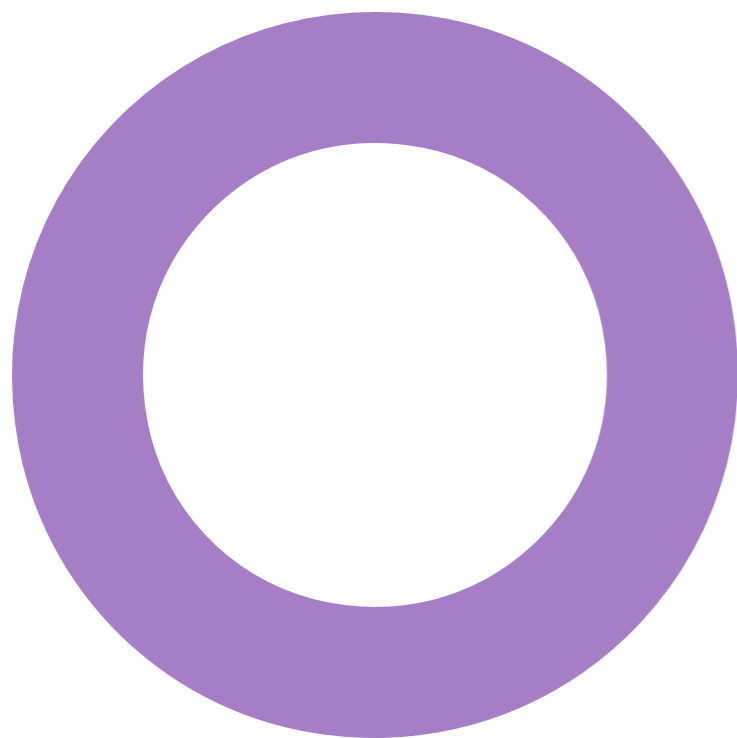


Proposed Great Wolf Lodge. Great Lakes UK Limited.

LIGHTING DESIGN
EXTERIOR LIGHTING CONCEPTS REPORT
STAGE 2 PLANNING DOCUMENT 06

NOVEMBER 2019



Audit sheet.

Rev	Date	Description	Prepared	Verified
01	20/09/2019	Preliminary Issue	HD	BA
02	04/10/2019	Stage 2 Planning Issue	HD	BA
03	09/10/2019	Car park levels revised	DLB	SK
04	24/10/2019	Client comments incorporated	BA	SK
05	30/10/2019	Client comments incorporated	BA	SK
06	05/11/2019	Client comments incorporated	BA	SK

This report has been prepared for the client as stated within our appointment only and expressly for the purposes set out in an appointment and we owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

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Introduction.

This document covers the proposed lighting approach for the external areas of the proposed Great Wolf Lodge.

The overall lighting philosophy is to ensure the scheme is not only interesting but also provides a safe and inviting environment for visitors, whilst minimising the impact on the environment and the surrounding areas.

This document considers how the functional illumination should be achieved, in addition to the use of feature lighting to further develop the lighting approach across the site.

This document should be read in conjunction with the External Lighting Baseline Survey and Illumination Impact Profile.



Approach & Objectives.

The purpose of landscape lighting is to create external realm spaces which are inviting, safe and can be enjoyed at all hours. For spaces such as the Proposed Development, it is also important to make an environment which is visually interesting as it forms a vital interaction point for visitors to the development.

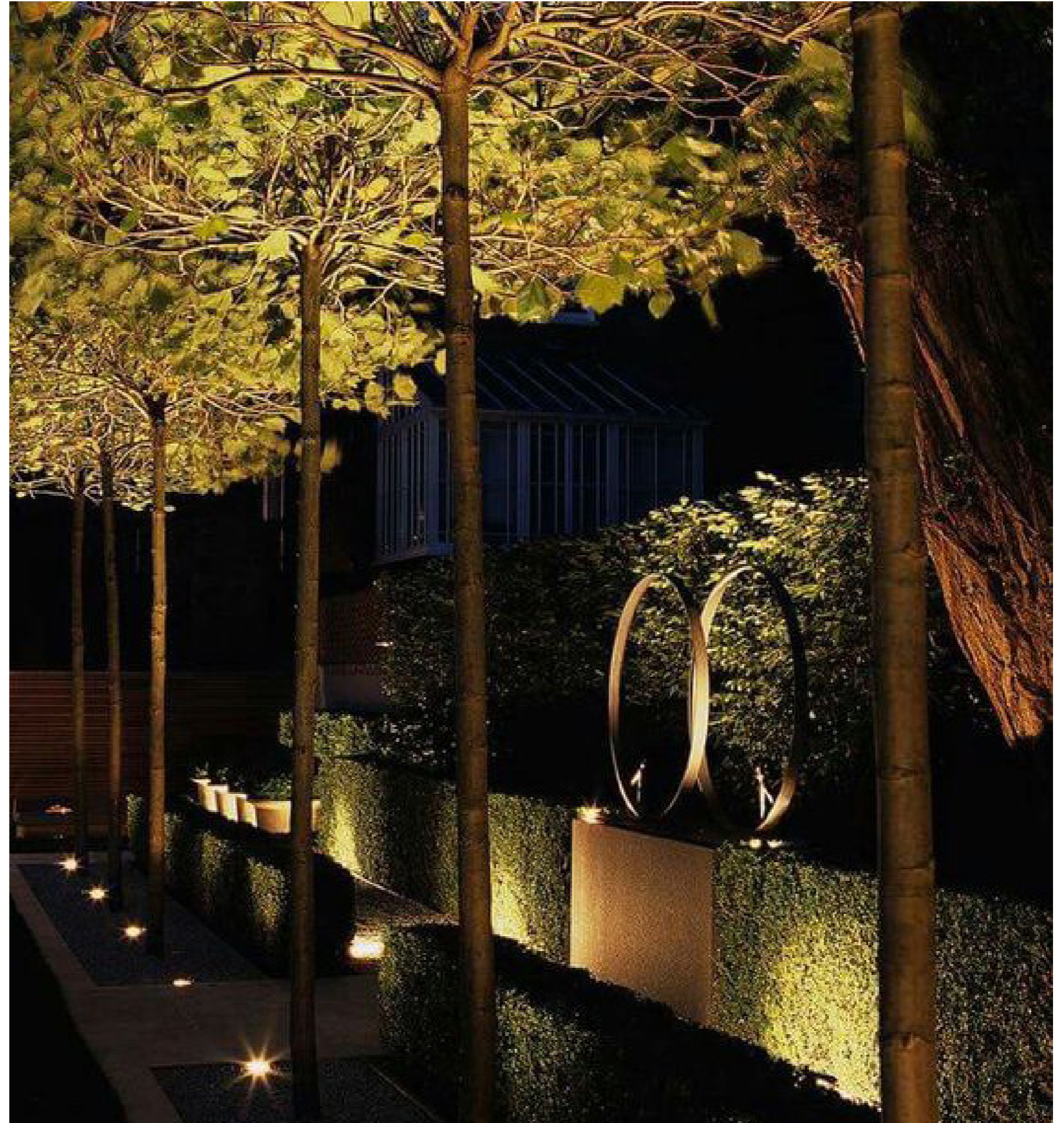
A textured approach to the lighting is proposed with a background illuminance, for safety and interaction, balanced with illumination to key landscape features.

The texture of light pattern creates visual interest and excitement through incorporating a number of lighting events to be interacted with on both a macro and micro level.

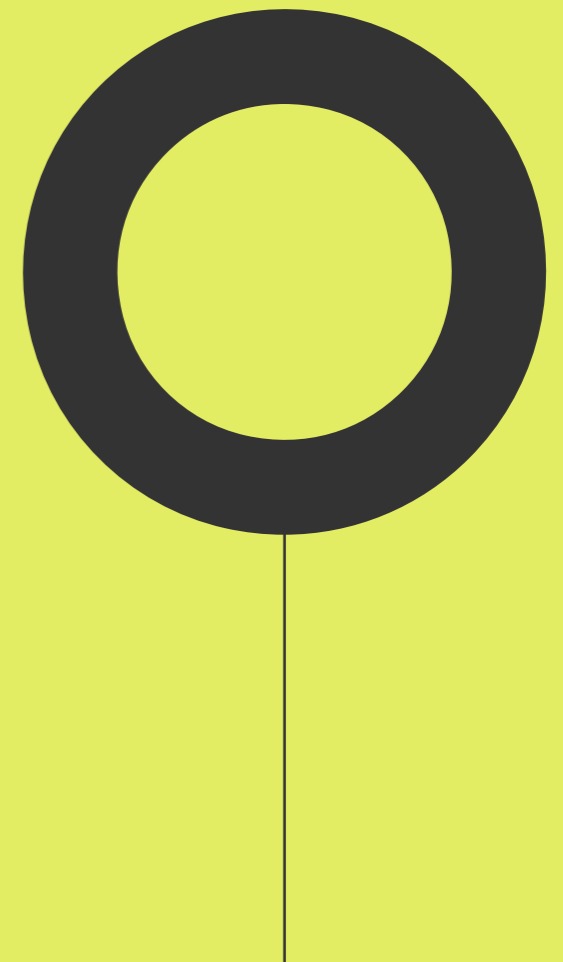
Lighting events can be enjoyed on a human scale, when one moves through the environment, and on a wider scale as the site is viewed from guest rooms.

The creation of exciting lighting environments can enhance the specification and commercial success of a space by creating a vibrant visual identity for the development within the nightscape.

The above approach will develop a scheme that is safe, secure and accessible via a sustainable approach while minimising light pollution to residents and on an ecology basis.



Lighting Design Considerations.



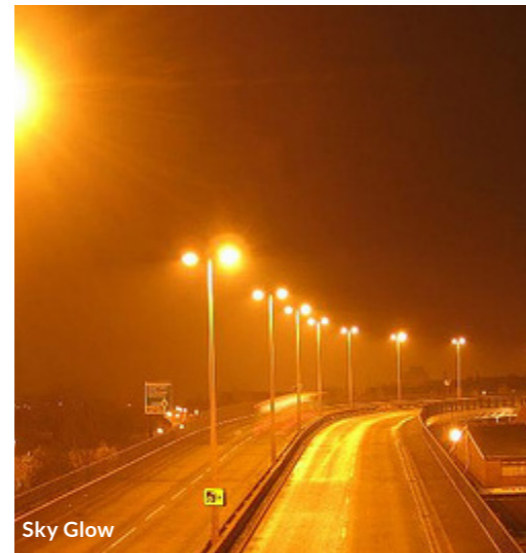
Lighting Design Considerations.

Light pollution

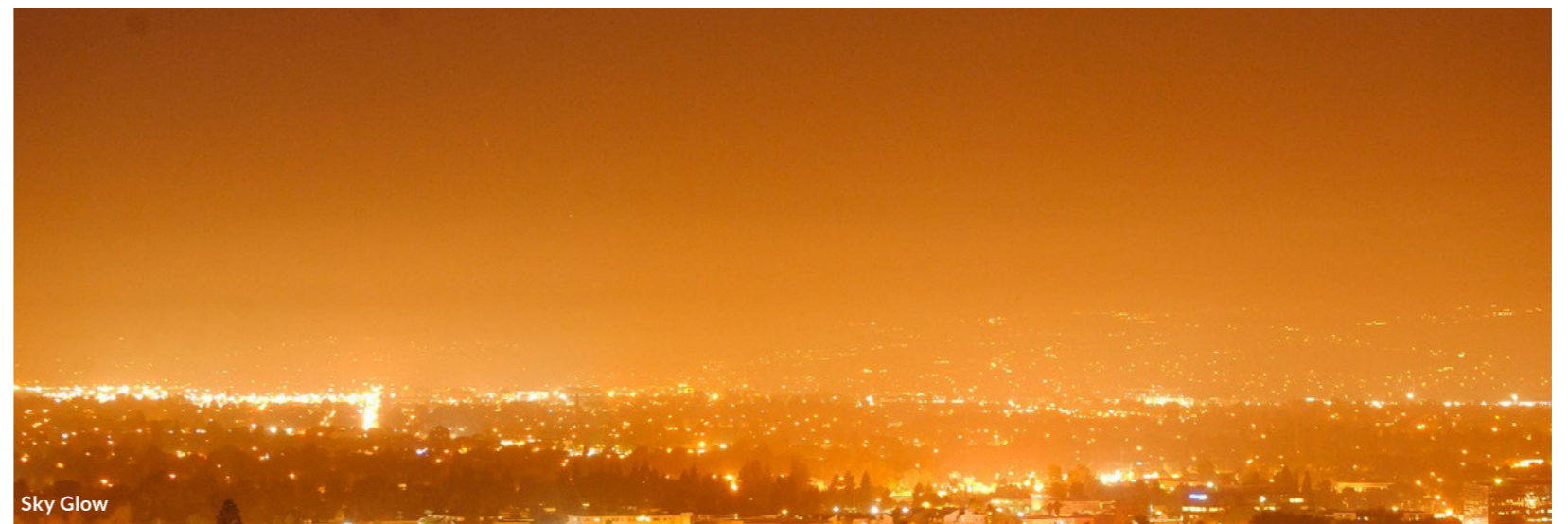
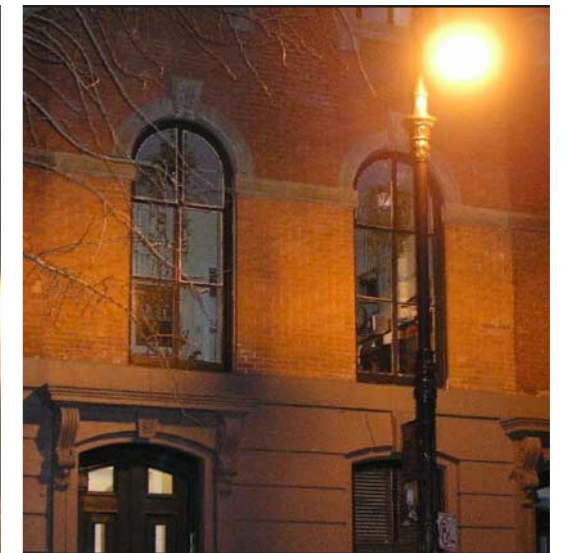
The general heading for the negative effects of light at night is Light Pollution but this heading actually covers four key factors. These are:

- Glare: This occurs when the site user sees light directly from the fixture (or lamp) and contrast ratios are high.
- Light Trespass/Encroachment: Poor outdoor lighting shines onto neighbourhood properties and into bedroom windows, reducing privacy and hindering sleep.
- Sky Glow: A large fraction of poor lighting shines directly upwards, creating the adverse sky glow above towns and cities that washes out views of the dark night sky, taking away an important natural resource.
- Energy Waste: Much outdoor lighting wastes energy because it is not well-designed with light not directed where it is required.

Within the 'Clean Neighbourhoods and Environment Act (2005)' exterior lighting joins noise and smell as an element that can be treated as a Statutory Nuisance. Although there are many exclusions, it does start to highlight the importance of well designed external lighting as a integral part of the modern urban landscape.



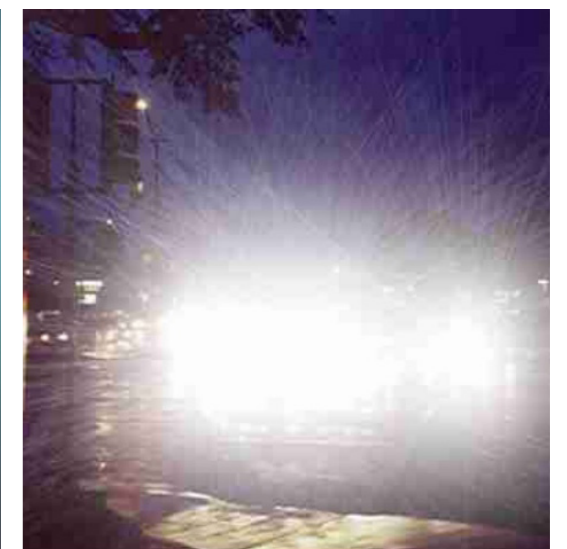
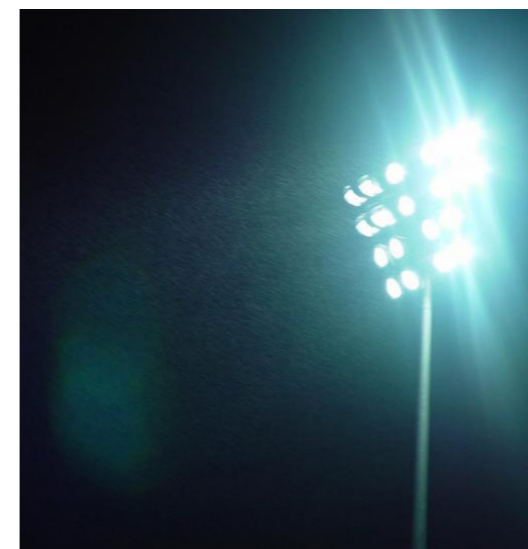
Sky Glow



Sky Glow



Glare



Lighting Design Considerations.

Colour temperature and colour rendering

When one considers colour in light it is important to consider the colour of white lighting. Like daylight and sunlight, the temperature of white light can vary in warmth. The spectrum of white light should be considered to suit the Proposed Development and its use.

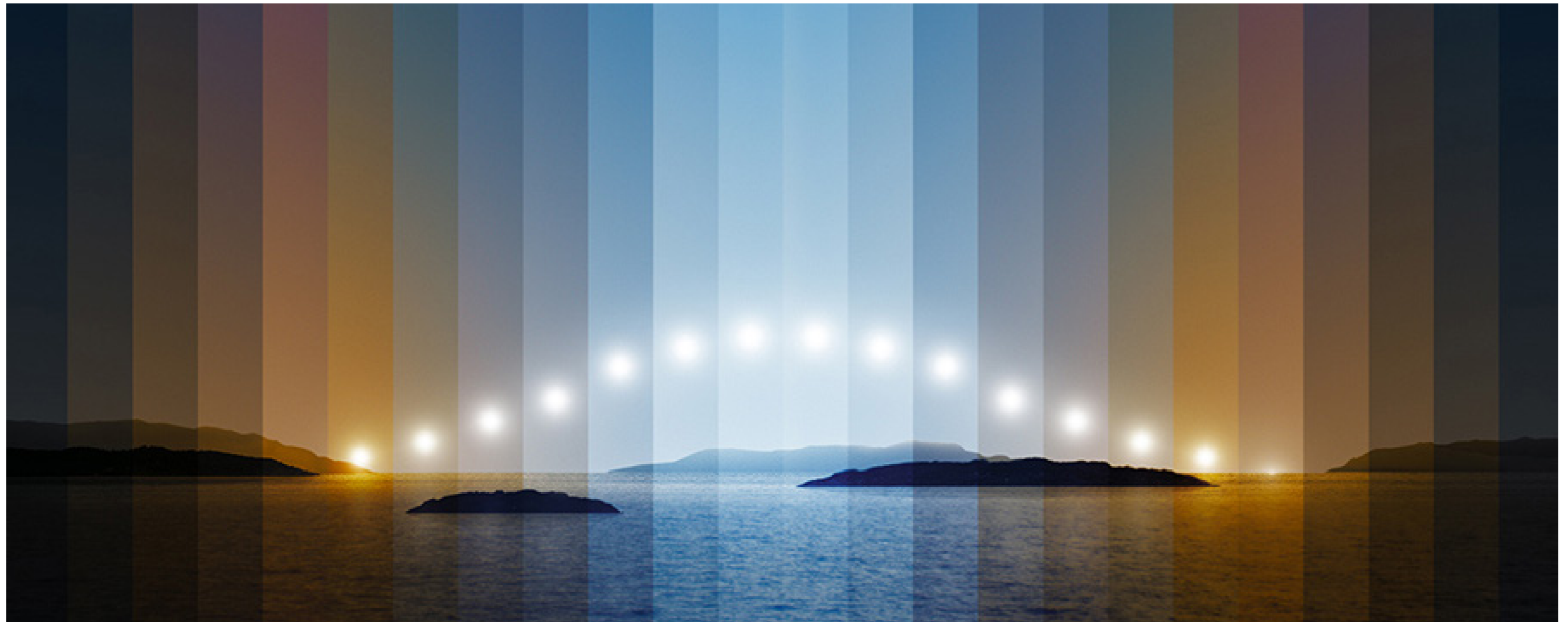
Changes in white colour temperature are often an intuitive experience for people, as it relates to the natural rhythms of daylight.

Different colours of white light will provide different impressions and have differing properties when it comes to rendering surface finish.

Impressions of character and impact can be expressed through the appropriate use of colour. The visual impact of coloured light changes in relation to illumination levels, be that through daylight or artificial light sources.

By understanding the eye's sensitivity to colour, one can utilise coloured light to create a strong visual impression that would have required a greater amount of energy to achieve in white light.

Hoare Lea recommend using a warmer white light colour temperature of 3000K throughout the Proposed Development. This is to add warmth and enhance the materiality of the landscape and buildings.

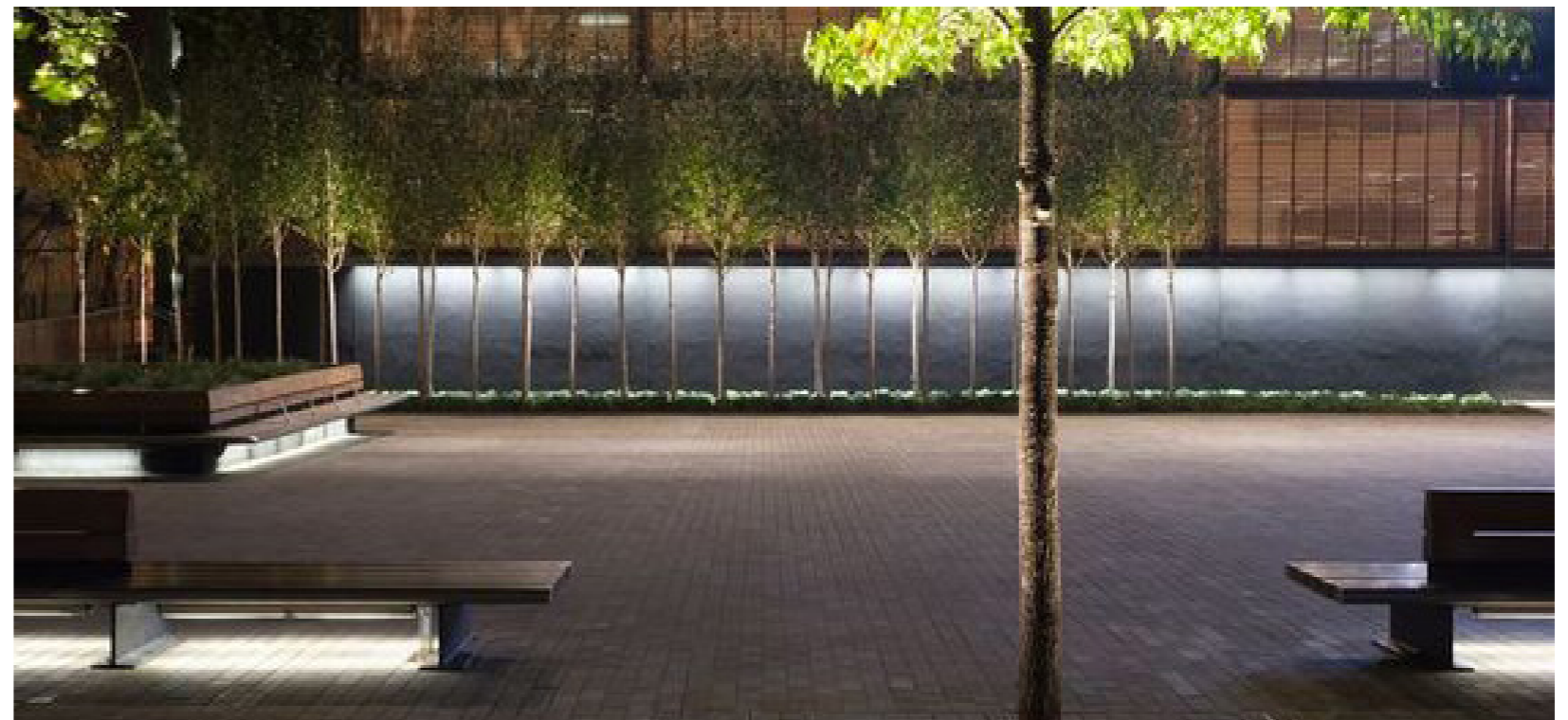


Lighting Design Considerations.

Feature elements

Providing certain lighting treatments to landscape details and illuminating key vertical surfaces will make all spaces feel inviting and comfortable to use.

Please note that the above statement does not give us as lighting designers the freedom to do as we please or desire. There will need to be design rationale which will be focused towards providing a cohesive layered approach. Hoare Lea Lighting feel that a layered approach to feature landscape elements should be low level with close attention paid to light distribution to these feature elements. Also, providing focused illumination to key vertical elements can provide perspective recognition which is required when persons travel through any space.



Lighting Design Considerations.

Families of equipment

In order to maintain a holistic view across the site a consistent design language of: luminaire family, luminaire type, light sources, and performance will be considered. Where possible the design language and finishes of lights will compliment each-other and the architecture.

All luminaires are to be LED to ensure maximum energy saving and consistency while minimising the maintenance burden.



Lighting Design Considerations.

Ecology

In conjunction with the ecology reports and the proposed site development plans a lighting strategy can be formed to eliminate or mitigate the potential effects of lighting onto surrounding light sensitive areas.

For further information on the lighting impact to the site please refer to documents:

EXTERNAL LIGHTING BASELINE SURVEY

ILLUMINATION IMPACT PROFILE



Lighting Design Considerations.

Lighting controls

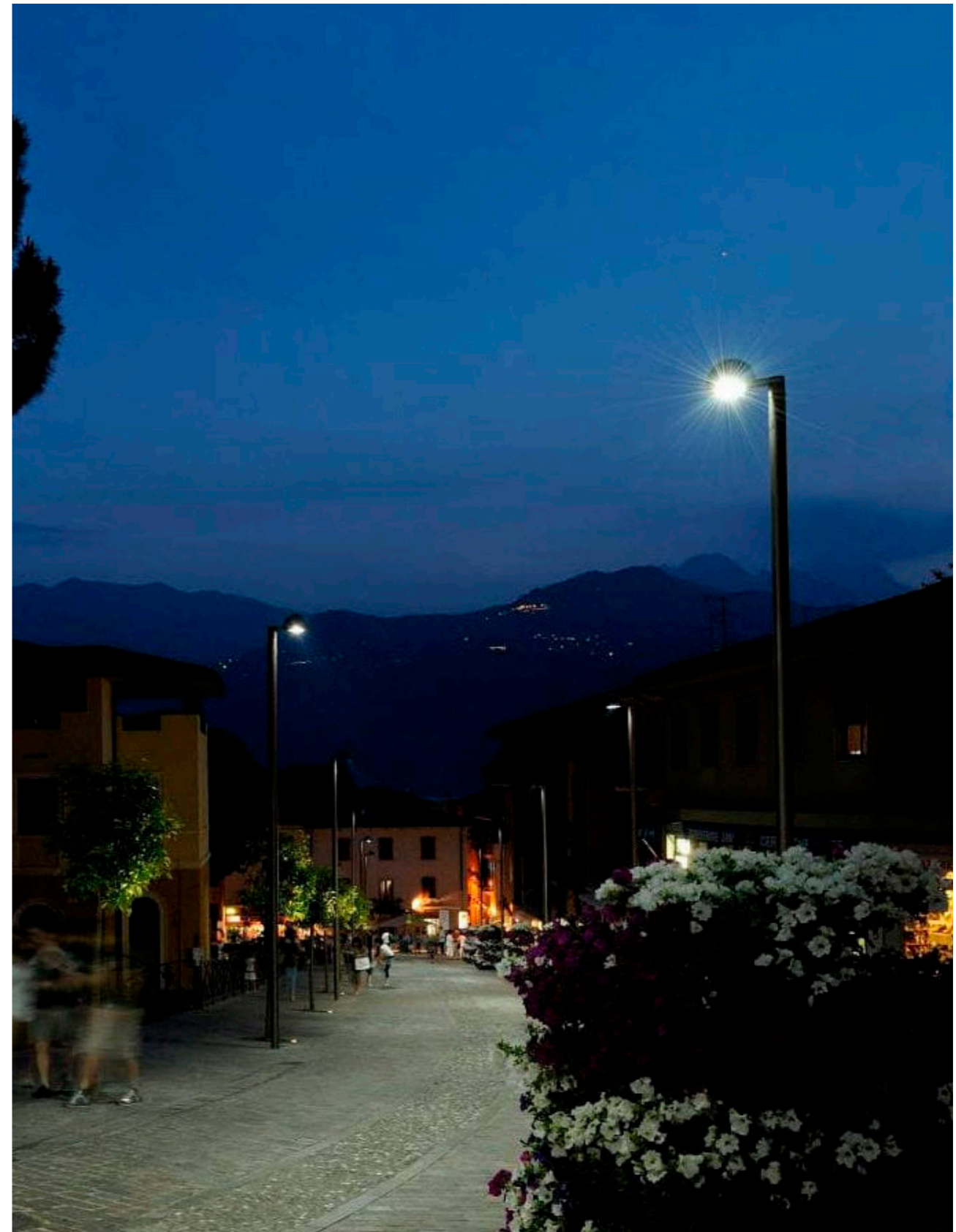
The use of lighting controls within the Proposed Development are important to consider. It enables variation and ensures the scheme is used efficiently, through the control of grouped fittings and their lighting output.

The lighting control system need not require specific technical knowledge to operate, providing the user with a simple and easy to navigate interface, with control through either an app or pre-set control panel.

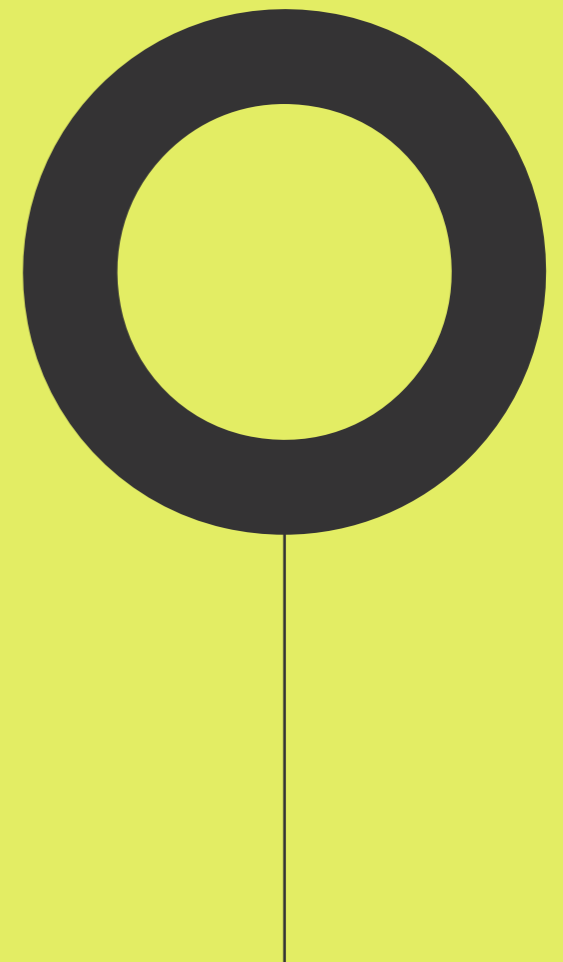
Different lighting treatments shown throughout this document could be utilised to be kept on for alternative lengths of time/brightness dependant on the needs or requirements of the given area.

Things to consider:

- Time clocks
- Photocells
- Sensors
- Scene setting
- Inbuilt step dimming



Lighting Criteria.



Lighting Criteria.

Policy and guidance

A number of documents lay down the best practice and guidance on providing sufficient and appropriate lighting for pedestrian passage and visual interest.

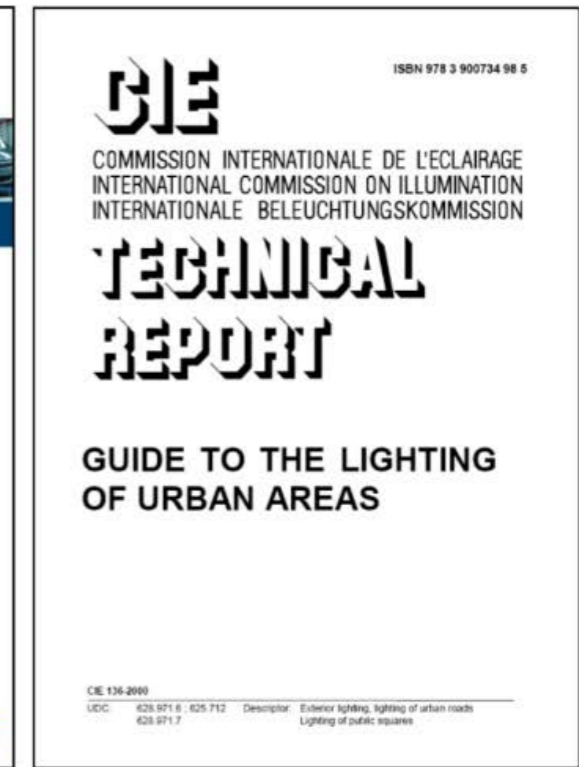
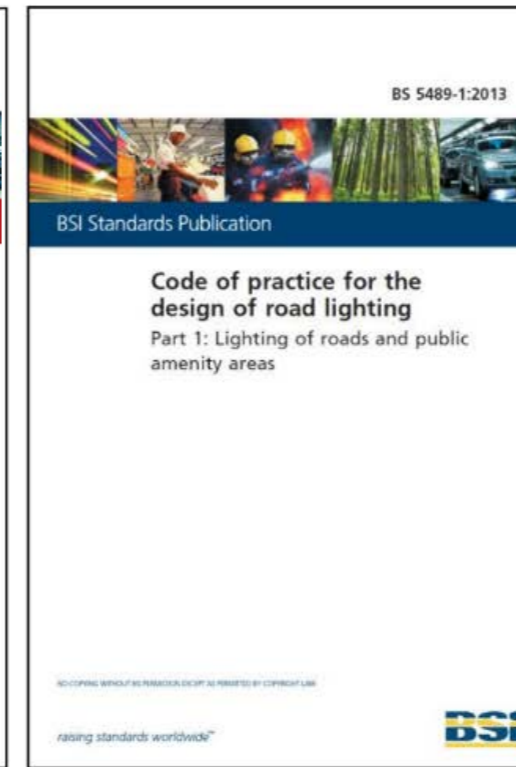
These include:

- BS5489-1:2013
- BS EN13201-2:2015
- CIE136: 2000
- SLL Code for Lighting

And if appropriate:

CIBSE Lighting Guide 6: The Outdoor Environment 2016

CIBSE : Lighting the Environment: A guide to good urban lighting



Lighting Criteria.

Environmental zone classification

Obtrusive light should be in accordance with the parameters recommended within the Institute of Lighting Professionals (ILP) Guidance Notes for the Reduction of Obtrusive Light GN01:2011 for the relevant Environmental Zone.

It is noted, however, within this document that these recommendations may not be achievable for all road lighting situations.

The site has been classified within the following categories.

Environmental Zone E2 category

Table 1 - Environmental Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

Table extracted from 'Guidance Notes for the Reduction of Obtrusive Light GN01:2011'

Table 2 - Obtrusive Light Limitations for Exterior Lighting Installations - General Observers

Zone	Sky Glow ULR [Max %] ⁽¹⁾	Lighting Intrusion (into Windows) E _v [lux] ⁽²⁾		Luminaire Intensity I [candelas] ⁽³⁾		Building Luminance Pre-curfew ⁽⁴⁾
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average L [cd/m ²]
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,000	25

Table extracted from 'Guidance Notes for the Reduction of Obtrusive Light GN01:2011'

Table 2 Notes.

- ULR** = **Upward Light Ratio of the Installation** is the maximum permitted percentage of luminaire flux that goes directly into the sky.
- E_v** = **Vertical Illuminance in Lux** - measured flat on the glazing at the centre of the window.
- I** = **Light Intensity in Candelas (cd)**
- L** = **Luminance in Candelas per Square Metre (cd/m²)**
- Curfew** = **the time after which stricter requirements (for the control of obtrusive light) will apply**; often a condition of use of lighting applied by the local planning authority. If not otherwise stated - 23.00hrs is suggested.
- *** = **Permitted only from** Public road lighting installations

- (1) Upward Light Ratio** – Some lighting schemes will require the deliberate and careful use of upward light, e.g. ground recessed luminaires, ground mounted floodlights, festive lighting, to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.
- (2) Light Intrusion (into Windows)** – These values are suggested maxima and need to take account of existing light intrusion at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light intrusion into the window down to the post curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.
- (3) Luminaire Intensity** – This applies to each luminaire in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.
- (4) Building Luminance** – This should be limited to avoid over lighting, and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.

Lighting Criteria.

Lighting requirements

It is important that the lighting applications provide both an aesthetic quality and also the appropriate levels of illumination required for the space they inhabit.

The adjacent table, extracted from BS EN 12464-2:2014 gives a guide to the target levels of illumination within the parking area.

It is important to remember however that these are a guide only and appropriate interpretation of the space and how these requirements align with its intended use should be taken into account.

The lighting requirements within the scope area fall into the following categories:

Service/Loading Yard	5.1.4 Pedestrian passages, vehicle turning, loading and unloading points
Vehicle Route (Main Entrance)	5.1.3 Regular vehicle traffic (max 40km/h)
Car Par / Service Road	5.9.2 Medium traffic.
Pedestrian Routes	No class, illumination for ease of navigation only

Depending on the light source used for the final specification, the S/P ratio should be taken into account and the lighting level requirements adjusted accordingly in accordance with BS5489. The S/P ration is a formula which takes into account the ability of the human eye to respond more effectively some white light sources in comparison to older types of lighting which emit a "yellow" type of light.

Based on the size and anticipated level of usage of the car park, it has been classed as a medium traffic area requiring 10 lux average with 25% uniformity.

Table 5.1 General requirements for areas and for cleaning at outdoor work places

Ref. no.	Types of area, task or activity	Em lx	Uo -	R/GL -	Ra -
5.1.1	Walkway exclusively for pedestrians	5	0.25	50	20
5.1.2	Traffic areas for slowly moving vehicles (max. 10km/h), e.g. bicycles, trucks and excavators	10	0.4	50	20
5.1.3	Regular vehicle traffic (max 40 km/h)	20	0.4	45	20
5.1.4	Pedestrian passages, vehicle turning, loading and unloading points	50	0.4	50	20
5.1.5	Cleaning and servicing	50	0.25	50	20

Table extracted from 'BS EN 12464-2:2014'

Table 5.9 Parking Areas

Ref. no.	Types of area, task or activity	Em lx	Uo -	R/GL -	Ra -
5.9.1	Light traffic e.g. parking areas of shops, terraced and apartment houses: cycle parks	5	0.25	55	20
5.9.2	Medium traffic e.g. parking areas of department stores, office buildings, plants, sports and multi-purpose building complexes	10	0.25	50	20
5.9.3	Heavy traffic e.g. parking areas of major shopping centres, major sports and multi-purpose building complexes	20	0.25	50	20

Table extracted from 'BS EN 12464-2:2014'

Lighting Criteria.

Lighting levels

The below table and adjacent plan set out the lighting class and lighting level requirements for all areas.

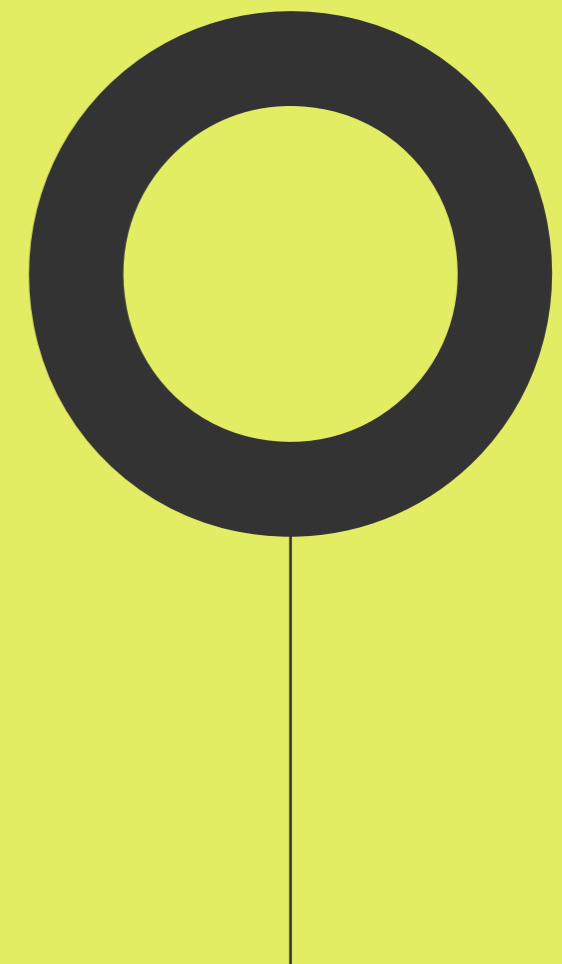
While the vehicle route follows the British Standards figures as set out on the previous pages, it is proposed that the pedestrian routes will not be illuminated to a specific lux level.

Instead, low level discrete lighting will be provided from a number of different techniques that will allow for the safe navigation of the site. This approach has been developed in particular for the amenity areas to the north west of the building in an effort to minimise light pollution with unnecessary lighting. This approach not only minimises unnecessary light but will also lead to a visually interesting environment.

Area	Average Lux	Minimum Lux	Uniformity (Minimum)
Car Parks / Service Road	10	2.5	0.25
Vehicle Routes (Main Entrance)	20	8	0.4
Pedestrian Routes	Navigational assistance only		
Service Yard	50	20	0.4



Concept Lighting Design. Functional Illumination



Plan Overview.



Northern Trail

Main Entrance

FEC Open Space

Main Car Park

Service Road

Service Yards

Note. All visualisations are for illustrative purposes only.

Main Entrance.

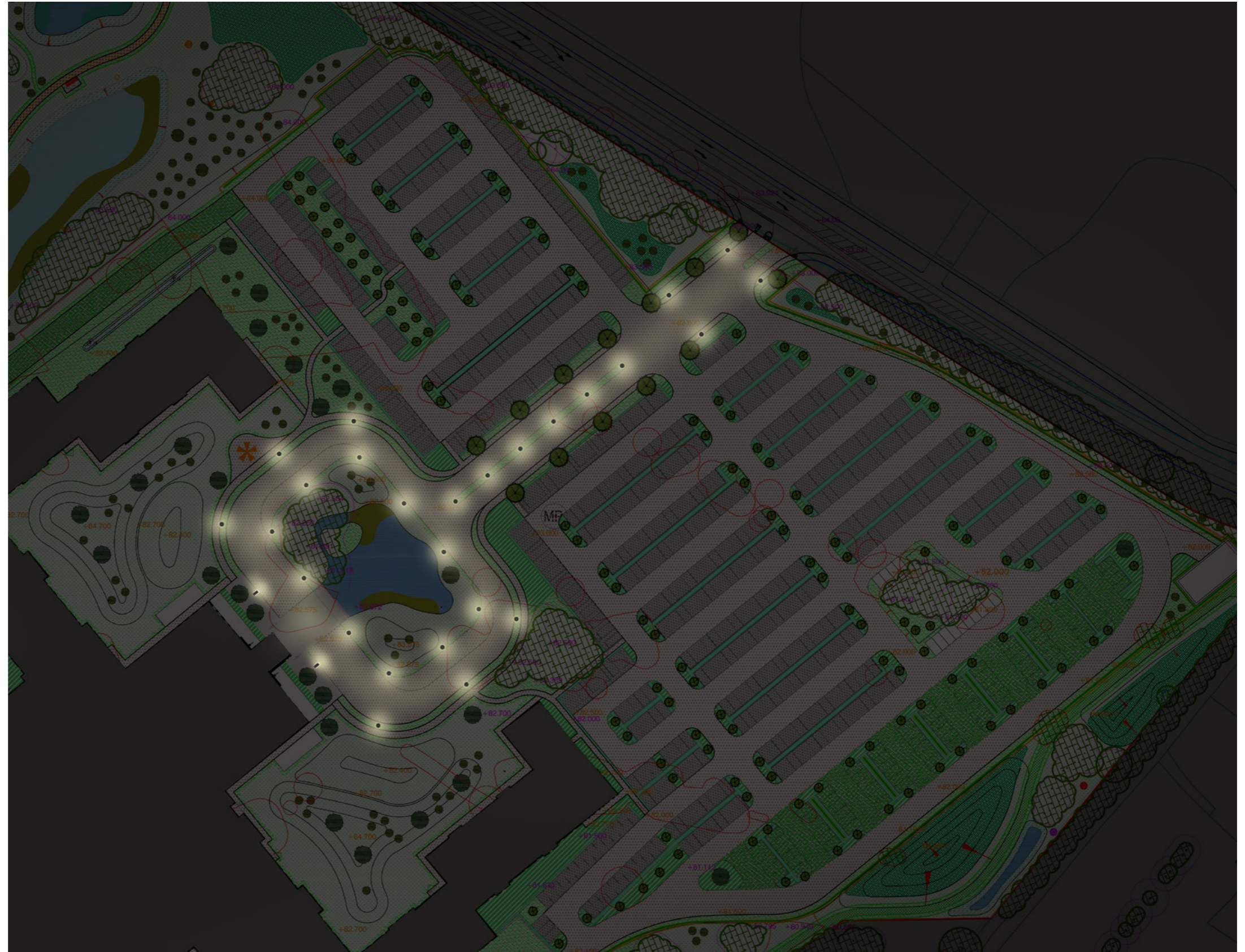
Column lights

On entering the site you are met with a tree lined vista leading to the main hotel entrance. The lighting within the car park and adjacent areas will be coordinated in order to emphasise this vista.

To provide functional illumination amenity style column lights will be used delivering a soft and welcoming aesthetic.

The columns will be 4m tall offering a balance between an intimate feel and an efficient height to minimise quantities.

This lighting approach will not only run down the approach vista but also around the drop off area and water feature to lead visitors up to the main building.

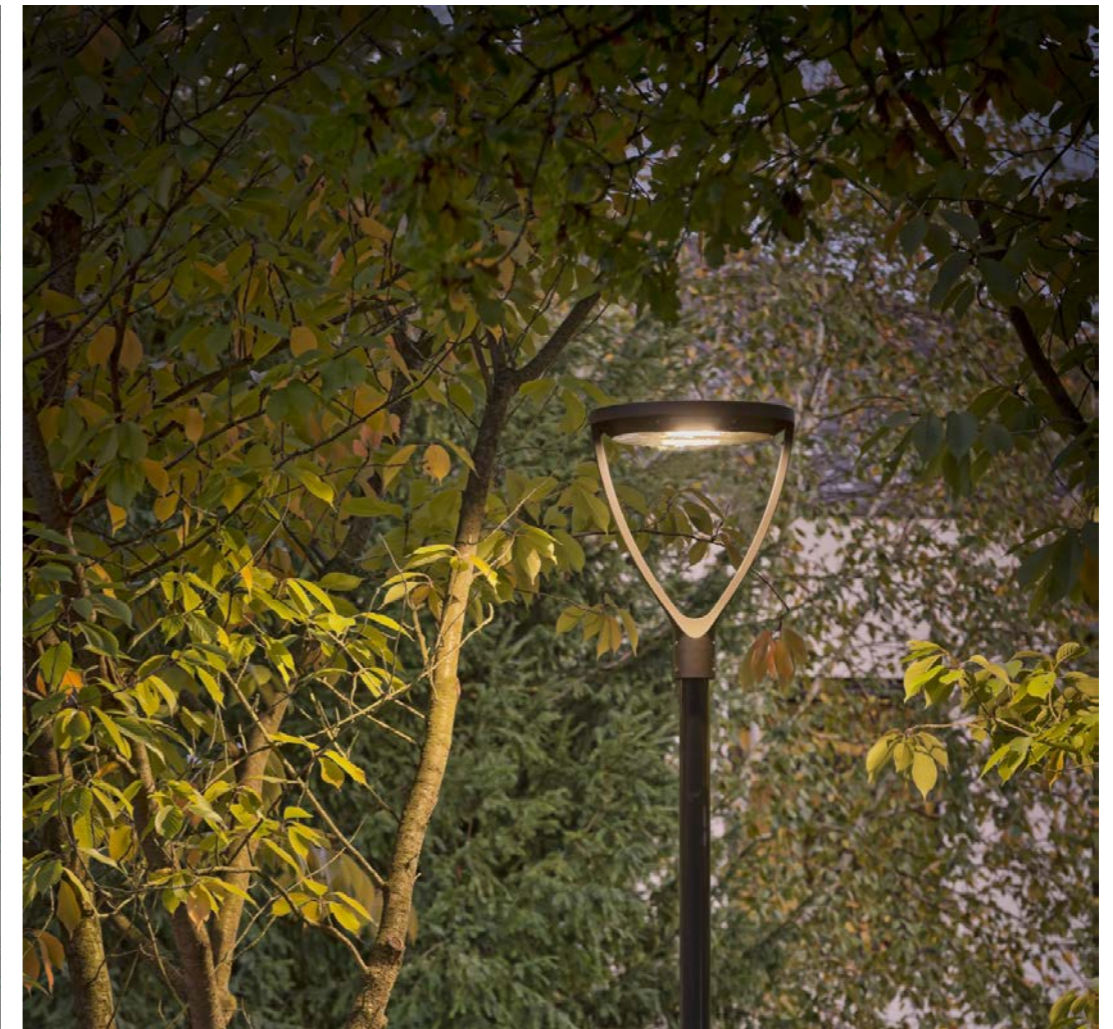


Main Entrance.

Column lights

The images on this page illustrate the quantities and locations of the amenity column lights required along with the proposed style of luminaire.

The adjacent car park will be illuminated with an alternative approach to accentuate the central vista leading to the building.



Main Car Park.

Column lights

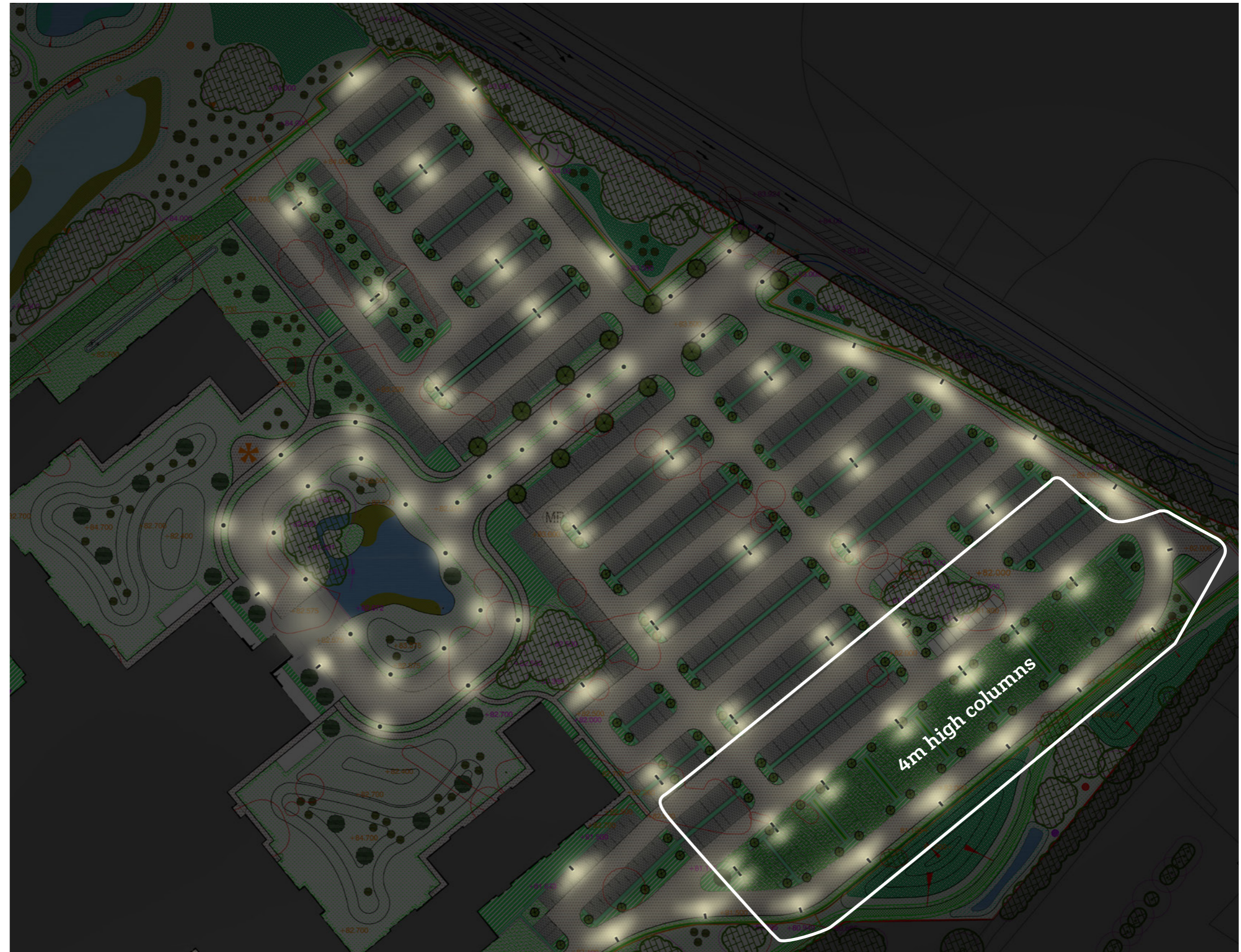
To provide the illumination to the main large car park it is proposed that efficient street lights are used. The high performance flexible optics of street lights ensure large spacings can be achieved while delivering a uniformed light level.

The lights will be mounted on 6m high columns, which offers a balance between a suitable height for efficient spacings while not being so high that they can be seen from great distances. Limiting the height of the columns also assists in minimising light spill to the perimeter of the site.

The exception to this is the section of columns to the south east of the site, these lights will utilise 4m high columns to mitigate views from the neighbouring properties.

It is also important to consider the boundary to the south east will comprise of mounding and landscaping that will assist in the concealment of luminaires to the site. Please refer to the landscape proposal for further information.

Column locations are indicative, final locations will be confirmed during the design stages.



Main Car Park.

Column lights

The images on this page provide examples of the style of luminaire proposed for the car parks.

All luminaires mounted to the perimeter of the Site will also benefit from integral glare guards to further restrict spill, to the site.

All luminaires will utilise inbuilt photocells to ensure the lights only come on after dark and step dimming to provide automatic dimming. It is proposed from sun set till midnight the lights are on at 100%, they will then automatically dim down to 50% output until 5am, before ramping back up to 100% until sun rise. The exact times for change will be confirmed with the client prior to procurement.

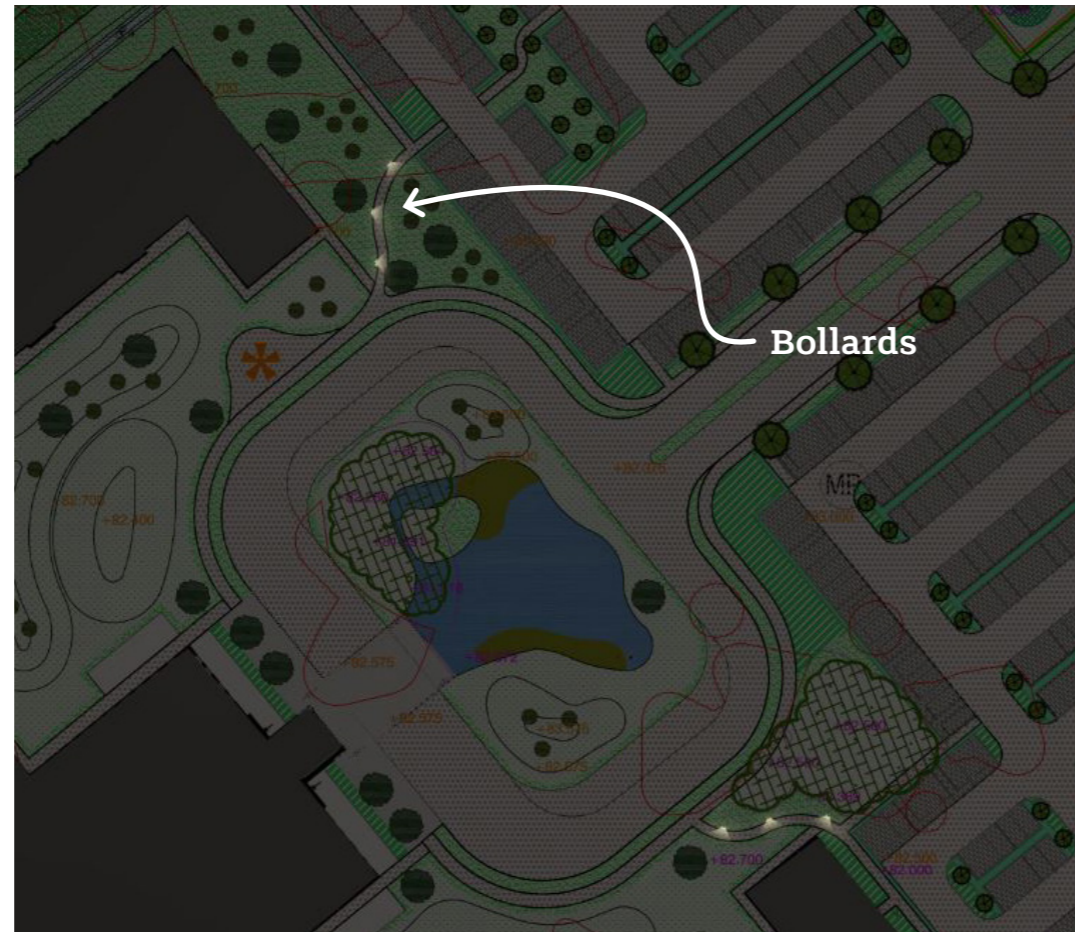


Main Car Park.

Pathway lighting

Walkways leading from the main car park will have way finding illumination provided by bollards.

Bollards will be placed along one side of the pathway pushing light across and onto the walkway to aid with navigation through the space.

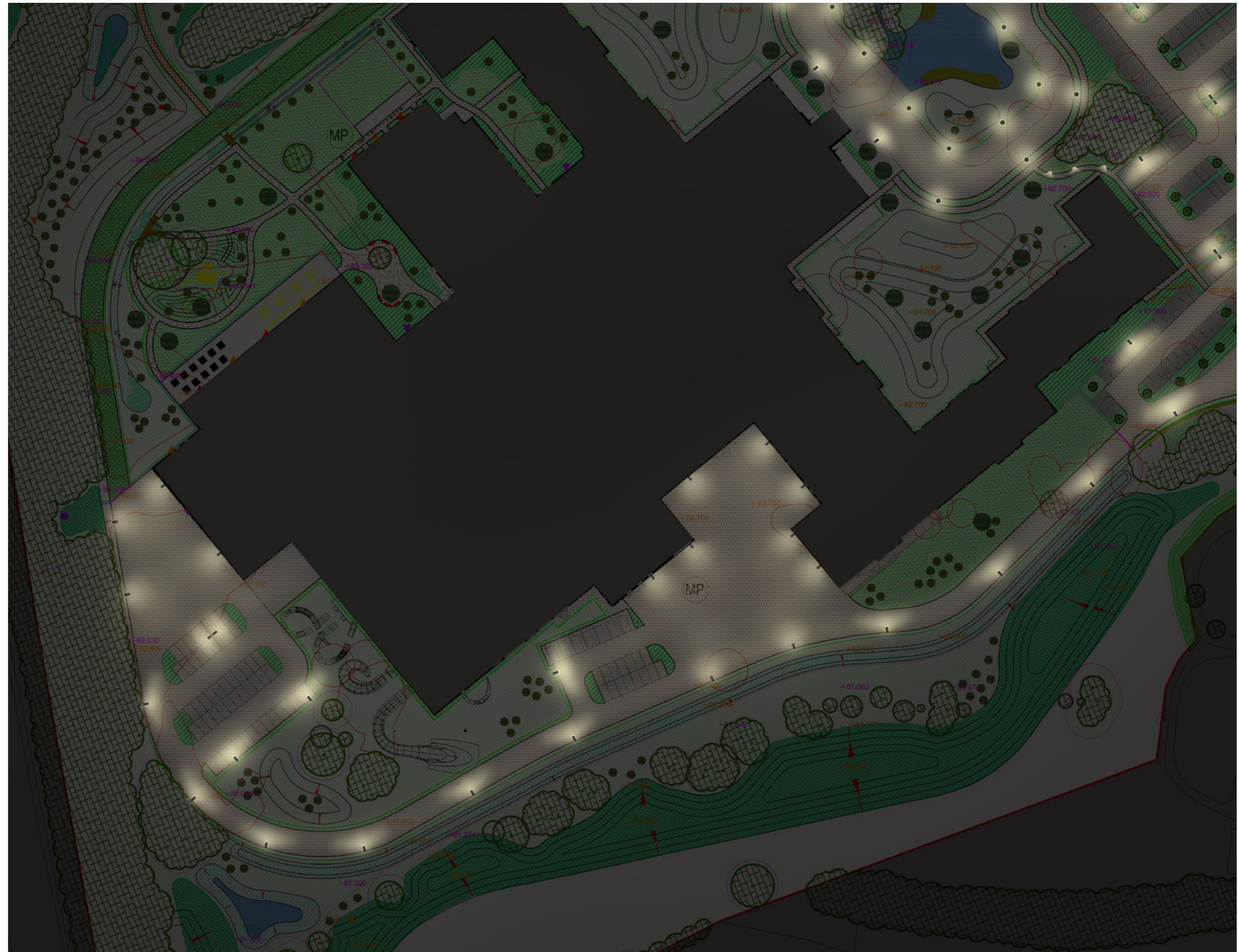


Service Road.

Column & building lighting

The illumination of the service road leading from the main car park to the service yards will be illuminated by columns, and building mounted lights within the service yard vicinity.

Both column and building mounted luminaires will be positioned at 6m to ensure minimum impact on the surrounding areas.

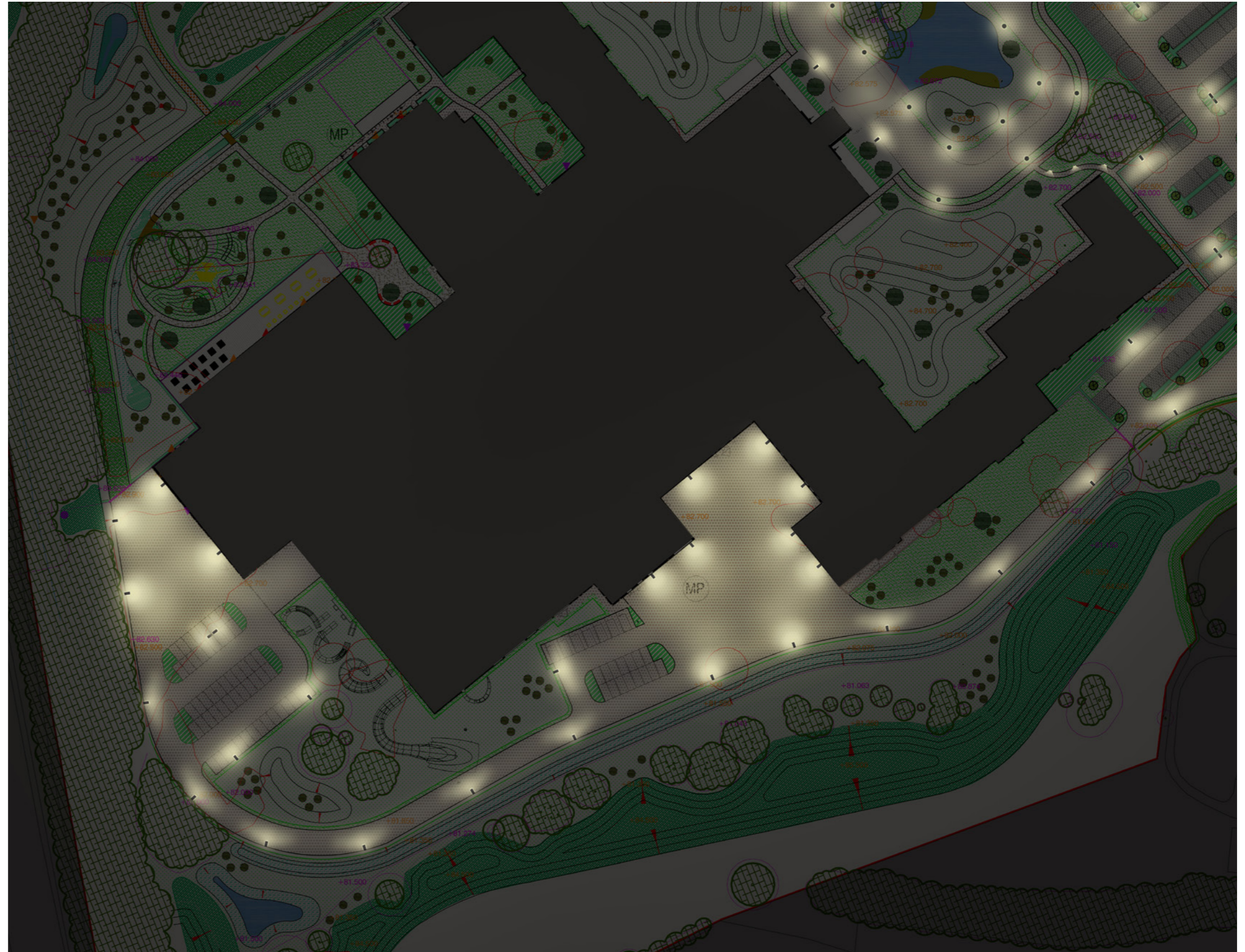


Service Yard.

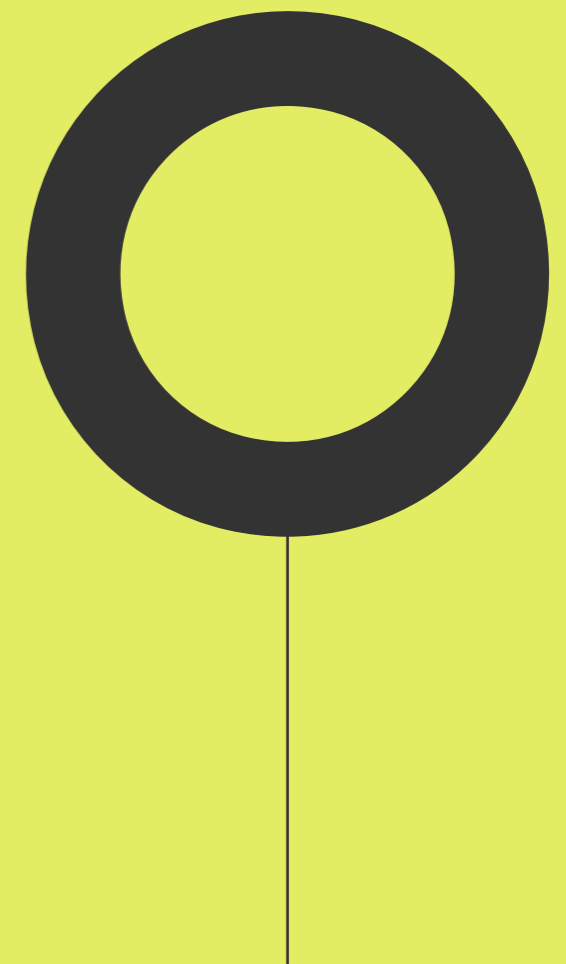
Column & building lighting

To ensure a safe working environment is provided to the service yard a level of 50 lux is required. This in comparison to the 10 lux being provided to the service road and main car park.

The lighting to the service yard will be switch-able between two levels of illumination. The majority of the time when deliveries aren't happening the yards will be illuminated to 10 lux. When the service yard is accepting deliveries out of day-lit hours the lighting will then be switched up to the 50 lux requirement. This approach will ensure the high level of illumination will be limited to only when it is required.



Concept Lighting Design. Feature Illumination



Main Entrance.

Tree lighting

It is proposed the avenue of trees lining the main vista leading up to the resort will be up-lit to further accentuate this key approach and provide a sense of arrival.

In addition to the avenue, the larger trees close to the hotel entrance will also be illuminated drawing attention to the centre of the site, away from the car parks.

This technique offers valuable vertical illumination to the front of the resort which will evolve and change through the seasons as the trees change.

