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Richborough
Land North of Wonastow Road
Monmouth
Flood Consequence Assessment

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EXECUTIVE SUMMARY

This Flood Consequence Assessment (FCA) is compliant with the requirements set out in Planning Policy Wales and the Technical Advice Note 15: Development and Flood Risk (TAN15). The FCA has been produced on behalf of Richborough in respect of a mixed use commercial and residential scheme on Land North of Wonastow Road, Monmouth (NGR SO 49128 11965).

This report demonstrates that the proposed development is not at significant flood risk, subject to the recommended flood mitigation strategies being implemented.

The Natural Resource Wales (NRW) Flood Map for Planning shows the site is located entirely within Flood Zone 1 and elevated approximately 2.5m above the nearest Flood Zone extents, associated with the Town Ditch and River Monnow. Therefore, the site is considered to be at a low risk of flooding from Main Rivers.

There is considered to be a low risk of flooding from the Unnamed Ordinary Watercourse (UOW), drain and field ditch within the site based on their limited contributing catchments and a review of NRW surface water and small watercourse mapping.

It is recommended that finished flood levels are raised a minimum of 150mm above surrounding ground levels. Ground levels should be profiled to encourage pluvial runoff away from built development and towards the nearest drainage point.

It is recommended that the UOW and on-site drain are retained within the development layout such that their conveyance downstream is not impeded. Any new structures proposed on these features should be appropriately sized and provide sufficient freeboard during the 1 in 100-year plus climate change event such that there is no impact on the conveyance of flows.

Based on shallow groundwater levels encountered in the adjacent development, there is considered to be a high risk of groundwater flooding. It is recommended that groundwater levels are monitored during construction and that any necessary dewatering is undertaken if groundwater is encountered during excavations.

The development will discharge surface water at the equivalent greenfield QBAR rate. Attenuated surface water storage will be provided with capacity for the 1 in 100-year storm with an allowance for climate change. It is proposed to drain used water from the development separately to surface water.

In compliance with the requirements of TAN15, and subject to the mitigation measures proposed, the development could proceed without being subject to significant flood risk. Moreover, the development will not increase flood risk to the wider catchment area subject to suitable management of surface water runoff discharging from the site.

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1. INTRODUCTION

- 1.1 This FCA is compliant with the requirements set out in Planning Policy Wales (PPW) and TAN15. The FCA has been produced on behalf of Richborough in respect of a mixed use residential and commercial scheme on Land North of Wonastow Road, Monmouth.
- 1.2 This FCA is intended to support the promotion of the site through the Replacement Local Development Plan (RLDP) process for a mixed use development. The level of detail included is commensurate and subject to the nature of the proposals at the planning stage. Summary information is included as **Table 1.1**.

Table 1.1: Site Summary

Site Name	Land North of Wonastow Road
Location	Monmouth
NGR (approx.)	SO 49128 11965
Application Site Area (ha)	11.4 (approx.)
Development Type	Commercial and Residential
NRW Flood Map for Planning Zone/s	Flood Zone 1
TAN15 Vulnerability	Highly & Less Vulnerable
Anticipated Development Lifetime	100 years (approx.)
NRW Office	South East Wales
Lead Local Flood Authority	Monmouthshire County Council (MCC)
Local Planning Authority	MCC

Sources of Data

- i. Environment Agency (EA) 2022 1m Light Detection and Ranging (LiDAR) data
- ii. NRW Flood Map for Planning
- iii. MCC Correspondence
- iv. South East Wales Stage 1 Strategic Flood Consequence Assessment
- v. MCC Preliminary Flood Risk Assessment and Addendum
- vi. MCC Local Flood Risk Management Strategy
- vii. MCC Flood Risk Management Plan
- viii. Welsh Water Sewer Records

ix. British Geological Survey (BGS) Drift & Geology Maps

Existing Site

- 1.3 The site is located off Wonastow Road, approximately 1.4km south-west of Monmouth town centre. The site is bound to the west and north by agricultural fields, residential development and Ternata Drive to the east. The site is greenfield in nature comprising agricultural fields. The site's location is illustrated within **Figure 1.1**.

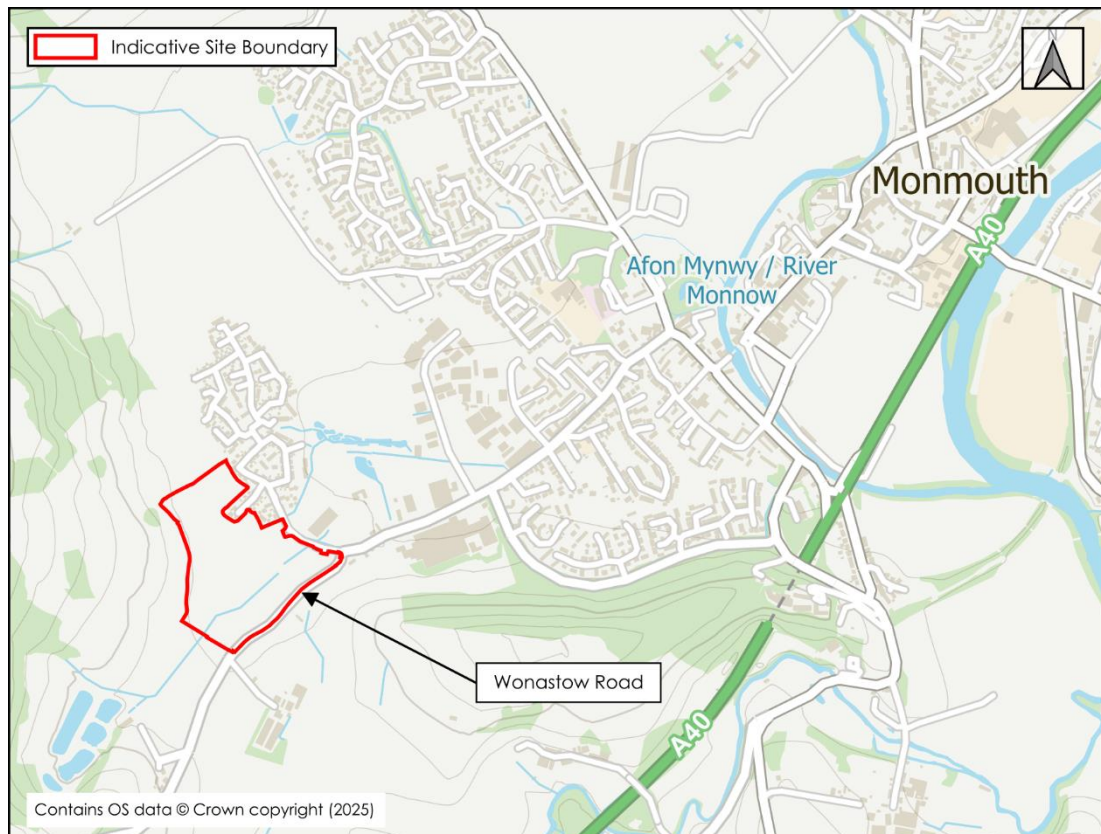


Figure 1.1: Site Location

- 1.4 In the absence of a site specific topographical survey, EA 1m LiDAR, shown in **Figure 1.2**, has been used to inform the topography of the site. Ground levels are shown to fall generally from west to east with levels ranging from approximately 32.9 metres Above Ordnance Datum (mAOD) in the west to approximately 21.7mAOD in the east.

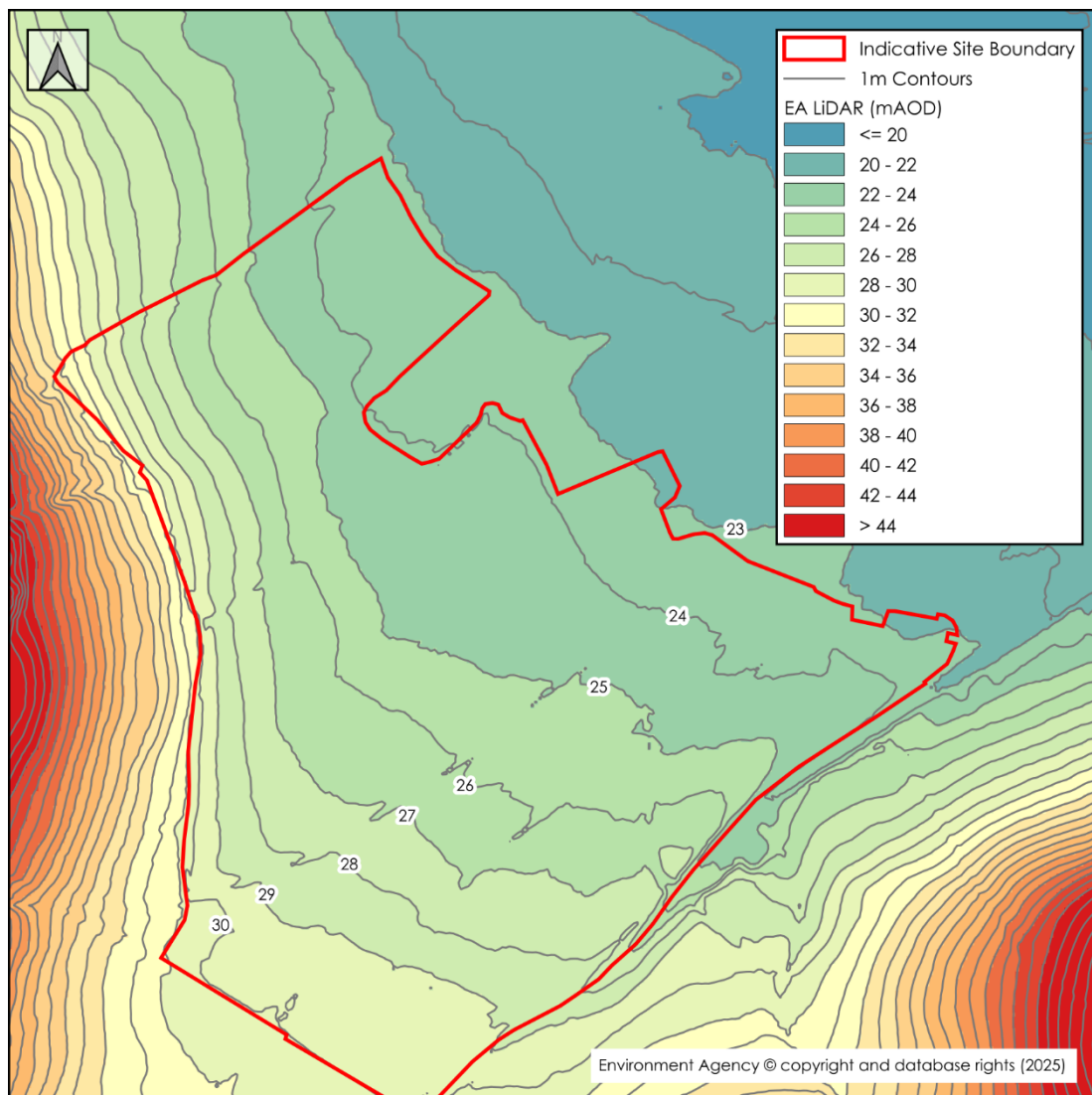


Figure 1.2: Generalised Topography as informed by EA 1m LiDAR Data

Proposed Development

- 1.5 The proposed development is understood to comprise a mixed use scheme comprising residential, employment and community facilities. Proposed access is to be taken from the existing junction at Ternata Drive and Kingswood Gate. Illustrative proposals are included in **Appendix 1**.

2. FLOOD RISK PLANNING POLICY & GUIDANCE

Technical Advice Note 15 (TAN15)

- 2.1 The Welsh Government's national policies on different aspects of land use planning in relation to flood risk is outlined within TAN15¹. TAN15 provides a framework within which the flood risk arising from rivers, the sea and surface water, and the risk of coastal erosion can be assessed. It also provides advice on the consequences of the risks and adapting to and living with flood risk.
- 2.2 TAN15 should be read in conjunction with PPW² and the Welsh National Marine Plan³.
- 2.3 TAN15 states that managing flooding is an important part of contributing towards achieving sustainable development and identifies:
- Fundamental principles to restrict new development in Zone 3 subject to the limited exceptions in 'Section 10' and to ensure that decision makers have taken flood risk matters into consideration in all other zones.
 - A FCA is required for any development proposal located fully or partly in Surface Water and Small Watercourses - Flood Zones 2 and 3.
 - Planning authorities should ensure any new development adjacent to Flood Zones 2 and 3 for Surface Water and Small Watercourses is appropriately set back to allow for extreme flood events.
 - 'Figure 2' (Technical requirements of a FCA) sets out the components and data that should accompany a site-specific FCA.
 - 'Figure 5' (Flood events in which development must be flood-free) sets out the flood events in which development must remain flood free based on the development vulnerability set out in Figure 4.
- 2.4 This FCA is written in accordance with the adopted TAN15 and associated PPW.

Flood Map for Planning Wales

- 2.5 The NRW Flood Map for Planning (FMfP) is a tool which supports TAN15. The FMfP shows how climate change will affect flood risk extents over the next century and shows the potential extent of flooding assuming no defences are in place. The Welsh Government and Natural Resources Wales have more confidence in the FMfP, which represents better and more up-to-date information than the now superseded Development Advice Map.
- 2.6 A description of the Flood Zone Categories is included below in **Table 2.1**.

¹ Technical Advice Note 15: Development and Flood Risk (Welsh Assembly Government, March 2025)

² Planning Policy Wales, Edition 12 (Welsh Government, updated February 2024)

³ Welsh National Marine Plan (Welsh Government, November 2019)

Table 2.1: NRW Flood Map for Planning Rivers

Flood Zone	Annual Probability of Flooding (%)
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.

2.7 The NRW FMfP also includes 'TAN 15' Defended Zones which are areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1 in 100-year (plus climate change and freeboard).

2.8 The site is located entirely within Flood Zone 1, as illustrated in **Figure 2.1**.

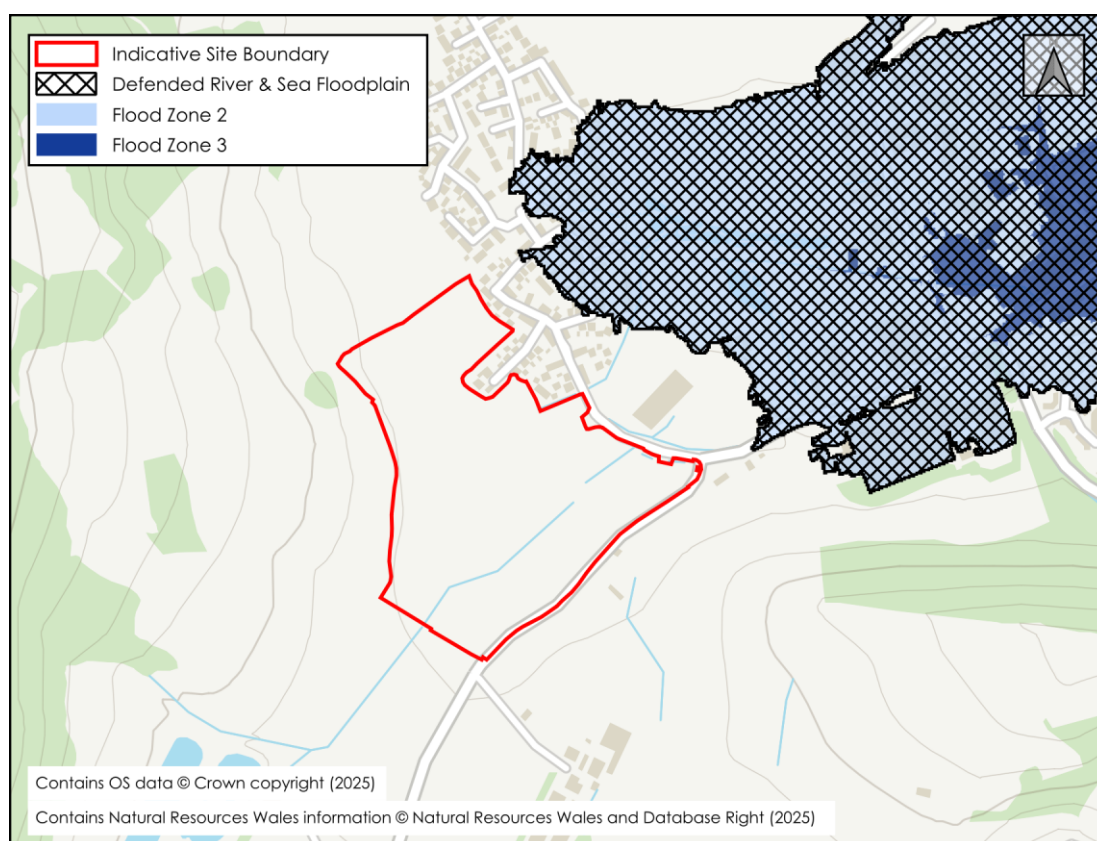


Figure 2.1: Flood Map for Planning

Design Flood

2.9 TAN15 notes that all development must be designed to be flood free during the 1% river flood (i.e. a flood with a 1 in 100 chance of occurring in any year) and the 0.5% flood from the sea (i.e. a flood with a 1 in 200 chance of occurring in any year), plus an allowance for climate change over the lifetime of development.

Flood Consequences

2.10 Where development is justified the assessment can be used to establish whether suitable mitigation measures can be incorporated within the design to ensure that development is as safe as possible and there is:

- minimal risk to life;
- minimal disruption to people living and working in the area;
- minimal potential damage to property;
- minimal impact of the proposed development on flood risk generally; and,
- minimal disruption to natural heritage

2.11 The Primary objective of a FCA is to develop a full appreciation of:

- The risk and consequence of flooding on the development; and
- The risk and consequences of the development on flood risk elsewhere.

Climate Change

2.12 Predicted future changes in peak river flows caused by climate change are provided by the Welsh Government⁴, with a range of projections applied to the three 'River Basin Districts' that cover Wales.

2.13 The site falls within the Severn River Basin District. **Table 2.2** identifies the relevant peak river flow allowances from this River Basin District.

⁴ Flood Consequences Assessments: Climate change allowances (Welsh Government, September 2021)

Table 2.2: Peak River Flow Allowance for the Severn River Basin District

Allowance Category	Total potential change anticipated for the '2020s'	Total potential change anticipated for the '2050s'	Total potential change anticipated for the '2080s'
Upper end estimate	25%	40%	70%
Change factor/central estimate	10%	20%	25%
Lower end estimate	0%	5%	5%

- 2.14 When determining the appropriate allowance for use in a FCA, the guidance recommends that the central estimate, for the 2080s, should be used. In addition to the change factor, an assessment of risk should be made using the upper end estimate. The site is located within Flood Zone 1 of the FMfP and as such is considered to be located outside of the climate change extents.

Strategic Flood Consequence Assessment

- 2.15 The South East Wales Stage 1 Strategic Flood Consequence Assessment (SFCA)⁵, inclusive of Monmouthshire County Council, has been reviewed in the production of the FCA. The SFCA provides information specific to the site location in the form of fluvial, surface water and groundwater flood risk mapping, as well as records of historical flooding. It also includes flood risk policy and guidance for the area. The site is referenced within the SFCA Site Screening Tool as 'Land north of Wonastow Road' and concludes there are no significant flood risk considerations to the allocation. Information from the SFCA will be referenced within **Section 3**, where applicable.

Preliminary Flood Risk Assessment

- 2.16 A Preliminary Flood Risk Assessment (PFRA) is an assessment of floods that have taken place in the past and floods that could take place in the future. It generally considers flooding from surface water runoff, groundwater and ordinary watercourses, and is prepared by the Lead Local Flood Authorities (LLFAs).
- 2.17 The MCC PFRA⁶ considers flooding from surface water runoff, groundwater, ordinary watercourses and canals. It also references the historical river flooding which occurred in the local area in 1993, 2001, 2002 and 2003. Upon review no applicable information in relation to flood risk at the site was identified within the PFRA.
- 2.18 An addendum to the PFRA⁷ was produced in November 2017 and reports there have been no floods experienced that resulted in locally significant harmful consequences

⁵ Stage 1 Strategic Flood Consequence Assessment (JBA Consulting, November 2022)

⁶ Preliminary Flood Risk Assessment (Monmouthshire County Council, November 2011)

⁷ Preliminary Flood Risk Assessment Addendum (Monmouthshire County Council, November 2011)

since the publication of the PFRA in 2011. In addition, there has been no new information identified which has led to a change in understanding of future flood risk.

Monmouthshire County Council Flood Risk Management Plan

- 2.19 The MCC Flood Risk Management Plan⁸ considers a range of activities to help manage flood risk, including better planning to ensure new developments decrease rather than increase flood risk for its neighbours, in addition to ensuring that emergency responses have a good understanding of where flood risk is greatest. The plan has been reviewed in relation to the site's location and will be referenced in **Section 3**, where applicable.

Local Flood Risk Management Strategy

- 2.20 A Local Flood Risk Management Strategy (LFRMS) is prepared by a LLFA to help understand and manage flood risk at a local level.
- 2.21 The LFRMS aims to ensure that the knowledge of local flood risk issues is communicated effectively so that they can be better managed. The LFRMS also aims to promote sustainable development and environmental protection.
- 2.22 The MCC LFRMS⁹ has been reviewed and no applicable information in relation to flood risk at the site was identified.

River Basin Flood Risk Management Plan

- 2.23 Flood Risk Management Plans (FRMPs) explain the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs. FRMPs set out how risk management authorities will work with communities to manage flood and coastal risk. Risk management authorities include the EA, NRW, local councils, Internal Drainage Boards, National Highways and LLFAs.
- 2.24 The first FRMPs were published in March 2016 and subsequently updated in December 2022. They describe actions to manage flood risk across England between 2021 to 2027.
- 2.25 The site is located within the Severn River Basin District, and the Severn FRMP¹⁰ has been reviewed; however, no relevant site scale objectives were found.

Section 19 Flood Investigation Reports

- 2.26 Under their duties of the Flood and Water Management Act 2010, LLFAs have a responsibility to publish reports of investigations of flood incidents. A section 19 flood investigation report is a public statement of the circumstances of a historical flood event and what parties have a role in managing the risks. The investigation does not always give an in-depth analysis of the flood risk or mechanisms, but it can provide a valuable record of past events.

⁸ Flood Risk Management Plan (Monmouthshire County Council, February 2016)

⁹ Local Flood Risk Management Strategy (Monmouthshire County Council, April 2013)

¹⁰ Severn River Basin District Flood Risk Management Plan (Environment Agency, December 2022)

- 2.27 MCC have published 12 Section 19 reports on their website, which document the flooding that occurred in 2019, and 2020. The reports have been reviewed in relation to the site's location, but no evidence of flooding at the site or immediate vicinity was identified.

Local Plan

- 2.28 The MCC Adopted Local Development Plan¹¹ sets out policies for development over a ten year period to 2021.
- 2.29 Policy SD3 – *Flood Risk* states that “Development proposals within a flood plain will be required to demonstrate that:
- the development is or can be protected by approved engineering works and / or other flood protection measures;
 - such remedial measures would not cause flooding or significantly increase the risk of flooding elsewhere;
 - the development, including any remedial measures, can be sympathetically assimilated into the environment in terms of its siting, scale, design and landscaping;
 - the development does not interfere with the ability of the Environment Agency or other bodies to carry out flood control works or maintenance; and
 - the nature conservation interest of the water source corridor is protected and, where practicable, enhanced.”
- 2.30 Policy S12 – *Efficient Resource Use and Flood Risk* states that “all new development must avoid the siting of inappropriate development in areas at risk of flooding.”
- 2.31 The RLDP¹² covers a period from 2018-2033. The plan is not currently adopted but is available for review. The plan has been reviewed in the production of this FCA. A portion of the site in the south is allocated for employment use under *Policy EA1* as ‘*Land North of Wonastow Road, Monmouth*’.
- 2.32 The above policies within the Adopted Local Development Plan have been replaced within the Replacement Local Development by Strategic Policy S4 – Climate Change and Policy CC1 - Sustainable Drainage Systems.
- 2.33 Strategic Policy S4 – Climate Change states that “All development proposals will be required to address the causes of, and adapt to the impacts of, climate change. Means of achieving this will include:
- Avoiding locating development in areas at risk of flooding, or where appropriate, minimising the risk of flooding including the incorporation of measures such as Sustainable Drainage Systems (SuDs) and flood resilient design.”
- 2.34 Policy CC1 – Sustainable Drainage Systems states that “Development proposals will be expected to incorporate water management measures, including Sustainable Drainage Systems (SuDS), to reduce surface water run-off and minimise its contribution

¹¹ Adopted Local Development Plan (Monmouthshire County Council, February 2014)

¹² Replacement Local Development Plan (Monmouthshire County Council, October 2024)

to flood risk elsewhere. Climate Change 64 The distribution of SuDS features across the site should be prioritised, reducing the size of any single SuDS feature."

3. POTENTIAL SOURCES OF FLOOD RISK

- 3.1 Flooding can occur from a variety of sources, or combination of sources, which may be natural or artificial. **Table 3.1** below identifies the potential sources of flood risk to the site in its current condition, and the impacts which the development could have in the wider catchment, prior to mitigation. These are discussed in greater detail in the forthcoming section. The mitigation measures proposed to address flood risk issues and ensure the development is appropriate for its location are discussed within **Section 4**.

Table 3.1: Pre-Mitigation Sources of Flood Risk

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Fluvial			X		The site is located entirely within Flood Zone 1 of the FMfP.
			X		Flood Zones associated with the UOW are generally confined to the channel with only minor exceedance of Flood Zone 2.
Coastal				X	The site is not considered to be at risk from tidal inundation.
Canals				X	The nearest canal is located approximately 18.4km west of the site and is not considered to pose a risk
Groundwater	X				Based on shallow groundwater identified within the adjacent development the risk of groundwater flooding is considered to be high.
Reservoirs and waterbodies			X		The site is shown to fall outside of the area at risk of reservoir failure. A series of ponds are located to the west of the site; however, the risk of exceedance from these features is considered to be low.
Pluvial runoff			X		The site is generally at low risk of flooding from surface water. There are small areas of Flood Zone 2 and 3 associated with the UOW and minor field drain.

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Sewers			X		There are no public sewers within the site. The nearest sewer network is located in the adjacent development to the east. Exceedance flows would be directed away from the site to the east in line with the local topography.
Effect of Development on Wider Catchment			X		Development will not result in impedance of surface water flow routes.
		X			The development will increase the area of impermeable surfaces leading to a potential increase in runoff, unless appropriately mitigated.

Fluvial Flood Risk

- 3.2 Flooding from watercourses occurs when flows exceed the capacity of the channel, or where a restrictive structure is encountered, which leads to water overtopping the banks into the floodplain. This process can be exacerbated when debris is mobilised by high flows and accumulates at structures.

Historical Flooding

- 3.3 The NRW Recorded Flood Extents Map shows there to be no recorded flood outlines within the site. The nearest recorded flood outline is located approximately 330m east of the site associated with the River Monnow in December 1979.

FMfP

- 3.4 The site is located entirely within Flood Zone 1. The nearest Flood Zone 2 extents are located approximately 70m east of the site and are considered to be a floodplain associated with the combined flood extents from the Town Ditch and River Monnow. These watercourses are designated as NRW Main Rivers and are located approximately 900m and 1.2km east of the site respectively. A review of EA LiDAR shows the site is elevated approximately 2.5m above the nearest Flood Zone extents and ground levels in this area continue to fall away from the site to the east. The Flood Zones include an allowance for climate change, therefore the site is expected to be located outside of the Flood Zone associated with these watercourses including an allowance for climate change.
- 3.5 Overall the site is considered to be at a low risk of flooding from Main Rivers.

Ordinary Watercourses

- 3.6 OS mapping shows an UOW to be located within the southern portion of the site. The watercourse flows from south west to north east across the site and appears to originate from an area of woodland to the west. Following a review of EA LiDAR, a shallow drain feature is also present in the northern portion of the site flowing from south west to north east and an isolated field ditch is present within the centre of the site. The location of these features are illustrated in **Figure 3.1**.



Figure 3.1: Local Watercourse Network

- 3.7 A review of the FEH Web Service indicates that the UOW has a contributing catchment of <1km². The drain and field ditch are not represented on the FEH mapping and are therefore considered to have contributing catchments of <0.5km². Based on these catchment areas it is expected that flows within these features will be minimal.
- 3.8 NRW's Risk of Flooding from Surface Water and Small Watercourses mapping (**Figure 3.2**) shows an area of Flood Zones 2 (1 in 1000 to 1 in 100) and 3 (1 in 100) including an allowance for climate change which aligns with the UOW. The extents are largely shown to be confined to the channel with only nominal exceedance during the low risk event. The UOW does not demonstrate Flood Zones across its full reach within the site which suggests there to not be significant risk from the feature.
- 3.9 The drain is not represented within the mapping which suggest there is not significant risk from this feature. The field ditch shows areas of Flood Zones 2 and 3; however, the extents are considered to be contained within the feature. The areas of Flood Zone 2

adjacent to the feature are considered to be isolated areas formed due to topographical low spots shown in EA LiDAR.

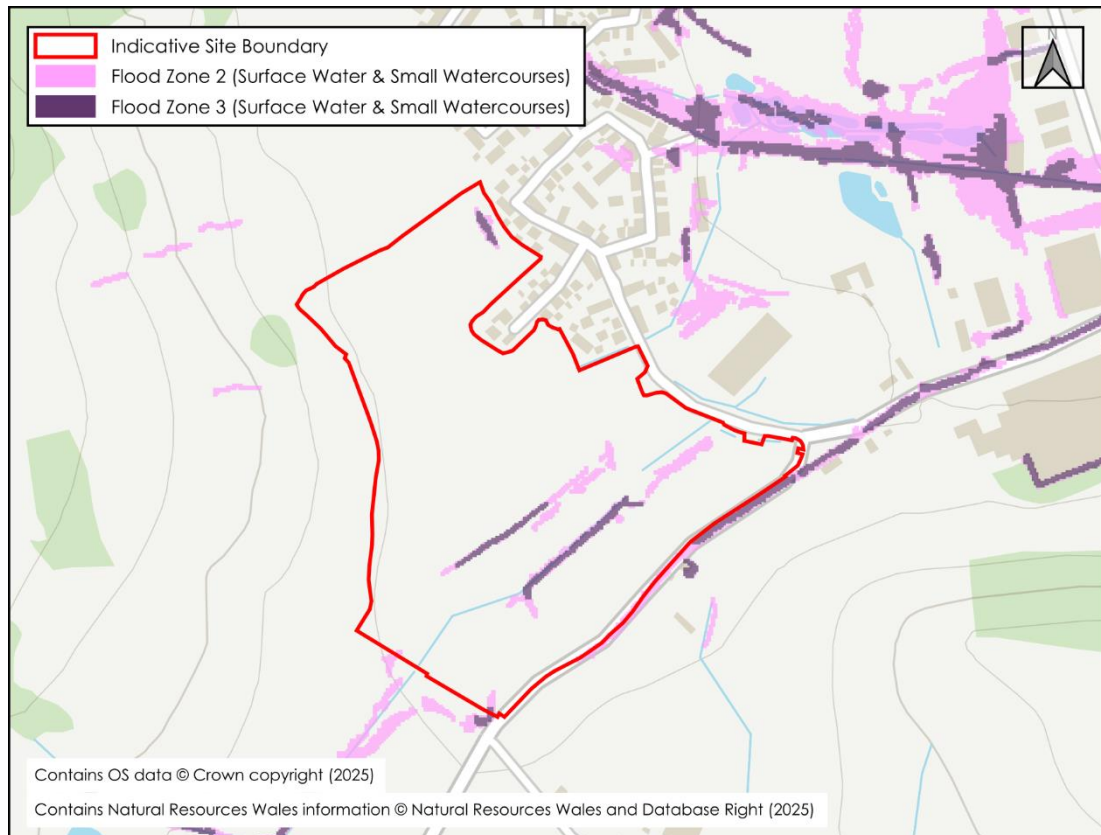


Figure 3.2: NRW Risk of Flooding from Surface Water and Small Watercourses

- 3.10 Correspondence with MCC, included as **Appendix 2** reports flooding around 41 Acre Way to the north of the site due to a collapsed bank. This event is not noted as having impacted the site. The correspondence also includes a plan which shows flooding from a small ditch adjacent to the site's eastern boundary which overspilled, flooding a garage along Ternata Drive, this was not considered to impact the site itself.
- 3.11 Overall, the risk of fluvial flooding is considered to be low. Appropriate mitigation for any residual risk is discussed in **Section 4**.

Pluvial Flood Risk

- 3.12 Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 3.13 Risk of Flooding from Surface Water and Small Watercourses mapping has been collated and published by NRW, and is shown in **Figure 3.2**.
- 3.14 The mapping shows the site is predominantly located with Flood Zone 1. Areas of Flood Zone 2 and 3 are located within the south of the site associated with the UOW, this is discussed in the **Fluvial Flood Risk** section above.
- 3.15 An isolated area of Flood Zone 2 and 3 is located to the north of the UOW, a review of EA LiDAR suggests this is associated with the isolated field ditch.
- 3.16 A small, isolated area of Flood Zones 2 and 3 is located within the north-east corner of the site. A review of EA LiDAR suggests this is associated with a small topographical depression.
- 3.17 Access and egress from the Ternata Drive and Kingswood Gate junction is shown to be at a very low risk of flooding from surface water.
- 3.18 Correspondence with MCC (**Appendix 2**) includes reference of historical flooding within the adjacent development around 13 Acre Way, to the east of the site. The correspondence also notes flooding around the junction of Wonastow Road and Ternata Drive to the south-east of the site. This is reported as highway flooding; however, no further information, including the extents of flooding are provided. The correspondence also notes that the area has a history of shallow surface overland flows with the adjacent housing estate having experience internal flooding.
- 3.19 Overall, the risk of flooding from surface water is considered to be low. Appropriate mitigation measures for any residual risk is discussed in **Section 4**.

Groundwater Flood Risk

- 3.20 Groundwater flooding occurs when the water table rises above ground elevations, or it rises to depths containing basement level development. It is most likely to happen in low lying areas underlain by permeable geology. This is most common on regional scale chalk aquifers, but there may also be a risk on sandstone and limestone aquifers or on thick deposits of sands and gravels underlain by less permeable strata such as that in a river valley.
- 3.21 BGS mapping shows the site is underlain entirely by Raglan Mudstone Formation (Siltstone and Mudstone). This is designated by NRW as a Secondary A Aquifer, defined as permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers.

- 3.22 Superficial deposits of Alluvium (Clay, Silt, Sand and Gravel) and River Terrace Deposits (Sand and Gravel) are expected to be present within the site. These are designated as Secondary A Aquifers.
- 3.23 The BGS also hold records of observations taken from borehole samples across the UK. These are not a substitute for long-term groundwater monitoring and only represent an observation in a single place and time. However, they can indicate whether shallow groundwater levels could be encountered.
- 3.24 Flood Risk from Groundwater mapping appended to the Stage 1 SFCA shows the site to sit within an area at a low risk from groundwater flooding.
- 3.25 There are no BGS boreholes located within the site. One borehole (SO41SE23) is located approximately 150m south of the site, underlain by clay deposits. Groundwater was struck in the log at 12 metres below ground level (m bgl) to its excavated depth of 30m bgl.
- 3.26 The existing residential development to the east is shown to be underlain by the same geology as the site. A review of the ground investigation, undertaken in October 2012 (reference: 11948) as part of this planning application (DC/2013/00368), noted groundwater was encountered with groundwater levels ranging between 0.7 and 3.40m bgl.
- 3.27 No records of historical groundwater flooding are reported in the PFRA or LFRMS.
- 3.28 Correspondence with MCC notes there to be springs in the area which may indicate the presence of shallow groundwater within the site.
- 3.29 Superficial deposits are potentially in continuity with the UOW; however, as levels slope towards this feature the risk of emergence is reduced.
- 3.30 Overall, based on shallow groundwater levels encountered in the adjacent development, the risk of groundwater flooding at the site is considered to be high. Appropriate mitigation measures are discussed in **Section 4**.

Flood Risk from Reservoirs & Large Waterbodies

- 3.31 Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain water in times of flood. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.
- 3.32 To help identify this risk, reservoir failure flood risk mapping has been prepared by NRW, this shows the worst-case scenario for the area that could be flooded if a large reservoir were to fail and release the water it holds. The map displays a worst-case scenario and is only intended as a guide. An extract of the mapping is shown in **Figure 3.3**.



Figure 3.3: NRW Reservoir Failure Extents

- 3.33 The site is shown to be located outside of the extents associated with a reservoir failure, the nearest extents are located approximately 4.4km south of the site.
- 3.34 There a series of small ponds located to the west of the site associated with Redhill Fishery. A review of EA LiDAR shows these ponds are set approximately 13m above the site and are impounded above the immediate surrounding topography. In the event of a breach or overtopping, flows would be directed across the site in line with the local topography.
- 3.35 The ponds are operated and maintained by Redhill Fishery and it is expected that they will have a general maintenance regime for these features. Therefore, the risk of exceedance or breach from these features is considered to be low. It is also considered that a proportion of exceedance flows could be intercepted by the UOW and conveyed via its channel.
- 3.36 Overall, the risk of flooding at the site from this source is also considered to be low.

Flood Risk from Sewers

- 3.37 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or as a result of a reduction in capacity due to collapse or blockage, or if the downstream system becomes surcharged. This can lead to the sewers flooding onto the surrounding ground via manholes and gullies, which can generate overland flows.

- 3.38 The local sewerage undertaker is Welsh Water; a copy of their sewer records is included as **Appendix 2**. There are no public sewerage assets within the site. A private foul water sewer is located within Ternata Drive, adjacent to the site's eastern boundary. However, the size, condition, and depth information is not provided for this asset. In the event of exceedance flows would be directed away from the site to the east, in line with the local topography as informed by EA LiDAR.
- 3.39 There are no records of sewer flooding at the site reported within the PFRA.
- 3.40 Overall, based on the local topography, the risk of flooding from sewers is considered to be low.

Effect of Development on Wider Catchment

Displacement of Floodplain

- 3.41 There is potential for displacement of the floodplain associated with the UOW unless appropriately mitigated. However, it is noted that due to the limited contributing catchment of the watercourse and steep topography the associated floodplain is expected to be negligible. Appropriate mitigation is discussed in **Section 4**.

Impedance of Flood Flows

- 3.42 The proposed development will not result in impedance or loss of overland flow routes.

Development Land Use/Drainage Considerations

- 3.43 The development will increase the area of impermeable surfaces leading to a potential increase in runoff, unless appropriately mitigated. Appropriate mitigation is discussed in **Section 4**.

4. FLOOD RISK MITIGATION

- 4.1 **Section 3**, has identified the sources of flooding which could potentially pose a risk to the site and the proposed development. This section of the FCA sets out the mitigation measures which are to be incorporated within the proposed development to address and reduce the risk of flooding to within acceptable levels.

Development Levels

- 4.2 It is recommended that finished flood levels are raised a minimum of 150mm above surrounding ground levels.
- 4.3 Ground levels should be profiled to encourage pluvial runoff and overland flows away from the built development and towards the nearest drainage point.

UOW and Drains

- 4.4 It is recommended that the UOW and on-site drain are retained within the development layout such that their conveyance downstream is not impeded. Any new structures proposed on these features should be appropriately sized and provide sufficient freeboard during the 1 in 100-year plus climate change event.

Easements

- 4.5 Appropriate easements should be provided from top of bank from the UOW and drain within the site. This easement should be confirmed through consultation with MCC.

Safe Access and Egress

- 4.6 Access and egress from Ternata Drive is shown to be at a low risk of flooding from all sources. Therefore, safe access and egress from the proposed development is considered to be achievable.

Groundwater Considerations

- 4.7 It is recommended that groundwater levels are monitored during construction and that any necessary dewatering is undertaken if groundwater is encountered during excavations.

Surface Water Drainage

- 4.8 To mitigate the development's impact on the current runoff regime it is proposed to incorporate surface water attenuation and storage as part of the development proposals.
- 4.9 Further information on the drainage approach is provided within the accompanying Sustainable Drainage Statement (SDS), reference 243686-BWB-ZZ-XX-T-W-0002_SDS.

- 4.10 In brief, the development will discharge surface water at the equivalent greenfield QBAR rate. Attenuated surface water storage will be provided capacity for the 1 in 100-year storm with an allowance for climate change.
- 4.11 MCC have noted (**Appendix 2**) that due to a history of shallow surface overland flow in the area, future development is expected to include robust mitigation. These mitigation measures are outlined further within **Section 5**.
- 4.12 The development should be designed with exceedance in mind, road network used to convey excess overland flows towards the attenuation points. Overflow should be provided from the basin to the watercourse should the design standard of the drainage be exceeded.

Foul Water Drainage

- 4.13 It is proposed to drain foul water from the development separately to surface water.

5. SURFACE WATER AND FOUL MANAGEMENT

Surface Water

- 5.1 Development comprising 100m² or more of construction area will require sustainable drainage to manage on-site surface water. These Sustainable Drainage Systems (SuDS) must be designed and constructed in accordance with the Welsh Government Standards for Sustainable Drainage¹³ and Sustainable Drainage Approving Body (SAB) approval must be sought independently from the planning approval.
- 5.2 The Standards for Sustainable Drainage note that SuDS schemes should aim to manage water on or close to the surface and as close to the source of the runoff as possible as well as take into account likely pressures on flood risk, the environment and water recourses such as climate change and urban creep.
- 5.3 An Outline Drainage Strategy has been prepared and is presented as **Appendix 5**, with the supporting calculations provided within **Appendix 6**.

Surface Water Runoff Destination

- 5.4 The Standards for Sustainable Drainage outlines the use of surface water by the development and where it should be discharged. The aim is to ensure that runoff is treated as a resource and managed in a way that minimises negative impacts of development on flood risk. The surface water runoff destination is outlined below with Priority Level 1 being the preferred option to be considered in the first instance, with 4 and 5 being used only in exceptional circumstances:
- Priority Level 1: Surface water runoff is collected for use;
 - 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 a combined sewer.

Surface Water Drainage Concept

- 5.5 In line with the surface water runoff destination, it is recommended that rainwater harvesting is incorporated within the development where possible, however, it is acknowledged that in most cases, rainwater harvesting alone will not be adequate to deal with the site drainage. Therefore, in line with Priority Level 2, infiltration testing in accordance with BRE 365 should be undertaken to confirm whether infiltration is viable for the disposal of surface water.

¹³ Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems (Welsh Government, 2018)

- 5.6 Based on the geology of the site, the recorded geology of the surrounding areas and the recorded levels of groundwater, it is assumed that infiltration is unlikely viable and therefore, will not be further considered at this concept design stage.
- 5.7 Surface water runoff should be discharged from the site at a restricted rate to the Unnamed tributary of the River Monnow in line with Priority Level 3 via an existing surface water sewer network that was installed to facilitate future development. An assessment of the greenfield surface water runoff rates per hectare from the site has been undertaken and is summarised within **Table 5.1** and included as **Appendix 4**.

Table 5.1: Existing Greenfield Runoff Rate per Hectare

Return Period (Yrs.)	Runoff Rate (l/s/ha)
1	1.9
Mean Annual Flow Rate (QBAR)	2.2
30	3.9
100	4.8

- 5.8 The proposed drainage strategy assumes that infiltration is not viable, and surface water will be limited to the lowest practicable rate of 2.2l/s/ha prorated based on the proposed impermeable area, including attenuation basins, for all events up to and including the 1 in 100-year + climate change critical storm as outlined in **Table 5.2**.

Table 5.2: Existing and Proposed Greenfield Runoff Rate for the Assumed Impermeable Development Area

Return Period (Yrs.)	Existing Runoff Rate (l/s/ha)	Proposed Runoff Rate (l/s) based on an assumed impermeable area of 6.87 ha
1	1.9	15.1
Mean Annual Flow Rate (QBAR)	2.2	
30	3.9	
100	4.8	

- 5.9 The LLFA have a surface water drainage destination proforma, which has been completed, as best as possible at this concept design stage, and is presented as **Appendix 7**.

Drainage Catchment Details

- 5.10 A development area for the proposed residential areas has been measured based on the masterplan included as **Appendix 1**. It is assumed at this time that 65% of the development area will be impermeable and an additional 10% has been added to account for urban creep. The footprint associated with attenuation basins has also been

included within the impermeable area calculations. The commercial units have been assumed to be 100 % impermeable as part of the calculations.

- 5.11 Based on the existing site topography, watercourse locations and to break up the surface water attenuation throughout the development, including each individual commercial unit, it is proposed to drain the surface water from the proposed development via seven drainage catchments. The proposed drainage catchments are illustrated on the Conceptual Drainage Strategy presented as **Appendix 5**, with catchment details outlined within **Table 5.3**.

Table 5.3: Proposed Drainage Catchment Details

Catchment	Development Area (ha)	Assumed Impermeable Area* (ha)	Maximum Discharge Rate** (l/s)	Outfall Location
1	1.41	1.18	2.6	Catchment 2
2	2.83	2.42	12.3***	Unnamed Tributary
3	0.76	0.76	1.7	Catchment 2
4	0.52	0.52	1.1	Unnamed Tributary
5	0.49	0.49	1.1	Catchment 2
6	0.74	0.74	1.6	Catchment 2
7	0.76	0.76	1.7	Unnamed Tributary
Total	7.51	6.87	15.1	

* Includes proposed attenuation basin areas

** Maximum discharge rate based on 2.2l/s/ha multiplied by the proposed catchment impermeable area

*** Cumulative discharge rate of Catchments 1, 2, 3, 5 and 6

- 5.12 It should be noted at this concept stage, Catchment 2 outfalls to the unnamed tributary to the immediate northeast of the site and Catchments 1,3,5 &6 outfalls via Catchment 2 through a series of cascades. Catchments 4 and 7 discharge to the unnamed tributary to the north of the eastern extents of the site.

Attenuation Storage

- 5.13 As the development proposals require a restricted runoff rate, it will be necessary to provide attenuated storage to balance the excess volume in a safe manner within the site.
- 5.14 The surface water storage should be located within the site in a position where it can receive runoff from the development and discharge from the site by gravity, and also

in a position where it is hydraulically isolated from any fluvial floodplain or external surface water floodplain / overland flow route that may be present in the site.

- 5.15 Sufficient storage for events up to the 1 in 100-year storm with an allowance for climate change should be provided.
- 5.16 It is proposed that surface water will be stored in above ground attenuation basins located at the lowest point of each catchment for the residential developments and in attenuation tanks for the commercial development. For the purpose of this outline design stage, the basins and tanks have been designed to accommodate the 1 in 100-year + 40% climate change event. Simulations have been run using Causeway Flow to identify the necessary storage provision for each catchment using FEH22 rainfall data. The results are summarised in **Table 5.4** and calculations are included as **Appendix 6**.

Table 5.4: Attenuated Storage Requirements

Catchment	Critical Storm	Maximum Volume (m³)
1	2,160-min Winter	1,100
2	2,880-min Winter	2,365
3	2,880-min Winter	720
4	2,880-min Winter	505
5	2,160-min Winter	460
6	2,880-min Winter	710
7	2,880-min Winter	715
Total	-	6,575

- 5.17 At this conceptual stage it is expected that a minimum of 6,575m³ of attenuated storage will be required to cater for the maximum anticipated runoff volume for all storm durations up to the 1 in 100-year return period storm, including a 40% climate change allowance.
- 5.18 It is envisaged that the final required attenuated storage volume will be determined as the scheme progresses in more detail.

Sustainable Drainage System

- 5.19 The basins have been designed to be 1.4m deep with 1:4 slopes. It is recommended that a 3m maintenance walkway is provided around the perimeter of any open water feature (i.e. attenuation basin) in order to allow for maintenance.

- 5.20 As the masterplan progresses, a combination of SuDS should be incorporated into the development in addition to the main attenuation basins to provide multiple levels of treatment and to attenuate runoff as close to the source as possible.
- 5.21 Consideration should be made for roadside swales to allow for reduced gullies and improved maintenance.
- 5.22 As part of the development of the surface water drainage strategy, the four pillars of SuDS should be considered; water quality, water quantity, biodiversity and amenity.

Water Quality

- 5.1 As the scheme progresses in more detail and the final development and proposed SuDS arrangements are confirmed, a water quality assessment in accordance with the CIRIA Simple Index Approach should be undertaken.

Residual Risk and Designing for Exceedance

- 5.2 It is recommended that the final layout uses the proposed road infrastructure to provide drainage exceedance (overland flood flow) routes through the development and towards the attenuating SuDS for events in excess of the capacity of the drainage system.
- 5.3 In the event of exceedance of the drainage system within the commercial areas, the finished levels of the external areas should be designed for exceedance water to safely pond within the external car park away from any built development.
- 5.4 The detention basins have been designed to not flood during the 1 in 100-year + 40% critical storms, with additional freeboard provided above the design event.
- 5.5 In addition to the volume of storage provided within the main attenuation, there will be capacity within upstream pipes and manholes which has not been accounted for at this stage and a further level of redundancy to the network will therefore be provided.

Foul Water

- 5.6 It is recommended that a developer enquiry is submitted to Welsh Water regarding local foul water and treatment capacity. Welsh Water sewer records, included as **Appendix 3**, show the presence of two foul stubs located within the site that connect to the existing foul sewer within Ternata Drive located adjacent to the northern site boundary. Levels indicate that a gravity connection would be achievable.
- 5.7 The foul water drainage strategy will be confirmed as the scheme progresses in more detail. Given the scale of the proposed development, it is anticipated that the Welsh Water will need to hydraulically model the impact of the proposed development coming forward to confirm any future improvement works to the wider public drainage system close to the site.

6. CONCLUSIONS AND RECOMMENDATIONS

- 6.1 This FCA is compliant with the requirements set out in PPW and TAN15. The FCA has been produced on behalf of Richborough in respect of an outline planning application for a mixed use residential and commercial scheme on Land North of Wonastow Road, Monmouth.
- 6.2 This FCA is intended to support the promotion of the site through the RLDP, the level of detail included is commensurate and subject to the nature of the proposals at the planning stage.
- 6.3 This report demonstrates that the proposed development is not at significant flood risk, subject to the recommended flood mitigation strategies being implemented. The identified risks and mitigation measures are summarised within **Table 6.1**:

Table 6.1: Summary of Flood Risk Assessment

Flood Source	Risk & Proposed Mitigation Measures
Fluvial	The site is located entirely within Flood Zone 1 and elevated approximately 2.5m above the nearest Flood Zones. Therefore, the risk from Main Rivers is considered to be low. There is considered to be a low risk of flooding from the UOW, drain, and field ditch within the site based on their limited contributing catchments and a review of NRW Risk of Flooding from Surface Water and Small Watercourses mapping. It is recommended that finished floor levels are raised a minimum of 150mm above surrounding ground levels.
Groundwater	Based on shallow groundwater levels encountered in the adjacent development, there is considered to be a high risk of groundwater flooding. It is recommended that groundwater levels are monitored during construction and that any necessary dewatering is undertaken if groundwater is encountered during excavations.
Pluvial runoff	The site is generally at a low risk of flooding from pluvial sources. Ground levels should be profiled to encourage runoff away from built development and towards the nearest drainage point.
Impact of the Development	The development will discharge surface water at the equivalent greenfield QBAR rate. Attenuated surface water storage will be provided in the form of a SuDS detention basin with capacity for the 1 in 100-year storm with an allowance for climate change. It is proposed to drain foul water from the development separately to surface water. It is recommended that the UOW, drain, and ditch are retained within the development layout such that their conveyance downstream is not impeded. Any new structures proposed on these features should be appropriately sized and provide sufficient freeboard during the 1 in 100-year plus climate change event.

This summary should be read in conjunction with BWB's full report. It reflects an assessment of the Site based on information received by BWB at the time of production.

- 6.4 In compliance with the requirements of TAN15, and subject to the mitigation measures proposed, the development could proceed without being subject to significant flood risk. Moreover, the development will not increase flood risk to the wider catchment area subject to suitable management of surface water runoff discharging from the site.

APPENDICES

Appendix 1: Illustrative Masterplan

illustrative masterplan



Sustainable drainage with wild life and **biodiversity** benefits



Residential land proposed to deliver over 150 new **sustainable homes**, 50% affordable



Enhancements to existing **Green Infrastructure**



Recreational spaces



Community facilities(0.23Ha)



Sustainable drainage with wild life and **biodiversity** benefits



Access to employment site from **existing** infrastructure



EV charging in all car parks



Yards **shielded** from housing to reduce noise impact



Public right of way



Green Corridor with wild life and **biodiversity** benefits



High Quality sustainable commercial buildings

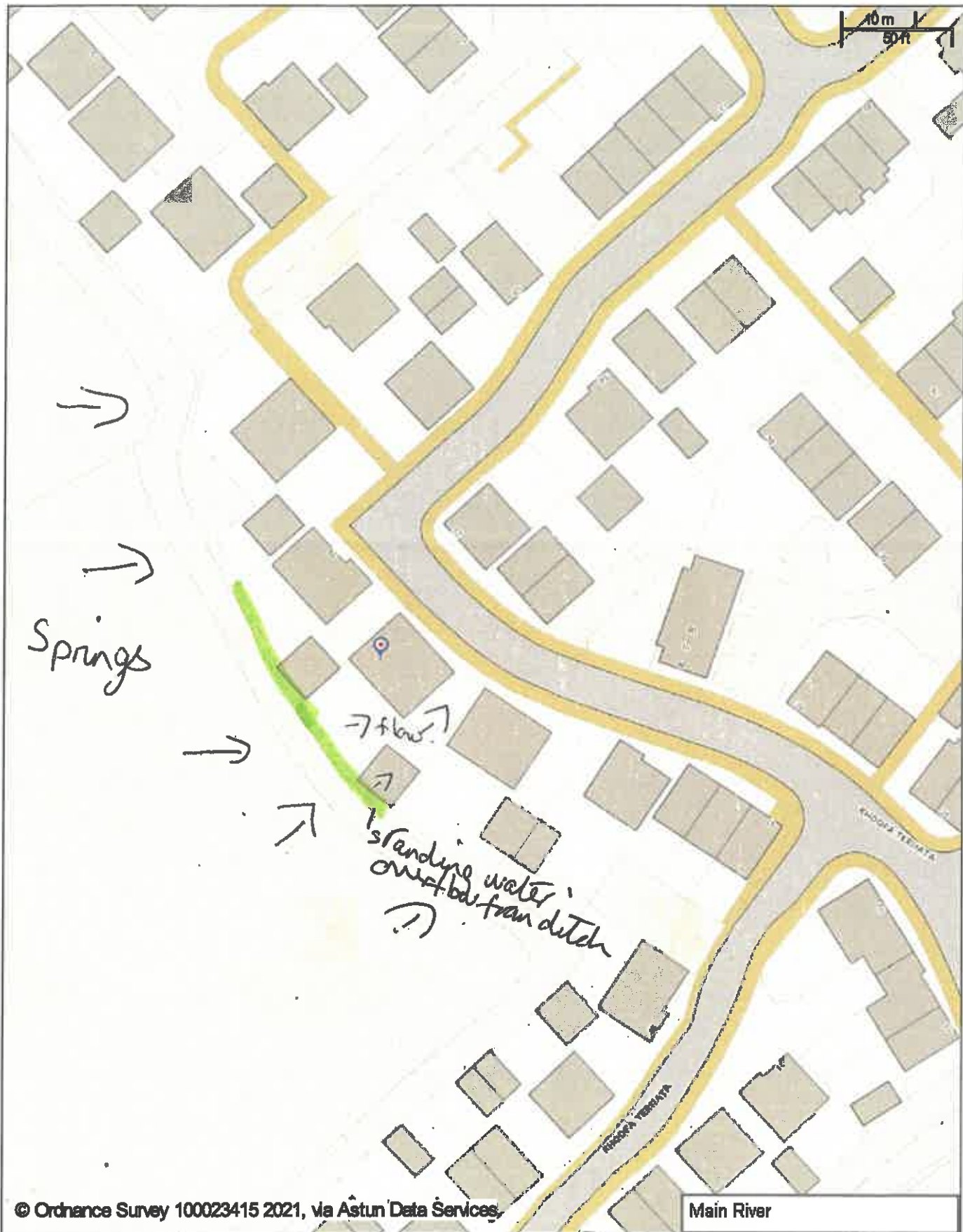


Potential **access** to employment site from **existing** road infrastructure



Employment site boundary (4.5 hectares, delivering approx 125,000sq.ft GFA)

Appendix 2: Monmouthshire County Council Correspondence



Print title: 57 Terratta Drive, Monmouth

Print description: Monmouthshire County Council, County Hall, The Rhadyr, Usk. NP15 1GA

Scale: 1:709

Printed: 22/1/2021 at 8:08 AM

Grid Ref: 349161,212188



From:
Sent: 01 February 2024 16:39
To:
Cc:
Subject: RE: 243686 - Land North of Wonastow Road, Monmouth - FOI Request
Attachments: 975E09199B44664FE0531401A8C03CDF_Video2.mp4; 2021-01-22 plan.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

In response to your enquiry below.

For SAB applications we currently expect at least a 30% allowance for climate change.

I have reviewed our database of land drainage investigations in the vicinity. These are summarised as follows:

2020-03-LD02. Water coming across field behind 41 Acer Way making field very boggy. Water coming from watercourse with a collapsed bank so pouring out into field.
2020-01-LD03. Similar issue to above. Video attached. Report of flooded garage and water in gardens around 13 Acer Way.
2021-01-LD26. "Springs" recorded in field behind Terrata Drive. Sketch plan attached. Ditch overspilled. Water entered a garage.
2018-02-LD05 Inspection of screens in watercourses on housing estate. Not directly relevant.
2017-05-LD05 Correspondence regarding SuDS on housing estate. Not directly relevant.
2019-11-LD14 Report of repeated highway flooding at junction of Wonastow Road and Ternata Drive.
2019-03-LD05 Water repeatedly running down Wonastow Road to Wonastow Road/Ternata Drive junction.

This area, alongside many others has a history of shallow surface overland flow in times of heavy rainfall. These flows typically are not deep enough to register on flood modelling. However, when they run into the back of a housing estate they have potential to cause internal flooding. The existing estate has suffered from such flows. We would expect future developments to be designed with more robust mitigation measure (cut off ditches etc.).

I hope the above is helpful.

(BSc FGS)
Assistant Engineer (Flood Risk Management)
Highways & Flood Management
Monmouthshire County Council / Cyngor Sir Fynwy

Email / Epost: _____
Website / Gwefan: www.monmouthshire.gov.uk



I now work Monday to Thursday only.

From: _____ >
Sent: Monday, January 22, 2024 2:04 PM
To: MCC - SAB <SAB@monmouthshire.gov.uk>
Cc: _____ >
Subject: 243686 - Land North of Wonastow Road, Monmouth - FOI Request

Good Afternoon,

I hope this finds you well.

We are currently conducting a Flood Risk Assessment and Sustainable Drainage Statement on a site located in Monmouth, with the approximate NGR: SO 49128 11965 and would appreciate the Councils input for any additional guidance regarding the drainage requirements.

Please could you confirm what the latest peak rainfall and river climate change allowance percentages are?

Additionally, I would like to enquire as to whether you have any records/ maps/modelling data of flooding in or around the immediate site or surrounding area. In particular do you have any information relating to historic flooding, sewer flooding, surface water or groundwater information. Attached is a site location plan. In particular we are interested in all available flood data and any historic data.

I look forward to hearing from you.

Kindest regards,

Graduate Engineer | Environmental Engineering | BWB Consulting Limited

Livery Place, 35 Livery Street, Colmore Business District, Birmingham B3 2PB

W _____



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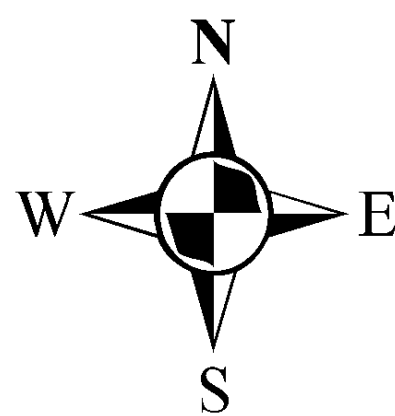
chi yw'r derbynnydd bwriadedig, rhaid i chi beidio copïo, dosbarthu neu gymryd unrhyw gamau yn seiliedig arni. Os cawsoch y neges e-bost yma drwy gamgymeriad hysbyswch ni cyn gynted ag sydd modd os gwelwch yn dda drwy ffonio 01633 644644. Cafodd y neges e-bost yma sgan firws gan Microsoft Exchange Online Protection . Mae'r Cyngor yn croesawu gohebiaeth yn Gymraeg, Saesneg neu yn y ddwy iaith. Byddwn yn cyfathrebu â chi yn ôl eich dewis. Ni fydd gohebu yn Gymraeg yn arwain at oedi. Gwybodaeth preifatrwydd: Os ydych wedi gofyn am wasanaeth neu wybodaeth gennym, byddwn yn cofnodi eich data ar gyfer dibenion prosesu a chaiff hyn ei gadw yn ein system gwybodaeth cwsmeriaid Fy Sir Fynwy. I gael gwybodaeth preifatrwydd, cyfeiriwch at y dudalen Gwefan a Chwcis ar ein gwefan - <https://www.monmouthshire.gov.uk/cy/eich-preifatrwydd/43785-2/>. This email and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom they are addressed. It may contain privileged and confidential information and if you are not the intended recipient, you must not copy, distribute or take any action in reliance on it. If you have received this email in error, please notify us as soon as possible by telephone on 01633 644644. This email has been virus scanned by Microsoft Exchange Online Protection. The Council welcomes correspondence in English or Welsh or both, and will respond to you according to your preference. Corresponding in Welsh will not lead to a delay. Privacy Information: If you have requested a service from us, your data will be processed via our customer services management system called 'My Monmouthshire'. For privacy information, please refer to the Website & Cookies page on our website - <https://www.monmouthshire.gov.uk/your-privacy/website-cookies/>.

Appendix 3: Welsh Water Sewer Records



Dŵr Cymru
Welsh Water

Monmouthshire NP25 5UZ 349128, 211965



LEGEND(Representative of most common features)

Waste network:	Foul chamber	Outfall
Surface water chamber	LH	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 adaptation agreement	
	Private Sewer Transfer	
	Lateral Drain	
	Inspection Chamber	

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 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 to be used as a guide only. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company is given as to the position of its underground apparatus only and is not to be used as a guide for any other purpose. It is the responsibility of the user to ensure that the information is used in accordance with the requirements 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 provisions 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: 349128,211966
Map scale: 1:1000
Printed by: Zara Howells
Printed on: 24 Jan 2024

Appendix 4: Greenfield Runoff Rates

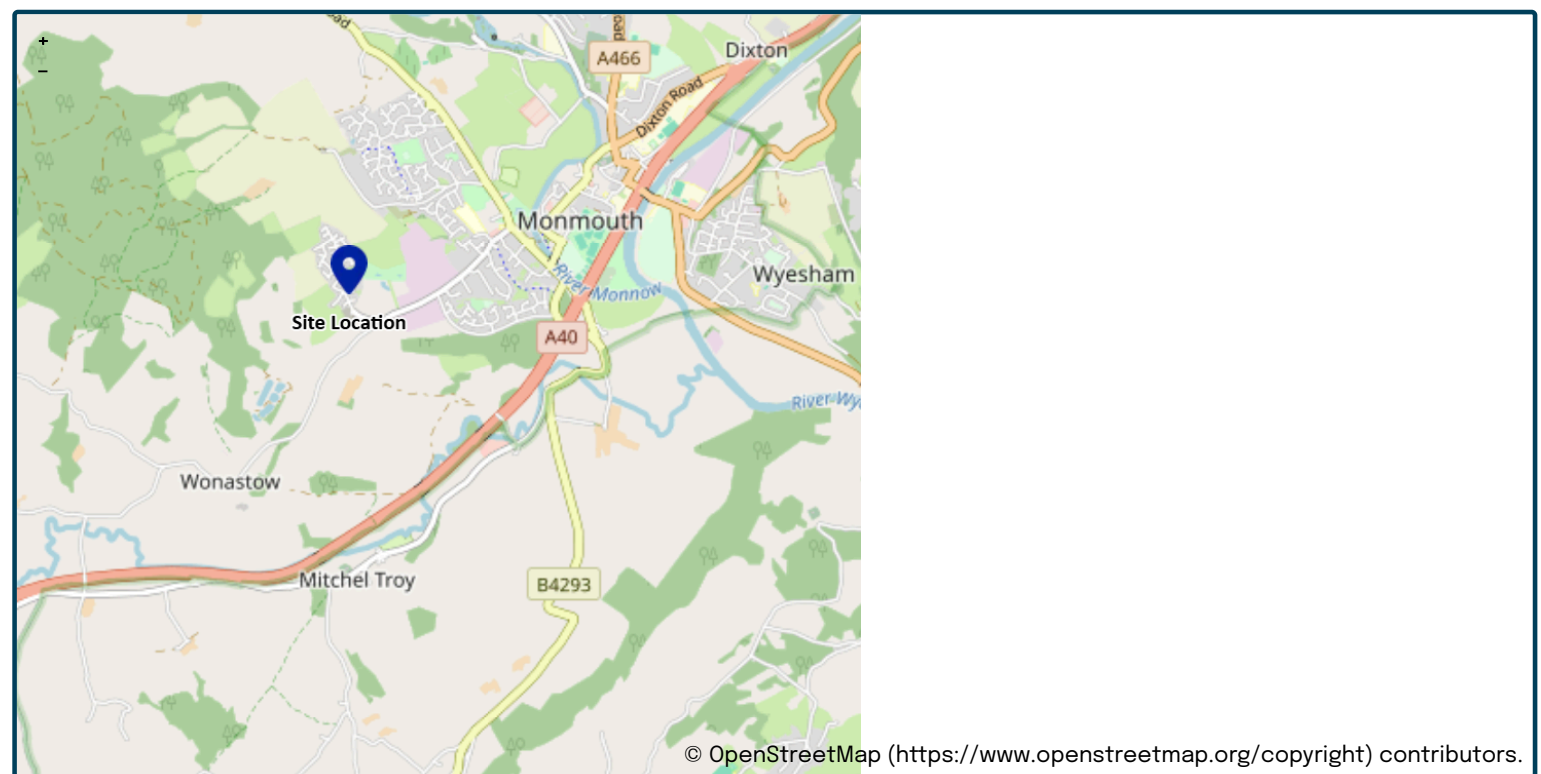
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	25/06/2025
Calculated by	CL
Reference	243686
Model version	2.0.1

Location

Site name	Wonastow Road
Site location	Monmouth



Site easting	349251
Site northing	212011

Site details

Total site area (ha)	1	ha
----------------------	--------------------------------	----

Greenfield runoff

Method

Method	IH124	
IH124		
	<u>My value</u>	<u>Map value</u>
SAAR (mm)	819 mm	819
How should SPR be derived?	WRAP soil type	
WRAP soil type	2	2
SPR	0.3	
QBar (IH124) (l/s)	2.2 l/s	

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	9	9
1 year growth factor	0.88	
2 year growth factor	0.93	
10 year growth factor	1.42	
30 year growth factor	1.78	
100 year growth factor	2.18	
200 year growth factor	2.46	

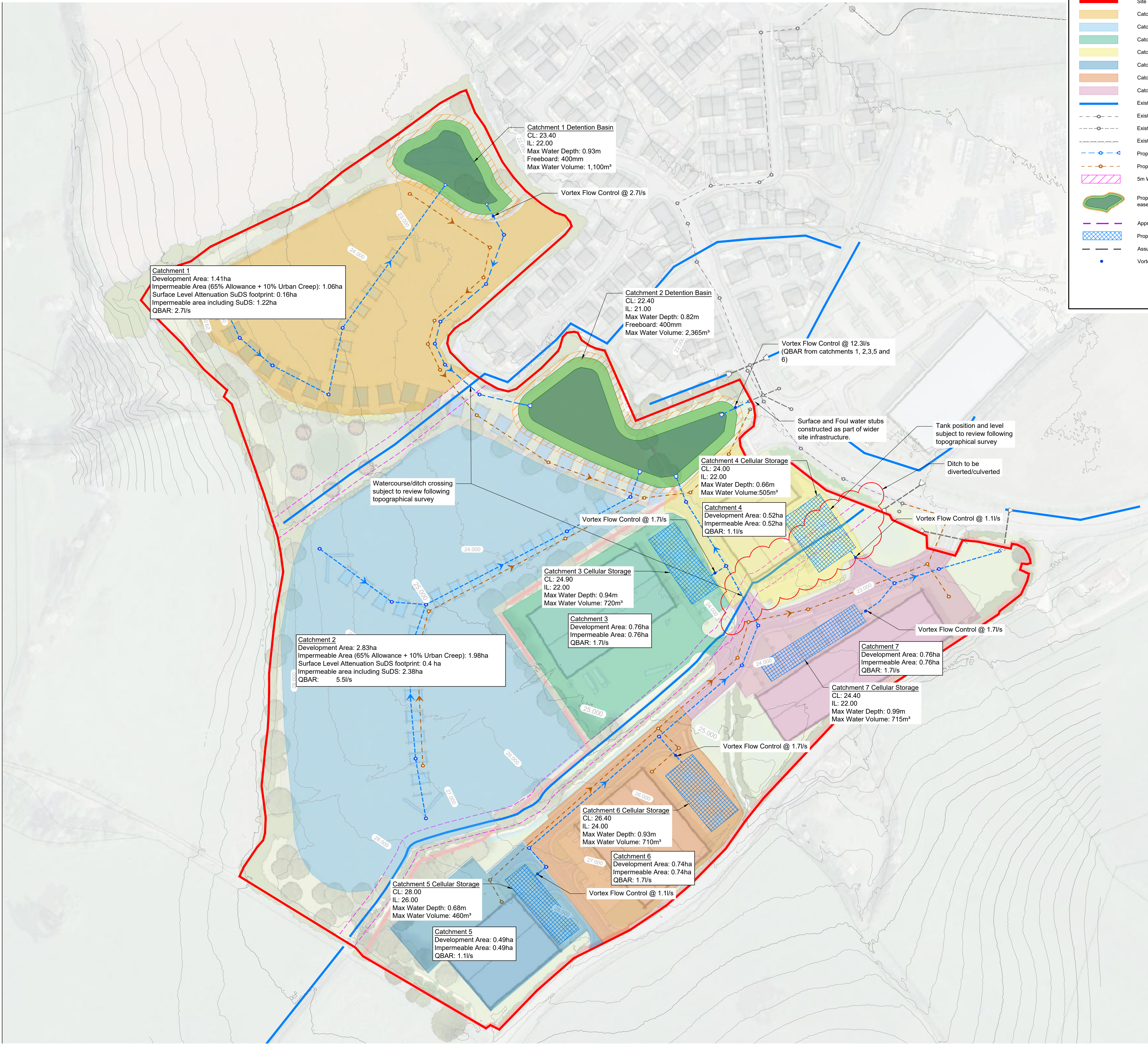
Results

Method	IH124	
Flow rate 1 year (l/s)	1.9 l/s	
Flow rate 2 year (l/s)	2 l/s	
Flow rate 10 years (l/s)	3.1 l/s	
Flow rate 30 years (l/s)	3.9 l/s	
Flow rate 100 years (l/s)	4.8 l/s	
Flow rate 200 years (l/s)	5.4 l/s	

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.0.1) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com) (<https://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 [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix 5: Concept Drainage Strategy



Legend	
—	Site Area
—	Catchment 1
—	Catchment 2
—	Catchment 3
—	Catchment 4
—	Catchment 5
—	Catchment 6
—	Catchment 7
—	Existing Watercourse
—	Existing Foul Sewer
—	Existing Surface Water Sewer
—	Existing Foul Rising Main
—	Proposed Surface Water Sewer
—	Proposed Foul Sewer
—	5m Watercourse Easement
—	Proposed Detention Basin (inc. 3m maintenance easement)
—	Approximate Earthworks Extent
—	Proposed Geocellular Storage
—	Assumed Culvert Route
•	Vortex Flow Control

- Notes
- Do not scale this drawing. All dimensions must be checked / verified on site. If in doubt ask.
 - This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
 - All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
 - Any discrepancies noted on site are to be reported to the engineer immediately.
 - Enclosed Masterplan based on Pegasus Group Development Framework Plan (ref:Wonastow Road Indicative Masterplan dated December 2024).
 - Enclosed Welsh Water infrastructure details are based on PDF asset plans (ref:349128,211966), dated 24/01/24. The exact location and level information of the existing public sewerage infrastructure is to be confirmed and has been given without liability or warranty.
 - Do not construct or cost from this drawing.
 - The maximum catchment discharge rates are based on calculated greenfield QBAR rate of 2.2l/s/ha, multiplied by the measured total catchment areas.
 - All basins have been designed to accommodate the 1 in 100-year + 40% critical storm event with a 300mm freeboard. The attenuation calculations has been undertaken using Flood Estimation Handbook (FEH) and Flood Studies Report (FSR) rainfall data.
 - All detention basins to have minimum 1:4 internal side slopes. Basin forebays and erosion protection should be considered at detailed design.
 - This strategy is a proof of concept only and all details are to be confirmed at the detailed design stage in agreement with all relevant statutory consultees.
 - It is assumed at this stage that 65% of the residential development is impermeable with a 10% allowance for urban creep whilst commercial units are 100% impermeable. This should be refined as the masterplan develops.
 - Locations of watercourses/ditches and easements are approximate. This is to be confirmed as the masterplan progresses.
 - Outfall to watercourses are subject to land ownership, consent and details on watercourse levels.
 - There is no topographical survey available for the site and therefore basin locations are approximate and subject to change following receipt of detailed topographical information.
 - In the absence of a topographical survey, Light Detection and Ranging (LIDAR) data from the Environment Agency has been used. This data set is from 2022 and is at 1m resolution. (Environment Agency © copyright and database).
 - Proposed drainage outfall locations are based upon QuadConsult Limited drawing (ref:300-2) that is on the Monmouthshire County Council Planning Portal under planning application DC/2017/00185.

P02	26.06.24	Updated Masterplan	CL	MPB	
P01	26.11.24	Preliminary Issue	WJ	LDR	
Rev	Date	Details of issue / revision	Drw	Rev	

Issues & Revisions



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Client

Richborough Estates Limited

Project Title

Wonastow Road, Monmouth

Drawing Title

Conceptual Drainage Strategy

Drawn:	W. James	Reviewed:	L. Ream
BWB Ref:	243686	Date:	12.11.24
Scale@A1:	1:1000		
Drawing Status			
PRELIMINARY			
Project - Originator - Zone - Level - Type - Role - Number			Status Rev
243686-BWB-ZZ-XX-D-W-0001			S2 P02

Appendix 6: Source Control Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Catchment 1	1.180	5.00	23.400		-76.009	122.754	1.400
Catchment 2	2.420	5.00	22.400		-52.573	85.319	1.400
Catchment 5	0.490	5.00	28.000	1200	-67.460	-3.406	2.000
Catchment 6	0.740	5.00	26.400		-35.701	21.056	2.400
Catchment 7	0.760		24.400	1200	1.676	50.583	2.400
Catchment 3	0.760	5.00	24.900		-45.044	54.391	2.900
Catchment 4	0.520		24.000		-16.167	63.461	2.000
1			26.500	1200	-58.931	13.258	1.100
2			25.000	1200	-27.448	46.021	2.000
3			24.000	1350	-41.293	66.756	2.200
4			22.500	1350	-49.569	92.027	1.800

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	1 year (l/s)	13.2
Rainfall Events	Singular	Drain Down Time (mins)	240	30 year (l/s)	27.1
Summer CV	0.750	Additional Storage (m³/ha)	20.0	100 year (l/s)	32.8
Winter CV	0.840	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.80
Greenfield Method	IH124	Growth Factor 100 year	2.18
Positively Drained Area (ha)	6.870	Betterment (%)	0
SAAR (mm)	819	QBar	15.1
Soil Index	2	Q 1 year (l/s)	13.2
SPR	0.30	Q 30 year (l/s)	27.1
Region	9	Q 100 year (l/s)	32.8
Growth Factor 1 year	0.88		

Node Catchment 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	4.000	Sump Available	✓
Replaces Downstream Link	x	Product Number	CTL-SHE-0077-2600-1000-2600
Invert Level (m)	22.000	Min Outlet Diameter (m)	0.100
Design Depth (m)	1.000	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.6		

Node Catchment 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	21.000	Product Number	CTL-SHE-0160-1230-1000-1230
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	12.3	Min Node Diameter (mm)	1500

Node Catchment 5 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0052-1100-0800-1100
Invert Level (m)	26.000	Min Outlet Diameter (m)	0.075
Design Depth (m)	0.800	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.1		

Node Catchment 6 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	2.000	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0057-1600-1200-1600
Invert Level (m)	24.000	Min Outlet Diameter (m)	0.075
Design Depth (m)	1.200	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.6		

Node Catchment 7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	22.000	Product Number	CTL-SHE-0059-1700-1200-1700
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.7	Min Node Diameter (mm)	1200

Node Catchment 3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	22.000	Product Number	CTL-SHE-0059-1700-1200-1700
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.7	Min Node Diameter (mm)	1200

Node Catchment 4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	22.000	Product Number	CTL-SHE-0049-1100-1000-1100
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.1	Min Node Diameter (mm)	1200

Node Catchment 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	887.0	0.0	1.400	1735.0	0.0

Node Catchment 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	21.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	2384.0	0.0	1.400	3998.0	0.0

Node Catchment 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	26.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	700.0	0.0	0.800	700.0	0.0	0.801	0.0	0.0

Node Catchment 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	24.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	800.0	0.0	1.200	800.0	0.0	1.201	0.0	0.0

Node Catchment 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	750.0	0.0	1.200	750.0	0.0	1.201	0.0	0.0

Node Catchment 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	800.0	0.0	1.200	800.0	0.0	1.201	0.0	0.0

Node Catchment 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	22.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	800.0	0.0	1.000	800.0	0.0	1.001	0.0	0.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	Catchment 1	2100	22.928	0.928	26.1	1099.2310	0.0000	SURCHARGED
2880 minute winter	Catchment 2	2820	21.818	0.818	48.7	2363.6160	0.0000	SURCHARGED
2160 minute winter	Catchment 5	2100	26.682	0.682	10.8	457.6077	0.0000	SURCHARGED
2880 minute winter	Catchment 6	2820	24.925	0.925	13.1	708.7406	0.0000	SURCHARGED
2880 minute winter	Catchment 7	2820	22.994	0.994	13.4	715.9553	0.0000	OK
2880 minute winter	Catchment 3	2820	22.941	0.941	13.4	719.9404	0.0000	SURCHARGED
2880 minute winter	Catchment 4	2820	22.662	0.662	9.2	506.3113	0.0000	OK
30 minute summer	1	33	25.414	0.014	1.1	0.0159	0.0000	OK
2160 minute winter	2	2100	23.021	0.021	2.5	0.0241	0.0000	OK
2160 minute winter	3	2100	21.827	0.027	4.0	0.0384	0.0000	OK
60 minute summer	4	291	20.744	0.044	12.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	Catchment 1	4.000	Catchment 2	2.6	0.187	0.016	1.6200	
2880 minute winter	Catchment 2	1.004	4	12.3	1.637	0.030	0.0552	1613.7
2160 minute winter	Catchment 5	Hydro-Brake®	1	1.1				
2880 minute winter	Catchment 6	Hydro-Brake®	2	1.4				
2880 minute winter	Catchment 7	Hydro-Brake®		1.6				232.2
2880 minute winter	Catchment 3	Hydro-Brake®	3	1.5				
2880 minute winter	Catchment 4	Hydro-Brake®		0.9				138.3
30 minute summer	1	1.001	2	1.1	0.641	0.004	0.0753	
2160 minute winter	2	1.002	3	2.5	0.932	0.010	0.0657	
2160 minute winter	3	1.003	Catchment 2	4.0	0.308	0.010	1.2355	

Appendix 7: Drainage Priority Proforma

Please fill in the boxes coloured green.

Where required and helpful, please reference other plans and documents within the planning application.

1. Details of site location and existing drainage arrangements.

Site name	Land off Wonastow Road
Proposed works	mixed use scheme comprising residential, employment and community facilities
Description of any existing drainage arrangements for the site and any adjacent land that drains onto the site.	Site is greenfield
Construction area of proposed development. Include: any new roof area; any new roadways, driveways, patios, and tracks and similar whether they are permeable or impermeable. You need not include re-surfacing works where the full construction depth is not replaced.	68,700 m ²

2. Details of how surface water is to be managed and discharged (compliance with the Welsh Government's Statutory Standards for Sustainable Drainage Systems will be required for applications with a construction area greater than 100 m²).

The SuDS Standards and Building Regulations require surface water to be discharged at the highest priority level available for that site. Please complete the tables below to show how surface water will be discharge from the site and why water has not been discharged at higher priority levels. Where required and helpful, please reference other plans and documents within the planning application.

Priority Level 1 – Surface water runoff is collected for use	
Will surface water be collected for use?	YES
If yes, what form will that rainwater harvesting take?	Rainwater harvesting to be incorporated into the final design but will not be adequate to deal with the site drainage
If no, why not?	

Priority Level 2 – Surface water runoff is infiltrated to ground	
Will surface water be infiltrated to ground?	NO
If yes, what infiltration features are proposed?	
If yes, please provide evidence that use of infiltration is viable.	
If no, why not?	Surrounding geology is not indicative of infiltration

Priority Level 3 – Surface water runoff is discharged to a surface water body i.e. watercourse	
Will surface water be discharged to a surface water body?	YES
If yes, please provide details of your proposed discharge location. If the surface water body does not appear on OS maps please include details of the surface water body from the point of discharge to the first point it appears on OS mapping.	Catchment 1,2,3,5 and 6 are proposed to discharge to an unnamed tributary of the River Monnow at NGR: SO492120. Catchments 4 and 7 is proposed to discharge to a land drain at NGR: SO494119
If yes, and a connection across third party land is proposed, please provide evidence that permission for the proposed works has been obtained from the landowner.	
If no, why not?	

Priority Level 4 – Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system	
Will surface water be discharged to a surface water sewer, highway drain or another drainage system?	NO
If yes, please provide details of the system into which you intend to discharge. Reference other plans in the planning application if necessary.	
If yes, please provide evidence of permission to discharge into that system from the owner of that system.	
If yes, and a new surface water sewer across third party land is proposed (for example, to reach a surface water body), please provide evidence that permission for the proposed sewer has been obtained.	
If no, why not?	Aim to Discharge to a watercourse.

Priority Level 5 – Surface water runoff is discharged to a combined sewer	
Will surface water be discharged to a combined sewer? <i>Please note, the SuDS Standards do not allow surface water to be discharged to a <u>foul</u> sewer.</i>	NO
If yes, please provide details of your proposed discharge location.	
If yes, please provide evidence that the sewage undertaker is willing to accept a connection.	

3. Information for the proposed SuDS elements of the surface water drainage system and an indication of the intended future maintenance regime.

Please provide a description of the SuDS features proposed, bearing in mind the requirement to provide hydraulic control, treatment, biodiversity and amenity. This might be aided by including a proposed surface water drainage layout plan in the planning application.	Attenuation ponds that serve Catchments 1,2,3,5 and 6 and Attenuation tanks in 3,4,5,6 and 7. Consideration should be made for road side swales to allow for reduced gullies and improved maintenance at the design stage.
Who will be responsible for future maintenance of the SuDS features? <i>MCC is required to adopt SuDS features serving two or more properties (unless the site is controlled by a single person or two or more persons together). Agreement of commuted sums would be required for such an adoption.</i>	SUDS will be adoptable by MCC. If MCC do not adopt geo-cellular attenuation tanks, a management company will be appointed to undertake the maintenance of these features.

Useful references

Key documents and links which will assist with the production of an appropriate surface water drainage strategy and completion of this document:

<https://www.monmouthshire.gov.uk/sab/>

Statutory Standards for Sustainable Drainage Systems – Welsh Government – 2018. *This is the document against which applications for SuDS approval are assessed.*

The SuDS Manual (C753) – CIRIA – 2015. *This document is available from CIRIA as a free of cost download. It contains a huge amount of information on SuDS.*

BRE Digest 365. Soakaway Design. *This document contains the method for infiltration rate tests which will be required for most applications for SuDS approval. Applicants should also note the requirement to understand ground conditions and the likely consequences of using any infiltration features.*

The Building Regulations 2010. Approved Document H. Drainage and Waste Disposal. *The percolation test described by this document is only appropriate for infiltration features serving an area of less than 100 m². Full scale rate tests (as described by BRE Digest 365) are normally required for SuDS approval.*

British Standard BS EN 16941-1:2018 - Rainwater Harvesting Systems. *This document is a recommended Code of Practice for no-potable non-potable rainwater harvesting systems.*

Planning Policy Wales Technical Advice Note 15 (TAN15) – Development, flooding and coastal erosion – Welsh Assembly Government – March 2025.

