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Kirkby Leisure Centre
Large and Small Pitches
and Car park Lighting

New Housing Estate
Lighting Impact
Assessment Report

Date : 23/12/2022

Rev B

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1.0 Introduction

This Lighting Environmental Impact Assessment has been requested to ensure the existing lighting on the Kirkby Leisure Centre sports pitches and car park meets the current Obtrusive light limitation in relation to the proposed circa 807 property housing estate Cherryfield Drive Kirkby.

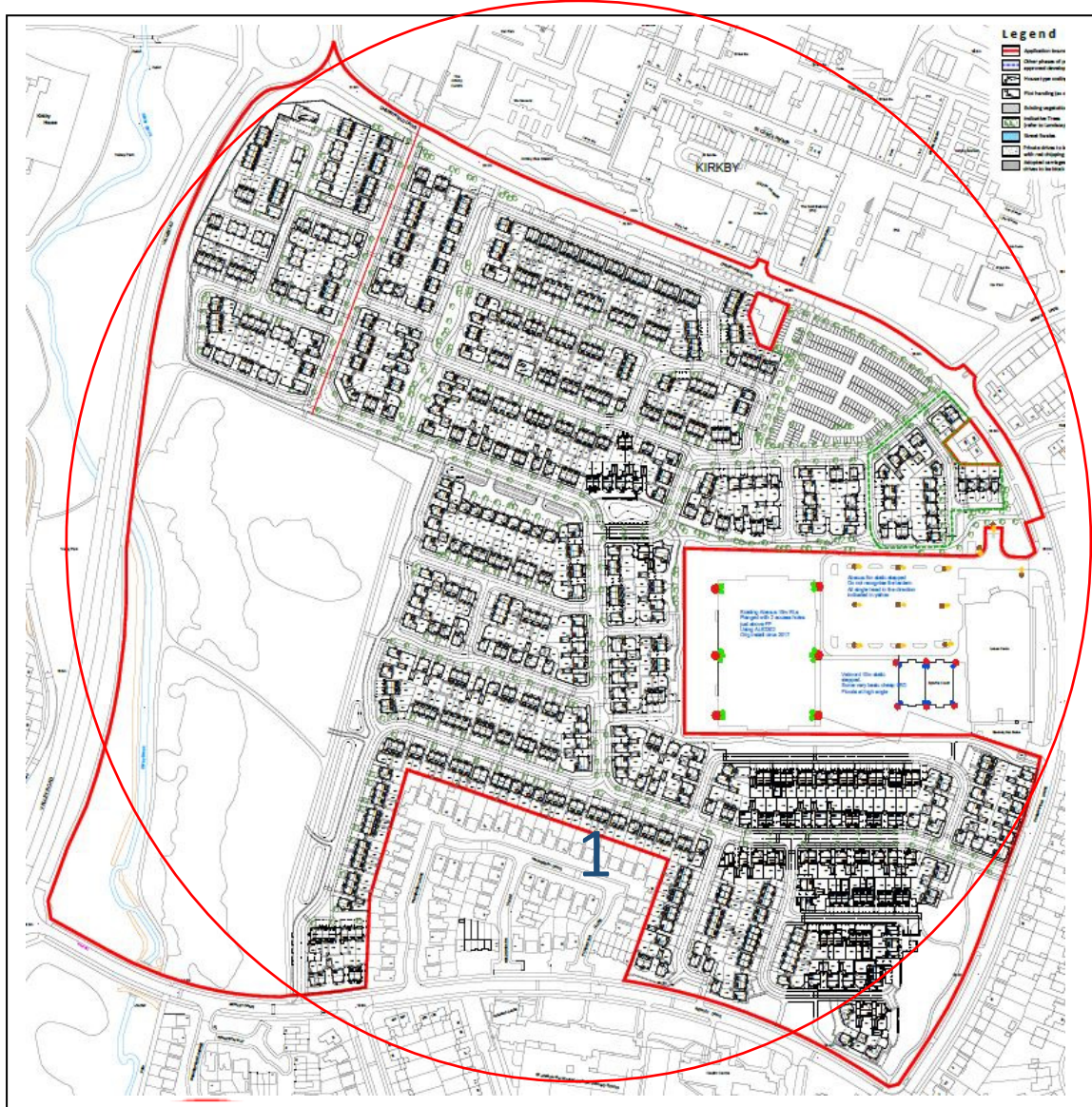
The Kirkby Leisure Centre and Cherryfield Drive site is located in Kirkby Between Cherryfield Drive, the A506 and Bewley Lane, located not far from junction 6 of the M57.

The proposed housing estate and existing sports pitches are surrounded by a bus station, retail premises and residential housing to the North, and residential housing to the East, South and West. The proposed housing estate is being built on a greenfield site that wraps around the already lit sports pitches. Based on the description of the sites surroundings the area is designated environmental zone E3 a Suburban medium district brightness area, a well inhabited rural and urban settlement.

The existing sports pitches and car park site is noted in the red circle below.



The existing sports pitches, car park and proposed housing estate is noted in the red circle below.



At present the closest existing housing (noted as no. 1 above) is located 115m away. The proposed new housing estate brings the closest housing to 27m away from the nearest floodlights, although the floodlighting and car park lighting is existing a check of the obtrusive light calculations against the E3 limits in the ILP Guidance notes for the reduction of obtrusive light 2020 GN 01/20 are required.

2.0 The Standards

Standards to meet:

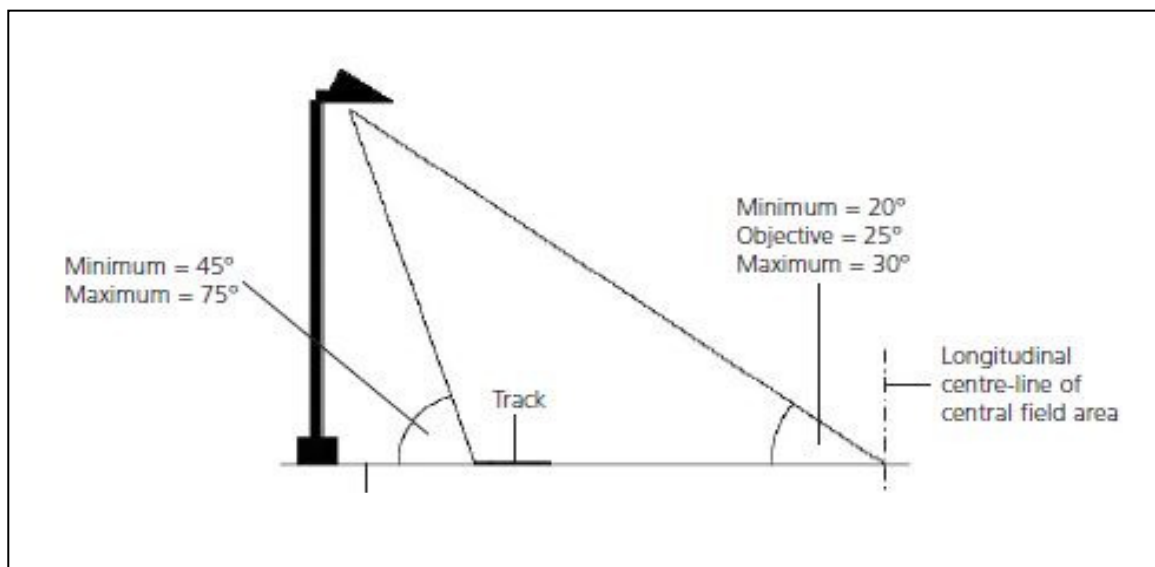
The Obtrusive light limitations to meet the levels are set out in the ILP Guidance notes for the reduction of obtrusive light (GN 01/20) 2020 Environmental zone E3.

Sports pitch Columns heights:

The large sports pitch has been lit from masts with headframes at 15m above the pitch surface, three columns down each side, placed at intervals which give the best light control to the surrounding area. The small pitches have been lit from 10m columns.

The existing column heights used have been checked against the criteria set out in CIBSE LG4 Part B Figure 27, which advises the angle from the centre line of the pitch to the top of the columns which should be between a minimum of 20 degrees to a maximum of 30° to avoid glare on and off the pitch and minimise light overspill. The column height to centre of the pitch angle on the large pitch is 22° which falls within the CIBSE LG4 Part B Limits.

The column height to centre of the pitch angle on the small pitch is 30° which meets the maximum CIBSE LG4 Part B Limit.



The existing column heights used meet the CIBSE LG4 Part B Limit which are recommended to avoid glare on the pitches and to reduce light overspill outside the area.

3.0 Luminaire types

Large sports pitch floodlights:



Challenger 1 Floodlight

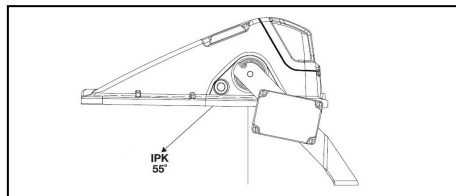
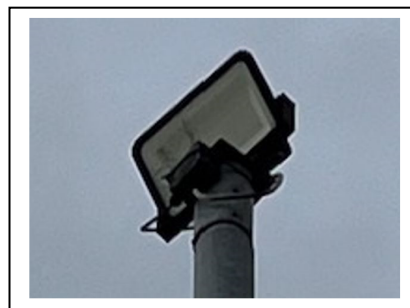


Diagram 1

The large sports pitch is lit using the 14 x Challenger 1 floodlight, types AL6001 POS B/2KW/MHN-FC/B and AL6002 POS B/2KW/MHN-FC/B. These floodlights have 2000W MBI lamps. The floodlight has several peak beam angle settings, the existing Challenger 1 floodlights on site are set in 'B' position which is a peak beam angle of 55° see diagram 1 below, this means when the peak beam of the floodlights are elevated at 55° the front glass is parallel with the ground, and therefore floodlight type is low glare and limits the amount of light overspill. This asymmetric floodlight distribution is recommended in the ILP Guidance notes for the reduction of obtrusive light.

Small sports pitch floodlights:

The small sports pitch existing floodlighting is said to be a 150W LED with symmetrical distribution. Although this floodlight is a symmetrical distribution the low wattage and low lumen output of this floodlight means that the light overspill be limited.



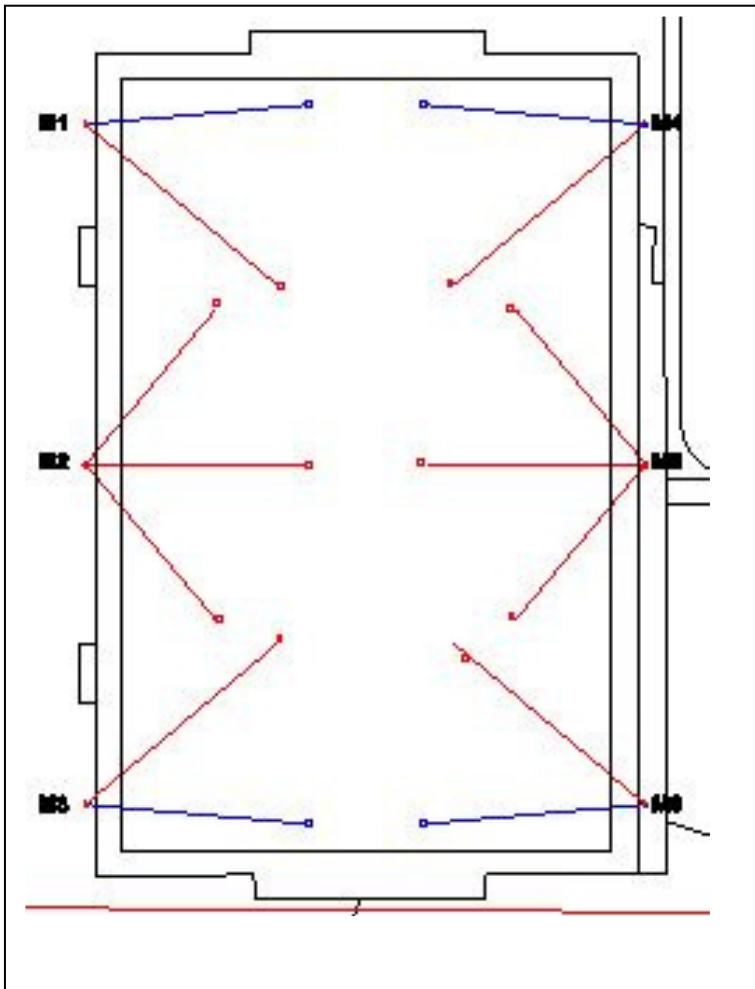
Car park Luminaires:



The car park and access road lighting consist of 12 x 8m columns carrying 1 x 120W LED side entry luminaires. This luminaire has a road lighting distribution that concentrates the illuminance up and down the car parking roads, limiting the overspill of light outside the area.

4.0 The Lighting Design

Large Pitch Floodlight layout plan



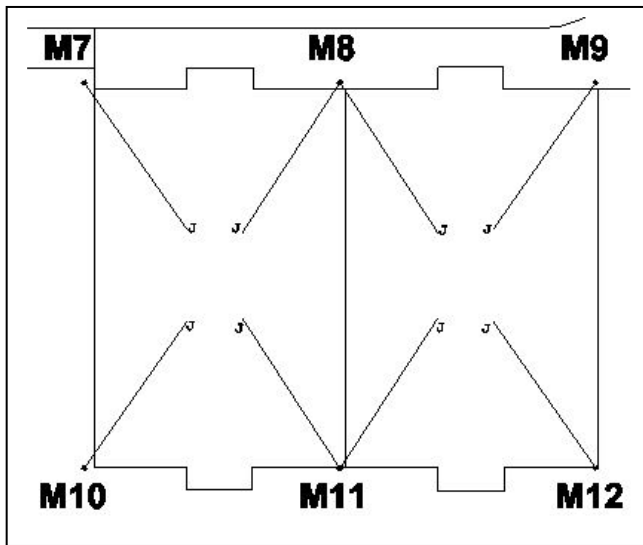
The Existing large sport pitch is lit from six 15m columns.

The four columns towards the corners are carrying 1 x AL6001 floodlight with a front glass elevation of only 7° above the horizontal noted in Blue, and 1 x AL6002 floodlight with a front glass elevation of only 10° above the horizontal noted in red (M1, M4, M3 & M6).

The two columns on the centre line across the pitch are carrying 2 x AL6002 floodlight with a front glass elevation of only 5 degrees above the horizontal noted in red, and 1 x AL6002 floodlight with a front glass elevation of only 7° above the horizontal also noted in red (M2 & M5).

As the large sports pitch has been lit with the AL6000 Challenger 1 floodlight with its asymmetric light distribution with the floodlight peak beam angle emerging from the front of the floodlight at 55° (see above diagram 1) this means the floodlight are aimed almost flat giving good upward light control, as well as good glare and light overspill control.

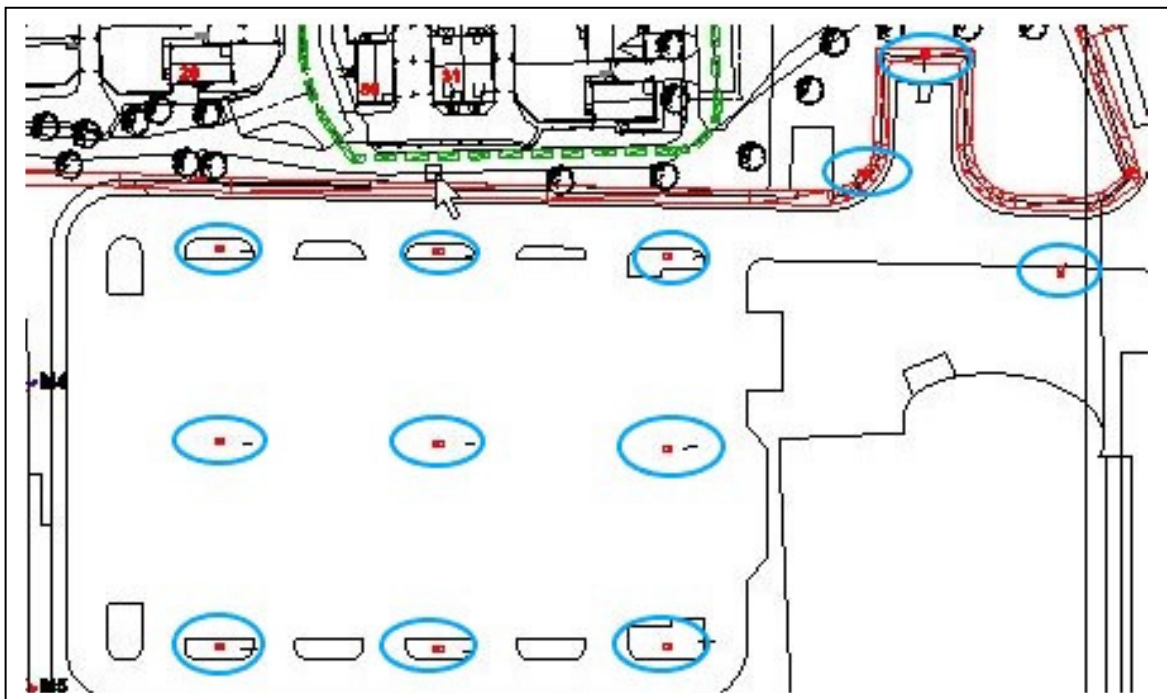
Small Pitch Floodlight layout plan:



The existing small pitches have been lit from six 8m column, four located at each of the outer corners (M7, M9, M10 & M12) each carrying 1 x 150W LED Floodlight on each column, and two located opposite each other on the centre line (M8, M11) each carrying 2 x 150W LED Floodlight on each column.

This floodlight is an off the shelf floodlight and has a symmetrical distribution and therefore has an no internal beam elevation. Although this is not a good style of light distribution for light control, the low lumen output of the flood means that the negative effects of this are minimum.

Car park luminaire layout plan:



The existing car park lighting is from 12 x 8m columns carrying 120W luminaires in the positions circled in blue on the plan above. The luminaires have a road style light distribution so is well controlled for the area and as the lumen output is low these luminaires they will give very little issues to the surrounding area.

5.0 Obtrusive light parameters

In order to ensure that the existing lighting scheme is suitable for the new build housing estate properties, it is necessary to calculate certain parameters to compare against obtrusive light standards set out in ILP Guidance notes for the reduction of obtrusive light document GN01/20 which is based on CIE 150 & CIE126.

The area is designated as Environmental zone E3 – Medium district brightness, Suburban well inhabited rural and urban settlements, small town centres of suburban locations. This sets the limits as follows:

Maximum Vertical illuminance on properties Table 3 : E3 = 10 Lux maximum

Maximum value of upward light ratio (ULR) of luminaires Table 6 : E3 = 5% ULR

Maximum value of upward flux ratio of the installation (UFR) Table 7 : E3 = 6%

Maximum value of threshold increment on roadways in relevant viewing direction (TI) Table 5 = 15%

6.0 Results and comparison

Maximum Vertical illuminance on properties Table 3 : E3 = 10 Lux maximum

Achieved level : Maximum 7 Lux vertical illuminance – located at properties:

New Build House_9_III_Seg1, New Build House_10_III_Seg1, New Build House_11_III_Seg1,

New Build House_16_III_Seg1 & New Build House_17_III_Seg1. (see location numbers on the drawing below.)

Maximum value of upward light ratio (ULR) of luminaires Table 6 = E3 = 5% ULR

Achieved level : 1.3% ULR

Maximum value of upward flux ratio of the installation (UFR) Table 7 : E3 = 6%

Achieved level : 1.04% UFR

Maximum value of threshold increment in relevant viewing direction (TI) Table 5 = 15%

Achieved level : Maximum 14% TI – roadway located between properties 310 and 334 (Traveling East)

Horizontal Illuminance levels and Contours



It can be seen on drawing LS4059404_A Kirkby Leisure Centre provided and the excerpt from that drawing on the previous page show that the horizontal illuminance contours from the existing pitch and car park lighting is giving minimal illuminance past the boundary, with the 5 lux contour falling short of all properties.

The considerations for the proposed properties are to ensure that the light overspill from the existing lit sports pitches and car park towards these proposed properties still falls within the ILP Guidance notes for the reduction of obtrusive light (GN 01/20) now the housing and roadways proposed will be closer, when calculating vertical illuminance to properties and glare to roadways.

With the maximum vertical illuminance level of 10 lux allowed, and the existing lighting achieving a maximum of 7 lux it falls well within the required limits.

The threshold increments TI % in the direction of travel has a maximum allowable value of <TI 15%. Of eight roadways calculated the road located between properties 310 and 334 is the highest calculated value of TI = 14% which falls within the ILP limit of TI=15% .

All obtrusive Light calculations have been made with a Maintenance factor of 1 (initial levels).

7.0 Conclusion

When assessing the calculations for obtrusive light against the ILP Guidance notes for the reduction of obtrusive light GN 01/20 & CIE 150 / CIE 126, it can be confirmed that the light overspill from the existing sport pitch lighting and car park lighting to the properties on the proposed new build housing estate passes the criteria for environmental zone E3.

The assessment found that Vertical illuminance to properties falls below the ILP zone E3 maximum restricted levels with the maximum vertical illuminance on the property of 7 lux with an allowable 10 lux.

The ILP Guidance notes state the Upward Light Ratio (ULR) or also known as Upward Waste Light Ratio (UWLR) has a maximum allowable ULR of 5% in an environmental zone E3, the existing lighting meets this with 1.3% ULR which falls well within the parameters.

The ILP Guidance Environmental zone E3 also requires the existing lighting to meet an Upward Flux Ratio, which for Zone E3 is a maximum of 6%. With a reflectance of 18% for the surrounding area the proposed lighting has a UFR of 1.04% well below the maximum allowable.

It can also be seen from the accompanying drawing LS4059404_A Kirkby Leisure Centre that the horizontal illuminance contours / light overspill is very well contained, even though the lighting was installed before proposed housing estate, with the levels rapidly dropping off to 2 lux.

In conclusion the existing lighting at Kirkby leisure centre complies with ILP Guidance notes for the reduction of obtrusive light 01/20 & CIE 150 / CIE126 Environmental zone E3 when testing the obtrusive light criteria against the proposed properties on the new build housing estate.

8.0 Possible alternative solution

The existing lighting is less efficient than the LED floodlights available now, so it may be worth looking at installing a possible alternative lighting solution to light both the large pitch and the small pitches to meet 200 Lux average while still maintaining the obtrusive light results within the environmental zone E3 levels, and taking advantage of the lower cost LED solution.

Large pitch alternative LED floodlight

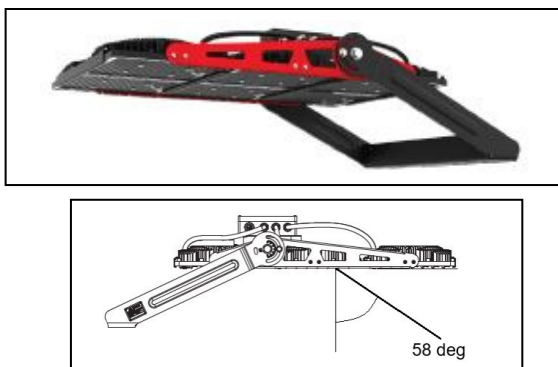


Diagram 2

The proposal for the large sports pitch would use a total 12 x Challenger 1 LED floodlight to light the pitch, types AL6101/15752SI+FS2, AL6101/15752SI+FS2+RS2, AL6102/15752SI+FS3 and AL6102/15752SI+RS2. The floodlight has peak beam angle 58° see diagram 2, this means when the peak beam of the floodlights are elevated at 58° the front glass is parallel with the ground, and therefore floodlight type is low glare and limits the amount of light overspill. This asymmetric floodlight distribution is recommended in the ILP Guidance notes for the reduction of obtrusive light.

Small pitch alternative LED floodlight

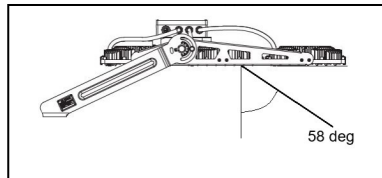


Diagram 3

The proposal for the Small sports pitch would use a total 8 x Challenger 1 LED floodlight to light the pitch, types AL6302/05752SI and. The floodlight has peak beam angle 58° see diagram 3, this means when the peak beam of the floodlights are elevated at 58° the front glass is parallel with the ground, and therefore floodlight type is low glare and limits the amount of light overspill. This asymmetric floodlight distribution is recommended in the ILP Guidance notes for the reduction of obtrusive light.

The reason for offering this alternative is that it meets the same environmental Zone E3, the illuminance on the small sports pitches have been increased to 200 Lux average, a more suitable levels for playing sports, and the large pitch has improved uniformity. Another big advantage though is in the use of power in total over all pitches.

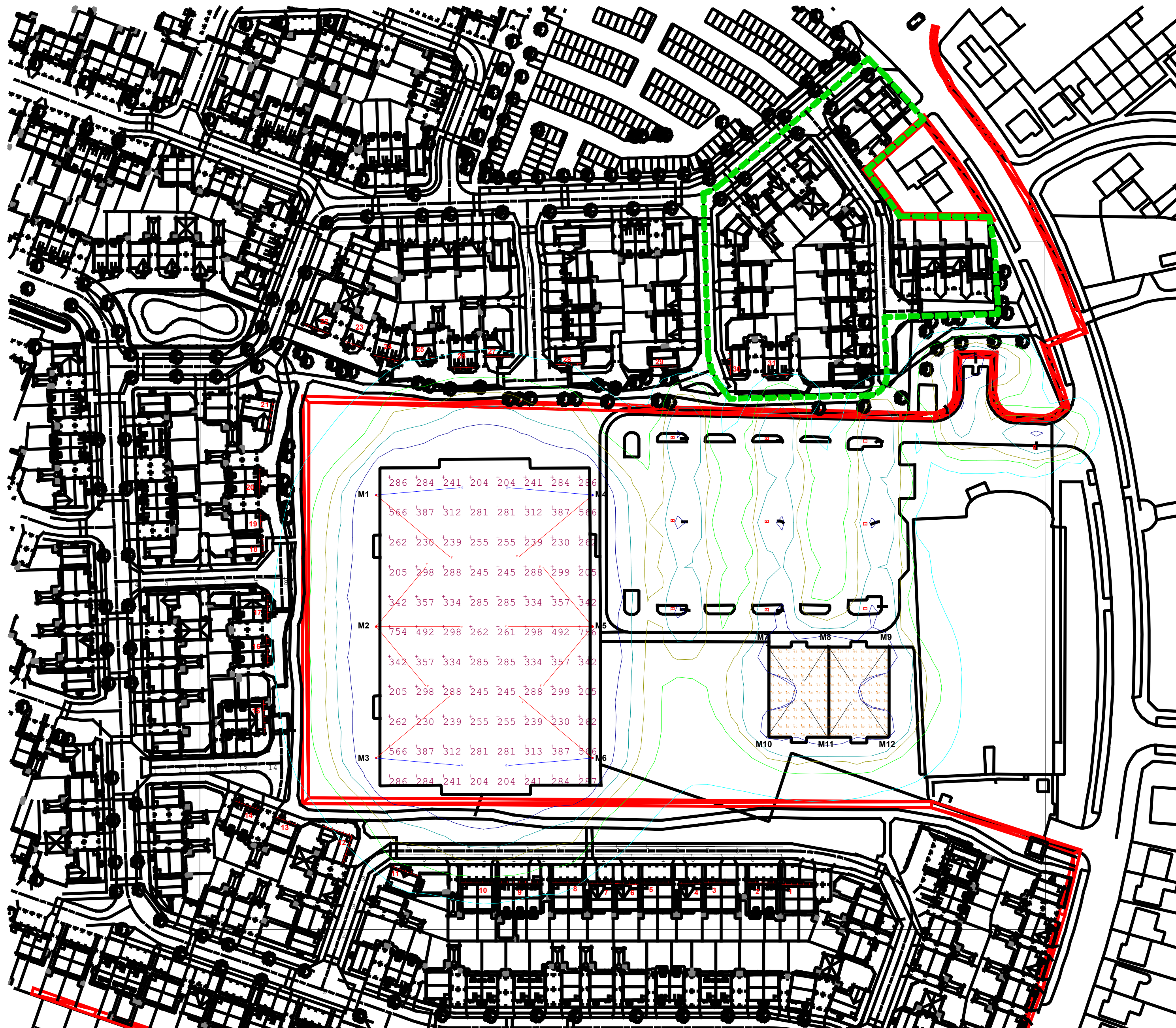
Existing power usage for the large and small pitch = 34359W

Proposed new LED lighting power usage for the large and small pitch = 22160W

Changing over to the LED solution for lighting the pitches would result in a potential 35% reduction in power usage.

Please see drawing LS4059404 Kirkby Leisure Centre New for the illuminance level details and obtrusive light calculations.

Report by John Telford MSc BSc MSLL



Luminaire Schedule						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	J	8	150W LED Floodlight simulated data	10	150	24002
	H	12	Simulated existing 120W Road lanterns, AK	8	120	11448
	F	10	AL6002_B MHN-FC_B	15	2368.7	204739
	G	4	AL6001_B MHN-FC_B	15	2368	202090

Luminaire Schedule						
Project: M1,M3						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	F	1	AL6002_B MHN-FC_B	15	2368.7	204739
	G	1	AL6001_B MHN-FC_B	15	2368	202090

Luminaire Schedule						
Project: M2						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	F	3	AL6002_B MHN-FC_B	15	2368.7	204739

Luminaire Schedule						
Project: M4,M6						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	F	1	AL6002_B MHN-FC_B	15	2368.7	204739
	G	1	AL6001_B MHN-FC_B	15	2368	202090

Luminaire Schedule						
Project: M5						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	F	3	AL6002_B MHN-FC_B	15	2368.7	204739

Luminaire Schedule						
Project: M7,M9,M10,M12						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	J	1	150W LED Floodlight simulated data	10	150	24002

Luminaire Schedule						
Project: M8,M11						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	J	2	150W LED Floodlight simulated data	10	150	24002

Calculation Summary Maintenance Factor: 1.0						
Project: Calculations						
Label	CalcType	Units	# Pts	Avg	Max	Min
Large MUGA	Illuminance	Lux	88	309.33	756	204

Calculation Summary Maintenance Factor: 1.0						
Project: Small 1						
Label	CalcType	Units	# Pts	Avg	Max	Min
Small MUGA 1	Illuminance	Lux	88	69.22	131	38

Calculation Summary Maintenance Factor: 0.8						
Project: Calculations						
Label	CalcType	Units	# Pts	Avg	Max	Min
Large MUGA	Illuminance	Lux	88	247.46	604.8	163.2

Calculation Summary Maintenance Factor: 0.9						
Project: Small 1						
Label	CalcType	Units	# Pts	Avg	Max	Min
Small MUGA 1	Illuminance	Lux	88	62.29	117.9	34.2

Threshold Increment (TI)						
Maximum Allowable Value: 15%						
Calculations Tested (6):						
ObtrusiveLight_T1_1						
Obtrusive - Threshold Increment (%)						
Adaptation Luminance=5						
Average=5.67 Maximum=6 Minimum=4 Min/Avg=0.71 Min/Max=0.65 RelativeTI=4%						
ObtrusiveLight_T1_2						
Obtrusive - Threshold Increment (%)						
Adaptation Luminance=5						
Average=5.60 Maximum=6 Minimum=4 Min/Avg=0.71 Min/Max=0.65 RelativeTI=4%						
ObtrusiveLight_T1_3						
Obtrusive - Threshold Increment (%)						
Adaptation Luminance=5						
Average=2.89 Maximum=3 Minimum=2 Min/Avg=0.80 Min/Max=0.65 RelativeTI=2%						
ObtrusiveLight_T1_4						
Obtrusive - Threshold Increment (%)						
Adaptation Luminance=5						
Average=6.77 Maximum=8 Minimum=5 Min/Avg=0.80 Min/Max=0.65 RelativeTI=3%						
ObtrusiveLight_T1_5						
Obtrusive - Threshold Increment (%)						
Adaptation Luminance=5						
Average=6.54 Maximum=8 Minimum=5 Min/Avg=0.80 Min/Max=0.65 RelativeTI=3%						
ObtrusiveLight_T1_6						
Obtrusive - Threshold Increment (%)						
Adaptation Luminance=5						
Average=12.20 Maximum=14 Minimum=11 Min/Avg=0.80 Min/Max=0.79 RelativeTI=14%						
ObtrusiveLight_T1_7						
Obtrusive - Threshold Increment (%)						
Adaptation Luminance=5						
Average=5.40 Maximum=6 Minimum=5 Min/Avg=0.83 Min/Max=0.67 RelativeTI=3%						
ObtrusiveLight_T1_8						
Obtrusive - Threshold Increment (%)						
Adaptation Luminance=5						
Average=6.90 Maximum=8 Minimum=6 Min/Avg=0.80 Min/Max=0.65 RelativeTI=4%						

Area Summary	
Label	Total Watts
Sports Area_1	3579

Isoline Legend	
Illuminance (Lux)	
Colour	Value
	2
	5
	10
	20
	50

Maintenance Factor:MBI=0.8, LED=0.9	
Based upon:	
LED Lifetime L80B10: > 60,000 hours	
DRI depreciation factor based on BSS489-1:2020 Table C.1	
12 month cleaning interval of luminaires	

Close Summary	
Label	GRmax
Large MUGA	47
Small MUGA	33

Calculation Grid Intervals	
Area	Grid
Large MUGA: 11 x 6	
Small MUGA: 2.5m x 2.5m	

Area Dimensions		
Area	L (m)	W (m)
Large MUGA: 100	64	
Small MUGA: 30	20	

Initial levels shown on the plan and used for obtrusive light calculations i.e. MF = 1.0

Obtrusive Light - Compliance Report
CIE 150:2017, E3-Medium District Brightness, Pre-Curlew
Filename: LS4059404_A Kirkby Leisure Centre v1
22/12/2022 00:21:59

Illuminance
Maximum Allowable Value: 10 Lux

Calculations Tested (32):

Calculation Label	Test Results	Max. Illum.
New Build House_1_IL_Seg1	PASS	4
New Build House_2_IL_Seg1	PASS	4
New Build House_3_IL_Seg1	PASS	4
New Build House_4_IL_Seg1	PASS	3
New Build House_5_IL_Seg1	PASS	4
New Build House_6_IL_Seg1	PASS	4
New Build House_7_IL_Seg1	PASS	5
New Build House_8_IL_Seg1	PASS	6
New Build House_9_IL_Seg1	PASS	7
New Build House_10_IL_Seg1	PASS	7
New Build House_11_IL_Seg1	PASS	7
New Build House_12_IL_Seg1	PASS	2
New Build House_12_IL_Seg2	PASS	6
New Build House_13_IL_Seg1	PASS	3
New Build House_14_IL_Seg1	PASS	2
New Build House_15_IL_Seg1	PASS	6
New Build House_16_IL_Seg1	PASS	7
New Build House_17_IL_Seg1	PASS	7
New Build House_18_IL_Seg1	PASS	5
New Build House_19_IL_Seg1	PASS	5
New Build House_20_IL_Seg1	PASS	4
New Build House_21_IL_Seg1	PASS	2
New Build House_22_IL_Seg1	PASS	1
New Build House_23_IL_Seg1	PASS	2
New Build House_24_IL_Seg1	PASS	4
New Build House_25_IL_Seg1	PASS	4
New Build House_26_IL_Seg1	PASS	7
New Build House_27_IL_Seg1	PASS	5
New Build House_28_IL_Seg1	PASS	5
New Build House_29_IL_Seg1	PASS	3
New Build House_30_IL_Seg1	PASS	1
New Build House_31_IL_Seg1	PASS	3

Upward Waste Light Ratio (UWLR)
Maximum Allowable Value: 5.0 %
Calculated UWLR: 1.3 %
Test Results: PASS

Upward Flux Ratio (UFR)
Maximum Allowable Value: 6.0
Reference Area(s): Large MUGA
Small MUGA 2

Average Reflectance - Reference Area(s): 0.86
Average Reflectance - Surround: 0.18
Initial Average Illuminance - Reference Area(s): 276.42 Lux
Average Maintained Illuminance Required: 300.00 Lux
Total Area - Reference Area(s): 9248 Sq.m.
Total Luminaire Flux (All Locations): 3543050
Downward Light Ratio (DLR): 0.86
Upward Light Ratio (ULR): 0.013
Utilization Factor (UF): 0.722

Calculated UFR: 1.04
Test Results: PASS

Notes:
This scheme has been developed based upon a flat and open area, where shadowing from buildings, plants and equipment have not been taken into consideration.

Drawing and mast locations converted from satellite image, please check dimensions before ordering and installing.

Customer to confirm suitability and structural integrity of existing masts prior to placing an order.

Initial levels shown on drawing.



Luminaire Schedule						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	C	2	AL6101_15752SI + FS2 Challenger 1 LED	15	1528.7	172970
	D	2	AL6101_15752SI + FS2 + RS2 Challenger 1 LED	15	1504.3	163561
	A	4	AL6102_15752SI + FS3 Challenger 1 LED	15	1542.8	184489
	B	4	AL6102_15752SI + RS2 Challenger 1 LED	15	1525	193278
	E	8	AL6302_05752SI Challenger 1 LED	10	477.9	63780
	H	12	Simulated existing 120W Road luminaire_4K	8	120	11448

Luminaire Schedule						
Project: M1,M3						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	D	1	AL6101_15752SI + FS2 + RS2 Challenger 1 LED	15	1504.3	163561
	B	1	AL6102_15752SI + RS2 Challenger 1 LED	15	1525	193278

Luminaire Schedule						
Project: M2						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	B	2	AL6102_15752SI + RS2 Challenger 1 LED	15	1525	193278

Luminaire Schedule						
Project: M4,M6						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	C	1	AL6101_15752SI + FS2 Challenger 1 LED	15	1528.7	172970
	A	1	AL6102_15752SI + FS3 Challenger 1 LED	15	1542.8	184489

Luminaire Schedule						
Project: M5						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	A	2	AL6102_15752SI + FS3 Challenger 1 LED	15	1542.8	184489

Luminaire Schedule						
Project: M7,M9,M10,M12						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	E	1	AL6302_05752SI Challenger 1 LED	10	477.9	63780

Luminaire Schedule						
Project: M8,M11						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	E	2	AL6302_05752SI Challenger 1 LED	10	477.9	63780

Horizontal Illuminance Levels Designed To Meet:					
Customer Specified Levels					
Label	CalcType	Units	Avg	Min/Avg	
Large MUGA	Illuminance	Lux	200	0.60	
Small MUGA	Illuminance	Lux	200	0.60	

Calculation Summary								
Initial Calculations - Separately Switched								
Label	CalcType	Units	# Pts	Avg	Max	Min	Min/Avg	Min/Max
Large MUGA	Illuminance	Lux	88	222.93	362	142	0.64	0.39
Small MUGA 1	Illuminance	Lux	88	242.77	322	164	0.68	0.51
Small MUGA 2	Illuminance	Lux	88	242.84	322	163	0.67	0.51

Calculation Summary								
Maintained Calculations - Separately Switched								
Label	CalcType	Units	# Pts	Avg	Max	Min	Min/Avg	Min/Max
Large MUGA	Illuminance	Lux	88	200.25	326	128	0.64	0.39
Small MUGA 1	Illuminance	Lux	88	217.31	288	147	0.68	0.51
Small MUGA 2	Illuminance	Lux	88	217.33	288	146	0.67	0.51

Threshold Increment (TI)									
Maximum Allowable Value: 15%									
Calculation Tested (R):									
ObtrusiveLight_TI_1									
Obtrusive - Threshold Increment (%)									
Adaptation Luminance=5									
Average=0.00 Maximum=0 Minimum=0 Min/Avg=0.71 Min/Max=0.60 RelativeTI=1%									
ObtrusiveLight_TI_2									
Obtrusive - Threshold Increment (%)									
Adaptation Luminance=5									
Average=1.00 Maximum=2 Minimum=0 Min/Avg=0.83 Min/Max=0.60 RelativeTI=2%									
ObtrusiveLight_TI_3									
Obtrusive - Threshold Increment (%)									
Adaptation Luminance=5									
Average=0.00 Maximum=0 Minimum=0 Min/Avg=N.A. Min/Max=N.A. RelativeTI=N.A.									
ObtrusiveLight_TI_4									
Obtrusive - Threshold Increment (%)									
Adaptation Luminance=5									
Average=0.00 Maximum=2 Minimum=0 Min/Avg=0.00 Min/Max=0.00 RelativeTI=1%									
ObtrusiveLight_TI_5									
Obtrusive - Threshold Increment (%)									
Adaptation Luminance=5									
Average=0.00 Maximum=2 Minimum=0 Min/Avg=0.00 Min/Max=0.00 RelativeTI=2%									
ObtrusiveLight_TI_6									
Obtrusive - Threshold Increment (%)									
Adaptation Luminance=5									
Average=1.00 Maximum=2 Minimum=1 Min/Avg=0.50 Min/Max=0.00 RelativeTI=1%									
ObtrusiveLight_TI_7									
Obtrusive - Threshold Increment (%)									
Adaptation Luminance=5									
Average=1.00 Maximum=2 Minimum=1 Min/Avg=0.50 Min/Max=0.00 RelativeTI=2%									
ObtrusiveLight_TI_8									
Obtrusive - Threshold Increment (%)									
Adaptation Luminance=5									
Average=1.00 Maximum=1 Minimum=1 Min/Avg=1.00 Min/Max=1.00 RelativeTI=1%									

Area Summary		
Label	Total Watts	
Sports Area_2	23600.4	

Isoline Legend	
Illuminance (Lux)	
Colour	Value
	2
	5
	10
	20
	50

Maintenance Factor: 0.9
Based upon:
LED lifetime L80B10: > 60,000 hours
Dirt depreciation factor based on BS5489-1:2020 Table C.1
12 month cleaning interval of luminaires

Glare Summary	
Label	GRmax
Large MUGA	46
Small MUGA	35

Calculation Grid Intervals	
Area	Grid
Large MUGA	11 x 8
Small MUGA	2.5m x 2.5m

Area Dimensions	
Area	L (m) W (m)
Large MUGA	100 64
Small MUGA	30 20

Obtrusive Light - Compliance Report
On: 16/12/2022 13:45:00
Filename: LS4059404 Kirkby Leisure Centre V2
22/12/2022 01:39:32

Illuminance
Maximum Allowable Value: 10 Lux

Calculations Tested (32):

Calculation Label	Test Results	Max. Illum.
New Build House_1_III_Seg1	PASS	2
New Build House_2_III_Seg1	PASS	2
New Build House_3_III_Seg1	PASS	2
New Build House_4_III_Seg1	PASS	2
New Build House_5_III_Seg1	PASS	3
New Build House_6_III_Seg1	PASS	4
New Build House_7_III_Seg1	PASS	6
New Build House_8_III_Seg1	PASS	7
New Build House_9_III_Seg1	PASS	10
New Build House_10_III_Seg1	PASS	10
New Build House_11_III_Seg1	PASS	7
New Build House_12_III_Seg1	PASS	3
New Build House_12_III_Seg2	PASS	6
New Build House_13_III_Seg1	PASS	3
New Build House_14_III_Seg1	PASS	3
New Build House_15_III_Seg1	PASS	6
New Build House_16_III_Seg1	PASS	6
New Build House_17_III_Seg1	PASS	6
New Build House_18_III_Seg1	PASS	5
New Build House_19_III_Seg1	PASS	4
New Build House_20_III_Seg1	PASS	4
New Build House_21_III_Seg1	PASS	3
New Build House_22_III_Seg1	PASS	1
New Build House_23_III_Seg1	PASS	1
New Build House_24_III_Seg1	PASS	3
New Build House_25_III_Seg1	PASS	5
New Build House_26_III_Seg1	PASS	8
New Build House_27_III_Seg1	PASS	7
New Build House_28_III_Seg1	PASS	6
New Build House_29_III_Seg1	PASS	3
New Build House_30_III_Seg1	PASS	3
New Build House_31_III_Seg1	PASS	2

Upward Waste Light Ratio (UWLR)
Maximum Allowable Value: 5.0 %
Calculated UWLR: 0.2 % Test Results: **PASS**

Upward Flux Ratio (UFR)
Maximum Allowable Value: 6.0
Reference Area(s): Large MUGA, Small MUGA 1, Small MUGA 2
Average Reflectance - Reference Area(s): 0.66
Average Reflectance - Surround: 0.18
Initial Average Illuminance - Reference Area(s): 232.64 Lux
Average Maintained Illuminance Required: 300.00 Lux
Total Area - Reference Area(s): 9248 Sq.m
Total Luminaire Flux (All Locations): 2846440
Downward Light Ratio (DLO): 0.998
Upward Light Ratio (ULO): 0.002
Utilization Factor (UF): 0.756

Notes:
This scheme has been developed based upon a flat and open area, where shadowing from buildings, plants and equipment have not been taken into consideration.

Drawing and mast locations converted from satellite image, please check dimensions before ordering and installing.

Customer to confirm suitability and structural integrity of existing masts prior to placing an order.

Initial levels shown on drawing.