

## BRISTOL AIRPORT

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### Development of Bristol Airport to Accommodate 12 Million Passengers per Annum.

### Additional Information for Natural England

## 1 INTRODUCTION

- 1.1.1 This note has been prepared in response to comments and advice provided by Natural England in an email dated on 17<sup>th</sup> April 2019 under a Discretionary Advisory Service agreement, relating to the planning application and supporting environmental statement (ES) for the proposed development of Bristol Airport to accommodate 12 million passengers per annum (mppa) (Application no. 18/p/5118/out). Specifically, the note responds to comments and advice received in respect of the biodiversity impacts of the proposed development. Many thanks for these.
- 1.1.2 The remainder of this note highlights the comments from Natural England (shown as NE) and provides a response to them (shown as JA).

## 2 COMMENTS AND RESPONSES

- 2.1.1 NE: Our overall impression from the site visit is that there is potential to enhance the woodland for HS bats and potentially for dormice too, but we do have some questions and concerns:  
JA: This feedback is welcomed and aligns with the site meeting with NE and also a site meeting and ongoing dialogue with North Somerset Council's Biodiversity Officer, Sarah Dale.
- 2.1.2 NE: According to our GIS records, FC's National Forest Inventory describes the woodland as 'conifer'; however although conifer is present in parts of the woodland, other tree species and a degree of understorey are also present. A map showing the % of conifer/broadleaf and ideally tree species is needed to determine more accurately its existing habitat value to HS bats.  
JA: As part of the investigations conducted by Bristol Airport and Johns Associates, a formal woodland survey and inventory of tree species, coverage and standing crop of timber was completed

in 2018. This informed the evaluation of the woodland as being suitable as SPD replacement habitat and the conclusions drawn in the ES. These conclusions were supported by completion of the SPD calculator and its review and approval by North Somerset Council's ecologist, with this data being discussed and shared with Natural England during an earlier DAS agreement. Collectively, this supported the conclusion the woodland was suitable as replacement habitat, that sufficient area could be enhanced as per the habitat criteria under the SPD and the decision to purchase the woodland for this purpose.

2.1.3 JA: Our field survey of the Bristol Airport owned woodland, completed in 2018 by a suitably experienced specialist, confirms the following areas associated with different tree species:

Grand total area of 6.24ha woodland, within much larger connected woodland/forestry area.

Goldstone Wood (2.18ha total): 1.06ha hybrid larch in the north west, 0.17ha of Scot's pine in the south east. Remainder of 0.95ha of yew and mixed native broadleaved associated with the quarrying. **Total of 1.23ha suitable replacement habitat.**

Cleeve Wood (2.29ha): 1.88ha of Scots Pine (with a scattering of mature native broadleaves (ash and oak within the canopy and sycamore and holly in the understorey), with 0.51ha with Yew and native mixed broadleaved. **Total of 1.88ha suitable replacement habitat.**

Fountain Wood (1.77ha): 1.64ha of hybrid larch, 0.11 of Scot's Pine, 0.02ha footpath. **Total of 1.75ha suitable replacement habitat.**

2018 SPD calculations required 4.38ha. The BRS woodland provides 4.86ha of suitable replacement habitat outside of the boundary associated with Goblin Coombe SSSI, based on removal of conifers only to achieve 20% canopy coverage within this area (representing 77.4% of BRS woodland), leaving 22.6% non-modified.

Please refer to Figure 1 provided overleaf.

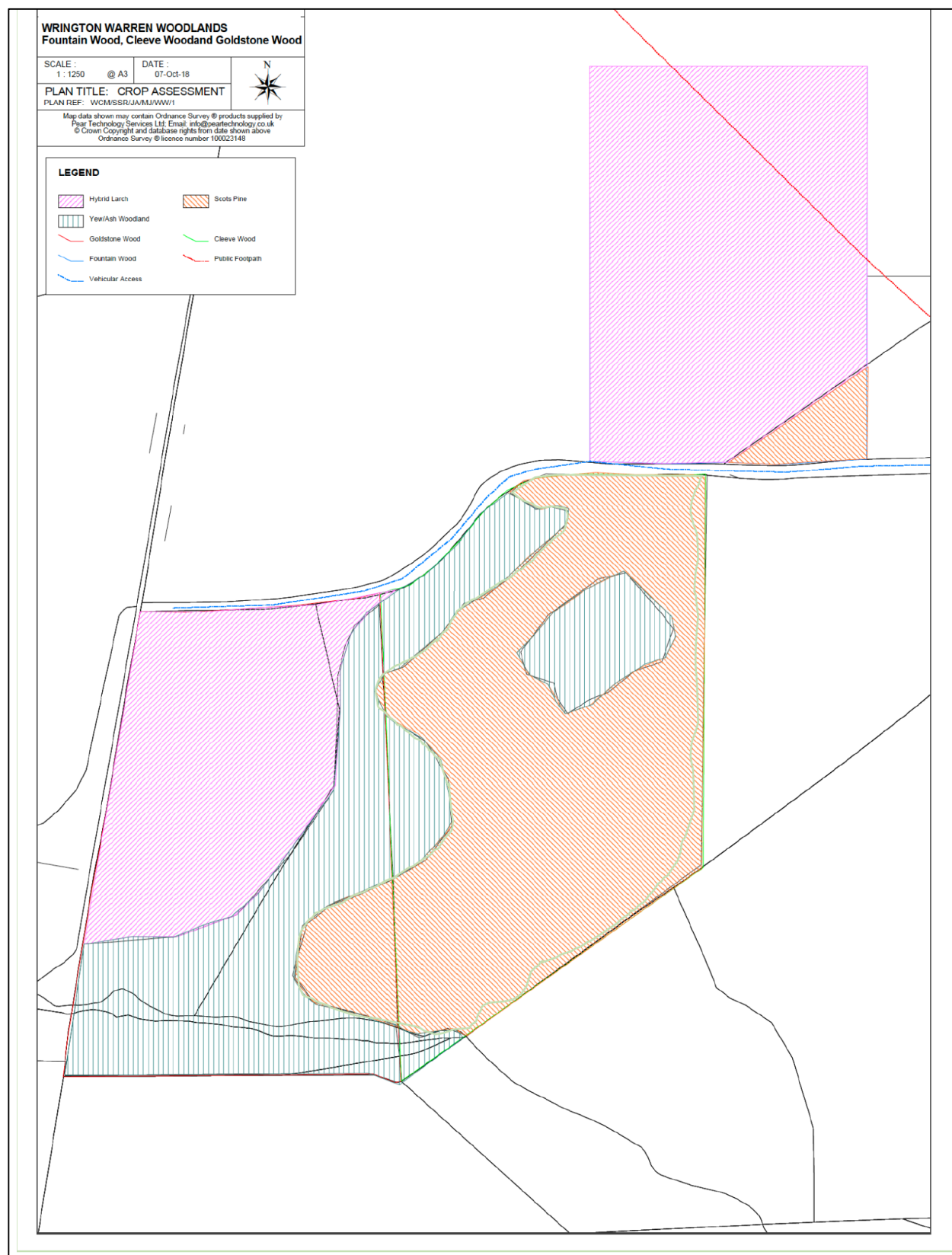


Figure 1. Bristol Airport Woodland/Proposed SPD/SAC Replacement Habitat and Tree/Crop Boundaries

- 2.1.4 NE: There appeared to be little obvious connectivity between the woodland and Brockley Hall SSSI/Kingswood and Urchin Wood SSSI. JA: Connectivity exists within the wider woodland via tracks and along existing rides between the compartments (and elsewhere) and the footpath on the top of the slope/SSSI. The existing track and rides also connect directly to Brockley Coombe and the Brockley Hall Stables SSSI. The proposed retained yew dominated spine through the SPD-enhanced woodland block will also provide good connectivity throughout the overall BRS woodland parcels and emphasise this strong connective link to the adjacent woodland areas and the lower lying SSSI habitat. In general terms, connectivity to the roost has been demonstrated through the fact that greater and lesser horseshoe bats are moving and foraging beyond the far side of the woodland block containing the proposed replacement habitat as recorded at both the Bristol Airport proposed Silver Zone Extension Areas and the A38/Downside Road Junction (and elsewhere).
- 2.1.5 NE: We welcome your intention to carry out bat surveys, which we think will be needed to determine whether the woodland is already providing HS bat habitat (and if so to what extent) and to inform mitigation requirements. For example, if HS bats are using the woodland it will be necessary to show a proportionate uplift in habitat value; conversely if HS bats are not using the woodland we need to understand why and whether suitable connections could be made. JA: This is not something that is specifically required by the SPD (as was in 2018 at the time of submission), or identified through earlier statutory consultee consultation, including a previous NE DAS, and the replacement habitat proposal is in accordance with that policy, as confirmed to us previously by North Somerset Council. It is our understanding that the approval of appropriate SPD management requirements is based on the application of the SPD criteria not baseline data. Rather the proposed surveys will inform the specific management details and ongoing management, not confirm policy compliance at the determination stage, as well as establishing a robust baseline to allow future monitoring to inform the success of the replacement habitat at that point in time and to inform dynamic and responsive future management as appropriate. We also propose to establish a Steering Group to oversee the implementation and ongoing management, including Natural England and North Somerset Council, ensuring joined up landscape scale habitat enhancement, extending the benefits of these proposals beyond just the 12mppa planning application.
- 2.1.6 NE: With respect to the exact mechanics for how you judge existing / post-enhancement horseshoe activity - which might be difficult to pin down given HS use of woodland (e.g. LHS tend to forage high in the canopy) - we suggest harp/mist netting could be one means alongside use of suitable static detectors in key locations. We would however expect the approach to be devised by BA ecologist(s) and then agreed with NE. It would also be helpful to know more about the ownership of neighbouring woodland in terms of potential to create connected grassy rides and glades. JA: The recently BRS agreed monitoring proposals include methods as per best practice (BCT and SPD) with fixed automated detectors at canopy, woodland floor and woodland edge locations, recording a total of 50 events under suitable conditions across the main spring/summer/early autumn bat activity season, as well as two walking transect surveys per month and mist netting and harp trapping to investigate presence of maternity usage. This will amass considerable data to inform the management proposals. We are happy to discuss and agree with NSC and NE, but because the



methods are compliant with the SPD and BCT methods, they have commenced to ensure sufficient data is captured. The methods will form the basis of periodic ongoing monitoring to measure change in bat activity, species, usage and behaviour. Such surveys will be on a regular basis as reasonably requested or as agreed by the aforementioned steering group in order to have full transparency in the progress of the mitigation proposed under the planning application.

- 2.1.7 NE: We understand that both GHS and LHS bats are target species, which have slightly differing hunting and prey requirements – it is currently not clear how this has been considered in the proposals. JA: The SPD highlights the 20% canopy reduction as the highest scoring woodland management technique for both species and this approach has been approved by NSC's specialist in pre-submission consultation and post-submission responses. There will remain a variety of features within the managed woodland (dense vegetated sections, open sections, canopy, rides, deadwood, increased species diversity throughout etc and the current management approach has been adopted and agreed with NSC based on the criteria in the SPD (2018). The final detailed management prescription (beyond the 20% canopy cover target) will be informed by the baseline survey work and through consultation and agreement with NE and NSC. In addition, further features can be added to as per the SPD e.g. addition of water/ponds etc for moths would enhance for LHS particularly (SPD annex 6 habitat prescriptions para A6.7-A6.10 p 55-56 Woodland with Water - "Therefore the incorporation of ponds in association with woodland habitat is likely to increase their value to Lesser horseshoe bats"). It would appear perfectly possible to improve a woodland habitat for both macro (grass/herb layer/ferns) and micro moths (herb/shrub but esp. water). Both increase with diversity/cover of broadleaves. It would also be possible to split the woodland into two different management regimes for each species, but we see this as unnecessary.
- 2.1.8 NE: Dormice are a feature of Goblin Combe SSSI and likely to be present within the woodland – it will be very important therefore to ensure dormice are not adversely affected by tree felling or other woodland mgmt. and that in the long term these measures are beneficial to both bats and dormice. JA: We have discussed dormouse with North Somerset Council during a site visit and agree that there are good opportunities to enhance habitat quality, arboreal connectivity and habitat features (e.g. 50 nest boxes are proposed, promotion of increased variety of seasonal foods, good connectivity, positive influence on neighbours and use of educational boards and talks). The baseline surveys will inform whether a NE dormouse licence is required or whether a non-licensable approach is appropriate, both methods following best practice to avoid legal offences/negative effects on dormouse (and other species). The baseline surveys underway include updated Extended Phase 1 Habitat Survey, NVC and lower plants, potential tree and rock face bat roost screening (with follow up climbing inspections if present), badger, reptile, bat and dormouse as discussed, great crested newt habitat screening (full surveys of the nearest ponds were completed in 2018 >500m away). The management proposals are multispecies, will significantly increase habitat structure, connectivity, species diversity, feeding, resting, breeding and overwintering habitat.
- 2.1.9 NE: Has FC been consulted for their opinion on a change in this area? Is a felling licence required? JA: We have consulted the FC (Mark Malins) and their advice is that a felling licence is

advised (rather than rely on any potential planning application), and the initial verbal feedback was very positive and supportive. We would refer to and integrate joint advice from NE and NSC into this application. An application will be made shortly.

2.1.10 NE: In case you are not aware, North Somerset & Mendip Bats SAC Guidance has been updated recently and includes a revised HEP calculation spreadsheet (attached). JA: For completeness, we have made a full comparison of the 2018 and 2019 SPD requirements. We feel strongly that the survey, assessment and replacement habitat requirements should be based on the adopted North Somerset Council 2018 policy document that was available at the time of EIA Scoping, planning submission and associated with all previous consultation with NSC and NE, scheme design and replacement habitat purchase. The use of a document that is not adopted policy does not represent a robust position from our perspective.

2.1.11 NE: The Guidance sets out a number of considerations and requirements in relation to off-site mitigation habitat, including the following, which we think are particularly relevant to the above points:-

*8.4 Where the replacement provision is to be made on land off-site (outside the red line development boundary for the planning application) any existing value of that land as bat habitat will also have to be factored in to the calculation.*

JA: We have factored this into the calculation as per the adopted 2018 SPD, which has been signed off by NSC prior to submission and subsequently, with a draft copy provided to NE during the pre-submission DAS consultation period and available in the submission documents.

*8.3 Any replacement habitat must be accessible to the horseshoe bat population affected.*

JA: The location of the woodland is within SAC Band A so is optimal and connectivity is present and will be further enhanced through the scheme (see response under 2.1.4). Incorporating a factor for direct connectivity was not previously identified as a SPD constraint to adopting this replacement habitat site, due to its location within the core sustenance zone. Further connectivity can be created through liaison with other landowners, but in our opinion this should not form a barrier to enhancing this area of woodland. Our proposals act to create habitat as defined by the SPD as being suitable, within the much larger block of connected woodland/forestry as open habitat not present in extensive amounts elsewhere and as such provide ongoing opportunities for both HS species as well as other bat species.

*4.6 Where replacement habitat is required off site in mitigation the land should not be a designated Site of Special Scientific Interest, be contributing already to supporting conservation features or in countryside stewardship to enhance for bats.*

JA: The proposed replacement habitat is adjacent to but does not form part of Goblin Coombe SSSI, does not already support conservation features and is not under countryside stewardship for bats.

Measures to conserve and enhance the SSSI within the Bristol Airport ownership are proposed (e.g. eradication on INNS and appropriate educational signage on the public right of way).

#### *Annex 6: Habitat Creation Prescriptions*

##### *Woodland*

*A6.4 Again off-site the replacement of coniferous woodland with broad-leaved woodland would benefit Greater Horseshoe bats. This should be carried out gradually over a period of time to avoid extensive clear-felling.*

JA: The proposals are not clear felling, rather a reduction in canopy cover to 20% in some circa 75% of the woodland area with circa 25% being retained in a more dense/existing form. Subject to approval, we do propose to undertake this reduction in canopy as a single carefully implemented activity (e.g. over a few months) to bring about the habitat enhancement benefits quickly, prior to any existing habitat loss, noting the significant expanse of adjoining retained 3<sup>rd</sup> party woodland. Please

refer to a basic draft plan of areas proposed to be reduced in canopy density and those retained in Figure 2 below).

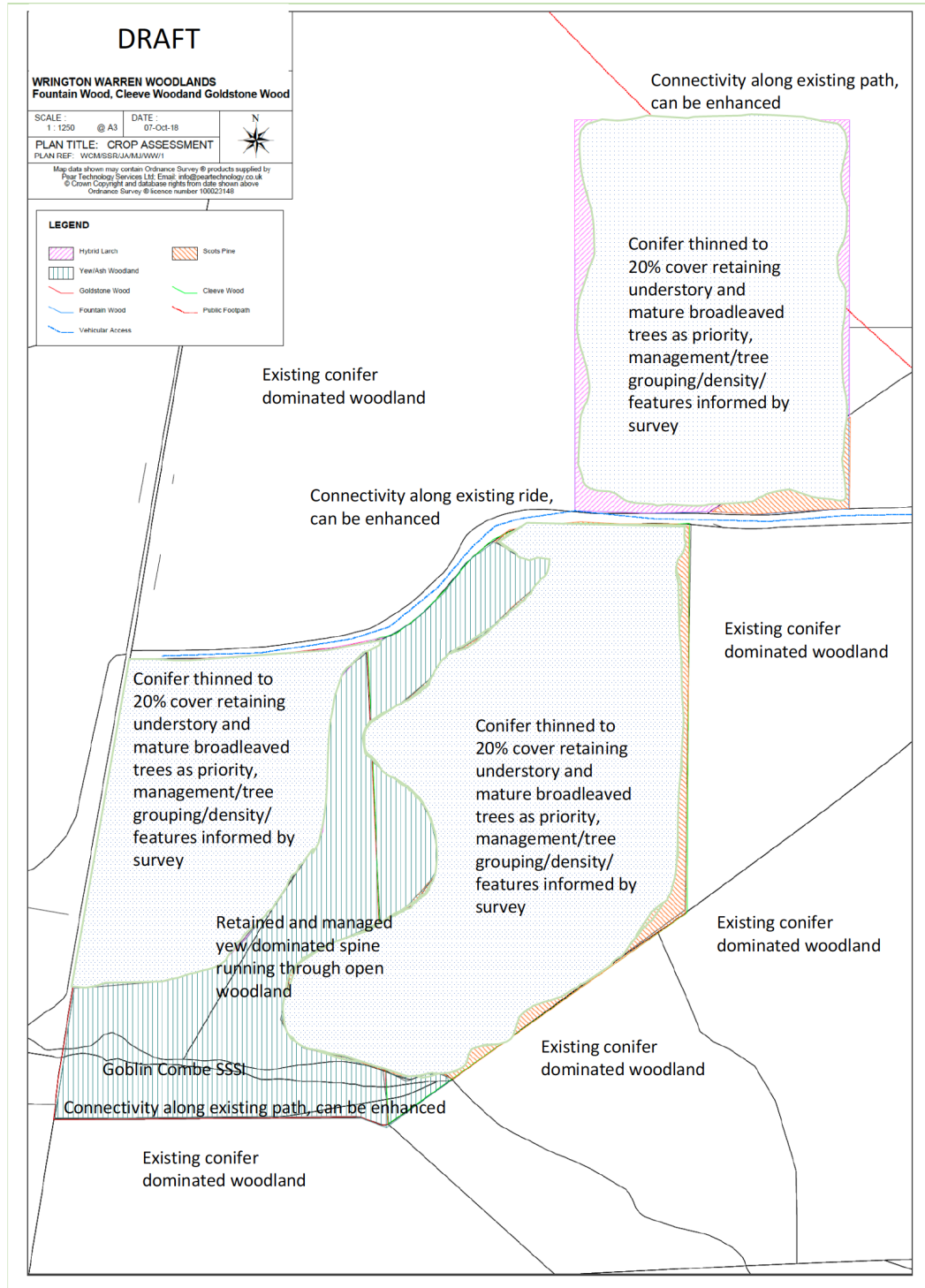


Figure 2. Draft outline management approach

*Macromoth abundance is higher at the edge of woodland than in the interior. All woodlands should be permeated by grassy rides, and contain grassy glades. They should be managed without insecticide treatments. Glades probably need to be 10 - 15 metres across before they will be used by the bats for feeding.*

*Macromoth abundance and species richness were positively affected by tree species richness and by the relative abundance of native trees in a woodland patch. Of dominant ground types, 'grass' and 'litter' had higher abundances and species richness than bare ground, herbs, moss or ferns.*

JA: The proposals will include replacement of retained conifers (over time) with native broad leaved species to maximise tree and shrub species diversity and further planting can occur as well. The ground flora can be managed to support this objective, informed by the monitoring, and taking into account wider species requirements.

*Woodland size is positively related to macromoth abundance. Woodlands over 5ha have the highest values of moth diversity and abundance. However, relatively small patches (e.g. woodlands between 1 and 5 ha) seem to contain relatively large moth populations.*

JA: The BRS woodland is around 6ha so suitable for encouraging macromoth abundance.

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Project name	Bristol Airport 12MPPA Extension		
Design note title	Lighting Impact Assessment - Additional Study		
Document reference	C-09194		
Author	Hannah Jane		
Revision	P01		
Date	25 April 2019	Approved	✓

## 1. INTRODUCTION

Following a review of the Lighting Impact Assessment for the Bristol Airport 12MPPA extension by the North Somerset Council, an additional lighting study has been prepared to review illuminance levels around three areas of importance to bats: a landscaped bund to the north of the northern car parks; along Downside Road; and land between Downside Road and the northern car parks. These areas are shown in Figure 1. Please refer to report 09194-HYD-XX-GF-RP-ME-0001 for the information regarding the Lighting Impact Assessment.

This technical note describes the existing illuminance levels in each area and compares these to predicted illuminance levels following indicative light modelling of the proposed scheme.

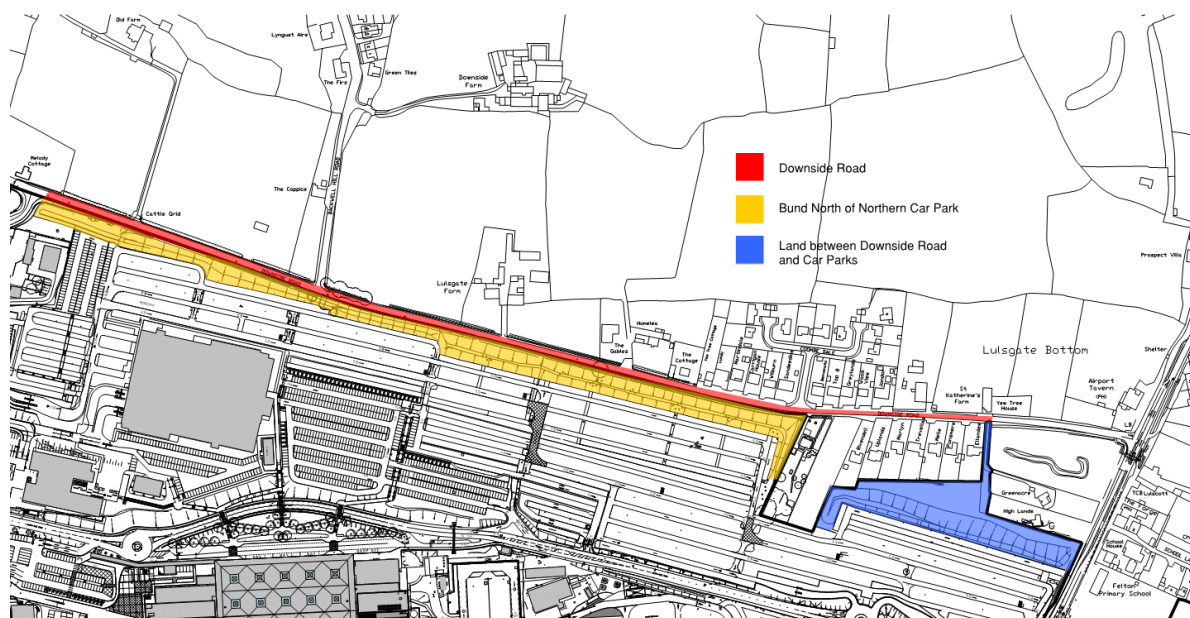


Figure 1: Areas of study.

## 2. BASELINE SURVEY

A baseline lighting survey took place on Thursday 18th April 2019 between 9.00pm and 11.00pm to cover the areas discussed above. The weather was dry with moderate to thick cloud cover. Moonlight can affect illuminance measurements, with bright moonlight contributing to around 0.25 to 0.35 lux.

Little moonlight was visible during the survey due to cloud cover, so illuminance recordings should not be affected.

The measurements were taken using a calibrated handheld lux meter. Horizontal illuminance measurements have been taken at all locations at 0m above ground, and vertical measurements have been taken when deemed necessary, at 1.5m above ground.

The bund was mostly inaccessible due to thick foliage however recordings have been taken within the bund where possible.

Please see Appendix A for all illuminance recordings taken during the survey.

## 2.1 Northern Car Park

The northern car park is currently lit with column luminaires. Most columns are approximately 6m to 8m tall, though some columns were found to be smaller at 3m to 4m. A range of Correlated Colour Temperatures (CCTs) and lighting technologies were found in this area. CCTs ranged from 2700°K to 4000°K and lamps were found to be a mix of LED, SON and halogen technologies.

The multi-storey car park to the west of the site is lit with surface mounted batten luminaires. These provided a higher light spill into immediately adjacent areas, with a maximum horizontal recorded measurement of 73.2 lux.

It was noted during the survey that sections of the car park were lit by two lamps on one column, with one lamp directed into the foliage on the bund. This created high levels of illuminance in the foliage which reached a maximum of 34.0 lux. A 2m tall fence separated the car park from the bund during one section of the car park. Illuminance levels behind the fence were found to be high (an average of 7.8 lux).



Figure 2: Light spill into bund foliage from northern car park (left) and behind 2m tall fence within northern car park (right).



## 2.2 Downside Road

Downside Road is currently unlit with most measurements recorded at 0.0 lux due to thick foliage and a 2m tall fence blocking light spill from the airport. The measurements increased to a maximum of 0.7 lux where tree cover became sparse and illumination from the car park and multi-storey car park was visible.

A vertical illuminance measurement was taken above and below the 2m tall fence (7.3 lux and 0.0 lux respectively) which indicates the fence provides high levels of shielding from the northern car parks. The multi-storey car park was not visible in locations where the fence is located.



Figure 3: Light spill over fence and bund onto Downside Road.



Figure 4: Light spill from car park and multi-storey car park as seen on Downside Road (location without fence - 0.7 reading taken).

## 2.3 Land between Downside Road and Car Parks

The land between Downside Road and the northern car parks is currently unlit, with the only illumination provided by the northern car park columns. Tall, thick foliage currently separated the two areas which mostly reduces lux levels to below 1 lux, with a maximum of 1.2 lux recorded.



*Figure 5: Columns visible from land between Downside Road and northern car parks.*

## 3. INDICATIVE LIGHTING STRATEGY

An indicative lighting strategy for the areas discussed above has been modelled using Dialux Evo 8.0 professional lighting modelling software to predict illuminance levels. Each area has been assessed for their residual effects against guidance given in the ILP Professional Lighting Guide 4, shown in Table 1.

Nature	Ref.	Level	Descriptions	Remedial needs
Positive	1	Major/substantial beneficial effects	Significant improvement in night environment and/or reductions in glare, spill light and sky glow etc.	
	2	Moderate beneficial effects	Noticeable improvement in night environment and/or reductions in glare, spill light and sky glow etc.	
	3	Minor beneficial effects	Slight improvement in night environment and/or reductions in glare, spill light and sky glow etc.	
Neutral	4	None/negligible	No significant effect or overall effects balancing out	None
Negative	5	Minor adverse effects	Slight increase in visibility of site, glare, sky glow etc.	Develop appropriate levels and type of mitigation
	6	Moderate adverse effects	Noticeable increase in visibility of site, glare, sky glow etc.	
	7	Major adverse effects	Significant increase in visibility of site, glare, sky glow etc.	

Table 1: Residual effects table - ILP Professional Lighting Guide 4.

Please see Appendix B for predicted light spill drawings.

### 3.1 Bund - Northern Car Park Side

The 12MPPA extension proposes to create a new gyratory road, with internal surface car parking located in the centre, and the addition of a multi-storey car park towards the North West of the site. The northern car parks have been modelled with 6m tall column luminaires with a CCT of 3000°K. Each lamp has a tilt of 0° and has been designed to produce zero upward light in order to reduce the overall sky glow from the airport.

In accordance with BS EN 12464-1:2014 standards, the area has been lit to an average of 10 lux with 0.25 uniformity, assuming that it is a medium use car park. Columns have been positioned away from the bund where possible, whilst still maintaining the required lux levels and uniformity of illuminance. The proposed multi-storey car parks have been modelled with ceiling mounted batten luminaires with a CCT of 3000°K. The top level of the car park has been modelled with 4m tall column luminaires with a CCT of 3000°K and a tilt of 0°.

Vertical illuminance calculations have been undertaken to assess the vertical light spill onto the bund to the north of the northern car parks. Table 2 shows the existing illuminance recordings taken on the baseline light survey against the predicted vertical illuminance. The vertical illuminance calculation points have been measured at a height of 1.5m from floor level to correspond to measured heights.

It should be noted that the topography of the bund has been modelled, but no foliage has been modelled along this section so the predicted illuminances should be seen as a worst-case scenario.

Baseline Illuminance - Vertical [lux]	Predicted illuminance - Vertical [lux]
7.6	7.7
15.4	6.8
46.4	6.5
22.2	6.6
12.4	8.1
5.1	9.7
11.7	12.2
6.5	9.2
17.2	14.6
4.0	9.0
7.3	8.5
4.2	3.9
7.4	6.7
5.3	6.6
13.1	4.3
2.4	4.0
7.3	3.9
3.6	3.3
7.0	4.8
3.9	4.5
12.4	9.8
1.9	5.7
3.6	3.2
3.9	7.6
6.1	6.2
3.0	7.6
34.0	7.0
2.3	5.8
23.3	6.6
8.4	6.4
27.2	6.2
3.7	6.0
41.9	5.8
6.3	5.3
32.2	5.5
7.1	7.3
21.0	6.9
2.0	6.3
16.5	5.9
2.2	4.1
19.5	3.9
2.9	3.3
21.5	3.0
26.2	2.9
3.5	6.8
15.6	2.2
8.3	6.0
2.9	2.7
11.6	2.5
28.0	4.3

Table 2: Baseline vs. predicted illuminances - Bund - northern car park side.

Following the calculations, the area is deemed to have a minor beneficial effect to the bund as the predicted illuminance levels are largely in line with the measurements recorded on site, however, the maximum calculated illuminance point (14.6 lux) is much lower than the maximum recorded illuminance point (41.9 lux).

## 3.2 Downside Road

There are no lighting changes proposed to Downside Road but the effect of the northern car park lighting on the area has been assessed against the baseline light levels. Table 3 shows the existing illuminance recordings taken on the baseline light survey against the predicted vertical illuminance.

It should be noted that the topography of the bund has been modelled, but no foliage has been modelled along this section so the predicted illuminances should be seen as a worst-case scenario.

Baseline Illuminance [lux]	Predicted illuminance [lux]
0.0	0.03
0.0	0.00
0.0	0.09
0.1	0.00
0.0	0.02
0.2	0.01
0.1	0.02
0.7	0.04
0.2	0.05
0.1	0.00
0.0	0.04
0.2	0.03
0.0	0.02
0.1	0.03
0.2	0.03
0.5	0.02

Table 3: Baseline vs. predicted illuminances - Downside Road.

Following the calculations, the area is deemed to have a negligible effect to Downside Road as the predicted illuminance levels are in line with the measurements recorded on site.

## 3.3 Land between Downside Road and Car Parks

There are no lighting changes proposed to the land between Downside Road and the northern car parks however the effect of the northern car park lighting on the area has been assessed against the baseline light levels. Table 4 shows the existing illuminance recordings taken on the baseline light survey against the predicted vertical illuminance. The maximum illuminance point in this area is 0.56 lux.

It should be noted that the topography of the bund has been modelled, but no foliage has been modelled along this section so the predicted illuminances should be seen as a worst-case scenario.

Baseline Illuminance [lux]	Predicted illuminance [lux]
0.0	0.03
0.0	0.07
0.4	0.35
0.3	0.16
0.1	0.23
0.1	0.17
0.6	0.15

0.5	0.19
0.1	0.56
1.1	0.24
0.5	0.17
0.1	0.15
0.2	0.12
0.3	0.11
0.2	0.04
2.2	0.03

*Table 4: Baseline vs. predicted illuminances - Land between Downside Road and northern car parks.*

Following the calculations, the area is deemed to have a negligible effect to the land between Downside Road and the northern car parks as the predicted illuminance levels are in line with the measurements recorded on site.

## 4. SUMMARY

A baseline survey has been carried out to record existing illuminance levels around the areas identified as useful to bats. Indicative modelling has also been completed to demonstrate the light output and potential spill from the proposed scheme.

Indicative modelling has identified that the predicted illuminance levels are either below, or in line with, illuminance recordings found on the baseline survey. This is due to the use of more modern, directional, energy efficient LED lamps and a more sensitive lighting design strategy which aims to reduce the amount of light shone directly onto sensitive areas. Therefore, it is not perceived that the proposed lighting changes will have a negative impact on the areas noted to be important to bats.

## *Appendix A: Baseline Survey Measurements*





- NOTES:
1. ALL DIMENSIONS ARE TO BE CHECKED ON SITE BEFORE THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
  2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS' AND SERVICE ENGINEERS' DRAWINGS AND SPECIFICATIONS. THIS DRAWING IS COPYRIGHT.

- Legend:
- Existing column luminaire
  - Existing bollard luminaire
  - Existing floodlight luminaire
  - Existing building/structure mounted luminaire
  - Horizontal illuminance (measurement)
  - Vertical illuminance (measurement)
  - Extrapolated values
  - Area in-accessible

P02	25/04/19	Updated following additional survey	HJ	ES
P01	24/09/18	Preliminary	HJ	ES
Rev	Date	Description	By	Ckd

TODD ARCHITECTS



Client:  
BRISTOL AIRPORT

Project Title:  
BRISTOL AIRPORT  
12MPPA EXTENSION  
NORTH WEST OF SITE

Drawing Title:  
ELECTRICAL SERVICES  
BASELINE LIGHT SURVEY  
ILLUMINANCE MEASUREMENTS

Drawing Status:  
PLANNING

Hydrock Job No:		C-09194		
Drawn	Checked	Scale @ A1	Date	Issue Date
HJ	ES	1:400	SEPT 2018	25/04/19
Drawing Number:				Revision:
09194-HYD-XX-GF-DR-E-9007				P02





- NOTES:
1. ALL DIMENSIONS ARE TO BE CHECKED ON SITE BEFORE THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
  2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS' AND SERVICE ENGINEERS' DRAWINGS AND SPECIFICATIONS. THIS DRAWING IS COPYRIGHT.

- Legend:**
- Existing column luminaire
  - Existing bollard luminaire
  - Existing floodlight luminaire
  - Existing building/structure mounted luminaire
  - 0.0 [lx] Horizontal illuminance (measurement)
  - 0.0 [lx] Vertical illuminance (measurement)
  - 0.0 [lx] Extrapolated values

P02	25/04/19	Updated following additional survey	HJ	ES
P01	24/09/18	Preliminary	HJ	ES
Rev	Date	Description	By	Ckd

Architect :  
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Client :  
BRISTOL AIRPORT

Project Title:  
BRISTOL AIRPORT  
12MPPA EXTENSION  
NORTH EAST OF SITE

Drawing Title:  
ELECTRICAL SERVICES  
BASELINE LIGHT SURVEY  
ILLUMINANCE MEASUREMENTS

Drawing Status:  
**PLANNING**

Hydrock Job No:		C-09194		
Drawn	Checked	Scale @ A1	Date	Issue Date
HJ	ES	1:400	SEPT 2018	25/04/19
Drawing Number:				Revision:
09194-HYD-XX-GF-DR-E-9008				P02



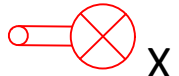
## *Appendix B: Predicted Light Spill Drawings*






- NOTES:
1. ALL DIMENSIONS ARE TO BE CHECKED ON SITE BEFORE THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
  2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS' AND SERVICE ENGINEERS' DRAWINGS AND SPECIFICATIONS. THIS DRAWING IS COPYRIGHT.

**Legend:**

 **x** Indicative column luminaire

 **lx** Maximum vertical illuminance recorded

P01	25/04/19	Additional Works	HJ	ES
Rev	Date	Description	By	Ckd

Architect :  
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Client :  
**BRISTOL AIRPORT**

Project Title:  
**BRISTOL AIRPORT  
12MPPA EXTENSION**

Drawing Title:  
**ELECTRICAL SERVICES  
INDICATIVE LIGHTING  
NORTH WEST  
LIGHT SPILL CALCULATIONS**

Drawing Status:  
**PRELIMINARY**

Hydrock Job No: **C-09194**

Drawn: <b>HJ</b>	Checked: <b>ES</b>	Scale @ A1: <b>1:1000</b>	Date: <b>APR 2019</b>	Issue Date: <b>25/04/19</b>
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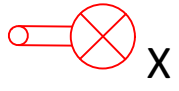
Drawing Number: <b>09194-HYD-XX-GF-DR-E-9013</b>	Revision: <b>P01</b>
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**Legend:**

 **x** Indicative column luminaire

 **lx** Maximum vertical illuminance recorded

P01	25/04/19	Additional Works	HJ	ES
Rev	Date	Description	By	Ckd

Architect :  
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Project Title:  
**BRISTOL AIRPORT  
12MPPA EXTENSION**

Drawing Title:  
**ELECTRICAL SERVICES  
INDICATIVE LIGHTING  
NORTH EAST  
LIGHT SPILL CALCULATIONS**

Drawing Status:  
**PRELIMINARY**

Hydrock Job No: **C-09194**

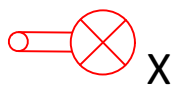
Drawn: <b>HJ</b>	Checked: <b>ES</b>	Scale @ A1: <b>1:1000</b>	Date: <b>APR 2019</b>	Issue Date: <b>25/04/19</b>
Drawing Number: <b>09194-HYD-XX-GF-DR-E-9014</b>				Revision: <b>P01</b>






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**Legend:**

 **X** Indicative column luminaire

 **lx** Maximum vertical illuminance recorded

P01	11/03/19	Preliminary	HJ	ES
Rev	Date	Description	By	Ckd

Architect :  
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Client :  
**BRISTOL AIRPORT**

Project Title:  
**BRISTOL AIRPORT  
12MPPA EXTENSION**

Drawing Title:  
**ELECTRICAL SERVICES  
INDICATIVE LIGHTING  
WOODLAND AT A38/DOWNSIDE ROAD  
LIGHT SPILL WITH MITIGATION METHODS**

Drawing Status:  
**PRELIMINARY**

Hydrock Job No: **C-09194**

Drawn: <b>HJ</b>	Checked: <b>ES</b>	Scale @ A1: <b>1:1000</b>	Date: <b>MAR 2019</b>	Issue Date: <b>11/03/19</b>
Drawing Number: <b>09194-HYD-XX-GF-DR-E-9014</b>				Revision: <b>P01</b>