

FLOOD CONSEQUENCES ASSESSMENT

Project: - **Equipment Storage Building at Margam Green Energy Plant**

Date: - **May 2020**

1.0 Introduction

- 1.1 In October 2014, Neath Port Talbot County Borough Council (NPT) granted consent for a 40MW biomass power station (hereon referred to as Margam Green Energy Plant / MGEP) on land at Longlands Lane, Margam (Ref: P2014/0705). This was subsequently updated by planning permission 2016/0949.
- 1.2 A Flood Consequences Assessment (FCA) was undertaken by Weetwood Services, dated July 2014, and submitted in support of the MGEP planning application. The FCA provides an assessment of the flood risk for the entire MGEP. On the 31st October 2014, Condition 10 relating to surface water drainage of permission P2014/0705 was discharged (Ref: P2014/0790).
- 1.3 Only a small proportion of the site would be developed in relation to this planning application. However, the findings of the 2014 FCA and information submitted to discharge Condition 10 of planning permission P2014/0705 are considered relevant to the proposed Equipment Storage Building and are summarised in this assessment. The full FCA for the MGEP is provided at Annex A to this FCA.
- 1.4 The Local Planning Authority, when approving the MGEP planning application, found the flood risk impacts of the scheme to be acceptable, as did the planning Inspector when approving a similar previous application on this site.
- 1.5 The following sections of this report provide an overview of local flooding related planning policies, details of the justification test set-out in national guidance on flood risk, an appraisal of the site specific risks from flooding, a summary of the conclusions from the Weetwood FCA, and finally, conclusions and recommended mitigation measures for the implementation of the proposed development with the minor material amendments in relation to flood risk.

2.0 Local Planning Policy

- 2.1 The adopted Neath and Port Talbot LDP (January 2016) addresses flooding in policies SP1 and BE1 as follows:

Policy SP1; Climate Change – Likely increased flood risk will be taken into account and addressed by ensuring that there is greater resilience by guiding development away from land that is at risk of flooding or locations that could increase the risk of flooding elsewhere.

Policy BE1; Design – All development proposals will be expected to demonstrate high quality design which fully takes into account the natural, historic and built environmental context and contributes to the creation of attractive sustainable places. Proposals will only be permitted where its drainage systems are designed to limit surface water runoff and flood risk and prevent pollution.

3.0 TAN 15

- 3.1 TAN 15 provides technical guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding. The general approach of TAN15 is to advise caution in respect of new development in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions. The overarching aim of the framework is, in order of preference, to:

- Direct new development away from those areas which are at a high risk of flooding and
- Where development has to be considered in high risk areas (i.e. Zone C) only those development which can be justified should be located in such areas.

- 3.2 The new building would be located within Zone B. Chapter 7.0 of TAN 15 on requires an assessment of flooding consequences to be provided in parts of zone B where flooding has been identified as a material consideration to allow for localised problems. No flooding issues have been identified at the site since it was constructed. However, on the basis that at the time the MGEP was originally consented the site was classified as being located within Zone C2 this FCA addendum has been provided.

4.0 Flood Risk Features

4.1 There are several waterbodies which may impact the site which are as follows:

- Upper Mother Ditch flows in a predominately northerly direction approximately 0.2 km to the west of the site, which is classified as an 'ordinary watercourse'
- Ffrwd Wylt flows in a predominately westerly direction approximately 3.0 km to the north of the site, which is classified as an 'ordinary watercourse'
- The Afon Cynffig is flows in a predominately westerly direction approximately 3 km to the south of the site, which is classified as a 'main river'
- The River Avon flows in a predominately south-westerly direction approximately 4.3 km to the north of the site, which is classified as a 'main river'.
- The south Wales coastline is located 2.2 km to the west of the site
- The Eglwys Nunydd Reservoir is located 0.7 km to the south of the site

4.2 According to the latest Development Advice Map the site is entirely located within Zone B and does not fall within Natural Resources Wales Flood Zone 2 or 3 i.e. areas at high risk of flooding. This is shown in Figure 1 below.

Figure 1 – Extract from the NRW Flood Zone Mapping



5.0 Flood Consequences

- 5.1 The 2014 FCA indicated that the 6.79m AOD development platform would be expected to remain dry during the 1 in 200 and 1 in 1000 annual probability events. Based on the peak tidal level information, it may be possible for the development to become inundated to maximum depths of 0.11 m during the 1 in 200 annual probability plus climate change event.
- 5.2 The information submitted to discharge Condition 10 of planning permission P2014/0705 included a lagoon with a slightly increased storage capacity and a lowering of discharge rate from 16.2 l/s to 10.0 l/s).
- 5.3 The proposed ground floor level of the Equipment Building has been set at a minimum of 6.94m AOD to comply with the requirements of Condition 17 of permission P2016/0949, the current operative permission for the MGEP. This is above the potential inundated level during the 1 in 200 annual probability plus climate change event, as set out in the 2014 FCA. As such the risk of flooding at the proposed Administration Building has been further mitigated through design and is considered to comply with the requirements of TAN 15.
- 5.4 The NRW detailed flood mapping has shown:
- The site does not lie in a high risk area of flooding from rivers or the sea
 - The site is not shown to be in a flood warning area or flood alert area
 - The site is not a risk from reservoir flooding
 - The site is not shown to be susceptible to surface water flooding.
- 5.5 The surface water drainage system would comprise a piped system which would discharge water into a surface water attenuation feature located to the east of the building. The attenuation feature would provide adequate storage for a 1 in 100 year storm event plus 40% for climate change. It would discharge into the existing surface water ditch which runs along the southern edge of the MGEP site. The discharge would be limited to a greenfield runoff rate. A drainage strategy has been submitted with the application which described in detail how surface water would be managed.

6.0 Conclusions Recommendations

- 6.1 This report, the previous FCA undertaken by Weetwood (Annex A) for this site and the drainage strategy which accompanies the planning application demonstrates that the proposed development can be completed without conflicting with the requirements of TAN15 or LDP subject to the following:
- Development platform level to be set at a minimum of 6.79 m AOD
 - The detailed drainage strategy which accompanies the planning application should be adopted. This could be controlled by a suitably worded planning condition.
- 6.2 Subject to the implementation of the above measures, there would be no conflict with TAN 15 or policies in the adopted Neath and Port Talbot Local Development Plan (January 2016).

Annex A

MGEP Flood Consequences Assessment 2014

ES Addendum

Appendix 10.1 FCA



Development • Planning • Environment

MARGAM GREEN ENERGY PLANT

FLOOD CONSEQUENCES ASSESSMENT

Final Report v1.1

July 2014

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1 INTRODUCTION

1.1 PURPOSE OF REPORT

Weetwood Services Ltd ("Weetwood") has been instructed by Axis PED Ltd to undertake a Flood Consequences Assessment (FCA) for the proposed development of a Green Energy Plant located off Longlands Lane, Margam.

Planning consent¹ for a Biomass Power Station was granted on Appeal in March 2011 for the site. It is understood that a new full planning application is to be submitted with a view to permit a variation on the approved design. Given that the previous supporting FCA was undertaken in 2007 (by Atkins) a new FCA has been prepared to consider the most up-to-date flood risk information available.

This FCA has been prepared in accordance with the requirements of Technical Advice Note 15 (TAN15): Development and Flood Risk.

1.2 STRUCTURE OF THE REPORT

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Presents national and local flood risk and drainage planning policy
- Section 3** Provides background information relating to the development site, the development proposals, ground conditions and existing site access arrangements
- Section 4** Assesses the potential sources of flooding to the development site
- Section 5** Presents flood risk mitigation measures based on the findings of the assessment
- Section 6** Addresses the effect of the proposed development on surface water runoff and presents an illustrative surface water drainage scheme to ensure that surface water runoff is sustainably managed and flood risk is not increased elsewhere.
- Section 7** Presents a summary of key findings
- Section 8** Presents the recommendations

¹ Reference: APP/Y6930/A/10/2135473

2 PLANNING POLICY AND GUIDANCE

2.1 TECHNICAL ADVICE NOTE 15; DEVELOPMENT AND FLOOD RISK

The general approach of TAN15 is to advise caution in respect of new development in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions. The overarching aim of the framework is, in order of preference, to:

- Direct new development away from those areas which are at a high risk of flooding.
- Where development has to be considered in high risk areas (i.e. Zone C) only those development which can be justified should be located in such areas.

2.1.1 Justification Test

The site currently benefits from an extant planning permission and proposals are to amend the approved site layout. Furthermore, the site is located within an Employment Landbank within the Neath and Port Talbot County Borough Council (CBC) Unitary Development Plan (UDP). As such, it is assumed that the planning requirements of the Justification Test as set out in Paragraph 6 of TAN15 have already been met.

2.2 LOCAL PLANNING POLICY AND GUIDANCE

The Neath Port Talbot CBC Deposit Local Plan (August 2013) states:

Policy SP1; Climate Change – Likely increased flood risk will be taken into account and addressed by ensuring that there is greater resilience by guiding development away from land that is at risk of flooding or locations that could increase the risk of flooding elsewhere.

Policy BE1; Design – All development proposals will be expected to demonstrate high quality design which fully takes into account the natural, historic and built environmental context and contributes to the creation of attractive sustainable places. Proposals will only be permitted where its drainage systems are designed to limit surface water runoff and flood risk and prevent pollution.

The adopted Neath and Port Talbot CBC UDP (March 2008) states:

Policy ENV 11; Environment – Proposals for development will be resisted unless they have taken all reasonable steps to ensure that surface water run-off is controlled as near to the source as possible by the use of sustainable drainage systems.

2.3 FLOOD DEFENCE CONSENT

Flood defence consent is required before the commencement of any works in, over, or under a main river to ensure that any works do not increase flood risk, damage flood defences, or harm the environment, fisheries, or wildlife (Water Resources Act 1991). Ordinary watercourse consent is required where the watercourse is not a main river (Land Drainage Act 1991).

For main rivers, responsibility for consenting rests with the Environment Agency (EA) in England and Natural Resources Wales (NRW) in Wales. For ordinary watercourses, responsibility usually rests with the Lead Local Flood Authority or Internal Drainage Board (Flood and Water Management Act 2010).

Undertaking activities controlled by local Byelaws (made under the Water Resources Act 1991) also requires the relevant consent. The Welsh Land Drainage Byelaws typically include erecting an obstruction with 7 metres of a main river or erecting structures within the floodplain.

2.4 RELEVANT DOCUMENTS

The FCA has been informed by the following documents:

- Stage 3 Strategic Flood Consequences Assessment (SFCA), Neath Port Talbot CBC, August 2013
- Preliminary Flood Risk Assessment (PFRA), Neath Port Talbot CBC, March 2011

3 SITE DETAILS AND PROPOSED DEVELOPMENT

3.1 SITE LOCATION

The site is located approximately 0.12 km to the north of Heolcae'r-Bont at Ordnance Survey National Grid Reference SS 789 863, as shown in **Figure 1**. The total site is approximately 2.86 hectares (ha) in area.

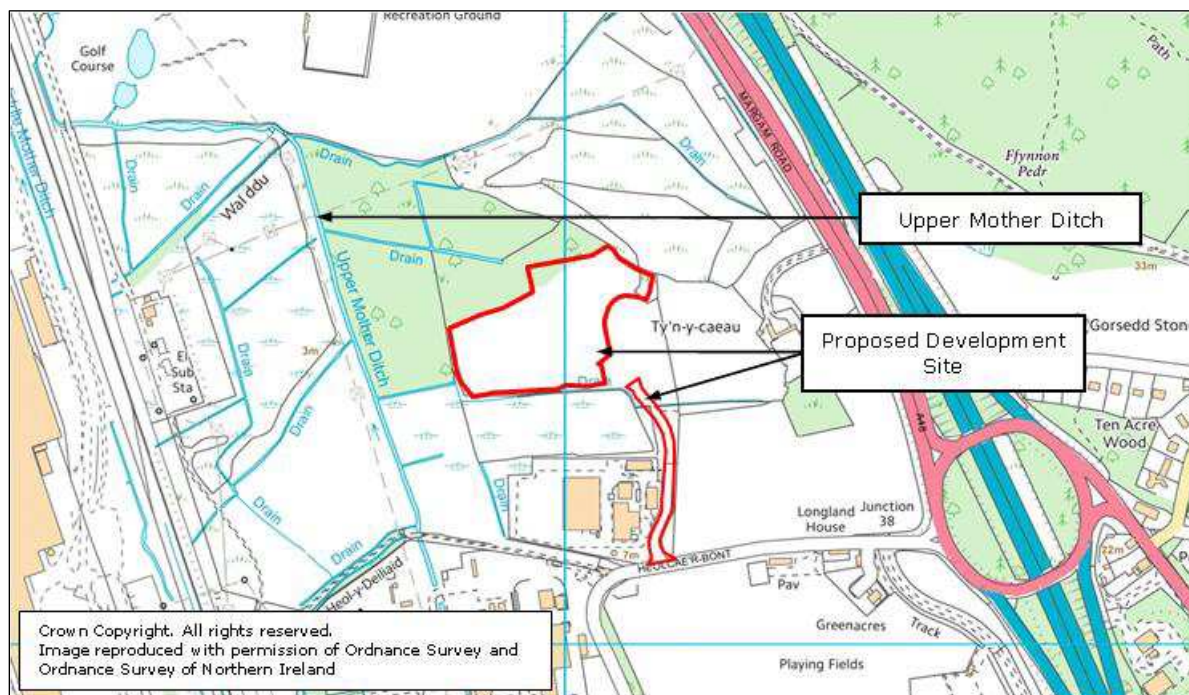


Figure 1: Site Location

3.2 EXISTING AND PROPOSED DEVELOPMENT

The site currently comprises undeveloped pastureland.

Development proposals are for the construction of Green Energy Plant with associated hardstanding and access (**Appendix A**). The southern segment of the redline boundary is for the construction of a link road to the existing biomass plant and Longlands lane to the south.

The proposed link road will be connected to a consented access road to the east of the site that leads onto the recently consented Peripheral Distributor Road.

TAN15 classifies general industry development as 'less vulnerable' land use².

3.3 WATERBODIES IN THE VICINITY OF THE SITE

There are several waterbodies which may impact the site which are as follows:

² TAN15, Figure 2

- Upper Mother Ditch flows in a predominately northerly direction approximately 0.1 km to the west of the site, which is classified as an 'ordinary watercourse'
- Ffrwd Wylt flows in a predominately westerly direction approximately 3.0 km to the north of the site, which is classified as an 'ordinary watercourse'
- The Afon Cynffig is flows in a predominately westerly direction approximately 2.8 km to the south of the site, which is classified as a 'main river'
- The River Avon flows in a predominately south-westerly direction approximately 4.3 km to the north of the site, which is classified as a 'main river'.
- The south Wales coastline is located 2.1 km to the west of the site
- The Eglwys Nunydd Reservoir is located 0.6 km to the south of the site

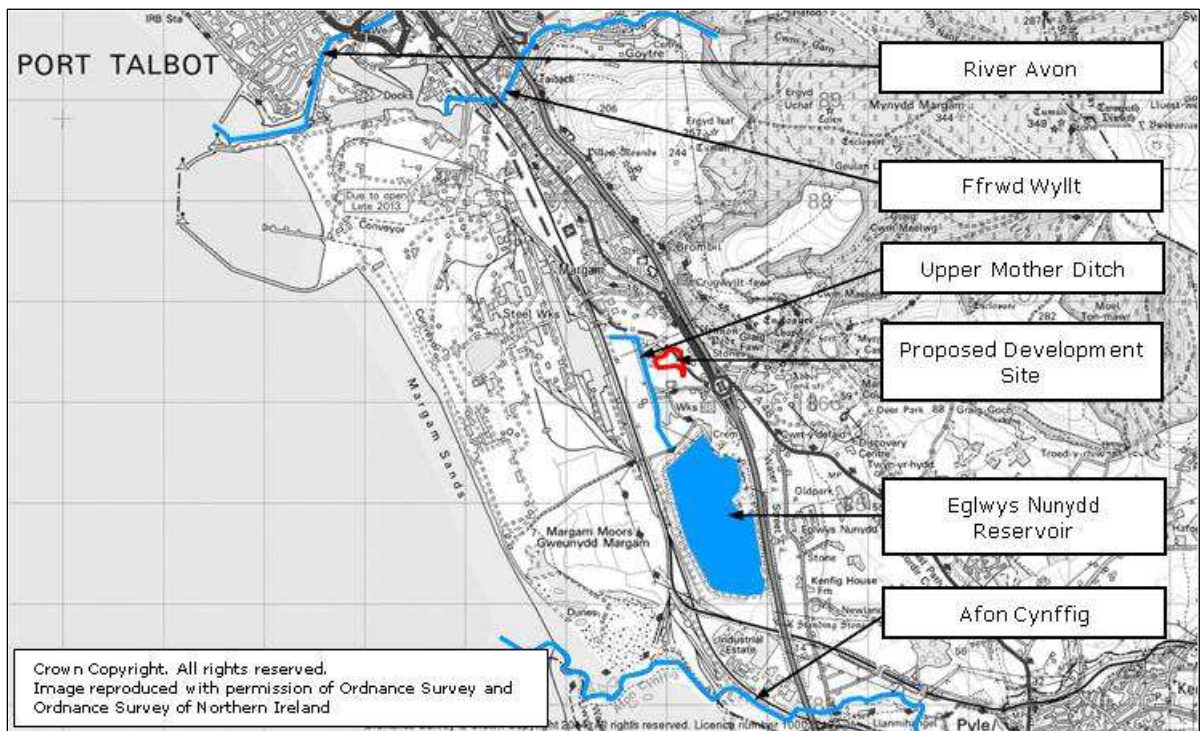


Figure 2: Location of Waterbodies

3.4 GROUND CONDITIONS

The Quantum Geotechnical Report (November 2007, Report No. X071043) indicates that made ground up to 2.3 m deep consisting of clayey sandy gravel was encountered across the majority of the site. Below this in all locations was peat, which in turn overlies intermittent sandy gravelly clay and in turn alluvial sands and gravels.

According to the Soilscales maps produced by the National Soils Research Institute³, soil conditions at the west of the site and within the surrounding area are described as '*loamy and clayey soils of coastal flats with naturally high groundwater*'. Conversely, soil conditions to the east of the site and the surrounding area are described as '*freely draining slightly acid loamy soils*'.

³ Soilscales www.landis.org.uk/soilscales/

3.5 SITE LEVELS

A topographic survey of the site is provided in **Appendix B**.

This information has been utilised to develop a digital elevation model as illustrated in **Figure 3**.

Site levels are generally shown to be in the region of 8.00 metres Above Ordnance Datum (m AOD) at the south-east of the site which steadily fall to approximately 5.50 m AOD to the north and 4.20 m AOD to the west of the site.

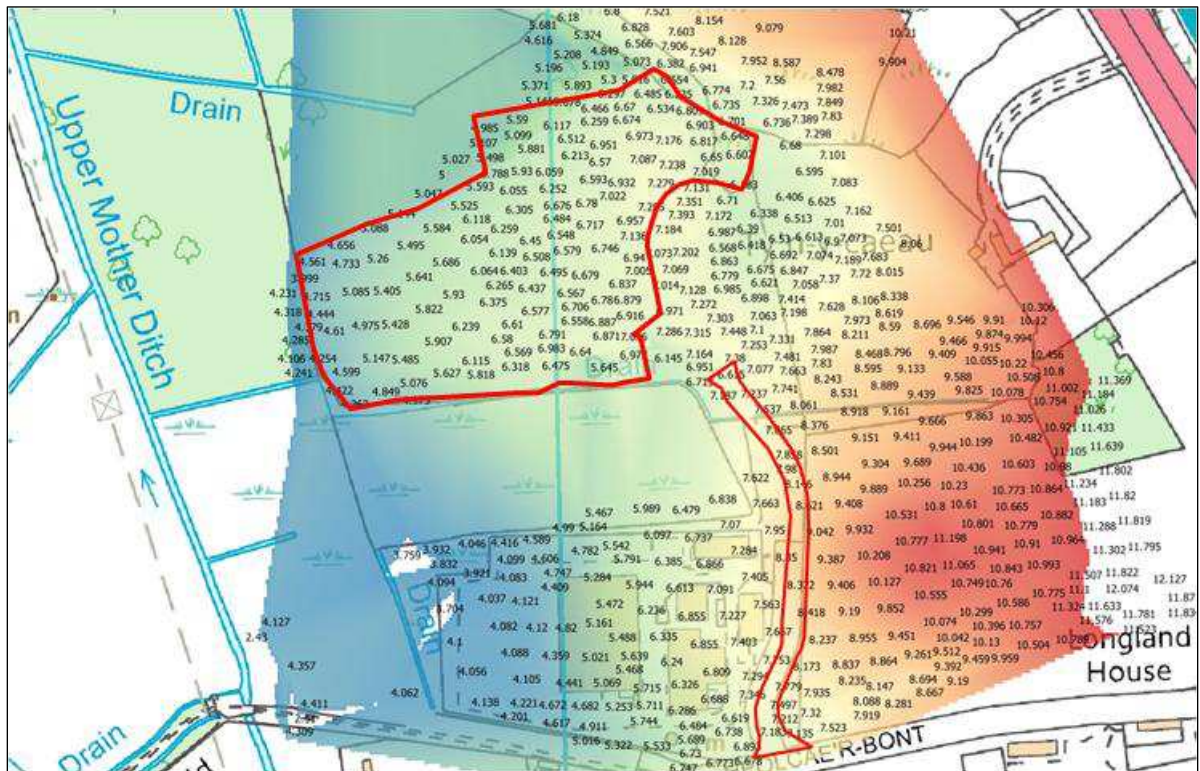


Figure 3: Digital Elevation Model

3.6 ACCESS AND EGRESS

Given the existing undeveloped nature of the site, there is currently no formal access route.

Following development of the site, access will be via the consented access road to the east of the site that leads onto the recently consented Peripheral Distributor Road to the north-east. Levels along the consented access road will be 8.21 m AOD adjacent to the site which will steadily increase to 9.28 m AOD to the north-east.

4 REVIEW OF FLOOD RISK

4.1 FLOOD ZONE DESIGNATION

Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. TAN15 defines flood zones as follows⁴:

- **Zone A.** Considered to be at little or no risk of fluvial or tidal/coastal flooding.
- **Zone B.** Areas known to have been flooded in the past evidenced by sedimentary deposits.
- **Zone C.** Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal). Zone C is subdivided into the following two zones:
 - **Zone C1.** Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
 - **Zone C2.** Areas of the floodplain without significant flood defence infrastructure.

The Flood Zones are currently shown on the Welsh Government Development Advice Map and the EA Flood Map for Planning (Rivers and Sea) and do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

4.1.1 Development Advice Map

According to the latest Development Advice Map the site is largely located within Zone C2. Within the northern redline boundary a small area in the south-east is located within Zone B and the majority of the southern redline boundary is located within Zone A (Figure 4).

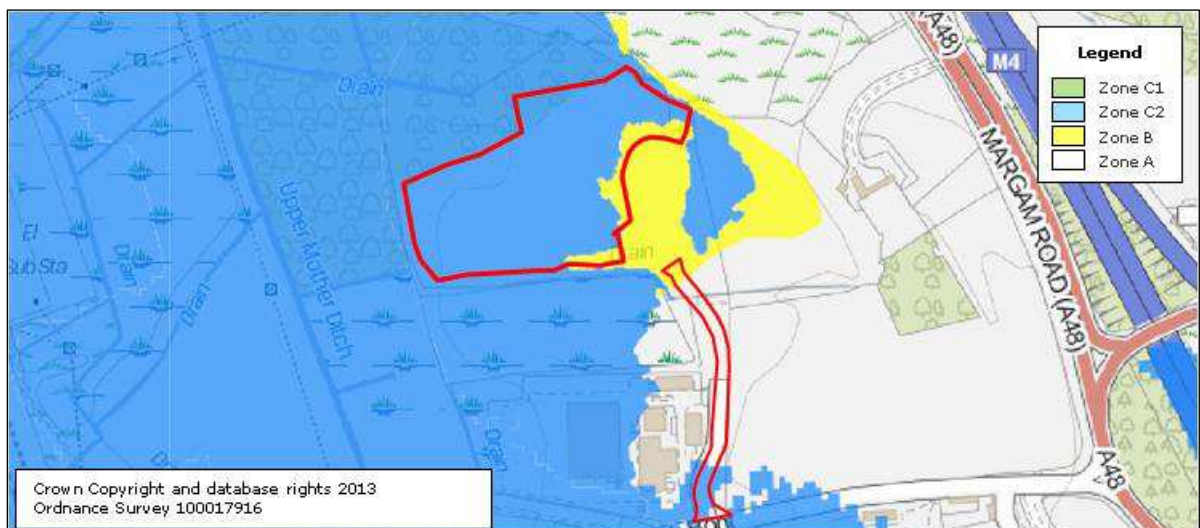


Figure 4: Development Advice Map
(Source: Welsh Government website)

⁴ TAN15, Figure 1

4.1.2 Natural Resources Wales Flood Map

According to the NRW Flood Map⁵ (**Figure 5**) the western extent of the site is located in the 1 in 100 annual probability fluvial / 1 in 200 annual probability tidal flood outline. Some areas towards the centre and east of the site are located within the 1 in 1000 annual probability flood outline. The eastern area within the northern redline boundary and the majority of the southern redline boundary is located outside the 1 in 1000 annual probability flood outline.

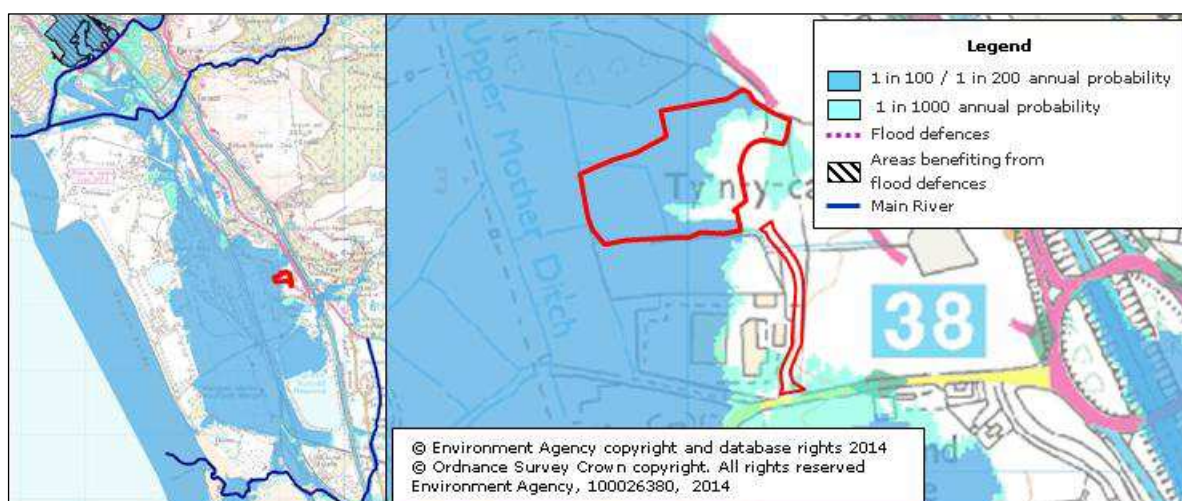


Figure 5: Natural Resources Wales Flood Map
(Source: EA website)

4.2 HISTORICAL RECORDS OF FLOODING

NRW has advised⁶ that they do not hold any record of historical flood events within the vicinity of the site.

4.3 TIDAL / COASTAL FLOOD RISK – AFON CYNFFIG & RIVER AVON

NRW has been consulted to determine the mechanism of flood risk to the site and has subsequently advised⁷ that "the flood extent outline shown for the area of interest is based on tidal inundation". **Figure 5** indicates that the tidal flood risk to the site is not directly from the south Wales coastline but from the Afon Cynffig to the south and/or the River Avon to the north, both of which are tidally dominated watercourses within the vicinity of the site.

NRW has confirmed that the flood extent within **Figure 5** has not been derived by detailed modelling but by a still water projection utilising peak tidal levels from the adjacent coastline. Considering that the site's flooding mechanism is not directly from the coastline itself, as shown in **Figure 5**, this is expected to be a very conservative estimate of flood risk. The site is located 2.8 km and 4.3 km away from the Afon Cynffig and River Avon respectively and it is therefore likely that intervening infrastructure and areas of raised land would impede floodwaters and reduce the flood level at the site in comparison with peak tidal levels from the coastline. However, only peak tidal levels

⁵ Currently provided on the Environment Agency website as the Flood Map for Planning (Rivers and Sea)

⁶ Email from NRW to Weetwood, 9 July 2014 (Ref: ATI 04856a)

⁷ Email from NRW to Weetwood, 3 July 2014 (Ref: ATI 04856a)

from the adjacent coastline are currently available and these have been used to help determine the maximum possible flood risk to the site from this source.

4.3.1 Tidal Levels

NRW has provided modelled design peak tidal levels from 2008. These tidal levels have been increased by 21 mm to account for climate change up to 2014:

- 1 in 200 annual probability 6.22 m AOD
- 1 in 1000 annual probability 6.52 m AOD

TAN15 requires an allowance for climate change to be made. Using the recommended contingency allowances⁸ and a development lifetime of 75 years, this has been calculated as 681.5 mm (**Table 1**). The 1 in 200 annual probability plus climate change level is therefore taken as 6.90 m AOD.

Table 1: Climate Change Allowance

Period	Net Sea Level Rise (mm/yr)	No. of years	Total Sea Level Rise (mm)
2014-2025	3.5	11	38.5
2025-2055	8.0	30	240
2055-2085	11.5	30	345
2085-2089	14.5	4	58
			681.5

The proposed development will include a minimum platform level of 6.79 m AOD in accordance with previously approved scheme⁹. Given the peak tidal levels as stipulated above, the development would be expected to remain dry during the 1 in 200 and 1 in 1000 annual probability events.

Based on the peak tidal level information, it may be possible for the development to become inundated to maximum depths of 0.11 m during the 1 in 200 annual probability plus climate change event; however, as detailed previously (**Section 4.3**) this is likely to be a very conservative assumption. As such, it is unlikely that even this minimal depth of flooding would be realised.

Given the existing ground levels in the vicinity of the proposed access route (**Appendix B**) as discussed in **Section 3.6**, dry access will be available in up to the 1 in 200 annual probability plus climate change event.

The residual risk of flooding will be mitigated though the implementation of the measures proposed in **Section 5** of this report.

4.4 FLUVIAL FLOOD RISK – UPPER MOTHER DITCH

Upper Mother Ditch is located 0.1 km to the west of the site which flows in a predominately north-westerly direction and Ffrwd Wyllt flows in a predominately westerly direction approximately 3.0 km to the north of the site.

⁸ Table 1 in Supplementary Note to Operating Authorities – Climate Change Impacts, October 2006, Dept of Environment, Fisheries and Rural Affairs

⁹ Condition 5 of the Appeal Decision Notice, 8 March 2011 (Ref: APP/Y6930/A/10/2135473)

NRW has confirmed that the dominant flood risk to the site is from tidal sources and it is therefore assumed that the site is at negligible risk of fluvial flooding.

As detailed previously, the development is to be set at 6.79 m AOD. **Appendix B** shows a typical water level within Upper Mother Ditch of 2.51 m AOD which is approximately 4.28 m below that of the proposed development. As such it is reasonable to conclude that flood risk from this source in isolation is negligible; however, there remains the potential issue of tide-locking whereupon tidal flood levels will again dominate.

Recognising the above, the residual risk of fluvial flooding will be appropriately mitigated though the implementation of the measures proposed in **Section 5** of this report to address tidal flood risk.

4.5 FLOOD RISK FROM RESERVOIRS, CANALS AND OTHER ARTIFICIAL SOURCES

Reservoir or canal flooding may occur as a result of the facility being overwhelmed and/or as a result of dam or bank failure.

The Eglwys Nunydd Reservoir is located 0.6 km to the south of the site.

The NRW Risk of Flooding from Reservoirs map¹⁰ (**Figure 6**) indicates that the western extent of the site is at risk of flooding from this source. The flood outline within **Figure 6** appears to be slightly less than that shown in **Figure 5**. It is therefore assumed that the potential level of flood risk would be less to that of tidal flood risk. Irrespective, reservoir flooding is extremely unlikely to happen as all large reservoirs are regularly inspected by reservoir panel engineers and essential safety work is carried out.



Figure 6: Risk of Flooding from Reservoirs Map

(Source: EA website)

There is no recent history of flooding from reservoirs within this area. The risk of flooding from this source is expected to be low; irrespective, the risk of flooding will be mitigated though implementation of the measures proposed in **Section 5** of this report.

¹⁰ Currently provided on the Environment Agency website

4.6 FLOOD RISK FROM GROUNDWATER

Groundwater flooding generally occurs during intense, long-duration rainfall events, when infiltration of rainwater into the ground raises the level of the water table until it exceeds ground levels. It is most common in low-lying areas overlain by permeable soils and permeable geology, or in areas with a naturally high water table.

As detailed in **Section 3.4** ground conditions at the site and within the surrounding area are described as 'loamy and clayey soils of coastal flats with naturally high groundwater' to the west and 'freely draining slightly acid loamy soils' to the east. As such, there may therefore be the propensity for some groundwater flooding.

The Quantum Geotechnical Report indicates that groundwater was encountered within the majority of exploratory trial pits between 0.0 and 3.0 m below ground level (BGL).

According to the British Geological Survey (BGS) Groundwater Flooding Hazard map (**Figure 7**) the susceptibility to groundwater flooding is moderate to significant.



Figure 7: Groundwater Flooding Hazard Map
(Source: Findmaps)

The risk of flooding from this source will be mitigated through the implementation of the measures proposed in **Section 5** of this report.

4.7 FLOOD RISK FROM SURFACE WATER

Surface water flooding comprises pluvial flooding and flooding from sewers and highway drains and gullies.

4.7.1 Risk of Pluvial Flooding

Pluvial flooding results from rainfall-generated overland flow, before the runoff enters any watercourse or sewer, or where the sewerage/drainage systems and watercourses are overwhelmed and therefore unable to accept surface water.

Pluvial flooding is usually associated with high intensity rainfall events but may also occur with lower intensity rainfall where the ground is saturated, developed or otherwise has low permeability resulting in overland flow and ponding within depressions in the topography.

As detailed in **Section 3.4** ground conditions at the site and within the surrounding area are described as *loamy and clayey soils of coastal flats with naturally high groundwater* to the west and *'freely draining slightly acid loamy soils'* to the east. There may therefore be the propensity for surface water flooding at the west of the site; however, given that ground levels are shown to fall towards Upper Mother Ditch, surface water would be expected to runoff accordingly and would not be expected to accumulate to any significant depth at the site itself. The surrounding area is also shown to be served by an extensive drainage ditch network. The propensity for surface water flooding may therefore be considered low.

This is reiterated by the NRW Risk of Flooding from Surface Water map¹¹ (**Figure 8**), which indicates the site is at 'very low' risk of flooding from this source.



Figure 8: Natural Resources Wales Risk of Flooding from Surface Water
(Source: EA website)

The risk of pluvial flooding at the site is assessed to be low. However, residual flood risk from this source will be addressed through the mitigation measures as detailed in **Section 5** and the surface water drainage strategy in **Section 6**.

4.7.2 Risk of Flooding from Sewers and Highway Drains and Gullies

Flooding of land and/or property can occur when the capacity of the sewer/drainage system is overwhelmed by heavy rainfall, becomes blocked or is of inadequate capacity or where the normal discharge of sewers and drains through outfalls is impeded by high water levels in receiving waters.

Dwr Cymru Welsh Water (DCWW) has been consulted to ascertain whether it holds any records of sewer flooding at the site. At the time of writing as response is awaited.

Given that no highways are currently located within the immediate vicinity of the site, it is reasonable to assume that flood risk from this source is negligible.

¹¹ Currently provided on the Environment Agency website

5 FLOOD RISK MITIGATION MEASURES

5.1 FLOOD MITIGATION

The flood risk to the site from tidal and groundwater sources and any residual risk of flooding from other sources will be mitigated through the implementation of the measures proposed within the following section of this report.

5.1.1 Finished Floor Levels

As detailed previously the development platform will be set at a minimum of 6.79 m AOD in accordance with planning condition 5 of the previously consented scheme. This provides a significant freeboard above the 1 in 200 and 1 in 1000 annual probability peak tidal levels adjacent to the site (6.22 and 6.52 m AOD respectively). Although this level is slightly below the 1 in 200 annual probability plus climate change peak tidal level (6.90 m AOD) from the coastline, given the mechanism of flooding to the site from this source it is reasonable to conclude that flood levels at the site during this event would be significantly lower. As such, the proposed development platform level of 6.79 m AOD is considered reasonable to mitigate flood risk from tidal sources up to the 1 in 200 annual probability plus climate change event thereby complying with A1.14 of TAN15.

Finished floor levels should be set at a minimum of 0.15 m above adjacent ground levels following reprofiling of the site. This will enable any potential overland flows to be conveyed safely across the site without affecting property in accordance with the approach promoted by government policy¹².

5.2 FLOOD RISK ELSEWHERE

Any proposal to modify ground levels should demonstrate that there is no increase in flood risk to the development itself, or to any existing buildings which are known to, or are likely to flood.

Developers must ensure there will be no loss of flood flow or flood storage capacity for floods up to the severity of the 1 in 100 annual probability fluvial event. Whilst not specified by TAN15, NRW generally recommends that this should be the case over the lifetime of development (i.e. should take into account climate change).

Compensatory storage is generally not required for the loss of floodplain storage or conveyance during a tidally dominated event. Furthermore, in the absence of detailed modelled information it would be unreasonable to produce a compensatory flood storage scheme based on the currently available information, which is expected to be a very conservative estimate of flood risk to the site.

Irrespective of the above, the site currently benefits from a planning consent which includes an identical platform level to that outlined in **Section 5.1.1**, and a total building footprint of 5,062 m². Proposals for the new application are to amend the site layout which will reduce the building footprint to 4,419 m². This will provide betterment over the existing consented scheme in terms of the potential displacement of floodwaters during an extreme flood event.

¹² Making Space for Water, Taking forward a new Government strategy for flood and coastal erosion risk management in England, March 2005, Dept for Environment, Food and Rural Affairs

6 SURFACE WATER MANAGEMENT

6.1 REQUIREMENTS FOR SURFACE WATER MANAGEMENT

TAN15 provides an overview of the requirements for the management of surface water to ensure that development does not increase flood risk at the site or elsewhere.

Paragraph 8.3 of TAN15 states *"the aim should be for new development not to create additional run-off when compared with the undeveloped situation, and for redevelopment to reduce runoff where possible. It is accepted that there may be practical difficulties in achieving this aim"*.

6.1.1 Lead Local Flood Authority – Neath and Port Talbot CBC

See Policy ENV 11 of the Neath and Port Talbot CBC UDP outlined in **Section 2.2**.

6.2 SURFACE WATER DRAINAGE AT THE EXISTING SITE

The northern redline boundary of the site consists of approximately 2.57 ha of permeable (greenfield) land. The southern redline boundary consists of 0.29 ha of permeable (greenfield) land.

As discussed in **Section 3.4**, ground conditions at the west of the site are described as *'loamy and clayey soils of coastal flats with naturally high groundwater'*. Conversely, soil conditions to the east of the site and the surrounding area are described as *'freely draining slightly acid loamy soils'*.

Surface water runoff from the site drains to the west towards Upper Mother Ditch.

6.2.1 Surface Water Runoff Rate

The greenfield surface water runoff rate has been calculated using the ICP SUDS method within MicroDrainage. The mean annual greenfield flow (Q_{bar}) from this area has been calculated to be 6.3 l/s/ha. Details of the input parameters and the output results are provided in **Appendix C**.

The southern segment of the redline boundary (0.29 ha) has been ignored for the purpose of the drainage calculations as this part of the site will be included within the existing drainage scheme for the Peripheral Distributor Road to the east.

Table 2: Peak Runoff Rate - Existing Site

Annual probability of rainfall event	Peak Runoff Rate (l/s) for 2.57 ha		
	Impermeable areas	Permeable areas	Total
1 in 2	0.0	16.2	16.2
1 in 30	0.0	28.5	28.5
1 in 100	0.0	35.2	35.2

6.3 SURFACE WATER RUNOFF FROM THE DEVELOPED SITE

6.3.1 Site Areas

Within the northern redline boundary, approximately 1.28 ha of the site will comprise impermeable surfaces following development.

6.3.2 Disposal of Surface Water

Building Regulations Approved Document Part H sets out a hierarchy of preferred methods for the disposal of surface water runoff. Disposal by infiltration is preferred, followed by disposal to a watercourse, with disposal to a public sewer the least preferred option¹³.

As discussed in **Section 6.2**, there may be the propensity for surface water to infiltrate at the east of the site; however, ground levels at the site are shown to fall from east to west towards an area underlain by soils with impeded drainage and may therefore be unsuitable for infiltration. As such it is proposed to direct all runoff from the developed site to Upper Mother Ditch to the west. At this stage no infiltration tests have been undertaken to confirm whether this may be feasible.

6.3.3 Peak Flow Rate

For the purposes of the outline surface water drainage strategy, it has been assumed that the surface water runoff generated by a 1 in 100 annual probability rainfall event including an allowance for climate change would be limited to the mean annual greenfield runoff rate (Q_{bar}) of 16.2 l/s. This will afford significant betterment over the existing site in terms of reduced surface water runoff as shown in **Table 3**.

Table 3: Reduction in Surface Water Runoff

Annual probability of rainfall event	Existing Discharge Rate (l/s)	Proposed Discharge Rate (l/s)	Reduction (%)
1 in 2	16.2	16.2	0
1 in 30	28.5	16.2	43
1 in 100	35.2	16.2	54

6.3.4 Sustainable Drainage Systems

One of the philosophies behind the use of SuDS is the “management train” concept. A management train provides different SuDS components in sequence to control flows and volumes through the system. Some components may also remove or reduce pollutants from runoff thereby improving water quality.

A decision on the types of surface water storage to be provided at the site will be made at the detailed drainage design stage. Potential SuDS components which may be considered at the site include the following:

- **Green roofs** control runoff at source
- Roof runoff could be directed to **soakaways**, enabling infiltration into the ground

¹³ Building Regulations Approved Document H, Section 3 page 45

- Roof runoff could be directed to **rain gardens**. Rain gardens are vegetated depressions into which runoff is drained, where it infiltrates into the ground or is taken up by plants.
- **Permeable surfaces** can be used for car parking areas or residential roads. Surface water storage may be provided within an aggregate sub-base with 30% voids, which offers good water quality treatment. Run-off from roofs may be directed into a permeable pavement sub-base.
- Run-off from non-permeable roads and parking areas may be directed over a **filter strip**. Filter strips are vegetated strips of land designed to accept run-off as overland sheet flow. They treat run-off by vegetative filtering and promote settlement of particulate pollutants. Small filter strips 1-2m wide may be effective.
- Surface water may be directed from permeable pavements, filter strips, roofs or roads into a **swale**. Swales are shallow channels designed to store and convey runoff and remove pollutants. Dry swales include a filter bed which overlays an under-drain system. The preferred gradient for swales is no steeper than 1 in 100. It is, however, possible to position swales perpendicular to the slope, keeping the gradients within acceptable limits. Alternatively, check dams may be used.
- Surface water may be directed from permeable pavements, filter strips, roofs or roads into a **filter drain** or **infiltration trench**. Filter drains are gravel-filled trenches with a perforated pipe at the base, which store and convey water and remove pollutants. Infiltration trenches are stone-filled trenches which allow water to soak into the ground.
- Flows from the above SuDS elements may be directed to **detention basins, infiltration basins** or **retention ponds** for a final storage and treatment stage. Detention basins are vegetated depressions designed to store runoff prior to discharge to a watercourse or other water body. Infiltration basins are similar to detention basins, can they infiltrate water gradually into the ground instead of, or in addition to, discharge to a watercourse. Retention ponds contain water all year round and provide additional storage during rainfall events above the normal water level.

6.3.5 Storage Calculations

For the purposes of the outline surface water drainage strategy, it has been assumed that surface water storage would be provided within a retention pond/detention basin. An indication of where this may be located is illustrated in **Appendix A**.

Additional source and site control SuDS features described in **Section 6.3.4** may be incorporated into the surface water drainage strategy at the detailed design stage.

The surface water storage facilities have been modelled using the Detailed Design module of MicroDrainage Source Control (**Appendix D**).

The required storage volume has been sized to store the 1 in 100 annual probability rainfall event including a 30% increase in rainfall intensity in order to allow for climate change in accordance with DEFRA guidance¹⁴. Assuming a peak discharge rate of 16.2 l/s (**Section 6.3.3**), a storage volume of 607.9 m³ would be required. This could be accommodated within a pond which has a 1.1 m bank top level which is designed to fill to a depth of 1 m (i.e. includes a 100 mm freeboard). This structure could be accommodated within an area of land totalling 772.6 m² which includes 1 in 3 side slopes. The balancing pond outlined in **Appendix A** should provide sufficient area to accommodate the required storage volume.

¹⁴ Footnote 8

6.4 MAINTENANCE OF SUDS

In the past local planning authorities and water companies have been reluctant to adopt SuDS. With no arrangements in place that require local planning authorities or water companies to adopt SuDS their maintenance has subsequently been the responsibility of the developer.

The Flood and Water Management Act (2010) is currently being implemented through a series of Commencement Orders. Section 32 introduces Schedule 3: Sustainable Drainage. This introduces:

- New standards for the design, construction, operation and maintenance of new rainwater drainage systems
- A new 'approving body' (generally a unitary, county or county borough local authority)
- A requirement for the approving body to approve most types of rainwater drainage systems before any construction work with drainage implications can start, subject to: (i) the system being constructed in line with an approved drainage plan to national standards; (ii) the approving body being satisfied the drainage system has been built and functions in accordance with the drainage plan, and (iii) the system being a sustainable drainage system, as defined by regulations.

However, this provision is awaiting commencement following further work by DEFRA on arrangements for adoption and maintenance. It is envisaged that these arrangements will not be implemented before Spring 2015.

6.5 SUMMARY

The purpose of this FCA is to demonstrate that a surface water drainage strategy is feasible for the site given the development proposals and the land available. The proposals provide the opportunity for the inclusion of SuDS elements, ensuring that there will be no increase in surface water runoff from the proposed development.

Appendix A provides an outline surface water drainage layout for the site. The storage facilities have been sized to accommodate the entire storage requirements for the site.

The extent which this is justified given the close proximity of the watercourse to the sea may be reconsidered at the detailed design stage when a final decision on types and size of storage required will be made.

7 SUMMARY

This FCA has been prepared on behalf of Axis PED Ltd and relates to the proposed development of Margam Green Energy Plant.

According to the latest Development Advice Map the site is largely located within Zone C2. Part of the site to the east of the northern redline outline is located within Zone B and the majority of the southern redline boundary is located within Zone A

The site currently benefits from an extant planning permission and proposals are to amend the approved site layout. Furthermore, the site is located within an Employment Landbank within the Neath and Port Talbot UDP. As such, it is assumed that the requirements of the Justification Test as set out in Paragraph 6 of TAN15 have already been met.

Tidal flood risk to the site is not directly from the south Wales coastline but from the Afon Cynffig to the south and/or the River Avon to the north, both of which are tidally dominated watercourses within the vicinity of the site. Given the proposed development platform level of 6.79 m AOD and the existing ground levels in the vicinity of the proposed access road, it has been concluded that the site and access road would be expected to remain dry in up to the 1 in 200 annual probability plus climate change tidal flood event thus complying with A1.14 of TAN15.

NRW has confirmed that the dominant flood risk to the site is from tidal sources and mitigation against this source will more than deal with any residual fluvial flooding.

The risk of flooding from reservoirs has been assessed to be low.

The susceptibility to groundwater flooding at the site has been assessed to be moderate to significant.

The susceptibility to surface water flooding at the site has been assessed to be low.

Raising the development platform to a minimum of 6.79 m AOD in accordance with planning condition 5 of the previously consented scheme is considered reasonable to mitigate flood risk from tidal sources up to the 1 in 200 annual probability plus climate change event.

Finished floor levels should be set at a minimum of 0.15 m above adjacent ground levels following reprofiling of the site.

Compensatory storage should not be required for the proposed scheme.

Surface water runoff from the developed site can be sustainably managed in accordance with TAN15 and local policy.

8 RECOMMENDATIONS

This FCA has demonstrated that the proposed development may be completed without conflicting with the requirements of TAN15 subject to the following:

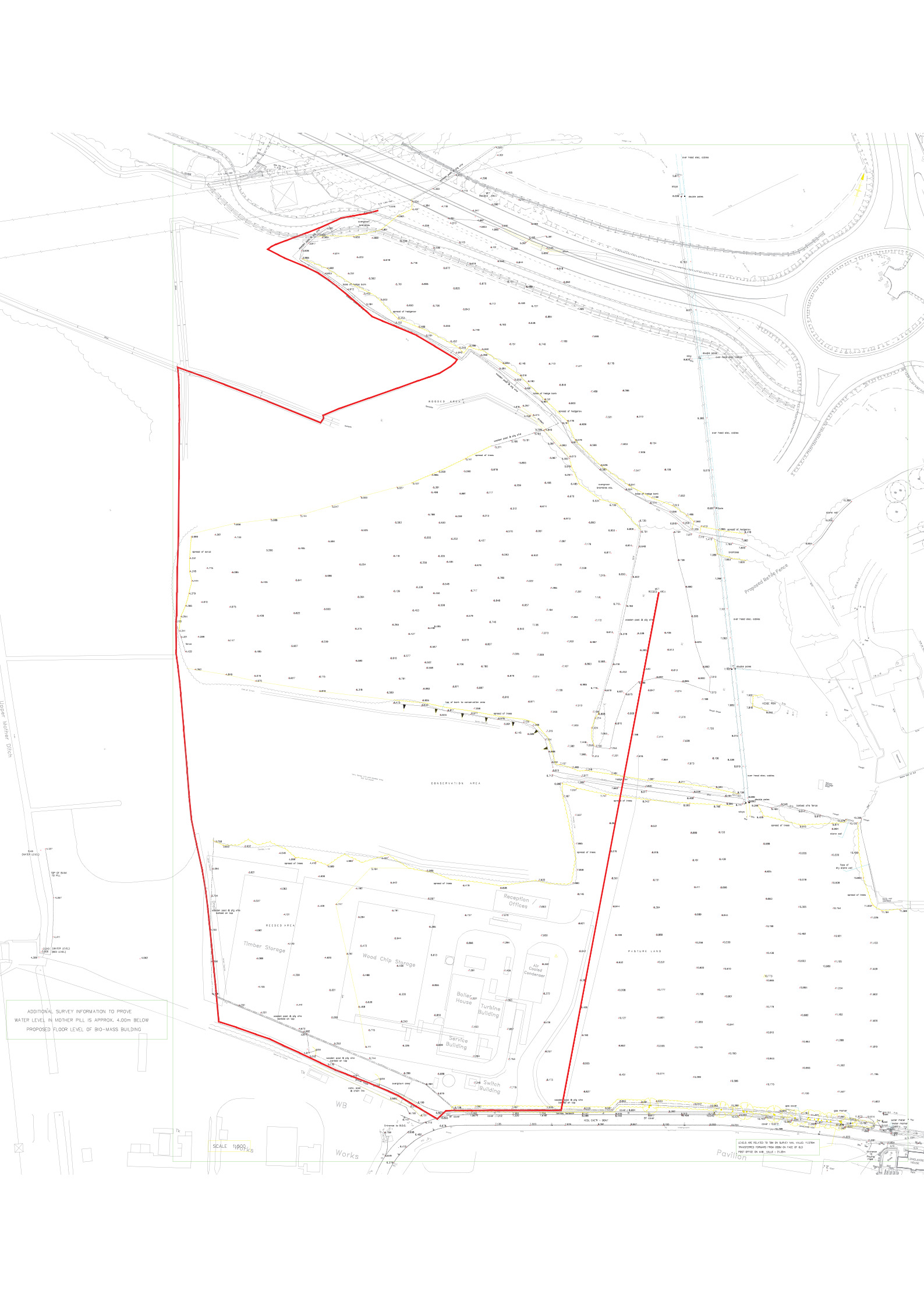
- Development platform level to be set at a minimum of 6.79 m AOD
- Finished floor levels to be set 0.15 m above adjacent ground levels
- The detailed drainage design should be submitted to and approved by the local planning authority prior to the commencement of development

APPENDIX A:

Development Proposals

APPENDIX B:

Topographic Survey



ADDITIONAL SURVEY INFORMATION TO PROVE
WATER LEVEL IN MOTHER PILL IS APPROX. 4.00m BELOW
PROPOSED FLOOR LEVEL OF BIO-MASS BUILDING

SCALE 1:500

LEVELS ARE RELATED TO THE ON SURVEY AND VALUE 115.00m
UNLESS OTHERWISE STATED WHEN ON FACE OF A.D.
NOT SHOWN ON A.D. VALUE 1.00m

APPENDIX C:

Greenfield Runoff Calculations

Weetwood		Page 1
Suite 1 Park House Broncoed Bus Park Wrexham Rd Mold		
Date 14/07/2014 11:49 File	Designed by AdamEdgerley Checked by	
Micro Drainage		Source Control 2014.1
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.400 Area (ha) 1.000 Urban 0.000 SAAR (mm) 1183 Region Number Region 9 Results l/s QBAR Rural 6.3 QBAR Urban 6.3 Q100 years 13.7 Q1 year 5.5 Q30 years 11.1 Q100 years 13.7		
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APPENDIX D:

Surface Water Attenuation - Storage Volume Calculation

Weetwood					Page 1
Suite 1 Park House Broncoed Bus Park Wrexham Rd Mold					
Date 16/07/2014 17:33 File 2765 140714 Pond 100yCC...			Designed by AdamEdgerley Checked by		
Micro Drainage			Source Control 2014.1		
Summary of Results for 100 year Return Period (+30%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.417	0.417	13.5	221.6	O K
30 min Summer	0.552	0.552	13.5	302.9	O K
60 min Summer	0.688	0.688	13.9	389.6	O K
120 min Summer	0.810	0.810	14.7	471.4	O K
180 min Summer	0.861	0.861	15.1	507.4	O K
240 min Summer	0.883	0.883	15.2	522.4	O K
360 min Summer	0.893	0.893	15.3	529.7	O K
480 min Summer	0.894	0.894	15.3	530.7	O K
600 min Summer	0.889	0.889	15.3	527.2	O K
720 min Summer	0.880	0.880	15.2	520.9	O K
960 min Summer	0.856	0.856	15.0	503.4	O K
1440 min Summer	0.796	0.796	14.6	462.0	O K
2160 min Summer	0.702	0.702	14.0	398.6	O K
2880 min Summer	0.609	0.609	13.5	338.9	O K
4320 min Summer	0.439	0.439	13.5	234.6	O K
5760 min Summer	0.315	0.315	13.4	163.8	O K
7200 min Summer	0.248	0.248	12.7	127.0	O K
8640 min Summer	0.208	0.208	11.7	105.2	O K
10080 min Summer	0.184	0.184	10.8	92.6	O K
15 min Winter	0.463	0.463	13.5	249.2	O K
30 min Winter	0.612	0.612	13.5	340.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	96.918	0.0	230.5	20	
30 min Summer	67.029	0.0	319.3	34	
60 min Summer	44.405	0.0	425.5	64	
120 min Summer	28.487	0.0	546.1	122	
180 min Summer	21.655	0.0	622.7	182	
240 min Summer	17.694	0.0	678.5	240	
360 min Summer	13.184	0.0	758.3	298	
480 min Summer	10.704	0.0	820.9	362	
600 min Summer	9.097	0.0	872.1	428	
720 min Summer	7.960	0.0	915.6	498	
960 min Summer	6.440	0.0	987.6	636	
1440 min Summer	4.766	0.0	1096.0	910	
2160 min Summer	3.518	0.0	1215.2	1316	
2880 min Summer	2.831	0.0	1303.9	1704	
4320 min Summer	2.079	0.0	1435.9	2420	
5760 min Summer	1.668	0.0	1537.0	3064	
7200 min Summer	1.408	0.0	1621.6	3752	
8640 min Summer	1.226	0.0	1694.1	4416	
10080 min Summer	1.090	0.0	1757.5	5144	
15 min Winter	96.918	0.0	258.3	21	
30 min Winter	67.029	0.0	357.7	34	
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Weetwood				Page 2		
Suite 1 Park House Broncoed Bus Park Wrexham Rd Mold						
Date 16/07/2014 17:33 File 2765 140714 Pond 100yCC...						
Designed by AdamEdgerley Checked by						
Micro Drainage			Source Control 2014.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
60 min Winter	0.763	0.763	14.4	439.5	O K	
120 min Winter	0.900	0.900	15.3	534.6	O K	
180 min Winter	0.961	0.961	15.8	578.7	O K	
240 min Winter	0.989	0.989	16.0	599.5	O K	
360 min Winter	1.000	1.000	16.1	607.9	O K	
480 min Winter	0.998	0.998	16.1	606.3	O K	
600 min Winter	0.990	0.990	16.0	600.5	O K	
720 min Winter	0.976	0.976	15.9	590.3	O K	
960 min Winter	0.939	0.939	15.6	562.7	O K	
1440 min Winter	0.848	0.848	15.0	497.9	O K	
2160 min Winter	0.705	0.705	14.0	400.6	O K	
2880 min Winter	0.562	0.562	13.5	309.0	O K	
4320 min Winter	0.317	0.317	13.4	165.0	O K	
5760 min Winter	0.216	0.216	12.0	109.8	O K	
7200 min Winter	0.175	0.175	10.4	88.1	O K	
8640 min Winter	0.152	0.152	9.1	76.1	O K	
10080 min Winter	0.137	0.137	8.2	68.2	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
60 min Winter	44.405	0.0	476.6	62		
120 min Winter	28.487	0.0	611.7	120		
180 min Winter	21.655	0.0	697.5	178		
240 min Winter	17.694	0.0	759.9	232		
360 min Winter	13.184	0.0	849.4	336		
480 min Winter	10.704	0.0	919.5	382		
600 min Winter	9.097	0.0	976.7	458		
720 min Winter	7.960	0.0	1025.5	536		
960 min Winter	6.440	0.0	1106.2	690		
1440 min Winter	4.766	0.0	1227.5	984		
2160 min Winter	3.518	0.0	1361.1	1408		
2880 min Winter	2.831	0.0	1460.4	1812		
4320 min Winter	2.079	0.0	1608.5	2428		
5760 min Winter	1.668	0.0	1721.4	3056		
7200 min Winter	1.408	0.0	1816.2	3744		
8640 min Winter	1.226	0.0	1897.5	4416		
10080 min Winter	1.090	0.0	1968.7	5144		
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Suite 1 Park House Broncoed Bus Park Wrexham Rd Mold																																						
Date 16/07/2014 17:33 File 2765 140714 Pond 100yCC...	Designed by AdamEdgerley Checked by																																					
Micro Drainage		Source Control 2014.1																																				
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>17.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.300</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 1.280 <table> <thead> <tr> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> </tr> <tr> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> </tr> </thead> <tbody> <tr> <td>0 4</td> <td>1.000</td> <td>4 8</td> <td>0.280</td> </tr> </tbody> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	17.000	Shortest Storm (mins)	15	Ratio R	0.300	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)	Area	Time (mins)	Area	From: To:	(ha)	From: To:	(ha)	0 4	1.000	4 8	0.280
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Micro Drainage		Source Control 2014.1

Model Details

Storage is Online Cover Level (m) 1.100

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	481.6	1.000	743.3	1.100	772.6

Hydro-Brake[®] Outflow Control

Design Head (m) 1.000 Hydro-Brake[®] Type Md5 SW Only Invert Level (m) 0.000
 Design Flow (l/s) 16.2 Diameter (mm) 163

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.6	1.200	17.5	3.000	27.7	7.000	42.3
0.200	11.5	1.400	18.9	3.500	29.9	7.500	43.8
0.300	13.3	1.600	20.2	4.000	32.0	8.000	45.2
0.400	13.4	1.800	21.5	4.500	33.9	8.500	46.6
0.500	13.3	2.000	22.6	5.000	35.8	9.000	48.0
0.600	13.5	2.200	23.7	5.500	37.5	9.500	49.3
0.800	14.6	2.400	24.8	6.000	39.2		
1.000	16.1	2.600	25.8	6.500	40.8		

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