

## Appendix 9.3

Technical Photography, 3D Modelling and Verified Visualisations

Fair Oaks Renewable Energy Park

Ruddington

for

Fair Oaks Renewable Park Ltd

April 2023



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### Introduction

Mike Spence BA (Hons), MLD, CMLI, REIA, FRGS is a 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 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 on their windfarm visualisation guidance. His background as a Chartered Landscape Architect, Registered EIA Practitioner and Fellow of the Royal Geographic 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 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 Kew Royal Botanic Gardens, Fountains Abbey for The National Trust, and Derwent Valley Mills for Amber Valley Borough Council. 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 and developers.

In November 2021 Fair Oaks Renewable Energy Park Ltd contacted MSE to request Technical Photography, GNSS/RTK Surveying, 3D Modelling and Visualisation support for the proposed Fair Oaks Renewable Energy Park, near Ruddington.

## Verified Photography and 3D Modelling

The photographs were taken with a full frame camera (Canon EOS 5D Mark III) 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 9 viewpoints were identified providing views of the site and visited on 17 & 23 November 2021 and 17 February 2022. The weather was good 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. The panoramic tripod head was set with increments to give approximately 50% overlap between frames. Photographs were taken in both landscape and portrait format. From each photograph location a full 360 degree field of view was taken centred around a nodal point. The nodal point was set to avoid any problems of foreground parallax. A Sigma 50mm f/1.4 lens was used for all viewpoint photographs.





Single Frame 50mm photograph is insufficient to capture the wide spread of a solar farm in the view. Instead a panorama is created by stitching multiple 50mm images together:





Extracted 90 degree portion

For each 360 degree panorama the images were cylindrically corrected and stitched together. This allowed an accurate 90, 180 or 270 degree cylindrical view to be extracted from the full panorama, to illustrate the wider 'landscape setting' of the development.

Technical information for the camera locations is provided for each viewpoint in Appendix 9.3.1.



#### 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 SP80 GNSS smart antennae with Panasonic Toughpad data recorder. Points were saved using DigiTerra software. A photograph of the camera location was taken.



#### **3D Modelling**

MSEnvironmental constructed a geo-referenced 3D model using Rhino 3D from a 3D DWG and PDFs supplied by Ridge Clean Energy together with LIDAR 2m DTM data. The model was geo-referenced and placed in the correct geographic coordinate system (OSGB36) using ground heights to correspond wth the survey and site layout.

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

LIDAR DSM data and target points were taken from the existing features in the view and built into the 3D model. This allowed the horizontal and vertical alignment of the photograph and 3D model to be checked, cross-referenced and verified.

Cylindrical renders generated using VRay for Rhino were exported from the 3D modelling software and used to overlay the single frame planar images.

Target points from both the photograph and the model view were aligned to ensure a precise fit between the two images.

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

1. Existing View



#### 2. 3D Model View



3. Composite 3D Model Photo-Overlay View



#### 4. Photomontage





The topography of the site has been generated from a site topographical survey supplied by Engena. The surrounding landform has been created using 2m LIDAR DTM data, with triangulated surfaces generated using Rhinoterrain.

The 3D Model was built in Rhino 3D by MSE. The model is fully geo-referenced and positioned to correspond with the site layout and elevations supplied in the planning application drawings:

# Proposed Fair Oaks Layout Model (April 2023) on the LIDAR DTM





Fair Oaks LVIA

### **Planar vs Cylindrical Projection**

All photographs are taken as a series of single frame planar images. A planar image is a single frame image which has a single point of perspective lying centrally in the image. The limitation of single frame images is that they have a limited horizontal field of view. To allow a wider field of view we stitch the individual planar images using software, such as PTGUI which automatically corrects the geometry to give a cylindrical panoramic image. To undertake this accurately the use of a levelled tripod and panoramic tripod head set up to avoid foreground parallax is necessary.

A full 360 degree panorama is taken with overlapping images. These images are stitched together and cylndrically projected, as if the panorama was being located in the inner face of a cylinder.

The 3D model views are rendered out in cylindrical projection to allow the precise image re-mapping to match the 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 alignment of the 3D model. 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.

VRay for Rhino has been used for rendering. The use of a sunlight sytem adds a 3 dimensional effect with shadow, to understand the form and materials of the proposed solar panels, fencing and ancilliary development.

### **Viewing Printed Images**

The visualisations have been prepared to be printed at A1 wide by A4 high (841mm x 297mm), to fully show the limts of the proposed solar farm development within its local landscape context.

### Calculation of Visibility (ZTVs)

GIS viewshed software has been used to calculate visibility of the proposed development. A landform model has been constructed using Environment Agency 2m LIDAR Digital Terrain Model (DTM) data. 200 target points have been set at points along the panels at a height of 3m. An observer's eye height of 1.6m has been used.

A second calculation has been made of the substation, using the same landform data and eye height. The results illustrate maximum theoretical visibility, and do not include the screening effects of buildings or vegetation.

### **Summary**

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

The photography has been undertaken in a robust manner, using professional full frame sensor DSLR and 50mm lens with panoramic head and tripod. The camera position has been surveyed using highly accurate GNSS equipment, giving high levels of accuracy of camera location. The 3D model has been built in Rhino 3D. An additional check on the vertical scaling has been undertaken using RESOFT Windfarm. The resultant visualisations are highly accurate,

The sheets are set up to be printed at the true monocular viewing distance of 50cm. So the images will appear true to scale when viewed on site with one eye.

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

The visibility calculations use highly detailed LIDAR DTM data and helpful in understanding maximum theoretical visibility, without visual buffers.

Mike Sperce

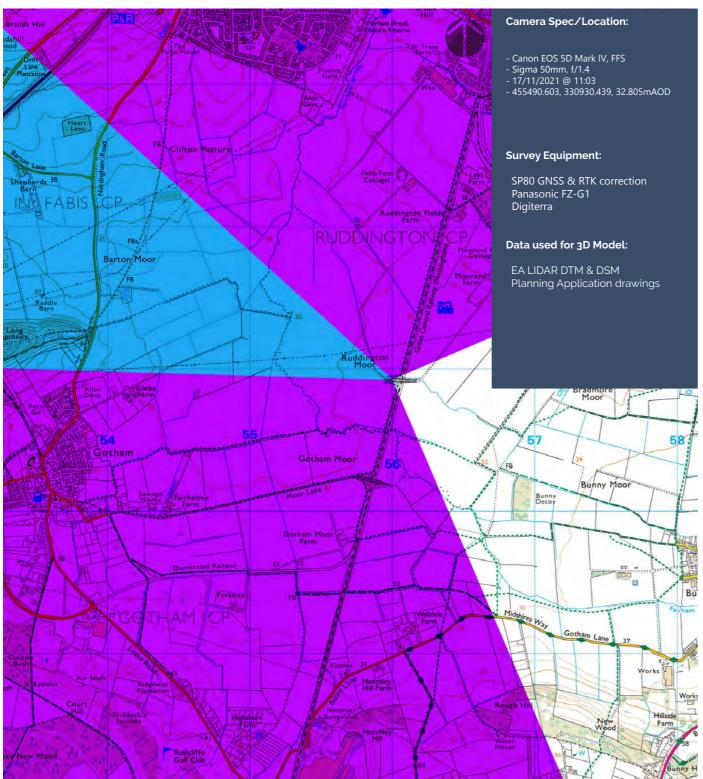
M.A.Spence BA(Hons), MLD, CMLI, REIA, FRGS 26 April 2023 Principal, MSEnvironmental



## APPENDIX 9.3.1: VIEWPOINT DETAILS



#### **Camera Location:**



### Tripod:



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Fair Oaks LVIA



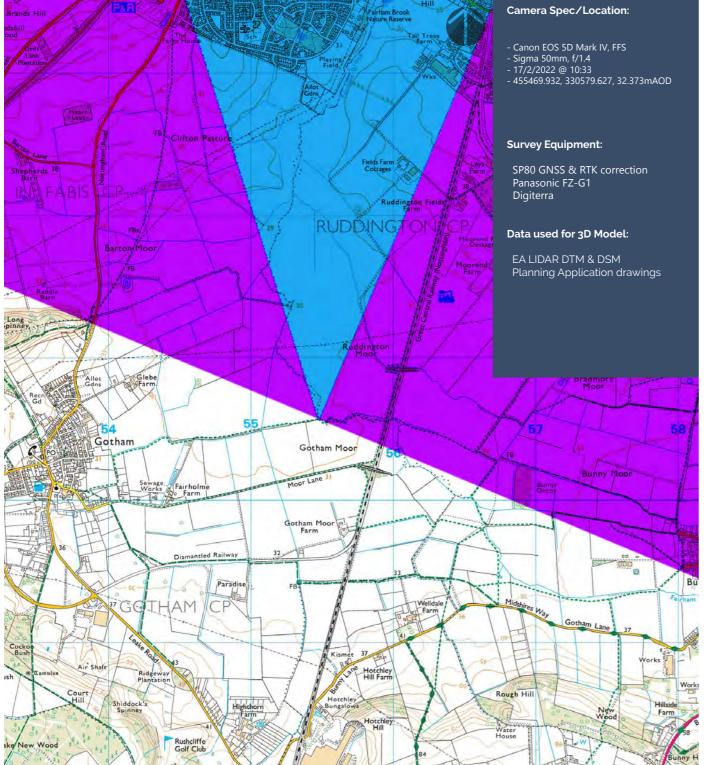


Point of Perspective

## Viewpoint 1 Single Frame 50mm image

50mm Lens Planar Projection (actual 49.7mm; 39.9 deg HFoV)

#### **Camera Location:**



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### Tripod:





Fair Oaks LVIA

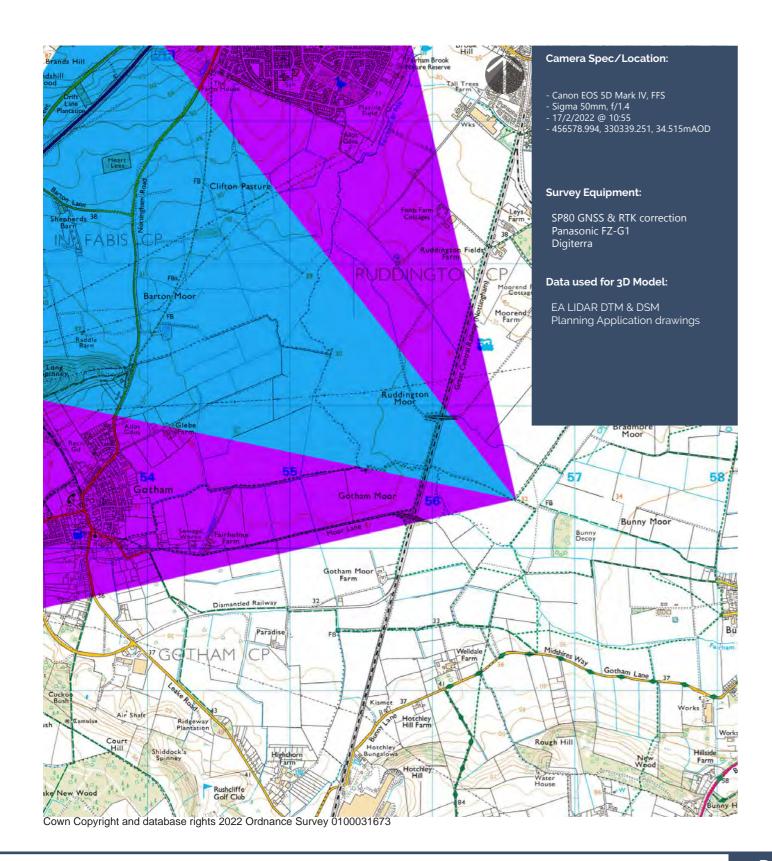




Point of Perspective

## Viewpoint 2 Single Frame 50mm image

#### **Camera Location:**



### Tripod:



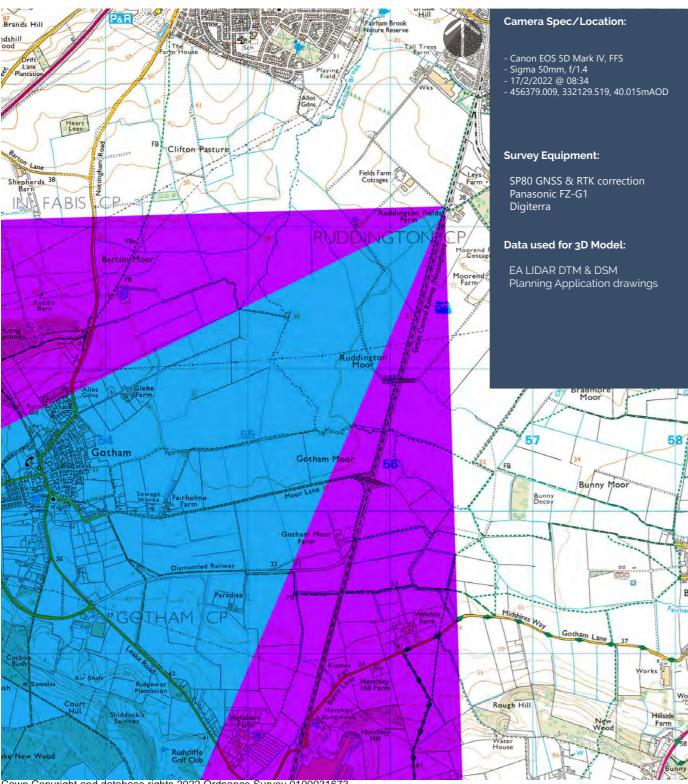


Fair Oaks LVIA

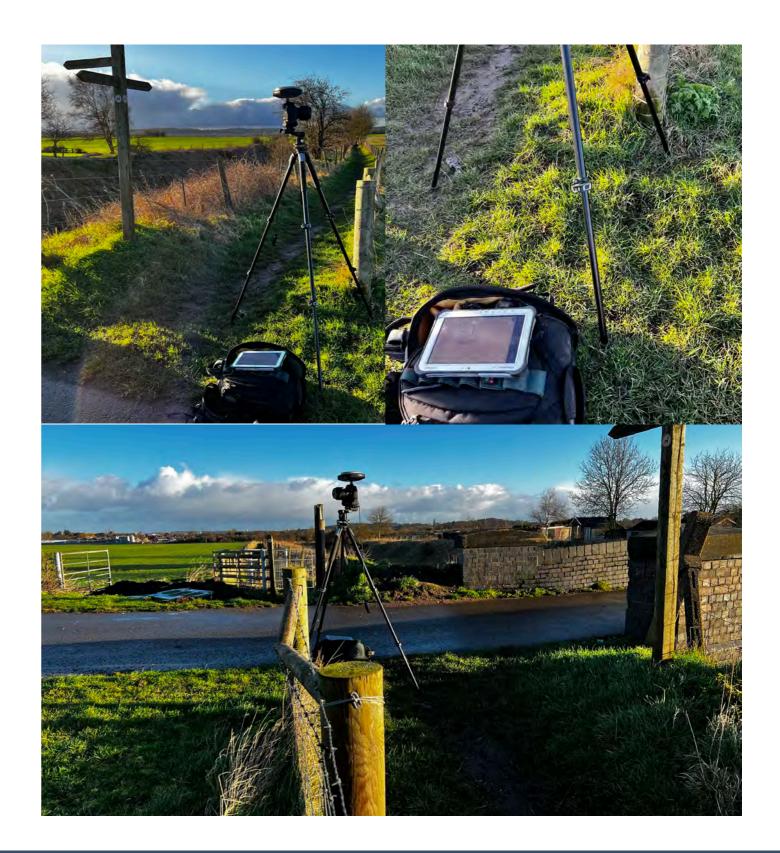


## Viewpoint 3 Single Frame 50mm image

#### **Camera Location:**



### Tripod:



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Fair Oaks LVIA





Point of Perspective



## Viewpoint 4 Single Frame 50mm image

#### **Camera Location:**

## Camera Spec/Location: - Canon EOS 5D Mark IV, FFS - Sigma 50mm, f/1.4 - 17/2/2022 @ 12:41 - 454299.832, 332068.582, 33.012mAOD Survey Equipment: SP80 GNSS & RTK correction Panasonic FZ-G1 Digiterra Data used for 3D Model: Heart EA LIDAR DTM & DSM Planning Application drawings Clifto ds 38 FABIS Ruddington RUDDINGTON Bradmor 54 Gotham cled Railw Buon Paradi AM 30

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### Tripod:





Fair Oaks LVIA



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Point of Perspective

Point of Perspective

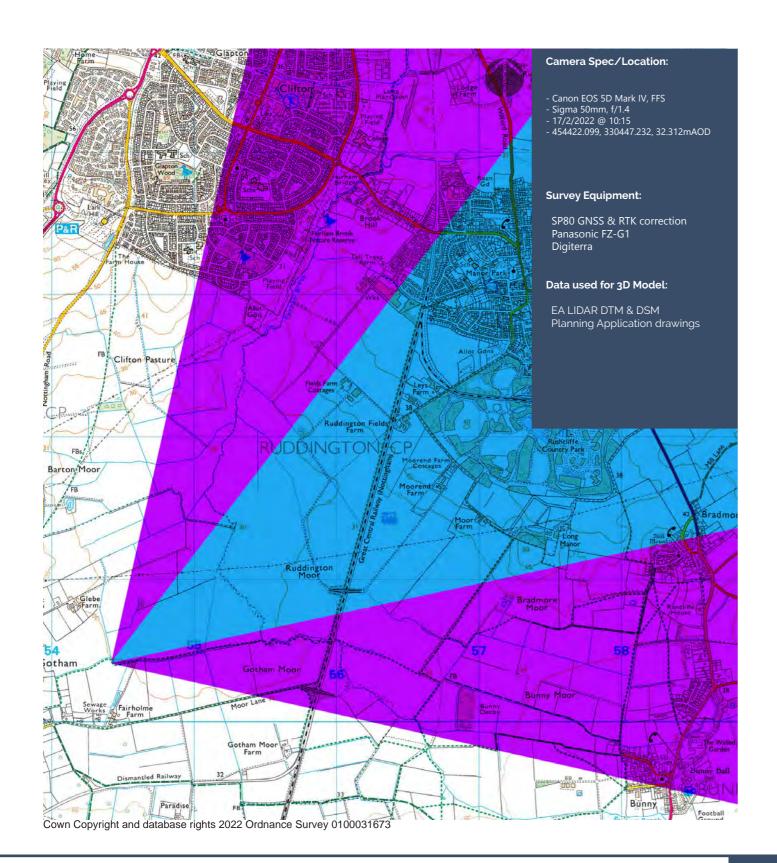


Point of Perspective

## Viewpoint 5 Single Frame 50mm image

o tourna turna turna turna turna turna la uni

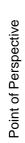
#### **Camera Location:**



### Tripod:



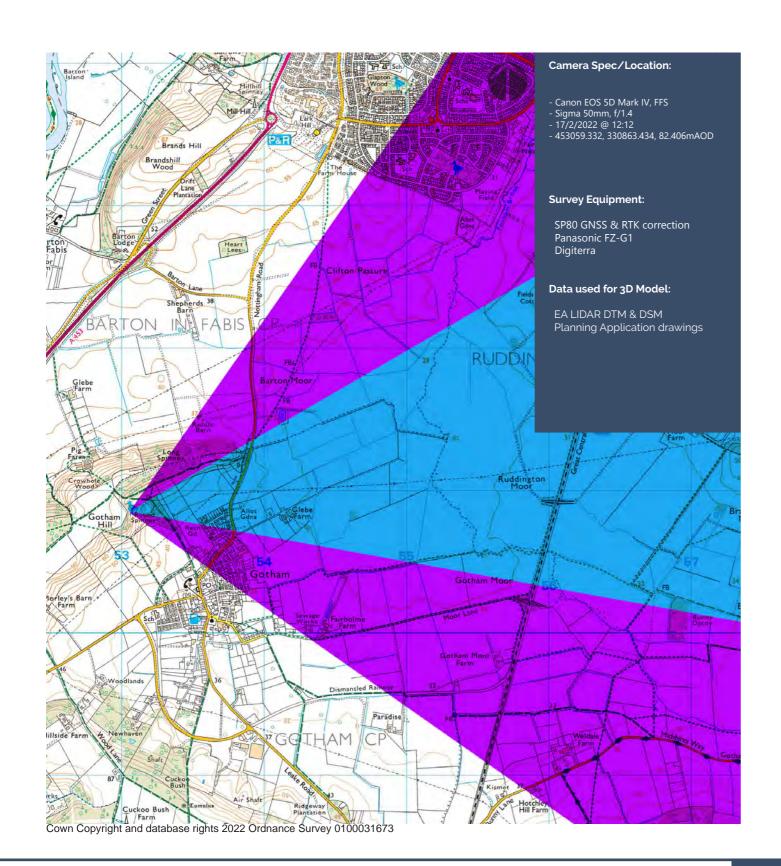




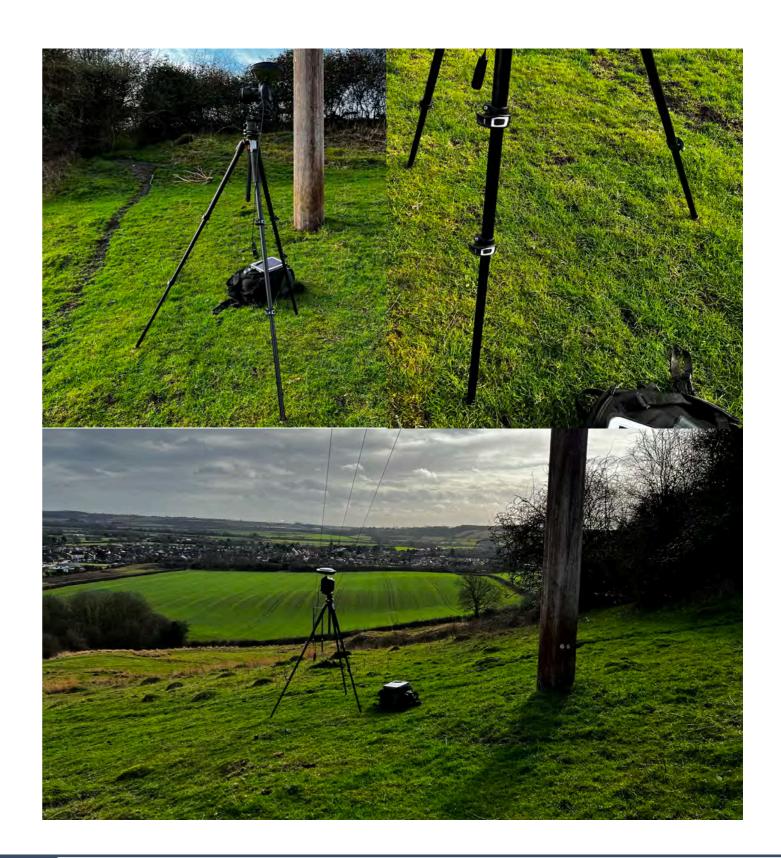


## Viewpoint 6 Single Frame 50mm image

#### **Camera Location:**



### Tripod:





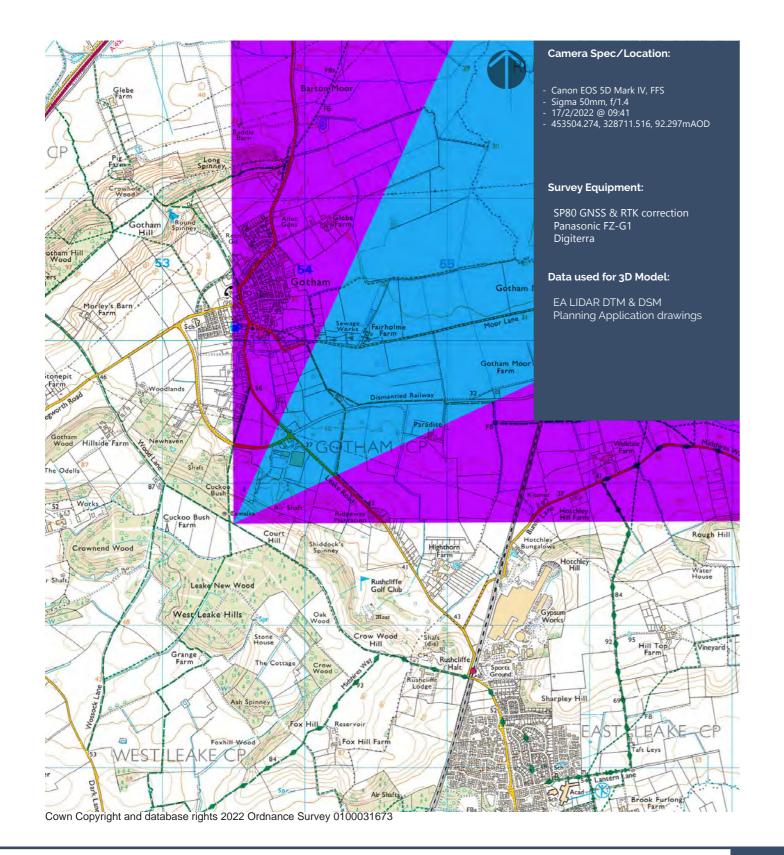


Point of Perspective

## Viewpoint 7 Single Frame 50mm image

#### **Camera Location:**

### Tripod:







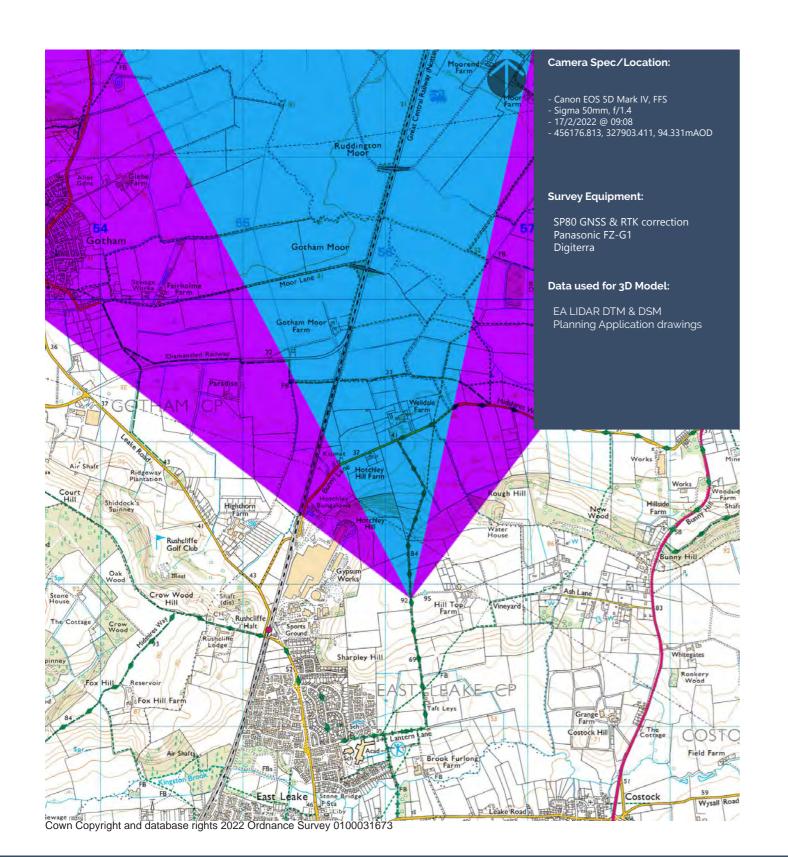


Page 21



### Viewpoint 8 Single Frame 50mm image

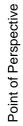
#### **Camera Location:**



### Tripod:



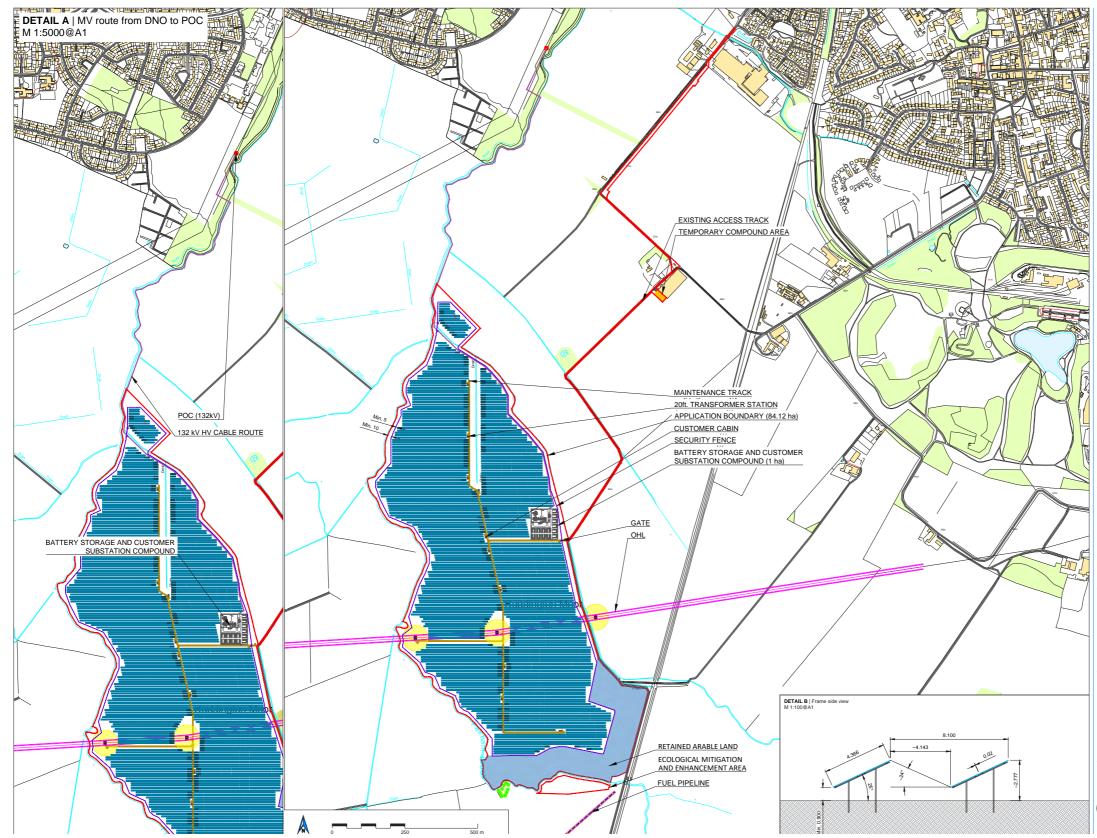






Point of Perspective

## Viewpoint 9 Single Frame 50mm image









orary construction compound area
ry storage unit
omer substation compound area
49 980 @215kVA
107 068 Canadian Solar CS7L-590MB 2173x1305x35
2 modules in portrait 25° ~24° Due south 8 100mm ~4 143mm
232 Huawei SUN2000-215KTL-H0 1.21 / 1.28 @215kVA

ens: ens 10 ~68.81 ha ~4 180m ~84.12 ha



#### Revisions: Rev Date Comments Drawn 0. 68/11/22 Sabstaint compound updated MG A. 22111/22 Sabstaint compound updated MG 1. 191/222 Minor Ispost amediments. MG

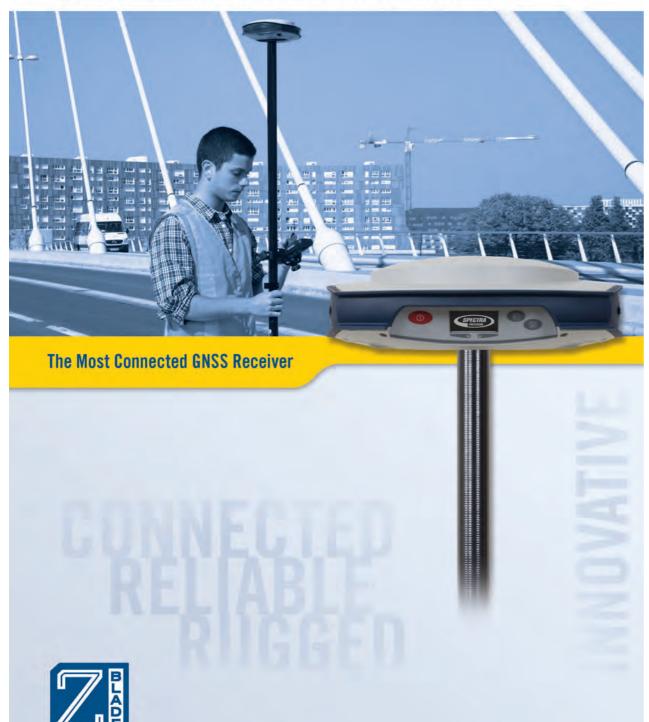
C	21/04/23	East side buffer added	AP
D	24/04/23	Added modules	AP
E	24/04/23	Added modules	AP
			-
Proje	ct:	Fair Oaks Renewable Energy	gy Park
.oca	tion:	Fields Farm, Asher Lane,	
		Ruddington, Nottingham,	
		NG11 6JX, UK	
		52°52'58.83"N 1°10'44.65"V	N
Title:		Figure 1.3A - Proposed Site La	ayout

# Drawn: DETRA / MG Checked: JF Scale: 1:5000@A1 Date: 24/04/23 Drawing No: RCE1003-100 Rev: E

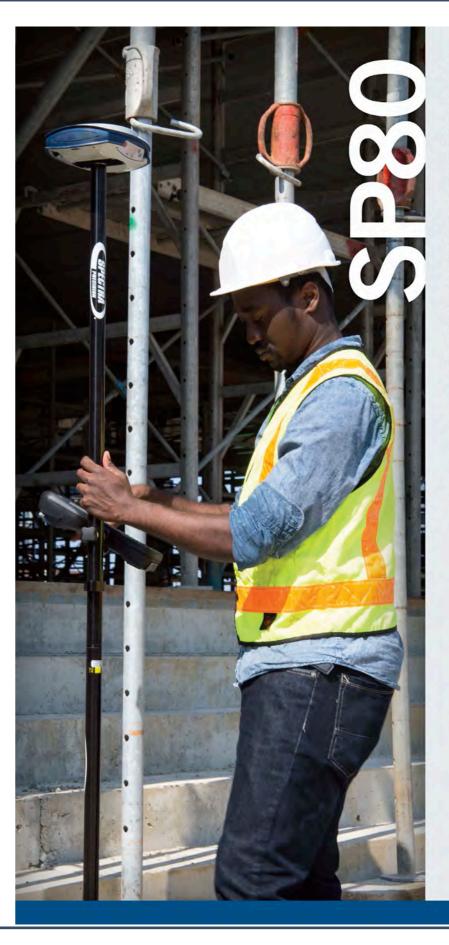
Ridge Clean Energy Notes As A Market Saret Charlas energy@ridgeckanenergy.com



## **Spectra Precision SP80 GNSS Receiver**



TECHNOLOGY INSID





#### SP80 GNSS Receiver

The Spectra Precision SP80 is a next generation GNSS receiver that combines decades of GNSS RTK technology with revolutionary new GNSS processing. Featuring the new 240-channel "6G" chipset, the SP80 system is optimized for tracking and processing signals from all GNSS constellations.

In addition, SP80 is the most connected GNSS receiver in the industry. It is the first to offer a unique combination of integrated 3.5G cellular, Wi-Fi and UHF communications with SMS, email and anti-theft features.

These powerful capabilities, packaged in an ultra-rugged and cable-free housing with unlimited operation time (hot-swappable batteries), make SP80 an extremely versatile turnkey solution.

#### **Key Features**

- New 240-channel 6G ASIC
- Z-Blade GNSS-centric
- 3.5G cellular modem
- Internal TRx UHF radio
- Built-in WiFi communication
- SMS and e-mail alerts
- Anti-theft protection
- Hot-swappable batteries

Patented inside-the-rod mounted UHF antenna design



### **APPENDIX 9.3.3: SURVEY EQUIPMENT**



#### Unique 6G GNSS-centric Technology

Exclusive Z-Blade processing technology running on a nextgeneration Spectra Precision 240-channel 6G ASIC fully utilizes all 6 GNSS systems: GPS, GLONASS, BeiDou, Galileo, QZSS and SBAS. The unique GNSS-centric capability optimally combines GNSS signals without dependency on any specific GNSS system; this allows SP80 to operate in GPS-only, GLONASS-only or BeiDou-only mode if needed. In addition, SP80 supports the recently approved 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

SP80 has a unique combination of communication technologies including an integrated 3.5G GSM/UMTS modem, Bluetooth and Wi-Fi connectivity, and optional internal UHF transmit radio. The cellular modem may be used for SMS (text message) and e-mail alerts as well as regular Internet or VRS connectivity. Likewise, SP80 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.



#### Anti-Theft Protection

A unique anti-theft technology secures SP80 when installed as a field base station in remote or public places and can detect if the product is 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, SP80 will generate an audio alert and show an alert message on its display. Furthermore, an SMS or e-mail will be sent to the surveyor's mobile phone or computer and provides the receiver's current coordinates allowing tracking of its position and facilitating recovery of the receiver. SP80's anti-theft technology provides surveyors with remote security and peace of mind.

#### The Most Powerful Tool for Reliable Field Use

The SP80's rugged housing, created by Spectra Precision's engineering design lab in Germany, 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 glass-fiber reinforced casing, designed to withstand 2m pole drops and waterproof to IP67, ensures that SP80 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. These powerful design features combine to make SP80 the most capable, most reliable GNSS receiver, backed by a comprehensive standard 2 year warranty.



#### The Spectra Precision Experience

With the most advanced and rugged field data collectors from Spectra Precision, surveyors get maximum productivity and reliability every day. Spectra Precision Survey Pro or FAST Survey software is specifically tailored for the SP80 GNSS receiver providing easy-to-use, yet powerful GNSS workflows, letting the surveyor concentrate on getting the job done. Spectra

Precision 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 Precision field and office software, SP80 is a very powerful and complete solution.





## **APPENDIX 9.3.3: SURVEY EQUIPMENT**

## TOUGHPAD FZ-G1

#### Panasonic recommends Windows.

SOFTWARE	<ul> <li>Windows 10 Pro 64 bit</li> <li>Panasonic Utilities (including Dashboard), Recovery Partition</li> </ul>	WARR S-ye
DURABILITY	<ul> <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 desuble free desuble desuble</li></ul>	DIMEN 10.6 2.4 3.0 INTEG 4.6 I Cho Mici
CPU	■ Intel® Core™ 15-6300U vPro™ Processor - 2.4 GHz up to 3.0 GHz with Intel® Turbo Boost Technology - Intel Smart Cache 3MB	
STORAGE & MEMORY	<ul> <li>8GB DDR3L SDRAM<sup>15</sup></li> <li>256GB solid state drive [SSD] with heater<sup>45</sup></li> <li>Optional 5120B         <ul> <li>up to 64GB additional storage with optional microSDXC card slot</li> </ul> </li> </ul>	AC A Star Lon Lon
DISPLAY	<ul> <li>10.1" WUXGA 1920 x 1200 with LED backlighting</li> <li>10-point capacitive multi touch + Waterproof Digitizer pen daylight-readable screen - 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<sup>a</sup> HD Graphics 520 (Bull-in CPU) video controller</li> <li>Concealed mode (configurable)</li> </ul>	Sinc LIN LIN LIN LIN LIN Tall Rotz Set Tour Tour
AUDIO	Integrated microphone Reattek high-definition audio Integrated speaker On-screen and button volume and mute controls	<ul> <li>Tou</li> <li>Des</li> <li>Vehi</li> <li>– Ga</li> <li>– Ha</li> </ul>
KEYBOARD & INPUT	<ul> <li>10-point gloved multi touch + digitizer screen         <ul> <li>Supports bare-hand touch and gestures and electronic waterproof stylus pen</li> <li>Supports glove mode and wet-touch mode</li> <li>Tablet buttons (2 user-definable)</li> <li>Integrated stylus holder</li> <li>On-screen QWERTY keyboard</li> </ul> </li> </ul>	- Vehi - Ga - Ha Cra - Ve - AT Rep Tetr
CAMERAS	<ul> <li>720p webcam with mic</li> <li>8MP rear camera with autofocus and LED light</li> </ul>	■ 10.1
EXPANSION	Optional MicroSDXC3	. Please co Caution: 1 Approx
INTERFACE	Docking connector         24-pin           HDMI         Type A           Headphones/speaker         Mini-jack stereo           Optional Serial Dongle <sup>2</sup> D-sub 9-pin           USB 30 (x 1) <sup>2</sup> 4-pin           Optional Id(10/10/000 Ethernel <sup>2</sup> )         4-pin           Optional 10/10/1000 Ethernel <sup>2</sup> H-45	<ul> <li>Approx</li> <li>brightn</li> <li>Battery</li> <li>Bridge</li> <li>contact</li> <li>access</li> <li>aCPS, S</li> <li>4 IGB</li> <li>5 Total u</li> </ul>
WIRELESS	<ul> <li>Optional integrated 4G LTE multi carrier mobile broadband with satellite GPS</li> <li>Optional GPS [u-blox NEO MRN]<sup>19</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> <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> <li>Dual high-gain antema pass-through</li> </ul> </li> </ul>	* The siz Windov 7 Magstr reader mediur 8 Requirt 9 Length access access
POWER SUPPLY	<ul> <li>Li-lon battery pack:         <ul> <li>Standard battery: Li-lon 11.1 V, 4200 mAh [typ.], 4080 mAh [min.]</li> <li>Optional long life battery': Li-lon 0n.80h (y. 9300mAh[typ.], 8700mAh [min.]</li> </ul> </li> <li>Standard battery: IA hours         <ul> <li>Optional long life battery': 28 hours</li> <li>Battery charging time':</li> <li>Standard battery: 25 hours off, 3 hours onf, 4 hours on</li> <li>Optional long life battery': 51 hours on</li> <li>Optional long life battery': 16 hours on</li> </ul> </li> </ul>	™ Hazard for ava ™ TPM 1.
POWER MANAGEMENT	<ul> <li>Suspend/Resume Function, Hibernation, Standby</li> </ul>	
SECURITY FEATURES	<ul> <li>Password Security: Supervisor, User, Hard Disk Lock</li> <li>Kensington cable lock slot</li> <li>Trusted platform module (ITPM) security chip v2.0<sup>19</sup></li> <li>Computrace<sup>®</sup> theft protection agent in BIOS8</li> <li>Optional Insertable SmartCard reader<sup>25</sup></li> <li>Optional Contactless SmartCard/HF RFID reader<sup>2</sup></li> <li>Soft Soft 3nd T4443 AVB compliant</li> </ul>	

RRANTY 3-year limited warranty, parts and labor	
<b>1ENSIONS &amp; WEIGHT<sup>9</sup></b> 10.6°[L] x 7.4°[W] x 0.8°[H] 2.4 lbs. (standard battery] 3.0 lbs. (optional long life battery) <sup>7</sup>	
EGRATED OPTIONS <sup>10</sup> G LTE multi carrier mobile broadband with satellit bhoice of 10/20 barcode reader [EA11 or EA21], GP MicroSDKC or second USB 2.0 port <sup>2</sup> hoice of bridge battery, mogstripe reader, insertable nsertable SmartCard reader with bridge battery, co fr eader or UHF 900MH2 RE/TD reader [EPC Gen 2	S, Serial Dongle, Ethern le SmartCard reader, ntactless SmartCard/RF
CESSORIES <sup>10</sup>	
AC Adapter (3-prong) Standard Battery Pack Long Life Battery Pack <sup>7</sup>	CF-AA6413CM FZ-VZSU84A2U FZ-VZSU88U
.ong Life Battery Bundle includes rotating hand strap and corner guard set] ingle Battery Charger Bundle IND 3-Bay Battery (Charger IND Car Adapter 70W IND Car Adapter 70W (with USB port] IND Car Adapter 90W MIL-STD All Corner Guard Set	FZ-BNDLG1LL1ST1CG4 FZ-BNDLG1BATCHRG FZ-LND3BAYG1 CF-LNDDC120 CF-LNDACDC90 CF-LNDMLDC90 FZ-WCGG111
Rotating Hand Strap and Tall Corner Guard Set Bundle foughMate G1 Always-On Case [with hand strap] foughMate G1 Professional Portfolio foughMate G1 "X" Hand Strap Desktop Cradle	FZ-BNDLG1ST1CG4 TBCG1AONL-P TBCG1PFLIO-BLK-P TBCG1XSTP-P FZ-VEBG11AU
/ehicle Docks (no pass-through) · Gamber-Johnson · Havis with LIND power supply /ehicle Docks (dual pass-through)	7160-0486-00-P CF-H-PAN-702-P
- Gamber-Johnson - Havis with LIND power supply Cradlepoint Router	7160-0486-02-P CF-H-PAN-702-2-P
- Verizon - AT&T Replacement Digitizer Pen Waterproof Tether 10.1° LCD Protective Film	CP-IBR1100LPE-VZ CP-IBR1100LPE-AT FZ-VNPG11U-S FZ-VNTG11U FZ-VPFG11U
se consult your reseller or Panasonic representative before purchasing. ion: Do not expose bare skin to this product when handling this unit in ext proximate time. Battery operation and recharge times will vary based on r ghtness, applications, features, power management, battery conditioning therv testion results from MobileArk 2007.	nany factors, including screen
sidge battery, magstripe reader, insertable SmartlCard reader, insertable Sm ntactless SmartCard reader and UHF RFID reader are mutually exclusive. Excessed when the unit is equipped with the magstripe reader, but opfiomal S, Serial Dungle, Ethernet, MicroSDKC and second USB port are mutually 8 - 1000,000,000 bytes.	Yease note, USB 3.0 port cannot be USB 2.0 port can be accessed. exclusive options.
tal usable memory will be less depending upon actual system configurativ e size of the VRAM cannot be set by the user and varies by operating syst indows 7 max. VRAM is 15555M8. aggitipe reader, insertable SmartCard reader, insertable SmartCard reader ader include tall corner guards and rotating hand strap. Bridge battery (wi	em as well as the size of the RAM. with bridge battery and UHF RFID
edium corner guards and rotating hand strap. quires software and activation to enable theft protection.	

requires sortraite and activation to enable interp protection.
 l'ength measurements do not include protoxism. Weight varies with options and diplicer pen.
 # Accessories and Integrated Options may vary depending on your configuration. Visit the Panasanic website for not accessories and details.
 Histardous location certifications may not apply to all configurations. Consult your Panasanic representative

for availability. TPM 1.2 available upon request - please contact your reseller or Panasonic representative.



TOUGHPAD

#### 1.800.662.3537

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## APPENDIX 9.3.4: CAMERA EQUIPMENT (CANON 5D MARK III)

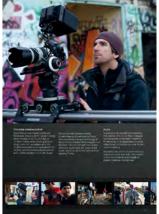


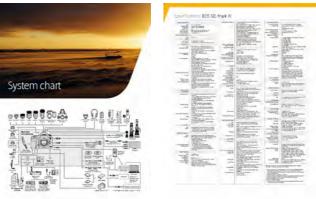












## APPENDIX 9.3.5: CAMERA EQUIPMENT (SIGMA 50mm f/1.4)

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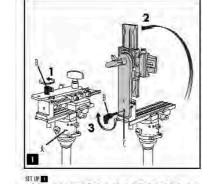




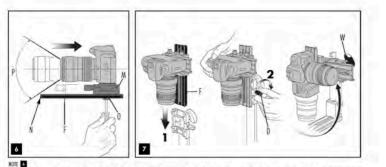
### **APPENDIX 9.3.6: CAMERA EQUIPMENT (MANFROTTO 303 SPH)**







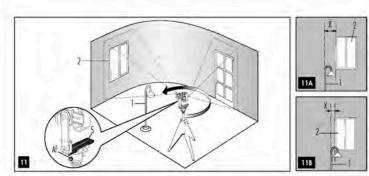
nn sapplied) is the ripod, then the "Wi" head on the leveling device via tanale attritument "A". "Wi "roome the bracket inco the vertical position as shown in Tg. Tand lod, it in place by serving, the knok "B" in 16 hok "T". Fix he leveling device



Here of the hausine "M" relative to the long plate "F" will need to be objected: lossen strew "O" to slide the housing. The ideal position it with the camera body as far back on the plate as II can go before the front edge "N" of the long plate "P" becomes visible in the comero's field of view "P".

MOUNT THE CAMERA ON THE HEAD

Menni the whole top assentiby + camera on the head as shown in Figure 7 by stiding the long plate "F" into its loading and locking it by strewing lands "D", then encore knob "W" and more the camera on the vertical plane. 4

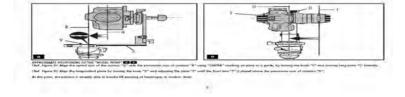


#### LATERAL POSITIONING

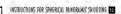
Latter Continues and Control of the Control of the Control of Co

1

Once the right position is achieved it is VERY USEFUL to memorize it by nating the position of the plate "5" on the index on the graduated scale.



2



Associations and Sectional RANDAMIC SHOUNDS [2] Tayloid percenticase is altitude by roting register particular conservations at different angle from the horizonts. Heat you will used to dearch the under of parameticspectra, will be in a complete the sphere departing on the orgin of the key will be using. Believe sturing with the parameticspectra, do used the initial vertical orgin into a rod of the key will be using. Believe sturing with the parameticspectra, do used the initial vertical orgin into a rod of the level of the Uncover location. "As '' arranges' a completely from 44 a stread for most be used to completely type roting which the bead is used in the vertical pacified, with a rod of ny accident in woment of the bead is any pacified."

spherical "VR" head is designed, lo allow virtual scenes to be created by Composer from a vis paroramic sequences of digital or ågitæd photographs, toker at different vertual

Accirclely leveling of the pararamic axis A Vancramit head that enables you to choose the angle of rotation between one shotand

the next. The dulity is position the comercuso the "Nodal Point" of the lens (the front lens) is

excity done he pannanic accorración, lo elminate any paralaxionalemos beixean Ne ner mál dismi digectión he sciene. In a definint construcción accorración de la pannanic sequencesa i differencier icol angles in order a ablice a maplex spherial sene.

The pherical "VR" head comprises hree main modules hat perform the functions mentioned above in points 2, 3 and 4.

Alles your lipsd has a but in keeling device (such as he Nan Foto in Ne'le Fipod's Shinn had Sall, you will need to use one of he keeling accessive available. From he Man Foto range he assne acarae keeling of he head (see point 1).

re are 4 remitements to achieve and a moranic sequence shots:

Decide the nomber of shots or the angle of rotation between each shorf or the first panoratrics equence is each e door below)

 
 Angle
 90°
 50°
 45°
 38°
 39°
 94°
 20°
 15°
 10°
 5°

 n.rbvt
 4
 6
 8
 10°
 12°
 15
 18
 24
 38.
 72°
 + Screw knob "AG" into the selected setting holes "AA".

\* Some han "W" in the released setting hale "W". \* Balens heling lever "W" on an that he cannot hang plate "UP" in the perior of the testscha. • Will the cannee in period and instance accound hered "UP" with the first "date, typ" is needed, then lock lever "W". • Note the fastshared then nome the canners in the sear "date, typ" with wire besing "UP" and take the outschar. Testime this process with the start positive is readed. The typ these conflicted the first complex manimized periods, you can start in the other provincies express needed to one the space change the search and bale that "W" and nome scale "Z", will expert the space minic sequences needed where the outschart of where the space change the search of search of start search one the space change the search and gale using bank "W" and nome scale "Z", will expert the space minic sequences.

No base of the bood "AD" has produced scale markings from 0 to 300° and a networks index "AE" on the earned harm! "AC". Has In the used to see angles not no the cham, I was the bood in this way, minds band "AD" to disagge the "disk any" during romation of earned harm! "AD" and use the lacking hand "AP" to lack the position during shorting.

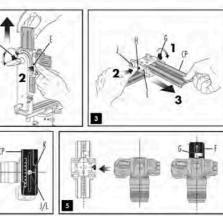
NOTE: The angle of the lever on the antibertand "UB" can be reportinged as required without effecting the lade itself. Pull the lever notwards, rated as required and release and itwill leave in the new partition.

34 2 4

8

12





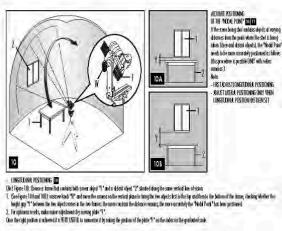
3

#### EUNTING THE CAMERA 2 3 4 3

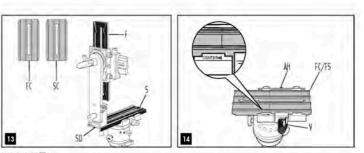
Remove the top assembly (fig. 7) by releating load "O". To tilde it completely out of the housing, push safety botton "E".

Rémove comens plate "(P" (lig. 3) by releasing knob "G". To slide it completely out of the housing, push safety button "H".

safely botton "b". Figure 40 botton "b". Figure 40 botton "b". Depending on your camera bigod attachment, decay the cereat caree and use its bit your camera is gain provide the series of the series of the series of the cere to align the law with the centre of the plate indicated by laters of the series of the series of bit of the camera centre is the series of the series bit of the camera centre is the series of the series bit of the camera centre is the series of the series bit of the camera centre is the series of the series bit of the camera centre is the series of the series is layers by shifting the camera centre is the series of the series tadys is platen with later point "t". The lens and must be pericely above the del of the plate as shown in Signa 5. The angle is the series of the series as shown in Signa 5. The angle is the later of the tend is the "the series of the late have around at the tend point "to" centre respectioned is a segurited without difficient is lack head height the lawer arounds, trathe centre of the series and it will locate is the new position.



6



#### ADDITIONAL PLATES 13

If you have a very compact unnext we suggest you it out the short plates "SL" (lig. 13) and "R" (supplied with the head) (totend of the two long plates "P" and "S" is order to reduce space and weight of the system. To reduce the plates "P", places relate to fig. 6 and moree screw "O"

USE OF THE KIT AS AN OBJECT PARIDRAMA TURNISHE TO The head new also be used as a twinkible, workelf for stationing object processions. For this are, losses knob. "If" and push botton "AM" to slide the lower plate "S" out of the boosing on the ponoramic relation have with the fiber of the long target and by parametry associations of the shorter plates supplied as a base tory our abject. The plate basesing has a "waster" mark to help you pathon your object accumular above the center of parameteric relation.

9