Flood Risk and Drainage

JBA Project Code	2025s1363
Contract	East Caldicot Expansion
Client	Monmouthshire County Council (MCC)
Date	September 2025
Author	Charlotte Lickman BSc (Hons) Polly Stradling BSc (Hons)
Reviewer	Faye Tomalin BSc (Hons) MSc MCIWEM C.WEM
Subject	East Caldicot Expansion, Portskewett

1 Introduction

JBA Consulting was commissioned by Monmouthshire County Council to undertake a Flood Risk and Drainage Statement for the land near Bradbury Farm, Portskewett. The assessment is to support Stage 2 of the Candidate Sites process as part of Monmouthshire County Council's ongoing review of a replacement/new Local Development Plan (LDP). This Technical Note will be used to understand the appropriateness of development in accordance with Welsh Government policy as set out in Technical Advice Note 15 (TAN-15) and the Statutory Standards for SuDS in Wales.

2 The Site

2.1 Site Description

The proposed development site is located near Bradbury Farm to the north of Portskewett as shown in Figure 2-1. The site is currently used as agricultural grazing land.

The site is bound to the west by Crick Road, and to the east by the B4245, which meet in the south of the site. Beyond, land is mostly used for agricultural purposes with some areas to the west utilised for commercial and leisure purposes. The north of the site is greenfield land, some of which is being utilised as a solar farm and some of which is woodland area.

It is understood that the site is being considered for mixed residential and commercial development consisting of up to 385 houses, a primary school, a small local centre, a council depot, and GRT sites.

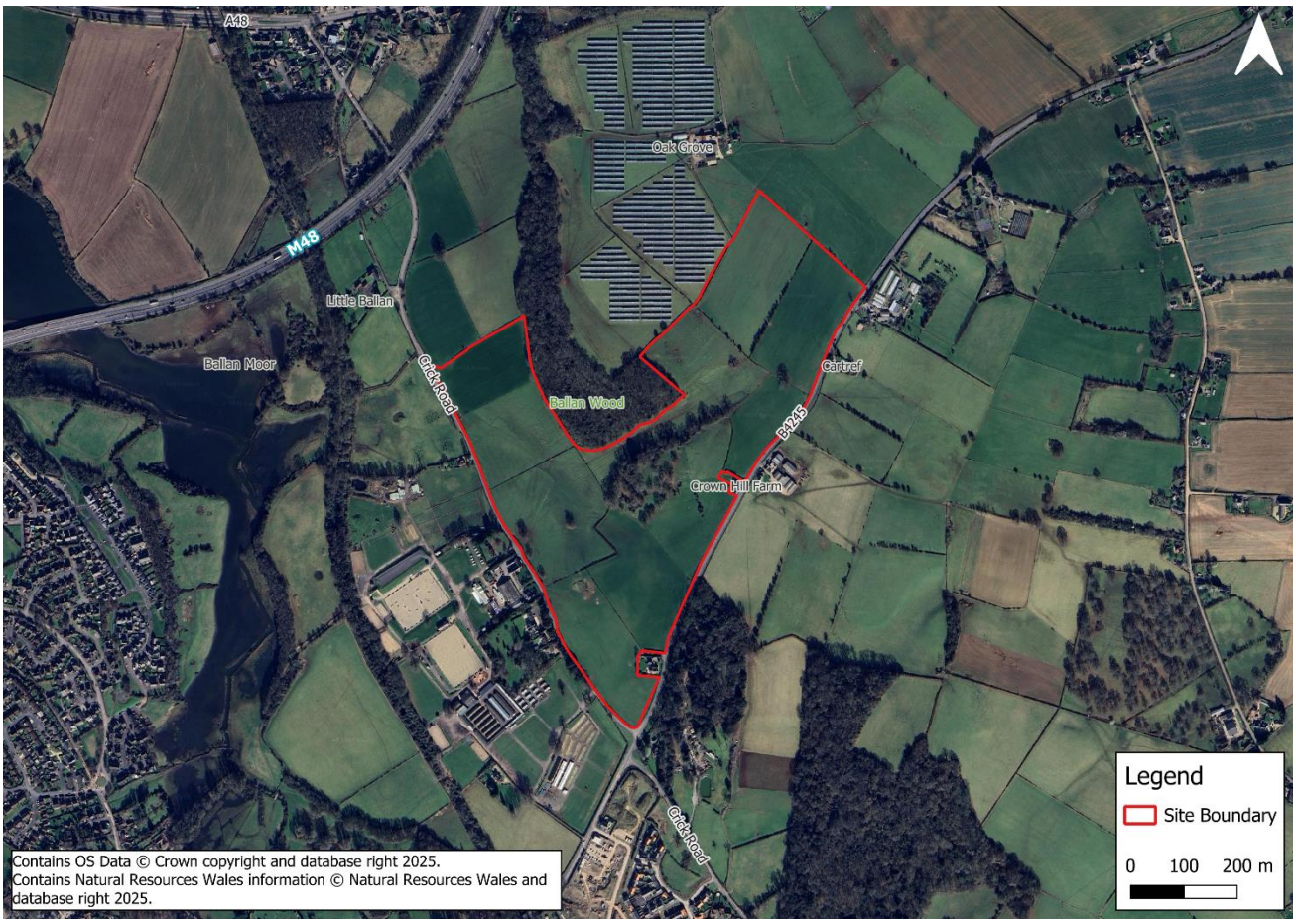

Figure 2-1 Site Location

2.2 Site topography

Natural Resources Wales (NRW) 1m LiDAR data has been used to illustrate the topography of the site, as shown in Figure 2-2. The site is relatively steep and generally slopes from its highest point of approximately 48.1 m AOD in the east to its lowest point in the west where ground levels are as low as 8.4m AOD. The west of the site slopes down considerably to a low-lying area from the higher ground to the east. The eastern parcel of land slopes from north-east to south-west more gradually.

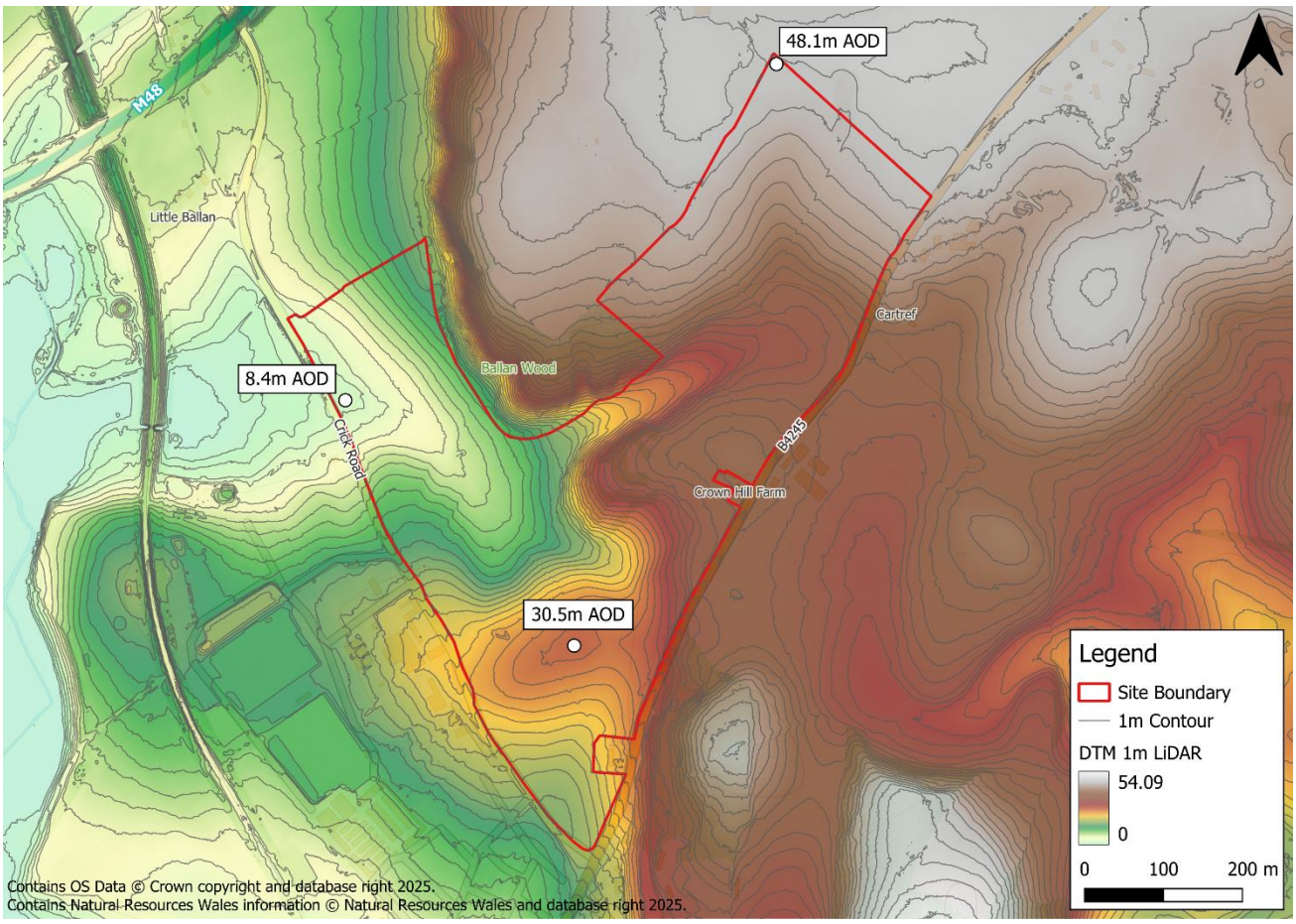

Figure 2-2 DTM 1m LiDAR

2.3 Watercourses and Defences

Nedern Brook, a designated 'Main River', is located approximately 380m to the west of the site and flows in a southerly direction.

An unnamed tributary of the watercourse flows approximately 150m to the northwest of the site in a southerly direction until it meets the confluence with Nedern Brook approximately 380m to the west of the site.

There is an unnamed agricultural drainage ditch approximately 10m to the west of the site, on the opposite side of Crick Road as shown in Figure 2-3.

The development site does not benefit from the presence of flood defences.

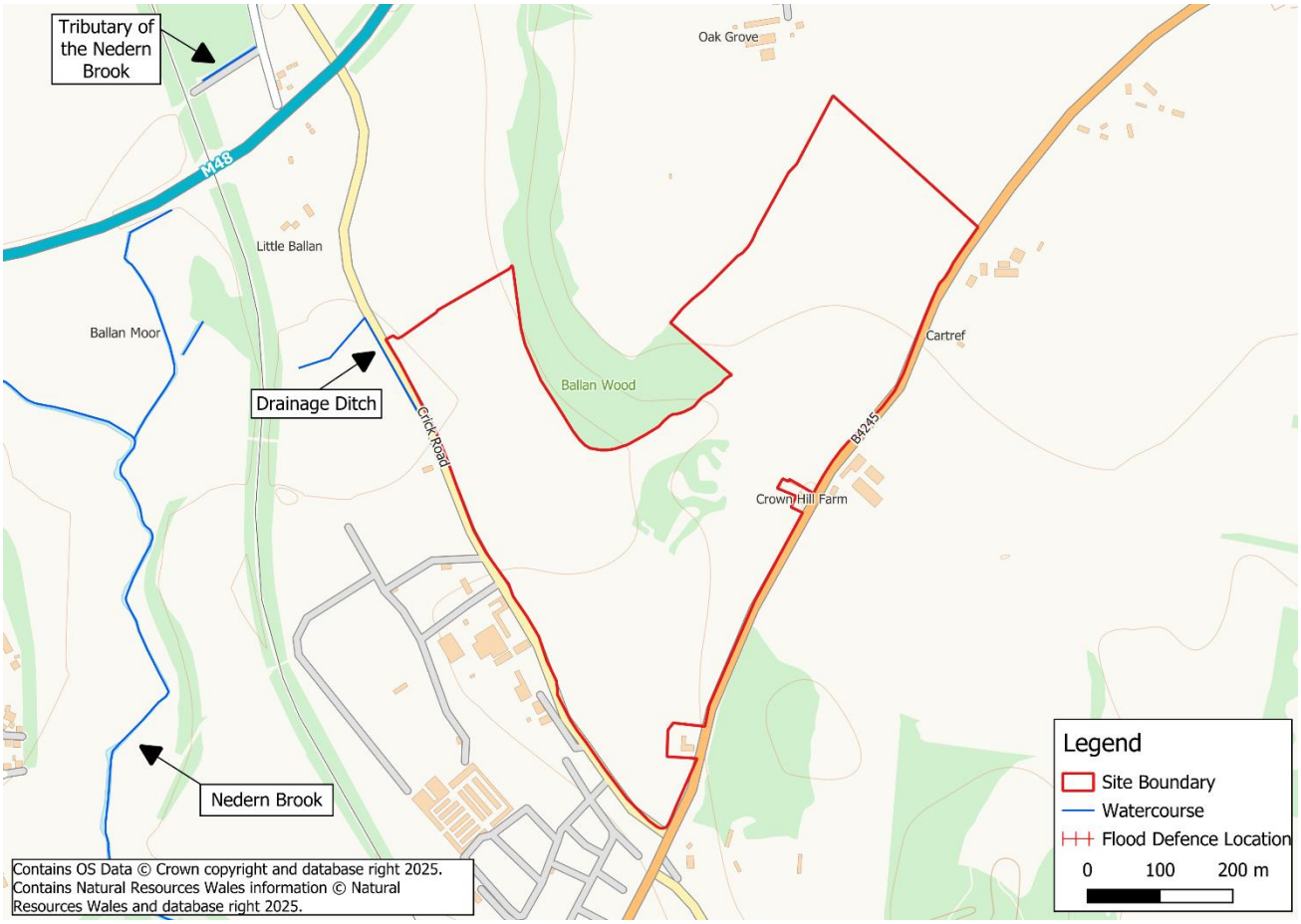

Figure 2-3 Watercourses and Flood Defences

3 Local Planning Policy

3.1 Monmouthshire County Council Adopted Local Development Plan (2014)

The Monmouthshire County Council Local Development Plan (LDP), adopted in 2014, sets out the council's vision and objectives for the development and use of land in Monmouthshire, together with the policies and proposals to implement them over a 10-year period to 2021.

The LDP sets out the spatial strategy and strategic policies, which have been developed to implement the plan's key objectives. Detailed development management policies are also set out, grouped by the plan's themes, against which all development proposals in the County will be assessed and provides the basis for the rational and consistent consideration of planning applications and appeals.

The LDP contains Development Management Policies SD3 Flood Risk and SD4 Sustainable Drainage. Policy SD3 details the requirements for highly vulnerable and less vulnerable development in areas at risk of flooding whilst Policy SD4 describes how proposals should incorporate sustainable drainage to prevent increasing flood risk elsewhere.

Site allocations policies are also detailed in relation to strategic/ urban and rural housing, tourism, waste and employment sites. A strategic site is identified near Crick Road approximately 50m to the south of the study site to the north-west of Portskewett. The site is allocated for mixed use residential and employment development. The LDP identifies that the site is located on the Great Spring Source Protection Zone 1 (SPZ1) and that any future planning application for the site would need to be accompanied by a Preliminary Risk Assessment in relation to any potential impacts on the aquifer.

3.2 Monmouthshire County Council Strategic Flood Consequences Assessment

A Stage 1 Strategic Flood Consequences Assessment was undertaken in 2009 to provide an overview of flood risk from all sources in the MCC area.

The Level 1 SFCA identifies that there is a risk of fluvial flooding within the MCC area associated with main rivers and ordinary watercourses as well as tidal flooding and surface water flooding.

Details of historical tidal, fluvial and surface water flooding are provided within the SFCA. There are no historical flood events reported to have occurred within the site boundary.

Groundwater levels are not a significant flood risk on a strategic scale within Monmouthshire and groundwater levels are known to rise and fall slowly. There are localised areas within MCC administrative boundary where groundwater flooding has known to have occurred previously though none of these areas are located within the vicinity of the site.

No further issues have been identified within the SFCA in relation to flood risk at the site.

4 Planning Policy and Flood Risk

4.1 Planning Context

Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which, together with PPW, provide the national planning policy framework for Wales. These policies aim to make all development in Wales sustainable, and improve the social, economic, environmental, and cultural wellbeing of Wales as set out in the Wellbeing of Future Generations Act 2015.

Technical Advice Note 15 (TAN-15), originally introduced by the Welsh Government in 2004 and most recently updated in March 2025, provides technical guidance relating to development planning and flood risk in Wales. TAN-15 provides a framework within which the flood risks arising from rivers, the sea and surface water, and the associated risk of coastal erosion can be assessed. The approach set out in the most recent update to TAN1-5 ensures flooding and coastal erosion are accorded appropriate consideration in plan-making and development management decisions

4.2 Form of Development

TAN-15 recognises two key forms of development; New Development and Redevelopment. The definition of both terms is provided in Table 4-1.

Table 4-1 TAN-15 Vulnerability Classification

Form of Development	Definition
New Development	Any Development on greenfield land
Redevelopment	Any Development on previously developed land as defined in Planning Policy Wales

As detailed in Section 2.1, the development site is located on greenfield land and is therefore classified as **'New Development'**.

4.3 Vulnerability Classification

TAN-15 assigns one of three flood risk vulnerability classifications to a development, as shown in Table 3-2. The proposed development site is being considered for mixed residential and commercial development consisting of up to 385 houses, a primary school, a small local centre, a council depot, and GRT sites. It is therefore classified as both **'Highly Vulnerable and Less Vulnerable Development'.**

Table 4-2 TAN-15 Vulnerability Classification

Development category	
Highly Vulnerable Development	All residential premises (including hotels, Gypsy and Traveller sites, caravan parks and camping sites). Schools and childcare establishments, colleges and universities. Hospitals and GP surgeries. Especially vulnerable industrial development (e.g. power generating and distribution elements of power stations, transformers, chemical plants, incinerators), and waste disposal sites. Emergency services, including: ambulance stations, fire stations, police stations, command centres, emergency depots. Buildings used to provide emergency shelter in time of flood.
Less Vulnerable Development	General industrial, employment, commercial and retail development. Transport and utilities infrastructure. Car parks. Mineral extraction sites and associated processing facilities (excluding waste disposal sites). Public buildings including libraries, community centres and leisure centres (excluding those identified as in Highly Vulnerable category and emergency shelters). Places of worship. Cemeteries. Equipped play areas. Renewable energy generation facilities (excluding hydro generation).
Water compatible Development	Boatyards, marinas and essential works required at mooring basins. Development associated with canals. Flood defences and management infrastructure. Open spaces (excluding equipped play areas). Hydro renewable energy generation.

4.4 Lifetime of development

An FCA should help the planning authority determine whether the risk and consequences of flooding are acceptable over the lifetime of development.TAN-15 states:

'Generally, it is appropriate to think of new dwellings as having a lifetime of 100 years. Lifetimes for other types of development will vary, but 75 years is considered a reasonable rule of thumb'.

As the proposals are for a mixed-use residential and commercial development, a 100-year lifetime of development has been considered in this assessment.

4.5 Flood Map for Planning

The Flood Map for Planning (FMfP) is the starting point for consideration of flood risk. The map uses flood zones to indicate the degree to which land is at risk of flooding from rivers, the sea, surface water and small watercourses. The main zones are Zone 1, Zone 2, Zone 3 and the Defended Zone. The FMfP displays predicted future flood risk with an allowance made for climate change over a 100-year lifetime of development.

Proposals for development located partially or wholly in Flood Zone 2 or 3 must be supported by a Flood Consequences Assessment (FCA).

4.5.1 Flood Map for Planning – Flood Risk from Rivers

The Flood Map for Planning – Flood Risk from Rivers identifies that the site is located within Flood Zone 1, as shown in Figure 4-1. Flood Zone 1 is defined as a less than 0.1% AEP (1 in 1000) (plus climate change) chance of flooding in a given year.

All forms of development are suitable within Flood Zone 1.

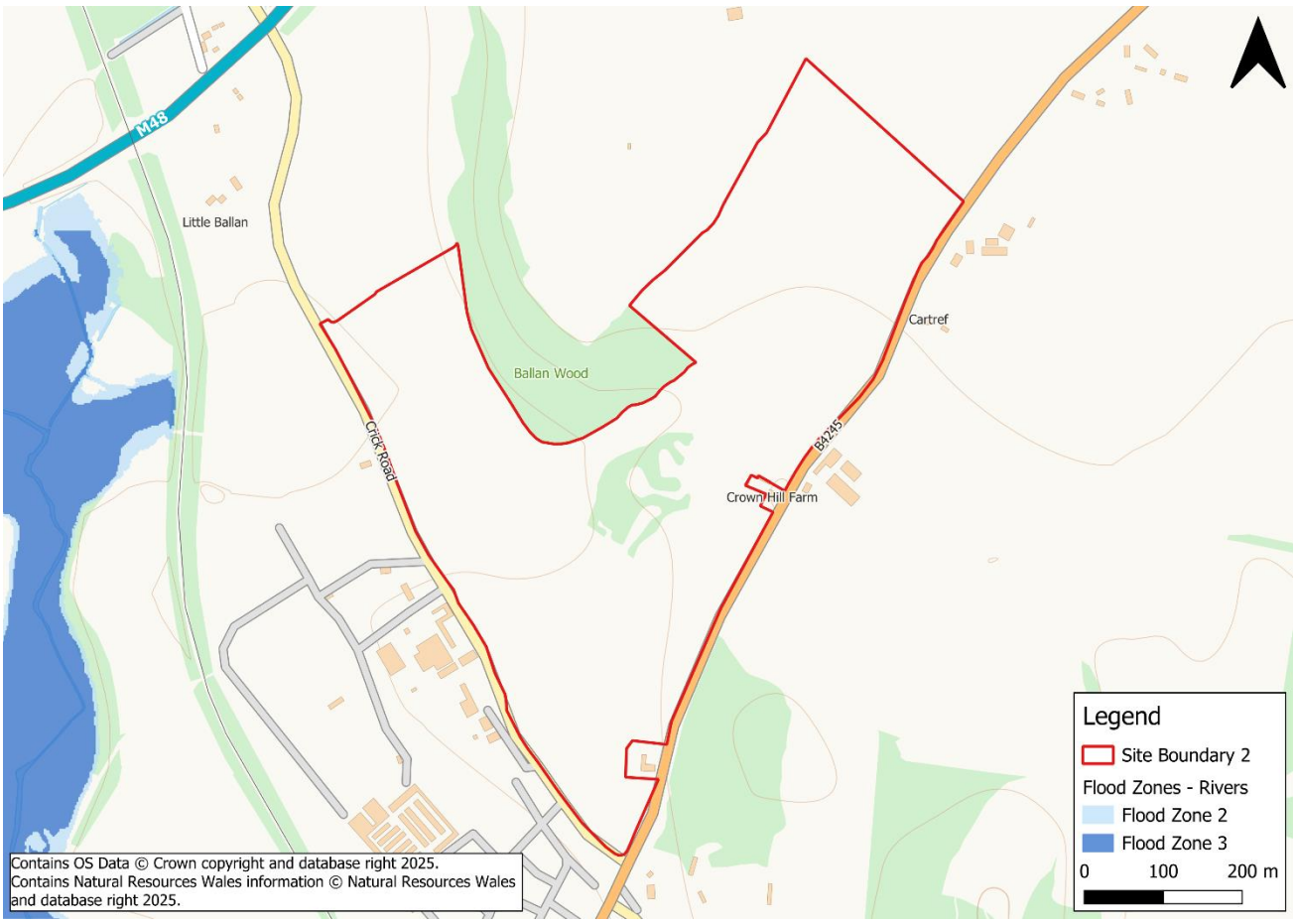

Figure 4-1 FMfP - Flood Risk from Rivers

4.5.2 Flood Map for Planning – Flood Risk from the Sea

The Flood Map for Planning – Flood Risk from the sea shows the site is located within Flood Zone 1, as shown in Figure 4-2. This means that there is a less than 0.1% AEP (1 in 1000) (plus climate change) chance of flooding in a given year.

All forms of development are suitable within Flood Zone 1.

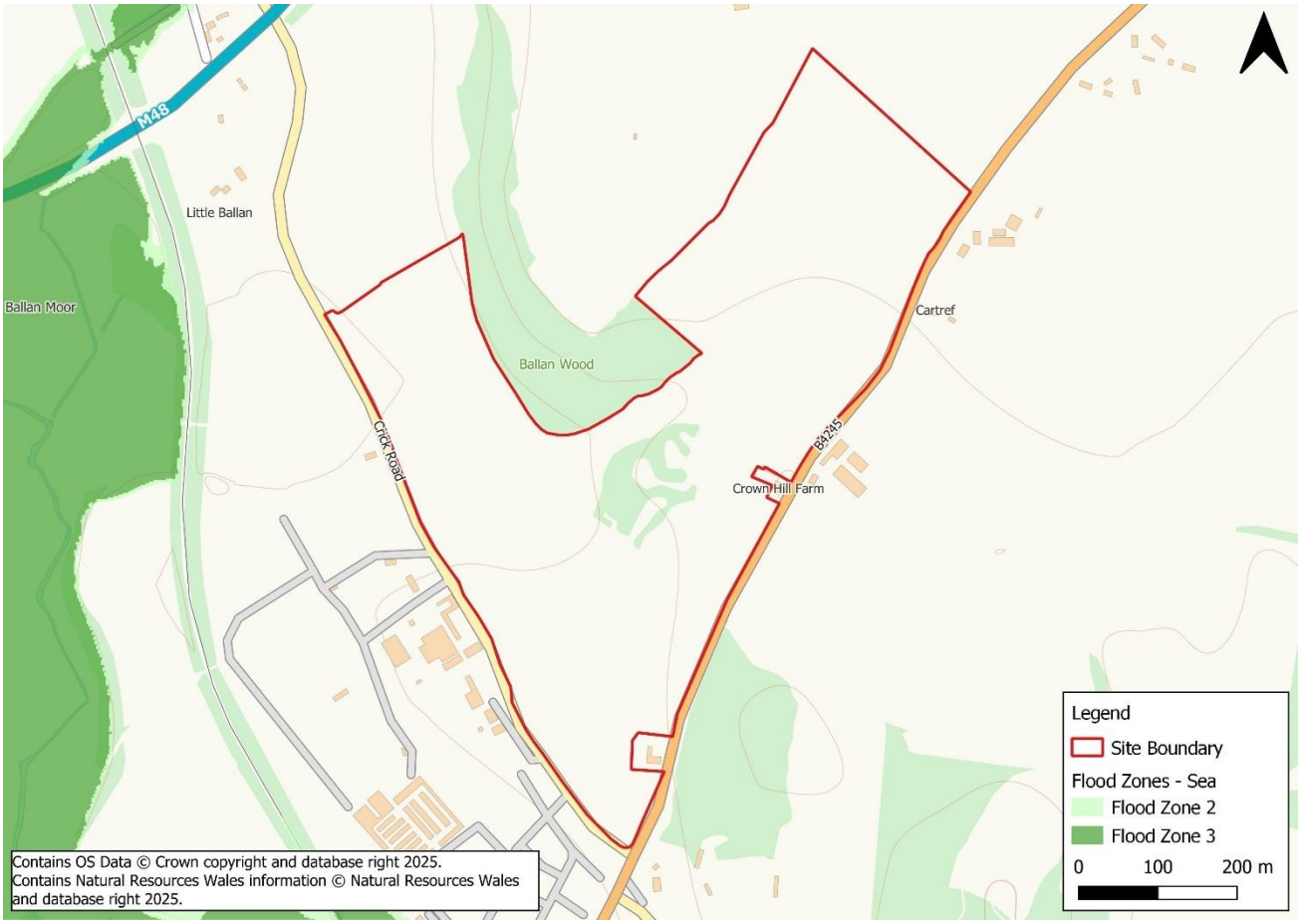

Figure 4-2 FMfP - Flood Risk from the Sea

4.5.3 Flood Map for Planning – Flood Risk from Surface Water and Small Watercourses

The Flood Map for Planning – Flood Risk from Surface Water and Small Watercourses shows that the development site is predominantly located within Flood Zone 1, as shown in Figure 4-3. Two surface water flow paths are shown to be present in the north-west of the site, predominantly classified as Flood Zone 2, with a small area along the north-western boundary shown to be located within Flood Zone 3.

Flood Zone 1 indicates a less than 0.1% AEP (1 in 1000) chance of flooding in any given year including climate change.

Flood Zone 2 suggests that there is between a 0.1% AEP and 1% AEP (1 in 1000 to 1 in 100) chance of flooding from these sources in any given year, including an allowance for climate change.

Flood Zone 3 presents area that have a greater than 1% AEP (1 in 100) chance of flooding in a given year, including climate change.

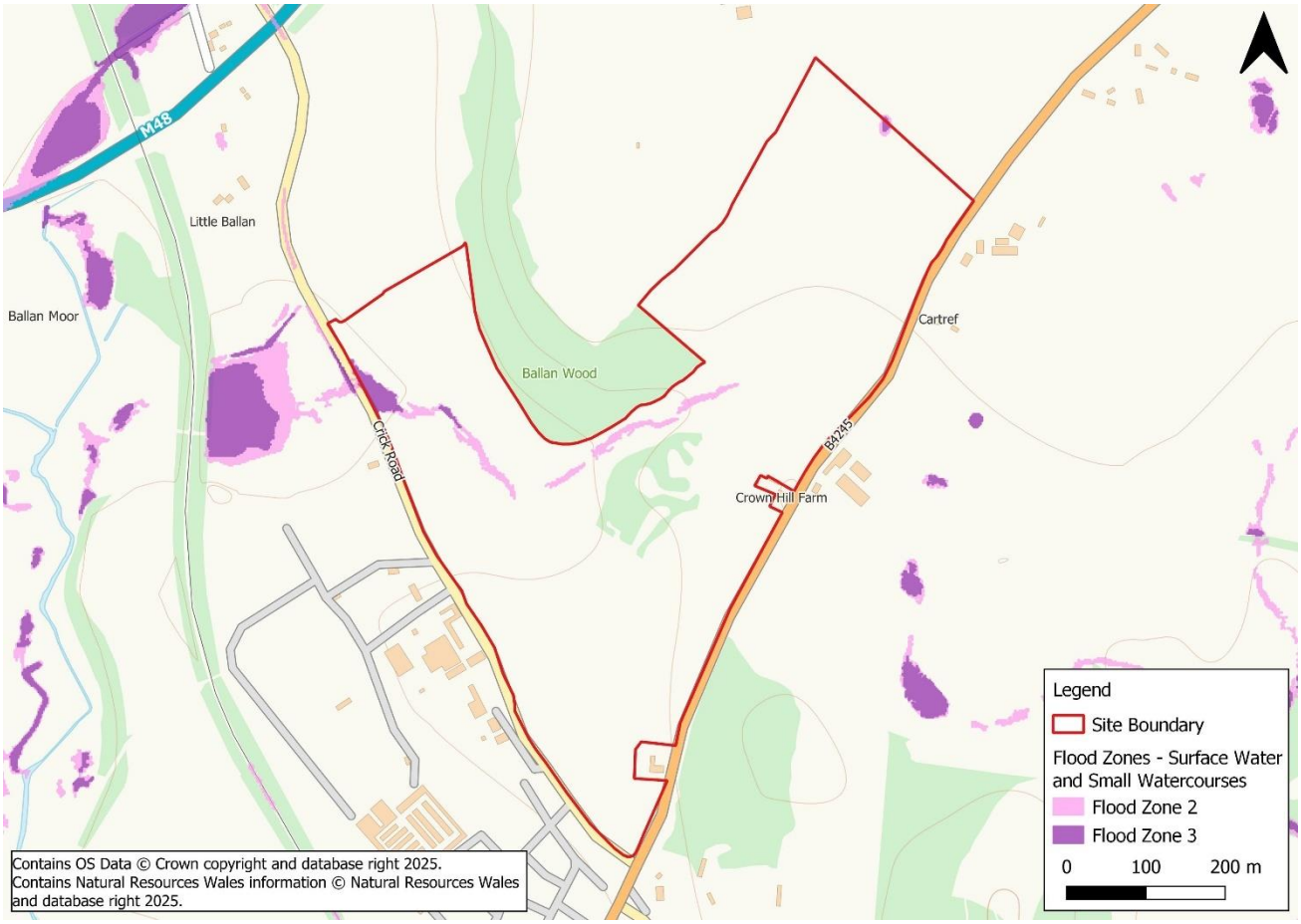

Figure 4-3 FMfP - Flood Risk from Surface Water and Small Watercourses

5 Assessment of Flood Risk

This section assesses the risk to the proposed development from all sources of flooding, the risk of increased flooding to others, and how flood risk can be managed.

5.1 Review of Existing Flood Risk Data

The latest available information on flood risk at the site is summarised in Table 5-1 below.

Table 5-1 Summary of Flood Risk

Source of Flooding	Onsite Presence	Description
Flood Risk from Rivers	×	The site is at very low risk of flooding from flooding from fluvial sources as shown in FMfP in Section 4.5.1.
Flood Risk from the Sea	×	The site is at very low risk of flooding from the sea as shown in FMfP in Section 4.5.2.
Flood Risk from Surface Water and Small Watercourses	✓	The site is at low to moderate risk of flooding form Surface Water and Small Watercourses. **Further assessed in Section 5.3 below.**
Flood Risk from Groundwater	✓	The site is at low risk of groundwater flooding. **Further assessed in Section 5.4 below**
Flood Risk from Reservoirs	✓	The site is at low risk from reservoir flooding.
Flood Risk from Sewers	×	The site is at very low risk from sewer flooding.

5.2 Historical Flooding

NRW's map of recorded flood extents does not show any evidence of historic flooding on the site.

Furthermore, the Monmouthshire Preliminary Flood Risk Assessment shows no site-specific mention of historical flood events[1].

5.3 Flood Risk from Surface Water and Small Watercourses

Surface water flooding occurs when rain falling on saturated grounds flow overland, following the local topography. Surface water flooding and subsequent overland flow can therefore pose a risk to both the development site and the surrounding land. The overland

1 https://www.monmouthshire.gov.uk/app/uploads/2018/02/Preliminary-Flood-Risk-Assessment-2011.pdf

flow may originate from the site itself or adjoining land at a higher elevation from which flow migrates onto the development.

The Flood Map for Planning – Surface Water and Small Watercourses indicates that localised areas in the Northwest of the site are at risk of flooding, as a consequence of both surface water ponding and overland flow paths.

Detailed LiDAR analysis shows that the site slopes from east to west. Surface water flows in this direction, along the flow path and ponds where the ground levels are at the lowest point on the site adjacent to the western redline boundary. Crick Road is located immediately beyond the western site boundary, which is located at a higher elevation compared to the topographic depression on the development site. The road, acts as a physical barrier, preventing surface water from discharging freely, and creates a localised low point where runoff becomes trapped during rainfall events causing ponding.

The NRW National Flood Hazard Mapping (NFHM) has been used to provide further assessment of flooding. During the 1% AEP plus climate change event, flood depths of up to 502mm are predicted, as shown in Figure 5-1. In the 0.1% AEP plus climate change event, flood depths of up to 550mm are predicted and are shown in Figure 5-2. Two overland flow paths are present in the 0.1% AEP plus climate change event and have a maximum predicted flood depth of 23mm.

Surface water overland flows originate within the site. It is therefore envisaged that surface water flood risk within the site boundary shall be managed through effective SuDS design, integrated within the site masterplan.

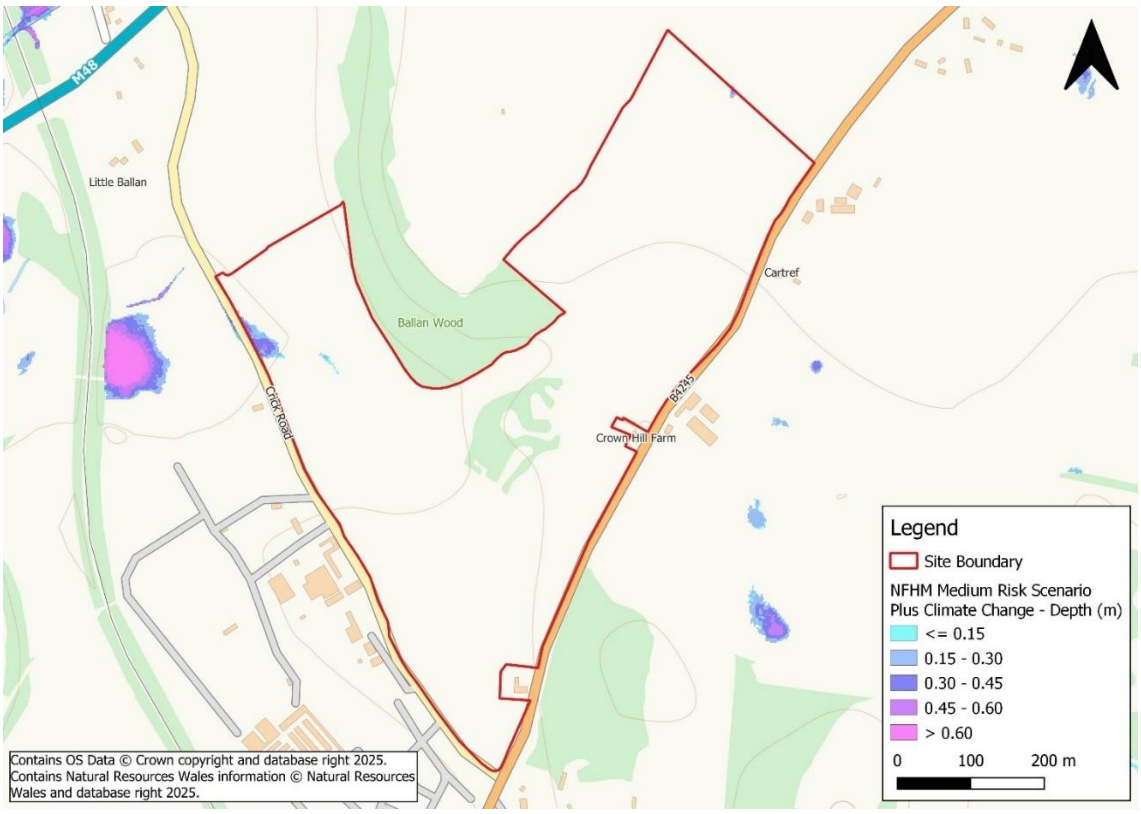

Figure 5-1 Flood Risk from Surface Water - 1% AEP + Climate Change - Depths (m)

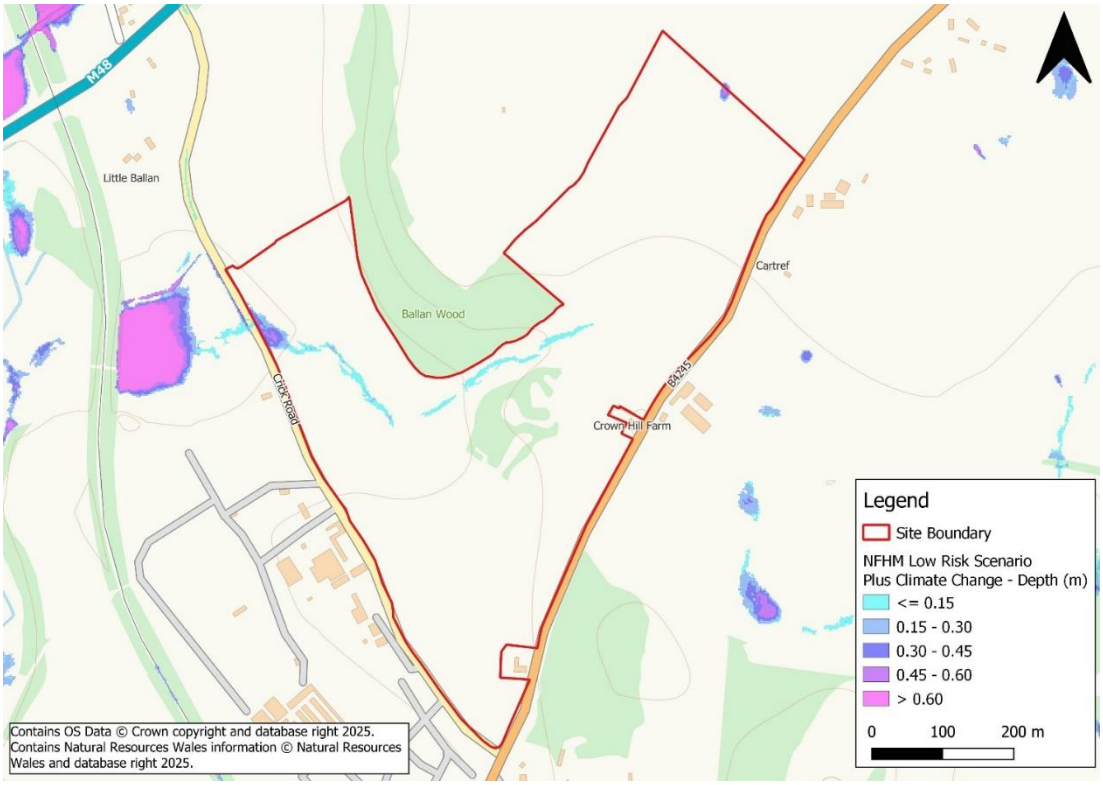

Figure 5-2 Flood Risk from Surface Water - 0.1% AEP + Climate Change - Depths (m)

5.4 Flood Risk from Groundwater

Groundwater flooding is cause by unusually high groundwater levels. It occurs as excess water emerging at the ground surface or within man-made structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and can result in significant damage to property. The risk of groundwater flooding depends on the nature of the geological strata underlying the sites, as well as on local topography.

The British Geological Survey GeoIndex indicates that the site is largely underlain by the Mercia Mudstone Group consisting of Mudstone. There are localised outcrops of the Hunts Bay Oolite Subgroup consisting of Limestone.

The site is located above groundwater Source Protection Zone (SPZ) 1 also known as the inner protection zone. SPZs are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction.

Although groundwater flooding can occur in geological settings that consist of limestone, the Monmouthshire Strategic Flood Consequences Assessment states that the risk of groundwater flooding in the study area in considered to be low and the site is not identified as an area where groundwater has occurred previously.

Overall, the risk of groundwater flooding to the proposed development site is considered to be low.

5.5 Flood Risk from Reservoirs

NRW mapping indicates negligible encroachment of the likely flood extent in the unlikely event of a breach in a reservoir structure (Wentwood Reservoir) in the north-west of the site, as shown in Figure 5-3.

As the enforcement authority for the Reservoirs Act 1975 in Wales, NRW ensure that reservoirs are inspected regularly, and essential safety work is carried out. The regulatory nature of reservoir management means that the probability of a failure at a statutory reservoir is low. The Wentwood Reservoir is located approximately 7km to the north-west of the site, allowing sufficient warning time should failure occur. It is therefore concluded, given the probability and consequences of such an event, the risk at the proposed development site as a result of reservoir failure is very low.

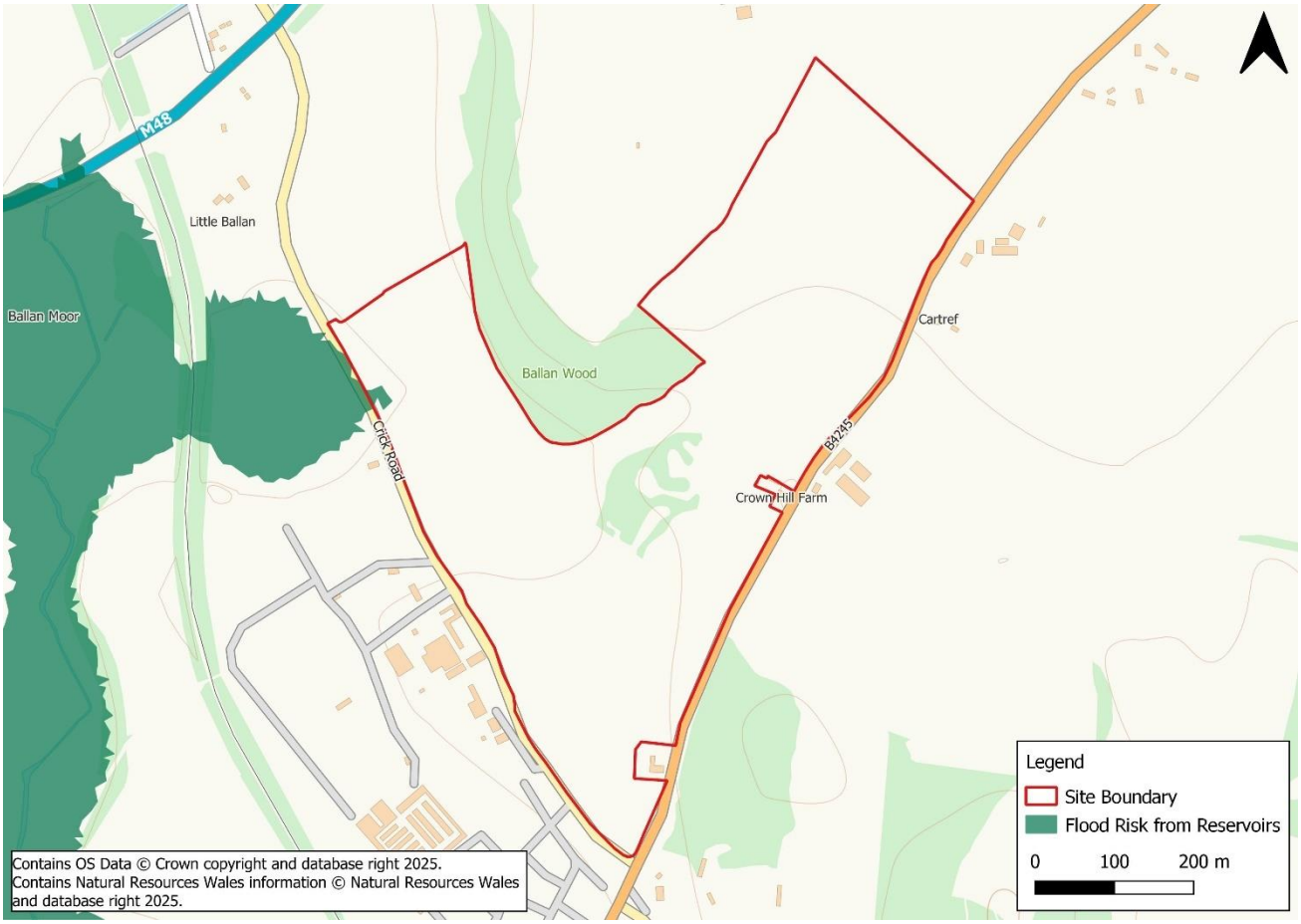

Figure 5-3 FRAW - Flood Risk from Reservoirs

6 Application of Flood Zones to Development Management Decisions

Sections 10 and 11 of TAN-15 do not strictly to apply to the surface water and small watercourse zones in which this proposed development site lies.

The site is predominantly located within Flood Zone 1. All forms of development are permissible within Flood Zone 1.

Areas of Flood Zone 2 and 3 of the Flood Map for Planning – Flood Risk from Surface Water and Small Watercourses are associated with surface water ponding and two overland flow paths located in the northwest of the development site.

Given these conditions, it is considered that surface water flood risk can be adequately managed through the implementation of Sustainable Drainage Systems (SuDS). A Surface Water Drainage Statement is provided in Section 7, demonstrating how surface water can be managed in accordance with the Statutory Standards for SuDS in Wales, thereby ensuring compliance with TAN-15.

7 Surface Water Management Approach

7.1 Sustainable drainage systems

Sustainable Drainage Systems (SuDS) aim to mimic the natural processes of Greenfield surface water drainage by allowing water to flow along natural flow routes and also aims to reduce the runoff rates and volumes during storm events, whilst providing water treatment benefits. SuDS also have the advantage of providing Blue and Green Infrastructure and ecology and recreational benefits when designed and maintained properly.

Schedule 3 of the Flood and Water Management Act 2010 was enacted in Wales in January 2019, leading to the requirement for all new developments to incorporate the four pillars of SuDS design, shown in Figure 7-1.

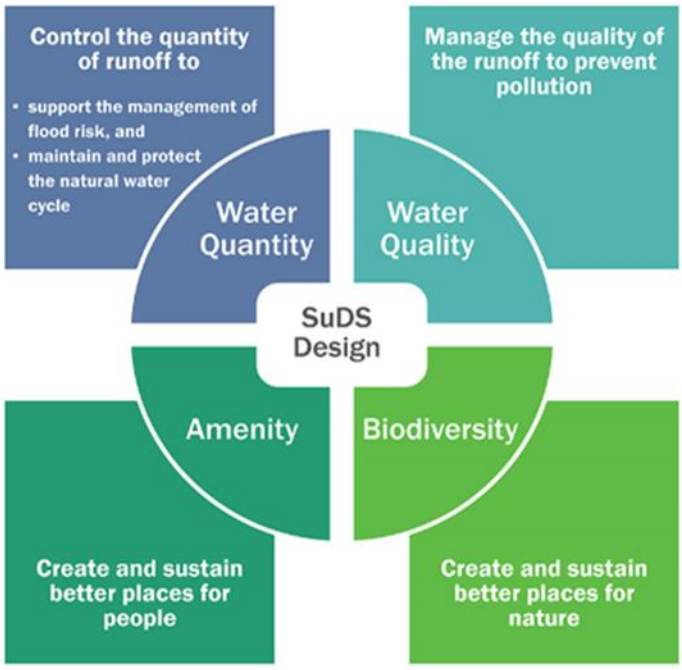

Figure 7-1 The Four Pillars of SuDS Design (Ciria 2015)

7.2 Design criteria

The following national guidance documents and design standards have been considered when developing this conceptual surface water drainage strategy:

- C753 The SuDS Manual (Ciria 2015)
- Statutory Standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems (Welsh Government 2018)
- Planning Policy Wales – Edition 11, February 2021
- The Building Regulations 2010 Part H: Drainage and Waste Disposal

- Sewers for Adoption 7th Edition

Monmouthshire County Council does not have any specific guidance related to SuDS. Should guidance be developed during the outline or detailed drainage design this should be consulted.

7.3 Existing discharge location

The British Geological Survey 1:50,000 scale mapping indicates that the site is underlain predominantly by the Mercia Mudstone Group with localised areas underlain by the Oolite Subgroup consisting of Limestone.

Cranfield University Soilscapes has highlighted two soil types across the site. The soils in the west of the site are described as 'freely draining slightly acid loamy soils'. The soils in the east of the site are described as 'freely draining slightly acid but base-rich soils'. Based on the ground conditions described, it is considered likely that the site primarily drains through infiltration into the ground and evapotranspiration.

As a result of the potential for infiltration across the site, it is recommended that infiltration testing in accordance with BRE365 is undertaken as soon as possible to inform any future outline or detailed drainage strategy for the site.

7.4 Greenfield Runoff Rates

Table 2.41 of Ciria C753 The SUDS Manual2 indicates that the FEH methods (FEH Statistical and ReFH) should be the preferred methods for calculating peak runoff rates. This is supported by Natural Resources Wales GN008 Flood Estimation: Technical Guidance and Environment Agency research by Faulkner et al which concluded that they should be used in place of outdated methods such as IH124 and ADAS 345 where possible.

The UK SUDS tool was used to calculate Greenfield runoff rates for site. Catchment descriptors were extracted from the FEH Webservice. The calculated greenfield runoff rates are shown in **Error! Reference source not found.** below, and the UK SUDS calculation r ecord is found in Appendix A.

Table 7-1 Greenfield Runoff Rates

Return Period	Specific Runoff (l/s/ha)	Peak Runoff Rate (l/s)
1	3.81	114.87
QBAR	4.33	130.53
30	7.72	232.35
100	9.44	284.56

2 The SuDS Manual (C753), CIRIA 2015. https://www.ciria.org

7.5 Greenfield Runoff Volumes

Greenfield runoff volumes were calculated for a six-hour storm event at the site using the FSSR16 method as shown in Equation 1 below.

Equation 1: Runoff volume = Site Area x Rainfall Depth x Percentage Runoff

Percentage runoff was calculated using the FSSR16 methodology which accounts for soil type, catchment wetness and storm intensity. The rainfall depths for a six-hour 100-year storm event were extracted from the FEH Web Service and are summarised in Table 7-2 with the calculated Greenfield runoff volumes.

Table 7-2 Greenfield rainfall depths and runoff volumes

Return Period	6-hour rainfall runoff depth (mm)	Greenfield runoff volume (m3)
30	52.05	3525
100	63.55	4598

7.5.1 Surface Water Runoff Destination (Drainage Hierarchy)

The Statutory Standards for SUDS in Wales address the use of surface water by the development and where it should be discharged. It has developed a destination hierarchy which sets out the preferred routes for discharge of runoff from the site:

- Priority Level 1: Surface water runoff is collected for reuse
- Priority Level 2: Surface water runoff is infiltrated to ground
- Priority Level 3: Surface water runoff is discharged to a surface water body
- Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system
- Priority Level 5: Surface water runoff is discharged to the combined sewer

Priority Level 1 is the preferred (highest priority) and 4 and 5 should only be used in exceptional circumstances. The following outlines how the proposed development adheres to the drainage hierarchy.

Priority Level 1 – Water for re-use

As per the principles of the Statutory Standards for SuDS in Wales, the increase in surface water runoff from the proposed development (as a result of an increase in impermeable surfaces) should primarily be collected for re-use – Priority Level 1 of the discharge hierarchy. The yield: use ratio is unlikely to be sufficient for this site to allow the disposal of

surface water via rainwater harvesting alone; however, water butts should be provided at each proposed dwelling to allow for the potential re-use of rainwater across the site.

Priority Level 2 – Infiltration

There is potential for the development site to infiltrate to the ground. It is recommended that infiltration testing is undertaken prior to any outline or detailed design to determine the best means of surface water disposal from the site. Should infiltration be viable across the site, this should be the preferred means of surface water disposal in line with the drainage hierarchy.

As the site is located within Groundwater Source Protection Zone 1, a hydrogeological risk assessment should be undertaken where infiltration SUDS are proposed for anything other than clean roof drainage, to ensure that the system does not pose an unacceptable risk to groundwater supply. This is in line with the Environment Agency's guidance to groundwater protection published in February 2018 and adopted by Natural Resources Wales.

- The guidance states that, where infiltration SuDS are to be used in an SPZ for surface run-off from roads, car parking and public or amenity areas, they should:
- Be suitably designed.
- Meet Governments non-statutory technical standards for sustainable drainage systems – these standards should be used in conjunction with the National Planning Policy Framework and Planning Practice Guidance.
- Use a SuDS management treatment train – that is, use drainage components in series to achieve a robust surface water management system that does not pose an unacceptable risk of pollution to groundwater.

Priority Level 3 – Discharge to a surface water body

Should infiltration not be viable across the site then opportunities to discharge surface water to a watercourse should be explored. The west of the site should aim to discharge to the drainage ditch along Crick Road.

No other watercourses cross the site, and therefore the remaining eastern area of the site may require an alternative means of discharge.

BWB Consulting have produced an Outline Surface Water Drainage Strategy for land to the west of the proposed development site. Following some collaboration between the two candidate sites, a third-party outfall corridor through the adjacent site has been proposed to provide access to a discharge point into the Nedern Brook. This would be connected to from the southern corner of the site. The viability of this option to discharge to a surface water body is subject to further discussion and coordination prior to outline and detailed design stage.

Priority Level 4 - Discharge to a surface water sewer, highway drain or another drainage system

Where priority levels 1-3 are not possible, water shall be discharged to any surface water sewer or highway drain within the vicinity of the site.

Sewer plans have been obtained from Welsh Water which indicate that there is a surface water sewer located 230 metres north-west of the site. This is unlikely to be a suitable discharge location as water would have to be pumped against gravity. This opposes the general principles of SuDS to drain surface water via gravity systems. The Welsh Water sewer plans are contained in Appendix B.

As discharging to a public surface water sewer is not a suitable option, discharge to a highway drain should be investigated as any other alternative discharge location is unlikely to be viable for some areas of the proposed development site. As a result of this, it is recommended that early engagement with Monmouthshire County Council Highways Authority and SuDS Approval Body (SAB) is undertaken prior to any outline drainage design for the site.

Priority Level 5- Discharge to a combined sewer

There are no combined sewers in the vicinity of the proposed development site.

7.5.2 S2: Surface Water Runoff Hydraulic Control

There are typically three design storm events which should be considered when designing the SuDS system for managing flows and volumes:

- 1 in 1-year event, on sloping sites without basements, where surcharging above soffits of any surface water drainage pipework is not permitted.
- 1 in 30-year storm event, where surface water flooding of the site is not permitted at this frequency.
- 1 in 100-year storm event with allowances for future climate change, where runoff should be managed within the extents of the development site, ensuring that it cannot affect people or properties either within the development or surrounding developments.
- Allowance for Climate Change

Allowance for Climate Change

The Welsh Government has produced Adapting to Climate Change guidance which contains updated representative climate change allowances for Wales peak flows. The

guidance contains indicative sensitivity ranges for peak rainfall intensity. A 100-year lifetime of development is assumed for residential development, and 75 years for commercial development. As such, the 2070-2115 estimates should be used. The recommended climate change factor for small catchments using the Central estimate for the 2070-2115 epoch is 20%. However, a sensitivity check should be undertaken in the Upper estimate value of 40%.

Discharge Limits and Attenuation Volume

Should infiltration be viable across the site the discharge rate shall be dictated by the infiltration potential of the underlying soils.

Should infiltration not be viable, the discharge limit for the site should be set to the Greenfield runoff rate of 4.33 l/s/ha.

Currently, the impermeable surfaced proportion of the proposed development is unknown and so the exact required attenuation volume cannot be calculated. Due to the size of the site, a large volume of attenuation volume is likely to the required. This should be considered at all stage of master planning and site design to facilitate the implementation of SuDS across the site through Blue-Green Corridors and source control techniques wherever possible.

In order to provide indicative surface water attenuation features, greenfield storage volumes have been estimated based on the following assumed impermeability for each development type:

- Residential – 65% impermeable area plus 10% urban creep
- Non-residential (e.g. school) – 80% impermeable area

Interception of Rainfall

When rainfall takes place on Greenfield sites there is, for the majority of rainfall events, no runoff from a site due to evapotranspiration or groundwater recharge. Therefore, interception mechanisms are based on runoff volume reduction using evapotranspiration and infiltration processes. A simplified approach to interception can be used based on assumed compliance of various drainage components. Table G2.1 of the Statutory Standards for SUDS in Wales lists the interception drainage components which have assumed compliance.

Should infiltration be viable across the site, it is evident that the site shall comply with the requirements for interception. Should an alternative discharge point be required, further consideration shall be required on the use of SUDS to provide sufficient interception of rainfall across the site.

7.5.3 S3: Water Quality

The surface water drainage system should provide a sufficient level of water quality treatment to prevent pollution of receiving waterbodies. During the water treatment design event (5mm rainfall across the entire site) no runoff should leave the site. This is usually achieved through source control techniques such as permeable pavements and rain gardens.

Table 4.3 of the SuDS Manual advocates the use of the “simple index approach” to determine an appropriate level of pollution mitigation for development sites. This splits pollution into three contaminant types (Total Suspended Solids, Metals and Hydrocarbons) and assigns a “pollution hazard index” to each type. Different SuDS features are then assigned a “SuDS Mitigation Index” and sufficient treatment is deemed to be provided if the “SuDS Mitigation Index” is equal to or greater than the “pollution hazard index” for each pollutant type. When more than one SuDS component is required a multiplication factor of 0.5 is applied to mitigation indices for secondary and tertiary components to account for reduced performance.

It is understood that the site is being considered for mixed residential and commercial development consisting of up to 385 houses, a primary school, a small local centre, a council depot, and GRT sites.

Low traffic roads associated with commercial development have a 'low' pollution hazard level whilst commercial yard and delivery areas have a 'medium' pollution hazard level. Should uses with a ‘medium’ pollution hazard be present on site, the whole development site should be assigned ‘medium’ hazard pollution indices.

The “pollution hazard indices” for a medium pollution hazard site are given in Table 7-3 below.

Table 7-3 Pollution hazard indices for the site

Pollution hazard level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Medium	0.7	0.6	0.7

7.5.4 S4 & S5: Amenity & Biodiversity

The design of the surface water management system should maximise amenity benefits across the site. SuDS components can enhance the provision of high-quality, attractive public space which can help to provide health and well-being benefits, improve liveability and contribute to improving the climate resilience of new developments.

The aim of Standard 4 is to ensure that wherever possible and having regard to the need to prioritise infiltration drainage, the SuDS scheme makes the best contribution towards maximising benefits for amenity.

Across this development site, SuDS components such as rain gardens and vegetated swales/rills would provide open and accessible areas, creating a pleasant place to live and promoting the well-being of residents across the site. Rain gardens and swales would also assist in the climate resilience of the development, promoting carbon sequestration, and permeable paving would provide amenity benefits from its multifunctionality.

The surface water drainage system should seek to enhance habitats within the site and complement neighbouring habitats. The ecological potential of the SuDS system can be maximised by utilising local planting, locating SuDS adjacent to existing features and utilising the known surface water flow paths across the site. The strategy should create a range of habitats and provide varied water depths within the SuDS features, which should be sustained by ensuring that an effective management regime is implemented.

7.5.5 S6: Design for Construction, Maintenance and Structural Integrity

The national SuDS standards state that components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

Health and Safety

The surface water drainage system should be designed so that it minimises health and safety risk to the site occupants. SUDS are sometimes perceived as unsafe features with fears of drowning and overturning cars, but with correct design, these risks can be mitigated. A CDM Designers Risk Assessment should be undertaken demonstrating that any proposed surface water drainage system is fit for purpose, with risks designed out of the proposal, or mitigated wherever necessary.

Adoption and Maintenance

Schedule 3 of the Flood and Water Management Act was implemented in Wales on the 7th of January 2019. Under this legislation, SUDS that serve multiple properties must be approved and adopted by the SUDS Approval Body (SAB) – a function performed by the Lead Local Flood Authority at Monmouthshire County Council.

During detailed design phase, a detailed maintenance plan should be developed to demonstrate the maintenance required to ensure the proposed drainage system functions to optimal capacity in perpetuity.

7.6 Site Opportunities and Constraints

A range of SuDS components should be used within the development site in an interconnected system designed to manage, treat, and make the best use of surface water runoff. The proposed development site provides many opportunities and constraints for the disposal of surface water via the use of SuDS. A map of these is shown in Appendix B.

In order to manage surface water, the proposed development site has been divided into sub-catchments, based on the natural topography of the site and a preliminary development plan. Due to the location of lowest ground levels and presence of waterbodies in the west of the site, surface water shall naturally drain in a westerly direction.

As discussed in Section 7.5.1, the desktop study suggests that the underlying soils and geology of the site may cause infiltration to be a viable means of surface water in the north-west of the site. However, infiltration tests are required to determine infiltration rates across the site prior to outline design stage.

Where infiltration is unsuitable for some / all of the site, a connection to the unnamed ordinary watercourse to the north west of the site may be available. However, further investigation into the capacity of this drainage ditch to receive flows form the development should be carried out. Additionally, a third-party connection through an adjacent site to the west may present an opportunity for surface water to be connected and discharged into the Nedern Brook. Further discussion and investigation will be required to ensure that any connection are located above the water level under a 1% AEP scenario to ensure hydraulic locking does not occur. If this is not a viable option, surface water from the southern area of the site will likely need to be discharged into the highway drainage system if there are no other viable discharge locations.

The current strategic masterplan includes areas of open space and landscaping which can be utilised for surface water attenuation and conveyance. Green corridors should be provided across the site to store and convey flow. Provision of green corridors will enhance wildlife and aid habitat connectivity. Due to the steep topography from west to east, check dams may be required to reduce the velocity of flow in conveyance structures, also managing the risk of erosion.

Due to the steep topography across the site, indicative attenuation basins have been proposed to attenuate the required storage volume for the 1 in 30-year event, rather than the 1 in 100 year plus (40%) climate change scenario. This is in line with best practice as detailed in the Statutory Standards for SuDS in Wales, and at this stage is deemed to be a more suitable solution for the site in order to minimise the footprint of attenuation basins for each sub catchment. It is proposed that attenuation tanks are installed beneath the basins in order to attenuate the remaining storage volume required for the 1 in 100 plus (40%) climate change event. Overflow pipes and flow controls will connect and control the flow of surface water between the basin and attenuation tanking, prior to it being discharged at a controlled flow rate. Further work and discussion shall be required to determine whether

this is the most appropriate and acceptable solution for the site at outline and prior to detailed design stages.

Cross slope features should be considered across the development layout to intercept overland flow and promote above-ground conveyance of surface water towards the recommended green corridors. Incorporating these features across the site will aid habitat connectivity, providing biodiverse ecosystems across the site.

Multifunctional uses across the site should also be considered in areas of open and green space. SuDS can be incorporated into play areas and areas of public open spaces to promote the multifunctional benefits of SuDS. During the design stage of multifunctional features, considerations towards the speed and inundation and drain time will need to be considered to maximise the practicability and safety of SuDS features across the site.

Within residential areas and along highways of the proposed development, tree pits or rain gardens can be utilised to encourage attenuation of flow at the source. These bioretention features shall also increase the amenity, biodiversity, and water quality benefits of SuDS. Consideration needs to be given to the proximity of SuDS assets in relation to proposed buildings and existing vegetation across the boundary of the site. Retention of existing vegetation should be encouraged, and any proposed SuDS assets should seek to enhance existing habitats in these areas.

7.7 Summary of SuDS viability on site

Given the design criteria above, and the opportunities and constraints across the site, consideration has been given to various SuDS components and their viability for use across the proposed development site. Table 7-4 provides a summary of the SuDS component and their viability, along with indication of the additional benefits they can provide, such as amenity, biodiversity and water quality benefits. This demonstrates that there are a wide range of SuDS options that could potentially be deployed at the site. Such SuDS options would be deployed in combination to form a SuDS 'management train' to achieve the multiple requirements and objectives of the SuDS standards.

Table 7-4 Viability of SuDS Techniques on site

SuDS Component	Site Viability	Amenity Benefits	Biodiversity Benefits	Water Quality Benefits	Comments
Rainwater harvesting	×	✓	×	×	Unlikely to establish the yield: use ratio required

SuDS Component	Site Viability	Amenity Benefits	Biodiversity Benefits	Water Quality Benefits	Comments
Green roofs	✓	✓	✓	✓	Structural and maintenance requirements of these on dwellings to be considered though possibility on commercial units
Infiltration systems and soakaways	✓	✓	✓	✓	Across site soakaway testing required to establish infiltration rates - may not be viable in westerns areas of the site
Filter strips	✓	×	×	✓	Opportunities for inclusion within Green Corridors
Filter drains	✓	×	×	✓	Beneficial for use within a treatment train
Swales	✓	✓	✓	✓	Consideration to be given to areas of steep site topography and swale gradient requirements. Existing overland flow paths should be retained
Bioretention systems and rain gardens	✓	✓	✓	✓	Beneficial for use within treatment trains and for implementation of SuDS at source - e.g. along highways
Pervious Pavements	✓	×	×	✓	Beneficial for use within treatment trains and for implementation of SuDS at source

SuDS Component	Site Viability	Amenity Benefits	Biodiversity Benefits	Water Quality Benefits	Comments
Attenuation Storage Tanks	✓	×	×	×	Above ground SuDS should be considered prior to the use of below ground storage
Detention Basins	✓	✓	✓	✓	Opportunities for habitat creation and inclusion within areas of public open space
Pond and Wetlands	✓	✓	✓	✓	Opportunities to enhance biodiversity and habitat creation

7.8 Foul Drainage

Building Regulations 2010: Part H: Drainage and Waste Disposal

Part H of the Building Regulations 2010 state that foul drainage should be connected to the foul or combined sewer wherever this is reasonably practicable.

The Dŵr Cymru Welsh Water (DCWW) sewer map (Figure 7-2**Error! Reference source not found.Error! Reference source not found.**) shows that there is a private foul sewer approximately 600 metres to the northwest of the site. As a result, a pumped system is likely to be required. A pre-planning consultation request would need to be submitted to Dŵr Cymru Welsh Water (DCWW), to determine if there is sufficient capacity within the existing foul water network to receive foul flows from the proposed development site.

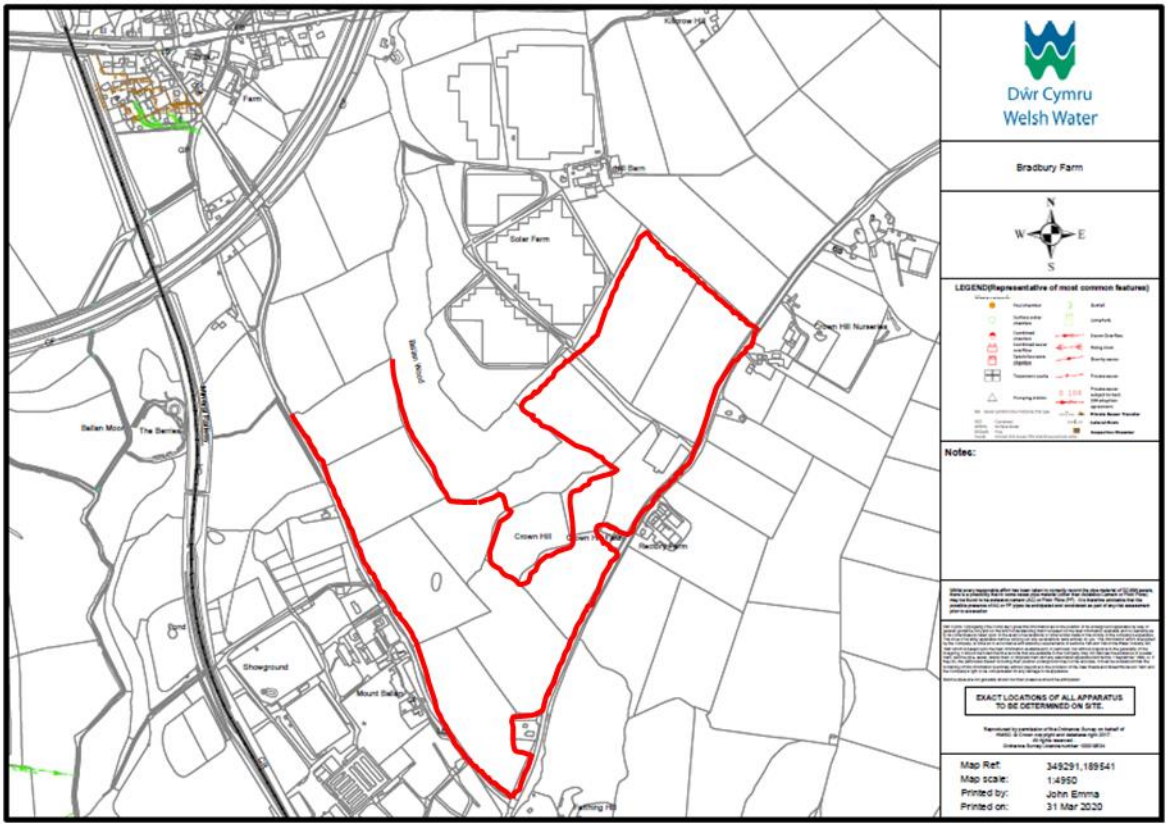

Figure 7-2 Dŵr Cymru Welsh Water Sewer Map

8 Conclusions and Recommendations

JBA Consulting were commissioned by Monmouthshire County Council to undertake a Flood Risk and Drainage Statement for the land near Bradbury Farm, Portskewett. The assessment is to support Stage 2 of the Candidate Sites process as part of Monmouthshire County Council's ongoing review of a replacement/new Local Development Plan (LDP).

The proposed development site is currently greenfield in nature. The Nedern Brook, a designated 'Main River', is located approximately 380m to the west of the site and flows in a southerly direction. An unnamed tributary of this watercourse flows approximately 150m to the northwest of the site in a southerly direction. There is an unnamed agricultural drainage ditch approximately 10m to the west of the site, to the west of Crick Road.

Flood Risk

It is understood that the development site would be allocated for a mixture of residential and commercial development. Residential development is classified as highly vulnerable development whilst commercial development is classified as less vulnerable development by TAN-15.

A 100-year lifetime of development has been used in this assessment.

The site is at very low/low risk of flooding from tidal, fluvial, groundwater, sewers and reservoirs.

The Flood Map for Planning for Surface Water and Small Watercourses indicates that the site is predominantly located within Flood Zone 1. Two surface water flow paths are shown to be present in the north-west of the site, predominantly classified as Flood Zone 2, with a small area along the north-western boundary shown to be located within Flood Zone 3. Flood Zone 3 presents area that have a greater than 1% AEP (1 in 100) chance of flooding in a given year, including climate change.

Given these conditions, it is considered that surface water flood risk can be adequately managed through the implementation of SuDS and good site design.

Whilst TAN-15, states that due to the presence of Flood Zones 2 and 3 an FCA shall be required, it is likely that the risk of surface water flooding can be adequately covered through a Flood Risk and Drainage Statement submitted with any future planning application.

Surface Water Drainage

There are two soil types beneath the site, both of which are described as freely draining. Underlying geology is comprised of mudstone and limestone. As a result, it is possible that the north-west of the site will have sufficient infiltration rates to discharge of surface water. However, infiltration testing to BRE 365 will be required, and it is advised that this is

completed prior to outline design. If infiltration is proposed at the site, a hydrogeological risk assessment should be undertaken to prevent pollution to the underlying groundwater Source Protection Zone.

Further work is required in conjunction with BWB Consulting regarding crossing third party land to the west in order to make a connection and discharge of surface water into the Nedern Brook. If infiltration or discharge to a surface water body are not viable options, water shall be discharged to any surface water sewer or highway drain within the vicinity of the site.

There is no known surface water infrastructure across the proposed development site, and it is therefore assumed that surface water is partially discharged via evapo-transpiration and runoff in a general westerly direction towards the Nedern Brook and unnamed drainage ditch.

Greenfield runoff rates have been calculated as 4.33 l/s/ha for the QBAR event.

The surface water drainage system should reduce post development runoff rates and volumes as close to greenfield runoff rates as possible, in line with Statutory Standards for SuDS in Wales. The drainage strategy should provide multiple benefits and ensure water quality downstream is not adversely affected as a result of the proposed development.

The topography of the proposed development site will need to be accounted for within the SuDS design. Initially, due to topographic constraints, the attenuation basins have been designed to attenuate the 1 in 30-year storage volume. Attenuation tanks beneath the footprint of the basin have been proposed to accommodate the remaining storage volume required for the 1 in 100 year plus (40%) climate change scenario. Check dams may be required to reduce the velocity of flow in conveyance structures and promote attenuation across the site.

SuDS features should aim to maximise amenity and biodiversity benefits across the site wherever possible.