

# A1. H7 ASSET MANAGEMENT AND COMPLIANCE PROGRAMME APPENDIX

**This appendix covers the following:**

- Our Asset Management and Compliance Programme Delivery Objectives.
- Illustrations of assets and specific projects within our Asset Management Categories.
- The importance of effective asset management in ensuring service, resilience and consumer outcomes.
- The impact of approach to asset management on capital and operating cost efficiencies.
- Techniques we use to inform an estimate for projects, including asset management.
- Providing further detail of current projects

## **Our proposed H7 Delivery Objective for the H7 Asset Management and Compliance Programme**

<b>Asset Management and Compliance Delivery Objectives</b>																	
<b>Baggage</b>	<p>Heathrow will invest £65m (2018p) to replace life-expired assets to keep colleagues and consumers safe and secure. The investment is required to deliver operational continuity, predictable operating costs, and availability of assets.</p> <p>The scope includes Baggage systems – departures, arrivals, transfers; Inter terminal transfers; Threat Detection for hold baggage; Stillage.</p> <p>This contributes to the following OBR measures:</p>																
	<table border="1"> <thead> <tr> <th><b>OBR Measure</b></th> <th><b>Baggage</b></th> </tr> </thead> <tbody> <tr> <td>Cleanliness</td> <td>✓</td> </tr> <tr> <td>Availability of check-in infrastructure</td> <td>✓</td> </tr> <tr> <td>Availability of arrival baggage carousels</td> <td>✓</td> </tr> <tr> <td>Timely delivery from departures baggage system</td> <td>✓</td> </tr> <tr> <td>Baggage Misconnect Rates</td> <td>✓</td> </tr> <tr> <td>Overall satisfaction</td> <td>✓</td> </tr> <tr> <td>Customer effort (ease)</td> <td>✓</td> </tr> </tbody> </table>	<b>OBR Measure</b>	<b>Baggage</b>	Cleanliness	✓	Availability of check-in infrastructure	✓	Availability of arrival baggage carousels	✓	Timely delivery from departures baggage system	✓	Baggage Misconnect Rates	✓	Overall satisfaction	✓	Customer effort (ease)	✓
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	Airport that meets my needs	✓																									
	Feel safe & secure	✓																									
	Departures flight punctuality	✓																									
	Passenger injuries	✓																									
<b>Rail</b>	<p>Heathrow will invest £93m (2018p) to replace life-expired assets to keep colleagues and consumers safe and secure. The investment is required to deliver operational continuity, predictable operating costs, and availability of assets.</p> <p>The scope includes track, signalling, telecoms, stations, tunnel systems and overhead line equipment, TTS.</p> <p>This contributes to the following OBR measures:</p> <table border="1"> <thead> <tr> <th>OBR Measure</th> <th>Rail</th> </tr> </thead> <tbody> <tr> <td>Wayfinding</td> <td>✓</td> </tr> <tr> <td>Availability of T5 TTS</td> <td>✓</td> </tr> <tr> <td>Overall satisfaction</td> <td>✓</td> </tr> <tr> <td>Customer effort (ease)</td> <td>✓</td> </tr> <tr> <td>Enjoy my time at the airport</td> <td>✓</td> </tr> <tr> <td>Airport that meets my needs</td> <td>✓</td> </tr> <tr> <td>Feel safe &amp; secure</td> <td>✓</td> </tr> <tr> <td>Ease of access to the airport</td> <td>✓</td> </tr> <tr> <td>Departures flight punctuality</td> <td>✓</td> </tr> <tr> <td>% of UK population within 3 hrs</td> <td>✓</td> </tr> <tr> <td>Passenger injuries</td> <td>✓</td> </tr> </tbody> </table>			OBR Measure	Rail	Wayfinding	✓	Availability of T5 TTS	✓	Overall satisfaction	✓	Customer effort (ease)	✓	Enjoy my time at the airport	✓	Airport that meets my needs	✓	Feel safe & secure	✓	Ease of access to the airport	✓	Departures flight punctuality	✓	% of UK population within 3 hrs	✓	Passenger injuries	✓
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<b>Mechanical</b>	<p>Heathrow will invest £158m (2018p) to replace life-expired assets to keep colleagues and consumers safe and secure. The investment is required to deliver operational continuity, predictable operating costs, and availability of assets.</p> <p>The scope includes lifts, escalators and passenger conveyors, airbridges, heating ventilation and air conditioning, PCA, potable water, fire main, foul network, surface water drainage and pollution control.</p> <p>This contributes to the following OBR measures:</p>																										

	OBR Measure	Mech					
	Cleanliness	✓					
	Control post vehicle queue time	✓					
	Availability of lifts, escalators and travelators	✓					
	Availability of stands	✓					
	Pier served stand usage	✓					
	Runway operational resilience	✓					
	Hygiene safety testing	✓					
	Overall satisfaction	✓					
	Customer effort (ease)	✓					
	Enjoy my time at the airport	✓					
	Airport that meets my needs	✓					
	Feel safe & secure	✓					
	Ease of access to the airport	✓					
	Passengers with reduce mobility - overall satisfaction	✓					
	Departures flight punctuality	✓					
	Airport Arrivals management	✓					
	Passenger injuries	✓					
<p><b>Electrical</b></p> <p>Heathrow will invest £68m (2018p) to replace life-expired assets to keep colleagues and consumers safe and secure. The investment is required to deliver operational continuity, predictable operating costs, and availability of assets.</p> <p>The scope includes High Voltage and Low Voltage networks, airfield ground lighting, airfield standby generation; emergency escape lighting and lighting.</p> <p>This contributes to the following OBR measures:</p>	<table border="1"> <thead> <tr> <th>OBR Measure</th> <th>Elec</th> </tr> </thead> <tbody> <tr> <td>Cleanliness</td> <td>✓</td> </tr> <tr> <td>Security queue time - central search</td> <td>✓</td> </tr> </tbody> </table>	OBR Measure	Elec	Cleanliness	✓	Security queue time - central search	✓
OBR Measure	Elec						
Cleanliness	✓						
Security queue time - central search	✓						

	Security queue time - transfer search	✓
	Security queue time - staff search	✓
	Control post vehicle queue time	✓
	Availability of lifts, escalators and travelators	✓
	Availability of check-in infrastructure	✓
	Availability of arrival baggage carousels	✓
	Availability of T5 TTS	✓
	Availability of stands	✓
	Pier served stand usage	✓
	Runway operational resilience	✓
	Hygiene safety testing	✓
	Timely delivery from departures baggage system	✓
	Overall satisfaction	✓
	Customer effort (ease)	✓
	Enjoy my time at the airport	✓
	Airport that meets my needs	✓
	Feel safe & secure	✓
	Ease of access to the airport	✓
	passengers with reduce mobility - overall satisfaction	✓
	Departures flight punctuality	✓
	Airport Arrivals management	✓
	passenger injuries	✓
	Immigration queue times	✓
<b>Controls</b>	Heathrow will invest £92m (2018p) to replace life-expired assets to keep colleagues and consumers safe and secure. The investment is required to deliver operational continuity, predictable operating costs, and availability of assets.	

	<p>The scope includes door access controls, fire detection and alarms, security threat detection, nav aids, HART (Heathrow Airport Remote Telemetry) and BMS.</p> <p>This contributes to the following OBR measures:</p> <table border="1"> <thead> <tr> <th>OBR Measure</th> <th>Controls</th> </tr> </thead> <tbody> <tr> <td>Security queue time - central search</td> <td>✓</td> </tr> <tr> <td>Security queue time - transfer search</td> <td>✓</td> </tr> <tr> <td>Security queue time - staff search</td> <td>✓</td> </tr> <tr> <td>Control post vehicle queue time</td> <td>✓</td> </tr> <tr> <td>Availability of lifts, escalators and travelators</td> <td>✓</td> </tr> <tr> <td>Availability of stands</td> <td>✓</td> </tr> <tr> <td>Pier served stand usage</td> <td>✓</td> </tr> <tr> <td>Runway operational resilience</td> <td>✓</td> </tr> <tr> <td>Hygiene safety testing</td> <td>✓</td> </tr> <tr> <td>Overall satisfaction</td> <td>✓</td> </tr> <tr> <td>Customer effort (ease)</td> <td>✓</td> </tr> <tr> <td>Enjoy my time at the airport</td> <td>✓</td> </tr> <tr> <td>Airport that meets my needs</td> <td>✓</td> </tr> <tr> <td>Feel safe &amp; secure</td> <td>✓</td> </tr> <tr> <td>passengers with reduce mobility - overall satisfaction</td> <td>✓</td> </tr> <tr> <td>Departures flight punctuality</td> <td>✓</td> </tr> <tr> <td>Airport Arrivals management</td> <td>✓</td> </tr> <tr> <td>Passenger injuries</td> <td>✓</td> </tr> </tbody> </table>	OBR Measure	Controls	Security queue time - central search	✓	Security queue time - transfer search	✓	Security queue time - staff search	✓	Control post vehicle queue time	✓	Availability of lifts, escalators and travelators	✓	Availability of stands	✓	Pier served stand usage	✓	Runway operational resilience	✓	Hygiene safety testing	✓	Overall satisfaction	✓	Customer effort (ease)	✓	Enjoy my time at the airport	✓	Airport that meets my needs	✓	Feel safe & secure	✓	passengers with reduce mobility - overall satisfaction	✓	Departures flight punctuality	✓	Airport Arrivals management	✓	Passenger injuries	✓
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<p><b>Civils</b></p>	<p>Heathrow will invest £331m (2018p) to replace life-expired assets to keep colleagues and consumers safe and secure. The investment is required to deliver operational continuity, predictable operating costs, and availability of assets.</p> <p>The scope includes:</p>																																						

Road network - all carriageways, pedestrian walkways, traffic signals, road signs, lighting, safety measures and protective barriers.

Tunnels, subways and bridges for the flow of road and rail transport vehicles, pedestrians, baggage, and building services beneath airfield surfaces and terminal buildings. Airside boundary fence.

The structure, fabric, décor and furniture of all terminals and buildings.

Passenger and colleague car park facilities, including multi-story terminal car parks.

This contributes to the following OBR measures:

OBR Measure	Civils
Cleanliness	✓
Wayfinding	✓
Helpfulness/attitude of security staff	✓
Control post vehicle queue time	✓
Timely delivery from departures baggage system	✓
Overall satisfaction	✓
Customer effort (ease)	✓
Enjoy my time at the airport	✓
Airport that meets my needs	✓
Feel safe & secure	✓
Ease of access to the airport	✓
passengers with reduce mobility - overall satisfaction	✓
Departures flight punctuality	✓
Airport Arrivals management	✓
% of UK population within 3 hrs	✓
Passenger injuries	✓
Immigration queue times	✓

<b>Airfield</b>	<p>Heathrow will invest £455m (2018p) to replace life-expired assets to keep colleagues and consumers safe and secure. The investment is required to deliver operational continuity, predictable operating costs, and availability of assets.</p> <p>The scope includes airfield pavements, including all manoeuvring areas, stands, taxiways, runways aprons and signage.</p> <p>This contributes to the following OBR measures:</p>																										
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	Airport Arrivals management	✓																									
Passenger injuries	✓																										
<b>IT &amp; Cyber</b>	<ul style="list-style-type: none"> <li>• Heathrow will invest £204m (2018p) to: <ul style="list-style-type: none"> <li>○ Continue Cyber+ to meet cyber compliance as defined by regulatory regimes and sustain our cyber posture.</li> <li>○ Replace, consolidate, and upgrade the IT asset footprint and deliver rolling maintenance schedules and service roadmaps.</li> <li>○ Remove legacy technology components with known cyber vulnerabilities and ensure assets remain supportable, secure, and fit for purpose whilst delivering efficient total cost of ownership.</li> </ul> </li> </ul> <p>This contributes to the following OBR measures:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4b4b8b; color: white;"> <th style="text-align: center;">OBR Measure</th> <th style="text-align: center;">Tech</th> </tr> </thead> <tbody> </tbody> </table>	OBR Measure	Tech																								
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	Feel safe & secure	✓								
	Ease of access to the airport	✓								
	passengers with reduce mobility - overall satisfaction	✓								
	Departures flight punctuality	✓								
	Airport Arrivals management	✓								
	Passenger injuries	✓								
<p><b>Compliance</b></p>	<p>Heathrow will invest £107m (2018p) to replace life-expired assets to keep colleagues and consumers safe and secure. The investment is required to deliver operational continuity, predictable operating costs, and availability of assets.</p> <p>The scope includes T4 HSB, PFOS and responding to new or enhanced compliance requirements which are not yet explicitly foreseen, such as security equipment upgrades and environmental standards.</p> <p>This contributes to the following OBR measures:</p> <table border="1"> <thead> <tr> <th>OBR Measure</th> <th>Compliance</th> </tr> </thead> <tbody> <tr> <td>Overall satisfaction</td> <td>✓</td> </tr> <tr> <td>Customer effort (ease)</td> <td>✓</td> </tr> <tr> <td>Enjoy my time at the airport</td> <td>✓</td> </tr> </tbody> </table>		OBR Measure	Compliance	Overall satisfaction	✓	Customer effort (ease)	✓	Enjoy my time at the airport	✓
OBR Measure	Compliance									
Overall satisfaction	✓									
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Enjoy my time at the airport	✓									

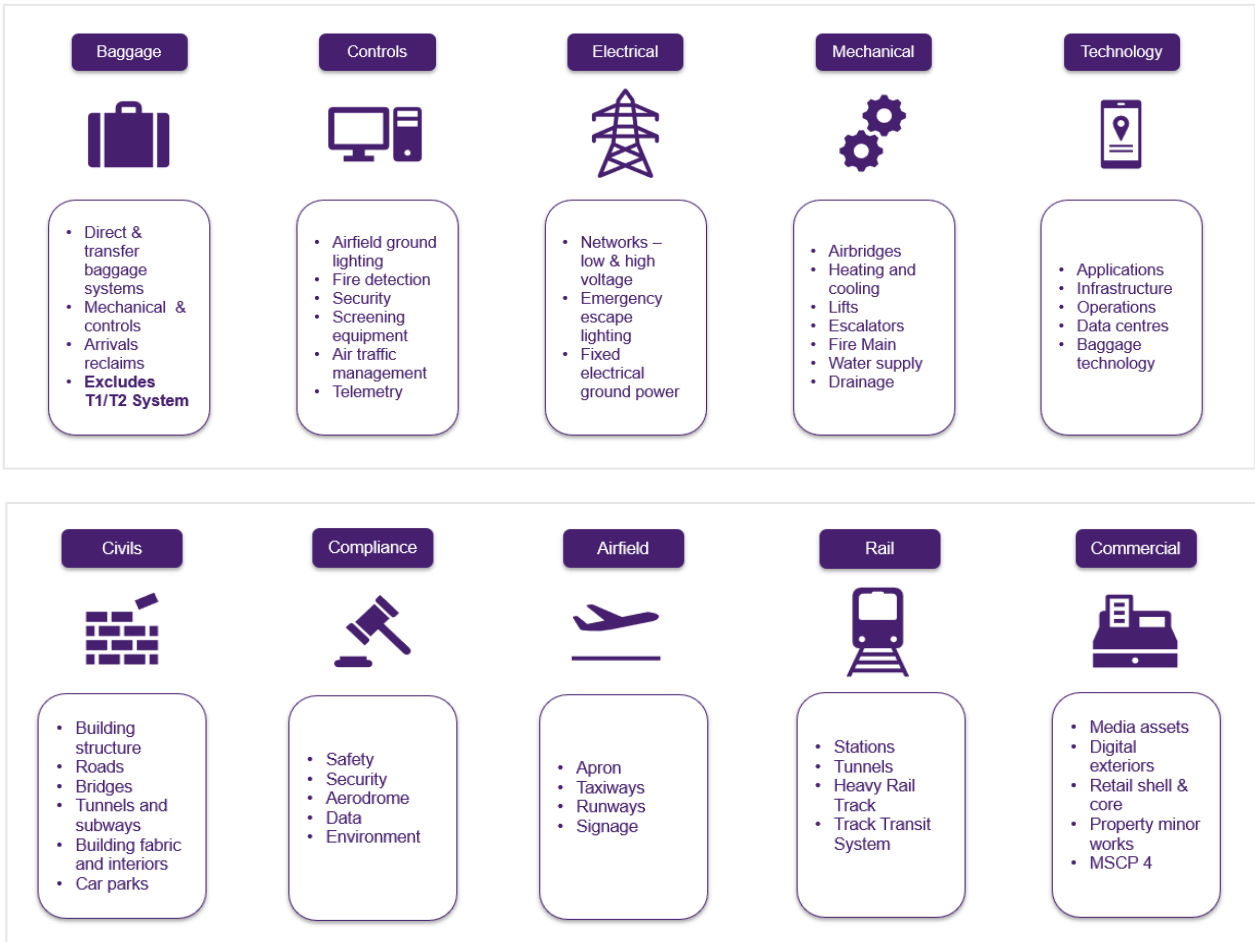


	Airport that meets my needs	✓														
	Feel safe & secure	✓														
	Passenger injuries	✓														
<b>Commercial Asset Management and Compliance</b>	Heathrow will invest £132m (2018p) to replace life-expired commercial assets to keep colleagues and consumers safe and secure. This investment is required to keep commercial facilities operational and therefore maintain existing revenue sources.															
	The scope includes:															
	<ul style="list-style-type: none"> <li>- Retail and media asset replacement including shell and core works</li> <li>- Refurbishment of MSCP4 within the existing footprint</li> <li>- Essential property works including Heathrow Consolidation Centre decant, BA crew car park refurbishment, EPC compliance and Common area refurbishment</li> </ul>															
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Customer effort (ease)	✓															
Enjoy my time at the airport	✓															
Airport that meets my needs	✓															
Ease of access to the airport	✓															

**Illustrations of assets and specific projects within our Asset Management Categories**

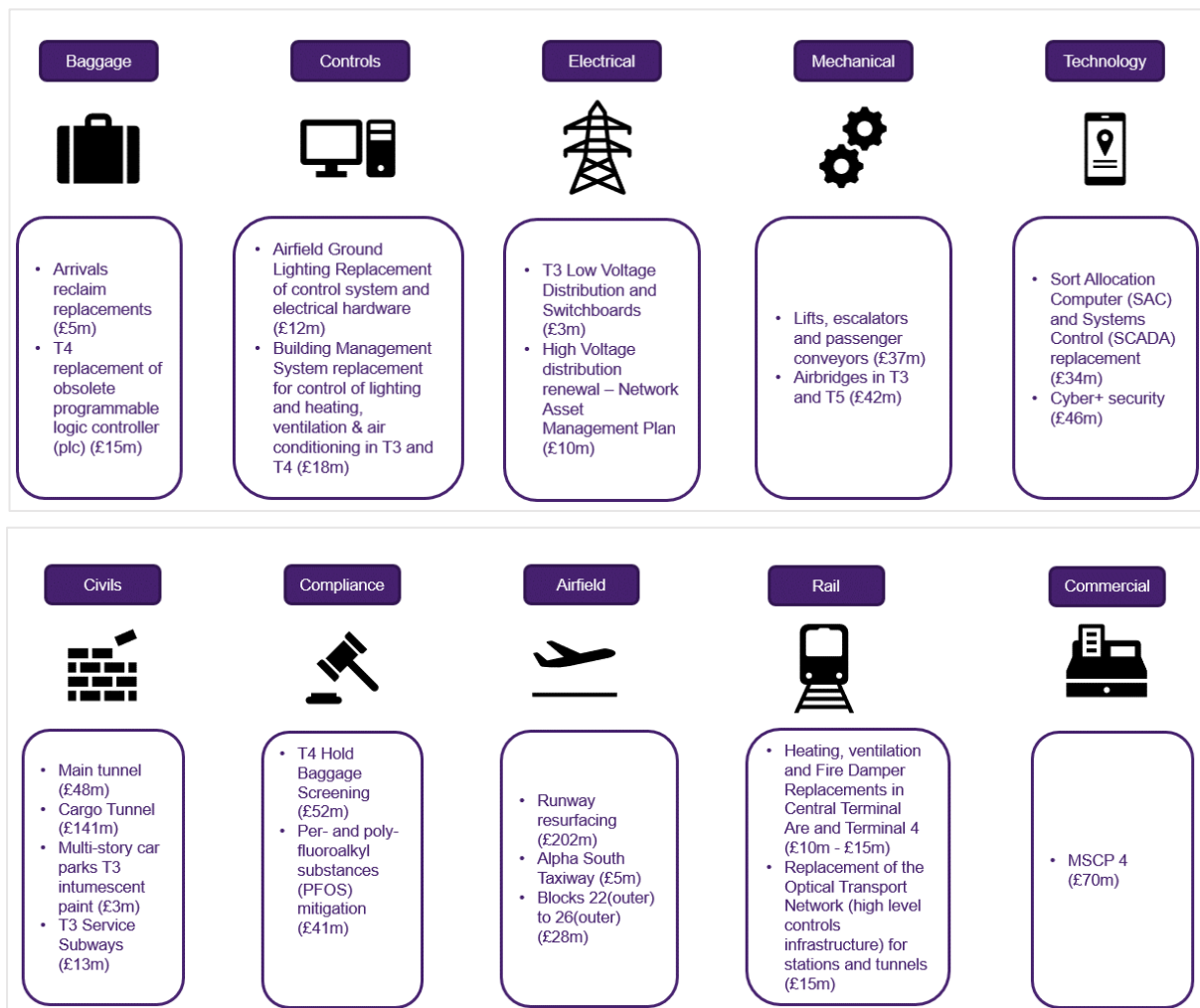
A1.1 Below we set out examples of assets contained within each of our proposed Asset Management and Compliance categories, and then examples of significant business cases that fall under each of our proposed Asset Management and Compliance categories.

Figure 1: Examples of assets within Asset Management Categories



Source: Heathrow

Figure 2: Examples of projects within each Asset Management Category



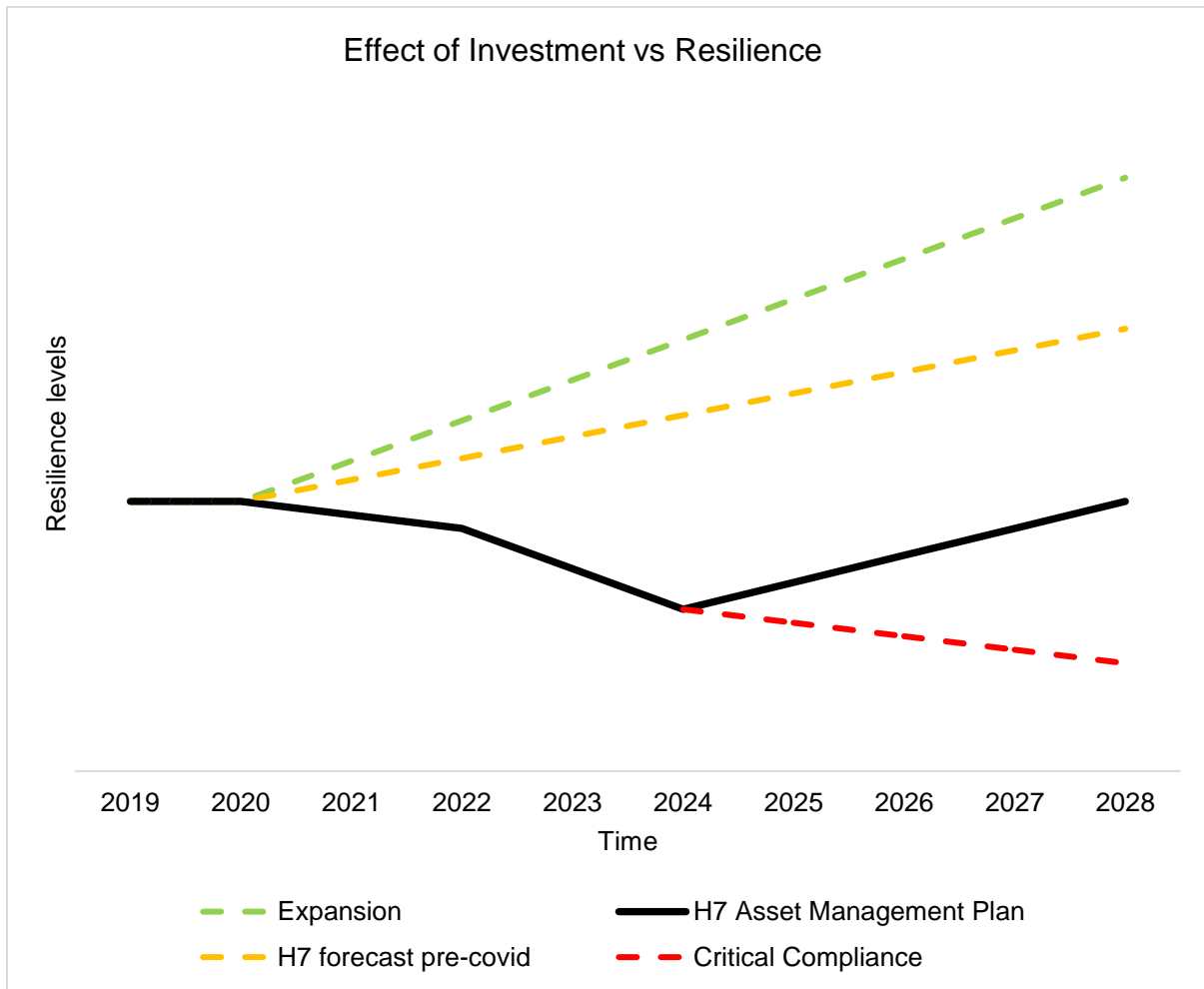
Source: Heathrow

## The importance of effective asset management in ensuring service, resilience and consumer outcomes

A1.2 The right level of investment in asset management is required from the start of H7 to avoid impact on safety service, resilience and consumer outcomes. In particular, the long timescales associated with developing and delivering certain solutions results in outcomes not being realised until later in H7 – for example, investments in our runways and tunnels.

A1.3 In the absence of being able to take an optimal approach to asset management, it is also increasingly difficult to adopt new technologies that benefit service, resilience and consumer outcomes.

Figure 3: Graph showing effect of investment scenarios on resilience levels



Source: Heathrow

A1.4 Our Asset Management and Compliance Programme drives a significant number of consumer outcomes. Below we provide a summary view of the OBR measures delivered across our Asset Management Categories:

Figure 4: OBR measures delivered across our Asset Management Categories

	Baggage	Rail	Mech	Elec	Controls	Civils	Airfield	Tech	Compliance	Commercial
Cleanliness	✓	✓	✓	✓		✓				✓
Wayfinding		✓	✓	✓		✓		✓		
Helpfulness/attitude of security staff						✓				
Wi-Fi performance								✓		
Security queue time - central search				✓	✓			✓		
Security queue time - transfer search				✓	✓			✓		
Security queue time - staff search				✓	✓			✓		
Control post vehicle queue time			✓	✓	✓	✓		✓		
Availability of lifts, escalators and travelators			✓	✓	✓	✓				
Availability of check-in infrastructure	✓			✓						
Availability of arrival baggage carousels	✓			✓		✓				
Availability of T5 TTS		✓		✓						
Availability of stands			✓	✓	✓	✓	✓			
Provision of stand facilities						✓				
Provision of stand facilities										
Pier served stand usage			✓	✓	✓		✓			
Runway operational resilience			✓	✓	✓		✓			
Hygiene safety testing										
Timely delivery from departures baggage system	✓			✓		✓				
Overall satisfaction	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Customer effort (ease)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Enjoy my time at the airport	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Airport that meets my needs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Feel safe & secure	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Ease of access to the airport		✓	✓	✓		✓		✓		✓
Helpfulness/attitude of airport staff										
Being able to social distance if I want to										
Ease of understanding Heathrow's Covid 19 safety information										
Passengers with reduce mobility - overall satisfaction			✓	✓	✓	✓		✓		
Departures flight punctuality	✓	✓	✓	✓	✓	✓	✓	✓		
Airport Departure management	✓	✓	✓	✓	✓	✓	✓	✓		
Airport Arrivals management			✓	✓	✓	✓	✓	✓		
% of UK population within 3 hrs		✓	✓	✓	✓	✓		✓		
Passenger injuries	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Immigration queue times				✓	✓	✓				
Reduction in Heathrow's carbon footprint	✓	✓	✓	✓	✓	✓	✓	✓		

Source: Heathrow

**The impact of approach to asset management on capital and operating cost efficiencies**

A1.5 Our approach to asset management has a direct impact on our operating cost efficiencies, and we take into account a wide range of variables to establish the optimal point at which to replace any given asset on our estate.

A1.6 Failure to replace assets at the established optimal point can lead to increased operating costs, for example as a result of operational mitigations required to ensure resilience and/or safety.

A1.7 Below are two examples of situations where a delay in asset replacement led to the incurring of additional operating costs:

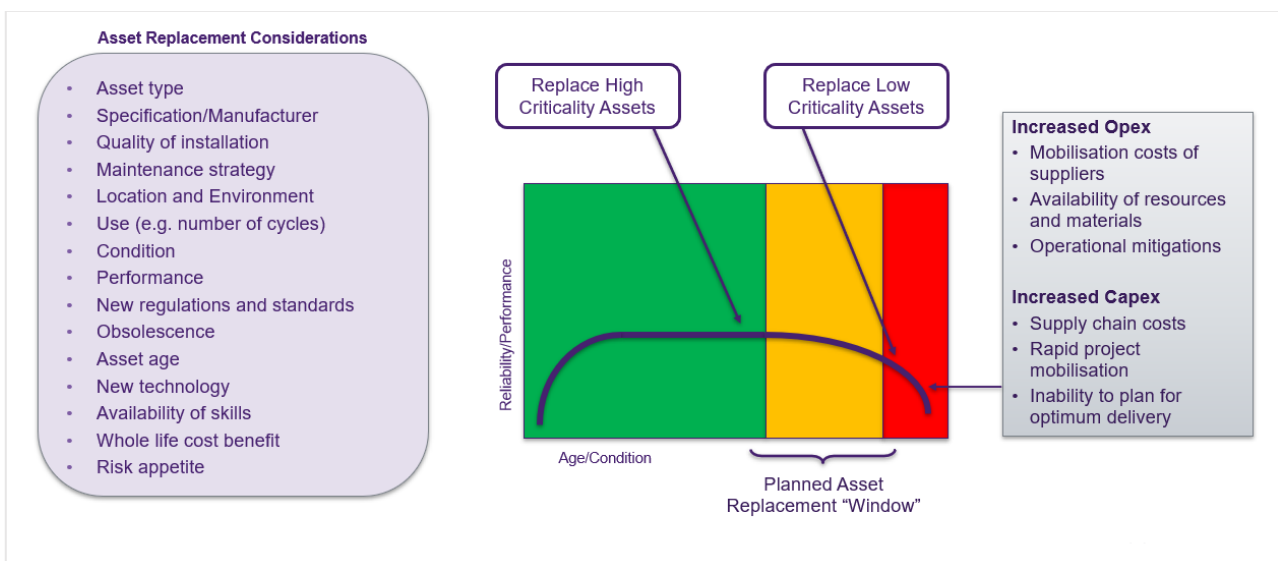
- Northern Perimeter Road pit and duct replacement – only the first phase of this made the initial 2021 prioritisation. Electrical circuits falling within the second phase have now been isolated by UKPN, who operates these, on the grounds of safety. This has resulted in additional operating costs to provide temporary lighting replacements.
- T3 Arrivals Balcony – this project was paused as a result of Covid-19. This pause resulted in a need for a fire watch to attend the area to ensure safety, at a cost of £1480 per week, until smoke detectors could be installed.

A1.8 Suboptimal timing of asset replacement can also drive increased and less efficient capital spend, for example as a result of having to rapidly mobilise a business case to replace an asset that has failed in service.

A1.9 Below are two examples of situations where a delay in asset replacement led to sub-optimal capital spend.

- The Terminal 1 Baggage System is a key example of capital investment risks associated with delayed asset replacement. The detail around the Terminal 1 Baggage System is covered in the following chapter on our T2 Baggage Programme.
- Chillers are used across our terminals to provide a comfortable environment for our passengers and colleagues, as well as to cool sensitive IT equipment that is required for smooth operation of the airport. Chillers in Building 694 provide the majority of cooling for areas across Terminal 3. A 15 year old chiller in Building 694 recently failed. It required an overhaul of the compressor in 2020, but due to the capital constraints, the work didn't make it high enough in the prioritisation. A few months later, there was a failure requiring full replacement of the chiller, with the end result being more works required than had the overhaul been completed on time.

Figure 5: Summary of asset replacement considerations



Source: Heathrow

### Techniques we use to inform an estimate for projects, including asset management

A1.10 There are different techniques that can be used to inform a project estimate – we use the following techniques:

- Cost Range
- Order of Magnitude
- Three Point Estimate

- Single Point Estimate

A1.11 The technique applied is dependent on:

- The maturity of the scope
- The required level of accuracy (cost certainty)
- Time and resources available
- The level and quality of the available inputs

A1.12 Consistent application of cost definitions and categories is one of the key principles in our cost planning activities. A Heathrow Airport - specific Cost Breakdown Structure (CBS) named 'HAL CBS 1' has been created to serve this purpose, which adopts the RICS - NRM1 structure and provides guidance on the quantification of building works for the purpose of preparing cost estimates and cost plans.

A1.13 The cost estimates are coded as follows:

#### Pre-G0

- G0 / P1 Estimates are developed to either Facility and/or Sub Facility level (i.e., Terminal)

This is often referred to as “top down” estimating, as this technique uses high level project definition to determine a predicted cost. It is prepared using a combination of the following methods:

- Personal (or team) experience / view of cost.
- Factoring - i.e., taking the known cost of a similar facility and factoring the cost for size or other attributes.
- Facility and functional level cost information (benchmarks) - e.g., cost per pier, cost per stand.
- Elemental cost information (benchmarks).
- Unit cost information (benchmarks) - e.g., cost per 1,000 passengers, cost per 1,000 bags.
- Cost modelling (also known as parametric estimating).

#### Post-G0

- G1 Estimates are developed to Group Element level (i.e., Internal Finishes)
- G2 Estimates are developed to Element level (i.e., Floor Finishes)
- G3 Estimates are developed to Sub Element level (i.e., Finishes to Floor)

A1.14 Three Point Estimates are used at G1 and G2: these are developed when there is incomplete information – they produce the following outputs:

- Optimistic – based on optimal delivery of the scope

- Most Likely – based on normalised scope delivery
- Pessimistic – based on sub-optimal delivery of the scope

A1.15 The Project & Cost Manager will assess the project complexity and risk in the relative weighting. A cost estimate can have a mixture of both single and three point cost estimates where there are still some scope areas with limited information.

A1.16 Single Point Estimates are used at G3: these use data to develop a single value estimate. Single point estimates are utilised when a scope of work has reached a level of maturity such that minimal possible uncertainty remains. The cost estimate will typically be developed using first principles (bottom up) and will be informed by supplier quotations / advice. The residual areas of uncertainty are identified and included on a fully detailed risk register.

A1.17 Pre G0 & G0 / P1 project examples (in nominal prices)

- Fixed Electrical Ground Power (£6.5m): There are 246 units of type 2200 and 2300 that will need replacement. We estimate that we can replace ~20 units a year at cost of ~£1m/£1.5m a year. The average cost per unit is ~£50k (based on recent price of 9 units at ~£450k).
- Airbridges in Terminal 3 and Terminal 5 (£45.3m): Analysis of replacing the three airbridges on Stand 301 has shown that replacement is more cost effective than removal and factory refurbishment. The cost for replacing the three airbridges on Stand 301 is £6.8m, and the work will be completed in 2022. We estimate that we will be able to replace four per year thereafter over H7 (a total of ~20 over H7 at cost of ~£2.3m per airbridge).
- High Voltage electrical distribution (£12.4m): The replacement of high voltage substations and transformers is carried out by the specialist utility company UKPNS. Asset replacement cost forecasts are provided by UKPNS based on the type of asset. The average cost for a substation is £200k – 250k and there are between five and fifteen assets replaced in a year (estimating ~50 replaced over H7 period).

A1.18 Post G0 project examples (in nominal prices) – Providing scope and cost information that is provided to airlines as part of the project gateway governance.

- B6206.13 Rail Optical Transport Network (OTN) & Programmable Logic Controller (PLC) Replacement: The indicative solution is to bring the network and hardware up to date through replacing obsolete and mature components. This will ensure continued vendor support, and mitigate the risk of spare parts not being available in the event of a hardware fault. The project will provide a lifecycle upgrade of the OTN, and PLCs.



Table 1: B6206.13 Rail OTN and PLC Replacement cost plan summary

Cost Plan Summary	Mid Point of Cost Plan £m	%age of Total Cost
Building Works (Base Cost)	6.929	42%
Building Works (Project Specific)	-	0%
Preliminaries	0.848	5%
Contractor Overheads & Profit	0.590	4%
Design	1.390	8%
Risk (All Parties)	3.899	24%
Inflation	0.613	4%
HAL Logistics & Leadership	2.207	13%
<b>Cost Plan Total</b>	<b>16.476</b>	<b>100%</b>
(2 decimal places)		
Optimistic	14.043	85%
Most Likely	16.476	100%
Pessimistic	19.256	117%

B7228 H7 Runway Resurfacing:

Figure 6: B7228 H7 Runway Resurfacing scope detail

**Scope overview**

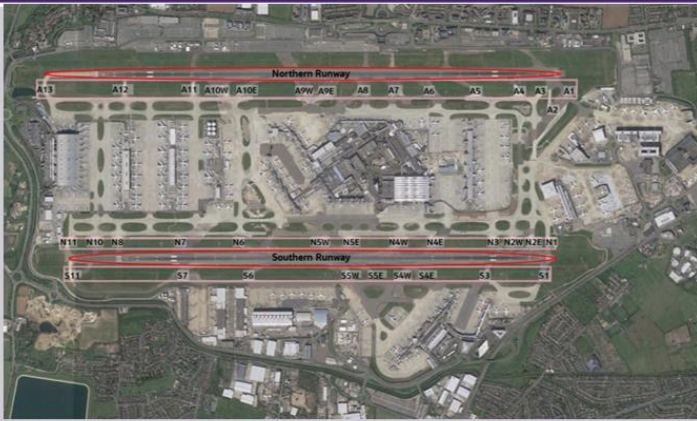
The proposed scope comprises:

Deep Interventions:

- Crack repairs on Southern Runway, Northern Runway and associated RETs/RATs/Links similar in nature to works carried out in 2020 under B7218.
- Ducting of chased AGL cables in areas of higher traffic and where chased AGLs would interfere with future masterplan works (displacement of thresholds)

Main Works (proposed to start in April 2023)

- Resurface Southern Runway, Northern Runway and associated RETs/RATs/Links out to Cat 1 bar (see note)
- Additional works required to ensure realisation of full benefits (e.g. pavement rehabilitation elsewhere within the runway strip; scope from other H7 business cases that this project is best placed to deliver)



Note: the "Cat 1 bars" define the extent of the controlled runway strip. No works can take place within this zone unless the runway is closed.

Table 2: B7228 H7 Runway Resurfacing cost plan summary

Cost Plan Summary	Mid Point of Cost Plan £m	%age of Total Cost
Building Works (Base Cost)	77.30	43%
Building Works (Project Specific)	0	0%
Preliminaries	17.63	10%
Contractor Overheads & Profit	7.21	4%
Design	11.40	6%
Risk (All Parties)	31.89	18%
Inflation	11.15	6%
HAL Logistics & Leadership	24.23	13%
<b>Cost Plan Total</b>	<b>180.81</b>	<b>100%</b>
(2 decimal places)		
Optimistic	159.01	88%
Most Likely	180.81	100%
Pessimistic	240.61	133%

B7201.10 Electra Avenue Car Park Safety Remedial Works:

Figure 7: Illustration of Electra Avenue Car Park Safety Remedial Works

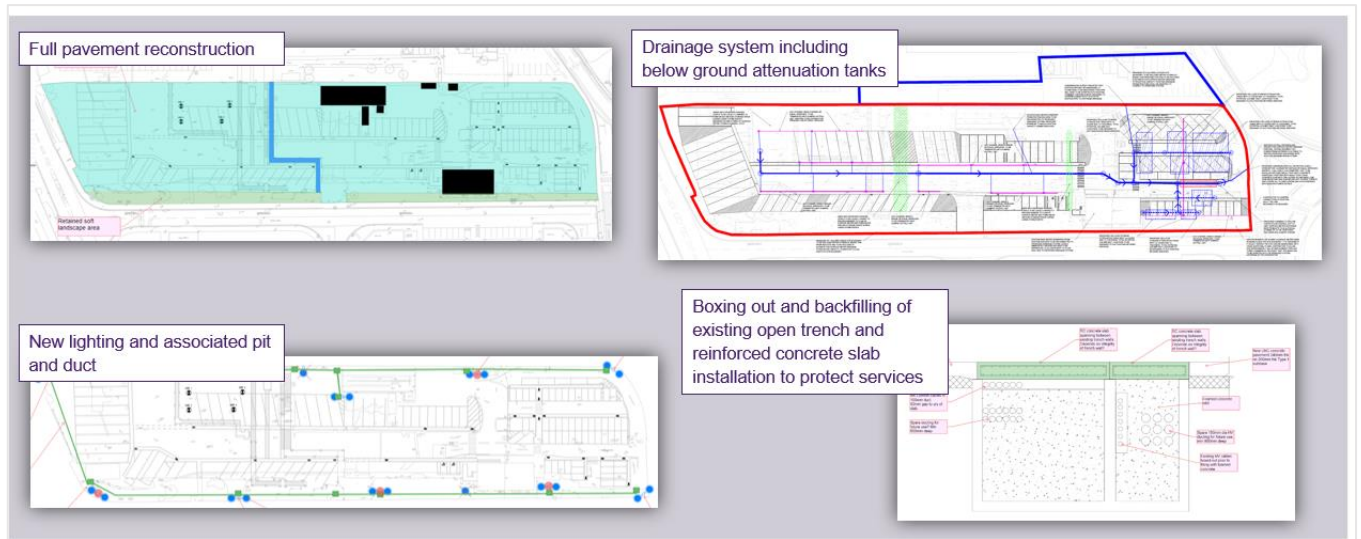


Table 3: B7201.10 Electra Avenue Car Park Safety Remedial Works cost plan summary

Cost Plan Summary	Mid Point of Cost Plan £m	%age of Total Cost
Building Works (Base Cost)	2.720	40%
Building Works (Project Specific)	0	0%
Preliminaries	0.761	11%
Contractor Overheads & Profit	0.259	4%
Design	0.116	2%
Risk (All Parties)	1.974	29%
Inflation	0.102	1%
HAL Logistics & Leadership	0.918	13%
<b>Cost Plan Total</b>	<b>6.853</b>	<b>100%</b>
		(2 decimal places)
Optimistic	5.942	87%
Most Likely	6.853	100%
Pessimistic	7.298	106%

**Providing further detail of current projects**

A1.19 Below we provide further detail the main Asset Management and Compliance projects currently in flights. The list is a sample, not exhaustive, of all the scope in the Programme. They also represent a snapshot at a point in time, and changes may occur due to the live nature of the scope.

Airfield	HGL Stage	2022 £m	2023 £m	2024 £m	2025 £m	2026 £m	Total £m	Total £m in 2018 prices
B7228.00 Runway Resurfacing	Pre-G3	15	80	80	40	0	215	202
B243 KAD Including Substructure	Post-G3	23	22	3	0	0	48	45
B6119.02 Tower Transformation – Integrated Consolidated Working Position - Visual Control Room (VCR) - System Upgrade	Pre-G3	0	6	15	6	6	33	31
B6119.03 Tower Transformation - Virtual Contingency Facility (VCF) System Upgrade	Pre-G3	1	8	3	10	0	22	21
B6119.01 Tower Transformation - Virtual Contingency Facility (VCF) Build	Pre-G3	5	16	0	0	0	21	20
B7229 Fire Training Ground (Phase2)- RIG replacement	Pre-G3	0	6	14	0	0	20	19
B6210.03 Alpha South	Post-G3	5	0	0	0	0	5	5
B6113 - Pedestrian crossing standardisation	Pre-G3	2	0	0	0	0	2	2
B6214.07 Airside Water Treatment	Pre-G3	2	0	0	0	0	2	2
B7229 Fire Training Ground	Pre-G3	1	0	0	0	0	1	1

Baggage	HGL Stage	2022 £m	2023 £m	2024 £m	2025 £m	2026 £m	Total £m	Total £m in 2018 prices
B7232 Western Campus Baggage Obsolescence	Pre-G3	5	11	0	0	0	16	15

B6313 T5 LLC Component Obsolescence	Post-G3	4	5	1	0	0	10	10
B7320 Western Campus PILZ Safety System Obsolescence	Pre-G3	1	3	3	2	0	9	9

Civils	HGL Stage	2022 £m	2023 £m	2024 £m	2025 £m	2026 £m	Total £m	Total £m in 2018 prices
Cargo Tunnel	Post-G3	42	42	59	7	0	150	141
Main Tunnel	Post-G3	26	25	0	0	0	51	48
B7227.00 Terminals Critical Asset Management and Compliance	Pre-G3	11	3	4	0	0	18	17
B7209.03 - MSCP4 Urgent Structural Works	Pre-G3	3	5	6	0	0	14	13
B7201.08 Forecourt Health and Safety Works	Pre-G3	4	1	0	0	0	5	5
B7201 T3 Pier 5/7 High Alumina Cement Refurbishment & Strengthening	Pre-G3	0	4	0	0	0	4	4
BC7201.10 Electra Avenue Car Park	Pre-G3	2	0	0	0	0	2	2

Compliance	HGL Stage	2022 £m	2023 £m	2024 £m	2025 £m	2026 £m	Total £m	Total £m in 2018 prices
B7221.00 PFOS (Trace contaminants – Fluorosurfactants (PFOS))	Pre-G3	2	42	0	0	0	45	42
B7679 Cargo OAA Security Improvements	Post-G3	4	0	0	0	0	4	4

B6672.01 Ballistic Protection	Post-G3	3	0	0	0	0	3	2
B7681.00 Central Minor Works	Pre-G3	2	0	0	0	0	2	2
B6677 C-UAS Phase 4	Pre-G3	2	0	0	0	0	2	2
B6612.11 Sandringham Road H&S and Parking	Pre-G3	1	1	0	0	0	2	2
B6672.02 Blast Protection	Pre-G3	1	0	0	0	0	1	1
B7651.03 Electric Hoist & COS Pedestrian Crossing	Pre-G3	1	0	0	0	0	1	1
B7651.04 Subway Fire Evacuation	Pre-G3	0	1	0	0	0	1	1

Controls	HGL Stage	2022 £m	2023 £m	2024 £m	2025 £m	2026 £m	Total £m	Total £m in 2018 prices
B7216 AGL Reinforcement	Pre-G3	6	7	0	0	0	13	12
B7205.05 Outstation Communication Renewal	Pre-G3	1	0	0	0	0	1	1
B6124 NATS Asset Replacement - ADIS	Pre-G3	1	0	0	0	0	1	1
B6124 NATS Asset Replacement - IRVR	Pre-G3	1	0	0	0	0	1	1
B7201 Tunnel Ancillaries Renewals	Post-G3	1	0	0	0	0	1	1

Electrical	HGL Stage	2022 £m	2023 £m	2024 £m	2025 £m	2026 £m	Total £m	Total £m in
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								2018 prices	
B7201 Electrical Circuit Replacement - Northern Perimeter Road (NPR) Lighting	Post-G3	3	0	0	0	0	3	3	
B7205 - Installation of UPS for critical assets	Pre-G3	2	1	0	0	0	3	3	
B7213 NAMP 2021	Post-G3	2	0	0	0	0	2	2	
B7213.04 NAMP 2022	Pre-G3	1	0	0	0	0	1	1	
T5 Emergency Lighting	Post-G3	1	0	0	0	0	1	1	

Mechanical	HGL Stage	2022 £m	2023 £m	2024 £m	2025 £m	2026 £m	Total £m	Total £m in 2018 prices
B7226 T2 chilled water	Pre-G3	1	6	10	0	0	18	17
B7231 Airside/Landside Critical Asset Management & Compliance	Pre-G3	3	1	0	0	0	4	4
B6214.02 Pollution Infrastructure Renewal	Pre-G3	1	2	0	0	0	3	3
B6204.05 Fire Main Valve Replacement	Pre-G3	1	0	0	0	0	1	1
B6204.01 Internal Potable Water Renewal	Post-G3	1	0	0	0	0	1	1

Rail	HGL Stage	2022 £m	2023 £m	2024 £m	2025 £m	2026 £m	Total £m	Total £m in 2018 prices
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B6401 TTS Enhancements	Post-G3	29	6	0	0	0	<b>35</b>	<b>33</b>
B6206.13 Rail OTN & PLC Replacement	Pre-G3	1	10	5	0	0	<b>15</b>	<b>14</b>
B6206.05 HVAC Replacement	Pre-G3	1	6	1	0	0	<b>8</b>	<b>8</b>
B6206.03 Rail Access Control	Pre-G3	1	1	0	6	0	<b>7</b>	<b>7</b>
B6621 HEx CL387 Train Modifications	Post-G3	2	0	0	0	0	<b>2</b>	<b>2</b>
B6206.08 Station Systems Renewal	Pre-G3	0	0	0	2	0	<b>2</b>	<b>1</b>
B6206.14 Rail Platform Safety Edging	Pre-G3	1	0	0	0	0	<b>1</b>	<b>1</b>
PMO005 Fire System Renewal	Post-G3	1	0	0	0	0	<b>1</b>	<b>1</b>

Technology	HGL Stage	2022 £m	2023 £m	2024 £m	2025 £m	2026 £m	Total £m	Total £m in 2018 prices
B7501 CYBER plus Phase 3	Pre-G3	25	0	0	0	0	<b>24</b>	<b>23</b>
B7517.00 Critical IT Infrastructure Refresh - Network Distribution & Core upgrade	Post-G3	7	4	3	0	0	<b>13</b>	<b>13</b>
B6361.02 Western Campus Logistics and Compliance	Post-G3	7	5	0	0	0	<b>11</b>	<b>11</b>
B6361.01 Eastern Campus Logistics and Compliance	Post-G3	6	4	0	0	0	<b>9</b>	<b>9</b>
B6363.06 BAG ITSC-3rd Node (Dev)	Post-G3	7	1	1	0	0	<b>9</b>	<b>8</b>
B7518.00 Infrastructure - Messaging Technology	Post-G3	7	0	0	0	0	<b>7</b>	<b>6</b>



B6649 CUSS Kiosks	Pre-G3	4	0	0	0	0	4	3
B6676.01 Access Control	Pre-G3	0	3	0	0	0	3	3
B7508 Corporate Finance	Pre-G3	2	0	0	0	0	2	2
B7520 OSCAR - Aeronautical Messaging Server (AMS)	Pre-G3	2	0	0	0	0	2	2
Data Storage	Post-G3	2	0	0	0	0	2	2
B6212 Asset Spatial BIM/CDE	Post-G3	2	0	0	0	0	2	1
B7509 Magenta	Post-G3	1	0	0	0	0	1	1
B6611.05 – GRD Replacement – MRI Horizon	Post-G3	1	0	0	0	0	1	1
B6503.02 Infrastructure and Platforms Ph2.	Post-G3	1	0	0	0	0	1	1