



Nick Smith Associates

Lighting to the end of the tunnel

FORMER GAS HOLDER SITE AT KENAVON DRIVE, READING



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Project no 2569

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1 INTRODUCTION

Nick Smith Associates (NSA) has been commissioned to carry out a review of the existing lighting at the proposed development site and consider the potential impact of the light emitted from the development and consider if there would be an impact on the ecology.

2 NICK SMITH ASSOCIATES LTD

Nick Smith Associates Ltd is a specialist exterior lighting design consultancy based in Chesterfield, Derbyshire. The work commissioned by their clients falls into a number of areas. The majority of the work carried out is lighting design for adopted and private highways, car parking and sports lighting applications. An increasing part of the work the company does is the assessment of lighting installations, providing an independent view outside the manufacturer and client base. This work will often form part of an environmental assessment. It may also be to simply corroborate or refute the concern by local residents, the local planning authority or other concerned parties that the new lighting installation may create "Light Pollution" and as such affect their current living or working environment.

The Company have acted for local authority planning departments to assess planning applications, for developers wishing to install an installation and for manufacturers supplying the equipment to be installed.

The writer of the report has experience in the lighting industry which exceeds 30 years. He is a Member of the "Institution of Lighting Professionals" (ILP); previously known as the Institution of Lighting Engineers (ILE) as well as an Incorporated Engineer with the Engineering Council. He also worked with the ILP and BCT in the preparation of the recently released "Bats and artificial lighting document.

The Company also has a vast experience of providing lighting designs, lecturing on the European lighting techniques and the European lighting standard as well as and sitting on EN13201 and BS5489 committees.

3 SITE ASSESSMENT

3.1 EXISTING LIGHTING

The existing lighting around the site is split into 5 distinct areas. The south side of the river along Kennet Side, Kennet Walk and Robert Parker Road. The footbridge and ramp over the river Kennet and the river area beyond the railway bridge to the north east of the site.

Drawing 2569-D-01-rev A has been prepared to show the existing lighting now and the extent of the spill light from the existing lighting around the development.

KENNET SIDE

Kennet Side is lit with a mixture of WRTL Stela lanterns and Urbis Axia. Both of these are what I would term generation one LED lanterns and both types utilise cool white LED. The Stela was one of the first LED lantern to be made commercially available in the UK through WRTL who were bought by Philips in 2012. The Stela is no longer in production. The fitting used cool white LED's around 5700° Kelvin, this was measured on site at a little over 5800° Kelvin. The fitting has a built in 10° tilt to maximise the sideways distributions.



WRTL Stela

The Axia is a product market by Urbis the UK part of the Schreder group. It was a generation one LED fitting and used up to 6 no 8 LED modules in each fitting, up to 48 LEDS. The fitting on site vary some are 3 x 8 (24 no) LED units and some are 4 x 8 (32 no) LED modules. The Axia also used cool white LED in the early generation. The colour temperatures measured on site are constant with this being the case. Values as high as 6217° Kelvin were measured on site all though many were much lower / The fitting are installed with a 5° tilt



Urbis Axia

All of the columns along Kennet Side are installed on 6m columns

KENNET WALK

The area of Kennet walk is thought to be a private road. The lantern installed are high pressure sodium though to be 70w SON-T. The fittings have been installed since at least 2012. The fitting is installed with a 5° tilt principally on brackets on 5m columns. At least a third of the column were not working when I visited site in October 2019.



Philips ME / SGS201

ROBERT PARKER ROAD

Most of the column along Robert Parker Road are 3 x 8 no LED units Urbis Axia lantern which were installed between 2014 and 2016 when this site was developed by Bellway Homes.

The Axia is a product market by Urbis the UK part of the Schreder group. The fitting on this part of the site are 3 x 8 (24 no) no LED unit modules. The Axia also used cool white LED in the early generations. The colour temperatures measured on site are consistent with this being the case. Values between 5188° Kelvin and 6217 ° Kelvin were measured on site. The fittings are installed with a 5° tilt on aluminium 5m columns



Urbis Axia

FOOTBRIDGE AND RAMPS

The footbridge and the ramps are lit with a mixture of fittings. Principally the Urbis Axia is used with 3 x 8 (24 no) no LED unit modules. These are a on 5m column on the approaches and on the stairs and ramps. The footbridge is lit using wall packet fitting attached to the side rail of the bridge. The fittings are all covered with wire guards to prevent damage. A number of the lighting units were not working.



Wall pack

OTHER EXISTING SITE LIGHTING

It was noted during the site visit there was existing lighting adjacent to the river and the main gates also by the water tower on the far east of the existing yard. All these lighting points were controlled by movement detectors. We have not considered the impact of this lighting in the model because the lighting will be removed as part of the site clearance.

4 COMMENTARY OF THE EXISTING LIGHTING

During the night site assessment the lighting level on the steps, footbridge, Kennet walk and Kennet side were measured. The lighting levels along Kennet side are very high, the colour temperature of the fitting used is also very high. It is thought that the amount of light spilling into the river could be vastly improved if a fitting with better optical control were used this could be coupled with a warm white light at 2700° kelvin to further reduce the amount of blue light which will effecting the ecology.

5 SITE CLASSIFICATION

The Institution of Lighting Professionals (ILP nee ILE) produces the “Guidance notes for the reduction of obtrusive light”. The current version at the time of writing is GN01:2011, it is under review. This document has environmental zones based on certain criteria within that designated area. A copy of this document is available from the ILP website <https://www.theilp.org.uk/documents/obtrusive-light/>. Selected appropriate tables are shown below have been taken from this publication.

The area of the proposed development falls into an E2 area being an area of low district brightness areas outer suburban locations. The site is sited within Reading which is clearly an E3 or E4 area but the presence of ecology along the river has encouraged me to consider it a lower classification.

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 centre

Table 1 (Table 1 from ILP GN01) – Environmental Zones

Table 2 – Obtrusive Light Limitations for Exterior Lighting Installations – General Observers						
Environmental Zone	Sky Glow ULR [Max %] ⁽¹⁾	Light 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	2,500	25

Table 2 (Table 2 from GN01) – Obtrusive Light Limitations for Exterior Lighting Installations – General Observers

6 ECOLOGY AND ARTIFICIAL LIGHTING

Ecology is covered in much more detail in a report prepared by Greenspace Ecology Solutions. It is worth pointing out that the ecology can be detrimentally affected by lighting levels, mounting height and the blue content emitted from the light source. These facts are set out in many research documents and the Bats and artificial lighting document jointly published by the Institution of Lighting Professionals (ILP) and the Bat Conservation Trust (BCT).

7 PROPOSED EXTERIOR LIGHTING EQUIPMENT

The equipment proposed on the development has been carefully chosen to reduce the impact on the river and ecology using the area to feed, live and commute.

The light sources used for the exterior lighting will be LED and use a colour temperature of 2700° Kelvin also referred to as warm white. There are three principle areas. The car park, footpaths and the stairs.

The car park will be lit using 5m columns and a more industrial type of fitting. Details can be seen on drawing 2569-D-03 at A1 size, a smaller form version is available in the appendix at the back of this report. The car park is situated between block B and block C. Block A will provide a masking effect for the river and block B and C will provide a masking effect of the lighting to the railway embankment to help further control the lighting. It is still important to use a warm white fitting to reduce the blue light content in the area.

The footpaths in front of block B connecting with the car park will be lit using illuminated bollards. The fittings used in the outline design on drawing 2569-D-03 use a bollard mounted on the river side of the path but lighting back towards the building. The use of a 180° distribution will mean the light spilling back to the river will be minimised. The use of planting which I understand will be in the order of 2m in height will further reduce the impact of the footpath lighting in the river and ecology.

There are steps on the east side of block B. These will need lighting to help reduce trips and falls. It has been proposed for these to be lit using an illuminated handrail. Based upon the current width it should be adequately illuminated for the east side only using an asymmetric distribution to ensure adequate light level and uniformity on the treads and risers.

8 BUILDING MODEL COMMENTARY

As part of the lighting design considerations a calculation has been modelled to determine the light emitted from the buildings. The lighting levels are shown on drawing 2569-D-02 and 03. Drawing 02 shows lighting levels at the river level and drawing 03 shows lighting levels above the river at +5m, +10m, +15m and +20m above the river level measure in the topographical survey,

All floors have been modelled using a light source with an 800 lumen output mounted on the ceiling in each room. Some rooms have more than one fitting depending on the size of the room. A source was modelled with an 800 lumen output, no reduction for lumen depreciation was considered and a symmetrical 360 degree distribution was used. 800 lumens represent the equivalent of a 60w incandescent lamp (light bulb) or an equivalent 15w LED source. We have no indication what each resident will install once they move in.

It should be remembered that lighting levels reduce by the square of the distance as inverse square law. Hence the most significant impact will come from the ground floor and will be decreased to each higher floor. The presence of balconies will further reduce the impact although the balustrades on the balconies have not be included in the calculations. It was also noted that on block B the floors 2-9 are set back from the lower section of the building frontage. This will mean upper section of the first floor will provide a partial obstruction of the light emitted from the property.

All windows have been included with **NO** reduction in light as it passes through the windows. It is not uncommon to get a 20% reduction in light output which is common industry calculation practice.

It has also been assumed that ALL the lighting in the building will be switched on, there are no curtains, no net curtains a circumstance which I expect will never happen but the worst case has been considered.

The use of planting which I understand will be in the order of 2m in height will further reduce the impact of the footpath lighting in the river and ecology. This is shown on drawings 04 and 05.

No external lighting has been included on the balconies. It was noted that in the Bellway development further to the west that wall mounted eyelid fittings had been used. It is thought this type of fitting would raise the lighting levels higher than is acceptable along the river and along the river bank. If external lighting is necessary it is recommended that had illuminated hand rail with an asymmetric distribution is used directly opposite the door so that it light back towards the building. The sides of the balconies should not utilise illuminated hand rail as this could further spill light in the river and the bank.

There was discussion with the developer about the impact of the lighting on the area to the north of the railway line to the north and north east of the site. There are a number of well-developed trees on the railway embankment on both sides of the railways line which can be seen in the image below. These trees and the railway embankment will reduce any light emitted from the building. The impact of lighting in this area over what is already from the existing lighting present will be so small it is not measurable. The light level at the bridge are already close to 0.1 lux and this will further reduce the further away from the development one gets.



9 REQUIREMENTS OF LIGHTING

9.1 LIGHTING LEVELS

The car park has been lit to the equivalent level of the adjacent development, to deliver a maintained illuminance equivalent to a P5 lighting class from EN13201-2:2015 average of 3 lux minimum of 0.6 lux. This level is broadly in accordance with EN1242-2 for small car parks but following the assessment of risk balanced against the impact on ecology It is considered this lighting level would be adequate. The footpaths have been lit to a P6 class lighting class from EN13201-2:2015 average of 2 lux minimum of 0.4 lux. Often with bollard projects the average is a lot higher due to the proximity of the source to the footpath. It should be remembered that the calculated lighting level are the highest they will ever be representing the level on day 1 and not the day before source replacement or maintained illuminance which is more common in lighting design.

9.2 LAMP CONSIDERATIONS

The choice of light source used has been selected carefully due to the indication of bat presence close to the site. It should be noted that there has been a change in the suitability of light sources which emit ultra violet light, most exterior project for the few last year or so have now been designed using LED which has no UV output and allows significantly better control of the light output from the fittings due the small size optics.

Recent research has also shown that the use of light sources with a high colour temperature also have a high level of blue light. It is known that various forms of ecology are affected by higher levels of blue light and not just ultra violet.

A warm white LED with a colour temperature of 2700° kelvin has been chosen so it will significantly reduce the blue content most likely to disturb the ecology. Based upon current data 2700° Kelvin will give ≈ 60% reduction in blue light content compared to neutral white. Clearly blue content cannot be completely removed of the source would no longer be white and beneficial to humans for best illumination.

10 RESIDUAL IMPACTS

10.1 IMPACT ON THE SURROUNDING LAND AND RIVER FROM THE PROPOSED DEVELOPMENT

The lighting has been considered in such a way that the impact of the river and the north side of the bank adjacent to the development will be negligible. The landscape planting in the 8m ecology buffer zone will play a part in this reduction. A height of at least a metre and preferably two metres will be beneficial in reducing the impact of the development.

It is expected most of the residents will fit net curtains, curtains, blinds or similar which will further reduce the impact of the internal lighting when it is used. It should be noted these are not included in the lighting calculations as it assumes the worse case scenario of residents not installing curtains.

It is not expected the proposed exterior lighting for the development will have an impact in raising lighting levels to impact ecology.

10.2 IMPACT ON THE SURROUNDING LAND AND RIVER FROM THE PROPOSED DEVELOPMENT

The lighting conditions around the river could be further improved if the lighting on the Kennet side of the river (south side opposite the development) and the area around the footbridges on both sides of the river were to be reduced in light level and colour temperature by the Council. There is substantial spill light into the river from the existing steps lighting and bridge lighting. The colour temperature of the existing light fittings could be dramatically improved too reducing the blue content in the area.

11 SUMMARY AND CONCLUSIONS

The criteria set out in “Guidance notes for the reduction of obtrusive light” which not affect this development. The light sources used are substantially below the values stated for Luminaire Intensity. The building will not be decoratively illuminated so the building luminance need not be considered. All fittings are mounted horizontal so the upward light output will be zero.

This lighting scheme has been designed to minimise the lux levels on the adjacent habitats, in order to ensure the development has no significant impact on the surrounding habitats.

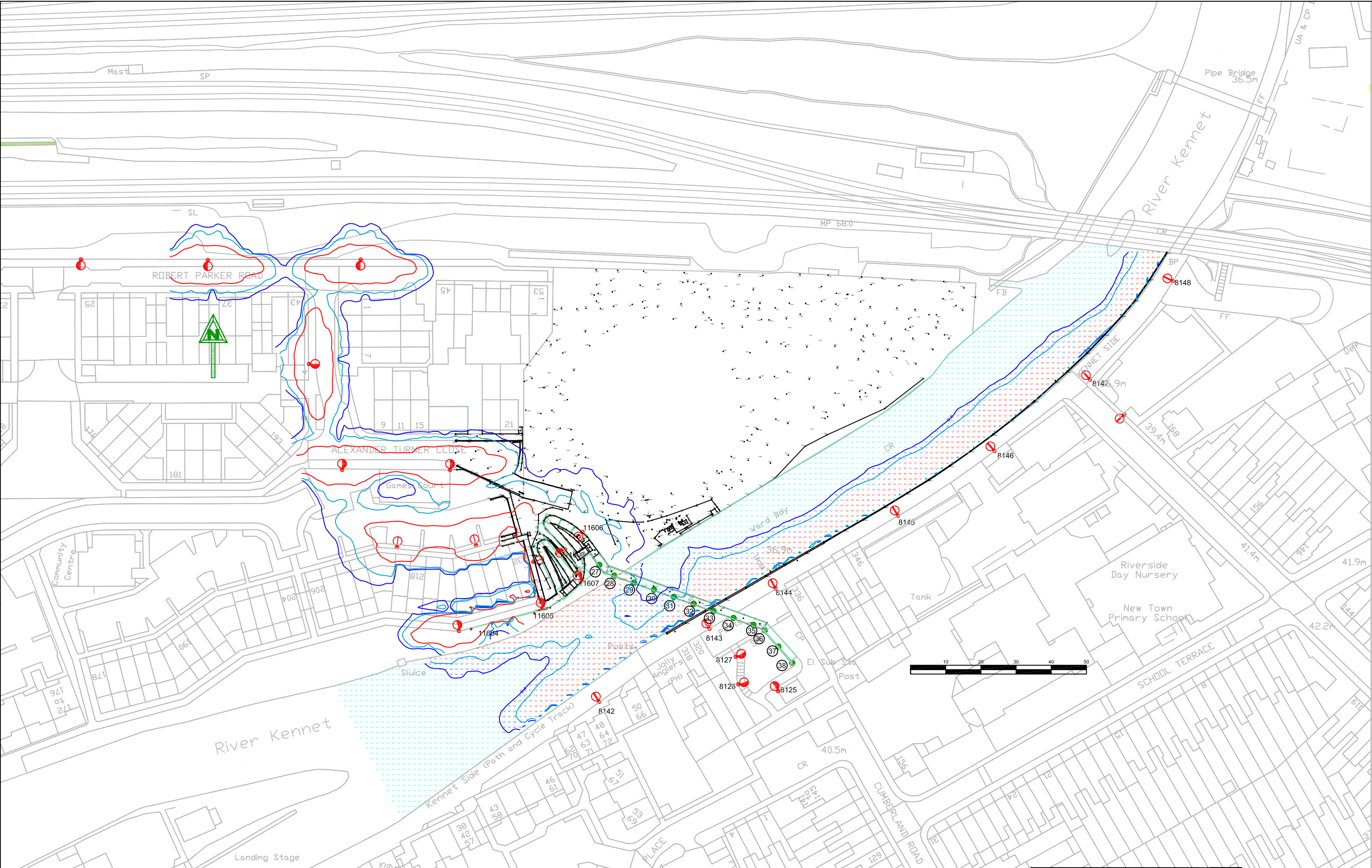
In regard to ecology; through application of low mounting heights and warm white LED lamps, the external lighting impacts from the development are considered minimal. It is considered that the lighting equipment shown on drawing 2569-D-03 and 04 is considered adequate for the purpose of the development and the retention of the adjacent ecological requirements.

However, in accumulation with the existing illumination from the southern bank of the River Kennet, the lux modelling has demonstrated an increase within the river corridor of ≈ 0.4 lux in the central section. Having demonstrated that in isolation the on-site lighting strategy results in no significant detrimental impact to the corridor, through discussion with the appointed ecologist it has been established that upgrading the lighting on the southern bank of the River Kennet, will significantly reduce the lux levels to ≤ 0.4 lux across the majority of the river corridor. It is therefore recommended that in addition to the on-site lighting strategy; consideration to upgrading the adjacent off-site lighting be considered, this to achieve bio-diversity net gains and benefits to the wider area.

12 APPENDIX A

12.1 DRAWINGS AT A4 SIZE

EXISTING LIGHITNG DRAWINGS



Client	Danescroft (Kenavon Drive Project Management) LLP
Project Title	Land at former SGN Gasholder No 4, Kenavon Drive, Reading RG1 3DH.

Existing Lighting
and Illuminance
Layout

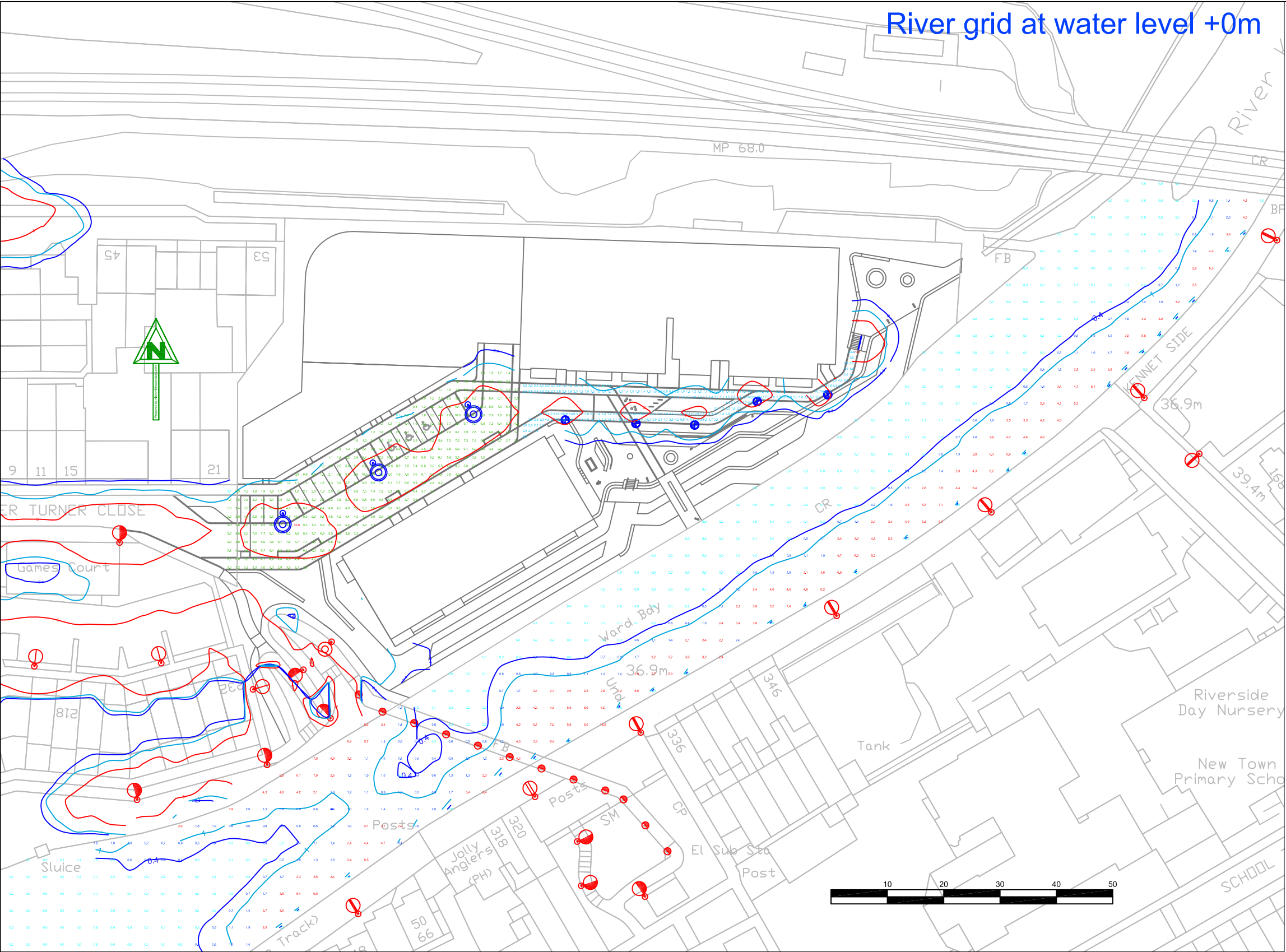
Drawing Number	2569-Ex-A3-01	Rev	A
Scale at A3	1:1000		
Drawn	NWS		
Date	14.10.2019		

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PROPOSED EXTERIOR LIGHTING DRAWING



Notes

1. In this instance the use of 3 dimensional masking has been used to take into consideration the actual position of high sided objects such as buildings and the like. Trees and shrubs etc have not been considered as their masking ability will vary with seasonal conditions.
2. Iso contours produced in this drawing have been created using a conventional symmetrical grid. This does not take into account the spacing or weightings as detailed in BS5489 or BS EN 13201-3:2003.
3. The water level in the river has been modelled at 35.31m above OS zero level. This data was gathered from the topographical survey.
4. The ground level for the north side of the site has been modelled 38.45m above OS zero level.
5. The ramps and footbridge have been models using data from the 3D survey. the height of the ramp and footbridge varies.

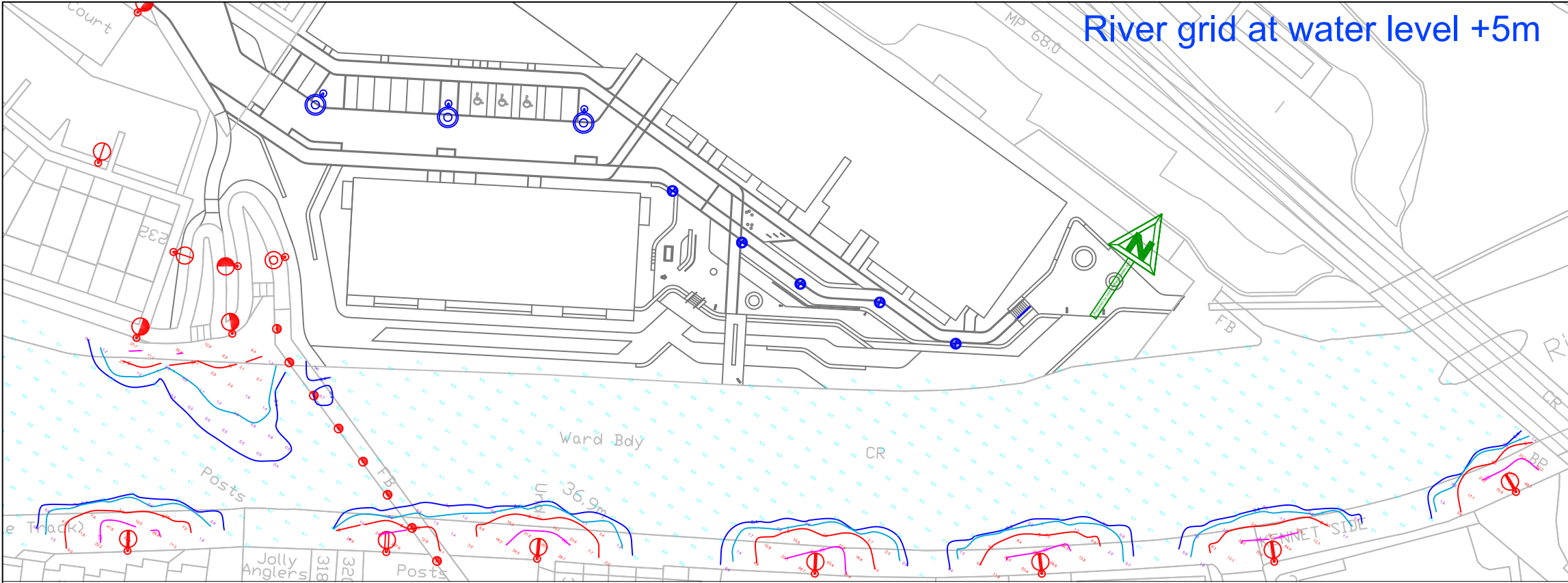
River grid at water level +0m
734 points at z=35.31, sp 3m by 3m
HORIZONTAL LUX
Average 1.1
Maximum 12.5
Minimum 0.0
Min/Avg(Uo) 0.000
Min/Max 0.000
Coef Var 1.619
UnifGrad N/A

Footpaths
197 points at z=38.45, sp 1m by 1m
HORIZONTAL LUX
Average 4.7
Maximum 73.5
Minimum 0.7
Min/Avg(Uo) 0.147
Min/Max 0.010
Coef Var 1.383
UnifGrad 6.58

Car Park
386 points at z=38.45, sp 1.5m by 1.5m
HORIZONTAL LUX
Average 4.8
Maximum 10.8
Minimum 0.7
Min/Avg(Uo) 0.147
Min/Max 0.065
Coef Var 0.514
UnifGrad 2.17

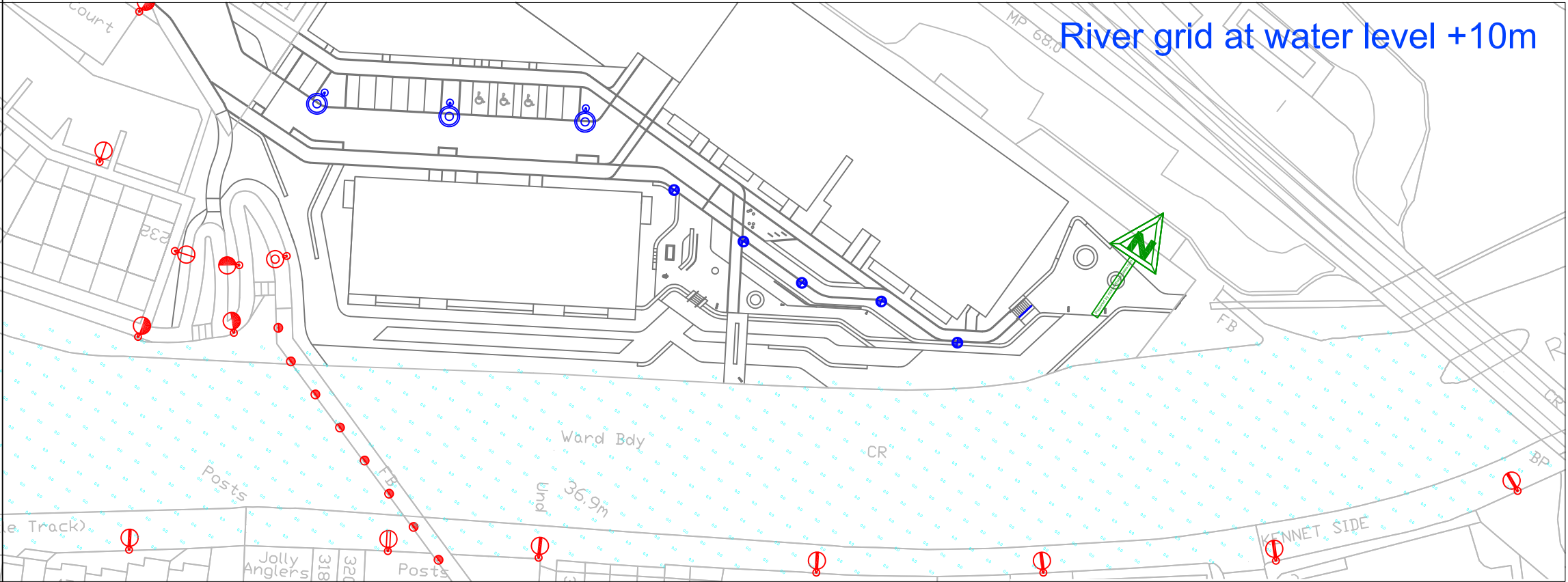
This drawing includes the light from the existing street lighting around the development, the proposed exterior lighting on the proposed development. The light emitted from the rooms within the proposed building has NOT been included.

Client Danescroft (Kenavon Drive Project Management) LLP	Proposed Exterior lighting and illuminance Layout	Drawing Number 2569-D-A3-01	Rev A	Nick Smith Associates Limited  Tel: 01246 229444 Fax: 01246 270465 mail@nicksmithassociates.com www.nicksmithassociates.com
Project Title SGN Gasholder No 4, Kenavon Drive, Reading RG1 3DH.		Scale at A3 : 1-750		
		Drawn NWS		
		Date 22.10.19		



- ## Notes
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River grid at water level +5m
946 points at z=40, sp 3m by 3m
HORIZONTAL LUX
Average 2.2
Maximum 247.8
Minimum 0.0
Min/Avg(Uo) 0.000
Min/Max 0.000
Coef Var 5.233
UnifGrad N/A



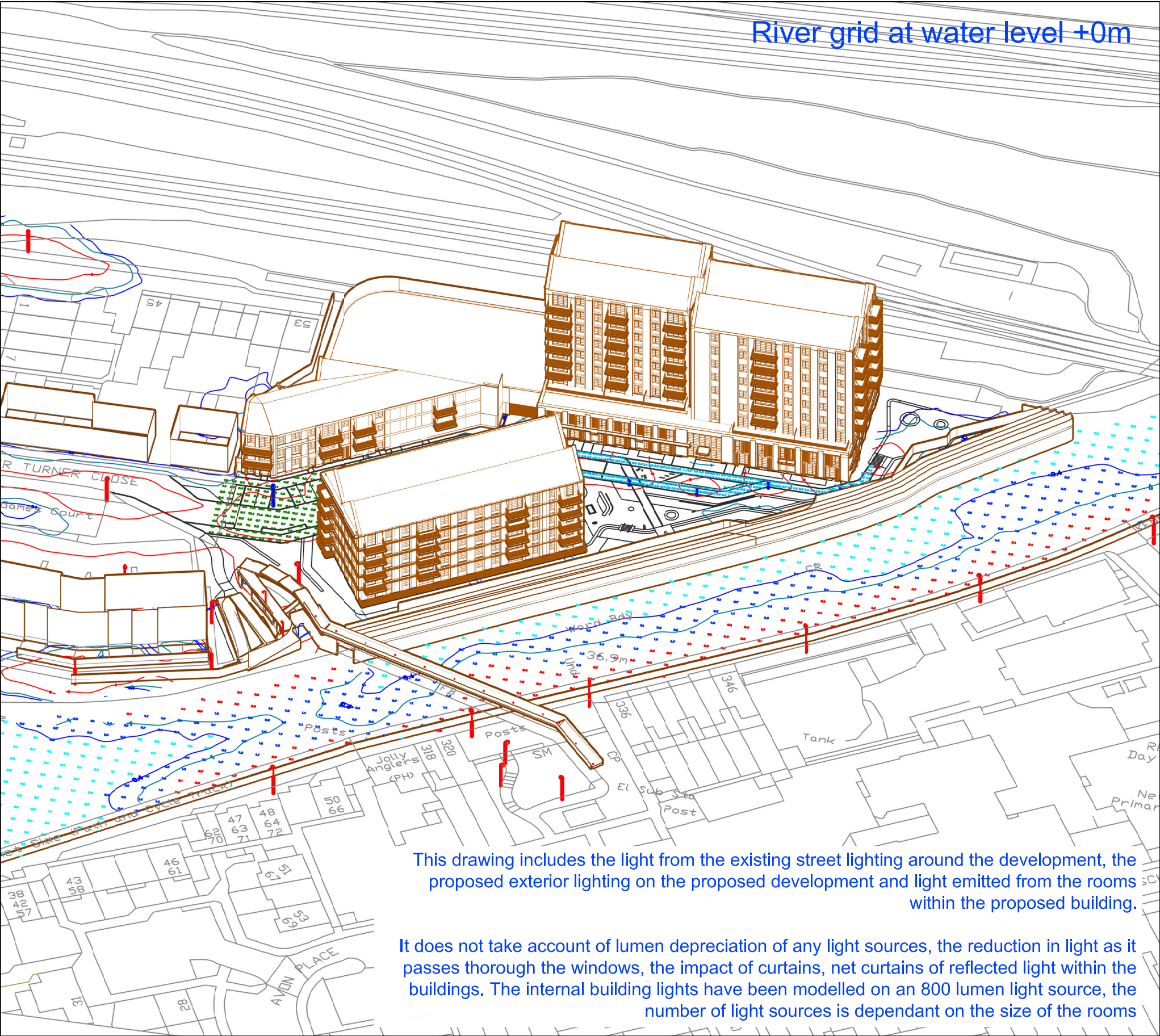
River grid at water level +10m
944 points at z=45, sp 3m by 3m
HORIZONTAL LUX
Average 0.0
Maximum 0.1
Minimum 0.0
Min/Avg(Uo) 0.000
Min/Max 0.000
Coef Var 17.711
UnifGrad N/A

This drawing includes the light from the existing street lighting around the development, the proposed exterior lighting on the proposed development. The light emitted from the rooms within the proposed building has NOT been included.

Client Danescroft (Kenavon Drive Project Management) LLP	Proposed Exterior lighting and illuminance Layout at 5m and 10m above river height	Drawing Number 2569-D-A3-05	Rev A	Nick Smith Associates Limited  Tel: 01246 229444 Fax: 01246 270465 mail@nicksmithassociates.com www.nicksmithassociates.com
Project Title SGN Gasholder No 4, Kenavon Drive, Reading RG1 3DH.		Scale at A3 : 1-750		
		Drawn NWS		
		Date 22.10.19		

LIGHTING DRAWING WITH THE CONTRIBUTION FROM THE BUILDING

River grid at water level +0m



Notes

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- 5. The ramps and footbridge have been models using data from the 3D survey. the height of the ramp and footbridge varies.

Light levels less than 0.4 are shown in cyan, values above 2 lux are shown in red. Other calculated values correspond to the colour of the grid

River grid at water level
735 points at z=35.31, sp 3m by 3m
HORIZONTAL LUX

Average	1.3
Maximum	11.8
Minimum	0.0
Min/Avg(Uo)	0.000
Min/Max	0.000
Coef Var	1.431
UnifGrad	N/A

Footpaths
197 points at z=38.45, sp 1m by 1m
HORIZONTAL LUX

Average	7.3
Maximum	73.8
Minimum	1.4
Min/Avg(Uo)	0.192
Min/Max	0.019
Coef Var	0.957
UnifGrad	6.21

Car Park
386 points at z=38.45, sp 1.5m by 1.5m
HORIZONTAL LUX

Average	5.9
Maximum	14.1
Minimum	0.5
Min/Avg(Uo)	0.084
Min/Max	0.035
Coef Var	0.441
UnifGrad	5.67

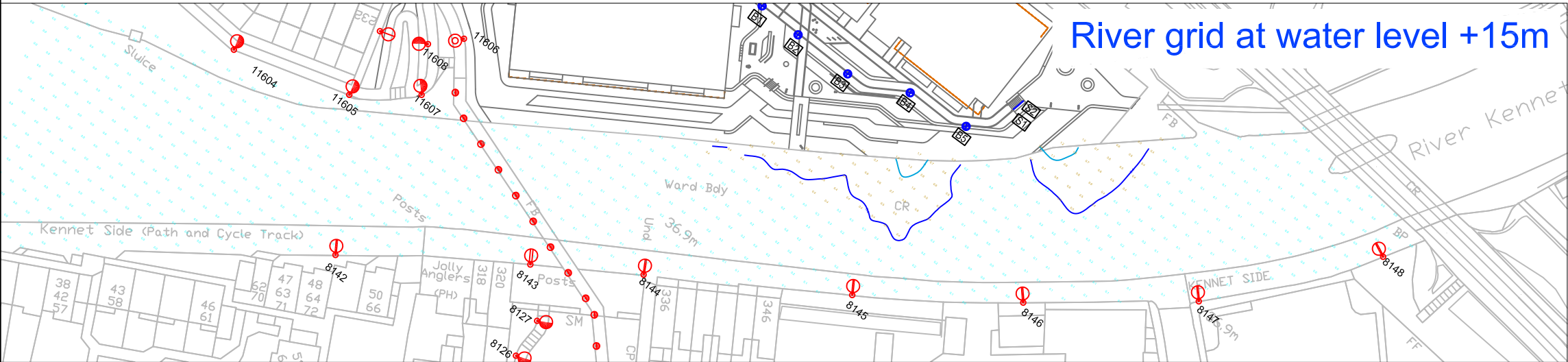
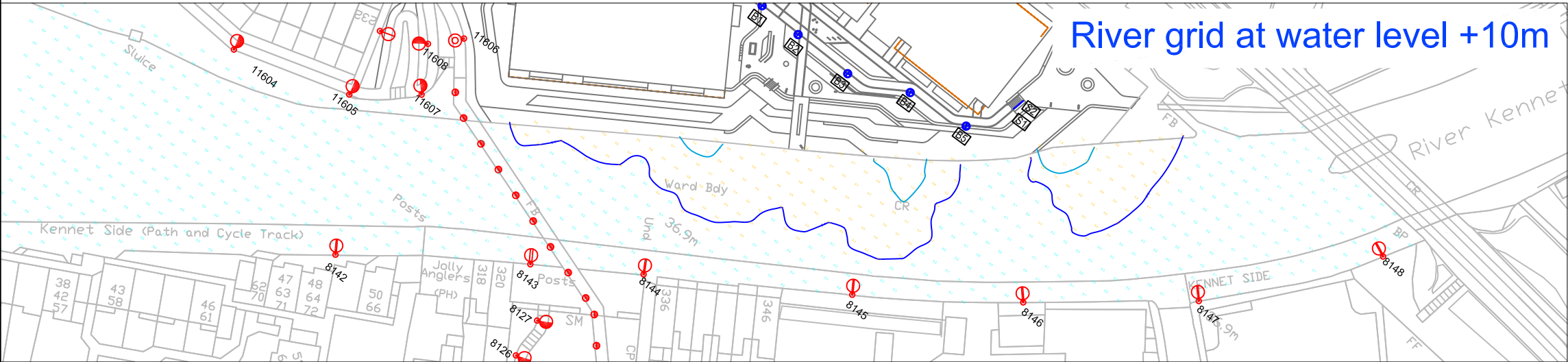
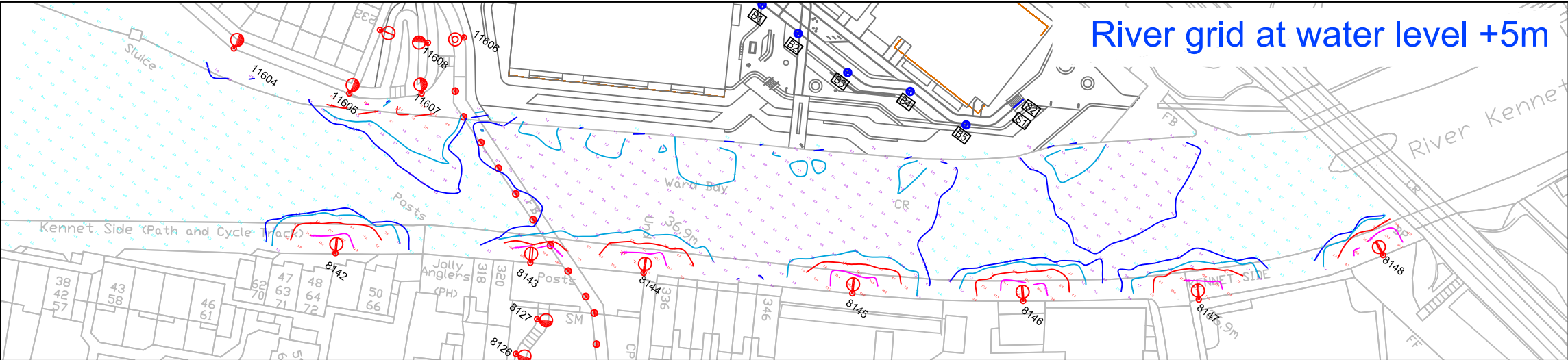
Client	Danescroft
Project Title	Land at SGN Gasholder No 4, Kenavon drive, Reading
	RG1 3DH

Proposed
lighting illuminance levels
considering all proposed lighting

Drawing Number	2569-D-A3-02	Rev	A
Scale at A3	1:1000		
Drawn	NWS		
Date	22.10.19		

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 5. The ramps and footbridge have been models using data from the 3D survey. the height of the ramp and footbridge varies.

Light levels less than 0.4 are shown in cyan, values above 2 lux are shown in red, other calculated values correspond to the colour of the grid. e.g Purple for River grid at water level +5m and orange for River grid at water level +10m

River grid at water level +5m	
945 points at z=40, sp 3m by 3m	
HORIZONTAL LUX	
Average	2.5
Maximum	240.7
Minimum	0.0
Min/Avg(Uo)	0.000
Min/Max	0.000
Coef Var	4.659
UnifGrad	N/A

River grid at water level +10m	
946 points at z=45, sp 3m by 3m	
HORIZONTAL LUX	
Average	0.2
Maximum	1.6
Minimum	0.0
Min/Avg(Uo)	0.000
Min/Max	0.000
Coef Var	1.361
UnifGrad	N/A

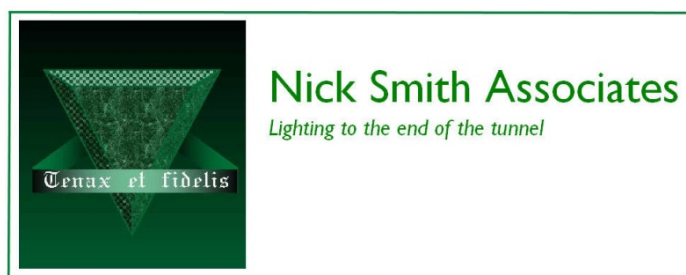
River grid at water level +15m	
941 points at z=50, sp 3m by 3m	
HORIZONTAL LUX	
Average	0.1
Maximum	1.7
Minimum	0.0
Min/Avg(Uo)	0.000
Min/Max	0.000
Coef Var	1.630
UnifGrad	N/A

River grid at water level +20m	
946 points at z=55, sp 3m by 3m	
HORIZONTAL LUX	

This drawing includes the light from the existing street lighting around the development, the proposed exterior lighting on the proposed development and light emitted from the rooms within the proposed building.

It does not take account of lumen depreciation of any light sources, the reduction in light as it passes thorough the windows, the impact of curtains, net curtains of reflected light within the buildings. The internal building lights have been modelled on an 800 lumen light source, the number of light sources is dependant on the size of the rooms

Client	Danescroft	Proposed lighting illuminance levels considering all proposed lighting	Drawing Number 2569-D-A3-02		Rev A	Nick Smith Associates Limited  Tel: 01246 229444 Fax: 01246 270465 mail@nicksmithassociates.com www.nicksmithassociates.com
Project Title	Land at SGN Gasholder No 4, Kenavon drive, Reading RG1 3DH		Scale at A3 : 1-1000			
			Drawn NWS			
			Date 22.10.19			



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