

**Land at Shripney PV,
West Sussex
Flood Risk Assessment**

On behalf of BNRG Renewables Ltd.



Project Ref: 29259/001 | Rev: V3 | Date: May 2014

Office Address: Lakeside House, Blackbrook Business Park, Blackbrook Park Avenue, Taunton TA1 2PX



Document Control Sheet

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	Name	Position	Signature	Date
Prepared by:	Stacey Clifford	Graduate Engineer		5.05.2014
Reviewed by:	Andrew Johns	Principal Engineer		5.05.2014
Approved by:	Paul Swindale	LLP Director		5.05.2014
For and on behalf of Peter Brett Associates LLP				

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Contents

1	Executive Summary	1
1.1	General	1
2	Introduction	2
2.1	Planning	2
2.2	Peter Brett Associates	2
3	Proposed Development Site	3
3.1	Site Location	3
3.2	Development Proposals	3
3.3	Existing Site Levels	3
3.4	Existing Site Surface Water Features	4
4	Assessment of Flood Risk	5
4.1	Sources of Data	5
4.2	Flood Zone	5
4.3	Existing Defences	5
4.4	Tidal Flooding	5
4.5	Fluvial Flooding	6
4.6	Groundwater Flooding	6
4.7	Surface Water Flooding	6
4.8	Artificial Sources of Flooding	7
4.9	Historic Records of Flooding	7
5	Managing Flood Risk	8
5.1	Requirements under NPPF	8
5.2	Mitigation Measures	8
5.3	Access and Egress	9
5.4	Flood Risk Management	9
5.5	Managing Surface Water	10
5.6	Residual Risk	10
6	Conclusions	11
6.1	General	11

Figures

Figure 1: Photograph depicting the probable arrangement of the PV panels	3
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Appendices

- Appendix A Figures
- Appendix B Topographical Survey
- Appendix C Environment Agency Data

1 Executive Summary

1.1 General

- 1.1.1 BNRG Renewables Ltd is proposing to construct a new photovoltaic park on greenfield land near Shripney, to the north of Bognor Regis, West Sussex. The site is just to the north of Bognor Regis and to the west of the Village of Shripney. The site is entirely enclosed by greenfield land and small country lanes.
- 1.1.2 This report considers the policy requirements for the proposed PV park as defined in the National Planning Policy Framework (NPPF).
- 1.1.3 Consultation with the Environment Agency (EA) and a review of the Arun District Council SFRA has formed the basis of the appraisal of flood risk at the site.
- 1.1.4 The classification of Flood Zones ignores the presence of existing flood defences, and as such, the majority of the site at Shripney is located within Flood Zone 3 – ‘High Probability’; the probability of flooding is greater than 1% annual probability (1 in 100 years) with the remainder lying within Flood Zones 1 and 2.
- 1.1.5 The proposed site is considered to fall under the definition of “essential infrastructure” as defined in Table 2 of the Technical Guidance to the NPPF.
- 1.1.6 As defined in Table 3 of the Technical Guidance to the NPPF, development classified as ‘Essential Infrastructure’ is compatible within Flood Zones 3a and 3b subject to the requirements of the Sequential Test and the Exception Test being met.
- 1.1.7 Analysis of potentially available land and the Sequential Test has been addressed by others, separate to this Flood Risk Assessment.
- 1.1.8 This report demonstrates that the requirements of the Exception Test as laid out in the NPPF are met.
- 1.1.9 The principal residual risk to the site is from tidal flooding as a result of overtopping or breaching of the existing coastal defences. The most significant actual risk to the site (the risk taking account of existing defences) is considered to be from fluvial flooding. The site benefits from extensive coastal defences but no fluvial flood defences.
- 1.1.10 As mitigation against flood risk at the site, the majority of the infrastructure will be located within Flood Zone 1 or otherwise raised at least 150mm above the predicted tidal 1 in 200 year (0.5% AEP) flood level of 2.98mAOD.
- 1.1.11 Panels which are located within the predicted fluvial flooding zone (as defined by the 1 in 1000 year event), will be situated so the trailing edge is at a minimum of 1.65mAOD, significantly above the predicted 1 in 1000 (0.1% AEP) flood level of 1.5mAOD.
- 1.1.12 The existing surface water regime will not be affected by the proposed development which will continue to drain naturally at existing rates.
- 1.1.13 Access and egress to the site during extreme flood events will not be precluded.
- 1.1.14 Site personnel will receive EA flood warnings to allow planning of maintenance work to avoid putting themselves at risk.

2 Introduction

2.1 Planning

- 2.1.1 Government policy with respect to development in flood risk areas is contained within the National Planning Policy Framework (NPPF) and the Technical Guidance to the NPPF, both published in March 2012 by the Department for Communities and Local Government (DCLG).
- 2.1.2 The NPPF and the Technical Guidance replace Planning Policy Statement 25 (PPS25) 'Development and Flood Risk' along with the PPS25 Practice Guide. However, the Technical Guidance to the NPPF retains key elements of PPS25 as 'an interim measure pending a wider review of guidance to support planning policy'.
- 2.1.3 The local planning authority will make decisions with regard to any planning application within any floodplain or flood risk area, although the Environment Agency (EA) is a designated statutory consultee and plays a key role in providing advice on development and flood risk issues.
- 2.1.4 This Flood Risk Assessment has been prepared in accordance with the NPPF and Local Planning Policy. Any recommendations regarding floor levels are based on the relevant British Standards (BS8533), the standing advice provided by the EA or based on common practice. However, it should be noted that the insurance market applies its own tests to properties in terms of determining premiums and the insurability of properties for flood risk. Those undertaking development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurers (ABI) to seek further guidance prior to commencing development.
- 2.1.5 This FRA should be read in conjunction with other Planning Application supporting documents.

2.2 Peter Brett Associates

- 2.2.1 Peter Brett Associates LLP (PBA) has prepared this study in accordance with the NPPF and the Technical Guidance. PBA has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering.
- 2.2.2 PBA has been one of the EA's National Framework Consultants for flood risk mapping, a Term Consultant to the South West Region of the EA and has provided engineering services through the NEECA2 Framework Agreement. PBA has been involved in the assessment of both tidal and fluvial flooding and the design and implementation of flood defences on behalf of the Agency as well as undertaking numerous Flood Risk Assessments to support planning application submissions.
- 2.2.3 PBA does not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

3 Proposed Development Site

3.1 Site Location

- 3.1.1 The proposed site is located just beyond the northern edge of the Bognor Regis and to the west of the village of Shripney. The site comprises 2 fields totalling approximately 49.7 hectares of arable land and is surrounded by greenfield land.
- 3.1.2 The site is approximately 3.0 km as the crow flies from the south coast of England (National Grid Reference SU 92935 02405).
- 3.1.3 Access to the site is via private tracks from the east and south which join Shripney Lane
- 3.1.4 A location plan is provided in Appendix A.

3.2 Development Proposals

- 3.2.1 BNRG Renewables Ltd is seeking planning permission for a Photovoltaic (PV) Park for solar energy generation. The proposals include:
- Arrays of PV panels
 - Inverter huts
 - Transformer substation
 - Access tracks
- 3.2.2 Once operational, the park will have no permanent manned presence. Monitoring will be carried out remotely and only occasional visits for maintenance will be required.
- 3.2.3 The photograph below provides an example of how the arrays of PV panels will be arranged.



Figure 1: Photograph depicting the probable arrangement of the PV panels

- 3.2.4 A plan showing the proposed development is located in Appendix A.

3.3 Existing Site Levels

- 3.3.1 Levels across the site vary between 0.76mAOD near the reservoir at the western corner to 5.85mAOD on the northern edge. The site has two raised areas to the north and in the centre from which the land gently slopes generally in a westerly or south westerly direction.

3.3.2 Topographical survey information is presented in Appendix B.

3.4 Existing Site Surface Water Features

- 3.4.1 The site is served by a perimeter field ditches which are connected the Aldingbourne Rife. The Aldingbourne Rife joins the Lidsey Rife within the built up area of Bognor Regis. The Aldingbourne Rife then flows through Bognor Regis and into the sea.
- 3.4.2 There is also a depression within the centre of the site, roughly 9000m² in area, where water may accumulate to depths of 300mm if the soil is poorly drained.
- 3.4.3 On the western side of the site is a reservoir with approximate top water surface area of 3300m². It is presumed that the reservoir discharges to the ditch to south if the water level exceeds the design top level.

4 Assessment of Flood Risk

4.1 Sources of Data

- 4.1.1 This Chapter is based on information provided through consultation with the EA and from review of the Arun District Council SFRA.

4.2 Flood Zone

- 4.2.1 As defined in the information provided by the EA (reproduced in Appendix C), the majority of the site lies within Flood Zone 1 as defined in Table 1 in the Technical Guidance to the NPPF. At the western, southern and south eastern edges a small proportion of the site is within Flood Zones 2 and 3. It should be noted that the Flood Zone definitions ignore the presence of existing defences.

4.3 Existing Defences

- 4.3.1 The coastline of Bognor Regis and Middleton-on-Sea benefits from extensive tidal defences, including a series of breakwaters and groynes. From the Ryebank Rife to the Arun, tidal flood defence comprises shingle ridge with low walls at Poole Place to Atherington, and the Shingle Ridge beach at Atherington to Littlehampton Harbour. The standard of protection provided by these defences is typically in the region of 1 in 100 year (1% annual exceedance probability), with crest levels generally ranging from 4.6m to 5.3m AOD.
- 4.3.2 From the Aldingbourne Rife to the Ryebank Rife tidal flood protection comprises a pumping station and flapped outfall from the Aldingbourne Rife. At Elmer, an offshore rubble mound acts as a wave energy screen. There is also active beach recharge at Elmer. The estimated level of protection in this region is 1 in 200 year (0.5% AEP).
- 4.3.3 The proposed PV site lies around 3.0km inland from the southern shoreline as the crow flies.
- 4.3.4 The site does not benefit from the presence of fluvial flood defences.

4.4 Tidal Flooding

- 4.4.1 Tidal flooding extents and levels have been provided by the EA (reproduced in Appendix C), however these do not take into account any existing defences. These had been derived using TUFLOW in 2009 and include tidal TUFLOW extents for the 1 in 20 year event to 1 in 1000 year flood extents. The maximum predicted 1 in 200 year tidal flood level in the vicinity of the site is 2.74mAOD.
- 4.4.2 1 in 1000 year tidal flood extents were also modelled, with the maximum predicted level being 3.06mAOD.
- 4.4.3 Consequently, during an extreme tidal event areas of the site could be subjected to significant flood depths.
- 4.4.4 It has been assumed that this information does not take account of predicted sea-level rise as a result of climate change.
- 4.4.5 ADC outlined a 'Coastal Risk Area'. Amongst other factors, this was defined by topographic DTM data showing land lying below 5.73m AOD (approximately equal to the 2106 0.1% AEP tide level plus 600mm). This is a less realistic estimate of flooding than that provided by the EA as it takes no account of the difference between the predicted peak sea level and the peak flood level some kilometres inland. Furthermore, the target date of the peak water level is well

beyond the lifetime of the PV Park. Consequently, the data provided by the EA has been used as it is deemed more appropriate to the development proposals.

Wave Action

- 4.4.6 In the case whereby wave overtopping or breaching of the existing flood defences occurs, wave action may cause damage, particularly to those areas immediately and close behind the defence. The proposed development is approximately 3.0km from the coast and consequently wave energy will dissipate before reaching the site.

Future Sea Level Rise

- 4.4.7 Table 4 of the *Technical Guidance to the NPPF* provides recommended contingency allowances for net sea level rise. Using these allowances, the predicted sea level between 2008 and 2045 rise (over the 30 year lifetime of the development) is 238mm in the south east of England. Assuming that this increase in peak tidal level directly translates to an equivalent in inland tidal floodwater levels, the 1 in 200 year tide level at Shripney in 2045 would be 2.98m AOD.

4.5 Fluvial Flooding

- 4.5.1 Fluvial flooding extents and levels have been provided by the EA. These had been derived using JFLOW in 2009 and included fluvial extents for the 1 in 100 year and 1 in 1000 year events. The maximum predicted 1 in 1000 year flood level in the vicinity of the site is 1.5m AOD.
- 4.5.2 As the site is not protected by fluvial defences the flooding presented in the EA model outputs map are not dependent upon failure of defences and represent the actual risk. It is presumed that the information does not take account of predicted future increases in fluvial flows. Given their 30 year design life and that the panels are not susceptible to temporary inundation, the potential for increased fluvial flood levels will be accounted for by applying a 150mm freeboard allowance.
- 4.5.3 The SFRA also presents flood outlines for predicted fluvial flooding. There are no reported flood levels and given that the report was produced prior to the 2009 modelling work which forms the basis of the information provided by the EA. Consequently the information provided by the EA is assessed as being more accurate and forms the basis of this assessment in terms of fluvial flood risk.

4.6 Groundwater Flooding

- 4.6.1 The SFRA presents a high level assessment of groundwater flooding (Map G1). The PV site is shown as being within a high risk area for groundwater flooding and also as being within a groundwater emergence area.

4.7 Surface Water Flooding

- 4.7.1 The EA provided broadscale mapping of areas at risk of surface water flooding (reproduced in Appendix C). It shows isolated areas within the site as being flooded to depths of 100-300mm. Notable areas about the reservoir retaining embankment and within the low spot in the centre of the site
- 4.7.2 The risk to the site from surface water is considered to be negligible. Due to the fairly flat nature of the topography and the extensive drainage network in the surrounding area, the site will not receive significant amounts of surface water from outside the site. There is potential for water to accumulate in the depression in the centre of the site to depths of around 300mm.

4.8 Artificial Sources of Flooding

- 4.8.1 The only source of flooding not yet discussed is from the onsite reservoir which is impounded by earth embankments with side slopes of 1 in 4. The topographical survey shows crest levels to be 1.5-2.2m above surrounding ground levels. The lowest surveyed crest level is at the north western corner and is 500mm above the water level at the time of survey.
- 4.8.2 The risk of overtopping is considered to be negligible. It is assumed that there is an emergency overflow arrangement which discharges to the ditch to south.
- 4.8.3 The risk of failure of the retaining structure is considered to be low. In the unlikely event of failure the consequences would be limited to damage to on site infrastructure, which the developer is aware of. As the site will not be manned, there will only be people on site infrequently and the risk to life is extremely low. There are no public thorough fares or properties within the vicinity of the reservoir and so risk to third parties is insignificant.

4.9 Historic Records of Flooding

- 4.9.1 Data provided by the EA shows historic flooding of Shripney Road through the village of Shripney and other isolated patches within the village but nothing at the site itself. It is presumed that this flooding was caused by surface water runoff from the surrounding agricultural land flowing down the road.
- 4.9.2 Map H in the Arun District Council SFRA presents historic flooding information in the district. There are two isolated areas within the site shown as being subjected to fluvial flooding and a larger area immediately to the south on either side of the Aldingbourne Rife. The SFRA report states:

"review of the datasets has identified in broad terms the locations and types of previous flooding problems"
- 4.9.3 The mechanism of flooding of the two isolated patches within the site is not clear as it is disconnected from flooding shown alongside the Aldingbourne Rife. Furthermore, the outlines shown are not in agreement with the topography as recorded in the survey and lie outside the 1 in 1000 year (0.1%) flood extent as defined by the Environment Agency.
- 4.9.4 Given the broadscale nature of the SFRA mapping and the discrepancies discussed above, it is concluded that these areas are not at risk of fluvial flooding.

5 Managing Flood Risk

5.1 Requirements under NPPF

Vulnerability

- 5.1.1 The criteria for a development's acceptability with respect to flood risk are set out in the National Planning Policy Framework and accompanying guidance. Instrumental in defining the requirements is the vulnerability of the proposed development.
- 5.1.2 Flood risk vulnerability classifications are provided in the Technical Guidance to the NPPF, Table 2. The proposed development is classed as 'Essential Infrastructure' thus is compatible with Flood Zones 3a and 3b subject to the requirements of the Sequential Test and the Exception Test being met.

The Sequential Test

- 5.1.3 The NPPF requires that all Local Planning Authorities, in allocating land for development, should apply the Sequential Test to demonstrate that there is no other land available for the proposed development that has less probability of flooding.
- 5.1.4 Analysis of potentially available land and the Sequential Test has been addressed by others, separate to this Flood Risk Assessment.

The Exception Test

- 5.1.5 For the exception test to be passed, the following must be demonstrated:
- The development provides wider sustainability benefits to the community that outweigh the flood risk.
 - That the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
- 5.1.6 For the first requirement, the sustainable benefits of solar energy are very clear. The development will help reduce the UK's dependence on fossil energy sources and will contribute to a more sustainable future delivering environmental objectives which are integral to both local and national policy.
- 5.1.7 The second requirement is demonstrated in this Flood Risk Assessment.

5.2 Mitigation Measures

- 5.2.1 As noted earlier, the designation of Flood Zones ignores the presence of existing defences. This reflects the conservative principles of the NPPF and recognises the residual risk for low-lying land situated behind flood defences. For the site at Shripney, the residual risks include:
- Overtopping of defences in extreme tide events.
 - Breaching of defences.
- 5.2.2 For the tidal 1 in 200 year extreme flood event, the highest flood water level shown on the site as part of the EA's Tidal TUFLOW model is 2.74m AOD. Adjustment of this level to account for predicted sea level rise to 2045 yields a level of 2.98mAOD. The lowest site levels, to the

west of the reservoir are 0.8m AOD. Therefore, it is expected that flood depths in the event of a coastal defence failure would be a maximum of the 2.2m on the western part of the site.

5.2.3 The peak fluvial flood water level for the 1 in 1000 year event is 1.5mAOD and it is proposed to allow a further 150mm freeboard to account for uncertainty and the effects of climate change up to 2045.

5.2.4 To protect the PV equipment and preserve the operation of the development during such an event, the following mitigation measures are proposed:

- The substation will be located in Flood Zone 1 on a development platform at least 150mm above existing ground levels.
- Inverter huts will be preferably located in Flood Zone 1, otherwise raised at least 150mm above the predicted flood level of 2.98mAOD.
- Solar panels within the area identified as being at risk from a 1 in 1000 year fluvial flood, will be elevated above ground level so that the lower edge of the solar panels is set at a minimum of 1.65mAOD. This will only affect panels to the west of the reservoir, and equates approximately to being raised up to 0.6m above existing ground levels.
- Where solar panels are located in Flood Zones 2 and 3, the connectors for panels in these areas will be set to a minimum level of 2.8mAOD and will be located in the centre of two adjoining panels. In the worst case (panels to the west of the reservoir) this can reach approximately 1.8m above existing ground levels, though is more commonly less than 0.7m above ground level elsewhere around the perimeter on the site.

5.2.5 The manufacturer has confirmed that the PV panels can be submerged for a period without damage. Therefore, the PV panels themselves are not included among the 'water-sensitive' apparatus.

5.3 Access and Egress

5.3.1 During a flood event access via the access track running across the middle of site will remain flood free for all but the most extreme flood events, as depicted in the EA flood map (reproduced in Appendix C). During extreme tidal events Shripney Lane and Shripney Road, connecting the site to areas to the north are predicted to be flooded. In such extreme events, flood warnings will be issued well in advance allowing personnel time to rearrange any maintenance visits.

5.4 Flood Risk Management

5.4.1 The flood risk management of the PV Park will be simplified by there being no personnel permanently on site. In any case, those responsible for the site should sign-up to the Environment Agency (EA) flood warning service. The EA provides up to the minute information and can inform the site of the severity of flooding expected.

5.4.2 For times when personnel are expected on site, such as maintenance, the warning system can be checked in advance and the maintenance schedule adjusted to avoid any forecasted flooding issues.

5.4.3 The warning system will be of particular importance during construction when there will be a more significant human presence on site. Close monitoring of the warning system will ensure the site can be swiftly evacuated, of both personnel and equipment, in the event of flooding.

5.5 Managing Surface Water

- 5.5.1 The proposed development will not have a significant effect on the existing drainage characteristics at the site. The PV panel units will be mounted south-facing, on a stilt construction without concrete foundations. Precipitation on each panel will run onto the ground at the south side of the panel. During large storm events, runoff will be slightly more concentrated at this location as it falls off the panels. However, the site's flat topography and the area underneath the panels that is 'shaded' will provide adequate area for the runoff to dissipate.
- 5.5.2 Access tracks will be constructed with permeable materials so as to minimise any impact on site runoff. The small inverter huts and transformer station will be surrounded with gravel strip drains. This will need to be carefully considered as part of the construction quality control procedures.
- 5.5.3 The nature of the development will mean there is very little, if any, change to the existing drainage characteristics of the site. Therefore, there is no requirement to modify the existing surface water regime and there will be no increase in flood risk to third parties.

5.6 Residual Risk

- 5.6.1 The primary residual risk for the site is in the case of a breach or failure of coastal defences. As the site's drainage system is connected to both the River Arun and the Aldinbourne Rife. Failure of defences at either these locations could lead to flooding of lower areas of the site. This could be caused by failure of a flapped outfall or a pumping station during a rare fluvial event, or breach of the shingle ridge.
- 5.6.2 The flood extents and levels provided by the Environment Agency (reproduced in Appendix C) ignore the presence of all defences and this information has been considered for defining the locations and levels of vulnerable infrastructure.

6 Conclusions

6.1 General

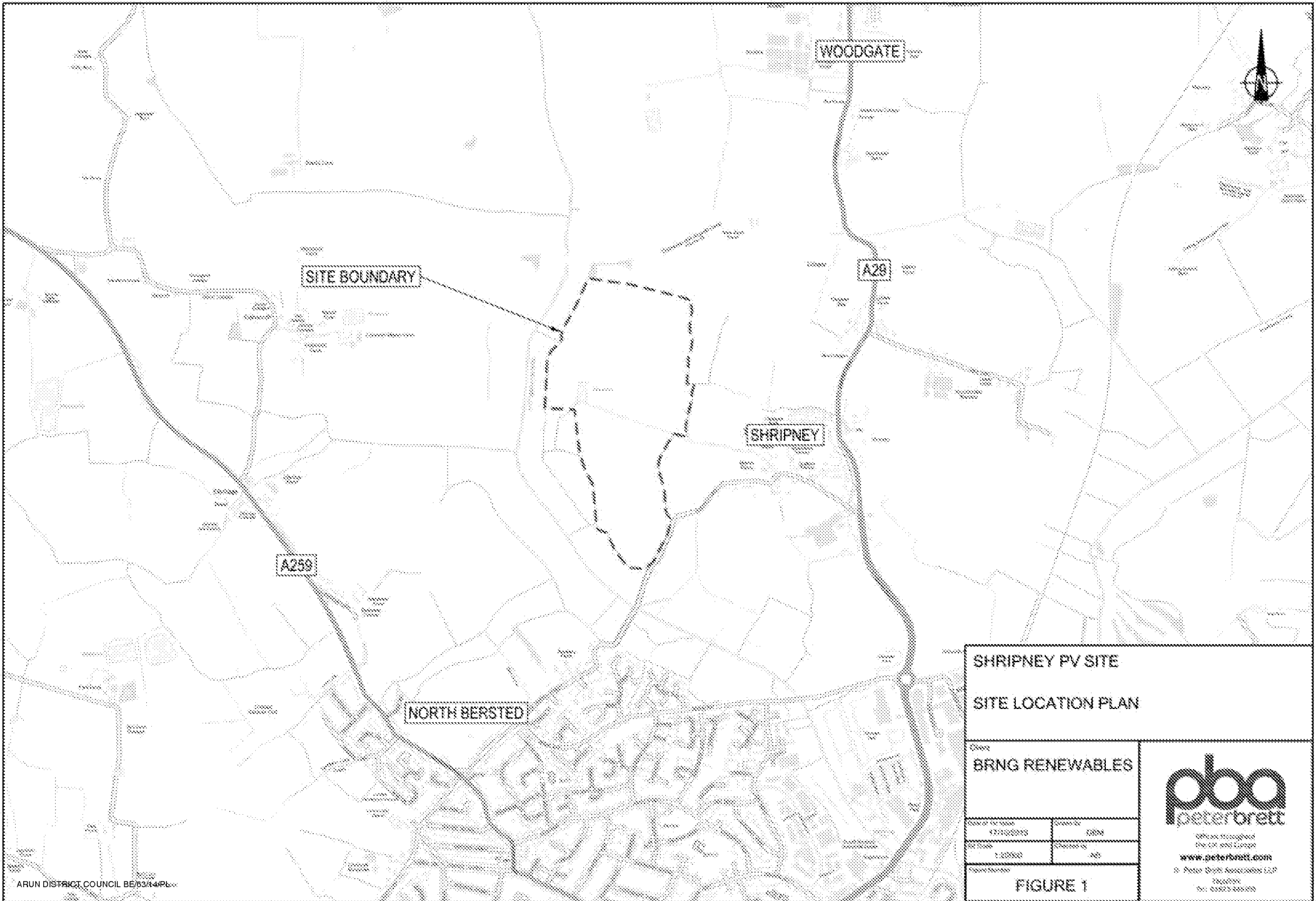
- 6.1.1 The majority of the proposed PV site is situated within Flood Zone 1 with the remainder lying within Flood Zones 2 and 3. The site is at risk from both fluvial and tidal flooding.
- 6.1.2 The most significant residual risk is from tidal flooding, either as a result of overtopping or breaching of existing coastal defences. Continual monitoring and maintenance schedules will minimise the risk of a breach occurring, however there can be no guarantee that a breach will not occur.
- 6.1.3 The most significant actual risk (the risk taking account of existing defences) to the site is from fluvial flooding.
- 6.1.4 In the event that flood water does impact the site, sufficient mitigation measures will be in place so that the PV Park and equipment is not significantly affected and the overall functionality of the site is not compromised by the flood water.
- 6.1.5 Human presence on the site will be fairly limited and so the risk to human life is minimal. To further minimise the risk, those responsible for the site should subscribe to the EA flood warning system as a means of anticipating likely flooding events and acting accordingly. This measure will also provide valuable information during the PV Park construction phase when more personnel will be on site.
- 6.1.6 No significant changes will be made to the site's permeability characteristics and the existing surface water regime will be retained.
- 6.1.7 This report demonstrates that the development will meet the requirements with respect to flood risk as outlined in NPPF and associated guidance; that it will be safe over the lifetime of the development, that it will not put human lives at risk and that it will not increase flood risk elsewhere.

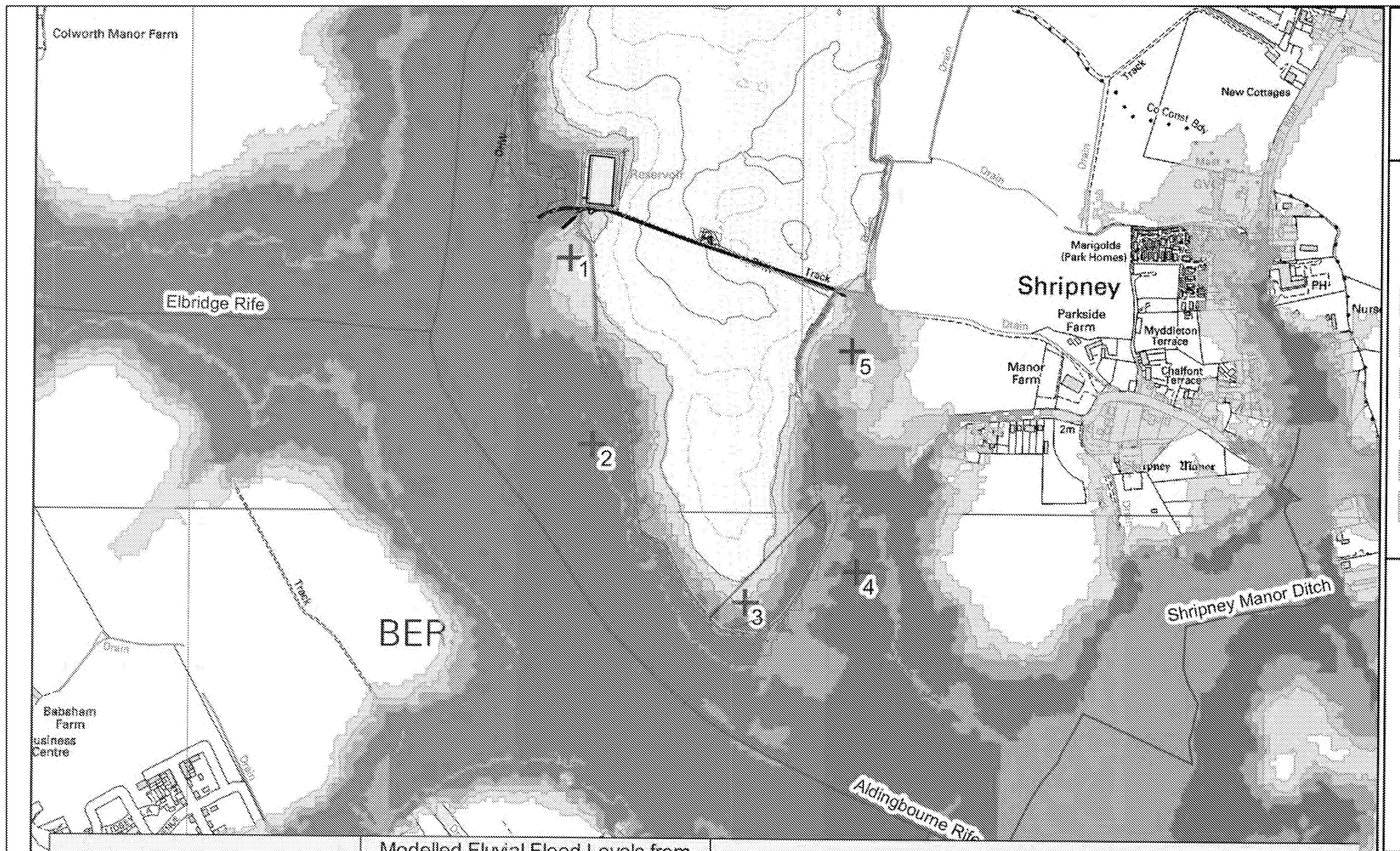
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Appendix A Figures

- Figure 1 - Location Plan
- Figure 2 - Proposed Development Plan
- Figure 3 – Site Flood Extents

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Modelled Eluvial Flood Levels from

Shripney PV site

Environment Agency flood extents



BRNG Renewables Ltd.

Architect

01454 669 543/5110. Do not work from this drawing. If you do, add 0762176 5 4595. The position of any existing utility or service lines, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty of this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is responsible for identifying and then developing where the presence of any existing service, services, plant or apparatus may affect the operations.

Mark	Revision	Drawn	Date	Chkd
Drawing Status:				
For Information				
Date of 1st issue	26.09.13	Drawing Number		Revision
A3 Scale	NTS	29259/001/SK01		-
Drawn by	SMG			
Checked by	APJ			

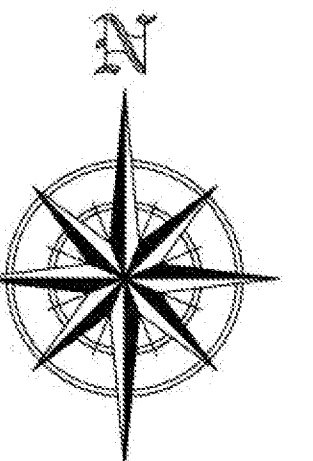
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Appendix B Topographical Survey

- Topographical Survey drawing from Kemp Engineering and Surveying
- Dwg: 13-4469-002 A
- Dwg: 13-4469-004 A
- Dwg: 13-4469-005 A

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LEGEND	
	Mushrooms/Covers
	Inspection Covers
	Prest
	Gate
	Ground Level
	Top of Fence Level
	Master Foot
	Overhead Wires
	Electricity
	Top of Pole Level
	Roof Level
	Existing Building
	Wall Line
	Fence
	Hedge/Earth & Stone Wall
	Embankment
	Edge of Tree Canopy
	Tree Drawn To Size
	Edge of Vegetation/Shrub
	Top of Hedge Level
	Top of Tree Level
	Water Level
	Grass Line
	Channel Line



Coordinate system is Ordnance Survey National Grid (OSNG).

Local datum and coordinate system were established using the OS active station GNS8 network.

No allowance has been made for sea surface entry by marlholes or other channels or voids below ground level. Therefore any details relating to depths, sizes or locations of marlholes should be treated as approximate only.

It is important to note that the same accuracies implied by the plotting scale are equally applicable to digital data.

Every effort has been made to identify all visible above ground features, however it should be borne in mind that there may be elements obscured at the time of survey.

Visible features in the vicinity of the boundaries, as shown on this plan, may not represent the extent or location of the actual features.

Tree sizes are approximate only. Tree shows are symbols indicating an approximate canopy fit.

Unless otherwise stated, Trees shown have not been identified by an Arboriculturist and therefore have been assigned the "Family" name rather than the "Species" name. It is noted that only those trees that fall within the site limits have been surveyed under this contract.

ing Surveys
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Out
neering

Tel (01209) 214687
Fax (01209) 215189
office@kempengineering.co.uk

Measured Building Surveys
Utility Tracing
G.P.S.
Earthworks Measurement

ntum House, 8 Barncoose Industrial Estate, Redruth, Cornwall, TR15 3RQ.




 Chartered Land & Engineering Surveyors

Client
BNRG Renewables Ltd
Festival House
Jessop Avenue
Cherttenham
GL50 3SH

Project Title	Shripney Solar Farm
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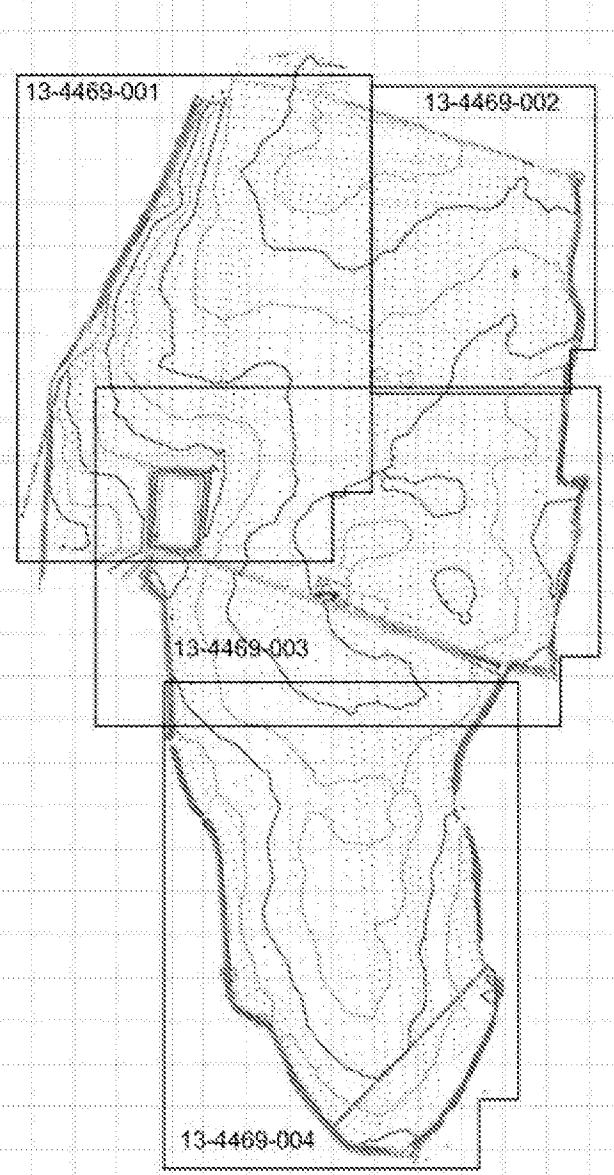
Drawing Detail

Topographical Survey

Rev.	Date	Description	Surveyed by	SA	RP	RW	JG	Date	4.9.13
A	9.9.13	Original	Checked by	AS				Date	9.9.13
			Drawing Scale	1:500 @AO					
			Drawing No	13-4469-002					
				Revision A					



KEY PLAN



LEGEND	
	Manholes/Covers
	Inspection Covers
	Posts
	Girds
	Ground Level
	Top of Fence Level
	Marker Poles
	Overhead Wires
	Electricity Poles
	Top of Pole Level
	Roof Level
	Existing Building
	Wall Line
	Fences
	Hedge/Earth & Stone Wall
	Embankment
	Edge of Tree Canopy
	Tree Drawn To Size
	Edge of Vegetation
	Struts
	Top of Hedge Level
	Top of Tree Level
	Water Level
	Gorse Line
	Channel Line

Notes

Levels are in metres above Ordnance Survey datum.

Coordinate system is Ordnance Survey National Grid OSG836(02).

Level datum and coordinate system were established using the OS active station GNSS network.

No allowance has been made for sub surface entry into manholes or other chambers or voids below ground level. Therefore any details relating to depths, sizes etc. are taken from above ground and as such will be approximate only.

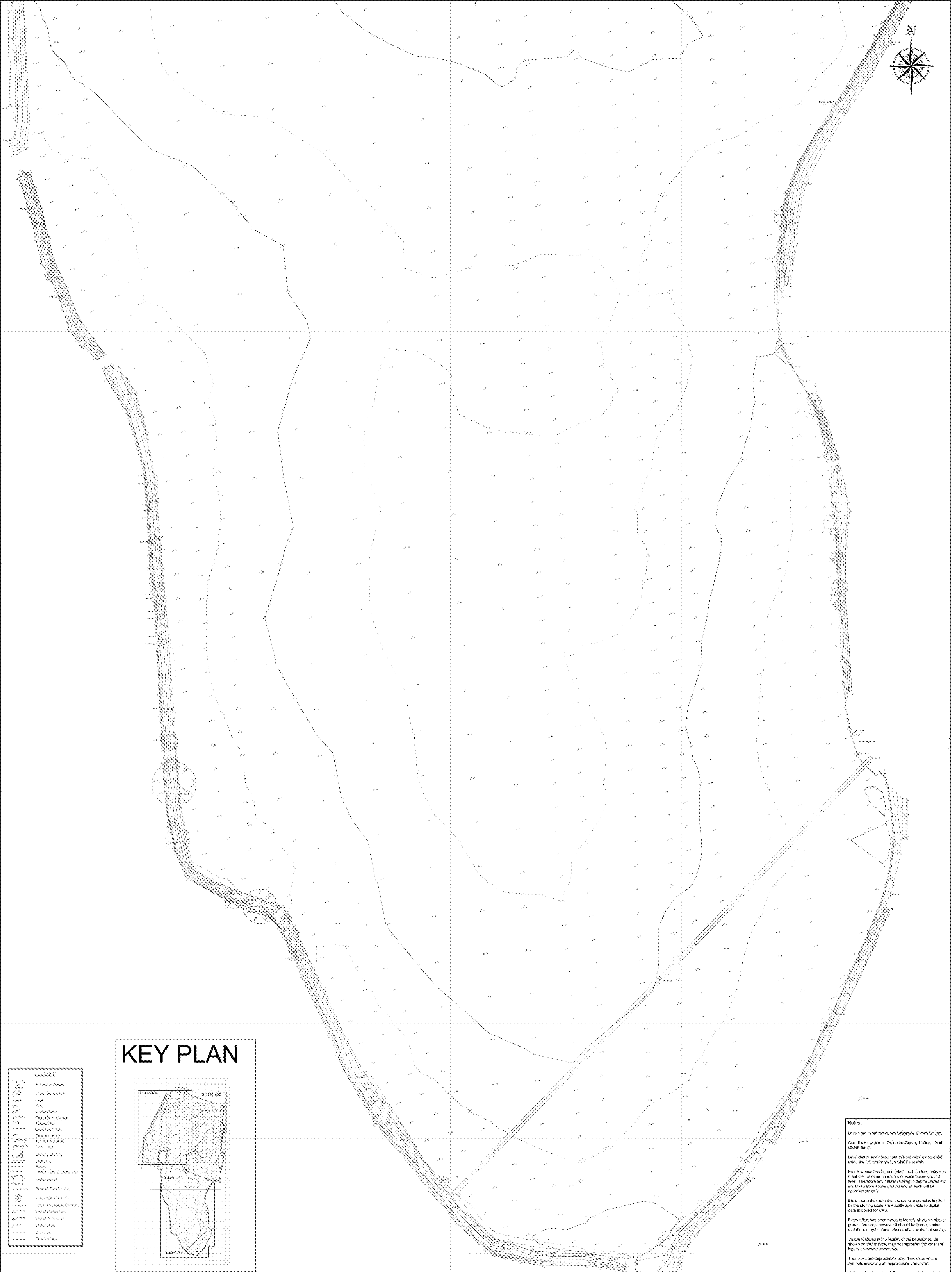
It is important to note that the same accuracies implied by the plotting scale are equally applicable to digital data supplied for CAD.

Every effort has been made to identify all visible above ground features, however it should be borne in mind that there may be items obscured at the time of survey.

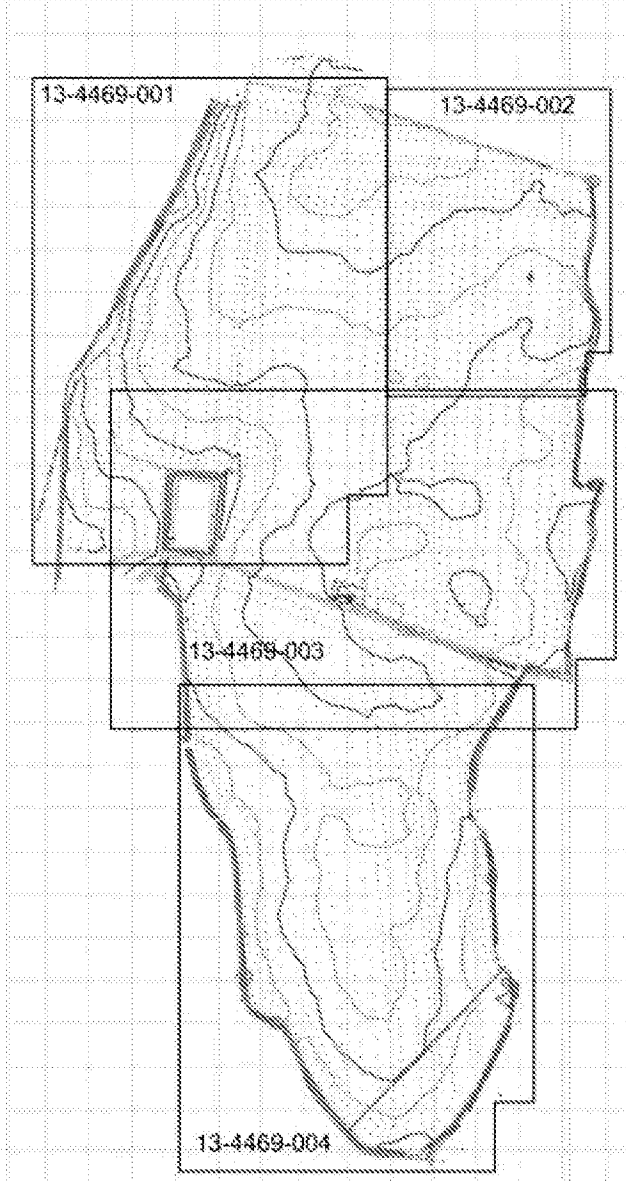
Visible features in the vicinity of the boundaries, as shown on this survey, may not represent the extent of legally conveyed ownership.

Tree sizes are approximate only. Trees shown are symbols indicating an approximate canopy fit.

Unless otherwise stated, Trees shown have not been identified by an Arboriculturist and therefore have been assigned their "family" name rather than their "individual" name. It must be noted that only those trees that fall within the site limits have been surveyed unless otherwise specified.



KEY PLAN



LEGEND

	Manholes/Covers
	Inspection Covers
	Post
	Gate
	Ground Level
	Top of Fence Level
	Marker Post
	Overhead Wires
	Electricity Pole
	Top of Pole Level
	Roof Level
	Existing Building
	Wall Line
	Fence
	Hedge/Earth & Stone Wall
	Embankment
	Edge of Tree Canopy
	Tree Drawn To Size
	Edge of Vegetation/Shrub
	Top of Hedge Level
	Top of Tree Level
	Water Level
	Grass Line
	Channel Line

Notes

Levels are in metres above Ordnance Survey Datum.

Coordinate system is Ordnance Survey National Grid OSGB36(02)

Level datum and coordinate system were established using the OS active station GNSS network.

No allowance has been made for sub surface entry into manholes or other chambers or voids below ground level. Therefore any details relating to depths, sizes etc. are taken from above ground and as such will be approximate only.

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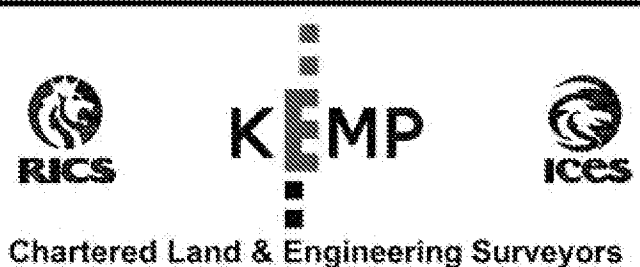
Visible features in the vicinity of the boundaries, as shown on this survey, may not represent the extent of legally conveyed ownership.

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KEMP ENGINEERING & SURVEYING

■ Engineering Surveys	Tel (01209) 214687	Measured Building Surveys
■ Land Surveys	Fax (01209) 215189	Utility Tracing
■ Setting Out	office@kempengineering.co.uk	G.P.S.
■ Site Engineering		Earthworks Measurement



Client
BNRG Renewables Ltd
Festival House
Jessop Avenue
Chisleham
G50 3SH

Project Title
Shipney Solar Farm

Drawing Detail
Topographical Survey

Rev.	Date	Description
A	9.9.13	Original

Surveyed by	SA	RP	RW	JG	Date	4.9.13
Checked by	AS				Date	9.9.13
Drawing Scale	1:500	@AO				
Drawing No	13-4469-005				Revision	A

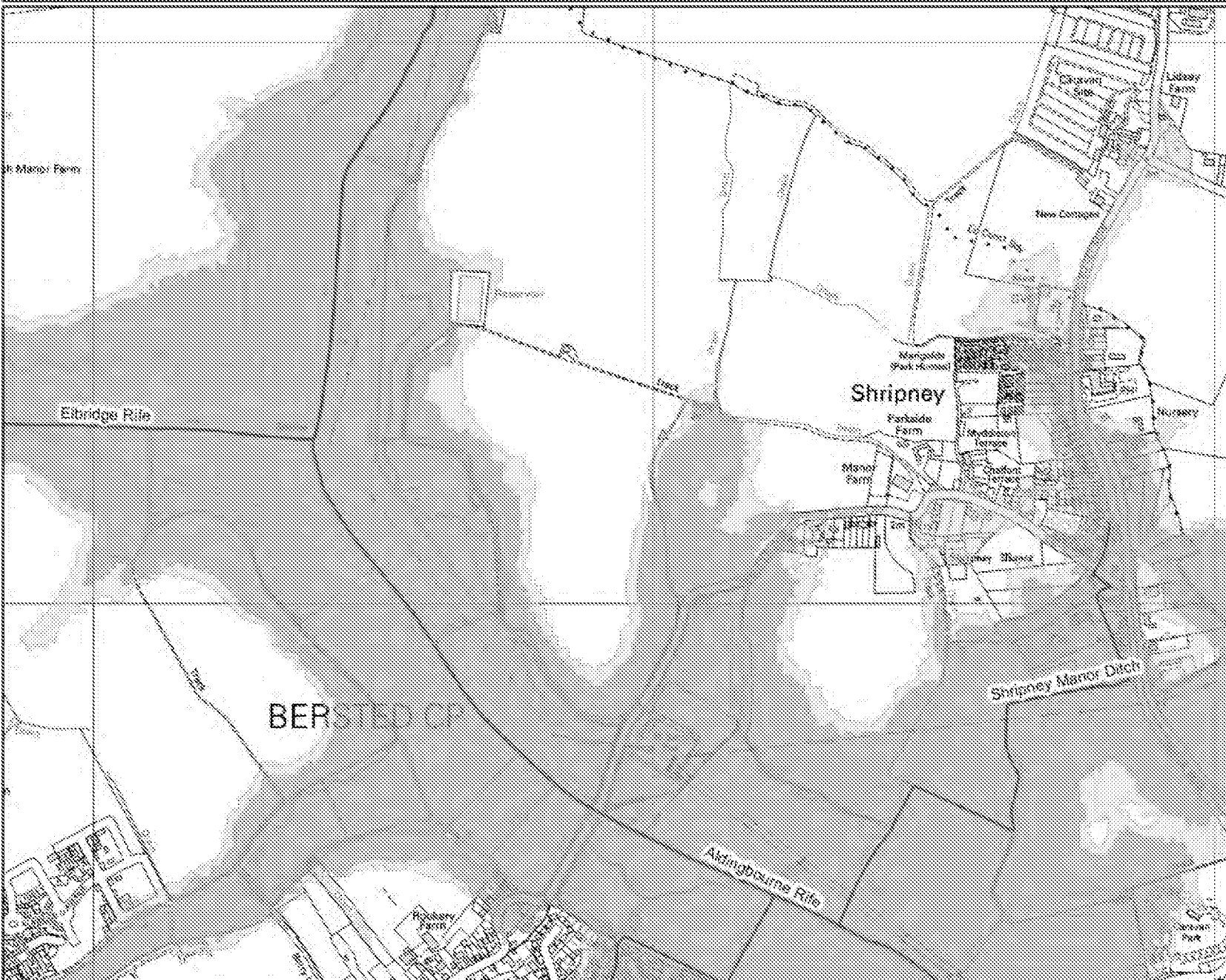
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Appendix C Environment Agency Data

- EA Flood Map
- EA Fluvial JFlow Mapping
- EA Flood Map for Surface Water (1 in 30 Year)
- EA Flood Map for Surface Water (1 in 200 Year)
- EA Historic Flood Outlines

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**Flood Map Centered on SU928024 -
Created 19/09/2013 [Ref: SSD/1885/VH]**



**Environment
Agency**

Legend

- Main River
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3

Shows the area that could be affected by flooding
- from the sea with an 1 in 200 or greater chance of happening each year.
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2

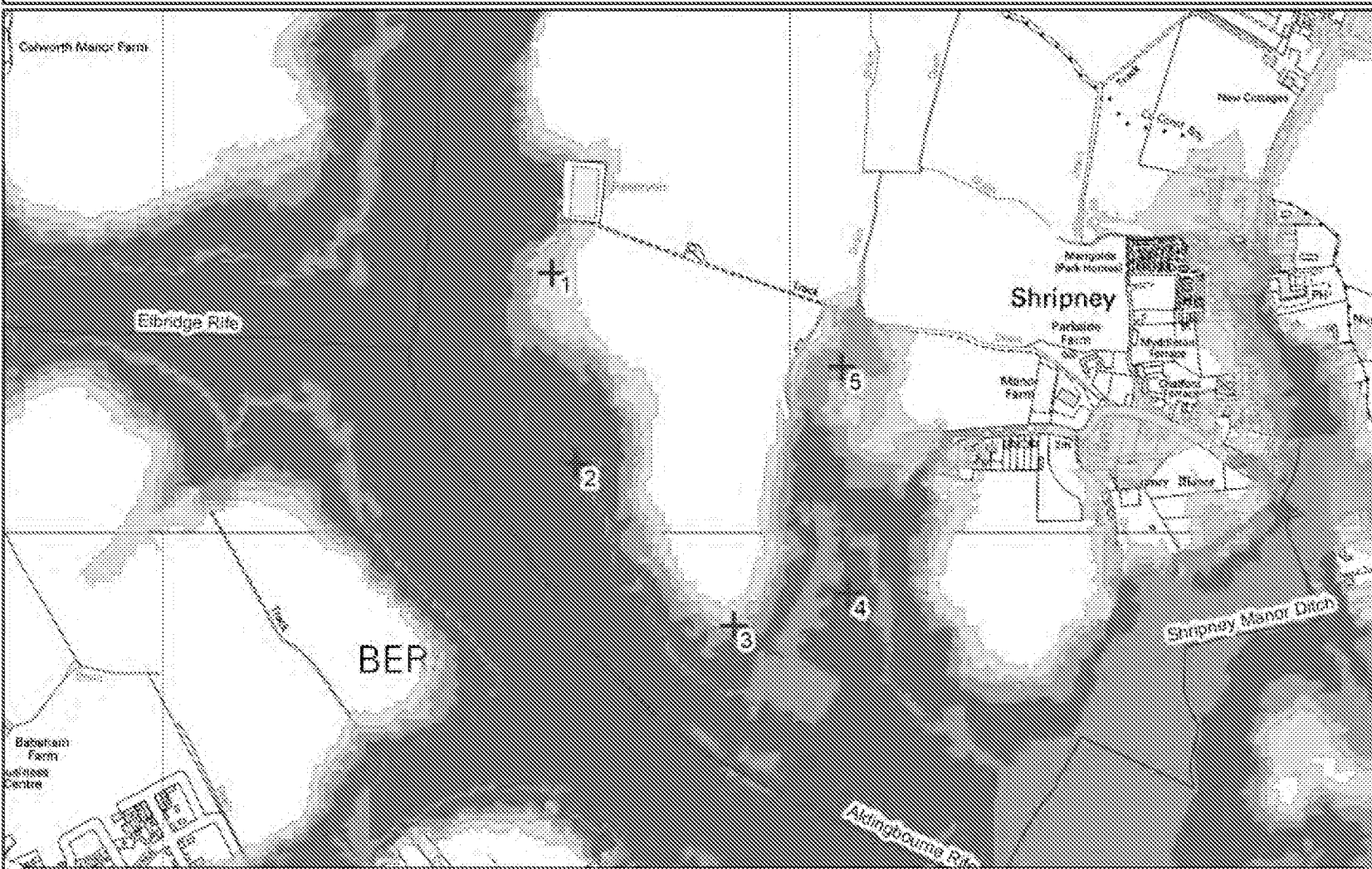
Shows the extent of an extreme flood from rivers of the sea with up to a 1 in 1000 chance of occurring each year.

1:10,000 *

*when printed at A4.



**2009 Fluvial JFLOW and 2009 Tidal TUFLOW Extents Centered on SU928024 -
Created 19/09/2013 [Ref: SSD/1885/VH]**



Legend

- Main River
- 1% 1in100yr FLUVIAL
- 0.1% 1in1000yr FLUVIAL
- 5% 1in20yr TIDAL
- 1% 1in100yr TIDAL
- 0.5% 1in200yr TIDAL
- 0.1% 1in1000yr TIDAL

Node Point	Easting	Northing	Modelled Fluvial Flood Levels from 2009 JFLOW [mAOD]		Modelled Tidal Flood Levels from 2009 TUFLOW [mAOD]			
			1% [1in100yr]	0.1% [1in1000yr]	5% [1in20yr]	1% [1in100yr]	0.5% [1in200yr]	0.1% [1in1000yr]
1	492619	102413	Null	Null	Null	Null	Null	3.06
2	492658	102110	1.24	1.29	2.32	2.57	2.74	3.06
3	492910	101850	Null	Null	Null	2.57	2.74	3.06
4	493092	101900	1.22	1.5	2.32	2.57	2.74	3.06
5	493080	102261	Null	Null	Null	2.57	2.74	3.06

1:10,000 *

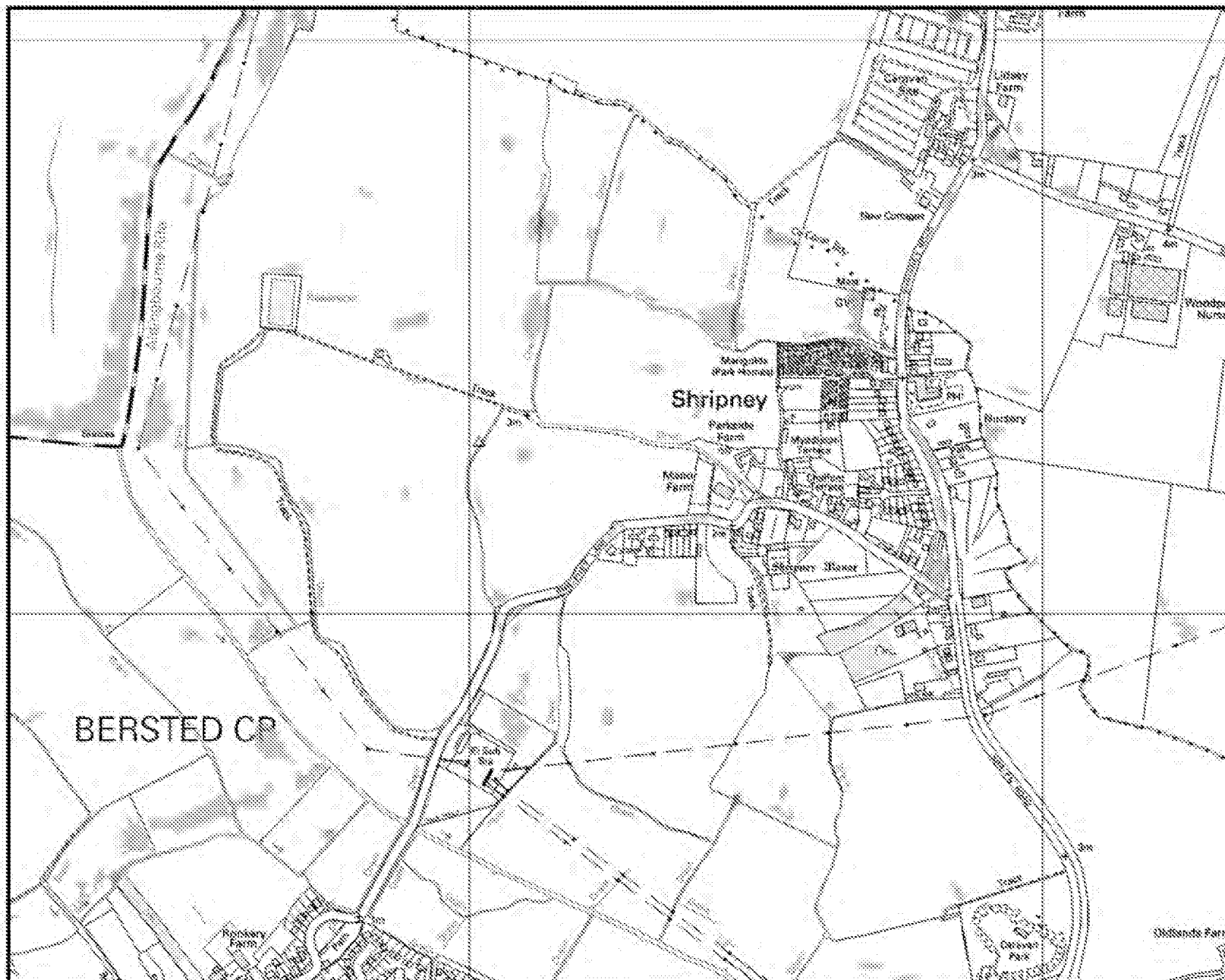
*when printed at A4.



Flood Map for Surface Water - PO22 9NU



Environment
Agency
Asiantaeth yr
Amgylchedd

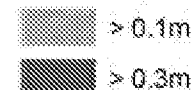


Note - this map provides a general indication of the broad areas that may be at risk of surface water flooding. It is taken from a national assessment which takes broad account of drainage and typical storms which are likely to cause flooding, but these will vary locally and are therefore not appropriate everywhere.

Important

- This information may be useful to help inform emergency & spatial planning and general awareness of surface water flood risk.
- It is not suitable for use at an individual property scale due to the method used.
- The information should not be interpreted as stating that the location you are interested in will or won't actually flood, but simply that it is in or not in an area shown at risk on the maps.
- As there are various sources of surface water information available, you should contact your local authority to ask them what surface water information best represents local conditions.

**Flood depths from rainfall
with a 1 in 30 chance
of occurring in any given
year**



1:10,000

Data produced 2010.

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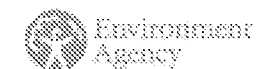
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Environment
Agency
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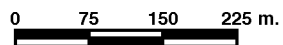
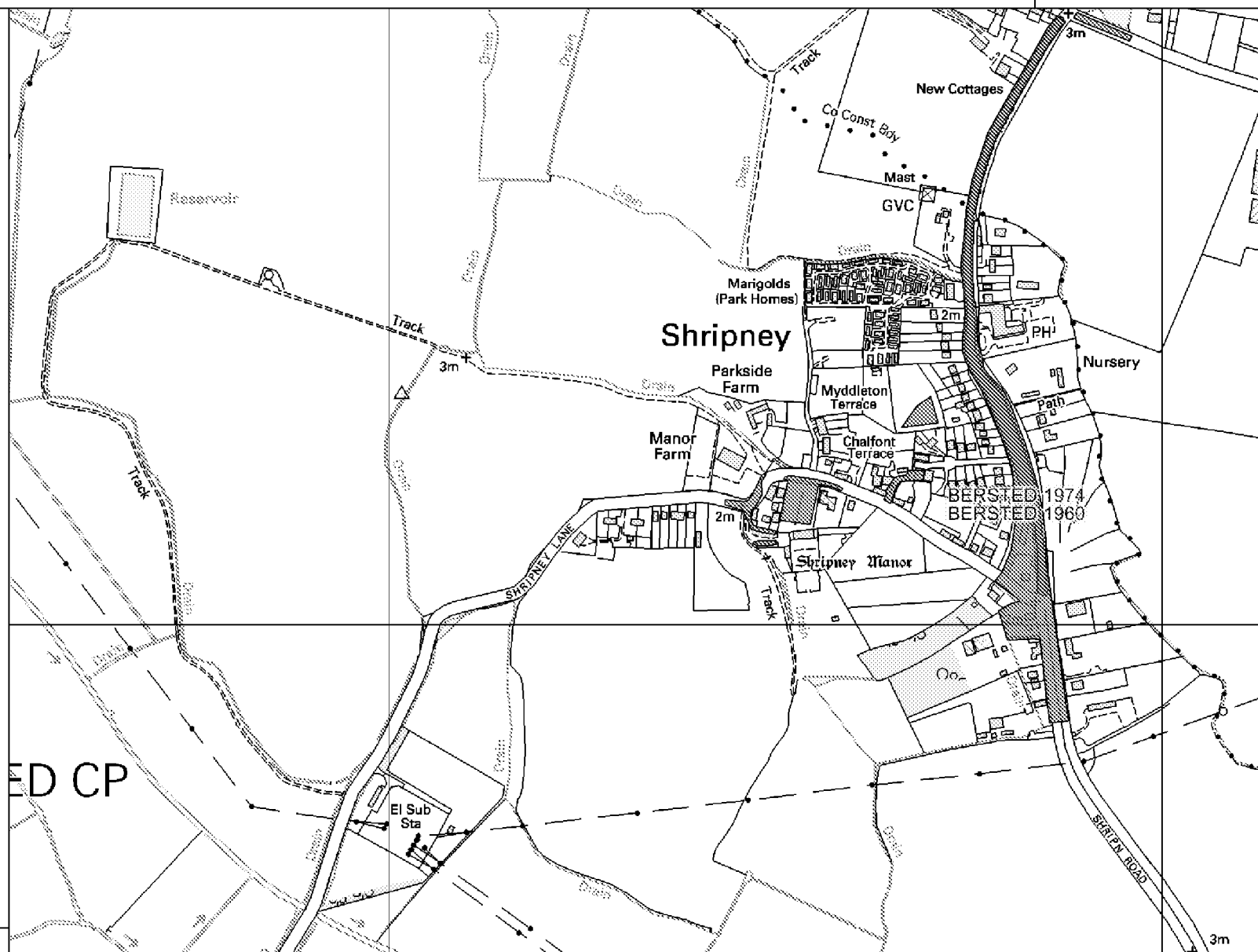
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SSD/1885/VH Historic Flood Outlines



Legend

 Flood Event Outlines



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