16. Lighting

Appendix 16.1

LIGHTING ASSESSMENT TECHNICAL & FIGURES

Everton Stadium Development Ltd

The People's Project, Merseyside

Lighting Assessment

August 2020

Tel: 0116 234 8000
Email: nathan.allen@wyg.com

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Prepared by:	Nathan Allen *Senior Environmental Consultant*	Initialled:	NA

Contributor:	Matthew Smith *Senior Environmental Consultant*	Initialled:	MCS

Verified by:	Nigel Mann *Director*	Initialled:	NM

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Contents Page

Figures

Appendices

Appendix A – Ecological Results

Appendix B – Proposed Floodlighting Products

Appendix C – Façade Lighting Products

Appendix D – Bowl Lighting Products

Appendix E – Buro Happold Lighting Presentation Detailing Lighting Design Strategy

Appendix F – Report Terms and Conditions

1.0 Introduction

WYG Environment Planning Transport (WYG) have been commissioned by Everton Stadium Development Ltd (hereafter 'Everton') to prepare an updated lighting assessment in support of a revised planning application for the development of a 52,888-seat capacity stadium with associated facilities and infrastructure at Bramley-Moore Dock, Liverpool. A planning application (LPA ref. 20F/0001) was originally submitted in December 2019 and has been subject to statutory consultation. This issue of report has been updated following changes to the lighting layout, detailed in Section 1.1 below.

A detailed description of development is provided in the wider planning application submission (Planning Statement, Environmental Statement etc.). However, in summary, the application proposes:

- Demolition of non-listed structures; part-demolition of listed structures (Regent Road wall); remediation; infill of BMD; engineering works; and alterations to the dock walls to accommodate the development of the stadium (Use Class D2) with vehicle parking (external at grade).
- Creation of a new (non-navigable) water channel, vehicular and pedestrian accesses, and hard / soft landscaping (including lighting, public art and boundary treatments).
- Proposed change of use of the Grade II listed Hydraulic Tower structure to an exhibition/cultural centre (Use Class D1) (works to the tower to be subject to separate listed building consent submissions).

The stadium is proposed to be orientated north-south with public realm and circulatory space to the west beyond the new water channel and a large fan zone plaza to the east with some soft landscaping.

1.1 2020 Planning Submission Update

The following changes have been made to the submitted planning application scheme (LPA ref. 20F/0001):

- Removal of multi-storey carpark (MSCP) – redesign of western elevation to incorporate a new elevated stepped amenity area / public realm, with sheltered access / egress to the west stand turnstiles below;
- Removal of surface carpark PV canopy to the west of the water channel and its relocation on to the south stand of the stadium roof (to be structurally integrated with roof so not visible from street level);
- Relocation of Outside Broadcasting (OB) compound and sub-station to northern extent of west quay. As a result of relocation of OB compound and sub-station, surface carparking has been relocated to the south of the west quay;
- Roof optimisation – reduction in building height to below 45m height; and

- Internal stadium layout changes – relocation of plant areas and inclusion of battery storage areas.

In accordance with the methodology outlined in Chapter 2, ES Volume II, a Level 2 update has been undertaken for this assessment. This technical report relating to lighting has been reviewed against the following aspects and for each it has been confirmed that there are no amendments required to the content of this report:

- Baseline data validity: There have been no relevant changes to the baseline data, and the results of the lighting survey presented in Section 4.0 of the technical report remain valid;
- Legislation/policy revisions: There have been no related updates to legislation/policy that have affected either the methodology or findings of this assessment; and
- Amendments to construction methodology: The changes to the proposed construction methodology do not affect the findings of the lighting assessment.

However, limited technical assessment has been undertaken to confirm the validity of the previous conclusions due to the following:

- The relevance and scale of the proposed development amendments, including amendments to the operational lighting which has been updated following changes to the lighting design such as inclusion of a large glazed portal in the west stand façade and associated public realm changes following the omission of the MSCP proposed in the originally submitted scheme;
- Addition of new cumulative schemes; and
- Statutory consultee comments (A response to these comments is set out in section 3 of this report).

The relevant assessment information is presented within this appendix and this report has been revised to reflect these updates.

The sections that have been updated are detailed below:

- Section 5.0 – Lighting Design and Control
- Sub-section 5.1.1 – Public Realm and External Lighting
- Sub-section 5.1.2 – Bowl Lighting
- Section 6.0 – Quantified Effect of Proposed Lighting
- Sub-section 6.1.2 – Pre-Curfew Model Results
- Sub-section 6.1.3 – Post-Curfew Model Results

1.2 Site Location and Context

The application site currently consists of Bramley Moore Dock, the approximate national grid reference of which is SJ3345292491. The site is 8.67 hectares and is bounded to the north by the United Utilities waste water treatment plant and Sandon Half Tide Dock, to the east by Regent Road (beyond large Grade II listed wall) and to the west by the River Mersey wall.

To the south of the development is Nelson Dock which is subject to extant outline planning permission (LPA ref. 19NM/1121 as most recent variation of original permission ref. 10O/2424) for residential-led development as part of the wider 'Liverpool Waters' scheme. Refer to Figure 1 for a visual representation of the application site and surrounding area.

1.3 Lighting Design and Assessment - Overview

The proposed development will require the installation of a number of luminaires (internal and external to the proposed stadium) that have the potential to increase existing light levels at sensitive locations within the vicinity of the application site. including:

- Lighting of Public Realm to provide a safe and vibrant place within the city;
- Lighting within the seating areas of the stadium;
- Lighting of access roads and security areas;
- Architectural lighting;
- Floodlighting of the pitch using the lighting detailed in Appendix B;
- Lighting of the area surrounding the pitch to Sports Ground Safety Authority Standard (SGSA) Green Book Guidance;
- Lighting of broadcast areas.

The proposed lighting strategy for the scheme therefore has the potential to increase existing light levels at sensitive locations within the vicinity of the application site (including the future baseline of the Liverpool Waters planning permission which proposes residential development on the adjacent Nelson Dock).

The following stages have therefore been undertaken in order to produce a suitable lighting layout and assess potential impacts:

- Baseline survey;
- Modelling of an indicative lighting layout to meet recommended lighting levels for operational activity at the proposed development;

- Quantitative assessment of potential lighting impacts at existing and proposed light sensitive receptors bordering the proposed application site, based on the proposed external lighting design;
- Formulation of appropriate mitigation measures, where necessary, in order to minimise the potentially detrimental impacts of the proposed lighting scheme.

The results of the assessment are detailed in the following sections of this report.

2.0 Planning Policy, Legislation and Relevant Agencies

2.1 Documents Consulted

The following documents were consulted during the undertaking of this assessment:

- Guidance Notes for the Reduction of Obtrusive Light, The Institution of Lighting Professionals, 2020;
- Guidance Note 08/18 Bats and Artificial Lighting in the UK, The Institution of Lighting Professionals 2018;
- National Planning Policy Framework, Ministry of Housing, Communities & Local Government, February 2019;
- Planning Practice Guidance on Light Pollution, Ministry of Housing, Communities & Local Government, 1st November 2019;
- Environmental Protection Act, 1990;
- Statutory Nuisance from Insects and Artificial Light, Guidance on Sections 101 to 103 of the Clean Neighbourhoods and Environment Act 2005, DEFRA 2006;
- BS EN 12464-2: Lighting of Work Places - Outdoor Work Places, British Standards Institute, 2007;
- BS EN 13201-4: Road Lighting – Methods of Measuring Lighting Performance, 2003;
- BS 5489-1: Code of Practice for the Design of Outdoor Lighting - Lighting of Roads and Public Amenity Areas, British Standards Institute, 2013;
- PLG 04- Guidance on Undertaking Environmental Lighting Impact Assessments, ILP, 2013;
- Liverpool Unitary Development Plan (UDP) November 2002;
- Liverpool Maritime Mercantile City World Heritage Site Supplementary Planning Document (SPD) (2009);
- Liverpool Local Plan 2012-2033, May 2018; and,
- Sports Grounds Safety Authority Green Guide 2018.

2.2 Legislative Framework

Light pollution was introduced within the Clean Neighbourhoods and Environment Act (2005) as a form of

statutory nuisance under the Environmental Protection Act (1990), which was amended to include the following nuisance definition:

"(fb) artificial light emitted from premises so as to be prejudicial to health or nuisance;"

Although light was described as a statutory nuisance, no prescriptive limits or rules have been set for assessment. Guidance within the National Planning Policy Guidance with regards to Light pollution has been referred to while producing this assessment as well as documents produced by the International Commission on Illumination (CIE), Institute of Lighting Professionals (ILP) and the Chartered Institute of Building Services Engineers (CIBSE).

2.3 Design Standards

2.3.1 National Standards

The appropriate lighting design criteria for the scheme are contained within:

- BS EN 12464-2: Lighting of Work Places - Outdoor Work Places, 2014;
- BS 5489-1: Code of Practice for the Design of Outdoor Lighting - Lighting of Roads and Public Amenity Areas, 2013; and,
- BS EN 13201-2: Road Lighting - Performance Requirements, 2003.
- Sports Grounds Safety Authority Green Guide 2018

Good lighting design also includes luminaires that have been selected to minimise light intrusion and glare to pedestrians and drivers, as discussed within the ILP document "Guidance Notes for the Reduction of Obtrusive Light".

2.4 Planning Policy and Guidance

Section 38(6) of the Planning and Compulsory Purchase Act 2004 and Section 70(2) of the Town & Country Planning Act 1990 requires planning applications should be determined in accordance with the statutory development plan, unless material considerations indicate otherwise. The statutory development plan for the City of Liverpool currently comprises the Unitary Development Plan (adopted 2002).

The statutory development plan policies relevant to the application proposal are summarised below. The following policies and guidance are material considerations which also inform the assessment:

- National Planning Policy Framework (February 2019);
- Planning Practice Guidance (November 2019);

- Liverpool Local Plan (Submission Draft, May 2018); and
- Supplementary Planning Documents.

2.4.1 Unitary Development Plan

Following a review of the Liverpool Unitary Development Plan (adopted 2002), the following policies were identified as being relevant to potential light impacts associated with the proposed scheme:

Policy HD20 (Crime Prevention)

The City Council will encourage developers, in the design and layout of new developments, to incorporate measures which reflect the need to make proper provision for personal safety and crime prevention, paying attention to;

- *increase the overlooking of public areas*
- *incorporate the use of hard and soft landscaping arrangements in ways which do not create hiding places;*
- *the design and relationship of car parking, particularly its lighting and visibility, from buildings;*
- *the design and location of entrances and pedestrian circulation within and out of the site; and*
- *making a clear distinction between public and private space and providing 'defensible space'.*

Policy HD28 (Light Spillage)

The City Council will require developers to take account of the following principles in schemes where external lighting is required

i) the lighting scheme proposed is the minimum required for security and working purposes to undertake the task, and

ii) light spillage and potential glare is minimised particularly to:

- *residential and commercial areas;*
- *areas of wildlife interest; and*
- *areas whose open landscape qualities would be affected, particularly those open areas on the urban fringe.*

Policy T7 (Walking and Pedestrians)

The City Council will support measures to encourage walking and make the pedestrian environment safer by improving signing, lighting, surfaces and visibility. All major development and redevelopment sites should cater for pedestrians' needs in the design of all new highway improvement schemes, traffic management

schemes, the road maintenance programme, and giving consideration to the provision of safe and convenient walking routes.

2.4.2 National Policy – (NPPF & PPG)

The National Planning Policy Framework (NPPF), February 2019 principally brings together and summarises the suite of Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) which previously guided planning policy making. The NPPF broadly retains the principles of PPS 23: Planning and Pollution Control and with regard to light pollution, paragraph 180 states that;

"*180 Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

> *c. limits the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

The National Planning Practice Guidance web-based resource was launched by the Department for Communities and Local Government (DCLG) on 6 March 2014 to support the National Planning Policy Framework and make it more accessible. It was updated on November 1st, 2019. The below extract is considered relevant for this application:

The following questions indicate matters that may need to be considered in relation to managing the effects of light pollution:

- *Does an existing lighting installation make the proposed location for a development unsuitable, or suitable only with appropriate mitigation? For example, this might be because:*
    - *the artificial light has a significant effect on the locality; and/or*
    - *users of the proposed development (e.g. a hospital) may be particularly sensitive to light intrusion from the existing light source.*
    - *Where necessary, development proposed in the vicinity of existing activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme, reflecting the agent of change principle. Additional guidance on applying this principle is set out in the planning practice guidance on noise.*
- *Will a new development, or a proposed change to an existing site, be likely to materially alter light levels in the environment around the site and/or have the potential to adversely affect the use or*

enjoyment of nearby buildings or open spaces?

- *Will the impact of new lighting conflict with the needs of specialist facilities requiring low levels of surrounding light (such as observatories, airports and general aviation facilities)? Impacts on other activities that rely on low levels of light such as astronomy may also be a consideration but will need to be considered in terms of both their severity and alongside the wider benefits of the development.*
- *Is the development in or near a protected area of dark sky or an intrinsically dark landscape where new lighting would be conspicuously out of keeping with local nocturnal light levels, making it desirable to minimise or avoid new lighting?*
- *Would new lighting have any safety impacts, for example in creating a hazard for road users?*
- *Is a proposal likely to have a significant impact on a protected site or species? This could be a particular concern where forms of artificial light with a potentially high impact on wildlife and ecosystems (e.g. white or ultraviolet light) are being proposed close to protected sites, sensitive wildlife receptors or areas, including where the light is likely to shine on water where bats feed.*
- *Does the proposed development include smooth, reflective building materials, including large horizontal expanses of glass, particularly near water bodies? (As it may change natural light, creating polarised light pollution that can affect wildlife behaviour.)*

If the answer to any of the above questions is 'yes', local planning authorities and applicants should think about:

- *where the light shines;*
- *when the light shines;*
- *how much light shines; and*
- *possible ecological impacts.*

2.4.3 Liverpool Local Plan May 2018

Following a review of the Liverpool Local Plan 2012-2033 Pre-submission draft May 2018, the following policies were identified as being relevant to potential light impacts associated with the proposed scheme:

Draft Policy STP2. Sustainable Growth Principles and Managing Environmental Impacts)

States that "new development should seek to avoid negative impacts on the environment through adoption of best practice. Where a negative effect is identified this should be mitigated by appropriate measures. Specifically, to ensure the sustainable growth of the City, new development should:

i) Deliver high quality contextual design which helps to reinforce the distinct character and identity of the various parts of the City; and results in the efficient use of resources generally including materials, water and energy; reduces carbon emissions and thus contributes to achieving zero carbon buildings; promotes opportunities for physical activity; and minimises waste, light and noise pollution."

Draft Policy CC10 (Waterfront Design Requirements)

states that "development on the Waterfront should be of a high-quality design that respects its sensitive historic surroundings, whilst making adequate provision for access, parking and servicing. Development proposals should:

Part m) Include appropriate street furniture, public art and feature lighting which enhances the waterfront."

Draft Policy CC11 (Recreational Use of Dock Water Spaces, Quaysides and the Waterfront)

will support "proposals which facilitate greater access and recreational / leisure use of dock water spaces and their quaysides and which contribute towards the creation of an inclusive and usable movement route along Liverpool's Waterfront, specifically:

c. feature lighting installations that assist in animating dock water spaces and adjacent quaysides"

Draft Policy R1 (Air, Light and Noise Pollution)

states that "development proposals which are likely to have a pollution impact should demonstrate that:

- *the impact of noise, vibration and lighting will not be significant."*

Draft Policy UD2 (Development Layout and Form)

"development proposals should demonstrate that the layout and form of the proposal ensures that:

o. There is sufficient sunlight and daylight to penetrate into and between buildings and ensure that adjoining land or properties are protected from unacceptable overshadowing."

Draft Policy UD3 (Public Realm)

states that "the design of public realm should demonstrate that:

k. Incorporates appropriate street lighting and signage."

3.0 Methodology

The Lighting Assessment includes the establishment of baseline ambient light conditions and an evaluation of impacts associated with the proposed lighting design. This includes an assessment of change in light obtrusion at existing receptor locations. The ecology assessment for this site has been undertaken in accordance with the guidelines set out in the Bats and Artificial Lighting in the UK Guidance Note 08/18.

Light modelling was undertaken using DIALux software, an independent lighting model which is capable of calculating daylight and artificial lighting scenes in interior and exterior scenarios. The model incorporates ILP, CIE 112 and BS EN 12464-2 calculation methodologies and is commonly used for lighting impact assessment.

3.1 Scenarios

For the purposes of this assessment, two operational scenarios have been considered:

- Event night; and,
- Non-event night.

Details of the different lighting associated with each scenario are contained in Section 5.

3.2 Scoping Assessment Stage

The lighting assessment methodology within the EIA scoping report was submitted to LCC and relevant parties in May 2017 with the scoping opinion provided in June 2017. The following comments relating to lighting were received.

"Air quality, noise and lighting assessments are proposed to inform the EIA. These assessments should consider impacts upon statutory designated nature conservation sites".

Both Historic England and Liverpool City Council were engaged at pre-application stage and consulted on the proposed lighting arrangements by Buro Happold.

3.3 Planning Application Consultation

Following submission of the previous lighting report (Dec 2019) with the original planning application (LPA ref. 20F/0001) the following comments regarding lighting were received from Dr Ian Rushforth, Senior Environmental Officer at Liverpool City Council:

"I have studied the details in respect of lighting for the site once it is operational, and I am satisfied that there will not be an adverse impact from light overspill affecting nearby residents."

Natural England also provided the following within its consultation response:

"*Lighting: We disagree that impacts associated with lighting are ruled out at this stage based on the limited evidence and justification provided here to support the conclusions made. Further consideration to measures to limit light spill to surrounding habitats is required. The visual disturbance of lighting at this site is likely to be considerably more than the baseline lighting on the site, we question how this will impact upon supporting habitat and SPA bird behaviours such as roosting and foraging."*

In response to this comment, further justification for this position is set out below.

In relation to the construction phase, the working hours at the application site are proposed to be 07:00-19:00 Monday-Friday and 07:00-13:00 on Saturdays. During the winter months there may be the need for some task lighting using temporary light fixings beyond standard working hours during specific small-scale/short timeframe works (i.e. power float finishing of concrete slabs). However, by keeping all lights onsite low level and angled into the application site (a measure that will be included within the CEMP in due course), it is not anticipated that construction lighting will affect any of the scoped in features of the designated site. Therefore, no disturbance to qualifying features as a result of construction lighting is anticipated during the construction phase of works.

The results of the assessment of potential lighting effects on ecological receptors during the operational phase of the scheme are set out Section 6 of this report. in the absence of any guidance regarding ecological receptors, impacts are considered potentially significant where predicted illuminance significantly exceeds 2 lux at ecological receptors in line with the ILP criteria. This assessment has determined that operational lighting will exceed 2 lux at only six of the 42 locations considered: at Nelson Dock to the south and at the entrance to Sandon Half-Tide Dock to the north of the application site.

No guidance is currently available regarding light levels which may cause disturbance to wintering birds such as the scoped in qualifying features of the relevant designated sites. However, "The Impact of artificial Light on waterfowl behaviour" (BTO 1990) (document provided by MEAS), indicates that water birds that forage within estuarine habitats may benefit from artificial lighting as this has the potential to increase foraging time.

Given that the event day scenario is only expected to occur fewer than 32 times a year including football matches (depending on Everton's progress in Domestic and European cup competitions – not all games in the evening) and concerts, the overall impact of lighting on ecological receptors from event day lighting is not considered significant. In addition, non-event day lighting along the western, southern and northern boundary levels will not exceed ILP criteria of 2 lux except for the entrance to Sandon Half-Tide Dock, the

results do show that the locations surrounding this area and further back into the dock (beyond 5m from this location) will be below 2 lux.

Such lighting is therefore considered unlikely to cause displacement or disturbance to the scoped in features of the designated sites. Furthermore, such lighting effects have the potential to enhance foraging/hunting success and therefore benefit notifiable features in accordance with the above BTO study.

It is therefore unlikely that the operational phase of the proposed development will adversely affect the conservation status of the scoped in qualifying features of the designated sites as a result of lighting on site.

Therefore, significant adverse effects on these designated sites as a result of this impact pathway are not anticipated.

3.4 Lighting Assessment Criteria

3.4.1 Obtrusive Light

Baseline light conditions were determined during a site survey of the application site and surrounding area. A lighting model was subsequently developed to represent the proposed external lighting scheme and to enable the obtrusive light from the proposed development to be calculated at local receptors.

The ILP has developed an Environmental Zone classification system for the categorisation of sensitive receptor locations based on typical levels of baseline obtrusive light. This is summarised in Table 3.1.

Table 3.1 Environmental Zone Classification

Category	Description	Examples
E0	Dark landscapes	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Intrinsically dark landscapes	National Parks, Areas of Outstanding National Beauty, etc
E2	Low district brightness areas	Village or relatively dark outer suburban urban locations
E3	Medium district brightness	Small town centres or suburban locations
E4	High district brightness areas	Town/city centres with high levels of night-time activity

For each Environmental Zone, recommended obtrusive light limits for exterior lighting installations have also been determined. These are summarised in Table 3.2.

Table 3.2 Obtrusive Light Limitations for Exterior Lighting Installations

Environmental Zone	Max Sky Glow ULR[a] (%)	Light Trespass (into Windows) Ev (lx)[b]		Source Intensity I (kcd)		Building Luminance Pre-curfew
		Pre-curfew[d]	Post-curfew[e]	Pre-curfew[d]	Post-curfew[e]	Average L[c] (Cd.m^{-2})
E0	0	0	0	0	0	0
E1	0	2	1[*]	2.5	0	0
E2	2.5	5	1	7.5	0.5	5
E3	5.0	10	2	10	1.0	10
E4	15.0	25	5	25	2.5	25

NOTE: (a) Upward light ratio (ULR) of the installation - maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.

(b) Vertical Illuminance measured flat at the glazing at the centre of the window.

(c) Luminance.

(d) Typically considered to be between 07:00 and 23:00

(e) Typically considered to be between 23:00 and 07:00

(*) Permitted only from public road light installations

The assessment determined the lighting levels and Environmental Zone classification in the vicinity of the proposed development through the baseline survey. Modelling of the lighting scheme was undertaken and predicted obtrusive light values compared with the relevant guidelines, as detailed within Table 3.2

The potential environmental effects of the proposed development are identified, having regard to submitted suite of planning and landscape drawings.

3.4.2 Significance Criteria

The significance criteria is presented below.

Table 3.3 Significance Criteria

Receptor	Significant	Not Significant
Residential	Development results in Lux levels above the relevant ILP Environmental Zone Criteria OR If already above Environmental Zone Criteria, an increase of more than 10%	Development results in Lux levels below relevant ILP Environmental Zone criteria.
Building Illumination	Development results in Luminance levels (cd/m^2) above the relevant ILP Environmental Zone Criteria at building facades	Development results in Luminance levels (cd/m^2) below the relevant ILP Environmental Zone Criteria at building facades
Ecological	Development results in Lux levels above 1 lux at sensitive ecological receptors (sensitivity to be determined through consultation with ecologist)	Development results in Lux levels below1 lux at sensitive ecological receptors (sensitivity to be determined through consultation with ecologist)
Dark Sky	Development results in Max Sky Glow ULR above that required in the ILP Environmental Zone Criteria	Development results in Max Sky Glow ULR below that required in the ILP Environmental Zone Criteria

4.0 Baseline

This section provides a review of the existing lighting levels at the site in order to provide a benchmark against which to assess potential impacts associated with the proposed development at Bramley Moore Dock.

4.1 Baseline Survey

4.1.1 Survey Conditions

A baseline lighting survey was undertaken on the 30th April 2018. An initial survey was undertaken between 23:45 hours and 00:45 hours to establish the existing post-curfew (23:00-07:00) lighting conditions.

The survey was conducted using a Digital Lux Meter which meets CIE photopic spectral response, with a maximum resolution of 0.01 lux. The survey was undertaken with a meter resolution of 0.01 lux.

4.1.2 Existing Light Sources

Existing light sources surrounding the application site are predominantly street lighting. Lighting was noted across Regent Road, (east of the application site boundary), the A5054 Blackstone Street and Water Street also containing their own street lighting. Lighting from the industrial units and wider port operations to the north was noticeable. There are also lighting sources noted within Bramley Moore Dock from boats and floodlighting on the northern façade of the container building on site.

4.1.3 Survey Locations

Light monitoring was undertaken at a number of survey locations to determine variations in baseline light levels within the site. Reference should be made to Figure 2 for an illustrative site map of the monitoring locations.

The purpose of the survey is fourfold:

- The survey enables quantified light levels at (or as near as possible to) local sensitive receptor locations to be measured;
- The site survey also provides an understanding of any significant landforms and vegetation that can potentially provide a pathway screen between light sources and receptors;
- The survey enables the ILP environmental zone to be determined based on sound, quantified evidence; and,
- The survey enables existing significant sources of artificial light and natural screens to be accounted for outside of the quantified model predictions.

The survey therefore provides a robust understanding of the current artificial lighting illuminance levels currently experienced at the application site. The locations of all the light monitoring locations and the results from the survey are summarised in Table 4.1.

A series of measurements were taken at key points; a horizontal ground level measurement and four vertical measurements at 1.5m facing north, east, south and west in general accordance with the recommended monitoring method in the statutory guidance issued by the ILP. Illuminance levels at a resolution of 0.01 lux can vary quite significantly over relatively small distances and even with slight changes in the plane of the lens. Therefore, the range of measurements taken over a monitoring length was recorded, in order to determine minimum and maximum illuminance at receptor façades.

The southern section of Nelson Dock has been assessed within the modelling section of the report. For the purposes of the assessment, a worse case assumption of lighting levels of 0 lux in the baseline has been used for this area.

Table 4.1 Baseline Light Monitoring Locations

Reference	Monitoring Location	Key Local Sources of Light
L1	West quayside of the Bramley Moore Dock	Dock lights
L2	West quayside of the Bramley Moore Dock	
L3	West quayside of the Bramley Moore Dock	
L4	West quayside of the Bramley Moore Dock	
L5	West quayside of the Bramley Moore Dock	
L6	Centre of southern quayside of Bramley Moore Dock	
L7	Centre of southern quayside of Bramley Moore Dock	
L8	Centre of southern quayside of Bramley Moore Dock	
L9	Northeast of the Bramley Moore Dock on Regent Road. Most Northerly location.	Streetlights
L10	Northeast of the Bramley Moore Dock on Regent Road. South of L9.	
L11	East of the Bramley Moore Dock on the adjoining A5054 Blackstone Street to Regent Road. South of L10.	
L12	East of the Bramley Moore Dock on the adjoining A5054 Blackstone Street to Regent Road. East of L11. Most Easterly	

Reference	Monitoring Location	Key Local Sources of Light
	location.	
L13	East of the Bramley Moore Dock on Regent Road. South of L11.	
L14	East of the Bramley Moore Dock on Regent Road. South of L13.	
L15	Southeast of the Bramley Moore Dock on the intersection of Regent Road and Walter Street. South of L14.	
L16	Southeast of the Bramley Moore Dock on Walter Street. East of L15.	
L17	Southeast of the Bramley Moore Dock on Regent Road. South of L15.	

4.1.4 Survey Results

The results of the monitoring are displayed in Table 4.2.

Table 4.2 Baseline Light Monitoring Locations

Reference	Recorded Illuminance (Lux)				
	Facing Up	Facing North	Facing East	Facing South	Facing West
L1	0.38	0.17	0.65	0.22	0.06
L2	0.35	0.15	0.60	0.25	0.08
L3	0.15	0.18	0.31	0.23	0.05
L4	0.08	0.19	0.15	0.23	0.10
L5	0.13	0.12	0.16	0.25	0.08
L6	0.10	0.04	0.15	0.23	0.05
L7	0.10	0.04	0.15	0.26	0.07
L8	0.10	0.05	0.22	0.26	0.05
L9	0.13	0.12	0.15	0.28	0.17
L10	5.15	3.87	2.33	7.97	2.08
L11	8.86	5.88	3.41	10.64	6.84
L12	4.08	5.53	4.12	8.45	9.69
L13a (Floodlights in yard on)	6.34	5.38	5.62	5.64	6.19
L13b (Floodlights in yard off)	3.01	4.59	1.02	5.28	6.15
L14	1.09	1.75	0.21	1.52	2.32
L15	11.14	8.42	3.25	15.86	6.09

Reference	Recorded Illuminance (Lux)				
	Facing Up	Facing North	Facing East	Facing South	Facing West
L16	0.31	0.12	0.76	0.87	0.49
L17	2.79	3.44	0.73	4.82	4.31

Following the environmental lighting survey, it was concluded that the application site is in an industrial location with relatively high levels of light, therefore, the proposed application site should be classified as 'Environmental Zone E3 – Medium district brightness area, in accordance with the ILP guidance limits outlined within Table 3.2. Therefore, the worst case permitted light trespass limit at an offsite receptor in the pre-curfew period (typically considered to be 07:00-23:00) is 10 lux and in the post curfew period (typically considered to be 23:00-07:00) is 2 lux.

4.2 Future Baseline

4.2.1 Liverpool Waters Planning Permission 10O/2424

Peel Land & Property secured outline planning permission in 2013 for a mixed-use development comprising a maximum of 1,690,000m² of mixed-use development including 9,000 dwellings and 310,000m² of office space (figures rounded). The site stretches from Princes Dock in the south to Bramley-Moore Dock in the north. The timeframe for full delivery of the scheme at the time of planning application was 2041.

Since planning permission was granted, Peel Land & Property has submitted a series of discharge of conditions applications, reserved matters and non-material amendment applications. A neighbourhood masterplan for the Central Docks has been submitted (ref:19DIS/1315) in accordance with the requirements of the planning conditions attached to the outline planning permission and was approved on the 12th November 2019. There has been a further non-material amendment recently submitted for Liverpool Waters which at the time of this assessment has not been consented (Ref 20NM/1801); the area surrounding Nelson Dock has not changed as part of these approved and proposed amendments and therefore no further changes to the locations of the proposed receptors is deemed necessary.

4.2.2 Bramley-Moore Dock

The proposed stadium site is located within the Northern Docks (comprising Nelson Dock and Bramley-Moore Dock) proposed in the Liverpool Waters planning application for development to take place between 2036 and 2041 for the following uses:

- C3 Dwellings- 219,500m².
- A1 Retail- 5,000m².

- A2 Financial & Professional services- 300m².
- A3 Food & drink- 2,200m².
- A4 Drinking establishments- 1,200 m².
- B1 Business- 1,800m².
- D1 Non-Residential Institutions- 6,600m².
- D2 Assembly and Leisure-1,000m².
- Sui Generis- 1,000m².

The amount of the development listed above which relates to Bramley-Moore Dock (excluding Nelson Dock) is not specified in the permission, which details the amount of development per Neighbourhood only.

Receptors at proposed residential receptors within the future baseline have been included as part of this assessment.

4.3 Receptors

The term 'receptors' includes any persons, locations or systems that may be susceptible to changes in environmental factors as a consequence of the proposed development.

4.3.1 Existing Residential Receptors

During the site survey key residential properties were identified which have the potential to be impacted by obtrusive light from the proposed development, as highlighted in Table 4.1. Reference should be made to Figures 4 and 5 for an illustration of the residential receptors used for the purposes of this assessment.

Table 4.1 Existing Residential Receptors

ID	Description	ILP Environmental Zone
R1	Titanic Hotel Liverpool	E3
R2	57 Regent Street	E3
R3	62 Regent Street	E3

All the identified residential receptors are considered to be within ILP Environmental Zone E3. Each receptor was input into the model at a height of 4.0m at a distance of 10 cm from the building façade in order to represent illuminance at first floor window level, representing a typical bedroom, which is deemed to be the most sensitive receptor room.

4.3.2 Committed Residential Receptors

To the south of the application site is the consented Liverpool Waters scheme which is a parameters-based outline permission (original outline ref. 10O/2424 (LPA ref. latest consented variation: 19NM/1121; latest variation submitted for determination: 20NM/1801) that fixed development blocks (siting and volumetrically); there are no details of facades or window locations at this time. The approved parameters plan has been used to identify the receptors at the outline building facades. It should however be noted that as the approved development parameter blocks for the east and west quay of Nelson Dock straddle the application site boundary with Bramley-Moore Dock then a robust position has been adopted whereby the development block is reduced back to the application redline boundary between Nelson and Bramley-Moore Dock.

Table 4.2 Committed Residential Receptors in Proximity to the Site

ID	Description	ILP Environmental Zone
PR1	Northern facade western block	E3
PR2	Northern facade western block	E3
PR3	Eastern facade western block	E3
PR4	Eastern facade western block	E3
PR5	Northern facade southern block	E3
PR6	Northern facade central block	E3
PR7	Northern facade central block	E3
PR8	Western facade eastern block	E3
PR9	Northern facade eastern block	E3
PR10	Eastern façade eastern block	E3
PR11	Blackstone Street Hotel (LPA ref. 20F/0217)	E3

All other cumulative schemes included within the scope of the EIA (listed in Table 2.7, Chapter 2, ES Volume II) are considered to be located too far away from the application site to result in lighting effects from the proposed scheme and have therefore been scoped out of the assessment.

4.3.3 Ecological Receptors

Lighting associated with the operational phase of the proposed development has the potential to impact on receptors of ecological sensitivity within the vicinity of the application site. The Conservation of Habitats and Species Regulations (2017) and subsequent amendments require competent authorities to review planning applications and consents that have the potential to impact on European designated sites (e.g. Special Areas of Conservation). Following a review of the application site and immediate surrounding area using the online MAGIC facility, the River Mersey to the west of the application site and the wider dock system has been identified as potentially sensitive.

Following further consultation with project ecologists (WYG Ecology), it was determined that a number of bird species use the water surrounding the proposed application site with potential sensitivity to light. It was also determined that Pipistrelle bats use the Hydraulic Tower Building on site as a roost, therefore the northern and western facades of this building have been assessed.

The River Mersey and surrounding dock system to the north and south of the site have been included within the assessment.

For the purposes of the assessment, ecological receptor locations have been included surrounding the application site, with individual receptors spaced out along the rows at heights of 0.75, 1.5m and 5.0m (unless otherwise stated in table 4.3) and different distances from the proposed development as detailed in Table 4.3. A full spatial illustration of modelled ecological receptors is included in Figure 3.

Table 4.3 Ecological Receptors

ID	Description
Eco 1	River Mersey 160m from the site
Eco 2	River Mersey 160m from the site
Eco 3	River Mersey 160m from the site
Eco 4	River Mersey 160m from the site
Eco 5	River Mersey 170m from the site
Eco 6	River Mersey 140m from the site
Eco 7	River Mersey 140m from the site
Eco 8	River Mersey 109m from the site
Eco 9	River Mersey 120m from the site
Eco 10	Wellington Dock 80m from the site
Eco 11	Wellington Dock 70m from the site
Eco 12	Wellington Dock 70m from the site
Eco 13	Nelson Dock 50m from the site
Eco 14	Nelson Dock 50m from the site
Eco 15	River Mersey 50m from the site
Eco 16	River Mersey 50m from the site
Eco 17	River Mersey 50m from the site
Eco 18	River Mersey 50m from the site
Eco 19	River Mersey 50m from the site
Eco 20	River Mersey 50m from the site
Eco 21	River Mersey 50m from the site
Eco 22	River Mersey 50m from the site
Eco 23	River Mersey 50m from the site
Eco 24	Wellington Dock 30m from the site
Eco 25	Wellington Dock 30m from the site
Eco 26	Wellington Dock 30m from the site
Eco 27	River Mersey 15m from the site

ID	Description
Eco 28	River Mersey 15m from the site
Eco 29	River Mersey 15m from the site
Eco 30	River Mersey 15m from the site
Eco 31	River Mersey 15m from the site
Eco 32	River Mersey 15m from the site
Eco 33	River Mersey 15m from the site
Eco 34	Wellington Dock 12m from the site
Eco 35	Wellington Dock 8m from the site
Eco 36	Wellington Dock 10m from the site
Eco 37	Wellington Dock 10m from the site
Eco 38	Nelson Dock 10m from the site
Eco 39	Nelson Dock 10m from the site
Eco 40	Nelson Dock 13m from the site
Eco 41	Ecological Receptors on the Hydraulic Tower (5.5m)
Eco 42	Ecological Receptors on the Hydraulic Tower (5.5m)

5.0 Lighting Design and Control

The proposed lighting scheme for the development was designed by Buro Happold Engineering in accordance with the standards outlined earlier in Section 2.3. Full details of the proposed lighting design and scheme of lighting are included in Appendix C as provided by Buro Happold.

The design of the lighting has been undertaken to meet the following requirements:

- Lighting of Public Realm to provide a safe and vibrant place within the city;
- Lighting within the seating areas of the stadium;
- Lighting of access roads and security areas;
- Architectural lighting of the Hydraulic Tower;
- Floodlighting of the pitch using the lighting detailed in Appendix B;
- Lighting of the area surrounding the pitch to Sports Ground Safety Authority Standard (SGSA) Green Book Guidance; and
- Lighting of broadcast areas.

This design needs to be balanced against the light obtrusion limitations stated within the relevant standards and guidance in order to avoid any detriment to existing and future amenity for existing and committed residential receptors and wildlife (ecological) receptors.

The lighting design has been produced with the design principals shown in Figure 6. The different areas of the site have been designed in accordance with the guidance set out in BS EN 12464-2:2014.

Further details are given below as to how the lighting has been designed to safeguard the environment while creating a functional and attractive proposal.

5.1.1 Public Realm and External Lighting

Lighting is required for general open spaces, circulation spaces, access roads and car parks at the proposed development and has been designed in order to provide sufficient light for each of these areas as shown in Table 5.1 below.

Table 5.1 Design Principles

Area	Event average lux	Non-Event average lux
Access and Security Areas	50	20
General Open Spaces	30	15
Dwelling Areas, Restricted use vehicle roads, Water's edge	15	10
Open Car Park	20	10
Broadcasting Areas	40	-

These areas will be lit by a combination of column mounted, wall mounted, and tree mounted lighting as detailed in Figure 6.

5.1.2 Bowl Lighting

Figure 12 shows a 3D representation of the proposed bowl lighting. It is proposed to have lighting to highlight a mesh outer layer as shown in the figure.

5.1.3 The Hydraulic Tower

Onsite there is a Grade II listed building known as "the Hydraulic Tower" which will include some architectural lighting as a result of the proposed development (works to the tower being subject to separate listed building consent submissions). As discussed in section 4.3.3 there are identified pipistrelle bat roosts within the tower. The best practice principles proposed for the tower as shown in Figure 7 have been designed in such a way to comply with Historic England's "External Lighting for Historic Buildings" (April 2007) design document.

The lighting principles for the hydraulic tower include low level lighting and will be compliant with the 'Bats and Artificial Lighting in the UK' guidance document. A warm white spectrum will be used which has less of an effect on bat activity. It should also be noted that pipistrelles are one of the species least sensitive to artificial light.

5.1.4 Façade Lighting

Detail is provided in Appendix B. Light spill from the up lighting and signage on the northern and southern facade of the stadium has been included within this report. Details of the lighting of the northern and southern façade can be found in Figure 10.

Signage Lighting

On all four sides of the building will be various illuminated signage lit on event days as shown in Figures 10 and 11. The assessment of these signs can be found in section 6.1.4.

5.1.5 Stadium Pitch Floodlighting

Floodlighting of the stadium will be compliant with Sports England and FA requirements for Class 1 stadia.

The design of the floodlighting has been undertaken using specific products (Musco TLC-LED-1400 Luminaires) designed to minimise upward light spill with bright, uniform light directed onto the field and not spilling above it. This is shown in Figure 14 which demonstrates the efficacy of the lighting at the Arsenal Emirates stadium scheme. A diagram of the upward light ratio from the flood lights used can be found in Figure 13. For further details on the proposed floodlighting please refer to Document ref..187772B By Musco Lighting.

With regards to the stadium floodlights, it is understood that all of the floodlights will be below the top height of the stadium and therefore enclosed within the bowl, and as the stadium bowl is totally enclosed no direct light spill is anticipated. Lighting from the glass façade to the south of the site has been included within this assessment.

5.1.6 Internal Stadium Lighting

Lighting within the stadium has been designed in accordance with the department for Culture, Media and Sport document "Guide to Safety at Sports Grounds" which states:

17.10 Lighting The lighting in all parts of a sports ground accessible to spectators should allow them to enter, to leave and move about the ground in safety. This is particularly important in relation to entry and exit routes and stairways used by the public. At all times when the daylight in any section of a ground accessible to the public is insufficient, or if the ground is to be used in non-daylight hours, adequate artificial lighting should be provided. This lighting should be sufficient to illuminate all signs, in accordance with relevant European Union Directives (see also Section 16.28). Consideration should also be given to the lighting required for CCTV systems to operate satisfactorily (see Sections 16.16–16.20). The minimum level of illumination should be as recommended by the Chartered Institute of Building Services Engineers. (For details of guides produced by CIBSE, see Bibliography. For guidance on emergency lighting, see Section 17.13.).

5.1.7 Onsite Construction Lighting

The Construction Management Plan for the project produced by Laing O'Rourke states the following with regards to lighting;

"All site lighting will be LED energy efficient and kept low level and angled to point into the site. Lighting will be switched off outside of working hours"

As working hours of the site are proposed to be 07:30-18:00 Monday-Friday and 08:30-14:00 on Saturdays. During the winter months there may be the need for some task lighting using temporary light fixings. However, by keeping all lights onsite low level and angled into the site it is not anticipated that construction lighting will impact any of the surrounding existing/proposed residential properties or ecological receptors.

The site compound is proposed to be adjacent to the Hydraulic Tower which as discussed in section 4.3.3 contains bat roosts, however all lighting on the compound will be kept away from the sensitive northern and western facades of the building as to avoid light pointing directly onto the bat roost entrance. In addition, based upon the times of construction lighting, luminaries on site will be mostly operated during the winter periods where bats are at their least active, due to hibernation patterns. Therefore, given the above measures construction lighting is not anticipated to cause a significant impact upon the ecological receptors within the Hydraulic Tower.

5.1.8 Light Spill from façade Metal Panels

Along the façade on all four sides of the proposed stadium metal panels are proposed to be inserted between the brick piers. The metal panels will be set back from the brick wall and be perforated to a maximum of 20% perforation depending on location. Therefore, internal light will spill out of the perforations. The proposed internal light levels are shown within Figure 9. The assessment of these facades can be found in section 6.1.6.

6.0 Quantified Effect of Proposed Lighting

Potential impacts associated with the proposed development's lighting design at locations in the vicinity of the application site were assessed as described in the following sections.

6.1.1 Obtrusive Light Modelling

Building plans were provided by the architects for the development, Pattern Architects. These were used with the proposed lighting designed by Buro Happold Engineering to develop a model within DIALux of the proposed development.

The model is only able to accurately represent the effects of solid structures such as buildings and walls on light obtrusion. Non-solid barriers such as trees and hedges cannot be accurately modelled and therefore, the effects of these are dealt with qualitatively outside the model calculations.

It is important to note that other proposed minor structural features, such as barriers and street furniture, have not been included within the model to present a worst-case scenario. These elements would provide some additional screening to lighting.

Table 5.1 shows the different lighting configurations for the development in event and non-event scenarios. An event and non-event scenario have been assessed.

The assessment consists of comparing the measured baseline illuminance levels at each of the receptor locations against the predicted light obtrusion from the lighting model. Where it was not practicable to measure existing illuminance at the receptor location, monitoring results from the nearest equivalent representative monitoring location are used.

The ULR of the proposed development has been calculated and referenced to the maximum permitted limitations for the relevant Environmental Zones of the receptor locations, as detailed in Table 3.2.

6.1.2 Pre-Curfew Model Results

Residential Receptors

Table 6.1 compares the measured baseline data and the modelled proposed lighting arrangements when operational during both event day and non-event day scenarios. These results are compared against the ILP pre-curfew and post-curfew criteria limits for ILP Environmental Zone E3, in accordance with the classifications detailed in Table 3.2.

Table 6.1 Pre-Curfew Existing Residential Receptor Assessment Results

ID	ILP Pre-curfew Criteria (Lx)	ILP Post-curfew Criteria (Lx)	Measured Baseline Illuminance (lx)		Predicted Model Illuminance (lx) Event Day	Predicted Model Illuminance (lx) Non-Event Day	Increase in Illuminance from Baseline to Proposed (lx)	
			Baseline Minimum	Baseline Maximum			Baseline Minimum	Baseline Maximum
R1	10	2	6.09	15.86	0.34	0.14	0.00	0.00
R2	10	2	3.41	10.64	7.25	1.80	3.84	0.00
R3	10	2	3.41	10.64	1.82	0.59	0.00	0.00

As Table 6.1 shows, given that neither the ILP pre- -curfew criteria for Environmental Zone E3 of 10 lux respectively are predicted to be exceeded as a result of the proposed development no further mitigation is required.

Table 6.2 Pre-Curfew Committed Residential Receptor Assessment Results (inclusive of signage lighting, public realm lighting, bowl (including any flood lighting spillage) lighting and façade lighting)

ID	Predicted Model Illuminance Event	Predicted Model Illuminance Non-Event
PR1	0.96	0.39
PR2	1.30	0.55
PR3	0.92	0.43
PR4	0.48	0.25
PR5	0.36	0.18
PR6	0.70	0.35
PR7	0.91	0.46
PR8	3.63	1.81
PR9	8.76	4.39
PR10	7.68	3.82
PR11	6.30	1.58

As Table 6.2 shows, given that the ILP pre-curfew criteria for Environmental Zone E3 of 10 lux is not predicted to be exceeded at surrounding proposed residential receptors as a result of the proposed development therefore no further mitigation is required.

However, the Post-Curfew Criteria for Environmental Zone E3 of 2 lux is predicted to be exceeded at two

proposed residential receptors (PR9 and PR10) as a result of the proposed development. Given that the event day scenario is expected to occur fewer than 32 times a year including football matches and concerts (with several of the football matches being on a weekend afternoon), the overall impact of lighting on proposed receptors from event day lighting is not considered significant.

6.1.3 Post-Curfew Model Results

While most of the lighting will not be required during post-curfew periods, there will be some requirement on event days for lighting during post curfew periods. As the only receptors above the ILP limit post-curfew limit in both event days and non-event days are PR9 and PR10 (the committed outline block on the east side of Nelson Quay), a review of the lighting at this area has been undertaken. The modelling results with the closest lighting which is pointed towards this area turned off. The results are shown in Table 6.3 below.

Table 6.3 Post-Curfew Committed Residential Receptor Assessment Results

ID	Predicted Model Illuminance Non-Event (Post-curfew)
PR1	1.08
PR2	1.42
PR3	1.01
PR4	0.52
PR5	0.26
PR6	0.30
PR7	0.25
PR8	0.25
PR9	1.55
PR10	1.30
PR11	1.58

As shown above, with this measure in place there will be no exceedance of the ILP post curfew criteria at any receptor. Figure 15 shows the locations of the lights that need to be switched off.

Ecological Receptors

When determining the likely effects of lighting associated with the proposed development on foraging and commuting routes, the assessment has considered the effect of lighting pre-mitigation. Table A1-A2 in Appendix A of this report presents the modelled proposed light trespass values on the water surrounding the application site to assess the potential impact on birds. There is no guidance that gives specific lux levels for

the disruption of marine birds, therefore, impacts are considered potentially significant where predicted illuminance significantly exceeds 2 lux at ecological receptors in line with the ILP criteria.

Table A1 shows that during an event day only six modelled locations at Nelson Dock to the south and the entrance to Sandon Half-Tide Dock to the north of the application site will be over the 2-lux limit. Following conversations with the project ecologist, the bird species situated in this area (Cormorant) are not considered sensitive to light. Other species found on the surrounding western and northern boundaries, all of which are expected to experience lux levels below 2 lux. Given that the event day scenario is only expected to occur fewer than 32 times a year including football matches (depending on Everton's progress in Domestic and European cup competitions – not all games in the evening) and concerts, the overall impact of lighting on ecological receptors from event daylighting is not considered significant.

The results in for locations E41 and E42 in tables A1 & A2 in appendix A show that during both event and non-event daylight levels at the proposed bat roost location will be below 1 lux, therefore it is not anticipated that onsite lighting will have a significant impact on the bats roosting within the Hydraulic Tower.

Table A2 shows that on a non-event day along the western, southern and northern boundary levels will not exceed the post-curfew ILP criteria of 2 lux, except for location E35 (at 0.75m and 1.5m, with levels at 5m being below 2lux) which is the entrance to Sandon Half-Tide Dock. The results show that the locations surrounding this area and further back into the dock will be below 2 lux. Further discussion is included in Section 3.

6.1.4 Building Luminance

The luminance of the proposed stadium has been assessed and the results shown in Table 6.4 below. The luminance has been assessed against the pre-curfew criteria of 10cd/m^2.

Table 6.4 Building Luminance

Building Element	Luminance (cd/m^2)	Meets Criteria?
Bowl Mesh	0.038	Yes
Façade of Stadium	1.054	Yes

6.1.5 Illuminated Signage

Figures 10 and 11 show that there are proposed to be 9 illuminated signages at the proposed development site. The external illuminated advertisements/signage recommendations as part of the ILP guidance note for the reduction of lighting pollution will be applied; these are as follows for Environmental Zone E3:

Illuminated area <10m2 – 600cd/m^2;

Illuminated area >10m^2 – 300cd/m^2.

Based upon these ILP limits, the predicted illuminance at the nearest sensitive receptors can be calculated by the following formula; the results have been tabulated in Table 6.5.

The illuminance Ev in lux (lx) is equal to the luminous intensity Iv in candela (cd), divided by the square distance from the light source d2 in square meters (m^2):

$Ev(lx) = Iv(cd) / (d(m))^2$

Table 6.5 Signage Luminance and Effect at Receptors

Sign Number	Luminance Limit (cd/m^2)	Signage location – Façade ?	Nearest Receptor	Distance to Receptor	Lux level
1	600	North	E37	40	0.375
2	600	South	E40	50	0.24
3	300	East	R3 & R4	127	0.01
4	300	East	R3 & R4	140	0.01
5	300	West	E27	140	0.01
6	600	West	E28	150	0.02
7	300	North	E37	38	0.20
8	300	South	E39	30	0.33

The results in the table above have been included within the results in Table 6.2, the results show that lighting from the illuminated signage on the building façade is not predicted to have a significant impact on any surrounding light sensitive receptors. The sign numbers are shown in Figures 10 and 11.

6.1.6 Façade Metal Panel Light Spill.

As stated in the submitted Design and Access Statement and in section 5.1.9 above, the façades of the stadium building will include some perforated metal panels. These perforations in the façade will lead to some light spill, therefore modelling has been undertaken of the internal layouts along the facade of the building. These internal layouts have been lit to an average of 200lux as shown in Figure 9. Light spill levels from the façade panels are shown in the table below.

Table 6.6 Signage Luminance and Effect at Receptors

Internal Lux Levels	Lux Level at 3m - 1.8m High	Lux Level at 10m - 1.8m High	Edge of Nelson Dock to the southern façade (30m) – 1.8m High
200	3.32	13.00	0.24

The results above show that light spill from the perforated metal panels on the stadium building façade is not predicted to have a significant impact on any surrounding light sensitive receptors and has been included within the cumulative results.

6.1.7 Dark Sky Assessment - Column, Wall Mounted and Façade Lighting

The model has been used to calculate the predicted ULR of the proposed external lighting scheme. Model outputs predict a sky glow figure (ULR) of 1.5%. As illustrated in Table 3.2, the ILP sky glow limitation for an area classified as Environmental Zone E3 is 5.0% ULR. As such the proposed lighting scheme meets the ILP sky glow limitations and is therefore not considered to result in detrimental impacts on the night sky.

7.0 Stadium Floodlighting

Lighting Products

The floodlight design will be internal, facing inwards to the pitch and will be designed to take into account the surrounding ecological and residential constraints. It is not anticipated that that lighting from the flood lights will cause a significant impact on surrounding ecological and residential receptors.

Upward Light Spill

With regards to the stadium floodlights, it is understood that all of the floodlights will be below the top height of the stadium and therefore enclosed within the bowl, and as the stadium bowl is totally enclosed no direct light spill is anticipated. Lighting from the glass façade to the south of the site has been included within this assessment.

The design of the floodlighting has been undertaken using specific products (Musco TLC-LED-1400 Luminaires) designed to minimise upward light spill with bright, uniform light directed onto the field and not spilling above it. This is shown in Figure 14 which demonstrates the efficacy of the lighting at the Arsenal Emirates stadium scheme, the figure shows the difference between the previous floodlights initially installed and the Musco floodlights fitted. Figure 13 shows that sky glow luminance the will escape the centre of the pitch, the predicted a sky glow figure (ULR) of the floodlights is predicted to be below 1.5% and be within the ILP sky glow limitation for an area classified as Environmental Zone E3 is 5.0% ULR.

8.0 Conclusions

WYG Environment Planning Transport (WYG) have been commissioned by Everton Stadium Development Ltd to prepare a lighting assessment in support of a full planning application for the development of a stadium with associated infrastructure and facilities at Bramley Moore Dock.

Modelling of the proposed lighting associated with the development has been assessed from:

- Construction Lighting;
- Public Realm Lighting;
- Stadium Floodlighting;
- Hydraulic Tower Lighting;
- Signage Lighting; and
- Façade and Bowl Lighting.

The assessment has included consideration of the committed Liverpool Waters development (approved Nelson Dock development block parameters – as per permission 19NM/1121 – variation of original outline ref. 10O/2424) and the potential effect on future residential receptors within this development as well as existing surrounding residents.

The assessment has concluded that the risk of the proposed scheme resulting in exceedances of either the ILP pre-curfew or post-curfew obtrusive light limitations will be low at both existing and committed residential receptors during the event and non-event scenarios.

Ecological habitats along the southern and western boundaries of the site are not predicted to experience light trespass that significantly exceeds 2 lux. As the events are not constant occurrences and the surrounding species not considered overly sensitive to light it is considered that the effect will be not significant during the event and non-event scenarios.

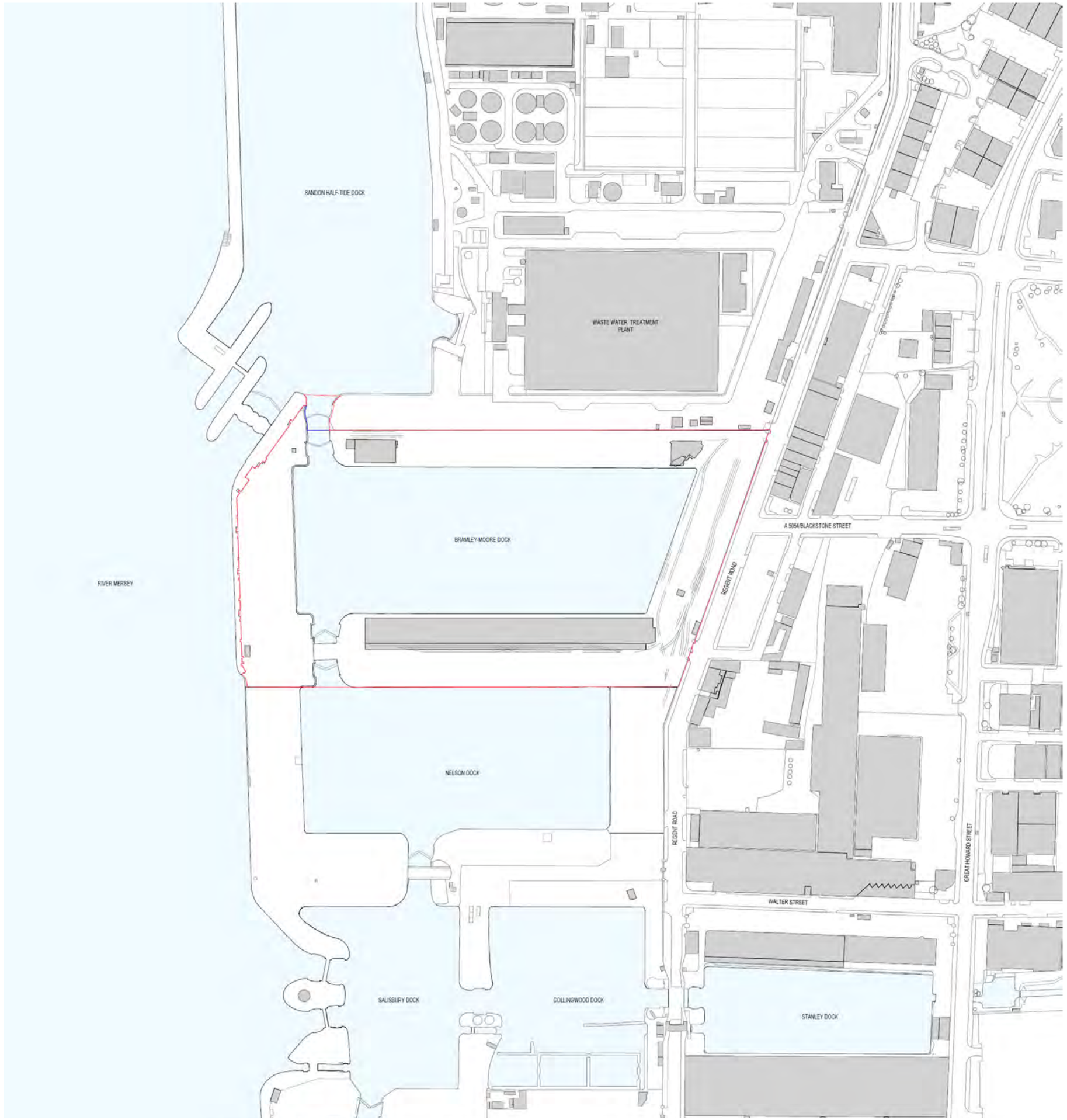
Comments on the previous application have been received from LCC and Natural England and have been addressed within this report.

The assessment has concluded that, provided the specified lighting design and design principles are implemented, the sky glow levels associated with the development will meet the ILP Environmental Zone criteria.

Units and Abbreviations Used

CIBSE	Chartered Institute of Building Services Engineers
CIE	Commission on Illumination
ILP	Institute of Lighting Professionals
LDF	Local Development Framework
LP	Local Plan
CS	Core Strategy
DPD	Adopted Development Plan Documents
SPD	Adopted Supplementary Planning Documents
SG	Endorsed Supplementary Guidance Documents
NGR	National Grid Reference
PPS	Planning Policy Statement
NPPF	National Planning Policy Framework
Lx	Lux
ULR	Upward Lighting Ratio
WYG	WYG Planning and Environment

Figures



Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 1: Site Boundary

creative minds safe hands

DRAWN BY	CHECKED BY	DATE	REVISION
NA	MSC	24/07/2020	A

Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 2: Monitoring Locations

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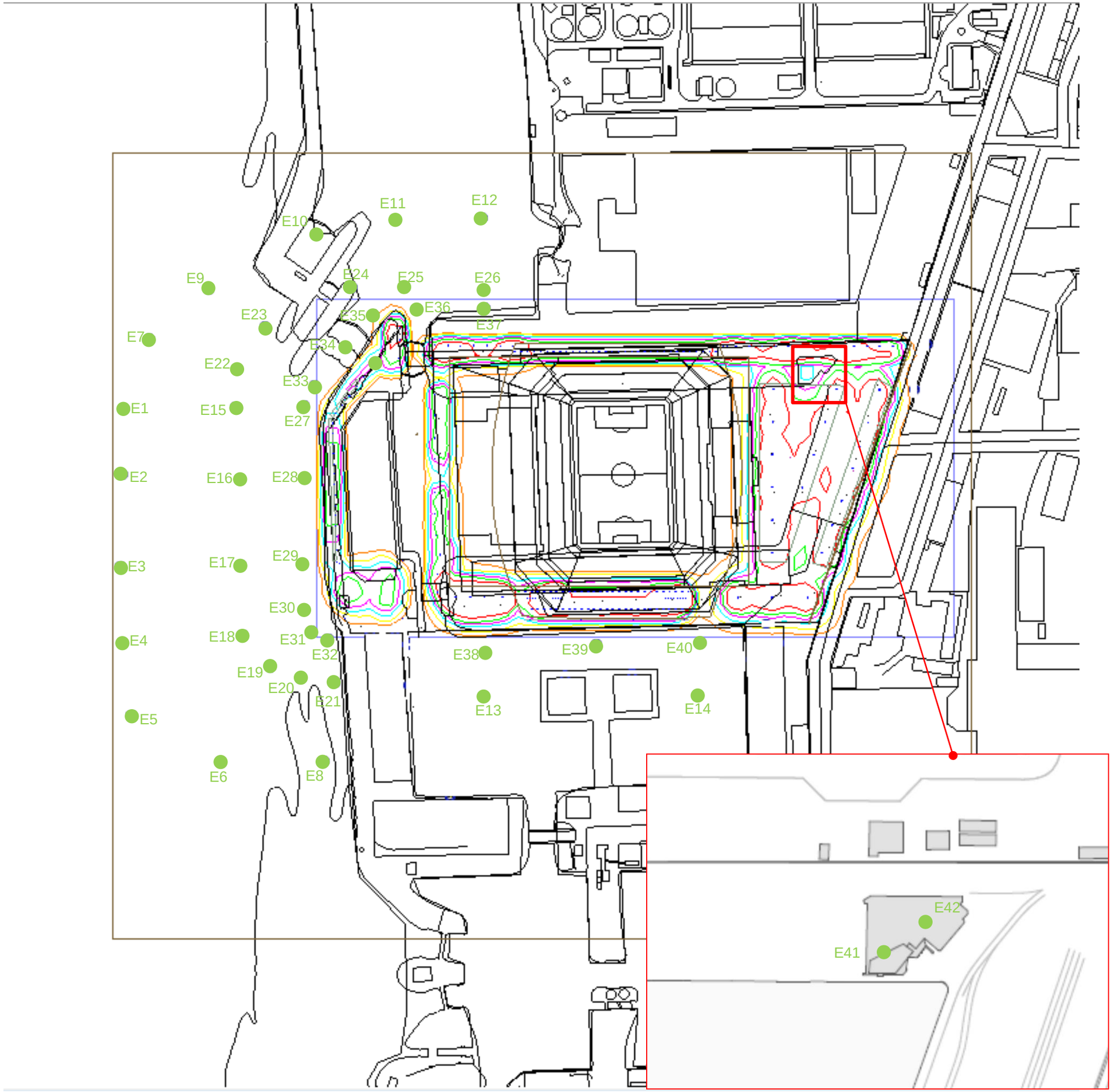

Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 3: Existing Ecological Receptors Parcel

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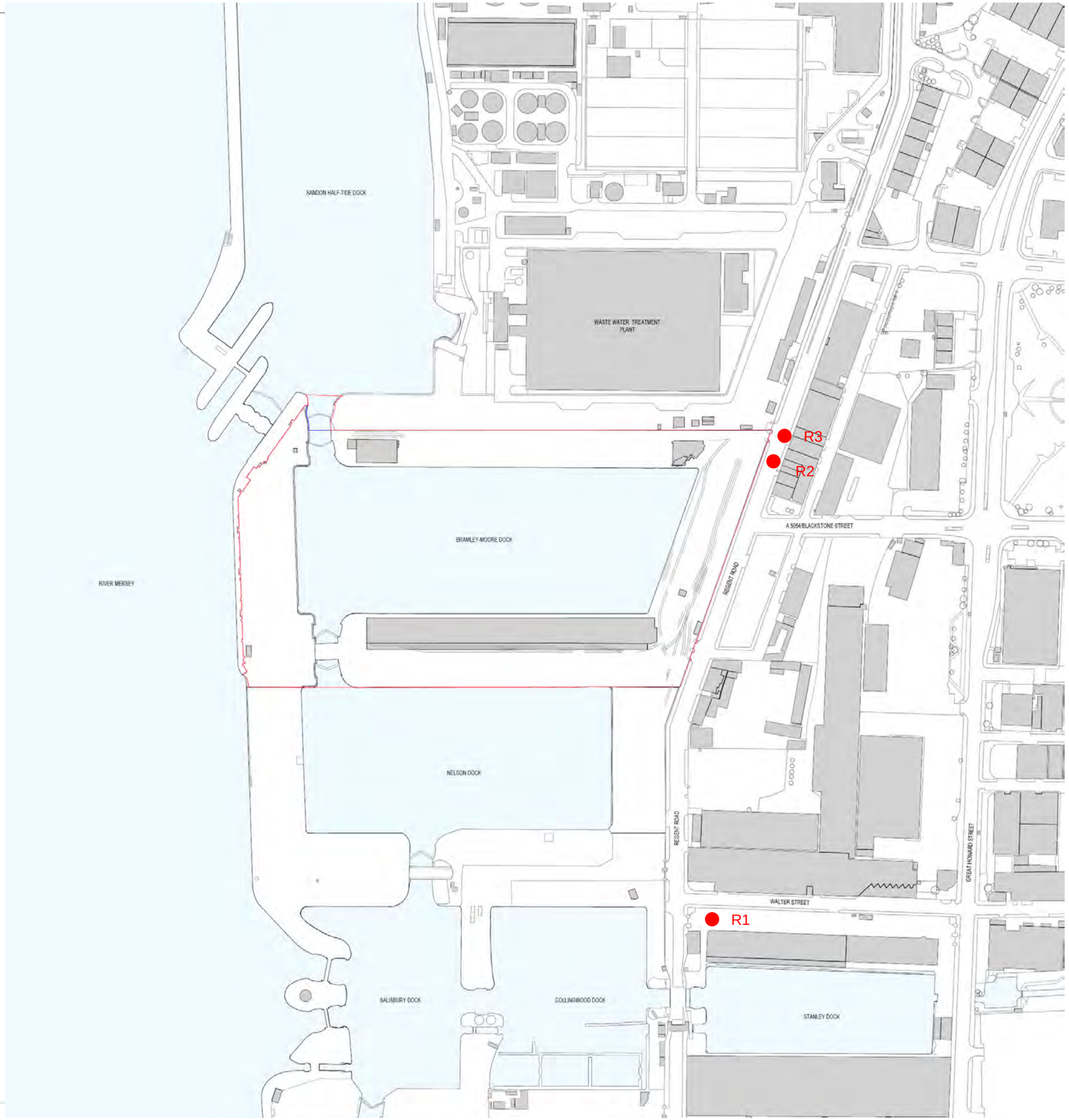
NA	MSC	24/07/2020	A



Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 4: Existing Receptors

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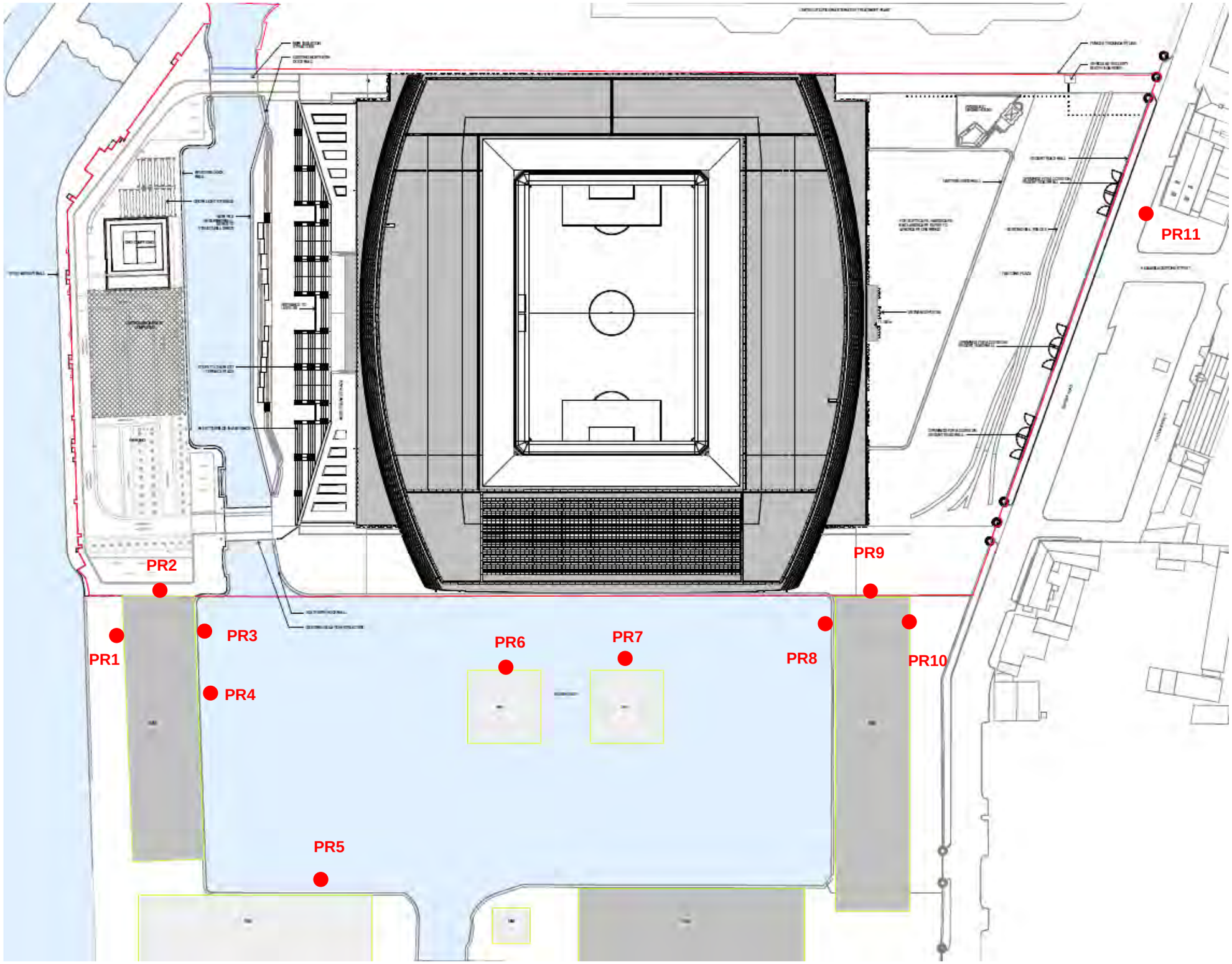

Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 5: Committed Residential Receptors at Liverpool Waters

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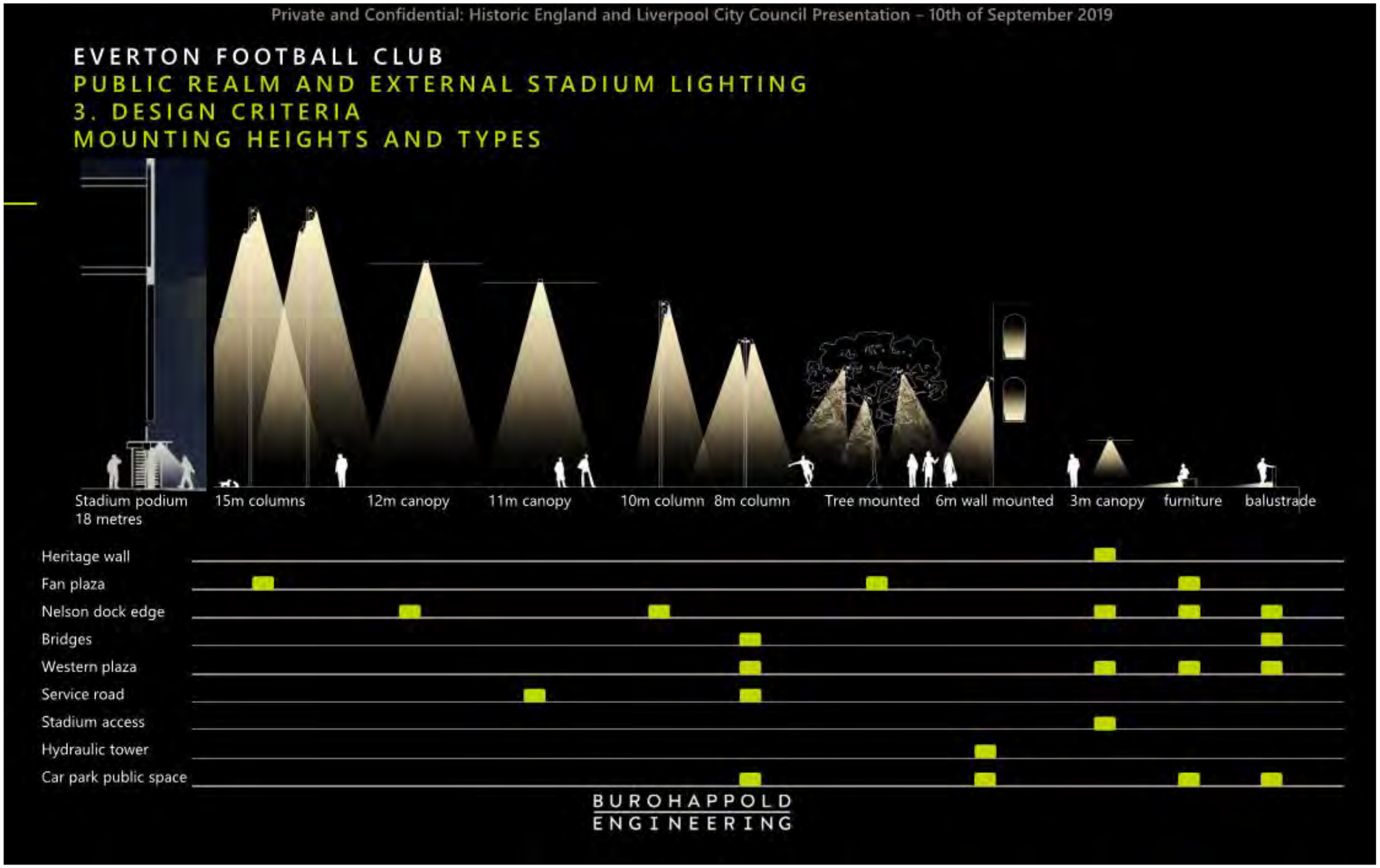

Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

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Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 6: Lighting Design Principles

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Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 7: Hydraulic Tower Lighting Design Principles

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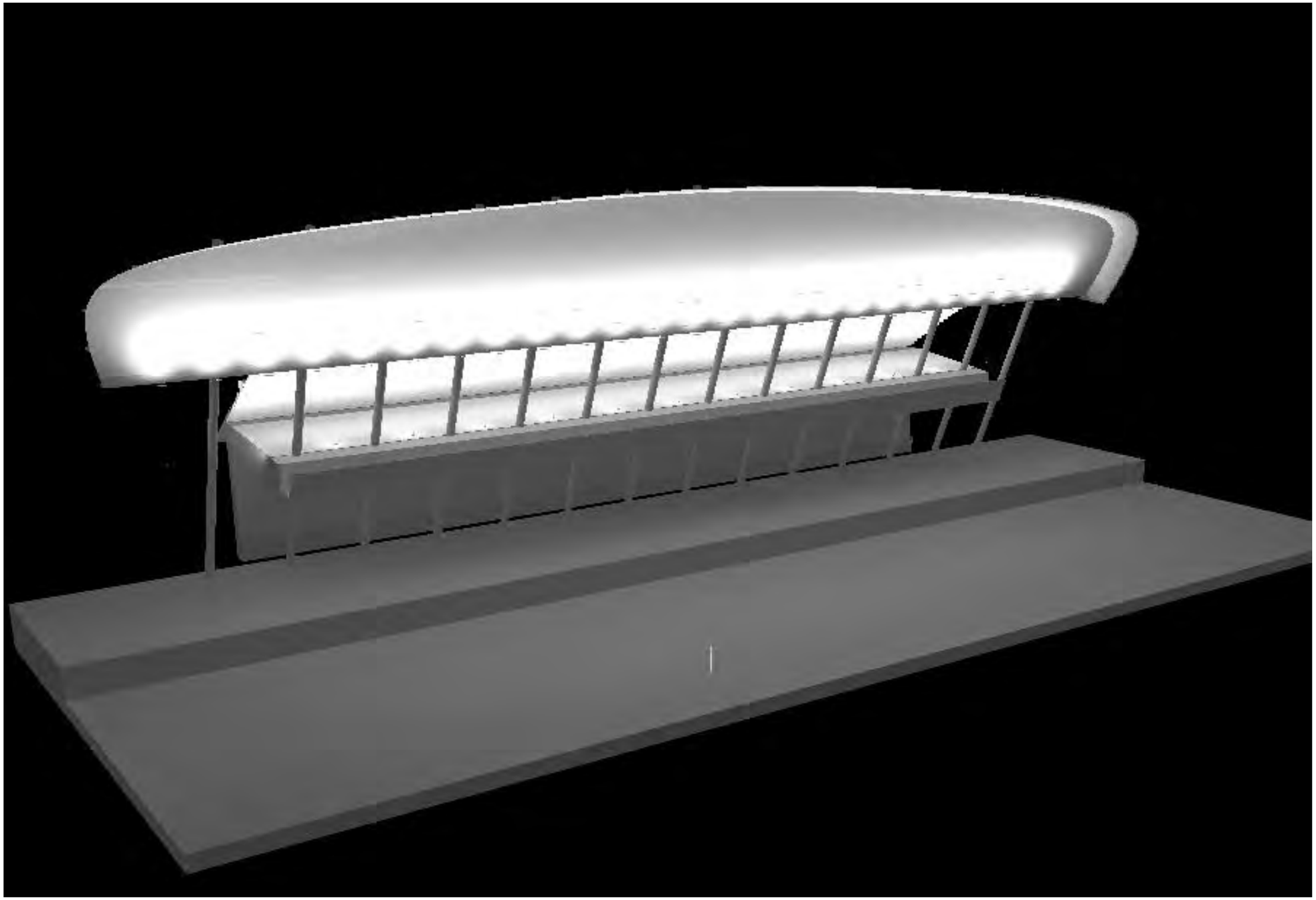
NA	MSC	24/07/2020	A



Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 8: 3D Representation of Proposed Southern Façade Lighting

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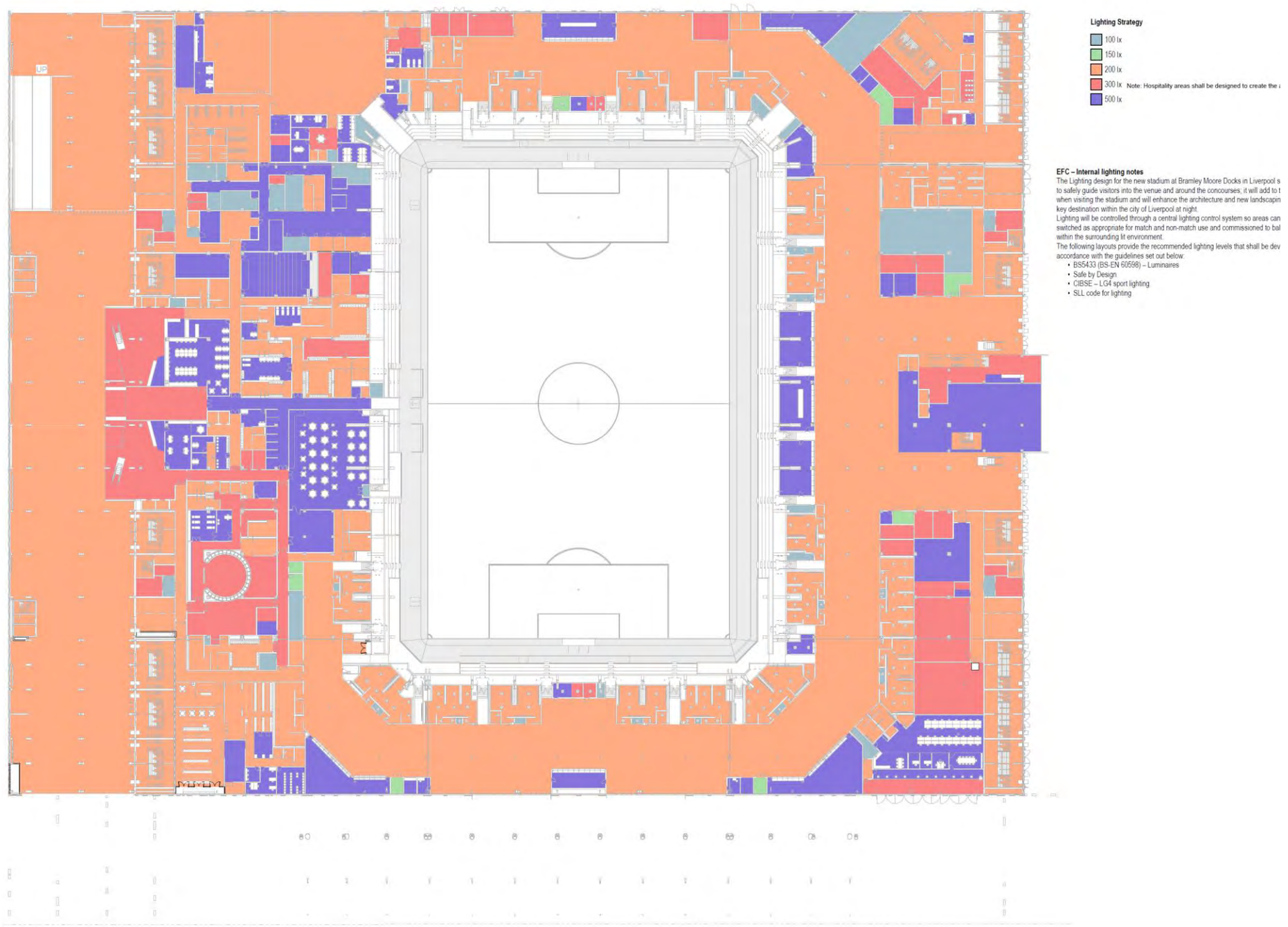
NA	MSC	24/07/2020	A



Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 9: Internal Lighting Ground Floor

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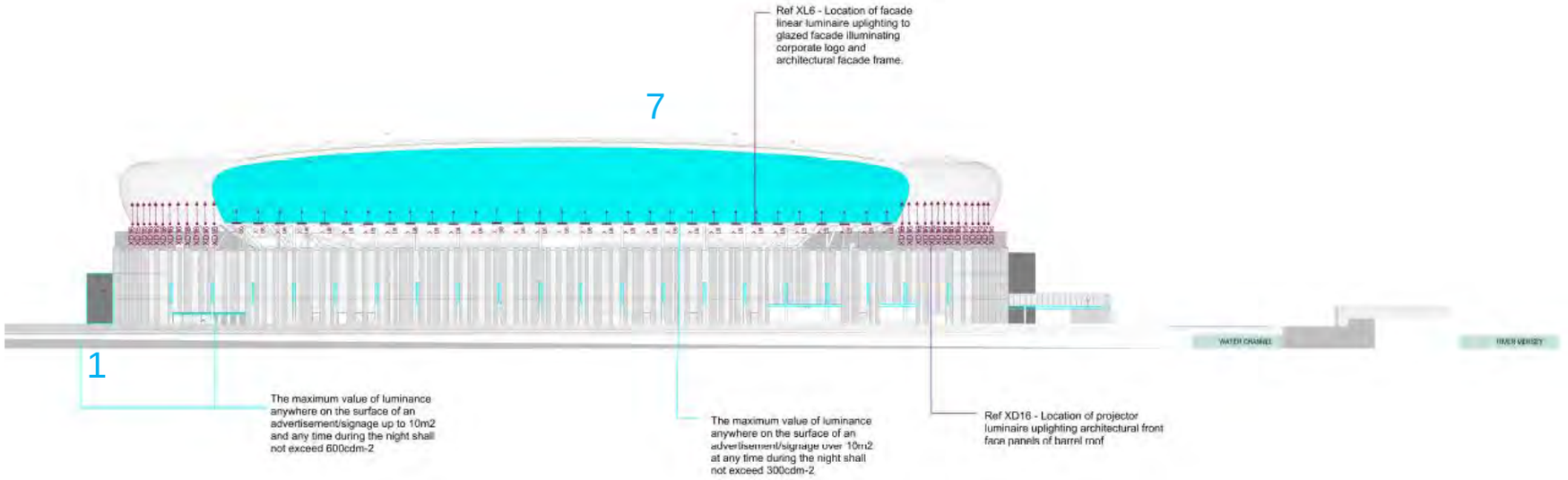
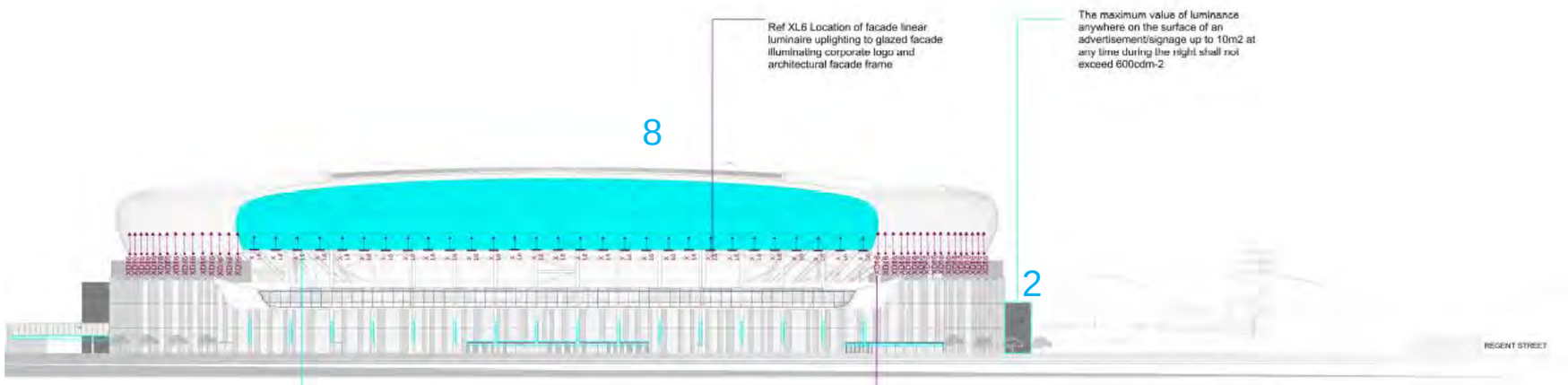
NA	MSC	24/07/2020	A





Signage/naming rights lighting notes:

Lighting to the naming rights signage by signage specialist is anticipated to be back lit or halo illuminated to where the light source itself cannot be viewed directly from any angle.

The external illuminated advertisements/signage recommendations as part of the ILP guidance note for the reduction of light pollution should be applied:
A - Luminaires should be positioned such that light sources itself is not directly visible from any usual viewing angle
B - Luminaires should be adequately secured and positioned such that they light away from the adjacent properties or highways. Differs, shield or louvres should be incorporated where necessary to control spill light.
C - Illumination should be switched off when not required e.g. during daytime and post agreed curfew.
D - Direct light downwards whenever possible. If there is no alternative to uplighting, shields and baffles should be used to help reduce light spill.

The maximum value of luminance anywhere on the surface of an advertisement/signage at any time during the night is noted within the table below:

Maximum permitted recommended luminance (cdm -2)					
Illuminated area m²	Zone E0	Zone E1	Zone E2	Zone E3	Zone E4
Up to 10	0	100	400	600	600
Over 10	0	N /A	200	300	300

Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 10: Façade Lighting/ Signage and Up lighting – North and South

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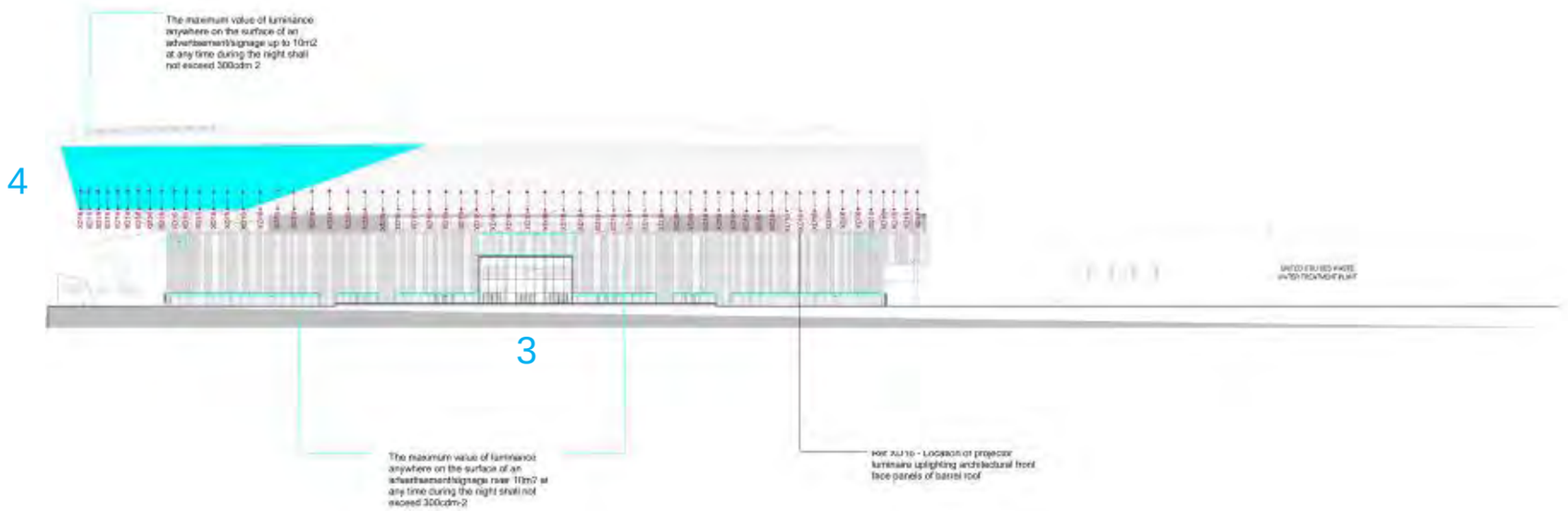
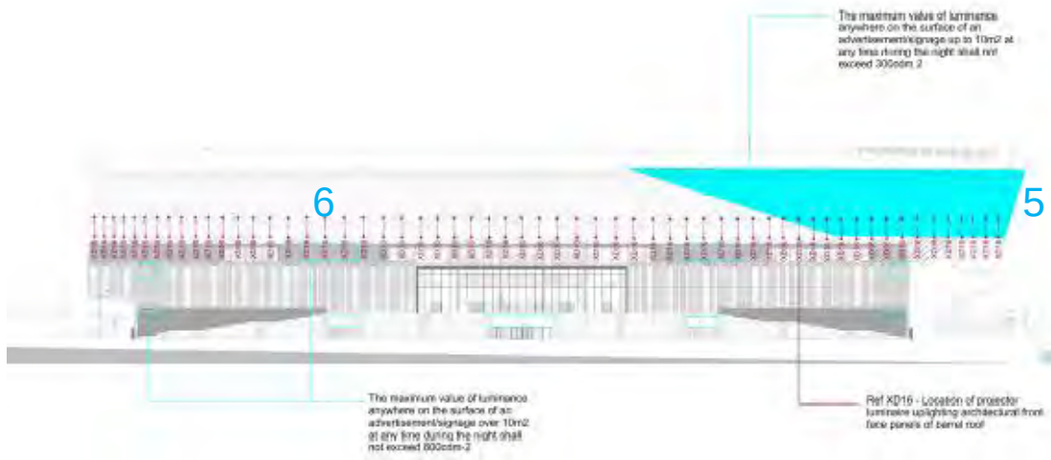
DRAWN BY	CHECKED BY	DATE	REVISION
NA	MSC	24/07/2020	A





Signage/naming rights lighting notes:

Lighting to the naming rights signage by signage specialist is anticipated to be basic in so how illuminated to where the light source itself cannot be viewed directly from any angle.

The external illuminated advertisements/signage requirements as part of the ILP guidance note for the reduction of light pollution should be applied:
A - Luminaires should be positioned such that light sources itself is not directly visible from any usual viewing angle
B - Luminaires should be adequately secured and positioned such that they light away from the adjacent properties or highways. Differs, shield or louvres should be incorporated where necessary to control spill light.
C - Illumination should be switched off when not required e.g. during daytime and post agreed curfew.
D - Direct light downwards wherever possible. If there is no alternative to uplighting, shields and baffles should be used to help reduce light spill.

The maximum value of luminance anywhere on the surface of an advertisement/signage at any time during the night is noted within the table below:

Maximum permitted recommended luminance (cd/m -2)					
Illuminated area m²	Zone E0	Zone E1	Zone E2	Zone E3	Zone E4
Up to 10	0	100	400	600	600
Over 10	0	N/A	200	300	300

Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

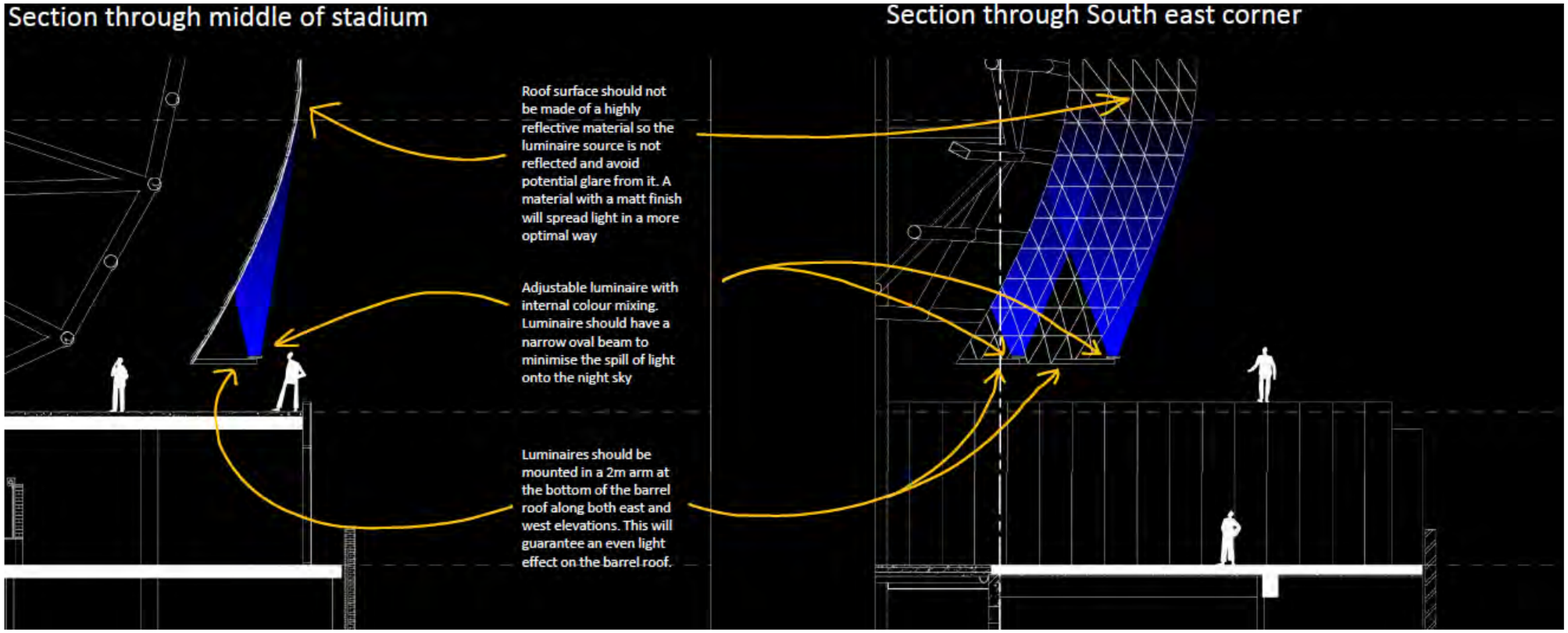
Everton Stadium Development Ltd

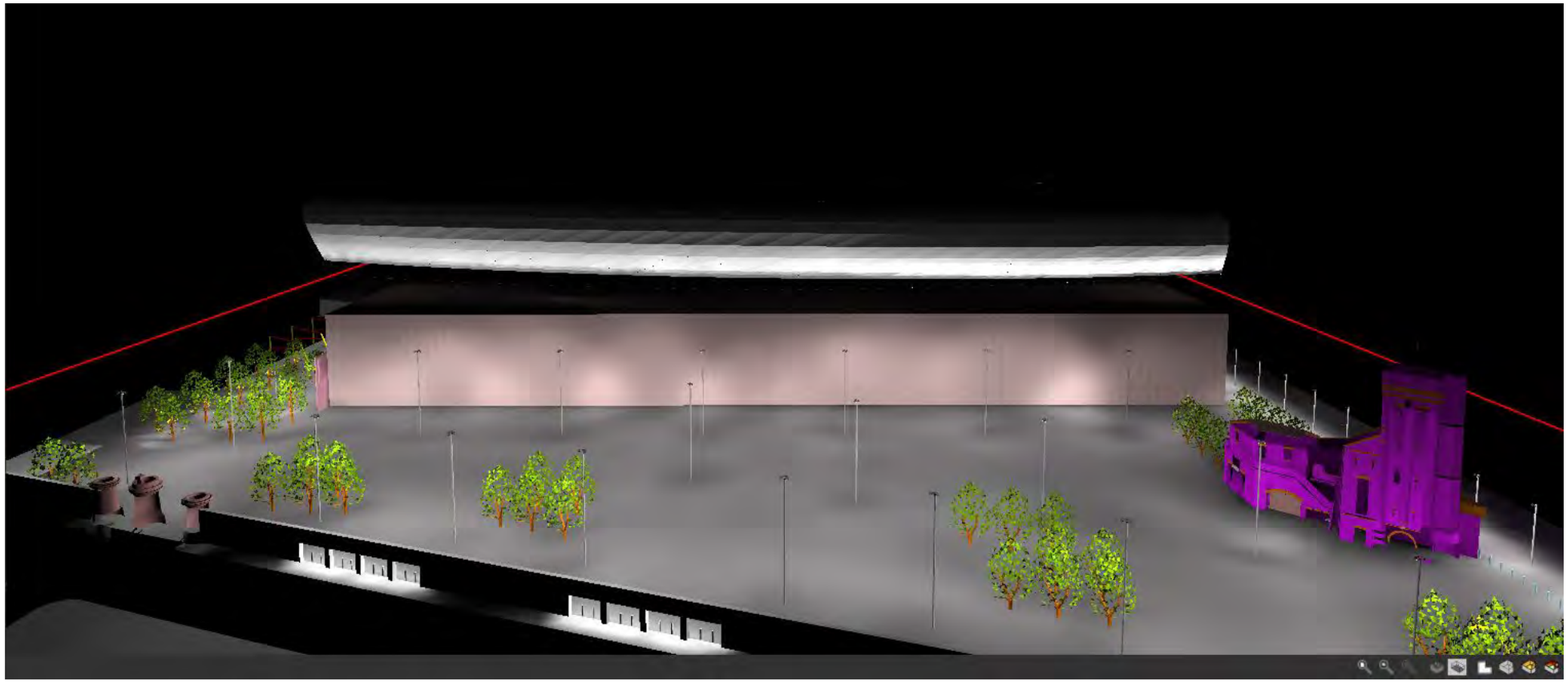
Drawing Title:

Figure 11: Façade Lighting/ Signage and Up lighting – East and West

creative minds safe hands

DRAWN BY	CHECKED BY	DATE	REVISION
NA	MSC	24/07/2020	A





Model Representation

Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 12: 3D Representation of Proposed Bowl Lighting

creative minds safe hands

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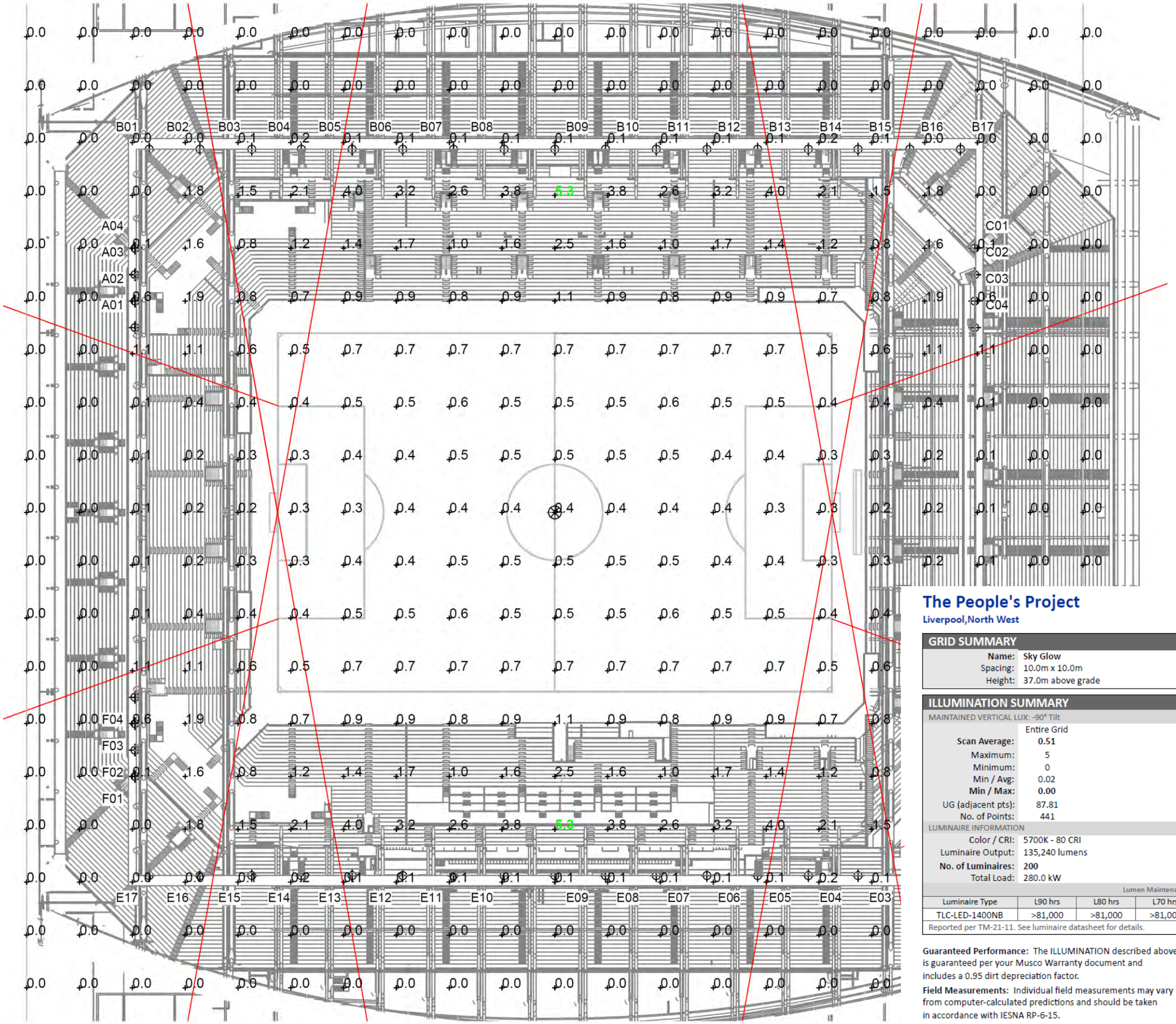
NA	MSC	24/07/2020	A



Executive Park
Avalon Way
Anstey
Leicester
LE7 7GR

Tel: 0116 234 8000
Fax: 0116 234 8002
e-mail: leicester@wyg.com

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

The People's Project

Liverpool,North West

GRID SUMMARY

Name:	Sky Glow
Spacing:	10.0m x 10.0m
Height:	37.0m above grade

ILLUMINATION SUMMARY

MAINTAINED VERTICAL LUX: -90° Tilt

	Entire Grid
Scan Average:	**0.51**
Maximum:	5
Minimum:	0
Min / Avg:	0.02
Min / Max:	**0.00**
UG (adjacent pts):	87.81
No. of Points:	441

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

Drawing Title:

Figure 13: Musco Sky Glow Calculations

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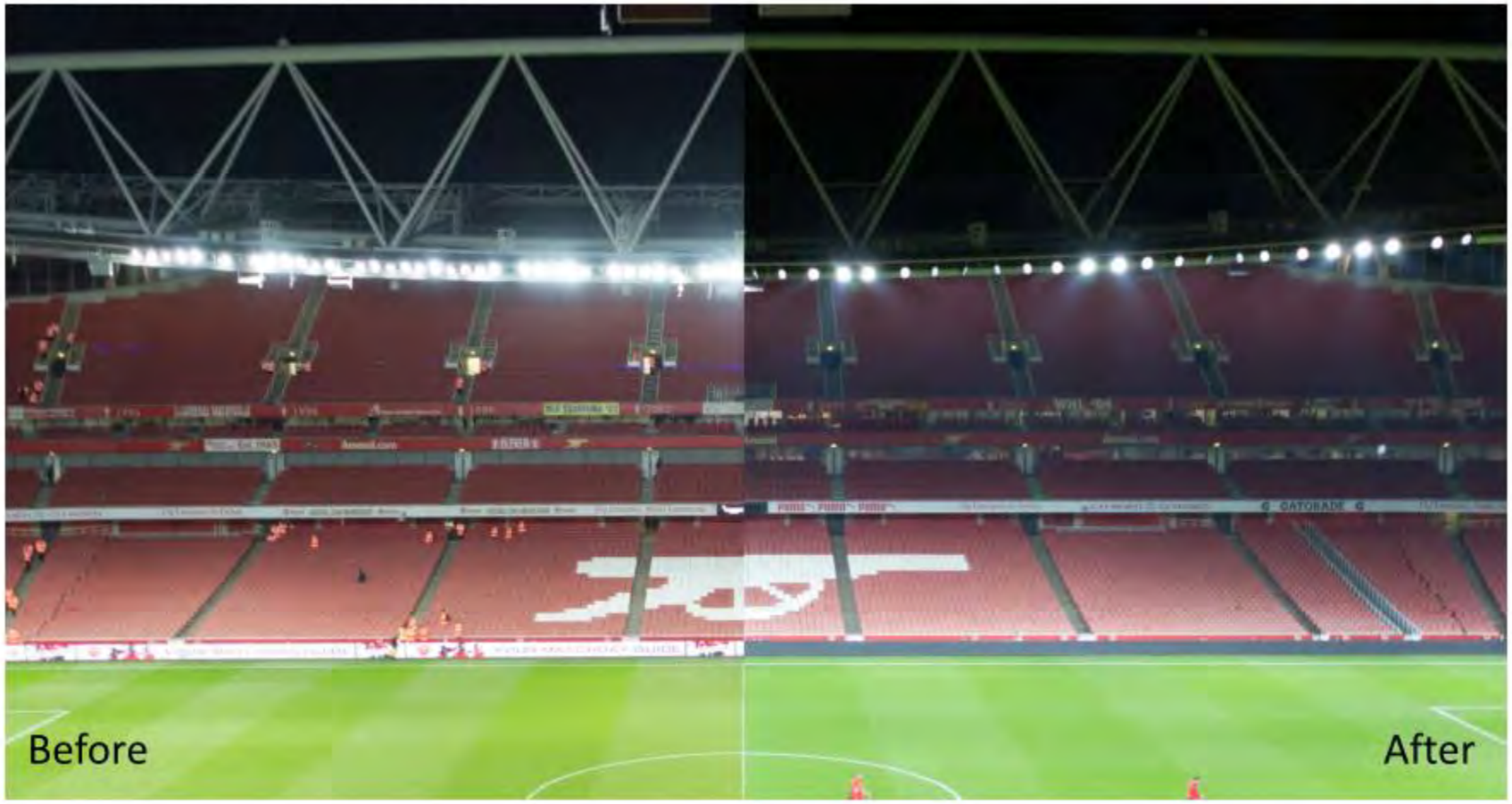
NA	MSC	24/07/2020	A

Bringing LED to Emirates Stadium

MUSCO Lighting
We Make It Happen

Light Control Comparison



WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 14: Light Control from Proposed Floodlighting

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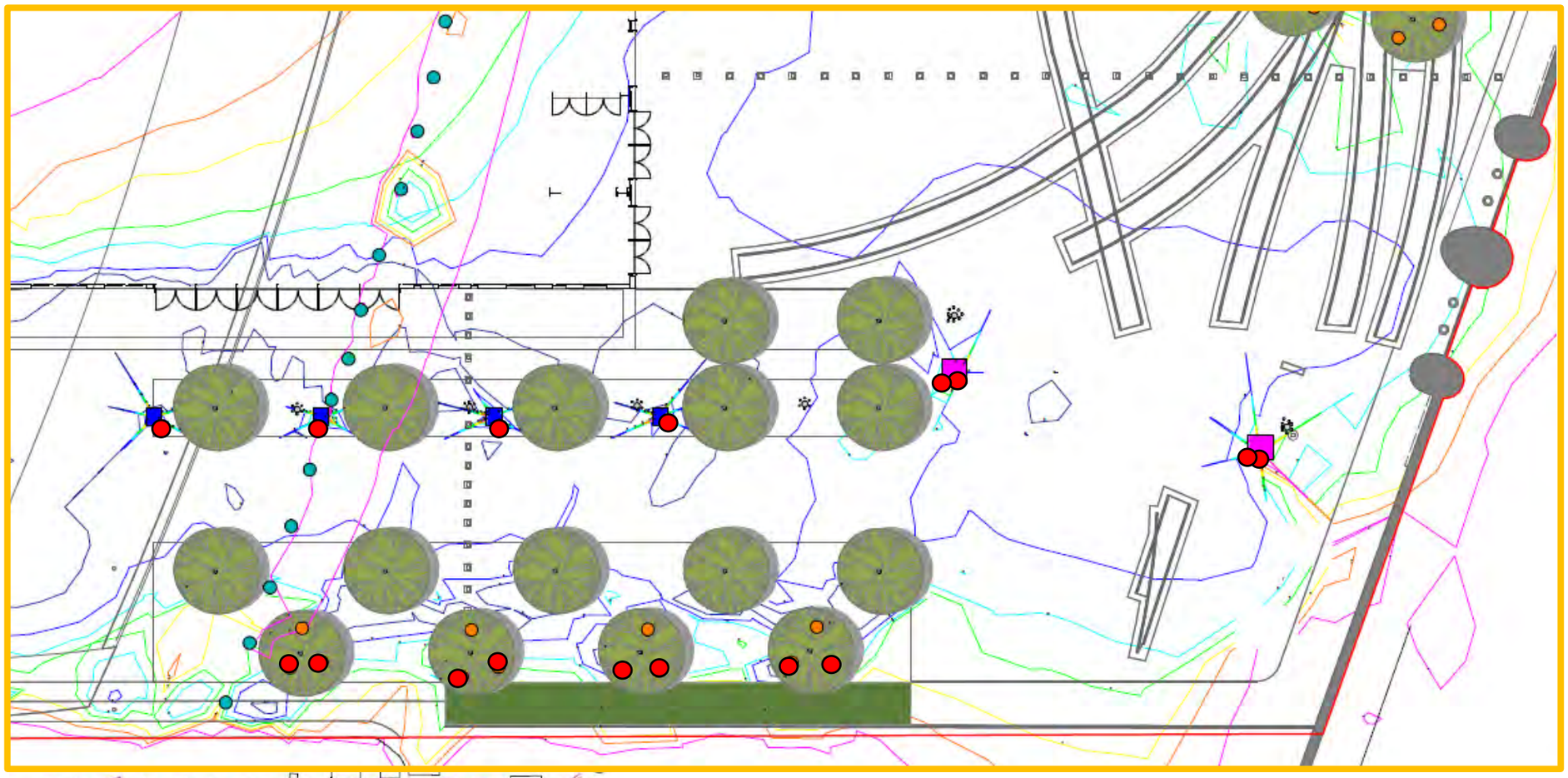
NA	MSC	24/07/2020	A



Light to be turned off post-curfew

WYG ENVIRONMENT

Project:

The People's Project, Merseyside

Client:

Everton Stadium Development Ltd

Drawing Title:

Figure 15: Lighting to be Switched Off During the Post-Curfew Period

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Appendix A – Ecological Results.

Table A1: Pre-Curfew Ecological Receptor Assessment Results – Event

ID	Predicted Model Illuminance at 0.75m Height (lux)	Predicted Model Illuminance at 1.5m Height (lux)	Predicted Model Illuminance at 5m Height (lux)
E1	0.18	0.13	0.13
E2	0.22	0.15	0.16
E3	0.22	0.16	0.16
E4	0.20	0.14	0.14
E5	0.16	0.12	0.12
E6	0.21	0.16	0.17
E7	0.18	0.12	0.12
E8	0.22	0.18	0.19
E9	0.23	0.16	0.17
E10	0.28	0.23	0.25
E11	0.30	0.25	0.27
E12	0.29	0.28	0.28
E13	1.11	1.09	0.90
E14	1.43	1.28	1.35
E15	0.47	0.34	0.34
E16	0.62	0.47	0.49
E17	0.60	0.46	0.45
E18	0.42	0.32	0.33
E19	0.39	0.31	0.32
E20	0.40	0.32	0.33
E21	0.46	0.37	0.36
E22	0.33	0.23	0.26
E23	0.38	0.26	0.30
E24	0.62	0.50	0.51
E25	0.64	0.54	0.59
E26	0.55	0.52	0.53
E27	1.03	0.97	0.98
E28	1.67	1.40	1.33
E29	1.41	1.18	1.13
E30	1.26	0.90	0.74
E31	0.90	0.76	0.75
E32	1.02	0.95	0.86
E33	0.95	0.79	0.81
E34	0.56	0.17	0.97
E35	10.90	9.18	2.43
E36	5.38	4.79	2.27
E37	2.60	2.53	2.53
E38	3.97	4.26	3.40
E39	3.09	3.33	3.60
E40	3.41	3.54	3.96
E41	-	-	0.18
E42	-	-	0.20

Table A2: Pre-Curfew Ecological Receptor Assessment Results – Non-event

ID	Predicted Model Illuminance at 0.75m Height (lux)	Predicted Model Illuminance at 1.5m Height (lux)	Predicted Model Illuminance at 5m Height (lux)
E1	0.09	0.09	0.09
E2	0.10	0.10	0.10
E3	0.10	0.10	0.10
E4	0.09	0.09	0.09
E5	0.08	0.08	0.08
E6	0.10	0.10	0.10
E7	0.08	0.08	0.08
E8	0.10	0.10	0.11
E9	0.11	0.11	0.11
E10	0.14	0.13	0.14
E11	0.14	0.14	0.15
E12	0.14	0.14	0.15
E13	0.55	0.55	0.45
E14	0.71	0.64	0.67
E15	0.20	0.19	0.20
E16	0.26	0.26	0.27
E17	0.25	0.25	0.25
E18	0.18	0.18	0.19
E19	0.17	0.17	0.18
E20	0.18	0.18	0.19
E21	0.19	0.19	0.19
E22	0.15	0.15	0.16
E23	0.17	0.17	0.18
E24	0.30	0.25	0.27
E25	0.31	0.25	0.28
E26	0.28	0.27	0.28
E27	0.32	0.38	0.40
E28	0.56	0.55	0.54
E29	0.48	0.47	0.46
E30	0.41	0.35	0.32
E31	0.32	0.32	0.32
E32	0.37	0.36	0.35
E33	0.31	0.32	0.33
E34	0.22	0.06	0.45
E35	5.40	2.53	0.85
E36	1.91	1.03	0.55
E37	0.56	0.54	0.55
E38	1.34	1.51	1.06
E39	0.60	0.60	0.66
E40	0.69	0.79	0.84
E41			0.10
E42			0.09

Appendix B – Proposed Floodlighting Products

The People's Project

Liverpool,North West

Lighting System

Pole / Fixture Summary

Pole ID	Pole Height	Mtg Height	Fixture Qty	Luminaire Type	Load	Circuit
A01, A02, A03, A04, B01, B02, B03, B04, B05, B06, B07, B08, B9-B17, C01, C02, C03, C04, D01, D02, D03, D04, E01, E02, E03, E04, E05, E06, E07, E08, E9-E17, F01, F02, F03, F04	--	35.2	4	TLC-LED-1400NB	5.60 kW	A
50			***200***		***280.00 kW***	

Circuit Summary

Circuit	Description	Load	Fixture Qty
A		280.0 kW	200

Fixture Type Summary

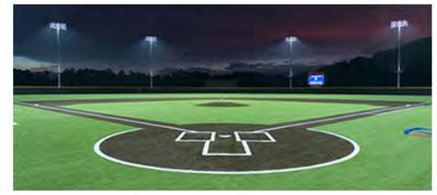
Type	Source	Wattage	Lumens	L90	L80	L70	Quantity
TLC-LED-1400NB	LED 5700K - 80 CRI	1400W	135,240	>81,000	>81,000	>81,000	200

Light Level Summary

Calculation Grid Summary

Grid Name	Calculation Metric	Illumination					Circuits	Fixture Qty
		Ave	Min	Max	Min/Max	Min/Ave		
Sky Glow	Sky Glow	0.51	0	5	0.00	0.00	A	200
The People's Project	01) Horizontal Illuminance	2034	1845	2395	0.77	0.91	A	200
The People's Project	02) Main Camera	1654	1371	1919	0.71	0.83	A	200
The People's Project	03) 270° Vertical	1508	1250	1743	0.72	0.83	A	200
The People's Project	04) 90° Vertical	1508	1250	1743	0.72	0.83	A	200
The People's Project	05) 180° Vertical	1312	1025	1532	0.67	0.78	A	200
The People's Project	06) 0° Vertical	1312	1025	1532	0.67	0.78	A	200
The People's Project	Glare Rating	41.1	40	42	0.94	0.97	A	200
The People's Project	Vertical Uniformity	0.76	1	1	0.75	1.32	A	200

From Hometown to Professional



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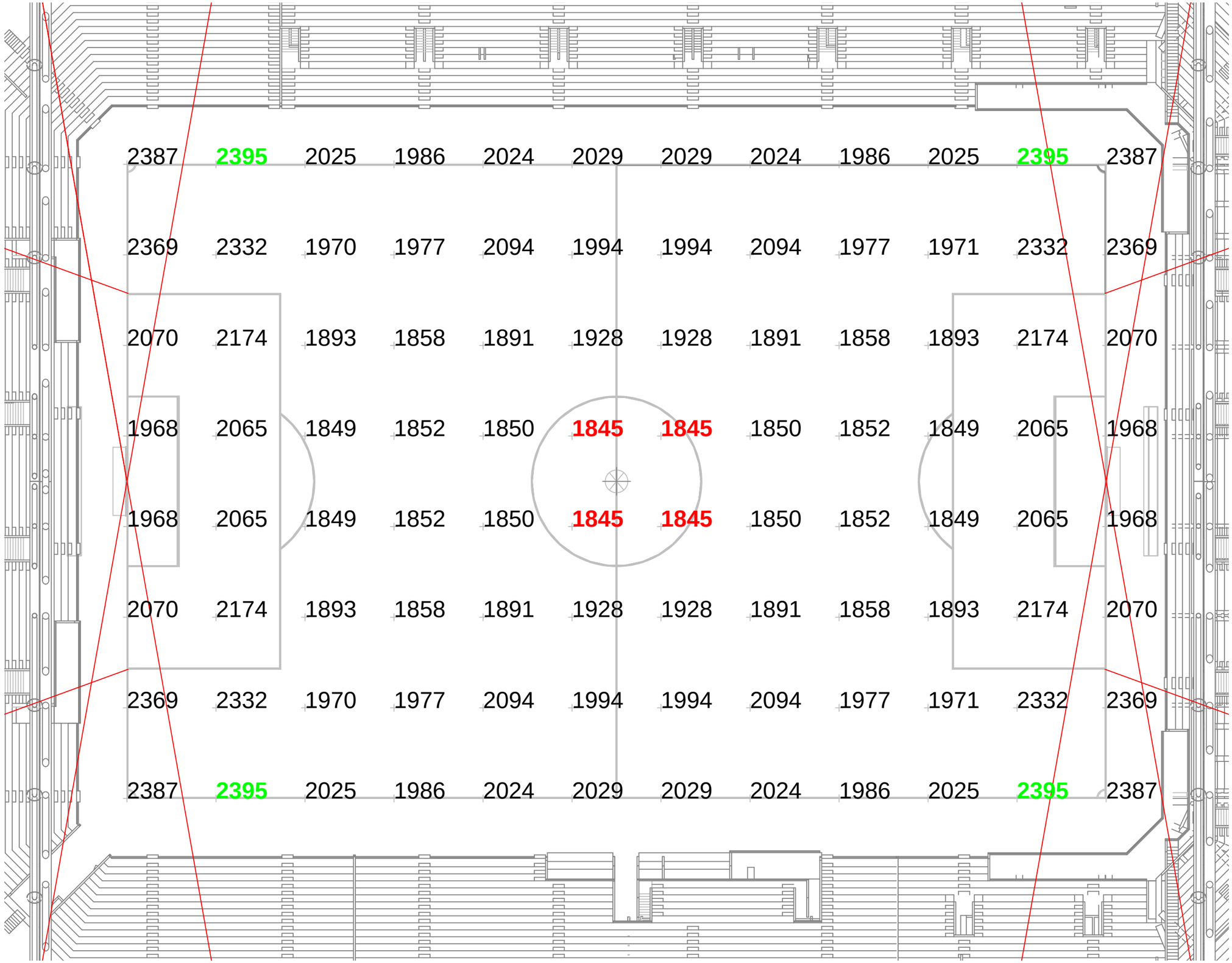

The People's Project

Liverpool,North West

GRID SUMMARY

Name:	**The People's Project**
Size:	105.0m x 68.0m
Spacing:	9.5m x 9.7m
Height:	1.0m above grade

ILLUMINATION SUMMARY

MAINTAINED HORIZONTAL LUX

	Entire Grid
Guaranteed Average:	**1650**
Scan Average:	2034.39
Maximum:	2395
Minimum:	1845
Guaranteed Min / Avg:	**0.7**
Min / Avg:	0.91
Min / Max:	**0.77**
UG (adjacent pts):	1.18
CU:	0.66
No. of Points:	96

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE 1 : 400

0 10m 20m

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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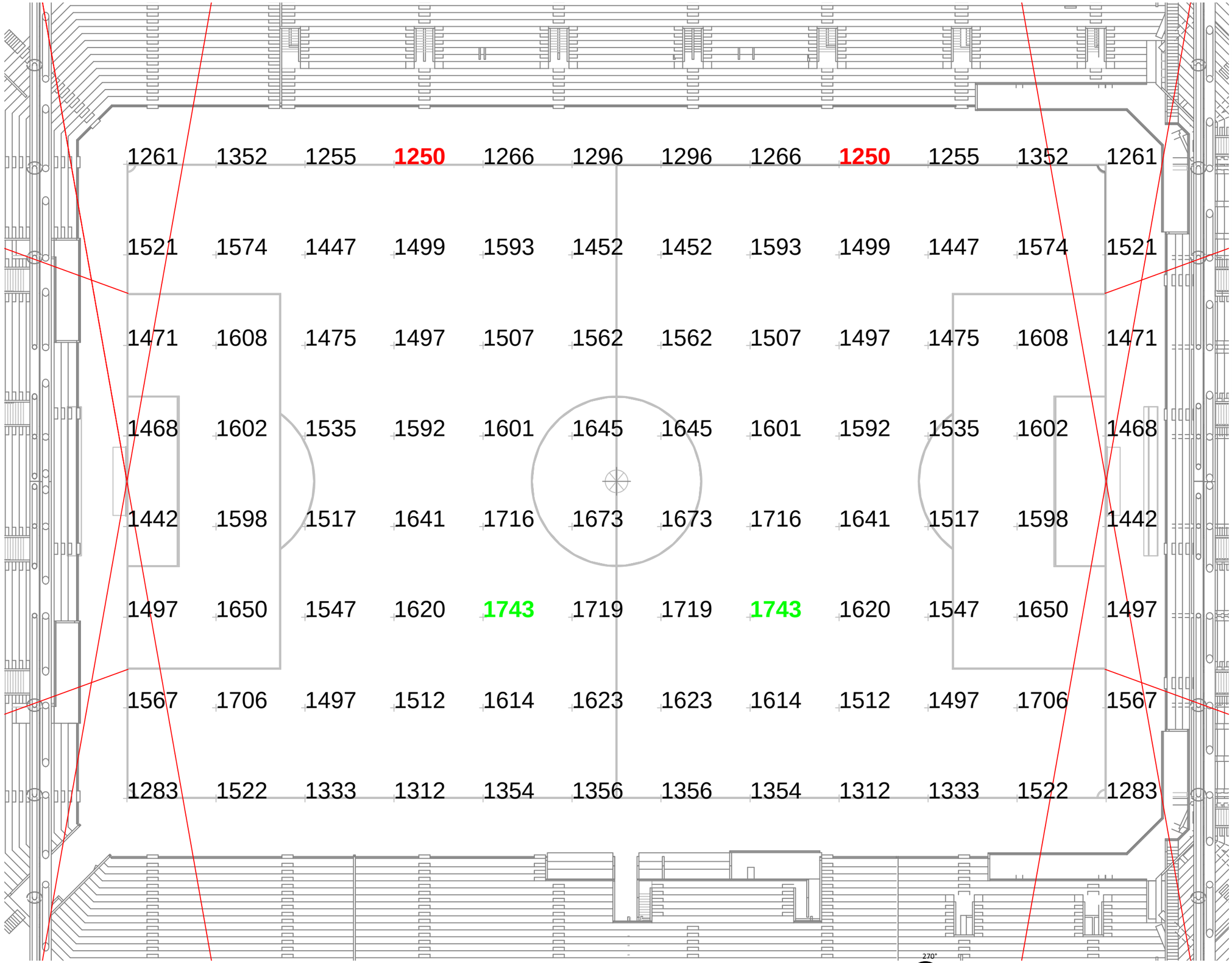

The People's Project

Liverpool,North West

GRID SUMMARY

Name:	**The People's Project**
Size:	105.0m x 68.0m
Spacing:	9.5m x 9.7m
Height:	1.0m above grade

ILLUMINATION SUMMARY

MAINTAINED VERTICAL LUX: 0° Tilt

	Entire Grid
Guaranteed Average:	**1250**
Scan Average:	1507.63
Maximum:	1743
Minimum:	1250
Guaranteed Min / Avg:	**0.6**
Min / Avg:	0.83
Min / Max:	**0.72**
UG (adjacent pts):	1.26
CU:	0.66
No. of Points:	96

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

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Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

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Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE 1 : 400

0 10m 20m

270° 180° 0° 90°
METER ORIENTATION

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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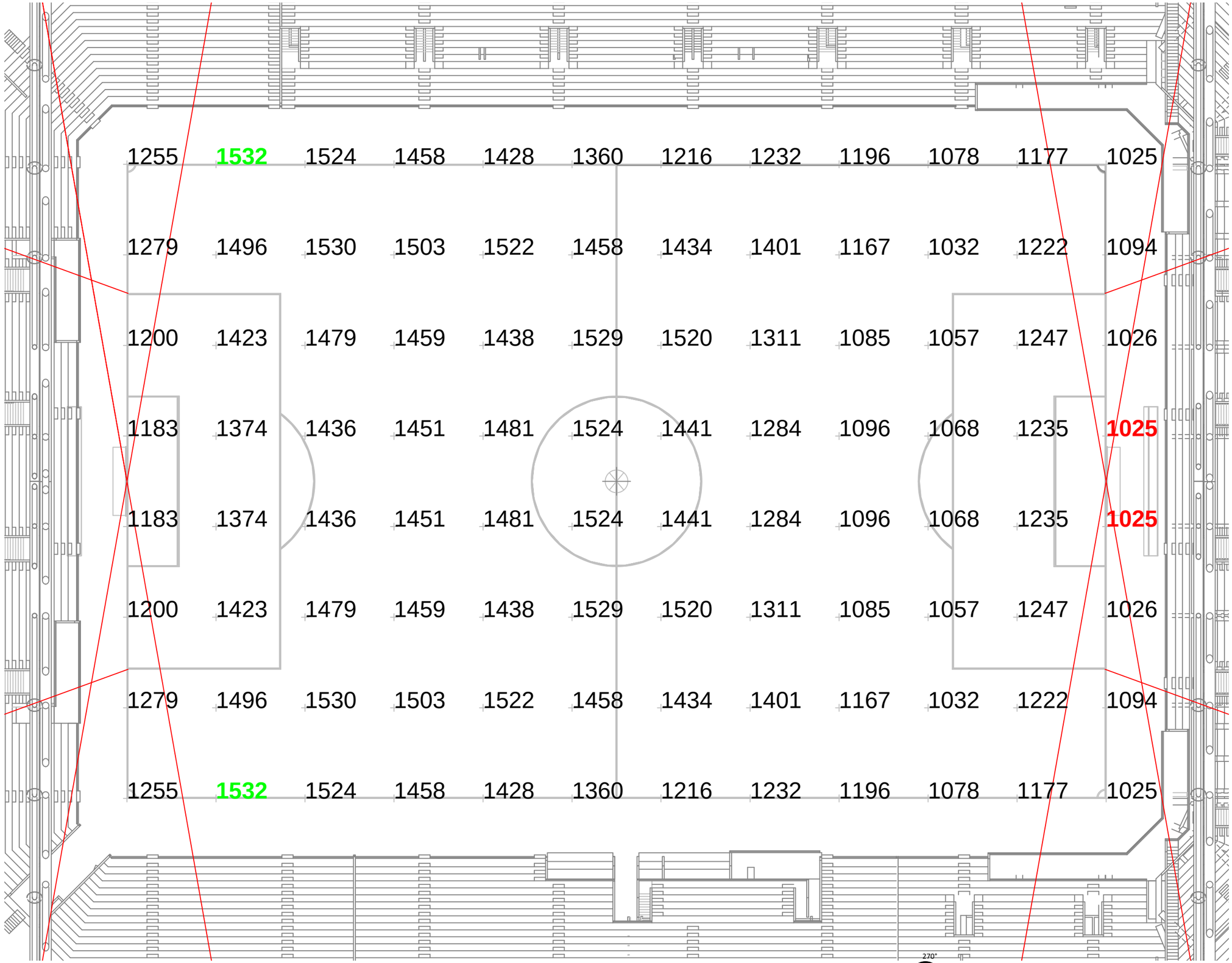

The People's Project

Liverpool,North West

GRID SUMMARY

Name:	**The People's Project**
Size:	105.0m x 68.0m
Spacing:	9.5m x 9.7m
Height:	1.0m above grade

ILLUMINATION SUMMARY

MAINTAINED VERTICAL LUX: 0° Tilt

	Entire Grid
Guaranteed Average:	**1250**
Scan Average:	1312.29
Maximum:	1532
Minimum:	1025
Guaranteed Min / Avg:	**0.6**
Min / Avg:	0.78
Min / Max:	**0.67**
UG (adjacent pts):	1.22
CU:	0.66
No. of Points:	96

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE 1 : 400

0 10m 20m

270° 180° 0° 90°
METER ORIENTATION

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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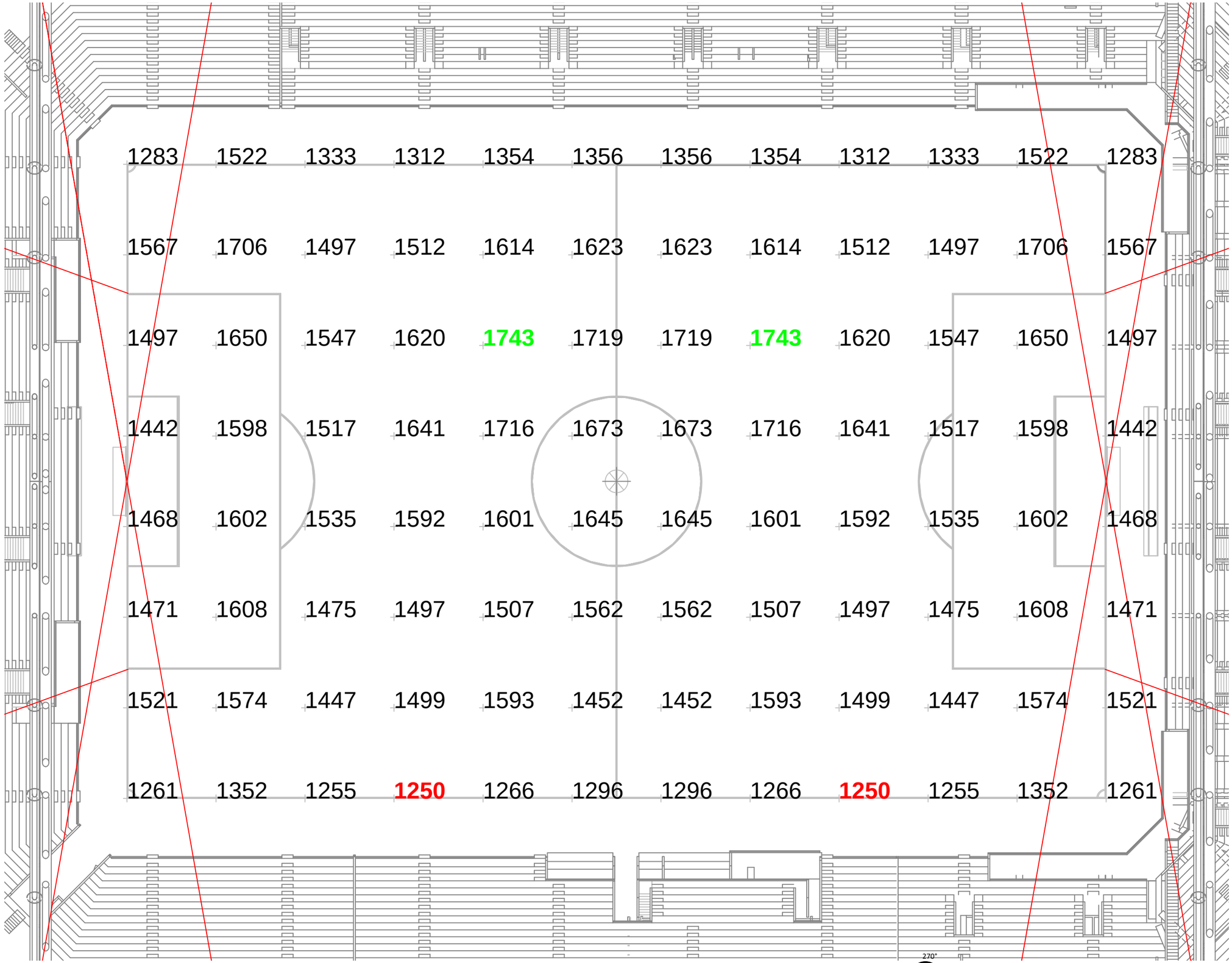

The People's Project

Liverpool,North West

GRID SUMMARY

Name:	**The People's Project**
Size:	105.0m x 68.0m
Spacing:	9.5m x 9.7m
Height:	1.0m above grade

ILLUMINATION SUMMARY

MAINTAINED VERTICAL LUX: 0° Tilt

	Entire Grid
Guaranteed Average:	**1250**
Scan Average:	1507.63
Maximum:	1743
Minimum:	1250
Guaranteed Min / Avg:	**0.6**
Min / Avg:	0.83
Min / Max:	**0.72**
UG (adjacent pts):	1.26
CU:	0.66
No. of Points:	96

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE 1 : 400

0 10m 20m

270° 180° 0° 90°
METER ORIENTATION

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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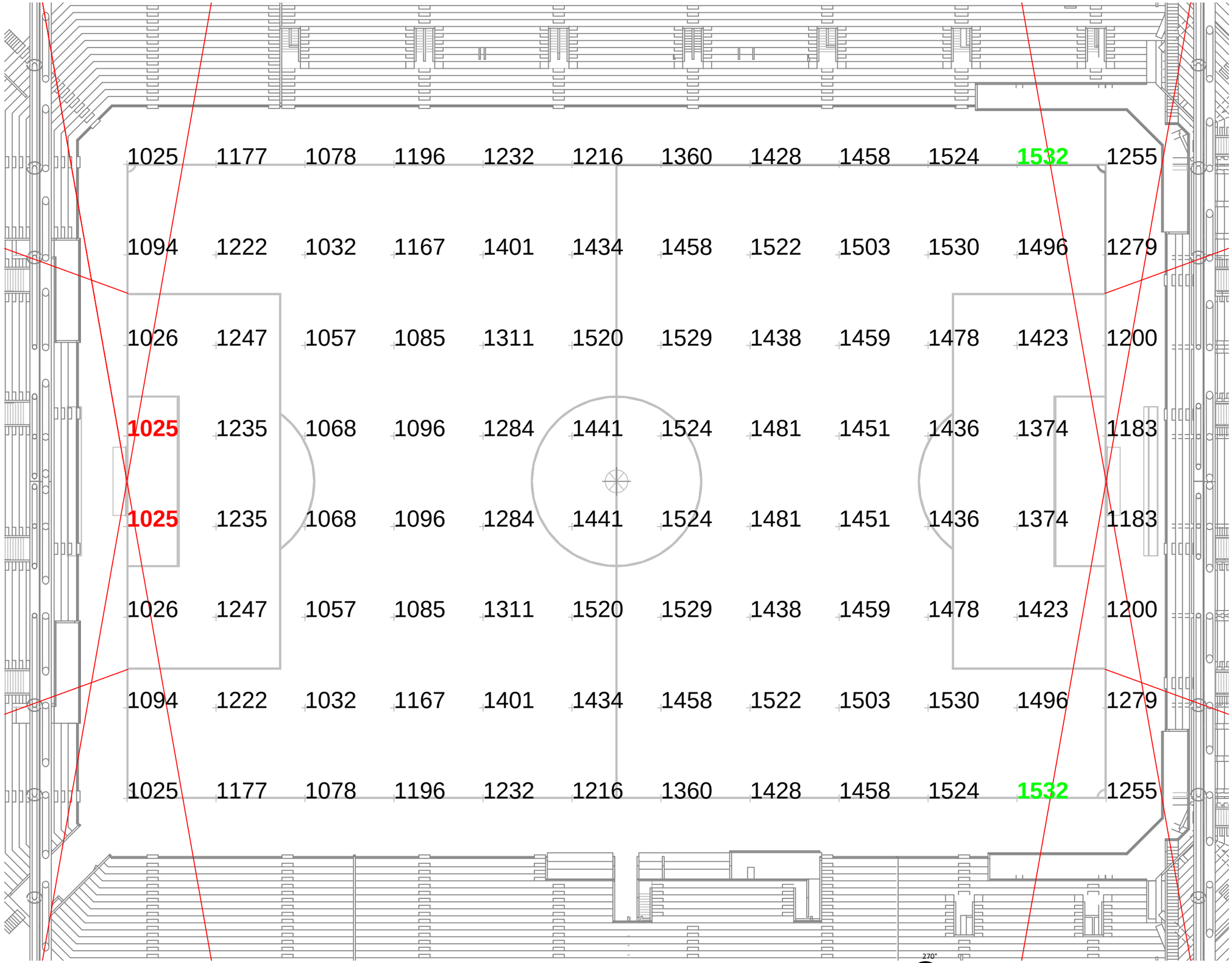

SCALE 1 : 400

0 10m 20m

270° 180° 0° 90°
METER ORIENTATION

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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The People's Project

Liverpool,North West

GRID SUMMARY

Name:	**The People's Project**
Size:	105.0m x 68.0m
Spacing:	9.5m x 9.7m
Height:	1.0m above grade

ILLUMINATION SUMMARY

MAINTAINED VERTICAL LUX: 0° Tilt

	Entire Grid
Guaranteed Average:	**1250**
Scan Average:	1312.29
Maximum:	1532
Minimum:	1025
Guaranteed Min / Avg:	**0.6**
Min / Avg:	0.78
Min / Max:	**0.67**
UG (adjacent pts):	1.22
CU:	0.66
No. of Points:	96

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

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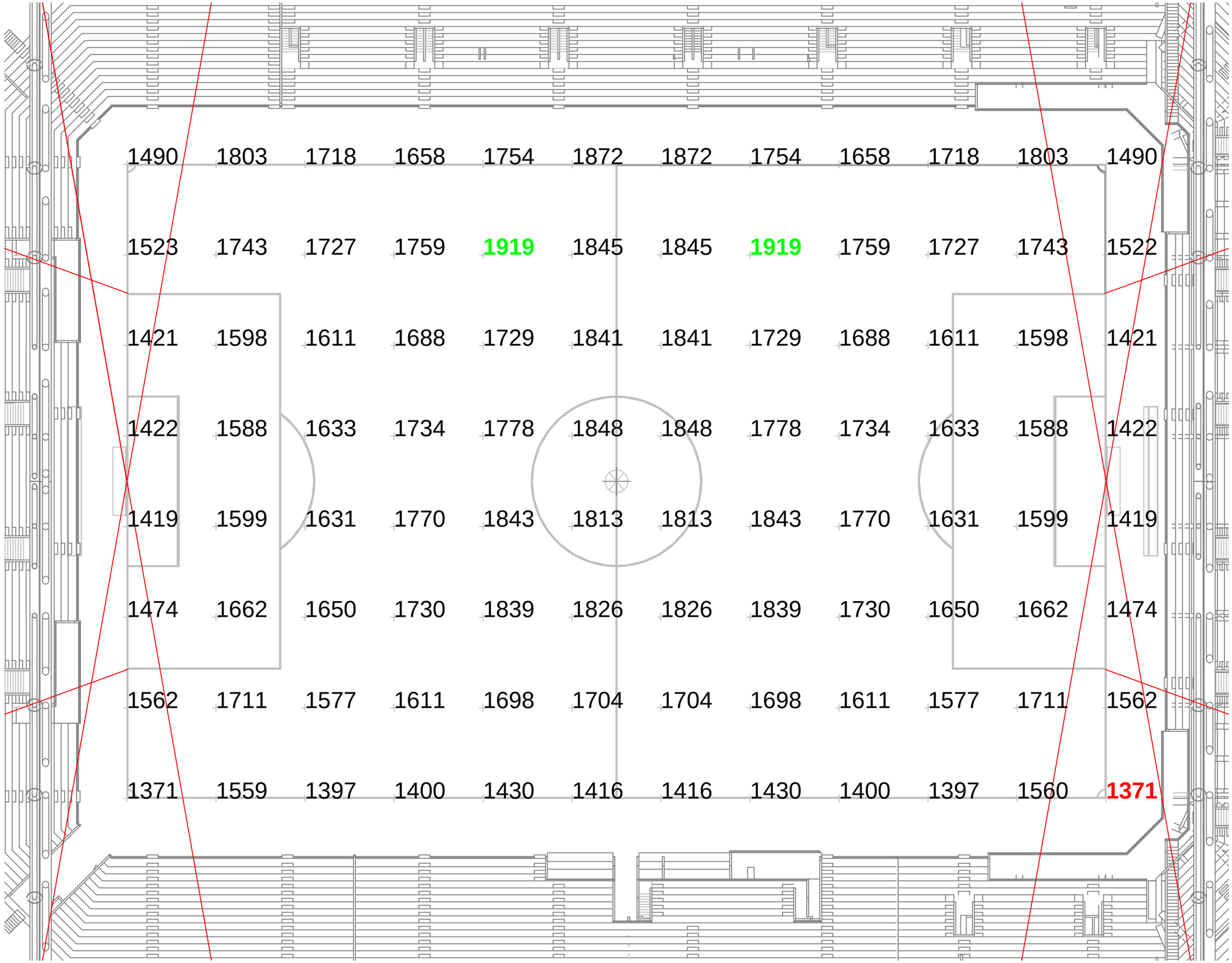

The People's Project

Liverpool,North West

GRID SUMMARY

Name:	**The People's Project**
Size:	105.0m x 68.0m
Spacing:	9.5m x 9.7m
Height:	1.0m above grade

ILLUMINATION SUMMARY

MAINTAINED TV LUX: 02) Main Camera

	Entire Grid
Guaranteed Average:	**1650**
Scan Average:	1654.09
Maximum:	1919
Minimum:	1371
Guaranteed Min / Avg:	**0.6**
Min / Avg:	0.83
Min / Max:	**0.71**
UG (adjacent pts):	1.21
CU:	0.66
No. of Points:	96

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE 1 : 400

0 10m 20m

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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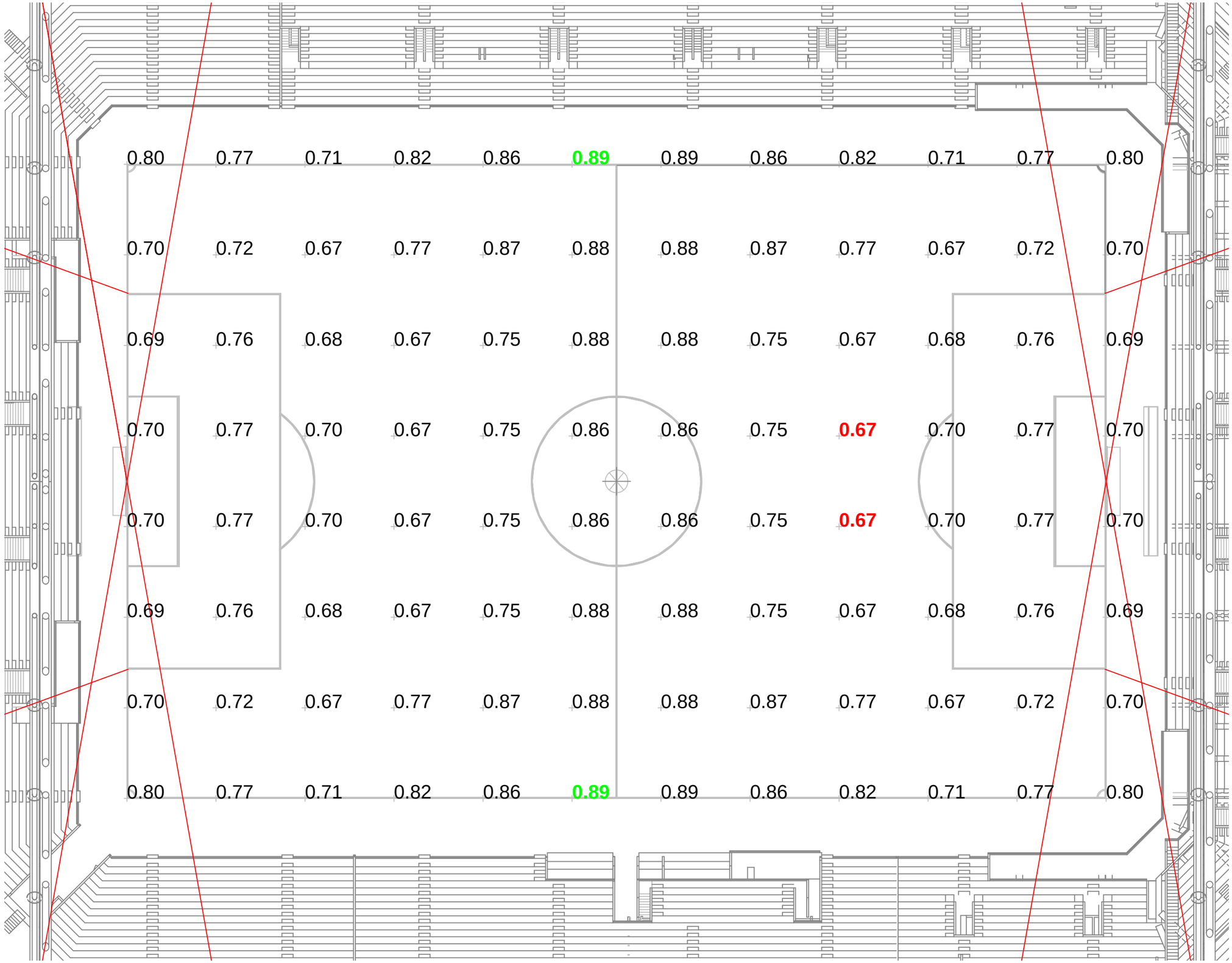

The People's Project

Liverpool,North West

GRID SUMMARY

Name:	**The People's Project**
Size:	105.0m x 68.0m
Spacing:	9.5m x 9.7m
Height:	1.0m above grade

ILLUMINATION SUMMARY

MAINTAINED LUX

	Entire Grid
Scan Average:	**0.76**
Maximum:	0.89
Minimum:	0.67
Min / Avg:	0.87
Min / Max:	**0.75**
UG (adjacent pts):	1.18
CU:	0.66
No. of Points:	96

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE 1 : 400

0 10m 20m

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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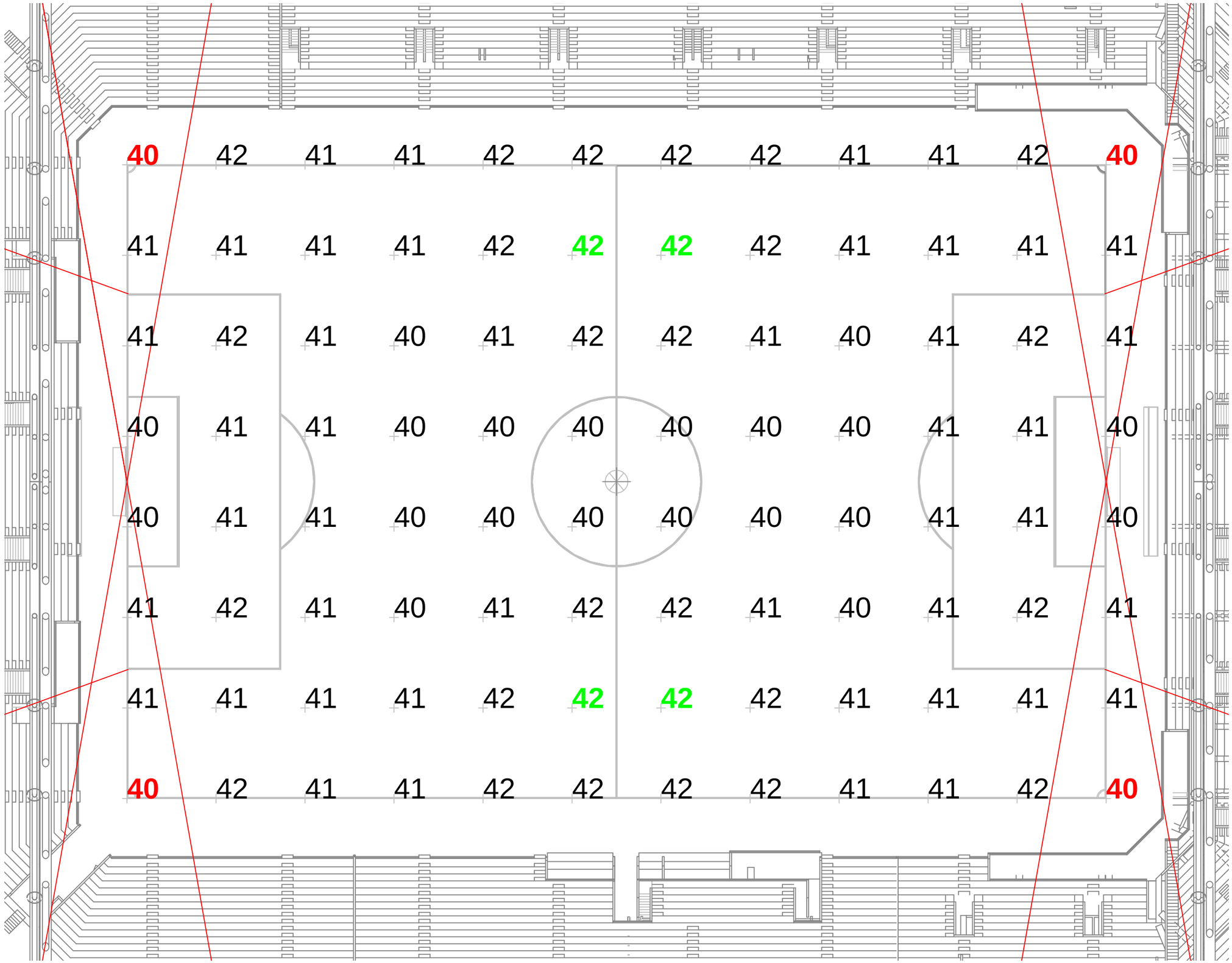

The People's Project

Liverpool,North West

GRID SUMMARY

Name:	**The People's Project**
Size:	105.0m x 68.0m
Spacing:	9.5m x 9.7m
Height:	1.0m above grade

ILLUMINATION SUMMARY

MAINTAINED GLARE RATING: Max Reading

	Entire Grid
Scan Average:	**41.09**
Guaranteed Maximum:	**50**
Maximum:	42
Minimum:	40
No. of Points:	96

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE 1 : 400

0 10m 20m

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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The People's Project

Liverpool,North West

GRID SUMMARY

Name:	**Sky Glow**
Spacing:	10.0m x 10.0m
Height:	37.0m above grade

ILLUMINATION SUMMARY

MAINTAINED VERTICAL LUX: -90° Tilt

	Entire Grid
Scan Average:	**0.51**
Maximum:	5
Minimum:	0
Min / Avg:	0.02
Min / Max:	**0.00**
UG (adjacent pts):	87.81
No. of Points:	441

LUMINAIRE INFORMATION

Color / CRI:	5700K - 80 CRI
Luminaire Output:	135,240 lumens
No. of Luminaires:	**200**
Total Load:	280.0 kW

Lumen Maintenance

Luminaire Type	L90 hrs	L80 hrs	L70 hrs
TLC-LED-1400NB	>81,000	>81,000	>81,000

Reported per TM-21-11. See luminaire datasheet for details.

Guaranteed Performance: The ILLUMINATION described above is guaranteed per your Musco Warranty document and includes a 0.95 dirt depreciation factor.

Field Measurements: Individual field measurements may vary from computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

SCALE 1 : 750

0 20m 40m

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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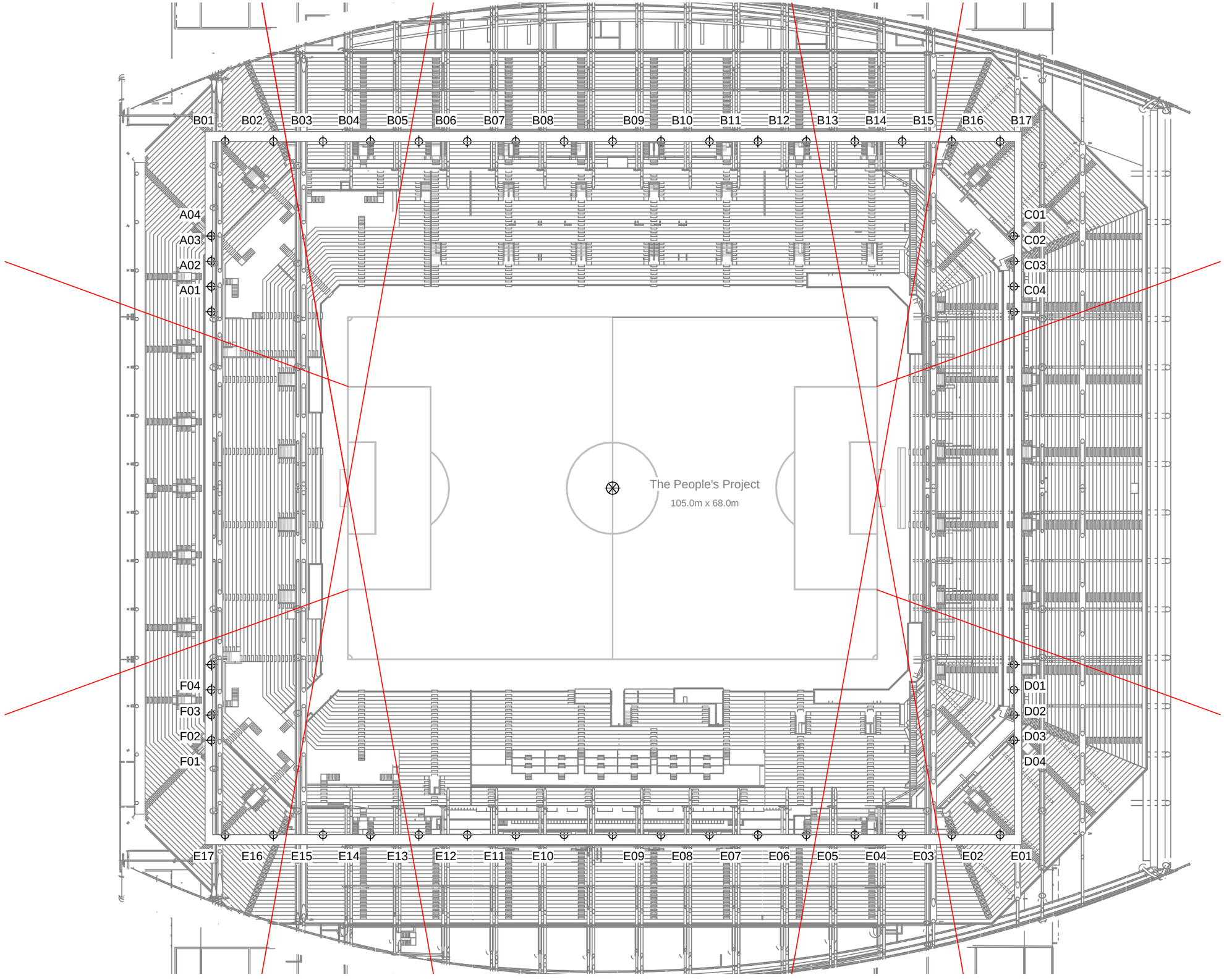

SCALE 1 : 750

0 20m 40m

Pole location(s) ⊕ dimensions are relative to 0,0 reference point(s) ⊗

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The People's Project

Liverpool,North West

EQUIPMENT LAYOUT

INCLUDES:

· The People's Project

Electrical System Requirements: Refer to Amperage Draw Chart and/or the **"Musco Control System Summary"** for electrical sizing.

Installation Requirements: Results assume ± 3% nominal voltage at line side of the driver and structures located within 3 feet (1m) of design locations.

EQUIPMENT LIST FOR AREAS SHOWN

Pole				Luminaires		
QTY	LOCATION	SIZE	GRADE ELEVATION	MOUNTING HEIGHT	LUMINAIRE TYPE	QTY / POLE
50	A01, A02 A03, A04 B01, B02 B03, B04 B05, B06 B07, B08 B09 B10-B17 C01, C02 C03, C04 D01, D02 D03, D04 E01, E02 E03, E04 E05, E06 E07, E08 E09 E10-E17 F01, F02 F03, F04		35.15m	35.15m	TLC-LED-1400NB	4
50	TOTALS					200

SINGLE LUMINAIRE AMPERAGE DRAW CHART

Ballast Specifications (.90 min power factor)	Line Amperage Per Luminaire (max draw)					
Single Phase Voltage	220 (50)	230 (50)	240 (50)	380 (50)	400 (50)	415 (50)
TLC-LED-1400	7.4	7.1	6.8	4.3	4.1	3.9

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Pole ID	Dimensioned From	Pole Location		Light Bank Mounting Height	Reflector NEMA Type	Number	Aiming Point			Aiming Angle		Circuit
		X	Y				X	Y	Z	HOR	VER	
A01	The People's Project	-79.50	35.00	35.15	2	1	-49.99	-32.02	0.00	L 65.9	26.39	A
					3	4	-45.00	30.99	0.00	L 9.1	45.68	A
					3	2	-45.96	-4.02	0.00	L 49.1	34.94	A
					3	3	-24.95	10.00	0.00	L 25.1	30.66	A
A02	The People's Project	-79.50	40.00	35.15	2	5	-45.97	-25.96	0.00	L 62.6	26.13	A
					2	8	-9.98	31.02	0.00	L 8.6	26.92	A
					3	6	-34.97	4.03	0.00	L 38.6	32.08	A
					2	7	10.04	6.03	0.00	L 21.1	20.39	A
A03	The People's Project	-79.50	45.00	35.15	3	9	-48.05	-9.05	0.00	L 59.2	30.21	A
					2	12	15.02	15.03	0.00	L 18.4	19.70	A
					3	10	-44.97	14.92	0.00	L 40.7	38.14	A
					3	11	-49.95	32.95	0.00	L 23.1	48.09	A
A04	The People's Project	-79.50	50.00	35.15	3	13	-48.97	7.02	0.00	L 53.8	34.71	A
					2	16	20.03	32.01	0.00	L 11.1	19.38	A
					3	14	-49.97	29.99	0.00	L 33.6	45.28	A
					3	15	-26.02	28.00	0.00	L 22.9	31.60	A
B01	The People's Project	-76.80	68.75	35.15	2	17	-35.98	-30.05	0.00	R 23.2	18.36	A
					3	20	-19.95	29.98	0.00	R 55.1	27.82	A
					3	18	-49.89	24.92	0.00	R 32.1	34.63	A
					2	19	-4.89	-15.02	0.00	R 40.5	17.95	A
B02	The People's Project	-67.20	68.75	35.15	2	21	-51.97	-32.01	0.00	R 9.4	19.25	A
					2	24	17.98	25.99	0.00	R 63.0	20.77	A
					2	22	5.03	-10.07	0.00	R 42.8	18.39	A
					3	23	-14.91	24.98	0.00	R 49.9	27.74	A
B03	The People's Project	-57.40	68.75	35.15	3	25	-44.96	19.97	0.00	R 16.0	35.15	A
					2	28	45.13	34.91	0.00	R 71.6	18.49	A
					2	26	-5.00	-30.01	0.00	R 28.2	17.65	A
					2	27	4.95	5.01	0.00	R 44.2	21.88	A
B04	The People's Project	-48.00	68.75	35.15	2	29	-24.96	-30.02	0.00	R 14.0	19.31	A
					2	32	40.04	9.93	0.00	R 55.9	18.81	A
					2	30	2.99	-29.99	0.00	R 27.6	17.76	A
					2	31	28.97	-9.99	0.00	R 44.2	17.99	A
B05	The People's Project	-38.40	68.75	35.15	3	33	-51.97	29.97	0.00	L 17.3	41.35	A
					2	36	39.98	29.00	0.00	R 62.7	22.38	A
					2	34	-16.98	-29.99	0.00	R 12.5	19.42	A
					2	35	12.98	-29.99	0.00	R 27.3	17.80	A
B06	The People's Project	-28.80	68.75	35.15	2	37	-50.04	-31.03	0.00	L 11.2	19.32	A
					2	40	51.01	34.98	0.00	R 66.8	22.68	A
					2	38	-8.99	-29.99	0.00	R 11.6	19.48	A
					2	39	39.93	-0.06	0.00	R 44.8	20.20	A
B07	The People's Project	-19.20	68.75	35.15	3	41	-42.02	29.97	0.00	L 28.9	38.91	A
					2	44	51.03	9.96	0.00	R 49.5	21.52	A
					2	42	-45.97	-30.98	0.00	L 14.8	19.08	A
					2	43	20.99	-30.01	0.00	R 21.9	18.52	A
B08	The People's Project	-9.60	68.75	35.15	2	45	-30.98	-29.99	0.00	L 11.4	19.50	A
					3	48	50.99	29.99	0.00	R 56.8	26.77	A
					3	46	4.98	30.01	0.00	R 21.3	40.68	A
					2	47	40.08	-30.00	0.00	R 26.5	17.91	A
B09	The People's Project	0.00	68.75	35.15	3	49	-28.03	29.97	0.00	L 34.5	37.24	A
					3	52	28.03	29.97	0.00	R 34.5	37.24	A
					3	50	-13.98	30.01	0.00	L 19.3	41.06	A
					3	51	13.98	30.01	0.00	R 19.3	41.06	A
B10	The People's Project	9.60	68.75	35.15	3	53	-50.99	29.99	0.00	L 56.8	26.77	A
					2	56	30.98	-29.99	0.00	R 11.4	19.50	A
					2	54	-40.08	-30.00	0.00	L 26.5	17.91	A
					3	55	-4.98	30.01	0.00	L 21.3	40.68	A
B11	The People's Project	19.20	68.75	35.15	2	57	-51.03	9.96	0.00	L 49.5	21.52	A
					3	60	42.02	29.97	0.00	R 28.9	38.91	A
					2	58	-20.99	-30.01	0.00	L 21.9	18.52	A
					2	59	45.97	-30.98	0.00	R 14.8	19.08	A
B12	The People's Project	28.80	68.75	35.15	2	61	-51.01	34.98	0.00	L 66.8	22.68	A
					2	64	50.04	-31.03	0.00	R 11.2	19.32	A
					2	62	-39.93	-0.06	0.00	L 44.8	20.20	A
					2	63	8.99	-29.99	0.00	L 11.6	19.48	A
B13	The People's Project	38.40	68.75	35.15	2	65	-39.98	29.00	0.00	L 62.7	22.38	A

The People's Project

Liverpool,North West

Zone Description	Circuits
Zone1	A

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Pole ID	Dimensioned From	Pole Location		Light Bank Mounting Height	Reflector NEMA Type	Number	Aiming Point			Aiming Angle		Circuit
		X	Y				X	Y	Z	HOR	VER	
					3	68	51.97	29.97	0.00	R 17.3	41.35	A
					2	66	-12.98	-29.99	0.00	L 27.3	17.80	A
					2	67	16.98	-29.99	0.00	L 12.5	19.42	A
B14	The People's Project	48.00	68.75	35.15	2	69	-40.04	9.93	0.00	L 55.9	18.81	A
					2	72	24.96	-30.02	0.00	L 14.0	19.31	A
					2	70	-28.97	-9.99	0.00	L 44.2	17.99	A
					2	71	-2.99	-29.99	0.00	L 27.6	17.76	A
B15	The People's Project	57.40	68.75	35.15	2	73	-45.13	34.91	0.00	L 71.6	18.49	A
					3	76	44.96	19.97	0.00	L 16.0	35.15	A
					2	74	-4.95	5.01	0.00	L 44.2	21.88	A
					2	75	5.00	-30.01	0.00	L 28.2	17.65	A
B16	The People's Project	67.20	68.75	35.15	2	77	-17.98	25.99	0.00	L 63.0	20.77	A
					2	80	51.97	-32.01	0.00	L 9.4	19.25	A
					3	78	14.91	24.98	0.00	L 49.9	27.74	A
					2	79	-5.03	-10.07	0.00	L 42.8	18.39	A
B17	The People's Project	76.80	68.75	35.15	3	81	19.95	29.98	0.00	L 55.1	27.82	A
					2	84	35.98	-30.05	0.00	L 23.2	18.36	A
					2	82	4.89	-15.02	0.00	L 40.5	17.95	A
					3	83	49.89	24.92	0.00	L 32.1	34.63	A
C01	The People's Project	79.50	50.00	35.15	2	85	-20.03	32.01	0.00	R 11.1	19.38	A
					3	88	48.97	7.02	0.00	R 53.8	34.71	A
					3	86	26.02	28.00	0.00	R 22.9	31.60	A
					3	87	49.97	29.99	0.00	R 33.6	45.28	A
C02	The People's Project	79.50	45.00	35.15	2	89	-15.02	15.03	0.00	R 18.4	19.70	A
					3	92	48.05	-9.05	0.00	R 59.2	30.21	A
					3	90	49.95	32.95	0.00	R 23.1	48.09	A
					3	91	44.97	14.92	0.00	R 40.7	38.14	A
C03	The People's Project	79.50	40.00	35.15	2	93	9.98	31.02	0.00	R 8.6	26.92	A
					2	96	45.97	-25.96	0.00	R 62.6	26.13	A
					2	94	-10.04	6.03	0.00	R 21.1	20.39	A
					3	95	34.97	4.03	0.00	R 38.6	32.08	A
C04	The People's Project	79.50	35.00	35.15	3	97	45.00	30.99	0.00	R 9.1	45.68	A
					2	100	49.99	-32.02	0.00	R 65.9	26.39	A
					3	98	24.95	10.00	0.00	R 25.1	30.66	A
					3	99	45.96	-4.02	0.00	R 49.1	34.94	A
D01	The People's Project	79.50	-35.00	35.15	2	101	49.99	32.02	0.00	L 65.9	26.39	A
					3	104	45.00	-30.99	0.00	L 9.1	45.68	A
					3	102	45.96	4.02	0.00	L 49.1	34.94	A
					3	103	24.95	-10.00	0.00	L 25.1	30.66	A
D02	The People's Project	79.50	-40.00	35.15	2	105	45.97	25.96	0.00	L 62.6	26.13	A
					2	108	9.98	-31.02	0.00	L 8.6	26.92	A
					3	106	34.97	-4.03	0.00	L 38.6	32.08	A
					2	107	-10.04	-6.03	0.00	L 21.1	20.39	A
D03	The People's Project	79.50	-45.00	35.15	3	109	48.05	9.05	0.00	L 59.2	30.21	A
					2	112	-15.02	-15.03	0.00	L 18.4	19.70	A
					3	110	44.97	-14.92	0.00	L 40.7	38.14	A
					3	111	49.95	-32.95	0.00	L 23.1	48.09	A
D04	The People's Project	79.50	-50.00	35.15	3	113	48.97	-7.02	0.00	L 53.8	34.71	A
					2	116	-20.03	-32.01	0.00	L 11.1	19.38	A
					3	114	49.97	-29.99	0.00	L 33.6	45.28	A
					3	115	26.02	-28.00	0.00	L 22.9	31.60	A
E01	The People's Project	76.80	-68.75	35.15	2	117	35.98	30.05	0.00	R 23.2	18.36	A
					3	120	19.95	-29.98	0.00	R 55.1	27.82	A
					3	118	49.89	-24.92	0.00	R 32.1	34.63	A
					2	119	4.89	15.02	0.00	R 40.5	17.95	A
E02	The People's Project	67.20	-68.75	35.15	2	121	51.97	32.01	0.00	R 9.4	19.25	A
					2	124	-17.98	-25.99	0.00	R 63.0	20.77	A
					2	122	-5.03	10.07	0.00	R 42.8	18.39	A
					3	123	14.91	-24.98	0.00	R 49.9	27.74	A
E03	The People's Project	57.40	-68.75	35.15	3	125	44.96	-19.97	0.00	R 16.0	35.15	A
					2	128	-45.13	-34.91	0.00	R 71.6	18.49	A
					2	126	5.00	30.01	0.00	R 28.2	17.65	A
					2	127	-4.95	-5.01	0.00	R 44.2	21.88	A

The People's Project

Liverpool,North West

Zone Description	Circuits
Zone1	A

ENGINEERED DESIGN By: Nick Rohrer • File #187772B • 03-Dec-19

Pole ID	Dimensioned From	Pole Location		Light Bank Mounting Height	Reflector NEMA Type	Number	Aiming Point			Aiming Angle		Circuit
		X	Y				X	Y	Z	HOR	VER	
E04	The People's Project	48.00	-68.75	35.15	2	129	24.96	30.02	0.00	R 14.0	19.31	A
					2	132	-40.04	-9.93	0.00	R 55.9	18.81	A
					2	130	-2.99	29.99	0.00	R 27.6	17.76	A
					2	131	-28.97	9.99	0.00	R 44.2	17.99	A
E05	The People's Project	38.40	-68.75	35.15	3	133	51.97	-29.97	0.00	L 17.3	41.35	A
					2	136	-39.98	-29.00	0.00	R 62.7	22.38	A
					2	134	16.98	29.99	0.00	R 12.5	19.42	A
					2	135	-12.98	29.99	0.00	R 27.3	17.80	A
E06	The People's Project	28.80	-68.75	35.15	2	137	50.04	31.03	0.00	L 11.2	19.32	A
					2	140	-51.01	-34.98	0.00	R 66.8	22.68	A
					2	138	8.99	29.99	0.00	R 11.6	19.48	A
					2	139	-39.93	0.06	0.00	R 44.8	20.20	A
E07	The People's Project	19.20	-68.75	35.15	3	141	42.02	-29.97	0.00	L 28.9	38.91	A
					2	144	-51.03	-9.96	0.00	R 49.5	21.52	A
					2	142	45.97	30.98	0.00	L 14.8	19.08	A
					2	143	-20.99	30.01	0.00	R 21.9	18.52	A
E08	The People's Project	9.60	-68.75	35.15	2	145	30.98	29.99	0.00	L 11.4	19.50	A
					3	148	-50.99	-29.99	0.00	R 56.8	26.77	A
					3	146	-4.98	-30.01	0.00	R 21.3	40.68	A
					2	147	-40.08	30.00	0.00	R 26.5	17.91	A
E09	The People's Project	0.00	-68.75	35.15	3	149	28.03	-29.97	0.00	L 34.5	37.24	A
					3	152	-28.03	-29.97	0.00	R 34.5	37.24	A
					3	150	13.98	-30.01	0.00	L 19.3	41.06	A
					3	151	-13.98	-30.01	0.00	R 19.3	41.06	A
E10	The People's Project	-9.60	-68.75	35.15	3	153	50.99	-29.99	0.00	L 56.8	26.77	A
					2	156	-30.98	29.99	0.00	R 11.4	19.50	A
					2	154	40.08	30.00	0.00	L 26.5	17.91	A
					3	155	4.98	-30.01	0.00	L 21.3	40.68	A
E11	The People's Project	-19.20	-68.75	35.15	2	157	51.03	-9.96	0.00	L 49.5	21.52	A
					3	160	-42.02	-29.97	0.00	R 28.9	38.91	A
					2	158	20.99	30.01	0.00	L 21.9	18.52	A
					2	159	-45.97	30.98	0.00	R 14.8	19.08	A
E12	The People's Project	-28.80	-68.75	35.15	2	161	51.01	-34.98	0.00	L 66.8	22.68	A
					2	164	-50.04	31.03	0.00	R 11.2	19.32	A
					2	162	39.93	0.06	0.00	L 44.8	20.20	A
					2	163	-8.99	29.99	0.00	L 11.6	19.48	A
E13	The People's Project	-38.40	-68.75	35.15	2	165	39.98	-29.00	0.00	L 62.7	22.38	A
					3	168	-51.97	-29.97	0.00	R 17.3	41.35	A
					2	166	12.98	29.99	0.00	L 27.3	17.80	A
					2	167	-16.98	29.99	0.00	L 12.5	19.42	A
E14	The People's Project	-48.00	-68.75	35.15	2	169	40.04	-9.93	0.00	L 55.9	18.81	A
					2	172	-24.96	30.02	0.00	L 14.0	19.31	A
					2	170	28.97	9.99	0.00	L 44.2	17.99	A
					2	171	2.99	29.99	0.00	L 27.6	17.76	A
E15	The People's Project	-57.40	-68.75	35.15	2	173	45.13	-34.91	0.00	L 71.6	18.49	A
					3	176	-44.96	-19.97	0.00	L 16.0	35.15	A
					2	174	4.95	-5.01	0.00	L 44.2	21.88	A
					2	175	-5.00	30.01	0.00	L 28.2	17.65	A
E16	The People's Project	-67.20	-68.75	35.15	2	177	17.98	-25.99	0.00	L 63.0	20.77	A
					2	180	-51.97	32.01	0.00	L 9.4	19.25	A
					3	178	-14.91	-24.98	0.00	L 49.9	27.74	A
					2	179	5.03	10.07	0.00	L 42.8	18.39	A
E17	The People's Project	-76.80	-68.75	35.15	3	181	-19.95	-29.98	0.00	L 55.1	27.82	A
					2	184	-35.98	30.05	0.00	L 23.2	18.36	A
					2	182	-4.89	15.02	0.00	L 40.5	17.95	A
					3	183	-49.89	-24.92	0.00	L 32.1	34.63	A
F01	The People's Project	-79.50	-50.00	35.15	2	185	20.03	-32.01	0.00	R 11.1	19.38	A
					3	188	-48.97	-7.02	0.00	R 53.8	34.71	A
					3	186	-26.02	-28.00	0.00	R 22.9	31.60	A
					3	187	-49.97	-29.99	0.00	R 33.6	45.28	A
F02	The People's Project	-79.50	-45.00	35.15	2	189	15.02	-15.03	0.00	R 18.4	19.70	A
					3	192	-48.05	9.05	0.00	R 59.2	30.21	A
					3	190	-49.95	-32.95	0.00	R 23.1	48.09	A

The People's Project

Liverpool,North West

Zone Description	Circuits
Zone1	A

ENGINEERED DESIGN By: Nick Rohrer • File #187772B • 03-Dec-19

Pole ID	Dimensioned From	Pole Location		Light Bank Mounting Height	Reflector NEMA Type	Number	Aiming Point			Aiming Angle		Circuit
		X	Y				X	Y	Z	HOR	VER	
					3	191	-44.97	-14.92	0.00	R 40.7	38.14	A
F03	The People's Project	-79.50	-40.00	35.15	2	193	-9.98	-31.02	0.00	R 8.6	26.92	A
					2	196	-45.97	25.96	0.00	R 62.6	26.13	A
					2	194	10.04	-6.03	0.00	R 21.1	20.39	A
					3	195	-34.97	-4.03	0.00	R 38.6	32.08	A
F04	The People's Project	-79.50	-35.00	35.15	3	197	-45.00	-30.99	0.00	R 9.1	45.68	A
					2	200	-49.99	32.02	0.00	R 65.9	26.39	A
					3	198	-24.95	-10.00	0.00	R 25.1	30.66	A
					3	199	-45.96	4.02	0.00	R 49.1	34.94	A

The People's Project

Liverpool,North West

Zone Description	Circuits
Zone1	A

Light-Structure Green™ – 228NB 1400 LED Luminaire

Appendix C – Façade Lighting Products

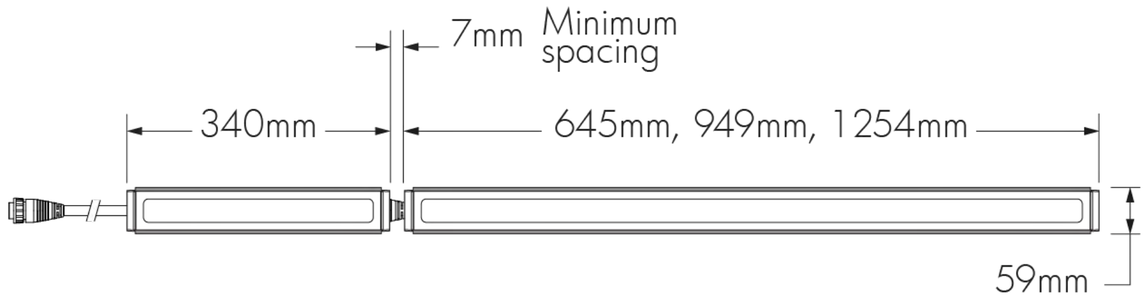
Specification Sheet

lumenfacade
LOG

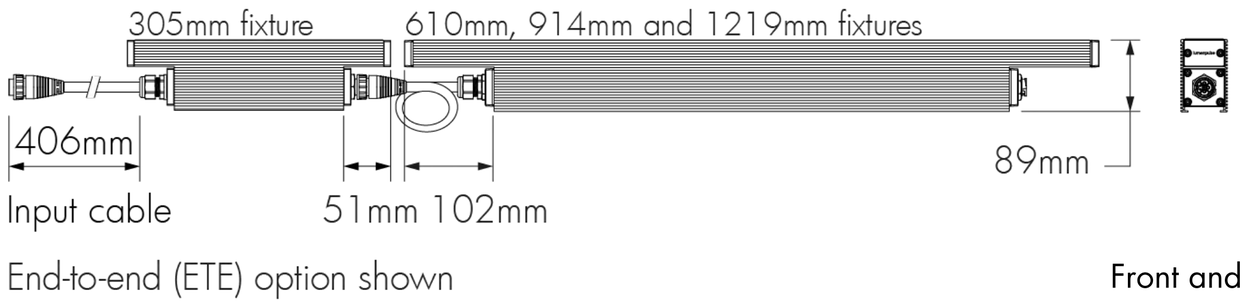
WHITE AND STATIC COLOURS

Project Name _____ **Qty** _____

Type _____ **Catalog / Part Number** _____



Top view



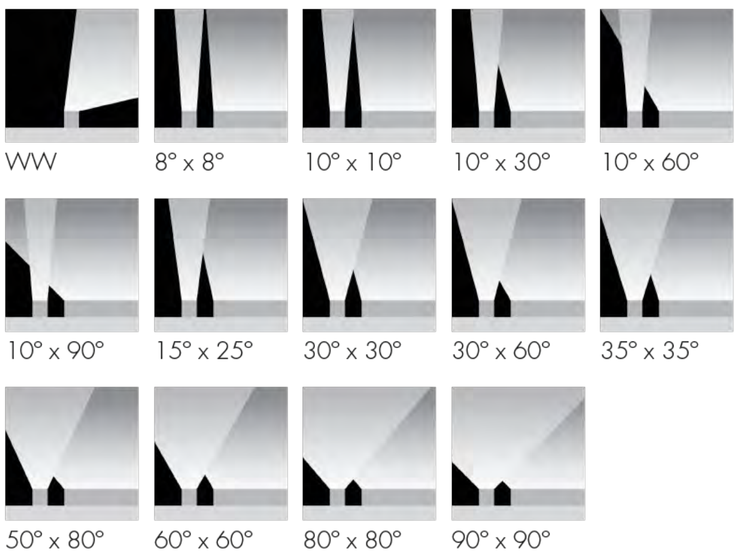
Front and side views

Photometric Summary

	Delivered output (lm)	Intensity (peak cd)
WW	3,592	5,159
8°x8°	4,045	77,896
10°x10°	3,768*	38,346*
10°x30°	3,830	30,056
10°x60°	3,692	19,654
10°x90°	3,576	7,897
30°x30°	3,765	14,726
30°x60°	3,862*	5,119*
60°x60°	3,447*	3,015*
90°x90°	3,592	1,886

Based on HO 4000K, 4ft [1219mm] configuration.
Photometric performance is measured in compliance with IESNA LM-79-08.
*Estimated. Consult website for the latest photometric files.

Optics



Colours and Colour Temperatures

Description

The Lumenfacade is a high-performance linear LED luminaire for grazing or floodlighting exterior walls and facades. Featuring second generation LED technology, the luminaire is available in 305 mm, 610 mm, 914 mm or 1219 mm sections, and can be configured with a wide number of options, including: optics for grazing or flood lighting; a choice of outputs (ASHRAE 16.4 W/m, RO 27.89 W/m or HO 50.03 W/m); various colour temperatures or static colours; various mounting options, finishes, accessories and controls. The Lumenfacade is also available with a unique asymmetric wallwash distribution, providing exceptional uniformity and brightness for walls and signage.

Features

Colour and Colour Temperature	2200K, 2700K, 3000K, 3500K, 4000K, Red, Green, Blue
Length (nominal)	305 mm, 610 mm, 914 mm, 1219 mm
Optics	Asymmetric Wallwash, 8° x 8°, 10° x 10°, 10° x 30°, 10° x 60°, 10° x 90°, 15° x 25°, 30° x 30°, 30° x 60°, 35° x 35°, 50° x 80°, 60° x 60°, 80° x 80°, 90° x 90°
Options	End-to-end configuration (factory installed 16 in black input cable included), Corrosion-resistant coating for hostile environments, 3G ANSI C136.31 Vibration Rating for bridge applications, CE (certification covers European Economic Area)
Power Consumption	16.4 W/m (meets ASHRAE standards for linear lighting on building facades - not available for 305 mm fixture lengths), 27.89 W/m (RO version), 50.03 W/m (HO version), Typically 20% higher for 305 mm fixture lengths
Warranty	5-year limited warranty

Performance

Illuminance at Distance	Minimum 1 lx at 140 m (HO 4000K, 1219 mm fixture, 10° x 60°, DMX/RDM)
Colour Consistency	2 SDCM, 3 SDCM (2200K)
Colour Rendering	Minimum CRI 80
Lumen Maintenance	L80 B10 100,000 hrs, L80 B50 160,000 hrs

lumenpulse™
11/13 Weston Street, Unit no 13.3.2 London, SE1 3ER GB **T** +44 (0) 2031 765370
info@lumenpulse.com **www.lumenpulsegroup.com** **www.lumenpulse.com/products/1046/lumenfacade**

Controls

ON/OFF 1-10V DALI

lumentalk DMXrdm EcoSystem Enabled

Ratings

IP66 IK07*

*asymmetric wallwash lens is IK06 rated

Certifications

cULus CE RoHS 5 YEARS lumenpulse

Physical

Housing Material	Low copper content extruded aluminium
Lens Material	Clear tempered glass
Hardware Material	Stainless steel
End Cap Material	Machined aluminium
Gasket Material	Silicone
Surface Finish	Electrostatically applied polyester powder coat
Weight	305 mm: 2.04 kg, 610 mm: 3.18 kg, 914 mm: 4.76 kg, 1219 mm: 6.35 kg

Electrical and control

Voltage	100 to 277 volts
Fixture Cable	Power and data in one cable, End-to-end option (ETE): 406 mm black input cable (no jumper cable needed for minimum spacing between two fixtures)
Leader Cable Conductors	5C: 5 x 1,5 mm^2
Maximum Cable and Fixture Run Length	76.8 m (On/Off, 277V, RO version), 50 m (On/Off, 277V, HO version)
Inrush Current (peak)	55A @230VAC
Control	On/Off control, Lumentalk, 1-10V dimming, DALI dimming, Lutron® EcoSystem® Enabled dimming, DMX/RDM enabled
Resolution (DMX/RDM)	Per foot or per fixture (configured with LumenID V3 software), 8-bit or 16-bit

Environmental

Storage Temperature	-40 °C to 85 °C (device must reach start-up temperature value before operating)
Start-up Temperature	-25 °C to 50 °C
Operating Temperature	-40 °C to 50 °C
Ingress Protection Rating	IP66
Impact Resistance Rating	IK07 (asymmetric wallwash lens is IK06 rated)

Accessories (order separately)

Optical Accessories	Lumenfacade Radial Louvre
Cables	Leader cable (standard), Jumper cable (standard), Leader cable (ETE), Jumper cable (ETE)
Control Boxes	DMX/RDM enabled (daisy chain or star configuration), Ethernet enabled (daisy chain or star configuration), Lumentalk Data Bridge
Control Systems	Pharos® kit
Diagnostic and Addressing Tools	LumenID, LumentalkID

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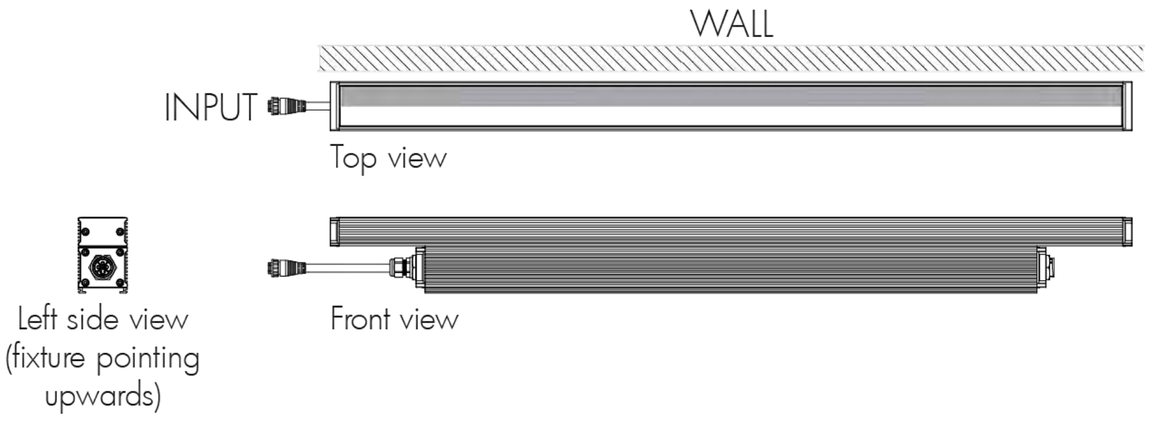
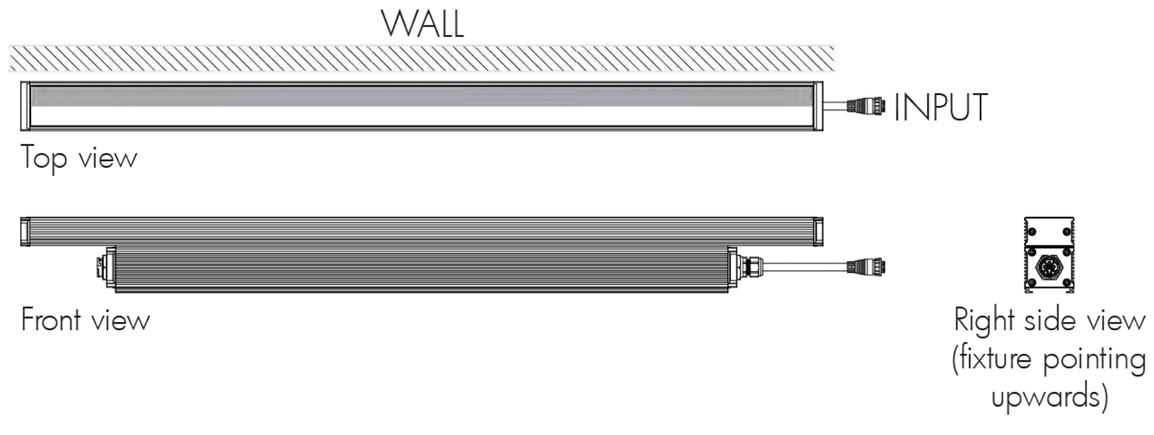
Asymmetric wallwash optic details

WWLF - Asymmetric wallwash optic, left feed



WWRF - Asymmetric wallwash optic, right feed

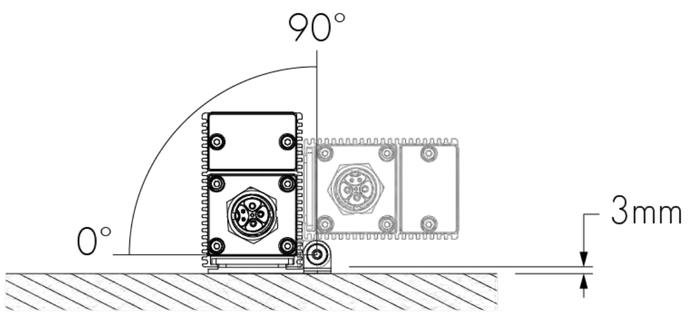


- Always position frosted side toward the wall.
- Fixture's feeding side is based on uplight installations. Feeding sides are reversed when fixture is used in a downlight application.
- Recommended setback from wall is 1/10 of the wall height. Example: 0.6 m setback for a 6 m wall.

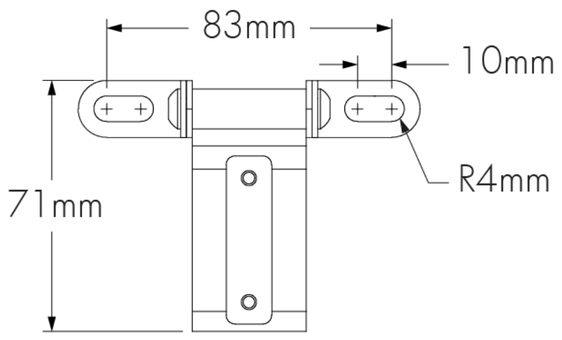
Mounting options

Surface Mount

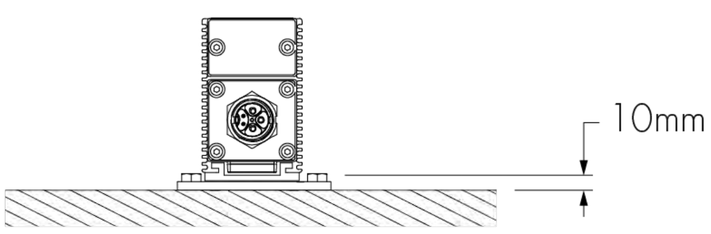
SAM - Slim Adjustable Mounting



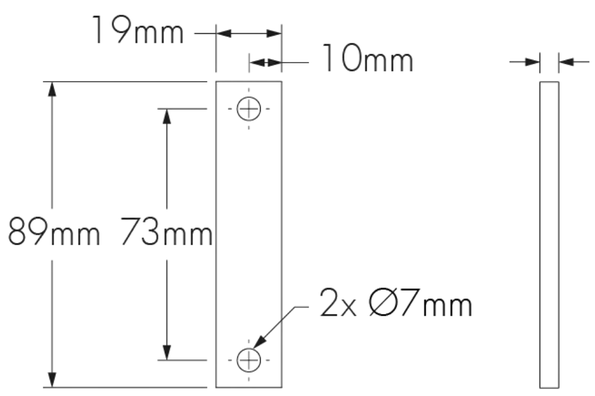
SAM - Mounting hole pattern



UMP - Fixed Mounting

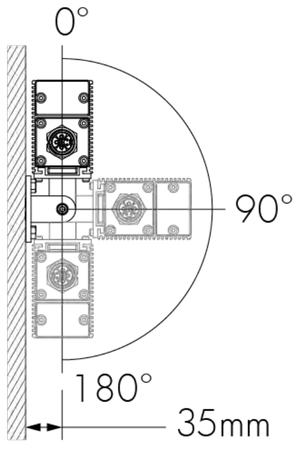


UMP - Mounting hole pattern

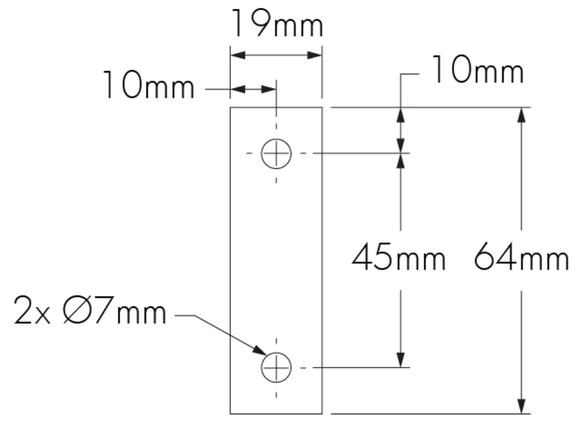


Wall Mount

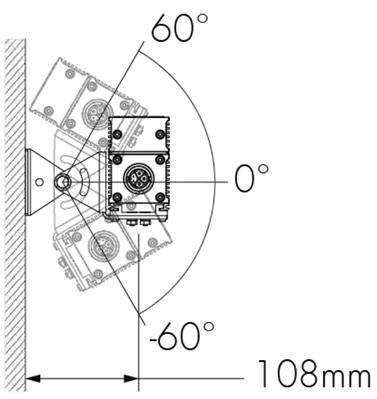
UMAS - Universal Adjustable Mounting



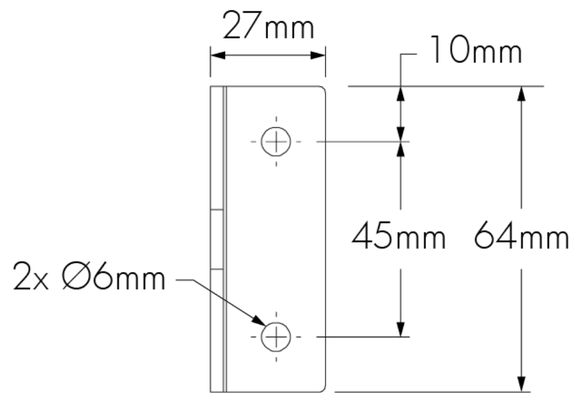
UMAS - Mounting hole pattern



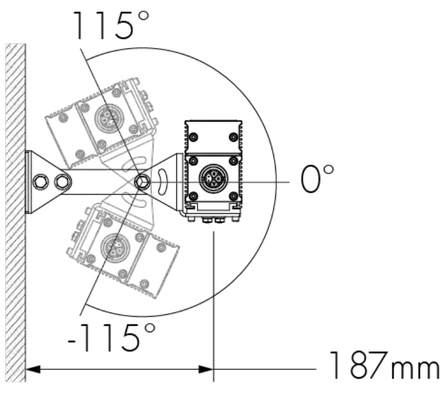
WAM2 - Adjustable Wall Mounting 51 mm



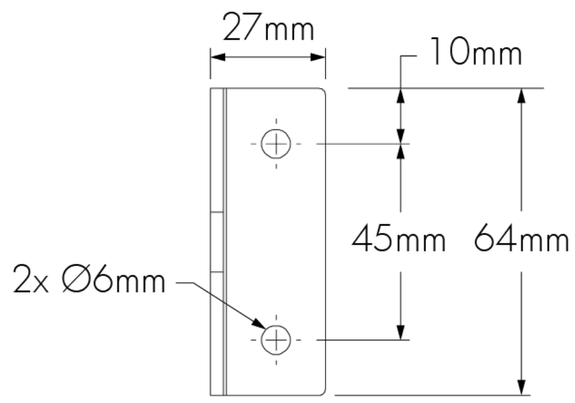
WAM2 - Mounting hole pattern



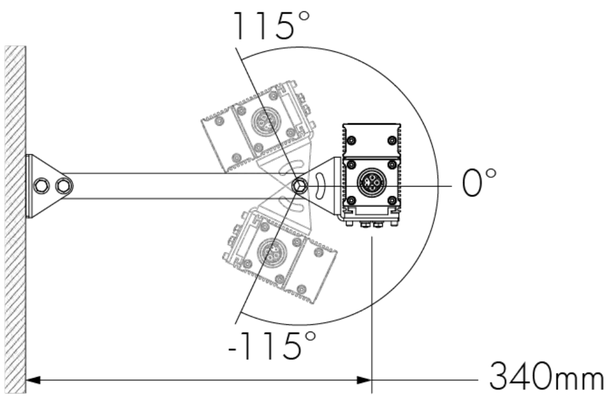
WAM6 - Adjustable Extended Arm Mounting 152 mm



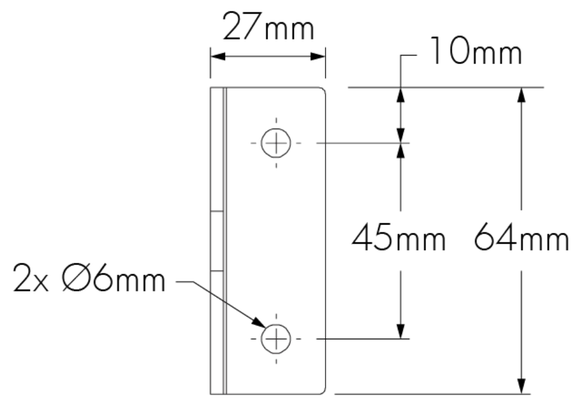
WAM6 - Mounting hole pattern



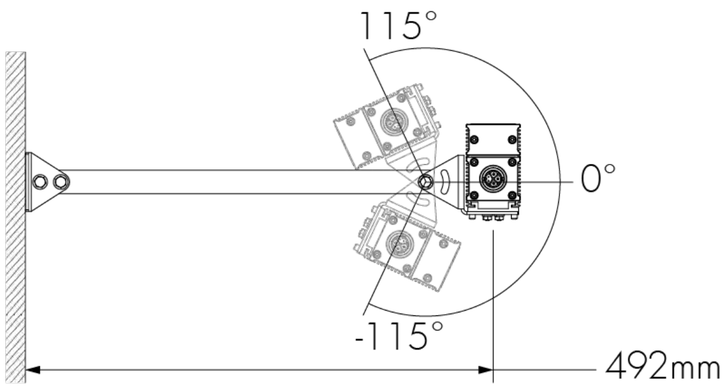
WAM12 - Adjustable Extended Arm Mounting 305 mm



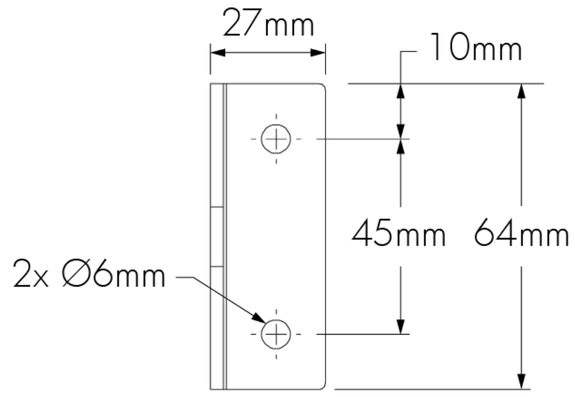
WAM12 - Mounting hole pattern



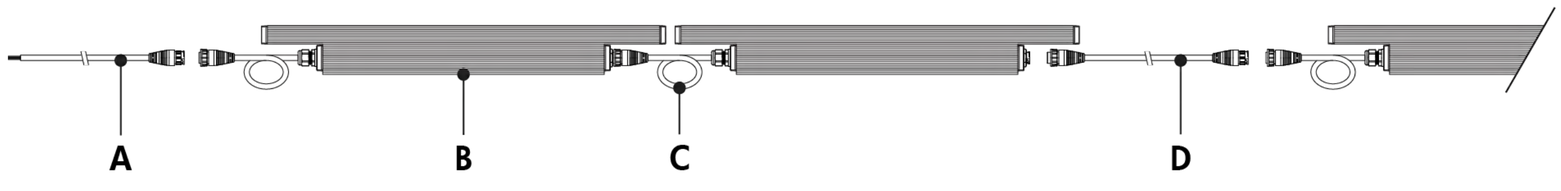
WAM18 - Adjustable Extended Arm Mounting 457 mm



WAM18 - Mounting hole pattern



End-to-end configuration option (ETE)

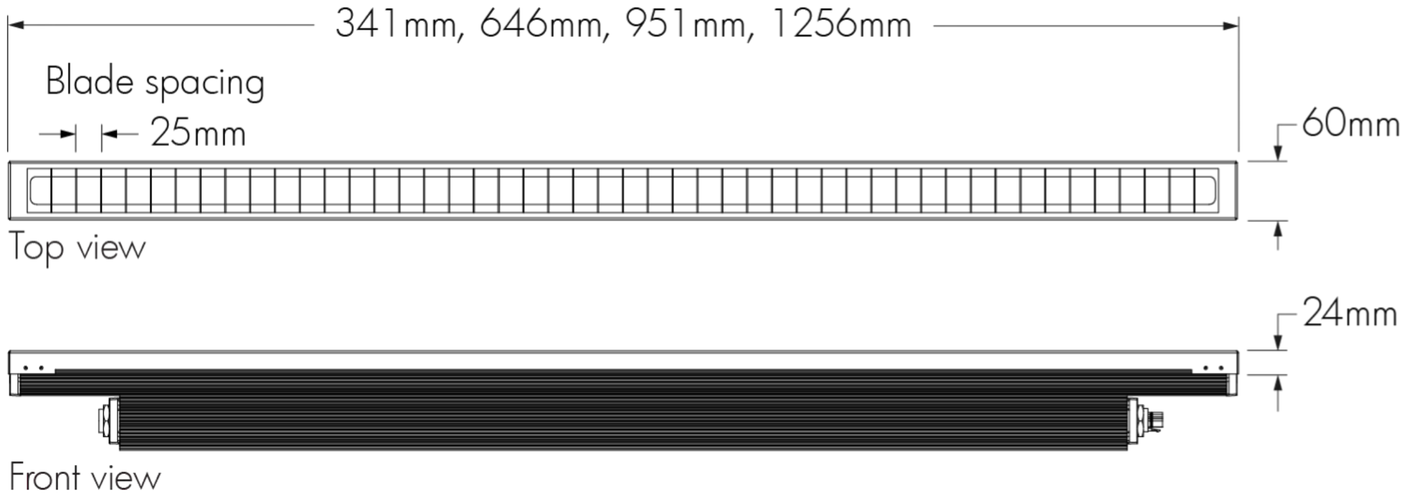


A - ETE leader cable (order separately)
B - Lumenfacade with ETE option
C - ETE 406 mm black input cable
D - ETE jumper cable (order separately)

Includes a factory installed 406 mm black input cable. A jumper cable is not required for minimum spacing between two end-to-end (ETE) fixtures. An ETE jumper cable is required only if a longer distance between two adjacent ETE fixtures is needed, or to connect two continuous runs of ETE fixtures together.

Optical accessories (order separately)

LOGRD - Radial louvre for Lumenfacade



LOGRD-**LENGTH-FINISH-OPTIONS**

Please specify:
LENGTH: 305 mm, 610 mm, 914 mm or 1219 mm; **FINISH**: BK - Black Sandtex®, BRZ - Bronze Sandtex®, SI - Silver Sandtex®, WH - Smooth white or CC - custom colour and finish (please specify RAL colour); **OPTIONS**: CRC - Corrosion-resistant coating for hostile environments

- The addition of a louvre will affect beam distribution. Consult factory for application support.
- Not suitable for asymmetric wallwash optic.

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Cables (order separately)

LOGLC - Leader cable for Lumenfacade

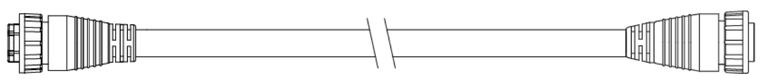
Standard construction
LOGLC-**CERTIFICATION**-STD-**LENGTH**-**CABLE COLOUR**

End-to-end (ETE) option
LOGLC-**CERTIFICATION**-ETE-**LENGTH**-**CABLE COLOUR**

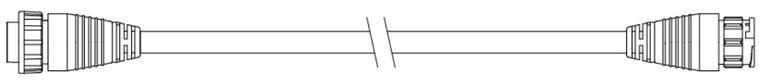
Please specify:
CERTIFICATION: UL or CE; **LENGTH**: 3 m, 7.6 m, 15.2 m, 30 m, 45 m or 61 m; **CABLE COLOUR**: black or white (connectors are black as standard; ETE fixture input cables are black as standard)

- Suitable for dimming/data and non-dimming applications.
- Sealing end cap is mandatory for any unused connector. One (1) included with every leader cable.
- Consult Lumenfacade leader cable specification sheet for details.

LOGJC - Jumper cable for Lumenfacade



Standard construction
LOGJC-**CERTIFICATION**-STD-**LENGTH**-**CABLE COLOUR**



End-to-end (ETE) option
LOGJC-**CERTIFICATION**-ETE-**LENGTH**-**CABLE COLOUR**

Please specify:
CERTIFICATION: UL or CE; **LENGTH**: 0.3 m (available for ETE option only), 0.6 m to 10 m (available in 0.3 m increments) or 15 m; **CABLE COLOUR**: black or white (connectors are black as standard; ETE fixture input cables are black as standard)

- Suitable for dimming/data and non-dimming applications.
- Consult Lumenfacade jumper cable specification sheet for details.

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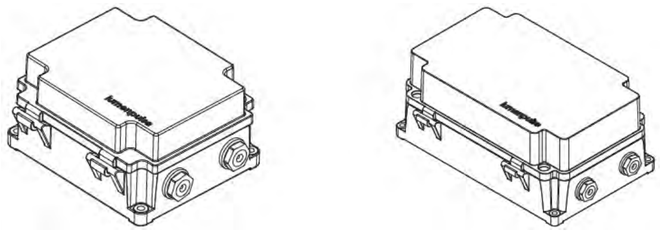
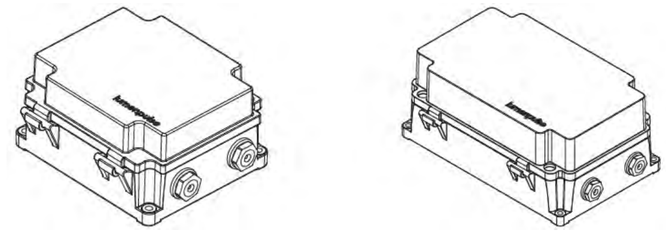
Control boxes (order separately)

CBX-DMX/RDM - DMX/RDM enabled (daisy chain or star configuration)



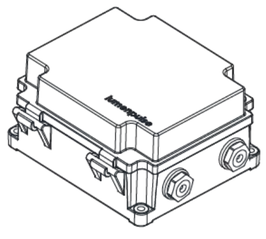
DMX/RDM control box. Up to six power and data outputs to fixtures or fixture runs. Consult CBX specification sheet and installation instructions for details. Lumenterminators provided with CBX (2x for daisy chain configuration, 6x for star configuration), consult factory to order spares.

CBX-ENET - Ethernet enabled (daisy chain or star configuration)



Ethernet control box. Up to four power and data outputs to fixture or fixture runs. Consult Ethernet CBX specification sheet and installation instructions for details.

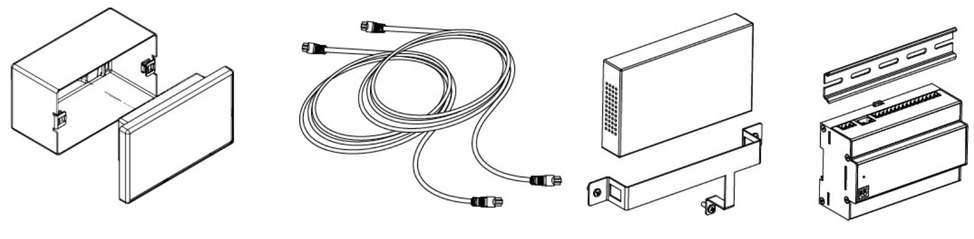
LDB - Lumentalk Data Bridge



Lumentalk Data Bridge, 1-10V or DMX output. Consult LDB specification sheet for details.

Control systems (order separately)

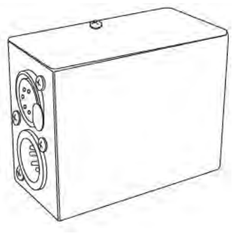
PHAROS - Pharos® kit



The Pharos kit, available for 1 or 2 DMX universes, allows for complete control of large lighting installations. 2 DMX universes kit shown.

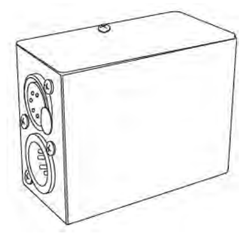
Diagnostic and addressing tools (order separately)

LID - LumenID



LumenID is a diagnostic and addressing DMX/RDM tool. It must be specified on all DMX applications. Consult LID specification sheet for details.

LID-LT - LumentalkID



LumentalkID is a diagnostic and addressing tool. It must be specified for all Lumentalk (LT) applications. Consult LID-LT specification sheet for details.

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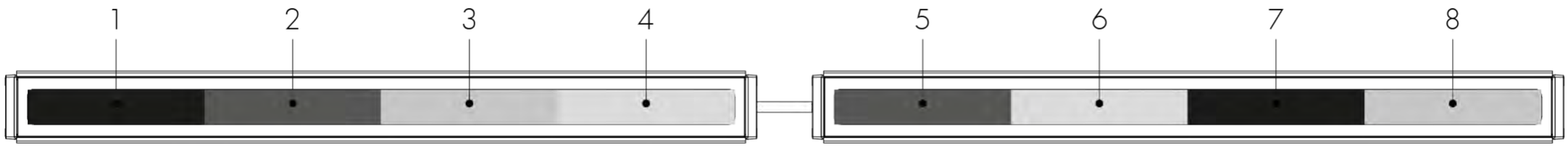
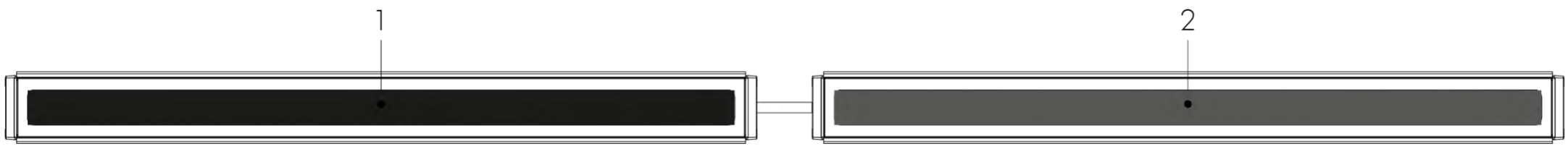
Resolution details

Resolution per foot: each 305 mm section is addressed independently
DMX addresses:



Resolution per fixture: each fixture is addressed independently
DMX addresses:



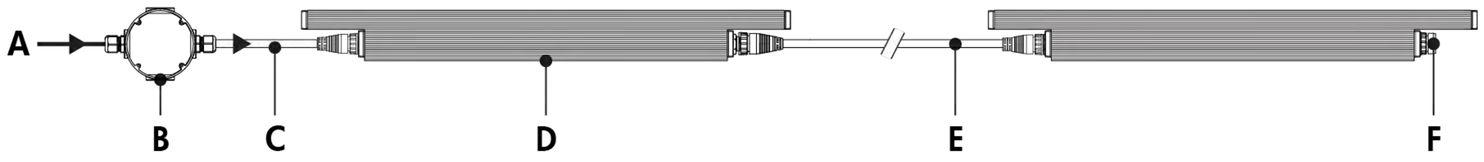
- 1219 mm fixtures shown.
- Applicable for DMX/RDM control option only. Fixture resolution can be configured on-site within the LumenID V3 software. A DMX/RDM enabled CBX is required.

Typical wiring diagrams

Wiring colour code

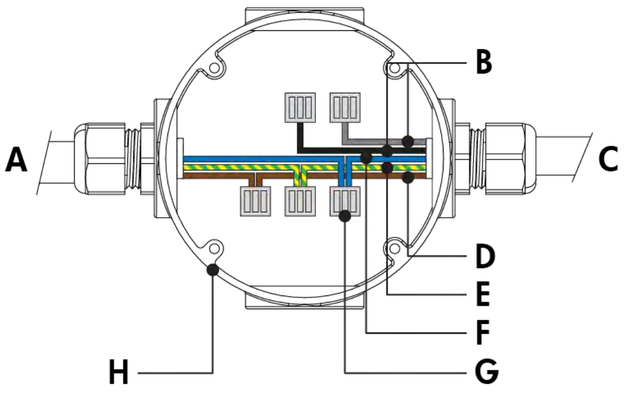
CE Colour Code	USE
Yellow/Green	Ground
Brown	Line
Blue	Line/Neutral
Black	1-10V / Data +
Grey	1-10V / Data -

On/Off control (NO)



A - Power input (100-277V, wiring by others)
B - Junction box (by others)
C - Leader cable (LOGLC)
D - Lumenfacade
E - Jumper cable (LOGJC)
F - Sealing end cap

On/Off control (NO) - wiring detail



A - Power input
B - Not required
C - To fixture
D - Line
E - Ground
F - Line/Neutral
G - Terminal connector (by others)
H - Junction box (by others)

- Consult factory for specific applications and maximum fixture count/cable length recommendations.
- ASHRAE version (not available for 305 mm fixture lengths): 16.4 W/m; Regular Output version: 27.89 W/m; High Output version: 50.03 W/m.

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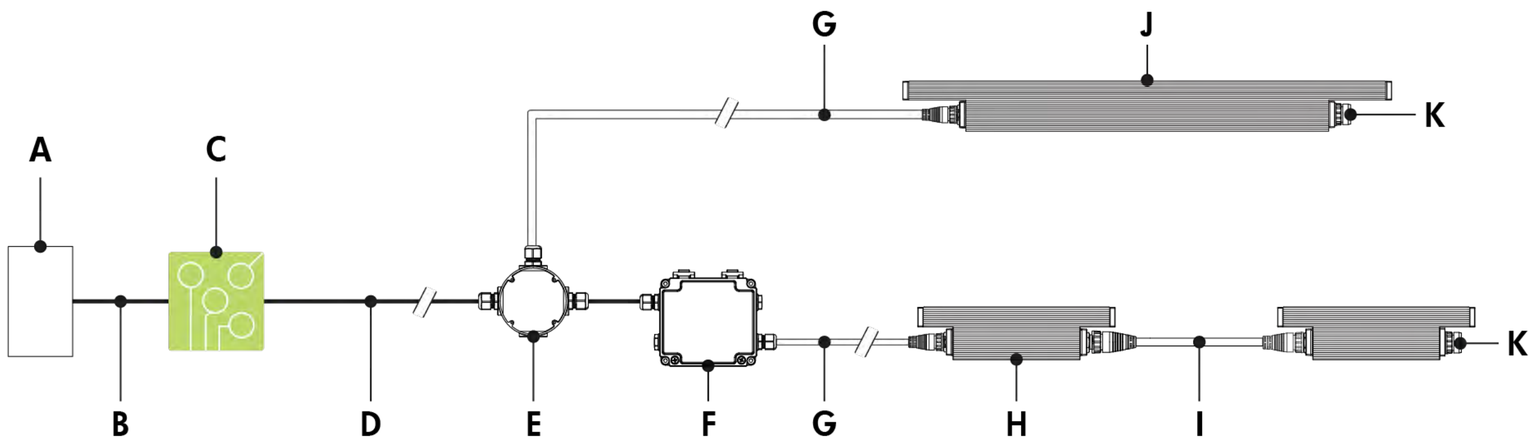
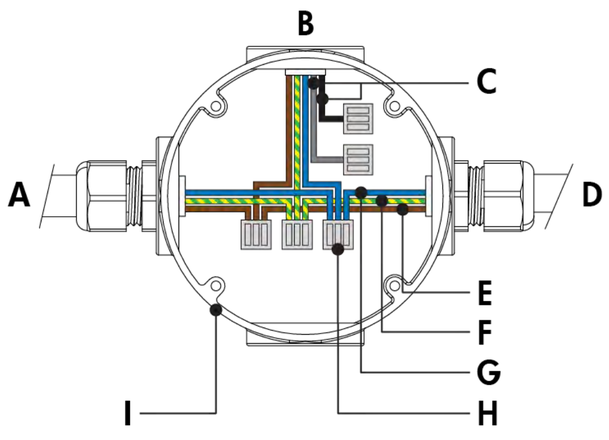
Lumentalk (LT)



A - Dimmer/controller (order separately from Lumenpulse, or by others)
B - Data wiring (by others)
C - Lumentranslator (LTL-010, -DMX, -TRIAC, -DALI)
D - Power line (120-277V AC, wiring by others)
E - Junction box (by others)
F - Lumentalk Data Bridge (LDB-DIM or LDB-DMX)
G - Leader cable (LOGLC)
H - Lumenfacade 305 mm
I - Jumper cable (LOGJC)
J - Lumenfacade (610 mm, 914 mm or 1219 mm fixture lengths)
K - Sealing end cap

Lumentalk (LT) - wiring detail



A - Power input (control over power line via Lumentalk system)
B - To fixture
C - Not required
D - To Lumentalk Data Bridge (for run lengths with 305 mm fixtures)
E - Line
F - Ground
G - Line/Neutral
H - Terminal connector (by others)
I - Junction box (by others)

- Consult factory for specific applications and maximum fixture count/cable length recommendations.
- Lumentalk Data Bridge required for 305 mm fixture lengths, see LDB installation instructions for details.

- For applications with all fixtures controlled as 1 zone: fixtures and Lumentalk Data Bridge must be specified as DIM. Maximum of 10 fixtures per LDB-DIM, consult factory for applications that require additional capabilities.
- For applications with fixtures controlled individually: fixtures and Lumentalk Data Bridge must be specified as DMX, 2-step commissioning process: 1 - DMX/RDM system using LumenID software and a LID, 2 - Lumentalk system using LumentalkID software and a LID-LT. Maximum of 32 fixtures per LDB-DMX. Consult factory for details.

- For DMX applications: 1 DMX controller per Lumentalk network, maximum of 48 DMX channels per Lumentalk network (minimum step transition update rate is 1 second, minimum fade time between two colours is 1 minute). Consult factory for applications that require additional capabilities.
- Maximum of 1 transmitter (Lumentranslator or Lumenlink) per system.
- No third party fixtures allowed on the same circuit.
- Consult factory for DALI Lumentalk applications.
- 1% minimum dimming value.
- ASHRAE version (not available for 305 mm fixture lengths): 16.4 W/m; Regular Output version: 27.89 W/m; High Output version: 50.03 W/m.

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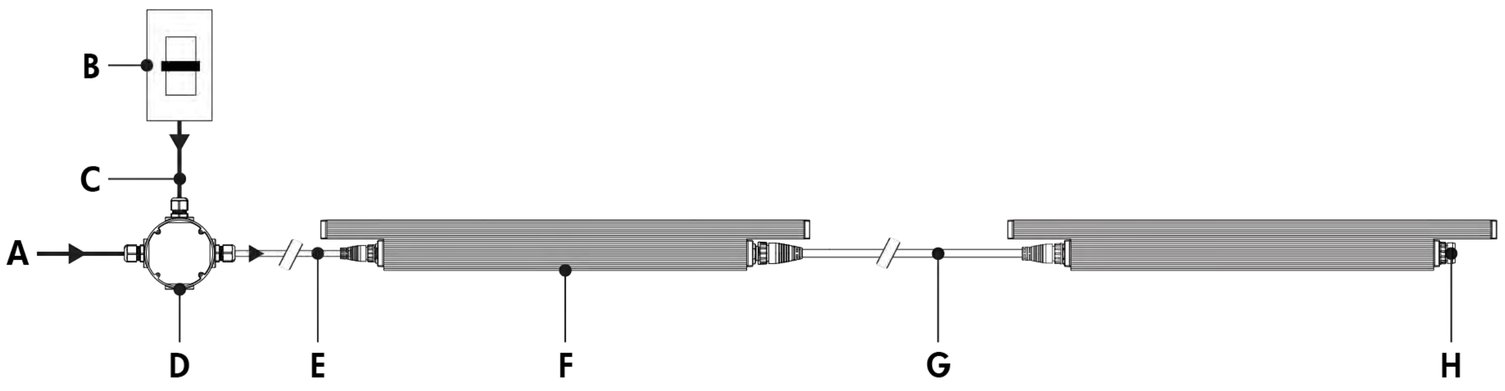
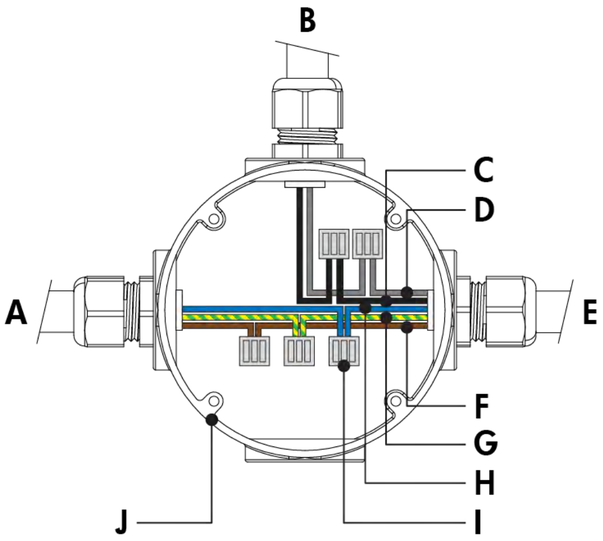
1-10V dimming (DIM)



A - Power input (100-277V, wiring by others)
B - Dimmer (by others)
C - Data wiring (by others)
D - Junction box (by others)
E - Leader cable (LOGLC)
F - Lumenfacade
G - Jumper cable (LOGJC)
H - Sealing end cap

1-10V dimming (DIM) - wiring detail



A - Power input
B - From dimmer (by others)
C - 1-10V +
D - 1-10V -
E - To fixture
F - Line
G - Ground
H - Neutral
I - Terminal connector (by others)
J - Junction box (by others)

- Consult factory for specific applications and maximum fixture count/cable length recommendations.
- 1-10V mA ratings: passive dimmer (Current Sink): 3 mA per fixture, active dimmer (Current Source): 0.5 mA per fixture.
- 10% minimum dimming value.
- ASHRAE version (not available for 305 mm fixture lengths): 16.4 W/m; Regular Output version: 27.89 W/m; High Output version: 50.03 W/m.

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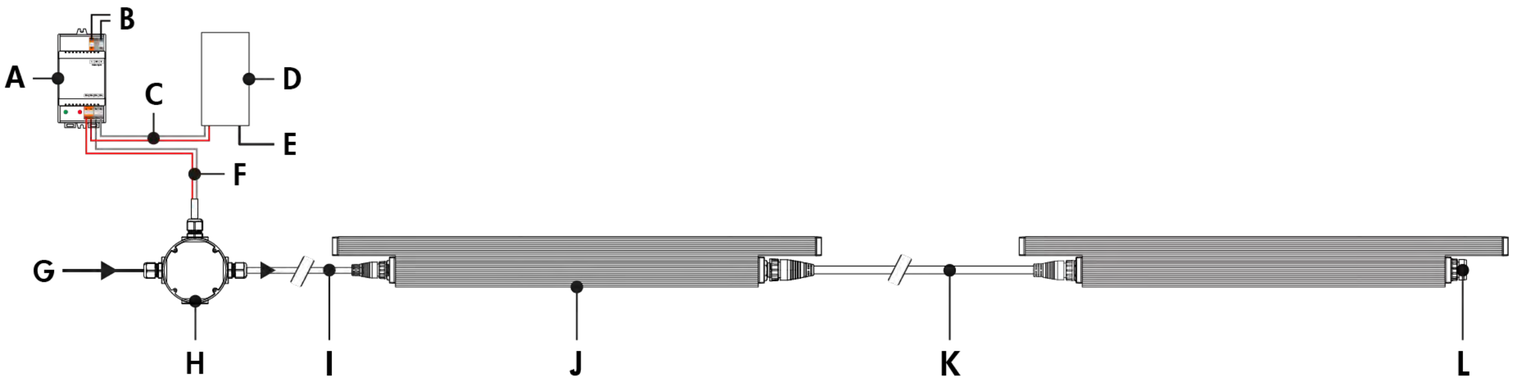
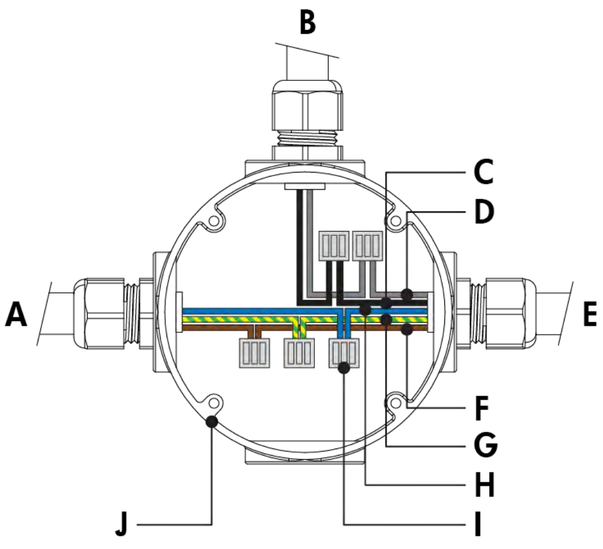
DALI dimming (DALI)



A - DALI bus power supply (by others)
B - Power input for DALI bus power supply (wiring by others)
C - Data output to DALI controller (wiring by others)
D - DALI controller (by others)
E - Power input for DALI controller (wiring by others)
F - Data output to fixture (wiring by others)
G - Power input (100-277V, wiring by others)
H - Junction box (by others)
I - Leader cable (LOGLC)
J - Lumenfacade
K - Jumper cable (LOGJC)
L - Sealing end cap

DALI dimming (DALI) - wiring detail



A - Power input
B - From DALI controller (by others)
C - Data +
D - Data -
E - To fixture
F - Line
G - Ground
H - Neutral
I - Terminal connector (by others)
J - Junction box (by others)

- Consult factory for specific applications and maximum fixture count/cable length recommendations.
- Maximum of 64 DALI fixtures per DALI loop.
- 1% minimum dimming value.
- ASHRAE version (not available for 305 mm fixture lengths): 16.4 W/m; Regular Output version: 27.89 W/m; High Output version: 50.03 W/m.

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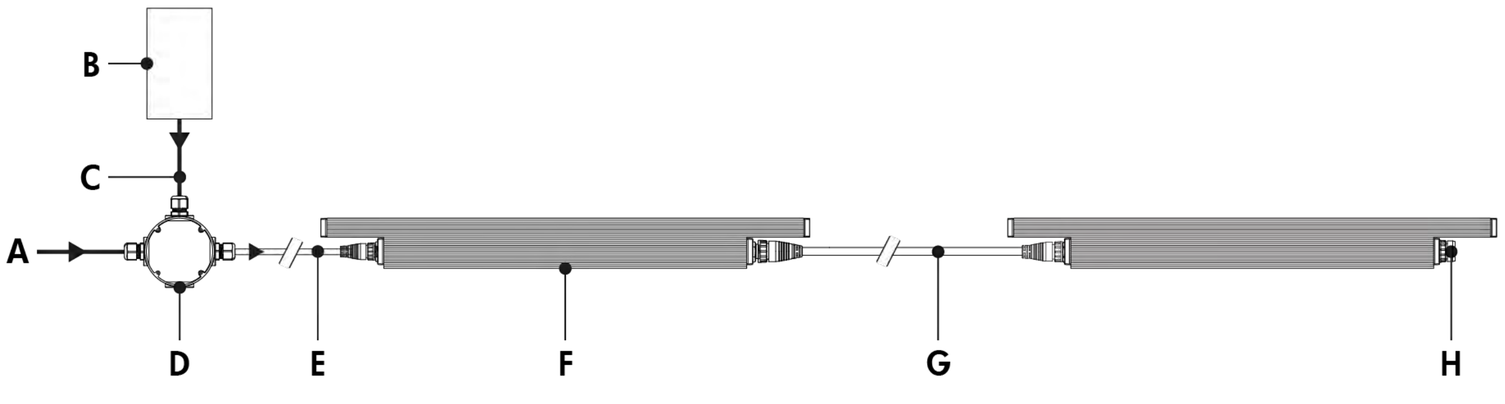
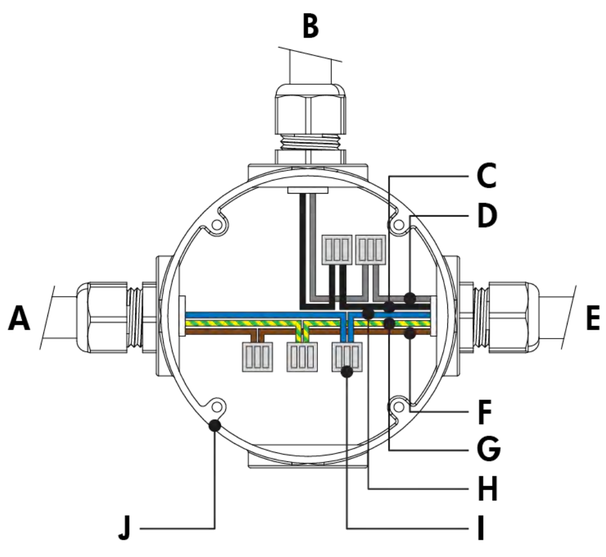
Lutron® EcoSystem® Enabled dimming (ES)



A - Power input (100-277V, wiring by others)
B - Lutron® EcoSystem® controller (by others)
C - Data wiring (by others)
D - Junction box (by others)
E - Leader cable (LOGLC)
F - Lumenfacade (610 mm, 914 mm or 1219 mm fixture lengths)
G - Jumper cable (LOGJC)
H - Sealing end cap

Lutron® EcoSystem® Enabled dimming (ES) - wiring detail



A - Power input
B - From Lutron® EcoSystem® controller (by others)
C - Data +
D - Data -
E - To fixture
F - Line
G - Ground
H - Neutral
I - Terminal connector (by others)
J - Junction box (by others)

- Consult factory for specific applications and maximum fixture count/cable length recommendations.
- Each Lutron® EcoSystem® enabled fixture has its own address; for the example shown, there are a total of 2 EcoSystem® addresses.
- 1% minimum dimming value.
- ASHRAE version (not available for 305 mm fixture lengths): 16.4 W/m; Regular Output version: 27.89 W/m; High Output version: 50.03 W/m.

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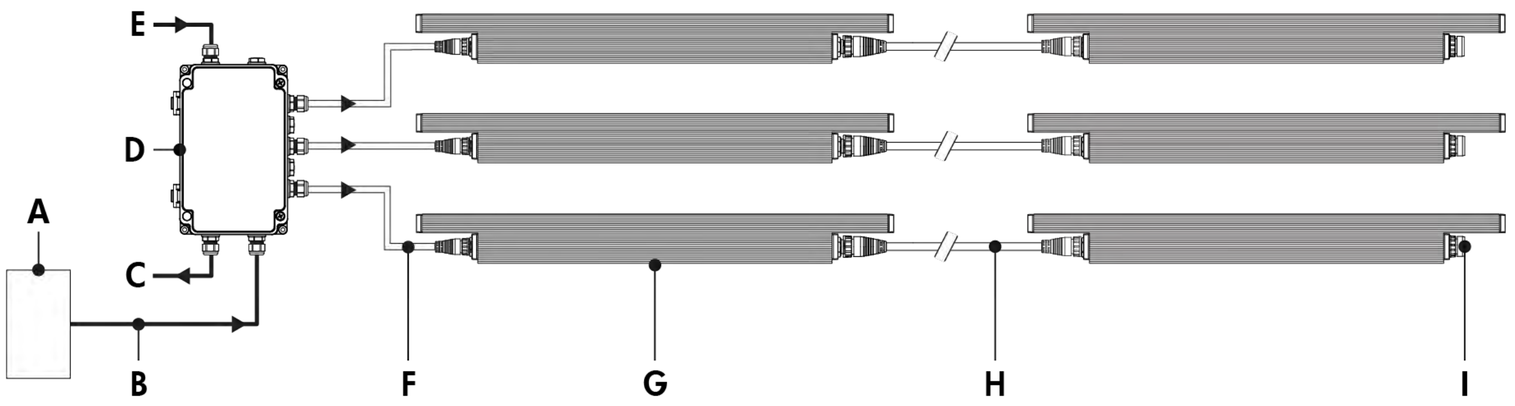
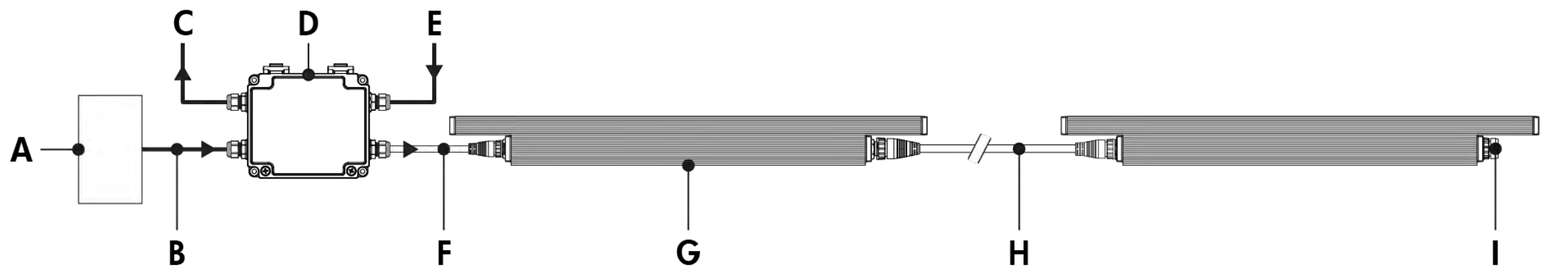
Star Layout (DMX/RDM)



A - DMX/RDM controller (order separately from Lumenpulse, or by others)
B - Data input (Belden 9841 or equivalent, by others)
C - Data output to next CBX (optional, not isolated/not boosted)
D - CBX-ST
E - Power input (100-277V, wiring by others)
F - Leader cable (LOGLC)
G - Lumenfacade
H - Jumper cable (LOGJC)
I - Sealing end cap

Daisy Chain Layout (DMX/RDM)



A - DMX/RDM controller (order separately from Lumenpulse, or by others)
B - Data input (Belden 9841 or equivalent, by others)
C - Data output to next CBX (optional, not isolated/not boosted)
D - CBX-DS
E - Power input (100-277V, wiring by others)
F - Leader cable (LOGLC)
G - Lumenfacade
H - Jumper cable (LOGJC)
I - Sealing end cap

Maximum run length

Configuration/Voltage	**120V**	**240V**	**277V**
LOG HO	21m	23m	26m
LOG RO	37m	39m	39m
LOG ASHRAE	39m	39m	39m

Based on 16A maximum, 15 m leader cable.

- Consult CBX installation instructions for additional wiring details.
- Consult factory for specific applications and maximum fixture count/cable length recommendations. Maximum run length calculations are typically based on 1219 mm fixtures.
- Run length calculations are based on a voltage drop of no more than 25V.
- The DMX/RDM protocol states a maximum of 32 DMX/RDM enabled fixtures on any single run.
- Maximum of 4 DMX/RDM repeaters/CBX cascading in line.
- Maximum of 6 outputs per CBX-ST; maximum of 1 output per CBX-DS.
- Each fixture requires 1 DMX address.
- 1% minimum dimming value.
- ASHRAE version (not available for 305 mm fixture lengths): 16.4 W/m; Regular Output version: 27.89 W/m; High Output version: 50.03 W/m.

lumenpulse™

11/13 Weston Street, Unit no 13.3.2 London, SE1 3ER GB **T** +44 (0) 2031 765370
info@lumenpulse.com **www.lumenpulsegroup.com** **www.lumenpulse.com/products/1046/lumenfacade**

How to order

1	2	3	4	5	6	7	8

9

1 . Housing [1]

LOG ASHRAE	Lumenfacade™, 16.4 W/m ASHRAE compliant [2]
LOG RO	Lumenfacade™ Regular Output, 27.89 W/m
LOG HO	Lumenfacade™ High Output, 50.03 W/m

[1] Power consumption is typically 20% higher for 305 mm fixture lengths.

[2] ASHRAE version not available for 305 mm fixture lengths.

2 . Voltage

100	100 volts
120	120 volts
208	208 volts
220	220 volts
240	240 volts
277	277 volts

3 . Length

12	340 mm (2.04 kg) [1] [2]
24	645 mm (3.18 kg)
36	949 mm (4.76 kg)
48	1254 mm (6.35 kg)

[1] Power consumption is typically 20% higher for 305 mm fixture lengths.

[2] To connect 305 mm fixture lengths to the Lumentalk system, DIM or DMX/RDM must be specified as the control option, and a Lumentalk Data Bridge (LDB) is required. See the typical wiring diagrams in the specification sheet for details.

4 . Colour and Colour Temperature [1]

22K	2200K
27K	2700K
30K	3000K
35K	3500K
40K	4000K
RD	Red [2]
GR	Green [2]
BL	Blue [2]

[1] Consult factory for availability of static Royal Blue, 6500K and 90+ CRI.

[2] Static colours made to order 8-10 weeks.

5 . Optics

WWLF	Asymmetric Wallwash, left feed
WWRF	Asymmetric Wallwash, right feed
8x8	8° x 8° [1]
10x10	10° x 10° [1]
10x30	10° x 30°
10x60	10° x 60°
10x90	10° x 90°
15x25	15° x 25°
30x30	30° x 30°
30x60	30° x 60°
35x35	35° x 35°
50x80	50° x 80°
60x60	60° x 60°
80x80	80° x 80°
90x90	90° x 90

[1] For best results use with HO fixtures at a 6 in setback from surface. Contact factory for application support.

6 . Mounting Options

SAM	Slim Adjustable Mounting
UMP	Fixed Mounting [1]
UMAS	Universal Adjustable Mounting [1]
WAM2	Adjustable Wall Mounting 51 mm
WAM6	Adjustable Extended Arm Mounting 152 mm
WAM12	Adjustable Extended Arm Mounting 305 mm
WAM18	Adjustable Extended Arm Mounting 457 mm

[1] Suitable to use when 3GV option is specified.

7 . Finish

BK	Black Sandtex®
BRZ	Bronze Sandtex®
SI	Silver Sandtex®
WH	Smooth white
CC	Custom colour and finish (please specify RAL colour) [1]

[1] Lumenpulse offers a wide selection of RAL CLASSIC (K7) colours with a smooth texture and high-gloss finish. Please consult factory for a list of available K7 colours, other RAL textures and glosses, or to match alternate colour charts. Final colour matching results may vary.

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8 . Control

NO	On/Off control
LT	Lumentalk [1] [2]
DIM	1-10V dimming
DALI	DALI dimming
ES	Lutron® EcoSystem® Enabled dimming [3]
DMX/RDM	DMX/RDM enabled [4]

[1] To connect 305 mm fixture lengths to the Lumentalk system, DIM or DMX/RDM must be specified as the control option, and a Lumentalk Data Bridge (LDB) is required. See the typical wiring diagrams in the specification sheet for details.

[2] A Lumentranslator and LumentalkID (LIDLT) must be specified for Lumentalk applications. Consult Lumentranslator and Lumentalk pages and specification sheets for details.

[3] Available for 610 mm (ASHRAE and RO only), 914 mm and 1219 mm fixture lengths only.

[4] A control box (CBX) and LumenID (LID) must be specified.

9 . Options

ETE	End-to-end configuration (factory installed 16 in black input cable included)
CRC	Corrosion-resistant coating for hostile environments [1]
3GV	3G ANSI C136.31 Vibration Rating for bridge applications [2]
CE	CE (certification covers European Economic Area)

[1] Use only when exposed to salt spray and harsh chemicals. This option is not required for normal outdoor exposure.

[2] Available with UMP and UMAS mounting options only.

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Appendix D – Bowl Lighting Products

Preliminary

traxon

Date: _____ Quantity: _____

Company: _____

Project: _____

IP66 Optional Accessories

Allegro Washer AC RGBW

The Allegro Washer AC RGBW is a compact, AC line powered high brightness luminaire. The fixture is controllable via DMX512, and features 16.7 million additive RGB colors plus white. The simplicity of the luminaire's topology means it can be simply daisy-chained to form long runs. The simplicity of the luminaire's topology means it can be easily daisy-chained to form long runs. Remote Device Management (RDM) circuits are built into each luminaire that enables extensive control and monitoring of the entire lighting installation

Product Specifications

	50W	100W	150W	200W
Light Source	High power LEDs			
Color Range	RGBW (white CCT 3000K); Other options: RGB, DW, 3000K, 3500K, 4000K, 5700K			
Beam Angle	Native 5° with field-installable spread lens			
Luminous Flux	2250 lm	4500 lm	6750 lm	9000 lm
Efficacy	45 lm/W typ.			
Lumen Maintenance	L70 @25°C - 80,000hrs			
Cover Lens	Tempered glass cover			
Housing	Aluminium, power coating			
Adjustment Options	135° vertical tilt; ±180° horizontal			
Dimensions (W × H × D)	Φ230 × 340 × 195mm 9" × 13.4" × 7.7"	Φ310 × 420 × 248mm 12.2" × 16.5" × 9.8"	Φ392 × 476 × 261mm 15.4" × 18.7" × 10.3"	
Weight	7kg/15.4lbs	13kg/28.7lbs	19kg/41.9lbs	20kg/44lbs
Regulatory Listing & Safety Approval	CE, cETLus			
Operating Temperature	–30°C to +50°C / –22°F to +122°F (–20°C / –4°F starting)			
Storage Temperature	–40°C to +70°C / –40°F to +158°F			
Environment	Outdoor (IP66), suitable for coastal environments			
Humidity	85%, non-condensing			

Electrical Specifications

Input Voltage	120V - 277V AC nominal			
Power Consumption	50W	100W	150W	200W
Power Factor	≥ 0.9			

System Specifications

Power	AC line
Control	DMX512, Remote Device Management (RDM)
Power Supply	Built-in
Fixture Interconnection	

LED CHARACTERISTICS Because LEDs are semiconductor devices, their performances are subject to inherent variability commonly found in semiconductor industry. To improve consistency in performance across the same product, LED manufacturers "sort" LEDs into bins according to different preset parameters, such as forward driving voltage, illumination, etc. Whereas binning is a sorting function, it is not a correction process. Inherent variability in the manufacturing process results always in different binning distributions according to different production lots. Traxon uses automatically binned LEDs on its products, thereby minimizing output variations within the model range.

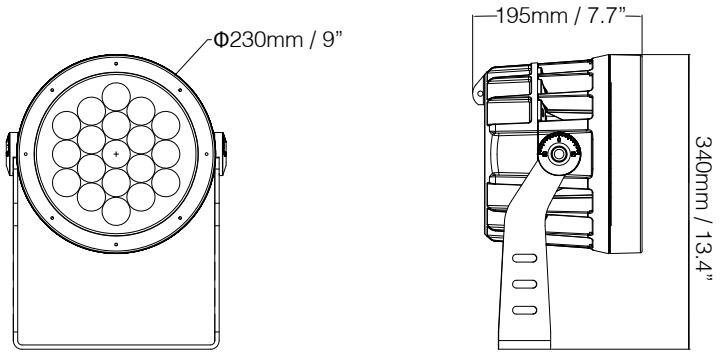
As with all electronic devices, LED output degrades over time – a term called lumen depreciation. This also explains why it is nearly impossible to expect photometric performances of two LED products with different service life spans to be the same. The rate of LED degrade is a complicate function of many factors such as operating efficiency, duration of continuous operation, and more significantly, environmental conditions (ambient temperature for example). If allowed working under optimal operating temperature range and with good ventilation, LED devices enjoy long service lives over conventional light sources. When using/installing LED devices, care should be taken to ensure that the devices will operate within the operating conditions specified in respective product literature.

Lumen measurement compiles with LM-79-08 standard.
Lumen maintenance is calculated based on LM-80 compliant measurement.

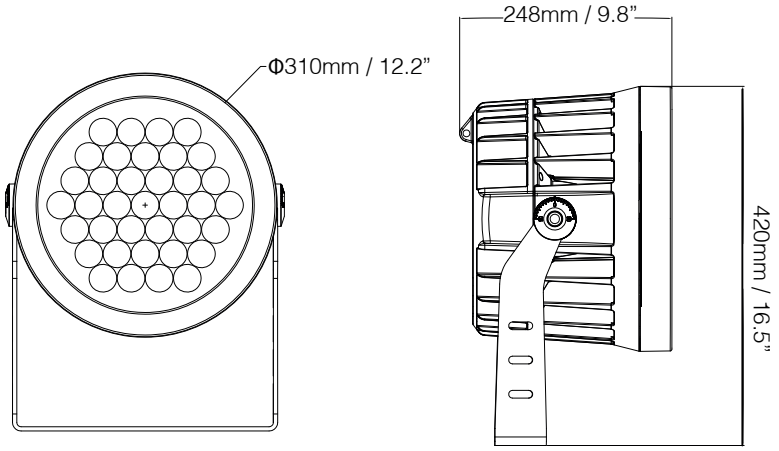
www.traxontechnologies.com

Allegro Washer AC RGBW Dimensions

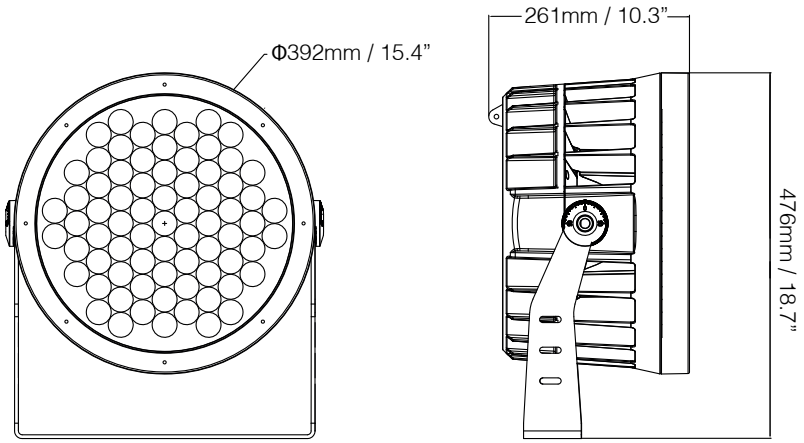
50W



100W



150W / 200W



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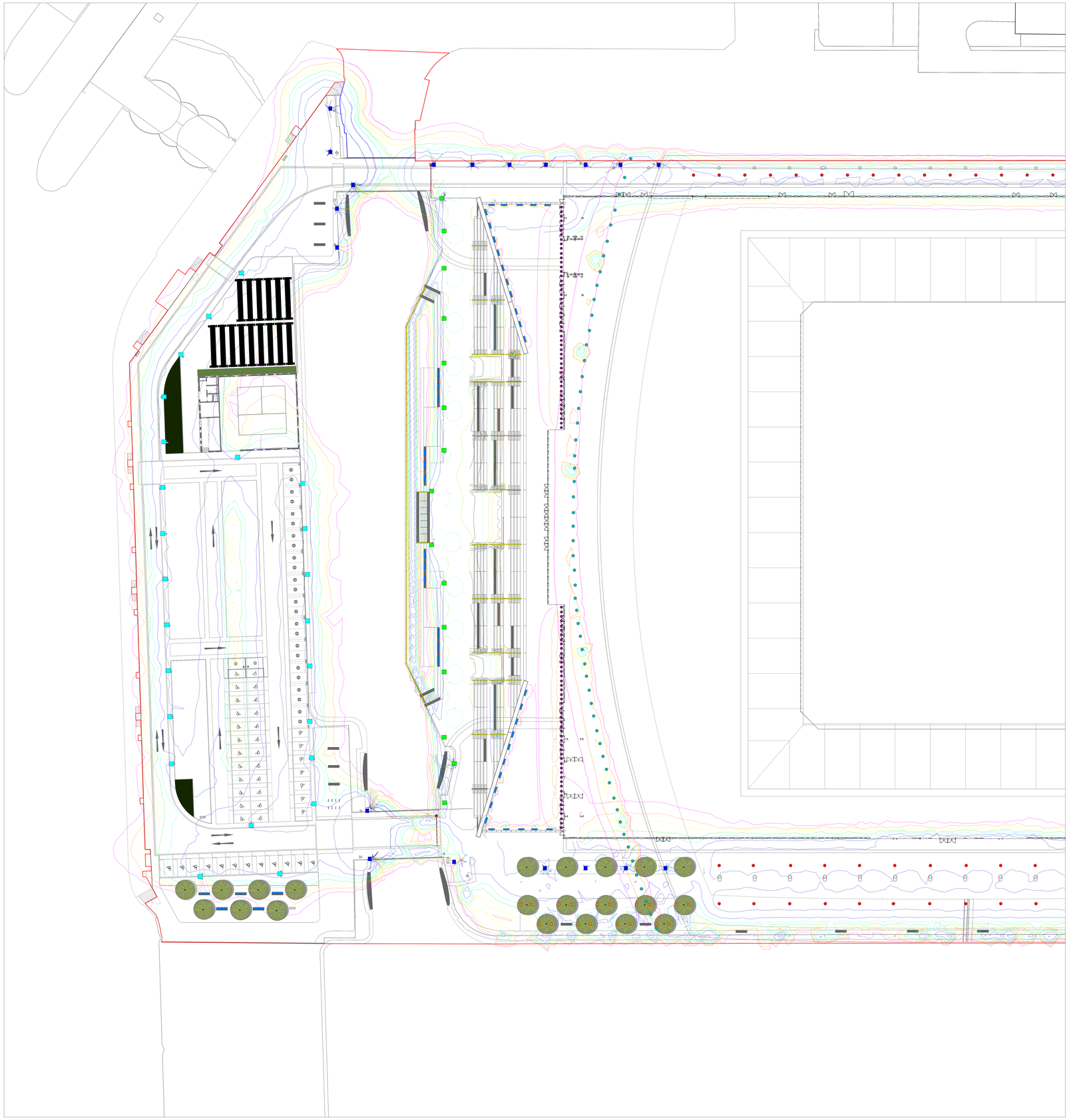
Appendix E – Buro Happold Lighting Presentation Detailing Lighting Design Strategy



LIGHTING KEY:

- LARGE MULTI DIRECTIONAL LIGHTING
  15M HIGH POLE MOUNTED LUMINAIRES
  8-10 LUMINAIRE FIXTURES PER COLUMN
  TO LIGHTING SPECIALISTS SPECIFICATION
- SMALL MULTI DIRECTIONAL LIGHTING
  8M HIGH POLE MOUNTED LUMINAIRES
  2 LUMINAIRE FIXTURES PER COLUMN
  TO LIGHTING SPECIALISTS SPECIFICATION
- MEDIUM MULTI DIRECTIONAL LIGHTING
  12M HIGH POLE MOUNTED LUMINAIRES
  8-10 LUMINAIRE FIXTURES PER COLUMN
  TO LIGHTING SPECIALISTS SPECIFICATION
- 12M & 8M HIGH POLE MOUNTED LUMINAIRES
  2 LUMINAIRE FIXTURES PER COLUMN
  TO LIGHTING SPECIALISTS SPECIFICATION
- CEILING RECESSED LUMINAIRES
  TO LIGHTING SPECIALISTS SPECIFICATION
- TREE MOUNTED SPOTLIGHTS
  TO LIGHTING SPECIALISTS SPECIFICATION
- UPLIGHT WALLWASHER LUMINAIRES
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- HANDRAIL/BALUSTRADE INTEGRATED LUMINAIRE
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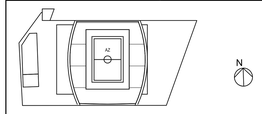
- WALL/BENCH INTEGRATED LUMINAIRE
  FULLY ENCLOSED,WATER TIGHT UNITS
  TO LIGHTING SPECIALISTS SPECIFICATION
- PROJECTOR LUMINAIRE UPLIGHTING ARCHITECTURAL FRONT FACE PANELS OF BARREL ROOF
  TO LIGHTING SPECIALISTS SPECIFICATION

LUX PLOT KEY:

- 3.0 LUX
- 5.0 LUX
- 7.5 LUX
- 10.0 LUX
- 15.0 LUX
- 20.0 LUX
- 30.0 LUX
- 50.0 LUX
- 80.0 LUX

(FOR LOCAL AUTHORITY USE)

QR Code



General Notes

LIGHTING NOTES

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No.	Description

SAFETY, HEALTH AND ENVIRONMENT INFORMATION
Brief details on the identified hazard symbol referencing the unusual residual hazards / risks are listed above.

Rev	Description	Aprvr	Chk'd	Date
P04	D3-PLANNING	RMC	AR	10.06.20
P03	D3-PLANNING	RMC	AR	22.11.19
P02	D3-PLANNING	RMC	AR	02.10.19
P01	D3-PLANNING	RMC	AR	30.09.19

Client

Project Manager: GT GARDINER &THEOBALD

Planning Consultant: CBRE

Main Contractor: LAING O'ROURKE

Design Consultant: PATTERN

Structural / MEP / Infrastructure: BURO HAPPOLD

Project Title
N3967_The People's Project

Drawing Title
EXTERNAL LIGHTING
SHEET 1

Checked	Drawn	Designed
AW	JRH	AR

Purpose of Issue
D3- PLANNING

Model File Ref
BMD01-BHE-ZZ-ZZ-M3-E-ElectricalRevit

Drawing No
BMD01-BHE-ZX-XX-DR-YB-0300

Scale A0 (841x1189)	Status	Revision No
1 : 400	D3	P04

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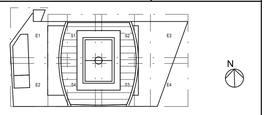
- 80.0 LUX

(FOR LOCAL AUTHORITY USE)

WORK IN PROGRESS

QR Code



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P05	D3-PLANNING	RMC	LK	14.07.20
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Design Consultant

PATTERN

Structural / MEP / Infrastructure

BURO HAPPOLD

Project Title

N3967_The People's Project

Drawing Title

EXTERNAL LIGHTING SHEET 2

Checked	Drawn	Designed
AW	JRH	AR

Purpose of Issue
D3- PLANNING

Model File Ref
BMD01-BHE-ZZ-ZZ-M3-E-ElectricalRevit

Drawing No
BMD01-BHE-ZX-XX-DR-YB-0301

Scale A0 (841x1189)	Status	Revision No
1 : 400	D3	P05

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