

External Lighting

Environmental Statement
for
Boundary Lakes
Golf Clubhouse

Dec 23

CMCE
CONSULTING ENGINEERS

Version History

Revision	Purpose	Date	Issued by
4	Updated for Planning	1/12/2023	C. Murphy

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Introduction

Context of the Report

Purpose

This report was commissioned by Hampshire County Cricket Club and their property advisors Land and Development Advisory Ltd (Ladal) to provide details to Eastleigh Borough Council (EBC) on the concepts that informed the external lighting design for the new Boundary Lakes Golf Clubhouse at Moorhills Road West End.

An application for Planning Permission has been made under the conditions of National Planning Policy Framework to build a new golf clubhouse. Under the Borough Council's planning rules any application for a new development must demonstrate compliance with EBC Local List for Validation (LLV) of Planning Approvals before being granted permission and a Lawful Development Certificate.

The above mentioned LLV sets out the evidence base that must accompany all Applications to the Local Authority Planning Committee. Section 13 of the LLV deals with the impacts of flood lighting or obtrusive external lighting on neighboring properties. Acting in accordance with the above, the case officer has advised that a lighting study should be submitted to demonstrate the impacts of the golf clubhouse and carpark lighting systems on local natural habitats and ecology.

This report responds to this requirement as well as complimenting the project ecologist Johns Associates' report recommendations for mitigation of impacts on local biodiversity.

Who we are

By way of introduction, the authors of this report are Ollio - The Building Performance Consultancy & CMCE who are members of the Institute of Lighting Professionals

Ollio is a consultancy, specifically founded to set new standards in property design. One that provides parity of importance in achieving exceptional low carbon sustainable outcomes with that of ensuring the customer's and local stakeholders use experience of their new building is exceptional too.

Design Strategy

The design strategy promotes an external lighting design for the golf clubhouse that seeks to mitigate impacts on biodiversity. To achieve this the design is arranged to comply with the key requirements of the Institute of Lighting's best practice Guidance Note 8 which was published in October 2018 and the updated ILP Guidance Note 1 published in 2020.

The designers have worked in concert with the project ecologist, who has guided the nature of the final solutions presented here.

Further, this report's strategy is intended to be a starting point which can be passed on to the future designers, constructors, and the client (HCCC) as a reference point for the important operational and maintenance aspects of the lighting systems both internal and external so that they continue to inform mitigation impacts on site ecology over the life of the building.

Background

Context for the External Lighting Design

Clubhouse Design

The starting place for sustainability and environmental husbandry is stated within the architect's Design and Access Statement, which outlines a commitment for a new clubhouse that is mindful of its immediate setting and responds sensitively to its new location.

In doing so, the new clubhouse will serve to upgrade the club's changing facilities, pro shop, office, and member's bar/restaurant. The club envisage activity and access to the site will continue to be low key with predictable patterns of usage, mainly confined to serving members of the clubhouse. The new facility is expected to continue to operate year-round, mostly during daylight hours but with and some occasional calendared events from through the year.

Site Context

The new Boundary Lakes golf clubhouse will be located on Moorhills Road, Eastleigh. The entrance will be approximately 140 meters from the A27 Kane's Hill roundabout. The site has single occupancy residences on either side. The nearest north eastern property lies approximately 70 meters from the site boundary with what will be unobscured view to the new clubhouse position. A residential property to the south east is much closer at approximately 30 meters but well secluded by a tall hedgerow with intermittent trees.

The general area of the site can be classified as suburban rural fringe and therefore an area classified by the Institute of Lighting Professionals (ILP) to be in the median classification (E2) of light pollution sensitivity (see Table 1 below). It is expected therefore that any new external lighting design will meet the requirements by limiting the addition of new lighting to the night sky and having a minimum illuminance of **5 lux** on the vertical plane at the edge of the site, reducing to **1 lux** during the sensitive periods around dusk and dawn for ecological protection purposes.

The ILP guidance aligns with Eastleigh Borough Council ecology advisors reports which states that the lighting on ecologically sensitive zones should be no more than 1 lux during times of nocturnal bat activity.

Light pollution classification table

Zone rating	Description
E1	Areas with intrinsically dark landscapes National parks or residential areas with strict limits on light trespass. Roads usually unlit
E2	Areas of low ambient brightness Rural, small village, or relatively dark urban locations
E3	Areas of medium ambient brightness Small town centres or urban locations
E4	Areas of high ambient brightness Urban areas, residential and commercial with high levels of night-time activity

Table 1. Lighting environmental zones, as adapted by ILP

Ecological Context and Receptors

Eastern and Southern Woodland Strip

On review of the Ecological Appraisal Report undertaken by Johns Associates, it is noted that the broadleaf woodland strip along the western and southern site boundaries are of ecological interest and value. The woodland strip (see Fig 1 below) is home to varied flora and provide shelter and food to local bird, animal, and insect species.

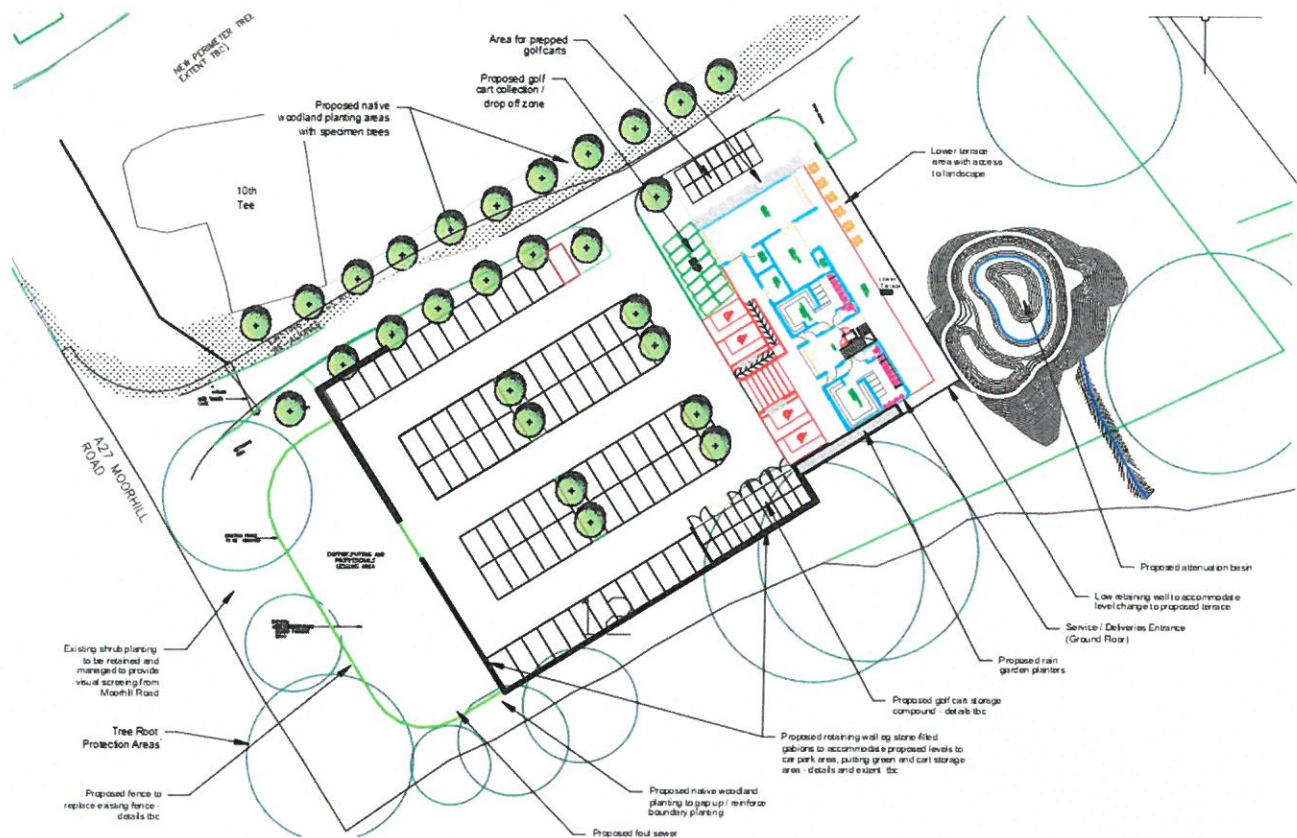
Bat Population

There is a large local bat population which may forage on insects and possibly roost within the woodland strip. The recommendation is therefore that existing light levels incident on these eastern and southern boundaries should not be increased over present levels.

Ecological Concern

The main ecologists concern is that artificial lighting to the building and car park will affect the feeding behaviour of bats. There are two aspects to this. One is the attraction that light from certain types of light sources has to a range of insects; the other is the presence of lit conditions posing a barrier to movement.

Many night-flying species of insect are attracted to visible light wavelengths, especially the ultraviolet frequencies or sources with high blue visible spectral content. This is particularly a problem if it is a single light source in a relatively dark E2 area. As well as moths, a range of other insects can be attracted to light such as craneflies, midges, and lacewings. If attracted they are taken away from the natural feeding areas for bats and towards human habitations which would prevent them from feeding at all.



This is most problematic for the slower flying broad winged bats such as long-eared bats, the myotis species (which include Brandt's bat, whiskered, Daubenton's bat, Natterer's bat and Bechstein's bat), barbastelle, and greater and lesser horseshoe bats all of which avoid streetlights thus putting them at a competitive disadvantage to less reserved bats such as the Common Pipistrelle. A situation which poses the serious risk of population collapse to the more light avoiding species.

Mitigate Blue Light Frequencies

In the main, most flying insects tend to be attracted to higher (blue-red) temperature visible spectrum frequencies. It is fortunate that in recent years LED lighting has been improved to emit in the low blue "warm white" range (more yellow/orange colour) at around 3000°K with little reduction in lumen output.

Additionally, modern LED lamps typically feature no UV component and research indicates that while lower UV components attract fewer invertebrates, warmer colour temperatures with peak wavelengths greater than 550nm (~3000°K) cause less impacts on bat foraging.

Light Spill Mitigation

Given that most fittings to be deployed at the new clubhouse will be low blue component LED, the main issue becomes one of ensuring that levels of lighting are kept low, and the spill of lighting from the internal and external luminaires falling on or in direct line of sight of the environmentally sensitive broadleaf woodland strip to the east and south of the site is minimised.

That said, there is also a requirement to design the lighting solution so that it provides adequate safety for patrons as they navigate the carpark and external areas.

Design

External Lighting Design Details

Design Parameters

The external lighting design process for the new Boundary Lakes Golf Clubhouse will comply with the Institution of Lighting Professionals (ILP) Guidance Note 1 Guidance Note for the avoidance of obtrusive light and Guidance Note 8: Bats and Artificial Lighting in the UK.

The latter advocates a five-step approach to the design of external lighting installations for the mitigation of impacts on local ecology particularly where lawfully protected habitats and species are present.

The five steps are as outlined in Fig 2 below:

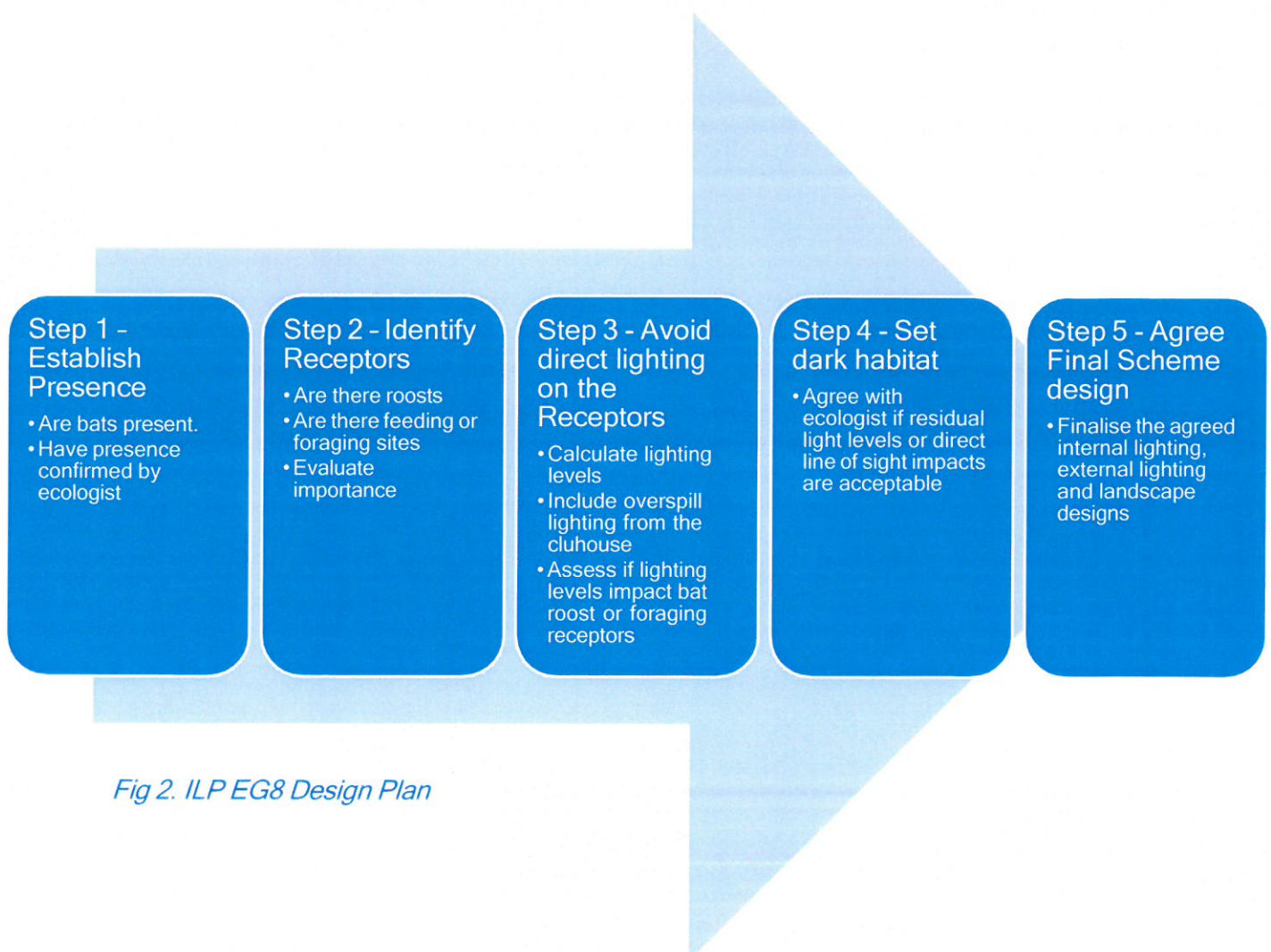


Fig 2. ILP EG8 Design Plan

Step 1 and 2 – Establish presence and receptors

The Johns Associates Ecological Appraisal Report confirms a high-level presence of several species of bat. Initial indications are that there are no roosts, and that activity is limited to foraging primarily along the perimeter western and southern woodland strips with some flight paths dissecting the site as individuals move from one side of the site to the other.

The guidance from the ecologist is that no new light should fall on the east and south broadleaf woodland strips during the hours of peak foraging before dusk and dawn.

Step 3: Avoid direct lighting on the roost or foraging area receptors

ILP GN8 Step 3 requires a full analysis and evaluation of lighting levels from the proposed new clubhouse and car park lighting systems. The analysis should include review of incidental light spill to ecological receptors from both external and internal light emitters (via any large planar windows) of the clubhouse.

To establish the resultant lighting levels a full digital model of the lighting installation was compiled using Lighting Reality proprietary lighting design software.

The full lighting model output from the calculation software is presented as an index at the rear of this report. The analysis includes vertical calculation grids which detail lighting levels at the boundary and receptor points, plus extended grids which detail lighting levels 4m above the proposed development. As the exit from the car park connects to a main primary route the A27, under

Step 4 – Set a dark habitat control and zoning strategy

Based on the output from the in Step 3 an agreed strategy was established with our ecologist Johns Associates, which informed the final design of the internal, external perimeter and car park lighting design together with a curfew lighting control strategy for the times of most bat activity. The summary lighting design strategy is presented in a Commentary section below.

Step 5 - Agree the final artificial lighting and landscape design

This step finalises the design, taking into consideration any further recommendations made by the Eastleigh Borough Planning Authority.

The detailed design concepts and conclusions of the model study are presented in detail below.

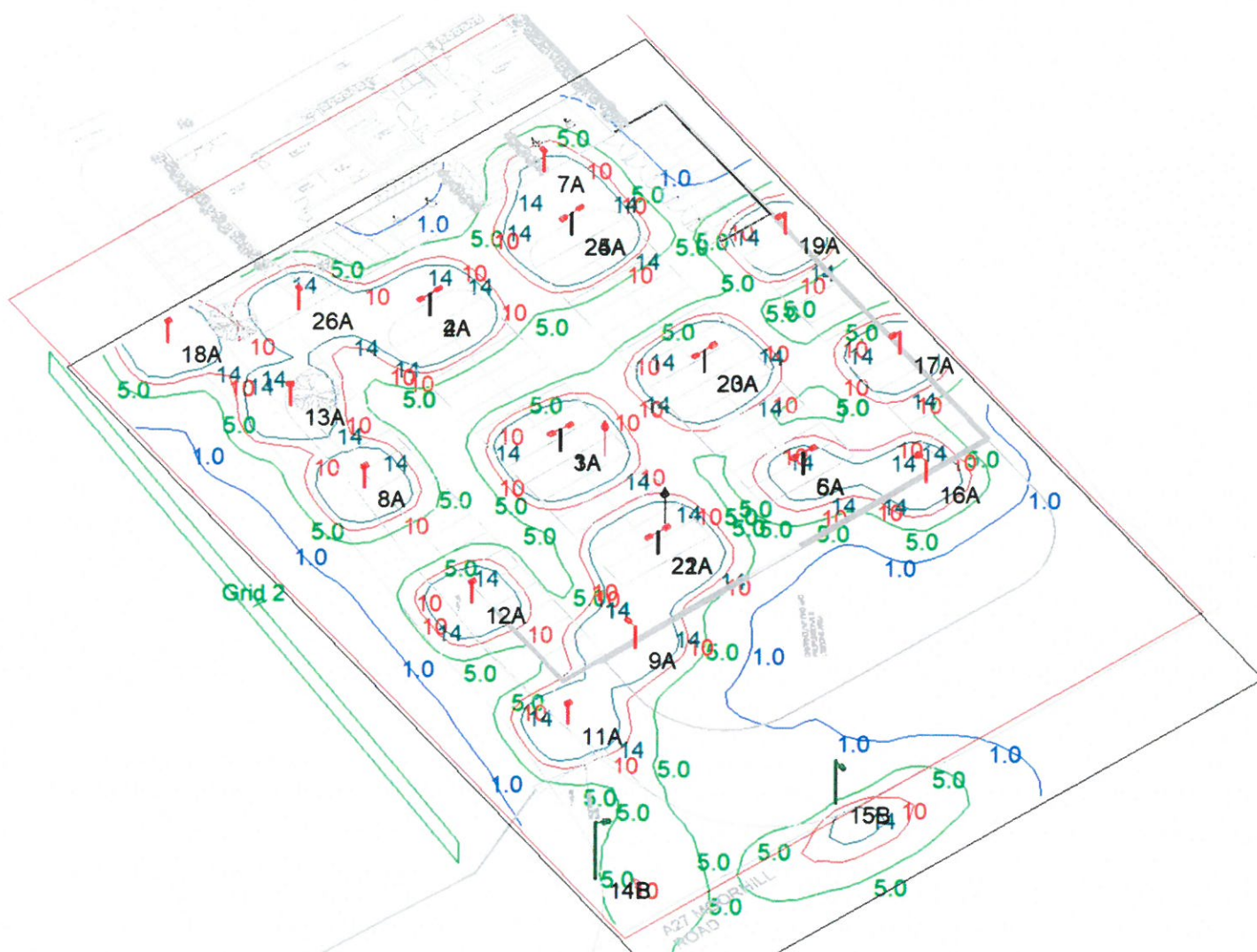


Fig 3 Lighting Model View

Luminaires



Luminaire A Data

Supplier	Cree Lighting
Type	TRSA-02-ARS-4L22828W
Lamp(s)	8lu4L28W22K
Lamp Flux (klm)	3.25
File Name	TRSA-02-ARS-4L-228 28W-203-QL21-S05.IES
Maintenance Factor	0.78
Imax70,80,90(cd/klm)	235.0, 18.4, 0.0
No. in Project	23

Fig 4 Luminaire

Lighting Model – Control and Zoning Strategy

The overarching strategy is that the lighting design should be low key to maintain as discreet a night-time presence as possible on Moorhills Road. Whilst complying with recognised standards and traffic safety

However, in undertaking the design it is recognised that the various elevations to the building and the main areas of the car park and entrance drive, each present differing impact to the key east and south broadleaf woodland strip. The report should also comment on any obtrusive light reaching neighboring properties.

In recognition of this the lighting design was split into the following areas:

The Conflict zone connection to the A27

It is proposed that in compliance with EN 13201:2015 that the entrance to the site on to Moorhill Road (A27) be denoted as a conflict zone and thus is lit to M4 standard. The existing 6m columns will remain and new LED fittings attached plus 2 new columns with fittings will be installed to comply with the M4 road lighting standard. All fittings will be fitted with individual photo cells, programmed to turn lights on at 17 lux and off at 35 lux.



Cree Energy Uno.
2200k

Once inside the gates the approach road to the car-parking and golf course will be lit by 2200k LED fittings mounted on 3m columns which will light the driveway to the required standard of P3 standard ie an average lux level of 10 Lux and uniformity U of 0.2 (Emin/Eave)

The selected fittings are Cree Energy Uno 2200K or similar type fittings, focused to provide illuminance to the road surface only, with no light upwards or towards the neighboring west boundary (across the 10th tee) components.

Main Car Park

In keeping with the infrequent amenity use of the car park during night-time hours it was decided to relax compliance with normal carpark lighting standards BS EN 12464 and BS 5489: 2013 and so use 3m columns rather than an orthodox 6-meter mast system.

The low-level system will still maintain full compliance with BS EN 12464 and BS 5489: 2013 the car park is designated as Medium use with an Eave = 10 and U_o = 2.5, which is equivalent to EN13201:2015 P3 stand for road lighting.

East and South Perimeter: On east and south perimeter next to the ecologically sensitive woodland strip the fittings we have completed a calculation Grid demonstration no light spill to adjacent areas.

A full copy of the lighting design report follows

DATE: 1 December 2023
DESIGNER: Chris Murphy (ILP)
PROJECT No: 20714 Boundary Lakes
PROJECT NAME: Boundary Lakes Golf Course

CHRIS MURPHY
CONSULTING ENGINEERS



- M&E CONSULTANTS
- PROJECT MANAGERS
- SUSTAINABLE SOLUTIONS
- ENERGY & ACoustics
- PROOF & SITE COORDINATION

Scheme consists of 4 calculation Grids

Grid 1 Main Carpark and Access Road to P3 standard

Grid 2 Verticle grid to woods and adjoining Property

Grid 3 Extended to 4 Meters above ground level to calculate Spill to Dark skies

Grid 4 Conflict Zone entrance to A27

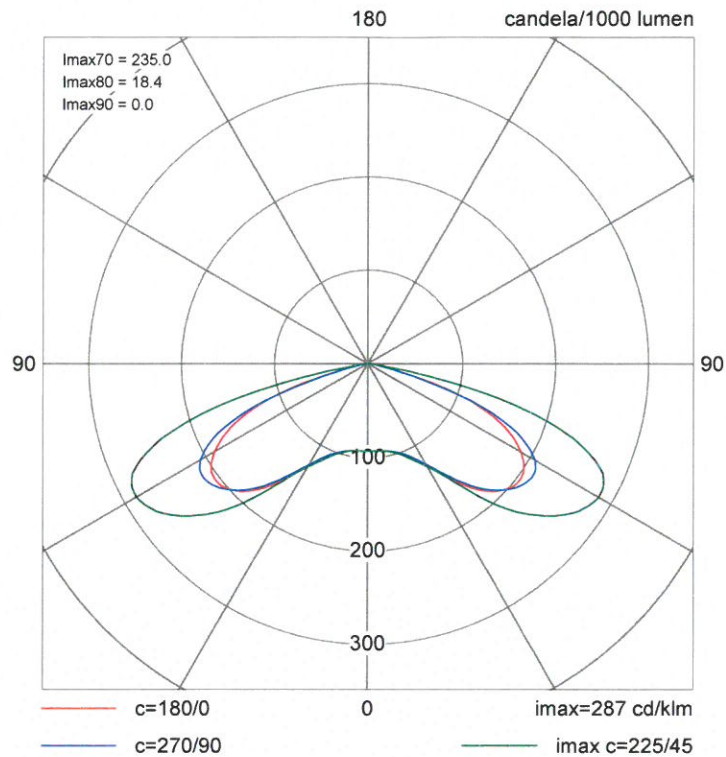
Car Park and Access Road Lighting

Layout Continued

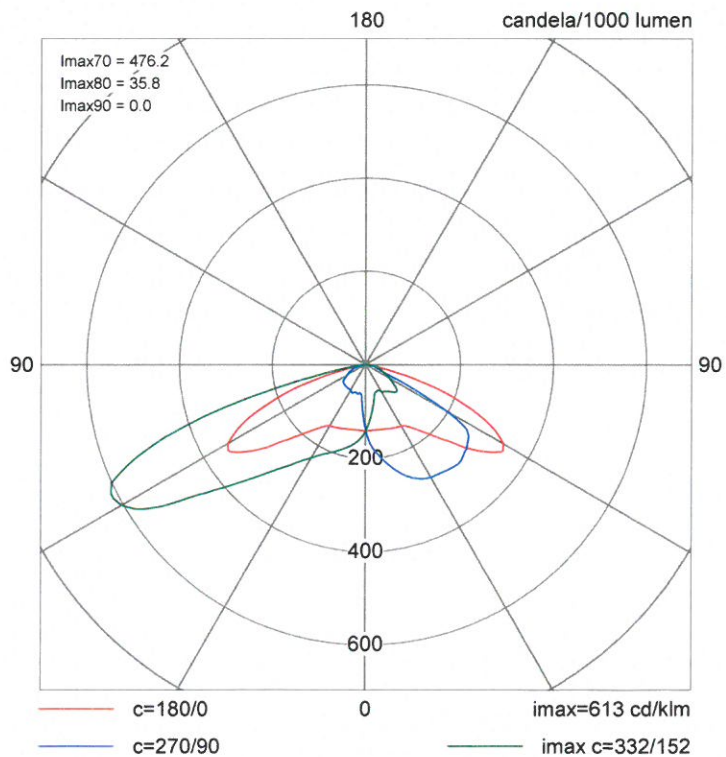
ID /Mast	Type	X	Y	Height	Angle	Tilt	Cant	Out- reach	Dimmed to	Target X	Target Y	Target Z
19	A	1753.25	-260.23	3.00	123.00	0.00	0.00	0.80	100%			
19/5	A	1737.96	-251.39	3.00	305.00	0.00	0.00	1.00	100%			
20/1	A	1716.32	-245.69	3.00	300.00	0.00	0.00	1.00	100%			
21/1	A	1716.32	-245.69	3.00	120.00	0.00	0.00	1.00	100%			
22/5	A	1737.96	-251.39	3.00	125.00	0.00	0.00	1.00	100%			
23/6	A	1754.81	-241.38	3.00	305.00	0.00	0.00	1.00	100%			
24/6	A	1754.81	-241.38	3.00	125.00	0.00	0.00	1.00	100%			
26	A	1747.87	-215.62	3.00	212.00	0.00	0.00	0.00	100%			
26	B	1678.76	-269.60	6.00	34.00	0.00	0.00	0.40	100%			
27	B	1684.52	-258.18	6.00	190.00	0.00	0.00	0.40	100%			
28	B	1697.47	-299.23	6.00	49.00	0.00	0.00	0.40	100%			
29	B	1693.99	-277.39	6.00	212.00	0.00	0.00	0.40	100%			

Polar Diagrams

Luminaire A TRSA-02-ARS-4L22828W



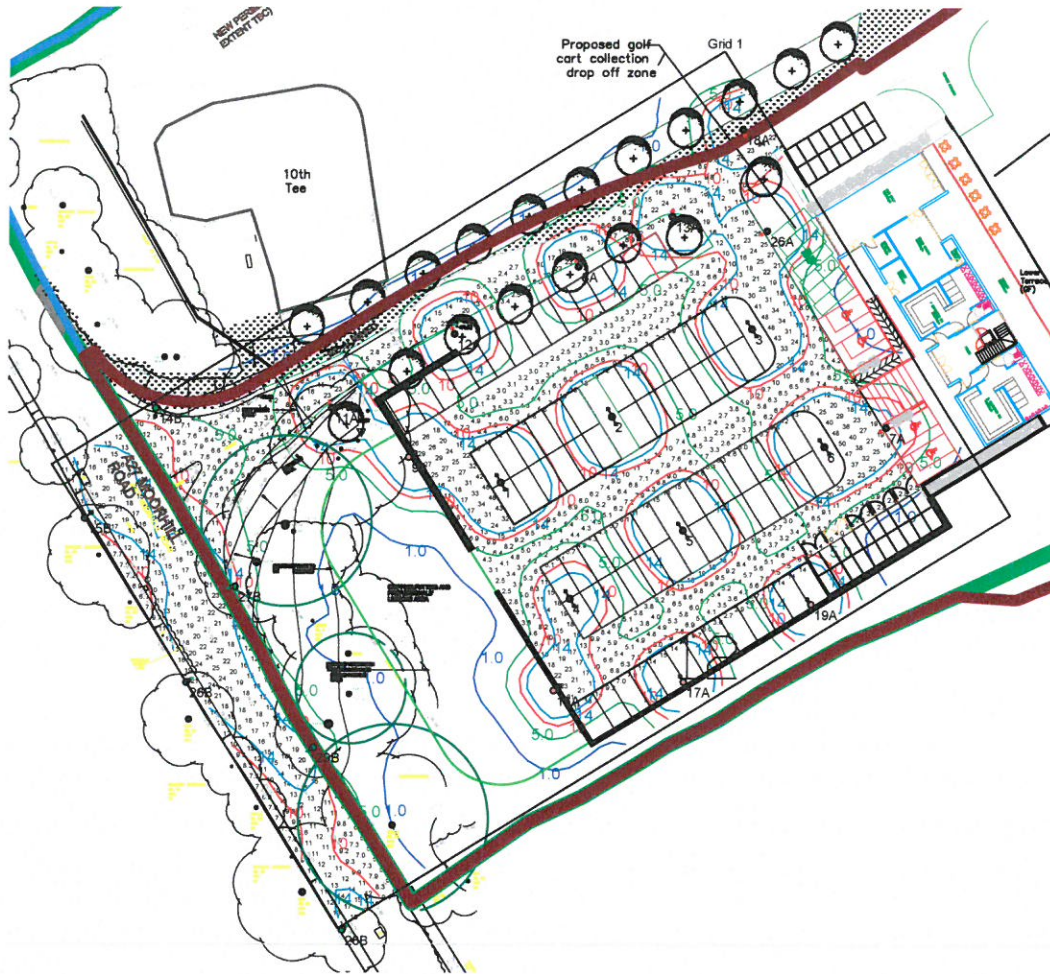
Luminaire B TRSA-02-150-6L30827W





Horizontal Illuminance (lux)

Grid 1



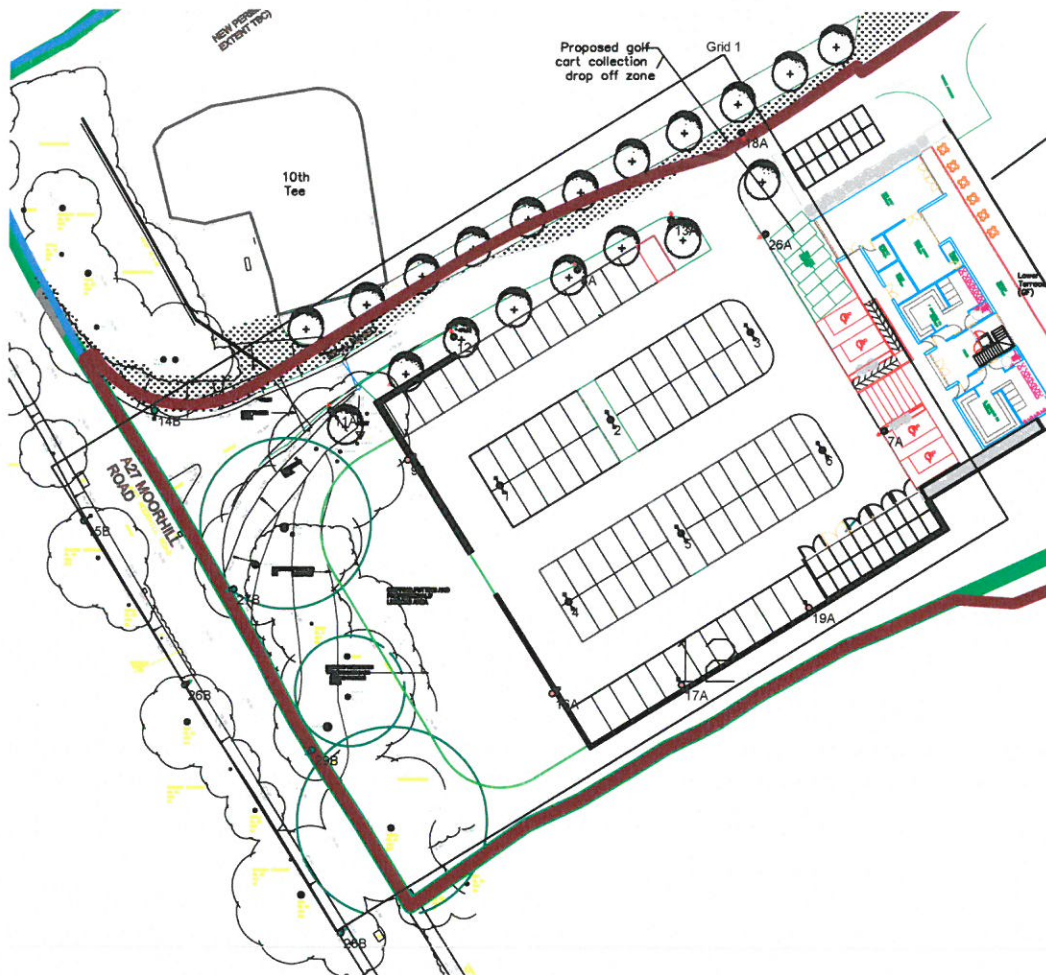
Results

Eav	11.84
Emin	2.40
E _{max}	50.18
Emin/E _{max}	0.05
Emin/Eav	0.20
E _{max} /Eav	4.24



Horizontal Illuminance (lux)

Grid 1

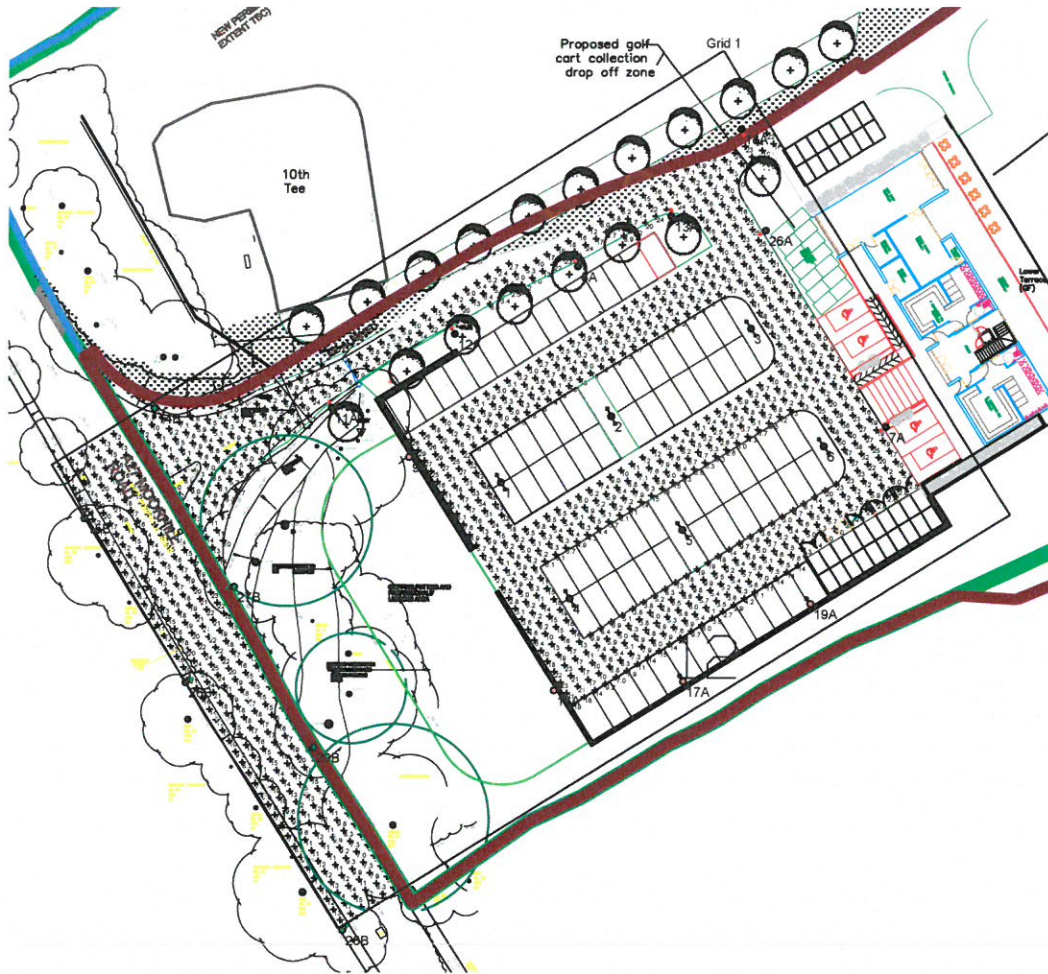


Results

Eav	11.84
Emin	2.40
E _{max}	50.18
Emin/E _{max}	0.05
Emin/Eav	0.20
E _{max} /Eav	4.24

Horizontal Illuminance (lux)

Grid 1



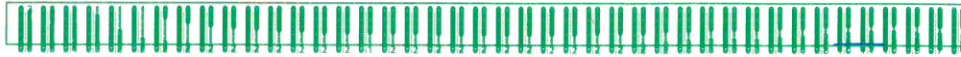
Results

Eav	11.84
Emin	2.40
E _{max}	50.18
Emin/E _{max}	0.05
Emin/Eav	0.20
E _{max} /Eav	4.24



Illuminance (lux)

Grid 2



Results

Eav	0.12
Emin	0.00
E _{max}	1.09
Emin/E _{max}	0.00
Emin/Eav	0.01
E _{max} /Eav	8.98

Illuminance (lux)

Grid 2



Results

Eav	0.12
Emin	0.00
E _{max}	1.09
Emin/E _{max}	0.00
Emin/Eav	0.01
E _{max} /Eav	8.98

Illuminance (lux)

Grid 2

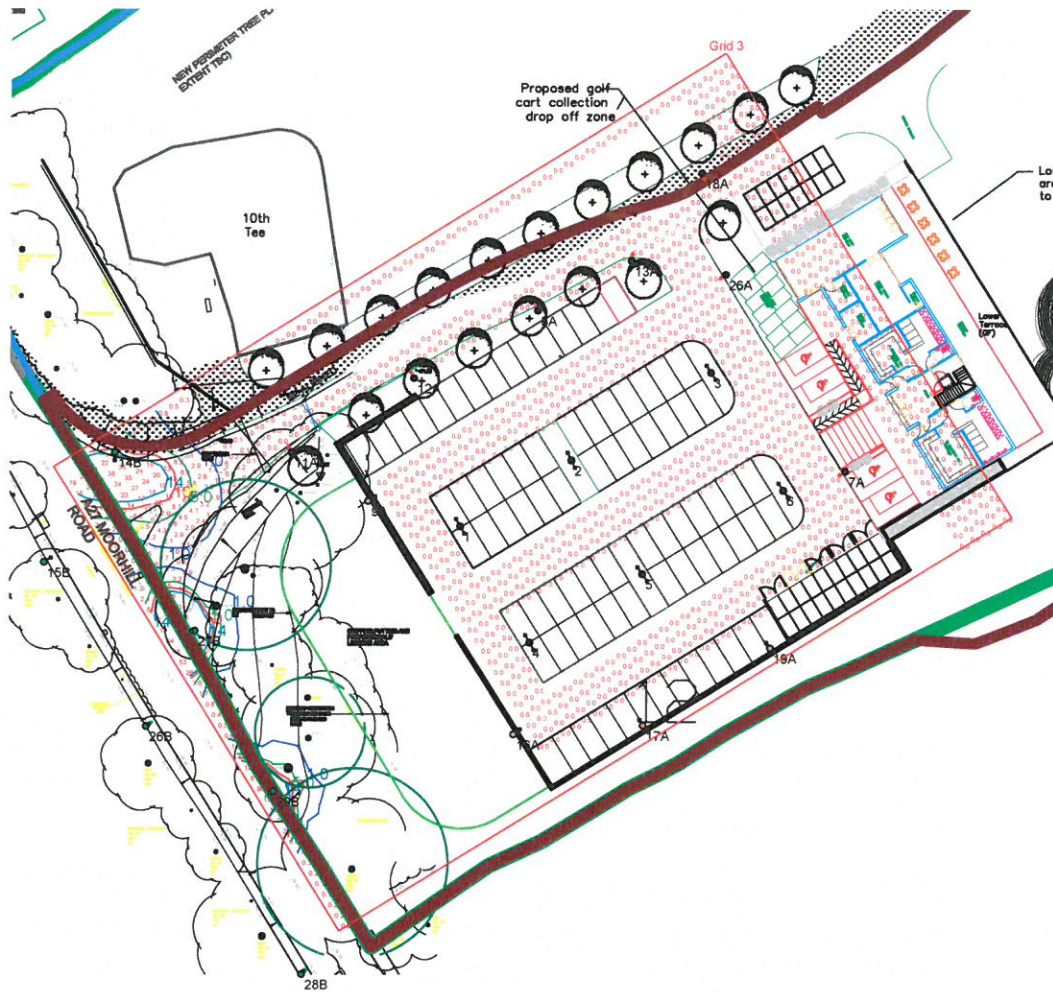


Results

Eav	0.12
Emin	0.00
E _{max}	1.09
Emin/E _{max}	0.00
Emin/Eav	0.01
E _{max} /Eav	8.98

Horizontal Illuminance (lux)

Grid 3

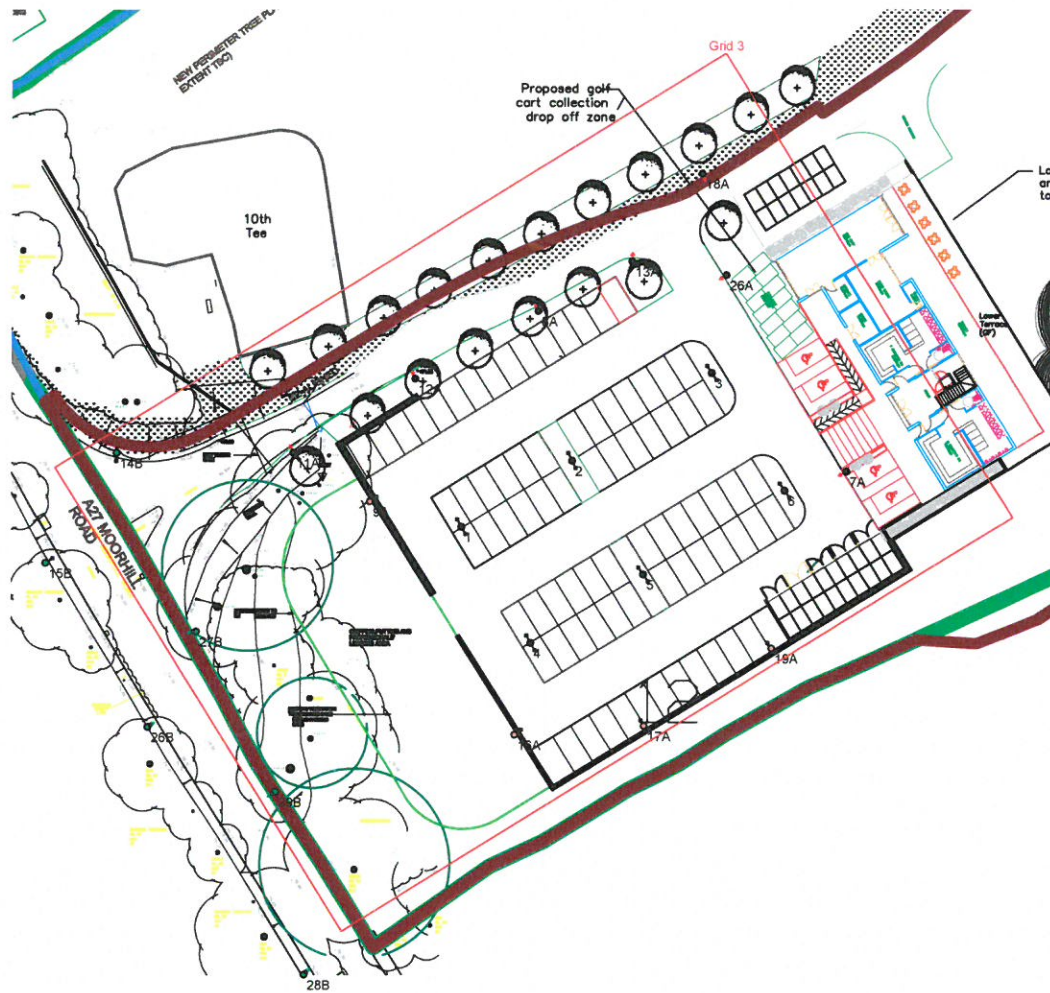


Results

Eav	2.14
Emin	0.00
E _{max}	158.35
Emin/E _{max}	0.00
Emin/Eav	0.00
E _{max} /Eav	73.83

Horizontal Illuminance (lux)

Grid 3

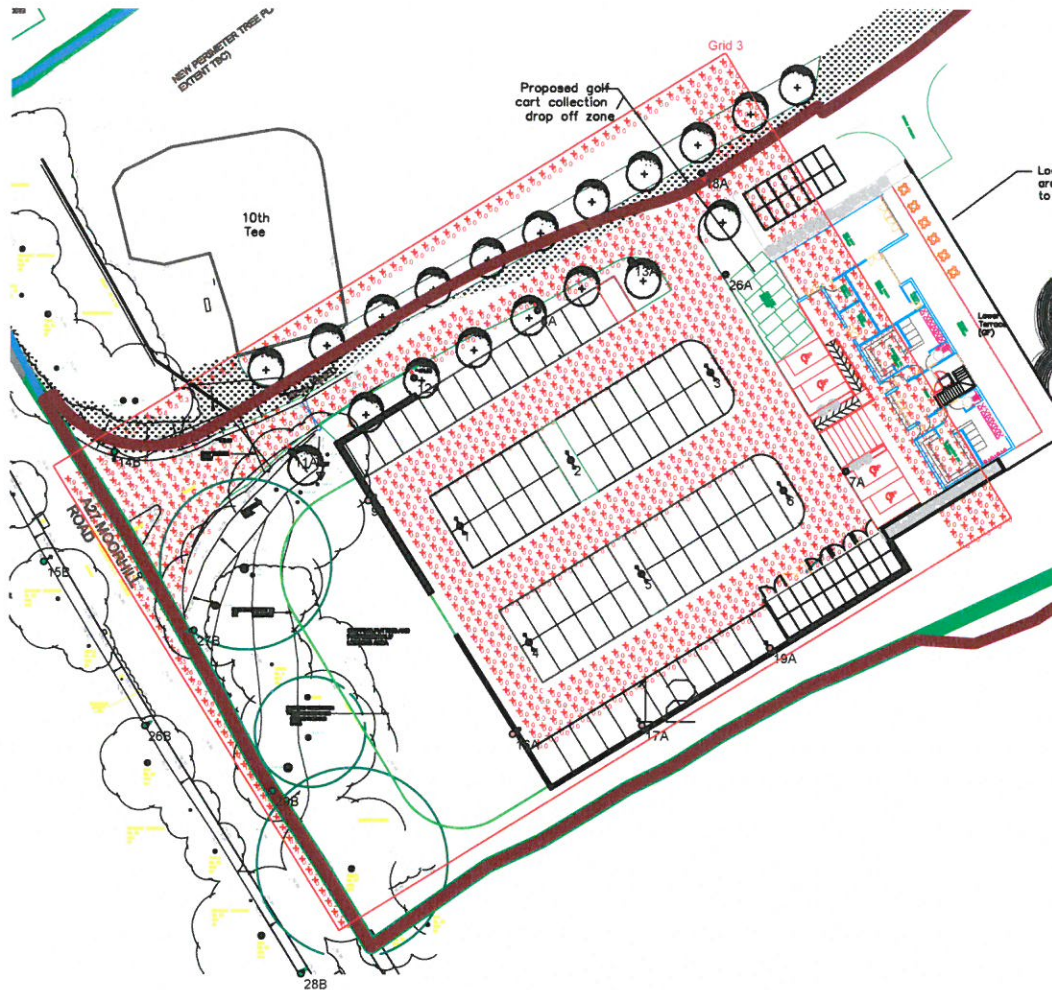


Results

Eav	2.14
Emin	0.00
Emax	158.35
Emin/Emax	0.00
Emin/Eav	0.00
Emax/Eav	73.83

Horizontal Illuminance (lux)

Grid 3

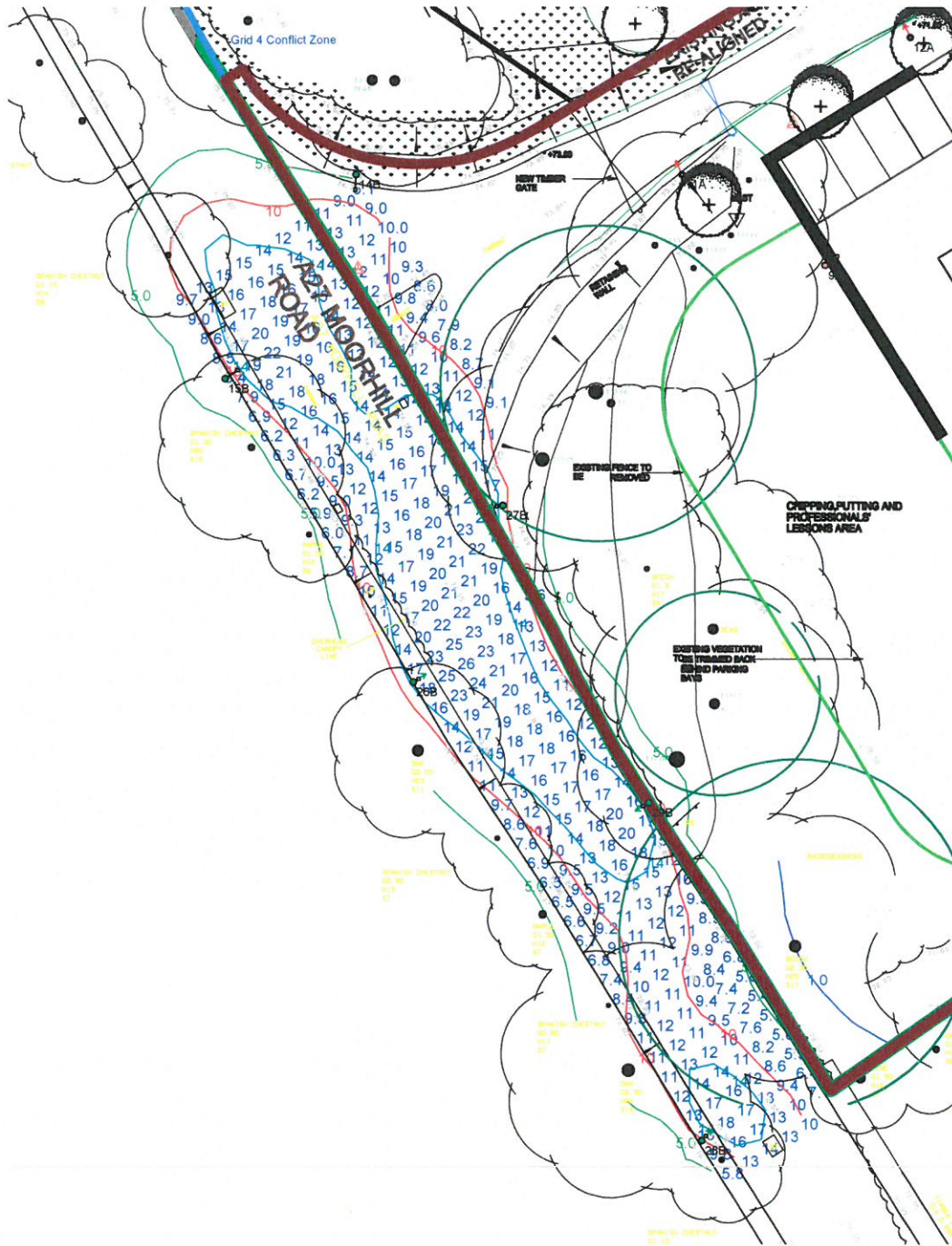


Results

Eav	2.14
Emin	0.00
E _{max}	158.35
Emin/E _{max}	0.00
Emin/Eav	0.00
E _{max} /Eav	73.83

Horizontal Illuminance (lux)

Grid 4 Conflict Zone

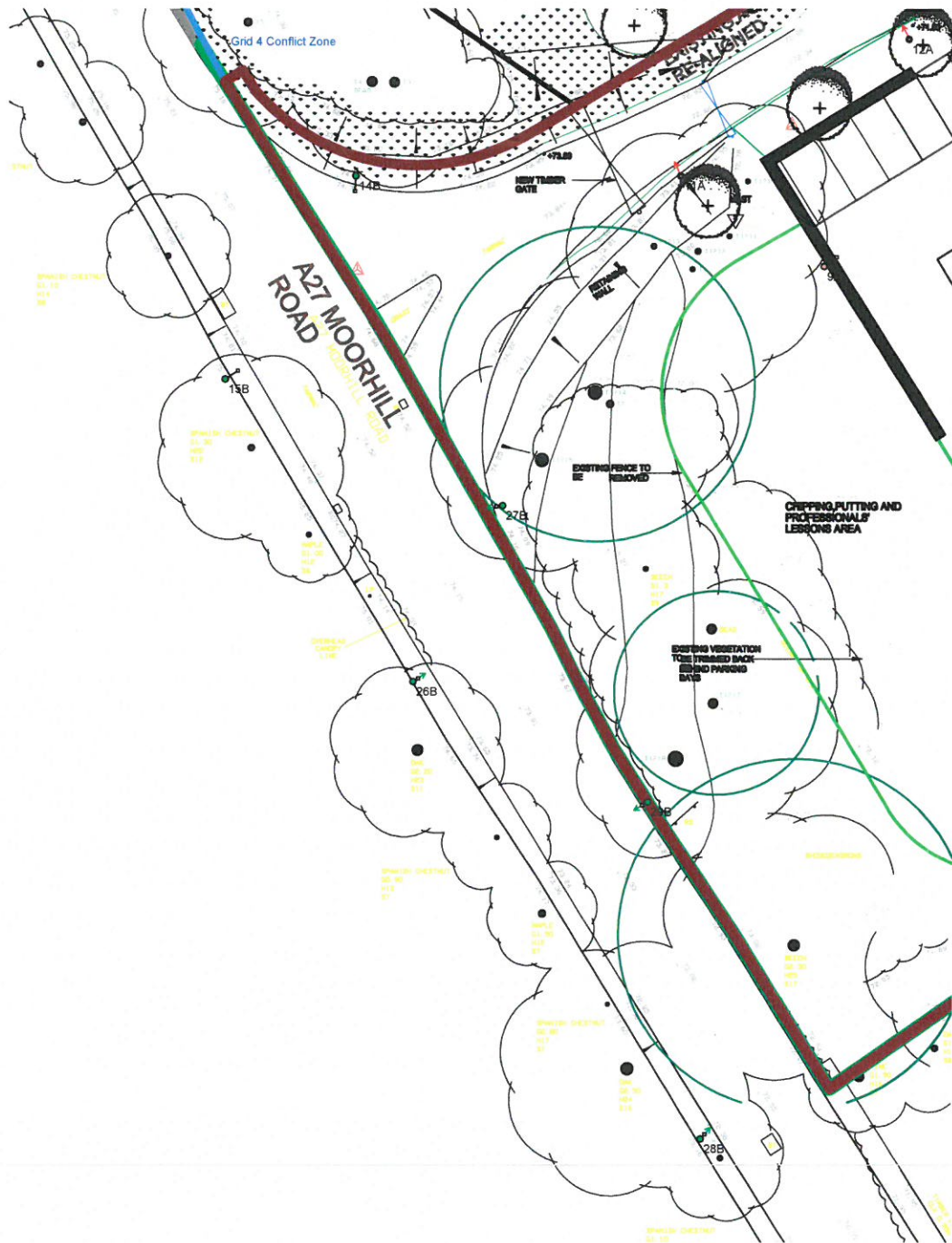


Results

Eav	13.51
Emin	5.06
E _{max}	25.84
Emin/E _{max}	0.20
Emin/Eav	0.37
E _{max} /Eav	1.91

Horizontal Illuminance (lux)

Grid 4 Conflict Zone



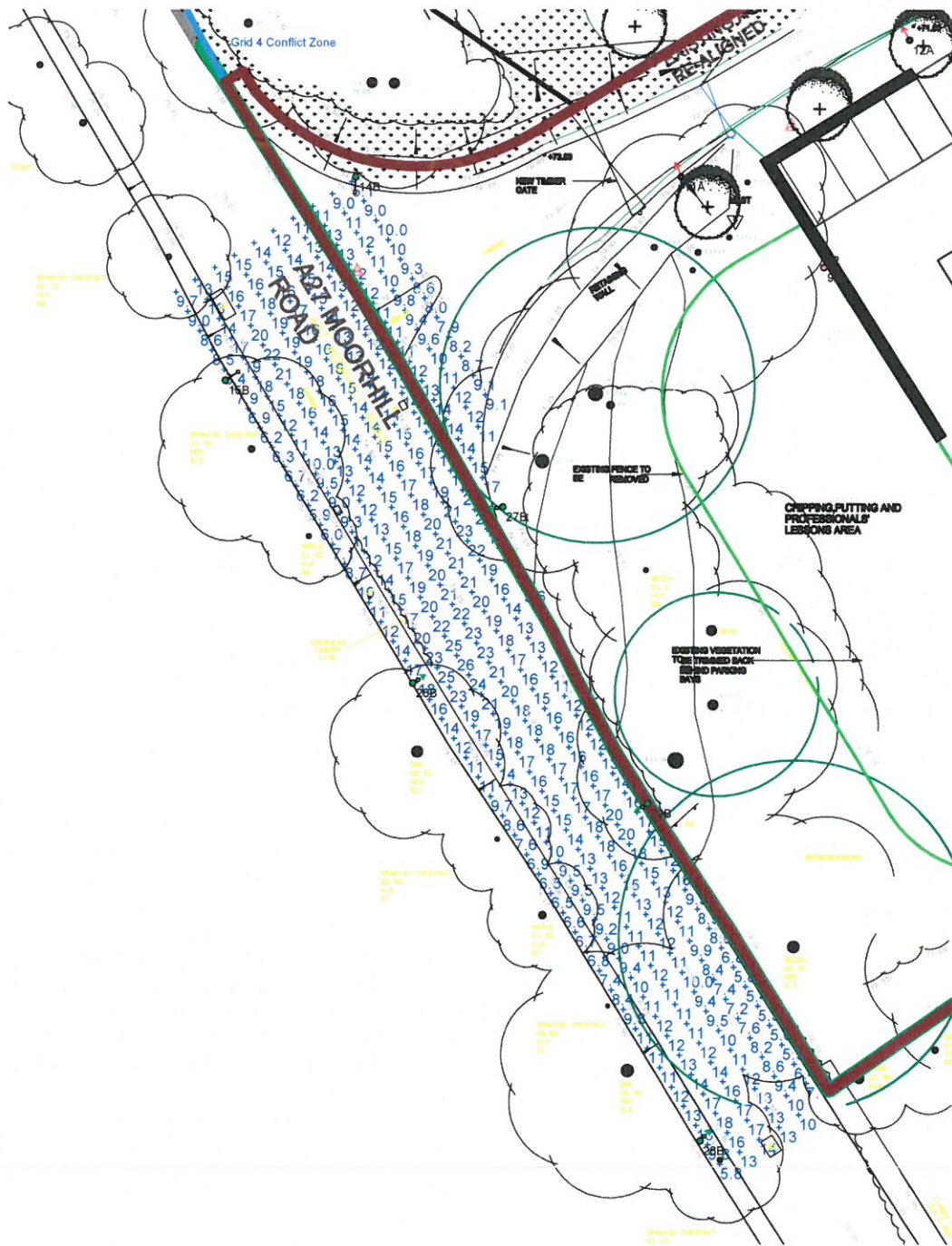
Results

Eav	13.51
Emin	5.06
Emax	25.84
Emin/Emax	0.20
Emin/Eav	0.37
Emax/Eav	1.91



Horizontal Illuminance (lux)

Grid 4 Conflict Zone



Results

Eav	13.51
Emin	5.06
Emax	25.84
Emin/Emax	0.20
Emin/Eav	0.37
Emax/Eav	1.91

Conclusion

From the detailed Reality Calculation file it is clear that All issues have now been addressed in addition the following control measures are proposed after as further interventions to mitigate the issues:

- The design will introduce a curfew period control strategy. All external lighting at the south and east perimeter of the car park and adjacent to the protected broadleaf wooded strip will be automatically set to off for the two-hour before and after dusk and again for the hour before dawn into the rest of the day.
- All internal lighting in the changing rooms will be automatically set to 25% dimmed in the hour before and after dusk and again at dawn.
- All lighting in the external recess space on the east elevation, except the fitting at the caretakers flat will automatically be set to off. The overdoor lighting to the changing, kitchen will be set to off but will be energised (fail safe on) in the event of a fire alarm.
- All lighting in the restaurant will be automatically dimmed to 40% output (100lux).
- All lamps are selected to be warm light 2200°K colour temperature LED with reduced UV component which are found to be less disturbing to bats and insects.
- There is no upward lighting component in any of the selected luminaires. Refer to Polar diagrams in Reality Report
- Lighting is directed at the task
- All staff will be made aware of and the CDM report and O&M manuals for the building, will include this report to maintain design continuity into operation.

With all the above measures in place the lighting model predicts that the lighting installation will be fully compliant with the requirements of ILP Design Guidance Notes GN1 and GN8.