

Appendix J – Drainage Strategy Addendum (Part 1)



Sperberry Hill Solar

Drainage Strategy Addendum Resubmission Scheme

October 2024

Project Information	
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Client:	Axis P.E.D Ltd
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Revision	Date	Comment
01	27/09/2024	Draft Report
02	01/10/2024	Second issue- updated with revised Masterplan
03	22/10/2024	Third issue- updated to address LLFA comments and to include revised Masterplan

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This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

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Introduction

Waterco has been instructed by Axis P.E.D Ltd to prepare a Drainage Strategy Addendum Report in relation to a proposed solar farm with associated battery storage and ancillary infrastructure, located on land to the south of Wymondley Substation and south of Sperberry Hill, St Ippolyts, Hertfordshire, SG4 7NZ. The site covers an area of 35.5 hectares. A location plan and an aerial image are included in Appendix A.

Planning Application Reference: 22/00709/fp was originally submitted for a proposal with the same description on the same plot of land but was refused by North Hertfordshire District Council in November 2023. This previous application, hereafter referred to as the '2023 Scheme', was made by RNA Energy Ltd. That company has subsequently been acquired by Brockwell Energy Limited and now exists as BSSL.

BSSL has now elected to submit a revised planning application for the 2023 Scheme, with some specific design changes. For ease of understanding, this is referred to as the 'Resubmission Scheme'.

This report should be read in conjunction with Weetwood's Flood Risk Assessment (Final Report v1.0) issued in December 2021 as the original flood risk to the site has not changed. This addendum focuses on surface water drainage only.

Existing Conditions

Online mapping (including Google Maps / Google Streetview imagery, accessed October 2024) shows that the site comprises and is surrounded by undeveloped agricultural land. The site is bordered by Sperberry Hill and Stevenage Road to the north and there is a small ditch/watercourse which crosses through the south-eastern extent of the site. Access to the site is provided from the north.

Local Topography

Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR data shows that site levels vary from 98.5m AOD in the north-west to 82m AOD in the location of a watercourse in the south-east. A LiDAR extract is provided as Appendix B.

Ground Conditions

The British Geological Survey (BGS) online mapping (1:50,000 scale) shows that the easternmost extent of the site is underlain by superficial deposits of the Lowestoft Formation generally comprising Diamicton. The westernmost extent of the site is underlain by Glaciofluvial Deposits generally comprising sand and gravel. The underlying bedrock comprises the Holywell Nodular Chalk Formation and New Pit Chalk Formation.

According to the EA's Aquifer Designation data, obtained from MAGIC's online mapping [accessed October 2024], the Lowestoft Formation is classified as a Secondary Undifferentiated Aquifer. Secondary Undifferentiated Aquifers are assigned in '*cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type*'.

The Glaciofluvial Deposits is classified as a Secondary A Aquifer. Secondary A Aquifers are '*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers*'.

The underlying bedrock (Holywell Nodular Chalk Formation and New Pit Chalk Formation) is classified as a Principal Aquifer. Principal Aquifers are '*layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale*'.

The EA's 'Source Protection Zones' data, obtained from MAGIC's online mapping [October 2024], indicates that the site is partially located within Groundwater Source protection Zone III- Total Catchment. Zone III is defined as '*a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point*'.

Resubmission Scheme

The Resubmission Scheme is described as follows:

- The Application Site is identical to that for the 2023 Scheme and remains at 35.5 hectares.
- It is proposed that the description of development is identical to that for the 2023 Scheme.
- The proposal includes the same scheme components as the 2023 Scheme, including solar panels, 8 no. battery storage units; string inverters; a DNO substation; a switchroom; a control room; a grid connection / cabling to the nearby National Grid Wymondley Substation; internal stone tracks; 2 No. improved existing access points off Little Almshoe Lane, and an access point from Stevenage Road; fencing; CCTV cameras; and a combination of woodland and hedgerow planting. The 2023 Scheme also had 5 no. transformer stations, this is now reduced to 4 no. transformer stations for the Resubmission Scheme.
- For the 2023 Scheme, the individual solar panels had a power rating of 640 watts. Since the formulation of that application panel technology has continued to advance, and for the Resubmission Scheme it is proposed to install panels with a rating of 700 watts (noting a limited number of suppliers now offer an even greater power rating). The panel size, mountings, spacing and distance above ground level at the front (lower) and back (higher) edges would all be the same as the 2023 Scheme. However, with the greater power rating per panel, the Resubmission Scheme would deliver exactly the same 25MW output to the point of connection as the 2023 Scheme, but with an overall reduction in the area of solar panels of just over 8.5%. In short, the overall area of solar panels now proposed in the Resubmission Scheme is circa 8.5% less than the 2023 Scheme.

The principal design changes are as follows:

a. The area of solar panels (and all associated infrastructure) in the south-eastern corner of the 2023 Scheme, lying south-east of the Hertfordshire Way have been removed. In doing so the Hertfordshire Way would no longer pass through the solar farm but simply run alongside its southernmost boundary. As a consequence, views south from this section of the footpath would remain open and unchanged from the present. This design change is judged to materially reduce the effects of the proposal on users of this section of the public right of way.

b. The scheme has been altered in a number of regards around the southern and western boundaries of the curtilage of the Redcoats Farm complex. These design changes are as follows:

- The bund proposed to the south of the curtilage boundary in the 2023 Scheme has now been removed with alternative mitigation proposed. It is noted that the independent landscape review commissioned by NHDC in relation to the 2023 Scheme undertaken by The Landscape Partnership (the TLP Review) commented on the bund having an unnatural form.

- The solar panels (and associated fencing) have now been moved some considerable distance away from the south of the property curtilage (to between 41m and 58m at the eastern and western ends of the southern boundary respectively).

- Alongside the northern edge of the solar panels in this location will be a timber stock fence and a new hedge. Thus, where views are attainable from the southern edge of the curtilage, the current experience of the ground falling away, and openness of the views will be retained. The timber fence will provide an initial, appropriate style of boundary feature and within a few years the new hedge would become a fully effective screening feature.

- The solar panels (and associated fencing) have also been moved further away from the western curtilage of the Redcoats Farm complex and a new block of woodland planting is proposed in this location. This new woodland block is again consistent with recommendations made in the TLP Review (see their para 5.5.2 b.).

c. An area of solar panels has also been removed from the north-western corner of the scheme and a further area of new woodland planting proposed in this location. This again follows the TLP Review recommendation that such planting would soften views from residential properties to the edge of St Ippolyts.

d. The area of new woodland planting proposed in the 2023 Scheme was circa 5,600m². With the addition of the aforementioned new areas of woodland planting this figure will increase. The length of new hedgerow planting in the 2023 Scheme (new and gapping up existing) was circa 2,335m². It is likely that this figure will slightly decrease associated with the aforementioned design changes alongside the Hertfordshire Way. In short, there would be no hedge on the southern side of the footpath and no hedge encompassing the area south of the footpath which previously contained solar panels.

A proposed development plan is included as Appendix C.

Surface Water Management

The site is not currently formally drained and is therefore considered to be 100% permeable.

The proposed development will introduce formally drained areas in the form of new access tracks and a compound area containing the 8.No battery energy storage system (BESS) units, DNO substation, control centre, battery transfer units and switchroom. Formally drained areas in the form of the compound and access tracks will comprise approximately 5,000m².

Surface Water Management from Solar Modules

The proposed ground-mounted solar arrays will be laid on ram mounted posts ensuring the ground beneath each panel remains permeable. The rows of panels will be spaced with a 'rainwater gap' between each row of panels. Rainfall runoff from the solar arrays will infiltrate to the land beneath and between the panels. It is therefore considered that the solar arrays do not contribute to the impermeable area of the site and will not result in an increase in the surface water runoff rates and volumes.

Whilst the solar arrays will not result in an increase in the surface water runoff rates and volumes, runoff from the panels will be concentrated at the base of each panel which could result in soil compaction at the panel base and potential erosion (rivulets) forming.

To minimise overland flow and associated erosion risk, and to provide betterment over the existing greenfield scenario, erosion control features such as filter drains will be placed at regular intervals between rows of panels. Filter drains are proposed between every 10 – 15 rows of solar panels and will be laid along the ground contours.

A filter drain is a gravel or stone filled trench which would intercept overland flows and provide erosion control. Filter drains will be approximately 0.5m wide x 0.3m deep. It is noted that the filter drains would serve an erosion control purpose and are not intended to provide storm water storage. To further ensure erosion control, a planting regime comprising pasture and grassland is also proposed.

Surface Water Management from Transformer Stations

The development also includes 4no. transformer stations distributed across the site. Each transformer station (comprising a small kiosk type unit) will introduce a minimal area of hardstanding (less than 10m²) and as such will not be formally drained (no surface water attenuation or flow control). Filter drains will be positioned on the perimeter of the transformer stations to intercept any runoff from the structures.

Surface Water Management from Access Tracks and the Compound Area

A formal drainage system is proposed for the compound area containing the 8.No battery energy storage system (BESS) units, DNO substation, control centre, battery transfer units and Switchroom. The compound will be designed so that it can contain firefighting water (in the event of a fire). The compound will be bunded and lined with a suitable impermeable material (geotextile or similar). A formal drainage system is also proposed for the access tracks. The combined area of the compound and access tracks is 5,000m².

Discharge Method

Paragraph 056 of the NPPG: Flood Risk and Coastal Change sets out the following hierarchy of drainage options:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain or another drainage system;
4. to a combined sewer.

Infiltration

The first consideration for the disposal of surface water is infiltration (soakaways). The British Geological Survey (BGS) online mapping (1:50,000 scale) shows that the eastern extent of the site is underlain by Superficial Deposits of the Lowestoft Formation generally comprising Diamicton. The impermeable nature of the underlying superficial deposits will limit the potential for infiltration drainage techniques.

Infiltration testing in accordance with the BRE 365 Specification should be undertaken at the detailed design stage to determine the suitability of infiltration techniques.

Surface Water Body

Where infiltration drainage techniques are not suitable, discharge from the access tracks and compound area will be made to the unnamed watercourse which crosses through the site. The watercourse is located approximately 130m south of the compound area. The compound is situated at a minimum level of approximately 90m AOD and 8m above the level of the watercourse. A gravity connection can therefore be achieved.

Discharge Rates

Greenfield runoff rates have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method. A summary of the greenfield runoff rates for a range of events is provided as Appendix D. The 1 in 1 year greenfield runoff rate for the 5,000m² combined access track and BESS compound area is 0.31 l/s.

A discharge rate of 1 l/s is proposed to ensure the drainage system is self-cleansing and is the lowest discharge rate which can be accommodated by a hydro-brake flow control device.

Proposed Drainage System

The access roads will comprise a porous compacted stone surface. Filter drains will be installed adjacent to the access roads. The access roads will be laid at fall so that runoff will enter the filter drains. The filter drains will convey flows to a proposed attenuation basin in the lower south-eastern extent of the site. The basin will discharge to the watercourse at a limited rate of 1 l/s.

The following drainage system is proposed for the compound area:

- The compound will be formed from a crushed stone material. The base of the stone material will be lined with a suitable impermeable material to prevent infiltration of firefighting water to the underlying aquifer.
- Perforated pipework will be laid within the stone surfacing and will direct surface water flows to a shut off valve chamber (or similar) which can be activated to prevent any discharge of surface water from the compound in the event of a fire. In the event of a fire, contaminated water will be removed from the site (by tanker) and disposed of in an appropriate wastewater treatment facility.
- In normal conditions, surface water will pass through the shut off valve chamber and will be piped to an attenuation basin located to the south of the compound. The basin will discharge to the watercourse at a limited rate of 1 l/s.

Attenuation Storage

Attenuation storage will be required to achieve a limited discharge rate of 1 l/s. An attenuation storage estimate has been undertaken using MicroDrainage software and is included in Appendix E. An attenuation storage volume of 503m³ will be required to accommodate flow from the proposed access roads and compound area during the 1 in 100 year plus 40% CC event. The attenuation storage estimate is based on a pond (basin) structure, an impermeable drainage area of 5,000m², a discharge rate of 1 l/s and a design head of 1m.

Concept drainage sketches are included as Appendix F. The concept drainage sketches are provided for:

- 1) The filter drain arrangement serving the solar panels (erosion control measures)
- 2) The drainage system serving the proposed access roads and compound area based on attenuation storage within a basin and discharge to watercourse at 1 l/s.

Exceedance Event

Storage will be provided for the 1 in 100 year plus 40% CC event. Storm events in excess of the 1 in 100 year plus 40% CC event will be permitted to produce temporary shallow depth flooding within landscaped areas.

Surface Water Treatment

In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), other roofs (applicable to roofs in the compound area) have a 'low' pollution hazard level, with low traffic roads (applicable to the access roads) also classified as having a 'low' pollution hazard level. Table 1 shows the pollution hazard indices for each land use.

Table 1 – Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other Roofs	Low	0.3	0.2	0.05
Low Traffic Roads	Low	0.5	0.4	0.4

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2

* Indices values range from 0-1.

The access roads will be formed from permeable surfacing. The compound area will drain to a basin. Table 2 demonstrates that permeable surfacing and a basin will provide sufficient treatment.

Table 2 – SuDS Mitigation Indices

Type of SuDS	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Surfaces	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.3

Maintenance

Maintenance of drainage features such as permeable surfacing, a detention basin and filter drains will be the responsibility of the site owner. Maintenance schedules for filter drains, a basin and permeable paving (applicable to the access roads) are included in Appendix G.

Conclusions

The proposed development is for a solar farm measuring 35.5 hectares with associated battery storage and ancillary infrastructure, located on land to the south of Wymondley substation and south of Sperberry Hill, St Ippolyts, Hertfordshire.

The proposed development will introduce formally drained areas in the form of new access roads and a compound containing the 8.No battery energy storage system (BESS) units, DNO substation, control centre, battery transfer units and switchroom. Formally drained areas in the form of the compound and access tracks will comprise approximately 5,000m².

Discharge of surface water from the access road and compound area will be made to the unnamed watercourse which crosses through the site at a limited discharge rate of 1 l/s.

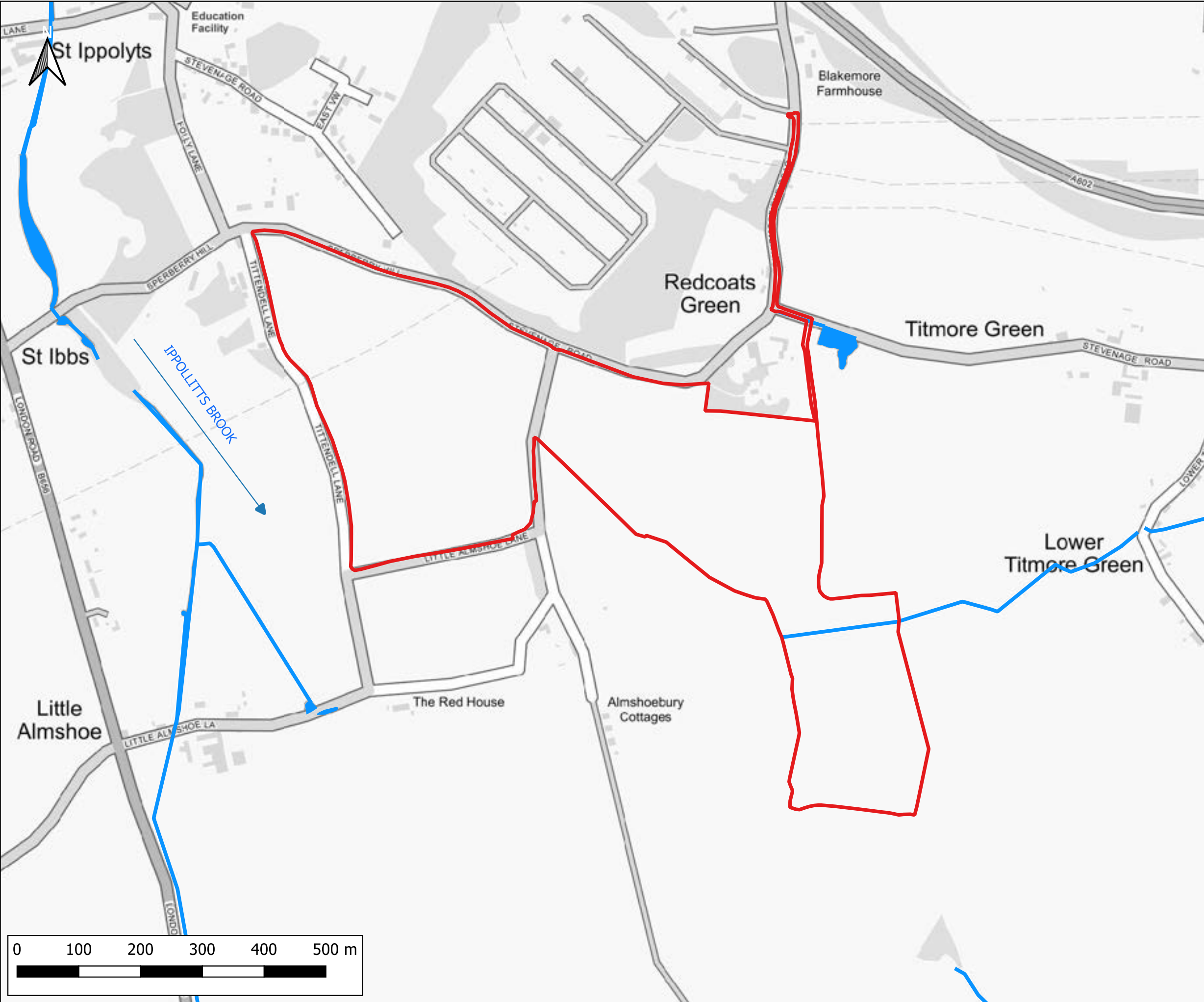
The access roads will comprise a porous compacted stone surface. Filter drains will be installed adjacent to the access roads. The access roads will be laid at fall so that runoff will enter the filter drains. The filter drains will convey flows to a proposed attenuation basin in the lower south-eastern extent of the site. The compound will also drain to the attenuation basin which will be sized to accommodate storm events up to and including the 1 in 100 year plus 40% climate change (CC) event.

The proposed ground-mounted solar arrays will be laid on ram mounted posts ensuring the ground beneath each panel remains permeable. The rows of panels will be spaced with a 'rainwater gap' between each row of panels. Rainfall runoff from the solar arrays will infiltrate to the land beneath and between the panels. It is therefore considered that the solar arrays will not result in an increase in the surface water runoff rates and volumes. Whilst the solar arrays will not result in an increase in the surface water runoff rates and volumes, runoff from the panels will be concentrated at the base of each panel which could result in soil compaction at the panel base and potential erosion (rivulets) forming.

To minimise overland flow and associated erosion risk, and to provide betterment over the existing greenfield scenario, erosion control features such as filter drains will be placed at regular intervals between rows of panels. Filter drains are proposed between every 10 – 15 rows of solar panels and will be laid along the ground contours.

A Concept Designer's Risk Assessment (cDRA) has been prepared to inform future designers of any identified hazards associated with the scheme. The cDRA has been included in Appendix H.

Appendix A Location Plan & Aerial Image



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Watercourses
- Waterbodies

CLIENT:

Axis P.E.D Ltd

www.waterco.co.uk

SCHEME:

Sperberry Hill Solar

PLOT TITLE:

Location Plan

PLOT STATUS:		FINAL		DATE:	01-10-2024
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:		
JJ	MW	AW	1:6000		
PLOT NAME:				REVISION:	
14855_Location_Plan				-	



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

Site Boundary

CLIENT:

Axis P.E.D Ltd

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SCHEME:

Sperberry Hill Solar

PLOT TITLE:

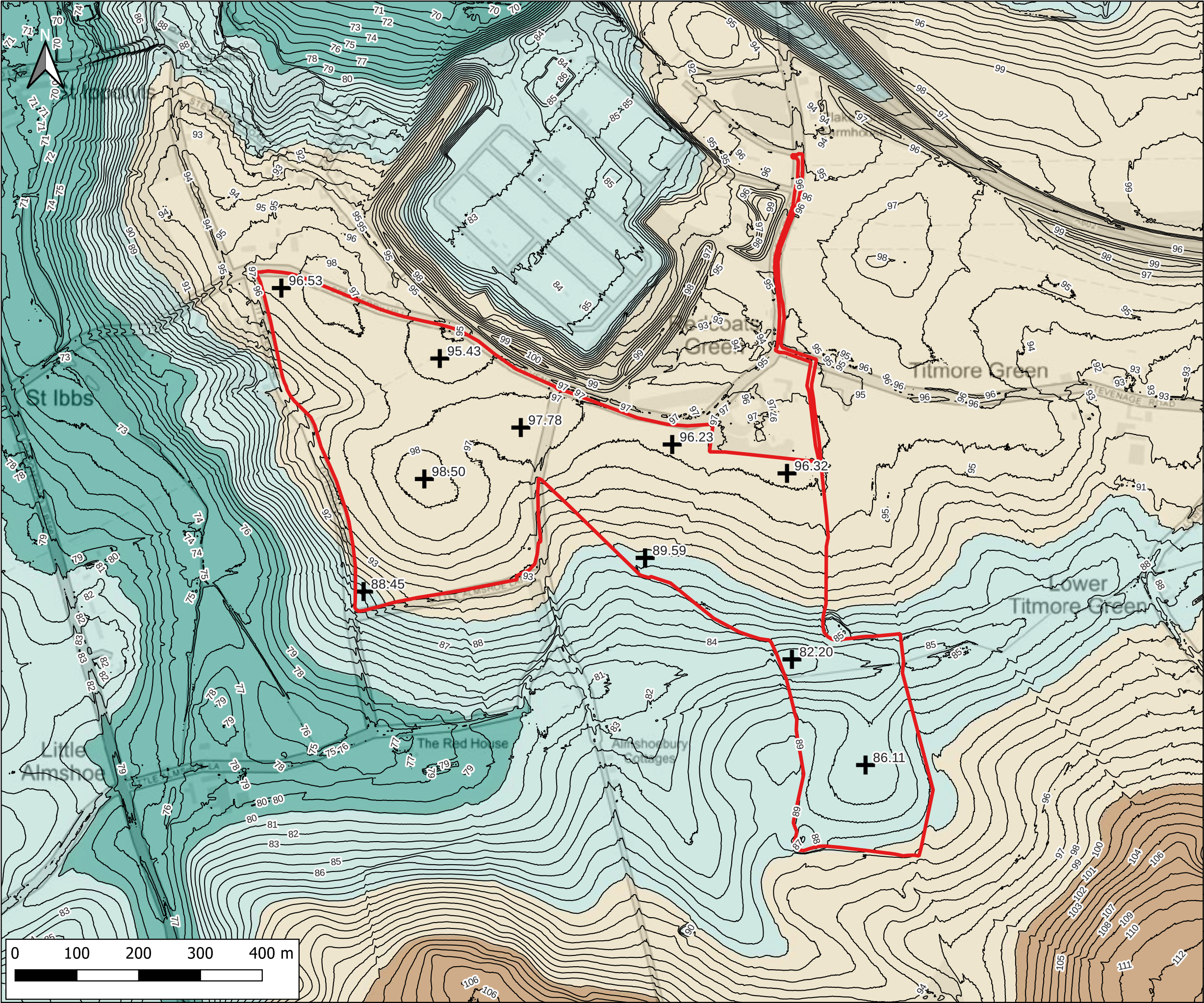
Aerial Plan

PLOT STATUS:			DATE:
FINAL			01-10-2024

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
JJ	MW	AW	1:6000

PLOT NAME:	REVISION:
14855_Aerial_Plan	-

Appendix B LiDAR Plan



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- 1m contour
- Site Levels (m AOD)

Ground Elevations (m AOD)

- <= 80
- 80 - 90
- 90 - 100
- > 100

CLIENT:

Axis P.E.D Ltd

www.waterco.co.uk

SCHEME:

Sperberry Hill Solar

PLOT TITLE:

LiDAR Plan
1m Resolution
Data from Environment Agency

PLOT STATUS:		FINAL		DATE:	01-10-2024
DRAWN:	JJ	CHECKED:	MW	APPROVED:	AW
PLOT NAME:				14855_LiDAR_Plan	
PLOT SCALE AT A3:				1:6000	
REVISION:				-	

Appendix C Development Plan



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revision: G desc: Resubmission Layout

date: 21-10-24



- Application Site
- Deer / Stock Fence
- Solar PV Arrays
- String Inverter
- Transformer Station
- Battery Container
- Battery Transformer Unit
- Other Building (Labelled)
- Existing Access Track Upgraded
- Proposed Access Track
- Proposed Compound Areas
- Archaeologically Sensitive Area
- Surface Water Attenuation Basin
- CCTV

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Client
Brockwell Storage and Solar Ltd
Project
Sperberry Hill Solar Array and BESS
Drawing Title

General Arrangement

Scale
1:5000 @A3
Date
October 2024

Status
Planning
Drawn
TR
Checked
ToK

Dwg no
3732-01-03
Rev
G



- Application Site
- Deer / Stock Fence
- Solar PV Arrays
- String Inverter
- Transformer Station
- Battery Container
- Battery Transformer Unit
- Other Building (Labelled)
- Existing Access Track Upgraded
- Proposed Access Track
- Existing Vegetation (Indicative)
- Proposed Woodland
- Proposed Hedgerow
- Proposed Low Maintenance Pasture
- Proposed Species-Rich Grassland
- Proposed Compound Areas
- Archaeologically Sensitive Area
- Surface Water Attenuation Basin
- CCTV

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Client

Brockwell Storage and Solar Ltd

Project

Sperberry Hill Solar Array and BESS

Drawing Title

Landscape Masterplan

Scale

1:5000 @A3

Date

October 2024

Dwg no

3732-01-12

Status

Planning

Drawn Checked

TR ToK

Rev

G

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revision: G desc: Resubmission Layout

date: 21-10-24

