

DATE: 14 December 2021
DESIGNER: Don Kinghan
PROJECT No: DAR21005
PROJECT NAME: LEL Castlelost Energy Storage Facility R0

DARAMACK
Exterior Lighting Design

Lighting designed in accordance with BS5489 - Lighting of Roads and Public Amenity Areas and CIBSE SLL Lighting Handbook - Exterior Workplaces.

Internal Roads - Lighting Class P5

Maintained average illuminance >3.0Lux
Minimum point illuminance >0.60Lux

Luminaire selected Philips Luma Nano BGP701 2.2klm LED complete with factory fitted integral back shield.

Outdoor Lighting Report

PREPARED BY: W Don Kinghan
www.daramacklighting.co.uk

Layout Report

General Data

Dimensions in Metres Angles in Degrees

Calculation Grids

ID	Grid Name	X	Y	X' Length	Y' Length	X' Spacing	Y' Spacing
1	Entrance	644787.17	738995.15	220.35	502.26	1.50	2.01
2	Grid 2	644849.26	738872.43	345.00	75.00	1.50	1.50
3	Grid 3	644833.46	738898.91	150.00	66.00	1.50	1.50
4	Grid 16	644909.40	738838.38	57.00	54.00	1.50	1.50
5	Grid 5	645181.46	738966.47	75.00	123.00	1.50	1.50
6	Grid 6	644980.32	738766.69	153.00	141.00	1.50	1.50
7	Grid 7	645129.82	738806.70	45.00	141.00	1.50	1.50
8	Grid 8	645174.32	738819.08	45.00	141.00	1.50	1.50
9	Grid 9	644907.97	739014.18	57.00	30.00	1.50	1.50
10	Vertical on house	644679.25	739430.02	12.00	4.00	0.50	0.50

Luminaires



Luminaire A Data

Supplier	Philips
Type	BGP701 DM11 BL1
Lamp(s)	LED-HB 5.2S 830
Lamp Flux (klm)	2.20
File Name	Luma Gen2 Nano_BGP701_DM11 BL1_22 00_10LED_5.2S_CLO_L90_830.ies
Maintenance Factor	0.83
Lum. Int. Class	G2
No. in Project	82

Layout

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1	A	644753.00	739495.22	5.00	205.00	0.00	0.00	0.40			
2	A	644686.77	739437.81	5.00	14.00	0.00	0.00	0.40			
3	A	644708.25	739454.45	5.00	117.00	0.00	0.00	0.40			
4	A	644742.65	739470.06	5.00	115.00	0.00	0.00	0.40			
5	A	644695.40	739410.94	5.00	19.00	0.00	0.00	0.40			
6	A	644707.65	739375.06	5.00	21.00	0.00	0.00	0.40			
7	A	644731.70	739303.81	5.00	22.00	0.00	0.00	0.40			
8	A	644742.76	739271.10	5.00	19.00	0.00	0.00	0.40			
9	A	644754.64	739236.68	5.00	21.00	0.00	0.00	0.40			
10	A	644765.85	739202.41	5.00	20.00	0.00	0.00	0.40			
11	A	644777.22	739168.09	5.00	21.00	0.00	0.00	0.40			

Layout Continued

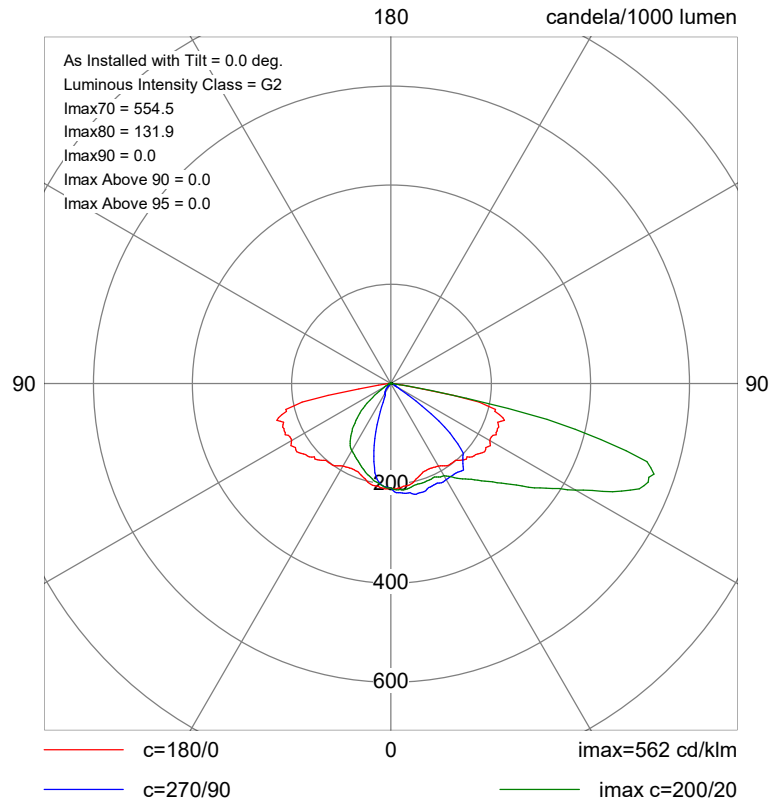
ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
12	A	644794.51	739143.03	5.00	54.00	0.00	0.00	0.40			
13	A	644821.50	739131.75	5.00	62.00	0.00	0.00	0.40			
14	A	644857.71	739115.93	5.00	68.00	0.00	0.00	0.40			
15	A	644897.19	739109.13	5.00	248.00	0.00	0.00	0.40			
16	A	644925.45	739082.09	5.00	197.00	0.00	0.00	0.40			
17	A	644943.56	739032.12	5.00	106.00	0.00	0.00	0.30			
18	A	644934.32	739051.53	5.00	195.00	0.00	0.00	0.40			
19	A	644918.17	739033.48	5.00	293.00	0.00	0.00	0.30			
29	A	644885.73	739022.06	5.00	294.00	0.00	0.00	0.40			
30	A	644862.21	738911.21	5.00	57.00	0.00	0.00	0.40			
31	A	644879.29	738900.62	5.00	68.00	0.00	0.00	0.40			
32	A	644902.12	738896.30	5.00	97.00	0.00	0.00	0.40			
33	A	644938.01	738905.83	5.00	109.00	0.00	0.00	0.40			
34	A	644973.78	738916.10	5.00	106.00	0.00	0.00	0.40			
35	A	645006.25	738925.30	5.00	109.00	0.00	0.00	0.40			
36	A	645034.37	738933.19	5.00	105.00	0.00	0.00	0.40			
37	A	645061.25	738941.02	5.00	108.00	0.00	0.00	0.40			
38	A	645084.53	738947.22	5.00	107.00	0.00	0.00	0.40			
39	A	645116.99	738956.78	5.00	106.00	0.00	0.00	0.40			
40	A	645150.45	738966.70	5.00	108.00	0.00	0.00	0.40			
41	A	645008.98	738917.32	5.00	287.00	0.00	0.00	0.40			
42	A	645036.69	738925.65	5.00	287.00	0.00	0.00	0.40			
43	A	645063.78	738933.47	5.00	287.00	0.00	0.00	0.40			
44	A	644931.79	738891.48	5.00	197.00	0.00	0.00	0.40			
45	A	645094.87	738933.15	5.00	17.00	0.00	0.00	0.40			
46	A	645139.65	738948.02	5.00	17.00	0.00	0.00	0.40			
47	A	644995.45	738906.43	5.00	17.00	0.00	0.00	0.40			
48	A	644851.27	738944.77	5.00	151.00	0.00	0.00	0.40			
49	A	644835.89	738935.73	5.00	330.00	0.00	0.00	0.40			
50	A	644852.15	738928.65	5.00	239.00	0.00	0.00	0.40			
51	A	645083.62	738928.64	5.00	194.00	0.00	0.00	0.40			
52	A	644835.16	738915.45	5.00	143.00	0.00	0.00	0.40			
53	A	645187.35	738978.25	5.00	111.00	0.00	0.00	0.40			
54	A	644866.80	739003.11	5.00	326.00	0.00	0.00	0.40			
55	A	644854.66	738975.70	5.00	335.00	0.00	0.00	0.40			
69	A	645037.51	738782.99	5.00	193.00	0.00	0.00	0.40			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
88	A	645221.14	738988.00	5.00	110.00	0.00	0.00	0.40			
89	A	645234.55	739017.13	5.00	200.00	0.00	0.00	0.40			
90	A	645225.08	739049.93	5.00	193.00	0.00	0.00	0.40			
91	A	645215.42	739083.86	5.00	197.00	0.00	0.00	0.40			
92	A	645166.37	739084.51	5.00	288.00	0.00	0.00	0.40			
93	A	645157.09	739066.92	5.00	13.00	0.00	0.00	0.40			
94	A	645166.47	739033.70	5.00	19.00	0.00	0.00	0.40			
95	A	645176.17	738999.09	5.00	16.00	0.00	0.00	0.40			
96	A	645196.22	739092.96	5.00	287.00	0.00	0.00	0.40			
97	A	645005.90	738868.91	5.00	18.00	0.00	0.00	0.40			
98	A	645015.73	738835.05	5.00	17.00	0.00	0.00	0.40			
99	A	645031.93	738810.56	5.00	219.00	0.00	0.00	0.40			
100	A	645054.53	738810.66	5.00	287.00	0.00	0.00	0.40			
101	A	645090.51	738820.98	5.00	284.00	0.00	0.00	0.40			
102	A	645114.52	738819.49	5.00	193.00	0.00	0.00	0.40			
103	A	645104.58	738854.61	5.00	195.00	0.00	0.00	0.40			
104	A	645094.01	738891.19	5.00	193.00	0.00	0.00	0.40			
105	A	645105.72	738898.18	5.00	18.00	0.00	0.00	0.40			
106	A	645135.45	738886.19	5.00	105.00	0.00	0.00	0.40			
107	A	645116.92	738858.86	5.00	21.00	0.00	0.00	0.40			
108	A	645127.24	738823.33	5.00	18.00	0.00	0.00	0.40			
109	A	645150.22	738910.92	5.00	19.00	0.00	0.00	0.40			
110	A	645161.50	738873.45	5.00	19.00	0.00	0.00	0.40			
111	A	645171.18	738839.45	5.00	17.00	0.00	0.00	0.40			
112	A	645187.70	738827.38	5.00	110.00	0.00	0.00	0.40			
113	A	645203.08	738845.07	5.00	196.00	0.00	0.00	0.40			
114	A	645193.05	738880.16	5.00	197.00	0.00	0.00	0.40			
115	A	645170.08	738905.29	5.00	283.00	0.00	0.00	0.40			
116	A	645186.66	738902.98	5.00	196.00	0.00	0.00	0.40			
130	A	644939.55	738864.75	5.00	196.00	0.00	0.00	0.40			
131	A	644918.56	738855.36	5.00	106.00	0.00	0.00	0.40			
132	A	644719.26	739340.69	5.00	17.00	0.00	0.00	0.40			
133	A	645141.60	738984.60	5.00	13.00	0.00	0.00	0.40			
134	A	645132.81	739015.65	5.00	14.00	0.00	0.00	0.40			
135	A	645164.84	738979.70	5.00	286.00	0.00	0.00	0.40			

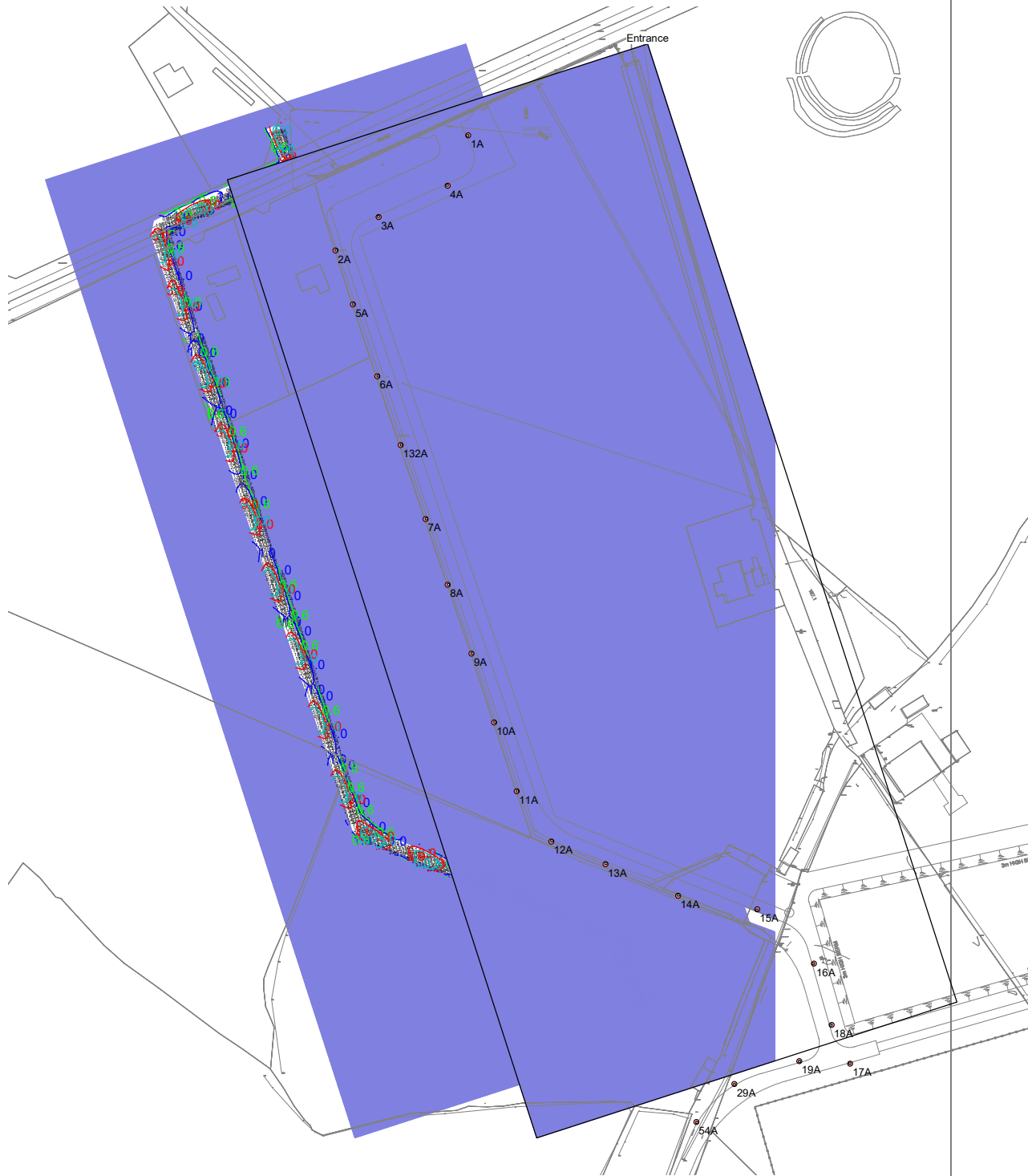
Polar Diagram

Luminaire A BGP701 DM11 BL1



Horizontal Illuminance (lux)

Entrance

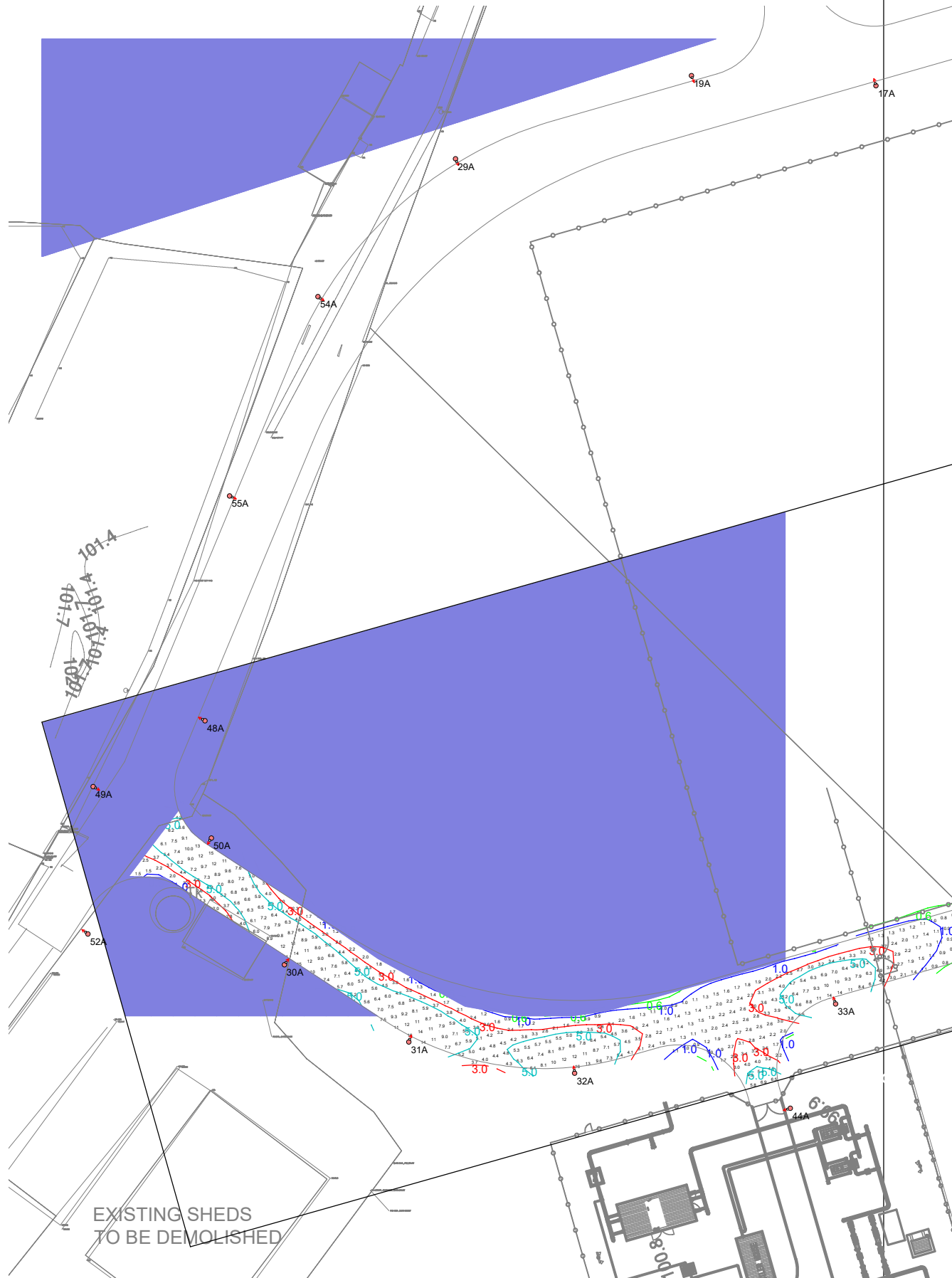


Results

Eav	3.57
Emin	0.61
E _{max}	15.35
E _{min} /E _{max}	0.04
E _{min} /E _{av}	0.17

Horizontal Illuminance (lux)

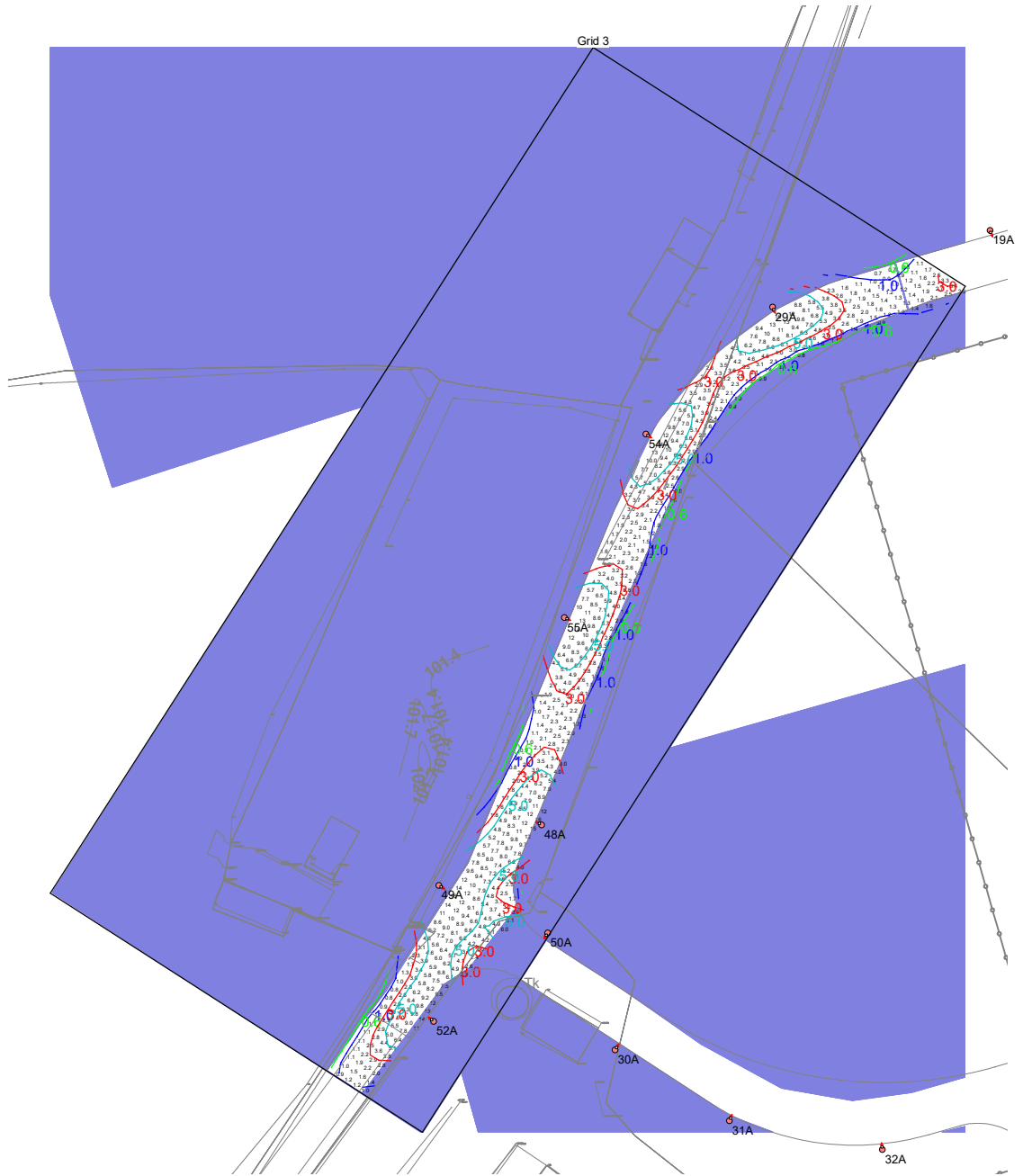
Grid 2



EXISTING SHEDS
TO BE DEMOLISHED

Horizontal Illuminance (lux)

Grid 3



Results

Eav	4.59
Emin	0.64
Emax	15.96
Emin/Emax	0.04
Emin/Eav	0.14

Horizontal Illuminance (lux)

Grid 16

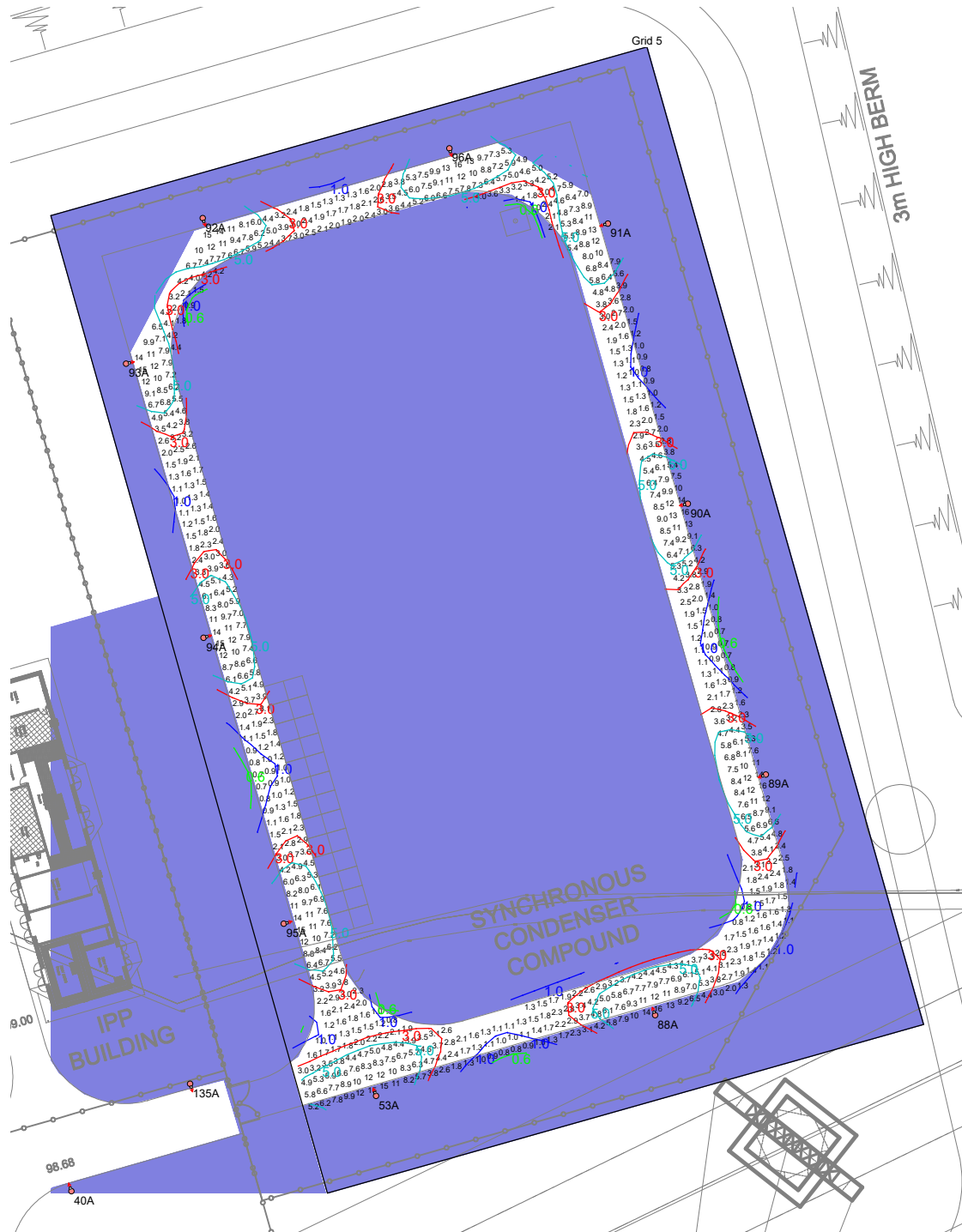


Results

Eav	5.70
Emin	1.16
E _{max}	14.14
E _{min} /E _{max}	0.08
E _{min} /E _{av}	0.20

Horizontal Illuminance (lux)

Grid 5

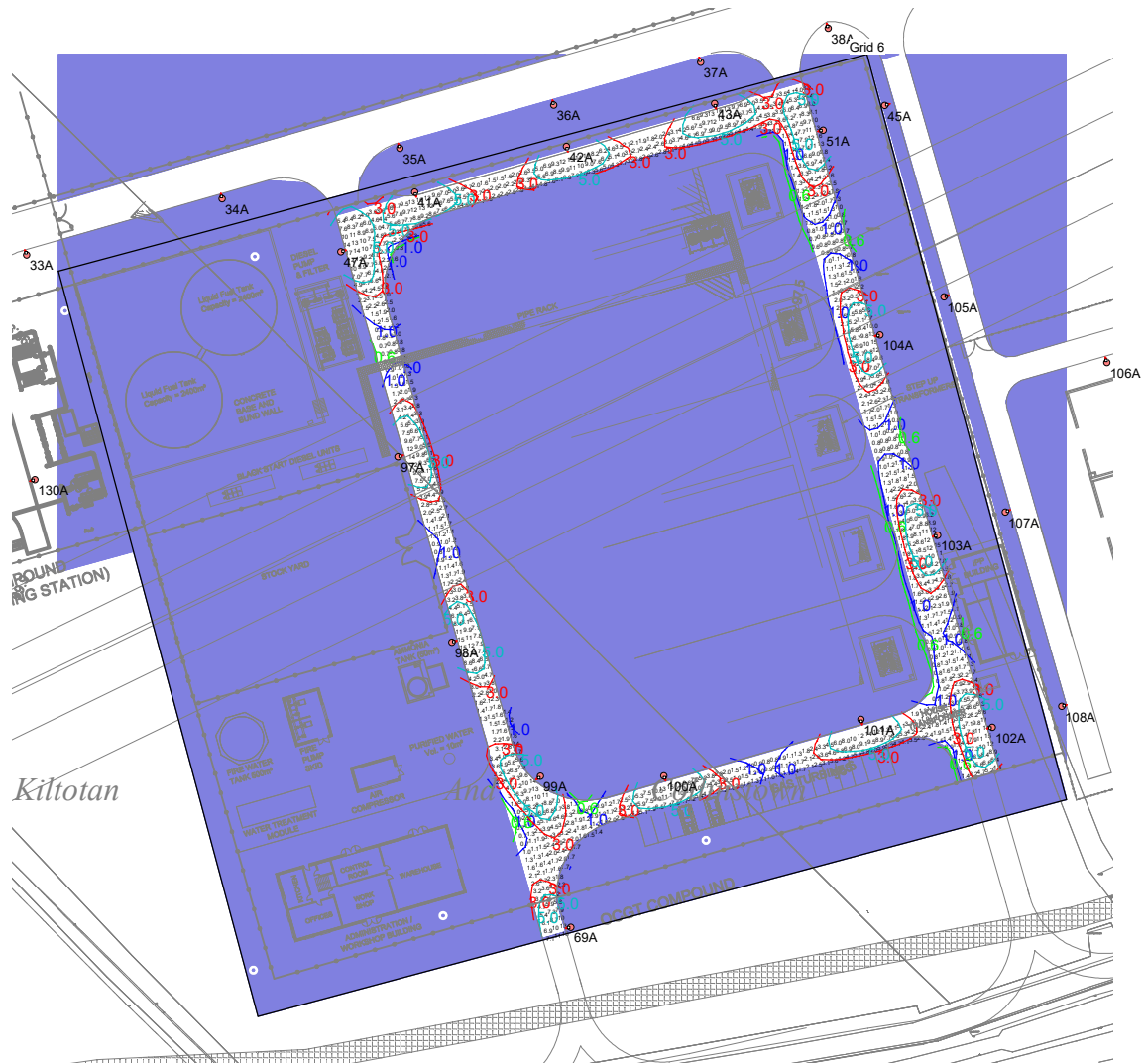


Results

Eav	4.66
Emin	0.67
Emax	15.85
Emin/Emax	0.04
Emin/Eav	0.14

Horizontal Illuminance (lux)

Grid 6



Results

Eav	4.35
Emin	0.64
Emax	16.90
Emin/Emax	0.04
Emin/Eav	0.15

Horizontal Illuminance (lux)

Grid 7

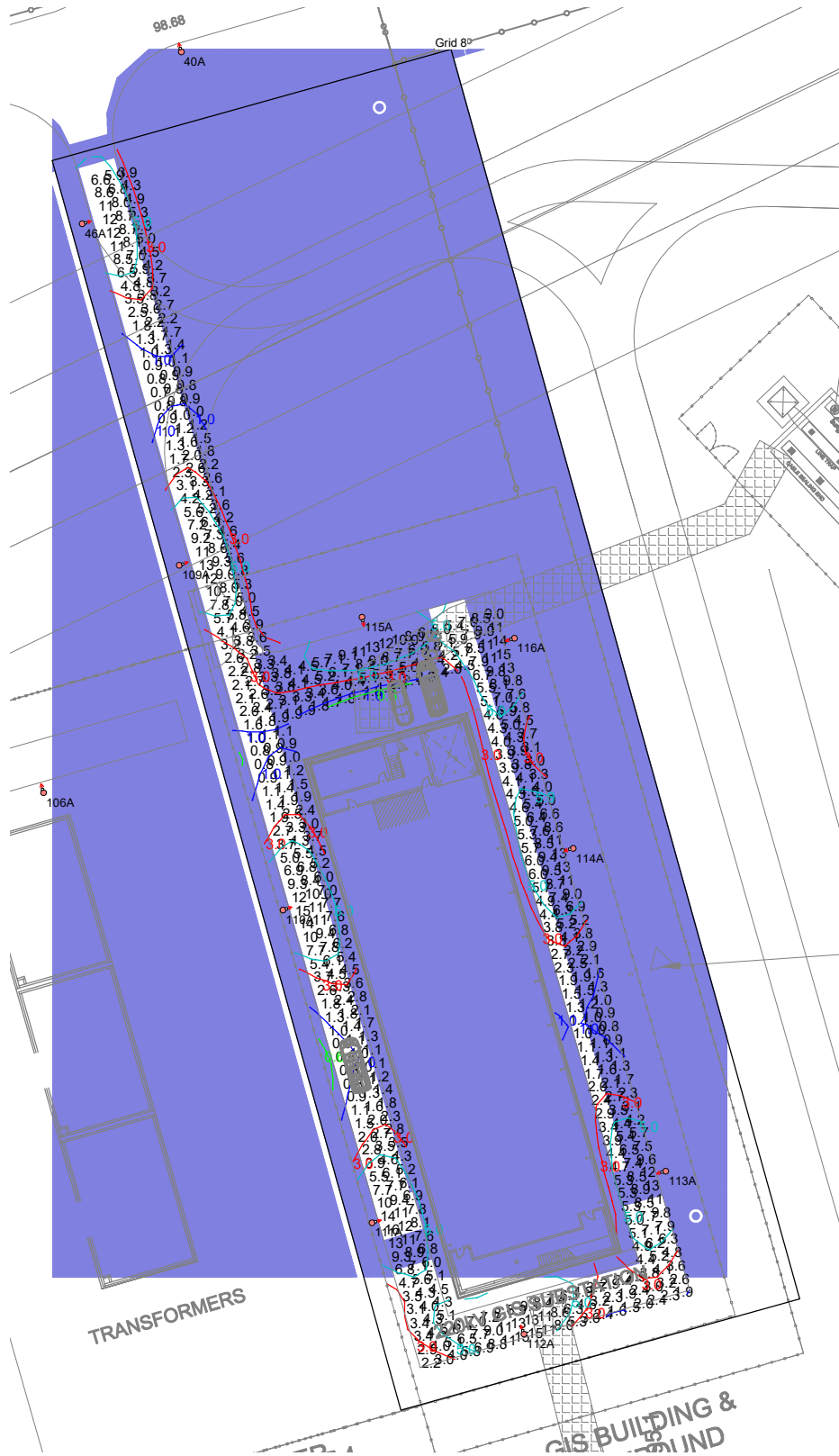


Results

Eav	4.15
Emin	0.65
Emax	14.65
Emin/Emax	0.04
Emin/Eav	0.16

Horizontal Illuminance (lux)

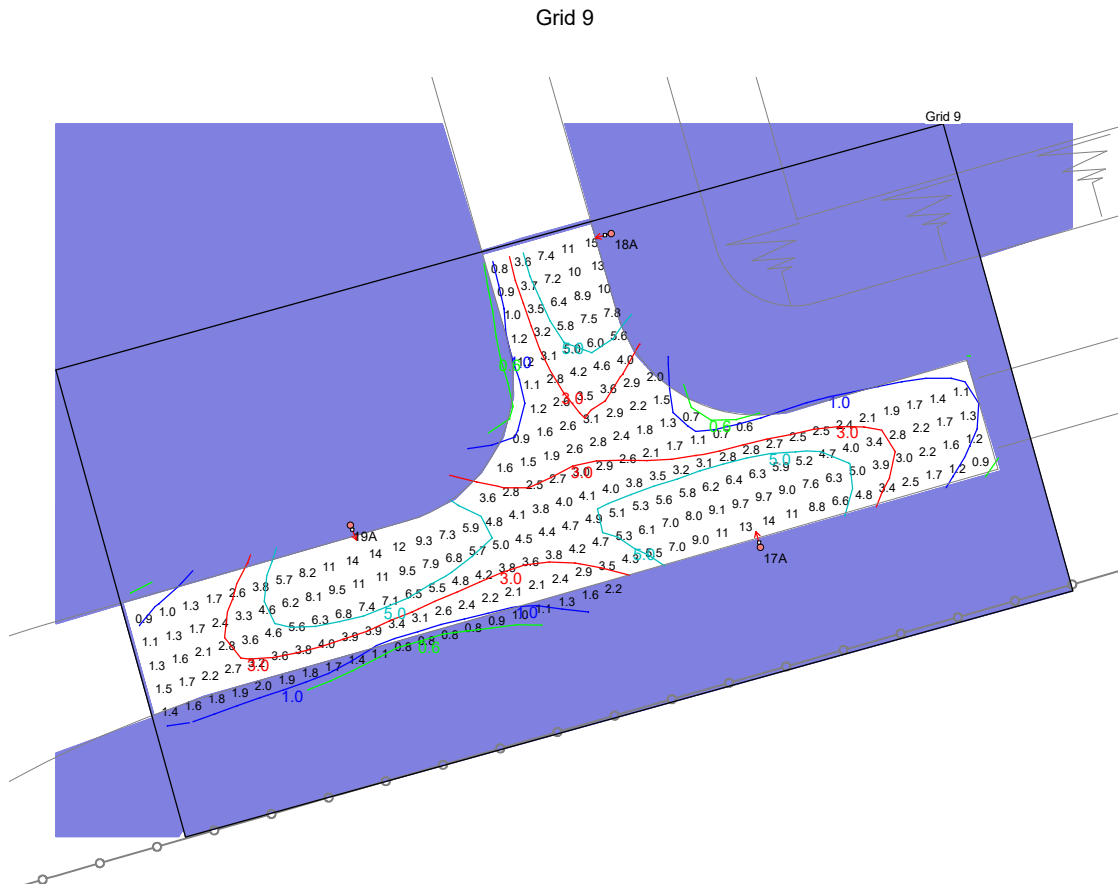
Grid 8



Results

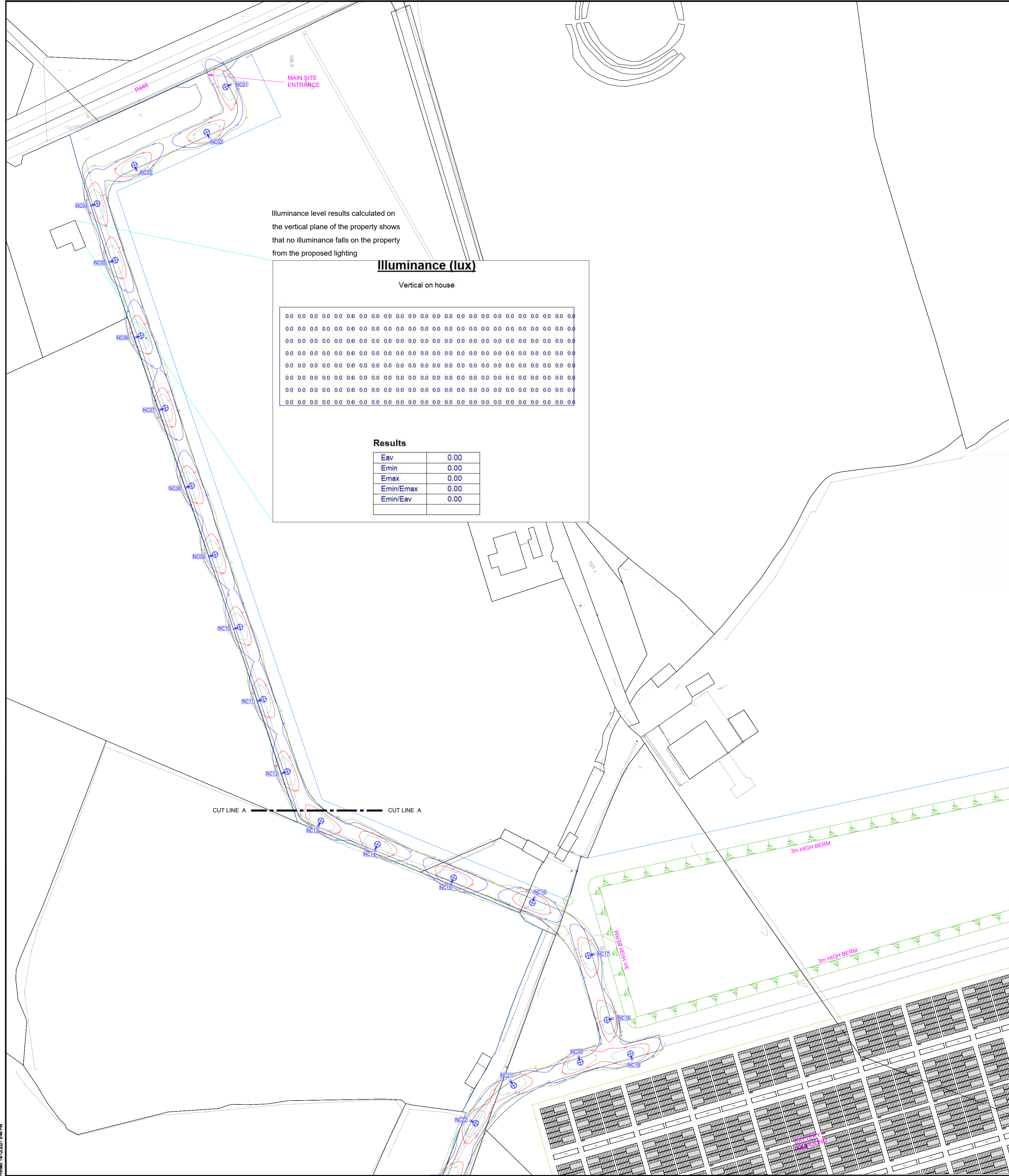
Eav	0.00
Emin	0.00
Emax	0.00
Emin/Emax	0.00
E _{avg}	13

Horizontal Illuminance (lux)



Results

Eav	4.22
Emin	0.61
Emax	15.10
Emin/Emax	0.04
Emin/Eav	0.14



1. LIGHTING DESIGN

Lighting Levels

Internal road lighting designed to the recommendations of BS5489-1:2020 and Lighting Class P5 for roads. This is based on a safe movement of traffic level for motorized and pedestrians in an Environmental Zone 2 (sparsely inhabited rural areas), speed limit <30mph, quiet traffic flow, occasional vehicles which can be applied to the site roads.

Table A.5 — Lighting classes for subsidiary roads

Traffic flow	Lighting class		
	E1 to E4 ⁽¹⁾ Pedestrian and cyclists only	E1 to E2 ⁽²⁾ Speed limit v ≤ 30 mph	E3 to E4 ⁽³⁾ Speed limit v ≤ 30 mph
Busy ⁽⁵⁾	P5	P4	P3
Normal ⁽⁵⁾	P5	P5	P4
Quiet ⁽⁵⁾	P6	P5	P4

Table 3 — P lighting classes

Class	Horizontal illuminance		Additional requirement if facial recognition is necessary	
	E _a [*] [minimum maintained] lx	E _{min} [maintained] lx	E _{v, min} [maintained] lx	E _{v, min} [maintained] lx
P1	15,0	3,00	5,0	5,0
P2	10,0	2,00	3,0	2,0
P3	7,50	1,50	2,5	1,5
P4	5,00	1,00	1,5	1,0
P5	3,00	0,60	1,0	0,6
P6	2,00	0,40	0,6	0,2

Lighting calculations have been produced for the compound using the industry recognized Lighting Reality (Version 2.1). The lux level targets should be read in conjunction with the results in "3.RESULTS".

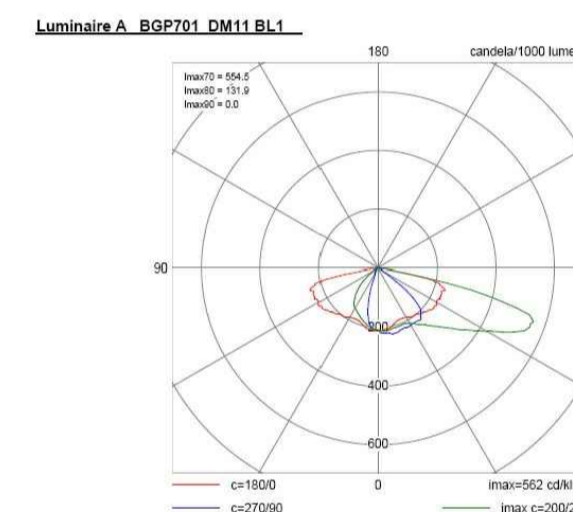
2. LUMINAIRE

Lighting Arrangement

Lighting columns are arranged to achieve the required minimum lighting levels while avoiding excessive light spill onto the site perimeter. These lighting columns are installed with luminaires mounted at 8m, with factory fitted rear shields, a 0° tilt angle and a G2 rating. (This is a rating (G1 - G6) of the control of obtrusive light and upward light output with G6 being the highest.)



The Philips Lighting luminaire range - Philips Luma Gen2 Nano - has been selected to provide the lighting. Philips are a reputable and approved manufacturer which have lighting units installed on Northern Ireland's road networks and many exterior lighting applications. Polar diagram, right, for the G2 rated luminaire right shows the light distribution.



3. RESULTS

Illuminance results are provided in a separate accompanying lighting calculation report. The site area is broken down into a number of grids to cover the site area. The results show that a light spill is limited to within a few metres behind the lighting column with the use of a low 5m mounting height, 0° tilt, integral back shields and have been proposed with integral factory fitted back shields to maximize the optical control and minimize the spill light beyond the compound perimeter. A warmer 3000K colour temperature LED light source has been selected as opposed to a typical 4000K neutral white light as the warmer colour temperature has a less detrimental effect on flying insects and bats.

Illuminance levels have been exported as lux level contours and overlaid on the site layout.

NOTES:

The electricity storage facility will not be a manned facility. It is anticipated that personnel will only be on site for planned maintenance which would be expected to be carried out in daylight hours.

The chosen lighting level has been selected from the BS5489-1:2020 to provide safe movement of both personnel and vehicular traffic where the risk level is low and with only occasional vehicles.

Additional lighting mitigation measures could be applied such as photocell control to switch lights on and off at dusk and dawn and timed off and on at preset times such as the example below:

- Dusk - 22:00hrs - ON
- 22:00 - 06:00hrs - OFF
- 06:00 - Dawn - ON

It is anticipated the buildings within the facility will have perimeter wall-mounted lighting installed which should select fittings with downward optical lighting control. For maintenance purposes portable lighting would be recommended to be carried by the maintenance personnel to provide localized lighting where required which further reduces the amount of permanent site lighting required.

The contour Lux plots show that the light levels will be considerably below the maximum allowed levels as described in the ILP "Guidance notes for the reduction of obtrusive light" Table 3 shown below. Additional guidance has been taken from the Institution of Lighting Professionals (ILP) guidance documents "Bats and Lighting in the UK" and "Dark Sky Ireland - Policy Document"

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E _v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

CONSTRUCTION DESIGN RISKS AND RESIDUAL ENVIRONMENTAL RISKS	

- Do not scale from this drawing.
- Site verify all dimensions prior to construction
- Report all discrepancies to the Drawing Originator immediately
- This drawing is to be read in conjunction with all relevant documents and drawings

Notes:

- 80 Luminaire as Philips Luma Gen2 Nano BGP701, 2.2km 10LED 11W DM11 BL1 3000K Warm White CLO post top mounted luminaire complete with factory-fitted rear shields at 0° tilt on 5m standard galvanized steel planted lighting columns.
- 5.0 5.0Lux Contour Line -
- 3.0 3.0Lux Contour Line - Target average illuminance required
- 1.0 1.0Lux Contour Line - typical maximum allowed at perimeter
- 0.6 0.6Lux Contour Line - Target minimum illuminance required

LUX RATING CHART

Condition	Light Level (LUX)	Foot Candles (FC)
Sunlight	107,527	10,000
Daylight	10,752.70	1,000
Overcast Day	1,075.30	100
Very Dark Day	107.53	10
Twilight	10.75	1
Deep Twilight	1.08	0.1
Full Moon	0.108	0.01
Quarter Moon	0.0108	0.001
Starlight	0.0011	0.0001
Overcast Night	0.0001	0.00001

Rev	Date	Description	Drn	Chkd
R0	14/12/2021	FIRST ISSUE	WDK	WDK



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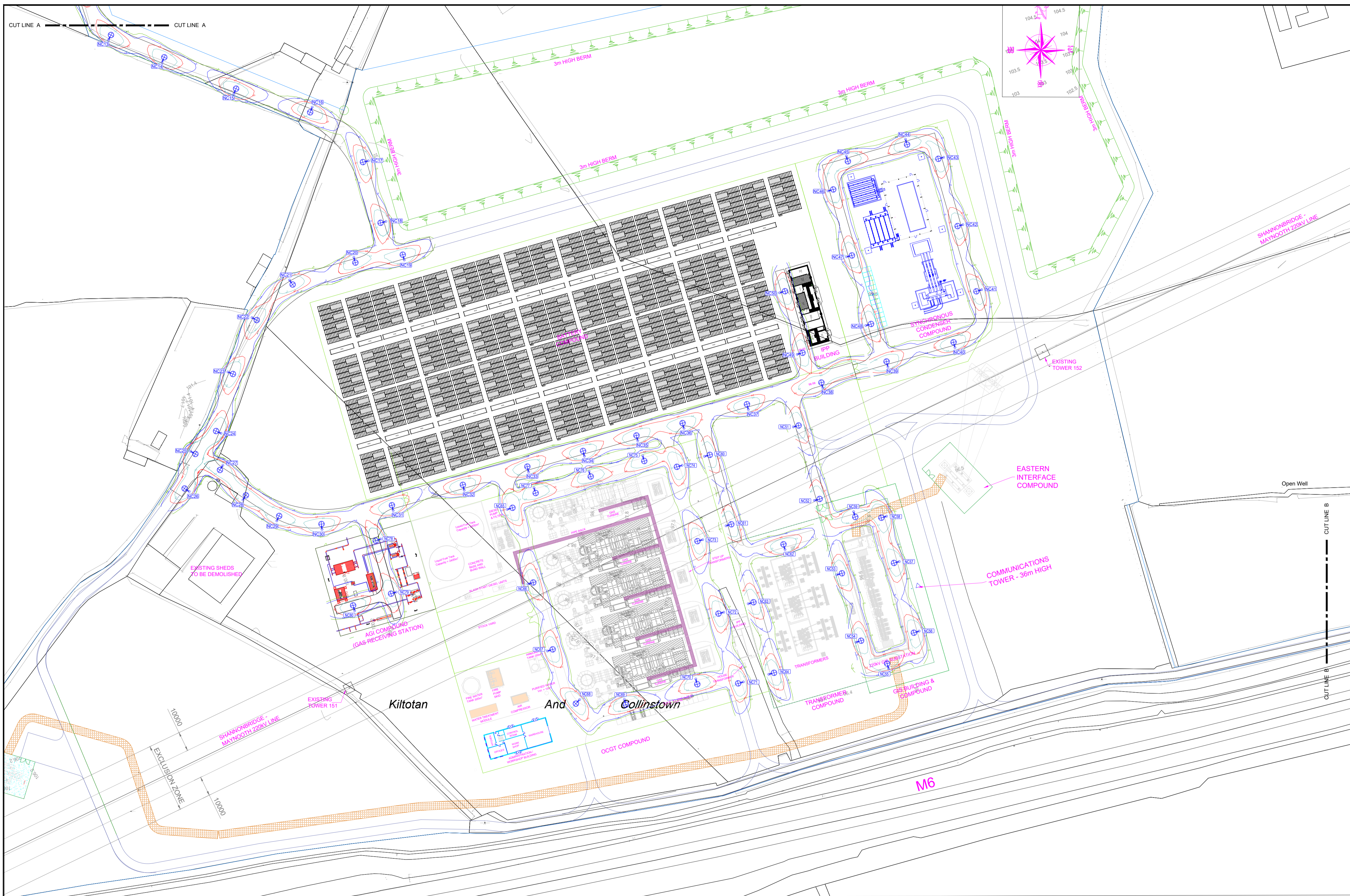
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PRELIMINARY

Project Name			
LEL Castlelost Energy Storage Facility			
Drawn by	Drawn Date	Checked by	Checked Date
WDK	10 DEC 2021	WDK	10 DEC 2021
Approved by	Approved Date	Scale	
		1:1000	

EXTERNAL LIGHTING LAYOUT WITH LUX LEVEL CONTOURS SHEET 1 OF 2

Drawing Number	Revision
DAR21005/001	R0



CDM RESIDUAL DESIGN RISKS AND RESIDUAL ENVIRONMENTAL RISKS

In accordance with the Construction Design Management Regulations 2015, Daramack Lighting Consultancy has undertaken a design risk assessment for the elements of work shown on this drawing. The above are some but not all the residual risks identified in the risk assessment. For a comprehensive list refer to the design risk assessment.

- Do not scale from this drawing.
- Site verify all dimensions prior to construction
- Report all discrepancies to the Drawing Originator immediately
- This drawing is to be read in conjunction with all relevant documents and drawings

- Notes:
- 80 Luminaire as Philips Luma Gen2 Nano BGP701, 2.2km 10LED 11W DM11 BL1 3000K Warm White CLO post top mounted luminaire complete with factory-fitted rear shields at 0° tilt on 5m standard galvanized steel planted lighting columns.
 - 5.0 5.0Lux Contour Line -
 - 3.0 3.0Lux Contour Line - Target average illuminance required
 - 1.0 1.0Lux Contour Line - typical maximum allowed at perimeter
 - 0.6 0.6Lux Contour Line - Target minimum illuminance required

LUX RATING CHART

Condition	Light Level (LUX)	Foot Candles (FC)
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Daylight	10,752.70	1,000
Overcast Day	1,075.30	100
Very Dark Day	107.53	10
Twilight	10.75	1
Deep Twilight	1.08	0.1
Full Moon	0.108	0.01
Quarter Moon	0.0108	0.001
Starlight	0.0011	0.0001
Overcast Night	0.0001	0.00001

Rev	Date	Description	Dn	Chkd
RO	14/12/2021	FIRST ISSUE		WDK/WDK

Revisions



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Drawing Status
PRELIMINARY

Project Name
LEL Castlelost Energy Storage Facility

Drawn by WDK	Drawn Date 10 DEC 2021	Checked by WDK	Checked Date 10 DEC 2021
Approved by	Approved Date	Scale 1:1000	

Title
Original drawing sheet is A1

EXTERNAL LIGHTING LAYOUT WITH LUX LEVEL CONTOURS SHEET 2 OF 2

Drawing Number DAR21005/001	Revision RO
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