Information to Inform Habitats Regulations Assessment

March 2025

Land at Carisbrook Road, Mitcheldean

Prepared by
CSA Environmental

On behalf of:
Gladman Developments Ltd

Report No: CSA/4057/17

CSA environmental

urban design | ecology | landscape | heritage

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1.0 INTRODUCTION

1.1 This document has been prepared by CSA Environmental on behalf of Gladman Developments Ltd, in relation to land off Carisbrook Road, Mitcheldean (hereafter referred to as 'the Site') where outline planning permission is sought for residential development. The Site location is shown in Appendix A.

1.2 This document provides information to assist Forest of Dean District Council (FoDDC) in their consideration of whether the proposed development will have likely significant effects on any European site. This process is commonly termed Habitats Regulations Assessment (HRA).

1.3 As the decision-making authority, FoDDC are the 'competent authority' in respect of Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended). This document is intended to provide the necessary information to FoDDC with which to make their assessment (pursuant to Regulation 63(2) of the above Regulations).

Project Description & Background

1.4 The Site occupies an area of c. 9.72ha and currently consists of a single agricultural field partially bounded by native hedgerows with small amounts of scrub, bracken and mature trees (see Habitats Plan in Appendix A). The Site is located around central grid reference SO 664 193, to the north of Mitcheldean. The wider landscape is dominated by residential and commercial use to the east, south and west, with extensive agricultural land to the north and steep, wooded valleys further west.

1.5 Outline planning consent is sought for residential development of the Site which will be comprise:

- Residential development of up to 180 new dwellings.
- New vehicular access point off Carisbrook Road
- New Public Open Space (POS) including play area, recreational walking routes and trim trails.
- Other associated infrastructure, landscaping and drainage features including one drainage basin in the south-east of the Site and a pumping station in the south-west
- Retention of all boundary hedgerows and trees
- Provision of new woodland, scrub and grassland planting at the peripheries of the Site to strengthen, extend, buffer and/or enhance existing habitat features. and for screening.

1.6 It should be noted that development at the Site was subject to a previous application for up to 125 dwellings in 2018 (FoD ref: P/1994/18/OUT). This was subsequently refused but bat survey information collected during 2018-2019, as well as the results of

consultation with Natural England in 2018 (see Appendix D), are referred to herein and help inform the assessment.

1.7 This report has been prepared with consideration of the following documents:

- Wye Valley and Forest of Dean Bat SAC – Development Management - Horseshoe Bat activity survey and assessment guidance (FoDDC, 2021)
- Habitats Regulations Assessment (Appropriate Assessment) Report for FoDC Allocations Plan Publication Version, March 2015
- Habitats Regulations Assessment (HRA) Screening & Appropriate Assessment (AA) Report. FoDDC Local Plan Review 2021-2041: Regulation 18 Draft. June 2024.
- Wye Valley & Forest of Dean Horseshoe Bat Action Plan 2018-19 and "A Strategy for the Conservation of Horseshoe Bats in the Wye Valley and Forest of Dean"

Summary of Applicable Legislation and Policy

1.8 Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), termed 'European sites'. For ease of reference and consistent with their treatment under UK government policy, Ramsar sites are also referred to here as European sites.

1.9 All European sites in England and Wales are afforded strict protection through the Conservation of Habitats and Species Regulations 2017 (as amended). These Regulations, widely referred to as the 'Habitat Regulations', establish a framework for decision-making authorities to assess the potential for harmful effects on European sites to arise as a result of proposed plans or projects. This assessment process is commonly referred to as 'Habitats Regulations Assessment' (HRA).

1.10 Within the Forest of Dean district, local policies relevant to the protection of European Sites are set out within Core Policy CSP.1 – Design and Environmental Protection. Further guidance for developers and ecologists is set out within the Wye Valley and Forest of Dean Bat SAC Development Management guidance published by FoDDC (2021).

1.11 Further detail of the legislative and case law context, as well as national and local planning policies relevant to HRA, are provided within Appendix B.

2.0 EXEMPTION, EXCLUSION AND ELIMINATION

2.1 It is necessary in the first instance to undertake preliminary screening to determine whether the proposed development is exempt, excluded or eliminated from the Regulation 63 requirements, and to refine which European site designations warrant further consideration. If the proposed development 'passes' any of the preliminary screening tests shown below in Table 1, then no further screening for likely significant effects is required.

Table 1. Preliminary Screening

Preliminary Screening Test	Pass?
Is the scheme directly connected with or necessary to the management of a European site for nature conservation purposes?	No
Is the proposed scheme the continuation, without material change, of ongoing activities not subject to any form of authorisation?	No
In light of the nature, scale, duration and location of the scheme, is it obvious that it could not have any conceivable effect on any European site?	No

2.2 In view of the final preliminary screening test in Table 1, the following European sites (and component SSSIs) could conceivably be affected by the proposed development. This is determined with regard to the professional opinion of the author, in view of the nature, scale, duration and location of the proposed development, as well as with regard to the results of consultation with Natural England in 2018. These designations will therefore be screened for likely significant effects in Section 3 of this document.

- Wye Valley and Forest of Dean Bat Sites SAC (480m west)
    - Wigpool Ironstone Mine SSSI (480m west)
    - Westbury Brook Ironstone Mine SSSI (2.1km south)
    - Blaisdon Hall SSSI (4km)

- Wye Valley Woodlands SAC (c. 8.9km west)

2.3 Consideration has been given to recent research and emerging policy with respect to other designated sites. This includes consideration of recreational pressure on the Severn Estuary SAC/SPA/Ramsar, which is currently most relevant to new residential and tourism developments around the Lydney area, with the Site at Mitcheldean well beyond the 6.2km zone of influence identified by Forest of Dean District Council (FoDDC, 2024). More recent research has indicated a larger c. 12km zone of influence may be required (Enfusion, 2024), though this is not currently adopted and further investigation into a recreational strategy for the estuary is underway (Afallen, 2024). It is further acknowledged that a buffer around the River Wye SAC is also being considered with respect to recreational pressure though nothing is in place currently (Enfusion, 2024).

2.4 Comprehensive details on the characteristics of the above European sites are presented in Appendix C. These characteristics form the basis of assessment and include their spatial relationship with the Site, component Sites of Special Scientific Interest (SSSIs), qualifying features, published conservation objectives and any known vulnerabilities or threats to their favourable conservation statuses.

3.0 SCREENING FOR LIKELY SIGNIFICANT EFFECTS

Potential Impact Pathways

3.1 In the context of the information on European site characteristics (Appendix C), potential impact pathways shared by the proposed development and the conservation objectives of the European sites identified in Section 2 of this report are screened below (Table 2).

3.2 Pathways are considered on the basis of the development *as proposed*, i.e. including any facets which, in addition/secondary to their primary purpose, may act to mitigate effects that might otherwise occur on European sites. However, in accordance with the 'People Over Wind' ruling of the Court of Justice for the European Union (CJEU; Case C-323/17), screening for likely significant effects takes place in the absence of measures specifically adopted to avoid or reduce harmful effects on European sites.

Table 2. Screening summary of Likely Significant Effects on the Wye Valley and Forest of Dean Bat Sites SAC – Impact Pathways

<table>
<tr><th rowspan="2">Impact Pathway</th><th colspan="2">Likely Significant Effect?</th></tr>
<tr><th>Wye Valley and Forest of Dean Bat Sites SAC</th><th>Wye Valley Woodlands SAC</th></tr>
<tr><td>Land take by development within European site</td><td rowspan="2">No
The Site does not require direct impacts to land within the SAC</td><td rowspan="2">No</td></tr>
<tr><td>Fragmentation of European site habitats</td></tr>
<tr><td>Increased mortality of key species</td><td>No</td><td>No</td></tr>
<tr><td>Disturbance to key species / deterioration of habitats</td><td>Yes
Increased artificial lighting within the Site may disturb foraging and commuting horseshoe bats using adjacent habitats (outside the SAC).

Disturbance to roost sites from new residents is considered unlikely, with the main pressure likely to come from caving groups or other recreation activities undertaken during the winter months.</td><td rowspan="2">Yes
The proposals are unlikely to result in direct disturbance or deterioration of habitats, though adverse impacts to the population or distribution of bats associated with the Wye Valley and Forest of Dean Bat Sites SAC may in turn impact on the integrity of populations within the Wye Valley Woodlands SAC</td></tr>
<tr><td>Damage or deterioration of supporting habitats, outside European site</td><td>Yes
The proposals will result in land use changes to habitats used by lesser and greater horseshoe bats i.e. removal of agricultural habitat, increased built development and increased light-spill. The mean foraging area around a hibernation site is 1.2km (Natural England, 2018b). Whilst the Site is unlikely to provide an important foraging resource it is identified as supporting</td></tr>
</table>

	flight paths likely associated with the SAC	
Atmospheric pollution/air quality	**No** A small area of the woodland within the Westbury Brook Ironstone Mine component SSSI falls within 200m of the A4136 to the south of the Site and could be affected by nitrification, however this is unlikely to significantly impact associated bat populations given its scale.	**No** The A466 is within 200m of some of the component sites for the SAC meaning that increased traffic on this road could impact habitats in the vicinity. However, the proposed development is over 15km from this area and no perceptible increase in traffic flow is considered likely.
Changes to soil chemistry	**No** As above	**No**
Hydrological regime change	**No** The Site is not hydrologically linked to the SACs	**No**
Pollution of surface/ground water		

Outcome of Screening

3.3 Based on review of the above impact pathways, conclusions on the potential for likely significant effects on European sites to arise from the proposed development, alone and in combination with other plans or projects, are made in the following tables.

Table 3: Outcome of Screening (proposed **development alone**)

Will there be <u>any effect</u> on a European site? (proposed development **alone**) *If no, proposed development is screened out*	**YES**
Will there be <u>likely significant effects</u> on the European site, or does uncertainty remain over the potential for significant effects? (proposed development **alone**) *If yes, proposed development is screened in* *If no, assess in combination with other plans or projects below*	**YES** The proposed development could impact flight paths used by horseshoe bats associated with the Wye Valley and Forest of Dean Bat Sites SAC (and indirectly the Wye Valley Woodlands SAC)

3.4 Therefore, in the absence of mitigation, the proposed development is considered to have potential to result in a likely significant effect on the Wye Valley and Forest of Dean Bat Sites SAC, and Wye Valley Woodlands SAC <u>alone</u>. Therefore the development does not need to be assessed in-combination with other plans or projects at this screening stage.

3.5 As such, further Appropriate Assessment would be required, including consideration of proposed measures intended to avoid or reduce harmful effects, in order that it may ascertained whether the scheme will have any adverse effect on the integrity of the above European sites.

4.0 APPROPRIATE ASSESSMENT

4.1 Due to the proximity of the Site to the Wye Valley and Forest of Dean Bat Sites SAC, there was considered to be potential for development proposals to adversely impact upon habitats used by lesser and greater horseshoe bats outside the SAC, or to disturb bats associated with the SAC. The Wye Valley Woodlands SAC was also screened in due to links with lesser horseshoe bat populations in the Forest of Dean.

Discussion of Bat Survey Results

4.2 A suite of bat survey work has been completed at the Site, full results of which are presented within Appendices F and G of the Ecological Impact Assessment report (CSA/4057/13).

4.3 This included monthly winter monitoring of bat activity at strategic positions around the Site between October 2018 and March 2019, with monthly surveys during the bat active period between April and September 2019. Updates to this work have commenced in 2024, with five walkover surveys and monthly static monitoring of bat activity between July and October 2024 and monthly static monitoring of winter activity between December 2024 and February 2025 completed to date. A full dataset will be obtained following further surveys scheduled for April to June 2025. This assessment is informed by extensive existing datasets available at the time of writing and will be updated following the completion of further survey work.

4.4 Activity by lesser and greater horseshoe bats has been recorded in all areas of the Site, though there is a strong association with the northern boundary hedgerow, and vegetation in the north-west of the Site.

Greater horseshoe bat

4.5 During winter 2018/2019, single greater horseshoe bats were recorded with a total of two contacts recorded overall at ML1, and three at ML2. They were not recorded at all at ML3 or ML4. This species was not recorded during winter monitoring surveys in 2024/. During survey work in the active season (July-October 2024) only 13, 8, 6 and 5 contacts were recorded at ML1-4, respectively. Slightly higher activity was recorded in 2024 overall compared to 2019, even considering the smaller data set. A total of 48 contacts were recorded at ML2 although average (median) activity is low with less than 0.1 contacts per hour per night, as this species was not recorded on all nights surveyed. The total number of contacts is influenced by suspected foraging behaviour detected during September 2024, particularly at ML4 where there were up to 11 contacts in a night, but typically none at other times.

4.6 The data indicates intermittent use of on-site hedgerows by greater horseshoe bat, particularly the northern boundary. Other areas are used sporadically and there is occasional foraging value, likely dependent on

the land-use which changes in accordance with the agricultural management regime.

Lesser horseshoe bat

4.7 During winter 2018/2019, lesser horseshoe bat activity was almost entirely focussed on the northern site boundary (ML2) with a total of 71 contacts recorded between November and March (median contacts/hour/night was 0, with a peak o 1.02). There was minimal activity recorded at ML1 and ML3, and no contacts recorded at ML4. During winter 2024/2025, lesser horseshoe bat was only recorded during December but they were detected at all monitoring locations, with greatest activity at ML2 where several contacts were recorded on most nights within a few hours of sunset.

4.8 During winter, recorded activity by horseshoe bats has been consistently higher at dusk than other times of night, further suggesting the Site (and the northern hedgerow in particular) forms part of a commuting route between roosting and foraging areas. This pattern was less apparent during non-winter months. A pre-dawn peak in commuting behaviour would not necessarily be expected as horseshoe bats often make use of alternative roost sites throughout the season and may also return to roost at any point during the night (Schofield, 2008). During winter, the earliest passes were of a lesser horseshoe bat 23 minutes after sunset and most activity was recorded approximately half an hour to one hour after sunset which might relate to bats hibernating within the SAC. The earliest recording of a lesser horseshoe bat during non-winter was made c.12 minutes after sunset in June, suggesting the presence of a nearby roost although this was only recorded on one occasion.

4.9 During the active season 2019, lesser horseshoe bat activity was focussed at ML1 and ML2 with a small number of contacts elsewhere. It was notable that early activity was recorded just 12 minutes after sunset, indicating a roost location very close to the Site, though no strong commuting routes were observed/inferred.

4.10 In summer 2024, commuting behaviour was observed for a small number of bats (suspected 3) seen flying west to east along the northern Site boundary. It is not known exactly where these bats entered/exited the Site. Foraging behaviour was also observed at ML1, and this formed the most significant area of activity during a period of high foraging activity (for all species) in September 2024. As the 2024 dataset is incomplete, direct comparisons between this data and the 2019 data cannot be made, however it is notable that patterns of activity have been repeated (activity focussed at ML1/ML2) and average (median) activity for the two years is very similar (less than 1 contact/hour/night in all cases). Average activity during 2024 was lower than recorded in 2019, although the total number of contacts is much higher as a result of the short-term foraging events recorded in September 2024.

Discussion

4.11 It is considered that horseshoe bats recorded on-site are likely to be associated with the Wye Valley and Forest of Dean Bat Sites SAC (particularly during winter) given the proximity of the Wigpool hibernation roost, possible habitat connections and pattern of activity observed.

4.12 Although small amounts of activity have been recorded on all boundaries, the northern hedgerows, and north-west corner are determined to be the most significant feature on-site for commuting bats. Some foraging behaviour has also been recorded but this appears to be opportunistic, rather than the Site offering a key foraging resource. A more significant but short-term foraging event recorded in September 2024 is of note, though the exact cause of this is unknown. Overall activity is low (average 0 contacts/hour/night for greater horseshoe bat, and 0 - 0.8 contacts/hour/night for lesser horseshoe bat).

4.13 With view of the surrounding landscape and likely habitat connections for horseshoe bats, it is considered most likely that horseshoe bats travel towards the Site from the west, likely crossing over Ross Road/B4224 near the north-west corner of the Site. It should be noted that this area is lit off-site by streetlights but that there are overhanging tree canopies which may offer a sheltered route for horseshoe bats. Targeted effort has been made to see if bats instead arrive on-site using hedgerow connections from the north (rather than the west), and although only a partial dataset is available for review and the possibility can't be discounted, the evidence does not currently suggest this. With consideration of low horseshoe bat activity recorded at ML3, and the urban habitats located to south-east of the Site, it is suspected that bat commuting across the Site make their way north and/or east towards wider foraging areas.

Baseline Lighting Survey

4.14 A baseline lighting survey of the Site was completed by Illume Design in June 2019 to inform the ecological assessment of the Site. Full methods and results are provided in Appendix E. An updated survey has not been completed though observations on-site during 2024 bat survey work indicate there are no significant changes since (i.e. changes to streetlamp arrangements or surrounding land use).

4.15 Whilst the Site itself is currently unlit, there is light spill from streetlamps along the western, southern and parts of the eastern boundaries, as well as from industrial buildings south-east of the Site. The boundary hedgerows vary in height and density, affecting the amount of light spill on to the Site, and ground levels also vary greatly, with on-site hedgerows becoming higher than the streetlamps along northern parts of Ross Road.

4.16 Greatest illuminance was recorded on-site at the southern tip of the Site and along the south-eastern boundary where there is light spill from the adjacent street lighting, and very limited screening vegetation. Vertical illuminance (recorded at c.1.5m to account for conditions likely observed by bats in flight) was greatest at the southern tip, with 1.72lux recorded when facing east. Lux levels were recorded at 0 along much of the eastern and northern Site boundaries, as well as the northern tip of the western boundary. As would be expected, light levels were much higher on the offsite side of the hedgerows, closest to the streetlamps.

4.17 It should be noted that not all of the luminaires within the factory were operational during the survey, and that roadside lighting was dimmed for set periods of the night: lights along Carisbrook Road and Ross Road (south and west of the Site) are scheduled to dim by 30% at midnight until 5:30am, with streetlamps along Bradley Court Road (east of the Site) dimming by 50% from 10pm. As the survey needed to be undertaken after 11pm when natural ambient light was at its lowest, the lux levels presented will represent the dimmed settings and could be as much as 70% higher earlier in the evening. This system of dimming was in place in 2019, and it is anticipated to be unchanged at the current time.

4.18 The pattern of bat activity at the Site is largely in keeping with the lighting survey results, with most bats recorded in the northern half of the Site where there is least artificial light-spill. However, horseshoe bats were recorded at MP4 in the southern tip of the Site at times with multiple bat passes registered before the time at which the streetlamps would have dimmed. This suggests that the lighting is not likely to completely deter bats from this area although overall, horseshoe bat activity in this location was lower than in darker parts of the Site and it is expected that this would likely be the case in the future too (i.e. post-development). It is possible that the mature willow trees at ML4 provide screening and/or cover from predators for horseshoe bats in this location, reducing the potential impact of lighting on their behaviour.

Likely Significant Effects

4.19 Likely significant effects in relation to the deterioration of habitats (outside the SAC) and the disturbance of bats (outside the SAC) were screened in for further consideration.

4.20 Whilst the Wye Valley and Forest of Dean Bat Sites SAC is important for both breeding and hibernating populations of horseshoe bats, the closest component SSSI is a hibernation site (Wigpool Ironstone Mine c. 510m west of the Site) with a second hibernation site (Westbury Brook Ironstone Mine) c. 2.1km to the south. Natural England have also highlighted a significant but non-designated maternity roost of 300 lesser horseshoe bats within Longhope, c. 2km east of the Site which should be included within this (Natural England, 2018b).

4.21 Bat activity surveys undertaken at the Site between October 2018 and September 2019, July to October 2024 and December 2024 to February 2025 confirmed the presence of lesser and greater horseshoe bats on-site, including in winter. Very few passes by greater horseshoe bats were recorded, and lesser horseshoe bat activity was low on average. The majority of the Site is intensive agricultural land, with a rotation of crops and grass ley (cut with short-term aftermath grazing in 2014), which will vary the opportunities available for bats. Predominantly, agricultural land is considered to be of low value for these species, and lesser horseshoe bats (the main horseshoe bat species recorded) are most likely to favour woodland, hedgerows and cluttered vegetation in the surrounding area, particularly in the vicinity of hibernation sites. September foraging activity detected cross the Site was possibly related to a mass prey emergence, possibly associated with the Site's use as grassland at the time. It is unknown how regularly this opportunity may arise for bats on-site, and whether it occurs during other rotational uses (e.g. cereal crops). Greater horseshoe bats are known to favour grazed grassland for foraging, but the lack of activity recorded on-site (by static detectors, and during walkover surveys which covered both boundary and open field habitats) suggests that habitats at the Site do not provide a significant resource for this species.

4.22 As a result, the Site is considered to form part of a commuting route for lesser horseshoe bats, with some foraging value associated with the hedgerows and trees. Greater horseshoe bat activity is not considered to be significant.

4.23 The Core Sustenance Zone (CSZ) for hibernating bats is considered by Natural England to be c. 1.5km-2km, with the CSZ for breeding greater and lesser horseshoe bats given as 4km and 3km from the roost, respectively (Natural England, 2018b). As the Site is located within these zones, it is reasonable to assume that bats recorded on-site are associated with the SAC. Links to the Longhope breeding roost are less likely with consideration of the distance, intervening habitats and pattern of activity recorded on-site, however this cannot be discounted.

4.24 In the absence of avoidance and mitigation measures, residential development at the Site could result in the loss, fragmentation or deterioration of key flight lines, requiring individual bats to make use of longer or less suitable routes to access foraging areas. As horseshoe bat species are particularly sensitive to breaks in their flightpaths, including barriers created by excess light spill (ILP, 2023), preferred foraging areas may become inaccessible. Where significant, this could result in reduced foraging success and lowered survival for hibernating bats within Wigpool Ironstone Mine, thereby undermining the conservation objectives of the SAC. As mentioned above, significant impacts to bats within the Wye Valley and Forest of Dean Bats SAC could have indirect knock-on effects to the integrity of the Wye Valley Woodlands SAC.

Mitigation Measures

Retention and enhancement of key bat habitat

4.25 The proposed development will retain all on-site hedgerows and trees, although there will be a small loss of bramble and bracken to facilitate the main access road. The creation of this access point may create a minor disruption for horseshoe bats, were they to move around the southern end of the Site, although the survey data suggests this is not a regular/key flightpath.

4.26 To respect key horseshoe bat flight lines and foraging areas, a 30m buffer has been included between the built development and the northern boundary hedgerow. This will be strengthened with extensive native woodland planting (to include broadleaved tree and shrub species appropriate to the local landscape), grading to scrub, wildflower grassland and open space with scattered tree planting.

4.27 Along the western Site boundary, there is a c. 25m buffer from built development. The existing hedgerow will be extended southwards with new species-rich native planting, and thicket will be used in front of the offsite trees to improve habitat structure, screening and diversity in this area, of benefit to foraging and commuting horseshoe bats.

4.28 In addition, thicket and woodland planting will be provided within the eastern and southern landscape buffers, to strengthen existing boundaries and provide additional screening, and habitat structure and diversity. Wildflower and short grassland, along with scattered trees will also be included providing additional shelter, canopy cover and foraging opportunities. The attenuation basin in the southern corner of the Site will be periodically wet, and a detailed landscaping scheme would be prepared at the reserved matters stage to confirm the nature of native aquatic and shrub planting suited to these conditions.

4.29 As all key bat habitats at the Site are being retained alongside the proposed development, the habitat creation measures proposed are expected to provide enhanced opportunities for commuting and foraging bats compared to current conditions.

4.30 The success of these measures in mitigating and enhancing opportunities for horseshoe bats, will be dependent on securing a suitable species-mix for new planting, implementing it to a high standard and providing sufficient after-care and long-term management. Detailed management prescriptions for new and retained planting would be detailed within a Landscape and Ecology Management Plan (LEMP), and detailed landscaping strategy which could be secured by a planning condition.

Sensitive Lighting Strategy

4.31 A lighting strategy has been prepared by DFL-UK, to illustrate the lighting associated with the proposed development. This has been prepared in

liaison with CSA to understand the sensitive ecological receptors at the Site and assess potential impacts. The northern hedgerow and vegetation in the north-west and north-east were specifically included in the lighting model to gather lighting data for these areas. Horizontal light spill was modelled at 1.5m height to simulate the typical flight path of horseshoe bats.

4.32 As detailed within the lighting strategy, the proposed development will include lighting within adoptable roadways and property frontages/rears. The following principals/specifications will be adhered to in order to reduce impacts to bats and their habitats, in line with current guidance from the Bat Conservation Trust and the Institute of Lighting Professionals (ILP, 2023):

- Lighting will be restricted to adoptable roads only, with private roads left unlit. The lowest possible lighting levels are proposed within the strategy.
- Luminaires will distribute lighting downwards only. Luminaires will have no upward tilt and no backwards light spill.
- Pathways will be unlit (though reflective bollards may be used where there is a safety risk for cyclists e.g. change in direction/ground level)
- Lighting proposed for private dwellings will be downward-facing only and activated by motion sensor.
- Lighting products will utilise LED light sources with a warm white colour temperature of <3000K to reduce the blue light component which can disrupt bats and their prey. Roadside street lighting products are standard 3000K but consultation is proposed to reduce this to 2700K. Lighting products for private properties would be special order to ensure a temperature of <2700K.
- Buffer zones around key bat flightlines further reduce the levels of light-spill onto key habitats. The lighting model does not account for proposed vegetation e.g. woodland, and so presents a worse-case scenario. The proposed planting will provide additional screening for bats once established.
- The development design predominantly keeps adoptable roads within the interior of the Site, thus concentrating light spill from street lighting away from sensitive areas.
- It is likely that any street lighting within the development adopted by the Forest of Dean District Council would follow the same regime as that within the adjacent residential areas, and dim by 30% at midnight. To ensure the worst-case scenario is modelled, the highest potential light levels have been presented in the light spill diagram.

4.33 As a result of the above measures, modelled light levels are below 0.2lux on the horizontal plane and below 0.4lux (0-0.01 lux) on the vertical plane within all sensitive ecological receptors, and indeed on all boundary vegetation. This level of light is extremely low and suitable for

habitat features used by horseshoe bats (ILP, 2023). The illuminance diagrams prepared by DFL included in Appendix E.

4.34 It should be noted that although the modelled lux levels onto bat habitats are negligible, this does not account for existing light from the surrounding environment. Existing light spill onto southern areas of the Site was found to be high in places (e.g. over 1lux near ML4) but horseshoe bat activity was still recorded in these areas, albeit at low levels. The proposed planting scheme is expected to help reduce light-spill into the Site from external areas by extending and strengthening boundary vegetation, planting up areas which are currently unvegetated and increase the amount of tall tree/woodland habitat to screen offsite light sources.

4.35 Whilst it will take time for new planting to grow and establish, as the modelled lux levels are a worst-case scenario and do not considering screening or shading effects, it can be determined that light-spill from the proposed development will be sufficiently low from the outset, to avoid disturbance to horseshoe bats and their habitats.

4.36 An updated lighting strategy would need to be prepared as part of a reserved matters application, to fully assess the detailed scheme.

Effects on Integrity

4.37 With consideration of the average low level of bat activity recorded at the Site, the retention of key habitats and the measures proposed to avoid and reduce development effects, it is considered that the development as proposed would have no adverse effect on the integrity of any European site, either alone or in combination with other plans or projects.

5.0 SUMMARY AND CONCLUSION

5.1 Due to the proximity of the proposed development site at Mitcheldean to the Wye Valley and Forest of Dean Bat Sites SAC, extensive bat surveys have been undertaken to understand the use of on-site habitats by horseshoe bats which may be associated with the SAC.

5.2 Likely significant effects from habitat loss or deterioration (outside the SAC) and disturbance of bats (outside the SAC) were screened in for further consideration. These effects were considered most likely to impact the Wye Valley and Forest of Dean Bat Sites SAC, although the Wye Valley Woodlands SAC was also screened in for further assessment as the two sites and their associated populations of lesser horseshoe bats are functionally linked.

5.3 Bat survey work found the Site hedgerows to be used regularly by lesser horseshoe bats with little activity by greater horseshoe bats recorded. Activity was greatest along features in the north of the Site and it is suspected that these form part of a local network for commuting bats. Baseline lighting surveys showed the southern end of the Site to be most affected by artificial light spill, and conditions experienced by bats using the Site during the hibernation period are likely to be exacerbated as a result of reduced foliage on screening vegetation and higher streetlamp intensity in some areas (due to the timing of dimming settings).

5.4 The development footprint has been offset from the key northern hedgerows. Additional hedgerow buffers and supplementary planting have been proposed to avoid impacts and enhance opportunities for commuting and foraging bats. It is proposed that a detailed landscaping scheme, management plan and lighting strategy would be agreed as part of a future planning application to FoDDC.

5.5 With consideration of the proposed measures intended to avoid or reduce effects, it is anticipated that FoDDCs own Appropriate Assessment would ascertain that the development as proposed would not have any adverse effect on the integrity of any European site, either alone or in combination with other plans or projects, as set out here-in.

6.0 REFERENCES AND RESOURCES

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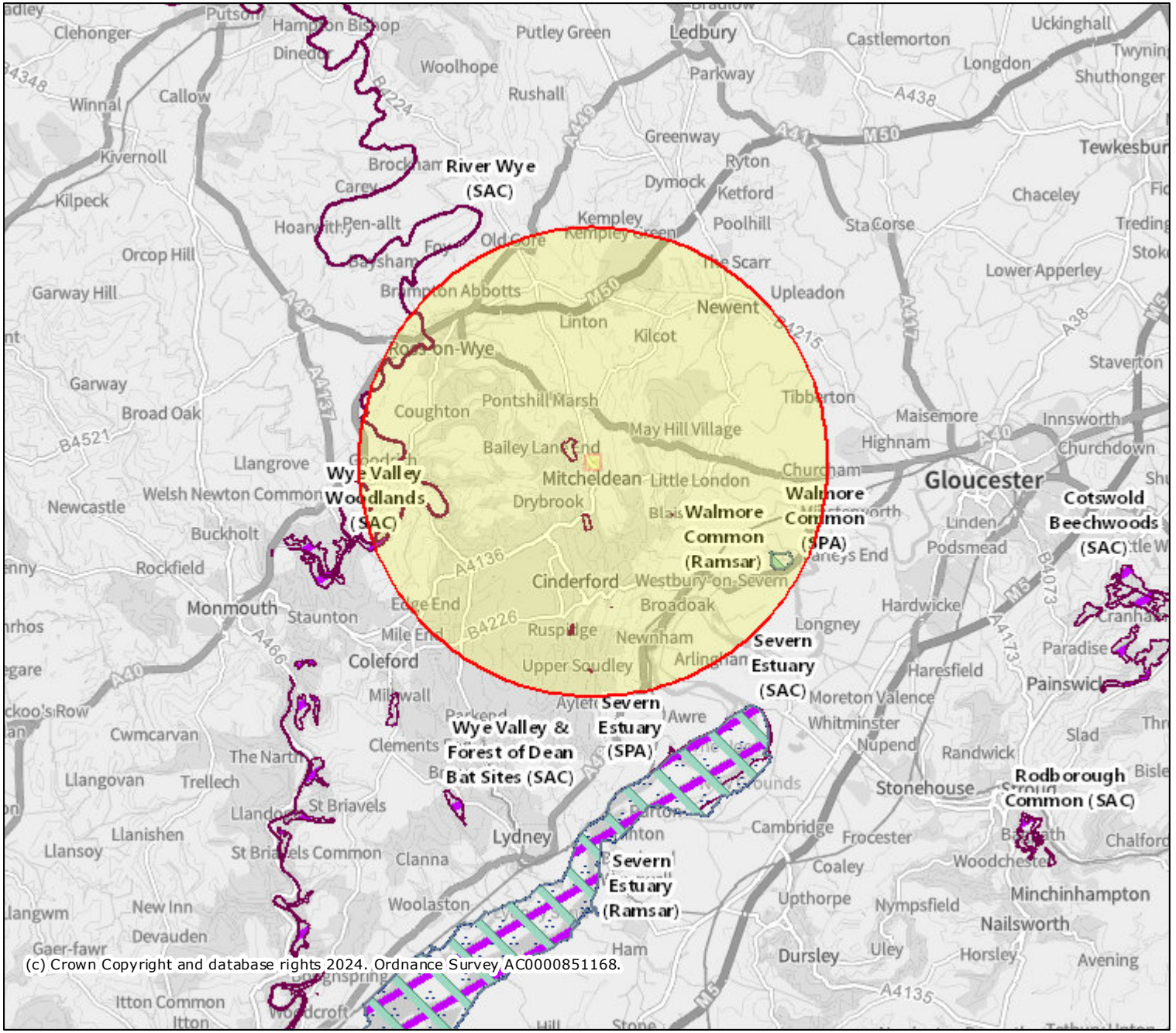
Appendix A

Site Location

Site Check - 10km International Sites



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Legend

- Ramsar Sites (England)
- Proposed Ramsar Sites (England)
- Special Areas of Conservation (England)
- Possible Special Areas of Conservation (England)
- Special Protection Areas (England)
- Potential Special Protection Areas (England)

Projection = OSGB36
xmin = 302700
ymin = 185600
xmax = 429700
ymax = 248200

0 5 10
km

Map produced by MAGIC on 25 June, 2024.

Appendix B

Legislation and Planning Context

European Sites

1.2. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), termed 'European sites', collectively form part of a suite of sites known in the UK as the national site network, and are afforded strict protection from the potentially damaging effects of human activities. For ease of reference here, and consistent with their treatment under UK government policy, sites designated by the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971), or 'Ramsar sites', are also referred to here as European sites.

1.3. All European sites in England and Wales are afforded protection through the Conservation of Habitats and Species Regulations 2017 (as amended). These Regulations are widely referred to as the 'Habitat Regulations'. Regulation 63 of these Regulations states that, "A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which (a) is likely to have a significant effect on a European site…(either alone or in combination with other plans or projects), and (b) is not directly connected with or necessary to the management of that site, must make an appropriate assessment of the implications of the plan or project for that site in view of that site's conservation objectives." This assessment process is commonly referred to as 'Habitats Regulations Assessment' (HRA).

1.4. The above Regulations formerly transposed Article 6(3) of Council Directive 92/43/EEC on the 'Conservation of Natural Habitats and of Wild Fauna and Flora', commonly referred to as the 'Habitats Directive'. This Directive is the means by which the European Union meets its obligations under the Bern Convention (1992) on the Conservation of European Wildlife and Natural Habitats. Following the UK's departure from the European Union, the provisions of the Regulations have been retained through enactment of the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, which came into force on 31 December 2020.

Notable Case Law

1.5. Many procedural facets of HRA have been established through case law. In light of Section 6(3) EU (Withdrawal) Act 2018 (as amended), UK courts will continue to be bound by HRA judgments handed down by the Court of Justice for the European Union CJEU prior to 31 December 2020 when interpreting the Conservation of Habitats and Species Regulations 2017 (as amended). A non-exhaustive summary of some of some key judgements is provided below:

In Relation to HRA Screening

Waddenzee (ECJ Case C-127/02; 07.09.04.)

1.6. This case considered when Appropriate Assessment might be triggered and concluded that it is required where there is a, "*probability or risk*," of significant effects, and that, "*such a risk exists if it cannot be excluded on the basis of objective information that the plan or project will not have significant effects on the site concerned*." The ruling clarifies that, "*in case of doubt as to the absence of significant effects such an assessment must be carried out*."

1.7. The ruling further states that, "*in assessing the potential effects of a plan or project, their significance must be established in the light, inter alia, of the characteristics and species environmental conditions of the site concerned by that plan or project*." As such, when assessing potential effects the current condition of the features for designation of a European site must be considered. Such information may be provided within, amongst other sources, published Condition Assessments of component Sites of Special Scientific Interest (SSSI's) and Site Improvement Plans (SIPs).

Boggis v Natural England (EWCA Civ 1061; 20.10.09.)

1.8. This case built upon guidance for the correct interpretation of what constitutes a 'likely' significant effect from that provided in Waddenzee. It was ruled that, "*Notwithstanding the word 'likely'...the precondition before there can be a requirement to carry out an appropriate assessment is not that significant effects are probable, a risk is sufficient...*" however this must be, "*real, rather than a hypothetical, risk…*"

People over Wind (CJEU Case C-323/17, 12.04.2018)

1.9. The recent 'People Over Wind' ruling determined whether mitigation measures may be considered when determining if a an effect is 'likely' and therefore whether it should be 'screened-in' for further assessment within the HRA process (i.e. be subject to Appropriate Assessment). Previously it has been established (R (Hart DC) v SSCLG; known as the 'Dilly Lane' decision) that any measures introduced to avoid or mitigate effects on a European sites could be considered in the initial screening stage. However, in the People Over Wind case the CJEU ruled that that such measures not be considered during HRA screening.

1.10. Paragraph 40: "*…in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site*."

In Relation to Appropriate Assessment

Waddenzee (ECJ Case C-127/02; 07.09.04)

1.11. Paragraph 59 of the ruling provides guidance on confidence thresholds in Appropriate Assessment, stating that, "*An appropriate assessment of the implications for the site concerned of the plan or project implies that prior to its approval, all the aspects of the plan or project which can…affect the site's conservation objectives must be identified in the light of the best scientific knowledge in the field. The competent national authorities, taking account of the conclusions of the appropriate assessment of the implications of [a project] for the site concerned, in light of the site's conservation objectives, are to authorise such activity only if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects*."

National Policy

1.12. The term 'European site' used in reference to SACs and SPAs is derived from the above Regulations. The National Planning Policy Framework (NPPF) (Department for Levelling up, Housing and Communities, 2023) establishes that sites designated by the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971), or 'Ramsar sites', as well as 'potential SPAs' and 'possible SACs', should be given the same protection as European sites.

1.13. At paragraph 182, the Framework establishes that the presumption in favour of sustainable development (also known as the 'tilted balance' in planning) does not apply where the plan or project is likely to have a significant effect on a European site, unless an appropriate assessment has concluded that the plan or project will not adversely affect the integrity of the European site.

Local Policy

1.14. Adopted development management policies relevant to HRA in the Forest of Dean are summarised in Table 1 below.

Table 1: Summary of Local Planning Policy

Policy	Summary
Forest of Dean District Council, Core Strategy Adopted Version (2012)	
Policy CSP.1 – Design and environmental protection	Design, environmental protection and enhancement (strategic objective: providing quality environments) The design and construction of new development must take into account important characteristics of the environment and conserve, preserve or otherwise respect them in a manner that maintains or enhances their contribution to the environment, including their wider context. New development should demonstrate an efficient use of resources. It should respect

Policy	Summary
	wider natural corridors and other natural areas, providing green infrastructure where necessary. In achieving the above, the following will be considered: • The effect of the proposal on the landscape including AONBs and any mitigation/ enhancement that is necessary or desirable • The impact on any protected sites (natural and historic sites and heritage assets and potential for avoiding and/ or mitigating any impacts, or providing enhancement, should the development be acceptable • The requirements of the management plans of the AONBs • Whether the existing infrastructure is adequate- additional provision will be required where it is not. • Whether the development is at risk from flooding, whether it can be permitted taking into account any risks, and the sequential approach and any mitigation that may be necessary to ensure the development is safe and flood risk is not increased elsewhere • The impact of the development on any land contamination or risk to the development from ground instability including the mining legacy- Proposals must undertake appropriate remediation measures and verification works where contamination and /or stability issues are identified • The potential for the development to cause pollution and any mitigation measures to avoid pollution or make environmental improvements where existing problems occur • The provision of water supply and the development's impact on groundwater, watercourses and any protected abstractions • Any potential impact on the sterilisation of mineral resources and consideration of the potential for the prior extraction of those mineral resources ahead of development • Proposals for waste minimisation and management Development that is not able to be satisfactorily accommodated in respect of the above will not be permitted
Policy CSP.2 – Climate Change	Proposals for development will be required to demonstrate that their design and layout will reduce the impacts of climatic change as identified in national, regional and local predictions over the lifetime of the development concerned. The following should be addressed in an integrated way, demonstrating that one element benefits another: Managing surface run off- Sustainable Drainage Systems (SUDS) and measures to reduce or avoid water contamination and safeguard ground water supply should be incorporated into all development unless it can be demonstrated that this is not appropriate in a specific location 3 Biodiversity 1. Developments must support green infrastructure corridors that link to existing habitat features and networks. They must show that the integrity of any affected nature conservation sites is not compromised by the development proposed.

Policy	Summary
	Proposals that prevent or restrict network connections will not be supported. Developments will be required to make long lasting biodiversity enhancements which could include the creation of new habitats where these would be appropriate. They should support existing features (trees, ponds, hedgerows etc), provide and manage public open space and should also provide additional features for a wide variety of species and habitats in appropriate locations throughout the development. Additional features provided should be consistent with the characteristics of the surrounding area.
Mitcheldean Neighbourhood Development Plan–Post 3rd Public Consultation Version April 2018	
Draft Policy E4 Biodiversity	Wherever practical and feasible, development proposals should include measures to enhance biodiversity as part of landscaping and building design. Proposals should include enhancements such as sustainable drainage systems, re-naturalising watercourses, woodland planting, roosting opportunities for bats, the installation of bird nest boxes and the use of native species in the landscape planting. In order to preserve and enhance biodiversity within the parish with particular regard to the rarer and notable species (Horseshoe bats, dormice…) and to ensure habitats, wildlife corridors and commuting/foraging/core sustenance zones are protected and enhanced, the following policies apply:- 1 The NDP seeks to protect ancient hedgerows and to preserve and enhance wildlife corridors with the addition of native planting. 2 The NDP supports the retention of agricultural farmland within the in the environmentally sensitive zones/protection zones and the protection of priority habitats. 3 Dark skies are to be preserved in the Protection Zones and advice should be taken in relation to lighting. Lighting must be bat sensitive and ecologically approved. 4 Applications for new developments of multiple dwellings should follow the principles and ideally be certified by "Building with Nature" (ref: Glos Wildlife Trust). 5. The reintroduction and preservation of Traditional Orchards would be supported where appropriate. 6. New development, of any kind, (with the exception of appropriately designed extensions on existing dwellings) is not supported in the Protection Zones, unless there is an evidenced based long term agricultural need and there is no impact on wildlife or priority habitats.

Appendix C

European Site Characteristics

Site Characteristics	Wye Valley and Forest of Dean Bat Sites SAC	Wye Valley Woodlands SAC
Distance and direction from the proposed development Site	c. 510m west	c. 8.9km west
Size	142.70ha	913.32ha
Grid reference	SO521107 (multiple sites)	ST530957 (multiple sites)

Component SSSIs	England
	• Blaisdon Hall SSSI
	• Buckshraft Mine and Bradley Hill Railway Tunnel SSSI
	• Caerwood and Ashberry Goose House SSSI
	• Dean Hall Coach House and Cellar SSSI
	• Devil's Chapel Scowles SSSI
	• Old Bow and Old Ham Mines SSSI
	• Sylvan House Barn SSSI
	• Westbury Brook Ironstone Mine SSSI
	• Wigpool Ironstone Mine SSSI
	
	Wales
	• Llangovan Church SSSI
	• Mwyngloddfa Mynydd-Bach SSSI
	• Newton Court Stable Block SSSI,
	• Wye Valley Lesser Horseshoe Bat Sites SSSI (comprising four separate sites:
	  • Itton Court Stud
	  • Penallt Old Church
	  • Priory Llandogo
	  • Tregeiriog Farm
		England
		• Astridge Wood SSSI
		• Bigsweir Woods SSSI
		• Highbury Wood SSSI
		• Lower Wye Gorge SSSI
		• Shorn Cliff and Caswell Woods SSSI
		• Swanpool Wood and Furnace Grove SSSI
		• The Hudnalls SSSI
		• Upper Wye Gorge SSSI
		
		Wales
		• Blackcliff-Wyndcliff
		• Cleddon Shoots Woodland
		• Fiddler's Elbow
		• Graig Wood
		• Harper Grove – Lord's Grove
		• Livox Wood
		• Lower Hael Wood
		• Pierce, Alcove and Piercefield Woods
		
		Cross Border
		Upper Wye Gorge

Relationship with other international designated sites	The sites that make up this SAC lie very close to and functionally overlap with the Wye Valley Woodlands SAC.	Adjacent and sometimes overlaps the River Wye SAC. Functionally overlaps with the Wye Valley and Forest of Dean Bats Site SAC.
Qualifying features (Directive 92/43/EEC Annex I habitats / Annex II species)	• **Greater horseshoe bat *Rhinolophus ferrumequinum***: supports the greatest concentration of this species in the UK (c. 6% of the national population at the time of designation), and contains the main maternity roost for bats in this areas as well as hibernation sites within the many disused mines. • **Lesser horseshoe bat *Rhinolophus hipposideros*:** supports c. 26% of the national population at the	• **Asperulo-Fagetum beech forests** (beech forests on neutral to rich soils) • **Tilio-Acerion forests of slopes, screes and ravines** (*priority feature) (Mixed woodland on base-rich soils associated with rocky slopes) • **Taxus baccata woods of the British Isles** (*priority feature) (yew-dominated woodland)

	time of designation. An exceptional breeding population (the majority of sites are maternity roosts), as well as hibernating bats within the disused mines.	• **Lesser horseshoe bat *Rhinolophus hipposideros*** (significant numbers hibernate within caves in the site)
Published Conservation Objectives	"Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of the habitats of qualifying species • The structure and function of the habitats of qualifying species • The supporting processes on which the habitats of qualifying species rely • The populations of qualifying species, and • The distribution of qualifying species within the site." Draft supplementary advice on conserving and restoring site features is also published (Natural England, 2018). Detailed conservation objectives and performance indicators for the Welsh sites are published within the Wye Valley and Forest of Dean Bat SAC Core Management Plan (Countryside Council for Wales, 2008)	"Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site. " Draft supplementary advice on conserving and restoring site features is also published (Natural England, 2018). Detailed conservation objectives and performance indicators for the Welsh sites are published within the Wye Valley Woodlands Core Management Plan (CCW, 2008).
Known vulnerabilities	With reference to the JNCC Standard Data Form and Site Improvement Plan, the following threats are identified: • Physical modification of roost sites • Human induced changes in hydraulic conditions • Public access / disturbance of roost sites (i.e. from outdoor recreation/sports) • Loss of connectivity with supporting habitats outside the SAC	With reference to the JNCC Standard Data Form and Site Improvement Plan, the following threats are identified: • Problematic invasive and native species (i.e. deer) and disease • Woodland management practices • Habitat connectivity • Species decline • Air pollution (nitrogen deposition) Public access/disturbance

Appendix D

Natural England DAS Response (December 2018)

DAS PRE APP - Scope of survey information required to inform development proposals in proximity to the Wye Valley and Forest of Dean Bats SAC - Carisbrooke Road, Mitcheldean, Forest of Dean, GL17 0SA

DAS case: 13869

The site in question is located edge of Mitcheldean. The development is arable field, lined with hedgerows.

Preliminary Ecological Appraisal

As a minimum, a Preliminary Ecological Appraisal should be completed, providing baseline information for the site in question. Natural England would need to have information to highlight if or how bats are using the site and providing basic ecological information about the site.

Core Sustenance zones

The Forest of Dean and surrounding landscape is of international importance for its horseshoe bats; it supports UK breeding populations of Lesser Horseshoe bats (LHB) and Greater Horseshoe bats (GHB). As a consequence, a suite of the largest maternity and hibernation roosts are designated with SSSI status and are collectively a Special Area of Conservation (SAC) under the EU Habitats Directive.

There are also a significant number of horseshoe bat roosts in the area which are not designated but which exceed the criteria for SSSI selection.

The following gives an idea of core sustenance zones for lesser and greater horseshoe bats and the immediate radius of land that is key for bats.

Lesser horseshoe bats – 3km

Greater horseshoe bats – 4km

Hibernating bats – 1.5 – 2km

Designated sites

The following designated sites should be screened as part of the HRA process.

Designated sites; (all part of Wye Valley and Forest of Dean Bat Site SAC)

- Wigpool Ironstone Mine SSSI – 0.6km
- Westbury Brook Ironstone Mine SSSI – 2.2km
- Blaisdon Hall SSSI – 4km – just outside core sustenance zone

Longhope maternity roost is located about 2km from development site. Although this is not designated as part of the Wye Valley and Forest of Dean SAC, it is a known LHB roost

of 300 bats and integral to the SAC. It is advisable to take this into consideration when considering mitigation.

People over Wind ruling

You should also be aware that as of April 2018 a new HRA ruling was made;

Notwithstanding the above, your authority should be aware of a Ruling made recently by the Court of Justice of the European Union (the CJEU) on the interpretation of the Habitats Directive in the case of People Over Wind and Sweetman vs Coillte Teoranta. Read the case (ref: C-323/17).

The case relates to the treatment of mitigation measures at the screening stage of a HRA when deciding whether an appropriate assessment of a plan/project is required. Competent authorities currently making HRAs should be mindful of this case and should seek their own legal advice on any implications of this recent ruling for their decisions.

Bat Survey

If potential impacts are likely, a licensed bat ecologist, will need to undertake bat surveys, reflecting the sensitivity of the site, and the nature and scale of the proposals. The activity surveys should also establish the presence of bats. A preliminary visit should be undertaken and desk study to assess the risk and the need for further survey works.

It is Natural England's advice that any avoidance measures should be based on activity surveys, taken throughout the year, including the winter months. Surveys should be carried out in accordance with the BCT Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition).

The bat survey to accompany application should provide a bit more detail. The following information shows what could be included as part of the survey.

- Desk study
- Field survey/walked transect
- Use of bat detectors
- Radio tracking
- Any boundary features affected?
- Heat maps to show bat distribution and hotspots
- LHB and GHB distribution recorded during walked transects

You could think about extending surveys to any connecting hedgerows/linear features which bats may be using.

Consider any foraging sites throughout the immediate landscape that may be outside of the proposal site.

Other issues for consideration

- What level of housing is being proposed?
- Is there a new access road being built? If so, where?
- Any hedgerow removal? If so, is there the potential for hedgerow transect?
- Any information provided on flight line? Further information on how bats are using the site
- Any bat roosts on site?
- Any trees to be removed/any trees with bat potential?
- What mitigation is being proposed?
- Mitigation should consider lighting/foraging/commuting routes/flight lines/vegetation/hedgerow removal
- Consider how to mitigate against adverse effects on integrity

This concludes Natural England's discretionary advice service for this proposal

Appendix E

Baseline Lighting Survey (Illume, 2019)

Mitcheldean

Lighting Impact Assessment – Lighting Baseline

DATE: 28.06.19

PROJECT No. 4086

PREPARED FOR:

CSA Environmental

Mitcheldean

Lighting Impact Assessment – Lighting Baseline

PROJECT: 4086

CURRENT REVISION: 0.2

DATE OF ISSUE: 28.06.19

PREPARED BY: Bonnie Brooks MSc CEng MSLL MCIBSE

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APPENDIX A: Lighting Terminology

APPENDIX B: Baseline Lighting Survey Location Plan

1 Introduction

1.1 Scope of the Report

Illume Design Ltd have been commissioned by CSA Environmental to undertake a Baseline Lighting Survey for the proposed residential development on land off Carisbrook Road, Mitcheldean, Gloucestershire.

The purpose of the baseline survey was to record existing light levels throughout the site to inform the Ecological Assessments.

This Baseline Survey report outlines the methodology, summaries the information collected, and measurements taken during the lighting survey.

1.2 Site Location

The site is located north of Carisbrook Road in Mitcheldean, Gloucestershire.

The approximate Ordnance Survey (OS) grid reference for the centre of the site is SO 66407 19322.

The site currently comprises of an arable agricultural field bounded by hedgerows and some trees. This is immediately bounded by B4224, Ross Road and Carisbrook Road to the south-west, and Bradley Court Road to the south-east. Existing residential properties are located to the south and west. There is an industrial area to the south-east of the site. Further open farmland is immediately to the north.

The site is ecologically sensitive, particularly in relation to bat habitat. For further information refer to the Ecological reports.

2 Survey Methodology

A day and night-time site visit were undertaken on 3rd June 2019 to ascertain the levels of illuminance at the sensitive site boundaries. A record was made of the types of lighting installations present within the Site, and immediate surrounding area.

The weather conditions were dry with light cloud during the day, and dry during the evening, with a New Moon phase (i.e. the moon was not visible). Night-time measurements were taken between 11pm - 1am.

An evening during the New Moon phase was selected as 'natural' ambient light levels from the moon will be as low as possible, allowing any 'artificial' ambient lighting levels from surrounding lighting, light aura or sky glow etc. to be measured as accurately as possible. This provides a baseline upon which any new lighting effects will be additive.

Natural ambient light from moon light will have an additive effect to the lighting levels measured during the survey depending on the phase of the moon and sky conditions. The typical level of illuminance at ground level from a full moon on a clear night in the UK is 0.35 lux.

Survey locations were selected at measured 40m intervals along the boundary hedgerow within the site, and at 25m intervals along the boundary hedgerow immediately outside of the site in the selected locations. Measurements of point illuminance were recorded at each of the survey locations. These were recorded horizontally on the ground at each location, and at 1.5m in the vertical plane in the four compass directions, North, South, East and West. An additional measurement was taken perpendicular to the boundary hedgerow at 1.5m in height in each location. Measurements were taken using a calibrated Konica Minolta T-10A Illuminance Meter (Serial no: 30018095/20016053).

GPS coordinates were recorded at each survey location and are listed in table 2.1. (NB: Measured GPS coordinates generally have an accuracy of within 3m.)

62 survey locations were chosen in conjunction with the project ecologist in relation to potentially sensitive ecological receptor locations within the site. Refer to the Ecological Reports for further detail. These locations are denoted by the prefix E, and are listed in Table 2.1.

TABLE 2.1: ECOLOGICAL RECEPTOR SURVEY LOCATIONS

Survey Location Reference	Survey Location GPS Coordinates
E01	SO 66501 19124
E02	SO 66526 19156
E03	SO 66539 19195
E04	SO 66549 19232
E05	SO 66549 19271
E06	SO 66551 19310
E07	SO 66560 19349

E08	SO 66566 19388
E09	SO 66569 19426
E10	SO 66572 19466
E11	SO 66571 19506
E12	SO 66567 19525
E13	SO 66529 19511
E14	SO 66494 19496
E15	SO 66457 19481
E16	SO 66422 19462
E17	SO 66390 19438
E18	SO 66372 19426
E19	SO 66358 19463
E20	SO 66342 19499
E21	SO 66338 19510
E22	SO 66298 19501
E23	SO 66261 19490
E24	SO 66224 19480
E25	SO 66226 19442
E26	SO 66234 19403
E27	SO 66245 19365
E28	SO 66258 19328
E29	SO 66274 19288
E30	SO 66291 19252
E31	SO 66312 19218
E32	SO 66341 19189
E33	SO 66376 19168
E34	SO 66411 19150
E35	SO 66444 19134
E36	SO 66482 19118
E37	SO 66247 19342
E38	SO 66255 19319
E39	SO 66264 19293
E40	SO 66275 19271
E41	SO 66284 19249
E42	SO 66295 19226
E43	SO 66311 19206

E44	SO 66329 19188
E45	SO 66347 19171
E46	SO 66366 19162
E47	SO 66392 19148
E48	SO 66411 19141
E49	SO 66439 19120
E50	SO 66462 19112
E51	SO 66481 19103
E52	SO 66508 19114
E53	SO 66528 19130
E54	SO 66532 19153
E55	SO 66540 19174
E56	SO 66546 19199
E57	SO 66549 19226
E58	SO 66551 19254
E59	SO 66553 19282
E60	SO 66556 19307
E61	SO 66561 19341
E62	SO 66562 19368

Refer to Appendix B for Lighting Baseline Survey Location Plan.

3 Survey Results

3.1 Baseline Conditions within the Site and Surrounding Area

The site is currently un-lit.

Street lighting is immediately adjacent to the site along the B4224, Ross Road and Carisbrook Road to the south-west. LED street lighting is also present immediately adjacent to a section along the south-eastern boundary, along Bradley Court Road up to the point where the speed limit changes from 30mph to national speed limit, which is just north of the entrance to the Blade Room Ltd factory. A number of the street lighting columns are mounted on the side of the road closest to the site, and therefore there is a considerable amount of light spill currently impacting on the boundary hedgerows of the site.

The street lighting surrounding the site is dimmed for set periods during the night. Gloucestershire County Council's dimming policy is as follows:

- Traffic Routes – LED Lanterns dim to 50% lighting output from 2200hrs to 0530hrs
- Residential areas – LED Lanterns dim to 30% light output from Midnight to 0530hrs

Carisbrook and Ross Road are classed as residential roads with street lighting dimming to 30% at midnight, and Bradley Court Road is classed as a traffic route with street lighting dimming to 50% from 10pm.

These dimming regimes will affect the measurements taken during the survey, with lower readings recorded at some survey locations due to the adjacent street lighting being dimmed. As the survey has been conducted in the summer months, measurements can only be taken during hours of darkness (from 11pm onwards). Measurements at survey locations E24-E36 locations E01-E04, E36, and E52-E56 have the potential to be at least 50% higher than recorded as the street lights along Bradley Court Road were dimmed to 50% when the measurements were taken. Levels of illuminance at survey locations E37-E51 have the potential to be at least 70% higher than recorded as the street lights along Carisbrook and Ross Road dim to 30% from midnight, which would have occurred during the survey.

There is various column mounted and building mounted lighting within the external areas to the Blade Room Ltd factory to the south-east of the site. During the survey only one out of the six column mounted luminaires within the car parking area was operational. There was also a couple of wall mounted luminaires within this area that were operational. White light sources were utilised in these luminaries, most likely to be metal halide or LED. If all of the luminaires within this area were switched on/ operational the levels of illuminance recorded in adjacent areas could potentially be significantly higher. This could affect the levels of illuminance at survey locations E52-E56 and E01-E04.

The following images within this section of the report show the luminaire types within the immediate surrounding area to the site.

Section 3.2 details the measurements of illuminance recorded at each survey location.

The measurements recorded show that at a number of the ecological receptor locations levels of illuminance are above ambient conditions.

The boundary hedgerow and vegetation vary in height and density, which influences the amount of light spill impacting on the various survey locations within the site. There is also a difference in ground levels between the inside and external boundary.

Levels of illuminance in excess of 0.2 lux were recorded at survey locations E01-E02, and E29-E36 within the site. This is due to light spill from the adjacent street lighting. The boundary vegetation is taller and denser at locations E24- E28 and therefore light spill is much lower, with only a very small increase in levels of illuminance at E24 where there is an adjacent streetlight immediately outside the site. All other survey locations within the site were representative of ambient natural lighting conditions. However, there is potential for levels of illuminance to be higher along the south-eastern boundary before 10pm during winter months when the street lighting is operating at full output. Also, levels may be higher along this boundary when all of the luminaires within the Blade Room Ltd factory are operational.

Levels of illuminance immediately outside the site boundary at survey locations E37-E55 are generally above 0.5 lux due to the street lighting. At these locations' levels could potentially be 50% or 70% higher depending on location if measured when the street lighting is operating at full output.

Survey locations E56-E62 are representative of ambient conditions as street lighting is not present to the north of the Blade Room Ltd factory entrance. There is potential for levels to be higher than recorded along this section of boundary if all of the lights within the industrial area were operational.

Figures 3.1 and 3.2- show the column mounted LED street lighting along Bradley Court Road and at the junction with Carisbrook Road/ B4224. This type of street lighting continued along Carisbrook Road/ Ross Road/ B4224.

Figure 3.3 – shows a close up of one of the LED street lights shown in figures 3.1 and 3.2.

Figures 3.4 and 3.5 – show the column mounted lighting within the Blade Room Ltd factory to the south-east of the site. Only one out of the six column luminaires present was operational at the time of the survey.

Figure 3.6 – shows a close up of one of the column mounted luminaires shown in figures 3.1 and 3.2.

Figures 3.7 and 3.8 – shows one of the LED column mounted street lights along the B4224 north of the roundabout with Ross Road, immediately adjacent to the north western corner of the site.

3.2 Measurements of Illuminance at Ecological Receptor Survey Locations

Table 3.1 summarises the levels of illuminance recorded at each survey location. (Levels of illuminance recorded that equal or exceed 0.2 lux have been coloured orange, and levels that equal or exceed 0.5 lux have been coloured red. The survey location plan in Appendix B has also been colour coded to reflect these results.)

TABLE 3.1 : ECOLOGICAL RECEPTOR LOCATIONS - LEVELS OF ILLUMINANCE RECORDED

Survey Location Reference	Horizontal Illuminance at Ground level	Vertical Illuminance at 1.5m				
		Perpendicular to area of interest	N	E	S	W
E01	0.09	0.06	0.06	0.25	0.00	0.02
E02	0.61	0.04	0.46	1.72	0.18	0.04
E03	0.00	0.00	0.00	0.10	0.07	0.00
E04	0.00	0.00	0.00	0.00	0.00	0.00
E05	0.00	0.00	0.00	0.00	0.00	0.00
E06	0.00	0.00	0.00	0.00	0.00	0.00
E07	0.00	0.00	0.00	0.00	0.00	0.00
E08	0.00	0.00	0.00	0.00	0.00	0.00
E09	0.00	0.00	0.00	0.00	0.00	0.00
E10	0.00	0.00	0.00	0.00	0.00	0.00
E11	0.00	0.00	0.00	0.00	0.00	0.00
E12	0.00	0.00	0.00	0.00	0.00	0.00
E13	0.00	0.00	0.00	0.00	0.00	0.00
E14	0.00	0.00	0.00	0.00	0.00	0.00
E15	0.00	0.00	0.00	0.00	0.00	0.00
E16	0.00	0.00	0.00	0.00	0.02	0.00
E17	0.00	0.00	0.00	0.00	0.00	0.00
E18	0.00	0.00	0.00	0.00	0.02	0.00
E19	0.00	0.00	0.00	0.00	0.00	0.00
E20	0.00	0.00	0.00	0.00	0.00	0.00
E21	0.00	0.00	0.00	0.00	0.00	0.00
E22	0.00	0.00	0.00	0.00	0.00	0.00
E23	0.00	0.00	0.00	0.00	0.00	0.00
E24	0.00	0.03	0.05	0.01	0.11	0.10
E25	0.00	0.00	0.00	0.00	0.00	0.00
E26	0.00	0.00	0.01	0.00	0.00	0.00

E27	0.00	0.00	0.00	0.00	0.00	0.00
E28	0.00	0.00	0.00	0.00	0.05	0.06
E29	0.01	0.02	0.27	0.02	0.02	0.38
E30	0.00	0.02	0.40	0.02	0.02	0.42
E31	0.00	0.01	0.18	0.01	0.05	0.34
E32	0.01	0.02	0.09	0.02	0.02	0.56
E33	0.04	0.01	0.02	0.02	0.26	0.14
E34	0.00	0.03	0.06	0.03	0.26	0.07
E35	0.03	0.11	0.11	0.11	0.34	0.16
E36	0.04	0.04	0.06	0.05	0.22	0.16
E37	2.36	2.84	1.30	0.07	1.83	2.84
E38	0.36	2.12	1.16	0.06	1.46	2.12
E39	5.03	0.73	0.82	1.83	6.56	0.73
E40	0.44	0.21	0.09	0.05	0.84	0.21
E41	1.07	0.08	1.84	0.13	0.07	0.08
E42	5.22	1.61	0.32	0.26	4.99	1.61
E43	3.60	3.90	1.16	0.09	0.33	3.90
E44	4.19	0.48	0.37	0.75	3.11	0.48
E45	1.09	0.89	0.17	0.03	0.80	0.89
E46	1.07	0.29	0.22	0.67	1.91	0.29
E47	0.17	0.05	0.47	0.03	0.07	0.05
E48	3.44	0.05	0.11	2.59	3.16	0.20
E49	0.37	0.10	0.12	0.42	0.45	0.10
E50	1.00	0.75	1.20	0.06	0.14	0.75
E51	0.76	0.68	0.03	0.28	0.67	0.17
E52	1.66	1.26	0.55	1.19	1.19	0.06
E53	11.33	1.48	0.54	1.48	8.55	0.43
E54	11.70	1.10	8.27	0.77	0.62	1.07
E55	0.10	0.06	0.02	0.06	1.41	0.19
E56	0.00	0.00	0.00	0.00	0.00	0.02
E57	0.00	0.00	0.00	0.00	0.00	0.00
E58	0.00	0.00	0.00	0.00	0.00	0.00
E59	0.00	0.00	0.00	0.00	0.00	0.00
E60	0.00	0.00	0.00	0.00	0.00	0.00
E61	0.00	0.00	0.00	0.00	0.00	0.00
E62	0.00	0.00	0.00	0.00	0.00	0.00

4 Conclusion/ Summary

The baseline measurements recorded show that at many of the ecological receptor locations within the southern and south-western parts of the site, levels of illuminance are above ambient conditions with levels greater than 0.2 lux recorded. At the hedgerow immediately outside the site, levels of illuminance in these areas are in excess of 0.5 lux. This is due to light spill from the adjacent street lighting, and levels of illuminance will be higher at times when the street lighting is not dimmed. The northern and north-eastern areas of the site are dark, predominantly representative of natural ambient lighting conditions.

There is a potential for existing levels of illuminance to be higher than recorded as the majority of the lighting within the adjacent industrial area was not operational at the time of the survey and the street lighting immediately adjacent to the site operates on various dimming regimes, as detailed in this report, which means that the street lighting along Bradley Court Road was only operating at 50% output during the survey, and the street lighting along Carisbrook and Ross Road dimmed to 30% output during the survey affecting the measurements taken on the external boundary of the site adjacent to these roads..

It is recommended that dependant on the agreed locations of proposed dark zones for the developed site, that an additional lighting survey is conducted prior to construction during autumn/ winter months when measurements can be taken during hours of darkness between 8pm and 10pm to ensure that the existing light levels recorded are representative of the worst case with all lights in the area switched on and adjacent street lighting operating at full output. If post construction monitoring of levels of illuminance is required, it will be essential that this additional survey work is carried out pre construction.

APPENDIX A

Lighting Terminology

Lighting Terminology

For the purpose of this report, the definitions given below apply:

CIBSE: Chartered Institute of Building Services Engineers

Colour Rendering Index (CRI): A scale of the colour appearance of an object under a particular light source compared to its colour appearance under a reference light source. Expressed on a scale of 1 to 100 Ra, where 100 Ra represents the colour rendering of natural daylight i.e. perfect colour.

Illuminance: Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is designated by the symbol E. The unit is the lux (lx). One lux equals one lumen per square metre (lm/m^2).

Light Pollution: The spillage of light into areas where it is not required.

Light Intrusion: Light that impacts on a surface outside of the area designed to be lit by a lighting installation.

Disability Glare: Glare which impairs the vision of objects but may not cause discomfort.

Discomfort Glare: Glare causing discomfort which may not impair the ability to see objects.

Photocell: A unit which senses light to control luminaires.

Curfew: The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by a government controlling authority, usually the local government (CIE, 2003).

Environmental Zones: Area where specific activities take place or are planned and where specific requirements for the restriction of obtrusive light are recommended. Zones are indicated by the zone rating (E1… E4) (CIE, 2003).

Obtrusive Light: Spill light which because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information (CIE, 2003).

Residential Property: Land upon which a dwelling exists (CIE, 2003).

Sky Glow: The brightening of the night sky caused by artificial lighting resulting from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols and particulate matter), in the direction of observation. It comprises two separate components as follows:

(a) *Natural sky glow* - That part of the sky glow which is attributable to radiation from celestial sources and luminescent processes in the Earth's upper atmosphere.

(b) *Man-made sky glow* - That part of the sky glow which is attributable to man-made sources of radiation (e.g. outdoor electric lighting), including radiation that is emitted directly upwards and radiation that is reflected from the surface of the Earth (CIE, 2003).

Spill Light (Stray Light): Light emitted by a lighting installation which falls outside the boundaries of the property for which the lighting installation is designed (CIE, 2003).

Upward Light Ratio: The maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.

APPENDIX B

Baseline Survey Location Plan

A1 - Do not scale

LEGEND

- APPLICATION BOUNDARY
- SURVEY LOCATION
- Exx DENOTES ECOLOGICAL RECEPTOR SURVEY LOCATION
- SURVEY LOCATIONS WHERE THE MAXIMUM LEVEL OF ILLUMINANCE MEASURED WAS EQUAL TO OR EXCEEDED 0.5 LUX
- SURVEY LOCATIONS WHERE THE MAXIMUM LEVEL OF ILLUMINANCE MEASURED WAS EQUAL TO OR EXCEEDED 0.2 LUX

NOTES

1. POSITIONS SHOWN ON LOCATION PLAN ARE INDICATIVE. PLEASE REFER TO BASELINE SURVEY REPORT AND GPS LOCATIONS.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE BASELINE SURVEY REPORT.

Rev	Details	Drn / Chkd	Date
P02	UPDATED TO CLIENT COMMENTS	MB / BB	28/06/19
P01	FIRST ISSUE	MB / BB	14/06/19

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Client
CSA ENVIRONMENTAL

Project
MITCHELDEAN

Drawing Title
BASELINE SURVEY
LOCATION PLAN

Scale at A1
1:1250

Discipline
LIGHTING

Job Number	Job Status	Issue
4086	PLANNING	P02

Drawing Number
4086-ID-DR-1001

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DESIGN

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Appendix F

Indicative Light-Spill Diagrams. Horizontal and Vertical Illuminance (DFL-UK)

	Luminaire A	Luminaire C
Supplier	Urbis Schreder	Urbis Schreder
Type	AXIA 3 1 5267 Integrated lenses Rear louvers 16 OSLON SQUAR	AXIA 3 1 5295 Integrated lenses Rear louvers 16 OSLON SQUAR
Lamp(s)	16 OSI ON SQUARE GIANT@480 mA WW 730 230V 01-37-041	16 OSI ON SQUARE GIANT@300 mA WW 727 230V 01-37-041
Lamp Flux (klm)	2.30	1.52
Maintenance Factor	1.00	1.00
No. in Project	1	29

219459.06m

Grid 1 - P5 Horizontal Illuminance (lux)

Play Area

LINING WOOD

Sewage Ppg Sta

HOLLYWELL ROAD

CANBROOKE RO

PROJECT NAME:	**Mitcheldean**
PROJECT No:	**3541-DFL-ELG-XX-CA-EO-13001-S3-P02**
SCALE: **1:1000**	DATE: **5 July 2024**
CALCULATION:	**Horizontal Illuminance (lux)**
DESIGNER:	**DFL-UK (AJB)**

Indicative light spill diagram.
> Not for construction.
> Initial light levels shown.
> Light spill diagram does not consider blocking or shading effects of light limiting objects and represents worst-case horizontal light spill at ground floor level.
> Light spill diagram to be read in conjunction with Lighting Strategy: 3541-DFL-ELG-XX-RP-EO-13001-S3

Isolux contours shown:
10 Lux: Blue
5.0 Lux: Green
1.0 Lux: Red
0.5 Lux: Purple
0.2 Lux: Yellow

Page Size: A2
Scale: 1:1000

CHECKED BY: **AL**	APPROVED BY: **AL**
REVISION: **P03**	SUITABILITY: **S3**

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8514910981

DATE: 18 November 2024

DESIGNER: DFL-UK (AJB)

PROJECT No: 3541

PROJECT NAME: Mitcheldean

Indicative light spill diagram.
> Not for construction.
> Initial light levels shown.
> Light spill diagram does not consider blocking or shading effects of light limiting objects and represents worst-case
> Light spill diagram to be read in conjunction with Lighting Strategy: 3541-DFL-ELG-XX-RP-EO-13001-S3

3541-DFL-ELG-XX-LD-EO-13002-S3-P03

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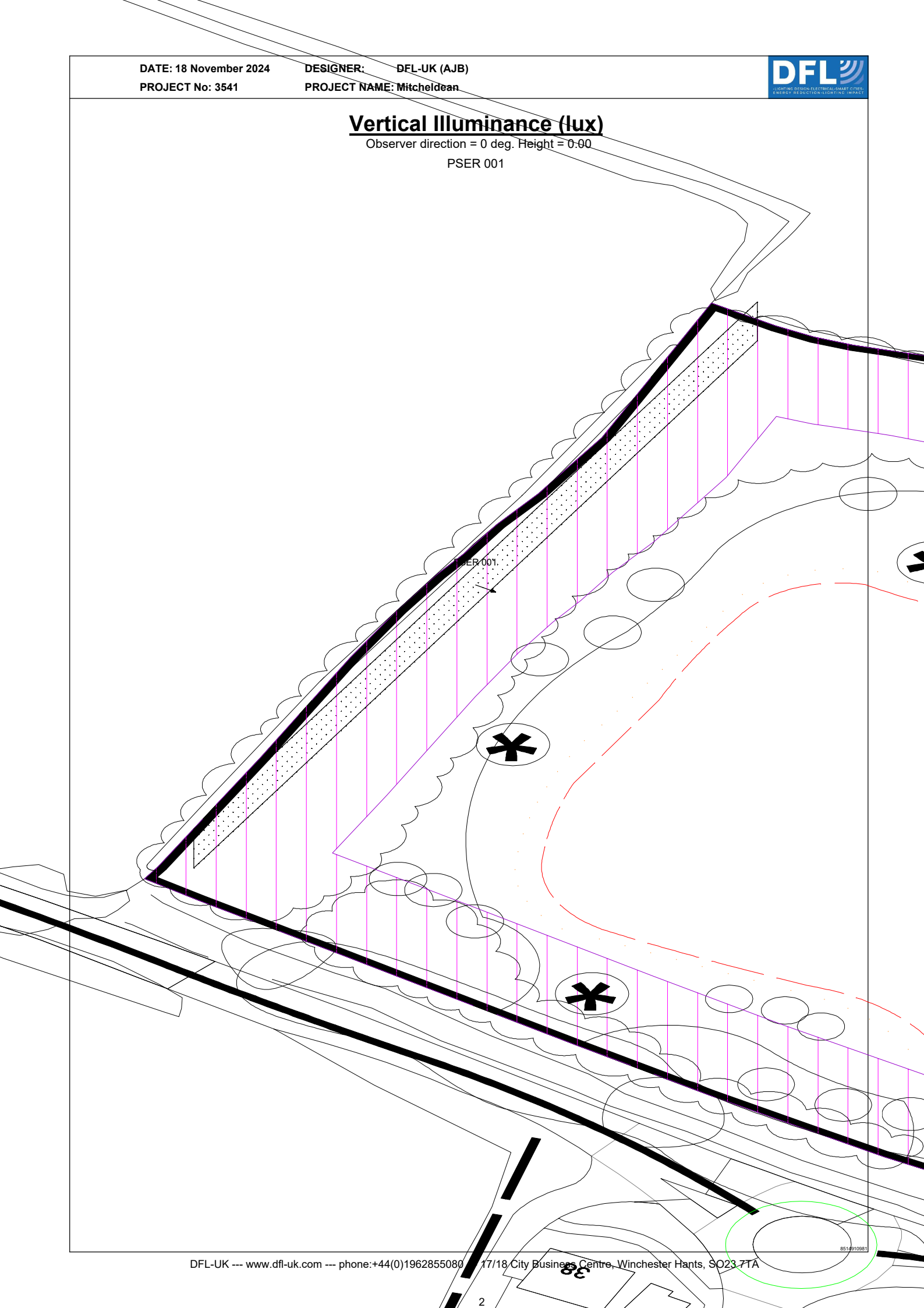
Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

PSER 001



Illuminance (lux)

PSER 001

Results

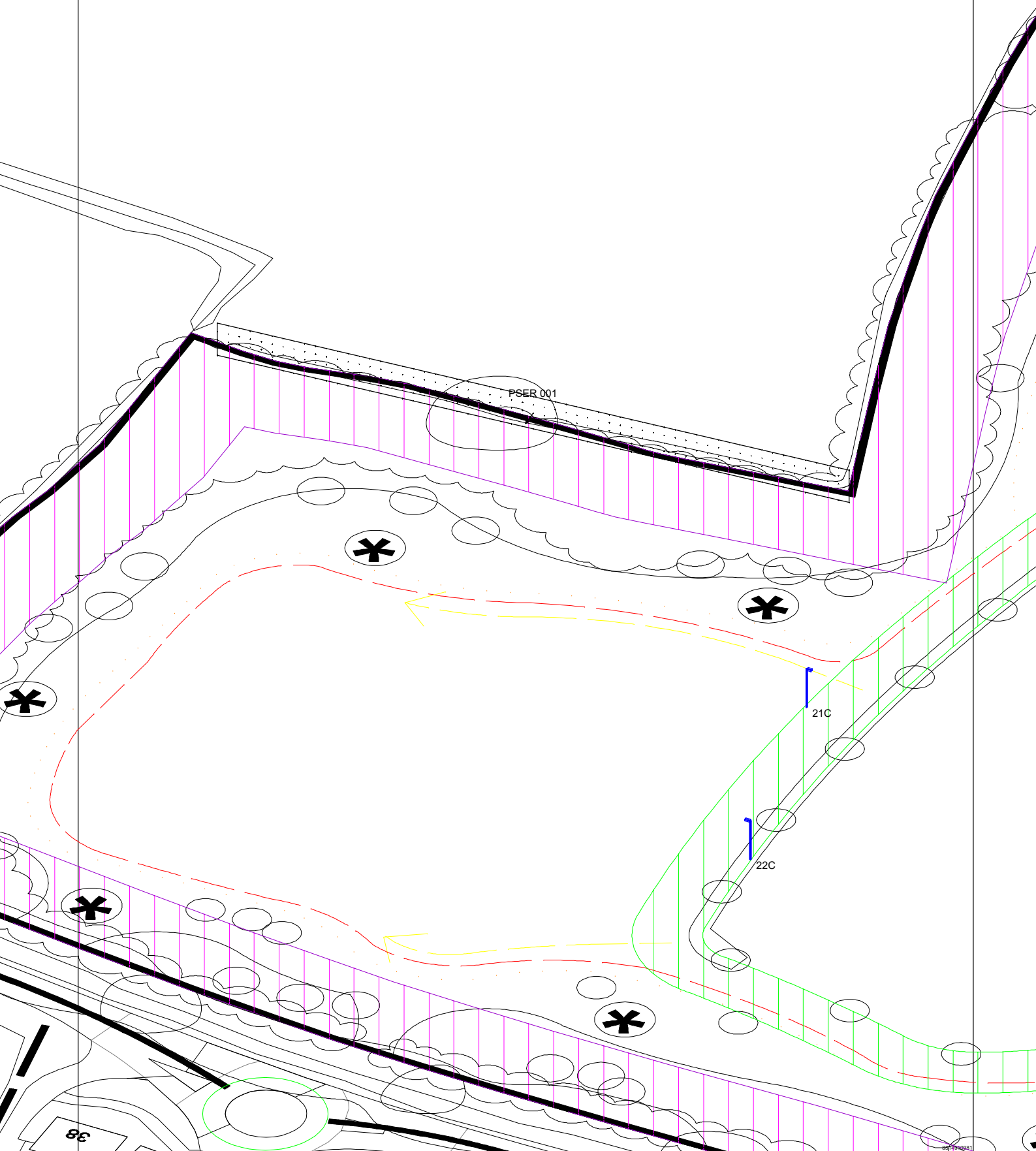
Eav	0.00
Emin	0.00
Emax	0.00
Emin/Emax	0.00
Emin/Eav	0.00

8514910981

Vertical Illuminance (lux)

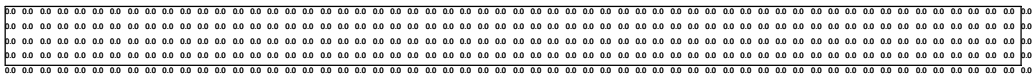
Observer direction = 0 deg. Height = 0.00

PSER 001



Illuminance (lux)

PSER 001



Results

Eav	0.00
Emin	0.00
Emax	0.00
Emin/Emax	0.00
Emin/Eav	0.00

8514910981

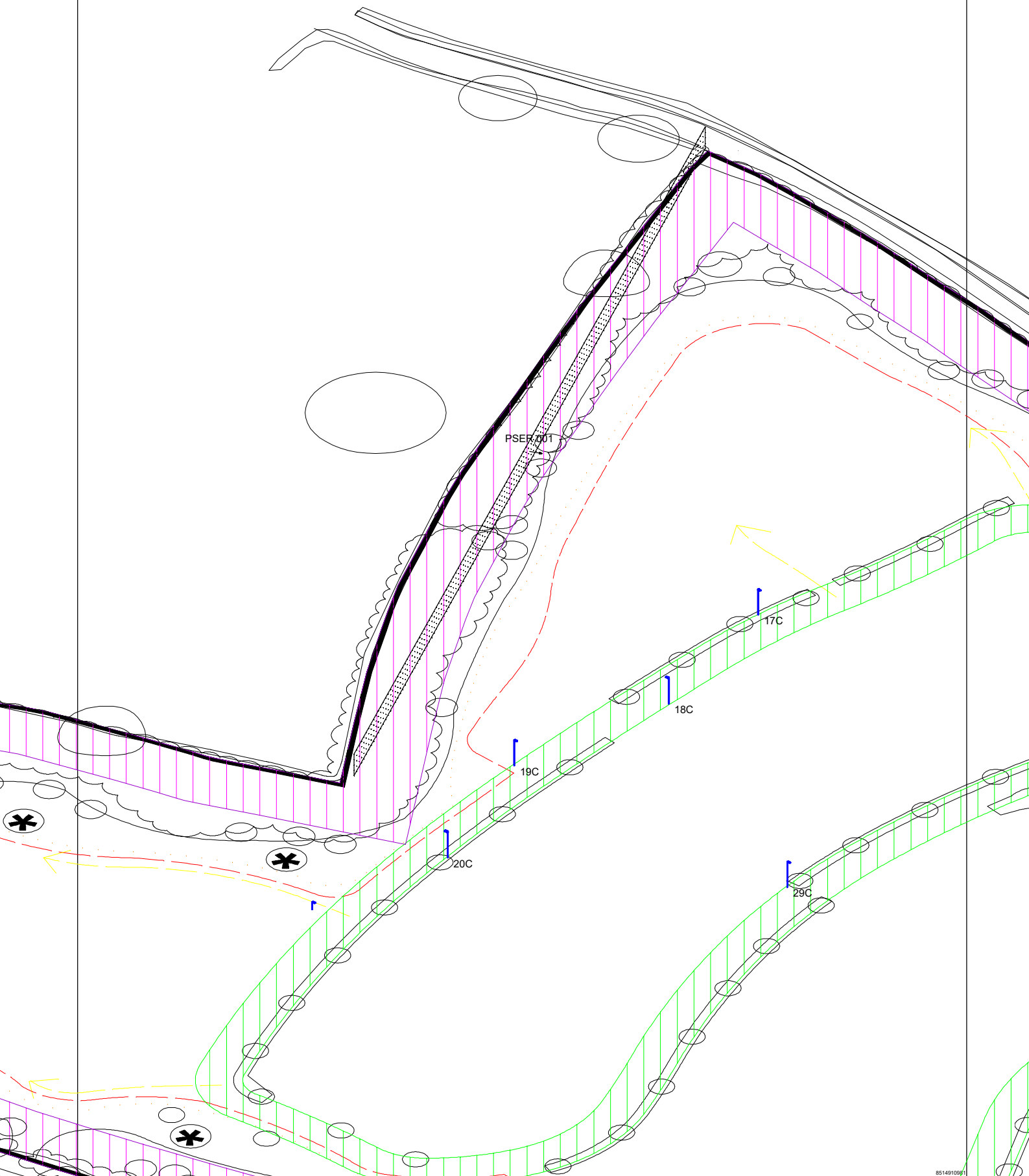
DATE: 18 November 2024 DESIGNER: DFL-UK (AJB)

PROJECT No: 3541 PROJECT NAME: Mitcheldean

Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

PSER 001



8514910981

Illuminance (lux)

PSER 001

Results

Eav	0.00
Emin	0.00
Emax	0.01
Emin/Emax	0.00
Emin/Eav	0.00

DATE: 18 November 2024 DESIGNER: DFL-UK (AJB)

PROJECT No: 3541 PROJECT NAME: Mitcheldean

Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

PSER 002

8514910981

Illuminance (lux)

PSER 002

Results

Eav	0.00
Emin	0.00
Emax	0.01
Emin/Emax	0.00
Emin/Eav	0.00

8514910981

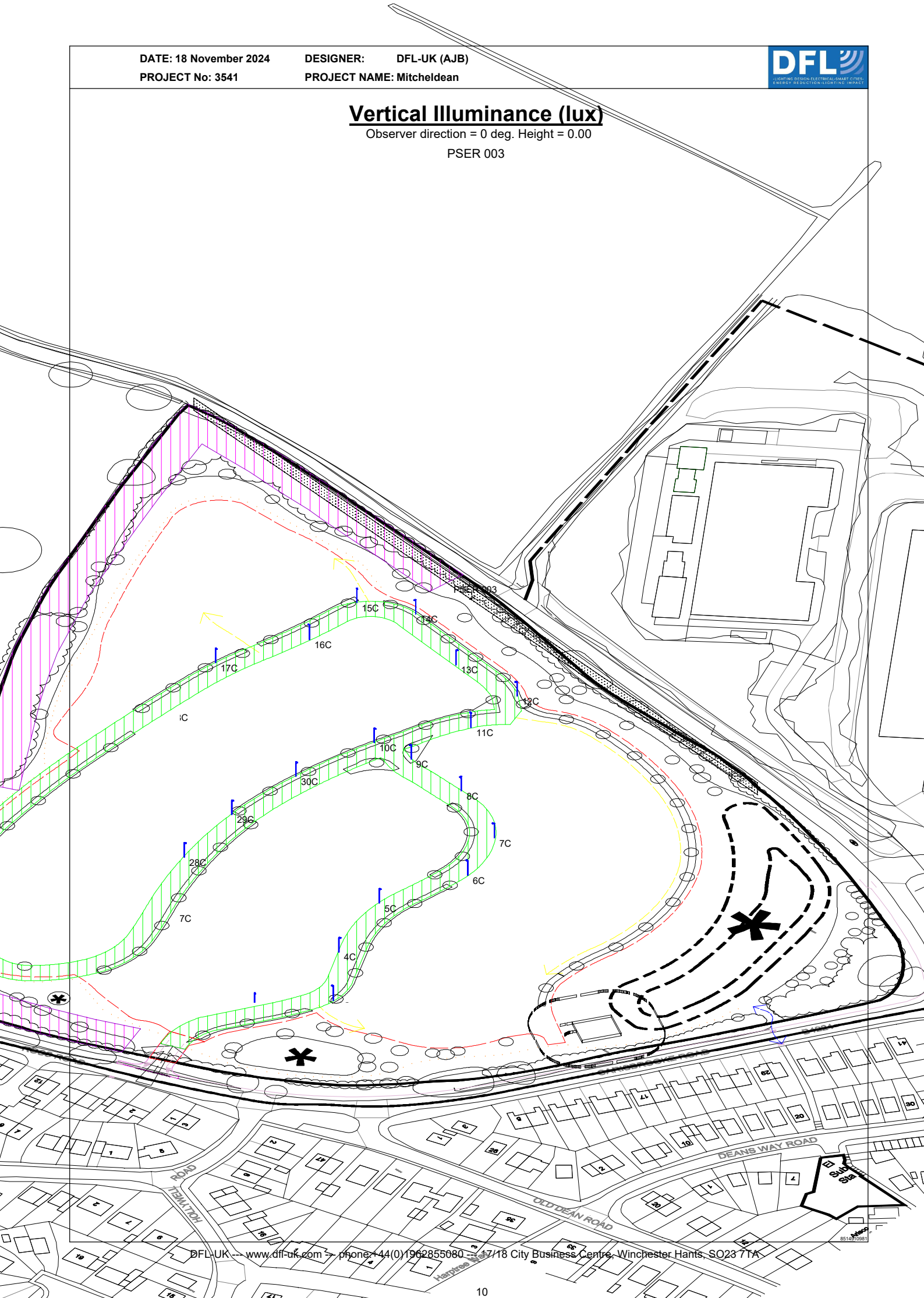
DATE: 18 November 2024 DESIGNER: DFL-UK (AJB)

PROJECT No: 3541 PROJECT NAME: Mitcheldean

Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

PSER 003



Illuminance (lux)

PSER 003

Results

Eav	0.00
Emin	0.00
Emax	0.01
Emin/Emax	0.00
Emin/Eav	0.00

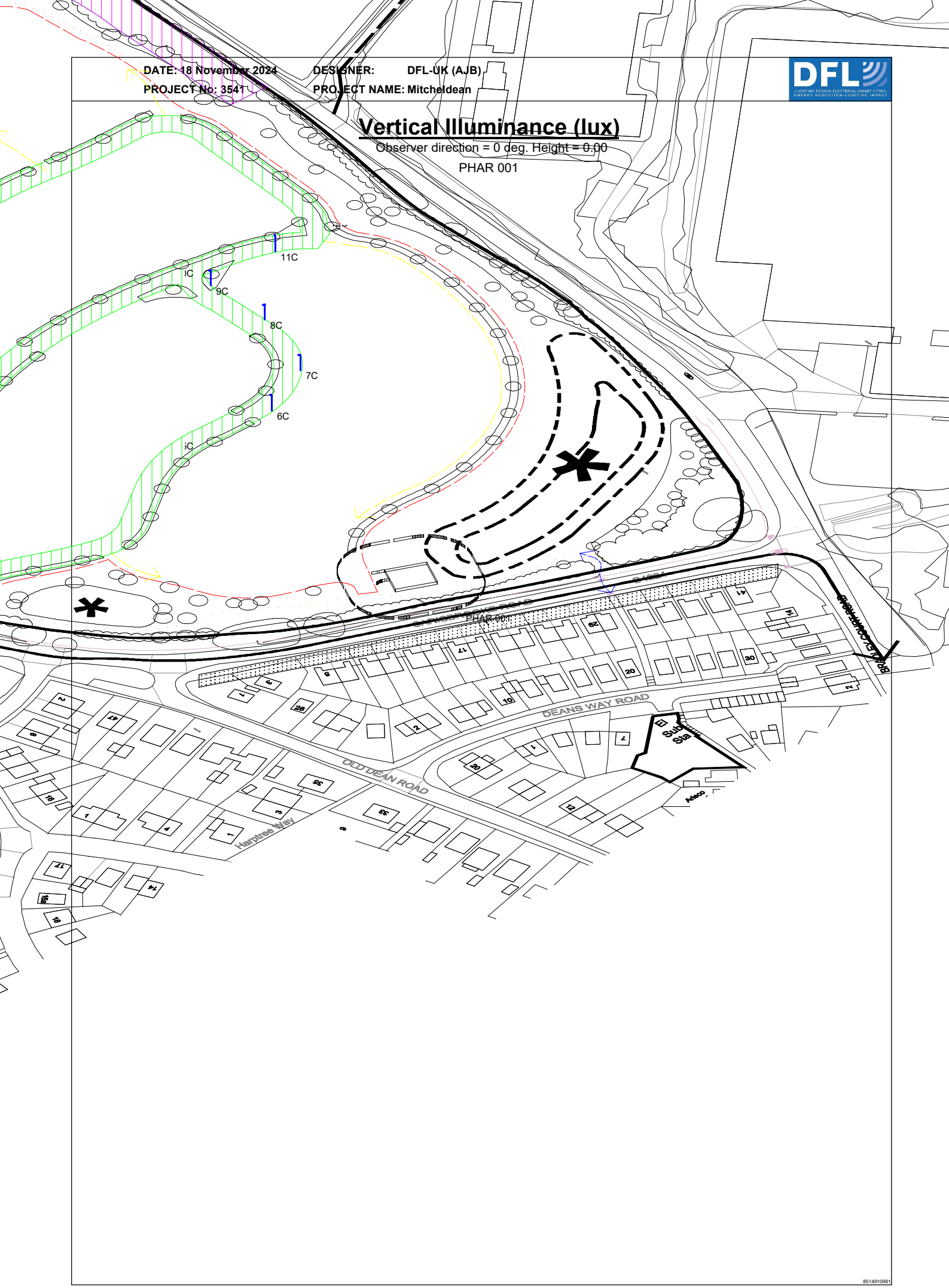
DATE: 18 November 2024 DESIGNER: DFL-UK (AJB)

PROJECT No: 3541 PROJECT NAME: Mitcheldean

Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

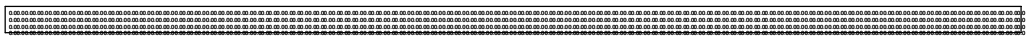
PHAR 001



851491098

Illuminance (lux)

PHAR 001



Results

Eav	0.00
Emin	0.00
Emax	0.00
Emin/Emax	0.00
Emin/Eav	0.00

8514910981

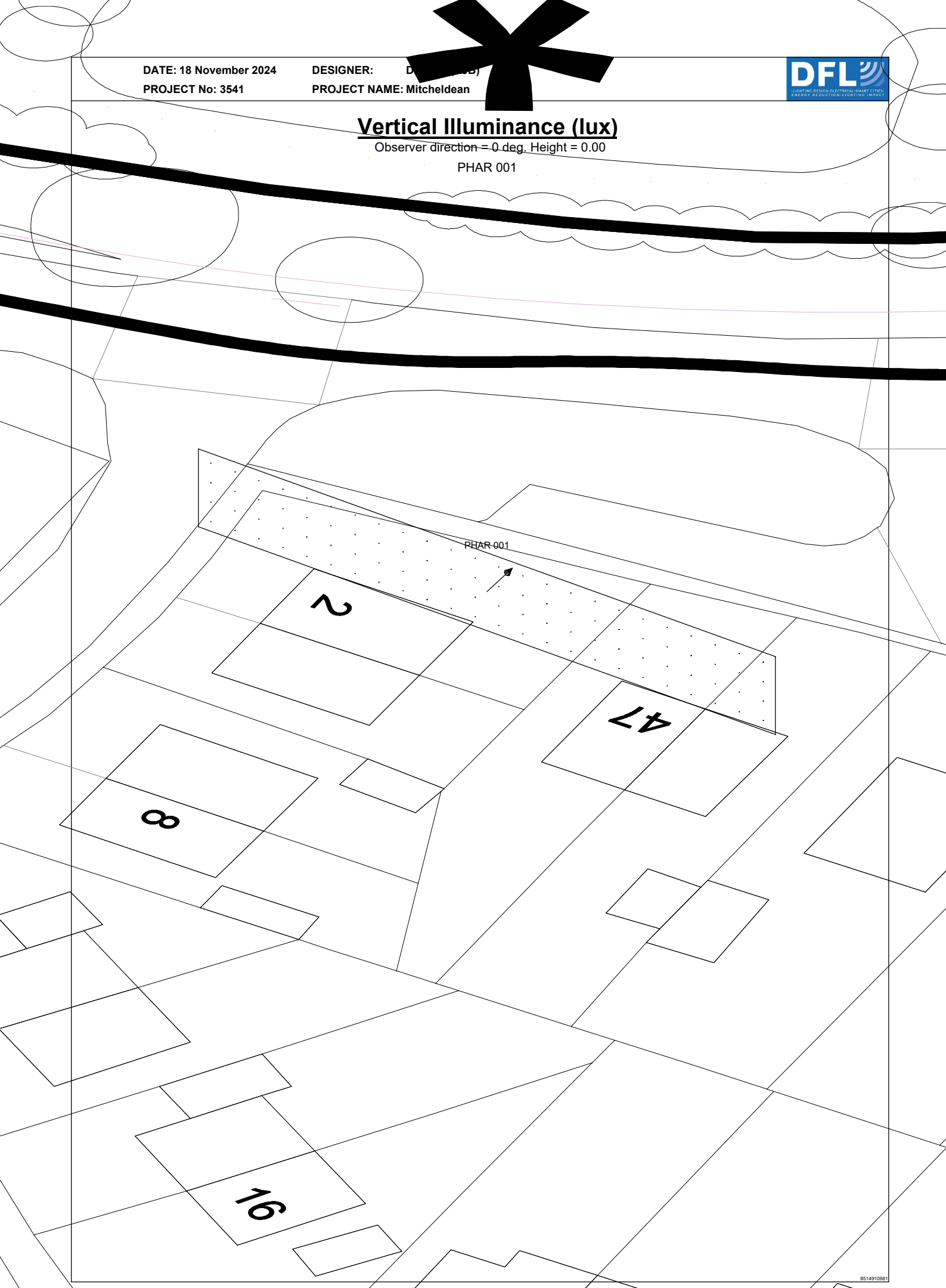
DATE: 18 November 2024 DESIGNER: D[redacted]

PROJECT No: 3541 PROJECT NAME: Mitcheldean

Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

PHAR 001



851491098

Illuminance (lux)

PHAR 001

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Results

Eav	0.00
Emin	0.00
Emax	0.00
Emin/Emax	0.00
Emin/Eav	0.00

8514910981

DATE: 18 November 2024 DESIGNER: DFL-UK (AJB)

PROJECT No: 3541 PROJECT NAME: Mitcheldean

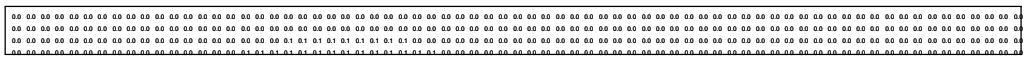
Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

PHAR 001

Illuminance (lux)

PHAR 001



Results

Eav	0.02
Emin	0.00
Emax	0.14
Emin/Emax	0.02
Emin/Eav	0.15

8514910981

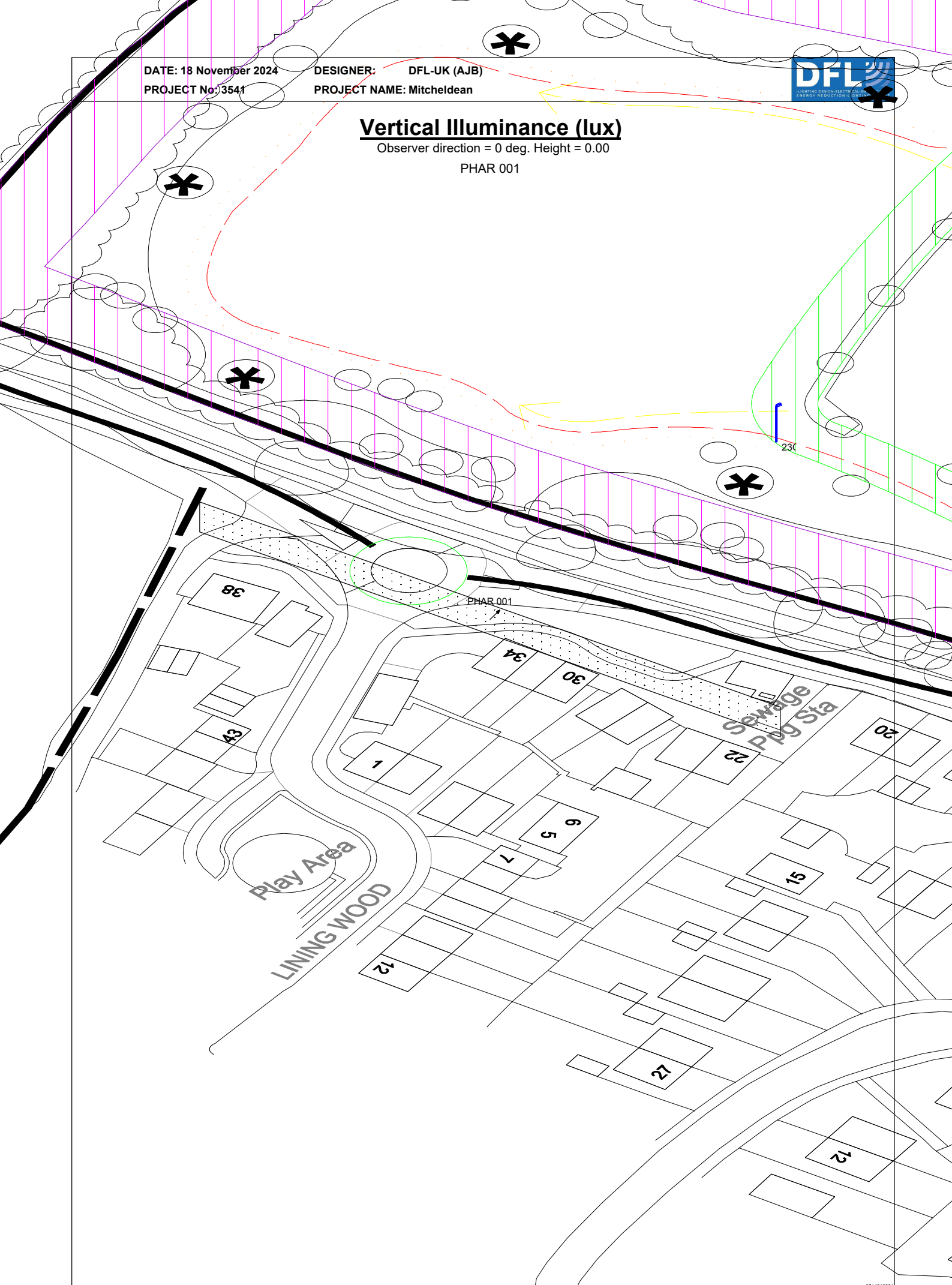
DATE: 18 November 2024 DESIGNER: DFL-UK (AJB)

PROJECT No: 3541 PROJECT NAME: Mitcheldean

Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

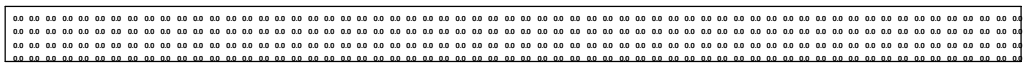
PHAR 001



8514910981

Illuminance (lux)

PHAR 001



Results

Eav	0.00
Emin	0.00
Emax	0.00
Emin/Emax	0.00
Emin/Eav	0.00

8514910981

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