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**Lighting Scheme**

Condition 40

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## 1 Introduction

- 1.1 This submission is in response to 'Condition 40' of the outline consent (ref no. ) and requires a detailed scheme....etc). This scheme is relevant to all phases.
- 1.2 This lighting scheme looks to build upon the external lighting strategy previously produced by BWB in February 2018, demonstrating and applying lighting solutions that serve the needs of the resort and are consistent with the surrounds and obtrusive light criteria. The scheme seeks to address the concerns of visual and residential amenity, control of obtrusive light (light spill), and biodiversity and protection of habitats and species outlined within policies EN8 and BE1 of the Neath Port Talbot Local Development Plan.
- 1.3 The scheme sets out to develop and define a range of lighting solutions that make up a common language across the resort, responding to the revised and emerging architectural and landscape layouts, and materials palette. From this family of solutions, the scheme seeks to show their general application across the resort. Lighting solutions have been photometrically tested on key areas of the resort to determine their suitability and inform the various technical parameters. As part of the testing process example luminaires have been used and shown for the various lighting solutions. Final luminaire selection, specification and placements will be undertaken at future design phases in accordance with the scheme, performance requirements and constraints established within this document.

## 2 Core Principles

- 2.1 The following core principles are intended to inform the lighting design and provide reference for appraising the solution's suitability at each location.
  - Provide illumination that activates and supports the core public realms surrounding the key activity centres.
  - Embrace the natural setting by minimising extent of lighting away from core activity centres.
  - Lighting should be clearly associated with building or purpose, extensive areas of lighting away from buildings or activity hubs is to be avoided.
  - Provide light for movement by illuminating destinations, nodal, decision, and conflict areas along routes.
  - Apply passive lighting measures where possible.
  - Scale lighting solutions to be appropriate to the landscape and topography. Seek to avoid luminaires and light sources becoming prominent features on horizons and views to and from the resort.
  - Use of Warm White ( $\leq 3000$ Kelvin) colour temperature across the resort. Preferably  $\leq 2700$ Kelvin for street and area lighting.
  - Material finish of lighting products to compliment the palette of materials used within the architecture and landscape the resort.
  - Seek lighting solutions consistent with Environmental Lighting Zone E1 within the resort wherever possible and not to exceed Environmental Lighting Zone E2 within the site or at surrounding receptors.
  - No direct upward light for trees or architectural features etc. Including from in-ground up lights or spike mounted spotlighting.

### 3 Standards and Guidelines

- 3.1 The following documents serve as reference for the development of the lighting scheme. The standards and guidelines do not directly address the rural and resort nature of the proposed developments. However the following documents inform the scheme, and are adapted to the setting, seeking to avoid an "Institutionalised" numerically driven solution which risks over-lighting and disrupting the environmental character of the resort and surroundings.

#### GENERAL ILLUMINATION STANDARDS

- 3.2 British Standards
- BS 5489-1:2020 Design of road lighting. Lighting of roads and public amenity areas
  - BS EN 13201-1:2014 Road Lighting, Part 1 Guidelines on selection of lighting classes
  - BS EN 13201-2:2015 Road lighting - Performance requirements
  - BS EN 12464-2:2014 Light and lighting - Lighting of work places Part 2: Outdoor work places
  - BS 5266-1:2016 - Code of practice for the emergency lighting of premises
- 3.3 Chartered institute of Building Services Engineers (CIBSE) / Society of Light and Lighting (SLL)
- Lighting Guide 6 - The Exterior Environment, 2016
  - Lighting Guide 4 - Sports Lighting, 2016
  - Lighting Guide 9 - Lighting for Communal Residential Buildings, 2013

#### OBTRUSIVE LIGHT

- 3.4 Institution of Lighting Professionals (ILP)
- Guidance Note 01:2021 - The Reduction Of Obtrusive Light
  - Guidance Note 08:2018 - Bats and Artificial Lighting in The UK (joint publication with Bat Conservation Trust)

## 4 Obtrusive Light Considerations & General Resort Lighting Intensity

- 4.1

The previous accepted Lighting Scheme by BWB considers the site as falling within an E2 Environmental Lighting Zone (Rural, Low Brightness District), acknowledging the potential for consideration of E1 (Natural, intrinsically Dark).
- 4.2

The E2 classification results from lighting present at surrounding settlements. There is no lighting present within the site at its baseline condition and it is anticipated that whilst lighting is present from surrounds a higher quality view of the night sky from within the site would be experienced than within the adjacent settlements. The aspiration for the resort as a place where people connect with the outdoors means seeking to keep lighting to a minimum and developing lighting solutions in a way that do not intrude on or disrupt views to and from the resort.
- 4.3

This desire is balanced with the safety of guests and facilitating the various activities across the resort. Curfews may be applicable to individual activity areas, however with the need for safe movement across the resort portions of general circulation lighting are likely to be operational for a greater proportion of the night or until a set duration after the conclusion of last hospitality function enabling guests to return to their accommodation.
- 4.4

Thresholds for both Environmental Lighting Zones are shown below based upon values within the institution of Lighting Professionals Guidance Note 01/21 The Reduction Of Obtrusive Light (ILP GN01).
- 4.5

The development of the resort will undoubtedly change the night-time character of the area. It is recognised that the limits of an E1 Environmental Zone with the resort would preclude some of the functionality for the resort. Consequently, E1 values are shown as desirable and applicable where easily achieved, such managing direct upward light, however E2 thresholds will be monitored through the process and development of the lighting scheme. The objective is to provide the minimum amount of light appropriate for the safety and enjoyments of guests, and the safe and efficient operation of the resort.

Table Ltg01 - Obtrusive Light Thresholds for Environmental Lighting Zones

Environmental Lighting Zone	Sky Glow Maximum values of (upward Light Ratio) ULR [ULR%] <sup>(1)</sup>	Light intrusion (into Windows) Ev [lux]		Maximum permitted values of average surface Luminance (cd/m2) <sup>(2)</sup>		Limits for the luminous intensity of bright luminaires
		Pre-Curfew	Post Curfew	Building façade illuminance	Sign luminance	
E1	0	2	<0.1*	0.1	50	Refer to Table Ltg02
E2	2.5	5	1	5	400	

Definitions

**ULR = Upward Light Ratio of the installation** is the maximum permitted percentage of luminaire flux for that goes directly into the sky.

**Ev = Vertical illuminance in Lux** and is measured flat on the glazing at the centre of the window

**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.

(1) This does not take into account the effect of light reflected upwards from ground that also contributes to sky glow. This is the traditional method to limit sky glow and is suitable to compare different single luminaires or the percentage of an entire installation.

(2) The values apply to both pre- and post-curfew, except that in zones 0 and 1 the values shall be zero post curfew. The values for signs do not apply to signs for traffic control purposes

\* if the installation is for public (road) lighting then this may be up to 1 lx.

Table Ltg02 - Limits for the luminous intensity of luminaires

Environmental Lighting Zone		Luminaire group (projected area AP in m2)					
		0<Ap ≤0.002	0.002< Ap ≤ 0.01	0.01< Ap ≤ 0.03	0.03< Ap ≤ 0.13	0.13 < Ap≤ 0.50	Ap > 0.50
E1	Pre-Curfew	0.29d	0.63d	1.3d	2.5d	5.1d	2500cd
	Post - Curfew	0	0	0	0	0	0
E2	Pre-Curfew	0.57 d	1.3 d	2.5d	5.0d	10d	7,500cd
	Post - Curfew	0.29 d	0.63 d	1.3d	2.5d	5.1d	500cd

- 4.6

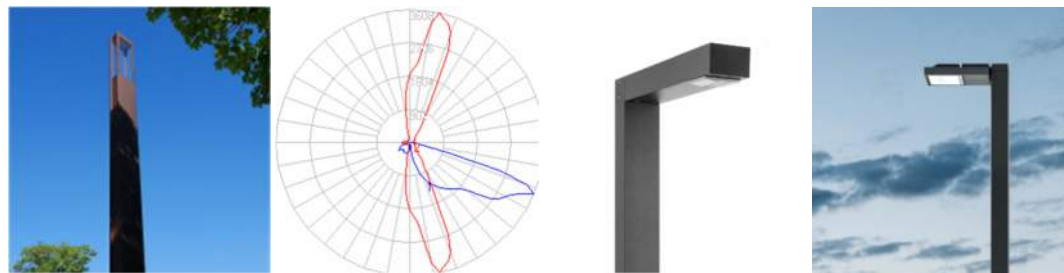
Limits for the luminous intensity of luminaires is intended for instances where views are likely to be maintained and not for short-term or transitory views. The values are established as a multiple of the distance (in metres) between the observer and light source. Guidance on the application of these limits notes that where sources are in elevated positions and can be viewed against the night sky then post-curfew levels should be consistently applied. Whilst previously classified as Environmental Lighting Zone E2, lighting designs shall seek to meet E1 criteria wherever possible for on resort conditions. Views to the site from surrounding settlements will still consider E2 criteria as the receptor location

## 5 Lighting Solutions

- 5.1 Lighting across the resort can be broken into a number of common solutions and techniques. These solutions and techniques are discussed below alongside indicative luminaires and performance characteristics. Final selections of luminaires will be undertaken at future phases

### LIGHTING COLUMNS - "STREETLIGHTING"

- 5.2 The application of "streetlighting" is intended to be kept to a minimum across the resort. where required column heights will be kept proportional to the surrounding buildings and landscape. Column based luminaires for guest facing areas of the resort will have an architectural design and quality. Luminaires will generate no direct upward light and have horizontal orientation with 0° tilt. Optics and outputs will be selected according to the task and area being illuminated. For roadways long lateral distribution with forward throw appropriate to the road width will be selected. Rear spill shall be largely controlled through optic selection, additional 'bolt-on' cowls and louvers will be avoided.



- 5.3 Example column luminaires for spine road. Typical space 25-30 metres and typical lumen output 1400 lumens.

### BOLLARDS

- 5.5 Bollards are anticipated on subsidiary lodge roads, public areas around resort buildings, and some footpaths. Bollards will be <1.2m, typically <1m height, fully cut-off with no direct upward light, and optics will be selected that do not present light sources or strong lit elements to the viewers. This reduces strong contrast within the relatively dark setting of the resort.



- 5.6 Example bollards with wide lateral distribution for subsidiary lodge roads.

### MULTI HEADED COLUMNS / MASTS

- 5.7 The multi-headed columns offer an opportunity for illuminating larger areas whilst minimising the visibility and intensity of light sources. The multi-headed columns also offer the potential for integration of other services and mounting locations for temporary installations leading to uncluttered and cleaner spaces.
- 5.8 Compared to large scale area lighting from "floodlights" which distribute light across a broad area from a single luminaire, the multi-headed column approach uses smaller lower output luminaires with narrower distributions targeted at particular areas. This means that the visibility of light sources is reduced as peak brightness is within these narrower beam angles and so visible only from the locations the luminaire is illuminating. By adding cowls and snoots the visibility of light sources can be further reduced. This is in keeping with the objective of limits for the luminous intensity of luminaires, particularly as to illuminate the large expanses of areas, column heights will be greater and there is potential for luminaires to be viewed against the sky.



- 5.9 The approach also allows for a separation between column supply and luminaire supply allowing for the columns to be designed architecturally and incorporate provision for other services. Column heights will vary according to locations but would be limited to the height of adjacent buildings or trees such that lighting is in keeping with the scale of the setting and is never the highest object. Varying luminaire types can be applied to columns which could allow for multiple layers of light from normal white, coloured, and textured gobo options. Subject to the design of the columns there is potential that these columns could serve as temporary or permanent mounting points for event lighting.





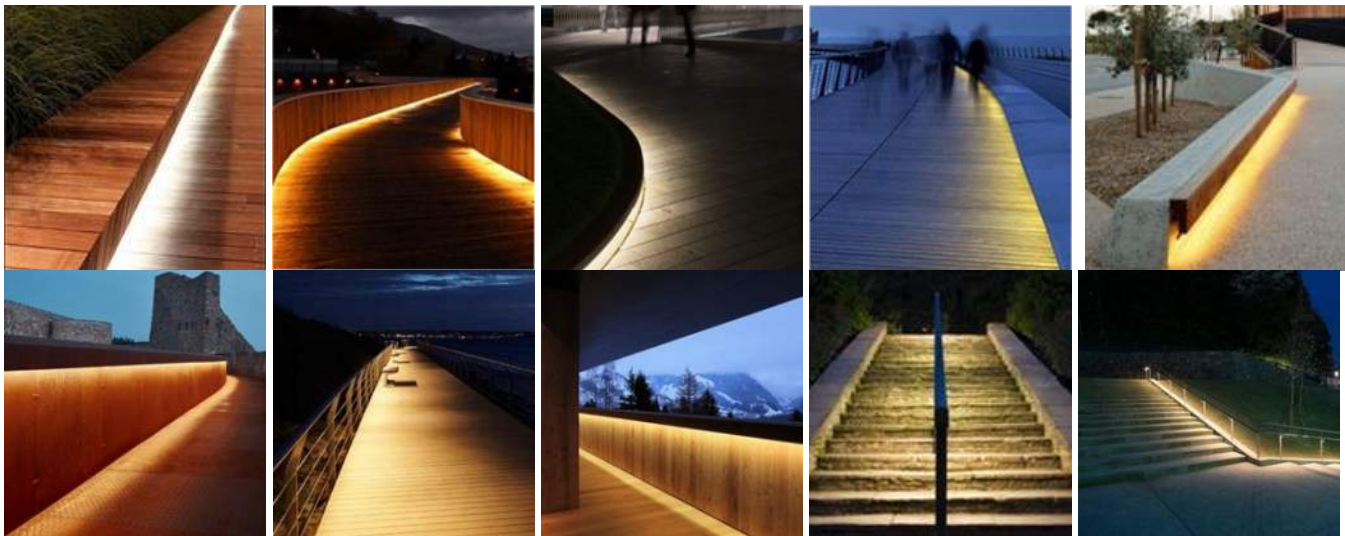
**BUILDING INTEGRATED LIGHTING**

- 5.10 Where public areas are adjacent to buildings, using lighting integrated with the building is an effective way to provide localised and general lighting to the immediate area.
- 5.11 A linear integrated source at the junction of wall and canopy source provides both general lighting to the horizontal (ground) plane but also catches the vertical with a soft grazing light that both enhances the texture and allows perception of movement in front by virtue of contrast against the lit surface. The solution generates no direct upward light. The texture and reflectance of the vertical surface and extent of any canopy overhang would determine the extent of any reflected light directed upwards.
- 5.12 Whilst illuminating large surface areas of façade, this can be at lower luminance because of the extent of the source. Care will be taken to manage the outputs of linear sources to balance the illuminance of the space with the intensity and luminance of the vertical surface. These will reference the E2 limits of 5cd/m<sup>2</sup>. Where buildings are visible from outside the site, notably the arrivals building and summit hub the softer continual lit surfaces are considered preferable to smaller higher output light sources (wall bulkheads) which create “hot-spots” on the façade.
- 5.13 The intensity of the source and effect can be varied according to the location. For example, at the arrivals building a higher ambient illumination can be provided, which is also direct and reflected from the façade to drivers’ face as they interact with staff through car windows. At lodges, levels can be reduced to a minimum, provide a soft ambience to the entrances as well as vertical surfaces against which movement can be perceived.
- 5.14 This solution can also be applied at entrances to storage and service areas providing a high quality of light at the threshold when doors are open.



**HANDRAIL / KICK RAIL / CONTINUOUS LINEAR LIGHTING**

- 5.15 Where handrails and balustrades are present these offer integration solutions appropriate to bridges and terraces.
- 5.16 The structure of balustrades and level of transparency will determine if high level or low level integration is most appropriate.



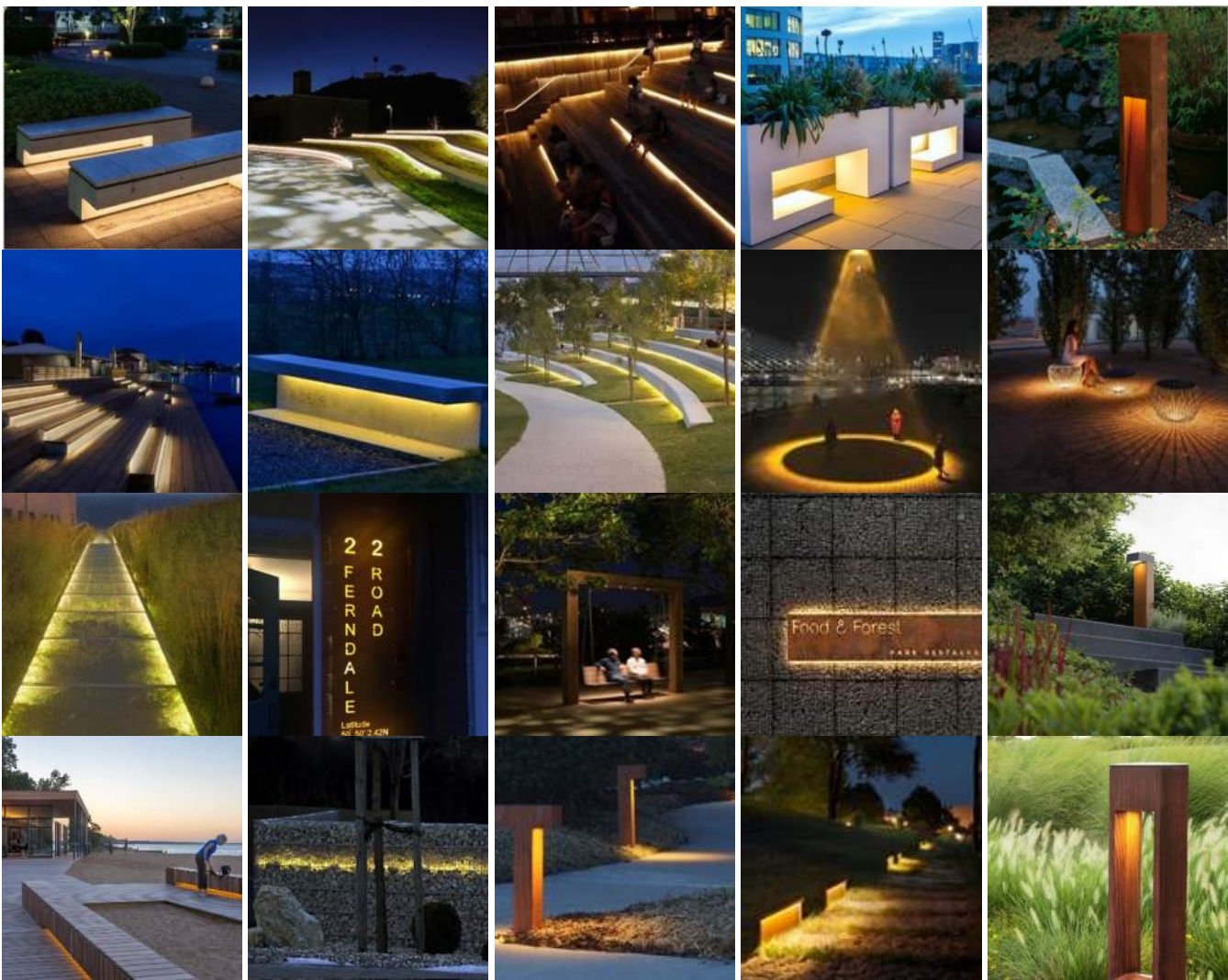
- 5.17 For steps, stairs and ramps, discrete modules or points sources can be applied to illuminate the changes in level.
- 5.18 There are other opportunities for integrated linear lighting within knee rails or low level barriers at the perimeter of spaces.





INTEGRATED LANDSCAPE LIGHTING

- 5.19 Lighting integrated within the landscape seeks to serve two purposes. It aims to define routes and support movement through the resort as well as create "moments" and spaces to pause or undertake activities.
- 5.20 Opportunities to incorporate light into landscape features such as terracing or retaining structures will be used to reduce the number of additional components within the setting. Integration of lighting with street furniture such as benches and cycle stands offers localised lighting from lower mounting heights, reducing the number of columns required across the resort.



- 5.21 Where lighting is used as way markers along routes then opportunities for a playful interaction between the landscape material palette such as wood, stone, Corten steel and light is possible.
- 5.22 Uplighting to trees, planting or features will not be used within the site.

PORTABLE LIGHTING

- 5.23 For social and dining locations the use of portable lighting (battery powered or (bio)oil based) at tables can provide a localised increase in illuminance and add to the atmosphere of the location. Lighting integrated into shades or umbrellas should be low glare, directional to the table.



OTHER SOLUTIONS

- 5.24 The above sections look to capture the core treatments used across the site which will be used and adapted. Unique applications may be required for particular activities or locations; however, these variations will be kept to a minimum and any unique treatments or solutions will work to comply with obtrusive lighting limits.

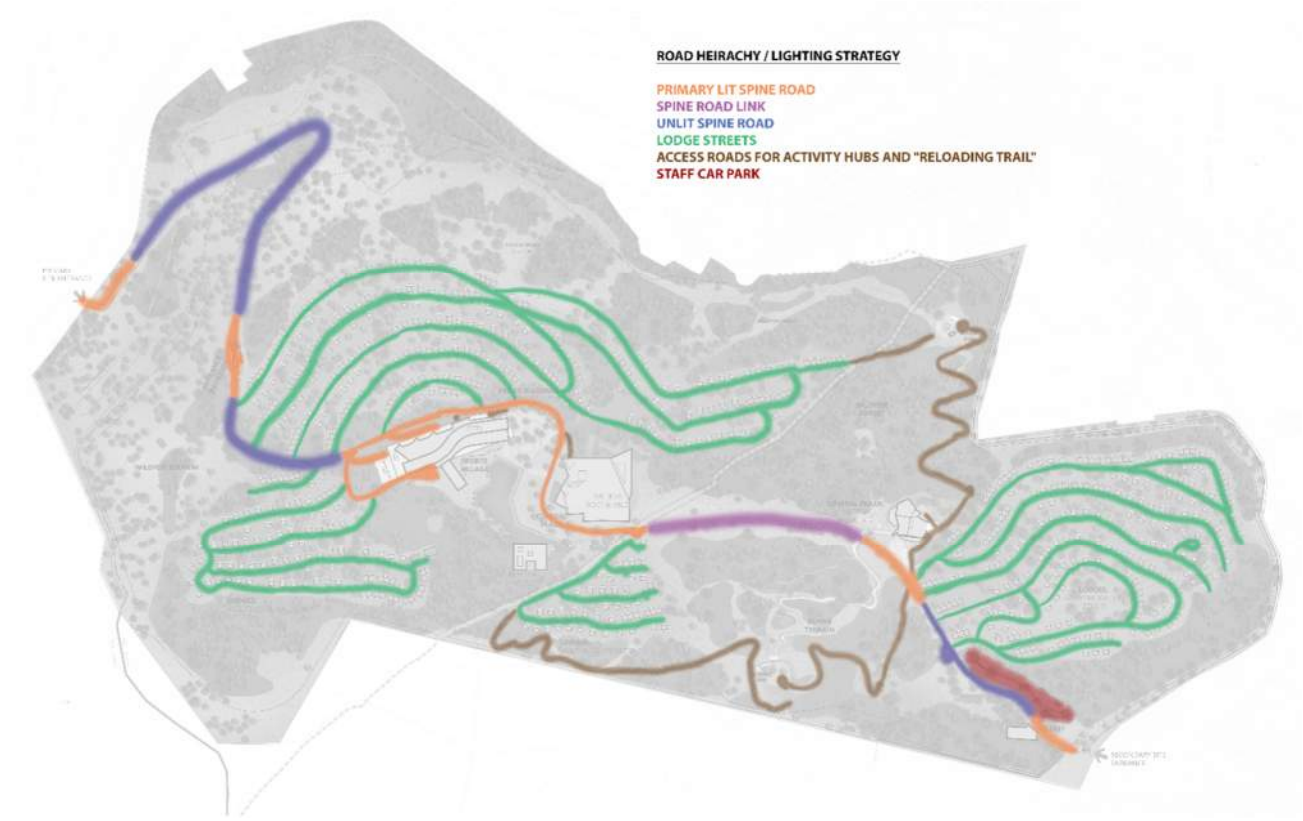
EMERGENCY LIGHTING

- 5.25 BS 5266-1 implies that emergency lighting should be provided to a place of safety. This is often interpreted as the boundary to the public realm, however in the case of the resort is expected to be a series of muster or assembly points.
- 5.26 At present the locations of muster points has not been advised, however it is understood that appropriate battery or generator backed lighting circuits will be provided to luminaires serving these routes and locations.



6 Roads

- 6.1 None of the roadways within the proposed developed are intended to be submitted for adoption by the local highway authority. There is no statutory requirement to provide streetlighting for roads public or private, however there is a requirement under the Health and Safety at Work act 1974 to ensure that staff can safely undertake their tasks, and by extension of this includes the guests.
- 6.2 The majority of roadways comprise of shared surfaces with no separated foot or cycleway. Roads will be used by guest vehicles on changeover days, however outside of these times are limited to service vehicles. Whilst a network of footpaths and cycleways cross the site it is anticipated that roadways will be used extensively by pedestrian and cycle traffic. There is potential for cycle traffic to continue into the evening with guest using bikes to access and return from the central activity areas. The combinations of vehicle, cycle and pedestrian movements will vary during the week, with peak vehicle movements on change-over days.
- 6.3 The previous BWB report asserts a target average illuminance of 10lux regardless of road types. This is akin to a P2 or C4 lighting class by reference to BS 13201-2. The report also states maximum column heights of 6m for street lighting. Whilst the streets allow shared use by motorised vehicles, cyclists, and pedestrians a site-wide application of 10lux average illuminance is considered as out of keeping with the rural, retreat and natural aspirations for the resort.
- 6.4 Illuminance levels will be determined to the relative busyness, levels of conflict and surrounding ambient conditions. Motorised vehicles will operate with headlamps and at speeds appropriate to the shared surface nature of the site. Whilst it is desirable for cyclists to use lighting, it is recognised that there is a high probability for some cyclists to attempt to use roadways without headlamps having forgotten them, engaged in activities longer than expected and returning to lodges after dark, or with flat batteries in headlamps. It is noted that hire cycles will be provided with lights. As cycles have the potential to travel at higher speeds than will likely required for motorised vehicles and without lights there may be difficulty in observing them or their rate of observation to obstructions in the road (including pedestrians). Mitigation through full illumination of all streets is out of keeping with the character of the resort, lighting treatments are determined based on the expected density and risks at each location.
- 6.5 Streetlighting can be broadly grouped into the following types
  - Spine Road at Activity hubs and Conflict areas
  - Spine Road
  - Spine Road Link
  - Lodge Streets
  - Back of house and service
  - Access roads for activity hubs and "reloading trail"



SPINE ROAD AT ACTIVITY HUBS AND CONFLICT AREAS

6.6 There is expected to be the greatest density of vehicle, pedestrian and cycle movements around the activity hubs comprising of Hotel, Rock & Wild, Spa, and Wildfox Mountain and spanning out to the initial junctions with footpaths or roads to lodge accommodation zones. Utilising Table 4 of BESN 13201-1:2014 Guidelines on selection of lighting classes and BS 5489-1:2020 results in either P5 or P6 lighting class depending on the presence of parked cars (P5 with parked cars and P6 without). These values are provided for reference noting that there is no statutory requirement for streetlighting or to a particular class.

	Horizontal illuminance	
	Average Maintained Minimum (Lux)	Minimum Maintained (Lux)
P5	3 - 4.5	0.6
P6	2 - 3	0.4

6.7 To provide illuminance in the region of the above lighting classes column-based lighting is considered the most optimal solution. Lighting columns however will be architectural in form and in keeping with the materials palette within the landscape and architectural solutions.

6.8 Column heights will be limited to 4.5m with luminaire spacings of 25-30 metres anticipated. Views into the resort as well as views from lodges and the hotel are considered in locating the columns to the side of the road where there is the least potential direct view to the source. Rear shields or in-fills will be applied where required, noting the potential visibility of any illuminated shield when viewed from the illuminated side. Indicative column locations are shown within the strategic area calculations later in this report.

UNLIT SPINE ROAD

6.9 Outside of the core activity areas and conflict areas there is a desire for the spine road to be largely unlit. This begins at points after sufficient lodge street junctions and footpaths have intersected with the spine road such that pedestrian and cycle movements have been dissipated. This approach seeks to keep lighting associated with the active and built portions of the resort. Junctions and crossings would be identified through active and passive lighting features at scales appropriate to the landscape.

SPINE ROAD LINK

6.10 The portion of spine road linking the east and west sides of the resort passes through an area of the site without many surrounding buildings. This portion of road has the potential for extensive shared use between pedestrians, cyclists, guest vehicles (on changeover days) and staff vehicles. The continuation of columns along this portion of the road, whilst partially shielded by the forest in views from outside, is out of keeping with the desire to keep lighting associated to the built areas of the development.

6.11 Low mounting height (<1m mounting height) continuous light along the length of this section of road. A near continuous solution along this section is favoured over bollards to reduce the unevenness of light produced from widely spaced bollards. Whilst the lower mounting height does not provide light to faces, it allows the discernment of obstructions and movement. Lighting is proposed to be integrated into a timber knee rail or similar which also supports the demarcation of the road. By mounting the light on the north side of the road, with asymmetric distribution views to the light source are minimised as the southern side of the road moves to higher ground and so views to the light source are limited.

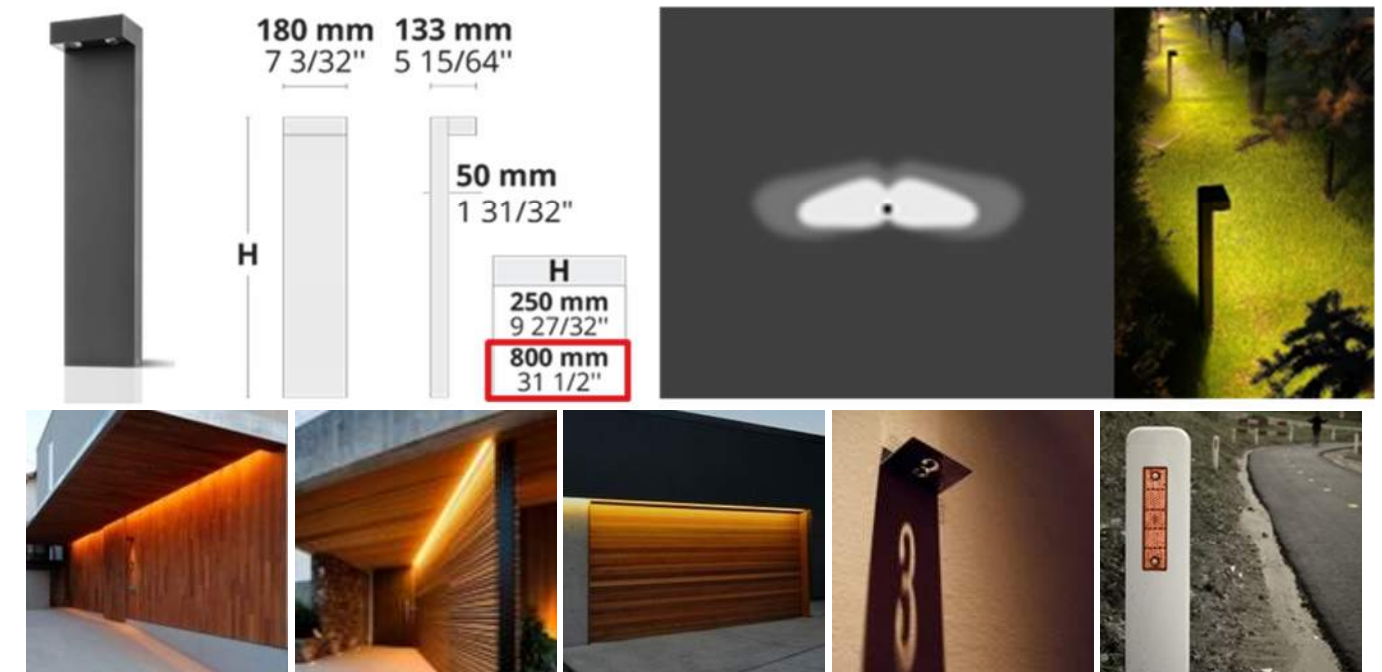




## LODGE ROADS

- 6.12 The lodge roads are intended as places of rest and retreat within the resort. It is important that the setting is distinct from typical adopted public realm low density residential street lighting and supports the leisure function of the resort alongside the rural and sometimes exposed locations. The scheme should embrace and respect the relative darkness of the setting alongside the rural, as well as consider the views to and from the lodges from both inside and outside the resort. The terrain of the site and lodges at varying elevations on the hillside allows views out from each of the lodges, and whilst a number of lodges are two storey these are set into the hillside such that there is only a single storey presented on the side of the road dropping to lower levels. Typical column based streetlighting is not considered appropriate to the lodge roads as the scale and frequency of columns would not be in keeping with the low-rise nature of the lodges and would present themselves as distinctive and notable light sources when viewing the resort from the external surrounds.
- 6.13 Utilising Table 4 of BESN 13201-1:2014 Guidelines on selection of lighting classes suggests a P5 (with parked cars) or P6 (without parked cars) lighting class. Additional requirements for facial recognition have not been factored in to design requirements. These values are being provided for reference noting that there is no statutory requirement for streetlighting or to a particular class.
- 6.14 Lighting within the lodge roads is to be kept below the heights of the lodges, both to reduce visibility of the light sources in views to the site from external viewpoints and to not obscure views out from the lodges, footpaths and roadways. Lighting is proposed from bollards located at the entrance to each property and at key junctions along the route. This is in keeping with the objective of keeping lighting associated with buildings or activity areas, which aids in the clarity of the site by making bollard lighting largely consistent with residential entrances. Luminaires are low in height (<1m) and have a downward distribution with wide lateral throw. This optical distribution extends the lit area along the road and softens the transitions from peak of lighting intensity directly by the bollard to relative low illuminance between bollards. Lodge road lighting sources are kept below eyeline allowing views over the luminaires and appreciation of the wider natural setting.
- 6.15 To provide the ability to distinguish movement and therefore pedestrians or cyclists, light at higher elevations than the bollards is desirable. This can be achieved through lighting on the lodges, where careful integration of lighting to the façade can bring both functional light at the entrances to the lodge and light on the vertical plane against which movement and contrast can be perceived. Whilst this is a light source above eyeline, through integration and the soft illumination of the vertical surface the luminance is managed to be less disruptive to views by comparison to typical column mounted roadlighting. Assuming 20% reflectance and ~150lm/m lambertian output from the linear source the average surface luminance is ~3cd/sqM (primarily as a result of the initial peak close to the luminaire, with a rapid drop off to lower levels), this is in keeping with the E2 Environmental Lighting Zone. As an integrated solution is considered more sympathetic to the resort than column based alternatives or intensive point sources. This integrated approach places external lighting to the lodges as part of the sitewide lighting and outside of guest control.

- 6.16 The myriad of sight lines and viewing angles does not ensure that pedestrians or cyclists are always seen against lit surfaces however provides greater opportunity for identifying movement without requiring typical lighting columns disrupting the character of the lodge roads.
- 6.17 As an alternative to bollards, sections of Knee rail could be introduced either as a consistent treatment across the resort or as a method of illuminating road junctions away from lodges and as such retaining the bollards as feature clearly associated with lodge entrances.



#### BACK OF HOUSE AND SERVICE

- 6.18 Where servicing areas are extensively visible to guests, luminaires should consist of the same architectural quality as those in guest accessible areas.
- 6.19 Illumination levels will be kept appropriate to tasks being undertaken, with lighting control applied to reduce or switch off when areas are not required. Lighting will be kept localised to task locations, for example at loading bays, peak illuminance will be at the expected unloading points of the vehicle and entry to the building as opposed to a blanket coverage of the yard.
- 6.20 Light will be focussed at task areas, such as loading unloading points and adjacent to buildings, rather than across the full expanse of yards and compounds.
- 6.21 For more remote and less frequented locations (during the hours of darkness), such as refuse stores, or some storage compounds then presence detection should be applied to only illuminate for the duration of activity.
- 6.22 Within the staff carpark it is anticipated that lighting column lighting will incorporate presence detection such that lighting is only raised to full levels when required and returns to a basic minimum when no one is present. Fade times for transitions are anticipated to be ~3seconds to on and ~20 seconds reduction to minimum after agreed time-out period. Column heights will be kept appropriate for the terrain, not exceeding the 6m previously stated limit.

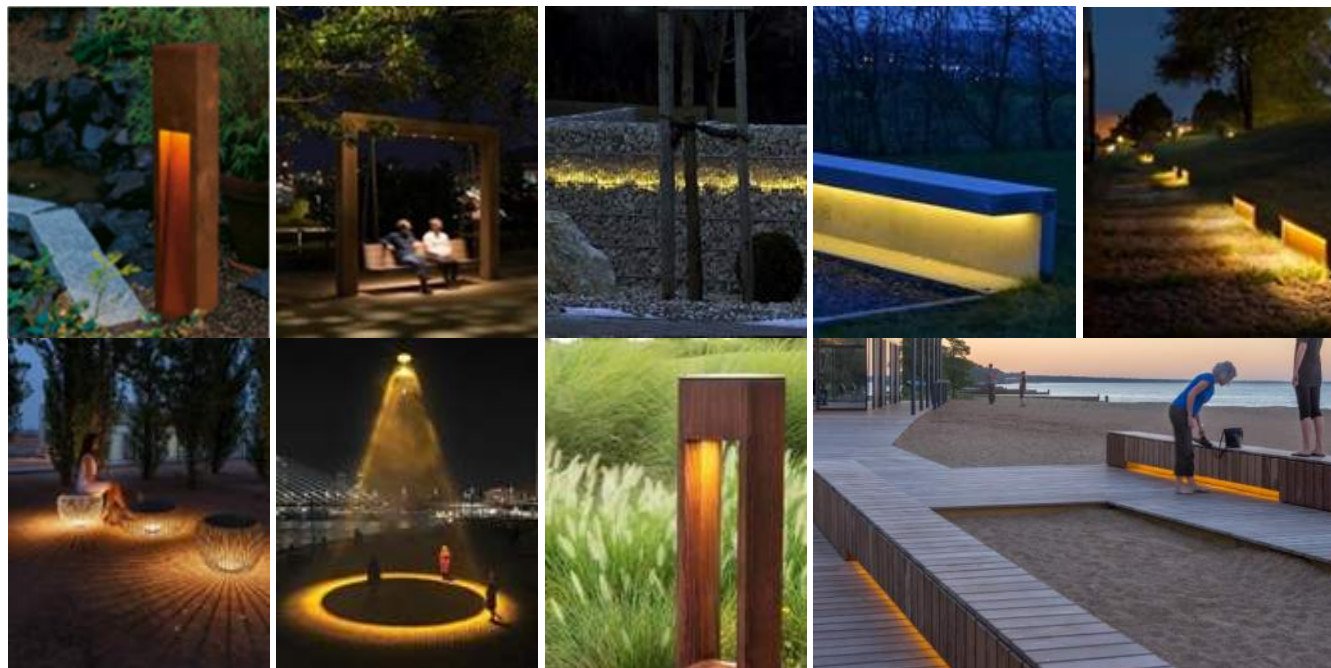
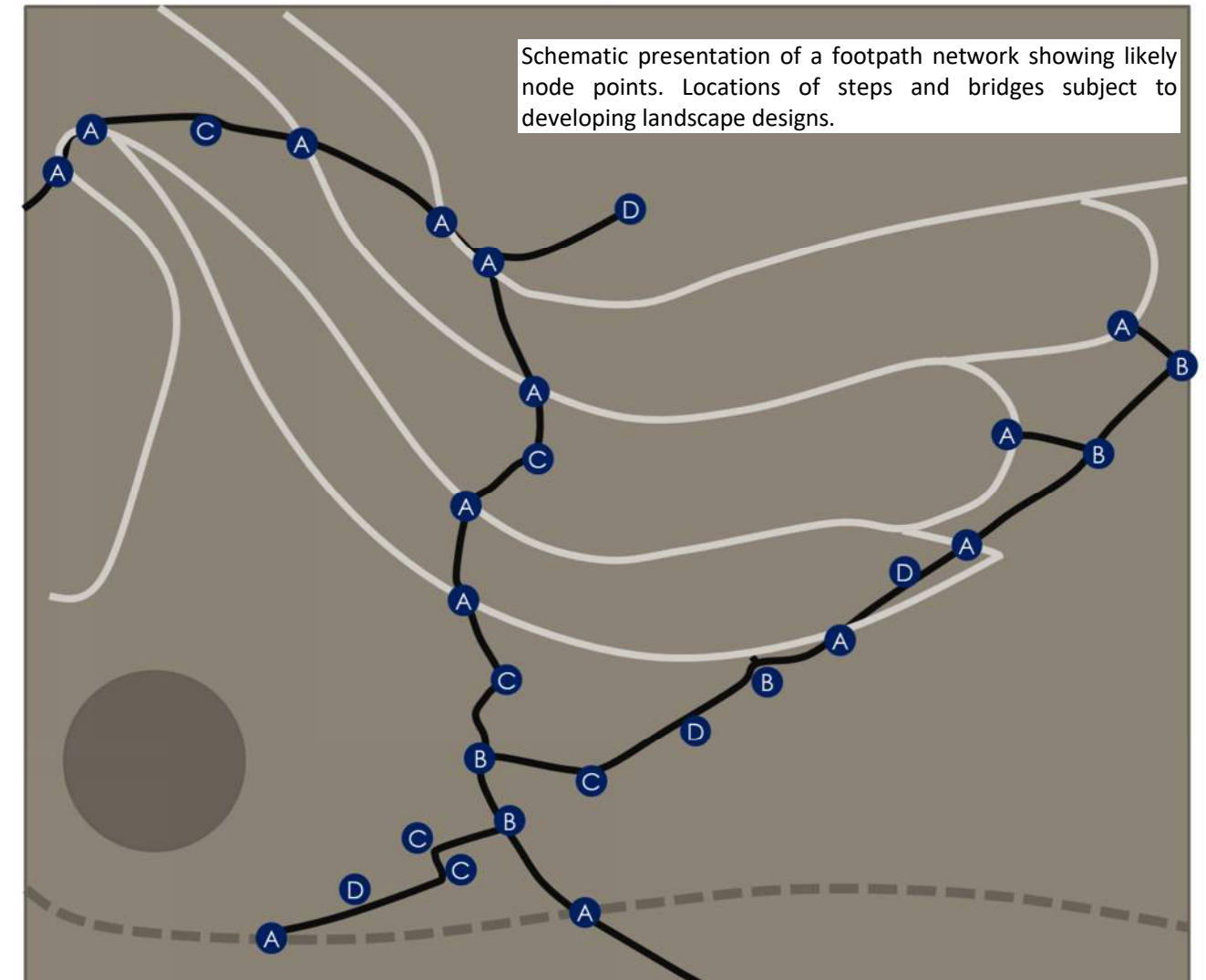
#### ACCESS ROADS FOR ACTIVITY HUBS AND "RELOADING TRAIL"

- 6.23 As these tracks are intended for staff and service vehicles only and not for guest vehicle, cycle or pedestrian use the intention is that these trails are essentially unlit unless passing adjacent to strongly illuminated portions of the resort. At unlit locations and where provision of permanent task lighting for loading or unloading would be out of keeping with the darker or exposed locations it is proposed that lighting from the vehicles is used to provide illumination to the immediate surrounds for safe loading and unloading. Lighting integrated within vehicles for the purpose of task lighting will consider the principles established within the fixed lighting scheme to avoid direct upward light and excessive viewed source intensities. Vehicle integrated lighting can be used as supplementary task lighting at other lit loading and unloading locations.
- 6.24 Where roads and trails also serve as footpaths then the footpath lighting scheme will be applied.



## 7 Node Based Circulation (Footpaths)

- 7.1 Lighting to dedicated footpaths aims to guide users from node to node across the site with lighting concentrated at nodes and being allowed to drop to natural levels between. The node points act as clear reference points along the journey, giving guests clear target destinations and clarity on direction of the route, but not necessarily illuminating the full extent of the path.
- 7.2 Node points will consist of the following
- A. Road Crossings
  - B. Junctions with other footpaths
  - C. Changes of direction
  - D. Pause points & landscape features (Including benches)
    - Changes in level (steps/ramps)
    - Bridges
- 7.3 No numerical illuminance targets are set for footpaths. Changes in level, steps and ramps will be illuminated to a minimum of 5lux average, minimum 2 lux for at least 1.5m width of the steps and ramp. Lighting and materials at steps will look to ensure risers are clearly distinguishable.
- 7.4 The public right of way “Pig Trail” that crosses the Site is currently unlit. It is intended that this remains the case with the exception of where the “Pig Trail” intersects with, or forms part of the resort’s pedestrian circulation routes.



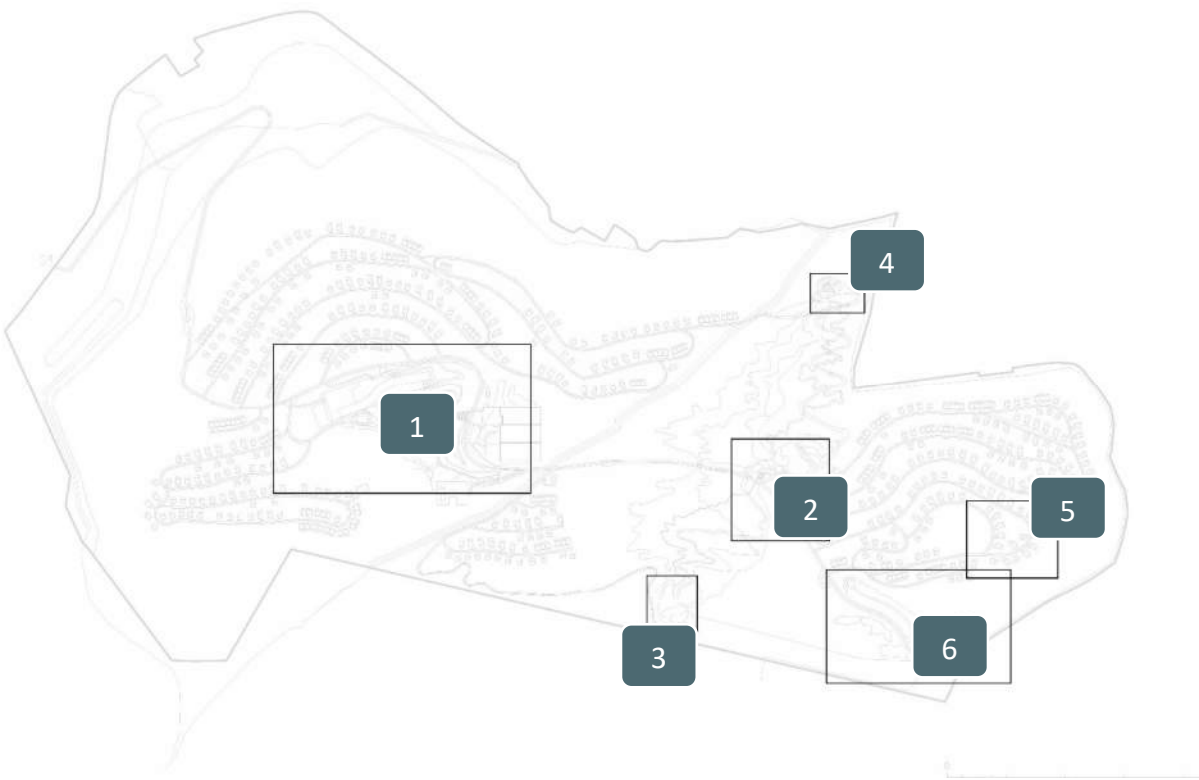
## 8 Construction Lighting

- 8.1 Development of a detailed construction lighting scheme is not feasible at this stage. Consideration of construction lighting will be included as part of the Construction Environmental Management Plan (CEMP).
- 8.2 Lighting is required for the safe undertaking of tasks alongside facilitating safe and secure access to offices, compounds, welfare facilities, parking areas, fuel storage areas and plant storage areas.
- 8.3 The following principles will be applied and expanded upon in the design and location of temporary construction lighting.
- Construction task lighting will be limited to agreed working hours for the development. Lighting will only be operational for the duration of each task and switched off when no longer required.
  - Luminaires on fixed / long term features to use with dark-sky considerate luminaires, avoiding tilt angles that expose the light source or contribute to upward light.
  - Security and access lighting will be controlled through photocell and presence detection wherever practical.
  - Visual screening, such as hoardings can be applied to surrounds of compounds to contain light within those locations. Where practical luminaires should be mounted at the upper height of the screening so light sources are not visible from external to the compound.
  - Temporary shielding and screening applied between task areas and sensitive receptors.
  - Minimise the external application of linear battens or bulkheads with clear, ribbed or opal polycarbonate diffusers. Whilst providing general illumination the wide distribution of these luminaires emits a significant percentage of their output as upward light, particularly when mounted on vertical surfaces. Use within structures or on underside of canopies/scaffolding may yield source visibility and some upward light but this is greatly reduced compared to their application along the side of paths or hoardings.
  - Portable or temporary task lighting to be appropriate scale and mounting height and distance from task, avoiding extreme tilt angles of luminaires. The use of a greater number of lower output luminaires correctly positioned is considered preferable to a smaller number of high output luminaires covering an expansive area.
  - Use low light or infrared flood lighting with CCTV where appropriate.
  - For vehicle circulation areas where pedestrian movement is not present consideration of unlit routes with passive (retroreflective) markers indicating routes, junctions, and crossings.



# 9 Initial Calculations

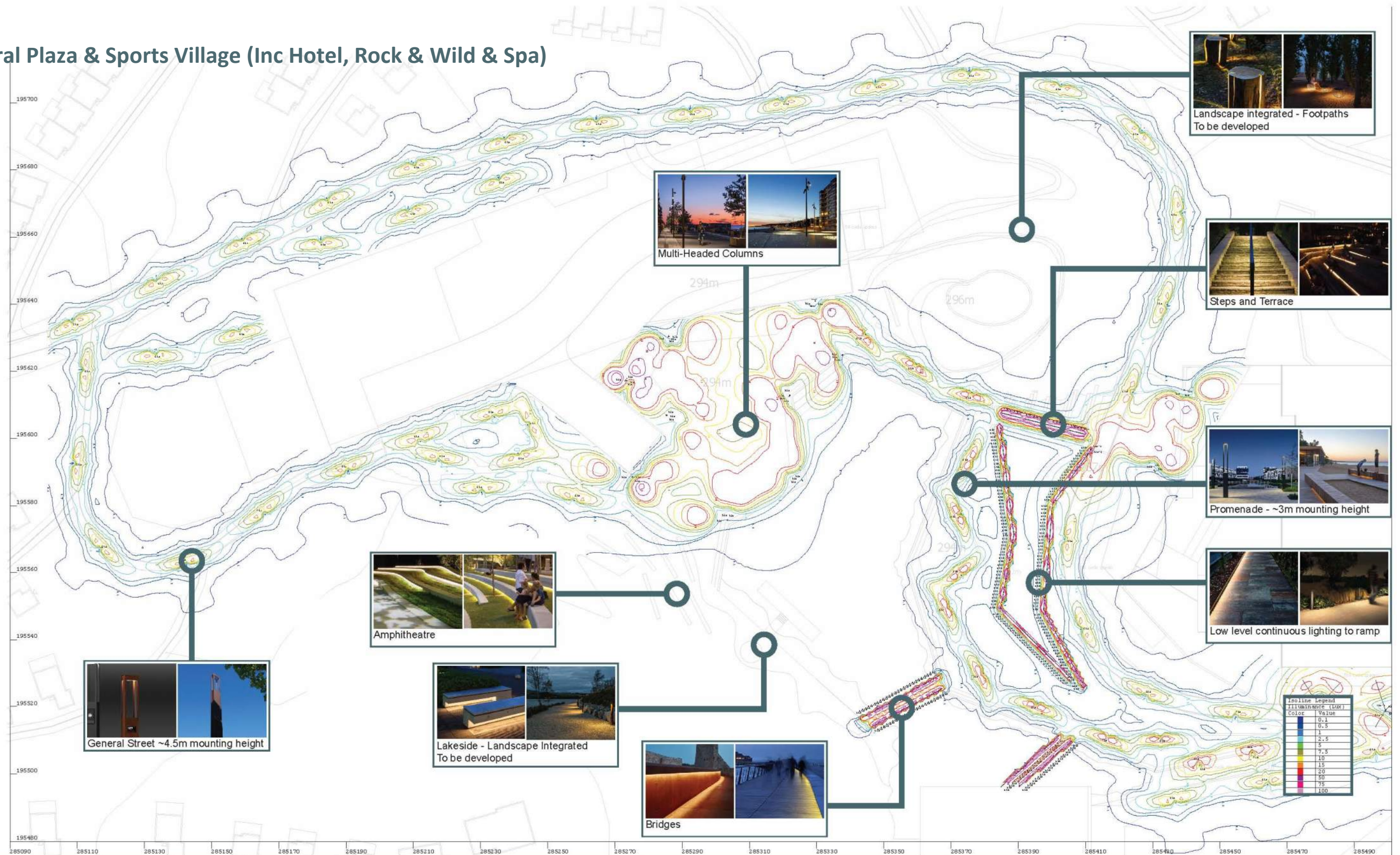
- 9.1 The following pages take the core areas of the resort and look at the initial application of the lighting scheme informing anticipated performance requirements of luminaires and the extent of lighting surrounding the target illumination areas.
- 9.2 Initial calculations focus on external light sources only and do not include modelling of potential light egress from buildings.
- 9.3 Inserted images provide a guide to the likely lighting strategies applied, subject to detailed development of structures, surfaces, and landscape.



- 1. Central Plaza & Sports Village (Inc Hotel, Rock & Wild & Spa)
- 2. Wildfox Mountain
- 3. Summit Hub
- 4. Reload Point
- 5. Lodge Roads
- 6. Staff & Facilities



# Central Plaza & Sports Village (Inc Hotel, Rock & Wild & Spa)



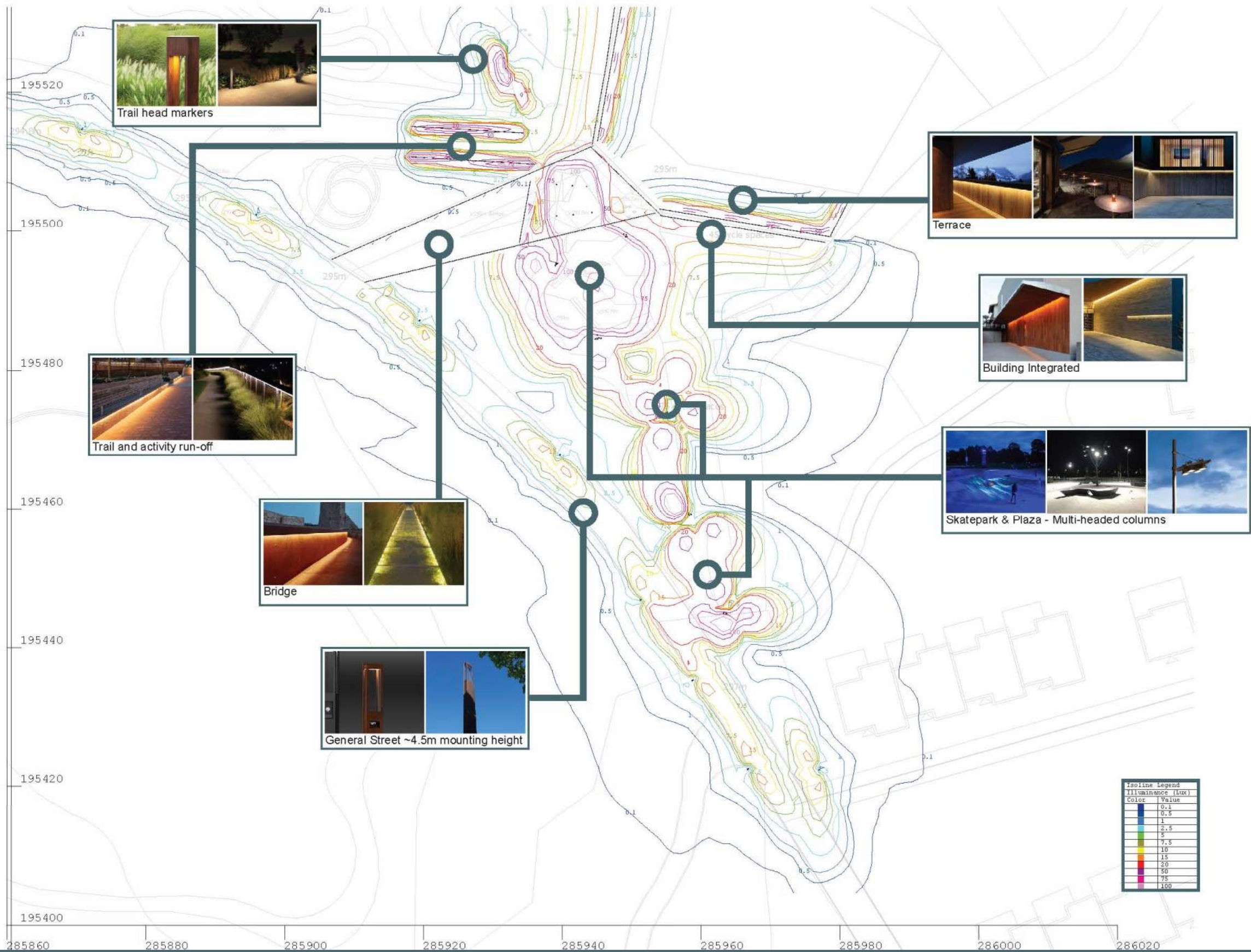


# Wildfox Mountain

Lighting around the Wildfox mounting is mainly contained to the south of the building and as such is shielded by the building in views from the north and the topography in views from the south.

Integration opportunities within the bridge structure and building facades will be sought to minimise the number of distinct and discrete lighting elements.

The skatepark is one of the few locations within the resort where defined illuminance levels are considered. The Public Skatepark Development Guide, from The Skatepark Project (formerly known as the Tony Hawk Foundation) states *“Skateboarders can be tenacious and will use a skatepark with even dim lighting... [however] 100–200 lux [Horizontal illuminance] should be ample illumination.”* The lower thresholds within this realm are targeted given the overall low brightness of the surrounds. Multi-headed columns can provide lighting to the skatepark at targeted illuminance and to the surrounding plaza area albeit to a lower and more appropriate illuminance





# Summit Hub

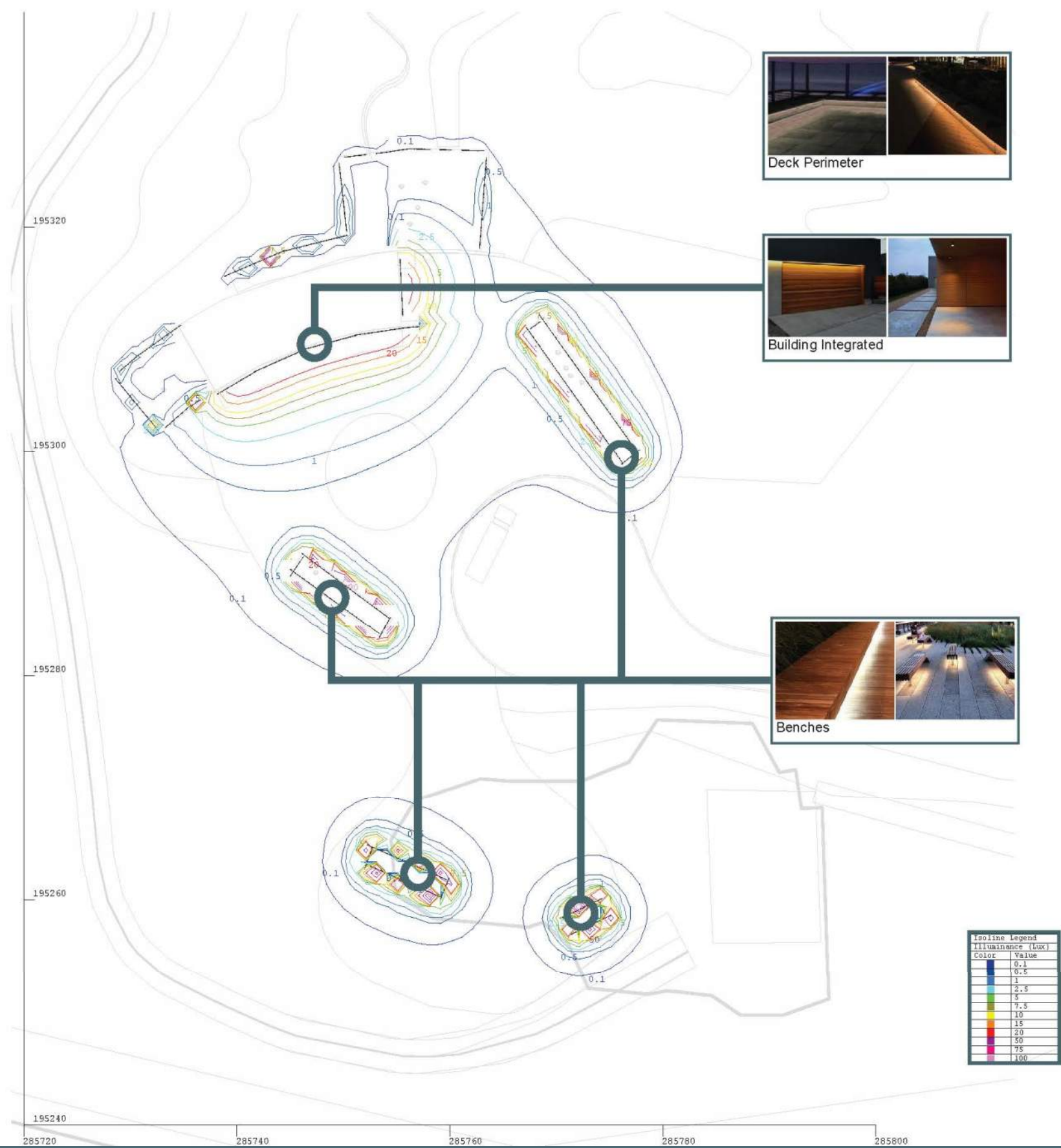
Lighting at the Summit is kept to a minimum given the prominence of the location on the high point of the resort.

The summit is expected to have limited use in the hours of darkness, however some lighting for basic orientation and “in-fill” twilight is included to accommodate those walking at dusk.

Minimal lighting is provided from low level integration to benches and at the perimeter of the terraces. The low mounting height and intensity of these is unlikely to have direct or indirect (reflected upward light) views when looking up the hill.

Lighting integrated into the summit building would be more prominent in illuminating the façade of the building, however operating hours would be managed through lighting control and used only when required. The integrated approach provides a soft gradient of light out into the summit public realm.

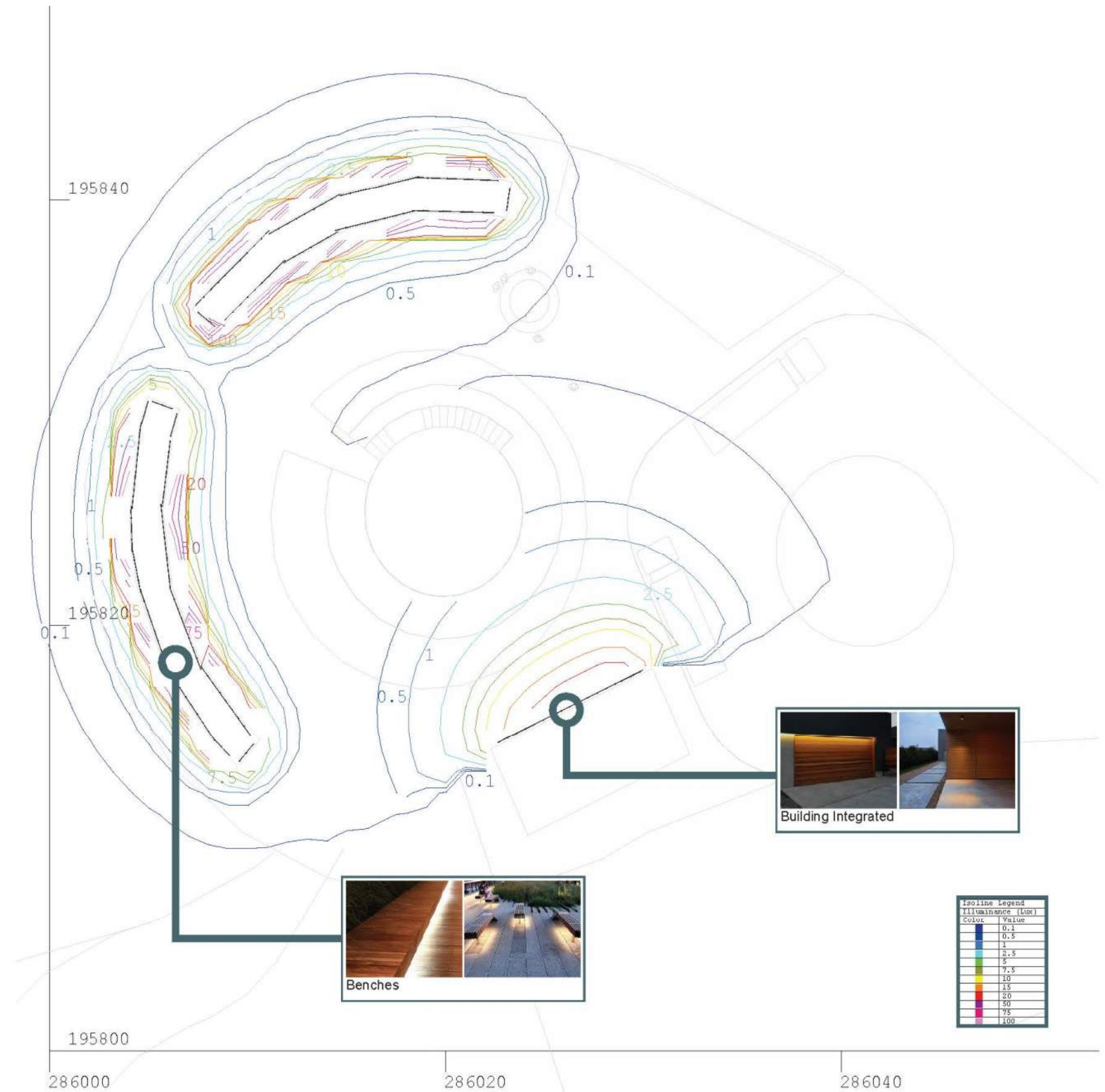
Footpaths approaching the summit will be illuminated based on the nodal footpath strategy with the benches forming the destination nodes.





## Reload Point

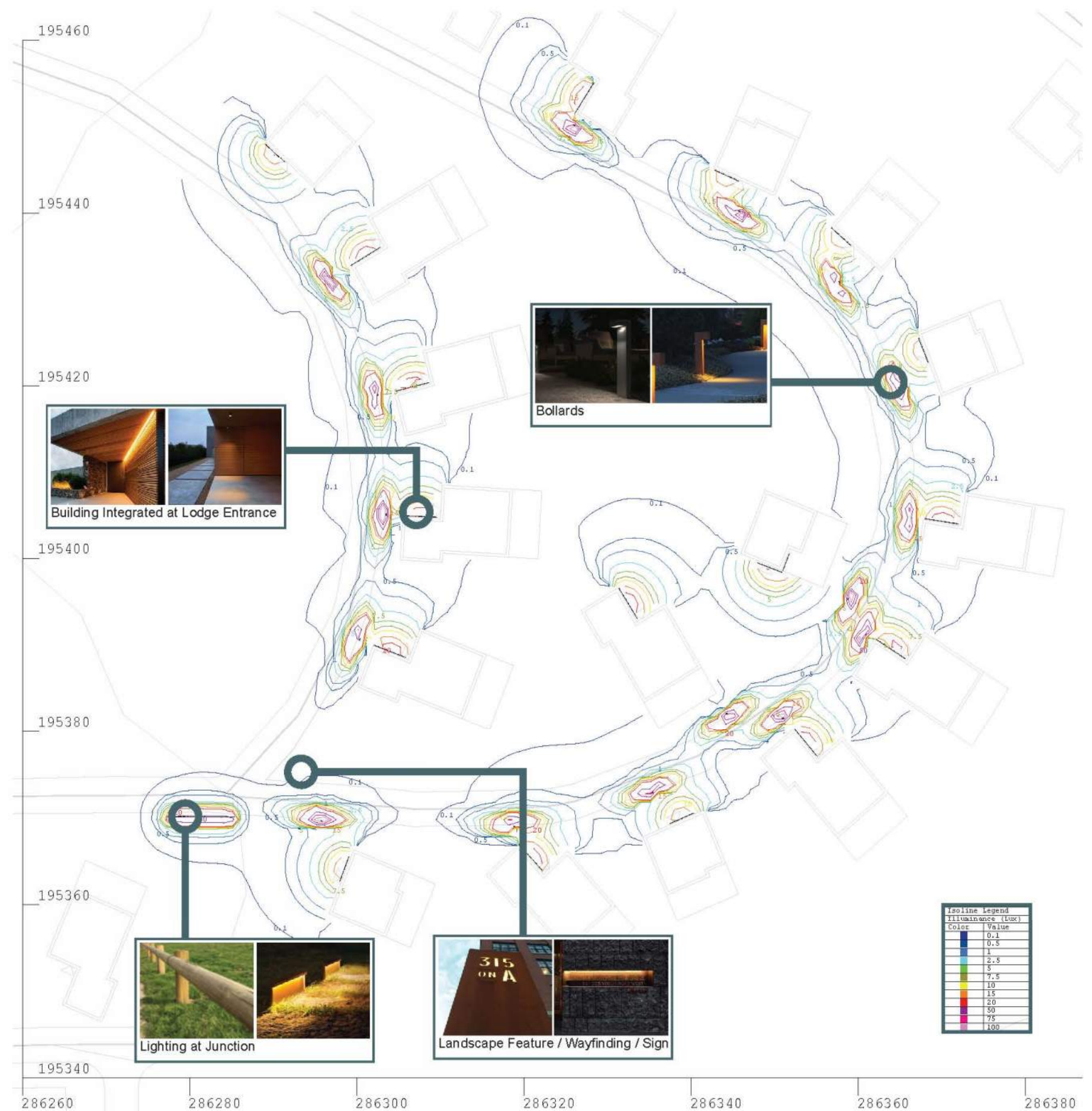
The reload point is expected to see limited use at night. Integrated lighting within benches provides orientation and destination to the location as a conclusion of any footpaths reaching the site. External lighting on the facilities building is intended to provide a soft gradation of light to the building and will be linked to the buildings operating hours. Presence detection control may be applied to raise illuminance from a background level up to a greater intensity and lowering back to background when the building or reload courtyard is not occupied.



## Lodge Roads

Calculations show limited spill light from low level bollards with the 0.1 lux horizontal contour a few metres from the road. A greater distribution is given from lighting at the lodge entrances where the ambient lighting from building integrated lighting provides illumination to both the façade and to higher elevations for facial recognition and the simple task of accessing the lodges.

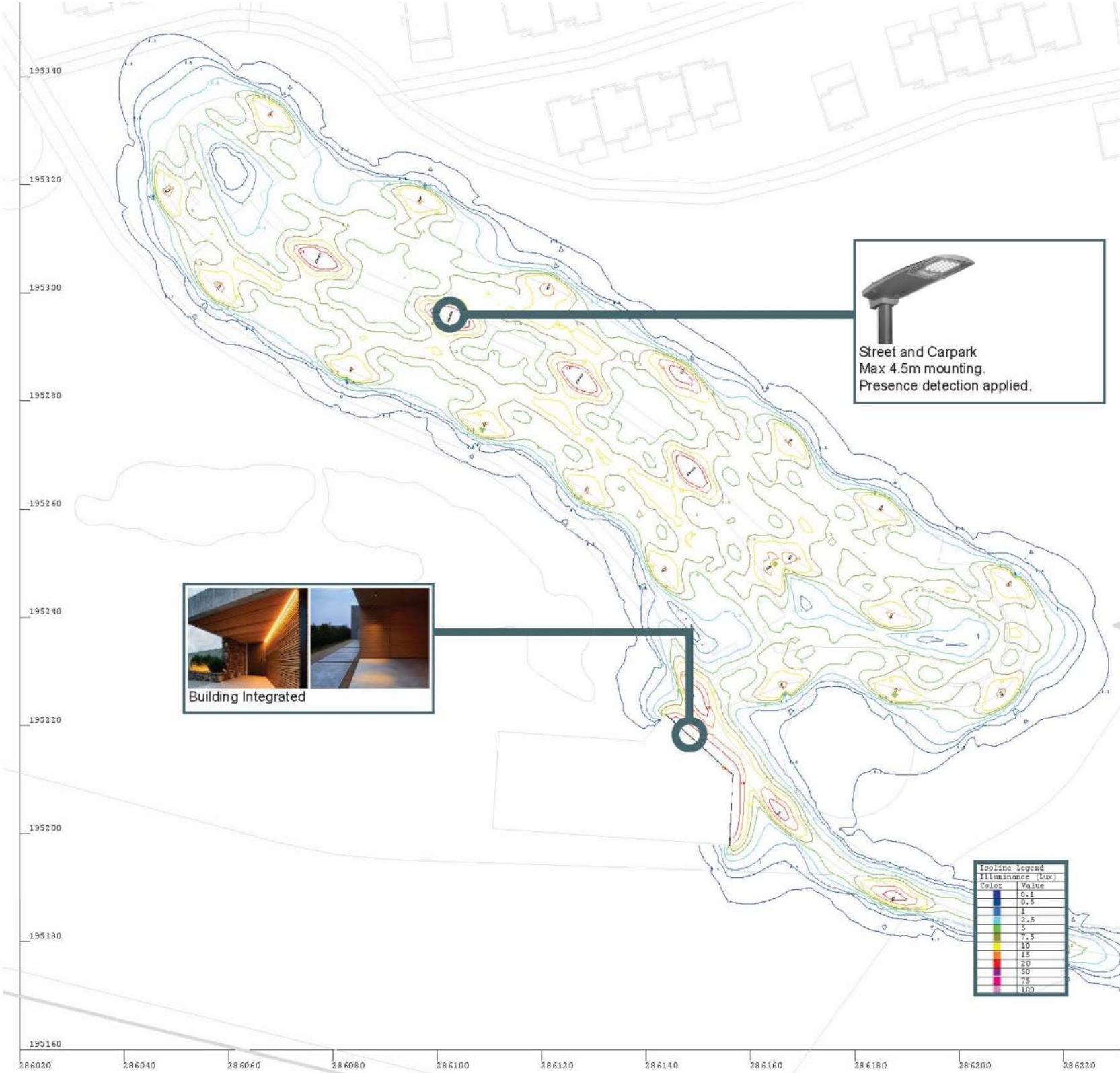
Lighting for the lodge streets does not extend beyond the depth of the lodges, meaning any light to the rear of lodges would be from terrace lighting or light egress





# Staff & Facilities

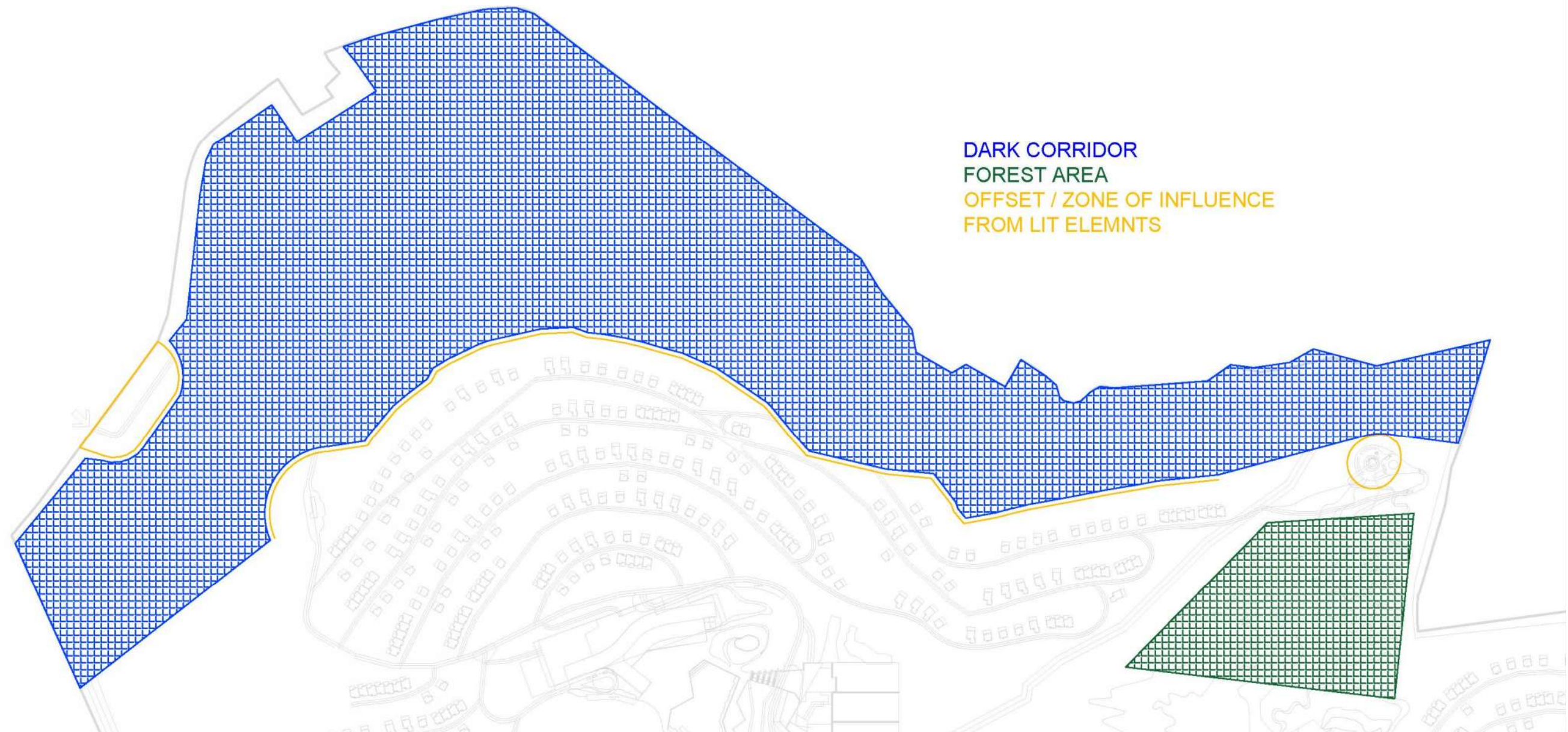
Staff car parking and access uses more conventional lighting for roadways and car parks. Through application of rear spill cowls and louvres the lit extent to the 0.1lux contour is kept within reasonable distances from the car park and road perimeter. As previously discussed, options for the use of lighting control will be considered to reduce the duration lighting is operational t full intensity.





## 10 Ecology Considerations & Dark Corridor

- 10.1 In addition to the obtrusive light considerations within the Lighting scheme, a dark corridor has previously been proposed running along the north of the site.
- 10.2 Based on the location of built areas (Lodges, Entrance Building and Reload Point) and the strategic photometric calculations undertaken to date, which include a study of 0.1lux horizontal spill, it is expected that the dark corridor can be retained with clear continuity across the route. Significant lighting features are also avoided within the existing wooded portion of the Site.
- 10.3 Consideration is also given to potential impacts of light egress and external and terrace lighting from lodges. A 25m “zone of influence” has been plotted based on anticipated internal lighting and glazing extents.
- 10.4 Illuminated footpaths are not anticipated within these zones, however footpath requiring lighting will follow the minimal nodal point lighting scheme providing highly localised illumination from low mounting heights and retaining darkness above for flight paths of any bats using this corridor. The localised nodal scheme also ensures that there are no continual bands of light that may form a perceived barrier for movement of nocturnal species.


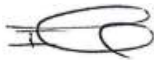





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	Name	Position	Signature	Date
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For and on behalf of Stantec UK Limited				

Revision	Date	Description	Prepared	Reviewed	Approved
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01	19 <sup>th</sup> August 2022	Revised Following Comments	GD	MD / IS	-
02	24 <sup>th</sup> August 2022	Issued for Comments	GD	IS / NY	-
03	1 <sup>st</sup> September 2022	Final Issue	GD	IS / NY	IS

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