

ARCADIS GUIDANCE TO THE CIVIL AVIATION AUTHORITY

HAL RBP UPDATE 2 – CAPEX PLAN REVIEW

FINAL REPORT – 29th June 2022



Version Control

Authors	Chris Mattock Nicky Jones Angus McIntyre
Checker	Theo Panayi
Approver	Jason Buckland
Version	1.5
Date	29 th June 2022

Our Team



Chris Mattock

Commercial Director

M: +44 (0) 747 867 9799

E: chris.mattock@arcadis.com

Arcadis

80 Fenchurch Street

London

EC3M 4BY



Angus McIntyre

Associate Director

M: +44 (0) 7884 115917

E: angus.mcintyre@arcadis.com

Arcadis

Interchange House

81-85 Station Road

Croydon

CR0 2AJ



Nicky Jones

Commercial Director

M: +44 (0) 7971 417106

E: nicky.jones@arcadis.com

Arcadis

80 Fenchurch Street

London

EC3M 4BY



Jason Buckland

Consulting Director

M: +44 (0) 7736 778756

E: jason.buckland@arcadis.com

Arcadis

Interchange House

81-85 Station Road

Croydon

CR0 2AJ

Definitions

2018p	2018 Prices
BHS	Baggage Handling System
BWIC	Builder's Works in Connection
H7	CAA's review of Heathrow's regulatory arrangements for the period 1 January 2022 – 31 December 2026 (the H7 period)
CAPEX	Capital Expenditure
CPB	Capital Programme Board
CAA	Civil Aviation Authority
EBS	Early Bag Store
EV	Electric Vehicle
FPG	Future Portfolio Group
G3	Gateway 3 of HAL's governance model
HAL	Heathrow Airport Limited
T1, 2, 3, 4, 5	Heathrow Airport Terminals 1 to 5
HBS	Hold Baggage Screening
IFS	Independent Fund Surveyor
IBP	Initial Business Plan
iH7	Interim H7
LHR	London Heathrow Airport
MSCP	Multistorey Car Park
OPEX	Operational Expenditure
OBR	Outcome Based Regulation
PCA	Pre-Conditioned Air
SPONS	Refers to the SPONS series of construction price books, issued annually
RPI	Retail Price Index
RBP	Revised Business Plan
ROM	Rough Order of Magnitude
TPI	Tender Price Index
Update 1	The first update to the RBP issued by HAL
Update 2	The second update to the RBP issued by HAL
TTS	Track Transit System

Contents

1. Executive Summary
2. Background
3. Methodology
4. Market Intelligence
5. Programme Review
 - a) Asset Management & Compliance
 - b) iH7 Rollover
 - c) T2 Baggage
 - d) Regulated Security
 - e) Carbon & Sustainability
 - f) Crossrail
 - g) Commercial Revenues
 - h) Efficient Airport
 - i) Expansion
6. Summary of Arcadis View
7. Appendices
 - A. Arcadis Market View Spring 2022
 - B. Asset Management Calculations
 - C. Information Requested
 - D. Cost Plan Checks
 - E. Carbon & Sustainability Checks

1. Executive Summary

1. Executive Summary

The RBP Update 2 (received by Arcadis on 20th December 2021) provided updates on the RBP Capex Plan published in December 2020, and subsequent Update 1 (received by Arcadis on 16th July 2021).

New market data and information was included, as well as changes to reflect policy developments. The update was clearly presented, well articulated and used a sensible breakdown of programmes that are compliant with the CAA definitions, however the removal of the different plans (“Safety Only” and “Optimal”) reduced our visibility of what was essential to the safe, secure, compliant and efficient running of the airport, and what was developmental.

Whilst the update and associated documents did not provide the sufficient level of detail for a meaningful review to be conducted we have worked collaboratively with the CAA, HAL, and airline community to get a greater level of detail following specific information requests.

Each programme contained within the H7 plan has been reviewed, information requested, and analysis conducted – the output of this exercise is demonstrated in the following slides.

In general we found that where evidence was available, HAL have followed their processes which are in accordance with good industry practice, the quantities had been measured correctly, and whilst some costs were higher than our benchmarks they are robust when the project specific challenges were taken into consideration.

With our understanding of the current market conditions, difficulties in resourcing, as well as rising materials and energy prices we believe that HAL will face a significant challenge in delivering their proposed levels of activity, particularly in the first two years of the H7 period, where they will have to ramp up delivery following two years of the pandemic and the final two years of the H7 period, where CAPEX spend is forecast to be significantly higher than previously delivered.

The evidence shows that HAL’s plan includes measures beyond what is necessary for the safe, secure, compliant and efficient operation of Heathrow Airport, and that many of the projects included within the H7 plan aim to improve the passenger experience, increase efficiency and maximise revenues.

Our conclusions on each programme in the H7 plan are included in the following slides and summarised in Section 6.

2. Background, Methodology & Approach

2. Background

Arcadis has been appointed as a technical advisor to the Civil Aviation Authority.

We have previously undertaken a review of HAL's Revised Business Plan and HAL's RBP Update 1, which resulted in the following reports being produced:

- **CAPEX REVIEW REPORT**

This report reviewed the Revised Business Plan chapters that related to CAPEX to understand the level of compliance with CAP1940 as well as the quality of information provided within.

- **HAL RBP UPDATE – CAPEX PLAN REVIEW**

This report reviewed the RBP Update 1 chapters that related to CAPEX to review the proposed spend during the H7 period and provide comment on the discretionary spend proposed by HAL.

Subsequently, in December 2021, HAL issued RBP Update 2, and their response to CAP2265.

RBP Update 2 provided a revised business plan which included:

- Developments since RBP Update 1.
- Updates to HAL's consumer insights.
- Updates to HAL's building block forecasts.

Following HAL's issuance of RBP Update 2, the CAA instructed Arcadis to conduct a further review of RBP Update 2 to:


- Propose an approach for setting a capex baseline for H7.
- Develop an efficient Baseline CAPEX plan.
- Recommend whether projects included in other portfolios should also form part of the CAA's efficient Baseline CAPEX plan.

3. Methodology

The Invitation to Provide a Proposal (IPP) published by the CAA to provide HAL H7 price control: Advice on H7 capital expenditure (capex), stated the following Project Objectives for Task 1.

- a) We expect the advisor to propose changes to the current CAA approach, with reference to their technical expertise and knowledge of industry best practice
- b) In particular, the advisor should:
 - Propose a suitable cost estimation framework, given the H7 timetable described above; and
 - Assess if there is sufficient evidence to implement a “deep dive” analysis for a sample of projects/programmes for FPs.
- c) The **output** from this Task should be a methodology document that proposes a suitable approach for the rest of this project. This methodology document should initially be provided in draft with a final methodology document provided as the project progresses (expected to be in late January) to reflect developments in the approach based on updated evidence from HAL.

OFFICIAL-SENSITIVE COMMERCIAL
Handling Instructions:



Invitation to Provide a Proposal (IPP)

For the provision of a service contract under the terms of the CAA Economic Services Framework Agreement

Heathrow Airport Limited (HAL) H7 price control: Advice on H7 capital expenditure (capex)

Contract Ref. 3164

Deadline for submission of response	12:00 p.m. on 2 December 2021
IPP Queries	All queries relating to content of this IPP should be made via the e-Sourcing Portal Message Centre to CAA.
e-Sourcing Portal Technical Queries	All technical queries regarding access to, completion and submission of the IPP document should be directed to the e-Sourcing Portal Helpdesk using the following contact details: Phone: 0845 270 7050 E-mail: helpdesk@delta-esourcing.com
Submission instructions	Proposals must be submitted via CAA e-Sourcing Portal in the format outlined in this document. Any bids received after the deadline CAA reserves the right to reject.
Documentation Checklist	
1) This document	Guidance document & Specification
2) Online Questionnaire	You are required to upload your response to this IPP via the online questionnaire on the eSourcing Portal

Page 1 of 19

IPP Template V1 April 2021
© Copyright of CAA

3. Methodology

Task 1 methodology report was presented to the CAA prior to understanding what information would be received from HAL. It became evident that the information required would not be made available and the report was subsequently updated to reflect this. Following the issuance of the report a series of engagement sessions were held with HAL and additional information was provided following several requests. This has now enabled us to interrogate the methods used to develop the Capital Plan.

The following steps were undertaken to gather and assess the Capital Plan based on the level of information made available to Arcadis by HAL:

- Information requested for the key programmes: Asset Management, Regulated Security and T2 Baggage. With regards to the Asset Management a selection of 'In Flight' and 'Demand' projects were selected.
- Arcadis undertook a first pass review of the above information and of the higher level information provided for the other programmes.
- Subsequent information requests and queries were raised with HAL.
- Meetings were held where HAL presented more in-depth details of how the Capital Plan had been developed for the three main programmes.
- HAL provided detailed cost plans for the Regulated Security, T2 Baggage and the 'In Flight' Asset Management projects.
- Arcadis undertook detailed reviews of these cost plans focussing on:
 - Computation checks.
 - Quantification and scope review; albeit that there were very few scope drawings available and given the level of maturity of the programmes many of the quantities were derived by the designers.
 - Rates have been benchmarked where possible and HAL's method of benchmarking and normalising rates was presented by HAL at various meetings.
 - Percentage additions within the base costs were reviewed and the method of application discussed with HAL.
 - On cost percentage mark ups were reviewed.

The following slides review the detailed approach and provide examples of what was undertaken.

3. Methodology: Bottom Up Estimate Checks

Computation Checks

- Formulae are checked to ensure they are consistent and correct.
- Summary sheets are checked to ensure that data is pulled through correctly.
- Consistency of pricing of similar items.
- Percentage additions and basis of application are correct and consistent.
- Evidence of our checks can be found in Appendices D and E.

Example

- Electra Avenue – calculations and formulae have been checked throughout the cost plan. No errors found.
- Runway resurfacing - links for each item have been checked. No errors found.
- Alpha South - links for each item have been checked. No errors found.
- Carbon and Sustainability - the total value for the most likely cost should be £6,562,442 but the value indicated £6,562,000. No significant impact.

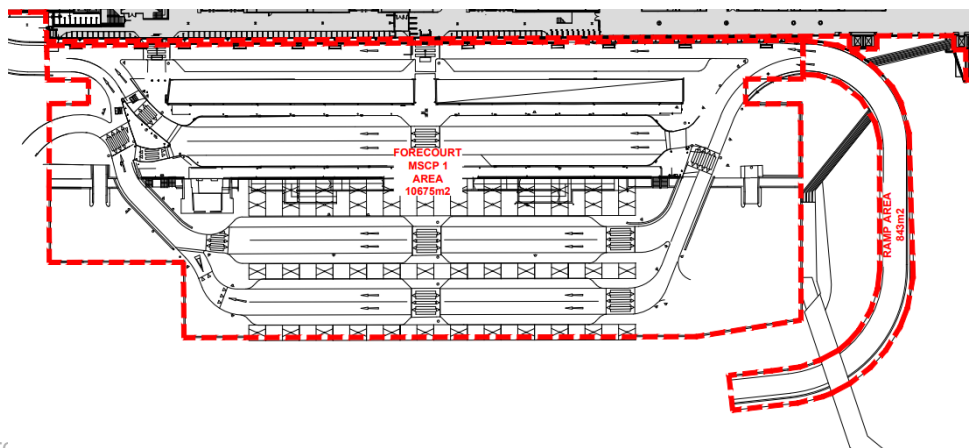
3. Methodology: Bottom Up Estimate Checks

Quantities

- We use the scope documents available to use to check the quantities present in the cost plan.
- Where drawings are provided we can check:
 - Linear measures against scale drawings.
 - Item counts.
 - Measured areas.
- If drawings are not available we use any relevant information that is available to us – such as presentation slides, satellite imagery etc.
- Evidence of our checks can be found in Appendices D and E.

Example

T1 baggage; existing drawings have been provided and below is an example of the checks undertaken.



The drawing abstract left indicates the forecourt MSCP1 at 10,675m² and the ramp at 843m² totalling **11,518m²**, this has been checked and verifies the quantities included in the T1 baggage programme cost plan as shown in the abstract below.

	Building Fabric		
07 Work to existing str	Replacement/ repair of roof	20,001	m2
03 Internal finishes	RZ boundary replacement	500	m
05 Services	Drainage	20,001	m2
08 External works	T1 forecourt	11,518	m2

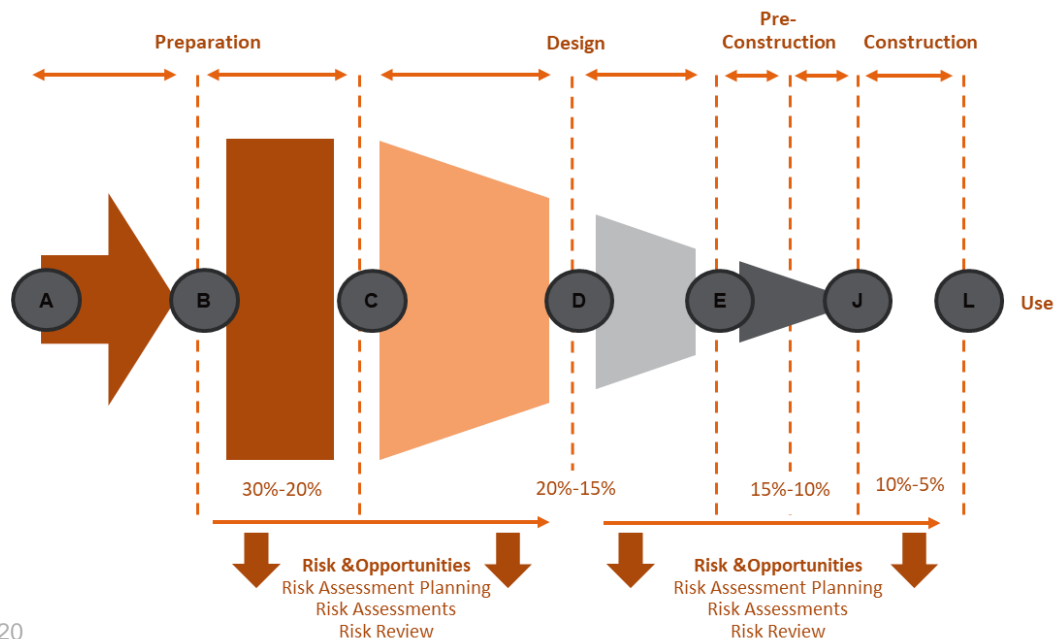
3. Methodology: Bottom Up Estimate Checks

Percentage Mark Up

- Items such as risk, prelims, overheads, contractor profit etc. are checked against industry benchmarks.
- Factors such as the design stage are taken into consideration.
- Project specific costs are considered.
- Evidence of our checks can be found in Appendices D and E.

Example

The diagram below shows the expected risk percentages, subject to specific project factors, at the relevant project stages and against which we have reviewed the percentage additions within the cost plans. The example shows T2 Baggage shown as having 20% Risk and Uncertainty, which is appropriate for this level of project maturity.



4. Market Intelligence

4. Market Intelligence

Arcadis’ full “Market View Spring 2022” can be found in Appendix A, but some key items to be considered when reviewing HAL’s RBP are included below:

- Impact of the invasion of Ukraine on UK construction market is as yet unknown, but likely to cause supply chain issues.
- We are experiencing the highest inflation in 40 years, particularly noting that values in the RBP and updates are presented in 2018 prices.
- There is a tight labour market with economy wide vacancy numbers 50-60% higher than long-term average – this will have particular impact on HAL who will need to increase their resources significantly to deliver according to plan.
- Current TPI on Infrastructure Construction is very high and therefore delivery will be impacted by increased costs.
- The skills shortage in the construction industry will compound these problems with no obvious solution.
- Increased contractor costs will be passed on to clients such as HAL.
- Raw material and energy prices will cause further impacts on prices, as will wage inflation.



	Regional Building Construction TPI	London Building Construction TPI	National Infrastructure Construction TPI
2021	5% (4-5%)	6% (4-6%)	6% (5-6%)
2022	5% (3%-4%)	5% (3%-4%)	6% (4%-5%)
2023	5% (3%)	5% (3%)	6% (5%)
2024	5% (5%)	5% (5%)	5% (5%)
2025	5% (5%)	5% (5%)	5% (5%)
2026	4% (5%)	4% (5%)	5% (5%)
Total	29% (27%)	30% (28%)	33% (31%)

Inflationary drivers

- Energy costs driving material price inflation
- Increase in national insurance rates
- Fall in the number of self-employed workers and emerging labour shortages
- Strong order books easing pressure on the need to win new work
- Uncertainty about the construction materials prices trajectory
- Removal of Red Diesel rebate
- Contractors aiming to improve margins

Deflationary drivers

- Willingness to secure work long-term

5(a) Programme Review: Asset Management & Compliance

5 (a) Programme Review: Asset Management & Compliance Background

- HAL has proposed £1,704M for the H7 period in the Asset Management & Compliance programme.
- A full list of projects that makes up the proposed Asset Management programme was provided, this totalled £2,800M.
- A “Deep Dive” session was held on the 14th January 2022, with the presented slide deck being issued shortly afterwards.
- A further session was held on the 8th February 2022 to provide further information on the Asset Management spreadsheet previously provided.
- The site visit to the baggage facility on the 16th March 2022 also provided valuable insight into the condition of assets.
- We were informed that deliverability was the limiting factor for this programme of works, and the full value was not being requested.
- Whilst we were told that deliverability was based on historic spend, we were not provided any further information.
- Business Cases together with all supporting documentation, project brief, scope, option appraisals, cost plans (detailed backups not just the summaries), benchmark data, risk registers, programme etc. as well as cost plans were requested on the following selected ‘In flight’ projects:
 - B6210.03 Alpha South.
 - B243 KAD Including Substructure.
 - B7228.00 Runway Resurfacing.
 - BC7201.10 Electra Avenue Car Park.
- The same information was requested on the following ‘hopper’ projects:
 - T4 Toilet Block Rolling refurb programme - 2 blocks per year (4 x staff facilities total at T4).
 - T5 Toilet Block Rolling refurb programme - T5 Front and Back of House - 6 blocks per year.
 - N4E Resurfacing.
 - Liquid Explosive Detection System (LEDS) Replacement.

5 (a) Programme Review: Asset Management & Compliance

Airline Views

The following comments have been received from the airlines:

- The airlines are unable to validate the overall requirements / proposed level of spend, due to lack of information shared by Heathrow with airlines at this stage. They will agree to work on a prioritised and portfolio basis.
- The airlines believe that the following should form part of the iH7 rollover projects, and they have moved these to committed projects at the approved G3 amount:
 - Cargo tunnel.
 - Main tunnel.
 - Cyber Plus – Phase 3 (this may be a rollover project, but this requires confirmation).
- T4 HBS, the requirement is to be confirmed and if confirmed then this project will be part of the baggage prioritisation / resilience programme.
- The pier service and remote stands project appears to be a duplication with the Western Campus Connectivity (Efficient Airport). This is capacity related and therefore the requirement should be linked to the Passenger Forecast and not required based on HAL's forecast .
- The MSCP4 Urgent Structural Works project; there is a need to understand the MSCP4 strategy given long term asset issues. This is not in the property or surface access strategy.

5 (a) Programme Review: Asset Management & Compliance

Arcadis Review

- We received cost plans on the ‘in flight’ projects and conducted reviews of the rates and allowances contained within, finding them to have been completed in accordance with their standard processes and in line with our benchmark rates.
- The lack of clear scope documents meant that at this stage we have not been able to confirm that the quantities contained within are accurate.
- Very little information was provided on the ‘hopper’ projects, which is expected due to their lower level of maturity, however we would have anticipated more detail than that provided. For example, the Liquid Explosive Detection System (LEDS) Replacement project has £6.5M predicted spend in 2022, we would expect a high level of detail in cases like this, where the level of maturity is demonstrably higher. The ‘CAA-H7-621 –Hopper list sample’ file provided indicated a G3 cost plan existed, but this has not been provided.
- We believe HAL have some duplication in the ‘in flight’ projects and the iH7 projects for example: KAD, T3 service subways and TTS enhancements.
- There is little doubt that HAL has an extensive programme of asset management; on site visits around the campus, it is evident that the Engineering team are both professional and proactive in their approach to asset management and compliance, for example capturing rainwater from the roof leaks in T1 – with an unusual but effective solution.
- Their priority appears to be to maintain the asset in the most effective and efficient way given the financial constraints that they operate under.
- The condition of certain assets are in clear need of intervention to either replace or radically overhaul and refurbish the units concerned.
- HAL was able to demonstrate this during our site visit both in situ and via detailed presentations for assets that we were not able to visit in person. Multiple examples of concrete failing with visible exposed steel reinforcement bar were shown as well as plant rooms partially submerged in water.
- With the information provided it is not possible to provide an estimate for the value of the entire programme but based on our assessments we are confident it is, as HAL suggests, above the £1.7Bn that they feel is deliverable during the H7 period.
- Approximately 60% of ‘in flight’ projects are not what we would consider to be projects that are required for the safe, secure, compliant and efficient operation of the airport, and we would suggest a review and reprioritisation.
- We requested information from HAL on how they had calculated deliverability, but are yet to receive this information, so a further review was then conducted to determine what we felt was deliverable in the H7 period based on HAL’s historic accounts.

5 (a) Programme Review: Asset Management & Compliance

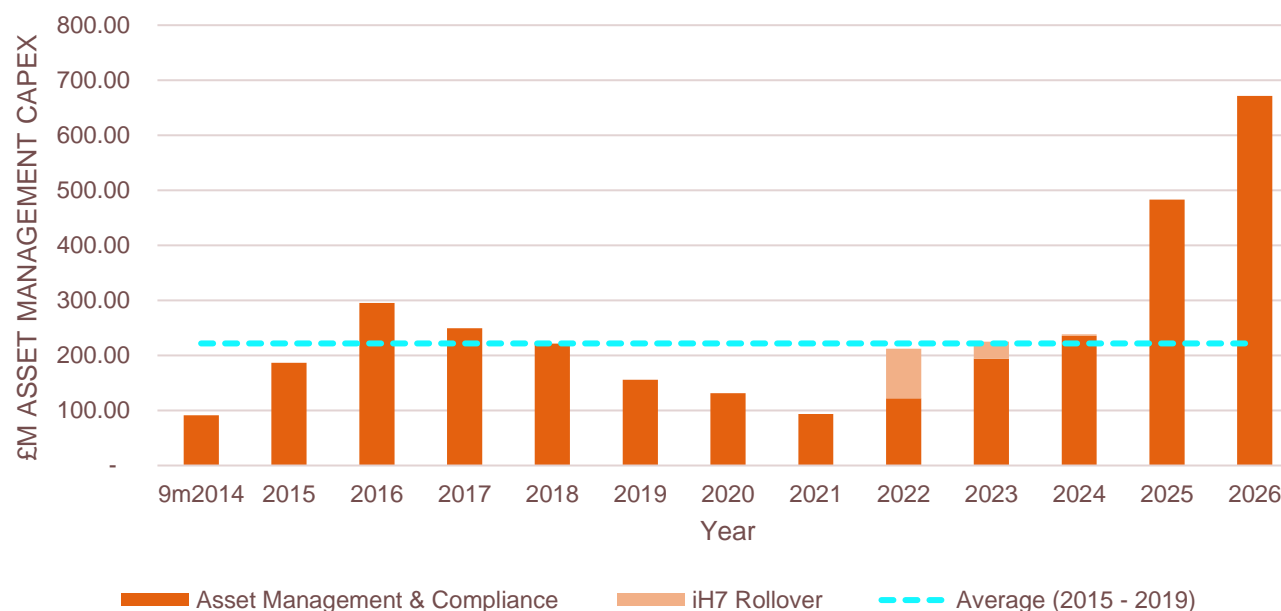
Arcadis Review

- 2014 was only a 9 month period within the audited accounts and has been excluded from our calculations.
- 2020 and 2021 were also excluded from our calculations due to the impact of the COVID-19 pandemic.
- HAL's prioritisation adjustment has been included.
- The iH7 Rollover programme has been included as we believe that delivery would be alongside the Asset Management & Compliance programme and be subject to the same deliverability constraints.
- 2025 and 2026 spends represent a significant challenge to HAL, the CAA might consider reducing the allowance to a more attainable value, £300M in 2025 would be approximately in line with the previous highest spend since pre-2015, increasing to £400M in 2026, which would represent a proportional increase.

5 (a) Programme Review: Asset Management & Compliance

Arcadis Review

- The historic Asset Management spend (adjusted to 2018p using Arcadis National Infrastructure TPI) is shown on the below, alongside the proposed H7 Asset Management spend.
- The total delivered from 2015 to 2019 was £1,107M (2018p).
- The total proposed for the H7 period is £1,829M (2018p) – including iH7 Rollover.
- The historic average from 2015 to 2019 was £221M (2018p) per year, with a peak of £295M (2018p).
- The proposed average for the H7 period is £366M (2018p) per year, with a peak of £671M (2018p) – including iH7 Rollover.
- Details of these calculations are included in the Appendix B.



5 (a) Programme Review: Asset Management & Compliance Conclusion

- During 2020 and 2021, years heavily affected by the COVID pandemic, there was a reduced level of spend on Asset Management and Compliance (averaging £112M per year). This reduced spend likely means that assets were neglected in this period and additional cost will be incurred to bring them back to a suitable condition. This would lead to an increase in Asset Management Costs over the next year and beyond.
- Limited evidence was provided by HAL to give us confidence in their costs, but the limitation of *deliverability* means that we have sufficient confidence to say that the required spend is more than the proposed Asset Management programme spend and is considered fair.
- Without a detailed programme of works, specifically identifying every single element in scope for H7, it is difficult to decipher if every element of the programme is essential, but it is clear as previously stated that there is an extensive pipeline of works that require investment in order to maintain the integrity [and condition] of the assets concerned.
- However, we have not been presented with evidence that gives us confidence that this programme is deliverable on the scale proposed by HAL, which is more than historic trend.
- Significant spends in the Baggage and Security Programmes for specialist equipment delivered by 3rd parties will increase the amount that HAL is able to deliver.
- Following the impact of the pandemic and Brexit, the construction industry, and in particular the aviation sector, is experiencing shortages in resources, skilled labour and material. We believe that this will impact the amount that HAL can deliver in the first few years of H7, this has not been addressed by HAL.
- The iH7 Rollover programme would be delivered alongside the Asset Management & Compliance programme, creating further pressure.
- HAL's results indicate a CAPEX spend of £134M in Q1. That is 30% above the £103M we would expect for a quarter based on HAL's forecast spend of £412M for 2022, this provides some confidence in HAL's ability to deliver to the proposed Update 2 plan.
- The Prioritisation included by HAL increases the likelihood of being able to deliver to their 2022 – 2024 plans but puts significant pressure on the back end of the period.
- The RBP Update 2 presents a challenging programme of delivery for Asset Management & Compliance – but ample time has been allowed for HAL to scale up.

OUR RECOMMENDATION WOULD BE TO ALLOW BETWEEN £1,375M AND THE FULL VALUE OF £1,829M REQUESTED (THIS INCLUDES AN ALLOWANCE FOR iH7 ROLLOVER PROJECTS)

5(b) Programme Review: iH7 Rollover

5 (b) Programme Review: iH7 Rollover Background

- HAL has proposed £124M for the H7 period in the iH7 Rollover programme.
- These are investments that commenced in iH7 and are proposed to be completed in H7.
- A list of these projects was requested from HAL but has not yet been provided.

Airline Views

- Potential duplication with the Asset Management and Commercial Revenues Programme for the T3 and T4 Ramp Up projects.

Arcadis Review

- We have not had sufficient information to conduct a detailed review.
- However, we understand that there are ‘in flight’ projects from the iH7 period that would require completion, and from our limited reviews of *other* HAL cost plans it is likely that at least in terms of the rates used, that these are reasonably robust.
- We were told that a review was conducted to determine whether projects should be paused, terminated or continued, but we have not seen that evidence.
- Our previous report on RBP Update 1 raised concerns over the criticality of the projects included within this programme, as well as the maturity of estimates, these concerns remain.

Conclusion

- A detailed review has not been conducted, however based on other programmes that have been checked it is likely that the costs presented are robust.
- However the *deliverability* issues discussed in the Asset Management and Compliance programme are also valid here.
- We also would like to see further evidence of how these projects sit in terms of criticality to the operation of the airport.

5(c) Programme Review: T2 Baggage

5 (c) Programme Review: T2 Baggage Background

- HAL has proposed £432M for the H7 period in the T2 Baggage programme.
- In HAL's original RBP and Update 1 they proposed a temporary solution to extend the life of the BHS operating out of T1. In RBP Update 2 further investigation has led HAL to believe that it is not a viable solution, due to the condition of the T1 baggage system.
- A 'Deep Dive' virtual meeting was held on the 20th January 2022 which provided us some insight into the challenges and proposed approach, with slides being transmitted after the meeting.
- A tour of the facility was provided by HAL on the 16th March 2022 which demonstrated first-hand the issues with the T1 baggage handling system.
- The cost plan was provided as well as Rough Order of Magnitude pricing from the BHS supplier, [REDACTED].
- A layout drawing was also provided showing the basement and the apron.
- A further meeting covering Security and Baggage was held on the 25th March 2022 where several questions were asked of HAL, time constraints prevented Baggage being discussed in detail, no responses were provided.
- Additional information was provided to Arcadis on the 17th May 2022, the documents include those necessary for the endorsement of P1 and budget approval for P2 at the FPG to be held on the 26th May 2022.

5 (c) Programme Review: T2 Baggage

Airline Views

The following comment has been received from the airlines:

- The IT element needs to be validated; related to T1 Masterplan / closure so whilst the airlines recognise the opportunities, they believe this may not be the most appropriate time in a capital constrained environment to invest in this.
- The airline community have largely voiced their support for the T2 baggage programme to proceed in some form, however they have raised concerns around elements of the work presented by HAL.

5 (c) Programme Review: T2 Baggage

Arcadis View

- We can confirm that the Rough Order of Magnitude (ROM) costs from [REDACTED] (Concept 2) and the cost plan align, and we have confidence in the costs provided by [REDACTED]; though at this stage only as a ROM.
- A review of other rates within the cost plan shows HAL's rates to be higher than our internal and external benchmarks, though at this stage of project maturity and with the limited scope information available the increased rates are largely within reason.
- No benchmarking evidence has been provided to give us further confidence in the above.
- The totals when deflated to 2018 prices, using the indexation provide in the Asset Management programme, give a total of £605M across H7 & 8. This does not align with the Airline Deep dive slides which states a commitment of £432M in H7 and £142M in H8 totalling £574m.
- There is no build up to the IT costs.
- Limited scope documentation has been provided so we are unable to interrogate any of the quantities.
- Risk has been applied appropriately.
- It is clear that facilities such as the T1 Early Bag Store (EBS) are reaching the end of their useful economic life and it is already the case that the T1 EBS has lost 20% of its capacity as deemed unsafe to work in that section.
- The product is of its time and is out of keeping for an airport of LHR's standing in the 21st century with the throughput rates that Heathrow experiences.
- When compared to the baggage facilities in both T2 and T5, such a facility compares poorly.
- There is space available within the lower floors of T2 to accommodate a better EBS and baggage facility for the eastern campus which would also address the ongoing costs for maintaining an operational presence in T1 which was scheduled for demolition some years ago.
- The additional information provided on the 26th May 2022 demonstrates an increase in the baggage solution, but as this review is conducted based on the 2018p submitted by HAL it does not affect our findings.

5 (c) Programme Review: T2 Baggage Conclusion

- There is clearly a need for an immediate solution and the solution presented by HAL seems sensible.
- We have confidence in HAL's assessment of options, the processes gone through to evaluate the options appears reasonable and the processes followed in line with what we would expect to see.
- The costs presented by HAL are use not unreasonable given the level of maturity of the programme.
- There are various inconsistencies on rates, percentages, inflation – but nothing that would make a significant difference in cost.
- The documents received on the 22nd of May 2022 show an increase in the expected cost of this programme, this increase is largely due to inflation and whilst it does not affect this report, being based on 2018p, it is something to be considered when cost planning any future works.

OUR RECOMMENDATION WOULD BE THAT THIS IS INCLUDED AT £432M AS REQUESTED

5(d) Programme Review: Regulated Security

5 (d) Programme Review: Regulated Security

Background

- HAL has proposed £747M for the H7 period in the Regulated Security programme.
- This programme was initially included as three programmes within the RBP – Regulated Security (£420M), Security Compliance (£230M), Security Transformation (£130M).
- Compliance and Transformation both sat in the “Win the Recovery” portfolio, with Regulated Security in “Protect the Business”.
- A tour of the new trial lanes at Heathrow Terminal 2 was provided on the 24th November 2021, and a meeting held afterwards where the security programme was explained to us.
- Briefing documents, working group minutes, a schedule and other documents were provided to us, alongside a cost plan.
- Detailed information on the procurement of security equipment that is a large portion of the cost, has not been provided. However, we understand that a competitive procurement process was conducted.
- A further meeting covering Security and Baggage was held on the 25th March 2022 where several questions were asked of HAL, the explanations provided in the meeting provided good support of HAL’s Cost Plans but were never provided formally.

5 (d) Programme Review: Regulated Security

Airline Views

The following comments have been received from the airlines:

- The programme must include & avoid double counting elsewhere, e.g.: (i) Regulatory Queue Measurement; and (ii) Airside / Landside Efficiencies.
- There is a challenge on phasing and benefit realisation, particularly where this is linked to transformation.

5 (d) Programme Review: Regulated Security Arcadis Review

- HAL has sought expert advice and undertaken investigative works to develop potential options.
- Strategic options have been assessed and considered.
- The processes that HAL have gone through to evaluate the options appears reasonable and the processes followed are in line with what we would expect to see.
- Five out of six of the Security Programme’s Objectives, as presented by HAL, are unrelated to essential or compliance requirements, see image on the right.
- Certain items in the cost plan and equipment list have not been justified as required in terms of compliance and seem to be aimed at increasing efficiency and/or passenger experience.
- The Security Transformation project is a clear requirement in order for HAL to meet its compliance obligations against the new DfT directives.
- There are potential OPEX savings that have not been considered in this exercise.
- Whilst the programme will not deliver the full compliant estate by [REDACTED], the works are required, and any subsequent delays will only put the risk of completion during H7 in doubt.
- Some of elements of the programme may be considered over and above a minimum level of spend in order to achieve a compliant product but this would involve repurposing or reusing older kit in amongst new technology which could present a rather confusing and disjointed impression of the security product at HAL in the eyes of the passenger and other key stakeholders.
- We have reviewed the P1 Cost Plan by looking at the following:
 - The application of Inflation within the cost plan and deflation to RBP Update 2 summary.
 - Scope.
 - Benchmarking.
 - Rates.
 - % additions and on costs.

Objectives

Ensure compliance to DfT security mandates to protect our license to operate.

Create operational efficiencies and optimised throughput in Terminals and on Campus.

Create a professionally collaborative environment with our suppliers to aid implementing a transformed security product to make the airport safer, reduce risks with enhanced threat detection capabilities, agility and a more secure boundary

Contribute to delivering the world's best airport service by providing a consumer enabled security experience that is a safe, predictable, reliable, secure, inclusive and comfortable.

Transform the colleague ecosystem helping ensure Heathrow is a great place to work.

Ensure sustainable, safeguarded and supportable growth that is affordable and resilient and has the ability to respond to future requirements.

5 (d) Programme Review: Regulated Security

Arcadis Review

- We have reviewed the high-level scope and the headings are in line with the documentation provide however we are unable to verify the quantities.
- Our review of the Cost Plan result in the following findings:
 - The granularity is at a level expected at this level of programme maturity.
 - They are largely reasonable and in line with our benchmarks.
 - Rates for equipment are reasonable and in line with our benchmarks – however procurement information that has been requested and not yet received would build confidence further.
 - The general programme costs are not clearly articulated as to what is covered, it appears that there are potential duplications in design costs and body scanners. There is also allowance for business change capex with no clarity on what this is for.
 - Security lane costs do not allow for any re-use of equipment from the existing lanes.
 - There are some inconsistencies in rates (e.g. modular buildings).
 - Percentages for IT, BWIC, Testing and Commissioning etc. have been applied across all items – however an explanation of the reasoning was provided in our meeting of the 25th March that offered adequate explanation.
 - Preliminaries appears high at 45%, our benchmarks for aviation sector work is in the region of 20-25%, however given the operation critical areas in question, the likely constraints on works and the security requirements we consider this to be reasonable, but an opportunity to manage preliminaries down as the project develops maturity.
- We have not been able to review the transformation costs as no detail has been provided.

5 (d) Programme Review: Regulated Security Conclusion

- HAL face a significant challenge in delivering the Security Programme to meet 2024 requirements.
- The costs presented are reasonable for the works detailed.
- We believe that a significant portion of the costs are not related to compliance or essential operations, as demonstrated by their own “objectives”.
- This is further reinforced by the removal of Transformation and Compliance programme definitions, that were not part of “HAL’s Safety Only Plan”.

OUR RECOMMENDATION WOULD BE THAT THIS IS INCLUDED AT A MINIMUM OF £420M, HOWEVER WE ALSO RECOMMEND CONSIDERATION IS GIVEN TO INCREASING THIS SOME WAY TO THE FULL VALUE OF £747M TO REALISE THE EFFICIENCY AND EXPERIENCE IMPROVEMENTS OF A FULL COORDINATED SOLUTION

5(e) Programme Review: Carbon & Sustainability

5 (e) Programme Review: Carbon & Sustainability Background

- HAL has proposed £188M for the H7 period in the Carbon & Sustainability programme.
- This is broken down as shown here:

Carbon and Sustainability Programme - 2018 prices	2022	2023	2024	2025	2026	H7	Gateway Status	Cost estimate basis
Reducing aircraft emissions								
Airspace modernisation*	2.0	2.0	14.0	14.0	6.0	38	G0	Order of magnitude
Air traffic management efficiency	0.0	0.0	5.0	10.0	5.0	20	Pre G0	Estimated provision
Upgrading existing PCA provision	2.0	2.0	5.0	10.0	33.0	52	Pre G0	Based on per PCA unit cost
Enabling zero emissions aircraft								
Hydrogen infrastructure design and enabling work (linked to ongoing research)				2.5	2.5	5	Pre G0	Estimated provision
Decarbonising surface access and vehicles								
Surface access mode share initiatives	1.5	1.5	4.0	4.0	2.0	13	Pre G0	Estimated provision
EV charging infrastructure (operational vehicles, colleagues and passengers)	4.0	4.0	5.0	8.0	16.0	37	G1	Order of Magnitude
Decarbonising heat and upgrading our electrical network								
Decarbonising Heat - Develop options, scheme design and Operational trials	0.3	0.3	0.5	6.5	14.4	22	G0	Estimated provision
Electrical Network upgrades - Scheme design to support increase in electricity demand for decarbonisation	0.3	0.3	0.5			1	G0	Estimated provision
Total	10	10	34	55	79	188		

- In the RBP and Update 1 all items except for “Airspace modernisation”, which was included in “Protect the Business”, were included in the “Build Back Better” portfolio.
- A ‘Deep Dive’ was held on the 21st January 2022.
- A meeting was held on the 25th March 2022 where HAL explained this programme in more detail.
- Cost plans and scope for three areas was requested – Airspace Modernisation, Upgrading existing PCA provisions, and EV charging infrastructure, these were received and a review conducted, the details can be found in Appendix E.
- Additional information in the form of a Marginal Abatement Cost Curve (MACC) Analysis, was provided to Arcadis on the 18th May 2022.

5 (e) Programme Review: Carbon & Sustainability

Airline Views

The following comments were received from the airlines for this programme:

- The ATM efficiency appears to be a duplication of works under the Airfield Efficiency / Efficient Airport programme, which should also be include Carbon savings within the benefits.
- Upgrade of the PCA units, whilst the airlines support this as an urgent priority, however the delivery model has yet to be agreed; the airlines do not necessarily agree that this proposed CAPEX is the correct approach.
- The Hydrogen infrastructure project is not a priority in H7 given the capital constraints and the current uncertainty in future technologies.
- The EV Vehicle Charging projects is supported, but alternative funding / delivery models should be followed given the capital constraints. This project must split between colleague (airside / commercial) and passenger (landside).
- Decarbonising heat is not a priority in H7 given the current capital restraints and the projected returns.

5 (e) Programme Review: Carbon & Sustainability

Arcadis Review

- A review was conducted of the 8 cost plans that were provided, full details of that review can be found in Appendix E.
- Not enough scope was provided for quantities to be checked.
- Computational checks found only very minor errors.
- Checks on rates showed that rates were considerably above our benchmarks – further scope information may provide good reason for that, however with the detail we have the costs seem excessive. Examples include PCA and EV Bus Charging points where we have strong benchmark data that indicates costs below what HAL have proposed.
- The information was often old and the base year for pricing unclear.
- Quotations, schedules, scope detail, and drawings are often listed, but not supplied.
- The airport community agree certain investments should be made in the Carbon and Sustainability programme.
- Whilst the detail behind the exact programme may not have been provided, it is clear that, for example, investment in an upgraded PCA product at LHR is required as the current offering is considered sub optimal by the airlines and not user friendly by the ground handlers who have to operate the infrastructure.
- To what extent the full £150m is required is hard to determine without further granularity from HAL on the exact works involved.
- The MACC Analysis provides some evidence that demonstrates the value for money for each carbon initiative, which would support a prioritisation exercise.

Conclusion

- Cost information provided is in need of updating and presentation in 2018p.
- Costs are high when compared to our benchmarks, though further scope information may demonstrate why.
- Based on the previous inclusion of large portions of this work in the “Build Back Better” portfolio we believe a lot of this is discretionary rather than essential spend.

OUR RECOMMENDATION WOULD BE THAT THIS IS INCLUDED AT A MINIMUM OF £38M FOR THE REQUIRED AIRSPACE MODERNISATION , HOWEVER WE ALSO RECOMMEND CONSIDERATION IS GIVEN TO INCREASING THIS SOME WAY TO THE FULL VALUE OF £188M TO REALISE FURTHER SUSTAINABLE SOLUTIONS

5(f) Programme Review: Crossrail

5 (f) Programme Review: Crossrail Background

- HAL has proposed £67M for the H7 period in the Crossrail programme.

Airlines Views

- No comments have been received

Arcadis Review

- HAL advised that this contribution has been agreed.
- No further review has been conducted as it is not construction CAPEX.

Conclusion

- Arcadis has no comment on this programme.

ARCADIS HAVE NO RECOMMENDATION ON THIS PROGRAMME

5(g) Programme Review: Commercial Revenues

5 (g) Programme Review: Commercial Revenues

Background

- HAL has proposed £494M for the H7 period in the Commercial Revenues programme.
- A “Deep Dive” virtual meeting was held on the 27th January 2022 which provided us some insight into the challenges and proposed approach, with slides being transmitted after the meeting.
- We have not requested further information.
- It is not in our scope to review the revenues predicted by HAL in this programme although we understand that CAA has separately reviewed the revenue estimates.

Airline Views

- For the Retail & Media; Digital & Data Transfer and Surface Access projects the airlines are awaiting the outcome of the CAA review, there are inconsistencies in assigning revenue benefits that must be addressed with a focus on returns within H7. For the Retail & Media project HAL have identified a 33% spend and 75% revenue benefit with likely further opportunities to reduce the budget.
- The Property Programme is not a priority within H7, HAL are suggesting alternative models where a prioritisation and an appropriate business case can be proposed.
- Crossrail commitment should be moved to “Commitment” and Cargo moved to “Efficient Airport”.

Arcadis Review

- The objective of this programme is to drive revenue.
- Revenue and Revenue at Risk predictions for projects within this programme were provided in the Deep Dive, these should be considered.

Conclusion

- If Revenue and Revenue at Risk predictions are valid, then this will provide a steer on whether the projects should proceed.
- None of the projects in this programme would be considered essential to the safe and compliant operation of the airport – further information is on the following slide.

A DECISION SHOULD BE MADE FOLLOWING THE REVIEW OF REVENUES AND REVENUE AT RISK

5 (g) Programme Review: Commercial Revenues

PROJECT CATEGORIES	HAL JUSTIFICATION	ARCADIS COMMENTS	RBP2 Update	Core	Consider for Development
			£m	£m	£m
Agile Fund / Contingency		We believe this is an allowance	4.7		4.7
Cargo	Grow Heathrow's cargo proposition through the delivery of safety, security, efficiency and capacity improvements linked to SEGRO's investment in the cargo estate. This will enable Heathrow to become competitive in its cargo proposition, preventing loss of market share to other UK and European airports, protecting both Heathrow's and airlines' economic models and improving resilience to future passenger shocks. This contributes to the OBR measures of departures flight punctuality and control post vehicle queue times. There is [REDACTED] of [REDACTED] and the payback period is [REDACTED] years.	The works are not Core CAPEX and HAL have not demonstrated any viable business case however, HAL state that this maintains their competitiveness in the cargo market. The works will enable the development of [REDACTED] new cargo facilities which will increase capacity at a future date. This potentially may mean that the business case realisation will not be seen until H8.	26.9		26.9
Digital & Data Transformation	Upgrade existing legacy capability & implement new digital & data propositions through H7, to enhance each passengers' end to end journey through Heathrow. This investment reflects the need to modernise given changing consumer expectations of service & protect revenue given a significant shift to eCommerce post Covid. It will help to contribute to the following OBR measures; Enjoy my time at the airport; overall satisfaction; helpfulness/attitude of airport staff; ease of understanding Heathrow's Covid-19 safety information & an airport that meets my needs. There is an incremental revenue of [REDACTED], revenue protection of [REDACTED] and a payback period of [REDACTED] years.	Whilst the works are not Core CAPEX, the business case appears justifiable and should be considered for inclusion as Development CAPEX.	61.8		61.8
Property - Development	To deliver a range of property development projects across the Heathrow estate to protect revenue at risk and generate incremental revenue whilst ensuring safety and compliance requirements are met. There is an incremental revenue of [REDACTED], revenue protection of [REDACTED] and a payback period of [REDACTED] years.	The works are not Core CAPEX and HAL have not demonstrated any viable business case. HAL have noted that the benefits are to meet H&S and legislative requirements, protect reputation as leading hub airport, set up revenue success for H8, supports carbon zero and improved passenger and partner experience. The areas of development are Eastern Business Park; Estate optimisation; Mayfield farm - mineral extraction and mixed- use development; D'Albiac House replacement; Car Park densification- T4 long stay and perimeter / CTA development. Whilst we can see that there is potential for revenue generation HAL need to demonstrate viable business cases.	161.2		161.2
Retail & Media - Development	To drive space optimisation and operational compliance & improvements across the retail estate ensuring revenue is protected, incremental revenue is generated, and passenger experience is improved. There is an incremental revenue of [REDACTED], revenue protection of [REDACTED] and a payback period of [REDACTED] years.	Whilst the works are not Core CAPEX, the business case appears justifiable and should be considered for inclusion as Development CAPEX.	207.1		207.1
Surface Access	Improvements to our passenger and colleague parking proposition, protecting revenue at risk and delivering incremental revenue through H7. Terminal Drop Off Charge infrastructure to protect this revenue stream through H7. There is an incremental revenue of [REDACTED], revenue protection of [REDACTED] and a payback period of [REDACTED] years.	Whilst the works are not Core CAPEX, the business case appears justifiable should be considered for inclusion as Development CAPEX.	32.6		32.6
TOTAL			494.3	0	494.3

5(h) Programme Review: Efficient Airport

5 (h) Programme Review: Efficient Airport Background

- HAL has proposed £315M for the H7 period in the Efficient Airport programme.
- A 'Deep Dive' virtual meeting was held on the 10th January 2022 which provided us some insight into the challenges and proposed approach, with slides being transmitted after the meeting.
- Several documents were provided on individual projects.
- We have not requested further information.
- It is not in our scope to review the efficiencies predicted by HAL in this programme.

Airlines Views

- The Compass Centre Exit should be moved to Commitment.
- The completion of the Passenger Automation Programme is a priority, including Bio-metrics however clarification is required on T3 SBG. 'Next Generation' needs to be defined and prioritised in accordance with overall settlement.
- Baggage Optimisation, Airfield Optimisation and service initiatives require validation and prioritisation. Also, service initiatives requires a budget to reduce Regulatory Queue Measurement and there is a concern that it is too broad and expect reductions.
- Given the focus on efficiencies, Cargo should be moved from 'Commercial Revenues' to Efficient Airport. Following further discussion between HAL and airlines through capital governance HAL have assigned £19m for Segro Redevelopment and stated that it provides £44m revenue protection which was not previously acknowledged within the RBPs (previously Cargo capital had no associated Commercial Revenues so it would be expected that this would show an uplift in the revenue plan). Note airside/landside efficiencies are to be within Security Programme. There is support for Transshipment facility, but legal and customs hurdles means that this cannot be a commitment at this stage.
- Western Campus Connectivity is subject to passenger demand; HAL's passenger forecast suggests that this is not required within H7 however the airline forecast suggests that it is.

5 (h) Programme Review: Efficient Airport Arcadis Review

- The objective of this programme is to drive mostly unjustified efficiencies.
- As such we do not consider this an essential programme.

Conclusion

- Only the Compass Centre project in this programme would be considered essential to the safe and compliant operation of the airport – further information is on the following slide.

OUR RECOMMENDATION IS TO ALLOW FOR THE COMPASS CENTRE EXIT PROGRAMME IN FULL AT £44.3M. WITH REGARDS TO OTHER AREAS, OUR RECOMMENDATION IS THAT THEY ARE NOT INCLUDED UNLESS THE EFFICIENCIES ARE CONSIDERED CRITICAL

5 (h) Programme Review: Efficient Airport

PROJECT CATEGORIES	HAL JUSTIFICATION	ARCADIS COMMENTS	CORE £m	CONSIDER FOR DEVELOPMENT £m
Compass Centre	Ensure an efficient, cost effective & timely transition to exit Compass Centre. (This is now a must do given planned the sale of Compass Centre)	HAL must exit the Compass Centre due to the expiry of the lease. No details of cost but allow this in full, subject to airline approval of the estimated capex at G3.	44.3	
Passenger process automation	Renew, replace and introduce new automation across the passenger journey to meet growing consumer expectations for predictable and reliable journeys. This will also support our airline customers to achieve operating cost savings and support airline customer propositions, ensuring we remain competitive against other airports. Scope includes T4 Self Boarding Gates, T3 Self Service, T4 CUSS Kiosks / Automated Check-in, Automated gate announcements (T2, T3 and T4), onboarding of airline automation requests and implementation of biometrics/ PAX ID across passenger journey. This contributes to the OBR measures of value for money of overall journey, overall satisfaction, customer effort (ease) and airport that meets my needs	None of this is required for safety only. No justifiable business case currently provided to substantiate this project. HAL note that there will be OPEX savings.	0	49.6
Baggage Optimisation	Develop and implement automation of a range of baggage handling processes across Heathrow to meet growing consumer expectations for predictable and reliable journeys, and to support our airline customers to achieve operating cost savings and support airline customer propositions. This contributes to the OBR measures of value for money of overall journey, baggage misconnect rate and timely delivery of departures baggage	None of this is required for safety only. No justifiable business case currently provided to substantiate this project. HAL note that there will be OPEX savings.	0	43.1
Airfield optimisation	Drive airport efficiency through the implementation of new technology, integration & liberation of data and new business processes. The scope includes AI capable CCTV on stands, which can track and time stamp critical turnaround activity, further sharing and integration of telematics, integration of airfield systems and replacement of current stand planning platforms. This will meet growing consumer expectations for predictable and reliable journeys and support our airline customers to achieve operating cost savings and support airline customer propositions. This contributes to the OBR measures of departures punctuality, value for money of overall journey, airport arrivals management and runway operational resilience.	None of this is required for safety only. No justifiable business case currently provided to substantiate this project. HAL note that there will be OPEX savings.	0	39.1
Terminal Capacity Optimisation	Provide three additional remote stands on GA20, delivering additional efficiency in the western campus through enabling more inter-terminal connections and a more efficient towing operation. This contributes to the following OBR measures; wayfinding, overall satisfaction, customer effort (ease), airport that meets my needs, and departures flight punctuality.	None of this is required for safety only. No justifiable business case currently provided to substantiate this project. HAL note that there will be OPEX savings.	0	32.8
Service Initiatives	Deliver improved wait times at the Border, improved facilities and service for Passengers Requiring Support, improved seating and charging options for passengers and utilising digital wayfinding, ensuring their journeys are more predictable, reliable, comfortable and providing a more welcoming and accessible airport where passengers feel cared for. Areas prioritised are those most valued by consumers based on passenger In-sights. This contributes to the following OBR measures; cleanliness, wayfinding, overall satisfaction, customer effort (ease), enjoy my time at the airport, airport that meets my needs, helpfulness/attitude of airport staff, immigration queue times and passengers with reduced mobility – overall satisfaction.	None of this is required for safety only. No justifiable business case currently provided to substantiate this project. HAL note that there will be OPEX savings.	0	106
TOTAL			44.3	270.6

5(i) Programme Review: Expansion

5 (i) Programme Review: Expansion Background

- HAL has proposed £30M for the H7 period in the Expansion programme.

Airline Views

- No comments have been received

Review

- HAL advised that this is a ring-fenced amount with no detail to support the allowance, how it is calculated, or what it allows for.
- We understand this is for ongoing commitments following the Expansion programme.
- No further information has been provided for review.

Conclusion

- This is a relatively small value programme.
- We agree it is likely that there are ongoing commitments and this is likely a reasonable value.
- However, further information would be required to understand this in more detail. We understand that CAA has separately reviewed these costs.

WE RECOMMEND THIS BEING INCLUDED AT THE FULL VALUE

6 Summary

6 Summary of Arcadis View

- Figures below are in £M, presented in 2018p.

	Arcadis Recommendation			
	HAL RBP Update 2	Minimum	Maximum	
Asset Management & Compliance	£ 1,704.00	£ 1,375.00	£ 1,829.00	(this includes iH7 Rollover Projects below)
iH7 Rollover	£ 124.00	£ -	£ -	(included in Asset Management & Compliance)
T2 Baggage	£ 432.00	£ 432.00	£ 432.00	
Regulated Security	£ 747.00	£ 420.00	£ 747.00	
Carbon & Sustainability	£ 188.00	£ 38.00	£ 188.00	
Crossrail	£ 67.00	£ 67.00	£ 67.00	(no recommendation from Arcadis – but we understand it's agreed by all parties)
Commercial Revenues	£ 494.00			(no recommendation from Arcadis, as this will depend on a review of revenues)
Efficient Airport	£ 315.00	£ 44.30	£ 44.30	
Expansion	£ 30.00	£ 30.00	£ 30.00	
TOTALS	£ 4,101.00	£ 2,406.30	£ 3,337.30	

7 Appendices

Appendices

The Appendices have been included as separate files and are as follows:

- A. Arcadis Market View Spring 2022
- B. Asset Management Calculations
- C. Information Requested
- D. Cost Plan Checks
- E. Carbon & Sustainability Checks