Pentavia, Mill Hill

London NW7 2ET

Visibility and Light Pollution Study

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Pentavia Retail Park

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1. Executive Summary

Eb7 are instructed to provide advice on the potential impact on the performance of UCL's observatory due to the proposed redevelopment of Pentavia Retail Park at Mill Hill for residential use. The Development is located some 500 meters to the South downhill from the observatory.

UCL is specifically concerned about the potential reduction in sky visibility and the increment of night time light pollution. We have engaged with UCL in order to understand their specific requirements and to provide mitigation suitable to this situation.

Our discussions with UCL have resulted in a sculptured massing that is almost completely obscured from the observatory, assuring a negligible reduction of their view of the sky.

The proposal is compliant with standard guidance and best practice for night time light pollution. However, concerns have been raised with regards to special requirements of astronomical observations. Direct light from the Development was UCL's main concern, but our verified views show that the final design is virtually invisible. Indirect light pollution is also addressed using additional mitigation.

In light of the above and given the design changes undertaken to specifically meet UCL's concerns, we believe that the Development will not worsen the current baseline conditions for the observatory in terms of night time light pollution or sky visibility.

This document summarises the discussions with UCL, our technical analysis and the mitigation proposed.

2. Assessment Objectives

Through our discussions with UCL, they have expressed their concerns on two potential adverse impacts on the work of their observatory due to the proposed Development:

- Reduction of sky visibility from the observatory. UCL's concern on the building height is based on the relative height of the proposal compared with that of the observatory on the basis that this could impact their observations of the night sky; and
- Potential interference with their night time measurements as a result of additional light pollution from the Development. Their main concern regarding light pollution was the scattering of light when travelling through the atmosphere, which could result in a glowing effect at night. The source of this effect can be light sources within the development, both internal or external, or car headlights.

The UCL Observatory consists of five observation domes, the larger and most important houses the Radcliffe telescope (figs. 3 and 4 at page 4). As this is the most relevant one, we have concentrated our analysis from this dome.

3. Proposed Development

The proposal is located on a triangular site, currently occupied by a retail park. It is neighboured to both west and east by significant main roads, namely M1 and A1 (Watford Way). To the north, the site adjoins a wooded area and, beyond this, new houses at Palmerstone Court along Bunns Lane. Further north, half a kilometre up hill, is the UCL observatory.

The proposal has undergone a series of modifications in response to discussions with UCL. The latest scheme consists of two series of blocks, shielding the main external amenity area from the main roads. The scheme is lower to the north in order to hide the massing of the buildings from the observatory.

4. Visibility Studies

4.1. Existing Scenario

During a site visit, pictures were taken from the main Radcliff telescope (figs. 1 and 2). These pictures are pointing south and they range about 80° horizontally.

It can be seen from the daytime picture (fig. 1) that some elements are already protruding from the horizon, obstructing the view of the lower part of the sky dome. The obstructing elements are mostly trees, but some buildings can also be seen to the southwest.

4.2. Verified View

In order to quantify the potential reduction of the view of the sky, we have created a Verified View of the scheme from the Radcliffe dome, which is the tallest and most relevant in the observatory (figs. 3 and 4).

A Verified View is a photomontage that shows a true representation of the finished Development with a high and verifiable degree of accuracy. This level of accuracy is achieved by complying with London View Management Framework SPG, Appendix C: Accurate Visual Representations.

Our Verified View (fig. 5) shows, in a standard 35mm picture, that the scheme falls mainly below the tree line and it is virtually invisible from the observatory. Only glimpses of the building can be seen through or above the branches. The outline of the building has been included for reference with a broken red line. Given the limited visibility of the scheme, a real representation of the finishing materials was not deemed necessary.

It should also be noted that the original image corresponds to early November, when most trees had already lost their leaves. UCL was more concerned about the visibility of the southern part of the sky in summer, and in that season the leaves will completely mask the proposed scheme.

The comparison between the existing and the proposed scenario can be understood in our panoramic views from the Radcliffe dome (figs. 6 and 7). They show in a wider context that the skyline as viewed from the observatory will not be modified. As the proposal is almost invisible, its outline has been highlighted with a whote line (fig. 8), so its location behind the trees can be more easily understood.

In light of the above, we can conclude that the proposed Development will not cause any additional impact to the sky visibility enjoyed by the observatory or reduction to the view of the night sky.

5. Light Pollution Studies

5.1. Existing Scenario

The night picture (fig. 2) shows that some degree of light pollution is already affecting the observatory. Sky glow is happening as a result of the suburban location, where a wide urban area is already contributing to the illumination of the sky.

Light pollution from Watford Way, 20m to the East, is also visible. To the Southwest, several lit buildings are visible in the background. This includes TNQ-tower, Greenpoint, Utility Warehouse and arch of Wembley Stadium through the branches. The strongest effect corresponds to unshielded street lights. In the near field, lights can be seen from Parkmead Gardens, 100m to the southwest.

5.2. Standard Guidance

In order to minimize any potential light pollution from the Development, the design will follow the recommendations in the ILP guide GN01:2011 'Guidance notes for the reduction of obtrusive light', which is the document of reference for standard night time assessments in UK. This document gives recommendations regarding four different issues:

•sky glow;

•night time glare;

•light intrusion; and

•building luminance.

Sky glow refers to the brightening of the sky directly from light sources of indirectly bounced off materials. This propagation of artificial lighting in the atmosphere can be noticed at hundreds of kilometres from the light source [1]. The sky glow to the south is influenced by the entire metropolitan area, and the proposal will constitute a very small contribution to the brightening of the sky. The ILP guide recommends limiting the Upward Light Ratio, which is the maximum permitted percentage of luminaire flux that goes directly into the sky, to less than 5% for suburban areas. We advise the design team to achieve this by the proper application of suitable directional luminaires and light controlling attachments (ie. by using hoods or being ceiling-mounted) in the Development.

Night time glare is the uncomfortable brightness as a result of the contrast with a dark background, which is generally the result of direct light from light fittings. The ILP guide recommends limiting the intensity of the light sources. Light fittings are typically of limited intensity within residential schemes, especially internal lights. With regards to the observatory, this issue is not applicable, as the light fittings in the Development will be hidden from view, with the exception of a handful of windows in winter.

Light intrusion refers to the excessive spill of light beyond the area to be lit. This specifically relates to light cast upon neighbouring windows, and the potential impacts which are dependent on the existing lighting environment.

Light intrusion for suburban zones is typically within the recommended limits for distances up to 30 meters, unless unusually bright light sources are used at night (ie. sport facilities). The closest unit at Palmerstone Court is located 36 meters away and therefore they should not receive light intensities beyond recommendation. The UCL observatory is located about 500 meters from the proposal and therefore, the light intrusion from the proposal will be minimal and not distinguishable from that of the surrounds.

Building luminance is another form of night glare that refers to buildings directly illuminated as night-time features, causing an uncomfortable glow from the illuminated facades. We advise the design team not to implement external flood lighting or feature lighting in order to avoid over lighting, which could potentially cause a glowing effect.

[1] Canadian Dark Sky Initiatives. Bidwell, Dick, Goering and Welch. Starlight 2008.

5.3. Specific Guidance

Our analysis demonstrates that the proposal is completely compliant with standard guidance and best practice for night time light pollution. Despite this, concerns have been raised with regards to special requirements of astronomical observations.

In response to those concerns, we have reviewed guidance and local regulations for areas around astronomical observatories worldwide. As these facilities are usually located in remote areas, documents tend to refer to macro scale effects from the entire city, such as sky glow, which is already part of the ILP guide.

Micro scale impacts from nearby buildings are not included in guidance for astronomical sites, but they all mention the importance of shielding external lights and limiting the colour temperature of the lights. Given that the external lights in the Development will not be directly visible from the observatory, these mitigations are not strictly necessary. However, we recommend the design team to include them where possible.

In previous reports we have included specialised assessments to understand the effect of car headlights from nearby roads when cast upon the proposed scheme, which could cause unwanted light reflections. Given that the Development is almost completely obscured from the observatory, we believe that these assessments are now of no relevance.

6. Mitigation

Considering the above and the specific sensitivity of an observatory to light pollution we recommend the following mitigation:

- No external illumination of the buildings as a night feature;

- Control and limit the luminaire intensity to the minimum levels necessary;

- Minimise the light spillage beyond the task area to be illuminated by shielding all external lighting;

- Use external light fittings with zero upward light ratio;

- Limit the colour temperature (blue component) of the external lights;

- Dimming or switching off the external lighting at certain times of the night;

- Apply non-reflective materials, such as brick, on the facade where possible.

7. Conclusions

This practive has worked closely with the design team to study and address UCL's main concerns regarding the height of the building and potential light pollution from the proposal. This has resulted in a substantial modification of the mass of the building and specific mitigation relevant to astronomical observations.

Our visibility studies show that the Development falls mainly below the tree line, and therefore it will be virtually invisible from UCL's observatory. As such, their view of the sky will not be altered.

With regards to light pollution, the Development will be compliant with the ILP guide, the main document of reference in the UK. This assures that the typical light pollution issues (sky glow, night time glare, light intrusion and building luminance) will be within recommendation.

Specific concerns from UCL like glare from windows and light reflections from car headlights are not applicable since the building will be essentially concealed from the observatory.

In light of the above, we believe that the Development will not significantly affect the work of the observatory in terms of view of the sky or light pollution. We have however recommended the implementation of mitigation beyond standard recommendation as a precaution, and in recognition of the special sensitivities of the observatory.

Fig. 1: Daytime View South

Fig. 2: Night time View South

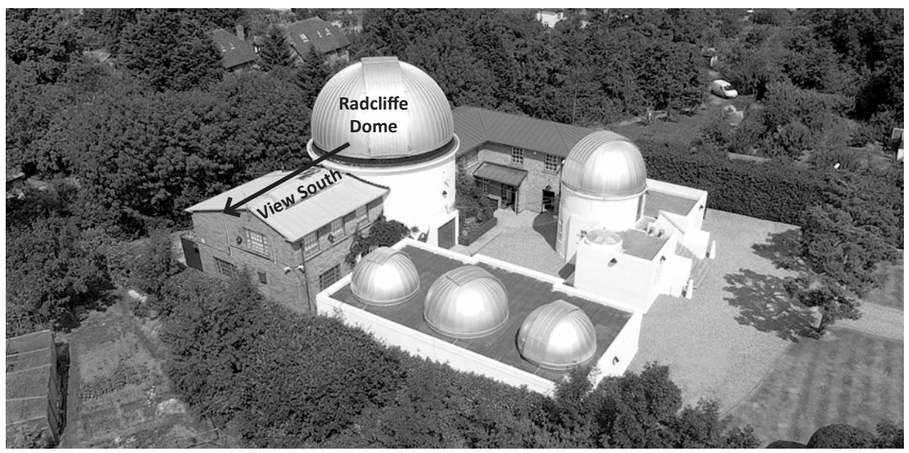
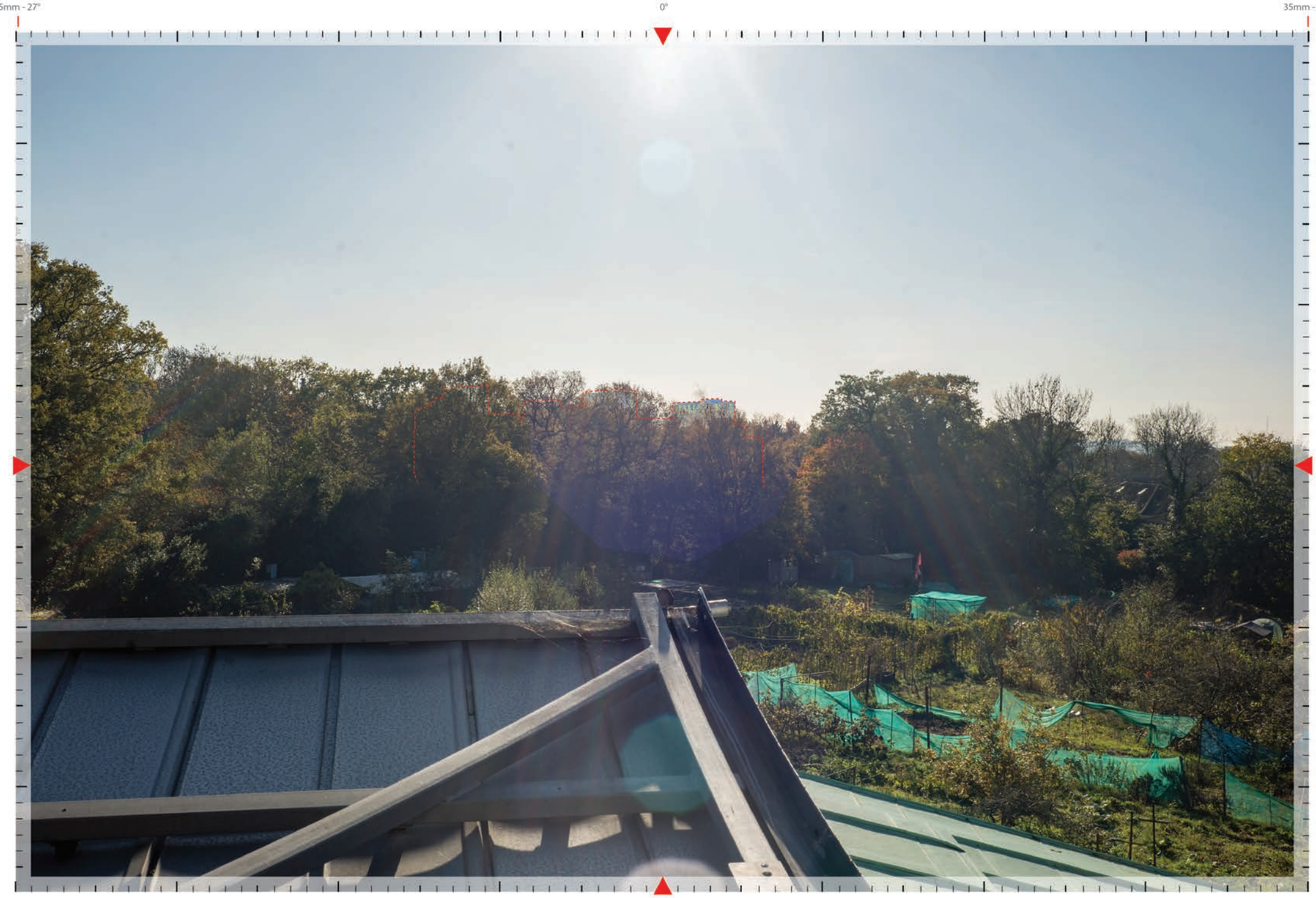


Fig. 3: Bird's Eye View of UCL's Observatory

Fig. 4: View of UCL's Observatory at night



Note: The colour of the proposal is not representative of the finishing materials.

Fig. 5: Verified View from Radcliffe Dome

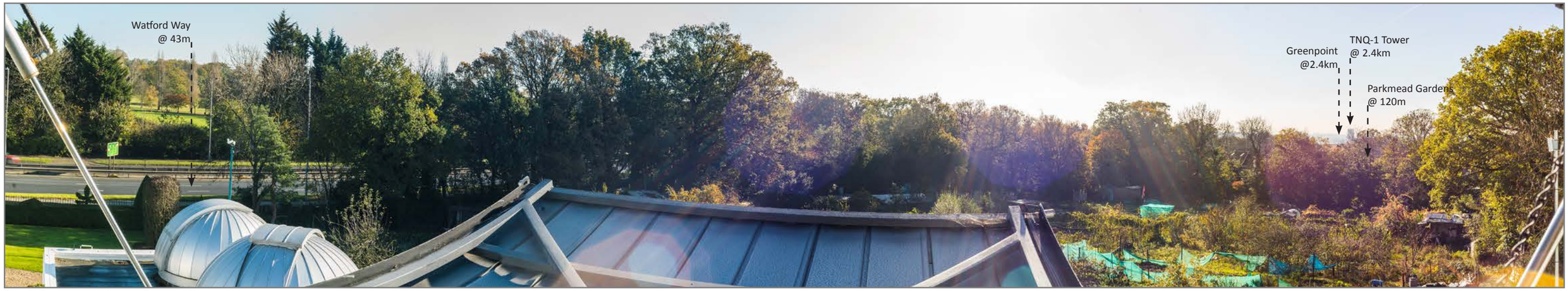


Fig. 6: Panoramic View - Existing Scenario

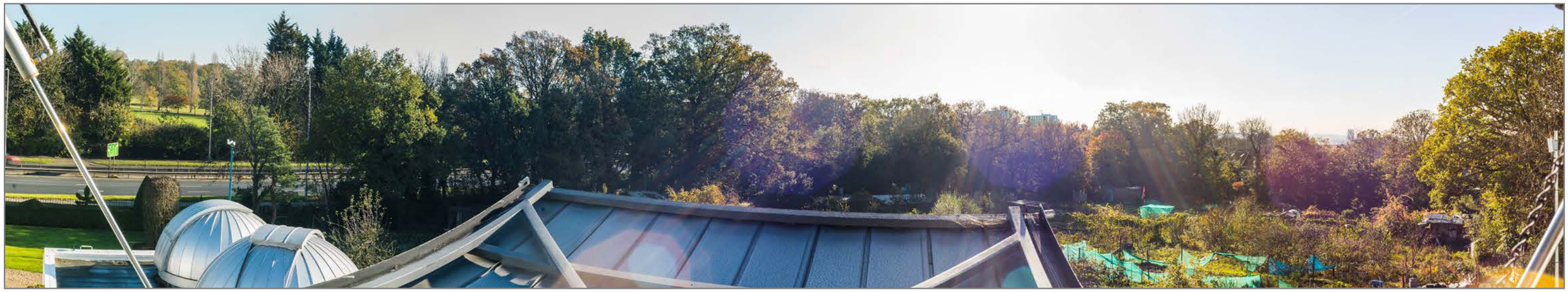


Fig. 7: Panoramic View - Proposed Scenario

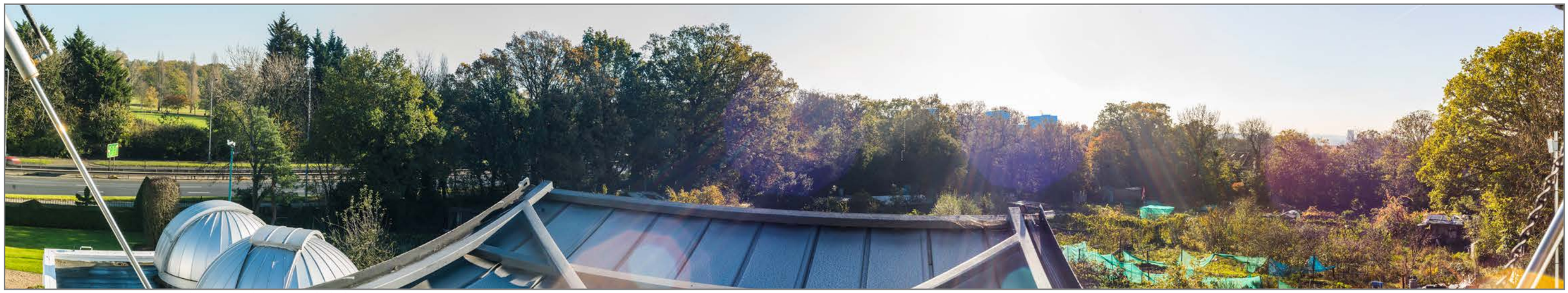


Fig. 8: Panoramic View - Proposed Scenario showing occluded view