

Appendix 6.3

Verified Views Methodology

Project:

Upper Brook Street

MANCHESTER

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	Visualisation Type	Level of accuracy of location	Render / Wireline	Ref	OS-E	OS-N	Height (AOD)	Height (AGL)	Lens equivalent	Lens choice	Field of view	Date	time
Vw01	Type 4	Better than 0.05m	Render	2453	384669.715	396995.411	38.536	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	17:27:14
Vw02	Type 4	Better than 0.05m	Render	2443	384856.956	396725.634	39.186	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	11:16:40
Vw03	Type 4	Better than 0.05m	Render	2447	384986.446	396821.4	39.418	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	14:10:50
Vw04	Type 4	Better than 0.05m	Render	2448	384944.485	396858.193	39.049	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	14:36:38
Vw05	Type 4	Better than 0.05m	Wireline	2454	384562.464	397165.423	38.664	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	17:55:00
Vw06	Type 4	Better than 0.05m	Wireline	2455	384769.771	397081.704	39.245	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	18:29:26
Vw07	Type 4	Better than 0.05m	Wireline	2445	385072.432	397125.473	39.97	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	12:37:00
Vw08	Type 4	Better than 0.05m	Wireline	2446	384968.041	396987.504	39.659	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	13:16:15
Vw09	Type 4	Better than 0.05m	Wireline	2444	385173.328	396986.322	40.135	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	12:00:29
Vw10	Type 4	Better than 0.05m	Wireline	2449	384986.655	396539.999	39.724	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	15:17:09
Vw11	Type 4	Better than 0.05m	Wireline	2450	384724.27	396630.389	38.605	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	15:56:17
Vw12	Type 4	Better than 0.05m	Wireline	2451	384553.715	396720.25	38.195	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	16:29:01
Vw13	Type 4	Better than 0.05m	Wireline	2452	384658.187	396832.221	38.272	1.6	24mm (22mm)	Inclusion of the full context of site	74°	03/04/2021	17:01:02

1.0 Introduction

1.1 Methodology overviews

The methodology applied by HDMI Limited to produce the ‘Type 4 Photomontages survey / scale verifiable’¹ or views contained in this document are described below. In the drafting of this methodology and the production and presentation of the images, guidance has been taken from the ‘TGN 06/19 Visual Representation of development proposals’ (TGN06/19) from the Landscape Institute published on 17 September 2019 in support of GLVIA3. The disciplines employed are of the highest possible levels of accuracy and photo-realism which are achievable with today’s standards of architectural photography and computer-generated models.

1.2 View Selection

The viewpoints are being selected through a process of consultation with relevant statutory consultees by townscape/heritage consultants and having regard to relevant planning policy and guidance.

2.0 Photograph

¹ TGN 06/19 Visual Representation of development proposals.’

Available at: https://landscapewpstorage01.blob.core.windows.net/www-landsca-peinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022).pp. 21-2

2.1 Photography

High quality digital full frame sensor cameras are being utilised.

2.2 Lenses

In accordance with TGN 06/19, HDMI Ltd balances the need to include the extent of the site and sufficient context with the stated preference for 50mm lenses. For local urban views a wide-angle lens of equivalent 24mm or 35mm are generally used. For more open spaces the default is 50mm, intermediate distance views are photographed with a lens between 35mm to 70mm and occasionally long-range views may be required with lens options ranging from 70mm to 1200mm. As a guide, the following approach is used: (HDMI prefer to shoot to 22.3mm equivalent and frame boarder 24mm allowing for lenses distortion at image extreme)

View	Lens options
Relevant foreground, urban context, or large site	Circa 24mm-35mm (equivalent)
Open Spaces, where proposed development can be included	50mm
800 to 5000m – intermediate	35mm-70mm
5000+ metres – long	70mm -1200mm

2.3 TGN 06/19

States that: “2.2 Baseline photography should: [...] include the extent of the site and sufficient context;”²

“1.1.7 If a 50mm FL lens cannot capture the view in landscape or portrait orientation (for example, if the highest point of the development is approaching 18° above horizontal) the use of wider-angled prime lenses should be considered, working through the following sequence of fixed lenses (or equivalents) in this order: 35mm FL > 28mm FL > 24mm FL > 24mm FL Tilt-Shift. Tilt-Shift Lenses are considered at Appendix 13. In these unusual situations, the reasoning for the choice and

² TGN 06/19 Visual Representation of development proposals.’

Available at: https://landscapewpstorage01.blob.core.windows.net/www-landsca-peinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf

(Accessed: March 2022).pp. 5, Paragraph 2.2

the approach used should be documented, and the agreement of the competent authority should be sought (see Appendix 10 Technical Methodology).”³ and “Views should include the full context of the site / development and show the effect it has upon the receptor location.[...]”⁴

2.4 Digital camera⁵

HDMI Lab uses high quality professional DSLR (digital single lens reflex)

and DSLM (digital single lens mirrorless) cameras. The cameras utilise FFS

(Full frame sensors) so declared focal lengths require no conversion to be understood in line with TGN 06/19 guidelines. HDMI Lab use high quality lenses that are matched to the resolution of the cameras to ensure high contrast and sharp rendition of the images.

2.5 Position, time and date recording

The photographer is provided with (i) an Ordnance Survey map or equivalent indicating the position of each viewpoint from which the required photographs are to be taken, and (ii) a digital mock-up rendered with a context model of the desired view. For each viewpoint the camera is positioned at a height of 1.60 metres above the ground level which closely approximates the human eye altitude and falls into the 1.5-1.65m range provided by TGN 06/19. ⁶If local conditions required a deviation to capture the view, the exact height can be found in the Table of Views. A point vertically beneath the entrance pupil of the lens is marked on the ground as a survey reference point and two digital reference photographs are taken of (i) the camera/tripod location and (ii) the survey reference point (as shown in Figures 3 and 4). The date and time of the photograph are recorded by the camera.

³ TGN 06/19 Visual Representation of development proposals.â€™™

Available at: https://landscapewpstorage01.blob.core.windows.net/www-landsca-peinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf (Accessed: March 2022).pp. 28, Paragraph 1.1.7

⁴ ‘TGN 06/19 Visual Representation of development proposals.’

Available at: https://landscapewpstorage01.blob.core.windows.net/www-landsca-peinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf (Accessed: March 2022).pp. 35, Paragraph 4.1.5

⁶ ‘TGN 06/19 Visual Representation of development proposals.’

Available at: https://landscapewpstorage01.blob.core.windows.net/www-landsca-peinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf (Accessed: March 2022).pp. 50



1: Local view



2: Intermediate view



3: Camera location



4: Survey reference point

3.0 Digital image correction

3.1 Raw file conversion

Professional digital cameras produce a raw file format, which is then processed for both high detail and colour accuracy. The final image is saved as an 8-bit tiff file.⁷

3.2 Digital image correction

The digital photographs were prepared for the next stage of camera matching (see Sections 6 and 7).

All lenses exhibit a degree of geometric distortion. The most common types are radially symmetrical along the principal axis of the lens and tend to grow in size towards the perimeter of the image. The outer edges of the images are therefore not taken into consideration to reduce inaccuracies. Figure 5 illustrates the ‘safe’ or non-distortive area of an image which is marked by a red overlay.

The adjusted or corrected digital image, known as the ‘background plate’, is then saved ready for the camera matching process (see Sections 6 and 7). In preparation for the survey (see Section 3.2) HDMI Lab indicates on each background plate the safe area and priority survey points, such as corners of buildings, retained elements and party walls for survey (see Figure 6).

⁷ is the name given to a specific format of image file stored digitally on a computer.



5: Area of interest to be surveyed



6: Background plate highlighting critical survey points in green and secondary survey strings in red

4.0 Type 4 visualisations

4.1 Type 4 visualisation

Unless otherwise specified visualisations are completed to TGN 06/19⁸ Type 4 Photomontage / Photo wire (survey / scale verifiable) standards.

4.2 Survey

An independent surveyor is contracted to undertake the survey of (i) each viewpoint as marked on the ground beneath the entrance pupil of the lens at the time the photograph is taken (and recorded by way of digital photograph (see Section 1 above) and (ii) all the required points on buildings, hard landscape features or immobile permanent objects within the safe zone. The survey is coordinated onto the Ordnance Survey National Grid (OSGB36) by using GNSS (global navigation satellite system such as GPS⁹) equipment (see, for example, Figure 7) and processing software. The Ordnance Survey National Grid (OSGB36) is chosen as it is the most widely used and because it also allows the captured data to be incorporated into other available digital products (such as Ordnance Survey maps). The height datum used is Ordnance Survey Newlyn Datum and is also derived using the GNSS.

Improvements to the real-time position of GNSS data is achieved by RTK (real time kinematic) compensation, which utilises a comparison between known base stations positions and their current position fix to produce correction data to the measurements. The required points on each building are surveyed using conventional survey techniques utilising an electronic theodolite and reflector less laser technology (shown in Figure 8). In certain circumstances, a viewpoint may need to be surveyed using conventional survey techniques as opposed to RTK, if, for example, the viewpoint is in a position where GNSS information cannot be received.

4.3 False origin

3D modelling programs, unlike CAD/BIM programs, have inherent inaccuracies the further an object is away from the origin. HDMI Lab decide on and record a local, 'false origin' that is used to move the model closer to the origin. This alleviates the inaccuracies. The 3D model of the proposed development, consented scheme models, and survey data are all moved uniformly to this new false origin. When performing positioning checks (see Section 5.2) the offset between false origin and OS are added back to the coordinates

⁸ 'TGN 06/19 Visual Representation of development proposals.'

Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022).pp.11, Table2, pp 21-24.

⁹⁹ <https://www.rics.org/globalassets/rics-website/media/upholding-professionalstandards/sector-standards/land/guidelines-for-the-use-of-gnss-in-surveying-andmapping-2nd-edition-rics.pdf>



7: Field survey being carried out, GNSS receiver



8: Field survey being carried out, total station

5.0 Type 3 visualisations

5.1 Type 3 visualisation

These visualisations are as described in TGN 06/19¹⁰ Type 3 Photomontage / Photo wire (not survey / scale verifiable) standards. In contrast to Type 4, Type 3 visualisations rely on good quality data for camera matching but are not relying on surveys as described in Section 3.2. Data sources such as GPS, OS Maps, 3D City models, geo-referenced aerial photography, LiDAR or 3D models can be used.

The individual data source used is declared in an accompanying table. The possible angular shift of a 1m lateral displacement of the camera against its actual coordinate depends on the distance of the object from the camera¹¹:

Distance from camera	Apparent shift
10m	5.7°
100m	0.57°
1,000m	0.057°

¹⁰ 'TGN 06/19 Visual Representation of development proposals.'

Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022). pp.11, Table2, pp 19-20.

¹¹ 'TGN 06/19 Visual Representation of development proposals.'

Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022). pp 56-57

¹² 'Guidance - Visual representation of wind farms - Feb 2017'

Available at: <https://www.nature.scot/sites/default/files/2019-09/Guidance%20-%20Visual%20representation%20of%20wind%20farms%20-%20Feb%202017.pdf>
(Accessed at March 2022). pp 8-9

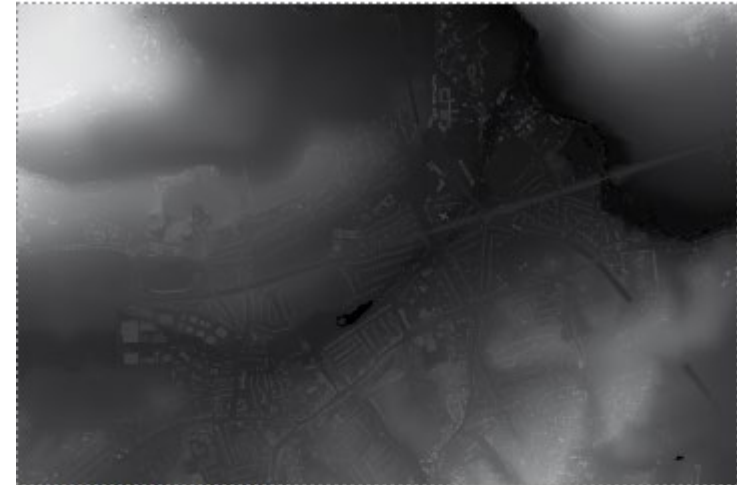
10,000m	0.006°
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HDMI also create 3D DSM (Digital Surface Model) models from publicly available data sources, such as Defra LiDAR scans from the Defra Data Services Platform. We always choose the newest data available at the highest possible resolution, typically at 1m resolution. The data is processed to coordinate onto Ordnance Survey National Grid (OSGB36) and converted to a Square Grid DSM. The square grid is then optimised into a TIN (Triangulated Irregular Network). The optimisation has been validated to produce no loss in usable information of the geometric mesh. This process follows the guidelines set out in 'Guidance - Visual representation of wind farms - Feb 2017'¹². DSM source is typically the Defra LiDAR Composite DSM, 2020, resolution 1m.

5.2 False origin

3D modelling programs, unlike CAD/BIM programs, have inherent inaccuracies the further an object is away from the origin. HDMI Lab decide on and record a local, 'false origin' that is used to move the model closer to the origin. This alleviates the inaccuracies. The 3D model of the proposed development, consented scheme models, and survey data are all moved uniformly to this new false origin. When performing positioning checks (see

Section 5.2) the offset between false origin and OS are added back to the



11: 1m resolution LIDAR GeoTIFF



coordinates. 12: Resulting 3D TIN mesh

6.0 Model positioning

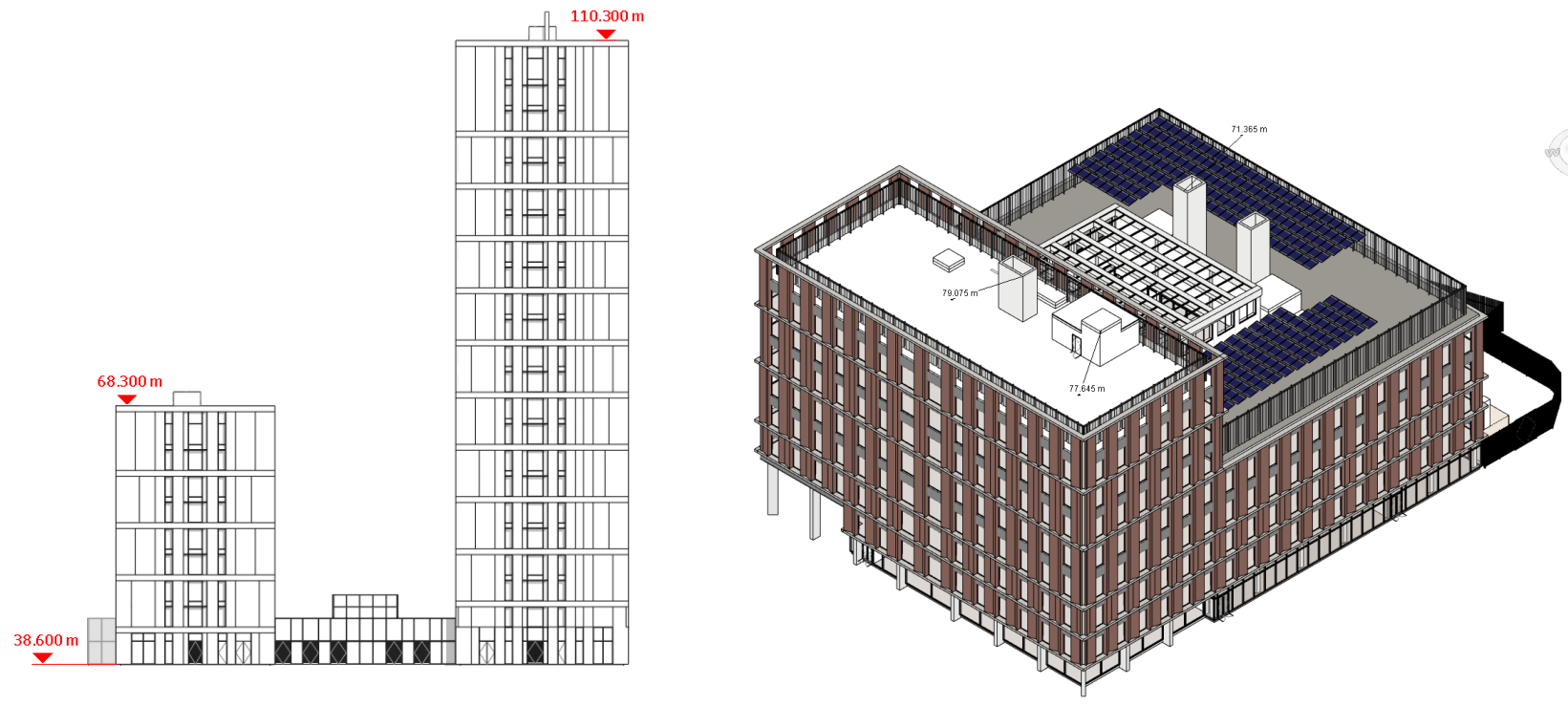
Applies to Type 3 and Type 4 visualisation

6.1 Model source

A wireframe 3D model of the proposed scheme if not provided is created by HDMI Lab from plans and elevations provided by the architects and from survey information of the ground levels on site and various other points on and around the site, such as the edge of adjacent roads and pavements etc. provided by the surveyor.

6.2 Proposed model position check

The architect supplies a 3D model in OS coordinates that can be used 'as is' for position checks as described below (utilising the false origin as described in Section 4.3). Alternatively, a non OS located model can be provided together with a floor plan that is positioned in an OS map. The model can then be positioned by way of setting it on the floor plan. Heights are either preserved from the original model if supplied in AOD, or taken from supplied elevations. Once the model is positioned, confirmation of height and Easting/Northing Coordinates is requested from the architect. At least two clear reference points are agreed and used to confirm the placement of the model.



7.0 Camera matching – Type 4 visualisations.

7.1 Camera matching process

The following information is required for the camera matching process:

- Specific details of the camera and lens used to take the photograph and therefore the field of view (see Section 1);
- The adjusted or corrected digital image i.e. the 'background plate' (see Section 2);

- The GNSS surveyed viewpoint coordinates (see Section 3.2);
- The GNSS surveyed coordinates of points within the the background plate (see Section 3.2);
- Selected models from HDMI Lab’s database (see Section 6.1);
- The GNSS surveyed coordinates of the site of the proposed scheme (see Section 3.2);

The data is combined in a 3D software package and is then used to situate HDMI’s virtual camera such that the 3D model aligns exactly over the background plate (i.e. a ‘virtual viewer’ within the 3D model would therefore be standing exactly on the same viewpoint from which the original photograph was taken (Figure 3). This is the camera matching process.

9.0 Camera matching – Type 3 visualisations.

9.1 HDMI Lab’s context models

HDMI Ltd have purchased available 3D city models of large parts of London and other parts of the UK that are modelled to within 25cm accuracy. Where available this data is used to create camera matches for Type 3 visualisations, or additional data is purchased.

In addition, or where 3D city models are not available, DSM data is used for camera matching (see Section 4).

9.2 Camera matching process

The following information is required for the camera matching process:

- Specific details of the camera and lens used to take the photograph and therefore the field of view (see Section 1);
- The adjusted or corrected digital image i.e. the ‘background plate’ (see Section 2);
- 3D city model and/or DSM context model (see Section 4);
- Selected models from HDMI Lab’s database (see Section 6.1);
- A 3D model of the proposed scheme (see Section 5)

The data is combined in a 3D software package and is then used to situate HDMI Lab's virtual camera such that the 3D model/DSM aligns exactly over the background plate (as shown in Figure 20) (i.e., a 'virtual viewer' within the 3D model would therefore be standing very close to the same viewpoint from which the original photograph was taken (Figure 3). This is the camera matching process.

9.0 Rendering

9.1 Wireline image (AVR 0/1)

The proposed developments are shown using a constant thickness wireline. The line is generated from a computer rendering of the 3D model and follows an "inside stroke" principle. Rendering is a technical term referring to the process of creating a two-dimensional output image from the 3D model. The "inside stroke" principle is followed so that the outer edge of the line touches the outline of the render from the inside, fairly representing the maximum visibility.

The camera matching process is repeated for each view and a wireline image of the proposal from each viewpoint is then produced. The wireline image enables a quantitative analysis of the impact of the proposed scheme on views.

9.2 Rendered image (AVR 3)

In order to assist a more qualitative assessment of the proposals, the output image needs to be a photo-realistic reflection of what the proposed scheme would look like once constructed. This is called an AVR3.

9.3 Texturing

The process of transforming the wireframe 3D scheme model into one that can be used to create a photorealistic image is called texturing¹³.

Prior to rendering, HDMI Lab requires details from the architect regarding the proposed materials (e.g., type of glass, steel, aluminium etc.) to be utilised. HDMI Lab also use high resolution photographic imagery of real-world material samples, supplied by the client or the manufacturer, to create accurate photorealistic textures for use in all our images. This information is used to produce the appearance and qualities in the image that most closely relates to the real materials to be used (as shown in Figure 21).

9.4 Lighting and sun direction

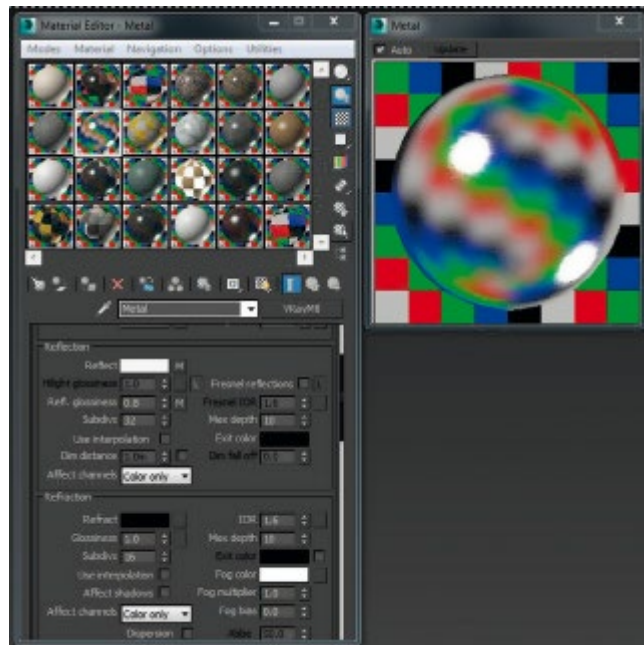
The next stage is to light the 3D model to match the photographic environment. The date, time of the photograph and the latitude and longitude of the city are

¹³ texturing is often referred to as part of the rendering process, however, in the industry, it is a process that occurs prior to the rendering process.

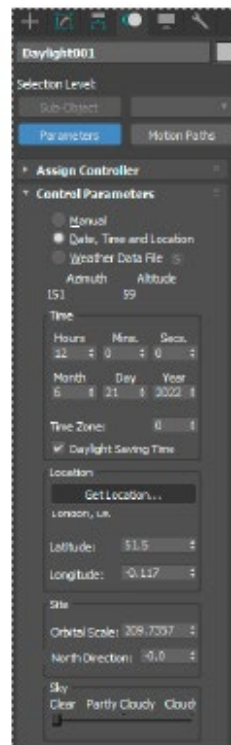
input (see Figure 22) into the unbiased physically accurate render engine. HDMI Lab selects a 'sky' (e.g. clear blue, grey, overcast, varying cloud density, varying weather conditions) from the hundreds of

'skies' held within its database to resemble as closely as possible the sky

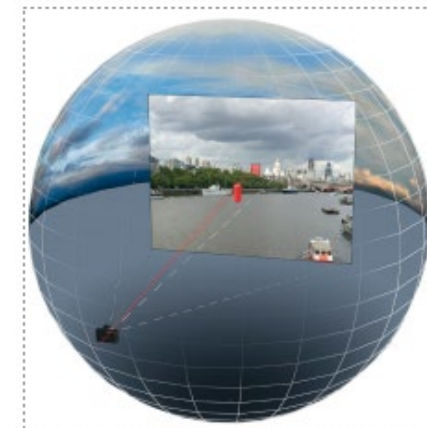
in the background plate. The 3D model of the proposed scheme is placed within the selected sky (see Figure 23) and using the material properties also entered, the computer calculates the effects of the sky conditions (including the sun) on the appearance of the proposed scheme.



21: Screenshot of some materials in the 3D rendering package.



22: Screenshot of environment information (time, date and year) entered to locate the sun correctly (see Section 7).



23: Example of a proposed scheme highlighted in red within the selected sky and rendered onto the background plate.

10.0 Postproduction

10.1 Postproduction

Finally, the rendered image of the scheme model is inserted and positioned against the camera matched background plate. Once in position, the rendered images are edited using Adobe Photoshop®. Masks are created in Photoshop where the line of sight to the rendered image of the proposed scheme is interrupted by foreground buildings (as shown in Figure 24). The result is a verified image or view of the proposed scheme (as shown in Figure 25).



Thankyou
