

OFFICIAL - SENSITIVE

Airports Commission Surface Access Works

Strategic Road Network Proposals
Validation of Costs and Delivery Assumptions

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1. Executive Summary - Costs

1.1 Background

In October 2015, DfT asked Highways England to review the Airports Commission's estimated costs and delivery timescales for works to the Strategic Road Network (SRN) proposed for surface access to the alternative options for expansion of Heathrow or Gatwick airports.

That exercise was heavily constrained by the limited extent of design information made available, which was insufficient for robust assurance of the Commission's estimates.

DfT subsequently requested Highways England to carry out a robust assessment of the estimated costs and deliverability for each proposed intervention on the SRN set out in the Commission's report. DfT's specification of requirements for Highways England's validation of cost and delivery viability of the Strategic Road Network surface access proposals is contained in Annex A.

This report is in response to the scope and remit set out in Annex A. Highways England reserves the right to comment separately and at other times on any matters outside this scope and remit. Range cost estimates have been produced based on a number of assumptions as set out in the report. Any future assessment of costs will require us to revisit the assumptions made.

1.2 The Scope of Proposed Works to the Strategic Road Network

The Commission's proposed SRN surface access works for expansion at Gatwick are the same as those proposed by the promoter. There is substantial variance between the promoters and the Commission's proposed SRN surface access works for expansion at Heathrow. The promoters' proposed works are limited to the M25 South of Junction 15 but the Commission has also included widening and upgrades of the M4 between Junctions 2 and 4B inclusive. The development of the next Road Investment Strategy will provide the mechanism for the Government to take a view on the future investment needs for the M4, as part of long-term investment planning process established under the Infrastructure Act 2015, and the main steps in the process are described in more depth in Highways England's Licence.

[Table 1](#) contains the scope of SRN surface access works considered in our assessment.

1.3 Comparison of Airports Commission's Estimated Costs and Highways England Assessment

The Commission's estimated costs for the SRN works are based on high-level unit rates and approximate scheme lengths. Highways England's Commercial Services Division has produced detailed range cost estimates for each of the Commission's proposed interventions to the SRN and compared these estimates with the Commission's figures. Cost estimates have been prepared for the capital costs of scheme delivery and the resulting incremental operation and maintenance costs.

Our estimates include all costs within our standard work breakdown covering Options Phase, Development Phase, Construction and all ancillary costs except for lands costs which are volatile and would require specialist input from the District Valuer.

The Airports Commission has prepared point estimates inclusive of Optimism Bias and the most comparable figure in our range assessment is our Maximum Range point, which includes unmitigated Optimism Bias.

1.3.1 Gatwick Airport

Scheme Implementation / Capex

Of the four schemes assessed at Gatwick, the Airports Commission capex estimates for three schemes fall within our range estimates. The Commission's estimate for the M23 J9 slip road widening and improvement is above our range assessment.

The Commission's aggregated capex costs for the Gatwick SRN proposals are consistent with our overall range estimate. See [Table 2](#) for details.

Operation and Maintenance Costs

The Airports Commission's operation and maintenance costs for the Gatwick proposals are within with our range estimate as shown in [Table 3](#).

1.3.2 Heathrow Airport

Scheme Implementation / Capex

Aggregated, the Airports Commission's capex estimates for the overall package of SRN works at Heathrow lie within the range of our assessment. However, our assessment of estimated costs for individual proposals is significantly at variances with Commission's figures as shown in [Table 4](#) and [Table 6](#) for the two Heathrow options.

We consider that there is significant potential for cost overruns of the largest schemes by value:

- M4 J2 to J3 Widening
- M25 tunnels and works south of Junction 15

The proposed SRN works to the M4 at Heathrow are recommended by the Commission but are not part of the promoters' proposals or technical submissions. We have developed a scope, design and planning basis of estimates for these proposals but there is high inherent uncertainty around these assumptions at this stage of design development.

This is particularly the case for M4 J2-3 widening which includes elevated sections of the M4 in the built-up areas west of Junction 2 and is very challenging. We have developed a proposed solution that we consider feasible including a bored tunnel for eastbound traffic to J2. But there are numerous unknowns in relation to key cost drivers – for example, required capacity, ground conditions, impacts on the surrounding network at Junction 2, lands costs and the internal condition of the elevated sections of the M4.

Operation and Maintenance Costs

There is substantial variance between the Commission's figures and our estimate of operation and maintenance costs for the Heathrow SRN surface access proposals. The comparable total within the

Commission's report, derived from its use of high-level unit rates per lane km with optimism bias, is £334M. This is 51% of our maximum range point of £657M over a 60 year assessment period.

[Table 5](#) and [Table 7](#) contains a summary of our estimate of the incremental operation and maintenance costs for each proposal versus the current do-minimum scenario.

This variance is overwhelmingly driven by the high costs of tunnel operation and maintenance for the M25 South of Junction 15 and M4 J2-3 Widening. The Commission's estimates of opex and asset replacement costs are based on average national unit rates for a given road classification and therefore effectively omit the high costs of operating and maintaining these tunnel assets.

We have assumed that each tunnel will require a dedicated control centre and works depot with 24 hour surveillance and recovery vehicle facilities. The most appropriate location of a dedicated control facility will be subject to assessment, but could be stand alone or co-located with Highways England's or Heathrow's existing control facilities.

Asset replacement costs are far greater than standard highway rates in order to cover renewals of tunnel fabric and finishes, HVAC & ventilation, hydraulic treatment, electrical distribution and control, fire detection and suppression systems, surveillance, monitoring and control systems, etc.

For the production of operation and maintenance costs, we have assumed that all SRN surface access proposals will be maintained concurrently with the adjacent Highways England network under the current operating and maintenance regime. The resulting estimates are therefore of the incremental operation and maintenance costs versus the baseline of the existing SRN network in the vicinity of the proposals.

1.3.3 Optimism Bias Factors

The Commission has applied an uplift of 44% for Optimism Bias consistently to all capex, opex and asset replacement estimates for the Gatwick and Heathrow SRN proposals.

We consider that the Gatwick surface access proposals on the SRN are standard complexity and have applied OB uplifts of 44%, consistent with the Airports Commission's approach, for capex and operation and maintenance cost estimates.

We have classified the Heathrow SRN proposals as complex, non-standard works for the determination of Optimism Bias capex uplifts resulting in an uplift of 66% to the base capex estimates. The constraints on construction presented by the M4 and M25 level of congestion and availability of road-space mean construction is highly complex on these areas of the network and we consider that the schemes should be classed as complex for the determination of OB.

We agree with the Commission's approach to apply the standard complexity OB uplifts for this stage of appraisal (44%) to operation and maintenance costs for all proposals and have included this uplift in the maximum of each range estimates for operation and maintenance costs.

2. Executive Summary - Delivery

2.1 Delivery Summary

In summary, all proposals are viable and given the scale of the respective operations are unlikely to fail but the relative risks and likely impacts on a number of factors are different between Gatwick and Heathrow within the context of interface with the Strategic Network and as individual highway projects

- The Gatwick proposal, whilst being a significant construction scheme does not represent a significant risk to the existing network during construction or have unusual risk of not being delivered in the suggested timeframe;
- The Gatwick proposal is the lesser in terms of overall delivery risk, impact on existing network during construction and has no apparent direct impact on RIS commitments;
- Gatwick information and presentation material indicated a good level of methodology and planning development that would support a high level of delivery confidence in line with proposals;
- Both Gatwick and Heathrow proposals, together with enquiry during promoter engagement indicate a low level of time contingency, particularly in the pre-construction development and statutory process phase;
- The timing of Gatwick and Heathrow proposals align with the RIS programme to the extent that circa 50 schemes will be going through DCO nationally at the same time and a similar number of schemes are scheduled to start on site at similar times. Whilst unquantifiable within the constraints of this report, all schemes but particularly the Heathrow proposals will place significant pressure on Tier 1 contractors' resources if timescales for infrastructure projects in the UK and particularly the South of England stay the same;
- Both schemes start dates are critically linked to the DCO process and this represents a significant risk in both cases, though perhaps more so on the Heathrow proposal due to scale ;
- Heathrow proposals will most likely constitute the largest DCO application to date;
- The proposal for a tunnel to accommodate the M25 within the Heathrow proposals is achievable within the construction timescales indicated;
- The Heathrow proposals in particular have a series of complex interdependencies that each represents significant risk to the timeline (and as such cost). A number of these are referenced in the Heathrow section in the main report but of particular note is the A4/M25 interface once works have commenced which represents a risk to the delivery of a new or extended runway.

3. Background

The Airports Commission report *Cost and Commercial Viability: Financial Modelling Input Costs Update* dated 15 July 2015 included details of proposed surface access works to the Strategic Road Network (SRN) associated with proposed expansion at Gatwick and Heathrow airports, along with the estimated capital, operation and maintenance costs and assumed delivery timescales.

The DfT asked Highways England to review the Airports Commission's estimated costs and delivery timescales in October 2015. That exercise was constrained by the limited extent of design information made available, particularly for proposed works that were not originally part of the airport expansion promoters' technical submissions to the Commission.

DfT subsequently requested Highways England to carry out a robust assessment of the estimated costs and deliverability for each proposed intervention on the SRN set out in the Commission's report. DfT's specification of requirements for Highways England's validation of cost and delivery viability of the Strategic Road Network surface access proposals is contained in Annex A.

This document sets out the methodology and approach for this assessment and our findings. Our approach is described in detail below and has been structured around the following stages:

Cost

- Scoping and development of the validation methodology
- Data collection and engagement with promoters through DfT
- Confirmation of the scope of proposals set out by the promoters
- Development of assumed scope of works for proposals recommended by the Airports Commission but outside the promoters' technical submissions (i.e. proposals without concept designs)
- Measurement of the proposed works' quantities and generation of bills of quantities for pricing
- Preparation of independent estimates of costs (capital, operation and maintenance) using a consistent methodology and cost basis across all alternative options
- Application of optimism bias
- Comparison with the figures contained in the Commission's report and identification and commentary on variances

Delivery

- A statement covering Highways England's assessment of the scale of delivery risks.

4. Scope of Validation Exercise

The scope of our cost and delivery exercise is limited to consideration of the SRN surface access proposals included in the Airports Commission’s report *Cost and Commercial Viability: Financial Modelling Input Costs Update*, July 2015, which are listed in Table 1.

Table 1: Schedule of proposed surface access highways works by airport option

Route	Airports Commission Description of Proposed Works
Heathrow Airport Northwest Runway / Extended Runway	
M4 J3 to J4	“Hard shoulder running in both directions + additional road widening”
M4 Airport Spur	“Road widening in both directions”
M4 J2 to J3	“Road widening in both directions”
M4 J4 to J4b	“Additional road widening in both directions”
M4	“Large M4 junction, J4b replacement”
M4	“Implementation of higher capacity at the M4 junction, J4a”
M4†	“Capacity improvements to existing main airport tunnel”
M25	“M25 tunnelling costs (south of junction 15) – Northwest Runway”
M25	“M25 tunnelling costs (south of junction 15) – Extended Runway”
Gatwick Airport Second Runway Option	
M23	“Junction 9 slip road widening”
M23	“Junction 9 grade-separated flyover”
M23	“Junction 9 to 9a road widening”
<i>Airport Way*</i>	“Lane widening”
<i>North terminal access*</i>	“New high capacity roundabout and approaches A23 to Airport Way grade-separated flyover”

† Note these proposals were classed as part of the Strategic Road Network in the Commission’s report but the main airport tunnel is not part of Highways England’s network and we have not included validation of these estimated costs in our assessment

*Note these works were classed as local roads in the Commission’s report but the affected section of the A23 from M23 J9A is part of Highways England’s network and we have included validation of these estimated costs in the scope of our assessment.

The Airports Commission’s description of the proposed surface access works for the Heathrow Airport Extended Northern Runway option is similar to those for the Heathrow North West Runway. However, there are differences in the scope of the proposed works to the M25 between the alternative options for expansion at Heathrow and these are summarised in Section 7.

The scope of our validation exercise covers assessment of the following items:

- The capital costs of each proposal contained in Table 1 with estimates of associated costs of implementation including Options Phase and Development Phase (design and preparation activities prior to the Construction Phase), supervision and ancillary costs and optimism bias allowances

- Operation and maintenance costs for each proposal for an assessment period of 60 years from the year of opening to traffic including discounting using unadjusted discount factors given in HM Treasury's Green Book
- Comparison of cost and delivery assessments with the Airports Commission's figures – comparison with the promoters' figures is outside the scope of our assessment
- The delivery timescales for each proposal and schedule risks
- Response to DfT points of clarification requests, 22 January 2016.

The costs or delivery viability of proposed works to the airports' internal road systems or local road network have not been considered.

Our assessment excludes validation of the Airports Commission's traffic analysis. Some risks of potential impact on the surrounding network of the Airports Commission's proposals for Heathrow have been highlighted in Section 8. However, scope of works, costs and delivery schedules for such risks have not been developed as this would require further traffic modelling and design development.

5. Summary of Assessment Methodology: Cost

In accordance with the DfT's specification of requirements contained in Annex A, we have produced independent estimates of capital and operation and maintenance costs for each proposal.

Base estimates of capital costs have been produced in accordance with the Highways England Commercial Services Division's Major Projects standard work breakdown structure and rate libraries. The work breakdown structure is contained in Annex C.

It should be noted that Highways England estimates currently exclude lands costs. Several proposals require substantial acquisition and lands costs will be significant. However, specialist input is required from the District Valuer for a robust assessment at this stage and this would require more time to produce following the receipt of design information and clarification of scope in March-April 2016. Caution is recommended when comparing Highways England estimates with the Airport Commission's costs which make no reference to the inclusion of lands costs.

We have generated quantities in accordance with the Method of Measurement for Highways Works from the available plans and long sections. Where design details and specification are not developed, we have assumed highway cross sections and details based on the Design Manual for Roads and Bridges (DMRB) and current Major Projects' scheme details.

Indirect and ancillary costs have generally been estimated using an assessment of percentage factors or lump sum allowances based on data from recent and current Major Projects schemes. Annex F provides a summary of the principal basis of estimate assumptions for each head of cost and MMHW series.

Highways England's standard estimating process uses three point range estimating with assessment of project-level risk / opportunity, Knightian Uncertainty and Portfolio-level risk / opportunity in place of Optimism Bias.

Rather than following standard Highways England procedure, we have applied Optimism Bias uplifts for the proposals in this case for the following reasons:

- Given the concept stage of design development, especially for proposals recommended by the Airports Commission but not developed by the promoters, it is not practical to develop robust risk registers and risk assessments at this time
- The Commission's estimates include Optimism Bias factors and we have followed this approach for consistency of comparisons.

The estimated range of outturn costs has been assessed in a similar manner to the Airports Commission's approach:

- Minimum of Range Estimate: Highways England deterministic estimate plus application of typical minimum range point factor for similar schemes at Stage 0 of Highways England's Project Control Framework (-29% of the deterministic estimate)
- Maximum of Range Estimate: Highways England deterministic estimate plus unmitigated Optimism Bias uplift

For the production of operation and maintenance costs, we have assumed that all SRN surface access proposals will be maintained concurrently with the adjacent Highways England network under the current operating and maintenance regime. The resulting estimates are therefore of the incremental operation and maintenance costs versus the baseline of the existing SRN network in the vicinity of the proposals.

Parametric estimating has been used for operation, maintenance and lifecycle cost estimates using cost models for highways and technology assets in order to produce incremental costs versus the base case of the existing network. These estimates have been prepared in real terms before and after discounting using unadjusted HM Treasury Green Book discount factors for an assessment period of 60 years. We have not included any allowance for relative price increase.

Operation and Maintenance cost estimates have been produced based on the following parameters and data:

- unit costs for routine operation and maintenance per square metre of running lane derived from current contract prices for Highways England's network management areas
- periodic renewals based on a standardised set of renewals frequencies as applied in our process for the calculation of commuted sums for future maintenance

For general highways, routine operation and maintenance costs are based on existing maintenance contract average lump sum prices for areas across England. These rates have been uplifted by 25% to reflect the higher cost of operation and maintenance activities in the South East of England and the M25 DBFO contract compared with national averages. Renewals cost estimates are based on a standard set of renewal frequencies, contained in Annex G, and contract schedule of rates data, also uplifted by 25%.

We have included an assessment of betterment for removal or renewal of assets within the existing maintenance burden.

We have presented estimates in real terms in this report to facilitate comparisons with the figures in the Airports Commission's *Cost and Commercial Viability: Cost and Revenue Identification Update* for each expansion option. Highways England's current default inflation forecast for major projects is included in Annex F for information. Estimates are at a price base of Q1, 2014 unless noted otherwise, which is consistent with the price base of figures in the Commission's *Cost and Commercial Viability: Cost and Revenue Identification Update* documents.

6. Stakeholder Engagement

While our focus is to validate the costs and delivery timescales in the Airports Commission's report, we have engaged with the promoters via DfT in order to confirm the current scope of proposals and reference information.

Following collection of the current design and planning data for each proposal, the following meetings were held with DfT and the promoters to clarify current design and delivery assumptions for the proposals developed by the promoters and identify any further data required for robust assessments:

- Gatwick Airport – 16th March 2016
- Heathrow Airport Limited – 6th April 2016

Drawings for the Heathrow Extended Northern Runway were received from the promoter, Heathrow HUB, on 20th April 2016.

7. Reference Documentation

Following a review of the Airports Commission reports, we have collected the technical submissions made by the promoters to the Commission and general arrangement drawings in advance of the above engagement meetings. Design and planning assumptions were clarified with the promoters at the engagement meetings in order to establish the basis of estimates.

A schedule of the reference documents used to derive the design and planning basis for each option is contained in Annex D.

The principal area where documentation is lacking is the design definition of surface proposals that have been recommended by the Airports Commission but not developed by the promoters.

8. Assumed Scope and Design Basis of Surface Access Proposals

8.1 Gatwick Airport Second Runway

The proposed SRN surface access works for Gatwick have no significant changes from the technical submissions made to the Commission. There is also no variance in the scope of proposals

recommended by the Commission and those proposed by Gatwick Airport Limited, which are shown on drawings with the following reference numbers:

- LGW2NR-ARP-ZZ-ZZ-DR-CH-00001 Rev P02.1
- LGW2NR-ARP-ZZ-ZZ-DR-CH-00101 Rev P02.1
- LGW2NR-ARP-ZZ-ZZ-DR-CH-00102 Rev P02.1
- LGW2NR-ARP-ZZ-ZZ-DR-CH-00103 Rev P02.1
- LGW2NR-ARP-ZZ-ZZ-DR-CH-00104 Rev P02.1
- LGW2NR-ARP-ZZ-ZZ-DR-CH-00105 Rev P02.1
- LGW2NR-ARP-ZZ-ZZ-DR-CH-00106 Rev P02.1

As noted in Section 4 of this report, the Airports Commission classified works to the North Terminal Access and A23 west of M23 Junction 9A as local roads, outside of the SRN. However, this short section of the A23 is part of the SRN.

The scope of each proposal is summarised below – further details are provided in the reference documents contained in Annex D.

- Junction 9 slip road widening
 - Widening of the M23 northbound merge at Junction 9.
 - Widening of the M23 southbound merge at Junction 9 including demolition and construction of the overbridge at Church Lane.
 - Widening of the M23 northbound slip lane at Junction 9 including the divergent M23 northbound link road.
 - Construction of the M23 Link road eastbound from Junction 9 including Balcombe Road diversion overbridge (Bridge 15) and terminating at the merge with the M23 Southbound Link Road.
 - Minor adjustment to the M23 southbound slip lane arising from construction of the M23 Southbound Link Road.
- Junction 9 grade-separated flyover
 - M23 Southbound Link Road commencing on the M23 immediately south of Perrylands Lane.
 - Widening of the M23 carriageway southbound from Perrylands Land for approximately 450m
 - Construction of new earthworks embankment and 2 lane carriageway southbound to Junction 9.
 - Construction of a 5 span flyover spanning Junction 9 and Balcombe Road diversion.
 - Construction of new earthworks embankment and 2 lane carriageway westbound from Junction 9 and terminating at the transition from Rural to Urban road at approximate chainage 1875 on drawing no LGW2NR-ARP-ZZ-ZZ-DR-CH-00102 Rev P02.1.

- Upgrade motorway communications and technology, including the addition of a sign and signal gantry, AMIs, MS4, MS3, CCTV, MIDAS loops and Emergency Roadside Telephones.
- Junction 9 to 9a road widening
 - Widening and realignment of the M23 spur eastbound carriageway from Junction 9 to Junction 9a
 - Hardening of the central reserve between Junction 9 and Junction 9a.
 - Extension of each end of the bridge over Peeks Brook Lane.
 - Construction of the Terminal Access Road outbound from the western abutment of Bridge 2 – TAR over the Junction 9 to Junction 9a carriageway to the merge with M23 spur eastbound.
 - Upgrade motorway communications and technology, including the addition of a sign and signal gantry, AMIs, MS4, MS3, CCTV, MIDAS loops and Emergency Roadside Telephones.
 - Localised widening to the Junction 9a roundabout to accommodate increased capacity.

There are also works to the A23 / Airport Way between M23 Junction 9A and the North Terminal Access point which is classed as local road works in the Airports Commission documents. This short stretch of the A23 is part of the SRN and we have produced an additional estimate for review versus the Commission's estimate for these proposed works. The scope of these works is shown on drawings LGW2NR-ARP-ZZ-ZZ-DR-CH-00103 Rev P02.1 and LGW2NR-ARP-ZZ-ZZ-DR-CH-00104 Rev P02.1 and is summarised below.

- A23 Realignment
 - Widening and realignment of Airport Way from Junction 9a to immediately east of Longbridge Junction, excluding reconfiguration of the existing roundabout to a signalised intersection.
 - Construction of the grade separated North Terminal Roundabout including Airport Way on and off slip roads but excluding link roads into the terminal.
 - Construction of the A23 southbound link from Airport Way to the northern abutment (by others) of the realigned A23 bridge over the Terminal Access Road - Bridge 9.
 - Construction of the A23 northbound link from the northern abutment (by others) of the realigned A23 bridge over the Terminal Access Road - Bridge 9.
 - Construction of Bridge 13, duplication of the Airport Way bridge over rail and conversion of the existing bridge to accommodate four eastbound lanes.
 - Construction of Bridge 14 - Airport Way over the North Terminal Roundabout.
 - Replacement of Airport Way bridge over waterway approximately 150m south east of Longbridge Junction.

- Construction of Bridge 11, A23 southbound link over Airport Way.
- Construction of Bridge 8, A23 southbound link over Ring Road south.

8.2 Heathrow Northwest Runway

The proposed SRN surface access works for the Heathrow North West Runway option are generally unchanged from the technical submissions made to the Commission. However, there is significant variance in the scope of proposals recommended by the Commission and those proposed by Heathrow Airport for the North West Runway option. Heathrow's proposals for the SRN are limited to works to the M25 and associated link roads south of M4 Junction 4B but the Commission's recommendations include the following additional elements:

- M4 J3 to J4 – Hard shoulder running in both directions and additional road widening
- M4 Airport Spur – Road widening in both directions
- M4 J2 to J3 – Road widening in both directions
- M4 J4 to J4b – Additional road widening in both directions
- M4 J4B – “Large M4 Junction 4B replacement” – deemed to be capacity improvements at M4 J4B
- M4 J4A – Implementation of higher capacity at the M4 Junction 4A
- M4 – Capacity improvements to existing main airport tunnel

The scope of the promoters' surface access design proposals has been clarified through collection of design information and engagement meetings. No drawings are available for those proposals recommended by the Commission but not developed by the promoters. We have therefore developed an outline scope and design assumptions for each of these proposals to form a basis for estimates.

The basis of estimate scope and design assumptions used for the validation of costs for each proposal are summarised below – further details are provided in the reference documents contained in Annex D.

- M4 J3 to J4 - Hard shoulder running in both directions and additional road widening
 - Widening of the M4 eastbound merge at Junction 4
 - Widening of the M4 westbound off-slip at Junction 4
 - Widening of the M4 carriageway eastbound and westbound to provide sufficient width for conversion of the existing hard shoulder into a running lane including reconstruction of the existing hard shoulder
 - Hardening of the central reserve
 - Replacement of road restraint systems
 - Provision of increased drainage capacity

- Demolition and replacement of the A437 bridge over the M4
- Widening of underpasses near Fuller Way and Shepiston Lane
- Widening of the M4 Junction 3 underbridge
- Remove existing portal and cantilever gantries
- Supply, install and commission roadside technology to enable implementation of Smart Motorways All Lane Running
- Provision of emergency refuge areas
- M4 Airport Spur - Road widening in both directions
 - Widen by one lane in each direction
 - Reconstruction of the existing hard shoulder
 - Demolition and replacement of 3 no. overbridges
 - Remove existing portal and cantilever gantries
 - Provision of replacement sign and signal gantries complete with electronic and static signage
 - Replace road restraint systems
 - Provision of increased drainage capacity
 - Provision of piled retaining walls to retain widened earthworks cut
- M4 J4 to J4b - Additional road widening in both directions
 - Provide one additional lane in each direction
 - Widen M4 Junction 4 westbound merge and eastbound off-slip
 - Widen M4 Junction 4b eastbound merge and westbound off-slip
 - Replace road restraint systems
 - Provision of increased drainage capacity
 - Remove and replace lighting as required
 - Demolish and replace one overbridge and one pedestrian bridge
 - Widen four underbridges at Holloway Lane, one pedestrian underpass, and bridges over two waterways to the east of Junction 4b
 - Remove existing portal and cantilever gantries
 - Provision of replacement sign and signal gantries complete with electronic and static signage
- M4 - Implementation of higher capacity at the M4 junction, J4a
 - Provide a mainline underpass under the Junction 4a roundabout

- Construct piled retaining walls to form a slot for the roundabout underpass
- Construct three overbridges spanning the slot – two bridges forming the roundabout and one bridge on the A4 carriageway
- Excluded is reconfiguration of the roundabout and upgrading of the A4
- M25 - M25 tunnelling costs (south of junction 15)
 - The following new and realigned carriageways include where applicable:
 - Demolition and construction of bridges
 - Removal of gantries and replacement with sign and signal gantries
 - Drainage capacity increase
 - Removal and replacement of road restraint systems
 - Widening/realignment of carriageways
 - Removal and replacement of lighting as required
 - M25 Realignment to the north and south of the cut and cover tunnel
 - Cut and Cover tunnel 82 m in overall width and 640m long consisting of four carriageway cells
 - Entry and exit slots for the cut and cover tunnel
 - Widening and realignment of the M4 eastbound link to the M25 anticlockwise
 - Widening and realignment of the M4 westbound link to the M25 anticlockwise
 - Widening and realignment of the M25 clockwise link to the M4 eastbound
 - Widening and realignment of the M25 clockwise link to the M4 westbound
 - Construction of the M25 clockwise to airport entry
 - Realignment of Junction 14
 - Realignment of Junction 14a
 - Realignment of the airport exit to Junction 14a
 - Realignment of the airport exit to Junction 14
 - Realign the Junction 14 to airport entry link road
 - Construction of the M25 anticlockwise to airport entry
 - Construction of the Junction 14 link to the M25 clockwise
 - Realignment of the Junction 14 link to the M25 anticlockwise
 - Realign and construct the Junction 14 connection to the M25 clockwise to M4 link road
 - Realignment of the airport exit to the M4 westbound link road to the M25 anticlockwise

- Construction of the M25 clockwise to Horton Road link road

Scope Definition of Proposed “M4 J2-3 Widening” and “M4 J4B Replacement”

The scope of works proposed for widening of M4 J2-3 requires particular attention because of the elevated sections of the M4 immediately west of J2 and the high concentration of properties immediately adjacent to the highway boundaries over this section. Widening the M4 over this location is very challenging and it is highly probable that tunnelling would be required in the built-up areas to the west of M4 J2. There is a high level of inherent uncertainty in the scope of works required for widening of the M4 between junctions 2 and 3. Our assumed scope for the basis of our estimate is summarised below:

- M4 J2 to J3 - Road widening in both directions
 - Provide one additional lane in each direction
 - Widen M4 Junction 3 eastbound merge and westbound off-slip
 - Adjust Motorway Service Area entry and exits
 - Remove existing portal and cantilever gantries
 - Provision of replacement sign and signal gantries complete with electronic and static signage
 - Demolish and replace three overbridges
 - Provision of increased drainage capacity
 - Remove and replace lighting as required
 - Replace road restraint systems
 - Demolish and replace one footbridge
 - Widening of the M4 Junction 3 underbridge, three overbridges, one waterway crossing, one pedestrian underpass and one rail crossing
 - Convert the elevated viaduct/carrageway from junction 2 to westbound only travel for approximately 3km to immediately west of the existing rail overbridge
 - Construct a driven 3 lane tunnel for eastbound traffic with the entry slot to the east of the rail noted above and exiting in parkland to the north of Junction 2, ramping up to merge with the existing viaduct

The Airports Commission report refers to a “replacement” of M4 Junction 4B, which may be a legacy of previous options for expansion at Heathrow. We have developed a baseline scope for pricing maintaining the existing interchange but with in-situ replacement of existing links and merge / diverge scope with higher capacity alignments – providing an additional running lane and increasing merge / diverge classes where feasible. We have not increased link capacity where the existing links currently have two running lanes. The assumed scope of these works is summarised below.

- M4 Junction 4b "Replacement" (Capacity Increase)
 - Widening of the M25 clockwise and anticlockwise to four lanes south of Thorney Mill Road to south of the M4 eastbound to M25 anticlockwise link road overbridge including widening of the M25 bridge over link roads, rail and the M4.
 - Widening of the M25 to M4 eastbound and westbound link road from the M25 to the eastbound and westbound diverge.
 - Widening of the M25 clockwise to M4 eastbound link road to 2 lanes where it is currently one lane.
 - Replacement of the M4 bridge over rail and link roads to accommodate link road widening.
 - Widening of the M4 westbound to M25 clockwise link road including replacement of the bridge over the M25, M4, link roads and rail.
 - Widening of the M4 eastbound to M25 anticlockwise link road including replacement of the bridge over the M25, M4, link roads and rail.
 - Widening of the merged M25 clockwise/anticlockwise to M4 westbound link road.

8.3 Heathrow Extended Northern Runway

The SRN surface access proposals for the Extended Northern Runway option are generally consistent with those for the North West Runway option with the following exceptions:

- The M25 south of Junction 15 is realigned over a greater length and further to the west.
- Junction 14a is removed
- The entry to and exit from the airport is via Junction 14, whereas for the North West Runway option there is a one-way entry to the airport from Junction 14 with exit via Junction 14a
- Junction 14 is relocated to the south and is reconfigured with two flyovers and elimination of the roundabout
- The M25 to M4 links at Junction 15 differ in alignment

We have adopted the Heathrow North West Runway design basis and planning assumptions for the basis of estimates for the Extended Northern Runway surface access works and these are contained in Annex F. The Heathrow Extended Northern Runway surface access proposals and phasing are shown on the drawings with the following reference numbers received from Heathrow HUB:

- P 47067372/TL/SK/127 Rev. 02
- P 47067372/TL/SK/128 Rev. 02
- P 47067372/TL/SK/129 Rev. 02
- P 47067372/TL/SK/130 Rev. 02
- P 47067372/TL/SK/131 Rev. 02
- P 47067372/TL/SK/132 Rev. 02

8.4 Impacts of Proposals on the Surrounding Road Network

The Commission's report sets out proposed surface access works on the strategic highway network and local road network. The validation of cost and delivery assumptions for those works on the local road network is outside the scope of our brief and we have not analysed the local roads proposals. However, the impact of the proposed widening of M4 J2-3 is an area of concern. Providing an additional lane of capacity in both directions between M4 J2-3 is likely to impact the surrounding road network at J2 and may require substantial works in this heavily built-up location.

An assessment of the impact of proposals on the surrounding road network at M4 J2 would require wider validation of the Commission's traffic modelling and forecasting. This is outside our scope but we consider there is a risk of increased scope of works required to cater for the additional capacity at M4 J2 in particular.

9. Comparisons with Airports Commission's estimated costs

Our assessment of the estimated costs for implementation of the SRN proposals and comparison with the Airports Commission's figures is contained in following tables. Annex E contains build-ups of the estimated costs to implement each proposal by work breakdown structure cost elements. Annex G contains profiles of estimated operation and maintenance costs (covering routine opex and asset renewals) for an assessment period of 60 years.

9.1 Treatment of Risk, Optimism Basis and Estimate Range

Section 4 describes our rationale for use of Optimism Bias in place of our normal approach of specific consideration of individual proposals risk, opportunity and uncertainty. However, our approach to Optimism Bias is different to the Airports Commission's approach for the implementation of all proposals on the M4 and M25.

We have classified these schemes as complex, non-standard works and have accordingly applied an OB uplift of 66%. The Airports Commission has applied OB at 44% (the unmitigated factor for standard highways schemes at this stage) in the figures used for comparisons in this document. However, the constraints on construction presented by the M4 and M25 level of congestion and availability of road-space mean construction is highly complex on these areas of the network and we consider that the schemes should be classed as complex for the application of OB.

We consider that the Gatwick surface access proposals on the SRN are standard complexity and have applied OB uplifts of 44%, consistent with the Airports Commission's approach.

We have applied OB to Operation and Maintenance cost estimates at 44%. The Commission's *Cost and Commercial Viability: Cost and Revenue Identification Update* documents have been selected for the purpose of comparison. For each option, the Commission's costs do not include OB in calculations of asset replacements and opex for the SRN in isolation. (The Commission has applied Optimism Bias at 44% for opex and asset replacement for the combined works on the SRN and local road networks.) HM Treasury Green Book does not specify Optimism Bias uplifts for operation and

maintenance costs but Green Book Supplementary Guidance recognises that Optimism bias should be considered. We agree with the Commission’s approach to apply the standard complexity OB uplifts for this stage of appraisal (44%) to operation and maintenance costs for all proposals.

9.2 Gatwick Second Runway – Estimated SRN Surface Access Capex Estimates

Table 2 below compares our assessment of implementation costs for each SRN surface access proposal for Gatwick with those included in the Airports Commission’s report.

Table 2: Gatwick Second Runway – Summary of Estimated Scheme Costs vs .Commission’s Figures

Proposed Works	Airports Commission Estimate (£M @ 2014 prices incl. OB)	Highways England Range Estimate (£M @ 2014 Prices)	
		Minimum Range Point	Maximum Range Point
Junction 9 Slip Road Widening & Improvements	£61	£22	£45
Junction 9 Grade Separated Flyover	£50	£34	£68
Junction 9 to Junction 9A Widening	£32	£17	£36
Airport Way Lane Widening, North Terminal Access Roundabout / approaches & A23 to Airport Way Links	£91	£75	£151
Totals:	£234	£148	£300

The Airports Commission’s estimates are within our range estimates for all proposals except the M23 Junction 9 slip road widening and improvement. Our November 2015 exercise raised concerns that the Commission’s estimated costs for a flyover at M23 J9 were lower than our range of costs for recent junction flyover works. Following clarification of the scope and design of the proposals at M23 J9, the scope of works is less complex than we envisaged in November and the Commission’s estimated costs for the M23 J9 Flyover falls within the range of our bottom-up assessment.

9.3 Gatwick Second Runway – SRN Surface Access Operation and Maintenance Estimates

Table 3 below contains a summary of our estimate of the incremental operation and maintenance costs for each proposal versus the current do-minimum scenario.

Table 3: Gatwick Second Runway –Estimated Operation and Maintenance Costs (After Discounting) vs. Commission’s Figures

SRN Surface Access Proposal	Highways England Range Minimum Estimate (Excl. OB) (After Discounting)	Highways England Range Maximum Estimate (incl. OB @ 44%) (After Discounting)	AC Comparable Total (derived from stated lane-km allowances, incl. OB at 44%) (After Discounting)
M23 J9 Slip Road widening	£6,567,121	£9,456,654.24	
M23 J9 Flyover	£6,228,416	£8,968,919.04	
M23 J9-9A widening	£5,215,046	£7,509,666.24	
Airport Way Lane Widening, North Terminal Access Roundabout / approaches & A23 to Airport Way Links	£22,674,072	£32,650,664	
TOTAL	£40,684,655	£58,585,904	£54,823,973

We have applied optimism bias to our base estimate of operation and maintenance costs (covering routine operation and maintenance and asset renewals) and used this to produce a range estimate with the range maximum including unmitigated OB allowances

These estimates assume an assessment period of 60 years and discounting using unadjusted factors from HM Treasury’s Green Book. Estimates include allowances for betterment where existing assets are replaced with new infrastructure or removed from the current maintenance burden. Profiles of estimated operation and maintenance costs by year are contained in Annex G with the standard renewal frequencies assumed for the basis of estimates.

The Commission’s *Cost and Commercial Viability: Cost and Revenue Identification Update* documents set out unit rates per lane-km per annum for routine operation and maintenance (“opex” in the Commission’s reports) and asset renewals. These are £0.046M per lane-km per annum and £0.045M per lane-km per annum respectively. We have produced a commuted sum for future maintenance using these rates and the Commission’s assumptions as follows, in order to provide a like-for-like comparison with outputs produced using our estimating methodology:

- Clarification of the incremental lane-km resulting from each of the Commission’s proposals using the lengths of proposals quoted in the Commission’s reports
- Production of the incremental annual estimated cost for opex and asset renewals by applying these unit rates to the stated lengths in the Commission’s reports
- Application of discounting for each estimated annual cost using unadjusted factors from HM Treasury’s Green Book for an assessment period of 60 years
- Application of Optimism Bias at 44%

This approach is consistent with our procedures for the calculation of commuted lump sums for future maintenance that would be charged to third party developer schemes except that optimism bias is not included in the commuted sum calculation.

9.4 Heathrow Northwest Runway – Estimate Summary

Table 4 below compares our assessment of implementation costs for each SRN surface access proposal for Heathrow North West Runway with those included in the Airports Commission’s report.

Table 4: Heathrow North West Runway – Summary of Estimated Scheme Costs vs .Commission’s Figures

Proposed Works - Airports Commission Description	Airports Commission Estimate (£M @ 2014 prices incl. OB)	Highways England Range Estimate (£M @ 2014 Prices)	
		Minimum Range Point	Maximum Range Point
M4 J3 to J4: Hard shoulder running in both directions and additional road widening	£274	£37	£86
M4 Airport Spur: Road widening in both directions	£202	£33	£76
M4 J2 to J3: Road widening in both directions	£1,267	£763	£1,785
M4 J4 to J4b: Additional road widening in both directions	£338	£58	£136
M4 J4B Large M4 junction, J4b replacement	£216	£131	£305
M4 J4A Implementation of higher capacity at the M4 junction, J4a	£58	£35	£82
M4 - Existing Airport Tunnel Capacity improvements to existing main airport tunnel	<i>This link is not part of Highways England’s road network and has been excluded from the scope of our assessment</i>		
M25 M25 tunnelling costs (south of Junction 15)	£576	£471	£1,101
Totals (excl.M4 Existing Airport Tunnel)	£2,931	£1,528	£3,571

Our assessment shows substantial variances in the estimated costs for individual proposals, in particular the largest proposals by cost: M4 J2 to J3 Widening and M25 tunnels and works south of Junction 15. Aggregated, the Airports Commission’s estimates lie within the range of our assessment but we consider there is significant potential for cost overruns of these large-scale proposals on the M25 and M4 J2-3 because of the high level of uncertainty over the scope of works

required. As described in Section 8.1, we have applied an increased optimism bias factor to reflect this uncertainty but there remains potential for increased scope and constraints leading to cost increases in excess of this uplift. This is particularly the case for the M4 J2-3 widening where we have assumed alignment and there are numerous unknowns in relation to key cost drivers – for example, required capacity, ground conditions, impacts on the surrounding network at Junction 2, lands costs and internal condition of the elevated sections of the M4.

The Airports Commission has prepared point estimates inclusive of Optimism Bias and the most comparable figure in our range assessment is our Maximum Range point, which includes unmitigated Optimism Bias. Our assessment is based on discrete construction of individual proposals (many of which are phased) rather than delivery as a single programme.

9.5 Heathrow Northwest Runway – Operation and Maintenance Costs

Table 5 below contains a summary of our estimate of the incremental operation and maintenance costs for each proposal versus the current do-minimum scenario.

There is substantial variance between the Commission's figures and our estimate of operation and maintenance costs for the Heathrow SRN surface access proposals. The comparable total within the Commission's report, derived from its use of high-level unit rates per lane km with optimism bias, is £334M. This is 51% of our maximum range point of £657M over a 60 year assessment period.

As set out above for the Gatwick Second Runway analysis, we have derived this figure by applying the Commission's rates per lane-km for asset renewals and routine opex over the stated lengths of proposals given in the Commission's report to produce an estimated annual cost for operation and maintenance, including optimism bias at 44%. This has then been discounted over an assessment period of 60 years to provide a like for like comparison with our parametric estimate.

We have produced our range assessment by including Optimism Bias uplifts at 44% for the maximum range point. We have therefore classed Operation and Maintenance activities as standard complexity works rather than the classification of complex applied to the implementation works for the M4 and M25 proposals.

This variance is overwhelmingly driven by the high costs of tunnel operation and maintenance for the M25 South of Junction 15 and M4 J2-3 Widening. The Commission's estimates of opex and asset replacement costs are based on average national unit rates for a given road classification and therefore effectively omit the high costs of operating and maintaining these tunnel assets.

Table 5: Heathrow Northwest Runway – Summary of Estimated O&M Costs vs .Commission’s Figures

SRN Surface Access Proposal	Highways England Base Estimate (Excl. OB) (After Discounting)	Highways England Estimate Total (incl. OB@44%) (After Discounting)	AC Comparable Total (derived from stated lane-km allowances, incl. OB @ 44%) (After Discounting)
M4 J3 to J4 Widening	£16,842,340	£24,252,970	
M4 Airport Spur Widening	£9,832,341	£14,158,571	
M4 J2 to J3 Widening (Incl. Tunnel O&M)	£210,709,815	£303,422,133	
M4 Junction 4 to Junction 4b	£19,404,012	£27,941,777	
Implementation of higher capacity at the M4 junction J4a	£15,952,763	£22,971,979	
M25 south of M25 Junction 15 (incl. Tunnel O&M)	£159,024,290	£228,994,977	
M4 J4B “Replacement” (Capacity Increase)	£24,403,134	£35,140,513	
TOTALS:	£456,168,695	£656,882,920	£333,591,102

We have assumed that each tunnel will require a dedicated control centre and works depot with 24 hour surveillance and recovery vehicle facilities (location will be subject to assessment).

Renewal frequencies for asset replacement have been assessed with renewals for the following assets required during the assessment period: pavements, tunnel fabric and finishes, air monitoring, HVAC & ventilation, hydraulic treatment, storm water and drainage pump stations, high / low voltage electrical distribution and control, power supplies, lighting, electronic signage, fire detection and suppression systems, surveillance, monitoring and control systems and servers, telephones, communications and public address and roadside furniture.

9.6 Heathrow Extended Runway – Estimate Summary

The Commission’s proposed scope of SRN surface access works are largely identical for both expansion options at Heathrow, the *Northwest Runway* and *Extended Northern Runway* alternatives, the only area of difference being proposals for the M25 south of Junction 15.

Our assessment of the costs of the proposals for this section of the M25 found that costs were similar and:

- the Airports Commission’s capex estimates were within our range estimate of expected cost for both alternatives
- Airports Commission’s estimates for opex and asset replacement were below our range estimate of expected cost for both alternatives, primarily due to the Commission’s use of national average unit rates for these costs which did not take account of the higher costs of operation and maintenance of the congested M25-M4 network and, in particular, proposed tunnels on the M25

Table 6 contains a summary of our range estimate of the costs of delivery for each SRN surface access proposal and comparison with the Commission’s estimates.

Table 6 - Extended Northern Runway – Summary of Estimated Scheme Costs vs. Commission’s Figures

Proposed Works - Airports Commission Description	Airports Commission Estimate (£M @ 2014 prices incl. OB)	Highways England Range Estimate (£M @ 2014 Prices)	
		Minimum Range Point	Maximum Range Point (incl. OB @ 66%)
M4 J3 to J4: Hard shoulder running in both directions and additional road widening	£274	£37	£86
M4 Airport Spur: Road widening in both directions	£202	£33	£76
M4 J2 to J3: Road widening in both directions	£1,267	£763	£1,785
M4 J4 to J4b: Additional road widening in both directions	£338	£58	£136
M4 J4B Large M4 junction, J4b replacement	£216	£131	£305
M4 J4A Implementation of higher capacity at the M4 junction, J4a	£58	£35	£82
M4 - Existing Airport Tunnel Capacity improvements to existing main airport tunnel	<i>This link is not part of Highways England’s road network and has been excluded from the scope of our assessment</i>		
M25 M25 tunnelling costs (south of Junction 15)	£864	£513	£1,200
Totals (excl.M4 Existing Airport Tunnel)	£3,277	£1,570	£3,670

The Extended Northern Runway surface access proposals include realignment of the M25 to the west and wholesale removal of the existing M25 between Junction 15 and Stanwell, south of

Junction 14. Our assessment shows the Extended Northern Runway proposals for the M25 have a significantly higher capex cost than the North West Runway proposals, which maintain the M25's existing alignment apart from the proposed tunnels. Although the Extended Northern Runway proposals for the M25 have a higher estimated capex than the North West Runway, operation and maintenance estimates are c. 20% lower, largely due to the extent of removal of M25 junctions, slip roads and associated aged assets from the existing maintenance burden (see below).

9.7 Heathrow Extended Northern Runway – Operation and Maintenance Costs

Table 7 contains a summary of our estimate of the incremental operation and maintenance costs for each proposal, assessed versus the current do-minimum scenario for a 60 year assessment period with discounting.

Table 7 - Heathrow Extended Northern Runway –Estimated O&M Costs vs. Commission's Figures

SRN Surface Access Proposal	Highways England Base Estimate (Excl. OB) (After Discounting)	Highways England Estimate Total (incl. OB@44%) (After Discounting)	AC Comparable Total (derived from stated lane-km allowances, incl. OB @ 44%) (After Discounting)
M4 J3 to J4 Widening	£16,842,340	£24,252,970	
M4 Airport Spur Widening	£9,832,341	£14,158,571	
M4 J2 to J3 Widening (Incl. Tunnel O&M)	£210,584,830	£303,242,155	
M4 Junction 4 to Junction 4b	£19,404,012	£27,941,777	
Implementation of higher capacity at the M4 junction J4a	£15,952,763	£22,971,979	
M25 south of M25 Junction 15 (incl. Tunnel O&M)	£126,199,148	£181,726,773	
M4 J4B "Replacement" (Capacity Increase)	£24,403,134	£35,140,513	
TOTALS:	£423,218,567	£609,434,737	£333,591,102

As with the North West runway, the variance with the Commission is overwhelmingly driven by the high costs of tunnel operation and maintenance for the M25 South of Junction 15 and M4 J2-3 Widening. The Commission's estimates of opex and asset replacement costs are based on average

national unit rates for a given road classification and therefore effectively omit the high costs of operating and maintaining these tunnel assets.

We have assumed that each tunnel will require a dedicated control centre and works depot with 24 hour surveillance and recovery vehicle facilities and asset replacement costs are far greater than standard highway rates in order to cover renewals of tunnel fabric and finishes, HVAC & ventilation, hydraulic treatment, electrical distribution and control, fire detection and suppression systems, surveillance, monitoring and control systems, etc.

10. Validation of Deliverability

10.1 Methodology of Delivery Viability Assessment:

The assessment of viability of the Gatwick and Heathrow proposals are confined to major interface elements with the existing Strategic Network.

It is not in the scope of this report to assess the relative benefits in parallel to the risks and impacts that come with each proposal.

In accordance with the requirements of the DfT Specification of Requirements (see Annex A) the focus of the report is limited to the following:

- Delivery timescales and milestones (including Start and Finish dates)
- An assessment (qualitative) of delivery risks
- Significant assumptions and interdependencies
- Network disruption
- Potential impact on Road Investment Strategy commitments and delivery

Engagement and documentation is as previously noted in the Cost Validation section. Additionally a report commissioned by HAL and produced by Mace in February 2015 was used as a key reference for the assessment of the HAL proposal.

Due to the limited material and engagement, the assessment is largely qualitative and based on the experience of the Highways England Major Projects and Operational teams. Where possible and available a desk top analysis of proposed timelines and methodology was carried out with the intent of validating or otherwise the viability of the proposals and apportioning a relative scale to the associated risks and impacts.

No detailed numerical/data analysis or any form of modelling has been carried out.

10.2 Gatwick Airport Limited:

Summary

Gatwick Airport Limited (GAL) have developed their proposal using primary consultant input from Bechtel (project management) and Arup (technical and design).

The main element of the proposal that directly interfaces with the existing strategic network is the construction of a new grade separated junction alongside the existing Junction 9 of the M23, which forms the primary access for North/South traffic to the airport.

An assessment is made on the potential impact on the existing local network in general of the development as it is clearly a significant operation that will have relatively large numbers of vehicles accessing on a daily basis during the construction works which will represent a large increase in local traffic and in particular HGV's.

GAL were able to give the Highways England review team a good level of confidence in respect of their development of methodology and timeline both through the engagement meeting and materials provided.

Deliverability assessment

It was apparent from discussion and information tabled both at the engagement meeting and additional material subsequently provided, that significant effort and thought had been applied, resulting in a relatively (for the stage of development) high level of granularity around the construction process.

This was supported by a sixteen page schedule to Level 2/3 detail, and was assessed as being well thought out with solid logical relationships between elements of work.

The parties were readily able to discuss in detail the construction sequence and methodologies included in the development proposal, adding to the positive view of the proposal. This was further supported by a highways specific timeline.

Deliverability advice and input was confirmed as being from within Bechtel only, as opposed to a Tier 1 contractor which is generally regarded as offering a higher confidence level. However Bechtel have gone to a level of detail whereby for example, specific plant types have been considered which would indicate that timescales have been worked out on a production and logic basis by experienced parties.

The scope of works is captured in the Cost Validation section of this report. Perhaps the most significant element with regard to the network is the super-elevated bridge spanning the existing

M23 Junction 9 and the Balcombe Road diversion, with an overall span of circa 350m. Significantly, most of the works are to be carried out off-line and only one weekend closure of the M23 was stated as being required.

This part of the proposal is a large civil engineering project in itself, but not particularly novel or previously untested in the UK. As such, it represents a relatively low risk of not being delivered in accordance with the proposed timeline and is within the recent experience of the UK's top contractors.

The largely off-line nature of the works gives a relatively low impact on the existing network.

The works associated with the M23 were shown as being due to commence during the latter part of 2021. This is reasonable if the development and Statutory (DCO) process were progressed without undue delay starting in 2016/2017. Evidence suggested that GAL were likely to have a sufficiently developed submission to meet programme requirements for the statutory process to proceed. GAL confirmed that they intended to submit one overall submission for the DCO encompassing all elements of the development. This means that full powers to GAL are in place from the start of the delivery phase, though perhaps creates a risk that one element of challenge could delay the whole process.

On the assumption that the procurement strategy employed by GAL would result in a Tier 1 civils contractor(s) being engaged under a relatively standard and not negatively amended form of contract, it is unlikely that failure of the construction vehicle will factor in the certainty of delivery. Whilst the market is likely to be very active at the time work commences, a high profile scheme such as this is likely to be high on the list of desirable undertakings for the key suppliers.

A Project Execution Plan and Logistics Strategy have been produced (during the first half of 2015), showing that development had continued beyond the initial submission. Whilst not necessarily at a level of detail for construction to start and in some respects non-committal, they are comprehensive for the stage of the scheme, address significant issues and demonstrates the level of detail that has been considered.

Associated Network impact/Roads Investment Strategy

Construction is likely to be largely off-line and a specific closure of the M23 has been mentioned during the placement of superstructure elements to the grade separated junction flyover. As such, whilst some reduction in traffic flow is inevitable due to access and tie-in traffic management combined with the volume of construction related vehicles (excluding rail delivery) large scale disruption would not be envisaged.

The scheme does not appear to have any specific or significant impact on the RIS programme in its current form as far as physical or locational factors go. However, the number of large schemes within the RIS programme alone that are due to be on site at the same time will create significant pressure on suitable resources.

10.3 Heathrow Airport Limited (HAL)

Background

Recently HAL have appointed Mace, Arup, CH2M and Turner and Townsend as delivery partners in the event of their proposal being confirmed. Arup also produced the outline design for GAL's proposal.

Specifically relevant to the assessment of deliverability on this option is the Construction Delivery Report commissioned by HAL and produced by Mace in February 2015.

The HAL option is significantly larger in scale as far as the interface with the Strategic Road Network goes and has a more complex solution in that the M25 is diverted along a 4km route including a 650m section of tunnel as a new third runway passes through the alignment of the M25. This also involves a significant temporary diversion of the A4 over the completed section of tunnel whilst the tunnel and new A4 are completed. This will involve significant lengths of traffic management and consequential travel disruption in an already heavily congested part of the network.

As is the case with the GAL proposal the nature of construction proposed, whilst not novel in itself is significant in scale and will potentially place resource challenges on the industry as it runs concurrently with the more than half of construction phases in the RIS programme alone. A more detailed market capacity review in line with the emerging RIS programme detail, would generate a more detailed understanding of this issue.

Deliverability assessment

Considering the scale of the proposal and the time that has elapsed since original submission to the Airports Commission, it was surprising that the main point of reference provided for this assessment was the February 2015 Mace report.

The scheme had not been progressed significantly since 2014 and as such there is a significant risk that delay would eventuate from a delayed DCO submission that would be accepted for examination.

The HAL team were confident that they would be ready to submit for DCO examination in the proposed time-frame, however this confidence was not visibly supported by progress at the engagement session or in subsequent dialogue.

By way of comparison, far simpler schemes within the RIS programme remain a significant challenge to achieve first quarter 2020 start dates.

The Heathrow proposals have specific and significant interface with both the M25 and the A4; this assessment focuses on these two areas of work.

Overall, the Heathrow proposals are significantly more complex and have more critical areas of risk associated with them than the simpler and more “green field” Gatwick proposal.

Additionally, the area around Heathrow has extensive Thames Water assets (reservoirs, shallow tunnels and major pipelines) all of which represent a significant set of strategic assets (eg, London drinking water supply) which may be impacted by the works. We are not in a position to understand the risks associated with this at this stage, but they represent reasonably significant risk to timelines.

M25:

The M25 proposal in summary diverts the existing motorway over a 4km length with a parallel section in tunnels (cut and cover) over a length of approximately 650m underneath the new runway and surrounding development.

Development of the M25 works in order to commence in 2020/21 is extremely challenging.

In consideration of the enabling works, the timescale and lag to start of tunnelling appears to be reasonable, though exact assumptions are unclear and detail of tunnel foundations for example may put this timescale at risk.

A particular element of risk is the diversion of overhead power lines prior to the granting of the DCO and demolition of existing lines. Whilst there is three year timescale assigned to it commencing in 2016, such large utility diversions can be extremely complex and difficult to realise in a timely fashion.

The tunnel construction, whilst significant in terms of quantum is not novel or particularly high risk in relation to required outputs. It is taken that the assumed methodology is traditional in-situ reinforced concrete. It is reasonable to conclude any of the major contractors would develop an operational sequence capable of achieving programmed outputs.

However, in common with the proposal in general it appeared that design development was at a largely outline stage at best requiring a more conservative approach to assessing risk and to this end it is reasonable to conclude the M25 diversion proposal is certainly deliverable in the timescales assumed but with a higher degree of risk than might otherwise be assigned due to the lack of detail in design development. There was no evidence to support the inclusion of significant time contingency in the timeline detailed in the Mace report, which should therefore be considered a risk to start of works as well as achievement of some of the significant interdependency milestones.

The M25 works are firmly on the critical path and as such their successful completion directly impacts on the delivery and hence benefit realisation of the entire proposal. The South West section in which the M25 works are located has a number of complex challenges,

The interface between the A4 and M25 is noted in the Mace report as being one that will require very careful planning and it is clear that it is an area of schedule risk.

During the meeting of the 6th April it was noted that the intended route for procurement was to create a “delivery team”. Successful realisation of this is a critical element in realising the stated outcomes. Whilst partners have been appointed to deliver the development stage of the scheme, there is as yet no evidence of a contractor being brought on board and early involvement of a construction partner would be seen as a significant risk mitigation in itself.

A4:

The route of the A4 is diverted North of the development with crossings of the new M25 tunnels and significant phasing of the works as the tunnels are built and the traffic is transferred from the existing A4 (including the bridge over the M25) to the new.

Aside from the general location of the works and important phasing, the intended construction appears to be of a normal risk profile and shouldn't offer any heightened risks to delivery. The A4 works are not shown as being critical path, however it appears that any significant delay to progress of the section that interfaces with the M25 would impact the M25 tunnels and therefore the delivery of the runway. This is a potential risk to the overall development.

The Mace Report makes note of opportunities to commence enabling works outside of the DCO regulated area at an early stage. It appears that this is not taken as an opportunity to the schedule and as such is an area that would create contingency in the schedule if realised.

Associated Network impact/Roads Investment Strategy

Existing Network:

The South West quadrant is one of the busiest sections of the network and regularly experiences significant journey time delay. The proposed highway works, albeit that large elements are constructed off-line and even with careful phasing and traffic management is likely to make the situation significantly worse.

Whilst it is stated that the intent would be to utilise rail transport and on-site generated earthworks and aggregate supply, it is inevitable that there will be significant additional movement of commercial vehicles in the area. This is likely to add to the disruptive element of the works to traffic flow in the area which is a complex network of routes compared to the Gatwick area.

Particular pinch points will be the numerous switchovers as works progress for example the switch between the old A4 bridge over the M25 and the temporary diversion over the constructed section of the new M25 tunnel.

A repeated theme in the responses to questions both during and subsequent to the meeting of the 6th April, was Heathrow Airport Limited's emphasis that the scheme was in an early stage of

development. This reinforced the view that there was no evidence that development had progressed since 2014.

The experience of Highways England teams is that the M25 already experiences over capacity periods in the area of Junction 14 (part of the RIS SMART Motorway scheme to alleviate this situation). Additionally the location of the tunnel sections relatively close to Junction 15 could increase the likelihood of incidents as traffic will only have a relatively short distance prior to the junction. That said, the proposed layout on the approaches to the tunnels due reduce the weaving tendencies of traffic compared with the existing layout.

Highways England Operational experts have confirmed that tunnels have a high level of sensitivity to incidents and the impact is often significant on the flow of traffic. Suffice to say, in such a heavily trafficked area even minor incidents or break downs will have a significant impact on journey times.

The stretch of M25 is part of a well-documented DBFO arrangement with Connect Plus. As previously noted in the Highways England initial response of the 27th November 2015, the contractual amendments brought about by the Heathrow options are likely to be both arduous in negotiation and costly in agreement.

By way of previous examples, the then Highways Agency took steps to vary the PFI contract for significant changes (for example Later Upgrade Sections (£52m); DFFC Stage 1 (£125m); M3 Smart Motorway (£5m). Each change took over a year to agree. The cost of each change was also significant - ranging from £1m to £3m. It is anticipated that a major change to the DBFO Contract such as for one of the Heathrow options would generate a significant quantity of contractual activity between HE and Connect Plus and potentially impede delivery timescales and impact on the cost of the Project.

The cost of any change would not be limited to the maintenance of new infrastructure, but may have a lasting impact on the DBFO CO's payment mechanisms - notably the Route Performance Management Adjustment; Lane Closure Charges, Safety Performance and any impact on Critical Incidents. Also the DBFO Co would inevitably seek relief from its forgoing and longer term performance obligations due to the nature and size and duration of the Project.

Steps could be taken to minimise the anticipated challenges, however Highways England would need further details of the projects commercial and packaging approach to better advise on the delivery of the Project.

RIS Programme:

The proposed development and specifically works to the M25 will have a clear bearing on the RIS committed scheme between Junction 10 and 16 of the M25. The RIS describes it as:

M25 Junctions 10-16 – upgrading the M25 between junction 10 (A3) and junction 16 (M40) through a mixture of enhancements, including hard shoulder running between junctions 15 and 16, as well as four-lane through-junction running between junctions 10 and 12.

The scheme is being developed under the SMART Motorway programme and is due to start construction by the end of the first quarter of 2020. The nearest section affected would be four lane running through Junction 15 and there is a strong possibility that construction phases would overlap – hence the need for a review.

As noted in Highways England initial response of 27th November 2015, the works to the M25 and shift into tunnels would require at the very least a re-assessment of requirements for this scheme and likely delay in commencement of construction with probable abortive and other significant costs being incurred. Clearly a delay in upgrade of the M25 in this area will have a negative impact on benefits realisation of this important part of the network.

Referring to the Airport Commission “Cost and Commercial Viability: Financial Modelling Input Costs Update” of July 2015 and specifically Figure 17 of Section 2.2.2 Surface Access Costs, the overall cost of surface access is considered to total £4,962m and a spend profile is illustrated over the years 2021 to 2026.

By inspection of the above referenced document, it appears that spend in the early stages is circa £33m/month rising to circa £70m/month between 2022 and 2024 on surface access alone. This is a significant spend rate and will require rapid and significant mobilisation as well as availability of resource. This is somewhere approaching the half of the entire spend associated with the whole Regional Investment Programme within RIS at its peak during 2020-2022.

The timing of Heathrow (and Gatwick) proposals align with the RIS programme to the extent that circa 50 schemes will be going through DCO nationally at the same time and a similar number of schemes are scheduled to start on site at similar times. Whilst unquantifiable within the constraints of this report, all schemes but particularly the Heathrow proposals will place significant pressure on Tier 1 contractors’ resources if timescales for infrastructure projects in the UK and particularly the South of England stay the same.

An assessment will also need to be made of the likely and growing national impacts on Highways England’s KPIs for network availability and customer satisfaction, if a project of this scale and potential disruption is executed at the peak of planning and construction activity across the overall programme.

There will be a substantial risk of excessive customer frustration about what might be prolonged period of disruption, first while any Heathrow works are done and then while our works are completed within the wider area.

In planning this, Highways England will need to dovetail future works (e.g. - those which come out of the current South West Quadrant strategic study) with the Heathrow works. Clearly, from a customer’s perspective there is an opportunity to minimise the disruption and maximise the gain. That would require either Highways England’s works to be wrapped into Heathrow’s DCO, or for us to run them separately but to similar timescales. Complications abound with both options.

ANNEX A**DfT SPECIFICATION OF REQUIREMENTS: HIGHWAYS ENGLAND VALIDATION OF COST AND DELIVERY VIABILITY OF STRATEGIC ROAD SURFACE ACCESS PROPOSALS****OFFICIAL – SENSITIVE****Document Purpose:**

1. This document sets out the specification of requirements for Highways England to provide validation of the costs and delivery viability of the Strategic Road surface access proposals identified by the Airports Commission in their July 2015 report in relation to airport expansion. The specification of work seeks to build on, and provide clarification where necessary, on the initial advice provided by Highways England in their letter of 27 November 2015, which is contained in Annex A.

Background:

2. As part of the Department consideration of the work of the Airport's Commission and the Government's decision making process in relation to airport expansion, the Department's Aviation Capacity Division sought advice from Highways England on validation of the costs and delivery viability of the strategic road surface access proposals set out by the Airports Commission.

3. Highways England's response said that the information provided by the Department at the time in terms of published Airports Commission documentation, was insufficient to enable a validation but provided comments in relation to the capital costs for each of the proposals as well as comments in relation to deliverability.

4. The response also said that to provide a robust assessment of the costs and deliverability of the surface access schemes, Highways England would need a more detailed understanding of scheme scope and assumptions made by the Airports Commission. It also said that to achieve such an understanding Highways England would need direct liaison with the scheme promoters and their transport consultants, or they could develop and design their own proposals to meet the developer's requirements and cost them accordingly.

Scope of Requirements:

5. The Department requires views and advice from Highways England which provide a robust assessment of the estimated costs for each of the strategic road surface access proposals identified for each of the short-listed options. In addition, the Department requires a robust assessment of the viability of the delivery of the same surface access proposals.

6. In relation to the assessment of delivery, the focus should be on the timescales for delivery rather than establishing the detailed impacts of the proposals on issues such as air

quality or noise, but where such impacts may be considered a factor in the timescales for delivery, they should be explained and highlighted within the assessment.

Scope Exclusions:

7. Excluded from the scope of work is a need for Highways England to validate the traffic analysis or assessment conducted either by the Airports Commission or by the scheme promoters. However, were Highways England to have concerns about such aspects, these should be highlighted and explained.

Methodology:

Promoter Engagement

8. Highways England should develop an appropriate methodology in order to provide such assessment but subject to agreement from the Secretary of State, the Department would recommend a process of engagement with each scheme promoter to determine the availability further detailed information of the scope of each proposal.

9. The Department would look to agree the proposed methodology and agree the details and proposed plans for promoter engagement to ensure consistency and alignment with other capacity-related activities with the scheme promoters.

Scope of surface access proposals

10. The Department recognises that for some proposals, the promoters may have revised the propositions previously submitted to the Airports Commission. The Department will therefore agree with Highways England which specific proposals are in scope of the validation of costs and the viability work, recognising that the focus remains on the validation of the Airport Commission's estimates of costs and delivery, underpinned by further scheme specific information available from the promoters. Where assessments are undertaken in relation to varied proposals, indications and explanations of the variances should be documented.

11. Where engagement cannot provide the further information of the scope of proposals (such as for schemes recommended by the Commission but not proposed by the promoter) Highways England should develop sufficiently detailed initial designs for such proposals in order to establish a meaningful and comparable assessment of costs, and viability.

Outputs:

12. The main output requirements from this specification is a report from Highways England which sets out in detail the work undertaken to establish robust and comparable estimates of the potential costs of the strategic road surface access proposals for each of the 3 short-listed options, and a detailed and robust assessment of the viability of delivery of those surface access proposals. In providing the information required, Highways England should provide a report which cover the following areas:

- Executive Summary

Background and Methodology

- Introduction
- Methodology
- Details of stakeholder engagement (where conducted)
- Details of and/or references to the documentation considered

Surface Access proposals

- Details of the specific surface access proposals considered, to include indications and explanations for any variances from the Commission's/promoters proposals.

Validation of costs

- An assessment of the cost estimates established for each of the specified surface access proposals; to include:
 - o Total and profile of capital costs (*real terms at 2014 prices*)
 - o Total and profile resource costs to 2050 (*development, maintenance and operation*)
 - o Methodology and estimates of the costs of risks and optimism basis
 - o Details of the cost estimate assumptions (inflation factors etc.)
 - o Comparisons and rationale for differences with other costs estimates (*Airport Commission/Promoters*)

Validation of delivery

- An assessment of the delivery viability for each of the specified surface access proposals, to include;
 - o Prospective delivery timescales with potential development and planning milestones, as well as potential Start and End of Works dates.
 - o An assessment of the scale of delivery risks
 - o Details of any relevant delivery assumptions and/or interdependencies
 - o Comparisons and rationale for difference with other delivery estimates (*Airport Commission/promoters*).

Other Considerations:Contractual considerations

13. Alongside the information in relation to the scheme specific assessment of cost and viability, Highways England should also provide advice and assessment of the related delivery challenges surrounding the potential contractual considerations that may need resolution in terms of the current M25 DBFO contract, and whether any impacts in terms of costs and timescales need to be factor into the scheme specific information.

Network disruption

14. In addition, the Department requires information of the delivery challenges for the specific proposals in relation to the impacts and costs of delivery in relation to the potential disruption to and/or impacts on the maintenance of network performance levels during any construction period.

Road investment portfolio

15. Highways England should provide information in relation to the delivery of the potential surface access proposals in relation to the overall delivery challenge of the future road investment portfolio.

Longer-term network investment and management

16. Given the current M25 South West Quadrant Strategic Study it is important that the validation of the costs and viability of the delivery of potential surface access proposals for a potentially expanded airport are considered and aligned with the work of the study where the objective is to consider and establish lasting capacity solutions for the M25 and surrounding transport network.

17. Additionally, Highways England should provide information that considers the longer-term implications that the choice of a location for an expanded airport could have in relation to limiting the opportunity and timescales for the consideration and agreement to a wider longer-term, future network investment and management strategy for the strategic road network in the area.

18. In considering the initial advice provided by Highways England, the Department have identified a number of points of clarification which are set out at Annex B. The Department requires the final outputs from this specification of work to address these points of clarification, as part of or separately to the outputs specified earlier.

Governance and Assurance

19. The Department will establish the governance arrangements for the work between Aviation Capacity Division, Strategic Roads and Highways England, to ensure they are consistent with governance principles established between the Department and Highways England.

20. Details of monitoring, progress reporting and the assurance arrangements for the work will also be established by Aviation Capacity, Strategic Roads and Highways England.

Timescales:

21. The Department requires the outputs from this specification to be provided no later than **Friday 1st April 2016**. Where Highways England considers that the proposed delivery date for the work cannot be achieved, they should provide a potential revised achievable date for the completion of the work.

Publication of Information:

22. The outcomes and outputs from this specification will inform the Department's consideration of the airport capacity in the South East, and as such, the expectation is that the information will be published or made publicly available as part of a transparent decision making process. Highways England would therefore need to develop the information necessary in the expectation of publication and should ensure that any necessary assurances are completed in terms of propriety requirements and in relation to assurances in terms of conflicts of interest. The outputs should also indicate where any information provided is of a commercial sensitive nature or had been provided in confidence.

HIGHWAYS ENGLAND LETTER OF 27 NOVEMBER 2015



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27 November 2015

Air-Roads Strategy Manager
 Airports Surface Access Strategy
 Airport capacity Directorate
 Department for Transport
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AIRPORTS COMMISSION: SURFACE ACCESS

1. Thank you for your email of 20 November.
2. Last month, the Department asked Highways England to validate the Airports Commission's published proposals in relation to the cost and deliverability of the surface access schemes necessary to facilitate the two expansion options at London Heathrow and expansion at London Gatwick.
3. As we subsequently discussed in early November having undertaken a review of the material provided by the Department, we were unable to provide a response that could be classified as a formal validation exercise because of the very limited nature of the material we were asked to review. The information below is in response to your requirements set out in your e mail of 20 November

THE METHODOLOGY ADOPTED

Highways England's approach has been to review the proposals provided by the Airports Commission covering the costings, timings and deliverability using the knowledge of our specialist commercial teams, our major projects teams and our operational teams.





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DETAILS OF THE DOCUMENTATION CONSIDERED

4. As requested by the Department, the primary documentation that was considered were the four documents provided by yourselves as published by the Airports Commission. These were:
 - 3 No. reports produced by Jacobs named 'Cost and Commercial Viability: Cost & Revenue Identification Update' published in June 2015 (one report for each of the two Heathrow options and one for Gatwick).
 - 'Cost & Commercial Viability: Financial Modelling Input Costs Update' published by PWC in July 2015.

5. In an attempt to seek further clarity on the proposed schemes, we also reviewed:
 - Gatwick Airport Limited Response to Airports Commission Consultation Appendix 8 - Surface Access Report, Arup
 - Appraisal Framework Module 4, Surface Access: Heathrow Airport North West Runway, 5th November 2014.
 - Heathrow Airport Limited, *Taking Britain Further* technical specification documents submitted May 2014
 - Drawing R3500-XX-GA-904-000040, Heathrow 3R Masterplan, North West

CONSIDERATION

Recognising that the information provided was insufficient to enable a validation the following sets out our comments.

Costs (Capital)

6. Detail of the scope of the surface access schemes in the published reports is limited. Typical cost ranges for broadly comparable schemes using an inferred scope for the surface access schemes was used and our comments are as follows.

Gatwick Airport



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7. **M23 Junction 9 grade-separated flyover** – The Commission's figure of £50M is significantly below Highways England's typical range of costs for the reference schemes we use for a flyover and additional tier for a junction of this size. Our inferred scope needs to be checked for consistency and further detail of the surface access proposals are required.
8. **M23 Junction 9 Junction 9 to 9A widening** - For the M23 Junction 9 to 9A road widening we consider that a unit rate should be applied over a length of 1.2km (centre of junction to centre of junction) rather than the figure of 0.75km used in the AC report.

Heathrow Airport (both options)

9. **M4 J3 to J4 Hard shoulder running in both directions & additional road widening** – The Commission's unit rate of £72M / km is substantially above existing rates for ALR schemes which we have assumed would be the solution. We have assumed this is effectively implementation of All Lane Running (ALR) on this link with conversion of the hard shoulder to running lane and widening of c1.5m of each carriageway, not widening by a full lane width. Our inferred scope needs to be checked for consistency and further detail of the surface access proposals are required.
10. **M4 Airport Spur Road widening in both directions** – The Commission's unit rate of £72M / km is well above our typical range of costs for the reference schemes comparable to the inferred scope. Our inferred scope needs to be checked for consistency and further detail of the surface access proposals are required.
11. **M4 J2 to J3 Road widening in both directions** – The Commission's figure of £1.27bn is marginally below the typical range of costs expected from our widening reference schemes which we have assumed are similar to the inferred scope (£1.32bn to £2.83bn). We have however included an order of magnitude allowance for the possible inclusion of a tunnelling solution immediately west of M4 Junction 2.





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12. ***M4 J4 to J4B, Additional widening in both directions*** – The Commission's unit rate of £72m / km is well above the Highways England typical range of costs for schemes comparable to the inferred scope. Our inferred scope needs to be checked for consistency with further detail of the surface access proposals.
13. ***Optimism Bias uplifts for complex infrastructure schemes (tunnel works, M4 J4B and M4 J2-3 Widening)*** – Given the use of Optimism Bias, we recommend that the following surface access proposals are classified as complex, non-standard schemes with an OB uplift of 66% (rather than 44% as currently presented), in accordance with the unadjusted uplifts contained in HM Treasury's Green Book supplementary guidance:
- All works involving tunnelling and amendment to existing tunnel assets
 - M4 J4B replacement junction, because of the severe constraints associated with replacing this strategic junction whilst maintaining acceptable service levels on the M25 and M4
 - Any widening of the M4 immediately west of Junction 2 should not be classed as a standard civil engineering scheme – the deliverability of this scheme is complex and may warrant consideration of tunnelling alternatives
14. We require further details of the proposed works for "*M4 Capacity improvements to existing main airport tunnel*" and "*M25 tunnelling costs (south of junction 15)*" in order to define scope and design to the extent we can provide some meaningful validation of costs.

Costs: Asset Replacement and Opex

15. The Airports Commission approach to asset replacement and opex costs is very much top-down. It does not take account of project characteristics (for example tunnelling assets) nor specific site and location considerations. We do not consider this level of top-down assessment appropriate in this case as it takes no account of these important factors, for example:
- Intensity of traffic and its impact on asset renewal frequencies, maintenance working windows and costs;



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- Rates for South-East England resources compared with other areas of the country;
- Maintenance procurement and contractual environment, e.g. potential impacts on DBFO contracts;
- Any requirement for step changes in maintenance activities compared with concurrent maintenance of new assets with the surrounding highway network through existing contracts, e.g. new control centre facilities and maintenance teams for tunnel assets;
- The more onerous requirements and higher costs of maintenance of tunnel assets and elevated sections of highways (flyovers, etc...) that are a significant part of the surface access proposals;
- The potential for relative price increase over the assessment period compared with general inflation.

Costs: General

16. Inflation allowances at 3.5% per annum may be insufficient given the location of the proposed works – several forecasts indicate that there is substantial potential for inflation in the South-East to be significantly above this figure. We recommend that inflation is reviewed using the latest industry forecasts. Our default inflation forecast profile for the period to 2020 is at or above 3.5% for all years.
17. Highway England has a 30 year Design Build, Finance and Operate (DBFO) Private Finance Initiative (PFI) contract with Connect Plus on the M25 and the PFI is now out of its capital expenditure period and into its operational phase (until 2039). Highways England (and previously Highways Agency) has taken steps to vary the PFI contract for significant changes. Each change has taken over a year to agree and the cost of change has also been significant ranging from £1m to £3m. It is anticipated that a major change to the DBFO Contract would generate a significant quantity of contractual activity between Highways England and Connect Plus and potentially impact on the cost of the surface access schemes at Heathrow.
18. The cost of any change would not be limited to the maintenance of new infrastructure, but may have a lasting impact on the DBFO Co's payment mechanisms - notably the Route Performance Management Adjustment; Lane





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Closure Charges, Safety Performance and any impact on Critical Incidents. Also the DBFO Co would inevitably seek relief from its forgoing and longer term performance obligations due to the nature and size and duration of the Project.

DELIVERABILITY

19. For the Gatwick option, we believe the SOW dates are achievable, assuming development work starts in 2016/17.
20. For the Heathrow options, the majority of schemes listed have achievable SoW dates, assuming development work starts in 2016/17. The works would however need to be given priority over other schemes planned for these areas of the network and the reduced level of service due to the works would have to be accepted by DfT.
21. The two Heathrow options have different costs for the M25 tunnelling schemes but are both shown as 4km long. There is no reason shown for this as the assumptions / scopes are not provided. As indicated above, the lack of such information makes it difficult to comment on the costs as well as the deliverability of this scheme.
22. However on the limited information available we view the SOW dates for the M25 tunnelling scheme as very high risk (2022). For a scheme of this complexity, we would expect the preconstruction timescale to exceed the 6 years assumed (a comparison with A303 Stonehenge, for example, would suggest a longer period). Such works would also have to be given priority and the reduced level of service due to the works would have to be acceptable to the DfT.
23. The stated construction periods for this and some of the larger schemes also require further consideration based on the proposed spending profile.

Operational considerations

24. This section of M25 is extremely congested with frequent queuing southbound on the approaches to J14 as traffic merges from the M4 at J15. With less than a mile between J15 and 14 the point at which the carriageway goes into tunnel will





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be critical and may reduce further the available length over which traffic can achieve the correct lanes. That being the case, careful consideration will need to be given as to how traffic may have information provided to them within the tunnel. Elsewhere, this is extremely difficult, generally because of height and space to accommodate motorway signs and signals (and probably a general desire to avoid too much information for drivers within the tunnel environment).

25. Incidents within tunnels are resource intensive and cause disproportionate disruption to traffic flows. Broken down vehicles are subject to immediate removal and tunnels without hard shoulder requires the closure of adjacent lanes whilst any workforce is in the road. These will impact significantly on tunnel design, build and operations, as well as security, especially so in multi-lane, multi-bore configuration.
26. It should also be noted that RIS 1 includes a major scheme on the M25 in this vicinity (J10-16) which may prove to be abortive, at least in part, if the tunnelling scheme goes ahead later. It could certainly adversely impact on its BCR. It should also be noted that the Department are funding a strategic study covering the M25 SW Quadrant to identify the long term solutions to the existing and future needs of this section of the M25.
27. The Heathrow Surface Access options generally will involve significant disruption during construction and the extent of works may be difficult to construct simultaneously without causing gridlock, given how busy the network is in this area and how much traffic management would be required. This would create a significant economic dis-benefit /cost, which would be reflected in the BCRs, derived from QUADRO assessments. However, it is not reflected in this very coarse assessment, which only considers an estimate of capital cost.

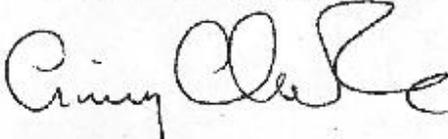
CONCLUSION

28. To provide a robust assessment of cost and deliverability of all the surface access schemes, we need a more detailed understanding of scheme scope and assumptions made by the Commission. To achieve that understanding we want to liaise directly with the scheme promoters and their transport consultants. Alternatively, we could develop and design our own scheme proposals to meet



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the developer's requirements and cost them accordingly. This would however take many months to conclude.



Ginny Clarke
Executive Director

Cc Jim O'Sullivan
Martin Fellows

Paul O'Sullivan

POINTS OF CLARIFICATION ON 27 NOVEMBER LETTERGatwick Airport

M23 Junction 9 grade separated flyover (*paragraph 7*).

Grateful if HE are able to supply the typical range of costs for the reference schemes where the use of a fly over is applied and historical examples of design costs and actual end costs for flyovers of similar designs

M23 Junction 9 Junction 9 to widening (*paragraph 8*)

Please advise as to the requirement of applying the unit rate to 1.2km rather than the 0.75km advised by the AC at M23 Junction 9 to 9A widening.

Heathrow Airport (*both options*)

M4 Airport Spur Road (*paragraph 10*)

We would be grateful for consistency checking and engagement with the scheme promoter in order that details are satisfied.

M4 J2 to J3 widening (*paragraph 11*)

Provision of the details of the inferred scope of the scheme used in developing the indicative cost range (£1.32bn to £2.83bn) and details of the overall scheme including the location and length of the possible inclusion of a tunnelled solution to the west of Junction 2 of the M4.

M4 J4 to J4B (*paragraph 12*)

The AC unit rate of £72m / km is above the HE rate, but that the inferred scope would need further checking. Please carry out the checks for consistency with further details following promoter engagement into the surface access proposals?

Optimism Bias uplifts for complex schemes (*paragraph 13*)

Please provide further on optimism basis. The suggestion is that the HE OB uplifts to 66%, does this include the 20% OB that Jacobs fed into the Airports Commission (AC) figures, or is it in addition to the initial figure used by Jacobs?

- Please can HE also set out further information on scheme specific OB along with the rationale?

Costs: Asset Placement and Opex (paragraph 15)

It would be helpful if HE is able to offer refinement of costs based on historical knowledge.

- Please advise what the difference in rates of the South-East resources are compared to the National average and other regions of England;
- Please set out HE understanding of the potential for relative price increases over the assessment period compared with general inflation;
- Please set out HE assessment of the intensity of traffic and its impact on asset renewal frequencies, maintenance working windows and costs;
- Please set out the reasoning and background, around the consideration of the difference and understanding on maintenance procurement and contractual environment, e.g. potential impacts on DBFO contracts;
- Please set out the reasoning and costs around the requirements and maintenance of tunnel assets and elevated highways.
- Please provide details on the required step changes and costs of maintenance of current assets and new assets and the interaction with existing contracts.

Costs: General (paragraph 16, 17, 18)

- On inflation what is the inflation rate in HE accounts that is budgeted for in the years ahead? What assumptions are made on costs and what is budgeted for possible problems in delivery?
- What is the risk to HE and to surface access delivery of 'future-proofing' costs?
- What is the breakdown of the current on-going maintenance costs and operational costs?
- Are the assumption of costs of change to DBFO accounted for in the inflation allowance of 3.5%?
- In the possible change to the DBFO contract would this include performance metrics, what would the cost of this be?
- How much signage would be required in a tunnel based on design following engagement with scheme promoters, what would be the cost of the signage?
- When did the DBFO start, given that it is possible the DBFO could be running post completion of surface access delivery?

Deliverability (paragraphs 21, 22 and 23)

If both Heathrow tunnels are 4km but have different costs what is the reasons behind the difference? Please lay out the reasoning for the difference and any additional risks that there may be.

What would HE consider a realistic timescale in comparison of other works? What is the expected level of reduction of service due to the works (on both tunnelling options)?

Please can HE expand on paragraph 23, what is the necessary spend profile for HE? What is the impact on wider programmes?

Please provide more details with regards to the requirements in paragraph 23 on information both within the tunnel and outside of the tunnel on the approach.

Operational Considerations (paragraphs 24 to 27)

Would there be benefits from delaying the RIS1 schemes in the interest of efficiency if tunnelling was to start, would HE support delaying the RIS1 work?

What are the costs dis-benefit and how are the quantified (paragraph 27)?

Annex B: DfT Points of Clarification Requests, January 2016

Proposal	Clarification Request	Clarification Response
Gatwick Airport - M23 Junction 9 grade separated flyover	Grateful if HE are able to supply the typical range of costs for the reference schemes where the use of a fly over is applied and historical examples of design costs and actual end costs for flyovers of similar designs	<p>In the absence of general arrangement drawings, we selected the following reference schemes (a mixture of planned and completed) which contain flyover works of varying scale and complexity:</p> <ul style="list-style-type: none"> ▪ Cathorpe Viaduct Replacement ▪ M4 Huntercombe Spur Overbridge ▪ A12 Colchester Bypass ▪ Manchester Smart Motorways Phase 2 – A57 / M60 Junction ▪ A38 Derby Junctions Improvements <p>The range of cost of construction of the flyover works identified in these schemes varied between £28M and £91M at Q1, 2014 prices.</p> <p>It is difficult to isolate the costs of design for the flyover works alone as the sample projects contain numerous other elements. Base Options and Development Phase costs (excluding lands) for the schemes as a whole are 13% of the base costs of construction (excluding risk).</p>
Gatwick Airport - M23 Junction 9 Junction 9 to widening	Please advise as to the requirement of applying the unit rate to 1.2km rather than the 0.75km advised by the AC at M23 Junction 9 to 9A widening.	This was originally measured from the Gatwick masterplan drawing. 750m appears to represent the length from the entry / exit of M23 Junction 9 to the proposed boundary between urban and rural road classifications. Our measurement of the total length widening to tie-in with the current SRN alignment is 1.2km and this figure should be used for application of our unit rates which are based on the full extent of widening including alterations to merge and diverge layouts.
Heathrow Airport - M4 Airport Spur Road	We would be grateful for consistency checking and engagement with the scheme promoter in order that details are satisfied.	We have carried out data collection and engagement meetings with the promoters through DfT.

Annex B: DfT Points of Clarification Requests, January 2016

Proposal	Clarification Request	Clarification Response
Heathrow Airport - M4 J2 to J3 widening	Provision of the details of the inferred scope of the scheme used in developing the indicative cost range (£1.32bn to £2.83bn) and details of the overall scheme including the location and length of the possible inclusion of a tunnelled solution to the west of Junction 2 of the M4.	<p>A summary of the assumed scope of works from our November 2015 validation exercise as follows:</p> <ul style="list-style-type: none"> • 1 no. additional lane in each direction • Length of scheme = 8.8km • Upgrade of 4no slips at Junction 3 • RCB and mounted street lighting • Signal / electrical cabinets relocation • 3 no. over-bridges - demolish and rebuild • 1 no. railway bridge - retained and VRS replacement and utilise hatched areas to provide 3no running lanes • 3 no. road bridges - widen to allow additional lane width • 2 no. river crossings bridges - widen to allow additional lane width • 1 no. rail bridge - widen to allow additional lane width • 1no. footbridge - demolish and rebuild. • Retaining structure demolished and replaced with new noise barriers installed • Substantial land acquisition of residential and commercial properties in vicinity of Winchester Avenue • Provision of new noise barrier adjacent to all areas with adjacent properties • Junction 2 (currently 2no running lanes and no hard shoulder) – widening of existing bridge with extensive land purchase • Realignment of service station entry / exit slips • Upgrading of drainage system over entire length <p>The maximum range point is derived from provision of a bored tunnel solution immediately west of J2 for the length of the elevated sections (to London Playing Fields)</p>

Annex B: DfT Points of Clarification Requests, January 2016

Proposal	Clarification Request	Clarification Response
Heathrow Airport - M4 J4 to J4B	The AC unit rate of £72m / km is above the HE rate, but that the inferred scope would need further checking. Please carry out the checks for consistency with further details following promoter engagement into the surface access proposals?	We have carried out data collection and engagement meetings with the promoters through DfT to clarify the proposal's scope.
General - Optimism Bias uplifts for complex schemes	Please provide further on optimism basis. The suggestion is that the HE OB uplifts to 66%, does this include the 20% OB that Jacobs fed into the Airports Commission (AC) figures, or is it in addition to the initial figure used by Jacobs?	Our proposed Optimism Bias allowances do not include the 20% allowance for "risk". The Commission's report states a risk assessment has not been carried out at this stage. We consider that unmitigated Optimism Bias allowances should be applied only, in accordance with our recommended percentages. This is in place of our normal assessment of project risk / opportunity, uncertainty allowances and portfolio level risk / opportunity.
General - Optimism Bias uplifts for complex schemes	Please can HE also set out further information on scheme specific OB along with the rationale?	Our assessment of Optimism Bias in the Cost and Delivery Viability Validation Report.
Costs: Asset Replacement and Opex	It would be helpful if HE is able to offer refinement of costs based on historical knowledge.	Rates used in our estimates of asset replacement and opex costs are based on current contractual rates from Highways England's term maintenance and capital works Area contracts. Metrics for operation and maintenance costs are currently being developed by our Cost Intelligence Team.

Annex B: DfT Points of Clarification Requests, January 2016

Proposal	Clarification Request	Clarification Response
Costs: Asset Replacement and Opex	Please advise what the difference in rates of the South-East resources are compared to the National average and other regions of England;	It is difficult to identify the precise variance in rates due to differing contractual conditions and varying rate descriptions, site variables (e.g. level of congestion), risk-levels and so forth. However, our assessment is that south-east resource rates are c. 25% above national averages.
Costs: Asset Replacement and Opex	Please set out HE understanding of the potential for relative price increases over the assessment period compared with general inflation;	Our current forecast for most likely highways cost inflation post 2020 is 3.5% per annum, i.e. 1.5 % above the Bank of England long term inflation target. This aligns with the 2015 IUK forecast. Clearly there is a range of potential inflation scenarios relative to general inflation.
Costs: Asset Replacement and Opex	Please set out HE assessment of the intensity of traffic and its impact on asset renewal frequencies, maintenance working windows and costs;	Impacts vary for each asset type and this is a very complex piece of analysis which we have not incorporated in the scope of this assessment.
Costs: Asset Replacement and Opex	Please set out the reasoning and background, around the consideration of the difference and understanding on maintenance procurement and contractual environment, e.g. potential impacts on DBFO contracts;	Highway England has a 30 year Design Build, Finance and Operate (DBFO) Private Finance Initiative (PFI) contract on the M25; the PFI is now out of its capital expenditure period and into its operational phase (until 2039). The PFI contractor is Connect Plus. Highways England (and previously Highways Agency) has taken steps to vary the PFI contract for significant changes (Later Upgrade Sections (£52m); DFFC Stage 1 (£125m); M3 Smart Motorway (£5m) and RTMC (£3m). Each change took over a year to agree. The cost of each change has also been significant ranging from £1m to £3m. It is anticipated that a major change to the DBFO Contract such as for one of the Heathrow options would generate a significant quantity of contractual activity between HE and Connect Plus and potentially

Annex B: DfT Points of Clarification Requests, January 2016

Proposal	Clarification Request	Clarification Response
		<p>impede delivery timescales and impact on the cost of the Project.</p> <p>The cost of any change would not be limited to the maintenance of new infrastructure, but may have a lasting impact on the DBFO Cos payment mechanisms. Notably the Route Performance Management Adjustment; Lane Closure Charges, Safety Performance and any impact on Critical Incidents. Also the DBFO Co would inevitably seek relief from its forgoing and longer term performance obligations due to the nature and size and duration of the Project.</p> <p>Steps could be taken to minimise the anticipated challenges, however Highways England would need further details of the projects commercial and packaging approach to better advise on the delivery of the Project.</p>
Costs: Asset Replacement and Opex	Please set out the reasoning and costs around the requirements and maintenance of tunnel assets and elevated highways.	We have assumed that a specific tunnel control room and service depot will be required for the M25 tunnel and the tunnelling solution we consider required for widening on the M4 west of J2.
	Please provide details on the required step changes and costs of maintenance of current assets and new assets and the interaction with existing contracts.	See main report.

Annex B: DfT Points of Clarification Requests, January 2016

Proposal	Clarification Request	Clarification Response												
Costs - General	On inflation what is the inflation rate in HE accounts that is budgeted for in the years ahead? What assumptions are made on costs and what is budgeted for possible problems in delivery?	<p>The following inflation profile has been adopted – in line with Highways England Commercial Services Division’s current default forecast profile</p> <table border="1"> <thead> <tr> <th>Financial Year</th> <th>2016/17</th> <th>2017/18</th> <th>2018/19</th> <th>2019/20</th> <th>2020/21+</th> </tr> </thead> <tbody> <tr> <td>Annual Inflation</td> <td>4.20%</td> <td>4.10%</td> <td>3.80%</td> <td>3.80%</td> <td>3.50%</td> </tr> </tbody> </table>	Financial Year	2016/17	2017/18	2018/19	2019/20	2020/21+	Annual Inflation	4.20%	4.10%	3.80%	3.80%	3.50%
Financial Year	2016/17	2017/18	2018/19	2019/20	2020/21+									
Annual Inflation	4.20%	4.10%	3.80%	3.80%	3.50%									
Costs - General	What is the risk to HE and to surface access delivery of ‘future-proofing’ costs?	We would be happy to discuss this as we have not included such a risk assessment on this basis.												
Costs - General	What is the breakdown of the current on-going maintenance costs and operational costs?	Our Cost Intelligence analysis indicates routine operational costs (excluding the capital works for maintenance) are typically c. 20-30% of Operations Directorate expenditure												
Costs - General	Are the assumptions of costs of change to DBFO accounted for in the inflation allowance of 3.5%?	No, these impacts are not included in the inflation allowance.												
Costs - General	In the possible change to the DBFO contract would this include performance metrics, what would the cost of this be?	The performance metrics would be affected but the costs would be subject to negotiation – see DBFO references above.												

Annex B: DfT Points of Clarification Requests, January 2016

Proposal	Clarification Request	Clarification Response
Costs - General	How much signage would be required in a tunnel based on design following engagement with scheme promoters, what would be the cost of the signage?	Please refer to the bills of quantities produced for the Heathrow proposals.
Costs - General	When did the DBFO start, given that it is possible the DBFO could be running post completion of surface access delivery?	The M25 DBFO was awarded to Connect Plus in 2009 and runs for a 30-year period. It will therefore operate post completion of the SRN surface access proposals.
Deliverability	If both Heathrow tunnels are 4km but have different costs what is the reasons behind the difference? Please lay out the reasoning for the difference and any additional risks that there may be.	There is only minor variance between these costs following clarification of design details.
Deliverability	What would HE consider a realistic timescale in comparison of other works? What is the expected level of reduction of service due to the works (on both tunnelling options)?	See Delivery commentary.
Deliverability	Please can HE expand on paragraph 23, what is the necessary spend profile for HE? What is the impact on wider programmes?	See Delivery commentary.

Annex B: DfT Points of Clarification Requests, January 2016

Proposal	Clarification Request	Clarification Response
Deliverability	Please provide more details with regards to the requirements in paragraph 23 on information both within the tunnel and outside of the tunnel on the approach.	Detailed layouts would need to be agreed to understand signing requirements that are safe and compatible with existing design standards and tunnel regulations.
Operational Considerations	Would there be benefits from delaying the RIS1 schemes in the interest of efficiency if tunnelling was to start, would HE support delaying the RIS1 work?	Variation of the RIS would be subject to formal change control – to be agreed between the Department, Highways England and ORR.
Operational Considerations	What are the costs of dis-benefits and how are they quantified?	Clarification of question required in relation to Operational Considerations.

Annex C

Work Breakdown Structure – Capital Cost Estimates

Cost Estimating Process – Heads of Cost		
Options and Development Phase	Construction	Supervision & Third Parties
Options Phase	Project Overheads	Statutory Undertakers & Authorities
Historic Costs - month end	Cost of Offices	Power – Underground
Highways England Stage 1	Construction Management	Power – Overhead
Highways England Stage 2	Design Management	Telecommunications
Employers Agent Stage 1	Insurance	Water
Employers Agent Stage 2	Ancillary Overhead Costs	Gas
Contractor Stage 1 (if applicable)	General Labour	Third Party Costs
Contractor Stage 2 (if applicable)	Method Related Cost	Rail Authority costs
	General Plant	Environment Agency Costs
Development Phase	Temporary Works	Local Authority costs
Historic Costs - month end	Traffic Management	
Highways England Stage 3		Supervision and PCF Stage 6-7 Non-Construction Costs
Highways England Stage 4	Roadworks Series	Highways England Stage 6
Highways England Stage 5	Site Clearance	Highways England Stage 7
Employers Agent Stage 3	Fencing	Employers Agent Stage 6
Employers Agent Stage 4	Road Restraint Systems	Employers Agent Stage 7
Employers Agent Stage 5	Drainage and Ducts	NR VAT
Contractor Stage 3	Earthworks	
Contractor Stage 4	Pavement	Third Party Contributions
Contractor Stage 5	Kerbs, Footways and Paved Areas	Any other Project Income
Contractor Stage 6 (incl. advance fee)	Traffic Signs and Road Markings	
Bonus Payments	Lighting & CCTV Columns / Masts	
	Electrical Work for Lighting and Signs	
Lands	Motorway Comms and Technology	
Lands (blight)	Brickwork, Blockwork & Stonework	
Lands (Acquisition)	Landscape and Ecology	
Lands (Part 1 Claims)	Maintenance Painting of Steelwork	
Lands (interest)		
	Structures	
	Underbridges	
	Overbridges	
	Gantries	
	Strengthening of existing structures	
	Footbridges	
	Miscellaneous structures e.g. culverts	
	Retaining Walls	
	Tunnels	
	Contractors attendance for SU	
	Accommodation Works	
	Bonus (incl. Final Bonus)	
	Contractor Fee	

ANNEX D

REGISTER OF REFERENCE DOCUMENTS USED FOR VALIDATION OF ESTIMATED COSTS AND DELIVERY

Document Ref. / Date	Document Title
A3 Appendices Consultation Response 2015	Heathrow Airports Commission Initial Assessments – Consultation A3 Appendices
20141105 Gatwick Airport Second Runway Cost and Revenue Identification Final	Jacobs & Leigh Fisher - Appraisal Framework Module 13. Cost and Commercial Viability: Cost and Revenue Identification Gatwick Airport Second Runway
R2 Technical Report V0.9 Final	Gatwick Airport Ltd Response to Airports Commission Consultation. Appendix 23 EC Harris – Cost & Commercial Technical Report
160122 HE Specification (v1.0)	Specification of requirements: Highways England Validation cost and delivery viability of strategic road surface access proposals
July 2015	Airports Commission Final Report
Appendix 15	Refreshed North West masterplan M25 Junction 14-14a layout
Appendix 15e	Refreshed North West masterplan M25 operating concept
Appendix 15g	Refreshed North West masterplan M25 signage proposals
Appendix 15h	Refreshed North West masterplan Junction 14 geometric planning
2R Cost and Revenue Identification Update Final 29 th June 2015	Jacobs Leigh Fisher Cost and Commercial Viability: Cost and Revenue Identification Update – Gatwick Airport Second Runway
ENR Cost and Revenue Identification Update Final 30 th June 2015	Jacobs Leigh Fisher Cost and Commercial Viability: Cost and Revenue Identification Update – Heathrow Airport Extended Northern Runway
NWR Cost and Revenue Identification Update Final 30 th June 2015	Jacobs Leigh Fisher Cost and Commercial Viability: Cost and Revenue Identification Update – Heathrow Airport North West Runway
PWC July 2015	PWC Cost and Commercial Viability: Financial Modelling Input Costs Update
16 th March 2016	<i>London Gatwick Obviously</i> – Presentation to Department for Transport Surface Access
Final Report, dated 29 January 2015	Gatwick Airport Ltd Response to Airports Commission Consultation Appendix 8 Arup – Surface Access Report
Arcadis Presentation, dated 7 th April 2016	Gatwick Highways Network Study
Data issued on April 11 th 2016 post-engagement meeting	Gatwick Second Runway Highway Proposals – List of Structures
	Heathrow 3R masterplan North West LHR
Report dated 5 th November 2015	Jacobs Appraisal Framework Module 4. Surface Access: Heathrow Airport North West Runway Final for Consultation Airports Commission
LGW2NR-ARP-ZZ-ZZ-DR-CH-00001_P2.1	Highways Layout General Arrangement Key plan
LGW2NR-ARP-ZZ-ZZ-DR-CH-00101_P2.1	Highways Layout General Arrangement Sheet 1
LGW2NR-ARP-ZZ-ZZ-DR-CH-00102_P2.1	Highways Layout General Arrangement Sheet 2

Document Ref. / Date	Document Title
LGW2NR-ARP-ZZ-ZZ-DR-CH-00103_P2.1	Highways Layout General Arrangement Sheet 3
LGW2NR-ARP-ZZ-ZZ-DR-CH-00104_P2.1	Highways Layout General Arrangement Sheet 4
LGW2NR-ARP-ZZ-ZZ-DR-CH-00105_P2.1	Highways Layout General Arrangement Sheet 5
LGW2NR-ARP-ZZ-ZZ-DR-CH-00106_P2.1	Highways Layout General Arrangement Sheet 6
LGW2NR-ARP-ZZ-ZZ-DR-CH-00107_P2.1	Highways Layout General Arrangement Sheet 6
LGW2NR-ARP-ZZ-ZZ-DR-CH-00201	Highways Profiles Sheet 1 A23 Phase 1 and Terminal Access Road
LGW2NR-ARP-ZZ-ZZ-DR-CH-00202	Highways Profiles Sheet 2 M25 Link Southbound Road
LGW2NR-ARP-ZZ-ZZ-DR-CH-00203	Highways Profiles Sheet 3 M23 Link Roads and Balcombe Road
LGW2NR-ARP-ZZ-ZZ-DR-CH-00204	Highways Profiles Sheet 4 M23 Spur Eastbound & New Terminal Access Outbound
LGW2NR-ARP-ZZ-ZZ-DR-CH-00205	Highways Profiles Sheet 5 A23 North and Airport Way
LGW2NR-ARP-ZZ-ZZ-DR-CH-00206	Highways Profiles Sheet 6 A23 North and Airport Way Junction
June 2006 The COBA Manual	Volume 13 Economic Assessment of Road Schemes Section 1 The COBA Manual Part 2 Valuation of Costs and Benefits
March 2016	<i>London Gatwick Obviously</i> R2 Phasing and Programme
January 2014	DFT TAG A1.2 Scheme Costs
Heathrow Airport Ltd 2014 Vol 1	Heathrow – Taking Britain Further Vo1 1. Heathrow’s plan for connecting the UK to growth
Heathrow Airport Ltd 2014 Vol 2	Heathrow – Taking Britain Further Vo1 2. Heathrow’s plan for connecting the UK to growth
Heathrow Airport Ltd 2014 Vol 3	Heathrow – Taking Britain Further Vo1 3. Heathrow’s plan for connecting the UK to growth
P 47067372/TL/SK/127 r. 02	Heathrow Northern Runway Phasing Plan - Phase 1
P 47067372/TL/SK/128 r. 02	Heathrow Northern Runway Phasing Plan - Phase 2
P 47067372/TL/SK/129 r. 02	Heathrow Northern Runway Phasing Plan - Phase 3
P 47067372/TL/SK/130 r. 02	Heathrow Northern Runway Phasing Plan - Phase 4
P 47067372/TL/SK/131 r. 02	Heathrow Northern Runway Phasing Plan - Phase 5
P 47067372/TL/SK/132 r. 02	Heathrow Northern Runway Phasing Plan - Phase 6

ANNEX E – ESTIMATED COSTS BY MMHW SERIES / COST ELEMENTS

Gatwick Airport Second Runway

Proposal:	Junction 9 Slip Road Widening			Junction 9 Grade Separated Flyover			Junction 9 to Junction 9a		
Cost Head / MMHW Series	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max
Options & Development Phase	£2,542,510	£3,581,000	£5,156,640	£3,569,880	£5,028,000	£7,240,320	£1,938,300	£2,730,000	£3,931,200
Lands	<u>Excl.</u>	<u>Excl.</u>	<u>Excl.</u>	<u>Excl.</u>	<u>Excl.</u>	<u>Excl.</u>	<u>Excl.</u>	<u>Excl.</u>	<u>Excl.</u>
Options & Development Total	£2,542,510	£3,581,000	£5,156,640	£3,569,880	£5,028,000	£7,240,320	£1,938,300	£2,730,000	£3,931,200
CONSTRUCTION PHASE									
Series 100 - Project Overheads	£3,061,520	£4,312,000	£6,209,280	£4,298,340	£6,054,000	£8,717,760	£2,333,770	£3,287,000	£4,733,280
Series 100 - Method Related Costs	£2,041,250	£2,875,000	£4,140,000	£2,865,560	£4,036,000	£5,811,840	£1,556,320	£2,192,000	£3,156,480
Series 200 - Site Clearance	£107,920	£152,000	£218,880	£26,980	£38,000	£54,720	£22,720	£32,000	£46,080
Series 300 - Fencing	£44,730	£63,000	£90,720	£17,750	£25,000	£36,000	£27,690	£39,000	£56,160
Series 400 – Vehicle Restraint Systems	£300,330	£423,000	£609,120	£163,300	£230,000	£331,200	£299,620	£422,000	£607,680
Series 500 – Drainage	£471,440	£664,000	£956,160	£157,620	£222,000	£319,680	£488,480	£688,000	£990,720
Series 600 – Earthworks	£3,024,600	£4,260,000	£6,134,400	£6,797,540	£9,574,000	£13,786,560	£1,207,000	£1,700,000	£2,448,000
Series 700 – Pavement	£1,935,460	£2,726,000	£3,925,440	£925,840	£1,304,000	£1,877,760	£1,089,850	£1,535,000	£2,210,400
Series 1100 – Kerbs, Footways and Paved Areas	£300,330	£423,000	£609,120	£117,150	£165,000	£237,600	£154,780	£218,000	£313,920
Series 1200 - Traffic Signs	£56,800	£80,000	£115,200	£34,080	£48,000	£69,120	£53,250	£75,000	£108,000
Series 1300 – Road Lighting	£0	£0	£0	£0	£0	£0	£13,490	£19,000	£27,360
Series 1400 – Electrical Work for Lighting and Signs	£0	£0	£0	£0	£0	£0	£83,070	£117,000	£168,480
Series 1500 – Communications	£630,480	£888,000	£1,278,720	£274,770	£387,000	£557,280	£690,830	£973,000	£1,401,120
Series 3000 – Landscape and	£330,860	£466,000	£671,040	£110,760	£156,000	£224,640	£377,720	£532,000	£766,080

Proposal:	Junction 9 Slip Road Widening			Junction 9 Grade Separated Flyover			Junction 9 to Junction 9a		
Cost Head / MMHW Series	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max
Ecology									
Series S – Structures	£3,002,590	£4,229,000	£6,089,760	£5,701,300	£8,030,000	£11,563,200	£3,118,320	£4,392,000	£6,324,480
Accommodation Works	£102,240	£144,000	£207,360	£143,420	£202,000	£290,880	£78,100	£110,000	£158,400
Contractor Fee	£1,541,410	£2,171,000	£3,126,240	£2,163,370	£3,047,000	£4,387,680	£1,175,050	£1,655,000	£2,383,200
Cost of Construction	£16,951,960	£23,876,000	£34,381,440	£23,797,780	£33,518,000	£48,265,920	£12,770,060	£17,986,000	£25,899,840
<u>ANCILLARY COSTS</u>									
Statutory Undertakers and Third Party Costs	£355,000	£500,000	£720,000	£2,130,000	£3,000,000	£4,320,000	£1,065,000	£1,500,000	£2,160,000
HE Agents Pre AoC	£177,500	£250,000	£360,000	£355,000	£500,000	£720,000	£142,000	£200,000	£288,000
HE Agents Post AoC	£1,017,430	£1,433,000	£2,063,520	£1,427,810	£2,011,000	£2,895,840	£775,320	£1,092,000	£1,572,480
NR VAT	£1,017,430	£1,433,000	£2,063,520	£2,379,920	£3,352,000	£4,826,880	£775,320	£1,092,000	£1,572,480
Total Base Cost Estimate (Q1, 2014 prices excl. Inflation)	£22,061,830	£31,073,000	£44,745,120	£33,660,390	£47,409,000	£68,268,960	£17,466,000	£24,600,000	£35,424,000
<u>RANGING / RISK AND OPTIMISM BIAS</u>	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max
Inclusion of Optimism Bias @ 44%	excl.	excl.	incl.	excl.	excl.	incl.	excl.	excl.	incl.
Total Range Cost Estimate	£22,061,830	£31,073,000	£44,745,120	£33,660,390	£47,409,000	£68,268,960	£17,466,000	£24,600,000	£35,424,000
Airports Commission Surface Access Point Estimate (incl. OB)	£61,000,000			£50,000,000			£32,000,000		

All costs at 2014 prices u.n.o.

Proposal:	A23 Realignment		
	Range Min	Deterministic	Range Max
Cost Head / MMHW Series			
Options & Development Phase	£8,294,220	£11,682,000	£16,822,080
Lands		Not Included	
Options & Development Total	£8,294,220	£11,682,000	£16,822,080
<u>CONSTRUCTION PHASE</u>			
Series 100 - Project Overheads	£10,928,320	£15,392,000	£22,164,480
Series 100 - Method Related Costs	£7,805,740	£10,994,000	£15,831,360
Series 200 - Site Clearance	£1,018,140	£1,434,000	£2,064,960
Series 300 - Fencing	£19,880	£28,000	£40,320
Series 400 – Vehicle Restraint Systems	£857,680	£1,208,000	£1,739,520
Series 500 – Drainage	£908,800	£1,280,000	£1,843,200
Series 600 – Earthworks	£8,042,170	£11,327,000	£16,310,880
Series 700 – Pavement	£4,329,580	£6,098,000	£8,781,120
Series 1100 – Kerbs, Footways and Paved Areas	£526,110	£741,000	£1,067,040
Series 1200 - Traffic Signs	£430,970	£607,000	£874,080
Series 1300 – Road Lighting	£380,560	£536,000	£771,840
Series 1400 – Electrical Work for Lighting and Signs	£1,187,120	£1,672,000	£2,407,680
Series 1500 – Communications	£1,349,000	£1,900,000	£2,736,000
Series 3000 – Landscape and Ecology	£816,500	£1,150,000	£1,656,000
Series S – Structures	£11,357,160	£15,996,000	£23,034,240
Accommodation Works	£312,400	£440,000	£633,600
Contractor Fee	£5,026,800	£7,080,000	£10,195,200

Proposal:	A23 Realignment		
Cost Head / MMHW Series	Range Min	Deterministic	Range Max
Cost of Construction	£55,296,930	£77,883,000	£112,151,520
<u>ANCILLARY COSTS</u>			
Statutory Undertakers and Third Party Costs	£1,775,000	£2,500,000	£3,600,000
HE Agents Pre AoC	£355,000	£500,000	£720,000
HE Agents Post AoC	£3,317,830	£4,673,000	£6,729,120
NR VAT	£5,529,480	£7,788,000	£11,214,720
Total Base Cost Estimate (Q1, 2014 prices excl. Inflation)	£74,568,460	£105,026,000	£151,237,440
<u>RANGING / RISK AND OPTIMISM BIAS</u>	Range Min	Deterministic	Range Max
Inclusion of Optimism Bias @ 44%	excl.	excl.	incl.
Total Range Cost Estimate	£74,568,460	£105,026,000	£151,237,440
Airports Commission Surface Access Point Estimate (incl. OB)	£91,000,000		

Heathrow Northwest Runway

Proposal:	M4 J3 to J4 HSR & Widening			M4 Airport Spur Road Widening			M4 J2 to J3 Road Widening		
	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Options & Development Phase	£3,820,240	£5,618,000	£9,325,880	£3,399,320	£4,999,000	£8,298,340	£70,794,120	£104,109,000	£172,820,940
Lands		Not Included			Not Included			Not Included	
Options & Development Total	£3,988,780	£5,618,000	£9,325,880	£3,549,290	£4,999,000	£8,298,340	£73,917,390	£104,109,000	£172,820,940
CONSTRUCTION PHASE									
Series 100 - Project Overheads	£5,602,930	£7,891,450	£13,099,807	£4,985,656	£ 7,022,050	£ 11,656,603	£ 110,195,337	£155,204,700	£ 257,639,802
Series 100 - Method Related Costs	£4,002,093	£ 5,636,750	£9,357,005	£3,561,183	£ 5,015,750	£8,326,145	£ 78,710,955	£110,860,500	£ 184,028,430
Series 200 - Site Clearance	£ 188,150	£ 265,000	£ 439,900	£ 367,780	£ 518,000	£ 859,880	£ 821,470	£ 1,157,000	£ 1,920,620
Series 300 – Fencing	£ 87,330	£ 123,000	£ 204,180	£ 21,300	£ 30,000	£ 49,800	£ 157,620	£ 222,000	£ 368,520
Series 400 – Vehicle Restraint Systems	£ 592,850	£ 835,000	£1,386,100	£ 189,570	£ 267,000	£ 443,220	£ 904,540	£ 1,274,000	£ 2,114,840
Series 500 – Drainage	£1,346,870	£ 1,897,000	£3,149,020	£ 475,700	£ 670,000	£1,112,200	£ 2,084,560	£ 2,936,000	£ 4,873,760
Series 600 – Earthworks	£1,928,360	£ 2,716,000	£4,508,560	£1,408,640	£ 1,984,000	£3,293,440	£ 22,474,340	£ 31,654,000	£ 52,545,640
Series 700 – Pavement	£3,109,090	£ 4,379,000	£7,269,140	£1,290,780	£ 1,818,000	£3,017,880	£ 821,470	£ 1,157,000	£ 1,920,620
Series 1100 – Kerbs, Footways & Paved Areas	£ 572,970	£ 807,000	£1,339,620	£ 219,390	£ 309,000	£ 512,940	£ 157,620	£ 222,000	£ 368,520
Series 1200 - Traffic Signs	£ 131,350	£ 185,000	£ 307,100	£ 95,850	£ 135,000	£ 224,100	£ 904,540	£ 1,274,000	£ 2,114,840
Series 1300 – Road Lighting	£ 195,250	£ 275,000	£ 456,500	£ 85,200	£ 120,000	£ 199,200	£ 2,084,560	£ 2,936,000	£ 4,873,760

Proposal:	M4 J3 to J4 HSR & Widening			M4 Airport Spur Road Widening			M4 J2 to J3 Road Widening		
	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Series 1400 – Electrical Work for Lighting and Signs	£ 623,380	£ 878,000	£1,457,480	£ 208,030	£ 293,000	£ 486,380	£ 22,474,340	£ 31,654,000	£ 52,545,640
Series 1500 – Communications	£2,037,700	£ 2,870,000	£4,764,200	£ 788,810	£ 1,111,000	£1,844,260	£ 5,201,460	£ 7,326,000	£ 12,161,160
Series 1600 - -Piling and Embedded Retaining Walls	incl.	incl.	incl.	£5,371,860	£ 7,566,000	£ 12,559,560	£ 1,021,690	£ 1,439,000	£ 2,388,740
Series 3000 – Landscape and Ecology	£1,070,680	£ 1,508,000	£2,503,280	£ 463,630	£ 653,000	£1,083,980	£ 550,250	£ 775,000	£ 1,286,500
Series S – Structures	£4,124,390	£ 5,809,000	£9,642,940	£3,258,190	£ 4,589,000	£7,617,740	£ 255,185,360	£359,416,000	£ 596,630,560
Accommodation Works	£ 159,750	£ 225,000	£ 373,500	£ 142,710	£ 201,000	£ 333,660	£ 2,964,250	£ 4,175,000	£ 6,930,500
Contractor Fee	£2,417,550	£ 3,405,000	£5,652,300	£2,151,300	£ 3,030,000	£5,029,800	£ 44,759,820	£ 63,042,000	£ 104,649,720
Cost of Construction	£ 28,190,692	£ 39,705,200	£ 65,910,632	£ 25,085,578	£ 35,331,800	£ 58,650,788	£ 551,474,182	£776,724,200	£ 1,289,362,172
ANCILLARY COSTS									
Statutory Undertakers and Third Party Costs	£1,420,000	£ 2,000,000	£3,320,000	£1,420,000	£ 2,000,000	£3,320,000	£ 24,850,000	£ 35,000,000	£ 58,100,000
HE Agents Pre AoC	£ 531,790	£ 749,000	£1,243,340	£ 236,430	£ 333,000	£ 552,780	£ 9,846,990	£ 13,869,000	£ 23,022,540
HE Agents Post AoC	£1,595,370	£ 2,247,000	£3,730,020	£1,420,000	£ 2,000,000	£3,320,000	£ 29,541,680	£ 41,608,000	£ 69,069,280
NR VAT	£1,065,000	£ 1,500,000	£2,490,000	£ 923,000	£ 1,300,000	£2,158,000	£ 73,840,000	£104,000,000	£ 172,640,000
Total Base Cost Estimate (Q1, 2014 prices excl. Inflation)	£ 36,791,632	£ 51,819,200	£ 86,019,872	£ 32,634,298	£ 45,963,800	£ 76,299,908	£ 763,470,242	£ 1,075,310,200	£ 1,785,014,930

Proposal:	M4 J3 to J4 HSR & Widening			M4 Airport Spur Road Widening			M4 J2 to J3 Road Widening		
Cost Head / MMHW Series	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
								0	2
<u>RANGING / RISK AND OPTIMISM BIAS</u>	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max
Inclusion of Optimism Bias @ 66%	excl.	excl.	incl.	excl.	excl.	incl.	excl.	excl.	incl.
Total Range Cost Estimate	£ 36,791,632	£ 51,819,200	£ 86,019,872	£ 32,634,298	£ 45,963,800	£ 76,299,908	£ 763,470,242	£ 1,075,310,200	£ 1,785,014,932
Airports Commission Estimated Cost of SRN Surface Access Proposal (incl. OB)	£274,000,000			£202,000,000			£1,267,000,000		

Proposal:	M4 J4 to J4b Road Widening			M4 Higher Capacity at Junction, J4a			M25 Tunnelling and Works South of J15		
	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Options & Development Phase	£ 6,103,160	£ 8,596,000	£ 14,269,360	£ 3,832	£ 5,397	£ 8,959	£ 49,045,380	£ 69,078,000	£ 114,669,480
Lands		Not Included			Not Included			Not Included	
Options & Development Total	£ 6,103,160	£ 8,596,000	£ 14,269,360	£ 3,831,870	£ 5,397,000	£ 8,959,020	£ 49,045,380	£ 69,078,000	£ 114,669,480
CONSTRUCTION PHASE									
Series 100 - Project Overheads	£ 8,573,747	£ 12,075,700	£ 20,045,662	£ 5,383,007	£ 7,581,700	£ 12,585,622	£ 68,897,868	£ 97,039,250	£ 161,085,155
Series 100 - Method Related Costs	£ 6,124,105	£ 8,625,500	£ 14,318,330	£ 3,845,005	£ 5,415,500	£ 8,989,730	£ 49,212,763	£ 69,313,750	£ 115,060,825
Series 200 - Site Clearance	£ 560,190	£ 789,000	£ 1,309,740	£ 97,980	£ 138,000	£ 229,080	£ 3,004,720	£ 4,232,000	£ 7,025,120
Series 300 – Fencing	£ 80,230	£ 113,000	£ 187,580	£ -	£ -	£ -	£ 710,000	£ 1,000,000	£ 1,660,000
Series 400 – Vehicle Restraint Systems	£ 504,810	£ 711,000	£ 1,180,260	£ 161,170	£ 227,000	£ 376,820	£ 2,717,170	£ 3,827,000	£ 6,352,820
Series 500 – Drainage	£ 1,498,810	£ 2,111,000	£ 3,504,260	£ 350,030	£ 493,000	£ 818,380	£ 5,784,370	£ 8,147,000	£ 13,524,020
Series 600 – Earthworks	£ 2,842,840	£ 4,004,000	£ 6,646,640	£ 3,335,580	£ 4,698,000	£ 7,798,680	£ 38,151,140	£ 53,734,000	£ 89,198,440
Series 700 – Pavement	£ 3,452,020	£ 4,862,000	£ 8,070,920	£ 2,847,100	£ 4,010,000	£ 6,656,600	£ 14,388,860	£ 20,266,000	£ 33,641,560
Series 1100 – Kerbs, Footways and Paved Areas	£ 715,680	£ 1,008,000	£ 1,673,280	£ 75,260	£ 106,000	£ 175,960	£ 3,013,240	£ 4,244,000	£ 7,045,040

Proposal:	M4 J4 to J4b Road Widening			M4 Higher Capacity at Junction, J4a			M25 Tunnelling and Works South of J15		
	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Series 1200 - Traffic Signs	£ 144,840	£ 204,000	£ 338,640	£ 62,480	£ 88,000	£ 146,080	£ 832,830	£ 1,173,000	£ 1,947,180
Series 1300 – Road Lighting	£ 482,800	£ 680,000	£ 1,128,800	£ 146,260	£ 206,000	£ 341,960	£ 921,580	£ 1,298,000	£ 2,154,680
Series 1400 – Electrical Work for Lighting and Signs	£ 1,812,630	£ 2,553,000	£ 4,237,980	£ 445,880	£ 628,000	£ 1,042,480	£ 3,759,450	£ 5,295,000	£ 8,789,700
Series 1500 – Communications	£ 2,746,280	£ 3,868,000	£ 6,420,880	£ 712,840	£ 1,004,000	£ 1,666,640	£ 3,695,550	£ 5,205,000	£ 8,640,300
Series 1600 - -Piling and Embedded Retaining Walls	incl.	incl.	incl.	£ 4,137,880	£ 5,828,000	£ 9,674,480	incl.	incl.	incl.
Series 3000 – Landscape and Ecology	£ 631,900	£ 890,000	£ 1,477,400	£ 248,500	£ 350,000	£ 581,000	£ 4,189,000	£ 5,900,000	£ 9,794,000
Series S – Structures	£ 9,023,390	£ 12,709,000	£ 21,096,940	£ 2,759,060	£ 3,886,000	£ 6,450,760	£ 115,683,140	£ 162,934,000	£ 270,470,440
Accommodation Works	£ 244,950	£ 345,000	£ 572,700	£ 154,070	£ 217,000	£ 360,220	£ 1,968,830	£ 2,773,000	£ 4,603,180
Contractor Fee	£ 3,699,100	£ 5,210,000	£ 8,648,600	£ 2,322,410	£ 3,271,000	£ 5,429,860	£ 29,724,860	£ 41,866,000	£ 69,497,560
Cost of Construction	£ 43,138,322	£ 60,758,200	£ 100,858,612	£ 27,084,512	£ 38,147,200	£ 63,324,352	£ 346,655,370	£ 488,247,000	£ 810,490,020
ANCILLARY COSTS									
Statutory Undertakers and Third Party Costs	£ 2,130,000	£ 3,000,000	£ 4,980,000	£ 1,420,000	£ 2,000,000	£ 3,320,000	£ 9,940,000	£ 14,000,000	£ 23,240,000
HE Agents Pre AoC	£ 406,830	£ 573,000	£ 951,180	£ 511,200	£ 720,000	£ 1,195,200	£ 6,539,100	£ 9,210,000	£ 15,288,600
HE Agents Post AoC	£ 2,440,980	£ 3,438,000	£ 5,707,080	£ 1,532,890	£ 2,159,000	£ 3,583,940	£ 19,618,010	£ 27,631,000	£ 45,867,460

Proposal:	M4 J4 to J4b Road Widening			M4 Higher Capacity at Junction, J4a			M25 Tunnelling and Works South of J15		
Cost Head / MMHW Series	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
NR VAT	£ 4,047,000	£ 5,700,000	£ 9,462,000	£ 497,000	£ 700,000	£ 1,162,000	£ 39,263,000	£ 55,300,000	£ 91,798,000
Total Base Cost Estimate (Q1, 2014 prices excl. Inflation)	£ 58,266,292	£ 82,065,200	£ 136,228,232	£ 34,877,472	£ 49,123,200	£ 81,544,512	£ 471,060,860	£ 663,466,000	£ 1,101,353,560
<u>RANGING / RISK AND OPTIMISM BIAS</u>	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max
Inclusion of Optimism Bias @ 66%	excl.	excl.	incl.	excl.	excl.	incl.	excl.	excl.	incl.
Total Range Cost Estimate	£ 58,266,292	£ 82,065,200	£ 136,228,232	£ 34,877,472	£ 49,123,200	£ 81,544,512	£ 471,060,860	£ 663,466,000	£ 1,101,353,560
Airports Commission Estimated Cost of SRN Surface Access Proposal (incl. OB)	£338,000,000			£58,000,000			£576,000,000		

All costs at 2014 prices u.n.o.

Proposal:	M4 "M4 Junction J4b Replacement"		
	Min	Deterministic	Max
Cost Head / MMHW Series			
Options & Development Phase	£ 15,160,630	£ 21,353,000	£ 35,445,980
Lands		Not Included	
Options & Development Total	£ 15,160,630	£ 21,353,000	£ 35,445,980
<u>CONSTRUCTION PHASE</u>			
Series 100 - Project Overheads	£ 19,973,720	£ 28,132,000	£ 46,699,120
Series 100 - Method Related Costs	£ 14,267,450	£ 20,095,000	£ 33,357,700
Series 200 - Site Clearance	£ 2,123,610	£ 2,991,000	£ 4,965,060
Series 300 – Fencing	£ 20,590	£ 29,000	£ 48,140
Series 400 – Vehicle Restraint Systems	£ 423,160	£ 596,000	£ 989,360
Series 500 – Drainage	£ 1,078,490	£ 1,519,000	£ 2,521,540
Series 600 – Earthworks	£ 6,618,620	£ 9,322,000	£ 15,474,520
Series 700 – Pavement	£ 2,350,100	£ 3,310,000	£ 5,494,600

Proposal:	M4 "M4 Junction J4b Replacement"		
	Min	Deterministic	Max
Series 1100 – Kerbs, Footways and Paved Areas	£ 488,480	£ 688,000	£ 1,142,080
Series 1200 - Traffic Signs	£ 258,440	£ 364,000	£ 604,240
Series 1300 – Road Lighting	£ 254,180	£ 358,000	£ 594,280
Series 1400 – Electrical Work for Lighting and Signs	£ 1,161,560	£ 1,636,000	£ 2,715,760
Series 1500 – Communications	£ 2,018,530	£ 2,843,000	£ 4,719,380
Series 1600 - Piling and Embedded Retaining Walls	incl.	£	incl.
Series 3000 – Landscape and Ecology	£ 781,000	£ 1,100,000	£ 1,826,000
Series S – Structures	£ 39,491,620	£ 55,622,000	£ 92,332,520
Accommodation Works	£ 570,840	£ 804,000	£ 1,334,640
Contractor Fee	£ 9,188,110	£ 12,941,000	£ 21,482,060
Cost of Construction	£ 101,068,500	£ 142,350,000	£ 236,301,000
ANCILLARY COSTS			
Statutory Undertakers and Third Party Costs	£ 3,195,000	£ 4,500,000	£ 7,470,000
HE Agents Pre AoC	£ 1,011,040	£ 1,424,000	£ 2,363,840

Proposal:	M4 "M4 Junction J4b Replacement"		
	Min	Deterministic	Max
Cost Head / MMHW Series			
HE Agents Post AoC	£ 6,064,110	£ 8,541,000	£ 14,178,060
NR VAT	£ 4,042,740	£ 5,694,000	£ 9,452,040
Total Base Cost Estimate (Q1, 2014 prices excl. Inflation)	£ 130,542,020	£ 183,862,000	£ 305,210,920
<u>RANGING / RISK AND OPTIMISM BIAS</u>	Range Min	Deterministic	Range Max
Inclusion of Optimism Bias @ 66%	excl.	excl.	incl.
Total Range Cost Estimate	£ 130,542,020	£ 183,862,000	£ 305,210,920
Airports Commission Estimated Cost of SRN Surface Access Proposal (incl. OB)	£216,000,000		

Heathrow Extended Northern Runway

Proposal:	M4 J3 to J4 HSR & Widening			M4 Airport Spur Road Widening			M4 J2 to J3 Road Widening		
	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Options & Development Phase	£3,820,240	£5,618,000	£9,325,880	£3,399,320	£4,999,000	£8,298,340	£70,794,120	£104,109,000	£172,820,940
Lands		Not Included			Not Included			Not Included	
Options & Development Total	£3,988,780	£5,618,000	£9,325,880	£3,549,290	£4,999,000	£8,298,340	£73,917,390	£104,109,000	£172,820,940
CONSTRUCTION PHASE									
Series 100 - Project Overheads	£5,602,930	£7,891,450	£13,099,807	£4,985,656	£7,022,050	£11,656,603	£110,195,337	£155,204,700	£257,639,802
Series 100 - Method Related Costs	£4,002,093	£5,636,750	£9,357,005	£3,561,183	£5,015,750	£8,326,145	£78,710,955	£110,860,500	£184,028,430
Series 200 - Site Clearance	£188,150	£265,000	£439,900	£367,780	£518,000	£859,880	£821,470	£1,157,000	£1,920,620
Series 300 – Fencing	£87,330	£123,000	£204,180	£21,300	£30,000	£49,800	£157,620	£222,000	£368,520
Series 400 – Vehicle Restraint Systems	£592,850	£835,000	£1,386,100	£189,570	£267,000	£443,220	£904,540	£1,274,000	£2,114,840
Series 500 – Drainage	£1,346,870	£1,897,000	£3,149,020	£475,700	£670,000	£1,112,200	£2,084,560	£2,936,000	£4,873,760
Series 600 – Earthworks	£1,928,360	£2,716,000	£4,508,560	£1,408,640	£1,984,000	£3,293,440	£22,474,340	£31,654,000	£52,545,640
Series 700 – Pavement	£3,109,090	£4,379,000	£7,269,140	£1,290,780	£1,818,000	£3,017,880	£821,470	£1,157,000	£1,920,620
Series 1100 – Kerbs, Footways & Paved Areas	£572,970	£807,000	£1,339,620	£219,390	£309,000	£512,940	£157,620	£222,000	£368,520
Series 1200 - Traffic Signs	£131,350	£185,000	£307,100	£95,850	£135,000	£224,100	£904,540	£1,274,000	£2,114,840
Series 1300 – Road Lighting	£195,250	£275,000	£456,500	£85,200	£120,000	£199,200	£2,084,560	£2,936,000	£4,873,760

Proposal:	M4 J3 to J4 HSR & Widening			M4 Airport Spur Road Widening			M4 J2 to J3 Road Widening		
	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Series 1400 – Electrical Work for Lighting and Signs	£623,380	£878,000	£1,457,480	£208,030	£293,000	£486,380	£22,474,340	£31,654,000	£52,545,640
Series 1500 – Communications	£2,037,700	£2,870,000	£4,764,200	£788,810	£1,111,000	£1,844,260	£5,201,460	£7,326,000	£12,161,160
Series 1600 - -Piling and Embedded Retaining Walls	incl.	incl.	incl.	£5,371,860	£7,566,000	£12,559,560	£1,021,690	£1,439,000	£2,388,740
Series 3000 – Landscape and Ecology	£1,070,680	£1,508,000	£2,503,280	£463,630	£653,000	£1,083,980	£550,250	£775,000	£1,286,500
Series S – Structures	£4,124,390	£5,809,000	£9,642,940	£3,258,190	£4,589,000	£7,617,740	£255,185,360	£359,416,000	£596,630,560
Accommodation Works	£159,750	£225,000	£373,500	£142,710	£201,000	£333,660	£2,964,250	£4,175,000	£6,930,500
Contractor Fee	£2,417,550	£3,405,000	£5,652,300	£2,151,300	£3,030,000	£5,029,800	£44,759,820	£63,042,000	£104,649,720
Cost of Construction	£28,190,692	£39,705,200	£65,910,632	£25,085,578	£35,331,800	£58,650,788	£551,474,182	£776,724,200	£1,289,362,172
ANCILLARY COSTS									
Statutory Undertakers and Third Party Costs	£1,420,000	£2,000,000	£3,320,000	£1,420,000	£2,000,000	£3,320,000	£24,850,000	£35,000,000	£58,100,000
HE Agents Pre AoC	£531,790	£749,000	£1,243,340	£236,430	£333,000	£552,780	£9,846,990	£13,869,000	£23,022,540
HE Agents Post AoC	£1,595,370	£2,247,000	£3,730,020	£1,420,000	£2,000,000	£3,320,000	£29,541,680	£41,608,000	£69,069,280
NR VAT	£1,065,000	£1,500,000	£2,490,000	£923,000	£1,300,000	£2,158,000	£73,840,000	£104,000,000	£172,640,000
Total Base Cost Estimate (Q1, 2014 prices excl. Inflation)	£36,791,632	£51,819,200	£86,019,872	£32,634,298	£45,963,800	£76,299,908	£763,470,242	£1,075,310,200	£1,785,014,932
RANGING / RISK AND OPTIMISM BIAS	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max
Inclusion of Optimism Bias @ 66%	excl.	excl.	incl.	excl.	excl.	incl.	excl.	excl.	incl.

Proposal:	M4 J3 to J4 HSR & Widening			M4 Airport Spur Road Widening			M4 J2 to J3 Road Widening		
	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Cost Head / MMHW Series									
Total Range Cost Estimate	£36,791,632	£51,819,200	£86,019,872	£32,634,298	£45,963,800	£76,299,908	£763,470,242	£1,075,310,200	£1,785,014,932
Airports Commission Estimated Cost of SRN Surface Access Proposal (incl. OB)	£274,000,000			£202,000,000			£1,267,000,000		

Proposal:	M4 J4 to J4b			M4			M25		
	Road Widening			Higher Capacity at Junction, J4a			Tunnelling and Works South of J15		
Cost Head / MMHW Series	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Options & Development Phase	£6,103,160	£8,596,000	£14,269,360	£3,832	£5,397	£8,959	£54,866,148	£77,276,265	£128,278,600
Lands		Not Included			Not Included			Not Included	
Options & Development Total	£6,103,160	£8,596,000	£14,269,360	£3,831,870	£5,397,000	£8,959,020	£49,045,380	£69,078,000	£114,669,480
CONSTRUCTION PHASE									
Series 100 - Project Overheads	£8,573,747	£12,075,700	£20,045,662	£5,383,007	£7,581,700	£12,585,622	£72,287,408	£101,813,250	£169,009,995
Series 100 - Method Related Costs	£6,124,105	£8,625,500	£14,318,330	£3,845,005	£5,415,500	£8,989,730	£51,633,863	£72,723,750	£120,721,425
Series 200 - Site Clearance	£560,190	£789,000	£1,309,740	£97,980	£138,000	£229,080	£6,212,500	£8,750,000	£14,525,000
Series 300 – Fencing	£80,230	£113,000	£187,580	£-	£-	£-	£710,000	£1,000,000	£1,660,000

Proposal:	M4 J4 to J4b			M4			M25		
	Road Widening			Higher Capacity at Junction, J4a			Tunnelling and Works South of J15		
Cost Head / MMHW Series	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Series 400 – Vehicle Restraint Systems	£504,810	£711,000	£1,180,260	£161,170	£227,000	£376,820	£1,934,040	£2,724,000	£4,521,840
Series 500 – Drainage	£1,498,810	£2,111,000	£3,504,260	£350,030	£493,000	£818,380	£4,960,770	£6,987,000	£11,598,420
Series 600 – Earthworks	£2,842,840	£4,004,000	£6,646,640	£3,335,580	£4,698,000	£7,798,680	£56,131,180	£79,058,000	£131,236,280
Series 700 – Pavement	£3,452,020	£4,862,000	£8,070,920	£2,847,100	£4,010,000	£6,656,600	£14,324,250	£20,175,000	£33,490,500
Series 1100 – Kerbs, Footways and Paved Areas	£715,680	£1,008,000	£1,673,280	£75,260	£106,000	£175,960	£1,961,730	£2,763,000	£4,586,580
Series 1200 - Traffic Signs	£144,840	£204,000	£338,640	£62,480	£88,000	£146,080	£790,940	£1,114,000	£1,849,240
Series 1300 – Road Lighting	£482,800	£680,000	£1,128,800	£146,260	£206,000	£341,960	£709,290	£999,000	£1,658,340
Series 1400 – Electrical Work for Lighting and Signs	£1,812,630	£2,553,000	£4,237,980	£445,880	£628,000	£1,042,480	£2,712,910	£3,821,000	£6,342,860
Series 1500 – Communications	£2,746,280	£3,868,000	£6,420,880	£712,840	£1,004,000	£1,666,640	£5,521,670	£7,777,000	£12,909,820
Series 1600 - -Piling and Embedded Retaining Walls	incl.	incl.	incl.	£4,137,880	£5,828,000	£9,674,480	incl.	incl.	incl.
Series 3000 – Landscape and Ecology	£631,900	£890,000	£1,477,400	£248,500	£350,000	£581,000	£3,940,500	£5,550,000	£9,213,000
Series S – Structures	£9,023,390	£12,709,000	£21,096,940	£2,759,060	£3,886,000	£6,450,760	£106,625,670	£150,177,000	£249,293,820
Accommodation Works	£244,950	£345,000	£572,700	£154,070	£217,000	£360,220	£2,065,390	£2,909,000	£4,828,940

Proposal:	M4 J4 to J4b			M4			M25		
	Road Widening			Higher Capacity at Junction, J4a			Tunnelling and Works South of J15		
Cost Head / MMHW Series	Min	Deterministic	Max	Min	Deterministic	Max	Min	Deterministic	Max
Contractor Fee	£3,699,100	£5,210,000	£8,648,600	£2,322,410	£3,271,000	£5,429,860	£33,252,211	£46,834,100	£77,744,606
Cost of Construction	£43,138,322	£60,758,200	£100,858,612	£27,084,512	£38,147,200	£63,324,352	£365,774,321	£515,175,100	£855,190,666
<u>ANCILLARY COSTS</u>									
Statutory Undertakers and Third Party Costs	£2,130,000	£3,000,000	£4,980,000	£1,420,000	£2,000,000	£3,320,000	£10,295,000	£14,500,000	£24,070,000
HE Agents Pre AoC	£406,830	£573,000	£951,180	£511,200	£720,000	£1,195,200	£6,861,440	£9,664,000	£16,042,240
HE Agents Post AoC	£2,440,980	£3,438,000	£5,707,080	£1,532,890	£2,159,000	£3,583,940	£20,583,610	£28,991,000	£48,125,060
NR VAT	£4,047,000	£5,700,000	£9,462,000	£497,000	£700,000	£1,162,000	£54,888,680	£77,308,000	£128,331,280
Total Base Cost Estimate (Q1, 2014 prices excl. Inflation)	£58,266,292	£82,065,200	£136,228,232	£34,877,472	£49,123,200	£81,544,512	£513,269,199	£722,914,365	£1,200,037,846
<u>RANGING / RISK AND OPTIMISM BIAS</u>	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max	Range Min	Deterministic	Range Max
Inclusion of Optimism Bias @ 66%	excl.	excl.	incl.	excl.	excl.	incl.	excl.	excl.	incl.
Total Range Cost Estimate	£58,266,292	£82,065,200	£136,228,232	£34,877,472	£49,123,200	£81,544,512	£513,269,199	£722,914,365	£1,200,037,846
Airports Commission Estimated Cost of SRN Surface Access Proposal (incl. OB)	£338,000,000			£58,000,000			£864,000,000		

All costs at 2014 prices u.n.o.

Proposal:	M4 "M4 Junction J4b Replacement"		
	Min	Deterministic	Max
Cost Head / MMHW Series			
Options & Development Phase	£15,160,630	£21,353,000	£35,445,980
Lands		Not Included	
Options & Development Total	£15,160,630	£21,353,000	£35,445,980
<u>CONSTRUCTION PHASE</u>			
Series 100 - Project Overheads	£19,973,720	£28,132,000	£46,699,120
Series 100 - Method Related Costs	£14,267,450	£20,095,000	£33,357,700
Series 200 - Site Clearance	£2,123,610	£2,991,000	£4,965,060
Series 300 – Fencing	£20,590	£29,000	£48,140
Series 400 – Vehicle Restraint Systems	£423,160	£596,000	£989,360
Series 500 – Drainage	£1,078,490	£1,519,000	£2,521,540
Series 600 – Earthworks	£6,618,620	£9,322,000	£15,474,520
Series 700 – Pavement	£2,350,100	£3,310,000	£5,494,600
Series 1100 – Kerbs, Footways and Paved Areas	£488,480	£688,000	£1,142,080
Series 1200 - Traffic Signs	£258,440	£364,000	£604,240
Series 1300 – Road Lighting	£254,180	£358,000	£594,280
Series 1400 – Electrical Work for Lighting and Signs	£1,161,560	£1,636,000	£2,715,760
Series 1500 – Communications	£2,018,530	£2,843,000	£4,719,380
Series 1600 - Piling and Embedded Retaining Walls	incl.	Incl.	incl.
Series 3000 – Landscape and Ecology	£781,000	£1,100,000	£1,826,000
Series S – Structures	£39,491,620	£55,622,000	£92,332,520

Proposal:	M4 “M4 Junction J4b Replacement”		
	Min	Deterministic	Max
Cost Head / MMHW Series			
Accommodation Works	£570,840	£804,000	£1,334,640
Contractor Fee	£9,188,110	£12,941,000	£21,482,060
Cost of Construction	£101,068,500	£142,350,000	£236,301,000
ANCILLARY COSTS			
Statutory Undertakers and Third Party Costs	£3,195,000	£4,500,000	£7,470,000
HE Agents Pre AoC	£1,011,040	£1,424,000	£2,363,840
HE Agents Post AoC	£6,064,110	£8,541,000	£14,178,060
NR VAT	£4,042,740	£5,694,000	£9,452,040
Total Base Cost Estimate (Q1, 2014 prices excl. Inflation)	£130,542,020	£183,862,000	£305,210,920
<u>RANGING / RISK AND OPTIMISM BIAS</u>	Range Min	Deterministic	Range Max
Inclusion of Optimism Bias @ 66%	excl.	excl.	incl.
Total Range Cost Estimate	£130,542,020	£183,862,000	£305,210,920
Airports Commission Estimated Cost of SRN Surface Access Proposal (incl. OB)	£216,000,000		

ANNEX F – BASIS OF ESTIMATE ASSUMPTIONS

Gatwick Second Runway – summary of basis of estimate assumptions

Cost Head	Approach
Historic Costs	Please note expenditure on the <u>study work and development to date is excluded from our estimates.</u>
Options and Development Phase	Application of percentage allowances of the cost of construction based on analysis of recent outturns and agreed tender prices.
Lands	Please note that <u>Lands costs are excluded</u> from our assessment as they will require specialist input from the District Valuer for robust validation.
Roadworks Series – Direct Costs	<p>Collection of reference design information and meetings with DfT and promoters to confirm assumed design basis for estimates.</p> <p>Quantity measurement and development of BoQs in standard work breakdown format for pricing using the Commercial Services Division’s current rate libraries for Major Projects at a price base of Q1, 2014.</p>
Series 200 – Site Clearance	Site clearance for the earthworks footprint plus a margin to allow for construction activities. Additional allowances have been made where demolition of built items of significant size is required. Typically, these items include safety fencing, road lighting columns, electronic signs and bridges.
Series 300 – Fencing	Timber post and rail fencing to the perimeter of the works.
Series 400 – Vehicle Restraint Systems	<p>TCB Safety barriers (designed to be impacted on one side only) located verge-side of new and realigned carriageways, except at Terminal Access Road (TAR).</p> <p>VCB edge barriers have been allowed for the TAR where the carriageway is grade separated from the J9 to J9a carriageway.</p> <p>TCB safety barriers (designed to be impacted on both sides) have been allowed in the central reserve between J9 and J9a</p> <p>Allowance has been made for terminals and connection to existing vehicle restraint systems.</p>
Series 500 – Drainage	<p>New carrier drainage system is installed along all widened and realigned carriageways. It was considered that in instances where the existing carriageway is widened, the increased area of impermeable surface may increase the intensity of rainfall runoff resulting in the installed capacity of the drainage system being exceeded.</p> <p>The cost validation for Gatwick surface access allows for:</p> <ul style="list-style-type: none"> ▪ 450mm carrier average pipe diameter ▪ Gullies at 25m spacing

Cost Head	Approach
	<ul style="list-style-type: none"> ▪ Chambers at 75m spacing <p>In addition, narrow filter drains (Type 9) have been allowed at one edge of the widened or realigned carriageway.</p> <p>A lump sum allowance for transverse drainage has been included between Junction 9 and Junction 9a</p>
<p>Series 600 – Earthworks</p>	<p>Topsoil strip to a depth of 200mm to the extent of the earthworks footprint with either permanent storage or storage for later reuse.</p> <p>Excavation of material (excluding Class 5a) with an allowance of 10% of the excavated volume for unacceptable material U1A, 5% allowance for unacceptable material U2 and 5% allowance for excavation of soft spots below cuttings or under embankments.</p> <p>Removal and backfill of disused drains. This has been applied to the anticipated extent of the existing drainage system impacted by carriageway widening.</p> <p>Imported material – all material for construction of embankments and capping has been included as imported material.</p> <p>Allowance has been made for topsoil placement to embankment batters and other areas of earthworks disturbed by construction.</p>
<p>Series 700 - Pavement</p>	<p>Areas measured using quantity measurement software where general arrangement plans have been provided. Estimates include hardening of the central reserve between Junction 9 and Junction 9a.</p> <p>Assumed pavement design thicknesses are:</p> <ul style="list-style-type: none"> ▪ Sub-base – 250mm thickness of Type 1 material (unbound) ▪ Base – 250mm thickness of Dense Bitumen Macadam ▪ Binder – 60mm thickness of Dense Bitumen Macadam ▪ Surface Course – 50mm of Close Graded Macadam <p>Cold Milling and Regulating Course – Allowance for level adjustment at the interface of new and existing pavement.</p> <p>Mill and Inlay – Allowance to remove and replace a portion of the existing carriageway surface course in areas of significant carriageway adjustment and at the longitudinal interface between new and existing pavements.</p>
<p>Series 1100 – Kerbs, Footways and Paved Areas</p>	<p>New kerb installed along all widened and realigned carriageway.</p>

Cost Head	Approach
Series 1200 – Traffic Signs	Replacement of existing traffic signs.
Series 1300 – Road Lighting	Replacement of lighting at Junction 9a to accommodate potential pavement widening.
Series 1400 – Electrical Work for Lighting and Signs	Upgrade electrical reticulation to Junction 9a lighting.
Series 1500 – Communications	<p>Upgrade communications and technology including gantry mounted AMI, MS4 and MS3.</p> <p>MIDAS</p> <p>CCTV</p> <p>Emergency Roadside Telephones</p> <p>Upgraded NRTS service provisioning capability and transmission station</p> <p>Installation of power and communications ducting and cabling</p>
Series 3000 – Landscape and Ecology	<p>Replacement or conservation of significant vegetation on the M23 in the vicinity of Junction 9.</p> <p>Provision of a lump sum allowance for architectural treatment between Junction 9 and Junction 9a on approach to Gatwick Airport.</p>
Structures	<p>The following structures and structural form are included:</p> <p>M23 SB Link Road (Bridge 1) over M23 Junction 9 – 5 span precast post tensioned segmental box girder, balanced cantilever construction supported on circular piers</p> <p>M23 SB Link Road – Transverse culverts for waterway at approximate chainage 875 and 975 (ref drawing no LGW2NR-ARP-ZZ-ZZ-DR-CH-00102 Rev P02.1).</p> <p>Slip Road Widening – Extension of an existing culvert to the north of Junction 9.</p> <p>Slip Road Widening – M23 Northbound Link Road over Balcombe Road Diversion – Single span on piled abutments with superstructure of precast prestressed beam construction.</p> <p>Slip Road Widening – Replacement of the Church Lane Overbridge - 2 span precast post tensioned segmental box girder, balanced cantilever construction supported on circular piers.</p> <p>Junction 9 to Junction 9a – Extension to both ends of the bridge over Peeks Brook Lane.</p>

Cost Head	Approach
	<p>Terminal Access Road over J9 to J9a (Bridge 2) - 5 span precast post tensioned segmental box girder, balanced cantilever construction supported on circular piers</p> <p>Sign and Signal Gantries and foundations – One included on the M23 southbound approach to Junction 9, one on the M23 northbound approach to Junction 9 and one on the westbound approach to Junction 9a. Superspan gantries spanning from the verge to the central reserve.</p> <p>Cantilever structures for MS3 and foundations – One included on the M23 northbound departure from Junction 9 and one on the westbound approach to Junction 9a.</p>
<p>Project Overheads and Method Related Costs</p>	<p>Application of percentage factor of 50% of the direct costs of construction based on analysis of recent Series 100 costs for Major Projects schemes (averaging 42% of the direct cost of construction) to cover the following elements:</p> <p>Project Overheads</p> <ul style="list-style-type: none"> ▪ Cost of Offices ▪ Construction Management ▪ Design Management ▪ Insurance ▪ Ancillary Overhead Costs ▪ General Labour <p>Method Related Costs</p> <ul style="list-style-type: none"> ▪ General Plant ▪ Temporary Works ▪ Traffic Management
<p>Accommodation Works</p>	<p>A lump sum allowance is included at 1% of the direct cost of construction for miscellaneous accommodation works</p>
<p>Contractor Fee</p>	<p>We have allowed for contractor’s fee at 10% of the direct cost of construction inclusive of Project Overheads, Method Related costs and Accommodation Works allowance</p>
<p>Statutory Undertakers and Third Party Costs</p>	<p>Lump sum allowances have been included based on assessment of the level of impacts of each proposal in relation to:</p> <ul style="list-style-type: none"> ▪ Power - Underground ▪ Power - Overhead ▪ Telecommunications ▪ Water ▪ Gas ▪ Other Miscellaneous SU costs ▪ Rail Authority costs

Cost Head	Approach												
	<ul style="list-style-type: none"> ▪ Environment Agency costs ▪ Local Authority costs <p>Allowances are between 1% and 3% of the costs of construction.</p>												
Supervision and Other PCF Stage 6-7	Provision for Highways England Agents costs (procurement, supervision, commercial assurance, etc... is included as lump sum allowances (the post-award of contract allowance is 6% of the cost of construction)												
NR VAT	An assessment of the value of works constructed beyond the existing highway boundary has been made for each proposal and VAT on this spend classed as non-recoverable at the current VAT rate of 20%. VAT on expenditure within the existing highway boundary is assumed to be recoverable.												
Risk and Optimism Bias	Optimism Bias uplifts of 44% have been applied for all Gatwick proposals (standard complexity highways schemes), in accordance with HM Treasury Green Book guidance. We have applied Optimism Bias uplifts to both capital and operation and maintenance cost estimates. The description of our Optimism Bias approach compared with the Commission’s approach is described in Section 8.												
Inflation	<p>Our cost estimates have been presented in real terms for ease of comparison with the Commission’s figures. Inflation allowances will depend on delivery timescales. Commercial Services Division’s current inflation forecast profile is as follows:</p> <table border="1"> <thead> <tr> <th>Financial Year</th> <th>2016/17</th> <th>2017/18</th> <th>2018/19</th> <th>2019/20</th> <th>2020/21 +</th> </tr> </thead> <tbody> <tr> <td>Annual Inflation</td> <td>4.20%</td> <td>4.10%</td> <td>3.80%</td> <td>3.80%</td> <td>3.50%</td> </tr> </tbody> </table> <p>We have generally presented estimated costs in real terms at a price base of Q1, 2014 for comparison with the Airports Commission’s figures (also at a price base of Q1, 2014). For estimates presented in nominal terms it should be noted that inflation allowances are based on provided delivery timescales and increased timescales will require revision of nominal terms estimates to reflect the additional cost inflation that will result.</p>	Financial Year	2016/17	2017/18	2018/19	2019/20	2020/21 +	Annual Inflation	4.20%	4.10%	3.80%	3.80%	3.50%
Financial Year	2016/17	2017/18	2018/19	2019/20	2020/21 +								
Annual Inflation	4.20%	4.10%	3.80%	3.80%	3.50%								

Heathrow North West Runway – summary of basis of estimate assumptions**Heathrow Extended Northern Runway – summary of basis of estimate assumptions**

Cost Head	Approach
Historic Costs	Please note expenditure on the <u>study work and development to date is excluded from our estimates.</u>
Options and Development Phase	Application of percentage allowances of the cost of construction based on analysis of recent outturns and agreed tender prices.
Lands	Please note that <u>Lands costs are excluded</u> from our assessment as they will require specialist input from the District Valuer for robust validation.
Roadworks Series – Direct Costs	Collection of reference design information and meetings with DfT and promoters to confirm assumed design basis for estimates. Quantity measurement and development of BoQs in standard work breakdown format for pricing using the Commercial Services Division’s current rate libraries for Major Projects at a price base of Q1, 2014.
Series 200 – Site Clearance	Site clearance for the earthworks footprint plus a margin to allow for construction activities. Additional allowances have been made where demolition of built items of significant size is required. Typically, these items include safety fencing, road lighting columns, electronic signs and bridges.
Series 300 – Fencing	Timber post and rail fencing to the perimeter of the works.
Series 400 – Vehicle Restraint Systems	TCB Safety barriers (designed to be impacted on one side only) located verge-side of new and realigned carriageways Dual TCB safety barriers (designed to be impacted on one side only) have been allowed in the central reserve of new or realigned dual carriageways Allowance has been made for terminals and connection to existing vehicle restraint systems.
Series 500 – Drainage	New carrier drainage system is installed along all new, widened and realigned carriageways. It was considered that in instances where the existing carriageway is widened, the increased area of impermeable surface may increase the intensity of rainfall runoff resulting in the installed capacity of the drainage system being exceeded. The cost validation for the Heathrow Northern Runway extension surface access allows for: <ul style="list-style-type: none"> ▪ 450mm carrier average pipe diameter ▪ Gullies at 25m spacing ▪ Chambers at 75m spacing

Cost Head	Approach
	<p>In addition, narrow filter drains (Type 9) have been allowed at one edge new, widened or realigned carriageway.</p> <p>Lump sum allowances for transverse drainage have been included for all new, widened or realigned carriageways where the finished pavement levels are at or above existing levels.</p> <p>Installation of pumps and discharge pipework for drainage of cut and cover tunnels under the northern runway extension and at the proposed M4 slot under Junction 4a.</p>
<p>Series 600 – Earthworks</p>	<p>Topsoil strip to a depth of 200mm to the extent of the earthworks footprint with either permanent storage or storage for later reuse.</p> <p>Excavation of material (excluding Class 5a) with an allowance of 5% of the excavated volume for unacceptable material U1A, 2% allowance for unacceptable material U2 and 2% allowance for excavation of soft spots below cuttings or under embankments.</p> <p>Allowance for removal and backfill of disused sewers, drains, cables, ducts, pipelines and the like. This has been applied to the anticipated extent of the new, widened and realigned carriageway.</p> <p>Imported material – all material for construction of embankments and capping has been included as imported material.</p> <p>Allowance has been made for topsoil placement to embankment batters and other areas of earthworks disturbed by construction.</p>
<p>Series 700 - Pavement</p>	<p>Pavement areas have been estimated from scaled carriageway lengths multiplied by estimated pavement widths. Pavement widths allow for hard shoulder, hard strip and appropriate number of running lanes. Estimates include hardening of central reserves where dual carriageways are either realigned or new dual carriageways are constructed.</p> <p>Assumed pavement design thicknesses are:</p> <ul style="list-style-type: none"> ▪ Sub-base – 250mm thickness of Type 1 material (unbound) ▪ Base – 250mm thickness of Dense Bitumen Macadam ▪ Binder – 60mm thickness of Dense Bitumen Macadam ▪ Surface Course – 50mm of Close Graded Macadam <p>Cold Milling and Regulating Course – Allowance for level adjustment at the interface of new and existing pavement.</p> <p>Mill and Inlay – Allowance to remove and replace a portion of the existing carriageway surface course in areas of significant carriageway adjustment and</p>

Cost Head	Approach
	at the longitudinal interface between new and existing pavements.
Series 1100 – Kerbs, Footways and Paved Areas	New kerb installed along all widened, realigned and new carriageways.
Series 1200 – Traffic Signs	Replacement of existing traffic signs or provision of additional traffic signs for new carriageways.
Series 1300 – Road Lighting	Replacement of lighting where carriageways are widened or realigned and provision of additional lighting along new carriageways.
Series 1400 – Electrical Work for Lighting and Signs	Upgrade electrical reticulation to roadside lighting.
Series 1500 – Communications	Upgrade communications and technology including gantry mounted AMI, MS4 and MS3. MIDAS CCTV Emergency Roadside Telephones Upgraded NRTS service provisioning capability and transmission station Installation of power and communications ducting and cabling
Series 1600 – Piling and Embedded Retaining Walls	Piled retaining walls have been allowed to confine the footprint of the widened M4 airport spur from Sipson Lane (north) to Junction 4a, at Junction 4a to enable construction of a slot below the junction to accommodate the M4 airport spur and widening of the M25 northbound to M4 westbound link road at the M25 Junction 15.
Series 2500 – Special Structures	Provision of reinforced soil walls to accommodate mainline widening at M4 Junctions 3 and 4 without impinging on the footprint of the junction slip roads. Noise walls have been allowed on each side of the M4 between Junctions 2 and 3 from North Hyde Lane to Heston Road where residential properties are in close proximity to the widened Motorway.
Series 3000 – Landscape and Ecology	Replacement or conservation of vegetation. Provision of a lump sum allowance for architectural treatments.
Structures	The following structures are included:

Cost Head	Approach
	M4 Junction 3 to Junction 4 - A437 Overbridge
	M4 Junction 3 to Junction 4 - Connection to Fuller
	M4 Junction 3 to Junction 4 - Connection Shepiston Lane to St Peters Way
	M4 Junction 3 to Junction 4 - Widen Junction 3 Underbridge
	M4 Junction 3 to Junction 4 - Widen Junction 4 Underbridge
	M4 Airport Spur - Sipson Lane Overbridge – two locations
	M4 Airport Spur - Carpark Access
	M4 Junction 2 to Junction 3 - New Overbridge at Southall Lane
	M4 Junction 2 to Junction 3 - New Overbridge at North Hyde Lane
	M4 Junction 2 to Junction 3 - Footbridge over the M4 near Osterley Lane
	M4 Junction 2 to Junction 3 - New Overbridge at Osterley Lane
	M4 Junction 2 to Junction 3 - Widened/New Bridge at River Crossing
	M4 Junction 2 to Junction 3 - Reconstruct J2 EB Merge
	M4 Junction 2 to Junction 3 - Cut and Cover Tunnel - Tunnel Exit
	M4 Junction 2 to Junction 3 - Cut and Cover Tunnel - Tunnel Entry
	M4 Junction 2 to Junction 3 - Tunnel Exit Slot
	M4 Junction 2 to Junction 3 - Tunnel Entry Slot
	M4 Junction 2 to Junction 3 - Driven Tunnel
	M4 Junction 2 to Junction 3 - Widen Junction 3 Underbridge
	M4 Junction 2 to Junction 3 - Widen Pedestrian Underpass at Winchester Ave
	M4 Junction 2 to Junction 3 - Widen Underbridge at Oxford Ave
	M4 Junction 2 to Junction 3 - Widen Underbridge at Heston Road
	M4 Junction 2 to Junction 3 - Widen Underbridge at Windmill Lane
	M4 Junction 2 to Junction 3 - Widen Underbridge at Rail Crossing
	M4 Junction 4 to Junction 4b - Harmondsworth Road Overbridge
	M4 Junction 4 to Junction 4b - Footbridge over the M4 at Rowan Road

Cost Head	Approach
	<p>M4 Junction 4 to Junction 4b - Widen Underbridges at Holloway Lane</p> <p>M4 Junction 4 to Junction 4b - Widen Pedestrian Underpass at Sipson Road</p> <p>M4 Junction 4 to Junction 4b - Widen Bridges over Waterway East of Junction J4b</p> <p>M4 Junction 4 to Junction 4b - Widen Bridges over Waterway East of Junction J4b</p> <p>M4 Junction 4 to Junction 4b - Widen Junction 4 Underbridge</p>
<p>Project Overheads and Method Related Costs</p>	<p>Application of percentage factor of 60% of the direct costs of construction based on analysis of recent Series 100 costs for Major Projects schemes (averaging 42% of the direct cost of construction) to cover the following elements:</p> <p>Project Overheads</p> <ul style="list-style-type: none"> ▪ Cost of Offices ▪ Construction Management ▪ Design Management ▪ Insurance ▪ Ancillary Overhead Costs ▪ General Labour <p>Method Related Costs</p> <ul style="list-style-type: none"> ▪ General Plant ▪ Temporary Works ▪ Traffic Management
<p>Accommodation Works</p>	<p>A lump sum allowance is included at 1% of the direct cost of construction for miscellaneous accommodation works</p>
<p>Contractor Fee</p>	<p>We have allowed for contractor’s fee at 10% of the direct cost of construction inclusive of Project Overheads, Method Related costs and Accommodation Works allowance</p>
<p>Statutory Undertakers and Third Party Costs</p>	<p>We have allowed 4.2% of the direct cost of construction for the impacts of the proposal in relation to:</p> <ul style="list-style-type: none"> ▪ Power - Underground ▪ Power - Overhead ▪ Telecommunications ▪ Water ▪ Gas ▪ Other Miscellaneous SU costs ▪ Rail Authority costs ▪ Environment Agency costs ▪ Local Authority costs

Cost Head	Approach												
Supervision and Other PCF Stage 6-7	Provision for Highways England Agents costs (procurement, supervision, commercial assurance, etc... is included as lump sum allowances (the post-award of contract allowance is 6% of the cost of construction)												
NR VAT	An assessment of the value of works constructed beyond the existing highway boundary has been made for each proposal and VAT on this spend classed as non-recoverable at the current VAT rate of 20%. VAT on expenditure within the existing highway boundary is assumed to be recoverable.												
Risk and Optimism Bias	Optimism Bias uplifts of 66% have been applied for all Heathrow proposals (complex highways schemes), in accordance with HM Treasury Green Book guidance. We have applied Optimism Bias uplifts to both capital and operation and maintenance cost estimates. The description of our Optimism Bias approach compared with the Commission’s approach is described in Section 8.3 below.												
Inflation	<p>Our cost estimates have been presented in real terms for ease of comparison with the Commission’s figures. Inflation allowances will depend on delivery timescales. Commercial Services Division’s current inflation forecast profile is as follows:</p> <table border="1"> <thead> <tr> <th>Financial Year</th> <th>2016/17</th> <th>2017/18</th> <th>2018/19</th> <th>2019/20</th> <th>2020/21 +</th> </tr> </thead> <tbody> <tr> <td>Annual Inflation</td> <td>4.20%</td> <td>4.10%</td> <td>3.80%</td> <td>3.80%</td> <td>3.50%</td> </tr> </tbody> </table> <p>We have generally presented estimated costs in real terms at a price base of Q1, 2014 for comparison with the Airports Commission’s figures (also at a price base of Q1, 2014). For estimates presented in nominal terms it should be noted that inflation allowances are based on provided delivery timescales and increased timescales will require revision of nominal terms estimates to reflect the additional cost inflation that will result.</p>	Financial Year	2016/17	2017/18	2018/19	2019/20	2020/21 +	Annual Inflation	4.20%	4.10%	3.80%	3.80%	3.50%
Financial Year	2016/17	2017/18	2018/19	2019/20	2020/21 +								
Annual Inflation	4.20%	4.10%	3.80%	3.80%	3.50%								

ANNEX G – OPERATION AND MAINTENANCE COST ESTIMATES AND ASSUMED ASSET RENEWAL FREQUENCIES (estimates presented excluding Optimism Bias)

Gatwick Second Runway – M23 J9 Flyover

COMMUTED SUM FOR FUTURE MAINTENANCE

Summary	
Total: Routine Maintenance	£ 2,966,798.07
Total: Renewal of New Asset (Incl. TM & Prelims)	£ 1,373,841.88
Total: Structures	£ 1,996,968.84
Total: Betterment	£ 109,193.22
<i>Of which TM and Prelims</i>	£ 5,214.82
Total of Estimated Commuted Sum	£ 6,228,415.57

Project Details	
Project Title:	M23 J9 Flyover
Date:	14/04/2016
Opening Year:	2023
Model Details	
Model Version:	2.0
Valid From:	
Valid To:	

ROUTINE MAINTENANCE - Description	Unit	Annual Rate	Additional Quantity
Annual maintenance for Pavements	m2 of Pavement	£5.76	18,260

Structure Name	Capital Cost	Commuted Sum
Total Structures	£ 8,030,588.00	£ 1,996,968.84

Year	Discount	Relative Price Change	Routine Maintenance excl. Structures		Renewal of New Asset excl. Structures			Betterment (renewal or removal of existing asset) excl. Structures					Total					
			Annual	After Effective Discounting	Renewal Incl. TM & Prelims	Total	After Effective Discounting	Early Renewal	TM & Prelims	Removal	TM & Prelims	Total		After Effective Discounting				
1	0.966	1.000																
2	0.934	1.000	£ 121,544.87	£ 113,463.44	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 113,463.44
3	0.902	1.000	£ 121,544.87	£ 109,626.51	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 109,626.51
4	0.871	1.000	£ 121,544.87	£ 105,919.34	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 105,919.34
5	0.842	1.000	£ 121,544.87	£ 102,337.52	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 102,337.52
6	0.814	1.000	£ 121,544.87	£ 98,876.83	£ 6,757.19	£ 6,757.19	£ 5,496.98	£ 114,978.94	£ 3,116.68	£ -	£ -	£ -	£ -	£ 118,095.62	£ 96,070.86	£ -	£ -	£ 8,302.95
7	0.786	1.000	£ 121,544.87	£ 95,533.17	£ 8,725.93	£ 8,725.93	£ 6,858.50	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 102,391.67
8	0.759	1.000	£ 121,544.87	£ 92,302.58	£ 17,451.84	£ 17,451.84	£ 13,253.13	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 105,555.71
9	0.734	1.000	£ 121,544.87	£ 89,181.24	£ 13,400.53	£ 13,400.53	£ 9,832.38	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 99,013.62
10	0.709	1.000	£ 121,544.87	£ 86,165.45	£ 9,349.20	£ 9,349.20	£ 6,627.82	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 92,793.27
11	0.685	1.000	£ 121,544.87	£ 83,251.64	£ 377,956.60	£ 377,956.60	£ 258,879.75	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 342,131.39
12	0.662	1.000	£ 121,544.87	£ 80,436.37	£ 33,898.44	£ 33,898.44	£ 22,433.42	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 102,869.79
13	0.639	1.000	£ 121,544.87	£ 77,716.30	£ 54,282.49	£ 54,282.49	£ 34,708.45	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 112,424.75
14	0.618	1.000	£ 121,544.87	£ 75,088.21	£ 57,391.63	£ 57,391.63	£ 35,455.50	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 110,543.71
15	0.597	1.000	£ 121,544.87	£ 72,549.00	£ 69,226.66	£ 69,226.66	£ 41,320.75	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 113,869.74
16	0.577	1.000	£ 121,544.87	£ 70,095.65	£ 71,960.25	£ 71,960.25	£ 41,499.90	£ 18,107.96	£ 4,646.03	£ -	£ -	£ -	£ -	£ 22,753.99	£ 13,122.36	£ -	£ -	£ 98,473.19
17	0.557	1.000	£ 121,544.87	£ 67,725.26	£ 8,725.93	£ 8,725.93	£ 4,862.12	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 72,587.38
18	0.538	1.000	£ 121,544.87	£ 65,435.04	£ 6,757.19	£ 6,757.19	£ 3,637.81	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 69,072.84
19	0.520	1.000	£ 121,544.87	£ 63,222.26	£ 4,674.60	£ 4,674.60	£ 2,431.52	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 65,653.78
20	0.503	1.000	£ 121,544.87	£ 61,084.31	£ 9,349.20	£ 9,349.20	£ 4,698.59	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 65,782.90
21	0.486	1.000	£ 121,544.87	£ 59,018.65	£ 377,956.60	£ 377,956.60	£ 183,524.73	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 242,543.38
22	0.469	1.000	£ 121,544.87	£ 57,022.85	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 57,022.85
23	0.453	1.000	£ 121,544.87	£ 55,094.55	£ 8,725.93	£ 8,725.93	£ 3,955.34	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 59,049.88
24	0.438	1.000	£ 121,544.87	£ 53,231.44	£ 24,209.03	£ 24,209.03	£ 10,602.52	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 63,833.96
25	0.423	1.000	£ 121,544.87	£ 51,431.35	£ 35,867.18	£ 35,867.18	£ 15,177.09	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 66,608.43
26	0.409	1.000	£ 121,544.87	£ 49,692.12	£ 54,282.49	£ 54,282.49	£ 22,192.73	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 71,884.85
27	0.395	1.000	£ 121,544.87	£ 48,011.71	£ 27,141.25	£ 27,141.25	£ 10,721.13	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 58,732.84
28	0.382	1.000	£ 121,544.87	£ 46,388.13	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 46,388.13
29	0.369	1.000	£ 121,544.87	£ 44,819.45	£ 74,945.51	£ 74,945.51	£ 27,636.02	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 72,455.47
30	0.356	1.000	£ 121,544.87	£ 43,303.81	£ 156,648.21	£ 156,648.21	£ 55,810.38	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 99,114.19
31	0.346	1.000	£ 121,544.87	£ 42,042.54	£ 832,019.71	£ 832,019.71	£ 287,796.76	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 329,839.30
32	0.336	1.000	£ 121,544.87	£ 40,818.00	£ 17,451.84	£ 17,451.84	£ 5,860.79	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 46,678.79
33	0.326	1.000	£ 121,544.87	£ 39,629.12	£ 8,725.93	£ 8,725.93	£ 2,845.05	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 42,474.17
34	0.317	1.000	£ 121,544.87	£ 38,474.88	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 38,474.88
35	0.307	1.000	£ 121,544.87	£ 37,354.25	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 37,354.25
36	0.298	1.000	£ 121,544.87	£ 36,266.26	£ 6,757.19	£ 6,757.19	£ 2,016.19	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 38,282.46
37	0.290	1.000	£ 121,544.87	£ 35,209.96	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 35,209.96
38	0.281	1.000	£ 121,544.87	£ 34,184.43	£ 27,141.25	£ 27,141.25	£ 7,633.46	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 41,817.89
39	0.273	1.000	£ 121,544.87	£ 33,188.77	£ 67,683.01	£ 67,683.01	£ 18,481.37	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 51,670.14
40	0.265	1.000	£ 121,544.87	£ 32,222.10	£ 53,942.29	£ 53,942.29	£ 14,300.35	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 46,522.45
41	0.257	1.000	£ 121,544.87	£ 31,283.60	£ 315,217.82	£ 315,217.82	£ 81,131.74	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 112,415.34
42	0.250	1.000	£ 121,544.87	£ 30,372.42	£ 6,757.19	£ 6,757.19	£ 1,688.53	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 32,060.95
43	0.243	1.000	£ 121,544.87	£ 29,487.79	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 29,487.79
44	0.236	1.000	£ 121,544.87	£ 28,628.92	£ 30,250.38	£ 30,250.38	£ 7,125.23	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 35,754.16
45	0.229	1.000	£ 121,544.87	£ 27,795.07	£ 60,500.74	£ 60,500.74	£ 13,835.40	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 41,630.47
46	0.222	1.000	£ 121,544.87	£ 26,985.51	£ 50,280.14	£ 50,280.14	£ 11,163.24	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 38,148.75
47	0.216	1.000	£ 121,544.87	£ 26,199.52	£ 8,725.93	£ 8,725.93	£ 1,880.91	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 28,080.43
48	0.209	1.000	£ 121,544.87	£ 25,436.43	£ 24,209.03	£ 24,209.03	£ 5,066.37	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 30,502.80
49	0.203	1.000	£ 121,544.87	£ 24,695.56	£ 13,400.53	£ 13,400.53	£ 2,722.73	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 27,418.29
50	0.197	1.000	£ 121,544.87	£ 23,976.27	£ 9,349.20	£ 9,349.20	£ 1,844.25	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 25,820.52
51	0.192	1.000	£ 121,544.87	£ 23,277.93	£ 333,633.14	£ 333,633.14	£ 63,896.49	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 87,174.42
52	0.186	1.000	£ 121,544.87	£ 22,599.94	£ 54,282.49	£ 54,282.49	£ 10,093.23	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 32,693.17
53	0.181	1.000	£ 121,544.87	£ 21,941.69	£ 27,141.25	£ 27,141.25	£ 4,899.63	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 26,841.31
54	0.175	1.000	£ 121,544.87	£ 21,302.61	£ 6,757.19	£ 6,757.19	£ 1,184.30	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 22,486.91
55	0.170	1.000	£ 121,544.87	£ 20,682.14	£ 8,725.93	£ 8,725.93	£ 1,484.81	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 22,166.95
56	0.165	1.000	£ 121,544.87	£ 20,079.75	£ 17,451.84	£ 17,451.84	£ 2,883.12	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 22,962.87
57	0.160	1.000	£ 121,544.87	£ 19,494.90	£ 8,725.93	£ 8,725.93	£ 1,399.57	£ -	£ -	£ -	£ -</							

Gatwick Second Runway – M23 J9 Slip Road Widening

COMMUTED SUM FOR FUTURE MAINTENANCE

Summary		
Total: Routine Maintenance	£	4,277,612.56
Total: Renewal of New Asset (Incl. TM & Prelims)	£	2,283,376.18
Total: Structures	£	1,057,646.82
Total: Betterment	£	1,051,514.73
<i>Of which TM and Prelims</i>	£	<i>68,451.50</i>
Total of Estimated Commuted Sum	£	6,567,120.83

Project Details	
Project Title:	M23 J9 Slip Road Widening
Date:	14/04/2016
Opening Year:	2023
Model Details	
Model Version:	2.0
Valid From:	
Valid To:	

ROUTINE MAINTENANCE - Description	Unit	Annual Rate	Additional Quantity
Annual maintenance for Pavements	m2 of Pavement	£5.76	25,000

Structure Name	Capital Cost	Commuted Sum
Total Structures	£ 4,253,209.00	£ 1,057,646.82

Year	Discount	Relative Price Change	Routine Maintenance excl. Structures		Renewal of New Asset excl. Structures			Betterment (renewal or removal of existing asset) excl. Structures					Total			
			Annual	After Effective Discounting	Renewal Incl. TM & Prelims	Total	After Effective Discounting	Early Renewal	TM & Prelims	Removal	TM & Prelims	Total		After Effective Discounting		
1	0.966	1.000	£ 175,246.80	£ 163,594.77	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 163,594.77
2	0.934	1.000	£ 175,246.80	£ 158,062.58	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 158,062.58
3	0.902	1.000	£ 175,246.80	£ 152,717.47	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 152,717.47
4	0.871	1.000	£ 175,246.80	£ 147,553.11	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 147,553.11
5	0.842	1.000	£ 175,246.80	£ 142,563.39	£ 10,328.64	£ 10,328.64	£ 8,402.35	£ 1,064,193.93	£ 33,291.51	£ -	£ -	£ -	£ -	£ 1,097,485.45	£ 892,805.12	£ 741,839.38
6	0.814	1.000	£ 175,246.80	£ 137,742.40	£ 8,725.93	£ 8,725.93	£ 6,858.50	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 144,600.90
7	0.786	1.000	£ 175,246.80	£ 133,084.45	£ 17,451.84	£ 17,451.84	£ 13,253.13	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 146,337.58
8	0.759	1.000	£ 175,246.80	£ 128,584.01	£ 27,424.31	£ 27,424.31	£ 20,122.07	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 148,706.08
9	0.734	1.000	£ 175,246.80	£ 124,235.76	£ 37,396.79	£ 37,396.79	£ 26,511.29	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 150,747.04
10	0.709	1.000	£ 175,246.80	£ 120,034.55	£ 566,286.22	£ 566,286.22	£ 387,875.32	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 507,909.87
11	0.685	1.000	£ 175,246.80	£ 115,975.41	£ 52,597.99	£ 52,597.99	£ 34,808.47	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 150,783.88
12	0.662	1.000	£ 175,246.80	£ 112,053.53	£ 84,538.69	£ 84,538.69	£ 54,054.39	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 166,107.92
13	0.639	1.000	£ 175,246.80	£ 108,264.28	£ 102,770.09	£ 102,770.09	£ 63,489.49	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 171,753.77
14	0.618	1.000	£ 175,246.80	£ 104,603.17	£ 129,727.39	£ 129,727.39	£ 77,433.06	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 182,036.23
15	0.597	1.000	£ 175,246.80	£ 101,065.87	£ 186,739.94	£ 186,739.94	£ 107,694.03	£ 203,467.27	£ 71,732.97	£ -	£ -	£ -	£ -	£ 275,200.24	£ 158,709.61	£ 50,050.29
16	0.577	1.000	£ 175,246.80	£ 97,648.18	£ 8,725.93	£ 8,725.93	£ 4,862.12	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 102,510.30
17	0.557	1.000	£ 175,246.80	£ 94,346.07	£ 10,328.64	£ 10,328.64	£ 5,560.54	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 99,906.61
18	0.538	1.000	£ 175,246.80	£ 91,155.62	£ 18,698.39	£ 18,698.39	£ 9,726.07	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 100,881.70
19	0.520	1.000	£ 175,246.80	£ 88,073.07	£ 37,396.79	£ 37,396.79	£ 18,794.35	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 106,867.42
20	0.503	1.000	£ 175,246.80	£ 85,094.75	£ 566,286.22	£ 566,286.22	£ 274,972.11	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 360,066.86
21	0.486	1.000	£ 175,246.80	£ 82,217.15	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 82,217.15
22	0.469	1.000	£ 175,246.80	£ 79,436.86	£ 8,725.93	£ 8,725.93	£ 3,955.34	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 83,392.20
23	0.453	1.000	£ 175,246.80	£ 76,750.59	£ 27,780.48	£ 27,780.48	£ 12,166.66	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 88,917.25
24	0.438	1.000	£ 175,246.80	£ 74,155.16	£ 50,995.28	£ 50,995.28	£ 21,578.50	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 95,733.65
25	0.423	1.000	£ 175,246.80	£ 71,647.50	£ 84,538.69	£ 84,538.69	£ 34,562.60	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 106,210.10
26	0.409	1.000	£ 175,246.80	£ 69,224.63	£ 42,269.35	£ 42,269.35	£ 16,696.91	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 85,921.54
27	0.395	1.000	£ 175,246.80	£ 66,883.70	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 66,883.70
28	0.382	1.000	£ 175,246.80	£ 64,621.94	£ 150,910.31	£ 150,910.31	£ 55,647.90	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 120,269.84
29	0.369	1.000	£ 175,246.80	£ 62,436.65	£ 312,149.30	£ 312,149.30	£ 111,212.06	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 173,648.71
30	0.356	1.000	£ 175,246.80	£ 60,618.11	£ 1,394,994.40	£ 1,394,994.40	£ 482,530.47	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 543,148.58
31	0.346	1.000	£ 175,246.80	£ 58,852.53	£ 17,451.84	£ 17,451.84	£ 5,860.79	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 64,713.32
32	0.336	1.000	£ 175,246.80	£ 57,138.38	£ 8,725.93	£ 8,725.93	£ 2,845.05	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 59,983.43
33	0.326	1.000	£ 175,246.80	£ 55,474.16	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 55,474.16
34	0.317	1.000	£ 175,246.80	£ 53,858.41	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 53,858.41
35	0.307	1.000	£ 175,246.80	£ 52,289.71	£ 10,328.64	£ 10,328.64	£ 3,081.83	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 55,371.55
36	0.298	1.000	£ 175,246.80	£ 50,766.71	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 50,766.71
37	0.290	1.000	£ 175,246.80	£ 49,288.07	£ 42,269.35	£ 42,269.35	£ 11,888.23	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 61,176.30
38	0.281	1.000	£ 175,246.80	£ 47,852.50	£ 111,963.00	£ 111,963.00	£ 30,572.36	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 78,424.86
39	0.273	1.000	£ 175,246.80	£ 46,458.73	£ 97,117.98	£ 97,117.98	£ 25,746.42	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 72,205.16
40	0.265	1.000	£ 175,246.80	£ 45,105.57	£ 475,051.71	£ 475,051.71	£ 122,270.28	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 167,375.85
41	0.257	1.000	£ 175,246.80	£ 43,791.81	£ 10,328.64	£ 10,328.64	£ 2,580.99	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 46,372.80
42	0.250	1.000	£ 175,246.80	£ 42,516.32	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 42,516.32
43	0.243	1.000	£ 175,246.80	£ 41,277.98	£ 60,500.74	£ 60,500.74	£ 14,250.46	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 55,528.45
44	0.236	1.000	£ 175,246.80	£ 40,075.71	£ 121,001.46	£ 121,001.46	£ 27,670.80	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 67,746.51
45	0.229	1.000	£ 175,246.80	£ 38,908.46	£ 150,207.86	£ 150,207.86	£ 33,349.29	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 72,257.75
46	0.222	1.000	£ 175,246.80	£ 37,775.20	£ 8,725.93	£ 8,725.93	£ 1,880.91	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 39,656.11
47	0.216	1.000	£ 175,246.80	£ 36,674.95	£ 27,780.48	£ 27,780.48	£ 5,813.79	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 42,488.74
48	0.209	1.000	£ 175,246.80	£ 35,606.75	£ 27,424.31	£ 27,424.31	£ 5,572.09	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 41,178.84
49	0.203	1.000	£ 175,246.80	£ 34,569.66	£ 37,396.79	£ 37,396.79	£ 7,376.99	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 41,946.65
50	0.197	1.000	£ 175,246.80	£ 33,562.78	£ 508,595.13	£ 508,595.13	£ 97,404.72	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 130,967.49
51	0.192	1.000	£ 175,246.80	£ 32,585.22	£ 84,538.69	£ 84,538.69	£ 15,719.04	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 48,304.26
52	0.186	1.000	£ 175,246.80	£ 31,636.14	£ 42,269.35	£ 42,269.35	£ 7,630.60	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 39,266.74
53	0.181	1.000	£ 175,246.80	£ 30,714.70	£ 10,328.64	£ 10,328.64	£ 1,810.25	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 32,524.95
54	0.175	1.000	£ 175,246.80	£ 29,820.09	£ 8,725.93	£ 8,725.93	£ 1,484.81	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 31,304.90
55	0.170	1.000	£ 175,246.80	£ 28,951.55	£ 17,451.84	£ 17,451.84	£ 2,883.12	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 31,834.67
56	0.165	1.000	£ 175,246.80	£ 28,108.30	£ 8,725.93	£ 8,725.93	£ 1,399.57	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 29,507.87
57	0.160	1.000	£ 175,246.80	£ 27,289.61	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 27,289.61
58	0.156	1.000	£ 175,246.80	£ 26,494.77	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 26,494.77
59	0.151	1.000	£ 175,246.80	£ 25,723.07	£ 10,328.64	£ 10,328.64	£ 1,516.06	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 27,239.13
60	0.147	1.000	£ 175,246.80	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -

Heathrow Airport – M4 J2 to J3, road widening in both directions

Highways Engalnd Commercial Services Division
Airports Commission Cost Validation

Commuted Sum for Future Maintenance - Calculation Output by Year

COMMUTED SUM FOR FUTURE MAINTENANCE

Summary	
Total: Routine Maintenance	£ 197,262,283.55
Total: Renewal of New Asset (Incl. TM & Prelims)	£ 10,796,090.19
Total: Structures	£ 6,417,066.20
Total: Betterment	£ 3,890,610.06
<i>Of which TM and Prelims</i>	£ 615,267.01
Total of Estimated Commuted Sum	£ 210,584,829.88

Project Details	
Project Title:	M4 J2 to J3
Date:	26/04/2016
Opening Year:	2025
Model Details	
Model Version:	2.0
Valid From:	
Valid To:	

ROUTINE MAINTENANCE - Description	Unit	Annual Rate	Additional Quantity
Annual maintenance for Pavements	m2 of Pavement	£5.76	70,000

Structure Name	Capital Cost	Commuted Sum
Total Structures (Excl. Tunnels)	£ 24,705,508.00	£ 6,417,066.20

Year	Discount	Relative Price Change	Routine Maintenance excl. Structures		Renewal of New Asset excl. Structures		Betterment (renewal or removal of existing asset) excl. Structures					Total			
			Annual	After Effective Discounting	Renewal Incl. TM & Prelims	Total	After Effective Discounting	Early Renewal	TM & Prelims	Removal	TM & Prelims		Total	After Effective Discounting	
1	0.966	1.000	£ 8,081,513.78	£ 7,544,179.59	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 7,544,179.59	
2	0.934	1.000	£ 8,081,513.78	£ 7,289,062.41	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 7,289,062.41	
3	0.902	1.000	£ 8,081,513.78	£ 7,042,572.37	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 7,042,572.37	
4	0.871	1.000	£ 8,081,513.78	£ 6,804,417.75	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 6,804,417.75	
5	0.842	1.000	£ 8,081,513.78	£ 6,574,316.67	£ 61,087.61	£ 61,087.61	£ 49,694.81	£ 2,580,446.70	£ 76,773.88	£ -	£ -	£ -	£ 2,657,220.58	£ 2,161,650.65	£ 4,462,360.83
6	0.814	1.000	£ 8,081,513.78	£ 6,351,996.78	£ 27,343.33	£ 27,343.33	£ 21,491.61	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 6,373,488.39
7	0.786	1.000	£ 8,081,513.78	£ 6,137,194.96	£ 54,686.65	£ 54,686.65	£ 41,529.67	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 6,178,724.63
8	0.759	1.000	£ 8,081,513.78	£ 5,929,656.97	£ 144,528.96	£ 144,528.96	£ 106,045.38	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 6,035,702.34
9	0.734	1.000	£ 8,081,513.78	£ 5,729,137.16	£ 234,371.28	£ 234,371.28	£ 166,150.21	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 5,895,287.37
10	0.709	1.000	£ 8,081,513.78	£ 5,535,398.23	£ 2,329,814.81	£ 2,329,814.81	£ 1,595,796.67	£ -	£ -	£ 536,266.45	£ 300,050.40	£ 836,316.85	£ 572,831.64	£ -	£ 6,558,363.26
11	0.685	1.000	£ 8,081,513.78	£ 5,348,210.85	£ 289,353.75	£ 289,353.75	£ 191,489.48	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 5,539,700.33
12	0.662	1.000	£ 8,081,513.78	£ 5,167,353.48	£ 456,532.29	£ 456,532.29	£ 291,908.64	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 5,459,262.12
13	0.639	1.000	£ 8,081,513.78	£ 4,992,612.05	£ 464,801.44	£ 464,801.44	£ 287,145.86	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 5,279,757.92
14	0.618	1.000	£ 8,081,513.78	£ 4,823,779.76	£ 500,413.93	£ 500,413.93	£ 298,692.38	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 5,122,472.14
15	0.597	1.000	£ 8,081,513.78	£ 4,660,656.77	£ 1,323,326.83	£ 1,323,326.83	£ 763,170.41	£ 672,398.65	£ 221,715.11	£ 166,338.18	£ 72,836.05	£ 1,133,287.97	£ 653,573.87	£ -	£ 4,770,253.30
16	0.577	1.000	£ 8,081,513.78	£ 4,503,050.02	£ 27,343.33	£ 27,343.33	£ 15,235.80	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,518,285.83
17	0.557	1.000	£ 8,081,513.78	£ 4,350,772.97	£ 61,087.61	£ 61,087.61	£ 32,887.20	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,383,660.17
18	0.538	1.000	£ 8,081,513.78	£ 4,203,645.38	£ 117,185.64	£ 117,185.64	£ 60,954.78	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,264,600.16
19	0.520	1.000	£ 8,081,513.78	£ 4,061,493.12	£ 234,371.28	£ 234,371.28	£ 117,787.01	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,179,280.13
20	0.503	1.000	£ 8,081,513.78	£ 3,924,147.94	£ 2,329,814.81	£ 2,329,814.81	£ 1,131,290.28	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 5,055,438.23
21	0.486	1.000	£ 8,081,513.78	£ 3,791,447.29	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,791,447.29
22	0.469	1.000	£ 8,081,513.78	£ 3,663,234.10	£ 27,343.33	£ 27,343.33	£ 12,394.34	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,675,628.43
23	0.453	1.000	£ 8,081,513.78	£ 3,539,356.61	£ 115,774.26	£ 115,774.26	£ 50,704.16	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,590,060.78
24	0.438	1.000	£ 8,081,513.78	£ 3,419,668.23	£ 255,609.46	£ 255,609.46	£ 108,160.37	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,527,828.60
25	0.423	1.000	£ 8,081,513.78	£ 3,304,027.27	£ 456,532.29	£ 456,532.29	£ 186,647.60	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,490,674.87
26	0.409	1.000	£ 8,081,513.78	£ 3,192,296.88	£ 228,266.14	£ 228,266.14	£ 90,167.92	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,282,464.80
27	0.395	1.000	£ 8,081,513.78	£ 3,084,344.81	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,084,344.81
28	0.382	1.000	£ 8,081,513.78	£ 2,980,043.30	£ 820,547.28	£ 820,547.28	£ 302,575.29	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,282,618.59
29	0.369	1.000	£ 8,081,513.78	£ 2,879,268.89	£ 1,702,182.18	£ 1,702,182.18	£ 606,450.76	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,485,719.65
30	0.356	1.000	£ 8,081,513.78	£ 2,795,406.69	£ 6,424,270.94	£ 6,424,270.94	£ 2,222,164.12	£ -	£ -	£ 536,266.45	£ 300,050.40	£ 836,316.85	£ 289,283.14	£ -	£ 4,728,287.66
31	0.346	1.000	£ 8,081,513.78	£ 2,713,987.07	£ 54,686.65	£ 54,686.65	£ 18,365.23	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,732,352.30
32	0.336	1.000	£ 8,081,513.78	£ 2,634,938.91	£ 27,343.33	£ 27,343.33	£ 8,915.16	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,643,854.07
33	0.326	1.000	£ 8,081,513.78	£ 2,558,193.11	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,558,193.11
34	0.317	1.000	£ 8,081,513.78	£ 2,483,682.63	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,483,682.63
35	0.307	1.000	£ 8,081,513.78	£ 2,411,342.36	£ 61,087.61	£ 61,087.61	£ 18,227.17	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,429,569.54
36	0.298	1.000	£ 8,081,513.78	£ 2,341,109.09	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,341,109.09
37	0.290	1.000	£ 8,081,513.78	£ 2,272,921.45	£ 228,266.14	£ 228,266.14	£ 64,199.73	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,337,121.18
38	0.281	1.000	£ 8,081,513.78	£ 2,206,719.85	£ 601,061.25	£ 601,061.25	£ 164,124.42	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,370,844.27
39	0.273	1.000	£ 8,081,513.78	£ 2,142,446.46	£ 517,324.06	£ 517,324.06	£ 137,144.99	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,279,591.44
40	0.265	1.000	£ 8,081,513.78	£ 2,080,045.10	£ 2,017,393.04	£ 2,017,393.04	£ 519,242.88	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,599,287.99
41	0.257	1.000	£ 8,081,513.78	£ 2,019,461.27	£ 61,087.61	£ 61,087.61	£ 15,264.97	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,034,726.24
42	0.250	1.000	£ 8,081,513.78	£ 1,960,642.01	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,960,642.01
43	0.243	1.000	£ 8,081,513.78	£ 1,903,535.93	£ 236,535.30	£ 236,535.30	£ 55,714.00	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,959,249.93
44	0.236	1.000	£ 8,081,513.78	£ 1,848,093.13	£ 473,070.60	£ 473,070.60	£ 108,182.52	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,956,275.65
45	0.229	1.000	£ 8,081,513.78	£ 1,794,265.18	£ 1,088,939.02	£ 1,088,939.02	£ 241,767.25	£ -	£ -	£ 166,338.18	£ 72,836.05	£ 239,174.22	£ 53,101.68	£ -	£ 1,982,930.75
46	0.222	1.000	£ 8,081,513.78	£ 1,742,005.03	£ 27,343.33	£ 27,343.33	£ 5,893.97	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,747,899.00
47	0.216	1.000	£ 8,081,513.78	£ 1,691,267.02	£ 115,774.26	£ 115,774.26	£ 24,228.78	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,715,495.79
48	0.209	1.000	£ 8,081,513.78	£ 1,642,006.81	£ 144,528.96	£ 144,528.96	£ 29,365.48	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,671,372.29
49	0.203	1.000	£ 8,081,513.78	£ 1,594,181.37	£ 234,371.28	£ 234,371.28	£ 46,232.71	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,640,414.09
50	0.197	1.000	£ 8,081,513.78	£ 1,547,748.90	£ 2,218,315.86	£ 2,218,315.86	£ 424,845.65	£ -	£ -	£ 536,266.45	£ 300,050.40	£ 836,316.85	£ 160,169.06	£ -	£ 1,812,425.49
51	0.192	1.000	£ 8,081,513.78	£ 1,502,668.84	£ 456,532.29	£ 456,532.29	£ 84,887.17	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,587,556.01
52	0.186	1.000	£ 8,081,513.78	£ 1,458,901.79	£ 228,266.14	£ 228,266.14	£ 41,207.36	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,500,109.15
53	0.181	1.000	£ 8,081,513.78	£ 1,416,409.50	£ 61,087.61	£ 61,087.61	£ 10,706.54	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,427,116.04
54	0.175	1.000	£ 8,081,513.78	£ 1,375,154.86	£ 27,343.33	£ 27,343.33	£ 4,652.76	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,379,807.61
55	0.170	1.000	£ 8,081,513.78	£ 1,335,101.80	£ 54,686.65	£ 54,686.65	£ 9,034.48	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,344,136.28
56	0.165	1.000	£ 8,081,513.78	£ 1,296,215.34	£ 27,343.33	£ 27,343.33	£ 4,385.67	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,300,601.01
57	0.160	1.000	£ 8,081,513.78	£ 1,258,461.50	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,258,461.50
58	0.156	1.000	£ 8,081,513.78	£ 1,221,807.28	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,221,807.28
59	0.151														

Heathrow Airport – M4 J4A, implementation of higher capacity at the M4 Junction 4A

COMMUTED SUM FOR FUTURE MAINTENANCE

Summary		Project Details	
Total: Routine Maintenance	£ 9,509,057.96	Project Title:	Implementation of higher capacity at the M4 J4a
Total: Renewal of New Asset (Incl. TM & Prelims)	£ 4,072,851.93	Date:	26/04/2016
Total: Structures	£ 2,523,378.29	Opening Year:	2025
Total: Betterment	£ 152,524.85	Model Details	
<i>Of which TM and Prelims</i>	£ 19,395.75	Model Version:	2.0
Total of Estimated Commuted Sum	£ 15,952,763.34	Valid From:	
		Valid To:	

ROUTINE MAINTENANCE - Description	Unit	Annual Rate	Additional Quantity
Annual maintenance for Pavements	m2 of Pavement	£5.76	60,000

Structure Name	Capital Cost	Commuted Sum
Total Structures	£ 9,714,929.00	£ 2,523,378.29

Year	Discount	Relative Price Change	Routine Maintenance excl. Structures		Renewal of New Asset excl. Structures			Betterment (renewal or removal of existing asset) excl. Structures					Total				
			Annual	After Effective Discounting	Renewal Incl. TM & Prelims	Total	After Effective Discounting	Early Renewal	TM & Prelims	Removal	TM & Prelims	Total		After Effective Discounting			
1	0.966	1.000															
2	0.934	1.000	£ 389,570.58	£ 363,668.31	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 363,668.31
3	0.902	1.000	£ 389,570.58	£ 351,370.35	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 351,370.35
4	0.871	1.000	£ 389,570.58	£ 339,488.26	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 339,488.26
5	0.842	1.000	£ 389,570.58	£ 328,007.98	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 328,007.98
6	0.814	1.000	£ 389,570.58	£ 316,915.92	£ 12,591.43	£ 12,591.43	£ 10,243.13	£ 120,098.36	£ 4,303.27	£ -	£ -	£ 124,401.63	£ 101,200.81	£ -	£ -	£ -	£ 225,958.25
7	0.786	1.000	£ 389,570.58	£ 306,198.96	£ 18,228.89	£ 18,228.89	£ 14,327.74	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 320,526.70
8	0.759	1.000	£ 389,570.58	£ 295,844.40	£ 36,457.78	£ 36,457.78	£ 27,686.46	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 323,530.86
9	0.734	1.000	£ 389,570.58	£ 285,840.00	£ 37,759.83	£ 37,759.83	£ 27,705.55	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 313,545.56
10	0.709	1.000	£ 389,570.58	£ 276,173.92	£ 39,061.88	£ 39,061.88	£ 27,691.70	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 303,865.61
11	0.685	1.000	£ 389,570.58	£ 266,834.70	£ 1,285,607.48	£ 1,285,607.48	£ 880,571.34	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,147,406.04
12	0.662	1.000	£ 389,570.58	£ 257,811.31	£ 90,104.14	£ 90,104.14	£ 59,629.41	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 317,440.72
13	0.639	1.000	£ 389,570.58	£ 249,093.05	£ 155,025.45	£ 155,025.45	£ 99,123.92	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 348,216.97
14	0.618	1.000	£ 389,570.58	£ 240,669.61	£ 143,955.80	£ 143,955.80	£ 88,933.27	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 329,602.88
15	0.597	1.000	£ 389,570.58	£ 232,531.03	£ 151,115.05	£ 151,115.05	£ 90,199.16	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 322,730.18
16	0.577	1.000	£ 389,570.58	£ 224,667.66	£ 199,457.79	£ 199,457.79	£ 115,028.49	£ -	£ -	£ 44,356.85	£ 19,900.47	£ 64,257.31	£ 37,057.57	£ -	£ -	£ -	£ 302,638.57
17	0.557	1.000	£ 389,570.58	£ 217,070.20	£ 18,228.89	£ 18,228.89	£ 10,157.21	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 227,227.41
18	0.538	1.000	£ 389,570.58	£ 209,729.66	£ 12,591.43	£ 12,591.43	£ 6,778.73	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 216,508.40
19	0.520	1.000	£ 389,570.58	£ 202,637.36	£ 19,530.94	£ 19,530.94	£ 10,159.13	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 212,796.48
20	0.503	1.000	£ 389,570.58	£ 195,784.89	£ 39,061.88	£ 39,061.88	£ 19,631.17	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 215,416.05
21	0.486	1.000	£ 389,570.58	£ 189,164.14	£ 1,285,607.48	£ 1,285,607.48	£ 624,253.59	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 813,417.73
22	0.469	1.000	£ 389,570.58	£ 182,767.29	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 182,767.29
23	0.453	1.000	£ 389,570.58	£ 176,586.75	£ 18,228.89	£ 18,228.89	£ 8,262.89	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 184,849.64
24	0.438	1.000	£ 389,570.58	£ 170,615.22	£ 49,049.20	£ 49,049.20	£ 21,481.45	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 192,096.66
25	0.423	1.000	£ 389,570.58	£ 164,845.62	£ 95,741.60	£ 95,741.60	£ 40,512.77	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 205,358.39
26	0.409	1.000	£ 389,570.58	£ 159,271.13	£ 155,025.45	£ 155,025.45	£ 63,380.24	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 222,651.37
27	0.395	1.000	£ 389,570.58	£ 153,885.15	£ 77,512.71	£ 77,512.71	£ 30,618.47	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 184,503.62
28	0.382	1.000	£ 389,570.58	£ 148,681.30	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 148,681.30
29	0.369	1.000	£ 389,570.58	£ 143,653.43	£ 169,578.93	£ 169,578.93	£ 62,531.92	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 206,185.35
30	0.356	1.000	£ 389,570.58	£ 138,795.59	£ 351,749.28	£ 351,749.28	£ 125,320.67	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 264,116.26
31	0.346	1.000	£ 389,570.58	£ 134,753.00	£ 2,351,135.07	£ 2,351,135.07	£ 813,260.84	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 948,013.84
32	0.336	1.000	£ 389,570.58	£ 130,828.15	£ 36,457.78	£ 36,457.78	£ 12,243.49	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 143,071.64
33	0.326	1.000	£ 389,570.58	£ 127,017.63	£ 18,228.89	£ 18,228.89	£ 5,943.44	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 132,961.07
34	0.317	1.000	£ 389,570.58	£ 123,318.08	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 123,318.08
35	0.307	1.000	£ 389,570.58	£ 119,726.29	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 119,726.29
36	0.298	1.000	£ 389,570.58	£ 116,239.12	£ 12,591.43	£ 12,591.43	£ 3,757.00	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 119,996.12
37	0.290	1.000	£ 389,570.58	£ 112,853.51	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 112,853.51
38	0.281	1.000	£ 389,570.58	£ 109,566.52	£ 77,512.71	£ 77,512.71	£ 21,800.41	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 131,366.93
39	0.273	1.000	£ 389,570.58	£ 106,375.26	£ 192,785.28	£ 192,785.28	£ 52,641.51	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 159,016.77
40	0.265	1.000	£ 389,570.58	£ 103,276.95	£ 153,032.36	£ 153,032.36	£ 40,569.58	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 143,846.54
41	0.257	1.000	£ 389,570.58	£ 100,268.89	£ 1,062,289.45	£ 1,062,289.45	£ 273,415.36	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 373,684.24
42	0.250	1.000	£ 389,570.58	£ 97,348.43	£ 12,591.43	£ 12,591.43	£ 3,146.43	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 100,494.86
43	0.243	1.000	£ 389,570.58	£ 94,513.04	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 94,513.04
44	0.236	1.000	£ 389,570.58	£ 91,760.23	£ 66,443.09	£ 66,443.09	£ 15,650.14	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 107,410.37
45	0.229	1.000	£ 389,570.58	£ 89,087.61	£ 132,886.16	£ 132,886.16	£ 30,388.61	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 119,476.22
46	0.222	1.000	£ 389,570.58	£ 86,492.82	£ 146,439.93	£ 146,439.93	£ 32,512.73	£ -	£ -	£ 44,356.85	£ 19,900.47	£ 64,257.31	£ 14,266.47	£ -	£ -	£ -	£ 104,739.08
47	0.216	1.000	£ 389,570.58	£ 83,973.61	£ 18,228.89	£ 18,228.89	£ 3,929.32	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 87,902.93
48	0.209	1.000	£ 389,570.58	£ 81,527.78	£ 49,049.20	£ 49,049.20	£ 10,264.82	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 91,792.60
49	0.203	1.000	£ 389,570.58	£ 79,153.18	£ 37,759.83	£ 37,759.83	£ 7,672.06	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 86,825.25
50	0.197	1.000	£ 389,570.58	£ 76,847.75	£ 39,061.88	£ 39,061.88	£ 7,705.45	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 84,553.20
51	0.192	1.000	£ 389,570.58	£ 74,609.47	£ 1,121,573.27	£ 1,121,573.27	£ 214,800.57	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 289,410.04
52	0.186	1.000	£ 389,570.58	£ 72,436.38	£ 155,025.45	£ 155,025.45	£ 28,825.28	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 101,261.66
53	0.181	1.000	£ 389,570.58	£ 70,326.58	£ 77,512.71	£ 77,512.71	£ 13,992.85	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 84,319.43
54	0.175	1.000	£ 389,570.58	£ 68,278.23	£ 12,591.43	£ 12,591.43	£ 2,206.84	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 70,485.07
55	0.170	1.000	£ 389,570.58	£ 66,289.55	£ 18,228.89	£ 18,228.89	£ 3,101.84	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 69,391.38
56	0.165	1.000	£ 389,570.58	£ 64,358.78	£ 36,457.78	£ 36,457.78	£ 6,022.99	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 70,381.77
57	0.160	1.000	£ 389,570.58	£ 62,484.25	£ 18,228.89	£ 18,228.89	£ 2,923.78	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 65,408.03
58	0.156	1.000	£ 389,570.58	£ 60,664.33	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 60,664.33
59	0.151	1.000	£ 389,570.58	£ 58,897.40													

Heathrow Airport – M4 J4B “Replacement” (Capacity Increase)

COMMUTED SUM FOR FUTURE MAINTENANCE

Summary		Project Details	
Total: Routine Maintenance	£ 6,199,255.12	Project Title:	M4 J4B-M25 J15 Capacity Increase
Total: Renewal of New Asset (Incl. TM & Prelims)	£ 5,939,663.00	Date:	06/05/2016
Total: Structures	£ 14,291,542.45	Opening Year:	2025
Total: Betterment	£ 2,027,326.82	Model Details	
<i>Of which TM and Prelims</i>	£ 329,255.50	Model Version:	2.0
Total of Estimated Commuted Sum	£ 24,403,133.75	Valid From:	
		Valid To:	

ROUTINE MAINTENANCE - Description	Unit	Annual Rate	Additional Quantity
Annual maintenance for Pavements	m2 of Pavement	£5.76	21,460

Structure Name	Capital Cost	Commuted Sum
Total Structures	£ 55,022,000.00	£ 14,291,542.45

Year	Discount	Relative Price Change	Routine Maintenance excl. Structures		Renewal of New Asset excl. Structures			Betterment (renewal or removal of existing asset) excl. Structures					Total				
			Annual	After Effective Discounting	Renewal Incl. TM & Prelims	Total	After Effective Discounting	Early Renewal	TM & Prelims	Removal	TM & Prelims	Total		After Effective Discounting			
1	0.966	1.000															
2	0.934	1.000	£ 253,973.36	£ 237,086.85	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 237,086.85
3	0.902	1.000	£ 253,973.36	£ 229,069.42	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 229,069.42
4	0.871	1.000	£ 253,973.36	£ 221,323.11	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 221,323.11
5	0.842	1.000	£ 253,973.36	£ 213,838.76	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 213,838.76
6	0.814	1.000	£ 253,973.36	£ 206,607.50	£ 34,974.29	£ 34,974.29	£ 28,451.61	£ 1,280,298.55	£ 39,435.50	£ -	£ -	£ -	£ 1,319,734.05	£ 1,073,604.50	£ -	£ -	£ 838,545.40
7	0.786	1.000	£ 253,973.36	£ 199,620.77	£ 41,014.99	£ 41,014.99	£ 32,237.41	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 231,858.18
8	0.759	1.000	£ 253,973.36	£ 192,870.31	£ 82,029.99	£ 82,029.99	£ 62,294.52	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 255,164.83
9	0.734	1.000	£ 253,973.36	£ 186,348.12	£ 84,959.60	£ 84,959.60	£ 62,337.49	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 248,685.61
10	0.709	1.000	£ 253,973.36	£ 180,046.50	£ 87,889.23	£ 87,889.23	£ 62,306.33	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 242,352.82
11	0.685	1.000	£ 253,973.36	£ 173,957.97	£ 656,128.20	£ 656,128.20	£ 449,412.20	£ -	£ -	£ 214,506.58	£ 120,475.45	£ 334,982.03	£ 229,444.50	£ -	£ -	£ -	£ 393,925.66
12	0.662	1.000	£ 253,973.36	£ 168,075.33	£ 274,750.64	£ 274,750.64	£ 181,825.38	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 349,900.71
13	0.639	1.000	£ 253,973.36	£ 162,391.62	£ 479,552.73	£ 479,552.73	£ 306,628.00	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 469,019.63
14	0.618	1.000	£ 253,973.36	£ 156,900.12	£ 504,660.35	£ 504,660.35	£ 311,769.97	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 468,670.09
15	0.597	1.000	£ 253,973.36	£ 151,594.32	£ 570,783.00	£ 570,783.00	£ 340,695.02	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 492,289.34
16	0.577	1.000	£ 253,973.36	£ 146,467.94	£ 740,043.58	£ 740,043.58	£ 426,787.51	£ -	£ -	£ 493,713.78	£ 187,685.95	£ 681,399.73	£ 392,967.25	£ -	£ -	£ -	£ 180,288.19
17	0.557	1.000	£ 253,973.36	£ 141,514.92	£ 41,014.99	£ 41,014.99	£ 22,853.71	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 164,368.62
18	0.538	1.000	£ 253,973.36	£ 136,729.39	£ 34,974.29	£ 34,974.29	£ 18,828.80	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 155,558.19
19	0.520	1.000	£ 253,973.36	£ 132,105.69	£ 43,944.61	£ 43,944.61	£ 22,858.04	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 154,963.73
20	0.503	1.000	£ 253,973.36	£ 127,638.35	£ 87,889.23	£ 87,889.23	£ 44,170.13	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 171,808.47
21	0.486	1.000	£ 253,973.36	£ 123,322.08	£ 656,128.20	£ 656,128.20	£ 318,596.76	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 441,918.84
22	0.469	1.000	£ 253,973.36	£ 119,151.76	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 119,151.76
23	0.453	1.000	£ 253,973.36	£ 115,122.48	£ 41,014.99	£ 41,014.99	£ 18,591.50	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 133,713.98
24	0.438	1.000	£ 253,973.36	£ 111,229.45	£ 117,004.28	£ 117,004.28	£ 51,242.86	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 162,472.30
25	0.423	1.000	£ 253,973.36	£ 107,468.06	£ 280,791.34	£ 280,791.34	£ 118,816.01	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 226,284.07
26	0.409	1.000	£ 253,973.36	£ 103,833.88	£ 479,552.73	£ 479,552.73	£ 196,059.22	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 299,893.10
27	0.395	1.000	£ 253,973.36	£ 100,322.59	£ 239,776.35	£ 239,776.35	£ 94,714.59	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 195,037.18
28	0.382	1.000	£ 253,973.36	£ 96,930.04	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 96,930.04
29	0.369	1.000	£ 253,973.36	£ 93,652.21	£ 559,643.33	£ 559,643.33	£ 206,367.44	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 300,019.65
30	0.356	1.000	£ 253,973.36	£ 90,485.23	£ 1,154,260.95	£ 1,154,260.95	£ 411,238.26	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 501,723.48
31	0.346	1.000	£ 253,973.36	£ 87,849.73	£ 2,604,411.17	£ 2,604,411.17	£ 900,869.39	£ -	£ -	£ 214,506.58	£ 120,475.45	£ 334,982.03	£ 115,870.74	£ -	£ -	£ -	£ 872,848.38
32	0.336	1.000	£ 253,973.36	£ 85,291.00	£ 82,029.99	£ 82,029.99	£ 27,547.85	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 112,838.85
33	0.326	1.000	£ 253,973.36	£ 82,806.80	£ 41,014.99	£ 41,014.99	£ 13,372.74	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 96,179.54
34	0.317	1.000	£ 253,973.36	£ 80,394.95	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 80,394.95
35	0.307	1.000	£ 253,973.36	£ 78,053.35	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 78,053.35
36	0.298	1.000	£ 253,973.36	£ 75,779.95	£ 34,974.29	£ 34,974.29	£ 10,435.54	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 86,215.50
37	0.290	1.000	£ 253,973.36	£ 73,572.77	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 73,572.77
38	0.281	1.000	£ 253,973.36	£ 71,429.87	£ 239,776.35	£ 239,776.35	£ 67,436.97	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 138,866.84
39	0.273	1.000	£ 253,973.36	£ 69,349.39	£ 564,512.33	£ 564,512.33	£ 154,144.46	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 223,493.85
40	0.265	1.000	£ 253,973.36	£ 67,329.51	£ 409,695.56	£ 409,695.56	£ 108,612.18	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 175,941.68
41	0.257	1.000	£ 253,973.36	£ 65,368.45	£ 597,087.70	£ 597,087.70	£ 153,680.28	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 219,048.74
42	0.250	1.000	£ 253,973.36	£ 63,464.52	£ 34,974.29	£ 34,974.29	£ 8,739.60	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 72,204.12
43	0.243	1.000	£ 253,973.36	£ 61,616.04	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 61,616.04
44	0.236	1.000	£ 253,973.36	£ 59,821.39	£ 264,884.00	£ 264,884.00	£ 62,391.31	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 122,212.70
45	0.229	1.000	£ 253,973.36	£ 58,079.02	£ 529,768.01	£ 529,768.01	£ 121,148.17	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 179,227.20
46	0.222	1.000	£ 253,973.36	£ 56,387.40	£ 590,173.60	£ 590,173.60	£ 131,030.89	£ -	£ -	£ 493,713.78	£ 187,685.95	£ 681,399.73	£ 151,285.00	£ -	£ -	£ -	£ 36,133.29
47	0.216	1.000	£ 253,973.36	£ 54,745.05	£ 41,014.99	£ 41,014.99	£ 8,840.96	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 63,586.01
48	0.209	1.000	£ 253,973.36	£ 53,150.53	£ 117,004.28	£ 117,004.28	£ 24,486.19	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 77,636.72
49	0.203	1.000	£ 253,973.36	£ 51,602.46	£ 84,959.60	£ 84,959.60	£ 17,262.14	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 68,864.60
50	0.197	1.000	£ 253,973.36	£ 50,099.48	£ 87,889.23	£ 87,889.23	£ 17,337.27	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 67,436.74
51	0.192	1.000	£ 253,973.36	£ 48,640.27	£ 795,849.06	£ 795,849.06	£ 152,418.78	£ -	£ -	£ 214,506.58	£ 120,475.45	£ 334,982.03	£ 64,154.82	£ -	£ -	£ -	£ 136,904.23
52	0.186	1.000	£ 253,973.36	£ 47,223.56	£ 479,552.73	£ 479,552.73	£ 89,167.57	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 136,391.13
53	0.181	1.000	£ 253,973.36	£ 45,848.12	£ 239,776.35	£ 239,776.35	£ 43,285.23	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 89,133.34
54	0.175	1.000	£ 253,973.36	£ 44,512.74	£ 34,974.29	£ 34,974.29	£ 6,129.78	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 50,642.52
55	0.170	1.000	£ 253,973.36	£ 43,216.25	£ 41,014.99	£ 41,014.99	£ 6,979.13	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 50,195.38
56	0.165	1.000	£ 253,973.36	£ 41,957.52	£ 82,029.99	£ 82,029.99	£ 13,551.72	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 55,509.24
57	0.160	1.000	£ 253,973.36	£ 40,735.46	£ 41,014.99	£ 41,014.99	£ 6,578.50	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 47,313.96
58	0.156	1.000	£ 253,973.36	£													

Heathrow Airport – M25 Works South of Junction 15 – Northwest Runway

Highways Engalnd Commercial Services Division
Airports Commission Cost Validation

Commuted Sum for Future Maintenance - Calculation Output by Year

COMMUTED SUM FOR FUTURE MAINTENANCE

Summary		Project Details	
Total: Routine Maintenance	£ 131,452,865.32	Project Title:	M25 Tunnelling costs south of M25 J15
Total: Renewal of New Asset (Incl. TM & Prelims)	£ 25,016,503.24	Date:	26/04/2016
Total: Structures	£ 9,288,070.90	Opening Year:	2025
Total: Betterment	£ 6,795,642.79	Model Details	
<i>Of which TM and Prelims</i>	£ 759,176.11	Model Version:	2.0
Total of Estimated Commuted Sum	£ 158,961,796.66	Valid From:	
		Valid To:	

ROUTINE MAINTENANCE - Description	Unit	Annual Rate	Additional Quantity
Annual maintenance for Pavements	m2 of Pavement	£5.76	247,555

Structure Name	Capital Cost	Commuted Sum
Total Structures (Excl. Tunnels)	£ 35,758,788.00	£ 9,288,070.90

Year	Discount	Relative Price Change	Routine Maintenance excl. Structures		Renewal of New Asset excl. Structures		Betterment (renewal or removal of existing asset) excl. Structures					Total		
			Annual	After Effective Discounting	Renewal Incl. TM & Prelims	Total	After Effective Discounting	Early Renewal	TM & Prelims	Removal	TM & Prelims		Total	After Effective Discounting
1	0.966	1.000	£ 5,385,409.33	£ 5,027,337.24	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 5,027,337.24	
2	0.934	1.000	£ 5,385,409.33	£ 4,857,330.67	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,857,330.67	
3	0.902	1.000	£ 5,385,409.33	£ 4,693,073.11	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,693,073.11	
4	0.871	1.000	£ 5,385,409.33	£ 4,534,370.15	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,534,370.15	
5	0.842	1.000	£ 5,385,409.33	£ 4,381,033.96	£ 111,449.03	£ 111,449.03	£ 90,663.85	£ 496,239.75	£ 14,859.56	£ 1,310,072.94	£ 39,435.50	£ 1,860,607.74	£ 1,513,605.60	£ 2,958,092.22
6	0.814	1.000	£ 5,385,409.33	£ 4,232,883.06	£ 63,801.10	£ 63,801.10	£ 50,147.09	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,283,030.14
7	0.786	1.000	£ 5,385,409.33	£ 4,089,742.08	£ 127,602.20	£ 127,602.20	£ 96,902.59	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,186,644.67
8	0.759	1.000	£ 5,385,409.33	£ 3,951,441.63	£ 161,455.80	£ 161,455.80	£ 118,465.12	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,069,906.75
9	0.734	1.000	£ 5,385,409.33	£ 3,817,818.00	£ 195,309.39	£ 195,309.39	£ 138,458.50	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,956,276.50
10	0.709	1.000	£ 5,385,409.33	£ 3,688,713.04	£ 7,025,164.52	£ 7,025,164.52	£ 4,811,856.33	£ -	£ -	£ 589,893.09	£ 330,924.48	£ 920,817.57	£ 630,710.05	£ 7,869,859.32
11	0.685	1.000	£ 5,385,409.33	£ 3,563,973.95	£ 697,144.63	£ 697,144.63	£ 461,358.67	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,025,332.62
12	0.662	1.000	£ 5,385,409.33	£ 3,443,453.09	£ 1,171,391.20	£ 1,171,391.20	£ 748,992.40	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,192,445.49
13	0.639	1.000	£ 5,385,409.33	£ 3,327,007.82	£ 812,485.23	£ 812,485.23	£ 501,938.58	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,828,946.40
14	0.618	1.000	£ 5,385,409.33	£ 3,214,500.31	£ 517,380.35	£ 517,380.35	£ 308,819.48	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,523,319.79
15	0.597	1.000	£ 5,385,409.33	£ 3,105,797.40	£ 2,000,778.54	£ 2,000,778.54	£ 1,153,860.81	£ 739,143.50	£ 243,456.29	£ 2,850,491.55	£ 169,882.60	£ 4,002,973.94	£ 2,308,538.73	£ 1,951,119.48
16	0.577	1.000	£ 5,385,409.33	£ 3,000,770.43	£ 63,801.10	£ 63,801.10	£ 35,550.21	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,036,320.65
17	0.557	1.000	£ 5,385,409.33	£ 2,899,295.11	£ 111,449.03	£ 111,449.03	£ 59,999.82	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,959,294.93
18	0.538	1.000	£ 5,385,409.33	£ 2,801,251.31	£ 97,654.70	£ 97,654.70	£ 50,795.65	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,852,046.96
19	0.520	1.000	£ 5,385,409.33	£ 2,706,523.00	£ 195,309.39	£ 195,309.39	£ 98,155.84	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,804,678.84
20	0.503	1.000	£ 5,385,409.33	£ 2,614,998.07	£ 7,268,849.87	£ 7,268,849.87	£ 3,529,541.99	£ -	£ -	£ -	£ -	£ -	£ -	£ 6,144,540.06
21	0.486	1.000	£ 5,385,409.33	£ 2,526,568.19	£ 63,801.10	£ 63,801.10	£ 28,920.12	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,526,568.19
22	0.469	1.000	£ 5,385,409.33	£ 2,441,128.68	£ 239,051.23	£ 239,051.23	£ 104,694.19	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,470,048.80
23	0.453	1.000	£ 5,385,409.33	£ 2,358,578.44	£ 649,496.70	£ 649,496.70	£ 274,832.57	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,463,272.63
24	0.438	1.000	£ 5,385,409.33	£ 2,278,819.75	£ 1,171,391.20	£ 1,171,391.20	£ 478,908.85	£ -	£ -	£ 1,310,072.94	£ 39,435.50	£ 1,349,508.44	£ 551,729.89	£ 2,553,652.32
25	0.423	1.000	£ 5,385,409.33	£ 2,201,758.21	£ 585,695.60	£ 585,695.60	£ 231,356.93	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,128,937.17
26	0.409	1.000	£ 5,385,409.33	£ 2,127,302.62	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,358,659.55
27	0.395	1.000	£ 5,385,409.33	£ 2,055,364.85	£ 1,141,814.24	£ 1,141,814.24	£ 421,041.89	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,055,364.85
28	0.382	1.000	£ 5,385,409.33	£ 1,985,859.76	£ 2,395,077.49	£ 2,395,077.49	£ 853,314.40	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,406,901.65
29	0.369	1.000	£ 5,385,409.33	£ 1,918,705.08	£ 16,403,137.45	£ 16,403,137.45	£ 5,673,867.71	£ -	£ -	£ 589,893.09	£ 330,924.48	£ 920,817.57	£ 318,512.06	£ 2,772,019.48
30	0.356	1.000	£ 5,385,409.33	£ 1,862,820.46	£ 127,602.20	£ 127,602.20	£ 42,852.21	£ -	£ -	£ -	£ -	£ -	£ -	£ 7,218,176.11
31	0.346	1.000	£ 5,385,409.33	£ 1,808,563.56	£ 63,801.10	£ 63,801.10	£ 20,802.04	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,851,415.77
32	0.336	1.000	£ 5,385,409.33	£ 1,755,886.95	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,776,688.99
33	0.326	1.000	£ 5,385,409.33	£ 1,704,744.61	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,704,744.61
34	0.317	1.000	£ 5,385,409.33	£ 1,655,091.85	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,655,091.85
35	0.307	1.000	£ 5,385,409.33	£ 1,606,885.30	£ 111,449.03	£ 111,449.03	£ 33,253.89	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,237,476.15
36	0.298	1.000	£ 5,385,409.33	£ 1,560,082.81	£ 585,695.60	£ 585,695.60	£ 164,726.58	£ -	£ -	£ 1,310,072.94	£ 39,435.50	£ 1,349,508.44	£ 402,663.04	£ 1,560,082.81
37	0.290	1.000	£ 5,385,409.33	£ 1,514,643.51	£ 1,332,847.00	£ 1,332,847.00	£ 363,944.18	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,679,370.08
38	0.281	1.000	£ 5,385,409.33	£ 1,470,527.68	£ 908,607.19	£ 908,607.19	£ 240,875.94	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,834,471.86
39	0.273	1.000	£ 5,385,409.33	£ 1,427,696.77	£ 5,995,375.03	£ 5,995,375.03	£ 1,543,108.24	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,668,572.72
40	0.265	1.000	£ 5,385,409.33	£ 1,386,113.37	£ 111,449.03	£ 111,449.03	£ 27,849.61	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,929,221.61
41	0.257	1.000	£ 5,385,409.33	£ 1,345,741.14	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,373,590.75
42	0.250	1.000	£ 5,385,409.33	£ 1,306,544.79	£ 226,789.63	£ 226,789.63	£ 53,418.48	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,306,544.79
43	0.243	1.000	£ 5,385,409.33	£ 1,268,490.09	£ 453,579.25	£ 453,579.25	£ 103,725.21	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,321,908.57
44	0.236	1.000	£ 5,385,409.33	£ 1,231,543.78	£ 1,585,621.85	£ 1,585,621.85	£ 352,041.23	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,335,268.99
45	0.229	1.000	£ 5,385,409.33	£ 1,195,673.57	£ 63,801.10	£ 63,801.10	£ 13,752.60	£ -	£ -	£ 2,850,491.55	£ 169,882.60	£ 3,020,374.15	£ 670,586.27	£ 877,128.54
46	0.222	1.000	£ 5,385,409.33	£ 1,160,848.13	£ 239,051.23	£ 239,051.23	£ 50,027.69	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,174,600.73
47	0.216	1.000	£ 5,385,409.33	£ 1,127,037.02	£ 161,455.80	£ 161,455.80	£ 32,804.69	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,177,064.70
48	0.209	1.000	£ 5,385,409.33	£ 1,094,210.70	£ 195,309.39	£ 195,309.39	£ 38,527.26	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,127,015.38
49	0.203	1.000	£ 5,385,409.33	£ 1,062,340.48	£ 6,321,880.02	£ 6,321,880.02	£ 1,210,748.77	£ -	£ -	£ 589,893.09	£ 330,924.48	£ 920,817.57	£ 176,352.40	£ 1,100,867.74
50	0.197	1.000	£ 5,385,409.33	£ 1,031,398.53	£ 1,171,391.20	£ 1,171,391.20	£ 217,807.34	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,065,794.89
51	0.192	1.000	£ 5,385,409.33	£ 1,001,357.79	£ 585,695.60	£ 585,695.60	£ 105,731.72	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,219,165.14
52	0.186	1.000	£ 5,385,409.33	£ 972,192.03	£ 111,449.03	£ 111,449.03	£ 19,533.15	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,077,923.75
53	0.181	1.000	£ 5,385,409.33	£ 943,875.76	£ 63,801.10	£ 63,801.10	£ 10,856.43	£ -	£ -	£ -	£ -	£ -	£ -	£ 963,408.91
54	0.175	1.000	£ 5,385,409.33	£ 916,384.23	£ 127,602.20	£ 127,602.20	£ 21,080.45	£ -	£ -	£ 1,310,072.94	£ 39,435.50	£ 1,349,508.44	£ 222,944.76	£ 927,240.66
55	0.170	1.000	£ 5,385,409.33	£ 889,693.43	£ 63,801.10	£ 63,801.10	£ 10,233.23	£ -	£ -	£ -	£ -	£ -	£ -	£ 889,693.43
56	0.165	1.000	£ 5,385,409.33	£ 863,780.03	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 874,013.25
57	0.160	1.000	£ 5,385,409.33	£ 838,621.39	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 838,621.39
58	0.156	1.000	£ 5,385,409.33	£ 814,195.52	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 814,195.52
59	0.151	1.000	£ 5,385,409.33	£ 790,481.09	£ 111,449.03	£ 111,449.03	£ 16,358.71	£ -	£ -	£ -	£ -	£ -	£ -	£ 806,839.80
60	0.147	1.000	£ 5,385,409.33	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -

CMSM-AC V1-M25 & Tunnel

Heathrow Airport – M25 Works South of Junction 15 – Extended Runway

COMMUTED SUM FOR FUTURE MAINTENANCE

Summary	
Total: Routine Maintenance	£ 115,744,395.43
Total: Renewal of New Asset (Incl. TM & Prelims)	£ 30,281,818.81
Total: Structures	£ 8,204,411.87
Total: Betterment	£ 28,031,478.14
<i>Of which TM and Prelims</i>	£ 912,796.91
Total of Estimated Commuted Sum	£ 126,199,147.97

Project Details	
Project Title:	M25 Tunnelling costs South of M25 Junction 15
Date:	06/05/2016
Opening Year:	2025
Model Details	
Model Version:	2.0
Valid From:	
Valid To:	

ROUTINE MAINTENANCE	Unit	Annual Rate	Additional Quantity
Annual Routine O&M of pavement area	m2 of Pavement	£5.76	103,693

Structure Name	Capital Cost	Commuted Sum
Total Structures (Excl. Tunnels)	£ 31,586,734.00	£ 8,204,411.87
Betterment for Existing Structures (Removal)	£ 45,928,000.00	-£ 11,929,445.71

Year	Discount	Relative Price Change	Routine Maintenance excl. Structures		Renewal of New Asset excl. Structures			Betterment (renewal or removal of existing asset) excl. Structures					Total					
			Annual	After Effective Discounting	Renewal Incl. TM & Prelims	Total	After Effective Discounting	Early Renewal	TM & Prelims	Removal	TM & Prelims	Total		After Effective Discounting				
1	0.966	1.000																
2	0.934	1.000	£ 4,741,858.96	£ 4,426,576.08	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,426,576.08
3	0.902	1.000	£ 4,741,858.96	£ 4,276,885.10	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,276,885.10
4	0.871	1.000	£ 4,741,858.96	£ 4,132,256.14	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,132,256.14
5	0.842	1.000	£ 4,741,858.96	£ 3,992,518.01	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,992,518.01
6	0.814	1.000	£ 4,741,858.96	£ 3,857,505.32	£ 167,406.16	£ 167,406.16	£ 136,185.02	£ 297,743.85	£ 10,447.26	£ 4,205,135.64	£ 123,565.47	£ 4,636,892.22	£ 3,772,114.81	£ -	£ -	£ -	£ -	£ 221,575.53
7	0.786	1.000	£ 4,741,858.96	£ 3,727,058.28	£ 150,388.30	£ 150,388.30	£ 118,203.84	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,845,262.13
8	0.759	1.000	£ 4,741,858.96	£ 3,601,022.49	£ 300,776.60	£ 300,776.60	£ 228,413.23	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,829,435.72
9	0.734	1.000	£ 4,741,858.96	£ 3,479,248.79	£ 287,104.88	£ 287,104.88	£ 210,657.74	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,689,906.52
10	0.709	1.000	£ 4,741,858.96	£ 3,361,593.03	£ 273,433.15	£ 273,433.15	£ 193,841.90	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,555,434.93
11	0.685	1.000	£ 4,741,858.96	£ 3,247,915.97	£ 6,979,861.22	£ 6,979,861.22	£ 4,780,826.03	£ -	£ -	£ 500,515.35	£ 280,989.83	£ 781,505.18	£ 535,288.62	£ -	£ -	£ -	£ -	£ 7,493,453.37
12	0.662	1.000	£ 4,741,858.96	£ 3,138,083.06	£ 952,869.41	£ 952,869.41	£ 630,593.06	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,768,676.13
13	0.639	1.000	£ 4,741,858.96	£ 3,031,964.31	£ 1,570,926.50	£ 1,570,926.50	£ 1,004,456.93	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 4,036,421.24
14	0.618	1.000	£ 4,741,858.96	£ 2,929,434.12	£ 1,560,623.91	£ 1,560,623.91	£ 964,125.03	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,893,559.15
15	0.597	1.000	£ 4,741,858.96	£ 2,830,371.13	£ 1,700,709.63	£ 1,700,709.63	£ 1,015,137.62	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,845,508.75
16	0.577	1.000	£ 4,741,858.96	£ 2,734,658.10	£ 2,722,323.98	£ 2,722,323.98	£ 1,569,980.33	£ -	£ -	£ 9,071,543.30	£ 441,333.09	£ 9,512,876.40	£ 5,486,132.06	£ -	£ -	£ -	£ -	£ 1,181,493.63
17	0.557	1.000	£ 4,741,858.96	£ 2,642,181.73	£ 150,388.30	£ 150,388.30	£ 83,796.93	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,725,978.66
18	0.538	1.000	£ 4,741,858.96	£ 2,552,832.59	£ 167,406.16	£ 167,406.16	£ 90,124.97	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,642,957.57
19	0.520	1.000	£ 4,741,858.96	£ 2,466,504.92	£ 136,716.58	£ 136,716.58	£ 71,113.90	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,537,618.83
20	0.503	1.000	£ 4,741,858.96	£ 2,383,096.54	£ 273,433.15	£ 273,433.15	£ 137,418.17	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,520,514.72
21	0.486	1.000	£ 4,741,858.96	£ 2,302,508.74	£ 6,979,861.22	£ 6,979,861.22	£ 3,389,217.52	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 5,691,726.25
22	0.469	1.000	£ 4,741,858.96	£ 2,224,646.12	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,224,646.12
23	0.453	1.000	£ 4,741,858.96	£ 2,149,416.54	£ 150,388.30	£ 150,388.30	£ 68,168.86	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,217,585.40
24	0.438	1.000	£ 4,741,858.96	£ 2,076,730.96	£ 468,182.76	£ 468,182.76	£ 205,043.98	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,281,774.94
25	0.423	1.000	£ 4,741,858.96	£ 2,006,503.34	£ 935,851.55	£ 935,851.55	£ 396,002.77	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,402,506.11
26	0.409	1.000	£ 4,741,858.96	£ 1,938,650.57	£ 1,570,926.50	£ 1,570,926.50	£ 642,253.93	£ -	£ -	£ 4,205,135.64	£ 123,565.47	£ 4,328,701.11	£ 1,769,736.08	£ -	£ -	£ -	£ -	£ 811,168.42
27	0.395	1.000	£ 4,741,858.96	£ 1,873,092.34	£ 785,463.25	£ 785,463.25	£ 310,267.60	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,183,359.94
28	0.382	1.000	£ 4,741,858.96	£ 1,809,751.05	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,809,751.05
29	0.369	1.000	£ 4,741,858.96	£ 1,748,551.74	£ 2,147,271.66	£ 2,147,271.66	£ 791,802.46	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,540,354.21
30	0.356	1.000	£ 4,741,858.96	£ 1,689,421.97	£ 4,461,949.51	£ 4,461,949.51	£ 1,589,696.28	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 3,279,118.25
31	0.346	1.000	£ 4,741,858.96	£ 1,640,215.51	£ 16,588,921.77	£ 16,588,921.77	£ 5,738,130.76	£ -	£ -	£ 500,515.35	£ 280,989.83	£ 781,505.18	£ 270,323.71	£ -	£ -	£ -	£ -	£ 7,108,022.56
32	0.336	1.000	£ 4,741,858.96	£ 1,592,442.24	£ 300,776.60	£ 300,776.60	£ 101,008.77	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,693,451.02
33	0.326	1.000	£ 4,741,858.96	£ 1,546,060.43	£ 150,388.30	£ 150,388.30	£ 49,033.39	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,595,093.81
34	0.317	1.000	£ 4,741,858.96	£ 1,501,029.54	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,501,029.54
35	0.307	1.000	£ 4,741,858.96	£ 1,457,310.24	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,457,310.24
36	0.298	1.000	£ 4,741,858.96	£ 1,414,864.31	£ 167,406.16	£ 167,406.16	£ 49,950.24	£ -	£ -	£ 4,205,135.64	£ 123,565.47	£ 4,328,701.11	£ 1,291,587.28	£ -	£ -	£ -	£ -	£ 173,227.27
37	0.290	1.000	£ 4,741,858.96	£ 1,373,654.67	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,373,654.67
38	0.281	1.000	£ 4,741,858.96	£ 1,333,645.31	£ 785,463.25	£ 785,463.25	£ 220,911.12	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,554,556.43
39	0.273	1.000	£ 4,741,858.96	£ 1,294,801.27	£ 1,858,031.38	£ 1,858,031.38	£ 507,349.84	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,802,151.11
40	0.265	1.000	£ 4,741,858.96	£ 1,257,088.61	£ 1,359,673.00	£ 1,359,673.00	£ 360,455.56	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,617,544.17
41	0.257	1.000	£ 4,741,858.96	£ 1,220,474.38	£ 5,844,089.56	£ 5,844,089.56	£ 1,504,169.91	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 2,724,644.29
42	0.250	1.000	£ 4,741,858.96	£ 1,184,926.58	£ 167,406.16	£ 167,406.16	£ 41,832.54	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,226,759.12
43	0.243	1.000	£ 4,741,858.96	£ 1,150,414.16	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,150,414.16
44	0.236	1.000	£ 4,741,858.96	£ 1,116,906.95	£ 775,160.66	£ 775,160.66	£ 182,582.89	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,299,489.84
45	0.229	1.000	£ 4,741,858.96	£ 1,084,375.68	£ 1,550,321.33	£ 1,550,321.33	£ 354,529.89	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,438,905.57
46	0.222	1.000	£ 4,741,858.96	£ 1,052,791.92	£ 2,133,992.89	£ 2,133,992.89	£ 473,791.08	£ -	£ -	£ 9,071,543.30	£ 441,333.09	£ 9,512,876.40	£ 2,112,057.63	£ -	£ -	£ -	£ -	£ 585,474.63
47	0.216	1.000	£ 4,741,858.96	£ 1,022,128.08	£ 150,388.30	£ 150,388.30	£ 32,416.84	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,054,544.92
48	0.209	1.000	£ 4,741,858.96	£ 992,357.36	£ 468,182.76	£ 468,182.76	£ 97,979.42	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,090,336.78
49	0.203	1.000	£ 4,741,858.96	£ 963,453.75	£ 287,104.88	£ 287,104.88	£ 58,334.14	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 1,021,787.89
50	0.197	1.000	£ 4,741,858.96	£ 935,391.99	£ 273,433.15	£ 273,433.15	£ 53,938.17	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ -	£ 989,330.15
51	0.192	1.000	£ 4,741,858.96	£ 908,147.56	£ 6,479,164.51	£ 6,479,164.51	£ 1,240,871.46	£ -	£ -	£ 500,515.35	£ 280,989.83	£ 781,505.18	£ 149,671.69	£ -	£ -	£ -	£ -	£ 1,999,347.33
52	0.186	1.000	£ 4,741,858.96	£ 881,696.66	£ 1,570,926.50	£ 1,570,926.50	£ 292,096.55	£ -	£ -	£ -	£ -	£ -						

Assumed Asset Renewal Frequencies Applied for Basis of Operation and Maintenance Cost Estimates

Series	Asset / Maintenance Activity	Unit	Frequency (Years)	DfT Whole Life Costing report (Years)
0400	Road Restraints			
	Single Sided OBB/TCB			
	H1 W3	m	30	15-25
	H1 W4	m	30	15-25
	H2 W2	m	30	15-25
	H2 W3	m	30	15-25
	H2 W4	m	30	15-25
	N2 W2	m	30	15-25
	N2 W3	m	30	15-25
	N2 W4	m	30	15-25
	Terminals			
	P1 D1.1	no.	30	15-25
	P4 D1.1	no.	30	15-25
	Pedestrian Guardrails	m	30	20-30
0700	Pavement			
	Replace Thin Surface Course	m2	10	10-25
	Replace Binder & Thin Surface Course	m2	30	10-25
	Replace HRA Surface Course	m2	15	10-25
	Replace Binder and HRA Surface Course	m2	30	10-25
	High Friction Surfacing	m2	10	5-10
1100	Kerbs Footways and Paved Areas			
	HB2 Kerb	m	20	n/a
	Path Edging	m	20	n/a
	Paved Area (Asphalt)	m2	20	10-25
1200	Traffic Signs & Roadmarkings			
	Sign Post (tubular) - Small	no.	30	10-20
	Sign Post (tubular) - Large	no.	30	10-20
	Sign Post (Rectangular) - Large	no.	30	10-20
	Sign Post (passive) - Small	no.	30	10-20
	Sign Post (passive) - Large	no.	30	10-20
	Sign - <=0.25m - New	no.	15	10-20
	Sign - >0.25m2 but <=0.75m2 - New	no.	15	10-20
	Sign - >0.75m2 but <=1m2 - New	no.	15	10-20
	Sign - >1m2 but <=2m2 - New	no.	15	10-20
	Sign - >2m2 but <=3m2 - New	no.	15	10-20
	Sign - >3m2 but <=4m2 - New	no.	15	10-20
	Sign - >4m2 but <=5m2 - New	no.	15	10-20
	Sign - >5m2 but <=10m2 - New	no.	15	10-20
	Sign - >10m2 but <=11m2 - New	no.	15	10-20
	Sign - >11m2 but <=15m2 - New	no.	15	10-20
	Sign - >15m2 but <=16m2 - New	no.	15	10-20
	Sign - >16m2 but <=20m2 - New	no.	15	10-20
	Sign - >20m2 but <=25m2 - New	no.	15	10-20
	Sign - >25m2	no.	15	10-20
	Continuous Line	m	10	3-7
	Intermittent Line - 150mm wide, 1000mm long, 1000mm gap	m	10	3-7
	Intermittent Line - 150mm wide, 4000mm long, 2000mm gap	m	10	3-7
	Intermittent Line - 150mm wide, 2000mm long, 4000mm gap	m	10	3-7
	Intermittent Line - 150mm wide, 1000mm long, 5000mm gap	m	10	3-7
	Intermittent Line - 150mm wide, 2000mm long, 7000mm gap	m	10	3-7
	Intermittent Line - 250mm wide, 1000mm long, 1000mm gap	m	10	3-7
	Raised Rib Lines - 150mm wide, 500mm rib centres	m	10	3-7
	Raised Rib Lines - 200mm wide, 250mm rib centres	m	10	3-7
	Arrows	no.	10	3-7
	Chevrons	m	10	3-7
	Hatching	m	10	3-7
	Yellow Lines - Single	m	10	3-7
	Yellow Lines - Double	m	10	3-7
	Symbol	no.	10	3-7
	Solid Areas	m2	10	3-7
	Letters	no.	10	3-7
	Road Studs - Uni-directional	no.	10	10-20
	Road Studs - Bi-directional	no.	10	10-20
	Traffic Signal Controller	no.	20	3-7
	Traffic Signals	no.	20	15-35
	Traffic Signal Loops	no.	30	20-40
	Lamps for Traffic Sign	no.	15	10-20
1300	Road Lighting & Electrical Works to Road Lighting			
	Streetlights Single Arm <=8m (complete)	no.	30	25-40
	Streetlights Double Arm <=8m (complete)	no.	30	25-40
	Streetlights Single Arm >8m but <=12m (complete)	no.	30	25-40
	Streetlights Double Arm >8m but <=12m (complete)	no.	30	25-40
	Illuminated Bollard	no.	15	15-25
0300	Fencing			
	Four rail fencing 1.4m high with timber posts	m	30	20-40
2500	Noise Barrier			
	2.0m high Timber Reflective Acoustic Fence (Environmental Barrier)	m	30	20-40
	3.0m high Timber Reflective Acoustic Fence (Environmental Barrier)	m	30	20-40
	2.0m high Timber Absorptive Acoustic Fence (Environmental Barrier)	m	30	20-40
	3.0m high Timber Absorptive Acoustic Fence (Environmental Barrier)	m	30	20-40
S	Structures			
	Structures	no.	n/a	n/a