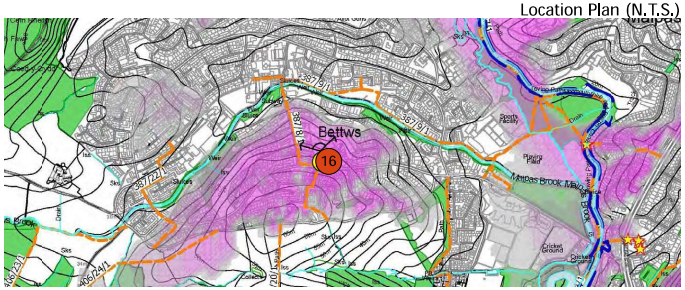
Site Context Photograph 16: View North, from open space near Wye Crescent.

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

Location Plan (N.T.S.)



Easting:	329067	Date Taken:	13/04/2023
Northing:	190527	Camera:	Canon 6D (Full Frame Sensor)
Elevation:	51m AOD	Lens:	50mm fixed lens
Distance to the Site:	1.6km		
Visualisation Type:	Type 1 Annotated Viewpoint Photograph	Drawn By:	DW/AC
Enlargement Factor:	100%	Checked By:	IK
Projection:	Cylindrical	Approved By:	DD/MF

Project Number: 333100902
Project Name: Pentre Bach

Site Context Photographs

View at a comfortable arm's length @A1

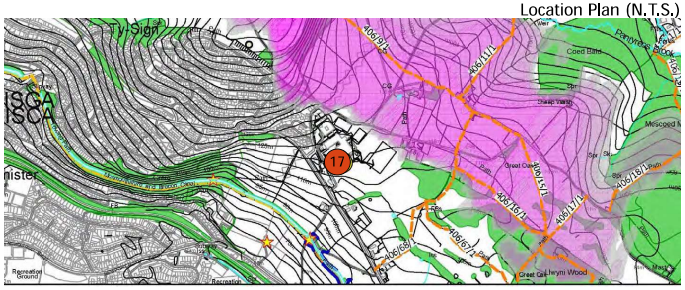
Stantec

Site Context Photograph 17: View North-East, from outside Risca Leisure Centre.

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

Location Plan (N.T.S.)



Easting:	326037	Date Taken:	13/04/2023
Northing:	190125	Camera:	Canon 6D (Full Frame Sensor)
Elevation:	120m AOD	Lens:	50mm fixed lens
Distance to the Site:	2.79km		
Visualisation Type:	Type 1 Annotated Viewpoint Photograph	Drawn By:	DW/AC
Enlargement Factor:	100%	Checked By:	IK
Projection:	Cylindrical	Approved By:	DD/MF

Project Number: 333100902
Project Name: Pentre Bach

Site Context Photographs

View at a comfortable arm's length @A1

Stantec

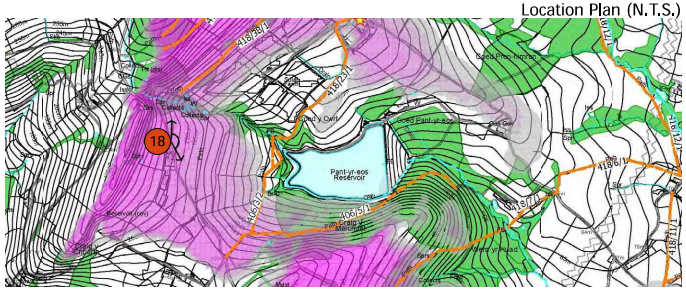
Approximate extent of the Site

Site Context Photograph 18: View East, from Mountain Road.

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

Location Plan (N.T.S.)



Easting:	324954	Date Taken:	13/04/2023
Northing:	191661	Camera:	Canon 6D (Full Frame Sensor)
Elevation:	207m AOD	Lens:	50mm fixed lens
Distance to the Site:	3.02km		
Visualisation Type:	Type 1 Annotated Viewpoint Photograph	Drawn By:	DW/AC
Enlargement Factor:	100%	Checked By:	IK
Projection:	Cylindrical	Approved By:	DD/MF

Project Number: 333100902
Project Name: Pentre Bach

Site Context Photographs

View at a comfortable arm's length @A1

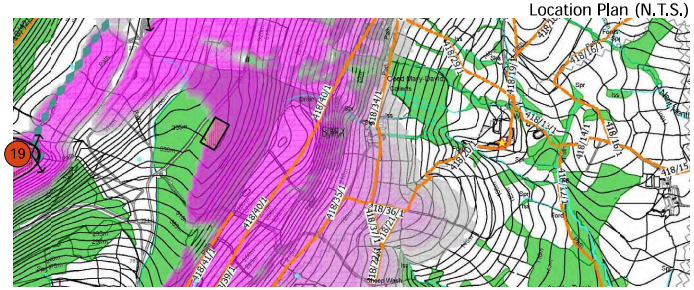
Stantec

Site Context Photograph 19: View East, from Castle Mound Scheduled Monument.

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

Location Plan (N.T.S.)



Easting:	324397	Date Taken:	13/04/2023
Northing:	192663	Camera:	Canon 6D (Full Frame Sensor)
Elevation:	408m (AOD)	Lens:	50mm fixed lens
Distance to the Site:	3.5km		
Visualisation Type:	Type 1 Annotated Viewpoint Photograph	Drawn By:	DW/AC
Enlargement Factor:	100%	Checked By:	IK
Projection:	Cylindrical	Approved By:	DD/MF

Project Number: 333100902
Project Name: Pentre Bach

Site Context Photographs

View at a comfortable arm's length @A1

Stantec

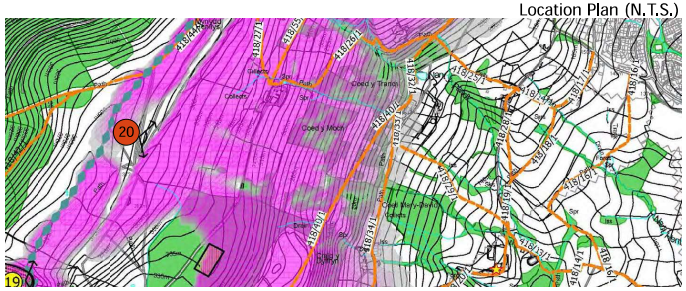
Approximate extent of the Site

Site Context Photograph 20: View East, from path near PRoW 418/44/1.

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

Location Plan (N.T.S.)



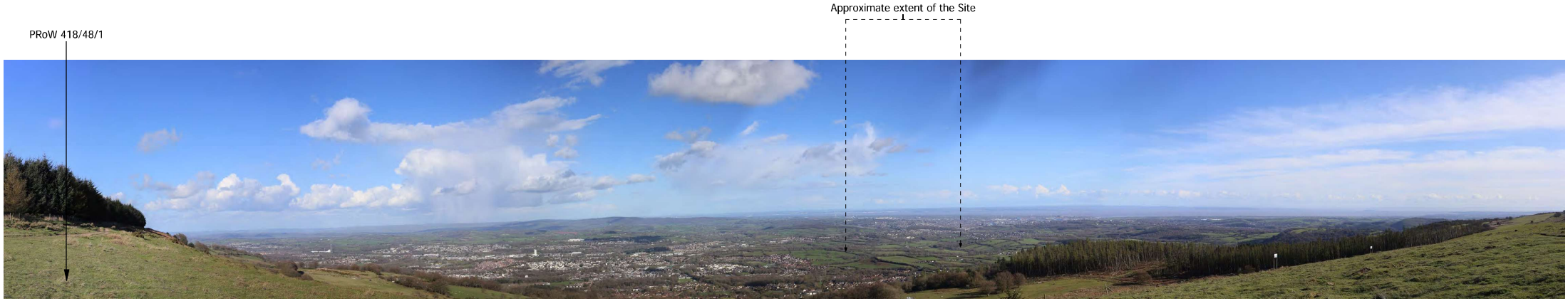
Easting:	324828	Date Taken:	13/04/2023
Northing:	193193	Camera:	Canon 6D (Full Frame Sensor)
Elevation:	372m AOD	Lens:	50mm fixed lens
Distance to the Site:	3.16km		
Visualisation Type:	Type 1 Annotated Viewpoint Photograph	Drawn By:	DW/AC
Enlargement Factor:	100%	Checked By:	IK
Projection:	Cylindrical	Approved By:	DD/MF

Project Number: 333100902
Project Name: Pentre Bach

Site Context Photographs

View at a comfortable arm's length @A1

Stantec

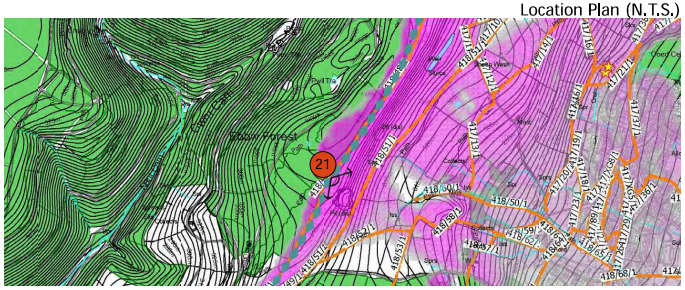


Site Context Photograph 21: View South-East, from PRoW 418/48/1.

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

Location Plan (N.T.S.)



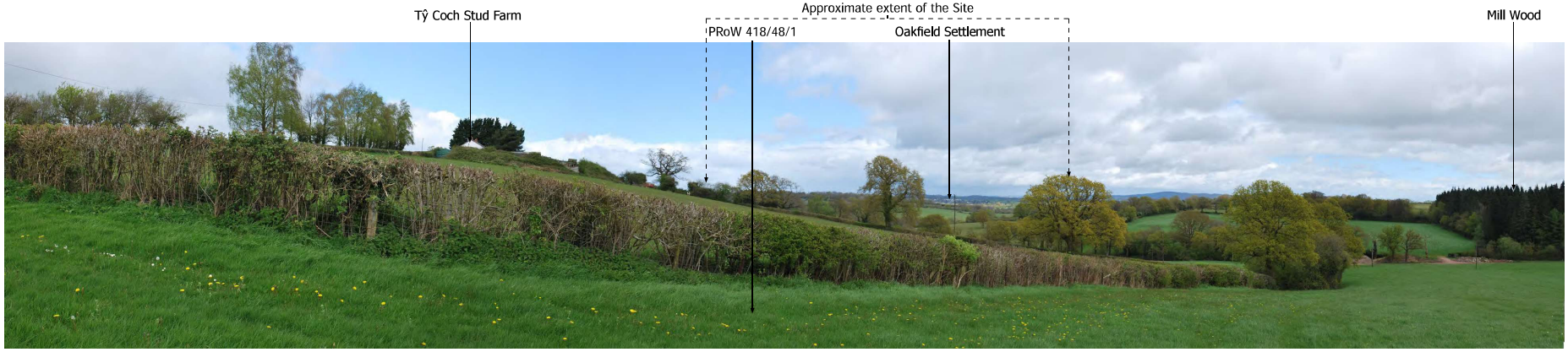
Easting:	325588	Date Taken:	13/04/2023
Northing:	194512	Camera:	Canon 6D (Full Frame Sensor)
Elevation:	402m AOD	Lens:	50mm fixed lens
Distance to the Site:	2.96km		
Visualisation Type:	Type 1 Annotated Viewpoint Photograph	Drawn By:	DW/AC
Enlargement Factor:	100%	Checked By:	IK
Projection:	Cylindrical	Approved By:	DD/MF

Project Number: 333100902
Project Name: Pentre Bach

Site Context Photographs

View at a comfortable arm's length @A1

Stantec

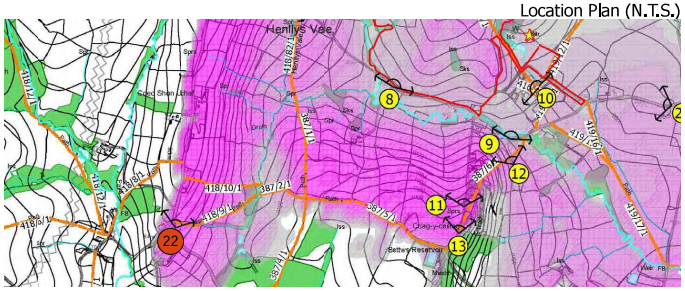


Site Context Photograph 22: View North-West, from PRoW 418/9/1.

This panorama is not to scale. For contextual information only

Site Context Photograph 22: View South-East, from PRoW 418/48/1

Location Plan (N.T.S.)



Easting:	327210	Date Taken:	19/04/2024
Northing:	191573	Camera:	Nikon D60 (Full Frame Sensor)
Elevation:	84m AOD	Lens:	30mm fixed lens
Distance to the Site:	952m		
Visualisation Type:	Type 1 Annotated Viewpoint Photograph	Drawn By:	AC
Enlargement Factor:	100%	Checked By:	AC
Projection:	Cylindrical	Approved By:	MF

Project Number: 333100902
Project Name: Pentre Bach

Site Context Photographs

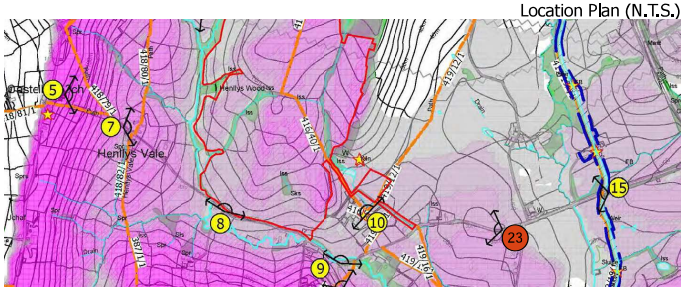
View at a comfortable arm's length @A1

Stantec

Site Context Photograph 23: View North-West, from Pentre Lane.

This panorama is not to scale. For contextual information only

Location Plan (N.T.S.)



Easting:	329050	Date Taken:	19/04/2024
Northing:	192024	Camera:	Nikon D60 (Full Frame Sensor)
Elevation:	30m AOD	Lens:	30mm fixed lens
Distance to the Site:	540m		
Visualisation Type:	Type 1 Annotated Viewpoint Photograph	Drawn By:	AC
Enlargement Factor:	100%	Checked By:	AC
Projection:	Cylindrical	Approved By:	MF

Project Number: 333100902
Project Name: Pentre Bach

Site Context Photographs

View at a comfortable arm's length @A1

Stantec

Appendix A.4: Verified Photomontages

Pentre Bach Solar Farm

Photomontages:
Methodology and Supporting Evidence

July 2024

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- 2.3 2D CAD, plans, drawings
- 2.4 Landscape
- 2.5 Camera matching
- 2.6 Lighting and rendering
- 2.7 Post production
- 2.8 Recommended viewing distances
- 2.9 Caveats

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4.0 Final verified photomontages Page 17

1.0 Overview

This document has been prepared by Realm Communications to explain the methodology used to create visual representations of the proposed development at Pentre Bach, Wales. The visual assessment of the proposed development reflects current best practice in relation to the verification of images, a process which is constantly being refined and improved with advances in technology and industry experience.

The purpose of the photomontages is to present an accurate overview of the proposed development which enables its effect on the landscape and views to be objectively evaluated. Every image contained within this document is verified unless otherwise stated. Final images should not be used as a standalone tool to assess the suitability of a development, but should be used in conjunction with a site visit. This audit trail demonstrates the key stages of production (that can, if required, be checked by a third party) including photography, surveying, 3D modelling and camera matching processes - all critical to ensuring the accuracy of the final photomontages. These methodologies are in accordance with current best practice and follow recommendations from The Landscape Institute's Technical Guidance Note (TGN 06/19) : Visual Representation of Development Proposals. The entities responsible for the preparation of the views set out in the following pages comprise:

The entities responsible for the preparation of the views set out in the following pages comprise:

Photography
Arcminute Ltd
62 Grove Park Terrace
London W4 3QE
Phone: 07774 857627

Survey of existing views and camera locations
Datum Survey Services Ltd
Brickfield Business Centre, Brickfield House
High Road, Thornwood, Epping CM16 6TH
Phone: 07977 111935

Production and checking of verified photomontages
Realm
The Workshop, Old Barn Cottage, Down Lane
Compton, Guildford GU3 1DQ
Phone: 01483 813888

Supply of landscape information
Stantec
10th Floor
Bank House
8 Cherry Street
Birmingham
B2 5AL
Phone : 0207 446 6834

Supply of Building model/CAD
Stantec
10th Floor
Bank House
8 Cherry Street
Birmingham
B2 5AL
Phone : 0207 446 6834

2.0 Methodology

2.1 Photography

The professional architectural photographer employed on this project was briefed by Realm to work to a methodology which conforms to the principles specified in section 1.0 Overview. The following methodology statement has been supplied by Arcminute:

Photography brief The following methodology applies to the production of photographic images originated in which form the pictorial basis for visual impact assessment photomontages for 4 views for the proposed development at Pentre Bach, Wales.

Equipment Images are captured on a 36mm x 24mm 21 megapixel digital sensor in combination with the following shift lenses:

- Focal length 24mm | Horizontal FOV 74° (for close views in built-up streetscapes)
- Focal length 35mm | Horizontal FOV 55° (for close views requiring selective framing)
- Focal length 50mm | Horizontal FOV 40° (for long distance views)

Lenses outside these parameters are also available for use in certain circumstances but these 3 lenses have been found to cover the vast majority of situations required in this type of work.

Choice of lens We prefer to replicate (as far as possible) what may have already been provided in terms of preliminary view studies as typically these would have been generated using pre-considered factors as to what each view would need to illustrate e.g. context, key visual receptors etc. In the absence of a definitive steer, we will generally use a 74° HFOV lens for medium to close views in an urban environment and a 40° HFOV lens for long distance views. However, the actual size and nature of a scheme (single building or large multibuilding development) and its location will also be considered before lens selection. The Landscape Institute's latest guidelines have been relaxed with regard to lens choice and they are no longer insistent that a 'standard' lens be used wherever possible.

Photography The camera is mounted on a tripod at eye level which on level ground is 1.65m within a +/- 100mm tolerance. The camera is then levelled in roll and pitch to a tolerance of 30mm per 100m using a precision spirit level. The point on the lens which coincides with the virtual render camera is horizontally referenced to a survey mark (nail or paint) to +/- 2mm using a survey standard procedure and the height above this is measured using a steel tape measure to the same tolerance. A photograph is taken of the tripod in its location, the survey point on the ground and the tape measure reading against a reference point on the camera mount. During image capture particular emphasis is placed on the following:

- Rendering all points in the scene as sharply as possible to avoid any sense of selective focus.
- Capturing all tonal detail in the scene and avoiding 'blown out' highlights and 'blocked up' shadows.

Where a scene's brightness range exceeds that of the sensors dynamic capture range it may be necessary to combine two or more different exposures to create a final image to overcome this limitation and to maintain a realistic tonal rendering closer to that of the human eye.

Post production The camera images are captured using a native camera or 'RAW' format and a software application is used to turn these into universally accessible RGB raster images. At this conversion stage colour and tonal adjustments are made to recreate as honestly as possible the scene as was presented to the photographer at the time of capture. RGB images are corrected using specialist software to remove non-perspective optical distortion in order to create a geometrically accurate 2D projection which can be precisely aligned with CGI renderings and survey data. The image is then placed in a standard sized image template and the calibrated lens axis position is aligned with the documents centre. This accounts for both deliberate offset through lens shift and manufacturing tolerances in lens to camera body alignment. A text file in the image document records camera height above the survey point, lens focal length, film gate, date and time, nominal lens offset and document pixel dimensions. All images are also accompanied with photographic evidence of camera location, survey point location and height above survey point.

Where temporary survey targets have been set up in the scene the before and after images are included as separate TIFF layers to enable both accurate camera alignment and seamless removal of the targets for final output.

For panoramic images, proprietary software creates a seamless and accurate cylindrical projection from an overlapping sequence of images (10 stitched together for a 120° panoramic, 14 for a 180° and 27 for a 360°) which share a single camera coordinate. The image is then placed in a pre-prepared template where the centre of the optical axis is aligned with the image centre to account for any offset used in vertical farming adjustments or mechanical misalignment of the lens' optical axis and that of the sensor.

2.2 Survey

All of the baseline photographs were taken by a professional architectural photographer. Each viewpoint location is surveyed and identified by Ordnance Survey co-ordinates. The heights and distances of significant points within each view that are easily distinguishable have also been recorded as Ordnance Survey grid and level datum and their accuracy has been checked relative to the fixed camera position. The survey points for each view provide an effective check for ensuring that the 3D model and existing views are

accurately merged together.

The following methodology statement has been supplied by Datum Survey Services:

Survey brief We were commissioned to survey and record co-ordinates (Eastings, Northings and AOD Height) of known points of detail in respect of the proposed development at Pentre Bach, Wales. Digital files of the 8 views together with camera point locations were provided by the photographer.

Date of survey December 2020.

Camera point positioning Network RTK solutions were established using a Leica GPS + GLONASS SmartRover receiver. The equipment was set-up directly over the camera position (survey nail) and multiple observations were recorded. A second (reference) point was taken approximately 100m away from the camera position using the same method.

Data capture Traditional survey techniques were employed to record the points of detail within each view. A Leica TCRA TS15 Total Station with long range reflector-less distance measurement capabilities was set-up directly over the camera point and orientated to Ordnance Survey National Grid using the two sets of co-ordinates determined by the SmartRover receiver.

Deliverables The completed survey data was issued as follows:

- Microsoft Excel Spreadsheet comprising point numbers, coordinate data and descriptions
- PDF copies of each photo with point locations and view specific point numbers clearly marked
- AutoCAD DWG file containing 3D survey points with view specific point numbers

2.3 Model/CAD

Realm modelled from CAD supplied by Stantec.

2.4 Landscape

Supplied by Stantec.

2.5 Camera matching

The verification process confirms the accuracy of the 3D model in relation to each view. The camera matching process involves accurately matching the position of the virtual camera with the real world camera in OS space, and the location of the 3D model of the proposed development within each (existing) view. This is achieved through aligning the imported 3D cloud of survey points within the base photo and 3D environment, creating a virtual camera that replicates the exact position and height of the real world camera to produce an image where the rendered survey points match in visual location those recorded by the survey team and photographer.

The specifications of the lens type relating to each existing view is also entered into 3DS Max to help guide with alignment. An alignment is deemed correct only when all survey points sit exactly over the pixel in the photo that corresponds with the marked-up survey photo. If all points match, the virtual camera must therefore be correctly aligned.

For each view we measure the distance from camera to target and apply respective equations to establish the potential adjustment necessary to compensate for both curvature of the earth and light refraction. Typically, when the real world camera is positioned within 1.5km from the target, the effects of curvature of the earth and light refraction are deemed to be negligible in terms of their visual impact and therefore no adjustment is made to the Z axis of the building model within the view.

2.6 Lighting and rendering

To accurately light the 3D model, 3DS Max's 'daylight system' is set to replicate the solar time, date and geographic location (longitude and latitude) as recorded in the base photograph. The settings used for each base photograph (F stop, shutter speed etc) are replicated in both this 'daylight system' and the virtual camera set-up. This process mimics the virtual sun so that the lighting falls upon the 3D model as it would in real life at the point when the photograph was captured. Fine tuning is sometimes necessary to better match the resultant lighting and shadows to the base photograph.
Once the camera matching and lighting processes are complete, the render of the 3D model is output to the same pixel resolution as per each respective base photograph.

2.7 Post production

Fully rendered views The render of the three-dimensional model was superimposed on the existing still views in Adobe Photoshop. The foreground of the existing views was then copied and placed over the rendered model in order to ensure that the depth is accurate within the photomontage view between the foreground, background and the rendered model. At this stage, for the fully rendered photomontages, the textured model can be further adjusted to match the resolution, colouring and saturation of the photograph taken to create a close impression of what the textures of the buildings and structures would look like. This is a qualitative exercise and requires interpretation by the designer on how the structure will look. A final qualitative check of all of the photomontage images has been carried out to ensure that they provide objectively accurate views of the proposed development, based on the information supplied to us.

2.8 Recommended viewing distances

It is recommended that final images are viewed at an optimum viewing distance (in relation to the size of printed photomontage) to give a correct sense of scale. We recommend that images are printed to a size that creates a comfortable viewing distance of up to 525mm.

Panoramic Views:

In line with the Landscape Institute's latest guidance (TGN-06-19) full size panoramas will no longer be provided with a specific RVD due to the variables involved (including the need for it to be held in a curve). Therefore, we recommend taking a 40 degree crop (4000 x 2700 pixels) of the full panorama, printing it on A3 paper and viewing it by holding it at comfortable arm's length.

2.9 Caveats

Please note that while the placement and position of the PV units shown in view is verified/accurate (based on baseline photography and view specific survey data undertaken) it should be noted that the PV units themselves are based on the Indicative Layout Plan, which indicates how the development might be arranged. The arrangement shown is therefore subject to change and in this regard the visualisations are illustrative only.

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3.0 Supporting evidence

Ordnance Survey coordinates			
View Ref	Eastings	Northings	AOD Height
4	327513.762	192926.062	117.824
16	329063.133	190512.753	50.938
19	324384.839	192661.928	420.475
21	325592.353	194517.587	404.234

View Location Plan

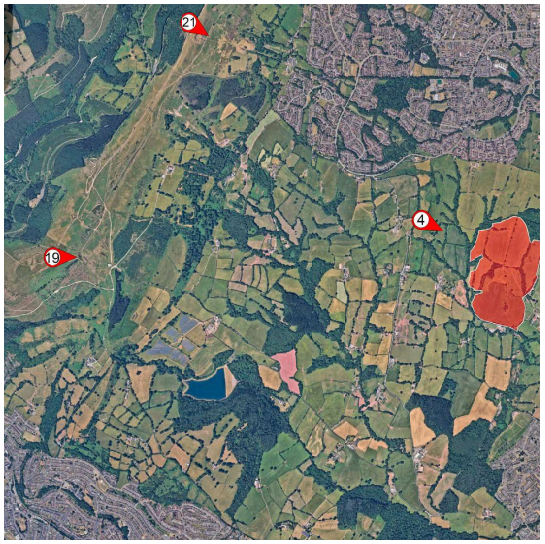
View 4

01.1 Ordnance Survey coordinates

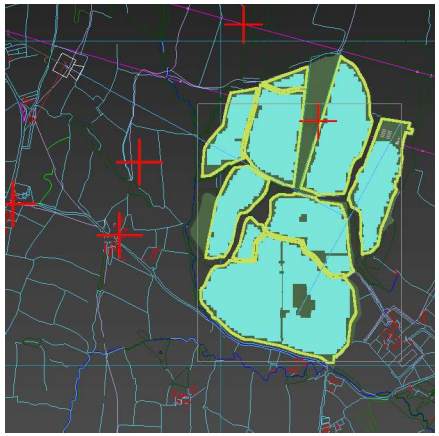
Point Ref	Eastings	Northings	AOD height
401	327517.219	192917.612	114.406
402	327517.274	192917.585	114.855
403	327526.365	192907.338	111.453
404	327529.060	192913.492	111.730
405	327542.803	192905.937	107.718
406	327520.447	192922.435	114.890
407	327520.375	192922.455	114.450
408	327531.694	192919.501	112.012
409	327523.550	192926.727	114.882
410	327523.512	192926.733	114.447
411	327532.625	192927.219	112.892
412	327356.924	192498.401	118.572
413	327686.084	192400.786	69.695
414	327748.607	192627.123	68.202
415	328299.613	192753.508	84.386
416	328069.728	193052.077	75.788
417	328304.140	193401.564	102.973

01.3 View 4 camera location

Eastings	327513.7628m
Northings	192926.062m
AOD height	117.824m
Distance to centre of site	830m
Bearing from North	118°



01.2 OS survey points marked on photograph



01.4 Screen grab of camera location in 3D Studio Max software

01.5 Screen grab of calculated horizon line

01.6 Screen grab of camera matching to OS data

01.7 Screen grab of model matched to photograph

01.8 Final camera matched photomontage

View 16

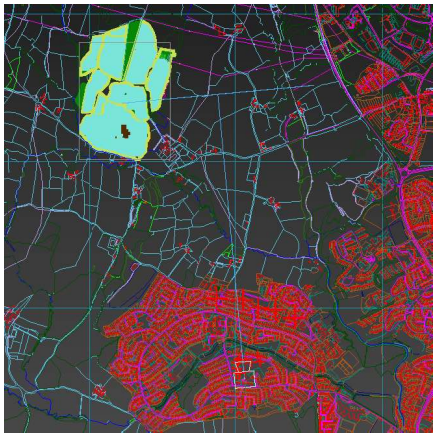
01.1 Ordnance Survey coordinates

Point Ref	Eastings	Northings	AOD height
1601	329005.463	190555.524	51.596
1602	329026.246	190555.923	52.599
1603	329015.488	190586.538	45.180
1604	329011.612	190627.190	39.865
1605	328873.595	191065.567	44.370
1606	329024.882	190642.770	36.196
1607	329034.996	190652.159	41.418
1608	329073.877	190651.698	28.524
1609	329107.928	190630.477	32.245
1610	329151.536	190674.720	25.991
1611	329167.758	190636.070	34.270
1612	329406.557	190933.877	34.366
1613	329272.816	190992.137	36.758
1614	329155.471	191001.458	36.470
1615	329051.275	191055.578	41.669
1616	329065.182	190565.133	47.437
1617	329034.243	190561.124	44.648

01.3 View 16 camera location

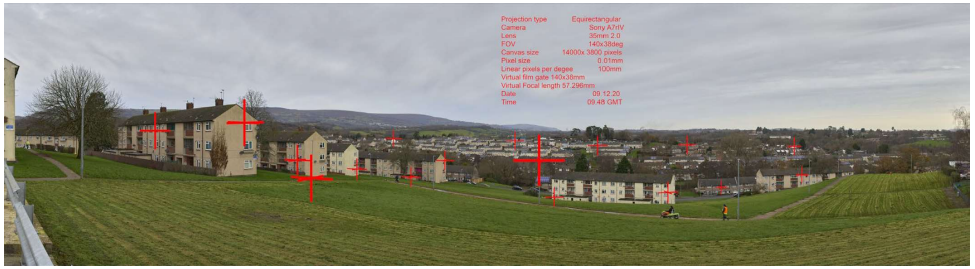
Eastings	329063.133m
Northings	190512.753m
AOD height	50.9385m
Distance to centre of site	2167m
Bearing from North	355°

01.2 OS survey points marked on photograph

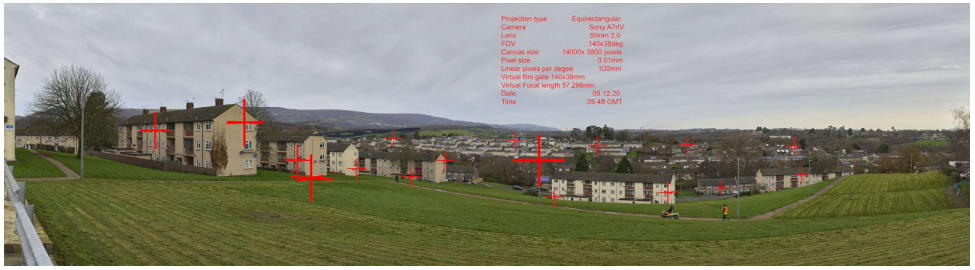


01.4 Screen grab of camera location in 3D Studio Max software

01.5 Screen grab of calculated horizon line



01.6 Screen grab of camera matching to OS data



01.7 Screen grab of model matched to photograph

01.8 Final camera matched photomontage