



Land Use Consultants

Rhigos Road Solar Farm

Flood Consequence Assessment

680555-R1(07)-FRA



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JULY 2023

RSK GENERAL NOTES

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This work has been undertaken in accordance with the quality management system of RSK LDE Ltd.

Land Use Consultants
Rhigos Road Solar Farm
Flood Consequence Assessment & Outline Drainage Strategy
680555-R1(07)-FRA

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1 INTRODUCTION

1.1 Context

RSK Land and Development Engineering Ltd (RSK) was commissioned to carry out a Flood Consequence Assessment (FCA) and outline drainage strategy for Land Use Consultants (the 'client'). The assessment is in support of the planning submission for the proposed Rhigos Road Solar Farm, Aberdare, in the Rhondda Cynon Taf Borough in south-east Wales (the 'site').

This assessment has been prepared in accordance with the Planning Policy Wales¹ and its accompanying Technical Advice Note 15², the Interim Code of Practice for Sustainable Drainage³, BS 8533-2011 Assessing and Managing Flood Risk in Development Code of Practice⁴ and the Recommended Non-Statutory Standards for Sustainable Drainage (SuDS) in Wales⁵, with site-specific advice from Natural Resources Wales (NRW), the Lead Local Flood Authority (LLFA), the architect and the client.

The PPW / TAN15 sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. The key definitions are:

- "areas at risk of flooding" means land within Flood Zones B and C; or land within Flood Zone A which has critical drainage problems and which has been notified to the local planning authority by the NRW; and,
- "flood risk" means risk from all sources of flooding - including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources.

For this site, the key aspects that require the assessment are:

- The Development Advice Map (**Figure 1.1**) shows the site to lie within an area designated as Zone A – at little to no risk of fluvial or coastal/tidal flooding;
- The Flood Map for Planning (**Figure 1.2**) shows the site to lie within an area of a fluvial Flood Zone 1, though the Flood Map for Planning is not a material consideration until June 2023; and,
- The site is more than 16.30ha in size.

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

¹ Welsh Assembly Government (2021) Planning Policy Wales Edition 11

² Welsh Assembly Government (2004), Planning Policy Wales Technical Advice Note 15: Development, flooding and coastal erosion

³ DEFRA (2004), 'Interim Code of Practice for Sustainable Drainage Systems' National SuDS Working Group

⁴ BSI (2011), 'BS 8533-2011 Assessing and managing flood risk in development Code of practice'

⁵ Welsh Assembly Government (2016) 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales – designing, constructing, operating and maintaining surface water drainage systems'

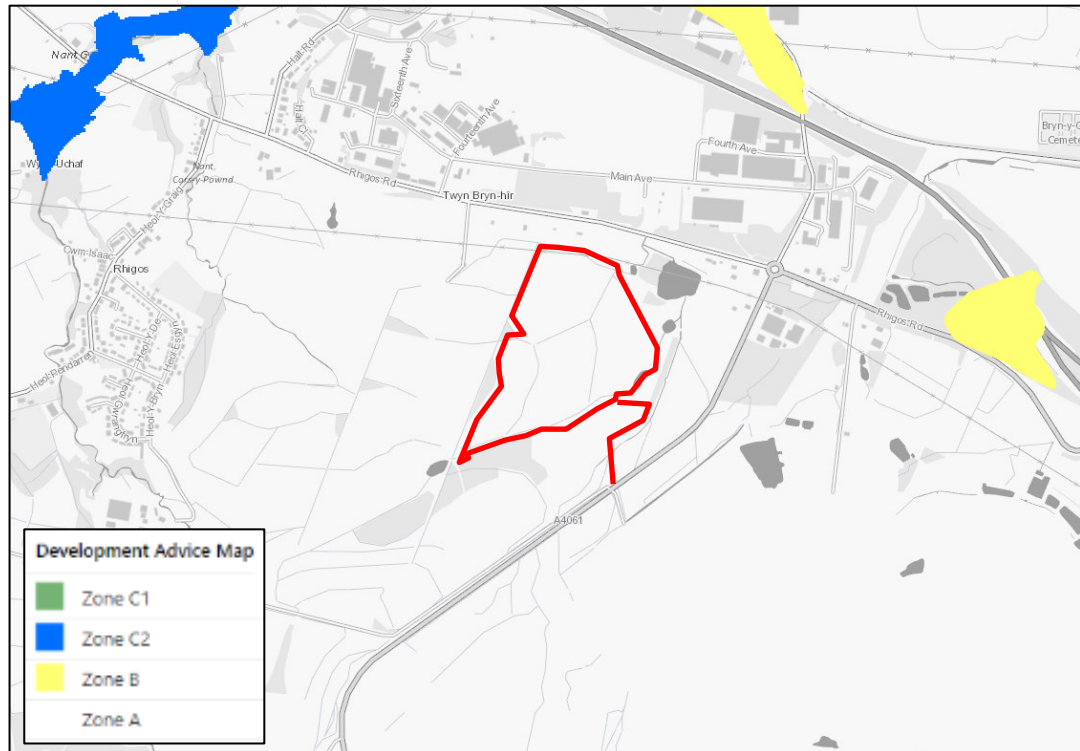


Figure 1.1: NRW flood zone map (accessed July 2022)

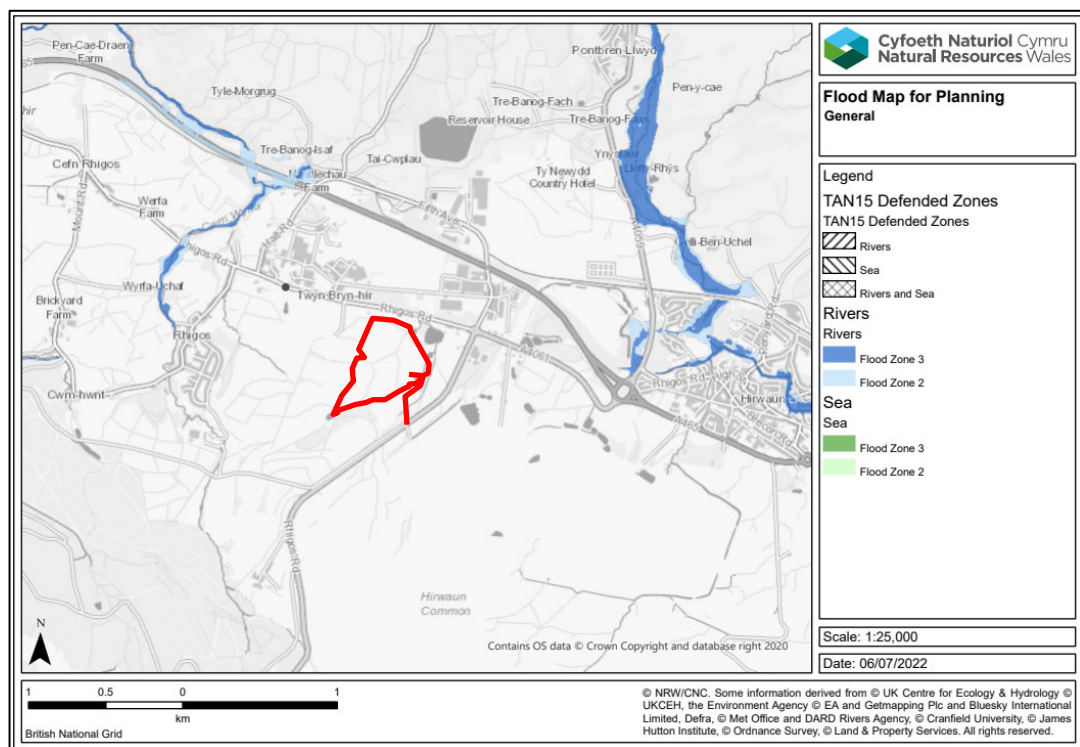


Figure 1.2: Flood map for planning (not in consideration until June 2023) (accessed July 2022)

2 CONTEXT AND SCOPE OF WORK

A key element of project development is to prepare a Flood Consequence Assessment (FCA) to establish the flood risk associated with the proposed development and to propose suitable mitigation, if required, to reduce the risk to a more acceptable level.

The scope of work relating to a FCA is based on the guidance provided in PPW and its accompanying TAN15.

A site-specific FCA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. The scope of this assessment therefore comprises the following elements:

- To review architect plans, planning information and other studies to determine existing site conditions;
- To obtain information on the hydrology and hydrological regime in and around the site;
- To obtain the views of the NRW / LLFA including scope, location and impacts;
- To determine the extent of new flooding provision and the influence on the site;
- To assess the impact on the site from climate change effects and anticipated increases in rainfall over a 40-year period for the proposed commercial lease;
- To review site surface water drainage based on the proposed layout and, if necessary, to determine the extent of infrastructure required; and,
- To prepare a report including calculations and summaries of the source information and elements reviewed.

3 SITE DESCRIPTION

3.1 Existing site

Site Name and Address: Land off Rhigos Road, Cefn Rhigos, Rhigos, Rhondda Cynon Taf, Wales, CF44 9UG

Site National Grid Reference: 293535 , 205722

The solar farm development site is 16.3ha in size and is located to the south of Aberdare. The site is a large section of an existing field, the landowners boundary is a total of 50.74ha (although this report will only use the solar farm site area).

The site is located off Rhigos Road to north and west and will be accessed via the existing entrance off this road to the west. **Figure 2.1** shows a site location map and a site location plan is shown in **Appendix B**.

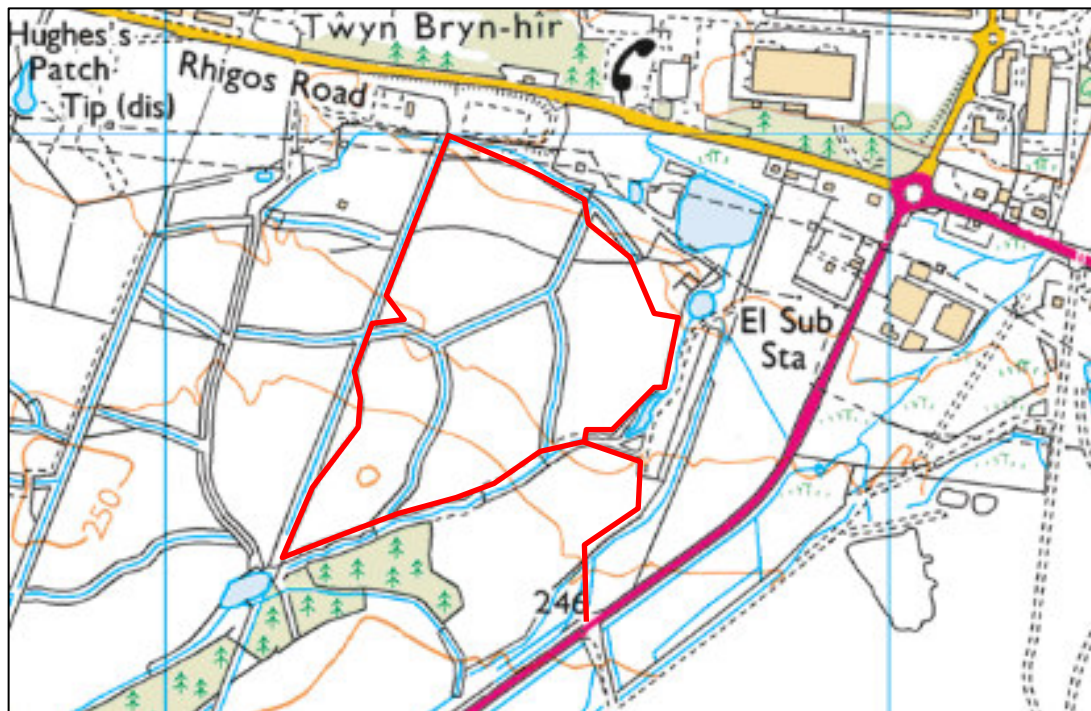


Figure 2.1: Site location map

3.2 Topography

A site-specific topographical survey (included in **Appendix C**) shows the site to have a general northern fall, falling from a maximum elevation of 237.2m AOD at the southern site boundary, to a minimum elevation of 214.9m AOD at the northern site boundary.

3.3 Hydrology

The nearest named watercourse to the site is the Pwll y Crochan watercourse located approximately 2km to the west.

The site itself is enclosed by and contains a number of existing land drainage ditchcourses all running north-east towards various cut-off ditches or a reservoir located beyond the substation. According to NRC every other non 'main river' open watercourse in Wales is known as an "ordinary watercourse".

3.4 Geology

Based on published British Geological Survey online geological records⁶ for the area, the site exhibits the following geology:

- Superficial Geology: Till, Devensian - Diamicton. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by ice age conditions.
- Bedrock Geology: South Wales Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone. Sedimentary Bedrock formed approximately 318 to 319 million years ago in the Carboniferous Period. Local environment previously dominated by swamps, estuaries and deltas.

3.5 Climate Change

Within the context of the existing flood risk at the site, and the requirements of the PPW and TAN15, climate change impacts from different flood sources have been considered alongside the present day scenario as described in Section 8.

As an overview; climate change can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability.

In accordance with the requirements of the PPW and following consultation with Natural Resources Wales the latest climate change predictions will be considered within this assessment.

In line with the Flood Consequence Assessments: Climate Change Allowances⁷ it is noted that "The projected peak river flow change is a range, with the highest estimate equally likely to occur as the lowest estimate. For this reason, it is recommended that the central estimate, or change factor, for the 2080s for the relevant river basin district is used to assess the potential impact of climate change as part of a flood consequence assessment (FCA) and to inform design levels. If a figure other than the central estimate is used, applicants will be expected to provide full justification within the FCA."

As such for the Severn River Basin District, a climate change factor of 25% will be utilised to assess flood risk associated with climate change increases in flows.

⁶ British Geological Survey online mapping, available at <http://mapapps.bgs.ac.uk/geologyofbritain/home.html?location=&gobBtn=go>

⁷ Welsh Assembly Government Flood Consequence Assessments: Climate Change Allowances, September 2021

3.6 Development Proposals

The development comprises the redevelopment of the site into a large scale solar farm including a single entrance to the south-east. The proposed development plans to provide 9,888kW Total DC Power and includes 25 Inverter Stations.

The latest development proposals are included as **Appendix D**.

4 LEGISLATION, POLICY AND GUIDANCE

4.1 National policy

Table 4.1: National legislation and policy context

Legislation	Key provisions
Planning Policy Wales Edition 11 (Feb 2021)	The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.
Technical Advice Note 15 (2004)	PPW is supported by the Technical Advice Note 15, which provide additional guidance on flood risk – note the updated TAN15 is scheduled for adoption in 2023.
Flood and Water Management Act 2010 ⁸	This legislation was formally ratified in May 2010 with the aim is to implementing the findings of the 2007 Pitt Review and co-ordinating control of drainage and flood issues. There are a number of increased responsibilities within the act that affect adoption of Sustainable Drainage Systems (SuDS) features and the role of the NRW to expand on the mapping data they provide. The implementation of SuDS features has many beneficial impacts on the treatment of surface water during remediation works.
Water Resources Act 1991 ⁹	Section 24 – NRW is empowered under this Act to maintain and improve the quality of 'controlled' waters Section 85 – It is an offence to cause or knowingly permit pollution of controlled waters Section 88 – Discharge consents are required for discharges to controlled waters
Water Framework Directive (2000) ¹⁰	The Water Framework Directive requires all inland and coastal waters to reach 'good' chemical and biological status. Flood risk management is unlikely to have a significant impact on chemical water quality except where maintenance works disturb sediment (such as de-silting) or where pollutants are mobilised from contaminated land by floodwaters. The main impact of the WFD on flood risk management, both now and in the future, relates to the ecological quality of water bodies. Channel works, such as straightening and deepening, or flood risk management schemes that modify geomorphological processes can change river morphology. The WFD aims to protect conservation sites identified by the EC Habitats Directive and Birds

⁸ Flood and Water Management Act 2010

⁹ Water Resources Act 1991

¹⁰ European Commission (2000) , 'Directive 2000/60/EC - Water Framework Directive'

Legislation	Key provisions
	Directive that have water-related features, by designating them as 'protected sites'.
Planning (Hazardous Substances) (Wales) Regulations 2015 ¹¹	These Regulations consolidate, with amendments, the Planning (Hazardous Substances) Regulations 1992 (S.I. 1992/656) and subsequent amending instruments insofar as they apply to Wales. They also include provision relating to the period for determination of procedure under sections 20 and 21 of the Planning (Hazardous Substances) Act 1990 ("the PHSA"). The regulations outline the quantity of hazardous substances that can be stored on site prior to the requirement for hazardous substances consent.

4.2 Local policy

Local policies ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and making development safe without increasing flood risk elsewhere and where possible, reducing flood risk. The Local Development Plan will set out a long term spatial vision, objectives and the planning and development strategy for the County.

Relevant policies to flood risk, drainage and hydrology are outlined in **Table 4.2** below.

Table 4.2: Local policy context

LDP document	Key provisions and policies
Rhondda Cynon Taf Local Development Plan 2006-2021 (November 2019) ¹²	<u>Sustainable Drainage Systems</u> 2.22. Schedule 3 to the Flood and Water Management Act (2010) makes Sustainable Drainage Systems (SuDS) a mandatory requirement for certain development in Wales. As of 7th January 2019, SuDS are now required for all new developments of more than one dwelling or where the construction area is 100m² or more. Construction cannot begin without SuDS approval. This requirement is likely to have an effect on development, such as housing density requirements and development viability. The preparation of new or updated policies for a revised LDP will need to consider the potential implications of SuDS.

¹¹ The Planning (Hazardous Substances) (Wales) Regulations 2015

¹² Rhondda Cynon Taf, Local Development Plan, 2006-2021 Review Report, November 2019

<https://www.rctcbc.gov.uk/EN/Resident/PlanningandBuildingControl/RelatedDocuments/Pdfs/LDPRReviewReport2019.pdf>

5 TECHNICAL ADVICE NOTE 15

TAN15 provides technical guidance on flood risk and development which supplements the policy set out in Planning Policy Wales.

In line with Figure 2 of TAN15, the development category for the works is Less Vulnerable Development, which includes all general industrial development.

5.1 Justification Test

All other new development should only be permitted within zones C1 and C2 if determined by the planning authority to be justified in that location. 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; and,
 - iv. The potential consequences of a flooding event for the particular type of development have been considered, and found to be acceptable.

Based on the information provided, the proposed development is justifiable on the following grounds;

- The site's location in Flood Zone A;
- The site is a greenfield site and has been vacant for a prolonged period of time;
- The proposed development seeks to redevelop the vacant area to a solar farm.

5.2 Assessing Flood Consequences

The FCA seeks to demonstrate how the flood consequences can be properly managed for the lifetime of the development (Sections 7, 8 and 9) ensuring that the site and the occupants are safe in line with TAN15.

6 SOURCES OF INFORMATION

6.1 Introduction

Reliance has been placed on factual and anecdotal data obtained from the sources identified. RSK cannot be held responsible for any omissions, misrepresentations, errors or inaccuracies with the supplied information. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report.

The information in this report has been prepared following consultation with third party consultees, and receipt of third party information. In some instances, this may only be verbal or informal responses.

Such information and opinions received from third parties are likely to be subjective to the individuals concerned and may not necessarily represent the opinions of the bodies themselves. As such, said opinions may be subject to variation, clarification or expansion upon submission of more detailed proposals from the developer. All opinions expressed are based upon current design standards and policies in force at the date of this report. These standards may be subject to change with the passage of time.

The opinions expressed herein are intended to provide general guidance as to how a problem related to a particular development might be resolved. Given the paucity of the original information, and the often-indirect nature of information received, they should not be relied upon as absolute or definitive guidance as to any particular solution. Such conclusions can only sensibly be arrived at upon detailed design.

As a consequence of the above, RSK LDE will not be held liable for any consequential losses, howsoever caused, as a consequence of inaccurate missing, incomplete, or erroneous data contained in this report, nor any data capable of being subject to variable interpretation by means of its generalised nature.

6.2 NRW consultation

6.2.1 Flood zone maps

NRW Flood Zone mapping study for Wales is available on their website at <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en>

The Welsh Assembly Government's Development Advice Maps which are available at: <http://data.wales.gov.uk/apps/floodmapping/>

6.2.2 Consultation

NRW was contacted with regard to fluvial / tidal flood levels in the in the vicinity of the site. They suggested consulting the flood maps and their website for further information.

6.3 Rhondda Cynon Taf County Council Response

Rhondda Cynon Taf County Council was contacted to obtain relevant data/guidance and establish key site constraints, their response is yet to be received.

7 SOURCES OF FLOOD RISK

7.1 Criteria

In accordance with PPW and advice from NRW, a prediction of the flood sources and levels is required along with the effects of climate change from the present for the design life of the development (in this case a lease of 40 years). To consider these effects of climate change, new standard industry guidance recommends consideration of a 25% increase in peak river flows over this timeframe.

The flood risk elements that need to be considered for any site are defined in BS 8533 as the “Forms of Flooding” and are listed as:

- Flooding from Rivers (fluvial flood risk);
- Flooding from the Sea (tidal flood risk);
- Flooding from the Land;
- Flooding from Groundwater;
- Flooding from Sewers (sewer and drain exceedance, pumping station failure etc);
- Flooding from Reservoirs, Canals and other Artificial Structures.

The following section reviews each of these in respect of the subject site.

7.2 Definitions of Risk

Table 7.1: Flood Map for Planning Risk Zoning

Flood Zone	Description
Zone A	Considered to be at little or no risk of fluvial or coastal/tidal flooding
Zone B	Areas known to have flooded in the past
Zone C1	Served by significant infrastructure, including flood defences
Zone C2	Without significant flood defence infrastructure

Table 7.2: Flood Risk from Rivers, Flood Risk from the Sea and Flood Risk from Surface Water & Small Watercourses

Flood Risk	Description
High	High means that each year, this area has a chance of flooding of greater than 1 in 30 years (3.3%) from Rivers, surface water & small watercourses and Tidal sources
Medium	Medium means that each year, this area has a chance of flooding of between 1 in 100 years (1%) and 1 in 30 years (3.3%) from Rivers, surface water & small watercourses sources.

Flood Risk	Description
	For Tidal sources Medium means that each year, this area has a chance of flooding of between 1 in 200 years (0.5%) and 1 in 30 years (3.3%).
Low	Low means that each year, this area has a chance of flooding between 1 in 1000 year (0.1%) and 1 in 100 year (1%) for Rivers, surface water & small watercourses sources. For Tidal sources Low means that each year, this area has a chance of flooding of between 1 in 1000 years (0.1%) and 1 in 200 years (0.5%).
Very Low	Without significant flood defence infrastructure

7.3 Flooding from rivers (fluvial flood risk)

The Welsh Government Development Advice Maps (**Figure 7.1**) shows that the site is designated as Zone A. As noted in Table 7.1, Zone A refers to at little or no risk of fluvial or coastal/tidal flooding. Therefore, the site should be considered at **low** risk from Main River flooding (**Figure 7.2**).

The NRW 'Flood Risk from Rivers' map shows the extents of flooding from rivers designated as 'Main Rivers' by the NRW. The flood map for planning (**Figure 7.3**) indicates that the site is located within Flood Zone 1.

7.3.1 Flood Defences

The site is not located in any areas with fluvial flood defences. Whilst the NRW Flood Map for Planning (**Figure 7.4**) is not a material planning consideration until June 2023, the data provided with respect to the flood defences builds on the information provided in the Flood Map for Wales.

7.3.2 Climate change

Fluvial flooding is likely to increase as a result of climate change. A greater intensity and frequency of precipitation is likely to raise river levels and increase the likelihood of a river overtopping its banks, however, the impact of climate change on fluvial flooding at the site is considered to be low.

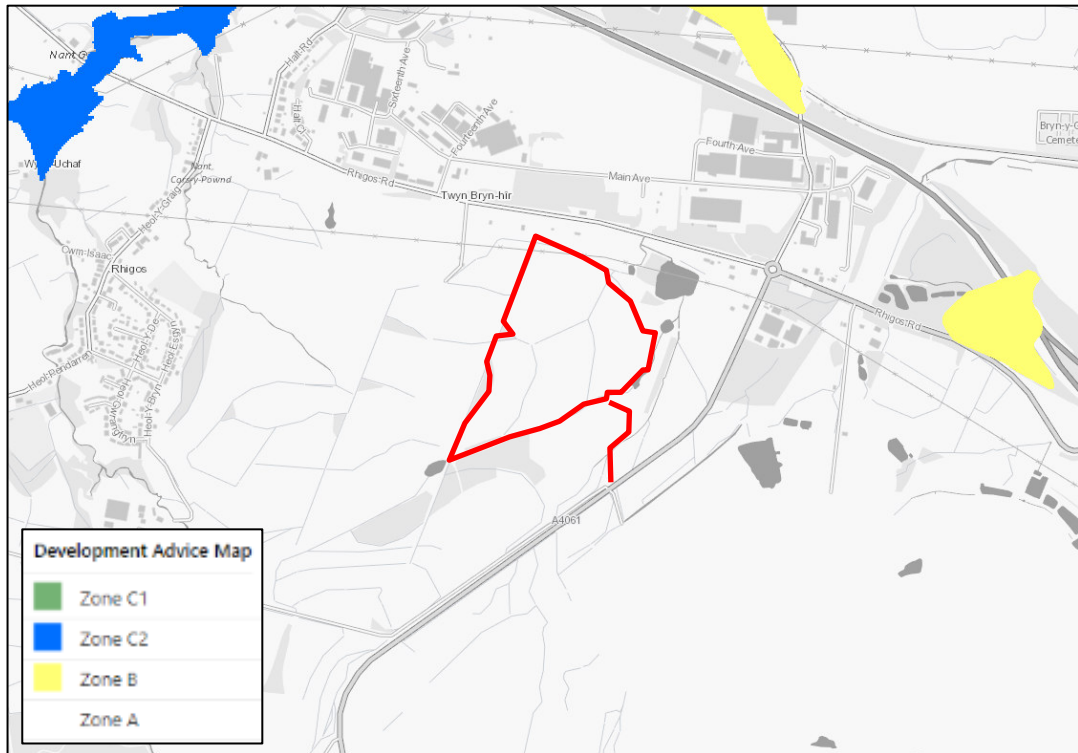


Figure 7.1: Development Advice Map (accessed July 2022)

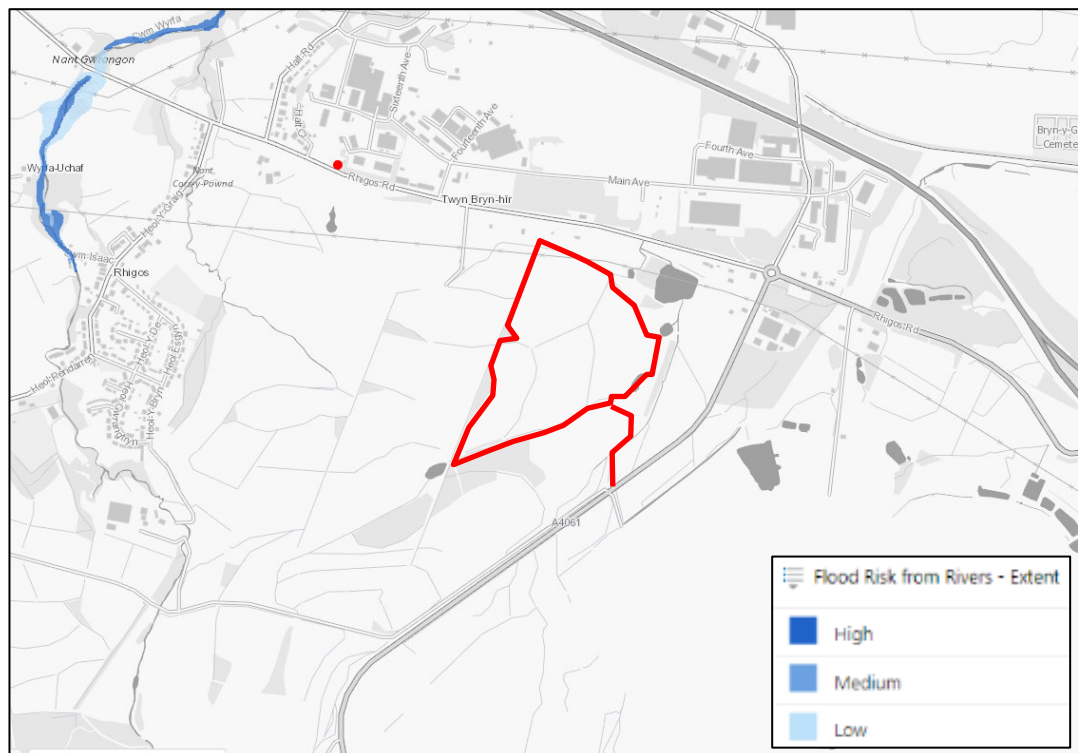


Figure 7.2: NRW flood risk from rivers extent map (accessed July 2022)

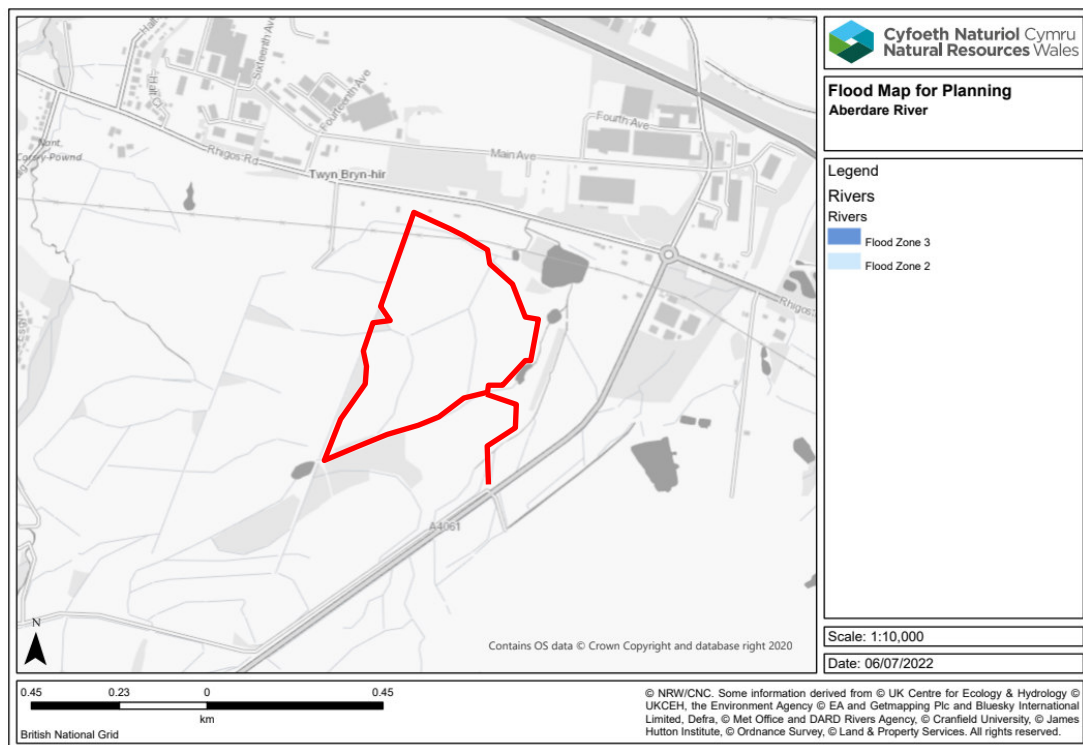


Figure 7.3: NRW fluvial flood risk map (not in consideration until June 2023) (accessed July 2022)

7.4 Flooding from the sea (tidal flood risk)

The NRW tidal flood risk maps (**Figure 7.5**) shows the site to be located outside the area at risk of tidal flooding. Therefore, tidal flood risk is considered **low**.

7.4.1 Climate change

Due to its location, climate change impacts upon the tidal flood risk to the site will be negligible.

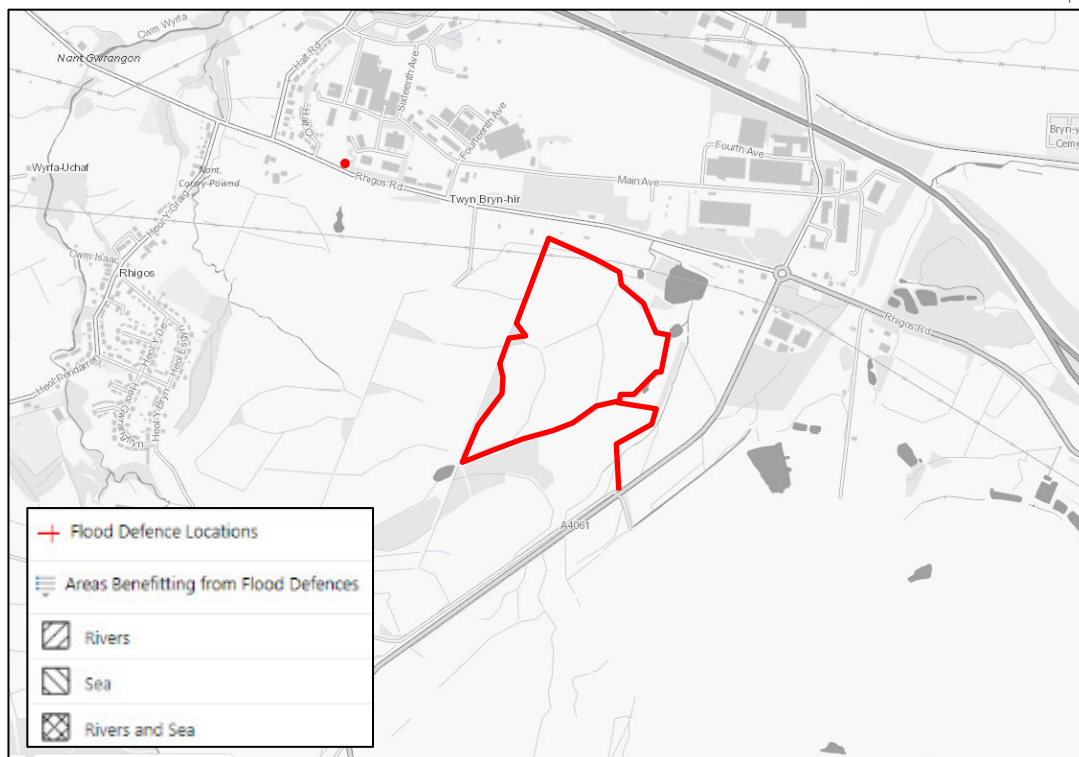


Figure 7.4: NRW fluvial flood risk map (accessed July 2022)

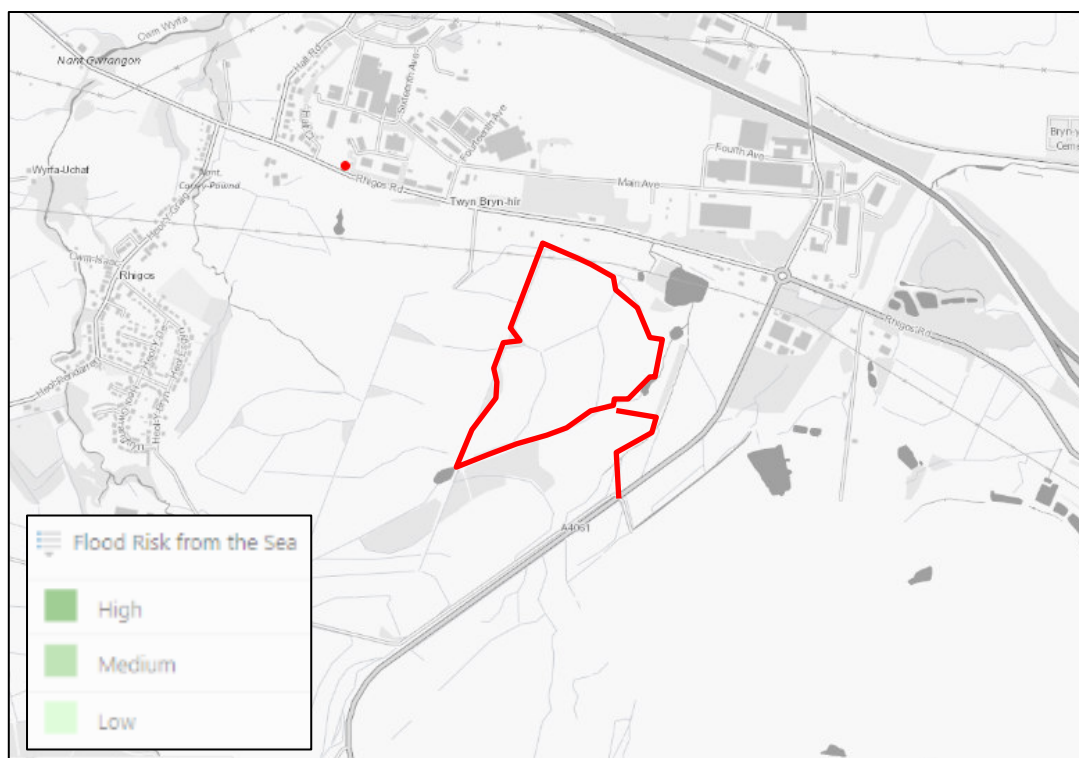


Figure 7.5: NRW Tidal Flood Map (Accessed July 2022)

7.5 Flooding from the land (overland pluvial flood risk)

If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff will occur. Excess surface water flows from the site are believed to drain naturally to the local water features, either by overland flow or through infiltration.

Both the NRW's surface water flood map (**Figure 7.6**) and the Flood Map for Planning (**Figure 7.7**) shows that the majority of the site is not in an area of surface water flood risk. However the watercourse along the southern edge of the site lies partially within Flood Zones 2 and 3. This appears to be constrained to the banks of the watercourse and only a single very small patch of risk area is present within the centre of the site and a junction of the internal land drainage ditches.

The Rhondda Cynon Taf Council Local Flood Risk Management Strategy (LFRMS)¹³ indicates that the site is within a low risk area, due to the major land drainage system lying along the southern boundary while the majority of the site has no classification. Given the sloping topography of the site and the extensive surface water drainage network, any surface water flooding is likely to be directed away from the site.

In line with the NRW data, the risk of pluvial flooding to the site can be considered **low**.

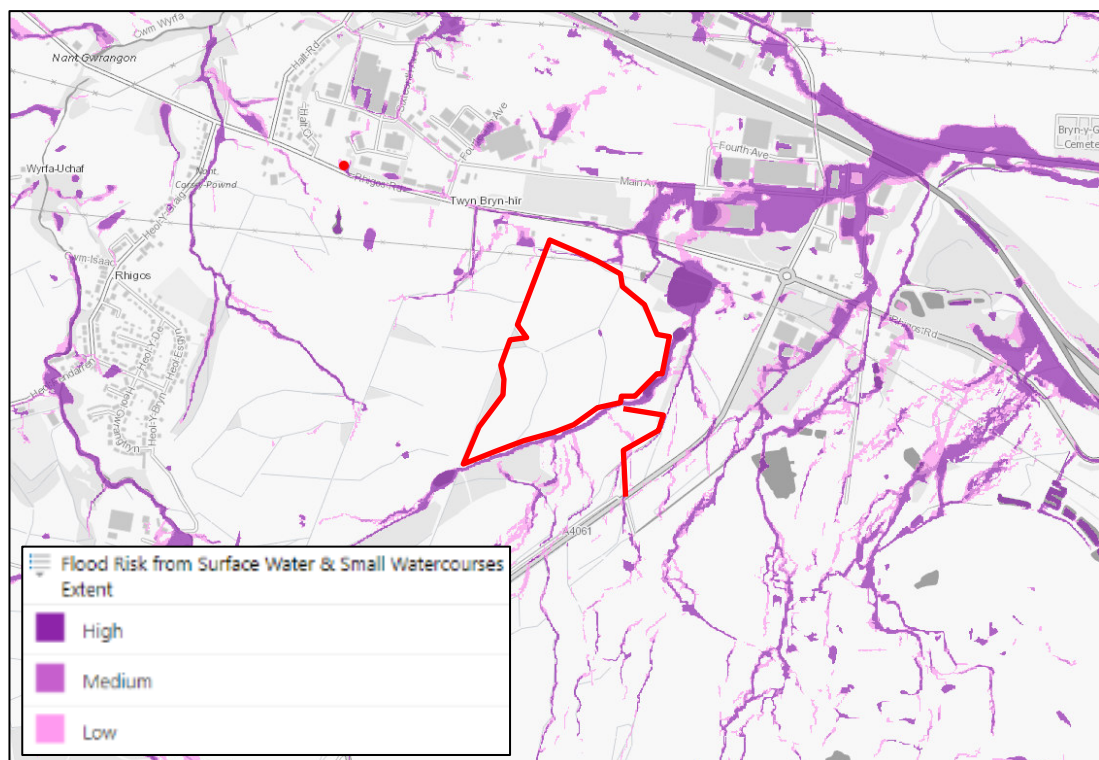


Figure 7.6: NRW Surface Water Flood Map (Accessed July 2022)

¹³ Rhondda Cynon Taff County Borough Council - Local Flood Risk Management Strategy Summary
<https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/RelatedDocuments/lfrmssummaryeng.pdf>

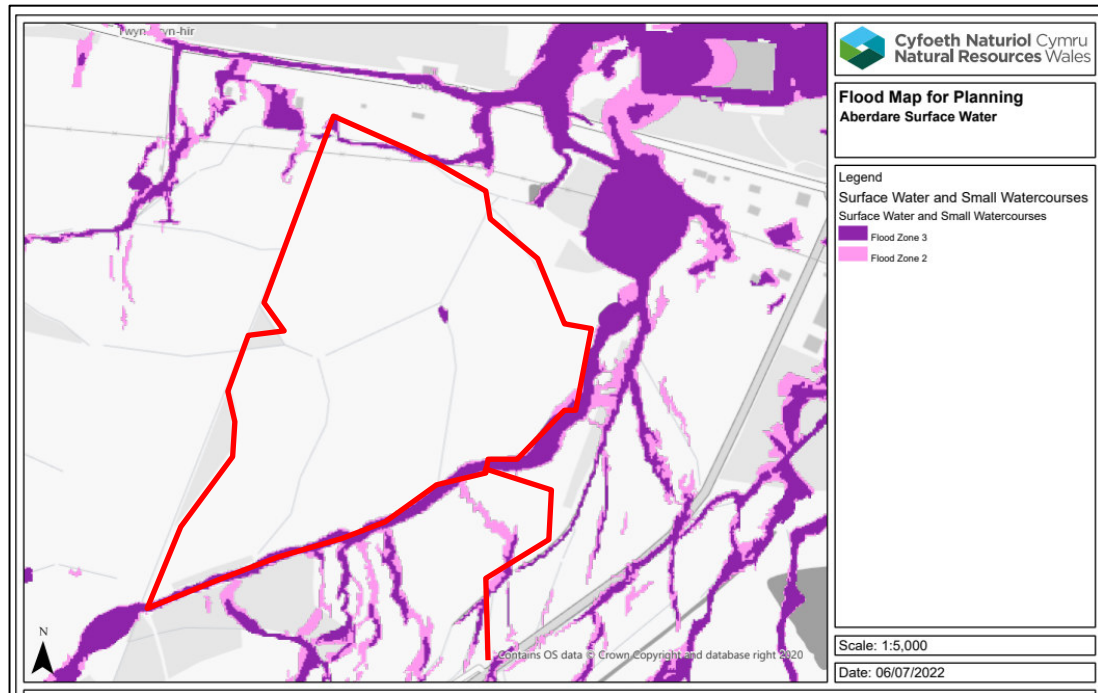


Figure 7.7: Surface Water Flood Map for Planning (not in consideration until June 2023) (Accessed July 2022)

7.5.1 Climate change

Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow, however the impact of climate change on pluvial flooding at the site is considered to be low.

7.6 Flooding from groundwater

Groundwater flooding tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas, the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

The generally low permeability of the geology suggests that it is unlikely to be conductive of groundwater. However, the NRW classifies the bedrock geology of the site to act as a Secondary A Aquifer defined as “permeable layers that can support local water supplies, and may form an source of base flow to rivers”.

BGS Boreholes taken from Rhigos Primary School, approximately 200m west of the site, indicate that groundwater seepage doesn't occur above depths of 6m.

The risk of groundwater flooding is therefore concluded to be **low**.

7.6.1 Climate change

Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. If winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may however be balanced by lower recharge during the predicted hotter and drier summers. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. It is probable that any locally perched aquifers (small water tables perched on top of local impermeable base layers) may be more affected, but these are likely to be isolated. The change in flood risk is likely to be low.

7.7 Flooding from sewers

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. A sewer flood is often caused by surface water drains discharging into the combined sewer systems; sewer capacity is exceeded in large rainfall events causing the backing up of floodwaters within properties or discharging through manholes.

Most adopted surface water drainage networks are designed to the criteria set out in Sewers for Adoption¹⁴. One of the design parameters is that sewer systems be designed such that no flooding of any part of the site occurs in a 1 in 30 year rainfall event. By definition a 1 in 100 year event would exceed the capacity of the surrounding sewer network as well as any proposed drainage.

To ensure that sewer and surface water flooding is not exacerbated; surface water must be considered within the design of the site. This ensures that any additional surface water and overland flows are managed correctly, to minimise flood risk to the site and the surrounding area. Any new surface water network on the site should be designed to ensure exceedance of the network has been considered.

Records requested from Welsh Water (included in **Appendix E**) show that the site has no existing surface or foul water sewers crossing the sites area. The Rhondda Cynon Taf Council LFRMS¹² does not indicate that the site has any previous records of sewer flooding. Any surcharging of sewer networks will likely be directed through the site following local topographies. The generally sloping nature of the site suggests that any such flows would be 'sheet flow', shallow in nature and ultimately directed away from the site (i.e. no localised ponding).

Given that the risk of sewer flooding is likely only in the event of failure or blockage, this is considered to be a 'residual' risk, and as such the risk of potential flooding from sewers is concluded to be **low**.

7.7.1 Climate change

The impact of climate change is likely to be negative regarding flooding from sewers. Increased rainfall and more frequent flooding put existing sewer and drainage systems under additional pressure resulting in the potential for more frequent surcharging and

¹⁴ WRC (2020), 'Sewers for Adoption' 8th Edition

potential flooding. This would increase the frequency of local sewer flooding but would not be significant in terms of the proposed development.

7.8 Reservoirs

Flood events can occur from a sudden release of large volumes of water from reservoirs, canals and artificial structures.

Reservoir flooding is also extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then reservoir safety legislation has been introduced to ensure reservoirs are maintained.

The reservoir flood map for planning (**Figure 7.8**) shows that the site is not in an area at risk of flooding from this source and as such is considered at a **very low** risk from this source.

7.8.1 Climate change

Reservoirs can be managed over time, controlling inflow/outflow of water and therefore there is the capacity to control the effects of climate change. Increased rainfall has the potential to increase base flow, but this should be minimal. It is unlikely that there will be a substantial change to the risk of flooding for this site.

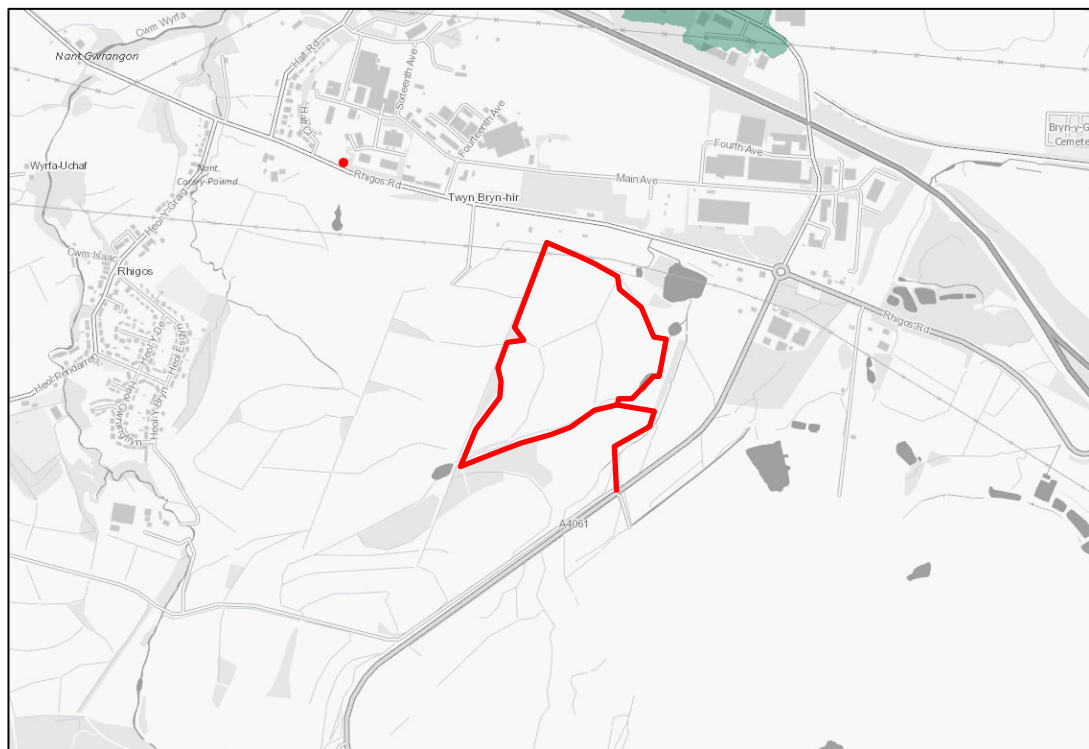


Figure 7.8: Reservoir flood map for planning (not in consideration until June 2023) (Accessed July 2022)

7.9 Canals

There are no Canal & River Trust owned canals within the vicinity of the site, therefore no risk is attributed to this source.

7.10 Flood risk resulting from the development

The proposed development will use the latest best practice guidance to ensure that flood risk is not increased as a result of the development. The proposed development is located on an area of open fields, as such will not contribute additional runoff into the drainage systems.

Whilst it is acknowledged that there is a low residual risk of fluvial flooding to the site due to the proximity of the surrounding land drainage ditch-courses, this will not be increased to the site or the surrounding area as a result of the development.

8 DEVELOPMENT ACCEPTABILITY

8.1 Development justification

As the site is located within currently undeveloped land in an area designated as Zone A (little or no risk of fluvial or coastal/tidal flooding) according to the Development Advice Map, the criteria from Tan15 detailed in **Section 5.1** is required to be satisfied.

8.2 Finished floor levels and site design

The site is shown to be at a low risk of flooding with its location within Zone A.

There are no residential accommodation aspects of the development so there is no need to provide freeboard against any potential residual flooding.

8.3 Safe access and egress

Site access will be provided from an entrance off Rhigos Road via a new build access bridge from the south-west over the watercourse (see **Appendix C**) which is indicated to at 'low' risk of flooding from all assessed sources.

As such, safe access and egress is concluded to be possible to and from site save any extreme flooding events, and due to a solar farms limited personnel requirements it is assumed that the site will be accessible for most situations.

8.4 Flood Warnings and Advice Packs

The developer / site users should sign up to the relevant NRW flood warnings / flood alerts covering the local area (<https://flood-warning.naturalresources.wales/>).

Details of the flood warning data, safe access and egress protocols and other pertinent information with respect to ensuring that the property and occupants remain safe should a flood occur should be included in an advice pack contained within the properties.

8.5 Existing defences

The site is not afforded any protection from existing defences.

9 SURFACE WATER DRAINAGE STRATEGY

9.1 Scope

The TAN15 states that SuDS should be considered wherever practical. The use of SuDS is also encouraged, and the surface water drainage strategy should seek to implement a SuDS hierarchy that aspires to achieve reductions in surface water runoff rates to greenfield rates.

9.2 Pre-development situation

The existing site area is 16.3ha and 0% impermeable.

The pro-rata IoH 124 method¹⁵ has been used to estimate the Greenfield surface water runoff for the total site area of the site, shown in **Table 9.1**. Calculations are contained in **Appendix F**.

Table 9.1: IOH 124 surface water runoff (greenfield) for total site area (16.3ha)

Return period	Peak flow (l/s)
QBar	344.5
1 in 1 year	303.2
1 in 30 year	613.3
1 in 100 year	751.1

9.3 Off-site discharge options and limits

9.3.1 Infiltration

Infiltration should be considered as the primary option to discharge surface water from the developed site. The effectiveness of infiltration is completely dependent on the physical conditions at the site. Potential obstacles include:

- Local variations in permeability preventing infiltration – It is understood from the BGS geological mapping that the site is underlain with superficial till and diamicton geology, underlain with Coal Measures (Mudstone, Siltstone, Sandstone) bedrock geology;
- Shallow groundwater table - For infiltration drainage devices, Building Regulation approved document H states that these “should not be built in ground where the water table reaches the bottom of the device at any time of the year”; and,
- Source Protection Zones - The site is not located within a Groundwater Source Protection Zone.

¹⁵ Institute of Hydrology (IoH), ‘Flood Estimation for small catchments - Report 124’, 1994

Since the site is located on a partially Sandstone bedrock there is a possibility that the region might have some infiltration potential. However, this is dependent on future soakage testing or ground investigation confirming a viable soakage rate and groundwater level.

Due to the small impermeable areas resulting from the development, infiltration is considered to a potentially viable means of discharge. In accordance with the Local Plan described in **Section 4.2**, the use of sustainable drainage features is always encouraged for all new developments.

9.3.2 Discharge to watercourse

Discharging surface water directly to a local watercourse is considered feasible for the site, as there are various ordinary watercourses along the eastern, southern and western site boundaries.

9.3.3 Discharge to surface water sewer

There are no surface water sewers on-site or within the vicinity of the site, hence discharge to sewer is not a feasible option.

9.4 Post-development situation

According to the principles of the BRE planning guidance for the development of large-scale ground mounted solar PV systems, in general solar panels do not increase the impermeable area of a site and it is generally considered that they do not contribute to an increase in surface water runoff from the site.

The solar panels will not increase the impermeable area across the site; therefore, no formal drainage is required. As such a pragmatic approach has been developed to promote infiltration and provide storage areas across the site. This will involve the management and maintenance of vegetated and grassed areas surrounding the panels (particularly at the low edge) and backfilled infiltration trench features for the transformer stations. These small surface features will intercept and attenuate runoff, promoting infiltration across the site.

9.4.1 Solar arrays

9.4.1.1 Design

It is anticipated that any precipitation falling on each solar panel will runoff the panels and flow towards / infiltrate in the rain shadow of the down-slope modules. The rows of panels on the site are generally aligned from parallel to a 25° angle to the contours of the site. As such rainwater falling of the trailing edge of the panels will generally flow away from the base of the panels between a 90° and 25° angle towards the rain shadow of the down-slope panels. This feature will enable the use of the rain shadow area of the panels to maintain the infiltration potential of the site.

In some instances, runoff from solar panels could result in the kinetic compaction of soils at the base of the panels and the intensification of runoff into rivulets running along the trailing edge of the rows of panels. This could conceivably lead to a slight increase in the amount of runoff when compared to the pre-development situation resulting from a decrease in infiltration potential.

The specifications of the solar array supports are to be designed to be widely spaced and are driven vertically into the ground with no additional foundations. The arrays are in rows with spaces of several metres in between the leading edge of one row and the trailing edge of the row behind.

The panels are typically mounted in double horizontal rows and are separated by a horizontal 'rainwater' gap. This gap allows rainwater to drain freely to the ground between the panels helping to replicate the Greenfield runoff conditions.

9.4.1.2 *Vegetation and soil structure*

Sustainable management of the post development situation in terms of vegetation planting and soil type can be used as a means of managing surface water runoff from the solar panels. As such to ensure that there is no increase in surface water runoff managed sustainable vegetation (with a good soil structure e.g. chisel ploughed soils) will be allowed to grow beneath the solar panels, which will avoid kinetic compaction and ensure that any potential instances of rivulet formation are minimised and surface water runoff flows over the ground in a natural way as noted in the paper Hydrologic Response of Solar Farms (Cook and McCuen 2013¹⁶). Vegetation planting and soil management should be site wide to encompass all solar panel rows.

9.4.2 **Transformer Stations**

It is intended that surface water runoff from the transformer stations will infiltrate into the ground after passing through a drainage trench to closely mimic the existing situation. The design rainfall event for this assessment has been taken as the 6 hour, 1 in 100-year event with the intention of retaining any additional surface water runoff generated as a result of the development on the site in the drainage trench. The possible methods of discharging surface water from the site will be via the existing drainage infrastructure on site or due to the small volumes of runoff, by using natural infiltration / evaporation.

Table 9.2 details the specifications of the indicative drainage trenches that could be used to serve the transformer stations.

The length of the drainage trench has been determined using the perimeters of the transformer stations. It is intended that test ditches are backfilled with a granular material for health and safety reasons and to allow access.

The rainfall data used in the calculations has been gathered from the Centre of Ecology and Hydrology's Flood Estimation Handbook rainfall database. In accordance with National Planning Policy Framework, climate change has been taken into consideration for the lifetime of the development; as such an increase in rainfall of 20% has been included in the storage requirements.

¹⁶ Cook, L.M and McCuen, R. H (2013), Hydrologic Response of Solar Panels, Journal of Hydrologic Engineering, American Society of Civil Engineers, May 2013

Table 9.2: Approximate Drainage Trench Sizing and Volumes

Description	1 in 100-year Rainfall (m)	Impermeable Development Area (m ²)	1 in 100 yr Surface Water Volume Required (m ³)	1 in 100yr Volume Required with 20% Climate Change (m ³)	Trench Sizing				Volume Created (m ³) *
					Side Slope	Base Width (m)	Depth (m)	Length (m)	
Power Stations (x4)	0.0838	24.6 (98.4)	2.06	2.47	Vertical	0.7	0.8	15	2.52
Switchgear Enclosure	0.0838	109.8	9.20	11.04	Vertical	0.8	1.2	40	11.52

*Assuming a void ratio of 0.3

The attenuation volume (m³) calculated per metre for the hardstanding, has been calculated using a void ratio of 0.3 of the total volume of aggregate in the trench. The trenches are to be back filled with suitably sized and sourced aggregate, to allow appropriate attenuation.

If natural infiltration on-site is not adequate to effectively discharge surface water runoff from the transformer stations, the trenches would be utilised as on-site attenuation. These would be designed to store excess runoff before naturally discharging at greenfield rates across the site.

Figure 9.1 shows the cross-sectional diagram of the proposed infiltration trenches surrounding the transformer stations.

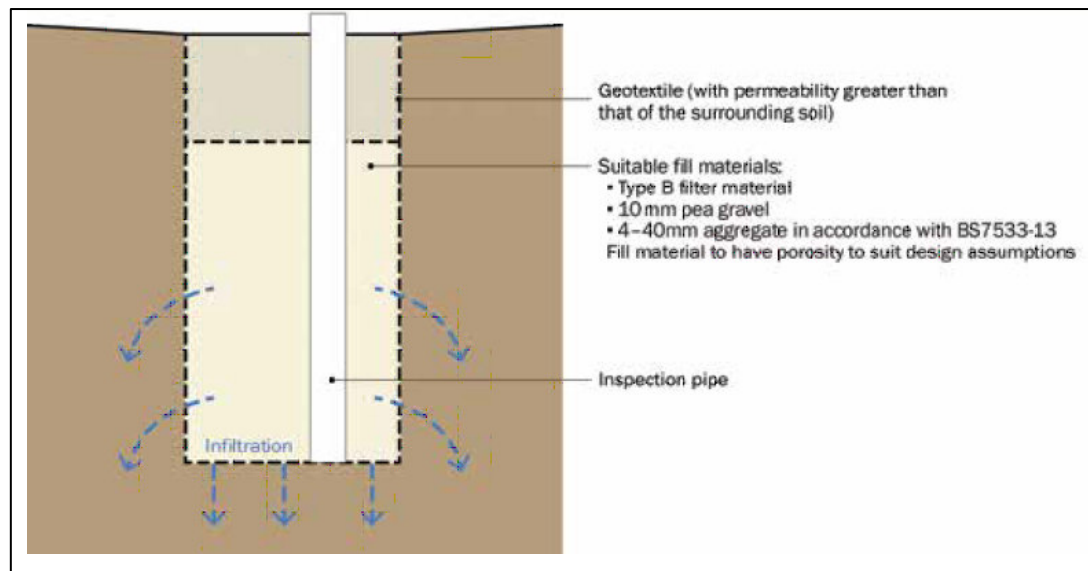


Figure 9.1: Cross-sectional diagram of an infiltration trench (taken from CIRIA C753)

9.4.3 Access track surface water drainage

Where required, access tracks are kept to a minimum, and be a temporary measure. As such, 'floating roads' could be used on site, typically these will require a wide strip of geotextile laid on the ground covered by a nominal layer of stone to form the track. As such, the access tracks will maintain a permeable nature and not increase the surface water runoff from the development. Any flows in excess of the infiltration rates will discharge to the surrounding ground and will not impact on land outside of the site. For solar panel maintenance access could be gained by way of using 4x4 vehicle, quadbike or agricultural vehicles to minimise impacts on the ground.

Although part of the access track crosses the high risk surface water flow path, this should not disrupt the route of the existing flow path as it will be made from permeable material.

9.4.4 Maintenance

Maintenance of any drainage network is essential to ensure optimal performance of the drainage elements. As such maintenance requirements of the drainage system will include, but not be limited to the management and maintenance of the vegetation between the panels and the inspection and cleaning of backfilled trenches / swales to ensure that the capacity and infiltration rates are maintained.

The drainage systems are likely to remain in private ownership and therefore the site operator will be responsible for the maintenance of the drainage features on-site.

10 CONCLUSIONS AND RECOMMENDATIONS

This FCA complies with the PPW and its Technical Guidance (TAN15) and demonstrates that flood risk from all sources has been considered in the proposed development. It is also consistent with the Local Planning Authority requirements with regards to flood risk.

The proposed development is predominantly on existing permeable ground. Post-development there will be a negligible change to the on-site cover since solar panels are not regarded as a typical impermeable surface.

This flood consequence assessment has concluded that:

- The site lies mostly within an area designated as Zone A – at little to no flood risk
- Flood risk from surface water is low at the site although the surrounding land drainage ditch-courses are classed as high risk;
- Flood risk from other sources – groundwater, sewers, reservoirs and artificial sources – is demonstrated to be low or very low;
- The development (both during and post construction) will have minimal to no impact on other forms of flooding;
- Surface water runoff resulting from the development will promote sustainable drainage and infiltration, with additional attenuated storage.
- The FCA has demonstrated that the proposed developments in the locations assessed are justifiable and have acceptable consequences of flooding in line with TAN15.

Overall, taking into account the above points, the developments at the location outlined should not be precluded on flood risk grounds.

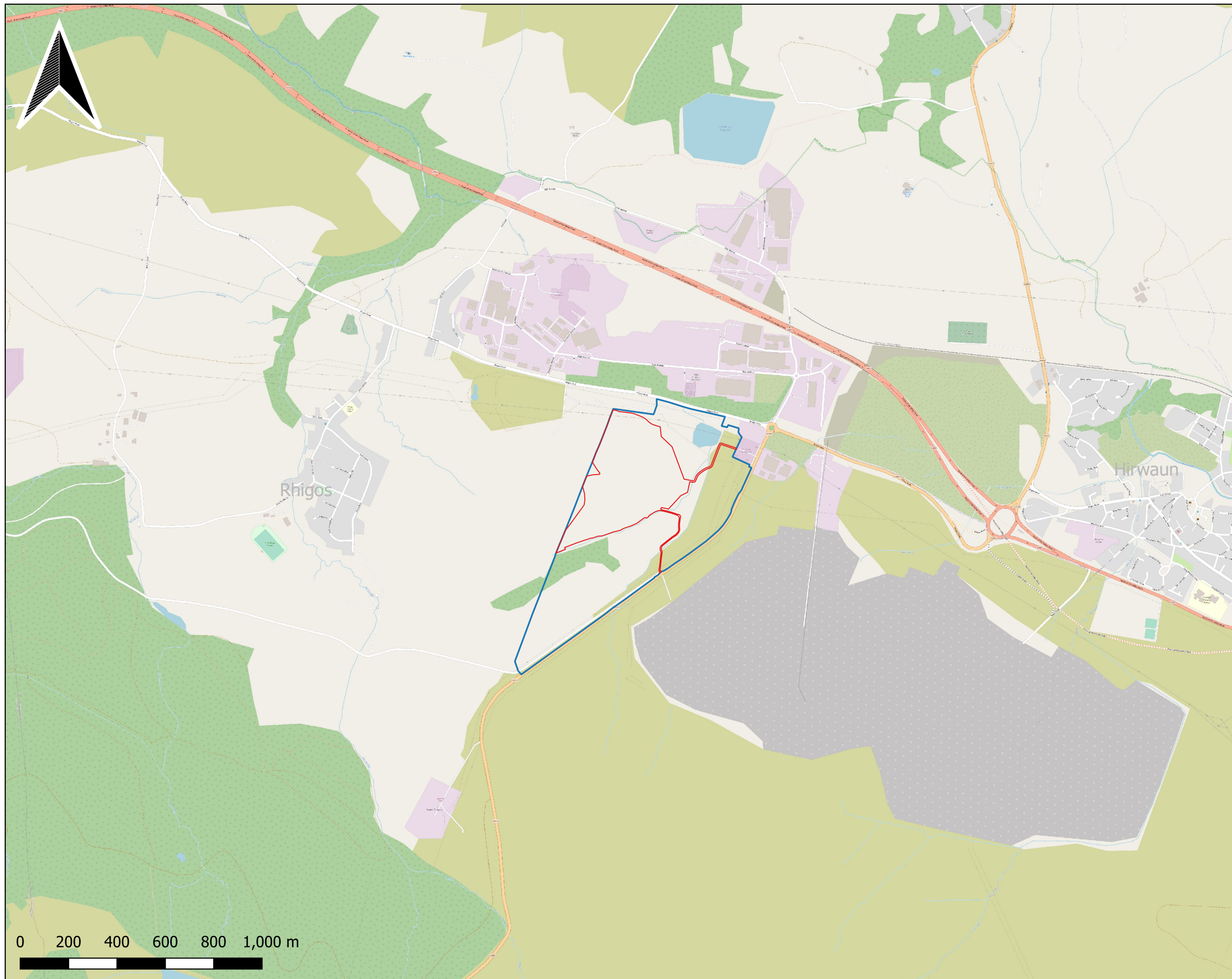
APPENDIX A

RSK GROUP SERVICE CONSTRAINTS

1. This report and the drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for Land Use Consultants (the "client") in accordance with the terms of a contract between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable civil engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.
7. The Services are based upon RSK's observations of existing physical conditions at the site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.
8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (boreholes, trial pits etc) annotated on site plans are not drawn to scale but are centred over the appropriate location. Such features should not be used for setting out and should be considered indicative only.

APPENDIX B

SITE LOCATION PLAN



Site Name: Land at Rhigos Road
Map Title: Location Plan
Map Revision: v6.1
Date: 01/12/22

Legend

- Site_Area_(16.30Ha)
- Landowner_Boundary (50.74Ha)

Scale (A3): 1:15,000

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APPENDIX C

TOPOGRAPHIC SURVEY



LEGEND

- Tree canopy/hedgerow/foliage. Heights where given are to nearest meter.¹
- Tree shapes for use in *PVcase*. **These do not represent exact tree locations**, but rather, entities which will be automatically recognised and converted to appropriate shading elements by *PVcase*. Areas of forest are therefore filled with trees of appropriate height. Height to nearest meter.¹
- Water (dashed for apparent drainage feature or approx. path)
- Sealed road
- Unsealed track
- Power-line (or other overhead line) with utility post
- Fence, gate
- Railway track
- Public footpath/bridleway
- Apparent field boundary (As seen from aerial survey. NOT official boundary.)
- UAV mapping boundary (approx.)
- Building or other permanent structure
- Stone wall

ELEVATIONS

- Elevation of point above vertical datum (see 'COORDINATE REFERENCE SYSTEM AND DATUM' at bottom).²
- Contours (0.25 m) of digital surface model (dashed when over areas of obvious crop or vegetation).^{3,4}

G.I.S. DATA

- 100m grid in OSGB36 map projection
- LAT. LONG. The specific lines of latitude and longitude which pass through the site are marked in degrees, minutes, seconds (WGS84).
- NORTH Grid North follows the direction of the North-South lines of the OSGB36 grid. True North follows lines of longitude, which converge on the axis of rotation of the Earth. True South points to the equator. The convergence angle (precision 2 d.p.) between Grid North and True North for this specific location is given. Magnetic North is not shown (but will be different again).

Third-party data

Site boundaries from client. Approx. public footpath routes from OS map.

NOTES

- Heights of hedgerows and dense trees are marked alongside the foliage. All tree/hedge heights given are approximate heights above nearby ground, based on the Digital Surface Model.
- It is important to note that this grid is from a Surface Model, not a Terrain Model, and therefore point-heights can only be interpreted as terrain when on areas of earth or hardstanding.
- Likewise, the Contours are surface contours, not terrain contours, so should be interpreted carefully. Where contours are obviously not on earth or hardstanding, they are dashed.
- Contours are generated from a subsampled (10m) terrain model to provide smooth but representative contour lines. Where contours cross trees, the path of the contour below the tree(s) is approximated.
- Lat./long. lines are precisely calculated, but should be considered approximate because they represent a spherical coordinate system on a map projection. Locations and dimensions are accurate in the underlying map projection. But conversion of coordinates from the map projection to lat./long. (if required) should be performed using the appropriate transformation, not by inference from this plot.
- Features hidden under dense vegetation (e.g. walls, fences) are only marked if visible from drone footage (or location otherwise provided or noted).

REVISIONS

1.0	13 May 2022	Published to client [MP]

PROJECT

Regener8 Power - UAV SURFACE TOPOGRAPHY
Rhigos Project in Mid Glamorgan, U.K.

TITLE

RHIGOS LINEWORK ("CAD")

DETAILS

Regener8 Power, The Old Hop Kiln, Long Garden Walk,
GU9 7HX (Ashley Fromberg)

LOCATION

Rhigos Road, Aberdare, Mid Glamorgan, Wales, CF44 9UD

COORDINATE SYSTEM AND DATUM

OSGB36, British National Grid Map Projection (EPSG: 27700). Units: meters
Elevations relative to sea level as height in meters above Ordnance Datum Newlyn (ODN) (EPSG: 5101). Geoid model, OSGM15.

SCALE OF MAIN DRAWING:
1:2000 when printed 100% on A0
Do not scale from this plot. All dimensions to be checked on-site.



Above Surveying Ltd.
Block C2 Knowledge Gateway
Newfield Road,
Colchester, CO4 3ZL, U.K.
T: +44 1206 483043
E: support@abovesurveying.com

APPENDIX D

PROPOSED SITE LAYOUT


ENVIROMENA

ADDRESS:
Enviromena Project Management UK Ltd
Tel: +44 330 107 1415
15 Diddenham Court, Grazeley
Reading, RG7 1JQ, United Kingdom

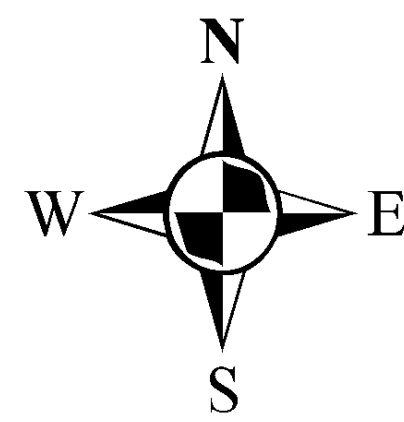
APPENDIX E

SEWER RECORDS



Dŵr Cymru
Welsh Water

RCT CF44 9UE



LEGEND

- Clean network:

Sluice valve

Pressure reducing valve

Meter

Bulk meter

Hydrant

Cap end

Air valve
- Stop tap

Water Treatment Works

Water Pumping Station

Existing main

Non-operational main

Raw Water
- NB: Water main symbol colour indicates the type.

LIGHT BLUE

- Trunk

DARK BLUE

- Distribution

YELLOW

- Raw Water

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases, pipe material (other than Asbestos Cement or Pitch Fibre (PF)) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dŵr Cymru Cyllynedy (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available, and is not warranted as to its completeness or accuracy in the event of excavations or other works made in the vicinity of the Company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company is solely for the purpose of providing a general indication of the position of its apparatus and is not intended to be used as a basis for any excavation or other works made in the vicinity of the Company's apparatus. It is the responsibility of the user to ensure that the information is used in accordance with the provisions of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1988, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

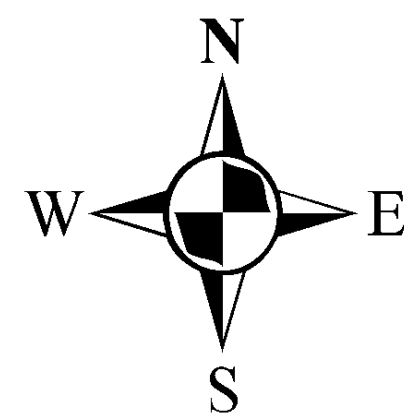
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Map Ref: 293404,205771
Map scale: 1:1250
Printed by: Zara Howells
Printed on: 04 Jul 2022



Dŵr Cymru
Welsh Water

RCT CF44 9UE



LEGEND(Representative of most common features)

- Waste network:
- | | | | |
|--|--|--|---|
| | Foul chamber | | Outfall |
| | Surface water chamber | | Lampole |
| | Combined chamber | | Storm Overflow |
| | Combined sewer overflow | | Rising main |
| | Special purpose chamber | | Gravity sewer |
| | Treatment works | | Private sewer |
| | Pumping station | | Private sewer subject to Sect. 104 adoption agreement |
| | Combined | | Private Sewer Transfer |
| | Surface Water | | Lateral Drain |
| | Foul | | Inspection Chamber |
| | Former S24 sewers (for indicative purposes only) | | |
- NB: Sewer symbol colour indicates the type.
- RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases, pipe material (other than Asbestos Cement or Pitch Fibre (PF)) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dŵr Cymru Cyllyngeby (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and is not warranted as to its correctness or value, save in the event of excavations or other works made in the vicinity of the Company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of this, it should be noted that the records that are available to the Company may not disclose the existence of a water, main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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Map Ref: 293405,205747
Map scale: 1:1250
Printed by: Zara Howells
Printed on: 04 Jul 2022

APPENDIX F

GREENFIELD RUNOFF CALCULATIONS

Calculated by:

Benjamin Donoghue

Site name:

Rhigos Road

Site location:

Methyr Tydfill

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

51.74047°

Longitude:

3.54155°

Reference:

36310789

Date:

May 19 2023 14:

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):

16.3

Methodology

Q_{BAR} estimation method:

Calculate from SPR and SAAR

SPR estimation method:

Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

Default

Edited

SOIL type:

5

5

HOST class:

N/A

N/A

SPR/SPRHOST:

0.53

0.53

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

Default

Edited

SAAR (mm):

1979

1979

Hydrological region:

9

9

Growth curve factor 1 year:

0.88

0.88

Growth curve factor 30 years:

1.78

1.78

Growth curve factor 100 years:

2.18

2.18

Growth curve factor 200 years:

2.46

2.46

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	344.54	344.54
1 in 1 year (l/s):	303.2	303.2
1 in 30 years (l/s):	613.29	613.29
1 in 100 year (l/s):	751.11	751.11
1 in 200 years (l/s):	847.58	847.58

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.