



APPENDIX 10.2 - LIGHTING ASSESSMENT REPORT

Updated to incorporate evolution of the lighting strategy provided by SSE. Includes a new Appendix B – Outline Lighting Management Scheme



West Sussex County Council

A29 REALIGNMENT

Lighting Assessment Report



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Lighting Assessment Report

PUBLIC

PROJECT NO. 70060779

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1 INTRODUCTION

1.1 BACKGROUND

This document is provided in regard to the submission of a detailed planning application on behalf of West Sussex County Council (WSSCC) for the realignment of the A29 (referred to as the 'Scheme') on land located to the north of Eastergate and to the north-west of Barnham, shown in **Figure 1-1**, hereby referred to as 'the Site'. In support of the planning application we have been appointed to undertake a lighting assessment for the Scheme.

1.2 THE SITE

The Site is located within arable fields, woodland, orchard and areas of managed grassland, between the B2233, Barnham Road in Eastergate and the A29 south of Eastergate Lane. The city of Chichester is located approximately 8.5km to the west and the towns of Bognor Regis and Worthing are located 6km to the south and 10km to the south-east respectively.

The area surrounding the Site contains a mixture of rural and suburban areas consisting of residential and commercial buildings which are surrounded by agricultural land.

There are residential areas close to the Scheme, including those along the B2233 Barnham Road, Downview Road, Ewens Gardens, Murrell Gardens, Cherry Tree Drive, Collins Close and A29 Fontwell Avenue.

To the north-west of the Site, the A29 is unlit; areas to the south including the B2233 Barnham Road along with adjacent residential roads are within street lit areas.

A Public Right of Way (PRoW) (Footpath 318) crosses the Site, connecting Eastergate Lane to the north and the B2233 Barnham Road to the south.

There are no formal designations covering the Site which falls within the planning authority of Barnham and Eastergate Parish Council, Arun District Council (ADC) and West Sussex County Council. The southern boundary of the South Downs National Park is located approximately 1.4km to the north of the Site.

1.3 THE SCHEME

The Scheme includes the construction of a 30mph, 1.25km single carriageway road with a 3m wide shared cycleway and footway, four uncontrolled crossings, three roundabouts, landscaping, noise barriers and other associated works.

The new carriageway will tie into the A29 Fontwell Avenue to the north-west and the B2233 Barnham Road to the south, with two new roundabouts and a third roundabout in the centre of the Scheme that will provide access to planned residential areas.

One uncontrolled pedestrian crossing with central island will enable users of a Public Right of Way (PRoW) to cross the carriageway to maintain the connectivity of the PRoW.

There will be three construction compounds:

- Compound A (main compound) will be located just south of Barnham Road on the Old Nursery site. This compound will be for the location of the main site offices, staff parking and welfare.
- Compound B will be located just off Fontwell Avenue. This will provide localised parking for site staff, welfare and some plant and materials storage.
- Compound C will be located halfway along the Scheme, offline from the new carriageway alignment.

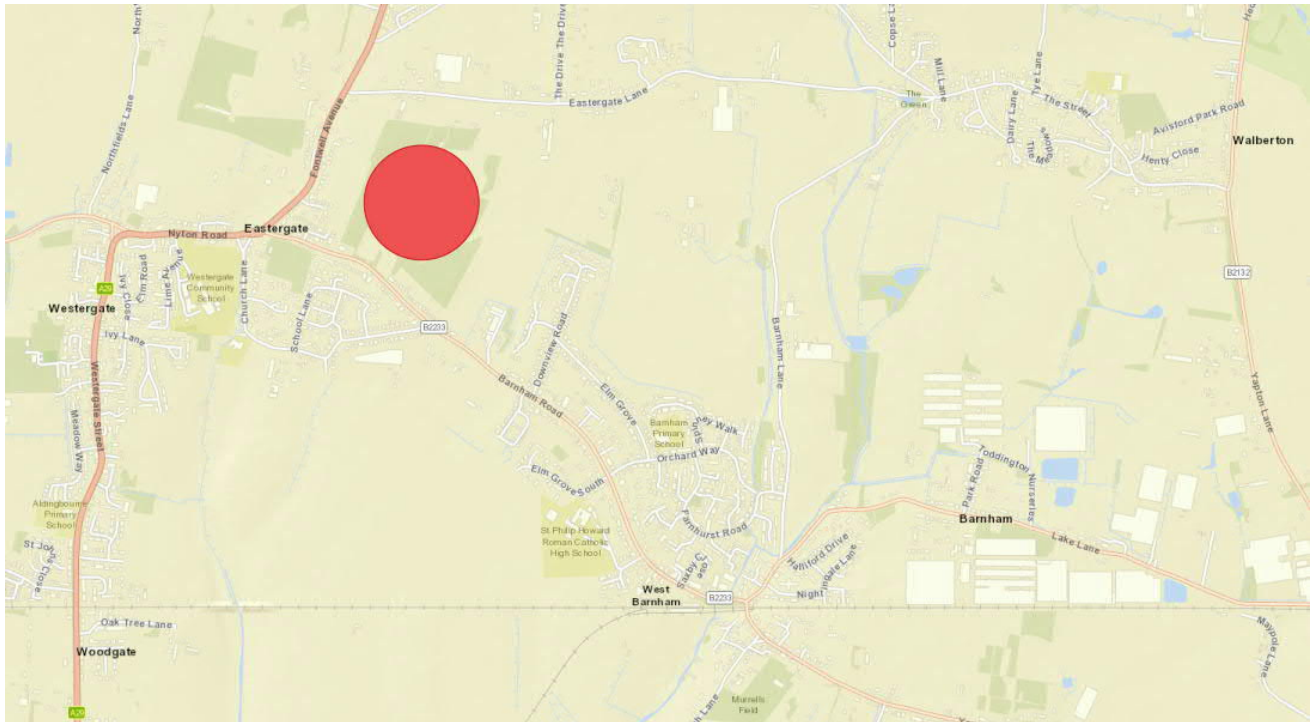


Figure 1-1 – Location of the Scheme

1.4 AIM OF THIS DOCUMENT

This document outlines:

- The background to artificial light pollution and associated guidance.
- Legislation, planning policies and guidance applicable to the type and location of the Scheme.
- The existing lighting conditions within and surrounding the Site.
- Environmental limitations that may be placed on the proposed lighting of the Scheme, in accordance with current standards and guidance.
- Expected levels of illumination for the activities proposed for the Scheme.
- Equipment performance requirements that are likely to achieve compliance with both lighting and environmental guidance.
- The assessment of potential effects of lighting on the wider environment.

2 IMPACT OF ARTIFICIAL LIGHTING

2.1 POTENTIAL NEGATIVE EFFECTS

A well-designed lighting installation may transform a space after dark; allowing it to be used safely, effectively and for uses that may not be otherwise possible. While road lighting tends to be the dominant type of lighting in a residential type development, there may also be public amenity lighting in core spaces, lighting at sports facilities and decorative features.

There is a general correlation between the complexity of a task, or how hazardous that task is, and the level of illumination required to safely undertake the task. Owners with more complex and hazardous spaces will generally provide greater levels of illumination, in-line with national, international and industry standards and guidance.

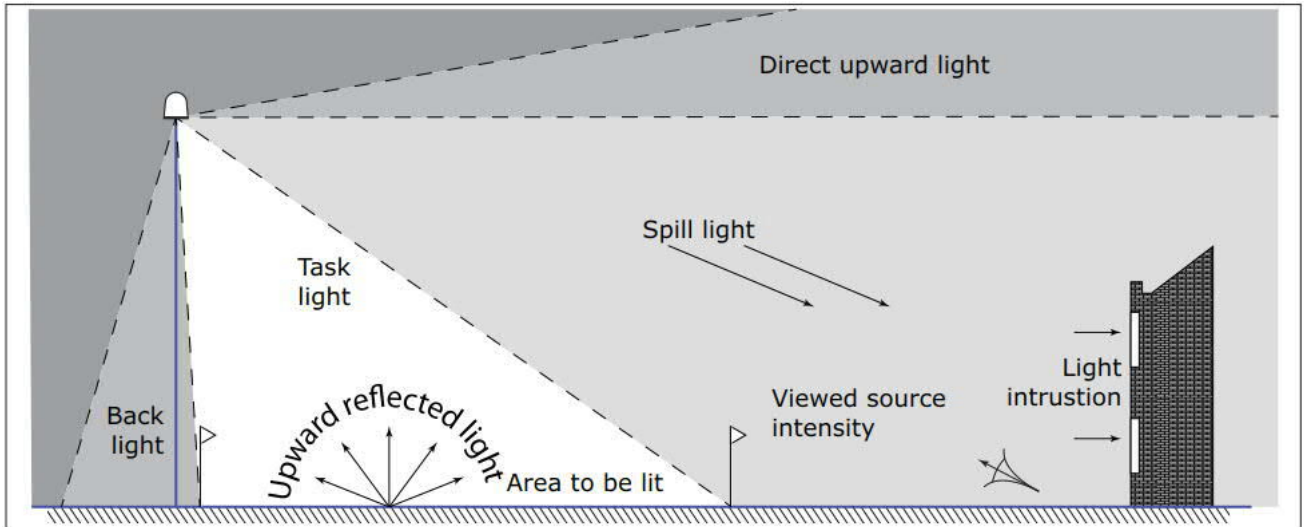
The correct level of lighting must be carefully selected to suit the task being undertaken, while ensuring that only the light necessary for the task is brought to bear. Excessive lighting is not only energy inefficient but can also negatively impact the local environment and ecology. In extreme cases poor lighting may make the task it is provided for more difficult to accomplish.

The incorrect application of lighting can have a negative effect on the local environment, in the form of pollution and nuisance. Light pollution is defined as emitted light that is serving no useful purpose as it falls outside of the area required to be illuminated. This can take the form of spill light outside the extents of a site, building or event, but also includes 'sky glow' – the emission of light into the atmosphere as a result of poor control. The cumulative effects of sky glow are most noticeable above urban areas, where a variety of poorly controlled sources combine to create a brightening of the horizon and night sky. In addition to poorly controlled light, a component of sky glow will be formed from upward reflected light.

Nuisance lighting may take the form of localised spill light or glare. Glare occurs where the light source itself proves a distraction or disability to normal vision. Poorly orientated lighting units may exhibit glare and, while the disabling effects of glare diminish with distance, lighting may still provide a nuisance over several hundred metres.

A graphical representation of types of light nuisance is provided in **Figure 2-1**.

Figure 2-1 - Types of light nuisance



GN01 (ILP, 2020)

2.2 STATUTORY REQUIREMENTS AND POLICIES

Details of pertinent statutory requirements and policies relevant to the Scheme are included within this section. These requirements and policies are considered further in **Section 3.0**, which details the existing lighting scenario and lists limitations appropriate for the Site, and **Section 4.0** which provides lighting proposals and mitigation measures which aim to limit the effects of lighting to the immediate and wider environment.

The following information is not exhaustive and further statutory requirements and policies may be applicable.

LEGISLATION

The Clean Neighbourhoods and Environment Act 2005 (the 'CNEA') gives local authorities powers to deal with artificial lighting by classifying artificial light emitted from defined premises as a statutory nuisance. The CNEA amends Section 79 of the Environmental Protection Act 1990 to extend the statutory nuisance regime to include light spill and glare (emitted from certain premises) defined as, 'artificial light emitted from premises so as to be prejudicial to health or a nuisance.' Several defined types of premises are exempt from this provision, including premises where higher levels of light are to be expected for the purposes of safety, such as airports and lighthouses.

Guidance produced on Sections 101 to 103 of the CNEA by the Department of Environment, Food and Rural Affairs (DEFRA) extends the duty on local authorities to ensure their areas are checked periodically for existing and potential sources of statutory nuisances, including situations where a nuisance arises from the use of artificial lighting. It should be noted that under CNEA, the definition of premises does not extend to a highway, therefore light emitted from a highway lighting installation cannot be deemed a statutory nuisance.

NATIONAL POLICIES

The Ministry of Housing, Communities and Local Government, National Planning Policy Framework (NPPF), February 2019 states that, 'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.' (NPPF, Paragraph 180, 2018)

The Ministry of Housing, Communities and Local Government provides guidance on light pollution on the gov.uk website (<https://www.gov.uk/guidance/light-pollution>) and details the following:

- What light pollution consideration does planning need to address?
- What factors can be considered when assessing whether a development proposal might have implications for light pollution?
- What factors are relevant when considering where light shines?
- What factors are relevant when considering when light shines?
- What factors are relevant when considering how much the light shines?
- What factors are relevant when considering possible ecological impacts of lighting?
- What other information is available that could inform approaches to lighting and help reduce light pollution? (gov.uk, 1 November 2019)

LOCAL POLICIES

The local planning authority, Arun District Council has a number of planning policies relating to lighting as detailed in the Arun District Council Adoption Arun Local Plan 2012-2013 (July 2018).

The local plan identifies light pollution as having the potential to cause disturbance and annoyance and recognises the importance of carefully designed lighting which minimises light spillage and glare. The importance of maintaining dark skies is highlighted which is further emphasised with the locality of the South Downs National Park International Dark Sky Reserve. Preserving the tranquillity of intrinsically dark green spaces in terms of their enjoyment and nature conservation is highlighted along with avoiding light pollution in these areas which are both relevant to the Green Infrastructure Corridor and Public Rights of Way footpath present within the Site.

The policies pertinent to this commentary are:

Policy GI SP1 - Green Infrastructure and development which states that "All major development must be designed to protect and enhance existing Green Infrastructure assets, and the connections between them, in order to ensure a joined up Green Infrastructure Network. The Green Infrastructure Network must be protected from light pollution to ensure that areas defined by their tranquillity are protected from the negative effects of light in development."

Policy QE DM2 - Light pollution which states that for planning permission for proposals which involve outdoor lighting must be accompanied by a lighting scheme prepared according to the latest national design guidance and relevant British Standards publications. Outdoor lighting schemes will be considered against the following criteria:

- a. No adverse impact on neighbouring uses or the wider landscape, particularly with regard the South Downs International Dark Sky Reserve designation;
- b. Light levels being the minimum required for security and working purposes;
- c. Minimising the potential glare and spillage; and
- d. The degree to which outdoor lighting can be powered by on-site renewable sources.

Where appropriate, the Local Planning Authority will seek to control the times of illumination.

Policy LAN DM1- Protection of landscape character states that development within the setting of the South Downs National Park must have special regard to the conservation of that setting, including views into and out of the Park, and will not be permitted where there would be harmful effects on these considerations.

The Barnham and Eastergate Neighbourhood Plan 2014-2029 provides a further planning policy with regards to lighting. **Policy HDQ9: Comprehensive attention to detailing from the start of the design process** states that lighting must be considered at an early stage and goes on to provide a requirement for “Lighting schemes that prevent light spillage and glare and face inwards away from open landscapes.

2.3 GUIDANCE FOR IMPLEMENTATION

Applicable guidance for lighting designers on the subject of obtrusive light is predominantly covered by the following international documents:

- CIE 150:2017 Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (International Commission on Illumination, 2017)
- CIE 126:1997 Guidelines for Minimizing Sky Glow (International Commission on Illumination, 1997)

National guidance is produced by the Institution of Lighting Professionals (ILP) in the following documents:

- Professional Lighting Guide 04, Guidance on Undertaking Environmental Lighting Impact Assessments (PLG04) (ILP, 2013)
- Guidance Note 01/20 Guidance Notes for the Reduction of Obtrusive Light (GN01) (ILP, 2020)
- Bat Guidance Note 08/18 Bats and artificial lighting in the UK (ILP, 2018)

Although the scheme is not located within the South Downs National Park (SDNP), due to the locality of the National Park and the International Dark Sky Reserve (IDSR) designation, there is a planning requirement to consider the potential impact of the Scheme to views into and out of the Park. With this in mind further guidance on methods of limiting lighting impacts to this particular setting can be sought from the South Downs National Park, Technical Advice Note (South Downs National Park Authority, April 2018).

3 RECEPTOR AND BASELINE ASSESSMENT

3.1 METHODOLOGY

A desktop assessment of the Site has been prepared in order to examine the existing baseline lighting conditions on the Site and in the immediate surrounds and identify site specific sensitivities.

At the time of writing, working restrictions are in place related to the outbreak of the Coronavirus Disease 2019 meaning that a baseline survey of the Site cannot be undertaken. The assessment is therefore based on photographs taken as part of the LVA and ecology assessments along with aerial and street view imagery provided by Google Maps. The use of this imagery has been combined with experience and judgement to anticipate existing baseline lighting conditions.

There are however limitations with this method such as imagery being outdated or not available and therefore predicted conditions and views have not been verified as accurate. It is recommended that during the detailed design stage, baseline data should be collected from areas where lighting could have a negative effect. Baseline surveys should be undertaken in accordance with ILP PLG04 (ILP, 2013).

3.2 SITE CLASSIFICATION

The criteria used to provide a baseline for the impact of lighting on the surrounding environment are drawn from GN01, based on the derived Environmental Zone. The five potential zones are provided in **Table 3-1**.

Table 3-1 – Environmental Zones

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark	Astronomical Observable dark skies, UNESCO starlight reserves, International Dark-Sky Association (IDA) dark sky places
E1	Natural	Dark	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

GN01 (ILP, 2020)

3.3 SITE-SPECIFIC SENSITIVITIES

A number of site-specific sensitive locations, which have the potential to be adversely affected by lighting, have been identified as part of a desk study of the Site. These are shown on Viewpoint / Receptor Location Plans 70060779-WSP-LIA-XXX-SK-PL-0001 to 0003 included in **Appendix A**.

Table 3-2 – Summary of sensitive locations

Viewpoint number	Location	Sensitivities
A1	A29 Fontwell Avenue	Residential properties
A2	A29 Fontwell Avenue – Rear of properties	Residential properties
A3	Corner of A29 Fontwell Avenue and Eastergate Lane	Residential properties
A4	PRoW 318 which links Eastergate Lane and Barnham Road	Users of PRoW
A5	Road to the side of Stoney Field Cottages, Eastergate Lane	Residential properties – Stoneyfield Cottages
L1	A29 Fontwell Avenue	LVA and Residential properties
L5	Downview Road, Barnham	LVA and Residential properties
L6	Murrell Gardens, Barnham	LVA and Residential properties
L7	Barnham Road, Barnham	LVA and Residential properties
L8	Cherry Tree Drive, Barnham – Rear of properties	LVA and Residential properties
E1	Folly Foot Farm Barn	Ecological
E2	Land to south of Eastergate Lane	Ecological
E3	PRoW Footpath 318	Ecological

In addition to these sensitive locations, consideration of the night-time views towards and from within the South Downs National Park, Dark Skies Reserve will be given.

The character of the area of the Site and its surrounds is mainly rural with pockets of residential and commercial areas between Eastergate and Barnham. The Site is located within an agricultural field, containing green infrastructure corridors with areas of unlit landscape surrounding the site including roads and residential areas such as A29 Fontwell Avenue, Eastergate Lane, Downview Road, Ewens Garden and Murrell Gardens.

There are principle sources of lighting within the locality such as:

- Road lighting along B2233 Barnham Road including the A29 Fontwell Avenue junction in Eastergate consisting lighting columns 10m in height with yellow high-pressure sodium lighting.

- Floodlighting within the Fordingbridge Industrial Estate consisting of lighting columns approximately 6m in height (colour of light source unknown) with various orientations and luminaires tilts which could give rise to levels of obtrusive light.

A commentary on each viewpoint is provided in **Table 3-3**. As described above the descriptions are partially based on photography provided as part of the survey's undertaken for the LVA and Ecology assessment. These surveys were carried out on the 25 February 2020 for LVA and the 11 July 2018 and 26 May 2020 for Ecology.

Table 3-3 – Baseline Descriptions

Site Reference	Commentary
A1, A2 and L1	<p>Viewpoint A1 is located outside property Ashmead on Fontwell Avenue looking north to north-east towards the proposed A29 roundabout and is intended to represent the views from the residential properties in this area. Both deciduous and evergreen trees and bushes line the A29 are visible, varying in height and density. There are intermittent views of single and two-storey properties visible through the vegetation with some larger gaps. It is likely that there will be views of the A29 from some of the properties, more so for those with larger gaps in vegetation and during the winter months where vegetation is deciduous. Distant views beyond the Site are obscured by a slight bend in the road which is densely lined with vegetation.</p> <p>Viewpoint L1 is located to the north of viewpoint A1, outside properties Farrenden and Freya on Fontwell Avenue adjacent to and looking north-east towards the proposed A29 roundabout. Views to the north-east and east are primarily screened by a flint wall or fence both approximately 1.5m in height, behind these features is a line of tall evergreen trees, some of which are dense providing further screening; there is however partial views of properties behind the trees indicating that some onward views might be present.</p> <p>There is no immediate road lighting visible on the A29 and viewpoints A1 and L1 will appear dark with only limited views of artificial lighting visible through the windows of neighbouring properties, residential security or decorative lighting and vehicle headlights. There is a single road light located at the A29 Fontwell Avenue junction with Eastergate Lane which could be visible to the north of viewpoint L1.</p> <p>Viewpoint A2 is located to the rear of two-storey properties on the A29 Fontwell Avenue looking east towards the proposed central roundabout. There are likely to be initial views of an agricultural field and then a large area of tall dense vegetation likely to obscure onward views. The viewpoint is anticipated to be dark with only the occasional distant light source being visible.</p> <p>The SDNP IDSR is located to the north and distant sky glow is anticipated to be minor. Localised sky glow is likely to be present to the north associated with a small residential area off Wandleys Lane, Fontwell Park Racecourse and the road lit A27 located approximately 1.2km from the viewpoint. Views towards the east are likely to experience sky glow from the village of Walberton and the A27.</p>
A3	<p>Viewpoint A3 is located at the A29 Fontwell Avenue junction with Eastgate Lane looking south-west towards the proposed A29 roundabout and intended to represent the views from the residential properties adjacent to the junction. The view along the A29 towards the proposed roundabout is unobstructed however views either side of the road are screened by the tall dense vegetation noted at viewpoints A1 and L1. The residential property directly to the north-east (Spode Cottage) of the viewpoint is surrounded by dense deciduous vegetation screening views to the south-west. There are unobscured views of two-storey residential properties from the viewpoint to the north (Northfields Farm Cottages) and south-east (Lyndhurst), there is however dense evergreen vegetation in the south-western corner of</p>

Site Reference	Commentary
	<p>Lyndhurst and dense deciduous vegetation to the south of Northfields Farm Cottages which are likely to screen onward views to the south-west.</p> <p>There is a single road light, approximately 6m in height with a white florescent light source and lit road sign at the junction. Where there are views to the south-west, the A29 is not lit in this direction and views will appear dark albeit for instances of interior and exterior residential and security lighting and vehicle headlights.</p> <p>The previously described deciduous and evergreen vegetation may obscure some views of sky glow, where there are views of the sky it is likely that sky glow will be visible to the south-west emanating from the villages of Eastergate and Westergate.</p>
E1, E2 and E3	<p>Viewpoints E2 is located within the area of agricultural and wooded land to the east of the A29, Fontwell Avenue with viewpoint E1 located adjacent to a barn to the west of this area within Folly Foot Farm located off the A29. Viewpoint E3 is located on the PRoW, Footpath 318 which transects the area from north to south and has been identified as corridor used by bats. The baseline conditions at all three viewpoints are recorded looking north and have been recorded to support the ecologic assessment.</p> <p>Screening surrounding the barn associated with viewpoint E1 is limited with open views across the agricultural land for approximately 150m stopping at the boundary with Eastergate Lane to the north and a large bank of dense woodland to the east approximately 75m from the barn. It is anticipated that artificial lighting near to the barn will be minimal with residential and agricultural buildings to the west and south-west of the barn having the potential for sources of lighting. There are no further instances of artificial lighting close enough to the viewpoint to affect existing levels of spill and glare and it is anticipated that the viewpoint will appear dark.</p> <p>Viewpoint E2 is located within the area of dense deciduous woodland with onward views screened by the vegetation surrounding the viewpoint. There is dense deciduous vegetation lining the PRoW at viewpoint E3 with onwards views again obscured, there may however be instances where breaks in the vegetation provide intermittent views of distant light sources such as those emanating from the residential properties on Eastergate Lane or from local farm buildings. There are no sources of artificial light near to both the viewpoints and it is anticipated that the these will not be affected by levels of spill lighting or glare and will appear dark.</p> <p>Where views of the sky are not obscured by vegetation it is anticipated the sky glow will be visible much like viewpoints A1, A2 and L1.</p>
A4	<p>Viewpoint A4 is located on the PRoW south of Eastergate Lane looking south and used to describe the baseline conditions for users of the PRoW. The PRoW is lined mainly with deciduous trees and bushes partially screening views to the east and west, through the vegetation there are partial views of open fields and farm buildings. There are views along the PRoW to the south but onward views are obscured by the vegetation which in some instances is growing above the PRoW screening some views of the sky.</p> <p>Night-time views along the PRoW will be dark, there is the potential for intermittent views of artificial lighting attached to some of the farm buildings, but these are unlikely to contribute to levels of spill light or glare. Views of sky glow to the south are likely from local road lighting in Eastergate and Barnham and there will be views of distant sky glow emanating from the urbanised areas of Bognor Regis.</p>
A5	<p>Viewpoint A5 is located along a lane south of Eastergate Lane and to the south-east of Stoneyfield Cottages looking south-west towards the proposed central roundabout. The</p>

Site Reference	Commentary
	<p>viewpoint is used to record the views from the two-storey residential properties at Stoneyfield Cottages. From the lane there are initial views across an agricultural field from west to south. The residential properties are located to the north-west of the viewpoint with the gardens to the properties bounding the agricultural field to the north and separated by a line of deciduous bushes. Onward views to the west and south-west are screened by a thin line of deciduous hedgerow at the western boundary of the agricultural field, behind which there is another field with is bounded with a line of deciduous trees screening onward views to the south-west. Behind the field there is a row of single storey barns to the west. There is a line of deciduous trees and bushes at the southern boundary of the field screening views of a large complex of industrial greenhouses.</p> <p>Night-time views will appear initially dark across the agricultural fields, there is potential for artificial lighting to be visible associated with the barns and industrial greenhouses but due to the screening bounding the field the viewpoint is unlikely to experience obtrusive levels of spill light or glare.</p> <p>View of sky glow to the south-west are likely to be visible emanating from the road lit areas of Eastergate and Westergate.</p>
L5	<p>Viewpoint L5 is located at the end of Downview Road looking west and has been assessed to understand the existing views from the residential properties at the end of the road. To the west of the viewpoint a narrow grass field is visible which is bounded by a thin row of deciduous hedges approximately 2m in height. Visible through the row of hedges is another grass field behind which a tall dense line of deciduous trees can be seen. To the south-west a single-storey industrial building located with the Fordingbridge Industrial Estate is visible above the hedgerow and more clearly through a gap in the vegetation. Views to the south are obscured by vegetation bounding the rear gardens of Downview Road and Ewens Gardens. There is a row of deciduous trees visible to the north-west through which there is a partial view of the industrial greenhouses. There are distant views of the roofs of two-storey houses above the row of hedges and through a thinning of the tall tree line to the west-south-west.</p> <p>There are no views of artificial lighting installations during the day and night-time views are anticipated to be predominantly dark principally to the west. Downview Road and adjacent residential roads are assumed to not be lit, and the ambient night-time levels will be low with minor contribution from interior and external residential security lighting. Although not visible during the day, it is likely that there will be intermittent views through the vegetation of artificial lighting from the Fordingbridge Industrial Estate and road lighting on the B2233 Barnham Road during the night to the south-west.</p> <p>Views of sky glow are likely to be prominent to the west both locally from Westergate and Eastergate and more distant from the city of Chichester.</p>
L6	<p>Viewpoint L6 is located on Murrell Gardens looking west and has been surveyed to understand the views from existing residential properties. View to the west are initially of a small strip of grass land and then a large cluster of brambles and deciduous trees through which industrial buildings located within the Fordingbridge Industrial Estate can be seen. Road lighting columns located on the B2233 Barnham Road are clearly visible to the south-west. Adjacent to Barnham Road there is a line of deciduous hedges with a large commercial greenhouse visible through and above the hedgerow. There are views to the north-north-east of the narrow grass field adjacent to viewpoint L5 with distant intermittent views of the second-floor windows of residential properties on Eastergate Lane visible through the vegetation of treelines and hedgerows. There is no road lighting present on Murrell Gardens to the east and north-east of the viewpoint however security lighting is attached to the two-story residential properties.</p> <p>It is anticipated that the viewpoint will appear dark albeit for a minor level of spill light emanating through the windows of the residential properties and from the security lighting</p>

Site Reference	Commentary
	<p>attached to the properties. Glare from the floodlighting within the Fordingbridge Industrial Estate is possibly visible to the west. Road lighting on the B2233 Barnham Road will be visible and although likely to spill light onto the vegetation adjacent to the road, due to the distance from the viewpoint will not contribute significantly to levels of spill light.</p> <p>Views of sky glow are likely to be prominent to the west both locally from Westergate and Eastergate and more distant from the city of Chichester.</p>
L7	<p>Viewpoint L7 is located on the B2233 Barnham Road to the south of L6 looking north and has been assessed to understand the existing baseline conditions for the residential properties along Barnham Road. Barnham Road is initially visible to the north which is lined by a wooden fence approximately 2m in height. Above the fence, single-storey industrial buildings within the Fordingbridge Industrial Estate along with two 6m height lighting columns each with three floodlights mounted at various orientations and tilts. There are roof lights visible on some of the industrial buildings. Behind the industrial units a row of tall mature deciduous trees can be seen. Road lighting is visible along Barnham Road to the north-west and south-east, the road lighting is located on either side of the road and consists of 10m height lighting columns with high-pressure sodium luminaires producing light of a yellow appearance. There are two residential properties visible to the north-north-east of the viewpoint, both the ground and first floor windows of both properties are visible from the viewpoint. Dense vegetation and wooden fences obscure the properties to the east of the viewpoint.</p> <p>The viewpoint is likely to be affected by spill light and glare from the road lighting. Road lighting is orientated towards the two residential properties, although the properties are set back from the road these are likely to be affected by obtrusive levels of spill lighting and glare. There will be views of the floodlighting within the Fordingbridge Industrial Estate which may contribute to levels of glare and sky glow. Vehicle headlights will also be visible at the viewpoint.</p> <p>Views of sky glow to the north are likely to be influence by the presence of floodlighting within the industrial estate and along with distant views of Fontwell Park Racecourse and the road lit A27.</p>
L8	<p>Viewpoint L8 is located at the southern end of PRow Footpath 318, north of B2233 Barnham Road looking north-east and has been assessed to understand the existing views from residential properties on Barnham Road. There is dense deciduous and evergreen vegetation surrounding the viewpoint, but a break is present to the north-east where a grassed field is visible bounded by deciduous hedgerow. Above the hedgerow there is a row of tall deciduous trees through which industrial greenhouses can be seen and second-floor windows of residential properties on Downview Road and Ewens Gardens. There are views to the north-east and east of tall dense deciduous trees with partial views of industrial buildings located within the Fordingbridge Industrial Estate visible through the vegetation. To the south-east and south-west of the viewpoint there is deciduous and evergreen vegetation lining the footpath varying in density with intermittent views of second floor windows of a residential property on Barnham Road.</p> <p>There is no artificial lighting near to the viewpoint and it is anticipated that night-time ambient lighting will be low. Night-time views will appear mainly dark to the north-east with only the occasional distant light source likely to be visible. The Fordingbridge Industrial Estate is located immediately to the east and while artificial lighting is not visible during the day there could be intermittent views during the night of the floodlighting within the estate. It is anticipated that there may also be intermittent views of road lighting to the south-west although this will be mainly screened by the dense vegetation surrounding the viewpoint.</p> <p>It is anticipated that only very low levels of distant sky glow will be visible to the north-east as the outlying landscape is undeveloped and rural in nature.</p>



The Site and immediate surrounds are indicative of either rural areas or villages having low district brightness and it is our recommendation that the Site is classified as **Environmental Zone E2**.

3.4 SITE LIMITATIONS

The limitations imposed on exterior lighting for Environmental Zone E2 are as follows (from GN01). Further guidance on limitations and how these are calculated are provided in CIE 150:2017.

Where a curfew is included, this refers to the time after which stricter requirements for the control of obtrusive light will apply, as stipulated by the local planning authority. If not otherwise stated, 23:00 to 05:00 hours are suggested.

Table 3-4 – Obtrusive light limitations for E2 zone

Sky Glow ULR (Max %)	Light intrusion (into windows) Ev (lux)	
	Pre-curfew	Post-curfew
2.5	5.0	1.0

GN01 (ILP, 2020)

Notes

1. Upward Light Ratio (ULR) is the maximum permitted percentage of luminaire flux that goes directly into the sky.
2. Ev = vertical illuminance in lux, measured flat on the glazing at the centre of the window.

Table 3-5 – Limits for luminous intensity for E2 zone

	Luminaire projected area Ap in m ²					
	0<Ap≤0.002	0.002<Ap≤0.01	0.01<Ap≤0.03	0.03<Ap≤0.13	0.13<Ap≤0.5	Ap>0.5
Pre-curfew (maximum cd)	0.57 d	1.3 d	2.5 d	5.0 d	10 d	7,500
Post-curfew (maximum cd)	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	500
Aid to gauging Ap	2 to 5cm	5 to 10cm	10 to 20cm	20 to 40cm	40 to 80cm	>80cm
Geometric mean of diameter (cm)	3.2cm	7.1cm	14.1cm	26.3cm	56.6cm	>80cm
Corresponding Ap representative area (m ²)	0.0008	0.004	0.016	0.063	0.251	>0.5

GN01 (ILP, 2020)

Notes

1. d is the distance between the observer and the luminaire in metres.
2. Ap is the apparent surface of the light source seen from the observer position
3. Cd = Candela

The limitations for luminous intensity detailed in **Table 3-5** are intended for the assessment of the brightness of luminaires from locations where there will be maintained views such as those from

residential properties. The requirements of **Table 3-5** are a recent amendment to ILP GN01:2020 and at the time of writing the report guidance on the implementation of these limitations is still being compiled therefore the requirements of AP>0.5 have been used for the upper limits.

The Scheme does not include proposals for the façades of buildings to be lit as a night-time feature, nor lit advertisements, therefore limitations have not been included for these elements.

ECOLOGY

Ecological guidance for the site has identified Folly Foot Farm Barn, Land to south of Eastergate Lane and the PRoW (Footpath 318) as being sensitive areas.

Artificial lighting may affect sensitive fauna at these types of habitats, including impacting roosts, commuting routes and established and created dark corridors. It is useful in most situations to establish primary mitigation by assessing the impact of lighting proposals on bats. If a lighting scheme can be developed that is sensitive to bats, then it is likely that the proposed installation will not be presenting any additional harm to other species.

Different species of bat are affected by lighting in different ways. Reducing the spectral output of proposed units will limit the number of species that may be affected. In addition, shorter wavelength sources should be avoided as much as possible. Therefore, the use of warmer white LED sources, which may inherently have a more limited spectral distribution and naturally limit shorter wavelength output, is recommended.

The presence of bat and other sensitive populations in the area would necessitate specific design requirements to mitigate the impact of lighting:

- Light spill onto confirmed, suspected or introduced roosts, boxes and the like is prohibited and should be avoided primarily through good design and secondarily by physical shields where necessary.
- Light spill onto trees and hedgerows should be minimised through good design, with physical shields installed where necessary.
- A 'buffer zone' of very low illuminance (if any) should be created adjacent to established or proposed key habitats, such as adjacent to treelines.
- Landscaping measures in the form of shrubs and tree planting to further act as secondary mitigation to screen and soften the effects of installed artificial light sources should be considered.

It is not always possible to completely remove levels of spill light onto nearby sensitive features near to artificial lighting installations as low levels of spill light can be present at significant distances from the installation.

The ILP Bat Guidance Note 08/18 Bats and artificial lighting in the UK (ILP, 2018) suggests limitations to the amount of spill light onto sensitive features being **0.2 lux on the horizontal plane** (e.g. at ground level) and **0.4 lux on the vertical plane** (e.g. along the sides of hedgerow or treelines, calculated at an equivalent bat flying height).

3.5 CONSULTATIONS

Consultation with Arun District Council Environmental Health Officers (EHO) has been carried out to agree the following:

- The baseline methodology to be used in the absence of on-site assessments and lighting measurements.
- Locations of viewpoint locations which will be used as the basis for the assessment.
- The lighting proposals will be reviewed against the requirements of ILP GN01 (2020).
- Environmental zone classification E2.

In response to the request the following comments were received on 10 July 2020 and responded to on or before 05 August 2020.

Table 3-6 – Consultation

Arun District Council (EHO) comment	Response
<p>Has the SDNP been consulted in regards to lighting?</p>	<p>We have not consulted with the SDNP but will consider any applicable recommendations detailed in their guidance document South Downs National Park, Technical Advice Note (South Downs National Park Authority, April 2018). We will also consider the policies which make reference to the SDNP in the Arun District Council Adoption Arun Local Plan 20122-2013 (July 2018).</p> <p>An outline lighting design has been completed by WSCC's lighting PFI contractor SSE who have advised that they have previously discussed the type of lighting equipment used within the county and have advised that this meets the requirements of the SDNP. Furthermore, the lighting equipment being specified does not emit light directly into the sky. Light sources are specified as LED with warm white colour temperatures which reduces the blue light component and helps to limit the effects of sky glow and on local ecology. Lighting levels have been designed based on current British Standards with the aim to provide a suitable level of light for health and safety while not over lighting.</p>
<p>If it is at all possible, Environmental Health would be happier with baseline surveys rather than a desktop study (safety of your staff obviously being paramount here). As restrictions are gradually being lifted, would this be possible? Given the size of the scheme, we think the baseline surveys method would be preferable.</p>	<p>With some of the current restrictions we are currently working within it will not be possible to undertake the baseline survey at this time. We will however undertake a desktop review of baseline conditions in a conservative manner to predict the existing lighting conditions.</p> <p>For areas identified as having significant adverse effects from lighting or where particularly sensitive areas are identified we will recommend that baseline surveys of these areas are undertaken to record existing lighting conditions post planning application.</p>
<p>Environmental Health agree that E2 zone is likely to be appropriate but have 2 questions regarding this. Firstly will skyglow from the southern section impacting</p>	<p>We will consider this in our assessment; it is likely that the lighting scheme will adhere to direct upward light limitations detailed in the ILP Guidance Notes for the Reduction of Obtrusive Light for both E1 and E2 zones.</p> <p>Although parts of the study area will be dark, existing road lighting is present in the nearby villages of Eastergate and Westergate to the south</p>

Arun District Council (EHO) comment	Response
<p>on the SDNP be taken into account? And secondly, is it certain that no parts of the survey area fall into E1 given the SDNP designation and previous land use (i.e. very low level of population in some areas hence very low levels of light currently)</p>	<p>and on the A27 to the north and it is our opinion that the area best aligns with environmental zone E2. Although the lighting assessment will consider whether the lighting limitations associated with environmental zone E2 are likely to be exceeded, the assessment will also consider the potential change in lighting conditions such as those around the Fontwell Avenue roundabout where it is currently dark.</p>
<p>Environmental Health notes that some of the roundabouts have very close residential premises, will this be taken into account?</p>	<p>We have included viewpoints near to the proposed Fontwell Avenue and Barnham Road roundabouts and these will be included as part of the lighting assessment.</p>

3.6 ASSESSEMENT METHODOLOGY

The proposed development will impact on the surrounding environment in ways that may be measured by magnitude and significance, as described by PLG 04 and presented in **Table 3-6**.

The assessment is both quantitative and qualitative in nature and is based on an anticipated deviation from the baseline lighting conditions alongside calculations to understand the levels of obtrusive light. The ILP ‘Guidance on Undertaking Environmental Lighting Impact Assessments’ and Guidance Notes have been used in order to inform the assessment alongside professional judgement.

The assessment has evaluated the effects on existing residential receptors, users of the local PRow and national trail network based on the following factors:

- Existing lighting conditions and indicative Environmental Zone
- Anticipated future sources of lighting, including type, purpose, location and orientation
- Distance from receptor to light source(s)
- Screening (both existing and proposed) between light source(s) and receptor(s)

The assessment of changes in the night-time scene has considered the above factors alongside:

- The anticipated sources of lighting (temporary and permanent) viewed alongside existing sources of lighting
- The extent or absence of lighting within the overall field of view and the degree to which this would change
- The main focus of views from the receptors that contribute toward the night-time scene

Table 3-7 – Evaluation Table

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	None
	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	
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, and sky glow etc	Develop appropriate levels and type of mitigation
	6	Moderate adverse effects	Noticeable increase in visibility of site, glare and sky glow etc	
	7	Major adverse effects	Significant problems with increase in visibility of site, glare and sky glow etc	

PLG04 (ILP, 2013)

Calculations have been completed to calculate levels of light intrusion and luminous intensity using standard calculation software, Lighting Analysis AGi32, version 19.5 based on the following assumptions:

- A maintenance factor of 1.0 has been used to model the worst-case, day-one output of the installation.
- Technical parameters have been applied to calculations based on professional knowledge and the expected conditions and installation practices of the site. Any calculation variations applied to explore the impact of obtrusive light do not necessarily take account of any impact on the functional lighting levels of the site, the design of which is outside the scope of this assessment.
- The height of residential properties is assumed to be either 5m (two-storey) or 2.5m (single-storey); the location of windows have not been surveyed and calculation grids have been placed to calculate levels of light spill across the frontage of each relevant property to represent a worst-case scenario.
- The blocking effects of proposed and existing vegetation is not considered in the calculation as the duration and level of screening of deciduous vegetation during the autumn and winter months cannot be relied upon.



- Differences in the heights of existing and proposed ground levels and the relationship between the heights of calculation grids and the proposed lighting has been omitted as the difference in heights for relevant areas is not considered significant.

4 PROPOSALS

4.1 PROPOSED SOLUTION

Lighting should be designed by competent designers and in accordance with publications listed in this document, as well as other industry and site-specific documents dealing with lighting. Pertinent standards and guidance include (in addition to those detailed in **Section 2.3**):

- BS 5489-1:2020 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas (BSI, 2012)
- BS EN 13201 (all parts) Road lighting (BSI, 2014-2015)
- Lighting of Developer Promoted Highway Schemes in West Sussex (West Sussex County Council, 2019)
- BS EN 12464-2:2014 Light and lighting – Lighting of work places – Part 2: Outdoor work places (BSI, 2014)
- Institution of Lighting Professionals Professional Lighting Guide PLG 02, The application of conflict areas on the highway. (PLG 02) (ILP, 2013)
- WSP Outline Lighting Management Scheme, 70079718-WSP-A29-XX-RP-LI-0001 (provided in Appendix B).

CONSTRUCTION

During the construction phase of the Scheme there may be the need to provide temporary lighting for construction tasks and security.

Lighting provided during construction would generally be standard fixings and equipment. Working areas may be surrounded by hoarding onto which lighting may be attached. Such lighting may perform directional and security tasks.

Construction works are likely to be limited to agreed working hours and works during the hours of darkness may be required during the winter months.

Construction lighting may be assessed as part of a temporary lighting design, undertaken by a competent lighting professional. All such lighting should meet the constraints of the applicable Environmental Zone. Purely temporary task lighting may not be subject to a design process but should adhere to the same constraints during its operation.

Specifically, construction-related lighting would:

- Be required to provide the correct levels of lighting to ensure the safety of workers and general users of the site.
- Be designed such that, where practicable, all luminaires are installed internal to the site (such as on the inside of hoarding) and are directed towards the working area.
- Be operational only during construction works, except where lighting is required for out-of-hours security or safety reasons.
- Adhere to industry best practice, including guidance from industry bodies (such as the Construction Industry Research and Information Association, CIRIA). CIRIA guidance, for example, notes that lighting on construction sites is typically required for security and safety, while at the same time being required to minimise impact on the surrounding environment in accordance with current best practice.

- Be mindful of temporary impact on sensitive flora and fauna and limit the intensity and duration of lighting to the minimum required.

OPERATIONAL

A street lighting design has been prepared by SSE Enterprise on behalf of WSCC as detailed on Street Lighting Layout Drawings, numbered SSE281768-1300-002-G, SSE281768-1300-003-E, SSE281768-1300-004-E, SSE281768-1300-005-E and SSE281768-1300-006-F, copies of which are provided in the Outline Lighting Management Scheme in Appendix B.

Street lighting is proposed at the three roundabouts (Fontwell Avenue, Barnham Road and the New Road central roundabout), along the entire section of cycle way from Fontwell Avenue to Barham Road and at the proposed pedestrian crossing at the PRoW (Footpath 318).

Lighting has been minimised to include lighting to the roundabouts and their approaches. The carriageways between each roundabout (except for the approach lighting which ranges between c.50m and c.80m) are not directly lit and instead only the cycleways are provided with lighting, thereby reducing the lighting column heights from 10m to 6m and the required levels of lighting in these sections.

Other than the section of PRoW (Footpath 318) that intersects with the new road, the remote sections of the PRoW will remain unlit. WSCC has advised that the PRoW is rarely used at present and that a PRoW of this type would not typically be lit.

The principles of the design are summarised below and detailed further in **Table 4-1**.

- Lighting has been designed in accordance with BS5489-1:2013.
- LED luminaires are proposed which offer good optical control providing an energy efficient solution. Some luminaires are fitted with integral louvres which restrict levels of back light as detailed on the lighting layout drawings and denoted by BL1 under Optic Setting.

The luminaires used on the scheme vary between the Philips Luma Mini, Micro and Medium variants depending on the area being lit with examples provided in **Figures 4-1 and 4-2**.

Figure 4-1 – Philips Luma Mini



Figure 4-2 – Philips Luma Medium



- Each luminaire is specified to be installed at 0° to the horizontal so that no light is emitted directly above the luminaires.
- LED luminaires have been specified with a colour temperature of 3000K to minimise the blue-light component of the light source to minimise the impact on fauna populations and contribution to sky glow.
- Luminaires will be mounted on lighting columns which do not exceed 10m in height.
- Lighting to be controlled by a central management system and will be operational from dusk (35 Lux) until dawn (18 Lux).
- WSCC's standard dimming regime is to be implemented across the Scheme as follows:
 - Between 20:00 and 22:00 hours lighting to be dimmed by 25% of total lumen output.
 - Between 22:00 and 06:00 hours lighting to be dimmed by 50% of total lumen output.
- ~~West Sussex County Council's, Lighting of Developer Promoted Highway Schemes in West Sussex (West Sussex County Council, 2019) standard dimming regime suggests that the lighting could be dimmed by 40% between midnight and 05:30. However, owing to the sensitive fauna in the area, a site specific dimming regime in the months where bats are active is recommended.~~

~~There is a proposal to have~~ During the period between April and October, lighting located within the PRoW (Footpath 318) buffer zone will either be switched off (lighting columns 17, 18, 21, 22 and 23) or dimmed to 30% lumen output (lighting columns 19 and 20) to ensure the ecological limitations detailed in **Section 3.4** are achieved in line with the recommendations in ILP PLG08. Outside of these periods, during the winter months where bats are less active, this lighting will be operational during dusk and dawn utilising WSCC's standard dimming regime.

For further details of the Scheme's operational periods and comment on highway safety related to lighting, reference should be made to the Outline Lighting Management Scheme in **Appendix B**.



~~Returning this lighting to WSCC's standard dimming regime in the winter months where bats are less active would need to be undertaken in agreement with WSP's ecologists and consider the functionality of the council's lighting control system.~~

- Illuminated traffic signs will be installed as part of the scheme.

Table 4-1 – Details of proposed lighting

Area	Lighting class	Target lighting levels	Column height
<ul style="list-style-type: none"> ■ Fontwell Avenue Roundabout ■ New Road Central Roundabout 	Conflict area lighting class - C3	<ul style="list-style-type: none"> ■ Eav - 15 Lux ■ Uniformity – 0.4 	8m
<ul style="list-style-type: none"> ■ Approaches to Fontwell Avenue Roundabout ■ Approaches to New Road Central roundabouts ■ Lighting to be provided for approximately 69m in each direction in accordance with ILP, PLG 02 	<p>Traffic route lighting class - M4</p> <p>Equivalent to lighting class - C4</p>	<ul style="list-style-type: none"> ■ L - 0.75 Cd/m² ■ Uniformity 0.4 ■ Lane uniformity 0.6 ■ Threshold increment 15% ■ Surround lighting – 0.3 <p>Equivalent to -</p> <ul style="list-style-type: none"> ■ Eav - 10 Lux ■ Uniformity 0.4 	8m
<ul style="list-style-type: none"> ■ Barnham Road Roundabout 	Conflict area lighting class - C2	<ul style="list-style-type: none"> ■ Eav - 20 Lux ■ Uniformity – 0.4 	10m
<ul style="list-style-type: none"> ■ Approaches to Barnham Road roundabout ■ Lighting to be provided for approximately 69m in each direction in accordance with ILP, PLG 02 	<p>Traffic route lighting class - M3</p> <p>Equivalent to lighting class – C3</p>	<ul style="list-style-type: none"> ■ L – 1.0 Cd/m² ■ Uniformity 0.4 ■ Lane uniformity 0.6 ■ Threshold increment 15% ■ Surround lighting – 0.3 <p>Equivalent to -</p> <ul style="list-style-type: none"> ■ Eav - 15 Lux ■ Uniformity 0.4 	10m
<ul style="list-style-type: none"> ■ New Road Cycleway 	Subsidiary road lighting class - P4	<ul style="list-style-type: none"> ■ 5.0 Lux Eav ■ 1.0 Lux Emin 	6m
<ul style="list-style-type: none"> ■ PRow Pedestrian Crossing 	<p><u>Subsidiary road lighting class - P4</u></p> <p>Not to a defined standard</p>	<ul style="list-style-type: none"> ■ <u>5.0 Lux Eav</u> ■ <u>1.0 Lux Emin</u> <p>Not to a defined standard</p>	5m

Source – SSE Enterprise drawings SSE281768-1300-002-G, SSE281768-1300-003-E, SSE281768-1300-004-E, SSE281768-1300-005-E and SSE281768-1300-006-F.

Notes

1. Eav is the average horizontal illuminance, Emin is the minimum horizontal illuminance
2. L is the average road surface luminance
3. Uniformity is the ratio between minimum and average values

4. Threshold increment is the maximum percentage of contract increase needed to make an object visible as a consequence of disability glare.
5. Surround lighting is the ratio of lighting required for adjacent areas
6. Subsidiary road lighting classes are intended for pedestrian areas, footpaths and cycle tracks (BS 5489-1:2020, BSI 2020)

Proposed lighting near to the PRow (Footpath 318) has been identified as being a particular ecological concern due to the presence of light sensitive bats using the PRow. To maintain the connectivity across the new road for pedestrians an uncontrolled pedestrian crossing is proposed to be located near to the PRow. Lighting of the pedestrian crossing has been proposed to improve the safety of people using the crossing however light spilling from the crossing onto the PRow could deter bats using this route.

A buffer zone, 15m either side of the PRow has been established in liaison with WSP ecologists; lighting within this zone will not be operational while bats are actively using the route. The pedestrian crossing has been relocated to a distance where it can be lit and not spill light onto the PRow in excess of the limitations detailed in **Section 3.4**. Although lighting units are proposed to be installed within the buffer zone, these units will be switched off during periods when the PRow will be actively used by bats but provides the option to have operational lighting during the winter months when bats are less likely to be active. The timing of when this lighting will be switched on along with details of how this will be managed are detailed further in the Outline Lighting Management Scheme (Appendix B). ~~will need to be agreed with WSP ecologists as part of further development of the lighting proposals.~~

To put the lighting levels mentioned previously into context, the comparable examples detailed in **Table 4-2** can be used.

Table 4-2 – Typical lighting levels

Lighting condition	Lighting Level	Lighting condition	Lighting Level
Bright moonlight	1 Lux	Candle	1 Candelas
Subsidiary roads with medium traffic flow	10 Lux	100W incandescent lamp	80 Candelas
Parking area for large shopping centre	20 Lux	Car head lamp	15,000 Candelas
City centre / family living room	50 Lux		
School circulation halls	100 Lux		
Railway waiting room	200 Lux		
Office reception areas	300 Lux		
Overcast day	1,000 Lux		

5 LIGHTING ASSESSMENT

5.1 ANTICIPATED IMPACTS

The assessment of potential effects considers the site-specific sensitive areas described in **Section 3.3** and how these are impacted by the lighting proposals considering the lighting limitations defined in **Section 3.4** alongside the evaluation matrix outlined in **Table 3-7**. While the matrix has been used as a basis for the assessment, it is not prescriptive and professional judgement has been applied, where appropriate. It is recommended that these anticipated impacts are re-assessed once a detailed lighting design has been developed and assumptions regarding baseline conditions have been verified.

CONSTRUCTION

Adopting the principles outlined provides a methodology to ensure that lighting during construction does not cause a nuisance and is not obtrusive to the surrounding environment. If the guidance is implemented appropriately then the residual effects of construction lighting are likely to be negligible and short term.

OPERATION

The assessment for operational lighting is based on SSE Enterprise Street Lighting Layout Drawings, numbered SSE281768-1300-002-G, SSE281768-1300-003-E, SSE281768-1300-004-E, SSE281768-1300-005-E and SSE281768-1300-006-F.

In addition to the spill light contours shown on the Street Lighting Layout Drawings, the results for the calculated levels of light intrusion and luminous intensity are provided in **Appendix C** and summarised in **Table 5-1**.

Sky Glow

Sky glow is the illumination of the night sky by artificial lighting and is a concern for the South Downs National Park International Dark Sky Reserve located to the north of the Scheme. Limitations to control effects to sky glow consider the upward light ratio (ULR) of an installation and aim to limit the direct upward light emitted from luminaires.

Reflected light can also contribute to levels of sky glow but can be harder to control which is why lighting levels should be correctly specified in accordance with relevant guidance and standards and the design should aim to not exceed the specified levels.

Artificial light sources with a higher component of blue light, such as those with higher colour temperatures (Cool White $\geq 4000\text{K}$) can have a greater impact to levels of sky glow than light sources with a warmer appearance (colour temperatures $\leq 3000\text{K}$). The use of warmer colour temperatures has also been shown to have less of an effect to light sensitive ecology.

As described in **Section 4.1**, the operational lighting has been specified to be installed at 0° to the horizontal so that no light is emitted directly upward above the luminaire which equates to an ULR of 0% which adheres to the limitations for environmental zones E1 and E2.

The colour temperature of the specified light source is 3000K.

Lighting levels have been specified in accordance with BS5489-1:2013 and the proposed lighting levels are in keeping with the type and level of usage and existing ambient artificial lighting in the locality. Lighting will be provided in areas deemed necessary for the health, safety and wellbeing of users and these areas have been minimised to include lighting to the roundabouts and their approaches and a reduction in lighting between the roundabouts where only the cycleways are lit.

While there is a 2020 revision to BS5489, there are no anticipated changes needed to align the lighting design with this revised standard and therefore the lighting levels and anticipated impacts detailed will not significantly change should further lighting design development be needed.

~~It is however recommended that lighting levels are reviewed at the detailed design stage with a view to reducing these levels where appropriate to do so based on; detailed traffic flow data and the low ambient luminance and environmental zone of sections of the Scheme (such as Fontwell Avenue). It is also noted that the designs have been based on the 2013 version of BS5489 and should be reviewed against the 2020 amendments.~~

The proposed lighting measures should ensure that the Scheme's contribution to sky glow is minimal and does not adversely affect the SDNP International Dark Sky Reserve to the north. When considering views from the north towards the Scheme, there is likely to be existing views of sky glow from the road lighting installations within Barnham, Eastergate and Westergate to the south and against this backdrop the Scheme is anticipated to have a **negligible** contribution to sky glow.

The lighting proposals for the Scheme in terms of its contribution to sky glow in relation to the SDNP IDSR and the wider environment is again anticipated to have a **negligible effect**.

Light Intrusion and Luminaire Intensity

Light intrusion is light that falls beyond the boundary of the area being lit which has potential to cause nuisance to nearby residential properties. The luminous intensity of luminaires is the measure of how bright a luminaire appears in a given direction. Both the measurements for light intrusion and luminous intensity of the lighting installation have been calculated at residential properties adjacent to the Scheme. Existing and proposed vegetation and fencing can provide screening which can reduce or completely block the spread or visibility of lighting thereby reducing the effects of light intrusion and luminous intensity. While the calculations undertaken do not take account of this blocking effect, a professional judgement can be made where screening features exist as to their level of effectiveness.

The calculation for light intrusion and luminous intensity shows that in most instances the proposed lighting is well controlled and designed so that the limits for both pre-curfew and post-curfew are not exceeded. This is the case for the residential properties on Fontwell Avenue, Murrell Gardens, Chantry Mead and Ewens Gardens with calculated levels shown in **Appendix C** and summarised in **Table 5-1**.

~~Two~~ One property on the B2233 Barnham Road (Greenoaks ~~and Wentbridge~~) exceeds the limitations for ~~either light intrusion and/or~~ luminous intensity during post-curfew which is recommended by the ILP to be the period after 23:00.

WSCC standard dimming regime is to dim luminaires by 50% between 22:00 and 06:00. WSCC have a policy to dim lighting on traffic routes by 40% between midnight and 05:30 (GMT) and 01:00 and 06:30 (BST). During these dimmed periods, levels of obtrusive light will be reduced however, Greenoaks which will be located near to the proposed B2233 Barnham Road roundabout and will still experience levels of luminous intensity in excess of the ILP post-curfew limitations. The properties on the B2233 Barnham Road are located within an area that is currently lit and it is likely that existing levels of luminaire intensity are in excess of the ILP limitations and will be relatively comparable if not worse when compared to ~~with~~ the calculated levels for the proposed lighting. An indication of the existing levels of obtrusive light are provided in **Appendix C**.

With regards to Greenoaks it is unlikely that existing vegetation or fencing in front of the property will provide screening from ~~light intrusion or~~ luminous intensity however considering the likely extents of existing obtrusive light in the locality, the proposed lighting installation is envisaged to be at worst comparable if not an improvement to the baseline conditions. While luminaire shields or louvres can reduce levels of obtrusive light, they are not recommended in this area unless it can be proved that their application is not detrimental to the lighting levels on the road, but may benefit from additional luminaire shields and louvres being installed for the lighting on the proposed roundabout.

Table 5-1 – Assessment Table

Viewpoint number / Receptor description	Baseline conditions	Predicted impacts
<p>A1, A2 and L1</p> <p>Views from residential properties on Fontwell Avenue</p>	<p>No exiting lit views and the area will appear dark with minimal ambient artificial lighting. The density of screening at each property varies, some have no existing screening while others will have views obscured by dense mainly deciduous vegetation.</p>	<ol style="list-style-type: none"> 1. Proposed lighting is within ILP obtrusive light limits. 2. Existing views will change from a dark to a lit night-time scene with the introduction of the roundabout and approach lighting. 3. Existing deciduous screening to the front of some properties exists but this will become less effective at shielding the proposed lighting during autumn and winter months. <p>It is anticipated that there will be a moderate adverse effect (Noticeable increase in visibility of the site mainly due to the introduction of new lighting within an existing dark area)</p>
<p>A2</p> <p>Views from the rear of Fontwell Avenue properties looking east</p>	<p>Existing dark views with no ambient artificial lighting. Distant views likely to be obscured by dense deciduous vegetation from large wooded areas and orchards.</p>	<ol style="list-style-type: none"> 1. Within ILP obtrusive light limits. 2. No existing views of lighting and retained vegetation will continue to screen the majority of views of proposed lighting.

Viewpoint number / Receptor description	Baseline conditions	Predicted impacts
		It is anticipated that there will be a minor adverse effect (slight increase in visibility of the site)
<p>A3</p> <p>Views looking south-west from residential properties at the A29 Fontwell Avenue junction with Eastergate Lane</p>	Existing views of a single streetlight located at the junction with onward views of dark landscape. There is a mixture of heavily screened properties and properties with minimal to no screening.	<ol style="list-style-type: none"> 1. Within ILP obtrusive light limits 2. Existing views of street lighting and proposed lighting will be installed approximately 30m from the junction. 3. Where views are not obscured by existing vegetation, distant views of dark landscape will change to a lit environment. <p>It is anticipated that there will be a minor adverse effect (slight increase in visibility of the site)</p>
<p>A4</p> <p>Users of PRoW (footpath 318)</p> <p>A5</p> <p>Views from residential properties on Stoneyfield cottages off Eastergate Lane</p>	Located within an area with no immediate artificial lighting and will appear dark, onwards views heavily screened by deciduous vegetation with only intermittent views of distant lighting.	<ol style="list-style-type: none"> 1. Within ILP obtrusive light limits 2. Likely to only have intermittent views of proposed lighting through existing vegetation. <p>It is anticipated that there will be none / negligible effects (No significant effects or overall effect balancing out)</p>
<p>L5</p> <p>Views from residential properties on Downview Road</p>	No existing lit views and the area will appear dark with none to minimal ambient artificial lighting. Potential for only minor intermittent views of artificial lighting with Fordingbridge Industrial Estate and road lighting on the B2233 Barnham Road.	<ol style="list-style-type: none"> 1. Within ILP obtrusive light limits. 2. Existing views of dark landscape. 3. Proposed lighting to be installed in excess of 100m from the properties. 4. Relatively low mounting height lighting columns, 6m in height, might be visible but will be mainly screened by the noise barrier. <p>It is anticipated that there will be a minor adverse effect (slight increase in visibility of the site)</p>

Viewpoint number / Receptor description	Baseline conditions	Predicted impacts
<p>L6</p> <p>Views from residential properties on Murrell Gardens</p>	<p>There is no immediate street lighting and the viewpoint will appear dark. Although unlikely to be visible during the day, due to the dense deciduous vegetation surrounding the Fordingbridge Industrial Estate to the west, intermittent views of floodlighting visible within the estate could be visible during the evening and winter months when vegetation has died back. The streetlighting on Barnham Road is likely to be visible towards the south.</p>	<ol style="list-style-type: none"> 1. Within ILP obtrusive light limits. 2. Potential intermittent views of existing lighting in the direction of the Scheme. 3. Lighting columns of 10m in height likely to be visible above noise barrier. <p>It is anticipated that there will be a minor adverse effect (slight increase in visibility of the site)</p>
<p>L7</p> <p>Views from residential properties on Barnham Road</p>	<p>Existing street lit area with likely high levels of lighting contributing to light intrusion and luminous intensity at residential properties. Density of screening varies; views of existing lit scene likely.</p>	<ol style="list-style-type: none"> 1. Exceeds ILP obtrusive light limits. 2. Views of artificial lighting will be retained, existing level of obtrusive light likely to be reduced. <p>It is anticipated that there will be a minor beneficial effect (slight improvement in night environment and/or reductions in glare, spill light and sky glow).</p>
<p>L8</p> <p>Views from the rear of residential properties on B2233 Barnham Road near to PRow</p>	<p>Artificial lighting is not present, and the area will appear dark. There is dense deciduous vegetation screening however some intermittent views of lighting may exist.</p>	<ol style="list-style-type: none"> 1. Within ILP obtrusive light limits. 2. Heavily screened but may have intermittent views of existing lighting. 3. Distant intermittent views of lighting columns 6m in height could be visible. <p>It is anticipated that there will be none / negligible effects (No significant effects or overall effect balancing out).</p>

There are planned future residential developments to the south of the Barnham Road roundabout and to the south of the realigned A29 central roundabout. These developments do not form part of this application but could be impacted by obtrusive light from the Scheme if the lighting is not suitably controlled. The layout of the residential dwellings has not been finalised, or details in relation to the retained and created ecological habitats. Measures to reduce light spill, luminous intensity and sky glow to the receptors identified as part of this assessment will conversely benefit

both future developments and it is not anticipated that the lighting proposed on the Scheme will significantly impact these future developments.

It is recommended that the location of residential properties and sensitive habitat is planned considering the spill light emanating from the Scheme and where appropriate, landscaping features should be considered. As the location of any future human or ecological receptors is unknown, the application of luminaire shields or louvres would be inappropriate, but these can be retrospectively applied if deemed necessary in consultation with SSE / WSCC.

ECOLOGY

A combination of calculated vertical lighting levels (as shown in **Appendix C**) and light spill contours shown on the SSE Enterprise Street Lighting Layout Drawings have been used for the assessment.

Lighting in the vicinity of the PRow, which is identified as a bat foraging route, will be controlled during the active bat season (April to October) so that levels of spill light are within the limitations detailed in **Section 3.4**.

~~Lighting equipment is proposed to be located within the PRow (Footpath 318) buffer zone; it is proposed to have this equipment switched off and this assessment is based on this being the case for lighting columns 17, 18, 21, 22 and 23 along with lighting columns located either side of the PRow pedestrian crossing (columns 19 and 20) being dimmed to 30% lumen output. The periods when this lighting can be operational, such as times when sensitive ecology will be less active must be discussed and agreed with WSP ecologists.~~

Further ecological receptors are located within existing dark areas and are likely to experience an increase in lighting levels as a result of the scheme. Measures have been taken to limit the increase to lighting levels so that these are within recognised tolerances to not be detrimental to sensitive fauna. An overall assessment of the effects of lighting on sensitive fauna will be undertaken as part of the ecology assessment.

6 SUMMARY

A lighting assessment has been prepared in support of the proposals to provide road lighting to the proposed A29 Realigned linking the A29 Fontwell Avenue to the B2233 Barnham Road. A summary of the likely significant effects of artificial lighting is provided in **Table 5-1**.

A desktop study has been undertaken to ascertain the baseline lighting conditions on the Site and in the immediate surrounding area. The area is located on the outskirts of the towns of Eastergate and Barnham and is mainly rural in nature. There is a mixture of areas of low ambient lighting alongside existing road lighting such as that on the B2233 Barnham Road. The general area is indicative of an E2 Environmental Zone ('low district brightness').

New road lighting is proposed at each of the three proposed roundabouts and along the cycleway linking the two existing roads. Proposed lighting has been carefully designed to limit to impact on existing residents, sensitive ecology and the South Downs National Park International Dark Sky Reserve which is located approximately 1.4k to the north of the Scheme.

Levels of obtrusive light including sky glow, light intrusion and luminous intensity either meet the requirements of the ILP Guidance Notes for the Reduction of Obtrusive Light (ILP, 2020) or are likely to show a decrease in existing levels of obtrusive light. Residents on the B2233 Barnham Road will likely see a **minor beneficial effect** from improvements to the lighting in this area.

Other existing residential areas such as Chantry Mead, Downview Road, Ewens Gardens and Murrell Gardens are likely to see a slight increase in the visibility of the site resulting in **minor adverse effects**.

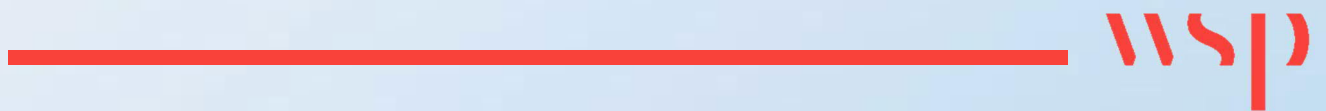
It is predicted that there will be a noticeable increase in the visibility of the scheme for some residents located near to the proposed A29 Fontwell Avenue roundabout leading to a **moderate adverse effect**.

Lighting onto sensitive fauna is likely to show a minor increase but will be within recognised tolerances to not be detrimental as long as lighting near to the PRoW (footpath 318) is will not be in operation while sensitive fauna is actively using the PRoW.

As the Scheme progresses to detailed design, where changes are made to the lighting calculations designs, these should be carried out along with further reassessed assessment of anticipated effects to ensure that lighting limitations are not exceeded and the environmental principles detailed in this report are implemented, so that long term environmental lighting impacts are minimised.

Appendix A

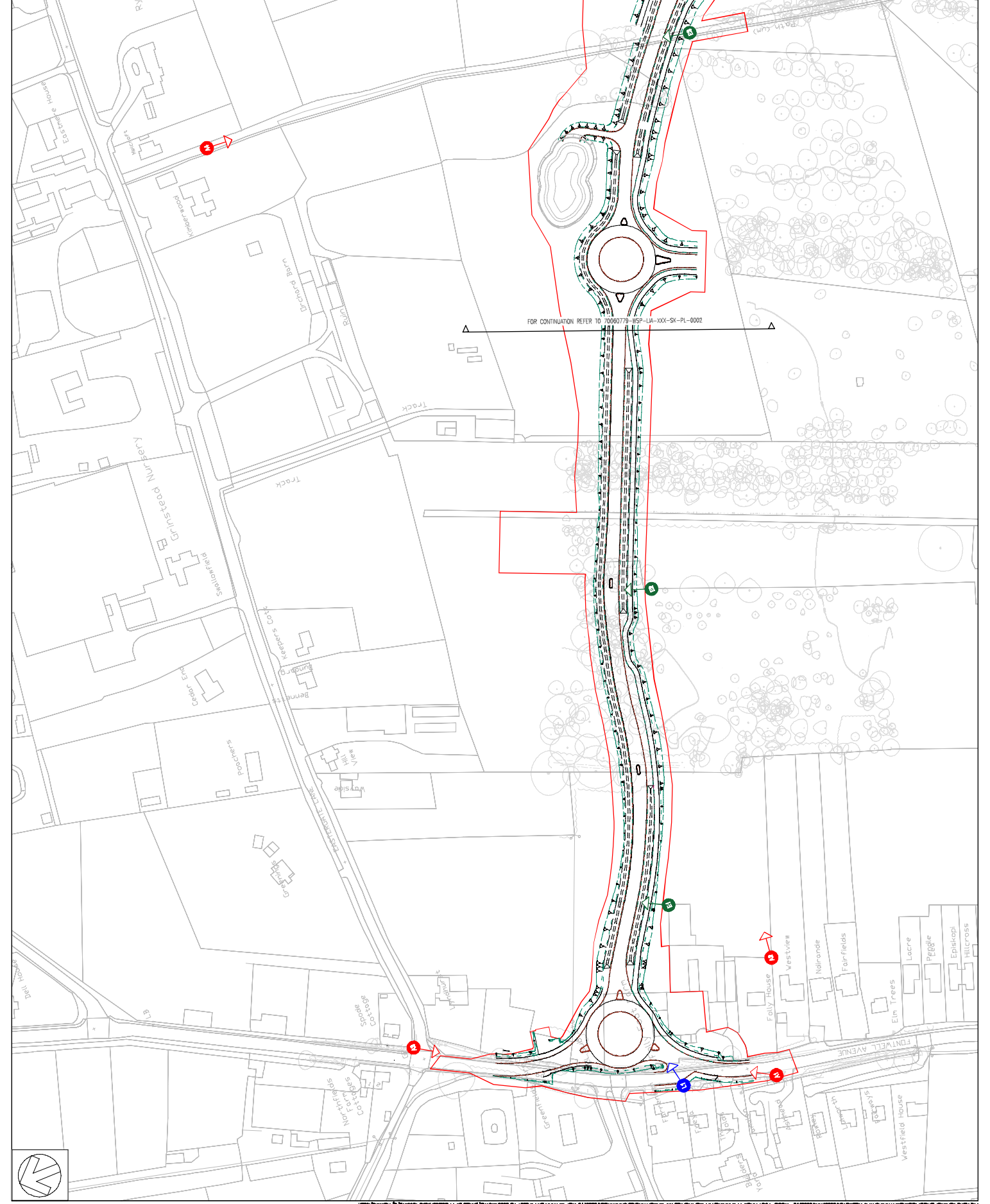
VIEWPOINT PLANS



DO NOT SCALE

NOTES:

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2. DO NOT SCALE. IF IN DOUBT CONTACT WSP UK
3. NUMBERING OF LIGHTING VIEWPOINTS TO SUPPORT LANDSCAPE AND VISUAL ASSESSMENT (LVA) ARE NOT SEQUENTIAL AND CORRESPOND TO NUMBERING USED WITHIN THE LVA.



FOR CONTINUATION REFER TO 70060779-WSP-LIA-100-SK-PL-0002

REV	DATE	BY	CHK	APP	DESCRIPTION
01	14/10/2024	DA	FR	FR	ISSUED FOR REVIEW
02	16/10/2024	DA	FR	FR	FOR REVIEW
03	16/10/2024	DA	FR	FR	FOR APPROVAL

S3 - FOR REVIEW

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WEST SUSSEX COUNTY COUNCIL

ASB REALIGNMENT

**LIGHTING ASSESSMENT
VIEWPOINT RECEPTOR LOCATION PLAN**

SHEET 1 OF 3

PROJECT NO	70060779-WSP-LIA-100-SK-PL-0001
DATE	14/10/2024
SCALE	1:1000
PROJECT NAME	ASB REALIGNMENT
CLIENT	WEST SUSSEX COUNTY COUNCIL
DESIGNER	WSP
CHECKED BY	FR
APPROVED BY	FR

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- DO NOT SCALE. IF IN DOUBT CONTACT WSP UK
- NUMBERING OF LIGHTING VIEWPOINTS TO SUPPORT LANDSCAPE AND VISUAL ASSESSMENT (LVA) ARE NOT SEQUENTIAL AND CORRESPOND TO NUMBERING USED WITH THE LVA.

LIGHTING VIEWPOINT. ARROW INDICATES DIRECTION OF SURVEY / DESKTOP ASSESSMENT
 LIGHTING VIEWPOINT (TO SUPPORT LVA). ARROW INDICATES DIRECTION OF SURVEY / DESKTOP ASSESSMENT
 LIGHTING VIEWPOINT (TO SUPPORT ECOLOGY ASSESSMENT). ARROW INDICATES DIRECTION OF SURVEY / DESKTOP ASSESSMENT
 RED LINE SCHEME BOUNDARY

REV	DATE	BY	CHK	APP
01	14/10/2023	AMENDED DD JAE & HIRSHAW JARROLD	AE	PR
02	10/06/2023	FOR REVIEW	AE	PR
03	01/06/2023	FOR APPROVAL	AE	PR

DATE: 14/10/2023
 DRAWN: JAE
 CHECKED: HIRSHAW
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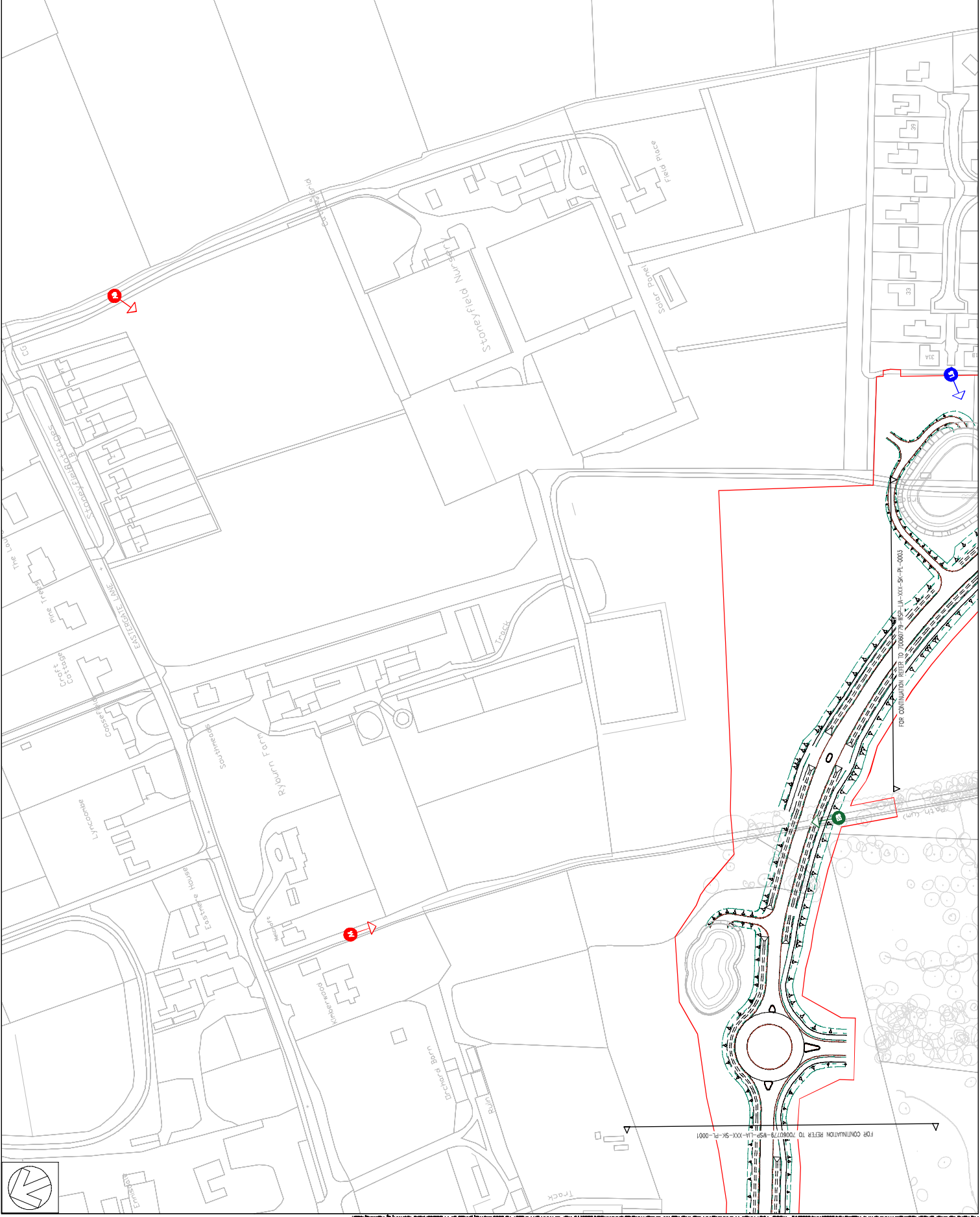
WEST SUSSEX COUNTY COUNCIL

ADJ REALIGNMENT

LIGHTING ASSESSMENT
 VIEWPOINT / RECEPTOR LOCATION PLAN
 SHEET 2 OF 3

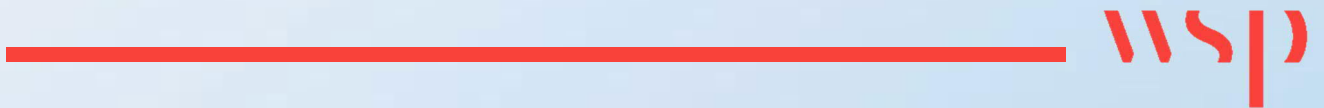
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Appendix B

OUTLINE LIGHTING MANAGEMENT SCHEME





West Sussex County Council

A29 PHASE 1

Outline Lighting Management Scheme





West Sussex County Council

A29 PHASE 1

Outline Lighting Management Scheme

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70079718

OUR REF. NO. 70079718-WSP-A29-XX-RP-LI-0001

DATE: APRIL 2021

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
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Signature	 North, Jo (UKJFN001) <small>Digitally signed by North, Jo (UKJFN001) DN: cn=North, Jo (UKJFN001), ou=Active, email=Joanne.North@wsp.com Reason: Authorised Date: 2021.04.29 14:35:00 +01'00'</small>			
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Report number	70079718-WSP-A29-XX-RP-LI-0001			
File reference	70079718-WSP-A29-XX-RP-LI-0001			

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ECOLOGY LIGHTING GUIDANCE

APPENDIX B

WSSC / SSE LIGHTING PLANS

1

INTRODUCTION



1 INTRODUCTION

1.1 PURPOSE

This Outline Lighting Management Scheme (LMS) has been prepared in support of the A29 Realignment and the provision of road lighting. This plan details specific environmental sensitivities that will be affected by the road lighting and measures to be implemented to mitigate these effects. This document should be read alongside A29 Phase 1, Lighting Assessment Report, 70079718-WSP-A29-XX-RP-LI-0001 (**Appendix 10.2 of the Revised ES**)

Relevant information pertinent to and appended to this LMS:

- A29 Realignment – Ecology lighting guidance is provided in **Appendix A** of this LMS.
- Street Lighting Layout Drawings, SSE281768-1300-002-G, SSE281768-1300-003-E, SSE281768-1300-004-E, SSE281768-1300-005-E and SSE281768-1300-006-F provided in **Appendix B**.

In preparing the LMS, reference is made to the Institution of Lighting Professionals (ILP), Guidance Note 01/20 Guidance Notes for the Reduction of Obtrusive Light (GN01) (ILP, 2020), Bat Guidance Note 08/18 Bats and artificial lighting in the UK (ILP, 2018).

The LMS considers that the lighting proposals detailed on drawings SSE281768-1300-002 to SSE281768-1300-006 along with any further requirements of the LMS, are to be fully adopted and that any deviation will require the reassessment of effects from a competent environmental specialist.

1.2 SENSITIVITIES

The sensitivities identified and covered within the LMS:

- Existing residential properties.
- Public right of way (PRoW) bisecting the Site considered important for foraging and commuting Barbastelle bats, which are particularly sensitive to artificial lighting.
- South Downs National Park.

1.3 LIMITATIONS

The LMS does not cover temporary artificial lighting provided for construction activities.

The limitations imposed on exterior lighting for Environmental Zone E2 (Rural / Low District Brightness) are as follows (from GN01).

Where a curfew is included, this refers to the time after which stricter requirements for the control of obtrusive light will apply, as stipulated by the local planning authority. If not otherwise stated, 23:00 to 05:00 hours are suggested.

Table 1-1 – Obtrusive light limitations for E2 zone

Sky Glow ULR (Max %)	Light intrusion (into windows) Ev (lux)	
	Pre-curfew	Post-curfew
2.5	5.0	1.0

GN01 (ILP, 2020)

Notes

1. Upward Light Ratio (ULR) is the maximum permitted percentage of luminaire flux that goes directly into the sky.
2. Ev = vertical illuminance in lux, measured flat on the glazing at the centre of the window.

Table 1-2 – Limits for luminous intensity for E2 zone

	Luminaire projected area Ap in m ²					
	0<Ap≤0.00 2	0.002<Ap≤ 0.01	0.01<Ap≤0 .03	0.03<Ap≤0 .13	0.13<Ap≤0 .5	Ap>0.5
Pre-curfew (maximum cd)	0.57 d	1.3 d	2.5 d	5.0 d	10 d	7,500
Post-curfew (maximum cd)	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	500
Aid to gauging Ap	2 to 5cm	5 to 10cm	10 to 20cm	20 to 40cm	40 to 80cm	>80cm
Geometric mean of diameter (cm)	3.2cm	7.1cm	14.1cm	26.3cm	56.6cm	>80cm
Corresponding Ap representative area (m ²)	0.0008	0.004	0.016	0.063	0.251	>0.5

GN01 (ILP, 2020)

Notes

1. d is the distance between the observer and the luminaire in metres.
2. Ap is the apparent surface of the light source seen from the observer position
3. Cd = Candela

The ILP Bat Guidance Note 08/18 Bats and artificial lighting in the UK (ILP, 2018) suggests limitations to the amount of spill light onto sensitive features **being 0.2 lux on the horizontal plane** (e.g. at ground level) and **0.4 lux on the vertical plane** (e.g. along the sides of hedgerow or treelines, calculated at an equivalent bat flying height).

2 LIGHTING PROPOSALS

2.1 DESCRIPTION OF PROPOSED LIGHTING

Lighting proposals have been developed by SSE Enterprise with due consideration to identified sensitivities, in liaison with the scheme’s ecologist with mitigation measures incorporated within the lighting design.

Road lighting will be provided at the three new roundabouts on Fontwell Avenue, Barnham Road and New Road / Central Roundabout including lighting to the approaches. The extents of the approach lighting to each roundabout varies between circa. 50m and circa. 80m to account for environmental sensitivities or complex road layouts but aims to meet industry best practice by providing five seconds of lighting at the given road speed (67m at 30mph).

The sections of new road between each roundabout will not be lit, instead the cycleway adjacent to the road will be lit with lower mounting heights and lighting levels appropriate for non-motorised users. The PRoW intersects with the new road and to aid pedestrian movement a crossing, shown in **Figures 3-1** and **3-2**, is provided. To highlight the presence of pedestrians waiting or using the crossing, artificial lighting is proposed.

New road and pedestrian lighting to be designed to standards:

- BS 5489-1:2020 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas (BSI, 2012)
- BS EN 13201 (all parts) Road lighting (BSI, 2014-2015)
- Lighting of Developer Promoted Highway Schemes in West Sussex (West Sussex County Council, 2019)
- Institution of Lighting Professionals Professional Lighting Guide PLG 02, The application of conflict areas on the highway. (PLG 02) (ILP, 2013)

The lighting proposals detailed on drawings SSE281768-1300-002-G, SSE281768-1300-003-E, SSE281768-1300-004-E, SSE281768-1300-005-E and SSE281768-1300-006-F as shown in **Appendix B** and lighting levels detailed in **Table 2-1** will be adopted, in accordance with BS 5489-1:2020, based in-part on anticipated traffic flow figures.

Table 2-1 – Lighting levels

Road	Traffic Flow (AADT) Traffic Flow	Lighting Class	Maximum luminaire mounting heights
Fontwell Avenue	7,000 - 40,000	M4	8m
Fontwell Avenue Roundabout	7,000 - 40,000	C3	8m
New Road	7,000 - 40,000	M4	8m

Road	Traffic Flow (AADT) Traffic Flow	Lighting Class	Maximum luminaire mounting heights
New Road Roundabout	7,000 - 40,000	C3	8m
New Road Cycleway	Low Usage	P4	6m
PRoW Pedestrian Crossing	Low Usage	P4	5m
Barnham Road	7,000 - 40,000	M3	10m
Barnham Road Roundabout	7,000 - 40,000	C2	10m

Notes

1. Lighting classes to be reduced during the periods shown in Table 1-4 – Dimming Regime.
2. Lighting Classes have been defined by SSE Enterprise as detailed on SSE281768-1300-002-G, SSE281768-1300-003-E, SSE281768-1300-004-E, SSE281768-1300-005-E and SSE281768-1300-006-F.
3. Associated lighting levels are detailed within A29 Phase 1, Lighting Assessment Report, 70079718-WSP-A29-XX-RP-LI-0001, and BS EN 13201.

The following mitigation measures are intended to formalise the approach to the proposed road and pedestrian lighting and will be adopted as part of the operational requirements of the Scheme.

2.2 GENERAL PRINCIPLES

Each luminaire must be installed at 0° to the horizontal so that no light is emitted directly above the luminaires.

Each luminaire to be specified with a colour temperature of 3000K to minimise the blue-light component of the light source to reduce the impact on fauna populations and contribution to sky glow.

A system of control and operation will be implemented that allows; dimming of lighting to a lower level during periods of low use or switch-off. Each luminaire to be installed with external node and controlled via the Mayflower Central Management System. The system is to allow individual luminaires to be switched or dimmed in line with the requirements set out in the LMS.

While it is not envisaged shield and baffles will be required, where levels of obtrusive light cannot be limited through good design, these should be considered; however their application should be agreed with WSCC and SSE to ensure carriageway lighting levels are not compromised.

Lighting will switch on at dusk (35 lux) and off at dawn (18 Lux); the times at which lighting is operational will vary throughout the year however when switched-on the dimming regime detailed within **Table 2-2** is to apply to all luminaires other than during the periods identified in **Table 3-1**.

Table 2-2 – Dimming Regime

Dimming Regime	Total lumen output of luminaires dimmed to %								
	Switch-on	20:00	21:30	22:00	00:00	05:00	05:30	06:00	Switch-off
D50 – All night	100%	75%	75%	50%	50%	50%	50%	100%	0%

3 SPECIFIC MITIGATION

To mitigate against the impact to bats foraging and commuting along the ProW crossing the new road, as recommended within the Ecology lighting guidance provided in **Appendix A**, and considering the active bat season is between April and October, the following proposals are to be incorporated within the operational lighting requirements of the Scheme.

Table 3-1 – Specific bat mitigation

Lighting Column	April to October	November to March
17, 18, 21, 22, 23	Switched-off	Standard operational profile - refer to Table 2-2
19 & 20	Total lumen output of luminaires dimmed to 30%	Standard operational profile - refer to Table 2-2
All other lighting columns	Standard operational profile - refer to Table 2-2	Standard operational profile - refer to Table 2-2

Figures 3-1 and **3-2** provide a visual representation of the effects of utilising the dimming and luminaire switch-off requirements of **Table 3-1**. This mitigation will reduce spill light onto the bat corridor to levels below that recommended within the ILP Bat Guidance Note 08/18 Bats and artificial lighting in the UK (ILP, 2018).

Figure 3-1 – Light spill (April – October)

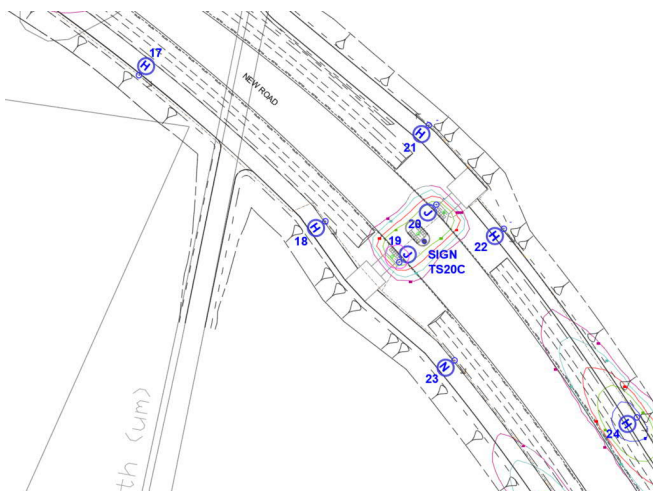


Figure 3-2 – Light spill (November – March)



3.1 MONITORING REQUIREMENTS

WSCC will monitor the effectiveness of lighting mitigation measures for the Scheme. Monitoring will consist of surveys that will involve the measurement of artificial lighting levels following the baseline assessment methodology detailed in ILP Professional Lighting Guide 04, Guidance on Undertaking Environmental Lighting Impact Assessments (PLG04) (ILP, 2013) with measurements compared against the limitations set within the LMS. Improvements will be carried out where necessary and practicable to do so, along with periodic maintenance and inspections.

3.2 TRAFFIC SAFETY

The following commentary on traffic safety has been developed alongside and agreed with the Scheme designer's SSE and Jacksons.

Road lighting has been designed so that it is appropriate for the estimated usage of the Scheme. Where significant flows of motorised traffic intersect, i.e. at the roundabouts, road lighting is applied, however due to environmental considerations previously detailed, the carriageways between the roundabouts are predominately unlit with the exception of small sections of carriageway approaching the roundabouts.

*The cycleways adjacent to the unlit carriageways are however lit in order to encourage the use of the cycleway. During normal operation, the cycleways are lit in their entirety in accordance with WSCC's specification to ensure that any hazards or obstacles on the route are easily identifiable. Due to the environmental sensitives of the PRow as a bat commuting / foraging corridor, lighting along the cycleway near to the PRow will be switched-off during the periods detailed in **Table 3-1** leaving an area of circa. 110m of unlit cycleway. While the cycleway is not lit, the uncontrolled crossing linking the PRow will be lit and during these periods the lighting levels provided will be dimmed to a level outlined in BS5489-1. The periods where the lighting is switched off or dimmed will be during a period (April and October) where the sunset times are generally later in the evening coinciding with anticipated lower non-motorised user activity. Although there will be a section of unlit cycleway, as the usage is anticipated to be low and adjacent vegetation will be kept low as to provide good forward visibility, it is not anticipated that the unlit section of cycleway will present a significant risk to users.*

*During the winter months where sunset times are much earlier in the evening and usage is anticipated to be greater, lighting along the cycleway and uncontrolled crossing will be operational but aligned with dimming profile detailed within **Table 2-1**.*

The lighting will be controlled by WSCC's Central Management System (CMS), a system that not only controls dimming but reports faults.

It is recommended that the lighting proposals are reviewed as part of the Scheme's full safety audit and further safety features, such as advanced warning signs and routine vegetation clearance, are implemented.

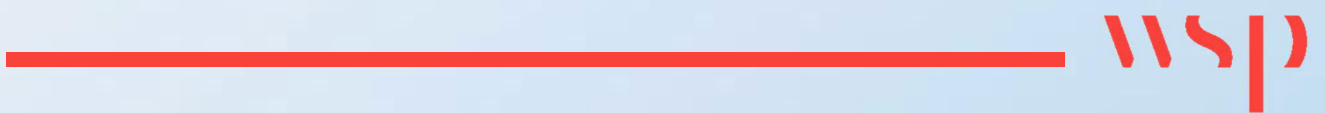
4 REFERENCES

The following documents are referenced within the LMS.

- A29 Phase 1, Lighting Assessment Report, 70079718-WSP-A29-XX-RP-LI-0001 P04 (WSP, March 2021)
- A29 Realignment – Lighting Guidance Ecology (WSP, March 2021)
- Street Lighting Layout Drawings, SSE281768-1300-002-G, SSE281768-1300-003-E, SSE281768-1300-004-E, SSE281768-1300-005-E and SSE281768-1300-006-F
- Institution of Lighting Professionals, Guidance Note 01/20 Guidance Notes for the Reduction of Obtrusive Light (GN01) (ILP, 2020)
- Institution of Lighting Professionals, Bat Guidance Note 08/18 Bats and artificial lighting in the UK (ILP, 2018).
- BS 5489-1:2020 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas (BSI, 2012)
- BS EN 13201 (all parts) Road lighting (BSI, 2014-2015)
- Lighting of Developer Promoted Highway Schemes in West Sussex (West Sussex County Council, 2019)
- Institution of Lighting Professionals, Professional Lighting Guide PLG 02, The application of conflict areas on the highway. (PLG 02) (ILP, 2013)
- Institution of Lighting Professionals, Professional Lighting Guide 04, Guidance on Undertaking Environmental Lighting Impact Assessments (PLG04) (ILP, 2013)

Appendix A

ECOLOGY LIGHTING GUIDANCE





TECHNICAL NOTE 1

DATE:	17 March 2021	CONFIDENTIALITY:	Public
SUBJECT:	A29 Realignment – Ecology Lighting guidance		
PROJECT:	70079718	AUTHOR:	Verity Dickie
CHECKED:	Owen Peat	APPROVED:	Jo North

BACKGROUND

WSP undertook a suite of ecological surveys in 2019 to support the Ecology and Nature Conservation Chapter of the Environmental Statement (ES) and planning application for the A29 (Phase 1) realignment project. Surveys undertaken included bat activity surveys whereby four static bat detectors were deployed on a monthly basis from April – October at specific locations across the Site.

The surveys identified at least eight species across the Site, with common and soprano pipistrelle *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus* which are widespread and common bat species^{1,2} accounting for over 75% of all bat activity recorded. The remaining recordings were made by a range of species, including the rarer greater horseshoe bat *Rhinolophus ferrumequinum*, Barbastelle bat *Barbastella barbastellus* and Leisler's bat *Nyctalus leisleri*. Other species recorded included noctule *Nyctalus noctule*, serotine *Eptesicus serotinus* and Nathusius' pipistrelle *Pipistrellus nathusii*. other genus, that could not be identified to species level included *Plecotus* sp. and *Myotis* sp.

One detector was located along the public right of way (PRoW) that bisects the Site and was considered to be an important foraging / commuting passage for Barbastelle bats, a species which are particularly sensitive to artificial lighting and are considered to be up to district level importance. As such through liaison with SSE who prepared the lighting design, as well as WSP lighting specialists who prepared the lighting strategy to support the ES, lighting was reduced as much as possible through careful design along the route of this PRoW.

Adaptations that were made at the detailed design stage to ensure that reduced lighting levels could be incorporated into the lighting design included moving the central roundabout 100m west to avoid light spill along the PRoW. Additionally, designs were also adapted to move a pedestrian crossing (which must be lit for safety purposes) by 21m to the east to avoid light spill onto the PRoW and therefore there will be a dark corridor, 15m either side of the PRoW. Whilst this corridor will be as dark as possible, it is noted in the lighting strategy that it is not always possible to completely remove levels of spill light onto nearby sensitive features near to artificial lighting installations as low levels of spill light can be present at significant distances from the installation.

The ES set out that an appropriate lighting strategy will be created for the Scheme, informed by current best practice guidance with regards to bats and lighting (ILP, 2018³). In particular, the lighting strategy will require that new permanent lighting is the minimum required and will avoid light spill directly onto retained and newly created ecological features (e.g. hedgerows and woodland) within the Scheme. Warm white LEDs will be used, and hoods and louvres will be used to prevent backwards, upwards or other light spill. The lighting strategy will also detail the careful timing of when the lighting will be operational to reduce the

¹ Bat Conservation Trust (2017a). National Bat Monitoring Programme Population Trends | The state of the UK's bats 2017.

² Bat Conservation Trust (2017b). National Bat Monitoring | Annual report 2017.

³ Institute of Lighting Professionals (2018) Guidance Note 08/18: Bats and artificial lighting in the UK. Bat Conservation Trust, London.

TECHNICAL NOTE 1

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light spill further. This will be achieved through the use of Mayflower lighting in which it is possible to establish a site-specific switching regime, whereby each lighting unit fitted with a Mayflower external node can be controlled individually and set to dim at any time of day during operation. By using this control, it will be possible to reduce the lighting at the times when bats are active.

Following receipt of a Regulation 25 request, further information has been provided on the mechanism that will be put in place to ensure that the lighting is dimmed / turned-off at appropriate times to meet commitments made within the ES chapter. This technical note provides further information on the lighting reductions in the most ecologically sensitive areas and forms an appendix to the Outline Lighting Management Scheme.

GUIDANCE ON LIGHTING REDUCTION

Following a review of the static bat data that was collected between April to October 2019, the timing in which barbastelle calls were recorded in relation to sunset / sunrise times was analysed, with a breakdown of each month provided in Table 1 below.

Month	Approximate Sunset / Sunrise range	Earliest barbastelle bat call	Latest barbastelle bat call
April	19:35 – 20:20 / 06:35 – 05:35	21:28pm	02:56am
May	20:20 – 21:05 / 05:35 – 04:55	22:07pm	03:20am
June	21:05 – 21:20 / 04:50 – 04:55	22:23pm	02:49am
July	21:20 – 20:50 / 04:55 – 05:30	22:39pm	00:44am
August	20:45 – 19:50 / 05:30 – 06:15	21:21pm	04:24am
September	19:45 – 18:40 / 06:15 – 07:00	21:03pm	01:59am
October	18:40 – 17:40 / 07:05 – 07:50	19:31pm	19:31pm

In all months, with the exception of August and October, all barbastelle calls were at least one hour after the latest sunset time in the month. In all months, the latest calls recorded were all at least one hour prior the earliest sunrise time in each month.

For August, the earliest call at 21:21pm was on the 19th August, when sunset is approximately 20:15pm, as such this call was approximately an hour after sunset. Similarly, in October, the single call recorded at 19:31pm was on the 11th October, when sunset is approximately 18:20pm, and therefore this call was over an hour after sunset.

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Barbastelle are typically later emerging species (Table 3.3 - Collins (ed.) 2016) with the data collected during the bat activity surveys correlating with this. In general, bats are typically active from April until October. Between November and March, they are either in a state of torpor or hibernating, although in March, they will start to feed on warmer nights (Figure 3.1 Collins (ed.) 2016).

As shown in Appendix B, the lighting design (inset drawing ref SSE281768-1300-004) details that in the immediate vicinity of the footpath, lighting columns 17, 18, 21, 22 and 23 will be set to 0% lumen output and lighting units 19 and 20 will be set to 30% lumen output significantly reducing the light spill in the location of the existing footpath. This reduction should be in place during the bat active season (April to October), but during the winter, these lights can be turned on if required for safety reasons.

As standard on WSCC schemes, lighting is dimmed by 40% on all 'all night' lighting from midnight which will benefit a range of protected nocturnal species including bats and badgers. For the A29 scheme, it is understood that this dimming regime will be increased and extended, with lighting dimmed to 75% at 20:00, and then to 50% from 22:00 until 06:00 therefore providing additional benefit to protected species.

CONCLUSION

Providing the guidance set out above is adhered to, as set out in the ES, overall there is anticipated to be a negligible adverse effect on foraging and commuting bats during the operational phase of the Scheme. This is due to the measures that have been taken to reduce the lighting levels in the most sensitive areas for bats, whilst also recognising that overall there will be a permanent increase in the levels of artificial lighting across the Scheme.

Appendix B

WSCC / SSE LIGHTING PLANS





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Appendix C

OBTRUSIVE LIGHT VALUES

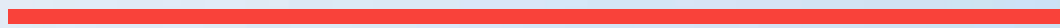


Table B-1 – Light intrusion and luminous intensity calculation (Proposed lighting)

Location	Calculation	Maximum Result Pre-curfew		Maximum Result Post-curfew	
		Value	Pass/Fail	Value	Pass/Fail
A29 – Lyndhurst	Luminous Intensity	25 candelas	Pass	13 candelas	Pass
	Light Intrusion	0.0 lux	Pass	0.0 lux	Pass
A29 - Greenfields	Luminous Intensity	185 candelas	Pass	92 candelas	Pass
	Light Intrusion	0.2 lux	Pass	0.1 lux	Pass
A29 - Farrenden	Luminous Intensity	410 candelas	Pass	205 candelas	Pass
	Light Intrusion	0.6 lux	Pass	0.3 lux	Pass
A29 - Freya	Luminous Intensity	160 candelas	Pass	80 candelas	Pass
	Light Intrusion	0.2 lux	Pass	0.1 lux	Pass
A29 – The Wolds	Luminous Intensity	162 candelas	Pass	81 candelas	Pass
	Light Intrusion	0.1 lux	Pass	0.1 lux	Pass
A29 - Barkies	Luminous Intensity	235 candelas	Pass	117 candelas	Pass
	Light Intrusion	0.1 lux	Pass	0.0 lux	Pass
A29 - Ashmead	Luminous Intensity	100 candelas	Pass	50 candelas	Pass
	Light Intrusion	0.0 lux	Pass	0.0 lux	Pass
A29 – Folly House	Luminous Intensity	87 candelas	Pass	43 candelas	Pass
	Light Intrusion	0.0 lux	Pass	0.0 lux	Pass
A29 - Westview	Luminous Intensity	49 candelas	Pass	25 candelas	Pass
	Light Intrusion	0.0 lux	Pass	0.0 lux	Pass
Murrell Gardens, Chantry Mead and Ewens Gardens	Luminous Intensity	208 candelas	Pass	104 candelas	Pass
	Light Intrusion	0.3 lux	Pass	0.1 lux	Pass
Barnham Road - Greenoaks	Luminous Intensity	1519 candelas	Pass	759 candelas	Fail
	Light Intrusion	1.0 lux	Pass	0.5 lux	Pass
Barnham Road - Wentbridge	Luminous Intensity	448 candelas	Pass	224 candelas	Pass
	Light Intrusion	0.7 lux	Pass	0.4 lux	Pass
	Luminous Intensity	405 candelas	Pass	203 candelas	Pass

Location	Calculation	Maximum Result Pre-curfew		Maximum Result Post-curfew	
		Value	Pass/Fail	Value	Pass/Fail
Barnham Road - Wilton	Light Intrusion	0.4 lux	Pass	0.2 lux	Pass

Table B-2 – Light intrusion and luminous intensity calculation (Existing lighting)

Location	Calculation	Maximum Result
Barnham Road - Greenoaks	Luminous Intensity	2451 candelas
	Light Intrusion	1.7 lux
Barnham Road - Wentbridge	Luminous Intensity	2809 candelas
	Light Intrusion	2.7 lux
Barnham Road - Wilton	Luminous Intensity	2326 candelas
	Light Intrusion	1.7 lux

Table B-3 – Light spill ecology

Location	Calculation	Maximum Result
E1 – Folly Foot Farm Barn	Light spill	0.2 lux (vertical)
E3 – PRoW (Footpath 318)	Light spill	0.0 lux (vertical)
E3 – PRoW (Footpath 318) 15m Buffer	Light spill	0.5 lux (vertical)



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