
**Energy from Waste Facility
Trident Park, Cardiff**

Archaeological Impact Assessment



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1.0 INTRODUCTION

1.1 Planning and scoping background

A planning application for an Energy from Waste (EfW) facility has been submitted to Cardiff Council. (Ref:08/02616).

The accompanying Environmental Statement (ES) included a chapter on Cultural Heritage which presented a brief review of known sites from the Historic Environment Record within the surrounding 3km, and in particular provided a gazetteer of listed buildings, conservation areas and scheduled monuments, identifying nationally important designated sites in the vicinity. This level of assessment was considered appropriate because scoping response from Cardiff Council (Appendix A) and Cadw (Appendix B) failed to identify archaeology or other aspects of the historic environment as being of concern for the proposed scheme.

Comment has since been received by Cardiff City Council from Glamorgan-Gwent Archaeological Trust's (GGAT) Archaeological Planning Manager on the scope and content of the cultural heritage chapter. As a result of GGAT's concerns a supplementary statement has been requested to inform the authorities in more detail on the buried archaeological and palaeoenvironmental potential of the site. This report has been commissioned to fulfil that role, by undertaking a baseline survey of the known and potential cultural resource of the site and to place it in its socio-historic context. It outlines the expected impact and proposes a series of measures to mitigate the impact of the EfW plant.

1.2 Legislation and planning guidance

1.2.1 Introduction

Cultural heritage resources include World Heritage Sites, Scheduled Monuments (SMs), Archaeological Areas and other archaeological features; Listed Buildings and other buildings of historic or architectural significance; Conservation Areas and significant townscapes; Battlefields, Historic Parks and Gardens and designed landscapes, as well as other significant historic landscapes.

The importance of cultural heritage is clearly recognised at both national and local levels. Certain features that are deemed to be of particular importance are given legal protection through various statutes including the Ancient Monuments and Archaeological Areas Act 1979 (amended by the National Heritage Act 1983) (Scheduled Ancient Monuments), the Town and Country Planning Act 1990 (Listed Buildings) and the Hedgerows Regulations 1997.

1.2.2 Ancient Monuments and Archaeological Areas Act 1979

Under the Ancient Monuments and Archaeological Areas Act 1979, there is a requirement to compile and maintain a Schedule of Monuments considered to be of national importance. The statutory consent of the Secretary of State is required before any works are carried out which would have the effect of demolishing, destroying, damaging, removing, repairing, altering, adding to, flooding or covering up a Scheduled Monument (SM). Development works that may affect the setting of a SM form an important consideration in the granting or refusal of planning permission to conduct development works. Further information on development control procedures relating to SMs and other aspects of the historic environment is provided in the following:

1.2.3 *Welsh Office Circular 60/96 (Planning and the Historic Environment: Archaeology) re-issued March 2002*

This guideline establishes the principles and framework within which archaeological matters are a material consideration within the planning process. It identifies how sites are preserved and recorded, and the role of local authorities and the Welsh Office working through Cadw. It states:

‘Archaeological remains should be seen as a finite and non-renewable resource, in many cases highly fragile and vulnerable to damage and destruction..... They are part of our sense of national identity and are valuable both for their own sake and for their role in education, leisure and tourism’. (Paragraph 3).

Para 7 states: *‘Positive planning and management can help bring about sensible solutions to the treatment of sites with archaeological remains and reduce the areas of potential conflict between development and preservation.*

Whilst Cadw has an important role to play, the key to the future of the great majority of archaeological sites and historic landscapes lies with local authorities acting within the framework set by central government in their various capacities as planning, education, recreational authorities as well as with owners and occupiers of sites themselves. Appropriate planning policies in development plans and their implementation through development control will be especially important

Welsh Office Circular 60/96 places emphasis on the need for early consultation with the appropriate authorities (Paragraph 11) and includes information on the need for formal Environmental Assessments in some circumstances (Paragraph 12). In Wales this guidance replaces Planning Policy Guideline (PPG) 16: Archaeology and Planning (1990).

1.2.4 *Welsh Office Circular 61/96 (Planning and the Historic Environment: Historic Buildings and Conservation Areas)*

This document addresses issues associated with development proposals affecting standing buildings, and also recommends consideration of other designations including the settings of listed buildings, World Heritage Sites and Historic Landscapes, Parks and Gardens as a material consideration for planners when scrutinising applications. It lays out the criteria for the Listing process.

1.2.5 *Welsh Assembly Government: Planning Policy Wales March 2002*

Chapter 6 of this document, *Conserving the Historic Environment*, endorses and enhances the Welsh Office circulars and places them in a national policy framework for Wales. In summary it states:

It is important that the historic environment encompassing archaeology and ancient monuments, listed buildings, conservation areas, and historic parks and gardens and landscapes, is protected’. The Assembly Government’s objectives in this field are to protect archaeological remains which are a finite and non renewable resource, part of the historical and cultural identity of Wales and valuable both for their own sake and for their role in education leisure and the economy particularly tourism.

1.2.6 *Local policies*

Unitary Development Plan

The Cardiff Unitary Development Plan to 2016 (Oct 2003) includes Policy 11 on protection of the Historic Environment (p.54). This has discrete sub-policies for designated heritage

assets such as scheduled monuments and listed buildings, conservation areas, and parks and gardens, but it also refers in 2.1.8 to a general requirement for developers to investigate and assess the heritage potential prior to submission of development proposals:

In seeking to address the requirements of these Part 2 policies, developers are encouraged to follow a sequence of investigation and assessment to identify the cultural significance of a place before developing proposals for change or alteration. In this way, proposals can be well informed and strategies developed to protect the historic environment. The process follows advice within Welsh Office Circular 61/96 and draws on principles set out within the ICOMOS Charter (1988) and advice within BS Standard 7913, 1998.

Supplementary Planning Guidance

Cardiff City Council has SPG on Archaeologically Sensitive Areas, approved 20th July 2006. The guidance includes reference to pre-existing policies and wider requirements for developers:

This Supplementary Planning Guidance (SPG) supplements Policy B1 of the South Glamorgan Replacement Structure Plan 1991-2011 (adopted April 1997) and Policies 1 and 2 of the City of Cardiff Local Plan (adopted January 1996) which seek the protection of archaeological heritage and its setting.

Areas where there is a concentration of archaeological sites have been defined as Archaeologically Sensitive Areas [ASAs]. However, it should be noted that archaeological sites that could have an impact on planning decisions also exist outside the defined areas.

City of Cardiff Local Plan

Para 2.2.10 of the Local Plan adopted January 1996 states that:

Where remains are known to exist, or where there is a likelihood of remains existing, the City Council will require developers to provide for an archaeological field evaluation to be carried out prior to determination of the planning application. This will enable a determination to be made as to whether an interest exists and if so whether the remains merit protection by merely recording or rescuing.

The Local Plan has two policies relating to archaeology:

*Policy 1: Ancient Monuments and other Nationally Important Archaeological Remains
There will be a presumption against development which would cause harm to ancient monuments or other nationally important archaeological remains whether scheduled or not, or which would have an adverse impact on their setting.*

*Policy 2: Locally Important Archaeological Remains
Where locally important archaeological remains are affected by development proposals their preservation on site will be sought wherever possible. Where the significance of such remains is not sufficient to justify their preservation on site or is outweighed by other material planning considerations appropriate statutory arrangements for their excavation and record will be sought by means of agreement or planning conditions.*

In the context of Trident Park it is this second policy that is of specific relevance.

2.0 SITE SETTING

2.1 Location

The site is located at NGR ST023 755 on the south side of Cardiff city in the docklands, a heavily industrialised part of the urban environment. Traditionally part of Cardiff East Moors the site lies c.1km south-west of the centre of Splott, 1.2km south of domestic terraced housing at Newton, and 1.5km southeast of the historic core of Cardiff.

2.2 Geology

The stratigraphic sequence for the site has been investigated by means of a borehole survey and through reference to the British Geological Survey (BGS) mapping for the area. In brief the hard geology comprises Merican Mudstone at c.12m depth, which has been overlain by a sand and gravel (weathered Mudstone) alluvial clay horizon, with alluvial clays above, of varying thickness between 1.5 - 3m. A peat deposit of c.1m thickness lies above at between 8 - 9m depth, with an alluvial sequence of interbedded silts and clays sealing it; total thickness of alluvial sequence and peat deposit c.8m. Above this lies 4m of made ground, part of the reclamation of the area before its use for industrial purposes in the 19th century.

2.3 Topography

The site lies within Cardiff's urban waterfront, located on reclaimed ground from the underlying estuarine muds. Originally part of tidal flats, the land surface is now c.8.5mAOD, a level roughly consistent for much of the dockland area. Groundwater uses the sand and gravel deposit as an aquifer, although its location at mean sea level makes it susceptible to a degree of tidal ebb and flow. Perched water tables occur at higher levels in the sequence, such as the peat deposit, and water also flows through the made ground at the top of the sequence.

3.0 DESIGN OUTLINE AND POTENTIAL IMPACT

The EfW development will include the construction of a single building, with an adjacent stack. The stack and the boiler hall have been identified as parts of the structure that will require foundations capable of high load bearing capacity. These will consist of piles, although the type, size and array have yet to be determined. In addition a large bunker will be excavated for waste storage, 70m x 16m and 12m deep so that it is anchored into the Mudstone. Retaining walls and water management facilities will need to be installed, so that excavation and operation of the bunker can be conducted safely.

Various constraints restrict the areas of the site available for construction. Below ground foundations survive for the crane base erected in 1942 for Castle Rolling Mill. In addition the recent pile foundations for the glass factory (1994) will need to be removed if construction in the northern part of the site is necessary.

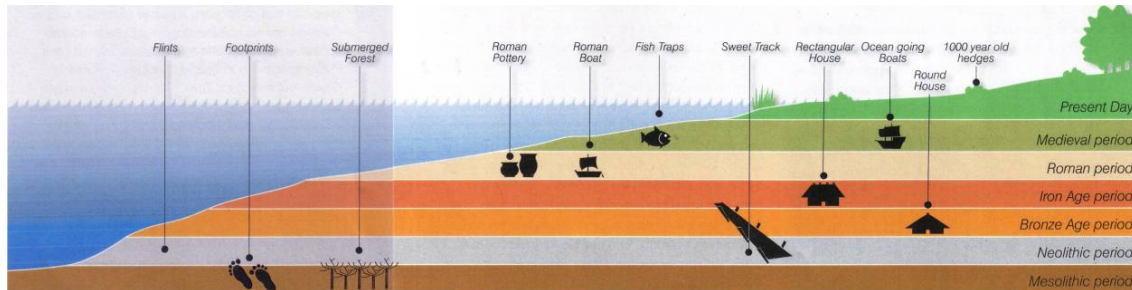
4.0 PALAEOENVIRONMENTAL BACKGROUND

4.1 Introduction

The Palaeoenvironmental records of the Gwent Levels can be considered a significant and finite resource. In recent years much work has been undertaken in the region and along the inter-tidal zone of Somerset and North Devon (e.g. Allen & Rae 1987; Allen 2001; Allen & Bell 2000; Bell, M., Caseldine, A. & Neumann 2000; Nayling & Caseldine 1996; Rippon 1996). Although the Trident Park site stands within the eastern part of the Cardiff Docks area and has, over the past 150 years been heavily impacted upon, it also lies within the western

end of the Gwent Levels, and these underlying deposits form a continuation of the more visible designated Landscape of Outstanding Historic Interest in Wales No.17 which is found further east.

Figure 1
Schematic diagram of buried landscapes in Gwent Levels



From *The Archaeology of the Severn Estuary DCLC*

Within this area and extending along the northern part of the Severn Estuary and the Bristol Channel is arguably Britain's greatest concentration of intertidal archaeology dating from the later prehistoric period (c.2000 cal. BC) (Children & Nash 1996). Identified within the area are a series of important indicator palaeoenvironmental deposits include a significant peat deposit. Allen & Rae (1987) postulate a date for this peat sequence of around 9,000 cal. BC. However, this *circa* date is not based on radiocarbon dating. Bell & Neumann (1997) have provided a summary of radiocarbon dates on peat within the vicinity of the site of c. 5,500 cal. BC. However, according to the two radiocarbon dates collated for the SLR report the peat sequence appears to have developed during the Late Neolithic and the latter part of the Early Bronze Age, at a time when climatic changes were consistently occurring throughout North-western Europe; from a warm dry climate to a slightly mild and wetter climate.

4.2 Geology and pre-reclamation topography

According to the Soil Survey of England & Wales (1983) no soil information is available due to recent historical industrial development of the area. However, the soils extending west of the site and away from the industrial development, and extending along the coastal fringe between Cardiff and Newport (geographically known as the Wentlooge Levels) comprises a NEWCHURCH 2 814c. Generically these soils form part of a series of marine alluvial deposits, the result of the seasonal transgression and regression of marine deposition. The soils are mainly deep stoneless calcareous clayey regoliths and are sometimes prone to surface flooding from tidal surges.

The topography for the site and the surrounding area can be described as flat and low lying, extending to c. 6m AOD, although much of the surround area has been artificially raised. Within the site boundary the ordnance datum level stands around c. 10m (AOD). The site and the surrounding area stand approximately 1.1 km from the shoreline of the Bristol Channel. During prehistoric to post-medieval times this stretch of land would have comprised brackish salt marsh. The historic maps of the area show an enclosed landscape with fields surrounded by drainage channels and ditches. It is probable that these fields were prone to sea water inundation during high tidal water events.

4.3 Trident Park site specific

Based on the Ordnance Survey map of 1880 and prior to the industrial development of the area, the site and surrounding land (formally known as the *Cardiff Moors*) would have

comprised intertidal marshland. A series of levies along the Cardiff Flats suggests that at this time much of the land was under a process of reclamation. Prior to this, the general landscape, according to Bell *et al.* (2000) and Rippon (1996) was formally intertidal salt marsh and would have probably extended north of the site.

Although no palaeoenvironmental research has been undertaken in or around the Trident Park site, peat sampling was undertaken on land at Wentlooge Industrial Estate, Newlands Road, east of the Cardiff Bay area in 2007 (SLR 2007). From this fieldwork, comprising the recording of 6 test-pits, a significant peat sequence, part of the *Wentlooge Formation* was uncovered. The peat sequence was consistent in depth and thickness with peat found elsewhere, including the primary results from borehole sampling at Trident Park (at around 2.90 below the existing ground level with a mean thickness of 0.30m – see Table 1). Included within the peat were macrofossil remains. However, no pollen or soil micromorphological analysis was undertaken.

Two peat samples obtained for chronometric dating contained macro fossils, primarily *phragmites* (possibly *Phragmites australis*), a common reed found in temperate wetland environments. Other macrofossils included twigs belonging to the birch family [sp. *Betula*] (probably dwarf birch - *Betula nana*). The peat is described as a lightly compacted dark brown rich organic regolith. Both samples were chronometrically dated and promote a date range of between 3850±BP [upper sample] and 4480±31 BP [lower sample] (Lab Nos. Wk23278 & Wk23279). This date range falls within an archaeological period range that includes the Late Neolithic [lower sample] to the latter part of the Middle Bronze Age [upper sample], at a time when the climate was ameliorating; from a warm temperate climate (with average summer temperatures similar to present) to a slightly milder, wetter climate. It is during this time that many upland peat bogs and wetland peat sequences begin to form (e.g. Bradley 1985).

4.4 The palaeoenvironmental potential of Trident Park

It is possible that within the area of site significant prehistoric buried remains may be present (above and below the peats). In addition, and based on previous detailed research, initially by Allen & Rae (1987) and later by Bell *et al.* (2000) natural features such as palaeochannels may also exist (e.g. Nayling & Caseldine 1996).

The peat sequence within the borehole logs at Trident Park extended to c. 8.50m below the present ground level and is around c. 0.80m – 1m in thickness. The borehole log describes this peat sequence as amorphous peat – i.e. a highly acidic and virtually structureless soil and without the presence of macrofossils. This lithographic sequence is present in other bore logs across the site. Based on the mid- to late 19th century mapping of the immediate area, the ground has been periodically made-up with a series of top soils – termed 'Made Grounds'. This series of soils extends on average to a depth of around 4 to 4.5m below the present ground level. Therefore the peat sequence would have been around c. 4m below the pre-industrial land surface level.

Although the archaeology and associated environmental work undertaken along the Gwent Levels has in the recent past been extensive, the interaction between humans and change climate/shoreline of this area still requires further research. Based on the limited work undertaken at the Wentlooge Industrial Estate (SLR 2008) and the more selective research undertaken at, say, Redwick, looking at in particular then sub-fossil insect assemblage (*Coleoptera*) from the ['Fourth'] peat sequence (Paddock - ongoing), it is clear that the potential for further palaeoenvironmental remains is high.

Table 4-1
Summary of peat profiles

ID	NGR	Depth of trench	Depth to upper peat level	Thickness of peat
Test Pit 1	ST 23570 79487	3.40m	2.70m	0.25m
Test Pit 2	ST 23610 79503	3.20m	2.90m	0.33m
Test Pit 3	ST 23568 79447	3.40m	2.75m	0.30m
Test Pit 4	ST 23604 79445	3.35m	2.80m	0.35m
Test Pit 5	ST 23664 79458	3.60m	2.90m	0.30m
Test Pit 6	ST 23639 79375	3.45m	2.95m	0.27m

5.0 ARCHAEOLOGICAL BACKGROUND

5.1 Potential prehistoric activity within the vicinity of Trident Park, Cardiff

The presence of prehistoric remains within the city boundary is considered very limited.¹ This is mainly due to post-medieval and, in particular 20th century development activity, especially around the Cardiff Bay Area. For example, and based on the borehole survey undertaken at Trident Park, at least 4m of modern overburden overlies the drift geology. Furthermore, it is more than probable that prior to the deposition of the overburden, a significant amount of top soil was removed (i.e. levelling).

Prior to the development of Trident Park and the immediate area, and based on 19th century cartographic evidence, very little of the area had been developed. Marked on the 1st edition Ordnance Survey map of 1888 is a levee which had been constructed around the shoreline (high water tide mark), to the east and south of Trident Park. The immediate landscape is shown as marshland, probably an intertidal brackish marsh. It is probable that this landscape was in existence during the later prehistoric period and may have supported small fishing communities, similar to the evidence discovered at nearby Goldcliff (NGR ST 362 820).²

The borehole survey undertaken at Trident Park has revealed a significant peat sequence probably belonging to the *Wentlooge Formation*. Recent chronometric dating on a similar/associated peat sequence has been undertaken at the nearby Wentlooge Industrial Estate (SLR 2008 (see above Palaeoenvironmental background)). It is more than likely that human activity is present above and below this sequence because of evidence from Usk Mouth where Mesolithic footprints were found immediately beneath the peat, and therefore one cannot rule out a similar presence above and below the peat sequence at Trident Park.

It has been argued that a significant prehistoric resource is submerged below the mean high tidal water mark (Rippon 1996). Sites such as Gold Cliff and Magor on the Gwent Levels have revealed remains that date to the Mesolithic period and extend well into the estuarine zone of the Bristol Channel.

¹ In neighbouring Newport there is a significant prehistoric findspot and site that dates to at least the Bronze Age (Children & Nash 1996).

² Fowler (1983) postulates that this area has well-over 280 potential growing days per year

5.1.1 *Upper Palaeolithic (c. 35,000 to 10,000 cal. BC) and Mesolithic (c. 10,000 to 4,000 cal. BC)*

Based on information supplied by the regional HER there are no Upper Palaeolithic or Mesolithic sites in or around the Trident park site. The Upper Palaeolithic and Mesolithic periods represents a time when there are significant changes to climate, environment, flora and fauna, especially in South Wales. These changes heavily influence the way hunter/fisher/gatherer communities organised and shaped their world.

Although no Upper Palaeolithic sites/finds are present within the Cardiff area two hand-axes dating from the Lower and Middle Palaeolithic have been found at Pen-y-lan and Caerphilly Road. These two finds may have originated from river or beach terrace gravels. Alternatively, it is conceivable that a previous glacial episode, the Anglian Glaciation (ISO Stage 12) may have deposited these artefacts from sites further north during the ice advance or from sites further south during the ice retreat (e.g. Doniford Gravels, West Somerset).

Fresh water released from the Welsh Ice Cap (belonging to the Devensian Ice Age [ISO Stages 2 to 5]) during the early part of the Late Upper Palaeolithic raised the sea level around the Bristol Channel quite considerably, may be between 30 - 50 m (Jacobi 1980). Prior to the rapid rise in sea level, the Bristol Channel would have comprised an immense river valley that would have extended to the present day coastline of north Devon and Cornwall. The southern extent of the Welsh Ice Cap was sited some way north of Cardiff. However, there is evidence of periglacial activity in the form of extensive sand and gravel deposits, a result of glacial outwash deposition. Based on the climate it is more than likely that there was no human presence within area prior to, say, 16000 cal. BC.

Although Upper Palaeolithic sites in this part of Britain are relatively uncommon, there are several cave sites of international importance on the Gower Coast (e.g. Paviland and Minchin Hole). One must assume that Upper Palaeolithic communities were not just inhabiting caves sites along this coastline and there is a possibly, albeit very limited that such communities were also utilising temporality encampments as well.

During the Early Mesolithic the landmass that once extended across the Bristol Channel is inundated with water and much of the present coastline was shaped during this period (although there have been complex fluctuations of the mean tidal range during later prehistoric and historical times). Mesolithic remains have been discovered along the Gwent Levels at Goldcliff, underlying the now dated peat deposits (e.g. SLR 2008). Uniquely, Mesolithic footprints, imprinted into fine estuarine clays have also been found at two locations: Uskmouth and Magor Pill, both chronometrically dated to 3720±80 cal. BC and 4250±80 ca. BC respectively.³ Within the Cardiff area Wymer (1977) has recognised four sites where diagnostic Mesolithic flint has been recovered including pieces from St Lythans, Cog and Whitchurch.

5.1.2 *Neolithic (c. 4,000 to 2,000 cal. BC)*

Based on information supplied by the regional HER there is one Neolithic site within close vicinity of the site. It is probable, based on this evidence and from other artefacts recovered within the city boundary, that Neolithic communities were utilising this landscape (e.g. Evans 2006).

³ Samples taken from the overlying peat.

Concerning Neolithic settlement and land use two clear landscape zones are recognised: domestic and burial/ritual. There are two stone chambered burial monuments on the western side of Cardiff; Tinkinswood [Parish of St Nicholas (NGR ST 0921 7331)] and nearby Maes-y-Felin [Parish of St Lythans (NGR ST 1009 7230)] that occupy the intermediate slopes and plateaus. Both monuments are substantial structures and each would have served large farming/coastal communities (Nash 2006). Tinkinswood, excavated by John Ward in 1914 has the largest capstone of any burial monument in Wales (see Ward 1915, 1916). To the east of Cardiff and Trident Park is the ruined burial monument of Cleppa Park (NGR ST 2740 8571). This monument, unlike the other two has full view of the Bristol Channel, standing 4.3km from the shoreline. Within the Cardiff area is the small chambered monument of Cae-yr-Arfau (NGR ST 077 821).

Apart from funerary monuments there is little evidence of human activity within the immediate area of Trident Park. However in neighbouring Roath, at Roath Park an end-scraper was discovered by employees of Cardiff Corporation and in nearby Maindy an hour-glass mace-head was found (Grimes 1951, 158 & 166). These two objects suggest that Neolithic communities were utilising this area for domestic rather than ritual purposes. To emphasise the importance of this area with other Neolithic core areas, two polished stone axes originating from the Craig Lwyd axe factory were found at the Dowlais Steelworks site (adjacent to Trident Park) and at St Fagans near Cardiff (Grimes 1951, 14, 237).

Caseldine (1990, 51) has highlighted the potential of cereal impressions in pottery at Ogmores-on-Sea (Emmer and Celtic bean impressions in Late Neolithic pottery – see also Peterson 2003).⁴ Furthermore, auroch bone dating to the 3rd millennium BC has been recovered from Rhymney, east of Cardiff. Savory (1980b, 211) has highlighted albeit diagrammatically that there are numerous Neolithic findspots between the valleys of the Ely (west of Cardiff) and Rhymney (east of Cardiff). Finds include an array of diagnostic lithics and stone implements. Through systematic field walking further Neolithic and Bronze Age flint has been recovered on land within the parish of St Mellons

5.1.3 Bronze Age (c. 2,000 to 800 cal. BC)

Based on information supplied by the regional HER there are no Bronze Age sites on or within the vicinity of Trident Park. However, significant Bronze Age remains exist outside the city boundary and east, along the Gwent Levels.

In a wider context and based on the pollen evidence the Bronze Age is characterised by the extensive clearance of woodland. It is also a period that is marked by the slow deterioration of the climate as witnessed by the formation of upland peat bogs (e.g. north of Cardiff).

The period is also marked by the change in funerary monumentality, from large stone-chambered corporate long mounds to smaller circular single-status cairns or barrows. A substantial Early Bronze age barrow known as Sant-y-Nyll is located at St Brides-super-Ely, west of Cardiff. Found within this cairn was a large assemblage of pottery including several sherds that were Neolithic and were associated with post-holes that were considered to belong to a Neolithic structure, possibly one of three houses on the site (in Peterson 2003, 117).⁵ This settlement and succeeding burial monument is not uncommon in Wales. Close by, at Peterstone-super-Ely is the remains of a Late Bronze Age cooking mound. Further funerary evidence of probably Middle or Late Bronze Age date is located on Garth Hill (NGR SW 1026 8347), some 8 km north-west of Cardiff. Here, there are four large burial mounds

⁴ Recovered from excavation of a section of eroding coastline (NGR SS 861 756)

⁵ Possibly three huts (Savory 1963, 10-23).

that are arranged in a line on the summit of the hill, standing around 300 m AOD; all but one has been opened, probably by antiquarians.

Within the city boundary W.F. Grimes (1951) lists two metal hoards: the Cardiff Hoard, an assemblage of metal implements including socketed axes, chisels and sickles, and two razors and the cap of a chariot pole⁶ found in 1928 on the floodplain between the rivers Ely and Taff at Leckwith and the St Fagans Hoard. Several further find spots⁷ including a socketed axe were found during the exaction of building foundations at Rhymney; a socketed axe in St Mary Street during the excavation of a sewage trench; and a socketed axe at Thompson Avenue, Victoria Park, Canton in 1940 during excavation for an air raid shelter (*ibid.* 1951; Savory 1976);⁸ Findspots found up to 1980 are listed in Savory (1980a) and include bronze palstaves at Llanrumney and Whitchurch; two small hoards at Fairwater, Llandaff and Cyncoed. The presence of such artefacts, in particular the two hoards suggest that Bronze Age communities within the Cardiff area were probably witnessing a time of crisis.

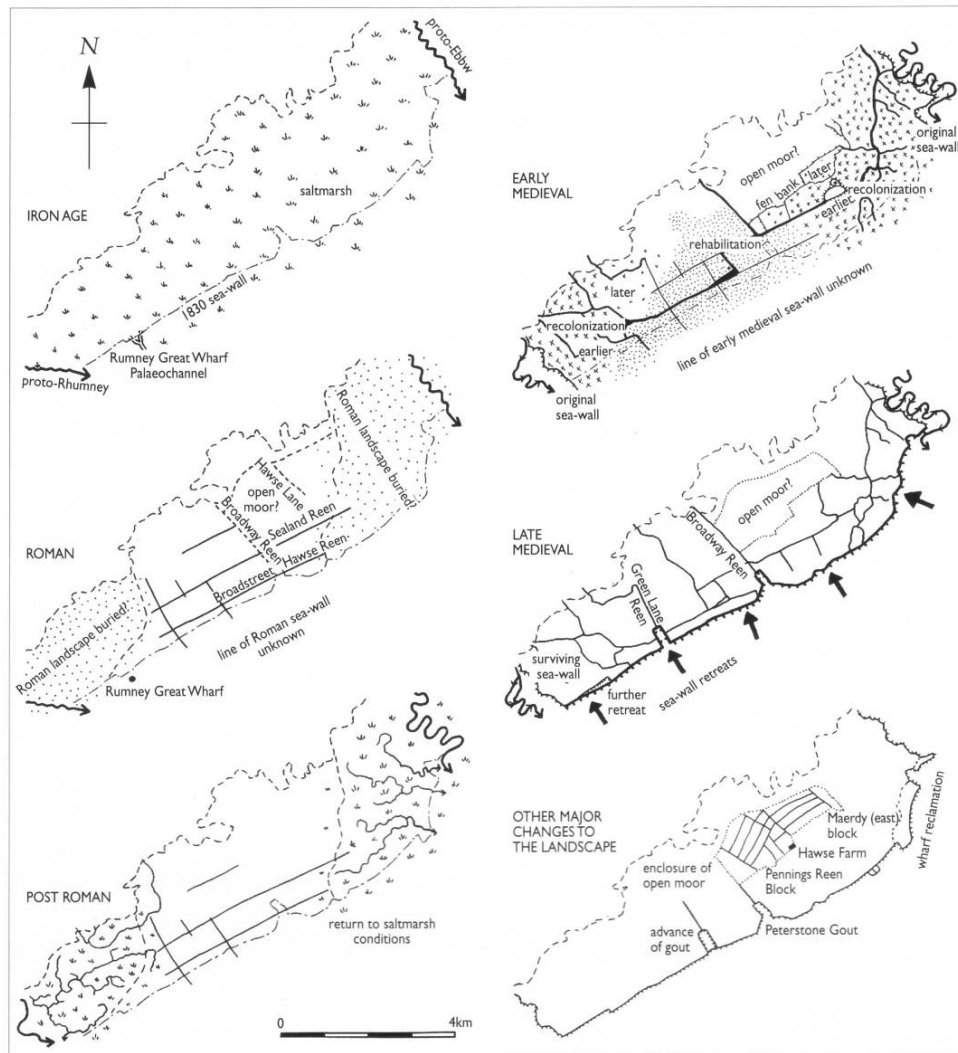
Approximately, 1 km NE of the site, on the eastern side of the Rhymney Estuary a watching brief discovered the remains of a fish trap. This significant discovery along with a small assemblage of flint was found in peat overlying a former palaeochannel near Rumney Great Wharf at 3.06m OD (Lewis 2005, 144). It is more probable that similar items exist along the foreshores either side of the estuary.

⁶ The chariot pole is evidence that horses become domesticated

⁷ Finds are now in the National Museum of Wales, Cardiff

⁸ See also Savory 1976 and Savory 1980.

Figure 2
Schematic representation of Gwent Levels landscapes as they developed over various epochs



From Register of Landscapes of Outstanding Historic Interest in Wales Cadw

5.1.4 Iron Age (c. 800 to 55 cal. BC)

Based on information supplied by the regional HER there are no Iron Age sites on or within the vicinity of the site. There are however up to five hill[forts] enclosures (all are designated Scheduled Monuments). These sites, dominate the hinterlands and coastal plains and include Caerau (NGR ST 136 750), Wenallt Camp (NGR ST 152 827), Caer Castell Camp (NGR ST 136 705), Castle Field Camp (NGR ST 059 699) and Llynda-Ddu Camp (NGR ST 108 809).

5.2 Roman activity

5.2.1 Outline of Roman presence in Cardiff

Initial Roman advances into South Wales met with much resistance from the Silures, and a fort may have been constructed as a forward base at Cardiff in the mid-50s AD. A second

fort was built on the east bank of the River Taff to control the east-west road (the modern A48 follows this at times) and river crossing, probably in the post-Boudiccan period. This fort was located to the northwest of the historic core of the present town, where the castle now stands. It was replaced during the later 1st and early 2nd century with smaller forts as the needs for a large garrison receded. Further fortification has been dated to the late 3rd century with probable abandonment in the late 4th century. Civilian settlement to service the needs of the military is likely, and evidence for iron working and pottery manufacture has been found in the centre of Cardiff (Howell and Dunning 2004). The city's name comes from this Roman fort (*Caer*) and its location on the Taff. The navigable nature of the Taff must have contributed to the strategic importance of the Roman fort and settlement at Cardiff.

5.2.2 *Potential Roman activity at Trident Park*

Detailed information on the Roman period closer to the application site is non-existent, but inference can be drawn from evidence elsewhere along the Gwent Levels. The site would have formed part of the estuarine marshes during the Roman period, probably with seasonal use for grazing, salt-making and other coastline-related activities such as fish-traps, boats and even burials. A series of sites were discovered during investigations as part of the South East Coastal Strategy Pipeline implemented by Welsh Water in 1999 – 2000 (Carew 2003; Bradley and Bond 2003), including drainage ditches and buried land surfaces indicative of Roman landscape management and enclosure. Some related evidence for domestic settlement was also found from the first centuries of Roman occupation, but substantial deposits of alluvium in the late Roman period were found to have sealed the archaeological remains. A Roman boat was found in 1993 at Barland's Farm, near Redwick, dated by associated pottery to the 3rd – 4th centuries, and reused as a landing stage (Nayling and McGrail 2004). Closer to the application site discoveries were made in 2006 at Trowbridge c.6km to the northeast of the application site, of a settlement and field system on the edge of the Wentlooge Levels which appeared to extend throughout the Roman period.

At Rhymney Great Wharf, 5km northeast of the application site, evidence for Roman surfaces and reens, the drainage system employed along the Levels, has been found, suggesting that the present day drainage pattern is of Roman origin, and unique in Britain (Allen and Fulford 1986; Cadw 1998, p.64). By analogy therefore, the alluvial sequence above the peat deposit recorded in borehole logs at the application site could contain surviving evidence for Roman period activity.

5.3 **Medieval and post-medieval activity**

As indicated above for the Roman period, medieval and post-medieval use of the Gwent Levels has been found by archaeological investigation, with various activities represented as communities adapted their use of the salt-flats to changing opportunities and environmental conditions. Ridge and furrow cultivation, ditched enclosures and field systems have been found cut into the upper parts of the alluvial sequence, and water borne activities continue to leave evidence in the form of organic remains preserved by water-logging (Carew 2003; Archaeology of the Severn Estuary 2006), whilst evidence for dumping, metallised surfaces and reclamation can be found from post-medieval times onwards. Although much of the Levels were Common land, it is clear that there was a substantial amount of continuity in use throughout these times (Cadw 1998, p.64).

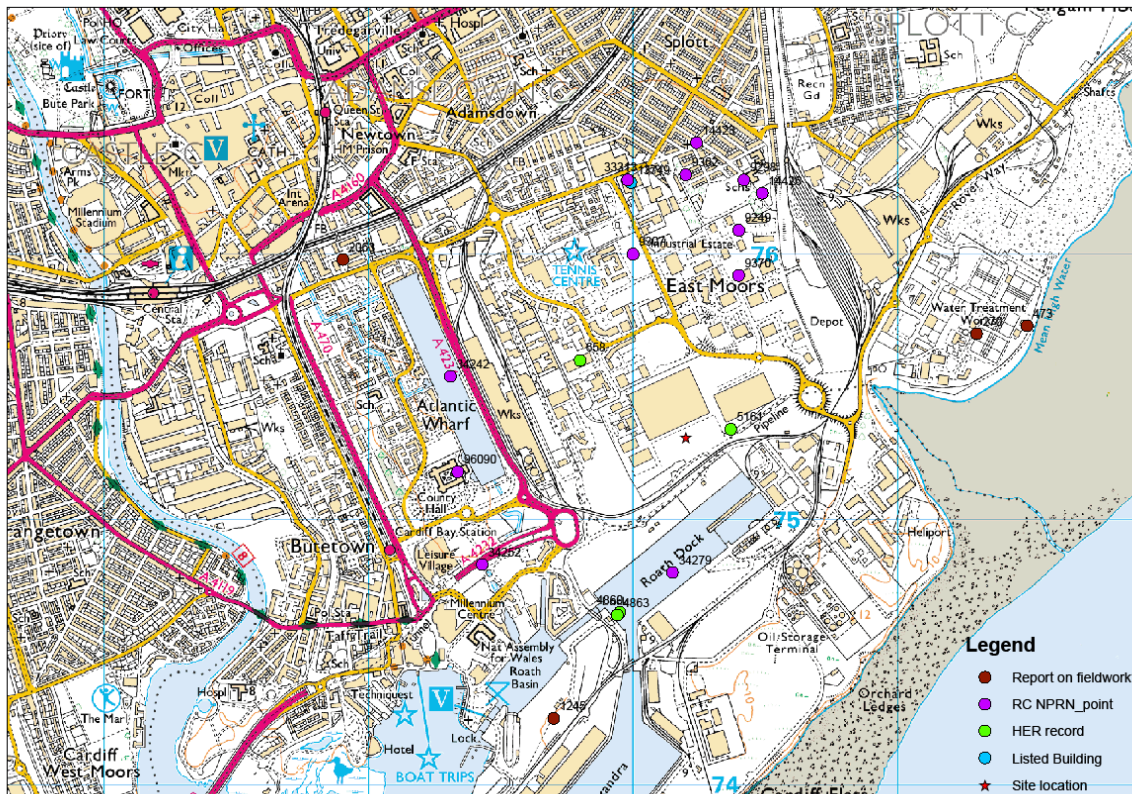
The LANDMAP technical report for Cardiff Unitary Authority (1999) identifies the Anglo-Norman settlement of the area, together with the Vale of Glamorgan, as being a distinctive cultural difference with the rest of Wales. The power of the Norman and later lords can be seen in the proliferation of castles, churches, civil organization and settlement pattern. LANDMAP also suggests that sea-defences around Cardiff and along the Gwent Levels probably derive from medieval or early post-medieval times.

5.4 Historic Environment Record and surveys

Consultation with Glamorgan Gwent Archaeological Trust’s Historic Environment Record has identified a small number of sites within 500m of Trident Park (Figure **). All but one of these sites, derived from Cadw, the Royal Commission for Archaeological and Historic Monuments (Wales) and GGAT’s own sources, are of listed buildings or features shown by Ordnance Survey historic mapping. The single exception is a Neolithic polished flint axe which was found just to the north of the application site, at Dowlais Steel Works in 1896, from a “peat bed” (HER 00159s).

In addition to these records, four reports on recent investigations and survey exist for a zone of 500m around Trident Park. Two are desk-based assessments of Roath basin and land off Tyndall Street (in Butetown 1km west of the application site) conducted in 2002 and 2006 respectively, whilst a third report is merely for a scheme of investigation. The final report describes the findings of a field survey in advance of Welsh Water’s construction of an outfall into the intertidal zone, conducted in 1997, 1k east of the application site. This field survey did not result in any archaeological finds being logged as entries within the HER.

Figure 3
Glamorgan Gwent Historic Environment Record finds, sites and events

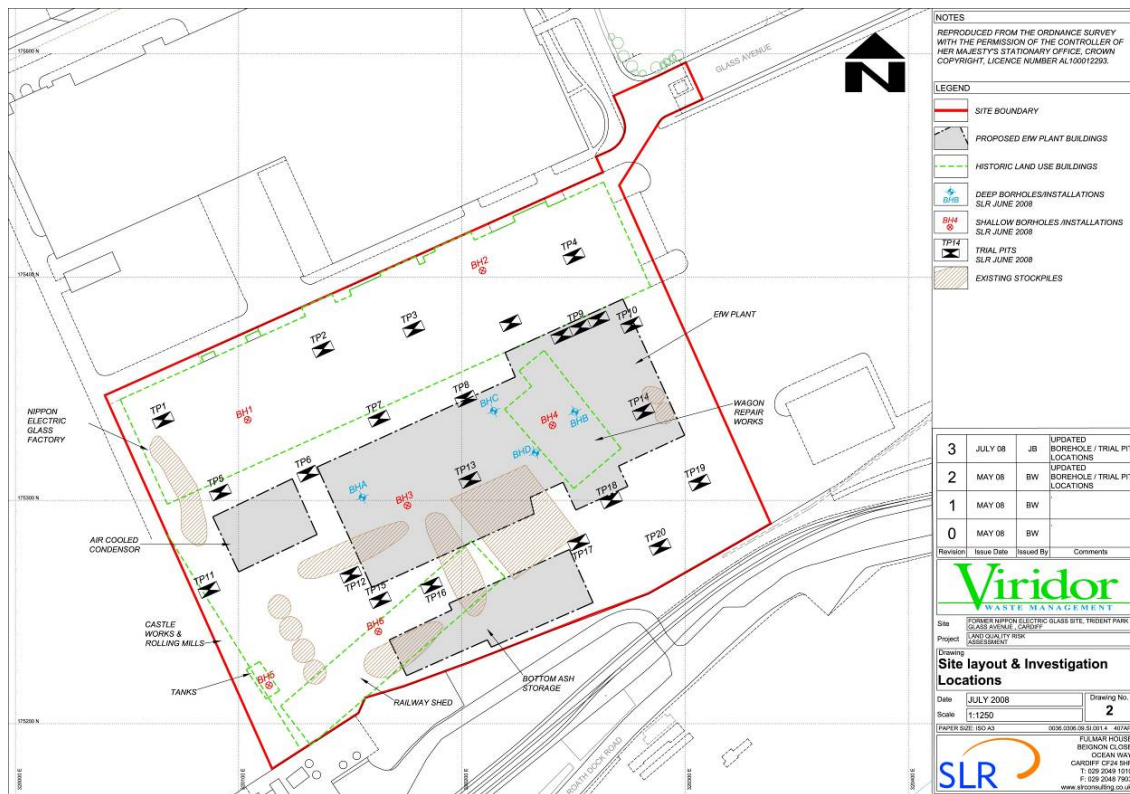


5.5 Sub-surface investigations

There have been no dedicated geotechnical surveys within Cardiff docks to investigate the potential for buried landscapes or on which to base predictive deposit modelling. Historic mapping would suggest that superficially the area of the docks and the application site has undergone major change during the past 150 years, but geotechnical borehole logs for Trident Park show that a deep sequence of alluvial deposits survives intact beneath the present day surface.

In 2008 SLR conducted a site investigation for ground stability purposes, consisting of 10 boreholes and 20 test-pits. The latter only extended to a depth of c.3m and did not penetrate below made ground. The boreholes however, went to depths from 4.5m - 28m, into the alluvial sequence and the bedrock Mercian Mudstone. These boreholes show the occurrence of a “brown plastic amorphous peat”, as well as pockets of peat and organic remains including wood (BHB) within the alluvial deposits of silty clays.

Figure 4
Location of geotechnical investigations at Trident Park



5.6 Designated sites

Although a large number of designated sites such as listed buildings exist (845), there are 27 scheduled monuments within the Cardiff Unitary Authority area, 16 registered parks and gardens, and several conservation areas. Those within 3km of Trident Park have been listed within chapter 12 of the ES, but their relevance to the current study has been scoped out through consultation with Cadw and GGAT.

Other designations of more relevance are Archaeologically Sensitive Areas (ASAs) and a Landscape of Outstanding Historic Interest in Wales. Of the four ASAs one comprises the Wentlooge levels, and this ASA is, in effect, a continuation and expansion of the Gwent Levels Landscape of Outstanding Historic Interest. The ASA lies c.1,5km northeast of the application site.

The LANDMAP technical report for Cardiff Unitary Authority (1999) identifies 30 Historic Landscape Areas. None of these however, include the docks and Trident Park. The Wentlooge Level is identified as part of a “landscape of international significance” defined as CHL012 Rumney Intertidal Zone. This largely corresponds with the ASA described above, and lies c.1.5km northeast of Trident Park.

6.0 HISTORICAL BACKGROUND TO CARDIFF DOCKS

6.1 Industrial development of the docks: chronological outline

Although the construction of the 25 mile long Glamorganshire Canal, opened in 1798, had provided an outlet for iron and coal from Merthyr Tydfil and the valleys via a basin and floating dock on the River Taff, the industrialisation of Cardiff, especially the docks, was largely the result of investment by the 2nd Marquis of Bute in the middle of the 19th century. An Act of Parliament was passed in 1830 to allow construction of the Bute Ship Canal, funded by the Marquis, which would provide better communications between the Glamorganshire Canal and the mouth of the River Taff; at that time the only manufacturing undertaken recently in the town was an iron foundry and a discontinued glass-works (Lewis 1833).

1839 Bute Ship Canal (later West Dock) opened; built on the orders of the Marquis of Bute

1841 Taff valley railway connected Cardiff docks with the iron and coal mines in the Glamorganshire valleys

1840 – 50 Irish immigration, major event

1845 – 55 Butetown constructed on reclaimed marshland; 2nd Marquis of Bute died 1848

1859 Bute East Dock opened

1874 Roath Basin opened

1886 Coal Exchange opened, located in the docks

1887 Roath Dock opened

1888 Dowlais Iron, Steel and Coal Co. leased land from the Bute Estate at East Moors to the north of the application site. The company transferred their production from Merthyr Tydfil to Cardiff, so that the new manufacturing plant could use imported ore from Spain, and easily export finished steel.

1907 Queen Alexandra Dock opened; Cardiff exported more cargo than either London or Liverpool

1913 Cardiff peak trade in coal: 10.7 million tons exported from the port

1919 Demobilisation and unemployment led to resentment at immigrant workers and race riots in Cardiff

1922 Great Western Railway takes over control of docks, buying out the Bute Estate; 122 shipping companies operate out of the port

1964 Bute West Dock closed; coal exports ceased

1970 Bute East Dock closed

1978 East Moors Steelworks closed and buildings on the application site were demolished

6.2 Trident Park: chronological outline

Originally an area of tidal flats, the Trident Park site became incorporated as part of Cardiff East Moors after construction of sea defences, possibly in the medieval period.

1891 Iron and steel manufacturing in western part of Trident Park site; Tarsis Copper and Sulphur Works to the east.

1902 Copper production ceased. East Moors Steel works expanded to include entire Trident Park site.

1978 Steel Works closed and demolition of most buildings had been completed by 1980.

1994 Nippon Electric Glass (NEG) factory and Schott glassworks were constructed on the application site. This was part of the Welsh Development Agency (WDA) regeneration programme for the docks. The area became known as Ocean Park.

2007 NEG/Schott glassworks closed and demolished

7.0 MAP REGRESSION AND INDUSTRIAL LAND-USE

The earliest mapping that shows Cardiff in any detail is John Speed's map of 1610. Trident Park is beyond the southeastern corner of this map, which does not show the East Moors or the shoreline.

Similarly John Wood's map of 1830 does not include the area of the present docks. A map dated 1851 however, held by the Record Office (DCH/23) shows the development of the docks in the southeastern corner of the map with the northern part of Bute East dock represented. Between these maps a map commissioned in 1839 (Q/D/P/50) for the development of Bute West Dock shows an extensive expanse of the docklands area laid out on a grid basis. No particular detail is given for the Trident Park site.

The 1st edition OS map of 1880 (1:2500 scale) and 1886 (1:10,560) shows the site on the edge of rough foreshore to the south, and a brick works to the north. Fields cover the north part of the site, with a drain issuing into the site. Various earth embankments are shown running north-south in the western part of the site, and west-east through the central part. On the northeastern side the Tarsis Copper Works are already in existence and from this a tramway cuts south through the application site to the foreshore. To the west lies the Glamorgan Lime Works, with a foundry, Tan and Resin Works, Wagon Works and Bute East Dock shown on the later map. The whole area is labelled as Cardiff East Moors.

The 2nd edition OS mapping of 1901 (1:2500 and 1:10,560 scales) show increased industrialisation with a complex network of railway lines running through the site (including an engine shed) connecting different parts of the docks with various works. Roath Dock has been constructed to the south, and is shown as a coal staith with a large number of crane and railhead locations, and surrounded by a timber yard. Tarsis Sulphur and Copper Works lies to the northeast, with Dowlais Iron and Steel works to the northwest. An access road from the east is labelled Roath Moor Road.

The OS mapping for 1919 – 1922 displays no significant change from the 2nd edition map, except that a north-south road along the eastern edge of the site (Lewis Road) connects with Roath Moor Road.

The 1942 1:2500 and the 1947 – 51 1:10,560 scale maps show that the Castle Works and Rolling Mills for Iron and Steel Works encroach into the western part of the application site. Rail or tram lines have been relaid on different alignments from the earlier mapping, and increased in number so that most of the site is covered by them. A new building on the southeastern corner of the application site is the Roath Engineering Works. The Tarsis Copper Works have been demolished and a blank space left, labelled as Cardiff East Moors. Beyond this area terraced housing can be seen to have migrated southwards of the east side of the former Copper Works. Roath Dock is still operating to the south, but the timber yard at its eastern end has been replaced by a flour mill. To the north of the site the East Moors Works has expanded its building and rail imprint as a major iron and steel works.

The 1950s mapping (1953-4 1:2500 and 1951 for 1:10,560 scales) show little significant change from the 1940s, except that ruins of the Tarsis Copper Works are depicted and a Wagon Repair Works has been built within the eastern part of the application site.

The 1960s mapping (1968-9 1:2500 and 1964-5 for the 1:10,560) shows little change except for infill of the previous Tarsis Copper Works site with what appears to be a conveyor system.

The 1970 – 75 1:10,560 OS map shows no change within or adjacent to the application site.

Mapping during the 1980s shows a cleared site with an access route from the southeastern corner at the junction of Lewis Road and Roath Moor Road. The western edge of the application site shows parts of the rolling mill works.

The 1999 OS 1:10,000 map shows the northern half of the application site filled by a long building oriented southwest – northeast. Around the site the infrastructure and nature of the surrounding landscape has changed considerably, with the laying out of a circuitous route (Ocean Way) and roundabout to the north and east, with Glass Avenues giving access to the site. The heavy industrialisation of the area has been replaced in part by other activities, such as the National Tennis Centre to the northwest, which occupies the former location of the iron and steel works. The rolling mill on the west side of the site has been replaced by a series of units. This pattern remains largely the same for the 2006 1:10,000 scale OS map.

8.0 HERITAGE VALUE ASSESSMENT

It is clear from the above baseline survey that there is a high probability of important archaeological landscapes lying buried beneath the made ground within the area of the application site. Remains from these landscapes date to several epochs, spanning thousands of years. In addition to archaeological evidence there is also the potential for significant palaeoenvironmental data, surviving as well-preserved organic fossils within the peat deposit, as well as possibly within the alluvial sequence. The discovery in 1896 of a Neolithic polished stone axe (c.3000 – 2500 BC) within the peat deposit at the adjacent Dowlais Steel Works emphasises the latent potential of the site for revealing deeply buried archaeological remains.

However, the area is not included within the Gwent Levels Landscape of Outstanding Historic Interest in Wales (Cadw 1998), described as the “*most significant example in Wales of a ‘hand-crafted’ landscape.... (with) a proven and possibly quite vast potential for extensive, well-preserved, buried, waterlogged archaeological and palaeoenvironmental deposits surviving from earlier landscapes*”. This designation does not provide statutory protection, but it does flag up the potential importance and sensitivity of the buried deposits to yield significant archaeological information if subject to archaeological investigation.

In terms of its heritage value, even though their existence has been masked by 19th and 20th century industrial expansion and therefore not included in the designated area, the buried alluvial and peat sequence at Trident Park is, in essence, a continuation of the Gwent Levels. By analogy therefore, the characteristics that have led to their landscape designation 3km further east at Rumney Great Wharf would argue for a similar understanding for the buried landscape at Cardiff Docks.

This analysis is also suggested by the LANDMAP technical report for Cardiff which highlights the richness of this archaeological resource:

“Recent work has shown that this historic landscape is rich not only in surviving earthworks and field patterns, but equally important in the remains of buried archaeology both in the intertidal zone and inland of the sea wall The protective blanket of alluvium, and the resulting waterlogged conditions, has allowed the excellent preservation of archaeological deposits and rare organic material”.

The Cadw funded GGAT report on *Urban Waterfronts in South-East Wales* (Howell and Dunning 2004) provides evidence for deeply stratified, waterlogged timbers surviving along a redundant course of the River Taff, and it suggests that there is high potential in the area south of the city centre for similar preservation and deposits (p.38):

“In addition, the smaller pills to the south of the city may have been attractive as temporary havens from the prehistoric period onwards, and like Newport, the possibility of the discovery of boats or ships cannot be ruled out. This area is also therefore considered to have a high potential”.

9.0 IMPACT ASSESSMENT

The EfW has been designed as a single building with a distinctive, high quality appearance, which is sustainable, environmentally friendly, and an exemplar waste management facility to last for 25 years. Full details are contained within chapter 4, Development Proposals, of the ES. In summary this building will be 229m long, 38 – 70m wide, and ranges in height from 7 – 29m to the apex of the roof. In addition a fin extends to 36m, whilst the stack rises to 90m with a 10m lightening conductor on top. Base ground level is at 9m AOD and the building will be orientated east-west.

Cadw has already stated that they have no concerns over the proposals, and therefore the indirect impact on settings of designated heritage assets will not be an issue. It is therefore the foundations and groundworks which will impact upon the potential archaeological resource buried beneath the existing 4m of made ground. These impacts consist of two elements discussed in the Geotechnical Constraints Report (SLR 2007):

- Piles for the heavy load-bearing parts of the facility which will be set into the hard geology of Mercian Mudstone >12m in depth
- Excavation of the waster storage bunker, with dimensions 70 x 16m and 12m deep

The resultant impact from the pile foundations and bunker will be destruction of c.1.3ha of the alluvial sequence, including peat deposit. The bunker will remove an estimated 8960 cubic metres of the alluvial sequence, whilst the direct impact of the pile foundations is unquantifiable at present because the final design for the foundations has yet to be agreed. Some of this area may already have been disturbed by previous piling for the NEG/Schott glassworks. Nonetheless it is likely that any pockets of the alluvial sequence that are left undisturbed by the piling, will have indirect impact from changes to the groundwater level and quality. This would probably lead to rapid decay of organic remains which have been preserved until now by the sealed anaerobic conditions of the site. The introduction of oxygen, for example, will introduce micro-bacterial activity and chemical changes which will pose significant threat to previously waterlogged archaeological and palaeoenvironmental remains.

Indirect impact to the buried deposits surrounding the application site could also result from changes to the burial environment and hydrological regime caused by the construction of the EfW plant. At present there is insufficient information to address this issue further.

The relatively recently discovered Newport Boat was problematic because the archaeological aspects of this development had not been considered of sufficient importance prior to discovery of the boat. This led to a high cost and long delays to the construction programme for the Theatre and Arts Centre. In the case of the Trident Park scheme this situation will be avoided through design of a fully integrated archaeological programme and its implementation in order to mitigate the impact of the development, which has been discussed and agreed in advance with Cardiff Council and their archaeological advisors.

10.0 MITIGATION

A mitigation strategy can be designed to alleviate some of the expected damage, by including within the excavation of the bunker a programme of archaeological direction and investigation. By proxy this can give valuable information which would also reflect the evidence from the deposits disturbed by piling.

The archaeological programme would consist of supervision of machine excavation until levels are reached which need to be archaeologically surveyed and sampled, after which machine excavation can proceed again until the next level of archaeological activity is observed. In this manner the alluvial sequence and peat deposit can be removed in an archaeologically beneficial method, and if valuable information survives within the deposits then this will be recorded and analysed, leading to a published report and dissemination of the findings.

In accordance with good practice, it is proposed that if planning permission is forthcoming, a detailed archaeological programme will be submitted and undertaken pursuant to any condition.

11.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Viridor Waste Management; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

12.0 SOURCES

12.1 General

Cadw 1998 *Register of Landscapes of Outstanding Historic Interest in Wales* Cadw Welsh Historic Monuments, Countryside Council for Wales, ICOMOS UK

Landmap: Cardiff Unitary Authority technical report

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APPENDIX A

Cardiff Council scoping response

My Ref: PJV/GC/11:2:17
Your Ref: 402.0036.00306

Date : 27th December 2007



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FAO - Will Ryan

Dear Sirs

Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 Request for Scoping Opinion for Proposed Energy from Waste Facility and Ancillary Development at Trident Park, Glass Avenue, Cardiff

I refer to your letter dated 24th October 2007 requesting a "scoping opinion" under the above Regulations.

Following consultation with the appropriate bodies, I would provide the following formal scoping opinion :

- (i) Paragraph 2.7 – 2.9 should state the number of the relevant planning permissions and the date of approval.
- (ii) It is considered that the proposed headings on Section 4 (environmental considerations) adequately cover the range of potential impacts of the proposed development. I would comment on the individual topics as follows :
 - (1) Air Quality and (4) Noise – I enclose the comments of the Countryside Council for Wales (CCW) and the Environment Agency (EA) which include reference to air quality and noise issues. However, I have not received a response from the Council's Pollution Control Division. If I receive any comments, I will forward them to you.
 - (2) Landscape and visual impact – see letter from CCW.
 - (3) Transportation – the Operational Manager Transportation has advised that, in addition to the Glass Avenue roundabout and the Nettlefold Road / Ocean Way junction, the transport assessment (TA) should examine the impact on the East Tyndall Street / Ocean Way and the Rover Way / Ocean Way roundabouts. As he advises that in the event of planning permission being granted, a planning condition may be considered necessary to require all traffic generated by the proposed facility to use the Rover Way approach, the TA should study the impact of all the generated traffic using the Ocean Way / Rover Way roundabout.
 - (5) Ground conditions and (6) Water Environment – See enclosed letters from the CCW and the FA. I would reiterate that no response has yet

APPENDIX B

Cadw scoping response letter



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Mr P J Vaughan
Cardiff County Council
County Hall
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CF10 4UW

Ffôn cyfeirnod Your reference	PJW/EF11:2:17
Elin cyfeirnod Our reference	A-CAM11-05-0062-00
Dyddiad Date	14 November 2007
Llinell unangyhoed Direct line	01443 33 6049
E-bost Email	Julie.Hill2@wales.gov.uk

Dear Mr Vaughan

REQUEST FOR A SCOPING OPINION FOR PROPOSED ENERGY FROM WASTE FACILITY AND ANCILLARY DEVELOPMENT AT TRIDENT PARK, GLASS AVENUE, CARDIFF

Thank you for your letter of 31 October 2007 inviting Cadw's comments on the above.

I can confirm that there are no scheduled ancient monuments, historic parks and gardens or historic landscapes affected by this proposal. Cadw therefore, does not have any concerns to raise in respect of the above.

I hope this information is of assistance.

Yours sincerely

Mrs Julie Hill
Gweinyddu Henblon / Ancient Monuments Administration

