



## Appendix A

Technical Methodology:  
Photography, 3D Modelling and Accurate Visual Representations

PINS reference: APP/U2235/W/23/3329481

Appeal

Site Address: Ashford Road, Maidstone

For

Maidstone Borough Council



Peter Radmall Associates  
Environmental Planning and Assessment

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## Introduction

**Michael Spence BA (Hons), MLD, CMLI, REIA, FRGS** is one of the UK's leading independent exponents of technical photography, verified photomontages and visualisations. Since 2013 Mike has been a technical advisor to the Landscape Institute on 'photography and photomontage in landscape and visual impact assessment', and has been undertaking this technical work for over 25 years. He is one of the main authors of the Landscape Institute's TGN 06/19 and provided technical support to Scottish Natural Heritage(NatureScot) on their windfarm visualisation guidance. He is a current member of the Landscape Institute Technical Committee. His background as a Chartered Landscape Architect, Registered EIA Practitioner and Fellow of the Royal Geographical Society working on strategic infrastructure projects has meant that the accuracy of the visualisation work is paramount, and technical photography, together with extensive surveying experience, use of GIS and detailed 3D modelling using real world co-ordinates ensures that the visualisations produced follow a clear and transparent methodology to ensure they are as accurate as possible.

Recent projects include the UNESCO World Heritage Sites at Valletta (Malta), Royal Botanic Gardens at Kew, Fountains Abbey for The National Trust, and West Cumbria Coal Mine for Friends of the Earth. Mike has also been working closely with Bath City Council on proposed development in the UNESCO World Heritage City of Bath. Mike's work and objective technical checks have been used at numerous Public Inquiries and Planning Hearings, on behalf of both local authorities, Historic England, the National Trust, Friends of the Earth and developers.

In September 2023 Peter Radmall Associates contacted MSE to request Technical Photography, GNSS/RTK Surveying, 3D Modelling and preparation of visualisations to illustrate the proposed impact of a shed development on Ashford Road in Maidstone.

## Verified Photography and 3D Modelling

The photographs were taken with a full frame camera (Canon EOS 5D Mark IV) and 50mm lens combination consistent with Landscape Institute's TGN 06/19, GLVIA3 and the emerging understanding of the requirement for technical photography for visualisation work. As part of the work 3 viewpoints were identified providing views of the site and visited in November 2023. The weather was excellent with clear visibility.

### Technical Photography

The camera was mounted on a Manfrotto 303 SPH panoramic tripod head, levelled using a Manfrotto Leveller, supported on a Manfrotto Tripod. The tripod head was levelled using a spirit level, to avoid pitch and roll. The camera was set with the centre of the lens 1.60m above ground level. Photographs were taken in Manual mode with an aperture of f/8 or f/11 and a fixed focal length throughout. Photographs were taken in landscape orientation. A Sigma 50mm f/1.4 lens was used for all viewpoint photographs.



A Single Frame 50mm photograph is insufficient to capture the extents of a wide, linear development. Each view was taken with a series of overlapping 50mm images, as shown above.



To ensure consistent geometry each image was cylindrically re-projected, as above. This ensures that a full 360 degree panorama can be created to match the 3D model view, as shown below:



From the 360 degree panorama a 90 (or 180 degree) degree portion can be extracted to present the context view as shown below:



### Surveying

The position of each camera location was surveyed using Spectra Precision GNSS equipment with Real Time Kinematic Correction (RTK) which achieves an accuracy down to 1cm in eastings, northings and height (metres Above Ordnance Datum). The equipment included Spectra Precision SP85 GNSS smart antennae with Panasonic Toughpad data recorder. A photograph of the camera location was taken.



### 3D Modelling

Using a 3D model built by MSE with added 3D LIDAR DTM height data into a geo-referenced model. The proposed shed development was constructed using layout proposals prepared by Pegasus/Scott Brownrigg.

Camera locations surveyed on site were added to the geo-referenced 3D model.

Cylindrical renders generated using V-Ray for Rhino were exported from the 3D modelling software and used to overlay the cylindrical images. Target points from both the photograph and the model view were aligned to ensure a precise fit between the two images.

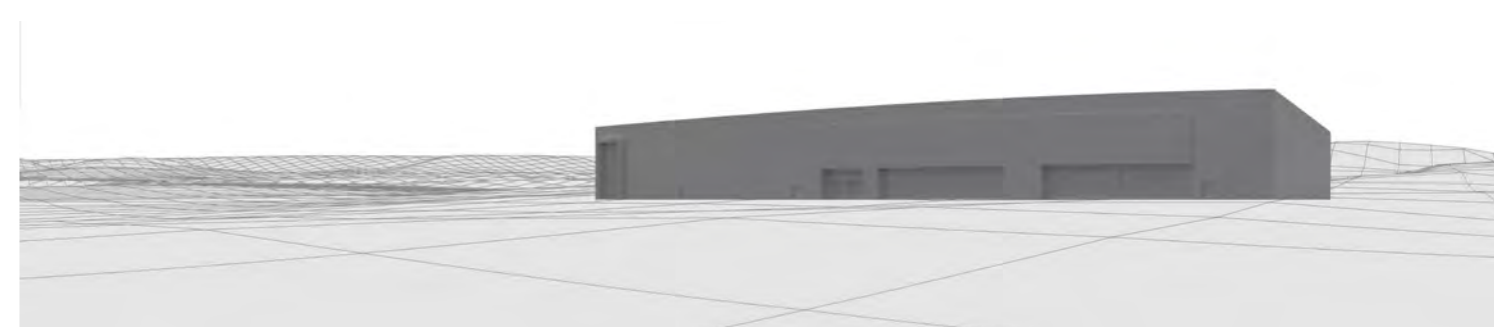
Visualisations are presented as either AVR 0, 1, 2 or 3. The differences are explained in the Landscape Institute's Technical Guidance Note 06/19: Visualisation of Development Proposals.

The results are presented as a sequence of visualisations as follows:

#### Existing View



#### Infrastructure/3D Model View

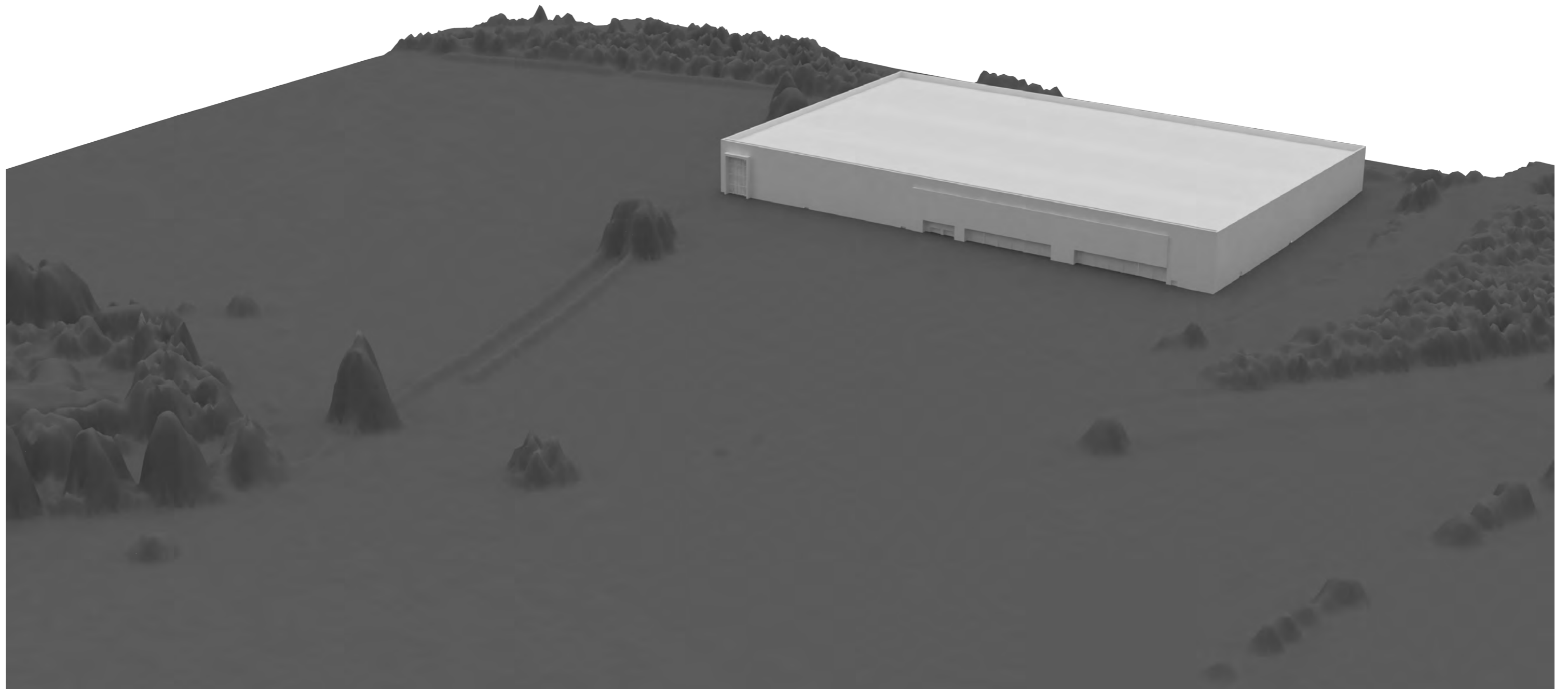


#### 3D Model Composite View



The following image illustrates the combination of the site layout on the LIDAR DSM built by MSE.  
FFL 52.5mAOD. Bulidning height 15m. Max height 67.5mAOD.

**3D~Model on LIDAR DSM data**



## 50mm lens on Full Frame Sensor Camera

For decades it has been accepted that a 50mm lens on a full frame sensor camera provides the optimum image to replicate what is seen by the human eye. There are important differences between the human eye (binocular) and the camera lens (monocular). These have been explored in research by The Highland Council & the University of Stirling, as well as by myself through the Landscape Institute. We know that a single frame 50mm image on an A3 sheet of paper provides the same view as that gained in the field by someone with one eye closed. As we are binocular, and normally use both eyes, a different size of image is required, and the reason why we have presented the images as effectively a 75mm image on A2 paper. This gives what The Highland Council, University of Stirling, Scottish Natural Heritage (NatureScot) and the Landscape Institute agree is the most representative size of image to understand the nature and scale of a development on a photograph.

## Planar or Cylindrical Projection

All photographs are taken as single frame planar images. Each single frame image has a single point of perspective lying at the centre of the image. To correctly match and align with the 3D modelling software the camera must be mounted on a levelled tripod, and directed towards the proposed development.

When a viewpoint is close to the development, or a development is wide or you want to show the context of a view, a wider panorama is required. The alternative is to use a series of overlapping 50mm images and generate a 'cylindrical' perspective view,.

The 3D model renders have been rendered out in cylindrical projection to allow the precise image re-mapping to match the 90 degree cylindrical photograph.

## 3D Modelling software

The work has largely been undertaken using Rhino 3D. All 3D modelling has been undertaken in metres and geo-referenced to align with OSGB36. RESOFT Windfarm was also used which is a 3D modelling package which we use to check on vertical and horizontal alignment of the 3D model against the precise image geometry. This is also set up to OSGB36. RESOFT Windfarm has been used to generate the geometric grid from LIDAR DTM data present in all 3D model visualisations. Scripting has been used to align the solar panels perfectly to the underlying LIDAR DTM data.

## Viewing Printed Images

The visualisations have been prepared to be printed in the Technical Methodology at A3 (420 x 297mm) and in the separate 'Verified Visualisations' document at A1 (841mm x 297mm), to show the scale of the proposed development.

The image size is considered to give a fair monocular representation of the view for everyone, and the scale of the development in that view.

## Summary

This work has been undertaken in accordance with the the Landscape Institute TGN 06/19 and the developing understanding of visualisation work. The accuracy of camera locations and 3D modelling conforms with the Landscape Institute's Type 4 (the highest level of accuracy). The 3D modelling has been produced to AVR3 (photorealistic).

The photography has been undertaken in an extremely robust manner, using professional full frame sensor DSLR and 50mm lens with levelled tripod. The camera position has been surveyed using highly accurate GNSS Smart Antennae equipment, giving high levels of accuracy of camera location. The 3D model has been built in Rhino 3D using detailed information contained in the planning application drawings. An additional check on the vertical scaling has been undertaken using RESOFT Windfarm.

The resultant visualisations are highly accurate.

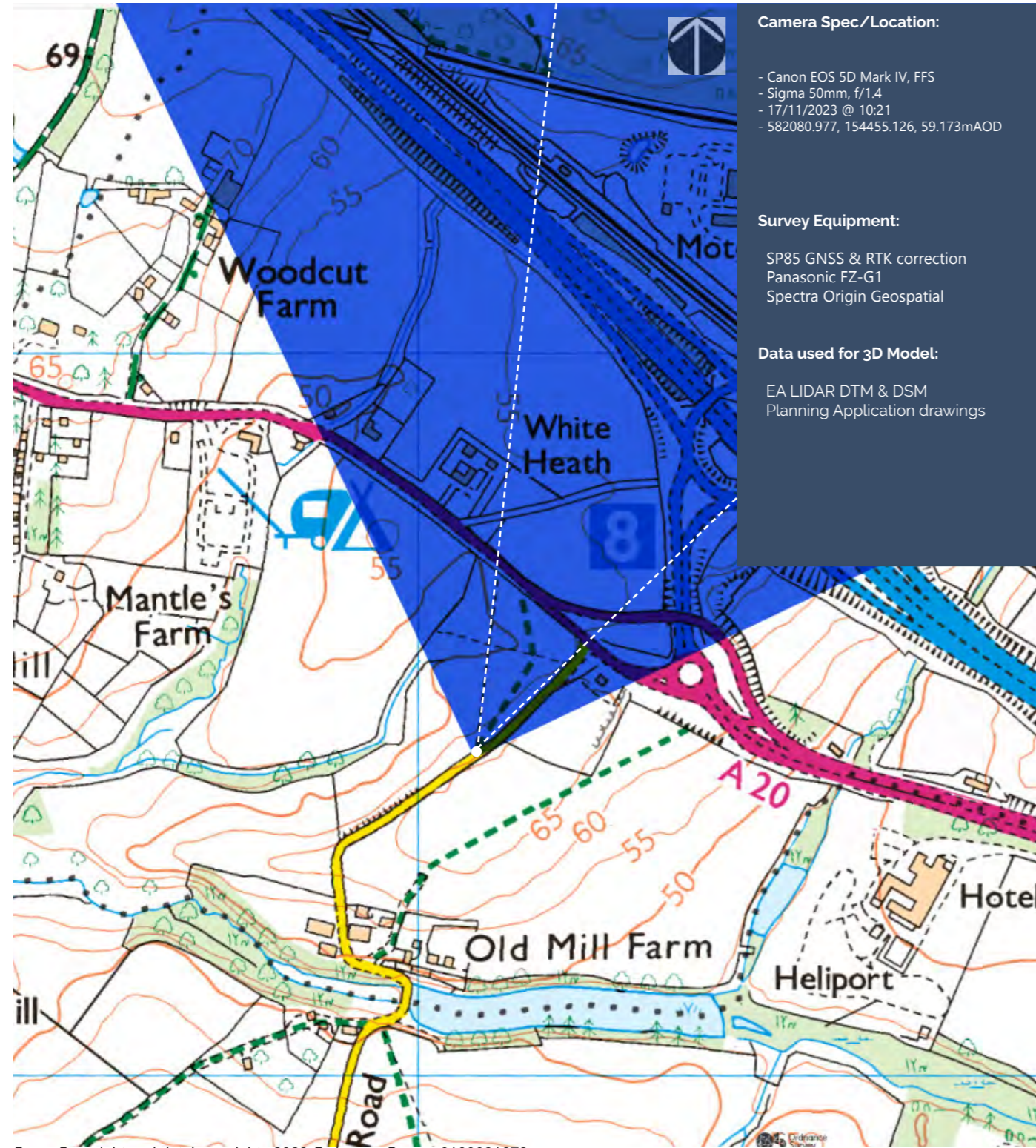
The photography, surveying and 3D modelling have followed a transparent methodology, and the resultant visualisations and the size at which they are presented are considered robust and fit for purpose to illustrate the positioning, and scale and massing of the proposed scheme in its local and wider context.



M.A.Spence BA(Hons), MLD, CMLI, REIA, FRGS 28 November 2023  
Principal, MSEnvironmental



## Camera Location:



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## Tripod:





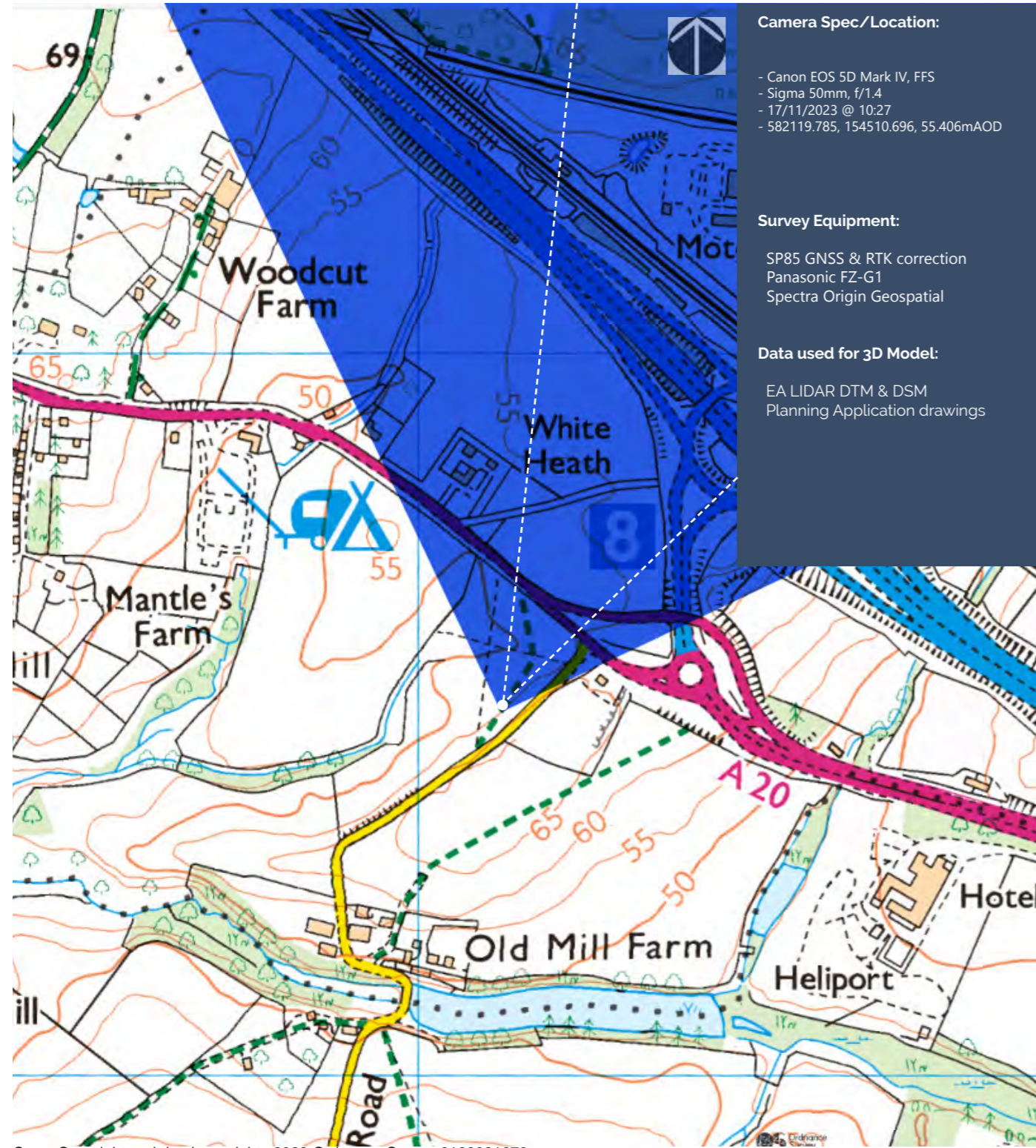
50mm Lens Planar Projection (actual 49.6mm; 39.9 deg HFOV)



Point of Perspective

Viewpoint 6 Single Frame 50mm Reference image

## Camera Location:



Crown Copyright and database rights 2023 Ordnance Survey 0100031673

## Tripod:



50mm Lens Planar Projection (actual 49.6mm; 39.9 deg HFOV)



Point of Perspective

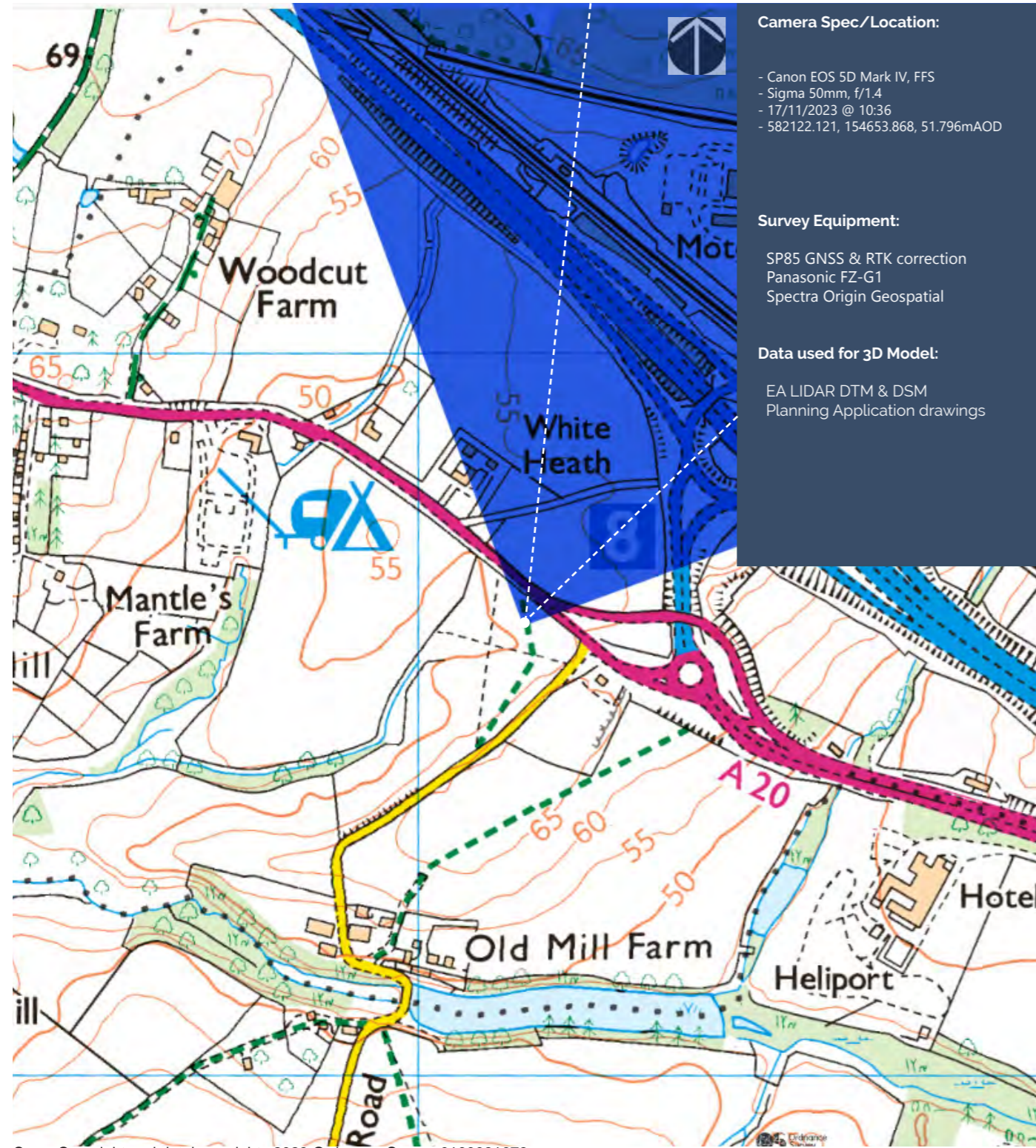
Point of Perspective

Point of Perspective

Point of Perspective

Viewpoint 6A Single Frame 50mm Reference image

## Camera Location:



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## Tripod:



50mm Lens Planar Projection (actual 49.6mm; 39.9 deg HFOV)



Point of Perspective

Viewpoint 6B Single Frame 50mm Reference image



©Scott Brownrigg Ltd  
 This drawing is to be read in conjunction with all relevant architect's and other designers' drawings and associated specifications. Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any work is put in hand.

SCALE BAR: 1:500



**NT = Indicative New Tree locations refer to Landscape design by Pegasus Group**

Revision	Description	Date	Drawn	Checked
5	Planning Issue	27/01/2022	PR	BC
4	Planning Issue	11/01/2022	PR	BC
3	Planning Issue	15/12/2021	PR	BC
2	Preliminary Issue	29/11/2021	PR	BC
1	First Issue	11/11/2021	PR	BC



St Catherine's Court  
 46-48 Portsmouth Road  
 Guildford GU2 4DU  
 T +44 (0)1483 568686  
 W scottbrownrigg.com

Client's Name  
 Wates Developments

Job Title  
 Ashford Road Maidstone

Drawing Title  
 Illustrative Master Plan

Scale  
 1 : 500 @A1

Project No. 19512-SBR-ZZ-XX-DR-A-83100

Subsidiary Code Status Rev  
 PLANNING ISSUE 5

**ILLUSTRATIVE MASTER PLAN**  
 1.500 @ A1

**SPECTRA®**  
GEOSPATIAL

# SP85



spectrageospatial.com

**UNMATCHED CONNECTIVITY**

**SPECTRA®**  
GEOSPATIAL

# SP85

#### GNSS CHARACTERISTICS

- 600 GNSS channels
  - GPS L1C/A, L1P(Y), L2C, L2P(Y), L5
  - GLONASS L1C/A, L1P, L2C/A, L2P, L3
  - BeiDou (Phase III) B1, B2
  - Galileo E1, E5a, E5b
  - QZSS L1C/A, L1C, L2C, L5
  - IRNSS L5
  - SBAS L1C/A, L5 (WAAS, EGNOS, MSAS, GAGAN, SDCM)
  - L-band MSS
- Patented Z-Blade technology for optimal GNSS performance
  - Full utilization of signals from all 7 GNSS systems (GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS and SBAS)
  - Enhanced GNSS-centric algorithm: fully-independent GNSS signal tracking and optimal data processing, including GPS-only, GLONASS-only, Galileo-only, or BeiDou-only solution (Autonomous to full RTK)
- Fast Search engine for quick acquisition and re-acquisition of GNSS signals
- SBAS ranging for using SBAS code & carrier observations and orbits in RTK processing
- Patented Strobe™ Correlator for reduced GNSS multi-path
- Up to 20 Hz real-time raw data (code & carrier and position output)
- Supported data formats: ATOM, CMR, CMR+, RTCM 2.1, 2.2, 2.3, 3.0, 3.1 and 3.2 (including MSM), CMRx and sCMRx (rover only)
- NMEA 0183 messages output

#### REAL-TIME ACCURACY (RMS) <sup>(1)(2)(3)</sup>

##### SBAS (WAAS/EGNOS/MSAS/GAGAN)

- Horizontal: < 50 cm
- Vertical: < 85 cm

##### Real-Time DGPS position

- Horizontal: 25 cm + 1 ppm
- Vertical: 50 cm + 1 ppm

##### Real-Time Kinematic Position (RTK)

- Horizontal: 8 mm + 1 ppm
- Vertical: 15 mm + 1 ppm

##### Network RTK <sup>(4)</sup>

- Horizontal: 8 mm + 0.5 ppm
- Vertical: 15 mm + 0.5 ppm

##### POST-PROCESSED KINEMATIC (PPK)

- Horizontal: 8 mm + 1 ppm
- Vertical: 15 mm + 1 ppm

##### REAL-TIME PERFORMANCE

- Instant-RTK® Initialization
  - Typically 2 sec for baselines < 20 km
  - Up to 99.9% reliability
- RTK initialization range: over 40 km

#### POST-PROCESSING ACCURACY (RMS) <sup>(1)(2)(3)</sup>

- **Static & Fast Static**
  - Horizontal: 3 mm + 0.5 ppm
  - Vertical: 5 mm + 0.5 ppm
- **High-Precision Static <sup>(5)</sup>**
  - Horizontal: 3 mm + 0.1 ppm
  - Vertical: 3.5 mm + 0.4 ppm

#### DATA LOGGING CHARACTERISTICS

##### Recording Interval

- 0.05 - 999 seconds

##### PHYSICAL CHARACTERISTICS

##### Size

- 22.2 x 19.4 x 7.5 cm (8.7 x 7.6 x 3.0 in)

##### Weight

- 1.17 kg (2.57 lb)

##### User Interface

- Graphical PMOLED display
- WEB UI (accessible via WiFi) for easy configuration, operation, status, and data transfer

##### I/O Interface

- RS232 serial link
- USB 2.0/UART
- Bluetooth 5.0 dual mode
- WiFi (802.11 b/g/n)
- 3.5G quad-band GSM (850/900/1800/1900 MHz) / penta-band UMTS module (800/850/900/1900/2100 MHz)

##### Memory

- 4GB internal memory NAND Flash (3.5 GB user data)
- Over two years of 15 sec. raw GNSS data from 14 satellites
- SD/SDHC internal memory card (up to 32GB)

##### Operation

- RTK rover & base
- RTK network rover: VRS, FKP, MAC
- NTRIP, Direct IP
- CSD mode
- Post-processing
- RTK bridge
- UHF repeater
- UHF networking

##### Environmental Characteristics

- Operating temperature: -40° to +65°C (-40° to +149°F) <sup>(6)</sup>
- Storage temperature: -40° to +85°C (-40° to +185°F) <sup>(6)</sup>
- Humidity: 100% condensing
- IP67 waterproof, sealed against sand and dust
- Drop: 2m pole drop on concrete
- Shock: ETS300 019
- Vibration: MIL-STD-810F

#### Power Characteristics

- 2 Li-Ion hot-swappable batteries, 41.4 Wh (2 x 7.4 V, 2800 mAh)
- Battery life time (two batteries): 10 hrs (GNSS On, and GSM or UHF Rx On)
- External DC power: 9-28 V

#### Standard System Components

- SP85 receiver
- 2 Li-Ion batteries
- Dual battery charger, power supply and international power cord kit
- Tape measure (3.6 m / 12 ft)
- 7 cm pole extension
- USB to mini-USB cable
- Hard case
- 2 year warranty

#### Optional System Components

- SP85 UHF Kit (410-470 MHz 2W TRx)
- SP85 Field Power Kit
- SP85 Office Power Kit
- Data collectors
  - ST10
  - Ranger™ 7
  - Ranger™ 3
  - T41
  - MobileMapper® 60
  - MobileMapper® 50
- Field software
  - Survey Pro
  - Survey Mobile (Android)
  - SPace control app for 3rd party devices (Android)

- 1 Accuracy and TFF specifications may be affected by atmospheric conditions, signal multipath, satellite geometry and corrections availability and quality.
- 2 Performance values assume minimum of five satellites, following the procedures recommended in the product manual. High multi-path areas, high PDOP values and periods of severe atmospheric conditions may degrade performance.
- 3 Long baselines, long occupations, precise ephemeris used
- 4 At very low temperatures UHF module should not be used in the transmitter mode.
- 5 Without batteries. Batteries can be stored up to +70°C.
- 6 Network RTK PPM values are referenced to the closest physical base station.
- 7 Receiver initialization time varies based on GNSS constellation health, level of multipath, and proximity to obstructions such as large trees and buildings.

CONTACT INFORMATION:  
Americas

Europe, Middle East and Africa

Asia-Pacific

## SP85 GNSS RECEIVER

The Spectra Geospatial® SP85 is a next generation GNSS receiver that combines decades of GNSS RTK technology with revolutionary new GNSS processing. Featuring the new 600-channel “7G” chipset combined with the patented Z-Blade™ technology, the SP85 system is optimized for tracking and processing signals from all GNSS constellations in challenging environments. With unmatched connectivity in the GNSS receiver market, the SP85 offers a unique combination of integrated 3.5G cellular, WiFi and UHF communications with SMS, email and anti-theft technology. These powerful capabilities, packaged in an ultra-rugged housing and patented antenna design, make SP85 an extremely versatile turnkey solution that can be used with unlimited operation time because of the SP85’s hot-swappable, dual battery setup.



### KEY FEATURES

- Patented Z-Blade™ technology
- 600-channel 7G ASIC
- Hot-swappable batteries
- Internal TxRx UHF radio
- L-band satellite capable GNSS antenna
- 3.5G cellular modem
- Built-in WiFi communication
- SMS and e-mail alerts
- Anti-theft technology
- Backup RTK
- RTK bridge
- eLevel technology
- Up to 20 Hz update rate

### UNIQUE 7G GNSS-CENTRIC TECHNOLOGY

Patented Z-Blade processing technology running on a next generation Spectra Geospatial 600-channel 7G ASIC fully utilizes all 6 GNSS systems: GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS and SBAS, in addition to MSS corrections delivered via L-band. Unlike GPS-centric technology which requires a minimum number of GPS satellites for GNSS processing, Z-Blade™ unique GNSS-centric capability optimally combines GNSS signals without dependency on any specific GNSS system; this allows SP85 to operate in GPS-only, GLONASS-only, Galileo-only or BeiDou-only mode if needed. In addition, SP85 supports RTCM 3.2 Multiple Signal Messages (MSM), a standardized definition for broadcasting all GNSS signals from space, regardless of their constellation. This protects the surveyor’s investment well into the future by providing superior performance and improved productivity as new signals become available.

### SMS AND EMAIL MESSAGING

SP85 has a unique combination of communication technologies including an integrated 3.5G GSM/UMTS modem, Bluetooth and WiFi connectivity, and optional internal UHF transmit radio, providing unmatched connectivity for the user. The cellular modem may be used for SMS (text message) and e-mail alerts as well as regular Internet or VRS connectivity. SMS (text messages) can be used to monitor and configure the receiver. Likewise, SP85 can use all available RTK correction sources and connect to the Internet from the field using WiFi hotspots, where available. The internal UHF transmit/receive radio allows for quick and easy setup as a local base station. This saves time and increases the surveyor’s efficiency, allowing for more productive workflows.

### ANTI-THEFT PROTECTION

A unique anti-theft technology secures the SP85 receiver when installed as a field base station in remote or public areas and can detect if the receiver has been disturbed, moved, or stolen. This technology allows the surveyor to lock the device to a specific location and make it unusable if the device is moved elsewhere. In this case, the SP85 receiver will generate an audio alert and show an alert message on its display. Additionally, a SMS or e-mail will be sent to the surveyor’s mobile phone or computer and provides the receiver’s current coordinates to allow tracking of its position and follow for a quick recovery of the receiver. SP85’s anti-theft technology provides surveyors with remote security and peace of mind.

### THE MOST POWERFUL TOOL FOR RELIABLE FIELD USE

The SP85’s rugged housing, created by Spectra Geospatial’s engineering design lab in France, incorporates a host of practical innovations. Dual hot-swappable batteries can be easily exchanged in the field as a one hand operation for an interruption-free working day, ensuring surveyors remain productive until the job is done. The impact-resistant fiberglass reinforced casing, designed to withstand 2 metre pole drops and waterproof to IP67, ensures that SP85 can handle the toughest outdoor conditions. The patented UHF antenna, set inside the rugged carbon fiber rod, extends the range of RTK radio performance at the same time as armoring protection. The sunlight-readable display offers instant access to key information like the number of satellites, RTK status, battery charge and available memory. With eLevel technology, the user is able to focus in one place when leveling and measuring as well as automatically store measurements when the receiver is level. These powerful design features combine to make SP85 the most capable, most reliable GNSS receiver, backed by a comprehensive standard 2 year warranty.



Patented inside-the-rod mounted UHF antenna design



### THE SPECTRA GEOSPATIAL EXPERIENCE

With the most advanced and rugged field data collectors from Spectra Geospatial, surveyors get maximum productivity and reliability every day. Spectra Geospatial Survey Pro software is specifically tailored for the SP85 GNSS receiver providing easy-to-use, yet powerful GNSS workflows, letting the surveyor concentrate on getting the job done. Spectra Geospatial Survey Office Software provides a complete office suite for post-processing GNSS data and adjusting survey data, as well as exporting the processed results directly back to the field or to engineering design software packages. Combined with Spectra Geospatial field and office software, SP85 is an extremely powerful and complete solution.



## TOUGHPAD FZ-G1

Panasonic recommends Windows.

<b>SOFTWARE</b>	<ul style="list-style-type: none"> <li>Windows 10 Pro 64 bit</li> <li>Panasonic Utilities including Dashboard, Recovery Partition</li> </ul>														
<b>DURABILITY</b>	<ul style="list-style-type: none"> <li>MIL-STD-810G certified (4' drop, shock, vibration, rain, dust, sand, altitude, freeze/thaw, high/low temperature, temperature shock, humidity, explosive atmosphere)</li> <li>IP65 certified sealed all-weather design</li> <li>Optional class I division 2, groups ABCD certified model</li> <li>Solid state drive heater</li> <li>Magnesium alloy chassis encased with ABS and elastomer corner guards</li> <li>Optional hand strap or rotating hand strap</li> <li>Port covers</li> <li>Raised bezel for LCD impact protection</li> <li>Pre-installed replaceable screen film for LCD protection</li> </ul>														
<b>CPU</b>	<ul style="list-style-type: none"> <li>Intel® Core™ i5-6300U vPro™ Processor</li> <li>~ 2.4 GHz up to 3.0 GHz with Intel® Turbo Boost Technology</li> <li>Intel Smart Cache 3MB</li> </ul>														
<b>STORAGE &amp; MEMORY</b>	<ul style="list-style-type: none"> <li>8GB DDR3L SDRAM<sup>4,5</sup></li> <li>256GB solid state drive (SSD) with heater<sup>4,5</sup></li> <li>Optional 512GB</li> <li>~ up to 64GB additional storage with optional microSDXC card slot</li> </ul>														
<b>DISPLAY</b>	<ul style="list-style-type: none"> <li>10.1" WUXGA 1920 x 1200 with LED backlighting</li> <li>10-point capacitive multi touch + Waterproof Digitizer pen daylight-readable screen</li> <li>~ 2-800 nit</li> <li>IPS display with direct bonding</li> <li>Anti-reflective and anti-glare screen treatments</li> <li>Ambient light sensor, digital compass, gyro and acceleration sensors</li> <li>Automatic screen rotation</li> <li>Intel® HD Graphics 520 (Built-in CPU) video controller</li> <li>Concealed mode (configurable)</li> </ul>														
<b>AUDIO</b>	<ul style="list-style-type: none"> <li>Integrated microphone</li> <li>Realtek high-definition audio</li> <li>Integrated speaker</li> <li>On-screen and button volume and mute controls</li> </ul>														
<b>KEYBOARD &amp; INPUT</b>	<ul style="list-style-type: none"> <li>10-point gloved multi touch + digitizer screen</li> <li>Supports bare-hand touch and gestures and electronic waterproof stylus pen</li> <li>Supports glove mode and wet-touch mode</li> <li>7 tablet buttons (2 user-definable)</li> <li>Integrated stylus holder</li> <li>On-screen QWERTY keyboard</li> </ul>														
<b>CAMERAS</b>	<ul style="list-style-type: none"> <li>720p webcam with mic</li> <li>8MP rear camera with autofocus and LED light</li> </ul>														
<b>EXPANSION</b>	<ul style="list-style-type: none"> <li>Optional MicroSDXC3</li> </ul>														
<b>INTERFACE</b>	<table border="0"> <tr> <td>Docking connector</td> <td>24-pin</td> </tr> <tr> <td>HDMI</td> <td>Type A</td> </tr> <tr> <td>Headphones/speaker</td> <td>Mini-jack stereo</td> </tr> <tr> <td>Optional Serial Dongle<sup>1</sup></td> <td>D-sub 9-pin</td> </tr> <tr> <td>USB 3.0 (x 1)<sup>2</sup></td> <td>4-pin</td> </tr> <tr> <td>Optional second USB 2.0<sup>2</sup></td> <td>4-pin</td> </tr> <tr> <td>Optional 10/100/1000 Ethernet<sup>3</sup></td> <td>RJ-45</td> </tr> </table>	Docking connector	24-pin	HDMI	Type A	Headphones/speaker	Mini-jack stereo	Optional Serial Dongle <sup>1</sup>	D-sub 9-pin	USB 3.0 (x 1) <sup>2</sup>	4-pin	Optional second USB 2.0 <sup>2</sup>	4-pin	Optional 10/100/1000 Ethernet <sup>3</sup>	RJ-45
Docking connector	24-pin														
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Optional second USB 2.0 <sup>2</sup>	4-pin														
Optional 10/100/1000 Ethernet <sup>3</sup>	RJ-45														
<b>WIRELESS</b>	<ul style="list-style-type: none"> <li>Optional integrated 4G LTE multi carrier mobile broadband with satellite GPS</li> <li>Optional GPS (u-blox NEO M8N)<sup>7</sup></li> <li>Intel® Dual Band Wireless-AC 8260 (IEEE802.11a/b/g/n/ac)</li> <li>Bluetooth v4.1, Classic mode/Low Energy mode, Class 1 (Windows 10 pro 64-bit)</li> <li>Security                     <ul style="list-style-type: none"> <li>Authentication: LEAP, WPA, 802.1x, EAP-TLS, EAP-FAST, PEAP</li> <li>Encryption: CKIP, TKIP, 128-bit and 64-bit WEP, Hardware AES</li> </ul> </li> <li>Dual high-gain antenna pass-through</li> </ul>														
<b>POWER SUPPLY</b>	<ul style="list-style-type: none"> <li>Li-ion battery pack:                     <ul style="list-style-type: none"> <li>Standard battery: Li-ion 11.1 V, 4200 mAh (typ.), 4080 mAh (min.)</li> <li>Optional long life battery<sup>8</sup>: Li-ion 10.8V, 9300mAh(10.8V), 8700mAh (min.)</li> </ul> </li> <li>Battery operation<sup>9</sup>:                     <ul style="list-style-type: none"> <li>Standard battery: 14 hours</li> <li>Optional long life battery<sup>8</sup>: 28 hours</li> </ul> </li> <li>Battery charging time<sup>9</sup>:                     <ul style="list-style-type: none"> <li>Standard battery: 2.5 hours off, 3 hours on</li> <li>Optional long life battery<sup>8</sup>: 3 hours off, 4 hours on</li> </ul> </li> <li>Optional bridge battery<sup>8</sup> (1 minute swap time)</li> </ul>														
<b>POWER MANAGEMENT</b>	<ul style="list-style-type: none"> <li>Suspend/Resume Function, Hibernation, Standby</li> </ul>														
<b>SECURITY FEATURES</b>	<ul style="list-style-type: none"> <li>Password Security: Supervisor, User, Hard Disk Lock</li> <li>Kensington cable lock slot</li> <li>Trusted platform module (TPM) security chip v2.0<sup>10</sup></li> <li>CompuTrace<sup>®</sup> theft protection agent in BIOS<sup>8</sup></li> <li>Optional Insertable SmartCard reader<sup>11</sup></li> <li>Optional Contactless SmartCard/HF RFID reader<sup>12</sup></li> <li>ISO 15693 and 14443 A/B compliant</li> </ul>														

<b>WARRANTY</b>	<ul style="list-style-type: none"> <li>3-year limited warranty, parts and labor</li> </ul>																																																						
<b>DIMENSIONS &amp; WEIGHT</b>	<ul style="list-style-type: none"> <li>10.6" (L) x 7.4" (W) x 0.8" (H)</li> <li>2.4 lbs. (standard battery)</li> <li>3.0 lbs. (optional long life battery)<sup>1</sup></li> </ul>																																																						
<b>INTEGRATED OPTIONS<sup>14</sup></b>	<ul style="list-style-type: none"> <li>4G LTE multi carrier mobile broadband with satellite GPS</li> <li>Choice of 1D/2D barcode reader (EA11 or EA21), GPS, Serial Dongle, Ethernet, MicroSDXC or second USB 2.0 port<sup>1</sup></li> <li>Choice of bridge battery, magstripe reader, insertable SmartCard reader, insertable SmartCard reader with bridge battery, contactless SmartCard/RFID HF reader or UHF 900MHz RFID reader (EPC Gen 2)<sup>12</sup></li> </ul>																																																						
<b>ACCESSORIES<sup>15</sup></b>	<table border="0"> <tr> <td>AC Adapter (3-prong)</td> <td>CF-AA6413CM</td> </tr> <tr> <td>Standard Battery Pack</td> <td>FZ-VS0864ZU</td> </tr> <tr> <td>Long Life Battery Pack<sup>1</sup></td> <td>FZ-VS0888U</td> </tr> <tr> <td>Long Life Battery Bundle (includes rotating hand strap and corner guard set)</td> <td>FZ-BNDL01LL15T1C04</td> </tr> <tr> <td>Single Battery Charger Bundle</td> <td>FZ-BNDL01BATCHR</td> </tr> <tr> <td>LIND 3-Bay Battery Charger</td> <td>FZ-LND3BAYG1</td> </tr> <tr> <td>LIND Car Adapter 120W</td> <td>CF-LNDDC120</td> </tr> <tr> <td>LIND Car/AC Adapter 90W (with USB port)</td> <td>CF-LNDACDC90</td> </tr> <tr> <td>LIND Car Adapter 90W MIL-STD</td> <td>CF-LNDMLDC90</td> </tr> <tr> <td>Tall Corner Guard Set</td> <td>FZ-WCGG111</td> </tr> <tr> <td>Rotating Hand Strap and Tall Corner Guard Set Bundle</td> <td>FZ-BNDL01ST1C04</td> </tr> <tr> <td>ToughMate G1 Always-On Case (with hand strap)</td> <td>TBCG1AGNL-P</td> </tr> <tr> <td>ToughMate G1 Professional Portfolio</td> <td>TBCG1PFLD-BLK-P</td> </tr> <tr> <td>ToughMate G1 X Hand Strap</td> <td>TBCG1XSTP-P</td> </tr> <tr> <td>Desktop Cradle</td> <td>FZ-VEBG11AU</td> </tr> <tr> <td>Vehicle Docks (no pass-through)</td> <td></td> </tr> <tr> <td>- Gamber-Johnson</td> <td>7160-0486-00-P</td> </tr> <tr> <td>- Havis with LIND power supply</td> <td>CF-H-PAN-702-P</td> </tr> <tr> <td>Vehicle Docks (dual pass-through)</td> <td></td> </tr> <tr> <td>- Gamber-Johnson</td> <td>7160-0486-02-P</td> </tr> <tr> <td>- Havis with LIND power supply</td> <td>CF-H-PAN-702-2-P</td> </tr> <tr> <td>Cradlepoint Router</td> <td></td> </tr> <tr> <td>- Verizon</td> <td>CP-IBR1100LPE-VZ</td> </tr> <tr> <td>- AT&amp;T</td> <td>CP-IBR1100LPE-AT</td> </tr> <tr> <td>Replacement Digitizer Pen Waterproof</td> <td>FZ-VNPG11U-S</td> </tr> <tr> <td>Tether</td> <td>FZ-VNTG11U</td> </tr> <tr> <td>10.1" LCD Protective Film</td> <td>FZ-VFPG11U</td> </tr> </table>	AC Adapter (3-prong)	CF-AA6413CM	Standard Battery Pack	FZ-VS0864ZU	Long Life Battery Pack <sup>1</sup>	FZ-VS0888U	Long Life Battery Bundle (includes rotating hand strap and corner guard set)	FZ-BNDL01LL15T1C04	Single Battery Charger Bundle	FZ-BNDL01BATCHR	LIND 3-Bay Battery Charger	FZ-LND3BAYG1	LIND Car Adapter 120W	CF-LNDDC120	LIND Car/AC Adapter 90W (with USB port)	CF-LNDACDC90	LIND Car Adapter 90W MIL-STD	CF-LNDMLDC90	Tall Corner Guard Set	FZ-WCGG111	Rotating Hand Strap and Tall Corner Guard Set Bundle	FZ-BNDL01ST1C04	ToughMate G1 Always-On Case (with hand strap)	TBCG1AGNL-P	ToughMate G1 Professional Portfolio	TBCG1PFLD-BLK-P	ToughMate G1 X Hand Strap	TBCG1XSTP-P	Desktop Cradle	FZ-VEBG11AU	Vehicle Docks (no pass-through)		- Gamber-Johnson	7160-0486-00-P	- Havis with LIND power supply	CF-H-PAN-702-P	Vehicle Docks (dual pass-through)		- Gamber-Johnson	7160-0486-02-P	- Havis with LIND power supply	CF-H-PAN-702-2-P	Cradlepoint Router		- Verizon	CP-IBR1100LPE-VZ	- AT&T	CP-IBR1100LPE-AT	Replacement Digitizer Pen Waterproof	FZ-VNPG11U-S	Tether	FZ-VNTG11U	10.1" LCD Protective Film	FZ-VFPG11U
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Tether	FZ-VNTG11U																																																						
10.1" LCD Protective Film	FZ-VFPG11U																																																						

Please consult your reseller or Panasonic representative before purchasing.

Caution: Do not expose bare skin to this product when handling this unit in extreme hot or cold environments.

<sup>1</sup> Approximate time. Battery operation and recharge times will vary based on many factors, including screen brightness, applications, features, power management, battery conditioning and other customer preferences. Battery testing results from MobileMark 2007.

<sup>2</sup> Bridge battery, magstripe reader, insertable SmartCard reader, insertable SmartCard reader with bridge battery, contactless SmartCard reader and UHF RFID reader are mutually exclusive. Please note, USB 3.0 port cannot be accessed when the unit is equipped with the magstripe reader, but optional USB 2.0 port can be accessed.

<sup>3</sup> GPS, Serial Dongle, Ethernet, MicroSDXC and second USB port are mutually exclusive options.

<sup>4</sup> 1GB = 1,000,000,000 bytes.

<sup>5</sup> Total usable memory will be less depending upon actual system configuration.

<sup>6</sup> The size of the VRAM cannot be set by the user and varies by operating system as well as the size of the RAM. Windows 7 max. VRAM is 1555MB.

<sup>7</sup> Magstripe reader, insertable SmartCard reader, insertable SmartCard reader with bridge battery and UHF RFID reader include full corner guards and rotating hand strap. Bridge battery (without SmartCard reader) includes medium corner guards and rotating hand strap.

<sup>8</sup> Requires software and activation to enable theft protection.

<sup>9</sup> Length measurements do not include protrusions. Weight varies with options and digitizer pen.

<sup>10</sup> Accessories and Integrated Options may vary depending on your configuration. Visit the Panasonic website for more accessories and details.

<sup>11</sup> Hazardous location certifications may not apply to all configurations. Consult your Panasonic representative for availability.

<sup>12</sup> TPM 1.2 available upon request - please contact your reseller or Panasonic representative.



1.800.662.3537  
[panasonic.com/toughpad/G1](http://panasonic.com/toughpad/G1)

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**Canon**  
**EOS 5D Mark IV**



+ Design detail



Incredible resolution ideal for the high-megapixel era. Introducing the new benchmark large-aperture standard lens

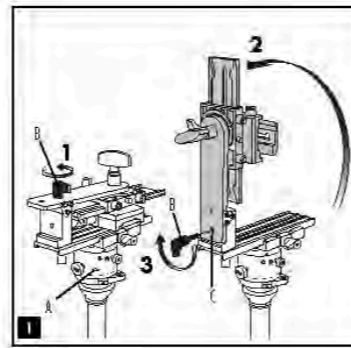
In 2008, Sigma released a large diameter standard lens designed for digital SLRs, "SIGMA 50mm F1.4 EX DG HSM". At that time, products for film cameras were prevalent, yet we spent enormous effort to set a new benchmark for the 50mm lens that optimizes the characteristics of digital cameras, such as compensating peripheral brightness, controlling the point images in the corners, and improving the image drawing, not only around the focusing point, but also other areas in the image.

# APPENDIX 1.4: CAMERA EQUIPMENT (MANFROTTO 303 SPH)



**MANFROTTO**  
INSTRUCTIONS

**303SPH**  
SPHERICAL "VR" HEAD



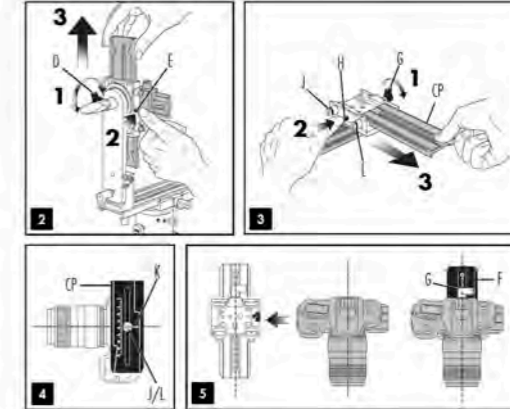
The spherical "VR" head is designed to allow vertical scenes to be created by Computer from a variety of panoramic sequences of digital or digital photographic, when a 3D frame is used, angles.

- There are 4 requirements to achieve good panoramic sequence shots:
1. Accurate leveling of the panoptic axis;
  2. A panoramic head that enables you to choose the angle of rotation between one distant and the next;
  3. The ability to position the camera on the "Metal Point" of the lens (the front lens) is exactly above the panoptic axis of rotation, to eliminate any parallax problems between the near and distant objects in the scene;
  4. An additional raising axis that enables you to disassemble panoramic sequences at different vertical angles in order to achieve a complete spherical scene.

The spherical "VR" head comprises three main modules that perform the functions mentioned above in points 2, 3 and 4.

When your tripod has a built-in leveling device (such as the one in the Ball Tripod's 50mm lid ball), you will need to use one of the leveling accessories available from the Manfrotto range to ensure accurate leveling of the head (see point 1).

**SET UP 1**  
Fit the leveling device (not supplied) to the tripod, then fit the "VR" head on the leveling device via knuckle attachment "A". Completely remove knob "B", rotate the knuckle into the vertical position as shown in Fig. 1 and lock it in place by screwing the knob "B" into hole "C".

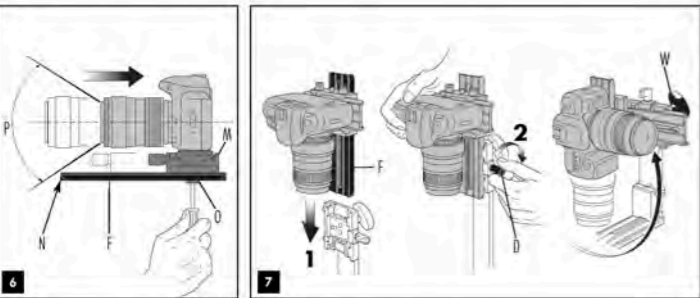


**MOUNTING THE CAMERA 2 3 4 5**  
Remove the top assembly (Fig. 7) by releasing knob "D". To slide it completely out of the housing, push safety button "E".

Remove camera plate "CP" (Fig. 3) by releasing knob "G". To slide it completely out of the housing, push safety button "H".

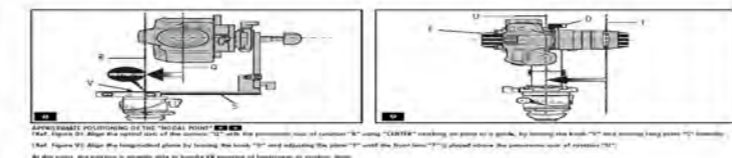
You will find two screws attached to the top assembly: screw "I" (Fig. 3) is 1/4 in. "L" is 3/8 in. Depending on your camera tripod attachment, choose the correct screw and use it to fix your camera to plate "CP" (Fig. 4). Use a coin or screwdriver to lock, take care to align the lens with the centre of the plate indicated by letter "K".

Mount the camera on the top assembly as shown in figure 5 by sliding the camera + plate into the housing following the direction shown by the "insert" arrow. Lock in place using knob "G", before locking, take care to align the lens with the long plate "P" - the lens axis must be perfectly above the slot of the plate as shown in figure 5. The angle of the lever on the rotator knob "C" can be repositioned as required without affecting the lock ball. Pull the lever upwards, rotate as required and release and it will locate in the new position.



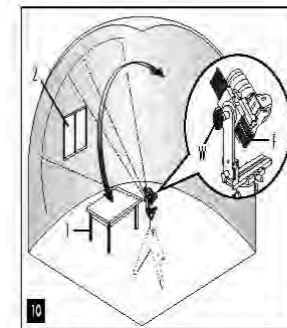
**NOTE 6**  
The position of the housing "M" relative to the long plate "P" will need to be adjusted: loosen screw "O" to slide the housing. The ideal position is with the camera body as far back on the plate as it can go before the front edge "N" of the long plate "P" becomes visible in the camera's field of view "Q".

**MOUNT THE CAMERA ON THE HEAD 7**  
Mount the whole top assembly + camera on the head as shown in figure 7 by sliding the long plate "P" into its housing and locking it by screwing knob "D". Then unscrew knob "B" and move the camera on the vertical plane.



**ADJUST CAMERA POSITIONING ON THE "METAL POINT" 8 9**  
1. See Figure 10 (and 10B) to ensure knob "M" and move the camera on the vertical plane to bring the two objects first in the top and then in the bottom of the frame, checking whether the height gap "Y" between the two objects in the two frames, the same (within the distance ranges, the more accurately the "Metal Point" has been positioned).  
2. For optimum results, make minor adjustments by moving plate "S".

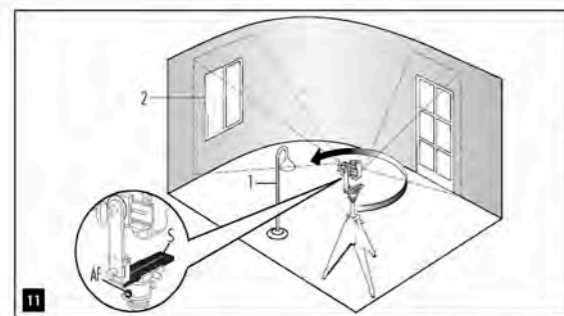
Once the right position is achieved it is VERY USEFUL to measure it by noting the position of the plate "S" on the index on the graduated scale.



**ADJUST POSITIONING OF THE "METAL POINT" 10**  
1. The two objects that are at varying distances from the point where the shot is being taken (near and distant objects) the "Metal Point" needs to be more accurately positioned to follow (the greater the possible ONE with wider camera).  
Note:  
- HORIZONTAL POSITIONING  
- ADJUST CAMERA POSITIONING ONLY WHEN LONGITUDINAL POSITIONING HAS BEEN SET

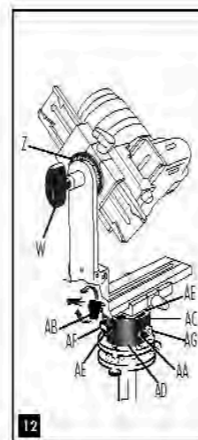
**LONGITUDINAL POSITIONING 10**  
1. (See Figure 10) Choose a frame that contains both a near object "1" and a distant object "2" situated along the same horizontal line of vision.  
2. (See Figure 10 and 10B) unscrew knob "M" and move the camera on the vertical plane to bring the two objects first in the top and then in the bottom of the frame, checking whether the height gap "Y" between the two objects in the two frames, the same (within the distance ranges, the more accurately the "Metal Point" has been positioned).  
2. For optimum results, make minor adjustments by moving plate "S".

Once the right position is achieved it is VERY USEFUL to measure it by noting the position of the plate "S" on the index on the graduated scale.



**LATERAL POSITIONING 11**  
1. (See Figure 11A and 11B): unscrew knob "AF" and move the camera around the panoptic axis so that the two objects are first on the left hand side of the frame, then on the right. Check whether the horizontal gap "X" between the two objects varies in the two frames: the more constant the distance remains, the more accurately the "Metal Point" has been positioned.  
2. For optimum results, make minor adjustments by moving plate "S".

Once the right position is achieved it is VERY USEFUL to measure it by noting the position of the plate "S" on the index on the graduated scale.



**INSTRUCTIONS FOR SPHERICAL PANORAMIC SHOOTING 12**

A special panoramic scene is obtained by adding together panoramic sequences taken at different angles from the horizontal. For this you will need to choose the number of panoramic sequences you will need to complete the sphere depending on the angle of the lens you will be using. Before starting with the panoramic sequence, choose the initial vertical angle using the rotator scale "Z" (Fig. 12). (Unscrew locking knob "AB" or remove it completely if you do not need it to avoid any accidental movement of the head in any position).

Decide the number of shots at the angle of rotation between each shot for the first panoramic sequence (see the chart below):

Angle	90°	60°	45°	36°	30°	24°	20°	15°	10°	5°
n. shots	4	6	8	10	12	15	18	24	36	72

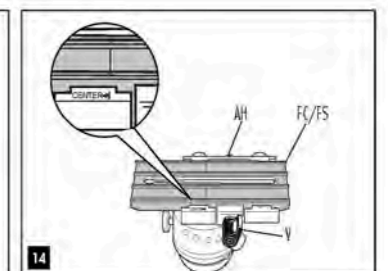
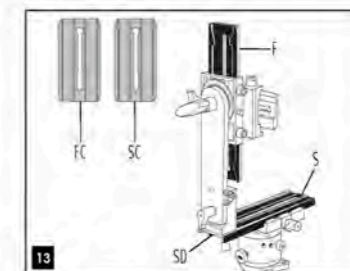
- Screw knob "AB" into the selected setting hole "AA".
- Release locking lever "AB" and rotate the camera on top plate "AE" to the position of the first shot.
- Hold the camera in position and rotate the central barrel "AC" until the first "click stop" is reached, then lock lever "AB".
- Take the first shot and then rotate the camera to the next "click stop" without releasing "AB" and take the next shot.

Continue the process until the start position is reached.

Once you have completed the first complete panoramic sequence, you can start in the other panoramic sequences needed to cover the sphere: change the vertical angle using knob "AF" and repeat the operations described above for each full sequence.

The base of the head "AD" has graduated scale markings from 0 to 360° and a reference index "AE" to the central barrel "AC". This is to be used to set angles not on the chart. To use the head in this way, release knob "AB" or disengage the "click stop" driving rotation of central barrel "AC" and use the locking knob "AB" to lock the position during shooting.

**NOTE:** The angle of the lever on the rotator knob "AB" can be repositioned as required without affecting the lock ball. Pull the lever upwards, rotate as required and release and it will locate in the new position.



**ADDITIONAL PLATES 13**  
If you have a very compact camera we suggest you fit one of the short plates "SC" (Fig. 13) and "FC" (supplied with this head) instead of the two long plates "P" and "S". In order to reduce space and weight of the system.  
To replace the plate "S", unscrew screw "SO" (Fig. 13).  
To replace the plate "P", please refer to Fig. 6 and unscrew screw "O".

**USE OF THE KIT AS AN OBJECT PANORAMA TURNABLE 14**  
The head can also be used as a turntable, useful for shooting object panoramas. For this use, loosen knob "M" and push button "AH" to slide the lower plate "S" out of the housing on the panoptic rotation base unit. In place of the long plate and top assembly, mount one of the two shorter plates supplied as a base for your object. The plate housing has a "center" mark to help you position your object accurately above the center of panoptic rotation.



## Appendix B

Photography, 3D Modelling and Accurate Visual Representations  
Viewpoints 6, 6A & 6B

PINS reference: APP/U2235/W/23/3329481

Appeal

Site Address: Ashford Road, Maidstone

For

Maidstone Borough Council





**Viewing Information**

This photograph and visualisation is a cylindrical projection panorama. Hold this sheet at a comfortable arm's length from your eyes and curve the image through 90° and turn head to view. Alternatively, the visualisation can be laid flat and viewed by scanning left or right parallel to the sheet maintaining a 50cm viewing distance between your eye and the page.

This visualisation is a tool for assessment and is best used for comparison in the field from the viewpoint location shown. It cannot be considered a substitute for visiting the viewpoint location.

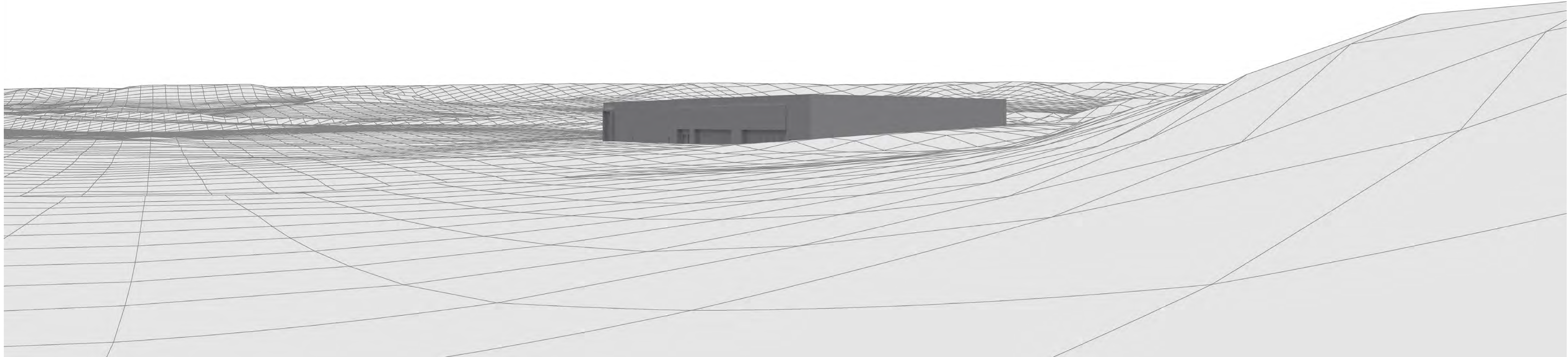
**Printing Note**

This viewpoint visualisation is spread across a single sheet 841mm wide and 297mm high. To give the correct viewing distance the sheet should be printed at a scale of 1:1 on large format paper and cut to size. Do not print at A3



**Peter Radmall Associates**  
Environmental Planning and Assessment

**Ashford Road, Maidstone**  
**Viewpoint 6**  
**Existing Context View**



**Viewing Information**

This photograph and visualisation is a cylindrical projection panorama. Hold this sheet at a comfortable arm's length from your eyes and curve the image through 90° and turn head to view. Alternatively, the visualisation can be laid flat and viewed by scanning left or right parallel to the sheet maintaining a 50cm viewing distance between your eye and the page.

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**Peter Radmall Associates**  
Environmental Planning and Assessment

**Ashford Road, Maidstone**  
**Viewpoint 6**  
**Predicted 3D Model View (AVR Type 2)**



**Viewing Information**

This photograph and visualisation is a cylindrical projection panorama. Hold this sheet at a comfortable arm's length from your eyes and curve the image through 90° and turn head to view. Alternatively, the visualisation can be laid flat and viewed by scanning left or right parallel to the sheet maintaining a 50cm viewing distance between your eye and the page.

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**Peter Radmall Associates**  
Environmental Planning and Assessment

**Ashford Road, Maidstone**  
**Viewpoint 6**  
**Composite 3D Model View (AVR Type 2)**





**Viewing Information**

This photograph and visualisation is a cylindrical projection panorama. Hold this sheet at a comfortable arm's length from your eyes and curve the image through 90° and turn head to view. Alternatively, the visualisation can be laid flat and viewed by scanning left or right parallel to the sheet maintaining a 50cm viewing distance between your eye and the page.

This visualisation is a tool for assessment and is best used for comparison in the field from the viewpoint location shown. It cannot be considered a substitute for visiting the viewpoint location.

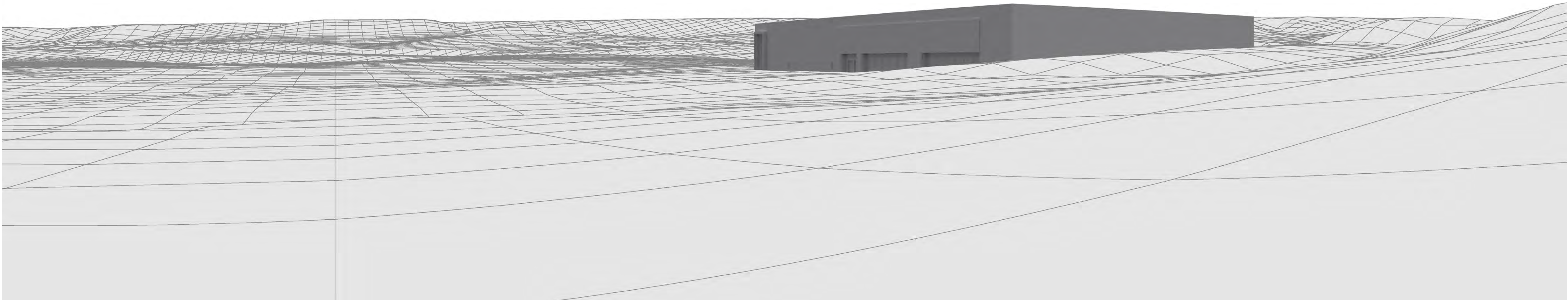
**Printing Note**

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**Peter Radmall Associates**  
Environmental Planning and Assessment

**Ashford Road, Maidstone**  
**Viewpoint 6A**  
**Existing Context View**



**Viewing Information**

This photograph and visualisation is a cylindrical projection panorama. Hold this sheet at a comfortable arm's length from your eyes and curve the image through 90° and turn head to view. Alternatively, the visualisation can be laid flat and viewed by scanning left or right parallel to the sheet maintaining a 50cm viewing distance between your eye and the page.

This visualisation is a tool for assessment and is best used for comparison in the field from the viewpoint location shown. It cannot be considered a substitute for visiting the viewpoint location.

**Printing Note**

This viewpoint visualisation is spread across a single sheet 841mm wide and 297mm high. To give the correct viewing distance the sheet should be printed at a scale of 1:1 on large format paper and cut to size. Do not print at A3



**Peter Radmall Associates**  
Environmental Planning and Assessment

**Ashford Road, Maidstone**  
**Viewpoint 6A**  
**Predicted 3D Model View (AVR Type 2)**



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**Peter Radmall Associates**  
Environmental Planning and Assessment

**Ashford Road, Maidstone**  
**Viewpoint 6A**  
**Composite 3D Model View (AVR Type 2)**



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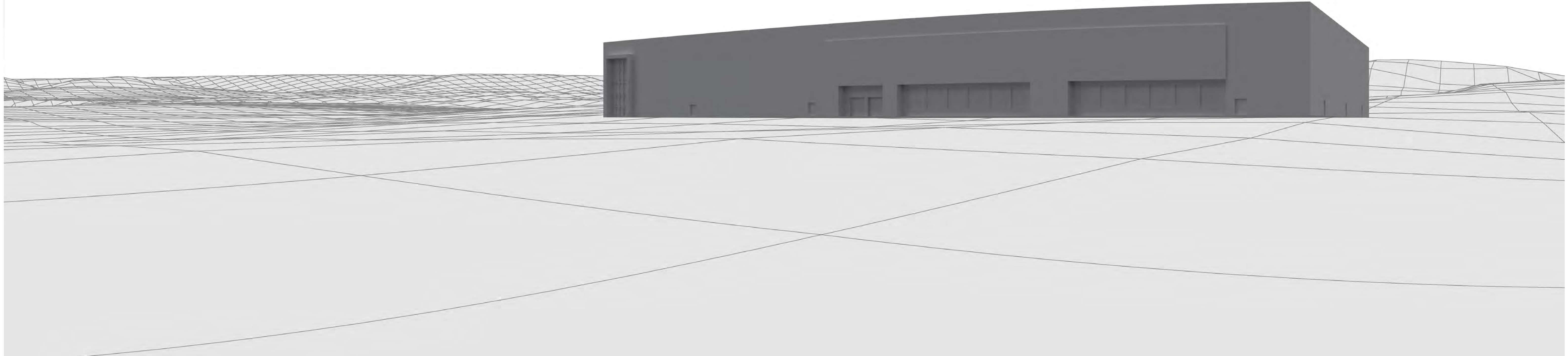
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**Peter Radmall Associates**  
Environmental Planning and Assessment

**Ashford Road, Maidstone**  
**Viewpoint 6B**  
**Existing Context View**



**Viewing Information**

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**Ashford Road, Maidstone**  
**Viewpoint 6B**  
**Predicted 3D Model View (AVR Type 2)**



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**Ashford Road, Maidstone**  
**Viewpoint 6B**  
**Composite 3D Model View (AVR Type 2)**