



PROPOSED SOLAR FARM, BARRY DOCK, WALES

FLOOD CONSEQUENCES ASSESSMENT

ABPmer

SEPTEMBER 2014



PFA Consulting
Stratton Park House
Wanborough Road
Swindon
SN3 4HG

Tel: 01793 828000
Fax: 01793 835500
Email: admin@pfapl.com
Web: www.pfapl.com

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1. INTRODUCTION

- 1.1. This Flood Consequences Assessment has been prepared on behalf of ABPmer in connection with proposals for the development of a Solar Photovoltaic (PV) Farm which could produce up to 10 MW of power on land at the Port of Barry, Barry, Glamorgan.
- 1.2. The site is situated adjacent to the Bristol Channel on the south eastern side of the town of Barry, south east of Number 2 Dock within the Port of Barry which is operated by the Associated British Ports (ABP). The extent of the site is shown on **Figure 1** below. The site extends to approximately 16.5 hectares in area and is in area of brownfield land containing an inert waste recycling operation, an unoccupied coal yard and some areas of scrub vegetation.

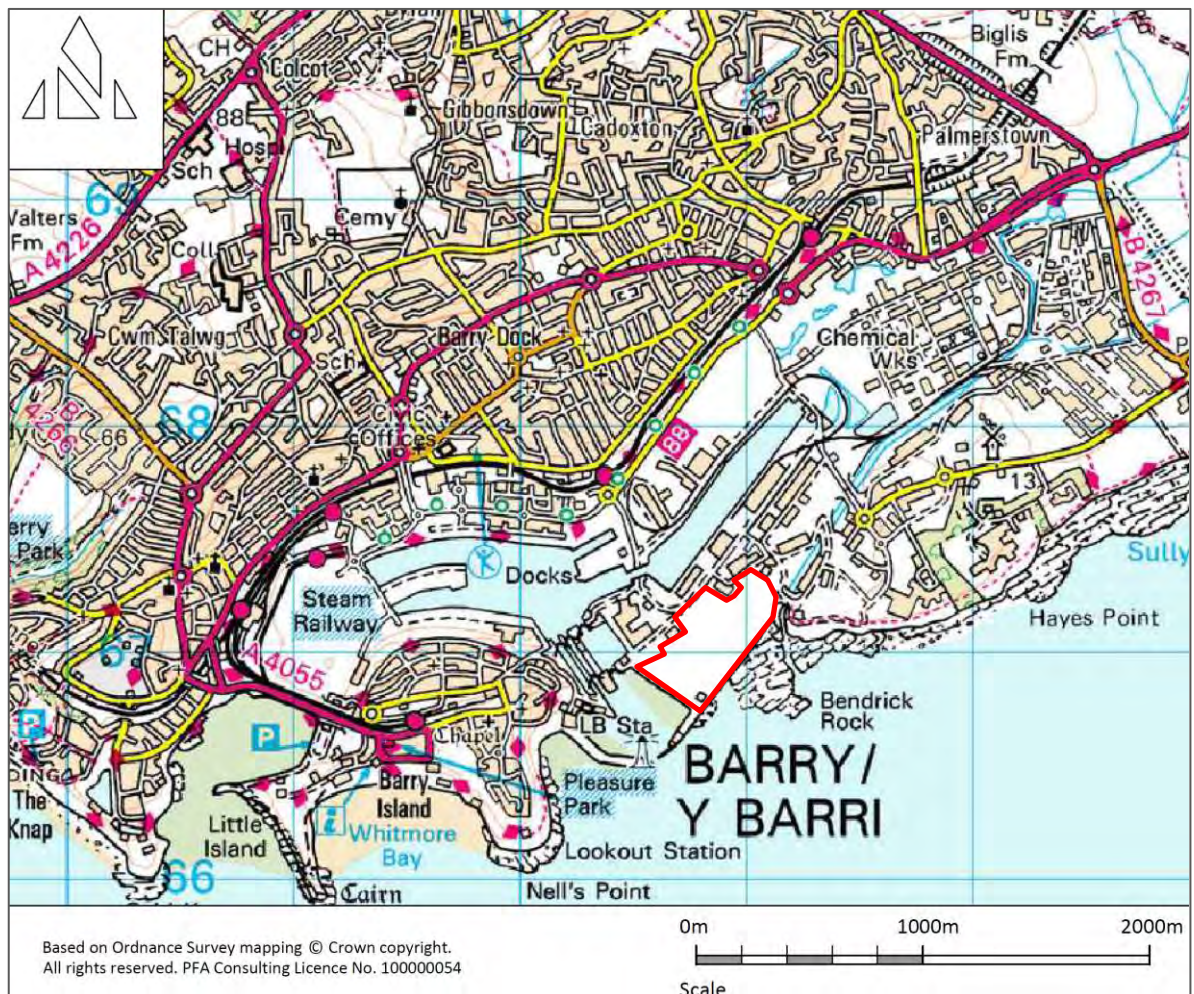


Figure 1: Site Location Plan

- 1.3. The development proposals comprise the construction of a Solar Farm consisting of photovoltaic modules mounted on metal frames, with associated site infrastructure and ancillary control equipment. An Indicative Site Layout is reproduced in **Appendix 1**.
- 1.4. The main purpose of this Flood Consequences Assessment is to provide sufficient flood risk information to support a planning application for the development proposals and to demonstrate that the development would be appropriately safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere.

2. SCOPE OF THE ASSESSMENT

National Planning Policy

- 2.1. Planning Policy Wales (PPW) 6th Edition was published by the Welsh Government in February 2014 and provides an overview of the planning system in Wales. It identifies that flood risk is a material consideration in land use planning. Paragraph 13.4.2 states that Local Planning Authorities should ensure that development does not:
- Increase the risk of flooding elsewhere by loss of flood storage or flood flow route; or
 - Increase the problem of surface water runoff.
- 2.2. PPW is supplemented by a series of Technical Advice Notes. Technical Advice Note 15 (TAN15): Development and Flood Risk, published in July 2004, sets out the Welsh Assembly Government's policy on development and flood risk.
- 2.3. TAN 15 sets out a precautionary framework to guide planning decisions for new development in areas at high risk of flooding with the aim to direct new development away from those areas which are at high risk of flooding. Paragraph 7.2 of TAN 15 states that whether a development should proceed or not will depend upon whether the consequences of flooding of that development can be managed down to a level which is acceptable for the nature/type of development being proposed, including its effects on existing development. Appendix 1 of TAN 15 provides guidance on the technical requirements for undertaking an assessment of potential consequence of a flooding event.
- 2.4. TAN15 categorises Wales into three Zones (A, B and C) based on their risk of flooding. The Welsh Government (WAG) published its Development Advice Map (DAM) determines when flood risk issues need to be taken into account in planning future development. The maps are based on the Environment Agency's extreme flood outlines (Zone C) and the British Geological Survey drift data (Zone B). An extract from the Welsh Government Development Advice Map obtained from its website, which shows the Flood Zones in the vicinity of the site, is reproduced as **Figure 2** below. The application site lies within Flood Zones A, B and C2.

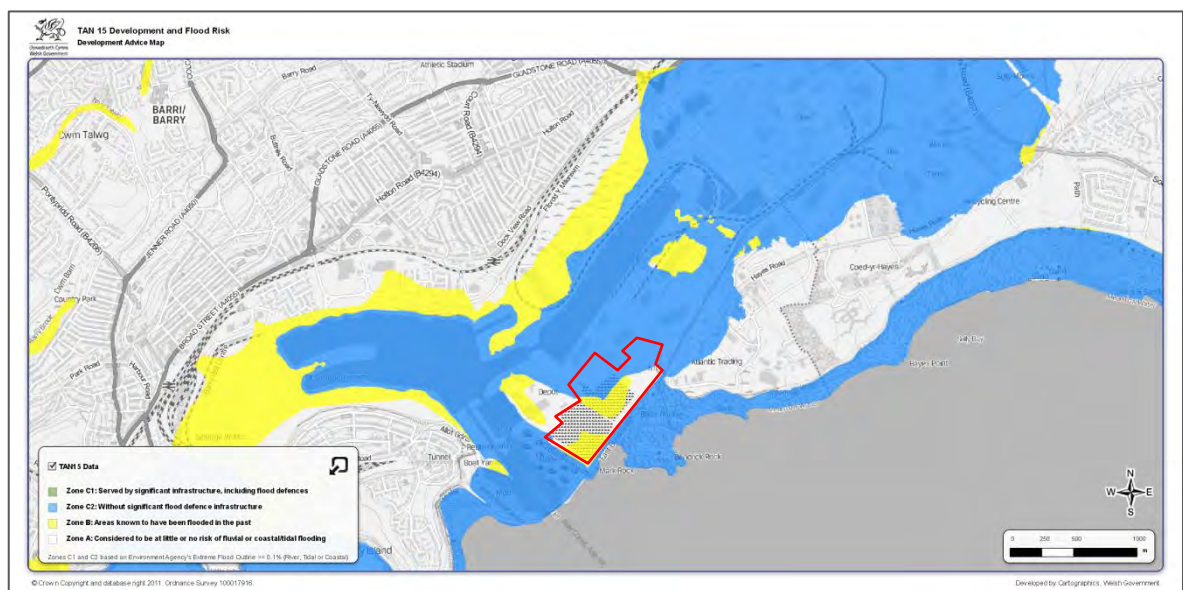


Figure 2: Welsh Government's Development Advice Map

2.5. Figure 1 within TAN15 describes each Zone and the implications with respect to flood risk management. Flood Zone A is considered to be at little or no risk of fluvial or tidal/coastal flooding and the justification test is not applicable for development in Zone A. Flood Zone B are areas known to have been flooded in the past evidenced by sedimentary deposits. Site levels need to be checked against the extreme (0.1%) flood level to determine if flood risk needs to be considered further. Flood Zone C2 is defined as areas of floodplain without significant flood defence infrastructure and should be used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences.

2.6. TAN 15 recognises the need for the assessment of the source of potential flooding from rivers, tidal, coastal, groundwater, surface water or any combination of these. Paragraph A1.17 contained in Appendix 1 of TAN 15 notes that the detail and technical complexity of an assessment of flood consequences will reflect the scale and potential significance of the development.

2.7. Paragraph 13.4.1 of PPW states that:

“Development proposals in areas defined as being of high flood hazard should only be considered where:

- **new development can be justified in that location, even though it is likely to be at risk from flooding; and**
- **the development proposal would not result in the intensification of existing development which may itself be at risk; and**
- **new development would not increase the potential adverse impacts of a flood event”**

2.8. Paragraph 8.3 in TAN 15 specifically states that development should not increase the risk of flooding elsewhere and that the aim of new development should be not to create additional run-off when compared with the undeveloped situation.

Local Planning Policy

2.9. The Adopted Unitary Development Plan 1996 – 2011 was adopted by the Vale of Glamorgan Council in April 2005. It remains the development plan for the district and contains several policies relevant to this assessment.

2.10. Policy ENV7: Water Resources states:

“River, other inland water and underground water resources will be safeguarded. Developments which improve the water environment or help to prevent flooding will be favoured. Development will be permitted where it would not:

i) Have an unacceptable effect on the quality or quantity of water resources or on fisheries, nature or heritage conservation, recreation or other amenity interests related to such waters;

or

ii) Be potentially at risk from flooding, or increase the risk of flooding locally or elsewhere to an unacceptable level.”

2.11. The Vale of Glamorgan Local Development Plan 2011 – 2026 is currently emerging and the Deposit Plan Written Statement was published in November 2013. This contains several draft policies which are relevant to this assessment.

2.12. Draft Policy MD 1 – Location of New Development:

“To ensure that new development on unallocated sites assists in delivering the strategy, development will be favoured where it:

8. Provides a positive context for the management of the water environment by minimising or avoiding areas of flood risk and safeguards resources;”

2.13. Draft Policy MD 8 – Environmental Protection

“development proposals will be required to demonstrate they will not result in an unacceptable impact on people, residential amenity, property and / or the natural environment from either:

5. Flood Risk and Consequences;

Where impacts are identified the council will require applicants to demonstrate that appropriate measures can be taken to minimise the impact identified to an acceptable level. Planning conditions may be imposed or legal obligation entered into, to secure any necessary mitigation and monitoring processes.”

Development Category

2.14. Figure 2 of TAN 15 sets the vulnerability of different land uses to flooding. Less vulnerable development describes development where the ability of occupants to decide on whether they wish to accept such risks is greater than that in the highly vulnerable category. It is considered that a Solar Farm development falls under the less vulnerable development category which includes utilities infrastructure.

TAN 15 Planning Requirements

2.15. TAN 15 sets out a precautionary framework to guide planning decisions with respect to new developments in areas at high risk of flooding.

2.16. TAN 15 states that the:

“Overarching aim of the precautionary framework is, in order of preference, to:-

- **Direct new development away from those areas which are at high risk of flooding.**
- **Where development has to be considered in high risk areas (zone C) only those developments which can be justified on the basis of tests outlined in section 6 and section 7 are located within such areas.”**

Justification Test

2.17. Section 6 of TAN 15 sets out the justification test which should be passed if development is proposed in Zones C1 and C2. TAN15 states:

“Development, including transport infrastructure, will only be justified if it can be demonstrated that:-

- i. **Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or,**

ii. Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

and,

iii. It concurs with the aims of PPW and meets the definition of previously developed land (PPW Fig 4.3); and,

iv. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable.”

2.18. With respect to points i and ii above the emerging Local Development Plan 2011 – 2026 designates Barry as a regeneration area. The adopted Unitary Development Plan 1996 – 2011 further supports this with paragraph 1.8.7 puts an emphasis on the regeneration of Barry Docks. Furthermore, Policy ENV 25 – Regeneration of Urban Areas in the Adopted Unitary Development Plan 1996 – 2011 states:

“Measures to improve the environmental quality of the urban fabric will be favoured with priority being given to older urban areas and housing estates. Particular attention will be given to the regeneration of derelict or degraded land especially within the former dockland of Barry and Penarth.”

2.19. Thus, it is considered the application site is on an area of underutilised and derelict land within an operational port and that the proposed development has the potential to enhance the site supporting the objectives for regeneration of land around Barry Docks. Therefore the requirements of points i. and ii. of the TAN 15 Justification Test are satisfied.

2.20. The proposed development site falls under the definition of previously developed land as described in PPW due to its former use as an inert landfill site, coal yard and light industrial and storage uses.

2.21. With respect to point iv. above the conclusions and residual risk section of this Flood Consequences Assessment demonstrate that the consequences of a flood event for the proposed development is acceptable.

2.22. Based on the information above, and the conclusions of this report, the proposed development is justified in Flood Zone C2 and the requirements of the TAN 15 Justification Test have been satisfied.

Report Scope

2.23. The scope of this Flood Consequences Assessment is therefore to provide sufficient information to satisfy the relevant requirements of PPW, TAN 15 and local planning policy.

3. FLOOD CONSEQUENCES ASSESSMENT

Site Description and Hydrological Context

- 3.1. The Ordnance Survey map of the area shows geographical features including watercourses and other bodies of water.
- 3.2. The site is located on the south eastern side of Barry Docks. Breakwaters extend to the south west of the site into the Bristol Channel / Severn Estuary. A rocky embankment forms the southern and south west boundaries of the site.
- 3.3. A natural rocky platform extends into the Bristol Channel / Severn Estuary on the south eastern boundary. This area of foreshore is part of the Hayes Point to Bendrick Rock Site of Special Scientific Interest (SSSI). The site is protected for its geological significance.
- 3.4. The Cadoxton River runs along the application site's south eastern boundary and is classified as a 'Main River'. A sluice gate (known as the Cadoxton Sea Outfall) is present at the mouth of the Cadoxton River. NRW have confirmed this structure provides a standard of protection of approximately 1 in 50 (2%). An image of the sluice gate and the Cadoxton River embankment is shown on **Figure 3** below.



Figure 3: Cadoxton Sea Outfall (sluice gate) and the Cadoxton River embankment

- 3.5. The site itself is rough ground containing areas of bare earth and areas of scrub vegetation. An inert waste recycling facility occupies the southern sector and a former coal yard occupies the northern sector of the site. A number of industrial buildings / sheds and Port infrastructure are in the vicinity of the site.
- 3.6. Below ground services are present in and around the application site with the majority restricted to the Atlantic Crescent and Atlantic Way roads. A Welsh Water sewer crosses the northern sector of the application site and outfalls into the Cadoxton River. The topographical survey does not identify any below ground below ground sewerage and drainage infrastructure in the southern sector. The location and approximate route of the below ground services are identified on the topographical survey, contained in **Appendix 2**.
- 3.7. At present any excess rainfall which does not infiltrate into the soil will pool onsite in any localised depressions and / or will follow the topography of the land and run overland, and be intercepted by the Dock's highway drainage system, and discharge into the Bristol Channel or Dock 2.

- 3.8. Natural Resources Wales (NRW) provided extreme sea levels in the vicinity of the site. The extreme sea levels comprise still water level including storm surge, however they do not account for local wave action. The extreme sea levels (taking into account the 95% confidence bound as a precaution) are shown in **Table A** below. The baseline estimations are for the year 2008 and sea level rise has to be taken into account. The approximate lifespan of the proposed development is 25 years and tide and sea levels have been adjusted to take into account climate change in the **Table A** below. A copy of NRW consultation response is reproduced in **Appendix 3**.

Table A: Extreme sea levels for the site (including 95% Confidence Bound) (m AOD)

Year	T25	T50	T75	T100	T200	T1000
2014	7.4	7.5	7.7	7.8	8.0	8.6
2039	7.6	7.70	7.9	7.9	8.1	8.7

Site Levels

- 3.9. The site is split into two sectors. The southern sector of the site is banked up from the surrounding land. The bottom of the bank is at a level of 8.0m AOD and rises to approximately 14.0m AOD. The gradient of the embankment is approximately 1 in 1.6. The top of the embankment is a plateau and predominately flat with small localised hollows due to its former use as an inert landfill site. The southern sector of the site is situated above the 1 in 1000 year flood level.
- 3.10. The northern sector of the site is predominately flat and the level ranges between approximately 7.5 – 9.0 m AOD. The gradient of the northern sector is approximately 1 in 85m AOD. The northern sector is presently above the 1 in 50 year flood level. A copy of the Topographical Survey is contained in Appendix 2.
- 3.11. The potential existing overland flow routes have been identified based on the site’s topography. These are marked on drawing number A251/03 which is based on the topographical survey of the site and reproduced in **Appendix 4**.

Ground Conditions

- 3.12. The British Geological Survey[®] NERC (2014) online geological mapping indicates that the majority application site is underlain by Tidal Flat Superficial Deposits (Clay, Silt and Sand) and entirely underlain by Mercia Mudstone Group (marginal Facies) - Conglomerate bedrock.
- 3.13. From an inspection of the Environment Agency’s Aquifer Designation Map on its website the site is underlain by Principal Aquifer bedrock and an area of Secondary Undifferentiated superficial aquifer. A ‘Principal’ Aquifer is classified as layers of rock or drift deposits that usually provide a high level of water storage. A ‘Secondary Undifferentiated’ Aquifer has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- 3.14. From an inspection of the Environment Agency’s Groundwater Source Protection Zone Map the site does not lie within a Groundwater Source Protection Zone.
- 3.15. The southern sector of site is a former landfill site and the underlying ground conditions would have been disturbed and capped with a layer of sub soil. The last waste deposited on the landfill site was in 1994.

Definition of the Flood Hazard and Probability

Sources of Information

- 3.16. A Preliminary Flood Risk Assessment (PFRA) was published by Vale of Glamorgan Council in June 2011. This aims to provide a high level overview of flood risk from local flood sources, including surface water, groundwater, ordinary watercourses, canals and lakes. The Vale of Glamorgan Council published its Local Flood Risk Management Strategy in December 2011 which assesses 'local flood risk' and devises a strategy to manage the flood risks identified within the county borough.
- 3.17. On 01 April 2013 Natural Resources Wales took over the work of the Environment Agency Wales. However, in the interim period the majority of the modelling procedures and flood risk data are still listed on the Environment Agency's website. In the absence of specific guidance for developments in Wales, Environment Agency information has been referenced throughout this report.
- 3.18. The Environment Agency's interactive Flood Hazard Maps, published on its website, show the risk of flooding from rivers and sea, from reservoirs, and from surface water, and indicate the extent, depth and velocity of water for a number of scenarios. These are not suitable for land-use planning and the Flood Map for Planning and Development Advice Map needs to be used for this purpose. Nonetheless these Flood Hazard Maps contain information which needs to be taken into account as part of a Flood Consequences Assessment.
- 3.19. Enquiries have been made to Natural Resources Wales (NRW) to obtain: the detailed flood map for the of the area; the latest available modelled tidal flood levels for the vicinity of the site; the modelled flood extents; details of historic flood events; and local flood history data from all sources of flooding. A copy of the NRW's response, including copies of the detailed Flood Map, and modelled data, are reproduced in Appendix 3.

Flooding from Watercourses and Sea

- 3.20. The Natural Resources Wales' current flood map, reproduced in **Figure 4** below, shows the Flood Zones in the vicinity of the site, identifies that the majority of the site lies within Flood Zone 1. This is defined as the zone with the lowest probability of flooding from rivers and the sea. Small areas of Flood Zones 2 and 3 are present around the edge of the development site associated with the Cadoxton River and tidal flooding. These are areas at higher risk of flooding from Rivers and Sea.
- 3.21. Flood Zone 2 extends into the site which is defined as areas of land having between a 1 in 200 and 1 in 1000 annual probability of sea flooding and land having between a 1 in 100 and 1 in 1000 annual probability of river flooding¹. It should be noted that Flood Zones 2 and 3 are based on an undefended scenario. The extent of flood zones are plotted on drawing A251/03 reproduced in Appendix 4. It should be noted that the flood map is continually being updated and therefore the extent of the extreme flood outline will differ from the published DAM.

¹ Environment Agency (2014) http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=query&floodrisk=1.4&lang=_e&topic=floodmap&floodX=313108&floodY=167394

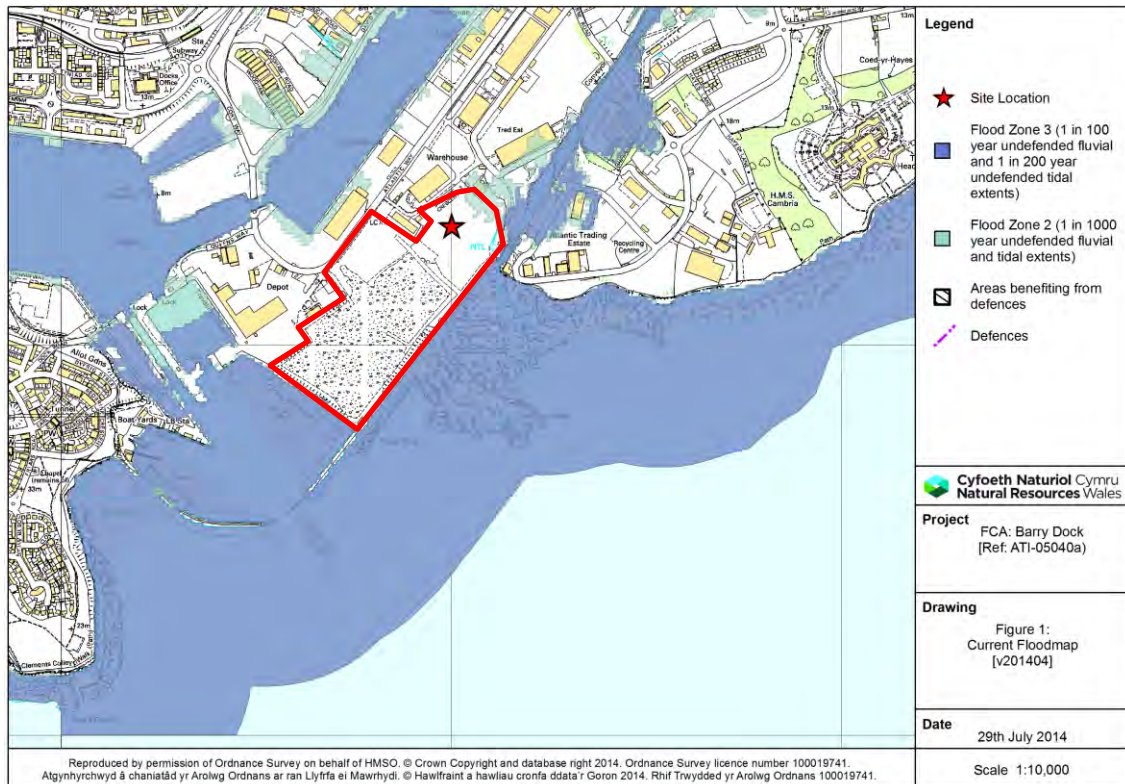


Figure 4: Environment Agency's Flood Map for Planning

- 3.22. The majority of the application site is at a level greater than the 1 in 1000 year (including an allowance for climate change) tidal flood level. A low point is present adjacent to the Cadoxton River in the northern sector of the site and during instances of extreme tides, flood waters would inundate the lower levels of the site.
- 3.23. NRW have not provided any indication of the effect of wave action during extreme tides. The majority of the application site is significantly above the extreme (1 in 1000 year + climate change) tide level. For example, typical ground levels in the southern plateau are approximately 10 – 13m AOD, which is 1 – 4m above the extreme tide level. It is considered the natural lie of the land provides adequate protection against wave action for the majority of the application site. It is considered that wave action affecting the northern sector of the development is not a significant issue as wave energy would be reduced as it inundates and spreads out over the flat area of the site.
- 3.24. The application site falls along a stretch of coastline which is subject to a Shoreline Management Plan (SMP). This is a large scale assessment of the coastline and identifies the risks to the developed, historic, and natural environments as the coast changes. The site is within Policy Unit Barry Island & Docks (2) in the Lavernock Point to St Ann's Head SMP. The policy for this stretch of coastline is to 'hold the line' for the next 100 years which aims for existing defences to be maintained and replaced along their current alignment.

Flooding from Surface Water

- 3.25. The Environment Agency's Risk of Flooding from Surface Water Map indicates where surface water may be expected to flood or pond. Surface water flooding happens when rainwater does not drain away through normal drainage system or soak into the ground, but lies on or flows over the ground instead. A copy of the Environment Agency's Risk of Flooding from Surface Water Map is reproduced in **Figure 5** below.

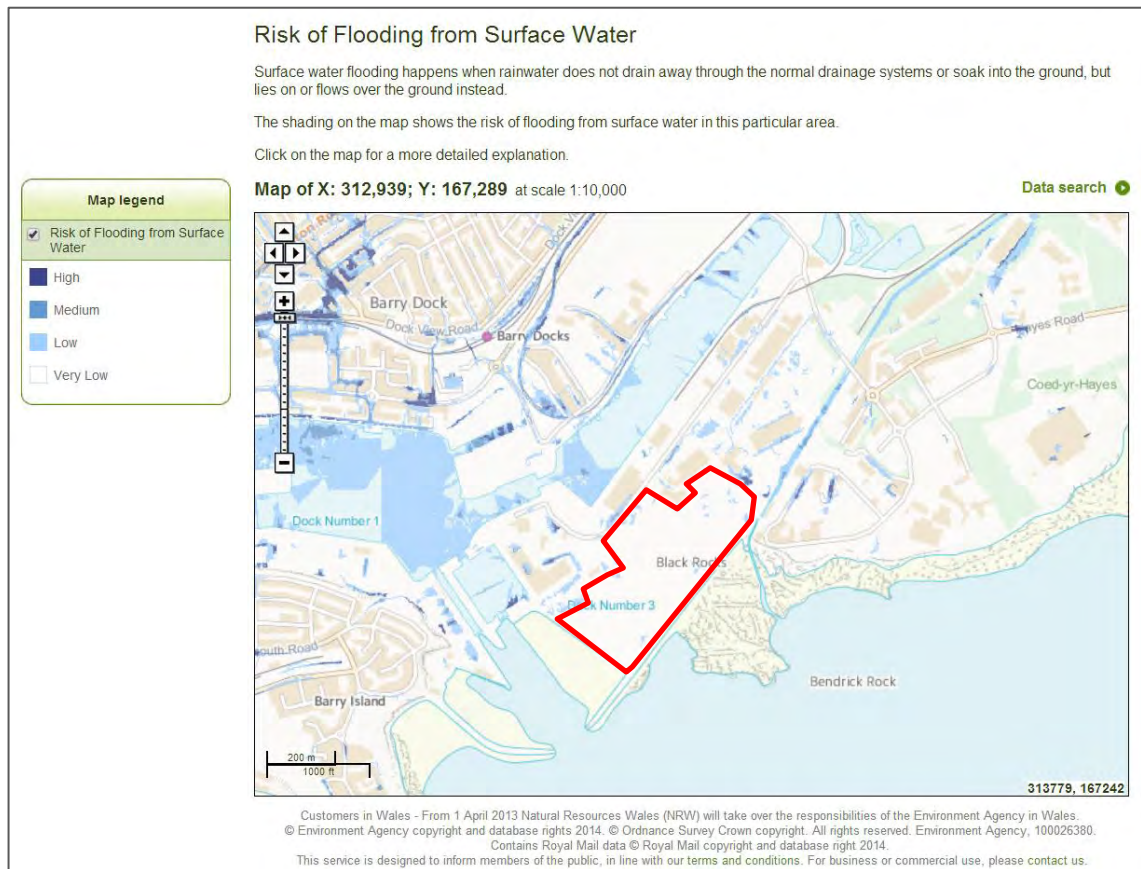


Figure 5: Environment Agency Risk of Flooding from Surface Water Map

3.26. The Risk of Flooding from Surface Water Map shows that the majority of the site lies in an area with a low chance of surface water flooding. Small areas of higher risk are associated with existing topographical depressions within the site and the channel of the Cadoxton River.

Flooding from Other Sources

3.27. No incidence of flooding from overwhelmed sewers and drainage systems affecting the site have been identified. The majority of the ABP Barry Docks development is not on mains sewerage and discharges to septic tanks.

3.28. The Environment Agency’s Risk of Flooding from Reservoirs Map indicates the site is not at risk of flooding from reservoir breaching.

3.29. The Local Flood Risk Management Strategy identifies that localised groundwater flooding has occurred in Barry. It also recognises that the site falls into two different risk categories, “<25% of the area has a geology susceptible to groundwater emergence” and “25-50% of the area’s geology is susceptible to groundwater emergence”. This mapping does not identify where groundwater emergence will occur only the presence of susceptible geology. The disturbed nature of the site’s underlying geology from its former use as a landfill suggests risk of groundwater emergence affecting the site is very low.

3.30. The PFRA does not identify any incidences of historic flooding within the vicinity of Barry Dock. Vale of Glamorgan Council have confirmed that they do not hold any records of flooding in the vicinity of the application site. A copy of Vale of Glamorgan Council’s consultation response is reproduced in **Appendix 5**.

- 3.31. NRW do not hold any historic flood information for the site or nearby vicinity. A copy of their consultation response is contained in Appendix 3.
- 3.32. A summary of the potential risk from all sources of flooding associated with the existing pre-development conditions is shown in **Table B** below.

Table B: Pre-development Potential Flood Risk from All Sources of Flooding

Flood Source	Potential Risk				Description
	Very Low	Low	Medium	High	
Watercourses and Sea	X			X ^a	The site is located in Flood Zone A, B and C2. The area of greater risk from extreme tidal flooding extends into the northern sector of the site. Majority of southern sector of the development is raised above the extreme tidal flood event.
Surface Water		X			The topography of the land indicates that any overland flow would be directed away from the site into the Bristol Channel or Dock 2.
Groundwater	X				No incidences of groundwater emergence have been reported on the site and the disturbed geology as a result of the site's former uses suggest risk of groundwater emergence is low.
Overwhelmed Sewers		X			Site contains sewerage infrastructure but no records of sewer flooding have been identified.
Artificial Sources	X				None identified.

Notes: ^a Area of high risk restricted to the lower area in the northern sector of the development site.

- 3.33. The pre-development potential flood risk to the site from all sources of flooding is considered to be generally low, but is a very small area at the north eastern edge is presently high. It is therefore considered that the 'most likely' cause of potential other flooding affecting the majority of the site would be extreme rainfall falling on the sub-catchment area exceeding the underlying ground's natural infiltration rate or capacity, leading to an increase in the volume and rate of runoff and resulting in overland flood flows and ponding at localised low spots. The 'greatest risk' posed to the development site is extreme high tides overwhelming the lower areas of the application site (in the northern sector).

The Development Proposals

- 3.34. The development proposals comprise the construction of a Solar Farm consisting of photovoltaic (PV) modules mounted on metal frames (known as arrays), with associated site infrastructure and ancillary control equipment. An Indicative Site Layout is reproduced in Appendix 1.
- 3.35. Due to the rough nature of the existing ground the site some 'levelling' will take place. There is potential for grass seeding to allow grass sward to ground around and underneath the panels. The frames have a minimal cross-sectional area and will sit on concrete 'ballast pad' footings to avoid excavation into previously disturbed ground. The concrete footings will sit on top of the existing ground, either areas of vegetation or compacted bare earth.

- 3.36. The array of panels will be situated in rows running from east to west, south facing inclined at an angle of approximately 25 degrees from the horizontal, with an approximate 6m separation between lines of panels. Each frame typically contains four rows of PV panels separated by a horizontal 'rainwater' gaps. This gap allows rainwater to drain freely to the ground beneath and between the PV panels, replicating the existing pre-development scenario. The lower edge of the panels will be a minimum of 0.8m above ground level. **Figure 6** shows a typical cross section of a Solar Array.

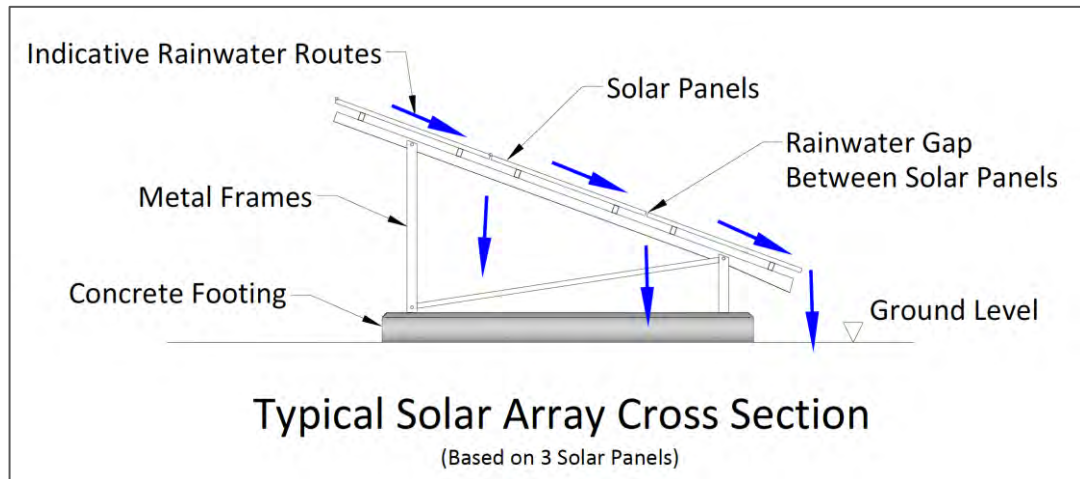


Figure 6 – Typical Solar Array Cross Section

Note: Based on four PV panels per frame.

- 3.37. Any access tracks will be formed using permeable materials (open graded stone or reinforced grass) so as to avoid creating impermeable areas across the site.
- 3.38. Ancillary equipment will be contained in small buildings, typically Glass Reinforced Plastic (GRP) kiosks. Ancillary equipment includes Inverter Cabinets which contain an Inverter, Transformers and associated switch gear; a separate Control Room; and a Sub-substation. Due to their small size it is proposed that roof water from these buildings will discharge directly onto the surrounding ground. Minimum floor levels for buildings on the site would be set at least 150mm above ground level to prevent the ingress of water.
- 3.39. The use of concrete 'ballast pad' footings and the incorporation of a rainwater gap between solar panels allows rainwater to run off the panels and onto the ground underneath and around the array. The concrete footings do not significantly affect overland flow routes. It is considered that the proposed development does not significantly alter the site's existing surface water drainage regime.
- 3.40. As part of site preparation the site levels in the northern sector of the development will be raised to a minimum of 8.1m AOD. This is considered to be the 1 in 200 year (including an allowance for climate change) tidal event (Table A). Subsequently, the whole development will be raised above the 1 in 200 year tidal flood level (including an allowance for climate change).

Runoff Rates

- 3.41. Due to the presence of rainwater gaps in the solar arrays and limited extent of impermeable area created by the proposed development (ancillary control equipment and concrete ballast pads) it is considered that the impact of the proposed development on the surface water drainage regime is limited. The impact of the proposed development on runoff rates would be negligible and water which does not locally infiltrate onsite will continue to run overland and discharge into the Bristol Channel or Dock 2.
- 3.42. The application site is adjacent to the Bristol Channel and the proposed development does not significantly alter the application site's drainage regime. Consequently, no formal drainage arrangements are proposed and water will continue to drain freely into the sea as it does in the site's current state. As the site discharges into a tidal area the effect of runoff entering the Bristol Channel does not increase the risk of flooding elsewhere (unlike discharging to a watercourse). Subsequently, the proposed development does not impact on neighbouring properties or elsewhere in the tidal floodplain.

Assessing Flooding Consequences, Off Site Impacts, and Residual Risk

- 3.43. When a development is justified, with respect to flood risk, section 7 of TAN 15 set outs that a development needs to be as safe as possible and there is:
- **“Minimal risk to life;**
 - **Minimal disruption to people living and working in the area;**
 - **Minimal potential damage to property;**
 - **Minimal impact of the proposed development on flood risk generally; and,**
 - **Minimal disruption to natural heritage.”**
- 3.44. The development is not “occupied” and personnel will only visit site during scheduled maintenance. During times of fluvial or tidal flood risk no personnel will be onsite or require access to the site. Therefore there is no risk to users of the development from flood risk.
- 3.45. The operating authority will be made aware of the potential flood risk which could affect the application site. The Solar Farm will be unmanned and will only require operatives to visit the site during scheduled maintenance visits. Thus, during periods of elevated flood risks operatives will not be present on site. The operating authority will register with the Environment Agency / Natural Resources Wales' flood warning service. This provides an automated telephone message which gives advanced notices when flooding is expected and will allow site operatives time to prepare and vacate the flood risk area. Evacuation routes will follow the Port's existing access routes.
- 3.46. After raising ground levels in the northern sector the entire site is raised above the 1 in 200 year (including an allowance for climate change) tidal flood event. This is in accordance with TAN 15 which states that development should be designed to be flood free during the 1% fluvial flood (i.e. that fluvial flood with a 100 to 1 change of occurring in any year) and the 0.5% tidal/coastal flood (i.e. 200 to 1 chance in any year event) (paragraph A1.14).

- 3.47. The residual risks posed to a development are the risks remaining after applying mitigation measures (e.g. developing outside flood risk areas and ground raising).
- 3.48. Ground raising in the northern sector of the site ensure that this area is only at risk of tidal flood events in excess of 0.5% (including an allowance for climate change). During events of greater magnitude than the 0.5% tidal flood the northern sector of the site is at risk of shallow flooding. It should be noted that the predicted maximum depth of flooding during the 1 in 1000 year flood event (including an allowance for climate change) would be 0.6m in the northern sector of the development site. This corresponds to the guidance on the maximum depth of flooding for General Infrastructure set out in Paragraph A1.15 of TAN 15. Solar panels in this area would be elevated (0.8m above ground level) above the predicted flood levels and ballast foundations would ensure that the solar arrays would not become dislodged during periods of tidal flooding. Thus, it is considered the whole development can remain safe and operational during times of shallow flooding.
- 3.49. The proposed development is surrounded by a wire mesh security fence which is considered permeable to flood waters. If a flood event in excess of 0.5% (including an allowance for climate change) were to occur flood waters could still inundate the lower areas of the site. All ancillary control equipment is restricted to the higher areas of the application site (and therefore at very low risk of flooding). All solar panels in the northern sector of the development are raised above the 1 in 1000 year (including an allowance for climate change) tidal flood event. There ballast foundations and shallow depth of flooding ensure the risk of damage to surrounding people and property is kept to a minimum. This assessment demonstrates that the consequence of the northern sector of the application site flooding is reduced to an acceptable level and would cause minimal disruption to people and property.
- 3.50. All ancillary control equipment is situated in the higher area of the site (and therefore not at risk of tidal flooding). In line with normal building practice it is proposed that any on site buildings will have floor levels raised at least 150mm above ground level with appropriate damp proof course protection this will ensure that the interior of any such buildings are kept suitably dry.
- 3.51. The layout of the development has ensured that the majority of development is directed away from flood risk areas and situated on land higher than the 1 in 1000 year (including an allowance for climate change) tidal flood event.
- 3.52. The ground raising measures and site layout minimise the risk of flooding posed to the development and the nature of the development means that the risk of flooding elsewhere is not increased.
- 3.53. For extreme events the site's topography will convey exceedance flows overland towards the low points as it would in the site's undeveloped state.
- 3.54. A summary of the potential risk from all sources of flooding post-development with the various development mitigation measures incorporated is shown in **Table C** below.

Table C: Post-development Potential Flood Risk from All Sources of Flooding

Flood Source	Potential Risk				Description
	Very Low	Low	Medium	High	
Watercourses and Sea	X			X ^a	The southern sector of the development is raised above the extreme tidal flood event and all ancillary control equipment will be restricted to this elevated area. Ground levels in the northern sector will be raised above the 1 in 200 year (+ climate change) tidal flood event.
Surface Water		X			No change compared with pre-development risk. Concrete 'ballast pads' will not significantly affect overland flow routes.
Groundwater	X				No change compared with pre-development risk.
Overwhelmed Sewers		X			No change compared with pre-development risk.
Artificial Sources	X				No change compared with pre-development risk.
Off-site Impacts		X			None identified. All sensitive equipment raised above the 1 in 1000 year (+ climate change) tidal flood level.

Notes: ^a Area of higher risk restricted to northern sector of the development site.

- 3.55. On this basis it is considered that the proposed ground raising and layout of the proposed development can safely manage any residual risks. It is therefore considered that the proposed development would have adequate flood protection for extreme events over the lifetime of the development.

4. CONCLUSIONS

- 4.1. This Flood Consequences Assessment has been prepared on behalf of ABPmer in connection with proposals for the development of a Solar Photovoltaic (PV) Farm which could produce up to 10 MW of power on land at the Port of Barry, Barry, Glamorgan.
- 4.2. The site is situated adjacent to the Bristol Channel on the south eastern side of the town of Barry, south east of Number 2 Dock within the Port of Barry which is operated by the Associated British Ports (ABP). The site extends to approximately 16.5 hectares in area and is in area of underutilised brownfield land containing an inert waste recycling operation, an unoccupied coal yard and some areas of scrub vegetation.
- 4.3. The development proposals comprise the construction of a Solar Farm consisting of photovoltaic modules mounted on metal frames, with associated site infrastructure and ancillary control equipment.
- 4.4. The northern sector of the site is predominately flat and the level ranges between approximately 7.5 – 9.0 m AOD. The southern sector of the site is banked up from the surrounding land. The bottom of the bank is at a level of 8.0m AOD and rises to approximately 14.0m AOD.
- 4.5. With reference to the Welsh Government's Development Advice Map, the site falls within Flood Zones A, B and C2. The Natural Resources Wales' current flood map identifies that the majority of the site lies within Flood Zone 1. This is defined as the zone with the lowest probability of flooding from rivers and the sea. Small areas of Flood Zones 2 and 3 are present around the edge of the development site associated with the Cadoxton River and tidal flooding. Flood Zone 2 extends into the site which is defined as areas of land having between a 1 in 200 and 1 in 1000 annual probability of sea flooding and land having between a 1 in 100 and 1 in 1000 annual probability of river flooding².
- 4.6. Natural Resources Wales (NRW) provided extreme sea levels in the vicinity of the site. The extreme sea levels (taking into account the 95% confidence bound as a precaution), including an allowance for climate change, for the 1 in 200 year tidal event is calculated as 8.1m AOD and the 1 in 1000 year tidal event is calculated as 8.7m AOD.
- 4.7. As part of the site groundworks which will level the application site the site levels in the northern half of the development will be raised to a minimum of 8.1m AOD. Subsequently, the whole development is above the 1 in 200 year tidal flood level. This is in accordance with TAN 15 which states that development should be designed to be flood free during the 1% fluvial flood (i.e. that fluvial flood with a 100 to 1 change of occurring in any year) and the 0.5% tidal/coastal flood (i.e. 200 to 1 chance in any year event) (paragraph A1.14).
- 4.8. All ancillary control equipment is situated in the elevated areas of the site (and therefore not at risk of tidal flooding).
- 4.9. During tidal events of greater magnitude than the 0.5% tidal flood, the northern sector of the site is at risk of shallow flooding. It should be noted that solar panels are elevated above the flood level and ballast foundations ensure that this area of the development can remain safe and operational during times of shallow flooding.

² Environment Agency (2014) http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=query&floodrisk=1.4&lang=_e&topic=floodmap&floodX=313108&floodY=167394

- 4.10. This report does not record any other sources of flooding which may affect the application site.
- 4.11. At present any excess rainfall which does not infiltrate into the soil will pool onsite in any localised depressions and / or will follow the topography of the land and run overland, or be intercepted by the Dock's highway drainage system, and discharge into the Bristol Channel or Dock 2. Rainfall falling onto the photovoltaic panels would runoff directly to the ground beneath the panels and infiltrate into the ground at the same rate as it does in the site's pre development state. The proposed development would therefore have a negligible impact upon site drainage.
- 4.12. On this basis it is considered that the proposed ground raising and layout of the proposed development can safely manage any residual risks. It is therefore considered that the proposed development would have adequate flood protection for extreme events over the lifetime of the development.
- 4.13. Based on the information contained in this report the proposed development is justified in Flood Zone C2, and the requirements of the TAN 15 Justification Test have been satisfied.
- 4.14. This assessment has fully assessed the consequences of flooding on the development. It demonstrates that the majority of the development is at a very low to low risk of flooding. Whereas, the consequence of the northern sector of the application site flooding is reduced to an acceptable level through ground raising. It is considered these measures minimises risk to life, damage to property and disruption to people living, working on the site or elsewhere in the floodplain.
- 4.15. The overall conclusions drawn from this Flood Consequences Assessment are that future users of the development would remain appropriately safe throughout the lifetime of the proposed development, risk and consequences of flooding can be acceptably managed and the development will not increase flood risk elsewhere.



- Blue Line Boundary
- Red Line Boundary
- Indicative Location of Proposed Solar Panels
- Site Access Points

Date	By	Size	Version
Sep 14	NMW	A3	1
Coordinate System		British National Grid	
Projection		Transverse Mercator	
Scale		1:2,500	
QA	FMM		
4233 Planning_2_Block_Plan.mxd			
Produced by ABPmer			



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Block Plan

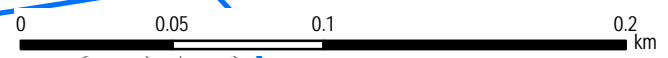
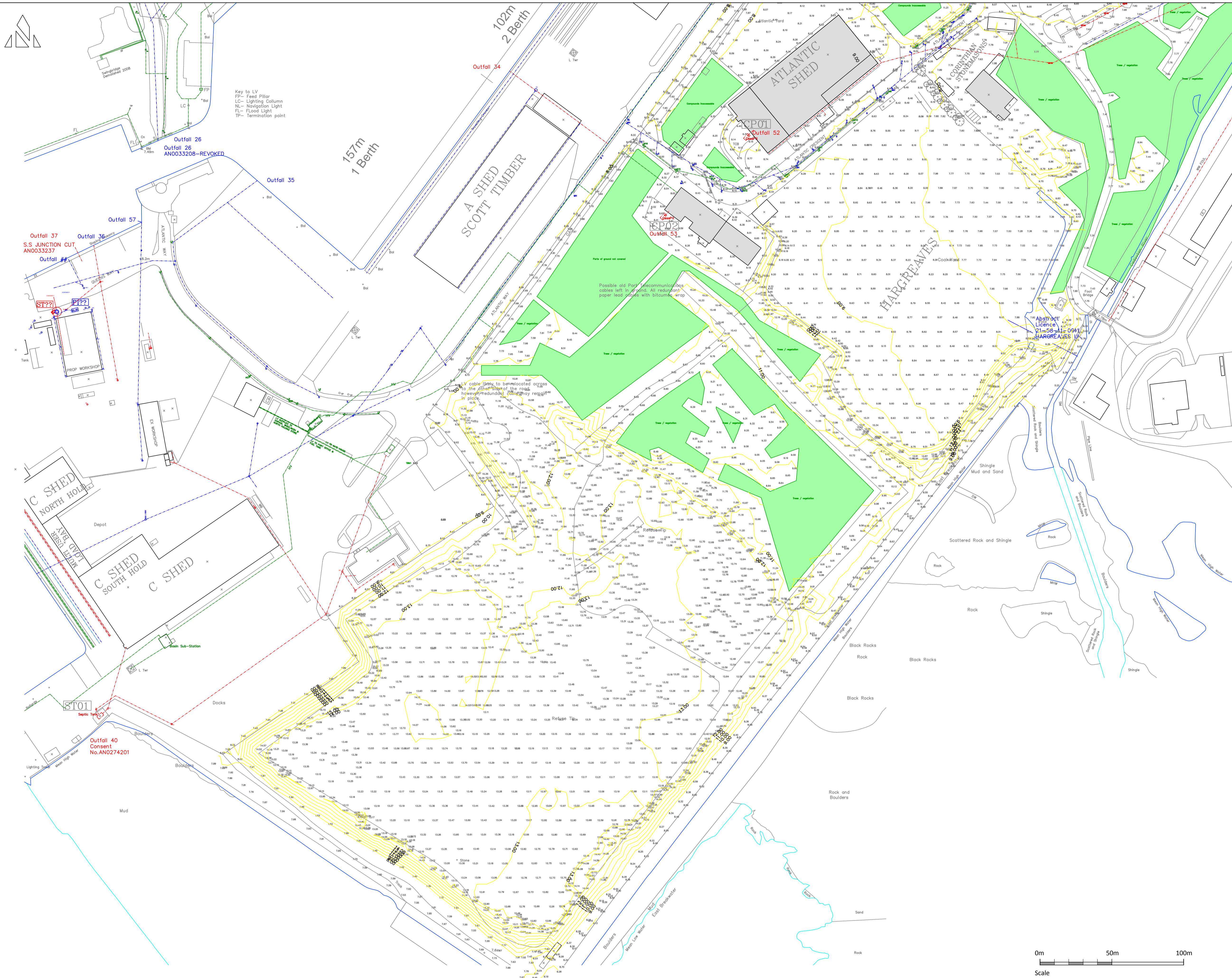


Figure 2



Stratton Park House, Wanborough Road
Swindon, SN3 4HG

Telephone
01793 828000

Facsimile
01793 835500

Email
admin@pfapl.com

Website
www.pfapl.com

Notes

a. Site Survey provided by ABPmer.

Rev	Date	Description	Initials
-----	------	-------------	----------

Client

ABPmer

Project

**Proposed Solar Park,
Barry Docks**

Drawing Title

Site Survey

Drawing No. **A251/05**

Date	August 2014
Scale	1:1250 @ A1
Drawn By	BF
Checked By	GE
E-Mail	geves@pfapl.com
File Ref.	F:\A251\Drawings\A251 05.dwg

Ben Fox

From: South Wales Information <swinformation@cyfoethnaturiolcymru.gov.uk>
Sent: 30 July 2014 12:35
To: bfox@pfaplc.com
Subject: CONFIDENTIAL - ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment
Attachments: ATI-05040a.pdf; ATI 05040A.pdf; Standard_Notice NRW.pdf
Flag Status: Flagged

Hello Ben

Please find attached the requested flood level information for this site, together with information on the current Flood Map, defences and flood history. Also attached is a receipt for your recent payment and our Standard Notice which outlines the permitted use of this information/data.

I am still making enquiries as to any information we may hold regarding previous use of the site. Should any relevant information come to light I will provide this by our 20 working day deadline of 11 August 2014.

Regards

Kathy

Eich Enw/Your name: Kathleen Banner
Teitl Swydd/Job Title: Swyddog Cysylltiadau Allanol/ External Relations Officer
Teitl eich tim/Title of your team: Cysylltiadau Allanol/External Relations
Cyfoeth Naturiol Cymru/Natural Resources Wales
Ffon/Tel: 01437 783024/ **VOIP: 03000653568** or Ganolfan Gwasanaethau Cwsmeriad/Customer Services Centre - 03000 65 3000
Ffacs/Fax: 01437 783091
E-bost/E-mail: accesstoinformationteam@naturalresourceswales.gov.uk
Gwefan/Website: www.cyfoethnaturiolcymru.gov.uk/www.naturalresourceswales.gov.uk

Dwy'n gweithio Dydd Mawrth, Dydd Mercher a Dydd Iau
Please note I work on a Tuesday, Wednesday and Thursday

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

----- Original Message -----

From: bfox@pfaplc.com
Received: 14/07/2014 14:09
To: Enquiries Queue
Subject: A251 - Barry Dock - Flood Consequence Assessment - CONFIDENTIAL

To Whom It May Concern:

A251 – Barry Dock – Flood Consequence Assessment – CONFIDENTIAL

PFA Consulting have been commissioned to look at the feasibility of developing a site at Barry Docks with respect to flood risk and drainage. The site is located at: NGR 313073, 313073 and the nearest postcode is CF63 3RG.

The Development Advice Map is attached. This mapping shows that proposed development site lies on the edge of the Tidal floodplain.

Please can you provide:

- Any information you hold on historic flood incidences which may have affected the application site;
- Detailed extents of A,B, C1 and C2;
- Presence and standard of protection provided by sea and river flood defences in the vicinity of the site;
- Any modelled flood levels, depths and extents in the vicinity of the application site (tidal and fluvial); and
- Any information regarding previous use of the site;

Please treat this data request as confidential as the proposed development site is commercially sensitive.

Do not hesitate to contact me should you require any further information to allow yourselves to proceed with this information request.

Regards,

Ben Fox

Graduate Engineer

PFA Consulting Ltd
Stratton Park House
Wanborough Road
Swindon
SN3 4HG

T: 01793 828000 F: 01793 835500 E: bfox@pfapl.com W: www.pfapl.com

PFA Consulting Ltd – a subsidiary of PFA Plc.
Company Registered in England 03871018. Registered address as above.

ATI-05040a – FCA: Barry Dock

E: 312998 N: 167285

1.0 Current Flood Map

Figure 1 shows the current Flood Map (version 201404) at this location. The Flood Map represents the undefended fluvial and tidal flood extents derived from a combination of detailed and generalised modelled data.

The current tidal flood data in this area was updated by NRW in 2013. This study uses sea level nodes within the Severn Estuary, based on a set of extreme sea levels generated by the EA in 2011 (*ref 2*) for current day (2008). The levels were projected in-land over a digital terrain model to produce depth and elevation grids as well as tidal mapped outlines for both the 0.5% (1 in 200) AEP (annual exceedance probability) and the 0.1% (1 in 1000) AEP; including climate change and upper confidence intervals (+/-95%).

More information on the Flood Map can be obtained from the Environment Agency website <https://www.gov.uk/government/organisations/environment-agency>

2.0 Extreme Sea Levels & Climate Change Guidance

In February 2011, extreme sea levels used in this model were superseded by a nationally consistent set of extreme sea levels (*ref 2*). These levels were derived using a tidal model calibrated to UK tidal gauge data. The model output is provided for node locations spaced at approximately 2km. 95% confidence bounds for these values were also derived using the confidence intervals for each node location. The extreme sea levels comprise still water level including storm surge, however they do not account for local wave action. The baseline estimations are for the year 2008, so climate change is calculated relative to this year, for example add 17.5mm for the year 2013.

Table 1: 2008 Baseline Extreme Sea Levels for adjacent nodes

Node	Easting	Northing	Extreme Event Sea Level (mAOD)					
			T25	T50	T75	T100	T200	T1000
424	313663	167054	7.22	7.33	7.39	7.44	7.55	7.87
426	312039	166117	7.19	7.30	7.36	7.41	7.51	7.82

To provide the estimate of extreme sea levels for the site (**Table 2**), levels were interpolated from the adjacent nodes.

Table 2: 2008 Baseline Extreme Sea Levels interpolated between adjacent nodes

Node	Easting	Northing	Extreme Event Sea Level (mAOD)					
			T25	T50	T75	T100	T200	T1000
Site	313663	167054	7.22	7.33	7.39	7.44	7.55	7.86
95% Confidence Bound (+/- m):			<i>0.20</i>	<i>0.20</i>	<i>0.30</i>	<i>0.30</i>	<i>0.40</i>	<i>0.70</i>

The current guidance on climate change from DEFRA is as follows:

Table 3: Sea level rise, mm per year

Assumed vertical land movement	1990-2025	2025-2055	2055-2085	2085-2115
-0.5	3.5	8.0	11.5	14.5

The calculated future extreme sea levels are shown in **Table 4**. Adopting a precautionary approach as advised by Agency guidance (*ref 4*), these levels include the upper level 95% confidence bound.

Table 4: Extreme sea levels for the site (including 95% Confidence Bound)

Year	Sea level rise(m)	Extreme Event Sea Level (mAOD)					
		T25	T50	T75	T100	T200	T1000
2014	0.021	7.4	7.5	7.7	7.8	8.0	8.6
2064	0.403	7.8	7.9	8.1	8.1	8.3	9.0
2089	0.703	8.1	8.2	8.4	8.4	8.6	9.3
2114	1.065	8.5	8.6	8.8	8.8	9.0	9.6

3.0 Additional Information

The NRW holds no historic flood information for the site or nearby vicinity.

The coastal flood defence embankment in the Wentlooge Levels area generally has a 1 in 200 year design standard of protection. There is a 750m section with a potentially lower standard of protection to the west of Tabb's Gout, with a crest height of approximately 8.60m AOD. The Agency is currently investigating raising this section of the embankment.

The local authority may be able to provide information on issues such as localised flooding from sewers, drains and culverts.

4.0 References

1. Tidal Flood Mapping Study (Penarth and Chepstow), Study report Issue 1, Atkins July 2008
2. Department for Environment, Food and Rural Affairs, 2011. *Technical Report Design sea levels*. R&D Report SC060064. Defra/Environment Agency
3. Flood and Coastal Defence Appraisal Guidance: FCDPAG3 Economic Appraisal. Supplementary Note to Operating Authorities – Climate Change Impacts; October 2006; Department for Environment, Food and Rural Affairs.
4. Using the national coastal flood boundary data for England and Wales, Environment Agency Operational Instruction 490_11, Issued 4/2/2011

5.0 Notes

Undefended scenarios are provided as being a possible worst case scenario in the event of defence failure. They are used as the basis of the Flood Map.

Extreme sea levels provided as part of this project are accurate to one decimal place (**Table 4**). Two decimal places have been provided to show the gradual change between nodes seen in the model, however, this does not imply greater accuracy.

The scope of the model is the mapping of flood risk, it is not intended for detailed design.

The model should be considered as the starting point for more detailed modelling, commensurate with the consequences of flooding at the site of interest.

NRW models are available under licence agreement for the purpose of further development. Contact Natural Resources Wales Access to Information team for details of terms, conditions and pricing.

If the data is used in support of an FCA, please include the reference number. Please refer to NRW standard terms and conditions.



Legend

-  Site Location
-  Statutory Main River
-  Bank Top E-Planning Tool (comprising: 20m buffer around the Main River network, River Bank features & around the mean high water level for estuaries wider than 40m)

 **Cyfoeth Naturiol Cymru**
Natural Resources Wales

Project
Barry Dock
[Ref: ATI-05040a]

Drawing
Figure 2:
Statutory Main Rivers

Date
29th July 2014



- Legend**
- ★ Site Location
 - Projection Lines
 - Node Point

 **Cyfoeth Naturiol Cymru**
Natural Resources Wales

Project
 Barry Dock
 [Ref: ATI-05040a]

Drawing
 Figure 3:
 Extreme Sea Level
 Node Locations

Date
 29th July 2014

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Ben Fox

From: South Wales Information <swinformation@cyfoethnaturiolcymru.gov.uk>
Sent: 12 August 2014 12:25
To: Ben Fox
Subject: CONFIDENTIAL - ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment

Hello Ben

Just to let you know that I'm awaiting feedback on your queries regarding the tidal flap (your email below) and wave action (your email of 5 August) and will be in touch as soon as I receive a response.

There is no such thing as a "defended" flood map - the "flood map" is a combination of tidal and fluvial undefended outlines. Unfortunately the model in this area has no depth grids, so there are no defended outlines for any return period.

Regards

Kathy

Eich Enw/Your name: Kathleen Banner
Teitl Swydd/Job Title: Swyddog Cysylltiadau Allanol/ External Relations Officer
Teitl eich tim/Title of your team: Cysylltiadau Allanol/External Relations
Cyfoeth Naturiol Cymru/Natural Resources Wales
Ffon/Tel: 01437 783024/ **VOIP: 03000653568** or Ganolfan Gwasanaethau Cwsmeriad/Customer Services Centre - 03000 65 3000
Ffacs/Fax: 01437 783091
E-bost/E-mail: accesstoinformationteam@naturalresourceswales.gov.uk
Gwefan/Website: www.cyfoethnaturiolcymru.gov.uk/www.naturalresourceswales.gov.uk

Dwy'n gweitho Dydd Mawrth, Dydd Mercher a Dydd Iau
Please note I work on a Tuesday, Wednesday and Thursday

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

From: Ben Fox [<mailto:bfox@pfaplc.com>]
Sent: 07 August 2014 16:36
To: South Wales Information
Subject: RE: CONFIDENTIAL - ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment

To Whom It May Concern:

ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment

Further to my email on the 5th August 2014 regarding allowance for wave action on tidal flood levels another issue has come to light.

Associated British Ports (ABP) have highlighted the presence of a tidal flap / sea door at the mouth of the River Cadoxton (Grid Reference: ST 13151 67246). This provides an outfall and protects land upstream of the structure. ABP have stated that this flood defence is operated and maintained by Natural Resources Wales.

Please can you confirm the standard of protection provided by this flood defence and if a 'defended' Flood Map is available?

If you require any further information to deal with both my queries or wish to discuss my requests do not hesitate to contact me.

Best regards,

Ben Fox
Graduate Engineer

PFA Consulting Ltd
Stratton Park House
Wanborough Road
Swindon
SN3 4HG

T: 01793 828000 F: 01793 835500 E: bfox@pfaplc.com W: www.pfaplc.com

PFA Consulting Ltd – a subsidiary of PFA Plc.
Company Registered in England 03871018. Registered address as above.

From: Ben Fox [<mailto:bfox@pfaplc.com>]
Sent: 05 August 2014 12:08
To: 'South Wales Information'
Subject: RE: CONFIDENTIAL - ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment

Kathy,

Thank you for your email providing flood risk information for Barry Docks.

I note that the Extreme Sea Levels provided do not account for local wave action. Can you please advise on what you would consider a precautionary estimate for wave action and if there is any general guidance available on this matter? Alternatively would including the 95% confidence band be a precautionary estimate for this hazard?

Regards,

Ben Fox
Graduate Engineer

PFA Consulting Ltd
Stratton Park House
Wanborough Road
Swindon
SN3 4HG

T: 01793 828000 F: 01793 835500 E: bfox@pfaplc.com W: www.pfaplc.com

PFA Consulting Ltd – a subsidiary of PFA Plc.
Company Registered in England 03871018. Registered address as above.

Ben Fox

From: South Wales Information <swinformation@cyfoethnaturiolcymru.gov.uk>
Sent: 21 August 2014 15:23
To: Ben Fox
Subject: CONFIDENTIAL - ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment
Attachments: Standard_Notice NRW.pdf
Flag Status: Flagged

Hello Ben

Please find below our response to the questions you raised about flood defences and wave action.

Existing information (October 2009) suggests that the area around the Cadoxton Sea Outfall has a standard of service in the order of 2% (1 in 50) from tidal inundation. This appears to be as a result of a 20m low spot within the embankment that surrounds the former coal yard in the general area of grid reference ST13118 67241.

We understand that some work has been carried out by the previous owner of the yard that has raised the low spot but we have no information on the type of material used and there is low confidence in the ability of the embankment at this location to cope with the hydrostatic load from a tide in excess of the 2% (1 in 50 year) event.

The Cadoxton model is currently being reviewed and will be available by the end of the calendar year. This model takes into account astronomical and surge tide and fluvial (including the sea outfall) but does not take wave action into account.

We have just received a Swan wave model from which it may be possible to extract information about local waves in the future.

Unfortunately we currently have no detailed modelling in the area, we would suggest that you contact us again in the near future to obtain more detailed data.

There is also a Shoreline Management Plan (Lavernock Point to St Ann's Head Shoreline Management Plan SMP2) which can be found via the following link:

<https://www.gov.uk/government/publications/shoreline-management-plans-smps>

Regards

Kathy

Eich Enw/Your name: Kathleen Banner

Teitl Swydd/Job Title: Swyddog Cysylltiadau Allanol/ External Relations Officer

Teitl eich tim/Title of your team: Cysylltiadau Allanol/External Relations

Cyfoeth Naturiol Cymru/Natural Resources Wales

Ffon/Tel: 01437 783024/ VOIP: 03000653568 or Ganolfan Gwasanaethau Cwsmeriad/Customer Services Centre - 03000 65 3000

Ffacs/Fax: 01437 783091

E-bost/E-mail: accesstoinformationteam@naturalresourceswales.gov.uk

Gwefan/Website: www.cyfoethnaturiolcymru.gov.uk/www.naturalresourceswales.gov.uk

Dwy'n gweitho Dydd Mawrth, Dydd Mercher a Dydd Iau

Please note I work on a Tuesday, Wednesday and Thursday

Ein diben yw sicrhau bod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

From: Ben Fox [mailto:bfox@pfaplc.com]

Sent: 07 August 2014 16:36

To: South Wales Information

Subject: RE: CONFIDENTIAL - ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment

To Whom It May Concern:

ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment

Further to my email on the 5th August 2014 regarding allowance for wave action on tidal flood levels another issue has come to light.

Associated British Ports (ABP) have highlighted the presence of a tidal flap / sea door at the mouth of the River Cadoxton (Grid Reference: ST 13151 67246). This provides an outfall and protects land upstream of the structure. ABP have stated that this flood defence is operated and maintained by Natural Resources Wales.

Please can you confirm the standard of protection provided by this flood defence and if a 'defended' Flood Map is available?

If you require any further information to deal with both my queries or wish to discuss my requests do not hesitate to contact me.

Best regards,

Ben Fox

Graduate Engineer

PFA Consulting Ltd
Stratton Park House
Wanborough Road
Swindon
SN3 4HG

T: 01793 828000 **F:** 01793 835500 **E:** bfox@pfaplc.com **W:** www.pfaplc.com

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Company Registered in England 03871018. Registered address as above.

From: Ben Fox [mailto:bfox@pfaplc.com]

Sent: 05 August 2014 12:08

To: 'South Wales Information'

Subject: RE: CONFIDENTIAL - ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment

Kathy,

Thank you for your email providing flood risk information for Barry Docks.

I note that the Extreme Sea Levels provided do not account for local wave action. Can you please advise on what you would consider a precautionary estimate for wave action and if there is any general guidance available on this matter? Alternatively would including the 95% confidence band be a precautionary estimate for this hazard?

Regards,

Ben Fox

Graduate Engineer

PFA Consulting Ltd
Stratton Park House
Wanborough Road
Swindon
SN3 4HG

T: 01793 828000 F: 01793 835500 E: bfox@pfapl.com W: www.pfapl.com

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Ben Fox

From: South Wales Information <swinformation@cyfoethnaturiolcymru.gov.uk>
Sent: 26 August 2014 15:05
To: Ben Fox
Subject: CONFIDENTIAL - ATI 05040A - A251 - Barry Dock - Flood Consequence Assessment
Attachments: Standard_Notice NRW.pdf
Flag Status: Flagged

Hello Ben

Apologies for the delay in providing the following information:

In response to your original request we can advise that within the site boundary, outlined red on the map provided, there are two existing waste permits:

WML 30362 – Levic Vehicle Dismantlers
WML 30354 – Atlantic Salvage Company

There are also three historic landfill sites:

Barry Dock, No. 1 Atlantic Trading Estate
Licence issued 2/11/77

Licence surrendered – 31/12/78

Waste last input 31/7/81 – packaging material, glass , timber waste, office rubbish, soil, rubble, hardcore and concrete

Barry Docks Area A

Licence issued 26/10/77

Licence surrendered – 31/12/78

Waste last input – 31/12/94 – absbestos, pvc and resins

Barry Docks Area B

Licence issued – 72/2/78

Licence surrendered – 31/12/78

Waste last input – 31/12/94 – general industrial waste

Prior to the Control of Pollution Act 1974 brought in a licensing system for Waste Management sites in 1976, they were regulated by the Local Authority Planning system. Any sites closed up to that time were then classed as contaminated land and subsequently became the regulatory responsibility of the Local Authority usually via their Environmental Health Department.

Waste sites that closed prior to the revised licensing system, introduced by the Environmental Protection Act 1990, technically are in a similar position. The date for these sites was pre April 1994. Up till then all the site operator had to do to surrender the licence was to give it back to the Waste Regulation Authority.

Since that date sites have to go through a formal closure and surrender process for their permit/licence. Until the establishment of the Environment Agency (EA) in 1996 that was the responsibility of the Local Authority (LA) Waste Regulation Authority.

Since then the responsibility for regulating surrender has been with the Environment Agency/Natural Resources Wales. However any site that has successfully passed through the surrender procedure would be considered as low risk as there are significant requirements to be met before surrender would be accepted and in particular, the production of a Site Condition Report that has to demonstrate that there has been no deterioration in the site condition as a result of permitted activities.

Regards

Kathy

Eich Enw/Your name: Kathleen Banner

Teitl Swydd/Job Title: Swyddog Cysylltiadau Allanol/ External Relations Officer

Teitl eich tim/Title of your team: Cysylltiadau Allanol/External Relations

Cyfoeth Naturiol Cymru/Natural Resources Wales

Ffon/Tel: 01437 783024/ **VOIP: 03000653568** or Ganolfan Gwasanaethau Cwsmeriad/Customer Services Centre - 03000 65 3000

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Dwy'n gweithio Dydd Mawrth, Dydd Mercher a Dydd Iau

Please note I work on a Tuesday, Wednesday and Thursday

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Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future.

----- Original Message -----

From: bfox@pfapl.com

Received: 14/07/2014 14:09

To: Enquiries Queue

Subject: A251 - Barry Dock - Flood Consequence Assessment - CONFIDENTIAL

To Whom It May Concern:

A251 – Barry Dock – Flood Consequence Assessment – CONFIDENTIAL

PFA Consulting have been commissioned to look at the feasibility of developing a site at Barry Docks with respect to flood risk and drainage. The site is located at: NGR 313073, 313073 and the nearest postcode is CF63 3RG.

The Development Advice Map is attached. This mapping shows that proposed development site lies on the edge of the Tidal floodplain.

Please can you provide:

- Any information you hold on historic flood incidences which may have affected the application site;
- Detailed extents of A,B, C1 and C2;
- Presence and standard of protection provided by sea and river flood defences in the vicinity of the site;
- Any modelled flood levels, depths and extents in the vicinity of the application site (tidal and fluvial); and
- Any information regarding previous use of the site;

Please treat this data request as confidential as the proposed development site is commercially sensitive.

Do not hesitate to contact me should you require any further information to allow yourselves to proceed with this information request.

Regards,

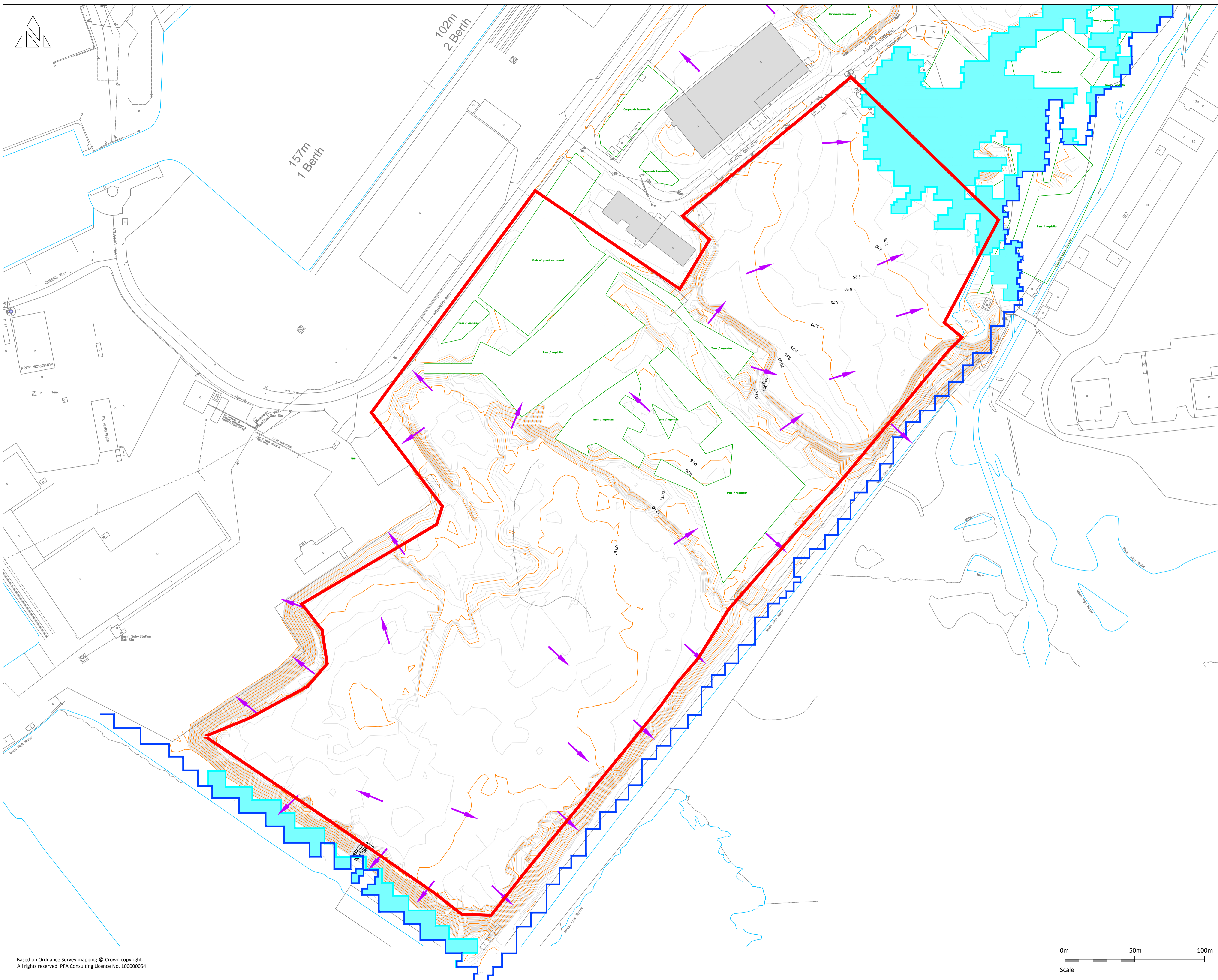
Ben Fox

Graduate Engineer

PFA Consulting Ltd
Stratton Park House
Wanborough Road
Swindon
SN3 4HG

T: 01793 828000 F: 01793 835500 E: bfox@pfapl.com W: www.pfapl.com

PFA Consulting Ltd – a subsidiary of PFA Plc.
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Stratton Park House, Wanborough Road
Swindon, SN3 4HG

Telephone
01793 828000

Facsimile
01793 835500

Email
admin@pfapl.com

Website
www.pfapl.com

- Key**
- Site Boundary (Indicative Only)
 - Flood Zone 3 (Traced from Natural Resources Wales 'Current Flood Map')
 - Flood Zone 2 (Traced from Natural Resources Wales 'Current Flood Map')
 - Areas of Vegetation (No Topographical Survey)
- Notes**
- a. Site Survey provided by ABPmer.

Rev	Date	Description	Initials
A	27/08/14	NRW Flood Zones added.	BF

Client

ABPmer

Project

**Proposed Solar Park,
Barry Docks**

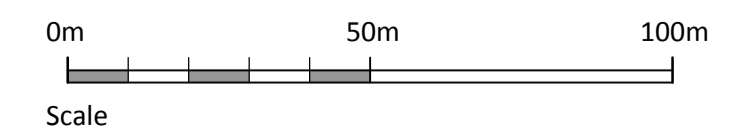
Drawing Title

Existing Flood Hazards

Drawing No. **A251/03** Rev A

Date	August 2014
Scale	1:1250 @ A1
Drawn By	BF
Checked By	GE
E-Mail	geves@pfapl.com
File Ref.	F:A251\Drawings\A251 03.dwg

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Ben Fox

From: Morgans, Huw <hmorgans@valeofglamorgan.gov.uk>
Sent: 24 July 2014 07:38
To: Ben Fox
Subject: RE: A251 - Barry Dock - Flood Consequence Assessment - CONFIDENTIAL

Flag Status: Flagged

Mr Fox

Your enquiry has passed to me for investigation. I will formally reply in August as I am on leave for the next two weeks. As an interim holding comment from memory we have had no flooding incidents at this location. The river is heavily modified at this point and Natural Resources Wales are the consenting body for main rivers and as this is a main river they may have more information. The coastal defence forms part of the ABP Barry Harbour entrance works and it would be their responsibility for maintenance and repair of the same. The site has been heavily modified over the years and part of it is currently operated as a waste processing operation again licensing would be from NRW. I will investigate further and reply in due course.

Regards Huw

Huw Morgans
Senior Engineering Assistant
Visible Services
Vale of Glamorgan Council / Cyngor Bro Morgannwg
tel / ffôn: 029 20673026
e-mail / e-bost: hmorgans@valeofglamorgan.gov.uk

Visit our Website at www.valeofglamorgan.gov.uk
Ewch i'n gwefan yn www.bromorgannwg.gov.uk

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Ystyriwch yr amgylchedd. Peidiwch ag argraffu'r neges hon oni bai fod gwir angen.*

From: Ben Fox [<mailto:bfox@pfaplc.com>]
Sent: 14 July 2014 15:18
To: Contact OneVale
Subject: A251 - Barry Dock - Flood Consequence Assessment - CONFIDENTIAL

To Whom It May Concern:

A251 – Barry Dock – Flood Consequence Assessment – CONFIDENTIAL

PFA Consulting have been commissioned to look at the feasibility of developing a site at Barry Docks with respect to flood risk and drainage matters. The site is located at: NGR 313073, 313073 and the nearest postcode is CF63 3RG.

The Development Advice Map is attached. This mapping shows that proposed development site lies on the edge of the tidal floodplain.

Please can you provide:

- Any information you hold on historic flood incidences which may have affected the application site;
- Presence and standard of protection provided by sea and river flood defences in the vicinity of the site;

- Any modelled flood levels, depths and extents in the vicinity of the application site (tidal and fluvial); and
- Any information regarding previous use of the site;

Please treat this data request as confidential as the proposed development site is commercially sensitive.

Do not hesitate to contact me should you require any further information to allow yourselves to proceed with this information request. Please note I have contacted Natural Resources Wales separately to ascertain any data they hold on the proposed development site.

Regards,

Ben Fox

Graduate Engineer

PFA Consulting Ltd
Stratton Park House
Wanborough Road
Swindon
SN3 4HG

T: 01793 828000 F: 01793 835500 E: bfox@pfapl.com W: www.pfapl.com

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Company Registered in England 03871018. Registered address as above.

Date/Dyddiad 1st September 2014
Ask for/Goftynwch am Huw Morgans
Telephone/Rhif ffôn 029 20673026
Fax/Ffacs 029 20673114
e-mail/e-bost Visibleservices@valeofglamorgan.gov.uk

The Vale of Glamorgan Council
The Alps, Wenvoe CF5 6AA

Cyngor Bro Morgannwg
Yr Alpau, Gwenfô CF5 6AA

www.valeofglamorgan.gov.uk
www.bromorgannwg.gov.uk



Your Ref/Eich Cyf

My Ref/Cyf V VH/HE/SP/HM

PFA Consulting Ltd
Stratton Park House
Wanborough Road
Swindon
SN3 4HG



Dear Mr Fox

Re: A251 - Barry Dock - Flood Consequence Assessment

As mentioned in my EMail Dated 24th July 2014 your enquiry has passed to me for investigation. Having checked our records I have found no formal or informal flooding incidents at this location.

As I also stated the river is heavily modified at this point its outfall being controlled by a sluice arrangement that effectively controls its level and restricts tidal inundation upstream.

The coastal defence at this location forms part of the ABP Barry Harbour entrance works and it would be their responsibility for maintenance and repair of the same. Again ABP as landowners and operators may have more information about flooding at this location.

The site has been heavily modified over the years and part of it is currently operated as a waste processing operation and licensing of such is regulated by NRW.

NRW have produced flood maps that are readily available for viewing on their Website under the 'Whats in my backyard category' which shows that the site is in the low to very low risk of flooding category.

Hoping that this information is of use to you.

Yours sincerely,

Huw Morgans

**for Operational Manager Highways and Engineering
ar ran Rheolwr Gweithredol Priffyrdd a Pheirianeg**