

ERECTION OF FOUR WIND TURBINES AT WEAR POINT, MILFORD HAVEN, PEMBROKESHIRE.

ARCHAEOLOGICAL WATCHING BRIEF



Prepared by Dyfed Archaeological Trust
For: Mott MacDonald



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RHIF YR ADRODDIAD / REPORT NO. 2013/25

RHIF Y PROSIECT / PROJECT RECORD NO. 105524

Hydref 2013

October 2013

**ERECTION OF FOUR WIND TURBINES AT WEAR
POINT, MILFORD HAVEN, PEMBROKESHIRE:
ARCHAEOLOGICAL WATCHING BRIEF**

Gan / By

Edward Davies & Andrew Shobbrook

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CONTENTS

SUMMARY	1
1. INTRODUCTION	2
1.1 Project Commission	2
1.2 Scope of the Project	2
1.3 Report outline	3
1.4 Abbreviations	3
1.5 Illustrations	3
1.6 Timeline	3
2. THE SITE	4
2.1 Location	4
2.2 Archaeological and Historical Background	5
3. METHODOLOGY	7
3.1 Fieldwork Methodology	7
3.2 Post-Fieldwork Reporting and Archiving	7
3.3 Timetabling	7
4. RESULTS AND DISCUSSION	8
4.1 Turbine Base 4 and Crane Pad	8
4.2 Turbine Base 3, Crane Pad and Haul Road	11
4.3 Turbine Base 2	14
4.4 Turbine Base 1	16
5. CONCLUSIONS	18
6. SOURCES	19

TABLES

Table 1:	Archaeological and historical timeline for wales	4
Table 2:	Table of sites contained within development boundary compiled from the Regional Historic Environment Record	.6
Table 3:	Turbine Base 4 table of contexts	8
Table 4:	Turbine Base 3 table of contexts	11
Table 5:	Turbine Base 2 table of contexts	15
Table 6:	Turbine Base 1 table of contexts	16

FIGURES

Figure 1:	Site location map	4
Figure 2:	Turbine location plan	9

PHOTOGRAPHS

Photo 1:	View west of Turbine Base 4 after topsoil removal	10
Photo 2:	View south west of Turbine Base 4 after topsoil removal	10
Photo 3:	View of probably field boundary on western edge of Turbine Base 4	11
Photo 4:	View west of haul road linking Turbine Bases 4 & 3 with topsoil removed	12
Photo 5:	View west of topsoil removal at Turbine Base 3	12
Photo 6:	View of bedrock encountered on haul road	13
Photo 7:	View south east of Turbine Base 3	13
Photo 8:	View west of Turbine Base 3 post topsoil removal	14
Photo 9:	View west of made ground deposits encountered at Turbine Base 2	15
Photo 10:	View north east of Turbine Base 2 excavated	16
Photo 11:	View east of stratigraphy of Turbine Base 1	17
Photo 12:	Overall view of excavation of Turbine Base 1 looking south east	17

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SUMMARY

An archaeological watching brief was undertaken during ground works associated with the construction of four wind turbines at Wear Point, Milford Haven, Pembrokeshire (Planning Application Reference-09/0544/PA). The archaeological watching brief requirement was placed as a condition on planning permission by the local planning authority.

The work was commissioned from Dyfed Archaeological Trust Field Services by Mott MacDonald Ltd.

The proposed wind turbines lie within marginal land near the boundary of the former Gulf Oil Refinery, now the SemLogistics storage facility. A site visit undertaken on the 09/05/12 indicated that much of the land on which the turbines were to be built appeared to have been heavily landscaped, possibly during the construction / dismantling of the oil refinery and establishment of the existing storage facility. No known archaeological remains lie within the proposed development area.

The scheme consisted of the erection of four turbines which are linked together by a main access track/haul road. Additional groundworks involved with the scheme included the excavation of a series of cable trenches, construction of a compound area, substation area and a meteorological station and mast near the centre.

The watching brief confirmed that the works have not impacted upon significant archaeological deposits. A substantial depth of made ground was noted in the eastern half of the development area, confirming the results of previous geotechnical works. Less made ground was present on the western half. This material could have sealed archaeological deposits beneath, although none were seen during the watching brief.

No significant archaeological deposits were revealed during the works, but there remains a potential for archaeological material to be present in the surrounding landscape.

1. INTRODUCTION

1.1 Project Commission

1.1.1 Dyfed Archaeological Trust field Services were commissioned by Mott McDonald to undertake an archaeological watching brief on ground works associated with the installation of four wind turbines at Wear Point, Milford Haven, Pembrokeshire (Planning Application Reference 09/0544/PA; Figures 1 and 2).

1.1.2 A condition was placed upon planning permission for the turbines by the Local Planning Authority. The condition stated that *"No development shall take place until the applicant, or their agents or successors in title, has secured the implementation of a programme of archaeological work. This shall be in accordance with a written scheme of investigation which has been submitted and approved in writing by the Local Planning Authority."*

1.1.3 Following discussion with the archaeological advisor to the planning authority (the Planning Services section of Dyfed Archaeological Trust) it was agreed that the scope of archaeological work required was a watching brief during development.

1.2 Scope of the Project

1.2.1 A written scheme of investigation (WSI) document for a watching brief was prepared by Dyfed Archaeological Trust Field Services prior to the commencement of the works. This was approved by the planning authority prior to any development works commencing. The WSI outlined methodologies for:

- *To monitor groundworks in order to identify the presence/absence of any archaeological deposits.*
- *To establish the character, extent and date range for any archaeological deposits to be affected by the proposed groundworks.*
- *To appropriately investigate and record any archaeological deposits to be affected by the groundworks.*
- *To produce an archive and report of any results.*

1.2.2 The overarching aim of the project was for: ***Archaeological attendance and recording during groundworks associated with the erection of four wind turbines and associated works at Wear Point Wind Farm, Milford Haven, Pembrokeshire. The groundworks will include the excavation of the Turbine Bases, access routes and installation of associated cabling, all of which may expose, damage or destroy any underlying archaeological remains, if present.***

1.3 Report Outline

1.3.1 This report provides a summary and discussion of the archaeological watching brief and its results.

1.4 Abbreviations

1.4.1 Sites recorded on the Regional Historic Environment Record¹ (HER) are identified by their Primary Record Number (PRN) and located by their National Grid Reference (NGR). Dyfed Archaeological Trust Field Services – DAT-FS;

¹ Held and managed by Dyfed Archaeological Trust, The Shire Hall, Carmarthen Street, Llandeilo SA19 6AF.

Dyfed Archaeological Trust Heritage Management – DAT-HM; Scheduled Ancient Monument – SAM; Written Scheme of Investigation – WSI.

1.5 Illustrations

1.5.1 Photographic images are to be found at the back of the report. Printed map extracts are not necessarily reproduced to their original scale.

1.6 Timeline

1.6.1 The following timeline is used within this report to give date ranges for the various archaeological periods that may be mentioned within the text (Table 1).

Period	Approximate date	
Palaeolithic –	c.450,000 – 10,000 BC	Prehistoric
Mesolithic –	c. 10,000 – 4400 BC	
Neolithic –	c.4400 – 2300 BC	
Bronze Age –	c.2300 – 700 BC	
Iron Age –	c.700 BC – AD 43	
Roman (Romano-British) Period –	AD 43 – c. AD 410	Historic
Post-Roman / Early Medieval Period –	c. AD 410 – AD 1086	
Medieval Period –	1086 – 1536	
Post-Medieval Period ² –	1536 – 1750	
Industrial Period –	1750 – 1899	
Modern –	20th century onwards	

Table 1: Archaeological and Historical Timeline for Wales

² The Post-Medieval and industrial periods are combined as the Post-Medieval period on the Regional Historic Environment Record as held by Dyfed Archaeological Trust

2. THE SITE

2.1 Location (Figures 1 and 2)

2.1.1 The site is located on the northern side of the River Cleddau, situated 1.2km to the south of the small hamlet of Waterston and 2.5km to the west of Neyland.

2.1.2 The site topography consists of gently undulating land c.50m – c.80m above sea level.

2.1.3 The underlying geology of the development area consists mainly of Lower Devonian sandstone and conglomerate with overlying superficial geology of Milford, a fine loamy reddish soil (Infinergy 2009).

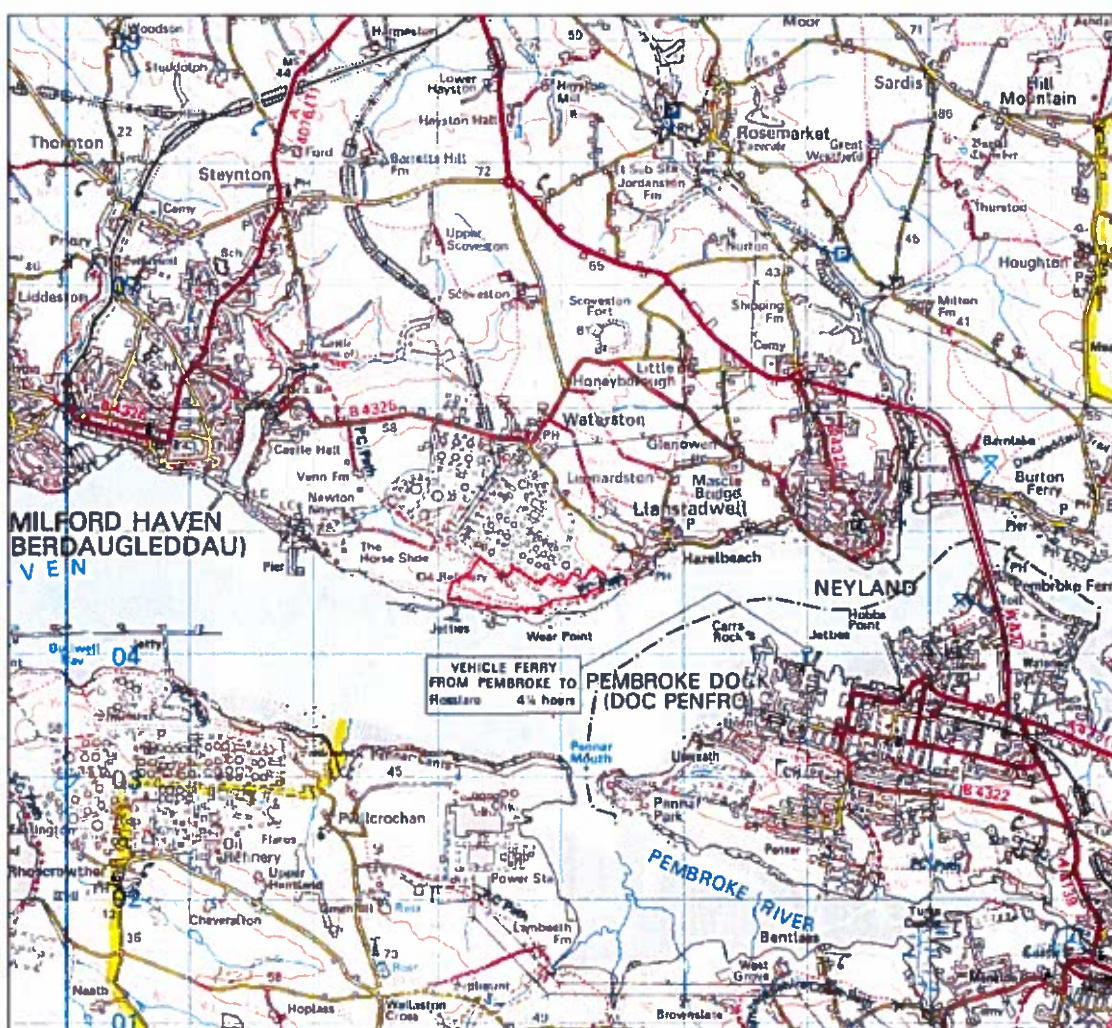


Figure 1: Site location map based upon the Ordnance Survey, with red outline showing the development outline

Reproduced from the 2003 Ordnance Survey 1:50,000 scale Landranger Map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright
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2.2 Archaeological and Historical Background

2.2.1 A detailed assessment of the archaeological and historical background, including map regression and searches of pertinent sources, for the site was commissioned during the design and planning application phase of this development (Infinergy, 2009, Appendix 11.1). A short summary of its key findings is included here for context.

2.2.2 A search of the Regional Historic Environment Record (HER) shows that there are 10 sites of archaeological or historical interest within the proposed development boundary (Table 2). There are many more records located within a 1km search radius of the centre of the development noted in the HER. Those within the development boundary date from the Post-Medieval period to the Modern period, while those outside it range in date from the Bronze Age to the Post-Medieval periods.

2.2.3 Prior to a development within the adjacent Gulf Oil Refinery in 2003, an archaeological excavation uncovered significant evidence for human activity ranging in date from the Bronze Age to the Post-Medieval period. This included a Bronze Age round house, 3 early Medieval corn driers, part of Newton House - a Medieval mansion (PRN 19990) and a Post-Medieval dovecote (Crane 2004).

2.2.4 Further medieval activity in the area is indicated by Newton Medieval settlement (PRN 12,904), 0.2km west of the western boundary of the site.

2.2.5 The study of past cartographic resources and aerial photography showed that the area within the development, had changed very little prior to the construction of the Gulf Oil Refinery on the adjacent land.

2.2.6 Geotechnical information provided by Mott MacDonald gave information on boreholes and test pits previously excavated in the proposed wind turbine areas. At Turbines 1 made ground was indicated to a depth of 2.5m and at Turbine 2 to a depth of 3.5m. For Turbines 3 and 4 the boreholes recorded a topsoil overlying a dense gravel of sandstone, which appears to be weathered bedrock. These results are also backed up by the information gained from a series of test pits excavated around their perimeters.

2.2.7 The geotechnical information would indicate that the western side of the proposed wind farm area comprises substantial depths of made ground. Such material may have been piled here during the construction or dismantling of the Gulf Oil Refinery or during construction of the existing storage facility. The eastern part of the site area, although having the appearance of being landscaped, may contain a layer of topsoil over the original decayed sandstone bedrock. Archaeological features, if present, may be visible at this interface between the topsoil and bedrock. It is possible that the weathered bedrock recorded around Turbines 3 and 4 is actually redeposited and compacted material stripped from the original oil refinery site.

2.2.8 The Archaeology and Historic Environment chapter of the Environmental Statement concluded that it was unlikely that any archaeological remains would be revealed within the wind turbine area due to previous development and groundworks associated with the construction of the oil refinery and storage facility.

PRN	Site Name	Description	Grid Reference	Period
34526	Newton Wear Damaged Cottage	Building identified from 1st Edition OS. Walls survive up to 1.5m high, remains of stone built cottage? Length approximately 16m, width 5m. Built on a terrace, now very overgrown surrounded by a series of paddocks and enclosures. BA & KM 1997.	SM 9392 0433	Post-Medieval
34527	Newton Wear Cottage, Building	Building identified from 1st Edition OS. Not seen, very overgrown and possibly within/under security fence of oil refinery. Site possibly destroyed by modern oil installation. BA & KM 1997.	SM 9392 0437	Post-Medieval
34528	Newton Wear Destroyed Boat House	Boat house identified from 1st Edition OS. Site destroyed by works associated with the oil refinery. BA & KM 1997.	SM 9394 0435	Post-Medieval
34529	Newton Wear Damaged Cottage	Building identified from 1st Edition OS. All that appears to remain is a length of wall built on top of the bedrock, approximately 8m long and 5m high. Area behind the wall very overgrown, therefore remains and plan of building unknown. BA & KM 1997.	SM 9398 0436	Post-Medieval
34843	Newton Wear Damaged Deserted Rural Settlement	Rectangular foundations of a building, approximately 15m by 5m, two celled, long axis along contours. Further foundations of smaller buildings immediately upslope. All are set in a complex of small paddocks/enclosures in dense woodland. BA & KM 1997.; As	SM 94063 04395	Post-Medieval
34844	Newton Wear Damaged Cottage	A terrace cut on a steep slope-dense woodland contains earthwork and rubble and stone walls. This seems to be the site of a cottage. It is set within a system of paddocks and enclosures. BA & KM 1997.	SM 9400 0439	Post-Medieval
34845	Newton Wear Damaged Sea Defences	A length of stone built sea wall, approximately 20m long and 4m high. It is uncertain what this wall once protected, possibly building PRN 34529. BA & KM 1997.	SM 9400 0434	Post-Medieval
34846	Newton Wear Damaged Pipeline	Pipeline cut through bedrock, approximately 2m wide, infilled with shattered rock. Concrete wall with sign on shoreline warning of pipeline. BA & KM 1997.	SM 9405 0434	Post-Medieval
34847	Newton Wear Intact Navigation Aid	Post Med stone-built cylindrical base, topped with a course of bricks on which is built a stone built core, plastered and originally whitewashed. Total height of structure approximately 5.6m. BA & KM 1997.	SM 9385 0428	Post-Medieval
34848	Newton Wear Near Intact Minewatchers Post	Mine watchers post identified by Roger Thomas, RT161. Brick and concrete structure, approximately 3m by 2m and 2m high. BA & KM 1997.	SM 9382 0430	Modern

Table 2: Table of sites contained within development boundary compiled from the Regional Historic Environment Record (HER)

3. METHODOLOGY

3.1 Fieldwork Methodology (Figure 2)

3.1.1 The detailed methodology for the watching brief was laid out within the WSI. The relevant methodology can be summarised as follows.

3.1.3 The ground works consisted of removal of topsoil deposits and the reduction of ground levels to provide a stable platform for the construction of the four wind turbines and associated construction compound, meteorology station and mast, access track and cable trenches.

3.1.4 Archaeological monitoring of the access track and cable trenches in the western half of the development area was not required as their shallow depth would not disturb significant archaeological deposits. Borehole and test pitting data indicated made ground deposits to a minimum depth of 2.5m in this area.

3.1.5 All archaeological deposits revealed during the ground works were examined and recorded to an appropriate level. Recording of all archaeological features or deposits conformed to best current professional practice and were carried out in accordance with the Recording Manual used by Dyfed Archaeological Trust Field Services.

3.2 Post-Fieldwork Reporting and Archiving

3.2.1 All data recovered during the fieldwork will be collated into a site archive structured in accordance with the specifications in *Archaeological Archives: a guide to best practice in creation, compilation, transfer and curation* (Brown 2007), and the procedures recommended by the National Monuments Record, Aberystwyth.

3.2.2 The results of the fieldwork have been assessed in local, regional and wider contexts. The report includes a summary of the key points of an archaeological and historical assessment that was submitted as part of the Environmental Statement (Infinergy, 2009) to aid explanation and interpretation.

3.2.3 A report fully representative of the results of the fieldwork has been prepared.

3.2.4 The project archive, including all artefacts and ecofacts (excepting those which may be deemed to be Treasure Trove) will be deposited with an appropriate body following agreement with the landowner.

3.3 Timetabling

3.3.1 An archaeological 'watching brief' was undertaken at the commencement of ground works. The watching brief was undertaken on 7th March, 30th April, 29th May and the 4th July 2013.

4. RESULTS

The Turbine Bases were numbered as in Figure 2, but are presented here in the chronological order of excavation.

4.1 Turbine Base 4 and Crane Pad (Photos 1 to 3)

4.1.1 The topsoil at Turbine 4 was a friable dark-brown silty clay [4000] 0.24m thick. Below that a light reddish brown silty clay deposit [4001] was found which contained frequent inclusions of small sub-angular sandstone gravels. In certain areas of Turbine Base 4, patches of the underlying bedrock were visible and appeared to have suffered erosion from past agricultural ploughing.

4.1.2 Located to the western edge of Turbine Base 4 the remnants of a double ditched field boundary were recorded. The boundary was on a northwest to southeast alignment and may be the remains of the boundary depicted on historic mapping. The two ditches [4002] and [4004] were parallel and both measured 1.20m in width, with similar fills of dark brown silty clay, fills [4003] and [4005] respectively. Whilst machining over this area it was observed that a number of large to medium sized sandstone blocks were contained within the topsoil, which may indicate that the boundary had a central earth core with an outer stone facing. This type of boundary is commonly seen in north Pembrokeshire, but less commonly in the south of the county, and this distribution is likely to reflect the available construction resources. Bedrock outcrops are present at Wear Point.

4.1.3 Fragments of Post-Medieval pot and a single piece of iron slag were the only artefacts recovered during groundwork's undertaken at Turbine Base 4. Such finds would be common wastage presumably relating to Post-Medieval land management.

4.1.4 No significant archaeological sites or features were discovered during the ground works undertaken within this area.

Context	Description	Dimensions
4000	Topsoil Dark brown silty clay topsoil with a friable compaction. Contained inclusions of Post-Medieval ceramic along with coal and slag.	0.24m in thickness
4001	Light reddish brown silty clay	Former soil horizon visible at 0.24 below ground level
4002	Cut of eastern ditch	1.20m maximum in width
4003	Fill of eastern ditch Dark brown silty clay	
4004	Cut of eastern ditch	1.20m maximum in width
4005	Fill of eastern ditch Dark brown silty clay	

Table 3: Turbine Base 4 table of contexts

Figure 2: Detailed Site Plan

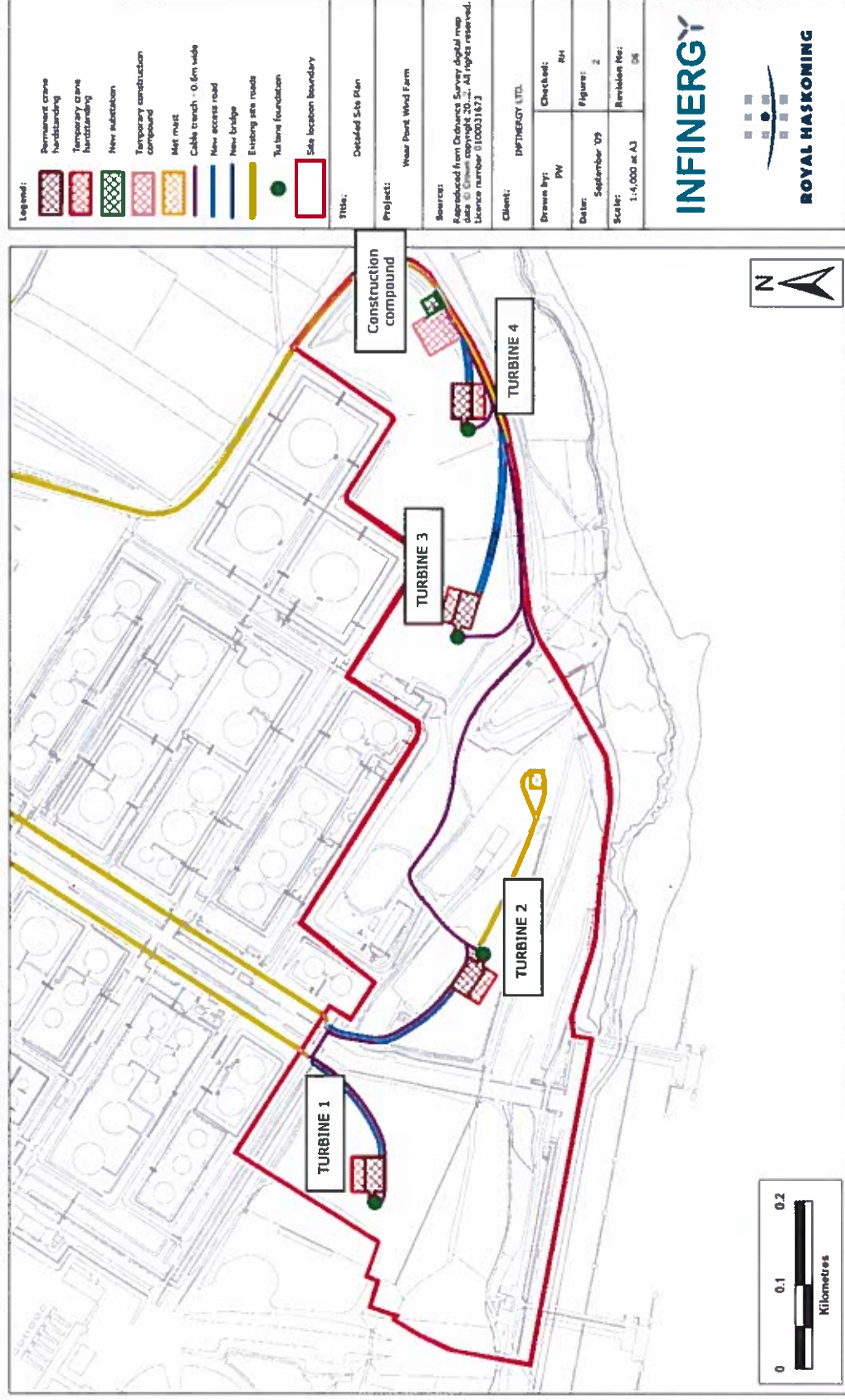


Figure 2: Map of proposed works provided by Mott MacDonald from ES



Photo 1: View west of Turbine Base 4 after topsoil removal



Photo 2: View south west of Turbine Base 4 after topsoil removal



Photo 3: View of probable field boundary on western edge of Turbine Base 4

4.2 Turbine Base 3, Crane Pad and Haul Road (Photos 4 to 8)

4.2.1 The topsoil at Turbine 3 consisted of very thin dark brown silty clay [3000] which continued to a maximum thickness of 0.13m. The underlying deposit [3001] consisted of a light to mid reddish-brown silty-clay which contained frequent, small to medium sized sub-angular stones. An outcrop of degrading bedrock was encountered on the eastern side of the Turbine Base. Bedrock was also encountered at the mid-section of the haul road which linked Turbine Base 3 to Turbine Base 4. It is likely that past landscaping undertaken within this area is responsible for the shallow depth of topsoil observed.

4.2.2 One clay pipe stem, numerous fragments of coal and Post-Medieval ceramics were the only artefacts found during the watching brief at Turbine 3.

4.2.3 No archaeological sites or features were discovered during the ground works undertaken within this area.

Context	Description	Dimensions
3000	Topsoil Dark brown silty clay topsoil with friable compaction. Contains inclusions of Post-Medieval ceramics along with coal fragments.	0.13m in thickness
3001	Light to mid reddish brown silty clay containing frequent small to medium sized sub-angular stones.	First observed at 0.13m below ground level.

Table 4: Turbine Base 3 table of contexts



Photo 4: View west of haul road linking
Turbine Bases 4 and 3 with topsoil removed.



Photo 5: View west of topsoil removal at Turbine Base 3



Photo 6: View of bedrock encountered on haul road between
Turbine Base 3 and Turbine Base 4



Photo 7: View southeast of Turbine Base 3



Photo 8: View west of Turbine Base 3 after topsoil removal

4.3 Turbine Base 2 (Photos 9 & 10)

4.3.1 Turbine Base 2 contained a large accumulation of made-ground deposits within its footprint. This is likely to represent past landscaping as part of the construction of the nearby former Gulf Oil Refinery. This was confirmed by the observation of tip-lines in the section of the deposit. Original ground level was reached at a depth of 2.63m.

4.3.2 The Turbine Base foundations were excavated to a total depth of 3.20m below present ground level. The first deposit encountered [2000] measured 1.09m in thickness and consisted of a light reddish brown silty clay. This deposit had the appearance of a re-deposited natural, and contained some modern metal objects.

4.3.3 The deposit below [2000] comprised a light yellowish brown silty clay [2001] which contained frequent inclusions of small sub-angular stones. This deposit is also believed to represent recent landscaping and measured a maximum thickness of 0.68m.

4.3.4 The final made-ground deposit encountered at Turbine Base 2 consisted of a mixed up, mid brown re-deposited natural [2002] containing occasional small sub rounded stones. Small pieces of brush wood were also visible within this layer. This deposit measured a maximum thickness of 0.53m.

4.3.5 Deposit [2003] was encountered at 2.63m below present ground level. It was a dark brown silty clay containing occasional small sub-angular stones and rare flecks of charcoal. This deposit continued to a maximum thickness of 0.20m and is thought to represent a buried topsoil, presumably the former ground surface.

4.3.6 The underlying deposit [2004] was first met at a depth of 3.04m below present ground level. It consisted of a light reddish brown silty clay which contained frequent inclusions of small sub-angular stones and was mainly visible on the western side of excavated area. Its similarity to the subsoil deposits encountered at Turbine Bases 4 and 3 mean we can be confident that this

represents a buried soil horizon. This deposit was not visible in the eastern side of the excavation area as the deposit [2003] was not excavated to its full depth in this area. We can surmise therefore that the original topography of the site was sloping west to east.

4.3.7 The first three deposits encountered [2000], [2001] and [2002] are the result of past landscaping associated with the construction of the former Gulf Oil Refinery. No archaeological features were discovered during the ground works undertaken within this area.

Context	Description	Dimensions
2000	Made ground deposit (Upper) Light reddish brown silty clay (redeposited natural substrata).	1.09m in thickness
2001	Made ground deposit (Mid) Light yellowish brown silty clay with frequent inclusions of small sub-angular stones.	0.68m in thickness
2002	Made ground deposit (Lower) Mid brown silty clay	0.53m in thickness
2003	Buried topsoil Dark brown silty clay	0.20m in thickness
2004	Light reddish brown silty clay	First viewed at 3.04m below present ground level

Table 5: Turbine Base 2 table of contexts



Photo 9: View west of made ground deposits encountered at Turbine Base 2



Photo 10: View northeast of Turbine Base 2 after excavation

4.4 Turbine Base 1 (Photos 11 & 12)

4.4.1 Turbine Base 1 was located at the western extremity of the scheme and, as Turbine 2, was located within an area containing substantial amounts of made ground.

4.4.2 A 2m deep made ground deposit [1000] was encountered at turbine 1 consisting of a light reddish brown silty clay. The deposit contained frequent amounts of small sub-angular stones and numerous small pieces of modern metal. This deposit is therefore likely to reflect landscaping during construction of the former Gulf refinery.

4.4.3 The underlying deposit [1001] was observed at a depth of 2m below present ground level and consisted of a light greyish yellow silty clay with frequent inclusions of small sub-angular stones. It is likely that this is the underlying superficial geological deposit known as Milford.

4.4.4 No archaeological sites or features were discovered during the ground works undertaken within this area.

Context	Description	Dimensions
1000	Made ground deposit Light reddish brown silty clay (re-deposited natural substrata).	2m in thickness
1001	Natural soil horizon Light greyish yellow silty clay	First viewed at 2m below ground level

Table 6: Turbine Base 1 table of contexts



Photo 11: View east of stratigraphy of Turbine Base 1



Photo 12: Overall view of excavation of Turbine Base 1.
Looking southeast

5. CONCLUSIONS

5.1 The archaeological watching brief has demonstrated that the construction of the wind farm at Wear Point has not impacted upon any archaeologically significant deposits or features.

5.2 The WSI suggested that Turbine Bases 4 and 3 had the greater archaeological potential. During the groundworks only a single archaeological feature was revealed, a Post-Medieval field boundary found at Turbine Base 4. The excavation of bases 4 and 3 yielded large quantities of Post-Medieval pottery fragments which are indicative of Post-Medieval activity or land management taking place in these areas. The shallow depth of topsoil indicates that the area had not been subject to significant landscaping works when the Gulf Oil Refinery was built, although topsoil may have been laid over the top.

5.3 Previous geotechnical works at Turbine Bases 1 and 2 suggested that these areas contained large accumulations of made ground which were likely to be related to the construction of the Gulf Oil Refinery. At both these locations, significant made ground deposits were encountered which ranged from 2m to 3.20m in depth and which had significantly altered the topography of the area. A buried soil horizon was uncovered at both Turbine Base locations below the made ground deposit. No archaeological features were observed in either of these locations sealed beneath or within these buried soils.

5.4 Although no significant archaeological features or remains were observed during the watching brief it is still possible that significant archaeological remains could be present in the surrounding area.

5.5 The watching brief has confirmed that the construction of the Gulf Oil Refinery did cause significant disturbance to the area, although this seems less evident in the eastern half of the site area. It is possible that further disturbance to the area may have occurred when the Gulf Oil Refinery was decommissioned and the SemLogistics storage facility was built. Such works may have led to more material being deposited on the margins of the site, and specifically on its southern side in the area where the four turbines are now being built.

6. SOURCES

Regional Historic Environment Record held at the Dyfed Archaeological Trust.

Crane, P.2004. '*Excavations at Newton, Llanstadwell, Pembrokeshire*'. Cambria Archaeology. Report No.2004/73.

Infinergy 2009. '*Wear Point Wind Farm: Environmental Statement*'. Chapter 11 and Appendix 11.1

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Hydref 2013
October 2013

Paratowyd yr adroddiad hwn gan / This report has been prepared by
EDWARD DAVIES AND ANDREW SHOBBROOK
Swydd / Position: **ARCHAEOLOGISTS**

Llofnod / Signature

Date 07/10/2013

Mae'r adroddiad hwn wedi ei gael yn gywir a derbyn sêl bendith
This report has been checked and approved by
JAMES MEEK

ar ran Ymddiriedolaeth Archaeolegol Dyfed Cyf.
on behalf of Dyfed Archaeological Trust Ltd.
Swydd / Position: **HEAD OF FIELD SERVICES**

Llofnod / Signature

Date 07/10/2013

*Yn unol â'n nôd i roddi gwasanaeth o ansawdd uchel, croesawn unrhyw sylwadau
sydd gennych ar gynnwys neu strwythur yr adroddiad hwn*

*As part of our desire to provide a quality service we would welcome any
comments you may have on the content or presentation of this report.*