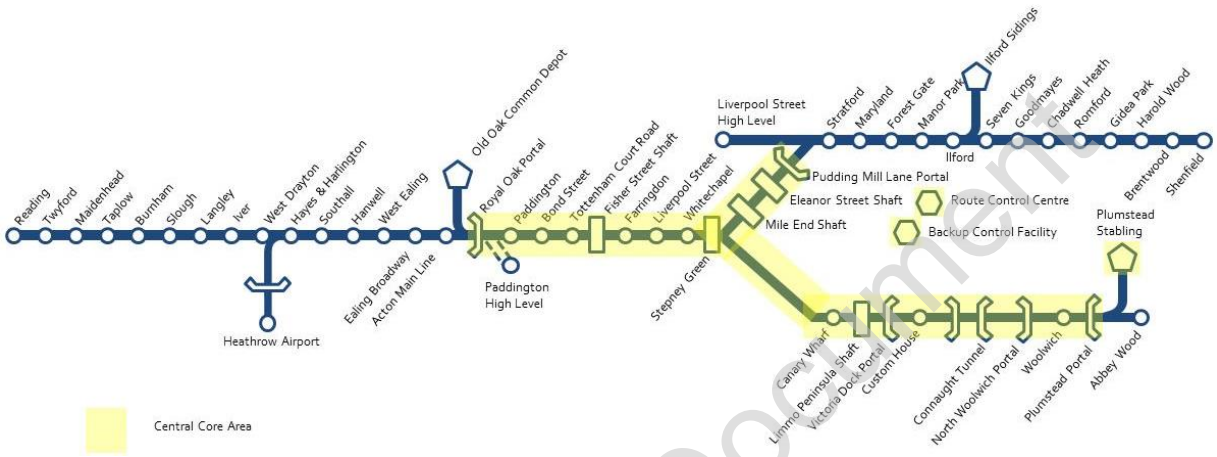

Figure 3-4 Central Core Area

4. On Network Section

On-Network Sections *(Figure 3-5)* means those sections of the Crossrail Project outside the Central Core Area.

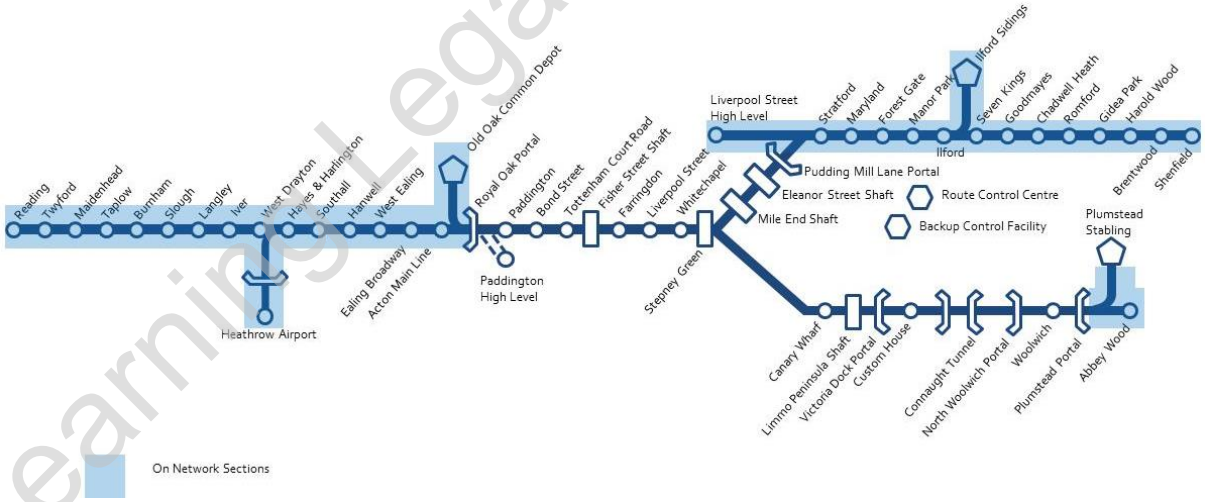

Figure 3-5 On Network Sections

This includes all of the works on the national rail network including infrastructure modifications and enhancements, station modifications and upgrades, signalling & control and stabling.

- Crossrail Surface West - The western section on the Great Western Main Line between Reading, Heathrow, and Portobello Road
- Crossrail Surface East - The eastern section on the existing electric suburban tracks of the Great Eastern Main Line (GE) between Pudding Mill Lane Junction and Shenfield and
- Crossrail Surface South East – between Plumstead Portal and Abbey Wood, including works to the existing electric suburban tracks of the North Kent line.

5. Depot and Rolling Stock

This comprises of all the new rolling stock fleet and depots required to deliver the Crossrail Project, including all associated stabling, maintenance facilities and accommodation.

6. Other Works

London Underground has also delivered works outside the Crossrail programme but without which Crossrail could not open with full functionality. These include congestion relief works at Bond Street and station upgrade works at Tottenham Court Road (including a new ticket office, escalators, and interconnecting passageways). London Underground has funded these works outside Crossrail's approved funding envelope and delivered them as a Nominated Undertaker under the Crossrail Act.

3.2 Staged Opening

The Staged Opening Plan for Crossrail was fundamentally changed by the Earliest Opening Programme (EOP) endorsed by the CRL Board in April 2019 to help address the delays which had been announced in 2018. Additional stages and revised target dates were announced in 2020 as part of the COVID-19 Recovery Execution Plan.

Crossrail services will now be introduced progressively from June 2017 to December 2022.* where possible, the date within each month shall be the date on which changes to the national rail network timetable are implemented.

† for the avoidance of doubt, this excludes the Westbourne Park train reversal facility and the new junction at Portobello Junction to permit access to the Central Section.

** The Crossrail railway has been extended to Reading, as per Sponsor Change Notice: CCN0017

Table 3-1) shows the revised staged opening plan. This sequence of service openings and its associated schedule is designed to minimise the risk in integrating the end-to-end Crossrail services following completion of the Central Section Works, by opening successive stages once earlier ones have stabilised.

Stage	Description	DCS1.1 Forecast Baseline Date*
1	**Liverpool Street High Level to Shenfield** Progressive introduction of new Class 345 Crossrail trains on existing suburban services into Liverpool Street by substitution	June 2017
2A	**Paddington High Level to Hayes & Harlington** On-Network Works between Heathrow and Paddington†. Substantially Complete with Class 345 Crossrail trains running at a frequency of 2 TPH from Hayes into Paddington (high level) and 2 TPH using Class 360s from Heathrow Terminal 4 into Paddington (high level) replacing Heathrow Connect	May 2018
2B	**Paddington High Level to Heathrow Airport** Class 345 Crossrail trains running at a frequency of 2 TPH from Heathrow terminals to Paddington (high level) plus the Inter Terminal Transfer (ITT) service between T4 and T2/3	July 2020
3A	**Paddington Low Level to Abbey Wood (EOP Stations)** Crossrail Services running throughout the Central Operating Section from Paddington (low level) to Abbey Wood (excluding Bond Street) at a frequency of 12 TPH	December 2021

Stage	Description	DCS1.1 Forecast Baseline Date*
3R	**Inclusion of all non-EOP stations within COS into the operating railway** No change in service level. All non-essential functionality included. Bond Street now included, with a contingency for Whitechapel if SC3 configuration is required.	September 2022
4A	**Liverpool Street High Level to Shenfield** Crossrail Services from Liverpool Street High Level to Shenfield 12 TPH (GE)	May 2021
4	**Paddington Low Level to Abbey Wood & Shenfield** Through running of Crossrail Services from Paddington (low level) to Shenfield and to Custom House/Abbey Wood. 24 TPH COS; 12 TPH (GE) and 12 TPH Abbey Wood Branch.	May 2022
5A	**Reading** & Maidenhead to Paddington High Level** Introduction of new Class 345 Crossrail trains running at a frequency of 4 TPH peak from Reading to Paddington (high level) and 2 TPH off-peak.	December 2019
5B	**Reading** & Heathrow to Abbey Wood & Shenfield** Full Crossrail Services from Reading and Heathrow through the Central Section to both Shenfield and Custom House/Abbey Wood. 12 TPH Western Route; 24 TPH COS; 12 TPH GE and 12 TPH Abbey Wood Branch.	December 2022

* where possible, the date within each month shall be the date on which changes to the national rail network timetable are implemented.
for the avoidance of doubt, this excludes the Westbourne Park train reversal facility and the new junction at Portobello Junction to permit access to the Central Section.
** The Crossrail railway has been extended to Reading, as per Sponsor Change Notice: CCN0017

Table 3-1 Summary of staged opening dates for Crossrail services

3.3 Elements

The Crossrail Network has been broken down by CRL into groups of assets and systems, each such group constituting an "Element" as defined by the PDA and agreed with the Operators. CRL is affecting a phased handover of these Elements to the Infrastructure Managers (IMs) once each Element has been commissioned and accepted, in accordance with this Delivery Strategy, in order to satisfy the Staged Opening Plan agreed with Sponsors.

(Table 3-2) sets out a summary of the Elements and *(Figure 3-6)* sets out the delivery responsibility for each Element

Group of Elements (Acceptance of Crossrail end-to-end)			Element	Delivered By	Party that receives handover	Future Operator (e.g M under ROGS)	Asset Maintainer	Stage Req'd For
Central Operating Section	RFLI Routeway	1	Railway Systems	CRL	RFLI	RFLI	RFLI	3A
		2	Non-traction power HV	CRL	RFLI	RFLI	RFLI	3A
		3	Tunnels (and structures)	CRL	RFLI	RFLI	RFLI	3A
		4	Plumstead Maintenance Facility and Reception Road	CRL	RFLI	RFLI	RFLI	3A
		5	Plumstead Sidings	CRL	RFLI	RFLI	RFLI	3A
		6	North Woolwich Portal	CRL	RFLI	RFLI	RFLI	3A
		7	Pudding Mill Lane Portal	CRL	RFLI	RFLI	RFLI	3A
		8	Victoria Dock Portal	CRL	RFLI	RFLI	RFLI	3A
		9	Royal Oak Portal	CRL	RFLI	RFLI	RFLI	3A
		10	Plumstead Portal	CRL	RFLI	RFLI	RFLI	3A
		11	Stepney Green Shaft	CRL	RFLI	RFLI	RFLI	3A
		12	Mile End Shaft	CRL	RFLI	RFLI	RFLI	3A
		13	Eleanor St Shaft	CRL	RFLI	RFLI	RFLI	3A
		14	Limmo Peninsula Shaft	CRL	RFLI	RFLI	RFLI	3A
		15	Fisher St Shaft	CRL	RFLI	RFLI	RFLI	3A
	LUL Stations	16	Liverpool Street station	CRL	LUL	LUL	LUL	3A
		17	Bond Street Station	CRL	LUL	LUL	LUL	3R
		18	Tottenham Court Road Station	CRL	LUL	LUL	LUL	3A
		19	Farringdon Station	CRL	LUL	LUL	LUL	3A
		20	Whitechapel Station	CRL	LUL	LUL	LUL	3A
	RFLI Stations	21	Custom House Station	CRL	RFLI	MTR	RFLI	3A
		22	Canary Wharf Station	CRL (CWG)	RFLI	MTR	RFLI	3A
		23	Woolwich Station	CRL (BH)	RFLI	MTR	RFLI	3A
		24	Paddington Station	CRL	RFLI	MTR	RFLI	3A
Rolling Stock and Depots		25	Rolling Stock	RfL	RFL	MTR	TfL	All Stages
		26	Old Oak Common Depot	RFLI	RFLI/ Bombardier	Bombardier	RFLI/ Bombardier	2
		27	Ilford Yard Stabling	CRL	Bombardier	Bombardier	Bombardier	1
		28	Yellow Plant	RFLI	RFLI	RFLI/TU	RFLI/TU	3A
On Network Section	South East Spur	1	Abbey Wood Station	NR	NR/RFLI	MTR	NR/RFLI	3A
	Great Eastern	2	On-network works GE routeway	NR	NR	NR	NR	4
		3	GE Stations	NR	RFLI/MTR	MTR	RFLI	4
		4	Early on-network works incl. DOO-CCTV	NR	RFLI	MTR	RFLI	1
	Great Western	5	On-network works GW routeway	NR	NR	NR	NR	5
		6	GW Stations	NR	NR/SFO	GW/MTR	NR/RFLI	5
		7	DOO CCTV Works on GW stations	NR	RFLI	MTR	RFLI	5A
	Heathrow Spur	8	On-network works	NR	HAL	NR	HAL	2B

Table 3-2 Table of Elements

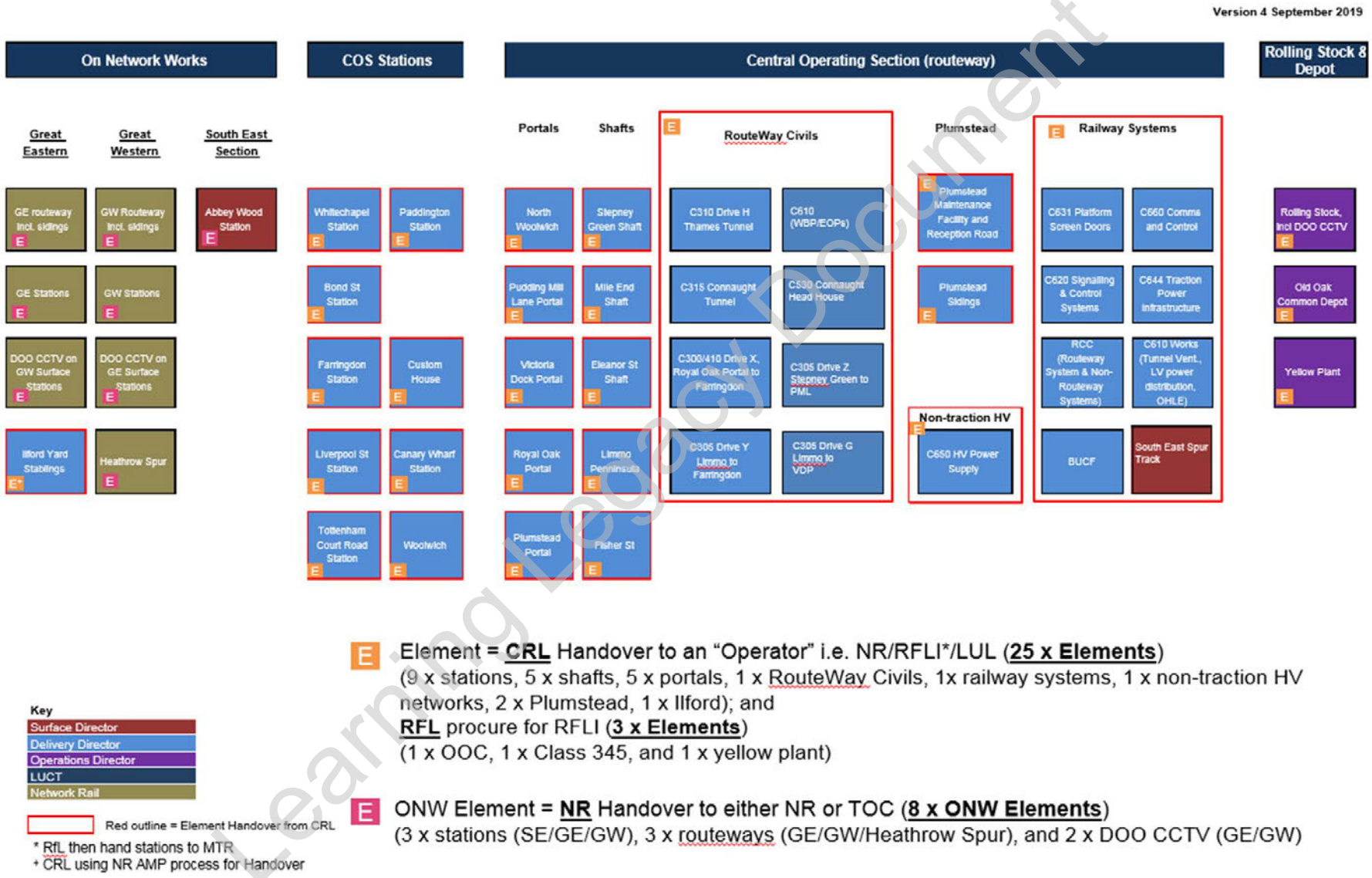

Figure 3-6 Element delivery responsibility

3.4 High-Level Schedule

The high-level schedule *(Figure 3-7)* shows the key elements of the Crossrail COVID-19 Recovery Plan for completion and operation of the railway. The detail is maintained in the Delivery Control Schedule (Baseline DCS1.1), September 2020.

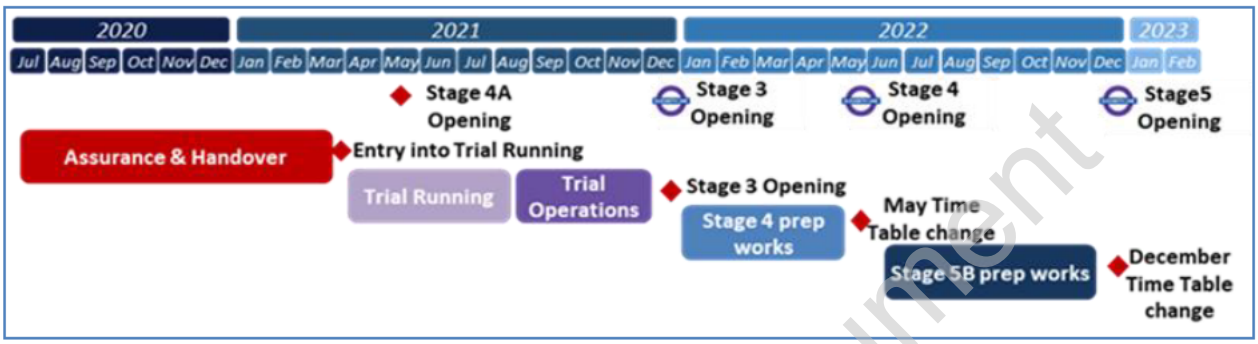

Figure 3-7 High level end to end schedule

3.5 Approved Funding Package

(Figure 3-8) lays out the approved funding package for Crossrail as of December 2019.

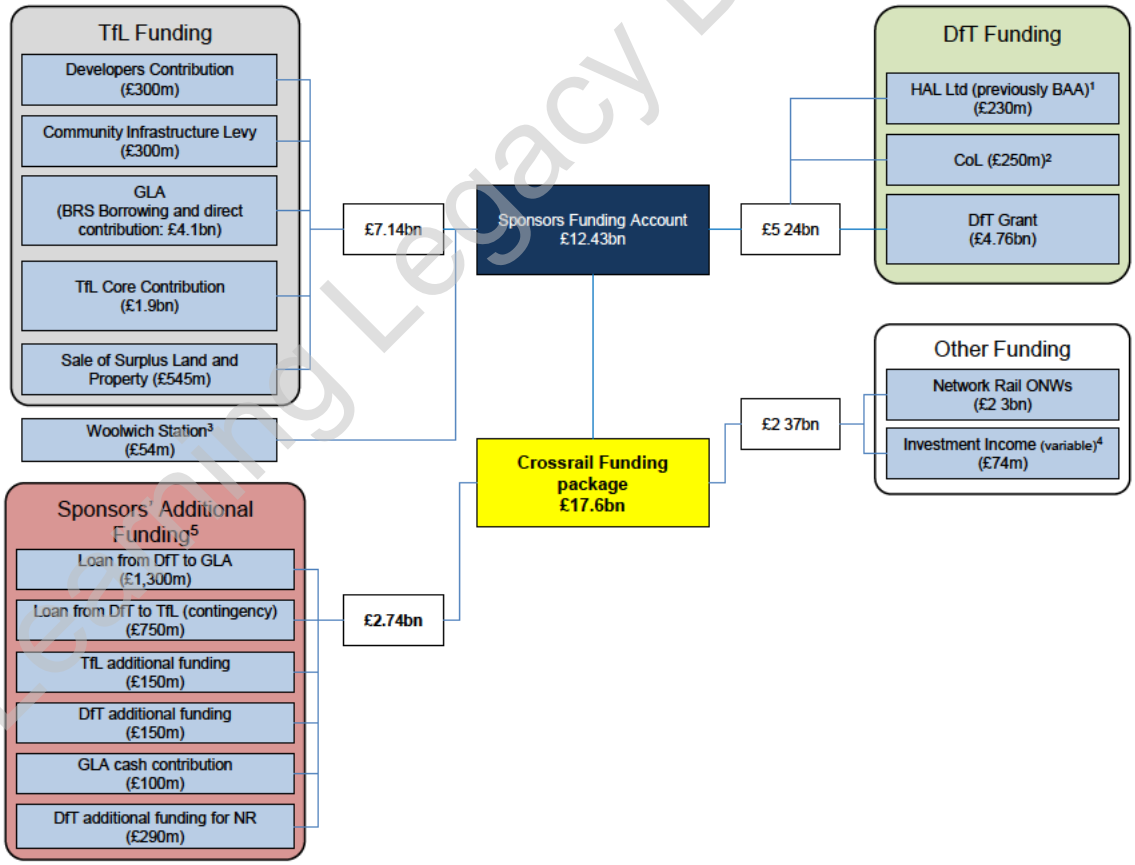

Figure 3-8 Funding Overview (December 2019)

1. The amount the DfT originally expected Heathrow Airport Ltd to pay in 2008 (then BAA) was £230m. However, this was subject to Civil Aviation Authority (CAA) approval. In 2014 the CAA determined that HAL should contribute £70m. The DfT is responsible for any shortfall.
2. In addition to the £250m, the DfT's agreement with the City of London originally included £100m of planned voluntary contributions from businesses. This is now unlikely to be received due to alternate funding of the CRL Arts Foundation. The DfT is not responsible for any shortfall.
3. The original scope for Crossrail did not include funding for an operational station at Woolwich. In July 2013, Berkeley Homes, the Royal Borough of Greenwich and Transport for London agreed to provide £54m towards the cost for the station.
4. Crossrail benefits from interest income on the money held in the Sponsor Funding Account. This is calculated in the Crossrail Investment Model every period and varies depending on forecast interest rates.
5. In December 2018 the funding envelope was increased to £17.6 billion (£2.8 billion more than the original £14.8bn funding envelope). The additional funding includes more than £2 billion of loans from the government to TfL and the Greater London Authority.

3.6 Current Cost Estimate (DCS 1.1)

The Anticipated Final Crossrail Direct Cost (AFCDC) has been re-estimated based on the Delivery Control Schedule (DCS) version 1.1 baseline. The methodology is to consolidate the forecast costs supplied by project teams along with their Quantified Risk Assessments (QRA) at a P50 level of exposure. This is then overlaid with programme level assessments:

- Cost amendments to achieve consistency of assumptions across projects
- QRA for risks managed at a programme level at P50
- Prolongation risk based on the schedule QRA at P50
- Central provision for un-costed scope
- Central provision for commercial allowances
- CEO management reserve.

The AFCDC at P50 has been baselined at £15,880m. At a P80 level of total risk exposure this rises to £16,035m. The funding gap at the point of estimation (see 3.5 above) was £916m at P50 and £1,071m at P80.

Section 4: Crossrail Organisation and Structure

4 Crossrail Organisation and Structure

This section sets out the adopted 'model' for the delivery of Crossrail and includes details on CRL as an organisation, the parties engaged in the delivery, how it is structured and the corporate governance framework adopted.

4.1 Description of Crossrail Limited

CRL has been established as a limited company with the sole purpose of managing and delivering Crossrail. At a high level the PDA (clause 3.2) states that CRL will manage and deliver the Crossrail Project as follows:

- So as to satisfy the Sponsors Requirements
- In accordance with the Crossrail Programme Functional Requirements (CPFR)
- In accordance with the terms of the PDA and the other Principal Project Documents to which it is a party
- In a manner consistent with the Delivery Strategy
- In a manner that will oblige the Operators to accept Handover of assets and systems in accordance with the Handover Strategy and Plan procedure and as referenced in PDA (clause 16.2)
- Using all reasonable endeavours to meet the Project Milestones so that the Final Delivery Date occurs on or before the Target Final Delivery Date and in any event, on or before the Longstop Date and
- In accordance with any additional conditions that are imposed by the Sponsors as a result of the Project Review.

CRL is the principal Nominated Undertaker as defined in the Crossrail Act and through the PDA, is accountable for the development and delivery of the whole of Crossrail including all of its component projects. In fulfilling this role CRL has to provide an overall programme management role and has duties in relation to the delivery of the Central Section Works and other projects.

CRL is a wholly owned subsidiary of TfL and consequently is subject to TfL governance. However, certain controls are held by the Sponsors jointly. Consequently, CRL's governance must comply with a number of existing defined arrangements.

CRL must also comply with company law and with a range of other directives concerning the behaviour of public bodies.

The PDA stated that TfL will delegate authority to make decisions in relation to the delivery of Crossrail to CRL after the Delivery Strategy had been accepted. A previous version of the Delivery Strategy was accepted by the Sponsors at Review Point 3, and the TfL Board progressively delegated authority to the CRL Board leading to a full delegation of procurement authority with effect from the 17th May 2010. Certain decisions remain subject to Sponsor approval in accordance with the PDA.

CRL's primary task is to manage the programme of interrelated projects and ensure that they are integrated to provide the operational capability required by the Sponsors. CRL is also responsible for the overall integration and assurance of systems to deliver the functions described in the CPFR.

CRL operates within an environment which is in part determined by the legal and commercial framework defined by its Agreements. There are a number of key documents from which the delivery arrangements must flow. Overviews of these key documents are set out below:

- **The Crossrail Act 2008**

  The Crossrail Bill received Royal Assent in July 2008, becoming the Crossrail Act 2008. The Crossrail Act gives the Secretary of State for Transport powers to acquire land and to construct and maintain Crossrail. The Secretary of State has delegated some of those powers to CRL as the principal Nominated Undertaker, save those delegated to London Underground for the works at Bond Street and Tottenham Court Road.

- **The Project Development Agreement (PDA)**

  In December 2008 the Sponsors Agreement, TfL Shareholder Agreement and PDA were signed. These agreements govern the relationship between TfL and DfT as joint Sponsors, regulate the composition of the CRL Board and set out CRL's obligations. The PDA prescribes how the Sponsors will engage CRL to deliver Crossrail.

- **The Sponsors Requirements**

  The Sponsors Requirements are an integral part of the PDA and describe the objectives and functional requirements for Crossrail. CRL's detailed interpretation of these requirements is set out in the Crossrail Project Functional Requirements (CPFR).

- **The Crossrail Environmental Minimum Requirements (EMR)**

  The EMR are an integral part of the deemed planning permission conferred by the Crossrail Act 2008. The PDA requires CRL to deliver Crossrail in compliance with the EMR. The EMR comprise:

  - Environmental Minimum Requirements - General Principles - Version 5.0 – dated 22 July 2008, paragraphs 1.5 and 3.6 to 3.10
    - the Construction Code
    - the Environmental Memorandum
  - the undertakings and assurances concerning the Crossrail Project specified in the Crossrail Register of Undertakings and Assurances published by the Department for Transport and
  - the Planning and Heritage Memorandum listing the building agreements and the overarching archaeological drafted scheme of investigation.

- **Existing Rail Industry Duty Holders**

  The parties who already operate or maintain the infrastructure and facilities that will form part of Crossrail, Network Rail, London Underground and Rail for London (RfL), will have roles and responsibilities in the operation and maintenance of the completed project.

- **The Agreements between CRL and its Industry Partners.**

  There are many agreements that set out the relationships with and responsibilities of the Industry Partners. The primary agreements are listed below.

  - Network Rail – Regulatory Protocol, Implementation Agreements and Protective Provisions Agreement
  - London Underground – Development Agreement
  - Docklands Light Railway – DLR Documents

- Canary Wharf Group – Canary Wharf Group Agreement
- Berkeley Homes – Woolwich Station Box Deed
- Canal & River Trust (formerly British Waterways Board (BWB)) documents and
- Heathrow Airport Limited (formerly British Airport Authority (BAA)) documents

Please note that access to the Industry Partner Agreements is determined by the relevant Agreement Owner Director (identified in the Agreements Management System) in consultation with General Council.

(Figure 4-1) outlines the contractual relationships between the main parties described above.

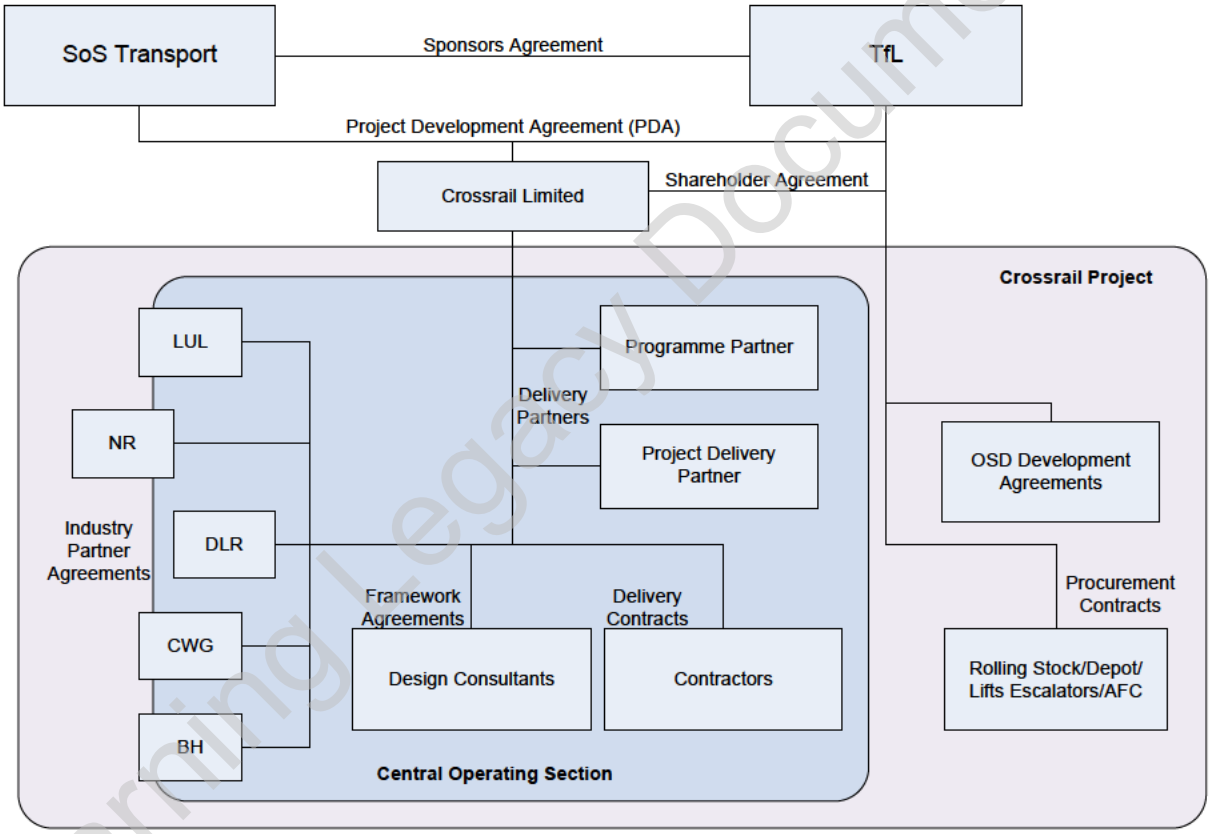

Figure 4-1 Contractual Relationships

4.2 CRL's corporate objectives

CRL has developed a key set of corporate objectives in order to govern and control the delivery of the programme, these are to:

1. Deliver the programme safely
2. Deliver the Crossrail programme to bring the Elizabeth line into passenger service
3. Define and deliver an effective Transition Plan to support the efficient delivery of the Elizabeth line
4. Create a culture for delivery and
5. Deliver the Elizabeth line whilst minimising further calls on the public purse.

Each year, a set of annual objectives are derived from these corporate objectives to focus attention on the key deliverables for the forthcoming twelve months *(Figure 4-2)*.

DELIVERING THE ELIZABETH LINE
OVER-ARCHING OBJECTIVES FROM 1 APRIL 2020 - 31 MARCH 2021

Theme	Focus Area	Goal
Safety	"Target Zero": 'We all have the right to go home unharmed everyday', 'We believe that all harm is preventable', 'We must all work together to achieve this'	• HSPI above 2.80 (including client actions) • LTC <0.15, AFR <0.09
Programme	Delivering the Crossrail programme to bring the Elizabeth line to passenger service	• Complete the blockade in accordance with our success criteria on 18 September 2020 • Start **SIDT by 3 December 2020** • Start **Trial Running by 31 March 2021**
Transition	Define and deliver an effective Transition Plan to support the efficient delivery of the Elizabeth line	• Top level Governance by end Nov 2020 and other key milestones as detailed in the Transition Plan delivered without disruption by 31 March 2021 • Workforce plan and organisation design required to enable Crossrail programme and Elizabeth line team set up in place, to enable readiness to give and receive the staged railway in line with DCS1.1 milestones
People	Creating a culture for delivery	• Clarity of programme progress and delivery requirements understood by all: i. Effective communication plan in place - Viewpoint survey and pulse feedback >70% on relevant engagement questions by 31 March 2021 ii. Culture focused on active intervention and accountability to deliver the Elizabeth line – measured by: a. Story, culture and engagement plan in place by December 2020 and b. Productivity in line with deliverables as defined in the DCS 1.1 across the EL team >60%+ by 31 March 2021 • Diversity and Inclusion alive in all parts of the Elizabeth line: RACE Charter and Women in Transport programme launched by 31 Dec 2020 and engagement into Staff Networks Group from EL team increased by 10%, including partner organisations, by 31 March 2021 • Wellbeing Score >3 (Average measured through regular pulse surveys/ Resource Hub)
Finance	Delivering the Elizabeth line whilst minimising further calls on the public purse	• Savings of at least 20% on in-directs through new target operating model when compared with the average periodic cost in 2018/19 delivered by the end of January 2021 • Deliver all necessary actions to support the revised Funding package by the end of November 2020

Figure 4-2 Crossrail's 2020 Corporate Objectives

4.3 Crossrail Sponsors and Industry Partners

The main parties involved in the delivery of Crossrail are as follows:

- **DfT and TfL (the Sponsors)**

  Report to the Secretary of State for Transport and the Mayor of London respectively; **Transport for London** (TfL) and the **Department for Transport** (DfT) are the joint **Sponsors** supported by a **Joint Sponsor Team** (JST) which acts as the main interface with CRL. The JST has appointed Jacobs as a **Project Representative** (P-Rep) to support them and provide additional technical expertise in relation to their oversight role

- **Rail for London (RfL)**

  Has three main roles as follows:

  1. The asset owner and maintainer of the Crossrail stations at Paddington, Canary Wharf, Custom House, Woolwich and Abbey Wood
  2. The Infrastructure Manager for the running tunnels and end-to-end railway systems for the Central Operating Section and
  3. The procurer of the Crossrail Train Operating Company (CTOC) to operate end-to-end Crossrail services and owner of the operating cost model.

  In these roles, RfL is engaged in the technical assurance process and will manage the train operator concession.

- **Mass Transit Rail [Crossrail] MTR[C]**

  Is the Crossrail Train Operating Company (CTOC) and has been awarded a seven-year concession to operate Crossrail services. It is the Infrastructure Manager of the Crossrail (RfL owned) stations at Paddington, Canary Wharf, Custom House, Woolwich and Abbey Wood.

- **Industry Partners are the existing industry bodies who are involved in the development, delivery, operation and maintenance of Crossrail as defined in the PDA:**

- **Network Rail (NR)**

  Has three primary roles in Crossrail:

  1. To undertake Crossrail Surface works
  2. To undertake works directly for CRL at the interfaces between Crossrail Surface and the Central Section Works and
  3. To act as Infrastructure Manager for Crossrail Surface routeway assets.

- **London Underground (LU)**

  Has three primary areas of involvement with Crossrail:

  1. To undertake the works within the existing Underground curtilage, the delivery of the congestion relief works at Bond Street and Tottenham Court Road & the Bakerloo Line Link and the integration of Crossrail systems within its existing Station Operation Rooms (SORs)
  2. To undertake the protection of London Underground's assets from Crossrail works in the vicinity and
  3. To act as the Infrastructure Manager for five stations (Bond Street, Tottenham Court Road, Farringdon, Liverpool Street and Whitechapel).

There is an opportunity for CRL and London Underground to integrate Crossrail works with LU investment projects to deliver the best overall economic outcome.

- Docklands Light Railway (DLR)

  Works with CRL to modify Docklands Light Railway's existing infrastructure to enable the development and operation of Crossrail alongside the Docklands Light Railway, particularly at Pudding Mill Lane and Custom House and also at other locations.

- Canary Wharf Group (CWG)

  Is responsible for the part-financing, design, and construction of the Crossrail station box in the North Dock at Canary Wharf.

- Berkeley Homes (BH)

  Is responsible for the part financing, design, and construction of the station box at Woolwich in accordance with the terms of the Woolwich Station Box Deed.

- Canal & River Trust

  Is the freehold owner and statutory harbour authority for West India Dock North and following transfer of the Canary Wharf Station site, will, subject to any subsequent arrangement, retain ownership of the air and water space for the oversite development.

- Heathrow Airport Limited (HAL)

  Owns the Heathrow Spur from Airport Junction on the Great Western mainline and through its subsidiary Heathrow Express Operating Company, operates train services between Paddington and Heathrow. HAL is providing a funding package of £70m. When Crossrail services start, the number of stopping services available to passengers to Heathrow will increase from 2 to 4 trains per hour.

4.4 Crossrail Delivery Partners

Crossrail Delivery Partners are organisations who have been procured to assist CRL in delivering the scope of the Crossrail Project and include:

- **The Programme Partner (Transcend, a joint venture between Aecom, Jacobs and the Nichols Group)**

  Has been appointed to support CRL through the formation of an integrated programme delivery team bringing specific skills which are necessary to ensure that the Sponsors Requirements will be met.

- **The Project Delivery Partner (Bechtel, supported by Halcrow and Systra)**

  Employed by CRL to support the delivery of the Central Section Works, including the utilities and enabling works.

- **Design consultants**

  Employed under framework agreements (known as the Framework Design Consultants – FDCs) and managed by the integrated Crossrail organisation to design the Central Section Works.

- **Works package contractors**

  Employed by CRL for the Central Section Works and managed by Crossrail's Delivery team

- **Bombardier - Rolling stock and Depot Service Provider**

  Design, build, supply and maintain the train fleet and depot - wholly funded by TfL but separate from the Sponsor funding of Crossrail.

- **Utility companies**

  Have a significant involvement in Crossrail as suppliers (e.g. of electrical power) and as contractors in carrying out diversions and support of the numerous utility interfaces with the main works.

- **The City of London Corporation**

  Which has agreed to make a direct contribution of £200m to the Crossrail Project. In addition, the City of London Corporation will seek contributions from businesses of £150m and has guaranteed £50m of these contributions.

- **Oversite developers**

  Who work with CRL and TfL in the design and planning of oversite schemes in order to maximise the potential development opportunities.

4.5 Crossrail Corporate Governance

4.5.1 Governance Framework

The CRL governance regime:

- Defines the arrangements to ensure compliance with CRL's statutory and contractual obligations
- Defines the relationship between the Sponsors, the Board, its Committees and Sub-committees, and the delegated decision-making structure within Crossrail
- Defines the processes by which CRL makes decisions and the controls on those decisions, and
- Provides arrangements to verify that processes are followed, and controls are effective.

(Figure 4-3) sets out the external governance arrangements for Crossrail.

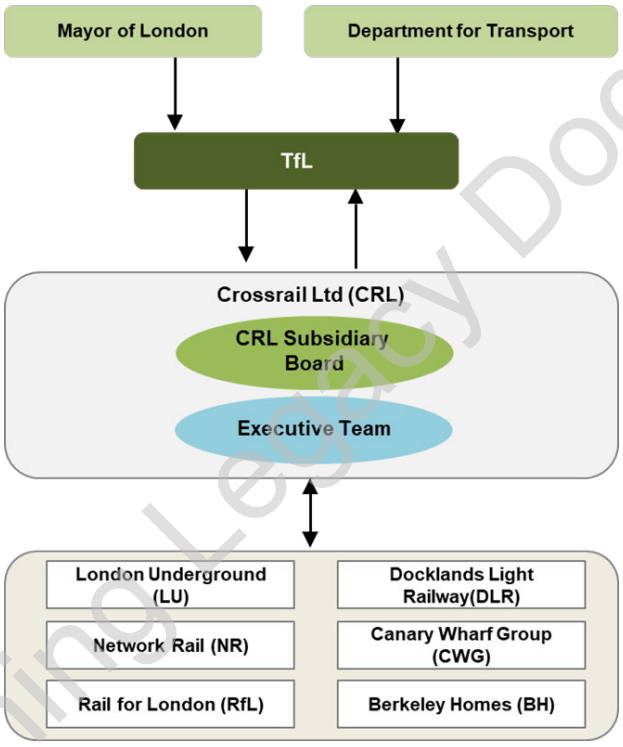

Figure 4-3 CRL External Governance structure

4.5.2 High level role of the governance forums

From the 1st October 2020, governance oversight of the Crossrail project is managed by the forums set out in *(*

)

High-level role of the new governance forums.

- **The TfL Board and its committees / panels**

  Will decide on CRL matters such as Audit & Assurance.

- **The Elizabeth Line Committee**

  Will decide on reserved matters and provide scrutiny. It will meet approximately every 8 weeks.[**20**]

- **The Elizabeth Line Delivery Group (ELDG)**

  Will supervise Crossrail performance, provide strategic direction, and oversee the Crossrail Executive. It will be chaired by the Transport Commissioner and meet every 4 weeks. [**21**]

- **The TfL ExCo**

  Will receive escalations by exception from the Transport Commissioner or CRL's CEO. [**23**]

- **The CRL Subsidiary Board**

  Will be a statutory board that meets once per annum, as a minimum, to discuss statutory requirements and filings.

- **The CRL Executive Group**

  Will continue to manage the programme. [**19**]

- **The Joint Transition Coordination Group (JTCG)**

  Will review and monitor the progress of the Transition of the programme on a periodic basis. [**22**]

4.5.3 CRL Executive Group

The Executive Group manages the day-to-day business of Crossrail *(Figure 4-3),* and includes health and safety, performance, risk, change and the strategic direction of the Crossrail Project. It is accountable to the Sponsors. It also exercises Executive-level oversight of all programme governance and must approve changes to its key terms of reference. The Executive Group meets every fortnight and is chaired by the Crossrail CEO.

4.6 Delegation strategy

As a subsidiary of TfL, CRL is subject to TfL's Standing Orders. Following the delegation of authority to the CRL Board by the TfL Board, the Standing Orders were amended to reflect the new arrangements. CRL has established a Scheme of Authorities which sets out the delegations, following TfL's Standing Orders.

The Scheme of Authorities sets appropriate levels of authority delegated to committees and post holders to ensure the efficient and effective discharge of CRL's responsibilities. This is in line with

the agreed governance structure and authorises the post holders to act on its behalf up to approved levels. Delegations at lower levels to named individuals are made by the CRL Chief Executive and are recorded in the Delegated Authority Register to ensure clear accountability.

Authorities are generally delegated to the lowest level considered consistent with adequate control. Levels of authority are consistent with the needs of a project of the scale of Crossrail.

Levels of delegation vary between categories of authority and have been clearly communicated. For cost control purposes, dual signatures are required above appropriate levels of commitment. In general, single sign-off will be expected elsewhere in line with the relevant accountability.

As far as possible the business systems, which are being used for entering and recording approvals, will be used to verify that authorisers have sufficient delegated authority, and to provide the appropriate audit trail. Delegations by the CRL Chief Executive will be consistent with the Scheme of Authorities, and Board Committee terms of reference.

4.7 Standards of behaviour

CRL recognises that it is a public body and is in the public eye. It has a Business Ethics Policy [**28**] and endorses the Seven Principles of Public Life developed by the Nolan Committee. CRL expects high standards of integrity from its staff. Internal audit monitors transactions for signs of any departure from these standards.

4.8 Crossrail Integrated Assurance Framework

CRL has implemented a 'Three Lines of Defence' Integrated Assurance Framework (3LoD IAF) to provide assurance to its Executive Group and Board that it can safely deliver the Crossrail Project on time and within funding *(Figure 4-4)*. This framework is based on industry best practice and has been developed in collaboration with TfL's Risk and Assurance Team, and the Infrastructure and Projects Authority.

The Integrated Assurance Framework provides assurance across all disciplines of the Crossrail Project including Quality, Health & Safety, Commercial, Technical Compliance and Regulatory, Cost, Finance, Programme Controls, Schedule, Legal Compliance, Environment, Sustainability and Consents, and People and Organisation; in line with the compliance requirements prescribed in the PDA and articulated within this Delivery Strategy.

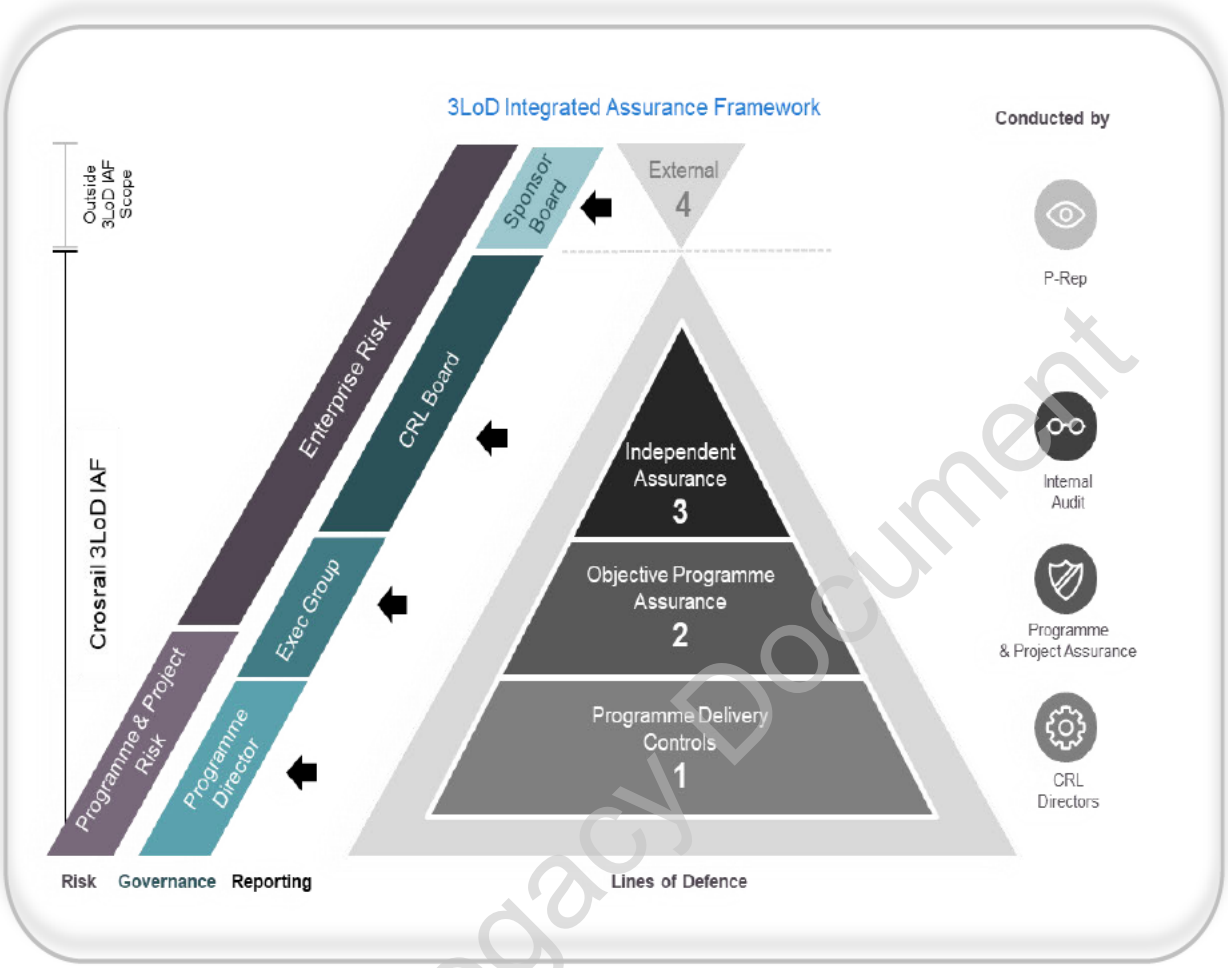

Figure 4-4 Crossrail 'Three lines of Defence' Integrated Assurance framework

4.8.1 1st Line: Programme Delivery Controls

The first line of defence is represented by the controls embedded into day-to-day management of the Crossrail Project to enable right first-time delivery. These are implemented by the Project Managers and Crossrail Directors who have responsibility to:

- ensure frontline delivery is compliant to the programme baseline
- control, mitigate and manage risk
- manage compliance of the contractors; and (d) provide effective challenge of programme delivery performance.

4.8.2 2nd Line: Project and Programme Assurance

The second line of defence is the Project and Programme Assurance (PPA) function. This is independent of delivery and tasked with undertaking proactive coordination and integration of all of the Crossrail Project's assurance activities. The five objectives of the PPA are to:

- Coordinate, align and maintain quality control of all functional assurance provided by Crossrail
- Coordinate all assurance activity with internal and external auditors (including TfL Internal Audit and P-Rep) through the Integrated Assurance and Approvals Plan (IAAP)
- Identify any gaps or overlaps in CRL's assurance framework and address these through targeted assurance activities

- Carry out targeted assurance reviews (deep dives) into key risk areas in the Crossrail Project going forwards
- Report on project and programme assurance to the Executive Group and Board periodically, and to the Audit and Assurance Committee quarterly (or as agreed).

The PPA Function is accountable to the Audit & Assurance Committee [**18**] for planning and coordinating assurance activities and securing resource across all three lines of defence. It will proactively horizon-scan for potential threats to the Crossrail Project objectives and recommend actions to enhance or mitigate performance issues and close any gaps identified through its assurance activities.

4.8.3 3rd Line: TfL Internal Audit

TfL Internal Audit will provide the third line of defence on behalf of the Crossrail Board. It will:

- provide an independent assessment of the overarching integrity and performance of CRL's Integrated Assurance Framework
- conduct independent risk-based internal audits as necessary, and
- provide the Audit & Assurance Committee with assurance that the overall enterprise risk framework is being adequately controlled.

TfL Internal Audit will provide quarterly reports to the Audit & Assurance Committee and an annual report at the end of the year. These reports will summarise the work completed against the IAAP.

4.8.4 External Audits

In addition, there will be external audits conducted by the P-Rep on behalf of the Sponsors, and potentially the National Audit Office (NAO). However, whilst the PPA function will aim to coordinate these activities, to avoid unnecessary duplication, Crossrail recognises the independence of P-Rep activities on behalf of the Sponsors, as well as that of the NAO, and CRL will therefore not place any reliance on P-Rep or NAO external audits within its assurance framework.

Section 5: Crossrail Operating Model

5 Crossrail Operating Model

Section 5 sets out the operating model for Crossrail and how it supports this Delivery Strategy.

5.1 Principles

CRL must have an organisation that is aligned with the Crossrail objectives, vision, and:

- Leads and manages the delivery of Crossrail as a whole in accordance with the Crossrail Act 2008, Project Development Agreement, and the Sponsors Requirements
- Is compliant with all legal, contractual, regulatory, and statutory obligations
- Discharges its appointment as the Nominated Undertaker pursuant to the Crossrail (Nomination) Order 2008
- Can demonstrate a compliant and effective Assurance Process as defined in the PDA
- Is structured, and continues to be structured to manage:
  - The Crossrail scope, including the full geography of the Crossrail routeway
  - All of Crossrail's stages of development – design, procurement, construction, integration, testing and commissioning, handover, operation, and completion
  - The complexity of the introducing of major new infrastructure into London
  - The ever changing macro and micro economic climate
  - The Crossrail procurement strategies
  - Its Agreements with the Parties, Industry Partner's, Delivery Partners, Oversite Developers, and 3rd Party Stakeholders
  - The relationships with the Operators

5.2 Chief Executive Officer

The Chief Executive Officer (CEO) is accountable for overall leadership and delivery of the Crossrail Project, and this Delivery Strategy. The CEO sets strategic priorities for the Crossrail Project, holds the Executive to account for delivering and is the public face of the project. The CEO is accountable for the success of the CRL Project to the Crossrail Board, Sponsors & External Stakeholders and is supported by the Chief of Staff to do this.

5.3 High-Level Organisation Structure

The principles outlined above provide the basis for the management structure of CRL. CRL has adopted an overall programme management structure in line with clause 6.2 of the PDA in order to organise, manage and co-ordinate the delivery of each of the different Elements of Crossrail and embed a "One team, One target" ethos. This is intended to drive collaborative behaviours and create ways of working that characterise success for the programme.

A new CRL leadership structure was established between September and December 2020 and there have been a number of associated changes to the operating model, including:

- Reviewing the Programme Directorate to drive integration and clarify interfaces in preparation for Trial Running. The new Programme Directorate will operate as a matrix organisation to enable integrated decision making, while retaining alignment to functionally defined policies and standards that will ultimately support the delivery of the DCS. In order for the Programme Directorate to deliver full and effective services it covers the following areas:

- Central Section Delivery
- Programme Integration
- Assurance and Transition
- Programme Controls

- Establishing the Communications, People and Transition Directorate under the Chief People Officer. This will enable focus on the delivery of the Elizabeth line Transition Plan, with support from existing functions such as Communications and Human Resources (HR).
- A new Commercial Director has been appointed within the Chief Finance Officer Group and the new, agile, close cut focussed and efficient Commercial Directorate organisation structure has been created. This was implemented in September 2020.
- Appointing a director for Health, Safety, Quality and the Environment to ensure focus on these key areas during the delivery process

The operating model aims to clarify interfaces across the organisation, as well as with RFLI and TfL. It aims to provide sufficient flexibility to deal with the ever-changing scale and complexity of a major programme environment, under the overarching leadership of the Crossrail CEO.

The size and structure of Crossrail will continue to evolve to suit the nature and stage of the programme going forwards. A Workforce Planning approach has been developed to provide a holistic view of resourcing across the life of the programme, including what Crossrail, RfL and TfL require. Each phase requires a different focus from CRL's management and delivery teams. *(Figure 5-1)* illustrates the key organisational transition points along CRL's future timeline.

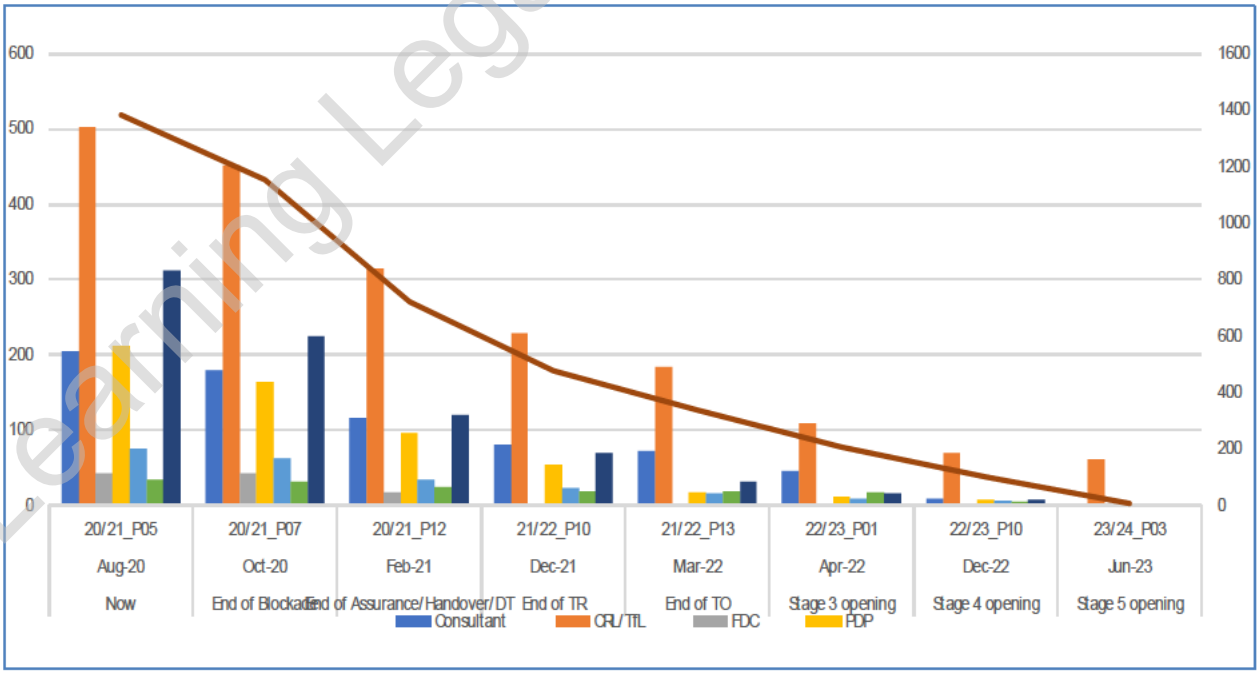

Figure 5-1 CRL Workforce Planning profile

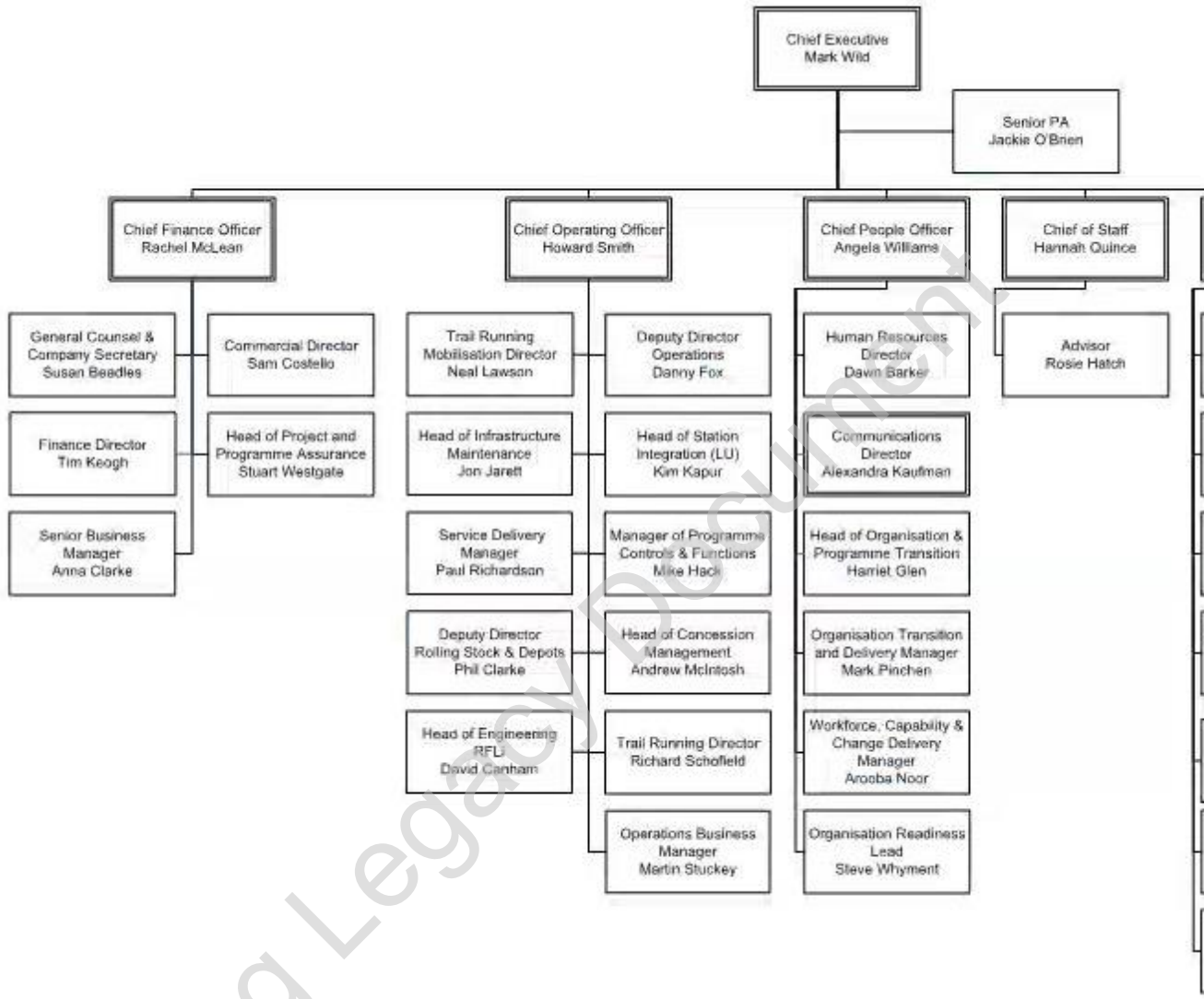

Figure 5-2*)* sets out the current division of top-level organisational responsibility and a description of each directorate is included in subsequent sections.

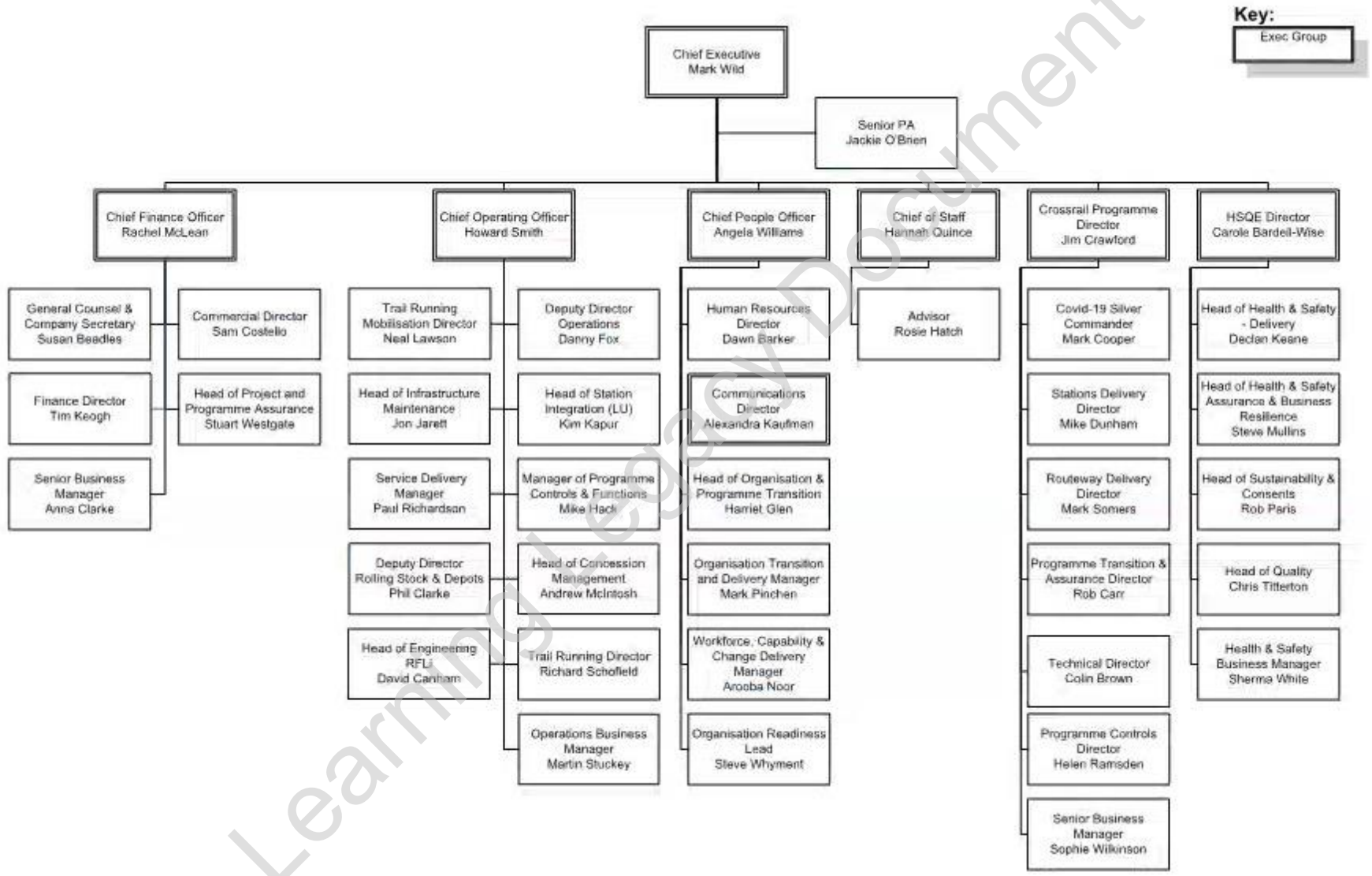

Figure 5-2 Crossrail Top-Level Organisational Structure

5.4 Health, Safety, Quality and Environment Directorate

The Health, Safety, Quality and Environment (HSQE) Director *(Figure 5-3)* is responsible for:

Figure 5-3 HSQE Organisation Structure

- **Health and Safety**

  Directs and manages Health & Safety strategy for Crossrail and assures exemplary health and safety performance from everyone in the Crossrail Project.

- **Quality**

  Provides the quality strategy, standards, policies and management system for the Crossrail Project, assures industry best practice and that ISO 9001 certification is maintained.

- **Environment**

  A function falling under the Sustainability & Consents (S&C) department. S&C provides management of Crossrail's sustainability agenda and its Environmental Minimum Requirements and acts as a subject matter expert for planning, traffic and environmental consents matters.

More detail can be found in the HSQE Management Plan [**10**], Sustainability Strategy [**50**], Undertakings Compliance Strategy [**53**] and Occupational Health Standard [**45**].

5.5 Chief Finance Officer Group

The Chief Finance Officer (CFO) is accountable for CRL's financial performance and assures Sponsors of any funding risk within CRL's approved funding envelope.

The CFO is responsible for the periodic Anticipated Final Cost (AFC) reviews, quarterly funding updates, annual budgeting, and business planning processes, and is responsible for establishing good financial management practice across CRL.

In addition, the CFO is accountable for the operation of a group of professional functions, known as the CFO Group *(*

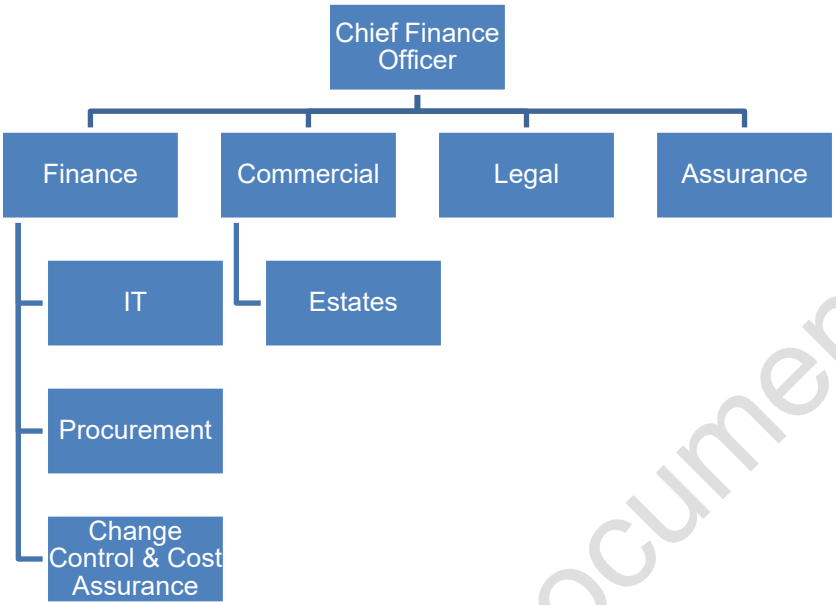

Figure 5-4*)* . The CFO Group works closely with the Delivery function and the PMO for cross cutting issues such as risk management, change control and commercial.

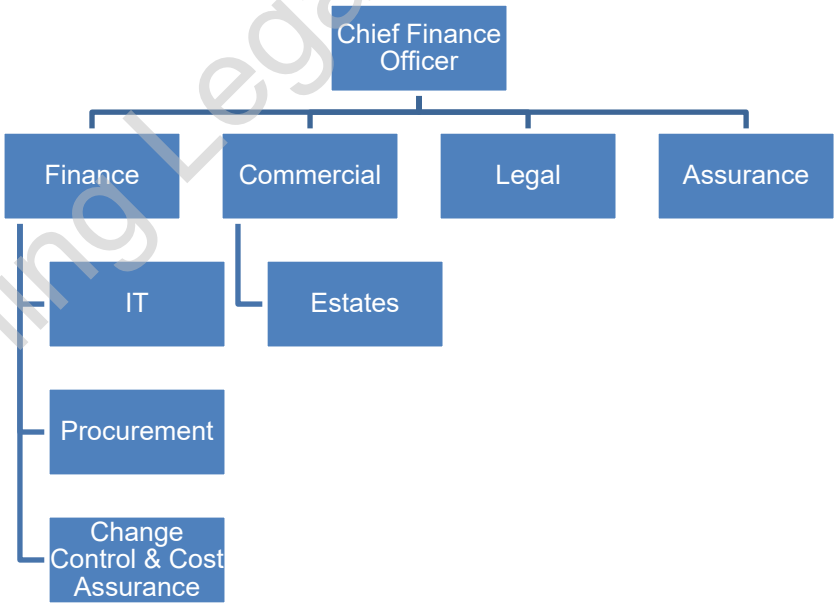

Figure 5-4 Chief Finance Group Organisation Structure

The CFO Group has three core objectives:

- **Control**

  Ensuring that the programme operates both generally within applicable law and specifically in compliance with the agreements to which CRL is a party. Controlling the funding and cash flow of the programme so that expenditures are properly incurred within Sponsor delegated

funding and payments are suitably approved. Finally, compliance with relevant policies such as in relation to IT.

- **Enabling Delivery**

  CFO Group employs suitably qualified and experienced people who have specialist expertise in their professional fields. That experience is deployed across the programme to underpin the project and programme delivery functions. Examples include the commercial management and procurement teams, who will also become directly involved in engagement with the supply chain. Finally, the CFO Group provides a range of management information to support the Executive, the Management team, the Elizabeth Line Committee, Elizabeth Line Delivery Group and stakeholders in their consideration of the programme.

- **LOD 2 Assurance**

  CFO Group is the organisational home for the Assurance function (see separate section), but each of the professions in the Group plays a part in identifying weaknesses in the overall control and management of the programme, notably in the Legal function.

  The following functional areas have their own management or strategic plans and/or specific company-wide policy documents which set out in detail how their functions are discharged.

  - Legal: Legal Services Management Plan [**12**]
  - Commercial: Commercial Management Plan [**5**]
  - Finance (including Finance Management, and Cost Assurance and Change Control).
    - Finance Management Plan[**9**]
    - Change Control & Budget Management Procedure[**29**]
    - Cost Management & Forecasting Procedure[**30**]
  - IT: Information Technology Management Plan[**11**]
  - Assurance: Functional Strategy - Assurance [**41**]
  - Procurement: Procurement Policy[**46**]
  - Estates: Estates Management Plan[**7**]

5.6 Programme Directorate

The Programme Directorate *(Figure 5-5)* is accountable for the delivery of the Central Section Works, which includes all the contracts for the shafts, portals, stations, routeway civils and railway systems, the management of interfaces between them and the Industry Partners, as well as other stakeholders including consent granting bodies. The Programme Director has an additional obligation to co-ordinate the overall programme End to End plan, which includes stages 4 and 5.

Figure 5-5 Programme Directorate Organisation Structure

The Programme Directorate owns and directs all the programme team functions that facilitate successful completion and handover of the Central Operating Section to the Operators. These include:

- **COVID-19 Silver Command**

  The COVID-19 Silver Commander works as part of an integrated team, providing leadership of Crossrail COVID-19 responses to foster programme resilience. This responsibility includes defining tactical deployment of the construction management team; providing strategic options

to Gold Response Team for decision; leading the bronze COVID-19 Working Group and co-ordination of Tier 2 and Tier 3 contractors to provide resilience to COVID-19.

- **Station Delivery**

  The Station Delivery team is responsible for the safe delivery and handover of all CRL Stations (RfL Stations (WOO, CAW, AWD, CUH), TfL Stations (FAR, TCR, LIS), Bond Street, Whitechapel and Paddington). It is supported by Deputy Stations Delivery Director and matrixed resource from Technical and Programme Controls, including the Integrated Delivery Team (IDT) Performance and Development team, H&S and Commercial support with a clear interface to the IDTs.

- **Routeway Delivery**

The Routeway Delivery team is responsible for the delivery of the routeway contracts and full integration of the railway (including stations). It consists of the following teams: C610 Routeway, C660 and C620 delivery and programme delivery integration; and matrixed technical teams managing Trials, Testing and Commissioning and System Integration.

- **Programme Transition and Readiness**

- Provides the strategy, guidance, facilitation, chairmanship and coordination of the various reviews and sessions required to the transition, and the readiness of the programme to enter Trial Running under Railways and Other Guided Systems (ROGS) Authorisation. Through the transition they will provide coordination of access control from the current construction approach to operational railway access control under the Operator, the completion of the handover process for the elements and assets that comprise the Elizabeth line, and lead on the overall end to end planning.

- **Technical**

- Directs and manages the effective delivery of all engineering, technical assurance, engineering safety management and systems integration across the Crossrail Programme. The Technical team establishes the technical procedures and standards to help track and measure the programmes progress and performance as well as identifying and managing technical risk and the associated mitigation plans. The Technical team provides technical leadership, safeguarding the technical integrity of the Programme and is responsible for ensuring the railway is safe, operable, maintainable and that the systems meet the Crossrail performance requirements.

- **Programme Controls**

  Directs and manages programme planning and reporting, and programme integration of the cost, risk, change and commercial processes across the project. Programme Controls resources are both embedded within project teams to support the management of project activities and located centrally within both the Programme Controls, Finance and Commercial teams to support the management of programme activities. LOD1 Assurance, programme change and IDT performance and development also sit within Programme Controls.

- **Business Management**

  Manages the Programme Director's office and creates connectivity across the Directorate teams. Responsible for strategic resource planning, working with the workforce planning team and business managers across the Directorate. Accountable for organisation design and further transition changes to the team structure. Interfaces with the CRL Communications team to ensure consistent and regular Directorate wide communication.

More detail can be found in Management Plan Volume 2 – Programme [**2**]

5.7 Communications, People and Transition Directorate

The Chief People Officer *(Figure 5-6)* is responsible for leading the transition of the programme through to the successful delivery of the Elizabeth line and engaging everyone working with the programme. This brings together existing services, including HR and Communications, and establishes a new Transition function, to execute a new People Strategy which defines and delivers the Elizabeth line Transition Plan, in alignment with TfL.

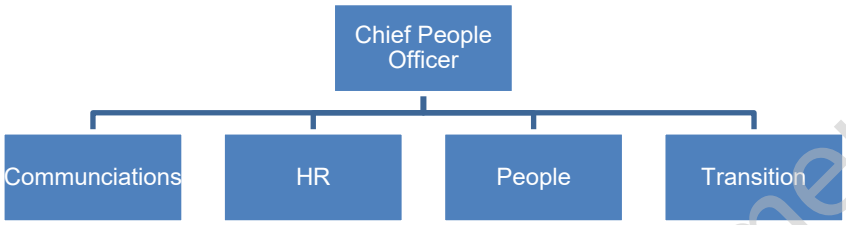

Figure 5-6 Communications, People and Transition Directorate Organisation Structure

The key functions of the Communications, People and Transition Directorate include:

- **Communications**

  Ensures clear communications and regular engagement with stakeholders, both internally and externally.

- **HR**

  Provides HR, recruitment, and facilities management services, and supports the management of human resources and organisational capability across the Crossrail Project

- **People**

  Provides employer's representation and manages key relationships and contracts for PP/PDP resource, working closely with the Commercial team

- **Transition**

  Defines and delivers the Elizabeth line Transition Plan, focusing on four key workstreams *(Figure 5-7*): People, Governance, Assets and Obligations.

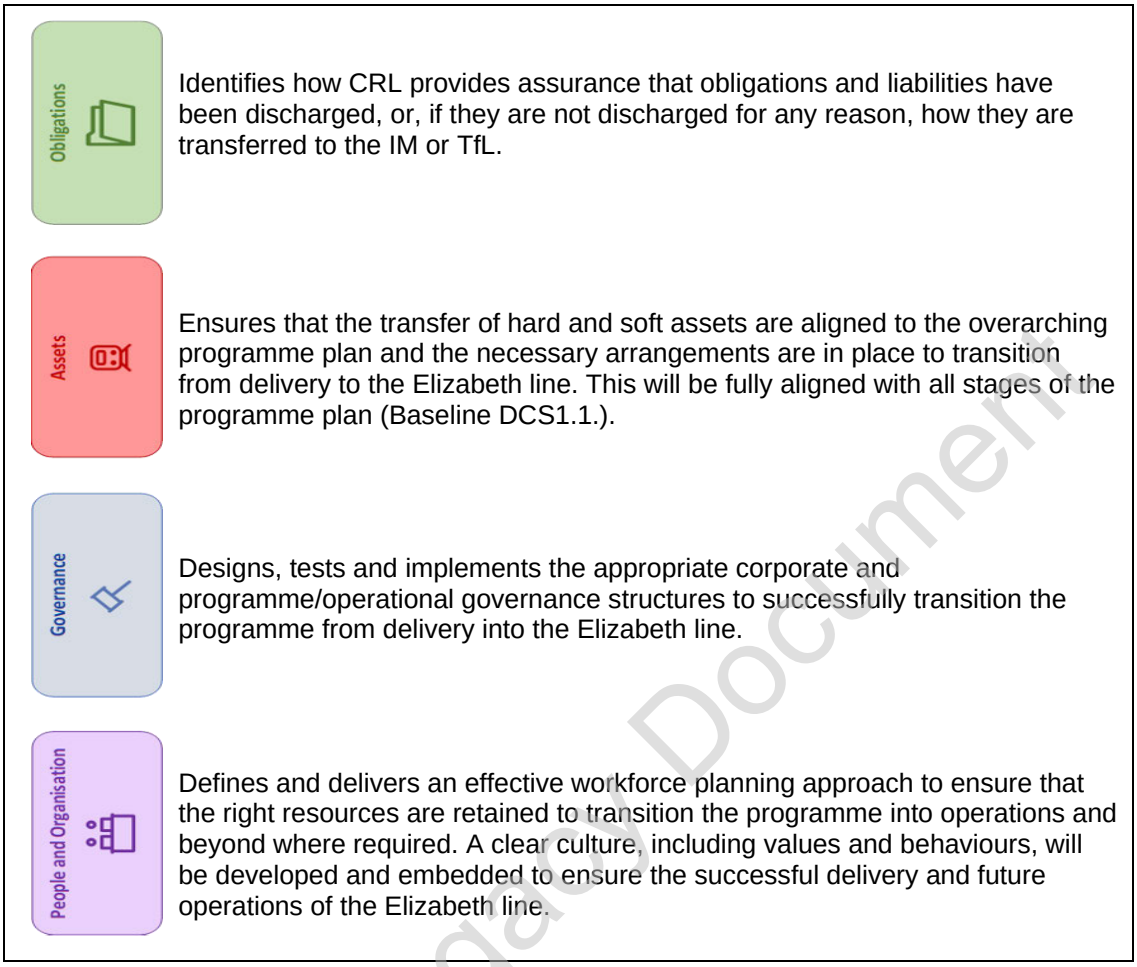

Figure 5-7 Transition Workstreams

More detail can be found in the Communications, People and Transition Management Plan [**6**].

5.8 Operations Directorate

The Chief Operations Officer (COO) leads the Operations Directorate, which is accountable for directing all operational and maintenance readiness activity for the Elizabeth line, so that it delivers a high performing service safely and reliably following each staged opening in compliance with the Sponsors Requirements.

The Operations Directorate is led by an RfL employee, on behalf of both CRL and RfL, and directs all the functions that facilitate acceptance from Crossrail's Delivery Partners and Industry Partners. It is responsible for the organisational mobilisation of the Operators. These include:

- **Infrastructure Management Engineering**

  The Head of Infrastructure Management leads the IM asset engineers and is responsible for accepting the railway infrastructure and related asset information from Crossrail in the Central Operating Section. This includes working with other Crossrail Directorates to define the outcomes for acceptance of each Element, prioritising delivery and technical assurance activity and aiding its acceleration and leading the 'pull' for the IM of handover acceptance.

- **Operational and Maintenance Mobilisation**

  The Head of Operations and Head of Maintenance are responsible for training, mobilising and directing contracted parties to operate and maintain a safe, operable, maintainable and reliable railway, including the delivery of the Route Control Centre at Romford, leading the

development of the RFLI rulebook, delivery of yellow-plant equipment and managing operational safety.

- **Concession Management**

  Owns the Elizabeth line customer proposition on behalf of TfL, manages the concession agreement with Mass Transit Rail [Crossrail] – the Crossrail Train Operating Company, and delivers the On Networks Station Improvement Programme (ONSIP). Completes and agrees timetabling in advance of revenue service for each staged opening.

- **Rolling Stock and Depots**

  Leads and manages delivery of the Bombardier (BT) rolling stock contract for the new fleet of Crossrail trains and Old Oak Common Depot. Directs sequencing and coordination of rolling stock contract priorities, in conjunction with the Testing & Commissioning director and Head of Systems Integration, to ensure the integrated programme achieves the staged opening milestones.

- **Surface Works & Integration**

  Owns the relationship with Network Rail and the CRL management of the 'On Network Functional Requirements' (ONFR) and leads and directs implementation and integration of NR's On Network Works (ONW) scope with the Stage 2B, 4A, 4, 5A and 5B opening programme.

The Operations Directorate includes both RfL and CRL personnel who work collaboratively together to deliver the staged opening strategy and the planning and development of system reliability in conjunction with the other Crossrail Directorates. It is supported by Operations Business Management, responsible for governance, controls and process management of all the above in alignment with wider Crossrail requirements.

More detail can be found in Management Plan Volume 4 - Operation [**4**].

5.9 Programme Governance

Clear governance and decision making allows the delivery of the Crossrail Project to run smoothly and effectively and ensures compliance with all of CRL's obligations.

(Figure 5-8) sets out Crossrail's high-level governance cadence structure. This structure has been developed to support the current needs of the programme and will evolve over time as the programme progresses and approaches completion.

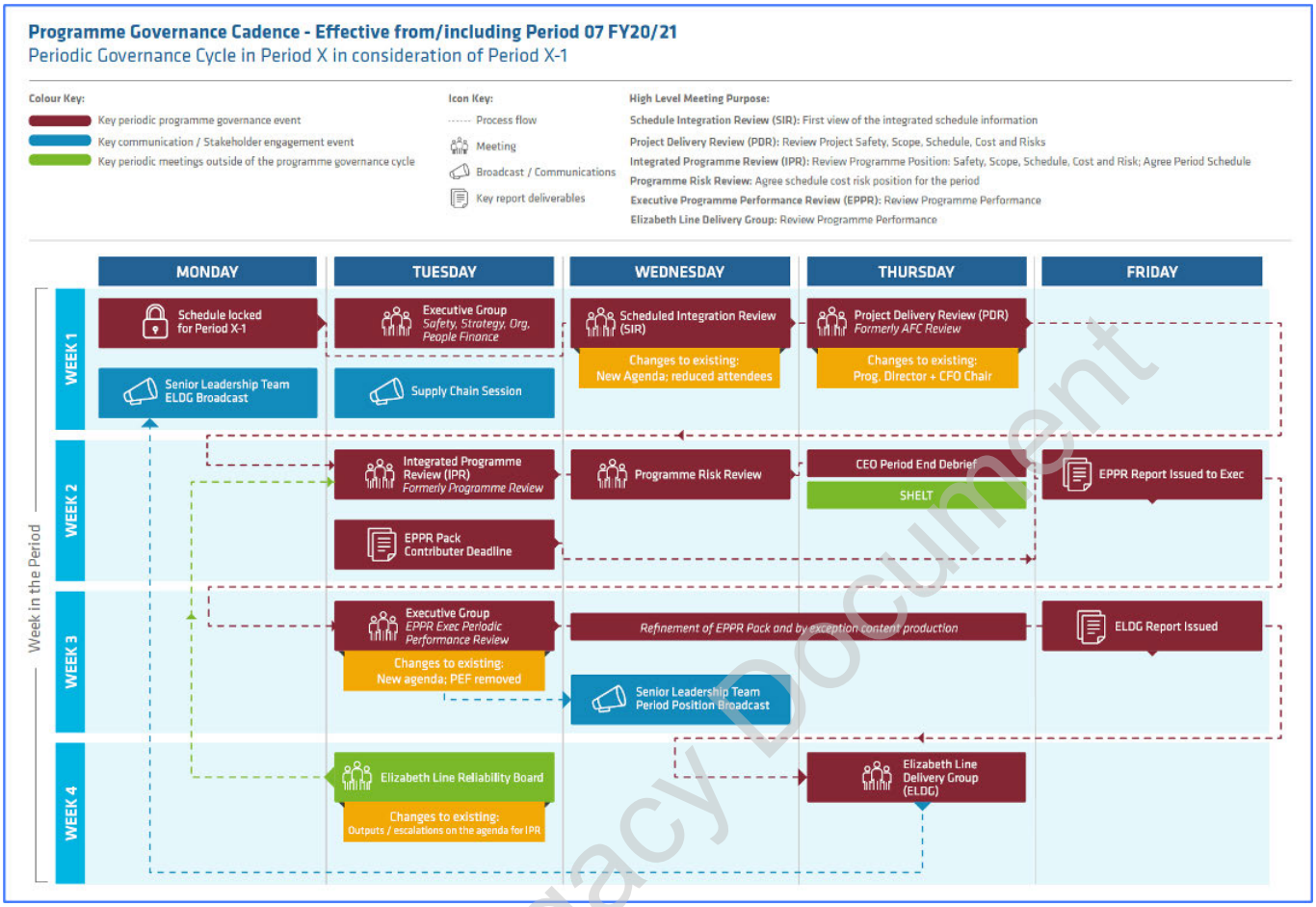

Figure 5-8 High Level Governance Cadence Structure

5.10 Crossrail Management System (CMS)

The Delivery Strategy (this document) is Crossrail's primary management document which is supported by the Crossrail Management System *(*Figure 5-9*).*

The CRL Management Plans (Volumes 1 to 4) are the top-level plans which provide a description of the organisation and way in which CRL implements its Delivery Strategy in order to meet the Sponsors Requirements for Crossrail. The 4 volumes cover the following:

- **Management Plan Volume 1 – Corporate, Support and Specialist Function Directorates**

  This documents the governance arrangements and references corporate function, support function and specialist management plans.

- **Management Plan Volume 2 – Programme**

  This mandates how the Crossrail Programme Directorate manages the Central Section which comprises of the Central Section Works by contractors engaged directly by Crossrail and other works by the Delivery Partners.

- **Management Plan Volume 3 – Surface Delivery**

  This mandates how the Crossrail Operations Directorate manages the surface works which comprise the "On Network" works undertaken by Network Rail and other work by contractors engaged directly by Crossrail.

- **Management Plan Volume 4 – Operations**

  This describes elements of the Crossrail project for which the Operations Directorate is accountable, including the delivery of the rolling stock, depot and associated services and working as RfL's agent to manage the delivery phase.

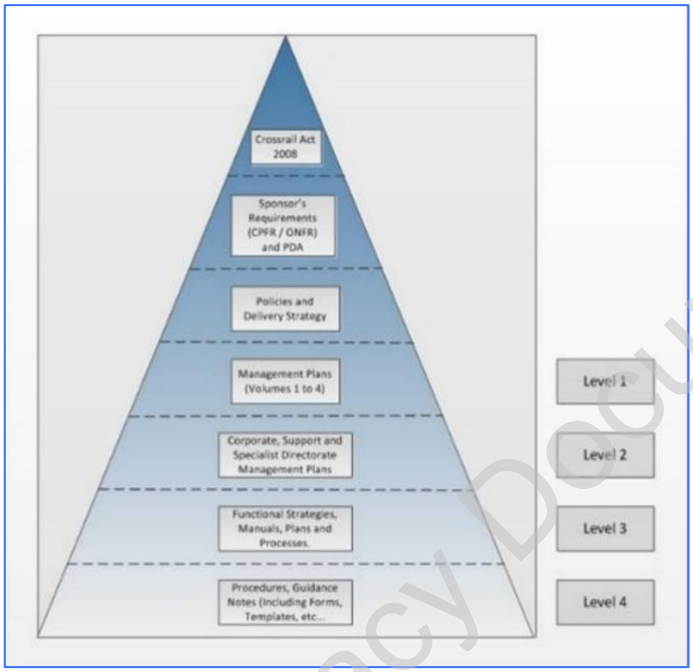

Figure 5-9 CMS Documentation Hierarchy

Beneath these lie the Key Management Plans that define the functions within the respective Directorates. The functional strategies, plans, processes, and procedures describe what is required in order to deliver the design, construction, testing, commissioning, and trial operation phases of Crossrail.

The CMS is regularly reviewed to ensure it meets the needs of Crossrail. Documents referred to in this Delivery Strategy are also listed in Appendix B – Reference Documents.

CMS documents can be accessed directly through eB (enterprise Bridge) or via the 'CMS Homepage' which is an easy to use online system utilising SharePoint to access the latest approved management system documents within eB, the CRL EDMS (Electronic Document Management System).

The CMS is certified to BS EN ISO 9001:2015 Quality Management Systems and is subject to annual assessment by Lloyds Register Quality Assurance (LRQA).

The CMS is maintained in accordance with the Crossrail Management System (CMS) Manual [**35**]

Section 6: Crossrail Delivery Strategy

6 Crossrail Delivery Strategy

This section sets out Crossrail's high-level delivery strategy to complete and finish the railway.

6.1 Earliest Opening Programme & the COVID-19 Recovery Execution Plan

The Earliest Opening Programme (EOP) Strategy [**40**] was approved in June 2019 as the new basis on which the Elizabeth line would be delivered and opened to the public.

It was considered to represent the shortest time path to end-to-end Revenue Service whilst minimising further capital expenditure. The key ways in which this was achieved included delaying the opening of Bond Street and Whitechapel, if necessary, reducing the service frequency for Stage 3 from 15 THP to 12 THP and delaying "non-critical" functionality, such as non-essential SCADA and signalling functionality. Within this remit the EOP ensured that upon opening of the Central Operating Section for Stage 3A - Revenue Service, the Elizabeth line would serve all the main stations (Paddington, Tottenham Court Road, Canary Wharf, Abbey Wood and at least one of either Liverpool Street and Farringdon) and be safe, operable, maintainable, and acceptably reliable. It was also structured to allow the opening of Stage 4 within 6 months (timetable dependent) of Stage 3A, with Stage 5B a further 6 months after and thus delivering Final Completion to the Sponsors.

In this way the minimum viable configuration could be opened at the earliest opportunity and any functionality deferred by EOP was expected to be delivered within one year of public opening on any given station. In support of this, the Trial Running System Description and Configuration State minimum requirements were documented and signed off between CRL and RFL in April 2020. This underpinned the shortest programme to operational service by facilitating the earliest possible Entry into Trial Running Date.

The EOP Strategy was the baseline for the Delivery Strategy up to 24 March 2020, when the Crossrail Executive Group decided to instruct a Safe Stop of all works due to the COVID-19 Pandemic and the Public Health Guidelines issued at the time. Following the Safe Stop, Crossrail developed a COVID-19 Recovery Execution Plan, with a number of scenarios and options. At the May 2020 Crossrail Board, an option was selected for the development of a Delivery Control Schedule referred to as DCS1.1, and the Recovery Execution Plan was documented and assured against the emerging schedule. DCS1.1 was adopted as the basis for planning and measuring progress at the August 2020 Board prior to the submission of a fully assured Baseline DCS1.1 in November 2020 for approval by the newly formed Elizabeth Line Committee. This supersedes the staged opening plan set out in the original 2011 Sponsor's Requirements.

During the development of the COVID-19 Recovery Execution Plan, the concept of the Minimum Viable Product for the Earliest Opening Programme was reconsidered. Critical path 1 of the recovery plan runs through Dynamic Testing (DT), Assurance for the Crossrail Engineering Safety Acceptance Certification (CESAC), Authorisation under ROGs and Trial Running. The delay to the programme caused by amongst other things the COVID-19 pandemic allowed for example the Routeway and the trainborne signalling systems to achieve a better configuration state by the revised Entry into Trial Running Date. The EOP planned Trial Running Software P_D+11/Y0.540 was successfully tested in Dynamic Testing by July 2020. However, it was recognised that significant operational restrictions in this version of the software could be removed in later versions. As a result, the COVID-19 Recovery Execution Plan proposed that a later version

TR2/Y0.603 software incorporating bug fixes and removing operating restrictions would be used for Trial Running. The Software strategy has been further developed so that the configuration state for Trial Operations includes other improvements to functionality available for operational service such as Automatic Reverse. (See the System Integration section in the COVID-19 Recovery Execution Plan for further details). This principle has been adopted across the Elizabeth line and a new Trial Running System Description and Configuration State [**52**] has been developed and was signed off in October 2020 to define the augmented minimum viable product that reduces the burden on the maintenance and operations teams and increases functionality where possible within the earliest opening programme constraint.

Critical path 2 runs through the stations to Trial Operations. Whilst the minimum acceptable stations for opening were considered as part of the recovery plan (part of the Strategic Interventions Plan D), this plus a number of station configuration options were presented as part of the plan to the August Board. It is recognised that whilst the Elizabeth line could open with as little as 6 stations, experience on previous programmes such as the Jubilee line indicate that delaying station opening to later phases significantly increases the final cost of the scheme and the time to finish and provide full functionality. As a result, the August board selected "configuration 2", all stations except for Bond St. to be ready for operational Service for Stage 3 opening.

As a result, the Recovery Execution Plan and Baseline DCS1.1 is considered to represent the shortest time path to end-to-end Revenue Service full functionality whilst minimising the total capital expenditure envelope for the scheme.

The following summarises the 10 modules of the Recovery Execution Plan, and the individual strategies that support it. More detailed Strategies are set out for each Module in version 2.0 of the COVID-19 Recovery Execution Plan.

Currently, there is no known effective COVID-19 vaccine, and it is expected that in the autumn/winter of 2020/21 there could be a second wave of infections that will affect the UK and global population more severely than before. The impact of this second wave is highly uncertain.

Against this backdrop, Crossrail has developed scenarios, tactical and programmatic interventions and restructured the delivery schedule to compensate.

The primary objective of the COVID-19 Recovery Execution Plan is to start Trial Running under ROGS authorisation as early as possible to minimise any delay to Stage 3 opening. To do this the plan aims to complete the Stage 3 Central Operating Section (COS) Construction, Testing & Commissioning and assurance of the works necessary for Trial Running by 1st quarter 2021. The construction works include delivery of Shafts and Portals, Routeway Chapters, and Stations complete as a minimum to SC1 configuration.

Crossrail, as with other infrastructure programmes has planned to maximise the shift work opportunity during the summer in a controlled blockade style approach. This has completed and has achieved productivity rates of 97%, with 50 acceptance certificates targeted for completion with the closeout of the corresponding Element Outstanding Works Lists (EOWLS).

Agreements with ASLEF have secured the ability to perform Dynamic Testing (and by extension Trial Running) under COVID-19 social distancing restrictions. Further, the Derogation by the ORR to allow up to 8 trains to be run at any one time has been granted. This de-risks software testing and the planned timetable running under System Integration Dynamic Testing (SIDT), and the transition into Trial Running at the end of the first quarter 2021.

The COVID-19 Recovery Execution Plan at a high level has been constructed to:

- complete outstanding Dynamic Testing of the current software configuration PD+11.4
- maximise construction access during August and September in a blockade to complete as much of the outstanding work as possible in a controlled way and focused on works needed for a timetabled service to start
- complete TR2 software testing and the remainder of non-signalling integration testing by mid-November
- transition to timetabled train running from December 2020 under SIDT
- commence Trial Running in a ROGS environment as early as possible to build confidence in the reliability of the system. Software updates that improve reliability (TR2 in August and Y0.610 in March 2021) resolve operational restrictions and system reliability issues, and these are accommodated in the plan.
- deliver a minimum of Station Configuration 2 by Trial Operations per the Baseline DCS1.1 P4 base plan for all stations and maximise the number of stations opened for revenue service.

The COVID-19 Recovery Execution Plan *(Figure 6-1)* describes the ten module recovery strategies that underpin and support the Delivery Control Schedule (Baseline DCS1.1). These include strategies to prepares RfL and CRL for the transition from a construction environment to an operational environment under ROGS, to transition to the end state Elizabeth line organisation. Together with the commercial strategy that will determine the most cost-effective way to close out the contracts in support of the DCS. Each module has an overall accountable owner.

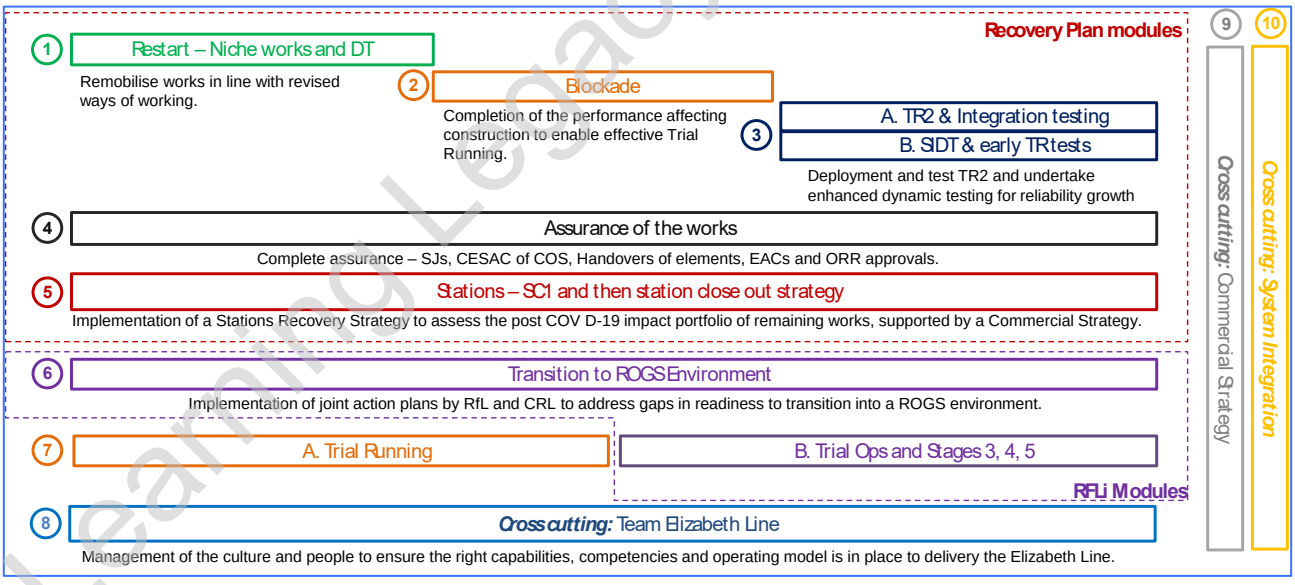

Figure 6-1 Overview of the 10 modules that form the foundation of the Recovery Execution Plan

Whilst the opening of Crossrail Stage 3 is our primary objective, key to programme success is the achievement of Stage 4 opening. This is because revenue generation significantly increases at this point. To achieve this, the Timetable bid at D40 must be accepted by Network Rail. For this to happen, confidence in the system reliability developed through mileage accumulation and software issue resolution must be enough to be able to confirm a robust timetable operation at 24 THP.

6.2 Execution Plan Critical Path

The critical path *(Figure 6-2)* shows the high-level activities that makes up nine modules. Highlighted is the critical path from now through to Stage 5. There are 2 critical paths:

1. Critical path 1 runs through Routeway completion, Assurance and CESAC submission to RAC-C, ROGS authorisation and Trial Running
2. Critical path 2 runs through Station commissioning to Trial Operations.

The plan has been developed to deliver the newly defined minimum viable product as described in *(para 6.1),* and has taken advantage of the opportunity to improve where possible the available functionality at Trial Running and Trial Operations to reduce Operational Restrictions and the overall programme funding envelope requirement.

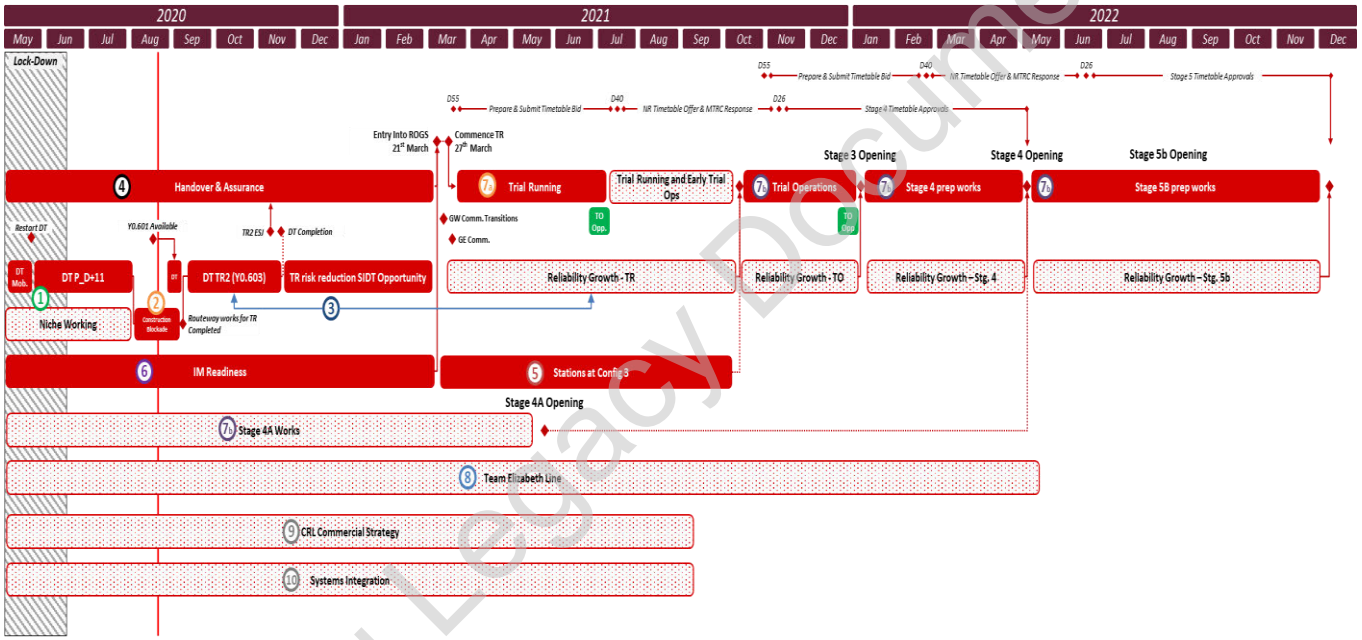

Figure 6-2 Execution Plan Critical Path

6.2.1 Module 1: Restart Niche Works and Dynamic Testing

The key success criteria for the Niche Working and Dynamic Testing phase was the safe start of critical works following Public Health Guidelines and the completion of the remaining 22 tests for the P_D+11/Y0.540 software in preparation for Trial Running.

Niche Works on the Central Operating Section allowed for critical maintenance and focused works to be undertaken that will have a beneficial impact on the assurance and handover process.

A Crossrail Guidance document entitled "Route to Finish" has been developed by the Programme Delivery team to detail the migration of Crossrail from Safe Stop and Niche Working to a new way of working. The approach taken is in alignment with the wider Construction Industry, the Construction Leadership Council and Transport for London (TfL) responses to COVID-19. On the 15th June, mobilisation of all the contractors in alignment with this document commenced. This continued until the commencement of the 6-week blockade to complete outstanding scope, documentation, certification and testing necessary to support the submission of the Central Operating Section (COS) Safety Justification to RAB-C and subsequent Crossrail Engineering Safety Acceptance Certificate (CESAC).

Dynamic Testing concerns the completion of the testing of the P_D+11/Y0.540 suite of software systems on a 4 day - 3 day split to accommodate further construction windows. This will ensure that Crossrail has a viable software product available for the commencement of Trial Running.

Niche works commenced on the 20 April 2020 and Dynamic Testing recommenced 29 May 2020. Both completed on the 31 July prior to the Blockade commencement.

6.2.2 Module 2: Blockade

A construction blockade immediately followed the completion of Dynamic Testing at the beginning of August. The key success criteria for the construction blockade is the completion of the critical construction works to support the Crossrail safety case to deliver a safe and operable railway and the majority of the works required for Trial Running. 3 shift, 7-day working is being deployed to maximise construction productivity. The blockade will provide up to 8 weeks recovery opportunity against the COVID-19 schedule impact.

The blockade is concentrating on the following:

1. Delivering the blockade in a safe COVID-19 environment
2. Prioritised access to complete essential works including Platform Screen Doors
3. Completion of all critical Fire Stopping in the Trace
4. Undertaking of specific stations integrated testing activities where HV isolations are required
5. Completion of outstanding works by the Principal contractors and their suppliers to enable future de-mobilisation of XXXXX ATC
6. Closeout of as many Element Outstanding Works Lists (EOWLs), 19 submitted as of 10th September, and Acceptance Certificates of which 17 are Routeway Acceptance Certificates with 7 submitted as of 10th September. These activities are all in support of the CESAC, and to minimise the works needed during TR and beyond
7. Critical scope of works of:
    - 84 Critical tunnel hop ups – Complete as of 4th September 2020
    - OHLE bent bolts – Complete as of 4th September 2020
    - Connaught tunnel water leaks – Complete as of 10th September 2020
    - Platform Screen Doors air gaps – Programmed for end of blockade

Furthermore, CRL have completed 9 out of 17 System Wide Integration Tests and successfully transitioned between Dynamic Testing and construction as per the blockade management plan. In addition, CRL has incorporated further scope into the baseline programme during the blockade via the addition of:

- Bond St Station – 173 of 251 trace dependant activities are now complete as of the 10th September
- EOWLs – 130 additional EOWLs of which 79 complete as of the 10th September

Outstanding works, predominantly at Bond Street, required for the Trial Running Phase are being programmed to be completed in a November 2020 mini blockade.

6.2.3 Module 3a: Software Version TR2 and Integration Testing

Following the Blockade, a key activity is planning the next CBTC Signalling Software upgrade 'TR2' for testing under Dynamic Testing conditions. The key success criteria for this module is to complete the testing of TR2 by the 19 November 2020 to allow for assurance activities to be completed in time for Trial Running commencement in the first quarter of 2021.

The CBTC Signalling software version TR2 release is key to de-risking the programme to Stage 3 opening and was available in mid-August 2020. It is expected that TR2/Y0.603 software will deliver a reduced number of operational restrictions for both drivers and traffic managers. Further updates bringing the configuration to Y0.610/PR6 in March 2021 will further de-risk passenger service by reducing operational restrictions, introducing auto-reverse functionality, and resolving known reliability issues (e.g. Platform Screen Doors).

The recent re-start of Dynamic Testing and completion of the subsequent blockade in mid-September provides an opportunity to commence earlier Dynamic Testing of TR2 software and an extended period of SIDT. This earlier testing of TR2 will be necessary to support the associated assurance evidence and submission of TR2 to RAB-C for approval by the ORR for Trial Running.

6.2.4 Module 3b: System Integration Dynamic Testing and early TR tests

Systems Integration Dynamic Testing (SIDT) is an opportunity, after completion of TR2 Dynamic Testing, to take advantage of the lag between the substantial completion of construction activity and the Dynamic Testing of TR2 and Assurance completion to permit entry into Trial Running. A key success criterion for the SIDT period is to undertake routeway integration tests originally planned for the Trial Running phase. In some instances, the test results can be banked in SIDT and will not need to be repeated in Trial Running. In the other cases, the tests will need to be repeated but undertaking the tests initially in SIDT may flush out issues sooner, thereby de-risking the later stages of the programme. A second success criteria for SIDT is to accumulate circa 100,000 miles of system Dynamic Testing under timetabled conditions. Whilst the preference is to achieve the start of Trial Running as early as possible, SIDT is an opportunity to provide an earlier indication of reliability and performance of the various Crossrail systems whilst the assurance for ROGS Authorisation is completed. SIDT provides the following opportunities:

- Running more trains and increasing mileage through the COS (circa 100,000 miles). This will gather a significant volume of reliability data to help support the timetable bidding process for D40
    - Running the systems to flush out hidden defects outside of the constraints of the traditional Dynamic Testing arrangements
    - Stress testing the systems up to 4 months earlier than originally planned, by running for longer periods, increasing mileage and increasing the defect discovery phase
    - Undertaking routeway integration tests previously scheduled for the Trial Running period
    - Enabling the cycling of an increased number of train units during this phase to identify any unit-specific defects
    - Enable RfL Ops and maintenance and MTR drivers a significant period of familiarisation of the Crossrail integrated railway systems and operations within a test environment. This should provide a more robust platform for moving into Trial Running.
    - SIDT provides an environment where RfL can gain operational experience on the COS prior to going under ROGS by signalling test trains under the ROGS exemption and CCRRB.

SIDT continues until the railway is authorised under ROGS regulations. Default timetable operation in the SIDT period operation will be 7 days during traffic hours. SIDT will operate a close headway timetable with a maximum of 8 trains operating. Each night there will be non-traffic hours where the railway infrastructure may be made available for other activities including maintenance and construction.

The Dynamic Testing, SIDT and Trial Running phases will be brought together under one controlling mind, the Trials, Testing & Commissioning team. This will be directed by the Head of

Test, Trial & Commissioning (TT&C). The Head of TT&C will continue to deploy the strategy to bring together and integrate the DT, SIDT and TR phases so that mutual opportunities to de-risk the programme can be implemented effectively.

6.2.5 Module 4: Assurance of the Works

This module covers the assurance of the construction works in order to achieve authorisation of the railway under ROGS. There is no float within the Assurance Fragnet [**27**] and as such, all the activities are on the critical path.

The key success criteria for the assurance of the works is achieving ROGS authorisation by the ORR the first quarter 2021 followed by the start of Trial Running. To deliver this, Structured Engineering Judgement (STEJ) is being deployed to mitigate any slippage in the schedule and potentially improve on the ROGS authorisation date. A series of Joint Hazard Review workshops by CRL (Technical and Delivery Directorates) and RfL, successfully used on past major projects in TfL, will be used for the final delivery stages of Trial Running and Trial Operations prior to Revenue Service.

CESAC submission takes place in February 2021 following the RAB-C approval of COS SJ, the integrated assurance approval and the Siemens signalling ESJ submission (TR2). RAB-C approval is planned two weeks later.

Routeway Assurance process overview:

- CSM-REA requires a Safety Justification (SJ) document to present the structured argument for safety
- This needs a clear System Definition with boundaries drawn around the System or Sub-system for which safety is being justified
- The contractor provides an Engineering Safety Justification (ESJ) at the asset level
- CRL generates a Safety Justification at the integrated Railway Sub-system level (e.g. Track, Energy, Signalling)
- CRL generates the Central Operating Section (COS) SJ at the Railway level.
- RFLI generates the RFLI SJ to cover the organisational change to become the COS Infrastructure Manager.

This workstream is directed through the Crossrail Technical Director, supported by the Crossrail Chief Engineer and the RfL Head of Engineering and Crossrail Infrastructure.

6.2.6 Module 5: Stations – SC1 and Station Close Out Strategy

The key success criteria for the Station Recovery is achieving all LU and RfL stations handed over into ROGS (SC3) by Trial Operations except for Bond Street which will be at SC2.

To achieve this, the priority order for Stations has been agreed and the stations split into 2 swim lanes: RfL and LU, with none of the early stations overlapping the previous station handover process beyond T-4. In this way the first 3 stations – Farringdon, Paddington and Tottenham Court Road have been scheduled to minimise the peak load on critical engineering assurance staff.

The Station Recovery Plan [**49**] is aligned to and supports the routeway blockade (see module 2) to ensure that the Station Tier 1 contractors take advantage of the opportunities afforded by the working window made available to complete all trace dependent works.

Defined physical scope to go is key to delivering the station recovery (EOWLS, COWLs, NCRs etc.) and requires all parties to agree to EOWL triage:

- Works required for trial running
- Works required for revenue service; and
- Works that can be delivered post revenue service.

6.2.7 Module 6: Transition to ROGS Environment

The change from full completion to a staged completion approach for delivery of the project inevitably introduces risk in managing the change through multiple stages. The primary objective of this module is to provide assurance that Crossrail and the Infrastructure Manager (RFLI) can stand up and operate safely under a ROGS environment through the transition from construction into and through Trial Running.

An IM readiness capability review commissioned by the CRL Executive and jointly sponsored by the Chief Operating Officer and Chief Programme Director was conducted in early April 2020, identifying several issues in plans to transfer safety responsibilities under ROGS, impacting mobilisation planning for Trial Running. A programme of work, supported by improved governance arrangements, was subsequently established to mitigate these issues with a focus on targeted intervention planning such that activity could be monitored with confidence into Trial Running with oversight from an appropriate RFLI or CRL Executive. The nominated initiatives are supported by working groups until they are under control and transitioned to business as usual.

A key challenge in mobilising sufficiently to transition into ROGS is the need to mobilise RFLI with the ability to accept the railway in a staged way, as well as the ability to operate the railway. Where RFLI have not been sized to cope with this, Crossrail has defined with RFLI, the CRL support required to be provided through personnel, support contracts and engineering expertise.

6.2.8 Module 7a: Trial Running

The purpose of Trial Running is to demonstrate that the railway is capable of reliably meeting the capacity and other requirements of the Crossrail Programme Functional Requirements and the Sponsors' Requirements. Trial Running will involve appropriate integrated testing with multiple trains to demonstrate that the Central Operating Section (COS) Railway system can achieve these requirements.

The key success criteria for this module is to provide evidence that the system is reliable enough for the Stage 3 timetable to recover from any Service Affecting Failures. Whilst the 15 Trial Running tests are expected to be completed in the SIDT phase, it will be necessary to successfully demonstrate full operation at up to 24 THP. Any outstanding works that are critical to operational service will also need to be completed and any associated assurance completed during Trial Running.

There is a detailed set of Trial Running Exit criteria, which needs to be demonstrably met in order to confirm that the railway can meet the operational and reliability requirements after being authorised into service under ROGS. These include consistent headway, overall performance and transition elements, both in terms of number of successful passes and in overall performance terms.

A detailed day by day model has been developed to fully detail the required activities to be conducted. This model has now been baselined following reviews with all relevant stakeholders. This plan integrates the key activities for the following 3 categories:

1. Traffic Day (MTR Timetable operations and CRL Integrations Testing)

2. Possessions & Signalling Protected Zone (SPZ) opportunities (to conduct Train and Signalling Updates) and
3. Non-traffic Hours (stations commissioning and maintenance cycles).

The Trial Running period will commence after the Elizabeth line is authorised into service under ROGS. This is currently planned for Q1 2021.

The strategic oversight and controlling mind for the Trial Running Phase will be held by the Head of Test, Trials and Commissioning, reporting into The Engineering Director. This will be integrated with the DT and SIDT strategy and philosophy (See module 2 and 3) to maintain a consistent and programme level approach to testing and commissioning across these three phases.

6.2.9 Module 7b: Trial Operations and Beyond high-level plan

This module covers the transition of the Elizabeth line from testing and commissioning the railway systems to operation of the railway under ROGS Authorisation in full passenger revenue service.

The Key Success Criteria for Module 7b is the successful entry into service of Stage 3 followed by the successful entry into Stages 4 & 5 and the appropriate timetable changes to maintain revenue growth. It also includes the launch of Stage 4a. This will be achieved through demonstration exercises during Trial Operations that the operations of the railway and stations are robust enough to deliver a reliable service of 12 TPH under any COVID-related Public Health England Guidelines in place at the time for Stage 3. There is then a minimum gap of 12 weeks (and a planning assumption of one national timetable phase) to increase reliability ready for Stage 4 and 24 TPH in the COS.

Commissioning Stage 4a will be a key de-risk activity for Stage 4.

Successful bidding of timetables for Stages 4 and 5 and implementation of these will be critical to capacity and revenue growth.

The delivery of this module is directed through the Chief Operating Officer working with MTR and Network Rail.

Trial Operations (TO) is a 13-week period of time supported by a detailed plan of 54 published tests and exercises and 20 unpublished exercises. These exercises include passenger evacuation exercises, infrastructure and rolling stock failures and are staggered across the 13 weeks. At the point of entering TO, CRL will commit to a specific date for first passenger service. Some exercises require approval (and witnessing) by key external parties such as ORR and London Fire Brigade where applicable (e.g. evacuation exercises).

Stage 4a is planned to take place on a national timetable change day prior to the commencement of Stage 3 passenger operations. It provides two primary benefits to the CRL programme:

1. It re-aligns the Full Length Unit fleet strategy giving a homogeneous fleet in terms of length and software. The longer platforms at Liverpool Street Station will mean a Full Length Unit service can operate on the east for the first time.
2. It should also mean Stage 4 can take place outside of a national timetable change (subject to wider industry agreement).

The Stage 4a timetable includes paths to run in and out of the COS to the GE off-peak to facilitate this growth in reliability and for driver training/familiarisation.

Stage 4 will provide a peak service of 24 THP in the COS. Heathrow and Reading services will continue to serve Paddington Mainline Station. A key assumption is that Stage 4 needs to be a minimum of 12 weeks after Stage 3, due to the need to prove reliability in the COS and for staff/passenger familiarity as well as continuing to run trains across the GE transition (empty and off-peak) to grow that reliability further, ready to support routine use at 12 THP.

The on-network works consist of two main elements:

1. Accessibility (induction loops, DDA toilets and lighting levels) and step-free access schemes (lifts and footbridges) during Station Refurbishment.
2. Auto reverse functionality is also an essential requirement for Stage 4 to allow 24 THP to turn at Paddington.

Stage 5b must be implemented on a national timetable change date due to the scale of change across the western rail network. For this reason, it is also considered that Stages 4 and 5b cannot be combined into one large change. Bidding for Stage 5 will start just over one year in advance with the main bid 40 weeks before.

6.2.10 Module 8: Organisation Design and Transition

This module concerns the definition of the organisation required between now and through to the end state and sets out how the transition will be delivered at each stage through a consistent approach. This is to underpin the successful delivery of the Recovery Plan with a right sized and capable organisation developed for each discrete state.

The key success criteria for this module is the successful implementation of the CRL Organisation transition from the Crossrail programme to the Elizabeth line organisation.

This module will be delivered by the Chief People Officer through four key workstreams: People & Organisation, Governance, Obligations and Assets *(Figure 5-7).*

The organisational transition plan will be underpinned and supported by key operating model considerations and includes a review of the governance required to ensure the delivery of the programme. A consistent methodology will apply to the design and implementation process and will define clear design principles to guide and shape the operating model, and transition approach throughout the process. The design will be delivered through the following key activities: scenario testing, change impact assessment, communication and engagement, and implementation.

Sponsor and stakeholder engagement will be a key element of this module. This is to involve key stakeholders at every stage so that the receiving organisations are set up for the successful transition of people (where appropriate), governance, obligations and assets.

6.2.11 Module 9: Commercial Strategy

From July 2020, the Commercial Directorate's priority and focus has transitioned from just supporting the delivery functions, to now driving through contract completion, commercial closure, leading to ultimate handover of residual commercial positions to TfL (IMs).

The Directorate's objectives can be summarised as:

- To drive commercial closure of existing contracts and third-party agreements (TPAs with commercial expenditure)
- To set out the detailed governance framework under which CRL's contracts are closed.
- To set out the commercial close out strategy

- To support project managers in their responsibility to make a fair and valid assessment of defined cost under CRL Contracts
- To maintain proportionate and accurate information on the status of contracts, to permit informed decision making
- To provide support to the business with investment decisions regarding the key Close Out review areas such as completion programmes, strategies, demobilisations and scope allocations
- To ensure that contracts are closed efficiently and effectively, while protecting value for money. This includes leading in discussions with suppliers, commercial negotiations and the development of contract amendments
- To support CRL with formal disputes and/or support to arbitration
- To provide support to those with delegated authority under the contracts.

- **Close Out Planning**

  As part of the Commercial and Contract Close Out process, 'Contract Close Out Plans' are now being produced under the leadership of the Commercial Teams and these will detail for each project:

  - Project Summary: Overview of the current statuses of the scope, commercial, schedule, risks and performance on the project
  - Close Out Assessment: Review of which aspects of the Close Out Toolkit [**34**] and bespoke mechanisms are applicable to the project
  - Close Out Plan: Definition of the proposed Scope & Contract Delivery Model and required actions
  - Further Opportunities: Details of any other potential areas of betterment across the AFC or programme
  - Governance: Lists of the required approvals to implement the various aspects of the Close Out Plan
  - Close Out Programme: Milestone schedule of the engagements, interventions, meetings, changes, papers, negotiations, escalations, etc.

- **Close Out Toolkit**

  To facilitate the production of these plan the Crossrail Close Out Tool Kit has been developed as below, which are the core options we can call upon to drive close out:

  - ADM/RWT: Review of the quantity, volume and classification of works being transferred to ADM, with a focus on transferring late stage or stand-alone scope items which could enable the earlier or more expedient demobilisation of the supply chain
  - 3rd Party Care & Custody: Review the option of introducing a 3rd Party Care & Custody supplier to enable the earlier or more expedient demobilisation of the Tier 1 site management and preliminaries
  - Delivery Intervention: Outlining any requirement for Crossrail to intervene or provide necessary direction in the delivery of the works, examples of which would be: prioritisation of Central Tier 2 Suppliers; sequencing changes or amended delivery priority management
  - Incentive A – Milestone Target: Introduction of incentive(s) to drive the supply chain to deliver SC3 and/or completion of EOWLs (pre ROGS), utilising risk mitigation and/or Tier 1 preliminary savings to determine the potential value of any such incentive

- Incentive B – Demobilisation Targets: Introduction of a periodically measured incentive which rewards the supply chain for meeting or reducing their period spend on the cost-reimbursable elements of their staff & site prelim, with the value of the payment being determined as a share of the saving against the programme AFC, including the current overlay
- Other Commercial Incentives: Utilisation of the unique commercial/contract nuances or each contract to create bespoke agreements such as staged payments weighted on EOWLs completion or early partial bond/PCG release at achievement of SC3

6.2.12 Module 10: Systems Integration

The objective of Systems Integration (SI) is to ensure that the Elizabeth line is commissioned in a structured and staged way, with appropriate controls to manage any deviations. This objective is accomplished through creation of a Migration Plan with sets out key integration milestones. These milestones are further defined as Configuration States of the railway that ensure the related functional and non-functional requirements (safety, reliability, operability, etc) are present to achieve the purpose of the state and are clearly understood by the Crossrail delivery projects. This is to ensure there is a balance between delivered functionality and operability (considering operational restrictions associated with functionality gaps or bugs) for each agreed Configuration State. The SI module is a pan Crossrail module and ensures integration across programme, technical and organisation.

The key success criteria is to develop and migrate system elements and software in accordance with the programme. To successfully integrate across signalling, trains, stations, control centre, customer information, depots/yellow plant and other railway systems to achieve sufficient reliability to enter passenger service. The successful outcome is a safe, resilient, operable, and maintainable railway.

System Integration is directed by The Technical Director and Head of Systems Integration. This is accomplished using 3 main integration streams:

1. Overall Railway level
2. Trains and Signalling, and
3. Stations Commissioning.

Siemens (CBTC Crossrail, Application Design, Interlocking, CBTC Integration (CIF)) and Bombardier Technology (BT) (Train Build, Train Systems Integration, Train Assurance) are the main contractors developing systems and software requirements for the programme. This is managed through a joint collaborative team, 'Plateau 1'. Similarly, the Stations integration and commissioning is managed collaboratively through 'Plateau 2'.

Under Plateau 1, the software configuration fully assured by CRL upon entry in to ROGS will be Y0.603. Following entry to ROGS Y0.610 will be released to enable the entry into Trial Running. This will be the first software released configuration assured under RFLI. A detailed software release plan has been developed which shows the 'last call for change', 'supplier approved' and 'fully assured' milestones for each release.

Plateau 2 combines the Communications and Controls elements with the Stations delivery and the RCC. A key principle of the commissioning strategy is to apply learnings from the first wave of stations that are commissioned which are Custom House (RfL station) and Farringdon (LU station).

Crossrail is responsible for Systems Integration, Software Strategy and the Testing Verification & Validation Strategy at a programme level. The overall railway level integration is managed through the System Integration team lead by the Head of Systems Integration , this team also acts to define and manage the configurations of the railway and well as defining system level integration test activities.

There are 3 key components that make up the systems integration module that are cross cutting:

- **Programme:**
  - Cardinal and key milestones for delivered configuration states
  - Definition of the Configuration States by phase
  - Integration with DCS, risks and opportunities
- **Technical:**
  - Routeway integration testing
  - Station Integration testing
  - Systems integration Dynamic Testing (SIDT)
  - Train signalling software integration and release strategy
  - 3rd party assets – e.g., DOO CCTV, Abbey Wood, NR assets
- **Organisation:**
  - Organisation alignment with the required functionality and any associated operational restrictions delivered at each phase (including 3rd party organisations such as MTR, NR, LU)

These components are described in further detail in the COVID-19 Recovery Execution Plan.

6.3 Central Section Works

The Central Section Works *(Figure 6-3)* include all contracts relating to the delivery of the Elements within the Central Operating Section, each of which has a principal contractor responsible for managing works through to completion. The scope of the contracts includes the main works required at each Element, as outlined in the Project Works Information document, their interfaces with each other, the asset protection and implementation works with Network Rail, London Underground and Docklands Light Railway assets, and interfacing with other stakeholders, including consent granting bodies.

Crossrail's role is to maintain oversight of the principal contractors and provide project management and programme leadership across the portfolio of contracts. The size of the Central Section Works is significant and delivery is therefore split across two main sectors within Crossrail's Programme Directorate: Stations and Routeway with the Routeway Directorate also including Shafts and Portals. In addition, Bond Street and Whitechapel have enhanced oversight to ensure focus on resolving the unique issues identified at these stations.

6.3.1 London Underground Crossrail Stations

Crossrail Stations to be passed to London Underground as the future Infrastructure Manager include the 'mined' stations of Bond Street, Tottenham Court Road, Farringdon, Liverpool Street and Whitechapel. Sponsors Requirements require Crossrail to integrate with the existing London Underground stations at each of these locations where LU will be the station operator, with overall

accountability for management and the Crossrail train operator who will manage train despatch from the Crossrail platforms.

The London Underground Development Agreement (LUDA) [**43**] sets out the scope of work relating to London Underground infrastructure and the importance of managing interfaces between Crossrail works on or affecting London Underground property or systems, including the creation of new combined operational facilities, such as stations operations rooms, or where infrastructure protection may be required. Crossrail will manage the Works, except where it is more appropriate for London Underground to do so; for example, relocation of safety-critical systems and interaction with single-source PFI equipment or where there is synergy with other London Underground projects.

The works will need to be delivered in a way to achieve acceptance by the future Infrastructure Manager. CRL will work together with London Underground in relation to:

- **Standards and Assurance**

  London Underground standards (S1-538) will apply to any modifications to existing London Underground infrastructure; appropriate standards will apply to all other works, subject to acceptance that all safety requirements are satisfied

- **Physical interfaces**

  CRL and London Underground have developed an interface schedule which describes each interface with London Underground assets and systems, as well as protection and/or monitoring of works adjacent to London Underground property. This forms the basis, subject to change control, for the management of design and implementation activities

- **Access**

  CRL and London Underground will work together to deliver Crossrail works in the least disruptive and most efficient way practicable, recognising the importance of keeping London moving during an intensive period of upgrading of the London Underground network. This includes working with London Underground Strategy and Service Development Events and Closures to identify synergies with other London Underground works.

6.3.2 Rail for London Crossrail Stations

Crossrail Stations to be passed to Rail for London as the future Infrastructure Manager include the 'box' stations of Paddington, Canary Wharf, Custom House and Woolwich. Sponsors Requirements also require Crossrail to integrate with the existing Docklands Light Railway station at Custom House and the Network Rail station at Paddington. There are distinct development agreements in place for Canary Wharf and Woolwich. At each of these locations RFLI will be the Infrastructure Manager, with overall accountability for the asset and the Crossrail train operator will be both the station operator and manage train despatch from the Crossrail platforms.

Canary Wharf Station – Canary Wharf Group

The Secretary of State and CRL have a Development Agreement with Canary Wharf Properties (CWP) (Crossrail) Limited (guaranteed by Canary Wharf Group Plc) to develop finance and part fund the new Canary Wharf (Crossrail) Station. The Agreement includes provisions for CRL and CWP to agree the plans and for CWG to provide access for subsequent railway works. On completion the Secretary of State for Transport may buy the station at a fixed price or take a lease.

CRL is responsible for:

- Maintaining the overall programme interface with CWG to ensure that all works are properly planned and coordinated to meet the project timetable
- Specifying the railway requirements and for systems integration
- Design and install of railway systems, not included in CWG scope
- Exercising due diligence over the CWG progress and likely outturn cost of the station and related oversite development works.

Woolwich Station – Berkeley Homes

An agreement with Berkeley Homes is in place for the design, construction, finance and part-funding of a Woolwich Station box (the Woolwich Station Box Deed). The agreement with Berkeley Homes provides for future arrangements to be made for the fitting out of an operational station. Following receipt of a Sponsors change notice in July 2013, CRL is delivering the fit-out of an operational Crossrail station at Woolwich. CRL is responsible for:

- Maintaining the overall programme interface with Berkeley Homes to ensure all works are properly planned and coordinated to meet the project timetable
- Specifying the railway requirements and for systems integration across the Crossrail route
- Fit out of the station box and the railway systems
- Exercising due diligence over the Berkeley Homes progress and likely outturn cost of the station box.

6.3.3 Routeway

The Routeway represents all the railway systems contracts and interfaces required to deliver a complete and fully tested safe railway to the Operators in the Central Operating Section for passenger service. In addition, under the PDA, CRL is required to deliver a railway with a resilient permanent energy infrastructure connection and supply network, together with the necessary metering, to the operator. These works include:

- Main works, including track, tunnel ventilation, tunnel lighting, walkways, and signage
- Signalling and control systems, including the Route Control Centre and Back-Up Control Facility (BUCF)
- Platform screen doors, integrated with the signalling system
- Communications and controls systems, including radio control, Crossrail fibre network, and the Supervisory Control and Data Acquisition (SCADA) system
- Traction power for Crossrail Rolling Stock
- Non-traction power for high voltage supplies to signals and controls systems, stations, tunnels, shafts, buildings and sidings.

CRL has also engaged Network Rail under an industry standard framework Implementation Agreement to undertake changes to its assets to enable the construction of interface works between the Central Section and the existing NR rail network.

Network Rail will also protect its assets as Crossrail performs its works at the interfaces under an industry standard Asset Protection Agreement (APA). All interface works are included in the Central Section Works and are a direct cost to CRL. CRL is directly accountable for the delivery of the interface works.

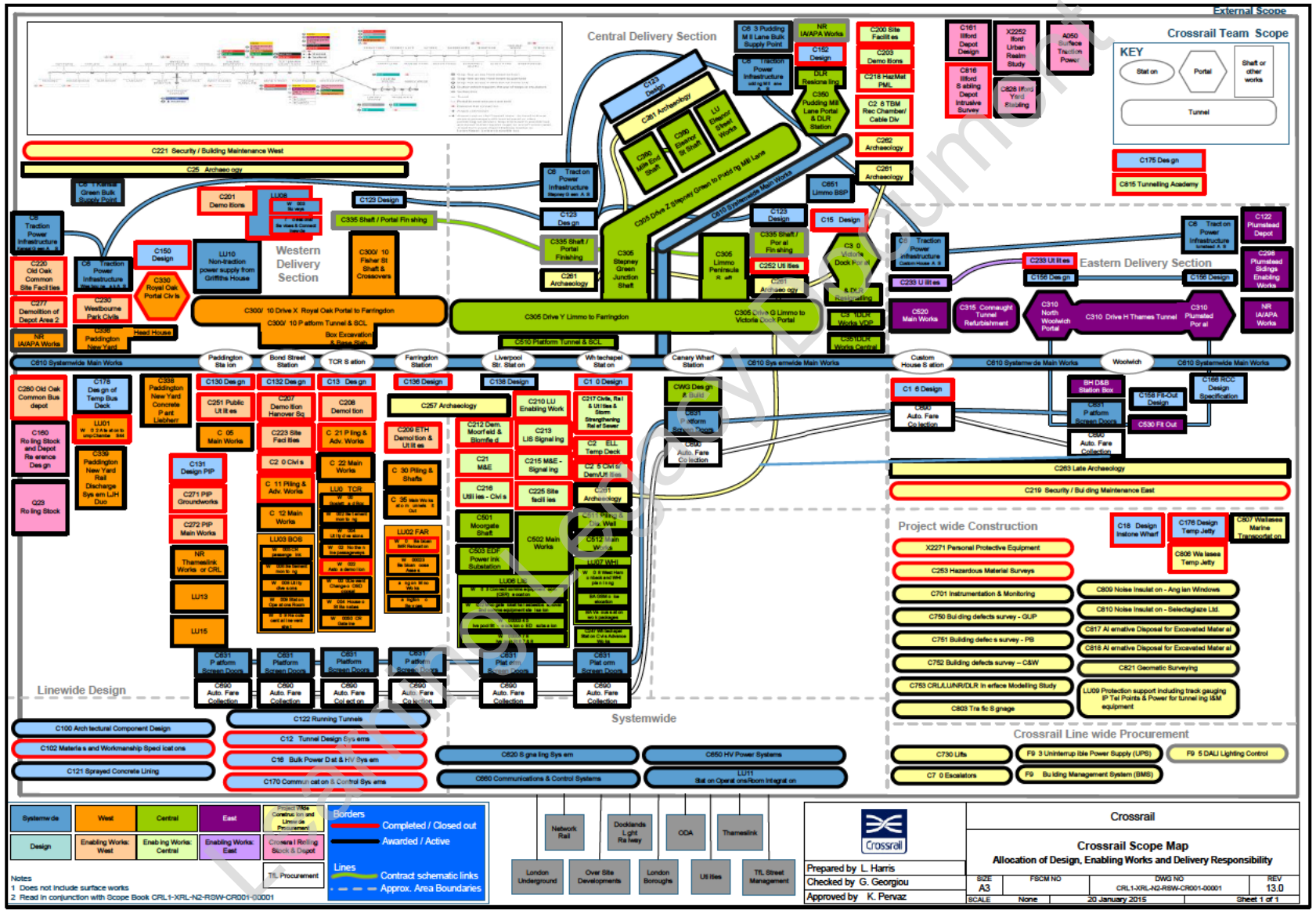

Figure 6-3 Crossrail Scope Map

6.4 On Network Works - Network Rail

CRL is accountable to the Sponsors for the delivery of the whole of Crossrail. CRL is the customer of Network Rail who deliver the On Network Works and other support services (together referenced as the Network Rail Programme). The Sponsors have designated CRL as the programme manager and systems integrator for Crossrail and CRL will perform its responsibilities and discharge its accountabilities in relation to the Network Rail Programme in accordance with the Regulatory Protocol.

In its role as Nominated Undertaker, CRL is both compulsory purchase agent for the permanent acquisition of land for On Network Works and responsible for satisfying itself that On Network Works are specified, developed, and implemented in accordance with the Crossrail Act, the Register of Undertakings and Assurances, the Environmental Minimum Requirements and related documents and formally submits applications for consent under the Crossrail Act.

While CRL retains accountability, the Network Rail Crossrail Delivery Team overseen by the Network Rail Crossrail Client Management Team (CCMT) will undertake the required activities. In its role as Overall Programme Manager and systems integrator CRL:

- Specifies, amends and owns the Network Rail Client Requirements. These are the requirements to deliver the Sponsors Requirements and cover infrastructure capability requirements (informed by railway system performance modelling) and schedule requirements
- Leads the systems integration of the network and satisfies itself of the deliverability of the Railway System Model outputs and required infrastructure capabilities for the Central Operating Section
- Ensures the integration of the various Elements and systems of Crossrail to deliver the Sponsors Requirements, and develops CRL procedures for systems integration and interfacing arrangements in relation to project control, assurance, dynamic testing and trial running, including the support and engagement reasonably required from Network Rail
- Owns an integrated delivery plan which co-ordinates On Network Works with the work in the Central Section, the rolling stock and depot elements, and the Infrastructure Managers
- Reviews and approves Network Rail's baseline plans including target costs
- Monitors and reports progress to the Sponsors on expenditure and delivery of Crossrail Surface through regular reporting by Network Rail
- Manages the interfaces between NR and other elements of Crossrail including interfaces where relevant with London Underground, RfL, TfL, Docklands Light Railway and HAL (Heathrow)

6.5 Rolling stock and depot facility – TfL, RfL and CRL

In accordance with the PDA and on behalf of RfL, CRL has procured the contract for provision of the Rolling Stock and Depot facilities, including appropriate long-term maintenance arrangements. This was undertaken as a single bundled procurement in accordance with the Sponsors' Commercial and Operational Requirements and the Sponsor approved Rolling Stock and Depot Procurement Strategy.

The Rolling Stock fleet has been specified in accordance with the Sponsors Requirements. The rolling stock output specification includes requirements for passenger loading, interconnecting

gangways between carriages, accommodation for passengers' luggage plus appropriate air conditioning, heating, and ventilation.

The location of the Crossrail depot is at the Old Oak Common, west of the Royal Oak tunnel portal. The depot output specification incentivises the delivery of economic and efficient whole life cost maintenance services for the rolling stock to ensure reliable provision of Crossrail services. In addition, stabling sidings and a maintenance facility is being provided at Plumstead.

The PDA sets out the process for TfL, RfL and CRL to cooperate to manage the procurement, project works and related interfaces at a programme level, and to the project timetable for the Rolling Stock and the depot.

CRL is responsible for:

- Determining the operations and performance requirements with RfL as the long-term Operator
- Leading the Rolling Stock and Depot procurement process in close consultation with Sponsors
- Ensuring that design, manufacture, testing and completion are properly planned and coordinated to meet the project timetable
- Assuring the railway and systems integration requirements are met
- Exercising due diligence over the construction progress and outturn cost

The contract is in the name of and is managed by RfL.

6.6 Handover and Staged Completion pursuant to the Crossrail Handover Strategy and Plan

Handover is the process by which responsibility for care, maintenance, management, and control of an Element is transferred to an Operator.

In accordance with Clause 16.2 of the PDA, the Crossrail Project scope has been categorised into Elements, each of which will go through a handover process to support the five key stages of opening.

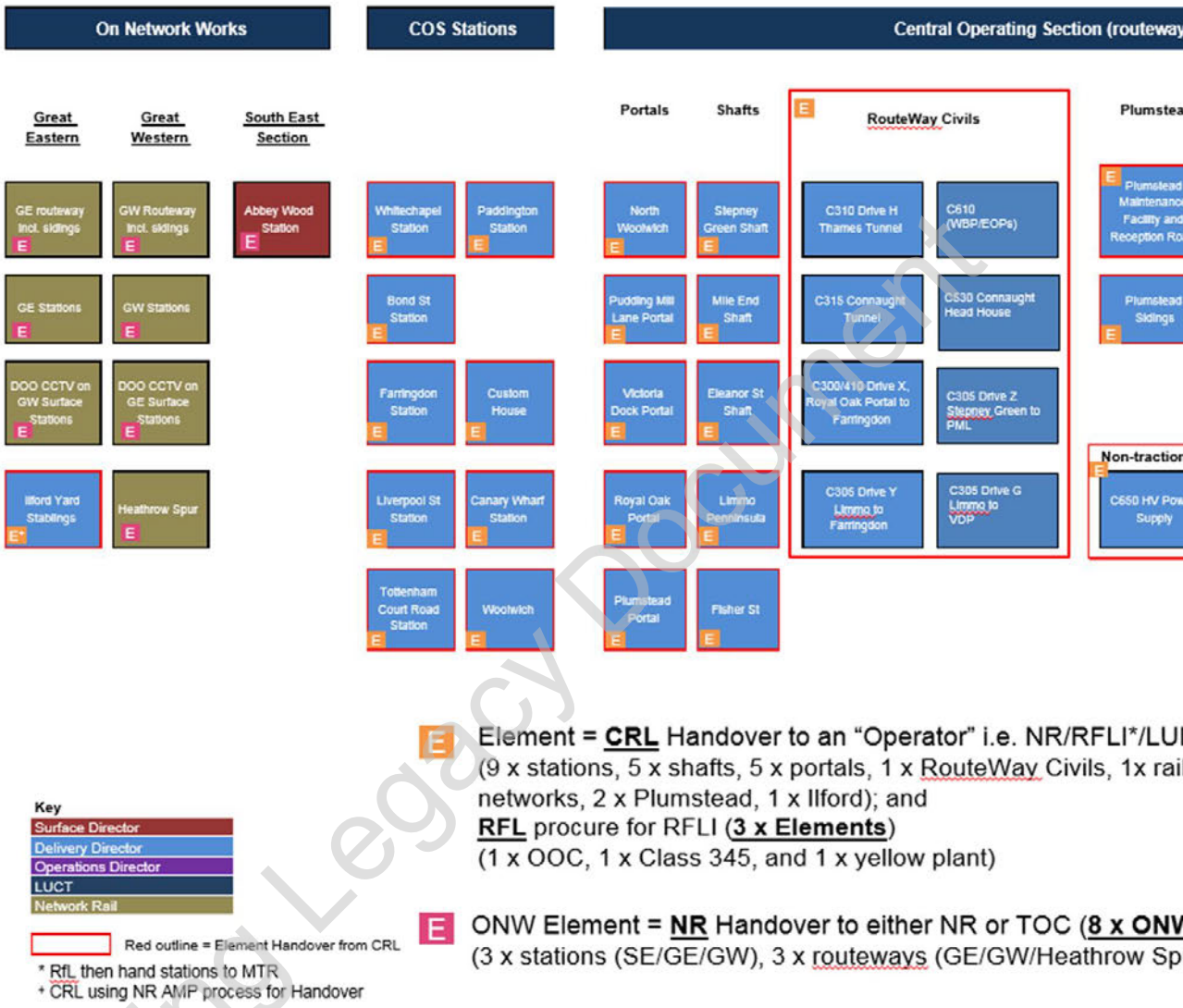

Figure 3-6*)* identifies the Elements, the party responsible for delivery of each Element and the party receiving the Element through a handover process.

From the total number of Elements identified there are 25 Elements that CRL will handover to either RFLI or LUL, as Operators, for Stage 3A and Stage 3R. Handover of these 25 Elements will be in accordance with the Assurance Process and managed by following the agreed Crossrail Handover Strategy and Plan *(Figure 6-4).*

- The Assurance Process is how CRL demonstrates compliance with its obligation to manage and deliver the Crossrail Project. This process is set out in the Technical Assurance Plan (TAP).
- The Handover process prescribes the requirements that have to be met for the care, maintenance, management, and control of an Element to be transferred from CRL to RFLI or LUL.

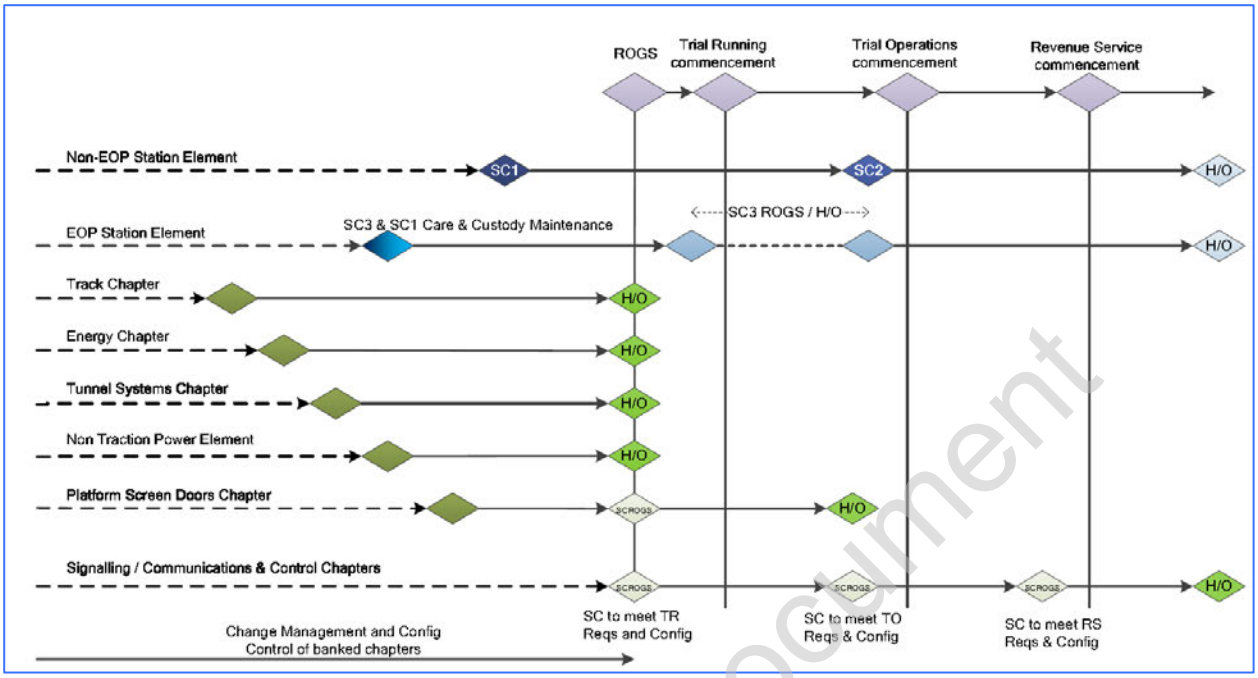

Figure 6-4 Crossrail Staged Completion and Handover map

A handover pursuant to the Crossrail Project Handover - Strategy and Plan [**42**] will be achieved following the satisfaction of all nine requirements for Handover:

1. Element Completion and Handover Report (ECHR) completed and signed
2. All Handover documentation transferred to the Infrastructure Manager
3. To the extent required for Handover, all agreements in place; property hand back certificates agreed and signed; compliance with regulatory consents or approvals confirmed and obligations under Undertakings & Assurances confirmed to be discharged
4. All Works, except those included in the EOWLs, are complete
5. All training has been delivered by CRL to the Infrastructure Manager
6. All required spares and equipment procured and available
7. Collateral warranties in relation to which RFLI or LUL as a beneficiary are identified in the Works Contracts Schedule for the Element
8. All Infrastructure Manager asset databases are populated and ready to use
9. Infrastructure Manager ready to accept

The overarching deliverable to be used for Handover to RFLI and LU will be the Element Completion Handover Report (ECHR) and supporting documents. CRL will produce separate ECHRs for each Element, as agreed in advance with RFLI and LU. RFLI and LUL will demonstrate Handover acceptance by countersigning and returning to CRL an Element Completion Handover Certificate (ECHC) to declare their acceptance of each Element and that responsibility for care, maintenance, management, and control is transferred from CRL to them from the date of Handover stated in the ECHC.

Since the PDA was executed in 2008, as described in the Remedial Action Plan in 2018 [**48**], the process by which Handover is achieved has been refined to include an interim stage, called Staged Completion.

A Staged Completion occurs in relation to part of an Element, i.e. less than the whole. The assets that form the part of the Element that is transferred must be sufficiently complete to allow safe

commencement of familiarisation and trial operations by RFLI or LUL and all required assurance evidence for those assets will have been agreed and accepted by RFLI or LUL.

Responsibility for systems cannot be transferred independently of the physical premises in which they are housed also being transferred. For stations, as a minimum, the part transferred must include some or all of the station premises. Staged Completion of the Railway Systems Element (Element No. 1) can only occur after responsibility for the care, maintenance, management, and control of the Routeway Civils (Element No. 3) has been transferred to RFLI.

CRL has agreed with both RFLI and LUL that where an Element is subject to a Staged Completion, responsibility for care, maintenance, management and control of the part that is subject to the Staged Completion is transferred from CRL to RFLI or LUL at the point when Staged Completion occurs.

Where part of an Element is subject to a Staged Completion, CRL and either RFLI or LUL will agree an action plan to complete the handover process for the whole Element.

A Staged Completion Report including a clear, unambiguous, and precise description of the part of the Element for which responsibility is being transferred will be prepared for a Staged Completion. The area that is not transferred remains a construction site under the control of the Principal Contractor.

RFLI and LUL will demonstrate acceptance of a Staged Completion by countersigning and returning to CRL an Staged Completion Certificate (SCC) to declare that responsibility for the care, maintenance, management, and control of the relevant part of the Element is transferred from CRL to them from the date of Staged Completion stated in the SCC.

Elements delivered by CRL that involve handover to an Operator other than RFLI or LU will be managed locally by the project team according to the specific requirements of that Operator. Handover of Elements delivered by parties other than CRL will be managed by those parties. Examples include:

- any handover of Old Oak Common will be managed by RFLI
- Elements relating to Stages 4 and 5 that are being delivered by Network Rail and handed over to RFLI or the train operating company (MTR Crossrail).

The Crossrail Handover Strategy and Plan is not relevant to any of these Elements.

6.7 Alternative Delivery Model

It is planned that all outstanding works on the EOWLs required to be delivered by the Tier 1 supply chain will be delivered pre-ROGS. However non-critical outstanding works; snagging and defects; system enhancements; and works which were deferred due to external factors or to relieve pressure in the programme may be passed from the CRL Tier 1s via the Alternative Delivery Model (ADM) to the Residual Work Team (RWT).

All residual and deferred works will be carried out in a manner compliant with the applicable elements of the EMR (including the Crossrail Register of Undertakings & Assurances).

(Figure 6-5) sets out the process of scope transfer.

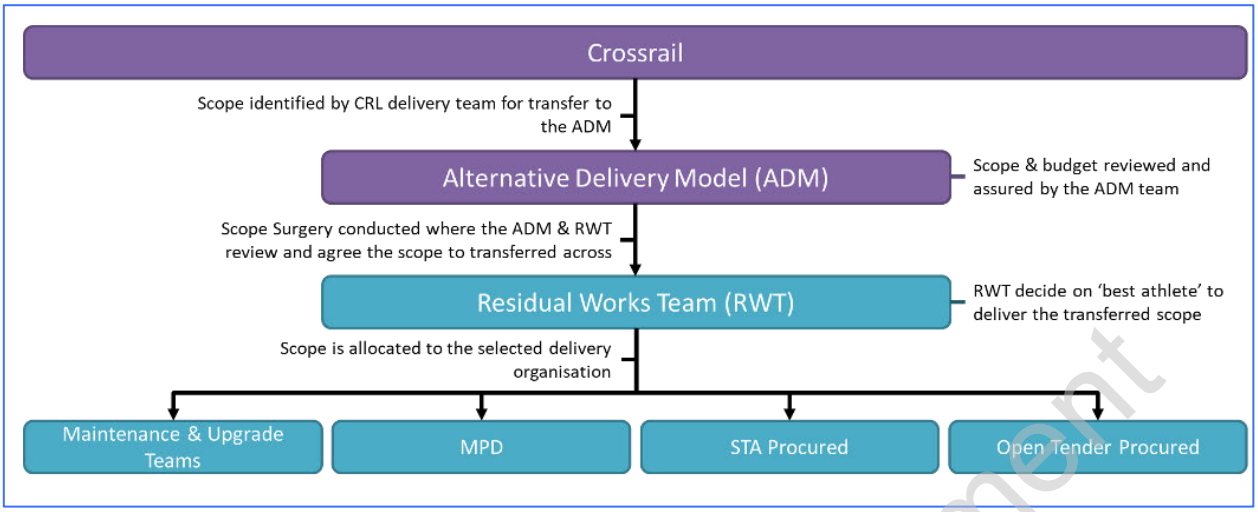

Figure 6-5 Process of Scope Transfer to the ADM

6.8 Regulatory Approvals

Each of the Stages of opening of the Elizabeth line requires the approval and deployment of new assets, in some cases by a new (or substantially changed) Operator also requiring regulatory authorisation.

Approval of new assets and their deployment is governed by two sets of regulations implementing European Union legislation: the Railways (Interoperability) Regulations, which require project entities (including CRL, Bombardier and NR) to obtain ORR authorisation to place equipment into service, and the Railways and Other Guided Transport Systems (Safety) Regulations ("ROGS"), which require Operators (including RfL, MTR [C] and NR) to hold a safety authorisation or a safety certificate, granted by the ORR following submission of a safety management system meeting regulatory requirements.

A safety review committee established by each Operator conducts safety reviews and acceptance activities in accordance with the requirements of its safety management system. Operators have a duty to co-operate with one another and with the party initiating changes to equipment or operations and are required to obtain the agreement of others affected.

The Crossrail regulatory approvals programme recognises that successful start-up of the end-to-end railway requires each of the many parties involved to act in a co-ordinated manner to obtain authorisation for accepting and deployment of assets. The ORR and all other parties have supported the principle that RfL has a role as lead duty holder, co-ordinating the efforts of the parties but not diluting the obligations of each of them under the law. The programme team, currently working within CRL but on behalf of RfL as well, is acting to align the expectations and programmes of each of the parties, to share information concerning issues and progress, and to facilitate the delivery of necessary submissions and approvals.

6.9 Handover of Stages 4 and 5, Substantial and Final Completion

The processes for bringing the complete railway into operation are established in Section 16 of the PDA which describes the relative responsibilities of CRL and the future Infrastructure Managers to '*carry out, or procure the carrying out of, the activities necessary to achieve Substantial Completion and Final Completion*'.

Schedule 11 sets out the framework for integration and bringing into service, which includes a standard template and definition of stages to incrementally integrate and bring sections of the railway into service through the steps set out in *(Figure 6-6*). This shows the respective responsibilities of CRL, the future Infrastructure Managers and the Operators across:

- Testing and Dynamic testing
- Handover
- Trial running
- Trial operations

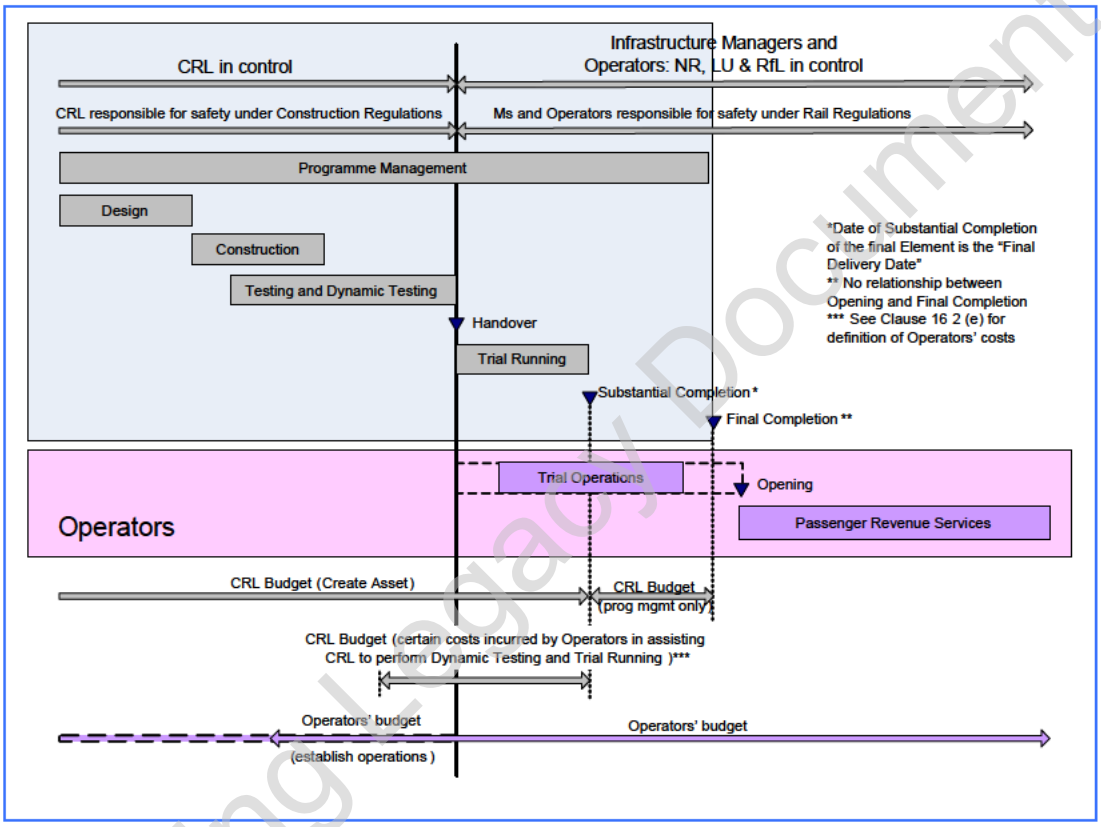

Figure 6-6 Staged Handover [PDA Schedule 11 - Handover, Completion and Opening]

- **Substantial Completion**

  Will apply to the group of Elements relevant to Stage 3A and Stage 3R. Substantial Completion will be endorsed by the Sponsors once CRL presents a Substantial Completion Certificate declaring that the Substantial Completion Criteria set out in clause 16.3 of the PDA have been met. The Substantial Completion Criteria include compliance in full with the Assurance Process by CRL, including satisfactory completion of Trial Running, the provision to the Sponsors of the Handover Certificates for the relevant Elements, and confirmation from RFLI and LUL that CRL has given them sufficient documentation to develop their Safety Management Systems.

- **Final Completion**

  Will occur once the Final Completion Criteria set out in clause 16.5 of the PDA have been met. Unexpired manufacturer or design/construction warranties in respect of the Railway must have been novated or assigned to the relevant Operator and all CRL's obligations contained within the PDA fully and finally discharged.

Section 7: Appendices

7 Appendices

7.1 Appendix A: Crossrail Statement of Objectives (from Appendix 1 of Sponsors Requirements)

London is a world city - a world leader in financial and business services, an international shopping centre and a major tourist destination, as well as a focal point of government, business, tourism, culture and learning in the UK. London's role as a driver and gateway for the UK economy means its success is important both to Londoners and to the UK as a whole. London's growth over recent decades is set to continue.

London's rail network has played a vital role in London's development. The capital possesses one of the most extensive public transport networks in the world and this network has ensured that it has the access to the markets and labour needed to develop and sustain a strong and vibrant central core.

However, London's growth has driven demands on this network to an historic high. Rail and underground services have high levels of overcrowding and congestion, which not only causes discomfort to passengers but also causes service unreliability and carries a real economic cost.

These demands are likely to continue to grow over the next decade. London competes with other cities around the world for investment, trade and tourism, and must continue to develop if it is to maintain its attractiveness. The Government and the Mayor are committed to building on London's success and developing it as an exemplary, sustainable, world class city fit for the twenty-first century.

Analysis for the London Plan shows that there will be continued pressure for growth in business and housing. But the Government and the Mayor are committed to ensuring that this growth is both sustainable and equitable. They want it to be accommodated without encroaching on open spaces, by intensifying development and using brownfield sites. And they want this growth to promote access to opportunities in the areas that need it most.

To achieve these targets, the Government and Mayor have set out detailed plans to regenerate large areas of the capital and its hinterland, particularly the Docklands, Thames Gateway and Lea Valley, as well as building on the success of existing growth areas such as the Heathrow - Reading corridor. And they have set out ambitious policies to minimise car use and reduce environmental impacts.

These plans mean that rail movements into London and, in particular, east-west rail movements, will increase significantly. London urgently needs improved rail facilities to provide room for population and employment growth. And it needs new rail routes to meet the changing patterns of demand that regeneration of the most deprived areas of London implies - improved connections between the City and the new financial centre in the Docklands, between the city centre and regeneration areas such as the Thames Gateway, and between all these areas and the city's airports.

The Government and Mayor plan a new cross London rail link to address these demands: "Crossrail." The aim of the scheme is to create the transport infrastructure needed to support the economic growth of London and its regeneration areas, sustain its position as a financial, retail,

cultural and tourist centre, and ensure that London remains competitive with other European cities.

Its key aims to support these objectives are to:

- Significantly increase rail network capacity into central London to relieve over-crowding and congestion on existing services, and cater for expected growth in demand for travel into the capital over the coming decades
- Significantly increase rail network capacity across London to relieve over-crowding and congestion on the Underground and cater for expected growth in demand for east-west travel across the capital over the coming decades
- Create the transport infrastructure to support London's growth and, in particular, facilitate the delivery of regeneration policy in communities such as Docklands, the Thames gateway and the Lea Valley
- Create transport infrastructure to facilitate access to central London's cultural, educational, historic, and recreational facilities, and support the growth and dynamism of tourism and culture in the city
- Significantly reduce cross-city journey times by creating new direct journey possibilities between points to the east and west of London and providing a high frequency, high speed service between stations
- Improve access to opportunities for those living in some of the most deprived areas of east and west London
- Support the development of an integrated transport network across London and the South East by contributing to the creation of a network of strategic interchanges between transport modes
- Facilitate the improvement of London's international connections by creating a new direct, high-capacity rail link between Heathrow and central / east London, and improving connections to Luton, Gatwick, Stansted and international rail services
- Support the wider transport, planning, social and environmental objectives of the Government's 10 Year Plan, the Mayor's Strategies for London, the Strategic Rail Authority's Strategic Plan and Regional Planning Guidance, and successor documents
- Deliver these objectives in a manner that ensures value for money for taxpayers and other contributors and enhances the London and UK economy during the project's construction.

7.2 Appendix B: Referenced documents

Top Level Management Plans

Ref:	**Document Title**	**Document Number**
1	Management Plan Volume 1 - Corporate, Support and Specialist Function Directorates	CR-XRL-O4-GPG-CR001-00001
2	Management Plan Volume 2 - Programme Delivery Plan	CRL1-XRL-Z9-STP-CR001-50002
3	Management Plan Volume 3 - Surface Delivery	CR-XRL-O4-GPG-CR001-00005
4	Management Plan Volume 4: Operations	CR-XRL-K2-STP-CR001-50001

Other Management Plans

Ref:	**Document Title**	**Document Number**
5	Commercial Management Plan	CR-XRL-V-STP-CR001-50002
6	Communications, People and Transition Management Plan	CRL1-XRL-Z2-STP-CR001-50001
7	Estates Management Plan	CR-XRL-T2-STP-CR001-50003
8	External Affairs Management Plan	CR-XRL-Z1-STP-CR001-50007
9	Finance Management Plan	CR-XRL-V2-GMN-CR001-00001
10	Health, Safety, Quality and Environment Management Plan	CR-XRL-Z7-STP-CR001-50004
11	Information Technology Management Plan	CR-XRL-Z5-STP-CR001-50003
12	Legal Services Management Plan	CR-XRL-Z6-STP-CR001-50031
13	Programme Controls Management Plan	CR-XRL-Z9-GST-CR001-00002
14	Programme Directorate Management Plan	CRL1-XRL-Z9-STP-CR001-50002
15	Risk Management Plan	CR-XRL-Z9-GPR-CR001-00014
16	Sponsor Interface Management Plan	CR-XRL-Z6-STP-CR001-50025
17	Technical Management Plan	CR-XRL-N2-GPL-CR001-00007

Committee / Sub-committee Terms of Reference

Ref:	Document Title	Document Number
18	Audit and Assurance Committee	CRL1-XRL-O-STP-CR001-50008

19	CRL Executive Group	CRL1-XRL-Z6-STP-CR001-50007
20	Elizabeth Line Committee	Contained in Appendix A of this document: LINK
21	Elizabeth Line Delivery Group	CRL1-XRL-Z6-STP-CR001-50013
22	Joint Transition Coordination Group	CRL1-XRL-Z6-STP-CR001-50012
23	TfL Exco	Details, further information and links can be found via this LINK:

Key Founding Documents References

Ref:	Document Title	Document Number
24	Crossrail Act 2008	CRL1-XRL-U-AAG-CRG03-50019
25	Project Development Agreement (PDA) – redacted version	CR-XRL-Z8-AAG-CR001-50178
26	Sponsors Requirements	CR-XRL-O6-GPD-CR001-50002

Key CRL documents

Ref:	**Document Title**	**Document Number**
27	Assurance Fragnet	Subset of DCS1.1 CRL1-XRL-Z9-TSC-CR001-50003
28	Business Ethics Policy	CR-XRL-Z2-PCY-CR001_Z-50006
29	Change Control and Budget Management Procedure	CR-XRL-Z9-GPD-CR001-50003
30	Cost Management and Forecasting Procedure	CR-XRL-Z9-GPR-CR001-00010
31	COVID 19 - Management Guidance for Route to Finish	CRL1-XRL-O1-GPD-CR001-50003
32	COVID-19 Recovery Execution Plan	CRL1-XRL-Z-STP-CR001-50038
33	CRL Environmental Minimum Requirement	CR-XRL-Z-GPR-CR001-00006
34	Crossrail Close Out Tool Kit	CRL1-XRL-V-STP-CR001-50005
35	Crossrail Management System Manual	CR-XRL-O4-GML-CR001-50001
36	Crossrail Programme Functional Requirements	T142-CPW-Z4-RGN-CR143-50007
37	Crossrail Project Handover - Strategy and Plan	CRL1-XRL-K1-STP-CR001-50001
38	Delegated Authority Register	CR-XRL-V2-LRG-CR001-50003

39	Delivery Control Schedule version 1.1	CRL1-XRL-Z9-TSC-CR001-50003
40	Earliest Opening Programme Strategy (EOP) - Redacted	CRL1-XRL-Z-STP-CR001-50031
41	Functional Strategy - Assurance	CRL1-XRL-O7-STP-CR001-50011
42	Handover Strategy and Plan	CRL1-XRL-K1-STP-CR001-50001
43	London Underground Development Agreement (LUDA)	CR-XRL-Z8-AAG-CR001-00120
44	Network Rail - 20090720 - Framework Asset Protection Agreement	CR-XRL-Z8-AAG-CR001-00132
45	Occupational Health Standard	CR-XRL-Z7-GPR-CR001-00012
46	Procurement Policy	CR-XRL-V3-UPP-CR001-00001
47	Project Representative Protocol Procedure	CR-XRL-Z6-GPD-CR001-50003
48	Remedial Action Plan (2018)	CRL1-XRL-Z6-COL-CR001-50002
49	Stations Recovery Plan	Updated every period. Click here for an example
50	Sustainability Strategy	CR-XRL-T1-GST-CR001-00001
51	Technical Assurance Plan	CRL1-XRL-O7-STP-CR001-50003
52	Trial Operations Systems Description	CRL1-XRL-O8-RGN-CR001-50494
53	Undertakings Compliance Strategy	CRL1-XRL-Z-STP-CR001-50001

External reference documents – versions are accurate at the time of issue

Ref:	Document Title	Document Number	Comments
54	BS ISO 45001:2018 Occupational Health & Safety Management Systems - requirements		External standard
55	Seven Principles of Public Life	LINK	UK Government guidance
56	Railways (Interoperability) Regulations 2011	LINK	External legislation
57	Railways and Other Guided Transport Systems (Safety) Regulations 2006.	CRL1-RFL-N3-RGN-CR001-50003 LINK	External legislation

7.3 Appendix C: Abbreviations

Abbreviation/ Acronyms	Explanation/Definition
ADM	Alternative Delivery Model
AFC	Anticipated Final Cost
AFCDC	Anticipated Final Crossrail Direct Cost
APA	Asset Protection Agreement
ATC	Alstom TSO Costain (contractor)
AWD	Abbey Wood Station
BAA	British Airport Authority
BH	Berkeley Homes
BT	Bombardier Transportation
BUCF	Back-Up Control Facility
BWB	Canal & River Trust formally known as British Waterways Board
CAW	Canary Wharf Station
CBTC	Communication Based Train Control
CCMT	Crossrail Client Management Team
CDM	Construction Design and Management
CEO	Chief Executive Officer
CESAC	Crossrail Engineering Safety Acceptance Certificate
CFO	Chief Finance Officer
CIAG	Crossrail Integrated Assurance Group
C-ICD	Construction Interface Control Document
CIF	Crossrail Integration Facility (test facility for signalling / train / infrastructure interaction)
CMS	Crossrail Management System
COO	Chief Operations Officer
COS	Central Operating Section
CPFR	Crossrail Programme Functional Requirements
CRL	Crossrail Limited
CSM-REA	Common Safety Method for Risk Evaluation and Assessment
CTOC	Crossrail Train Operating Company
CUH	Customs House Station
CWG	Canary Wharf Group
CWP	Canary Wharf Properties
DCS	Delivery Control Schedule
DDA	Disability Discrimination Act, 1995
DfT	Department for Transport

Abbreviation/ Acronyms	Explanation/Definition
DLR	Docklands Light Railway
eB	enterprise Bridge
ECHC	Element Completion Handover Certificate
ECHR	Element Completion Handover Report
EDF	EDF Energy Electricitè De France (London Electricity)
EDMS	Electronic Document Management System
ELDG	Elizabeth Line Delivery Group
EMR	Environmental Minimum Requirements
EMS	Environmental Management System
EOP	Earliest Opening Programme
EOWLS	Elements Outstanding Works Lists
ESJ	Engineering Safety Justification
ESM	Engineering Safety Management
EVA	Earned Value Analysis
ExCom	Executive Committee
FAR	Farringdon Station
FDC	Framework Design Consultant
FORS	Freight Operator Recognition Scheme
GE	Great Eastern
GLA	Greater London Authority
GRIP	Guide to Railway Investment Projects
H&S	Health & Safety
HAL	Heathrow Airport Limited (formerly part of British Airports Authority)
HR	Human Resources
HSQE	Health, Safety, Quality and Environment
IAAP	Integrated Assurance and Approval Plan
IAF	Integrated Assurance Framework
IDT	Integrated Delivery Team
IMPRG	Infrastructure Managers Progress Review Group
IMPRG	Infrastructure Manager
ITT	Inter Terminal Transfer
JST	Joint Sponsor Team
JTCG	Joint Transition Coordination Group
KPI	Key Performance Indicator
KSI	Key Sustainable Initiatives
LB	London Borough (of)
LIS	Liverpool Street Station

Abbreviation/ Acronyms	Explanation/Definition
LOD	Line of Defence
LU/LUL	London Underground Limited
LUDA	London Underground Development Agreement
MCS	Master Control Schedule
MPRG	Major Projects Review Group
MTR[C]	Mass Transit Rail [Crossrail]
NAO	National Audit Office
NR	Network Rail
ODA	Olympics Delivery Authority
OGC	Office of Government Commerce
OHLE	Overhead line equipment
ONFR	On-Network Functional Requirements
ONSIP	On Network Station Improvement Plan
ONW	On-Network Works (known as Crossrail Surface)
ORR	Office of Rail and Road
OSD	Oversite Development
PDA	Project Development Agreement
PDB	Programme Delivery Board
PDP	Programme Delivery Partner
PFI	Private funding Initiative
PP	Programme Partner
PPA	Project and Programme Assurance
PPM	Parts per Million
P-Rep	Project Representative
QMS	Quality Management System
QRA	Quantitive Risk Assessment
RAB-C	Railway Assurance Board [Crossrail]
RfL	Rail for London
RFLI	Rail For London Infrastructure
RIA	Railway Integration Authority
RIBA	Royal Institute of British Architects
RIR	Railways (Interoperability) Regulations
ROGS	Railways and other Guided Transport Systems (Safety) Regulations
RP3/4	Review Point 3/4
RSOPB	Railway Systems and Operations Programme Board
RSPB	Royal Society for the Protection of Birds
RWT	Residual Works Team

Abbreviation/ Acronyms	Explanation/Definition
S&C	Sustainability and Consents
SACR	Semi Annual Construction Report
SC	Staged Completion
SCADA	Supervisory Control and Data Acquisition
SCC	Staged Completion Certificate
SHELT	Safety and Health Leadership Team
SI	System Integration
SIDT	System Integration Dynamic Testing
SJ	Safety Justification
SOR	Stations Operations Room
SoS	Secretary of State (normally for Transport in Crossrail's case)
SPZ	Signalling Protection Zone
STEJ	Structured Engineering Judgement
TAP	Technical Assurance Plan
TBM	Tunnel Boring Machine
TCC	Traffic Coordination Centre
TCR	Tottenham Court Road Station
TfL	Transport for London
TIP	Technical Interface Parameter
TO	Trial Operations
TOC	Train Operating Company
TPA	Third Party Agreement
TPH	Trains Per Hour
U&A	Undertakings and Assurances
V&V	Verification and Validation
WBS	Work Breakdown Structure
WOO	Woolwich Station
WRAP	Waste and Resources Action Programme