Exhibit 1 - Appendix 1

STRI CVs

Appeal ref: APP/Q4245/W/20/3258552

PROFILE

CD-T11 P2

Contact details:

e. _____

m

t.

w. _____

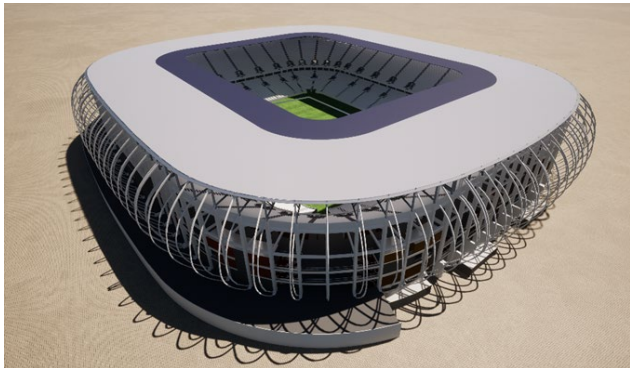
2019/20 – Camp Nou, Spain

Client:

FC Barcelona

2017, Fulham F.C, Fulham training ground

Client: Fulham F.C



2020 – Summa Stadium Dakar

Client: Summa Dakar Stadium

2018/20– Rangers FC, Glasgow

Client: Rangers FC

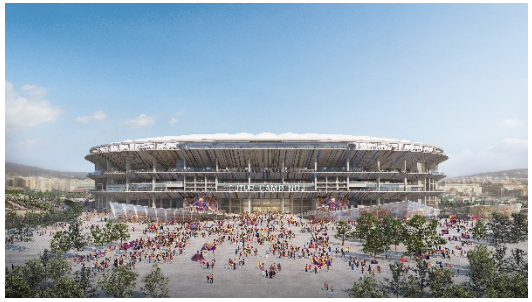
Lee Collier BA (Hons)
Project Lead Consultant

Lee is one of the most experienced design consultants in the sport surface industry playing a key role in the technical delivery of STRI's major projects across the globe using a creative approach to integrate the optimum solution. Understanding turfgrass requirements involves a holistic understanding of the architectural and climatic restrictions in each project. STRI's multi-disciplinary technical consultancy offers planning, design, and construction expertise to a wide range of clients across the globe. Integrating systems, Focused R&D and innovative technology to provide better turf solutions for turf management are at the core of what we do.

Project requirements range from complex integrated stadia designs with severe shade and air movement problems where supplementary pitch solutions are integrated to mitigate specific constraints such as VV systems, passive and automatic irrigation, undersoil heating technology, water management including SUDS and recycling systems. In addition, key considerations such as operational and end use requirements, code compliance, construction scheduling, planning and buildability are also key.

2019/20 – Dalian Wanda Training Facility, Dalian, China
Concept, detailed design and installation monitoring for a new elite level training facility in Dalian China
Client: Wanda

2018 – 2020 Qatar Foundation Stadium, Qatar
Concept to Detailed design and installation monitoring for new pitch for Qatar Foundation, to be used for the 2022 FIFA World Cup.
Client: Pattern



2018/20 – Nikken, Barcelona, Camp Nou redevelopment
Holistic climate review, design development, project coordination, detailed pitch infrastructure design including BIM modelling
Client: Nikken

2017 – 2018 Bankwest Stadium, Sydney
Detailed pitch infrastructure design, tender and construction monitoring
Client: Lendlease

Dr Christian Spring
Research Operations Manager

Qualifications:

BSc (Hons), PhD

Contact details:

STRI Ltd
St Ives Estate, Bingley
West Yorkshire BD16 1AU
t. **+44 (0)1274 565131**
m. **+44 (0)7545 100012**
e. **christian.spring@strigroup.com**

strigroup.com
STRI Group
@striturf
STRI Group
STRI Group

CD-T11 P4

Making great sport happen

PROFILE

After gaining his PhD investigating the structural effects of earthworms on soil, Christian joined STRI's Research Team in 2005 as a soil scientist.

Christian is STRI's Research Operations Manager, manages STRI's UK research team and is also Head of the Soil Laboratory. Christian leads research into a wide variety of subject areas, including sports surface construction and drainage, turfgrass nutrition, sports turf management, use of wetting agents and pesticides, surface performance assessment and machinery testing.

AREAS OF EXPERTISE:

- **Soil physics, soil chemistry and soil biology**
- **Sports surface design, construction and material selection**
- **Turf nutrition, wetting agents, supportive technologies and pesticides**
- **Natural & artificial turf surface performance assessments**
- **Integrated turf management**
- **Turf maintenance machinery**

PROJECT EXPERIENCE INCLUDES:

The Open Championship - The R&A: **Greens performance testing prior to and during The Open Championship.**

FIFA®
For the Game. For the World.

FIFA: **Pitch performance and quality assessments to identify suitable natural turf pitches for use as part of a Player Biomechanics and Physiology programme. During the research testing Christian's primary role was to perform pitch performance assessments and to liaise with groundstaff regarding turf maintenance requirements.**

Gaelic Athletic Association: **Christian was heavily involved in a project to measure the playing quality of pitches used for GAA sports such as Hurling or Gaelic Football. From this data, proposed surface performance standards were highlighted.**

Exhibit 1 - Hemiview 3D Light Assessment

Appeal ref: APP/Q4245/W/20/3258552

Making great sport happen

Former B&Q Site, Great Stone Road, Stretford, M32 0YP

Appeal by Accrue (forum) – 1LLP

LPA Ref: 100400/OUT/20

Appeal Ref: APP/Q4245/W/20/3258552

Exhibit 1: Hemiview ™ 3-D Light Assessment – Former B & Q Site, Great Stone Road, Stretford, M32 0YP proposed apartments on behalf of Accrue (Forum) 1 LLP

Report Date: 12th November 2020

Lee Collier
Senior Design Consultant

Michael Rowley
Digital Design Manager

CONTENTS

Executive Summary

STRI has been engaged by WSP Consultancy to provide guidance relating to the impact the proposed new build apartments may have on the adjacent cricket training facility at the Old Trafford Cricket Ground, Manchester.

STRI have a longstanding background in delivering specific light analysis for stadia and other sporting venues where light can be an issue and have been engaged by numerous stadium architects, FIFA, Wimbledon and FC Barcelona amongst many others to provide light analysis and management advice.

Sport England have stated their concerns as to whether the newly proposed apartment will impact on the fine turf and non turf training facility located adjacent to the development due to its massing and the sun path. The impact of the temporary stand should also be noted in this report.

Therefore, STRI have carried out a hemiview analysis on the proposed apartments to understand the light conditions relating to the potential impact on fine turf training area.

The challenges associated with providing a surface for elite level sport, whilst offering a sustainable, robust, and versatile surface that performs to the required standard are not to be underestimated in this situation. There are a number of potential options that could be considered either independently or in combination for the Training area and which will be discussed in more detail within this report:

- Architectural and management modifications to mitigate low light levels
- Turfgrass management options
- Supplementary pitch technologies (as appropriate)

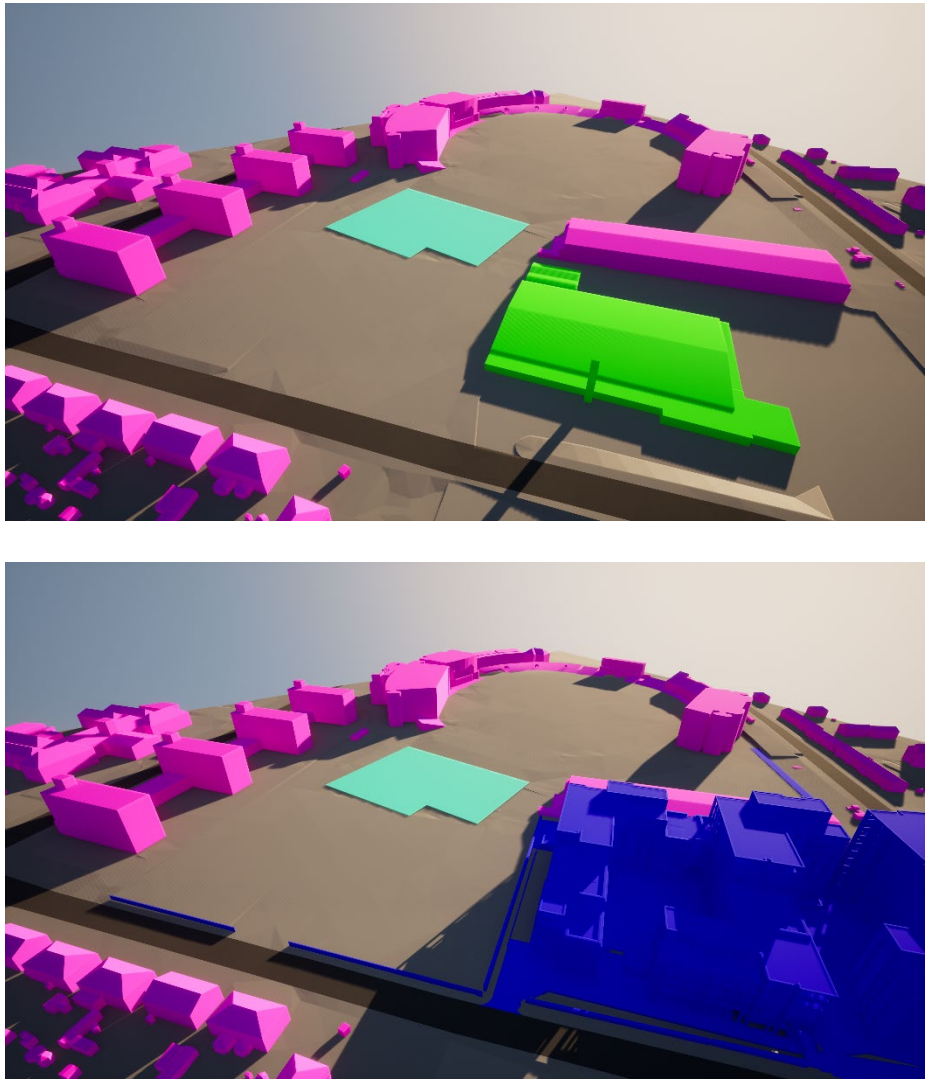


Fig 1. Existing infrastructure & Proposed apartment development images taken @ 7am, July 15th

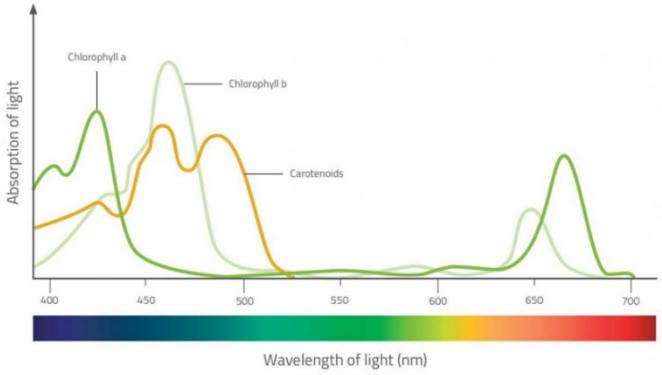
Hemiview Light Analysis Data and Parameters

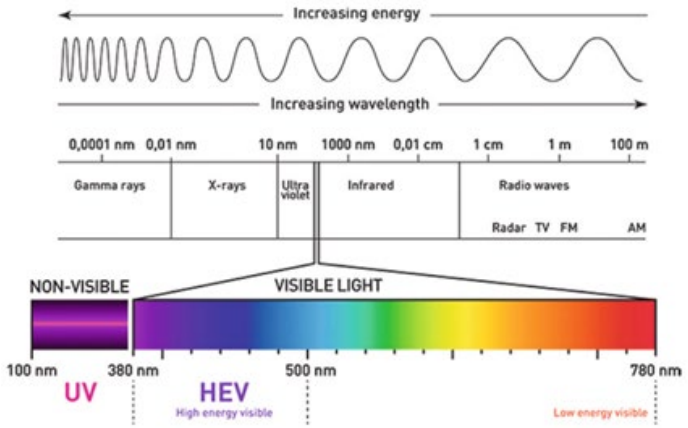
Background: Understanding how the architectural design of the proposed apartment block affects the light reaching the grassed playing surface on the Old Trafford training facility, this will be fundamental in knowing if the grass is affected by the proposed apartment blocks.

PAR is the abbreviated term for photosynthetically active radiation which describes the spectral range (wave band) of solar radiation from 400 to 700 nanometers that photosynthetic organisms are able to use in the process of photosynthesis. Photosynthesis is a process used by plants to convert light energy, normally from the sun, into chemical energy that can be later released to fuel the plants' activities.

Fundamentals of turf health:

- Light/water/air/nutrient
- Sufficient light
- Good balance of drainage/aeration
- Air movement/ventilation at the surface and in the rootzone
- Adequate soil moisture/Irrigation
- Adequate supply of nutrients satisfactory temperatures for growth





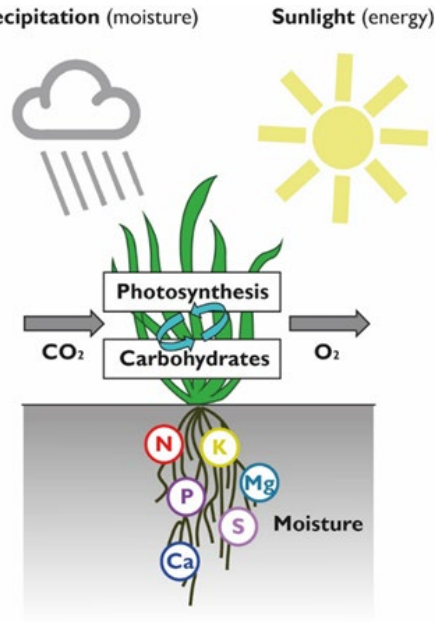


Fig 2, 3 & 4. Left Wavelength of light relative to plant growth; top Electromagnetic spectrum; Bottom Photosynthesis

Hemiview Methodology

The Hemiview analysis used by STRI uses industry standard software developed specifically to understand the light conditions primarily within stadia in order to direct strategic turfgrass management and the requirements for supplementary lighting and other turf technology to mitigate any negative impact on microclimate.

A number of Hemiview analysis scenarios have been undertaken relating to the potential impact on the cricket training area. For these, we have analysed the existing buildings and infrastructure around the Cricket Ground for benchmarking purposes and three additional scenarios have been undertaken. These include:

- Existing infrastructure
- Proposed apartment analysis
- Existing infrastructure & temporary stand system analysis
- Proposed apartments and temporary stand system analysis

The amount of PAR received on the training pitch area is a combination of the latitude and elevation of the site combined with the orientation of the training ground, the shape and height of the surrounding structures.

To analyse the interaction between the above variables, each scenario was rendered using a 3D model provided by WSP Consultancy and using a specialist lens. Figure 5 illustrates an image taken from the pitch centre which has had the sun's track superimposed over the image.

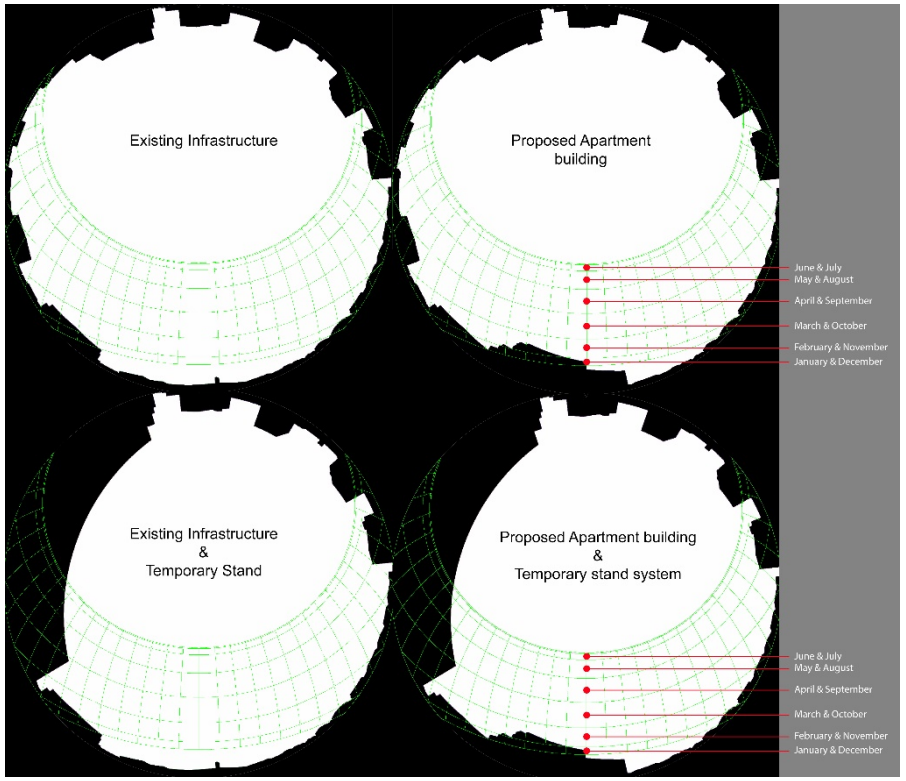


Fig 5: sun's track superimposed over Southern end image

Hemiview Images

The effect of obstructions on light levels reaching the natural turf surface caused by the surrounding structures and proposed apartment development was determined using images generated from **35 different reference positions within the 4 configurations**.

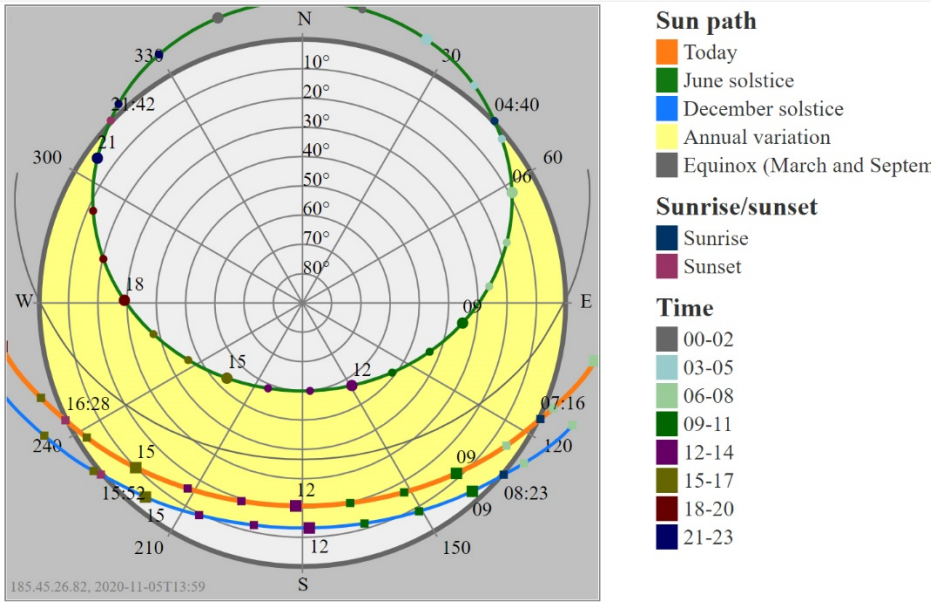


Fig 6: Hemiview rendered images – Proposed Apartments and temporary stand

Each of these images was a map of sky visibility and obstruction for a different position on the training area. These projections were placed on a grid at intervals of 12.3m by 11 m covering the whole training area of total dimensions of 73.6m x 43.6 m with the mid-point in both directions being positioned over the centre of the site.

The STRI image analysis software then processed the images to make calculations of direct and diffuse photosynthetic active radiation (PAR) reaching the pitch surface. The individual analyses for each image were used to draw contour diagrams showing the predicted distribution of PAR over the playing surface at different times of year over the training area. From this data the supplementary lighting levels required for each iteration was also calculated.

This information, in turn, was used to assess the four scenarios to determine whether the proposed apartment development has an impact on the training area. Although we are not advocating the use of grow lights, we have also provided information relating to deployment of supplementary grow lightings. The deployment plans are a useful way to see where the need for additional light is required, as it is unlikely that supplementary lighting would be used in this situation, what it does do is show up light deficiency.

It should be stressed that light alone forms only part of the conditions required for sustaining a healthy natural surface; therefore, temperature, air movement, humidity and other climatic factors should also be assessed as part of a holistic review of conditions.

Temporary Stand

From information gathered, the Cricket Club has a temporary 6,000 seat stand erected during the cricket season, this remaining in place for approximately six months of the year. To get a full understanding of the impact on turf health it is important to take all structures temporary and fixed into consideration.

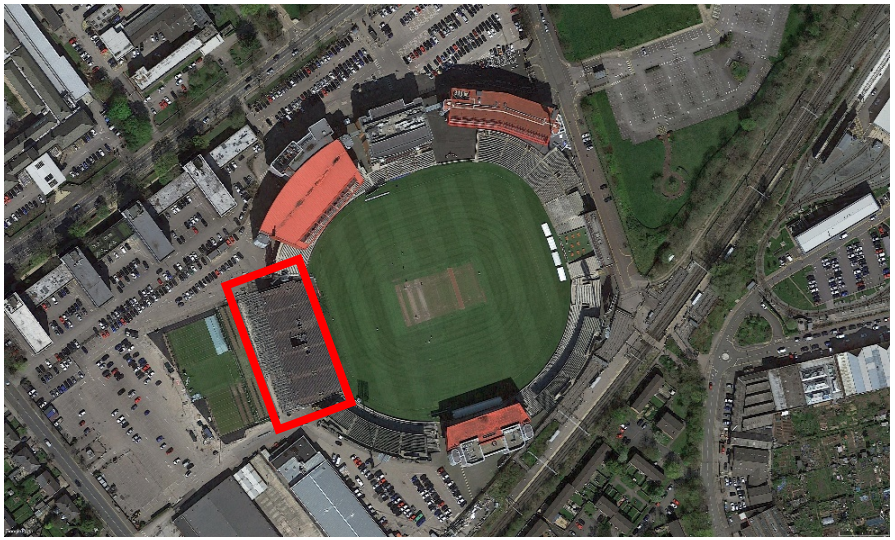


Figure 7: Temporary stand aerial view

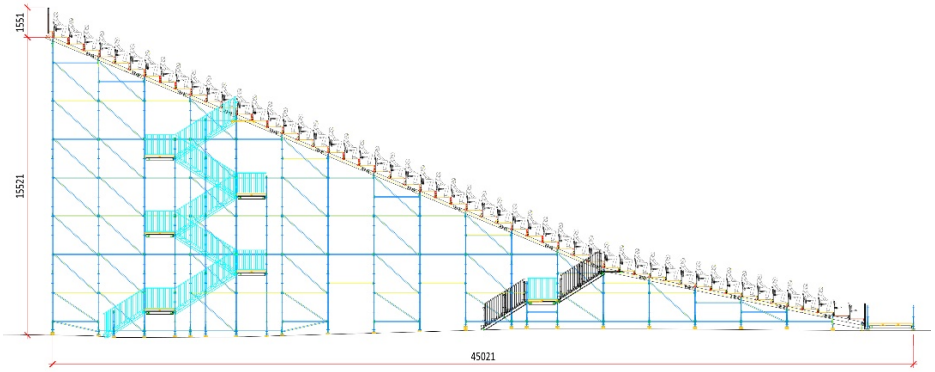


Figure 8: Temporary stand schematic sectional view

Informing the results for WSP Consultancy

The preliminary Hemiview light analysis contained within this document is based on four strategic scenarios. The analysis focuses on understanding the sustainability of the fine turf training area. The analysis also includes deployment plans for supplementary lighting rigs (as would be employed in a stadium environment), these being provided as a reference to indicate the degree of impact on grass growth by shading from the adjoining structures.

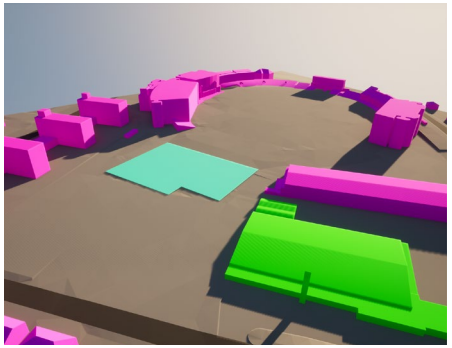
The analysis is based on the existing infrastructure and proposed apartment design scenarios as detailed below:

Target light levels

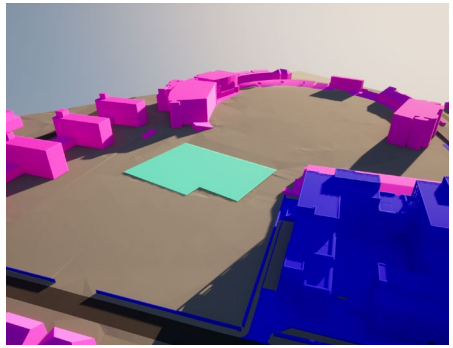
With many of our large stadia projects we use a baseline as our "standard" option which we will be using as a basis for this report. For cool season grasses we generally aim to get 8 - 12 mol/m²/day with winter months usually falling below this threshold. Essentially during the main growing season i.e spring to autumn target range would be 8 – 12. Naturally winter grasses are adapted to survive under lower light levels during the winter months as temperatures decline which is why typical light level thresholds are naturally lower in winter. As photosynthesis period is reducing the grass growing reduces.

Scenarios

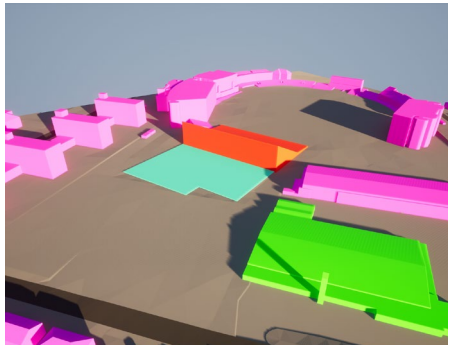
After discussion with WSP Consultancy it was decided that a number of simulations would be undertaken relating to the potential impact on cricket training area. A configuration of existing infrastructure for bench marking purposes and three additional scenarios have been undertaken.



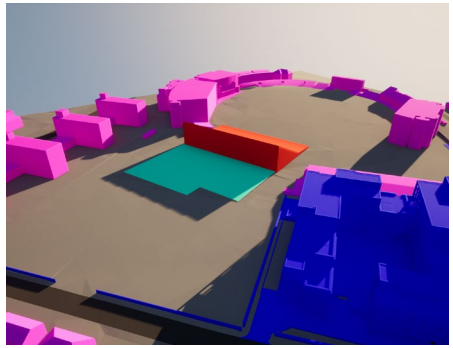
Scenario 1
Existing infrastructure



Scenario 2
Proposed apartments

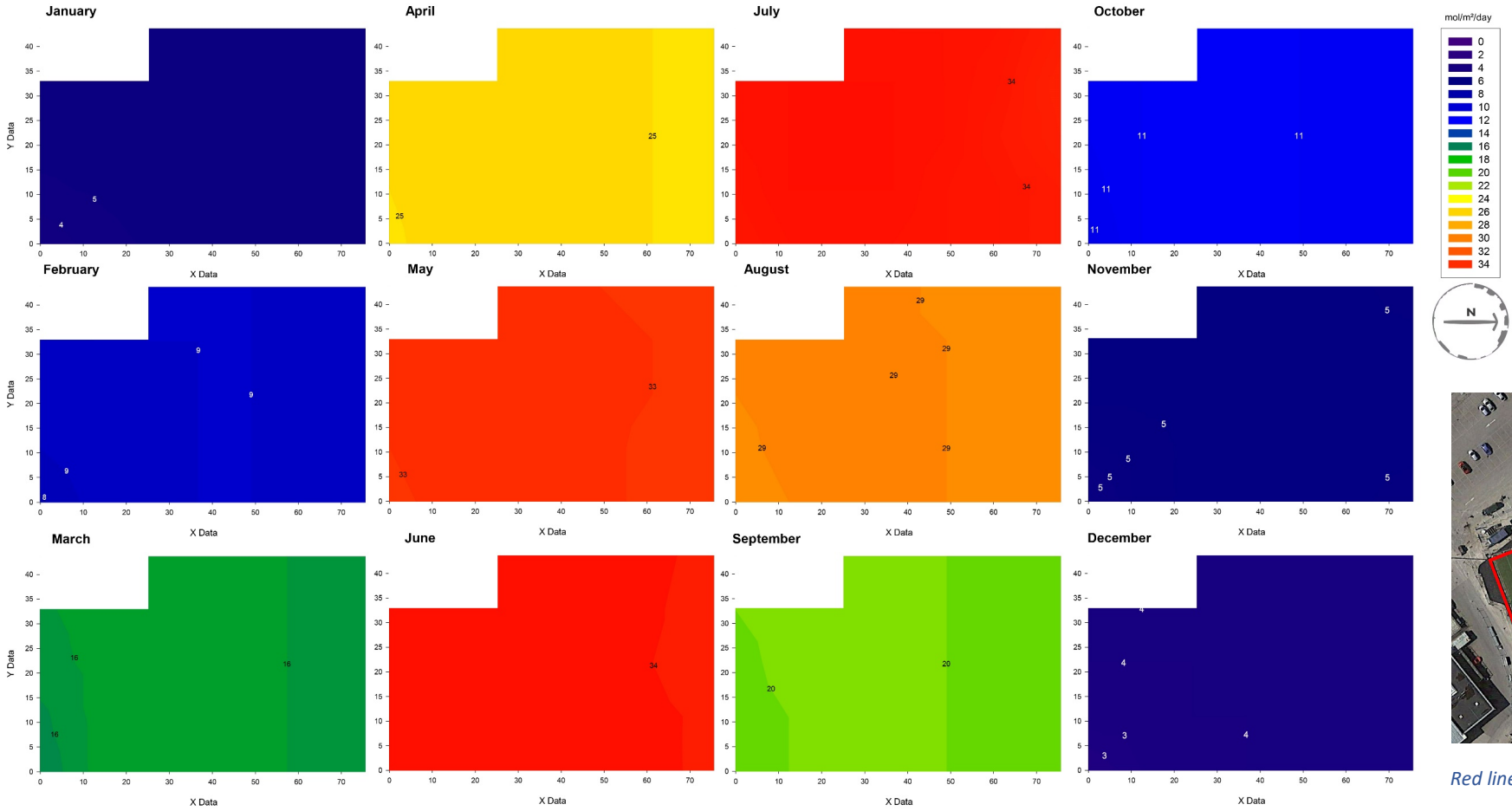


Scenario 3
Existing infrastructure
&
Temporary Stand System



Scenario 4
Proposed apartments
&
Temporary Stand System

Hemiview results - Scenario 1 Existing infrastructure



Red line boundary of the area analyzed

Figure 10: Scenario 1 - Gradient maps, monthly mol/m³/day

- Analysis shows a very consistent and natural change in gradient during the 12 months of the year.
- From March to September the training area is receiving 15 – 34 mol/m²/day and is well over the required 12 mol/m²/day for cool season turf and should be easily manageable with an annual maintenance program.
- During February & October the training area is receiving 8 – 11 mol/m²/day the lowest reading from February in the Southern part of the training area.
- In January, November & December are receiving between 3 – 5 mol/m²/day. Naturally, the solar track is causing significant shade and subsequently results in below threshold for active growth.
- Results indicate there is naturally an existing light deficit during the winter periods. This is only natural due to the lower solar track during these months.

Deficiency and Lighting Rig Deployment – Scenario 1 Existing infrastructure

Existing infrastructure - 04.11.2020 **Based on 1000W bulbs**

Deployment positions

South

		P07	P10	P13	P16
P04	P05	P08	P11	P14	P17
P03	P06	P09	P12	P15	P18

North

Target (mol/m²/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.00	8.00	10.00	12.00	12.00	12.00	12.00	12.00	12.00	10.00	8.00	6.00

Deployment (days per month)

January

		2	2	2	2
2	2	2	2	2	2
3	2	2	2	2	2

February

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

March

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

April

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

May

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

June

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

July

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

August

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

September

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

October

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

November

		4	4	4	4
4	4	4	4	4	4
4	4	4	4	4	4

December

		4	4	4	4
4	4	4	4	4	4
4	4	4	4	4	4

3 Deployment positions which at which achieving light levels is achieveable without supplimentary lighting rigs.

2 Deployment positions which at which achieving light levels is achieveable with minimal supplimentary lighting rigs

Figure 11: Scenario 1 - Target days Illustrates target level light level deficiency.

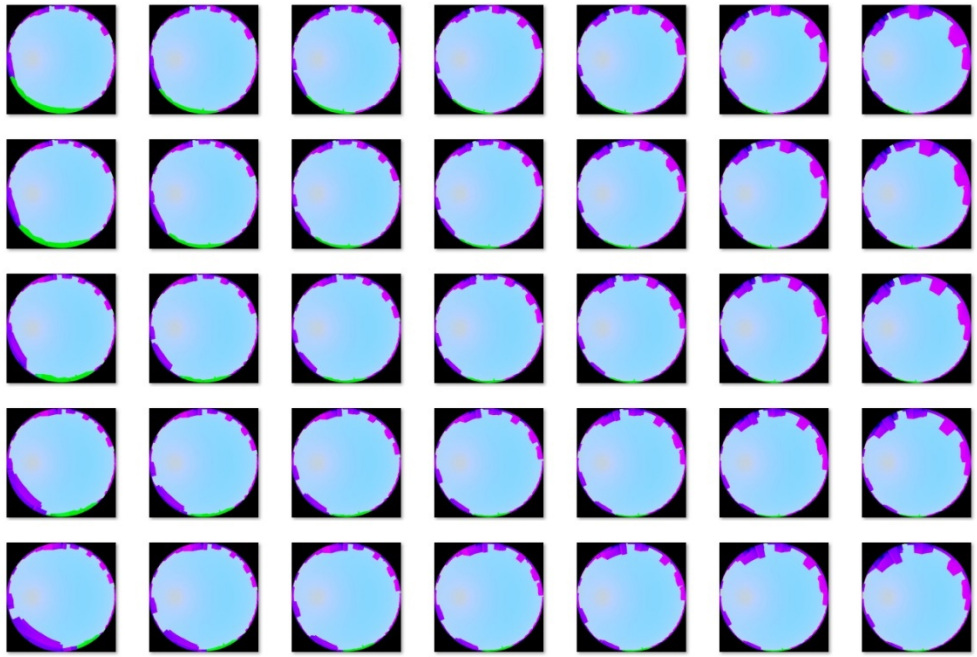
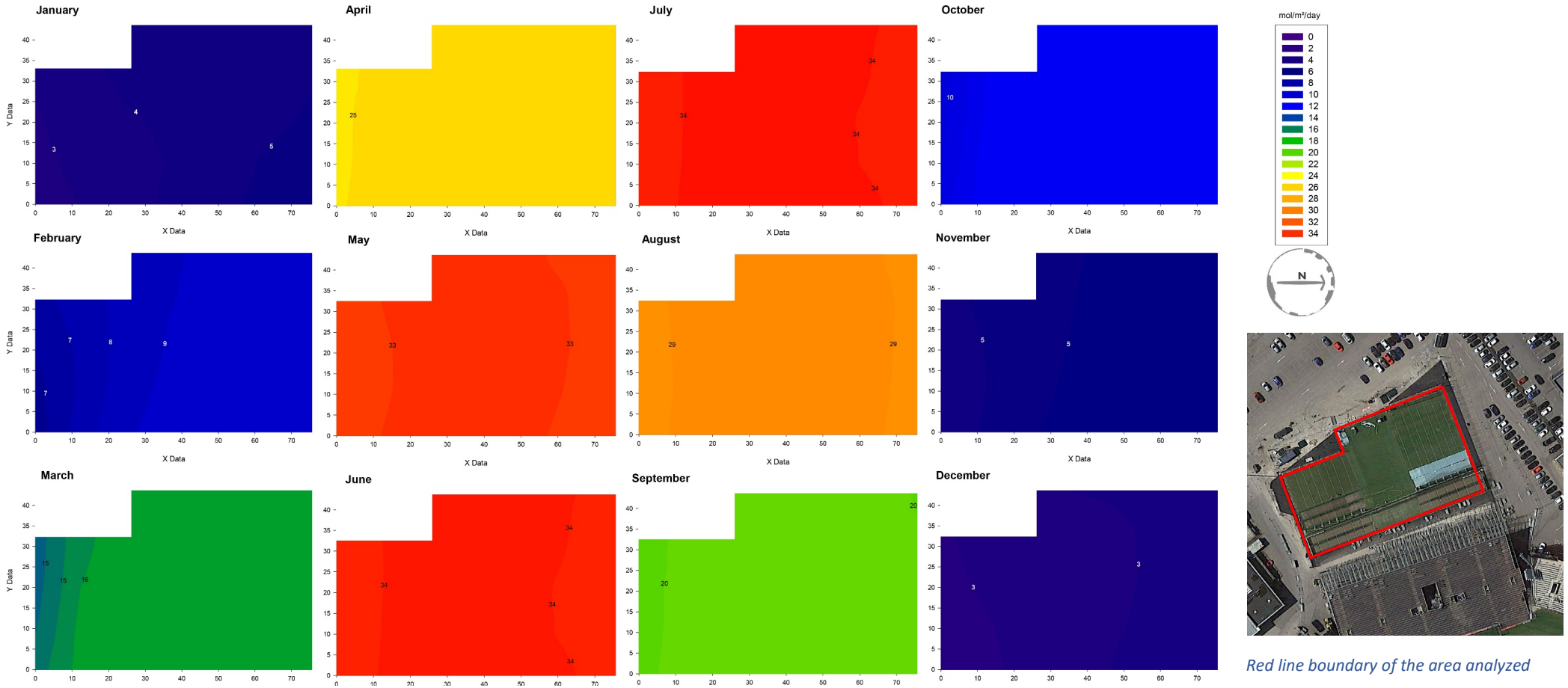


Figure 12: Scenario 1 – Hemiview rendered images

Summary Scenario 1: - Existing infrastructure

- When carrying out a hemiview view analysis in a built-up environment, the **deployment plans** are normally generated to show where there may be a requirement for use of supplementary lighting rigs.
- As stated above, this is a **theoretical exercise** - we are not necessarily advocating using grow lights specifically, the aim is to understand and contextualise light deficiency.
- Typically for cool season grasses we generally aim to get 8 - 12 mol/m²/day with winter months usually falling below this threshold. The deployment plans are a useful way to see where the need for additional light may be required.
- The light rig deployment information is provided only to highlight light deficiency, analysing the gradient maps above provide a more representative view of conditions and associated risks.
- The results highlight an existing impact in DLI deficiency during the winter periods, there is a consistent requirement to have minimal amounts of supplementary lighting during these months.

Hemiview results - Scenario 2 Proposed Apartments



Red line boundary of the area analyzed

Figure 13: Scenario 2 - Gradient maps, monthly mol/m³/day

- Analysis shows a very consistent and natural change in gradient during the 12 months of the year.
- Again, from March to September the training area is receiving 15 – 34 mol/m²/day and is well over the required 12 mol/m²/day for cool season turf and should be easily manageable with an annual maintenance program.
- During February & October the training area is receiving 7 – 10 mol/m²/day the lowest reading from February in the Southern part of the training area. This is only minimally below the preferred 8 mol/m²/day.
- January, November & December are receiving between 3 – 5 mol/m²/day. Naturally, the solar track is causing significant shade and subsequently results in below threshold for active growth.
- Results indicate the proposed apartment has a very minimal increase in impact when compared to the existing infrastructure surrounding the training area during the winter period. But a drop of 1-2 mol per average a day is not going to cause much undue stress during that time of year.

Deficiency and Lighting Rig Deployment – Scenario 2
Proposed Apartments

Proposed apartment - 04.11.2020 **Based on 1000W bulbs**

Deployment positions

South

		P07	P10	P13	P16
P04	P05	P08	P11	P14	P17
P03	P06	P09	P12	P15	P18

North

Target (mol/m²/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.00	8.00	10.00	12.00	12.00	12.00	12.00	12.00	12.00	10.00	8.00	6.00

Deployment (days per month)

January

		3	3	3	2
4	4	3	3	3	2
5	4	3	3	2	2

February

		0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0

March

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

April

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

May

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

June

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

July

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

August

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

September

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

October

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

November

		4	4	4	4
6	5	4	4	4	4
6	5	4	4	4	4

December

		5	4	4	4
6	5	5	5	4	4
6	5	5	5	4	4

3 Deployment positions which at which achieving light levels is achieveable without supplimentary lighting rigs.

2 Deployment positions which at which achieving light levels is achieveable with minimal supplimentary lighting rigs

Figure 14: Scenario 2 - Target days Illustrates target level light level deficiency.

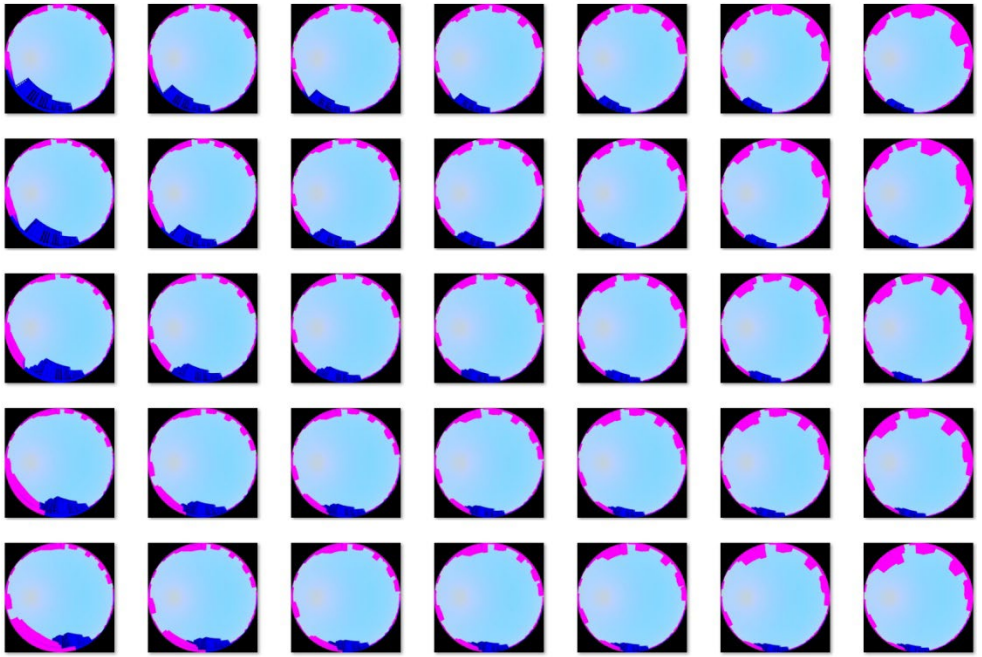


Figure 15: Scenario 2 – Hemiview rendered images

Summary Scenario 2: - Proposed apartment

- When carrying out a hemiview view analysis in a built-up environment, the **deployment plans** are normally generated to show where there maybe requirement for use of supplementary lighting rigs
- As stated above, this is a **theoretical exercise** - we are not necessarily advocating using grow lights specifically, the aim is to understand and contextualise light deficiency.
- Typically for cool season grasses we generally aim to get 8 - 12 mol/m²/day with winter months usually falling below this threshold. The deployment plans are a useful way to see where the need for additional light is required.
- The light rig deployment information is provided only to highlight light deficiency, analysing the gradient maps above provide a more representative view of conditions and associated risks.
- The results highlight increased shading during January, November & December in the southern and eastern end (see red line left).
- Deployment also highlights a very minimal impact during February in the South/East corner.

Hemiview results - Scenario 3 Existing infrastructure & Stand system

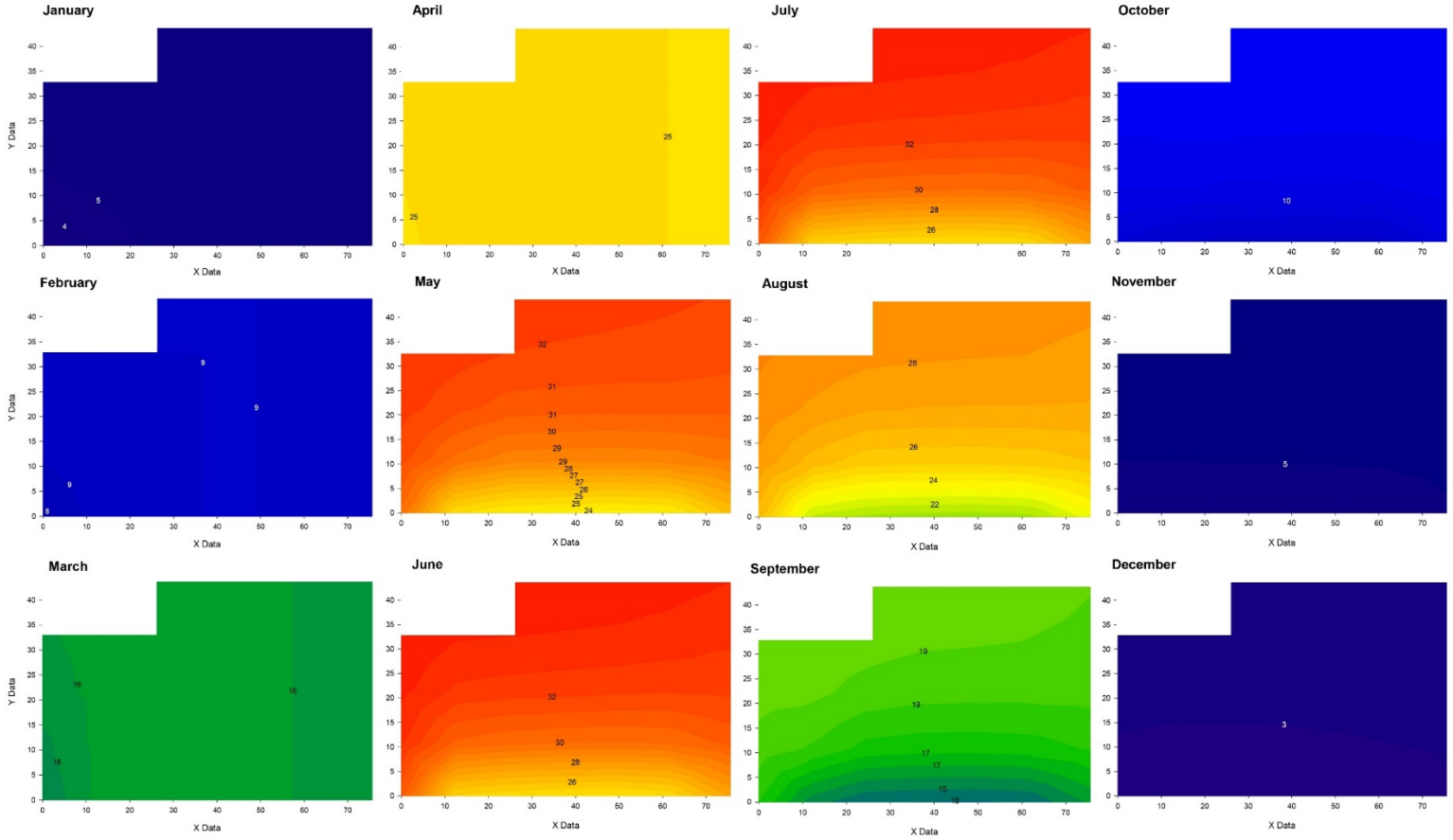


Figure 16: Scenario 3 - Gradient maps, monthly mol/m³/day

Red line boundary of the area analyzed

- Analysis shows the temporary stand system impacting on the eastern half of the training area from May to September receiving 14 – 32 mol/m²/day. The training area is still receiving the required mol/m²/day but grass health will be weaker in the most eastern area. These months are very important when it comes to maintaining good quality grass health.
- During February & October the training area is receiving 8 – 10 mol/m²/day the lowest reading from February in the Southern part of the training area. This is only minimally below the preferred 8 mol/m²/day.
- January, November & December are receiving between 3 – 5 mol/m²/day. Naturally, the solar track is causing significant shade and subsequently results in below threshold for active growth
- Results indicate the temporary stand system has a significant impact on the Eastern area of the training ground during the end of spring and through the summer periods. But does not fall below the preferred 8 mol/m²/day

Deficiency and Lighting Rig Deployment – Scenario 3 Existing infrastructure & Stand system

Existing infrastructure & temporary stand - 04.11.2020 **Based on 1000W bulbs**

Deployment positions

South

		P07	P10	P13	P16
P04	P05	P08	P11	P14	P17
P03	P06	P09	P12	P15	P18

North

Target (mol/m²/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.00	8.00	10.00	12.00	12.00	12.00	12.00	12.00	12.00	10.00	8.00	6.00

Deployment (days per month)

January

		2	2	2	2
2	2	2	2	2	2
3	2	2	2	2	2

February

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

March

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

April

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

May

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

June

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

July

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

August

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

September

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

October

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

November

		4	4	4	4
4	4	4	4	4	4
4	4	4	4	4	4

December

		4	4	4	4
4	4	4	4	4	4
4	4	4	4	4	4

3 Deployment positions which at which achieving light levels is achieveable without supplimentary lighting rigs.

2 Deployment positions which at which achieving light levels is achieveable with minimal supplimentary lighting rigs

Figure 17: Scenario 3 - Target days Illustrates target level light level deficiency.

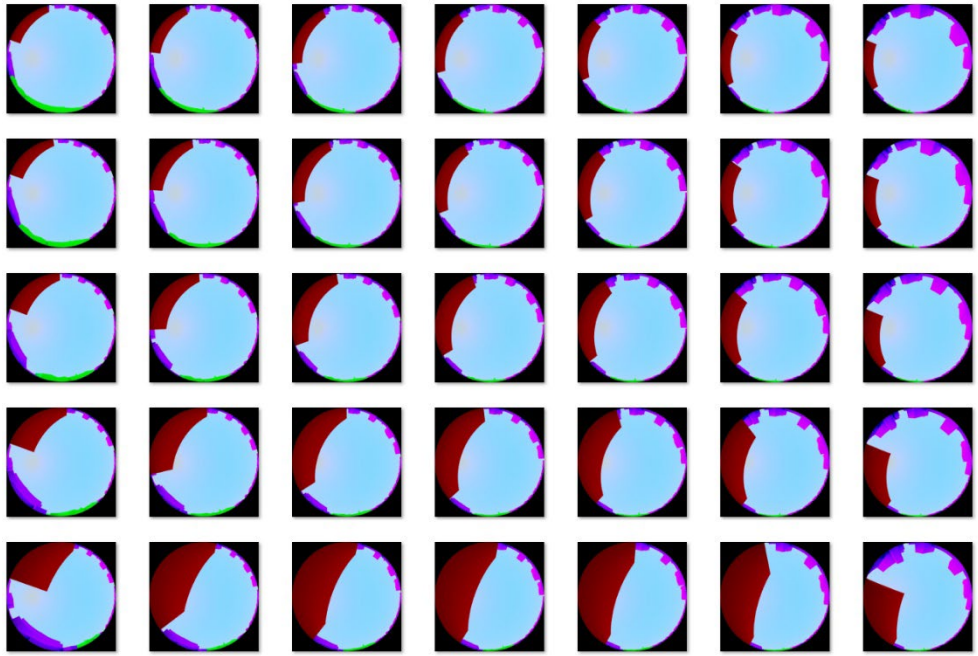
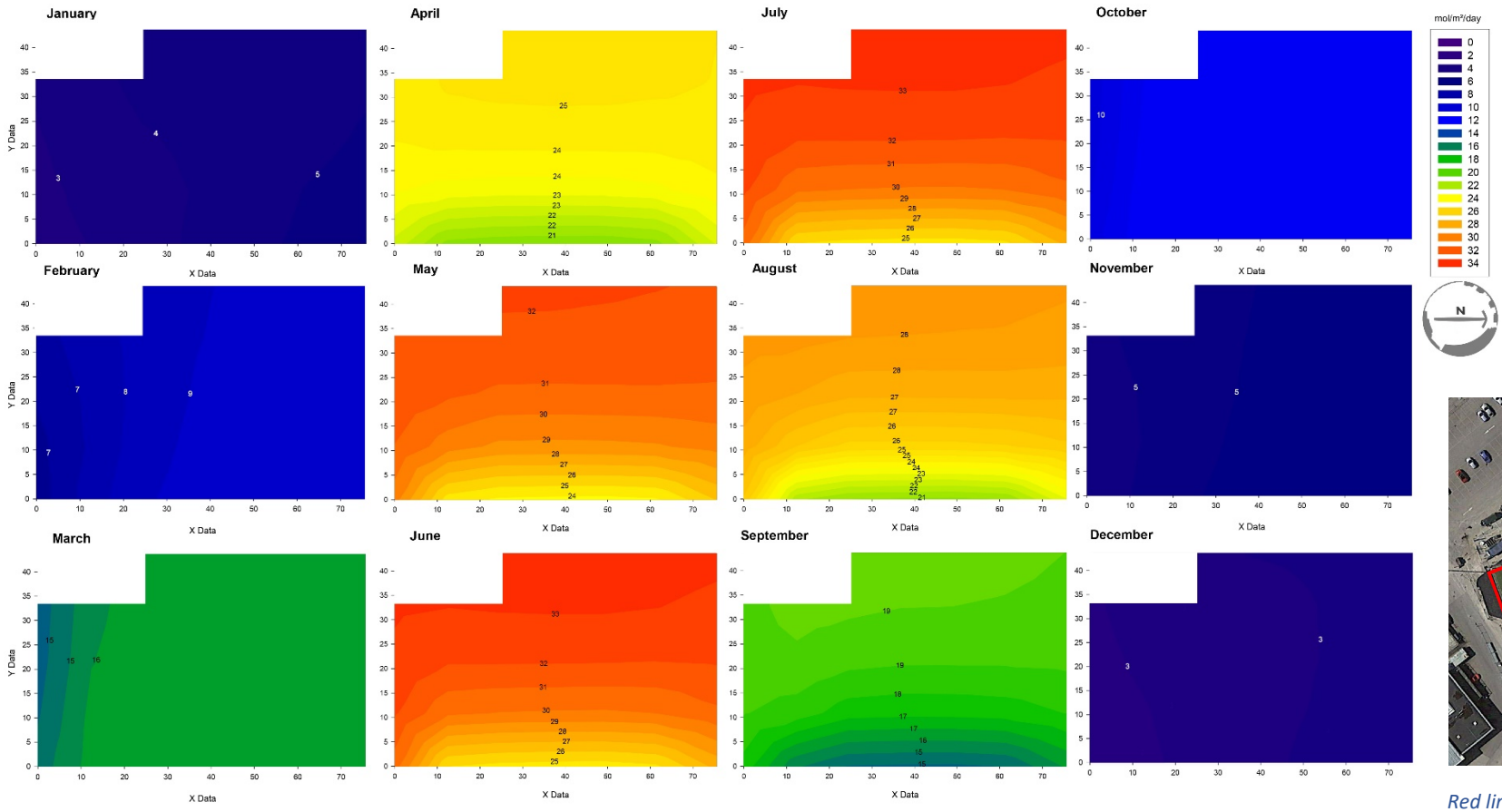


Figure 18: Scenario 3 – Hemiview rendered images

Summary Scenario 3: - Existing infrastructure & temporary stand system

- When carrying out a hemiview view analysis in a built-up environment, the **deployment plans** are normally generated to show where there may be requirement for use of supplementary lighting rigs
- As stated above, this is a **theoretical exercise** - we are not necessarily advocating using grow lights specifically, the aim is to understand and contextualise light deficiency through the various scenarios.
- Typically for cool season grasses we generally aim to get 8 - 12 mol/m²/day with winter months usually falling below this threshold. The deployment plans are a useful way to see where the need for additional light is required.
- The light rig deployment information is provided only to highlight light deficiency, analysing the gradient maps above provide a more representative view of conditions and associated risks
- The results reflect Scenario 1 highlighting the existing need for supplementary lighting during January, November & December.

Hemiview results - Scenario 4 Proposed Apartments & Temporary stand system



Red line boundary of the area analyzed

Figure 19: Scenario 4 - Gradient maps, monthly mol/m³/day

- Like scenario 3 the analysis shows the temporary stand system impacting on the eastern half of the training area from May to September receiving 14 – 32 mol/m²/day. The training area is still receiving the required mol/m²/day but grass health will be weaker in the most eastern area. it should be noted the proposed apartment has no impact during this period.
- During February & October the training area is receiving 7 – 10 mol/m²/day the lowest reading from February in the Southern part of the training area. This is only minimally below the preferred 8 mol/m²/day.
- March is receiving 14 – 16 mol/m²/day and shows a minimal increase in impact from the proposed apartment development. But does not fall below the required 8 – 10 mol/m²/day.
- January, November & December are receiving between 3 – 5 mol/m²/day. Naturally, the solar track is causing significant shade and subsequently results in below threshold for active growth.
- Results indicate the proposed apartment has a very minimal increase in impact when compared to the existing infrastructure surrounding the training area during the winter period. A drop of 1-2 mol per average a day is not going to cause much undue stress during that time of year. The results also indicate the temporary stand has more of an impact during the end spring and throughout the summer months but does not fall below the preferred 8 mol/m²/day.

Deficiency and Lighting Rig Deployment – Scenario 4 Proposed Apartments & Temporary stand system

Temporary stand & proposed apartment - 04.11.2020 **Based on 1000W bulbs**

Deployment positions

South

		P07	P10	P13	P16
P04	P05	P08	P11	P14	P17
P03	P06	P09	P12	P15	P18

North

Target (mol/m²/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.00	8.00	10.00	12.00	12.00	12.00	12.00	12.00	12.00	10.00	8.00	6.00

Deployment (days per month)

January

		3	3	3	2
4	4	3	3	3	2
5	4	3	3	2	2

February

		0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0

March

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

April

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

May

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

June

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

July

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

August

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

September

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

October

		0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

November

		4	4	4	4
6	5	4	4	4	4
6	5	4	4	4	4

December

		5	4	4	4
6	5	5	5	4	4
6	5	5	5	4	4

3 Deployment positions which at which achieving light levels is achieveable without supplimentary lighting rigs.

2 Deployment positions which at which achieving light levels is achieveable with minimal supplimentary lighting rigs

Figure 20: Scenario 4 - Target days Illustrates target level light level deficiency.

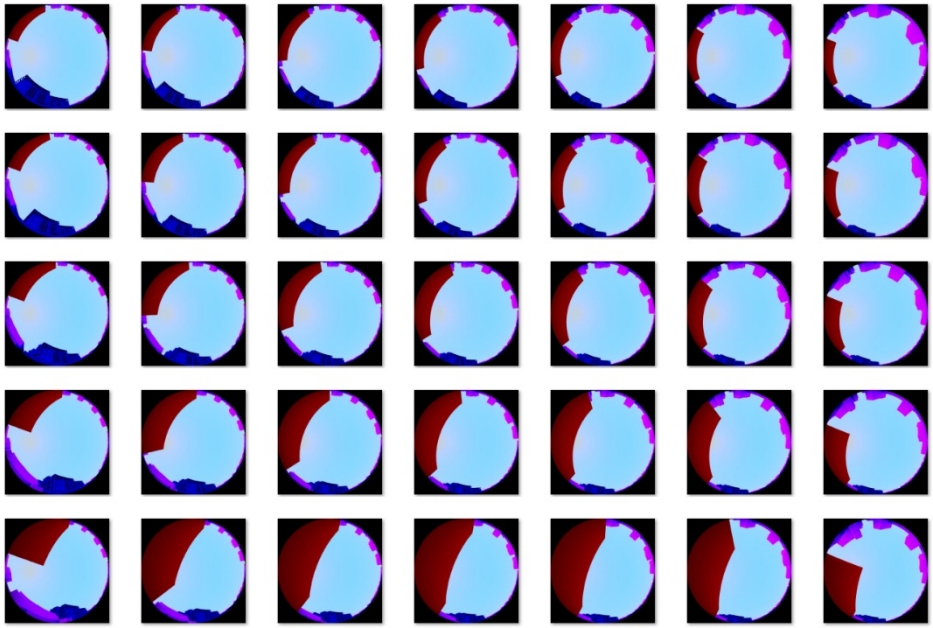


Figure 21: Scenario 4 – Hemiview rendered images

Summary Scenario 4: - Proposed apartment & temporary stand system

- When carrying out a hemiview view analysis in a built-up environment, the **deployment plans** are normally generated to show where there maybe requirement for use of supplementary lighting rigs
- As stated above, this is a **theoretical exercise** - we are not advocating using grow lights specifically, the aim is to understand and contextualise light deficiency.
- Typically for cool season grasses we generally aim to get 8 - 12 mol/m^2/day with winter months usually falling below this threshold. The deployment plans are a useful way to see where the need for additional light is required.
- The light rig deployment information is provided only to highlight light deficiency, analysing the gradient maps above provide a more representative view of conditions and associated risks.
- The results highlight a minimal increase in deficiency during January, November & December in the southern and eastern end (see red line left).
  Deployment also highlights a very minimal impact during February in the South/East corner.

Hemiview Summary

Based on the hemiview light modelling the fluctuations in light levels across the year according to seasons which is normal. The key feature is that the light levels are generally homogeneous across the whole site.

I.e., the infrastructure in and around the modelled area with the proposed apartment block is not having a significant impact.

The light levels fluctuate naturally throughout the seasons, but we are not going to have a situation where the new proposed development is likely to provide a significantly reduced growth potential due to shading, as level of shading is minimal.

Light levels are proven to be very consistent around the whole area modelled and are responding to natural changes in the seasons.

The proposed apartment building will only affect the area during winter months with only a small reduction in light levels. This is mainly caused by the time of year and not the development due to natural light levels during the winter periods.

The impact of new building in terms of light is minimal. There is a slight drop off in light levels in the Southern & Eastern area of the modelled area but is unlikely to provide significant impact.

Agronomically there isn't a significant impact over and above the time of year, drop off in light levels due to the slightly increased shading in the South East corner are likely not to result in inhibitory grass health. i.e., Winter periods, growth is at its lowest. Therefore, a small drop of in light levels is going to have less effect than it would during the spring growing period.

A reduction of 1-2 mol per average a day will not reduce growth potential significantly at that time of year. Although if the shading were an issue in summer for example, impact would be far greater in summer periods due to the grass plant wanting to naturally grow but with light levels inhibiting growth potential.

As would-be standard practice during the Autumn and Winter months turf surface moisture levels should be managed appropriately such as brushing or switching and preventative disease management strategies put into place. All of which reflect best management practices for turf during this period.

Sport England have stated - *at the end of the cricket season (end of Sept), the areas are renovated, and a new sward has to be grown-in during late autumn or early winter. Shade will reduce the soil temperature and light required for the sward to reach sufficient maturity to become winter hardy and the performance and durability of the net areas will be detrimentally affected."*

Realistically without provision of supporting technology such as lights, covers and heating following renovation, growth of the newly establishing turf will naturally tend to drop off in late October early November as air and soil temperature decline limiting potential for active growth.

If there was a significant shade issue present at the time and immediately after the renovation in September, then there would be more of an impact of shading on the turf as temperature s would be more conducive to growth.

As the hemiview modelling has shown in the renovation recovery period (October / early November) there will be negligible light reduction during that timeframe due to the proposed apartment blocks, therefore the impact of the proposed building will have a negligible impact on the establishment of grass during that period.

Glossary of keywords

DLI – is the amount of PAR received each day as a function of light intensity. It is expressed as moles of light (mol) per square meter per day. DLI measures the total amount of PAR received in a day. DLI is an important variable to measure because it influences grass plant growth.

Mol – micro mole is a way to measure the amount of a substance. In this case number of photons passing though a target area. one micro mole of light equals to just over 62 quadrillion photons

PAR - is the abbreviated term for photosynthetically active radiation which describes the spectral range (wave band) of solar radiation from 400 to 700 nanometres that photosynthetic organisms are able to use in the process of photosynthesis. Photosynthesis is a process used by plants to convert light energy, normally from the sun, into chemical energy that can be later released to fuel the plants' activities.

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Lee Collier	[redacted]	12th November 2020

REVISION RECORD					
Rev	**Date**	**Status**	**Description of Principal Revisions**	**Prepared**	**Approved**
1	##/##/##				
2					
3					
4					

Hemiview ™ Light Assessment, Benchmarking, Turfgrass Management and High-Level Concept Design